Figure 3.1-1a
AEMP Monitoring Sites, Northern Hope Bay Belt

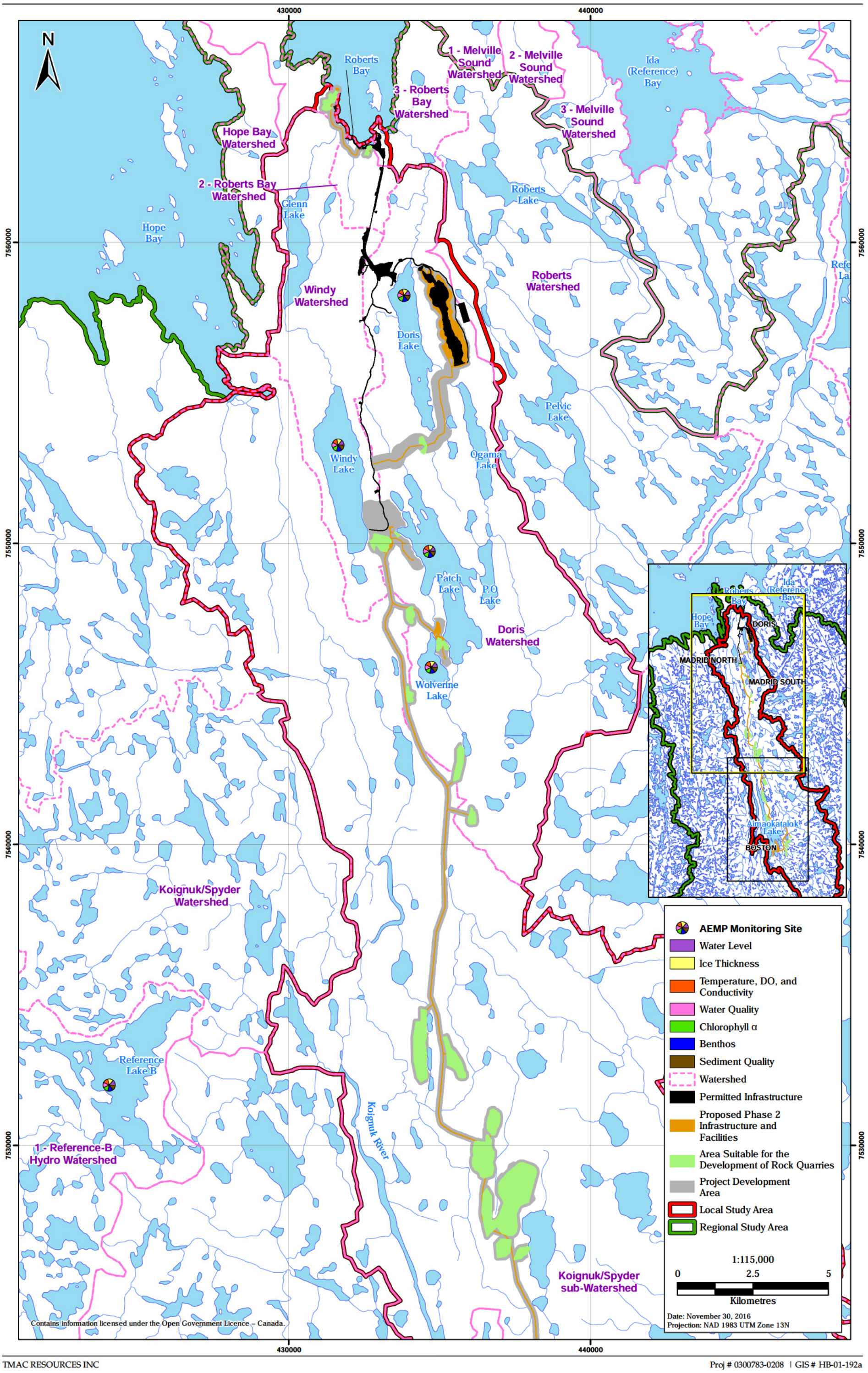

Figure 3.1-1b
AEMP Monitoring Sites, Southern Hope Bay Belt

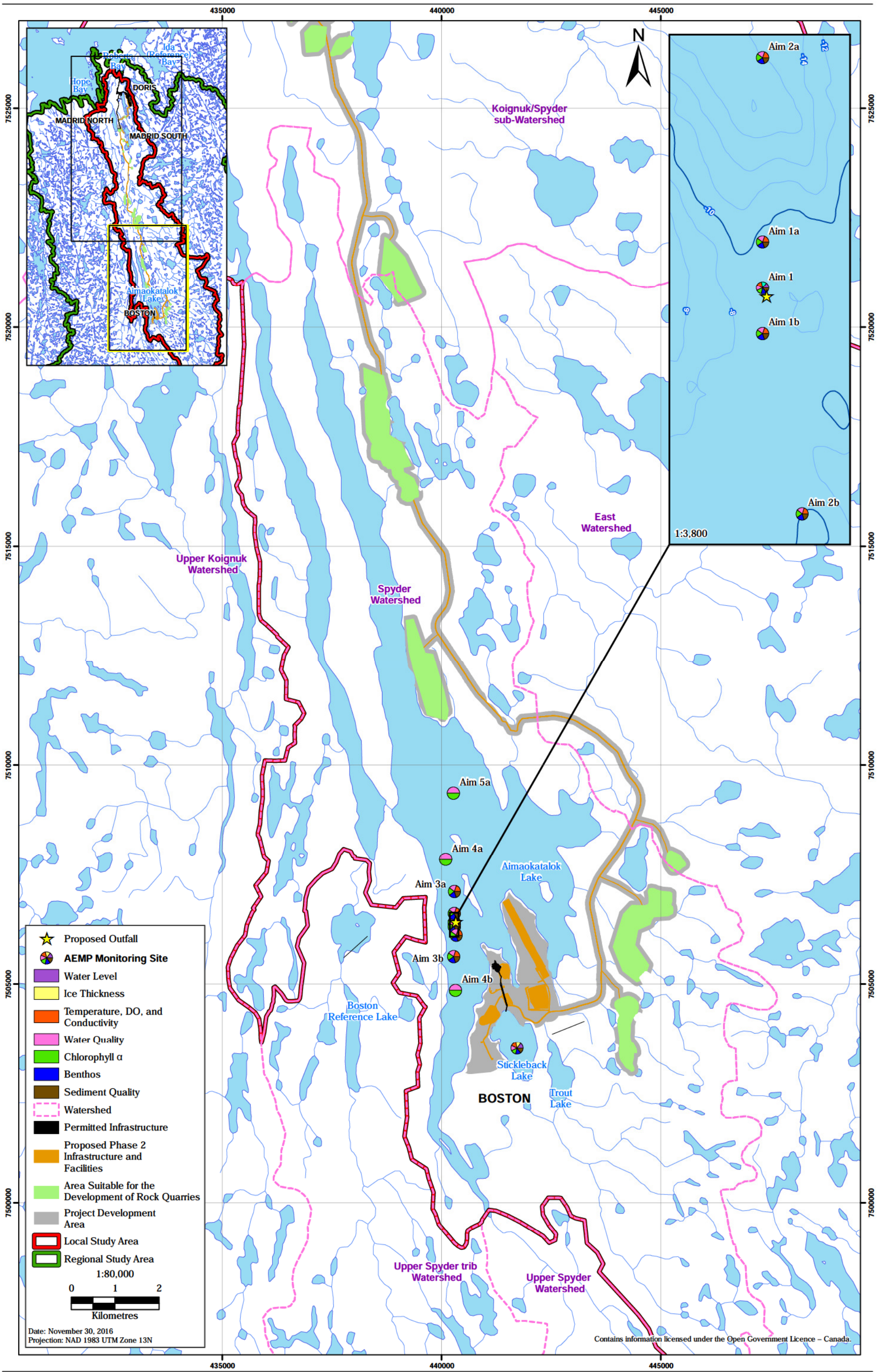

Table 3.1-1. Monitoring Location Descriptions and Monitoring Triggers

Watershed	Station	Description	Monitoring Trigger	Reason
Windy Watershed	Windy Lake	Deep basin representative of lake	Madrid North Construction and Operations	Direct water withdrawal; Indirect inputs due to proximity
			Madrid South Construction and Operations	Direct water withdrawal
Doris Watershed	Wolverine Lake	Deep basin representative of lake	Madrid South Construction and Operations	Groundwater inflows; Indirect inputs due to proximity
	Patch Lake	Deep area in center of lake representative of lake	Madrid North Construction and Operations	Groundwater inflows; Indirect inputs due to proximity
			Madrid South Construction and Operations	Groundwater inflows; Indirect inputs due to proximity
	Doris Lake	Deep basin representative of lake	Madrid North Construction and Operations	Direct water withdrawal; upstream loss from groundwater mine inflows Indirect inputs due to proximity
			Madrid South Construction and Operations	Direct Water withdrawal; upstream loss from groundwater mine inflows
			Boston Operations	Direct Water withdrawal
Aimaokatalok Watershed	Stickleback Lake	Deep basin representative of lake	Boston Construction and Operations	Indirect inputs due to proximity
	Aimaokatalok 1	Proposed diffuser location, near to Project activities	Boston Construction and Operations until replaced by MMER-EEM program	Indirect inputs due to proximity
	Aimaokatalok 1a	MMER EEM sampling location 50 m north of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 1b	MMER EEM sampling location 50 m south of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 2a	MMER EEM sampling location 250 m north of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity

Watershed	Station	Description	Monitoring Trigger	Reason
Aimaokatalok *(cont'd)*	Aimaokatalok 2b	MMER EEM sampling location 250 m south of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 3a	MMER EEM sampling location 750 m north of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 3b	MMER EEM sampling location 750 m south of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 4a	MMER EEM sampling location ~ 1.5 km north of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 4b	MMER EEM sampling location ~ 1.5 km south of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
	Aimaokatalok 5a	MMER EEM sampling location ~ 3 km north of diffuser, ~10-15 m depth	Discharge to Aimaokatalok Lake - MMER	Direct inputs (MMER discharge); Indirect inputs due to proximity
Reference	Reference Lake B	Deep basin representative of lake	Doris, Madrid, and Boston Construction and Operations	none

During Boston construction and operations, Stickleback Lake and Aimaokatalok Lake Station 1 (Aim 1) will be sampled for non-point source effects and water level. Following the initiation of discharge to Aimaokatalok Lake, sampling of Aim 1 will be replaced by sampling a larger group of locations in Aimaokatalok Lake arrayed in a gradient transect design focused on monitoring for mine discharge effects.

The monitoring schedule, sampling frequency, and sampling device for each of the Plan's environmental monitoring components is outlined in Table 3.1-2.

The water level in monitored lakes will be continuously recorded and downloaded annually at all sites. Ice thickness will be measured in at each monitoring lake in April. Water quality and phytoplankton biomass (as chlorophyll *a*) samples as well as physical profiles of temperature, dissolved oxygen, and conductivity will be collected twice a year to represent both winter (April sampling) and summer (August sampling) conditions. At Aimaokatalok Lake MMER-related sampling locations water quality will be additionally sampled in July and September to conform with MMER requirements. Benthic invertebrate and sediment quality sampling will be conducted very three years during August. Sampling will be conducted on a similar schedule in Reference Lake B for all environmental components, except water level, which will not be monitored in the lake.

Table 3.1-2. Monitoring Schedule, Sampling Frequency, and Sampling Device

Monitoring Parameter	Frequency*	Sampling Device
Water level	Continuous recording (download annually)	Transducer and data logger
Ice thickness	Annually (April)	Manual measurement
Temperature, dissolved oxygen and conductivity	2× per year (April, August)	Temperature-DO-conductivity meter
Water Quality (Physical, nutrients, total metals)	2× per year (April, August)	Discrete sampler
Phytoplankton Biomass (as chl *a*)	2× per year (April, August)	Discrete sampler
Benthic Invertebrates	once every 3 years (August)	Ekman Grab (500 µm sieve)
Sediment Quality	once every 3 years (August)	Ekman Grab

Monitoring frequency outlined in this table applies to periods during which monitoring is triggered as outlined in Table 3.1-1.
**For MMER EEM-related monitoring locations (as identified in Table 3.1-1), water quality sampling will also occur in July and September, and will follow requirements of the MMER at a minimum even if this deviates from this table.*

This Plan has been developed with a focus on Construction and Operations phases. During Care and Maintenance as well as Closure, sampling will continue as prescribed under the MMER at sites related to MMER EEM discharge sampling in Aimaokatalok Lake (as identified in Table 3.1-1). Water level monitoring will also continue as long as combined winter water withdrawal and groundwater inflows are greater than 10% of lake volume. Due to the reduction of site activities, other sampling addressing non-point-source inputs will be suspended during Care and Maintenance and Closure unless effects have been detected in immediately preceding years.

3.2. MONITORING COMPONENTS

3.2.1. Water Level and Ice Thickness

Methods

Lake water levels, and hence drawdown, will be measured continuously throughout the year at lakes depicted in Figure 3.1-1. A pressure transducer paired with a data logger will be installed in each lake at a depth suitable to avoid ice damage and to allow data to be collected throughout the year. Data are recorded in 10-minute intervals and are downloaded annually.

Ice thickness monitoring will occur once each year in April concurrent with water sampling.
The measurement will be taken through an augured hole and the thickness recorded using a metred rod. Lake bottom depth will also be measured using a depth sounder or a weighted and metred line.

Effects Analysis

Water level data will be examined to determine if water level reductions during impact years at Doris and Windy watershed lakes are within those predicted.

Quality Assurance and Quality Control (QA/QC)

The collection and analysis of water level data will follow procedures outlined in the 2014 Hydrology Report (ERM Rescan 2014). A number of procedures are used, both in the field and in the office, to assess and assure data quality obtained from the hydrometric station. Field QA/QC procedures include following accepted water level surveying procedures and using stable benchmarks (such as bedrock).

Field crews are trained to employ consistent methods for measuring ice thickness to ensure comparability of data.

3.2.2. Water Quality

Methods

Water quality sampling will be conducted in April and August of each year at all sites, and will be collected at the surface (1 m depth; 1 m below the ice in winter) and depth (2 m from sediments) during each survey using an acid-cleaned discrete sampling device (e.g., GO-FLO or Niskin).

All water samples will be collected using laboratory-approved clean sampling bottles, with personnel using powder-free nitrile gloves. Following collection, samples will be preserved with the appropriate chemicals and properly labelled and stored. All samples will be sent to an accredited analytical laboratory within the appropriate holding times, and at a minimum, will be analyzed for the water quality parameters outlined in Table 3.2-1 (except temperature and dissolved oxygen). Several other parameters not listed in the table (e.g., calcium, sodium, conductivity, total dissolved solids, sulphate, and other metals) will also be analyzed and will be reported in the appendices of the annual AEMP report.

Water quality samples collected from MMER EEM sites (as identified in Table 3.1-1) will also be analyzed for any additional parameters which may be required under the MMER (e.g., cyanide and Radium 226), and will additionally be sampled in July and September to address the MMER EEM requirements.

Dissolved oxygen, temperature, and conductivity profiles will be conducted during each water quality survey using a calibrated temperature-conductivity-dissolved oxygen meter. Each open-water profile will extend from the surface to approximately 1 m above the sediment surface, with values recorded every 1 m. Under-ice profiling will begin just below the base of the ice layer (approximately 2 m) and will extend to 1 m above the sediments. All data will be recorded onto field sheets with the applicable meta-data such as date, time, personnel, weather, calibration data, and ice thickness measurements.

Table 3.2-1. Freshwater Water Quality Parameters

Physico-chemical	Total Metals
pH [a, b, e]	Aluminum (Al) [a, c]
Alkalinity [b, e]	Arsenic (As) [a, d]
Hardness [b, e]	Boron (B) [a]
Chloride [a]	Cadmium (Cd) [a, c]
Salinity [e]	Chromium (Cr) [a]
Conductivity [e]	Copper (Cu) [a, d]
Total Suspended Solids [a, d]	Iron (Fe) [a, c]
Turbidity [a]	Lead (Pb) [a, d]
Temperature [a, b, e]	Mercury (Hg) [a, c]
Dissolved Oxygen [a, e]	Molybdenum (Mo) [a, c]
Water Depth	Nickel (Ni) [a, d]
Nutrients	Selenium (Se) [a, c]
Ammonia [a, c]	Silver (Ag) [a]
Nitrate [a, c]	Thallium (Tl) [a]
Nitrite [a]	Uranium (U) [a]
Total Phosphorus [a]	Zinc (Zn) [a, d]
Orthophosphate	

[a] *Parameters with CCME water quality guidelines for the protection of aquatic life.*
[b] *Co-factors for the determination of site-specific environmental quality benchmarks.*
[c] *subject to EEM Effluent Characterization Study (Schedule 5 s.4(1a-h))*
[d] *MMER deleterious effluent substance (Schedule 4 - Column 1)*
[e] *subject to EEM Water Quality Monitoring Study (Schedule 5 s. 7(1b-c))*

Analysis of Effects

For non MMER EEM-related sites, water quality parameters with CCME guidelines will be evaluated for potential effects using a before-after-control-impact (BACI) design. 'Before' data will be that collected at a site prior to potential impacts, and will differ by site and will include any comparable data collected to date. For Doris Lake, 'before' data will be data collected prior to 2016, as defined in the Doris AEMP. For other lakes identified as potentially impacted by Madrid North development, 'before' data will be data collected prior to mining at Madrid North. For Wolverine Lake (which may be affected by Madrid South development), 'before 'data will be data collected prior to Madrid South portal/mine development. Similar, for Boston non-MMER sampling, 'before' data will be that collected prior initiation of mining. Data collected following these project milestones will serve as the 'after' data.

Reference Lake B will be the 'control' component of this monitoring, and other monitoring sites will be the 'impact' components for analyses purposes. The interaction between the 'before-after' and 'control-impact' terms is the BACI effect of interest.

For the MMER EEM-related monitoring, where a replicated gradient sampling design has been employed, analysis will evaluate for spatial trends in effects relative to the point of discharge. This

analysis will consider 'before' conditions, which will be represented by data collected prior to initiation of mine discharge to Aimaokatalok Lake. Monitoring parameters analyzed will include water quality parameters with CCME guidelines as well as those listed under the MMER.

Those parameters without MMER or CCME guidelines, such as water hardness, sodium, and sulphate, will be reported in appendices with summary information, and the data used where necessary to support the evaluation of effects.

Quality Assurance and Quality Control (QA/QC)

Quality assurance measures will include Environmental staff being trained to carry out the sampling as well as QA/QC procedures such as using certified laboratories for analyses, and using lab-approved clean bottles, high quality preservatives, and distilled water. On-site quality control measures will include the use of chain-of-custody (CoCs) forms to track shipped samples and collecting travel blanks, field blanks, and replicate samples to assess potential sources of contamination and variability in the sampling program. The travel and field blanks are designed to identify sources of contamination during the collection and transportation of water samples, while replicate samples identify potential *in situ* variability within the sampling environment.

Rigorous quality assurance and control measures will be followed at the analytical laboratory, and will include identifying holding time exceedances and using split samples and spiked samples (using certified standards) to track laboratory precision and process recoverability.

3.2.3. Phytoplankton Biomass (as chlorophyll *a*)

Methods

Triplicate samples will be collected for phytoplankton biomass (as Chl *a*) from 1-m depth using a discrete sampling device. Each replicate sample will be collected in a foil-wrapped bottle and filtered onto a 0.45 µm filter. The volume of water filtered will be recorded, the filter frozen, and samples sent to a laboratory for analysis of chlorophyll *a*.

Analysis of Effects

Potential changes in phytoplankton biomass will be evaluated in a manner similar to that described for Water Quality, with chl *a* as the response parameter.

Quality Assurance and Quality Control (QA/QC)

The QA/QC program for chlorophyll *a* sampling will include collecting the water in a foil-wrapped bottle (to prevent further photosynthesis), keeping the filtered sample frozen at all times prior to analysis, collecting replicate samples, and use of CoC forms to track samples.

3.2.4. Benthos

Methods

Benthos will be collected using an Ekman grab sampler, with each sample being comprised of a composite of three subsamples. Each composited sample will be sieved to 500 µm, preserved with formalin, and sent to a taxonomist for identification and enumeration. Five replicate samples will be

collected in this manner from Wolverine, Patch, Doris and Windy lakes and Aimaokatalok Stn 1. A single sample will be collected from each of the MMER EEM-related monitoring locations in Aimaokatalok Lake, which target effects monitoring specific to MMER-related discharge.

Analysis of Effects

Potential changes in benthos will be evaluated as described for Water Quality with benthos metrics for effects evaluation including total density, richness, and diversity (both Simpson's and Bray-Curtis).

Quality Assurance and Quality Control (QA/QC)

The QA/QC program for benthos sampling will include the collection of subsamples and replicates to account for within-site variability and the use of CoC forms to track samples.

A re-sorting of randomly selected sample residues will be conducted by the taxonomist on a minimum of 10% of the benthos samples to determine the level of sorting efficiency. The criterion for an acceptable sorting will be that more than 90% of the total number of organisms will be recovered from the initial sort. The number of organisms initially recovered from the sample will be expressed as a percentage of the total number after the re-sort (total of initial and re-sort count). Any sample not meeting the 90% removal criterion will be re-sorted a third time.

3.2.5. Sediment Quality

Methods

Surficial sediment quality samples will be collected using an Ekman grab sampler. Samples will be collected concurrently with benthos sample collection. Each sediment sample will be carefully transferred onto a tray, and the top 2 to 3 cm of sediment will be removed and homogenized in a plastic bowl using a plastic spoon and placed into two containers: one for particle size, and one for sediment chemistry. All samples will be kept cool and sent to an accredited analytical laboratory within the appropriate holding times. Five replicate samples will be collected as described from Wolverine, Patch, Doris and Windy lakes and Aimaokatalok Stn 1. A single sample will be collected from each of the MMER EEM-related monitoring locations in Aimaokatalok Lake, which target effects monitoring specific to MMER-related discharge.

Samples will be analyzed for the sediment quality parameters outlined in Table 3.2-2. Other metal parameters not listed in the table may be analyzed as related outputs to the laboratory analyses necessary to produce the lists parameters. Any such parameters will also be reported in the appendices of the annual AEMP report.

Analysis of Effects

Sediment quality parameters will be evaluated for potential Project-related effects in a manner similar to that described for water quality.

Quality Assurance and Quality Control (QA/QC)

The QA/QC program for sediment quality sampling will include the collection of replicates to account for within-site variability and the use of chain of custody forms to track samples. Rigorous quality assurance and control measures will be followed at the analytical laboratory, and will include identifying holding

time exceedances and using split samples and spiked samples (using certified standards) to track laboratory precision and process recoverability.

Table 3.2-2. Freshwater Sediment Quality Parameters

Physical and Nutrients	Total Metals
% Moisture	Arsenic (As) a
pH	Cadmium (Cd) a
Particle size[b]	Chromium (Cr) a
Total Nitrogen	Copper (Cu) a
Total organic carbon[b]	Lead (Pb) a
	Mercury (Hg) a
	Zinc (Zn) a

[a] *Parameters with CCME sediment quality guidelines for the protection of aquatic life (CCME 2015).*
[b] *required for EEM benthic invertebrate survey*

4. REPORTING

The results of the monitoring and analysis described within this Plan will be reported annually to the NWB during construction and operations and as required by the MMER to ECCC. If adverse trends are detected, the results will be communicated to TMAC management and further investigation will be undertaken.

REFERENCES

Metal Mining Effluent Regulations, SOR/2002-222.

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Annex 22

Hope Bay Project Wildlife Mitigation and Monitoring Plan

PHASE 2 OF THE HOPE BAY PROJECT

WILDLIFE MITIGATION AND MONITORING PLAN

December 2016

PLAIN LANGUAGE SUMMARY

This Wildlife Mitigation and Monitoring Plan (WMMP; the Plan) describes what TMAC will do to confirm that wildlife near the Hope Bay Project (the Project) activities are not unduly affected by the Project.

The Plan describes the mitigation measures that will be used to reduce the potential for the Project to affect wildlife, and how information will be collected to determine if the mining activities are affecting wildlife in the area.

REVISION RECORD

Date	Section	Summary of Changes	Author	Approver
December 2016	Throughout	Initial Hope Bay Project-wide plan	K. Venter	TMAC
	Throughout		M. Setterington	EDI

GLOSSARY AND ACRONYMS

Term	Definition
AWR	All-Weather-Road
the Belt	Hope Bay Belt
BHP	BHP Billiton Ltd.
CESCC	Canadian Endangered Species Conservation Council
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
ELC	Ecosystem Land Classification
ECCC	Environment and Climate Change Canada (formerly Environment Canada (EC))
ERM	ERM Consultants Canada Ltd.
FEIS	Final Environmental Impact Statement
GIS	Geographical Information System
GN	Government of Nunavut
GN DOE	Government of Nunavut Department of Environment
IEAC	Inuit Environment Advisory Group
IQ	Inuit *Qauajimajatuqangit*
KIA	Kitikmeot Inuit Association
LSA	Local Study Area
MHBL	Miramar Hope Bay Limited
Miramar	Miramar Mining Corporation
MOU	Memorandum of Understanding
Nest Predator	Avian nest predators include species such as fox species, weasels, gulls, jaegers, and common raven.
Newmont	Newmont Mining Corporation
NIRB	Nunavut Impact Review Board
PRISM	Program for Regional and International Shorebird Monitoring
the Program	The Wildlife Mitigation and Monitoring Plan Compliance Monitoring Program
the Project	The Hope Bay Project
the Project Certificate	Doris North Gold Mine Project Certificate
the Report	The annual report generated as a product of execution of the Wildlife Mitigation and Monitoring Plan
RSA	Regional Study Area
RWED	Northwest Territories Department of Resources, Wildlife, and Economic Development

Term	Definition
SARA	*Species at Risk Act* (2002) - A Canadian federal statute which is designed to meet one of Canada's commitments under the International Convention on Biological Diversity. The goal of the Act is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy.
TIA	Tailings Impoundment Area located near Doris Camp
TMAC	TMAC Resources Inc.
TMA	Tailings Management Area located near Boston Camp
VECs	Valued Ecosystem Components
VRPC	Variable Radius Point Counts
WMMP	Wildlife Mitigation and Monitoring Plan
The Plan	This issuance of the Wildlife Mitigation and Monitoring Plan
WRT	Wildlife Response Team
ZOI	Zone of Influence

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1. INTRODUCTION

This wildlife mitigation and monitoring plan identifies the measures taken to minimize, monitor, and evaluate potential Hope Bay Project-related impacts on wildlife. The Hope Bay Project (the Project) includes the existing Doris Project (Nunavut Impact Review Board [NIRB] Project Certificate No. 003) as well as the proposed Phase 2 Project developments which includes three underground mines (Madrid North, Madrid South, and Boston) and associated infrastructure as well as use of the existing Doris facilities (as outlined in Phase 2 of the Hope Bay Project: Draft Environmental Impact Statement).

Due to the interconnectivity of the Hope Bay projects (Doris, Madrid and Boston), this belt-wide Wildlife Mitigation and Monitoring Plan (WMMP; the Plan) was developed. This Plan expands upon previous versions of the WMMP, e.g., (ERM 2016) for the Doris Project. The Doris WMMP was designed to fulfill the following wildlife-related requirements of the Doris North Gold Project:

- Terms and Conditions identified in the Nunavut Impact Review Board Project Certificate No. 003;
- Wildlife issues identified in the Framework Agreement between the KIA and TMAC Resources Inc. (TMAC); and
- To assess potential project-related effects on Valued Ecosystem Components (VECs) as predicted in the Doris Final Environmental Impact Statement.

The original WMMP was updated in 2006 (Miramar 2006), 2011 (Rescan 2011), 2013 (Rescan 2013), and 2016. On each filing of this Plan, input from all relevant organizations was sought by the NIRB, including the Kitikmeot Inuit Association (KIA), Government of Nunavut Department of Environment (GN DOE), Environment and Climate Change Canada (ECCC)/Canadian Wildlife Service (CWS), and Fisheries and Oceans Canada (DFO). Each Plan revision reflected input from the discussion with, and review by, the relevant agencies and organizations, as well as consideration of traditional knowledge gathered and improvements to scientific monitoring techniques.

This Plan is a living document, and it is anticipated that further revisions will be made based on ongoing input, monitoring outcomes, development activities, and improvements in technology or monitoring techniques. On approval of the Phase 2 Project, it is anticipated that this Hope Bay Project-wide Plan would replace the existing Doris WMMP.

1.1. PROJECT OVERVIEW

The Doris Project — Following acquisition of the Hope Bay Project by TMAC in March of 2013, planning and permitting, advanced exploration and construction activities focused on bringing Doris into gold production in early 2017. In 2016, the Nunavut Impact Review Board and Nunavut Water Board (NWB) granted an amendment to the Doris Project Certificate and Doris Type A Water Licence respectively, to expand mine operations to 6 years and mine the full Doris deposit. Mining and milling rates were increased to a nominal 1,000 tpd to 2,000 tpd.

The Doris Project includes the following:

- The Roberts Bay offloading facility: marine jetty, barge landing area, beach and pad laydown areas, fuel tank farm/transfer station, and quarries;
- The Doris site: Accommodations, laydown area, service complex (e.g., workshop, wash bay), quarries, fuel tank farm/transfer station, potable water treatment, waste water treatment, incinerators, explosives storage, and diesel power plant;
- Doris Mine works and processing: underground portal, temporary waste rock pile, ore stockpile, and processing plant;
- Water use for domestic, drilling and industrial uses, and groundwater inflows to underground development;
- Tailings Impoundment Area (TIA): Schedule 2 designation of Tail Lake with two dams (North and South dams), roads, pump house, and quarry;
- All-weather roads and airstrip, winter airstrip, and helicopter pads; and
- Water discharge from the TIA will be directed to the outfall in Roberts Bay.

The Phase 2 Project includes the Construction and Operation of commercial mining at the Madrid (North and South) and Boston sites, the continued operation of Roberts Bay and the Doris sites to support mining at Madrid and Boston, and the Reclamation and Closure and Post-Closure phases of all sites. Excluded from the Phase 2 project, for the purposes of the assessment, are the Reclamation and Closure and Post-closure of unaltered components the Doris Project as currently permitted and approved.

The Phase 2 Project represents the staged development of the Hope Bay Belt beyond the Doris Project (Phase 1). Phase 2 operations include:

- mining of the Madrid North, Madrid South, and Boston deposits;
- transportation of ore from Madrid North, Madrid South and Boston to Doris for processing, and transportation of concentrate from process plants at Madrid North and Boston to Doris for final gold refining once the process plants at Madrid North and Boston are constructed;
- use of Roberts Bay and Doris facilities, including processing at Doris and maintaining and operating the Robert's Bay outfall for discharge of water from the TIA;
- operation of a process plant at Madrid North to concentrate ore, and disposal of tailings at the Doris TIA;
- operation of a process plant at Boston to concentrate ore, and disposal of tailings to the Boston TMA; and
- ongoing use and maintenance of transportation infrastructure (cargo dock, jetty, roads, and quarries).

1.2. OVERALL OBJECTIVE

The WMMP identifies the mitigation measures used to minimize Project impacts to wildlife and specify the monitoring that will be conducted to verify that any residual impacts are comparable to those predicted.

Additional objectives specific to the targeted wildlife monitoring programs are outlined in Section 2.3. Where possible and practical, monitoring programs are coordinated with wildlife studies or monitoring activities conducted in the Project study area by other organizations, institutions, government departments to minimize the impacts on wildlife from studies or survey activities.

1.3. RELEVANT LEGISLATION AND GUIDANCE

There are a number federal and territorial regulations guiding TMAC's WMMP (Table 1.3-1).

Table 1.3-1. Relevant Regulations and Guidance

Regulation	Year	Governing Body	Relevance
Nunavut Wildlife Act	2003	Government of Nunavut	Identifies and defines wildlife management in Nunavut, including legislated responsibilities for the conservation, protection and recovery of species at risk, managing nuisance wildlife, and possession of wildlife.
Nunavut Land Claims Agreement Act	1993	Nunavut Wildlife Management Board	Establishes the Nunavut Wildlife Management Board as the responsible authority for the management of Nunavut wildlife and wildlife habitat in partnership with the government.
Canada *Wildlife Act*	1994	Environment and Climate Change Canada	Identifies wildlife research and conservation, and allows for the creation, management, and protection of wildlife areas
Migratory Birds Convention Act	1994	Environment and Climate Change Canada	Identifies wildlife research and conservation, and allows for the creation, management, and protection of wildlife areas
Canada *Species at Risk Act*	2002	Environment and Climate Change Canada	Designed to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct

1.4. RELATED TMAC DOCUMENTS AND PROGRAMS

The protection of the environment, including wildlife, is addressed through a variety of other mitigation measures implemented though various Hope Bay Project management plans within the Hope Bay Environmental Health and Safety Management System. Table 1.4-1 provides a summary of documents related to the Hope Bay Project WMMP. Further discussion on the relevant mitigation measures of each of these plans is provided in Section 4.2 of this document.

Table 1.4-1. Documents Related to the Wildlife Mitigation and Monitoring Plan

Document Title	Relevance
Noise Abatement Plan	Measures to reduce and monitor for noise impacts on the surrounding environment.
Air Quality Management Plan	Measures to reduce and monitor for environmental air quality impacts.
Spill Contingency Plan	Spill response procedures to minimize environmental effects, including wildlife-related spill response.
Non-Hazardous Waste Management Plan	Measures for segregation and management of wastes
Incineration Management Plan	Measures for disposal of food wastes to minimize wildlife attraction.
Hazardous Waste Management Plan	Measures for management of hazardous wastes protective of the environment.
Water Management Plan	Measures for managing Project-affected surface water to minimize impacts to the environment
Domestic Wastewater Treatment Management Plan	Measures for managing and treating domestic wastewater to minimize impacts to the environment
Oil Pollution Preparedness Plan/Oil Pollution Emergency Plan	Spill response procedures to minimize environmental effects, including wildlife-related spill response.

1.5. PLAN MANAGEMENT AND EXECUTION

The WMMP is a living document, intended to change over time in response to the results of the Program, changing conditions or development within the Hope Bay Belt, updates to scientific methods, and through discussions with the NIRB, KIA, ECCC/CWS, and the GN DOE.

The first WMMP was submitted as part of the Doris Project FEIS in 2005, and revisions were provided in 2006, 2001 and 2013.

During the evolution of the wildlife mitigation and monitoring programs applicable to the Hope Bay Belt projects, monitoring study design changes have been made based on regulatory and community feedback as well as monitoring results, technological and statistical advances, or project development. Traditional knowledge has also informed initial VECs selection, placement of caribou crossing structures, monitoring cameras, and DNA tripods, and has fed into practices of incinerating food waste to preclude the attraction of bears.

The result of this adaptive approach is that, in some cases, the objectives and methods used to study particular effects on certain VECs have changed and will continue to change over time. A brief overview of how the objectives of the WMMP have evolved over time is included in Section 2, Monitoring Objectives, along with the detailed objectives proposed in this Plan. Methods associated with the monitoring programs are discussed in Section 3, Methods.

Hence, the requirements for each new WMMP revision are predicated on previous versions of the WMMP, comments received on those Plans or during various permitting process, as well as comments on WMMP-related reporting. Changes can also be made as a result of ecological knowledge learned

from elders or land users while working in the field or from feedback from community workshops or comments and input from the Inuit Environment Advisory Group (IEAC).

TMAC is committed to considering and incorporating traditional knowledge into all stages of the WMMP, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs. Additionally, local hunters and community members have, and will continue to, participate in or lead the conduct of wildlife baseline and monitoring programs.

This Plan is reviewed annually and updated as needed. Personnel responsible for implementing and updating the Plan are identified in Table 1.5-1.

Table 1.5-1. Roles and Responsibilities

Role	Responsibility
VP Operations	Overall responsibility for, and implementation of, mitigation measures outlined in this management plan; Provide input on practicality of modifications to reduce potential impacts.
Surface Manager	Support and verify on-site adoption of management practices outlined in the Plan.
VP Environmental Affairs	Ensure this Plan is annually reviewed and updated as needed; Provide necessary resources for the execution of monitoring and reporting as outlined in this Plan.
Environmental Coordinators / Technicians / Consultants	Conduct the monitoring and reporting outlined in this Plan.

