NEWMONT
NORTH AMERICA

Hope Bay Mining Ltd.

Monitoring and Follow-Up Plan

With Operational Plan Summaries, and Extra AANDC Requests Included

HB-EM-ENV-MP-002

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Executive Summary

The monitoring and follow-up programs for Doris North are summarized by project phase in Table E-1. This table highlights changes to the programs by phase, including care and maintenance.

Table E-1. Summary of Doris North Project Monitoring Program Components During All Project Phases

Monitoring Requirement	Project Phase			
Monitoring Parameter	**Construction**	**Operations**	**Closure**	**Care and Maintenance**
AIR QUALITY				
Wind speed @ 10 m	Continuous recording	Continuous recording	Continuous recording	Continuous recording
Wind direction @ 10 m				
Temperature @ 2 m				
Relative humidity @ 2 m				
Solar radiation @ 2.5 m				
Rainfall (tipping bucket rain gauge)	Continuous recording - summer	Continuous recording - summer	Continuous recording - summer	Continuous recording - summer
Passive monitoring for SO2, NO2 and O3, dustfall (at the meteorology station)	Monthly sample	Monthly sample	Monthly sample	Monthly sample – seasonal
Particulate matter (TSP, PM10, PM2.5)	Intermittently (sampling every 6th day)	Intermittently (sampling every 6th day)	Intermittently (sampling every 6th day)	Intermittently (sampling every 6th day) – seasonal
Evaporation	Continuous recording - summer	Continuous recording - summer	Continuous recording - summer	Continuous recording - summer
Dustfall - local crusher, construction	Monthly sample	-	-	-
Incinerator Emissions - Dioxin, Furan, Mercury	Annual, unless otherwise approved	Annual, unless otherwise approved	Annual, unless otherwise approved	Annual, unless otherwise approved
Air Quality Mitigation Implemented?	Yes	Yes	Yes	Yes
NOISE ABATEMENT				
Environmental Noise Monitoring: L_{Aeq}, L_{AFmax}, L_{AFmin}, L_{Ceq}	Once during phase	Once during phase	Once during phase	-
Occupational Noise Monitoring	-	Yes	-	-
Noise Mitigation Implemented?	Yes	Yes	Yes	Yes
WILDLIFE				

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Monitoring Requirement	Project Phase			
Monitoring Parameter	**Construction**	**Operations**	**Closure**	**Care and Maintenance**
Habitat	Track habitat loss/gain and wildlife use	Track habitat loss/gain and wildlife use	Track habitat loss/gain and wildlife use	Track habitat loss/gain and wildlife use
Caribou	Discontinued in 2011 as per MOU with GN DoE, track incidental sightings	Discontinued in 2011 as per MOU with GN DoE, track incidental sightings	Discontinued in 2011 as per MOU with GN DoE, track incidental sightings	Track incidental sightings
Grizzly Bear	DNA Baseline Years 1 and 2 complete. Year 3 to be completed if construction resumes.	Track incidental sightings	Track incidental sightings	
Wolverine	DNA Baseline program complete.			
Muskox, Fox, Wolf, Ground Squirrel, and Marine Mammals	Track incidental sightings			
Upland Breeding Birds	Annual PRISM plots	Annual PRISM plots	Annual PRISM plots	
Waterfowl	Annual Aerial surveys	Annual Aerial surveys	Annual Aerial surveys	
Raptors				
Wildlife Mitigation Implemented?	Yes	Yes	Yes	Yes
AQUATIC EFFECTS (ENVIRONMENTAL EFFECTS MONITORING – METAL MINING EFFLUENT REGULATIONS)				
Water Quality (biological monitoring stations)	Winter, Spring, Summer, Fall	Once every 3 years as per EEM schedule, with biological monitoring program	Once every 3 years as per EEM schedule, with biological monitoring program	Spring, Summer, Fall
Water Quality (TIA and Effluent)	-	Quarterly, as per EEM Schedule	Quarterly, as per EEM Schedule	-
Phytoplankton/Periphyton	Winter, Spring, Summer, Fall	Not required in EEM	Not required in EEM	-
Sediment Quality	Fall	Once every 3 years, as per EEM Schedule	Once every 3 years, as per EEM Schedule	-
Benthic Invertebrates	Fall			-
Fish Population/Condition	-			-
Fish Tissue	-			-
LAND TREATMENT AREA				
Water Quality	Once prior to discharge, daily when discharging to the tundra	Once prior to discharge, daily when discharging to the tundra	Once prior to discharge, daily when discharging to the tundra	Once prior to discharge, weekly when discharging to the tundra

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Construction	Operations	Closure	Care and Maintenance
Soil Quality	Once prior to deposit if contaminant is unknown. Twice per season during active remediation Prior to removal of materials.	Once prior to deposit if contaminant is unknown. Twice per season during active remediation Prior to removal of materials.	Once prior to deposit if contaminant is unknown. Twice per season during active remediation Prior to removal of materials.	Once prior to deposit if contaminant is unknown. Twice per season during active remediation Prior to removal of materials.
Materials placement/removal	Volume and source for deposits, volume and discharge location for removals	Volume and source for deposits, volume and discharge location for removals	Volume and source for deposits, volume and discharge location for removals	Volume and source for deposits, volume and discharge location for removals
Active soil and water management required?	Yes	Yes	Yes	Yes
WASTE ROCK AND ORE				
Waste rock classification and segregation confirmatory testing	Yes, as per waste rock plan	Yes, as per waste rock plan	-	-
Waste rock pile segregation visual inspection	Annual	Annual	-	-
Seepage	Annual	Annual	Annual	Annual
Pollution Pond Water Quality (ST-2)	Monthly during open water season	Monthly during open water season	Monthly during open water season	Monthly during open water season
Underflow Sumps (STS-2A and STS-2B)	Monthly during open water season	Monthly during open water season	Monthly during open water season	Monthly during open water season
INTERIM WATER MANAGEMENT				
Sedimentation Pond ST-1 Water Quality	Once before any discharge, daily when discharging onto the tundra (HBML Change: Weekly when discharging to the TIA, no pre-discharge sampling required)	Once before any discharge, daily when discharging onto the tundra (HBML Change: Weekly when discharging to the TIA, no pre-discharge sampling required)	Once before any discharge, daily when discharging onto the tundra (HBML Change: Weekly when discharging to the TIA, no pre-discharge sampling required)	Once before any discharge, weekly when discharging onto the tundra (HBML Change: Weekly when discharging to the TIA, no pre-discharge sampling required)
Sedimentation Pond ST-1 Discharge Volume	Daily during discharge	Daily during discharge	Daily during discharge	Daily during discharge

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Construction	Operations	Closure	Care and Maintenance
Tail Lake Discharge Water Quality (TL-1 and TL-4)	Per licence schedule – Prior to discharge, then weekly and monthly parameters	Per licence schedule – Prior to discharge, then weekly and monthly parameters	Per licence schedule – Prior to discharge, then weekly and monthly parameters	Once prior to discharge, then weekly and monthly parameters per licence schedule
Tail Lake Discharge Volume (TL-4)	Daily during discharge	Daily during discharge	Daily during discharge	Daily during discharge
Doris Creek upstream and downstream (TL-2 and TL-3)	Per licence schedule – Prior to discharge (TL-2 only), then weekly (TL-2 and TL-3)	Per licence schedule – Prior to discharge (TL-2 only), then weekly(TL-2 and TL-3)	Per licence schedule – Prior to discharge (TL-2 only), then weekly(TL-2 and TL-3)	Once prior to discharge (TL-2 only), then weekly (TL-2 and TL-3)
Doris Creek upstream and downstream volume (TL-2 and TL-3)	Continuous during discharge (See Chapter 14)	Continuous during discharge (See Chapter 14)	Continuous during discharge (See Chapter 14)	Continuous during discharge (See Chapter 14)
TIA Station TL-10	Monthly during discharge starting 2 weeks prior to discharge (HBML note: under ice samples are not possible immediately prior to discharge season, therefore, a sample will be collected while ice conditions are still safe)	Monthly during discharge starting 2 weeks prior to discharge (HBML note: under ice samples are not possible immediately prior to discharge season, therefore, a sample will be collected while ice conditions are still safe)	Monthly during discharge starting 2 weeks prior to discharge (HBML note: under ice samples are not possible immediately prior to discharge season, therefore, a sample will be collected while ice conditions are still safe)	Monthly during discharge starting 2 weeks prior to discharge (HBML note: under ice samples are not possible immediately prior to discharge season, therefore, a sample will be collected while ice conditions are still safe)
Ice thickness on the TIA	monthly	monthly	monthly	Once upon camp re-opening
WASTE WATER TREATMENT				
Treated Effluent Quality (ST-8 and ST-9)	Prior to first discharge, monthly thereafter.	Prior to first discharge, monthly thereafter	Prior to first discharge, monthly thereafter	Prior to first discharge, monthly thereafter
Effluent discharge volume and volume sludge removed (incl. location of sludge disposal)	Daily	Daily	Daily	Daily
INCINERATOR MANAGEMENT				
Batch loading documentation	Yes	Yes	Yes	Yes
Stack testing	Yes, See air quality section above	Yes, See air quality section above	Yes, See air quality section above	Yes, See air quality section above
Ash characterization	Yes	Yes	Yes	Yes

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Construction	Operations	Closure	Care and Maintenance
NON-HAZARDOUS WASTE MANAGEMENT				
Waste tracking documentation collected?	Yes	Yes	Yes	Yes
Incinerator and Burn Pan ash characterization	Yes	Yes	Yes	Yes
HAZARDOUS WASTE MANAGEMENT				
Waste tracking documentation collected?	Yes	Yes	Yes	Yes
Waste oil characterization	Yes	Yes	Yes	Yes
SITE WATER MONITORING				
Water Intake (ST-7)	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use
Bulk Fuel Containments (ST-5, ST-6a and ST-6b) – volume and water quality	Quality prior to discharge, volume and quality daily during discharge	Quality prior to discharge, volume and quality daily during discharge	Quality prior to discharge, volume and quality daily during discharge	Quality Prior to discharge, volume weekly during discharge, quality weekly during discharge
Cyanide and Reagent Containment (Ammonium Nitrate Berm) (ST-11)	Quality prior to discharge, volume and quality daily during discharge	Quality prior to discharge, volume and quality daily during discharge	Quality prior to discharge, volume and quality daily during discharge	Quality once before any discharge, weekly when discharging onto the tundra, volume daily during discharge. Berm to be breached if compliant in first spring sampling
HYDROLOGY				
Tail Lake Water Level	Continuous	Continuous	Continuous	Continuous
Doris Lake Water Level	Continuous	Continuous	Continuous	Continuous
Doris Creek, upstream location (TL-2) – Water Level and Flow (Discharge)	Continuous monitoring of water levels during TIA discharge Periodic flow measurements during TIA discharge	Continuous monitoring of water levels during TIA discharge Periodic flow measurements during TIA discharge	Continuous monitoring of water levels during TIA discharge Periodic flow measurements during TIA discharge	Continuous monitoring of water levels during TIA discharge Periodic flow measurements during TIA discharge

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Construction	Operations	Closure	Care and Maintenance
Doris Creek, downstream location (TL-3) – Water Level and Flow (Discharge)	Periodic flow measurements during TIA discharge	Periodic flow measurements during TIA discharge	Periodic flow measurements during TIA discharge	Periodic flow measurements during TIA discharge
Tailings Effluent Discharge Point (TL-4) – Discharge Volume	Continuous flow and cumulative volume measurements during TIA discharge	Continuous flow and cumulative volume measurements during TIA discharge	Continuous flow and cumulative volume measurements during TIA discharge	Continuous flow and cumulative volume measurements during TIA discharge
Roberts Lake Outflow – Water Level and Flow (Discharge)	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years
Windy Lake and Outflow – Water Level and Flow (Discharge)	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years
Tide Gauge –Roberts Bay – Water Level	Continuous monitoring of water levels during bathymetric surveys	Continuous monitoring of water levels during bathymetric surveys	Continuous monitoring of water levels during bathymetric surveys	Continuous monitoring of water levels during bathymetric surveys
Lake Evaporation (see Air Quality)	Continuous – summer	Continuous – summer	Continuous – summer	Continuous – summer
QUARRY AND QUARRY SEEPAGE MONITORING				
Quarry face inspections	Weekly during active quarrying	Weekly during active quarrying	Weekly during active quarrying	Weekly during active quarrying
Quarry rock characterization	2 samples per quarry for sulphur, ABA if sulphur >0.01%	2 samples per quarry for sulphur, ABA if sulphur >0.01%	Not required	Not required
Quarry wall stability	As required for operational safety	As required for operational safety	Annual	Annual

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Monitoring Requirement	Project Phase			
Monitoring Parameter	**Construction**	**Operations**	**Closure**	**Care and Maintenance**
Quarry Sump Water Quality and volume	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.
Field identification of seeps &/or runoff from construction areas (2 years).	Annual for 2 years post construction	Annual for 2 years post construction if construction occurs	Annual for 2 years post construction if construction occurs	Final monitoring in 2013, unless additional construction occurs, then annual for 2 years on the new construction
CONSTRUCTION MONITORING				
Seepage survey - Turbidity	During freshet for 2 years post construction, after heavy rainfalls if appropriate based on freshet results	During freshet for 2 years post construction, after heavy rainfalls if appropriate based on freshet results	During freshet for 2 years post construction, after heavy rainfalls if appropriate based on freshet results	During freshet for 2 years post construction, after heavy rainfalls if appropriate based on freshet results
See Quarry Monitoring for additional programs				
FISHERIES AUTHOURIZATION MONITORING				
Jetty bathymetry – sediment transport monitoring	As per the schedule in the fisheries authorization and discussions with DFO	As per the schedule in the fisheries authorization and discussions with DFO	As per the schedule in the fisheries authorization and discussions with DFO	As per the schedule in the fisheries authorization and discussions with DFO
Roberts Bay Compensation Shoals	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization
Windy Lake Compensation Shoals	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization
E09 Habitat Enhancement	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization
Roberts Outflow Boulder Garden Enhancement	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization	As per the schedule in the fisheries authorization
SPILL CONTINGENCY PLAN				

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Construction	Operations	Closure	Care and Maintenance
Spill kit inspections	Minimum twice per year	Minimum twice per year	Minimum twice per year	Minimum twice per year
Chemical inventory	Minimum once per year	Minimum once per year	Minimum once per year	Minimum once per year
24-hour spill reporting	As required under the spill reporting regulations	As required under the spill reporting regulations	As required under the spill reporting regulations	As required under the spill reporting regulations
Internal spill tracking and monthly reporting	All spills	All spills	All spills	All spills
Use of spill containments during barge to/from jetty fuel transfers	Yes, when transfers are occurring	Yes, when transfers are occurring	Yes, when transfers are occurring	Yes, when transfers are occurring
Use of spill containments, and maintenance of the containments	Yes	Yes	Yes	Yes
QUALITY ASSURANCE AND QUALITY CONTROL				
QA/QC samples at 10% of all samples	Yes	Yes	Yes	Yes
WINTER INSPECTIONS				
Infrastructure Inspections – when camp closed	-	-	-	Monthly – Dec to Apr
Fuel Inspections – when camp closed	-	-	-	Monthly – Dec to Apr
SEASONAL CLOSURE PREPARATION				
Preparation of all infrastructure and equipment	-	-	-	Annual prior to seasonal closure

The monitoring and follow-up programs for Boston are summarized by project phase in Table E-2. This table highlights changes to the programs by phase, including care and maintenance.

Table E-2. Summary of Boston Project Monitoring Program Components During All Project Phases

Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline	Active Exploration	Closure	Care and Maintenance
AIR QUALITY				
Wind speed @ 10 m	Continuous recording	Not required	Not required	Not required

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline	Active Exploration	Closure	Care and Maintenance
Wind direction @ 10 m	Continuous recording	Not required	Not required	Not required
Temperature @ 2 m	Continuous recording	Not required	Not required	Not required
Relative humidity @ 2 m	Continuous recording	Not required	Not required	Not required
Solar radiation @ 2.5 m	Continuous recording	Not required	Not required	Not required
Snow Depth	Continuous recording - winter	Not required	Not required	Not required
Passive monitoring for SO2, NO2 and O3, dustfall (at the meteorology station)	Monthly sample	Not required	Not required	Not required
Air Quality Mitigation Implemented?	Yes	Yes	Yes	Yes
WILDLIFE				
Monitoring Required?	For expansion projects only	Not required	Not required	Not required
Wildlife Mitigation Implemented	Yes	Yes	Yes	Yes
LAND TREATMENT AREA				
Water Quality	Once prior to discharge, monthly when discharging to the tundra	Once prior to discharge, monthly when discharging to the tundra	Once prior to discharge, monthly when discharging to the tundra	Once prior to discharge, monthly when discharging to the tundra
Soil Quality – existing landfarm	Soil to be packaged for offsite disposal	Soil to be packaged for offsite disposal	Soil to be packaged for offsite disposal	Soil to be packaged for offsite disposal
WASTE ROCK AND ORE				
Seepage (BOS-8 and BOS-7 by ESR)	Monthly when seepage present	Monthly when seepage present	Monthly when seepage present	Monthly when seepage present
Ore Oxidation – rinse pH and conductivity	Every 10 years, beginning in 2008	Every 10 years, beginning in 2008	Every 10 years, beginning in 2008	Every 10 years, beginning in 2008
Seepage	Annual	Annual	Annual	Annual
Ephemeral Streams	Annual	Annual	Annual	Annual
WASTE WATER TREATMENT				
Treated Effluent Quality (ST-8 and ST-9)	Prior to first discharge, monthly thereafter.	Prior to first discharge, monthly thereafter	Prior to first discharge, monthly thereafter	Prior to first discharge, monthly thereafter

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline	Active Exploration	Closure	Care and Maintenance
Effluent discharge volume and volume sludge removed (incl. location of sludge disposal)	Daily	Daily	Daily	Daily
INCINERATOR MANAGEMENT				
Batch loading documentation	Yes	Yes	Yes	Yes
Incinerator stack testing	Not required	Not required	Not required	Not required
Ash characterization	Yes	Yes	Yes	Yes
NON-HAZARDOUS WASTE MANAGEMENT				
Waste tracking documentation collected?	Yes	Yes	Yes	Yes
Incinerator and Burn Pan ash characterization	Yes	Yes	Yes	Yes
HAZARDOUS WASTE MANAGEMENT				
Waste tracking documentation collected?	Yes	Yes	Yes	Yes
SITE WATER MANAGEMENT				
Water Intake (BOS-1) – volume and quality	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use
Containment Pond (BOS-2) and Portal – volume and quality	Quality prior to discharge and monthly during discharge, volume daily during discharge	Quality prior to discharge and monthly during discharge, volume daily during discharge	Quality prior to discharge and monthly during discharge, volume daily during discharge	Quality prior to discharge and monthly during discharge, volume daily during discharge
Bulk Fuel Containment (BOS-5) – volume and quality	Quality prior to discharge and monthly during discharge, volume daily during discharge	Quality prior to discharge and monthly during discharge, volume daily during discharge	Quality prior to discharge and monthly during discharge, volume daily during discharge	Quality prior to discharge and monthly during discharge, volume daily during discharge
Drilling – water usage	Daily during drilling	Daily during drilling	Not required when drilling program is not occurring	Not required when drilling program is not occurring
Under-ice pre and post drilling samples – water quality	Once prior to drilling program on each lake, once after each program	Once prior to drilling program on each lake, once after each program	Not required when drilling program is not occurring	Not required when drilling program is not occurring
SPILL CONTINGENCY PLAN				

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline	Active Exploration	Closure	Care and Maintenance
Spill kit inspections	Minimum twice per year	Minimum twice per year	Minimum twice per year	Minimum twice per year
Chemical inventory	Minimum once per year	Minimum once per year	Minimum once per year	Minimum once per year
24-hour spill reporting	As required under the spill reporting regulations	As required under the spill reporting regulations	As required under the spill reporting regulations	As required under the spill reporting regulations
Internal spill tracking and monthly reporting	All spills	All spills	All spills	All spills
Use of spill containments, and maintenance of the containments	Yes	Yes	Yes	Yes
QUALITY ASSURANCE AND QUALITY CONTROL				
QA/QC samples at 10% of all samples	Yes	Yes	Yes	Yes
WINTER INSPECTIONS				
Infrastructure Inspections – when camp closed	-	-	-	Monthly – Dec to Apr
Fuel Inspections – when camp closed	-	-	-	Monthly – Dec to Apr
SEASONAL CLOSURE PREPARATION				
Preparation of all infrastructure and equipment	-	-	-	Annual prior to seasonal closure

The monitoring and follow-up programs for the Regional Exploration Area (Windy/Patch) are summarized by project phase in Table E-3. This table highlights changes to the programs by phase, including care and maintenance.

Table E-3. Summary of Windy/Patch Project Monitoring Program Components During All Project Phases

Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline/ Construction	Active Exploration/ Operation	Closure	Care and Maintenance
WILDLIFE				
Monitoring Required?	For expansion projects only	Not required	Not required	Not required
Wildlife Mitigation Implemented	Yes	Yes	Yes	Yes
WASTE WATER TREATMENT				
Treated Effluent Quality (HOP-2 and HOP-3)	Monthly during discharge	Monthly during discharge	Monthly during discharge	Monthly during discharge

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline/ Construction	Active Exploration/ Operation	Closure	Care and Maintenance
Effluent discharge volume and volume sludge removed (incl. location of sludge disposal)	Daily	Daily	Daily	Daily
WASTE WATER TREATMENT				
Conditions apply, but there isn't a camp or WWTP operating under this licence at this time				
INCINERATOR MANAGEMENT				
Currently no incinerator operating under this licence				
NON-HAZARDOUS WASTE MANAGEMENT				
Waste tracking documentation collected?	Yes	Yes	Yes	Yes
Incinerator and Burn Pan ash characterization	Yes	Yes	Yes	Yes
HAZARDOUS WASTE MANAGEMENT				
Waste tracking documentation collected?	Yes	Yes	Yes	Yes
SITE WATER MANAGEMENT				
Water Intake (HOP-1) – volume and quality	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use	Volume daily, quality monthly when in use
Drilling – water usage	Daily during drilling	Daily during drilling	Not required when drilling program is not occurring	Not required when drilling program is not occurring
Under-ice pre and post drilling samples – water quality	Once prior to drilling program on each lake, once after each program	Once prior to drilling program on each lake, once after each program	Not required when drilling program is not occurring	Not required when drilling program is not occurring
QUARRY AND QUARRY ROCK SEEPAGE MONITORING				
Quarry face inspections	Weekly during active quarrying	Weekly during active quarrying	Weekly during active quarrying	Weekly during active quarrying
Quarry rock characterization	2 samples per quarry for sulphur, ABA if sulphur >0.01%	2 samples per quarry for sulphur, ABA if sulphur >0.01%	Not required	Not required
Quarry wall stability	As required for operational safety	As required for operational safety	Annual	Annual

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Monitoring Requirement	Project Phase			
Monitoring Parameter	Baseline/ Construction	Active Exploration/ Operation	Closure	Care and Maintenance
Quarry Sump Water Quality and volume	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.	Prior to discharge of water from quarry, field parameters measured when beginning discharge. Volume daily during discharge.
Field identification of seeps &/or runoff from Doris-Windy road during spring freshet (2 years).	Annual for 2 years post construction	Not required	Not required	Final monitoring in 2013
SPILL CONTINGENCY PLAN				
Spill kit inspections	Minimum twice per year	Minimum twice per year	Minimum twice per year	Minimum twice per year
Chemical inventory	Minimum once per year	Minimum once per year	Minimum once per year	Minimum once per year
24-hour spill reporting	As required under the spill reporting regulations	As required under the spill reporting regulations	As required under the spill reporting regulations	As required under the spill reporting regulations
Internal spill tracking and monthly reporting	All spills	All spills	All spills	All spills
Use of spill containments, and maintenance of the containments	Yes	Yes	Yes	Yes
QUALITY ASSURANCE AND QUALITY CONTROL				
QA/QC samples at 10% of all samples	Yes	Yes	Yes	Yes
PATCH CUTTING SUMP MONITORING				
Soil and water samples	-	-	Annual - summer	Annual - summer

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Glossary and Abbreviations

AANDC	Aboriginal Affairs and Northern Development
ABA	Acid Base Accounting
AEMP	Aquatic Effects Monitoring Program
ANSI	American National Standards Institute
AP	Acid Production
ARD	Acid Rock Drainage
ASTM	American Society for Testing and Materials
BOD_5	Biological Oxygen Demand
C&M	Care and Maintenance
CCME	Canadian Council for Ministers of the Environment
CEPA	Canadian Environmental Protection Act
CWS	Canadian Wildlife Service
dBA	Decibels in 'A' frequency, human hearing range
DNA	deoxyribonucleic acid; carries the genetic information in the cell
DFO	Department of Fisheries and Oceans
EEM	Environmental Effects Monitoring
EMS	Environmental Management System
ESR	Environment and Social Responsibility
GN	Government of Nunavut
GN DoE	Government of Nunavut, Department of Environment
HBML	Hope Bay Mining Limited
HSLP	Health Safety Loss Prevention
IATA	International Air Transport Association
ICP-MS	Inductively coupled plasma mass spectrometry
IMDG	International Marine Dangerous Goods
ISO	International Standards Organization
KIA	Kitikmeot Inuit Association
Leq	equivalent continuous sound pressure level
MBR	Membrane Biological Reactor
MDSRC	Mackenzie Delta Spill Response Corporation
MHBL	Miramar Hope Bay Limited
ML	Metal Leaching
MMER	Metal Mining Effluent Regulations

This Document is a summary document of stand-alone management plans and as such, this document is UNCONTROLLED in any format. In case of discrepancy between this document and the individual management plans, the individual management plans will be taken as the correct information.

MOU	Memorandum of Understanding
NIRB	Nunavut Impact Review Board
NNLP	No Net Loss Plan
NO_2	Nitrogen dioxide
NP	Neutralization Potential
NWB	Nunavut Water Board
O_3	Ozone
OPEP	Oil Pollution Emergency Plan
OPPP	Oil Pollution Prevention Plan
ORP	Oxidation Reduction Potential
PAG	Potentially Acid Generating
$PM_{2.5}$	Particulate Matter 2.5 microns or more
PM_{10}	Particulate Matter 10 microns or more
PRISM	Program for Regional and International Shorebird Monitoring
QA/QC	Quality Assurance/Quality Control
RBC	Rotating Biological Contactor
SO_2	Sulfur dioxide
TIA	Tailing Impoundment Area
TIC	Total Inorganic Carbon
TSP	Total Suspended Particulates
TWA	Threshold Weighted A
UV	Ultraviolet
VEC	Valued Ecosystem Component
WWTP	Waste Water Treatment Plant

1. Introduction

1.1 Project Areas

The Hope Bay Project Consists of 3 individual projects: the Doris North Project, the Boston Exploration Project, and the Regional Exploration Project. The Doris North Project is located approximately 125 km southwest from Cambridge Bay, Nunavut, on the south shore of Melville Sound. The nearest communities are Omingmaktok (75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property). The Boston Exploration Project is located 70 km south from Doris North, and the Regional Exploration project (generally referred to as "Windy") covers an area approximately 80 km by 25 km, which also surrounds both the Doris North and Boston Projects. The old Windy Camp is approximately 8 km southeast from Doris North, Patch Lake is approximately 4 km southeast, and Quarries A, B, and D are located along the all-weather road that connects Doris North to Windy Camp (Figure 1.1-1).

The Doris North Project will consist of an underground gold mine, associated mill site, roads, buildings, camp and other necessary infrastructure. All necessary permits, licences, and authorizations for development have been received for the Project. The Project is partially constructed, but was placed into Care and Maintenance (C&M) on January 31, 2012.

The Boston Exploration Project currently consists of an underground mine portal and workings, camp, ore storage, fuel storage, and associated buildings to support ongoing surface exploration programs. The portal and mine workings are currently inactive and have been temporarily sealed off. The Boston Camp was typically operated as a seasonal camp; however, it was closed in November 2011 and will remain in C&M along with the Doris North Project.

The Windy exploration project includes the decommissioned Patch Lake workshop and laydown facility, the closed Windy Camp, and three construction quarries. Windy Camp was abandoned in 2008; reclamation activities began in 2012. The Patch Lake facility was abandoned in 2009 and all infrastructure has been removed. Reclamation of both areas will be ongoing in 2013 and beyond.

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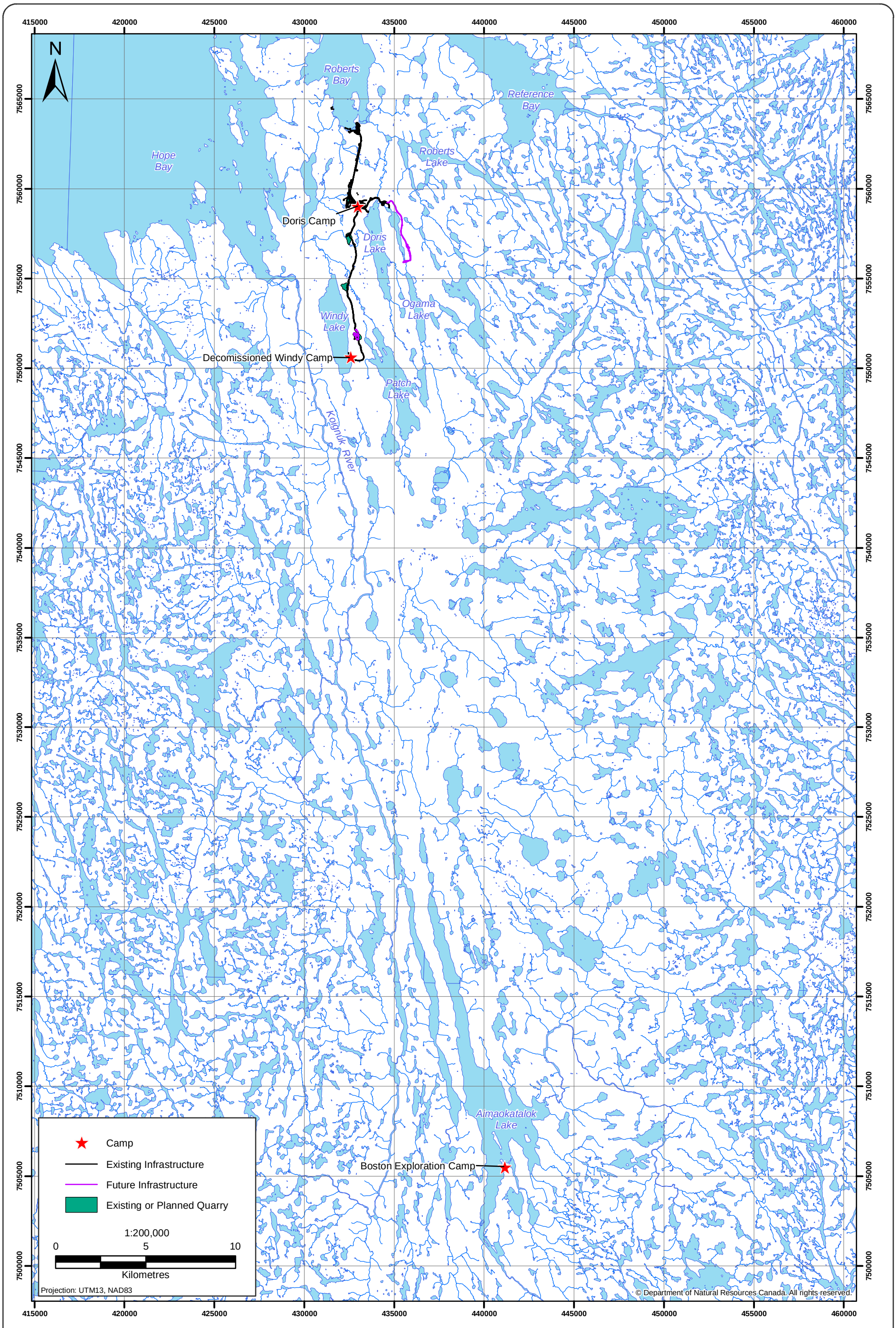

Figure 1.1-1

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Existing and Future Infrastructure, Hope Bay Project

Figure 1.1-1

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1.2 Monitoring and Follow-Up Plan Requirement

Several environmental monitoring programs have been developed for the Doris North Project as part of corporate commitments, regulatory approval conditions (e.g., Project Certificate from the Nunavut Impact Review Board (NIRB) and Type A Water Licence (2AM-DOH0713) from the Nunavut Water Board (NWB)) and as a result of stakeholder consultation. The Monitoring and Follow-up Plan is a component of the Environment, Health and Safety Management System for the Doris North Mine. This report summarizes the environmental monitoring programs that are currently in place for the Doris North Project in fulfillment of Section 4.0, Item 32 of the Doris North Project Certificate, (NIRB No 003), which states:

> Section 4.0. Item 32: Prior to the commencement of operation Hope Bay Mining Limited (HBML) 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; Education and Orientation 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 NIRB's Monitoring Officer.
>
> Commentary: HBML is expected to contact federal and territorial Government Departments immediately regarding the preparation of these plans. The [Government of Nunavut] GN, in particular, is involved with the approval of many of the plans and is encouraged to designate an official to approve the plans as applicable. Please see Appendix E for a list of GN contacts. NIRB considers the Environmental, Health and Safety Management System to be complete once HBML has submitted all required plans. NIRB expects the Environmental Health and Safety Management System to be completed prior to the commencement of construction.

The Doris North Type A Water Licence (2AM-DOH0713) also specifies that:

> Part K Item 5: The Licensee shall submit to the Board for review by March 01, 2008, a revised version of the July 2007 Monitoring and Follow-Up Plan

The Water Licence also refers to the Quarry Rock Construction Monitoring and Management section of the 2007 Monitoring and Follow-up Plan in Part D Items 9 and 21. In particular, these Items discuss the seepage surveys and geochemical analysis of quarry rock.

A monitoring and follow-up plan is not required as part of the Boston and Windy Type B Water Licences. However, the monitoring programs for these projects are included in this document for internal use, and as a quick reference at the request of the Aboriginal Affairs and Northern Development Canada (AANDC) Water Resources Inspector.

1.3 Purpose and Scope

The purpose of the Monitoring and Follow-Up Plan is to provide a consolidated summary of the monitoring and follow-up programs currently in place for the Hope Bay Project. This plan is a requirement for the Doris North Project, and contains a summary of the programs required by the Doris North Project Certificate (NIRB No. 003) and the Doris North Project

Type A Water Licence (2AM-DOH0713). Some monitoring programs are also designed to conform to additional regulatory requirements (e.g. fisheries authorizations), and this is noted where applicable.

Although a monitoring and follow-up plan is not a requirement of the Type B water licences for Boston and Windy Type B Water Licences, the monitoring requirements for the Boston Project, as outlined in the Type B Water Licence (2BB-BOS1217), and the Regional Exploration Project, as outlined in the Type B Water Licence (2BE-HOP1222), are included in this plan to provide a single complete document for internal use, and also for reference by the AANDC Inspector.

The monitoring and follow-up programs are intended to collect high quality data to:

- Enable HBML to monitor and report on performance compliance with all environmental legislation, regulations, Licenses, Permits, Leases and/or Authorizations applicable to ongoing operation of the Doris North Project;
- Enable HBML to obtain good quality data on environmental conditions at and around the mine to facilitate appropriate management of HBML's activities and facilities at the Doris North Project;
- Allow HBML to check the validity of the assumptions that were made during the design phase of the project and provide the data needed to adaptively manage its activities if such assumptions are shown to be incorrect; and
- Allow HBML to check the validity of the environmental impact assessment predictions made during the environmental assessment process and modify its activities if measured impacts are worse than predicted.

These procedures summarized in this document are an integral component of the overall Environmental Management System (EMS) for the Doris North Project. The individual management plans and this Monitoring and Follow-Up Plan will be reviewed regularly and updated as required. This Plan is a "living document" and will be reviewed and updated periodically during the mine life to ensure that site experience with monitoring and follow up activities are captured and shared amongst operating staff (adaptive management). The plan has been revised to include a summary of the monitoring programs as they have been designed for the construction and operations phases, as well as a care and maintenance monitoring section for each program. This approach will allow HBML to retain the most recently approved version of the complete operating plans in the event that the project is moved out of C&M.

This Monitoring and Follow-Up Plan provides a summary of existing programs, and will be provided to regulatory agencies, the land owner (Kitikmeot Inuit Association (KIA)), and HBML operating staff. It is important to note that HBML has designed the EMS to meet the document control standards of International Standards Organization (ISO) 14001. This document, as a summary document, does not conform to ISO 14001 standards because it is a duplication of the information provided in the individual controlled management plans; therefore, this document has been marked as an **uncontrolled** document in both electronic and hardcopy format. The document is provided as a reference only, and the individual management plans will be taken as the correct procedure if there are discrepancies between this document and the original sources.

