

April, 2014
Version 3

VOLUME 2 - PROJECT DESCRIPTION

Final Environmental Impact Statement (FEIS) - Meliadine Gold Project, Nunavut



AGNICO EAGLE

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EXECUTIVE SUMMARY

Introduction

This Detailed Project Description of the Final Environmental Impact Statement (FEIS) for the Meliadine Gold Project (the Project) includes both Section 1.0 – Introduction and Section 2.0 – Project Components and Activities. It presents the information related to the planning and design, construction, operation and reclamation phases of the Project.

Agnico Eagle Mines Limited (AEM) proposes to construct, operate, decommission and rehabilitate a conventional gold mine in the Kivalliq region of Nunavut, approximately 25 km north of the hamlet of Rankin Inlet. Gold was discovered at Meliadine in 1969 with the first mineral claims staked in 1987. AEM purchased the property in 2010. As of December 31, 2013, the proven and probable reserves were 2.8 million ounces of gold; measured and indicated resources were 3.1 million ounces; and inferred resources were 2.7 million ounces.

The Project components are largely located on Inuit Owned Lands (IOL) with some infrastructure within the municipal boundaries of Rankin Inlet. A controlled access, single lane All-weather Access Road (AWAR) was built in 2013 between Rankin Inlet and the proposed mine site to support advanced exploration activities. The Project is reliant on the services of Rankin Inlet businesses, airport and seaport.

The Project can be divided in three areas: (1) the mine site area, (2) the All-weather Access Roads to the Meliadine and Discovery mining areas, and (3) the Rankin Inlet support infrastructure area.

The proposed gold mine is comprised of five (5) deposits, which will be mined using conventional open pit and underground mining methods. A conventional gold milling circuit will be employed with thickened tailings reporting to a Tailings Storage Facility (TSF). Besides other normal mine infrastructure, the proposed Project will have a power plant, fuel tank farm, storage area, accommodation complex, waste management infrastructure, and sewage treatment plant; all common features of Arctic mines. Four (4) deposits (Tiriganiaq, Wesmeg, F Zone and Pump) are located in the vicinity of the proposed camp and mill infrastructure, which is planned to be near the current exploration camp. The Discovery deposit is located approximately 22 km southeast of the main mine site.

The Phase 1 of the AWAR was built in 2013 under a Type B Water License issued by the Nunavut Water Board in March 2012. AEM has sole responsibility for the construction and ongoing inspection and maintenance of all of the components of this road, including the road bed, the bridges, the culverts, and the borrow/quarry sites used in the construction. Phase 2 of the AWAR, which includes widening to two lanes, building the access road to Discovery and building the Rankin Inlet bypass road, is subject to review as part of this FEIS. The Phase 2 AWAR will be open to public use in the

section between Rankin Inlet and Meliadine Lake. Gates will be located at its north end and on Discovery road to prevent unauthorized access by the general public into the active areas of the Project to protect public safety.

The Rankin Inlet support infrastructure will include a spud barge (floating dock) facility to be located at the Itivia harbour, a fuel tank farm and a laydown yard area. The majority of the materials and supplies needed for operation will be transported to Rankin Inlet by seasonal sealift (only during open-water season). A total of 4 to 6 vessels annually will deliver dry goods, and 4 to 6 tankers annually will deliver diesel fuel.

Anticipated Benefits

The Project is forecasted to generate direct economic impacts for AEM (profits), the Kivalliq Inuit Association (KIA; lease payments, Inuit Impact and Benefit Agreement (IIBA) payments, water compensation payments and quarry fees), Nunavut Tunngavik Incorporated (NTI; mineral royalty payments), Government of Canada (corporate and income taxes, and Goods and Services Tax) and the Government of Nunavut (GN; equivalent municipal tax, payroll tax and fuel tax). The Project will also create indirect economic benefits to Rankin Inlet and to a lesser extent all of the other six communities in the Kivalliq region of Nunavut through wages, purchase of goods and services and other economic spin-offs.

AEM and the KIA initiated negotiations for an IIBA for the Project in January 2012 and continue to advance discussions on such an arrangement.

Over the projected mine life, the Project is estimated to generate revenue in the order of \$5.9 billion, have operating expenses in the range of \$3.0 billion, generate taxes and royalty payments in the order of \$518 million and give rise to mineral royalty payments in the order of \$185 million. It is important to note that these are pre-feasibility preliminary estimates and are subject to revision when the feasibility study is completed and are sensitive to the prevailing gold price.

Regulatory Regime

The Project is subject to the environmental and socio-economic impact assessment and permitting processes established under Article 12, Part 5 of the Nunavut Land Claims Agreement (NLCA) and coordinated by the Nunavut Impact Review Board (NIRB). The Project is located on IOL managed by the KIA for all surface rights, and by NTI for sub-surface mineral rights. It will require authorization and consent of the KIA for pre-development, construction, operation and closure of the mine and its related facilities. These approvals will be in the form of land use leases, a commercial production lease, an IIBA, a Water Compensation Agreement and other forms of approvals, permits and authorizations. Small sections of the AWAR to be constructed on Commissioner's land will also need to be leased by AEM. Rankin Inlet infrastructure will require leases from GN Department of

Community and Government Services (CGS) for approximately 14 ha of airport lands. The GN will require Rankin Inlet municipal consent before issuing such leases.

The Project will require a Type A Water Licence issued by the Nunavut Water Board for all project uses of water and the disposal of all mine related wastes. The proposed project is also subject to a number of Federal and Nunavut acts, regulations and guidelines.

AEM's Approach to Project Development

Linking the Project development with the Environmental Impact Assessment (EIA) early in the process is, in AEM's view, the best way of enhancing the opportunities for the results of the EIA and appropriate mitigation measures to be efficiently tailored and integrated into Project concepts and design. Also, development plans and potential impacts and benefits resulting from the Project were presented on an ongoing basis to the general public, community organizations, community leaders, businesses and government while at the same time looking for feedback on environmental and socio-economic concerns and expectations. Design, EIA and public engagement activity results were all incorporated in Project planning to optimize the Project from an environmental and socio-economic point of view, including costs and operability. This is part of AEM's approach to sustainable development in mining: limit negative environmental and social impacts, and enhance positive impacts.

AEM adopted a precautionary approach while developing the Project details for the purpose of evaluating its potential impacts. As such, conservative assumptions were used for design criteria and performance modeling, ensuring a robust concept and conservative impact predictions.

AEM's high standards with regards to environment, socio-economic, and health and safety are detailed.

Pre-Development and Construction Phases

Pre-development activities will follow issuance of the Project Certificate and will consist of site preparation and early construction of facilities or infrastructure needed to support the construction phase of the Project. It will also include pre-development of the mining facility, such as stripping of overburden from the first open pits, construction of service and haul roads, and development of the underground mine access portal, ramp and associated services. First pre-development activities will include preparing the Rankin Inlet support infrastructure (spud barge, laydown yard area and fuel tank farm) in order to receive construction materials, equipment and fuel. The Phase 2 AWAR, which includes the Rankin Inlet bypass road, will also be initiated to facilitate the transport of materials to the mine site. Pad construction, stripping, piling, concrete foundations works will be initiated during the pre-development phase, continuing through the construction phase. The stripped material will be used for construction where possible. If not suitable for construction, this overburden will be stored within the waste rock storage facilities.

The construction phase will include all the steps from engineering to instrumentation and control, including architecture, planning, site preparation, drainage and dewatering, excavation, backfilling, piling, concrete works, buildings construction/installation, piping and plumbing, mechanical, electrical, and communication installations, including programming. Specifically for mine infrastructure, it will also include planning and installation of ventilation and other underground services, as well as all infrastructure related to rock handling, mill processing and tailings and water management. The construction phase is expected to last about 3 years.

Both pre-development and construction activities will necessitate limited use of existing borrow pits and quarries, and the crushing of materials in order to generate aggregates necessary for the construction activities (roads, pads, concrete). The larger source of these materials will come from overburden and/or waste rock stripped from the first open pits, if suitable for construction.

Water management will start at pre-development and will continue through the construction phase with the proper management of water that comes into contact with Project activities.

Operation Phase

The EIS for the Project was completed based on a design and sizing of the major surface facilities for a production rate of up to 8,500 tonnes per day (tpd), or about 3.1 million tonnes of ore processed per year. With the current reserves and throughput, the mill would be in operation for a total of 13 years. The operation will be on a rotational basis with a 14-day/14-off schedule (12-hour shifts). Crew changes will take place by air through Rankin Inlet airport and employees arriving at the airport will be transported by bus to the permanent camp. The permanent camp will include accommodation as well as a reception and security area, a kitchen and dining room, a laundry, recreational facilities and an administration building including a first-aid clinic.

All gold deposits included in the EIS will be mined through open pits using standard drill-and-blast and truck-and-shovel methods, at a rate of about 6,000 tpd. A total of 27 million tonnes of ore, 373 million tonnes of waste rock and 57 million tonnes of overburden will come from the open pits during the mine life. The ore will be trucked to the mill site located near the Tiriganiaq deposit. When possible, the ore will be dumped directly into the primary crusher and transported via conveyor to a secondary crusher and then to the milling circuit. Temporary ore storage pads are also planned in case the crushers are not readily available. Waste rock and overburden (if not suitable/needed for construction purposes) will be placed in one of the identified storage areas.

In addition, the Tiriganiaq deposit will be mined using underground methods at a rate of about 2,500 tpd. A long-hole method is planned to be used with a mining sequence consisting of a combination of transversal and longitudinal stoping, using conventional technology (rubber-tired diesel machinery and drill-and-blast excavation). The underground mine will use part of the existing decline built for advanced underground exploration and bulk sampling program. This decline will be extended and a new portal will also be built closer to the mill. The underground mining will produce

a total of 11 million tonnes of ore and 5.3 million tonnes of waste rock over the mine life. A conveyor belt will be installed to deliver the crushed ore to the secondary crusher. This will necessitate a primary crusher be located underground to reduce the ore to a size that can be accommodated by the conveyor belt. The majority of the waste rock generated underground will be reused underground for ground stability purposes. Mined-out workings will be backfilled using coarse waste rock, cemented waste rock, paste tailings, or a combination of these. A backfill paste tailings plant will be part of the infrastructure (3,000 tpd).

Explosives will be prepared on site by an explosives supplier who will also be responsible for delivering explosives to the bore holes. The total quantity of explosives needed is estimated at about 12,000 tons of emulsion per year. The Emulsion Plant will operate 7-days a week on a 12-h/day basis. Blast frequency will be between 2 and 4 blasts per day, including surface and underground mining activities.

The ore will be processed in a centrally located facility that will comprise: crushing, grinding, gravity recovery, cyanidation and gold recovery in a carbon-in-leach (CIL) circuit. Gold bars will be smelted on-site. A thickener will be used to recover cyanide solution from the tailings for reuse in the mill. The thickened tailings (about 55% solids) will then pass through a conventional SO₂/air cyanide destruct process prior to being pumped to the Tailings Storage Facility (TSF).

The TSF is a diked storage facility located northwest of the mill site that will be used to store the thickened tailings. The TSF will also contain a Reclaim Pond for the storage of tailings bleed and runoff water, as well as water pumped from open pits. Reclaim Pond water will be recycled to the mill for re-use in the milling process. The TSF is designed to store about 38 million tons of tailings.

Diversion infrastructure will be constructed to avoid the contact of clean runoff water with areas affected by mining activities. Contact water, including mine dewatering water, originating from affected areas will be intercepted, collected, conveyed to central storage facilities for re-use in process or treated (if needed) prior to re-use or release to Meliadine Lake.

Fresh water for potable use and as make-up water for the mill and other operational needs will be sourced from Meliadine Lake.

Power will be generated by diesel-fuelled engines and will be completed with heat recovery. Camp waste will be managed through a waste management building to promote recycling and to direct waste to proper waste management infrastructure (incinerator, hazardous waste management, and landfill). A biopile will be constructed on-site to treat soils contaminated with light hydrocarbons.

Maintenance of all infrastructures will be completed on an ongoing basis throughout operations.

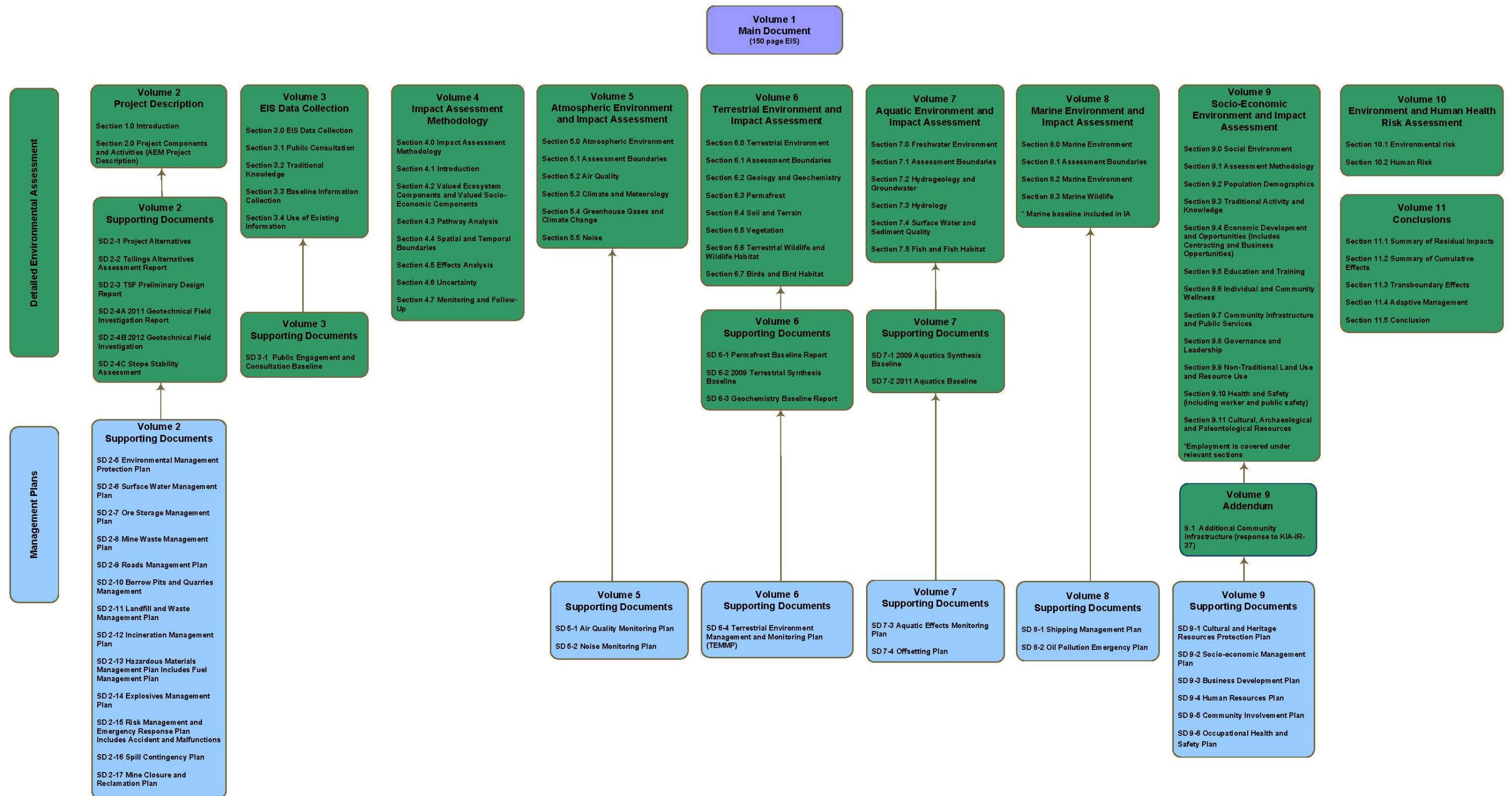
Temporary closure, decommissioning and reclamation are also discussed and detailed in related support documents.

DESCRIPTION OF SUPPORTING INFORMATION

The Meliadine Gold Project is subject to environmental review established under Article 12, Part 5 of the Nunavut Land Claims Agreement. To complete the environmental impact assessment, AEM has followed the steps listed below:

- Determined the Valued Ecosystem Components (VECs; air quality, climate and meteorology, noise and vibration, terrestrial environment, geology, hydrology, water quality, sediment quality, freshwater aquatic life, vegetation, terrestrial wildlife, birds, marine environment, and marine wildlife) and Valued Socio-Economic Components (VSECs; economic development, employment, education and training, contracting and business opportunities, population demographics, traditional knowledge, cultural and archaeological resources, individual and community wellness, community infrastructure and public services, and health and safety). These valued components were determined through public participation and engagement with Kivalliq communities, Inuit organizations, business associations, institutes of public government, and government departments, and through traditional knowledge and shared experience with other northern mines, in particular the Meadowbank Gold Mine;
- Conducted baseline studies for the VECs and VSECs, which were then integrated with traditional knowledge to give a complete picture;
- Used the combined baseline and traditional knowledge studies to determine the key potential impacts and interactions for each VEC and VSEC;
- Developed preliminary mitigation strategies for key potential interactions, and proposed management plans to mitigate unforeseen impacts by applying the precautionary principle and keeping sustainable development in mind;
- Developed results oriented monitoring plans to identify and track residual effects. In areas where mitigation measures are not proving effective, adaptive management will be employed to address shortcomings. These mitigation and monitoring programs will form an integral part of the Project development, and will assist in identifying changing socio-economic factors and how natural changes in the environment can be distinguished from Project-related impacts; and
- Produced and submitted an Environmental Impact Statement (EIS) to the Nunavut Impact Review Board.

As shown on the following page, this Statement is part of the documentation series that has been prepared through this environmental impact assessment process.



MELIADINE FEIS DOCUMENT MAP

DESCRIPTION OF MELIADINE PROJECT

The Meliadine Project is a proposed gold mine located in Nunavut, approximately 25 km north of Rankin Inlet and 80 km southwest of Chesterfield Inlet. Gold was discovered in 1969 with the first mineral claims staked in 1987. Over the ensuing years, there were episodic bursts of exploration by various operators and owners with the Project before ultimately being purchased by Agnico Eagle Mines Limited (AEM) in 2010. The Project is largely on Inuit Owned Lands (IOL RI-01, RI-12) with some Project infrastructure located within the municipal boundaries of the hamlet. There is presently a controlled access, single lane All-weather Access Road between the proposed mine site and Rankin Inlet constructed in 2013. The Project is reliant on the services of Rankin Inlet's businesses, airport and seaport.

The proposed gold mine is comprised of five deposits, which will be mined using conventional open pit and underground mining methods. A conventional gold milling circuit will be employed with tailings reporting to a tailings storage facility. Besides other normal mine infrastructure, the proposed mine site will have a power plant, fuel tank farm, accommodation complex, and sewage treatment plant; all common features of Arctic mines.

AEM submitted its project proposal for the Meliadine Gold Project to the Nunavut Impact Review Board (NIRB) on April 26, 2011. This initiated the environmental assessment process and, on September 14, 2011, the Minister of Aboriginal Affairs and Northern Development concurred with the NIRB's recommendation that the proposal requires review under Article 12, Part 5 or 6 of the Nunavut Land Claims Agreement. The Minister referred the Project to the NIRB for a *"review of its ecosystemic and socio-economic impacts in the Nunavut Settlement Area"*.

The NIRB issued final guidelines for the preparation of an Environmental Impact Statement to AEM on February 20, 2012 and subsequently updated these on March 6, 2013 based on supplemental information provided by AEM. This document was prepared in accordance with guidance issued by the NIRB.

MELIADINE FACT SHEET

Ownership: Agnico Eagle Mines Limited is the sole owner of the Meliadine Project.

Location: The proposed mine site is located on a peninsula extending into Meliadine Lake. It is 25 km north of Rankin Inlet and 80 km southwest of Chesterfield Inlet.

Access: The Phase 1 All-weather Access Road (AWAR) provides access between Rankin Inlet and the Meliadine site. This is a controlled access, single lane road, 23.8 km long. Once construction of the mine is approved, the AWAR will be widened to two lanes and opened to public use. Part of the Discovery access road will be built to allow access to Meliadine Lake by local residents. Gates at the north end of the AWAR and past the boat launch¹ on the Discovery access road will restrict access to the mine sites to mine personnel and contractors only.

Airstrip and Port: The site will use Rankin Inlet's airport and sea port. There will not be an airstrip at the site.

Mineral Claims: The gold deposits are situated on leased claims under the Canada Mining Regulations that were staked prior to the Nunavut Land Claims Agreement. The claim block covers 52,173 ha and is approximately 80 km long.

Mining Methods: The mine will have both open pit and underground mining. The mine production rate will be 8,500 tonnes per day (tpd), with an estimated 2,500 tpd from underground and 6,000 tpd from open pits. Over the life of the project, five deposits will be mined in sequence with some overlap possible. Mining and milling will take place 24 hours a day, 365 days per year.

Mining Areas: Open pit mining is planned at five deposits. Presently underground mining is only planned for the Tiriganiaq deposits. Underground mining cannot be ruled out at the other deposits; further work is being undertaken to determine if it is feasible.

Tiriganiaq	This is the largest gold deposit and the mill site is to be located immediately east of it.
F Zone	Located approximately 3 km south of the proposed mill site;
Discovery	Located approximately 21 km southeast of the proposed mill site;
Wesmeg	Located 100 to 300 m south of the Tiriganiaq pit; and
Pump	Located approximately 3 km southwest of the proposed mill site.

The project's total area of disturbance will cover an estimated 1,700 ha.

Life of Mine: Current estimates support a 13-year mine life based on estimated mineral resources as of December 31, 2011. The property has excellent exploration potential and an extension of the mine life is possible with further exploration.

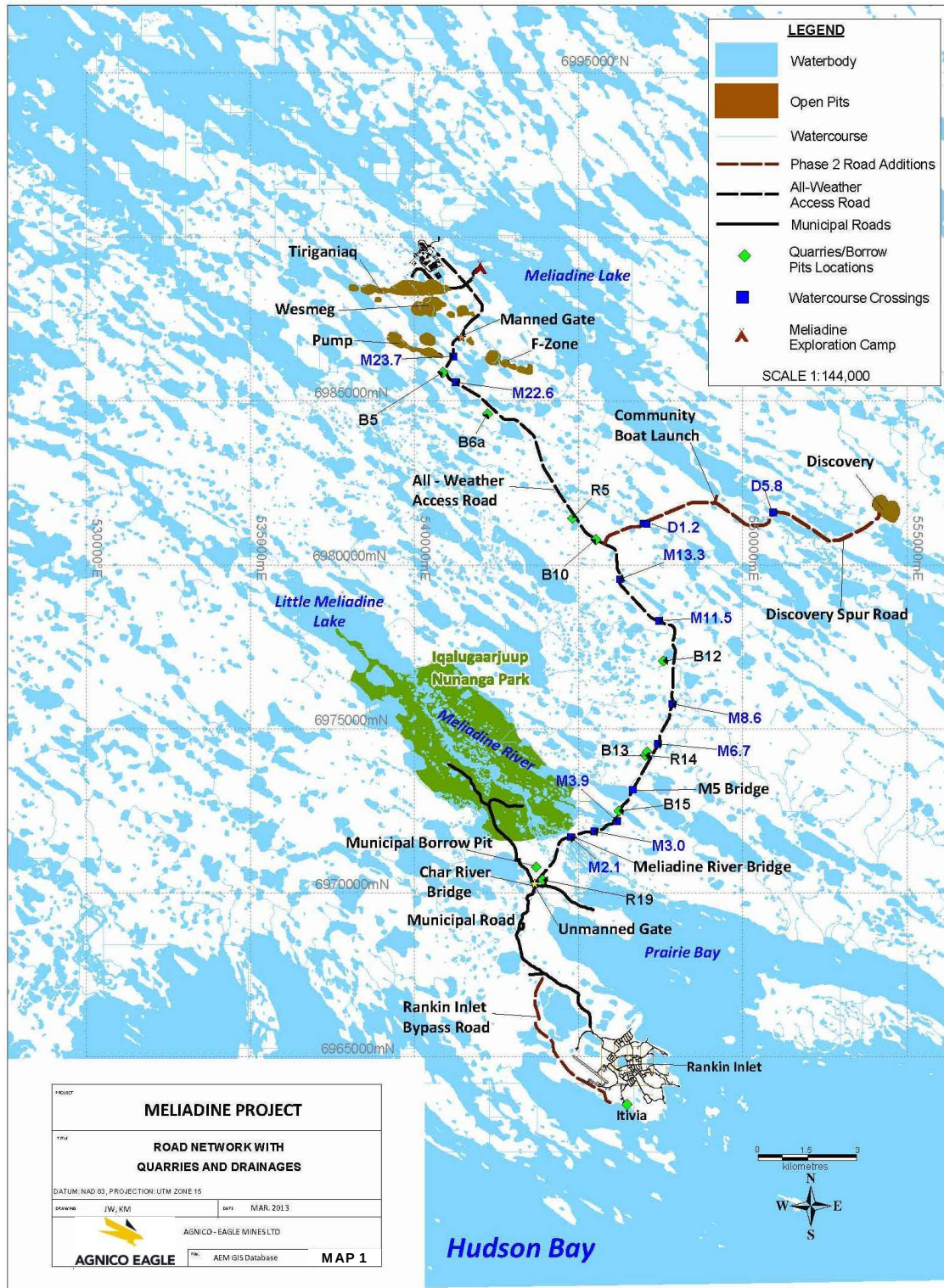
Gold Resources: As of December 31, 2013, the proven and probable reserves were 2.8 million ounces of gold; measured and indicated resources were 3.1 million ounces; and inferred resources were 2.7 million ounces.

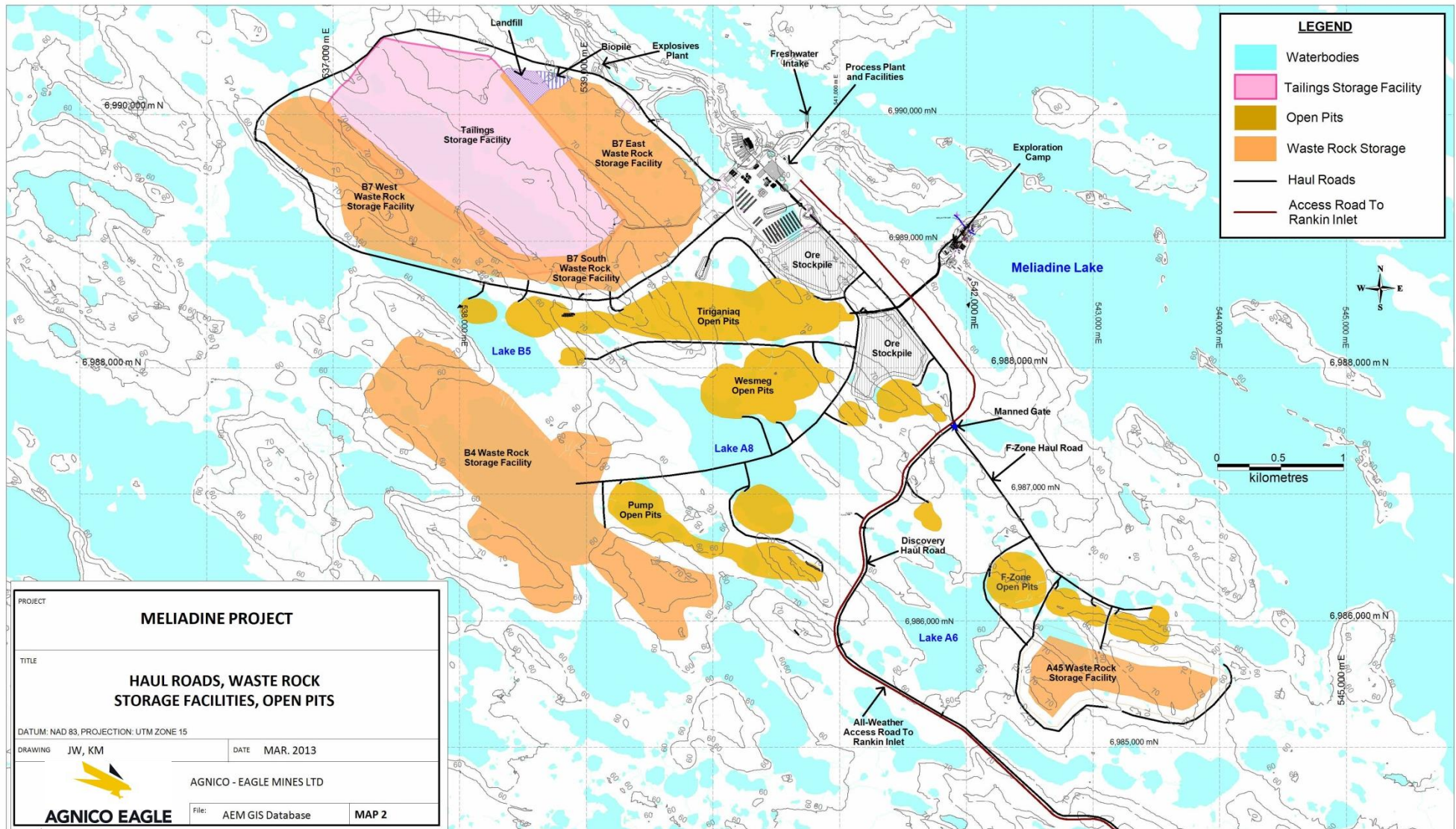
Mill Process: The ore will be processed using a conventional gold-milling circuit. The ore size will be reduced to the consistency of fine sand using a sequence of crushing and grinding circuits. A portion of the gold will be recovered in a gravity circuit. The remaining gold will be recovered using cyanidation and carbon adsorption, followed by elution, electrowinning and refining. Residual cyanide will be recovered for reuse or destroyed prior to the deposition of tailings in the Tailing Storage Facility. The final step in the mill process will be the smelting of gold bars on-site.

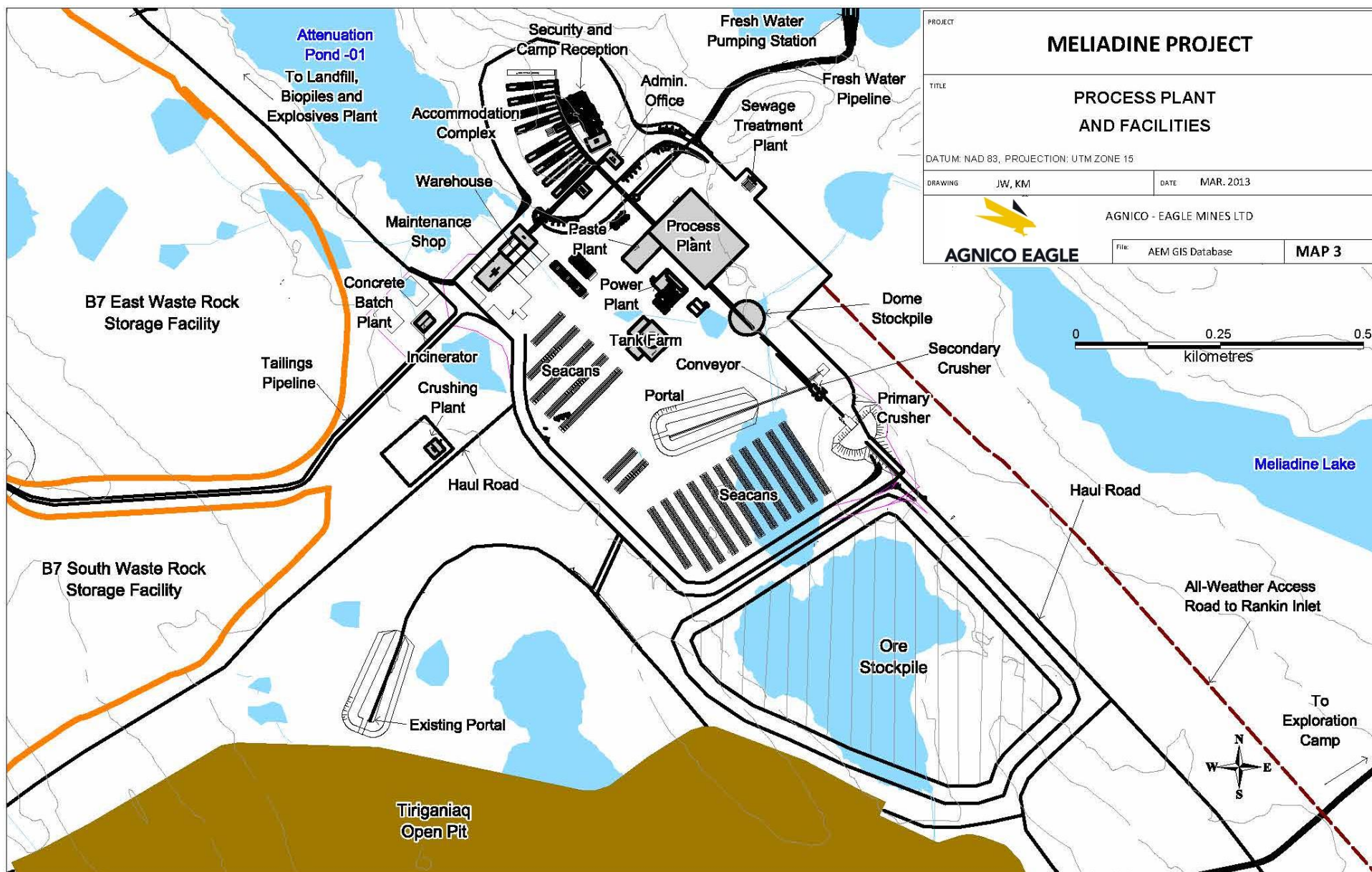
Personnel: A project workforce of approximately 1,000 personnel is required for construction and 700 for operations with 350 on-site at any one time.

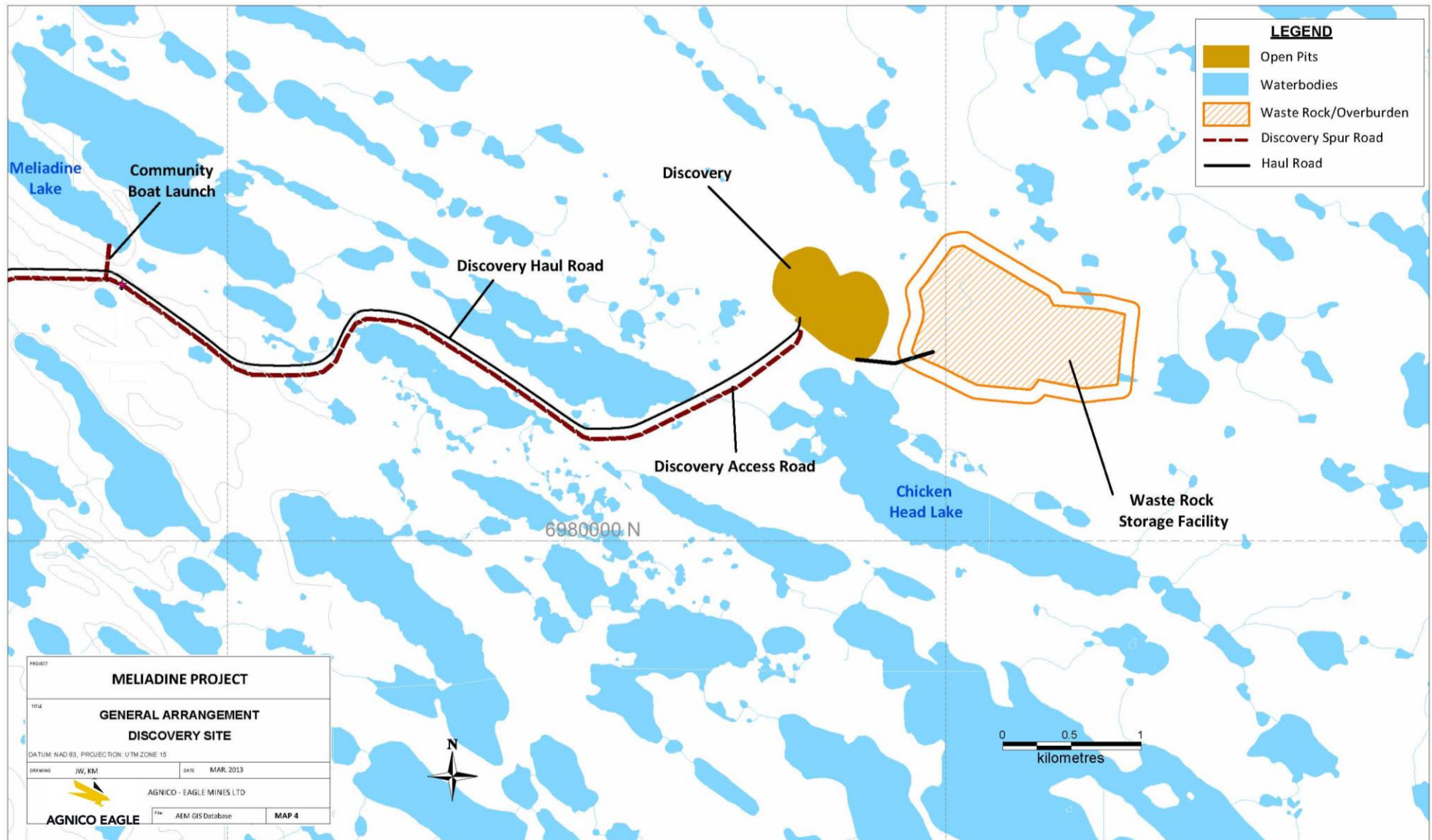
¹ It should be noted that AEM has committed to provide community access to the shore of Meliadine Lake for the purpose of putting a small boat into the lake. AEM is not proposing to build any structure or ramp into the lake that would physically impact the lake nor the shoreline at this location. The spur road would end in a small graveled parking area back from the lake shore line from where community residents could lift a boat into the lake.

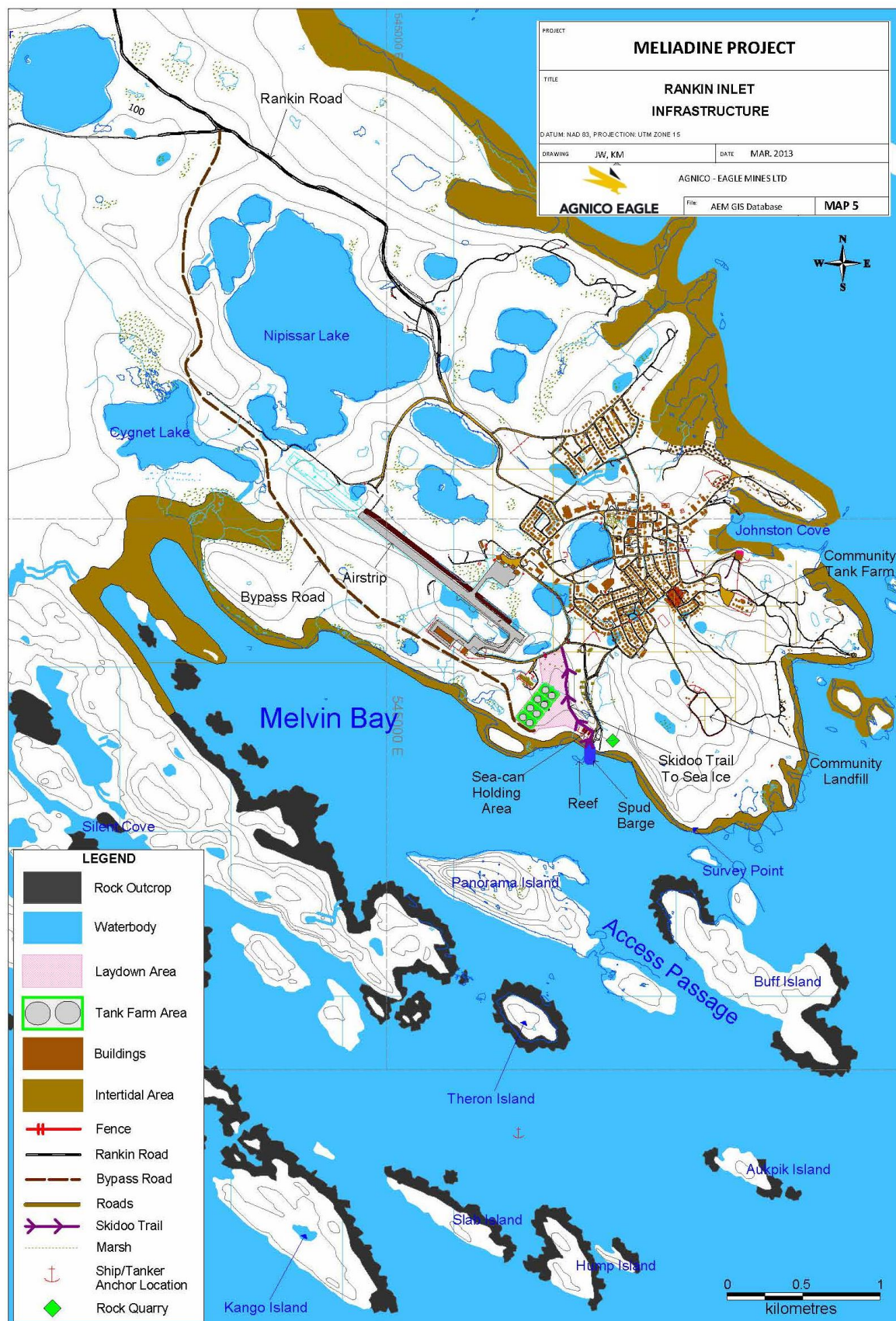
PROJECT LOCATION MAPS

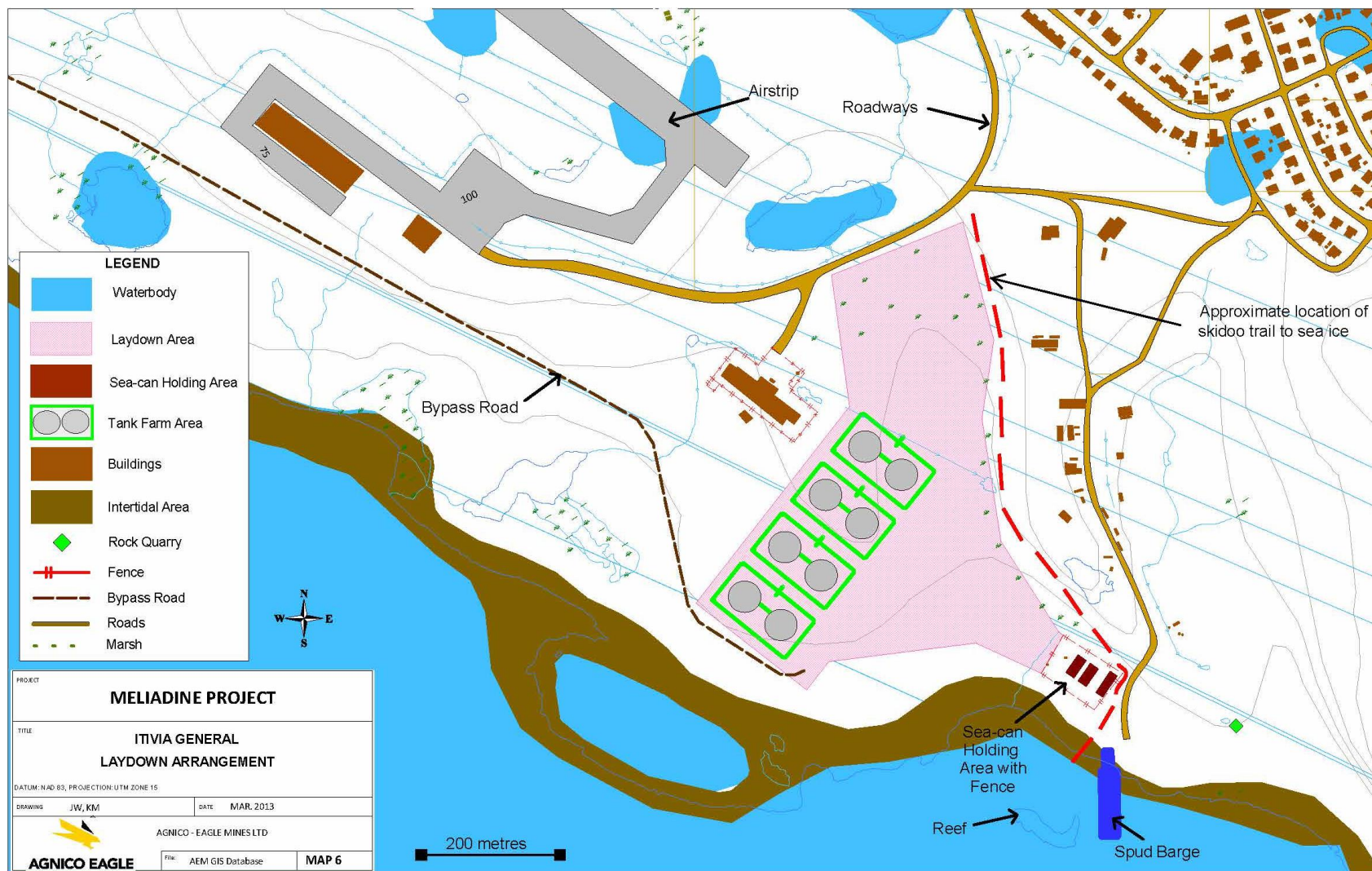












ACRONYMS

A	Ampere, a unit of electrical current
AANDC	Aboriginal Affairs and Northern Development Canada
ABA	Acid-Base Accounting
AD&D	Accidental Death and Dismemberment Insurance
AEM	Agnico Eagle Mines Limited
AMQ	Québec Mining Association
ANFO	Ammonium Nitrate – Fuel Oil; a type of explosive
AP-01	Attenuation Pond
ARD	Acid Rock Drainage
ATV	All-Terrain Vehicle
AWAR	All-weather Access Road
bgs	Below Ground Surface
BNQ	Bureau de Normalisation du Québec (member of the National Standards System of Canada)
BOP	Beginning of Period
BTU	British Thermal Unit
BWMP	Ballast Water Management Plan
CCME	Canadian Council of Ministers of Environment
CDP	Carbon Disclosure Project
cfm	Cubic Feet per Minute
CGS	Community and Government Services (Government of Nunavut)
CIL	Carbon-In-Leach
CIP	Carbon-In-Pulp
CLARC	Community Lands and Resources Committee
CLEY	Department of Culture, Language, Elders and Youth (Government of Nunavut)
CN	Cyanide
CSR	Corporate Social Responsibility
3D	Three-Dimensional Space
DFO	Department of Fisheries and Oceans Canada
DoE	Department of Environment (Government of Nunavut)
DofSD	Department of Sustainable Development (Government of Nunavut)
DR	Diameter Reduction (outside diameter divided by wall thickness)
EC	Environment Canada
EFAP	Employee and Family Assistance Program
EIS	Environmental Impact Statement
EMS	Environmental Management System
EOP	End of Period
ERT	Emergency Response Team

FEIS	Final Environmental Impact Statement
FM	Factory Mutual System (fire protection)
FW	Foot Wall
GMS	G Mining Services
GN	Government of Nunavut
GPS	Global Positioning System
GRG	Gravity Recoverable Gold
GRI	Global Reporting Initiative
GST	Goods and Services Tax
GVW	Gross Vehicle Weight
HADD	Harmful Alteration Disruption or Destruction (fish or fish habitat)
Hamlet	Hamlet of Rankin Inlet
HDPE	High Density Polyethylene
HFO	Heavy Fuel Oil
HP	Horse Power
HPR	Highly Protected Risk
HQ	Drilling hole diameter representing 96 mm (wider than the NQ, which is 75.7 mm)
HRSDC	Human Resources and Skills Development Canada
HSE	Health, Safety and Environment
HTO	Hunters' and Trappers' Organization
HVAC	Heating, Ventilation, and Air Conditioning
HW	Hanging Wall
IIBA	Inuit Impact and Benefit Agreement
IMO	International Marine Organization
INAC	Indian and Northern Affairs Canada (now AANDC)
IOL	Inuit Owned Lands
JSI	Jantzi Social Index
KIA	Kivalliq Inuit Association
LFO	Light Fuel Oil (also known as P50 Arctic diesel)
LNG	Liquefied Natural Gas
LOM	Life-Of-Mine
MAA	Multiple Accounts Analysis
MARPOL	International Convention for the Prevention of Pollution from Ships
ML	Metal Leaching
MMER	<i>Metal Mining Effluent Regulations</i>
MSO	Mineable Shape Optimiser
N	North
N/A	Not Applicable
NAD	North American Datum
NEAS	Nunavut East Arctic Company

NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
nm	Nautical Mile
NPC	Nunavut Planning Commission
NRI	Nunavut Research Institute
NRC	National Research Council Canada
NTI	Nunavut Tunngavik Incorporated
NT	Northwest Territories
NU	Nunavut
NWB	Nunavut Water Board
NWPA	<i>Navigable Waters Protection Act</i>
OHF	Oil Handling Facility
OP	Open pit (mine operation)
OPEP	Oil Pollution Emergency Plan
PAG	Potentially Acid Generating
non-PAG	Non-Potentially Acid Generating
PHC	Petroleum Hydrocarbons
PIT	Personal Income Taxes
PLC	Programmable Logic Controller
PM	Particulate Matter
Project	Meliadine Gold Project
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance / Quality Control Program
RCMP	Royal Canadian Mounted Police
REET	Regional Environmental Emergencies Team
RFFD	Reasonably Foreseeable Future Development
ROM	Run-Of-Mine
RQD	Rock Quality Designation
SAG	Semi-Autogenous Grinding
SEMC	Kivalliq regional Socio-Economic Monitoring Committee
SFE	Shake-Flask Extraction
STP	Sewage Treatment Plant
TAC	Transport Association of Canada
TC	Transport Canada
TDGA	<i>Transportation of Dangerous Goods Act</i>
TDS	Total Dissolved Solids
TEU	Twenty-foot Equivalent Unit, a measure used for capacity in container transportation (sea can)
tpd	Tonne(s) per day
TSF	Tailings Storage Facility
TSM	Towards Sustainable Mining

TSS	Total Suspended Solids
UG	Underground (mine operation)
UTM	Universal Transverse Mercator (coordinate system)
W	West
WCB	Workers' Compensation Board
WRSF	Waste Rock Storage Facility
wt %	Weight Percent

UNITS

Acronym		Conversion	
Weight measures			
mg	milligram		
g	gram	1 g	= 1000 mg
kg	kilogram	1 kg	= 1000 g
t	tonne	1 t	= 1000 kg
kt	kilotonne	1 kt	= 1000 t
oz	ounce	1 oz	= 28.3 g
Linear measures			
mm	millimetre		
cm	centimetre	1 cm	= 10 mm
m	metre	1 m	= 100 cm
km	kilometre	1 km	= 1000 m
Area measures			
m ²	square-metre		
km ²	square-kilometre	1 km ²	= 1,000,000 m ²
			= 100 ha
ha	hectare	1 ha	= 10,000 m ²
Volume measures			
mL	millilitre		
L	litre	1 L	= 1000 mL
ML	million litre		
cm ³	cubic centimetre		
m ³	cubic metre	1 m ³	= 1000 L
Time measures			
s	second		
min	minute	1 min	= 60 s
h	hour	1 h	= 60 min
d	day	1 d	= 24 h
y	year	1 y	= 365 d
Electrical measures			
V	volt		
kV	Kilovolt	1 kV	= 1000 V
MV	Megavolt	1 MV	= 1000 kV
W	Watt		
kW	Kilowatt	1 kW	= 1000 W
MW	Megawatt	1MW	= 1000 kW

SECTION 1.0 • INTRODUCTION

1.1 Integrating the Environmental Assessment into Project Development

A project development process proceeds in phases and is iterative in nature, and this is specially the case for mining projects where the understanding of the resource progressively increases as exploration and mining proceeds. Also, the evolution of the economic environment may transform through its life a project either by reducing it or increasing it depending on the changes of the value of the resource. Therefore, there is always something fluid with such projects during their life cycle; ideas are put on the table, first concepts developed, costs associated, and then project teams go back to the drawing table, and so on.

Project development decisions for mining projects are usually based on a feasibility study. These studies are quite detailed, and the closer we get to a “go/no-go” decision, the more confidence we need to have on the concepts, designs, and costs.

Linking the project development with the environmental assessment early in the process enhances the opportunities for the results of the impact assessment and appropriate mitigation measures to be efficiently tailored and integrated into project concepts and design, the goal being to come out with the best project as possible considering all of the environmental and economic components. In other words, achieve a “context-sensitive design”. As such, the Canadian Environmental Assessment Agency suggest that “an environmental assessment should be conducted as early as possible in the planning stage of a designated project in order for the proponent to be able to reflect the analysis in the proposed plans, including incorporation of mitigation measures to address adverse environmental effects²”.

In developing the Meliadine Project, Agnico Eagle Mines Limited (AEM) has decided to integrate the Project development engineering teams with the environmental and social specialists early in the process. In doing so, we also needed the environmental assessment to begin as soon as possible in the overall process. As mentioned before, this approach enhances opportunities of incorporating sensitive aspects into Project design concepts; however a downside of this approach is having to begin the environmental assessment process while the final and definitive Project description is still evolving.

To work around this challenge of having to assess potential environmental and social impacts while the final Project design is being finalized; AEM’s engineering and environmental teams sat together early in the Project development process and put together concepts and ideas to build a realistic Project that represents, on an impact point of view, the worst case scenario (Project footprint with

² <http://www.ceaa.gc.ca/default.asp?lang=En&n=B053F859-1#gen03> (accessed March 31, 2014).

the largest potential impact). That way, adapted mitigation measures can be incorporated directly into concepts while the other steps of the Project development are occurring.

This Detailed Project Description represents the outcome of this early team work. Parameters of Project and assessment were chosen to be as conservative as possible in order to make sure that all potential adverse impacts were captured by the study. As the results of the impact assessment were available, the concurrent Project development was adjusted. Project costs and designs were also refined in order to meet AEM expectations and standards. Work is still ongoing as the feasibility study has not yet been concluded (The Meliadine Project Feasibility Study is scheduled to be completed by the end of 2014).

However, in light of the work done up to now on the Project feasibility study, AEM expects that the final Project footprint may be somewhat smaller in size than the one presented in this Project description, without, however, resulting in what is perceived as major fundamental changes. The Meliadine Project, as defined in this Detailed Project Description has been selected by AEM as best representative of what should be subject to environmental assessment. We believe that this is a conservative approach to assessing the potential impacts from this Project and that if the Project footprint does change as the feasibility study proceeds then such change will be towards a smaller footprint with a subsequent reduction in potential impact on the land and water components of the environment.

The Project teams assembled by AEM to work on both this Environmental Impact Statement and on the Project Feasibility Study (including the pre-feasibility and trade-off studies) have been working together as an integrated team to ensure that Project development incorporates environmental and socio-economic considerations into the technical design. The integrated team looked at all phases of the Project life, including construction, operation, closure and post-closure, to ensure that design considerations looked at all of these phases and that environmental and socio-economic considerations were included at each phase. This has resulted in a Project design that has been modified and adapted to minimize environmental impacts where possible while meeting the technical and economic objectives for the Project; specifically technical and economic viability, minimum footprint, minimum impact on water bodies, avoidance of impacts on wildlife to the extent possible, avoidance of culturally sensitive areas, etc. These teams consisted of both AEM Project personnel and the Consultants specialists hired by AEM to help AEM work on the various components of these studies. AEM believes that this integrated team approach of working with the environmental assessment tool will help us achieve our objective of optimizing the blending of environmental and social interests into our Project development.

AEM believes that its history and record at the Meadowbank Mine speaks to how it has learned to incorporate environmental and socio-economic considerations successfully into the construction, operation and maintenance of its mining operations in Nunavut. AEM has demonstrated through its actions its ability to adaptively manage construction, operation and maintenance activities at its

Meadowbank Mine to protect the environment and minimize the adverse impacts of its operations on the land, water and wildlife of the area surrounding the Meadowbank Mine since construction started in 2008. AEM also believes that its track record at Meadowbank speaks to how it has learned to work with local communities, Inuit organizations and government agencies in an adaptive manner to minimize where possible the adverse social impacts of its activities while maximizing the socio-economic benefits to the residents of the Kivalliq region of Nunavut. AEM believes that overall its track record at Meadowbank has been viewed as being very positive on overall balance. Many of the outcomes or indicators resulting from the Meadowbank track record have been referenced in a number of external reports made public by groups such as the Kivalliq Socio-Economic Monitoring Committee (GN – SEMC Annual Reports) and by the Conference Board of Canada's Centre for the North reporting (http://www.centreforthenorth.ca/whats_up).

This Final Environmental Impact Statement (FEIS) has been prepared following the Nunavut Impact Review Board (NIRB) *Guidelines for the Preparation of an Environmental Impact Statement for Agnico-Eagle Mines Ltd.'s Meliadine Project* (NIRB File No. 11MN034) dated February 20, 2012, which were subsequently updated on March 6, 2013 based on supplemental information provided by AEM. Those guidelines were developed based on the information contained within the Revised Meliadine Project Proposal submitted by AEM and on the results of the NIRB's public scoping process; the current Volume of the FEIS describes in detail the various components and activities linked to the Project. Over the EIS, AEM has focus its discussion on key issues and weighted the level of detail as deemed appropriate. While developing its EIS, AEM also paid attention to the requirements of the Nunavut Land Claims Agreement (NLCA), NIRB's minimal EIS requirements, and the general EIS principles as described in the NIRB's *Guide 7: Guide to the Preparation of Environmental Impact Statements* (NIRB 2006).

1.2 Proponent Information

1.2.1 Corporate, Management and Operational Structure

Agnico Eagle Mines Limited (AEM or Agnico Eagle) is a long established gold producer based in Toronto, Ontario, with operations located in Canada (northwestern Québec and Nunavut), Finland and Mexico, and exploration and development activities in Canada, Finland, Mexico and the United States. In Nunavut AEM operates the Meadowbank Gold Mine, located approximately 75 km north of the community of Baker Lake in the Kivalliq region. The Meadowbank Mine was constructed in 2008 and 2009, entering commercial production in early 2010. Under current ore reserves AEM anticipates that Meadowbank will operate into 2017. The Meliadine Project is AEM's second gold mine project in Nunavut.

The Company is listed on the New York and Toronto Stock Exchange under trading symbol "AEM". It is held approximately 15 % by individuals and 85 % by institutions, primarily in North America. As of December 31, 2011, AEM had fully diluted shares outstanding of 170.3 million. The Meliadine Project is 100% owned by AEM.

OUR VISION

Agnico Eagle is committed to creating economic value for our shareholders by operating in a safe, socially and environmentally responsible manner while contributing to the prosperity of our employees and the communities in which we operate. Our goal is to establish a strong financial foundation which will allow us to share the wealth that is created through our investment in the mining and extraction of gold, and act as catalysts for the development of sustainable communities.

OUR VALUES

Operate safely

Protect the environment

Treat people and communities with respect

Make a profit

AEM's Corporate vision is summarized in the following statement:

AEM has been in existence as a Company since 1972. It was created through the merger of Agnico Mines Limited, a prominent silver producer operating mines in Cobalt, Ontario, and Eagle Gold Mines Limited, a successful gold exploration Company. When taking into account these two predecessor companies AEM has been in business in Canada as a mining Company for over 50 years.

AEM prides itself on the fact that as a Company it can rely on a highly experienced senior management team that have remained together for many years (the senior management team average approximately 20 years of service with AEM). As a Company, AEM has an excellent track record: as a local employer; in being a valued member of the communities in which we operate; in managing the environmental impact of our mining operations; in providing a safe work place and in reporting our performance to all of our stakeholders.

The Board of Directors is ultimately responsible for overseeing the management of the business and affairs of the Company and, in doing so, is required to act in the best interests of the Company. It consists of 13 directors, all but one being independent of management and free from any interest or business that could materially interfere with their ability to act in the Company's best interests. The Board discharges its responsibilities either directly or through four committees:

- Corporate Governance Committee;
- Audit Committee;
- Compensation Committee; and
- Health, Safety and Environment (HSE) Committee.

Amongst other, the Corporate Governance Committee advises and makes recommendations to the Board of Directors with respect to the development of the Corporation's corporate governance policies, principles, practices and processes. The HSE Committee advises and recommends with respect to (a) monitoring and reviewing of the health, safety and environmental policies, principles, practices and processes, (b) overseeing health, safety and environmental performance, and (c) monitoring and reviewing current and future regulatory issues relating to health, safety and the environment.

1.2.2 Sustainable Development Policy

AEM is committed to creating value for our shareholders by operating in a safe, socially and environmentally responsible manner while contributing to the prosperity of our employees, their families and the communities in which we operate. This is imbedded into the four fundamental values that make-up the keystones of AEM's Sustainable Development Policy: Operate Safely, Protect the Environment, and treat our Employees and Communities with Respect.

This commitment is reflected in AEM's published Sustainable Development Policy. This policy was last reviewed and approved by AEM's Board of Directors in 2013.. A copy of this Sustainable Development Policy is included (see next page).

Agnico Eagle Mines Limited - Sustainable Development Policy

Our Commitment

At the core of our Policy we are committed to creating value for our shareholders by operating in a safe, socially and environmentally responsible manner while contributing to the prosperity of our employees, their families and the communities in which we operate. This has translated into the four fundamental values of our Sustainable Development Policy: operate safely, protect the environment, and treat our employees and communities with respect.

This means we commit to:

- Promote leadership, personal commitment and accountability to these principles from all employees and contractors, both on and off the job;
- Assess potential impacts and risks associated with our activities throughout the life cycle of our projects or operations, including impacts of purchasing or acquisition decisions on the basis of our sustainability values;
- Ensure sufficient resources are allocated to implement and manage these commitments;
- Design and operate our facilities to ensure that effective controls and technologies are in place to minimize and mitigate the identified risks;
- Evaluate, control, eliminate or minimize risks through the implementation of a Responsible Mining Management System;
- Verify regularly our performance;
- Strive for continuous improvement by setting targets, measuring results against those targets and recognizing and rewarding performance;
- Comply in full with our internal policies and Code of Business Conduct and with the laws and regulations in each country in which we operate;
- Implement emergency response plans to eliminate or minimize and mitigate the impacts of unforeseen events;
- Engage in open and transparent communication and reporting of our policies, programs, payments to government and performance to our stakeholders;
- Provide appropriate planning and supervision to ensure that our policies, procedures and Responsible Mining Management System are implemented by all.


James D. Nasso
Chairman
March 2013


Sean Boyd
President & CEO
March 2013



We aim to maintain a safe and healthy workplace that is based on mutual respect, fairness and integrity.

To achieve this we:

- Ensure that no discriminatory conduct is tolerated in the workplace;
- Provide a fair and nondiscriminatory employee grievance system;
- Value diversity and treat all employees and contractors fairly, providing equal opportunity at all levels of the organization without bias;
- Employ and promote employees on the basis of merit;
- Provide fair and competitive compensation;
- Enforce a drug and alcohol free workplace;
- Maintain the confidentiality of collected personal and private information about employees;
- Recognize the right of employees to freedom of association;
- Provide appropriate training and development opportunities;
- Consult, communicate and provide appropriate support to employees during their association with AEM.



We aim to minimize the effects of our operations on the environment and maintain its viability and its diversity.

To achieve this we:

- Minimize the generation of waste and ensure its proper disposal;
- Manage tailings, waste rock and overburden to ensure environmental protection;
- Implement measures to conserve natural resources such as energy and water;
- Implement measures to reduce emissions to air, water and land, and to minimize our footprint;
- Implement measures to reduce our greenhouse gas emissions and address climate change;
- Integrate biodiversity conservation and land use planning considerations through all stages of business and production activities;
- Rehabilitate sites to ensure physical and chemical stability and in consultation with the communities in a timely manner.

We believe that all loss due to accidents/incidents is preventable. We aim to operate a safe and healthy work place that is injury and fatality free. We believe that if we all work together, we can achieve zero accidents in the work place and enhance the well-being of employees, contractors and communities.

To achieve a safe and healthy workplace we:

- Use sound engineering principles in the design and operation of our facilities;
- Provide appropriate training for all employees, at all levels of exploration, development, construction, and operations;
- Minimize the generation of hazardous conditions and ensure controls are in place;
- Maintain occupational health and industrial hygiene programs;
- Provide appropriate tools to carry out the work safely and efficiently;
- Maintain a high degree of emergency preparedness to effectively respond to emergencies.



We aim to contribute to the social and economic development of sustainable communities associated with our operations

To achieve this we:

- Provide a confidential complaint reporting mechanism to report unethical, illegal or irresponsible behaviour;
- Ensure that no child labour and any form of forced or compulsory labour are permitted in the workplace;
- Uphold fundamental human rights and respect cultures, customs and values of all affected by our activities;
- Foster an open, transparent and respectful dialogue with all communities of interest and ensure that activities on private lands and indigenous lands are performed with the free prior informed consent of the land owners;
- Support local communities and their sustainability through measures such as development programs, locally sourcing of goods and services and employing local people;
- Provide assurance that our operations will not support, benefit or contribute to unlawful armed conflict, serious human rights abuses, or breaches of international humanitarian law.

The commitments made in this Sustainable Development Policy extend to all of AEM operations worldwide and thus apply to both our Meadowbank Mine and to our Meliadine Project. This policy has been endorsed by the Chairman of the Board for AEM (Mr. James Nasso) and by AEM's Company President and Chief Executive Officer (Mr. Sean Boyd) and has been communicated throughout the Company and to the general public via the Company's website, the Company's intranet, internal and external Company publications. The Policy is posted throughout the Company's facilities and is part of our employee indoctrination process.

This policy states AEM's commitment to protect the environmental, public health and safety, and natural resources by conducting operations in an environmentally sound manner while pursuing continuous improvement of our environmental performance. AEM subscribes to the principle of sustainable development in mining. We make it our responsibility to limit negative environmental and social impacts and to enhance positive impacts. The environmental policy of the Company, as well as the health and safety policy, apply to all businesses for which AEM has an operating responsibility (i.e. employees, contractors, subcontractors and suppliers).

The Nunavut Impact Review Board (NIRB) Guidelines ask AEM to speak to the mechanisms that it has in place to ensure that our corporate policies are respected. These mechanisms can be broken down into two main categories:

- Internal mechanisms, such as internal responsibility and reporting mechanisms; and
- External mechanisms, such as external reporting and a third party "whistle blowing" system.

From an internal perspective the responsibility for ensuring that corporate policies are respected falls to the General Manager at each of AEM's operations. Each Manager has personnel assigned to the implementation, monitoring and performance of each of the policies; for example all of AEM's operations are staffed with qualified environmental and health and safety personnel. AEM has in place an integrated Health, Safety and Environmental Management System at each operation to support performance tracking and reporting activities.

The AEM Board of Director's has a separate HSE Committee. Each quarter this committee receives reporting on how each operation is performing in meetings its commitments and obligations under the Company's Sustainable Development Policy. This Committee in turn reports to the full Board of Directors. The HSE Board Committee will routinely review performance and direct adaptive corrective measures where necessary.

AT AEM, performance in meeting our policy commitments is part of the annual performance review mechanism for all senior management personnel.

From an external perspective, each year AEM publishes on-line an annual Corporate Social Responsibility (CSR) report that outlines its CSR performance, including environmental, health and

safety components (<http://www.agnicoeagle.com/en/Sustainability/Pages/default.aspx>). In the report AEM reports its performance against the following recognized indicators:

- The GRI global reporting initiative (<https://www.globalreporting.org/reporting/Pages/default.aspx>); and
- The Mining Association of Canada’s Towards Sustainable Mining Initiative performance indicators (<http://www.mining.ca/towards-sustainable-mining>).

These reports make clear to all stakeholders how the Company is doing in meeting its commitments and objectives as outlined in the Sustainable Development Policy. In addition AEM maintains a third party operated “whistle blowing” mechanism (Ethics Hotline - <http://www.agnicoeagle.com/en/About-Us/Governance/Pages/Ethics-Hotline.aspx>) where any party (internal or external) can report a breach of conduct. These are then transmitted to the AEM Board of Director’s for action.

AEM ENVIRONMENTAL POLICY

It is the policy of AEM to protect the environment, public health and safety, and natural resources by conducting operations in an environmentally sound manner while pursuing continuous improvement of our environmental performance.

Agnico Eagle also subscribes to the principle of sustainable development in mining. While mining cannot occur without an impact on the surrounding natural environment and communities, we make it our responsibility to limit negative environmental and social impacts and to enhance positive impacts.

To achieve these goals we are committed to:

- 1. Assess the potential environmental impacts of any new undertaking with an objective to minimise them.*
 - 2. Design and operate our facilities to ensure that effective controls are in place to minimise risks to health, safety and the environment.*
 - 3. Implement an emergency response plan to minimise the impacts of unforeseen events.*
 - 4. Provide a professional environmental staff to plan and direct environmental compliance programs and to assist in training and education activities.*
 - 5. Provide training and resources to develop environmentally responsible employees.*
 - 6. Ensure that environmental factors are included in the purchase of equipment and materials.*
 - 7. Ensure that contractors operate according to our environmental policy and procedures.*
 - 8. Comply with all applicable environmental laws and regulations.*
 - 9. Communicate with employees, the public, government agencies and other stakeholders on activities involving health, safety and the environment.*
 - 10. Regularly verify environmental performance and implement any required corrective action.*
 - 11. Minimise the generation of hazardous and non-hazardous waste and ensure proper disposal of all wastes.*
 - 12. Implement measures to conserve natural resources such as energy and water.*
 - 13. Rehabilitate sites in accordance with regulatory criteria and within the established time-frame.*
-

AEM HEALTH & SAFETY POLICY

Agnico Eagle Mines Limited is committed to Safe Production. The Health and Safety of people is a core value and our primary focus in producing the most possible ounces, at the lowest possible cost, to achieve the best possible benefits for all stake holders.

To achieve these goals, Agnico Eagle Mines Limited is committed to:

-
• <i>Promoting the concept that all loss due to accidents / incidents is preventable.</i>	• <i>The establishment and implementation of proper health and safety systems and processes to manage and control workplace risks.</i>
• <i>Encouraging and expecting safety leadership from all employees at all levels.</i>	
• <i>Encouraging a safety leadership that demonstrates a personal commitment and accountability to our safety principle.</i>	• <i>Design and operate our facilities to ensure that effective controls are in place to mitigate health and safety risks.</i>
• <i>Establishing a workplace environment that is supportive of all employees accepting responsibility.</i>	• <i>Provide professional safety staff to plan and direct safety / risk management compliance programs and assist in training and educational activities.</i>
• <i>Acting responsibly in the process of managing workplace risks.</i>	• <i>Comply with all applicable safety laws and regulations.</i>
• <i>Achieving Safe Production by applying proactively sound engineering principles and practical policies / procedures.</i>	• <i>Regularly audit our safety / risk management performance and implement any required corrective actions.</i>
• <i>Adequate training for all employees, at all levels of exploration, development construction, and operations.</i>	• <i>Minimize the generation of hazardous conditions and ensure controls are in place.</i>
-

We believe that the responsibility for the Health and Safety of our people is one that is shared with and between each employee, our suppliers and the contractors that are on our sites. We believe that each person has a contribution to make to the Health and Safety of everyone in the workplace and that such contribution is expected by all.

1.2.3 Corporate Social Responsibility (CSR) and Records

Current and trending performance on environmental, economic, human resources and community are summarized in our CSR annual report³.

Our core values support our long-term goals to responsibly grow our gold business, continuously improve our CSR performance, and deliver on our commitments to AEM's shareholders and stakeholders. In all aspects of our business we aim to: operate safely, protect the environment, treat people and communities with respect, and make a profit.

AEM approach to CSR

- *Respecting and valuing our employees because our progress is built on their competence, capacity and engagement*
- *Empowering our employees to work collaboratively in a culture where safety and respect are paramount*
- *Using best industry practices and innovation to continuously improve our environmental and safety performance*
- *Acting in a socially responsible manner and contributing to the communities in which we operate*
- *Working together with all of our employees and other stakeholders to create growth and prosperity which allows all stakeholders to benefit*
- *Learning from our past experiences*

Our performance is measured against the leading global standards of the mining industry and against the core values of AEM. As part of our overall commitment to achieving industry and global best practices, AEM has been steadily increasing its presence on national, international and industry-specific boards and organizations. As a participant in the following groups and initiatives, we have committed to meeting various compliance and industry standards:

- BNQ 21000;
- Carbon Disclosure Project (CDP);
- Global Reporting Initiative (GRI);
- International Cyanide Management Code;
- Towards Sustainable Mining (TSM) Initiative; and
- World Gold Council – Conflict Free Gold Standard.

³ <http://www.agnicoeagle.com/en/Sustainability/Pages/default.aspx>

Health and Safety

Creating and maintaining a safe workplace is a shared responsibility of the Company and each employee. Our overriding goal is zero harm to all workers at our sites. We do this through a combination of safety standards, safe work practices and procedures, incident reporting and tracking, knowledge sharing across our operations, and safety audits.

Each of our mine sites has an emergency response team – staffed with employees who volunteer for the assignment. Each employee receives extensive training and all the proper equipment they need to respond in an emergency situation.

The health and safety of employees is our top priority and, in 2011, our safety performance continued to improve. The Québec Mining Association (AMQ) acknowledged our leadership in this area, recognizing 15 AEM supervisors for keeping their workers safe.

In 2013, the combined lost-time accident frequency at all AEM operations was 1.70, a 30% reduction from the previous year's performance – and substantially below our target of 2.8.

Human Resources

At the end of 2013, we had approximately 4,000 employees at all of our sites worldwide. If we include contractors, the figure increases to approximately 5,000 people.

AEM conducted its first global employee engagement survey in 2011. The feedback indicated employees are engaged in their workplace, believe AEM is a good place to work, and are proud of AEM's CSR and community programs. They also indicated specific areas for improvement and we are addressing these concerns.

As our labour force requirements grow in step with our business, we want to ensure our employees have the tools and skills they need to perform their jobs efficiently and safely and to achieve their full potential. We continuously work on providing the type of training that helps enhance employees' personal and career development opportunities. We place a particular emphasis on health and safety training, to ensure that our employees are measuring up to AEM's health and safety standards in the workplace.

AEM's presence brings economic opportunities to regions around our mines and projects. We strive to be a catalyst for sustainable, long-term development by hiring and training local people to improve their long-term career prospects; and by creating a local labour force and market that will require their expertise in the future.

In a highly competitive and global workforce market, AEM strive to create a corporate culture in which every person is treated with dignity and respect, and people interact on the basis of collaboration, commitment and dedication to excellence.

At each of AEM's operations worldwide, our goal is to hire as much of our workforce – including our management teams – directly from the local region in which the operation is located. In northern Canada, we are working with various local authorities to develop key training initiatives in support of our goal to eventually hire 100 % of our workforce from the local region. At this time, approximately 30 % of our local mine workforce is drawn from Inuit of the Kivalliq region of Nunavut. These employees come from all seven of the communities in the Kivalliq region – Arviat, Baker Lake, Chesterfield Inlet, Coral Harbour, Rankin Inlet, Repulse Bay and Whale Cove – and they are transported to the mine site at AEM's expense in order to ensure employment opportunities are equally available across the region.

Some of the biggest challenges we face at our projects in the Canadian Arctic include harsh working conditions, lack of infrastructure and high employee turnover. High employee turnover rates are costly and disruptive to any organization, but particularly to large mining and production facilities. To address this issue, Meadowbank has embarked on an aggressive on-the-job training plan in partnership with the Inuit associations and Government of Nunavut to encourage retention of employees at our mine site.

At Meadowbank, the percentage of the workforce hired from surrounding communities is approximately 30 % – which underscores the fact that there is a lack of skilled workforce in our surrounding communities to fill the many positions we have available. Approximately only 39 % of the Inuit population of Nunavut have completed high school, and of the remaining 61 %, 37 % have completed below grade 9 educations. Finding people with the right skills and retaining them is thus a challenge we are facing at both Meadowbank and Meliadine in Nunavut, but we are redoubling our education, training and skills development focus to help address this issue. The training program aims at increasing the number of qualified candidates for apprenticeship programs for skilled workers, as well as training to assist with career progression.

Through the Inuit Impact and Benefit Agreement (IIBA) which we signed with the Kivalliq Inuit Association (KIA) for the Meadowbank Mine, AEM has committed to partnering with the Inuit to create both employment and new business opportunities for the Inuit of the Kivalliq region so that they can fully participate in the future development of their land.

Environment

In all parts of our business, we limit our environmental impacts by using natural resources efficiently, by limiting or preventing pollution, and by reducing waste. Accountability for protecting the environment extends to every employee and contractor who works for AEM. Everyone is expected to understand and act in accordance with our Environmental Policy, with various regulatory compliance requirements, and to report unacceptable practices to management.

In line with our Environmental Policy, our operations are required to meet and, where practical, exceed relevant laws, regulations and standards. We believe in using industry best practices to ensure that our operations minimize their impact on the environment to the greatest practical

extent possible. As part of our Environmental Management System (Responsible Mining Management System) each AEM operation is required to identify, analyze and manage the environmental risks specific to its activities and to work in a transparent manner with involved local stakeholders. AEM has ensured that the resources (both human and economic) have been made available to ensure that regulatory requirements are being fully met at all of its mining operations.

AEM has operated within Nunavut since early 2008 and has accumulated six years of operating experience under the Nunavut regulatory operating environment primarily at its Meadowbank Mine near Baker Lake. From this experience AEM has developed the personnel and management systems required to understand, track, monitor and report on its environmental performance against the regulatory requirements contained with its operating authorizations, permits, licenses, leases and as contained in the respective Acts and Regulations that apply in Nunavut. AEM believes that it has demonstrated openness, transparency and a history of being able to adaptively manage its operations to meet its regulatory obligations and requirements in Nunavut. AEM believes that it has demonstrated good faith in meeting all of its regulatory requirements at Meadowbank. Where activities have resulted in exceedances or departures from regulatory requirements AEM has demonstrated good corporate citizenship by prompt self-reporting of such occurrences and through working openly with all regulatory agencies to develop and implement “action plans” to correct such departures in a timely manner. The Meadowbank Mine is a complex facility with a large number of regulatory requirements and a complex reporting regime. While not everything has gone perfectly at Meadowbank, where exceedances or departures have occurred, corrective action has been readily taken by AEM in a timely fashion and on a voluntary basis. In other words at no time have any of the regulators had to resort to legal charges to get AEM to initiate corrective actions. It is also important to note that all of the exceedances or departures from regulatory requirements at Meadowbank have been successfully adaptively managed with the result that no significant long term harm to the surrounding land, water or wildlife has occurred.

Properly managing the water we use and the effluents we discharge is an important component of the environmental management programs at all of our mining operations. In 2012, the total water consumed by AEM from all sources was 4.9 million cubic metres, down from 5.7 million cubic meters in 2011 and from 5.9 million cubic metres in 2010, a decrease driven largely by stabilization in our production. Our withdrawal and use of fresh water from all sources was 0.40 cubic metres per tonne of ore milled in 2012 and in 2011, down from 0.52 in 2010 reflecting the continuing effort placed on this issue.

In 2012, we conducted 1,021 environmental inspections to verify key processes such as waste segregation, proper handling of hazardous waste, proper labelling of hazardous material, and water segregation and drainage, up from 655 in 2011. There were no serious environmental incidents recorded in 2012 and no major compliance actions were taken at any of our sites.

The best way to manage spills is to prevent them from occurring. Spill reporting is the key to prevention. Our employees are therefore encouraged to report all environmental spills and incidents, no matter how small, so they can be properly investigated and mitigation measures put in place to minimize damage and prevent any reoccurrence. In 2011, 138 spills were reported, very close to the 135 reported spills in 2010. Of these incidents, five occurred outside the mine boundaries, with only one involving a large volume (11,200 litres). Contaminated material from the larger spill was completely recovered with no effect on surface water. For the spills inside the mine boundaries, 32 were in the larger than 100 litres category, out of which 20 were larger than 1,000 litres. This compares to 26 and 11 spills in 2010 in these same categories. We believe that these higher numbers are more an indication of our improved tracking and reporting capabilities than an actual increase in spill events. With the use of Intalex⁴ as a reporting tool in 2011, and the accompanying emphasis on reporting incidents to improve performance, we expect the number of reported spills to increase again in 2012.

We focus on limiting our environmental impacts by using natural resources efficiently, by preventing or limiting pollution, and by reducing waste. Each of our operations is required to identify, analyze and manage its environmental risks and to work in a transparent manner involved with local stakeholders.

When environmental incidents occur, we determine the cause and take steps to prevent any recurrence. We have emergency preparedness and spill response plans at each of our operations and we regularly train our employees to ensure that our sites respond appropriately and efficiently when an incident occurs. Initial emergency response equipment is in place at all of our operation.

⁴ Intalex is an on-line HSE data recording and management system used at all of AEM's operating mines to help the site's track, report and watch for trends in environmental monitoring data. It also tracks regulatory requirements and helps manage management plans under AEM's integrated Health, Safety and Environmental Management system.

Learning from Incidents in Nunavut

Fuel for the operation of the Meadowbank Mine is delivered in bulk to Baker Lake during the annual sealift where it is stored in a tank farm consisting of six tanks of 10 million litres capacity each. Throughout the year, highway fuel tank trucks transfer the fuel from Baker Lake to a storage tank at the Meadowbank Mine site, a 110-kilometre journey. At the end of 2010, during the fuel transportation from Baker Lake to the mine, a fuel truck left the road and in the process, punctured its fuel tank. The emergency response crew was rapidly on the scene and, with the help of cold weather, prevented the spilled fuel from reaching the nearby watercourse. In addition to the cleanup of contaminated soil and snow, the incident led to a rethinking of emergency measures along the road. Having identified that the highest risk was watercourse contamination, it was decided that a sea can equipped with emergency response material would be placed near each of the nine (9) main water crossings along the road. In addition, all fuel delivery and material delivery personnel were trained on hazardous material transport.

Community Relations

AEM's proud 55-year history is a testament to our employees and local communities, who have been true partners in our success. We respect and value their support and, in turn, we are committed to operating in a safe and socially responsible manner and contributing to the communities in which we operate. As a result, in 2011, AEM was listed on Sustainalytics' Jantzi Social Index (JSI) for our solid social performance, relationships with indigenous communities, and commitment to employee health and safety.

AEM contributes to the sustainability of our local communities by supporting various health, educational and capacity building initiatives. Each mine has a community engagement plan, which is unique to the setting and updated annually. All divisions undertake their stakeholder engagement programs at local and regional levels. In addition, we have established a Stakeholder Advisory Committee to obtain input and guidance into our CSR programs.

Contribution to the Economy

In 2013, AEM paid \$372 million in global employee compensation, up from \$308.8 million in 2011. Through the payment of wages and benefits, this represents a contribution of approximately \$91 million to the economy of Nunavut.

Whenever and wherever we can, AEM gives preference to buying from local suppliers as a way of supporting our communities, stimulating the local economy, and minimizing the environmental impact of transporting materials from distant locations to our sites. However, local suppliers must still meet the same criteria that all potential suppliers must meet in order to do business with our Company. We continue to make steady progress toward increasing the overall level of local

spending at our mine sites. On average in 2013, approximately 50 % of the purchases at each of our mines were made through local suppliers and contractors.

A website is dedicated to our activities in Nunavut: <http://www.aemnunavut.ca/>. The objective of this website is to provide employees, communities, potential business partners and suppliers in the Kivalliq region with information and regular updates on our activities in the region. The website is also designed to help Inuit-owned and Nunavut based companies discover the many business opportunities available with the Meadowbank and Meliadine operations. It is a way business and suppliers can learn about our current community partnerships and opportunities to develop new partnerships as we continue establishing ourselves as a major contributor to the Kivalliq region. Employment opportunities will also be posted along with details on how to apply for a job.

Regulatory Expectations

Regulatory expectations are rising everywhere in the world as a result of the demands of the population for more accountability from the industrial sectors. Mining is no exception. With the members of the mining associations to which we belong, we are reviewing the regulatory landscape of the jurisdictions in which we operate to better prepare our operations for eventual changes in the laws that govern mining. Here are some of the trends in regulatory expectations that we see:

- More transparency regarding mining activities and decisions;
- More regard for the other land uses with which mining shares the territory;
- Public consultation becoming a requirement of permitting, legitimizing the “social licence to operate” informally sought by mining companies;
- Continuous improvement of environmental performance becoming a condition of permitting;
- Continuous improvement of health and safety performance; and
- Respect for human rights.

We are working towards being able to meet these expectations by improving our communications and consultations with the population, by implementing a health, safety and environment management system and by upgrading our policies.

After Mining - Mine Closure Responsibility

All of AEM’s operating mine sites have up-to-date mine closure and reclamation plans. These plans define the way that AEM will close out and reclaim each of its operating mine sites once mining has ceased. In addition the asset retirement obligation (ARO) or reclamation liability has been calculated for each site and accounting provisions taken for this liability. Financial assurance requirements for mine reclamation are being met as required at each site. In addition to our active mining sites, AEM is responsible for several closed mining properties in Québec and Ontario. The following is a short summary of the status at these sites:

Cobalt-Coleman, Ontario

AEM holds historical mining properties in the Cobalt- Coleman area of Ontario where numerous mines were exploited for silver between 1903 and 1989. AEM operated 20 mines between 1956 and 1989, for silver but also for cobalt. The mining activities ceased in 1989 due to low silver prices. A closure plan was submitted for each of the mines to the Ministry of Northern Development and Mines and the requirements from these plans were fulfilled.

In 2011, AEM continued to carry out work in the Cobalt- Coleman area. The work consisted of:

- Minor remediation works around known mine hazards;
- General housekeeping;
- Monitoring of remediated areas;
- Surveying of two tailings ponds and one former mill site, and identifying potential mine hazards; and
- Monitoring of water quality and water flow of the surface waters affected by old tailings ponds.

Throughout the years, AEM maintained contact on a regular basis with local stakeholders such as the Town of Cobalt, Coleman Township, Cobalt Historical Society, and the Cobalt Mining Museum. Discussions were also undertaken with the Ministry of Environment of Ontario and the Ministry of Northern Development and Mines to determine future remedial works to be conducted in the Cobalt-Coleman area.

Preissac Molybdenite, Québec

AEM holds a mining concession in Preissac Township, about 10 km north of LaRonde mine in Québec. This property, a former molybdenite mine, was part of the 1978 acquisition of the Dumagami mine (now the LaRonde mine). The site was mined from 1962 to 1971 and has seen a number of owners over the years. The last owner to operate at this site left in 1972 and used the site for metal recovery from scrap metal. Unfortunately, the previous owner left the site littered with empty barrels of chemicals and contaminated ground. AEM's only involvement with the site was to conduct an underground exploration campaign in the 1990s. During the molybdenite mine operation, the tailings were discharged directly into the environment without containment and were never rehabilitated by the original owner. In meeting its obligation for the long-term care and maintenance of this site, AEM has removed building foundations, sealed mine openings, fenced potential subsidence areas and cleaned the site of all remaining chemical and other scrap metal debris. We are in the process of demonstrating to the Québec government that the site is now stable, with the objective of returning the site to the province.

Eagle and Telbel, Québec

The former Eagle and Telbel mines and mill were closed in 1993. The remaining mine infrastructure (including all buildings) was demolished and removed between 1996 and 2000. All mine surface openings were sealed in accordance with the requirements of the Québec *Mining Act*. The area where the mine building and other infrastructure had been located was cleared, covered with a layer of soil and successfully revegetated in 2004. In response to questions from the Québec Ministry of Natural Resources and Fauna (MRNF) about the chemical reactivity of tailings, AEM has conducted a number of studies over the years. Meanwhile, AEM is continuing post-closure monitoring of the final effluent to support the conclusion of the studies and models. Some reclamation works were also conducted on the tailings pond during past years, most notably to increase pond stability by constructing larger and more stable spillways. The final reclamation plan was submitted to the Québec Ministry of Natural Resources and Fauna in 2010, which in turn asked environmental advice of the Ministry of Sustainable Development, Environment and Parks (MDDEP). Last summer, additional questions on the long-term fate of the tailings were brought by the MDDEP. AEM conducted an extensive study last fall with the best scientists in the field on the older tailings of the site to get answers for the remaining uncertainties. The results of this study were presented by AEM in 2012 to both Ministries (MRNF and MDDEP). AEM is now working with both Ministries to reach agreement on the best reclamation approach to permanently close out this tailings pond.

AEM continues to meet its reclamation obligations at all of these sites. These sites remain under the active long term care and maintenance of AEM, and AEM continues to monitor environmental performance at each site. AEM continues to work with the regulators and with the local communities to ensure that all of these sites remain stable and do not create any ongoing environmental or public safety risk to the surrounding area.

Meadowbank Mine, Nunavut

AEM maintains an updated Closure and Reclamation Plan for its Meadowbank Mine in Nunavut in accordance with both its Type A Water License and its Commercial Production Land Use Lease with the Kivalliq Inuit Association (KIA). This plan has been subject to review by the regulatory agencies and has been approved by the Nunavut Water Board and the KIA. This Plan addresses temporary, premature and final closure scenarios. AEM maintains security bonds against reclamation liability in the form of guaranteed Letters of Credit held by one of Canada's main banks that are pledged to the Government of Canada and to the KIA in the event that AEM does not complete reclamation at Meadowbank in accordance with the approved Closure and Reclamation Plan. In total, AEM has approximately \$100 Million in security bonds posted for its Meadowbank Mine for reclamation liability and for compensation for loss of fish habitat caused by the project. AEM also maintains insurance coverage in the event of an environmental accident resulting in major harm to a third party caused by its activities at Meadowbank. In addition AEM has provided a third party liability bond of \$5 Million to the Government of Nunavut against an accident at its fuel storage facility in

Baker Lake. AEM anticipates posting of similar security bonds if and when the Meliadine Project proceeds into construction.

AEM has completed a Water Compensation Agreement with the KIA for the Meadowbank Mine in accordance with Article 20 of the Nunavut Land Claims Agreement (NLCA). This provides ongoing water compensation payments to the KIA during the mine's construction, operations and into post closure phases.