2. MONITORING

2.1. PURPOSE

The main purposes of the WMMP are to:

- design and implement a WMMP that can be applied to all mine developments associated with the Hope Bay Belt Project;
- implement a WMMP designed to reduce the risks and disturbance to wildlife species and habitats;
- verify the accuracy of mitigated impact predictions made in the Doris FEIS and the Phase 2 DEIS, and identify unanticipated effects or areas for mitigation improvement;
- determine the effectiveness of mitigation;
- consider and incorporate, where possible, TK into the WMMP;
- where practical, design studies and data collection protocols that are consistent with other monitoring programs in the Arctic, which can be used to understand and manage regional cumulative effects, and participate in regional and/or collaborative programs;

- incorporate appropriate input from the GN DOE, ECCC, and the KIA as well as the Hope Bay Project Inuit Environmental Advisory Committee (IEAC);
- review and further refine the WMMP in collaboration with the GN DOE, ECCC, and the KIA as well as the Hope Bay Project Inuit Environmental Advisory Committee (IEAC); and
- provide regular reporting that will satisfy all interested and concerned stakeholders and provide the opportunity for feedback from communities, governments, and the public.

Monitoring described in this WMMP is organized around three monitoring themes based on the potential effects identified during the environmental assessment process. They are:

1. monitoring of habitat loss and alteration;
2. VEC-specific population monitoring to evaluate potential changes in distribution or density; and
3. monitoring for wildlife interactions with the Hope Bay Project (e.g., attraction to Project infrastructure), including incidents and mortalities.

Specific objectives are organised around these three themes and presented in Sections 2.1 and 2.2, respectively. These objectives are aligned with those of the existing Doris WMMP.

2.2. MONITORING SUMMARY

An overview of the wildlife monitoring conducted to date on the Hope Bay Belt is provided in the Phase 2 EIS.

Proposed monitoring programs which will be employed to address potential Hope Bay Project effects, by project phase, are outlined in Table 2.2-1.

Table 2.2-1. Proposed Wildlife Monitoring by Project Phase

	Care & Maintenance	Construction & Operations
1. Habitat Loss and Alteration *Objective: Measure habitat loss due to construction of the Project*		
1) GIS analysis comparing footprint with Habitat Suitability Mapping		x
2. VEC-Specific Monitoring *Objective: Measure for avoidance or attraction to the Project site*		
Caribou		
1) Remote camera monitoring		x
2) Memorandum of Understanding (contribution to regional monitoring initiatives)		x
3) Kernel density range analysis using available caribou collar data		x
Grizzly Bear		
1) Zone of influence monitoring with remote cameras		x
Wolverine		

	Care & Maintenance	Construction & Operations
1) Zone of influence monitoring with remote cameras		x
Upland Bird		
1) Point counts to monitor species richness and abundance		x
2) PRISM plots to monitor species richness and abundance		x
Waterfowl (including seabirds)		
1) Waterfowl and seabirds – aerial surveys to estimate density and species richness during spring pair establishment and the brood rearing periods		x
Raptors		
1) Nest monitoring to estimate occupancy rate and productivity		x
3. Wildlife Interactions with, and Incidents or Mortalities at, Site *Objective: Monitor for wildlife use of the site and any incidents or mortalities*		
1) Facilities interaction camera monitoring	x	x
2) Project monitoring of mitigation and tracking mortalities or incidents	x	x
3) Observational wildlife monitoring	x	x

2.3. OBJECTIVES AND OVERVIEW

2.3.1. Habitat Loss and Alteration

The objective of the program is to compare actual direct habitat loss associated with both the Doris and Phase 2 Projects to VEC-specific habitat loss predictions made for these projects. This objective has remained consistent for the Doris Project and is also appropriate for the Phase 2 Project.

Functional habitat loss may also occur due to alteration of habitat near to project development due to activities that alter the environment including noise, visual stimulation, or dust. These indirect project effects are quantified where appropriate and possible in the VEC-specific monitoring programs and the wildlife interaction, incidents, and mortalities monitoring as described below, as well as through other programs detailed in, and reported under, the Hope Bay Project Noise Abatement Plan and the Air Quality Management Plan. Where air quality related to the TIA has exceeded applicable objectives, the WMMP's habitat loss and alteration program will also include evaluation of those results in a caribou-specific habitat alteration context.

2.3.2. VEC-specific Monitoring

VEC-specific Monitoring describes the monitoring programs aimed at evaluating effects on the distribution and abundance of VEC species, or monitoring done specific to these species even if not specifically undertaken to directly address a response to disturbance (e.g., contributions for regional monitoring of caribou). The potential for wildlife to respond to disturbance from the Hope Bay Project mine developments by avoiding the projects or having other measurable effects (e.g., energetic or foraging costs for raptors) due to disturbance were evaluated as part of the Doris FEIS as well as the Phase 2 EIS.

The following sub-sections discuss the monitoring objectives on a species by species basis for each VEC and how these objectives may have been revised in response to methodological changes through time. The history of how the objectives of these programs have evolved over time, since the original Doris WMMP. A summary of this program evolution is provided below by VEC to create context for the currently proposed monitoring. Understandably, the objectives and programs currently determined appropriate for the Doris Project mine development are largely also appropriate for Phase 2 mine development with spatial expansion to cover the Phase 2 development areas. Any changes to the design of monitoring surveys that did not affect monitoring objectives are discussed in the methodological background sections for each VEC (see Section 3.3).

2.3.2.1. Caribou

Historical Monitoring

In 2005 the Doris FEIS predicted residual adverse effects for changes in movement and behaviour for caribou. The Doris FEIS described that caribou would likely avoid the Doris Project site, and have measurable changes in behaviour (e.g., more alert) near Doris. To evaluate the predicted effects, the 2005 and 2006 WMMPs proposed to measure "…caribou numbers, movement, distribution, behaviour, and group composition during the late winter and calving/post-calving periods". From 2006 to 2011, the caribou monitoring program built on baseline caribou studies that had been conducted from 1996 to 2005 using aerial surveys.

In 2010, following discussions with GN caribou biologists, a power analysis was conducted to examine whether it was possible to detect an avoidance effect in the distribution of caribou (a zone of influence - ZOI) through the existing aerial survey program. The results of the analysis found that caribou densities were too low to support this monitoring methodology, and these results were reported in the 2010 Report. Following subsequent discussions with GN caribou biologists, it was decided that the aerial survey program for caribou should be discontinued due to a lack of power to detect a possible ZOI and the undue disturbance low elevation aerial surveys might have on caribou given the limited usefulness of the resultant data.

In lieu of the aerial monitoring program for caribou, and following discussions with the GN in 2010 and 2011, it was proposed that the proponent enter into a collaborative process to monitor the Dolphin and Union caribou wherein the GN would take the lead on the program and the proponent would contribute funds or in-kind support. A Memorandum of Understanding (MOU) between TMAC and the GN was signed in 2015. This monitoring has comprised the off-site monitoring aspect for the Doris Mine, and would be used in a similar manner for the Phase 2 mines.

In addition to the caribou MOU, TMAC began remote camera monitoring and reporting on caribou densities observed. Due to the low caribou densities in the study area, these cameras were able to provide limited information on caribou densities, and as a result, this remote camera monitoring program was substantially revised in collaboration with the GN DoE and the KIA in 2016 to focus on maximizing program ability to detect a ZOI for grizzly bears, but with secondary uses for wolverine and caribou monitoring.

Additional information on the history of caribou monitoring at Hope Bay can be found in Appendix 1-1 of the 2014 Report (ERM 2015).

Proposed Monitoring

Due to the potential for impact to caribou from the Doris and Phase 2 projects, the objective of the caribou monitoring going forward is to continue with the monitoring determined appropriate for Doris with a spatial expansion of the area considered to include the Phase 2 developments. This monitoring includes continued contribution to the off-site Dolphin-Union caribou monitoring program being led by the GN as per the TMAC-GN 2015 MOU, as well as evaluation of remote camera data. Caribou collar data generated through the MOU will be compared to the Doris and Phase 2 projects (when under development or operation) annually, as will any available Beverly/Ahiak caribou collar data (see Section 3.4.3). The data collected from the camera program will continue to be used to quantify caribou densities, and be used to look for caribou density differences within varying distances from development footprints (see Section 3.4.1). The potential effects of mine-related activities on caribou will be monitored through the Wildlife Interactions, Incidents and Mortalities program described in Section 3.4.

2.3.2.2. Grizzly Bear

Historical Monitoring

In 2005, the Doris FEIS predicted that grizzly bear would alter their movement and behaviour to avoid the Doris site. It also predicted that grizzly bear may be attracted to elements of the site, including waste facilities. Grizzly bears may also be attracted to camps to investigate food and chemical smells.

The 2005 and 2006 Doris WMMPs proposed to evaluate whether grizzly bears are avoiding the Doris site with the objective of determining "…if the mine influences the relative use of seasonally preferred habitat by grizzly bears adjacent to the footprint". The methods to evaluate this objective included measuring the abundance of grizzly bear sign in high quality sites both near the Doris Project site and at a greater distance (control) sites. These data would then be analysed to evaluate whether there is a ZOI with fewer grizzly bear sign in an area surrounding the Project footprint. Following a safety review of the habitat monitoring program for grizzly bears, it was deemed too dangerous to have crews conducting remote ground surveys focused on high-quality bear habitat (e.g., willow and shrub patches along river) and this monitoring technique was discontinued in 2009.

Project Certificate requirements also influenced the design of the monitoring program, where they required the Project to collect a baseline population estimate of bears in the regional area using DNA techniques. In compliance with this requirement, Hope Bay Belt baseline bear population size was estimated using DNA mark-recapture studies in 2010 and 2011. Although DNA studies are able to provide some information on grizzly bear population in the region, these studies are not able to monitor for potential project effects.

In 2013 a revised WMMP outlined regional monitoring for grizzly bear using remote, motion and heat-triggered cameras. Cameras recorded bears and from these records differences in bear distribution were evaluated. This methodology has been successful elsewhere in determining the presence and phenology of large mammals within survey areas (Jenks et al. 2011; Tape and Gustine 2014). This program was improved in collaboration with the GN DoE and the KIA in 2016 and in consideration

of analyses (including power analysis of the ability to detect a ZOI) of the previously collected data. The revised camera-based sampling design was adopted in the summer of 2016.

Proposed Monitoring

As the proposed Phase 2 project has similar potential for effects to grizzly bears, monitoring objectives will remain the same as those currently employed for the Doris Project. Specifically, the potential effects of project-related activities on grizzly bear distribution will be monitored through the facilities and remote camera monitoring program described in Section 3.4.1. The remote camera monitoring will focus on whether there is an effect of the Hope Bay Project by analysing whether grizzly bear densities change with distance from infrastructure. The facilities and on-site monitoring will provide information on direct bear interaction with infrastructure.

2.3.2.3. Wolverine

Historical Monitoring

The 2005 Doris FEIS predicted that wolverine would alter their movement and behaviour to avoid the Doris Project. It also predicted that wolverine may be attracted to elements of the site, including waste facilities. Wolverine may be attracted to camps to investigate food and chemical smells.

The 2005 and 2006 Doris WMMPs proposed to evaluate if wolverine are avoiding the Doris Project site with an objective "…to determine if the mine influences the relative annual activity and probability of occurrence of wolverines adjacent to the footprint". The methods used to evaluate this objective included measuring the number of wolverine tracks along snow track surveys near the Project sites and at a greater distance (control) sites. These data would then be analysed to evaluate if there was a ZOI with fewer wolverine tracks in an area surrounding the Doris Project site compared to the control. Following a review of the data generated by this method, it was determined that this method was not generating sufficient information and was discontinued in 2009.

Following the discontinuation of the snow track surveys, wolverine hair-snagging based DNA studies were undertaken, influenced by the Doris Project Certificate requirement to estimate baseline wolverine population with this technology. Baseline DNA mark-recapture studies were performed in the Hope Bay Belt for wolverine in 2010 and 2011. As with grizzly bear, it was later determined that although this data was able to provide information on wolverine population in the region and supported the conclusion that wolverine occur in low densities in this area, these studies are not able to monitor for potential project effects.

The 2013 WMMP proposed regional monitoring for wolverine using remote, motion-triggered cameras. Cameras recorded wolverine (amongst other wildlife, and focusing on bears) and from these records a ZOI could be screened for. In collaboration with the KIA and GN DoE the wildlife camera program was re-designed in early 2016 to improve the likelihood of detecting a ZOI for wolverine should wolverine densities allow it.

Proposed Monitoring

As the proposed Phase 2 project has similar potential for effects to wolverine, monitoring objectives will remain the same as those currently employed for the Doris Project. Potential effects will be monitored

through the facilities and remote camera monitoring program described in Section 3.4.1 and the on-site monitoring (Section 3.4.2). The remote camera monitoring will focus on analyzing whether wolverine densities change with distance from the Project. The facilities and on-site monitoring will provide information on direct wolverine interaction with infrastructure.

2.3.2.4. Upland Breeding Birds

Historical Monitoring

The 2005 Doris FEIS predicted minor effects to upland breeding birds due to change in movement and behaviour (Construction and Operations) and attraction to the Doris Project (Construction and Operations). Changes in movement and behaviour were predicted with upland birds avoiding the site for nesting due to disturbance. Attraction to the Doris Project was evaluated as a potential effect for scavenger/nest predator birds and meso-predators like foxes being attracted to the landfill or other camp facilities.

To evaluate this prediction, the objective of the 2005 and 2006 Doris WMMP for upland breeding birds was "…to determine if the mine influences upland breeding bird density and species richness". The program was intended to evaluate if there is a zone of influence (ZOI) of lower density and species richness near the Project footprint. Methods included Variable Radius Point Count (VRPC) plots in transects extending from the Project site into the tundra and Program for Regional and International Shorebird Monitoring (PRISM) plots, as requested by CWS to add to the regional database of shorebirds in the Arctic.

These methodologies have continued to be employed for monitoring of upland breeding birds, with some plot redistribution over time to account for confounding differences in vegetation types. A rigorous statistical analysis of the data collected to date through this program is being undertaken by TMAC and may inform future program changes. More details regarding the design changes which have occurred to date are provided in Section 3.3.4.1.

PRISM plots, which examine a diverse group of tundra, ground-nesting species, are also a suitable method for detecting the ground-nesting short-eared owl as well as tundra-nesting shorebirds.

Proposed Monitoring

As the proposed Phase 2 project has similar potential for effects to upland breeding birds as the Doris Project, monitoring objectives will remain the same as those currently employed for Doris. Namely, the objective will be to determine whether the Project is resulting in a ZOI where upland breeding bird abundance and/or diversity is altered.

2.3.2.5. Waterbirds

Historical Monitoring

In 2005 the Doris FEIS predicted minor effects due to change in movement and behaviour during Construction and Operations. The objective of the 2005 and 2006 Doris WMMPs was to determine if the Doris Project might have affected the species richness or density of waterbirds in the waterbirds study area (see Section 3.3.5.1), with special attention to species of conservation concern, during (1) the period of nesting/pair territory establishment (2) and brood-rearing period.

The methods used to achieve these objectives included aerial surveys during the nesting and brood rearing periods in a series of treatment and control grids. Data analysis would compared the density and diversity of waterbirds near the Doris Project with control survey grids or areas of the same survey grid at a greater distance from the Doris and investigation of whether a ZOI is detectible surrounding the Doris Project. These stated objectives and methods were repeated, unchanged, in the 2009, 2011 and 2013 WMMPs. Changes to methodology prior to 2006 are described in Section 3.3.5.

Additional baseline aerial surveys were conducted for seabirds and seaducks in Roberts Bay in 2009 and 2010 to address Doris Project Certificate-specific requirements. Additionally, ground-based searches were also conducted on the shoreline and small islands in Roberts Bay in 2006, 2009, and 2010. Active nests detected were primarily of herring and glaucous gull, no colonial seaduck nesting areas were observed. Islands in Melville Sound, which Roberts Bay adjoins, and Maligihioviik are known to be good eider nesting locations (Banci and Spicker 2015a). The requirement to collect additional baseline for seabirds and seaducks is fulfilled through these data collection events.

In 2016 a rigorous statistical analysis of the data collected to date through the waterfowl aerial survey program is being undertaken by TMAC. Based on these analyses, and in collaboration with the CWS, KIA, and GN in a 2016 working group meeting, some program re-design was proposed, although the objectives of the program were not altered.

Proposed Monitoring

The objective of determining if a ZOI exists for waterfowl is appropriate for both Doris and Phase 2 monitoring. The monitoring for this program will also continue to involve aerial surveys covering the Doris and Roberts Bay areas, and will be expanded to encompass the Phase 2 Project.

2.3.2.6. Raptors

Historical Monitoring

In 2005 the Doris FEIS predicted a change in the movement and behaviour of raptors near the Doris Project site. Raptors may avoid the project site, and so fewer historic nest sites will be occupied near the Doris Project during Construction and Operations. Alternatively, the Doris FEIS stated that raptors may have energetic costs due to project-related disturbance. Energetic costs can result in lower reproductive success, resulting in lower productivity (chicks produced per nest) near Doris.

The objectives of the 2005 and 2006 WMMPs were to determine whether the Doris Project might have affected the distribution, occupancy rate, or productivity of raptors nesting in the raptor study area (see Section 3.3.6.1), with special attention to species of conservation concern. The methods used to achieve this objective have included aerial surveys of raptor nests during the nest initiation and chick brooding periods to determine raptor nest productivity. These data were then be analyzed to determine whether there is a ZOI surrounding the project site, measured as the occupancy rate of nest sites and the productivity of these nests.

The objectives and survey methods used for raptors have remained consistent in the 2009, 2011, and 2013 WMMPs. In 2013, control and treatment survey areas were delineated and methodology altered to reduce exposure to hazardous flying conditions as described in Section 3.3.6.1. Currently, the raptor data collected

to data is being more rigorously evaluated to determine whether any project-related effects have been observed, but also to determine the appropriateness and usefulness of this monitoring program.

Proposed Monitoring

The objective of raptor monitoring will be to confirm that effects on raptors are not exceeding predicted impacts. Methodology employed for this monitoring will remain as currently prescribed for Doris (aerial raptor nest surveys), but information from statistical analyses currently underway may inform methodological changes in the future.

2.3.3. Wildlife Interactions, Incidents, and Mortalities

Historical Monitoring

In 2005 the Doris FEIS evaluated the potential for wildlife VECs to interact with Doris Project infrastructure and/or vehicles and suffer mortality as a consequence. A residual effect was predicted for caribou due to collisions with vehicles and aircraft. Raptors were also evaluated for the potential for mortality due to collisions with aircraft, but this was not rated as a residual effect.

Wildlife VECs were also evaluated for potential attraction to the site, including scents from wastes. Grizzly bear and wolverine were both evaluated as having a residual adverse effect due to attraction. Upland breeding birds were also evaluated as having a residual effect due to attraction of scavengers/nest predators to the site by wastes, as a nesting location, or to forage.

To monitor and evaluate for Doris Project interactions, incidents, and mortalities the 2005 and 2006 WMMPs proposed to monitor the following:

- the number of incidental observations of mine-related incidents and mortality;
- the landfill site (which has not yet been constructed) to evaluate if waste management is effective; and
- human-wildlife interactions in relation to the mine site infrastructure such as the roads, airstrip, and the TIA.

In 2012, a remote camera monitoring program was implemented to supplement wildlife observation program and the wildlife incident monitoring. This program included both on-site and off-site cameras, with the on-site cameras monitoring for potential interactions between mammalian VEC species and nest predators with Doris Project infrastructure. This program was progressively focused, improved, and re-shaped, and the on-site monitoring program was separated from the off-site camera monitoring in 2015 due to the different objectives of these studies.

In 2016, additional monitoring related to wildlife interactions, incidents and mortalities were adopted as a result of comments generated through the Doris Project Certificate and Type A Water Licence Amendment process. These studies included:

- additional dustfall monitoring in association with the TIA to monitor potential habitat alteration (Section 3.2);

- using caribou collar data for the Beverly/Ahiak herds to determine the relative location of the calving grounds in relation to the Project (see Section 3.4.3);
- monitoring the TIA specifically to determine if caribou are being attracted to it (see Section 3.4.4);
- pre-construction surveys for migratory birds if footprint construction occurs during the bird breeding season (mid-May to mid-August; Section 4.1);
- updating the Spill Contingency Plan and Oil Pollution Prevention Plan (OPPP) and Oil Pollution Emergency Plan (OPEP) to include wildlife response equipment; and
- implementing additional caribou protection measures to minimize interactions (Section 4.3).

Proposed Monitoring

The overall objective of monitoring for wildlife interactions with the Project is to determine whether wildlife VECs or other species of interest such as nest predators are interacting with Project personnel or infrastructure, to document and report any wildlife incidents or mortalities that occur, and to use the results of the program to make recommendations for additions or changes to existing mitigation measures. Targeted monitoring will occur at key locations (e.g., waste management facilities and TIA) through the use of cameras (see Section 3.4.1.3 Facilities Monitoring). Monitoring is planned for every year during Construction and Operations.

2.4. CARE AND MAINTENANCE

The objectives for the Program during Care and Maintenance are the same as those identified above for VEC-specific monitoring of caribou (Section 2.3.2.1) and Wildlife Interactions, Incidents, and Mortality (see Section 2.3.3). The measurement of direct habitat loss and VEC-specific monitoring (other than caribou) will be suspended should the Doris or Phase 2 projects be placed into Care and Maintenance.

3. METHODS

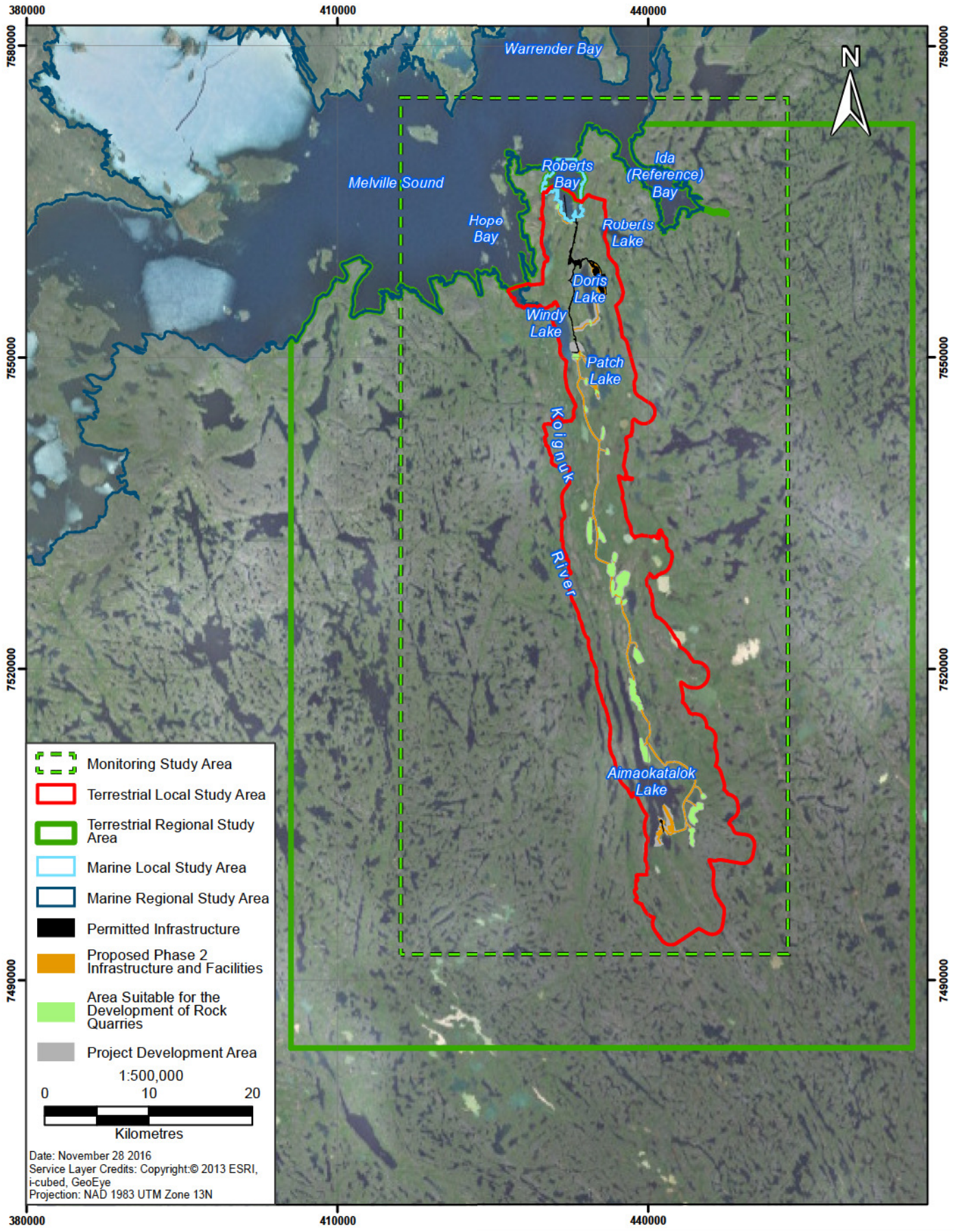
This section provides an overview of the methods used to accomplish the objectives described in Section 2. The overall study area is first described, followed by methods pertaining to each of the three monitoring themes (i.e., Habitat Loss and Alteration; VEC-specific Monitoring, and Wildlife Interactions, Incidents, and Mortalities).

3.1. PROGRAM STUDY AREA

The Program study area is illustrated in Figure 3.1-1 along with the local study area (LSA), and regional study area (RSA) delineated in the Doris and Phase 2 environmental impact statements. The Program study area encompasses the area within which both baseline and monitoring studies have taken place historically. Within the overall study area, monitoring takes place at locations and scales appropriate for each separate monitoring program (e.g. habitat loss and alteration, grizzly bear, waterfowl), and these monitoring areas are described in Sections 3.2 through 3.4.

Figure 3.1-1

Wildlife Mitigation and Monitoring Plan
Monitoring Study Area, Hope Bay Belt Project



3.2. HABITAT LOSS AND ALTERATION

3.2.1. Background

Predicted direct habitat loss due to the Doris and Phase 2 Project was assessed based on the Northwest Territories Department of Resources, Wildlife, and Economic Development (RWED) Ecological Land Classification (ELC) for the Slave Geological Province (Matthews, Epp, and Smith 2001). The RWED ELC segments the landscape into 21 land cover classes plus an unidentified class. The expected area of disturbance due to the project footprint was calculated as a proportion of the total area of the class within the RSA and LSA by overlaying the footprint overtop of the RWED ELC.

Habitats for each VEC species, including those monitored under this plan (caribou, wolverine, grizzly bear, upland breeding birds, waterbirds, and raptors) were identified using the RWED ELC. Each class was assigned a habitat suitability rating for each species based on published resource selection functions (a modelled value relating the availability of a habitat type to its observed use) in the case of caribou, grizzly bear, and wolverine (Table 3.2-1). Ratings for upland breeding birds, waterbirds, and raptors were based on observed habitat preferences (Table 3.2-1). Additional criteria for waterbirds were implemented, where any terrain outside of a 50 m buffer around waterbodies was considered Nil quality nesting habitat. Additional criteria for raptors were also implemented, where any terrain outside of 4 km of known raptor nest sites was considered Nil habitat. All habitat that is not Nil-rated habitat for a given VEC group is considered suitable for that group. General descriptions of the habitat suitability ratings are as follows:

- High: ecosystem types that are preferred or critical habitat, or have relatively high densities;
- Moderate: ecosystem types that are neither preferred nor selected against or have moderate densities;
- Low: ecosystem types that are generally selected against or types that have relatively low densities; and
- Nil: ecosystem types that are not used by the species, have no positive value, or for which no acceptable data exists to model suitability.

The expected change in overall habitat suitability due to the Project footprint was then calculated by overlaying the footprints of the Doris Project (including footprint expansions which have occurred since initial permitting of Doris Project) and the Phase 2 Project onto maps of habitat suitability for each VEC species. TIA dustfall predictions were also created for the Doris Project, and would be compared to caribou habitat suitability maps should dustfall monitoring (under the Air Quality Management Plan) indicate deviations from predictions.

Table 3.2-1. Habitat Suitability Ratings Assigned to Each Valued Ecosystem Component

Ecosystem Types	Habitat Suitability Ratings							
RWED ELC Unit[1]	Caribou Spring	Caribou Post-calving	Wolverine	Grizzly Bear Male	Grizzly Bear Female	Upland Breeding Birds	Waterfowl	Raptors
Heath Tundra	High	Moderate	Low	Moderate	High	Moderate	Low	Moderate
Heath/Bedrock	Moderate	Moderate	Low	Low	Moderate	Moderate	Low	Moderate
Heath/Boulder	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Low	Moderate
Bedrock Association	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Nil	Low
Boulder Association	Moderate	Moderate	Moderate	Moderate	Low	Low	Nil	Low
Lichen Veneer	High	Moderate	Low	Low	Moderate	Low	Low	Low
Gravel Deposit	Low	Moderate	Moderate	Moderate	Moderate	Low	Nil	Low
Esker Complex	Low	Moderate	Moderate	Moderate	Moderate	Nil	Low	Low
Bare Ground	Moderate	Moderate	Moderate	Nil	Nil	Low	Low	Low
Tussock/Hummock	Moderate	Moderate	High	High	Moderate	High	Moderate	Moderate
Riparian Tall Shrub	Low	High	Low	High	Moderate	High	Moderate	Moderate
Low Shrub	High	Low	Nil	Low	Moderate	High	Moderate	Moderate
Wetland (Sedge Wetland)	Moderate	Moderate	High	Low	Moderate	High	High	Moderate
Deep Water	Nil	Nil	Nil	Nil	Nil	Nil	High	Nil
Shallow Water	Nil	Nil	Nil	Nil	Nil	Nil	High	Nil
Unclassified	N/A	N/A	N/A	N/A	N/A	Moderate	High	Low
All terrestrial habitats within 50 m of water[2]	N/A	N/A	N/A	N/A	N/A	N/A	High	N/A
All habitat within 4 km of known raptor nest sites[3]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	High

[1] *Classification system used in Environmental Impact Statements to create predictions for habitat loss.*
[2] *Specific to Waterfowl.*
[3] *Specific to Raptors.*

3.2.2. Methodology

VEC habitat loss will be calculated every three years by overlaying constructed footprint (as-built footprint) of the Doris and Phase 2 projects onto the previously-generated wildlife habitat suitability maps using GIS. The proportion of suitable habitat lost will be expressed as a percentage of the amount available within the combined LSA from the Doris and Phase 2 FEIS's for upland breeding birds, waterbirds, and raptors and within the RSAs for caribou, grizzly bear, and wolverine. Calculated habitat loss will then be evaluated by VEC to confirm that it is within that predicted for the combined Doris and Phase 2 projects.

Habitat alteration will be concurrently reported for caribou in years in which TIA dustfall monitoring (which is monitored and reported under the Air Quality Management Plan and associated reports) has indicated that TIA dustfall is greater than objectives. In these instances, predicted annual dustfall contours will be directly scaled by actual annual dustfall monitoring results and the resultant contours overlaid on the caribou habitat suitability maps and additional habitat alteration quantified.

3.3. VEC-SPECIFIC MONITORING

The frequency and methodologies that will be used for caribou, grizzly bear, wolverine, upland breeding birds, waterbirds, and raptors are described in Sections 3.3-1 to 3.3.4 and summarized in Table 3.3-1.

Table 3.3-1. Proposed VEC-specific Monitoring

Focal Species and Proposed Methods	Construction and Operations	Care and Maintenance
Caribou		
1) Contribute to GN-led regional collaborative monitoring program	Annually	Annually
2) Remote Camera Monitoring[1]	Annually	-
3) Infrastructure interaction monitoring with cameras[2]	Annually	Annually
4) Kernel density range analysis using caribou collar data	Annually	-
Grizzly Bear		
1) Remote Camera ZOI Monitoring[1]	Annually	-
2) Infrastructure interaction monitoring with cameras[2]	Annually	Annually
Wolverine		
1) Remote Camera ZOI Monitoring[1]	Annually	-
1) Infrastructure interaction monitoring with cameras[2]	Annually	Annually
Upland Breeding Birds		
1) Point counts to monitor species richness and abundance	Tri-annually	-
2) Prism plots to monitor species richness and abundance	Tri-annually	-
Waterbirds		
1) Aerial surveys to estimate density and species richness during spring pair establishment and the brood rearing periods	Tri-annually	-
Raptors		
1) Aerial monitoring to estimate occupancy and productivity	Tri-annually	-

[1] *Remote monitoring discussed in Section 3.4.1.4*
[2] *Infrastructure monitoring discussed in Section 3.4.1.3.*

3.3.1. Caribou

3.3.1.1. Background

Currently, the ranges of the Beverly/Ahiak caribou herd (*Rangifer tarandus*) and the Dolphin and Union caribou herd (*Rangifer tarandus groenlandicus*) overlap with the WMMP study area. The Bathurst caribou herd occurs to the west of the WMMP study area (west of the Western River and Bathurst Inlet). The Dolphin and Union caribou herd is federally listed as Special Concern on Schedule 1 of SARA (COSEWIC 2004; Government of Canada 2016). Dolphin and Union caribou overlap the WMMP study area during winter, when this herd in on the mainland, and Beverly/Ahiak caribou overlap the study area, predominantly in the south, primarily during summer and fall. The WMMP study area does not overlap any caribou calving or post-calving grounds. However calving and post-calving grounds may change over time. Currently, the period of potential overlap with the WMMP study area are those during which caribou are more dispersed on the tundra, making many monitoring techniques ineffective, impractical, or unduly disturbing to caribou.

A history of the methodologies that have been employed to monitor caribou in the Hope Bay region is provided in Section 2.3.2.1.

3.3.1.2. Methodology

TMAC has entered into a collaborative process to monitor the Dolphin and Union caribou wherein the GN has taken the lead on the program and TMAC has contributed funds and/or in-kind support in replacement of regional monitoring previously conducted through aerial surveys. A Memorandum of Understanding (MOU) between TMAC and the GN was signed in 2015. The caribou collar data generated under this MOU will be analyzed to evaluate the overlap with the Hope Bay Project developments. Additionally, available caribou collar data from the Beverly/Ahiak herd generated by the Government of the Northwest Territories, will be analyzed using kernel density analysis to track the proximity of calving grounds to the Project infrastructure. Remote camera data will be collected as outlined in Section 3.4.1.4 and will be used to determine caribou densities at varying distances from Project infrastructure. Facilities camera data will be collected as outlined in Section 3.4.1.3 and on-site monitoring conducted as described in Section 3.4.2 will also be used to describe interactions with the Project.

3.3.2. Grizzly Bear

3.3.2.1. Background

Grizzly bears (*Ursus arctos*) are considered a species of special concern by COSEWIC (COSEWIC 2002, 2012). Barren ground grizzly bears (*Ursus arctos*) are at the most northern and eastern limits of the continental grizzly bear range with reduced productivity due to harsh climates and low habitat productivity (McLoughlin and Messier 2001; McLoughlin et al. 2003), and consequently reduced overall population connectivity (McLoughlin and Messier 2001). Consequently, grizzly bears in the central Arctic have the largest annual home ranges and likely have the lowest densities of any grizzly bear population studied in North America (McLoughlin et al. 1999). However, traditional knowledge indicates that the distribution and abundance of grizzly bears has increased in the region since the 1970s (Banci and Spicker 2015b). Grizzly bears have been associated with major river systems, their associated

watersheds, and the coast and were most often seen in the spring and fall, during fish-spawning periods, and following migrating caribou. The increase in grizzly bear abundance has resulted in greater depredation of ground squirrels.

A history of the methods used to monitor grizzly bear is provided in Section 2.1.2.2. Briefly, grizzly bear-specific monitoring programs in Hope Bay Belt have included comparing the abundance of grizzly bear sign in high quality habitat patches near the Project to control areas (2006 to 2008), DNA-based mark-recapture techniques for baseline population estimation (2010 and 2011), and grizzly bear distribution monitoring with remote cameras (2012 to present).

3.3.2.2. Methodology

Grizzly bear distribution relative to Project footprints will be monitored using remote cameras. The methodology for the remote camera program is described in Section 3.4.1. Data from this program will be analyzed in a spatio-temporal manner to determine if bear presence differs with distance from the Project, and, if so, to quantify the extent of this ZOI. Facilities (Section 3.4.1.3) and on-site (Section 3.4.2) monitoring data will also be examined for direct bear interactions with infrastructure. Results will be compared to predictions made during the permitting processes for the Doris and Phase 2 projects.

3.3.3. Wolverine

3.3.3.1. Background

Wolverine (*Gulo gulo*) use large home ranges and populations are generally low in the central Arctic (Mulders 2000). This species is an important cultural and economic resource for people in Nunavut and the NWT. Traditional knowledge has noted that, due to the reliance of wolverine on caribou as their main food source, the distribution and abundance of wolverine is affected by the trends in caribou populations (Banci and Spicker 2015). The Canada population of wolverine, including Nunavut, is considered a species of special concern by COSEWIC (2014).

Wolverine-specific monitoring is thwarted by low population densities. A history of the methods used to monitor wolverine is provided in Section 2.1.2.3. Briefly, programs in the WMMP study area have included comparing the number of tracks observed during snow track surveys near the Project to control areas (2006 to 2008), DNA-based mark-recapture techniques to quantify baseline population size (2010 and 2011), and wolverine distribution monitoring with remote cameras (2012 to present).