The following monitoring plans and requirements are summarized in this document:

NIRB Project Certificate No. 003 Monitoring Plans:

- Air Quality Monitoring Plan Rev 2.0 (HBML 2012a);

- Noise Abatement Plan Rev 3.0 (HBML 2012b);
- Wildlife Mitigation and Monitoring Plan Rev 1.0 (Rescan 2011a);

NWB Type A Water Licence (2AM-DOH0713) Monitoring and Operational Plans:

- Aquatic Effects Monitoring Plan Rev 1.0 (Rescan 2010a);
- Doris North Landfarm Management Plan Rev 1.0 (SRK 2010a);
- Waste Rock and Ore Management Plan Rev 2.0 (SRK 2010b);
- Interim Water Management Plan Rev 4.0 (SRK 2012a)
- Waste Water Treatment Management Plan Rev 3.0 (HBML 2012c);
- Incinerator Management Plan Rev 1.1 (HBML 2012d);
- Interim Non-hazardous Waste Management Plan Rev 1.1 (EBA 2010, HBML 2012e);
- Hazardous Waste Management Plan Rev 1.1 (HBML 2012f);

NWB Type A Water Licence (2AM-DOH0713) monitoring requirements that are not part of a required plan:

- General Site Water Quality Monitoring – sampling procedure included in the QA/QC Plan Rev 7.1 (HBML 2012g);
- Hydrology Monitoring (Rescan 2011b);
- Tailings and Site Geotechnical Monitoring (SRK 2006, SRK 2007, SRK 2011);
- Quarry Rock Seepage Monitoring (SRK 2012b);
- Construction Monitoring;

Fisheries Authorization Monitoring Requirements:

- Fish Monitoring (Golder 2007, Rescan 2010b, 2010c and 2012);

NWB Type B Water Licence (2BB-BOS1217) Monitoring and Operational Plans:

- Boston Land Treatment Area Management and Monitoring Plan Rev 1.0 (SRK 2012c);
- Water and Ore/Waste Rock Management Plan Rev 1.0 (SRK 2009); and
- Sewage Treatment Plan Operation and Maintenance Plan Rev 1.0 (FSC 2010).

NWB Type B Water Licence (2BB-BOS1217) monitoring requirements that are not part of a required plan:

- General Site Water Quality Monitoring – sampling procedure included in the QA/QC Plan Rev 7.1 (HBML 2012g);

NWB Type B Water Licence (2BE-HOP1222) Monitoring Plans:

- Quarry A, B and D Management and Monitoring Plan, Rev 1.0 (SRK 2010c).

NWB Type B Water Licence (2BE-HOP1222) monitoring requirement that are not part of a required plan:

- General Site Water Quality Monitoring – sampling procedure included in the QA/QC Plan Rev 7.1 (HBML 2012g);

NWB Type A and B Water Licences (2AM-DOH0713, 2BB-BOS1217, and 2BE-HOP1222) Operational Plans:

- Hope Bay Spill Contingency Plan Rev 5.0 (HBML 2012h);
- Quality Assurance and Quality Control Plan Rev 7.1 (HBML 2012g).

Hope Bay Care and Maintenance Specific Procedures:

- Winter Inspections During Seasonal Closures Rev 0.0 (HBML 2012i);
- Seasonal Closure Preparation Requirements Rev 0.0 (HBML 2012j).

Additional Monitoring or Tracking Requests by Regulatory Agencies:

- Patch Cuttings Sump Monitoring Rev 0.0 (HBML 2012k);

Closure Plans have been developed for Boston, Patch Lake and Windy Camp, as well as Doris North. These plans are currently under review by the NWB and will be finalized in the coming months, and are therefore, not included in this monitoring and follow-up plan.

2. Air Quality Monitoring Plan

2.1 Background and Rationale

HBML is committed to complying with the air quality monitoring requirements outlined in the Doris North Project Certificate (NIRB No. 003):

> Section 4.0. Item 30. HBML will install and fund an atmospheric monitoring station. This station and its location shall be developed in consultation with Environment Canada and Health Canada air quality officials and focus on particulates of concern generated at the mine site. The results of air-quality monitoring are to be reported every six months to NIRB through the Monitoring Officer, and from there to all of the parties.

> Commentary: NIRB expects that Canada Wide Standards for Dioxins and Furans and the Canada Wide Standards for Mercury will apply and should be followed including stack testing of incinerators.

In addition, Appendix A of the Project Certificate includes a number of mitigation commitments intended to minimize emissions from combustion and dust generation. HBML has implemented, and will continue to implement these mitigation commitments.

The Doris North Project Type A Water Licence (2AM-DOH0713) outlines to following air quality monitoring requirements:

> Part G. Item 6. The Licensee shall ensure that any on-site incinerator meets the requirements of the Canada-Wide Standards for Dioxins and Furans and Canada-Wide Standards for Mercury emissions.
>
> Part G. Item 7. The Licensee shall submit to the Board for review by May 1, 2008 an Incineration Management Plan in conjunction with Part G, Item 9 [the Landfill Management Plan].
>
> Schedule B. Item 12. [The Annual Report shall include] Annual Incineration stack testing results.
>
> Part D. Item 8. The Licensee shall submit an annual Construction Monitoring Report no later than March 31 in the year following the calendar year being reported. The report shall be developed in accordance with Schedule D Item 1.
>
> Schedule D. Item 1. The Construction Monitoring Report referred to in Part D, Item 8 shall include the following:
>
> > Monitoring of dust generation and use of water by the contractor to manage dust emissions from crushing and construction activity.

There are no air quality monitoring commitments in the Boston (2BB-BOS1217) or Regional Exploration (2BE-HOP1222) water licences.

2.2 Monitoring Program Summary

This section provides a summary of the ambient air quality, meteorology and stack emissions testing programs undertaken at Hope Bay. For detailed information, refer to the complete Air Quality Management Plan (HBML 2012a).

2.2.1 Construction, Operations and Closure Phases

Doris North Project

The ambient air quality monitoring program consists of total suspended particulates (TSP), particulate matter less than 2.5 µm ($PM_{2.5}$), particulate matter 10 µm (PM_{10}), dustfall, sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3) monitoring and the results are reported every 6 months (Table 2.2-1 and Figure 2.2-1). This monitoring program will continue during the remainder of construction, operations and closure. Samples will be analyzed at an accredited laboratory and will be compared with the Nunavut Environmental Guideline for Air Quality Sulphur Dioxide and

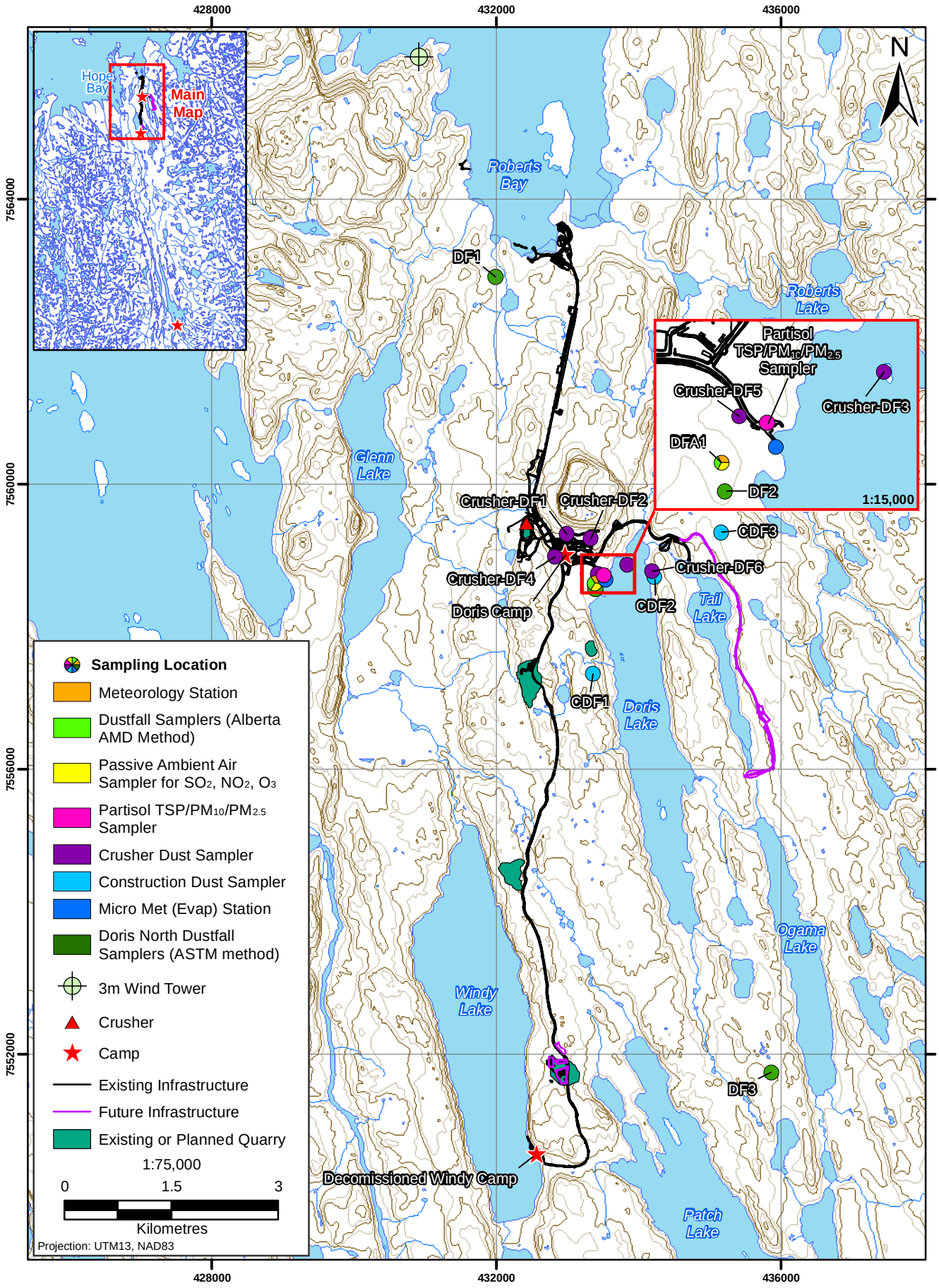
Suspended Particulates, and the National Ambient Air Quality Objectives (NAAQOs) established under the Canadian Environmental Protection Act (CEPA).

Passive air sampling for SO_2, NO_2 and O_3 consists of filter cartridges that are exposed to the ambient air for approximately 30 days prior to analysis. The dustfall monitoring station located at the Doris meteorology station is a standard size open-top plastic jar that is exposed for 30 days using the Alberta Environment method (Alberta AMD 1989). The particulate matter samples are collected with a Partisol plus ambient air sampler, which is and automated system that requires a climate controlled shelter and a stable 120 V AC power supply; the power is currently supplied by the camp powerhouse. This system is designed to automatically collect a 24-h sample every 6 days by actively drawing air through a filter cartridge based on the National Air Pollution Surveillance Network.

The meteorology station collects continuous measurements of air temperature, wind speed and direction, solar radiation, relative humidity, and rainfall (Table 2.2-1). This is an automated station that is connected to a data logger, and uses a car battery with a solar panel for power. The data logger can be read at any frequency. Typically, the data logger is downloaded 4 to 6 times per year.

Five construction dustfall monitoring stations (3 in the Doris Project area, 1 west of Patch Lake and 1 north of Aimaokatalok Lake) are active during summer months (May to September) (Figure 2.2-1) and use the American Society for Testing and Materials (ASTM) standard methodology was used for the siting, collection, and measurement of dustfall. The dustfall samplers are exposed for 30 days. Crusher dustfall monitoring was implemented in 2011 and 2012. Three stations were selected within the expected zone of deposition at progressively further distances from Quarry 2 and the main construction areas. These stations will remain active when the crusher is in use in Quarry 2. If the crusher is relocated to a different location, new dustfall station locations as appropriate.

The incinerator stack emissions were tested for mercury, dioxins and furans in 2009, 2011, and 2012. Stack testing is performed by a stack emissions testing specialist, and the samples are analyzed at an accredited laboratory. Based on conversations with Environment Canada, the frequency of testing the incinerator stack emissions may be decreased if the emissions meet the Canada Wide Standards (Dave Fox, pers.comm.). In 2012, the incinerator stack emissions were substantially lower than the Canada Wide Standards for Mercury (20 µg/Reference cubic meter), Dioxins and Furans (80 pg I-TEQ/m^3). HBML has requested that Environment Canada approve a reduced sampling frequency; however, until otherwise approved by Environment Canada and the NWB, the incinerator stack emissions testing program will continue to be completed annually (Table 2.2-1).



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Meteorology, Air Quality and Dustfall Monitoring Stations, North End of Belt, Doris North Project

Figure 2.2-1

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Table 2.2-1. Summary of Air Quality and Meteorology Monitoring Program During All Phases of Activity, Doris North

Parameter	Sampling Frequency		
	Construction	Operation, Closure	Care and Maintenance
Wind speed @ 10 m	Continuous	Continuous	Continuous
Wind direction @ 10 m			
Temperature @ 2 m			
Relative humidity @ 2 m			
Solar radiation @ 2.5 m			
Rainfall (tipping bucket rain gauge)	Continuous - summer	Continuous - summer	Continuous - summer
Passive monitoring for SO2, NO2 and O3, dustfall (at the meteorology station)	Monthly	Monthly	Monthly – seasonal[1]
Particulate matter (TSP, PM10, PM2.5)	Intermittently (sampling every 6th day)	Intermittently (sampling every 6th day)	Intermittently (sampling every 6th day) – seasonal[1]
Evaporation (Doris Lake)	Continuous - summer	Continuous - summer	Continuous - summer
Dustfall - local crusher, construction	Monthly	-	-
Incinerator Emissions - Dioxin, Furan, Mercury	Annual, unless otherwise approved	Annual, unless otherwise approved	Annual, unless otherwise approved

[1]*Seasonal is defined at the period where the camp is open (late-April/early-May until October)*

Boston Exploration Project

The Boston Exploration Project is not covered under the Doris North Project Certificate (NIRB No. 003). Air Quality Monitoring is not a requirement under the 2BB-BOS1217 Water Licence. The information in section 2.2.2 has been included for reference only.

The Boston air quality station is located by the meteorology station above the portal (Figure 2.2-2). This station is used to collect baseline data for use in environmental assessments of future expansion projects. The ambient air quality monitoring program includes dustfall, SO_2, NO_2 and O_3 (Table 2.2-2). The passive sampling system is the same as at Doris - filter cartridges and dustfall collection jars are exposed to the ambient air for approximately 30 days prior to analysis.

The meteorology station is located above the portal. It collects temperature, wind speed and direction, relative humidity, solar radiation and snow depth on an hourly basis (Table 2.2-2). This is an automated station that records data on a data logger and is powered by a car battery connected to a solar panel. The data logger can be downloaded at any frequency, but is typically downloaded 3 or 4 times per year.

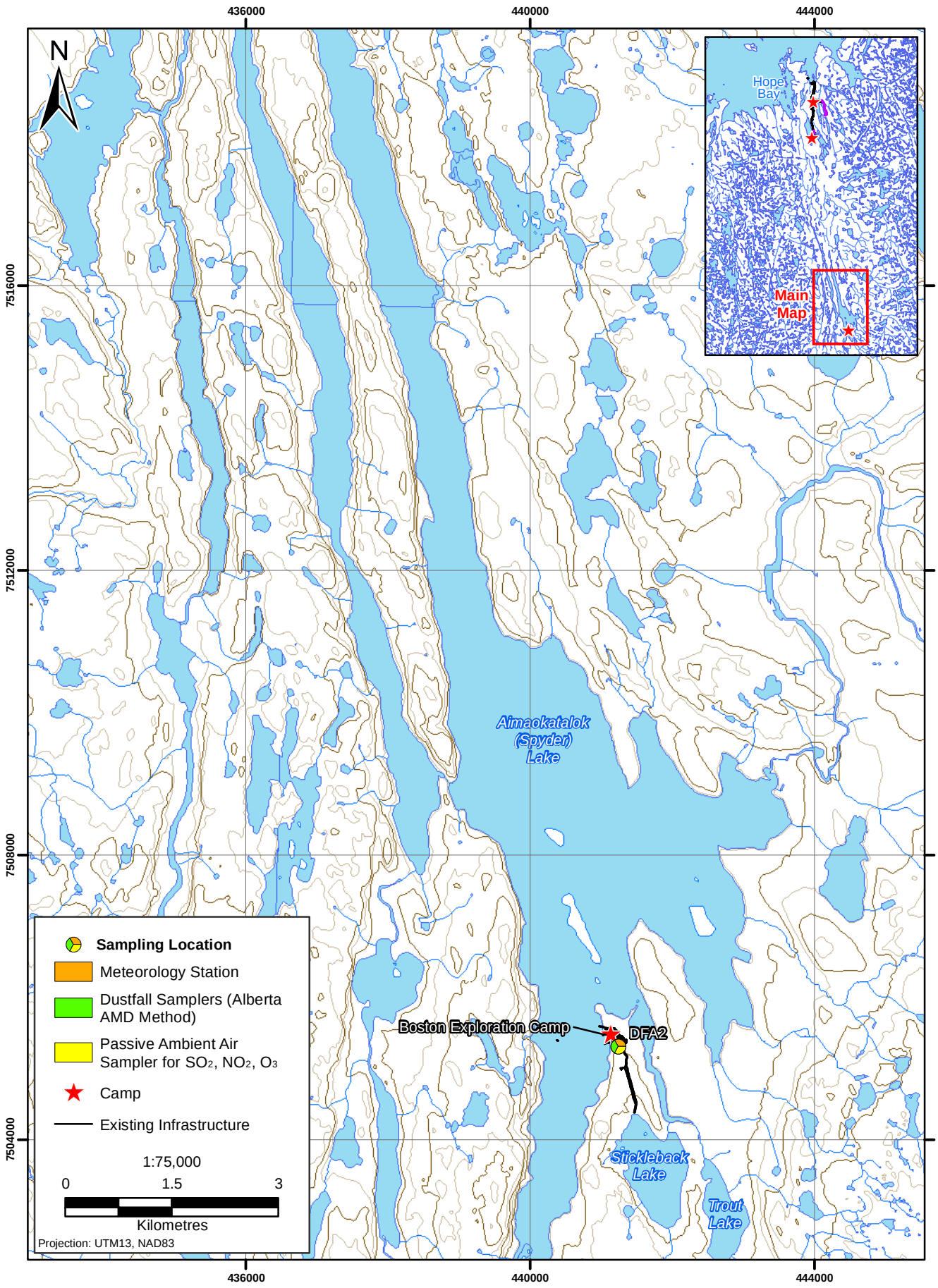

Figure 2.2-2

Meteorology, Air Quality and Dustfall Monitoring Stations, Boston Project

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists

Table 2.2-2. Summary of Air Quality and Meteorology Monitoring Program During All Phases of Activity, Boston

Parameter	Sampling Frequency	
	Baseline	Care and Maintenance
Wind speed @ 10 m	Continuous	Not required
Wind direction @ 10 m		
Temperature @ 2 m		
Relative humidity @ 2 m		
Solar radiation @ 2.5 m		
Snow depth	Continuous - winter	Not required
Passive monitoring for SO_2, NO_2 and O_3, dustfall	Monthly[1]	Not required -

[1]*Boston Camp is not consistently operated year round, therefore, sampling only occurs monthly when the camp is open*

2.2.2 Care and Maintenance Phase

Doris North Project

During C&M, the air quality monitoring program will be conducted seasonally when the camp is open. This will still allow HBML to meet the intended purpose of the air quality monitoring program – to monitor project related impacts to air quality. Table 2.2-1 shows the changes in monitoring frequency, if any, which will occur during C&M. The following changes to the program will occur:

1. Dustfall, SO_2, NO_2, O_3, TSP, $PM_{2.5}$, and PM_{10} will continue to be collected as per the schedule shown in Table 2.2-1;

2. Meteorology station will operate year round, but the data logger associated with the station will only be downloaded when the camp is open;

3. Lake evaporation will continue to be monitored during open-water season;

4. Construction dustfall sampling will not occur;

5. Data report preparation will change to an annual report schedule for a September – September period (i.e., September 2012 – September 2013). Reports will be submitted to NIRB by the end of each year (i.e., December 2013); and

6. Incinerator stack testing will continue to be completed annually, unless otherwise approved by Environment Canada and the NWB.

Boston Exploration Project

The air quality and meteorology station at Boston will not be operated during C&M. Data collection will not resume unless the expansion permitting process is restarted and further baseline data is required. The comparison of data collected during baseline programs and C&M is shown in Table 2.2-2.

2.3 Mitigation Summary

2.3.1 Construction, Operations and Closure Phases

HBML is committed to complying with the licences and authorizations issued for the Doris North Project and have worked with the regulators to develop appropriate on-site air quality mitigation measures and monitoring plans. In an ongoing effort to mitigate air contaminant and dust emissions during the Construction and Operation phases of the Doris North Project, HBML is currently implementing the following measures:

- On-site staff at all levels should have the necessary training and instruction in their duties relating to control of the process and emissions to air (e.g. the required measures to be implemented during start-up, shut down and abnormal conditions). The site operator should maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents should be made available to the regulator on request;
- Vehicles should be driven at designated speeds on site roads;
- Application of water or dust suppression fluids (EK35, as approved by AANDC) to high traffic roadways to minimise dust from vehicles, when ambient air temperatures permit;
- Minimization of vehicle and equipment idling, when not in use, taking account of differing operation requirements in summer and winter;
- Use of water sprays or dust suppression fluids compatible to suppress dust generation from equipment in the crushing facility, when ambient air temperatures permit;
- Regular removal of dust deposits on external parts of the plant in order to minimise the potential for wind entrainment;
- Minimize the discharge heights from the crushers onto conveyers, and conveyors onto stockpiles. In addition, the discharge from crushers onto conveyors or into other equipment should be enclosed as far as is practicable (e.g. free fall of materials from conveyors carrying material should be fitted with a full hood such as a plastic chute);
- Conditioning materials which are likely to generate dust with water or dust suppression fluids prior to transfer;
- Storage areas should be kept in a condition that does not give rise to visible dust emissions;

- Erection of windbreaks or fences around known problem areas or stockpiles to limit the dispersion of dust emissions from equipment and stockpiles, or activities likely to generate dust;
- The height of the stockpiles should be limited to lower than any windbreak or fences enclosing the stockpile;
- Installation of a waste oil burner unit equipped with a settling tank and filter system for particulate removal from the waste oil;
- Installation of an incinerator that complies with Nunavut standards (GN 2002a), Canada-Wide Standards for Dioxins and Furans (CCME 2000a) and Canada-Wide Standards for Mercury emissions (CCME 2000b). Operation of the incineration will include the following measures:
    - A waste segregation program will be implemented (i.e., materials that are unsuitable for incineration, e.g., chlorinated plastics, will be diverted to alternate waste disposal facilities); and
    - Personnel will be properly trained in incinerator operations;
- Regular servicing of all mobile and stationary engines to maintain efficiency; and
- Proper equipment maintenance.

2.3.2 Care and Maintenance Phase

HBML will continue to implement all applicable air quality mitigation measures as described in Section 2.3.1.

2.4 Adaptive Management

HBML is committed to examining options for reducing emissions and improving emissions quality at the Hope Bay Project. In the event that substantial negative impacts to air quality are detected (SO_2, NO_2, O_3, suspended particulates, or dustfall), HBML will examine the emissions sources on-site to identify opportunities to improve emissions quality. Dust suppression will be used whenever possible.

3. Noise Abatement Plan

3.1 Background and Rationale

The noise monitoring program, as part of the Noise Abatement Plan (HBML 2012b), is intended to comply with the requirements of the Doris North Project Certificate (NIRB No. 003) as follows:

Section 4.0 Item 29. HBML shall develop and implement a noise abatement plan to protect people and wildlife from mine activity noise, including blasting, drilling, equipment, vehicles and aircraft. The noise abatement plan will be developed in consultation with GN-DoE, Environment Canada, and Health Canada, and include:

- restrictions on blasting and drilling when migrating caribou, birds or local carnivores may be affected;
- the establishment of strict standards for noise levels;
- use of equipment and vehicles with the best noise attenuation devices;
- when practical, the use of fences or berms around noisy machinery or sites;
- flight corridor restrictions over sensitive areas with known concentrations of wildlife and birds whenever possible; and
- and requiring with the exception of take-off and approach for landing, a minimum flight altitude 300 metres above ground level when flights to and from the mine site are passing near sensitive wildlife and bird areas.

The noise abatement plan will also incorporate the use of sound meters to monitor sound levels at sites in and around the mine site and local study area. The location and design of the sound meters shall be selected in consultation with Environment Canada and set up immediately upon issuance of the Project Certificate for the purpose of obtaining baseline data, and during and after operations. The final noise abatement plan shall be filed with NIRB's Monitoring Officer within 6 months of the issuance of the Project Certificate.

Commentary: The Local Study Area refers to the combined spatial boundaries set by HBML in its [Doris North] Final Environmental Impact Statement for each sensitive Valued Ecosystem Components (VECs) including Arctic char, lake trout, lake whitefish, ninespine stickleback, caribou, grizzly bear, wolverine, upland breeding birds, waterfowl, and raptors. Also the noise abatement plan will consider potential blasting time restrictions with the Department of Fisheries and Oceans Canada (DFO) Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) as modified by DFO for use in the North. HBML should also consult with Health Canada, the GN-DoE, and the Workers Compensation Board in locating and designing the sound meters.

In addition, Appendix A of the Project Certificate includes a number of mitigation commitments intended to minimize noise. HBML has implemented, and will continue to implement these mitigation commitments.

There are no noise monitoring requirements in any of the 3 water licences held for Doris North (2AM-DOH0713), Boston (2BB-BOS1217) or Regional Exploration (2BE-HOP1222).

3.2 Monitoring Program Summary

This section provides a summary of the noise abatement program at Hope Bay. For detailed information, refer to the complete Noise Abatement Plan (HBML 2012b).

The Noise Abatement Plan is designed to monitor and protect both wildlife and people, and, as such, it is divided into "Environmental Noise Monitoring" and "Health and Safety Noise Monitoring" sections. A brief outline of these programs is presented here. This plan is only applicable to the Doris North Project at this time.

3.2.1 Construction, Operations and Closure Phases

Environmental Noise Monitoring

Environmental noise monitoring programs will be conducted at least once in each project stage: pre-construction (baseline), construction, operation and reclamation. HBML has completed the pre-construction and construction phase monitoring requirements.

The timing of noise measurement collection will coincide with critical wildlife periods and over a scale which is biologically relevant to compare to wildlife surveys in the area. Timing is guided by studies in the Doris North area, while distances for monitoring are guided by research at functioning mines in the Northwest Territories and Nunavut. Measurements will be conducted to encompass two critical periods for wildlife:

- The northward migration of the Dolphin and Union Caribou herd from the mainland to Victoria Island; and
- The summer period where resident wildlife are breeding and rearing young.

These two periods also encompass a wide amount of environmental variation, the first being conducted during spring conditions, with cool air and snow cover on the ground while the second occurs at the peak temperatures for the season and with growing vegetation.

Noise monitoring locations are selected based on relevant distances from the areas of Project activity and important wildlife areas. Figure 3.2-1 presents the noise monitor placement locations selected in 2010, which will be reused wherever possible during the operations phase monitoring year.

The specific distances where noise levels were monitored relative to project activities are as follows:

- To address potential effects on birds: <1 km, 1 km and >2 km; and
- To address potential effects on caribou: 5 km, 12 km, and 15 km.

These distances were selected based on findings from various research programs conducted in the Arctic. Wind direction and high use wildlife areas are also considered in the placement of noise monitors

Noise levels are recorded during two 24-hour logging periods at each of the 6 locations, at a 1-minute logging rate.

Weather data from one of the two on-site weather stations are used to validate data collected. In addition, a variety of field notes relating to the placement and environment of each noise monitor are recorded.

A monitoring report will be prepared following completion of the noise monitoring program. This data will also be incorporated into the Wildlife Mitigation and Monitoring Plan annual report.

Health and Safety Noise Monitoring

HBML's Health, Safety and Loss Prevention (HSLP) Department had begun implementing the occupational noise monitoring program during construction in 2011, and full implementation will begin prior to beginning operations. The noise monitoring component of the Occupational Health and Safety Program will comply with the Consolidation of Mine Health and Safety Regulations under the territorial Mine Health and Safety Act (sections 9.19 through 9.26 and Schedule 5).

The following list summarizes the monitoring plan:

- Area noise assessments shall be conducted and updated at a minimum of once per year and as new equipment and process are put in place. Noise assessments will be used to evaluate effectiveness of engineering controls, changes in noise due to aging equipment and to substantiate work group classifications.
- Employee noise exposure monitoring will be conducted on a regular basis.
- Employee noise exposure monitoring will be representative of the employee work shift.
- Personal noise monitoring equipment will conform to ANSI S1.25-1991 or ISO 1999 standards.
- Sites are responsible for implementing feasible engineering and administrative noise controls for any job classification with a noise exposure equal to or exceeding an 8-hour time weighted average range A (TWA) of 85 decibels A range (dBA).
- All employees exposed to the TWA 8 hour action level of 82 dBA (50% Dose) must be enrolled in a hearing conservation program
- Areas where it is likely that the 8 hr Leq exceeds 85 dBA must be identified and mapped, signposted or otherwise clearly communicated to employees working in the area
- The use of engineering and administrative controls will be continually evaluated and implemented. Control measures implemented will be posted and reviewed with affected crews at the time of implementation.

In addition, HBML employees and contractors are required to wear appropriate hearing protection for the activity and location in which they are working. HBML requires new employees to have a complete audiometric exam as part of the pre-employment medical, and annual re-testing is encouraged. Training employees to understand the potential impacts of working in high noise areas will also be a component of the occupational noise monitoring program during operations.

3.2.2 Care and Maintenance Phase

Environmental Noise Monitoring

Environmental noise monitoring will not be conducted during C&M due to the minimal activity planned during this period.

Health and Safety Noise Monitoring

Noise exposure during C&M will be limited, and employees will continue to be required to wear appropriate hearing protection when working in or near noisy equipment. HBML will continue to require pre-employment medical tests, including audiometric exams, for new employees.

3.3 Mitigation Summary

3.3.1 Construction, Operations and Closure Phases

Measures to mitigate potential effects of noise produced by helicopters and blasting on wildlife include

- Operating helicopters above 300 m, as per the caribou protection measure guidelines. Landing and takeoff would only be conducted when herds of caribou are not present in the immediate area. When major concentrations of waterfowl are observed during migration, staging and moulting periods, pilots will be advised to maintain an altitude of 650 m and avoid excessive hovering in the area until the concentration has moved on
- Pilot education on the potential effects of helicopters on caribou and the importance of maintaining proper distances from animals. Pilots will be provided with education maps that will highlight areas where raptors have historically nested in the Project area and pilots will avoid these areas whenever possible.
- Cessation of above ground blasting when caribou, muskox, grizzly bears or wolverines are observed within 500 m of the blast area.
- Whenever possible, blasting will be scheduled outside the peak periods of caribou presence in the project area.

Operational controls to minimize noise for both environmental protection and occupational health and safety include:

- mobile or motorized equipment fitted with mufflers or silencers where possible;
- enclosures, berms, acoustic screening and shrouding where stationary sources requiring control are identified;
- limiting the time of day for certain activity (strategic scheduling of noise events); and
- ensuring equipment is well maintained;
- design of mill and processing plants with noise minimization in mind;

3.3.2 Care and Maintenance Phase

HBML will continue to implement the applicable noise mitigation measures listed in Section 3.3.1 during C&M.

3.4 Adaptive Management

HBML will implement noise mitigation measures as described in section 3.3. If environmental noise monitoring or occupational noise monitoring results indicate that additional noise mitigation is required, HBML will implement additional mitigation measures to protect wildlife and employees.

4. Wildlife Mitigation and Monitoring Plan

4.1 Background and Rationale

HBML is committed to complying with the wildlife and vegetation requirements outlined in the Doris North Project Certificate (NIRB No. 003). Specific text relating to the Wildlife Monitoring and Mitigation Plan of the Project Certificate is as follows:

> Section 4.0. Item 22. HBML, in consultation with GN-DoE and KIA, shall immediately begin the design and implementation of baseline data collection methods to establish both the wolverine and grizzly bear population of the Hope Bay Belt region. Any baseline data results shall be reported to NIRB's Monitoring Officer.
>
> Section 4.0. Item 23. HBML shall designate one of its employees as a primary wildlife contact for the mine, who will work with NIRB's Monitoring Officer and regulatory officials in communicating on-site activities and to fulfill reporting requirements.
>
> Section 4.0. Item 24. As part of the training for HBML's on-site wildlife specialist, HBML shall provide training to that person in areas of bear encounters and safety, effects of noise on wildlife, recording wildlife sightings, waste management, records management, and reporting to NIRB's Monitoring Officer and regulatory officials.
>
> Section 4.0. Item 25. HBML shall file a monitoring plan focused on assessing and mitigating interaction between humans and wildlife at the mine site, including associated infrastructure such as the TIA, roads, and activity at the waterfall. A quarterly report must be sent to NIRB's Monitoring Officer on interactions that have occurred, any effect the interaction may have had on humans and wildlife, and mitigation measures taken to avoid similar interactions in the future.
>
> Section 4.0. Item 26. HBML shall consult with local Elders, Kitikmeot Hunters and Trappers Organizations, the Nunavut Wildlife Management Board, GN-DoE, and NIRB's Monitoring Officer to review and discuss the results of wildlife monitoring and develop mitigation measures, including measures to discourage wildlife and birds from coming into contact with Tail Lake and contaminated areas of the mill site. HBML shall incorporate a plan for this consultation into a revised Wildlife Monitoring and Mitigation Plan.
>
> Commentary: Consultation under this section should include Environment Canada
>
> Section 4.0. Item 27. HBML shall update and revise the Wildlife Mitigation and Monitoring Plan to reflect these terms and conditions and shall submit the revised Wildlife Mitigation and Monitoring Plan to NIRB. NIRB may consult with relevant Government departments and the Nunavut Wildlife Management Board prior to approving

the revised Wildlife Mitigation and Monitoring Plan. The Wildlife Mitigation and Monitoring Plan must be submitted within three (3) months of the issuance of a Project Certificate and it must be approved by NIRB prior to the commencement of construction. HBML must also submit an updated plan on an annual basis which must also be approved by NIRB.

Commentary: NIRB expects the annual plan to include the quarterly plans and the fourth quarter report then becomes part of the annual report.

The Type A Water Licence (2AM-DOH0713) also includes commitments for wildlife and vegetation:

Part L. Item 9. The Licensee shall implement progressive reclamation, including revegetation as soon as practically possible.

Schedule D. Item 1. The Construction Monitoring Report referred to in Part D, Item 8 shall include the following:

d. Monitoring for wildlife interactions;

e. Monitoring to ensure the protection of all migrating birds and their nesting sites;

h. Monitoring of contractor's activity to minimize ground impacts to the tundra (i.e. keeping vehicles off the tundra and on constructed roadways);

j. Vegetation monitoring;

The report shall discuss the monitoring results, analysis and any mitigation measures employed as a result of the monitoring, for each of the items listed above.

4.2 Monitoring Program Summary

This section provides a summary of the wildlife monitoring program for the Doris North Project, and baseline study area. For detailed information regarding this Plan, refer to the Hope Bay Wildlife Mitigation and Monitoring Plan Revision 1.0 (Rescan 2011a).

Based on the findings of the environmental assessment (MHBL 2005), and the comments and recommendations of stakeholders, the following VECs were selected for mitigation and monitoring:

- Wildlife habitat;
- Caribou (Dolphin-Union and Ahiak herds);
- Grizzly bears;
- Wolverines;
- Upland breeding birds (migratory songbirds, shorebirds, ptarmigan and short-eared owls);

- Waterfowl; and
- Raptors (e.g., falcons, eagles, hawks, ravens, and owls).

Interactions with other wildlife species (e.g., muskox, wolves, foxes, hares, ground squirrels, and marine mammals) are monitored to develop preventive mitigation of potential direct mine-related incidents that could, if not managed, lead to injury or mortality.

4.2.1 Construction, Operations and Closure Phases

The wildlife compliance monitoring program area for all wildlife species in the Doris North Project is shown in Figure 4.2-1. HBML will submit quarterly wildlife observations and mitigation activities as per the Project Certificate requirement. The annual report will be compiled to summarize the results of all of the wildlife monitoring components.