1.2.4 Experience in Mining

AEM was formed in 1972 through the merger of Agnico Mines Limited, a prominent silver producer in Cobalt, Ontario, and Eagle Gold Mines Limited, a successful gold exploration Company. Since then, the Company successfully operates open pit and underground mining operations in Québec, mainly, but also in Mexico, Finland, and Nunavut. Exploration is an important ongoing activity supporting the operations and the growth of the Company.

AEM operates currently 4 mines in Canada (LaRonde, Lapa, Goldex and Meadowbank), one mine in Finland (Kittilä) and two mines in Mexico (Pinos Altos and La India). Expected gold production for 2014 is between 1,175- and 1,205 thousand ounces.

Mining in the North

The majority of the operations of AEM, the exception being our two mines in Mexico, are located in areas where winter is present a large part of the year. The Company is thus used to operating in cold environments.

AEM started the production at its Meadowbank operation in Nunavut in early 2010. The Meadowbank Mine is located in the Kivalliq region of Nunavut, about 75 km north of Baker Lake. This operation depends on the annual sealift for transportation of bulk supplies and heavy equipment. We built and operate a 110-km all-weather road to link the site to Baker Lake, as well as an on-site airstrip for shipping food and goods and for transporting employees. The mine also relies on an on-site power plant for energy production, which operates with diesel fuel shipped by sea, stored in Baker Lake, and then transported to the mine site by tanker trucks. The camp disposes of all the support and safety infrastructures and procedures necessary in an isolated area. In developing the Meliadine Project, AEM strongly builds on its Meadowbank experience as the majority of the activities being proposed for that Project are already successfully operated at Meadowbank.

1.2.5 Ownership of Rights and Interests in the Project

On July 6, 2010, AEM purchased Comaplex Minerals Corporation (Comaplex), making it a wholly owned subsidiary. At the time, Comaplex was planning to move the Meliadine Gold Project from an advanced exploration site to an operating gold mine. Exploration at Meliadine camp over the years has shown the potential for a gold mine.

The following provides a summary of the interests in land that AEM (and formerly Comaplex) has acquired to date to constitute the Meliadine “property” (further detail is provided in Section 1.5 of this Volume).

The Meliadine property consists of 52,173 ha: 887 ha as claims, and 51,286 ha as leases. Those 51,286 ha are held under the Canada Mining Regulations, administered by Aboriginal Affairs and Northern Development Canada (AANDC; formerly Indian and Northern Affairs Canada (INAC)), and referred to as Crown Land. As well, AEM has 3,430 ha of sub-surface Nunavut Tunngavik Inc. (NTI) concessions where the sub-surface mineral rights are administered directly by NTI.

The gold deposits of the Meliadine Project are situated on Inuit Owned Lands (IOL) owned and administered by Nunavut Tunngavik Inc. (sub-surface and mineral rights) and the Kivalliq Inuit Association (KIA; surface rights) on behalf of the Inuit Beneficiaries as designated under the Nunavut Land Claims Agreement (NLCA). The mineral claims underlying the deposits at the Meliadine Project were staked with the Government of Canada prior to the signing of the NLCA in 1999 and have been held continuously by the mining rights holder (Comaplex, and now AEM). Consequently, they are considered to be grandfathered under the NLCA, meaning that the mineral production royalties payable to the land and mineral rights owner are administered by the Government of Canada under the *Canada Mining Regulations*, unless otherwise mutually agreed to by the mineral claim holder and the mineral rights owner. The royalty collected are then transferred to NTI as the new sub-surface mineral rights owner.

The Meliadine claim and concession block is contiguous with the exception of the CWM claims and the FAY, FELSIC, and ANT 3 concessions. A location map of the concessions, claims, and leases is shown in Figure 1-4 (as of December 31, 2010). Table 1-5 gives claims and leases details while Table 1-6, Table 1-7 and Table 1-8 describe the NTI concessions commitments.

To date AEM has negotiated a Water Compensation Agreement with the KIA covering the construction, operation and decommissioning of the Phase 1 all-weather access road (AWAR) between Rankin Inlet and the Project site. This agreement is in accordance with Article 20 of NLCA addressing Inuit Water Rights. AEM will require a similar Agreement with the KIA for the construction, operation and decommissioning of the proposed Meliadine Gold Mine project addressing compensation for Inuit Water Rights affected by the proposed Project. AEM and KIA have not yet initiated negotiations of such an agreement but have agreed to initiate such negotiations later in 2014 or early 2015. AEM knows of no other water rights that must be secured for the proposed Project outside of the Type A and Type B Water License (discussed in Section 1.3 later in this Volume).

1.2.6 Contact Information

Complete contact information is provided in Table 1-1.

Table 1-1 Meliadine Project Contact Information

Office	Contact	Address	Phone	Fax	Email
Corporate Office		Agnico Eagle Mines Limited 145 King Street East, Suite 400 Toronto, Ontario, M5C 2Y7, Canada	416.947.1212 1.888.822.6714	416.367.4681	info@agnicoeagle.com www.agnicoeagle.com
Project		Meliadine Gold Project – AEM 10 200, route de Preissac Rouyn-Noranda, Québec, J0Y 1C0, Canada	819.759.3700	819.759.3663	
Rankin Inlet	Selma Eccles	Meliadine Gold Project – AEM P.O. Box 879 Rankin Inlet, Nunavut, X0C 0G0, Canada	867.645.2920		selma.eccles@agnicoeagle.com
Project Management	Nancy Guay	Meliadine Gold Project -- AEM 10 200, route de Preissac Rouyn-Noranda, Québec, J0Y 1C0, Canada	647.260.3761 438.402.2365		nancy.guay@agnicoeagle.com
Exploration	Denis Vaillancourt	765, chemin de la mine Goldex Val-d'Or, Québec, J9P 4N9, Canada	819.874.5980		denis.vaillancourt@agnicoeagle.com
Environment	Stéphane Robert	Meliadine Gold Project -- AEM 10 200, route de Preissac Rouyn-Noranda, Québec, J0Y 1C0, Canada	819.759.3700 ext. 5188 819.763.0229		stephane.robert@agnicoeagle.com

1.3 Regulatory Regime

The proposed Meliadine Project is located within the Nunavut Territory and is thus subject to the regulatory processes established under the applicable laws and regulations of Canada and of Nunavut.

The Project is subject to a regulatory regime relating to Project approval, construction, operations, maintenance and monitoring, and closure. A list of existing authorizations is found at Table 1-9 in Section 1.5 - Land Tenure. The primary Project approval requirements are summarized in Table 1-2. A detailed list of all applicable statutes, regulations, codes and standards to which the Project may be subject is available in Table 1-3⁵.

Specifically, the Project is subject to the environmental and socio-economic impact assessment and permitting processes established under the Nunavut Land Claims Agreement (NLCA). Article 12, Part 5 of the NLCA sets out the environmental and socio-economic review and assessment requirements managed by the Nunavut Impact Review Board (NIRB), one of five Institutions of Public Government established under the NLCA. If the Project is successful in clearing all of the requirements of this review, then the NIRB may recommend to the Federal Minister of Aboriginal Affairs and Northern Development Canada (AANDC) that the Project be allowed to proceed under a Project Certificate. If the Minister concurs, then the NIRB may issue such a Project Certificate with incumbent conditions under which the Project may proceed to the permitting phase. No regulatory body can issue an authorization, license, approval for the Project until such a Certificate has been issued by the NIRB.

In early May 2011, AEM submitted to the NIRB, the Kivalliq Inuit Association (KIA), the Nunavut Planning Commission (NPC) and other regulatory agencies a Project Description (AEM 2011a) for its proposed Meliadine Gold Project. In accordance with the NLCA, this application was referred to NIRB and NPC. Pursuant to Article 11 of the NLCA, all applications for development proposals must be forwarded to and reviewed by the NPC for conformity with any applicable land use plan. The proposed Meliadine Gold Project received a positive conformity determination against the Keewatin Regional Land Use Plan (NPC 2000), and the NPC forwarded the Project proposal and their conformity determination to the NIRB in June 2011.

Subsequently the NIRB requested AEM provide additional project-specific information so as to facilitate community scoping sessions. On September 29, 2011 an updated Project Description was submitted by AEM to the NIRB, which addressed their specific information needs.

Pursuant to Article 12 of the NLCA, the NIRB then screened the Project proposal and forwarded a recommendation for an Article 12, Part 5 review of the proposed Meliadine Gold Project to be led by the NIRB to the Minister of AANDC in July 2011. The Minister concurred with NIRB

⁵ Bill C45 was passed by Parliament on December 14, 2012; however, as all information on modified Acts is not available at the time this document is submitted, Table 1-3 will be updated for Final EIS submission.

recommendation and directed in a decision released in September 2011 that the NIRB conduct an Article 12, Part 5 review of the Project. Final guidelines for the preparation of an Environmental Impact Statement (EIS) for the proposed Meliadine Gold Project were issued by the NIRB in February of 2012, which were subsequently updated on March 6, 2013 based on supplemental information provided by AEM.

Article 13 of the NLCA (in conjunction with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*) sets out the water licensing process managed by the Nunavut Water Board (NWB), another Institution of Public Government established under the NLCA. The water licensing process deals with all Project uses of water and the disposal of all mine related wastes. The process also addresses ultimate closure of the proposed mine and its related facilities. If the Proponent is successful in meeting all of the requirements of the water licensing process, then the NWB may recommend to the Minister of AANDC that the Project be allowed to proceed under a Water License. If the Minister concurs, then the NWB may issue such a Water License with incumbent conditions under which the Project may proceed to construction, operation, maintenance and ultimate closure and reclamation (including a temporary closure should that occur during the mine life).

The proposed Meliadine Project is located on Inuit Owned Lands managed by the KIA for all surface rights and by Nunavut Tunngavik Incorporated (NTI) for the sub-surface mineral rights. The Project will require the authorization and consent of the KIA for development, construction, operation and closure of the mine and its related facilities. These approvals will be in the form of land use leases, production lease, Inuit Impact and Benefit Agreement (IIBA), Water Compensation Agreement and other forms of approvals, permits and authorizations.

It is the responsibility of the Proponent (AEM) to apply for all of the required authorizations, permits, licenses, etc. that will be required for the development, construction, operation and maintenance, closure, reclamation and post-closure monitoring activities and facilities. AEM will also meet all requirements related to performance bonds that could be linked to mine closure, performance on land leases, and DFO authorizations. It is also the responsibility of the Proponent (AEM) to understand and comply with all of the requirements and conditions contained within these regulatory approvals and to provide the necessary resources to meet these obligations.

Table 1-2 Primary Project Approval Requirements

Permit/Approval Legislation	Administering Agency	Project Activity
Project Certificate NLCA (Article 12)	NIRB	Project approval
Inuit Impact and Benefit Agreement NLCA (Article 26)	KIA	Project commencement
Mineral Production Lease	NTI	Required for mineral production
Inuit Water Rights Compensation Agreement NLCA (Article 20)	KIA	May be required
Water Licence <i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i>	NWB	Required for water use and waste disposal
Class 1/Class 2 Archaeology Permit <i>Nunavut Archaeological and Paleontological Sites Regulations</i>	Government of Nunavut – Department of Culture, Language, Elders and Youth (CLEY)	Required to conduct archaeology research and to mitigate archaeological sites to allow development to occur
IOL – Commercial Land Use Lease or Right of Way NLCA	KIA	Long term land tenure required for land use on Inuit Owned Lands; land required for infrastructure, roads and activities associated with construction, operations, and closure phases
IOL – Quarry Lease/Permit NLCA	KIA	Required for quarrying of material on Inuit Owned Lands during construction, operation and closure
Crown Land – Lease/Land Use Permit <i>Territorial Lands Act</i> <i>Territorial Land Use Regulations</i>	AANDC	Required for quarrying of material on Crown land during construction, operation and closure
Approval and/or Exemption <i>Navigable Waters Protection Act</i> (sections 5, 22 and 23)	Transport Canada	Construction of works in navigable waters. Prescriptions of Sections 22 and 23 of the NWPA will be followed as necessary.
Fisheries Authorization for Harmful Alteration Disruption or Destruction (HADD) of Fish or Fish Habitat <i>Fisheries Act</i> (section 35)	Fisheries and Oceans Canada (DFO)	Required if HADD cannot be avoided; if HADD can be avoided, DFO may provide a letter of advice outlining best management practices
Licence for a Factory and Magazine <i>Explosives Act and Regulations</i>	Natural Resources Canada	Required for construction of explosives factories and magazine(s) and storage of explosives
Permit to Store Detonators <i>Explosives Use Act</i>	Nunavut Mine Health and Safety Nunavut Workers Compensation	Required to store detonators in a magazine

Permit/Approval Legislation	Administering Agency	Project Activity
<i>Mine Health and Safety Act and Regulations</i>	Board	
Explosive Use Permit <i>Explosives Use Act</i> <i>Mine Health and Safety Act and Regulations</i>	Nunavut Mine Health and Safety Nunavut Workers Compensation Board	A permit is required to use explosives unless used in accordance with the regulations
Spill Contingency Plan Approval <i>Environmental Protection Act</i> <i>Spill Contingency Planning and Reporting Regulations</i>	Nunavut Department of Environment (DoE)	A Spill Contingency Plan must be filed with the Chief Environmental Protection Officer to store fuel in an above-ground facility with a 20,000 L capacity or greater
Assorted Scientific Research Permits <i>Scientist Act</i> <i>Wildlife Act</i>	Nunavut Research Institute	Required to conduct some of the environmental monitoring activities

Table 1-3 Primary Applicable Acts, Regulations and Guidelines to the Meliadine Gold Project

Acts	Regulations	Guidelines
Federal		
<i>Canadian Environmental Protection Act (1999 c.33)</i>	<i>Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)</i> <i>Environmental Emergency Regulations (SOR/2003-307)</i> <i>Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301)</i> <i>Release and Environmental Emergency Notification Regulations (SOR/2011-90)</i>	Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
<i>Canada Wildlife Act (1985 w9)</i>		
<i>Species at Risk Act (2002 c.29)</i>		Species at Risk Policies
<i>Migratory Birds Convention Act (1994 c.22)</i>	<i>Migratory Birds Regulations (C.R.C., c. 1035)</i>	
<i>Canada Water Act (1985 c.11)</i>		
<i>Oceans Act (S.C. 1996, c. 31)</i>		
<i>Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)</i>	<i>Arctic Waters Pollution Prevention Regulations (C.R.C., c. 354)</i> <i>Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353)</i>	
<i>Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)</i>	<i>Transportation Safety Board Regulations (SOR/92-446)</i>	
<i>Canada Shipping Act, 2001 (S.C. 2001, c. 26)</i>	<i>Response Organizations and Oil Handling Facilities Regulations (SOR/95-405)</i> <i>Pollutant Discharge Reporting Regulations, 1995 (SOR/95-351)</i> <i>Environmental Response Arrangements Regulations (SOR/2008-275)</i> <i>Ballast Water Control and Management Regulations (SOR/2006-129)</i> <i>Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)</i>	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP

Acts	Regulations	Guidelines
		12401E 1995 Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
<i>Navigable Waters Protection Act</i> (R.S. 1985 c. N-22)	<i>Navigable Waters Works Regulations</i> (C.R.C., c. 1232) <i>Navigable Waters Bridges Regulations</i> (C.R.C., c. 1231)	
<i>Marine Liability Act</i> (A.C. 2001, c.6)	<i>Marine Liability Regulations</i> (SOR/2002-307)	
<i>Fisheries Act</i> (R.S.C. c. F-14) <i>35. (1) No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.</i> Projects that have the potential to obstruct fish passage, modify flow or result in the entrainment of fish may also cause <i>serious harm to fish</i> . In these situations, an authorization under Subsection 35(2) is required. Proponents are responsible for avoiding and mitigating <i>serious harm to fish</i> that are part of or support commercial, recreational or Aboriginal fisheries. When proponents are unable to completely avoid or mitigate <i>serious harm to fish</i> , their projects will normally require authorization under Subsection 35(2).	<i>Metal Mining Effluent Regulations</i> (SOR/2002-2222) <i>Marine Mammal Regulations</i> (SOR/93-56)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges The Fisheries Protection Policy Statement, 2013 Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting
<i>Safe Containers Convention Act</i> (R.C.C. 1985, c. S-1)		
<i>Transport of Dangerous Goods Act</i> (1992, c.34)	<i>Transportation of Dangerous Goods Regulations</i> (SOR/2001-286)	
<i>Explosives Act</i> (1985 c.E-17)	<i>Explosives Regulations</i> (C.R.C., c. 599) <i>Ammonium Nitrate and Fuel Oil Order</i> (C.R.C., c. 598)	
<i>National Fire Code of Canada</i> (2010)		

Acts	Regulations	Guidelines
<i>Nuclear Safety and Control Act</i> (s.c. 1997, c.9)	<i>General Nuclear Safety and Control Regulations</i> (SOR/2000-202)	
<i>Canadian Human Rights Act</i> (R.S.C., 1985, c. H-6)	Canadian Charter of Rights and Freedom	
<i>Canada Labour Code</i> (R.S.C., 1985, c. L-2)	<i>Canada Labour Standards Regulations</i> (C.R.C., c. 986) <i>Canada Occupational Health and Safety Regulations</i> (SOR/86 304)	
<i>Territorial Lands Act</i> (R.S. 1985, c. T-7)	<i>Northwest Territories and Nunavut Mining Regulations</i> (C.R.C., c. 1516) <i>Territorial Land Use Regulations</i> (C.R.C. 1524) <i>Territorial Quarrying Regulations</i> (C.R.C. c. 1527)	
<i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i> (2002, c. 10)	<i>Northwest Territories Waters Regulations</i> (SOR/93/303)	
<i>Nunavut Act</i> (1993 c.28)	<i>Nunavut Archaeological and Paleontological Sites Regulations</i> (SOR/2001-220)	
<i>Nunavut Land Claims Agreement Act</i> (1993, c. 29)		
Territorial – Nunavut		
<i>Environmental Protection Act</i> (RSNWT (Nu) 1988, c E-7)	<i>Spill Contingency Planning and Reporting Regulations</i> (NWT Reg (Nu) 068-93) <i>Used Oil and Waste Fuel Management Regulations</i> (NWT Reg 064-2003) [The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guidelines on Mercury-Containing Products and Waste Mercury Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries

Acts	Regulations	Guidelines
		Guideline for the Management of Waste Paint
		Guideline for the Management of Waste Solvents
		Guideline for Industrial Projects on Commissioner's Land
		Environmental Guideline for Ozone Depleting Substances
<i>Scientists Act</i> (RSNWT (Nu) 1988, c S-4)	<i>Scientists Act Administration Regulations</i> (NWT Reg (Nu) 174-96)	
<i>Historical Resources Act</i> (RSNWT (Nu) 1988, c H-3)		
<i>Territorial Parks Act</i> (RSNWT (Nu) 1988, c T-4)	<i>Territorial Parks Regulations</i> (RRNWT (Nu) 1990 c T-13)	
<i>Wildlife Act</i> (RSNWT (Nu) 1988, c W-4)	<i>Wildlife General Regulations</i> (NWT Reg (Nu) 026-92)	
	<i>Wildlife Licences and Permits Regulations</i> (NWT Reg (Nu) 027-92)	
	<i>Wildlife Management Barren-Ground Caribou Areas Regulations</i> (NWT Reg (Nu) 099-98)	
	<i>Wildlife Management Grizzly Bear Areas Regulations</i> (NWT Reg (Nu) 155-96)	
	<i>Wildlife Management Zones Regulations</i> (RRNWT (Nu) 1990 c W-17)	
	<i>Wildlife Regions Regulations</i> (NWT Reg (Nu) 108-98)	
<i>Commissioner's Land Act</i> (RSNWT 1988, c C-11)	<i>Commissioner's Airport Lands Regulations</i> (NWT Reg (Nu) 067-97)	
	<i>Commissioner's Land Regulations</i> (RRNWT 1990, c C-13)	
<i>Safety Act</i> (RSNWT 1988, c.S-1)	<i>General Safety Regulations</i> (RRNWT (Nu) 1990 c S-1)	
	<i>Work Site Hazardous Materials Information System Regulations</i> (RSNWT 1988, C 81 (Supp))	
<i>Mine Health and Safety Act</i> (SNWT (Nu) 1994, c 25)	<i>Mine Health and Safety Regulations</i> (NWT Reg (Nu) 125-95)	
<i>Workers' Compensation Act</i> (RSNWT, 1988, c. W-6)	<i>Workers' Compensation General Regulations</i> (Nu Reg 017-2010)	

Acts	Regulations	Guidelines
<i>Apprenticeship, Trade and Occupations Certification Act</i> (RSNWT (Nu) 1988, c A-4)	<i>Apprenticeship, Trade and Occupations Certification Regulations</i> (RRNWT (Nu) 1990 c A-8)	
<i>Labour Standards Act</i> (RSNWT (Nu) 1988, c L-1)	<i>Annual Vacations Regulations</i> (RRNWT 1990, c.L-1)	
	<i>Educational Work Experience Regulations</i> (RRNWT 1990, c.L-2)	
	<i>Employment of Young Persons Regulations</i> (RRNWT 1990, c.L-3)	
	<i>Labour Standards Meal Regulations</i> (RRNWT 1990, c.L-4)	
	<i>Notice of Termination Exemption Regulations</i> (RRNWT 1990 c.L-5)	
	<i>Pregnancy and Parental Leave Regulations</i> (RRNWT 1990, c.8(Supp.))	
	<i>Reciprocating Jurisdiction Order</i> (RRNWT 1990, c.L-6)	
	<i>Wages Regulations</i> (RRNWT 1990, c.L-7)	
<i>Electrical Protection Act</i> (RSNWT (Nu) 1988, c E-3)	<i>Electrical Protection Regulations</i> (RRNWT 1990 c. E-21)	
<i>Explosives Use Act</i> (RSNWT (Nu) 1988, c E-10)	<i>Explosives Regulations</i> (RRNWT (Nu) 1990 c E-27)	
<i>Petroleum Products Tax Act</i> (RSNWT (Nu) 1988, c P-5)	<i>Petroleum Products Tax Regulations</i> (RRNWT (Nu) 1990 c P-3)	
<i>Fire Prevention Act</i> (RSNWT (Nu) 1988, c F-6)	<i>Fire Prevention Regulations</i> (RRNWT (Nu) 1990 c F-12)	
<i>Hospital Insurance and Health and Social Services Administration Act</i> (RSNWT 1988, c T-3)	<i>Territorial Hospital Insurance Services Regulations</i> (RRNWT (Nu) 1990 c T-12)	
<i>Public Health Act</i> (RSNWT (Nu) 1988, c P-12)	<i>Camp Sanitation Regulations</i> (RRNWT (Nu) 1990 c P-12)	
	<i>General Sanitation Regulations</i> (RRNWT (Nu) 1990 c P-16)	
<i>All-terrain Vehicles Act</i> (RSNWT (Nu) 1988, c A-3)	<i>All-terrain Vehicles Regulations</i> (RRNWT (Nu) 1990 c A-1)	
<i>Motor Vehicles Act</i> (RSNWT (Nu) 1988, c M-16)	<i>Large Vehicle Control Regulations</i> (RRNWT (Nu) 1990 c M-30)	

Acts	Regulations	Guidelines
	<i>Motor Vehicle Registration and Licence Plate Regulations</i> (NWT Reg (Nu) 054-94)	
<i>Public Highways Act</i> (RSNWT (Nu) 1988, c P-13)	<i>Highway Designation and Classification Regulations</i> (NWT Reg (Nu) 047-92)	
<i>Transportation of Dangerous Goods Act</i> (1990, RSNWT (Nu) 1988, c 81 (Supp))	<i>Transportation of Dangerous Goods Regulations</i> (1991, NWT Reg (Nu) 095-91)	

AEM will abide with the *Nunavut Wildlife Act* (WA) and applicable regulations in the construction, operation and closure of the Meliadine Project. This includes the main mine site at Meliadine Lake, the Discovery area, Itivia in Rankin Inlet, and all roads.

AEM will not chase, harass or molest wildlife (WA, Article 74(1)), or injure, molest or destroy an egg of a bird (WA, Article 72(1)), and critical habitat, wildlife sanctuary or special management areas will be respected (WA, Article 65(1)). AEM will develop and enforce a “no hunting, trapping, harvesting or fishing policy” for employees and contractors for the Meliadine Project.

AEM will not allow the feeding of wildlife (WA, Article 90(1)), and will not place or leave attractants accessible to wildlife (WA, Article 90(2)). If necessary, AEM will annually obtain a Wildlife Research Licence or Permit to facilitate the monitoring of wildlife (WA, Article 117) at the Meliadine Project, particularly between along the Phase 2 All-weather Access Road (AWAR). If a Wildlife Research Licence or Permit is not issued to AEM for whatever reason, AEM will not undertake any monitoring of wildlife (WA, Article 59(2)).

AEM will work with the Kangiqliniq Hunters’ and Trappers’ Organization, Nunavut’s Department of Environment (DoE), and/or the Kivalliq Inuit Association in developing operating procedures for the AWAR. This includes procedures that will give due regard for the safety of other people and property (WA, Articles 89(1) and (2)). To facilitate due regard, hunting activity will not be allowed within one kilometre of active Meliadine mining work sites. Additionally, hunters must avoid shooting across or along roads and should respect a safe shooting distance from the road (suggested at 1 km – 500 m on each side).

If a dangerous animal poses a threat to persons at the Meliadine Project, AEM will, under instructions from the DoE Conservation Officer, dispatch the animal, or await the Conservation Officer coming on site to shoot the animal (WA, Article 92). In the event wildlife is inadvertently killed at the Meliadine Project or an emergency kill is required (WA, Articles 97 (1) and (3)), AEM will report the kill to the Conservation Officer in Rankin Inlet and subsequently deliver the carcass to the Conservation Officer or dispose of the remains in the site’s incinerator.

1.4 Regional Context

1.4.1. Location

The Meliadine property is located in the Kivalliq District of Nunavut near the western shore of Hudson Bay, in Northern Canada (Figure 1-1). It is located approximately 290 km southeast of AEM's producing Meadowbank Gold Mine. The Tiriganiaq gold deposit, which currently is the most important of the deposits on the property, is centered at 63°01'3" N, 92°12'3" W (National Topographic Survey sheets 55/J, N, and O).

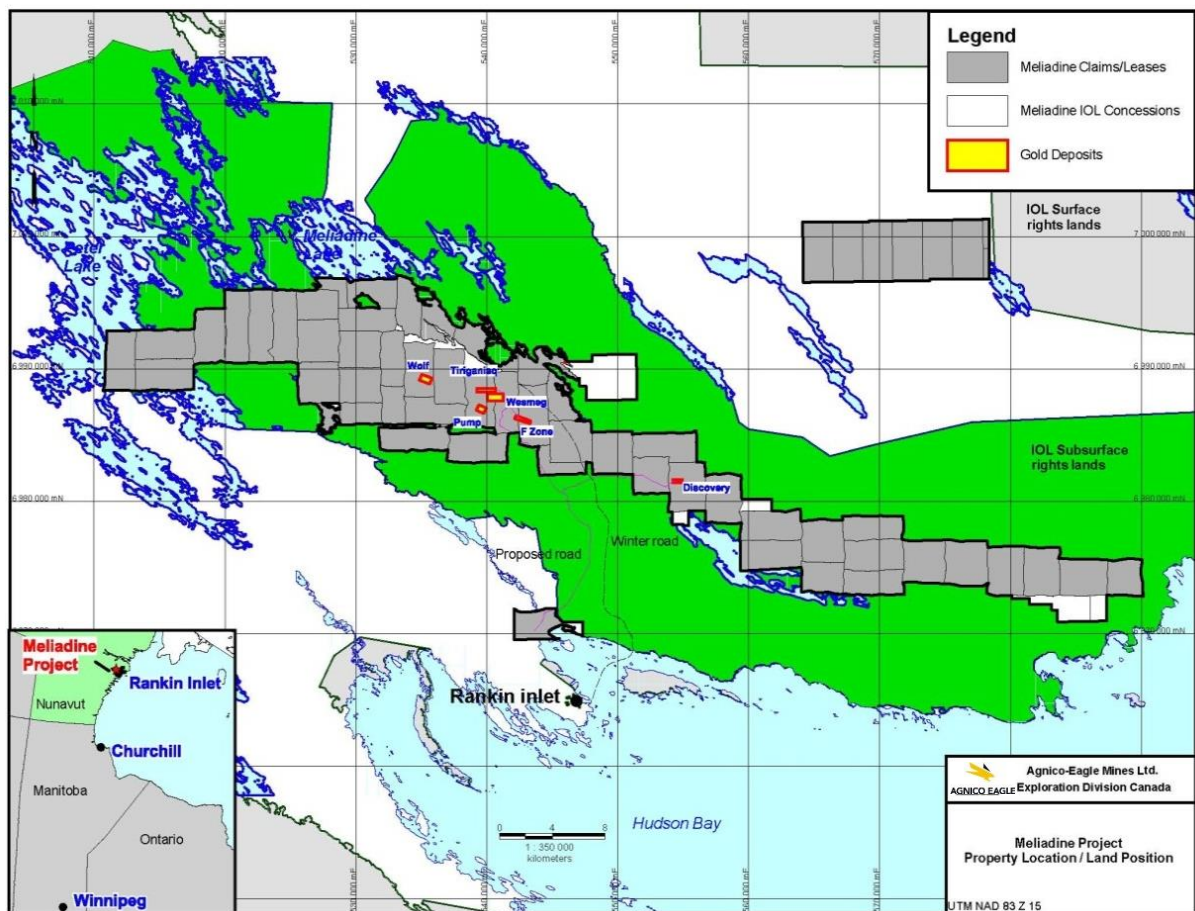


Figure 1-1 Meliadine Gold Project Property Location

The nearest community is Rankin Inlet (coordinates 62°48'35" N; 092°05'58" W), located at approximately 25 km southeast of the Tiriganiaq deposit. Rankin Inlet is an Inuit Hamlet on the Kudlulik Peninsula located between Chesterfield Inlet and Arviat. Rankin Inlet was established as a mining community in the early-to-mid-1950s with the discovery and subsequent development of a

nickel mine. It is the regional center and the largest community of the Kivalliq region, and the second-most populated community in Nunavut after the capital of Iqaluit. The Hamlet has an area of 20.24 km² and a population of 2,266 (Statistics Canada 2011). The closest major city is Winnipeg, in Manitoba, about 1,500 km to the south. The community has developed strong entrepreneurship and serves as a regional business centre.

1.4.2. Regional Biophysical and Socio-Economic Context

Nunavut was officially created in 1999 when the *Nunavut Act* and the *Nunavut Land Claims Agreement Act* came into force, though the actual boundaries had been established in 1993. It comprises a major portion of Northern Canada, and most of the Canadian Arctic Archipelago. The capital is Iqaluit, located on Baffin Island. Access to this territory is only possible by air and sea, since no terrestrial infrastructure links it to the rest of the country. The internal road system is neither well developed; there is no terrestrial road link between the different communities of Nunavut. People normally travel by air between communities and outside the region.

Nunavut is the least populous (35,591 residents as of July 1, 2013; Nunavut Bureau of Statistics) and the largest in area (1,877,787 km²) of the provinces and territories of Canada. It has land borders with the Northwest Territories on several islands as well as the mainland, Manitoba to the south of the Nunavut mainland, Saskatchewan to the southwest (at a single four-corner point) and a tiny land border with Newfoundland and Labrador on Killiniq Island. It also shares maritime borders with the provinces of Québec, Ontario, and Manitoba and with Greenland (see Figure 1-2).

Nunavut has supported a continuous population for approximately 4,000 years. Thousands of heritages sites, many of which contain artifacts, are located throughout the territory. Important historic sites also attest of the more recent arrivals in the region (whalers, explorers, traders and prospectors). The population is mainly composed of Inuit people. The population growth rate is well above the Canadian average; estimates showed that the population could increase by 60 % between 2000 and 2020 (NPC 2000). Along with Inuktitut, English and French are also official languages in Nunavut.

Inuit families lived as semi-nomadic hunters and gatherers for centuries, a pattern undisturbed until the 1950s, when most of the Inuit were relocated to communities on the coast (NPC 2000). The establishment of settlements led to a change in land use; however, the interest of Inuit in their ancestral lands remains strong (NPC 2000). Participation to cultural and traditional way of living is thus high in the communities of Nunavut. Service infrastructures are developed in the communities. They rely mainly on diesel fuel to run generators and produce electricity.

The economy is still mainly based on traditional hunting, trapping and fishing, also supported by government services and the growing mining, tourism and services sectors. Inuit rely on country food for much of their diet and basis needs, a fact which has important cultural, health and

economic implications (NPC 2000). The average hunter in the Arctic takes 1000 to 1500 kilograms of meat and fish each year (NPC 2000).

Nunavut is divided in three regions: Kitikmeot, Qikiqtaaluk, and Kivalliq. The Meliadine Project is location in the Kivalliq region. This region, formerly known as “Keewatin”, disposes of a regional land use plan (NPC 2000) which provides with a regional setting discussion. This section inspires from this plan.

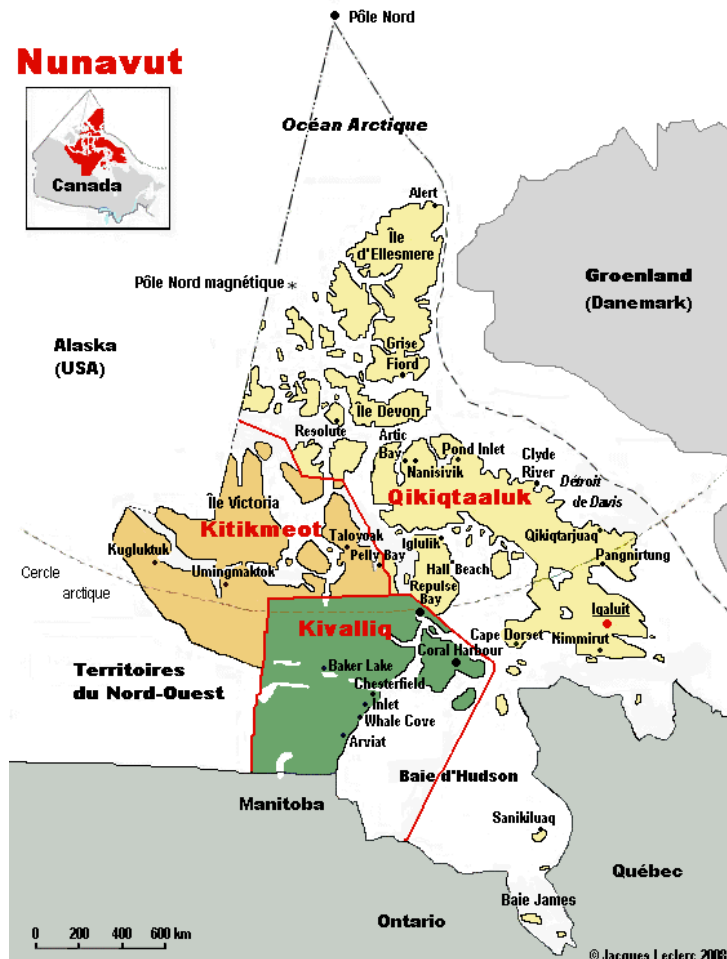


Figure 1-2 Regions of Nunavut

The Kivalliq region includes mainland to the west of Hudson Bay as well as Shouthampton Island and Coats Island. The population is 8,348 in an area of 445,109 km² (Statistics Canada 2007). It is

composed of seven (7) communities: Arviat, Whale Cove, Rankin Inlet (capital), Chesterfield Inlet, Baker Lake, Coral Harbour and Repulse Bay.

Most of this region is part of the Southern Arctic Ecozone (Ecological Stratification Working Group 1996). This ecozone represents a major area of vegetative transition between the taiga forest to the south and the treeless Arctic tundra to the north. It is characterized by dwarf shrubs mixed with various herbs and lichens. Wetlands are common in the low-lying areas and mainly support sedge-moss vegetation. Major limitations to vegetation growth are low precipitation, high winds and extremely dry winters. The vegetation present plays an important role in the food chain (NPC 2000). Nearly all sedges, grasses and fruticose lichens, as well as many herbaceous and woody plants, provide food for grazing animals. Birds and small rodents, that in turn become food of fur-bearing carnivores, consume seeds, winter buds and the roots of many species.

Winters are long and cold, while summers are short and cool. Spring and autumn are short. January is the coldest month (mean -28°C to -36°C) and July is the warmest, reaching a mean high of 14°C (NPC 2000). The growing season can be up to 750 growing degree-days, enhanced by long periods of daylight. Frost is however common during the summer. Total annual precipitation is less than 30 centimetres. The region is also known for high winds, which are due in part to the broad, flat, uninterrupted expanses offered to moving air masses (NPC 2000).

The physical features of the region have largely been determined by glaciation. Primarily underlain by Precambrian granitic bedrock, the terrain consists largely of broadly rolling uplands and lowlands. Much of it is mantled by discontinuous morainal deposits, except near the coasts, where fine-textured marine sediments cover the surface. Strung out across the landscape are long, sinuous eskers. This undulating landscape is studded with innumerable lakes, ponds and wetlands. Cryosols are the dominant soils, and are underlain by continuous permafrost with active layers that are usually moist or wet throughout the summer. The region is located in the Churchill geological province.

The region includes the major summer range and calving grounds for Canada's largest caribou herds. The major one is the Qamanirjuaq herd, which is the main food source for Inuit. This ecozone is also a major breeding and nesting ground for a variety of migratory birds.

The marine part of the Kivalliq region lies within the Northern Arctic Archipelago marine ecozone. It is largely ice-free during the two- to three-month summer and has a landfast ice during the winter. The marine ecozone is used by migratory birds and is a major breeding ground for Arctic loons, whistling swans and snow geese. Marine wildlife include walrus, seals (grey, harp, bearded, harbour and ringed) and whales (beluga, narwhal, sperm, northern bluenose and bowhead; NPC 2000).

Protection areas of the Kivalliq region include: Arvia'juaq and Qikiqtaaluk National Historic Site of Canada, East Bay Migratory Bird Sanctuary, Fall Caribou Crossing National Historic Site of Canada, Harry Gibbons Migratory Bird Sanctuary, Iqalugaarjuup Nunanga Territorial Park, Inuujaarvik

Territorial Park, McConnell River Migratory Bird Sanctuary, and part of the Thelon Wildlife Sanctuary.

As for the Nunavut, the Kivalliq region is sparsely populated. It is part of the Inuit homeland and Inuit form over 80 % of the population (Ecological Stratification Working Group 1996). Much of the economy is based on subsistence hunting, trapping and fishing. Mineral exploration and mining activities as well as construction, some tourism and government services are the other principal activities.

The Kivalliq region is considered to have excellent mineral potentials. For example, the Rankin-Ennadai-Kaminuriak (Qamanirjuaq) greenstone belt in the central Kivalliq is comparable to the Abitibi greenstone belt in Ontario and Québec for copper, gold, lead, nickel, platinum, silver and zinc (NPC 2000). Hudson Bay retains also some potential for hydrocarbons. There has been prospecting activities in the region for decades. The Atlas of Canada provides with some information on past and current mineral exploration on the territory. Figure 1-3 and Table 1-4 summarize this information.

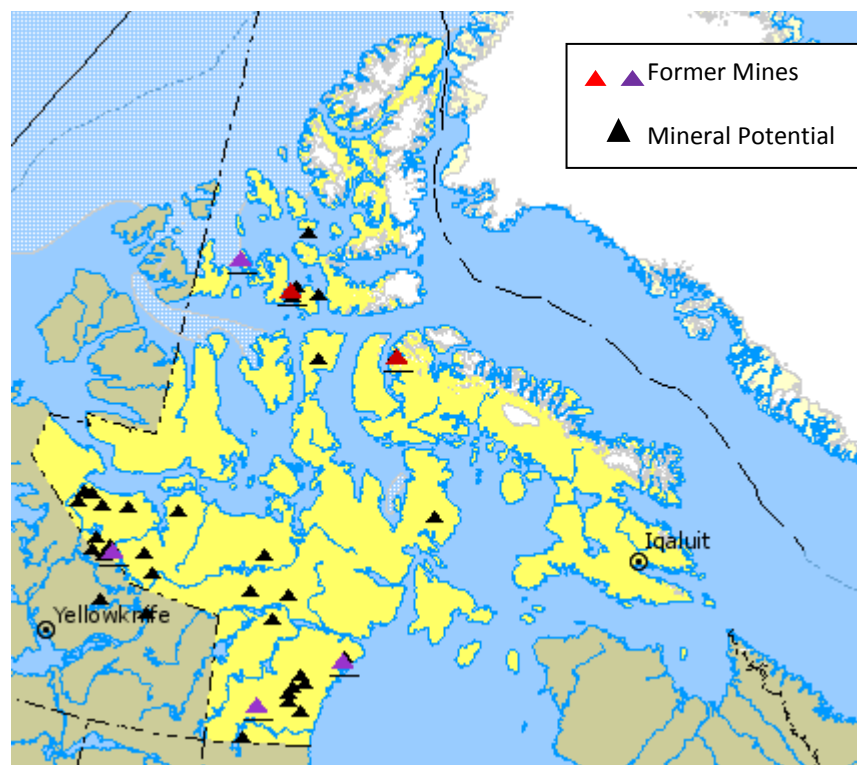


Figure 1-3 Nunavut's Mineral Potential

Source: Natural Resources Canada, Minerals and Metals Sector, Minerals and Mining Statistics Division, 1999.

<http://atlas.nrcan.gc.ca/site/english/maps/peopleandsociety/nunavut/mining/mineralexploitation>, accessed September 2012

Table 1-4 Location of Main Deposits in Nunavut and Kivalliq

Deposit	Mineral	Latitude	Longitude	Kivalliq?
Potentials				
Nueltin Lake	U	60.200	99.300	✓
Napajut	Au	61.100	95.200	✓
Heninga River	Volcanogenic Massive Sulphide	61.800	96.200	✓
Noomut	Au-Cu-Zn-Pb	61.400	96.100	✓
Turquetil Lake	Au	62.000	95.900	✓
Victory Lake	Au-Cu-Zn-Pb	62.400	95.300	✓
Kaminak	Au	62.100	95.000	✓
Kiggavik	U	64.300	97.600	✓
Sand Lake	U	65.100	99.400	✓
Deep Rose	U	66.400	98.400	✓
Musk	Volcanogenic Massive Sulphide	65.300	108.000	
Hackett River	Volcanogenic Massive Sulphide	65.900	108.000	
Gondor	Volcanogenic Massive Sulphide	65.600	112.000	
Izok	Volcanogenic Massive Sulphide	65.600	113.000	
Hood River	Volcanogenic Massive Sulphide	66.100	113.000	
Muskox Intrusion	Cr	67.000	115.000	
Doris North	Au	67.300	107.000	
High Lake	Volcanogenic Massive Sulphide	67.400	111.000	
Coppermine River	Cu	67.500	115.000	
Asiak River	U	67.500	114.000	
Boston	Au	67.600	106.000	
Nagavaak	Pb-Zn	67.300	83.400	
Somerset Island	Zn-Cu-Pb	73.100	93.300	
Eclipse	Zn-Pb	75.500	96.100	
Wellington	Pb-Zn	75.300	93.100	
Cornwallis Island	Zn-Cu-Pb	77.400	94.400	
Active Mines				
Meadowbank Mine (2010-)	Au	65.100	96.300	✓
Closed Mines				
North Rankin (1957-1962)	Ni	62.500	92.000	✓
Cullaton Lake/Shear Lake (1981-1985)	Au	60.200	99.300	✓
Lupin Mine (1982-2005)	Au	65.400	111.100	
Jericho Diamond Mine (2006-2008)	C	65.600	111.300	
Polaris Mine (1982-2002)	Zn-Pb	75.500	96.100	
Nanisivik Mine (1976-2002)	Zn-Pb	73.000	84.300	

Current and future land use planning is framed by the Regional Land Use Plan (NPC 2000). This plan establishes a set of objectives in different areas: community use areas and local authority; environmental protection and wildlife conservation; mineral, oil and gas exploration and development; heritage resources; transportation and regional infrastructure; and scientific research.

In the Kivalliq region of Nunavut, land use planning is guided by the existing Keewatin Regional Land Use Plan. The Nunavut Planning Commission (NPC) prepared the *Keewatin Regional Land Use Plan* in accordance with the procedure for public consultation and government review set out in Part 5, Article 11 of the *Nunavut Land Claims Agreement*. The plan was submitted to government for final consideration in May, 2000, and was approved by the Government of Canada in June, 2000. In the Keewatin Regional Land Use Plan, the NPC states that the primary purpose of land use planning in the Nunavut Settlement Area is “to protect and promote the existing and future well-being of those persons ordinarily resident and communities of the Nunavut Settlement Area taking into account the interests of all Canadians”. NPC goes on to indicate that “special attention shall be devoted to protecting and promoting the existing and future well-being of Inuit and Inuit Owned Lands (NLCA Article 11.2.1 (b))” and the “the purpose of a land use plan shall be [in addition to those stated above] ... to protect, and where necessary, to restore the environmental integrity of the Nunavut Settlement Area (11.3.2)”.

The NPC has prepared a *Draft Nunavut Land Use Plan* to encourage discussion on land use planning in the full geographic boundaries of the Nunavut Settlement Area. The Draft Plan provides an illustration of how the Nunavut Land Use Plan may guide and direct resource use and development, once approved. The Commission is using the Draft Plan to focus discussions with communities and other stakeholders, and encourages feedback from everyone to help make the plan better.

The Draft Plan contains goals, objectives and policies for land use planning in Nunavut. Areas and issues that have been identified for their significance to each Goal are discussed, and one of the following *Land Use Designations or Recommendations* is assigned:

- PSE Protecting and Sustaining the Environment;
- ECP Encouraging Conservation Planning;
- BHC Building Healthier Communities;
- ESED Encouraging Sustainable Economic Development; and
- MU Mixed Use.

Land Use Designations permit uses that are compatible with the identified value and may prohibit uses that are incompatible. *Recommendations* advise proponents and regulators of issues that should be considered during the review of project proposals. The *Draft Nunavut Land Use Plan* is available on the NPC’s Website at the following address: <http://www.nunavut.ca/en/downloads>.

In preparing this EIS, AEM commissioned Golder Associates to conduct a review of various publically available data sources to identify the location of other existing and potential development projects located within the regional study area as defined for the Meliadine Project. The results of this review are presented in Volume 4 – Impact Assessment Methodology of the supporting documents to the Meliadine EIS, specifically in Section 1A. The full review prepared by Golder Associates is included as an Appendix to this Volume. The information collected identified existing and reasonably foreseeable development projects within the Regional Study Area established for the Meliadine

Project environmental assessment. These projects were then included within the environmental assessment when looking at cumulative impacts from the proposed Meliadine Project.

1.5 Land Tenure

The Meliadine property consists of 52,173 ha: 887 ha as claims, and 51,286 ha as leases. Those 51,286 ha are held under the Canada Mining Regulations, administered by Aboriginal Affairs and Northern Development Canada (AANDC; formerly Indian and Northern Affairs Canada (INAC)), and referred to as Crown Land. As well, AEM has 3,430^{ha} of sub-surface Nunavut Tunngavik Inc. (NTI) concessions where the sub-surface mineral rights are administered directly by NTI.

The gold deposits of the Meliadine Project are situated on Inuit Owned Lands (IOL) owned and administered by Nunavut Tunngavik Inc. (NTI; sub-surface and mineral rights) and the Kivalliq Inuit Association (KIA; surface rights) on behalf of the Inuit Beneficiaries as designated under the Nunavut Land Claims Agreement (NLCA). The mineral claims underlying the deposits at the Meliadine Project were staked with the Government of Canada prior to the signing of the NLCA in 1999 and have been held continuously by the mining rights holder (Comaplex, and now AEM). Consequently, they are considered to be grandfathered under the NLCA, meaning that the mineral production royalties payable to the land and mineral rights owner are administered by the Government of Canada under the Canada Mining Regulations, unless otherwise mutually agreed to by the mineral claim holder and the mineral rights owner. The royalty collected are then transferred to NTI as the new sub-surface mineral rights owner.

The Meliadine claim and concession block is contiguous with the exception of the CWM claims and the FAY, FELSIC, and ANT 3 concessions. A location map of the concessions, claims, and leases is shown in Figure 1-4 (as of December 31, 2010). Table 1-5 gives claims and leases details while Table 1-6, Table 1-7 and Table 1-8 describe the NTI concessions commitments.

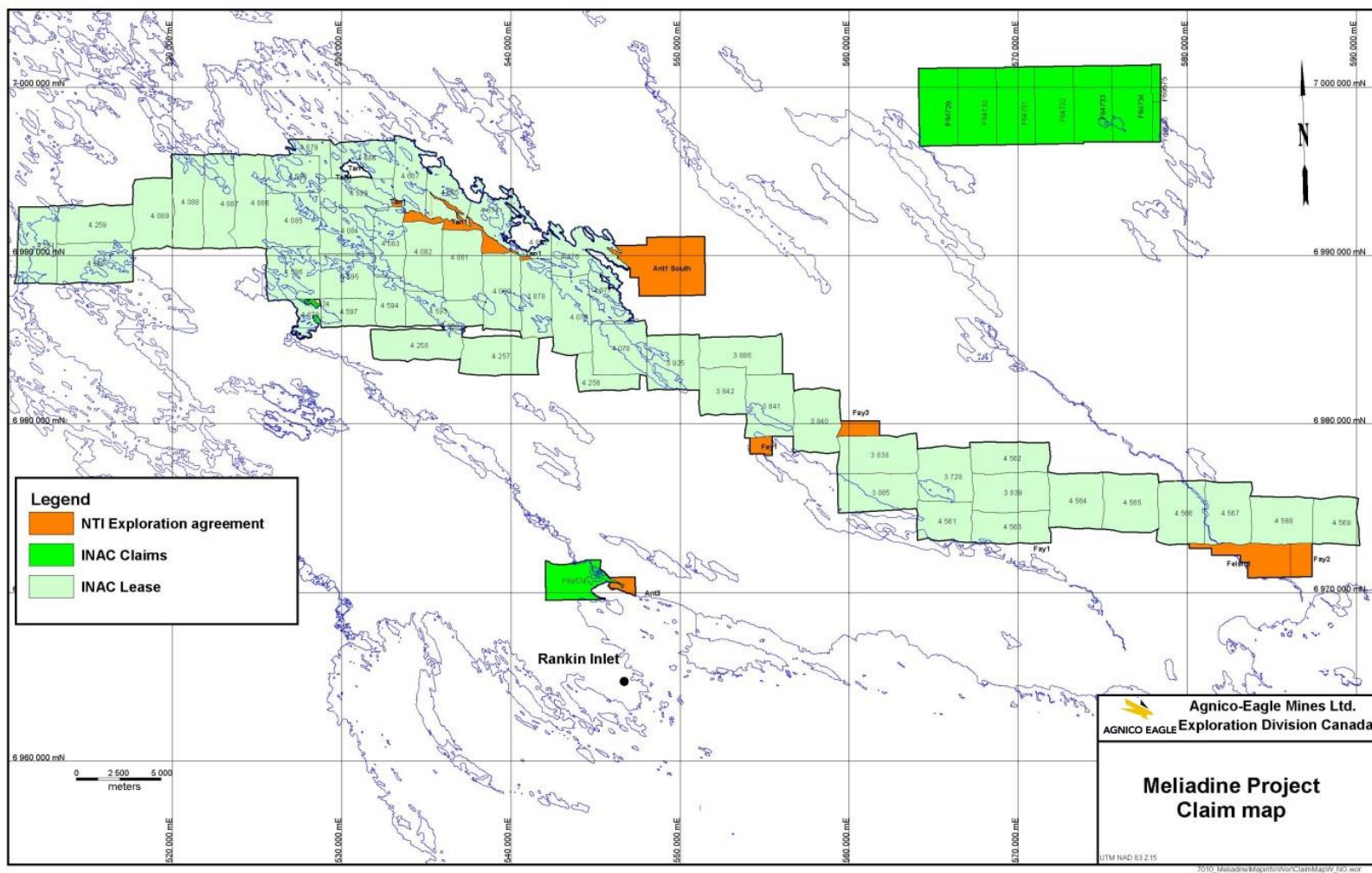


Figure 1-4 Meliadine Project Claims, Leases and Concessions

Table 1-5 Claims and Leases Details – Meliadine Gold Project

Number	Name	Status	Recorded	CLSR No.	Lease No.	Area (ha)
F14839	NAT	LEASE		81347	3728	1,021
F00526	NAT 2	LEASE		83022	3838	1,043
F00527	NAT 3	LEASE		82126	3839	1,038
F14842	NAT 4	LEASE		83023	3840	1,001
F14841	NAT 5	LEASE		83024	3841	1,021
F17843	NAT 6	LEASE		83025	3842	758
F18140	NAT 7	LEASE		84522	3925	989
F18141	NAT 8	LEASE		84523	4078	1,017
F18142	NAT 9	LEASE		84495	4079	1,047
F18143	NAT 10	LEASE		82125	3878	841
F18144	NAT 11	LEASE		84506	4080	1,006
F18145	NAT 12	LEASE		84486	4081	989
F18146	NAT 13	LEASE		84496	4082	920
F18147	NAT 14	LEASE		84524	4083	753
F18148	NAT 15	LEASE		84519	4084	878
F18149	NAT 16	LEASE		85649	4085	1,021
F18150	NAT 17	LEASE		85671	4086	1,027
F18151	NAT 18	LEASE		84525	4087	1,004
F18181	NAT 19	LEASE		84520	4088	1,007
F18182	NAT 20	LEASE		84521	4089	964
F18184	NAT 26	LEASE		84115	3886	975
F18190	NAT 27	LEASE		84020	3885	1,025
F19038	NAT 28	LEASE		85983	4259	994
F19039	NAT 29	LEASE		85366	4260	1,055
F19040	NAT 30	LEASE		85650	4261	1,034
F19048	NAT 31	LEASE		85657	4256	449
F19042	NAT 32	LEASE		85670	4257	999
F19043	NAT 33	LEASE		85484	4258	932
F19044	NAT 34	LEASE		88378	4593	817
F19045	NAT 35	LEASE		88379	4594	514
F19046	NAT 36	LEASE		88380	4595	851
F19047	NAT 37	LEASE		88993	4596	980
F19049	NAT 38	LEASE		88377	4597	525
F19620	NAT 40	LEASE		88994	4598	708
F19621	NAT 41	LEASE		88381	4599	756

Number	Name	Status	Recorded	CLSR No.	Lease No.	Area (ha)
F29192	NAT 51	LEASE		86060	4561	734
F29193	NAT 52	LEASE		86060	4562	824
F29194	NAT 53	LEASE		86060	4563	853
F29195	NAT 54	LEASE		86061	4564	1,023
F29196	NAT 55	LEASE		86061	4565	1,099
F29197	NAT 56	LEASE		86061	4566	1,019
F29198	NAT 57	LEASE		86061	4567	1,011
F29199	NAT 58	LEASE		86061	4568	1,004
F29200	NAT 59	LEASE		86061	4569	715
F44575	NAT 75	LEASE		88384	4879	298
F44578	NAT 78	LEASE		89212	4686	702
F44579	NAT 79	LEASE		88669	4687	729
F44580	NAT 80	LEASE		88670	4685	631
F51714	NAT 81	LEASE		88995	4874	678
F51715	NAT 82	LEASE		89213	4875	145
F51716	NAT 83	LEASE		89214	4876	775
F51717	NAT 84	LEASE		89315	4877	584
F43244	NAT 85	LEASE		88382	4880	28
F51724	NAT 86	LEASE		88996	4878	205
F64729	CWM 7	LEASE		92616	pending	1,045
F64730	CWM 8	LEASE		92616	pending	1,053
F64731	CWM 9	LEASE		92616	pending	1,035
F64732	CWM 10	LEASE		92616	pending	1,051
F64733	CWM 11	LEASE		92616	pending	1,047
F64734	CWM 12	LEASE		92616	pending	1,038
Total						51,286
F69575	CWM 13	CLAIM	2006-04-19			109
F69576	CWM 14	CLAIM	2006-04-19			109
F69574	PB1	CLAIM	2006-12-29			669
Total						887
Grand Total						52,173

Note: grandfathered leases and claims include NAT 8 - NAT 41 inclusive.

Data from AANDC Iqaluit office.

Table 1-6 NTI Concessions, Meliadine Gold Project

Concession Name	IOL Parcel	Recording Date	Area (ha)	Years
ANT 1	RI-01	1999-06-01	1,531	13
ANT 3	RI-01	1999-06-01	106	13
TAN 1	RI-01	1999-06-01	515	13
FAY 1B	RI-01	1999-12-31	139	13
FAY 2	RI-01	1999-12-31	233	13
FAY 3	RI-01	1999-06-01	204	13
FELSIC 1	RI-01	1996-12-31	702	16
Total			3,430	

Table 1-7 Yearly Fees for NTI Concessions

Year	NTI Yearly Fees (C\$ per ha)
1	1
2 to 5	2
6 to 20	2.5
11 to 20	4

Table 1-8 Yearly Work Commitments on NTI Concessions

Year	NTI Yearly Work Commitment (C\$ per ha)
1 to 2	4
3 to 5	10
6 to 10	18
11 to 15	30
16 to 20	40

The surface rights under the Meliadine property and concessions are administered by the KIA. AEM has a series of land use permits and a lease from KIA allowing it to explore and develop the minerals found under this property. AEM also holds a number of right-of-way permits covering winter road access to Meliadine and esker quarrying on IOL as well as leases from INAC covering exploration, drilling and quarrying on adjacent Federal Owned Land. Table 1-9 is the list of existing authorizations for the Meliadine Project (advanced exploration phase).

Table 1-9 List of Existing Licences/Permits for the Meliadine Gold Project

Licence Number	Explanation	Issued By	Issued Date	Expiry Date
Land Use Permits, Leases and Authorizations from KIA				
KVL100B195	Land use permit for IOL – Meliadine prospecting and staking	KIA	2000-05-23	2014-10-31
KVL302C268	NTI parcel drilling including Tiriganiaq	KIA		2014-07-01
KVCL102J168	Commercial lease for IOL – Meliadine West site including exploration camp, fuel and bulk sample	KIA	2002-07-01	2015-06-30
KVRW98F149	Meliadine right-of-way	KIA		2014-04-30
KVRW07F02	Winter road overland right-of-way	KIA	2010-08-20	2014-10-26
KVCA07Q08	Tiriganiaq esker quarry permit	KIA		2014-09-15
KVCA11Q01	Permanent road quarry permit	KIA	2012-04-19	
KVRW11F02	Permanent right-of-way land use permit	KIA	2012-04-19	2015-04-19
	Meliadine Phase 1 AWAR water compensation agreement	KIA	2012-04-19	
KVL308C07	Meliadine East exploration land use permit RI01	KIA		2015-06-13
Land Use Leases and Authorizations from AANDC				
N2010C0002	PB1, geotechnical drilling permit	AANDC	10EN006	2014-04-11
N2013-C002	CWM claims drilling	AANDC		2015-05-23
Land Use Leases from GN				
	Land use lease for Itivia laydown area in Rankin Inlet – land use lease from Nunavut Airports	GN - CGS	2011-07-01	2021-06-30
Water Use Licenses – Type B - NWB				
2BB-MEL0914	Type B water license – Meliadine West exploration	NWB	2009-07-31	2014-07-31
2BB-MEL0914	Amendment #1 – UG bulk sampling program	NWB	2010-06-28	2014-07-31
2BB-MEL0914	Amendment #2 – Geotechnical drilling near Meliadine River crossing	NWB	2010-07-08	2014-07-31

Licence Number	Explanation	Issued By	Issued Date	Expiry Date
2BB-MEL0914	Amendment #3 – Extension of UG bulk sampling program	NWB	2011-01-06	2014-07-31
2BB-MEL0914	Amendment #4 – Establishment of landfill	NWB	Pending	2014-07-31
2BB-MEL0914	Amendment #5 – Re-allocation of water use	NWB	2012-08-17	2014-07-31
2BE-MEL0813	Type B water license – Meliadine East exploration project	NWB	2008-06-17	2018-10-31
2BE-MEL0813	Amendment #1 – Increase in water use to 299 m ³ /day	NWB	2012-01-10	2018-10-31
2BW-MEL1215	Type B water license – Construction of Phase 1 AWAR	NWB	2012-03-12	2015-05-31
Other Licenses/Permits				
03 004014R-M	Baseline data collection	NRI		2014-12-31
	Nunavut archaeological permit	CLEY		Under renewal for 2014
	Wildlife research permit	DoE		Under renewal for 2014
	WCB program authorization	WCB		2015-12-31

1.6 Analysis of Need and Purpose of the Project

Currently, Kivalliq offers limited, and usually seasonal, employment opportunities. The population is predominately young with a high level of unemployment. Elders have stated that the young must find jobs in the wage economy as they will not be able to live off the land as Inuit did earlier. The proposed Project has the potential to offer year-round employment to interested Nunavummiut in Kivalliq. Benefits will accrue to Inuit from the IIBA, and also from royalties paid to NTI over the operating life of the mine.

Many of the policies and strategies for Nunavut speak to self-reliance and improved quality of life as drivers for economic development that requires both the protection and use of renewable resources balanced with the development of non-renewable resources. Sustainable development of the Meliadine Project will contribute to the economic development of Nunavut in ways that support self-reliant communities. It will reduced dependence on government without compromising the health of the people or the land through the creation of stable private sector employment that will both contribute to a better standard of living for the residents of Kivalliq as well as reducing dependence on social assistance programs. The Project will lend support to the vision and contribute to the goals of Inuit Beneficiaries of Nunavut as expressed by NTI and KIA. It will also contribute to the vision and goals for a more self-reliant Nunavut for all Nunavummiut as projected

by the Government of Nunavut in its published objectives and strategies. The Project will also contribute to the economic vision of a more self-reliant Nunavut as a key contributor to the future economic well-being of Canada as projected by the Government of Canada (GN 2007, GN 2009).

The Nunavut Land Claims Agreement states that the purpose of Inuit-Owned Lands (IOL) is to “...promote economic self-sufficiency of Inuit through time, in a manner consistent with Inuit societal and cultural needs and aspirations” (NLCA 17.1.1) and this economic self-sufficiency will be obtained through balanced economic development and selection of IOL that holds value both for renewable resources and the development of non-renewable resources (NLCA 17.1.2 and 17.1.3)”. Approximately 90% of all IOL identified in the NLCA is IOL-Surface lands in which Inuit Organizations administer surface rights only. The remaining IOL is designated to have both surface and subsurface (mineral) rights administered by Inuit organizations. All five of the deposits included within the proposed Meliadine Project are located on IOL where the surface rights and subsurface mineral rights are administered for the benefit of Inuit Beneficiaries by Inuit Organizations, KIA and NTI, respectively.

The Government of Nunavut describes the vision for Nunavut to the year 2030 and lists an improved standard of living; active, healthy and happy individuals and families; self-reliant communities with strong Inuit societal values and recognition for Nunavut’s unique culture. Nunavut’s economic and social development plans focus on the economic sectors that can provide the most growth and employment potential, without harming the environment. These sectors are mining, tourism (and arts and crafts) and commercial fishing (GN 2007).

To forgo the development of the Meliadine mine would mean abandoning forthcoming benefits and revenue stream to NTI and KIA, from direct taxes paid to hamlet, territorial and federal governments, personal income tax and sales tax from employment. The policies and strategies of Government and Inuit organizations will not easily be met in Kivalliq and Nunavut. Continued underemployment and limited opportunities for young members of society is likely to lead to increased social stress.

The purpose of the proposed Meliadine Gold Project is to mine five gold ore deposits, process the ore on site to extract the gold as a gold bullion, and then to ship the gold bullion for final refining and subsequent sale into the world gold markets. Gold is used in a number of uses including jewelry, electronics and underpinning the value of money. The Meliadine Project will contribute to durable social and economic benefits:

- Create employment for Canadians;
- Create employment for Nunavummiut;
- Contribute to the vision and goals of Nunavummiut in terms of sustainable development (employment, training, career development, economic stability for residents of the Kivalliq region, and the creation of new business opportunities for Nunavut based businesses);

- Contribute to the vision and goals of Inuit Beneficiaries through royalty payments to Nunavut Tunngavik Inc. and through land use fees, water compensation payments and IIBA benefits to the Kivalliq Inuit Association allowing both NTI and KIA to pursue their goals for sustainable development of Inuit Owned Lands;
- Provide revenue to the Government of Canada through corporate and income taxes allowing Canada to continue funding northern development and northern programs;
- Provide revenue to the Government of Nunavut (GN) through payroll taxes, equivalent municipal taxes and fuel taxes allowing the GN to pursue its goals and vision for Nunavut; and
- Generate a return on the investment made by AEM on behalf of its shareholders (return on investment) and generate a profit for AEM and its shareholders.

AEM commissioned Golder Associates to conduct a socio-economic baseline study for the proposed Meliadine Project and to complete an impact statement including an analysis of the positive and negative social and economic effects on existing industries, markets, and communities over the life of the Project. This analysis includes a discussion on the distribution and magnitude of benefits and/or losses to specific socio-economic groups in the relevant study area. The results of this work are presented in Volume 9 of the supporting documents to the Meliadine Final EIS, entitled Socio-Economic Environment and Impact Assessment, including an economic model of the Project effects.

1.6.1 Economic Feasibility

AEM is currently working on a feasibility study for the proposed Meliadine Project. This feasibility study is scheduled for completion in late 2014 and will become the key driver in AEM deciding on whether the proposed Project should proceed and when. This feasibility study will include a detailed assessment of the economics of the proposed Project, including updated capital and operating cost estimates, revenue forecasts, updated forecasts of payments to be made to KIA, NTI and the Governments of Canada and Nunavut through lease payments, royalty payments, IIBA payments, water compensation payments, and taxes (e.g. corporate and income taxes, equivalent municipal taxes, payroll taxes, fuel taxes and other sales taxes).

The AEM Board of Director's has not yet made a decision on whether the Meliadine Project should proceed into construction. This decision is not expected to be taken until after the Feasibility Study is completed (currently expected at the end of 2014). Consequently AEM has not committed final financing for the Meliadine Project. Based on current expectations, and assuming the Project is given approval to proceed, AEM believes that the Meliadine Project would be fully financed internally from revenue generated by mining at AEM's current operating mines. AEM does not at this point in time expect to have to go to outside financial institutions to finance development of the Meliadine Project, although it does not rule out finding a partner or seeking outside financial assistance to manage Project risk.

AEM currently funds its reclamation and water license financial security liability for its Meadowbank operation through guaranteed letters of credit issued by one of the five major Canadian based banks (currently issued by Scotia Bank for our Meadowbank Mine). These are irrevocable letters of credit issued to the interest of the Government of Canada (for water related financial security against reclamation or major accident causing environmental damage as outlined under the Type A Water License); to the Government of Nunavut (for accidents or incidents such as a fuel oil spill from the Baker Lake tank farm that could cause major damage to the environment); to the Kivalliq Inuit Association (for land and water related financial security against reclamation or major accident causing environmental damage as outlined under the Commercial and Production land use leases for Inuit Owned Lands) and to DFO (for financial security against successful implementation of fish compensation measures as authorized by DFO). The total value of these letters of credit are in the range of \$100 Million, pledged for reclamation liability, fish habitat compensation initiatives and various other forms of security (third party liability for the Baker Lake fuel tank farm, land use lease security, etc.). These letters of credit are deducted from AEM's credit lines held by the banks and are irrevocable letters of credit. AEM currently reports lines of credit available of approximately \$1 Billion consequently AEM is confident that it has the economic preparedness to meet the requirements for reclamation and security should the Project proceed. AEM expects that similar financial surety requirements will be required if and when the Meliadine Project is approved to proceed and is prepared to meet this obligation in a similar manner to how it met its financial security obligations for the Meadowbank Mine.

These financial security requirements (posted bonds or other forms of financial security) are intended to ensure that money is available to address cleanup including payment of compensation in the event of accidents that directly or indirectly result in major damage by the Project to the environment, as well as to cover the cost of planned or premature closure, whether temporary or permanent should the Proponent not be able to meet such obligations at such time.

1.6.2 Benefit to Nunavut Communities

The following discussion on the potential benefits to Nunavut communities has been written with sustainable development in mind. As discussed in Section 1.2.2, AEM is committed to fundamental sustainable development values: operate safely, protect the environment, and treat our employees and communities with respect. Meliadine Project is developed on the basis of those commitments. We aim at supporting governments' sustainable development visions and goals, notably the respect of intergenerational equity (the right of future generations to the sustainable use of renewable and non-renewable resources). Using the precautionary principle in developing and operating our projects, and sharing and promoting our core sustainable development values with our employees and partners are one of AEM's way of contributing to these global sustainable development goals.

Overall Net Benefit to Sustainable Development in Nunavut

The most substantial benefit to the Kivalliq Communities of Nunavut will be through the direct, indirect and induced employment opportunities created through the development of the Project.

Sustainable development of the Meliadine Project will contribute to the economic development of Nunavut in ways that support self-reliant communities with reduced dependence on government without a compromise to the health of the people or the land through the creation of stable private sector employment that will both contribute to a better standard of living for the residents of the region as well as reducing dependence on social assistance programs. The Project will lend support to the vision and contribute to the goals of Inuit Beneficiaries of Nunavut as expressed by NTI and KIA. It will also contribute to the vision and goals for a more self-reliant Nunavut for all Nunavummiut as projected by the Government of Nunavut in its published objectives and strategies. The Project will also contribute to the economic vision of a more self-reliant Nunavut as a key contributor to the future economic well-being of Canada as projected by the Government of Canada.

The Nunavut Land Claims Agreement (NLCA) states that the purpose of Inuit Owned Lands (IOL) is to:

“...promote economic self-sufficiency of Inuit through time, in a manner consistent with Inuit societal and cultural needs and aspirations (NLCA 17.1.1) and this economic self-sufficiency will be obtained through balanced economic development and selection of IOL that holds value both for renewable resources and the development of non-renewable resources (NLCA 17.1.2 and 17.1.3)”.

Approximately 90 % of all IOL identified in the NLCA is IOL-Surface lands in which Inuit Organizations administer rights for the surface only. The remaining IOL is designated to have both surface and subsurface (mineral) rights administered by Inuit organizations. All five of the deposits included within the proposed Meliadine Gold Project are located on IOL where both the surface and subsurface mineral rights are administered by Inuit Organizations (NTI and KIA) for the benefit of Inuit Beneficiaries.

The Government of Nunavut’s guiding action plan for the period 2009 thru 2013 is provided in a document entitled *Tamapta 2009 to 2013 – Building our Future Together* (GN 2009, http://www.gov.nu.ca/files/Tamapta%20Action%20Plan_eng.pdf). This document describes the vision for Nunavut to the year 2030 and provides the Government of Nunavut’s action plan to create an improved standard of living; active, healthy and happy individuals and families; self-reliant communities with strong Inuit societal values and recognition for Nunavut’s unique culture. Nunavut’s economic and social development plans focus on the economic sectors that can provide the most growth and employment, without harming the environment. These sectors are mining, tourism (and arts and crafts) and commercial fishing. The GN Exploration and Mining Strategy:

Parnautit – A Foundation for the Future (GN 2007) recognized the importance of mining to Nunavut's economic development.

Canada's Northern Strategy highlights the four objectives of:

1. Strengthened Canadian sovereignty;
2. Environmental protection;
3. Economic and social development; and
4. Governance.

Exploration and the development of mineral resources are included in the strategy to achieve economic and social development (INAC 2006).

Many of the policies and strategies for Nunavut speak to self-reliance and improved quality of life as drivers for balanced economic development that requires both the protection and use of renewable resources with the development of non-renewable resources. AEM believes that the Meliadine Project can be a key driver in meeting these objectives, particularly within the Kivalliq region of Nunavut. In support of this belief AEM has provided its understanding and projections of how the Meliadine Project can benefit the Kivalliq communities and all Nunavummiut in Volume 9 of the Final EIS. This Volume deals with the Socio-Economic Environment and Impact Assessment for the Meliadine Project as proposed. Section 9.4 deals with Economic Development and Opportunities (including contracting and business opportunities that may be created by the Project if it proceeds as proposed). The main benefits are:

- Creation of new employment in the region for Nunavummiut;
- Creation of new training opportunities in the region for Nunavummiut;
- Creation of new business opportunities in the region providing services and materials to the Project; and
- Creation of new income sources in Nunavut for the Government of Canada (corporate, GST and income taxes), Government of Nunavut (payroll taxes, municipal taxes and fuel taxes) and to the Inuit Organizations (royalties to NTI and IIBA transfers, Water Compensation and Land Use Fees to the KIA).

The Meliadine Project will also potentially provide economic benefits to the rest of Canada in the form of employment opportunities to southern employees coming to the Meliadine Project to fill the jobs not filled by Nunavummiut, income taxes to the provinces from where these employees reside, and business and contracting opportunities for southern businesses supplying the Project.

1.6.3 Strategic Implication

The Meliadine Project sits on an 80-km long greenstone belt with high geological potential to contain other ore bodies. While the future is not certain the Project development has the potential to spur other mineral exploration development in the immediate area around Rankin Inlet. It has the

potential to act as a catalyst for continued accelerated economic growth in the Hamlet of Rankin Inlet. It is expected that the Project development may result in the movement of Nunavummiut from the other communities in the Kivalliq region seeking employment both at the mine and in the business development that is expected to arise.

Already there is local interest in the construction of improved port facilities in Rankin Inlet, in the construction of a permanent road link to Rankin Inlet from northern Manitoba and in connecting Rankin Inlet to the Manitoba hydroelectric grid. While none of these potential projects can be economically justified on the basis of the Meliadine Project, the new interest in mineral development in the region is spurring action from Government to look at these types of projects over the next several decades.

The Meliadine Project in itself will not contribute to the strategic development of a permanent road link or power grid link to Manitoba but it may be a catalyst in bringing forward planning of such activity over the next several decades.

1.6.4 Past, Current and Potential Future Users of the Project Area

Rankin Inlet was a mining center in the late 1960's - early 1970's. With the cessation of mining Rankin Inlet has become the regional service center for the Kivalliq region on the basis of GN investment and around its regional airport. The Meliadine Project will help consolidate Rankin Inlet as the major service center for the Kivalliq region. There are no other major development projects currently in advanced planning in the immediate area around Rankin Inlet. The most important development that is well advanced in the Kivalliq region is the proposed development of the Kiggavik Uranium Project (AREVA Canada). This project is located about 50 km from Baker Lake and will not likely have a major direct impact on Rankin Inlet outside of employment.

North Rankin Nickel Mines identified gold mineralization in the area of Meliadine Lake during an exploration program for nickel and copper in the early 1960s. The first mineral claims in the Project area were staked by Comaplex and Asamera Minerals Inc. in 1987, with the Discovery deposit being found on the eastern half of the property in late 1989.

Successive exploration programs by Asamera, Rio Algom Ltd., and Comaplex, from 1990 to 1994, identified gold mineralization along the 80-kilometre-long east-west-trending Pyke Fault, with the first holes drilled into the Tiriganiaq, F Zone, and Pump deposits by Comaplex in 1993 and 1994. From 1995 to 2000, substantial exploration by WMC International Ltd., through an option on the western part of the Meliadine property, greatly expanded the Tiriganiaq deposit, led to the discovery of the Wolf deposit, and expanded the F Zone and Pump deposits. Work by Comaplex in 1996 and 1997 concentrated on the Discovery deposit on the eastern half of the property, known as Meliadine East.

In the ensuing years, and until late 2003, Comaplex and its partners continued exploration on Meliadine East, while little field work was completed by WMC on Meliadine West. In late 2003, Comaplex acquired WMC International's interest in the Meliadine West property. From 2004 onward, Comaplex devoted the majority of its efforts to outlining new, higher-grade gold resources in the deeper parts of the Tiriganiaq deposit, and to reconnaissance work on outlying targets. Sporadic exploration was conducted on Meliadine East.

In 2007 and 2008, Comaplex conducted an underground exploration and bulk sample program on the Tiriganiaq deposit. In early 2009, Comaplex completed a preliminary assessment for the Meliadine property, using independent mining consultant Micon International Ltd. This assessment indicated that the property had the potential to support a mining operation. On the basis of this information, Comaplex elected to advance the Project to the feasibility level, and initiated the regulatory process to permit a mining operation on the property.

On July, 2010, AEM completed its purchase of Comaplex and started drilling on the property's Wesmeg deposit. AEM is continuing with Comaplex's earlier decision to pursue the development of a gold mine.

In its guidance for this EIS, NIRB asks AEM to also speak to future users of the Local Study Area (LSA) and the Regional Study Area (RSA), and Project infrastructure, including commercial, government, public and private. It is important to remember that the majority of the Meliadine Project infrastructure will be constructed on private Inuit Owned Lands managed for all Inuit Beneficiaries of the Kivalliq region by the KIA. Consequently it is not up to AEM to determine whether any of the infrastructure can or will be used in the future once mining is completed. AEM will be a lease holder with a requirement that all infrastructures be removed once it is no longer needed for future mining activity. It is expected that the KIA will have some say on whether they wish to take responsibility (through purchase or other form of transfer) of any of this infrastructure once mining is completed. To date no such discussions have taken place and thus it would be very speculative to comment on whether any of this infrastructure will remain once mining is complete to serve future users. To date there are no other advanced mineral development projects within the LSA or RSA who could benefit from this infrastructure. It is unlikely that the KIA will want any of the infrastructure to remain without a viable business case for its ongoing use. For example the access road between Rankin Inlet and the Meliadine site does not align with any of the proposed road routes between Rankin Inlet and Manitoba and thus the Meliadine AWAR does not logically serve any purpose for such a future development.

The proposed Meliadine Project will see the development of a fuel storage facility in Rankin Inlet that could be of value to the Government of Nunavut in the future. However at the current point in time the GN has its own fuel storage facility and thus is unlikely to want to take over responsibility for the proposed AEM facility without some unknown change occurring in the LSA that could

generate a business case. The proposed Itivia docking facility is a temporary floating dock system that would be removed at the end of the mine life.

It is expected that Rankin Inlet will grow as a consequence of the development of the Meliadine Project and thus the community infrastructure can be expected to increase. However it is difficult to speculate on whether any of the mine infrastructure will be used by future users, either commercial, government, public or private. If a business case can be made then this type of use may be possible but at this point in time AEM is not aware of any such plans.

SECTION 2.0 • PROJECT COMPONENTS AND ACTIVITIES

2.1 Project Design

Because of its location, the Meliadine Project infrastructure will require special cold climate and permafrost design considerations. The climate data used for this study are based on the values specified in the National Building Code of Canada (NRC 2010; summarized in Table 2-1) and on experience building Agnico Eagle's Meadowbank Mine.

Table 2-1 Climate Design Criteria

	Value
Temperature	
January – 2.5 % design	-45°C
Extreme low	-50°C
July – 2.5 % design	21°C
Extreme high	33°C
Degree-days below 18°C	10,500
Precipitations	
Average annual total precipitation	306 mm ¹
Snow Load	
Ground snow load, S_g	3.0 kPa
Rain load, S_r	0.2 kPa
Hourly Wind Pressures	
1/10 year probability	0.47 kPa
1/30 year probability	0.50 kPa

¹ All data from National Building Code of Canada (2005), for Rankin Inlet location, except average annual total precipitation from on-site data (see Golder Associates 2009c and SD 7-2 2011 Aquatic Synthesis Report).

The Arctic design of the buildings will be reflected notably in heavy insulation and special foundation requirements, use of heated utilidors (insulated, enclosed utilities corridors) to connect the buildings, and extreme space-heating requirements.

The Project area is in permanent permafrost down to about 450 m. The active layer of annual freeze/thaw in the overburden is within 1 to 2 m of surface; consequently, where the bedrock is less than 2 m below surface, the foundations of buildings and heavy equipment will rest directly on bedrock without the need for piles or extensive structural fill. For concrete foundations, experience

has shown that bedrock tends to shatter when excavated in Arctic climates. Therefore, allowances will have to be made for pouring lean concrete and using rock dowels to stabilize these foundations.

Where the bedrock is deeper than 3 m, the foundations will be supported by pilings.

The proposed development is located within Seismic Zone 0 of the current National Building Code (based on the seismic hazard assessment provided by Pacific Geosciences Centre), meaning there is negligible seismic risk (as such, no risk assessment was further conducted and no management measures where needed to be developed).

A single process plant structure is proposed, notably to reduce heating needs. The power plant will be separated from the process plant but connected by a heated corridor. This will reduce the need for sound attenuation measures and firewalls. The mine truck service shop will also be separated from the process plant in order to be more accessible by mining equipment.

Space-heating requirements will be met through recovery of exhaust waste heat from the diesel engines driving the power generators. Auxiliary glycol/water-heating boilers will be provided for heating requirements in extreme conditions and emergencies. Another climate-driven feature will be heat-tracing of fuel, water and tailings lines.

Due to the remote location, it will be necessary to recruit employees from a wide area across Nunavut and the rest of Canada. For this reason, it will be necessary to provide catered accommodation at site. The permanent camp will be similar to those at other remote mines and will include individual rooms with flexibility for visiting senior staff and guests. Recreation facilities will provide a large variety of options for staff and are considered essential to recruit and retain employees.

The main facilities are located about 2 km northeast of the Tiriganiaq open pit or about 1.2 km northwest of the current exploration camp. A minimum safety distance of 750 m from pits has been used for locating the permanent infrastructure in order to reduce the impact of vibration and fly rock caused by blasting. A compact plant arrangement was designed in order to reduce site preparation as well as the overall Project footprint. The chosen location is also the most favorable site left after condemnation drilling because of its relatively shallow overburden and positive geotechnical conditions.

In its guidance, NIRB asked AEM to address how each of the following factors was taken into consideration in the design of the proposed Meliadine Project:

- **Need for Rankin Inlet infrastructure:** the Project will require facilities to offload the annual sealift freight during the construction, operation and closure phases of the Project. Because of geography the logical location for these facilities is in the nearby municipality of Rankin Inlet. AEM has chosen to propose installation of a portable floating dock facility similar to that used in Baker Lake to offload the sealift freight shipped to the Meadowbank Mine. AEM has proposed

that this facility be constructed at the Itivia site adjacent to the existing community sealift offload site. Adjacent to the proposed floating dock would be a laydown facility for the short term storage of incoming and outgoing sealift freight pending road transfer to the Meliadine site. The Project will also require the construction of a fuel storage facility near the Itivia port site to receive and store the annual mine site fuel requirements. AEM is proposing to construct this facility on lands to be leased from the Government of Nunavut. These elements constitute the only infrastructure that AEM feels must be constructed at Rankin Inlet. All other infrastructure would be constructed at the Meliadine site. A more detailed description of the proposed Meliadine Project Rankin Inlet port and fuel storage facility is presented later in this Detailed Project Description document at Section 2.6.2.

- **Oceanographic conditions in Rankin Inlet:** AEM commissioned a marine (oceanographic) baseline study of the Itivia harbour (Nunami Stantec 2012) to provide the required data needed to design the proposed port facilities for the Meliadine Project. This study included water and sediment quality, aquatic ecology and fisheries values in Itivia harbour and reference sites in Melvin Bay, as well as a desktop study on marine mammals and birds. Results indicated dominant substrates being cobble and/or gravel in the near shore area, including smaller substrates (gravels and fines) on a gentle slope at the proposed floating dock location. Tidal ranges in Itivia harbour typically range from 3 to 6 m depending on the time of the day and the lunar cycle (Nunami Stantec 2012). The harbour and Melvin Bay are relatively shallow with maximum depth in the proposed floating dock footprint reaching 6.6 m (Nunami Stantec 2012). A large rocky reef is present about 125 m offshore of the high water mark near the proposed spud barge location; this reef was taken into account when localizing the infrastructure. A bathymetric profile was developed by Nunami Stantec (2012) and presented in their report. Additional details are provided in Volume 8 of the supporting document addressing the Marine Environment.
- **How climate change has influenced the design, planning and management of the Project components and activities:** The Meliadine Project is anticipated to have a mine life of approximately 13 years. Assuming that AEM is successful in finding new ore, then this time frame could hopefully be doubled to say 25 years. Consequently for most of the proposed mine infrastructure, climate change potential effects had to be considered in the design, operation and maintenance of the Project components and activities over a time scale of approximately 25 years, as this infrastructure will be removed at the end of active mining. This includes the site buildings, roadways and temporary water diversion structures. The obvious exceptions are the design considerations associated with facilities that will remain in place well after active mining and reclamation have been completed, specifically for the open pits, the waste rock storage facilities, the tailings storage facility and permanent water diversion structures. For these structures, climate change had to be considered in the design, operation, maintenance and closure over a longer term time frame. To support this type of consideration AEM commissioned Golder Associates to look at how climate can realistically be expected to change

over time in this area of Nunavut. This information is presented in Volume 5 of the supporting document dealing with the Atmospheric Environment, specifically in Section 5.3 – Climate and Meteorology and in Section 5.4 – Greenhouse Gases and Climate Change. The projections of climate change were then applied in the proposed design of the facilities that are expected to endure beyond the mine's active life. Climate changes also formed a key design consideration in the operation and proposed closure and reclamation strategy for these facilities. AEM has also included its climate adaption "lessons learned" from its Meadowbank Mine in the design, operation, maintenance and closure considerations for the proposed Meliadine Project infrastructure and activities.

- **A discussion of how design, engineering, and management plans will maintain/enhance the existing eco-systemic integrity, focusing on various wildlife habitats, including freshwater habitat, marine habitat, and terrestrial habitat:** In designing the Meliadine Project, AEM has worked to reduce the overall footprint of its proposed operation and its associated facilities to the smallest practical footprint possible. This objective had two focuses: a) reduce the amount of land impacted and b) avoid impacts on as many small waterbodies (ponds and streams) as possible. This approach was taken with the intent of minimizing the overall impact of the proposed Project to the greatest practical extent, and keeping the impacted land close to the ore body locations. This helps reduce the overall Project impact on wildlife habitat, including freshwater and terrestrial habitat, thereby reducing the overall impact of the Project on the eco-systemic integrity. This approach is covered in the supporting documents to the Final EIS, specifically Volume 6 – Terrestrial Environment and Impact Assessment, and Volume 7 – Aquatic Environment and Impact Assessment. This has resulted in AEM proposing higher elevation waste rock storage areas to reduce overall footprint of these facilities and keeping all of the proposed facilities in a tight area in the vicinity of the Tiriganiaq deposit site. For the marine environment, AEM has proposed no shipping outside of the open water season and has proposed use of a temporary floating dock facility that will be removed once active mining and reclamation are completed. These approaches are discussed in Volume 8 – Marine Environment and Impact Assessment.
- **A discussion of how the Proponent has applied the precautionary principle in its Project planning, design and management:** As understood by AEM, the "precautionary principle" means: if an action has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus, then that action should be considered harmful. In such an event, the burden of proof that such an action is not harmful falls on the Proponent, in this case AEM. The principle also implies that there is a social responsibility to protect the public from exposure to harm when scientific investigation has found a plausible risk. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no serious or irreversible damage to the environment will result. When examining and designing the Meliadine Project, AEM is using this precautionary principle. The underlying approach can be summarized as follows:

- **Priority 1 – collect** the scientific data required to allow scientific consensus to be achieved. Throughout the Meliadine EIS and its supporting document, the reader will find evidence of the extensive work done by AEM and its consultants to collect the baseline information and to provide examples from other operations or sites to allow scientific consensus to be reached.
 - **Priority 2 – consult** with local stakeholders to incorporate local and traditional knowledge into our data to help reach consensus. Throughout the EIS, the reader will find evidence of where AEM has conducted such consultation and how the information obtained has been incorporated into our baseline data and understanding to further the objective of reaching consensus.
 - **Priority 3 – design** all facilities and activities with **adaptive management** in mind. In many instances, uncertainty may still remain because it is not possible to collect as much data as desired due to time or physical challenges. In such cases, AEM has looked for applicable data from similar settings elsewhere so that others experience can be brought into consideration. AEM has then used this data or experience to fill the voids in its own data. AEM has then built in appropriate safety factors in the design of the facility or in the proposed action. In each case, AEM has incorporated flexibility so that the activity or design can be actively adapted to accommodate possible future change. An example is in the design of containment and treatment facilities for groundwater with elevated saline concentrations that is likely to be encountered once underground mining goes below the permafrost. It is difficult to predict the volumes of this groundwater that will be encountered until mining goes below the permafrost. AEM has installed a very expensive special groundwater sampling well at Meliadine to obtain information to help predict how much groundwater and at what salinity will be expected once mining goes below the permafrost. This well provides some data but not sufficient data to allow scientific consensus to be reached. Consequently, AEM has applied the precautionary principle in designing its potential water treatment facility for this water source.
 - **Priority 4 – design and implement monitoring programs** to address all areas of uncertainty so that data is being generated to: a) allow for scientific consensus to be achieved in time, and b) to allow activities where some uncertainty exists to be adaptively managed in a timely manner.
-
- **A discussion of how potential impacts to workers and the public under both normal operations and potential accident and malfunction situations have influenced the design of the Project:** While the Meliadine Project is relatively close to Rankin Inlet and will be connected to the community by an AWAR, AEM has planned to incorporate facilities and processes to ensure that first responder emergency services are present on site on a year-round basis. The site will have a staffed medical clinic to address emergency medical care until a patient can be stabilized and transported to a hospital for further care. The site will be equipped with an ambulance and with a fire truck. There will be an emergency response team on site staffed by

workers under a volunteer arrangement. AEM will provide training and equipment for this team to prepare them to respond to fire emergencies, industrial and vehicle accidents, accidents involving hazardous materials and search and rescue emergencies. Similar arrangements are already in place at AEM's Meadowbank Mine and AEM plans to duplicate these services at the proposed Meliadine Project. In addition, there will be a mine rescue team established at the Meliadine Project to address the special nature of underground emergencies. The location of the Project influences the need to incorporate these types of emergency services and associated equipment and facilities into the proposed mine infrastructure.