3.3.3.2. Methodology

Wolverine distribution relative to Project footprints will be monitored using remote cameras to the extent practical. The methodology for the remote camera program is described in Section 3.4.1. Data from this program will be evaluated to determine if wolverine presence differs with distance from the Project, and, if so and if sufficient information to do so, quantify the extent of this ZOI. Facilities (Section 3.4.1.3) and on-site (Section 3.4.2) monitoring data will also be examined for direct wolverine interactions with infrastructure. Results will be compared to predictions made during the permitting processes for the Doris and Phase 2 projects.

3.3.4. Upland Breeding Birds

3.3.4.1. Background

Avian species are often selected for use in monitoring programs because they represent an abundant and diverse group that can be assessed with relative reliability and rigor. High densities and diversity facilitate the collection of data that can be analyzed statistically to provide a quantitative measure of an avian population at different locations – thus the surveys are able to evaluate if the number of upland breeding birds is lower near the Project site (a ZOI).

Upland breeding birds include songbirds (passerines, with the exception of common raven, which is included under raptors), shorebirds, and ptarmigan. During the breeding period, natural and anthropogenic disturbances can be associated with changes in density and species richness of bird communities. Six species of upland breeding birds recorded in the study area are ranked by the Canadian Endangered Species Conservation Council (CESCC 2010) as "Sensitive," including the American pipit, American tree sparrow, hoary redpoll, red-necked phalarope, snow buntings, and white-crowned sparrow. There are no upland bird species currently observed in the Project area that are listed by the *Species at Risk Act* (SARA; 2002). However, species diversity of upland breeding birds in Nunavut is changing with the northward expansion of species ranges (Banci and Spicker 2015a).

Initial point count plots (radius of 50 m) were established along transects adjacent to and radiating out from the expected Doris Project footprint as well as near the Boston deposit. Plots located greater than 4.0 km from the potential mine footprints were designated as control plots while plots less than 4.0 km from the footprint were designated as treatment plots. Survey methodology has followed standard point count methods (Environment Canada 2004; Ralph et al. 1993), with abundance determined up until 2011 as total abundance (which reported females and non-breeding birds) whereas the number of territories within a point count or prism plot (which provides a better indicator of use of the habitat by the detected birds) was measured beginning in 2012.

In 2013 point counts were stratified into treatment locations (<300 m of infrastructure) and control locations (>300 m of infrastructure) and by habitat type, moist to wet sites vs. dry to mixed sites. The distribution of PRISM plots was also changed to move more plots closer to the Project site such that both VRPC and PRISM plots could be used to evaluate for a potential ZOI. These distances reflect research indicating that bird densities are typically reduced primarily within 100 to 250 m of disturbance (Reijnen et al. 1995; Reijnen, Foppen, and Meeuwsen 1996).

PRISM is a comprehensive approach to monitoring shorebirds in the United States and Canada. The PRISM method generates data that have been useful for relating Arctic breeding shorebird species to habitat. For example, it has been found that most shorebird species prefer to nest in lowland wet sedge marshes and meadows, and in riparian areas (Latour et al. 2005; Andres 2006; Brown et al. 2007).

3.3.4.2. Methodology

Monitoring will occur every three years during construction and operation and will be suspended during Care and Maintenance (Table 2-1). A comprehensive data analysis of data collected to date for the Doris Project is underway and may alter sampling design or methodologies, in which case changes would be described in a future WMMP revision.

Point Count Surveys

The methods and design for the point count surveys remains unchanged from recent years. Treatment and control point count locations will be distributed within a similar geographic region, with control surveys conducted at a similar latitude to existing infrastructure. Surveys for upland breeding birds are conducted using standard point count methods (Environment Canada 2004; Ralph et al. 1993). All birds seen or heard within five minutes are used for analysis. Birds observed flying over or outside of a plot are recorded as incidentals and excluded from statistical analyses. Surveys are conducted in the morning hours when birds are actively singing. Surveys are typically not conducted when wind speeds exceed 29 km/h (Beaufort 5), or when temperatures are below 5º C (Environment Canada 2016).

PRISM Plot Surveys

PRISM plots are 300 m × 400 m in size (12 ha) each. All PRISM surveys will be conducted at Treatment sites classified as wetland habitat to census shorebird species. PRISM plots at Treatment sites will be placed at the edge of infrastructure and up to a maximum of 300 m from infrastructure. Although in close proximity to infrastructure, all Treatment PRISM plots contain 100% tundra habitat. Control plots are in areas of similar vegetation communities. PRISM plots will be surveyed by two observers, following protocols developed by the Canadian Wildlife Service (CWS 2010).

3.3.5. Waterbirds

3.3.5.1. Background

Tundra lakes and wetlands host a high density of migratory waterfowl, including tundra swans, loons, sandhill cranes, geese, and ducks. The breeding distribution of several species including the yellow-billed loon, tundra swan, and greater white-fronted goose is exclusive to the tundra region. Species richness of waterfowl is considered a valuable indicator of the quality of wetland habitats. Waterbird species such as geese, eiders, sandhill cranes, and loons and their eggs are an important food source for Inuit (Banci and Spicker 2015a).The first species to arrive in the regional area are geese, brant, and swans. Spring hunting typically occurs along the coast and on islands.

Aerial waterfowl surveys in the Project area began in 1996, with survey methodology varying until it was formalized in the 2006 WMMP (Miramar 2006). Initially, aerial surveys for waterfowl were conducted on four survey blocks: two blocks covering the anticipated Project footprint and two reference blocks. The blocks covering the anticipated Project footprint include Roberts Bay and Doris Camp. One reference block (Middle Control) covered lakes in the centre of the study area, and a second reference (South Control) block covered lakes in the south of the study area near Boston Camp. During the June 2006 surveys, each block was surveyed twice. During all subsequent surveys, each block was only surveyed once per period. All four blocks were surveyed until 2011, since then the block near Boston Camp has been omitted.

In 2005 the Doris FEIS predicted a minor effect from mine-related activities, including disturbances such as noise, on the distribution and species richness of waterfowl within the study area (a ZOI). Methodology set in the 2006 WMMP detailed two annual surveys: a staging survey during the establishment of nesting territories (late June to early July), and a brood survey during the brood rearing period (late July to early August). Surveys were conducted in transect blocks measuring 15 × 16 km.

Each survey block consisted of six, 16 km-long transects oriented in an east-west direction, spaced 2 km apart. Surveyors recorded waterfowl within 400 m on either side of the aircraft during the first survey and 200 m on either side of the aircraft during the second survey, yielding 800 m and 400 m-wide belt transects respectively. This methodology has been used in all subsequent years of monitoring, from 2007 to 2015. To help standardize survey effort and reduce disturbance to wildlife and hunters, beginning in 2013 observers stopped making deviations in the flight path (i.e., circling off transect) or speed (i.e., reducing speed) to accommodate identifying individuals to species, sex, or age.

Following a safety review in 2015, a decision was made to limit the number of long over-water and low-level helicopter flights (high-risk flights). This change primarily affects transects where they cross large lakes and transects with long stretches of over ocean flying. A GIS analysis (reported in the 2015 Doris WMMP Report) revealed that few historical observations occurred in areas that would be affected by these changes. Going forward, data gathered to date and future data will be compared by censoring out observations in the historic data set that were collected from the no-longer surveyed locations.

A sophisticated statistical analysis of the waterfowl dataset was conducted and reported in the 2015 Doris WMMP Report. In summary, analyses found no indication of an effect on waterfowl with distance from the Project, or with Project activity (phase). Subsequent supplementary analyses conducted in 2016 further indicated that there was reasonable ability of the program to identify project-effects on waterfowl density with distance from Project infrastructure should they have been present, and that further program focusing could further improve detection of effects, including the elimination of a confounding 'control' block (which contained more wetland area then treatment blocks) and a re-focusing of survey effort over development areas with transect lengths sized to also include non-impact areas (areas outside of the potential ZOI).

3.3.5.2. Methodology

Monitoring will occur every three years during Construction and Operations, and will be suspended during Care and Maintenance. Waterbird aerial surveys will be conducted along transect overlaying the footprints of the Roberts Bay laydown, and the Doris, Madrid North, Madrid South and Boston mines. Transects will be of sufficient length to include both a potential ZOI as well as 'non-impact' zones. Data collected from these transects will be evaluated to determine whether there is an effect of the Project on waterfowl density or diversity with distance from the Project.

Two aerial surveys will be conducted in each survey year; the first during the breeding period and the second during the brooding period. The breeding period will be captured in a spring pair survey conducted in the northern migration/establishment of nesting territories period in June and a summer brood survey conducted in mid-July after the egg-hatching period. The exact timing of nesting and brooding activities varies annually, depending on climatic conditions.

Aerial transects will be flown by helicopter with a pilot and two observers. The helicopter will fly at 60-125 km/hour, approximately 45 m above the water/ground. The altitude will be greater in some areas due to safety concerns where there is cliff habitat and speeds will be higher when the helicopter flies in the same direction as the wind. Two observers will search lake surfaces and wetlands for waterbirds and/or waterbird broods and record birds either within 400 m (during the breeding survey) or 200 m (during the brooding survey) of either side of the aircraft. Birds observed at a distance greater than the transect width from the aircraft and those birds that were observed in flight will be noted

separately as “off transect” observations and will be considered incidental observations. During spring pair and summer brood surveys, waterbird positions will be recorded, individuals and pairs will be identified to the species level, and sex, and age (young vs. adult), based on size and plumage.

To standardize survey effort, no deviations in the flight path (i.e., circling off transect) or speed (i.e., reducing speed) will be done to accommodate identifying individuals to species, sex, or age (CWS and USFWS 1987). In cases where species identity or sex cannot be determined due to observer distance from the waterbird, attempts will be made to identify the species group to which the waterbird belonged (i.e., unknown loon and unknown gull), based on body shape, size, and behavior (i.e., diving or flying) and will otherwise be classified as “unknown waterbird.”

During the summer brood survey, observers will record the presence of broods (young of the year, accompanied by adults) by classifying waterbird individuals into two categories: adult and young. Young will include birds that meet one or more of the following descriptions (adapted from Gollop and Marshall 1954; Bellrose 1980): a) covered by down (fully or partially); b) growing feathers on sides and tail, or over half or more of their body; c) full feathered but incapable of flight.

As mentioned in Section 3.3.5.1, transect layout for the Doris Project is currently under reconsideration based on the results of recent statistical evaluation of the existing datasets and discussions held with the CWS, KIA and GN. Once revisions to the Doris Project waterfowl program has been determined, similar principles will be used to design the specific transects to be used for the Phase 2 Project.

3.3.6. Raptors

3.3.6.1. Background

Raptors nests are protected under the Nunavut *Wildlife Act* (2003). Raptors present in the Project area include peregrine falcon (*Falco peregrinus tundrius*), gyrfalcon (*Falco rusticolus*), rough-legged hawk (*Buteo lagopus*), golden eagle (*Aquila chrysaetos*), short-eared owl (*Asio flammeus*), and snowy owl (*Nyctea scandiaca*) (Rescan 2010). Common ravens (*Corvus corvax*) are included as functional raptors in Nunavut because they compete for the same resources as cliff nesting raptors (White and Cade 1971; Root 1969). The tundra peregrine falcon and short-eared owl are ranked as a species of special concern by COSEWIC and listed under Schedule 1 of SARA (Government of Canada 2016), while the golden eagle, rough-legged hawk, gyrfalcon and short-eared owl are designated as sensitive by the Canadian Endangered Species Conservation Council (CESCC 2010).

There are 196 raptor nest sites that have been identified and monitored historically in the Hope Bay Belt area. The actual number of nesting sites monitored in each year varies as new nests are built and old nests fall apart or are not found in certain years and program objectives (baseline and monitoring) change. Two surveys of nest sites were conducted in each of 2004, 2006, 2007, and from 2009 to 2015. The first survey was flown in early- to mid-June to determine occupancy of historical nest sites and to identify potential new nests. The second survey was conducted in late July or early August to determine the success and productivity of each nest site. The productivity survey in 2004, and 2009-2015 resurveyed all nest sites, while in 2006 and 2007 only occupied sites (as identified in the first survey) were revisited.

Helicopter surveys were conducted by flying horizontally along cliff faces in known or potential raptor territories. Occupied nests included at least one adult bird, two birds together, or finding a nest containing eggs or young. If no raptors were observed after two or more passes with the helicopter, the site was considered unoccupied. Any new nest sites located during these surveys and during other wildlife surveys were added to the raptor database. At each occupied site, the following nest characteristics were recorded: nest substrate, nest height, percent overhang and aspect, and cliff height. The species, number of adults, and number of eggs or young observed were also recorded for each occupied site. Nests were considered successful only if young birds were observed at the site. Productivity was calculated as the number of young per occupied nest for the years in which both occupancy and productivity surveys were conducted.

In 2013, raptor territories were identified by reviewing historical records of nest occupancy in the Program study area. Several years of monitoring data were required to identify nests that belong to the same territory, as it is common among cliff-nesting species for a breeding pair to use alternate nest sites along a cliff, or on two adjacent cliffs, across the years (Newton and Marquiss 1982). Historical data was available as far back as 1996 for some nests. Territory boundaries were defined based on Poole and Bromley (1988) and Steenhof and Newton (2007). Poole and Bromley (1988) define a raptor territory as the area containing one or more nest sites within the range of a pair of actual or potential breeders. Steenhof and Newton (2007) define a raptor territory as the confined area where nests are found, usually in successive years, and where no more than one pair is known to have bred at one time. Thus, raptor territories in the study area were defined as a nest site or clusters of alternate nest sites in which only one breeding pair of a particular species has been known to have occupied the nest (or alternate nest sites in the territory) since monitoring of the nest or cluster of nests began. Individual nest sites can be used by multiple cliff-nesting species. For example, gyrfalcon often utilize nest sites built by other species, such as eagle or rough-legged hawk. Therefore, nesting territories can overlap where breeding pairs of different species use nearby nests across years.

The following productivity statuses, adapted from Poole and Bromley (1988), were assigned to surveyed territories, based on the evidence recorded:

- Breeding territory: a territory within which a breeding pair of raptors had produced at least one live chick of any age at the time of the productivity survey;
- Non-breeding territory: a territory within which one adult raptor was observed during the occupancy survey but no other signs of breeding were observed at that time, and no signs of breeding were observed during the productivity survey;
- Productive territory: a territory within which a minimum of one chick was raised to an advanced stage of development (80% of fledging age)1 or was known to have fledged during the time of the productivity survey; and
- Failed territory: a territory within which a breeding pair of raptors (as determined during the occupancy survey) failed to produce live chicks. Definitive evidence of breeding failure for all

[1] Young that reach 80% of the age at which they typically leave the nest are generally expected to successfully fledge from the nest (Steenhof and Newton 2007).

species were observations of at least one addled (dead) egg or one dead chick within nests that were previously occupied.

Treatment and Control areas were also defined in 2013 based on documented behavioural characteristics of raptors. Raptors make regular hunting forays during the breeding season, and increasingly so when there are live young, and a five kilometre radius around an active nest sites is considered to be the core hunting area for wide ranging species such as golden eagles and peregrine falcon (Enderson and Kirven 1983; Enderson and Craig 1997; McGrady et al. 2002). Thus, raptors nesting more than five kilometres from Project infrastructure would be unlikely to encounter Project activities on a regular basis. Thus, the Treatment Area for raptor monitoring studies was delineated as the area within 5 km of development. Treatment Area was further divided into two sub-areas: 1) the Project footprint with a 1 km buffer (1 km Study Area) and 2) the Project footprint with a 5 km buffer, excluding the 1 km buffer area (5 km Study Area) which would be expected to have lower potential for effect than those territories within the 1 km sub-area. Control Areas are areas within the WMMP study area which are more than 5 km from development and where there would be a sufficient number of raptor nesting territories to enable comparisons of the results of nesting activity between the Treatment and Control Areas (i.e., roughly equal numbers of nesting territories in the Treatment Area as the Control Area).

3.3.6.2. Methodology

Monitoring will occur every three years during construction and operation and will be suspended during Care and Maintenance (Table 2-1). Aerial surveys will be flown along cliff faces in known or potential raptor nesting territories in the Treatment and Control areas.

At each nest site, species occupying the nest site, the number of adults, the number of eggs or young (live or deceased), and any other signs of breeding are recorded to assign an occupancy and productivity status to each site. Nest habitat characteristics including nest substrate, nest height, cliff height, the percent of each nest covered by overhanging cliff, and cliff aspect are also recorded at each nest site. The occupancy and productivity surveys will follow previous established methods as in previous years. Data collected from these surveys will be evaluated to determine whether there is a Project effect on raptor occupancy or productivity, and if so, whether the effect was within predictions made during the project permitting processes.

A comprehensive data analysis will occur in 2016 similar to that undertaken for waterfowl in the 2015 Doris WMMP Report, with the objective of testing for a ZOI and confirming the optimal study design for future monitoring. The outcome of those analyses, when complete, will inform further possible program revisions. It is understood that these surveys, in and of themselves, represent a disturbance to both raptors and other wildlife. To minimize this effect, the amount of flying time will be kept to a minimum and the value of the data collected will continue to be weighed against possible survey-related impact.

3.4. WILDLIFE OBSERVATIONS, INTERACTIONS, INCIDENTS, AND MORTALITIES

Monitoring for wildlife interactions, incidents, and mortalities with the Project site uses three primary methods:

- motion-triggered cameras;
- TMAC onsite monitoring; and
- incidental wildlife observations.

3.4.1. Camera Monitoring

3.4.1.1. Background

In 2012, forty-five motion triggered cameras (Reconyx PC800 HyperFire™ Professional Semi-Covert Infrared) were deployed around camp infrastructure and on the tundra. Fifteen additional cameras were added in June 2013. In 2014, the placement of cameras was simplified, with 'Treatment' cameras placed at key infrastructure or <1 km from Doris footprint and 'Control' cameras were placed at locations ranging from 1 to 7 km from the Project infrastructure.

In 2016, TMAC met with representatives of the KIA and GN DOE to redesign the camera program based on comments from regulators on camera placement and use. Through these discussions, it was determined that the camera program would have two monitoring aspects: 1) Facilities Interaction Monitoring: cameras associated with specific infrastructure and conducting location-specific monitoring, such as at the waste facility and road crossing structures and 2) Remote Camera Monitoring: cameras placed in various distances from infrastructure and used to look for changes in species densities with proximity to the infrastructure. It was also decided that the remote camera monitoring program design be optimized for monitoring of grizzly bear, with wolverine and caribou as secondary focuses given the scarcity of these species in the area.

Subsequent to this redesign, a power analysis was conducted using the grizzly bear and wolverine datasets to determine the ability to detect project effects. For grizzly bear, it was determined that there was reasonable power to detect a halving or doubling of grizzly bear presence near to Doris over multiple years of monitoring. Power to detect wolverine effects was lower, due to the low densities of wolverine in the monitored areas.

3.4.1.2. Methodology

Camera monitoring is divided into two programs; 1) Facilities Interaction Monitoring and 2) Remote Camera Monitoring. For both of these programs, general monitoring methods described below will apply. Program-specific methodological details are provided in Section 3.4.1.3 and 3.4.1.4.

Cameras are mounted in a security enclosure on a wooden tripod, which are secured with rocks and covered with a plywood cap to deter birds from landing on the camera. In some cases, cameras may be protected with plywood siding to prevent excessive snow infiltration. Lithium batteries are used to maintain camera performance at low-temperatures.

Cameras are programmed to take two types of photos: timed photographs and motion-triggered photographs. During winter, timed photos are taken from 10 am to 5 pm to conserve battery during dark periods. Cameras take motion-triggered photos whenever there is movement in the field of view (~25 to 30 m). Cameras take 10 photos at one second intervals with each trigger. Each image records the photo type (i.e., timed [T] or motion triggered [M]), the camera number, date, time, temperature, and, for motion-triggered photos, the number from the triggered series of photos taken (i.e., 1/10 to 10/10).

Cameras are downloaded and checked twice annually at minimum and data will be analyzed to record the number of observations per camera day for wildlife VECs (caribou, grizzly bears, wolverines, raptors), nest predators (Arctic fox and red fox), and other species (e.g., muskox).

3.4.1.3. Facilities Monitoring

The facilities cameras monitor sites which may be attractants to wildlife (waste management areas, landfills, TIA or Tailings Management Area (TMA)) or to confirm wildlife use of wildlife mitigation structures (e.g. representative wildlife road crossings).

These cameras will serve to continue to provide information on the efficacy of mitigation measures and help in identifying potential concerns. The data is summarized to address the following sub-objectives:

- Monitoring the waste facilities for use by bears, wolverines and nest predators;
- Monitoring the camps and other structures for use by bears, wolverines and nest predators;
- Monitoring the road crossing structures for use by caribou; and
- Recording locations where wildlife may interact in an unpredicted way with project infrastructure.

3.4.1.4. Remote Monitoring

The remote monitoring-specific methods described below are the product of discussions with the KIA and GN related to the redesign of this Doris remote camera monitoring program, and are the methods currently employed at Doris. The remote camera monitoring will focus on whether there is an effect of the mines on grizzly bears and wolverine, and may also be used to look at caribou densities with distance from infrastructure. To better evaluate ZOI-type effects, the remote cameras were re-distributed into three “zones”:

1. Treatment, with cameras arrayed within 2 km of the Project site;
2. Control, with cameras arrayed outside of 10 km of the Project site; and
3. Zone of influence (ZOI), with cameras arrayed between 2 and 10 km.

The deployment of treatment cameras will occur at the Project sites, and within 2 km of infrastructure. The control and ZOI cameras will be deployed along a predominantly east-west axis such that control and ZOI cameras are at similar distances from the ocean shoreline as the Project treatment cameras. This is to account for possible latitudinal effects and the higher relative density of predators such as bears and wolverine at the coast vs. inland. Within each zone, cameras will be deployed in bands of

relatively equal number. For instance, in the ZOI band, cameras will be deployed in approximately north-south bands at 5, 7, and 9 km from the Project infrastructure.

To control for potential effects of habitat, cameras will be placed in areas of heath tundra if possible. ZOI and control cameras will be placed in locations comparable to treatment cameras locations to further minimize differences. Candidate locations for cameras will be chosen from vegetation maps prior to camera re-deployment with final camera positioning conducted by a biologist in the field. To improve independence, cameras will not be in line of sight of each other, and will preferably be a minimum of 2 km apart. Camera separation distances within ZOI and control zones will be similar to treatment cameras to minimize differences due to clustering. Cameras will be oriented to ensure the area within 40 m in front of the camera is clear so that cameras are equal in their "trigger zone" field of view.

Cameras will be equally distributed among zones (treatment, control, ZOI). Allocating the majority of cameras to the extreme distances (close to 0 km and 10 km) rather than allocating them uniformly between 0 and 10 km, would allow the design to have increased power to detect treatment effects relative to control. However, the exploration of a ZOI is important and 1/3 of the cameras remain for the exploration of the ZOI.

Where possible, camera locations will remain fixed to allow comparability between years and to improve power over time. Each camera will be deployed over all 12 months of the year. Camera data will be collected daily using triggered photos. However, it is unlikely that data will be analyzed at a daily level. Rather, statistical tests and models will be carried out on monthly data. In order to ensure that camera effort is accounted for, each camera will also take timed photos which will be examined for the number of days it is active and unobscured in each month.

3.4.2. Incident and Mortality Monitoring

3.4.2.1. Background

Wildlife incidents and mortalities on and around Project footprints are recorded by onsite personnel. Wildlife mortality is monitored to aid in the protection of both wildlife and personnel and help to identify areas in which additional mitigation measures could be applied in future. Wildlife carcasses can attract carnivores to the footprint, creating risks for both carnivores (e.g., if carnivores are attracted to the road by carrion and subsequently get hit by a vehicle) and people who encounter them. Mitigation measures, such as removing carcasses, are practiced where needed to avoid any potential negative interactions between wildlife and humans. As part of the Program, all wildlife mortalities are recorded and reported as required under the KIA Framework agreement and Doris Project Certificate. Possible causes of the mortalities are evaluated to determine if current mine activities contributed to a mortality event. Documenting mortalities also facilitates the incorporation of adaptive management approaches and development of mitigation measures.

An "incident" is defined as an interaction between animal(s) and human(s) that may compromise the safety of the animal(s) and/or human(s). Incidents also include any action where deterrent measures are deemed necessary. Incidents involving wildlife in close proximity to mine infrastructure (e.g., roads and buildings) must be managed to minimize risk to wildlife and staff. The purpose of managing wildlife incidents is to reduce the potential for wildlife-related safety concerns for employees, and to minimize potential effects of

mine activities on wildlife. Natural wildlife activity and ecological processes are left undisturbed unless there is risk of harm to onsite personnel. All wildlife incidents are recorded, and reviewed to develop mitigation measures and adaptive management procedures for re-occurring incidents.

3.4.2.2. Methodology

Wildlife interactions, incidents, and mortalities are recorded as part of the Wildlife Sightings/Reporting process and reported to the NIRB annually. Wildlife incidents relating to larger fauna are additionally reported to the KIA and the GN DoE on occurrence, and any wildlife mortalities are reported to the KIA, the GN DoE, and the NIRB. Reporting procedures at site occur through notification of the Environmental Department and/or Wildlife Response Team. A Wildlife Notification System is employed which includes non-emergency traffic awareness notifications in addition to higher levels of alerts for potentially dangerous wildlife. The site Environmental Department keeps a register of potential conflicts with, or deterrence of, animals which require a response from the Wildlife Response Team (WRT) and this forms the basis of the incident reporting component of the Annual Report.

3.4.3. Caribou Calving Ground Overlap

Currently, the Project does not overlap the calving grounds of any caribou herd, and no overlap has been indicated historically, although calving grounds are known to shift over time. To monitor the locations of calving grounds, TMAC will conduct a kernel density analysis of the calving range for the Beverly/Ahiak herds in each year that data is available. Based on this analysis:

- If the Project is outside of the calving range, then standard mitigation (see Tables 4.3-1 and 4.3-2) will apply.
- If the Project is within the 95% kernel, then standard mitigation will apply + a site notification for helicopters and vehicles will be issued, and mitigation will be reviewed.
- If the Project is within the 50% kernel, then the above will apply + additional wildlife monitoring will be triggered (e.g., daily surveys along the Roberts Bay to Boston road during the calving period), and staged reduction of activities that may cause disturbance.

3.4.4. Tailings Caribou Monitoring

Caribou have been observed ingesting minerals from naturally occurring salt licks (Calef and Lortie 1975; Williams and Elliot 1985; Carmack and Macdonald 2008; Katz 2010) as well as from tailings (Macdonald and Gunn 2004). In recognition of potential attraction of caribou to the TIA or the TMA:

- The TIA will be monitored for caribou tailings consumption prior to TIA closure;
- If caribou are observed consuming tailings, TMAC will engage the IEAC in the development of additional mitigation measures.

Post-closure monitoring of the TIA and TMA will be outlined in the final Closure Plans associated with those developments.

Water quality predictions for the TIA reclaim water pond have indicated that this water will not exceed guidelines for the protection of livestock. As such, no harm is anticipated by continued wildlife use of

this area; however, water quality in the reclaim pond will be monitored under the site water monitoring programs.

3.4.5. Wildlife Observations

3.4.5.1. Background

Observations of wildlife that are not collected during standardized surveys or are not related to wildlife interactions recorded through remote camera monitoring or as part of the TMAC onsite monitoring program for wildlife incidents and mortalities. These are the wildlife seen by site personnel as they went about their daily activities. Such incidental observations are most useful for identifying species that inhabit an area, and can often identify species that might not be encountered during formal wildlife surveys. These observations can also provide information on the timing of migrations (caribou, various bird species), emergence from hibernation (ground squirrels, grizzly bears), and calving (muskox, caribou).

3.4.5.2. Methodology

Incidental wildlife observations are collected on an opportunistic basis in three ways:

1. observations from the wildlife sightings log as reported by on-site personnel;
2. incidental observations made by ERM biologists during targeted wildlife surveys; and
3. observations of non-VEC wildlife species from the remote camera program.

Data collected using the three methods differs in nature and is therefore not quantitatively comparable. Moreover, some of the collection methodologies are inherently biased in terms of sightings frequency. This is particularly the case when examining the observations from the wildlife sightings log as reported by on-site personnel. This data is influenced by factors such as:

- Reporting preference - on-site personnel are more likely to report grizzly bear than sik-siks;
- Reporting frequency - he frequency of reporting tends to be higher when a species first appears on site and tapers off through the summer despite the fact that the species remains present on site during that time;
- Time of year - both the number of personnel working outside (fewer in winter) and the ability to see wildlife (due to limited winter daylight);
- Number of personnel on site – this varies seasonally, but can be corrected for;
- Reporting enthusiasm – personnel may vary in how consistently they report wildlife sightings;
- Multiple reporting – wildlife may be reported by more than one individual, this is more likely the case when the wildlife observed are large mammals or when the animal stays in an area.

Thus, incidental wildlife observations provide qualitative account of species presence on site, but should not be assessed in a quantitative manner despite the fact that the number of animals sighted is often reported and the frequency of sightings is available.

Observation data from the three sources are summarized for VEC species (i.e., caribou, grizzly bear, wolverine, upland breeding birds, raptors, and waterbirds), nest predators, and all other mammalian species (e.g., muskox). Nest predators include species such as fox species, weasels, gulls, jaegers, and the common raven.

4. MITIGATION PROTECTIVE OF WILDLIFE

4.1. GENERAL WILDLIFE PROTECTION MEASURES

TMAC undertakes the following actions and programs to mitigate and manage impacts to wildlife:

- provides guidance to staff on how to avoid staff/wildlife interactions;
- allows all wildlife the right-of-way;
- implements a no hunting policy for all Project staff and contractors while on site and requests no hunting by anyone near site roads or other footprint areas;
- does not tolerate the harassment of wildlife by helicopters;
- establishes and enforces speed limits on roads and limits off-road travel;
- monitors and manages air quality using dust suppression on roads and when needed during crushing activities or on tailings;
- implements a Noise Abatement Program, which aims to reduce mine, vehicle, and helicopter related disturbance to wildlife species, particularly caribou and muskoxen, and during sensitive periods;
- conducts wildlife checks prior to blasting activities and delays blasting when wolverine or grizzly bears are within 500 m of the quarry or caribou are within the distances outlined in Section 4.3 and when safe to do so;
- preferentially conducts construction activities outside of the migratory bird nesting and breeding season (mid-May to mid-August);
- conducts pre-construction surveys when construction cannot avoid the bird-nesting season using personnel trained in identifying indicators of bird nesting behaviour from a distance, and appropriate avoidance buffers are established if needed;
- implements a hierarchy of progressive procedures for safely directing animals away from hazardous areas (e.g., roads and airstrip), and bears from the mine site;
- designs structures to limit the potential for denning of foxes or wolverine within project facilities and routinely audits on-site denning potential for further management;
- designs pads and roads with lower slope areas that facilitate caribou crossing or builds caribou-specific road crossing structures;
- conducts proper industrial hygiene, supported by programs such as Non Hazardous and the Hazardous Waste Management Plans, Emergency Response/Spill Contingency Programs that are designed to prevent, for example, hydrocarbon contamination of water;

- reduces site attractants, including secure storage and daily incineration of all food wastes;
- includes in the Spill Contingency Plan and Oil Pollution Prevention Plan (OPPP) and Oil Pollution Emergency Plan (OPEP) information and guidelines relevant to implementation of wildlife response measures and equipment available for response, and aligned with the Birds and Oil – CWS Response Plan Guidance (CWS 2012);
- provides wildlife awareness and safety training for on-site personnel. This includes ongoing education related to the dangers of improper food waste disposal and feeding wildlife;
- does not use ice-breaking vessels and avoids ship-related ice-breaking activities;
- provides shippers with information on key marine wildlife areas for avoidance;
- has an anonymous reporting procedure to allow personnel to report any lapses in environmental protection;
- provides bear awareness training and implementation of Bear Notification and Response Procedures; and
- employs a Wildlife Response Team trained in bear and predatory wildlife response to minimize the risk to both personnel and wildlife.

4.2. MANAGEMENT PLANS PROTECTIVE OF THE ENVIRONMENT AND WILDLIFE

As indicated in Section 1.4 of this Plan, TMAC has many management plans that outline how various activities are performed on site in consideration of operational needs and regulatory requirements. Numerous mitigation actions associated with these management plans have environmental protection measures that are continuously implemented on site which reduces the overall impact of the Project to wildlife. Some of the plans that are particularly relevant to the protection and mitigation of wildlife are summarized below. Similar to this plan, all Project plans are subject to continual review and revision as necessary, and many will specifically be updated, revised or expanded to consider the Phase 2 Project when appropriate. Despite these continual changes, the general measures outlined below as protective of wildlife will remain.

Noise Abatement Plan

The Noise Abatement Plan lists the mitigation measures employed to reduce Project noise, and thus minimize noise effects on wildlife. The pre-blasting procedures that screen for the presence of wildlife, and the actions to ensure their absence, are outlined. This includes no blasting if any large mammals are observed specific distances of the quarry site (additional caribou-specific distances are outlined in Section 4.3). Restrictions on aircraft operations, and the timing of activities to avoid periods that are critical for wildlife, are described. The plan details the environmental noise monitoring that is prescribed during baseline studies as well as the construction and operation phases.

Air Quality Management Plan

The Air Quality Management Plan outlines the various mitigation measures employed specifically to reduce dust and air emissions caused by the Project. These mitigation measures include water or chemical suppression and reduced aeolian exposure. Air quality effects from equipment exhausts and incinerator stack emissions are managed according to prescribed standards. Air quality effects on wildlife from both

dust and emissions are consequently reduced. Detailed and ongoing monitoring is conducted and additional action undertaken if dust or emission anomalies become evident.

Spill Contingency Plan

The Spill Contingency Plan recognizes sensitive wildlife species, increased summer use of the area by wildlife, and the measures needed to deter wildlife from coming into contact with spilled harmful substances. It describes the spill response procedures to ensure timely and appropriate spill cleanup on land, water and ice, as well as identifying equipment available for possible oiled-bird response and rescue. It outlines wildlife spill response procedures and those for migratory birds in alignment with the CWS Birds and Oil – CWS Response Plan Guidance. There is a requirement that any spills of harmful substances near sensitive wildlife habitat is reported to the responsible authorities.

Non-hazardous Waste Management Plan

The Non-hazardous Waste Management Plan describes the collection, segregation, handling, treatment, storage, transport, and disposal of non-hazardous waste. In particular, to prevent potential wildlife access, waste segregation requirements are stipulated that ensure potential attractants are appropriately managed and food waste is safely stored and incinerated daily. Routine monitoring and inspection of all waste management facilities is undertaken. These actions reduce the attraction of wildlife to the Project.

Incineration Management Plan

Related to the Non-hazardous Water Management Plan, the Incineration Management Plan describes the management and disposal of food wastes in a manner that minimizes potential attractants and ensures that food wastes are safely stored and incinerated daily. Routine monitoring and inspection of all waste management facilities is undertaken. These actions reduce the attraction of wildlife to the Project.

Hazardous Waste Management Plan

The Hazardous Waste Management Plan describes the collection, segregation, handling, treatment, storage, transport and disposal of hazardous waste, with the objective of safe and efficient management that reduces the risk not only to the site workforce but also to potentially affected wildlife. Since the plan is primarily based on strict containment of hazardous wastes, achieving the prescribed level of management consequently reduces the possibility of wildlife exposure. On-going record keeping and revision of the plan occurs at regular intervals.

Water Management Plan

The Water Management Plan identifies precipitation and snowmelt on the permeable rockfill pads as the sources of runoff and underflow, and ponds, containment berms, interception sumps, and discharge pipelines comprise the current water management structures. Consequently, the collection, management and/or treatment of potentially impacted underflow and runoff is adequately managed and surface water bodies are protected from potential effects. Achieving the prescribed level of water management reduces the possibility of effects on wildlife.

Domestic Waste Water Treatment Management Plan

The Domestic Waste Water Treatment Management Plan describes the treatment system in place, consisting of pre-treatment, biological treatment and effluent separation, treated effluent discharge, and sludge dewatering and disposal. Treatment and discharge is in accordance with the allowances outlined in the Water Licence, and must meet established discharge criteria protective of the environment.

Oil Pollution Emergency Plan/Oil Pollution Prevention Plan

The Oil Pollution Emergency Plan/Oil Pollution Prevention Plan is focused on the shipping, transfer, handling and storage of fuel at the oil handling facility at Roberts Bay. Wildlife is known to be active in the area during transfer periods and workers performing monitoring duties are subject to wildlife encounters. Preventative measures are applied for encounters that are potentially dangerous, through an established wildlife notification and deterrent program. Roberts Bay lies along a migratory flight path for birds that spend summers in the Arctic. In the event of migratory birds potentially interacting with a spill of product under transfer at the facility, dispersal will be applied through the use of noisemakers and visual deterrents, and equipment available for oil-bird response will be listed.