Habitat

HBML tracks the footprint expansion and habitat loss as a result of the Doris North Project construction and will track habitat gain due to progressive reclamation once those activities begin. Tracking wildlife sightings on and near the project footprint can be used to qualitatively assess wildlife use of these disturbed areas.

Caribou

HBML has been developing a Memorandum of Understanding (MOU) with the GN Department of Environment (GN DoE) to participate in the regional caribou monitoring program proposed by the GN DoE in place of a local caribou monitoring program specific to Hope Bay. This agreement is currently awaiting signature by the GN. As per discussions with the GN DoE, HBML discontinued aerial caribou surveys in 2011.

Caribou sightings reported by employees and contractors will continue to be tracked by the Environment and Social Responsibility Department (ESR).

Grizzly Bears

The grizzly bear DNA program was a 3 year baseline program being completed as agreed to with the GN DoE. Two years of the program were completed in 2010 and 2011. The third year of the program will be completed if construction of the Hope Bay Project resumes, unless the GN DoE approves cancellation of the final year of baseline data collection.

The DNA program consists of placement of 64 tripods constructed of wood and barbed wire across the Hope Bay Project area. The tripods are scented using liquid lures and are left for approximately 2 weeks between sample collection trips. The sampling program takes place between May and September. The barbed wire traps hair samples from the bears when the animals investigate the scents used on the tripods. The hair samples are collected and sent for DNA analysis at an accredited laboratory.

Grizzly bear sightings reported by employees and contractors will continue to be tracked by ESR.

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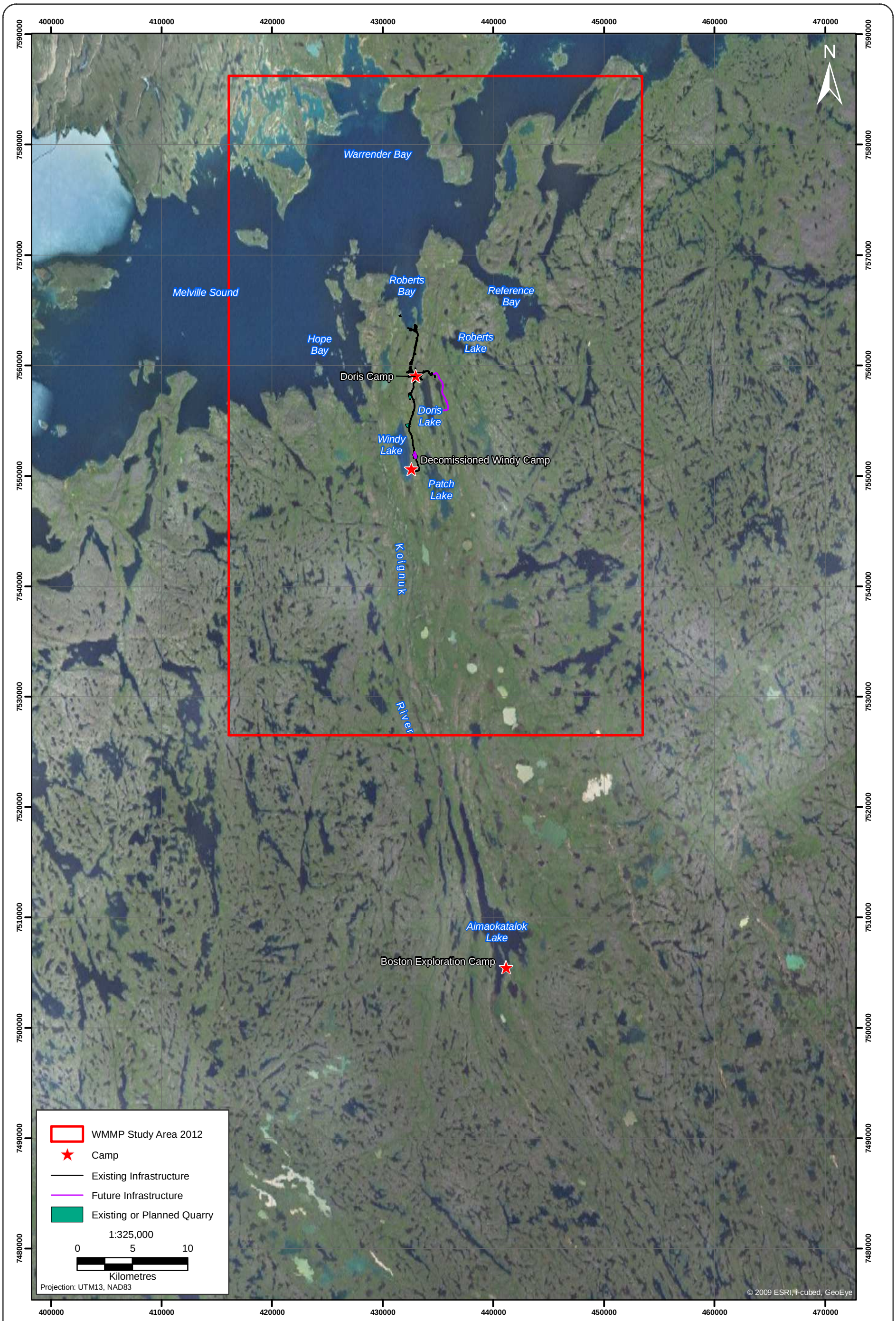

Figure 4.2-1

NEWMONT NORTH AMERICA

Compliance Study Area for the Wildlife Mitigation and Monitoring Program, Doris North Project

Figure 4.2-1

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Wolverines

The two year wolverine DNA program, as agreed to with the GN DoE, was completed in 2010 and 2011. Additional DNA sampling will not occur, however, sightings reported by employees and contractors will continue to be tracked by ESR.

Upland Breeding Birds

Upland breeding birds include songbirds (passerines, with the exception of the common raven, which is included under raptors), shorebirds and ptarmigan.

The Program for Regional and International Shorebird Monitoring (PRISM) is a collaborative effort to monitor continental trends in shorebird populations. At the suggestions of the Canadian Wildlife Service (CWS), HBML established PRISM plots at randomly selected locations throughout the study area, covering high, moderate and low quality shorebird habitats. These surveys contribute data on density, richness and diversity of other upland nesting species as well. A total of XX PRISM plots were selected in the Doris North compliance monitoring area.

Waterfowl

The waterfowl surveys include tundra swans, sandhill cranes, geese and ducks. Aerial surveys for waterfowl are conducted in the study area. The monitoring program consists of 2 events, a staging survey in late-June/early-July during the northern migration/establishment of nesting territories, and a brood survey during the rearing period from late-July to early-August. The surveyors fly in east-west transects spaced 2 km apart, and record waterfowl observed within 200 m on either side of the helicopter.

Raptors

Raptors in the project area include peregrine falcon, gyrfalcon, rough-legged hawk, golden eagle, short-eared owl, and snowy owl. Common ravens are included in the raptor survey because they compete for the same resources as the cliff-nesting raptors in the project area.

Two aerial surveys are completed per year, the first in early- to mid-June to determine occupancy of historical sites and identify new nests, and the second in late-July to early-August to determine nest success. These surveys are conducted by helicopter, flying along cliff faces in known and potential raptor nesting areas. Nest use, including adult presence and/or presence of eggs/young, is recorded, and nests with live young are recorded as successful nests.

Muskox, Foxes, Wolves, Ground Squirrels, and Marine Mammals

A formal monitoring program has not been developed for muskox, foxes, wolves, ground squirrels or marine mammals as these were not deemed to be VECs during the environmental assessment. Incidental observations reported by employees and contractors are recorded by ESR, and the environmental consulting contractor also documents incidental observations during the other components of the wildlife monitoring plan.

4.2.2 Care and Maintenance Phase

During C&M, HBML will not complete the wildlife monitoring program. The program is intended to assess the impacts of project activities on wildlife. These surveys are conducted via helicopter. Due to the limited activity that will occur during C&M, HBML has determined that the most disruptive activity that could take place is the use of helicopters to conduct the wildlife monitoring program. For example, a hovering helicopter near a raptor nest will result in greater stress to that animal than the maintenance activities that will take place in the immediate project footprint.

HBML has installed motion and heat triggered wildlife cameras to capture presence of wildlife in and around the project footprint. These cameras have been installed in various locations on the project footprint at Doris and Boston, and near the footprint.

Incidental wildlife sightings will continue to be recorded and reported quarterly. The annual wildlife monitoring report will be limited to the footprint changes (habitat monitoring), camera monitoring results and the incidental sightings and mitigation activities.

4.2.3 Baseline Data Collection

A large portion of the study area identified in the 2011 Wildlife Mitigation and Monitoring Plan Revision 1.0 was included to provide baseline data for use in environmental assessments for future expansion projects. The baseline study area is shown in figure 4.2-2. Studies in this baseline area will be discontinued until required for completion of environmental assessments for future expansion projects.

4.3 Mitigation Summary

4.3.1 Construction, Operations and Closure Phases

The following wildlife mitigation measures have been and will continue to be implemented at all Hope Bay sites:

- Application of dust suppressants, including water and EK35, to high traffic roads and pad areas;
- Strict waste management practices to prevent wildlife attraction to waste storage areas and work areas;
- Employee education and awareness programs to address specific wildlife attractant and waste disposal issues;
- Use of wildlife deterrents to encourage wildlife avoidance of mine facilities (i.e., noise) if wildlife are found to be lingering in the project footprint (i.e., wildlife isn't passing by quickly);
- Reduction of speed limits and installation of road signs indicating that animals have the right-of-way;
- Changing construction or blasting plans to avoid active raptor and migratory bird nests encountered during construction;

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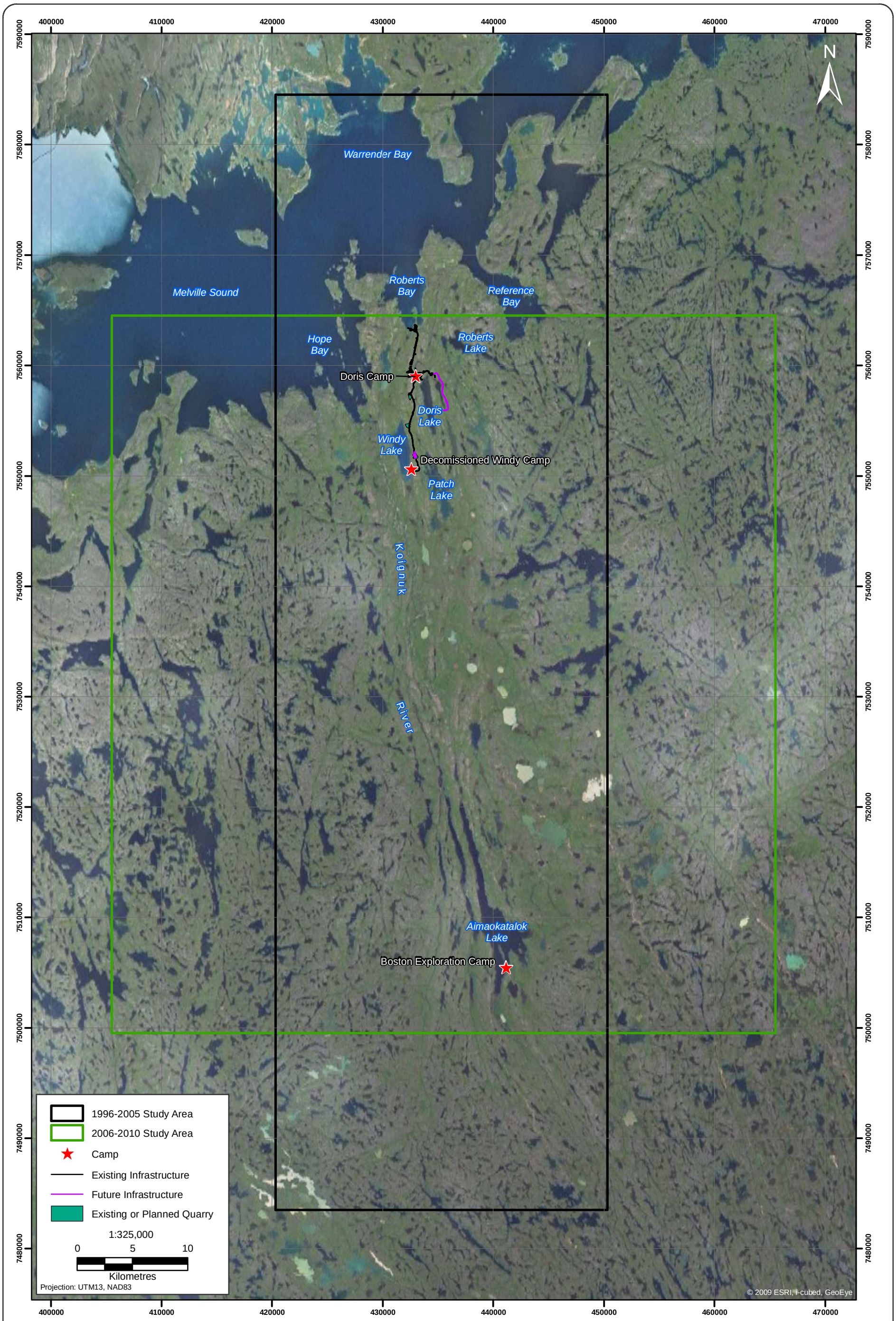

Figure 4.2-2

NEWMONT NORTH AMERICA

Baseline Study Area for the Wildlife Mitigation and Monitoring Program, Hope Bay Expansion Projects

Figure 4.2-2

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- Ensuring wildlife are not present within 500 m of a blast zone prior to blasting;
- Ensuring that wildlife entry-points into buildings are sealed (i.e., skirting on buildings, doors closed);
- Prevent nesting birds from constructing nests on project infrastructure and equipment;
- Avoid disturbance of nests containing eggs/young that are located on equipment, project infrastructure or materials, and leaving a 30 m buffer around nests, whenever possible, until the young have fledged;
- Avoid use of ropes for delineation of areas, or other uses where wildlife could become entangled;
- Avoid leaving mega-bags open or loosely folded to avoid trapping birds;
- Cover open-top barrels and pails that may collect rainwater with a solid lid or mesh to prevent entry of birds;
- Minimize project footprint wherever possible to reduce habitat loss; and
- Initiation of revegetation in areas to be reclaimed.

4.3.2 Care and Maintenance Phase

The applicable mitigation measures listed in section 4.3.1 will continue to be implemented during C&M. Nesting birds will not be prevented from nesting on equipment or infrastructure that will not be in use during C&M. These nests will not be disturbed until after the young birds have fledged if the need to use the infrastructure or equipment impacted arises.

4.4 Adaptive Management

When monitoring identifies situations where the project is having an impact on wildlife or vegetation beyond the mitigated expectations outline in the Doris North environmental assessment, or the Project is found to be out of compliance with permit requirements, a management response will be triggered. The response will be discussed with the applicable regulatory agencies, as required, to prevent future impacts to wildlife. HBML anticipates that the mitigation measures listed in 4.3 will limit the impacts of the project on wildlife.

5. Aquatic Effects Monitoring Plan

5.1 Background and Rationale

The following requirements are outlined in the Doris North Project Type A Water Licence (2AM-DOH0713):

> Part K. Item 7. The Licensee shall submit to the Board for approval by March 31, 2008, a proposal for the development of an Aquatic Effects Monitoring Plan (AEMP) in consultation with Environment Canada. The proposal for an AEMP shall consider modifications and advances in schedule which are consistent with the objectives and requirements of the Metal Mining Effluent Regulations (MMER);
>
> Part K. Item 8. The Licensee and Environment Canada shall coordinate with the NWB to ensure that the advanced submission of the AEMP meets the requirements of MMER;
>
> Part K. Item 9. The Licensee shall continue to collect baseline data consist[ent] with previously collected baseline data until such time as an AEMP is approved and implemented.
>
> Schedule B. Item 10. [The Annual Report shall include] The results of continued aquatic effects baseline data collection, and the results of the Aquatic Effects Monitoring Program in accordance with Part K, Item 4.

The AEMP is specific to the Doris North Project. There are no monitoring requirements for the Boston (2BB-BOS1217) or Regional Exploration (2BE-HOP1222) projects.

5.2 Monitoring Program Summary

The AEMP Plan was developed in consultation with Environment Canada and has been approved by the NWB. The AEMP will be carried out on an annual basis during construction and until the Environmental Effect Monitoring (EEM) Program is triggered during operations. The AEMP is designed to meet the requirements of the MMER EEM Program. The EEM program is triggered when Tailings have been placed into the Tailings Impoundment Area (TIA) and HBML begins depositing a deleterious substance through effluent discharge at a rate of 50 m^3/day. Once the Doris North Project is subject to the MMER EEM program, the AEMP will be converted to an EEM program in consultation with Environment Canada and this chapter will be revised.

For detailed information on the AEMP, refer to the Aquatic Effects Monitoring Plan Revision 0.0 (Rescan 2010a). A summary of this plan is included below. Details of the future EEM program are not discussed in this revision of the Monitoring and Follow-Up Plan

5.2.1 Construction, Operations and Closure Phases

The AEMP is required by the Doris North Water Licence during construction and until the project triggers the MMER EEM Program. The MMER EEM Program will be triggered once tailings are deposited into the TIA, and effluent is discharged from the TIA at a rate of 50 m^3/day. The AEMP includes the following sampling stations (Figure 5.2-1):

> Lakes: Little Roberts Lake, Roberts Lake, Doris Lake, Reference Lake B, and Reference Lake D
>
> Streams: Doris Outflow, Little Roberts Outflow, Roberts Outflow, Doris Outflow, Reference B Outflow, and Reference D Outflow
>
> Marine: Roberts Bay East, Roberts Bay West, Reference Bay

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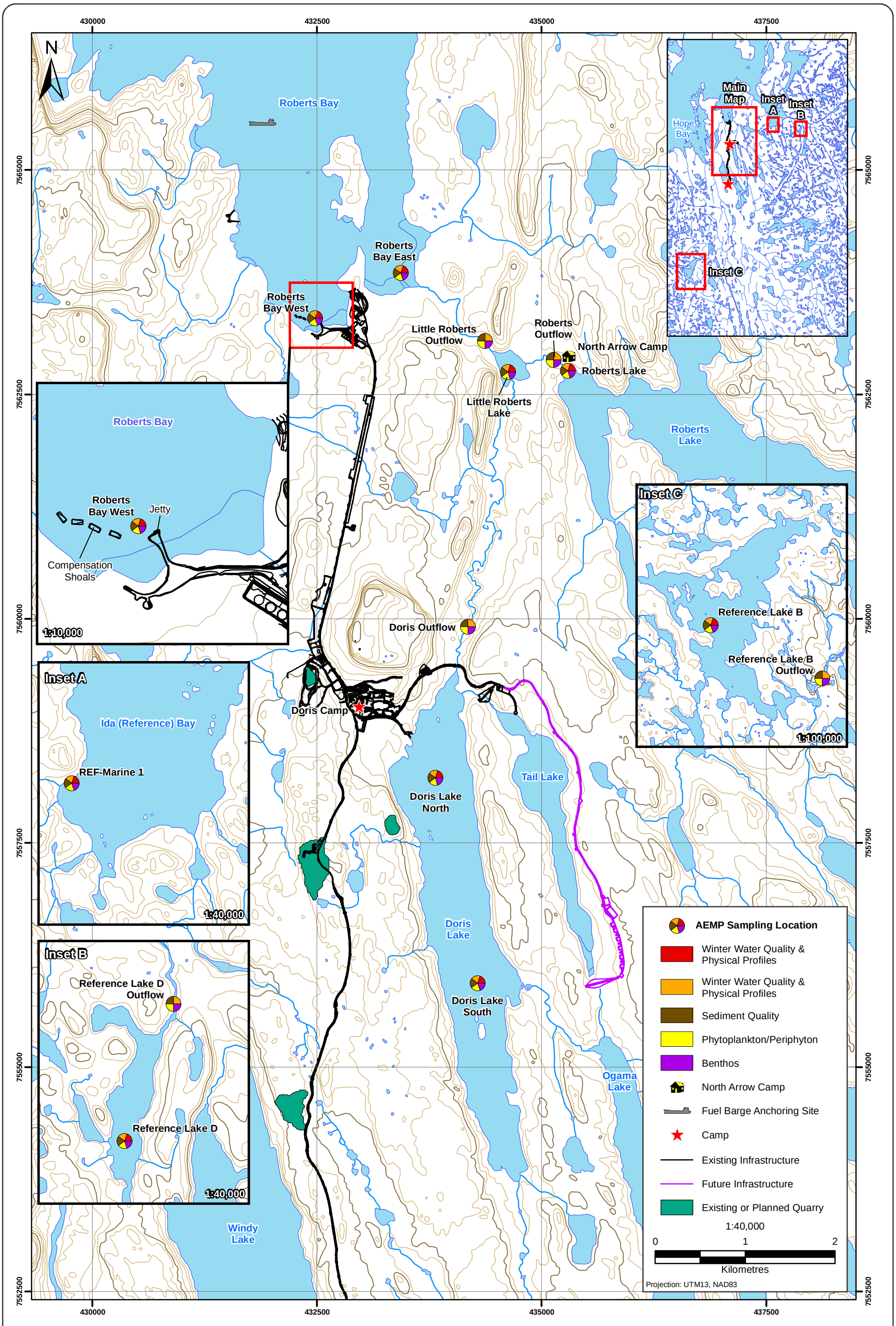

Figure 5.2-1

NEWMONT NORTH AMERICA

AEMP Sampling Locations, Doris North Project

Figure 5.2-1

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The sampling components and frequency for the AEMP and EEM is shown in Table 5.2-1. This chapter does not include EEM requirements for TIA water quality and effluent quality monitoring; however the sampling frequency is shown in Table 5.2-1 for completeness. For details on the TIA water quality and effluent quality monitoring, see Chapter 13: Site Water Quality Monitoring.

Table 5.2-1. Aquatic Effects Monitoring Program Components and Monitoring Frequency for all Project Phases, Doris North

Parameter	Project Phase			
	Construction (AEMP)	Operation (EEM)	Closure (EEM)	Care and Maintenance (AEMP)
Water Quality (biological monitoring stations)	Winter, Spring, Summer, Fall	Once every 3 years as per EEM schedule, with biological monitoring program	Once every 3 years as per EEM schedule, with biological monitoring program	Spring, Summer, Fall
Water Quality (TIA and Effluent)	-	Quarterly, as per EEM Schedule	Quarterly, as per EEM Schedule	-
Phytoplankton/Periphyton	Winter, Spring, Summer, Fall	Not required in EEM	Not required in EEM	-
Sediment Quality	Fall	Once every 3 years, as per EEM Schedule	Once every 3 years, as per EEM Schedule	-
Benthic Invertebrates	Fall			-
Fish Population/Condition	-			-
Fish Tissue	-			

Once the Doris North Project triggers the MMER, this chapter will be revised to replace the AEMP summary with the updated EEM summary.

5.2.2 Care and Maintenance Phase

The AEMP has been in place for the Doris North Project since 2010. No effects of Project activity on the aquatic and marine environment have been found to date. Under C&M, the AEMP will continue in a reduced capacity to reflect current site activity. This approach would be adaptively managed, with the program reviewed annually. During the first year of C&M, only water quality will be monitored at the AEMP stations, and if significant effects on the water quality are attributed to Project activity, then additional aquatic components could be included in future monitoring cycles. The monitoring frequency for water quality will be reduced to eliminate the winter water sampling trip due to the project having limited support capacity during late winter upon camp re-opening (i.e., helicopter will not be available, and emergency response capacity will not support a remote winter sampling program). A summary of the components and frequency of sampling to be included in the AEMP is summarized in Table 5.2-1.

5.3 Mitigation Summary

5.3.1 Construction, Operations and Closure Phases

To reduce the potential for project related impacts, HBML has been dewatering the partially constructed TIA to reduce the water elevation to 28.3 m (minimum) prior to deposition of tailings to increase the capacity of the TIA to hold tailings, thus extending the time period available to hold water prior to discharging tailings effluent to the environment.

The following mitigation measures have been considered for the ore processing designs and will be implemented once the project goes into operations:

- Recycling water into the processing circuit wherever possible; and
- Treatment of effluent prior to discharge, if required, to meet the MMER effluent quality requirements and CCME compliance point water quality.

5.3.2 Care and Maintenance Phase

During C&M, HBML will continue to dewater the partially constructed TIA to reduce the water elevation to 28.3 m (minimum). Once reaching this target water level, HBML will continue to dewater the TIA to maintain this water level.

5.4 Adaptive Management

During implementation of the AEMP, HBML does not anticipate any project related impacts to the aquatic environment because tailings are not yet being generated or deposited into the TIA. The only activity currently being undertaken that may impact water quality in the receiving environment is dewatering of the TIA. If impacts are detected, HBML will stop dewatering the TIA, and will implement appropriate mitigation measures prior to continuing dewatering.

Once the EEM program is triggered by deposition of tailings effluent into the receiving environment, HBML will be monitoring the water and effluent quality as well as the biological receptors and sediment as required under the EEM program. If project related impacts are identified during 2 consecutive monitoring cycles, HBML will proceed to the ‘Investigate Effects’ component of the EEM program which involves determining the magnitude and geographical extent of the effect. After investigating the magnitude and geographical extent of the effect, HBML would move into the ’Investigation of Cause’ component to determine the cause of each effect. This generally results in identifying changes that are required in the processing or water treatment design.

6. Land Treatment Area Management Plan

6.1 Background and Rationale

HBML currently holds approvals for operation of 2 landfarms as part of the Hope Bay Project. One landfarm is located at the Doris North Project, and the other at the Boston Project. The Regional Exploration Licence no longer has landfarm monitoring or maintenance requirements as this facility was removed in 2008.

Doris North

The Doris North Type A Water Licence (2AM-DOH0713) has the following requirements relating to the operation and monitoring of the Landfarm:

> Part G. Item 1. The Licensee shall provide at least 10 days notice to the Inspector prior to any planned discharges of any Facilities. The notice shall include the estimated volume proposed for discharge and location.
>
> Part G. Item 2. The Licensee shall ensure that all land applied discharges are performed in a manner that prevents erosion at the point of discharge and downstream.
>
> Part G. Item 14. The Licensee shall submit to the Board for review by June 1, 2008, a revised Landfarm Management Plan. The Plan shall include the following:
>
> > a. Operation and maintenance considerations including the methods of characterization, segregation and treatment;
> >
> > b. Confirmation of the Soil Quality Remediation Objectives and distinction between where parkland versus industrial standards will be applied;
> >
> > c. Contingency measure for contaminated soils that do not meet the Soil Quality Remediation Objectives; and
> >
> > d. Any proposed future uses.
>
> Part G. Item 19. The Licensee shall operate the Sewage Treatment Plant, Landfill, Landfarm, Fuel Storage and Containment Facilities, Sedimentation Pond, and Pollution Control Pond to the satisfaction of the Inspector.
>
> Part G. Item 22. The Licensee shall operate and maintain the Sumps in accordance with the following:
>
> > c. All Water discharged from the Landfarm Sump at monitoring station ST-4 shall not exceed the following effluent quality limits: (see Table 6.2-1)
> >
> > d. Water from the Landfarm Sump that is acceptable for discharge under Part G, Item 22(c) may be discharged to the tundra or as designated by an Inspector;

g. Sump water from the Landfill, Landfarm and Fuel Storage and Containment Facility that does not meet the criteria in Part G, Items 22(a),(c) and (e) respectively shall be directed to the Tailings Impoundment Area.

Part J. Item 20. The Licensee shall visually monitor and record observations on a daily basis during periods of discharge, all discharge onto the tundra from the:

c. Landfarm Sump;

In addition, the Schedule J Tables 1 and 2 specify the water chemistry parameters and sampling frequency required for the landfarm water monitoring program (Table 6.2-1).

Boston

The Boston Type B Water License 2BB-BOS1217 has the following requirements relating to the operation and monitoring of the landfarm:

Part B. Item 6. The Licensee shall file an Annual Report on the appurtenant undertaking with the Board no later than March 31st of the year following the calendar year being reported which shall contain the following information:

f. the annual quantities in cubic metres of all soil and types of contaminants from all locations that are placed within the Landfarm facility;

Part D. Item 14. The Licensee shall discharge all Effluent in such a manner to prevent surface erosion.

Part D. Item 18. The Licensee shall provide at least ten (10) days written notice to the Inspector prior to any planned discharges from the Bulk Fuel Storage Facility and the Landfarm at Monitoring Program Stations BOS-5 and BOS-6. This notice shall include the volume proposed for discharge and location, or intended use of effluent that meets the discharge criteria listed in Part D, Item 19.

Part D. Item 19. All effluent from the Bulk Fuel Storage Facility and the Landfarm, at monitoring stations BOS-5 and BOS-6 respectively, shall meet the following Effluent quality standards: (see Table 6.2-3)

Part D. Item 24. The Licensee shall maintain all constructed facilities, including the Sewage Disposal Facility, Landfarm, Bulk Fuel Storage Facility and the Containment Pond(s), to the satisfaction of an Inspector.

Part I. Item 9. […]The use of reclaimed soils for the purpose of back fill or general site grading may be carried out only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

Part J. Item 5. The Licensee shall measure and record, in cubic metres, the daily quantities of effluent discharged at Monitoring Program Stations BOS-2, BOS-3, BOS-5 and BOS-6.

Part J. Item 11. The Licensee shall sample at Monitoring Program Stations BOS-5 and BOS-6 monthly during removal of water from the facilities and analyzed for the following: (See Table 6.2-3).

6.2 Operational Plan and Monitoring Program Summary

This section summarizes the operational and monitoring procedures from the landfarm management plans for Doris North and Boston, as well as the applicable sections of the Hope Bay Quality Assurance (QA) and Quality Control (QC) Plan. For detailed information regarding these plans, please refer to the Doris North Land Farm Management and Monitoring Plan Revision 1.0 (SRK 2010a), the Boston Land Treatment Area Management and Monitoring Plan Revision 1.0 (SRK 2012c), and the Hope Bay QA/QC Plan Revision 7.1 (HBML 2012c).

6.2.1 Construction, Operations and Closure Phases

Doris North

The Doris North Landfarm was constructed with 3 separate management cells: one for contaminated soil, one for contaminated water (or snow), and one for clean treated water. The location of the landfarm sump ST-4 is shown in Figure 10.2-1.

Water Management

The contaminated water cell will be used to temporarily hold snow/water from the following potential sources prior to sampling and treatment, if required:

- Hydrocarbon contaminated snow as a result of spills or leaks (The spill response plan is summarized in Section 19);
- Potentially hydrocarbon contaminated water removed from small spill containments (i.e. spill pallets, tidy tank spill containments);
- Small volumes of potentially hydrocarbon contaminated water removed from the bulk fuel containments; and
- Water accumulated in the sump of the contaminated soil cell.

Records of water volumes deposited into the landfarm, or removed from the landfarm will be maintained as per the water licence requirement.

Water that is collected in the contaminated water cell will be sampled prior to treatment, and also post-treatment to determine if the water meets the discharge criteria outlined in the water licence (Table 6.2-1). As per the water licence requirements, HBML will submit a notification to the AANDC Inspector 10 days prior to discharge and will obtain the compliant sample results prior to discharging any water from the facility.

Table 6.2-1. Landfarm (ST-4) Water Sampling Requirements for all Project Phases, Doris North

Parameter	Discharge Criteria		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Concentration in any Grab Sample (mg/L)	Construction, Operation, Closure	Care and Maintenance
pH	6.0 – 9.0	9.0	Once prior to discharge, daily when discharging to the tundra	Once prior to discharge, weekly when discharging to the tundra
Total Suspended Solids (TSS)	15.0	30.0		
Total Oil and Grease	5; no visible sheen	10; no visible sheen		
Total Ammonia-N	2.0	4.0		
Total Lead	0.01	0.02		
Benzene	0.37	-		
Toluene	0.002	-		
Ethyl Benzene	0.090	-		
Discharge Volume	-	-	Daily during periods of discharge	Daily during periods of discharge

Compliant water is discharged from the contaminated water cell directly or from the oil-water separator if treatment is required to produce compliant water. HBML generally requests permission from the AANDC inspector to use compliant water for dust suppression on the roads and pads. If HBML is using the water for dust suppression, the water truck is used to remove the compliant water from the landfarm water cells.

Water treatment involves passing the water through an oil-water separator. The treatment system is a series of absorbent and charcoal filters that is designed for removal of hydrocarbons and low concentrations of metals (e.g., lead). If the water is non-compliant after treatment through the oil-water separator, HBML will transport the non-compliant treated water to the TIA.

All sample results and water volumes discharged from the landfarm are reported in the monthly and annual water licence reports.

Soil Management

Deposition of contaminated soils into the landfarm requires permission of the ESR Department. Only light fraction (BTEX, F1 and F2) hydrocarbon contaminated materials are permitted in the landfarm. Heavy fraction (F3 and F4) hydrocarbon contaminated material does not remediate well in the Arctic due to the short summer season, which limits bacterial breakdown and volatilization. Materials that are not suitable for placement in the landfarm, such as glycols, metal contamination and heavy hydrocarbons, will be packaged for off-site disposal.

Material must not be deposited within 0.1 m of the base of the interior slope of the cell walls to allow free movement of water to the sump.

Soil will be placed in thin layers, no more than 8 inches thick to maximize the surface area exposed to the air which will increase the remediation rate. Soils in the landfarm must be mixed (i.e., tilled or turned) frequently to obtain consistent and faster remediation results.

New soil deposits will not be placed on top of older deposits that are being remediated. If the landfarm is filled to approximately 8 inches across the entire operating area of the cell, the new contaminated soils will be held in covered drums or lined mega bags for treatment once remediated materials have been removed from the cell. Alternatively, excess contaminated material may be shipped off-site for disposal.

Soils may not be removed from the landfarm unless ESR has confirmed that the soils meet the Nunavut Tier 1 Guideline or Canadian Council of Ministers of the Environment (CCME) remediated soil guidelines for industrial or agriculture, as applicable (Table 6.2-2). For most purposes, the Industrial guidelines will be appropriate; however, in some situations more stringent criteria may be required.

Table 6.2-2. Landfarm Soil Sampling Requirements for all Project Phases, Doris North

Parameter	Criteria		Project Phase	
	Environmental Guideline for Contaminated Site Remediation – Nunavut- Industrial (mg/kg)	CCME Soil Quality Guideline for the Protection of Environmental and Human Health- Agriculture (mg/kg)	Construction, Operation, Closure	Care and Maintenance
Volume Removed and Location Placed	-	-	Each time soil is removed	Each time soil is removed
F1	240	210	Prior to placement in landfarm if spilled material is unknown. 1 or 2 times per year during remediation process. Prior to removal of material.	Prior to placement in landfarm if spilled material is unknown. 1 or 2 times per year during remediation process. Prior to removal of material.
F2	260	150		
F3	1700	300		
F4	3300	2800		
Benzene	0.03	0.03		
Toluene	0.37	0.37		
Ethyl benzene	0.082	0.082		
Xylene	11	11		
Arsenic	12*	12	Prior to placement in landfarm if spilled material is unknown.	Prior to placement in landfarm if spilled material is unknown.
Cadmium	22	1.4		
Lead	600	70		
Mercury	50	6.6		
Nickel	50	50		
Zinc	360	200		

**Arsenic and other metals are known to be elevated in baseline soils as a result of the ore deposit geology. Metals, if above the Nunavut or CCME criteria will be compared to baseline soil concentrations to determine if the metals are a result of the area geology.*

A record will be maintained of the volume of all material deposited or removed will be maintained, as well as the final location of all material removed from the facility. This information will be reported in the monthly and annual water licence reports.

Boston

The Boston landfarm consists of a single soil cell. This cell is currently full to capacity from historic spills that occurred while Miramar Hope Bay Ltd (MHBL) was operating the property. The landfarm sump is shown in Figure 10.2-2.

Water Management

The Boston landfarm was not constructed with a proper sump. It does, however, have a low point in one corner where excess water can occasionally collect on the surface. This water, if sufficient accumulation is present, will be transferred to the Containment Pond (BOS-2) which is used as a holding pond for water testing and treatment.