- **How potential impacts to wildlife (e.g., caribou, polar bear and peregrine falcons) have influenced the design of the Project, indicating methods designed to minimize impacts to wildlife, including the geographical location of Project components. Special attention should be paid to the influence of peregrine falcon habitat on the selection of borrow pits and quarry sites (where applicable):** As stated above, in designing the Meliadine Project, AEM has worked to reduce the overall footprint of its proposed operation and its associated facilities to the smallest practical footprint possible. This objective had two focuses: a) reduce the amount of land impacted and b) avoid impacts on as many small waterbodies (ponds and streams) as possible. This approach was taken with the intent of minimizing the overall impact of the proposed Project to the greatest practical extent, and keeping the impacted land close to the ore body locations. This helps reduce the overall Project impact on wildlife habitat, including freshwater and terrestrial habitat and thereby reducing the overall impact of the Project on wildlife in general. This approach is covered in the supporting documents to the Final EIS, specifically Volume 6 – Terrestrial Environment and Impact Assessment. This has resulted in AEM proposing higher elevation waste rock storage areas to reduce overall footprint of these facilities and keeping all of the proposed facilities in a tight area in the vicinity of the Tiriganiaq deposit site. AEM has prepared a number of management plans for the Meliadine Project that have the objective of establishing guidance for how the potential impacts to wildlife will be minimized. These include:
 - SD 2-9 – Roads Management Plan: this plan sets out operating guidance and rules for how the AWR between Rankin Inlet and the Meliadine site and the other site roads will be operated, including provisions to minimize potential impacts to wildlife and operating procedures to manage dust. Particular attention has been paid to limiting road operations to protect caribou during periods when caribou move through the Project site.
 - SD 6-4– Terrestrial Environment Management and Monitoring Plan: this plan sets out operating guidance and rules for how AEM will operate the Meliadine Project with the objective of mitigating potential impacts to the terrestrial environment components, notably wildlife.

Polar Bear are a rare occurrence at the Meliadine Project site and thus mitigation measures have been targeted at preventing the attraction of all carnivores (wolves, fox, wolverines, etc.) which will have similar benefit to avoid attraction of bears. These includes measures such as the segregation and high temperature incineration of putrescible waste, use of skirting and screening around building footings to prevent access by wildlife, etc.;

AEM has committed to constructing the all-weather and site roads during winter months only. This has two benefits: a) it protects the underlying permafrost allowing the permafrost below the roads to be maintained in its frozen condition; and b) it ensures that all migratory birds (including peregrine falcons) are not present during the construction period. This ensures that peregrine falcons are not disturbed by construction activities and that associated quarry activity only occurs when the peregrine falcon are absent. The Project will have some impact on existing peregrine nesting habitat; however, experience at Meadowbank suggests that while quarrying for road construction material may destroy some sites currently used by peregrine falcons, the same activity will open up new “cliff” type habitat for peregrine nesting in the quarries that are developed to supply road construction material for the Project. This subject is covered in Volume 6 – Terrestrial Environment and Impact Assessment, specifically in Section 6.6 – Wildlife and Wildlife Habitat.

- **How regional socio-economic conditions have influenced the Project design. For example, how local preferences and labour capacity, have influenced the design of work rotations, pace of construction, employment policy, etc.:** In officializing our labour strategies and employment policy, we inspired from our Meadowbank Mine which operates under similar regional socio-economic conditions than the future Meliadine Project. In light of what is currently offered in the industry for similar Projects at similar locations, AEM is proposing that the normal work rotation at the Meliadine Project be a two week on – two week off rotation, similar to that used at our Meadowbank Mine. This enables AEM to source its workforce at all seven of the Kivalliq Communities. However, AEM has recognized and opened the door to alternate work schedules at Meliadine for those employees who will be living in Rankin Inlet. AEM has consequently proposed employment policies that would support both styles of work rotation. This subject matter is covered in SD 9-4 – Human Resources Plan.
- **How the distribution of archaeological resources, sacred sites, and soapstone quarries have influenced Project design:** This subject matter is covered in Volume 9 – Socio-Economic Assessment and Impact Assessment, specifically in SD 9-1 – Cultural and Heritage Resources Protection Plan. AEM has conducted baseline studies to identify archaeological and culturally sensitive sites in the Project area. This information has been applied in siting the proposed Project facilities and has guided AEM in avoiding direct impacts wherever practical to such sites. To date, AEM’s work on site has not identified any potential soapstone quarry sources.

- **How current land use activities (such as harvesting, camping, and tourism) and protected areas (e.g., Territorial Parks) have influenced Project design:** This subject matter is covered in Volume 9 – Socio-Economic Assessment and Impact Assessment, specifically in Section 9.3 – Traditional Activity and Knowledge and Section 9.9 – Non-Traditional Land Use and Resource Use. AEM has designed the Meliadine Project, specifically the All-weather Access Road, to avoid any direct contact to the nearby Iqalugaarjuup Territorial Park. Harvesting, camping and tourism were not identified as intensive activities at the Project site such as no specific design features had to be put forward as a consequence of these activities.
- **How public consultation and TK have influenced the planning and design of the Project:** This subject matter is covered in Volume 3 – EIS Data Collection, specifically in Section 3.1 – Public Consultation, Section 9.2 – Traditional Knowledge and in SD 3-1 – Public Engagement and Consultation Baseline Report. It is also discussed in Volume 9 – Socio-Economic Environment and Impact Assessment, specifically in Section 9.3 – Traditional Activity and Knowledge. AEM has conducted public consultation and contracted local consultants based in Rankin Inlet to conduct baseline studies to identify traditional knowledge in the Project area. This information has been applied by AEM in siting the proposed Project facilities and has helped guide AEM in its alternatives assessment.
- **The considerations for future development:** AEM can only include proven ore reserves in its design of the Meliadine Project; however, AEM is confident that continued exploratory drilling at the Meliadine Project will in time convert much of the probable and mineralized resource into mineable reserves. Consequently, AEM has designed the Meliadine Project with some growth in mind. This growth is however limited to the five known ore bodies (Tiriganiaq, Wesmeg, F Zone, Pump and Discovery) and does not extend to ore bodies not yet discovered. Any further ore bodies would have to be addressed through future phases of development, which would have to undergo future environmental assessment.

2.2 Project Phases

AEM has divided the Meliadine Gold Project into four phases:

1. **Pre-Development Phase** – early construction activity of facilities or infrastructure needed to support the construction phase of the Project, including site preparation; also includes pre-development of the mining facility, such as stripping of overburden from the first open pits and development of underground mine access ramp.
2. **Construction Phase** – construction of the mine infrastructure and facilities (surface and underground) leading to the first production of gold.
3. **Operational Phase** – the ongoing operation of the mine and associated facilities to produce gold through to the end of the mine life.
4. **Decommissioning and Reclamation Phase** – the post operational period when gold is no longer being produced and the mine and the associated infrastructure are being decommissioned, demolished, or removed, and reclamation is underway to return the site to a physically and chemically stable condition. This phase includes post-closure activities.

A life of Project schedule was developed and is included at Figure 2-1.

[illegible]

2.2.1 Pre-Development Activities (Site Preparation)

AEM has had discussions to explore whether there are any opportunities to allow key components of the required construction to start as early as possible in the permitting process, given the constraint that no construction of any permanent infrastructure can begin until after the Project Certificate is issued. AEM has identified the following specific pre-development activities that would be beneficial in accelerating the overall Project schedule if they could be started as early as possible:

- Construction of fuel storage tanks farm in Rankin Inlet;
- Preparation of the laydown area in Rankin Inlet, including installation of the spud barge;
- Construction of a pad for the permanent camp;
- Installation of pilings for the permanent camp and infrastructure;
- Start of work on concrete foundations;
- Construction of necessary service roads to undertake the other pre-development activities;
- Stripping of open pit(s) (overburden and waste rock) and ore/waste rock stockpiling;
- New portal and conveyor ramp, including ventilation infrastructure; and
- Phase 2 of the AWAR and construction of the access roads.

It is expected that these activities will be separately permitted immediately after the Project Certificate is issued, allowing construction to start soon thereafter, before waiting for other permitting issues involving mine operations to be addressed. This is a similar approach to pre-development work completed at the Meadowbank Mine (under a land use permit from the KIA and a Type B Water License from the NWB). This pre-development permitting approach could allow construction work to start the first summer season after the Project Certificate is issued, which would be a substantial gain considering the very small window for construction in the Arctic each year.

As shown in Figure 2-1, AWAR phase 1, archeological sites mitigation and pre-delivery of material are included in the pre-development period. Activities in this pre-development period could be discontinuous.

2.2.2 Construction

Construction would only start once a Project Certificate has been obtained from the Nunavut Impact Review Board and the required permits, licences and authorizations have been obtained.

Construction tasks will include all the pre-development work identified in the list above. The construction phase will take about 3 years to complete, and will continue a couple of months concomitantly with the operation phase. Figure 2-2 shows the anticipated high-level pre-development and construction schedule.

Construction includes all the steps from engineering to instrumentation and control, including architecture, planning, site preparation, drainage and dewatering, excavation, backfilling, piling,

concrete works, buildings construction/installation, piping and plumbing, mechanical, electrical and communication installations, including programming. Specifically for mine infrastructure, it also includes planning and installing ventilation and other underground services, as well as all infrastructure related to rock handling, mill processing and tailings and water management.

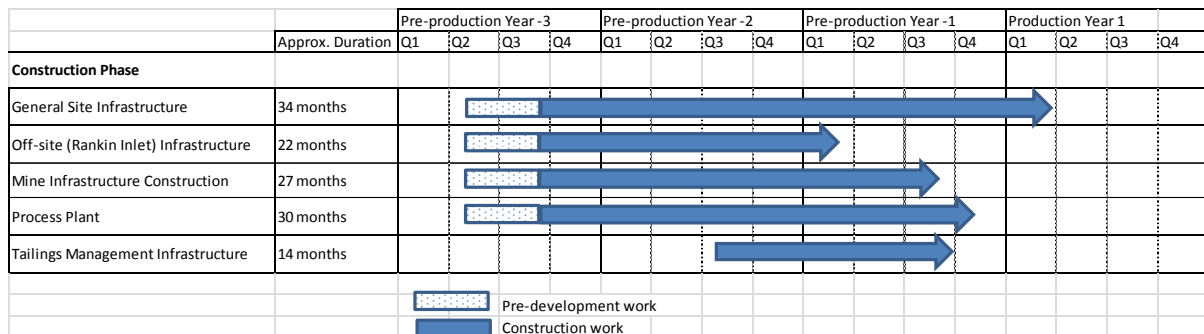


Figure 2-2 Pre-Production Schedule

In order to complete all the work scheduled for the construction phase, specialized equipment will be required as indicated in Table 2-2.

Table 2-2 Construction Equipment Requirements

Equipment Requirement	Quantity	Equipment Requirement	Quantity
Pick-up	12	Truck crane (250 t)	1
Small utility vehicle (mule)	10	Crawler (120 t)	1
Light tower plant	8	Mobile crane (90 t)	3
Diesel compressor (185 cfm; trailer mounted)	2	Mobile crane (30 t)	1
Diesel welder (400 A; trailer mounted)	6	Tractor	1
Electric welder	15	Rubber wheel backhoe	1
Diesel heater	30	Front end loader (4-m ³ -bucket)	1
Diesel heater (1.1M BTU; trailer mounted)	8	Front end loader (5.5-m ³ -bucket)	1
Electric scissor lift (32-ft)	4	Articulated truck (40 t)	3
Electric articulated boom (manlift; 45-ft)	6	Excavator (equivalent 330-CAT)	1
Diesel articulated boom (manlift; 85-ft)	10	Excavator (equivalent 345-CAT)	1
Diesel zoom boom (forklift; 10,000 lbs)	4	Track dozer (equivalent D6-CAT)	1
Container handler	1	Track dozer (equivalent D8-CAT)	1
Forklift (40 t)	1	Grader (equivalent 14M-CAT)	1
Boom truck (30 t)	1	Vibrating compactor	2
Tool carrier	1	Driving pilings equipment (mounted on excavator)	1

2.2.3 Operation

Operation is projected for about 13 years. Maintenance is part of the operation phase and will be done on an ongoing basis. If operations or plans need to be modified during the course of the operations to optimize efficiency or due to unexpected data, then these modifications will be captured through regular updates of the Operational Management Plans that have been developed for the Meliadine Project and which have been included as supporting documents to the Final EIS.

2.2.4 Decommissioning and Reclamation

If feasible, AEM intends to start reclamation works as soon as an area's operation is complete. Most removal or demolition of buildings and infrastructure will occur at the end of operation phase, though, and would be done in the first two years of decommissioning. Reclamation work should be completed within 3-4 years of the closure. The filling of open pits with water would extend for several years.

Post-closure activities, including needed monitoring, would continue until chemical and physical stability of site is demonstrated (for a minimum of 10 years beyond closure).

2.2.5 Temporary Closure

Temporary closure activities (care and maintenance) in the possibility that operations are unexpectedly suspended will be planned for and are explicitly described in the Mine Closure and Reclamation Plan (SD 2-17).

2.2.6 Monitoring and Mitigation through the Life of Project

There will be a need to conduct ongoing monitoring throughout the life of the Meliadine Project. The data collected through this monitoring will enable AEM to monitor trends and to compare such trends against the predictions made during the environmental assessment process. This will allow AEM to review its applied mitigation measures and adaptively modify, change, add or delete mitigation measures as needed to ensure that Project impacts are at a minimum meeting those predicted during the environmental assessment phase.

AEM's Environmental Management and Protection Plan (EMPP; SD 2-5) describes the overarching direction for environmental and socio-economic management and is supported by a suite of Project-specific mitigation, monitoring and/or management plans that set out the Project's standards and requirements for particular areas of environmental and socio-economic management. A cyclical feedback loop is employed where operations are planned and implemented, monitoring data collected and analyzed, and practices adjusted to reduce or eliminate any observed negative impacts. Continual use of this feedback loop allows adaptive environmental management decisions be made on an ongoing basis and leads to improvements to the environmental and socio-economic management system over time.

2.3 Future Development

The Meliadine property is quite large and thus represents a large prospective land package to be explored. AEM can only include proven ore reserves in its design of the Meliadine Project; however, AEM is confident that continued exploratory drilling at the Meliadine Project will in time convert much of the probable and mineralized resource into mineable reserves. Consequently, AEM has designed the Meliadine Project with some growth in mind. This growth is however limited to the five known ore bodies (Tiriganiaq, Wesmeg, F Zone, Pump Zone and the Discovery Zone) and does not extend to ore bodies not yet discovered. Any further ore bodies would have to be addressed through future phases of development, which would have to undergo future environmental assessment.

For example, the Wolf deposit, located north-west of the Tiriganiaq deposit, is currently known, but still requires additional exploration work to be better defined and included in the mine plan. Currently, the Wolf deposit does not have sufficient proven reserves to be economically mined; however, there are strong possibilities that this deposit could be economically developed in the future should exploration results and the following economic analyses be successful.

At this point in time AEM sees no expansion of the Meliadine Gold Project beyond what has been proposed within this Final EIS. Any future growth in the known ore reserve is likely to extend the current mine life but is not likely to result in any expansion of the mining and milling rates as laid out within this Final EIS. The proposed mine site infrastructure (i.e., the milling plant, the maintenance facilities, the camp, water management and treatment facilities) has been designed to accommodate such an extension in mine life. The tailings storage facility and other waste management facilities have been designed to accommodate additional capacity and can accommodate an increase in mine life without significant redesign or expansion being required. Consequently AEM is of the view that the effects assessment and mitigation measures as laid out within this Final EIS will not be significantly changed by potential future development at the Meliadine Project, specifically an extension of the mine life.

AEM is hopeful that future economic deposits will be found on the Meliadine Property that will allow the project life to be extended but while the potential is good, there is no guarantee that any new economic ore zones will be discovered. Any such discoveries will have to be the subject of their own environmental assessment.

The foreseeable future Project exploration activity planned by AEM will be for the most part restricted to the already known ore deposits (Discovery, Tiriganiaq, Westmeg, Pump, F Zone and Wolf) and thus AEM does not believe that its exploration activities will have added changes to existing baseline conditions outside of the immediate footprint covered by this Environmental Impact Statement. Similarly, the Phase 1 AWAR being constructed by AEM between Rankin Inlet and the Meliadine Project site under the NLCA 12.10.2 exception granted by NIRB in 2012 is not expected to result in added changes to the existing baseline conditions outside the EIS study area for

the AWAR. Any future Project activities that would occur outside of the study area adopted for this EIS would be subject to a separate review process, as required.

2.4 Alternatives to the Project

The Meliadine Project needs to be technically, economically, environmentally, and socially viable if it is to proceed. Alternatives to Project components and activities were assessed by AEM using the following criteria: technical feasibility, economic viability, environmental acceptability, community preference, social acceptability, and reclamation and closure. Select mine components could be constructed in different locations or operated differently. Activities can be completed or achieved in different ways. This led to alternatives being evaluated and rated using the above referenced criteria. In nearly all cases, AEM's preferred Project alternative was the one that returned the most favorable rating. The alternative assessment approach employed by AEM recognises that community preferences are important, and that positive and negative effects on VECs and VSECs have to be carefully weighed in selecting the preferred alternative. The process gave due consideration to the vulnerability of the Arctic ecosystem, the potential for extension of the mine life, reclamation and closure, and potential for cumulative effects.

AEM has completed an explicit analysis of all of the reasonable identified means of carrying out the Project components or activities, including the "no-go" alternative. The alternatives analysis is summarized here but is presented in more detail in the supporting document entitled "Project Alternatives" (SD 2-1). Project alternatives analyzed include:

- The marine shipping route for fuel and dry cargo;
- Access road alternatives – community bypass road alignment;
- All-weather Access Road – restricted or unrestricted use by public;
- Use of the Rankin Inlet airport or build airstrip on site;
- Use of Itivia or a private port;
- Production rate and mining methods – open pit vs underground mining;
- Location of mill complex and associated infrastructure;
- Alternatives to on-site processing of ore;
- Alternate road access to deposits;
- Location of main fuel storage tank farm;
- Power generation – power plant location, fuel transportation, choice of generating equipment, fuel choice, wind energy, solar, thermal energy and hydroelectric;
- Location and transport technology type for Tailings Storage Facility;
- Waste rock/overburden storage alternatives;
- Hiring point for work force;
- Waste management and disposal alternatives;
- Alternatives to using cyanide in the mill process;
- Form of mill tailings generated – slurry, thickened or filtered;
- Site water treatment alternatives;

- Salt water management (including concentrated brine disposal options);
- Mine dewatering alternatives;
- Closure and reclamation alternatives; and
- The “no-go” alternative.

It is recognized that the preferred Project alternative may change as the Project proceeds into detailed design and/or additional information becomes available. It is understood that AEM will need to consult with NIRB to determine whether any potential changes to the preferred alternative would result in a change to the scope of the Project as filed with the Board, and potentially require a review of this EIS.

There always remains the possibility that the Project as planned will not proceed to development. Various reasons could be that it is not technically feasible, the Project would fail to make a profit, major environmental effects could not be mitigated, or the Project is not socially acceptable to Inuit and/or government. The Project could also be delayed due to unforeseen circumstances.

2.5 Economic and Operating Environment

Caveat

AEM is currently in the process of negotiating with the KIA an Inuit Impact and Benefit Agreement (IIBA) for the Meliadine Project. In the current document, AEM has provided its intended actions based on its current practises at its Meadowbank Mine combined with its intentions for the Meliadine Project. However, it must be noted that once the IIBA is ratified by both parties, and subsequently implemented, the actual conditions as set out in the IIBA will take precedence over what is stated in this Project Description. The IIBA remains to be concluded for the Meliadine Project (see Section 2.5.5 for more details on the IIBA).

The proposed Meliadine Gold Project is located on Inuit Owned Lands (IOL) sited to the north of the Hamlet of Rankin Inlet. The surface rights to the land on which the mine and its associated facilities will lie are managed on behalf of Inuit Beneficiaries by the Kivalliq Inuit Association (KIA). AEM currently operates at this site under land use permits and a commercial lease from the KIA that covers exploration activity. AEM will require a commercial production land use lease from the KIA to allow for construction, operation, maintenance, closure and ultimate reclamation of the site if the Project is allowed to proceed. The sub-surface mineral rights are managed on behalf of all Inuit Beneficiaries by Nunavut Tunngavik Inc. (NTI). The mineral claims on which the known ore deposits currently within the proposed mine plan lie are on IOL and pre-date the signing of the NLCA. Consequently the royalty regime for these deposits is grandfathered under the NLCA. This means that the royalty payments for the minerals extracted at the proposed Meliadine Project will be made under the Canada Mining Regulations to the Government of Canada who in turn will then transfer these royalty payments to NTI in accordance with the NLCA.

The proposed Project will require facilities to be constructed within the Hamlet of Rankin Inlet, specifically facilities to enable the delivery of construction, operating and maintenance equipment and materials to the Meliadine mine site. These include a port facility, a storage or laydown yard, a fuel storage tank farm and connecting roads to facilitate transfer of the incoming equipment, materials and people to the Meliadine mine site. These components of infrastructure are planned for construction within the municipal boundary of Rankin Inlet and will thus require land use leases from the Government of Nunavut (GN) to permit such activity on municipal land. The GN will require municipal consent before issuing such leases.

Under the current governance environment in Nunavut, the Hamlet of Rankin Inlet will not directly receive any taxation income from AEM. The Hamlet receives the majority of its income through transfers from the GN and is thus dependent on such transfers for funding any increased level of service that it must provide to its residents resulting from the Project development (e.g. increased services due to increase in population of Rankin Inlet arising from the Project proceeding).

The GN will receive some income directly from AEM as a result of the Project, specifically in the form of equivalent municipal tax on the mine facilities, payroll tax and fuel tax. However, the GN receives most of its annual income in the form of direct transfer payments from the Government of Canada and is thus dependent on such transfers for funding any increased level of service that it must provide to its residents resulting from the Project development (e.g. increased services due to increase in population of Rankin Inlet arising from the Project proceeding).

The Project is forecast to generate direct economic impacts for AEM (profits), the KIA (lease payments, IIBA payments, water compensation payments and quarry fees), NTI (mineral royalty payments), Government of Canada (corporate and income taxes and Goods and Services Tax (GST)) and the Government of Nunavut (equivalent municipal tax, payroll tax and fuel tax). The Project will also create indirect economic benefits to Rankin Inlet and to a lesser extent all of the other six communities in the Kivalliq region of Nunavut through wages, purchase of goods and services and other economic spin-offs. AEM is currently working on a feasibility study for the proposed Meliadine Project. Once the feasibility study is completed, it will become the key driver in AEM deciding on whether the proposed Project should proceed and when. This feasibility study will include a detailed assessment of the economics of the proposed Project, including updated capital and operating cost estimates, revenue forecasts, updated forecasts of payments to be made to KIA, NTI and the Governments of Canada and Nunavut through lease payments, royalty payments, IIBA payments, water compensation payments, and taxes (e.g. corporate and income taxes, equivalent municipal taxes, payroll taxes, fuel taxes and other sales taxes).

For the EIS, AEM retained SJ Research Services Inc. to provide a preliminary evaluation of the economic impacts of the proposed Project. This evaluation is presented in detail in their report entitled *Economic impact of the Agnico-Eagle Mines Meliadine Gold Project on the Nunavut Territories* (SJ Research Services 2012) that has been included in the Final EIS as part of Volume 9 –

Socio-Economic Environment and Impact Assessment. Other information on how AEM perceives that the proposed Meliadine Project will create economic spin-offs in the Kivalliq region of Nunavut can be found in the following Management Plans that have been included as part of the Final EIS:

- Business Development Plan (SD 9-3);
- Human Resources Plan (SD 9-4); and
- Community Involvement Plan (SD 9-5).

The following sections are intended to provide the reader with a high level summary of the perceived economic impacts of the proposed Project.

2.5.1 Project Expenditures

In 2010, AEM acquired all of the outstanding shares in Comaplex Minerals Corporation (Comaplex) to give it a 100 % interest in the Meliadine Gold Project. The total acquisition cost of the Project to AEM was in the order of \$659 million. While AEM is still working on the feasibility study for the proposed Meliadine Project, AEM estimates that the capital cost to bring the proposed mine into production will be in the order of \$1.0 to \$1.3 billion with an annual average sustaining capital requirement in the order of \$20 million⁶.

Over the projected mine life, the preliminary estimates suggest that the Project would generate revenue in the order of \$5.9 billion (4.5 million ounces of gold at an average gold price of \$1,294 per ounce). Operating expenses would be in the range of \$3.0 billion over the mine life. Taxes and royalty payments are estimated to be in the order of \$518 million over the mine life. AEM estimates that it will be paying corporate taxes on the Meliadine production by the third year of planned production. Mineral royalty payments are estimated to be in the order of \$185 million over the mine life⁷.

The breakdown of potential taxation revenue to the Federal and Territorial governments as well as anticipated mineral royalty payments to NTI is presented in Table 2-3 (from SJ Research Services 2012).⁸ AEM estimates that initial corporate income taxes payments would start about 3 years after the mine starts its production (P. McNamara, AEM, 2012, pers. comm.).

⁶ This is based on an ore production rate of 8,500 tonnes per day. It is important to note that these are pre-feasibility estimates and are subject to revision as the feasibility study is completed.

⁷ These are pre-feasibility estimates and are subject to revision as the feasibility study is completed.

⁸ It is important to note that these are pre-feasibility preliminary estimates and are subject to revision when the feasibility study is completed.

Table 2-3 Estimate of Government Fiscal Impacts – Meliadine Gold Project⁹

	Personal Income Tax	Corporate Income Tax	Taxes Unincorporated Business Profits	Non- Renewable Resource Royalties ¹⁰	Sales and Excise Taxes	Payroll Taxes	Property Taxes
Construction Phase (Cumulative)							
Federal (\$, million)	121.8	2.8	3.3	-	9.5	-	-
Nunavut (\$, million)	9.5	2.2	1.3	2.8	2.4	8.1	0.5
Total	131.3	5.1	4.7	2.8	11.9	8.1	0.5
Operation Phase (Yearly)							
Federal (\$, million)	16.9	8.9	0.6	-	1.9	-	-
Nunavut (\$, million)	2.3	7.1	0.2	8.9	0.6	1.3	0.3
Total	19.2	16.1	0.8	8.9	2.5	1.3	0.3

As stated in the socio-economic impact report, the net fiscal impact of the Project on Nunavut revenues is difficult to measure but is likely in the range of 30 % of total revenues, less mining royalties.

2.5.2 Employment

The number of direct, indirect and induced jobs expected to be created from the Project phases will vary over time. During construction, the numbers of direct positions could reach 1,700 in years 2015 and 2016. On average, 1,000 workers will be employed during the construction phase¹¹. During the operations phase, about 700 workers will be employed¹². Indirect and induced employment was

⁹ The amounts presented in Table 2-3 are based on a projected ore production rate of 8,500 tonnes per day and a gold price of \$1294 per ounce. It is important to note that these are pre-feasibility estimates and are subject to revision as the feasibility study is completed (expected end of 2014). They are sensitive to the price of gold.

¹⁰ At the Meliadine Project, all of the known deposits lie on Inuit Owned Lands thus all mineral royalties will be payable to Inuit through Nunavut Tunngavik Inc. who own the sub-surface mineral rights as transferred under the Nunavut Land Claims Agreement (not the Government of Nunavut). As the Meliadine mineral claims pre-date the NLCA, the mineral royalties will be paid by AEM to the Government of Canada who in turn will transfer the payments to NTI. The rate of royalty payments is subject to the *Nunavut Mining Regulations* under the *Federal Territorial Lands Act*.

¹¹ The number of workers on site will be lower than the number of actual direct positions, since some workers will not be on site for various reasons (shift rotation, sick time, vacation). Please refer to Section 9.4 in the Environmental Impact Statement (EIS) for further discussion on the number of positions.

¹² This is based on an ore production rate of 8,500 tonnes per day. It is important to note that these are pre-feasibility estimates and are subject to revision as the feasibility study is completed.

estimated by SJ Research Services (2012) working on behalf of AEM. The breakdown of these estimates is presented in Table 2-4¹³.

Table 2-4 Estimated Employment – Meliadine Gold Project

	Workforce (# of workers)	Origin of Workforce (# of workers)		Wages (\$/year)
	Average	Nunavut	Elsewhere	Average
Construction Phase	1,000	200	800	
Management (2 %)	20	0		190,000
Supervisory/Professional (13 %)	130	0		140,000
Skilled (55 %)	550	50		90,000
Concrete, Machinery Operator, Carpenter, Cladding, Painting, Drywall, Plumber, Service HVAC (Heating, Ventilation, and Air Conditioning), Service Electrician, Millwright, Welder, Pipe Fitter				
Semi-Skilled/Manual (30 %)	300	150		60,000
Electrician Apprentice, Carpenter Apprentice, Plumber Apprentice, HVAC Apprentice, Millwright Apprentice, Journey Man				
Estimated Indirect Employment	282			
Estimated Induced Employment	91			
Operation Phase	700	210	490	
Management (2 %)	14	0		190,000
Supervisory/Professional (13 %)	91	7		140,000
Mine, Maintenance, Mill, Site Services Supervisor, Professionals (Engineering, Geology, Environment, HS and HR Departments)				
Skilled (30 %)	210	35		90,000
Mine, Maintenance, Mill, Site Services, Procurement, Camp, Power plant and Environment Departments)				
Semi-Skilled/Manual (55 %)	385	168		60,000
Mine, Maintenance, Mill, Site Services, Camp				
Estimated Indirect Employment	114			
Estimated Induced Employment	60			

¹³ It is important to note that these are pre-feasibility preliminary estimates and are subject to revision when the feasibility study is completed. Also, the employment assumptions presented below, especially regarding Inuit employment, are not linked to any ongoing IIBA negotiation process and should not be referenced as such.

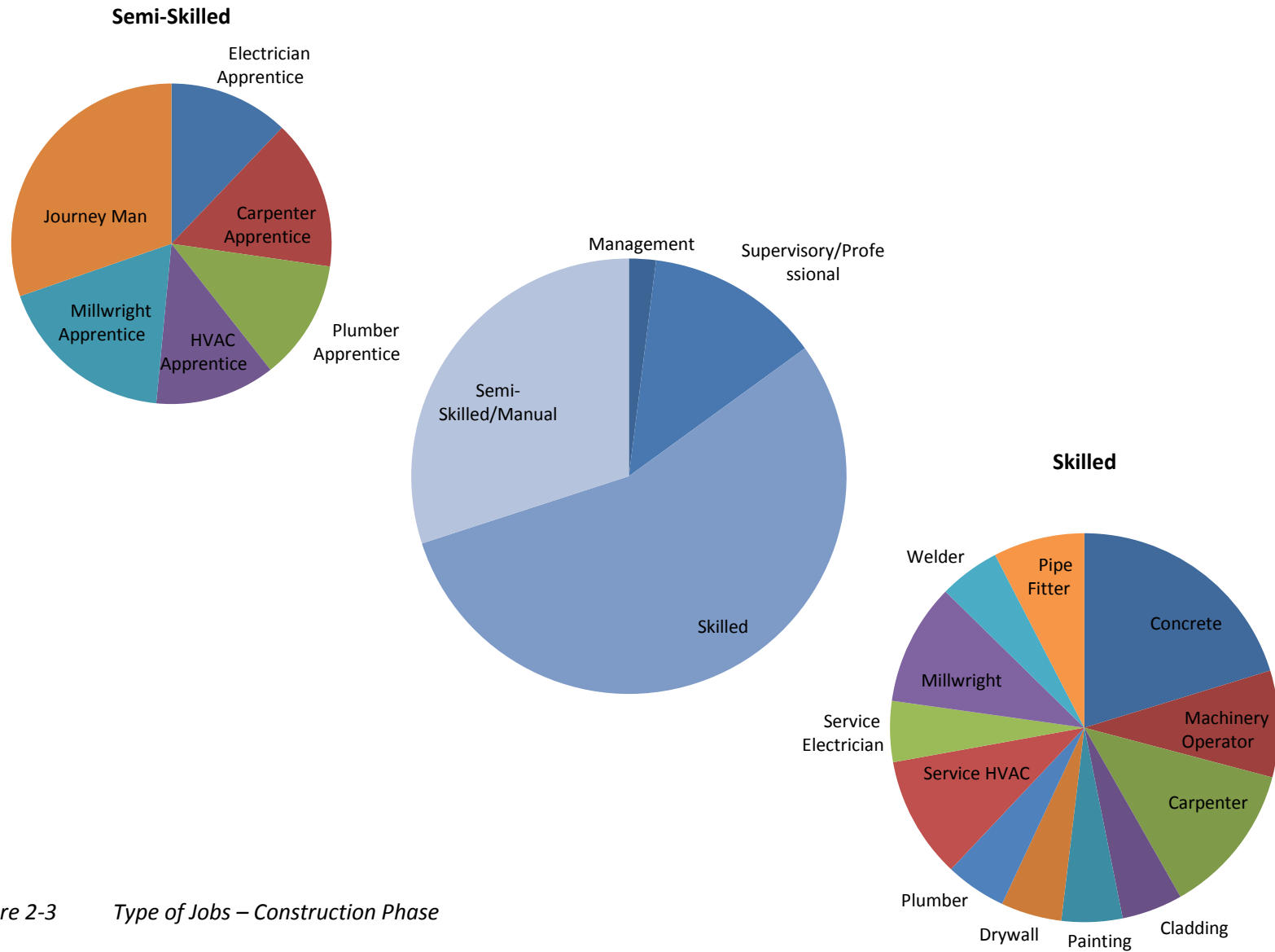


Figure 2-3 Type of Jobs – Construction Phase

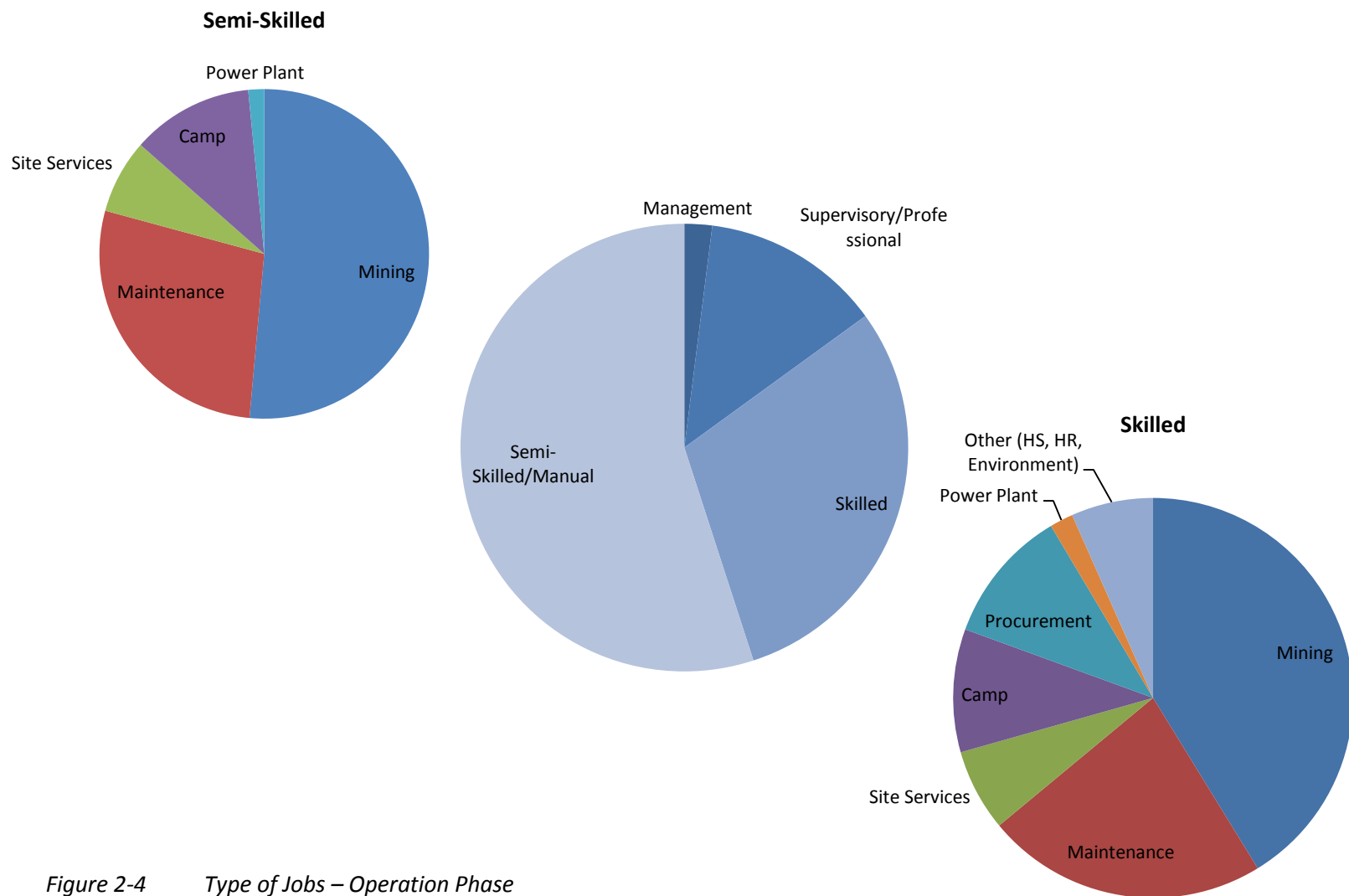


Figure 2-4 Type of Jobs – Operation Phase

Origin of Workforce

AEM has estimated the origin of this projected workforce based on its experience at the Meadowbank Gold Mine and our understanding of the current available labour force in the Kivalliq region of Nunavut. At Meadowbank, the Inuit employment proportion has varied between 30 % and 40 % over the first three years of operation. However, we have experienced high turnover rates amongst employees coming from the local region. This is probably indicative of the “newness” of going away to work at a remote mine site for two weeks every month and the inherent family dislocation that this type of rotation causes. AEM predicts that this will settle as people adjust and decide on what works best for their individual family situations. To be conservative, AEM has used the lower estimate of 30 % (operation phase; 20 % has been taken for construction phase as it represents a shorter period but intensive effort in terms of required workforce). It is in our business interest to maximize the number of employees coming from Rankin Inlet and the closest Kivalliq communities. It is very expensive to transport a workforce from Southern Canada. However, AEM cannot meet its production targets in an efficient and safe manner without having a skilled workforce. Thus, for AEM, the balance has to be between maximizing our Nunavut sourced workforce with maintaining a trained workforce (keeping local employees who have been trained and working with them to increase their skill level by on the job training) by reducing turnover of local employees.

AEM believes that the existing labour market in the Kivalliq region will enable these projections to be achieved. Under current development plans, the Meliadine Project should be entering production soon after mining operations at our Meadowbank operation are winding down. AEM anticipates that many of our current employees at Meadowbank will accept transfers to the Meliadine Project, giving us a good employee base to grow from.

AEM expects hiring workers from all seven of the Kivalliq communities, Val-d’Or, and other points in southern Canada as and when needed.

Labour Income

Total direct labour income per year is estimated to be: \$152.7 million during the construction phase (estimated to be a 3-year period) and \$66.0 million during the operation phase (estimated to be a 10 year period¹⁴).

The estimates of annual (peak) direct, indirect and induced labour income for both the construction and operational phases of the Project as calculated by SJ Research Services (2012) are presented in Table 2-5.

¹⁴ For socio-economic analysis, a conservative number of 10 year was used; the mining plan extends up to 13 years.

Table 2-5 Estimated Labour Income

Estimated Labour Income (\$, million)	
Construction Phase¹	
Direct labour income	152.7
Indirect labour income	20.7
Induced labour income	7.1
Total	180.5
Operation Phase	
Direct labour income	66.0
Indirect labour income	9.2
Induced labour income	4.7
Total	79.6

¹ Peak number

Work Schedule and Transportation

Mine crew and mine technical staff are currently planned to work 12-hour shifts on a 14-day/14-off schedule (fly-in/fly-out)¹⁵. Four crews will be required to operate 24 hours per day all year round. This is a common schedule used by remote operations in northern Canada and will result in 2,190 scheduled hours of work per year excluding vacation time. Crew changes will take place by air through Rankin Inlet airport as detailed in Section 2.6.7. Transportation will be paid to and from Kivalliq communities and from other regions in Canada. In-community liaison workers will be present to facilitate rotations (already present to support the Meadowbank Mine).

Employees arriving at the airport will be transported by bus to the permanent camp.

Housing

During the construction phase, the current exploration camp will first be used as temporary lodging for workers while the permanent camp is constructed. Priority will be given to build the dormitory and kitchen facilities.

For construction of Rankin Inlet facilities (spud barge, tank farm, storage facility), employees will be accommodated in Rankin Inlet as much as possible.

The permanent camp will be constructed as described in Section 2.6.12.2. The camp will be similar to those at other remote mines and will include individual rooms. The complex will have a basic capacity of 680 beds.

¹⁵ For the moment, daily commuting from Rankin Inlet is not envisioned, but will be discussed in the forthcoming months. AEM remains open to this type of work schedule for employees based in Rankin Inlet.

The permanent camp will also include a reception and security area, a kitchen and dining room, a laundry, and an administration building including a first-aid clinic. Recreational facilities will be included as they are considered essential to recruit and retain employees.

AEM already has an administration office in Rankin Inlet. Three (3) permanent employees provide services at this office.

2.5.3 Training and Benefit Programs

In order to attract, retain and develop the calibre of employees necessary to optimize operations, AEM will encourage and provide opportunity of advancement and promotion to current employees (as described in the Human Resources Plan SD 9-4).

AEM will adhere at all times to the training requirements outlined in the *Mine Health and Safety Act* and regulations. Employees will be provided job-specific training and instruction as part of their employment. Comprehensive testing and training programs will be implemented to ensure the safety of all employees at the mine site.

AEM will provide for all its employees a comprehensive benefits plan coverage, which includes dental, medical, AD&D (accidental death and dismemberment insurance), life insurance as well as an employee and family assistance program (EFAP) and retirement planning. More details on benefits are provided in the Human Resources Plan (SD 9-4).

2.5.4 Contracting

The Project should depend on several contract services for construction and operation. These could include the following, but not be restricted to:

- Open pit/underground mining;
- Underground infrastructure work;
- Mobile and fixed equipment maintenance;
- Camp services: catering, accommodation management;
- Transportation services and fuel services;
- Expediting/mine resupply;
- Environmental monitors;
- Communications;
- External trainers on site to conduct specialty training, e.g., conflict management, cultural awareness;
- Community relations;
- Security (gate); and
- Administration, logistics, and mechanical.

Some existing businesses will be able to capitalize on opportunities almost immediately, notably in the areas of transportation (air, water, and ground), storage, construction, and vehicle and equipment rental services. Other opportunities for Nunavut businesses could exist in power generation and waste heat management, information and financial services, rental and leasing, technical services, waste management, and warehousing.

AEM would also require contractors to draw labour from qualified local sources and provide on-the-job training program, especially during the construction phase.

During operation, AEM projects that contractor's employees employed at Meliadine would represent about 174 people (workforce). Those workers will be offered the same housing and lodging conditions as AEM personnel.

2.5.5 Inuit Impact and Benefit Agreement (IIBA)

Under the NLCA Section 12.5.2 f), AEM is required to detail the steps which it proposes to take to compensate interests adversely affected by the Project. The Meliadine Project lies fully within Inuit Owned Lands administered by the KIA. Inuit Beneficiaries in the Kivalliq region are represented by the KIA. Consequently, AEM has entered into negotiations with the KIA for the provision of benefits to Inuit through an Inuit Impact and Benefit Agreement (IIBA).

AEM and the KIA initiated negotiations for an IIBA for the Meliadine Project in January of 2012 and continue to advance discussions in accordance with the requirements set out in Article 26 of the NLCA. Both parties are working towards finalizing the IIBA which could occur by the end of 2014 or early in 2015. For the purposes of the Meliadine IIBA, the KIA and AEM have agreed that the most affected communities are Rankin Inlet and Chesterfield Inlet but the IIBA will cover all seven Kivalliq Communities.

Negotiation of the IIBA is progressing well. Once agreement in principle has been achieved on the IIBA both KIA and AEM will take the proposed IIBA to their respective Boards of Directors for approval. This is not likely to occur before submission of the Final EIS for the Meliadine Project. Thus AEM is not in a position to publically disclose any of the details of this IIBA at this point in the process.

While details of the draft IIBA cannot be publically disclosed at this point in time, AEM can indicate that the IIBA will include language to address the following areas:

- Inuit training at all levels;
- Inuit preferential hiring;
- employment rotation reflecting Inuit needs and preferences;
- scholarships;
- labour relations;
- business opportunities for Inuit including:

- provision of expert advice;
- notification of business opportunities;
- preferential contracting practices.
- housing, accommodation and recreation;
- safety, health and hygiene;
- language of workplace;
- research and development;
- Inuit access to facilities constructed for the Project such as roads;
- information flow and interpretation, including liaison between Inuit and the proponent regarding project management and Inuit participation and concerns;
- co-ordination with other developments; and
- obligations of subcontractors.

In addition to the IIBA, the parties will undertake the negotiation of an agreement to provide benefits for impacts on wildlife and wildlife habitat. AEM will also have to reach a Water Compensation Agreement with the KIA for the Meliadine Project in accordance with the requirements of Article 20 of the NLCA.

To the best of AEM's knowledge, there are no other outstanding or pending compensation issues associated with the development of the Meliadine Project.

2.5.6 Governance and Leadership Context

The proposed Meliadine Project is located on Inuit Owned Lands (IOL) located north of the Hamlet of Rankin Inlet. Surface rights for the mine and the mine site facilities and for most of the access road between Rankin Inlet and Meliadine are managed by the Kivalliq Inuit Association (KIA). Sub-surface mineral rights for the Meliadine ore deposits are managed by Nunavut Tunngavik Incorporated (NTI). The proposed Rankin Inlet port facility, laydown area, fuel tank farm, bypass road and the first 2 km of the All-weather Access Road are sited on municipal lands managed by the Municipality of Rankin Inlet and the GN Department of Government and Community Services. The proposed Itivia harbor laydown area and fuel tank farm are to be sited on airport lands administered by the GN.

Because it lies on IOL, the Meliadine Project can only proceed with the full consent of the Inuit as provided by the KIA working with NTI. However, the Project is closely aligned with the Hamlet of Rankin Inlet and thus, it will also require the cooperation and consent of the Hamlet of Rankin Inlet and the Government of Nunavut.

Three of the five institutions of public government created under the NLCA will also play a key role in deciding whether the Project can be developed and under what conditions, specifically:

- The **Nunavut Planning Commission (NPC)** – responsibility to ensure that the proposed development meets concordance with the existing Keewatin Regional Land Use Plan.
- The **Nunavut Impact Review Board (NIRB)** – responsible to screen and review the environmental and socio-economic impact of the proposed Project in a public setting to determine whether a recommendation should be made to the Federal Minister of Aboriginal Affairs and Northern Development on whether the Project should proceed or not and under what conditions. If the Project is approved to proceed, the NIRB also plays a role in monitoring that the Project is constructed, operated and ultimately closed in accordance with the commitments made and conditions applied during the review process.
- The **Nunavut Water Board (NWB)** – responsible for issuing the required water licenses for the Project should it be allowed to proceed. The water license addresses all water use at the Project including diversions and all deposition of waste to water generated as a result of mining, including ultimate closure and reclamation.

AEM will endeavor to try and avoid potential conflicts of interest that may arise in current governance regimes during the Project development by bringing all of the parties together in an open and transparent manner and working in a cooperative manner to seek accommodation that will avoid such conflicts. However where such conflict exists AEM will attempt to:

- Make all parties aware of the potential area of conflict of interest and potential implications;
- Try and seek consensus on how the conflict of interest should be managed in a fair and open manner to avoid negative implications; and
- Seek consensus and accommodation in an open manner so that such potential conflicts of interest can be addressed in an open manner.

AEM has initiated ongoing discussion and consultation with the GN, KIA, Hunters' and Trappers' Organization (HTO) and the Hamlet of Rankin Inlet to ensure that all parties are kept aware of our development plans for the Meliadine Project. This has enabled the GN, KIA and the Hamlet to incorporate, and where possible dovetail, our development plans with regional economic development plans. This dialogue has been underway for the past two years and will continue throughout the life of our Project. AEM will continue to meet directly with Hamlet council in Rankin Inlet to discuss all Project-related issues and to cooperate with the Hamlet where appropriate. AEM is a private business and cannot replace the role of Government. The Project will contribute new monetary income to both Federal and Territorial Governments through Project payments (taxes), but cannot directly take on the role of paying for new services or infrastructure within the community that are normally under the control of Federal, Territorial or Municipal governments.

In 2012, AEM created (with the assistance of the Hamlet) a Rankin Inlet – Meliadine Project Community Liaison Committee made up of representatives from various community groups who meet with the AEM Project Management team on a regular basis (at least quarterly) to allow all issues related to the proposed Project development to be aired and discussed in a troubleshooting

format. The meeting content and outcome are then made public. This committee met several times in 2012 and 2013 but has not met over the past six months. Committee members suggested that this initiative be replaced with an Inter-Agency Committee to provide more direct linkage with the various community groups rather than just with community individuals. AEM is intending to follow this suggestion and plans to re-engage the community in 2014 through an Inter-Agency Liaison Committee or some equivalent acceptable to the community.

With the assistance of KIA, AEM has engaged in meetings with the HTO and the Community Lands and Resources Committee (CLARC) to review the proposed Project development and to work on modifying the Project plan to meet issues of concern to local hunters, trappers and other traditional land users. This will continue throughout the mine life.

The Project will provide economic opportunities that will allow the local Hamlet and business community to grow and meet their future development aspirations. However the Hamlet is dependent upon the GN for economic resources and so it will be important for the GN to be involved in such discussions. To this end, AEM has approached the GN about the possibility of entering into discussions on a Development Partnership Agreement with AEM covering the Meliadine Project. The GN has acknowledged interest and need and is seeking internal approval on terms of reference for such an agreement. The scope would be to look at how AEM and GN can cooperate to help advance regional economic development sparked by this proposed Project.

AEM has and continues to play a key role as a participant within the Kivalliq regional Socio-Economic Monitoring Committee (SEMC). The SEMC is an initiative led by the GN with the objective of seeking ways to monitor, report on and propose mitigation strategies where necessary on how mineral development projects are impacting and affecting the socio-economic conditions within the Kivalliq region of Nunavut. The Department of Economic Development and Transportation (EDT) is the GN lead on the SEMCs. As such, the Department is responsible for collecting socio-economic data from across GN departments and other sources, consolidating this information, and disseminating it to the committees and other interested parties. EDT Regional Director of Community Operations chairs the SEMC. Coordination is driven by EDT's Regional Socio-Economic Coordinator to ensure efforts are consistent, traceable, comparable, and that they feed into other programs such as the Nunavut General Monitoring Plan. The SEMCs are conducted in collaboration with the Government of Canada, designated Inuit Organizations, Hamlets, and proponents. Complete information on those Committees, including their Terms of Reference, are available at: <http://nunavutsemc.com/>.

AEM has participated at every meeting of the SEMC since its inception in mid-2008. AEM provides the committee with annual updates and hard data on key indicators agreed to by the SEMC. These involve statistics on matters within AEM's control such as employment statistics at our mining operations, economic expenditure, contracting and business development activities, and training programs and initiatives. Other parties such as the GN contribute statistics collected within their area of control with the intent that the sum of the data helps the SEMC evaluate impacts and

change so that mitigation strategies can be proposed where and when necessary. AEM is committed to continue participation in this initiative and has already begun to include data from both Meadowbank and Meliadine in its reporting to the SEMC.

Working with the KIA and the GN, AEM helped create the Kivalliq Mine Training Society. This organization has been very successful in providing skills training for residents of the Kivalliq region looking for mine related employment. The Federal Government through Human Resources and Skills Development Canada (HRSDC) has been a key contributor of resources to this program. AEM continues to work with these partners on a number of fronts to develop and deliver skills training within the Kivalliq region of Nunavut. AEM provides its participation in both cash and in-kind training at Meadowbank and in the communities (e.g. the diamond drillers helpers training program created and delivered in Arviat). AEM is committed to continuing this participation to further mine related skills training in Nunavut. AEM is aware of (and is partner to) ongoing discussions in Nunavut to morph the Kivalliq Mine Training Society into a Nunavut Wide Mine Training Society and to create a pan territorial mine training initiative. These discussions will continue to evolve and AEM will continue to participate along with its partners. AEM has also entered into a number of agreements with the GN Department of Education to advance preparation of Nunavut students to enter into apprenticeship programs and to advance better understanding of what career paths are open to students in the Kivalliq schools (Mining Matters Program).

Community facility development is the responsibility of the Hamlets. AEM will not interfere in these areas however AEM has contributed to assist Baker Lake with development of community facilities as part of its Community Involvement Programs at Meadowbank. We see this type of involvement continuing in Rankin Inlet and Chesterfield Inlet once and if Meliadine goes into production. We see this type of involvement as part of our community outreach (being a good neighbor). However it is important to note that development of community facilities is a responsibility of the Hamlets and with the GN as their primary funding source.

In summary the proposed Meliadine Project will bring new opportunities (through employment, training and business development) and new wealth (through wages) into the region. This may create increased pressure on the Hamlets and the GN for new services and infrastructure, such as housing, increased policing, etc. AEM cannot take on the responsibility for the provision of these new services or infrastructure. This responsibility still lies with government (Federal, Territorial and Municipal). AEM will however provide through the taxes and payments that it will make to government new revenue to government. Similarly, employees will provide new revenue sources through the income taxes that they pay on wages earned at Meliadine. These are the sources that must be tapped to pay for the needed increase in services seen by the Hamlet and GN arising from the proposed Project.

2.6 Detailed Project Proposal Description

The Meliadine Project involves building, operating, decommissioning and rehabilitating a conventional gold mine. Some facilities development will take place at Rankin Inlet, where materials will be received by air and sea transport. Year-round access between Rankin Inlet and the mine site will be facilitated by an All-weather Access Road (AWAR). Figure 2-5 shows the overall Project layout, including the AWAR and Rankin Inlet proposed infrastructures.

Mine development will include open pit (OP) and underground (UG) mining that will provide ore to the mill. The mill, camp, powerhouse, tank farm, tailings storage facility, waste rock and overburden management areas, water supply and sewage treatment plant are integral components of this proposal. Currently, five gold deposits are included in the mine planning, Tiriganiaq being the largest one. The other deposits are: Discovery, F Zone, Pump and Wesmeg. Underground mining is planned for Tiriganiaq; nevertheless, all deposits are open at depth and further exploration work is needed to define if other deposits could also be mined through underground infrastructure. Surface exploration is also still ongoing and could lead to the definition of more ore deposits in the sector.

The main mine site surface infrastructures are mapped at Figure 2-6. The mill and camp infrastructure will be located near the existing exploration camp, and close to the Tiriganiaq deposit. The Discovery deposit is located approximately 22.4 km east-southeast of the proposed main site. It will be mined as a satellite deposit. The F Zone deposit is located approximately 5.1 km southeast of the Tiriganiaq deposit. The Pump deposit is about 3 km south of the Tiriganiaq deposit. Finally, the Wesmeg deposit is just south (0.3 km) of the Tiriganiaq deposit. Central coordinates are provided in Table 2-6.

The following sections detail the proposed Project's components and activities. Where appropriate, the impact assessment sections, development, management and monitoring plans, and/or specific sections of the detailed project description and development plan are cross-referenced for greater clarity and to guide the reader.

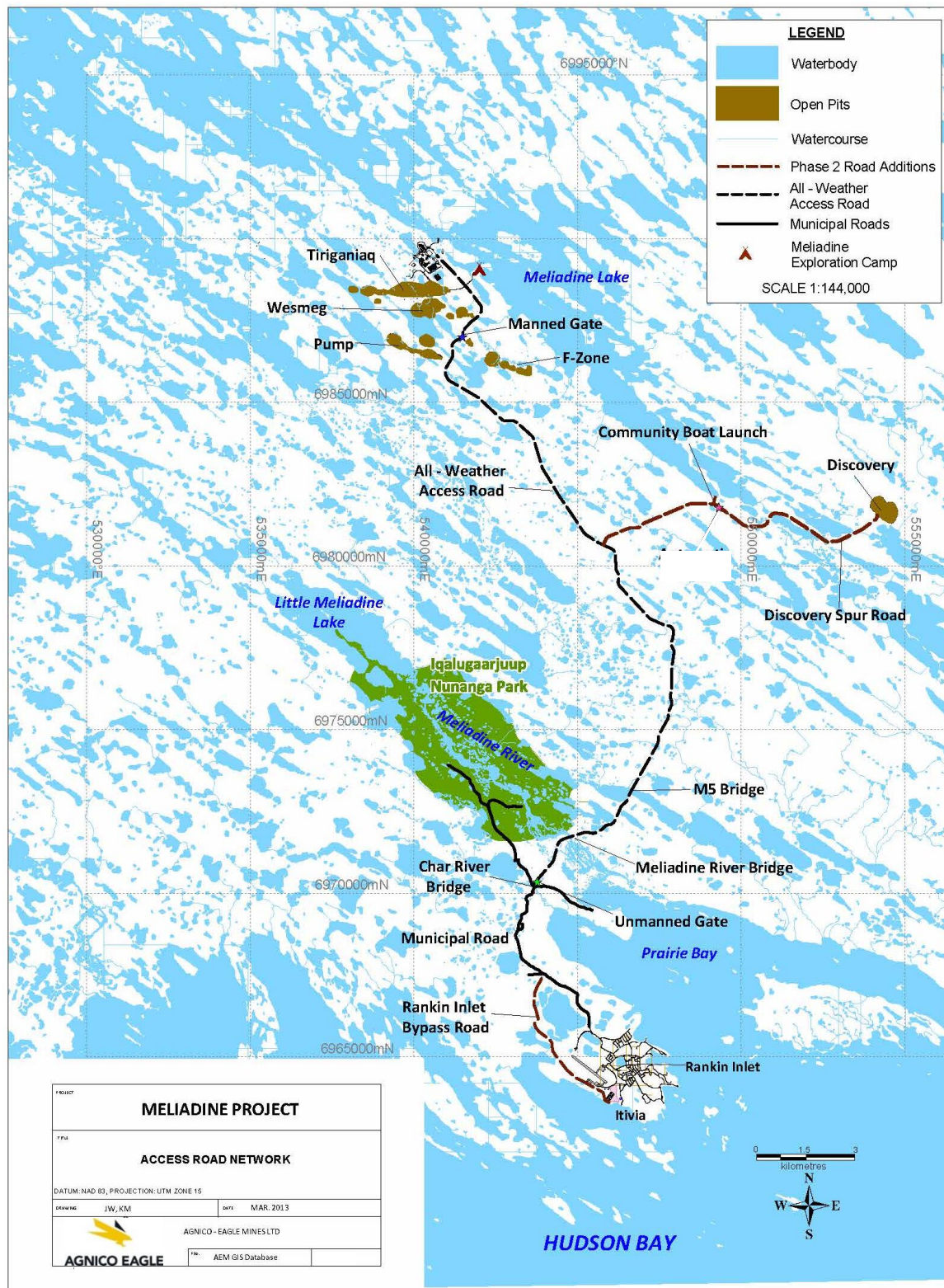


Figure 2-5 Meliadine Gold Project Overview

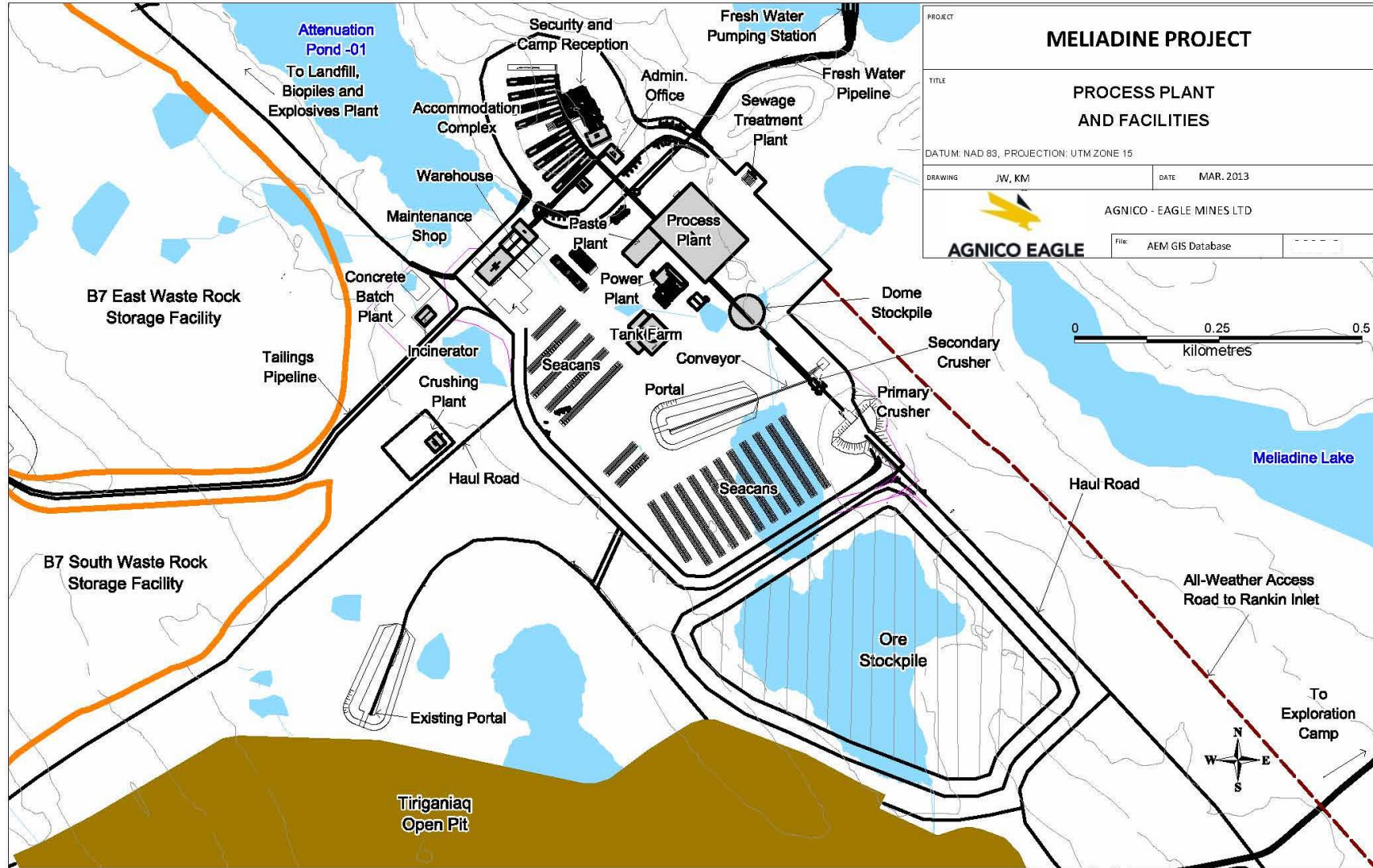


Figure 2-6 Main Site Infrastructure – Meliadine Gold Project

Table 2-6 Main Zones and Infrastructures Location, Meliadine Project

Zone	Coordinates		Latitude	Longitude	Mining	
	UTM ¹ East	North			OP	UG
Exploration Camp	541981.942	6989017.173	63° 1' 42.01"	92° 10' 13.28"		
Mill Site	540399.620	6989445.996	63° 1' 56.51"	92° 12' 5.46"		
Exploration Ramp	539911.714	6988731.504	63° 1' 33.62"	92° 12' 40.8"		✓
Tiriganiaq	539555.217	6988423.255	63° 1' 23.8"	92° 13' 6.42"	✓	✓
Discovery	554351.582	6981727.263	62° 57' 40.59"	91° 55' 42.08"	✓	
F Zone	542871.174	6986118.041	63° 0' 7.97"	92° 9' 12.75"	✓	
Pump	539983.082	6986790.620	63° 0' 30.89"	92° 12' 37.42"	✓	
Wesmeg	540862.185	6987740.396	63° 1' 1.22"	92° 11' 34.08"	✓	

¹ Coordinates Projection: UTM15V, Ellipsoïde : NAD83

2.6.1 Mine Sites

2.6.1.1 Geology and Mineralogy of the Ore Deposits

Regional Geology

The Meliadine Gold Project is located in the northern portion of the Archean Rankin Inlet Greenstone Belt, which is situated in the Northwest Hearne Sub-domain of the Churchill Structural Province that forms part of the northern Canadian Shield (see Figure 2-7; Tella et al. 1996). Supracrustal rocks of this belt consist of mafic volcanic rocks, felsic pyroclastic rocks, sedimentary rocks and gabbro sills of about 2.7 billion years old that have been polydeformed and metamorphosed (Bannatyne 1958, Laporte 1983, Tella et al. 1986, Tella 1994). These rocks were deformed in both the Archean and Proterozoic eras.

The Meliadine trend is defined by northwest-trending rock units as well as a major fault zone known as the Pyke Fault. The Pyke Fault is a several-kilometres long high strain zone characterized by multiple foliations and regionally important shear zones (Carpenter et al. 2005).

Local Geology

An interpretation of the bedrock geology and faults in the vicinity of the Tiriganiaq, Wesmeg, F Zone, and Pump deposits is presented in Figure 2-8 and, for the Discovery deposit, in Figure 2-9.

Structural deformation in the Project area originated with the development of an east-southeast dipping fold and extensive thrust faults. The Archean rock layers in the Rankin Inlet area were refolded due to northeast-southwest crustal shortening in the early to mid-second deformation event. This resulted in a regionally pervasive, penetrative shear foliation striking east-southeast and dipping 53° northeast and tight southeast-trending second generation folds.

It was the mid-second generation deformation event that caused the Pyke Fault at a slightly oblique angle to the regional stratigraphy and well-developed Z-shape folds across the entire length of the property. Individual folds range from centimetre to kilometre scale and are well developed north of the Pyke Fault.

Subsequent north-south shortening during a third deformation event resulted in shears trending roughly east-west as splays off the main southeast shear trend. Gold mineralization is interpreted to have been introduced during this event, and is postulated to be Proterozoic in age (Miller et al. 1995, Carpenter et al. 2005).

The weaker mica-bearing and argillite units show late-stage crenulation of the penetrative shear fabric locally. The crenulation is thought to post-date the gold mineralization.

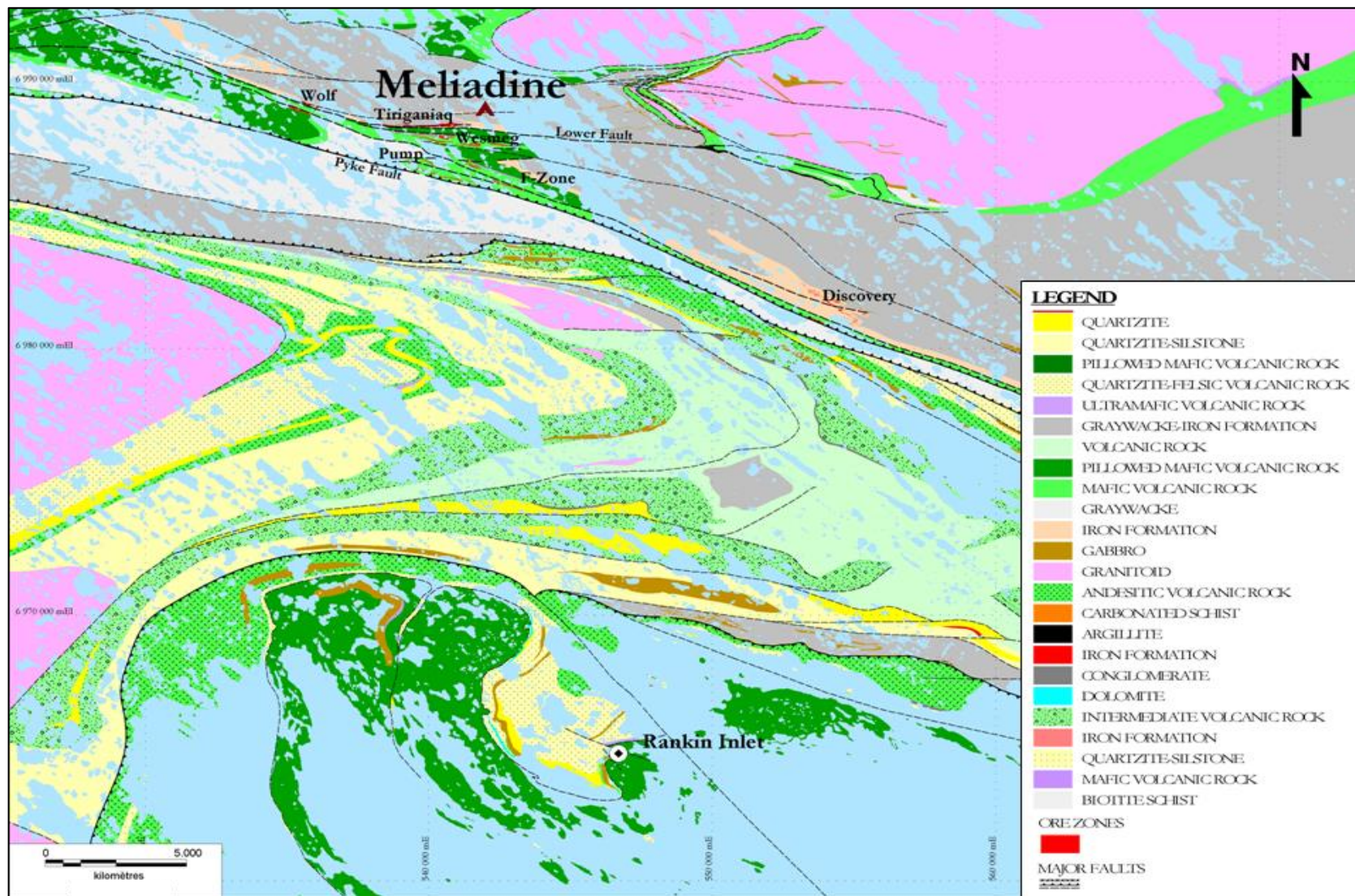


Figure 2-7 Regional Geology Map

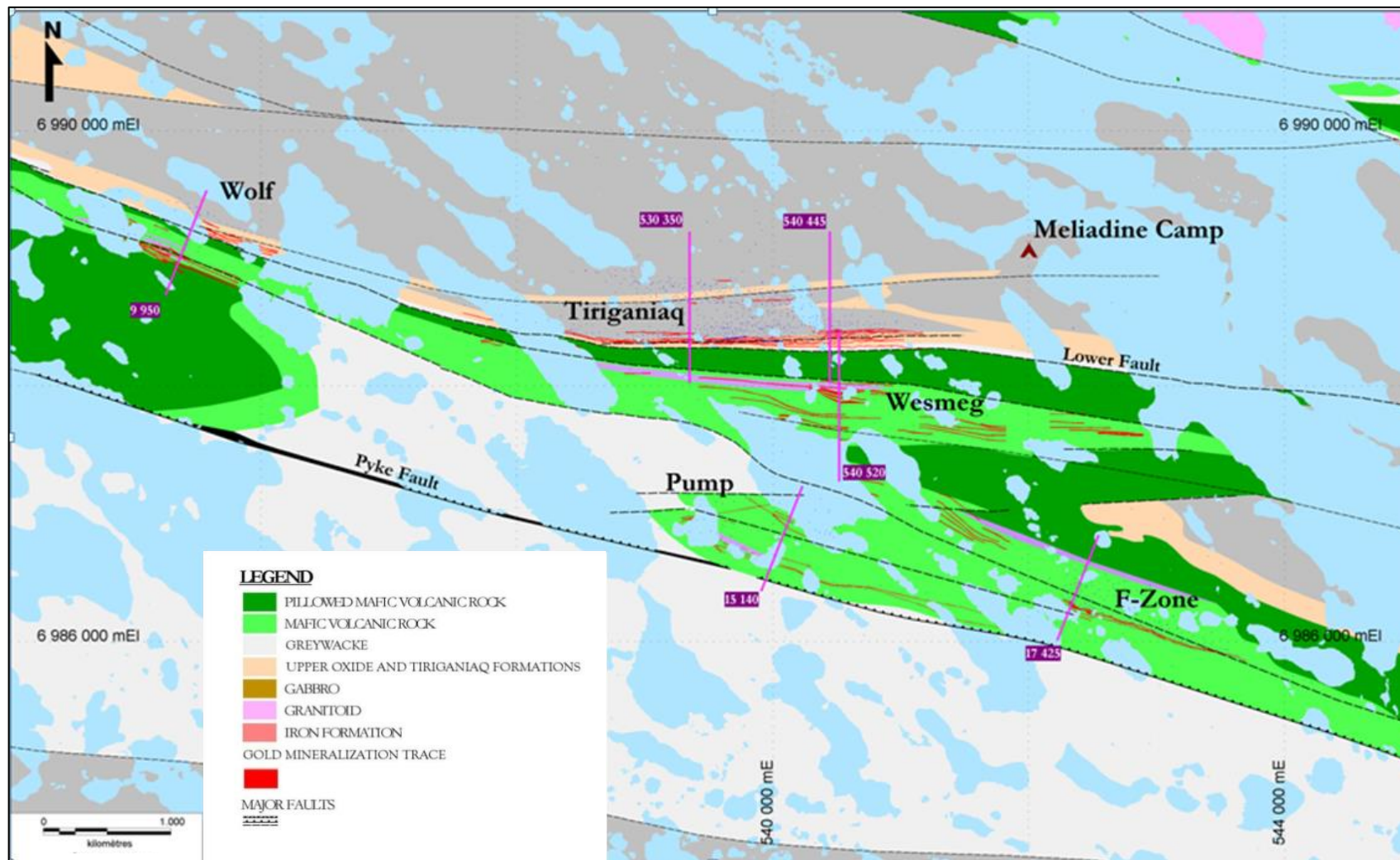


Figure 2-8 Local Geology Map showing the Tiriganiaq, Wesmeg, F Zone, Pump, and Wolf Deposits

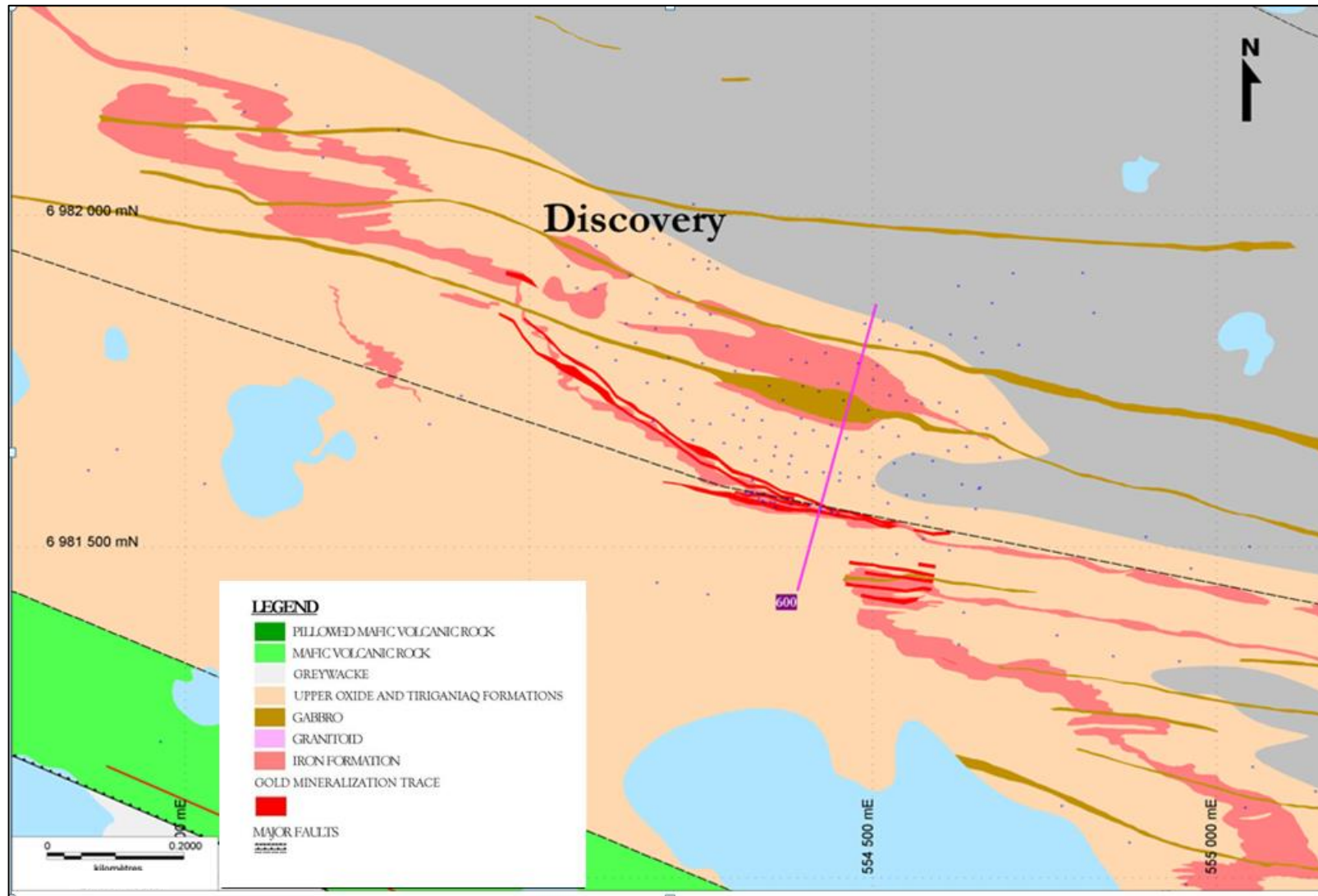


Figure 2-9 Local Geology Map showing the Discovery Deposit Area

Property Geology

Six (6) mineral deposits have been defined up to now at the Meliadine property, of which five (5) are included in the current Project proposal (Tiriganiaq, Discovery, F Zone, Pump, and Wesmeg).

Detailed surface mapping of the property and the deposits is not possible due to the general sparse occurrence of rock outcrop in the property area and the complete or almost complete lack of outcrop in the immediate vicinity of the deposits. The geology of the property and deposits has therefore been interpreted from a combination of drill information, high-density ground magnetic surveys, and outcrop mapping and channel sampling.

The facing direction evidence suggests that the rock layers have been overturned at each deposit, with the older rocks to the north lying structurally on top of the younger ones to the south.

Gabbro dykes and sills of several ages are recognized on the property. The oldest gabbro bodies are contained within the Wesmeg Formation and are interpreted as feeders to the overlying basalt pile. The youngest gabbros commonly cross-cut the second generation folds in the Sam Formation and postdate the deformation associated with the gold deposits.

Minor narrow undeformed lamprophyre dykes are intersected locally and cross-cut all older rock units, including mineralized veins.

All the rocks in the deposit areas are lower to middle greenschist metamorphic grade.

The main lithological units likely to be mined include:

- Turbiditic sedimentary rocks of the hanging wall, comprising greywacke, siltstone and argillite (Sam Formation) with gabbro dykes;
- Volcanic-hosted and sediment-hosted iron formation, including greywacke, siltstone and argillite (Upper Iron Formation) with abundant magnetite and chert layers;
- Sericite altered siltstones and graphitic argillite near the Lower Fault zone contact (Tiriganiaq Formation); and
- Schistose and carbonate-altered mafic volcanic rocks in the footwall (Wesmeg Formation).

The geology of each targeted deposit is described in the sections below. Local cross sections of the geology of each deposit are presented, showing geological units with elevation and linear geological structures. The Project area is in permanent permafrost down to about 450 m. A deep groundwater regime will be present only below permafrost.

Tiriganiaq

Figure 2-10 and Figure 2-11 are vertical cross sections showing the major rock units, gold mineralization traces, faults and dykes of the Tiriganiaq deposit.

The stratigraphic sequence in the Tiriganiaq deposit area strikes east-west and dips to the north at an average of 60°. The orientation of the Tiriganiaq gold deposit is unique on the property; the rock units are aligned for more than 3 km along what is interpreted as the mineralized shear direction.

Clastic turbidites of the Sam Formation are the oldest (northernmost) rocks. Beneath is the Upper Oxide Formation, a diverse package of iron-rich rocks that includes beds of magnetite, chert, chloritic mudstone, and greywacke. The upper contact with the Sam Formation is occupied by the distinct, laterally consistent “Upper Oxide Iron Formation”, which is easily recognized and traceable across the property due to its high magnetic susceptibility. Further south is the Tiriganiaq Formation of laminated siltstones.

At the base of the Tiriganiaq Formation, there is sporadic black argillite, commonly underlying 1000 lode mineralization. The Lower Fault likely formed along this obvious stratigraphic weakness. This fault defines the contact between the Tiriganiaq Formation and the underlying Wesmeg Formation of chlorite-rich massive to pillowed basalts with rare gabbro dykes and interflow sediments. The Lower Fault is the locus of intense late shearing that decreases away from the contact surface, but is more developed in the structural hanging wall. Splay faults emanating from the Lower Fault have resulted in repetition of the stratigraphy in the Tiriganiaq gold deposit.

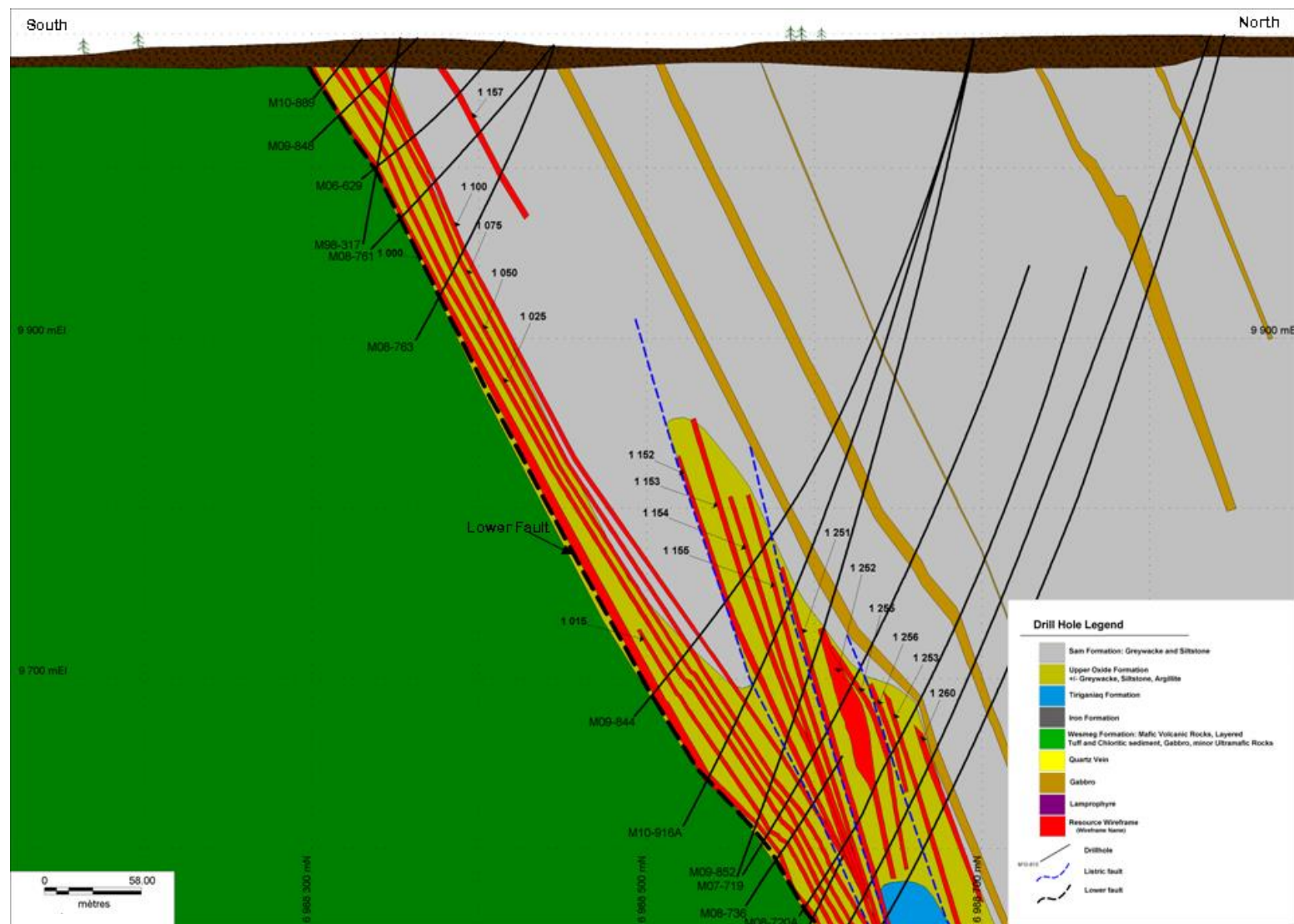


Figure 2-10 Tiriganiaq Vertical Cross Section at 539350 E showing Geology and Lode Mineralization Solids

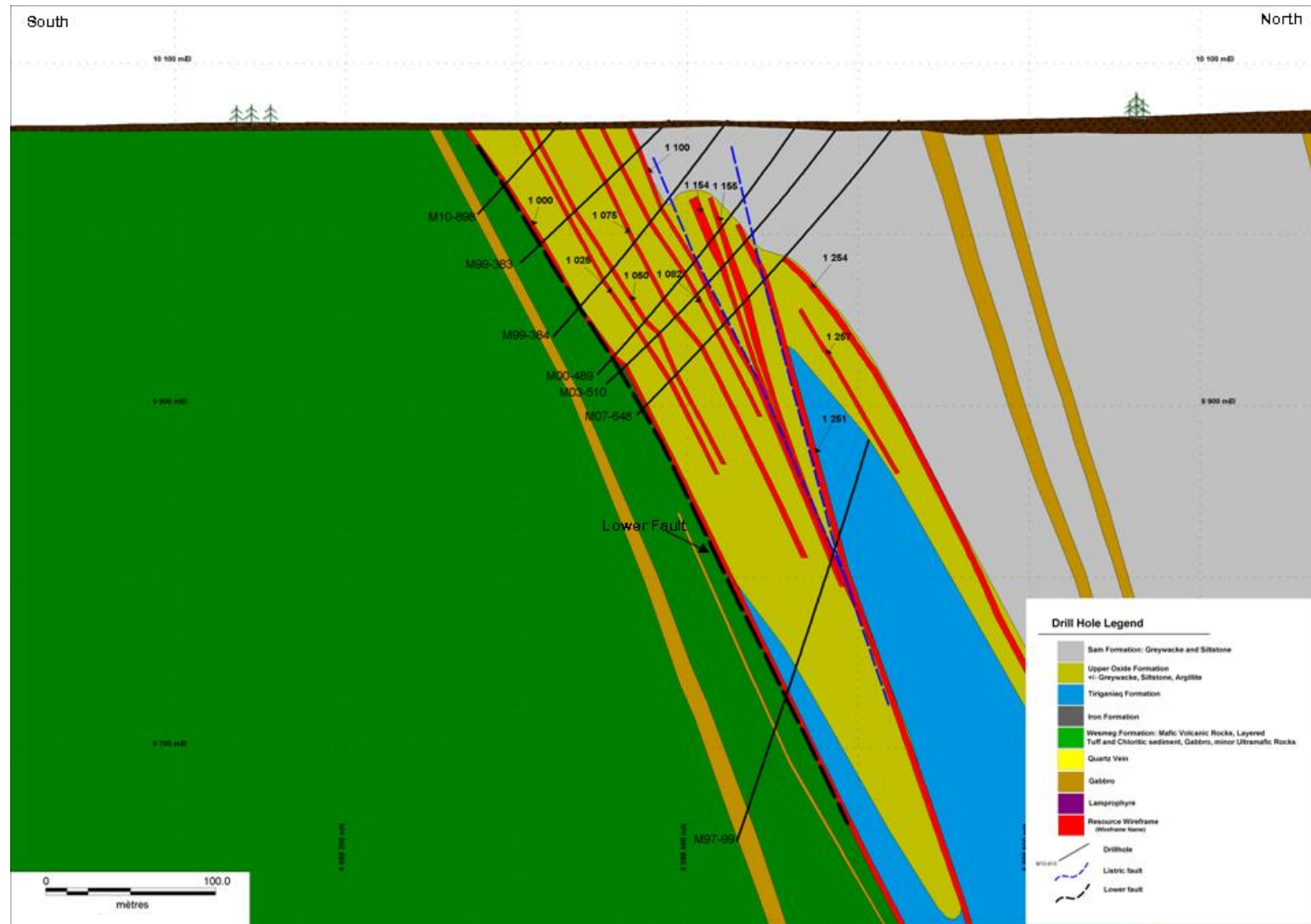


Figure 2-11 Tiriganiaq Vertical Cross Section at 540445 E showing Geology and Lode Mineralization Solids

Discovery

Figure 2-12 shows the rock units and gold mineralization in the Discovery deposit. The stratigraphic sequence in the Discovery deposit area strikes northwest-southeast and dips from 45° to 60° to the north.

Clastic turbidites of the Sam Formation are the oldest (northernmost) rocks. As at Tiriganiaq, these overlie the Upper Oxide Formation and its uppermost portion, the “Upper Oxide Iron Formation”. Chlorite-rich massive to pillowed basalts of the Wesmeg Formation form the structural footwall to the sequence but occur at least 600 m south of the Discovery deposit. The Lower Fault forms the contact between the Wesmeg and Upper Oxide formations and is interpreted as a basal detachment surface but, in the area of the Discovery deposit, is not exposed and has not been drilled so far. The Lower Fault, therefore, represents a potential target for Tiriganiaq-style lode gold vein zones similar to the 1000 lode.

The Upper Oxide Iron Formation hosts most of the gold mineralization at Discovery. It is strongly folded with most of the thicker and more continuous mineralization following the fold noses, which plunge to the east-northeast at 47°.

F Zone

Figure 2-13 is a vertical cross section showing the rock units and gold mineralization traces at F Zone. The stratigraphic sequence in the F Zone deposit area strikes northwest-southeast and dips from 45° to 50° to the north.