4.3. CARIBOU-SPECIFIC PROTECTION MEASURES

Mitigation specific to caribou that will be implemented during all seasons is presented in Table 4.3-1. Additional mitigation specific to the more sensitive calving period, from June 5 to 20 (Gunn, Fournier, and Nishi 2000), is presented in Table 4.3-2. The mitigation measures outlined in these tables have undergone multiple iterations of review and discussion with the KIA and GN DoE in 2016, and represented the agreed measures deemed appropriate for the Doris Project. These measures will also be adopted for the Phase 2 Project activities due to the similarity of anticipated activities and possibility of caribou effects.

5. REPORTING AND ADAPTIVE MANAGEMENT

Results of the WMMP will be reported annually to the NIRB who will make the reports publically available for review and comment by interested parties. Any wildlife incidents or mortalities will be reported on occurrence as outlined in Section 3.4.2.2, and will be summarized in the annual report.

Should monitoring results indicate effects beyond those predicted, a review of the mitigation measures currently employed will be undertaken to verify they are being implemented appropriately or whether changes or additional mitigation or management action is required.

Table 4.3-1. Caribou-specific Protection Measures during All Seasons

Activity/Location	Monitoring Method	Trigger		Mitigation
		# of Animals	Distance	
1) Project Site	All personnel	1+ animals	Visible from footprint areas	1. Site Notification issued
		1+ animals	< 500 m	2. Site Notification and Site Alert issued
		>50 animals	Visible from footprint areas	3. Site Notification and Site Alert issued
2) On-site roads	Drivers	1+ animals On road		1. Ongoing Mitigation • Speed limits are posted and enforced • Wildlife is given the right of way • Signs posted indicating wildlife has right of way 2. Triggered Mitigation • Site Notification and Site Alert
		>50 animals	1 km	1. Site Notification and Site Alert; 2. Standard wildlife right of way rules; 3. Vehicles may pass slowly (20 km/hr) if animals are not on the roadway.
3) Quarry blasting*	Pre-blast checks	1+ animals	2.2 km	1. Cessation of blasting until animals move >2.2 km from blast site; 2. Monitoring of caribou behaviour in response to quarry blasting if safe to do so.
4) Helicopters	Pilots	1+ animals	300 m	1. Helicopter flights avoid animals by as large a margin as possible, with a minimum of 300 m vertically and 600 m horizontally.
5) Airstrip	Air traffic personnel	1+ animals	250 m	1. In the case of caribou near the airstrip(s), pre-flight strip checks are performed. If the risk of interaction with a plane exists, the original procedures for moving them off the runway are followed. 2. GN-DoE are contacted for guidance when unusual situations arise not covered by established procedures, to ensure the best course of action is undertaken incorporating animal welfare as a prime objective.

Activity/Location	Monitoring Method	Trigger		Mitigation
		# of Animals	Distance	
6) Regional monitoring	Helicopter pilots and field personnel	>50 animals	15 km	1. Site Alert and Site Notification

Notes:
Site Notification refers to a posted notification on the site Wildlife Board, as well as information provided to staff in morning meetings.
Site Alert refers to radio broadcasts to site staff.
** Distances for caribou in the Noise Abatement Plan will be updated to those listed in Tables 4.3-1 and 4.3-2 in the next revision of that plan. Value in this Table is based on a lower threshold of 96 dB Lpeak at which ungulates display behavioural responses to noise (Maier et al. 1998, Reimers and Colman 2006 and references therein).*

Table 4.3-2. Additional Caribou-specific Protection Measures during the Calving Period (June 5 to June 20)

Activity/Location	Monitoring Method	Trigger		Mitigation
		# of Animals	Distance	
1) Project Site	Site staff (incidental observations)	3-50 ♀ with calves	Visible from footprint areas	1. Site Alert; 2. Stop all mobile heavy mobile equipment traffic within 250 m of the observed caribou, except at plant site; 3. Traffic to proceed slowly (<20 km/hr).
		>50 ♀ with calves	Visible from footprint areas (<2 km)	1. Actions above, plus 2. Trigger wildlife monitors to conduct periodic site monitoring to evaluate if caribou are still in the area and when activities can resume.
2) Quarry blasting*	Pre-blast checks	1+ ♀ with calve(s)	Visible from footprint areas (<4 km)	1. Cessation of blasting until animals move >4 km from blast site or to the limit of vision from the ground (quarry high point), whichever is closer; 2. Monitoring of caribou behaviour in response to quarry blasting if safe to do so.
3) Helicopters	Pilots	1+ animals	calving range	1. Helicopter flights will avoid animals by as large a margin as possible, with a minimum of 610 m vertically and 600 m horizontally.
4) Regional monitoring	Helicopter pilots and field personnel	1+ ♀	calving range	1. Helicopters will avoid caribou to the extent possible, and by a minimum of 610 m vertically and 600 m horizontally.
		1+ ♀ with calve(s)	15 km	1. Actions above, plus 2. Site Notification.

Activity/Location	Monitoring Method	Trigger		Mitigation
		# of Animals	Distance	
		50+ ♀ with calve(s)	15 km	1. Actions above, plus 2. Site Alert.
	Collar reports**	Any	**	1. Alert pilots 2. Site Notification.
		Any	**	1. Actions above, plus 2. Site Alert.

Notes:
Site Notification refers to a posted notification on the site Wildlife Board, as well as information provided to staff in morning meetings.
Site Alert refers to radio broadcasts to site staff.
** distances for caribou in the Noise Abatement Plan will be updated to those listed in Tables 4.3-1 and 4.3-2 in the next revision of that plan. Distance in this Table represents additional conservatism of 1.8 km added to the lower 96 dB Lpeak at which ungulates display behavioural responses to noise (Maier et al. 1998, Reimers and Colman 2006 and references therein).*
***collar reports will supplement other mitigation responses, if available and provided on a frequent enough basis to be useful for this purpose. Distances for actions related to data from collar reports will depend on frequency of data dissemination to TMAC.*

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Annex 23

Hope Bay Health and Safety Management Plan

MAC RESOURCES

HOPE BAY
HEATH & SAFETY MANAGEMENT PLAN

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REVISION RECORD

Document	Rev	Date	Originator	Details of change
Hope Bay Safety Management Plan	1.0	March 2013	HSLP Department	Original

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1. PURPOSE

The purpose of this Safety Management Plan (SMP) is to detail the Health Safety and Loss Prevention (HSLP) policies and systems adopted by TMAC Resources Inc. (TMAC) for the Hope Bay site during start-up and into production, and to provide the framework for their implementation.

This Safety Management Plan describes:

- strategies to be used for implementation;
- management systems required for measuring and auditing safety performance and objectives; and
- proactive identification and elimination (or acceptably managing) of occupational health and safety risk that may be associated with the execution of work.

The Safety Management Plan is supported by Safe Work Practices that are referred to in the text typically as (HB-HSLP-SOP-00-Document Name).

This Safety Management Plan and supporting documentation applies to all personnel assigned to Hope Bay including all contractors.

2. POLICY AND OBJECTIVES

2.1.1 Policy

The TMAC Management Team is committed to providing a healthy and safe working environment for all personnel. This fundamental belief is reflected in its requirement for continuous improvement pertaining to health and safety performance.

The Hope Bay HSLP Policy is displayed at prominent areas throughout the offices, camp complexes and work sites.

HOPE BAY HEALTH & SAFETY POLICY

People who work at TMAC Resources are our greatest asset and our most important resource. As such, TMAC Resources is committed to the promotion of health, safety and well-being of all its employees and contractors, and the prevention of occupational injuries and illnesses, damage to property and the environment. At TMAC, the ultimate objective is to achieve zero harm.

To achieve this objective, this statement of policy must guide our decisions and actions as we go about our daily activities, including the design and conduct of operations, selection of materials and resources, and the implementation of systems.

In order to meet the challenge of putting this policy into action, commitment by all employees and contractors from the top down is critical to its success.

TMAC's commitment to health and safety is based on the following principles:

- At TMAC, achieving zero harm is everyone's business
- All employees, executives, managers and supervisors take responsibility and accountability for health, safety and well-being as part of TMAC's internal responsibility system.
- We include safety and occupational health considerations as an integral part of our operations from design to closure
- Work identified as unsafe will stop immediately until best practices can determine an alternative safe method.
- We ensure that our employees receive suitable and adequate training to recognize, control and eliminate hazards or conditions that may cause or result in accidental losses.
- We work proactively with the public, contactors, regulators and governmental agencies in fostering a cohesive working relationship.
- Everyone is expected to identify hazards and manage risks
- We constantly monitor our performance and when required, we make adjustments and/or adopt changes to ensure that our performance meets or exceeds acceptable standards
- TMAC involves employee participation at all levels in the development of programs directed toward continuous improvement of safe operations and achieving zero harm.

This Policy shall be reviewed annually for continual improvements as the organization grows and develops in accordance with its expectations.

_____ _____

Chief Executive Officer Date

2.1.2 Objectives

TMAC Resources is committed to the following fundamental objectives:

- no personnel employed by TMAC Resources or its contractors should suffer either injury or illness arising from being employed at the Hope Bay site.
- all personnel, contractors, service providers and suppliers must rate safety and the protection of the environment as core values.

2.1.3 Health and Safety Management Commitment

All TMAC management is committed to ensuring a healthy and safe environment for all personnel and contractors. The commitment to safety excellence is based on the principle of controlling risk to provide a proactive and positive safety culture and an incident free workplace.

The objectives in implementing this policy are to:

- Have all personnel appropriately trained, responsible and accountable for safety management;
- Incorporate industry best practices for health and safety standards engineering, design and processes implemented at all workplaces;
- Comply with all relevant standards, codes of practice, and regulatory requirements.
- Provide effective training, adequate communication and continuous review of the Safety Management System (SMS).

3.0 HSLP COMMUNICATION, AWARENESS AND MOTIVATION

3.1.1 Hazardous Materials Register

A hazardous materials register is maintained in conjunction with the Environmental and Social Responsibility (ESR) and HSLP Departments. Registers are issued to site managers and supervisors.

3.1.2 HSLP Communication

The following media will also be used to inform personnel of HSLP issues based on an individual's right to know:

Memos on notice boards or direct to each employee in conjunction with;

- Posters;
- HSLP bulletins; and
- HSLP alerts.

Copies of all core HSLP procedures and operational specific procedures will be made available to all personnel on request.

4.0 RISK ASSESSMENT, RISK MANAGEMENT & HAZARD STUDIES

4.1.1 Risk Assessment

Risk assessment and risk management is the responsibility of all departments. This will include their contractors, general personnel and all levels of management. Risk management philosophy is based on the principle of reducing risk to a level that is As Low as Reasonably Practicable and is otherwise determined by comparison with and in consideration of:

- design specification;
- Industry best practice;
- statutory requirements;
- codes of practice;
- recognized and accepted best standards;

The Hope Bay site will adopt a "start to finish" philosophical approach which will include commencement of engineering, commissioning of all major work projects through to production. The site will use a structured approach to identify, analyze and manage areas of risk and/or hazard. In addition, other specific risk assessments and reviews may be used to analyze specific areas of risk and/or hazard.

If required, on a seasonal basis all departments will undertake the process of completing a risk assessment for work activities based on the scope of work going forward in their area of responsibility. The HSLP Department will assist in this process.

4.1.2 Identification and Assessment

At any stage, personnel may identify activities that require the application of risk identification, assessment and management processes. The identification of potential hazards is achieved through application of systematic procedures (e.g. Risk Assessments, Job Safety Analysis (JSA), Task Hazard Analysis (THA's), etc.). A master risk register shall be developed and maintained by the HSLP Department for the hazard studies conducted during operations.

The register will list potential major hazards to facilitate the recognition and consequent management of these concerns. Hazards and their attendant risks are analyzed on the basis of:

- Frequency of occurrence/exposure;
- Potential consequences for the site; and
- Potential for the hazard to compromise emergency systems.

4.1.3 Management Solutions/Controls

Having identified the potential hazards, the team is further responsible for identifying solutions to those hazards. The preferred hierarchy for developing solutions/controls is:

Elimination

Elimination of toxic substances, hazardous plant processes which are not necessary for a system to function safely.

Substitution

Where hazardous materials/chemicals have been identified as a hazard, the preferred option is to replace the material with a less hazardous one.

Engineering

The removal of potential hazards by engineering or re-engineering the job/process is a preferred option. This, for example may involve such actions as re-designing pipe work/equipment or re-configuring a crane.

Administrative Controls

The application of administrative controls for hazards may include such actions as limiting the time of exposure, rotating personnel, training/re-training of personnel, schedules, etc.

Personal Protective Equipment (PPE)

The provision of personal protective equipment does not eliminate the hazard, but only shields the individual from it.

4.1.4 Safety Management Procedures

The Site Management HSLP Procedures have been developed in consideration of statutory requirements, relevant standards, corporate standards and guidelines.

Copies of site specific procedures will be made accessible to all employees.

All contractors will be responsible for developing and maintaining specific Work Procedures for their area of specialized work.

4.1.5 Occupational Health

TMAC Resources will provide first aid facilities and trained first aid attendant or advanced medical care personnel (ACLS/ATLS), depending on camp loading. A record of all workplace first aid/medical treatments will be maintained by the person administering the treatment.

Smoking will not be allowed in buildings, vehicles or other enclosed spaces where the cigarette smoke may affect the health of any persons. This is pursuant to Section 45 of the NT /NU Mine Health & Safety Act – Environmental Tobacco Smoke Worksite Regulations.

Each contractor will be responsible to assign a Return to Work Coordinator (RTWC), who shall ensure that all personnel who are injured or suffer from work related illnesses are placed on a rehabilitation program, and shall submit a monthly report to the HSLP Department on all related

activities. The HSLP Specialist will monitor trends in injuries and occupational health through regular review of the treatment records and institute remedial safety actions as required.

The RTWC will submit a monthly progress report to the Site Manager and HSLP Department on the following:

- Medical condition of the injured person;
- Current and future treatment of the injured person;
- Likely return date; and
- Any other progressive and useful information as requested by the HSLP Department.

4.1.6 Fitness for Work

Everyone is responsible for their own fitness for work and ability to perform designated duties free of impairment of any kind. Fitness for work is mandatory for all personnel working at site including contractors.

The ability of personnel employed at Hope Bay to work effectively is critical to their wellbeing and the wellbeing of others. Consequently, fitness for work includes, but is not limited to the following matters:

- Fatigue Management
- Nutrition and Lifestyle
- Family and Social issues
- Stress
- Employee Assistance Programs (EAP's)
- Counseling support.

Personnel who are not fit for work must inform their manager.

4.1.7 Emergency Response

Prompt, effective and organized Emergency Response reduces the consequences and severity of Accidental losses, Emergencies and Disasters. The Emergency Response Plan provides all employees and contractors with written guidelines to be followed in the event of an emergency on the Hope Bay Belt.

Basic firefighting equipment is provided and maintained for the site. Personnel will be trained in first aid and Fire Warden Duties. In the event of an emergency the appropriate warden /supervisor will ensure personnel are evacuated as required in a safe manner and routed to their perspective muster station/assembly area.

All personnel working at Hope Bay must comply with the Emergency Response Plan (ERP). The ERP will provide identification of muster points/assembly areas and the accounting for site personnel during an emergency. The HSLP Specialist or his designate and the relevant Contractors will review and implement emergency response procedures and ensure that

personnel participate in regular emergency drills and exercises. The frequency of such drills will be dependent on the perceived level of risk at individual workplaces. However, emergency drills and rehearsals will occur every six months, as a minimum. The site induction and orientation will address the correct procedure and relevant muster points/assembly areas for all employees working in different areas of the site.

The Emergency Response Plan specifically addresses the following:

- Medical response;
- Fire response;
- Evacuation;
- Missing Persons;
- Aircraft Emergencies;
- Environmental threat response;
- Marine emergency response;
- Falling through Ice; and
- Acts of violence

Personnel will be trained in the use of firefighting equipment and procedures.

Basic first aid kits and survival gear must be provided and maintained by all personnel in:

- Motor vehicles;
- Remote worksites (i.e. drill sites); and
- Field locations outside the confines of any camp.

All worksites located at any camp must be suitability equipped with a first aid kit, fire extinguisher and communication device capable of communicating with the main camp. This can be in the form of a telephone, satellite phone or radio.

Journey Plans are an integral system for monitoring personnel working away from camp or established remote worksites. This includes personnel travelling in vehicles on ice roads which are not flagged and /or recognized as established routes.

The Spot Messenger is a personal tracking device utilizing GPS satellite tracking to monitor worker location, status and in the event of an emergency, request immediate assistance. This is a tool considered part of the normal survival gear when working in remote work /field locations.

Applicable References: *HB-HSLP-ERP-Emergency Response Plan (ERP);*
SRK-1CH008.009.500 Hope Bay Spill Contingency Plan;
HB-HSLP-SOP-002- Working on Ice; and
HB-HSLP-SOP-044- Winter Surface Travel

4.1.8 Fires

All fires must be reported to the Senior TMAC Manager at site and HSLP Department. In the event of a fire:

- Activate the local alarm. If there is no local alarm announce the fire over radio channel one (by stating "Code 1, Code1, Code1");
- If safe to do so, attempt to extinguish the fire. Ensure that the correct agent (Class A, B, C, D) is being used to extinguish the fire;
- If necessary, evacuate the area; and
- Observe and report all facts to the supervisor and Senior TMAC Manager.

NOTE: DO NOT PUT YOURSELF AT RISK AT ANY TIME, GET OUT AND REPORT

4.1.9 Injury and Incident Investigation and Reporting

Incidents and hazards shall be reported to the responsible supervisor immediately. All serious incidents shall be reported to the senior TMAC Manager and HSLP Department immediately. Minor incidents will be reported to the supervisor as soon as possible, but no later than the end of the shift in which it occurred. All personnel are responsible for reporting incidents (including near misses) and hazards to their immediate supervisor as soon as practicable after the incident occurs or the hazard is identified. Whenever practicable every individual is required to immediately rectify identified hazards provided they do not expose themselves to any risk.

All serious incidents shall be investigated by team members consisting of the supervisor in charge of the area, HSLP Department, Department Manager or a designate appointed by the Department Manager; Worker and Management member of the Joint Occupational Health & Safety Committee.

In the event of a fatality the senior TMAC Manager or his/her designate will be responsible for reporting to the RCMP, WSCC and NU Coroner.

Minor incidents shall be investigated by the supervisor in charge and any other person appointed within the Department or Company.

Investigation reports must be completed in full and submitted to the senior TMAC Manager, and HSLP Department within the timelines outlined in Accident /Incident Procedure.

Applicable references: *HB-HSLP-SOP-009 Incident Investigation.*
HB-HSLP-ERP-Emergency Response Plan (ERP)

4.1.10 Alcohol and Drugs

TMAC has a zero tolerance on their premises for the unlawful manufacture, distribution, dispensation, possession or use of illegal drugs and/or possession of or use of alcohol.

Personnel arriving at the airport/expediting company for flights to Hope Bay under the influence of alcohol or if they appear to be impaired by alcohol and/or drugs will be refused access to the aircraft.

Applicable references: TMAC Drug & Alcohol policy

5.0 HOPE BAY WORK INITIATIVES

5.1.1 Purpose

The purpose of this section is to define the safety procedures and systems for drilling, reclamation work, environmental studies, sealift operations and camp support work initiatives at Hope Bay.

5.1.2 Personnel Selection, Competency and Training

Each contractor is responsible for employing personnel with the relevant competencies for the individual tasks; retaining copies of relevant documentation, which will be made available to the site team as required and/or on request. Site team members will monitor competencies of the contractor workforce. This monitoring will ensure that only competent and certified persons are undertaking the specific tasks.

The more complex and/or higher risk tasks shall be conducted by the more experienced personnel; the inexperienced persons shall have support from more experienced peers and/or supervisors.

All personnel will receive TMAC General Site Orientation upon arrival to site. Further training needs shall be determined in accordance with an individual's evolving responsibilities, duties or different work location as determined by their employer.

Training will be conducted and recorded in accordance with the approved procedures and regulatory requirements. The type of training required would typically include, but will not be limited to the following:

- Training specific to the tasks required to be conducted, areas where work is being done;
- Skills upgrading and refresher training (e.g. core cutting saws);
- Workplace procedures and work methods (e.g. Task Hazard Analyses (THA's), safety leadership training for supervisory staff);
- Hot work procedures;
- Work permit, tagging and isolation procedures;
- Confined space;
- Safe work at heights (harness fitting and fall resistant system);
- Fire safety awareness; use of firefighting equipment; and
- Fitness for work.

Applicable references: *TMAC Contractor Safety Policy*

5.1.3 Induction and Orientation

Prior to entering any work area, personnel will be required to complete specified training related to their tasks, scope of work and duration of intended stay on site. All personnel are classified into two categories, namely:

- Site Visitors – those personnel intending to visit Hope Bay site for a period of less than 2 weeks and will be escorted/chaperoned at all times outside of the main camp by a competent person who has received a full orientation and is knowledgeable in potential hazards of the area being visited;
- Site Personnel – all personnel required to work at Hope Bay, and are not considered a Site Visitor by the definition above.

5.1.4 Visitors to Hope Bay

Irrespective of location or environment, TMAC demands the highest level of safety from all personnel including contractors and visitors to the site. Consequently, the requirement for personnel to perform all functions in a safe and professional manner does not vary with their location on the Belt. The safe systems for work are universal.

All personnel employed by the project who are required to visit, or who intend to visit the Hope Bay site shall comply with the Hope Bay Site Guide.

Visitors:

- Ensure proper notification, documentation and approval is completed prior to starting your journey to the Hope Bay site
- Notify senior site manager that you are a visitor to (name host), and report to site host/supervisor immediately after orientation.
- Read and understand the visitor sign off sheet with host.

The host:

- Ensure that all new and transferred employees/visitors have received the appropriate orientations prior to commencing work activities
- Ensure Job Instruction and/or Training techniques are used when assigning workers new, different, or highly hazardous work assignments, utilize the THA's!
- Forward copies of orientation records to HSLP.

5.1.5 Site Personnel

Site personnel are required to complete the following induction and orientation training:

- General Site Orientation may be Computer Based Learning or presentation style learning.

- Area specific induction and orientation.
- Attendance records, personal particulars forms and medical details must also be completed.

5.1.6 Training

All personnel including contractors shall ensure their employees possess the following skills:

Driver Training

Departments and contractors will ensure all of their personnel required to operate mobile equipment have received training to competently and safety operate the type of mobile equipment they are assigned to. A copy of their training must be submitted to the HSLP Department before personnel are permitted to operate equipment.

5.1.7 First Aid

Each department and contractor must ensure that a minimum of 10% of its workforce is trained and qualified in first aid. The HSLP Department shall be informed by each group the particulars of its trained staff. First aid trained personnel will be identified by a safety helmet label. Each work party will, as a minimum, have one qualified first aid attendant in the party whenever and wherever personnel are working.

5.1.8 Fire Training

Each department and contractor will ensure that its work areas and facilities are equipped with firefighting equipment suitable for the work being performed and that all personnel have been adequately trained in firefighting equipment application and limitations.

5.1.9 Competency Training

Competency training will be required for, **but not limited** to the following:

- Crane operators;
- Drilling /Drill rigs;
- Heavy vehicles;
- Elevated work platforms (EWPs);
- All rigging;
- Confined space;
- Working at height;
- Harness training;
- Firefighting equipment;
- Chainsaws;
- All scaffolding

Departments and contractors must ensure that all site personnel hold current and relevant qualifications for the work they are required to perform.

Documentation proving the competencies of employees are to be in accordance with relevant standards.

5.1.10 HEALTH AND SAFETY COMMUNICATION, AWARENESS AND MOTIVATION

5.1.11 Joint Occupational Health and Safety Committee

The site will support the creation of, and participate in, a Joint Occupational Health and Safety Committee (JOHSC). As a minimum, the JOHSC will comprise of the following:

- Management appointed TMAC and contactor representatives
- Nominated TMAC and contractor worker representatives
- Invited guests

The number of JOHSC members will be pursuant to the Mine Health and Safety Act and Regulations, section 3.02 (1).

The Committee will:

- Act as a direct communication channel for all employees;
- Create and maintain an active interest in HSLP matters and assist in reducing work injuries, work-related illnesses and hazards;
- Complete regular inspections of workplaces;
- Review site inspections and audits and make recommendations for corrective actions;
- Recommend and initiate programs aimed at arousing and maintaining interest in the workplace Health and Safety;
- Review safety statistics; and other lagging and leading indicators to help understand the operations strengths and weakness in HSLP performance; and
- Maintain records of meetings including any recommendations made.

5.1.12 Record of Meetings

A record of attendees and of matters discussed will be kept for all JOHSC meetings. The chairman of each meeting is responsible for ensuring such records are maintained, are current and are distributed to personnel, contractors and other interested parties.

Minutes of the meeting and other related information will be displayed on the camp Notice Board, and where practicable on each department & contractor facility notice board. A copy of the minutes will be submitted to the Chief Inspector of Mines by the senior TMAC Manager or his designate.

5.1.13 Daily Pre-Start /Toolbox Meetings

Pre-start /Toolbox meetings must be held prior to commencement of each shift and as required during the course of a shift where personnel are transferred to a new task or location. The supervisor of the work group must discuss the following:

- Outline the work task requirements
- Standard Safety Procedures for the task
- Approved Task Hazard Analysis (THA)
- Permit requirements
- Raise safety matters relevant to the task
- A record of the meeting must be noted in a daily diary or on a form specially designed for the purpose.

5.1.14 Safety Meetings

Safety meetings to discuss workplace HSLP issues will be conducted by the relevant department or contractor supervisor and presented to individual work groups. Safety meetings will be held weekly and will be attended by all members of the work group (including sub-contractor's personnel).

The agenda for safety meetings will be directed toward the activities and tasks associated with the work group. It will also deal with regulatory requirements concerning general HSLP issues that may be encountered in the course of those activities.

Typically such safety agenda items must include, but are not limited to:

- A specific safety topic;
- Follow up items raised at previous safety meetings;
- Review of incidents/near miss reports;
- Follow up discussion of inspections/audits;
- Items of general HSLP importance to the site;
- Items of HSLP interest to the work group;
- HSLP policy;
- HSLP initiatives and review of THAs, and
- HSLP performance.

The following personnel will attend/be represented at safety meetings:

- Senior site member of the Contractor or Sub-Contractor;
- TMAC supervisor for personnel he/she is responsible for.
- TMAC Senior Management as required
- All employees of the respective contractor or sub-contractor; and

- HSLP Representative and contractor or sub-contractor Safety representative (as required).

The objectives of safety meetings are to:

- Review the safety status in the work area in particular and the whole site in general;
- Discuss safety items which have not been resolved on a day-to-day basis;
- Discuss safety aspects of work planned for the next week; and
- Discuss any proposed changes to safety manual or procedures.

5.1.15 Chemical Hazard Communication Program

Communication on any hazardous materials will be established on the basis of an individual's right to know. Personnel working with hazardous materials will be provided with information and training concerning those materials as detailed in the Material Safety Data Sheets (MSDS's).

A database or register of hazardous materials will be established and maintained in the ESR and HSLP offices in order to assist with materials management, environmental management and emergency planning. Potentially hazardous materials to be shipped and used on site must be reviewed by the HSLP & ESR Departments prior to delivery. Potentially hazardous materials will be stored in accordance with Workplace Hazardous Materials Information System (WHMIS), and the Dangerous Goods Act (TDG).

Every workplace is required to have Material Safety Data Sheets available for every single hazardous chemical or substance used or stored in the area.

A manufacturer's MSDS for each product will be presented and logged in the hazardous materials register /database. Materials which arrive to site without an approved MSDS being available will be held in a suitable storage/lay down area until that information is available. MSDSs must be provided by manufacturers or distributors and maintained at site for reference and training.

Hazardous substances will be handled, stored and transported in accordance with regulatory requirements and approved codes of practice. Substances shall not be introduced to any worksite unless an MSDS is available at the workplace for that material.

Contractors are responsible for ensuring that chemicals and other hazardous materials proposed for use on site must first be authorized for use by the HSLP and ESR Departments. Adequate labeling, signage, transport, handling, storage and disposal requirements will be presented for approval to the HSLP and ESR Departments. Manufacturers' or distributors' warning labels must be attached to the hazardous materials containers and maintained until the containers are safely disposed of in accordance with the procedures. All other hazardous material containers used must also be labeled with comparable information.

Applicable references: *HB-HSLP-SOP-001 WHMIS*

5.1.16 Reporting and Resolving HSLP Issues

All hazards and HSLP issues are to be reported as soon as practicable to the relevant supervisor. Should the matter remain unresolved, it will then be addressed between the HSLP Department, employee's supervisor, and the applicable manager.

An employee may refuse to work at any worksite if he or she has reasonable cause to believe that the condition of the worksite could endanger the health or safety of any person. Any work refusal will follow all steps outlined in the Mine Health and Safety Act and Regulations, section 4.0 until the refusal is resolved.

5.1.17 Performance Management – Corrective Action

It is TMAC's intent to administer TMAC policies in a consistent and reasonable manner. Contractors are expected to be responsible for and to manage the performance of contractor employees.

If corrective action is required the type of corrective action taken will depend on the severity of the conduct, frequency of the violation(s), willfulness, history of corrective action and other considerations.

The types of corrective actions taken may include but are not limited to the following:

- Instructional Warning/coaching
- Level 1 – Recorded Verbal Warning
- Level 2 – Written Warning
- Level 3 – Final Written Warning
- Termination of employment for cause/ removal from site.

Cause for Instant Dismissal/Removal from Site

Personnel may be subject to instant dismissal and contractors personnel may be immediately removed from the site should any of the following occur:

- Failure to comply with safety tagging procedures.
- Performing highly skilled work without proper training, certification and authorization.
- Failure to comply with lock out procedures.
- Travelling to other locations within the Belt without prior approval and authorization resulting in search and rescue operations.
- Tampering with or damaging safety equipment or devices.
- The use or possession of alcohol or illegal drugs on site.
- Engaging in intentional acts of damage or sabotage.
- Working at height without the use of fall protection.
- Violent behaviour of any kind or threats of violence

As every situation may be different a full investigation will be undertaken by site management prior to making the decision to dismiss an employee or revoke camp privileges of contractor employee.

Applicable Reference: *Hope Bay Camp Cardinal Rules*

5.1.18 Safe Work Procedures (SWP)

All contractors are to ensure their SMPs address as a minimum the pertinent hazards identified and their risk assessment for the site. The risks associated with each of these hazards are to be addressed through the means of a safe work procedure or THA. Each Contractor will develop safe work procedures or work methods for their scope of work. These procedures /methods are to be developed with consideration of regulatory and site requirements and must be submitted for review to the relevant Manager and HSLP Department (or designate) prior to work commencing.

Work procedures may be developed from hazard analysis processes, such as Hazard and Operability studies (HAZOP) or Task Hazard Analysis (THA). Hazard analysis techniques will be applied to all tasks that are undertaken at site. Particular attention will be paid to the tasks that are complex in nature or that have a higher than normal level of risk (eg. dual crane lifts, critical crane lifts, work on 'live' equipment, pressure testing). For non-routine basic tasks without written procedures personnel must complete a formal THA. This will be done to ensure the proactive control of issues that may adversely affect the efficient and safe completion of the task.
Applicable Reference: *HB-HSLP-SOP-008 Safe Work Plan*

Caveat

Existing safe work procedures developed for site by the previous owner will continue to be used during the transition period or until replaced by a TMAC safe work procedure.

5.1.19 Task Hazard Analysis (THA)

Individual jobs/tasks that require a THA shall be analyzed in accordance with the following criteria:

- What are the steps making up the job or task? (*Steps*);
- What are the hazards that could impact on each step of the job? (*Hazards*); and
- What action is to be taken to remove or reduce the hazard? (*Controls*).

The supervisor responsible for performing the work is also responsible for identifying tasks for analysis and for conducting the process of the THA's. The HSLP Department is responsible for providing assistance to supervisors to conduct THA's when requested. All THA's will be conducted and recorded in accordance with company procedures. All high risk work requiring a THA's must be submitted to the relevant Manager and HSLP Department (or designate) prior to work commencing. All departments and contractors shall maintain copies of all THA's.

Applicable Reference: *HB-HSLP-SOP-008 Task Analysis and Standard Task Procedures preparation Administration and Review*

5.1.20 Safe Act Observation (SAO)

The process is designed to assist all workgroups in developing safer and better understanding of their work process. This is achieved by:

- Safe work procedures;
- Job plan;
- Task hazard analysis;
- Operating procedures;
- Equipment specifications;
- Manufacturers' manuals; and
- Policies and procedures.

When carrying out any SAO the following process shall be adhered to: Set the scene by explaining what you would like to do in an open, honest and friendly manner;

If you are given a genuine reason why you should not be doing this observation at that time, arrange a time suitable to both parties;

- Focus on the problem, not the person - don't be critical of the person;
- When making written comments, don't use names or apportion blame;
- Keep questions simple and to the point;
- Seek verbal feedback from the person doing the job and listen to what is said;
- Ensure understanding by asking questions until it is clear;
- End on a positive note and try to remain enthusiastic; and
- Revise job plan, THA and safe work procedure.
- A copy of the completed Safe Act Observation must be forwarded to the HSLP Department within 24 hours of completion.

Applicable Reference: *HB-HSLP-SOP-018 Behavioral Observation Program*

5.1.21 Planning Of Activities

Hazard Identification will determine management strategies for HSLP issues. Written work procedures will be developed as required. The complexity of each written work procedure will vary with the nature of the work scope of each job.

All departments and contractors will develop written work procedures which must address the following matters as a minimum:

- Scope and purpose/application;
- Objectives and goals;

- Risk assessment and safe work methods;
- Employee involvement;
- Employee qualification;
- Statutory requirements;
- Training;
- Field execution practices (eg. inspection, reporting, investigation, and communication);
- Responsibilities; and
- References.

All groups will be responsible for ensuring the following:

- The development of safe work procedures for all hazardous tasks;
- Providing a copy of all safe work procedures to the relevant supervisors and HSLP Department;
- Supervisors will provide training to all personnel on the job in the safe work procedure at the daily pre-start meetings;
- All safe work procedures (latest revision) will be maintained in a register. A copy must be available to all personnel at the work place at all times;
- The appropriate manager will retain copies of superseded safe work procedures. These procedures will not be readily available to site personnel; and
- Safe work procedures will be reviewed on a regular basis.

5.1.22 Planned Inspection

Inspections and audits required on the site are:

- Informal Daily Site Inspection - an informal inspection conducted by each supervisor at each of their work sites each day (this is not a formal recorded inspection), however, key findings, employee corrections and remedial actions should be noted in the supervisors log-book; and
- Formal Weekly /Monthly Site Inspection - this is a formal recorded inspection that will be conducted randomly by both contractor and site supervisors on a weekly /monthly basis. Any follow-up actions are to be entered into a Corrective Action Register (CAR).
- All rectification and remedial actions completed, resulting from inspections and audits shall be identified in the Register as “closed”
- All site inspections and audits must be made available to the HSLP Department for review on request.

Applicable Reference: *HB-HSLP-SOP-012 Inspections*

5.1.23 Monthly HSLP Report Matrix

Each contractor shall be responsible for the completion of a HSLP Monthly Report and submit to the HSLP Department before the 5th of each month. A matrix template will be provided by TMAC to all Contractors to assist with identifying Leading and Lagging indicators. This statistical information will be used to measure and benchmark against targets. The scope of the document will include, but not limited to:

- Trends;
- Corrective actions;
- Injury, property damage and other types of losses;
- Total Recordable Accident Frequency (TRAF), Lost Time Accident Frequency Rate (LTAFR); and
- Audits, Safety Meetings, Inspections and Task Observations

5.1.24 Maintenance, Inspection, Testing and Modification

Procedures for the maintenance, inspection and testing of equipment must be complied with at all times. These procedures are typically applied to:

- Scaffolding, and other equipment capable of working at height and load bearing (EWP's, ladders and rigging gear, etc);
- Portable electrical equipment and power generators (packs, generator sets, etc);
- All forms of light vehicles and vehicle mounted equipment;
- Firefighting equipment; and
- Medical/first aid equipment.

Records will be maintained by the relevant department or contractor and forwarded to the Maintenance Manager for all maintenance, inspection and testing activities carried out. Prior to arrival on site, all plant, vehicles and heavy equipment shall be inspected and certified by a qualified and competent authority/person. Copies of this certification must be forwarded to the Maintenance Manager a minimum of 72 hours before transportation of plant to site commences.