Table 6.2-3. Landfarm Water Sampling Requirements for all Project Phases, Boston

Parameter	Discharge Criteria	Project Phase	
	Maximum Allowable Grab Sample Concentration (mg/L)	Construction, Operation, Closure	Care and Maintenance
Benzene	0.37	Once prior to discharge, monthly when discharging to the tundra	Once prior to discharge, monthly when discharging to the tundra
Toluene	0.002		
Ethyl Benzene	0.090		
Total Lead	0.01		
Total Oil and Grease	15; no visible sheen		
Total Ammonia-N	2.0		
Discharge Volume	-	Daily during periods of discharge to tundra	Daily during periods of discharge to tundra

In addition, the following parameters must be sampled once per month when discharging to tundra:

- TPH (Total Petroleum Hydrocarbons)
- BTEX (Benzene, Toluene, Ethylbenzene, Xylene)
- PAH (Polycyclic Aromatic Hydrocarbons)
- Oil and Grease (analysis and visual)
- Total Phenols
- pH
- Electrical Conductivity
- Nitrate-Nitrite
- Total Alkalinity
- Total Hardness
- Potassium
- Magnesium
- Sodium
- Calcium
- Sulphate
- Total Cadmium
- Total Chromium
- Total Lead
- Total Nickel
- Total Arsenic
- Total Copper
- Total Iron
- Total Mercury

All sample results and water volumes discharged from the landfarm are reported in the monthly and annual water licence reports.

Soil Management

The current landfarm operation plan outlines the types of hydrocarbon contaminated materials that can be placed in the landfarm as well as the method for deposition and tilling, and records to be kept. However, since the landfarm is full to maximum capacity, the ESR Department is not allowing any further soil deposits in this facility.

During the Phase III Site Assessment conducted in 2012, HBML has discovered that the liner at the bottom of the landfarm facility is sloped and uneven, thus preventing safe mixing of the soils without puncturing the liner. In addition, the soils were above the CCME industrial guideline for the heavy F3 hydrocarbon fraction; The F3 fraction is not easily remediated during the short summer seasons that occur in the Arctic. As such HBML will not be attempting to remediate the soils and will not be collecting additional soil samples in the landfarm. Instead, HBML has determined that the best course of action is to package the soils for off-site disposal and dismantle the landfarm beginning in 2013 or 2014. The samples collected during the Phase III assessment can be used for proper classification and labelling of the contaminated materials for shipment. When the landfarm is dismantled, packaged and shipped off-site for disposal, HBML will include the volumes of material and dates of removal in the monthly and annual water licence reports.

If a new landfarm is constructed at Boston in the future, the procedure for managing the contaminated soil deposits is the same as summarized above for the Doris North landfarm, which is also as described in the Boston Land Treatment Area Management and Monitoring Plan. Records of material deposited into the facility will be maintained. Records will also be maintained of the volume of all material removed, pumped or otherwise discharged from any of the three ponds. In addition, a record will be maintained of the final location of all material removed, pumped or otherwise discharged from the facility. The soil will be sampled twice per year, beginning and end of season, to assess remediation progress. And soils will not be removed from the landfarm until ESR confirms that the material complies with the CCME remediated soil guidelines and approvals from the Inspector and the GN DoE have been obtained. The soil quality and volumes removed will be reported in the monthly and annual water licence reports.

6.2.2 Care and Maintenance Phase

Doris North

The landfarm management and monitoring is not impacted by the project status change to C&M. HBML will continue to manage water and soil in the landfarm according to the water licence requirements and the landfarm management plan as outlined in Section 6.2.1. Sample results and material volumes removed will continue to be reported in the monthly and annual water licence reports.

Boston

The landfarm management and monitoring plan is not impacted by the project status change to C&M. HBML will continue to manage water accumulated in the landfarm according to the water licence requirements summarized above, and as outlined in Section 6.2.1, HBML will be packaging the soil in the existing landfarm for off-site disposal. Sample results and material volumes removed will continue to be reported in the monthly and annual water licence reports.

6.3 Adaptive Management

If water from the Doris landfarm does not meet discharge criteria, even after treatment with the oil-water separator, HBML will transfer the water to the TIA. Water from the Boston landfarm will be transferred to the containment pond without treatment. Once in the containment pond, and combined with water from other sources, HBML will treat the water as required. If the water still does not meet discharge criteria after treatment, HBML will continue to hold the water and re-treat as required.

If soil remediation is not proceeding as intended (i.e., soil is not remediating in the landfarm), HBML may choose to add soil amendments to the material, or may package the soils for off-site disposal.

7. Waste Rock and Ore Management Plan

7.1 Background and Rationale

Waste Rock and Ore are present at both the Doris North and Boston Projects. The Regional exploration project does not have waste rock or ore, and therefore is excluded from this chapter.

The Doris Type A Water Licence (2AM-DOH0713) has the following requirements for waste rock and ore handling:

> Part D. Item 10. The Licensee shall tag any potentially acid generating rock identified through the Quarry Rock Construction Monitoring program for removal to the Temporary Waste Rock Pile, for ultimate disposal underground.
>
> Part D. Item 24 (Amended). The Licensee shall not use Waste Rock from underground for any purpose, including the construction of any infrastructure, unless otherwise approved by the Board under Part G, Item 17 and in accordance with the plan provided under Part G, Item 15, revised and approved accordingly.
>
> Part D. Item 28. The Licensee shall ensure all runoff and seepage from the Temporary Waste Rock Pad is directed to the Pollution Control Pond for collection and transfer to the Tailings Impoundment Area.
>
> Part G. Item 15. The Licensee shall submit to the Board for review by April 1, 2008, a Revised Waste Rock Management Plan.
>
> Part G. Item 16. The Licensee shall store all potentially acid generating rock at the Temporary Waste Rock Pad prior to ultimate disposal underground as mine backfill, unless otherwise approved by the Board.
>
> Part G. Item 17 (Amended). All Waste Rock brought to the surface from underground shall be managed in accordance with the approved Plan submitted under Part G, Item 15 and:
>
> a. stored on the Temporary Waste Rock Pad;
>
> b. stored at other locations as identified in the approved Waste Rock and Ore Storage Plan, and

c. managed as otherwise approved by the Board in writing.

Part G. Item 18. The Licensee shall segregate mineralized from un-mineralized Waste Rock on the Temporary Waste Rock Pad.

Part G. Item 32. (Amended). The Licensee shall submit to the Board for approval in writing, at least sixty (60) days prior to planned implementation, any changes that are contemplated to the geochemical confirmatory sampling and testing program or the criteria for using non-mineralized Waste Rock for construction as outlined in the approved Waste Rock Management Plan, submitted as per Part G, Item 15, including a description of and justification for the change.

Part G. Item 33. (Amended). The Licensee shall clearly identify and segregate all potentially acid generating Waste Rock for storage on the Temporary Waste Rock Pad, awaiting its ultimate disposal underground.

Part G. Item 34. (Amended). The Licensee shall submit to the Board as part of the Construction Monitoring Report referred to in Part D, Item 8, a Waste Rock and Quarry Monitoring Report. The Report shall be developed in accordance with Schedule D, Item 1 (f).

Part J. Item 12 (Amended). The Licensee shall measure and record all flow and volume measurements on a monthly basis (unless otherwise stated):

d. Tonnes of mineralized and un-mineralized Waste Rock stored on the Temporary Waste Rock Pad and at other locations approved by the Board in writing, during construction, operations and closure.

e. Tonnage of waste rock returned underground on a monthly basis during construction, operation and closure;

Part K. Item 6. The Licensee shall confirm the absence of seepage from the Temporary Waste Pad in groundwater downstream of the Pollution Control Pond.

The Boston Type B water licence (2BB-BOS1217) includes the following conditions for management of waste rock and ore:

Part D. Item 8. All Minewater and surface drainage from decline, waste rock and ore stockpiles shall be pumped to a Containment Pond prior to discharge.

Part J. Item 12. The Licensee shall utilize opportunistic sampling of seepage and runoff from the existing waste rock/ore storage locations, identified as monitoring station BOS-8, to be carried out initially during spring thaw, and at a minimum, monthly when flow is observed. These monitoring results are to be compared with previously reported kinetic testing results from the ARD Characterization Data Base, for the Boston Deposit.

Part J. Item 13. The Licensee shall analyze samples obtained under Part J, Item 12 in accordance with similar test methods as those used in previous kinetic testing for, at a minimum, the following parameters: (Table 7.2-5).

7.2 Operational Plan and Monitoring Program Summary

This section summarizes the waste rock and ore management plans for Doris North and Boston. For detailed information on these plans, please refer to the Hope Bay Project Doris North Waste Rock and Ore Management Plan Revision 2.0 (SRK 2010b) and the Water and Ore/Waste Rock Management Plan for the Boston Site (SRK 2009).

7.2.1 Construction, Operations and Closure Phases

Doris North

Geochemical characterization programs have shown that the majority of the waste rock from the underground mine has a low potential for metal leaching and/or acid rock drainage (ML/ARD), with characteristics that are similar to that of the quarries used for the infrastructure development.

The Doris mill, waste rock and ore pads are all designed to drain surface water into the pollution control pond, which is then pumped to the TIA. A summary of the water quality monitoring program related to this pond is discussed in the Interim Water Management Plan Chapter 8.

HBML has approval to use un-mineralized waste rock that is shown not to have ML/ARD issues for surface construction activities. This required HBML to segregate, and document the locations of, mineralized and un-mineralized rock on the waste rock pad. In addition, if potentially acid generating (PAG) rock is encountered in the quarries, the PAG material is to be stored in the mineralized rock storage area of the waste rock pads. The mineralized rock will be returned to the mine workings as backfill for closure.

The geological inspections will include a detailed examination of the working face or muck pile to identify the rock type, the quantity of sulphide minerals, quartz veining, carbonate mineralization, and the presence of fibrous minerals. If the visual inspections indicate that there is more than trace amounts (>0.5%) disseminated sulphides or any sulphide veining, waste rock would be designated as mineralized, and would be directed to the appropriate location on the waste rock pad.

Confirmatory samples will be collected from the blasted rock, either from within the mine, or immediately following placement in the waste rock pile. Both location of origin and the location where the material is placed in the dump will be established and recorded. The samples will be submitted to a commercial testing laboratory for full ABA (acid base accounting; including total sulphur, sulphur speciation, inorganic carbon, and modified Sobek NP), or total sulphur and TIC only.

The confirmatory sampling will focus on the rock that is located in zones that have a low potential for ML/ARD. However, the mineralized units will also be sampled to determine the actual range of geochemical characteristics that will be present in the mineralized part of the waste pile. The confirmatory sampling program for segregation of waste rock as described in the waste rock and ore plan (SRK 2010b) is presented in Table 7.2-1. After sufficient data has been collected to evaluate the effectiveness of the geological inspections in identifying rock that has an increased potential for ML/ARD potential, the frequency of sampling and testing will be re-evaluated.

Table 7.2-1. Waste Rock Classification Confirmatory Sampling Program, Doris North

Rock Type	Analyses	Project Phase	
		Construction, Operations	Care and Maintenance
Diabase	ABA tests	One sample for every 60 metres of mining (approximately 5,000 tonnes of rock)	No mining occurring. If waste rock is brought to surface, use same monitoring program as Construction/Operations
Basalt and buffer zone	ABA tests Or Total sulphur and TIC analyses only	One sample per 12 metres of mining (approximately 1000 tonnes of rock) A minimum of one in five samples for ABA, remaining 4 for sulphur and TIC	
Gabbro	ABA tests, Total sulphur and TIC	Once per 5,000 tonnes of rock	
Alteration zone	ABA tests, Total sulphur and TIC	Approximately one sample per 5,000 tonnes of rock	
Confirmed un-mineralized rock	Shake flask extraction - soluble salt, nutrients and metals	One in ten samples from the confirmatory testing (representing one sample per 50,000 tonnes of rock	No construction planned. If waste rock is desired for construction, use same monitoring program as Construction/Operations

Assuming that use of non-mineralized rock for construction is approved, data from the confirmatory sampling would be used to assess whether accessible areas of non-mineralized rock meet the criteria for use in construction. These criteria are outlined as follows:

- Non-mineralized diabase would need to have sulphur contents of less than 0.2%;
- Non-mineralized basalt would need to have sulphur contents of less than 0.5% and Total Inorganic Carbon (TIC)/Acid Production (AP) and Neutralization Potential(NP)/AP ratios greater than 3.

All of the ore extracted from the underground mine will be placed in a Temporary Ore Stockpile prior to processing in the mill. The ore stockpiles are located within the Pollution Containment System, and runoff is captured in the pollution control pond.

The runoff and seepage collected in the pollution control pond (ST-2) from the ore and waste rock pads are sampled following the requirements of the water licence (Table 7.2-2). HBML also monitors the water captured in the 2 underflow sumps (STS-2A and STS-2B) that were installed down-gradient of the pollution control pond to serve as a seepage bypass collection system. The sumps are monitored for the same parameters as the pollution control pond. To assist with waste rock geochemical analyses, HBML may collect samples at these 3 locations more frequently, but will collect at least one sample per month. The locations of these sampling stations are shown on Figure 10.2-1.

Table 7.2-2. Pollution Control Pond (ST-2) and Underflow Sumps (STS-2A and STS-2B) Sampling Program, Doris (as conducted by ESR)

Parameter	Project Phase	
	Operation, Closure	Care and Maintenance
pH	Monthly during open water season	Monthly during open water season
Total Suspended Solids		
Chloride		
Total Cyanide		
Total Ammonia, Nitrite and Nitrate		
Sulphate		
Total Metals (ICP-MS)		
Alkalinity		
Total oil and grease		
Flow and Volume (discharged)	Daily during discharge	Daily during discharge

Table 7.2-3 shows the additional geochemical monitoring programs recommended by the professional geochemist on contract for the project.

Table 7.2-3. Geochemist Waste Rock Monitoring Program, Doris North

Component	Location	Project Phase	
		Operation, Closure	Care and Maintenance
Visual inspection of waste rock pile	Mineralized and un-mineralized areas	Annual to assess if rock was segregated appropriately	Only required if rock is added or removed from the stockpile
Seepage	Down-gradient toe of the waste rock pile and below the Pollution Control Pond and access road	Annual for at least 2 years after placement of rock on the stockpile ends and also after backfilling ends	Annual for at least 2 years after placement of rock on the stockpile ends and also after backfilling ends
Construction Area Seepage	Anywhere waste rock has been used for surface construction	See Quarry Seepage Monitoring Chapter 16	See Quarry Seepage Monitoring Chapter 16

The seepage survey monitoring will involve identification of seeps from the toe of the waste rock pile and below the pollution control pond. Field pH, conductivity, temperature and oxidation-reduction potential (ORP) will be recorded at all seeps sampled. Reference sites will also be selected for comparison. In the immediate area of the waste rock pile, water samples will be collected from all distinct seepage locations and the samples will be analysed for pH, Total Dissolved Solids (TDS), acidity and/or alkalinity, sulphate, total ammonia, nitrate, and a full suite of metals by Inductively coupled plasma mass spectrometry (ICP-MS).

An annual Waste Rock and Quarry Monitoring Report will be submitted annually to the NWB and KIA to present the monitoring programs undertaken by the professional geochemist. The results for the samples collected from the pollution control pond, ST-2 will be included in the annual water licence reports.

Boston

The ore that is currently stored at Boston was mined during bulk exploration activities undertaken by BHP Minerals Canada in 1996 and 1997. HBML understands that Miramar had used some of the ore stockpiles for construction of a tank farm and pad surface repairs when the property was operated by MHBL between 2002 and 2007. There is currently no underground activity occurring at Boston, therefore no new waste rock or ore is being generated and HBML does not allow the use of ore from the stockpiles for any construction or repair purposes.

Geochemical analyses of the ore the results of these studies indicate that all of the waste rock and the majority of the ore is non-acid generating and that a small proportion of the ore has an uncertain potential for ARD. However, even if localized ARD were to develop in the ore stockpiles, the presence of non-acid generating waste rock in the underlying pad is expected to maintain neutral pH conditions. Although pH conditions are expected to remain neutral, seepage monitoring indicates that concentrations of arsenic and to a lesser extent, nickel and selenium may be somewhat elevated in comparison to CCME guidelines for aquatic life. Seepage, runoff and direct discharges from the camp pad are not having an impact on the downstream environment (SRK 2009).

Recent sampling of ephemeral streams down-gradient of the site (Attachment 1 of Supporting Document C) indicate that metal concentrations are all very low, suggesting that there is considerable attenuation of these parameters occurring along the flow paths in the tundra (SRK 2009).

Natural precipitation interacts with waste rock and ore and flows to the tundra either as runoff from the surface of the pile or as seepage that has infiltrated through ore and waste rock in the stockpiles and underlying pad. This water is not captured and pumped to the containment pond due to the very low volume of flow. Flowing seeps have been located at a few locations on the east side of the camp. These seeps, named BOS-8A, -8B, and -8C as well as BOS-7, are monitored by the ESR department monthly during periods of flow as per the licence requirements (Table 7.2-4). These data are provided to the project's professional geochemist. The BOS-7 station was originally intended to monitor landfill leachate, however, there isn't a landfill at Boston, and the location of BOS-7 is downslope of the tankfarm, which was constructed from ore by Miramar. The locations of these sampling stations are shown on Figure 10.2-2.

Table 7.2-4. Ore Pile (BOS-8 and BOS-7) Seep Sampling Program for all Project Phases, Boston (as conducted by ESR)

Parameter	Project Phase	
	Operation, Closure	Care and Maintenance
pH	Monthly when seepage present	Monthly when seepage present
Sulphate		
Electrical Conductivity		
Total Suspended Solids		
Total Ammonia-N		
Total Trace Metals (ICP Scan)		

Additional monitoring programs that have been recommended by a professional geochemist, and will be undertaken by a professional geochemist are described in Table 7.2-5.

Table 7.2-5. Geochemist Waste Rock and Ore Monitoring Program for all Project Phases, Boston

Component	Location	Project Phase	
		Operation, Closure	Care and Maintenance
Ore Oxidation – rinse pH and conductivity	Ore piles and areas constructed with ore	Every 10 years, beginning in 2008	Every 10 years, beginning in 2008
Seepage	BOS-8, BOS-7 and additional seeps around the footprint	Annual	Annual
Ephemeral Streams	ES-A through ES-E	Annual	Annual

The water management and monitoring program for water accumulated in the berms and containment ponds at Boston is discussed in Section 10.

7.2.2 Care and Maintenance Phase

Doris North

The change in project status does not alter the Doris North waste rock and ore monitoring program, however, the geochemical testing of the waste rock and rock management procedures only apply when there is active underground mining or if waste rock is to be used in surface construction activities. If rock were to be added or removed from the stockpiles, the management of that rock would continue as summarized in section 7.2.1. The water management and seepage monitoring will continue as summarized in section 7.2.1.

Boston

The change in project status to C&M does not alter the Boston Waste Rock and Ore monitoring program. The program will be continued as summarized in section 7.2.1.

7.3 Adaptive Management

To collect seepage from the waste rock and ore pads that may escape collection in the pollution control pond, HBML has installed two water collection sumps down-gradient from the pollution control pond. A summary of the sump water management and monitoring is provided in Section 8.

If waste rock does not meet the criteria for use in construction (i.e., ML/ARD or high ammonia, nitrates or salts), the rock will remain on the waste rock pad until it can be placed back underground.

8. Interim Water Management Plan

8.1 Background and Rationale

This chapter addresses the water management conditions relating to the management of water in the Doris mine site footprint, diversion berm, sedimentation pond, pollution control pond and sumps as well as monitoring programs related do dewatering of Tail Lake.

The conditions outlined in the Doris North 2AM-DOH0713 water license are as follows:

> Part F. Item 1.The Licensee shall submit to the Board for review by May 1, 2008, a revised Water Management Plan. The revised Plan shall include to the following:
>
> > a. A requirement to continuously monitor Doris Lake levels and outflow during the two (2) years of mining and beyond to confirm water balance model predictions;
> >
> > b. Requirements for on-going monitoring and calibration of the water quality model;
> >
> > c. A strategy to monitor and remove where necessary snow accumulation in the Pollution Control Pond, roads, ditches, and drainage channels; and
> >
> > d. The Plan shall consider the monitoring requirements set out in Parts J and K;
>
> Part F. Item 4. The Licensee shall carry out regular inspections of all water management structures during periods of flow (rock drains, culverts, sedimentation and pollution control ponds and associated diversion berms) and the records be kept for review upon request of an Inspector. More frequent inspections may be required at the request of an Inspector.
>
> Part G. Item 20. All Water from the Pollution Control Pond shall be directed to the Tailings Impoundment Area, unless otherwise authorized by the Board.
>
> Part G. Item 21. The Licensee shall operate and maintain the Sedimentation Pond in accordance with the following:
>
> > a. Water discharged from the Sedimentation Pond at monitoring station ST-1 shall not exceed the following effluent quality limits: (Table 8.2-1).
> >
> > b. The Licensee shall establish compliance with effluent quality limits prior to discharge;
> >
> > c. Water from the Sedimentation Pond that is acceptable for discharge under Part G, Item 22(a) shall be discharged immediately south of the facility approximately 500m upstream of Doris Lake, or as designated by an Inspector; and
> >
> > d. Sedimentation Pond Water that does not meet criteria in Part G, Item 21(a) shall be directed to the Tailings Impoundment Area.

Part G. Item 24. The Licensee shall operate and maintain the Tailings Impoundment Area (TIA) to engineering standards such that:

a. The Licensee shall maintain a minimum freeboard limit of one (1) meter below the top of the frozen core of the North and South Dams or as recommended by a Geotechnical Engineer;

b. Implement contingency measures where necessary to prevent overtopping of the North Dam;

c. Implement the Shoreline Erosion Protection and Adaptive Management strategies as required;

Part G. Item 25.The Licensee shall implement the Tailings Water Management Strategy in accordance with the following:

Part G. Item 26. All Water discharged from the Tailings Impoundment Area at monitoring station TL-4 shall not exceed the following effluent quality limits: (Table 8.2-2).

Part G. Item 27. The Licensee shall ensure that effluent discharged from monitoring stations TL-1 and TL-4 is demonstrated to be non-acutely toxic in accordance with Part J, Item 8.

Part G. Item 28. During periods of discharge, water quality in Doris Creek at monitoring station TL-3 shall not exceed the greater of background water quality at the time of discharge as measured at monitoring station TL-2, or the following water quality limits: (Table 8.2-3).

Part G. Item 29. The Licensee shall ensure that water within the Tailings Impoundment Area is maintained at an elevation of least 28.3 metres above sea level such that a minimum of four (4) metres of water cover is maintained over the tailings at all times.

Part G. Item 30. The Licensee shall ensure that the flow from the Tailings Impoundment Area into Doris Creek at monitoring station TL-4 does not exceed 10% of the background flow in Doris Creek as measured at monitoring station TL-2 at the time of discharge.

Part J. Item 1. The Licensee shall install and maintain flow meters or other such devices, or implement suitable methods required for the measuring of water use and Effluent discharge volumes, to be operated and maintained to the satisfaction of an Inspector.

Part J. Item 4. The Licensee shall:

a. Increase the sampling frequency to once every second day at monitoring stations TL-1, TL-2 and TL-3; should the measured concentration of any parameter listed under Part G, Item 28 at TL-3 deviate by more than 20% from that predicted by the water quality model; and

b. Submit to the Board and an Inspector an understanding and justification of any discrepancy should the Licensee request a reduction in sampling frequency.

Part J. Item 8. The Licensee shall conduct Acute Lethality Testing , at monitoring station TL-1 prior to discharge and at monitoring station TL-4 monthly thereafter during discharge, in accordance with the following test procedures:

a. Acute lethality to Rainbow Trout, Oncorhynchus mykiss (in accordance with Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and

b. Acute lethality to the crustacean, Daphnia magna (in accordance with Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

Part J. Item 12. The Licensee shall measure and record all flow and volume measurements on a monthly basis (unless otherwise stated):

g. The ice thickness in Tail Lake measured on a monthly basis during construction, operations and closure.

8.2 Operational Plan and Monitoring Program Summary

This section provides a summary of the management and monitoring program outlined in the Interim Water Management Plan Revision 5.0 (SRK 2012a). Relevant sections relating to the water quality monitoring associated with the mine site and tail lake sampling stations are also summarized from the Hope Bay QA/QC Plan Revision 7.1 (HBML 2012g). For detailed information please refer to the Interim Water Management Plan Revision 5.0 (SRK 2012a) and the Hope Bay QA/QC Plan Revision 7.1 (HBML 2012g).

8.2.1 Construction, Operations and Closure Phases

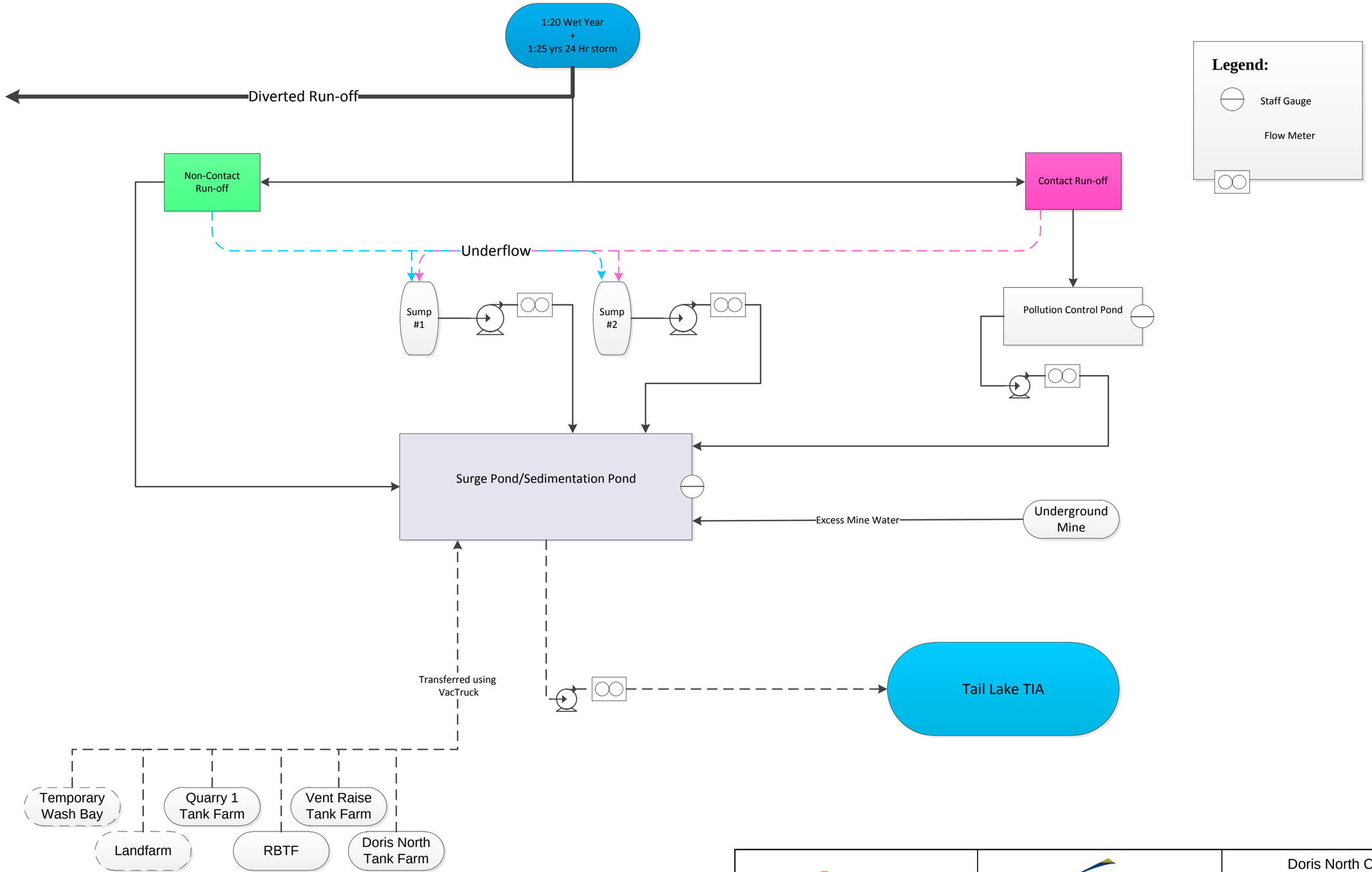
In 2012, HBML implemented a water management procedure that will continue to be followed until the project goes into operation. Once the project goes into operations, the Tailings Management Plan will be developed and the Interim Water Management Plan will be revised into the Final Water Management Plan, reflecting all of the conditions of the water licence that are required during operations.

Water Movements

The water management procedure to transferring water through the system is shown in Figure 8.2-1.

Water management procedures that have been changed from the water licence and approved in the Interim Water Management Plan are:

- The sedimentation pond is used as a collection pond prior to transfer to the TIA. The sedimentation pond is not discharged to tundra; and
- Installation of a temporary holding pond on the mill pad as extra containment capacity (constructed in 2011).



srk consulting	NEWMONT NORTH AMERICA	Doris North Camp **Water Management System**
Job No: 1CH008.050 Filename:DorisNorth_WaterManagementFigures…Rev01.pptx	HOPE BAY MINING LTD	Date: Jan. 19, 2012 | Approved: TS | Figure: **8.2-1**

As per the water licence requirements, HBML tracks the water volumes transferred through the system, and monitors the water quality for applicable stations.

Water Monitoring

The water quality criteria for the sedimentation pond are presented in Table 8.2-1. The water in the sedimentation pond is not being discharged to the Tundra under the Interim Water Management Plan, therefore, HBML is collecting samples weekly during discharge to the TIA and the discharge volume is still recorded daily.

Table 8.2-1. Water Quality Monitoring for the Sedimentation Pond (ST-1), Doris North

Parameter	Discharge Criteria		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)	Construction, Operation, Closure	Care and Maintenance
pH	6.0 – 9.0	9.0	Once before any discharge, daily when discharging onto the tundra (HBML Change: Weekly when discharging to the TIA, no pre-discharge sampling required)	Once before any discharge, weekly when discharging onto the tundra (HBML Change: Weekly when discharging to the TIA, no pre-discharge sampling required)
Total Suspended Solids	15	30		
Total Ammonia -N	2.0	4.0		
Total CN	1.0	2.0		
Total Oil and Grease	5; no visible sheen	10; no visible sheen		
Total Aluminum	1.0	2.0		
Total Arsenic	0.05	0.10		
Total Copper	0.02	0.30		
Total Iron	0.30	0.60		
Total Lead	0.01	0.02		
Total Nickel	0.05	0.10		
Total Zinc	0.01	0.02		
Nitrate and Nitrite	-	-		
Sulphate	-	-		
Volume Discharged	-	-	Daily during discharge	Daily during discharge

The water quality discharge criteria for the TIA discharge point is based on the MMER criteria. Although HBML has not deposited tailings into Tail Lake, HBML is depositing small volumes of water transferred from the Doris mine site via the sedimentation pond. Therefore, HBML has committed to conducting the water quality monitoring program as outlined in the water licence (Table 8.2-2). HBML collects samples from TL-1, which is the intake point of the discharge line, for the 2 weeks prior to discharge, then samples TL-4, which is the discharge end of the same pipeline, for the TL-1 and TL-4 parameters as per the required schedule for both stations. HBML does not collect separate TL-1 and TL-4 samples as described below because the water from each would be collected from the same pipe.

Table 8.2-2. Water Quality Monitoring for the TIA Effluent Discharge Point (TL-4) and Discharge Intake Point (TL-1), Doris North

Parameter	Discharge Criteria for TL-4		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)	Construction, Operation, Closure	Care and Maintenance
pH	6.0 – 9.5	9.5	TL-1 one duplicate sample collected twice per week for 2 weeks prior to discharge (as ice safety permits) then reducing to once per week (proposed) TL-4 Weekly during periods of discharge	TL-1 One duplicate sample prior to discharge (proposed) TL-4 Weekly during periods of discharge
Total Suspended Solids	15	30		
Total Arsenic	0.50	1.00		
Total Copper	0.30	0.60		
Total CN	1.00	2.00		
Total Lead	0.20	0.40		
Total Nickel	0.50	1.00		
Total Zinc	0.50	1.00		
Radium 226 (TL-4 only)	0.37 Bq/L	1.11 Bq/L		
Total Ammonia-N	6.0	-		
Nitrate and Nitrite	-	-		
Orthophosphate and Total Phosphate	-	-		
Total Dissolved Solids	-	-		
Chloride	-	-		
Total Metals Scan ICP-MS	-	-		
Biological Oxygen Demand (TL-4 only)	80	160	TL-4 Monthly during discharge	TL-4 Monthly during discharge
Fecal Coliforms (TL-4 only)	10,000 CFU/100 mL	10,000 CFU/100 mL		
Acute Toxicity	Non-acutely toxic	Non-acutely toxic	TL-1 Once prior to discharge TL-4 Monthly during discharge	TL-1 Once prior to discharge TL-4 Once during discharge (proposed)
Dissolved Oxygen and Redox Potential (TL-1 only)	-	-	TL-1 Every second month	TL-1 Every second month
Discharge Volume	-	-	Daily during discharge	Daily during discharge
Water Level (Tail Lake)			Continuous (see Chapter 14)	Continuous (see Chapter 14)

In addition, HBML will sample the Doris Creek upstream (TL-2) and downstream (TL-3) stations during discharge from the TIA. Water quality parameters at TL-3 must not exceed those listed in Table 8.2-3 or the Doris upstream water quality (TL-2), whichever is greater. The sampling program is summarized in Table 8.2-3.

Table 8.2-3. Water Quality Monitoring for the Doris Creek Upstream (TL-2) and Downstream (TL-3) Stations, Doris North

Parameter	Discharge Criteria for TL-3	Project Phase	
	Maximum Concentration of Any Grab Sample (mg/L)	Construction, Operation, Closure	Care and Maintenance
pH	6.0 – 9.0	One duplicate sample prior to discharge (as ice safety permits) then reducing to once per week (proposed)	One duplicate sample prior to discharge (as ice safety permits) then reducing to once per week (proposed)
Total Suspended Solids	15		
Total Oil and Grease (TL-3 only)	5		
Chloride	150		
Free CN	0.005		
Total CN	0.010		
Total Ammonia-N	1.54 at pH 7.5 and temperature of 20 degrees C		
Nitrate	2.9		
Nitrite	0.060		
Total Aluminum	0.100		
Total Arsenic	0.005		
Total Cadmium	0.000017		
Chromium (VI)	0.0010		
Total Copper	0.002		
Total Iron	0.300		
Total Mercury	0.000026		
Total Molybdenum	0.073		
Total Nickel	0.025		
Total Lead	0.001		
Total Selenium	0.001		
Total Silver	0.0001		
Total Thallium	0.0008		
Total Zinc	0.030		
Total Dissolved Solids	-		
Orthophosphate and Total Phosphate	-		
Total Metals Scan (ICP-MS)	-		

Parameter	Discharge Criteria for TL-3	Project Phase	
	Maximum Concentration of Any Grab Sample (mg/L)	Construction, Operation, Closure	Care and Maintenance
Discharge Volume	TL-3 may only be 10% greater than TL-2	Daily during discharge (See Chapter 14)	Daily during discharge (See Chapter 14)

The final station that is currently relevant to the HBML activities is TL-10, which is the TIA station located at the deep point of the lake. The monitoring program for this station is presented in Table 8.2-4. There are no water quality criteria for this station. Ice thickness will be measured near this station during winter months.

Table 8.2-4. Water Quality Monitoring for the TIA Station TL-10, Doris North

Parameter	Project Phase	
	Construction, Operation, Closure	Care and Maintenance
pH	Monthly during discharge starting 2 weeks prior to discharge (HBML note: under ice samples are not possible immediately prior to discharge season, therefore, a sample will be collected while ice conditions are still safe)	Monthly during discharge starting 2 weeks prior to discharge (HBML note: under ice samples are not possible immediately prior to discharge season, therefore, a sample will be collected while ice conditions are still safe)
Total Suspended Solids		
Total Dissolved Solids		
Chloride		
Free CN		
Total CN		
Total Ammonia-N, Nitrate and Nitrite		
Orthophosphate and Total Phosphate		
Total Metals Scan (ICP-MS)		
Dissolved Oxygen and Redox Potential		
Ice thickness	Monthly (HBML note: only when ice conditions are safe)	Once upon arrival at site in late-April/early-May

As required in the Doris North water licence, HBML will report the water volumes and water quality results in the monthly and annual water licence reports. Once the project goes into operations, and the TIA is functioning as permitted, HBML will use the collected information to update the water quality model and water balance.

Hydrology

The hydrologic monitoring required for Tail Lake, Doris Lake and Doris Creek is summarized in Section 11.

8.2.2 Care and Maintenance Phase

The interim water management plan was designed for managing water during C&M, therefore, the management of water will continue as described in Section 8.2.1. The water quality monitoring is the same during C&M (Tables 8.2-1, 8.2-3, and

8.2-4), with the exception of one changes to sample collection frequency prior to discharge at TL-1 and location of sample collection after discharge begins (Tables 8.2-2), and the collection of ice thickness data for the TIA (Table 8.2-4).