The host rocks for F Zone are chlorite-rich massive to pillowed basalts of the Wesmeg Formation, which are cut by rare gabbro dykes and interflow sediments. Within the Wesmeg Formation are chert-rich and iron-poor rocks of the Lower Lean Iron Formation that consist of metre-scale cherty iron formation units interbedded with centimetre-scale volcanic units. The iron formations that host the gold mineralization vary in thickness from metres to tens of metres. This great thickness is interpreted to be the result of the intersection of an east-southeast-trending iron formation with a dominant east-west-trending structure and a second southeast-trending structure. Plunges of these thick mineralized iron formations vary from steeply northeast to steeply northwest.

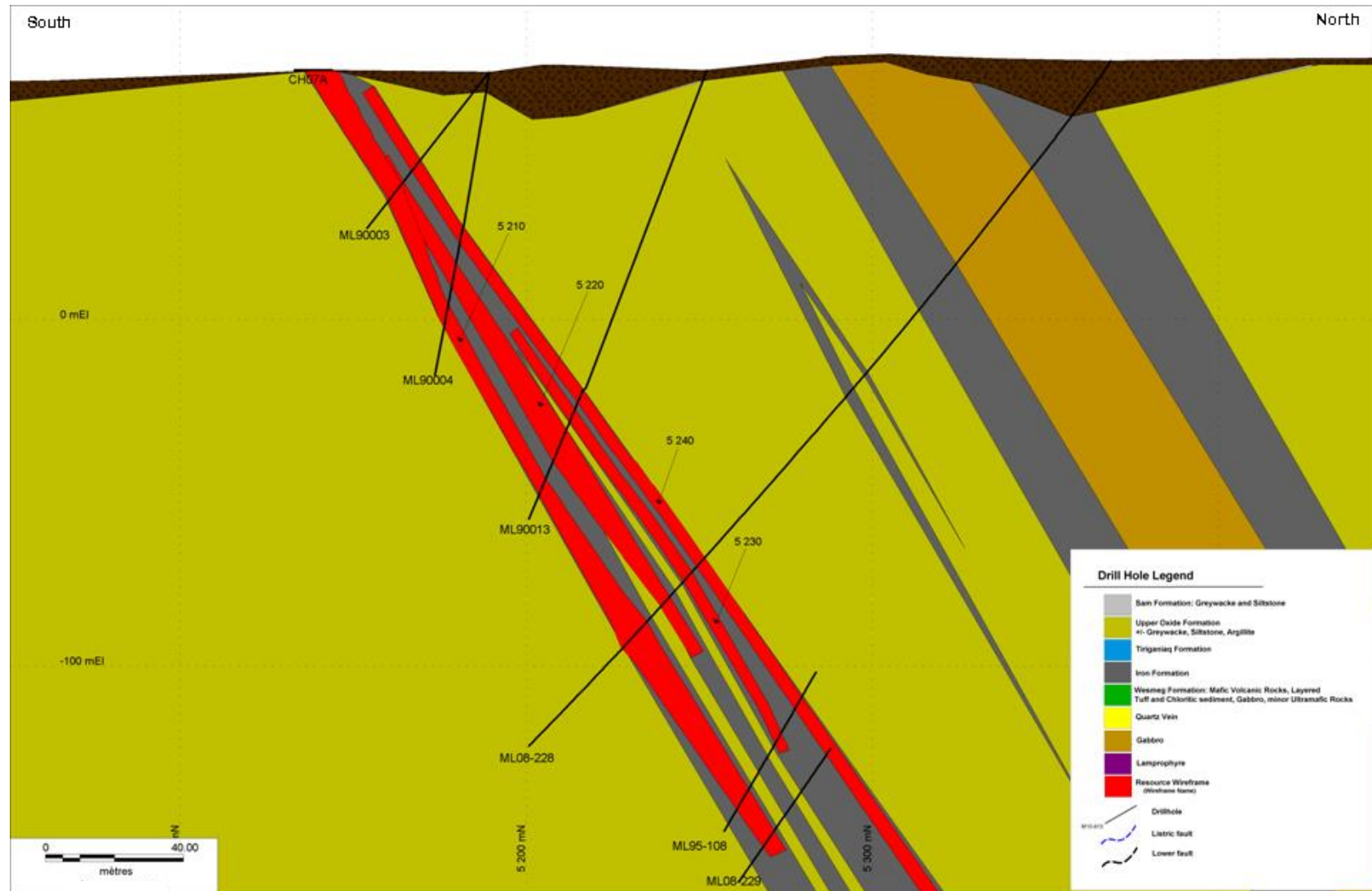


Figure 2-12 Discovery Vertical Cross Section at 600 E (local grid) showing Geology and Lode Mineralization Solids



Figure 2-13 F Zone Vertical Cross Section at 17425 E (local grid) showing Geology and Lode Mineralization Solids

Pump

Figure 2-14 is a vertical cross section showing the rock units and mineralization traces at the Pump deposit. The stratigraphic sequence in the Pump deposit area strikes northwest-southeast and dips 50° to the north.

As at F Zone, the host rocks for the Pump deposit are chlorite-rich massive to pillowed basalts of the Wesmeg Formation, which are cut by rare gabbro dykes and interflow sediments. At Pump, there are three types of chert-rich iron formations in the Lower Lean Iron Formation: chert-magnetite-chlorite iron formation, grunerite-cummingtonite-rich iron formation, and sulphide-rich beds in chert-dominated iron formation. Occasional metre-scale ultramafic units are noted in the sequence. The main structural feature is a kilometre-long Z-shaped fold formed by the intersection of east-west-oriented shear structures and the Lower Lean Iron Formation.

Wesmeg

The Wesmeg deposit was the target of a dedicated drill program for the first time in 2010. There appear to be two parts to the deposit: a northern and southern part.

In the northern part, Wesmeg's stratigraphic sequence strikes east-west and dips 65° to the north. This is similar to the east-west orientation of the Tiriganiaq gold deposit (about 400 m to the north of Wesmeg) where it is interpreted as the mineralized shear direction. This same orientation is observed in the results of a high-resolution magnetic survey over the northern part of the Wesmeg area. The stratigraphic sequence in the southern part of the Wesmeg area strikes northwest-southeast and dips 50° to the north.

Figure 2-15 is a vertical cross section showing the rock units and gold mineralization traces of the Wesmeg area. The host Wesmeg Formation is a chlorite-rich massive to pillowed basalts which is interlayered with mafic volcanoclastics with rare gabbro dykes and some interflow sediments comprising siltstone, mudstone (some graphitic) and minor iron formations. The chert-rich and iron-poor rocks of the Lower Lean Iron Formation consist of metre-scale cherty iron formation units interbedded with centimetre-scale volcanic and sedimentary units. The iron formation units hosting the gold mineralization at Wesmeg vary in thickness from metres to tens of metres.



Figure 2-14 Pump Vertical Cross Section at 15,140 E (local grid) showing Geology and Lode Mineralization Solids

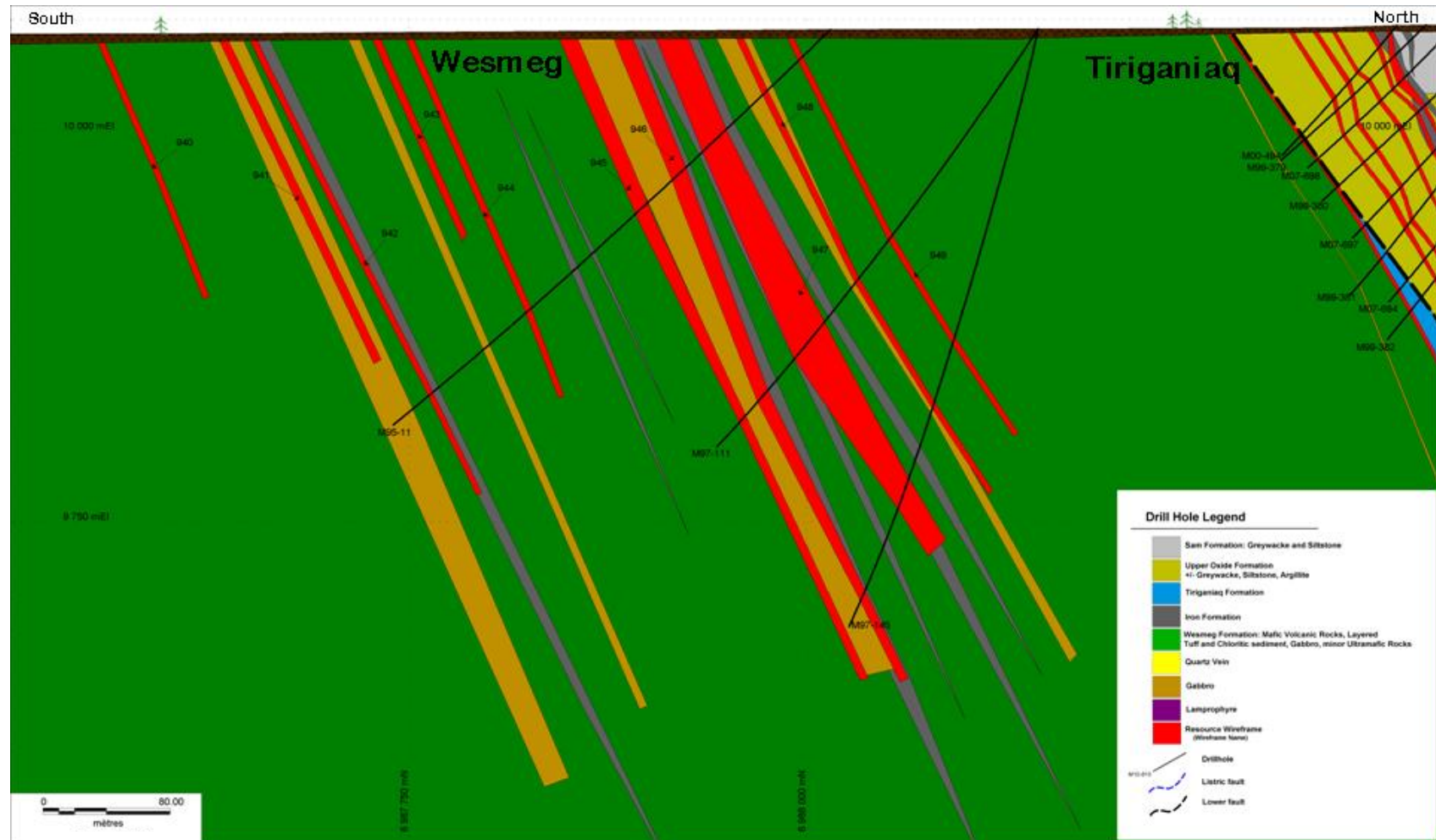


Figure 2-15 Wesmeg Cross Section at 10,520 E (local grid) showing Geology and Lode Mineralization Solids

Deposit Type

The main targets of exploration on the Meliadine Gold Project are mesothermal lode gold and shear-controlled deposits. The gold deposits defined on the property are vein- and shear-dominated occurrences hosted predominantly in iron formations, fine-grained sediments, and volcanics, either on an east-west-trending splay off the 115°-trending regional Pyke Fault (such as at the Tiriganiaq deposit), or else on structures parallel to the Pyke Fault (such as at the Discovery, Pump, and F Zone deposits). While these gold deposits are similar to other recognized iron formation-hosted gold deposits such as Lupin in Canada's Northwest Territories (e.g., Bullis et al. 1994) and Homestake in South Dakota, USA (e.g., Rye and Rye 1974), the strong association of quartz veins with gold mineralization in sediments at Meliadine is distinct from these other deposits.

Tectonic interleaving of the Archean supracrustal rocks, together with local and regional textural and mineralogical evidence suggest that a combination of early Archean structural preparation and later Proterozoic re-activation was responsible for the Lower Fault splay and subsequent dextral movement along it. Evidence to date suggests that the main gold mineralizing event at the Meliadine property was Proterozoic in age (Miller et al. 1995). This age is supported by a $^{207}\text{Pb}/^{206}\text{Pb}$ age of $1,854 \pm 6$ million years determined on hydrothermal monazite from gold-bearing quartz veins at the Tiriganiaq deposit (Carpenter et al. 2005).

Gold mineralization in these deposits is strongly correlated with shearing and quartz veining. Mineralized lodes are hosted in quartz-vein stockworks, laminated veins, and variably sulphidized iron formation in complexly folded and sheared iron formation, sedimentary, and volcanic rocks in or near the volcanic-sedimentary contact.

Tiriganiaq

Mineralization in the Tiriganiaq gold deposit is strongly associated with shearing and quartz veining, which likely developed during the Proterozoic third deformation event. The most intense and consistent gold mineralization is present within both the Upper Oxide Iron Formation and proximal to the Lower Fault in the siltstones of the Tiriganiaq Formation, but minor amounts of mineralization have been reported in all rock types. Areas of intense shearing are 'healed' by quartz veining and there is generally little to no brittle deformation.

The Tiriganiaq gold deposit has been subdivided into the Main and Western Deeps zones, the latter discovered in 2000, five years after the discovery of the Main zone. Drilling in and between the zones from 2005 to 2008 indicates the Western Deeps is the western down-plunge continuation of several of the Tiriganiaq gold deposit Main zone lodes. The current interpretation is that the Western Deeps zone and Main zone lodes are all part of the same deposit.

Quartz Veining

Gold mineralization is directly associated with syn- to post-deformational quartz veining. Vein appearance is highly variable from a several-metres-thick laminated vein along portions of the Lower Fault to wispy, apparently erratic quartz stringers and stockworks in the Tiriganiaq Formation.

With some exceptions, quartz-only and quartz-ankerite veins tend to be mineralized, while quartz-calcite veins are commonly barren in all lodes. This observation implies multiple veining events.

Oriented drill core measurements taken in 2005 indicate the most prevalent vein sets measured are sub-parallel to the dominant second generation foliation across the deposit, which is predominantly sub-parallel to bedding. This style of veining is localized and best developed in areas of high strain and associated gold mineralization (e.g., the 1000 lode). Although less prevalent, a second late vein set is recognized that crosscuts the prevalent veining and dips flatly to moderately northwards. The quartz-ankerite veins in this latter set are typically narrow and infrequent, but contain visible gold. Similar to the prevalent veining, the crosscutting set is most often associated with mineralized zones of high strain, formed perhaps as ladder-style extensional veins.

Sulphides

Sulphide minerals in the Tiriganiaq gold deposit are of two distinct generations: primary and late sulphides.

Primary sulphides consist of wispy, discontinuous, bedding-parallel laminations of pyrrhotite, pyrite, and chalcopyrite in oxide iron formations and black argillite. Fine-grained, web-textured sulphides in oxide iron formations close to quartz veins may represent remobilization of primary sulphides, but may alternatively signify sulphur introduced during mineralization. In the absence of quartz veining, gold values are generally low to absent in this sulphide assemblage.

Sulphidation of the iron formation is incomplete and variable in the Tiriganiaq gold deposit, even in well-mineralized gold-bearing lodes, and is clearly not a prerequisite to important gold values.

Late sulphides consist of coarse-grained (sub-centimetre-size) clots of arsenopyrite crystals and pyrrhotite associated with highly gold-bearing zones located in and close to quartz veining. The coarse arsenopyrite crystals rarely show signs of strain, having suffered little post-depositional deformation. Arsenopyrite of this type, in association with quartz veining, is a good visual indicator of elevated gold values.

Both primary and late sulphide assemblages host minor, local concentrations of galena and less abundant sphalerite. These minerals appear to be more prevalent in gold-rich areas in the Tiriganiaq Formation, specifically in the 1025, 1050, 1075, 1082 and 1087 lodes (see description of lodes below).

Visible gold is common in all lodes in the deposit and is present in quartz veins, pyrrhotite, and along the margins and late fractures of arsenopyrite crystals.

Alteration

Areas of elevated to strong gold mineralization near the Lower Fault are associated with moderate to strong sericite hydrothermal alteration that may be tens of metres thick. This is especially

apparent in Tiriganiaq Formation siltstones and Wesmeg Formation volcanics, where the intensity of alteration and deformation makes it difficult to differentiate the two units.

Sericite is present, but less well developed, in mineralized lodes in the iron formations. Chlorite and disseminated magnetite is common in the Upper Oxide Iron Formation but is interpreted to be part of the mineralogy of the silicate bands in the iron formations rather than a distinct hydrothermal alteration product.

Potassium replacement is present locally as biotite-bearing selvages in sedimentary rocks hosting mineralized quartz veins and/or iron formations.

Lodes

Gold mineralization has been interpreted into lode models, where a lode is defined as a mineral deposit consisting of a zone of veins, veinlets, disseminations or planar breccias (American Geological Institute 1987). The lode models are defined by the presence of shearing, elevated levels of quartz veining, rock-type and/or structural contacts, coarse arsenopyrite, gold grade and continuity. Known structural trends, dominantly shearing, have been used to define the lode orientations.

Four dominant lodes host the gold mineralization in the Tiriganiaq gold deposit. In general, lode geometries fall into two basic categories: layer-parallel lodes and plunging or non-layer-parallel lodes.

The dominant geologic control for layer-parallel lodes is a penetrative late, bedding-parallel shear system (e.g., 1000, 1025, 1050, 1075, 1082, 1087 and 1100 lodes). Two of the lodes (1000 and 1100) host major high grade gold concentrations over substantial widths. Geology, gold grade, alteration, mineralization, and strength of structure of these two lodes are moderately consistent and predictable within the Main zone of the Tiriganiaq deposit. The overall orientation of mineralization in these two lodes suggests a moderate plunge to the east, but mineralization of economic interest is restricted to shoots of smaller size that appear to have a slight west plunge within the overall body of lower grade mineralization. The 1025, 1050, 1075, 1082, and 1087 lodes may also follow this pattern.

The main control for plunging and non-layer-parallel lodes is that they host gold in multiple sub-parallel, west-plunging shear structures. These interpreted fold structures may be related to reactivated faulting and/or fold repetition of the Upper Oxide Iron Formation (the iron formation at the lower end of the 1100 lode). Many mineralized shears cut through the fold nose and the overall package plunges 9° to 15° to the west. Gold grades appear to be higher and more continuous where the shears cut the thicker iron formation in the nose of these folds.

Relative lode positions of the Tiriganiaq deposit are presented in Figure 2-16.

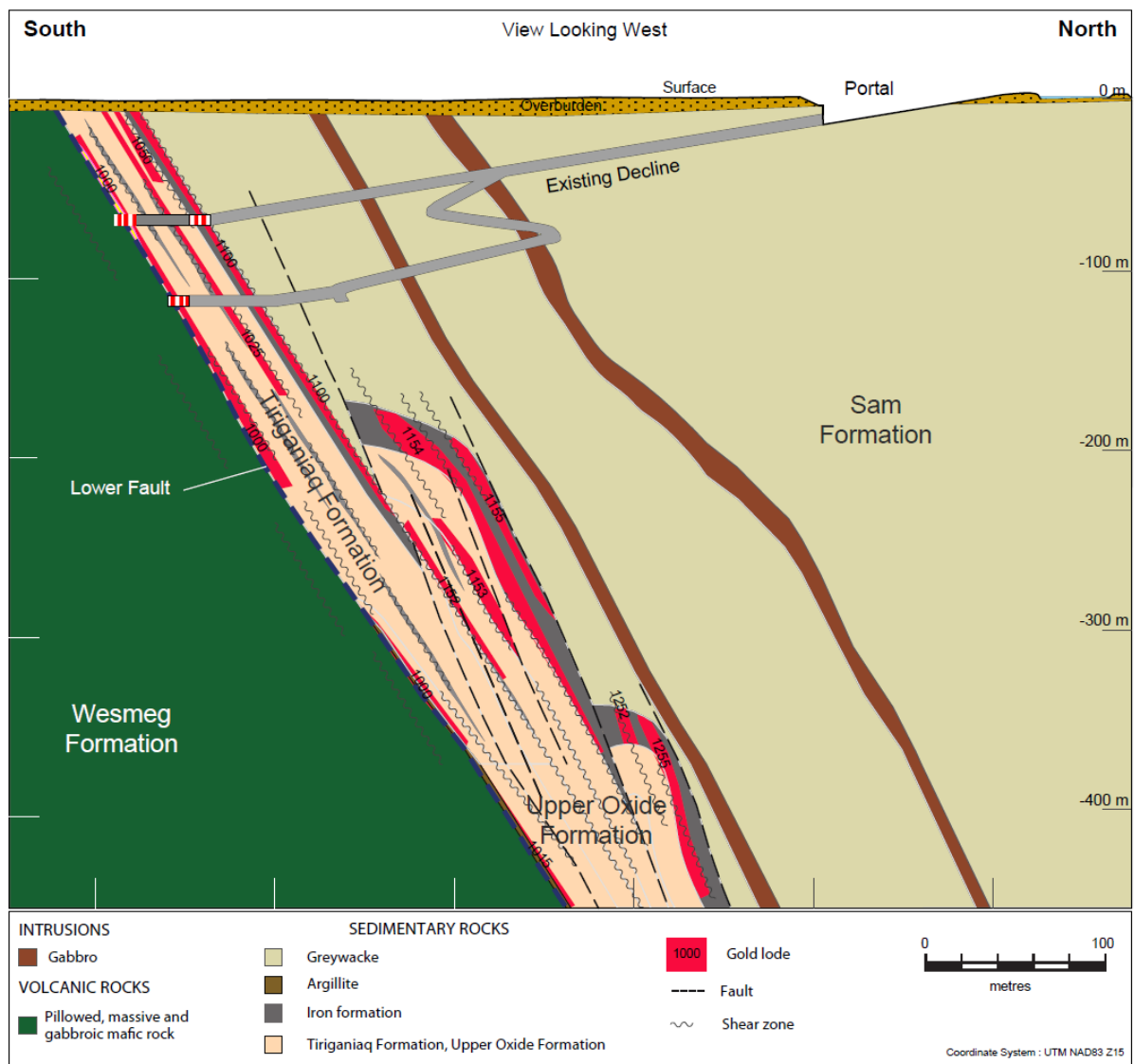


Figure 2-16 Tiriganiaq Schematic Geological Cross Section showing Relative Position of the Lodes

Discovery

Mineralization in the Discovery gold deposit is strongly associated with shearing and quartz veining within the Upper Oxide Iron Formation. The thicker, higher-gold-grade sections are controlled by the noses of Z-shaped folds that trend east-northeast and plunge 47°. In the area of the current mineral resource estimate, at least four of these fold noses have been identified: Pisces, Discovery, Discovery West, and Capricorn.

Free gold occurs as coatings and fracture fillings in large recrystallized arsenopyrite and pyrrhotite grains, and as disseminations in quartz veins and chlorite layers. Trace amounts of sphalerite and chalcopryrite are found locally.

Alteration envelopes occur adjacent to quartz-calcite veining and are characterized by hornblende/grunerite+biotite+calcite-bearing assemblages that overprinted the pre-existing regional greenschist metamorphic facies.

F Zone

Mineralization in the F Zone gold deposit is strongly associated with shearing and quartz veining within the Lower Lean Iron Formation. Thicker sections with higher gold grades are controlled by the intersection of the east-southeast-trending iron formation with a dominant east-west-oriented structure and a second southeast-trending structure. Plunges of this thickening vary from steeply northeast to steeply northwest depending on local changes in strike.

Free gold occurs as discrete blebs in pyrrhotite and quartz shears and to a lesser extent along fractures and grain boundaries in large recrystallized arsenopyrite.

Alteration envelopes occur adjacent to quartz-calcite veining and are characterized by hornblende/grunerite+biotite+calcite-bearing assemblages that overprint the pre-existing regional greenschist metamorphic facies.

Pump

Mineralization in the Pump gold deposit is also strongly associated with shearing and quartz veining within the Lower Lean Iron Formation, with thicker, higher-gold-grade sections associated with east-west shearing. As at the F Zone, the plunges of this thickening vary from steeply northeast to steeply northwest depending on local changes in strike.

Free gold occurs as discrete blebs in pyrrhotite and quartz shears and to a lesser extent along fractures and grain boundaries in large recrystallized arsenopyrite.

Alteration envelopes occur adjacent to quartz-calcite veining and are characterized by ankerite+silica+chlorite+biotite-bearing assemblages that overprint the pre-existing regional greenschist metamorphic facies.

Wesmeg

Mineralization in Wesmeg is strongly associated with shearing and quartz veining within the Lower Lean Iron Formation, with thicker, higher-gold-grade sections.

Free gold occurs as discrete to coarse blebs, locally disseminated, associated with very coarse to finely disseminated arsenopyrite.

Alteration envelopes occur adjacent to quartz-calcite veining and are characterized by ankerite+silica+chlorite+biotite-bearing assemblages that overprint the pre-existing regional greenschist metamorphic facies.

2.6.1.2 Resources and Reserves

From 1993 to the end of 2009, a total of C\$144.1 million in exploration funds was spent on the Meliadine Project. In 2010, another C\$22.7 million was spent on the Project. All appropriate methods of mineral exploration were applied. Lack of outcrop resulted in the use of high-density magnetic surveying, followed by drilling, as the most common and successful exploration strategy on the property.

Table 2-7 presents the December 31, 2010 resources and reserves estimate for the Meliadine property. These were disclosed by Agnico Eagle in a news release dated February 16, 2011. The three-year average metal prices used in this estimate, for the period ending December 31, 2010, are \$1,024 per ounce of gold and a C\$/US\$ exchange rate of 1.08.

The Meliadine reserve estimates were updated by AEM at the end of 2013 at a gold price of \$1,200 per ounce as follows:

- Proven and Probable Reserves 2,841,000 oz of Au at a grade of 7.38 g/t
- Measured and Indicated Resource 3,082,000 oz of Au
- Inferred Resource 2,712,000 oz of Au
- Total (all categories) 8,635,000 oz of Au

Table 2-7 Meliadine Property Mineral Resources and Reserves (December 31, 2010)

Deposit	Depth	Cut-off Gold Grade (g/t)	Classification	Tonnes (000s)	Gold Grade (g/t)	Contained Gold (000 oz)
Tiriganiaq	In pit	2.03	Probable Reserves	4,287	6.91	953
	Underground	4.88	Probable Reserves	5,180	9.89	1,647
	Total		Probable Reserves	9,467	8.54	2,600
Tiriganiaq	In pit	1.83	Indicated Resources	248	1.93	15
	Underground	2.93	Indicated Resources	5,159	4.80	795
		3.78	Inferred Resources*	7,883	7.55	1,913
Discovery	Surface to 9,960°m elevation	2.61	Indicated Resources	948	6.43	196
		3.0	Inferred Resources*	221	6.39	45
	Below 9,960°m elevation	5.22	Indicated Resources	374	9.89	119
		6.0	Inferred Resources*	277	11.03	98
F Zone	In pit	1.83	Indicated Resources	589	5.20	99
	Out pit	2.79	Indicated Resources	1,305	5.47	230
		3.78	Inferred Resources*	1,010	5.62	183
Pump	Surface to 9,980°m elevation	2.5	Inferred Resources*	432	5.91	82
	Below 9,980°m elevation	5.5	Inferred Resources*	62	8.93	18
Wesmeg	Surface to 9,960°m elevation	2.5	Inferred Resources*	1,000	4.45	143
Wolf	Surface to 9,950°m elevation	2.17	Indicated Resources	183	3.79	22
	Surface to 9,950°m elevation	2.5	Inferred Resources*	734	4.36	103
	Below 9,950°m elevation	5.5	Inferred Resources*	213	8.29	57
	Total		Indicated Resources	8,807	5.21	1,476
			Inferred Resources*	11,834	6.94	2,642

* Cut-off grades for inferred resources are undiluted

2.6.1.3 Bulk Sampling Program

An underground bulk sample program was done in 2011 on the Tiriganiaq deposit, extending the drifts developed by Comaplex in 2008. This program targeted parts of the 1000 and 1100 lodes at depths of 70 (level 10,000) and 120 (level 9,950) metres below the surface, respectively. The development and bulk sampling of 105 rounds was completed. The program exposed areas representing the gold mineralization with large contributions to the Tiriganiaq estimated reserves and resources.

Prior to the development, a diamond drilling program was done on a nominal spacing of 15 m, targeting the bulk sample areas. Eleven (11) holes were drilled on NQ caliber, and six (6) of them were twinned with a larger diameter hole (HQ). Special assaying protocols were selected to assay the full core in order to analyse the variance of the assaying method used.

The bulk sampling was done with a sample tower constructed for the purpose which was fed directly from the crushing plant at a nominal rate of 60 tonnes per hour. A primary and a secondary splitter, each with an opening of 7.5 cm and located on the two upper decks of the tower, collected successive sub-samples by cutting across the sample stream in free fall at a combined sample ratio of 0.80 %. A cone crusher on the third sample tower deck reduced the particle size of the remaining sample to 95 % passing 0.5 cm, and a rotary splitter subsequently produced two 30-kilogram field samples which together represent 0.06 % of the sample tower input. Subsequent sample preparation and assaying of the first field samples, and roughly 30 % of the second field sample, was undertaken under contract at SGS Lakefield. After drying, each sample was crushed to 95 % passing 840 µm and a 2000-gram sub-sample split out by rotary splitter ("Cut A"). This was pulverized to 95 % passing 105 µm and a screened metallic assay performed, screening at 105 µm, with the oversize (nominally 100 g) assayed to extinction, while one-assay-tonne duplicate fire assays with gravimetric finish were performed on the undersize. A second 2000-gram sub-sample ("Cut B") was also produced; 13 % were assayed.

A rigorous quality control program was undertaken during the course of the bulk sample program. A key item was the determination of the precision for each of the sample reduction/comminution steps of the bulk sample protocol, involving a large amount of duplicate sampling and assaying. A QA/QC program was implemented to include assaying of standard reference materials, insertion of field blank materials and a limited amount of check assays. Similarly, a QA/QC control was added to the analytical work of the laboratory for the underground chip and channel sample.

The program allowed the assessment of gold grade continuity, gold grade consistency and distribution and the evaluation of related mining properties by way of geological mapping, underground chip, channel and muck sampling, and geotechnical observations. Large metallurgical samples were also collected during this bulk sample program. The program confirmed, within expected precision, the resource estimation model that has been developed for the two principal zones (zones 1000 and 1100) at Tiriganiaq. An analysis of the results determined that the

4,573 tonnes of ore extracted and processed from the two principal lodes (lodes 1000 and 1100) contained 1,989 ounces of gold, which was 6.4 % more than the 1,869 ounces predicted by the block model for this area¹⁶. The following table shows the undiluted results of the 2011 bulk sample, which returned 13.5 g/t gold compared with the block model's estimated grade of 11.8 g/t gold.

Table 2-8 Results of the Tiriganiaq 2011 Bulk Sample vs the Block Model Estimates

Lode & Level	Block Model				Bulk Sample		
	Drill Holes	Tonnes	Gold Grade (g/t)	Gold (oz)	Tonnes	Gold Grade (g/t)	Gold (oz)
1000 Lode (9,950 Level)	20	2,391	9.4	720	2,158	10.0	691
1100 Lode (10,000 Level)	13	2,555	14.0	1,149	2,415	16.7	1,298
Total	33	4,946	11.8	1,869	4,573	13.5	1,989

Source: Strathcona Meliadine Bulk Sample Report 2012

2.6.1.4 Mineralogy and Geochemistry

Detailed information on mineralogy and geochemistry of overburden, waste rock and ore materials for the Meliadine Project is available in SD 6-3 – Geochemistry Baseline Report. The following section is a summary of the information found in this report.

Rock Types

The proportions of rock types for ore and waste materials (waste rock and overburden) from proposed open pit mining areas are presented in Table 2-9 (same as Table 2 in SD 6-3 Geochemistry Baseline Report). These proportions were calculated using a 3D lithological model (all block models from December 2010) and the ultimate pits shells. The final results were compiled by benches and used to define the rock types and quantities in each waste rock pile for each year of the mine operating life.

¹⁶ While the grade was 15 % higher than predicted by the block model, the tonnage was 7.5 % lower resulting overall in 6.4 % more gold ounces than predicted by the model.

Table 2-9 Total Waste Rock and Ore Material by Deposit and Rock Type for Open Pits

	Rock Type	Tiriganiaq (tonnes)	%	Discovery (tonnes)	%	F Zone (tonnes)	%	Pump (tonnes)	%	Wesmeg (tonnes)	%	Total (tonnes)	%
Waste	Gabbro	4,856,498	3	6,284,066	9	287,615	1	-	-	-	-	11,428,179	3
	Greywacke/Siltstone	113,694,449	81	43,323,426	60	-	-	196,718	1	-	-	157,214,593	44
	Iron Formation	7,514,454	5	20,906,136	29	2,666,736	8	5,530,812	14	30	0	36,618,168	10
	Mafic Volcanic	14,211,578	10	485,717	1	29,549,458	91	32,578,392	85	74,378,368	99	151,203,513	42
	Ultramafic	-	-	-	-	-	-	-	-	717,915	1	717,915	0.2
	Undefined ¹	954,282	1	1,078,852	1	-	-	-	-	-	-	2,033,134	0.6
	Waste – Total	141,231,271	100	72,078,198	100	32,503,810	100	38,305,922	100	75,096,312	100	359,215,513	100
Ore	Gabbro	-	-	8,749	0.3	-	-	-	-	-	-	8,749	0.0
	Greywacke/Siltstone	1,075,307	7	-	-	-	-	-	-	-	-	1,207,832	4
	Iron Formation	-	-	2,518,951	84	1,943,457	76	1,512,581	63	-	-	6,839,679	22
	Mafic Volcanic	779,912	5	-	-	607,879	24	876,982	37	6,484,585	99	9,029,704	29
	Ultramafic	-	-	-	-	-	-	-	-	78,499	1	78,499	0.3
	Undefined ¹	13,072,281	88	482,063	16	-	-	-	-	-	-	13,859,135	45
	Ore – Total	14,927,501	100	3,009,763	100	2,551,336	100	2,389,562	100	6,563,084	100	31,023,598	100

¹ Undefined material associated with minor rock types (2.5 % of total undefined unit)

From: SD 6-3 Geochemistry Baseline Report

Mineralogy

Mineralogical analyses were conducted to identify any potential source of acid generation (sulphide minerals) and buffering capacity (carbonates and some silicate minerals). Another objective of the mineralogical investigation was to identify arsenic-bearing minerals. Table 2-10 summarizes the main results of mineralogical analyses.

Geochemistry

The geochemical characterization program realized included standard static tests for waste rock, ore, tailings, and overburden, as well as standard kinetic tests for the waste rock and tailings, and modified kinetic tests (laboratory and field) for waste rock (see SD 6-3 – Geochemistry Baseline Report, Section 2.2 on analytical methods). A summary is provided here.

Samples were collected by Golder Associates geochemists for analysis of the following:

- Chemical composition through whole rock and trace element chemistry (aqua regia acid digest and ICP-MS scan);
- ARD potential through acid base accounting (ABA) by the Modified Sobek method (MEND 2009);
- Net acid generation tests on select waste rock samples (Amira 2002);
- Short-term, readily leachable metals, using the shake flask extraction method (SFE; based on ASTM D3987); and
- Mineralogical composition by XRD and Reitveld interpretation on selected waste rock samples.

In addition, the following were completed or are in progress:

- Forty six (46) standard humidity cell tests (HCTs based on ASTM D5744) on samples selected to represent median to upper quartile solid-phase arsenic concentration based on the results of static testing;
- Nine (9) large scale laboratory leaching columns of 42 to 100 kg of waste rock from each deposit and of each waste rock lithology from Tiriganiaq to investigate scale-up effects on waste rock leachate water quality;
- Larger scale field leaching barrel tests (approximately 250 kg) of run-of-mine Tiriganiaq waste rock (2 duplicate cells) and ore (2 cells of different ore) are on-going (during the summer) since 2011, meant to evaluate the effects of scale and site climate on the weathering behaviour; and
- Process water quality and static and kinetic leach test leachates were analyzed for the full suite of physical parameters, major ions, nutrients, and total and dissolved metals.

A total of 563 samples of waste rock and ore were selected from drill core from the five ore bodies considered, and 18 composite samples of the rock pad (12 full grain size distribution; 6 of fines – only less than 200 µm) consisting of Tiriganiaq waste rock that has been exposed to ambient conditions since 2008.

Waste rock drill cores were selected by reviewing geological cross-sections through the Tiriganiaq, F Zone, Discovery, Pump, Wesmeg and Wolf (not part of the current Project Description) deposits and targeting sample intervals that represent rock to be disturbed by mining. Samples of ore were collected within the anticipated ore body outline, while samples of waste rock were collected from borehole intervals located outside of the anticipated ore body limit but within the proposed outline of the maximum possible open pit size. Each waste rock sample consisted of a composite of 3 to 5 kg of core (whole or split) collected from previously drilled diamond drill core over an interval of up to 10 m. The length of the sample interval was intended to circumvent the effect of mineral clusters, particularly sulphide minerals, which may not be representative of the bulk rock mass along the targeted interval.

Composite samples of waste rock were collected from the Operations Pad¹⁷ for analysis and for use as charge material for large scale field leaching test cell construction. The composite samples were collected by Golder Associates geochemists from test pits spread throughout accessible portions of the Operations Pad. These samples consist of Tiriganiaq greywacke/siltstone waste rock mined from the existing decline which was placed as a flat surface stockpile and later used as an Operations Pad. This waste rock has been exposed to ambient conditions for three years and is considered analogous to waste rock that will be stored within the waste rock storage facilities.

Samples that represent future tailings were generated by SGS Canada Laboratory in 2009 and 2011. These were from samples of ore submitted for metallurgical testing by the previous owner (in 2009), and more recently by AEM. Twenty (20) samples of tailings solids from each ore body and 12 samples of process water were analyzed for the same suite of laboratory tests than waste rock (except large scale leaching tests).

Thirty four samples of overburden were collected in 2009 and 2011 by Golder Associates staff. The 2009 samples were collected using a metal shovel, while the 2011 samples were collected using a Kubota mechanical shovel provided by AEM. Samples consisted of 2 to 5 kg of material and sample depth ranged from 30 to 70 cm depth, in all cases limited by the presence of ground ice.

Summary of Results

Major constituents were similar for all rock types from all deposits and include silica, aluminum and iron in greywacke/siltstone and iron formation, as well as calcium in gabbro and mafic volcanic rocks. Major constituents showed little variation within each sample group. Minor constituents included calcium, magnesium, potassium and sodium.

¹⁷ The Operations Pad resulted from advancing the underground ramp through waste rock to collect bulk samples of the ore at depth in 2009 and again in 2011. The Operations Pad was built with the extracted waste rock.

Element concentrations that were greater than five times the typical crustal abundance for a similar rock type were considered to be enriched compared to typical crustal abundance and included: arsenic, gold, bismuth, antimony and selenium (SD 6-3 Geochemistry Baseline Report, Section 3.1).

Arsenic Content

Arsenic was identified as a parameter of environmental interest because of its documented presence in the Project area (McMartin 2000) as a natural anomaly, on a regional level, in soil and surface water, as well as its association with gold mineralization. As stated in SD 6-3 Geochemistry Baseline Report (Section 3.1.3), the mineralogical form of arsenic has an important influence on its mobility upon weathering: if arsenic is present in minerals other than sulphides, such as trace occurrences as impurities in other more soluble minerals, arsenic may be released with mineral dissolution or buffering reactions in addition to sulphide oxidation. In addition, arsenic is mobile under the neutral conditions which are likely to prevail in drainage water contacting non-PAG (potentially acid-generating) waste rock. For all these reasons, arsenic was given special attention.

Total arsenic content in the overburden samples tested ranged from 3 to 76 mg/kg, with median concentrations from each deposit above Canadian Council of Ministers of Environment (CCME) Industrial Soil Guidelines (12 mg/kg; CCME 2006). Results are thus consistent with previous studies (McMartin 2000).

As indicated in Table 2-11 below, the highest median arsenic concentrations were found associated with ore samples in the greywacke/siltstone, iron formation, and mafic volcanic units into which ore is hosted. All waste rock units reported enriched arsenic content, with the highest reported median concentrations being from the iron formation and greywacke/siltstone waste rock units.

Table 2-10 Main Minerals Weight Percent (wt %) per Rock Type and Deposit

	Minerals	Tiriganiaq	Discovery	F Zone	Pump	Wesmeg
Greywacke	Plagioclase Feldspar	21-37	30-39			
	Quartz	27-43	30-32			
	Muscovite	14-29	7.5-20			
	Biotite		6.1-8.4			
	Clinochlore	4.7-13	7.5-11			
	Ankerite	4.2-8.4				
	Calcite	0.8-2.8				
Mafic volcanic	Quartz	17-27		20-25	25-31	14-34
	Plagioclase	6.5-21		20-30	14-33	16.30
	Clinochlore	3.8-23		22-30	10-28	11-28
	Calcite	1.4-18		7-25	15-17	1.6-20
	Ilmenite			0.9-2.7	0.64-1.8	0.8-2.9
	Ankerite	2.7-39				1.9-10
	Biotite			2.6-6.6	1.9-4.3	
	Muscovite	7.2-21			4.4-14	
Iron formation	Quartz	42-57	34-42	69-75	53-56	
	Magnetite	8.6-25	10-38	0.37-3.6	2.7-7.7	
	Ankerite			3.6-5.8	4.9-8.4	
	Cummingtonite	10	12-14	6.6-10	1.0-1.4	
	Plagioclase Feldspar		5.9-11			
	Actinolite		8.2-8.8			
	Biotite		3.0-7.1			
	Clinochlore	14-17	1.2-5.4	1.4-4.7	4.3-6.5	
	Calcite	3.7-11	0.45-1.9		1.5	
	Siderite			0.56-6.5	18-24	
	Pyrrhotite	2.3		3.6-8.7	3.6-3.8	
	Pyrite				1.2	
Ultramafic	Clinochlore					28
	Quartz					27
	Calcite					20
	Plagioclase					15
	Magnetite					3.6
	Ankerite					3.2
	Actinolite					1.5
	Ilmenite					1.1

From : SD 6-3 Geochemistry Baseline Report

Table 2-11 Summary of Median Arsenic Content (mg/kg)

Deposit	Location	Waste Rock				Ore		
		Gabbro	Greywacke/ Siltstone	Iron Formation	Mafic Volcanic	Greywacke	Iron Formation	Mafic Volcanic
Tiriganiaq	Pad	- ¹	76	-	-	7200	-	-
	Open Pit/ Footwall	14	60	490	54	-	-	2400
	Open Pit/ Hanging Wall	7.9	51	47	24	260	-	7200
	Underground	-	47	215	11	-	-	-
Discovery	Open Pit	4.9	34	7.7	-	-	390	-
F Zone	Hanging Wall	-	-	48	6.7	-	970	-
	Footwall	-	-	108	23	-	970	-
Pump	Hanging Wall	-	-	103	22	-	7250	-
	Footwall	-	-	58	19	-	295	-
Wesmeg ²	Open Pit	-	-	-	23	-	-	10

¹ Either rock type does not present at specific deposit or rock type was not sampled

² Wesmeg ultramafic median = 37 mg/kg

From: Table 15 of SD 6-3 Geochemistry Baseline Report

Acid Rock Drainage (ARD) Potential

Acid rock drainage potential was evaluated using the acid-base accounting (ABA) method. Results were compared to the “Guidelines for Acid Rock Drainage Prediction in the North” (INAC 1992).

All overburden samples tested were non-acid generating. Sulphide content was low and buffering capacity was high (SD 6-3 Geochemistry Baseline Report, Section 3.2).

Most waste rock lithologies are non acid-generating except for Discovery greywacke and iron formation that have an uncertain ARD potential due to their lower quantity of carbonate buffering minerals present. However, these rock types have low sulphur content and kinetic testing have shown them to have some available buffering capacity. The iron formation waste rock from the Pump and F Zone deposits has an uncertain potential to generate ARD but these rock units also have low sulphur content and constitute minor proportions of the waste rock to be generated from these deposits (14% and 8% by tonnage, respectively). The other rock types from these deposits have excess buffering capacity such that the overall ARD potential of the F Zone stockpile and the stockpiles that will contain waste rock from the Tiriganiaq and Wesmeg deposits are expected to be non-potentially acid-generating (non-PAG). Some metal carbonate minerals are present but data suggests there is sufficient buffering capacity to neutralize acid that could potentially be generated.

Waste rock of most stockpiles does not require means to prevent oxidation, with the possible exception of Discovery. The Discovery waste rock pile is not expected to generate acidic drainage in the short to medium term based both on the low reactivity of potentially acid-generating (PAG) rock samples demonstrated through kinetic testing, and on AEM's experience at the Meadowbank Mine where the waste rock pile containing similar Iron Formation PAG rock froze within the first year of deposition. The Discovery pile is expected to freeze prior to the onset of ARD. The long-term ARD potential of Discovery waste rock, and particularly in the active thaw layer on the surface of the waste rock stockpile, is uncertain at this time.

The buffering capacity and sulphur content of Discovery waste rock and rock pile contact water quality will be monitored during operation. This waste rock will be managed according to its ARD potential.

All but the Discovery deposit tailings were non acid-generating. Discovery whole ore tailings were potentially acid-generating; they thus must be managed to avoid their prolonged exposure to prevent the development of localized acidification. The bulk of the tailings in the tailings storage facility was calculated to be non acid-generating on an annual basis, over most of the mine life, except for a short periods during operation where the acid generation potential of the bulk tailings is uncertain. The tailings mass is not anticipated to develop acidic drainage because tailings will be deposited as a water-saturated, thickened slurry which will minimize oxygen intake; Discovery ore will be milled together with other ore resulting in a mixture that will have available excess buffering capacity; and the milling rate is such that fresh tailings are continually being deposited on the surface limiting tailing exposure time during operations. A long lag time to oxidation of sulphide minerals in tailings is expected based on kinetic testing. Tailings production in the last 3 years of operations are non acid-generating; this will be managed to cover the entire tailings mass with a layer that is sufficiently thick to protect the underlying tailings from oxidizing agents.

Potential for Metal Leaching

The potential for the rock to leach metals was evaluated through a series of static and kinetic tests, on all types of materials. A complete suite of elements was evaluated.

The final pH values of the SFE (shake-flask extraction) leachates for ore and waste rock samples were circum-neutral to alkaline with values ranging from 6.1 to 9.5, corroborating high available buffering capacity.

For all rock types investigated (ore and waste rock) in the six deposits, the concentrations of almost all leachate parameters met mine effluent criteria (Metal Mining Effluent Regulations (MMER); DFO 2006) with the exception of arsenic (in <1 % of samples). Arsenic was leached in concentrations marginally higher than the MMER effluent limit (maximum monthly mean of 0.5 mg/L) in four leachate samples of the 577 samples subjected to the SFE test (SD 6-3 Geochemistry Baseline Report, Sections 3.3.1 and 3.3.2). However, short term leach tests are considered a conservative estimate of arsenic leachability. Large column and field cell tests, conducted at low water-to-rock ratios more similar to

expected site conditions, generated leachate concentrations well below MMER criteria. Scale up studies and on-site surface water quality results further support this conclusion (see SD 6-3 Geochemistry Baseline Report, Sections 3.3.3 to 3.3.5). Waste rock and overburden are considered acceptable for use in construction. Contact water quality and seepage, if present, will be monitored prior to discharge.

Metal release from overburden samples was low, including for arsenic. Leachate concentrations in overburden were generally lower than in waste rock samples and all met the MMER monthly mean limits (SD 6-3 Geochemistry Baseline Report, Section 5.3). Geochemical analyses determined that waste rock and overburden materials have compatible geochemistry such that they could be managed together in the same area.

The final pH values of SFE leachates for tailings samples were slightly alkaline, ranging from 7.4 to 8.2, indicating the presence of immediately available buffering capacity. Most leachates had constituent concentrations below MMER effluent regulations with the exception of arsenic in the Tiriganiaq and Pump whole ore tailings. Longer term kinetic leaching tests on 17 samples of tailings showed that although arsenic was present in early leaching cycles, concentrations decreased rapidly to be below the MMER limit by the 4th leaching cycle (SD 6-3 Geochemistry Baseline Report, Sections 4.3.1 to 4.3.3). Drainage of tailings contact water will nonetheless be managed in a way to capture water and monitor water quality prior to discharge.

Process water quality discharged with the tailings solids to the TSF may contain arsenic, cyanide and suspended solids above MMER criteria. Tailings process water is likely to require attenuation of pH, arsenic, cyanide and suspended solids to meet MMER criteria prior to discharge to the receiving environment.

2.6.1.5 Mining, Transport and Processing

The gold mineralization on the Meliadine property extends to the bedrock surface. This allows the upper part of the deposits to be mined with open pit (OP) methods. Based on the current known ore reserves, AEM proposes to mine the near surface deposits from the Tiriganiaq, Discovery, F Zone, Pump and Wesmeg by open pit mining methods. In addition, the Tiriganiaq deposit deeper portion will be mined by underground (UG) techniques. It should be noted that all deposits remain open at depth, so underground mining cannot be discarded for any of the deposits at this point in the Project life. What is known is that the only deposit that currently has the proven reserve base to support economically viable underground mining is the Tiriganiaq deposit. AEM expects that as exploratory drilling continues to convert probable and mineralized resource into ore, the viability of underground mining will extend to some of the other known deposits covered by this Final EIS, probably with the adjoining Wesmeg deposit being the first.

AEM has extensive experience in the design, operation and maintenance of gold mines, both open pit and underground in Northern climatic conditions. AEM operates the Meadowbank Mine near

Baker Lake in Nunavut. This is an open pit mining operation that sits in climatic and permafrost ground conditions that are very similar to those conditions expected to be encountered at the Meliadine Project site. AEM has used the experience and permafrost data collected from the Meadowbank operation to help in the design of the Meliadine mine workings. In fact the Project Manager worked as the chief mine engineer at the Meadowbank site. While Meadowbank is an open pit mine, AEM has extensive experience in the design and operation of underground gold mines in northern settings, specifically from its Kittilä Gold Mine located above the Arctic Circle in Northern Finland and at its LaRonde Mine in the Abitibi region of northwest Québec. However neither of these two operations is located in areas where permafrost is present. Consequently the AEM mine design team has toured the Raglan underground mine in the Nunavik region of Québec to understand the challenges and experience gained at this nickel operation, which mines under permafrost ground conditions. There has been an exchange of information that has allowed AEM's team to validate their design and operating plans for the Tiriganiaq underground mine workings.

As part of the baseline data collection program, AEM retained geotechnical expertise from Golder Associates to conduct a baseline data collection program on the status of permafrost in the immediate vicinity of the Meliadine Project site. This information is presented in supporting documents to the Meliadine Final EIS in Volume 6 – Terrestrial Environment and Impact Assessment, specifically in Section 6.3 – Permafrost, and in SD 6-1 – Permafrost Baseline Report. Through these contacts, other related technical literature on experience in mining in permafrost elsewhere in the world and with the assistance of Golder Associates, AEM mine engineering personnel have incorporated this information on the status of permafrost along with our understanding of the expected long term stability of the underlying permafrost into its underground mine design. Basic lessons learned include not allowing the permafrost in the mine walls to thaw which dictates the ambient temperatures that must be maintained underground (i.e., no mine air heating planned). It also dictates for the use of a brine as drill and dust suppression water in the underground mining cycle and techniques for recycling this brine solution within the sections of the mine that will be within permafrost.

AEM will need to monitor ground temperature conditions throughout the mine life and to adapt its operating conditions to maintain long term stability of the permafrost.

In order to mine the open pits, because there is almost complete lack of outcrop in the immediate vicinity of the deposits (see Property Geology description), pre-stripping of the overburden on top of the deposits will be required to expose the mineralized rock for mine production. The overburden stratigraphy is described in Volume 7, Section 7.2.2; it generally consists of a thin layer of topsoil overlying a 2-18 m thick layer of silty gravelly sand with cobbles and boulders. Geotechnical investigations were performed in 2011 (SD 2-4A 2011 Geotechnical Field Investigation Report) and 2012 to complete the dataset already available (SD 2-4B 2012 Geotechnical Field Investigation). Permafrost was described (SD 6-1 Permafrost Baseline Report) using the "National Research Council Field Description of Permafrost" (NRC 1979) with reference to ice content. Laboratory results

showed moisture content varying between 5 % and 33 % with excess ice content varying between 0 % and 519 % (SD 2-4A 2011 Geotechnical Field Investigation Report). Ice rich materials are considered to be soils with more than 10 % visible ice and/or having total moisture content greater than 20 % (SD 2-3 Tailings Storage Facility Preliminary Design Report). This information was used in designs.

The stripped material will be used for construction where possible. If not suitable for construction, this overburden will be stored within the waste rock storage facilities. Because of the projected ice content, AEM has taken the conservative approach assuming that it is unlikely that much of the overburden will be suitable for construction material. Consequently AEM intends to permanently store this overburden within cells developed within the waste rock storage facilities. In this way, the ice lenses can be contained and the runoff controlled should this material thaw. In time, this overburden will be totally encapsulated within the stored waste rock and will become frozen again.

The impact assessment of the Meliadine Gold Project is done on a design and sizing of the major surface facilities for a production rate of up to 8,500 tonnes per day (tpd), about 3.1 million tonnes of ore processed per year. About 6,000 tpd of the ore will come from the open pits (~2.2 million tonnes per year), and 2,500 tpd will come from the underground mining (~0.9 million tonnes per year). With the current reserves and throughput, the mill would be in operation for a total of 13 years.

Throughout the Project life, a total of 27 million tonnes of ore, 373 million tonnes of waste rock and 57 million tonnes of overburden will come from open pit mining of all five deposits. The underground mining will produce a total of 11 million tonnes of ore and 5.3 million tonnes of waste rock throughout the Project life.

The mining rate will be at around 40.1 million tonnes per year of moved material. The mine production schedule includes a 3-year pre-production period during which mining preparation works (ex. overburden stripping) will be done and some ore will be temporary stockpiled. The mining plan, including the sequence of development of the different deposits, is detailed at Table 2-12¹⁸.

¹⁸ Mining sequence was done to favour the best cash flow; an ore based cost of \$45.30/tonne was used for this estimation. Additional parameters were a gold price of US\$1,100/oz and an exchange rate of C\$1.08/US\$.

Table 2-12 Meliadine Mining Plan – 8,500 tpd

						To B7 Storage Area	To A45 Storage Area				To B4 Storage Area			To DE Storage Area			Total
Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	
Tiriganiaq OP Mining																	
Total Tonnage (kt)			30,080	40,031	40,002	9,724	18,360	14,504	10,680	7,284	3,919	1,373	3,124	9,512	4,985		193,578
Waste Rock Tonnage (kt)			12,456	37,380	37,414	8,978	16,331	12,581	8,994	5,957	2,856	801	2,282	7,307	4,669		158,006
Overburden Tonnage (kt)			16,963	405									708	2,127	-		20,203
Ore Tonnage (kt)			661	2,245	2,588	746	2,029	1,923	1,685	1,326	1,063	572	133	79	316		15,366
Average Mining Depth (m)			4.65	27.19	48.97	65.36	84.82	104.78	124.72	144.62	164.38	183.79	16.86	13.08	56.45		54.96
Tiriganiaq UG mining																	
Total Tonnage (kt)	105	281	599	762	1,325	1,362	1,363	1,337	1,313	1,262	1,213	1,212	1,113	1,112	1,063	791	16,213
Waste Rock Tonnage (kt)	105	281	574	637	412	450	450	425	400	350	300	300	200	200	150	53	5,287
Waste Used Backfill (kt)					26	207	240	249	229	189	189	189	189	189	189	102	2,187
Hauled to Surface (kt)	105	281	574	637	386	243	210	176	171	161	111	111	11	11	-39	-49	3,100
Paste Backfill (kt)				79	411	378	342	360	380	420	420	420	420	420	420	367	4,837
Ore Tonnage (kt)				125	913	912	913	912	913	912	913	912	913	912	913	738	10,901
Ore - Development			25	222	117	200	200	200	200	200	150	150	150	150	115	99	2,178
Ore - Stoping				100	574	712	713	712	713	712	763	762	763	762	798	639	8,723
To Stockpile			25	222													
From Stockpile				25	222												
Discovery																	
Total Tonnage (kt)								5,399	24,244	30,329	32,277	9,692	175				102,116
Waste Rock Tonnage (kt)								1,686	20,244	29,681	31,070	8,824	144				91,649
Overburden Tonnage (kt)								3,666	3,625								7,291
Ore Tonnage (kt)								47	375	649	1,206	868	31				3,176
Average Mining Depth (m)								5.82	19.60	46.81	91.39	144.87	190.00				61.83
F Zone																	
Total Tonnage (kt)						26,345	8,959	1,095									36,399
Waste Rock Tonnage (kt)						17,691	8,382	913									26,986
Overburden Tonnage (kt)						7,287											7,287
Ore Tonnage (kt)						1,367	577	181									2,125
Average Mining Depth (m)						15.91	68.15	117.63									31.83
Pump																	
Total Tonnage (kt)								16,418	3,893		3,097	14,853	2,546				40,807
Waste Rock Tonnage (kt)								10,178	3,586		28	13,563	2,268				29,623
Overburden Tonnage (kt)								5,785			3,068	635					9,488
Ore Tonnage (kt)								454	306		1	656	278				1,695
Average Mining Depth (m)								19.10	60.13		0.00	25.44	67.37				26.88

						To B7 Storage Area		To A45 Storage Area			To B4 Storage Area			To DE Storage Area								
Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	Total					
Wesmeg																						
Total Tonnage (kt)						3,963	12,753	24,447	7,579	4,585	5,760	3,258	4,636	12,129	5,222		84,332					
Waste Rock Tonnage (kt)						512	7,945	23,207	7,102	4,267	5,286	2,916	3,864	7,867	4,065		67,031					
Overburden Tonnage (kt)						3,423	4,413	55							3,993	831		12,715				
Ore Tonnage (kt)						28	394	1,185	477	317	475	342	772	269	325		4,584					
Average Mining Depth (m)						7.27	3.14	23.82	46.76	60.00	73.59	86.87	112.90	16.75	33.88		33.60					
Total - All Pits																						
Total Tonnage (kt)							30,080	40,031	40,002	40,032	40,072	40,046	40,076	40,006	40,008	40,005	32,305	24,362	10,207	457,232		
Waste Rock Tonnage (kt)							12,456	37,380	37,414	27,181	32,658	36,701	27,960	34,054	37,823	34,815	28,533	17,586	8,734	373,295		
Overburden Tonnage (kt)							16,963	405		10,710	4,413	55	9,451	3,625		3,068	1,343	6,120	831	56,984		
Ore Tonnage (kt)							661	2,245	2,588	2,141	3,000	3,289	2,663	2,324	2,187	2,121	2,429	657	641	26,946		
GRAND TOTAL (Pits + UG)																						
Total Tonnage (kt)						105	281	30,679	40,793	41,327	41,394	41,435	41,383	41,389	41,268	41,221	41,217	33,418	25,474	11,270	791	473,445
Waste Rock Tonnage (kt) – to surface						105	281	13,030	38,017	37,800	27,424	32,868	36,877	28,131	34,215	37,934	34,926	28,544	17,597	8,695	-49	376,395
Overburden Tonnage (kt)								16,963	405		10,710	4,413	55	9,451	3,625		3,068	1,343	6,120	831		56,984
Ore Tonnage (kt)								686	2,592	3,501	3,053	3,913	4,201	3,576	3,236	3,100	3,033	3,342	1,569	1,554	738	38,094

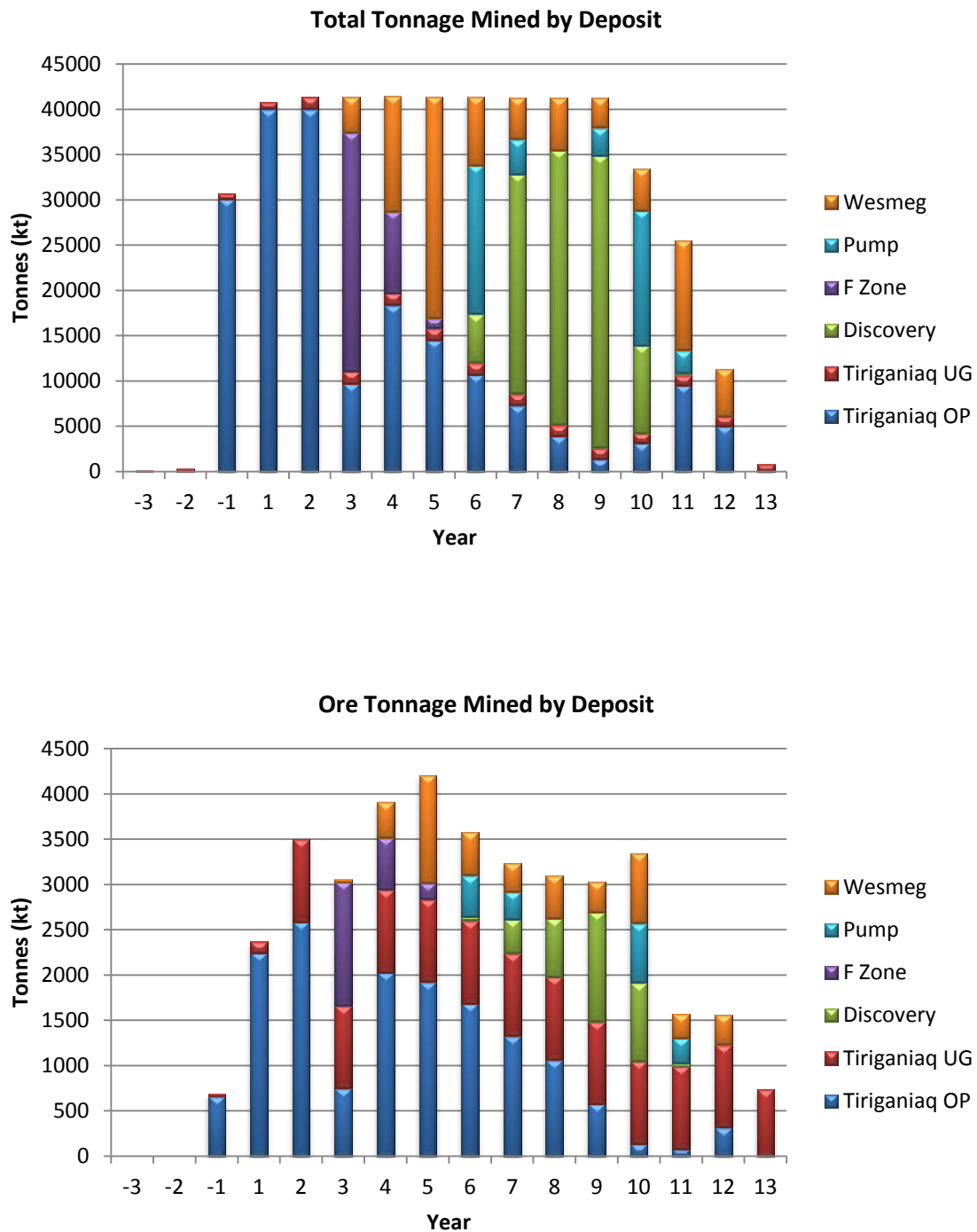


Figure 2-17 Meliadine Tonnage Summary

Open Pit Mining

Design and Methods

Resources located close to surface are to be mined by open pit methods. The mineral resources used to design the open pits were the combination of the indicated and inferred resources as of December 31, 2010 (see Table 2-7).

Each deposit includes at least one or, in several cases, several pits to be mined. It is possible that additional geological information could result in some of these pits coalescing on surface to form a larger single pit. Open pit characteristics¹⁹ are available in Table 2-13.

Table 2-13 Open Pit Characteristics

Open Pit	Operating Years	Ramp Elevation (m)	Waste Rock Destination	Depth (m)	Bottom Elevation (m)
Tiriganiaq					
Pit 1	-1-10	10,070	B7	200	9,870
Pit 2	9-11	10,058	B7	108	9,950
Pit 3	10	10,058	B4	48	10,010
Discovery					
Pit 1	6-11		DE	190	
F Zone					
Pit 1	4-7	10,056	A45	126	9,930
Pit 2	3-4	10,055	A45	70	9,985
Pit 3	4-5	10,057	A45	47	10,010
Pump					
Pit 1	6-7		B4	60	
Pit 2	9-11	10,059	B4	67	9,960
Wesmeg					
Pit 1	10-11	10,063	B4	48	10,015
Pit 2	3-6	10,063	B4	48	10,015
Pit 3	3-7	10,063	B4	87	9,976
Pit 4	6	10,068	B4	48	10,020
Pit 5	12	10,067	B4	102	9,965
Pit 6	3-4	10,065	B4	50	10,015
Pit 7	10-12	10,064	B4	39	10,025

¹⁹ Feasibility study is still ongoing; final mining designs will be available with this study and may slightly differ from the one presented in this study.

The Lerchs-Grossmann ultimate pits for all ore bodies were computed using NPVS V4 software. The rock mechanics parameters for wall slope stability were based on previous studies (SRK 2007, Golder Associates 2010a, 2010b, 2010c based on Golder Associates 2010d, 2010e). Those reports detailed the pit slope design criteria for Discovery, Tiriganiaq and F Zone deposits, respectively; a summary is provided in Table 2-14. The criteria for Wesmeg and Pump, just south of Tiriganiaq deposit, were extrapolated and adjusted from Tiriganiaq criteria. Final designs will be adjusted pending the results of the feasibility study and incorporating the geotechnical investigations results done on the deposits since 2010 (SD 2-4A 2011 Geotechnical Field Investigation Report, SD 2-4B 2012 Geotechnical Field Investigation).

The slope design criteria for overburden took into consideration the thickness of the till layer as well as the indices that could indicate the presence of ice into this layer (polygonal patterning of the ground surface). The rock mass rating of the various rock types is “good” to “very good”. The bench design criteria were based on structurally controlled failure mechanisms (plane failure, wedge failure, and toppling failure).

Adequate drainage and slope management procedures will be established where pit slopes may intersect areas of thick overburden that may contain ice in order to keep the active layer drained to reduce the potential for overburden slope failure. Also, controlled blasting operations, as well as adequate excavation, scaling and surface water management practices will help preventing slopes instability. During pit development, pit wall monitoring program, including a geotechnical structural mapping, will be implemented to confirm design assumptions and to rapidly detect any unexpected condition for follow-up and adaptive measures to be undertaken.

Table 2-14 Open Pits Slope Design Criteria

Deposit	Tiriganiaq ¹	F Zone	Discovery
Overburden			
Thickness (m)	3-20	6-14	6-20
Type	Sandy silt or silty sand	Sandy silt or silty sand	Sandy silt or silty sand
Slope Design			
Bench Height (m)	5	5	5
Catch Berm Width (m)	5	5	5
Bench Face Angle (°)	30	30	30
Overall Slope Angle (°)	22	22	22
Interface Catchment Berm Width (m)	10	10	10
Rock			
Bench Height (m)	10-20	10-20	10-20
Catch Berm Width (m)	4-10	3.5-10	4-10
Bench Face Angle (°)	64-65	53-70	54-65
Inter-Ramp Angle (°)	43-49	37-49	37-49
Limiting Factors	- Potential planar instability - Potential toppling instability	- Potential planar instability - Potential talus slope development - Potential toppling instability	- Potential planar instability - Potential talus slope development - Potential wedge instability - Potential toppling instability

¹ Criteria for Tiriganiaq were used and adjusted (rotated) for the design of Wesmeg and Pump

The Meliadine Project lies within an area of continuous permafrost where two (2) groundwater flow regimes can be observed: a shallow (active layer) and a deep (beneath permafrost) groundwater flow regimes. No hydraulic connection is anticipated between the two flow systems because of the presence of the permafrost. Depth of permafrost in the Project site is estimated to be about 360-495 m (Volume 7, Section 7.2.2). The deepest open pit design for this Project would extend down to only 200 m (see Table 2-13) so will remain into the permafrost layer²⁰. The active layer in the area is about 1.7 m thick. The overburden material within the active layer generally consists of silty gravelly sand with a hydraulic conductivity on the order of 1×10^{-6} m/s (Volume 7, Section 7.2.2). This active layer becomes thawed in the late spring to early autumn. Shallow groundwater gradients should be similar to the topographic gradients which generally vary from 0.006 m/m to 0.05 m/m throughout the Project site (Volume 7, Section 7.2.2).

²⁰ Because pits entirely into the permafrost layer, the groundwater pressures were not considered in the slope design criteria.

Design geometry of the mining benches were developed and used for pit design. The open pit optimization for Tiriganiaq was limited to a depth of 9,870 m above sea level elevation (200 m below surface); this was set as the ideal elevation for the top of a pillar between the open pit and underground mine with minimal ore loss. The pillar actually considered between the open pit floor and the underground mining is 60 m thick. The ultimate pit shells and MSO (Mineable Shape Optimizer²¹) Packet data were used by G Mining Services (GMS 2011) to make detailed pit plans, production schedules, equipment and labour requirements, operating cost estimates and equipment capital cost estimates. The tonnes and MSO packet grades were also used for mill feed scheduling and cash flow analysis.

The pit design exercise consisted of designing ramp accesses to the bottom of the pits using the geotechnical recommendations guiding the bench geometry (see Table 2-14). The ramps and haul roads were designed for the largest equipment (100-tonne class haul trucks). For double-lane traffic, the minimum width was set at 26 m including a drainage ditch and a 1.45 m-high safety berm. The safety berm on the outside edge will be constructed of crushed rock to a height equal to the rolling radius of the largest tire using the ramp. To facilitate drainage of the roadway, a two percent (2 %) cross slope on the ramp was planned. For single lane traffic, a minimum width of 16 m was used. The maximum ramp gradient was 10 %.

The figures of the pit designs are provided at Appendix A.

Operations

It is planned to mine the open pits using standard truck and shovel methods. Overburden and waste rock will be disposed in one of the storage areas (see Table 2-12) and the ore will be trucked to the mill site near the Tiriganiaq deposit.

Production blast patterns were developed with a target powder factor of 0.28 kg/t. The drill and blast activity will take place using 10 m bench heights, with six-inch diameter holes. In the ore zone, given the relatively shallow dip of the mineralization, the mining will be done in 5-m cuts to minimize dilution. Pre-split blasting is also planned to maximize stable bench face and inter-ramp angles along final walls.

Production drilling and pre-split drilling will be done with a diesel-powered, self-contained crawler-mounted drill rig. The angle drilling capability of this drill rig will also make it ideal for drilling the pre-split holes.

²¹ Mineable Shape Optimiser (MSO) software is a recent module added to the Datamine Studio program. MSO uses a new algorithm to optimize mining shapes (underground stopes or open pit blast packets) taking into account economic parameters and shape constraints like minimum width, length, height, orientation, dip constraints, minimum width of waste band (pillar) between lenses, dilution skin thickness on the far and near walls, etc.

MSO maximizes the recovered value and provides the user with a detailed design of final stopes or blast packet locations. The design includes the MSO packet grades for every packet. The packet grade is the average for all the tonnes in a packet including dilution skins and possible waste bands between lenses when several lenses are combined to satisfy minimum width requirements.

The emulsion will be prepared on site by an explosives supplier who will also be responsible for delivering explosives to the bore holes (see Section 2.6.10.3).

Once blasted, the rock material will be loaded in rigid trucks by hydraulic excavators. A high-precision global positioning system (GPS) for machine guidance will be considered for the operation to minimize risks of accidents. In addition to protecting people and equipment, the GPS system improves the productivity and grade control.

An example of equipment requirement is shown in Table 2-15; this list shows the maximum number required of any unit. Models in brackets are indicated as examples only; the ones bought could differ slightly.

Table 2-15 Meliadine Open Pit Equipment Requirements

Equipment Requirement	Quantity	Equipment Requirement	Quantity
Excavator (Terex RH120)	2	Water truck (Kenworth T800)	1
Wheel loader (Cat 993k)	2	Tire handler truck (Kenworth T800)	1
Excavator (Cat 390DL)	2	Fuel/lube truck (Kenworth T800)	2
Mining truck (Cat 777F)	20	Lowboy 125 t	1
Production drill (Sandvik DR560)	6	Light tower	8
Motor grader (Cat 16M)	2	Pickup trucks	15
Wheel dozer (Cat 824H)	2	Pit busses	2
Track dozer (Cat D9T)	4	Mobile welding machine	2
Excavator (Cat 345DL)	1	Mobile compressors	2
Excavator (Cat 345DL; rockbreaker)	1	Dewatering	2
Compactor (Cat CS56)	1	Dispatch system	1
Tool carrier (Cat IT62H)	2	Emulsion Plant infrastructure	1
Service truck (Kenworth T800)	2	Tools for maintenance shop	1

The maintenance department will fully maintain and repair the mobile equipment fleet, performing maintenance planning and training of employees. A maintenance control system will be implemented to manage maintenance and repair operations, linking with the parts management and inventory system.

Rock material will then be transported by mine production haul truck to either: (a) the primary crusher dump zone near the mill area for ore material or, (b) the designated waste rock storage area (see the production plan at Table 2-12 for the details on waste rock final destination by mining deposit). Temporary ore stockpiling pads will be sited near the primary crusher dump area in case the crusher is not available when a truck arrives for dumping. As described in further detail in the Ore Storage Management Plan (SD 2-7), these two temporary ore stockpiling pads will have the

capacity to temporary hold up to about 3.5 Mt ore material (approximately one-year of operation), though usage of the ore pads would be restricted as much as feasible as it would imply double-handling the material with a consequent extra cost to the operation.

Environmental Management

Any water reporting to the open pits will be collected in a sump and ultimately directed to the main attenuation pond (AP-01), either directly via a pump/pipe, or trucked if the distance is too important, and/or the volume to be managed too small to sustain pumping infrastructure.

Dust will be managed for environmental and safety reasons on pits haul ramps by spraying water whenever needed (a water truck is in the equipment requirements). An effective blast pattern control will also help minimizing the dust generation during blasting.

Equipment efficiency with reference to energy consumption will be ensured by following a regular maintenance schedule. In addition of enhancing the overall equipment efficiency, such programs help preventing time lost due to equipment break down.

Underground Mining

Currently, underground mining is only being considered for the Tiriganiaq deposit. This is the case because no other deposit has had enough drilling at depth to determine the underground potential. As mentioned, the selected mining rate from underground is set at 2,500 tpd on average.

Design and Methods

The mineral resources used to design the underground mine at the Tiriganiaq deposit were the combination of the indicated and inferred resources as of December 31, 2010. Table 2-16 shows an approximation of the contribution from the indicated and inferred resources (category 2 and 5 respectively) using the total reserve file generated by AEM's Technical Services Geology department. The final stope wireframes and resources used for this pass were generated by a consultant, using Datamine's MSO (Mineable shape optimizer) software.

Table 2-16 Total Reserve versus MSO Output – Tiriganiaq UG Design

Resource Category	Average Grade (g/t)	Gold (oz)	Ore (tonnes)	%	Stopes
Indicated	7.93	88,582	3,261,866	28	1,051
Inferred	7.92	2,111,813	8,291,337	72	1,405
Total	7.92	2,943,396	11,553,203	100	2,456
MSO Final	7.54	2,637,508	10,874,834	-	1,475

Underground Geotechnical Parameters

Geotechnical information was incorporated when designing the underground mine. This included: distribution of intact rock strength, distribution of rock mass classification values, and detailed

structural geology information (orientation of joint sets, continuity and spacing of the joint sets, engineering parameters for each joint set (shape, roughness, infill)). There have been no in-situ stress measurements made at the Project site; stress results were based on empirically determined estimates (Georock 2010).

The underground orebody at Tiriganiaq strikes in an east-west direction for approximately 2.5 km and dips to the north at approximately 62°. Gold mineralization is hosted in interbedded layers of banded chert and oxide iron formation, and in quartz veins (see Section 2.6.1.1 for more information on geology). Mineralized zones are numbered with lode identifiers increasing from south to north (from structural footwall to structural hanging wall) starting with the 1000 Lode. At present, the Tiriganiaq underground orebody consists of seven mining lodes stacked en-echelon. Individual lodes vary in thickness from 3 m to a maximum of about 30 m.

The rock quality data used to assess the rock mass conditions within the direct zone of influence of the planned underground mining areas were collected in geotechnical drill holes from 1997, 2000, 2008, 2009 and 2011 campaigns at Tiriganiaq (Golder Associates 2009a, 2010f; Georock 2010). Intact rock strength and rock mass quality data were analysed for the hanging wall (HW) and footwall (FW) of MSO stope blocks by extracting the geotechnical data in drill holes intersecting the stopes up to a distance of 10 m measured perpendicular to the stope boundaries (distal zone). Data corresponding to the mineable ore zones (Ore) and to the interstitial material (Interstitial) between en-echelon stopes were also extracted and analysed separately. Thirty-two drill holes intersected the proposed stoping blocks (7 lodes out of 12 were intercepted), which provided good coverage of the overall Tiriganiaq deposit.

Underground and drill core observations indicated that, in some cases, a zone of weaker and/or lower quality rock mass was sometimes present at the immediate contact of some ore zones. This “proximal zone” can be present on both the hanging wall and the footwall (proximal HW and FW), and its nature is not uniform in all cases. The localized poor quality zones predicted in the immediate hanging wall and footwall of stopes is expected to be encountered in 10% to 20% of the stopes. The weaker proximal zones have been encountered in 44% of holes intersecting Lode 1000 HW and 44% of holes intersecting Lode 1000 FW. The thicknesses encountered varied from 0.4 and 3 m thick, perpendicular to stope contacts with a majority at 2 m thick (Golder Associates 2013). The proximal zones do not extend throughout the deposit. In particular, for Lode 1000, the graphitic mudstone associated with the weakest ground is limited in extent.

The geotechnical parameters analysed are those used in Bieniawski’s RMR 76 and NG’s Q classification systems: RQD, Jn, Jr/Ja, intact rock strength and fracture frequency. For each lode, five zones were analysed: distal HW, proximal HW, Ore, proximal FW and distal FW. The anticipated rock mass quality within the zone of influence of the stoping areas were extracted and analysed to build the Tiriganiaq underground geotechnical model. The results, in terms of NGI Q’, are presented in Table 2-17.

Table 2-17 Rock Mass Quality Q' within the Zone of Influence of Stopes in Selected Lodes (Tiriganiaq Underground)

Lode	1000			1100			1153			1252			1256		
Q'	High	Ave	Low	High	Ave	Low	High	Ave	Low	High	Ave	Low	High	Ave	Low
Back	37	15	6	165	70	30	84	65	50	94	42	19	72	33	15
Walls	37	15	6	165	70	30	84	65	50	94	42	19	72	33	15
HW prox	19	4.9	1	14	9	6	-	-	-	-	-	-	-	11	-
FW prox	14	1.1	0.1	40	15	6	-	17	-	-	-	-	15	12	9
HW distal	50	27	15	90	49	27	61	45	34	59	36	23	46	31	21
FW distal	38	22	13	73	46	29	176	83	39	39	27	19	70	42	25

Stope Dimensions

Typical stope designs were created for what is thought to be the average stope size over the life of mine using the assumptions listed in Table 2-18. Dimensions of stopes planned for the first four years of operation are assumed being representative of the stope size over the life of mine. The longitudinal stope dip corresponds to the average dip of the Tiriganiaq deposit.

Based on expected rock mass quality, a sublevel interval (floor-to-floor) of 25 m with 5-m high development drifts was considered appropriate for stability and to allow for control of the drill hole deviation with the equipment and borehole size selected.

Table 2-18 Tiriganiaq Underground Typical Stope Designs

Assumption for Design	Transverse Stope	Longitudinal Stope
Rock density	2.82 t/m ³	2.82 t/m ³
Dipping	90°	60°
Width	15 m	3.4 m
Length	7.5 m	22.5 m
Vertical distance between sublevels	25 m	25 m
Drilling holes diameter	10 cm	7 cm

Ground Support

Golder Associates carried out pre-feasibility level ground support design studies (Golder Associates 2000). Another ground support design analysis was carried out in 2011 prior to the planned bulk sample mining (Golder Associates 2011c).

The ground support for the planned underground infrastructure was derived from the results of geotechnical data analyses.

Ground support underground will primarily be provided by bolting and screening as well as cable bolting. Cable bolting requirements for intersections and stopes were estimated using typical cable bolting patterns.

All underground infrastructure excavations will also be supported. One hundred mm (4") of shotcrete will be added to permanent excavations such as the maintenance bays, garage, and main refuges. Fifty mm (2") of shotcrete over the screen will be applied in lunchrooms, electrical substations, sump areas and other minor permanent excavations.

Mined-out workings will also be backfilled for reasons of ground stability, using coarse rock waste, cemented waste rock, paste tailings, or some combination of these. A paste plant will be part of the infrastructure. The paste production rate was established at 3,000 tpd. The estimated cement and calcium chloride (CaCl_2) needs for that paste production are presented in Table 2-19. For the moment, the bagging in 1-tonne bags and the transportation and storage in 20-tonne sea containers is considered. This would require the management and the transport of about 850 sea containers per year and 17,000 cement bags.

Table 2-19 Estimated Cement and Calcium Chloride Requirements for Paste Backfilling of the UG Infrastructure - Tiriganiaq

Year	Stope Tonnage	Volume (m ³)	Tailings (t)	Crushed Rock (t)	Cement (t)	CaCl ₂ (t)
1	123,438	43,311	35,150	28,759	3,195	32
2	642,141	225,313	184,800	151,200	16,800	168
3	590,541	207,207	169,950	139,050	15,450	154
4	535,032	187,731	153,975	125,980	13,998	140
5	562,500	197,368	161,880	132,447	14,716	147
6	593,750	208,333	170,873	139,806	15,534	155
7	656,250	230,263	188,860	154,522	17,169	172
8	656,250	230,263	188,860	157,522	17,169	172
9	656,250	230,263	188,860	157,522	17,169	172
10	656,250	230,263	188,860	157,522	17,169	172
11	656,250	230,263	188,860	157,522	17,169	172
12	656,250	230,263	188,860	157,522	17,169	172
13	573,804	201,335	165,133	135,109	15,012	150
Total	7,558,705	2,652,177	2,174,922	1,779,482	197,720	1,977

Mining Method

A long-hole method is planned to be used with a mining sequence of a combination of transversal stoping and longitudinal stoping. A detailed sequence was produced for the first three years of production and the four-month ramp-up period. Table 2-20 summarizes this sequence.

Table 2-20 Three-Year Production Sequence using MSO Data – Tiriganiaq UG

Production Year	Ore (t)	Average Grade (g/t)	Gold (oz)	Stopes
Ramp-Up	124,842	11.29	45,314	12
Year 1	682,629	10.21	224,012	71
Year 2	924,676	9.13	271,295	104
Year 3	916,501	7.59	223,781	115
Total	2,648,649	8.98	764,402	302
Remaining	8,226,185	7.09	1,874,413	1,173

A longitudinal section of the underground infrastructure planned for the Tiriganiaq deposit is available at Appendix A, Figure A6.

Hydrogeological Conditions

A numerical hydrogeological model was developed in order to estimate the quantity and quality of potential inflows to Tiriganiaq underground. The complete analysis can be found in the Hydrogeology Baseline Report (Volume 7, Section 7.2.2). A summary of the findings is provided here.

The underground mine at Tiriganiaq is anticipated to extend about 770 m below ground surface (bgs), so below the permafrost zone. The deep groundwater flow system will be encountered in the deeper portion of the mine. A WestBay well was installed in 2011 with 5 sampling ports. Single-well response tests were performed in the WestBay well and other locations (total 10 tests). These results were added to the 2009 report (Golder Associates 2009b) in order to have a database as complete as possible.

The tests indicated that the rock at the Project site below the base of the permafrost is of low hydraulic conductivity (order of 3×10^{-9} m/s). Tests also targeted the Lower Fault Zone and showed that it doesn't represent an enhanced permeability zone (Volume 7, Section 7.2.2).

Results from thermal modelling indicated that, near the Tiriganiaq deposit, only Meliadine Lake, Lake B7 and Lake D7 would have open taliks connected to the deep groundwater flow regime (Volume 7, Section 7.2.2). Generally, groundwater will flow from higher elevation lakes to lower elevation lakes. Given the hydraulic conductivity of the bedrock below the permafrost and the small hydraulic gradients between the lakes with through taliks, groundwater velocities are expected to be very low (Volume 7, Section 7.2.2).

The model consisted of 2 hydro stratigraphic units: competent rock, and fractured rock zones associated with sub-vertical faults. Three (3) faults were considered to be of possible hydrogeological significance for the underground mine: the Lower Fault Zone, the Pyke Fault Zone, and the North Fault Zone. As stated before, the Lower Fault was assumed having the same hydraulic conductivity as the competent rock (3×10^{-9} m/s). The Pyke Fault was input with a hydraulic conductivity of 5×10^{-7} m/s, and the North Fault, 1×10^{-7} m/s.

The model indicated that the underground mine would be in an area of groundwater flow divide: slowly flowing to Meliadine Lake East, and to a lesser extent to Meliadine Lake West. Groundwater velocities in the deep groundwater regime would be very low (order of 0.2-0.3 m/year). Groundwater from Lake B7 would take over 5,000 years to travel in a northeast direction to Meliadine Lake.

Groundwater Quality

Groundwater testing indicated, up to now²², high salinity content. This salinity content is expected to induce a freezing point depression of the water into permafrost. As a consequence, liquid

²² The WestBay well has not been fully developed yet.

groundwater could be encountered at depth of 350-375 m (while the base of the permafrost varies, for Tiriganiaq deposit, between 430-470 m bgs).

Operations

The underground mine at the Tiriganiaq deposit will use part of the existing decline built during the 2007-2008 underground exploration and bulk sampling program. This decline is to be extended. A new portal will also be built closer to the mill.

The ramp will be the main exhaust way until the 4.5 m-diameter raise bore exhaust is completed from level 275 to surface. An emergency exit will be needed from level 275 to surface before the portion of the pit over the existing decline is excavated.

The underground mine will employ conventional technology, using rubber-tired diesel machinery and drill-and-blast excavation. Typical underground mining equipment will be used, and a proposed equipment fleet is presented in Table 2-21.

Table 2-21 Proposed Underground Mining Equipment Fleet

Equipment Requirement	Quantity
Two-boom, electric-hydraulic development jumbo	4
Single-boom, electric-hydraulic stope jumbo	1
Longhole drilling rig	2
3-4-yard scooptram	3
6-7-yard scooptran	6
Mobile rockbreaker	1
Grader	1
Jeep	8
Material/modular truck	3
Scissor lift	2
40-tonne mine haul truck	5
Explosives truck	2
Screening/bolting rig	4
Service truck	2

Material Handling

A conveyor belt will be built to deliver the ore directly from the underground to the secondary crusher (dome) or close to it. This will necessitate that a crusher be located underground to reduce the ore to a size that can be accommodated on the conveyor belt. Details of ore handling system are provided below.

The lower section of the mine (levels 575 and below) will utilize a trucking system. Ore will be transported from the draw point to loading point via scoop trams. Ore will then be transferred to trucks and hauled (via ramp if the loading point is at level 600 or below) to the level 575 truck dump. From there, it will be gravity transferred directly to the start of the underground conveyor system on level 600. This first section of the conveying system will be approximately 1.5 m in width and will convey uncrushed ore.

Levels 550 and above will utilize a gravity handling system in addition to the trucking system. Ore trucked from loading points will be dumped into ore chutes with dumping locations on each level. Ore dumped into chutes in the western part of the mine and from levels 525 and 550 will be transferred to the underground conveyor system at its lowest point (i.e. level 600). Ore dumped into chutes in the eastern part of the mine will enter the underground conveyor system at level 525 after pre-crushing in an underground jaw crusher (to ≤ 150 mm). The jaw crusher will be fed via a truck dump located on level 515 (accessible from level 500 – level 500 being the bottom of the eastern ore chute system). Ore will be loaded and hauled along level 500 from the various ore chute exit locations, to level 515 truck dump.

Uncrushed ore from the lower section of the mine will be conveyed 1 km and directed through level 525 underground jaw crusher via a chute transfer system at level 485. It will then re-enter the conveying system at level 525 with the rest of the crushed ore.

From level 525, the crushed ore will be transported to surface on a conveyor system that is approximately 1.1 m wide and 4 km long. The system will involve four conveying sections with transfer points at levels 380, 225 and 40.

Underground waste rock will be transported through the same system that transports the ore but at different times, i.e. waste rock and ore will be transported intermittently at designated times. Separate waste rock chutes will be constructed so the waste rock can be stored separately from ore until the underground conveying/crushing system is clear and ready to handle waste.

Flow diagrams of the underground ore (Figure 2-18) and waste rock (Figure 2-19) handling systems are presented below.

Ventilation

Fresh air ventilation for the underground mine will average 700,000 cubic feet per minute (cfm) and will be provided through two 4.5 m-diameter raise bore intakes (see Figure 2-20). Early in the development of the underground mine, an alimak raise 3 m x 3 m will be used to provide fresh air ventilation for the underground ramp development and to access the main intake at level 275. This raise will be used later for rock fill distribution.

From level 275 to level 700, there will be a series of raise bores and drop raises to ventilate the production levels. The ramp leading to the surface installations will be exhausting used air. The

existing ramp, once excavated, will be rehabilitated; a breakthrough into the pit will allow it to serve as an exhaust for the production ramp. The main fans for the intakes will either be installed underground or be equipped with appropriate buffering system to control noise levels at surface. A booster fan will be installed at level 575 to supply fresh air to the deeper levels.