Documentation will be assessed and if acceptable, entered into a register. The responsible department or contractor shall then be issued with an authority and approval to transport to site, and estimated delivery date/details will be confirmed.

Upon arrival of equipment at site, originals of the certificate and inspection documentation shall be presented to the Maintenance Manager or his designate. Certification for lifting equipment shall be maintained by the responsible contractor /department with copies and documentation available on demand as required by site safety policies and procedures.

Portable electrical equipment must be inspected by a qualified electrician who shall deem it serviceable or non- serviceable. Serviceable equipment shall have the relevant and correct

colour tag entered into the portable electrical equipment register and be stamped or marked in accordance with the relevant standards.

A copy of the portable electrical equipment inspection register will be forwarded at completion of testing to the Maintenance Manager. No electrical equipment or test equipment shall be modified in any way other than as approved in writing by the manufacturer.

5.1.25 Portable Electrical Equipment

All portable electrical equipment shall be inspected and tagged with the appropriate colour code tag every three months. RCD (Residual Current Device) and other earth leakage protection must be inspected and tagged on a monthly basis. RCD's will be used in all cases where there is a requirement to use portable electrical equipment. Voltage Regulating Devices (VRD's) are to be used as required and tagged accordingly.

All electrical equipment is to be checked prior to use and any equipment that is damaged, defective or untagged (including out of date tag) shall not be used, shall have an out-of-service tag fitted and be reported to the supervisor.

All portable electrical equipment is to be entered on a register showing each item, date of inspection and serviceability. A copy of the portable electrical equipment inspection register shall be forwarded at completion of testing to the Maintenance Manager.

Portable electric equipment not complying with inspection and tagging requirements will not be permitted to be placed at site.

Applicable Reference: *HB-HSLP-SOP-039 Hand and Portable Electric Tools*

5.1.26 Rigging Equipment

Rigging equipment includes but is not limited to:

- Slings (all types) and all lifting chains;
- Four point cables;
- Shackles;
- Spreader bars;
- Chain blocks;
- Tirfor jacks; and
- Come-alongs.

A 'proof of load' certificate for load bearing equipment shall be provided and maintained in the rigging register. All equipment shall be inspected every 4 months. A tag or stamp showing the Working Load Limit (WLL) for that equipment must be visibly displayed on each item.

A register for all rigging equipment shall be completed and maintained. All equipment is to be checked prior to use and any equipment displaying signs of excessive wear or damage will be discarded and/or destroyed.

NOTE: High-Lift (jack-all) jacks are not permitted on site.

5.1.27 Management of Change

Changes to approved specifications, design, materials or work methods are required to be documented, analyzed for safety and approved before such changes are adopted. Following their implementation all management processes are subject to continued monitoring and review.

Applicable Reference: *HB-HSLP-SOP-016 Change Management*

5.1.28 Personal Protective Equipment (PPE)

Various work activities are carried out on the Hope Bay site that require personnel to be exposed to extreme weather conditions that range from white out conditions to extreme cold temperatures that can drop below - 60º C.

PROTECTIVE MEASURES

Proper planning and preparation for exposure to cold conditions is essential. Sudden cardiac events increase during a cold snap. Cold air can cause blood pressure to go up, especially when skin is exposed. Hypothermia and frostbite can be avoided by following these guidelines:

Warm Clothing

Dress so that comfort is maintained, moisture dissipates adequately and excess heat radiates freely from the body.

Wear layered clothing. Proper layers trap warm air near the body but will not trap perspiration next to the skin. Wear polypropylene clothing as it wicks the moisture away from the body. Use breathable fabrics, such as cotton and wool. Layers might include thermal underwear, undershirt, tracksuit, sweater, snowsuit, hat, scarf and mittens or gloves.

Minimize sweating by changing clothing to suit the activity level. Wear a warm hat. At near-freezing temperatures almost half of body heat escapes from the head if it is not covered.

Another one of the primary ways our bodies lose heat is through our breath. A balaclava conserves body energy and heat.

Protect feet and hands. Wear loose waterproof boots. If the boots have felt liners, carry an extra pair to replace damp ones. Mittens warm the hands more effectively than gloves. Carry an extra pair of mittens or gloves.

Try to stay in a heated environment, but avoid excessive sweating. Clothing wet with perspiration increases heat loss. In situations where it is likely that clothing may get wet from water exposure or excessive perspiration, it is advisable to have extra dry clothing available.

The following PPE is the minimum standard for the work site:

- Safety helmet for snow mobiles;
- CSA Safety glasses (wrap-around or with side shields);
- Hard hat in designated areas outside office buildings;
- CSA steel cap or approved composite toe safety footwear (recommended high lace-up boots);
- High visibility coveralls or vest (orange); and
- Any specialized PPE required (e.g. gloves, face shield, hearing protection).
  NOTE: It is recommended that 100% cotton long sleeved collared shirts and long trousers are worn at all times. All PPE must be serviceable, in good condition and comply with the relevant standards.
  Contractors and company personnel must provide training to their workers as required for the use of any specialized PPE or where required (e.g. how to fit hearing protection).

Applicable Reference: *HB-HSLP-SOP-011 Personal Protective Equipment*

5.1.29 Light Vehicles

All 4WD light vehicles working on site shall be fitted with:

- Buggy Whip and /or Flashing amber light
- Operating jack and wheel chocks;
- Fire extinguisher minimum 2.4 kg;
- Survival Gear including First aid kit;
- Reversing Alarm
- Seat belts for driver and all passengers (e.g. side seating vehicles, troop carriers, are not permitted to be used for the transport of personnel);
- Cargo barriers.

Drivers of light vehicles must have a current driver's license with the applicable classification code. Drivers will be held accountable for the condition of their vehicle, daily pre-start inspections and its operation on site.

Applicable References: *HB-HSLP- SOP- 038 Vehicles and Mobile Equipment*

5.1.30 Heavy Vehicles and Mobile Plant

All heavy vehicles and mobile plant equipment shall be diesel powered and be fitted with:

- Flashing amber light;
- Reversing alarm;
- ROPS (where applicable);
- Fire suppression (for underground) or extinguisher, minimum 9.0 kg; and
- Seatbelt for driver/operator and passengers (if applicable).

TMAC requires all heavy vehicles to observe the following procedure prior to operation:

- Pre-mobilization inspections of all equipment including cranes to be completed by a qualified person with appropriate documentation;
- Flashing amber lights and headlights on at all times the vehicle is mobile;
- Appropriate registration and certification such as crane rope inspection certificates, etc;
- Reverse parking at all times;
- Drivers and operators must be qualified and tested as competent by their employer;
- Wheel chocks for wheeled equipment;
- Documented weekly inspection is required on all equipment including light vehicles; and;
- No split rim tire repairs in the field.

Applicable References: *HB-HSLP- SOP- 047 Cranes and Lifting Equipment*
HB-HSLP-F-047 – Critical Lift Form

5.1.31 Buried Services

Prior to any excavation, an excavation permit together with a fully marked up drawing by the department or contractor, together with a services search, must be obtained.

Where services are identified within 1.5 meters of an excavation, hand tools only shall be used to expose and identify the buried services prior to any excavation work proceeding. A spotter must be used at all times machinery is being used to excavate in the vicinity of any buried service.

All new buried services shall be clearly marked above and below ground on the applicable drawing. Locations, survey markers and positions are to be included in drawings.

Applicable References: *HB-HSLP-SOP-040 Excavations and Trenching*
HB-HSLP-SOP-040 Excavations Permit Template
HB-HSLP-SOP-037 Energy Isolation

5.1.32 Confined Space Entry

All work occurring in any confined space must comply with site requirements. Prior to entry into any confined space the following minimum requirements must be complied with:

- Personnel entering a confined space, including the spotter, must meet the Confined Space requirements.
- Hazard identification session (to include identification of required isolations);
- Isolations completed;
- THA completed;
- Gas testing;
- Ventilation and lighting checked;
- Electrical equipment isolated;
- Means of access or egress (eg. scaffolding);
- Completed and approved permit;
- Communications provided;
- Emergency rescue preparedness;
- Controlled access/egress;
- Spotter;
- PPE and safety/rescue equipment; and
- Specialist equipment (eg. breathing apparatus for welding fumes, etc).

Applicable References: *HB-HSLP-SOP-040 Confined Space*
HB-HSLP-SOP-037 Energy Isolation

5.1.33 Working At Height

Working at height is not limited to working in areas that are above ground level. It may also include areas in which personnel are required to work below ground, but above a void of some description. In the event that this issue is unclear a THA and risk assessment shall be completed. Further assistance may be obtained from the HSLP Department. All personnel must be adequately trained and be certified prior to conducting any work at heights. Fall protection is required at any time, when:

- Working at height of 2.0m or higher when no engineering controls are in place;
- There is a risk that personnel may fall and injure themselves;
- Working outside of a handrail;
- Working from any elevated work platform or man cage;
- An employee feels that such protection is required; and
- Undertaking a work task closer than 2.0m to an open edge.

Fall protection may include, but is not limited to:

- Scaffolding;
- Substantial handrail; and
- Personal fall arrest or restraint equipment.

Applicable References: *HB-HSLP-SOP-045 Working at Heights Fall Protection*

5.1.34 Scaffolding

All scaffolding construction at site must be supervised, erected and dismantled by competent scaffold personnel and meet as a minimum the applicable Codes. As a minimum the scaffolding must have a Scafftag completed and attached to the point of entry, and be maintained and inspected daily (by scaffold personnel). Scaffolding shall:

- Have ladder access (to extend 1m past landing);
- Have handrail and midrail;
- Have tied or locked decking;
- Have sole plates (timber, not concrete);
- Be tied in or outriggers fitted when height is twice the base or more;
- Be engineer-designed and approved (for non-standard scaffolds); and
- Not have any modification or damage to any component.

Applicable References: *HB-HSLP-SOP-048 Scaffolding & Raised Platforms*

5.1.35 Handrails

Any barrier designed to protect a person from a fall:

- Must be substantial (i.e. if a person falls against it they cannot go through or over it);
- Must be 910mm to 1070mm high;
- Must have a mid-rail;
- Must have a kick plate not less than 100mm; and
- Must be checked weekly if not constructed of scaffolding components.

Applicable Reference: *NU Mine Regulations Section 1.91*

5.1.36 Fall Protection

Documented harness (Fall Protection) training must be conducted and provided by the responsible department /contractor. A THA shall be completed and a full body harness must be used in all cases. Requirements for harness use are:

- Inspection and maintenance (entered into harness register and certified by a competent person);
- Wearing and fitting of the harness
- Marking and identification of equipment;
- Anchor points and retrieval points checked;
- lanyard application (correct type and application);
- Inertia reel (SRL's) and requirements (e.g. do not use with a shock-absorbing lanyard);
- Register of equipment; and
- Pre- and post-use inspection.

- Static line certified fit for purpose and restrictions detailed (eg. do not use with a specified length of inertia reel).

Applicable References: *HB-HSLP-SOP-045 Working at Heights Fall Protection*
HB-HSLP-SOP-048 Scaffolding & Raised Platforms

5.1.37 Ladders

All ladders must be inspected prior to every use. Requirements for ladder use are:

- Tied-off and secure at base;
- Ladder inclination ratio to height is to be 1:4;
- If used onto a platform (landing), the ladder shall protrude at least one meter past the platform;
- Personnel shall not stand on the top 2 rungs;
- Maintain a 3-point grip on the ladder at all times;
- Do not use conductive (e.g. aluminum) ladders for electrical work or near electrical installations. For all electrical work only approved electrical work ladders are to be used;
- Maximum height for a ladder is six meters; and
- When using extension ladders the overlap must be a minimum of ¼ of the height.

Applicable References: *HB-HSLP-SOP-051 Ladders and Stairways*

5.1.38 Elevated Work Platforms (EWP's)

All EWP's to be used on site must have a pre-mobilization inspection prior to their arrival and are required to be pre-start inspected prior to every use. All personnel operating a EWP must be certified and competency-tested by their employer. The minimum requirements for using a EWP are:

- Operator must be properly trained, qualified and competent;
- Fall arrest harness is to be worn and anchored to the appropriate point within the basket at all times;
- Do not stand on hand rails or mid rails;
- EWP's are not to be used for lifting equipment apart from normal hand tools;
- Ensure the Safe Working Load (SWL) is not exceeded by personnel and/or tools;
- Do not use the EWP as a means of access /egress, unless a risk assessment has been done with the supervisor, and the competent person doing the task, that shows you are not increasing the risk of injury or harm occurring;
- Must be used on level ground only; and
- Pre-operational checks and records complete.

Applicable References: *HB-HSLP-SOP-048 Scaffolding & Raised Platforms*

5.1.39 Man Box/Man Cage/Lift Basket

All man boxes shall be certified and show a Safe Working Limit (SWL), and shall be inspected and approved prior to being used at site. Any lift requiring a man box to be used shall have a qualified rigger with radio communications with the crane operator in control of the lift. A crane without a slewing capacity or with any capacity for free fall will not be allowed to be used for operations involving Man Box/ Man Cage/ Lift Basket.

A THA must be completed by all personnel involved with the work requiring the man box and a permit will be completed and approved prior to the work commencing. Requirements for man box use include:

- A permit, accompanied by a completed THA, authorized by the Department Manager (or designate);
- The man box shall be designed by a professional engineer and copies of the design fabrication drawings will be kept at site;
- Clearly marked with an identification number, the weight of the man box and rigging and the safe working load of the man box
- Have supporting hooks and shackles latched or moused to prevent dislodgment;
- Swing radius under man box shall be barricaded and sign-posted warning of work above;
- Personnel within man box shall wear fall restraints and be fully attached at all times;
- While aloft, personnel are to remain fully within the man box;
- The man box is not to be used as a means of access to elevated platforms, etc;
- Man boxes are not to be used in windy conditions.

Applicable References: *HB-HSLP-SOP-048 Scaffolding & Raised Platforms*
HB-HSLP-SOP-045 Working at Heights Fall Protection
NU Mine Regulations section 10.133 (5)

5.1.40 Manual Handling

Prior to any manual-handling task, a hazard assessment shall be conducted to determine:

- Does the load need to be moved?
- Can it be handled by one person or is help required?
- Can mechanical lifting aids be used?
- Is the route and destination clear?

As a preventative measure, wherever possible mechanical lifting aids will be considered as the first option in moving any load. When the load must be lifted manually, the principles are as follows:

- Stand close to and facing the load;
- Squat keeping back straight and inclined to ensure balance;

- Bend at the knees to maintain balance;
- Look straight ahead and test the weight of the object and get a firm grip on it;
- Using the legs, lift the object, keeping the load close to the body (do not twist);
- Turn and face the direction of travel; and
- To place the object down, keep the back straight and inclined to maintain balance, and bend the knees to lower the object to the level required.

Applicable Reference: HB-HSLP-SOP- 030 *Manual Handling Procedure*

5.1.41 Working Alone

All supervisors are to ensure that any person working on any task by themselves has either visual contact or radio communications at all times. If continuous visual contact is not maintained, regular communication check is to be in place at intervals of not greater than two hours or more often as dictated by the nature of the work.

Personnel working in remote field locations are to use the buddy system at all times.

Applicable References: *NU Mine Regulations section 8.09*

5.1.42 Excavation Works

If land clearance is required prior to excavation or break in, approval and land clearance permit is required.

All excavations and penetrations undertaken at site must comply with the Procedure (HB-HSLP-SOP-040 Excavation Procedure) and must be submitted to the Maintenance Manager for authorization.

Prior to any excavation, break in or penetration over 150mm in depth an excavation permit must be issued and approved by the Maintenance Manager (or designate).

Applicable References: *HB-HSLP-SOP-040 Excavation Procedure*
HB-HSLP-SOP-040 Excavation Permit Template

5.1.43 Barricading

To avoid persons, plant or equipment falling into excavations or areas where fall potential exists, solid barricading must be used.

Solid barricading must be used for all excavations located within or adjacent to populated work areas and equipment or as defined by the HSLP Department. Solid barricading can be constructed from scaffold tubing or can be free standing units.

Bunting, flagging, tape or traffic cones or delineators will not be accepted as a substitute for solid barriers.

Details of barricading must be included in the THA submission for the task that involves the excavation or that exposes fall potential. Erection will only be under taken once approval has been granted.

All barricading erected by the Department or contractor must have an information tag attached, clearly identifying the company and the purpose of the barricade.

The minimum visual hazard identification standard for Caution barricade will be Orange triangles attached to rope. Plastic tape must not be used for barricade without authorization of the HSLP Department.

In all cases the following requirements shall be complied with:

- Barricading of excavation or holes over 300mm depth;
- Ladder access over 500mm depth;
- Battered or benched sides over 1.5 meter depth (shoring or trench guards are an option);
- Personnel not to work alone in any excavation over 1 meter depth; and
- Flashing lights/signage for open excavations adjacent to work areas and road ways;
- Erection of barricades;
- Not less than 1.0 meter from the hazard;
- Height to be 1.0 meter minimum;
- Earth windrows of 1.0 meter can be used in low access areas;
- All must be well anchored with sufficient supports to prevent sagging;
- Caps must be fitted to all-star pickets or stakes;
- Yellow flashing lights in darkness or high wind/dust conditions, and
- Illumination to be provided as for all traffic areas.

Responsibility for establishing and maintaining barricades:

- Any person who creates or is about to create a hazard;
- Any person that removes a barricade must re-establish it immediately;
- Contractors shall maintain barricades continuously until the hazard has been eliminated, and;
- All barricades shall be checked prior to the end of each shift.

5.1.44 Hot Work

All Hot Work undertaken at site must comply with the Hot Work Procedure.

Before any hot work commences at site, the surrounding area is to be cleared of all combustible material and a fire extinguisher or some other means of fire suppression shall be provided within 10 meters of the intended hot work.

Hot work includes, but is not limited to:

- Grinding;
- Heating with torch or open flame
- Thawing pipes
- Hot cutting;
- Oxy acetylene welding;
- Electrical welding; and
- Any other process that produces a spark or ignition source.

In all cases a fire watch shall be used during the hot work and a follow-up check shall be carried out 30 minutes after the work has ceased and up to 2 hours depending on the risk evaluation and potential exposures of combustible and flammable materials.

Appropriate fire protection must be in place with each cutting and welding unit prior to the commencement of work with special consideration to existing facilities and plant (eg. conveyors, electrical cables, piping, personnel working below, etc.).

Fire protection may include:

- Fire extinguishers (required for each cutting and welding unit);
- Fire hose reels;
- Welding/fire blankets; and
- Fire standby/observer person.

Specific equipment and hazard control devices must be used in accordance with the safety procedures, codes of practice, and statutory requirements.

These may include, but not be limited to:

- Cylinder storage frames and lashings;
- Dual flash back arrestors (fitted to both the hand piece and bottle);
- Residual current devices (RCDs); and
- Voltage regulator devices (VRDs).
- Prior to any hot work in a suspected flammable atmosphere, gas testing must be conducted to ensure an inert atmosphere prior to entry and work commencing. A THA must be completed for any hot work.

Applicable References: *HB-HSLP-SOP-040 Hot Work Procedure*
HB-HSLP-SOP-040 Hot Work Permit

5.1.45 Working on Roofs

Prior to working on any roofs, the contractor or personnel carrying out the work must present to the HSLP Department, a completed work method statement or procedure detailing the task to be completed. The following consideration shall be made:

- Age and material of the roof;
- Safety systems within the structure (eg. mesh underlay);
- Pitch of roof;
- Access (scaffold etc);
- Integrity of roof structure to support weight;
- Means of traversing the roof (crawl boards or walkways etc);
- Edge and fall protection;
- Hazards (eg. overhead power lines, gantry cranes, personnel working below, etc);
- Competency of the personnel to undertake the work task; and
- A THA shall be completed to ensure that all local conditions have been assessed.

Applicable References: *HB-HSLP-SOP-045 Working at Heights Fall Protection*
HB-HSLP-SOP-045 Roof Access Permit Template

5.1.46 Cranes and Lifting Equipment

Prior to being used at site, all cranes and other lifting equipment shall be inspected by a competent person with the completed pre-mobilization inspection form presented to the HSLP Department.

The inspection shall include:

- Serviceability and condition of the crane or equipment;
- Certification of the crane or equipment;
- Component inspections (eg. crane rope, block, etc);
- Compliance with statutory and site requirements.

Applicable References: *HB-HSLP-SOP-047 Cranes and Lifting Equipment*

5.1.47 Competency for Lifting Equipment

All personnel required to operate a crane or other lifting equipment at site must submit photocopies of all appropriate qualifications and their employer will be required to submit documented proof of a competency test prior to their operating on the site. Only trained and certified riggers will be used for the slinging and control of loads. All heavy lift operators must be fully conversant and familiar with the equipment they are about to use, and/or operate.

5.1.48 Lifting Operations

Any lift that is more than 75% of the WLL (at any radius), any dual or multiple crane lift, any critical lift (eg. over process piping, power lines, etc.) and any lift exceeding 20 tons will require a Lift Study and Lift Plan to be completed and approved prior to the commencement of the lift. A THA will be required for the walking of any loads or non-routine lifts (e.g. unloading of trucks, etc).

Tag lines shall be used where the load is lifted higher than chest height of the rigger. All loads being walked must be tied back to the crane with the rigger controlling the load and route from the front of the load.

For large awkward or non-routine loads, an escort vehicle shall be used in front of and behind the crane.

For overhead lifts or congested areas the swing radius shall be barricaded and sign posted to prevent access to all personnel and equipment. When a crane or any other type of lifting equipment must operate within 10 meters of any high voltage overhead power lines, the power must be isolated prior to any work commencing.

Applicable References: *HB-HSLP-SOP-047 Cranes and Lifting Equipment*
HB-HSLP-SOP-047 Critical Lift Form

5.1.49 Inspection and Maintenance

All cranes and lifting equipment must be inspected on a daily basis or prior to any lift. All rigging equipment shall be registered. It must also be inspected and tagged on a 4-monthly basis by a qualified person. All rigging equipment must be discarded if it shows any sign of structural damage (tear, crack, stretch, twist, etc) or more than 10% wear. The inspection register and certificates must be held in the crane cab.

5.1.50 Respiratory Protection

All personnel shall assess the hazard prior to commencement of the task by means of a THA. The requirements for respiratory protection shall be assessed. In the event personnel are required to wear respiratory protection, departments and contractors are responsible for ensuring the affected employees have undergone a medical examination specifically addressing their lung function capacity and have been trained in the use of respiratory protection (ensure seal, etc).

All department and contractors on site must maintain records of medical evaluation and training. All personnel must also ensure that respiratory protection is cleaned or disposed of after each task/shift. The employee issued with the respiratory protection must:

- Be fit tested for the respirator;
- Wear, inspect, store and maintain the equipment issued;
- Report any malfunction of this equipment;
- Report any change to the conditions which could affect the respirator fit; and
- Report any medical signs or symptoms related to use of the respirator.

All respiratory protection, selection, use and maintenance will be in accordance with the Respiratory Protection Procedure. All personnel that require respiratory protection must observe the following:

Be clean-shaven (male wearers should shave daily - no beards);

- Moustaches shall not protrude beyond the corner of the mouth; and
- Wearing a full face piece requires side burns to be no longer than the corner of the eye. With the exception of half face respirators, all respirators must have an identification tag.

Applicable Reference: *HB-HSLP-SOP-030 Respiratory Protection*

5.1.51 Traffic Management

All personnel required to drive a vehicle or mobile equipment at site must hold an appropriate driver's license. Only designated drivers who have authorization from their supervisor can operate any light vehicles within the site area.

Traffic patterns will be designed and posted to bulletin boards to accommodate on-going changes to construction and road work and ensure the safety of all personnel.

All personnel operating mobile equipment in and around the airstrip must be familiar and sign off on the HB-OPS-SOP-051 Airport Procedure

5.1.52 Speed Limits

All vehicles while driving at site, irrespective of their design, must comply with the posted and advised speed limits.

5.1.53 Site Driving Requirements

All vehicle drivers at site must comply with the following:

- Obey all stop and other road signs;
- Know and understand the vehicle horn signals
- Vehicles will yield to larger equipment, passenger vans /buses and emergency equipment by pulling into a turn-out.
- Do not enter any restricted areas. If there is any requirement to enter a restricted area, that area supervisor shall be contacted for permission and to arrange an escort;
- No overtaking on any roads is to occur without a positive hand signal or radio communications from the vehicle in front;

- Reverse parking at all times, headlights and flashing amber light on while vehicle is in motion. All light vehicles to have extended buggy whip mounted so it is above the cab of the vehicle by at least 1 meter.
- Drive to the prevailing road conditions at all times.

Applicable Reference: *SOP- HSLP-SOP-038 Light Vehicle and Road Safety*

5.1.54 Loading, Transport and Unloading Materials

It is the responsibility of any person who is responsible for delivery of materials at site to ensure they are familiar with safe procedures at all times.

These include:

- Wide load, escort requirements, travel times and rules for travel.
- Vehicle is correctly loaded and not overloaded, (weight distribution, hazardous materials, etc.);
- Vehicle and driver comply with all site requirements (flashing amber light, reflective apparel, PPE, etc.);
- Correct access procedures and routes used (laydown area location), including all required site documentation;

Applicable References: *HB-HSLP-SOP- 030 Manual Handling Procedure*
HB-HSLP-SOP-038 Vehicle and Mobile Equipment

5.1.55 Fatigue Management

Fatigue is defined as an impaired physical and mental condition which arises from an individual's exposure to physical and mental exertion and inadequate or disturbed sleep. Priority must be given to reducing the exposure of employees to disturbed sleep or inappropriate sleep/recovery periods. Where practicable, this is to be controlled or minimized through engineering controls.

This may including elimination of excess noise, abnormal and inappropriate shift patterns, task design, substitution and rotation of personnel displaying symptoms of fatigue, and the provision of adequate facilities that ensure employees are afforded the ability to recover/sleep without being disturbed.

Applicable References: *HB-HSLP-SOP- 030 Fatigue Management*

5.1.56 Safety Handover Report

All supervisors must read and countersign all reports of the previous rotation (shift) and discuss any health and safety matters of concern and any unusual or hazardous conditions or deficiencies with persons under his or her control before deploying them to their worksites.

Applicable References: *Mine Health and Safety Act and Regulations*

5.1.57 Pressurized Equipment

Site personnel including contractors required to use pressurized equipment at Hope Bay must ensure that employees are trained in the use of such equipment and furthermore are fully conversant with the hazards associated with pressurized equipment. Research has demonstrated that most pressurized equipment fails through being exposed to:

- Mistreatment;
- Sharp edges;
- Poor handling techniques;
- Incorrect installation or fitting;
- Incorrect fitting of whip check system, etc; and
- Incorrect flow rate.

The most significant hazard identified is that of the equipment containing stored energy, suddenly being unreleased in an uncontrolled manner. In the event of this sudden release of uncontrolled energy a whipping action occurs.

If inadequately restrained or 'whip checked', the resulting whipping effect may cause equipment damage and significant injury to or death of personnel.

Consequently, all pressurized equipment must be restrained, or 'whip checked', through the use or combined use of the following:

- Single leg cable stocking;
- Sling (i.e. one or two sling);
- Internal reinforcement; and
- Double or two leg cable stocking.

NOTE: During all operations requiring pressurized equipment on the site, all personnel will be required to use double or two leg cable stocking wherever and whenever practicable.

Pressurized equipment includes but is not limited to any equipment such as line, hose, vessel or container which is subjected to pressure above or below that of one atmosphere.

Particular attention must be given to the securing and whip checking of:

- Hydraulics lines and pressure units;

- High pressure water lines, pumps and vessels;
- Air compressors and lines; and
- Associated tools and accessories.

5.1.58 Drilling Operations

Contractors employed to provide drilling services at Hope Bay must ensure their operations manual and associated SMP's are submitted and fully reviewed prior to mobilization to site. Competency and qualifications of all crew members must be documented and provided prior to mobilization in accordance with the relevant standards.

5.1.59 Bulk Earthworks

These activities involve heavy earthmoving equipment and excavations on embankments, cuttings and trenches and transportation and movement between work sites/areas etc. Contractors tasked with Bulk Earthwork related tasks must identify the relevant risks and hazards associated with their operations. Specifically the potential for interaction between heavy machinery, light vehicles and personnel, overturning, falling from heights etc., must be assessed, eliminated/minimized and controlled.

5.1.60 Marine Operations

Marine operations form an integral part of the Hope Bay operations. The hazards and risks associated with marine operations or those operations adjacent to or over water have been assessed as high risk tasks. Consequently, the safe systems of work for the site require all personnel performing work near or over water to address, but not limit themselves to, the following elements:

- Safety meetings;
- Operations integration and liaison;
- Marine and Jetty Induction;
- Safety equipment;
- Hazard Identifications and management;
- THA;
- Vessel safety plans;
- Safety exercise drills;
- Access to Jetty;
- Shipping activities in waterways;
- Diving;
- Dredging in Shallow waters;
- Transfer between two vessels (materials and/or personnel);
- Emergency Procedures (equipment damage, fire and pollution); and
- Qualifications, competency and training of personnel.

These Procedural requirements will apply to all personnel working at Hope Bay and specifically those personnel working on or adjacent to marine operations.

The scope of these procedures are to describe the measures and actions that must be taken by all contractors and personnel to ensure all work is performed in a manner that safeguards employees, shipping, and the surrounding environment. Contractors performing work near or over water must produce the appropriate details in their SMP and procedures.

5.1.61 Noise

Noise induced hearing loss is permanent. All employees, contractors and visitors are not to be exposed to noise levels above the permissible limit of 85 dbA. This shall be achieved by control of plant and equipment wherever possible. THA's are to address noise minimization where appropriate. Noisy work places are to be properly sign-posted.

All personnel exposed to noise risk are to be advised and provided with the correct hearing protection.

5.1.62 Industrial Hygiene

Adverse health effects may result from exposure to dust. The normal composition of dust is enough to irritate the respiratory system and may result in asthma or asthmatic symptoms if over exposed. The most harmful component of dust, potentially present in rock at Hope Bay is that of silica and actinolite:

Silica

- Silica is one of the world's most abundant minerals and is found in all mining operations to varying degrees.
- Silica is freed into dust particles, which are often invisible to the naked eye.
- Silica causes a disease called silicosis. When silica is inhaled into the lungs it causes fibrous or hard tissue to develop around it. Long term or chronic exposure to silica can result in severe breathing problems, may also increase the risk of contracting tuberculosis, and possibly death. There is no known treatment for silicosis.
- Silica has recently been reclassified as a carcinogen or cancer-causing agent.

Actinolite

- Actinolite is a common amphibole mineral found in metamorphic rocks
- When people come into contact with friable actinolite asbestos and breath in or ingest its microscopic fibers, the fibers adhere to certain areas in the body are difficult to expel. Over time, the fibers damage surrounding cells and can lead to the development of lung cancer, mesothelioma, asbestosis, and other types of life-threatening cancers and illnesses.

To determine the continued necessity of respiratory protection or the need for additional protection, dust levels at Hope Bay site will be monitored, dictated by the type and location of work being performed at site.

At Hope Bay measures will be undertaken to protect all personnel from exposure to harmful dusts and other respiratory contaminates through stringent hygiene protocols, including but not limited to:

- Engineering Controls
- Respiratory Protection
- Safe Work Procedures & THA's
- Medical surveillance

SUMMARY OF IDENTIFIED RISKS

Hope Bay

Hazard No.	Area /Operations	Consequence	Likelihood & Frequency	Risk Ranking
1	Transport of materials	Major	Unlikely	High
2	Light vehicle movement	Major	Unlikely	High
3	Working at height	Major	Unlikely	High
4	People – Bus. LV. Aircraft	Major	Unlikely	High
5	Working on Ice	Major	Unlikely	High
6	Crane lifting Activities	Major	Rare	High
7	Jetty work	Major	Unlikely	High
8	Electrical Shock	Major	Rare	High
9	Excavation	Major	Rare	High
10	Mechanical Installation	Major	Rare	High
11	Electrical Installation	Major	Rare	High
12	Pressurized Equipment	Major	Rare	High
13	Cutting, Welding, drilling & grinding	Minor	Unlikely	Low
14	Hazmat transport	Minor	Unlikely	Low
15	Working in Cold Environment – Hypothermia /Frostbite	Major	Unlikely	High
16	Persons becoming disorientated /loss	Major	Unlikely	High
17	Blasting Operations	Major	Unlikely	High
18	Excavation, haulage and dumping	Major	Unlikely	High
19	Conveyors and conveyor belts	Moderate	Rare	Moderate
20	Barges (material & people)	Major	Unlikely	High
21	Working over water	Major	Rare	High
22	Worker Fatigue	Major	Rare	High
23	Fitness for work	Major	Rare	High
24	Environmental	Major	Rare	High
25	Noise	Moderate	Rare	Moderate
26	Hygiene /Dust exposure	Major	Unlikely	High
27	Site Security	Moderate	Rare	Moderate
28	Drilling Operations	Major	Unlikely	High
29	Fire	Moderate	Unlikely	Moderate
30	Helicopter Operations	Major	Rare	High
31	Fixed wing Operations	Major	Rare	High
32	Wildlife Threat	Moderate	Rare	Moderate
33	Respiratory exposures (dust)	Major	Rare	High

HSLP PLAN
THIS PLAN WILL BE IN EFFECT ON THE ISSUE DATE APPROVED BY THE UNDERSIGNED.

POSITION	*NAME*	*SIGNATURE*	*DATE OF ACCEPTANCE*

HSLP MANAGEMENT PLAN
REVIEW AND ACKNOWLEDGEMENT

By signing off on this form, you acknowledge that you have reviewed, understand and accept the terms of this Plan.

First Name (Print)	Last Name (Print)	Company	Position	Date	Signature	TMAC Representative

Annex 24

Hope Bay Project Community Involvement Plan

HOPE BAY PROJECT

COMMUNITY INVOLVEMENT PLAN

December 2016
Version 2016-12-14

COMMUNITY INVOLVEMENT PLAN

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REVISION RECORD

Revision #	Date	Section	Summary of Changes	Author
0	May 2005	New Document	Initial version of the Doris North Community Relations Management Program submitted with Doris North NIRB FEIS	Miramar Hope Bay Ltd.
1	April 2014	New Document	Hope Bay Mining Ltd. 2011/2012 Community Relations Management Program	Hope Bay Mining Ltd.
2	December 2016	New Document	TMAC version of Hope Bay Community Involvement Plan submitted in accordance with Doris North Project Certificate Amendment process.	TMAC

ABBREVIATIONS AND DEFINITIONS

"**Code**" means the Code of Ethical Business Conduct.

"**Community**" means Kugaaruk, Taloyoak, Gjoa Haven, Cambridge Bay, Umingmaktok, Kingaok and Kugluktuk, comprising the Kitikmeot region of Nunavut.

"**EFAP**" means the Employee and Family Assistance Program.

"**GN**" means Government of Nunavut.

"**Hope Bay"** or the **"Hope Bay Project**" or the **"Project"** means the area covered by the Hope Bay mineral property in the Hope Bay Greenstone Belt of the Kitikmeot region of Nunavut, including the Doris Gold Mine.

"**IC**" means the Implementation Committee of the IIBA.

"IEAC" means the Inuit Environmental Advisory Committee established under Schedule I of the IIBA.

"**IIBA**" means the Inuit Impact and Benefits Agreement that TMAC entered into on March 30, 2015 with the Kitikmeot Inuit Association.

"**KIA**" means the Kitikmeot Inuit Association.

"**Newmont**" means the Newmont Mining Corporation.

"**NIRB"** means Nunavut Impact Review Board.

"**NLCA"** means the Nunavut Land Claims Agreement.

"NWB" means the Nunavut Water Board.

"**PFS**" means Pre-Feasibility Study.

"**Plan**" means this Community Involvement Plan.

"Public" means a resident of the Kitikmeot region of Nunavut. A member of the public is also a Stakeholder.

"SEMP" means the Socio-Economic Monitoring Program instituted by TMAC to measure the socio-economic effects of the Hope Bay Project in accordance with a NIRB Project Certificate.

"Stakeholder" means an individual, or group of individuals, with interests that may affect (or be affected) by the Hope Bay Project.

"**TMAC**", the "**Company**", "**we**" or "**our**" means TMAC Resources Inc.

INTRODUCTION

PURPOSE

TMAC Resources Inc. ("**TMAC**", "**we**", "**our**" or the "**Company**") has developed this Community Involvement Plan ("**Plan**") to provide a framework for community involvement at the Hope Bay Project ("**Hope Bay"** or the **"Hope Bay Project"** or **"Project"**) in Nunavut.

TMAC seeks to provide communities potentially affected by the Hope Bay Project with job creation, economic growth and training opportunities that extend beyond the economic life of the Hope Bay Project. The Company provides employment opportunities to members of local communities and, in conjunction therewith, provides additional benefits and opportunities.