The changes and reason for them are as follows:

1. During C&M, TL-1 will be sampled only once (duplicate sample) prior to discharge to confirm compliance with the discharge criteria specified by the water licence.

   This change was made because HBML is not depositing tailings into the lake, and the 2012 monitoring data showed that the small volume of water being deposited into the lake from the sedimentation pond is not resulting in changes to the TIA water quality

2. Once discharge begins, samples will only be collected at TL-4 instead of TL-1 and TL-4. The TL-4 samples will still capture the required parameters for both TL-1 and TL-4.

   This change was made because TL-1 and TL-4 are collected from the intake and discharge ends of a single pipeline. There aren't any water additions or treatment occurring between the intake and discharge ends of the pipeline, therefore, a single sample represents the water quality at both stations.

3. The ice thickness on the TIA (near TL-10) will only be collected once after employees arrive at the site to open the camp in late-April/early-May.

   This change was made because the camp will be closed during the winter season.

8.3 Adaptive Management

There is no mitigation or adaptive management required for the mine site water management process. Water of any quality and volume is permitted to be transferred to the TIA. HBML is only permitted to discharge a maximum of 10% of the total flow in Doris; therefore HBML must closely monitor the daily discharge rates. The pumping rates will be adjusted regularly to ensure that the actual discharge volume does not exceed the permitted volume. If the permitted volume is exceeded, HBML will stop the pumps for the day and will resume pumping the following day.

If the water quality at TL-1/TL-4 exceeds discharge criteria, HBML will cease pumping immediately upon receipt of the results. If TL-3 consistently exceeds the compliance criteria, discharge will be stopped and the cause of the exceedence will be investigated.

9. Waste Water Treatment Management Plan

9.1 Background and Rationale

HBML currently has waste water (sewage) treatment plants (WWTPs) located at the Doris North camp and the Boston camp. These plants are operated based on the Water Licenses 2AM-DOH0713 and 2BB-BOS1217. Although the

Regional Exploration Project (2BE-HOP1222) also has conditions relating to WWTP management, there currently is not an operational camp or WWTP under that licence, therefore, the 2BE-HOP1222 licence is not discussed further in this document.

The Doris North water license (2AM-DOH0713) has the following conditions applicable to the operation of a WWTP:

> Part D Item 20. The Licensee shall ensure that the Sewage Treatment Plant is operated in accordance with conditions provided in Part G, Item 3 with compliance at monitoring station ST-8 during construction.
>
> Part G. Item 3. The Licensee shall operate the Sewage Treatment Plant in accordance with the following:
>
> > a. All sewage and grey water shall be collected and treated in the Sewage Treatment Plant.
> >
> > b. During the construction phase, all effluent from the Sewage Treatment Plant at monitoring station ST-8 shall not exceed the following effluent quality limits (Table 9.2-1):
> >
> > c. During site construction, treated effluent from the Sewage Treatment Plant shall be discharged approximately 400 metres north of the camp pad.
> >
> > d. Once the Tailings Impoundment Area is operational, all treated effluent from the Sewage Treatment Plant shall be discharged to the Tailings Impoundment Area.
> >
> > e. The Licensee shall notify an Inspector at least ten (10) days prior to start-up of the Sewage Treatment Plant and subsequent discharge from the facility.
>
> Part G. Item 4. The Licensee shall submit a Sewage Management Plan, to the Board for review sixty (60) days prior to commissioning the Sewage Treatment Plant that takes into consideration operation, maintenance and sludge management.
>
> Part G. Item 19. The Licensee shall operate the Sewage Treatment Plant, Landfill, Landfarm, Fuel Storage and Containment Facilities, Sedimentation Pond, and Pollution Control Pond to the satisfaction of the Inspector.
>
> Part J. Item 12. The Licensee shall measure and record all flow and volume measurements on a monthly basis (unless otherwise stated):
>
> > f. The volume of sewage sludge removed from the Sewage Treatment Plant and the locations or method of sewage sludge disposal during construction, operation and closure;
>
> Part J. Item 20. The Licensee shall visually monitor and record observations on a daily basis during periods of discharge, all discharge onto the tundra from the:
>
> > f. Sewage Treatment Plant (during the construction phase).

The Boston water license (2BB-BOS1217) has the following conditions applicable to the operation of a WWTP:

Part D. Item 11. Licensee shall direct all sewage and grey water to the Sewage Disposal Facility unless otherwise approved by the Board.

Part D. Item 12. The Licensee shall dispose of sludge removed from the Sewage Disposal Facility in a sump located a minimum of thirty-one (31) meters from the normal high water mark and such that they do not enter any water body, or as otherwise approved by the Board in writing under Part D, Item 13.

Part D. Item 13. The Board has approved the document entitled “Sewage Sludge Management Alternatives for the Hope Bay Project Ver. 1.0, June 2010”. Should alternative methods of disposal and treatment of Sludge be considered, the Licensee shall submit to the Board for approval in writing, at least four (4) months prior to the change in Sludge disposal plans, a revised plan which shall address:

a. Method of disposal;

b. Location of disposal area, if applicable;

c. Quantities and composition of sludge;

d. Mitigation measures to control run-off and restrict access;

e. A program for water quality monitoring;

f. An implementation schedule; and

g. An executive summary of the proposal in English and Inuktitut.

Part D. Item 14. The Licensee shall discharge all Effluent in such a manner to prevent surface erosion.

Part D. Item 15. All Effluent being discharged from the Sewage Disposal Facility, monitoring station BOS-3 shall meet the following Effluent quality standards: (Table 9.2-2).

Part D. Item 16. The Licensee shall ensure that effluent discharged from monitoring stations BOS-2 and BOS-3, is demonstrated to be non-acutely toxic in accordance with Part J, Item 3.

Part J. Item 4. The Licensee shall measure and record, in cubic metres, the monthly and annual quantities in cubic metres of Sludge removed from the Sewage Disposal Facility.

Part J. Item 5. The Licensee shall measure and record, in cubic metres, the daily quantities of effluent discharged at Monitoring Program Stations BOS-2, BOS-3, BOS-5 and BOS-6.

Part J. Item 9. The Licensee shall sample at Monitoring Program Stations BOS-3 and BOS-4 monthly during discharge. Samples shall be analyzed for the following parameters: (Table 9.2-2)

Part J. Item 10. The Licensee shall conduct toxicity testing on treated Sewage Disposal Facility Effluent at the point prior to entry into Aimaokatalok Lake, Monitoring Station BOS-4, once annually during open water season in accordance with the following test procedures:

a. Acute lethality to Rainbow Trout, Oncorhynchus mykiss (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and

b. Acute lethality to the crustacean, Daphnia magna (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

9.2 Operations Plan and Monitoring Program Summary

This section summarizes the operations plan for the Doris North and Boston WWTPs. For detailed information on these systems, refer to the Doris North Project Wastewater Treatment Management Plan Rev 3.0 (HBML. 2012c and the Sewage Treatment Plant Operation and Maintenance Plan for The Boston Camp Rev 1.0 (FSC 2010). The monitoring program follows the requirements in the water licences, and the methods are found in the QA/QC Plan Rev 7.1 (HBML 2012 g).

9.2.1 Construction, Operations and Closure Phases

Doris North

There are two Sanitherm® Membrane Biological Reactor (MBR) WWTPs, housed in seven 40 foot-long containers, located at the Doris Camp. Each of the Sanitherm® plants has a capacity for wastewater from 180 people and capacity to accept raw wastewater and sludge from other WWTPs into its surge/conditioning tanks. The Doris North camp is currently permitted to accommodate 180 people, which is below the maximum design capacity of 360 people for the two Sanitherm® plants.

The treatment process operates both aerobically and anoxically and will treat the carbon fraction of the wastewater (the BOD_5) and address ammonia and other nitrogen containing compounds to some extent. Ammonia reductions exceeding 95% are possible with this type of plant.

The system consists of the following major processes:

- Pre-Treatment:
    - Primary settling/screening and equalization are used to filter out non-biological materials and create a constant flow rate through the treatment system
- Biological treatment and effluent separation:
    - Anoxic treatment followed by aeration then the membrane reactor are used to break down the waste, remove nutrients, and reduce biological oxygen demand to produce high quality treated effluent
- Treated effluent discharge – the discharge system that transfers treated effluent to the tundra
- Sludge de-watering (membrane press) – the filtration system used to dewater the treated sludge to create a low moisture cake, suitable for composting or incineration

- Clean In-Place system – self-cleaning system that cleans the membranes to ensure treatment system continues to operate properly.

Prior to discharging effluent to the tundra, HBML passes the effluent through a Ultra Violet (UV) disinfection system.

Effluent is discharged to a rock outcrop approximately 1km northwest of the camp. This location was approved by the AANDC inspector in 2011. There are no waterbodies nearby that would receive the effluent; however, HBML does monitor the water quality at the shore of Glenn Lake approximately 1.1 km northwest of the discharge location (ST-9). The effluent is not detected at this lake. The old discharge location, approximately 600 m closer to the camp, has been retained as a back-up location, and may be used periodically. After completion of the TIA, HBML will move the effluent discharge to the TIA as permitted. The tundra discharge lines will be retained as back-up.

Sewage sludge will be handled in one of the following ways: burned in the incinerator, buried in the Quarry 2 overburden pile to allow the material to decompose via the freeze-thaw cycle, composted, or placed directly on isolated drill sites.

The sewage effluent is treated to meet the discharge criteria presented in Table 9.2-1. The frequency of monitoring is dictated by the water licence. As mentioned, HBML monitors a shoreline point on Glenn Lake (Station ST-9) to determine if effluent reaches the lake, as well as the treated effluent prior to discharge (ST-8). The sampling stations are shown on Figure 10.2-1.

Table 9.2-1. Waste Water Treatment Plan Monitoring Program for ST-8 and ST-9, Doris North

Parameter	Discharge Criteria (to Tundra)		Project Phase		
	Maximum Average (mg/L)	Maximum Allowable in a Grab Sample (mg/L)	Construction	Operation and Closure	Care and Maintenance
pH	6-9	9	monthly	monthly, if in use	monthly, when in use
Total Suspended Solids (TSS)	100	100			
BOD_5	80	80			
Fecal Coliform	10,000 CFU/100 mL	10,000 CFU/100 mL			
Total Oil and Grease	5 and no visible sheen	10 and no visible sheen			

Boston

The Boston WWTP is a Clementine Rotating Biological Contactor (RBC) system. the Clementine WWTP is comprised of a surge tank, a flow equalization tank, the Clementine RBC treatment unit with UV disinfection, and an emergency overflow tank. In addition, there is a digester, and several lift stations.

The treated effluent is discharged approximately 200 m east of the WWTP onto the tundra. This location has had geotextile weirs constructed to disperse flow. Flow from the effluent discharge has not been detected entering Aimaokatalok Lake, however, HBML monitors at the nearest point of the lake to the effluent discharge (BOS-4) to confirm that there are no impacts to the lake from the effluent as required in the water licence.

HBML has an approved sludge pit location located at 13W 0441191E 7504661N NAD83.However, HBML has been transferring sludge to be pressed in the Doris North sludge press, which is subsequently handled with the Doris sludge as described above. Due to the way the system operated at Boston, little sludge is transferred each year.

The sewage effluent (BOS-3) is treated to meet the discharge criteria presented in Table 9.2-2. The frequency of monitoring is dictated by the water licence. HBML also samples at the shore of Aimaokatalok Lake, approximately where the effluent should enter the lake if the effluent reaches there. Effluent is not observed entering the lake anywhere along the shoreline, indicating that it is absorbed into the tundra prior to reaching the lake. The sampling stations are shown on Figure 10.2-2.

Table 9.2-2. Waste Water Treatment Plan Monitoring Program BOS-3 and BOS-4, Boston

Parameter	Discharge Criteria for BOS-3	Project Phase	
	Maximum Allowable in a Grab Sample (mg/L)	Construction, Operation and Closure	Care and Maintenance
pH	6.0 – 9.5	monthly, when in use	monthly, when in use
Total Suspended Solids (TSS)	100		
BOD_5	80		
Fecal Coliform	10,000 CFU/100 mL		
Total Oil and Grease	no visible sheen		
Acute Lethality, Rainbow Trout and Daphnia magna	Non-acutely lethal	Once per year – during open water season, when in use	Once per year – during open water season, when in use

9.2.2 Care and Maintenance Phase

Doris North

During C&M, HBML plans to use one of the existing MBR plants to treat waste water. During camp opening and closing process, HBML may separate the grey water to discharge to the overburden pile rather than to the WWTP as approved by the AANDC Inspector in October 2012.

The manufacturer of the MBR plant has told HBML that the plants will operate and produce the same quality effluent (i.e., compliant) with smaller camp loadings by operating the plant at a slower feed rate. This means that effluent may not be discharged continuously with low camp loading. Effluent and sludge will continue to be handled the same way as during construction.

The effluent will be discharged to the rock outcrop 1 km northwest of camp, or to the old discharge point about 400 m northwest of camp during colder weather when the outcrop line may be frozen. This use of the old point will allow HBML to conserve fuel by not running the heat trace in the extra 600 m of the new line. Sludge will continue to be handled in one of the ways specified in section 9.2.1.

HBML will continue to monitor the effluent quality (ST-8) and at Glenn Lake (ST-9) as per the Doris North licence requirements when the camp is open and the WWTP is operating. The sample results, effluent discharge volume and sludge volume handled each month will continue to be reported in the monthly water licence reports.

Boston

Boston Camp has operated as a seasonal facility most years that HBML has operated the project. The existing WWTP will continue to be used if Boston Camp is reopened during C&M. The treatment process, effluent discharge, or sludge handling will not change from that described in section 9.2.1.

HBML will continue to monitor the effluent quality (BOS-3) and down-gradient in Aimaokatalok Lake (BOS-4) for the Boston WWTP when the camp is open. The sample results, effluent discharge volume and sludge volume handled each month will continue to be reported in the monthly water licence reports.

9.3 Adaptive Management

The potential does exist for isolated, short term discharges of treated wastewater effluent which does not meet the discharge limits due to equipment malfunction or operator error, however, the system design limits the potential for partially treated wastewater to be discharged from the plant.

In the event that analysis indicates that a monitoring sample exceeded the specified discharge limit, HBML will, as soon as possible upon receiving the analytical results:

- Re-sample the effluent and submit the sample for appropriate analysis;
- Conduct a detailed inspection of the entire WWTP and all associated facilities to identify the cause of the off specification discharge and ensure that the facility is operating within the prescribed parameters and operational limits;
- Correct the original cause; and
- If necessary, implement additional monitoring of the downstream environment to assess the level, if any, of the impact of the off specification discharge.

If HBML determines that the Doris North MBR plant is not operating well at low camp loadings during C&M, HBML may switch to an alternate system that will perform as required. HBML would provide notice to the NWB if this situation arises and will update the management plan to document the revised treatment system.

10. General Site Water Management and Monitoring

10.1 Background and Rationale

Doris North

Site water monitoring is conducted in compliance with both the Doris North Project Type A Water Licence (2AM-DOH0713) and the Doris North Project Certificate (NIRB No. 003). There are a number of required monitoring points; however, many of them have been included in the applicable chapters of this document. This section will focus only on those sampling points that are not captured elsewhere in this document.

The Doris North Project Type A Water Licence (2AM-DOH0713) requires that the following site water monitoring activities be conducted:

> Part E. Item 1. The Licensee shall obtain fresh water for domestic camp use, mining and milling and associated uses, from Doris Lake at SNP Station ST 7 using the Fresh Water Intake. The volume shall not exceed 480,000 cubic meters per year unless otherwise approved by the Board (Table 10.2-1).
>
> Part E. Item 3. The Licensee shall not use streams as a water source unless authorized and approved by the Board.
>
> Part E. Item 4. The Licensee shall maintain the Fresh Water Intake to the satisfaction of the Inspector.
>
> Part E. Item 5. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.
>
> Part G. Item 1. The Licensee shall provide at least 10 days notice to the Inspector prior to any planned discharges of any Facilities. The notice shall include the estimated volume proposed for discharge and location.
>
> Part G. Item 2. The Licensee shall ensure that all land applied discharges are performed in a manner that prevents erosion at the point of discharge and downstream.
>
> a. The volume of freshwater obtained from Doris Lake for potable water;
>
> b. The volume of freshwater obtained from Doris Lake for process water;
>
> Part G. Item 19. The Licensee shall operate the Sewage Treatment Plant, Landfill, Landfarm, Fuel Storage and Containment Facilities, Sedimentation Pond, Pollution Control Pond, and the Reagent and Cyanide Storage Facility sumps to the satisfaction of the Inspector.
>
> Part G. Item 21 (Amended). Water discharged from the Sedimentation Pond and Reagent and Cyanide Storage Facility Sumps at monitoring stations ST-1 and ST-11 respectively shall not exceed the following Effluent quality limits:

a. Water discharged from the Sedimentation Pond and Reagent and Cyanide Storage Facility Sumps at monitoring stations ST-1 and ST-11 respectively shall not exceed the Effluent quality limits in [Table 10.2-2].

Part G. Item 22. The Licensee shall operate and maintain the Sumps in accordance with the following:

e. Water discharged from the Fuel Storage and Containment Facility Sumps at monitoring stations ST-5, ST-6a and ST-6b shall not exceed the effluent quality limits [in Table 10.2-3].

f. Water from the Fuel Storage and Containment Facility Sump that is acceptable for discharge under Part G, Item 22(e) may be discharged to the tundra or as designated by an Inspector;

g. Sump water from the Landfill, Landfarm and Fuel Storage and Containment Facility that does not meet the criteria in Part G, Items 22(a),(c) and (e) respectively shall be directed to the Tailings Impoundment Area.

Part J. Item 1. The Licensee shall install and maintain flow meters or other such devices, or implement suitable methods required for the measuring of water use and Effluent discharge volumes, to be operated and maintained to the satisfaction of an Inspector.

Part J. Item 3. The Licensee shall undertake the Water Monitoring Program detailed in the Tables of Schedule J

Part J. Item 12. The Licensee shall measure and record all flow and volume measurements on a monthly basis (unless otherwise stated):

Part J. Item 20. The Licensee shall visually monitor and record observations on a daily basis during periods of discharge, all discharge onto the tundra from the:

d. Plant Site Fuel Storage and Containment Area Sump;

e. Roberts Bay Fuel Storage and Containment Area Sumps (addition in Amendment 2 for second fuel storage area);

g. Reagent and Cyanide Storage Facility Sumps (addition in Amendment 2). The monitoring results shall be made available to an Inspector upon request.

Part J. Item 21. The Licensee shall, within thirty (30) days following the month being reported, submit to the Board a monthly monitoring report in an electronic and hardcopy.

Boston

The Boston water licence has a number of required water monitoring stations. The various stations have been discussed in the applicable chapters of this document. This section will focus on those sampling points that are not captured elsewhere in this document.

Part C. Item 1. The Licensee shall obtain all water for domestic camp use from Aimaokatalok Lake at Surveillance Network Point Station BOS-1 using the Water Supply Facility or as otherwise approved by the Board. Water use for drilling and associated uses shall be obtained from Aimaokatalok Lake, Stickleback Lake or as required from sources proximal to the drilling targets. The total volume of water for the purposes of this Licence, from all sources shall not exceed 100 cubic meters per day (Table 10.2-4).

Part C. Item 4. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

Part D. Item 8. All Minewater and surface drainage from decline, waste rock and ore stockpiles shall be pumped to a Containment Pond prior to discharge.

Part D. Item 9. All discharge from Containment Pond at Monitoring Station BOS-2 shall not exceed the following Effluent quality limits: (Table 10.2-5).

Part D. Item 16. The Licensee shall ensure that effluent discharged from monitoring stations BOS-2 and BOS-3, is demonstrated to be non-acutely toxic in accordance with Part J, Item 3.

Part D. Item 18. The Licensee shall provide at least ten (10) days written notice to the Inspector prior to any planned discharges from the Bulk Fuel Storage Facility and the Landfarm at Monitoring Program Stations BOS-5 and BOS-6. This notice shall include the volume proposed for discharge and location, or intended use of effluent that meets the discharge criteria listed in Part D, Item 19.

Part D. Item 19. All effluent from the Bulk Fuel Storage Facility and the Landfarm, at monitoring stations BOS-5 and BOS-6 respectively, shall meet the following Effluent quality standards (Table 10.2-6).

Part D. Item 21. All discharges shall be released in such a manner to minimize surface erosion. Upon confirming compliance required of Part D, Item 19, water to be released to the environment may be used for other industrial purposes upon written request to the Board, including use for dust suppression activities on roads and quarries as well as drilling.

Part F. Item 7. The Licensee shall establish water quality conditions prior to and upon completion of any drilling program through lake ice. (Table 10.2-7)

Part J. Item 2. The Licensee shall measure and record, in cubic metres, the daily quantities of water used for Camp, drilling and for all other purposes from all sources.

Part J. Item 3. The Licensee shall measure and record, in cubic metres, the monthly and annual quantities in cubic metres of Minewater pumped from the underground.

Part J. Item 5. The Licensee shall measure and record, in cubic metres, the daily quantities of effluent discharged at Monitoring Program Stations BOS-2, BOS-3, BOS-5 and BOS-6.

Part J. Item 8. The Licensee shall sample at Monitoring Program Station BOS-2, once prior to discharge and weekly thereafter for parameters under Part D, Item 9.

Part J. Item 11. The Licensee shall sample at Monitoring Program Stations BOS-5 and BOS-6 monthly during removal of water from the facilities and analyzed for the following: (Table 10.2-6)

Regional Exploration (Windy)

The Regional water licence has a number of required water monitoring stations. The only active stations under this licence are the quarry monitoring stations, potentially the water intake location, and potentially drilling related water usage. The quarry monitoring will be included in section 16. This section will focus on the water intake and drilling sampling requirements.

Part C. Item 1. The Licensee shall obtain all water for domestic camp use from Windy Lake for the Windy Camp and Doris camp, not exceeding sixty three (63) cubic metres per day. Drill water shall be obtained from local water source(s), detailed on the June, 2007 drawing entitled “Hope Bay Exploration Drilling Water Sources”, and may include additional water bodies proximal to the drilling targets that possess a surface area greater than or equal to 15,000 m2, or as otherwise approved by the Board. The total volume of water for drilling purposes shall not exceed eighty (80) cubic metres per day. In addition, the Licensee shall obtain from Windy Lake, water for dust suppression on the Windy Lake all-weather road, not exceeding two hundred (200) cubic metres per day on a seasonal basis as required, from May through September. Total water use from all sources, for all purposes shall not exceed three hundred forty three (343) cubic metres per day. (Table 10.2-8)

Part C. Item 4. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

Part C. Item 9. Licensee shall provide written notice to the Inspector, at least five (5) days prior to any further requirement for water use from Windy Lake for domestic purposes at the Doris Camp. The notice shall include method of water taking, method of transport to the Camp, duration of water requirement and anticipated volumes required.

Part F. Item 7. The Licensee shall establish water quality conditions prior to and upon completion of any drilling program through lake ice. (Table 10.2-7)

Part J. Item 8. The Licensee shall measure and record, in cubic metres, the daily quantities of water used for Camp, drilling and for all other purposes. The use of Windy Lake as a temporary water source for the Doris Camp shall be recorded and reported as a separate use within the annual report required under Part B, Item 2(i). In addition, the daily quantities of water used for drilling shall be recorded for each water source used in accordance with Part C, Item 1.

10.2 Monitoring Program Summary

This section provides a summary of the monitoring requirements for the water intakes, bulk fuel containment berms, the Reagent and Cyanide Storage Facility Sumps (ammonium nitrate temporary berm), and under-ice pre and post drilling samples. The sampling procedures are described in the QA/QC Plan Rev 7.1 (HBML 2012c).

10.2.1 Construction, Operations and Closure Phases

Doris North

HBML will monitor the water quality at the Doris Lake water intake, the reagent and cyanide storage facility sumps (ammonium nitrate temporary berm) and the fuel containment berms as outlined in the 2AM-DOH0713 water licence.

HBML monitors the daily water usage from Doris Lake, including any water taken up at ST-7 (pumphouse; Figure 10.2-1) for domestic use and by water truck for industrial activities. The total monthly and annual volumes are reported in the monthly and annual water licence reports. A summary of the monitoring program for the water intake station ST-7 is presented in Table 10.2-2.

Table 10.2-1. Monitoring Program for Water Intake Station ST-7, Doris North

	Project Phase	
Parameter	**Construction, Operation, Closure**	**Care and Maintenance**
Water Volume (Max 480,000 m^3 per year)	Daily Usage (report monthly totals)	Daily Usage (report monthly totals)
pH	Monthly, when in use	Monthly, when in use
Total Suspended Solids		
Free Cyanide		
Total Cyanide		
Total Ammonia, Nitrate, and Nitrite		
Orthophosphate and Total phosphate		
Total Metals Suite (ICP-MS)		
BOD_5		
Fecal Coliforms		
Total Oil and Grease		

The reagent and cyanide storage facility (ST-11; Figure 10.2-1) has not been constructed yet, however, a temporary ammonium nitrate containment berm was constructed in 2011. The discharge criteria and sampling frequency are shown in Table 10.2-2.

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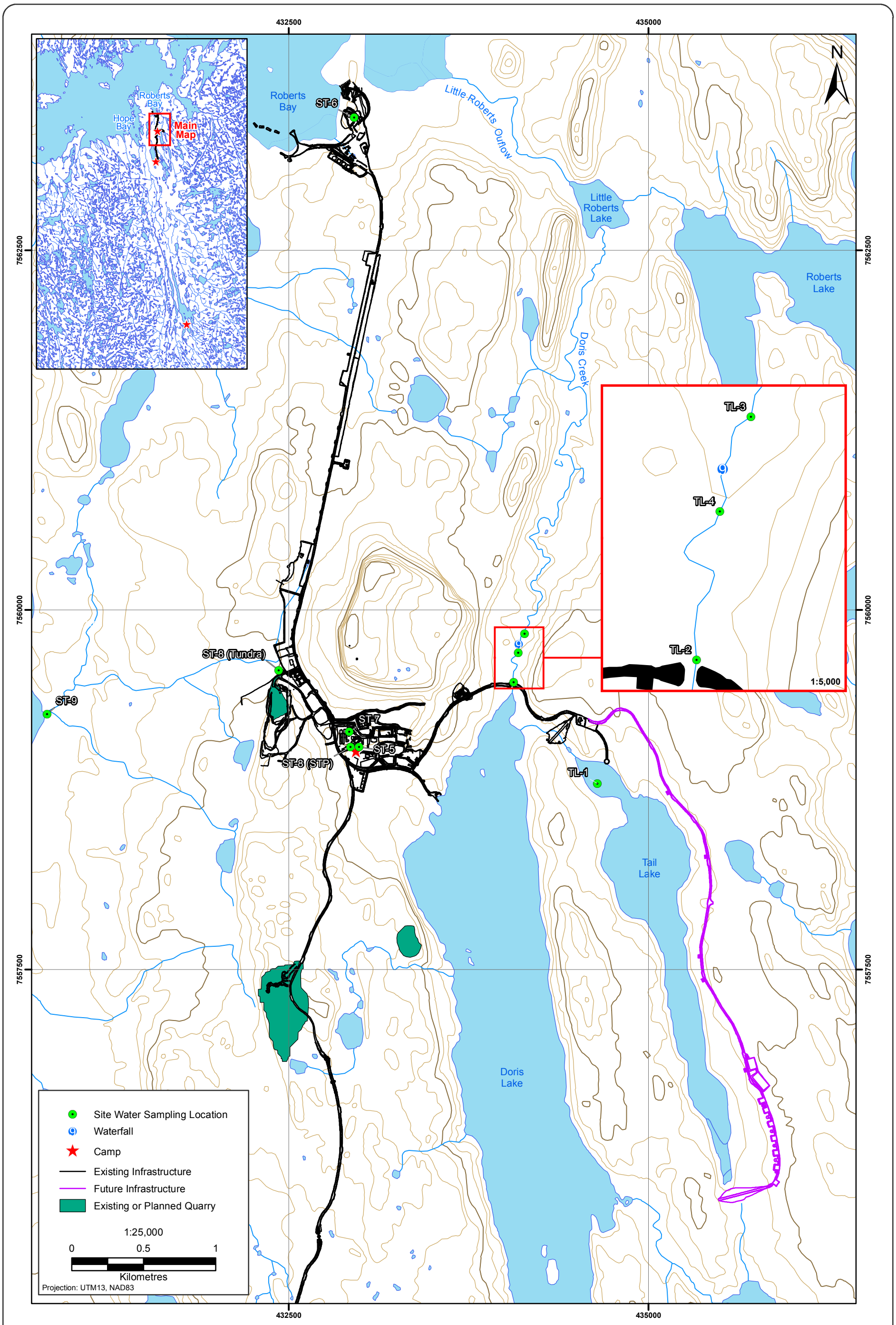

Figure 10.2-1

NEWMONT NORTH AMERICA

Site Water Monitoring Sampling Locations, Doris North Project

Figure 10.2-1

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Table 10.2-2. Monitoring Program for the Reagent and Cyanide Storage Facility Station ST-11, Doris North

Parameter	Discharge Criteria		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)	Construction, Operation, Closure	Care and Maintenance
pH	6.0 – 9.0	9.0	Once before any discharge, daily when discharging onto the tundra	Once before any discharge, weekly when discharging onto the tundra Berm to be breached if compliant in first spring sampling
Total Suspended Solids	15	30		
Total Ammonia -N	2.0	4.0		
Total CN	1.0	2.0		
Total Oil and Grease	5; no visible sheen	10; no visible sheen		
Total Aluminum	1.0	2.0		
Total Arsenic	0.05	0.10		
Total Copper	0.02	0.30		
Total Iron	0.30	0.60		
Total Lead	0.01	0.02		
Total Nickel	0.05	0.10		
Total Zinc	0.01	0.02		
Nitrate and Nitrite	-	-		
Sulphate	-	-		
Volume Discharged	-	-	Daily during discharge	Daily during discharge

There are currently 3 bulk fuel containment berms at the Doris North Project; Doris Camp Bulk Fuel Containment ST-5, Roberts Bay 5 Million Litre Containment ST-6a, and the Roberts Bay Bulk Fuel Containment ST-6b (Figure 10.2-1). The requirements and monitoring frequencies are the same for each of the containments (Table 10.2-3).

Table 10.2-3. Monitoring Program for Bulk Fuel Containments ST-5, ST-6a and ST-6b, Doris North

Parameter	Discharge Criteria		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Concentration in any Grab Sample (mg/L)	Construction, Operations, Closure	Care and Maintenance
pH	6.0 – 9.0	9.0	Once before any discharge, daily when discharging onto the tundra	Once before any discharge, weekly when discharging onto the tundra
Total Suspended Solids	15	30		
Total Oil and Grease	5	10		
Total Lead	0.01	0.02		
Benzene	0.37	-		
Toluene	0.002	-		
Ethyl Benzene	0.090	-		
Discharged Volume	-	-	Daily during discharge	Daily during discharge

HBML submits a 10 day notice to the AANDC Inspector prior to all discharges from containments, and requests permission to use compliant water for dust suppression. Upon receipt of compliant results, HBML then discharges to the tundra or uses the water for dust suppression whenever possible. Where required, HBML collects daily samples during discharge to tundra. HBML reports the water sampling results and total discharged volume in the monthly and annual water licence reports.

Boston

HBML monitors the water quality of Aimaokatalok Lake at the intake point (BOS-1; Figure 10.2-2) for the Boston Camp. The monitoring program is summarized in Table 10.2-4. HBML reports the sample results and water usage in the monthly and annual water licence reports.

Table 10.2-4. Monitoring Program Summary for Aimaokatalok Lake Intake (BOS-1), Boston

Parameter	Project Phase	
	Construction, Operation, Closure	Care and Maintenance
Water Volume (Max 100 m^3 per day)	Daily, when in use	Daily, when in use
BOD_5	Monthly, when in use	Monthly, when in use
Fecal Coliforms		
pH		
Total Suspended Solids		
Total Oil and Grease		

The water from the bulk fuel storage berm (BOS-5) is typically pumped into the containment pond (BOS-2) where samples can be collected and the water can be treated for discharge through the oil-water separator as required. HBML has been requesting permission from the AANDC Inspector to discharge the portal water direct to the tundra if the water is compliant with the BOS-2 discharge criteria (Figure 10.2-2). As such, the containment pond is typically sampled for both the BOS-2 and BOS-5 parameters to determine compliance for discharge. These requirements are presented separately in Tables 10.2-5 and 10.2-6.

Table 10.2-5. Monitoring Program Summary for the Containment Pond and Portal (BOS-2), Boston

Parameter	Discharge Criteria	Project Phase	
	Maximum Allowable Grab Sample Concentration (mg/L)	Construction, Operations, Closure	Care and Maintenance
Benzene	0.37	Prior to discharge, monthly during discharge	Prior to discharge, monthly during discharge
Toluene	0.002		
Ethyl Benzene	0.090		
Total Lead	0.001		
Total Oil and Grease	15, no visible sheen		
Discharged Volume	-	Daily during discharge	Daily during discharge

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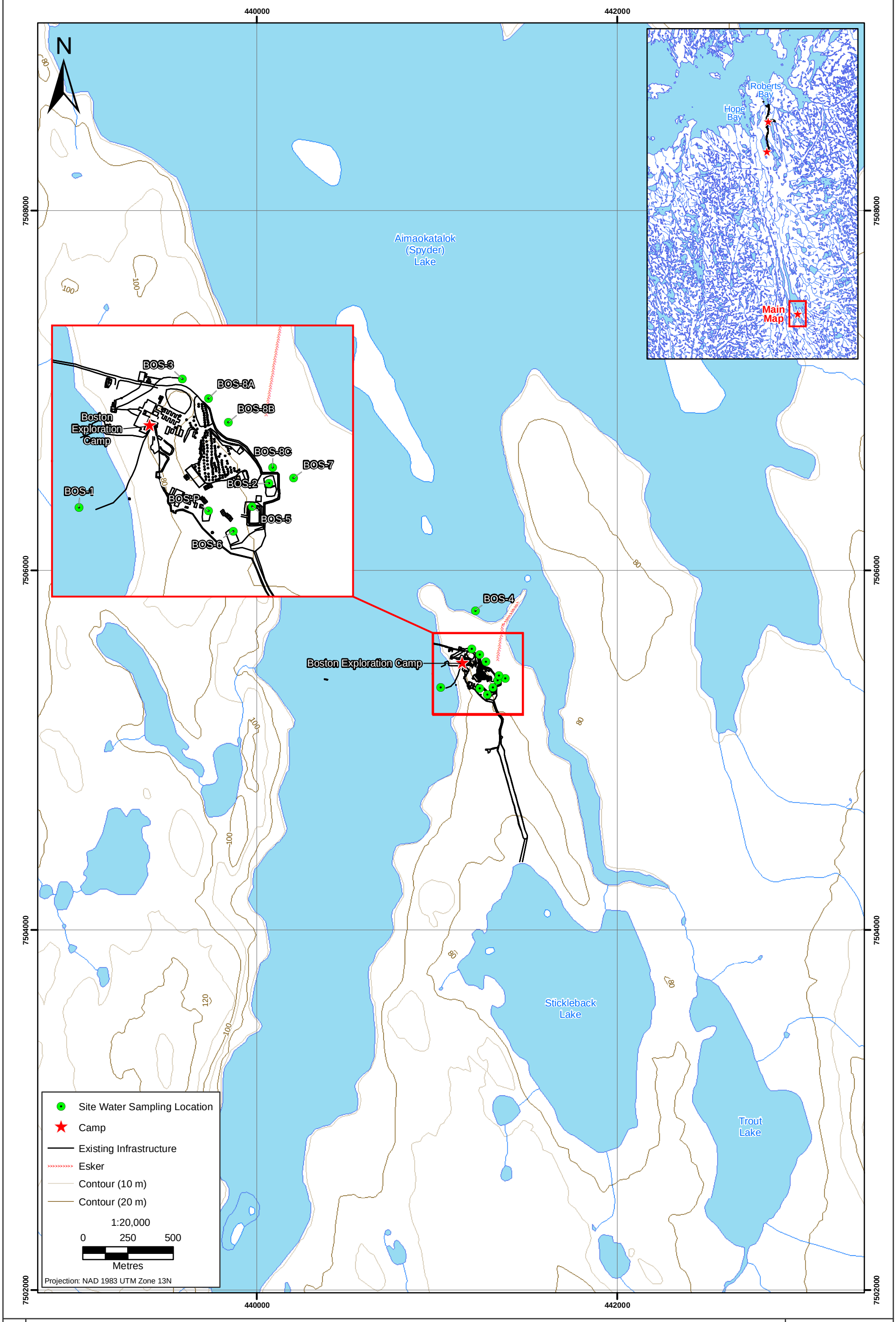

Figure 10.2-2

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Site Water Monitoring Sampling Locations, Boston Project

Figure 10.2-2

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Table 10.2-6. Monitoring Program Summary for the Bulk Fuel Containment Berm (BOS-5), Boston

Parameter	Discharge Criteria	Project Phase	
	Maximum Allowable Grab Sample Concentration (mg/L)	Construction, Operations, Closure	Care and Maintenance
Benzene	0.37	Prior to discharge, monthly during discharge	Prior to discharge, monthly during discharge
Toluene	0.002		
Ethyl Benzene	0.090		
Total Lead	0.001		
Total Oil and Grease	15, no visible sheen		
Total Petroleum Hydrocarbons	-	monthly during discharge	monthly during discharge
Polycyclic Aromatic Hydrocarbons	-		
Xylene			
pH			
Conductivity			
Nitrate, Nitrite			
Total Phenols			
Total Alkalinity			
Total Hardness			
Major ions			
Total Metals Scan (ICP-MS)			
Discharged Volume	-	Daily during discharge	Daily during discharge

When on-ice drilling programs are planned, HBML collects pre- and post-drilling program samples in each lake where drilling is to occur. Generally, HBML selects 5 sampling points near the proposed drilling locations to obtain representative water quality results. HBML monitors the parameters listed in Table 10.2-7. Water usage by drills is recorded daily. Sample results and water usage are reported in the monthly and annual water licence reports.