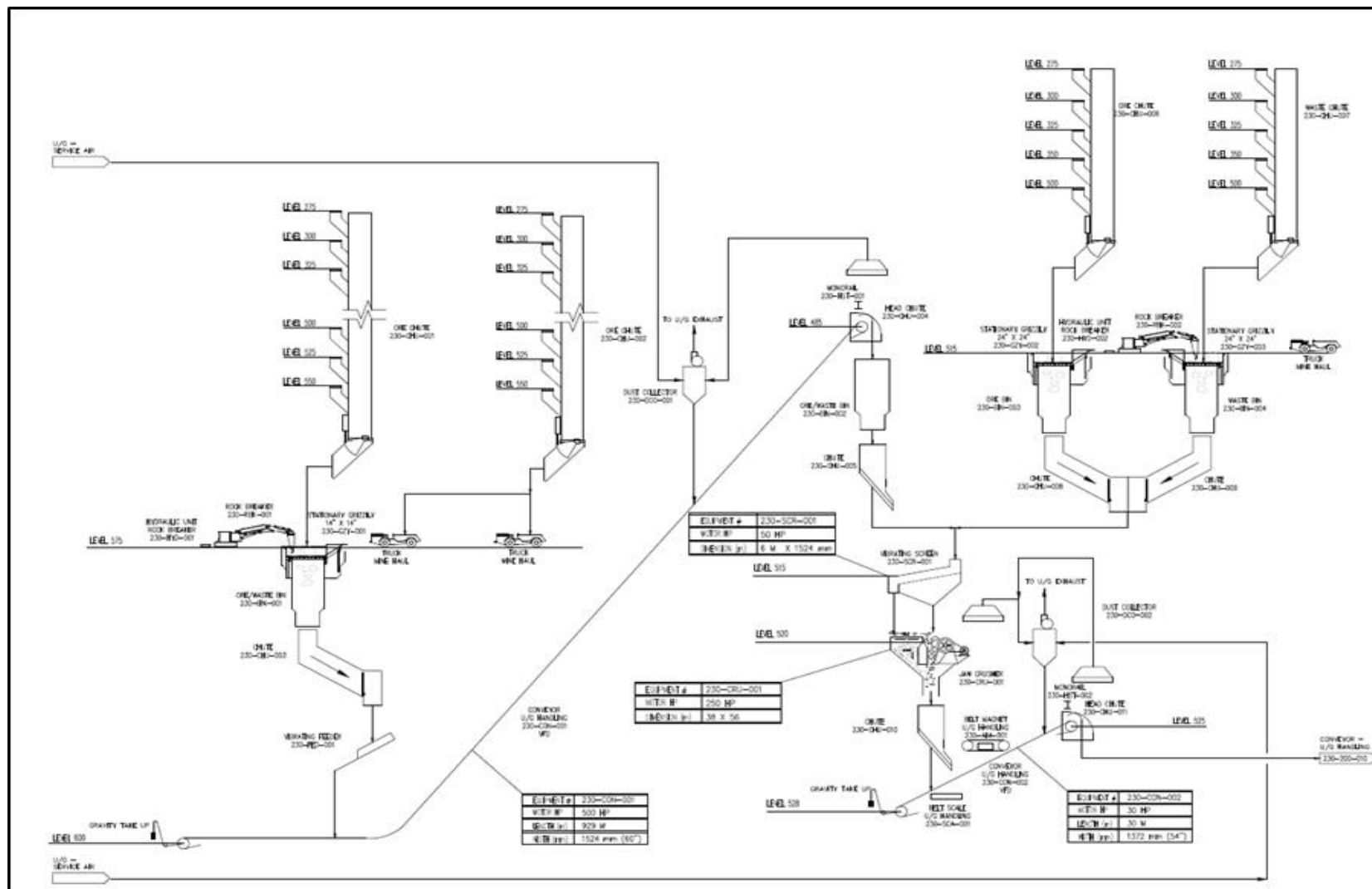


Figure 2-18 Tiriganiaq Underground Ore Handling System Flow Diagram

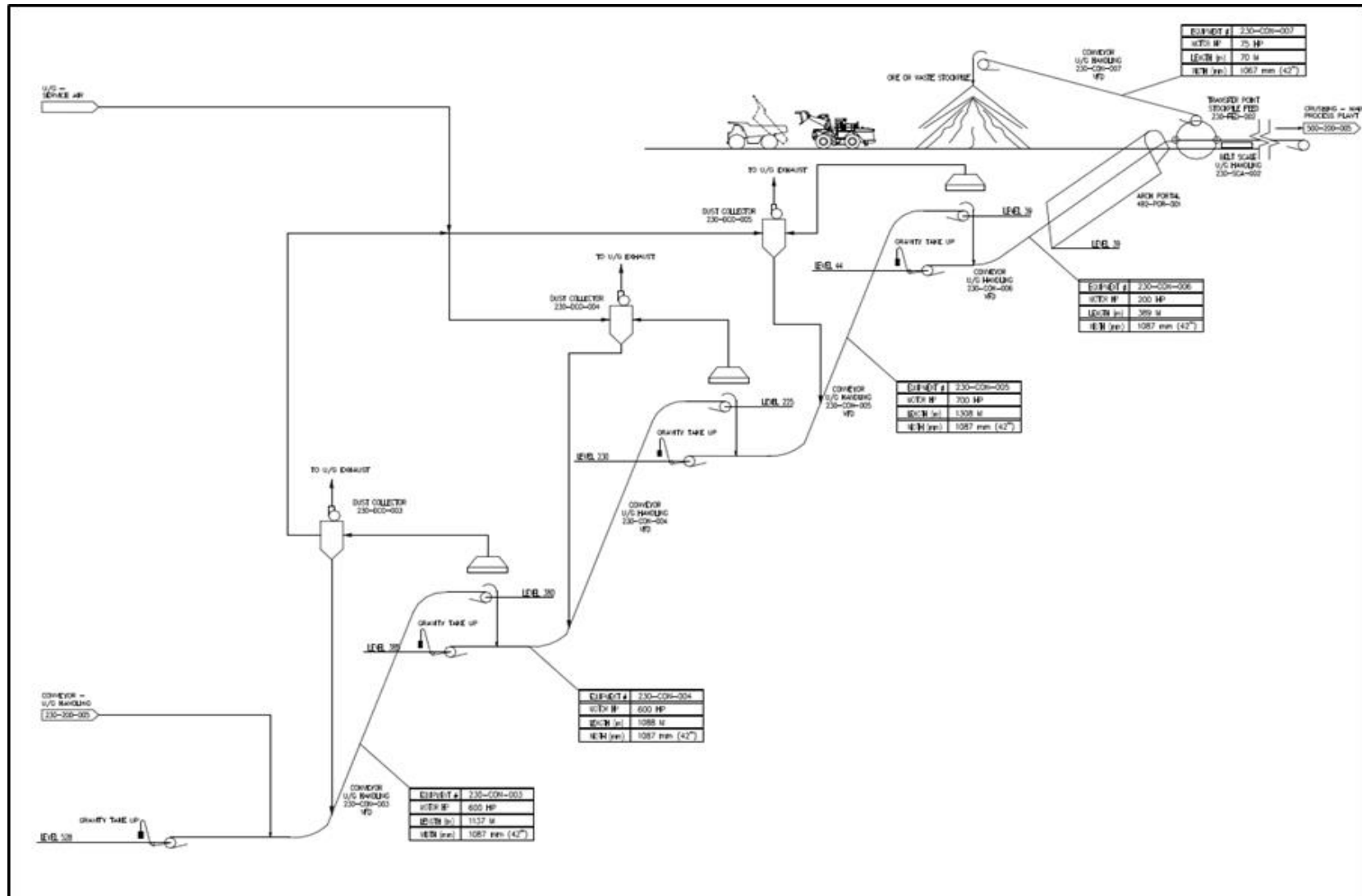


Figure 2-19 Tirigniaq Underground Waste Rock Handling System Flow Diagram

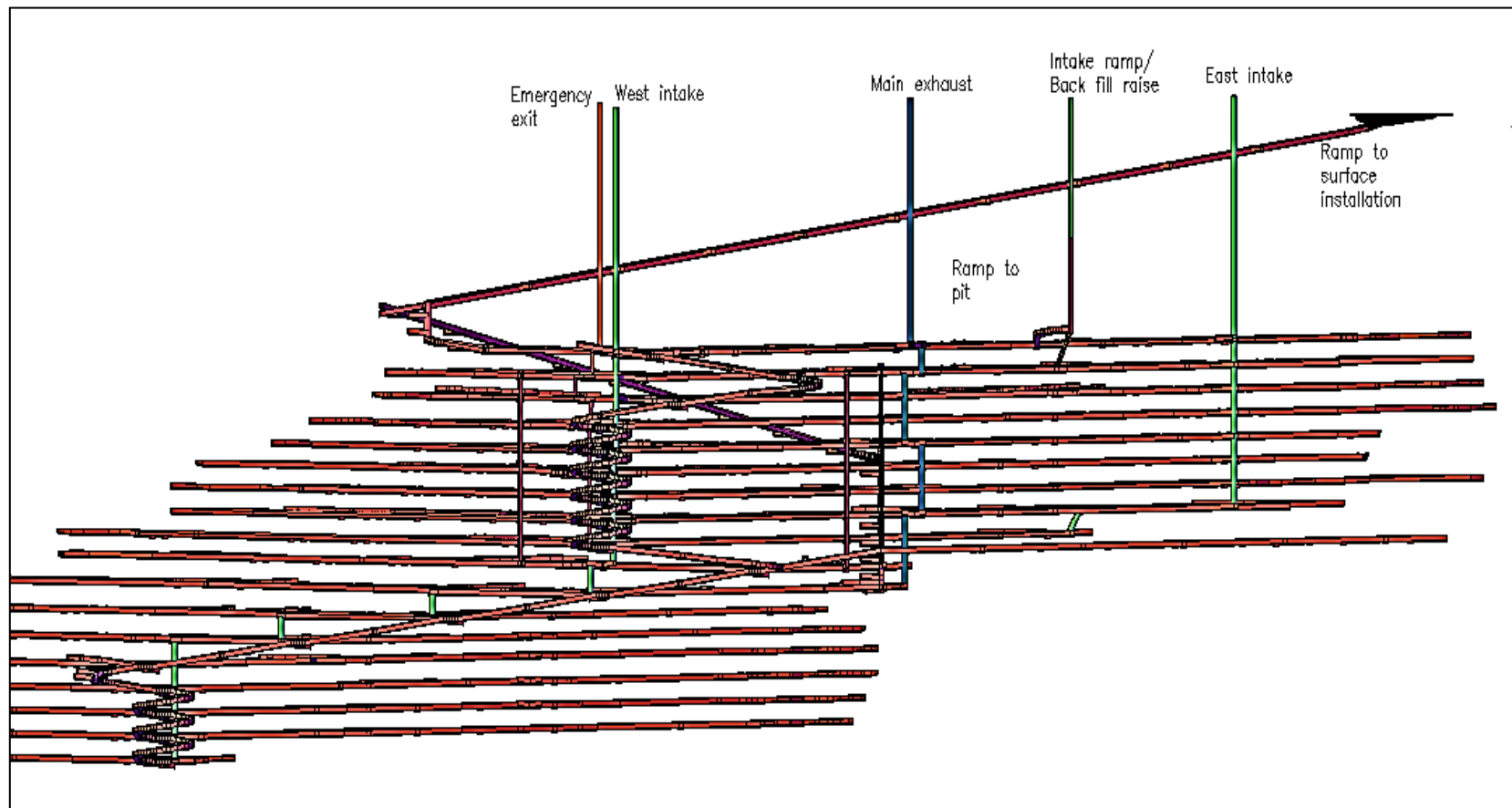


Figure 2-20 Tiriganiaq Underground Mining Planned Ventilation Network

Environmental Management

Drilling has shown that permafrost persists to depths of between 350 and 450 m from the surface. The early stages of the proposed mine will, therefore, be almost entirely situated in permafrost. Later in the mine's life, it is expected that the mining infrastructure will descend below the lower level of the permafrost, and will then have to deal with any groundwater encountered.

Mine water management will be handled through a series of sumps and sub-pumping stations.

Equipment efficiency with reference to energy consumption will be ensured by following a regular maintenance schedule. In addition of enhancing the overall equipment efficiency, such programs help preventing time lost due to equipment break down. Electrical power is an expensive commodity in Nunavut with power representing somewhere between 25% and 30% of the overall operating cost at our Meadowbank Mine. Consequently AEM will monitor its energy usage and consumption with a mandate to seek methods to reduce our overall consumption. Energy consumption is considered a key environmental performance indicator at all of AEM's operations. Our energy consumption per unit of production (per tonne milled and per oz of gold produced) is monitored and reported on a monthly basis and subject to review by senior management with a view to driving better energy efficiency measures. AEM also reports this energy consumption data by intensity annually to the public as part of its corporate social responsibility reporting with the objective of driving ourselves to improve our efficiency in use of energy.

Blasting

Explosives will be prepared on site by an explosives supplier who will also be responsible for delivering explosives to the bore holes (see Section 2.6.10.3 for details on explosives storage). For safety, environmental and economic reasons, blast designs will be optimized and include measures that favor complete detonation of all explosives. Drill patterns, explosive loads, and initiation methods will be designed and performed by experienced professionals, and will be adaptively managed to make necessary adjustments should any problems be observed. Also, having a single explosives supplier and trained certified blasters loading the holes and performing blasting activities will ensure consistency and efficiency of the activity.

The total quantity of explosives needed is estimated at about 12,000 tons of emulsion per year (full production years). Details of the estimated explosive consumption for both open pit and underground mining are provided at Table 2-22.

Table 2-22 Explosive Estimated Consumption – Meliadine Project 8,500 tpd

Year	-4	-3	-2	-1	1	2	3	4	5
UG Production Stope (t)					69	378	449	449	492
UG Development (t)	79	211	449	644	396	488	487	469	450
OP Explosives (t)	0	0	0	8,724	11,609	11,601	11,610	11,621	11,613
Total	79	211	449	9,368	12,075	12,466	12,546	12,538	12,556

6	7	8	9	10	11	12	13	Total
504	504	586	586	619	641	649	0	5,925
412	338	337	262	262	199	113	0	5,598
11,622	11,602	11,603	11,602	9,368	7,065	2,960	0	132,600
12,538	12,442	12,526	12,450	10,250	7,905	3,722	0	144,122

The Emulsion Plant will operate 7-days a week on a 12-h/day basis.

Blast frequency will be between 2 and 4 blasts per day. Table 2-23 summarizes the blasting information for both the open pit and underground operations.

The primary blast hole drills will be diesel-powered rigs. A number of operating procedures will be implemented in order to adapt blasting to factors that can affect the operations, including, notably, weather (pit operation). Blasting will be carried out by certified blasters following blasting regulations and safe practices. More details are available in SD 2-14 Explosives Management Plan.

Table 2-23 Blasting Details – Meliadine Gold Project

Parameters	Value
Open pit	
Quantity extracted per blast	120,000 t
Blasting area	120 m ²
Number of blasts per day	2-4
Underground	
Quantity extracted per blast (stope)	10,000 t
Quantity extracted per blast (development)	500 t
Blasting area	120 m ²
Number of blasts per day	2-4

Ore Processing

The proposed ore processing facility will be centrally located relative to the mining sites but at a sufficient distance from the open pits (a minimum safety distance of 750 m was used) to reduce the impact of vibration and fly rock caused by blasting. The detailed processing plan, including the stockpiling data, is presented in Table 2-24. The general design criteria for the process plant are summarized in Table 2-25.

The facilities will comprise crushing, grinding, gravity recovery, cyanidation and gold recovery in a carbon-in-leach (CIL) circuit. The simplified mill flow sheet is shown at Figure 2-21. The main ore processing streams will be continuous operations, while the carbon-handling and gold recovery circuits will be batch operations. The plant operating schedule will set to be on a continuous basis with 92 % plant availability, with a design processing rate at 385 t/h (8,500 tpd).

Table 2-24 Meliadine Processing and Stockpiling Plan – 8,500 tpd

Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Milling																	
Total Mill Feed (kt)				2,215	2,881	3,103	3,103	3,103	3,103	3,103	3,103	3,103	3,103	3,103	3,103	1,718	37,749
Ore from Pits (kt)				2,063	1,656	1,441	1,673	1,044	2,190	2,143	2,004	1,939	2,190	241	641		19,224
Ore from Underground (kt)					691	913	913	913	913	913	913	913	913	913	913	738	10,553
Ore from Stockpile (kt)				152	534	749	517	1,146		47	186	251		1,949	1,459	981	7,971
Stockpiling																	
Stockpile BOP Balance (kt)				686	938	1,336	1,287	2,098	3,197	3,670	3,806	3,802	3,734	3,973	2,440	981	
Stockpile Additions (kt)			686	404	932	700	1,328	2,245	474	183	183	183	239	416			
<i>Pit Ore (kt)</i>			661	183	932	700	1,328	2,245	474	183	183	183	239	416			
<i>Underground Ore (kt)</i>			25	222													
Stockpile Withdrawal (kt)				152	534	749	517	1,146		47	186	251		1,949	1,459	981	
Stockpile EOP Balance (kt)			686	938	1,336	1,287	2,098	3,197	3,670	3,806	3,802	3,734	3,973	2,440	981	0	

Table 2-25 Process Plant Design Criteria

Parameters	Unit	Value
Mine Production		
Ore production rate	t/y	3,102,500
Open pit	tpd	6,000
Underground	tpd	2,500
Total	tpd	8,500
Ore reserves (LOM)	t	38,094,000
Operating days per year	days	365
Schedule	shifts/day	2
	hours/shift	12
Gold Production		
Mill ore production rate	t/y	3,102,500
	tpd	8,500
Operating days per year	days	365
Ore grade (global average)	g/t	5.36
Overall recovery (global average)	%	94.7
Gravity recovery		
Design value	%	30
Gravity recoverable gold (GRG)	%	65
Gold production per year	oz/y	506,260
Gold production per day, operation		
Carbon-in-leach (CIL)	oz/d	1,030
Gravity	oz/d	478
Total	oz/d	1,508

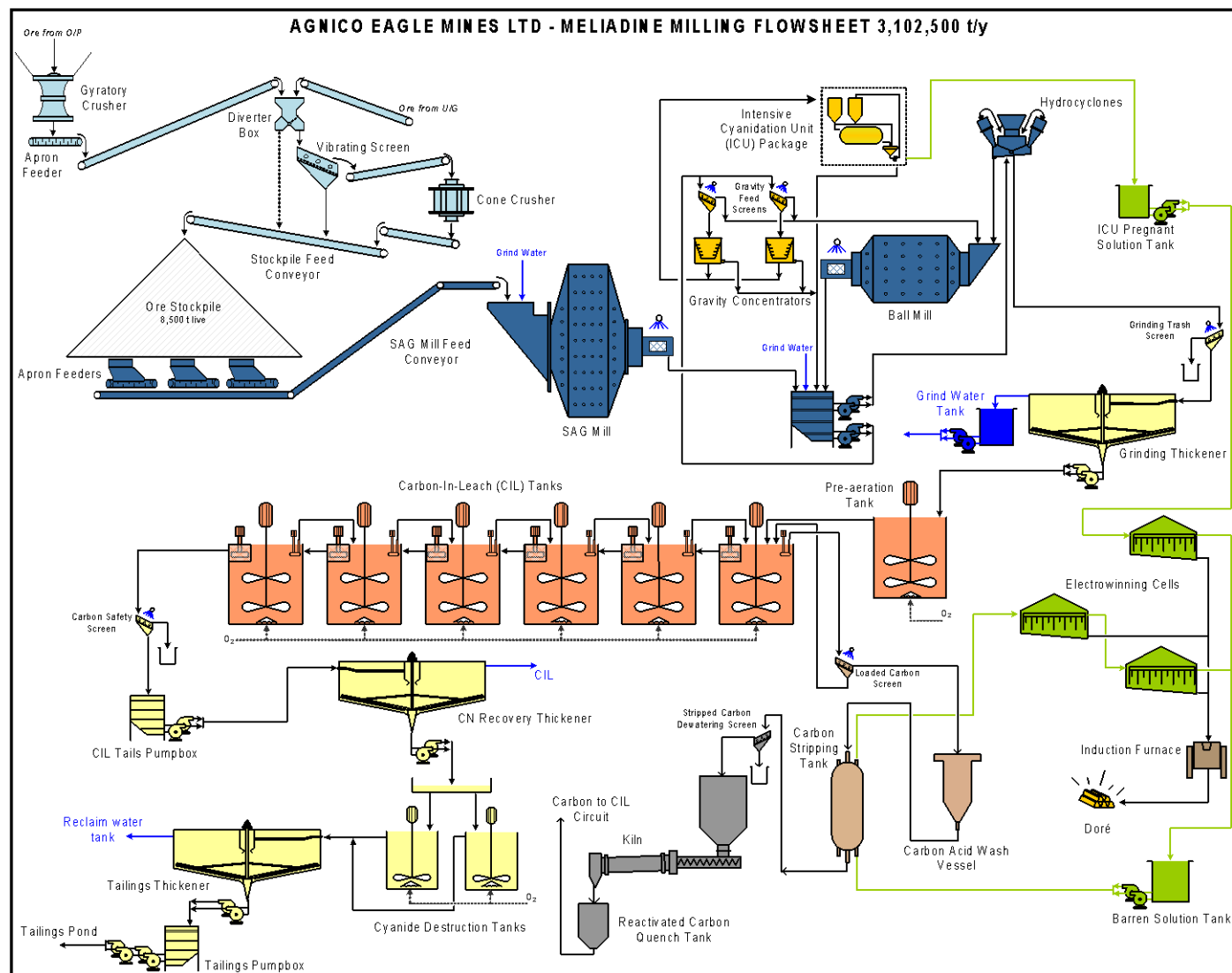


Figure 2-21 Meliadine Proposed Milling Flow Sheet – 8,500 tpd

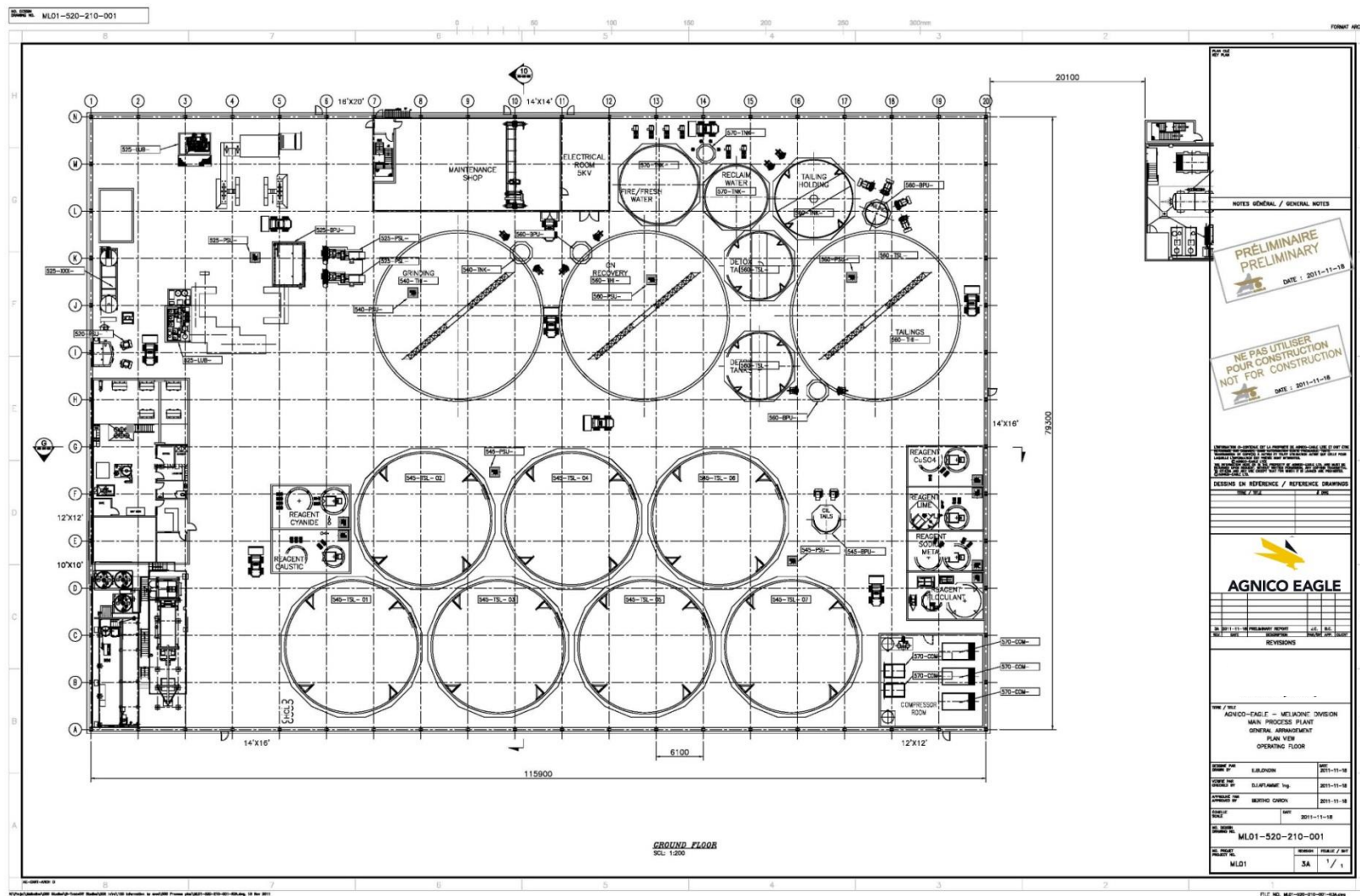


Figure 2-22 Meliadine Proposed Process Plant General Arrangement – Operating Floor

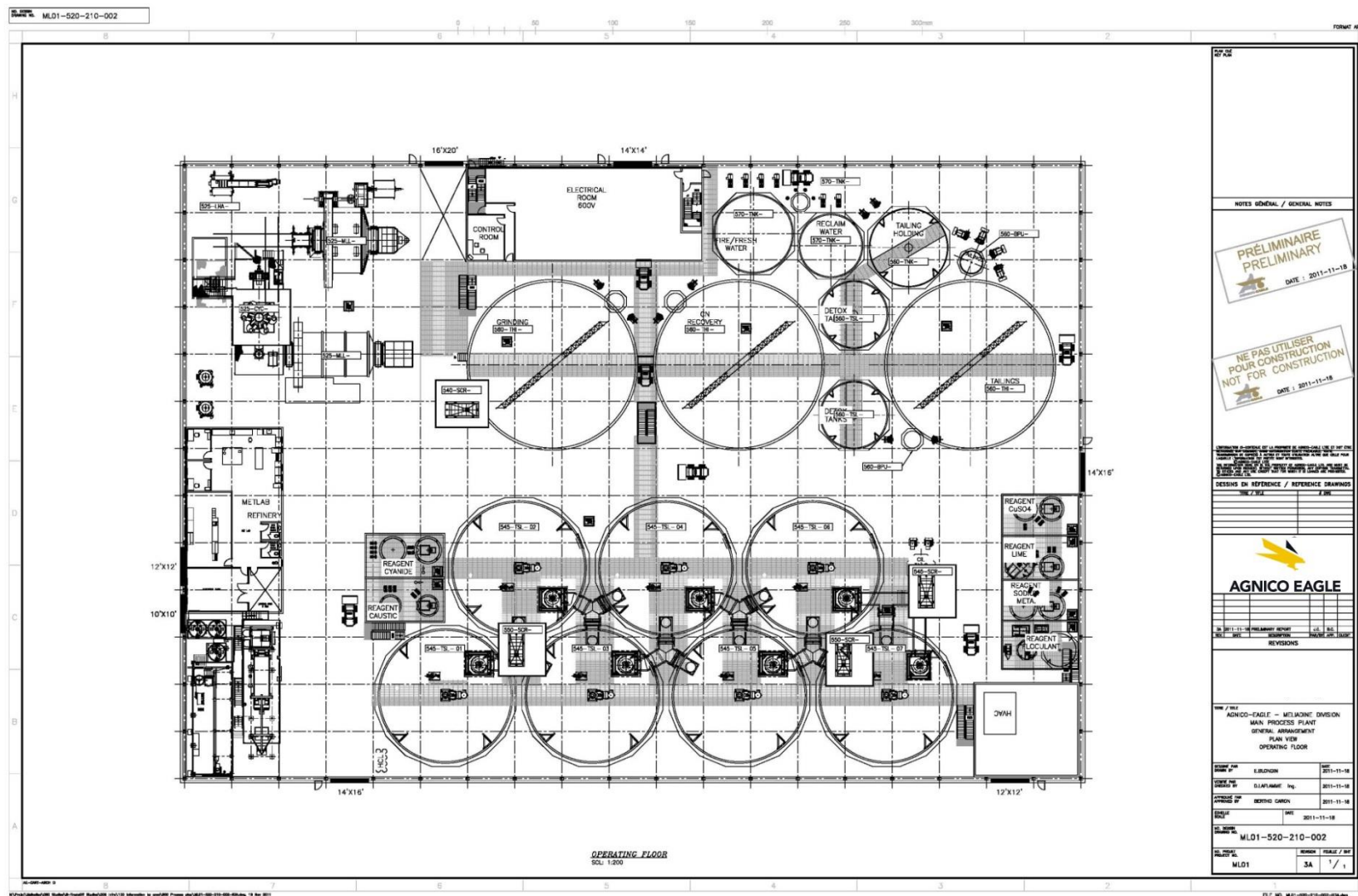


Figure 2-23 Meliadine Proposed Process Plant General Arrangement –Floor #1

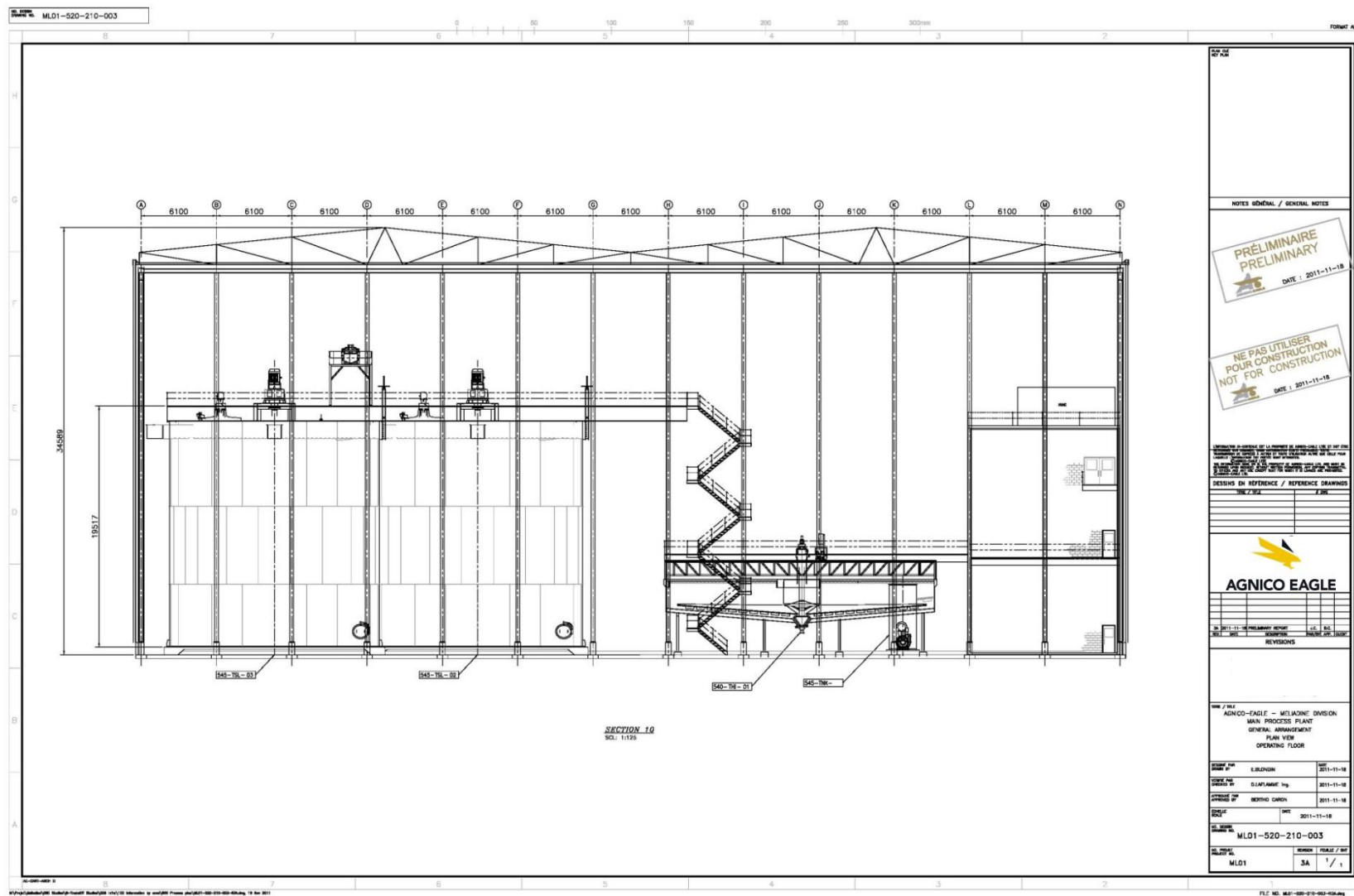


Figure 2-24 Meliadine Proposed Process Plant General Arrangement –Side View

The process plant building will house the ore processing equipment (see Figures 2-22, 2-23 and 2-24 for plant preliminary layout). The primary and secondary crushers and the ore stockpile dome will be linked to the mill by covered conveyor structures to transport the crushed ore to the mill building. The mill building will be a standard steel structure covered with cladding and a membrane roof to be assembled on site. Insulated pre-painted exterior wall (R20²³) and roof (R30) composition will be used. Internal walls will be steel stud, with single-skin steel panels. Gyproc will be added where required for fire rating. Internal offices will be prefabricated modules as much as possible in order to simplify installation and reduce on site construction time. Truck doors will provide access to a central corridor that will run the length of the process plant, providing space for laydown of equipment and access to parts and consumables. Overhead cranes will service the grinding circuit, the thickening circuit and the carbon-in-leach circuit, as well as the refinery.

The process plant building foundations will be concrete extending to bedrock wherever possible; rock dowels will be used to decrease the amount of concrete required for the mill foundations. The floor will be a concrete slab on a well compacted structural fill. All foundations will be insulated above bedrock to preserve the permafrost. The process plant building is designed to maintain an average inside temperature of 10°C.

AEM commissioned Golder Associates to conduct a permafrost baseline assessment of the proposed Meliadine Project site. The results of this assessment are presented in Volume 6 – Terrestrial Environment and Impact Assessment, specifically SD 6-1 – Permafrost Baseline Report. At this point in time, the process plant foundations are conceptually designed to be on bedrock, especially the critical components of the processing plants, i.e. the grinding circuit and the crushing plant. The plant location was selected using the permafrost and geotechnical baseline assessment work conducted by Golder Associates for AEM. The design intent is to avoid foundation conditions where thaw of the permafrost could be an issue. No specific permafrost thaw modeling has been conducted for the mill foundation design at this phase. If the Project is approved to proceed to the permitting phase, then AEM will initiate detailed engineering design of the processing plant foundations that will include additional geotechnical assessment of foundation conditions and thermal modeling of permafrost if found to be necessary based on actual foundation conditions.

The proposed process plant design is modelled on the process plant facilities installed by AEM at its Meadowbank Mine. The design ore processing throughput used (8,500 tpd) which is the same throughput used at the Meadowbank Mine. The proposed ore processing flow sheet is virtually identical to that being used at Meadowbank. This enabled AEM to bring all of the lessons learned at its Meadowbank ore processing plant to the proposed Meliadine ore processing plant design. AEM currently operates three ore processing plants that are sited in areas that see extreme northern weather conditions:

²³ R values are a way of labelling the effectiveness of insulating materials. The higher the R value, the more resistance the material has to the movement of heat.

- The Meadowbank Mine – located 75 km north of Baker Lake in Nunavut;
- The Kittilä Mine – located above the Arctic Circle in the Lapland region of Finland; and
- The LaRonde/Lapa Mine (a combined ore processing plant) located in the Abitibi region of northwestern Québec.

The applicable lessons learned at these three ore processing facilities were used by AEM in modeling the design that is proposed for ore processing at the Meliadine Project.

In addition the AEM design team visited the Raglan Nickel Mine in Northern Québec to study their ore processing and tailings disposal facility as part of the tailings alternatives assessment study. Raglan uses a filtered tailings approach. As part of AEM's alternative assessment of alternate tailings handling processes, the AEM team visited the Raglan Mine site to view and learn about the pros and cons of operating a filtered tailings process facility under Arctic weather conditions.

Flow Sheet Description

Ore from the open pits and underground will be fed to the crushing circuit. The crushed material will then be fed by conveyor to the covered ore stockpile. The covered pile will have a one-day live capacity (8,500 t). Usually, about 20 % of such a pile is considered as "live"; so to maintain a one-day live stockpile, about 4-5 times the daily rate will be maintained as covered crushed stockpile (about 32,000 to 40,000 t).

The ore will be reclaimed from the covered stockpile and fed via conveyor belt to the grinding circuit where the ore will first be reduced to a sand sized consistency in a semi autogenous grinding (SAG) mill. This will be followed by secondary grinding in a ball mill, which will reduce the rock to fine slurry. The target grind size for cyanidation should be 80 % passing 105 μm^{24} .

Gravity recovery test work showed that gold is amenable to recovery in a centrifugal concentrator; a gravity recovery circuit is therefore included in the flow sheet. It is expected that about 30 % of the gold will be recovered in the gravity circuit (final gravity recovery number will be ascertained in the feasibility study). Gravity concentrate will be subjected to intensive cyanidation in a batch inline leach reactor followed by electrowinning to produce a gold sludge suitable for smelting.

The final product from the grinding circuit will go to a thickener to increase pulp density prior to cyanide (CN) leaching. The overflow water will be recycled back to the grinding thickener. Underflow from the thickener will go to the pre-aeration tanks, followed by cyanidation and carbon adsorption in a carbon-in-leach (CIL) circuit. The selection of a CIL circuit over a carbon-in-pulp (CIP) circuit was made due to the presence of carbon in the ore which, in previous test work, showed preg-robbing properties. The extent of preg-robbing and the final circuit configuration in terms of CIL vs CIP and optimal number of stages is pending results of ongoing metallurgical test work programs.

²⁴ Target grind size may slightly change pending the results of the feasibility study.

Loaded carbon will be stripped of gold in a pressure Zadra type process and the gold bearing solution will be pumped through an electrowinning cell where gold will be recovered on steel wool cathodes. Gold sludge from the cathodes will be collected, dried and smelted in a furnace to produce doré bars (mix of gold and silver, although at Meliadine little silver is expected). The bars will be placed in a secure storage vault pending shipment to a custom refiner in southern Canada (AEM currently uses the Royal Canadian mint refining facility in Ottawa). The scheduling of when these gold doré bars will be shipped will be controlled by AEM site security personnel and will be somewhat random and disguised to enhance security of the process. The doré bars will be shipped from Rankin Inlet by air on either scheduled or chartered commercial air services. Transfer of the doré bars from site to the Rankin Inlet airport will be most likely by road (although sometimes it may be by helicopter) and will be controlled by site security and will be again somewhat random and disguised.

Cyanidation tailings will go to a thickener to recover cyanide solution, which will be recycled within the mill. Tailings containing residual cyanide will pass through cyanide destruction prior to being discharged to the Tailings Storage Facility (TSF). Cyanide destruction should employ the conventional SO_2 /air process where SO_2 and air are added to oxidize and destroy cyanide present in solution. The reaction is catalyzed by the presence of copper ions, which is added in the form of copper sulphate. The SO_2 will be generated by a sulphur burner with a sodium metabisulphate reagent system acting as a back-up. The final reagent additions and circuit configuration for cyanide destruction will be determined during the feasibility study. It is currently assumed that the final tailings will be transported directly to an impoundment area as a pumped slurry through a pipeline (similar to the process used by AEM at its Meadowbank Mine), but the possibility of partial filtration or paste thickening is being considered by AEM as part of the ongoing Feasibility Study and thus the final selection is pending results of this section of the study.

Services will be required for plant operation, which include reagent systems, water systems and air distribution systems. The expected reagent systems required are listed below and each will primarily consist of a mixing tank and holding tank. The steel balls will be added directly to the grinding circuit and the activated carbon directly to the carbon regeneration circuit, while the refinery reagents will be handled directly by the refiner. The final list of mill reagents and details of the circuit configuration will be finalized in the feasibility study. Additional information on how AEM proposes to manage these chemicals during transport from Rankin Inlet to the mine site and while on site is presented in the Hazardous Materials Management Plan (SD 2-13).

The required mill water systems are detailed in 2.6.1.7. Air compressors or an oxygen plant will be required to provide air for the cyanidation and cyanide destruction circuits, as well as compressors for crusher dust control and instrumentation air. The configuration of the air systems is dependent on the final process flow sheet and will be described in the feasibility study.

Table 2-26 Meliadine Reagents List

Reagent	Circuit	Quantity (kg/t)	Quantity per Bag (kg)	Annual Consumption (t)
Steel Balls	Grinding	1.5	2,000	5,058
Flocculant	Grinding	0.04	750	135
Lead Nitrate	Carbon-in-Leach	-		-
Cyanide	Carbon-in-Leach	0.6	1,000	2,023
Lime	Carbon-in-Leach	2.5	1,743	8,431
Activated Carbon	Carbon-in-Leach	0.03	500	101
Sodium Hydroxide	Elution-Regeneration	0.25	1,000	843
Chlorhydric Acid	Elution-Regeneration	0.7		2,361
Antiscalant	Mill	0.035		118
Borax	Refinery	0.005		17
Sodium Nitrate	Refinery	0.005		17
Silica	Refinery	0.005		17
Sodium Metabisulfite	Cyanide Destruction	-	1,000	-
Copper Sulfate	Cyanide Destruction	0.15	2,500	506
Sulfur Prills	Cyanide Destruction	0.7	1,000	2,172

Environmental Management

Fresh water use for the milling operations will be minimized as much as possible. As explained in details in Section 2.6.1.7 and in the Surface Water Management Plan (SD 2-6), tailings will be thickened in order to reclaim as much water as possible directly in the mill. Once in the Tailings Storage Facility (TSF), the material will settle allowing the reclaim of another part of the process water. All contact water will be collected and ultimately directed to an attenuation pond (AP-01) which will also be a source of reclaim water for the mill. Excess groundwater will be treated as necessary, treated water directed to AP-01 for service as reclaim. Optimizing freshwater use was, and will be, a first concern when designing operations.

Tailings will be managed in a TSF as further discussed in Section 2.6.3.2. Any other waste generated by the mill (waste reagents, for example) will be handled appropriately as per the Hazardous Materials Management Plan (SD 2-13). In nearly all cases, waste reagents that cannot be used in the milling process will be shipped back south for disposal at a licensed waste disposal facility. However, our experience at Meadowbank suggests that the mill will generate very little in the form of waste reagents. Most waste from the mill (outside of tailings) will be in the form of waste lubricating oil from equipment oil changes, which will be handled by the incinerator (see Incineration Management Plan – SD 2-12).

Dust bags will be present at appropriate locations in the crushing/conveying circuit and in the mill in order to control/minimize dusts. Having a covered crushed pile will also limit dust dispersion.

The mill, especially the crushing circuit, is one of the biggest energy consumers of the mine operation. Such, optimizing energy consumption is one of the design criteria and energy consumption optimization will be an ongoing activity. For example, alternative crushing/grinding circuit configurations such as the inclusion of secondary crushing or where the ball mill is replaced by a Vertimill are also being considered; final selection will be made pending ongoing trade-off studies. These options have the potential to reduce the overall mill power consumption.

2.6.1.6 Ore Stockpile Facilities

As describe in the Ore Processing Section and shown on the site surface infrastructure layout (Figure 2-6), two types of ore stockpiles will be available. First one will be the covered stockpile which will contain 8,500 t live of crushed material (about 32,000-40,000 t total). The dome will be installed on a prepared pad lying on concrete footing. Crushed material will thus be protected from weather, the enclosed area also helping controlling dust and water.

Two pads are also planned to temporarily stockpile ore material near the crusher. Should ore feed from the pit and underground operations be interrupted for extended periods, or to complement the feed, there will be the possibility of inputting material from this ROM (run-of-mine) ore stockpile. Stockpiled quantities planned for the life-of-mine are presented in Table 2-24. The ore stockpile pads were designed including a contingency plan such as to leave enough room to take extra material (to take into account, for example, moments where the crushing or milling circuits could be temporarily non operational).

Any contact water that could contain ML from the stockpiled ore material will be captured by contour ditches and managed through sumps. The majority of the ore material showed no potential for ARD, will be only temporarily stockpiled, and will be managed on a pad (protecting furthermore the underlying permafrost). Discovery ore is expected to be PAG but very slow reacting. This combined with the borrow-mode operation of the ore stockpiles will preclude ARD from developing. The drainage from the Discovery ore stockpile will also be collected and monitored prior to discharge.

More details on planned ore management is available in SD 2-7 Ore Storage Management Plan.

2.6.1.7 Water Supply and Fresh Water Treatment Facilities

Fresh water for potable use and as make-up water for the mill and other operational needs will be obtained from Meliadine Lake. Three (3) options were considered for fresh water intake: a rockfill jetty built out into the Meliadine Lake to access deeper water, a floating pumping barge and an insulated pipeline run along the lake bottom from the shore to deep water. The intent is to get far enough away from the shore into a depth of water where ice cover will not interfere with pumping

needs over winter months. Details on the alternative water intake that were assessed are available in the Project Alternatives Report (SD 2-1). The rock fill jetty was chosen in order to provide the best year round access for the required freshwater intake at Meliadine Lake. The jetty will be approximately 25 meters in length with a width of approximately 10 meters (design has not yet been finalized).

The rock fill jetty will be built with non-acid generating, low metal leaching material. A wet well will be excavated at the lake end of the jetty within the rockfill. The bottom of the wet well will be connected by pipe to Meliadine Lake. The pipe end (lake-end) will be equipped with a fish intake screen box designed to prevent fish entrapment or entry into the pump well. This fish intake screen box will be constructed in accordance with the existing DFO guidance for such structures. A pump house will be built over the pumping wet well. The pump house will be heated and insulated. Vertical fresh water pumps will be installed in the wet well and used to pump freshwater through a heat-traced, insulated piping that will extend from the wet well to an insulated main storage tank located at the plant site, providing both fire suppression and fresh water storage. Potable water will be drawn from the main storage tank and treated using a skid-mounted chlorination system located in a pre-fabricated structure adjacent to the accommodation camp. The treated potable water will be stored in an insulated water tank. A water distribution pump, also skid mounted, will distribute potable water to the site.

The pump in the wet well in Meliadine Lake will be located in water deeper than four (4) metres to allow year-round operation. Meliadine Lake is a relatively large lake and thus AEM's anticipated fresh water use is not projected to have substantial impacts on the lake levels within the lake. Consequently because of the large volume of water within Meliadine Lake, AEM is confident that using a wet well set in a rockfill jetty to reach water deeper than 4 m in Meliadine Lake will ensure year-round availability of fresh water to the Project for both operational and safety purposes, even during winter months and during dry years.

The fresh/fire water tank is to be located near the process plant. This tank will have a diameter of 10 m, be 10-m high, for a total capacity of 739 m³ (219 m³ for fire suppression and 520 m³ for other fresh water needs). The fresh water line from Meliadine Lake to the fresh/fire water tank will be an HDPE (high-density polyethylene) pipe (250 mm (10 in) DR17) about 600 m long.

Fresh water needs were evaluated considering the needs as described in Table 2-27, and including a 25 % contingency. The water needed for all activities, except potable water, will not require any treatment before being used.

Table 2-27 Fresh Water Estimated Needs – Meliadine Gold Project

Area	Freshwater need (m ³ /h)	Treated? Yes/No	Note
Mill	107.2	N	
Underground Production	50	N	
Pit Production	1.5	N	12,000 m ³ /year
Truck Shop Wash Bay	8.5	N	
Water Truck (summer)	18	N	45,000 m ³ /year, summer only
Emulsion Plant	1.6	N	
Paste Backfill Plant	5.5	N	
Camp Potable Water	5.67	Y	200 L/day/person x 680 workers
Total fresh water need	198		
Including contingency (25 %)	247.5		2,168,100 m³/year

It should be noted that AEM is not planning to use any water at the proposed Itivia facilities in Rankin Inlet. There will be no warehousing or office facility at this site hence no requirement for freshwater use or bathroom facilities. The same is true of the proposed fuel storage facility to be sited in Rankin Inlet. Consequently no freshwater facilities are planned for Rankin Inlet facilities.

Potable Water Supply and Treatment

The camp area will have a water treatment plant for potable (domestic) water. The design flow rate for the potable water for the main camp and accommodations (kitchen, laundry) is 136 m³ per day (based on a 680-people camp capacity and a nominal consumption of 200 L/day/person).

As mentioned before, fresh water will be sourced from the Meliadine Lake to fill the fresh/fire water tank. From there, it will be pumped to 10 x 10-m³ fresh water tanks inside the potable water treatment plant. In this plant, the water will first go through sand filters and then be pumped through ultraviolet units, and finally be treated with chlorine before being sent to the 4 x 10-m³ potable water tanks. The potable water treatment will have the capacity to treat about 136 m³/day, so treated water storage capacity was designed consequently.

A water distribution pump will distribute potable water to the site through a 100-mm-diameter PVC or HDPE pipe main routed through the Arctic corridor to the camp, the process plant and the other facilities requiring potable water.

Fire Protection – Pumping Stations

A fire water main pipe will be installed around the inside walls of the process plant and through the Arctic corridor to the camp. A sprinkler system will be provided in the power plant, offices,

warehouse and mine maintenance shop. An extension of the water main will run around the process plant. The fire water system will be kept under pressure by an electric pump. In case of fire, a diesel-powered firewater pump will pump the water from the fresh/fire water tank.

Fire hose stations and fire extinguishers will be located in every facility as required by regulations as described below.

The fire protection system is based on the Factory Mutual (FM) System, Highly Protected Risk (HPR) concept, in accordance with the recommendations contained in the FM Data Sheets. A fire water tank and booster pump will provide water to a pressurized firewater main supplying wall hydrants located on the outside walls of buildings and structures such that all building surfaces can be covered by a fire hose connected to a hydrant on an adjacent building. The firewater mains will also supply water to automatic sprinkler and standpipe systems located inside buildings and along rubber belt conveyors. All rubber belt conveyors will be protected by automatic sprinklers (dry system). Sprinkler protection will also be extended to areas containing hydraulic oil packs, air compressors, shops, the warehouse, generators, the main camp (kitchen, food warehouse, etc.) and other hazards involving Class A and B combustibles. An FM200 or other gaseous fire suppression system will be provided for the process plant control room and computers room. Hand-held type ABC fire extinguishers will be located in all buildings based on a minimum of one unit per 900-m² of floor area. Electrical rooms will be protected by smoke detectors, CO₂ hand held fire extinguishers and pre-action double interlocked fire protection systems (Total pac2). Manual fire alarm pull stations will be located at the exits and by the smoke or heat detectors in all buildings. Smoke detectors and pull stations will report alarms and trouble signals to a central fire alarm control panel located in the guard house where there will be personnel around the clock. Fire alarm horn/strobe units will be provided throughout the plant.

Description of Plans to Recycle or Re-Use Water Resources

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water and groundwater at the site. Water diversion infrastructure will be constructed to avoid the contact of clean runoff water with areas affected by the mine or mining activities. During mine construction and operation, contact water originating from affected areas will be intercepted, collected, conveyed to central storage facilities for re-use in process, or treatment (if needed) prior to release to the receiving aquatic environment. The uncontrolled release of contact water to neighbouring lakes is not anticipated.

Site contact water from the mine area will be stored in Attenuation Pond 1 (AP-01)²⁵ located north of the plant site. Contact water collected within the attenuation pond will be used to satisfy mill process water make-up requirements, with any excess water treated, if required, and discharged to Meliadine Lake. At the beginning of mine life, there will be enough re-use of water to avoid any discharge to the environment.

Reclaimed water from the TSF will also be available to meet the process water demand, with excess water being returned to AP-01 through a treatment plant. All attenuation ponds will be operated in a manner to minimize the amount of water stored within the facility during the open water period. This will limit water storage over the winter period, thereby maximizing the storage capacity available for the spring freshet.

Tailings will be stored within the TSF. Any process water (supernatant), seepage and surface water runoff from the tailings will be collected within the tailings reclaim pond. A series of dams will be constructed to allow the pond and tailings surface level to be raised above the current level so that sufficient process water volume is maintained.

The reclaim of supernatant and runoff water from the tailings reclaim pond will be achieved using a floating barge, which will be moved progressively during the operation of the TSF. It will probably be necessary to use heated reclaim pumps to ensure operation during the winter. A bubbler system may also be required to keep ice away from the barge.

2.6.1.8 *Natural Drainage Diversion*

The Meliadine Project is located within a polar tundra climate, the general physical setting of the Project site is typical of a remote, relatively undisturbed northern environment, which is comprised of a hummocky topography having glacial landforms draped with water bodies and tundra vegetation. A zone of continuous permafrost underlies the Project site. The Tiriganiaq deposit is the only deposit that is planned to be mined below the inferred depth of permafrost at the site (UG only). Half of the mean annual precipitation of the area occurs as snow and the other half occurs as rain. The regional surface drainage patterns are controlled by a series of low relief ridges composed of glacial deposits. The proposed Project is located on a peninsula that is surrounded on three sides by Meliadine Lake. A large proportion of the surface of the peninsula is covered by shallow ponds, lakes and interconnecting seasonal streams and wetlands.

Due to the predominantly flat topography, the regional study area is characterized by a large number of lakes and ponds (Table 2-28). The total surface area of these waterbodies comprise almost 30 % of the total drainage area (i.e., 70 % is terrestrial). The contributions of aquatic habitat

²⁵ A more detailed description of the way AEM proposes to manage water resources to maximize its re-use/recycle of water resources is contained in the Surface Water Management Plan (SD 2-6). A detailed conceptual water balance for the Project is included as Section 6 of that support document (Surface Water Management Plan (SD 2-6)).

to the total drainage areas of the peninsula, Meliadine River, and Atulik watersheds are lower (around 20 %) than in the Meliadine Lake watershed, where almost 40 % of the area is comprised of water (due to the large size of Meliadine Lake itself and several mid-sized lakes in the northeast part of the watershed).

Despite a large lake-to-land ratio, the mean lake surface area in each regional watershed (i.e., the total water surface area in each watershed divided by the number of waterbodies in each watershed) is small. The mean waterbody size ranges from 2.0 ha in the Hudson watershed (i.e., the combined watershed of Thompson, Dry Cove, and smaller sub-basins along the Hudson Bay coast between the Atulik and Meliadine River watersheds) to 9.5 ha in the Meliadine Lake watershed. The larger mean waterbody size in the Meliadine Lake watershed is mainly due to the large size of the Meliadine Lake itself (107 km²), which accounts for more than half (54 %) of the total water area in the watershed, distributed among 2082 lakes and ponds. The median lake size is less than 0.6 ha in all watersheds in the region. The mean density of waterbodies is similar among the regional watersheds, ranging from 2.2 waterbodies per km² in the Rankin Inlet watershed to 5.4 waterbodies per km² in the Hudson watershed (Table 2-28).

Table 2-28 Number, area, and size of lakes and ponds in regional study area watersheds

Watershed	Drainage area (km ²)	Total lake and pond area (km ²)	Water as % of drainage area	Number of lakes and ponds	Mean density of lakes and ponds (#/km ²)	Mean lake and pond area (ha)	Median lake and pond area (ha)
Meliadine Lake	559.1	197.5	35.3	2082	3.7	9.5	0.5
Meliadine River	210.2	52.2	24.8	843	4.0	6.2	0.8
Atulik	207.0	48.1	23.2	1067	5.2	4.5	0.4
Char River	72.0	14.5	20.1	239	3.3	6.1	1.2
Diana River	1682.0	485.2	28.8	6091	3.6	8.0	0.6
Rankin Inlet	101.5	9.5	9.4	219	2.2	4.3	1.1
Hudson	173.6	18.6	10.7	928	5.4	2.0	0.5
Total	3005.4	825.6	27.5	11469	3.8	7.2	0.6

The distribution of waterbody size classes is markedly similar among the compared watersheds. Waterbodies (mainly ponds) smaller than 5 ha in surface area predominate in all watersheds and contribute between 86 % (Meliadine River) and 91 % (Atulik) to the total number of waterbodies present. Lakes exceeding 20 ha in area are relatively rare, contributing between 2 to 5 % to the total number of waterbodies. For example, among 368 waterbodies enumerated within the peninsula watersheds, only 13 are larger than 20 ha in area and the largest one is 90 ha.

Within this setting it is inevitable that development of the Meliadine Project will have an impact on a number of these small waterbodies on the peninsula. A number of these small lakes and ponds will have to be dewatered to allow for mining of the underlying ore resources through open pit mining. Others will be impacted by the placement of waste rock and tailings. This in turn will result in flow diversions to a) direct non-contact surface runoff away from the mining and waste rock storage areas; and b) around the impacted water bodies. In developing the Project, AEM and its consultants have gone through a number of iterations looking at how to manage this surface water to minimize the amount of disturbance to the peninsula waterbodies, reduce the amount of water diverted while still allowing the underlying ore resource to be extracted. Guiding principles incorporated into these iterations were to avoid where practical any impact on large or deep waterbodies where fish are present on a year round basis or containing high quality fish habitat. These iterations have resulted in the development of a Surface Water Management Plan (SD 2-6) for the Meliadine Project that includes:

- A layout (in both tabular format (Table 7 in Section 3.1 of SD 2-6) and in Figures (Figures 2 thru 10 in SD 2-6)) of how the mine development plan will be staged over the pre-production phase, through the operational phase and into the closure and post-closure phases of the mine life and how this development interacts with the various waterbodies, including how and where surface waters will be diverted;
- An inventory of the waterbodies impacted by mining activities (Table 8 in Section 3.2.1 of SD 2-6); and
- A detailed conceptual water balance for the Project as proposed which incorporates the site water management activities (Section 6 of SD 2-6).

Two levels of catchment disturbance were defined for the Project area, namely undisturbed and disturbed. Areas disturbed as part of the mine development are considered disturbed catchments, while the areas left unaffected are considered undisturbed catchments. For the purposes of the proposed mine surface water management strategy, runoff from undisturbed areas was considered non-contact water, while runoff from disturbed catchment areas was considered contact water. Surface water that is diverted around the mine facilities, or groundwater that does not emerge into a mine facility, is considered non-contact water. Any non-contact water that mixes with contact water becomes contact water.

Disturbed areas include the following:

- Surface runoff from the mining and milling areas;
- Groundwater seepage into open pits and underground;
- Surface runoff and shallow drainage from rock storage areas;
- Surface runoff and shallow drainage from tailings disposal areas;
- Process water from tailings; and
- Water generated from consolidation of tailings (bleed water).

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water and groundwater at the site. Diversion infrastructure will be constructed to avoid the contact of clean runoff water with areas affected by the mine or mining activities. During mine construction and operation, contact water originating from affected areas will be intercepted, collected, conveyed to central storage facilities for re-use in process, or treatment (if needed), and discharged to the receiving environment when water quality meets discharge criteria. The uncontrolled release of contact water to neighbouring lakes is not anticipated.

Non-contact water is limited to runoff originating from areas unaffected by mining activity that does not come into contact with developed areas. Non-contact water will be intercepted and directed away from developed areas by means of natural or man-made diversion channels and allowed to flow to the neighbouring lakes untreated.

The various components of the water management system will be designed to meet the following criteria:

- Water management infrastructure along the perimeter of the developed areas will be able to intercept and convey to proper handling facilities contact water from a 1:100-year, 24-hour precipitation event (65 mm of rainfall plus 6.5 mm snowmelt).
- Water management infrastructure located within mining affected areas, where water has no chance of overflow outside of developed areas, will be able to handle the runoff from a 1:10-year, 24-hour precipitation event (50 mm of rainfall plus 6.5 mm snowmelt).
- Water management infrastructure along the perimeter of the developed areas will be able to divert non-contact water from a 1:100-year, 24-hour precipitation event.
- Minimum pumping capacities for contact water sumps and ponds will be selected to handle the greater of:
 - The average year spring melt (93 mm) volume in a 30-day period; and
 - The 1:100-year wet-year spring melt (249 mm) volume in a 90-day period.

While observing required storage volumes:

- In the case of the pit sumps, the pumps will be able to handle the expected maximum monthly flow volume including seepage in addition to the spring melt criterion.
- Attenuation ponds will be sized to accommodate the runoff from a 1:100-year, 24-hour precipitation event in excess of their maximum operating storage volume (average year climate conditions), while maintaining a 1 m freeboard.
- Sumps will be sized to accommodate the runoff from a 1:100-year, 24-hour precipitation event in excess of their maximum operating storage volume (average year climate conditions), while maintaining a 1 m freeboard.

As described, the Project consists of several gold-bearing deposits that will be mined from five (5) sets of open pits. A series of dikes will be required to isolate open pit mining activities from neighbouring lakes and to create attenuation ponds for contact water. Dewatering of Lake B7, which is at the location of the proposed Tailings Storage Facility (TSF), will be accomplished by pumping water to the west into Lake B6. Additional dikes will also be constructed to manage tailings within the B7 basin. Other lakes (i.e., A8, A6, B5 and B4) will also be dewatered to adjacent lakes to allow pit mining and development of waste rock storage facilities (WRSF).

The Surface Water Management Plan (SD 2-6) details the activities and infrastructure that are proposed to manage surface water in the various component areas of the Project, specifically:

- Section 4.4.2 outlines the activities and infrastructure needed to manage surface water in the plant site area;
- Section 4.5.1 outlines the activities and infrastructure needed to manage surface water at the tailings storage facility;
- Section 4.6 outlines the activities and infrastructure needed to manage surface water at the Tiriganiaq deposit area;
- Section 4.7 outlines the activities and infrastructure needed to manage surface water at the Wesmeg deposit area;
- Section 4.8 outlines the activities and infrastructure needed to manage surface water at the B4 waste rock storage facility and Pump deposit area;
- Section 4.9 outlines the activities and infrastructure needed to manage surface water at the A45-2 waste rock storage facility and F Zone deposit area; and
- Section 4.10 outlines the activities and infrastructure needed to manage surface water at the Discovery deposit area.

The total suspended solids (TSS) levels within the water that is dewatered or pumped from each basin will be closely monitored to verify that it is acceptable for release to the neighbouring lakes. Where necessary, additional TSS management practices will be used to ensure that pumped water meets discharge standards. These practices may include a reduction in pumping rates, the installation of silt curtains and/or baffles in the vicinity of exposed beaches to increase the flow path and residency time within each basin, and/or the use of dedicated TSS treatment systems such as the modular Actiflow Treatment plant that was used by AEM at its Meadowbank Mine to treat and remove TSS. Actiflow uses a combination of high capacity thickening and enhanced sedimentation using flocculants to remove TSS.

Similarly, diversion infrastructure will be put in place, and lined where necessary with rock or other liner material (half pipe or synthetic liners) to prevent erosion and degradation of the underlying permafrost. Based on experience gained at Meadowbank, AEM has learned that ditch construction in permafrost should be kept to a minimum. Excavating ditches in permafrost generally results in the exposure and subsequent melting of the permafrost underlying the excavated ditch including any

ice lenses encountered; causing the excavated channel to grow in an uncontrolled manner due to erosion and melting. AEM has learned to use natural topography to the greatest extent possible to collect flow in natural depressions that can then be used to collect runoff, reducing the amount of ditching required. Erosion caused by unlined diversionary ditches typically results in uncontrolled release of sediments through the permafrost degradation releasing sediment into the downstream receiving waters thereby undoing the purpose of the ditch.

AEM is proposing to design the diversion infrastructure to accommodate the peak runoff rate from a 1:100-year, 24-hour storm. Attempts will be made to avoid constructing ditches in ice-rich areas where thaw instability is a concern. A variety of mitigation measures are available where ice-rich areas cannot be avoided. For contact water ditches, mitigation may include providing training berms instead of, or in combination with, ditches, and lining and insulating channels with compact till or bentonite to prevent sedimentation and permafrost degradation. Where thaw-related impacts affect non-contact water ditches, special care will be taken to ensure linings comprise non-acid-generating and non-metal-leaching granular materials.

Prior to water management infrastructure construction, a review of the existing topographic and geotechnical conditions will be carried out to locate, to the extent possible, the channel alignments in favourable ground, with a ditch invert at or above the existing grade. If this cannot be achieved, the alignment will be located in-ground with shallow excavation into the overburden soil or rock. This may require the excavation and replacement of ice-rich soils with compacted till materials. The channels have been designed as oversized structures, which will allow for the addition of insulated channel lining materials where required.

The preliminary requirements of the diversion (non-contact) and collection (contact) ditches may be found in the Surface Water Management Plan (SD 2-6 – Section 5.2 and Figures 2 to 10). For practical purposes, drainage infrastructure with a minimum uniform base width of 1 m, channel slope of 0.5 %, 2H:1V side slopes, and depths adjusted to suit discharge requirements have been assumed.

As part of the environmental assessment of the Meliadine Project, AEM has conducted an impact assessment of the surface water diversion and lake dewatering activities associated with the mining. This assessment is presented in detail in Volume 7 – Aquatic Environment and Impact Assessment of the supporting documents to the Final EIS. The specific sections dealing with the impact associated with surface water diversion and lake dewatering is Section 7.3 – Hydrology and Section 7.4 – Surface Water and Sediment Quality. In summary, the assessment indicates that AEM believes that it can, with appropriate mitigation, manage these interactions and effects so that no lasting significant impact will occur on surface water quantity or quality as a result of the proposed Project activities.

The following Table 2-29 provides a tabular summary of the small ponds and lakes that will be impacted by the proposed development of the Meliadine Project.

Table 2-29 List of Waterbodies Impacted by the Meliadine Project

Watershed	Waterbody	Dewatering Volume (m ³) ^(a)	Pumping Location ^(b)	Pumping Capacity (m ³ /h) ^(c)	Notes
A	A54	40,400	Dewatered to A39	15	Converted into sump B7-S-02.
	A13, A12, A11, A10, A9	NA	NA	NA	Removed to implement Tiriganiaq Pit 1; assumed dewatering will not be required due to loss of watershed area.
	A39, A38, A35	NA	NA	NA	Removed to implement Tiriganiaq Pit 1 and Wesmeg Pit 2; assumed dewatering will not be required due to loss of watershed area.
	A37	NA	NA	NA	Removed to implement Wesmeg Pit 2; assumed dewatering will not be required due to loss of watershed area.
	A17, A58	NA	NA	NA	Covered by B7 WRSF.
	A8	1,500,000	A7	520	Dewatered to allow construction of dikes WM-D-01 and WM-D-02 under dry conditions and to allow construction of access road to B4 WRSF and Pump.
	A6	740,000	A1 through F-NC-01	255	Water level lowered by 1.0 m to allow construction of dike F-D-01 under dry conditions and to prevent water from entering F Zone Pit 3.
	A52	NA	A1 through F-NC-01	NA	Pumped to implement A45-2 WRSF.
	A53, A51, A50	NA	NA	NA	Removed to implement F Zone Pit 3; assumed dewatering will not be required.
	A19, A5, A4, A3, A2A, A2	NA	NA	NA	Removed to implement F Zone Pits 1 to 3; assumed dewatering will not be required due to loss of watershed area.
B	B39, B22, B19	NA	NA	NA	Covered by B4 WRSF; assumed dewatering will not be required (small size, therefore in-filled).
	B61, B62, B38, B37, B36	NA	NA	NA	Removed to implement Pump Pit 2; assumed dewatering will not be required.
	B4	942,000	Meliadine Lake	330	Ultimately covered by B4 WRSF, although first used to temporarily store water from underground workings.
	B30, B31, B32, B33, B9, B10, B33A	NA	NA	NA	Covered by B7 WRSF; assumed dewatering will not be required (small size, therefore in-filled).
	B5	1,170,200	D7	410	Converted to AP02; water level lowered, yielding a storage capacity of 220,700 m ³ .
	B28, B25, B8	NA	NA	NA	Covered by TSF; assumed dewatering will not be required (small size, therefore in-filled).

Watershed	Waterbody	Dewatering Volume (m ³) ^(a)	Pumping Location ^(b)	Pumping Capacity (m ³ /h) ^(c)	Notes
	B7	464,600	B6	160	Water level lowered by 1 m to construct the TSF.
E	E4	118,500	E3	40	Covered by B7 WRSF.
	E5	NA	B6	NA	Covered by B7 WRSF.
H	H18, H15G, H15E H15D, H15, H14A, H14, H13, H12, H11, H10, H9	NA	NA	NA	Covered by B7 WRSF; assumed dewatering will not be required (small size, therefore in-filled).
	H19, H16, H7, H6, H5, H4, H3, H2	NA	NA	NA	Covered by plant site pad; assumed dewatering will not be required (small size, therefore in-filled).
	H17	195,700	Meliadine	70	Becomes AP-01. Consider improvements to Lake H17 basin for seepage control with increase in water level based on site conditions.
	H20	NA	Meliadine	NA	
	J7	NA	J1	NA	
J	J8, J5, J4, J3, J2	NA	NA	NA	Covered by an infrastructure pad to host ore stockpile; assumed dewatering will not be required (small size, therefore in-filled).
Chicken Head (Discovery)	CH28, CH29, CH31, CH32	NA	NA	NA	Covered by the Discovery WRSF; assumed dewatering will not be required (small size, therefore in-filled).

a) The term NA indicates that a volume estimate is not available to calculate pumping capacity.

b) The term NA indicates that a pumping location is not application, since dewatering is not required.

c) The term NA indicate that no pumping capacity is required when no dewatering is required (NA in the pumping location column), or that a pumping capacity cannot be estimated when no lake volume is available (NA in the dewatering volume column).

Water will be withdrawn from each lake using the pump capacity listed above. The discharge piping will be heat traced and insulated, if required, and will be installed on a graded pipe bed with an installed vacuum break. This will allow the lines to be fully drained in the event of a prolonged pump outage. The pumping systems will be optimized as required based on the experiences gained during initial phases of the Project.

Dewatering may expose shoals composed of unconsolidated sediments, which may lead to local sedimentation within the impounded water. The introduction of sediments (total suspended solids or TSS) into the water column will depend on the type of material exposed, material properties, slope gradient, timing (e.g., ice cover versus open water conditions), prevailing weather conditions (e.g., wind speed and direction, wave action) and rate at which the waterbody is drawn down. Where underwater slopes are steep, these may be underlain by a thin layer of soft sediments overlying till or bedrock. Steep slopes are not anticipated based on bathymetry measurements from

the site. Nevertheless, slumping may occur as the waterbody is drawn down if steep areas are found to exist. Where underwater slopes are less steep, these may be underlain by thicker sequences of soft sediments overlying till or bedrock and may be prone to flow. It is not possible to accurately quantify areas that may be prone to slumping or flow other than in general terms.

The quality of water pumped from each waterbody will be monitored to verify that it is acceptable for release to the receiving environment. Where necessary, additional TSS control practices will be used to limit the amount of TSS reporting to the dewatering pumps and increase the amount of water released directly to the environment without further TSS management. These practices may include a reduction in pumping rates, and the installation of silt curtains and/or baffles in the vicinity of exposed beaches to increase the flow path and residency time within each waterbody, and limit the uptake of TSS laden water.

As a base case, approximately 60 % of total pooled water volume from each waterbody is assumed to be of suitable quality to permit direct discharge to neighbouring receiving environment without further TSS management. This estimate is consistent with other similar mining operations in the North requiring dewatering of mining areas. However, given the inherent uncertainties in TSS generation during dewatering, contingency scenarios of 50 % and 40 % direct discharge to the environment were also considered in the development of the water management plan. The approximate remaining water volumes and water levels within Lakes B7, B5, B4, A8, and A6 at 60 %, 50 % and 40 % dewatering are presented in Table 2-30 below.

Table 2-30 Lake Dewatering Levels

Lake	Original Volume (m ³)	Max Water Depth (m)	60% Dewatered Volume		50% Dewatered Volume		40% Dewatered Volume	
			Lake Volume (m ³)	Lake Level Lower By (m)	Lake Volume (m ³)	Lake Level Lower By (m)	Lake Volume (m ³)	Lake Level Lower By (m)
B7	852,510	5	341,004	1.17	426,255	0.91	511,506	0.71
B5	872,750	3	349,100	1.10	436,375	0.89	523,650	0.70
B4	753,510	2	301,404	0.68	376,755	0.52	452,106	0.41
A8	1,419,320	4	567,728	1.14	709,660	0.92	851,592	0.73
A6 ^(a)	839,260	4	335,704	1.20	419,630	0.94	503,556	0.74

a) A6 will not be fully dewatered. Water levels will be lowered by 1.5 m for the construction of F-D-01.

Since the waterbodies in the Project area are typically shallow, it is expected that TSS treatment will be required during dewatering, such as the treatment units used in other Northern projects (e.g., Meadowbank and Diavik). A treatment unit removes TSS by typically using chemical flocculants and fine sand to seed flocculent growth followed by high capacity clarification. The use of TSS treatment units is considered to provide the following advantages:

- Well proven technology in similar Northern environments, and thus low risk;
- Ability to operate year round ensuring that dewatering can continue year round, if necessary; and
- Opportunity for use on other dewatering phases of the Project.

Sludge from the clarifier will be disposed of within the footprint of the B7 waste rock storage facility so that drainage, if any, would report to contact water collection ponds. Similarly, any lake sediment that has to be excavated once each lake is dewatered will be similarly placed within the B7 waste rock storage facility.

Site contact water from the mine area will be collected in Attenuation Pond 1 (AP-01) located north of the plant site. Contact water collected within AP-01 will be used to satisfy mill process water make-up requirements, with any excess water treated, if required, and discharged at mine effluent. Reclaimed water from the TSF will also be available to meet the process water demand, with excess water being returned to AP-01 through a treatment plant. All attenuation ponds will be operated in a manner to minimize the amount of water stored within the facility during the open water period. This will limit water storage over the winter period, thereby maximizing the storage capacity available for the spring freshet.

Following completion of mining, the pits will be filled with water from Meliadine Lake over a period of about 10 years. The Tailings Reclaim Pond will remain in place until mining has been completed. At this time, excess reclaim water will be treated, if necessary, and pumped to AP-01 for discharge to Meliadine Lake or the Tiriganiaq Pit Lake.

Water management during closure and reclamation will involve maintaining surface water diversions to prevent clean runoff water from coming into contact with areas affected by the mine or mining activities. The water management facilities, including the dikes, attenuation ponds, water collection systems (sumps and ditches), and treatment plants (if necessary), will be required to remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions are acceptable for discharge of all contact water to the environment without further treatment.

All infrastructure that are maintained for mine operations, closure, and reclamation, including ditches and sumps, will be re-contoured and/or surface treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff, and to enhance the development site area for re-vegetation and wildlife habitat.

As described in the following section, all contact water will be intercepted and managed. At the beginning of mine life, there will be enough re-use of water to avoid any discharge to the environment.

2.6.1.9 Mine Dewatering

Mine dewatering consists of removing water from active pits and also keeping underground water levels below the working benches. Details of mine dewatering (flows, volumes, timing, etc.) are provided in the Surface Water Management Plan (SD 2-6, specifically Section 2.5 – Groundwater and Section 3.2 – Lake Dewatering). Details pertaining to groundwater are available in the Physical Hydrogeology Baseline Report (Volume 7, Section 7.2.2).

The two types of mining operations at the Meliadine Gold Project will present different types of water to be managed, namely: groundwater for the UG mine, and surface water for the pits. Ultimately, the management strategy will have the same philosophy: not releasing any contact water without making sure it meets the Water License and/or *Metal Mining Effluent Regulations* (MMER) limits. Only one MMER effluent is planned for the Project. All excess contact water collected will be ultimately directed to AP-01 to be reused as reclaim water in the process (after treatment for groundwater). Water quality will be monitored, and excess water from the overall water management system will be treated if needed before being discharged back to Meliadine Lake (regulated mine effluent discharge).

Tiriganiaq Underground Mine Dewatering

The proposed Tiriganiaq underground mine will extend to the deep groundwater flow regime beneath the permafrost. The mine is currently planned to extend to approximately 770 m below ground surface (bgs). For the Meliadine site, permafrost is estimated to be about 450 m bgs based on thermal data collected in the deep thermistors located on site (Volume 7, Section 7.2.2). The portion of permafrost where groundwater may be partially or wholly unfrozen, due to freezing depression point caused by groundwater salinity content, has been estimated to be at a depth of 350 m (Volume 7, Section 7.2.2).

Mine development will reach the unfrozen ground below the permafrost in Year -1 of mining. Brackish groundwater is expected to flow into the underground mine workings from this time until mine closure. Groundwater inflows are predicted to contain naturally elevated levels of chloride, sodium and calcium. Groundwater quality will not be suitable for direct discharge to the receiving environment. Groundwater will be used for drilling, as mixing water into the paste backfill, and for freeze control. The excess water will be sent to a membrane desalination plant that could be combined with an evaporation system to further increase brine concentration and decrease the volume of brine to be managed. AEM intends that saline underground mine water will be kept separate from other dewatering sources in order to minimize the overall cost of treatment. The desalination plant currently considered by AEM is expected to discharge 55 % of the plant inflow volume as treated water (based on the assumed feed water quality). The treated water is expected to have a chloride content of less than 1,000 mg/L. The treated effluent from the salt plant will be pumped to AP-01 prior to being discharged to Meliadine Lake or being re-used into the mill. The remaining 45 % of the inflow volume will consist of a concentrated brine (about 30 % salts). Options

for brine management were compared (see SD 2-1 Alternatives Assessment Report). The first option considered was to discharge underground inflows to the ocean (either directly or as a concentrated brine following treatment), and the second option was to treat the underground water, temporarily store the concentrated brine from the treatment process on site, and then pump this brine back underground at the end of mine life. Based on the considerations identified, the treat and store option has been provisionally identified as the preferred alternative; however, both options will be further evaluated during the feasibility design stage for the Project. This evaluation will include consideration of the potential environmental and social impacts associated with each alternative.

Permafrost is assumed to be virtually impermeable. Results of on-site hydraulic conductivity testing indicated that the competent rock, at all depths, is generally of low hydraulic conductivity (in the order of 3×10^{-9}). Three (3) faults were also considered to be of possible hydrogeological significance and were included in the conceptual model: the Lower fault zone, the Pyke fault zone, and the North fault zone.

Models (Volume 7, Section 7.2.2) indicated that the potential water inflows below the permafrost will range from approximately 420 m³/d to 640 m³/d. Methods used to determinate hydraulic conductivities and calculate inflow volumes are detailed in Golder Associates (2012c). Based on the estimated Total Dissolved Solids (TDS) profile, concentration of the inflow would range from 56,000 mg/L to 59,000 mg/L (see Table 2-31).

Table 2-31 Estimated Groundwater Inflow and Quality, Tiriganiaq UG Mine

Year	Approximate Depth (m bgs)	Estimated Inflow (m ³ /d)	Estimated TDS (mg/L)
-2 to 1	0-350	420	56,000
2 to 4	350-570	540	58,000
5 to 12	570-770	640	59,000

From: Volume 7, Section 7.2.2

In addition to that water, the underground operations will need around 1,200 m³/d of brine (12 % salt) for drilling and other mining operations. All the water in the underground mine will be directed to sumps where part of it could be re-used for operation, and the excess sent to surface via the designed UG water piping system. Once at surface, it will be sent to the desalination plant. The treated underground water will be directed to AP-01 to be subsequently reclaimed to the mill. The brine will be temporarily stored on site before being pumped underground at the end of mine life.

The numbers provided above are all estimates derived from field data collection, but limited in number, especially for the groundwater quality results. Collecting groundwater samples under the thickness of permafrost encountered at Meliadine site is very challenging. On AEM's behalf Golder Associates developed a model to predict groundwater quantity and quality taking into account both the available field data and data derived from literature at other underground mining operations

operating in and below permafrost conditions. Golder applied the precautionary principle to these projections given the limited data available; consequently this model will have to be validated as the underground development occurs. Volume and water quality will thus be monitored (in-situ and via the WestBay type groundwater well that was installed at the Meliadine by AEM in the summer of 2011) and accounted for in our adaptive management strategies. The groundwater monitoring program is detailed in the Water Management Plan (SD 2-6, specifically in Section 8 – Water Quality Monitoring Plan).

At this stage, AEM has assumed, and used in the Project design, a prudent assumption (using the precautionary principle) being that all underground dewatering waters pumped to surface should be segregated in their own containment pond, recycled back underground where possible with any excess being treated for TDS removal.

Open Pit Dewatering

None of the Project open pits is expected to intersect the deep groundwater regime below the permafrost or through-taliks below large lakes. The Discovery deposit is excavated entirely within permafrost using open pit mining methods and groundwater inflows are expected to be negligible. Portions of the Pump, Wesmeg, F Zone and Tiriganiaq open pits intersect dewatered lakes that have unfrozen groundwater within talik bulbs beneath them. Groundwater will flow from these taliks into the open pits. Predicted average inflows were generally low, ranging from 1 to 95 m³/day, with the exception of some stages of development of the Tiriganiaq and Pump pits where estimated inflows range from 5 to 280 m³/day. Average groundwater inflows to each of the pits are summarized as follows:

- Tiriganiaq: 3 to 18 m³/day (phases 1 to 3 of pit development);
- Wesmeg: 20 to 83 m³/day at pit 2; 2 to 6 m³/day at pit 3; and negligible at pits 1, 4 and 5;
- F Zone: negligible at pit 1; 2 to 33 m³/day at pit 2; and 1 to 94 m³/day at pit 3;
- Pump: 18 to 125 m³/day at pit 1; and 5 to 130 m³/day at pit 2; and
- Discovery: negligible.

Other water contribution to the pits will be from precipitation runoff. Details on the associated numbers, calculations and water management strategies are provided in the Surface Water Management Plan (SD 2-6, specifically in Section 5.1). Table 2-32 summarizes the anticipated pit water inflows and the required pumping rates for each pit.

Table 2-32 Estimated Pit Inflows and Required Pumping Rates

Pit	Drainage Area (ha)	Pump Rate (L/s)
Tiriganiaq Pit 1	84.9	51
Tiriganiaq Pit 2	29.1	17
Wesmeg Pit 1	4.2	2
Wesmeg Pit 2	49.7	30
Wesmeg Pit 3	14.5	9
Wesmeg Pit 4	4.9	3
Wesmeg Pit 5	3.6	2
Pump Pit 1	112.2	67
Pump Pit 2	22.2	13
F Zone 1	26.4	16
F Zone 2	20.1	12
F Zone 3	27.5	16
Discovery	73.3	44

Sumps will be located at the bottom of the pits and be designed and moved as needed to effectively collect and manage pit waters as pit development occurs. The preliminary storage and pumping requirements for sumps and ponds is based on the water management design criteria p (i.e., the average spring melt over a 30-day period and the 100-year spring melt over a 90-day period).

Water in the pit sumps will be allowed to settle before being pumped to the TSF using insulated and heat-traced HDPE pipes designed for that purpose.

2.6.1.10 Water Monitoring Program

Water quality monitoring is an important part of the site water management plan to verify the predicted water quality trends and conduct adaptive management should differing trends be observed. This section outlines the water quality monitoring concept, which will be further defined as the Project advances.

Water quality monitoring will be initiated at the pre-development stage and will continue during construction, operation, closure and post-closure. Monitoring will occur at two levels:

- **Regulated monitoring:** refers to the monitoring requirements that will be established through the water licensing process for the Project. It includes locations where water will be sampled and analyzed, and the data collected will be reported to authorities on a regular basis following the schedules established through the MMER and the water licensing process; and

- **Verification monitoring:** refers to an internally defined monitoring program that will be established to monitor the contribution of specific infrastructure components to the overall site water quality, and to apply targeted adaptive management strategies where required to meet the established performance standards at compliance (or regulated) monitoring points. These include locations where the presence of water will be monitored and, when present, samples may be collected and analyzed for parameters of interest for the purpose of internal verification. Data collected as part of the verification monitoring program will be used by AEM in the management of water on the mine site and the mine roads, they will not be reported to the authorities.

Regulated monitoring is expected to start following issuance of the Project water licences and when the volume of water discharged to the environment exceeds the MMER regulated thresholds. Regulated monitoring will be carried out at the frequency and for the parameters specified in the MMER and in the Type A and B water licences for the Project. Parameters for the Verification monitoring program will include those that are believed to be key parameters for the evaluation of site wide water quality during operations for the Project. The list of parameters will be developed through the water licensing process for the Project.

The proposed surface and groundwater monitoring program is presented in Section 8 of the Surface Water Management Plan (SD 2-6). Table 2-33 to Table 2-35 list the monitoring frequencies and analytical parameters for the construction, operation and closure periods. Additional monitoring of small lakes downstream of mine infrastructure is discussed within the Aquatic Effects Monitoring Plan for the Project (SD 7-3).

Table 2-33 Construction Period Water Quality Monitoring Program

Monitoring Location	Monitoring Frequency	Monitored Parameters
Regulated Monitoring		
Lake dewatering ML-1, B6, B34, A7	Daily during ice-free months, initiated upon dewatering.	TSS, turbidity, pH.
Meliadine Lake Discharge from AP-01	Weekly during ice-free months, when discharge occurs.	Temperature, conductivity, alkalinity, pH, suspended solids, MMER metals, cyanide, chloride, petroleum hydrocarbon.
Verification Monitoring		
Ponds AP-01, B4	Monthly during ice-free months, initiated upon construction of the pond.	Temperature, conductivity, alkalinity, pH, suspended solids, turbidity, metals, explosives by-products, petroleum hydrocarbon.

Monitoring of the water reporting to individual sumps reporting to AP-01 may also be included in the verification monitoring program as part of an adaptive management strategy.

Table 2-34 Operation Period Water Quality Monitoring Program

Monitoring Location	Monitoring Frequency	Monitored Parameters
Regulated Monitoring		
Meliadine Lake Discharge	Weekly during ice-free months, when discharge occurs.	Temperature, conductivity, alkalinity, pH, suspended solids, MMER metals, cyanide, chloride, petroleum hydrocarbon.
Lake dewatering A7, A1	Daily during the period of dewatering.	TSS, turbidity, pH.
Verification Monitoring		
Ponds B4 (Until Year 3), AP-01, AP02, and TSF; sumps B4-S, WM-S, FZ-S, Disc-S	Monthly during ice-free months when the pond is active.	Parameters of interest.
Open pit, waste rock, TSF berm seepages	Monthly during ice-free months, when water is present.	Visual Inspection of rock storage piles, open pit sumps and tailings management facility for seepages. Analysis: parameters of interest.

¹ Monitoring of the water reporting to individual sumps reporting to AP-01 may also be included in the verification monitoring program as part of an adaptive management strategy.

Table 2-35 Closure Period Water Quality Monitoring Program

Monitoring Location	Monitoring Frequency	Monitored Parameters
Regulated Monitoring		
Meliadine Lake discharge	Weekly during ice-free months, when discharge occurs.	Temperature, conductivity, alkalinity, pH, suspended solids, MMER metals, cyanide, chloride, petroleum hydrocarbon.
Verification Monitoring		
Open pits: Tiriganiaq, Wesmeg, Pump, F Zone, Discovery	Annual over the flooding period, during the ice-free months.	Parameters of interest.
Ponds AP-01, AP02, TSF	Monthly during ice-free months, when the pond is in operation.	Parameters of interest.
WRSF Seepages, TSF dike toe seepage	Monthly during ice-free months, when water is present.	Visual Inspection of rock storage piles and tailings management facilities for seepages. Analysis: parameters of interest.

2.6.2 Rankin Inlet Infrastructure – Fuel Storage, Port Facility and Laydown Area

As part of the Meliadine Gold Project, AEM is proposing to construct, operate, maintain and ultimately decommission the following structures and facilities to be located in Rankin Inlet to provide logistical support to the Project:

- A spud barge (floating dock) to be located at the existing Itivia area in Rankin Inlet to serve as a dock for offloading containers, materials and equipment from barges;
- A fuel tank farm to be constructed at Itivia to store up to 80 million litres of diesel fuel in 8 x 10-million litre tanks;
- A laydown yard area (14 hectares) to be constructed at Itivia to store incoming and outgoing containers, materials and equipment pending truck delivery to the Project site by road;
- A bypass road around the community to allow fuel, sea containers, materials and equipment to be transported between the Itivia area and the Meliadine site without passing through the built up areas within Rankin Inlet;
- The first two (2) kilometres of the AWAR between Rankin Inlet and the Meliadine site, located on municipal land;
- The first two (2) bridges on the AWAR (over the Char and Meliadine Rivers) located on municipal land; and
- Reclaimed rock quarry (R19) located on municipal land.

Figure 2-25 illustrates the proposed infrastructure for the Meliadine Project in Rankin Inlet area.

Early in the Project, AEM consulted with community leaders in Rankin Inlet regarding possible locations for siting of the proposed port facilities in Rankin Inlet. It quickly became evident that the community had a strong preference for placing AEM's proposed port facilities in the Itivia area of Rankin Inlet, adjacent to the community's sealift facility. AEM was also informed that Rankin Inlet in conjunction with the GN was looking at possible locations for an ultimate deep water wharf in Rankin Inlet. Consequently, based on this advice, AEM has proposed a floating dock facility in Melvin Bay in the Itivia area of Rankin Inlet. No other locations were considered based on this consultation. Nevertheless, an alternative assessment was realized (see SD 2-1) for the FEIS including a potential port project proposed by the Rankin Inlet Harbour Corporation in January 2014. While this option might have been a viable alternative for AEM should the facilities have been already in place, the timeframe and capital expenditures associated with the construction of a deep sea port make this option less interesting when considering the schedule of the Meliadine Project. That said, should a third party be interested in promoting the construction of a private port, AEM may be interested in using such facilities.

AEM has conducted an oceanographic assessment of this site and, based on this assessment, is confident that the Itivia site is technically feasible over the anticipated Project life, including consideration for extreme temperatures, ice thickness, seismic hazards, and water level change in

the immediate area (Melvin Bay). The floating dock will accommodate the projected changes in water level that are currently foreseeable. Based on its studies, AEM is confident that it has the data available to successfully design and operate a floating dock facility in this area. Consequently, it is AEM's view that the precautionary principle has been met in proposing this floating dock for this location and use.

It is known that isostatic rebound occurring in the Hudson Bay area is, and will over time, allowing the land level to rise with the side effect that water levels may decrease, making passage through existing navigable waters more difficult. Isostatic rebound is known to be a very slowly occurring event and will likely cause water levels to change in the order of inches and not feet over the projected life of the Meliadine Project. Consequently, AEM is of the opinion that isostatic rebound will not substantially impact shipping or offloading at the Itivia facility over the Project life.