This Plan is the basis by which TMAC fulfills the requirement for an Inuit Involvement Plan and Community Relations Plan pursuant to Condition 32 of the Amended Doris North Project Certificate, which states:

> *Prior to the commencement of operation the Proponent shall have a complete Environment, Health and Safety Management System in place which includes the following: Wildlife Mitigation and Monitoring Plan; Environmental Protection Plan; Emergency Response and Spill Contingency Plan; Occupational Health and Safety Plan; Reclamation Plan; Human Resources Plan; Inuit Involvement Plan; Community Relations Plan; Monitoring and Follow-up Plan; and Auditing and Continuous Improvement Plan. When complete, these Plans shall be forwarded to the Nunavut Impact Review Board's Monitoring Officer (emphasis added).*

This Plan supersedes the Doris North Community Relations Management Plan established and implemented by a previous owner of the Hope Bay Project.

This Plan anticipates further development of the Hope Bay Project that will be subject to further NIRB review, and is therefore structured as an Involvement Plan pursuant to NIRB Environmental Assessment guidelines.

Our policies and practices must align with our Inuit Impact and Benefits Agreement ("**IIBA**") with the Kitikmeot Inuit Association ("**KIA**").

BACKGROUND ON THE HOPE BAY PROJECT

In December 2007, Newmont Mining Corporation ("**Newmont**") acquired Miramar Mining Corporation, the owner of Hope Bay. Newmont subsequently upgraded the infrastructure including airstrips, fuel storage, camps, ports and underground Doris development. Newmont placed the Hope Bay Project in care and maintenance in 2012 ending all construction and exploration activity.

In March 2013, TMAC acquired the Hope Bay Project, including existing licenses and permits. Since the acquisition, TMAC has focused on the exploration and development of the Hope Bay Project and the raising of equity capital to fund such property exploration and development. In 2013, TMAC initiated an exploration program and completed a preliminary economic assessment. Exploration activities to determine the viability of gold mining at Hope Bay continued and Hope Bay was taken out of care and maintenance in 2015. Also in 2014, TMAC applied for permission to conduct a bulk sampling program on the Madrid Deposit. In 2015, TMAC issued new resource estimates for the Hope Bay gold deposits as a basis for the Pre-Feasibility Study ("**PFS**") published shortly thereafter. Later in the year, TMAC raised the capital necessary to initiate a twenty-year mining program consistent with the PFS via an Initial Public Offering and a loan facility. Based on the PFS, TMAC in 2015 applied for permission to vary the existing NIRB Project Certificate to allow for mining more and longer at Doris. In 2016, TMAC began implementing this mining program by entering into the final construction phase of development at Doris North Mine with a goal of producing gold in 2017. TMAC took steps in 2016 to begin the permitting process that will allow for mining gold at two other deposits at Hope Bay (Madrid and Boston).

INUIT IMPACT AND BENEFIT AGREEMENT

On March 30, 2015, TMAC entered into a Framework Agreement with the KIA allowing for surface access rights for a 20-year period. The Framework Agreement includes an IIBA supporting major project development at Hope Bay, including Doris, subject to IIBA terms and conditions. On March 30, 2015, TMAC entered into an IIBA administered by the KIA for Inuit-owned surface access rights for a 20-year period. The IIBA establishes various procedures through which TMAC and the KIA will communicate and maintain a working relationship and provides for certain benefits to the Inuit in the Kitikmeot region, as required by Article 26 of the Nunavut Land Claims Agreement. The IIBA replaces the previous Inuit impact and benefit agreement in respect to the Doris North project originally entered into by the KIA and a previous owner of the Hope Bay Project in September 2006, and transferred to the Company in 2013 pursuant to the acquisition of Hope Bay. An Implementation Committee ("**IC**") has been established to oversee certain aspects of the IIBA and commitments thereunder and the IC meets on a quarterly basis. In addition, the respective Presidents of TMAC and the KIA meet annually. Pursuant to the IIBA, the Company will provide certain employment, training and education opportunities for Inuit. TMAC will also provide business and contracting opportunities to certain qualified businesses in connection with the Hope Bay Project.

This Plan provides a basic overview of the terms of the IIBA; the IIBA document dated March 30, 2015 is the only document of reference for this plan.

COMMUNITY INVOLVEMENT FOUNDATIONS

TMAC is committed to engaging positively and effectively with Stakeholders in a manner that emphasizes respect, integrity and demonstrates a willingness to learn from experience and embrace necessary change. TMAC recognizes that maintaining engagement and stakeholder involvement is necessary throughout the mining cycle, and critical to continuous improvement.

TMAC bases its approach to community involvement on the following principles:

1. Identify all Stakeholders in our operations;
2. Effectively engage Stakeholders and establish a dialogue;
3. Provide Stakeholders with means to respond to us as well as generate responses; and
4. Report to Stakeholders and regulators on our Engagements.

Summaries of TMAC policies and practices relevant in undertaking community involvement activities are provided below (http://www.tmacresources.com/responsibility/default.aspx).

CODE OF ETHICAL BUSINESS CONDUCT AND RESPECTFUL WORKPLACE POLICIES

TMAC has implemented a Code of Ethical Business Conduct (the "**Code**") and a Respectful Workplace Policy both of which apply to employees and contractors. The Code and the Respectful Workplace Policy set out expectations of our employees in a number of areas. The Code clearly states, among other things, our commitment to health, safety, and the environment and sets standards for how we conduct business. Respectful Workplace Policy clearly outlines that TMAC has no tolerance for discrimination, harassment or violence.

Reading these policies and agreeing to comply is an employment condition for our employees.

WHISTLEBLOWER POLICY

TMAC has adopted a Whistleblower Policy for individuals to report complaints and concerns regarding questionable accounting practices, inadequate internal accounting controls or coercion relating to auditing matters, actual or potential violations of any applicable law and other suspected wrongdoing, including conduct prohibited under the Code. TMAC will treat all complaints as confidential and privileged to the fullest extent permitted by law. Retaliation, including harassment against those who make complaints in good faith is not permitted. However, allegations proven to have been made maliciously or in bad faith, or were knowingly false will be viewed as a serious disciplinary offense.

Reading this policy and agreeing to comply is an employment condition for our employees.

HEALTH AND SAFETY POLICY

TMAC has adopted several policies and implemented practices concerning health, safety, and the overall welfare of people and the environment. In addition to the Code discussed previously, we have a Health and Safety Policy which underlines our commitment to the health, safety and well-being of all employees, contractors, visitors and local communities. We believe that safe behaviour is determined not only by the adherence to laws, regulations and procedures but also by the personal values of our directors, employees and contractors.

Reading this policy and agreeing to comply is an employment condition for our employees.

CORRECTIVE ACTION POLICY

It is our goal to ensure that our employees are treated in a consistent manner. Occasionally the standards of job performance or behaviour expected from employees are not forthcoming. In circumstances where it is determined that corrective action is required, this will be exercised in a fair and progressive manner. The primary objectives of corrective action are to bring to the attention of an employee that a performance or behaviour problem exists and to give him or her an opportunity for improvement.

The degree of corrective action is based on the severity of the offence and/or prior corrective actions. Termination of employment may occur if it is determined that an employee is no longer suitable for employment and certain offences are cause for immediate discharge.

COMMUNITY COMPLAINTS PROCEDURE

TMAC is committed to treating the members of the communities in which we operate with fairness and respect and it is our goal to maintain the trust and confidence of the community. We have adopted a Community Complaints Procedure to address community concerns related to our activities and operations promptly and effectively.

TMAC will maintain a register of complaints received, the results of investigations and the actions taken to address complaints. The register will be reviewed quarterly at the operations level and annually across the organization. A copy of these procedure is attached as Appendix A.

LANGUAGE

Our official site language is English. Inuit who do not possess knowledge of the English language, either written or verbal, will be given reasonable opportunities to qualify for jobs where health and safety or job performance are not compromised. Furthermore, TMAC will not discipline or terminate Inuit employees due to their inability to speak English but may transfer them to a position that requires less knowledge of English or arrange training for a more suitable job if training is available.

TMAC will translate signs, safety regulations policies, procedures, instructions and job advertisements in Inuinnaqtun and Inuktitut where necessary and where human safety and job performance is paramount.

COMMUNICATIONS WITH OUR EMPLOYEES

TMAC has a variety of formal and informal procedures established to deal with employee concerns, suggestions or complaints and will endeavour to resolve these in a timely and effective manner.

In addition to the process outlined in our Whistleblower Policy, employees can contact their supervisors at site as well as the Human Resources department for information on policies and employment-related information. Bulletin boards are located at site as well as at TMAC's Cambridge Bay NU and Toronto ON offices and host a variety of relevant information. TMAC is developing a Human Resources Information System and a shared network drive to provide accessibility to information. TMAC commits that all employees will have access to a computer kiosk for necessary online information either at Hope Bay or at the Cambridge Bay office.

COMMUNICATIONS AVAILABLE TO EMPLOYEES AT HOPE BAY

We recognize the importance for our employees to be able to contact their families on a regular basis when at site. TMAC will provide on-site access to communications facilities to allow reasonable communication between employees and their spouses and families. These facilities will include telephone and computer supported technology as the Hope Bay Project evolves.

CROSS-CULTURAL AWARENESS AND ACTIVITIES

TMAC is sensitive to the importance of Inuit cultural heritage. We conduct archaeological surveys as required, as agreed in the IIBA, we will provide cultural activities at Hope Bay as determined by the IIBA Implementation Committee.

TMAC will provide Inuit cultural and cross-cultural orientation and training for all TMAC employees and for the employees of medium and long-term contractors at Hope Bay. The purpose of this orientation and training is to enhance positive interaction by promoting inter-cultural dialogue and understanding.

EMPLOYEE AND FAMILY ASSISTANCE PROGRAM

TMAC has implemented an Employee and Family Assistance Program (EFAP) to provide Inuit employees and their family's assistance dealing with personal problems, family matters, mental health concerns and alcohol, drug and gambling dependencies.

STAKEHOLDER IDENTIFICATION

For the purposes of this Plan, communities involved in the Hope Bay Project include Kugaaruk, Taloyoak, Gjoa Haven, Cambridge Bay, Umingmaktok, Kingaok and Kugluktuk, comprising the Kitikmeot region of Nunavut.

TMAC uses a number of methods of identifying Stakeholders in the management of our operation based on the engagement context.

TMAC is required by NIRB Guidelines to identify Stakeholders affected by our project as part of the Nunavut socio-economic environmental assessment process. Any Stakeholder is free to participate in this public process. The Doris Project amendment process has identified existing stakeholders. Future Hope Bay related environmental assessment processes may identify additional Stakeholders.

TMAC operates within Nunavut, and on Inuit Owned Lands. The Kitikmeot Inuit Association, representing the Inuit of the Kitikmeot region, advised TMAC during the IIBA negotiation process that all Kitikmeot communities are considered affected by Hope Bay. As a result, TMAC considers every Kitikmeot Inuk, and their representative organizations including the KIA to be Stakeholders.

TMAC undertakes a number of engagements consistent with this Plan, including community meetings and other methods of engagement. Stakeholders may self-identify through direct participation in any number of TMAC community involvement efforts.

TMAC is a business and interacts with a number of groups and individuals in the normal course of responsible and ethical commerce. By virtue of their direct interactions with our Company, we consider these groups and individuals to be Stakeholders. Such Stakeholders include:

a. Employees;
b. Shareholders;
c. Mining community members;
d. Suppliers;
e. Neighbours;
f. Customers;
g. KIA;
h. NTI;
i. Contractors;
j. Environmental organizations and other non-governmental organizations;
k. Government such as Hamlets, the Government of Nunavut, and Government of Canada; and
l. The financial community.

STAKEHOLDER ENGAGEMENT

In order to effectively engage, establish and maintain a dialogue with TMAC's various Stakeholders, the Company has implemented a number of steps and activities designed to support two-way communication. These efforts and activities are listed below.

CAMBRIDGE BAY OFFICE

TMAC maintains an office in Cambridge Bay, which is the closest, occupied, affected community to the Hope Bay Project. The office is centrally located in the community, furnished with bilingual signage, and accessible by the public during regular business hours. The primary purpose of this office is to facilitate community engagement. The Hope Bay Project will be in a continual state of environmental assessment and permitting during the foreseeable future. The Cambridge Bay office supports TMAC's engagement of government, regulators, intervenors, interested members of the public, employees, those seeking employment at Hope Bay and other interested parties.

Staff of the Cambridge Bay office are available to communicate directly with local Stakeholders and participate in a number of regional and territorial events that regularly occur in Cambridge Bay, thereby informing Stakeholders of TMAC operations, and actively soliciting feedback. The Cambridge Bay office is staffed with a Director of External and Community Relations, a TMAC Liaison and an HR/SR Coordinator. They engage regularly with the public using two-way communications for a variety of activities including:

- Employee and public relations;
- Annual community awareness meetings;
- Regular meetings with individual Inuit job seekers;
- Recruiting and onboarding Inuit personnel;
- Regular communications with Community Liaison Officers in the Kitikmeot;
- Annual meetings between KIA and TMAC Presidents;
- Annual updating of KIA Board by TMAC Executive;
- Attendance at the KIA Annual General Meeting;
- Quarterly participation in the IIBA Implementation Committee;
- Presentation of the IIBA Annual Evaluation Report to the KIA Board;
- At a minimum, semi-annual meetings of the Inuit Environmental Advisory Committee ("**IEAC**") in order to review environmental management and monitoring plans, discuss project related environmental issues, and obtain advice from knowledgeable Inuit on these matters;
- Meetings between TMAC staff and Kitikmeot Qualified Businesses;
- Regular meetings with relevant KIA Lands, Employment and Training and Executive staff; and
- Annual visits of the KIA Board, IIBA Implementation Committee, IEAC, and individual harvesters at Hope Bay.

ENGAGEMENT WITH INUIT THROUGH THE IIBA

In accordance with the IIBA, TMAC will regularly engage Inuit on a range of matters directly as well as through the KIA. The IIBA includes the following schedules which contain specific provisions of adaptive socio-economic effect mitigation measures aimed at Kitikmeot Inuit:

- Schedule D – Training and Education Opportunities: whereby Inuit are provided support and training for opportunities at the Hope Bay Project;
- Schedule E – Employment: whereby measures and supports are provided to maximize Inuit participation in the Hope Bay Project;
- Schedule F – Business and Contracting Opportunities: whereby Inuit are provided business and contracting opportunities; and
- Schedule I – Inuit Environmental Advisory Committee: whereby Inuit have the opportunity to receive and consider information, provide advice and attempt to resolve community concerns relative to the environment and wildlife for the Hope Bay Project.

COMMUNITY AWARENESS: KITIKMEOT COMMUNITY MEETINGS

TMAC will undertake regional consultation tours of the Kitikmeot region. The tours will consist of visits to each Kitikmeot community by TMAC community relations staff and relevant subject matter experts. TMAC will schedule the tour for a time of year that promotes participation and provide at least two weeks advanced notice for each Kitikmeot community. During the public meeting, TMAC will deliver a presentation that provides the public information on the socio-economic and environmental performance of the Company. TMAC will support public meeting proceedings with simultaneous translation consistent with the dialect of Inuktun used in each community. TMAC logs meeting participants for future reference. The public will have an opportunity to make comments, ask questions, and raise any concerns they may have regarding TMAC operations.

TMAC will document the proceedings of public meetings in order to track issues and follow up on any concerns.

During the regional tour, TMAC will make efforts to schedule meetings in each community with specific Stakeholder groups such as Kitikmeot Hamlet Councils and/or senior management, local Nunavut Arctic College and High School classes as specific Stakeholders that may have an interest in employment and training at TMAC.

COMMUNITY AWARENESS: KITIKMEOT CAREER AWARENESS SESSIONS

TMAC will host community and information and career awareness sessions in all Kitikmeot communities at least annually in order to maximize Inuit employment opportunities at Hope Bay. The purpose of these sessions will be to provide information on:

- expected labour needs of Hope Bay;
- the skills, behaviours and qualifications required for employment and advancement at Hope Bay;
- the training opportunities and educational support programs available to prepare for employment at Hope Bay; and
- career opportunities in related fields such as science, technology, mathematics or professional services.

SOCIAL MEDIA

TMAC will maintain a company Facebook ™ page to both share operational information with Stakeholders and increase awareness of mining, with a focus on Nunavut Stakeholders. TMAC will use its Facebook ™ page to augment information distributed through the Company's website. TMAC will also make use of Kitikmeot community Facebook ™ pages to advertise job postings, meeting notices, and any other news that may be of interest to Nunavut Stakeholders (http://www.facebook.com/tmacresources/).

Comments, questions or concerns received via social media are addressed promptly in a manner consistent with public meetings.

ELECTRONIC MAIL

TMAC will maintain and periodically update a listing of electronic mail addresses of Stakeholders. This listing includes, but is not restricted to the following:

- Public elected officials;
- Inuit elected officials;
- Relevant federal and territorial regulator employees;
- Relevant Inuit Organization employees;
- Relevant municipal officials; and
- Relevant training and employment agency employees.

When necessary, TMAC distributes electronic mail messages to this listing to inform them of TMAC related events, news and happenings. This engagement activity is conducted to ensure that Stakeholders are well informed and if willing, able to plan participation in any future TMAC engagement.

NUNAVUT EVENT PARTICIPATION

TMAC will ensure it is well informed of key events that occur on an annual basis in Nunavut that represent opportunities for community involvement and dialogue. TMAC will make staff available to attend these events in order to foster Stakeholder communications. These events may include the following:

- Kitikmeot Mayor's Meeting;

- Kitikmeot Trade Show; and
- Nunavut Mining Symposium.

STAKEHOLDER REPRESENTATIVE ORGANIZATIONS

TMAC recognizes that one of the most effective means of engagement and dialogue with Stakeholders is joining with them in an organization of mutual benefit. Towards this aim, TMAC is a member of established organizations involving numerous Stakeholders. The Company's participation in these groups provides Stakeholders with information on TMAC's activities and, allows them to discuss matters of mutual concern, and undertake initiatives of mutual benefit. These organizations may include the following:

- NWT/Nunavut Chamber of Mines;
- Nunavut Mine Training Roundtable; and
- Kitikmeot ASETS Stakeholder Working Group.

STAKEHOLDER RESPONSE

TMAC has a strong commitment to learning and adjusting our activities based on observed conditions. Input from Stakeholders is an important means by which we can learn about the effectiveness and utility of our practices and procedures. TMAC uses a number of communication avenues that allow our Company to react to Stakeholder comments, concerns and complaints.

COMMUNITY COMPLAINTS PROCEDURE

If a Stakeholder wishes to make a complaint against TMAC, our Community Complaints Procedure outlined above and attached as Appendix A provides a formal mechanism for TMAC to respond to the complaint.

ENVIRONMENTAL REVIEW

TMAC recognizes the value of the Nunavut Environmental Assessment process in creating avenues for community engagement. The NIRB review of TMAC's proposed mining operations at Hope Bay focuses Stakeholder attention on the Company's plans. It also identifies issues, allows the proponent to offer solutions, and identifies project design features that will mitigate or completely address concerns. TMAC compliance to the Socio-Economic terms and conditions pursuant to a NIRB Project Certificate or Screening Decision is the initial, formal, response to Stakeholders. The NIRB maintains an online public registry where TMAC responses to environmental management matters can be viewed (**http://www.nirb.ca/application?strP=r**).

At the permitting stage, the NWB provides another avenue for community involvement in relation to environmental matters. The resulting NWB decision or license issued, complied with by TMAC, is an initial formal response to Stakeholders.

The Inuit Environmental Advisory Committee as established under Schedule I of the IIBA provides Inuit with the opportunity to receive and consider information, provide advice and attempt to resolve community concerns relative to the environment and wildlife for the Hope Bay Project.

RESPONSES TO INUIT

In addition to contacting TMAC directly through any of its offices, individual Inuit that may have a dispute, complaint or concern about TMAC operations have a number of options available to them to obtain a response from TMAC:

- Utilize the Community Complaints procedure (preferred);
- Bring to the attention of the KIA, who then brings forward to TMAC for resolution (common); and
- Bring forward during a Kitikmeot Community Tour for direct TMAC response.

Finally, the IIBA provides for a formal dispute resolution process for IIBA related implementation between the KIA and TMAC. This procedure allows for multiple levels of response to a dispute, at first a functional and then a policy level. The escalating steps outlined for this process are:

- TMAC Liaison and KIA Implementation Manager work together to find a solution;
- IIBA Implementation Committee seeks a solution;
- TMAC and KIA Senior Management meet to resolve;
- Mediation; and
- Arbitration.

MEASURING EFFECTIVENESS

TMAC acknowledges that Stakeholders may recognize relationships and linkages to Hope Bay Project activities that are not readily apparent to our Company. If a Stakeholder responds to our engagement with commentary not related to the Hope Bay Project, we will ask probing questions to understand the relationships and linkages to Hope Bay Project activities being considered by the Stakeholders.

TMAC greatly appreciates objective feedback on our engagement activities. TMAC will consider feedback by regulators, levels of government, and Institutions of Public Government on the quality, and content of engagement materials and the timing of engagement meetings. TMAC acknowledges that despite best efforts, failures to engage may occur. If this happens, TMAC will review engagement materials and scheduling, consider how to limit potential meeting conflicts, and be mindful of "consultation fatigue".

TMAC will respond to Stakeholders' comments and interventions on a timely basis and as appropriate to the particular circumstances of the comment or intervention. Records will be kept of these communications and will be reviewed by TMAC from time to time for the quality and timeliness of TMAC's responses. Where the review indicates improvements are necessary TMAC will adjust procedures and practices to maintain an acceptable quality of response and communication.

PROMOTING THE PARTICIPATION OF NUNAVUMMIUT

TMAC will promote the participation of Nunavummiut at the Hope Bay Project through a number of means including employment, training and business contracting opportunities.

EMPLOYMENT AND TRAINING

TMAC's initiatives to advance employment will include:

- ensuring our recruitment process is fair, non-discriminatory and aligns with Human Rights legislation;
- ensuring effective methods for Kitikmeot residents to apply for positions at Hope Bay;
- working with the Kitikmeot Inuit Association and other agencies to:
  - explain our recruiting processes and maximize accessibility;
  - ensure that open positions are posted in the community;
- ensuring that Kitikmeot residents are aware of current and expected future labour needs at Hope Bay; current vacancies are provided to the KIA and posted in the communities, on TMAC's Facebook page and TMAC's website.
- providing air transportation to and from an employee's point of hire to Hope Bay for our Inuit employees who are resident in the communities of Kugluktuk, Cambridge Bay, Gjoa Haven, Taloyoak and Kugaaruk;
- providing a safe, working environment;
- providing competitive total rewards including fair and equitable compensation;
- providing employment support measures including an EFAP;
- providing inter-cultural awareness training to all employees to assist with the integration of Inuit at Hope Bay;
- working with the IC to assess and set annual and long term Inuit training targets and annual employment targets;
- developing and maintaining career development plans for all Inuit employees;
- employing a mixture of internal and external programs for training and development; and
- encouraging and developing interested, qualified Inuit into supervisory and management positions.

Further details can be found in TMAC's Human Resources Plan.

BUSINESS AND CONTRACTING OPPORTUNITIES

TMAC recognizes that the exploration and development of Hope Bay can provide valuable opportunities for expanding and/or enhancing the business community in the Kitikmeot Region, Inuit entrepreneurship, and employment of Inuit, and can add value to the economy in the Kitikmeot Region. TMAC has agreed to contract with businesses

in the region for certain services that will be required at Hope Bay, depending on the ability of the businesses to comply with certain safety and quality standards. The contracting opportunities relate to the provision of services. Consequently, labour and employment will be integral to these opportunities. Business and contracting opportunities are addressed in detail under Schedule F of the IIBA and a summary of the schedule can be found in TMAC's Human Resources Plan.

REPORTING

TMAC undertakes a number of reporting activities both external and internal, necessary to complete the Stakeholder engagement process. These efforts provide Stakeholders with the feedback necessary to be assured that TMAC has identified, engaged and responded to issues raised by them.

ENGAGEMENT REPORTING

TMAC community relations staff are responsible for documenting and reporting the results of Stakeholder engagements. TMAC's management is made aware of Stakeholder views in a timely manner, and can adapt, to the extent possible, TMAC operations in response to these views. Depending on the type of engagement, TMAC may report directly to Stakeholders regarding the TMAC response.

REPORTING TO INUIT

TMAC uses a number of reporting mechanisms specifically for Inuit which are summarized below.

Annual IIBA Evaluation Report to KIA Board

This report, produced by the IIBA Implementation Committee, outlines the effectiveness of IIBA implementation in avoiding harm and creating benefits for Inuit as a direct result of the Hope Bay Project. The KIA and TMAC may respond to this report by strengthening socio-economic mitigation efforts, and adapting benefits measures to increase positive effects.

Environmental Management Advice from IEAC

Environmental management plans and TMAC activities that may affect the environment are discussed by the IEAC. IEAC recommendations for improvements or changes are sought. IEAC members share ecological knowledge of the project area, and the views and values of Inuit harvesters generally. TMAC uses this advice to adapt plans to the Management Plans for implementation. Environmental Management plan reports and future revisions continue to be shared with the IEAC in an annual review cycle.

In-person Reporting at KIA Board Meetings

TMAC regularly reports to the KIA Board on Hope Bay related matters. The KIA Board provides commentary and advice to TMAC consistent with their role in promoting the cultural, social and economic well-being of Kitikmeot Inuit.

Regular and Direct Communication with KIA Staff

TMAC is in regular communication with relevant KIA staff (Lands, Beneficiary Services, and Training) on operational matters aimed at implementing the IIBA and involving Inuit beneficially with the Hope Bay Project. On a daily and weekly basis, KIA staff are aware of and assisting TMAC in engaging individual Inuit. KIA staff are able to work with TMAC on improving Inuit engagement.

SOCIO-ECONOMIC REPORTING

TMAC has established a Socio-Economic Monitoring Program ("**SEMP**") designed to track the socio economic effects of our operations in Nunavut. The SEMP additionally seeks to determine if effect predictions made during the environmental assessment process are valid, and provides insight into the effectiveness of mitigation measures. TMAC reports on an annual basis the results of the program to government agencies and the KIA.

The SEMP also reports to the Kitikmeot Socio Economic Monitoring Committee ("**KSEMC**"). This committee meets on an annual basis and consists of representatives of government and affected communities. The function of the KSEMC is to assist proponents in the development of project monitoring programs to ensure they meet the purposes specified in Article 12.7.2, namely:

a. "to measure the relevant effects of projects on the ecosystemic and socio-economic environments of the Nunavut Settlement Area;
b. "to determine whether and to what extent the land or resource use in question is carried out within the predetermined terms and conditions;
c. "to provide the information base necessary for agencies to enforce terms and conditions of land or resource use approvals; and,
d. "to assess the accuracy of the predictions contained in the project impact statements."

Annual SEMP reports are available online at **www.nunavutsemc.com**

TMAC as a Kitikmeot project proponent, has and continues to be an active participant in the KSEMC on an annual basis.

STAKETRACKER SOFTWARE

TMAC utilizes Staketracker™ online Stakeholder information management software in order to manage relationships, especially with respect to permitting matters. This software supports and documents relevant aspects of this Plan.

TEMPORARY CLOSURE AND SLOWDOWNS

In the event of periods of temporary closure or slowdowns, TMAC employees, shareholders and contractors would be notified concurrent with the capital markets. TMAC's disclosure would include the issuance of a press release. The press release would be disseminated under the Canadian timely disclosure distribution network of one of the news disseminators identified by the Toronto Stock Exchange and providing acceptably broad dissemination as well as to our email disclosure network which includes the KIA.

In the event of slowdowns, TMAC would strive to keep employees working for as long as possible. TMAC staff would remain in communications with laid off employees following a temporary closure or slowdown.

REFERENCES

Human Rights Act, S.Nu.2003, c.12

Ethical Principles for the Conduct of Research in the North, Association of Canadian Universities for Northern Studies, 2003. Accessed November 2016.

A Proponent's Guide to Conducting Public Consultation for the NIRB Environmental Assessment Process, NIRB, 2006. Accessed November 2016.

Consulting with Communities in Nunavut, Government of Nunavut, 2014.

TMAC Resources (TMAC) Inc. 2016 (a). Hope Bay Inuit Impact and Benefit Agreement with the Kitikmeot Inuit Association, March 2015.

TMAC Resources (TMAC) Inc. 2016 (b). Technical Report on the Hope Bay Project, Nunavut, Report for NI-43-101, Roscoe Postle Associates Inc. March 2015.

APPENDIX A – COMMUNITY COMPLAINTS PROCEDURE

TMAC RESOURCES INC.

Community Complaints Procedure

Purpose

1. TMAC Resources Inc. ("**TMAC**") are committed to treating the members of the communities in which we operate with fairness and respect and it is our goal to maintain the trust and confidence of the community.

2. The purpose of this procedure is to:
   (a) document, investigate and resolve community concerns promptly and effectively;
   (b) provide members of the community with an effective and efficient means of reporting concerns related to our activities and operations;
   (c) provide a clear procedure for dealing with concerns;
   (d) communicate effectively throughout the complaints procedure with a community member reporting a concern; and
   (e) monitor complaints about our activities.

Scope

3. The procedure applies to all:
   (a) jurisdictions in which we carry on business and in all affected communities; affected communities are communities where we carry out operations or that may be impacted by our operations in some way;
   (b) members of affected communities or anyone acting on their behalf; and
   (c) complaints related to the impact of TMAC's activities and operations on members of affected communities.

Responsibilities

4. Overall authority for this procedure sits with the President and Chief Technology Officer.

5. Operations Managers have primary responsibility to promote the effective implementation and application of this procedure and to:
   (a) ensure that anyone working for or on behalf of TMAC on any project or activity understands the importance of respecting the concerns of affected communities;
   (b) communicate this procedure to affected communities in their area of operations; communication should be in the local language and appropriate to the social and cultural context of the operating area; and
   (c) ensure anyone working for or on behalf of TMAC or any member of the affected communities feels able to raise concerns without fear of reprisals.

6. Anyone working for or acting on behalf of TMAC on a project or activity is responsible for reporting any complaints they may receive from members of affected communities to the appropriate individuals.

How to Report a Complaint

Reporting Methods

7. Any member of an affected community may raise a concern by phone, by email, in writing or in person to the following person in the areas noted below:
   (a) in Ontario – Julia Micks at 416-628-0216 or julia.micks@tmacresources.com;
   (b) in Nunavut - Alex Buchan at 867-983-2385 or alex.buchan@tmacresources.com

8. Any member of an affected community that has a complaint but is not comfortable raising the matter personally with a TMAC representative can appoint someone the complainant trusts to raise the concern on the complainant's behalf.

Confidentiality

9. If requested by the complainant, TMAC will, if appropriate, endeavour to keep the complainant's identity confidential. In some cases, the complainant may be asked to keep the complaint confidential.

10. There may be circumstances in which, because of the nature of the investigation or disclosure, it will be necessary to disclose the identity of the complainant.

How Complaints Are Handled

11. TMAC representative receiving the complaint shall complete a Community Complaints Report (see Appendix 1) noting: the time and date of complaint; name, address and contact number (if possible) of the complainant; the means of communication; and the nature of the complaint.

13. The complaint will be forwarded to the appropriate TMAC representative depending on the nature and location of the complaint.

14. The President and Chief Technology Officer shall be informed of community concerns of a significant nature by the TMAC representative who became aware of the complaint. Examples of a significant concern can include:
   (a) allegations of corruption or fraud;
   (b) violations of local laws;
   (c) infringement of human rights;
   (d) damage to property, environmental or cultural resources; and

(e) injury to members of the community.

15. TMAC will assign a Complaints Manager who will investigate the concern and communicate with the complainant.

16. An initial assessment will be conducted to determine whether an investigation is appropriate and, if deemed necessary, the scope and form of investigation that should take place.

17. The primary goal of the investigation will be to ascertain the facts underlying the complaint and recommend a course of action, if deemed appropriate.

18. The complainant may be asked to provide more information during the course of an investigation.

19. The Complaints Manager is responsible for recording details of the complaint and the actions taken by the complainant and TMAC in the Community Complaints Report.

20. Where an investigation identifies wrongdoing by TMAC personnel or anyone acting on behalf of TMAC, action will be taken as deemed appropriate by TMAC.

Communications with the Complainant

21. TMAC will acknowledge the receipt of a complaint and will respond to the complainant if deemed appropriate by TMAC.

22. When TMAC has completed its assessment of the complaint, the Complaints Manager will contact the complainant to relay TMAC's assessment. The Complaints Manager will attempt to provide information that is factual, unbiased and, wherever possible, scientifically based, in an effort to address the concerns to the satisfaction of the complainant.

23. In cases where the complainant continues to be dissatisfied, the complainant will be informed of their right to refer the complaint to the attention of the President and Chief Technology Officer.

Monitoring and Reviewing

24. TMAC will maintain a register of complaints received, the results of investigations and the actions taken to address complaints.

25. The register will be reviewed quarterly at the operations level and annually across the organization.

Appendix 1 - Community Complaints Report

Date of complaint:
Time of complaint:

Name of complainant:
Contact number:
Address of complainant:

Type of communication of complaint:

Nature of the complaint:

Annex 25

Hope Bay Heritage Resource Protection Plan

HOPE BAY PROJECT

HERITAGE RESOURCES PROTECTION PLAN

December 2016

PLAIN LANGUAGE SUMMARY

This Heritage Resources Protection Plan (the Plan) describes what TMAC will do to confirm that archaeological sites and artifacts near Hope Bay Project development are identified, avoided, protected or, where necessary, mitigated.

The Plan details the measures that will be used to reduce the potential for Project effects to archaeological resources. It explains when and how archaeological information will be collected, the factors that will be considered in determining appropriate mitigation, and the steps that will be taken.

REVISION RECORD

Revision Date	Summary of Changes	Author	Approved By
Nov 2003	Original	Points West Heritage Consulting Ltd.	Miramar
May 2005	Revisions to reflect comments received during permitting of the Doris Project	Points West Heritage Consulting Ltd.	HBML
Dec 2016	General updates, consideration of the Phase 2 Project, and conversion to TMAC management plan format	Points West Heritage Consulting Ltd.	TMAC

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1. INTRODUCTION

This Heritage Resources Protection Plan (the Plan) presents the archaeological monitoring, avoidance and mitigation procedures to be conducted during Hope Bay Project development and operation.

This document describes how specific aspects of the Hope Bay Project development and activities might affect heritage resources, both in general terms as well as with respect to specific known sites and areas. The archaeological investigations conducted thus far are discussed, and archaeological sites recorded to date are identified. These data are then used to formulate guidelines for protection and mitigation of heritage resources in the Hope Bay Belt during the life of this mining project.

1.1. OBJECTIVES

The purpose of this document is to provide a framework for the ongoing management and protection of heritage resources associated with the Hope Bay Project as required within the scope of relevant regulations. TMAC Resources Inc. is committed to maintaining sound environmental practices in all of its activities. With respect to heritage resources, this means that efforts will be made to identify the possible impacts to archaeological sites, both known and unknown, and to implement procedures to ensure that sites are avoided where possible, or to gather all pertinent cultural information prior to impact where sites cannot be avoided.

1.2. RELEVANT LEGISLATION AND GUIDANCE

This section provides a summary of federal and territorial regulations governing the Hope Bay *Heritage Resources Protection Plan* and associated guidelines.

> *"The archaeological record of the Nunavut Settlement Area is of spiritual, cultural, religious and educational importance to Inuit. Accordingly, the identification, protection and conservation of archaeological sites and specimens and the interpretation of the archaeological record is of primary importance to Inuit"* (Nunavut Land Claims Agreement 1993, Article 33, Section 2.2)

The purpose of this document is to provide a framework for the ongoing management and protection of heritage resources associated with the Hope Bay Project as required within the scope of relevant regulations. TMAC Resources Inc. is committed to maintaining sound environmental practices in all of its activities. With respect to heritage resources, this means that efforts will be made to identify the possible impacts to archaeological sites, both known and unknown, and to implement procedures to ensure that sites are avoided where possible, or to gather all pertinent cultural information prior to impact where sites cannot be avoided.