Table 10.2-7. Monitoring Program Summary for the Under-Ice Pre- and Post-Drilling Sampling, Boston

	Project Phase	
Parameter	Construction, Operation, Closure	Care and Maintenance
pH	Once before and once after the on-ice drilling program	Once before and once after the on-ice drilling program
Total Suspended Solids		
Conductivity		
Total Metals Suite (ICP-MS)		
Total Oil and Grease (not required, but typically collected)		

HBML submits a 10 day notice to the AANDC Inspector prior to all discharges from containments and ponds. Upon receipt of compliant results, HBML then discharges to the tundra. HBML reports the water sampling results and total discharged volume in the monthly and annual water licence reports.

Windy (Regional)

Windy Lake is permitted for use as a domestic water source for the Doris Camp as well as the new Windy Camp that has not yet been constructed. The 2BE-HOP1222 water licence does not include specific parameters to monitor for the water intake point (HOP-1; Figure 10.2-3); therefore, if water is used from Windy Lake, the water will be sampled monthly as per the requirements of the 2BB-BOS1217 water licence (Table 10.2-8). HBML reports the water sample results and water usage in the monthly and annual water licence reports.

Table 10.2-8. Monitoring Program Summary for Windy Lake Intake (HOP-1), Regional Exploration

Parameter	Project Phase	
	Construction, Operation, Closure	Care and Maintenance
Water Volume (Max 63 m^3 per day domestic, 80 m^3 per day drilling and 100 m^3 per day for dust suppression)	Daily	Daily
BOD_5	Monthly, when in use	Monthly, when in use
Fecal Coliforms		
pH		
Total Suspended Solids		
Total Oil and Grease		

When exploration activities are occurring, HBML records the daily water usage for the drills. Pre-and post-drilling samples are collected from under ice in each lake that on-ice drilling will occur. The parameters sampled are presented in Table 10.2-7. HBML reports the water usage and water quality results in the monthly and annual water licence reports.

10.2.2 Care and Maintenance Phase

Doris North

The monitoring parameters for the water intake and bulk fuel containment berms will not change during C&M when the camp is operating. HBML will continue to ensure that the water in the containment berms meets discharge criteria prior to pumping the water out of the berms. However, the frequency of monitoring during discharge of compliant water to tundra may change to once per week due to the limited number of flights that will be available during C&M. Collecting daily samples is not productive when they can only be shipped out once per week. The monitoring program and reporting will continue as summarized in Tables 10.2.-1, 10.2-2 and 10.2-3.

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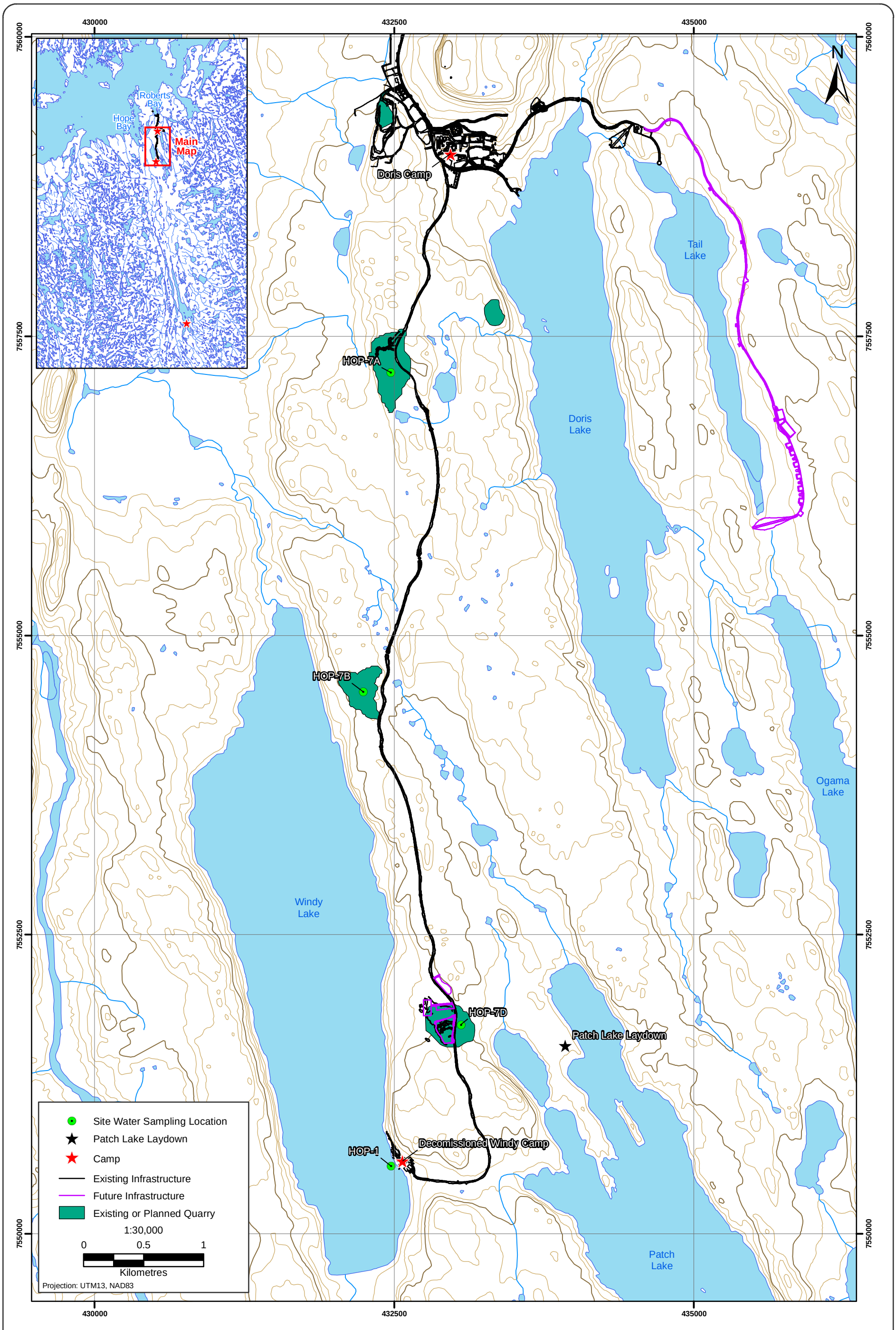

Figure 10.2-3

NEWMONT NORTH AMERICA

Site Water Monitoring Sampling Locations, Regional Exploration Project

Figure 10.2-3

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The ammonium nitrate, which had been stored in seacans in the berm, was shipped offsite in September 2012. As such, HBML will monitor the water quality in the berm in spring 2013. If the water is compliant, the berm will be breached so no further water accumulation occurs in the area. The berm will be reconstructed if ammonium nitrate is shipped back to site in the future.

Boston

The monitoring program for the water intake, containment pond and bulk fuel containment berm will not change during C&M when the camp is operating and the specified activities are taking place. HBML will be present on-site before spring freshet through to October. Drilling activities are not planned for the C&M period, therefore the water usage and under-ice sampling program will not be required. The remainder of the monitoring program and reporting will continue as summarized in section 10.2.2, and if a drilling program is restarted, the monitoring will also follow section 10.2.2.

Windy (Regional)

The monitoring program for the water intake will not change during C&M when the camp is operating and the specified activities are taking place. HBML will be present on-site before spring freshet through to October. Drilling activities are not planned for the C&M period, therefore the water usage and under-ice sampling program will not be required. The remainder of the monitoring program and reporting will continue as summarized in section 10.2.2, and if a drilling program is restarted, the monitoring will also follow section 10.2.2.

10.3 Mitigation Summary

10.3.1 Construction, Operations and Closure Phases

HBML will monitor the daily water usage for all activities to avoid exceeding the permitted water volumes. Whenever possible, HBML will recycle water usage by using compliant water from the berms for dust suppression or other activities.

HBML will remove as much snow as possible from containment areas prior to spring freshet to reduce the volume of water in the berms that must be handled.

10.3.2 Care and Maintenance Phase

HBML will implement the same mitigation measures during C&M.

10.4 Adaptive Management

At Doris North, if water quality in containment berms does not meet the applicable discharge criteria, HBML may either treat the water via the oil-water separator or will discharge to the TIA, if the oil-water separator is not appropriate, or was not able to adequately treat the water for compliant discharge.

At Boston, non-compliant water is held in the containment pond BOS-2, where it can be treated with the oil-water separator. If the water is still not compliant after treatment, HBML will have to continue treating the water until it meets discharge criteria, or hold the water until additional inputs are placed into the pond, at which time sampling and treatment will resume. If the portal water is not compliant, HBML may attempt use of the carbon filter that is included in the oil-water separator, or may choose to leave the water in the portal until additional precipitation inputs have accumulated. HBML cannot discharge all of the water in the portal because the metals tend to concentrate deeper into the decline. As such, HBML only discharges the maximum volume possible each year while remaining in compliance with the discharge criteria for BOS-2.

11. Hydrology Monitoring

11.1 Background and Rationale

The surface water Hydrology Monitoring Program is designed to collect water level data in order to comply with the following regulatory requirements:

Doris North Project Type A Water Licence (2AM-DOH0713):

> Part F. Item 1a: [the Water Management Plan should include] A requirement to continuously monitor Doris Lake levels and outflow during the two (2) years of mining and beyond to confirm water balance model predictions.
>
> Part G. Item 29. The Licensee shall ensure that water within the Tailings Impoundment Area is maintained at an elevation of least 28.3 metres above sea level such that a minimum of four (4) metres of water cover is maintained over the tailings at all times.
>
> Part G. Item 30. The Licensee shall ensure that the flow from the Tailings Impoundment Area into Doris Creek at monitoring station TL-4 does not exceed 10% of the background flow in Doris Creek as measured at monitoring station TL 2 at the time of discharge.
>
> Part G. Item 31. The Licensee shall on a monthly basis, input average monthly water quality, hydrology and climate monitoring data in to the water quality model and perform the following assessment:
>
> > a. Compare the predicted water elevation in the Tailings Impoundment Area to the measured elevations. If the difference between predicted and measured elevations is greater than 0.1 m, then the Licensee shall re-calibrate the volume rating curve;
> >
> > c. Predict the future discharge schedule and compare this prediction to the previously predicted discharge schedule. If necessary identify adaptive management strategies.
>
> Part J. Item 1. The Licensee shall install and maintain flow meters or other such devices, or implement suitable methods required for the measuring of water use and Effluent discharge volumes, to be operated and maintained to the satisfaction of an Inspector.

Part J. Item 2: The Licensee shall install appropriate instrumentation in Doris Creek at Monitoring Station TL 2, to monitor flow when ice conditions allow for such measurements to be taken, on a real time and continuous basis.

Part J. Item 3. The Licensee shall undertake the Water Monitoring Program detailed in the Tables of Schedule J [see Table 11.1-2 below; sites TL 2 and TL 3]

Part J. Item 5. The Licensee, in consultation with an Inspector, shall establish the locations and GPS coordinates for all monitoring stations referred to in Schedule J.

Part J. Item 6. The Licensee shall install and maintain, to the satisfaction of an Inspector, signs that identify monitoring stations. The signs shall be posted in English, Inuktitut and Inuinnaqtun.

Schedule B. Item 7. [The Annual Report will include] A comparison of the flows (m3/day) at monitoring stations TL 1, TL 2, TL 3, and TL 4.

Doris North Project Certificate (NIRB No. 003):

Appendix C: Final Hearing Report Appendix B, Additional Comments, DFO, Item 2: HBML will monitor stage and discharge in Doris Outflow both upstream and downstream of the decant discharge point to provide information that can be used in assessing the accuracy of the impact predictions relating to fish habitat downstream.

In addition to the hydrometric monitoring required under the Project Certificate and the Type A Water Licence, monitoring is being conducted to support fisheries authorization work including:

- Fisheries Authorization NU-02-0117 Roberts Bay Jetty – fisheries monitoring requires a tidal gauge in Roberts Bay; and
- Fisheries Authorization NU-02-0117.3 North Dam (Tail Outflow) and MMER Schedule 2 Listing of Tail Lake – fisheries monitoring requires hydrometric monitoring of Roberts Lake Outflow and Windy Lake Outflow.

There are no hydrology monitoring requirements

11.2 Monitoring Program Summary

This section summarizes the hydrology monitoring program that is conducted for the Doris North Project. For additional details on the hydrology monitoring program, refer to the Doris North Gold Mine Project: Hydrology Compliance Report, 2011 (Rescan 2011b).

11.2.1 Construction, Operations and Closure Phases

As per the water licence requirements, HBML has installed hydrometric stations, consisting of a pressure transducer with a data logger, in Tail and Doris lakes to record continuous water level measurements year round (Table 11.2-1). These stations are downloaded several times during open water season, and the water level is verified during those station visits. These stations are operated during all phases of the project.

Table 11.2-1. Summary of Hydrology Monitoring Components and Frequency During all Project Phases, Doris North

Location	Project Phase	
	Construction, Operation, Closure	Care and Maintenance
Tail Lake Water Level	Continuous monitoring of water levels	Continuous monitoring of water levels
Doris Lake Water Level	Continuous monitoring of water levels	Continuous monitoring of water levels
Doris Creek, upstream location (TL-2) – Water Level and Flow (Discharge)	Continuous monitoring of water levels during TIA discharge Periodic flow measurements during TIA discharge	Continuous monitoring of water levels during TIA discharge Periodic flow measurements during TIA discharge
Doris Creek, downstream location (TL-3) – Water Level and Flow (Discharge)	Periodic flow measurements during TIA discharge	Periodic flow measurements during TIA discharge
Tailings Effluent Discharge Point (TL-4) – Discharge Volume (Also, see Chapter 13 Site Water Monitoring)	Continuous flow and cumulative volume measurements during TIA discharge Also, see Chapter 13 Site Water Monitoring	Continuous flow and cumulative volume measurements during TIA discharge Also, see Chapter 13 Site Water Monitoring
Roberts Lake Outflow – Water Level and Flow (Discharge)	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years
Windy Lake and Outflow – Water Level and Flow (Discharge)	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years	Continuous monitoring of water levels – NNLP monitoring years Periodic flow measurements – summer, NNLP monitoring years
Tide Gauge –Roberts Bay – Water Level	Continuous monitoring of water levels during bathymetric surveys	Continuous monitoring of water levels during bathymetric surveys
Doris Lake – Evaporation (see Chapter 2 Air Quality)	Continuous – summer (see Chapter 2 Air Quality)	Continuous – summer (see Chapter 2 Air Quality)

In addition, the water licence requires HBML to monitor the stream discharge in Doris Creek as part of the tailings effluent discharge monitoring requirements (Table 11.2-1). HBML is only permitted to discharge effluent at a rate that does not increase the Doris Outflow stream discharge by more than 10% (i.e., the stream discharge volume downstream of the TL-4 effluent discharge point can be a maximum of 110% of the discharge volume immediately upstream of TL-4). Although HBML has not begun to process ore and therefore has not deposited tailings into the Tail Lake TIA, HBML has begun dewatering Tail Lake to maintain the baseline water level from prior to installation of the North Dam. As such, HBML seasonally installs a real-time hydrometric station at TL-2 (Figure 10.2-1) to calculate the daily discharge of Doris Creek which is then used to calculate the permitted daily effluent discharge volume. This station will be operated during the open water season in years where the TIA will be dewatered, regardless of whether tailings have been deposited into the TIA.

The hydrometric station installed at TL-3 (Figure 10.2-1) is operated during open water season to confirm the flow in Doris Creek downstream of the effluent discharge point, and TL-4 (Figure 10.2-1) cumulative discharge volume is recorded daily during TIA dewatering activities (Table 11.2-1).

As part of the No Net Loss Plan (NNLP) monitoring programs for the Fisheries Authorizations received for the construction of the North Dam across Tail Outflow and the Metal Mining Effluent (MMER) Regulations Schedule 2 listing of Tail Lake as a TIA, HBML monitors the stream discharge in Windy Lake and Roberts Outflow. As per the approved NNLP (Golder 2007, Rescan 2010a and 2010b), Windy Lake is the site where the 6 habitat compensation shoals were constructed, and Roberts Outflow boulder garden, near Roberts Lake, was modified to improve fish passage. The hydrometric monitoring is conducted as supporting information for the biological monitoring programs (see Chapter 18 Fish Monitoring). The hydrometric stations will be installed and monitored during the years where biological monitoring is required as described in the NNLP and Fisheries Authorization NU-02-117.3.

One of the requirements of the Roberts Bay Jetty Fisheries Authorization NU-02-117 is regular bathymetric surveys to assess changes in sediment transport as a result of the Jetty construction. To accurately collect bathymetric data in Roberts Bay, a tidal gauge must be installed to record the continuous water level in the bay. The tidal data can also be used as supporting data for the biological monitoring program that are conducted for the compensation habitat shoals that were constructed west of the jetty. In years where biological or bathymetric monitoring is required, the tidal gauge will be installed and monitored.

In all situations where HBML installed a hydrometric station, the station will consist of, at minimum, a calibrated pressure transducer connected to an automated data logger. The data loggers are programmed to record water levels at 10 minute intervals. At TL-2, a satellite uplink is also connected to allow remote real-time data collection. To verify the data being logged at the hydrometric station, HBML completed frequent (i.e., 4 times per year) manual flow measurements and calculates instantaneous discharge at each of the stream stations. Each hydrometric station is associated with a benchmark installed on shore, which allows HBML to verify the water level measurements using standard surveying techniques (e.g., rod and level).

An annual report is compiled for the hydrology data collected by HBML's environmental consultant. The TL-2 and TL-4 data are included in the monthly and annual water licence reports when dewatering activities are occurring.

11.2.2 Care and Maintenance Phase

The hydrology monitoring program is not affected by C&M. As summarized in Table 11.2-1, HBML will continue to collect the required hydrology data as required for each project activity. In years where HBML will be dewatering the TIA, HBML will comply with the hydrology monitoring requirements for TL-2, TL-3, and TL-4. Also, in years where the NNLP biological monitoring programs are required, HBML will continue to monitor the water level in Windy Lake and Roberts Bay, and discharge in Windy and Roberts outflows.

HBML will continue to report the monitoring data for TL-2 and TL-4 in the monthly and annual water licence reports when dewatering activities occur, and HBML's environmental consultant will also be required to continue producing an annual monitoring report for the data they have collected on behalf of HBML.

11.3 Mitigation Summary

11.3.1 Construction, Operations and Closure Phases

HBML is also permitted to discharge effluent from the TIA at a maximum rate of 10% of the background Doris Creek discharge volume. To ensure that this permitted daily discharge volume is not exceeded, HBML will:

- Calculate daily discharge for Doris Creek based on real-time data;
- Regulate pump rates to maintain a discharge rate below the permitted discharge volume;
- Begin discharge as early as possible during freshet to take advantage of high flows; and
- Remove as much snow as possible from berms and camp pads, and treat berm water where required and possible, to reduce the volume of contact water that may be required to be transferred into the TIA.

Although the hydrology program does not require specific mitigation measures for water usage, HBML has implemented the following commitments to conserve water to the extent possible:

- Recycling water in the ore processing facility and underground mining operation;
- Installing low flow toilets in the facilities;
- Using reject water from the reverse osmosis system in the camp potable water system for use in portable washcars, drilling activities and dust suppression; and
- Use of EK-35 on high traffic roads, the airstrip and laydown pads to reduce the requirement for water as a dust suppressant.

11.3.2 Care and Maintenance Phase

The mitigation measures identified in section 11.3.1 to maintain compliance during TIA discharge activities and reduce freshwater usage will not change during C&M.

11.4 Adaptive Management

Through monitoring daily water discharge from the TIA, HBML can quickly respond to potential issues that may result in exceedences of discharge volumes and reduce pumping rates as required.

12. Incinerator Management Plan

12.1 Background and Rationale

HBML currently operates two incinerators under the Hope Bay licences; the Doris North incinerator operating under 2AM-DOH0713, and the Boston incinerator operating under 2BB-HOP1222.

The Doris North water licence has the following conditions relating to the operation of the incinerator:

> Part G. Item 5. The Licensee shall dispose of all food waste in an incinerator designed for this purpose.
>
> Part G. Item 6. The Licensee shall ensure that any on-site incinerator meets the requirements of the Canada-Wide Standards for Dioxins and Furans and Canada-Wide Standards for Mercury emissions.
>
> Part G. Item 7. The Licensee shall submit to the Board for review by May 1, 2008 an Incineration Management Plan in conjunction with Part G, Item 9.
>
> Part G. Item 9. The Licensee shall submit to the Board for review by May 1, 2008, a revised Landfill Management Plan. The Plan shall consider the following:
>
> > b. Incineration technology selected;
> >
> > g. Emission measurements;
> >
> > h. Incinerator Ash disposal;
> >
> > j. Monitoring, characterization, and disposal of incinerator ash

The Boston water licence has the following conditions relating to the operation of the incinerator:

Part D. Item 3. The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.

The Regional Exploration licence 2BE-HOP1222 also contains conditions relating to incinerator operation, but HBML does not currently have an incinerator operating under that licence so those conditions are not discussed in this plan. Burnable waste collected during clean-up and reclamation activities at Windy Camp and Patch Laydown will be incinerated in the Doris North Project incinerators. The volume of waste handled from Windy and Patch will be tracked separately from the waste handled from the Doris North Project.

12.2 Operations Plan and Monitoring Program Summary

This section provides a summary of the incinerator management plan and documentation that is kept. For detailed information, refer to the Hope Bay Project Incinerator Management Plan Rev 1.1 (HBML 2012d).

12.2.1 Construction, Operations and Closure Phases

A dual chamber incinerator, Model CY-100-CA-D is currently situated in Roberts Bay next to the interim Waste Management Facility, operating under the Doris North water licence. The Boston camp is currently operating a small forced air incinerator Model CY-20-20-FA-D.

In 2011, HBML implemented an incinerator training program, initially developed and presented by the Ketek incinerator manufacturer. This program ensures that operators understand proper batch loading, pre-operational inspections, and monitoring the chamber and stack temperatures.

HBML has implemented a strict source waste sorting program, and limits the quantity of disposable packaging used on-site to remove the majority of the household plastic, glass and aluminum from the incinerator waste stream. HBML's incinerator operators weigh and sort the waste into proper batches of wet and dry materials to ensure a clean, hot burn that reduces production of dioxins and furans in the stack emissions. General classes of wastes burned in the incinerator include:

- Food waste, not including kitchen grease;
- Pressed sewage sludge; and
- Paper waste.

If there is a large amount of wet waste to be burned and insufficient dry domestic or paper waste available for the batch, HBML will also include:

- Very small quantities of oily rags and absorbents; and
- Very small quantities of wood or cardboard.

HBML does not include large amounts of wood, cardboard or oily rags in any incinerator batches because it increases the temperature too high and will damage the stack spark arrestor.

The CY-100 incinerator at Roberts Bay can handle approximately 500 kg of waste per batch. It is important to batch loads with the following wet to dry waste ratio to ensure a complete burn:

55% Food Waste (wet)

22% Sewage Sludge (very wet)

23% Paper waste (dry)

If sewage sludge is not being burned, the ratio can be adjusted for the other types to keep a similar wet:dry ratio. Small quantities of oily rags, wood and cardboard can also be incorporated as required.

The CY-20-20 incinerator at Boston can handle approximately 64 kg using the same wet:dry ratio.

HBML is currently required to conduct annual incinerator stack emissions testing as part of the Doris 2AM-DOH0713 water licence. A summary of the stack testing program is provided in the air quality chapter above (see Section 2.2.1). HBML has requested that Environment Canada approve a reduced sampling frequency; however, until otherwise approved by Environment Canada and the NWB, the incinerator stack emissions testing program will continue to be completed annually (see Section 2.2.1).

The incinerator operation sequence is as follows:

1. Clean ash from previous cycle
2. Pre-operational inspection
3. Start-up – warms chambers, operational checks
4. Waste batch loading
5. Burn cycle
6. Cool down

HBML can safely complete a maximum of 3 burn cycles per day, assuming that the final batch will be monitored by the crews only until the burn cycle is in progress, and the remainder of the burn cycle and cool down will occur after the crew is off-shift for the evening.

HBML tracks the waste volumes incinerated and ash volumes removed. Composite ash samples are collected to characterize the material for disposal in approved landfills. The parameters analysed include:

- Leachable metals
- Leachable mercury
- Leachable benzene, toluene, xylenes, and ethylbenzene
- Paint filter
- Flash point

12.2.2 Care and Maintenance Phase

The incinerator operation and monitoring will not change during C&M. HBML will continue to track waste and ash volumes, batch loading as per the manufacturer's instructions, and characterize ash.

13. Interim Non-hazardous Waste Management Plan

13.1 Background and Rationale

Waste management at Hope Bay is regulated by the 3 water licences held for the projects. The Doris North Type A Water Licence (2AM-DOH0713) specifies the following conditions related to management of non-hazardous wastes:

> Part G. Item 5.The Licensee shall dispose of all food waste in an incinerator designed for this purpose.
>
> Part G. Item 8. The Licensee is restricted to the open burning of paper products, paperboard packing and untreated wood waste in accordance with the Government of Nunavut policy Municipal Solid Wastes Suitable for Open Burning.
>
> Part G. Item 9. The Licensee shall submit to the Board for review by May 1, 2008, a revised Landfill Management Plan. The Plan shall consider the following:
>
> > a. Recycling/segregation waste program;
> >
> > b. Incineration technology selected;
> >
> > c. Waste audit – amount and types of wastes to be incinerated or otherwise disposed;
> >
> > d. Consolidation of wastes;
> >
> > e. Operational and maintenance records;
> >
> > f. Operator Training;
>
> Part G. Item 10. The Licensee is authorized to dispose of and contain all non-hazardous solid wastes at the Landfill or as otherwise approved by the Board.
>
> Part G. Item 12 The Licensee shall back haul and dispose of all hazardous wastes generated through the course of the operation at an approved waste disposal site.
>
> Part G. Item 13. The Licensee shall maintain records of all waste backhauled and confirmation of proper disposal. These records shall be made available to an Inspector upon request.
>
> Schedule D. Item 1. The Construction Monitoring Report referred to in Part D, Item 8 shall include the following:
>
> > g. The construction monitoring report shall include monitoring of the waste management practices employed by their contractors and employees this includes food waste, hazardous waste, and non-hazardous waste.

The Boston Type B Water Licence (2BB-BOS1217) specifies the following conditions for management of non-hazardous wastes:

Part D. Item 2. The Licensee shall not practice open burning or on-site land filling of domestic waste, unless otherwise approved by the Board in writing.

Part D. Item 3. The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.

Part D. Item 4. The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.

Part D. Item 5. The Licensee shall provide to the Board, documented authorization from the receiving community, prior to the backhauling of any non-hazardous waste for disposal at that community.

Part D. Item 6. The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation at an approved waste disposal site.

Part D. Item 7. The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector upon request.

The Regional Exploration Type B Water Licence (2BE-HOP1222) specifies the following conditions for management of non-hazardous wastes:

Part D. Item 2. The Licensee shall not practice open burning or on-site land filling of domestic waste, unless otherwise approved by the Board in writing.

Part D. Item 3. The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.

Part D. Item 4. The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.

Part D. Item 5. The Licensee shall provide to the Board, documented authorization from the receiving community, prior to the backhauling of any non-hazardous waste for disposal at that community.

Part D. Item 6. The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation at an approved waste disposal site.

Part D. Item 7. The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector upon request.

HBML does not have a landfill anywhere at the Hope Bay Project; therefore, the Landfill Management Plan is not appropriate for discussing waste handling at Hope Bay.

The Doris Type A licence references requirements for an incineration, landfill and hazardous waste plan as separate items. The two type B licences do not have requirements for submission of waste management plans, only that the conditions in the licences be met. HBML has merged waste management under all of the licences into the Incineration Management Plan (Section 12), Interim Non-Hazardous Waste Management Plan (instead of a landfill plan), and a Hazardous Waste Management Plan (section 14). These plans are applicable to all three water licences, as all waste on-site is handled in the same manner, and backhauled waste, regardless of the source location, must be transported to the Roberts Bay Waste Management Facility for packaging and shipment offsite.

13.2 Operation Plan and Monitoring Program Summary

This section provides a summary of the Hope Bay Interim Non-Hazardous Waste Management Plan Rev 1.1 (HBML 2012e). For detailed information, refer to the full plan.

13.2.1 Construction, Operations and Closure Phases

HBML does not have a landfill for the Hope Bay Project. As such, all non-burnable waste must be shipped offsite for disposal. Waste segregation is a core component of waste management and this process will be continually refined and improved upon going forward. The best method of segregation is at the source. HBML's waste sorting process is an effort to eliminate mixed industrial waste and mixtures of industrial and domestic waste from being handled at the waste management facility. In addition, the waste sorting policy includes segregation of domestic waste to reduce the introduction of materials into the incinerator which may reduce air quality, or negatively influence incinerator efficiency. Currently, non-hazardous wastes are sorted and segregated into the following categories:

- Plastic (domestic and construction related);
- Burnable wood;
- Non-burnable woods (painted or treated);
- Food cans and containers;
- Cardboard;
- Cooking oil;
- Scrap steel and metal;
- Glass;
- Electrical;
- Hoses and equipment parts that are no longer in use;
- Tires;

- Sewage sludge (only if handled on-site, offsite shipments considered Dangerous Goods);
- Oily rags and absorbents (if contaminated with fuel, then classified as Dangerous Goods);
- Hydrocarbon contaminated soils that can be placed in the landfarm;
- Incinerator and burn pan ash; and
- Oily water.

All Hope Bay personnel are trained in proper waste sorting procedures. The waste management facility personnel are provided with additional training for handling and shipping hazardous wastes, incinerator operation, and specialized equipment operation.

All non-hazardous wastes requiring transport off-site must be in appropriate containers specific to the waste stream and properly secured to ensure that no leaks or spills occur during transport. Non-hazardous wastes are not regulated so they can be shipped via aircraft or barge using a specialized Bill of Lading.

The waste management personnel monitor the waste management yard, and are responsible for ensuring that waste received has been properly sorted. These personnel package and label waste for off-site shipment, and operate the incinerator and burn pan.

Burnable waste is handled in the incinerator or the burn pan, as appropriate. The ash that is generated is characterized as summarized in section 12, and is shipped offsite for disposal.

As a result of issues previously noted with unauthorized deposits of non-burnable materials in the burn pan, HBML installed locking gates on the access road to the burn pan and landfarm area. HBML also created a log sheet and inspection requirement for the waste management personnel to ensure that the burn pan has been checked for non-burnable wastes prior to initiating a burn. With the rare exception, the waste management personnel physically load the burn pan themselves to further ensure that inappropriate materials are not burned.

Contaminated soils that are appropriate for remediation in the landfarm are handled as per the Landfarm Management Plan (section 6).

HBML ships all non-burnable or non-landfarmable waste to KBL Environmental, a professional waste management company that is authorized to receive and handle hazardous wastes. KBL is contracted to facilitate proper non-hazardous waste disposal at non-hazardous waste disposal or recycling facilities. KBL provides ‘certificates of disposal’ for all waste transferred to their facility to provide HBML with reassurance that the wastes were disposed of at appropriate facilities.

HBML is required to maintain records of all waste backhauled. HBML tracks the source of the received waste (i.e., Doris, Boston, Windy, Patch) to maintain records of the waste handled under each licence. Management of the incinerator and landfarm are detailed in the individual management plans, and are summarized in Sections 6 and 12 of this document. HBML provides a summary of the waste handled in the annual KIA land lease reports, and the NWB annual reports.

13.2.2 Care and Maintenance Phase

The waste management procedures will not change at Hope Bay during C&M. Waste will continue to be sorted, handled in the incinerator, or shipped offsite as appropriate. Waste from Boston, Windy and Patch will continue to be handled at the Roberts Bay waste management facility, with the exception of burnable waste at Boston that can be handled in the incinerator. HBML will continue to track the waste received from all sources, and the shipment of those materials offsite. This information is provided in the annual KIA land lease reports, and the NWB annual reports.

14. Hazardous Waste Management Plan

14.1 Background and Rationale

The Hope Bay Project Hazardous Waste Management Plan has been prepared by HBML in accordance with Section 33 of the NIRB Project Certificate (003) and in compliance with Water License No. 2AM-DOH0713, 2BE-HOP1222 and 2BB-BOS1217.

The NIRB Project Certificate requirements for the storage of fuel and hazardous material are:

> 33. MHBL shall ensure that areas used to store fuel of hazardous materials are contained using the safest methods practically available.

The waste management requirements outlined in the Doris North Type A Water Licence (2AM-DOH0713) are:

> Part G, Item 11: The Licensee shall submit to the Board for review by June 1, 2008, a revised Hazardous Waste Management Plan. The handling and disposal of wood crates used in the shipment of sodium cyanide shall be included in the Plan.
>
> Part G, Item 12: The Licensee shall back haul and dispose of all hazardous wastes generated through the course of the operation at an approved waste disposal site; and
>
> Part G, Item 13: The Licensee shall maintain records of all waste backhauled and confirmation of proper disposal. These records shall be made available to an Inspector upon request.

The waste management requirements outlined in the Boston Type B Water Licence (2BB-BOS1217) are:

> Part D, Item 6: The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation at an approved waste disposal site; and
>
> Part D, Item 7: The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector upon request.

And, finally, the waste management requirements outlined in the Regional Exploration Type B Water Licence (2BE-HOP1222) states:

Part D, Item 6: The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation at an approved waste disposal site; and

Part D, Item 7: The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector upon request.

This plan has been developed to address the requirements of the three water licenses and the project certificate to ensure that the Hope Bay Project has a consistent plan and that all Hope Bay Belt activities operate in a uniform and integrated manner with regard to the collection, handling, segregation, storage, transport, and disposal of all hazardous wastes. All wastes, hazardous or non-hazardous, from all project areas (Doris, Boston, Patch and Windy) are handled at the Roberts Bay Waste Management Facility for packaging, labelling and manifesting for off-site disposal.

14.2 Monitoring Program Summary

This section provides a summary of the Hope Bay Hazardous Waste Management Plan Rev 1.1 (HBML 2012f). For detailed information, refer to the full plan.

14.2.1 Construction, Operations and Closure Phases

Personnel working in the waste management facility are provided certified training courses and hands on training under direct supervision of qualified staff. This ensures that all personnel are aware of the regulations; safety requirements, Standard Operating Procedures and personal protective equipment required when handling waste.

Contractors and employees with specific or specialized requirements for on-site waste management for their respective work areas are provided with written instruction. This ensures compliance in contractor yards as well as proper packaging, sorting and labeling of waste prior to receipt at the waste management facility.

Hope Bay is registered as a Hazardous Waste Generator with the GN DoE (NUG 1000032) as well as a Hazardous Waste Storage Facility (NUF 400005). Although the Hope Bay Project does not consider the onsite storage of hazardous waste an acceptable long term waste management solution, there are certain waste streams that cannot be transported on aircraft for backhauls and must be stored for transport during the barge season.

Hazardous wastes are stored in appropriate, sturdy containers. Liquid wastes are stored in lined facilities, or lined seacans. The container storage area is inspected regularly, and damaged or leaking containers are immediately repackaged. The containers are labeled with the contents as per Workplace Hazardous Materials Inventory System requirements, and the Material Safety Data Sheets information is available in the waste management office.