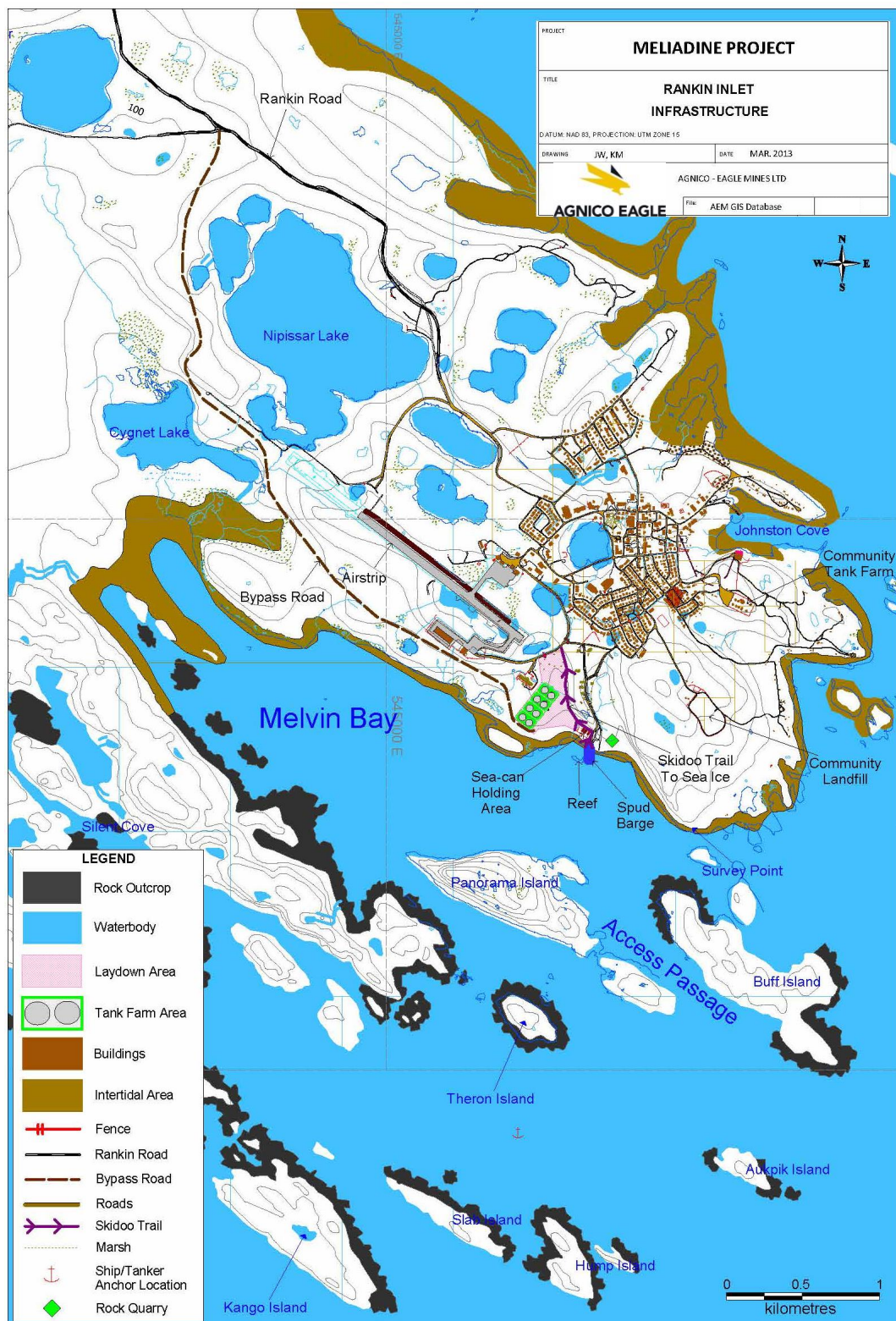


Figure 2-25 Proposed Meliadine Project Infrastructure near Rankin Inlet

During the construction and operation of the proposed Project, the majority of the materials and supplies will be transported to Rankin Inlet by seasonal sealift. The material will arrive in sea containers (sea cans) carried by cargo ships/vessels or on loaded barges towed by tugs.

In Rankin Inlet, the established harbour at Itivia will be used to receive loaded ships/barges from Bécancour, Québec, or other Canadian eastern ports during the open water season (typically, mid-July through late October). It is expected that the majority of sealift cargo will originate in the Bécancour port near Montreal and be carried down the St. Lawrence, around the Labrador Coast, and then through the Hudson Strait into Hudson Bay to arrive in Rankin Inlet. These vessels (ships), tankers and barges will be owned and operated by AEM's contracted shipping company and not by AEM. At our Meadowbank Mine, we are using the Woodward Group to ship our annual fuel supply, and Nunavut Sealink (NSSI) to ship our dry goods and equipment. A total of 4 to 6 vessels annually will deliver dry goods (estimated at 40,000 tonnes per year) and 4 to 6 tankers, diesel fuel (estimated at 122 million litres per year). These will provide equipment, supplies and fuel for a full year of Project operation. Hazardous and dangerous goods cargo is included in the above total. As stated in the Hazardous Materials Management Plan (SD 2-13), all hazardous materials will be delivered to site by commercial carriers in accordance with the requirements of the Canadian *Transportation of Dangerous Goods Act* (TDGA). Details on the nature and estimated needs for those materials are available in Section 2.6.3.5 below and in the Hazardous Materials Management Plan (SD 2-13). A section of the Shipping Management Plan (SD 8-1) also discusses the hazardous materials shipping procedures.

AEM gained extensive experience in shipping fuel and dry cargo to the Meadowbank Gold Mine since its construction began in 2008 and commercial production in 2010. The procedures for offloading equipment in the Itivia area will largely be similar to those currently used in Baker Lake for cargo being shipped to the Meadowbank Gold Mine.

The ship(s) will be located offshore in deep water (approximately 3 km from Itivia) where they will be offloaded onto barges for the transport of materials to the Itivia. Sea cans, large equipment, machinery and vehicles will be lightered onto the barges for transport through the access passage using tugs before being docked alongside the floating dock (the spud barge) located at Itivia. During lightering onto the barges, attention will be directed to ensuring the barges are secured alongside or anchored, with due consideration being given to the prevailing and expected wind, weather, and tide conditions. The tug/barges used to ferry the dry cargo to shore will be highly manoeuvrable and capable of transiting the access passage with its changing current patterns. All ships, tugs and tankers will be equipped with electronic navigational aids. Navigation will be during daylight hours and as much as possible with good visibility. Traffic through the access passage will be coordinated through communication between the tugs to avoid shipping conflicts and to ensure safety. AEM is not planning to install for any new water based navigational aids on the shipping approaches to Rankin Inlet but will take advice on whether any new aids are required from the shipping contractor once such a contract has been let.

Most materials will arrive in sea cans, which will be stacked in the Itivia laydown area or immediately moved to mine site. At the end of the shipping season, or when all the dry cargo has been received by AEM for the year, outgoing cargo will be loaded on the barges for the return trip to southern ports.

AEM will have a floating dock facility (spud barge) dedicated to the Meliadine Gold Project located at Itivia (see Figure 2-26). This floating dock will consist of a barge that is connected by cables to the shore while the other end is anchored in place by two “spuds” onto the seabed which allow the barge to rise and fall with the tides. The barge will be connected to the shore using a ramp or removable bridge section. A portable crane (capacity of about 200 t) will be set up on the floating dock and used to lift the sea cans and other containers and equipment directly off the delivery barges, and place them onto trucks. The barge model anticipated for that facility would be a barge series 1500b, type deck/bulk (length 76 m, breath 17 m, deadweight 2,190 t). The gateway to link the barge to the beach will be about 6.5 m wide by 21 m long.

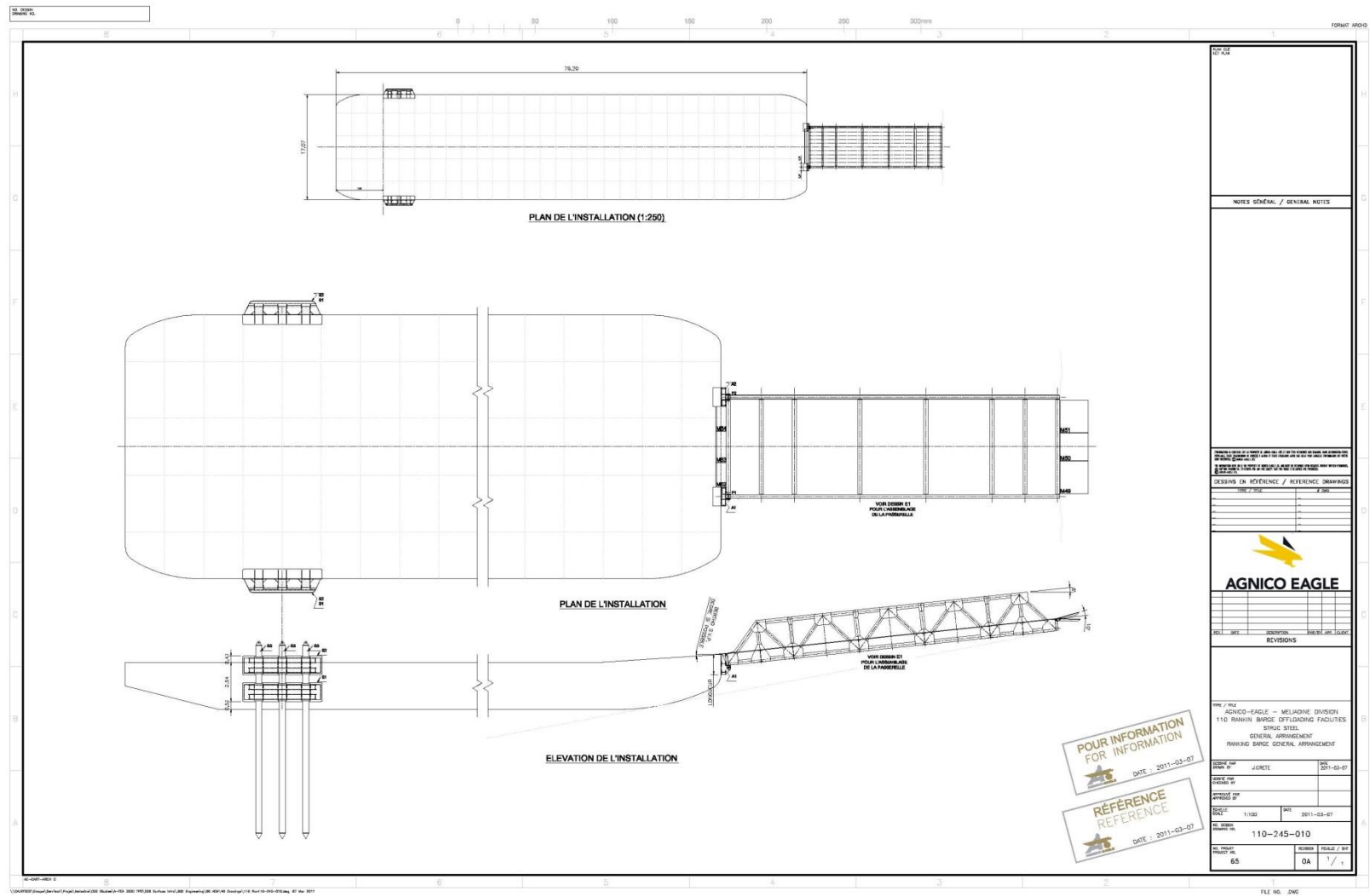


Figure 2-26 Conceptual Design of the Itivia Harbour Spud Barge

Marine baseline environmental data were gathered at Itivia by Nunami Stantec (2012). This study included bathymetry, water and sediment quality, aquatic ecology and fisheries values in Itivia harbour and reference sites in Melvin Bay, as well as a desktop study on marine mammals and birds. Results indicated dominant substrates being cobble and/or gravel in the near shore area, including smaller substrates (gravels and fines) on a gentle slope at the proposed spud barge location. Tidal ranges in Itivia harbour typically range from 3 to 6 m depending on the time of the day and the lunar cycle (Nunami Stantec 2012).

The harbour and Melvin Bay are relatively shallow with maximum depth in the spud barge footprint reaching 6.6 m (Nunami Stantec 2012). A large rocky reef is present about 125 m offshore of the high water mark near the proposed spud barge location; this reef was taken into account when localizing the infrastructure. A bathymetric profile was developed by Nunami Stantec (2012) and presented in their report.

Geotechnical studies (rock and sediments) were not required for the dock infrastructure as this will be a floating dwarf with minimal permanent elements.

AEM does not anticipate nor has it been approached by any third party requesting use of the proposed Meliadine floating dock system. AEM is designing the facility solely for use in supporting the sealift needs for the Meliadine Project.

2.6.2.1 Rankin Inlet Fuel Storage Area

AEM will need approximately 122 million liters of diesel fuel per year for use at the Meliadine Project²⁶. Annual fuel shipments to Rankin Inlet will come during the open water season (typically, mid-July through late October). The fuel will be shipped to Rankin Inlet using a licensed commercial fuel shipping company who will likely ship the fuel from an eastern North American seaport in a tanker ship that will anchor offshore in Hudson Bay. The tanker ships will be double hulled, have segregated ballast compartments and would be able to carry up to 20,000 m³ of diesel fuel.

The anchor point will be the same general location than the one for the dry cargo vessels (see Figure 2-25). A small tanker or fuel barge towed by a tug will then be used to lighter the fuel to the Itivia Oil Handling Facility (OHF or tank farm). Ship-to-ship transfer of fuel will occur at the anchor point from the larger tanker to a smaller tanker that can then navigate the access passage into Melvin Bay and the Itivia area. For ship-to-ship transfers, the ships will be secured alongside or anchored. The carrying capacity of the small tankers will be either 7,300 m³ or 10,500 m³ (based on the small tanker configurations currently used by Coastal Shipping Ltd (Woodward's Group)). Again, all ships, tugs and tankers will be equipped with electronic navigational aids. Navigation will be during daylight

²⁶ Details on fuel consumption and storage are available at Section 5.6.9.1.

hours and with good visibility. Traffic through the access passage will be coordinated through communication between the tugs and/or tankers to avoid shipping conflicts and to ensure safety.

Fuel will then be pumped from the small tanker or barge to the Meliadine Project tank farm using a floating pipeline at a rate of about 400 m³/h. A 300-500 m²⁷ floating pipeline will connect to a shore-based pipeline for transfer of fuel to the tank farm. Communications between the shore and the small tanker will be maintained throughout to ensure the safe transfer of the diesel. Contingency measures related to the transfer of fuel are described in the Oil Pollution Emergency Plan (SD 8-2).

The fuel storage tanks capacity in Rankin Inlet will be 80 ML stored in 8 x 10-million litre capacity tanks. The tanks will be field-erected steel tanks built to API-650 standards. They will be situated in a lined and bermed containment area capable of containing 110 % of the contents of the largest tank. The storage tanks and fuel-dispensing systems will be constructed in accordance with current regulatory requirements and fire regulations:

- National Fire Code 2010;
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* – 2008; and
- Canadian Council of Ministers of the Environment “Environmental Code of Practice of Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products – 2003 (PN1326)”.

The OHF will be constructed and operated in accordance with Transport Canada Arctic Waters Oil Transfer Guidelines (TP 10783E) and Oil Handling Facility Guidelines (TP 12402E). The OHF supervisors will receive training from a certified response organization and as a result will be able to respond to all incidents that might occur at the OHF.

Test pits and analyses were done in the area selected for the tank farm location in Rankin Inlet (Genivar 2012). The objective was to determine soil structure, thickness and characteristics. Grain-size analyses were done in laboratory and indicated that soils in the tank farm area are gravel and sand with some silt to silty sand with gravel (LVM 2012). Bedrock was reached in 3 out of 5 test pits at depth varying from 0.8 m to 2.2 m. The other two (2) excavations were stopped due to permafrost at 1.3 m and 0.85 m.

AEM has initiated discussions with the Government of Nunavut Department of Community and Government Services (CGS) covering the lease of approximately 14 ha of airport lands for the proposed tank farm and laydown yard area near Itivia as show in Figure 2-25.

²⁷ The anchoring location will vary based on a number of factors such as tide, wind and draught of the small tanker, which will call for the need of a longer or shorter floating pipeline.

From Rankin Inlet, fuel will be transported on a year-round basis by highway class tanker trucks to the Meliadine site via the bypass road and AWAR. Tanker trucks will be loaded on the fuel dispensing pad at rates of approximately 50 m³/h. Fuel loading rates for small vehicles will be approximately 3 m³/h. The facility will be completed with temperature compensated metering system to manage fuel flows, safety valve to prevent loss of fuel from the fuel facility, fire extinguishers, building heating and ventilation systems, building lighting systems and control systems for the pumps. These facilities will be linked to the existing power supply grid in existence within Rankin Inlet.

Spill contingency planning is described in details in the Spill Contingency Plan (SD 2-16) and Oil Pollution Emergency Plan (OPEP; SD 8-2). The first step in spill management is to take actions to prevent spills from occurring. The above plans further describe the actions to be taken in case of a spill of fuel in order to ensure a quick, safe and efficient response. Plans cover spills on land, on water, on snow and ice, as well as the means of disposal of the contaminated materials. The OPEP specifically centres on the activities in ship-to-shore transfer of fuel from a small tanker delivering fuel to the proposed AEM Rankin Inlet tank farm. On-site personnel at Itivia will be expected to respond to minor spill incidents that can be contained and cleaned up without assistance, while the AEM Emergency Response Team (ERT) will respond to larger spill.

2.6.2.2 Rankin Inlet Storage Facility

Upon arrival, materials and supplies will be offloaded and placed onto trucks which will either drive directly to the mine site via the bypass road and AWAR, or transport the material to a laydown yard located in Rankin Inlet for temporary storage. The procedures for offloading equipment in the Itivia will largely be similar to those for the Meadowbank Gold Mine at Baker Lake.

As discussed before, a drained area of approximately 14 ha will be established on land leased from Nunavut airport to act as a laydown yard for the incoming freight.

AEM is not proposing to construct, lease or operate any permanent warehouse or administration buildings at this wharf storage site. Materials will be kept within the seagoing containers in the storage yard pending truck transfer to the Project site. AEM currently leases an office within the centre of Rankin Inlet and the AEM staff overseeing the annual sealift operations will be based from this office site.

AEM currently does not plan to construct any bulk cement storage facilities in Rankin Inlet. Current planning has cement that will be used in construction and for underground mine backfilling will be delivered to site during the annual sealift in 1 tonne tote bags loaded in shipping containers. The containers will then be transferred by truck to the Meliadine site for storage.

AEM does not plan on there being any non-Project use of this Rankin Inlet docking facility or storage yard, and no other outside group has asked for such access. This facility is only being designed with the Meliadine Project in mind. AEM would consider such third party approaches if and when they

come forward, but any such use would have to be judged on its own merits and be within the constraints of the applicable authorizations/permits/licenses that may be granted for this facility by the municipality, GN and other regulatory bodies.

Communication at the dock and storage yard will be via two way portable radios and by cell phone. These systems already exist in Rankin Inlet and thus AEM is not proposing the addition of any new communication systems for this proposed facility. AEM does not expect that there will be any major power requirements at this site. Most of the activity during sealift will occur in daylight during the open water season and thus minimal external lighting is thought necessary. When necessary external lighting will be supplied by portable diesel fired lighting plants that are stored when not in use. Consequently no permanent power generating equipment is planned for the dock and wharf storage yard.

AEM does not see any need for year round security at this facility nor does it plan to fence the storage yard. During the sealift season, arriving materials will be kept within their arriving locked seagoing containers, and then stored within the storage yard pending truck transport to the Meliadine site. The intent is to transfer this material to the mine site as quickly as possible. Priority will be given to incoming hazardous materials such as reagents, chemicals, explosives, etc. with the intent that these be transferred immediately to their secure storage facilities at the Meliadine site. In the event that such hazardous materials must be kept in Rankin Inlet, AEM will arrange for a human security presence at the storage yard until the material is transferred. The objective is to ensure that these materials are protected from theft or vandalism while being offloaded.

At the end of Project life, it is AEM's intent that all of these facilities in Rankin Inlet will be removed and the site be fully reclaimed (the dock, the wharf storage yard and the fuel storage facility). The floating dock is a portable facility and will be removed for use elsewhere. As part of the Meliadine EIS, AEM commissioned Golder Associates to prepare a preliminary Mine Closure and Reclamation Plan (SD 2-17) for the Meliadine Project. This plan includes reclamation planning for the proposed AEM facilities to be sited within Rankin Inlet, including the port and fuel storage facility.

2.6.2.3 Rankin Inlet Bypass Road

Freight and fuel will be trucked from the Itivia laydown yard area to the Meliadine site via the AWAR. Employees arriving at or departing the airport will also be transported by bus using the bypass road. AEM has initiated discussion with the Municipality of Rankin Inlet on a new road link to allow personnel, freight and fuel transportation to the Project site bypassing the residential areas of Rankin Inlet. A total of three (3) bypass road options are being considered by AEM. The option most favoured by the community is known as Option 3 and involves construction of a new road that follows a pathway that would travel south of the Rankin Inlet airport runway and then skirts south of Nipisar Lake joining up with the existing Hamlet road to the Char River northeast of Nipisar Lake. The proposed alignment of this bypass road is presented in Figure 2-27.

AEM is currently working on a trade-off study looking at these three bypass road options and will continue to work with the municipality to select the best overall option. For the purpose of the environmental assessment, AEM recommends using the Option 3 proposed bypass road alignment. It is important to note that these discussions are still ongoing and consequently final design and operational details have not yet been completed. The road would lie on lands managed by the Government of Nunavut (both land managed by the GN airport authority and land managed by the Municipality of Rankin Inlet GN – GCS). AEM anticipates that this road would be a gravel all-weather road built to the same design standards as the proposed Phase 2 AWAR between Rankin Inlet and the Meliadine site, specifically a 2-lane road with a 8.0 m wide running surface. The full design standards are outlined later in this document in Table 2-49. AEM anticipates that the road would be built by AEM. AEM anticipates that ultimate ownership of the road would be the Hamlet of Rankin Inlet but during the mine life it would be operated and maintained by AEM. AEM further anticipates that during the mine life the road would be operated as a private road but without access control gates and with municipal access on an as needed basis. Consequently, public access would only be restricted via signage and education. It is important to note that these operational details have not been finalized with the Hamlet nor the GN and thus are subject to ongoing discussions.

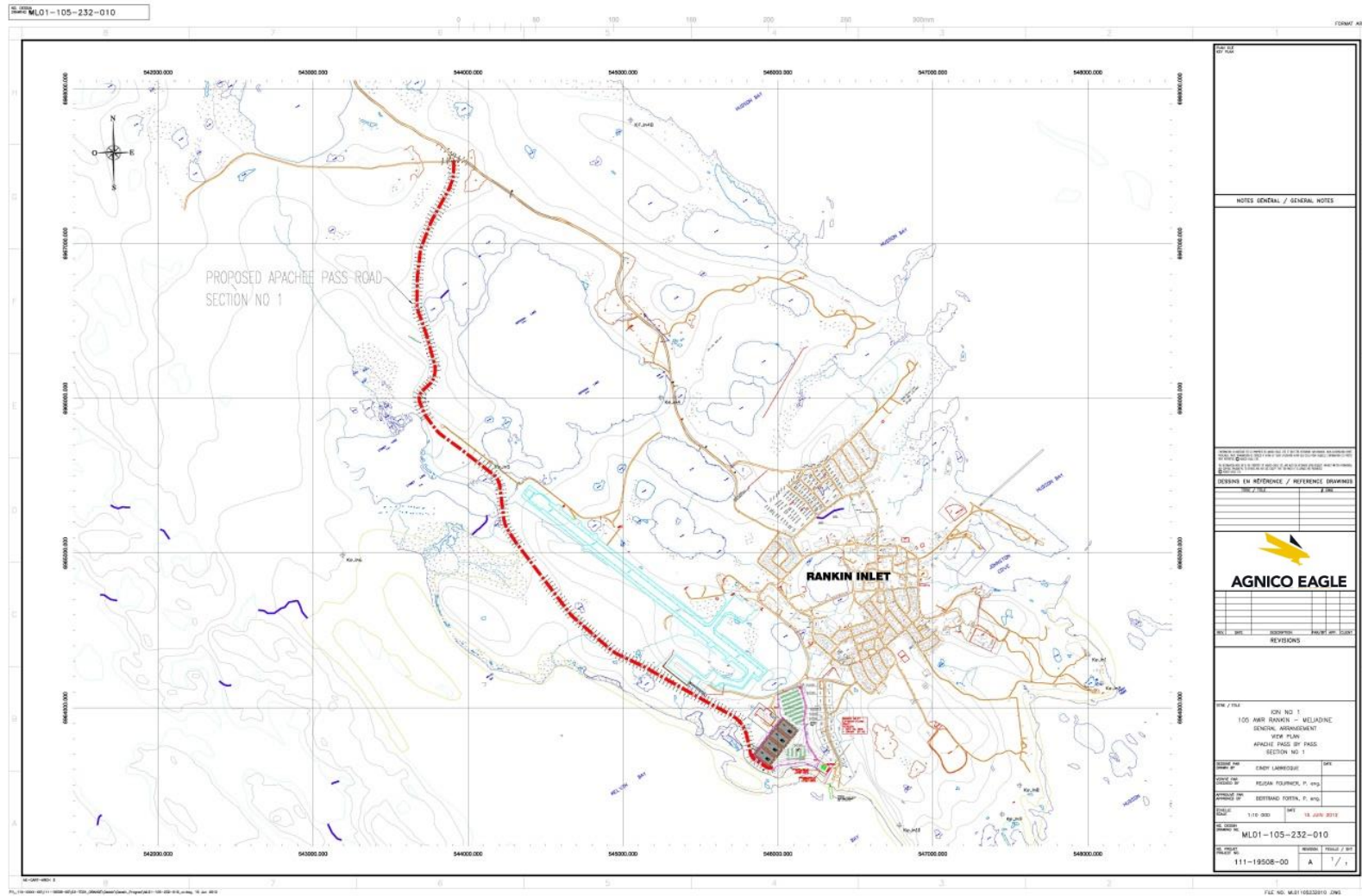


Figure 2-27 Bypass Road Alignment between Itivia Area and the All-weather Access Road to the Meliadine Project

2.6.3 Waste Management Facilities

2.6.3.1 Waste Rock Storage Facilities

The total tonnes of overburden and waste rock to be generated by open pit mining during the mine life will 430.3 Mt, broken down as follows:

- Overburden: 57.0 Mt
- Waste rock: 373.3 Mt

No additional waste rock will be generated by proposed construction activity.

Materials geochemistry was summarized in Section 2.6.1.4 and described in details in SD 6-3 Geochemistry Baseline Report (Sections 3.0 to 5.0). The waste rock and overburden from Meliadine Project are not considered to have ARD potential (SD 6-3 Geochemistry Baseline Report, Section 6.0).

An alternatives assessment analysis process was followed in determining the best locations for managing this material. The assessment tables used for this exercise are provided in the Mine Waste Management Plan (SD 2-8). A series of criteria was used to characterize the different waste rock and overburden management locations with reference to environmental, social, technological and economic aspects. Table 2-36 summarizes the criteria selected for that analysis.

Along with those criteria, site conditions (climate and permafrost), as well as material geochemistry, were taken into consideration when designing the waste rock and overburden piles. Parameters were adjusted to achieve better configuration, improve overall stability and/or reach minimal footprint. In light of all this information, a set of parameters was proposed and used in designing the piles. Details on the storage areas are provided in the Mine Waste Management Plan (SD 2-8).

The geochemical characterization of the waste rock expected to be generated by mining at Meliadine is described in detail in the report entitled “Geochemical Characterization of Waste Ore, Ore, Tailings and Overburden at the Meliadine Gold Project, Nunavut” included in Volume 6 (FEIS SD 6-3 Geochemistry Baseline Report). This study concludes that the waste rock expected to be generated at Meliadine will largely be non-acid generating, with the possible exception of Discovery. Most rock piles will not require means to prevent oxidation. The Discovery waste rock pile is not expected to generate acidic drainage in the short to medium term. The long-term ARD potential of Discovery waste rock in the active layer is uncertain. The buffering capacity and sulphur content of Discovery waste rock and rock pile contact water quality will be monitored during operation. This waste rock will be managed according to its ARD potential.

Kinetic tests completed on all waste rock types and at various scales show that drainage water quality is expected to meet MMER monthly mean effluent limits. Waste rock pile seepage and contact water should be managed in a way to capture water and monitor water quality prior to

discharge. Suspended solids and explosives residues (ammonia and/or nitrate) have not been assessed in this study but can be present in mine rock contact water.

Consequently, no special consideration needs to be taken regarding long-term climate change when addressing the potential for acid generation from the proposed waste rock storage facilities at the Meliadine site, except for Discovery where the upper layer hosting the active thaw depth will be managed to contain only non acid-generating waste rock. AEM has not conducted any studies of the chemistry of the frozen groundwater from joints and fractures in the permafrost under the proposed waste rock disposal areas, nor is this thought to be an issue for this specific site.

The study also concluded that the overburden from within the pit outlines is non-acid generating and does not require means to prevent oxidation (SD 6-3 Geochemistry Baseline Report, Section 5.0). Metal release under laboratory conditions is low. Leachate concentrations in overburden are generally lower than waste rock and all meet MMER monthly mean limits (SD 6-3 Geochemistry Baseline Report, Section 5.0). Waste rock and overburden have compatible geochemical characteristics such that they could be managed together in the same facility.

The proposed waste rock and overburden pile configuration was developed based on the following criteria (see also the Mine Waste Management Plan SD 2-8):

- Specific gravity for the waste rock of 2.82 t/m^3 with a swell factor of 1.5, resulting in a conversion factor between waste rock tonnage and volume of 1.88 t/m^3 ;
- Dry density for the overburden of 1.7 t/m^3 with a swell factor of 1.2, resulting in a conversion factor between overburden tonnage and volume of 1.42 t/m^3 ;
- Preliminary minimal distance from the toe of a waste rock pile to open pits to be respected for the design was assumed at 50 metres²⁸;
- The footprint was to provide adequate storage capacity for the existing need, based on the last LOM (February 2012); and
- Storage locations were selected to provide the shortest possible haulage distance from the open pits, where practicable, and in consideration of the mineral potential (or not) of the underlying ground.

²⁸ The distance of 50 m was selected as thick layers of soil may exist above the bedrock in some open pit areas, and a sufficient setback from the pit edge is required to accommodate for potential stability issues. This setback distance may be modified, when more detailed data on the foundation conditions become available. It is expected that the location of the pile will not be moved, but the footprint of the pile may be increased or decreased.

Table 2-36 Aspects Described in Waste Rock and Overburden Management Areas Selection Process

Environmental Aspects		
Potential to affect groundwater		
Potential production of contaminating agents	Watersheds	Number of affected watersheds Location within the watershed Area of affected waterbodies
	Fish habitat	Distance from Meliadine Lake Aquatic habitat loss (habitat units) Diversions Stream crossings Potential effect on surrounding aquatic habitat Distance from a known spawning ground
Terrestrial habitat and species	Footprint	
	Vegetation/habitat	Presence of uncommon vegetation Potential effect on surrounding vegetation
Social Aspects		
Traditional Use	Archeological sites, cultural or heritage assets	
Technical Aspects		
Site access		
Surface water management requirement		Number of sumps (surface runoff) Potential length of ditches or berms
Expansion possibilities		
Consequence of failure		
Economical Aspects		
Capital cost		
Operating costs		Distance/height
Closure and reclamation costs		

The majority of this material will be stored within four (4) waste rock storage facilities (WRSF):

- The B7 WRSF (East, South and West) located in a U-shape around the Tailings Storage Facility (TSF), north of the Tiriganiaq deposit;
- The B4 WRSF located west of the Wesmeg and Pump deposits;
- The A45 WRSF located south of the F Zone deposit; and
- The Discovery (DE) WRSF located east of the Discovery deposit.

The piles will be designed and operated to minimize the impact on the environment and considering geotechnical stability and geochemical considerations. The material will be generally transported by truck and end-dumped, following a sequence developed for the operation. Waste rock and overburden will be managed within the same area.

Although not a required for the management of metal leaching and ARD potential, waste rock and overburden will be disposed on land and in a manner that encourages total freezing. Based on similar projects in this region (e.g. Meadowbank), it is expected that the material within each piles will freeze within two years of placement, but this needs to be confirmed with thermal analyses. Several thermistors will be placed during operation to confirm the rate of freezing for the various material cells and modify the management if required.

Tonnage details and destination of waste rock and overburden materials for each pit mining area are provided in Table 2-12. A summary of where material will report to is schematized in Table 2-37. Finally, the yearly management of overburden and waste rock material is provided in Table 2-38.

Table 2-37 Waste Rock and Overburden Material Management Summary

Mining Area	Waste Rock Management Facility – Tonnage (Mt)				Total Tonnage (Mt)
	B7	B4	A45	DE	
Tiriganiaq OP	164.1	14.1			178.2 (41 %)
Tiriganiaq UG	3.1				3.1 (<1 %)
Discovery				98.9	98.9 (23 %)
F Zone			34.3		34.3 (8 %)
Pump		39.1			39.1 (9 %)
Wesmeg		79.7			79.7 (18 %)
Total Tonnage (Mt)	167.2 (38 %)	132.9 (31 %)	34.3 (8 %)	98.9 (23 %)	433.3 (100 %)

Table 2-38 Meliadine Waste Rock and Overburden Yearly Production and Management

Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
B7 WRSF																	
Overburden (Mt)			17.0	0.4									0.7				18.1
Pit Waste Rock (Mt)			12.4	37.4	37.4	9.0	16.3	12.6	9.0	5.9	2.9	0.8	2.3				146.0
UG Waste Rock (Mt)	0.1	0.3	0.5	0.6	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.01	0.01	-0.04	-0.05	3.1
<i>Total (Mt)</i>	<i>0.1</i>	<i>0.3</i>	<i>29.9</i>	<i>38.4</i>	<i>37.8</i>	<i>9.2</i>	<i>16.5</i>	<i>12.8</i>	<i>9.2</i>	<i>6.1</i>	<i>3.0</i>	<i>0.9</i>	<i>3.0</i>	<i>0.001</i>	<i>-0.04</i>	<i>-0.05</i>	167.2
Cumulative Total (Mt)	0.1	0.4	30.3	68.7	106.5	115.7	132.2	145.0	154.2	160.3	163.3	164.2	167.2	167.2	167.2	167.2	
B4 WRSF																	
Overburden (Mt)						3.4	4.4	0.06	5.8			3.1	0.6	6.1	0.8		24.3
Pit Waste Rock (Mt)						0.5	7.9	23.2	17.3	7.9	5.3	3.0	17.4	17.4	8.7		108.6
<i>Total (Mt)</i>						<i>3.9</i>	<i>12.3</i>	<i>23.3</i>	<i>23.1</i>	<i>7.9</i>	<i>5.3</i>	<i>6.1</i>	<i>18.0</i>	<i>23.5</i>	<i>9.5</i>		132.9
Cumulative Total (Mt)							16.2	39.5	62.6	70.5	75.8	81.9	99.9	123.4	132.9		
A45 WRSF																	
Overburden (Mt)						7.3											7.3
Pit Waste Rock (Mt)						17.7	8.4	0.9									27.0
<i>Total (Mt)</i>						<i>25.0</i>	<i>8.4</i>	<i>0.9</i>									34.3
Cumulative Total (Mt)							33.4	34.3									
DE WRSF																	
Overburden (Mt)									3.7	3.6							7.3
Pit Waste Rock (Mt)									1.7	20.2	29.7	31.1	8.8	0.1			91.6
<i>Total (Mt)</i>									<i>5.4</i>	<i>23.8</i>	<i>29.7</i>	<i>31.1</i>	<i>8.8</i>	<i>0.1</i>			98.9
Cumulative Total (Mt)										29.2	58.9	90.0	98.8	98.9			

2.6.3.2 Tailings Management Facilities

Tailings Alternative Assessment Process

The alternative assessment process described in Environment Canada's (EC) Guidelines (EC 2011) was followed in selecting the tailings management option. This process is composed of seven steps as described in Figure 2-28. All the process steps and results are described in the Tailings Alternative Assessment Report (SD 2-2 Tailings Alternatives Assessment Report).

Each potential tailings management option was defined based on a location and a deposition method. Eleven (11) footprints were first identified and submitted to pre-screening. Three (3) location and two (2) deposition methods came out of that pre-screening exercise, for a total of six (6) options that were carried on to the next stage: the Multiple Account Analysis (MAA; steps 3 to 6). Figure 2-29, extracted from SD 2-2 Tailings Alternatives Assessment Report shows the three (3) assessed locations and footprints for the thickened tailings alternatives. The study also included a review of tailings management methods in cold climates.

A MAA table was prepared and populated. The analysis involved the evaluation of each alternative regarding four aspects (accounts): environmental, social, technical and economic. Those were subdivided into sub-accounts and indicators that were weighted (Table 2-39 summarizes the selected aspects). A score (1 to 6) was assigned to each alternative, for each indicator. Accounts were weighted as suggested in the guidelines: environment – 6, social – 3, technical – 3, economic – 1.5. The final step of the MAA was a sensitivity analysis where a series of weightings were applied to the accounts to assess if different weightings would affect the overall rankings of the alternatives.

The alternatives assessment was complemented with a risk analysis on tailings management technologies (filtered and thickened; AEM 2011). The primary risks were then linked to the indicators in the MAA table, and new indicators were created as needed to accurately reflect the risks associated with the technologies.

The study concluded that the preferred option is thickened slurry disposal in B7 area located about 1.5 km northwest of the process plant infrastructure. The following section described the design criteria and proposed process and operation of the TSF.

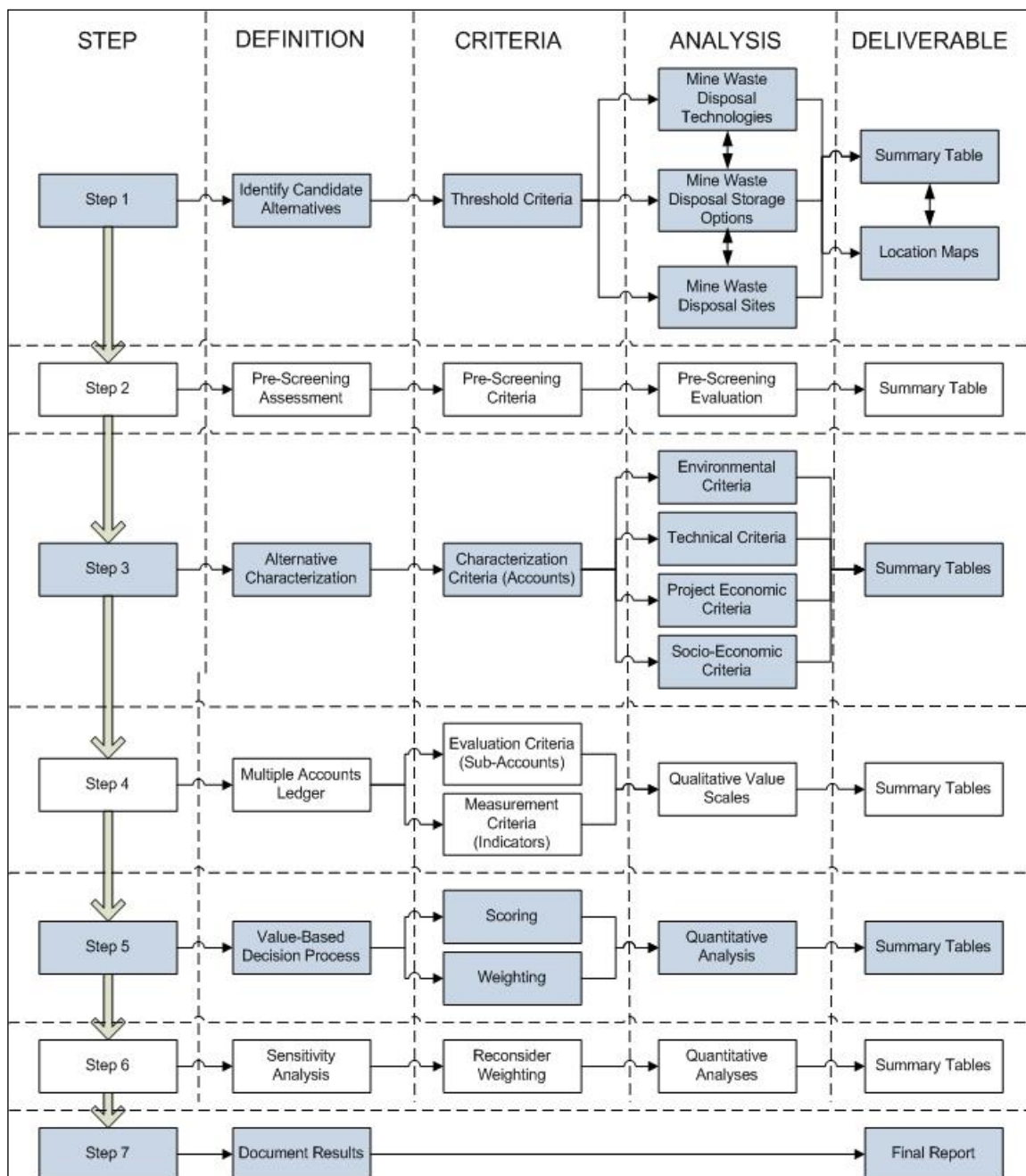


Figure 2-28 Steps in Assessing the Alternatives for Tailings Management

Table 2-39 Aspects Described in the Tailings Management Multiple Accounts Analysis

Environmental Aspects		
Possible production of contaminating agents	Potential for dust generation	Dust generation at the TSF Dust generation outside the TSF
	Potential release of potentially problematic water	Risk associated with the management of high volumes of water within the TSF Reclaim water pipeline Ground conditions (potential for seepage to groundwater)
	Tailings spill	Potential TSF failure during operations Accidental spill of tailings during transport in a non-confined area
	Greenhouse gas emissions	Emissions due to construction Emissions due to tailings transport
Water quality, aquatic habitat and species	Watersheds	Number of watershed(s) affected by TSF footprint Location within the watershed Area of affected sub-catchment(s) (ha)
	Fish habitat	Distance from Meliadine Lake (m) Area of aquatic habitat loss (ha) Stream diversion Stream crossing by the road/pipeline (# of crossings) Potential effect on surrounding aquatic habitat (ha)
Terrestrial habitat and species	TSF footprint area (ha)	No indicator required for measurement
	Vegetation and terrestrial habitat	Presence of vegetation that is uncommon within the footprint (ha) Potential effect on surrounding vegetation
	Potential effect on birds (wildfowl and shore birds) from TSF water	Potential effect on wildfowl and shore birds from TSF water Potential to affect raptor nesting habitat
	Distance from a natural park or protected habitat (km)	No indicator required for measurement
Social Aspects		
Traditional Use	Touristic, recreational and vacation activities and infrastructures	No indicator required for measurement
	Archeological sites, cultural or heritage assets	No indicator required for measurement
Visual aspects	Integration into the landscape	No indicator required for measurement
Health and safety	Potential to affect worker health and safety	Relative number of workers higher at risk of being affected by dust from the TSF Safety of workers
Technical Aspects		
Permitting	Risk of potential delays in permitting leading to delays in overall Project schedule and start-up	No indicator required for measurement
Construction risks	Risk associated with the construction phase for the TSF	Probability of having schedule delays Probability of reduced quality of construction

Technical Aspects (continued)		
Operation	Site access	No indicator required for measurement
	Reliability/efficiency of operation	Stability and continuousness of operations Risk related to plant shut down due to tailings transportation interruptions
	Equipment maintenance	No indicator required for measurement
	Water management	Potential to grow/trap ice and snow Length of reclaim pipeline (km) Quantity of water to be managed/reclaimed from the TSF Sumps for collection of seepage and/or surface runoff
	Storage efficiency	No indicator required for measurement
	Expansion possibilities	No indicator required for measurement
Closure and reclamation	Progressive reclamation	No indicator required for measurement
Economical Aspects		
Capital costs	Initial TSF construction costs	No indicator required for measurement
	Tailings dewatering infrastructure, equipment and parts inventory	No indicator required for measurement
	Tailings transport system and reclaim water system	No indicator required for measurement
Operating costs	Phased containment dike or erosion protection construction	No indicator required for measurement
	Tailings plant operation	No indicator required for measurement
	Tailings handling	No indicator required for measurement
	Fresh water make-up	No indicator required for measurement
Closure/reclamation costs	Construction of a cover over the TSF	No indicator required for measurement
	Water treatment	No indicator required for measurement

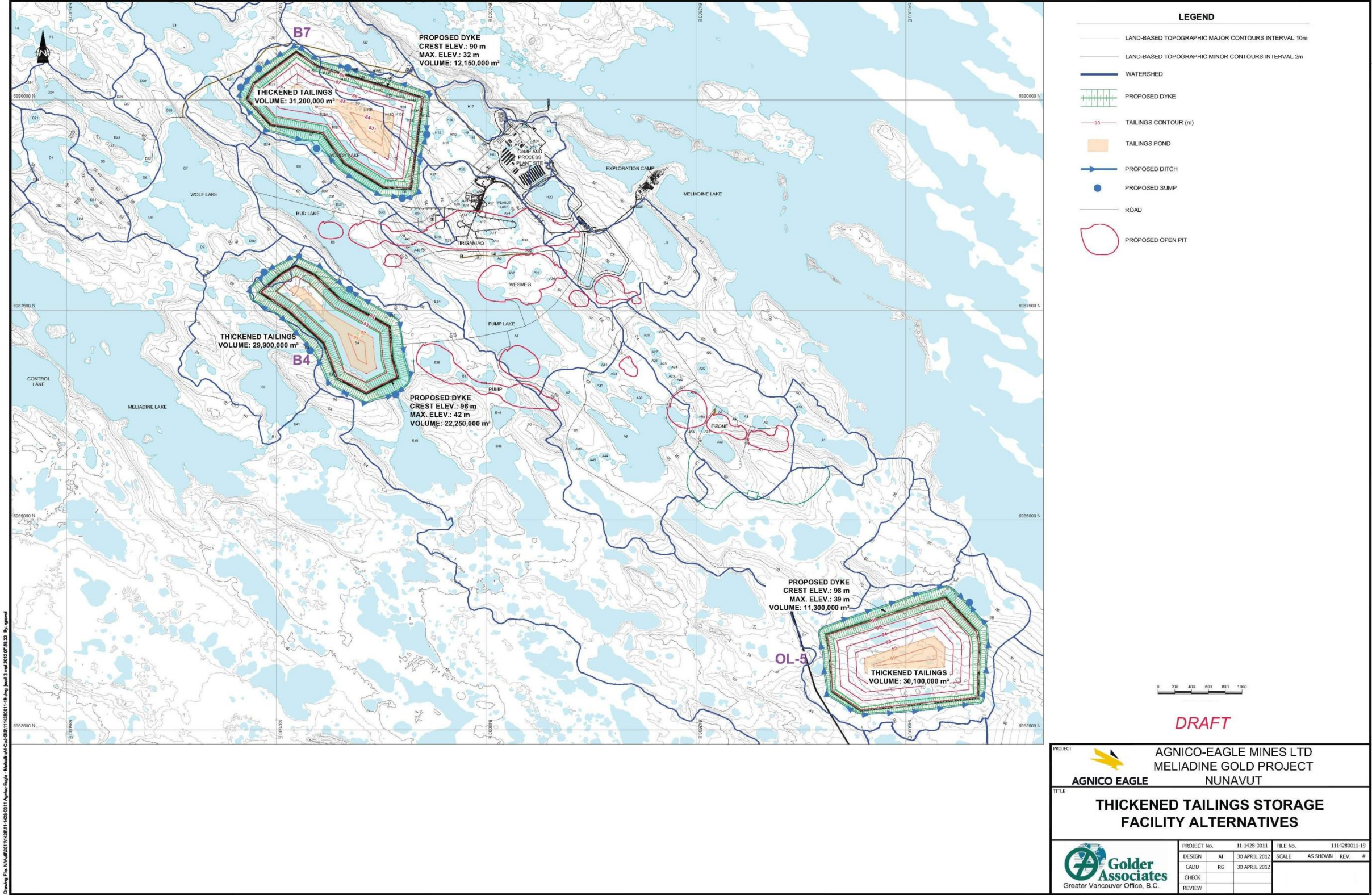


Figure 2-29 Thickened Tailings Storage Facility Alternatives

Proposed Tailings Storage Facility

The option retained through the alternative assessment will involve the pumping of detoxified (cyanide removal) tailings in a thickened form to a diked storage facility and the reclaim of water from that facility to the ore process milling facility. The following table (Table 2-40) details the design criteria used for the Tailings Storage Facility (TSF).

Table 2-40 Design Criteria - Tailings Storage Facility

Criteria	Value
Daily Tailings Production	8,500 tpd
Total Tailings Production (life-of-mine)	34.5 Mt
Total TSF Capacity (includes contingency)	37.4 Mt
Solid Content (by weight)	55 %
Average Frozen Pore Water Volume	20 %
Total: Tailings + Water/Ice Volume	30.2 Mm ³
In-situ density	
Tailings Only	1.37 t/m ³
With Ice Building	1.14 t/m ³
Tailings Surface Slope	
Above Water	1 %
Below Water	5 %
Dike dimensions	
Crest Width (maximum)	20 m
Side Slopes	3H:1V
Crest Elevation	86 m
Stripping Depth in Dike Footprint	Vary according to ice-low position
Freeboard Requirement	2.0 m

In addition to the above physical properties/criteria, design also took into consideration the geochemical properties of the material. Those were described in SD 6-3 Geochemistry Baseline Report and summarized in Section 2.6.1.4. Tailings material was described for its mineral and chemical composition, and tested through standard ABA, static and kinetic tests for ARD and metal leaching potential. The bulk tailings showed buffering capacity. Only a portion of the Discovery deposit tailings could be acid-generating, which will benefit from the overall buffering capacity of the tailings material.

The highest median Arsenic content was found associated with ore samples in the greywacke/siltstone, iron formation and mafic volcanic units, which will all report to the TSF. Results

of the leaching tests for tailings material for Arsenic almost all met the MMER criteria, except for some samples from Tiriganiaq and Pump deposits which slightly exceeded the monthly mean limit. Seepage management during operation, and closure plan design will ensure a control over potential water release directly from the TSF to the environment. Waste water management and treatment are discussed further in next section (2.6.3.3).

Management of the thickened tailings will involve building on-land dikes. Construction of the tailings storage facility will be phased in accordance with the mine production schedule and the availability of waste rock from mining as construction material. Dike construction would be supplemented with till material if needed. A road will also be constructed to the tailings impoundment area and would continue around its perimeter.

Tailings will be thickened at mill location in a conventional thickener to obtain material of about 55 % solids by weight. Water reclaimed at this first stage will be directly recycled into the milling operations.

Thickened tailings will then be pumped through a pipeline to the TSF where it will be allowed to settle. A sub-aerial discharge is planned. An average of 20 % of pore water sequestered as frozen ice was assumed in deposited tailings. Supernatant water will be reclaimed to the process operations through a reclaim system.

Tailings and reclaim pipelines will be routed along the service road and placed on a bench beside the road surface. The pipelines will be HDPE material, insulated and heat-traced for freeze protection. The tailings and reclaim pipeline characteristics are shown in Table 2-41. The road bench supporting the pipeline sections from the plant site to the tailings storage facility will be designed in order to control any possible leak or spill from the tailings pipes, which would drain towards controlled area or containment.

Reclaim water will be pumped from the tailings storage facility to a reclaim water tank located at the mill. The reclaim water pump station will be barge-mounted and designed to ensure the pump intake remains free of ice. Three (3) pumps will be mounted on the barge, discharging water through a 250-mm-diameter insulated and heat-traced HDPE reclaim pipeline.

Table 2-41 Tailings and Reclaim Pipeline Description

Pipeline	Flow Rate (m ³ /hour)	HDPE Pipe Diameter (mm)	Pipe Length (m)
Tailings Pipeline	386	350 DR11	2,000
		350 DR17	2,100
Reclaim Pipeline	128	250 DR17	2,200

A preliminary design report for the TSF was prepared by Golder Associates - SD 2-3 Tailings Storage Facility Preliminary Design Report. In designing the facility, site's climate condition and climate trends, as well as geotechnical factors, geological characteristics and permafrost conditions were considered. Geotechnical and geothermal investigations were completed at the Project site in 2007, 2009 and 2011.

The preliminary design drawings are presented in SD 2-3 Tailings Storage Facility Preliminary Design Report). The dike crest elevation will be at 86 m and the height of the dike will range from 10 m to 25 m. The proposed dike section includes a rock fill shell to support coarse and fine filter zones and a liner system. The liner is proposed to be anchored in a compacted fill trench at the upstream dike toe. Construction materials and quantities are summarized in Table 2-42. Stability and seepage analyses were carried for the preliminary design (SD 2-3 Tailings Storage Facility Preliminary Design Report) and found to meet the design criteria. Runoff and seepage collection infrastructures (ditches and sumps) will be located around the TSF to manage any contact water in that area (see the Surface Water Management Plan (SD 2-6) for the details).

A preliminary deposition plan was developed to confirm the storage capacity of the TSF and evaluate the feasibility of the closure concept. The TSF was sized to store the planned tailings production and manage excess process water and runoff throughout the operations. General closure concept is to place rock fill cover over a graded tailings surface with the tailings grading from the northwest to the southeast (see the Mine Closure and Reclamation Plan (SD 2-17) for the details on closure concepts). An operating spillway at the southwest corner of the facility will be maintained at closure so that surface runoff is directed through the spillway to Tiriganiaq pit.

Table 2-42 Summary of TSF Dike Construction Quantities

Material	Quantity
Length of dike	6,125 m
Foundation preparation area – upstream	413,500 m ²
Foundation excavation of ice rich soil – upstream	1,230,000 m ³
Foundation preparation area – downstream	332,950 m ²
Rockfill	6,965,500 m ³
Cut-off trench till backfill	257,000 m ³
Coarse filter (sand and gravel)	224,000 m ³
Fine filter (sand and gravel)	224,000 m ³
Liner area	396,500 m ²
Granular liner cover	140,000 m ³
Closure rockfill cover	9,489,000 m ³

From: SD 2-3 Tailings Storage Facility Preliminary Design Report

2.6.3.3 Waste Water Treatment Facilities

A water quantity and mass balance model was developed By Golder Associates to assist in the evaluation of the proposed water management infrastructure on a monthly basis over the life of the mine and under closure conditions. The model includes a water balance along with a mass balance of geochemical parameters. The full water balance is presented in Sections 6 and 7 of the Surface Water Management Plan (SD 2-6). The water management plan establishes the following:

- All excess contact water will be directed to the TSF or to open pits, if available, for temporary storage prior to recycle, re-use, treatment (if necessary) and release to the environment. Upon completion of mine life, excess water will be directed to the pit lakes to assist with flooding.
- The main Attenuation Pond (AP-01) has a capacity of approximately 158,000 m³. Water in AP-01 will be used to satisfy freshwater make-up requirements to the mill with any excess assumed to be monitored, treated (if necessary) and released at mine effluent. Additional capacity is obtained by construction of AP-02 and WM-S-01.
- The Project will have one effluent discharge point – a diffuser into Meliadine Lake to be sited off the peninsula on which the current exploration camp is located.

In summary, the Project is expected to require water treatment in the following areas:

- Tailings storage facility (TSF) overflow, called WTP-TSF;
- Excess saline underground water, called WTP-DESAL; and
- Sewage.

As explained in Section 2.6.1.8, the overall objectives of the water management strategy elaborated for the Meliadine Project is to: reduce and/or optimize contact water, limit fresh water make-up, and divert non-contact water. Figure 2-30 was extracted from the Surface Water Management Plan (SD 2-6) and shows a summary of the overall site water management plan.

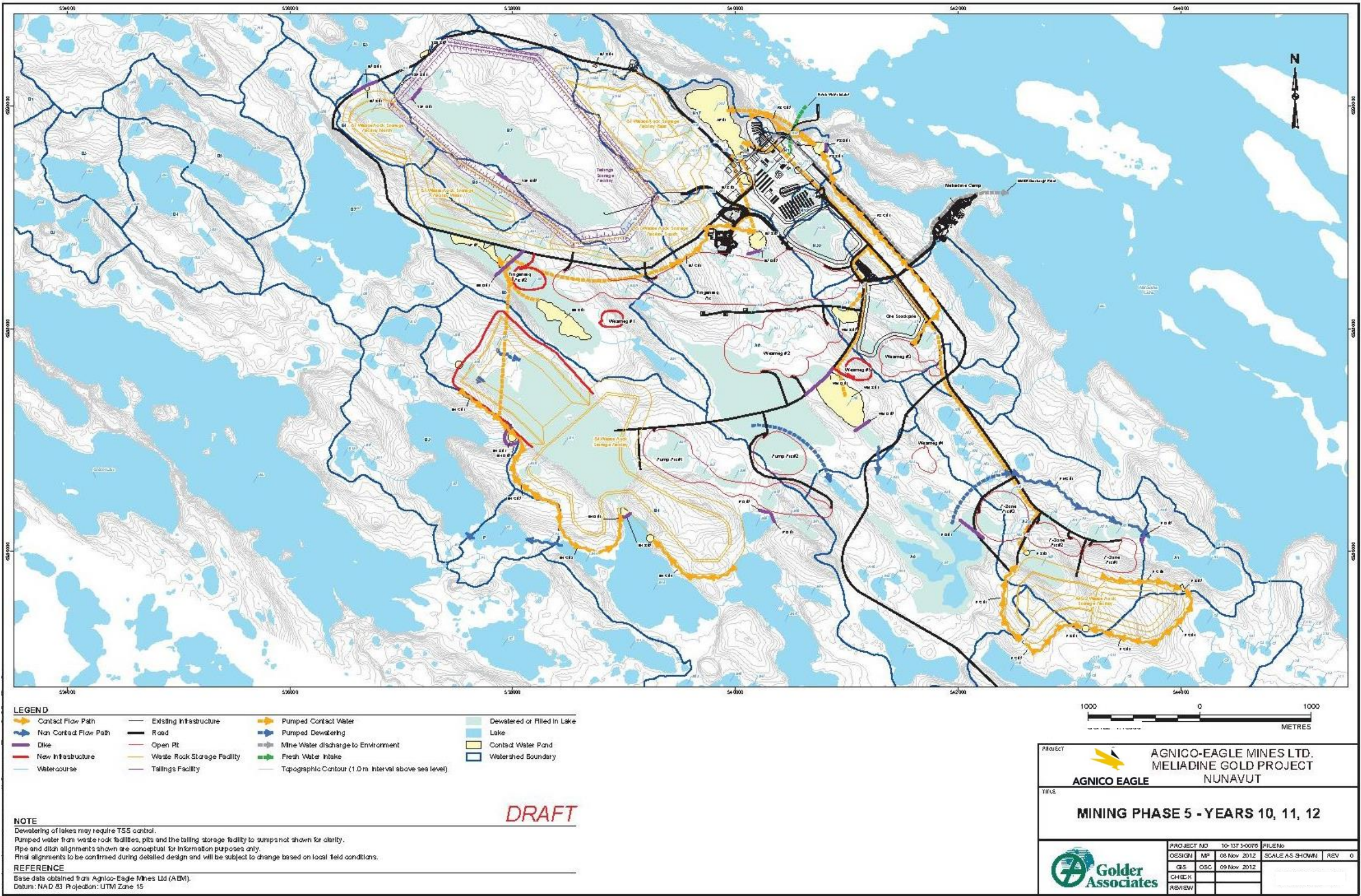


Figure 2-30 Site Water Management Plan

All of the open pits will have a sump to collect in-pit contact water. This water will then be directed to the TSF to be recycled in the process plant operation. All Waste Rock Storage Facility (WRSF) and main infrastructure pads will be designed with the appropriate contact water (drainage/runoff) management infrastructure, and the water collected will report to one of the two Attenuation Ponds (AP): AP-01 or AP-02. Excess water from the underground mine, which is expected to contain salt, will report to AP-01 after treatment (WTP-DESAL). The process plant will reclaim water from both the TSF pond and AP-01, and make-up with fresh water from Meliadine Lake when necessary. Water from AP-01 will also be used for dust control and truck wash.

The Project will have only one mine effluent which will discharge water into the environment back to Meliadine Lake after final treatment. This effluent discharge will meet the MMER limits as well as Water Licence requirements.

AEM has contracted Golder Associates to conduct an assessment of water treatment options to treat the overflow from the TSF (WTP-TSF) and to treat the excess saline underground water (WTP-DESAL). AEM is leading the water treatment process development effort and has made preliminary decisions on process selection. The purpose of Golder's water treatment assessment is to assist with the optimization of the design concepts.

The flows predicted for the WTP-TSF and WTP-DESAL are based on the water balance presented in Section 6 of the Surface Water Management Plan (SD 2-6). It is assumed that the TSF will act as a buffer for water volumes feeding the WTP-TSF. The B4 pond may act as a buffer volume for underground water in the initial stages of mine life. However, the current water management plan does not provide for storage of saline water from underground after start of Year 3 when pond B4 is overtaken by waste rock. Depending on the underground mine design(s), underground sumps may be used for feed volume buffering for the WTP-DESAL. The WTP-TSF plant will be designed to be seasonally operated (summer only), while the WTP-DESAL plant will be designed to treat water year round. The predicted design flows for the treatment plants are summarized in Table 2-43. The plant design minimum flow has not been defined at this stage. The minimum flow is used in the detailed design stage to help verify equipment sizes and plant performance under a range of operating conditions.

The site water balance assumes a TSF overflow (treatment) rate, up to Year 9 of mine life, of 380,000 m³/month during the months of July, August, September, and October, for a total annual flow of 1.5 Mm³/year. Excess water will be stored in the TSF during other periods. The monthly average flow for seasonal operation of the WTP-TSF during these four months is therefore 537 m³/h assuming 97 % plant availability. Similarly, assuming a nominal plant flow of 500 m³/h, the plant is predicted to operate for 127 days per year.

Table 2-43 Summary of WTP Design Flows

Flowrate	WTP-TSF (m ³ /h)	WTP-DESAL (m ³ /h)
Average	537	22
Design	500	25

The estimated mine water inflow to underground varies between 420 and 640 m³/d, based on the most recent hydrogeology assessments. This is a crucial parameter for the design of the WTP-DESAL and should be reviewed as the Project proceeds. This represents the minimum volume of water that must be discharged or removed to satisfy the underground water balance. Any inputs of other water sources, such as clean water for production, would add to the discharge requirements. For comparison purposes, it is predicted that 1,200 m³/day (50 m³/h) of 12 % CaCl₂ brine will be required as production water for drilling and other mining operations. This requirement may change if concentrated NaCl brine is deemed appropriate for underground use.

The WTP-DESAL plant sizing assumes that the production water may be recycled, treated to separate solids, and re-used. Therefore, the flow to the WTP-DESAL is predicted to be 22 m³/h. A nominal flow of 25 m³/h was selected for design purposes by AEM. At 55 % recovery, the discharge flow would be 13.8 m³/h, and the brine stream would be 11.2 m³/h.

The projected water quality inputs and potential treatment targets were assessed by Golder Associates using the water quantity and quality mass balance presented in Sections 6 and 7 of the Surface Water Management Plan (SD 2-6). The elements of concern for treatment are discussed in detail in this memo, which are:

- **WTP-TSF:** total cyanide, WAD (weak-acid dissociable) cyanide, Arsenic, Ammonium-Nitrogen, Copper, Chloride, and Selenium; and
- **WTP-DESAL:** Chloride, Ammonia-Nitrogen, Nitrate-Nitrogen, Aluminum, Boron and Iron.

Tailings Storage Facility (TSF) overflow, called WTP-TSF

AEM is proposing the use of a conventional cyanide destruction process followed by the use of alum or poly-alum to remove arsenic and copper through co-precipitation with iron or aluminum hydroxide. Considerations involved with this treatment are summarized as follows:

- Iron cyanide is one of the principal parameters of concern in the feed to the WTP-TSF. It may be removed in the cyanide destruction plant as a copper-cyanoferrate under the right conditions. This is considered by AEM to be the base case for the Meliadine site. Copper addition tests to determine dosages should be done under continuous trials, not batch trials, to avoid CuCN precipitation. CuCN is a solid which would report to the tailings solids, but would add to reagent costs.

- It is likely that receiving water criteria, not MMER criteria, will control the target discharge level of Total CN in the WTP-TSF, so further analysis of the receiving water to set dilution levels is recommended (underway at the time of preparing this document).
- An alternative cyanoferrate removal processes has been considered and selected which involves redox reactions and precipitation of iron-cyanoferrate complexes (Turnbull's Blue or Prussian Blue Process). Bench tests would be required to set the conditions, but the Fe:CN molar ratio for added iron salt would be approximately 0.5 based on published literature and Golder's experience. These tests would confirm that the iron cyanoferrate can be precipitated at neutral to alkaline pH of the TSF, under reducing conditions, and would measure the stability of the precipitates to develop appropriate solid management practices.
- Iron salts are much less costly than copper salts for TCN removal, particularly for long distance shipment, due to the reduced consumption and lower unit price. The potential cost savings offer justification to carry out the bench tests. Iron cyanoferrates tend to produce colloidal precipitates, but colloids may be removed using coagulants, such as aluminum salts, followed by sedimentation.
- Copper and arsenic may be removed from the TSF water using iron or aluminum co-precipitation followed by sedimentation. This may be carried out in a conventional clarifier or in a ballasted flocculation process such as Acti-flo and may be carried out simultaneously with colloidal cyanoferrate removal, subject to confirmatory bench testing.
- The stability of heavy metal-cyanoferrates complex is a potential concern, particularly in the presence of free cyanide. Therefore, iron cyanoferrates produced from water treatment might need to be disposed of separately from tailings. This would need to be determined through stability test work.
- Copper cyanoferrate precipitation could be carried out in the cyanide destruction circuit, but the iron cyanoferrate process would more likely take place in the WTP-TSF. It is possible (or likely) that the arsenic and copper removal process could be carried out simultaneously, eliminating the need for additional vessels, subject to: confirmation by bench tests and clarification of solid disposal issues.
- The beneficiation process of cyanide destruction by-products, such as cyanate or ammonia, may require further investigation during the detailed design phase. Mitigation measures will be put in place as necessary to limit beneficiation (e.g. aeration into TSF, regular follow-up of ammonia levels to allow for quick adaptive management should levels increase, etc.). In case follow-up measures show a trend that indicates ammonia could become problematic for effluent discharge criteria, an action plan will be put in place to

react quickly. AEM is experienced with operating air stripping towers, which could be one option to treat the effluent under such circumstances.

Should the monitoring program indicate, through the observed trends, that the effluent quality could become different than the quality anticipated by the models, AEM will use its follow-up program to allow for adaptive management to be put in place (see also SD 2-5 Environmental Management and Protection Plan). Depending on the component of concern, adequate treatment will be put in place (ex. reverse osmosis for chloride removal, ferric sulfate added to the Acti-Flo for additional arsenic precipitation, use of proprietary polymeric organosulfide chemicals to enhance metal precipitation into the Acti-Flo, etc.). AEM environment team includes water treatment specialists experienced in mine effluent treatment.

Detailed design phase will further describe the proposed mine water treatment facility(ies). Outflow for this type of water treatment is usually about 5% of the inflow. Sludge generated by water treatment will be directed to the TSF for subsequent settling.

Excess Saline Underground Water, called WTP-DESAL

AEM is proposing to use a conventional reverse osmosis membrane style treatment plant to treat the excess underground mine water, assuming that mine water generated is as predicted. The nominal capacity of the plant would be 25 m³ per hour. The plant would operate 365 days per year on a continuous basis. Considerations involved with this treatment are summarized as follows:

- Once pond B4 is overtaken by waste rock, an evaporation step could be added to WTP-DESAL to decrease the volume of brine to be managed. Option selected up to now is to temporarily store the concentrated brine from the treatment process on site, and then pump this brine back underground at the end of mine life. Options for brine management will be further evaluated during the feasibility design stage for the Project. This evaluation will include consideration of the potential environmental and social impacts associated with each alternative.
- The mine contact water from underground will contain a large proportion of production brine, which contains CaCl₂ to prevent freezing in underground equipment. This brine will mix with the mine contact water, and will be sent to a settling pond. It is assumed that some of the water may be recycled, but this is subject to the water quality constraints of the underground equipment. Higher proportions of NaCl into recycled water used for underground operations could cause premature wear of equipment.
- The estimated mine water inflow to underground varies between 420 and 640 m³/d, based on the most recent hydrogeology assessments. This is a crucial parameter for the design of the WTP-DESAL and must be reviewed as the Project proceeds. AEM believes this is to be an

- overly conservative estimate but has applied this estimate under the precautionary principle.
- The use of CaCl_2 to protect the underground equipment has a dominant effect on the composition of the feed to the WTP-DESAL. If CaCl_2 use is reduced, then it is expected that this will decrease the costs associated with the WTP-DESAL. Conversely, if the mine contact water cannot be recycled to be used in the drilling equipment, then the size of the WTP-DESAL is likely to be much larger than is presented in the design basis used by AEM, since fresh water will need to be brought underground for production brine make-up.
 - A membrane separation process, with pre-treatment, is considered feasible, but there are challenges associated with scaling and fouling compounds. Feasibility is subject to due diligence including confirmation of the feed quality and treatability testing.
 - .

A Saline Water Management section is included in SD 2-6 Water Management Plan. Adaptive measures will be implemented with reference to saline water management in order to constantly improve knowledge on inflows and usage, thus being able to proactively implement measures to improve saline water management. Such measures could be:

- Data collection (inflows, use, quality) with reference with water in the underground workings;
- Up-to-date water/mass (salt) balance for underground; and
- WTP-DESAL efficiency indicators, etc.

Sewage

Sewage will be collected from the camp and change-room facilities and pumped to a sewage treatment plant (STP). The sewage treatment system will be designed based on a flow rate of 200 L per day per worker for 680 workers, for an average daily flow rate of 136 m^3 ($5.67 \text{ m}^3/\text{h}$). Biological reactors like *Bionest Kodiak* units are envisioned to treat camp waste water. For the required flow rate, 11 units of this type would be required.

The sewage treatment plant for the camp facilities will be designed to meet appropriate guidelines for wastewater discharge (for example, NWT Water Board 1992). Wastewater System Effluent Regulations (WSER) criteria are not currently applicable to systems located in Nunavut, and is unlikely to apply to the Meliadine effluent should the applicability change. Table 2-44 provides the anticipated performance of the system compared to the WSER criteria.

Table 2-44 Anticipated STP (BIONEST) Treatment Performance

Parameter	WSER (average concentration in the effluent)	STP (BIONEST) Treatment Performances
Carbonaceous biochemical oxygen demand (CBOD)	25 mg/L	10 mg/L
Total suspended solids (TSS)	25 mg/L	10 mg/L
Total residual chlorine	0.02 mg/L (if chlorine used in treatment of waste water)	No chlorine to be used in treatment
Un-ionized ammonia	1.25 mg/L (expressed as nitrogen at 15°C ± 1°C)	< 10 mg/L NH ₄ -N, which represents ~ < 0.03 mg/L un-ionized ammonia*

* at 15°C, pH 7

It will be housed in a prefabricated (modular) structure adjacent to the camp close to the wastewater inputs. The effluent from this plant will be directed to the TSF pond. Disposal of this water into a controlled pond will ensure a contingency in case of STP malfunction and/or disturbance. Water will be further treated prior to be disposed of at final effluent.

Sludge will be incinerated if possible; if not, it will be disposed of in the TSF. Quantities of 1.8 kg/day of sewage sludge per person are usually expected (AEM 2008). For 680 workers, this would represent about 1,225 kg/day, or 447 t/year.

Final Effluent Discharge Point

The Project will have one effluent discharge point, specifically a diffuser into Meliadine Lake to be sited off the peninsula on which the current exploration camp is located. The diffuser will be similar in design to that installed at AEM's Meadowbank operation and will ensure that treated water meets CCME Guidelines for the protection of freshwater aquatic life and will be non-acutely lethal as required under the MMER. The diffuser will only operate during summer months when the WTP-TSF is operating. At all other times of the year, there will be no discharge of treated effluent into Meliadine Lake. Discharge rate is projected to be 380,000 m³ per day during the months of July, August, September and October for a total annual flow of 1.5 m³ per year. Excess water will be stored in the TSF during the rest of the year. The monthly average flow for seasonal operation of the WTP-TSF during these four months will be 537 m³/h assuming 97 % plant availability. Similarly, assuming a nominal plant flow of 500 m³/h, the plant is predicted to operate for 127 days per year.

If the WTP-TSF treatment plant fails to meet the required license criteria for discharge, then the effluent will be recycled back to the TSF for temporary storage until the problem with treatment is resolved and the plant is operating in accordance with its design.

As part of the environmental assessment for the Meliadine Project, AEM conducted aquatic baseline studies of the surrounding freshwater aquatic environment, including Meliadine Lake. The results of these studies are presented in Volume 7 – Aquatic Environment and Impact Assessment, and in SD 7-1 and SD 7-2. AEM also commissioned Golder Associates to conduct an impact assessment of the proposed Project on the aquatic receiving environment including the proposed summer discharge of treated effluent into Meliadine Lake. The assessment is included in Volume 7. In summary, AEM is of the belief that this proposed discharge will have no significant effect on the freshwater receiving environment in Meliadine Lake on the basis that the water quality within the lake will meet CCME guidelines for the protection of freshwater aquatic life and the treated effluent will be non-acutely toxic at the point of discharge.

2.6.3.4 Landfill Facilities

The overall waste management for the site is covered in the Landfill and Waste Management Plan (SD 2-11). Site operations will use all available opportunities to reduce, reuse and recycle waste materials. Where this is not possible, waste materials will be managed and disposed of in accordance with best practices and applicable regulations. Wastes that can be handled locally or on site will be managed daily. The accumulation of wastes will be avoided through an active waste management program.

We anticipate little waste to be generated at the Rankin Inlet facilities and these will be transported from Itivia to the on-site waste management building for processing.

All AEM personnel and contractors working at the Meliadine Project site will be trained in waste management. This will be included in the site orientation upon arrival, which includes the identity of waste bins and dumpsters for the different categories of waste and where these are located and the signage associated with each. Stewardship of the environment will be emphasized in that it is everybody's responsibility to properly dispose of waste, including wastes that can be recycled.

An on-site landfill will be required for the disposal of non-salvageable, non-hazardous solid wastes that cannot be incinerated. This controlled landfill is proposed to be located at the B7-East WRSF (Figure 2-31). The overall concept parallels the one used at AEM's Meadowbank Mine, which successfully operates such a facility. Figure 2-32 is a conceptual cross section of landfill (Meadowbank design). AEM has previously applied to the NWB to allow for the construction and operation of a landfill facility at the Meliadine Project site under its existing Type B Water License to allow for the landfill disposal of non-hazardous waste generated through its ongoing exploration activity. AEM would like to use this advanced landfill facility, if permitted, to store non-hazardous waste during the early construction phase until the permanent landfill can be constructed.

In locating and designing the landfill, the following criteria were used:

- Locate landfill where water will be collected and monitored as part of the overall mine plan;
- Use an already disturbed area as part of the overall mine plan;

- Locate landfill close to planned roads to facilitate access; and
- The landfill site has to be large enough to accommodate all the waste for the life of the Project.

During the initial period of the Project, construction waste will be landfilled; together with the higher number of people in camp, this will likely result in more waste than during the Project's operational phase. On a daily basis, it is estimated that about two times as much waste will be directed to the landfill during construction than operation.

Environment Canada's "State of the Environment InfoBase" indicates that the per capita non-hazardous solid waste generation in 2000 for Canada was almost 1 tonne per person per year. For the sake of calculating required landfilling capacity, the following conservative assumptions were made:

- Maximum population of 500 during construction, 350 during operation and 50 at closure;
- Per capita waste production per year: 1 tonne;
- Solid waste generated having a density of 0.5 t/m³;
- 50 % of the refuse by weight being incinerated (i.e. not landfilled except for the ash); and
- Incineration reduces the mass of waste by 70 percent.

Table 2-45 summarizes the estimated volumes of waste to be landfilled for the life of the Project. While there is a fair degree of confidence in the volume during the operational phase, there is less so during construction and closure as there could be considerable volumes of waste resulting from construction and closure activities (e.g. industrial waste, demolition waste, cover, etc.). To take that into account, allowance was included in the calculation. Closure waste was thus estimated at 5 times the volume per person.

Estimated needed capacity would be of around 10,000 m³ total. Using Meadowbank numbers as a comparison, the surface of the landfill was established at ~3,000 m², which leaves room for flexibility. Moreover, the location and flexibility in the landfill design will allow for a greater volume to be set aside in case more waste than estimated is destined for the landfill.

Table 2-45 Estimation of Volume of Landfill Waste over the Life of the Project

Project Phase	Workers on site	Annual Tonnes of Waste ¹	Annual Volume of Waste (m ³)	Years for each Phase of the Project	Total Volume of Waste for Life of Mine (m ³)
Construction	500	325	650	3	1,950
Operation	350	228	456	13	5,928
Closure	50	163 ²	326	4	1,304
Total					9,182

¹ After incineration of 50 %, including incineration ash mass.

² Waste generations at closure estimated 5 times the volume per person.

Hazardous wastes will not be placed in the landfill. Management procedures for those kinds of wastes are provided in the Hazardous Materials Management Plan (SD 2-13), and discussed in Section 2.6.3.5 below.

Putrescible wastes will not be placed in the landfill but directed to the incinerator; management procedures are described in the Incineration Management Plan (SD 2-12). This last point will eliminate the attraction to wildlife, in particular carnivores and/or raptors. In details, waste unacceptable for placement in landfill will be:

- Organic matter including food, septic tank sludge or sludge from waste water treatment, dead animals, paper, cardboard;
- Food containers and wrappings, unless cleaned;
- Hazardous waste including mercury, medical waste, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Materials that can economically be recycled;
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

Acceptable waste for landfilling will be the following:

Table 2-46 Materials Acceptable for Disposal at the Landfill

Waste	
Plastic (except expanded polystyrene)	Rubber
Steel, copper, aluminium, iron	Empty caulking tubes
White goods	Hardened caulk
Wire	Clothing
Wood	Glass (including light bulbs)
Fiberglass insulation	Waste Asbestos
Roofing	Small appliances (batteries removed)
Asphalt	Gyproc
Concrete	Ash (cooled to 60° or less)
Carpet	Vehicles and machinery (liquids, grease, batteries, and electronics removed)
Bricks	
Ceramics	

Due to the restriction on materials that will be landfilled and to the location of the landfill, the quantity of leachate is expected to be minimal and, if present, leachate is anticipated to be of low ionic strength. Moreover, because the landfill will be located in the B7 WRSF, any leachate will report to the area's contact water collection system.

Rockfill berms will act as a wind shield to reduce windblown debris during operation. Also, the slopes of the landfill will be covered with rockfill, protecting them from erosion. Waste will be periodically compacted and covered by waste rock during operating life.

At the end of the mine life, the landfill waste will be encapsulated within non-PAG rock material (waste rock and/or overburden) such as it is isolated from the environment and physically stabilized.

Details of the considerations to minimize impact on the surrounding environment, as well as operational planning, are provided in the Landfill and Waste Management Plan (SD 2-11). Engineering features and layout drawings are also available in that plan.

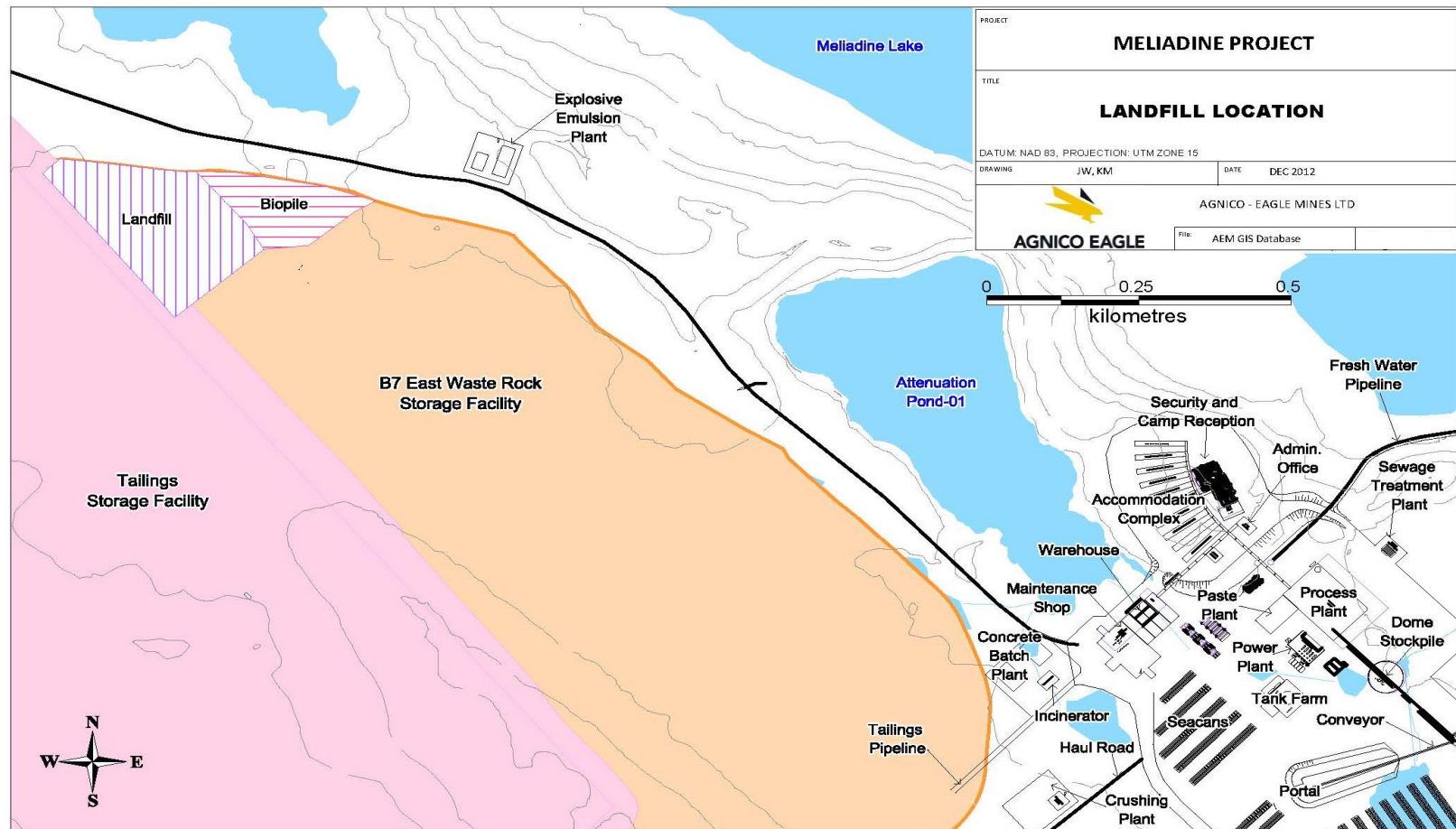


Figure 2-31 Location of the Proposed Landfill and Biopile at Meliadine Site

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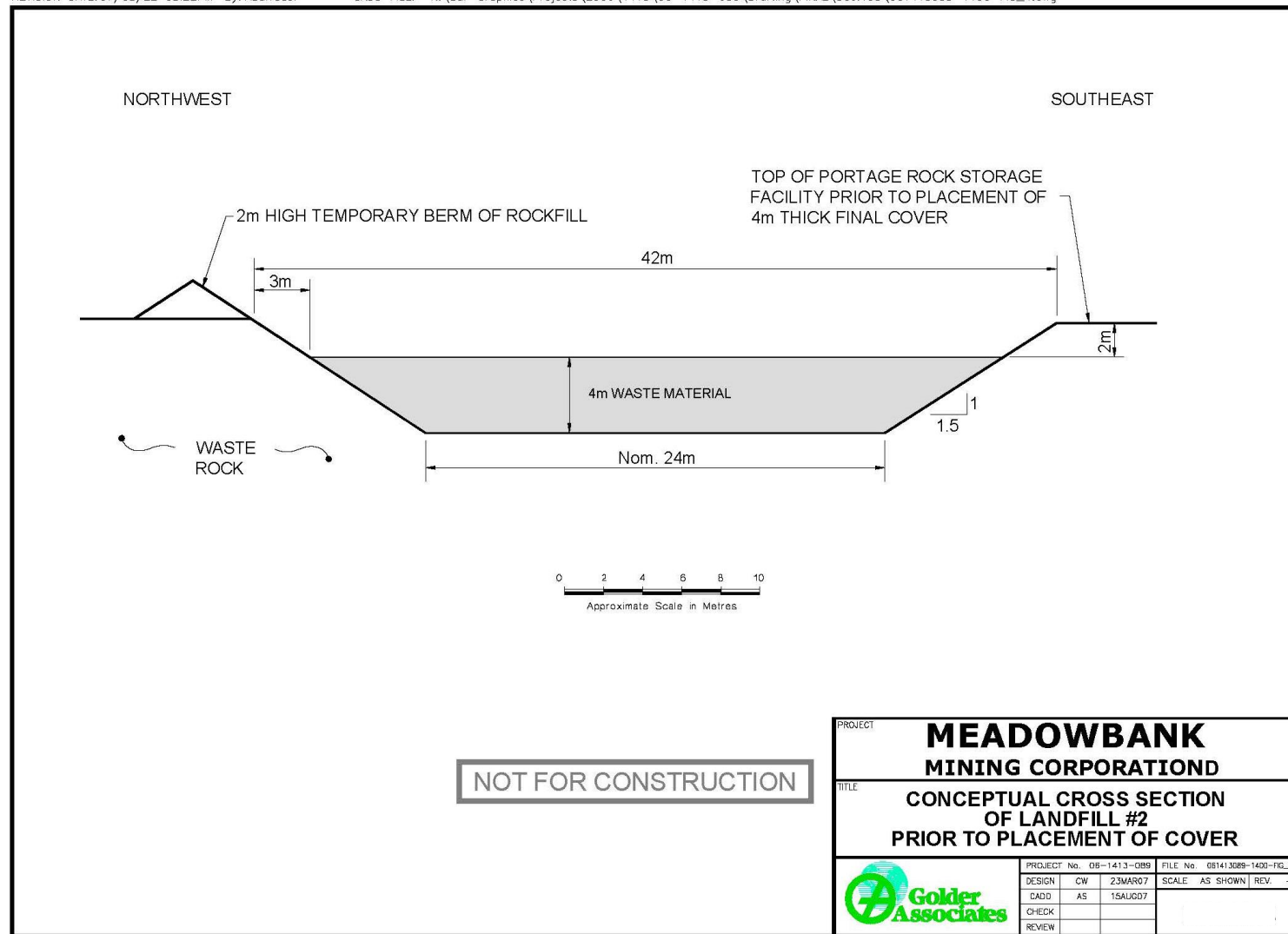


Figure 2-32 Conceptual Cross Section of Landfill

2.6.3.5 Hazardous Waste

AEM is committed to preventing, to the greatest extent possible, both inadvertent release of hazardous substances to the environment and accidents resulting from mishandling or mishap. AEM has instituted programs for employee training, facility inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

AEM actively works towards minimizing the generation of hazardous wastes by investigating alternatives to the use of hazardous materials, by recycling products and containers wherever feasible, and by treating wastes using state-of-the-art technologies before any release to the environment.

The mine site will include a dedicated waste management building in accordance with current practice at other northern mines. This building (462 m²) will be separate from the accommodation and mill complexes and will be used for waste processing. It will be a prefabricated steel frame (fold-away type) covered by cladding and roofing panels. Location of the waste management building is shown on Figure 2-6 (incinerator building).

The waste management building will house the incinerator and will include other equipment such as a barrel crusher, a plastic shredder, drip trays for oil filters and paint cans, and a means of packaging hazardous wastes. Hazardous wastes will be packaged for shipment off-site to registered hazardous management facilities in southern Canada (in compliance with the *Transportation of Dangerous Goods Act and Regulations*). They will be stored in secure facilities until they can be transported to other provincial jurisdictions for recycling or disposal (including their container). Detailed methods for storage, handling, transport and disposal for the hazardous waste are part of the Hazardous Materials Management Plan (SD 2-13).

The waste management building will be managed and operated by workers after proper training. They will be issued appropriate personal protective equipment, including the means for decontamination, as applicable. As with all other aspects of health and safety policy, all employees will be expected to comply with all applicable precautions and handling procedures with regard to hazardous waste.

Table 2-47 describes the types and predicted quantities of hazardous waste estimated to be produced at mine site. These quantities were estimated based on Meadowbank 2010 data. Hazardous waste generation related to shipping activities are not included in that table as these activities are under a third party responsibility. Details on the shipping company's plans and mandatory requirements to manage waste are provided in the Shipping Management Plan (SD 8-1).

Table 2-47 Hazardous Waste Management

Hazardous Waste Type	Estimated Quantity/Year	Destination
Used petroleum products (used oils and waste fuel)	350,000 L	Incinerator
Solid material contaminated with hydrocarbons ²⁹	30,000 kg	Shipped
Liquid contaminated with hydrocarbons	3,600 L	Shipped
Oil and grease	45,000 kg	Shipped
Antifreeze	1,000 kg	Shipped
Batteries	1,200 kg	Shipped
Paint and solvents	1,600 kg	Shipped
Aerosol and flammable	650 kg	Shipped
Flammable solids and organics	22,000 kg	Shipped

Used water generated at the Emulsion Plant will be re-used within the plant when feasible and excess used water will be evaporated (remaining solids will be disposed in the same manner as unusable emulsion). Any unusable emulsion waste will be taken to the mine blast patterns for disposal down the bore holes.

During the early part of the construction phase the permanent landfill and biopile facilities (see the following Section 2.6.3.6) will not yet be available. Consequently during this time period all hydrocarbon contaminated soil will have to be segregated and either stored until the biopile is available or transferred south during the annual sealift with the other hazardous waste for disposal at a licensed facility.