Heritage resources are protected under Articles 33 and 34 of the Nunavut Land Claims Agreement (1993), which are further clarified in the Nunavut Archaeological and Palaeontological Sites Regulations (2001), appended to Section 51(1) of the Nunavut Act (1993). Section 3(1) of these regulations states that:

> *"no person shall possess or sell an archaeological artifact that was removed from an archaeological site on or after June 15, 2001"*
> (with some specified exceptions noted)

Section 5(1) further states that:

> *"No person shall excavate, alter or otherwise disturb an archaeological site, or remove an archaeological artifact from an archaeological site, without a Class 2 permit"*

These Regulations define an archaeological artifact as:

> *"any tangible evidence of human activity that is more than 50 years old and in respect of which an unbroken chain of possession or regular pattern of usage cannot be demonstrated"*

and an archaeological site is defined as:

> *"a site where an archaeological artifact is found"* (Section 1)

Under Article 33 of the Nunavut Land Claims Agreement, an archaeological site means:

> *"a site or work within the Nunavut Settlement Area of archaeological, ethnological or historical importance, interest or significance or a place where an archaeological specimen is found, and includes explorers' cairns"* (Section 33.1.1)

Within Article 33 of the Nunavut Land Claims Agreement, creation of the Inuit Heritage Trust is discussed, and Article 33.4.3 specifies the responsibilities of the Trust "to support, encourage and facilitate the conservation, maintenance, restoration and display of archaeological sites and specimens in the Nunavut Settlement Area."

Under the federal Territorial Land Use Regulations administered by Indigenous and Northern Affairs Canada, "no land use permittee, unless expressly authorized, shall conduct a land use operation with 30 m of a known or suspected historical, archaeological or burial site."

The results of archaeological studies in Nunavut Territory are jointly managed by various agencies. Information on recorded sites is submitted to the Department of Culture and Heritage (CH) of the Government of Nunavut (GN). Archaeological specimens collected under permit are currently held at the Canadian Museum of Nature (CMN) in Ottawa (and formerly at the Prince of Wales Northern Heritage Centre in Yellowknife) until appropriate facilities are available within Nunavut. Reports on all investigations conducted under permit are submitted to CH-GN, the CMN, and the Inuit Heritage Trust.

In addition to the above definitions of heritage resources, archaeological sites and specimens, clarification of several relevant terms is useful. Archaeologists deal only with the physical remains of past human activities. Archaeological sites and artifacts are tangible objects, as defined above. Traditional knowledge is information held within the memories of local people relating to cultural practices, or settlement/use patterns within an area. As such, traditional knowledge does not have a physical component itself, but it can lead to locations of archaeological sites and artifacts, in areas where past human activities have occurred over a long period of time.

1.3. PLAN MANAGEMENT AND EXECUTION

The Plan will be reviewed regularly and updated as necessary. Personnel responsible for implementing and updating the AEMP are identified in Table 1.4-1.

Table 1-1. Roles and Responsibilities

Role	Responsibility
VP Operations	• Overall responsibility for ensuring this Plan is implemented and site personnel are appropriately aware of heritage resources
VP Environmental Affairs	• Overall responsibility for and implementation of this management plan; • Provide support for the education and awareness training outlined in this Plan; • Provide resources needed to carry out the monitoring required in this Plan
Environmental Director	• Support implementation of this monitoring plan; • Review and update this Plan as required
Archaeologist	• Conduct monitoring and mitigation as outlined in this plan; • Support training and education program development as needed; • Secure required archaeological permits and conduct reporting
Exploration geologists	• Review archaeological record to ensure avoidance in siting of activities • Provide proposed off-deposit drill locations to project archaeologist for pre-drill screening if appropriate
Site personnel	• Participate in heritage resource avoidance and identification training as appropriate based on activities • Report any potential archaeological sites to the site environmental group

2. PROJECT DESCRIPTION

The Hope Bay Project encompasses the Hope Bay Belt in a band approximately 20 km wide east-west and extending about 80 km to the south from the coast at Roberts Bay. The approved Doris Mine Project, located in the northern portion of the Belt, is the initial development phase of the Hope Bay Project. It includes a mine at Doris Lake; associated infrastructure consisting of a camp, mill, tailings impoundment area, all weather roads (one with an air strip); and a jetty and storage facilities at Roberts Bay. Much of this infrastructure will be used for the Phase 2 Project which comprises three additional mine areas, Madrid North, Madrid South and Boston, and associated infrastructure as well as an all-weather road and quarries extending between Madrid and Boston.

For the purposes of this document, the study areas are defined as follows.

1. The Doris Project encompasses the developed footprint of the mine and developed infrastructure from Roberts Bay to the Tailings Impoundment Area and to the south end of Windy Lake.
2. The Hope Bay Belt covers the full north-south and east-west extent of the claims area and encompasses all the proposed Phase 2 developments as well as the Doris Project. It has been divided into five segments from north to south for the purposes of this document:

    2.1. Roberts Bay- Hope Bay coastal area;

2.2. Doris Lake-Patch Lake: from just north of the Doris Mesa to the south end of Patch Lake, encompassing the Doris Project;

2.3. Central North: from the south end of Patch Lake to the south end of Midway Lake;

2.4. Central South: extending from the south end of Midway Lake to just north of the northern shore of the main body of Aimaokatalok Lake;

2.5. Aimaokatalok Lake South, from the above point on the northern shore on the body of Aimaokatalok Lake extending south to the southern edge of the Hope Bay Belt exploration area, encompassing the Boston Project infrastructure and the shores of Aimaokatalok Lake.

2.1. ARCHAEOLOGICAL INVESTIGATIONS CONDUCTED TO DATE

Archaeological study of the Hope Bay Project area began in 1995, and since that time, 18 seasons of field investigations have been completed on the Belt (Bussey 1995a, 1995b; Prager and Bussey 1997; Prager 1998, 2001, 2004, 2005, 2006, 2007, 2008, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017; Golder 2008). In each year of archaeological study, specific study objectives were directed toward project activities occurring at those times. All the field studies comprised assessments relating to each year's exploration program, while the development related studies varied as required by the evolving project plans.

The strategy of the Hope Bay Project archaeological studies has involved a multi-stage approach. An important initial step, background research, was completed in 1996 (Prager 1997, Prager 2002). Documentary data concerning human habitation of the Central Arctic were consulted. These documents comprised historic journals written by the first explorers to the region, early ethnographers' reports, and reports describing previous archaeological investigations in the region. Available relevant traditional knowledge information has been incorporated into subsequent archaeological studies. These documentary data are important for designing appropriate archaeological field studies and to provide a context within which the results of archaeological studies in the Hope Bay Project could be interpreted.

The investigation design developed for the conduct of the Hope Bay archaeological studies consists of up to six stages, which are: overview, reconnaissance, inventory, assessment, mitigation, surveillance and monitoring. These follow guidelines released by the GN-CH (CLEY 2003). The stage applied each field season depends on the project requirements for each year.

The early years of field work involved assessments of larger areas within which exploration activities would occur; the exact locations of those activities were often not specified. The initial areal overview involving low and slow helicopter overflights was crucial to identify landforms on which archaeological sites were possible. Those landforms were the primary focus for ground reconnaissance since the areas under consideration were frequently quite large; lower potential sections were often crossed during ground traverses and so provided a sample of terrain less likely to contain archaeological sites. In more recent years, exploration geologists provided more specific drill site locations thereby enabling more focused examination around those specific localities. Surrounding areas of good potential ground were still examined whenever time permitted in order to allow for small adjustments of drill site locations.

The first few years of archaeological assessments in the Hope Bay Belt focused on two main exploration areas around the Doris deposits in the north and the Boston deposit in the south, potential port site options in Roberts Bay, as well as possible and utilized winter road routes between Roberts Bay, Doris Lake, Windy Camp and Boston camp. These road routes generally followed low ground and water as much as possible, on a nearly direct north-south line (see Prager 1998). In the 2000 season, preliminary overview assessments of a potential all weather road route and associated quarry sites between Boston camp and Roberts Bay were carried out, in addition to assessments of several alternative locations for infrastructure associated with the Doris Project. In 2003 and 2005, archaeological assessments were completed of proposed infrastructure for the Doris Project as well as the ongoing exploration program. In 2004, 2006, 2007, and 2013 archaeological studies focused on exploration activities in the Hope Bay Belt. From the initial exploration focus at Boston and Doris, the program expanded over the years to include localities throughout the Hope Bay Belt. More recent exploration focused on two specific areas: Madrid North, north and west of Patch Lake, and Madrid South, between Patch and Wolverine lakes; consequently, these areas have been more intensively archaeologically surveyed. In 2008, 2009, 2010, 2014, 2015 more development related assessments were included. The 2010 season involved preliminary assessments of possible Phase 2 developments extending throughout the length of the Hope Bay Belt. The Hope Bay Project was placed into care and maintenance for one year, and a small amount of fieldwork completed in 2012 included mitigation of a small site on the shore of tail Lake. Mitigation actions at specific sites were included in the studies only as project development plans required or exploration in a particular area intensified; archaeological sites were mitigated in 1997, 2003, 2007, 2010, 2011, 2012, 2015, 2016.

2.2. RECORDED ARCHAEOLOGICAL SITES

The eighteen seasons of archaeological studies have clearly shown that archaeological sites are distributed throughout the Hope Bay Belt and that they are abundant. To date, 301 archaeological sites have been recorded. Since the initial studies focused on Roberts Bay, Doris Lake and Boston vicinities, most archaeological sites were recorded in those areas in the first few years of research. Roberts Bay, Doris and Windy lakes, the TIA area and Aimaokatalok (Spyder) Lake were focal points for past human activities, and numerous archaeological sites were found in those areas. As the archaeological study area expanded with the broader exploration focus, more sites were found outside of those initial study areas. As a result, archaeological sites have been recorded throughout the entire Belt, and two other focal areas of past human use have been identified: one is along the Koignuk River, particularly the southern section near the north arm of Aimaokatalok Lake, and the other is around the lake known as Midway Lake in the central part of the Belt.

In this study region, past human activities have resulted in the following types of archaeological remains:

- Various types and sizes of stone circles or stone alignments;
- Box, circular or windbreak style hearths;
- Rock cairns or caches which can appear as a simple pile of rocks, or a circular/oval or stacked pile of rocks around an opening;
- Traps which are typically a pile of rocks with flat slabs on top and an opening on one side;

- Signal rocks, ranging from recognizable inuksuit to a simple propping upright or stacking of two or more rocks;
- Other piled/propped rocks serving such functions as kayak or meat drying rack supports;
- Artifacts of stone (formed tools or scattered flakes), bone, or wood and metal.

While there are certainly single feature sites (most often stone circles) recorded in the Hope Bay Project area, the majority of sites contain several features. Some sites cover a large area, as much as 300mx150m in size, containing a variety of features. Most sites contain one or more stone circles with one or more hearths; often, there are associated caches or support structures. Scattered animal bone fragments within sites are common, but formed tools occur less frequently. To date, no human remains have been found in the Hope Bay project area.

A total of 27 sites have been mitigated by systematic data recovery over the eighteen field seasons (see Table 4-1). Two more sites have been partly mitigated; one of these latter sites, in Roberts Bay, has staking to mark an avoidance zone around the remaining features. One additional site has been staked and flagged for avoidance and is being monitored. All but seven of the mitigated sites were associated with development components for the Doris mine, particularly those in Roberts Bay and in quarries south of Doris mine. Another three were situated near activities at Boston camp, and five were within zones of intensive exploration in the Madrid area. Two sites were removed from the inventory due to their recent age

Management of archaeological resources in terms of the project development, in particular, avoidance of impacts, has required ongoing and close communication between the project archaeologist and the exploration geologists, project designers and planning engineers. As plans for the Phase 2 overall development move forward, this level of communication will continue to be crucial.

3. ARCHAEOLOGICAL SITES PROTECTION AND MITIGATION

Archaeological sites are nonrenewable resources that are highly sensitive to ground disturbing activities. They are of limited size and can be easily impacted. Conversely, the limited size of most sites makes them readily avoidable (by some types of developments) if the presence of the archaeological deposits is known. Therefore, it is important to conduct inventory surveys prior to proposed ground disturbance and, further, to continue to keep the potential presence of archaeological resources in mind.

3.1. POSSIBLE IMPACTS OF THIS PROJECT

Several types of impacts may occur as the result of a development project. Direct impact is the actual physical disturbance of the location of an archaeological site or artifact caused by an activity such as those associated with construction or development. Such impacts are permanent and irreversible. Indirect impact is disturbance caused by some peripheral activity, or simply by the proximity of the development. An example is the presence of higher numbers of people living and working in a confined area which can increase the potential for disturbance of sites at some distance from the actual development limits. The issue of short term versus long term impacts is irrelevant with respect to archaeological resources. Impacts to archaeological resources are generally immediate in terms of the

actual activity which will cause the disturbance or destruction. The only long term impact may result from the potential for ongoing indirect impacts with the continued presence of people in the general area.

3.1.1. Doris Mine Project

From 1995, various plans for development of the Doris project were considered until a plan was finalized and submitted for approval in 2003. Archaeological assessments were completed in support of each of these proposals, and mitigation by systematic data recovery was completed of 17 archaeological sites judged potentially vulnerable to impacts in Roberts Bay and Doris project area. Those sites are NbNh-13, NbNh-14, NbNh-15, NbNh-23, NbNh-27, NbNh-28, NaNh-4, NaNh-28, NaNh-49, NaNh-58, NaNh-60, NaNh-61, NaNh-62, NaNh-63, NaNh-64, NaNh-85, NaNh-86. Amendments proposed in 2010, 2014 and 2016 and approved prompted additional archaeological assessments and mitigation of four more sites (NaNh-30, NaNh-90, NbNh-47, 48); NbNh-12 was partly mitigated in 2010, due to a need for a fuel off load road in Roberts Bay, and a line of stakes was installed to protect the rest of the site. Since project plans changed several times over the years, most of the sites that were mitigated to date are still intact. Only eight sites (NbNh-12, NbNh-13, NbNh-47, NbNh-48, NaNh-60, NaNh-61, NaNh-62, NaNh-63) have been impacted thus far, and one of those (NbNh-12) only partially. Because these 22 sites have been fully mitigated with approval of CH-GN and IHT, if any of the remaining 14 mitigated sites fall within the currently proposed footprint for Phase 2, they are no longer of concern, with the exception of the protected portion of NbNh-12.

3.1.2. Hope Bay Belt Phase 2 Development

Phase 2 development will consist of various components extending from Roberts Bay through much of the Hope Bay Belt to Boston camp on Aimaoktalok Lake. This will include three additional mines: Madrid North, Madrid South and Boston, as well as associated infrastructure and connecting roads. Archaeological investigations in 2010, 2015 and 2016 have included overview assessments of potential Phase 2 development components, some of which included several options. The overview assessments provided early indication of potential archaeological issues and allowed consideration of avoidance possibilities in areas with dense or significant archaeological resources at every stage of planning. As the project design has proceeded, consideration has been given to alignments for roads and placement of the various project components so as to avoid known archaeological resources as much as possible. Final detailed design will continue with the avoidance of archaeological sites in mind. The sites listed in Table 3-1 are within the currently identified Phase 2 Project Development Area (PDA). The PDA is the area within which Phase 2 development will occur with a buffer allowance for possible minor infrastructure position adjustments. Some of the sites listed in Table 3-1 may be avoidable with some protection.

Table 3-1. Phase 2 Development Components with Possible Archaeological Site Conflicts

Development Component	Sites
Roberts Bay cargo dock+access	NbNh-17, 24, 25
Roberts Bay Fuel Tank Farm	NbNh-45
TIA - expanded	NaNh-24, 31, 32, 35, 36
TIA west dam	NaNh-31, 32, 35
Winter Road Rob Bay to Boston	NaNh-24, 31, 32, 35, 36
Madrid N-TIA Road	NaNh-44, 65, 57
Madrid N	NaNh-12, 59, 104
Madrid S All Season Road	NaNh-102
Potential Quarry G	NaNh-76
Madrid South Infrastructure	NaNh-7, 8, 1, 101
Potential Quarry H	NaNh-8
Potential Quarry L	MlNh-14, 15
Potential Quarry Z	MlNh-42
Boston Road - central	MlNh-4, 20
Quarry P	MlNh-48, 57, 58
Potential Quarry Q	MlNh-27, 29, 30, 31, 34
Potential Quarry R	MlNh-46, MlNh-49
Potential Quarry S	MkNh-56
Potential Quarry T	MkNh-40, 41, 43
Potential Quarry U	MkNh-52, 53
Boston road – south section	MkNg-2
Potential Quarry V	MjNg-4 (significant – not recommended)
Boston Infrastructure area	MjNh-9, MjNh-5 (significant - staked)
Boston Air Strip	MkNh-1
Boston Tailings	MjNh-3

Proposed Phase 2 developments have been subjected to preliminary overview assessment or spot checked but not all areas likely to be affected have been thoroughly surveyed. An intensive survey will be conducted prior to infrastructure component construction, once the limits of disturbance are accurately identified. Any additional sites found will be treated in the same manner as the currently known sites. Therefore, the steps to be taken will comprise:

1. intensive ground reconnaissance to identify all sites within potential disturbance zones;
2. detailed assessment of site size and content of identified sites;
3. consideration of avoidance possibilities in the final project design;
4. development of mitigation plans for sites that are within buffer zones.

The primary direct impacts of the Hope Bay Phase 2 Project on heritage resources will be from construction of infrastructure for the three mines, the Madrid to Boston road and the associated quarries. The clearing and levelling of the ground, development of quarries, construction of roads, and erection of buildings and related facilities are the primary sources of disturbance associated with the camps, process plant sites and mine infrastructure as well as at the Roberts Bay cargo dock and expanded laydown areas.

The Madrid to Boston road is situated largely on low lying tundra/tussock fields, which is terrain generally considered low potential for archaeological sites, although some portions will be on more elevated ground. Of higher archaeological potential are the rock quarries and the access roads which are on elevated bedrock outcrops. Needs and locations for temporary facilities such as construction camps, material storage and stockpile areas have not yet been identified. Such locations would require assessment once they are determined. As development proceeds, additional sites will likely require mitigation.

The actual operation of the mines is unlikely to further directly affect archaeological resources since the mines will be underground and no additional surface disturbance is likely once the required infrastructure is completed. If it becomes necessary to add any structure, storage area, quarry or stockpile areas as the project proceeds, archaeological resources will be considered.

Potential indirect impacts largely relate to increased human activity around the camps, mine and Roberts Bay facilities. People living and working in an area intentionally or unintentionally pick up artifacts or disturb rock features, for example, by driving snowmobiles over sites within readily accessible areas surrounding camps. In addition, a common source of potential disturbance throughout the north is the moving of rocks to build modern *inuksuit*. Unless there is a valid need for a marker, such activity will be discouraged, since there is potential for disturbing an actual heritage feature in that process. Furthermore, such features are not part of the historic landscape. Such possibilities have been limited on the Hope Bay Project by restricting most activities to developed areas and existing roads and educating employees on recognizing, avoiding and reporting possible archaeological sites.

3.1.3. Hope Bay Belt Exploration

Within the Hope Bay Belt, exploration has been conducted at specific localities throughout the claims area. Exploration activities, including survey, surface rock sampling and drilling, can result in archaeological site disturbance. In this area, location surveys may need to use rocks to prop up stakes, some of which may represent archaeological features. Rock sampling can result in damage to rocks that are part of archaeological features. Drilling and associated activities can encompass an area up- to 100 square metres. Other sources of potential impacts to archaeological sites associated with exploration can include camps and storage areas as well as winter road routes. Although each of the exploration activities affects a relatively small area, they can disturb archaeological features simply because of their location and focus on rock. Several such disturbances occurred during the early years of exploration on the Hope Bay Project. .Indirect impacts on heritage resources resulting from exploration activities can be expected to be similar to those described for the Project, above. Such occurrences are now very rare because of ongoing close communication between exploration geologists and the project archaeologist as well as education of field geologists about the archaeological resources.

3.2. MITIGATION OPTIONS

In order to determine how best to protect and/or mitigate heritage resources, it is necessary to identify the possible impacts and their severity on those resources. To achieve this goal, the locations, sizes and contents of archaeological deposits must be identified. Mitigation plans for archaeological sites are tailored to each specific site since every site is different and situated in diverse types of landscapes. In order to gain sufficient knowledge about each site, detailed assessment stage of investigation involves close inspection of the site area and some subsurface testing where sediments are present. This provides the detailed knowledge of site size and content necessary to formulate a specific site mitigation plan. Those plans are then submitted to the CH-GN for approval.

Only certain rare types of very significant sites would be considered for preservation (such as burials); it is also desirable to retain some representative examples of all other site types in an area. At the present time, there are no rare, highly significant sites known within the Phase 2 PDA. Furthermore, examples of many of the more common sites are now known outside of the PDA where there is no danger of impact under the present development plans, thus, those provide representative examples of the types of sites present in the project area.

The possible mitigation options that have been and will be considered are: avoidance by project re-design, protection by use of barriers, surveillance and monitoring, and site data recovery to record as much of the cultural content of a site as is possible in those cases where site disturbance is unavoidable.

3.2.1. Avoidance

It must be emphasized that avoidance is the preferred option for mitigation of possible effects on archaeological sites. Whenever feasible, sites will be avoided by project redesign or relocation of development activities at the Hope Bay Project. Archaeological site surveys will be done as early as possible during the planning for new developments or exploration, so that site avoidance can be considered early during planning. TMAC is committed to limiting the destruction of archaeological resources to as little as possible, fully understanding that heritage resources are non-renewable.

The Government of Canada's Territorial Land Use Regulations state that all land use activities must be a minimum of 30 m from a known or suspected cultural resource site. These regulations were developed for small scale exploration projects; for development projects with a large amount of construction activity, this is considered insufficient and the Government of Nunavut encourages proponents to ensure larger buffer zones. For the Phase 2 project, all sites within 30m of any project component will be mitigated. Sites that are within 100m of a large construction project, such as mine and camp infrastructure, will be mitigated. Sites between 30m and 100m of a smaller, intermittent, or temporary component of the project, such as a temporary construction camp or a road, will be monitored and may be mitigated or protected by use of physical barriers, as judged appropriate. The potential for impact will be assessed at each site and site-specific mitigation measures will be developed as appropriate for each site in consultation with Culture and Heritage, Government of Nunavut and the Inuit Heritage Trust.

3.2.2. Site Protection

In those cases where infrastructure cannot be easily relocated or redesigned but sites are not expected to be directly impacted, it may be necessary to enhance avoidance with surveillance, monitoring or site protection.

Archaeological surveillance involves a qualified individual observing a temporary project activity in close proximity to a site while it is occurring. This would be done, for example, where a site is at the 30m minimum buffer from a short term, temporary activity. Archaeological monitoring refers to periodic visits to archaeological sites that are considered close enough to ongoing activities that there is some potential for project related effects. The purpose of the monitoring is to assess any changes in the potential for impact to those sites. Frequency of monitoring depends on the distance and type of activity occurring nearby and will be determined on an individual site basis.

Sites located very near a temporary development activity, such as a laydown area or drill site, may be protected when complete avoidance at sufficient distance is not feasible for the period of the activity. Site protection can involve the creation of a buffer zone in which no activities will occur, the erection of physical barriers, or surveillance or monitoring of sites near temporary or ongoing activities. Buffer zones must be a minimum of 30 m as specified by Regulations, but larger distances are preferred wherever possible. All activities and equipment must remain outside of the specified buffer.

3.2.3. Site Data Recovery

Site avoidance will always be the first preference. However, where avoidance is not feasible even with protection, every effort is made to thoroughly document the site and collect a representative sample of the cultural information contained within it.

It is standard scientific procedure to collect all artifacts disturbed during evaluative subsurface testing or mitigation excavations, or artifacts on the surface when that surface will be disturbed by development activities. Close study of the tools can provide many clues about past activities and can assist in the understanding of past peoples' lives. It is, therefore, important to collect a sample of artifacts to conduct such detailed studies. Further, tools that are found on the surface may be collected where they are in danger of being lost, either through human or natural actions, or if they are an isolated occurrence that may be difficult to relocate. Archaeological resources belong to all the people of Nunavut. Thus, once the archaeologists' studies are completed, all collected artifacts are placed in a museum (currently the Canadian Museum of Nature in Ottawa) for safekeeping where they can be made available to anyone who wishes to see them.

The specific mitigation measures undertaken at a site depend on the combination of several factors: the scientific significance of the site, cultural significance where it can be determined, the nature of the archaeological deposits, and the nature of the impact. Assessment of site significance at threatened sites for management purposes should be based on a combination of scientific and cultural factors.

Scientific significance is determined by examining a variety of criteria such as site size, site integrity and the presence of features or artifacts that may contribute information to regional archaeological understanding and interpretation. In the Hope Bay area, the sites that are considered of most value in terms of potential

scientific contributions are those with multiple features, those containing artifacts, particularly when buried, and those sites with identifiable features and artifacts that can contribute to clarification of specific past cultural manifestations known for the central Arctic. Some of the recorded sites in this area are considered of high scientific significance (see Table 4-1) and discovery of more such sites is possible.

Inuit people define cultural significance based on a range of criteria that may include connections to camps and graves, sacred sites associated with the origins of a group, long history of use of an area, and key landmarks. The cultural significance of a heritage site to local Inuit residents needs to be determined through consultation with the appropriate people. Several references containing traditional knowledge of this general area have been used in developing investigation strategies as well as mitigation recommendations (Banci and Spicker 2015; Golder Associates 2003; Riewe 1992). These references indicate no presence of burials or significant spiritual sites in the Hope Bay project area.

Site data recovery actions typically consist of surface collection, detailed mapping to scale of individual features as well as the overall site locale, and subsurface testing to evaluate site deposits and/or excavation of a selected sample of the total site area. Collectively, this suite of methods is referred to as systematic data recovery. Because full scale excavations are also destructive of heritage resources, they are reserved for the rare instances, either when site disturbance due to development is anticipated, or when the expected cultural information is considered of sufficient value such that the excavation disturbance is warranted.

Mitigation plans discussed here provide a general outline of intent, but these will need to be tailored to each specific site. These general plans are based on the knowledge accumulated for the Hope Bay region thus far during the archaeological studies. If new site types are identified in the study area, it may be necessary to develop additional mitigation measures. All mitigation measures must be approved by CH-GN prior to implementation.

3.3. SPECIFIC PROCEDURES FOR IMPACT MANAGEMENT

Within any area proposed for intensive development and/or exploration, all efforts will be made to identify all heritage resources present. TMAC will avoid archaeological sites whenever possible. When avoidance is not possible, it is necessary to determine the potential significance of a site due to its content in order to identify the level of mitigation required, and thus, the most appropriate type of mitigation. All pertinent data will be gathered for each identified archaeological site through site evaluation procedures described above to develop appropriate mitigation recommendations.

Subsurface evaluative testing will be conducted at potentially threatened sites to determine if buried cultural deposits are present. All testing and collection must be done under a plan approved by CH-GN and conducted by an archaeologist holding a valid archaeological permit. TMAC will endeavour to have a qualified archaeologist obtain a Nunavut Territory Archaeologist Permit under such circumstances. Scientific and cultural analysis and interpretation of the archaeological data collected during mitigation is an integral part of the process and will be undertaken on behalf of TMAC in a timely fashion. TMAC will work with project archaeologists, CH-GN officials and local Inuit groups on issues related to site interpretation.

To assist in the locating known archaeological sites, especially in the winter when there is snow cover, location co-ordinates will be collected for each site using handheld GPS units. In areas of intensive, ongoing activities, differential GPS including survey quality GPS equipment can be used for greater accuracy. Sites that can be readily located can then be avoided.

An annual report of archaeological investigations is provided by TMAC's archaeological contractor to the CH-GN and the Inuit Heritage Trust to fulfil compliance with the terms of the archaeologist permit. Although not a requirement of the permit, copies of the yearly reports are also provided to the Kitikmeot Inuit Association to keep the community informed of ongoing investigations and findings.

The locations of all archaeological sites recorded to date need to be taken into consideration when development and exploration activities are planned. Because this information is highly confidential, release of specific site location data must be restricted to only those people responsible for planning development and exploration. TMAC has restricted access procedures in place.

Archaeological sites directly affected by the Doris Project have been mitigated by collection of sufficient data from each site (Prager 1997, 2003, 2005, 2010, 2011, 2016, 2017). Close to two thirds of the archaeological sites recorded to date in the entire Hope Bay study area are not located within the Phase 2 PDA in which development is currently proposed. These are the sites for which "none at present" is entered in the Recommendations column in Table 4-1. For sites that are close enough to proposed development that some effects may be possible, the potential for effects will be reassessed as boundaries of the various development components are delineated or the yearly exploration programs finalized. In those cases where impacts become more likely as planning proceeds, TMAC may undertake additional field evaluations in order to determine appropriate, site-specific mitigation.

Table 3-1 lists 49 sites that occur within the PDA and may be subject to possible direct and indirect impacts from Phase 2 proposed developments. The potential effects relate mostly to roads and associated quarries, with a lesser number affected by mining infrastructure (see Table 3-1). Another 20 sites are listed in Table 4-1 as possibly subject to indirect effects; these sites are close to the PDA and have been highlighted so that finalization of the project boundaries will maintain sufficient buffer or where that is not possible, these sites may require some protection. Since the PDA is an area which encompasses both the Project footprint and an additional area within which Project footprint may be altered prior to construction, the number of sites identified as potentially subject to direct or indirect impacts in Table 3-1 is conservative. It is expected that a significant proportion of these sites will not have direct Project impacts.

Sites recommended for assessment and/or monitoring in Table 4-1 are within close proximity to the proposed mines and camps or intensive exploration zones where indirect effects could occur. Several very significant sites are situated south of Boston camp, and any intensification of activity in that vicinity will require additional data collection at those sites, as well as consideration of appropriate protection measures (MjNh-5 has been staked and flagged for avoidance). These will be monitored regularly. This involves visits to assess whether impacts have occurred and to evaluate the potential for impact from any new or expanded activities. Furthermore, as the overall Hope Bay Project evolves and development areas are expanded, there is potential for other recorded sites to enter this category.

3.4. GUIDELINES FOR IMPACT MANAGEMENT

TMAC understands that the management of heritage resources will be an ongoing requirement throughout the life of this project. Since a large proportion of the Hope Bay Belt has not been investigated, unrecorded archaeological resources are likely present and may be encountered. In addition to ensuring that all potential development and exploration areas are subjected to intensive archaeological survey prior to ground disturbance and locations of known sites are avoided, procedures need to be in place to deal with unexpected cultural evidence if encountered during development or exploration activities. It is acknowledged to be important that environmental contractors and monitors, field geologists, and construction supervisors be informed as to how to recognize major types of cultural remains present in the area and the procedures that need to be followed if such remains are uncovered during any project activities. Site orientation required for all employees, contractors and visitors currently includes information on TMAC policies and procedures regarding archaeological remains. General operational procedures (Appendix A) and contingency plans for construction activities have been prepared; procedures to be followed are summarized below. These will be communicated to all personnel working outside the developed footprint.

The following procedures will be implemented by TMAC personnel if cultural remains are observed during any ground disturbing actions:

1. All construction activity in the immediate vicinity of the remains will cease.
2. The project archaeologist and Territorial Archaeologist will be contacted. Then:
    2.1. the potential significance of the remains will be assessed; and,
    2.2. mitigation options will be identified.
3. If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, the project archaeologist in consultation with the Territorial Archaeologist, the Inuit Heritage Trust and representatives of local communities, will recommend the appropriate course of action.
4. In the case of human remains, the RCMP will be contacted. In addition, a Coroner and/or physical anthropologist may be involved, if necessary. If the remains are determined to be archaeological, representatives of local communities as well as the Inuit Heritage Trust will be consulted to determine how best to handle the remains. Options could include avoidance or respectful removal and reburial.

TMAC will endeavour to educate all field staff and contractors in archaeological site protection. A detailed site orientation has been developed specifically aimed at field personnel that provides examples of the types of heritage resources to be expected so that people can recognize them. Recognition is the crucial first step toward ensuring inadvertent disturbances are minimized. The orientation further describes proper procedures for handling heritage resources and the consequences of disturbing an archaeological site or artifact, both to the individual and the project. An information summary sheet is provided to all field personnel (Appendix B).

4. STATUS OF RECORDED ARCHAEOLOGICAL RESOURCES

The following table 4-1 provides a summary of the archaeological sites recorded to date (by the general area divisions described in Section 2) in the Project area. It shows the level of investigations conducted at each site to date and the potential for impact, as well as significance rating for those sites that have been assessed. The categories of information included in this table are those judged to be most necessary to understand site specific protection/mitigation requirements. Refer to Section 3.2 for discussion of the types of recommendations.

Site Number: refers to the Borden designation assigned by the Sites Office of the Canadian Museum of Civilization. It is based on blocks of latitude and longitude and, therefore, generally locates the sites in a 10 minute by 10 minute square area; within that block, sites are numbered sequentially as they are reported.

Site Type/Content: features or artifacts found within the site.

SC = stone circle(s)

RF = a single type of rock feature that is not a stone circle

MRF = multiple rock features of different types (see section 2.2); MRF/A also has artifacts and bone fragments; MRF/b has bone fragments only

LS = lithic scatter;

LS/T = lithic scatter plus formed tools

Location: refers to the location of the site relative to the project components, or to natural features

Status: the level of archaeological investigations conducted to date (see Section 2 for description of the stages of investigations).

Recorded: the basic, first level of recording, sketch mapped and photographed (stage 2)

Updated: revisited to confirm location and content, condition

Evaluated: plan mapping of individual features: evaluative shovel testing (in those sites with some sediment accumulation) to assess site content; (stage 3)

Mitigated: mapped to scale and fixed datum and excavated to the point that no further data are likely to be recovered (stage 4); permit number for the report detailing the mitigation is provided.

Impact Potential: the possible impact of this development that can be predicted as of the date of this Plan; each of the types of impacts described in this Plan have been assessed as possible or probable.

Impact potential for each site will be reassessed as project plans evolve, footprint is confirmed, exploration intensifies and development activities move forward.

Project Component and Distance: For those sites where some impact is possible, the specific aspect of the project is noted and the distance between the site and that component is estimated, where possible.