HBML has a waste oil burner located at the Roberts Bay Waste Management Facility. HBML has implemented a waste oil characterization program, which involves collecting a composite sample from a stockpile of waste containers. The oil is analyzed for:

- Polychlorinated Biphenols
- Total Organic Halogens (Chlorine)

- Cadmium
- Chromium
- Metals (Lead)
- Flash Point (closed cup)

All hazardous waste transported off site for recycling or disposal must be packaged and transported according to the specifications provided in the Nunavut Environmental Guideline for General Management of Hazardous Waste, the Northwest Territories Guideline for General Management of Hazardous Waste in the NWT, the federal Transportation of Dangerous Goods Regulations, the International Air Transportation Association (IATA), the International Maritime Dangerous Goods (IMDG), and the Interprovincial Movement of Hazardous Wastes Regulations to meet specific requirements for packaging and labeling (i.e. placards, limitations, etc.) dependent on the mode of transportation. Only personnel trained, certified and competent in listed regulations for shipment of hazardous waste on an aircraft or barge (IATA/IMDG) can complete designated shipping documents.

Federal Interprovincial Movement of Hazardous Wastes Movement Documents must accompany all hazardous waste in transit regardless of the means of transport, and copies of the forms must be distributed to the waste generator, waste carriers, and waste disposal companies as indicated on the carbon copy form.

HBML ships all hazardous waste to KBL Environmental, a professional waste management company that is authorized to receive and handle hazardous wastes. KBL is contracted to facilitate proper hazardous waste disposal at hazardous waste disposal or recycling facilities. KBL provides ‘certificates of disposal’ for all waste transferred to their facility to provide HBML with reassurance that the wastes were disposed of at appropriate facilities.

“Certificates of Disposal” from KBL are stored in the waste management facility, along with the waste tracking sheets and a copy of the Interprovincial Movement of Hazardous Waste Movement Documents. These copies are stored for a period of at least five years.

HBML is required to maintain records of all waste backhauled and records of confirmation of proper management. HBML maintains an accurate record of all hazardous waste materials generated on site and all materials transported off site. That record, at a minimum, includes:

- A list of the materials being stored/transported;
- The volume of each material being stored/transported;
- The type of container used to store the material;
- The location of the stored material; and
- MSDS sheets for all waste handled by personnel to ensure safe handling and procedures are followed.

Electronic files are kept of all wastes transported off site. A summary of this information is prepared annually and is provided in the NIRB, NWB, and KIA annual reports.

14.2.2 Care and Maintenance Phase

The hazardous waste management process will not change during C&M. All handling, shipping, and documentation will continue as described in the Hazardous Waste Management Plan and as summarized in section 14.2.1. Waste oil characterization will continue for oil that is to be used in the waste oil burner. The waste summaries will continue to be reported in the annual regulatory reports.

15. Tailings and Site Geotechnical Monitoring

15.1 Background and Rationale

The following regulatory requirements relate to site geotechnical monitoring and tailings impoundment area monitoring (excluding water monitoring requirements):

The Doris North Project Certificate (NIRB No. 003) has the following commitments relating to geotechnical thermal monitoring:

> Appendix A: Addendum: EC. Item 1. HBML has committed to monitoring of permafrost in the vicinity of the North and South Dams, monitoring thermistors as long as they are operational, and monitoring seepage conditions to ensure design criteria are met. These monitoring measures will be further defined in the regulatory phase.
>
> Appendix A: Permafrost. Item 1. Additional thermistors will be installed during construction.
>
> Appendix A: Permafrost. Item 2. Reading of these thermistors will be included in routine site monitoring programs to ensure that the condition of the permafrost in close proximity to the key mine activity centres is being monitored to ensure that the permafrost integrity is being maintained through the planned design and mitigation strategies.

The Doris North Project Type A Water Licence (2AM-DOH0713) has the following conditions relating to geotechnical inspections and Tailings facility inspections:

> Part F. Item 4. The Licensee shall carry out regular inspections of all water management structures during periods of flow (rock drains, culverts, sedimentation and pollution control ponds and associated diversion berms, reagent and cyanide storage facility sumps, and sedimentation control berm at the overburden dump) and the records be kept for review upon request of an Inspector. More frequent inspections may be required at the request of an Inspector
>
> Part G. Item 2. The Licensee shall ensure that all land applied discharges are performed in a manner that prevents erosion at the point of discharge and downstream.
>
> Part J. Item 14. The Licensee shall undertake the Thermal Monitoring Program detailed in Table 3 of Schedule J.
>
> Part J. Item 15. The Licensee shall continue to monitor thermistors located between the Tailings Impoundment Area and Doris Lake and between Doris Lake and the underground workings. The monitoring shall be consistent with the baseline thermal monitoring program and shall be included in Table 3 of Schedule J.

Part J. Item 16. The Licensee shall install additional thermistors to monitor rock temperatures surrounding the underground mine openings, particularly in the pillar adjacent to the Doris Lake Talik. These thermistors shall be added to Table 3 of Schedule J and shall be monitored on a monthly basis during operations and closure.

Part J. Item 18. "The Licensee shall ensure that a geotechnical inspection is carried out annually between July and September by a Geotechnical Engineer. The inspection shall be conducted in accordance with the Canadian Dam Safety Guidelines where applicable and take into account all major earthworks, including the following:

a. North and South Dams;

b. Geotechnical instrumentation and associated monitoring data;

c. Tailings Impoundment Area shoreline and erosion strip survey monitoring results;

d. Emergency Dump Catch Basins;

e. All weather access roads;

f. Roberts Bay Jetty;

g. Landfill;

h. Landfarm;

i. Fuel Storage and Containment Facilities at the Plant Site and Roberts Bay site;

j. Sedimentation Pond;

k. Pollution control Pond;

l. Sumps;

m. Underground mine openings;

n. Groundwater conditions underground; and

o. Rock temperature measurements and groundwater inflow in the underground mine workings.

Part J. Item 19. The Licensee shall submit to the Board within sixty (60) days of completion of the geotechnical inspection, the Geotechnical Engineer's inspection report. The report shall include a cover letter from the Licensee outlining an implementation plan addressing each of the Geotechnical Engineer's recommendations.

The Doris North Project Type A Water Licence (2AM-DOH0713) has the following conditions relating to the Tailings Management Plan:

Part G. Item 23. The Licensee shall submit to the Board for review by September 1, 2008, a revised Tailings Management Plan. The Plan shall include Shoreline Erosion Protection Adaptive Management strategies for

monitoring and control. [HBML subsequently submitted a notice to the NWB that this plan will be submitted 6 months before tailings begin to be placed in the TIA.]

Part G. Item 24. The Licensee shall operate and maintain the TIA to engineering standards such that:

a. The Licensee shall maintain a minimum freeboard limit of one (1) meter below the top of the frozen core of the North and South Dams or as recommended by a Geotechnical Engineer;

b. Implement contingency measures where necessary to prevent overtopping of the North Dam;

c. Implement the Shoreline Erosion Protection and Adaptive Management strategies as required;

d. The Licensee shall collect and return seepage from the TIA, as determined by monitoring and follow-up water quality analyses;

e. The Licensee shall carry out at a minimum, weekly inspections to identify and remediate where necessary, areas of concern including issues of seepage, cracking, and ponding for all structures associated with the TIA including the North and South Dams, Emergency Dump Catch Basins, pipeline(s), pumps, mill tailings discharge points and other associated structures. The records shall be kept for review upon request of an Inspector;

f. The Licensee shall consult the Geotechnical Engineer when significant issues associated with the TIA are observed and implement the Engineer's recommendations as necessary;

h. An annual Geotechnical inspection shall be carried out in accordance with Part J, Item 19;

i. The Licensee shall, during operations, conduct a bathymetric survey of Tail Lake on an annual basis during summer, to facilitate tailings deposition management;

j. The Licensee shall, during construction, operations and closure, conduct a daily visual assessment of suspended sediment in the TIA;

k. The Licensee shall perform more frequent inspection of the facilities at the request of an Inspector; and

m. The Licensee shall provide at least ten (10) days written notice to an Inspector prior to any planned discharges from the TIA to Doris Creek.

The Boston Type B 2BB-BOS1217 Water licence requires:

Part D. Item 17. An inspection of the earthworks, geological regime, and the hydrological regime of the Project is to be carried out annually during the summer by a Geotechnical Engineer. The Geotechnical Engineer's report shall be submitted to the Board within sixty (60) days of the inspection, with a covering letter from the Licensee outlining an implementation plan to respond to the Engineer's recommendations.

15.2 Monitoring Program Summary

This section summarizes the geotechnical and tailings facility monitoring program for Doris North and the Geotechnical monitoring for Boston. For detailed information on the inspection programs, refer to the following reports:

- Design of Surface Infrastructure Components, Doris North project Nunavut, Canada (SRK 2006).
- Design of the Tailings Containment Area, Doris North Project, Hope Bay, Nunavut, Canada (SRK. 2007)
- 2011 Annual Geotechnical Inspection Doris North Project, Hope Bay, Nunavut (SRK. 2011).

Water monitoring in the TIA is not included in this section as the TIA is not fully constructed and HBML has not built the mill or processing facilities. When the TIA and processing facilities become active, HBML will update the applicable sections.

15.2.1 Construction, Operations and Closure Phases

Doris North

Annually, HBML contracts a qualified Professional Engineer registered in the Nunavut Territory to undertake a personal physical inspection of the surface infrastructure, including the north dam. This inspection is carried out in the summer and is followed up by a detailed Geotechnical Site Inspection Report.

Surface infrastructure components require two types of monitoring: Visual monitoring – physical inspection of all fill surfaces taking special care to identify any areas that may have undergone settlement; and thermal monitoring – to evaluate the depth of the active zone, such that advance warning of potential settlement can be determined.

The Professional Engineer inspects all surface infrastructure to note any areas of settlement, drainage issues, erosion, or cracking. Periodic surveys are used to monitor for settlement as well.

Detailed monitoring instrumentation has been included in the dam design. This equipment is used to monitor the thermal and deformation regime of the dams, and include the following: settlement monitoring points, vertical and horizontal ground temperature cables, climactic monitoring, Tail Lake water level monitoring and bathymetric surveys. The thermistors in the dam are connected to a data logger, which can be downloaded at any desired frequency.

Thermistors have also been installed in various locations around the Doris North Project, including the bridge footings, jetty, and some of the pads, as well as areas of future development. The majority of these thermistors are read on a monthly basis, however, during winter months, this frequency is typically longer.

HBML will prepare an Operation, Maintenance and Surveillance Manual and an Emergency Preparedness Plan prior to the start of operations at the TIA. These will be prepared in general accordance with the Dam Safety Guidelines published by the Canadian Dam Association.

The TIA is currently only partially constructed. The north dam was completed in 2012, which has blocked the natural outflow. As such, HBML must manage the water level in the TIA to prevent overtopping the dam, or erosion issues. HBML

will be dewatering the TIA on an annual basis to reduce the water level to the baseline elevation 28.3 m. This activity is expected to continue until ore processing begins and tailings begin to be placed in the lake. Maintaining the baseline water elevation will prevent permafrost degradation and potential erosion of the shorelines above the baseline water elevation. This will also extend the length of time between the start of tailings deposition and the first time that water will need to be released from the TIA.

Mine operations staff must carry out daily visual inspections of the north dam, taking note of any signs of settlement, unaccounted for drops in water levels, signs of seepage, or any signs of damage to instrument clusters. Mine operations staff must also carry out daily visual inspections along the TIA shoreline, taking note of, and recording any signs of shoreline erosion. Daily inspections will not include the entire perimeter of Tail Lake each day, instead, HBML staff will inspect different sections of the shoreline areas which area accessible by road each day, and the remainder of the lake will be inspected via helicopter once or twice per open water season. The daily inspections via truck and foot will focus around the dam areas to ensure the highest risk areas do not show signs of erosion (i.e., areas where the ground erosion could impact dam stability). In addition, the following permanent instrumentation will be installed around the TIA perimeter (note that some of this instrumentation has already been put in place): Ground temperature cables and survey transects.

Other monitoring commitments relating to the TIA are therefore not yet applicable. These monitoring activities will commence after the TIA has been fully constructed and operation of the facility begins.

Boston

Surface infrastructure components require visual monitoring – physical inspections of all fill surfaces taking special care to identify any areas that may have undergone settlement. Surveying of the tank farms occurs periodically to monitor for settlement.

15.2.2 Care and Maintenance Phase

Doris North

The annual inspection by the geotechnical engineer will continue during C&M. Inspections of the north dam and shoreline erosion will occur during the summer when snow cover has melted and staff is present on-site. The thermistors at the dam will continue to be logged continuously, and will be downloaded in spring upon the arrival of the HBML crews, and will be downloaded regularly throughout the open-water season. All other thermistors will continue to be downloaded monthly during periods when the camp is open and helicopter access is available.

Boston

The annual inspection by the geotechnical engineer will continue during C&M.

15.3 Adaptive Management

After the annual geotechnical inspection is completed, the geotechnical engineer will provide a written recommended actions memo to the HBML management team if geotechnical or other engineering issues are identified. The HBML management team will review and address the recommendations to resolve issues that were identified.

16. Quarry Monitoring and Quarry Rock Seepage Monitoring

16.1 Background and Rationale

Quarry and quarry rock monitoring at Hope Bay is regulated by the Doris North Project Certificate and Type A water licence, as well as the Regional Exploration Type B Water Licence. The Doris North Project Certificate (NIRB No. 003) includes the following conditions:

> Section 4.0. Item 18. HBML shall submit to the NWB, as part of the water licence application, a program detailing the methodology for testing quarried rock for acid generation and metal leaching potential. The sampling, testing and analysis must be done by a professional geologist registered in Nunavut.
>
> Section 4.0. Item 18. Commentary. NIRB expects any methodology to be certified by a Registered Professional and approved by the NWB. NIRB expects that any analysis of laboratory results must also be done by a Registered Professional. The designation of Registered Professional refers to all those professionals registered with NWT and Nunavut Association of Professional Engineers, Geologists, and Geophysicists (NAPEGG).
>
> Appendix A: Addendum: INAC/Hatch Acres. Item 1. HBML will carry out additional work prior to the start of construction to verify that the quarried rock to be used for construction will be non-acid generating. QA/QC procedures will be in place during construction to verify that the rock used is geochemically stable.

The requirements from the Doris North Project Type A Water Licence (2AM-DOH0713) regarding quarry and quarry rock monitoring include:

> Part D. Item 9. The Licensee shall include, in addition to conducting Quarry Rock Construction Monitoring and Management in accordance with the Water Licence Application, Monitoring and Follow Up Plan, dated July 2007, the following:
>
> > a. A subset of twenty (20) samples shall be subjected to Shake Flask Extraction tests with an emphasis on near surface rock samples; and
> >
> > b. Submit to the Board for review no later than 6 months after the collection of samples, a report that presents the data collected from the Quarry Rock Construction Monitoring Program. The report shall include a discussion of the interpretation of the geochemical data.
>
> Part D. Item 10. The Licensee shall tag any potentially acid generating rock identified through the Quarry Rock Construction Monitoring program for removal to the Temporary Waste Rock Pile, for ultimate disposal underground.
>
> Part D. Item 21. The Licensee shall conduct a Quarry Rock Seepage Monitoring and Management program in accordance with the Water Licence Application Monitoring and Follow Up Plan, dated July 2007 and in accordance with the following:
>
> > a. The seep survey shall measure pH and Electrical Conductivity levels in the precipitation runoff and snowmelt that comes into contact with rock along the roadways, building pads and quarry sites;

b. The seep survey shall measure pH and conductivity levels at several reference points on the tundra not subject to mine influences;

c. The quarry rock seepage program shall be conducted on any ephemeral seepage present at the time of the quarry rock seepage monitoring program and not at pre-determined seepage stations;

d. A minimum of at least 10% of the total sample set shall be submitted for secondary analysis, regardless of the values of measured field pH and conductivity; and

e. The Quarry Rock Seepage Monitoring Program shall be expanded beyond the 100 samples to include monitoring of all rock drains.

Part D. Item 22. The Licensee shall provide a report that presents the data collected from the Quarry Rock Seepage Monitoring Program conducted under Part D, Item 21. The report shall include a discussion of the interpretation of geochemical data and shall be presented to the Board for review, no later than six (6) months after the collection of samples.

Schedule D. Item 1. The Construction Monitoring Report referred to in Part D, Item 8 shall include the following:

f. Follow-up geochemical sampling of quarried rock used in construction of the site roads and pads to verify that the rock used is non-acid generating as predicted;

k. Summary of the Quarry Rock Construction Monitoring Program referred to in Part D, Item 3;

n. Summary of the Quarry Rock Seepage Monitoring Program referred to in Part D, Item 22;

The report shall discuss the monitoring results, analysis and any mitigation measures employed as a result of the monitoring, for each of the items listed above.

Part K. Item 6 (Amended). The Licensee shall confirm the absence of seepage from the Temporary Waste Rock Pad in groundwater downstream of the Pollution Control Pond

The licence requirements outlined in the Regional Exploration Type B water licence (2BE-HOP1222) are as follows:

Part D. Item 18. All drainage water being discharged from quarries A, B & D at monitoring stations HOP-7A, B &D respectively, shall not exceed the following Effluent quality limits (Table 16.2-1).

Part D. Item 22. The Licensee shall implement the approved, revised Hope Bay Project Quarry A, B & D Management and Monitoring Plan, dated October 20, 2010.

Part J. Item 5. The Licensee shall carry out an annual inspection of the quarries associated with Monitoring Program Stations HOP-7A, B and D, and in the event that the inspection identifies ponded water, carry out the monitoring as identified in the approved quarry management and monitoring plan, under Part D, Item 18.

Part J. Item 6. The Licensee shall sample at Monitoring Program Stations HOP-7A, B & D prior to discharge of ponded water from quarries A, B & D to confirm compliance. Samples shall be analyzed for the following parameters:

a. For compliance purposes, those parameters listed under Part D, Item 18; and

b. Total Sulphate, Nitrate, Alkalinity, ICP Metals analysis, and Reduction potential.

16.2 Monitoring Program Summary

This section provides a summary of the quarry monitoring programs for Doris North and the Regional Exploration Project. For detailed information, refer to the Quarry A, B and D Management and Monitoring Plan, Rev 1.0 (SRK 2010c) and the 2011 Waste Rock and Quarry Monitoring Report (SRK 2012b). Although Quarries A, B and D are part of the 2BE-HOP1222 licence, the same procedures apply to the Doris North quarries under the 2AM-DOH0713 licence.

16.2.1 Construction, Operations and Closure Phases

During quarrying operations, a visual inspection of the quarry face to verify the geological characteristics of the rock will be conducted by a qualified field geologist or geochemist at least once per week. The purpose of the inspection will be to confirm the presence of the expected rock types and that disseminated sulphides only (e.g. not veins) are being exposed and therefore used in road construction. A secondary objective of the inspection will be to confirm the absence of any fibrous forms of actinolite in the quarry material.

During quarrying activities, 2 samples of blast material from each quarry will be collected and submitted to an accredited external lab for sulphur analysis. In the event that the results return a sulphur value of greater than (>) 0.1 % sulphur, the samples will be subjected to ABA and other confirmatory test work including shake flask extraction tests on a representative subset of samples. The results of the analysis will be reported in Construction Monitoring Report submitted by March 31 of the year following construction (i.e. within six months of the collection of samples as prescribed in the License).

Table 16.2-1. Summary of Quarry A, B and D (Stations HOP-7A, -7B, and -7D) Monitoring Program, Regional Exploration

Parameter	Discharge Criteria		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Allowable Grab Sample Concentration (mg/L)	Construction, Operation, Closure	Care and Maintenance
pH	6.0 to 9.0	9.0	Prior to discharge of water from quarry, field parameters measured when beginning discharge	Prior to discharge of water from quarry, field parameters measured when beginning discharge
Electrical conductivity	500 µS/cm	500 µS/cm		
Total Ammonia	2	4		
Total Suspended Solids	15	30		
Oil and Grease	5, no visible sheen	10, no visible sheen		

Parameter	Discharge Criteria		Project Phase	
	Maximum Average Concentration (mg/L)	Maximum Allowable Grab Sample Concentration (mg/L)	Construction, Operation, Closure	Care and Maintenance
Total Aluminum	1.0	2.0		
Total Arsenic	0.05	0.10		
Total Copper	0.02	0.04		
Total Iron	0.30	0.60		
Total Lead	0.01	0.02		
Total Nickel	0.05	0.10		
Total Zinc	0.01	0.02		
Total Sulphate	-	-		
Nitrate	-	-		
Alkalinity	-	-		
ICP Metals analysis	-	-		
Reduction potential	-	-		
Volume Discharged	-	-	Daily during discharge	Daily during discharge

As per the commitment in the Quarry A, B &D Management and Monitoring Plan Rev 1.0, prior to the actual pumping, field pH, conductivity, and reduction potential readings will be conducted and a sample collected for confirmatory analyses. If the field pH in the sump is still between 6 and 8.5, and the conductivity measures less than (<) 500 µS/cm, pumping of the sump will be undertaken.

A visual inspection of each mined out quarry will be completed at least once per year in order to ensure that the site remains safe and no environmental of public health and safety concerns are manifest. In the event that potentially acid generating waste rock has been placed in one or more of the mined-out quarries, the area will be inspected to ensure that the 2 metre cover remains and that seeps from the material are not in evidence.

Seepage from the Doris-Windy all weather road, which was constructed from the Quarry A, B and D rock will be included in the annual site-wide seepage monitoring program for 2 years post-construction. The majority of the road was completed in 2010, with the bridges and final 1 km of the road completed in 2011. The final surface crush has not been placed on approximately 2 km of the road at the Windy Camp end of the road. The Professional Geochemist has monitored the 2010 constructed areas for the required 2 years and the 2011 constructed areas for 1 year. The second year of required monitoring is scheduled for 2013.

In the event that clean quarry rock from any of the three quarries (Quarry A, B and D) is used in the construction of any other infrastructure, the area in which the rock is used will be incorporated in the ongoing seep and sampling program currently established for the project. This includes, at a minimum, incorporate the requirements specified in Part D and Schedule D - Conditions Applying to Construction in the Type A Doris Water Licence 2AM-DOH0713 licence related to quarrying and placement of rock. The monitoring a sampling will be completed in order to insure that the highest regulated requirement for the management of construction rock is uniformly applied throughout the Hope Bay Belt.

The quarry monitoring results are compiled into a report which is submitted to the NWB on an annual basis.

16.2.2 Care and Maintenance Phase

The monitoring program for the quarries and quarry rock seepage will not change from that summarized in section 16.2.1 during C&M. However, HBML does not anticipate that additional quarrying will occur during this period, so assessment of the quarry faces and geochemical analyses of the newly quarried rock will not be required.

Quarry rock seepage monitoring is conducted at the toe of the pads and roads that have been recently constructed. HBML will continue the seepage surveys as per the recommendations of the Professional Geochemist after each annual survey.

The majority of the Doris-Windy all weather road has had 2 consecutive years of seepage monitoring completed. Several sections of the road were completed in 2011; therefore, the second year of monitoring will take place in 2013 during C&M.

Quarry monitoring results will continue to be presented along with the construction monitoring report, if any construction occurs, or as a stand-alone report if construction does not occur during C&M.

16.3 Adaptive Management

In the unlikely event that the visual inspection identifies potentially acid generating rock in the Regional Exploration quarries, the geologist will “tag” the material for avoidance or removal. If the material is excavated, it will be hauled back to one of the previously mined-out quarries. The rock fill will then be placed within the quarry and covered with a minimum of 2 metres of the more typical Mg-theolite basalt that was approved for use in the road or temporarily stored in an appropriate manner prior to eventual disposal underground. Potentially acid generating rock from the Doris North quarries will be hauled to the appropriate area of the underground waste rock pile for eventual placement underground.

In the event that the quarry water does not meet the discharge criteria, an investigation of the cause of the noted exceedence will be conducted, appropriate mitigation developed and a summary report prepared and submitted to the Inspector.

In the event that the field or laboratory measurements exceed the specified effluent quality limits and discharge is still required, the preferred interim contingency measure is to use a vacuum truck to remove sump water which will then be used to water down the road construction taking care not to discharge the water onto the road surface near stream crossings or any fish bearing waters. Once approvals are in place for use of the TIA, any non-compliant water that needs to be discharged would be hauled to the TIA.

17. Construction Monitoring;

17.1 Background and Rationale

Many of the construction-related monitoring activities are components of other monitoring programs and are summarized in other sections of this report. The air quality monitoring section (Section 2) addresses dust monitoring (Schedule D Item 1i). The underground waste rock monitoring (Section 7) and quarry monitoring (Section 16) sections address the Type A Water Licence Part D Items 9, 21, 22, and Schedule D Item 1 f, k, and n, as well as Project Certificate Appendix A Addendum INAC/Hatch Acres, Item 1. The waste management section (Section 13) addresses Type A Water Licence Schedule D Item 1g. The wildlife monitoring section (Section 4) discusses Type A Water Licence Schedule D Item 1d, e and j.

The Doris North Project Certificate (NIRB No. 003) specifies that:

> Appendix A: Addendum: INAC/Hatch Acres. Item 1. HBML will carry out additional work prior to the start of construction to verify that the quarried rock to be used for construction will be non-acid generating. QA/QC procedures will be in place during construction to verify that the rock used is geochemically stable (see Sections 7 and 16).

The Doris North Type A Water Licence (2AM-DOH0713) contains the following conditions relating to construction monitoring:

> Part D. Item 1. The Licensee shall ensure that all fill material used is from an approved source and shall be free of contaminants.
>
> Part D. Item 2. The Licensee shall ensure that any chemicals, fuel or wastes associated with the undertaking do not enter any water body.
>
> Part D. Item 3. Equipment storage holding areas should be located on gravel, sand or other durable land, a distance of at least thirty (30) metres above the ordinary high water mark of any water body in order to minimize impacts on surface drainage and water quality.
>
> Part D. Item 4. Sediment and erosion control measures shall be implemented prior to and maintained during the construction and operation where necessary to prevent entry of sediment into water.
>
> Part D. Item 5. The Licensee shall undertake appropriate corrective measures to mitigate impacts on surface drainage resulting from the Licensee's operations.
>
> Part D. Item 6. The Licensee shall limit any in-stream activity to low water period. In-stream activity is prohibited during fish migration.
>
> Part D. Item 7. The Licensee shall conduct construction monitoring during all phases of the project.

Part D. Item 8. The Licensee shall submit an annual Construction Monitoring Report no later than March 31 in the year following the calendar year being reported. The report shall be developed in accordance with Schedule D Item 1.

Part D. Item 11. The Licensee shall ensure that the construction and operation of the Fuel Storage and Containment Facility(s) meets, at a minimum, all applicable legislation and industry standards that include the following:

a. Environmental code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products, 2003; CCME, PN 1326; and

b. National Fire Code, 1995.

Part D. Item 13. The Licensee shall, for the purposes of bridge construction, ensure that all activities remain outside of the natural channel width by the placement of abutments, footings or armouring above the ordinary high water mark so that there is no restriction to the natural channel processes.

Part D. Item 15. The Licensee shall conduct all activities, including the construction of the all-weather roads, in such a way as to minimize impacts on surface drainage and shall immediately undertake any corrective measures in the event of pooling of water or any impacts on surface drainage.

Part D. Item 16. With respect to access road, pad construction or other earthworks where direct or indirect flow into a water body is possible, the deposition of debris or sediment into or onto any water body is prohibited. These materials shall be disposed a distance of at least thirty (30) metres from the ordinary high water mark in such a fashion that they do not enter the water.

Part D. Item 17. The Licensee shall monitor all activities for signs of erosion and shall implement and maintain sediment and erosion control measures prior to the undertaking to prevent entry of sediment into any water body.

Part D. Item 18. The licensee shall conduct daily visual inspections for all construction activity during spring freshet and during and after remarkable rainfall events with sampling of runoff/seepage where turbidity is evident.

Part D. Item 19. All surface runoff during the construction of any facilities, where flow may directly or indirectly enter a water body, shall meet the following effluent quality limits: TSS Maximum average concentration 50 mg/L, maximum concentration of any one grab sample 100 mg/L.

Part D. Item 23. The Licensee shall ensure that all rock used in construction is non-acid generating.

Part D. Item 24 (Amended). The Licensee shall not use Waste Rock from underground for any purpose, including the construction of any infrastructure, unless otherwise approved by the Board under Part G, Item 17 and in accordance with the plan provided under Part G, Item 15, revised and approved accordingly.

Part D. Item 25. The Licensee shall ensure that all containment and runoff control structures are constructed and maintained to prevent escape of wastes to the surface or groundwater systems.

Part D. Item 26. The Licensee shall submit to the Board for review, within ninety (90) days of completion of all structures designed to contain, withhold, divert or retain waters or wastes during the construction phase, a Construction Summary Report prepared by a qualified Engineer(s) that shall include as-built drawings, documentation of field decisions that deviate from original plans and any data used to support these decisions.

Part D. Item 27. The Licensee shall ensure that all construction of engineered structures is supervised and field checked by an appropriately qualified and experienced Engineer in such a manner that the project specification can be enforced and, where required, the quality control measures can be followed. The Licensee shall also ensure that the construction records of all engineered structures are maintained and made available at the request of the Board and/or an Inspector.

Part D. Item 29. The Licensee shall consider the principles of adaptive management in construction and operations.

Schedule D. Item 1. The Construction Monitoring Report referred to in Part D, Item 8 shall include the following:

a. Blast vibration monitoring for quarrying activity carried out in close proximity to fish bearing waters;

b. Monitoring of the performance of erosion protection measures employed by the construction contractor;

c. Monitoring for sediment release from construction areas;

d. Monitoring for wildlife interactions (see Section 4);

e. Monitoring to ensure the protection of all migrating birds and their nesting sites (see Section 4);

f. Follow-up geochemical sampling of quarried rock used in construction of the site roads and pads to verify that the rock used is non-acid generating as predicted (see Sections 7 and 16);

g. Monitoring of the waste management practices employed by the contractors and their employees (food waste, hazardous wastes such as engine oil and filters etc., non-hazardous wastes) (see Sections 13 and 14);

h. Monitoring of contractor's activity to minimize ground impacts to the tundra (i.e. keeping vehicles off the tundra and on constructed roadways);

i. Monitoring of dust generation and use of water by the contractor to manage dust emissions from crushing and construction activity (See Section 2);

j. Vegetation monitoring (See Section 4 Wildlife)

k. Summary of the Quarry Rock Construction Monitoring Program referred to in Part D, Item 3 (see Section 16);

l. Summary of the construction of the North and South Dams;

i. Laboratory results of subsurface investigations of the dam foundations from undisturbed samples;

ii. Details of the geotechnical instrumentation and monitoring plan proposed to monitor the performance of the dams; and

iii. Results of subsurface investigations and laboratory analyses must be reviewed by HBML and the dam design modified accordingly under the supervision of a Geotechnical Engineer.

m. Summary of the items referred to in Part D, Item 15 with respect to updated construction drawings for the all-weather access roads;

n. Summary of the Quarry Rock Seepage Monitoring Program referred to in Part D, Item 22 (see Section 16); and

o. Status of the Construction Summary Report referred to in Part D, Items 27.

The report shall discuss the monitoring results, analysis and any mitigation measures employed as a result of the monitoring, for each of the items listed above.

The Regional Exploration licence (2BE-HOP1222) has the following conditions related to construction:

Part E. Item 7. The Licensee shall provide to the Board for review and approval, at least sixty (60) days prior to commencing construction of the Bulk Fuel Storage Facility at Quarry Site D, for construction drawings of the Bulk Fuel Storage Facility, stamped and signed by a Professional Engineer registered in Nunavut.

Part E. Item 8. The Licensee shall provide to the Board, within ninety (90) days of completion of the construction of the New Bulk Fuel Storage Facilities at Quarry Site D all design drawings and construction reports, including as-built drawings, documentation of field decisions that deviate from original plans and any data used to support these decisions.

17.2 Monitoring Program Summary

17.2.1 Construction, Operations and Closure Phases

Sediment and erosion control measures are identified for each construction project during the project execution planning stage prior to beginning construction. Water samples are collected by HBML staff if substantial turbid runoff is observed from any construction area where the water may enter a waterbody. This situation is not encountered frequently in the project area, and sediment control measures are implemented to avoid the entry of turbid water into a waterbody. If during freshet, elevated turbidity is not measured in any of the seeps from construction areas, HBML will not monitor during rainfall events later in the season.

Construction monitoring is implemented during all construction activities by a qualified engineer to ensure that the project is completed as per the design specification. Seep surveys and shake flask tests are conducted by the engineering consultant as part of the quarry rock monitoring program. Seep surveys measure the pH and electrical conductivity as

required in the water licence, and un-impacted seeps or ephemeral streams are also sampled as control sites. A minimum of 100 sites are sampled, including control streams, and samples are collected at a minimum of 10% of the sites for analysis at an accredited laboratory. This program will be implemented for 2 years post construction, and longer if the engineering consultant's sampling results suggest that additional sampling is required.

17.2.2 Care and Maintenance Phase

Construction is not planned during C&M; however, seeps will be monitored for turbidity in recently constructed areas if construction takes place, including construction undertaken for progressive reclamation activities. The results of the monitoring will be included in the monthly and annual water licence reports.

17.3 Adaptive Management

Sediment and erosion control systems are inspected visually to determine effectiveness and mitigation measures are implemented if the system is not performing as anticipated. Additional erosion control may be added or existing controls may be repaired or replaced as required.

18. Fisheries Authorization Monitoring

18.1 Background and Rationale

HBML holds 2 fisheries authorizations – one for the construction of the Tail Lake North Dam across the Tail Lake Outflow, and one for construction of the jetty in Roberts Bay – and Tail Lake is listed as a TIA in Schedule 2 of the MMER. These approvals were granted based on the Doris North Project NNLP, Revision 6 (Golder 2007). Subsequent revisions were also approved (Rescan 2010b and 2010c). All three of these plans were used to implement the habitat compensation programs, which include:

- 4 artificial shoals built in 2008 in Roberts Bay to compensate for habitat loss as a result of the jetty construction;
- 6 shoals built in 2011 in Windy Lake to compensate for habitat loss as a result of the Tail Lake North Dam and as partial compensation for the loss of the lake as fish habitat as a result of the Schedule 2 listing as a Tailings Impoundment;
- 2 pools built in 2012 in E09, a tributary to Roberts Lake, as partial compensation for loss of the lake as fish habitat as a result of the Schedule 2 listing as a Tailings Impoundment; and
- Construction of fish passage channels through the Roberts Lake Outflow boulder garden, which is a barrier to upstream fish migration in late season during low flows.

The monitoring requirements and schedule stated in the Jetty Authorization (DFO File No. NU-02-0117) are as follows:

5.1. The approved monitoring plan shall be implemented in the following years: 2009, the year prior to mine construction, Year of mine construction, Year 2 of mine operation, Year 2 of active mine post-closure (i.e., year prior to jetty lowering to below high water level), Year 1 post lowering of jetty, and Year 2 post lowering of jetty. The detailed Monitoring Plan shall include, but not be limited to, the following:

5.1.1. The stability and successful utilization of all compensation features shall be assessed according to the schedule in 5.1 above.

5.1.2. If at any time during the monitoring period, compensation features are not functioning as intended, measures shall be identified to reduce the risk of future failure and additional compensation shall be created to meet the No Net Loss guiding principle using an adaptive management approach.

5.4 The effects of the jetty on nearshore sediment transport shall be monitored during the following years: 2008, 2009, Year of mine construction, Year 2 of mine operations, Year 2 active mine post-closure (i.e., year prior to jetty lowering to below high water level), Year 1 post-lowering of jetty.

5.4.1. Annual bathymetric surveys shall be conducted to determine the extent of sediment deposition adjacent to the facility.

HBML also has an authorization for expanding the Jetty, DFO File No. NU-10-0028, which is not addressed here as the construction has not occurred, nor is there a schedule for construction at this time.

The monitoring requirements and schedule stated in the Doris Mine Site Fisheries Authorization for Tail Outflow (DFO File No. NU-02-0117.3) are as follows:

5.1. The Proponent shall conduct monitoring of the compensatory habitat according to the approved Monitoring Plan and Criteria below:

5.1.1. The Monitoring Plan shall be implemented during Year One (the first year following construction of the compensatory habitat), Year Two, Three and Five.

5.1.2. The Monitoring Plan shall include, but not be limited to the following:

5.1.1.2. Assessing the stability and successful utilization of all compensation features according to the Monitoring Plan and schedule in 5.1.1 above.