2.6.3.6 Biopile

A biopile facility will be constructed to treat soils and rock contaminated by light hydrocarbons such as diesel fuel. This facility will not treat soils contaminated by heavy hydrocarbons such as hydraulic fluid or grease. Soils contaminated with heavier hydrocarbons will be segregated, packaged and shipped to the south for proper treatment and disposal (see Section 2.6.3.5).

A biopile is a low cost and easy implemented remedial solution to treat impacted soils in remote locations as it requires minimal supervision and guidance from bioremediation specialists, as well as minimal heavy machinery and specialized equipment. In addition, the on-site treatment of soils removes the need for transportation for off-site disposal and/or treatment.

²⁹ Includes: contaminated hydraulic hoses, filters, fabrics, packages, soils with heavy hydrocarbons, etc.

This technology relies on the biodegradation of petroleum hydrocarbons constituents by indigenous soil microorganisms which metabolize and break down hydrocarbons products. It has been successfully implemented in northern area (see Dessau 2011 for examples).

The treatment area will be located in the B7-west waste rock management area next to the landfill (Figure 2-31). This area was selected because of its proximity to the camp site, ease to access, already disturbed area where there are already water management infrastructures planned. The design includes a bermed enclosure and a treatment surface area profiled to have a double slope of 1 %. Ventilation pipes will ensure sufficient aeration of the pile in order to maximize treatment rate. At the bottom end of the treatment enclosure, a lined trench will recover leachate and runoff waters. The trench will be filled with granular activated carbon for treatment purpose and will be preceded by an oil/water separator to recover free phase floating hydrocarbons. Figure 2-33 shows an overview of a biopile process.

The designed area will be of approx. 130 m in length by 25 m in width to accommodate about 6,000 m³ of contaminated soils (~2.5 m thick of material). Contaminated soil, snow or ice will be collected with the appropriate tool (shovel, backhoe, loader) and transported to the biopile location for treatment. Soils will be sampled prior to treatment and regularly to monitor the progress of treatment. Once they meet the remediation objectives, the soils will be removed from the treatment area and may be reused on the mine site.

At final mine closure, the biopile area will be cleared of any remaining contaminated material, the piping and oil-water separator removed, and the area would be buried under a layer of non-PAG, non-leaching waste rock.

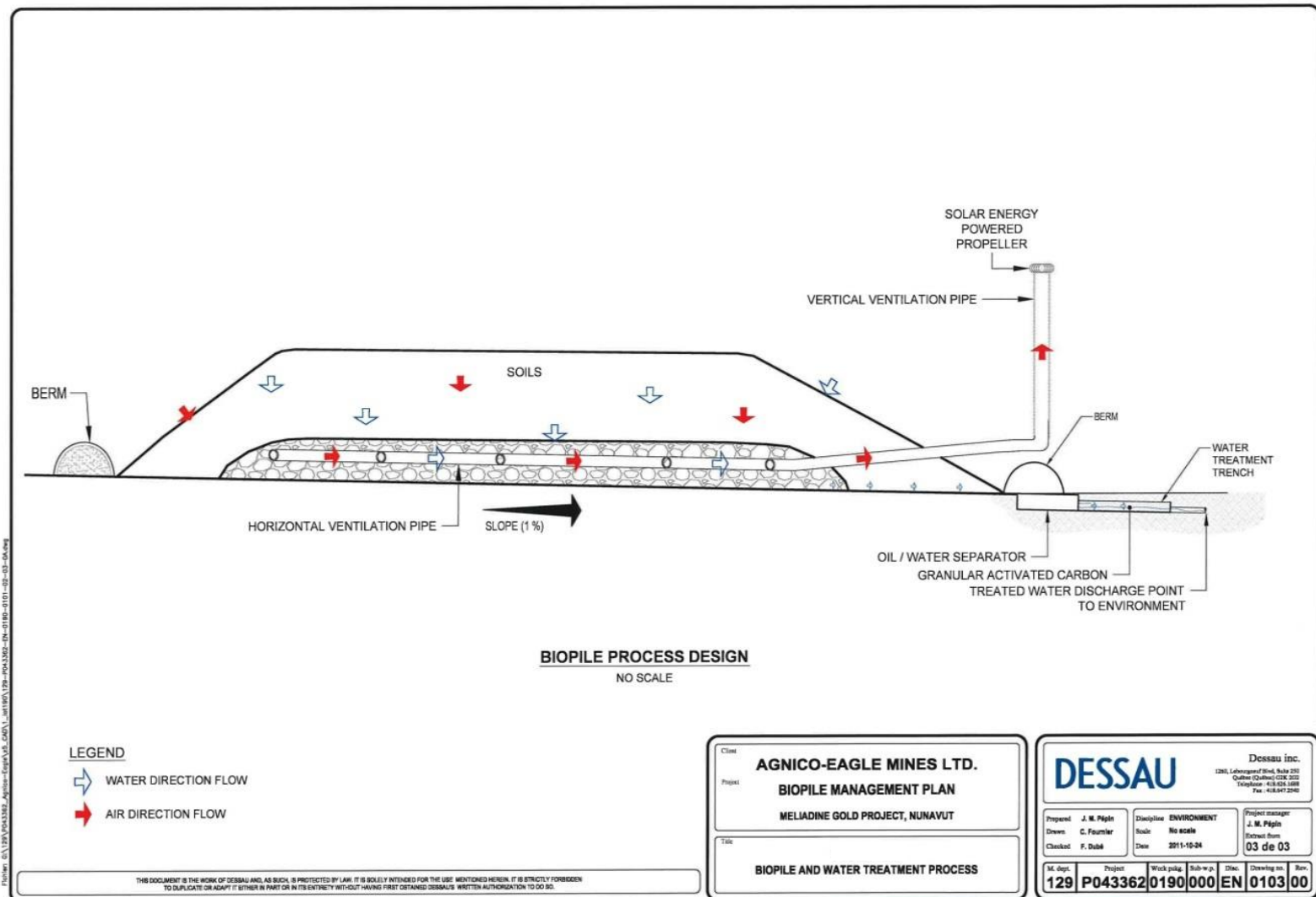


Figure 2-33 Biopile Soil Decontamination Process

2.6.3.7 Camp Waste

An industrial incinerator will be housed in the waste management building described in Section 2.6.3.5. The incinerator will be diesel-fired and its exhaust (1-m diameter stack, 12 m height from the ground) will be located downwind of the facilities. Waste feed will be transported in waste bins by forklift and loaded into the incinerator.

The incinerator will be a two-stage fuel fired high temperature unit based on the principals of pyrolysis (starved-air burning condition) and complete oxidation (high temperature, excess oxygen and sufficient time). In the first stage, waste will be converted to gas. Gases from the primary chamber will then enter the secondary chamber of oxygen rich and turbulent condition, typically at higher temperature to complete the combustion.

The chosen unit will be designed to comply with the dioxin and furans emission guideline (CCME 2000a) as well as mercury guideline (CCME 2000b) issued by the Canadian Council of Ministers of the Environment (CCME). Air pollution control systems will be included in the design and performance checked through periodic stack testing. Efficiency will be sought at the detailed Project design stage in order to minimize as much as possible the costs and environmental impacts of running such equipment. An Incineration Management Plan (SD 2-12) will be implemented as part of the site's Environmental Management System (EMS) (see SD 2-5 Environmental Management and Protection Plan). Also, in addition to the incinerator technology, the implementation of a waste management and segregation strategy will limit the emissions from the incinerator. Ash from the incinerator will be disposed of in the authorized landfill according to the *Environmental guideline for industrial waste discharges* (D of SD 2002).

Solid waste from the camp, kitchen, shops and offices³⁰ will be burned in the incinerator. The incineration will divert any waste that could create odour and potentially attract wildlife from the proposed landfill. Acceptable waste for incineration will include the following:

- Solid waste (mainly organic matter, including food, food containers and wrappings contaminated by food);
- Sludge from the sewage treatment plant; and
- Used oils, including flammable or combustible petroleum hydrocarbons, and plastic products.

Based on the volumes of waste predicted to be generated at site, the incinerator will require an approximate incineration capacity of 1,750 kg per day based on a 10-hour burn daily. Approximately 350,000 litres per year of used oil will also be burned in the incinerator (waste oils and fuels).

³⁰ Only land-based wastes are included here as the incinerator will be located at the mine site. Ship-based wastes will be managed by the shipping contractor.

The incineration will produce about 75 t/year of ash assuming the incineration process results in a 70 % reduction in mass. With a density of 1.2 t/m³, the volume would be about 63 m³/year of ash to be disposed of. Incinerator ash will be packaged in drums or sacks and the whole container land filled, eliminating any wind-blown effects.

2.6.4 Ground Transportation and Associated Water Crossings

All materials, equipment and people will be transported to and from the proposed Meliadine mine site from Rankin Inlet by an all-weather gravel surfaced road (AWAR) by motorized vehicle (trucks, buses, pick-up trucks). The distance between Rankin Inlet and the Project site is approximately 30 km by road. The AWAR is to be constructed in two phases: Phase 1 was built as a single lane approximately 28 km long AWAR to support the advanced exploration activities currently taking place at the Meliadine site; Phase 2 involves the widening of this road to a two-lane road to support mine construction and operation. Phase 1 was built under a Type B Water License issued by the Nunavut Water Board in March 2012 granted under an exception determination by the NIRB under Section 12.10.2 (b) of the NLCA. The granting of this exception eases the continuity of the general exploration as contemplated by AEM. Significant changes in baseline conditions are not expected to result from general exploration. The exception however allows the advanced exploration program to proceed as planned at the Meliadine site.

Phase 2 is subject to the Part 5 review being conducted by the NIRB.

In addition to the AWAR, the following new sections of additional roads are proposed for construction as part of the Project:

- A 9.8-km long all-weather road to access the Discovery deposit. This road will intersect with the proposed Meliadine AWAR at a junction approximately located at km 15 (as shown on Figure 2-36), just south of Borrow pit B10. This access road will be constructed to the same standard and dimensions as the proposed Phase 2 Meliadine AWAR (a two lane road - 8 m width). This Discovery road will be open in part to the public. AEM will install a control gate on this road to prevent inadvertent access to the mining area to ensure public safety. AEM is aware that there are existing ATV trails used by local hunters that are located at the east end of Meliadine Lake and that these must be left accessible.
- A segregated 20-km long mine haul truck road to be constructed between the Discovery mining site and the mill site. This road will be constructed alongside (same alignment) the Discovery access road and the AWAR to join up with the proposed haul road from the F Zone mining area at approximately km 25 (see Figure 2-34, Figure 2-35 and Figure 2-36). At this point, the haul road follows a separate alignment to the primary crusher and ore stockpile location (see Figure 2-35). This haul road will be wider than access roads (16 m wide) to accommodate mining haul trucks. The haul road will incorporate 26 m wide passing zones set every 500 m along the road to allow two trucks to pass. This haul road will be closed to

any public vehicle access for safety considerations. The publically accessible section of the Discovery access road and the AWAR from the junction with the Discovery road to the crossover at km 25 on the AWAR will parallel this haul road. The access and haul roads will be segregated from each other by a continuous safety berm that will be installed between the two roads to ensure that no contact can occur between haul trucks and vehicles on the access roads. This barrier should be a rock barrier of approximately 1.5 to 2.0 meters in height. There will be two locations where lighter vehicles need to cross over this haul road, only one of which will be within the publically accessible section of the AWAR. These are: i) at the public access to Meliadine Lake (south-east corner of Meliadine Lake – labelled as public boat launch area³¹); and at the cross-over between the Meliadine AWAR and the access road to the F Zone mining area (not accessible to the public, i.e., this cross-over point is north of the planned gate controlling public access into the mine working areas at the main site). At both of these sites, stop signs will be installed along with warning signs requiring light vehicles to give way to the mine haul trucks.

- A bypass road to be constructed around the south side of the Rankin Inlet airport runway to connect the Itivia laydown area to the AWAR. The purpose is to allow materials, fuel and equipment to be trucked between the Itivia facilities and the Meliadine site without having to drive through the developed areas of Rankin Inlet. The road will be constructed to the same design width (8.0 m) and specifications as that shown for the Phase 2 AWAR (provided later in this section). This road is proposed to enhance safety considerations and prevent unwanted interaction between the public and this trucking activity, and is endorsed by the Hamlet council.
- A network of roads on the Meliadine site to connect up the various mining areas and to access the various waste rock storage facilities and water management infrastructures. The location and alignment of these proposed roads is shown in Figure 2-35. The roads connecting the mining areas and the waste rock storage facilities to the main mine site will be constructed to a width of 26 m to accommodate two lane haul trucks passage while the other roads will be built to a narrower width (6.5 to 8.0 m in width) to accommodate service vehicles only. All of the network of roads on the Meliadine mine site will be closed to all publically owned vehicles for safety considerations.

The open pit ramps and haul roads will be designed for the largest equipment. For double lane traffic, the minimum width is 26 m and includes a drainage ditch and a safety berm. The safety berm on the outside edge will be constructed of crushed rock to a height equal to half the rolling radius of the largest tire using the ramp. To facilitate drainage of the roadway, a two percent cross slope on

³¹ It should be noted that AEM has committed to provide community access to the shore of Meliadine Lake for the purpose of putting a small boat into the lake. AEM is not proposing to build any structure or ramp into the lake that would physically impact the lake nor the shoreline at this location. The spur road would end in a small graveled parking area back from the lake shore line from where community residents could lift a boat into the lake.

the ramp is planned. For single-lane traffic, a minimum width of 16 m will be used. The maximum ramp gradient will be 10 %.

The access road to the Discovery deposit site (along with the associated Discovery haul road) is required to allow for the economic mining of the Discovery deposit. The distance between the Discovery mining site and the mill site is approximately 20 km by road. The ore reserve at Discovery is not sufficient to economically justify a separate ore processing facility, thus there has to be a cost effective means of moving the ore from Discovery to the mill. AEM considered the viability of a winter road; however, moving 800,000 tonnes per year of ore over a 4 to 5 year period would be very difficult by winter road without significantly scarring the underlying ground. An all-weather road was seen as the only viable alternative. The alignment of the road went through several iterations with the objective of reducing the overall length of the road and avoiding as many water crossings as possible. The initial road alignment had the access road approach the Discovery deposit around the north shore of the last lake (just to the west of the water course crossing at km 5.8). This was subsequently realigned to the south side of this lake which avoided a third water course crossing (formerly known as water course crossing 6.7).

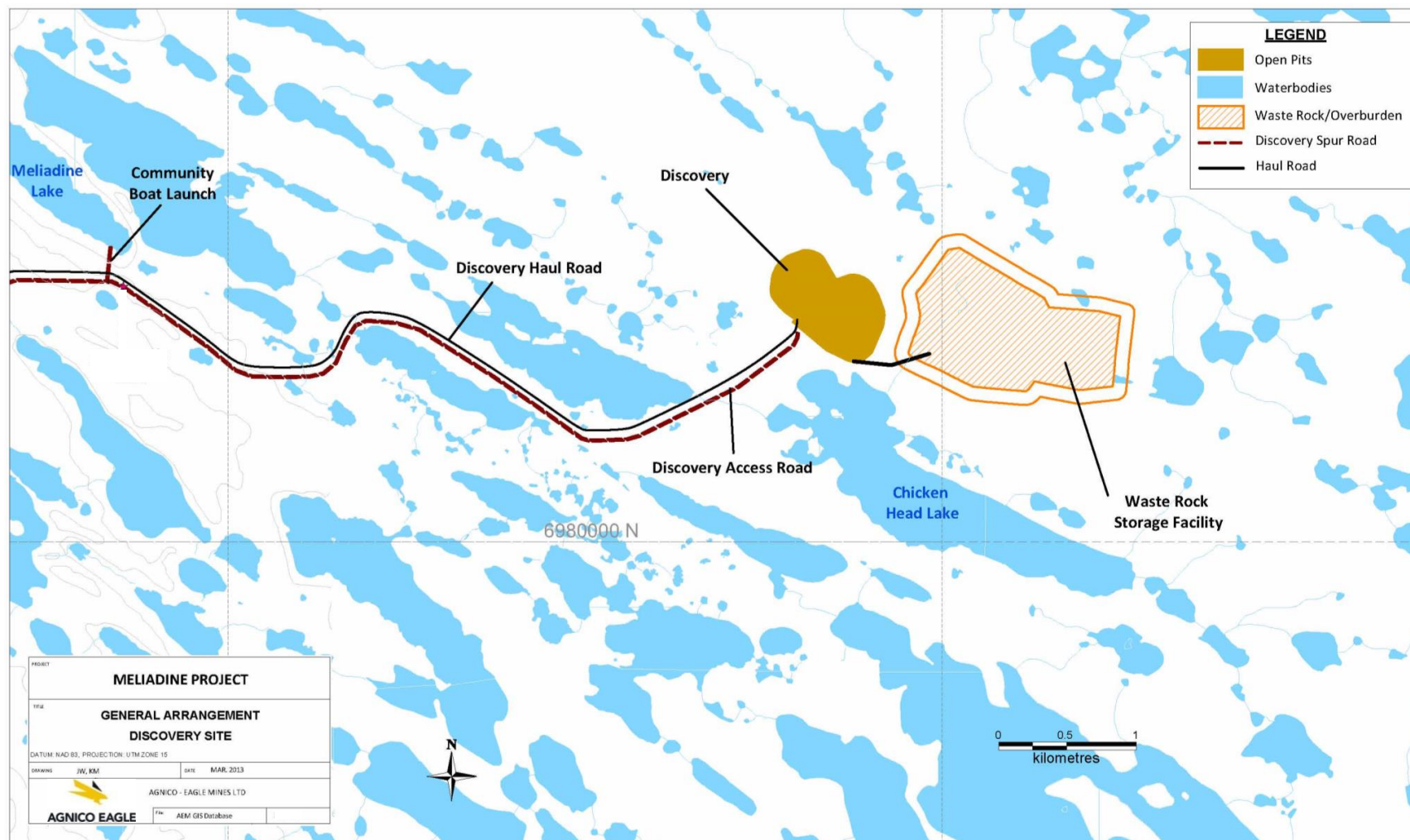


Figure 2-34 Proposed Alignment of the Access Road to the Discovery Deposit Site

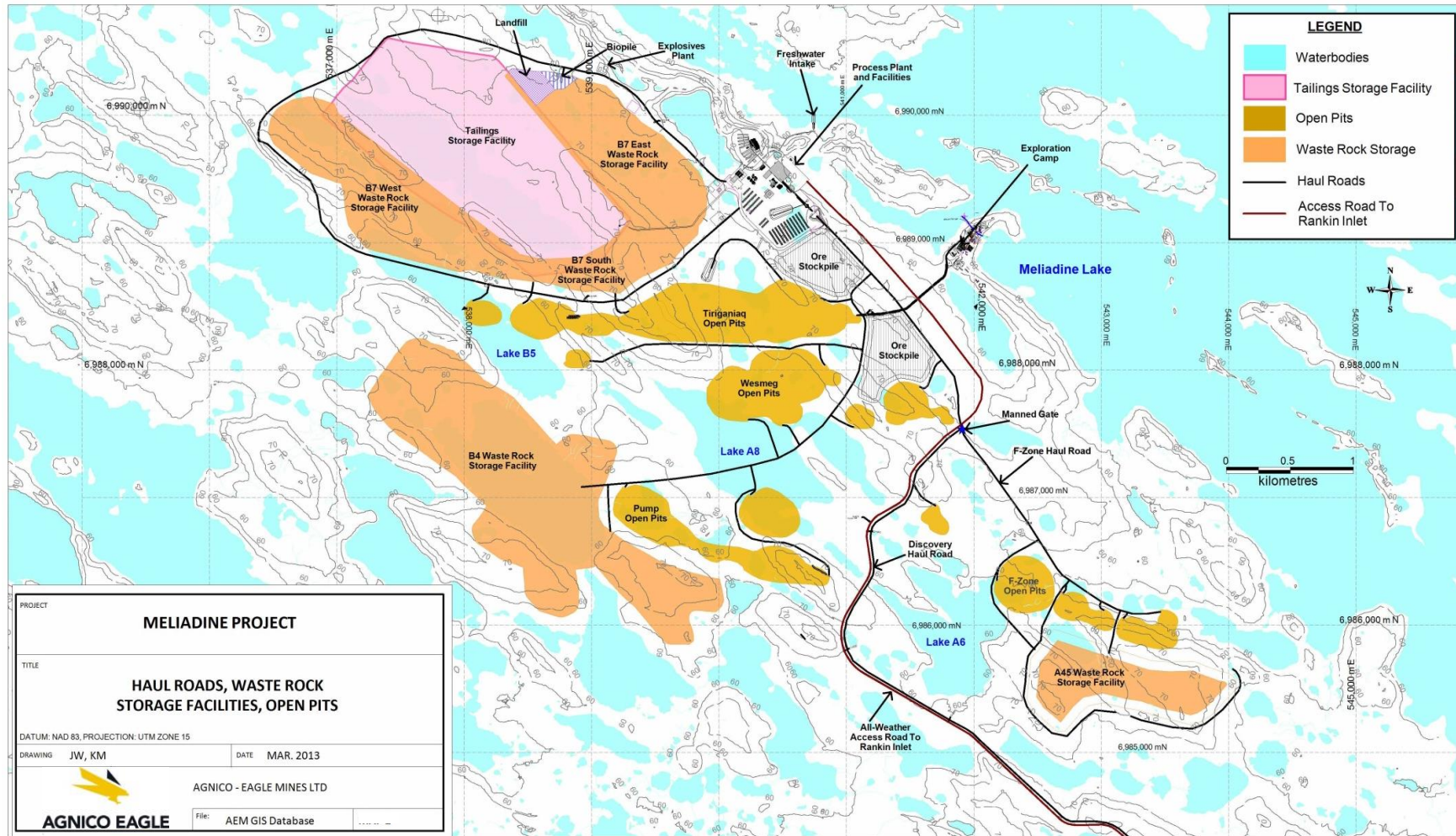


Figure 2-35 Main Site Service Roads Network

2.6.4.1 All-weather Access Road (AWAR) from Rankin Inlet to the Meliadine Site

AEM looked at a number of alternatives with the conclusion that the Project needed to be connected to Rankin Inlet by an All-weather Access Road to be economic, and that the selected route is the best alternative. The community did express support for this conclusion.

The Phase 1 AWAR involved the construction of a 23.8-km-long road between the Char River bridge turnoff and Meliadine Exploration camp, with access controlled by a manned gate located just after the Char River bridge turnoff. It will facilitate the timely transport of fuel and materials for the purposes of resupplying the ongoing advanced exploration program, obtaining year-round services from businesses in Rankin Inlet, and transporting workers between Rankin Inlet and the site. The Phase 1 AWAR will have controlled public access by motorized vehicle.

The selection of the alignment for this AWAR was the subject of an earlier screening process conducted by the NIRB. The Project Proposal submitted by AEM for this process can be accessed at the NIRB ftp site at the following link:

<http://ftp.nirb.ca/02-REVIEWS/ACTIVE%20REVIEWS/11MN034-AEM%20MELIADINE/1-SCREENING/01-APPLICATION/>

The AWAR route selected was based on extensive community consultation that involved collection of traditional knowledge. The AWAR follows a network of well-established trails that have traditionally been used to reach the Meliadine area. Access today is not along a single trail used by everyone, but on a network of trails developed over the years by different users, each using the trail best suited for the conditions at the time. Snowmobiles and all-terrain vehicles have developed these trails over the years. The selected route was chosen based on consultation conducted by Comaplex Resources with the residents of Rankin Inlet and the HTO. The route is the shortest, thus minimizing land disturbance, and minimizes water crossings. Some community members wished to see the road go further to the west towards the Diane River as this would have increased access to traditional caribou hunting areas, but this route would have increased the overall road length, would have brought the road closer to the Territorial Park for more of its length, and would have increased the number of wetland crossings required as the land between the north end of the Territorial Park and the Meliadine site is quite heavily covered in wetlands and small lakes.

AEM plans to widen the Phase 1 road to two lanes, extend the road to the mill site and build a road (with a segregated mine haul truck road) to the Discovery gold deposit as part of the Phase 2 AWAR development. Approval of the Phase 2 AWAR required to support the construction, operation, and decommissioning of the proposed Meliadine Gold Project is the subject of the Part 5 review being conducted by NIRB. The Phase 2 AWAR is part of the application for a Project Certificate for the proposed Meliadine Gold Project. AEM acknowledges that the NIRB may decide to recommend to the Minister of Aboriginal Affairs and Northern Development Canada (AANDC) that the full

Meliadine Gold Project not proceed as proposed, in which case the Phase 1 AWAR would be decommissioned and reclaimed by AEM once the exploration site has been fully reclaimed.

This road (both phases) would be a private road constructed primarily on Inuit Owned Lands leased by AEM from the Kivalliq Inuit Association (KIA), with small sections of the road constructed on Commissioner's land (2.3 km) that will also be leased by AEM. Consequently, AEM has sole responsibility for the construction and ongoing inspection and maintenance of all of the components of this road, including the road bed, the bridges, the culverts, and the borrow/quarry sites used in the construction of the road. This road will not be part of any Territorial highway system. The Phase 1 road is shown in Figure 2-36, with quarries and drainage infrastructure.

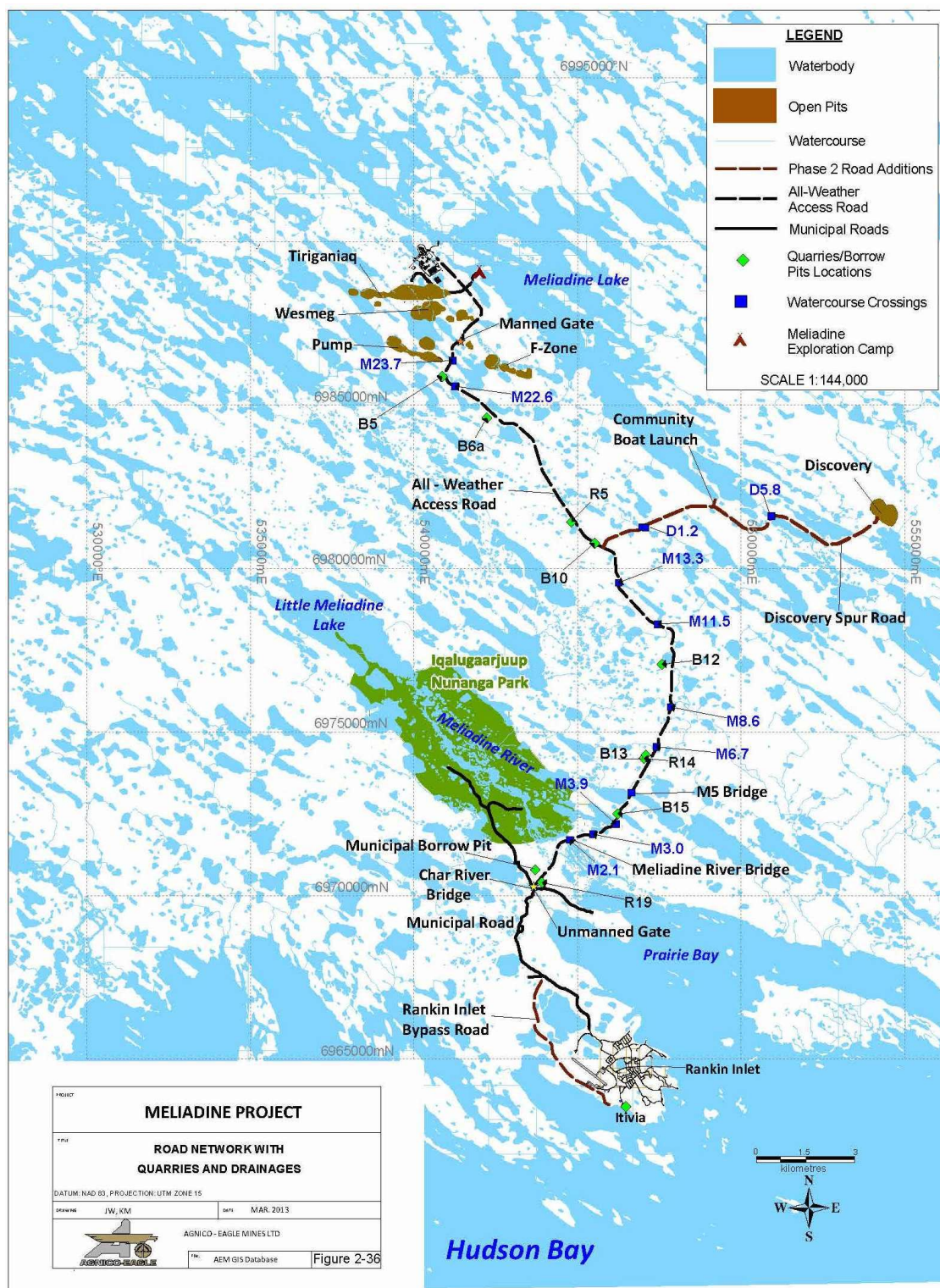


Figure 2-36 Meliadine AWAR with Quarries and Drainage

Phase 1 AWAR

Construction of the Phase 1 AWAR started in April 2012 and was suspended for the season in mid-May. Construction resumed once the ground froze again in the late fall of 2012 and was completed in the late fall of 2013. Placement of the roadbed material only takes place during winter months while the ground is frozen. This allowed, to the greatest extent possible, the construction of the AWAR to be carried out during winter months. Initially, a rough trail was advanced at the full base width of the Phase 1 AWAR from the southern end of the AWAR to the Meliadine exploration site so that the base of the road was laid down under winter frozen ground conditions, thus keeping this activity outside of the migratory bird nesting season. Under the *Migratory Birds Convention Act*, the road construction cannot disturb or destroy any active migratory bird nests.

Constructing the road base under winter conditions also helped protect the underlying permafrost and prevent generation and transport of sediment during construction. Similarly, the culverts were installed under winter conditions which mitigated generation and transport of sediment created through this construction activity.

In addition to those listed above, the following mitigation measures were used when necessary to minimize potential effects on water resources when road construction/maintenance activities occurred in non-winter months:

- Regular inspection of the road to identify areas of ponding, erosion, or sedimentation is conducted;
- Where applicable, construction runoff is captured and managed to minimize suspended solids in the watercourses; and
- Instream construction work is avoided, or limited, to the minimum extent possible.

The bridge footings were installed in the late summer of 2012 when water levels were at an annual low. Silt curtains were installed to mitigate the sediment release into the stream and river crossings while the footings were constructed. For all three bridges the footings were installed above the high water line thereby minimizing the amount of in-stream construction work. During the operational phase, regular inspections of the AWAR will be conducted by AEM personnel. If any sediment release is noted then immediate action will be taken to mitigate such release using a combination of silt curtains and diversion of runoff away from the source if practical.

The stream crossing culverts were also installed in the winter so that they can be fully completed before the start of the summer fisheries in-stream work exclusion window. The objective is to ensure that no construction takes place within the stream crossings during the summer annual fisheries window when fish may be using the streams. Once this rough track is laid down and the stream culverts installed, then construction of the final Phase 1 AWAR was completed by placing the final topping materials.

The Phase 1 AWAR is a nominal single-lane road with a running surface 6.5 m in width. There are passing turnouts 30 m in length, set at intervals of approximately 350 m. The nominal running surface at each passing turnout is 9.5 m in width. The minimum road depth is 1.0 m for areas over non-thaw-susceptible soil (well-drained soil over bedrock) and 1.3 m for areas over thaw-susceptible soil (poorly drained, ice-rich, organic or bog over bedrock). In both cases, the side slope of the road is 2.5H : 1V. Thus the maximum nominal base width of the road is 13.0 m, increasing to 16.0 m at each passing turnout, for a road thickness of 1.3 m.

Phase 2 AWAR

The Phase 2 AWAR will only proceed following issuance of a Project Certificate and after the appropriate permits are obtained (Water License, Land Use Leases, etc.). It will be constructed in a similar manner to that described above for the Phase 1 AWAR but would involve a final running surface width of 8.0 m. The design criteria would otherwise be similar. The running width of 8.0 meters is a nominal two lane road thus eliminating the need for additional passing zones.

Water Crossings (Phase 1 and 2)

There will be a total of 12 water crossings along the road route (10 along the Meliadine AWAR and 2 along the Discovery Road). Two (2) of these crossings will be achieved using clear-span bridges, at the Meliadine River and an unnamed stream at kilometre 5.0. The other stream crossings will be achieved using culverts. AEM will install a new clear-span bridge immediately adjacent to the existing Char River Bridge that is located on the existing municipal-owned and -operated road to the Iqaluqaarjuup Nunanga Territorial Park. These three (3) clear-span bridges were constructed during the summer of 2012.

A list of the 12 crossings and their hydraulic characteristics is shown in 0. Their locations are shown in Figure 2-36.

Table 2-48 Location and Hydraulic Characteristics of Water Crossings

Location	Latitude ¹	Longitude ¹	Drainage Area (km ²)	Design Discharge (m ³ /s) ²	Bankfull Width (m)	Bankfull Depth (m)	Design Depth (m)
Char River ³	62°51'31.8"	93°51'27.9"	69	N/A	N/A	N/A	N/A
Meliadine River	62°52'21.8"	92°07'10.4"	796	81	60	1.2	1.58
M3.0	62°52'26.6"	92°06'16.6"	2.77	1.5	2.5	0.12	0.24
M3.9	62°52'36.2"	92°05'32.5"	1.82	4.7	2.5	0.1	0.62
M5.0	62°53'06.5"	92°04'58.5"	11.02	9.1	10	0.2	0.81
M6.7	62°53'50.4"	92°04'04.3"	0.82	3.1	1	0.05	0.24
M8.6	62°54'36.1"	92°03'25.3"	1.4	4	3.9	0.16	0.57
M11.5	62°55'53.8"	92°03'55.7"	1.38	1.2	1.5	0.26	0.41
M13.3	62°56'34.0"	92°05'16.6"	0.16	0.4	3.75	0.2	0.27
M22.6	62°59'51.2"	92°11'08.8"	0.97	0.5	0.9	0.13	0.21
M23.7	63°00'16.6"	92°11'12.2"	3.62	0.5	3.2	0.25	0.31
D1.2	62°57'28.6"	92°04'30.1"	3.29	5	0.6	0.10	-
D5.9	62°57'38.3"	91°59'45.2"	1.31	-	20.0	0.10	-

¹ NAD 83² 1:25 year flood³ The Char River bridge is not on the Phase 1 AWAR; it is on existing municipal road leading to the Territorial Park.

Based on assessments carried out for AEM by a hydrologist from Golder Associates, confirmed by Transport Canada (TC), 11 of the 12 stream crossings along the AWAR (including the Discovery Road) are not considered as being navigable under the *Navigable Waters Protection Act*. The one exception is the Meliadine River crossing, which is crossed with a clear-span bridge set to avoid any interference with boats navigated on this river.

Similarly, Golder Associates (on behalf of AEM) completed fish habitat surveys at each of these crossings. Due to the poor quality fish habitat documented at most crossings during these surveys and because the crossing structures (bridges and culverts) would represent low risk to the fish populations, Fisheries and Oceans Canada (DFO) have advised AEM that the road is unlikely to result in impacts on fish and fish habitat if the operational statement for clear span bridges is followed. AEM conformed with all of the applicable DFO Operational Statements for protecting fish and fish habitat in constructing and operating these crossings. Consequently, the design of all of these water crossings has taken into consideration the facilitation and protection of fish movement and migration. With the planned maintenance, the road structures are not expected to impede fish movement in any way.

There is no infilling of lake, wetland or stream habitat associated with the Phase 1 and 2 AWAR construction.

In accordance with DFO and Environment Canada guidance, the following will be applied during the construction of the AWAR whenever near a waterbody or stream:

- No in-water work can take place from 1 May to 15 July, to protect fish spawning and nursery periods of local fish populations; this would apply to all stream crossings;
- Sediment and erosion control measures must be implemented prior to the start of work and maintained during the work phase to prevent entry of sediment into the water or the movement of re-suspended sediment into the stream crossings;
- Sediment and erosion control measure will be left in place until all disturbed areas have been stabilized;
- All disturbed areas are to be physically stabilized as soon as possible following construction and to the greatest extent possible re-vegetated with native species from the area, assuming that an appropriate source of vegetation can be found (seed or transplants);
- Machinery used near stream crossings should arrive on site in a clean condition and be maintained free of fluid leaks to keep contaminants out of the water;
- The equipment must be re-fuelled, serviced, and washed away from the stream crossings to prevent deleterious substances from entering the water. Fuel, lubricants, hydraulic fluids, etc., must not be stored within 31 m of the high water mark of any waterbody and should be kept in an area where spillage can be contained, and in a manner inaccessible to all wildlife; and
- An emergency spill kit should be kept at the work site in case of fluid leaks or spills from machinery.

The new Char River Bridge is required because the existing bridge is too narrow, its maximum load is only 50 t, and its abutments are at risk of being undermined by the river at certain times of the year, most notably during the spring freshet. The new Char River Bridge is a 29.5-m single-span steel bridge. The new bridge is located immediately west of the current bridge, but its abutments are set back farther from the river and have substantially more armouring to protect them.

A new 66.3-m single-span steel bridge was built across the Meliadine River. It is approximately three metres above the water, which meets the requirements for navigable waters.

For stream crossing M5.0, a single-span steel bridge of 23.5 m was built so that the natural channel of the stream remains unaffected and fish habitat is not disturbed.

The design for the 3 bridges is based on the *Canadian Highway Code*, using design CSA, S6-06, CL-625. For design stress loads, two 18-metre-long vehicles of GVW (gross vehicle weight) of 62,500 kg are considered to be travelling simultaneously on a bridge. The loading is factored by a 40 % dynamic allowance and another 60 % safety factor. The ultimate capacity is around 280,000 kg.

Ten ephemeral streams will be crossed using culverts and one stream will be crossed with a bridge (M5.0 as referenced above), all the while keeping in mind Arctic conditions and the necessity for fish

migration. The choice of culverts rather than bridges was based on the results of hydraulic analyses, preliminary observations of the channel characteristics at each watercourse crossing, and economic considerations.

For non-navigable stream crossing locations, it is initially assumed that multiple full-rounded corrugated steel pipe culverts with nominal sizes of 0.7, 1.0, and 1.3 m (internal diameter) will be used to pass the design flow. A minimum of 2 culverts placed in an “offset stacked” configuration will be used to enable flow conveyance before complete ice break-up within the watercourse. As part of the “offset stacked” configuration, the lowest culvert will be embedded into the watercourse to provide low water fish passage. For each fish bearing crossing, a hydraulic analysis was conducted to confirm that the estimated culvert flow velocities will not exceed 0.8 m per second during the 1:10 year, 3-day event. Figure 2-37 shows a typical design for the culverts that will be used for these ephemeral stream crossings.

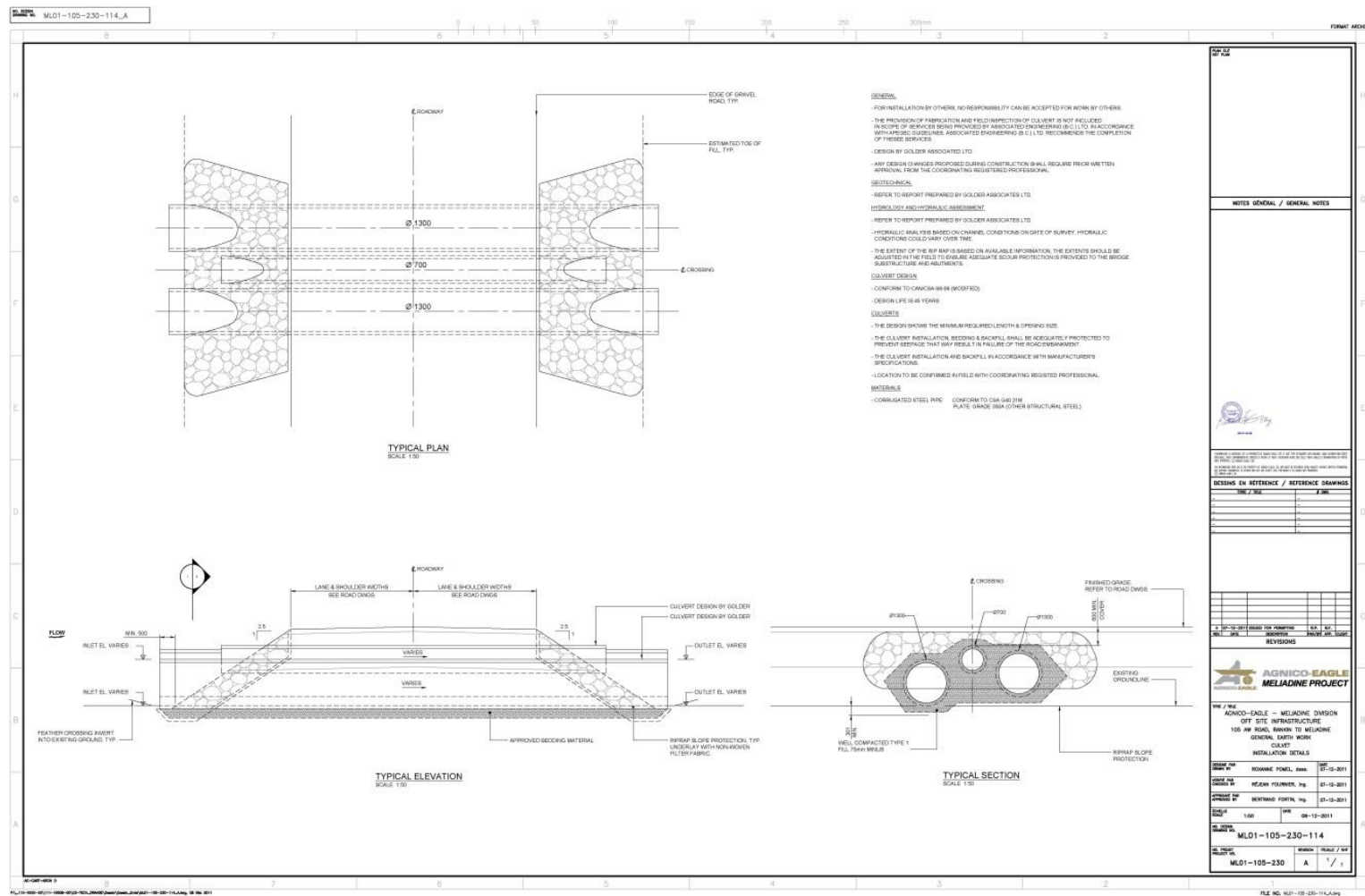


Figure 2-37 Typical Culvert Installation along the AWAR

AWAR Road Design (Phase 2, Discovery and Bypass)

The road design is detailed in the Golder Associates (2010g) design report. The design was based on the largest vehicle that would travel frequently on the proposed road, a B-Train tractor-trailer unit (2.4 m wide and 25 m long). This is the same transport truck seen on all highways across Canada. The design elements and criteria are given in Table 2-49.

For the Phase 2 AWAR, only the running surface will be widened to a double lane road (8.0 m width). Locations and hydraulic characteristics of water crossings will remain unchanged with the widening of the Phase 2 AWAR running surface to 8.0 metres. No changes are expected to the present culvert configurations excepting that they will be lengthened to accommodate the wider road. Mitigation measures will remain unchanged for the Phase 2 AWAR.

Construction of the Phase 2 AWAR will take place in winter with all or the majority of the road completed under winter conditions when there is no water to cause sedimentation problems. However, surface dressing may extend into summer. Should this occur, this last step in road construction by itself will have negligible effects. Various mitigation and best practices strategies/procedures that will be followed during road construction to control sedimentation are as follows:

- No in-water work will take place from 1 May to 15 July, to protect fish spawning and nursery periods of local fish populations; this would apply to all stream crossings;
- Sediment and erosion control measures will be implemented prior to the start of work and maintained during the work phase to prevent entry of sediment into the water or the movement of re-suspended sediment into the stream crossings;
- Sediment and erosion control measure will be left in place until all disturbed areas have been stabilized;
- All disturbed areas will be physically stabilized as soon as possible following construction using rock and/or vegetation;
- Machinery used near stream crossings will arrive on site in a clean condition and be maintained free of fluid leaks to keep contaminants out of the water;
- The equipment will be re-fuelled, serviced, and washed away from the stream crossings to prevent deleterious substances from entering the water. Fuel, lubricants, hydraulic fluids, etc., will not be stored within 31 m of the high water mark of any waterbody and will be kept in an area where spillage can be contained, and in a manner inaccessible to all wildlife; and
- An emergency spill kit will be kept at the work site in case of fluid leaks or spills from machinery.

In addition to those listed above, the following mitigation measures will be used to minimize potential effects on water resources should road construction activities occur in non-winter months:

- Regular inspection of the road to identify areas of ponding, erosion, or sedimentation, will be conducted;
- Where applicable, construction runoff will be captured and managed to minimize suspended solids in the watercourses; and
- Instream construction work will be avoided, or limited, to the minimum extent possible.

In pre-construction consultation, AEM has not identified any known wildlife movement trails or snowmobile/ATV (all-terrain vehicle) trails that cut across the road alignment. AEM did hear that ATV's and snowmobiles will typically follow the road in traveling between Rankin Inlet and Meliadine Lake. AEM has committed to both the HTO and KIA to work with the community to identify areas where the road shoulders need to be sloped at a more gradual angle to facilitate wildlife movement and snowmobile/ATV across the roadway. These will be retrofitted by AEM once identified through ongoing consultation.

Road signs will be properly positioned, legible and in compliance with standards for:

- Size, shape and colour;
- Sign placement and mounted height;
- Design and legibility – in English and Inuktitut; and
- Reflectivity level.

These will directly influence the safe use of the road.

Table 2-49 Road Design Criteria (Phase 2, Discovery and Bypass Roads)

Design Element	Criteria	Source/Comment
Widest vehicle on road	B-train (2.4 m wide)	TAC 2007 ¹
Longest vehicle on road	B-train (25 m long)	
Maximum design speed	50 km/h	Based on similar projects
Minimum stopping distance	110 m	Based on trucks with conventional braking systems, TAC 2007, 1.2.5.4 [for comparison, 65 m for trucks with antilock braking systems]
Minimum road width (2-way road, not including the shoulders)	8.0 m (plus 2 m width per safety berm where required) ³	Meets or exceeds NWT 1995 & TAC 2007
	Slope of road shoulders: 2H:1V	Based on 2.4 m (96") vehicle width, 1.1 m tire height, NWT 1995 ² p. 35 and TAC 2007, 2.2.2.11
Road alignment at watercourse crossings	Perpendicular to watercourse	Based on similar projects Crossings – 3 bridges and 9 culverts
Drainage culvert or French drain frequency	Every 50 m for low ground; may not apply on high ground	Based on similar projects For planning purposes; actual number to be determined in the field
Road section method	Fill (no cuts)	Based on similar projects Selective use of quarry material to minimize metal leaching
Super-elevation	None	Based on similar projects
Minimum radius of curvature	165 m	Based on 50 km/h maximum speed design and 0.12 coefficient of friction between road surface and vehicle tires, TAC 2007, 2.1.2.7
Maximum slope gradient	8 %	TAC 2007, 2.1.3.2
Minimum sag curve "K" value	12	Based on stopping distance, TAC 2007, 2.1.3.8
Minimum crest curve "K" value	9	Based on stopping distance, TAC 2007, 2.1.3.5
Offset from archaeological sites	30 m	<i>Nunavut Archaeological and Paleontological Sites Regulations (2003)</i>

¹ Transport Association of Canada (TAC). 2007. Geometric design guide for Canadian roads.² Nunavut/Northwest Territories Mine Health and Safety Act (NT 1994) and Regulations (NT 1995).³ The most common width of traffic lane is 3.7 m on two-way highways.

2.6.4.2 Road Maintenance, Watercourse Inspections and Dust Management

These maintenance procedures are outlined in the Roads Management Plan (SD 2-9) included as part of the proposed Environmental Management System for the Meliadine Project.

Road Inspection Procedures (apply to all roads)

Inspection precedes maintenance. Good inspection programs will lead to the early identification of areas of the road where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface. The following procedures are to be applied to all of the access roads to be constructed for the proposed Meliadine Project.

The road and its shoulders will be inspected weekly during the summer period for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment. This is expected and may lead to longitudinal cracking and thaw settlement, especially for portions of the road founded on ice-rich soil. When such areas are discovered, the affected area will be repaired using granular material and/or crushed rock.

During the summer, the road will be regularly graded, the frequency dependent on the condition of the driving surface. In the winter and if necessary, the road will be sanded to improve traction and increase safety.

Watercourse Inspections (apply to all roads)

Regular inspection activities of all watercourse crossings (including the bridge crossings at the Char River, lower Meliadine River and at the Bridge at crossing M5) will consist of:

- Visual inspection of infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required.
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of manual removal of accumulated debris and any necessary damage repair as soon as possible.
- Visual inspection of upstream and downstream channels to identify bed erosion or scour around the watercourse-crossing structure. Particular attention will be paid to bridge abutments and abutment foundations, as they are vulnerable to scour and erosion. Maintenance will consist of the remediation of any detected problems and any necessary damage repair as soon as possible.

Inspection frequency will be increased during the following critical time periods:

- Just prior to spring freshet to verify that the culverts and stream crossings are in good state to pass flows from the rapid spring thaw that occurs in the north;
- During the spring freshet to verify that the culverts and bridges are not impeding spring freshet and to initiate action when and where required to prevent road wash outs; and

- Just after heavy rainfall events to monitor water accumulation along the road, to verify that culverts are passing precipitation as planned and to initiate action when and where required to prevent erosion and road wash outs.

The watercourse crossing inspection and maintenance program will have 3 main components:

1. A regular inspection program to identify issues relating to watercourse crossings, such as impaired structural integrity and hydraulic function;
2. An event inspection program to track the effects of large storm events on watercourse crossings, such as effects on structural integrity and hydraulic function; and
3. A culvert location inspection program to verify that culverts have been installed in the right location with respect to the watercourse and that culvert capacity is adequate for passing water under all hydraulic conditions. In most cases, there are multiple culverts installed at different elevations at each stream crossing so that these culverts can adequately pass normal summer, spring freshet, and heavy rainfall flows.

During the freshet period, crossings inspections will be performed twice a week (mid-May to June) and weekly during the remainder of the ice-free period prior to fall freeze-up (July through October). These inspection activities for each watercourse crossing will consist of the following:

- Visual inspection of its infrastructure to identify defects, cracks, or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required.
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible.
- Visual inspection of the upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will be paid to bridge abutments and abutment foundations as they will be vulnerable to scour and erosion during flood events.

Particular attention will also be paid to potential sources of sediment transport and will include looking to identify areas of ponding, erosion, or sedimentation.

Results from these inspections will be recorded by AEM to help track changes in condition over time. The remediation of any detected problem and any necessary damage repairs will be undertaken as soon as possible, under the direction of AEM's road supervisor.

Following their installation, the culvert crossings will be visually inspected to confirm they have been properly executed and installed. These culverts will initially be installed during winter conditions and thus it is possible that a culvert will not be sited correctly to pass all ponding of water through the road. The intent is to check for such conditions during the first snow melt and after rain events so

that adjustments can be made accordingly. Additional culverts will be installed, if necessary, should the inspection indicate that the culverts were installed in a location that does not optimally route water flows.

AEM acknowledges that the GN Territorial Archaeologist has concerns that potential ice buildup at the site of the lower Meliadine River crossing bridge could cause water to back up and flood important archaeological sites upstream from the bridge in the Iqalugaarjuup Nunanga Territorial Park. AEM has committed to work with the GN to inspect and mitigate where possible such risks. To this effect AEM has committed to provide copies of its twice weekly inspections at the lower Meliadine River Bridge to the GN Territorial Archaeologist in the spring/early summer freshet period via email or FAX. The intention is to ensure that both AEM and the GN Territorial archaeologist monitor for this potential risk for the purpose of taking appropriate action in a timely manner should ice buildup reach the point where these sites are at risk of flooding. The intent is for action to be taken prior to harm being done. The action plan would be developed and implemented by AEM with consultation with the GN.

AEM has agreed to work with the GN to develop other protective measures to protect important archaeological sites upstream of the Meliadine River Bridge within the Iqalugaarjuup Nunanga Territorial Park if it is shown that these sites continue to be damaged by flooding caused by the bridge.

Winter Maintenance

Sections of the Meliadine roads are expected to experience snow drifts because of strong winds over the winter period. As much as possible, this snow will be cleared to the downwind side of the road to limit the wind re-depositing the same snow on the cleared road. Routine spring snow management will include the removal of any snow that accumulates at bridges and culverts so that water at freshet can move freely through the culverts and under bridges. In the case of culverts, snow will be removed from both ends but not from the inside.

Where ski-doo trails cross the road, snow clearing will be mindful of not placing snow on the trails thereby making crossing the roads easy. Snowmobile crossings will be identified by the HTO with signs identifying the trail placed along the road and a stop sign on the ski-doo track at the edge of the road.

The report, “Preliminary Snow Drift Assessment of the Meliadine All Weather Road from Rankin Inlet to the Meliadine Site, Nunavut” (Golder Associates 2011c) provides an assessment where snow drifts can be expected. It states:

“Observations seem to indicate that snow drifts can be expected on the lee of short, steep slopes and along lake shores.” and

“Maintenance will be required during operations to manage snow accumulation along the road alignment; however, most of the alignment appears to be located along the windward slopes and ridge crests where there should be a limited tendency for snow to build up.”

The design of the AWAR between the Meliadine site and Rankin Inlet factored in snow accumulation and this is one of the reasons the road is located along the height of land as much as possible and in a northerly alignment.

At Meadowbank, the AWAR is periodically closed under bad icing conditions until the road can be graded and/or sanded. AEM does have road sanding equipment at its Meadowbank operation to address icing road conditions. Similar procedures will be used on the Meliadine AWAR.

Dust Control Procedures (apply to all roads)

The amount of dust generated along the road is dependent on the dryness of the road surface, the number of vehicles, weight and speed, and maintenance of the driving surface. Regular grading of the road combined with the addition of granular material to the driving surface will be needed. This will improve road safety and also reduce the amount of dust. Dust will also be mitigated by maintaining posted speed limits. In areas or times identified by the AEM road supervisor as being prone to high dust levels or areas where safe road visibility is impaired or in areas where dust deposition is impacting fish habitat and/or water quality, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, placement of new coarser topping, and/or watering of the road surface. Use of chemical dust suppressants will be used only as a last resort and only in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment (January 2002)³². Other than water, the dust suppressant most likely to be used by AEM is calcium chloride, however its use will be kept to a minimum to prevent damage to vegetation adjacent to the road and to mitigate against creating an attractant to wildlife (salt lick effect).

Dust control measures along the AWAR and at all haul roads and yards at the mine site have been identified by the community of Rankin Inlet as an important health concern. Following the technical review and community roundtable sessions held by the NIRB on the Draft EIS, NIRB directed AEM to prepare a separate Dust Management Plan for inclusion with the Final EIS. This Dust Management Plan has been prepared and is included as Appendix C to the Roads Management Plan. It addresses the actions that AEM will take to manage dust generated by road traffic during the non-winter months when dust becomes an issue.

³² Available at: <http://env.gov.nu.ca/sites/default/files/Guideline%20Dust%20Suppression.pdf>

Noise and Vibrations

The passage of vehicular traffic along both the AWAR and the adjacent segregated haul road will create localized noise and vibration. An assessment of such noise and vibration impacts has been conducted with the results reported upon in Volume 5 of the Environmental Impact Statement, specifically in Section 5.5. Mitigation measures were included in the Noise Abatement Plan (SD 5-3). Overall, both noise and vibration effects are expected to be very localized and dependent upon traffic volumes.

2.6.4.3 Traffic Management

Under most conditions, the Phase 2 AWAR (including the Discovery and bypass roads) will be open to public use in the section between Rankin Inlet and Meliadine Lake. The road will have an unmanned gate at its south end, which will be open in most instances to allow public use of the road. However, public use of the road will not be without restrictions. AEM will err on the side of caution and close the southern gate if there is a risk to public safety.

A system will be established to allow AEM to communicate current road closures to the public. This will include announcements on community radio, public information sessions, email alerts to a subscription list of interested parties, email alerts to the Hamlet of Rankin Inlet and to the KIA, and other methods of communication that are found effective through ongoing experience and consultation. AEM will have in place a written Meliadine all-weather road operating procedure that will be periodically reviewed and updated. This will set out the rules for all use of the road and the procedures that will be employed by AEM in operating and maintaining the road (similar to the road-operating procedure that AEM has in place at Meadowbank for the road between Meadowbank and Baker Lake). Once the road is in operation, copies of the procedure will be provided regularly to the Hamlet office in Rankin Inlet, to the KIA office and to the HTO office in Rankin Inlet.

A manned control gate will be installed and operated at the northern end of the road (the Meliadine Project end of the road). This gate will be located at somewhere between km 24 and 25 just before the mine haul truck road crosses over the AWAR and just south of the junction with the F Zone access road.

There will also be an unmanned gate on the Discovery road to prevent unauthorized access by the general public into the Discovery mining area to protect public safety.

Heavy mining equipment such as bulldozers, back hoes, loaders and the like will be used within the Project areas. The public will not be allowed uncontrolled access into active areas of the Project to protect them from inadvertent contact with work areas where Mine Safety regulations are in force.

The southern gate will be closed to public traffic under the following circumstances:

- When the road and bridges are under construction;

- When major maintenance activities occur, such as the repair of a bridge or repositioning of a culvert;
- When the weather is deteriorating, during periods of low visibility, or when an impending storm is forecasted;
- When a large number of animals are on or adjacent to the road. The road could also be closed upon the request of the Rankin Inlet HTO;
- When oversized loads are being transported. Such a load would be escorted by a lead vehicle and a following vehicle, warning other traffic of its presence. This is a normal practice on all roads. Even though the southern gate would be closed in this instance, the lead and following vehicles would accompany the oversized load all the way to the Meliadine site; and
- When heavy mining machinery has to use the road. These are expected to be infrequent occurrences.

At intersections, Stop signs will be used to manage traffic interaction. Warning signs will be erected along the roads ahead of any intersection warning drivers of the upcoming intersection and warning of the need to Stop and yield to crossing traffic where appropriate. The specific interactions are planned:

- Intersection between AWAR and the existing Hamlet Road (just north of the Char River Bridge) – traffic coming south from the Meliadine site will be required to stop before turning onto the existing Hamlet road. Traffic along the Hamlet Road will have the right of way;
- Intersection between the AWAR and the Discovery road (km 15) – traffic coming west from the southeast end of Meliadine Lake or from the Discovery site will be required to stop before turning onto the AWAR. Traffic along the AWAR will have the right of way;
- Intersection between the Discovery road to access the community boat launch area on Meliadine Lake (crossing the Discovery haul road) – traffic crossing the Discovery haul road will be required to stop in both directions before crossing the haul road. Traffic coming from the boat launch spur will be required to stop before turning onto the Discovery road. Traffic along the haul road will have the right of way;
- Intersection between the AWAR and the haul road at km 25 – traffic crossing the haul road will be required to stop in both directions before crossing the haul road. Traffic along the haul road will have the right of way; and
- Intersection between the Discovery and F Zone mine haul truck roads – traffic coming from the Discovery mining area will have to stop when heading east – traffic along the F Zone mine haul truck road will have the right of way.

Traffic management procedures common to all jurisdictions will be used during road grading, maintenance and snow removal. In both these instances, signs will warn of the road work ahead; drivers will be required to reduce their speed to posted limits and approach the work zone with caution. If the road is reduced to one lane for a considerable distance, flag persons would be situated

at either end of the work area to allow traffic flow. Drivers must be prepared to stop and wait for permission to proceed.

There will be no public access allowed on any of the mine haul roadways. As stated previously, a physical barrier will be used to segregate the AWAR from the mine haul roadways.

Road Safety Rules (apply to all roads)

The following safety rules will apply for all users of the AWAR:

- Maximum speed limit on this road is 50 km/h;
- Use of seat belts by all drivers and passengers is mandatory;
- Driving under the influence of alcohol or intoxicating drugs is prohibited;
- Wildlife has right-of-way on the road and no harassment of wildlife is allowed (drivers should not leave their vehicle to look at or photograph caribou as this may constitute harassment);
- All hunting activity must avoid shooting across the road and should respect a safe shooting distance from the road (suggested at 1 km – 500 m on each side);
- Hunting will not be allowed within 1 km of the active Meliadine mining work sites;
- All traffic should give way to oncoming transport truck traffic;
- Vehicles should not park on the travelling surface of the road but should pull off the road in a turnout to park to prevent accidents; and
- Non-Project related traffic is not allowed within the Meliadine mine site. This is an industrial work site, and, thus, non-Project related vehicles should not go beyond km 25 without prior special arrangement with AEM. Signs will be posted at km 25 advising drivers of this rule.

These are the same safety rules that will apply to all users of the road, including AEM employees, AEM contractor employees, and non-Project related users of the road. It is worth noting that the Criminal Code of Canada applies to private roads. For example, if an accident were to occur on the road and alcohol was involved, that person could be charged by the RCMP.

AEM will hold public information sessions in Rankin Inlet for users of the AWAR prior to the road opening and on a regular basis thereafter (minimum of twice per year). A copy of the road safety rules will be presented at these sessions.

AEM also will use other communication tools to get the AWAR access procedures and road safety rules out to the residents in Rankin Inlet. These will include community radio, community TV, and postings around town, through the Meliadine Project office in Rankin Inlet, and via an AEM project website (<http://www.aemnunavut.ca/>). The communication will be in both English and Inuktitut.

Road Rules Required to Protect Interaction with Migrating Caribou (apply to all roads)

Wildlife is expected to be occasionally observed on or immediately along the side of the AWAR. Caribou and other wildlife will have the right-of-way at all times. Air, ground, and general noise disturbance can disrupt caribou behaviour with potential impacts to fitness and survival.

There is no permanent wildlife migration trails identified along the proposed AWAR. However, it is known that, at undetermined frequency, the annual migration of caribou may cross this road (it happened in the summer of 2012 but not in 2011). AEM will work with the KIA and HTO to monitor areas where the road may be impeding caribou migration. Based on experience gained from the Meadowbank road, the design of the road is not expected to impede free passage of any caribou migrating across the road. However, AEM is committed to retrofitting areas to create shallower shoulder angles where such monitoring indicates that caribou migration may be impeded. Similarly, AEM will work with the KIA and HTO to identify areas where the proposed road is impeding passage of snowmobiles and/or ATVs for traditional hunting or fishing purposes and is committed to retrofitting appropriate crossing in such areas. However at this point in time, no such obstacles have been identified through our ongoing consultations.

In the case of aggregations of caribou, or other wildlife-related issues, the environment personnel on site will be in charge of managing the situation, and, with the collaboration of the security department, will advise road users by patrolling the road. The Project personnel will be notified by dispatch radio if any wildlife is observed on the road.

The following protocol will be implemented on the road for the protection of wildlife:

- Vehicular traffic speeds on the access road will be limited to 50 km/h;
- No activity will be allowed that could block or cause diversion to migrating caribou. In the circumstance where road activity may interfere with caribou migration, AEM shall cease such activity until the migrating caribou have passed;
- The period of 1 May to 15 July is critical caribou calving time. During this window no road activity will be allowed that could disturb caribou present with calves within 250 m of the road alignment;
- Where small to moderate aggregations of caribou (i.e., 1 to 50 animals) are observed within 100 m of the road, travel speeds will be reduced to 30 km/h;
- Where large aggregations of caribou (i.e., 50 or more) are observed within 100 m of the road, at the discretion of the road supervisor, vehicle movements may be suspended until animals have moved away from the road;
- Caribou and all wildlife will be given right-of-way on the road and must be allowed to pass uninhibited. Vehicles must stop until the animal is off the road;
- Locations of large aggregations of animals must be reported to the road supervisor, who will inform all potentially affected employees and the environmental representative; and

- All incidents between vehicles and wildlife must be reported to the AEM road supervisor and the environmental representative whether they are:
 - near-miss;
 - collision with injury to the wildlife; or
 - accidental death of wildlife.

Each incident will be investigated by the road supervisor and the AEM Environment Department, and measures taken to avoid re-occurrence put in place. Disciplinary measures will be taken against any employee if the investigation concludes that the accident is the result of negligence.

In the case of accidental death of an animal, the AEM Meliadine Environment Coordinator will contact the GN Conservation Officer in Rankin Inlet. The carcass should be removed from the road and incinerated to avoid attracting scavengers such as Arctic fox, wolves, grizzly bear, and/or wolverine.

AEM must contact the GN Conservation Officer in Rankin Inlet under any of the following circumstances (KIA will also be informed):

- If a situation occurs where wildlife becomes a nuisance (returning frequently, or unable to deter);
- If wildlife has been killed (either to resolve a conflict or unintentionally);
- If wildlife has been injured and the injured animal has not been located or destroyed;
- If a human has been attacked or bitten by wildlife; or
- Assistance/advice is needed to deter nuisance wildlife to minimize potentially harmful wildlife-human contact.

Expected Road Use (AWAR and Discovery Road)

Road use by AEM and its contractors is not expected to vary as much as the public traffic between summer and winter. AEM and contractor vehicles expected to use the road will include, but not be limited to, pick-up trucks, cube vans, buses, fuel trucks, tractor-trailers, snowplows and graders. However, the amount of traffic will be highly dependent on the level of activity on site and the time of year, such as when supplies and materials arrive by sea, as well as on the weather (virtually no traffic is to be expected when the weather is bad). Also, should flights not be able to get into Rankin Inlet, passenger vans would only transport local employees to the site, which would reduce the number of vans by half.

Table 2-50 below provides with an estimate of traffic from both mine-related activities and public road use. For public use, we estimate that 25-50 % of the anticipated trips will be incremental to current access, which is by ATVs and snowmobiles.

Table 2-50 Estimated Potential AWAR Daily Road Traffic

Type of vehicle # of vehicles	Winter		Summer	
	Week Days	Weekends	Week Days	Weekends
Mine-related Traffic				
Pick-up Trucks	10-12	4-8	12-14	6-10
Cube Vans	6	2	8	2
Passenger Vans/Buses	4	1	4	1
Fuel Trucks ¹	8	8	8	8
Transport Trucks ²	1	1	6-14	6-14
Public Road Use				
Pick-up Trucks	4-6	2-4	6-8	12-16
ATVs/Snowmobiles	4-8	4-10	10-16	10-20

¹Transport of fuel will be continuous, year round. A fuel truck will carry on average 45,000 litres.

²Transport of dry goods will largely take place over a 4-month period, from August to November.

During Phase 1 operation of the FEIS, AEM will start to collect information on volume of people using the road (expected to start in the summer of 2014) but useful information is not yet available as during winter months public will be able to access the Meliadine area using snow mobiles, tracked vehicles and dog sleds which do not need to pass through the AWAR access gate. AEM commits to conduct periodic spot checks of public use of the AWAR once the Phase 2 is complete to gauge the accuracy of the predictions contained in Table 2-50. These will be periodic surveys conducted by AEM and not continuous monitoring.

Haul truck traffic between the Discovery and mill sites is expected to average 30 haul truck trips per day (15 loaded trucks from Discovery to the mill – 15 empty trucks returning). This is based on an average ore mining rate of 800,000 tonnes per year of ore (~2,300 tpd over 348 days per year). Mining is scheduled to start in earnest from the Discovery deposit in Year 7 of the mine life and to continue through Year 10. There would be some traffic in Year 6 and in Year 11, but much lower than in Years 7 thru 10 (see Table 2-12 for Mine Plan detail).

Control over Interaction with the Territorial Park

The proposed Meliadine AWAR will have no physical new road connections into the existing Iqalugaarjuup Nunaaga Territorial Park. The objective is to avoid providing any new routes of access into this park.

The GN Department of Environment (GN-DoE) has expressed a valid concern that there is potential for unauthorized trails/access routes to be created from the AWAR into a designated preservation zone within the Iqalugaarjuup Nunanga Territorial Park at an area to the northeast of the Meliadine River just past the new Meliadine River Bridge. The AWAR is in close proximity to the park boundary

in this location. GN-DoE have pointed out that such an unauthorized use of this designated preservation zone could cause irreparable damage to the natural and cultural features mean to be protected within this territorial park. AEM acknowledges this concern and commits to work with the GN-DoE to reduce/prevent this potential unauthorized access to this part of the park. In this respect AEM will take the following actions:

- AEM commits that it will not allow any of its employees or contractors to construct any side roads/trails off of the east side of the AWAR between Km 1 and Km 8. In actual fact, AEM has no intent of constructing any side roads and/or trails off of the designated AWAR corridor at any point along its length and, thus, additional regulatory approval would be needed under the Terms of the Road Use Lease with the KIA before any side road/trail could be constructed;
- AEM will task its Road Supervisor with keeping an eye on this critical section of the AWAR as part of its regular road inspections (as outlined in SD 2-9 Roads Management Plan) with the objective of identifying any signs of unauthorized trails/access routes leading from the AWAR into this area of the Park. If any evidence of unauthorized access trails is discovered, the Road Supervisor will contact GN-DoE Park Staff in Rankin Inlet to a) inform the GN-DoE Park Staff of the discovery and to b) jointly work on a plan to prevent any further use of such access point. AEM would then take the agreed upon measures to implement the plan provided that such measures are reasonable; and
- AEM will meet with GN-DoE Park Staff to jointly discuss what other measures can be taken to dissuade/prevent such potential unauthorized access into this area of the Park (e.g. possibly signage, public educational measures, placement of barriers, etc.). AEM will then implement such measures where reasonable. AEM will continue to periodically meet with GN-DoE Park Staff (at least annually but more frequently if required) to discuss protection of this designated preservation zone within the Park.

2.6.4.4 *Emergency Response (applies to all roads)*

The AWAR will be a private road, owned and operated by AEM, sited on IOL leased by AEM from the KIA. While public access will be allowed, it will be public access on a privately owned land. Consequently, the RCMP is not mandated under their contract with the Government of Nunavut to provide policing services along this road. Responsibility for enforcing all of the rules of operation along this road will lie with AEM and not the RCMP. AEM will be responsible for the provision of all emergency services along the road as outlined in this section. However, the RCMP will have the right to access the AWAR at any time to investigate any accident or incident where they believe there is a need. AEM would also report any unlawful activity observed by its personnel along the road. This principle would also apply to the mine site itself.

Emergency response is reactive, while the objective of prevention is to reduce the frequency of emergency responses. AEM's emphasis will be on prevention, while at the same time keeping resources close at hand in order to respond to emergencies on the road in a timely manner.

Three (3) possible causes of road emergencies are: the road, the vehicles, and the people. The interplay of these three elements leads to either safe use of the road or emergency responses. AEM is fully responsible for the design, construction and maintenance of the road for private and public use. AEM will ensure that its vehicles are in good working order before they venture out on the road. As well, AEM will train its employees far more than any legal minimum; by educating and protecting its workers, some of whom will also use the road as members of the public, AEM will lead by example in road safety. However, it is only through education that AEM can influence members of the public in their choices of vehicle and behaviour on the road.

Once the AWAR is open to unrestricted public access, AEM will implement a process to inform the public using the AWAR on how they can communicate with AEM in the event of an emergency on the road. AEM is hoping that it will be able to establish full cell phone service along the full length of the AWAR at some point in time during the construction phase of the project and continuing into the operational phase. Thus the prime mechanism for contacting AEM in the event of an emergency will be by cell phone. Once such service capability is in place AEM will take the following action to communicate how the public can contact AEM to report an emergency on the AWAR:

- Signage at the Rankin Inlet end of the road and at the mid-point emergency shelter (at a minimum) that provide the public with the AEM phone contact number (probably site security) to which the public can report an emergency along the AWAR;
- Include this information on periodic public information sessions on the road safety procedures delivered in Rankin Inlet; and
- Include this information in periodic community radio and TV announcements.

AEM will also work to develop partnerships with the public, community organizations and government departments in educating the public about road safety, shaping good driving practices and influencing behaviour on the road. Emphasis will be placed on the use of helmets and seat belts; observing posted speed limits; improving visibility for others by wearing reflective clothing when on a snowmobile or ATV; not drinking and driving, and not driving while impaired; dealing with driver inexperience, etc. AEM will, however, have little influence on the vehicles that people choose to use on the road. Vehicles used by the public may suffer from poor maintenance, and individuals may also make poor choices, such as using an ATV in winter when a snowmobile would be more appropriate.

There will be accidents and malfunctions that occur on this road. Such unfortunate events are inevitable, no matter how much effort is devoted to preventing them. However, mitigation measures and response plans will be developed that can be applied to reduce the frequency and severity of such events. The types of events considered likely are as follows:

- Vehicle collisions that may result in personal injury and spillage of potential harmful materials such as fuel, lubricating fluids, antifreeze, etc.;
- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury and spillage of potentially harmful materials, etc.;
- Single-vehicle accidents that may result in personal injury and spillage of potentially harmful materials;
- Risk of people getting stuck on the road in bad weather such as in heavy snow or whiteout conditions, or due to mechanical breakdown;
- Risk of accident due to an intoxicated or impaired driver on the road; and
- Spills of harmful materials onto the land or into water.

Emergency response equipment will be carried in all AEM vehicles using the road, in an effort to improve the response in the event of an incident or accident. This equipment includes survival gear, emergency first-aid equipment, and initial spill-response equipment.

AEM will respond to the following emergencies along the road:

Vehicular accidents – AEM emergency response personnel will be tasked to respond to any vehicle accident resulting in personal injury or spillage of harmful material. AEM will initiate extraction and transport to medical assistance at Rankin Inlet's medical centre. AEM would initiate spill-containment and cleanup measures.

Spills – AEM emergency response personnel will be tasked to respond to any spills and to initiate spill containment and cleanup.

Reporting – AEM will report all reportable scale incidents to the appropriate government authority (e.g., Mines Inspector, Water Board, NU Spill Line, Environment Canada, GN Department of Environment, Fisheries and Oceans Canada, Kivalliq Inuit Association and Hamlet of Rankin Inlet).

Emergency response personnel and equipment will be available at all times on the Project site to allow for quick action should an accident occur. AEM will have a program to train and maintain personnel on site at all times who can respond and address all emergencies that may occur, such as personal injuries, fire, spills of harmful materials, etc. AEM will also have appropriate equipment and material available to equip its emergency response personnel.

AEM can also count on the assistance of others such as the Canadian Coast Guard who can provide spill response equipment they store in Rankin Inlet, and on the advice of the Regional Environmental Emergencies Team³³.

³³ The Regional Environmental Emergencies Team (REET) is a multi-agency, multi-disciplinary group specializing in environmental emergencies. A REET is designed to provide consolidated and coordinated environmental advice, information and assistance in the event

An emergency shelter will be established at the midpoint of the road where individuals can seek refuge if they are trapped on the road due to poor weather, vehicle breakdown, or other conditions.

The Project site will have a Risk Management and Emergency Response Plan (SD 2-15) as well as a Spill Contingency Plan (SD 2-16) in place at its Project at all times. These plans will be reviewed and updated periodically in order to learn from past experience. Emergency response personnel will be trained in the procedures and protocols contained those plans. These same emergency response procedures would apply to other potential accidents that may occur between Rankin Inlet and the Meliadine site including an incident involving a helicopter.

Based on AEM experience with the road between Baker Lake and the Meadowbank Gold Mine, it is known that accidents will periodically occur but that the prevention and proposed mitigation measures as well as emergency response planning, training and preparation, will greatly reduce the risk, frequency and severity of such incidents.

2.6.4.5 Policing, Bylaw and Regulatory Enforcement

The Hamlet of Rankin Inlet can pass and enforce bylaws on the first two kilometres of road on municipal land. Under their current mandate, while the RCMP is not responsible for policing of the AWAR as it is a privately operated road, the RCMP will have the right to access the AWAR at any time to investigate any accident or incident where they believe there is a need. The *Criminal Code of Canada* applies to private roads. For example, if an accident was to occur on the road and alcohol was implicated, that person could be charged by the RCMP.

AEM will put efforts on raising public awareness of, and commitment to, road safety, and on improving communication, co-operation and collaboration among all stakeholders on the safe use of the road. Periodic patrols of the road will be undertaken by AEM security personnel to enforce road safety rules where appropriate. Also, all AEM vehicles using the road will have two-way radios to inform AEM security personnel of unsafe practices seen along the road, and to allow a quick response to unsafe conditions by road maintenance personnel.

All plans, drawing and documents related to the design and construction of the road are stamped by an engineer registered in the NT/Nunavut. This requirement assures AEM that the road is built to accepted engineering standards for roads in permafrost areas in the NT and Nunavut. regulatory inspectors can inspect the road and any associated infrastructure at will. AEM will abide with the recommendations and directives provided by inspectors.

of an environmental emergency. REET members represent several federal and territorial government departments, local communities, private sector agencies, and, on occasion, local individuals.

2.6.4.6 Site and Haul Roads

Speed limit: site 15-20 km/h, haul: 50 km/h.

2.6.5 Marine Shipping

2.6.5.1 Current Shipping in the Area

Ship traffic in Hudson Strait is presently limited to the open water season from July to October (NEAS 2012, Arctic Sealift Services 2012) and involves the following types of vessels:

- Dry cargo and fuel supply vessels servicing Arctic communities – most originating from ports in Atlantic Canada (Newfoundland and the St. Lawrence region);
- Dry cargo and fuel supply vessels servicing the Meadowbank Gold Mine;
- Grain ships bound for Africa, Europe and Mexico from the Port of Churchill;
- Research vessels;
- Tourist cruise ships; and
- Various pleasure crafts (A. Stewart 2012, pers. comm., AREVA Resources Canada Inc. 2013, NEAS 2012, Arctic Sealift Services 2012).

Estimates of existing dry cargo and fuel supply vessel transits along the Project shipping route were derived from the 2013 sealift cargo delivery schedule for Desgagnes Transartik Inc. and Nunavut East Arctic Company (NEAS 2012, Arctic Sealift Services 2012) and from personal communication with Coastal Shipping Ltd. (P. John 2013, pers. comm.). Estimates of current grain ship movements along the Project shipping route were based on mean annual ship rates provided by AREVA Resources Canada Inc. in a 2013 Information Request related to the Kiggavik Project (AREVA Resources Canada Inc. 2013).

Approximately 13 cargo vessels and 30 fuel tankers (6 tankers - 5 round trips each) transit through Hudson Strait on an annual basis to service Arctic communities (P. John 2013, pers. comm., NEAS 2012, Arctic Sealift Services 2012). An estimated 4 dry cargo and 4 fuel tankers transit through Hudson Strait annually to service the Meadowbank Gold Mine located near Baker Lake. A yearly average of 12 grain vessels also travel through Hudson Strait to the Port of Churchill (AREVA Resources Canada Inc. 2013). We have assumed that one additional research vessel and up to 5 tourist cruise ships may travel along the proposed shipping route annually. This results in a total of up to 69 vessels currently traveling through Hudson Strait during each shipping season.

2.6.5.2 Cumulative Shipping

The Meliadine Project, along with reasonably foreseeable future development (RFFD) in the Project area (Volume 4, Section 4.5.2.4 of the FEIS), have the potential to increase shipping and generate cumulative effects on marine resources. RFFD that may involve vessel traffic that will likely overlap spatially and temporally with the proposed Project shipping operations are:

- the Kiggavik Uranium Project;
- the Roche Bay Project;
- the Ferguson Lake Project; and
- the Churchill Diamonds Project.

The Mary River Project was not considered in this cumulative effect due to the new Baffinland's option, which does not include shipping through the Hudson Strait.

The following assumptions were made in estimating the shipping volumes presented in Tables 2-51 and 2-52:

- Tonnage information for dry cargo vessels servicing Arctic communities were based on deadweight specifications of vessel fleet provided on the company websites (NEAS 2012, Arctic Sealift Services 2012).
- The Ferguson Lake Project, Churchill Diamond Project and Roche Bay Project will NOT overlap temporally with Construction phase of the Meliadine Project.
- The Construction phase of the Kiggavik Project will overlap with the Construction phase of the Meliadine Project.
- The Meadowbank Gold Mine project will be in operation during the construction phase of the Meliadine Project and is expected to close in 2017.
- Traffic volume estimates for the Kiggavik Project and for the Port of Churchill commercial traffic are based on the 2013 Information Request responses for AREVA Resources Canada Inc. (AREVA Resources Canada Inc. 2013).
- Dry cargo and fuel shipping volume estimates for the Ferguson Lake, Churchill Diamond, and Roche Bay Project were assumed to be similar to that of the Kiggavik Project during operations.
- Vessel traffic associated with Arctic communities and the Port of Churchill are assumed to remain constant throughout the lifetime of the Meliadine Project.
- There is limited information regarding small pleasure craft traffic in the Project area. Pleasure craft traffic has therefore been excluded from the estimates.
- The development of a deep sea port in Rankin Inlet will not increase the number of vessels entering Melvin Bay.

AEM's Meadowbank Gold Mine will be closing as the Meliadine Project is entering operations. While up to 12 ships will be required annually for Meliadine during operations, there will be a commensurate decrease in shipping required for the Meadowbank Mine. In general, the net result of AEM shipping activity would be no percent increase in shipping traffic during Meliadine operations if only 8 to 10 ships delivered supplies annually to the project. If 12 ships were used, the net increase in ships due to AEM shipping would be about 2 per annum.

Table 2-51 and Table 2-52 outline estimated shipping volumes in Hudson Strait from RFFD projects that would likely overlap with the Meliadine Project during its construction and operation phases.

Table 2-51 Anticipated Yearly Vessel Traffic in Hudson Strait during the Meliadine Project – Construction Phase

Cargo Recipient	Dry Cargo (tonnes)	Fuel (tonnes)	Dry Cargo Return Trips	Fuel Cargo Return Trips	Total Number of Return Trips
Current Shipping Volumes					
Resupply vessels for Arctic communities	164,165	Not Available	13	30	43
Port of Churchill (commercial traffic)	400,000	-	12	-	12
Research Vessels	-	-	-	-	1
Tourist Cruise Ships	-	-	-	-	5
Meadowbank Gold Mine	40,000	80,000	4	4	8
Project and RFFD Related Shipping Volumes					
Kiggavik Project	53,000	33,000	6	2	8
Meliadine Project	40,000	103,700	5 to 8	4 to 6	9 to 14
Total increase in shipping as a result of Meliadine Project during Construction					9 to 14 (+13 to 20%)
Total cumulative increase in shipping as a result of Meliadine and Kiggavik Projects during Construction					17 to 22 (+25 to 32%)

Notes:

- : Not applicable

Table 2-52 Anticipated Yearly Vessel Traffic in Hudson Strait during the Meliadine Project – Operations Phase

Cargo Recipient	Dry Cargo (tonnes)	Fuel (tonnes)	Dry Cargo Return Trips	Fuel Cargo Return Trips	Total Number of Return Trips
Current Shipping Volumes					
Resupply vessels for Arctic communities	164,165	Not Available	13	30	43
Port of Churchill (commercial traffic)	400,000	-	12	-	12
Research Vessels	-	-	-	-	1
Tourist Cruise Ships	-	-	-	-	5
Project and RFFD Related Shipping Volumes					
Kiggavik Project	67,000	55,000	6	4	10
Ferguson Lake Project	67,000	55,000	6	4	10
Churchill Diamond Project	67,000	55,000	6	4	10
Roche Bay Project	67,000	55,000	6	4	10
Meliadine Project	40,000	103,700	4 to 6	4 to 6	8 to 12
Total increase in shipping as a result of Meliadine Project during Operations					8 to 12 (+13 to 20%)
Total cumulative increase in shipping as a result of Meliadine, Kiggavik, Ferguson Lake, Roche Bay and Churchill Diamond Projects during Operations					48 to 52 (+79 to 85%)

Notes:

- : Not applicable

The Meadowbank Gold Mine Project is not included in Table 2-51 as it is expected to close in 2017 just as the Meliadine Project is going into operation. The reduction in shipping associated with closure of Meadowbank will offset the shipping planned for Meliadine. This offset is not considered in the increases presented.

2.6.5.3 Shipping for the Meliadine Project

AEM gained extensive experience in shipping fuel and dry cargo to the Meadowbank Gold Mine since its construction began in 2008 and commercial production in 2010. Similar shipping, lightering and ship-to-shore fuel transfer procedures developed and in use for Meadowbank will be employed for the proposed Meliadine Gold Project in Rankin Inlet. All shipping for the Meliadine Project will be carried out during the open water summer season when Hudson Bay is free of ice cover. No ice breaking or winter shipping is being proposed as part of this Project.

AEM will not operate its own ships. AEM intends to contract the shipping of both dry cargo and fuel to one of the recognized marine shipping companies that currently supply annual sealift services to the Kivalliq region of Nunavut. Our current shipping contractors (at Meadowbank) are the Woodward Group for fuel, and Nunavut Sealink Services Inc. (NSSI) for dry cargo. AEM has not yet selected marine shipping contractor(s) for its Meliadine Project. This work would be tendered once

the Project has been authorized to proceed and after AEM has decided to proceed with construction. AEM will notify Transport Canada as soon as possible indicating who will be awarded the contract for shipping services required for the Meliadine Project.

More details on shipping component of the Meliadine Project are available in Project's Shipping Management Plan (SD 8-1) available as a support document to FEIS Volume 8.

2.6.5.4 Shipping Routes and General Lightering Procedures at Itivia Harbour

A total of approximately 40,000 tonnes of dry cargo (equipment and supplies) and 122 million litres of diesel fuel will be required annually for the operations of the Meliadine Project. To meet these needs, a total of 4 to 6 vessels will annually deliver dry goods, and 4 to 6 tankers will annually deliver diesel fuel for the Project. All shipping will be carried out during the open water season (typically from early August to late October) and will follow established shipping lanes that are presently in use for the annual sealift to Rankin Inlet and other communities. There will not be any ice breaking to extend the shipping season. Ships will not be serviced in Rankin Inlet and will arrive with enough fuel for the return voyage south.

The priorities in shipping dry cargo and fuel will be:

- The protection of the crews life and others in small boats that the ship may come across;
- The protection of the marine environment; and
- The preservation of the ship and its cargo.

All ships, tugs and tankers will be equipped with electronic navigation aids to provide safety in transit, reduce the risk of accidents, and remain within established sea lanes. AEM anticipates that the majority of its shipping will be between Eastern Canada³⁴ (mainly Bécancour, Québec) through the Hudson straight. This is consistent with the practises already being used in the Kivalliq region by the Kivalliq communities and the Government of Nunavut. Navigation along the coast of Labrador, Hudson Strait and Hudson Bay is routinely conducted during the open water season and is not expected to present any new challenges for this Project. The transit time between Bécancour and Rankin Inlet is approximately one week.

Once ships approach the offshore islands and reefs near Rankin Inlet, the ship's speed will need to be slowed, as is currently done, to navigate the shipping lane to its anchor point outside Melvin Bay. The route does not pose any substantial hazards and can be carried out without pilotage.

AEM has not conducted bathymetric surveys along the proposed shipping routes around the Labrador Coast and into Hudson Bay. AEM is relying upon its contracted shipping company to ensure that the shipping route that they select are through adequately charted waters to ensure; a) safe

³⁴ AEM looked at alternative shipping routes (see Project Alternatives Report - SD 2-1), including shipping to Rankin Inlet through the port of Churchill, Manitoba.

passage; b) that they maintain up-to-date navigational charts to ensure safe navigation; and c) that they select ships, barges and tugs of the correct size and draft to operate safely along the proposed shipping route and within Melvin Bay to Itivia area. Similarly AEM is relying upon its selected shipping contractor to monitor changing sea levels and the emergence of new reefs or shoals that may be occurring over time due to isostatic rebound through contact with the appropriate personnel at Transport Canada and the Canadian Coast Guard (CCG).

AEM did contract Nunami Stantec to conduct a bathymetric survey of the Itivia area within Melvin Bay in the area where AEM proposes to install its floating dock system (the spud barge). The results of this survey were used by AEM to select the location and alignment of the proposed floating dock.

Cargo

The marine transport of dry cargo will be comprised of four (4) main segments, all within established shipping lanes:

- Bécancour, Québec (or other eastern sea ports) on the St. Lawrence River, along the coast of Labrador to the Hudson Strait;
- Through Hudson Strait to Hudson Bay;
- Across Hudson Bay to Marble Island, this being approximately 45 km offshore Rankin Inlet;
- From Marble Island to the barrier islands, through the islands to an anchoring point outside the access passage to Melvin Bay and Itivia.

Dry cargo will be loaded on ocean-going barges and container ships in eastern ports (almost exclusively Bécancour, Québec) and delivered directly to Rankin Inlet³⁵. The first vessels of the year will normally arrive in Rankin Inlet in the latter part of July or early August. This first ship will include two (2) loaded barges having dry cargo, and two (2) tugs. Once the barges and tugs arrive in Rankin Inlet, they will remain until the last of the annual dry cargo has been received and lightered from the ships.

Up to six (6) freighters will arrive throughout the open water shipping season delivering dry cargo. These ships are too large to navigate the access passage to Rankin Inlet; they will thus anchor as approximately 3 km from Itivia (see Figure 2-25 for anchor site general location). Sea cans, large equipment, machinery and vehicles will be lightered onto the barges that arrived earlier for transport through the access passage using the tugs before being docked alongside the AEM floating dock located at Itivia. During lightering onto the barges, attention will be directed to ensuring the barges are secured alongside or anchored, with due consideration being given to the prevailing and expected wind, weather, and tide conditions.

³⁵ Exceptionally, some freight could also come by barge and tug from the Port of Churchill coming along the west side of Hudson Bay to Rankin Inlet.

There is a general cyclonic (counter clockwise) current in Hudson Bay with mean monthly residual currents of approximately 4 to 6 cm/sec. In Hudson Bay, stronger currents occur in summer than in winter and more variability occurs at the surface than at depth (Prinsenberg 1986). Based on the navigation charts prepared by Canadian Hydrographic Service (CHS), flow through the access passage into Melvin Bay can reach approximately 26 cm/s (0.5 knot; CHS 1997). Tidal range is about 4.6 metres at Panorama Island in Melvin Bay.

The lightering of dry cargo will occur in advance of high tide with the barges moved next to the floating dock at high tide. The tugs/barges will be highly manoeuvrable and capable of transiting the access passage with its changing current patterns. Navigation will be during daylight hours and with good visibility. Traffic through the access passage will be coordinated between the tugs to avoid shipping conflicts and to ensure safety.