Table 4-1. Status of Hope Bay Project Recorded Sites 1995-2016

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
ROBERTS BAY - HOPE BAY							
NaNi-3	SC/A	West Hope Bay	recorded	none at present			none at present
NaNi-4	MRF/b	West Hope Bay	recorded	none at present			none at present
NaNi-5	SCs/A	Hope Bay	recorded	none at present			none at present
NaNi-6	MRF/b	Hope Bay	recorded	none at present			none at present
NaNi-7	MRF/A+b	South Hope Bay	recorded	none at present			none at present
NaNi-8	MRF/A	Hope Bay	recorded	none at present			none at present
NaNi-9	MRF	Hope Bay	recorded	none at present			none at present
NaNi-10	SC/A+b	Hope Bay	recorded	none at present			none at present
NaNi-12	SC+RF	Hope Bay	recorded	none at present			none at present
NbNh-1	SC+hearth	island, Roberts Bay	recorded	none at present			none at present
NbNh-2	SC+hearth	island, Roberts Bay	recorded	none at present			none at present
NbNh-3	SCs/A	island, Roberts Bay	recorded	none at present			none at present
NbNh-4	SC	island, Roberts Bay	recorded	none at present			none at present
NbNh-5	MRF/A	island, Roberts Bay	recorded	none at present			none at present
NbNh-6	RF	island, Roberts Bay	recorded	none at present			none at present
NbNh-7	RF	island, Roberts Bay	recorded	none at present			none at present
NbNh-8	MRF	island, Roberts Bay	recorded	none at present			none at present
NbNh-9	MRF	island, Roberts Bay	recorded	none at present			none at present
NbNh-10	MRF/b	peninsula, S Roberts Bay	recorded, updated	possible indirect	Rob Bay activities	moderate-high	monitor, protect as needed
NbNh-11	RF	peninsula, S Roberts Bay	recorded; updated	possible indirect	Rob Bay activities	low	monitor

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NbNh-12	MRF	peninsula, S Roberts Bay	partly mitigated; 2011-30A	direct; possible indirect	Rob Bay fuel haul road; 0-30m	low-moderate	monitor, protect/mitigate as needed
NbNh-13	SCs/A+b	south shore Roberts Bay	mitigated; 97-850	direct	within Rob Bay laydown	low-moderate	no further work
NbNh-14	SCs/A+b	west Roberts Bay	mapped/evaluated ; 97-850	possible indirect	former port option	low-moderate	no further work
NbNh-15	RF	west Roberts Bay	mapped/evaluated ; 97-850	possible indirect	former port option	low	no further work
NbNh-16	SC+hearth	west Roberts Bay	mapped/evaluated ; 97-850	possible indirect	fomer barge landing	low-moderate	monitor
NbNh-17	SCs/A	west Roberts Bay	recorded	possible direct	RB cargo dock; 0m		monitor; mitigate as needed
NbNh-18	MRF/b	east Roberts Bay	recorded	none at present			none at present
NbNh-19	MRF/A+b	SE Roberts Bay	recorded	none at present			monitor
NbNh-21	MRF/A+b	east Roberts Bay	recorded	none at present			none at present
NbNh-22	SC	west Roberts Bay	recorded	none at present			none at present
NbNh-23	SC	south shore Roberts Bay	mitigated; 97-850, 2003-05A	direct	Rob Bay pad; 0 to 50m	moderate	no further work
NbNh-24	SCs	west Roberts Bay	recorded	possible direct	cargo dock; 0m	moderate	monitor; mitigate as needed
NbNh-25	MRF/A+b	SW Roberts Bay	recorded	possible direct/indirect	cargo dock access; 0-100m		monitor; mitigate/protect as needed
NbNh-27	RFs	peninsula, south Roberts Bay	mitigated: 2011-30A	possible indirect	Rob Bay fuel road/storage; 50m	low	no further work

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NbNh-28	MRF	south Roberts Bay	mitigated; 2003-30A	probable indirect	RB quarry; 40m	low	no further work
NbNh-29	SCs/b	south of Roberts Bay	recorded	none at present			none at present, monitor
NbNh-30	MRF/A	peninsula, S Roberts Bay	recorded	possible indirect	Rob Bay fuel road	moderate-high	monitor, protect as needed
NbNh-31	SCs/A+b	peninsula, S Roberts Bay	recorded	none at present		Moderate-high	monitor, protect as needed
NbNh-32	MRF/A	SE Roberts Bay	recorded	none at present			monitor
NbNh-33	RF	SE Roberts Bay	recorded	none at present			none at present
NbNh-34	MRF	SE Roberts Bay	recorded	none at present			none at present
NbNh-44	MRF	south of Roberts Bay	recorded	none at present			none at present
NbNh-45	RF	south of Roberts Bay	recorded	possible direct/ indirect	Rob Bay tank farm expansion	low-moderate	monitor; mitigate/protect as needed
NbNh-46	RF	south of Roberts Bay	recorded	none at present			none at present
NbNh-47	MRF	southwest Roberts Bay	mitigated; 2015-07A	possible direct	tailings discharge pipeline; 7m	low-moderate	no further work
NbNh-48	MRF	southwest Roberts Bay	mitigated; 2016-12A	direct	tailings discharge pipeline; 0 m	low-moderate	no further work
DORIS – PATCH LAKES							
NaNh-1	MRF/b	SW Patch Lake	mapped/evaluated ; 97-850	possible indirect	Madrid South	moderate	monitor
NaNh-2	RFs/b	north of Doris Lake	mapped/evaluated ; 97-850	possible indirect	Doris N	low-moderate	monitor; protect
NaNh-3	MRF	NE of Doris Lake	recorded	none at present			none at present
NaNh-4	MRF/A	north of Doris Lake	mitigated; 97-850; 2003-05A	probable indirect	Doris North; 200m	moderate	no further work

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NaNh-5	MF/A+b	south of Windy Lake	recorded	none at present		possibly significant	none at present
NaNh-6	SC+hearth	north of Windy Lake	recorded	none at present			none at present
NaNh-7	RFs+hearths	SW Patch Lake	partly mitigated; 97-850; 2011-30A	probable direct	Madrid South; 25m	moderate	complete mitigation
NaNh-8	MRF	SW Patch Lake	mapped/evaluated; 97-850; 2016-12A	partly direct	Madrid S quarry H; 0m	moderate	part mitigation; part possibly avoidable
NaNh-10	MRF/A	south Patch Lake	recorded; updated	none at present		high	monitor, protect
NaNh-11	SCs	S of Windy Lake	recorded	none at present			none at present
NaNh-12	SC+hearth	NW Patch Lake	recorded	possible direct	Madrid N	low	protect- mitigate if needed
NaNh-13	SCs	SE of Ogama Lake	recorded	none at present			none at present
NaNh-14	MRF	north Patch Lake	mitigated; 2007-18A	probable direct	Madrid exploration	moderate	no further work
NaNh-15	SC	east of Windy Lake	mapped/ evaluated; 97-850	possible indirect	Madrid exploration	low-moderate	no further work
NaNh-16	SC/A	N of Windy Lake	recorded	none at present			none at present
NaNh-17	MRF	island S Doris Lake	mapped/evaluated; 97-850	possible indirect	Doris North; winter road	moderate	monitor, protect if needed
NaNh-18	MRF	SE Doris Lake	recorded	none at present			none at present
NaNh-19	SC	N Ogama Lake	recorded	none at present			none at present
NaNh-20	SC	east of Glen Lake	recorded	none at present			none at present
NaNh-21	LS/T	N of Tail Lake	recorded/updated	possible indirect		high	monitor
NaNh-22	MRF/A	E side Doris Lake	recorded	possible indirect	Doris N-TIA	moderate-high	monitor
NaNh-23	MRF	E side Doris Lake	recorded	possible indirect	Doris N-TIA		monitor
NaNh-24	SC	E side Doris Lake	recorded	possible indirect	Doris N-TIA		monitor
NaNh-25	SC	SE Doris Lake	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NaNh-26	SC	SE Doris Lake	recorded	none at present			none at present
NaNh-27	RF	Little Roberts Creek	recorded	none at present			none at present
NaNh-28	RF	N of Doris Lake	mitigated; 2003-05A	probable direct	TIA road; 0 m	low	no further work
NaNh-29	MRF/b	NE of Tail Lake	recorded	none at present			none at present
NaNh-30	SC	east of Tail Lake	mitigated; 2010-14A	direct	TIA quarry	low	no further work
NaNh-31	SC	SW Tail Lake	recorded	probable direct	TIA: 0m	low	mitigate as needed
NaNh-32	SC	SW Tail Lake	recorded	possible indirect	TIA; 50m	low	monitor, protect
NaNh-33	MRF	east of Glen Lake	recorded	none at present			none at present
NaNh-34	SC+hearth	east of Glen Lake	recorded	none at present			none at present
NaNh-35	MRF	SW Tail Lake	recorded	probable direct	TIA; 7m	low-moderate	mitigate
NaNh-36	MRF	SW Tail Lake	recorded	possible indirect	TIA; 125m	low-moderate	monitor, protect
NaNh-37	SC	east side Patch Lake	recorded	none at present			none at present
NaNh-38	SCs	north of Windy lake	recorded	none at present			none at present
NaNh-39	SCs	east side Patch Lake	recorded	none at present			none at present
NaNh-40	MRF+b	NW Patch Lake	mitigated: 2007-18A	probable direct	Madrid exploration	low-moderate	no further work
NaNh-41	MRF/A	North Koignuk R	recorded	none at present			none at present
NaNh-42	MRF	North Koignuk R	recorded	none at present			none at present
NaNh-43	RF	north Patch Lake	recorded	possible indirect	Madrid N - TIA road	low	monitor; protect as needed
NaNh-44	MRF	south Doris Lake	recorded	possible direct	Madrid N - TIA road; 0-100m	low-moderate	monitor; mitigate/protect as needed
NaNh-45	MRF/A	east of Patch Lake	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NaNh-46	SC	S of Roberts Bay	recorded	none at present			none at present, reassess
NaNh-48	SC	west of Doris Lake	recorded	none at present			none at present
NaNh-49	MRF	west of Doris Lake	mitigated; 2010-14A	possible direct/ indirect	Windy-Doris road; quarry	moderate	monitor/protect as visitor interpretive site
NaNh-50	RF	west of Doris Lake	recorded	none at present			none at present
NaNh-51	RF	west of Doris Lake	recorded	none at present			none at present
NaNh-52	RF	west of Doris Lake	recorded	none at present			none at present
NaNh-53	SCs	east of Windy Lake	recorded	none at present			none at present
NaNh-54	RF	west of Doris Lake	recorded	none at present			none at present
NaNh-55	RFs	west of Doris Lake	recorded	none at present			none at present
NaNh-56	RF	north of Patch Lake	recorded	possible direct	Madrid N - TIA road; 0-100m	low	monitor; mitigate/protect as needed
NaNh-57	RFs	north of Patch Lake	recorded	possible indirect	Madrid N - TIA road	low	Monitor; protect as needed
NaNh-58	RF	NW of Patch Lake	mitigated: 2010-14A	possible direct	quarry D	low	no further work
NaNh-59	MRF	east of Windy Lake	recorded, assessed; 2015-07A	possible indirect	Madrid N; 6m	low-moderate	monitor; mitigate as needed
NaNh-60	RF- recent	west of Doris Lake	recorded, reassessed	direct	Quarry A	none	delete from inventory
NaNh-61	RF - recent	west of Doris Lake	recorded, reassessed	direct	Quarry A	none	delete from inventory
NaNh-62	RF	east of Windy Lake	mitigated; 2010-14A	direct	Quarry B	low	no further work

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NaNh-63	MRF	east of Windy Lake	mitigated; 2010-14A	direct	Quarry B	moderate	no further work
NaNh-64	MRF	east of Windy Lake	mitigated; 2010-14A	possible direct	Quarry B	low-moderate	no further work
NaNh-65	SC+hearth	east of Patch Lake	recorded	none at present			none at present
NaNh-66	RF	east side Patch Lake	recorded	none at present			none at present
NaNh-67	SC+hearth	east side Patch Lake	recorded	none at present			none at present
NaNh-68	RF	east side Patch Lake	recorded	none at present			none at present
NaNh-70	RF	S of Roberts Bay	recorded	none at present			none at present
NaNh-72	SC	north of Windy Lake	recorded	none at present			none at present
NaNh-73	SCs+hearths	north of Doris Lake	recorded	possible indirect	Doris N-Rob Bay Road-pads	low-moderate	monitor, protect as needed
NaNh-74	SC/A	east side Wolverine Lake	mitigated; 2011-30A	possible direct	Madrid S	low	no further work
NaNh-75	RF	north of Windy Lake	recorded	none at present			none at present
NaNh-76	MRF/A	west of Patch Lake	evaluated/mapped; 2016-12A	direct	Madrid S road quarry G	moderate-high	mitigate
NaNh-77	MRF	SE of Ogama Lake	recorded	none at present			none at present
NaNh-78	MRF/A	SE of Tail Lake	recorded	none at present			none at present
NaNh-79	SC	SE of Tail Lake	recorded	none at present			none at present
NaNh-80	SC	SE of Tail Lake	recorded	none at present			none at present
NaNh-81	SCs	east of Tail Lake	recorded	none at present			none at present
NaNh-82	SC	east of Tail Lake	recorded	none at present			none at present
NaNh-83	MRF	west side PO Lake	recorded	none at present			none at present
NaNh-84	MRF	west of Patch Lake	recorded	possible indirect	Madrid S road	low-moderate	monitor
NaNh-85	SC	NW of Doris Lake	mapped; 2011-30A	possible direct	possible quarry	low	no further work

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NaNh-86	RF	NW of Doris Lake	mapped; 2011-30A	possible direct	possible quarry	low	no further work
NaNh-87	MRF/b	east of Patch Lake	recorded	none at present			none at present
NaNh-89	SCs+hearths	west of Patch Lake	recorded	possible indirect	Madrid S road	moderate	monitor
NaNh-90	MRF	northwest Tail Lake	mitigated; 2012-10A	direct	TIA	low	no further work
NaNh-91	RF	Koignuk River	recorded	none at present			none at present
NaNh-92	MRF/b	south of Windy Lake	recorded	none at present			none at present
NaNh-93	MRF	south of Windy Lake	recorded	none at present			none at present
NaNh-94	MRF	south of Windy Lake	recorded	none at present			none at present
NaNh-95	MRF	south of Windy Lake	recorded	none at present			none at present
NaNh-96	SCs+hearths	north of Doris Lake	recorded	none at present			none at present
NaNh-97	MRF	SWof Windy Lake	recorded	none at present			none at present
NaNh-98	MRF	SWof Windy Lake	recorded	none at present			none at present
NaNh-99	SC	SE Windy Lake	mapped; 2014-07A	possible direct			no further work
NaNh-100	MRF	NW Doris Lake	mapped/evaluated; 2015-07A	possible indirect	Doris central vent raise	low-moderate	monitor; mitigate if needed
NaNh-101	SC+hearth	SW Patch Lake	recorded	possible direct/ indirect	Madrid S	low-moderate	assess, monitor; protect/mitigate as needed
NaNh-102	MRF	west of Patch Lake	recorded	possible indirect	Madrid S road	low-moderate	assess, monitor
NaNh-103	RF	west of Patch Lake	recorded	possible indirect	Madrid S road	low	monitor
NaNh-104	MRF	NW Patch Lake	recorded	possible indirect	Madrid N	low-moderate	monitor
NaNh-105	SC+hearth	west Roberts Lake	recorded	none at present			none at present
NaNh-106	SC+marker	west Ogama Lake	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
NaNi-2	MRF	east of Glen Lake	recorded; updated	none at present			none at present
NaNi-11	MRF/A+b	Koignuk R-Hope Bay	recorded	none at present		high	none at present
NbNh-20	MRF/A+b	west Roberts Lake	recorded	possible indirect	fish fence; 65m	moderate-high	monitor
NbNh-26	MRF/A	west Roberts Lake	recorded	none at present		high	none at present
NbNh-43	RF	south of Roberts Bay	recorded	none at present			none at present
CENTRAL NORTH							
MlNh-1	MRF/b	east side Mud L	mapped/evaluated	none at present			none at present
MlNh-2	SCs	east side Koignuk R	recorded	none at present			none at present
MlNh-3	SC	east of Koignuk R	recorded	none at present			none at present
MlNh-4	SC	east of Koignuk R	recorded	none at present			none at present
MlNh-5	SCs	east of Koignuk R	recorded/updated	none at present			none at present
MlNh-6	SCs	east of Koignuk R	recorded; /updated	none at present			none at present
MlNh-7	SC/A	east of Koignuk R	recorded	none at present			none at present
MlNh-8	SC/A	south of Mud Lake	recorded/updated	none at present			none at present
MlNh-9	SC	SE of Koignuk R	recorded/updated	none at present			none at present
MlNh-10	MRF	east side, Koignuk R	recorded	none at present			none at present
MlNh-11	SC	east side, Koignuk R	recorded	none at present			none at present
MlNh-12	SC	east side, Koignuk R	recorded	none at present			none at present
MlNh-13	SC	west of Koignuk R	recorded	none at present			none at present
MlNh-14	MRF/b	south of Patch Lake	recorded	direct	road quarry L	moderate	assess, monitor
MlNh-15	SCs	south of Patch Lake	recorded	direct	road quarry L	moderate-high	assess, monitor
MlNh-16	SCs	south of Patch Lake	recorded	none at present			none at present
MlNh-17	MRF	east of Koignuk R	recorded	none at present			none at present
MlNh-18	MRF	south of Patch Lake	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
MlNh-19	SC	NE of Midway Lake	recorded	none at present			none at present
MlNh-20	MRF	east of Koignuk R	recorded	possible indirect	Boston road; 120m	moderate-high	monitor; protect as needed
MlNh-21	MRF	east Midway Lake	recorded	none at present			none at present
MlNh-22	LS	east Midway Lake	recorded	none at present		significant	none at present
MlNh-23	SCs	east Midway Lake	recorded	none at present			none at present
MlNh-24	LS	east Midway Lake	recorded	none at present		significant	none at present
MlNh-25	SCs	east side Midway Lake	recorded	none at present			none at present
MlNh-26	MRF/A	east side Midway Lake	recorded	none at present			none at present
MlNh-27	MRF	NW Midway Lake	recorded	possible direct	road quarry Q; 0m	low-moderate	assess, mitigate as needed
MlNh-28	SC	NW Midway Lake	recorded	none at present			none at present
MlNh-29	MRF	north of Midway Lake	recorded	possible direct	road quarry Q; 0m	low-moderate	assess, monitor
MlNh-30	MRF	north of Midway Lake	recorded	possible direct	road quarry Q edge	low-moderate	assess, monitor; avoidable
MlNh-31	SCs	north of Midway Lake	recorded	possible indirect	road quarry Q; 125m	low-moderate	assess, monitor
MlNh-32	SCs	east of Koignuk R	recorded	none at present			none at present
MlNh-33	SC	north of Midway Lake	recorded	none at present			none at present
MlNh-34	MRF	west of Midway Lake	recorded	possible direct	road quarry Q; 0m	moderate	assess, mitigate as needed
MlNh-35	SC	east of Koignuk R	recorded	none at present			none at present
MlNh-36	MRF	east Midway Lake	recorded	none at present			none at present
MlNh-37	MRF	Melville S. drainage	recorded	none at present			none at present
MlNh-38	MRF	east side Koignuk R	recorded	none at present			none at present
MlNh-39	MRF	east side Koignuk R	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
MlNh-40	SC	east side Koignuk R	recorded	none at present			none at present
MlNh-41	SCs	SE of Koignuk R	recorded	none at present			none at present
MlNh-42	SC, hearth	east of Koignuk R	recorded	possible direct	road quarry Z; 0m	low	assess, monitor
MlNh-43	SCs	east side of Koignuk R	recorded	none at present			none at present
MlNh-44	SCs	east of Koignuk R	recorded	none at present			none at present
MlNh-45	MRF	west of Koignuk R	recorded	none at present			none at present
MlNh-46	RF	west of Midway Lake	recorded	probable direct	road quarry R; 0m	low	assess; mitigate as needed
MlNh-47	SC	east of Koignuk R	recorded	none at present			none at present
MlNh-48	SC/RF	NW of Midway Lake	recorded	possible direct	road quarry P; 0m	low	assess; mitigate as needed
MlNh-49	SC	west of Midway Lake	recorded	probable direct	road quarry R; 0m	low	assess; mitigate as needed
MlNh-50	SCs/RF	west of Koignuk R	recorded	none at present			none at present
MlNh-51	MRF	east side Koignuk R	recorded	none at present			none at present
MlNh-52	MRF	east side Koignuk R	recorded	none at present			none at present
MlNh-53	SC	east side Koignuk R	recorded	none at present			none at present
MlNh-54	SC	west side Koignuk R	recorded	none at present			
MlNh-55	SCs+cache	west side Koignuk R	recorded	none at present			
MlNh-56	SCs	west side Koignuk R	recorded	none at present			
MlNh-57	SCs	NW of Midway Lake	recorded	possible direct	road quarry P; 0m	low-moderate	assess, monitor; avoidable
MlNh-58	SC+RF	NW of Midway Lake	recorded	possible direct	road quarry P; 0m	low-moderate	assess; mitigate as needed
MlNi-1	MRF	west of central KoignukR	recorded	none at present			none at present

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NaNh-9	SC	south of Wolverine Lake	recorded	none at present			none at present
NaNh-47	RFs	south of Patch Lake	recorded	none at present			none at present
NaNh-69	SC/HPR/A	south of Patch Lake	recorded	none at present			none at present
NaNh-71	MRF/A+b	south of Patch Lake	recorded	none at present			none at present
NaNh-88	RF	south of Wolverine Lake	recorded	none at present			none at present
CENTRAL - SOUTH							
MkNh-2	SCs	east-NW Aimaokatalok	recorded	none at present			none at present
MkNh-6	SCs	east side Koignuk R	recorded	none at present		high	none at present
MkNh-7	SCs	west side Koignuk R	recorded	none at present			none at present
MkNh-8	RF/A+b	east NW Aimaokatalok	mapped/evaluated	none at present			none at present
MkNh-9	SC	east NW Aimaokatalok	recorded	none at present			none at present
MkNh-13	SC/b	east NW Aimaokatalok	recorded	none at present			none at present
MkNh-14	LS/T	east NW Aimaokatalok	recorded	none at present		high	none at present
MkNh-15	SC	east NW Aimaokatalok	recorded	none at present			none at present
MkNh-16	RFs	east NW Aimaokatalok	recorded	none at present			none at present
MkNh-17	SCs	N central Aimaokatalok	recorded	none at present		significant	none at present
MkNh-18	MRF/A+b	N central Aimaokatalok	recorded	none at present		high	none at present
MkNh-19	MRF/b	east NW Aimaokatalok	recorded	none at present			none at present
MkNh-20	MRF/A	west side Koignuk R	recorded	none at present			none at present
MkNh-21	RFs	west side Koignuk R	recorded	none at present			none at present
MkNh-22	MRF	west NE Aimaokatalok	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
MkNh-23	MRF/A	west NE Aimaokatalok	recorded	none at present			none at present
MkNh-24	SC	west NE Aimaokatalok	recorded	none at present			none at present
MkNh-25	MRF	N central Aimaokatalok	recorded	none at present			none at present
MkNh-26	MRF/A	north NE Aimaokatalok	recorded	none at present			reassess/possibly significant
MkNh-27	SCs/b	east NE Aimaokatalok	recorded	none at present			none at present
MkNh-28	SCs/A	east NE Aimaokatalok	recorded	none at present			none at present
MkNh-29	LS	east NE Aimaokatalok	recorded	none at present		high	monitor
MkNh-37	LS/T	east of N Aimaokatalok	recorded	possible indirect	road; 200m	significant	monitor
MkNh-38	SC	east of N Aimaokatalok	recorded	none at present			none at present
MkNh-39	A	east of N Aimaokatalok	recorded	none at present			none at present
MkNh-40	MRF/b	east of N Aimaokatalok	recorded	possible direct	Boston road & quarry T;0m	low-moderate	assess; mitigate as needed
MkNh-41	MRF	east NE Aimaokatalok	recorded	possible direct	road quarry T; 0m	low-moderate	assess; mitigate as needed
MkNh-42	MRF/A	east NE Aimaokatalok	recorded	none at present		high	monitor
MkNh-43	SC	east NE Aimaokatalok	recorded	possible direct	Boston road & quarry T; 0m	low	assess; mitigate as needed
MkNh-47	MRF	NW Aimaokatalok	recorded	none at present			none at present
MkNh-48	MRF	NW Aimaokatalok	recorded	none at present			none at present
MkNh-51	MRF/b	NW Aimaokatalok	recorded	none at present			monitor
MkNh-52	MRF/A	north Aimaokatalok	recorded	possible direct	road quarry U; 0m	moderate-high	assess; monitor; avoidable
MkNh-53	SC	north Aimaokatalok	recorded	probable direct	road quarry U; 0m	low-moderate	assess; mitigate as needed
MkNh-54	MRF	NW Aimaokatalok	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
MkNh-55	SC/RF	NW Aimaokatalok	recorded	none at present			none at present
MkNh-56	SCs/RF	east of N Aimaokatalok	recorded	possible direct	road quarry S; 0m	moderate	assess; monitor; avoidable
MkNh-57	SC/RF	north Aimaokatalok	recorded	none at present			none at present
MkNh-58	MRF	NW Aimaokatalok	recorded	none at present			none at present
AIMAOKATALOK - SOUTH							
MjNg-1	MRF/A	south of Boston	recorded	none at present			none at present
MjNg-2	SCs/b	south of Boston	recorded	none at present			none at present
MjNg-3	MRF	south of Boston	recorded	none at present			none at present
MjNg-4	MRF + tools	SE of Aimaokatalok	recorded	possible direct	road quarry V; 0m	high	assess; recommend avoidance
MjNh-1	SC	S of Boston camp	mitigated; 1995-803	possible indirect	Boston activities	low	no further work
MjNh-2	MRF/A+b	SW Aimaokatalok	recorded	none at present			reassess
MjNh-3	SC/A	E of Boston camp	mapped/evaluated	possible indirect	Boston TMA: 100m	low-moderate	monitor; mitigate as needed
MjNh-4	MRF	Sof Boston camp	mapped/evaluated	possible indirect	Boston activities		reassess
MjNh-5	SCs/A	S of Boston camp	mapped/evaluated	possible indirect	Boston activities	high	flagged to avoid, monitor
MjNh-6	MRF/A	S of Boston camp	mapped/evaluated	possible indirect	Boston activities	high	monitor
MjNh-7	A	S of Boston camp	mapped/evaluated; 1997-850	possible indirect	Boston activities	low	no further work
MjNh-8	RF	S of Boston camp	mitigated; 1997-850	possible direct	Boston quarry	low	no further work
MjNh-9	MRF/A	S of Boston camp	mapped/evaluated	direct	Boston mill quarry; 0m	moderate	mitigation as needed
MjNh-10	MRF	south of Aimaokatalok	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
MjNh-11	SCs	south of Aimaokatalok	recorded	none at present			none at present
MjNh-12	SCs	south of Aimaokatalok	recorded	none at present			none at present
MjNh-13	MRF	south of Aimaokatalok	recorded	none at present			none at present
MjNh-14	RFs	south of Aimaokatalok	recorded	none at present			none at present
MjNh-15	RF	west of Aimaokatalok	recorded	none at present			none at present
MjNh-16	SCs	S Koignuk R	recorded	none at present			none at present
MjNh-17	SC	S Koignuk R	recorded	none at present			none at present
MjNh-18	SC	S Koignuk R	recorded	none at present			none at present
MjNh-19	MRF/b	S Koignuk R	recorded	none at present			none at present
MjNh-20	RF	south of Aimaokatalok	recorded	none at present			none at present
MjNh-21	RF	south of Aimaokatalok	recorded	none at present			none at present
MjNh-22	RF	SW of Stickleback L	recorded	none at present			none at present
MkNg-1	MRF/b	NE Aimaokatalok	recorded	none at present			none at present
MkNg-2	T	east Aimaokatalok	recorded	none at present			none at present
MkNh-1	SCs/b	NE of Boston camp	mapped/evaluated	possible indirect	Boston airstrip	low-moderate	monitor; mitigate as needed
MkNh-3	MRF/b	north Aimaokatalok	recorded	none at present			none at present
MkNh-4	SCs/A	west Aimaokatalok	mapped/evaluated	none at present		high	none at present
MkNh-5	SC/A	west Aimaokatalok	mapped/evaluated	none at present		high	none at present
MkNh-10	MRF	west Aimaokatalok	recorded	none at present			none at present
MkNh-11	MRF/b	west Aimaokatalok	recorded	none at present			none at present
MkNh-12	MRF/b	west Aimaokatalok	recorded	none at present			none at present
MkNh-30	MRF/b	east side Aimaokatalok	recorded	none at present			none at present

Site #	Type*/ Content	Location	Status + Mitigation Permit Number	Impact Potential	Project Component & Distance	Scientific Significance	Recommendations/ Comments
MkNh-31	SCs	east side Aimaokatalok	recorded	none at present			none at present
MkNh-32	SC	east side Aimaokatalok	recorded	none at present			none at present
MkNh-33	MRF	east side Aimaokatalok	recorded	none at present			none at present
MkNh-34	MRF	east NE Aimaokatalok	recorded	none at present			none at present
MkNh-35	SCs	east NE Aimaokatalok	recorded	none at present			none at present
MkNh-36	MRF	NE Aimaokatalok	recorded	none at present			none at present
MkNh-44	MRF	NE Aimaokatalok	recorded	none at present			none at present
MkNh-45	MRF/A+b	west Aimaokatalok	recorded	none at present		significant	monitor
MkNh-46	RF	W Aimaokatalok	recorded	none at present			none at present
MkNh-49	SC	W Aimaokatalok	recorded	none at present			none at present
MkNh-50	SC	W Aimaokatalok	recorded	none at present			none at present

Scientific Significance: estimated where some impact is predicted; for those sites that have not yet been evaluated, this is a conservative estimate based on surface visibility only and may be revised once more detailed assessment has occurred. It is important to understand that the lack of a site significance entry means that insufficient information exists to make that assessment.

Recommendations: further archaeological study recommended; for sites not in close proximity to currently proposed development or exploration, no action is recommended at this time other than reassessment where yearly exploration programs or development plans have been identified; for those sites that are judged susceptible to some level of indirect impact, the general recommendations are to complete detailed assessment, if necessary, in order to develop appropriate site specific mitigation plans, to reassess potential for impacts once plans are finalized or revised, and/or to monitor (that is, visit periodically) to determine the effects of close activity, and to protect the site, if judged necessary. See Section 3 for further explanation of the mitigation recommendations.

5. PROCEDURES SUMMARIZED

Archaeologists deal only with the physical remains of past human activities. As noted previously, the following types of archaeological remains can be expected:

- Various types and sizes of stone circles or stone alignments;
- Box or circular or windbreak style hearths;
- Rock cairns or caches which can appear as a simple pile of rocks, or a circular/oval or stacked pile of rocks around an opening. Although highly unlikely, it is possible that human remains may be encountered; therefore, it is particularly important to identify cairns since these are often built over graves;
- Traps which are typically a pile of rocks with flat slabs on top and one side;
- Signal rocks, ranging from recognizable inuksuit to propping up or stacking of two or more rocks;
- Other piled rocks serving such functions as kayak supports or meat drying supports;
- Artifacts of stone (formed tools or scattered flakes), bone, or wood and metal.
- Although no human remains have been found in the Project area to date, archaeological studies and ongoing work will continue to be sensitive to that possibility.

Archaeological sites are considered environmentally sensitive areas and should be considered off limits to unauthorized personnel. To minimize the potential for indirect impacts to heritage resources, all field personnel involved in pre-development investigations and the ongoing exploration program within the Hope Bay Belt will be educated concerning the types of remains in the area, the significance of archaeological and heritage sites, and the importance of leaving artifacts in place. Camp regulations dealing with archaeological resources are included in site orientations that all employees and contractors must complete. All camp occupants and visitors are informed that archaeological sites and artifacts are protected by legislation, and that it is illegal to disturb a site or remove an artifact.

Future development and exploration plans will be reviewed by a qualified archaeologist to determine whether or not archaeological investigations have been or need to be conducted. The archaeologist who conducts the review should be qualified to hold a NU Archaeologist Permit. If field assessment is required, the archaeologist will obtain a NU Archaeologist Permit prior to initiating work. Such a review should be conducted well in advance of the field season, since the Government of Nunavut requires several months to process permit applications. Proximity of proposed development or exploration activities to any of the recorded archaeological sites will be reviewed, and potential for impacts and consequent needs for additional field work will be evaluated. Sites that are close to existing facilities will be monitored regularly to ensure continued avoidance.

TMAC will ensure that all areas of proposed intensive activities will be subjected to archaeological inventory as much in advance of the activity as possible so that unrecorded sites can be identified, thereby lessening the chances for inadvertent damage. Locations of known archaeological sites will be taken into consideration when planning additional development, exploration or any associated infrastructure requirements in order to avoid impact to known sites. Archaeological site locations are acknowledged to be highly confidential and will only be released to a small number of people planning exploration and development who need to know in order that recorded sites can be avoided.

It is emphasized that avoidance is TMAC's preferred mitigation measure. Systematic data recovery (surface collection/mapping/excavation) will continue to be used only if avoidance or protection is not feasible. TMAC will inform local communities about the status of archaeological sites and investigations through the Inuit Heritage Trust and the Kitikmeot Inuit Association.

In the unlikely event of an accidental impact to either a known or unrecorded archaeological, burial or heritage site, all work in the vicinity of the find will cease and the Operational Procedures outlined above and presented in Appendix A will be followed. The Territorial Archaeologist of the Government of Nunavut will be notified and a qualified archaeologist will assess the incident. If there is any uncertainty regarding potential for, or identification of, heritage resources, the project archaeologist should be consulted for direction.

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Appendix A
Construction Operational Procedures

CONSTRUCTION OPERATIONAL PROCEDURES

OVERVIEW – ARCHAEOLOGY

The Hope Bay area has had a long time period of occupation by humans, from as much as 4,000 years ago through to recent Inuit times. Archaeological sites are very common throughout the region, mostly consisting of stone structures that probably represent tent rings and shelters, caches, hunting blinds, traps, cairns and inukshuks. Stone tool making sites are also present. Archaeological sites are often difficult to recognize. They are valuable non-renewable sources of information about local people's history and provide crucial data for scientists studying Northern lifeways throughout the past. It is against the law to disturb known or suspected archaeological sites, punishable by fine or imprisonment. Many areas at the Project site have not been surveyed by a qualified archaeologist, and clearances must be obtained before traveling off existing roads or disturbing ground surfaces.

POTENTIAL IMPACTS TO ARCHAEOLOGICAL RESOURCES

The entire Hope Bay belt has been rated as having high overall archaeological potential. The Doris camp area has been closely surveyed and no archaeological sites have been identified near proposed areas of activity within the existing footprint, although it is still possible that sites may be uncovered while working in the area. Sites have been identified along the Doris-Windy road, near Boston camp, at borrow/quarry areas, and at Roberts Bay. Without mitigation, the following potential impacts (for both recorded and unrecorded sites) have been identified:

- All ground disturbing activities associated with road construction;
- Blasting of rock in quarries and excavation of sand and gravel within proposed borrows/quarries;
- Unauthorized use of portions of Hope Bay belt not already identified;
- General moving and travelling around project area by increased numbers of people.

Be aware that archaeological sites could still be uncovered during work, even if archaeological clearance has been obtained.

PROPOSED ENVIRONMENTAL PROTECTION MEASURES

- Do not deviate from already disturbed areas or established routes (existing roads and camp areas).
- Check to see if archaeological clearance has been obtained before operating equipment on previously undisturbed ground, and assume an area has not been cleared unless you know.
- Remain more than 30 m from all known or suspected archaeological sites and do not move any archaeological remains.
- Do not talk about any specific location since archaeological site locations must be kept confidential to prevent unauthorized collection or disturbance of artifacts.
- Do not build new inukshuks or rock piles or unnecessarily disturb rocks that may appear to be in some formation.

- Known archaeological sites will be avoided by re-routing roads and establishing quarry/borrow boundaries where the project archaeologist has provided notification of clearance.
- If sites cannot be avoided, the project archaeologist must obtain government approval to mitigate the site.
- Recognize temporary protection measures such as flagging, fluorescent stakes or snow fence and stay well away from them during construction.
- If a suspected archaeological site or human remains (structures, artifacts or bones) are unearthed during work operations, stop work immediately and notify the Operations Manager. The Operations Manager will contact the appropriate lands inspector and Government of Nunavut as required by law, and will consult the project archaeologist.

Appendix B

Northern Archaeology Information Handout

NORTHERN ARCHAEOLOGY

Archaeological sites representing the remains of the activities of past people are scattered all over the North. They are valuable non-renewable sources of information about local people's history and their ancestors, and provide crucial data for scientists studying Northern lifeways throughout the past.

Under Nunavut Laws and Regulations, it is prohibited to disturb archaeological remains or to collect artifacts. Such actions are punishable by fines and/or imprisonment.

WHAT TO WATCH OUT FOR

- In the North, archaeological sites are most likely to occur on elevated and/or relatively dry ground, typically on bedrock outcrops, on gravel or sand exposures or vegetation covered benches.
- Most sites in this region contain one or more stone features such as circles of various sizes, most often used to hold down tent covers or skins for drying; semi-circles that were used for shelters; lines or piles of rocks, some used as hunting blinds or markers; rocks encircling depressions often used as caches, small hearths/windbreaks, stone flake scatters where people made stone tools or even the tools themselves.

WHAT YOU NEED TO DO

1. Become familiar with what types of archaeological remains can be expected in this region.
2. Be observant – look for regularity in rock locations and outlines, anything un-natural looking.
3. Follow designated travel routes.
4. Avoid moving or disturbing rocks in any manner, if at all possible.
5. If you must move rocks or before sampling/ testing rocks, check very carefully and make a thorough consideration of possible features.
6. Ensure all new crew members are made aware of archaeological issues.
7. Record and report any finds.
8. Do NOT remove any artifacts or bones.
9. Avoid building modern rock features such as inukshuk or cairns.

IF YOU THINK YOU FOUND A SITE OR AN ARTIFACT

1. Take GPS coordinates (with datum used).
2. Mark location on a map.
3. Briefly describe find/site contents and local environment/terrain features.
4. Photograph and/or rough sketch map.
5. Record name of reporter, date and contact information.
6. Pass information on to the environmental representative, manager, and/or project archaeologist.

DO NOT DISTURB ANYTHING IF YOU SUSPECT AN ARCHAEOLOGICAL SITE – CONTEXT IS CRUCIAL INFORMATION

*Remember site locations are HIGHLY confidential – do not publicize!

Annex 26

Doris North Project Human Resources Plan

95 Wellington Street West
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M5J 2N7
416-628-0216

September 13, 2016

Kelli Gillard
NIRB Monitoring Officer - Doris North Project
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU
X0B 0C0

Dear Kelli:

RE: File 05MN047- Doris North Project Certificate Human Resources Plan

Enclosed you will find the Human Resources Plan (the "**Plan**") for TMAC Resources Inc. ("**TMAC**") as required under Project Certificate condition 32.

As discussed in TMAC's November 12, 2015 "Revisions to TMAC Resources Inc. Amendment Application No. 1 of Project Certificate 003 and Water Licence 2AM-DOH1323 – Updated Management Plans", this Plan incorporates the Human Resources Plan, Inuit Employment Plan, and Education and Orientation Plan listed in Condition 32, as well as the related Wellness Strategy.

Should you have any questions, please don't hesitate to contact me.

Kind regards,

Julia Micks
Executive Vice President, Human Resources

Enclosure

HOPE BAY PROJECT

HUMAN RESOURCES PLAN

September 2016
Version 2016-09-13