5.1.1.3. Conducting a control-impact study design to compare the compensation shoals with two reference habitat types in the littoral zone of Windy Lake according to the Monitoring Plan and schedule in 5.1.1 above.

5.1.1.4. Conducting the assessment based on density and diversity of benthic invertebrates and periphyton and the number of fish observed or captured according to the Monitoring Plan and schedule in 5.1.1 above.

5.1.3. If at any time during the monitoring period, compensation features are not functioning as intended, measures shall be identified to reduce the risk of future failure and additional compensatory

habitat shall be created to meet the No-Net-Loss guiding principle using an adaptive management approach.

5.1.4. A written report summarizing the results of the monitoring shall be submitted to DFO on, or before December 31 of each monitoring year, according to the schedule in 5.1.1 above.

18.2 Monitoring Program Summary

This section provides a summary of the fisheries monitoring programs that are required as part of the fisheries authorizations. Detailed information is available in the Doris North Project No Net Loss Plan, Revision 6 (Golder 2007), Hope Bay Belt Project: Updates to the Doris North No Net Loss Plan for Tail Outflow (Rescan. 2010b), Hope Bay Belt Project: Updates to the Doris North No Net Loss Plan for Tail Lake (Rescan. 2010c), and the most recent fisheries monitoring reports titled Doris Mine Site Fisheries Authorization Monitoring Report 2011 (Rescan 2012), and

18.2.1 Construction, Operations and Closure Phases

Bathymetry

Bathymetric surveys of Roberts Bay and Reference Bay have been conducted to assess sediment transport and the extent of sediment deposition adjacent to the compensation shoals and jetty in 2006 (prior to construction), 2008 (year of jetty construction), 2009, 2010 (year of mine construction) and 2012. Monitoring was not conducted in 2011 due to the inconsistence in clause 5.4 vs. 5.4.1. HBML is currently working with DFO to amend the clause for consistency and clarity on the required bathymetry monitoring schedule. HBML will conduct the monitoring as agreed to with DFO upon conclusion of the discussion.

Compensation Shoals

The fish habitat monitoring program was developed to monitor the stability of fish habitat compensation structures, specifically the jetty and shoals, and their use by fish. Compensation shoals in Roberts Bay were monitored in 2009 and 2010, as per the authorization schedule, using a Control/Impact study design. The constructed shoals and side-slope of the jetty are considered to be the impacted study area. The control or reference study site was established in Reference Bay because the shoals in its littoral zone are similar to the constructed habitat in Roberts Bay and because they will not be impacted by future Project activities. Study sites are shown on Figure 18.2-1.

The first year of compensation monitoring was completed in 2012 for the shoals constructed in Windy Lake in 2011. A control/impact study design was used, with selection of reference areas within other areas of Windy Lake. The impact areas were the constructed shoals; the reference areas included natural shoal areas and fine substrate areas (Figure 18.2-1).

For years when biological monitoring will occur, the fish habitat monitoring program will be conducted over two sampling periods during the open-water season. The first sampling event will take place at the end of July, when the ice has thawed. The second sampling event will take place in late August. As part of this program, the following components are sampled on the constructed compensation shoals in Roberts Bay and on the naturally-occurring shoals in Reference Bay:

- periphyton biomass (as indicated by the concentration of chlorophyll a);
- periphyton cell density and taxonomic composition;
- benthic invertebrate density and taxonomic composition;
- fish community species richness, numbers, catch-per-unit-effort and biological characteristics (e.g., length, weight, condition, age and growth); and
- use of habitat by fish, as indicated by snorkel surveys.

E09 Monitoring

As part of the compensation for Tail Lake, 2 pools were created to increase rearing habitat in E09, a tributary to Roberts Lake (Figure 18.2-1). To determine whether unrestricted access for Arctic char juveniles has been provided, backpack electrofishing surveys in the enhanced stream will be conducted annually during the operational period of the mine (two years). This monitoring will also be conducted again in Year-1 and Year-5 from decommissioning of the mine.

Roberts Outflow Boulder Garden

Additional compensation for Tail Lake will involve the enhancement of the boulder garden in Roberts Outflow (Figure 18.2-1) to increase accessibility to Roberts Lake for fish migrating upstream from the ocean, and to reduce the mortality of Arctic char that become stranded in the boulder zone. A baseline fish fence program to monitor Arctic char smolt outmigration was initiated in 2006 and has been repeated for 5 seasons between 2006 and 2012. The original plan was to use smolt outmigration as a measure of increased production of Arctic char as a measure of success for the migration channels to be constructed through the Roberts Outflow boulder garden. Monitoring smolts has proven to be a logistically challenging program due to high stream flows and large variations in number of smolts captured in the fence.

In 2012, DFO approved a change to the program to change from monitoring smolts to simply monitoring the adult fish passage upstream through the boulder garden. Baseline data was collected in 2003 through 2005 by placing a fish fence upstream and downstream of the boulder garden to capture fish entering and exiting the area. The habitat compensation construction was completed in September 2012, creating clear passages for the fish migrating through the boulder garden. HBML will continue to monitor adult fish passage as per the schedule provided in the No Net Loss Plan (Golder 2007).

Willow Habitat Monitoring

In addition to the above components associated with the fisheries compensation program, HBML has agreed to conduct follow-up monitoring in response to a concern raised by the Department of Fisheries and Oceans relating to potential changes to shoreline habitats along Doris Lake due to dewatering of Tail Lake outflow, and the potential effects on ninespine stickleback rearing habitat. To confirm that the ninespine stickleback habitat along the shoreline where Tail Outflow enters Doris Lake is not adversely affected by the project, HBML conducted a detailed survey of the willow habitat along this section of shoreline during the summer of 2007 (i.e., prior to construction).

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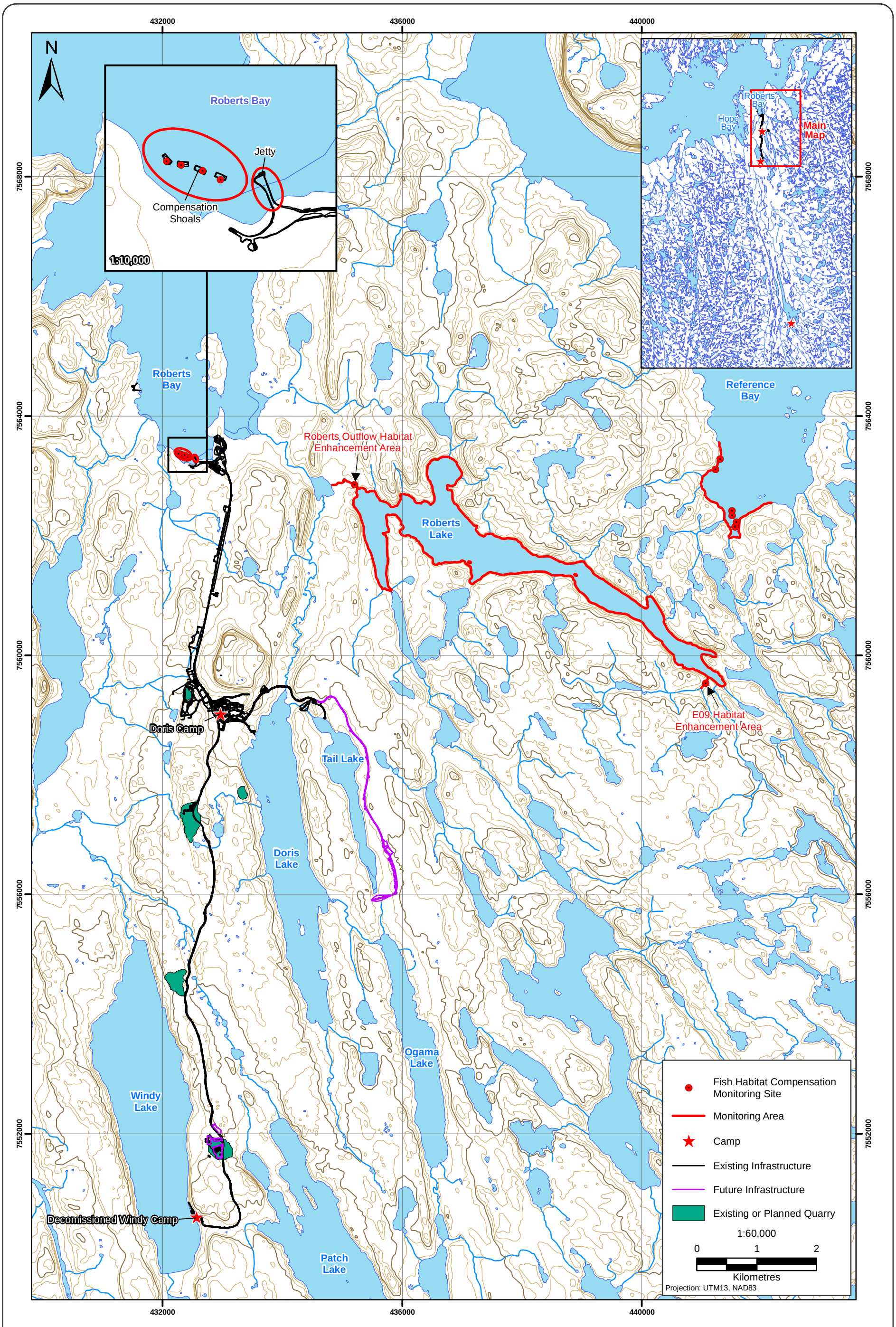

Figure 18.2-1

NEWMONT NORTH AMERICA

Fish Habitat Compensation Monitoring Sites for the Doris North Project

Figure 18.2-1

Rescan Engineers & Scientists

18.2.2 Care and Maintenance Phase

The monitoring programs will continue as per the schedules outlined in the fisheries authorizations, regardless of project phase.

18.3 Adaptive Management

If the monitoring programs indicated that the habitat compensation structures are not functioning as intended, HBML will discuss the issues with DFO and will develop an alternate plan for compensation works.

19. Hope Bay Spill Contingency Plan

19.1 Background and Rationale

Under each of the water licences and the project certificate, HBML is required to prepare a spill contingency plan. The Spill Contingency Plan is to be prepared in accordance with the Spill Contingency Planning and Reporting Regulations developed under Section 34 of the Environmental Protection Act.

In addition to the requirement for HBML to have a spill contingency plan prepared for the Doris North Project, one other specific condition in the NIRB Project Certificate No.003 is:

> Part 4. Item 20. MHBL shall ensure the use of containment booms and berms to control potential spills whenever fuel and or waste is transferred between a barge and the shore. MHBL shall ensure spill kits are at hand at these locations at all times.

In addition to the requirement for HBML to have a spill contingency plan for the Doris North Project, the specific conditions in the for Doris North Water Licence (2AM-DOH0713) are:

> Part I. Item 4. The Licensee shall review the Emergency Response and Contingency Plan annually and revise the Plan as necessary to reflect changes in operation and/or technology. Proposed changes to the Plan may be submitted to the Board for review, in the form of an addendum as part of the Annual Report under Part B, Item 3, complete with a revisions list detailing where significant content changes are made.
>
> Part I. Item 5. The Licensee shall ensure that any chemicals, petroleum products or unauthorized wastes associated with the project do not enter water. All Sumps and fuel caches shall be located at a distance of at least thirty (30) metres from the ordinary high water mark of any adjacent water body.
>
> Part I. Item 6. The Licensee shall provide to the satisfaction of an Inspector, secondary containment for fuel storage as required by applicable standards and acceptable industry practice.

Part I. Item 7. The Licensee shall perform regular inspections of Fuel Storage and Containment Areas, Sumps, Emergency Dump Catch Basins, other fuel tanks and connectors for leaks and movement and shall keep a written log of inspections to be made available to an Inspector upon request. More frequent inspections may be required at the request of an Inspector.

Part I. Item 8. If, during the period of this Licence an unauthorized discharge of waste and or effluent occurs, or if such discharge is foreseeable, the Licensee shall:

a. Employ the Emergency Response and Contingency Plan;

b. Report the incident immediately via the 24-Hour Spill Reporting Line (867)920-8130 and to the Inspector at (867) 975-4295; and

c. For each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site.

Part I. Item 9. If the Licensee provides notification under Part L, Item 2 [notification of C&M], the Licensee shall submit to the Board, an addendum to the Emergency Response and Contingency Plan, detailing the changes in operations, personnel, responsibilities, availability of equipment and access to the site for assistance.

Aside from the conditions stating that a Spill Contingency Plan is required, the specific conditions in the Boston Type B Water Licence (2BB-BOS1217) are:

Part H. Item 4.The Licensee shall ensure that any chemicals, petroleum products or wastes associated with the project do not enter water. All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary high water mark of any adjacent water body and inspected on a regular basis.

Part H. Item 5. The Licensee shall ensure that any equipment maintenance and servicing be conducted only in designated areas and shall implement special procedures (such as the use of drip pans) to manage motor fluids and other waste and contain potential spills.

Part H. Item 6. If during the term of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

a. Employ the Spill Contingency Plan;

b. Report the spill immediately to the 24-Hour Spill Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and

c. For each spill occurrence, submit to the Inspector, no later than thirty (30) days after initially reporting the event, a detailed report that will include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site.

Aside from the conditions stating that a Spill Contingency Plan is required, the specific conditions in the Regional Exploration Type B Water Licence (2BE-HOP1222) are:

Part H. Item 5. The Licensee shall review the Plan referred to in this Part as required by changes in operation and/or technology and modify the Plan accordingly. Revisions to the Plan are to be submitted in the form of an Addendum, to be included with the Annual Report, unless directed otherwise by an Inspector.

Part H. Item 6. The Licensee shall ensure that any chemicals, petroleum products or wastes associated with the project do not enter water. All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary high water mark of any adjacent water body and inspected on a regular basis.

Part H. Item 7. The Licensee shall ensure that any equipment maintenance and servicing be conducted only in designated areas and shall implement special procedures (such as the use of drip pans) to manage motor fluids and other waste and contain potential spills.

Part H. Item 8. If during the term of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

a. Employ the Spill Contingency Plan;

b. Report the spill immediately to the 24-Hour Spill Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and

c. For each spill occurrence, submit to the Inspector, no later than thirty (30) days after initially reporting the event, a detailed report that will include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site.

19.2 Program Summary

This section provides a very brief summary of the spill contingency plan. The reporting structures and personnel roles are not discussed in this document. Refer to the full Hope Bay Spill Contingency Plan Rev 5.0 (HBML 2012h) which has been prepared to meet the requirements of all of the project approvals. In addition, HBML has a Transport Canada approved Oil Pollution Prevention Plan (OPPP)/Oil Pollution Emergency Plan (OPEP) Rev1.2 (HBML 2012i).

19.2.1 Construction, Operations and Closure Phases

All Spill Kits will be inspected at least twice per calendar year or after use to ensure that each kit is appropriately located, sound and contains the requisite material in a usable condition.

Spill trays or secondary containment are used for storage of hydrocarbons or other chemicals. These containments are inspected during the regular worksite inspections.

HBML must regularly conduct chemical inventories to document the quantities and locations of storage. This inventory will be updated in the Spill Contingency Plan at least once per year.

HBML will maintain an up-to-date list of equipment and spill supplies available at site. This information is provided in the OPPP/OPEP.

Bulk fuel transfers taking place between a barge and the jetty will always require a spill containment boom to be placed around the jetty and barges. This is covered in detail in the approved OPPP/ OPEP. This plan is updated prior to each fuel transfer to ensure that the plan is specific to the transfer program planned for that year.

HBML conducts annual spill training with the personnel at site.

HBML is a member of the Mackenzie Delta Spill Response Corporation (MDSRC). As a member of the MDSRC, HBML has access to additional spill response resources in the event of a major spill.

The primary goal of HBML's Spill Contingency Plan is to protect the environment (vegetation, soil, wildlife, water, aquatic animals, historical resources, and equipment and infrastructure.

HBML tracks all spills that occur on-site. Spills that are of sufficient volume to trigger the Spill Contingency Planning and Reporting Regulations developed under Section 34 of the Environmental Protection Act are reported to the 24-hour spill reporting line. Spills smaller than the trigger volumes are reported in the monthly and annual water licence reports, as well as the KIA and NIRB annual reports.

The general spill response strategy is:

1. Identify the spilled material, the size of the spill and the safety of the area
2. Stop the spill if safe to do so
3. Contain the spill if safe to do so
4. Report to your supervisor, who will report to the HBML safety and environment departments, as well as the facilities manager
5. Stop and contain the spill if it hasn't already been done
6. Plan the approach, and clean up the spill
7. Properly dispose of clean-up materials and soils with the Waste Management Facility personnel
8. Enter the incident into the HBML Cintellate incident reporting system for spills of any volume, and report the spill to the 24-hour spill line if the volume triggers doing so.
9. Prepare a follow-up report to the 24-hour spill line report within 30 days.

19.2.2 Care and Maintenance Phase

The spill contingency plan does not change during C&M, however, limited numbers of personnel will be available on-site to respond. Spill reporting will continue using the same procedures.

20. Quality Assurance and Quality Control Plan

20.1 Background and Rationale

All of the Hope Bay Project licences and the project certificate require the submission of a QA/QC Plan for sample handling, collection, and analyses (where HBML completed the analyses in house).

The specific condition in the NIRB Project Certificate No. 003 is:

> Part 4. Item 10. Commentary. The NIRB's preference is for independent, third party sampling. In the case where MHBL collects its own samples, the sampling shall be conducted in accordance with a methodology approved by NWB though a Quality Assurance /Quality Control ("QA/QC") plan and must be submitted to an independent third party laboratory for analysis.

The Doris North water licence 2AM-DOH0713 contains the following requirements:

> Part K. Item 1. The Licensee shall submit to an Analyst for approval by March 1, 2008, a Quality Assurance/ Quality Control Plan that includes field and laboratory procedures and requirements. This Plan shall be developed in accordance with the 1996 QA and QC Guidelines for Use by Class "A" (INAC).
>
> Part K. Item 3. The Licensee shall annually review the approved QA/QC Plan and modify the Plan as necessary. Proposed changes shall be submitted to an Analyst for approval.
>
> Part K. Item 4. The Licensee shall implement the QA/QC Plan as and when approved by the Analyst.

The Boston water licence 2BB-BOS1217 contains the following requirements:

> Part J. Item 15. The Licensee shall submit to an analyst for approval, within three (3) months of the issuance of the Licence, a revised QA/QC Plan. The plan shall include analysis of field blanks and certified reference material, and replicate sampling in order to assess accuracy, precision and field contamination.
>
> Part J. Item 16. The Licensee shall annually review the approved Quality Assurance/Quality Control plan of Part J, Item 15 and modify it as necessary. Proposed modifications shall be submitted to an Analyst for approval.
>
> Part J. Item 17. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater, or by such other methods approved by the Board.
>
> Part J. Item 18. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

The Regional Exploration water licence 2BE-HOP1222 has the following requirements:

> Part J. Item 14. The Licensee shall implement the Hope Bay Mining Limited, Quality Assurance and Quality Control Plan R5, for the Windy Lake Camp and the Patch Lake Fuel Farm Area, dated December 31, 2010,

prepared in accordance with the INAC [now AANDC] document “Quality Assurance and Quality Control Guidelines for use by Class “B” Licensees in Collecting Representative Water Samples in the Field, 1996” approved by an Analyst on July 4, 2011.

Part J. Item 15. The Licensee shall annually review the approved Quality Assurance/Quality Control plan and modify it as necessary. Proposed modifications shall be submitted to an Analyst for approval.

Part J. Item 16. The approved Quality Assurance/Quality Control Plan shall be submitted to the Board for review and implemented as approved by an Analyst.

Part J. Item 17. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater, or by such other methods approved by the Board.

Part J. Item 18. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

20.2 Program Summary

This section briefly outlines the QA/QC Plan. Detailed information on this plan can be found in the Hope Bay QA/QC Plan. Revision 7.1 (HBML 2012g).

20.2.1 Construction, Operations and Closure Phases

The QA/QC Plan outlines the proper sampling procedures for water quality, soil, ash, process stream (in the mill and processing facility) and waste oil, as well as field parameter measurements for water quality. In addition, the plan identifies the applicable sampling stations that are, or are expected to be, active for the Hope Bay Project. Finally, the plan covers the proper field note records, sample labelling and chain of custody preparation. This plan is updated regularly to capture any changes in sampling locations. The sampling procedures follow standard protocols; therefore these generally do not require updating during the annual plan review.

HBML collects QA/QC samples at approximately 10% of all compliance samples (i.e., approximately 1 QA/QC sample is collected for every 10 compliance samples). QA/QC samples include field blanks, trip blanks, replicate and split samples.

HBML follows the sample collection procedures provided by ALS Environmental in Edmonton, AB. The sample bottles and preservatives are ordered from ALS and are shipped to site. Deionized water for field blanks, and prepared trip blanks are also ordered from ALS.

Samples are preserved in the field, or immediately upon return to the environmental lab at the main camp. Samples are then kept cool in the refrigerator prior to being packaged into coolers with ice packs for shipment to ALS. Some parameters cannot be preserved, or have short hold times, therefore HBML must be aware of the sample collection timing to ensure that samples reach the lab within the hold time.

Samples are identified with a unique code, which is formatted as required for uploading into the HBML EQWin sample database that is under development. It is important that the sample name on the bottles, the EQWin sample log and the lab chain-of-custody are all the same to allow easy uploading into the database.

20.2.2 Care and Maintenance Phase

The QA/QC procedures do not change for C&M as the procedures follow standard practice.

21. Seasonal Closure Preparation Requirements

21.1 Background and Rationale

The preparation requirements for seasonal closure are based on infrastructure maintenance requirements, the *Mine Site Reclamation Guidelines for the Northwest Territories – 1.4 Temporary Mine Closure,* and general risk mitigation. AANDC specifies that:

Temporary closure activities must maintain all operating facilities necessary to protect humans, wildlife, and the environment. The following measures should be implemented or completed to prepare the site for temporary mine closure:

- Access to the site, buildings, and all other structures must be secured and restricted to authorized personnel only
- All mine openings must be guarded or blocked and warning signs must be posted
- All waste management systems must be secured
- An inventory of chemicals and reagents, petroleum products, and other hazardous materials must be conducted and secured appropriately or removed if required
- All explosives must be relocated to the main powder magazine and secured, disposed of, or removed from the site

21.2 Program Summary

The closure considerations recommended by AANDC were included in HBML's seasonal closure planning and execution. To mitigate and manage environmental risk, and maintain integrity of the infrastructure, HBML will undertake, at minimum, the following steps for preparing the seasonal site closures:

- Board up, or lock, all accesses to buildings as they are closed down.
- Verify that security cameras are operating, charged, and have empty memory cards.

- Place restricted access signs on all major buildings.
- Ensure survival tents at Doris and Boston are set-up for emergency use by the winter inspection team or any hunters and trappers that may be stranded. Place signage to identify these locations and to direct people to the locations.
    - Gasoline drums should be placed in an accessible location, within containment, for use by winter crews or passing hunters to reduce the temptation to gain unauthorized access to the bulk fuel tanks, which contain diesel and are not of use to the visitors.
- All mine openings must be guarded or blocked and warning signs must be posted.
- The sewage treatment plants are being shut down and winterized and the building accesses must be locked.
- An inventory of chemicals and reagents, petroleum products, and other hazardous materials must be conducted and secured appropriately or removed if required.
    - Hazardous wastes must be shipped out throughout the operating season to minimize, or eliminate, the waste stored at site over shut down seasons.
    - Fuel must be distributed among the various bulk fuel tanks to ensure that the total volume within a containment berm is less than the maximum containment volume provided by the berm.
        - Tank valves must be locked out and should be blinded where possible.
        - The Doris Fuel Module must be winterized and locked out.
    - Small fuel tanks around the property must be drained, unless the tank is for use at the emergency shelters, or for infrastructure that needs to be started immediately upon return to camp in the spring, prior to the crews being able to start equipment to clear paths and move fuel.
        - Tanks that are not drained must be in spill containment.
- All explosives, if any are brought in to site for the summer operations, must be disposed of or removed from the site.
- Vital equipment that will be required for reopening the camp must be placed in the shops, along with Herman-Nelson heaters and work lamps to allow crews to access and warm the machines immediately upon landing at the camp. The batteries for these pieces of equipment should be removed and shipped to Con Mine for warm storage.
- All water piping in the camp facilities and washcars must be drained. Plumbing that cannot be completely drained must be winterized by addition of glycol as per the plumber's recommendations.
- The potable water treatment system and all associated piping must be drained and winterized.

- The fire suppression system and fire water storage tank must be drained and winterized.
- All food must be removed from the camp, and the kitchen must be cleaned carefully to remove temptation for wildlife to gain entry.
- The fire truck must be winterized.
- The camp powerhouse generators must be winterized.
- The medic's office must be emptied of all drugs.
- Electronics and batteries associated with camp infrastructure that cannot freeze must be removed and shipped to Con Mine in Yellowknife for warm storage.
- Domestic electronics (e.g., televisions, computers, etc.) must be shipped to Con Mine in Yellowknife for warm storage.
- Valuables should be locked securely in the camp or be removed from site for the seasonal closure period.
- Documentation required for completion of the annual licence reports must be scanned and copies taken with the ESR Site Manager upon departure from site.

Additional preparations may be required as identified by the HBML and contractor management teams. Electrical and plumbing preparations must be completed by qualified trades-people.

22. Winter Inspections During Seasonal Closures

22.1 Background and Rationale

A winter inspection plan for seasonal closures is not a requirement of the Doris North Project Certificate or any of the Hope Bay water licences. This procedure was developed to describe the winter inspection program that has been developed to enable HBML to regularly monitor the infrastructure and fuel that is present in the Hope Bay Project Area. These inspections are critical for identifying issues or risks during the seasonal winter closure periods when personnel are not stationed at the site.

In addition to Newmont's corporate requirement to regularly inspect facilities, HBML has considered the *Mine Site Reclamation Guidelines for the Northwest Territories – 1.4 Temporary Mine Closure* published by Indian and Northern Affairs Canada (now AANDC). These guidelines specify that:

- Fluid levels in all fuel tanks must be recorded and monitored regularly for leaks or removed from the site; and
- Facilities and infrastructure must be inspected regularly.

These guidelines also specify that:

- All physical, chemical and biological treatment and monitoring programs must continue according to licenses, permits, and leases in order to maintain compliance;
- All waste rock piles, ore stockpiles, tailings, mine water and other impoundment structures must be stable and maintained in an appropriate manner (including regular geotechnical inspections); and
- Drainage ditches and spillways must be inspected and maintained regularly (e.g. seasonally depending on snow and ice accumulation and melting) during the closure period and included as part of geotechnical inspections.

22.2 Monitoring Program Summary

This section summarizes the winter inspection program for Hope Bay during periods when the camps are not occupied. For detailed information, refer to the Winter Inspections During Seasonal Closures Rev 0.0 (HBML 2012j).

HBML commits to maintaining compliance with the project licences, permits and leases, and these three guidelines by operating the property on a seasonal basis. HBML's monitoring commitments in winter are related to fresh water use, waste water disposal and solid waste disposal. As the camp will not be open, there will be no fresh water used, and no waste water or solid waste disposal. Geotechnical inspections of the property are conducted annually in summer (between June and August) and this will continue during C&M. Geotechnical inspections are not required during the winter inspection trips.

The drainage ditches will be maintained during seasonal operating periods. HBML's winter inspections will document snow accumulation in the fuel berms which will guide decisions for the timing of camp re-opening. High snowfall in winter will require HBML to return to site somewhat earlier to allow enough time for clearing snow from the fuel containment berms

Monthly inspections of the property are scheduled to begin once the sea ice has formed and access by snowmobile from Cambridge Bay is possible. Inspections will cease when the camp is reopened in late-April/ early-May. This time period was deemed appropriate because the primary risk at Hope Bay is vandalism by residents of the area who could gain access to the site by snowmobile. Between October, when camp staff leave site, and late-December there is no access to the Hope Bay area unless by aircraft.

The following areas are identified on the Doris North Inspection form, along with a photo of the facility:

- Emergency Powerhouse and Intake Pumphouse – Doris Lake
- Vent Raise/Modules and Fuel Tank
- Portal Entrance and White Weatherhaven south of Portal
- 7.5 Million Litre Tank Farm – Doris Camp
- Doris Fuel Module
- Doris Camp Main Powerhouse & Day Tanks

- Camp Admin Area and Mine Dry
- Geology Admin Area
- ERT Building
- Newmont Warehouse/Core Shack
- Construction Powerhouse Doris Camp
- Main Camp
- Batch Plant and Seacan Storage Area
- Geotech Shop
- West Arc Shop
- KEL Explosives Washbay
- KEL Area, Emergency Shelter with Tank
- BBE Tower – Fuel/Lube Containers
- Orbit Shop
- 5 Million Litre Tank/Containers – Roberts Bay
- KBL Waste Management - Office
- KBL Waste Management – Incinerator
- Kingland Ford Tent
- Roberts Bay Tank Farm

Each of these areas are to be inspected for signs of entry (forced or wildlife), and signs of damage to the exterior. Areas with hydrocarbon storage also include checking for leaks. Bulk fuel tanks at Roberts Bay and Doris Camp tank farms include a space to record the fuel volume (as read from the tank gauges). Photographs of any damages or issues must be taken for use by HBML management to determine the appropriate course of action.

The following areas are identified on the Inspection form, along with a photo of the facility:

- Main Camp Perimeter
- Warehouse and Workshop

- Boston Fuel Tank Farm

As Boston is less accessible to unwanted human visitors, and the buildings layout is more compact, HBML has combined all camp buildings into “Main Camp Perimeter”. If there is damage or signs of entry to any building, the inspection team is to document where the damage was, and can circle the area on the photo included in the form if required. Photographs of any damages or issues must be taken for use by HBML management to determine the appropriate course of action.

During the inspections, the following actions are expected of the inspection team:

Inspection Finding	Action Taken by Inspection Team
No issues	Return completed inspection form to HBML
Minor damage to a building or tent	Photograph damage Repair damage to the best of team’s ability; photograph repair Note on inspection form and return completed inspection form along with photos of the damage and repairs to HBML If damage obviously caused by humans, Alex Buchan will report to HBML Loss Prevention and the RCMP. If possible, HBML will obtain and review adjacent remote camera photos. Retrieval of these photos may not occur until a subsequent inspection.
Major damage to a building or tent (beyond ability of inspection crews to repair)	Photograph damage Note on inspection form and return completed inspection form along with photos to HBML.
Wildlife Resident in Hope Bay infrastructure (i.e., Wolverine, Fox)	Photograph denning site Note on inspection form and return completed inspection form along with photos to HBML Alex Buchan to consult with GN-DOE on further action to be taken
Minor leaking from tanks	Photograph damage Using spill kits available onsite, attempt to stop the leak Note on inspection form and return completed inspection form and photographs to HBML HBML to take further action as required
Catastrophic tank damage/failure (empty bulk fuel tanks)	Photograph damage Estimate remaining volume of fuel in tanks (can be done by observing the height frost line on the tanks relative to the tank base) Contact Manager of Community and External Affairs (Alex Buchan) via satellite phone immediately. Complete remaining inspection items and return the completed forms along with photographs to HBML

In the event that major building damage or fuel tank failures occur, HBML will assess the issue and determine the appropriate, and available, course of action. As per the regulations, HBML will immediately report any spills of 100L or

greater to the Nunavut/Northwest Territories 24 hour spill line, following the procedures documented in the Hope Bay Spill Contingency Plan.

23. Patch Cuttings Sump Monitoring

23.1 Background and Rationale

During a routine site inspection in July 2012, the AANDC inspector requested that HBML develop a monitoring program to assess migration of salt from the Patch Laydown south cutting sump. The AANDC inspector was concerned specifically about whether salt has, or will, reach the pond down-gradient of the cuttings sump. The pond is connected to the north end of Patch Lake. As such, HBML developed a sampling plan titled *Cuttings Sump Salinity Monitoring Rev 0.0* (HBML 2012k), which was submitted to AANDC for review in November 2012.

23.2 Monitoring Program Summary

This section provides a summary of the cutting sump monitoring program developed to satisfy AANDC's request. The complete program is available in Cuttings Sump Salinity Monitoring Rev 0 (HBML 2012k).

The following sample parameters are consistent with those collected by the Arctic Soil Remediation Expert contracted from ABR Inc. at the University of Alaska, Fairbanks in 2012. Note, these parameters are not required in the water licences and there are no set criteria for assessing the results. As such, HBML will work with ABR Inc. to interpret the results in an environmentally relevant manner.

Soil	
Sodium Absorption Ratio	pH
Conductivity	Calcium
Chloride	Magnesium
Potassium	Sodium
Water	
Salinity	pH
Conductivity	Calcium
Chloride	Magnesium
Potassium	Sodium

Sample collection techniques, labelling and shipment instructions are to follow standard Newmont procedures which are outlined in the approved HB-QA-ENV-MP-001 QA/QC Management Plan document.

Soil samples must be collected from the mineral soil located immediately below the organic layer. To accomplish this, use a shovel to dig a small pit. Collect a small ziploc bag of mineral soil (approximately 500 mL).

Water samples will be grab samples collected from approximately 10 cm below the water surface, without disturbing the sediment. Samples will be collected in 500 mL plastic bottles provided by the lab, unless otherwise instructed by the lab. These samples do not require preservatives but must be kept cold until analysed at the lab.

Field data must document the location with a photo, GPS coordinates, and sample location name. The sample location should be marked with a wooden stake that includes the sample name and date.

A photographic record of the vegetation will be collected. A 5 m long vegetation plot will be selected at each soil sampling location. This plot will be marked with a survey stake at each end and photographs will be taken looking at the plot from 4 directions. Notes will be kept describing the condition of the vegetation (e.g., % stressed, dead).

The actual coordinates of the sampling stations will be determined in the field in the summer of 2013.

- Cuttings dump, soil – 3 samples of the cuttings will be collected from separate locations in the cuttings sump.
- Cuttings dump, water - If present, standing water in the cuttings sump will be sampled.
- Down gradient transect, soil – 2 soil samples, one near the lake shore and the other approximately halfway between the cuttings sump and the lake. Additional samples may be collected along the transect if visual assessment identifies suspected changes in soil conditions (e.g., changes in vegetation health or composition).
- Down gradient, water - One water sample will be collected of the surface water at the end of the down gradient soil transect.
- Control Transect, soil – one soil sample near the lake and one approximately halfway between the laydown and the lake will be collected. The transect will be selected in a zone that would not be impacted by salt migration from the cuttings sump.
- Control, water - water samples will be collected of the surface water at the end of the control transect.

These control and down-gradient water samples can be compared to historic data collected from the lake.

Interpretation of the sampling results will be discussed with ABR Inc. to ensure that HBML is accessing the expert resources available to them.

24. Revision Record

The Hope Bay Project Monitoring and Follow-Up Plan will be reviewed on a regular basis (at least once per calendar year) and revised as required. Each revision will be recorded in Table 24.0-1

Table 24.0-.1. Revision Record

Revision Number	Revision Date	Description	Revised By
0.0		Original Version	Miramar
1.0	May 2011	Complete revision	Katsky Venter/ Angela Holzapfel
2.0	December 2012	Addition of C&M sections, Boston monitoring requirements and Regional Exploration licence (Windy) monitoring requirements, operational plan summaries, and additional monitoring requests	Angela Holzapfel
2.1	January 2013	Minor edits as requested by AANDC	Katsky Venter

25. References

EBA. 2010. Quarry A Landfill Management Plan, Doris North Property, NU. Revision 1.0. Prepared for HBML June 2010. (not submitted to NWB).

FSC (FSC Architects & Engineers). 2010. Sewage Treatment Plant Operation and Maintenance Plan for The Boston Camp. Revision 1.0. Prepared for HBML for submission to NWB. October 2010.

HBML (Hope Bay Mining Ltd.). 2012a. Air Quality Management Plan. Revision 2.0. Prepared for NIRB. October 2012.

HBML. 2012b. Noise Abatement Plan. Revision 3.0. Prepared for NIRB. October 2012.

HBML. 2012c. Doris North Project Wastewater Treatment Management Plan. Revision 3.0. Prepared for NWB. October 2012.

HBML. 2012d. Incinerator Management Plan. Revision 1.1. Prepared for NWB. March 2012.

HBML. 2012e. Interim Non-Hazardous Waste Management Plan. Revision 1.1. Prepared for NWB. March 2012.

HBML. 2012f. Hazardous Waste Management Plan. Revision 1.1. Prepared for NWB. March 2012.

HBML. 2012g. Hope Bay Quality Assurance and Quality Control Plan. Revision 7.1. November 2012.

HBML. 2012h. Hope Bay Spill Contingency Plan. Revision 5.0. Prepared for NIRB and NWB. October 2012.

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