Most dry cargo will be transported in marine shipping containers (TEUs³⁶) stacked on the deck of general cargo vessels fitted with unloading cranes. The use of sea cans will limit spills and facilitate transfer from ship to shore where they will be stacked or immediately transported to the Project site.

Masters of tugs, large and small tankers, and dry cargo ships will be responsible for their vessels at all times – for the safe navigation of their vessels from the port of departure to Rankin Inlet. For tugs this also includes responsibility for the barge they are towing or pushing. When a barge is laid alongside a dry cargo vessel for lightering containers or equipment from the cargo ship to the barge, a loading supervisor on the ship will take charge of the barge. When a cargo barge is secured to the AEM floating dock facility, a shore supervisor will take charge of the cargo barge. The floating dock (spud barge) will be fitted with a crane to lift the sea cans and large pieces of cargo off the barges and onto trucks located on the deck. These will drive via a hinged bridge attached to the spud barge and extending to the shore.

At the end of the shipping season, or when all the dry cargo has been received by AEM for the year, outgoing cargo will be loaded on the barges for the return trip to southern ports. Outgoing cargo could include construction equipment being demobilized following the completion of construction and/or hazardous or other waste being sent to a certified waste management facility for treatment, recycling and/or disposal in another jurisdiction. No barge, no fuel vessel or no tug will remain at Rankin Inlet over the winter; all will return to southern ports. The only exception will be the spud barge (the floating dock) which will remain at Itivia for the duration of the Project (this is similar to the facility operated by AEM in Baker Lake for its Meadowbank Mine).

³⁶ Twenty-foot Equivalent Unit, a measure used for capacity in container transportation.

Fuel

The port of departure for transporting fuel will be different from that for dry cargo. The first leg of the voyage will be from an east coast refinery along the coast of Labrador to the Hudson Strait with the remainder of the voyage being the same as for the ships carrying dry goods.

It is expected that the large tankers delivering diesel fuel will anchor in the same general location as the dry cargo vessels. Ship-to-ship transfer of fuel will occur at this location from the larger tanker to a smaller tanker that can then navigate the access passage. The carrying capacity of the small tanker will be either 7,300 m³ or 10,500 m³, which is based on the current fleet configuration for Coastal Shipping Limited (part of the Woodward Group). Which of these two configurations that is to be used at any one time will be subject to its availability when the large fuel tanker is set to deliver fuel to AEM at Rankin Inlet. The smaller tankers will be able to navigate the access passage into Melvin Bay while the large tanker cannot. The small tanker will anchor opposite Itivia. From there, a floating pipeline of some 300-500 m will connect to a shore-based pipeline for transfer of fuel to the tank farm.

Explosives and Hazardous Materials

Part of the dry cargo received each year will be ammonium nitrate, which will be used on site for the manufacturing of explosives. Bulk ammonium nitrate will be shipped as prill, which is inert and will not require special handling during transit. The ammonium nitrate will remain in sea cans at the mine site until needed³⁷. Other needed raw materials and blasting related products will arrive in sea cans and will end up being stored in secure locations at the mine site.

It is AEM's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Meliadine site to avoid having such cargo remain in storage at the Itivia laydown yard. Sensitive products such as explosives, boosters and caps will be transported directly to the Project site. However, in the eventuality of a delay in their transit to the mine site, these products will be temporarily stored in Rankin Inlet according to applicable regulations which imply locked storage under constant surveillance. All handling, transport, storage, manufacture and use of explosives will be subject to federal approval under the *Explosives Act*, and the *Nunavut Mine Health and Safety Act*.

Hazardous waste and contaminated soil will be managed continually; consequently there will be little to no accumulation of such wastes during the operation of the mine, subject to seasonal shipping considerations. Hazardous waste that cannot be managed on site will be appropriately packaged for transport in sea cans and sent via a dry cargo vessel to a certified hazardous waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

³⁷ An on-site Emulsion Plant will be constructed for the manufacturing of explosives. More details on that subject are available in Section 2.6.10 below and in the Explosives Management Plan (SD 2-14).

Itivia is presently connected to the hamlet by a single road; AEM is proposing to build a bypass road for the transport of all its dry cargo and fuel around the community. This will include explosives and dangerous goods.

2.6.5.5 Interactions, Potential Effects and Mitigation Measures during Marine Shipping

Vessel discharges (sewage, solid wastes, ballast water), the sight of the vessels and their movement, vessel noise, as well as accidental spills and releases have the potential to interact and disturb marine wildlife and affect life cycle activities. Possible interactions between shipping and marine wildlife can have the following potential effects:

- Marine mammals may retreat to the water should a vessel pass too close to an island or reef where they have pulled themselves out of the water;
- The foraging of marine birds and mammals may be interrupted when vessels approach and pass them in the shipping lanes;
- The improper treatment and release of ballast water, grey water and bilge water could alter the water quality and contaminate the food supply;
- Mammal mortalities may result from collisions with the ship; and
- Fuel and/or oil spills could result in mortalities and, for marine birds, could lead to the loss of foraging and brood rearing habitat.

Potential for collisions with adult seals, whales, walruses, polar bears and marine birds in open water are considered very low. AEM will include in its contracts that ships should remain mindful of marine areas having a high density of marine mammals and birds and stay within shipping lanes, wherever possible. The following are mitigation measures that can be employed by the vessels when approaching marine wildlife:

- Under no circumstances, other than in the case of an emergency, will ships approach within 300 m of a walrus or polar bear observed on sea ice³⁸;
- Ships will remain at least 2 km from Marble Island to avoid disturbing seals, walrus and marine birds that might be in the vicinity. This would greatly reduce interactions between marine wildlife and vessels, and also reduce the noise in near-shore areas;
- Vessels shall maintain a minimum distance of 300 m from marine mammals engaged in feeding activities;
- For all other marine mammal encounters, vessels will not approach within 100 m of a marine mammal;
- If marine mammals approach within 100 m of a vessel, the vessel shall reduce its speed and, if possible, cautiously move away from the animal;

³⁸ As all shipping will occur during the open water season, collision with young seals in lairs is not likely to happen.

- If it is not possible for a vessel to move away from or detour around a stationary marine mammal or group of marine mammals, the vessel shall reduce its speed and wait until the animal(s) move to the side and remain at least 100 m from the vessel prior to resuming speed;
- The vessel shall not be operated in such a way as to separate an individual member(s) of a group of marine mammals from other members of the group. When weather conditions require, such as when visibility decreases, the vessel shall adjust its speed accordingly to avoid the likelihood of the ship striking an animal;
- Ballast water will only be released in designated areas and if there is no marine wildlife in the area; and
- Bilge water, grey water and sewage will be properly treated and only released in areas where no marine wildlife is present and at least 50 km from Itivia.

Spills from ships in transit could affect marine wildlife coming in contact with any petroleum product spilled. In the event of a spill, the ship personnel will discourage marine wildlife from coming in contact with the spilled material. The product most likely to be spilled would be diesel fuel, which floats on the water surface and has a high rate of evaporation. However, these occurrences are expected to be rare and the activation of the Shipboard Oil Pollution Emergency Plan (SOPEP) would greatly reduce their impact. Preventive and contingency measures already in place substantially reduce the risk from spills.

Shipping for the Project will occur during open water season, which is the same time that local Nunavummiut use the waters of Hudson Bay to hunt for marine mammals. The potential for interaction between the proposed marine shipping to the Meliadine Project and marine wildlife, including hunting activity was considered by AEM as part of its environmental assessment for the Project. This assessment is presented in Volume 8 – Marine Environment and Impact Assessment. The assessment concluded that no significant impact will occur as a result of this interaction.

As part of its environmental assessment, AEM contracted a Rankin Inlet based consultants to conduct a Traditional Knowledge study of the marine environment in the vicinity of Rankin Inlet with emphasis on the areas of Hudson Bay likely to be effected by the Project's marine shipping and on the timing of such shipping activity. The results of this study have been incorporated into the marine environment baseline study that can be found in Volume 8 – Marine Environment and Impact Assessment. The shipping routes planned to be used by AEM are the same routes that are currently being used by the commercial shipping companies supplying sealift services to the Kivalliq communities. The number of ship transits will increase but only by a relatively small number. Based on the Traditional Knowledge study, AEM heard no reason for changing from the existing shipping routes. What AEM did hear is: a) ice breaking should be avoided; b) to remain at least two km from Marble Island, and c) how ships should operate to prevent adverse interaction and impact between these ships and the marine mammals and small boats used by the local residents in their hunting

activity. This is the source of the mitigation measures previously presented in this section. AEM has not proposed any shipping activity that would require ice breaking.

Adaptive management will allow mitigation measures to be modified in response to new information arising from monitoring carried out by the vessel crews and from TK.

2.6.5.6 Safety of Persons Using Small Boats in the Shipping Lanes

The most likely areas where interactions may occur between small boats and barges-tugs and/or ships or vessels are:

1. Melvin Bay, particularly in the access passage;
2. Where the ship is transiting through the near shore islands and reefs; and
3. The area between Marble Island and the near shore islands.

Mitigation measures to safeguard the safety of those in small boats will include the following:

- AEM will consult with the community members mooring or beaching their boats in Melvin Bay on the shipping activities that can be expected over the ice free shipping season. Protocols will be developed to minimize the interaction between barge-tug or ship and small boats;
- Barge-tug or ship will travel at a slow speed (less than 2 knots) when transiting through the near shore islands and reefs to reduce the wake and not compromise the safety of people travelling in small boats along the shipping route. The slower speed will reduce the wake of the ship while also providing an opportunity for the small boats to move to the side;
- Barge-tug or ship would only travel through the near shore islands and reefs when there is good visibility. This would allow the ship and the small boats to see one another;
- Barge-tug or ship will restrict themselves to the shipping lanes thereby not surprising any small boat travelling outside the shipping lanes;
- The ship will sound its horn if a small boat seems unaware of its presence; and
- AEM, through the Community Liaison Committee, will recommend that all those in small boats wear personal floatation devices.

Shipping should not have significant adverse socio-economic effects if mitigation measures are followed.

2.6.5.7 On-board Waste Management

Canada is a signatory to the International Marine Organization, MARPOL (International convention for the prevention of pollution from ships), Annexes 1 to 6. These annexes promote the elimination of deliberate, negligent or accidental discharge of ship-source pollutants into the marine environment. The list of harmful ship-source discharges includes: oil, noxious liquid substances and

dangerous chemicals, sewage, garbage and air anti-fouling systems. Also, Canadian laws and regulations mirror the MARPOL annexes and conventions.

AEM expects to contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

Sewage

Vessels are to have an approved sewage treatment plant meeting Canadian standards³⁹. Holding tanks with the capacity for all grey and treated sewage while in port are expected to be part of the ship's infrastructure. AEM will advise ships that disposal of waste water into the environment is to be avoided within 50 km of Rankin Inlet.

Sewage sludge from the sewage treatment plant can be incinerated in the on-board incinerator.

Solid Waste

Solid waste materials are to be incinerated, not disposed of in the marine environment. Modern incinerators operating at very high combustion temperatures are expected on all vessels. These are capable of incinerating food and other domestic waste, residual oil separated from bilge water, waste oil and, in most cases, sewage. Ash from incineration will remain on board and be taken south for treatment, recycling and/or disposal in a certified waste management facility. By incinerating waste on board, the risk of introducing invasive non-aquatic species to the Rankin Inlet area is reduced. This would not be the case if the waste was transferred onshore for incineration/disposal.

Tugs will remain on site for the duration of the shipping season. Their waste will be incinerated and stored in containers, which will be shipped south at the end of the shipping season for treatment, recycling and/or disposal in a certified waste management facility.

Hazardous waste will not be incinerated but returned south for treatment, recycling and/or disposal in a certified waste management facility.

Ballast Water Management

Ballast water is essential to control trim, list, draught, stability, and/or stresses of the vessel. Ballast water control and management regulations protect waters under Canadian jurisdiction from non-indigenous aquatic organisms and pathogens that can be harmful to ecosystems. AEM recognises that when a new organism is introduced to an ecosystem, negative and irreversible changes may result, including a change in biodiversity. The *Ballast Management Control and Management Regulations* (TP 13617) are intended to minimize the probability of future introductions of harmful aquatic organisms and pathogens from vessels' ballast water while also protecting the safety of vessels (Transport Canada 2007).

³⁹ If all sewage is to be incinerated, there will not be any need for sewage treatment.

While an exemption exists in the regulations for vessels operating exclusively in waters under Canadian jurisdiction or certain adjacent waters, any Canadian vessel that has operated outside these waters may carry harmful aquatic organisms or pathogens in their residual ballast and, as such, is not eligible to exemption.

AEM expects to use vessels largely active in the coastal trade that operate almost exclusively in waters under Canadian jurisdiction. However, these vessels do on occasion venture into waters outside Canadian jurisdiction and, as such, will require a Ballast Water Management Plan (BWMP). The regulations require the preparation and carriage of a BWMP for each vessel, and for copies to be submitted to Transport Canada. The BWMPs will be specific to the vessel.

If AEM were to contract vessels originating from waters outside the jurisdiction of Canada, a BWMP would be required. All BWMP (reviewed by the National Administration) carried on ships of foreign origin would be based on the following international guidelines and guiding principles:

- IMO Resolution A.868(20): *Guidelines for the Control and Management of Ships Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens*, in particular Section 7.1;
- The *Model Ballast Water Management Plan* developed by the International Chamber of Shipping and the International Association of Independent Tanker Owners;
- Regulation B-1 of the IMO's *Regulations for the Control and Management of Ships' Ballast Water and Sediments*; and
- Part B of the Annex to Resolution MEPC.127(53): *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*.

AEM will expect contracted vessels not eligible to exemption to have a BWMP and provide AEM with a copy.

Ballast Water Exchange

It is recognised by the IMO that the exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability that harmful aquatic organisms and pathogens be transferred from/in vessels ballast water. If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another port as this could introduce harmful aquatic organisms. In particular, sediment found in the vessel's ballast tanks should be disposed of at sea in areas outside 200 nautical miles (370 km) from land and in water depths exceeding 2,000 m.

Vessels take on ballast water in segregated chambers for the main purpose of stabilizing the vessels by adding the weight of the water and maintaining a specified draught. Vessels laden with dry cargo or fuel will take on less ballast water than empty vessels. As all ships on the inward voyage to Rankin Inlet will be laden, they will have a minimum of ballast water. However, on the outward journey,

these vessels will take on ballast water. This will occur while on anchor outside the access passage after the lightering of dry cargo or fuel.

In the event that a ship is contracted from waters outside jurisdiction of Canada, ballast exchange is to occur at least 200 nautical miles (nm) from shore where the water is at least 2,000 m deep. If the foreign vessel undertakes this ballast exchange outside Canadian waters, it can undertake further ballast water exchanges within Canadian waters. If safety or other reasons dictates that the ballast exchange cannot occur outside waters under Canadian jurisdiction, an alternate designated area is available in Hudson Strait, east of 70° west longitude, where the water is over 300 m deep.

In the case of non-transoceanic navigation, and where ballast water is taken on board outside waters of Canadian jurisdiction, the water is to be exchanged before entering Canadian waters at a location at least 50 nm offshore, in water at least 500 m deep. If this is not possible due to safety or other reasons, the ballast water exchange can occur in the alternate designated area in Hudson Strait, east of 70° west longitude, where the water is over 300 m deep.

All coastal trade vessels⁴⁰ will in all likelihood not venture more than 200 nm from shore and will not exchange ballast water outside waters of Canadian jurisdiction. All the same, ballast water exchanges for all vessels operating in waters under Canadian jurisdiction are expected to meet the provisions of the Regulations, and to follow Part A of the IMO *Guidelines for ballast water management and development of ballast water management plans* as well as the IMO *Guidelines for ballast water exchange*.

It is believed that ballast water management will be required. The waters taken on-board at Bécancour, Québec, will be dissimilar to waters in Hudson Bay so ballast exchange could occur in Hudson Strait as noted above where the water salinity is approximately 30 parts per thousand.

After lightering their dry cargo or fuel at Rankin Inlet, the ships and tankers will be empty and will likely take on ballast water for the return voyage.

2.6.6 Navigation in Water Bodies

AEM met with Transport Canada to explore the implications of applying the new *Navigation Protection Act* to the Meliadine Project.

Amendments to the *Navigable Waters Protection Act* are anticipated to come into force in April 2014 as part of the Federal Government's 2012's Bill C-45. These amendments will:

- Change the name of the *Navigable Waters Protection Act* to the *Navigation Protection Act*;
- Include a schedule which clearly lists the major waterways for which regulatory approval is required prior to the placement or construction of a work;

⁴⁰ AEM will almost exclusively contract coastal vessels.

- Allow proponents of works in non-scheduled waters to opt-in and seek approval of their proposed work to give them additional legal certainty; and
- Expand the list of low risk works (e.g., minor repairs on bridges) that can be pre-approved because they pose very little impact on safe navigation.

Schedules listing major water bodies requiring regulatory approval include Schedule 2 Part 1 – Oceans and Lakes and Schedule 2 Part 2 – Rivers and Riverines. Schedule 2, Parts 1 and 2 do not include any water bodies found within the Meliadine Project's footprint. As such, all are non-scheduled water bodies and AEM undertook to determine if they are or are not navigable.

Using the *Navigable Protection Act*, AEM assessed the navigability of the small lakes, ponds and streams within the Project's footprint by asking the following questions⁴¹:

- Are the water bodies within the Project's footprint capable of being navigated by floating vessels for the purpose of transportation/recreational use?
 - If the answer is "no" to this question, the water bodies are not navigable.
 - If the answer is "yes", then additional questions were asked.
- Is there a public right to travel?
- Is there any historical use of the water bodies for navigation?
- Is there any proposed future use of the water bodies for navigation?
- Is the water body part of a navigational network or transit route to other water bodies?
- Is the water body a self-contained route for fishing or recreation?
- Will AEM's roads offer access to water bodies with the Project's footprint?

Based on all these questions, AEM determined that:

- Navigation of streams found within the Project's footprint is not feasible;
- Navigation to and between water bodies is not feasible;
- The water bodies within the Project's footprint do not form part of a navigational network or transit route;
- There is no evidence of historical use of the water bodies for navigation or recreation; and
- There is no anticipated future use of the water bodies for navigation.

At this time, AEM does not believe that the small lakes, ponds and streams within the Project's footprint are navigable water bodies. AEM does recognize that Meliadine Lake, Meliadine River and Melvin Bay⁴² in Rankin Inlet are navigable water bodies.

⁴¹ The questions being asked are in part based on the Draft Working Framework for determining a Navigable Water under the *Navigable Protection Act* prepared by Transport Canada.

⁴² Melvin Bay is in Hudson Bay and the port of Itivia is located there.

2.6.7 Air Transportation

The Meliadine Project will not have an airstrip on site. The Project will rely on Rankin Inlet municipal airport infrastructure for air transportation of personnel and some cargo (for example, perishable food, and emergency repair and maintenance parts). Both commercial and charter flights will be used. Incoming air freight will be moved directly from the airport to the mine site. Expediting services are currently provided by a local contractor.

Crew changes will take place by air through Rankin Inlet airport. Table 2-53 details air traffic anticipated for crew change and cargo flights to serve the Meliadine Project during the operational phase. During construction and operation, about one (1) flight per day is expected for crew change, Monday to Friday.

Table 2-53 Anticipated Air Traffic at Rankin Inlet Airport associated with Meliadine Project

Need	# of Flights per Week	From	Type of Aircraft
Southern crew change	4	Montréal and Val-d'Or	Charter flight (737-combi or equivalent)
Kivalliq crew change	1-2	Other Kivalliq Communities	Charter flight (ATR-42 or equivalent)
Cargo	1	South	Commercial flight or Charter flight (with crew change)

Any emergency air transportation from the mine site will be provided by helicopter. The existing helipad located near the current exploration camp is planned to be used in case of an emergency. During the operational phase, AEM anticipates that, outside of ongoing exploration, the Project will make very little use of helicopters. Nearly all transport requirements between the mine site and Rankin Inlet will be via the AWAR. AEM does not plan on maintain a helicopter presence on site at the operating mine.

AEM does not plan on building any new helicopter landing area or fuel station at the Project site as part of the proposed Meliadine Project. The existing helipad and fueling station located at the exploration camp will remain and will be the only helipad at site. This helipad will primarily be used by AEM's exploration personnel for regional exploration work conducted beyond the road network built for the mine. Helicopter use will be mostly limited to summer months, with much less traffic expected in winter months when surface access can be achieved using snowmobiles and tracked snow equipment. Overall, AEM expects that helicopter traffic associated with the Meliadine Project will be greatly reduced with the completion of the Phase 1 AWAR (expected in the spring of 2013). AEM does not plan to transport any hazardous materials by air to the Meliadine site once the Phase 1 AWAR has been completed. All such material will be transported by road. Further discussion of

AEM's proposed exploration activity during the mine's operational life is presented later in this document in Section 2.6.11.

AEM currently has in place as part of its exploration management plans for the Meliadine Project site a policy that informs all employees and contractors that no helicopter landings are to take place in the Iqalugaarjuup Nunanga Territorial Park to protect the Park's environmental integrity. This policy will continue to be enforced throughout the mine life. Similarly, employees and contractors are asked not to take Project-related vehicles into the Park for the same reason. This will also continue to be enforced during the mine life.

2.6.8 Borrow Pits and Quarry Sites

Borrow pits and quarry management procedures are described in detail in the Borrow Pits and Quarries Management Plan (SD 2-10).

2.6.8.1 Material Needs

Borrow pit and quarry material will essentially be needed to build the following infrastructure, but not restricted to:

- AWAR (as described in section 2.6.4);
- Haul/service roads; and
- Storage/operation pad(s).

Estimated volumes and potential surface areas of those borrow pits and quarries are presented in Table 2-54. Usually, rock quarry material is used for road/pad base construction; esker (glacial-fluvial material) borrow material is used as finishing/cover layer.

Table 2-54 Estimated Amounts of Borrow Material Needed to Build Meliadine Project Infrastructure

Infrastructure	Total Material Volume (m ³)	Total Surface Area (ha)
Phase 1 AWAR	400,000	15
Phase 2 AWAR		
From 6.5 m to 8 m wide	100,000	5
Stretch to Meliadine Lake	75,000	3.5
To Discovery deposit	125,000	6.5
Bypass road	100,000	5
Rankin Inlet laydown yard	21,000	14
Total	821,000	49

For haul/service roads (including the haul road to Discovery deposit) and camp infrastructure pads, as well as the fresh water pumping jetty, TSF and other necessary dikes, material will be sourced as much as possible, depending on the material characteristics (needs vs available), from waste rock and overburden extracted from mining operations. This material will be ensured to be non-acid generating and non-metal leaching prior to usage. It could be supplemented with other borrow or quarry material if needed (from already existing borrow pit and rock quarry areas). Up to now, there are no planned quarries or borrow pits to be developed on the mine site.

Phase 1 AWAR

The Phase 1 of the AWAR needed the use of 3 quarries and 7 borrow pits (see Table 2-55 and Figure 2-38).

Table 2-55 Phase 1 AWAR Rock Quarries and Borrow Pits

ID Number ¹	Surface (ha)	Volume (m ³)	Location ²
Rock Quarries			
R5	1.75	30,000	IOL
R14	1.35	30,000	IOL
R19	1.80	40,000	Hamlet
Subtotal	4.90	100,000	
Borrow Pits			
B5	1.45	55,000	IOL
B6A	2.00	45,000	IOL
B10	2.05	55,000	IOL
B11A	3.40	50,000	IOL
B12	1.40	26,000	IOL
B13	1.40	45,000	IOL
B15	1.60	24,000	IOL
Subtotal	13.30	300,000	
Grand Total	15.10	400,000	

¹ "R" stands for "rock quarry"; "B" stands for "borrow pit".

² Only R19 is located on municipal plans, the remainder of the quarries and borrow pits are located on Inuit Owned Lands (IOL) administered by the Kivalliq Inuit Association (KIA).

The Phase 2 AWAR will be constructed following receipt of the Project Certificate from the Nunavut Impact Review Board. Its construction will allow AEM to safely and efficiently support construction of the mine and its operations. Approximately 100,000 m³ of additional material will be extracted from existing borrow pits and rock quarries to upgrade the AWAR to a width of 8 m and 2 lanes⁴³. It is estimated that this will increase the surface area of the existing quarries and borrow pits by about 5 ha.

Road to Discovery Deposit

A second component of the Phase 2 AWAR is to construct the initial 3.7 km of the 9.8-km long road to the Discovery gold deposit. The construction and design of this road will be identical to the Phase 2 AWAR – 8 m wide and 2 lanes. This stretch of road will necessitate approximately 75,000 m³ with 25 to 40 % to come from existing borrow pit B10 and rock quarry R5, both of which are being used to build the Phase 1 and 2 AWAR. Three possible rock quarries have tentatively been identified near that road with a suitable borrow pit remaining to be found. Field surveys will be necessary to identify the preferred quarry and borrow pit for building this section of the road to Discovery. A single borrow pit and single quarry are anticipated to be required to build this section of the road, subject to the volume of material in each. The selection of any new quarry or borrow pit will follow the protocol established for the quarries and borrow pits for Phase 1.

The remainder of the road to Discovery will be built in advance of mining the gold deposit. Material could be sourced from waste rock, overburden, a rock quarry and/or a borrow pit.

Rankin Inlet Bypass Road

A bypass road will be built around the Rankin Inlet airstrip to Itivia as detailed in section 2.6.4. The bypass road will be approximately 5 km long and will require about 100,000 m³ of material. Rock quarry R19 is exhausted with no further material available to be extracted. A new quarry will be established or rock purchased from the Hamlet's quarry. AEM will purchase the required granular material from the Hamlet. No new borrow pit will be established in building the bypass road.

Storage Pad

The laydown yard area in Rankin Inlet will cover 14 ha. Leveling the pad will require in the order of 21,000 m³ of quarry and/or borrow pit material.

Maintenance

AEM estimates that it will require approximately 5,000 m³ of granular material each year for all maintenance associated with ground transportation (the AWAR and all other site roads, site infrastructure, and the dock site, etc.). This will be sourced from suitable mine waste rock or from the same quarry sites used during construction of the AWAR.

⁴³ Phase 1 AWAR is 6.5 metres wide and one lane only.

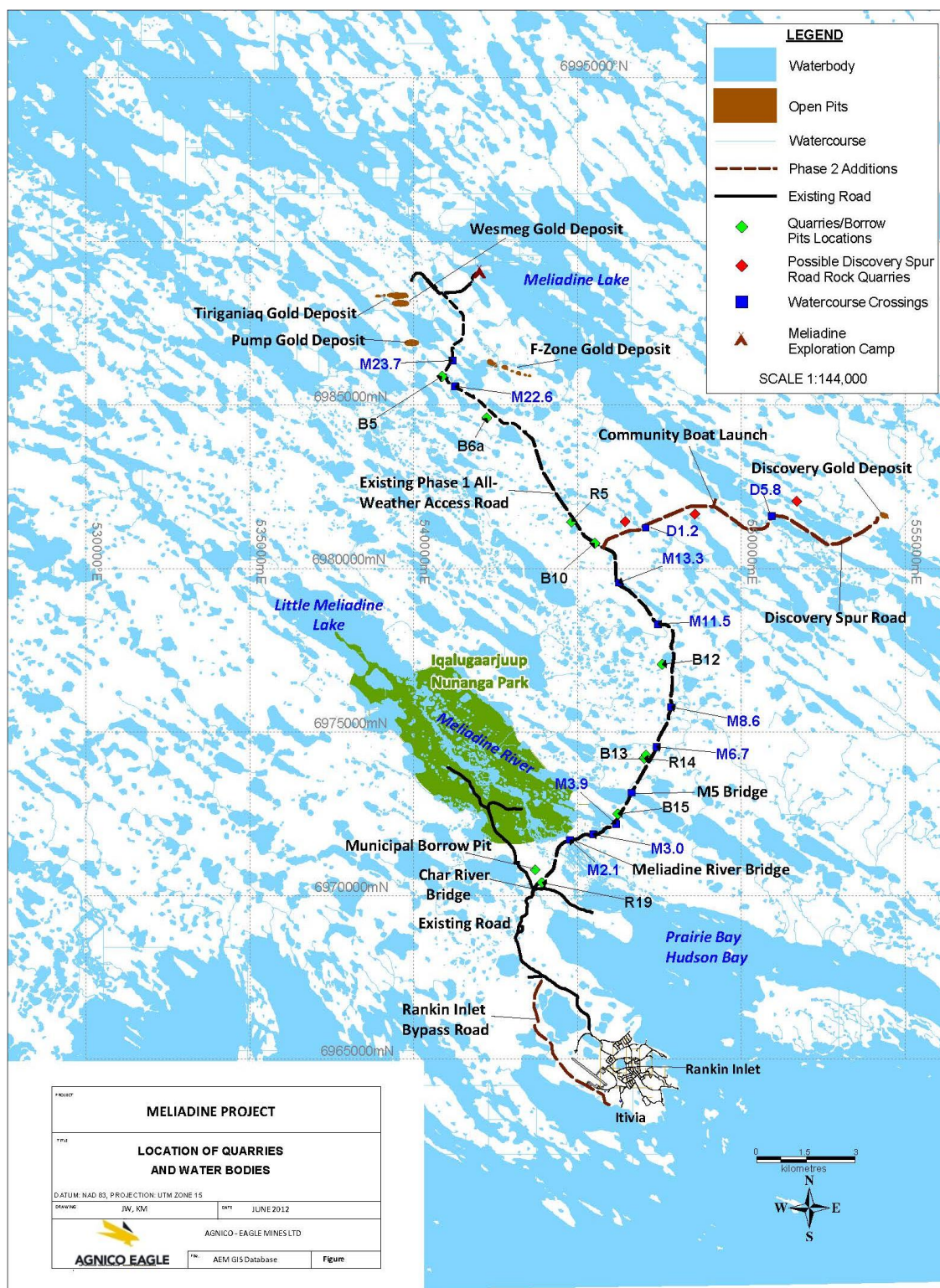


Figure 2-38 Current and Potential Rock Quarries and Borrow Pits for the Meliadine Project

2.6.8.2 Borrow Pit and Quarry Site Selection

Sites were selected to be as close as possible to where the material would be needed in order to minimize the haul distances for construction as well as the need to construct long access roads to those areas (minimizes the overall impacts). Other considerations in their selection included (Golder Associates 2011a):

- The volume of road building material available;
- Proximity to receiving waters (a buffer of at least 100 m of undisturbed land is maintained between quarries/borrow pits and water bodies);
- ARD/ML potential (material is characterized prior to extraction, and every 10,000 m³ extracted, along with visual inspections and water quality monitoring);
- Archaeological resources in the immediate vicinity;
- Surface area to be disturbed; and
- Wildlife and territorial park concerns that quarries and borrow pits will not be developed in or near the Iqalugaarjuup Nunanga Territorial Park.

The goal in selecting the quarries/borrow pits was to avoid or minimize wherever possible potential negative effects to the environment.

In selecting the borrow pits, well-drained areas with a positive topography rising above the local setting were privileged. These types of granular deposits were selected because they are largely free of ground ice, thereby minimizing possible thaw settlement and melting ground ice, which can result in erosion, slumping of side slopes, and an altered landscape that extends beyond the quarry.

2.6.8.3 Material Characterization

Initial testing of quarries and borrow pits to be used for the AWAR was first completed in 2010 (Golder Associates 2010). Static methods were used to assess the chemical composition of the potential road building material, its potential to generate acid rock drainage (ARD), and its potential to leach metals (ML) to the receiving environment upon exposure to ambient conditions.

Sampling and testing prior to use of any quarry or borrow pit reduced the risk of ARD/ML. The quarries and borrow pits selected for road building materials showed no potential to generate acid drainage due to the high buffering capacity and low sulphide content in the bedrock and glacial-fluvial deposits. In early testing, some potential quarries/borrow pits were rejected due to metal leaching (Golder Associates 2010). Avoiding the use of undesirable or questionable road building materials ranks this mitigation measure as highly desirable.

Additional measures will be used while the quarries and borrow pits are operational. Visual examinations of the quarry material for sulphur species and additional testing for ARD/ML will be conducted during construction. As recommended by Price (2009), for every 10,000 m³ of material removed from a borrow pit or rock quarry, a sample will be collected for static testing (ARD/ML);

this will include samples of wall rock. This additional testing will confirm that the best available building materials are being used.

The same procedures, as well as the site selection criteria described in previous section, will be used should any new quarries and/or borrow pits needed to be developed.

2.6.8.4 *Material Extraction*

Rock Quarry

Quarry operations will require the use of explosives. The design, size and shape of the blasts will be planned with safety being the foremost consideration. A predetermined pattern of drill holes will be drilled to a depth not exceeding the overall depth of the quarry and filled with explosives. Prior to a blast, all personnel and equipment will be moved to a safe distance from the blast area. The blast will fragment the rock, which will then be loaded into haul or dump trucks using a loader. The truck will drive to the end of the road where the rock will be dumped. The final step will be a dozer moving the rock into place. This sequence is simplistically called a “drill, blast, load, haul, dump sequence”.

Some rock could be moved to a crusher where aggregate of various sizes will be produced. The crusher, if needed, will be located as far from water as possible and where it is best shielded from the prevailing wind, preferably behind a high wall in the quarry so as to reduce the quantity of wind-blown dust and have as much dust as possible fall within the bounds of the quarry.

Borrow Pit

Wherever possible, borrow pit material will be ripped using a dozer. This loosens the material and allows it to be picked up using a loader and screened after to generate a good quality road topping material when necessary. Standard drill and blast procedures could be used in instances where ripping is not possible. The sequence of steps under this circumstance follows that for rock quarries.

Borrow sites will be reclaimed once they are no longer required; some will remain active for ongoing road maintenance.

2.6.8.5 *Best Management Practices*

Best management practices will employ the following general mitigation measures for the quarries and borrow pits:

- Minimize the surface area of quarries and borrow pits where possible;
- Minimize rock and borrow pit cuts where possible;
- Maintain the floor of the quarries and borrow pits slightly above the elevation of the surrounding area to promote drainage, to avoid creating quarry lakes, and to prevent permafrost degradation in borrow pits;

- Use progressive reclamation in closing quarries and borrow pits no longer needed following the completion of road building;
- Carry out ARD/ML testing and water quality monitoring in support of mitigation measures;
- Protect archeological resources; and
- Maintain air quality through dust control/suppression.

More details are available in the Borrow Pits and Quarries Management Plan (SD 2-10).

Dust Control

Dust is anticipated to be generated as part of quarry/borrow pit operations, mainly by crushing operations. One means to limit the creation of dust is to locate the crusher where it is best shielded from the prevailing wind, preferably behind a high wall in the quarry so as to reduce the quantity of wind-blown dust and have as much dust as possible fall within the bounds of the quarry.

Transport of material from the quarries/borrow pits will be subject to speed limit restrictions to help reduce dust.

Erosion and Sediment Control

Should erosion or slumping of side slopes happens in borrow pits, the area will be monitored and, if necessary, stabilized by covering the affected land with 1.0 to 1.5 m of rock or other granular material. This reclamation effort would allow the permafrost to move up into the material covering the area and stop any remaining ground ice from melting.

Although erosion is not expected to originate from water flow from quarries/borrow pits, any evidence of erosion will be repaired by placing rip-rap over the affected area and reducing the velocity of the water through the use of silt curtains and small dikes. Any major seeps as a result of ground ice or permafrost melting, or from precipitation events, will be monitored if the water is likely to reach receiving waters and necessary mitigation actions put forward.

2.6.8.6 Reclamation

Progressive reclamation will be pursued to return areas to natural conditions and avoid long-term care and maintenance requirements. Most quarries and borrow pits will no longer be needed following the completion of the Project's construction phase. Using best management practices, borrow pits and quarries will be reclaimed by stabilizing disturbed land surfaces, which will promote natural re-vegetation.

2.6.9 Power Generation

In 2011, AEM commissioned a trade-off study of power generation alternatives for the Meliadine Project (Exp Services Inc. 2011). This study looked at a number of potential options including: type of power generating equipment, fuel type to be utilized in the power plant, location of the power plant, and the method of delivering the selected fuel to the power plant site. In summary, this trade off study looked at the following alternatives:

- The study looked at two (2) types of electrical generating equipment: diesel fuel powered engine generators and gas turbine powered electrical generators. The study recommended not pursuing simple-cycle gas turbines on the basis that these units are not as efficient as diesel engine powered genset units, and that gas turbines would produce large amounts of high-temperature waste heat which could not likely be fully recovered at Meliadine.
- Natural gas, heavy fuel oil (HFO), and light fuel oil (LFO)⁴⁴, or diesel, were examined as possible fuel choices. The study recommended that AEM select LFO (P-50 Arctic Grade low sulfur diesel fuel) on the following basis:
 - It is a well proven fuel used for many years to generate electrical power throughout Nunavut and thus there is a long track record (much experience) in how to efficiently and safely transport, handle and store LFO;
 - LFO will meet Nunavut emission requirements;
 - LFO is a typically a “clean” fuel, containing little residue, requiring little tank cleaning, and thus the use of LFO results in little to no volume of waste to be handled and exported; and
 - LFO enjoys a relatively “low” and handling storage cost when compared to other alternative hydrocarbon fuels and does not necessitate the construction of more off-loading and storage facilities (i.e., no need for generating steam to liquefy heavier fuels for movement or more sophisticated storage facilities for natural gas).
- Three (3) potential power plant location options were assessed:
 - A power plant located at the Meliadine mine site;
 - A power plant located in Rankin Inlet with a high voltage transmission line between Rankin Inlet and the mine site; and
 - A dual location with smaller power plants constructed at both Rankin Inlet and the mine site with a smaller high voltage transmission line.

AEM consulted with Qullik Energy Corporation to assess the relative economics of these three alternatives, with AEM deciding that the best option was to site the power plant at the Meliadine site. The two Rankin Inlet location options were less attractive to AEM from both a capital and operating cost perspective.

⁴⁴ LFO is also known as P50 Arctic diesel.

- AEM also looked at two (2) options for the transportation of fuel from its proposed storage facilities in Rankin Inlet to the mine site: by truck and by pipeline. On the basis of capital cost and technical operating risk assessment, AEM chose to propose transporting fuel by truck in a manner similar to that used at our Meadowbank Mine.

AEM considered alternative energy sources, specifically solar and wind power generation, but the current state of these technologies makes them technically and economically unfeasible at this point in time. Alternative energy generation is better suited as secondary energy sources than primary sources, especially where there is no electrical supply grid to make-up the cyclical energy supply deficit associated with both wind and solar generated power.

AEM has commissioned SNC – Lavalin to assess the use of LNG (Liquefied Natural Gas) as a primary fuel source for both power generation and for powering mining heavy mobile equipment. This study concluded that the option is not economical at this moment.

At this point in time, AEM is proposing that the Meliadine power plant be a diesel-fuelled generation facility using multiple medium-speed reciprocating engines complete with heat recovery and all auxiliary equipment. The fuel specified will be Arctic grade light fuel oil (LFO) (ultra-low sulfur grade). About 177,000 L of diesel per day will be used by the power plant to provide the Project with energy. Details on fuel source, use, transportation, secondary containment and cleanup equipment and facilities are discussed at Section 2.6.10. Specific details on accident/incident management and reporting are available in the Spill Contingency Plan (SD 2-16).

The power output will be rated to meet the process plant, rock-handling underground, ancillary support loads and the camp requirements (see Table 2-56). The main electrical loads will be the crushing area, the reclaim area under the stockpile, the process plant, as well as the camp and the service complex. Ancillary loads will be the distribution, handling and treatment of water, and underground operation (mining, ventilation, and backfill). Two additional spare genset units will be installed so that any two units can be on standby and/or out of service for maintenance or repair. Emergency backup power will be supplied by a smaller power plant containing three 2-MW gensets (saved from the construction phase). The units will be used to feed emergency power to the camp and identified safety loads.

The power plant will be a pre-engineered insulated building constructed on pile foundations or on competent bedrock. The powerhouse will be designed to accommodate eleven (11) Wartsila 9L32 3.8 MW generator sets (suggested model) at 100 % power factor units, for a total of 42.7 MW installed power. At the 8,500 tpd mining rate, this meets the anticipated power requirement, calculated to be 30.6 MW (with all units operating at 88 % of full load, excluding the two standby units). The engines are most efficient when operating in the range of 75 % to 90 % of full load.

Table 2-56 Expected Power Demand and Planned Gensets

Parameters	Unit	Value
Electrical power demand	MW	30.6
Genset capacity (at load 100 %)	MV	3.88
Load	%	88
Generator installed		11
Generator running		9
Total Installed Capacity	MW	42.7

In order to minimize power losses, the power plant will be located adjacent to the largest loads, which will be in the grinding area of the process plant. The fuel will be delivered via pipeline to the daily feed tank beside the powerhouse from the Meliadine 5.6-million-litre fuel tank farm located about 100 m away (details regarding diesel consumption are provided at Section 2.6.10). Each genset will include a local engine control panel with its own PLC-based control and will be capable of manual or automated (remote) operation. The power plant will have a central control room with a supervisory control system using PLC and Human Machine Interface (an operator station) capable of manual or automatic control.

The power plant will be located south-east to the camp and the mill, downwind from the main populated infrastructures. It will be equipped with 4 stacks (1 m diameter, 30 m height from ground) to exhaust gas. To ensure engine efficiency, and thus minimizing greenhouse gas emissions associated with the power plant, a series of design and operational considerations will be implemented. Amongst other, we can identify: power plant located near the higher loads to reduce power losses, heat recovery system, running the engine at their most efficient operating range, chose efficient and up-to-date technology models, use low sulfur-type fuel, and implement a maintenance program to ensure engine efficiency, etc.

As part of its Environmental Management System, AEM has prepared a Spill Contingency Plan (SD 2-16); the Fuel Management Plan is included in the Hazardous Materials Management Plan (SD 2-13). The Spill Contingency Plan is designed to promote environmental awareness and safety, as well as facilitate the efficient cleanup of spills as the result of:

- All spill incidents at the proposed Meliadine site, along the AWAR, and at the Itivia site in Rankin Inlet involving the following substances:
 - P-50 diesel;
 - Gasoline;
 - Jet A and Jet B turbo fuel;
 - Hydraulic oil;
 - Lube oil;

- Waste oil;
- Propane; and
- Other materials hazardous to the safety of personnel and the environment.

The principal objectives of the Spill Contingency Plan are:

- To provide readily accessible emergency information to cleanup crews, Meliadine Gold Project personnel, Kivalliq Inuit Association (KIA), Hamlet of Rankin Inlet and government agencies in the event of a spill;
- To comply with federal and territorial regulations pertaining to the preparation of contingency plans and notification requirements;
- To promote the safe and effective recovery of spilled materials;
- To minimize the environmental impacts of spills to water, ice and/or land; and
- To facilitate the management of wastes according to environmental legislation.

The Risk Management and Emergency Response Plan (SD 2-15) is intended to provide a consolidated source of information for employees, contractors, and site visitors to respond quickly and efficiently to any foreseeable emergency that would likely occur at the Meliadine Project site. It is a working document that will be reviewed and updated on a regular basis as mine development, construction and operations proceed.

The Risk Management and Emergency Response Plan addresses gold mining, processing, transportation and related activities at the Meliadine site as well as possible emergency scenarios that may occur off-site along the AWAR or at the Rankin Inlet Itivia. Guiding the development of this document has been the principle that an effective Emergency Response Plan must provide:

- A clear chain of command for safety and health activities;
- Well-defined corporate expectations regarding safety and health;
- Comprehensive hazard prevention and control methods; and
- Record-keeping requirements to track program progress.

AEM will ensure that all employees, contractors and site visitors fully understand and comply with all legislated safety standards, and the policies and procedures outlined in the Emergency Response Plan (ERP).

This ERP will be reviewed annually, or more frequently as required, to ensure compliance with applicable legislation, to evaluate its effectiveness and to continually improve the procedures. All employees, contractors and site visitors will be encouraged to offer suggestions for ways to eliminate potential hazards and improve work procedures.

2.6.9.1 Heat Recovery

Waste heat from the diesel power plant's high-temperature loop (jacket water, oil cooler and after cooler) will be recovered to provide total space heating within the main mine site buildings (camp, mill, shops) and for domestic water heating. The heat circulation medium will be a 50 % ethylene glycol/water mixture. Heat will be recovered from the high-temperature-loop and will enter the heat exchanger at about 85°C. Excess heat will be dissipated through an outside air-cooled fluid cooler. Each diesel genset will include an engine-driven after-cooler pump that will circulate the water through an external after-cooler heat exchanger. Low-temperature-loop heat recovery will serve the powerhouse air supply system, and the excess will be used for heating domestic water.

2.6.9.2 Power Distribution

Power will be distributed from the powerhouse using appropriate cable and buried lines. Remote loads will be fed by a 4.16-kV buried line or on land via a transformer. The main distribution switchgear will be located in the power plant. This will be the electrical distribution hub for the site. Table 2-57 shows the voltages that will be utilized.

Table 2-57 Distribution of the Electrical Voltage

Sector	Voltage
Site distribution	
Power plant to UG sub-station	4.16 kV
Underground main distribution	
Process plant main distribution	
Grinding mill motors	
Motors over 300 HP	
Motors 300 HP and less	575 V
Underground distribution	575 V
Motors ½ HP and less	115 V
Controls, lighting, small power	120 V or 208 V

The electrical distribution system will consist of switchgear, transformers, starters, and feeder breakers for the motors and non-motorized loads in common line-ups. Lighting and small power applications will be fed from transformers and power panels as required, located in electrical rooms. Cables will be teck-type (shielded) installed in galvanized steel ladder trays.

The underground electrical distribution will be fed by 5 kV teck cable from a switch gear inside the power plant which will go through the ramp to each level. At each level, one junction box will be installed and will feed the electrical substation.

Dry transformers will be located in the process areas so the waste heat can be used to supplement building heating requirements. Units located outdoors will be standard oil-filled transformers.

Preliminary indications are that the power factor at the main 4.16 kV transformer will be approximately 0.9, assuming unit power factors for the mill and strip solution heaters. As such, no power factor correction equipment will be added.

2.6.9.3 Greenhouse Gas Reduction

AEM will apply Best Management Practices (BMP) to reduce where possible GHG emissions from its proposed Meliadine Project. However it should be noted that:

- The Meliadine Project will not commence operations until after the Meadowbank Mine shuts down and so GHGs from Meliadine will not be additive to GHG emissions from the Meadowbank Mine;
- AEM has investigated alternate energy sources for the Meliadine Project such as Liquid Natural Gas (LNG); however, the reality is that LNG is not economic given the relatively small size of the Project; and
- Wind turbine farms can reduce diesel usage but cannot replace the required diesel fired powerhouse facility and thus must be an added capital cost not a replacement capital cost.

In reality, AEM would like to see means to reduce its reliance on power generated by diesel fuel but sees no economically viable way to do this yet. Connecting the Kivalliq region to the Manitoba hydro grid would solve this problem and enhance the economics for the Meliadine Project, but the Meliadine Project does not have the mine life or the robust economics to pay for such a connection on its own.

AEM has committed, as a member of the Mining Association of Canada, to implementing the Towards Sustainable Mining Initiative (TSM) which includes an Energy and GHG Emissions protocol that incorporates commitment to use of BMPs to both monitor and reduce overall energy consumption and reduce GHG emissions where economically and technically feasible. AEM is also aware of Environment Canada's Environmental Code of Practice for Metal Mines (EC 2012) which does address use of BMPs for management of GHG emissions.

At our Meadowbank Mine, fuel makes up almost one third of our operating cost and, thus, finding means to reduce fuel usage not only reduces GHG emissions but positively impacts our bottom line and can help convert waste into ore. At Meadowbank, fuel consumption is tracked as a key performance indicator (KPI) on an ongoing monthly basis and all employees have been engaged in finding methods to reduce overall energy consumption. This engagement has had success in reducing fuel consumption per tonne milled or ounce of gold produced (depending on which KPI one tracks). The program has led to innovative employee-suggested initiatives such as a "no idling" policy for site vehicles even under winter conditions. and a "lights out or power off" initiative throughout the accommodation camp where employees are reminded to power down all

electronics and lighting in their rooms when they leave for the day and where housekeeping staff will use a “sticker” to reinforce these reminders when they find a room where lights, TV or computers have been left on. Management regularly communicates fuel usage statistics and trends to all employees through updated wall posters and through the in-house closed circuit AEM TV communication system. Employees can see through these techniques where fuel consumption is today and how it is trending for this month. While these measures are small, they are cumulative and do add up. More importantly, they create an attitude amongst the workforce where reducing fuel consumption is seen as an important task shared by all that ultimately improves the mine’s sustainability and contributes to job security. On the larger scale, AEM has initiated a number of activities designed to reduce site fuel consumption. For example, all of the camp is heated using a glycol heat recovery loop coming from waste engine heat from the powerhouse. AEM is committed to transferring these GHG reduction strategies and methodologies to its Meliadine Project and to continue working to find new means to reduce overall energy needs through efficiency improvements, reduction strategies, and through assessing alternative energy sources where practical and feasible.

2.6.10 Fuel and Explosives Facilities

This Section describes the proposed fuel storage and handling facilities planned for Rankin Inlet and at mine site, as well as the overall fuel needs anticipated for the Project. Additional management details related to fuel can be found in the Spill Contingency Plan (SD 2-16), the Hazardous Materials Management Plan (SD 2-13) and the Oil Pollution Emergency Plan (SD 8-2). A summary description of AEM’s proposed explosives storage and handling facilities and how explosives will be managed is also provided in this section; with further details that can be found in the Explosives Management Plan (SD 2-14).

2.6.10.1 Rankin Inlet Fuel Storage Facilities

The Project’s main fuel storage facility will be located in Rankin Inlet. The primary fuel will be diesel fuel used both for the generation of electrical power and to operate all of the heavy and light mobile equipment used in mining and in support of the mining activities. Fuel requirements and the proposed storage capacity are described in Table 2-58.

Table 2-58 Diesel Consumption Summary – Meliadine Project

Service	Consumption (L/y)
Mobile equipment (surface, OP and UG)	57,608,664
Power plant	64,579,198
Total	122,187,862
<i>Fuel requirement - 9 months</i>	<i>91,640,897</i>
Proposed Storage Capacity	Litres
Rankin Inlet (8 x 10 ML)	80,000,000
Meliadine (1 x 5.6 ML)	5,600,000

Annual fuel shipments to Rankin Inlet will come via deep-sea vessels from eastern ports during the open water season. Typically, first fuel delivery occurs in the latter part of July or early August of each summer, with the final delivery occurring in mid to late-October. Fuel will be pumped from the vessels to the tank farm using a floating pipeline. This is the same procedure common to Nunavut communities. From Rankin Inlet, fuel will be transported year-round by double-walled tanker trucks to the Meliadine fuel storage facilities⁴⁵. An outline of the proposed Rankin Inlet tank farm is shown in Figure 2-39.

The Rankin Inlet fuel storage tanks will have the nominal capacity to store a 9-10 month fuel supply to allow the mine to continue operation between annual sealifts. The required capacity for this fuel tank farm is 80 ML (8 x 10 ML capacity tanks). The tanks will be field-erected steel tanks built to API-650 standards. They will be situated in lined and bermed containment areas capable of containing 110 % of the contents of the largest tank. Fuel loading and unloading stations will be located on an extension of the lined berm and on a concrete pad with appropriate slope toward the tank farm containment. The storage tanks and fuel-dispensing systems will be constructed in accordance with current regulatory requirements and fire regulations. The only fuel stored within this facility will be light fuel oil.

The storage tanks will be constructed in accordance with Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* as developed under the *Canadian Environmental Protection Act* and in accordance with the CCME *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum and Allied Petroleum Products*. The minimum setback for any fuel storage tank from a water body is 100 m. The proposed AEM fuel storage facilities will be sited to ensure compliance with this minimum setback distance.

⁴⁵ Operational planning is provided in the Oil Pollution Emergency Plan (SD 8-2) and the Spill Contingency Plan (SD 2-16), and will be linked with the third party (shipping company) emergency and contingency planning.

In the Meliadine EIS guidelines, NIRB asked AEM to address what proposed measures AEM will take to ensure that the fuel used for mine related activities will conform with Canadian regulations (Government of Canada; 1990, 1991, 1997, 1999b, 1999c, and 2002b) for fuel to be consumed at a mine site. At the Meadowbank Mine, AEM goes out to the diesel fuel supply market with a Request for Proposal (RFP) covering its annual fuel supply requirements (the current supply contract is a multi-year contract valid through December 2015). The RFP contains:

- A specification that the diesel fuel must meet; the current specification is for Ultra Low Sulphur Diesel Fuel, Type A-ULS meeting the specifications of the Canadian General Standards Board CAN/CGSB - 3.517-2000; and
- A requirement and process for the use of an independent third party to both sample the fuel as it is being loaded into the ship heading to Baker Lake, and to test the fuel sampled to verify that this fuel meets the required specification. This third party sampling and testing is done at a frequency and timing as established by the independent third party.

AEM plans to use a similar process at its proposed Meliadine Project to ensure that the fuel supplied and used at the Project meets the Canadian regulations for fuel consumed at a mine site and to ensure that the fuel is ultra-low sulfur P-50 Arctic grade diesel to prevent gelling or waxing during winter months.

AEM will rely on its own fuel supply and does not anticipate having to source diesel fuel from the Government of Nunavut. Jet B fuel for helicopters and small amounts of gasoline for gas powered engines could be purchased from the GN.

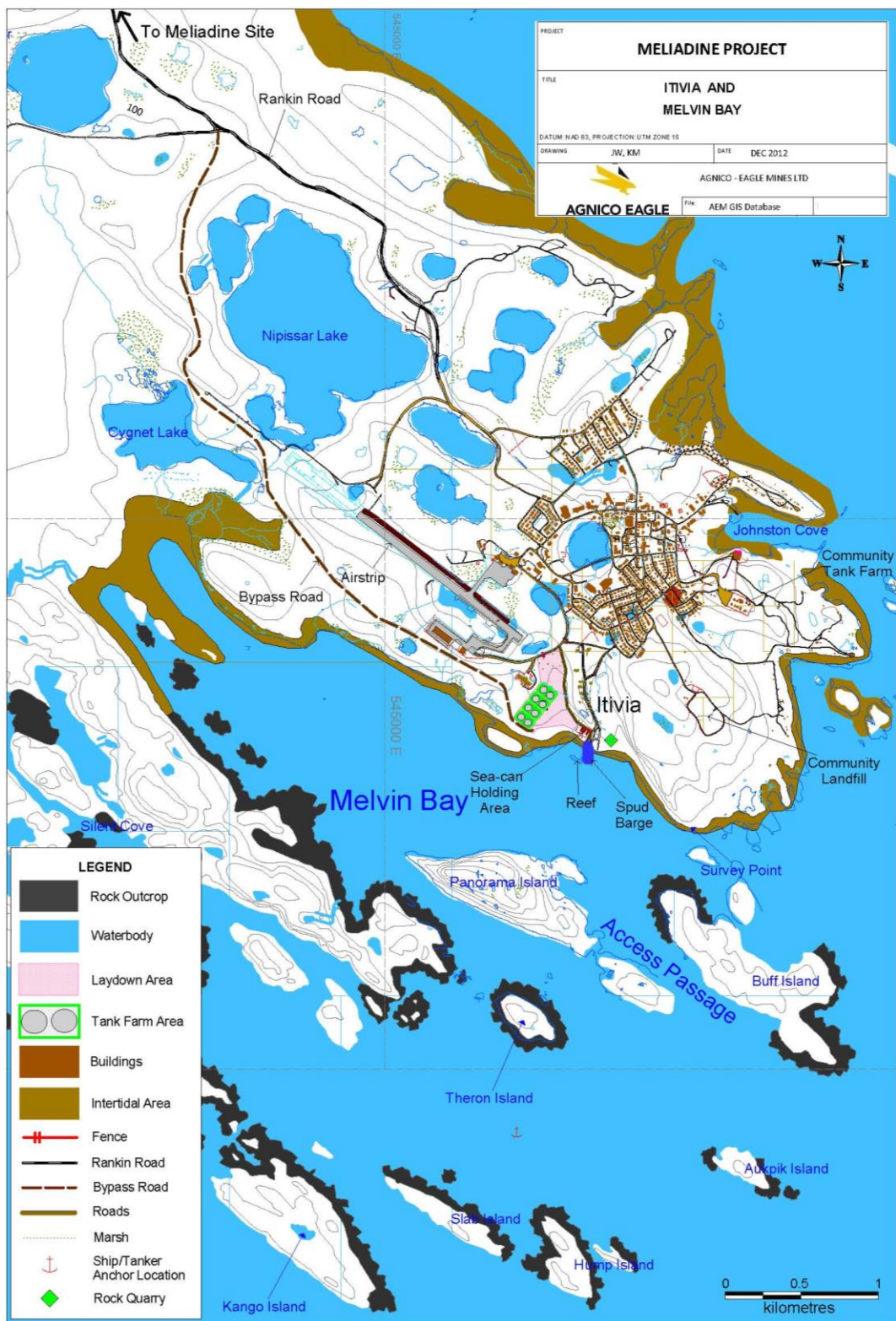


Figure 2-39 Planned Meliadine Diesel Fuel Storage Tanks Facility in Rankin Inlet

2.6.10.2 Mine Site Fuel Storage Facilities

Diesel fuel (LFO) will be delivered as required by 45,000-litre-capacity trucks over the AWAR from Rankin Inlet to a single 5.6-million-litre-capacity fuel storage tank located on site. The tank will be situated about 100 m southwest of the mine site power plant, convenient to the power generators, mining operations and plant facilities. The storage tank will meet Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* as developed under the *Canadian Environmental Protection Act*, *CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum and Allied Petroleum Products*, be constructed in accordance with the American Petroleum Institute specifications (API-650 standards) and of cold-temperature-resistant steel. The foundation design will involve placing structural fill to insulate the underlying bedrock and promote good drainage. A high-density polyethylene (HDPE) liner will extend up the inside slope of the perimeter berm. The bermed volume will have a capacity of 110 % of the largest fuel storage tank. Fuel loading and unloading stations will be located on an extension of the lined berm and on a concrete pad with appropriate slope toward the tank farm containment. The tank containment will be cleaned as required using a mobile vacuum truck. Fuel for the power plant and other facilities will be pumped to daily feed tanks through a buried piping network. A fuel dispensing station for the mine mobile equipment, fuel trucks and light vehicles will be provided.

Table 2-59 Proposed On-Site Fuel Products Storage Location

Product	Storage Location	Capacity	Container
Diesel	Main fuel tank	5.6 ML	Tank in bermed area
	Power plant	3 x 25,000 L	Tanks
	Mechanical shop	1,000 L	Tank
	Emulsion plant	25,000 L	Tank
Hydraulic fluids	Mechanical shop		Cubes or barrels
	Power plant		Cubes or barrels
	Mill		Cubes or barrel
Ethylene glycol	Mechanical shop		Cubes

The existing Meliadine exploration camp has a helipad with adjacent fuel storage tanks for Jet B fuel (3 x 100,000 litre double-walled storage tanks – Envirotanks). This helipad will remain in operation during the mine construction, operation and closure phase of the Project and will be the only helipad located at the mine site. The helipad will primarily support ongoing regional mineral exploration. The three (3) existing storage tanks for Jet B fuel will remain through the construction, operation and closure phases of the Project.

Project activities will respect the aims and values of the *Territorial Park Act* by not engaging in commercial or industrial activities, including the transportation, transfer or storage of fuel, within the boundaries of the Iqalugaarjuup Nunanga Territorial Park. Helicopter flights over the Park will be avoided wherever possible.

2.6.10.3 Emulsion Plant and Explosives Storage

In supporting the overall Meliadine Project development and mine operations, the use of emulsion-based explosives as well as ANFO (Ammonium Nitrate/Fuel Oil) will be required, depending on the blasting conditions. ANFO will mainly be used during the development phase until the emulsion plant becomes available for the manufacturing of emulsion.

All explosives will be shipped to the proposed Meliadine site by the annual sealift. The explosive agents will be packaged and transported in accordance with Canadian regulations for the transport and storage of explosives. It is AEM's intent that all explosives materials (including caps and boosters) be immediately transported to the mine site over the AWAR as soon as they are off-loaded at the Itivia port in Rankin Inlet. The intent is to never store explosives for any appreciable length of time at the Itivia laydown site in Rankin Inlet. The explosives would bypass the residential areas of Rankin Inlet by being transported along the proposed bypass road and then out the AWAR to the Meliadine site (this is similar to the practise in place at our Meadowbank Mine). In the unlikely eventuality of a delay in transport (due to bad weather or road closure), AEM will hold the explosive materials at the Itivia site in Rankin Inlet until the road is re-opened and the material can be safely transported. In such event, the explosives will be held on a short temporary basis at the AEM laydown area at Itivia under locked storage that is under constant human surveillance (security) in accordance with the applicable regulations.

At the mine site, the emulsion plant, raw material storage (products used to produce emulsion), and cap and powder magazines (surface and underground) will be safely located away from vulnerable facilities. The minimum setback distances between the emulsion plant, explosives storage facilities and the other mine site facilities will be governed by the *Quantity-Distance Principles User's Manual* as published by the Explosives Branch of Natural Resources Canada. Use of these setback distances will ensure that the location of these proposed facilities meet all federal and territorial regulations regarding safe siting of such facilities. The emulsion plant will be located 1.5 km north-west of the mine site and at least 31 m from surface water. The surface powder magazine area will be next to the emulsion plant. Caps will be stored in sea cans which will be located 250 m west of the emulsion plant. Sea cans containing ammonium nitrate (a raw material used to produce emulsion), will be stored in the raw material storage area next to the emulsion plant. Surface and underground mining activities will require in total approximately 10 to 20 magazines which will be managed according to applicable legislation. The emulsion plant will operate 7-days a week on a 12-h/day basis. The explosives truck(s) will be based at the emulsion plant. A garage will be included in the building for the maintenance and washing of trucks and equipment used to handle the explosives.

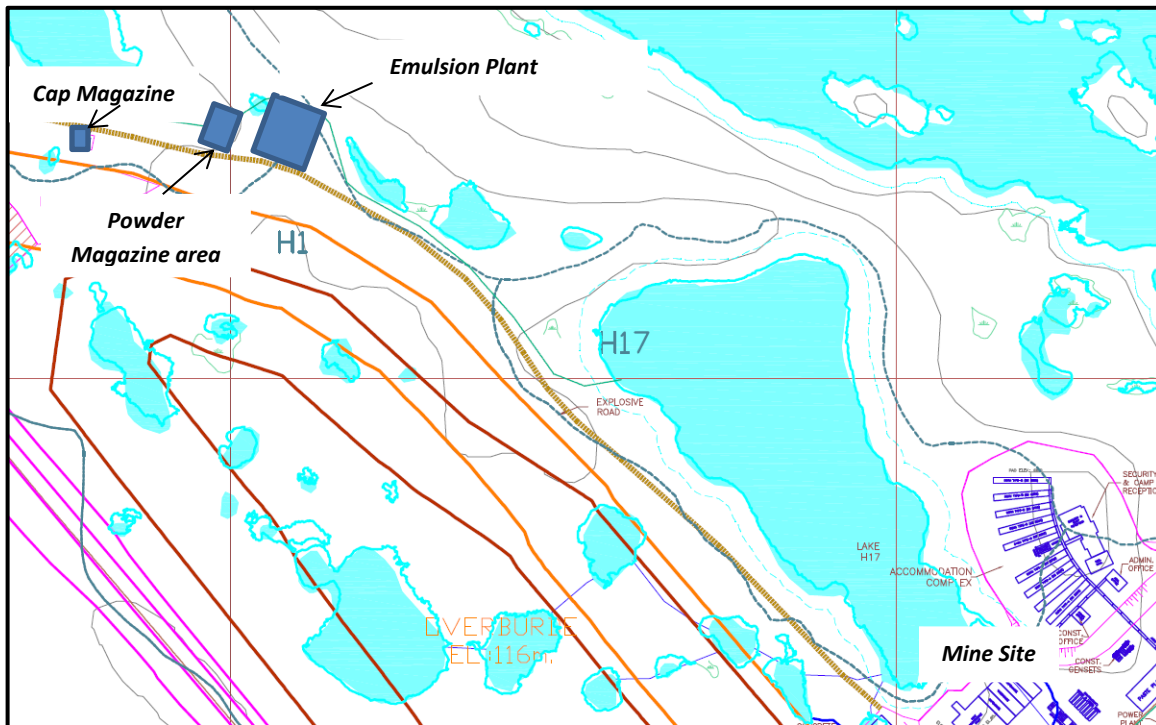


Figure 2-40 Location of Cap magazine, Powder Magazine area and Emulsion Plant

The flow sheet of the Emulsion Plant is presented in Figure 2-41. Briefly, the main steps of emulsion preparation are as follows:

1. Mixing ammonium nitrate with water (Mix #1 / Oxidising Melt Solution).
2. Mixing fuel and emulsifier (Mix #2 / Fuel Blend).
3. Mixing Mix #1 and Mix #2.
4. Emulsion ready to be loaded in explosives truck.

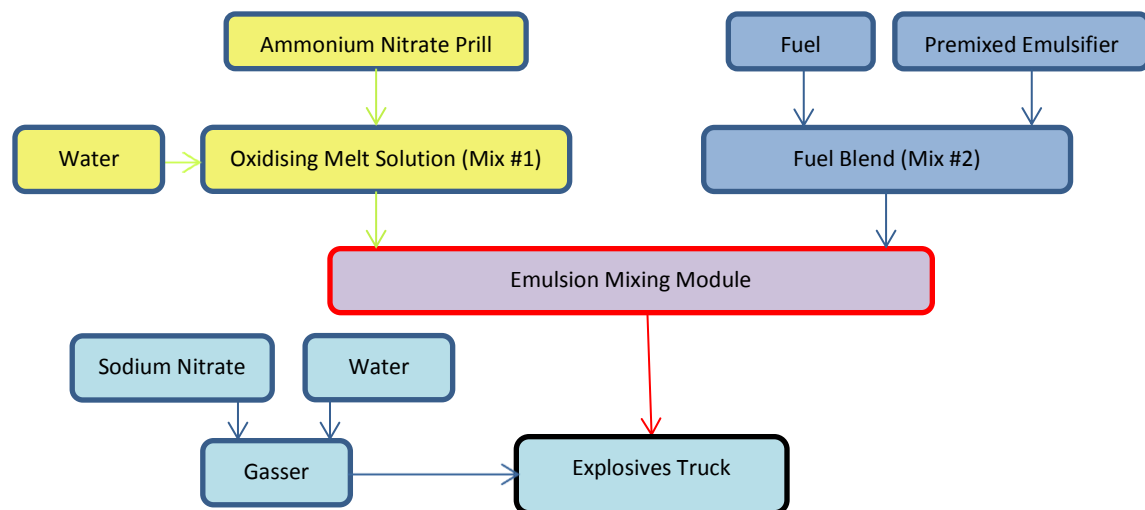


Figure 2-41 Emulsion Plant Flow Sheet

The amount of explosives that will be consumed during the life of the Project is forecasted to be 144,122 tonnes (approximately 12,000 tons/year for full production years). The fuel ratio used for emulsion mixing will be approximately 5.2 %, meaning that the emulsion consumption will require about 680,940 liters of diesel per year (with an average fuel density of 0.91 g/cm³). The emulsion plant will be equipped with a 25,000 liter capacity diesel fuel tank which will be replenished by a fuel truck. The water used for the manufacturing of emulsion will be supplied from the site's fresh water tank using a heat-traced pipeline at a flow rate of 1.6 m³/h, for a total of approximately 14,000 m³/year. Waste water generated by the emulsion plant will be re-used within the plant when feasible and any excess used water will be evaporated (remaining solids will be disposed in the same manner as unusable emulsion). Any unusable emulsion waste will be taken to the mine blast patterns for disposal down the bore holes.

2.6.11 Exploration⁴⁶

The Meliadine property consists of 52,173 ha: 887 ha as claims, and 51,286 ha as leases. This is a large property and AEM envisions ongoing mineral exploration for as long as there are targets to explore and budget to do so. Drilling effort done up to now is showed on Figure 2-42.

⁴⁶ Note that information on exploration activities is provided here for the benefit of the reader only. All activities to be pursued by the exploration group will be done under separate permitting and licensing, and are thus not part of the scope of the Project's EIS.

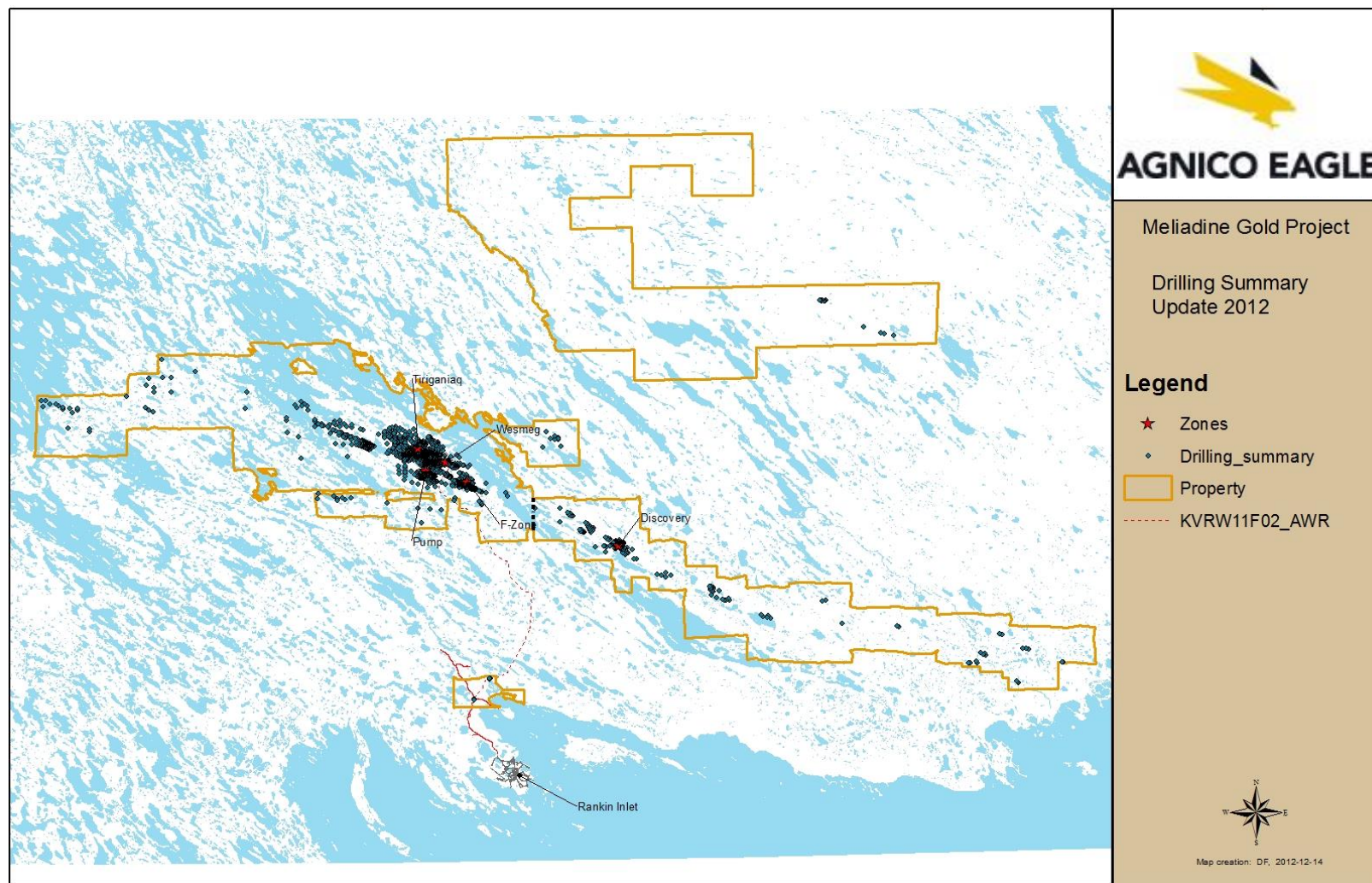


Figure 2-42 Meliadine Gold Project Drilling Summary Update - 2012

For the 2012-2013 drilling season, 10 sectors were targeted, plus the ongoing drilling on the current deposits (Tiriganiaq, Discovery, F Zone, Pump and Wesmeg). Other sectors drilled are located on the property north of Meliadine Lake.

Geotechnical drilling campaigns were also conducted in 2011 and 2012 in support of the ongoing feasibility study. Additional geotechnical drilling is expected to be necessary for 2013 to support future engineering. These investigations are being conducted under the proposed mine infrastructure (buildings, dikes, dams, pads etc.) to ensure proper ground information for design purposes. No seismic activity is planned for the Project at this point in time.

Each year, once exploration targets are identified, an archeologist is contracted to verify if any possible archeological and cultural resources may be impacted by exploration activities. Appropriate mitigation and monitoring measures are put in place before the beginning of the program to ensure appropriate actions are taken in order to protect this heritage. A subsequent report on these activities is then filed with the Government of Nunavut (GN-CLEY).

The drilling season is divided in two: winter drilling and summer drilling. The winter campaigns are usually done by land (ski-doo, ATV, etc.) and are thus restricted to the claim areas in close proximity to the existing exploration camp facilities located near the Tiriganiaq deposit. Summer campaigns are supported by aerial transportation, mainly helicopter, and are thus focussed both on regional exploration targets further afield from the existing exploration camp and on exploration targets close to the existing camp.

To support and guide exploration activities using helicopter support, AEM has put forward an Air Traffic Management Plan for the Meliadine Project as support for its existing exploration water use licenses and land use leases (see Appendix B). The main objective of this management plan is to minimize as much as possible all potential impacts to wildlife from low flying aircraft and helicopters. For long-range transportation, all flights are required to be at a minimum of 600 m above ground level except if there are risks to flight safety. For shorter distances, the Plan establishes a minimum flying height of 300 m. The Plan stipulates that all helicopter landings in remote areas should not be within 1 km of wildlife. When flying near a caribou herd, the Plan stipulates that these safety distances shall be respected, and indicates that all known areas of raptor nests and waterfowl and shorebirds staging areas should be avoided. This Plan makes it clear that all harassment of wildlife is expressly forbidden.

Winter Drilling

AEM has a specific procedure (MEL-ENV-0002; see Appendix B) in place to ensure best practices and appropriate environmental management while drilling over land or on lake ice during winter. This procedure is based on AEM standard practices, and includes all the terms and conditions of the licences and lease AEM have to comply with when completing such type of work. This procedure applies to all employees and contractors who are doing drilling activities. All drill sites are inspected by AEM personnel before, during and after drilling operations to ensure a clean, safe and secure

work site as well as the respect of the procedures. Water, fluids and hydrocarbons are to be controlled during drilling operations, and all garbage and solid waste are to be removed from the drill site and disposed of properly. All drill rigs are equipped with an emergency spill kit and spills are to be reported to AEM environmental staff. Water quality monitoring is completed by AEM environmental personnel before, during and after completion of any on-ice drilling activities.

Summer Drilling

During summer, no drilling or activity is permitted within 31 m of the ordinary high water mark of any water body. Transport to and from the drill site uses helicopter to protect Tundra soil and ground. In addition, and specifically relating to aquatic life including fish and fish habitat as defined in the *Fisheries Act*, the following mitigation measures are implemented:

- All drill waste, including water, chips, muds and salts (CaCl_2) are disposed of in a properly constructed sump or an appropriate natural depression (located at least 31 m from a body of water) where direct flow into a water body is not possible and no additional impacts are created.
- Non-submersible pumps are placed into a secondary containment tray to capture any unexpected fuel/oil leaks or spills.
- Waste oil is transported back to the camp or disposed of at an approved facility.
- All garbage and solid waste are removed from drill site and disposed of in an appropriate manner.
- All drill rigs are equipped with an emergency spill lot with oil absorbent material.

2.6.12 Other Project Facilities and Infrastructure

2.6.12.1 Assay Laboratory

The assay laboratory will be housed in a 462-m² building located near the west end of the process plant building. The lab building will be made of a prefabricated steel frame (fold-away type) covered by cladding and roofing panel. It will include a sample preparation room, a balance room, a fire-assay room and a sample receiving area, as well as an office for the chief assayer. The laboratory will operate 24 hours per day, seven days per week, and will be able to handle all mine and process plant samples including bullion assays. Exploration assays will be handled externally. The laboratory will also be equipped to perform grade control assays and some environmental analysis. Major equipment included in the assay lab is listed in Table 2-60.

Table 2-60 Assay Laboratory Major Equipment List

Equipment
Modular baghouse dust collectors for fire assay room
Modular baghouse dust collectors for sample preparation room
Furnace Mas-3
Dryer
Terminator jaw crusher over rotary sample splitter
Pulverizer LM2

2.6.12.2 Permanent Camp Complex

The permanent camp will be similar to those at other remote mines (Meadowbank being an example) and will include individual rooms, with flexibility for visiting staff and guests. Recreational facilities will be included as they are considered essential to recruit and retain employees.

The camp complex will be constructed of insulated structural wood frames on pile foundations. The accommodation complex will be composed of dormitory buildings and a building that will combine the reception area, security office, kitchen, dining room and recreational facilities. All modules (buildings) of the camp complex will be connected with Arctic corridors. Main reasons for linking all the camp facilities is to promote a more efficient foundation design, common walls, reduced heat losses and a compact site area. The building layout will allow for future expansion. The camp complex will be designed for both electric and glycol heating (heat recovery system).

The number of bedrooms was determined from the size of the permanent workforce, taking into account the construction workforce. The design provides one room per non-rotational staff and allow sharing of one room by two staff members on opposite rotations (cross shifts), based on a two-week-in/two-week-out rotation, and one bed per room.

With proper maintenance, this type of camp is expected to last for at least 10 years. The camp complex will meet the National Building Code of Canada (NRC 2010) Group C fire safety and occupancy requirements.

The security or guard house to be sited at the entry from the AWAR on to the mine site will be a modular (trailer style) building with an attached security gate. The building will be designed to provide physical control over vehicles entering and departing from the mine site. It will be equipped with both radio and telephone connections to allow the security personnel based there to communicate with all AEM and contractor vehicular traffic.

Reception and Security Office

A 194-m² reception and security office area will be located on the west end of the camp complex. All modules will be connected with Arctic corridors. The reception and security office will include: a reception for traveling workers, a waiting room, a security office and a baggage reception and storage area.

Dormitory

The dormitories will be built of pre-fabricated modules. The complex will have a basic capacity of 680 beds in 10 x 2-storey dormitory wings. The complex will consist of 5 x “type A” wings and 5 x “type B” wings. Total occupation during normal operations is estimated at 622 persons.

The “type A” dorm wings

The total floor space of each “type A” wing will be 785 m². Each dorm wing will have 58 rooms (29 rooms per level), for a total of 290 “type A” rooms. Each room will include a private bathroom with a shower, a sink and a toilet. The bedroom will include a bed, a desk with chair and a closet. All rooms will be equipped with a television and an internet connection. The inside dimensions of each room will be 3.6 m x 3.6 m x 2.4 m, with suspended ceilings.

The “type B” dorm wings

The total floor space of each “type B” wing will be 710 m². Each dorm wing will have 78 rooms (39 rooms per level), for a total of 390 “type B” rooms. The bedroom will include a bed, a desk with chair and a closet. All rooms will be equipped with a television and an internet connection. The inside dimensions of each room will be 3.6 m x 3.0 m x 2.4 m, with suspended ceilings. The “type B” dorm includes 9 individual bathrooms per level, with shower, sink and toilet in each bathroom.

Kitchen

The 3,280-m² kitchen section will be made from 49 modules and include sufficient facilities for 680 people. It will include a dry warehouse, an equipped kitchen and a dining room.

Laundry

A 194-m² laundry room will be located on the east end of the camp complex. The laundry room will include washing machines, dryers, hot water tanks and storage space.

Administration Building

A two-storey administration office (522 m² on each level) will be located on the east end of the camp complex. All modules will be connected with Arctic corridors. The administration building will accommodate the office staff including management, professional staff, administration, training, safety, and the first-aid clinic.

Mine Maintenance Shop

The mine maintenance shop will be a 1,984-m² pre-engineered structural building with steel cladding and roofing, located west of the process plant. The maintenance and repair shops were sized for heavy mobile equipment. The main service bays will be 15 m long, 11 m wide and have a clearance of 10 m under the 20-tonne overhead service crane. Four (4) heavy equipment repair bays, two (2) equipment basic service bays, one (1) light vehicle service bay, one (1) welding bay, one (1) machine shop bay and one (1) wash bay will be provided. The vehicle wash bay will be equipped with an oil/water separation unit to allow residual hydrocarbons to be removed from the dirty wash water generated by washing of the vehicles.

Additional parts of the maintenance shop will be a tool crib and an area to store large shop tools, lube, fast-moving spares and daily consumables, an office for the maintenance shift boss, a mechanical and electrical room, along with a toilet, a lunch room and offices for maintenance planning and HVAC (Heating, Ventilation, and Air Conditioning), as well as make-up air and shop exhaust systems.

Exhaust ventilation for the workshop and light vehicle service bays will be provided by source-collection hoods to efficiently evacuate fumes. Curtains and fume hoods, especially in the welding bay, will be provided while allowing only a minimum entry of cold make-up air. An under-slab glycol heating system supplied by heat recovery from the power plant will be installed in the workshop floor.

Workers Dry and Services

The workers' dry, mine rescue, ambulance, fire truck will be housed in a 1115-m² building.

The workers' dry facilities for men and women will be housed in an 844-m² building located on the west end of the camp complex. The building will be a prefabricated steel frame (fold-away type) covered by cladding and roofing panel. The dry facilities will be for the use of the operations, maintenance and mine contractor staff.

The workers dry facilities for men will include a changing area with one full-height locker for each worker on site (200). On the work side, a hanging basket will be provided for each worker (200). A separate dry for 14 female workers will be provided.

Main Warehouse and Cold Storage

The main warehouse will be housed in a 666-m² building located south of the camp complex. The building will be a prefabricated steel frame (fold-away type) covered by cladding and roofing panel. The warehouse will be designed to store small and medium-sized maintenance spares for the process plant, mine equipment, and plant support vehicles and equipment, including related consumables. The warehouse will be provided with forklifts and pallets for material handling, pallet racking, bins, and carousels. A separate contained area inside the warehouse will be dedicated to the storage of special lubricants and greases. In addition, a designated caged area will be provided

for flammable products such as solvents and paints. A separate area outside the warehouse will be available for storing large components of mining equipment. Large-sized process equipment spares will be stored in a dedicated laydown area on the east side of the process plant.

In the warehousing space, there will also be three cold storage fabric shelter buildings which will provide an additional 3,200 m² of storage space.

2.6.11.3 *Communications*

Communications to and from the site will be accomplished using satellite links. This will include telephone, fax, Internet and entertainment (television). On-site communication methods are listed in Table 2-61.

Table 2-61 Communications Methods at the Meliadine Site

Requirement	Method
Voice	Radio
Process computers	Data highway cable and optic fibre lines
Remote process	Radio link modems to the process control system
Non-process computers	Data highway cable and optic fibre lines

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APPENDIX A • MINE DESIGN

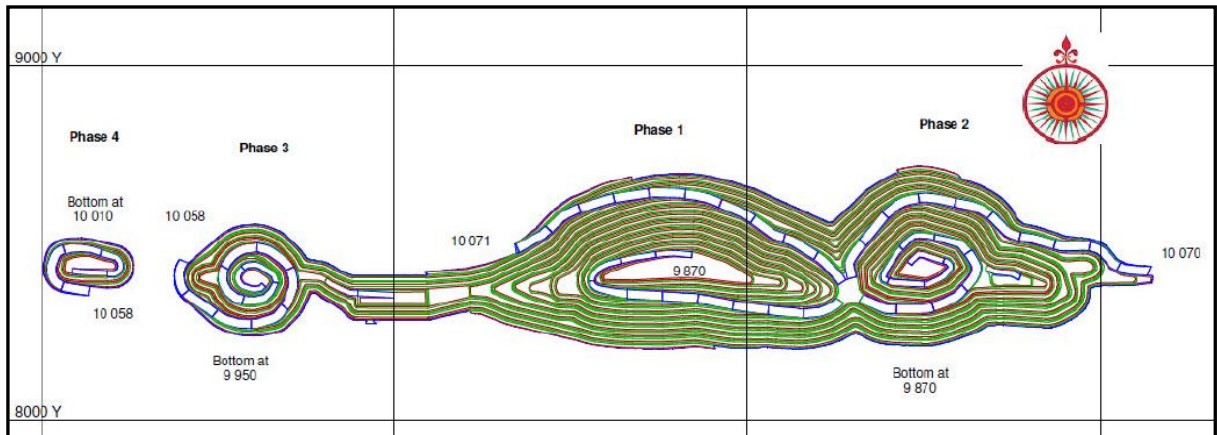


Figure A1. Tiriganiaq pit design

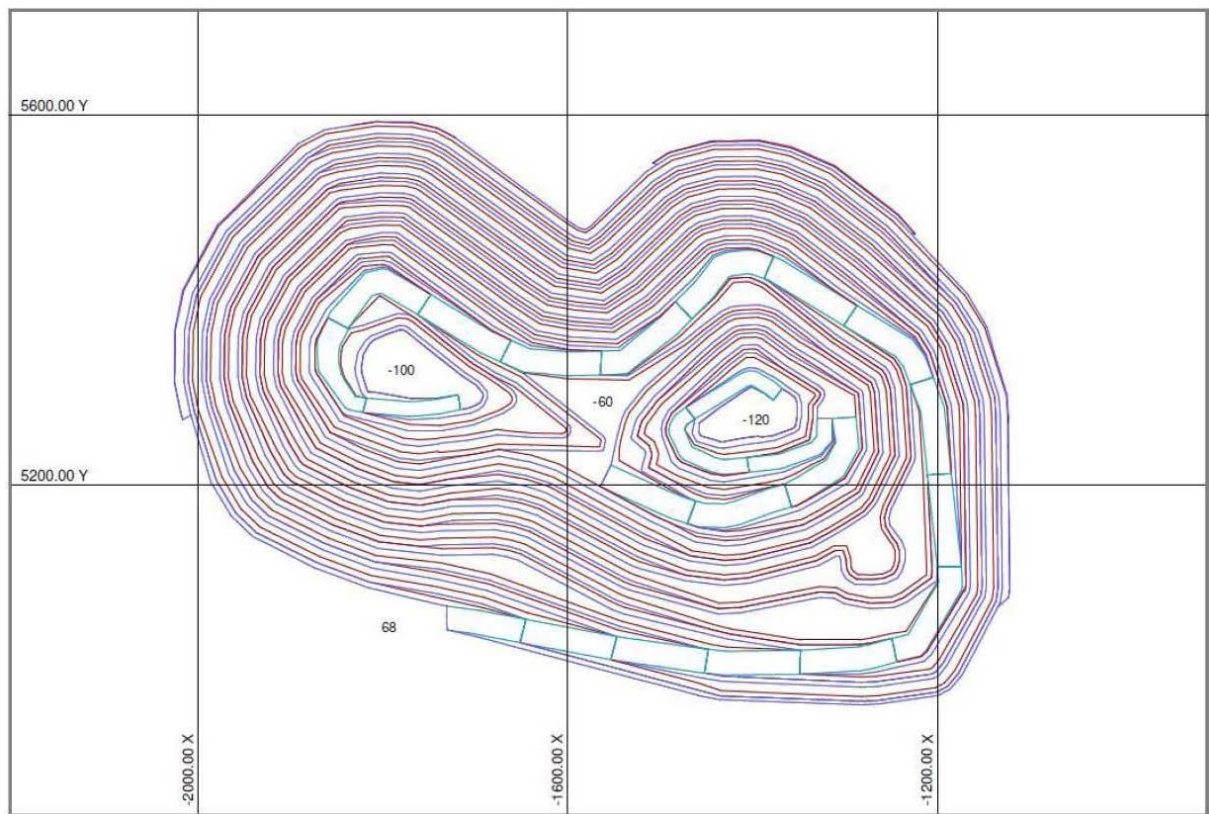


Figure A2. Discovery pit design

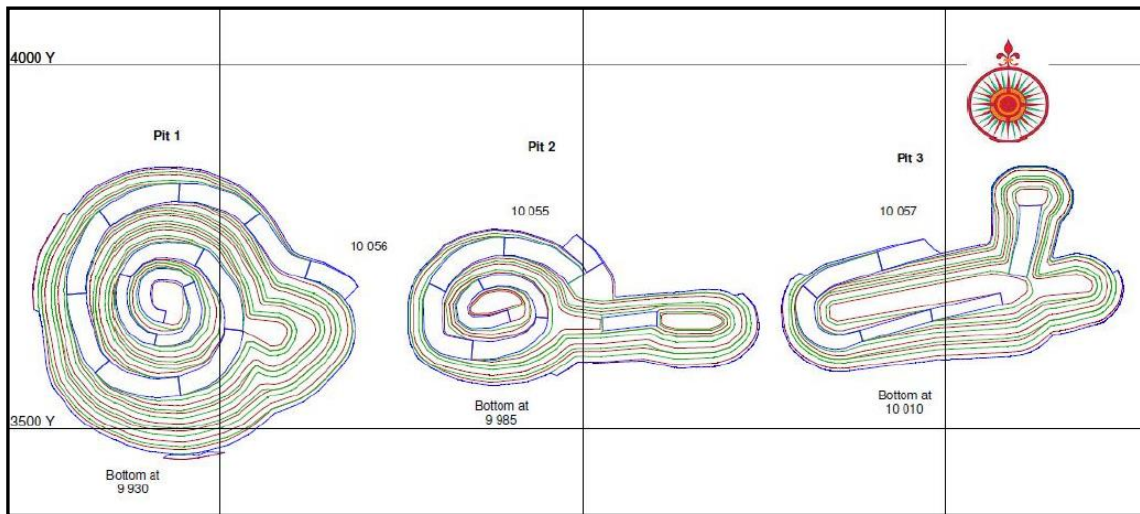


Figure A3. F Zone pit design

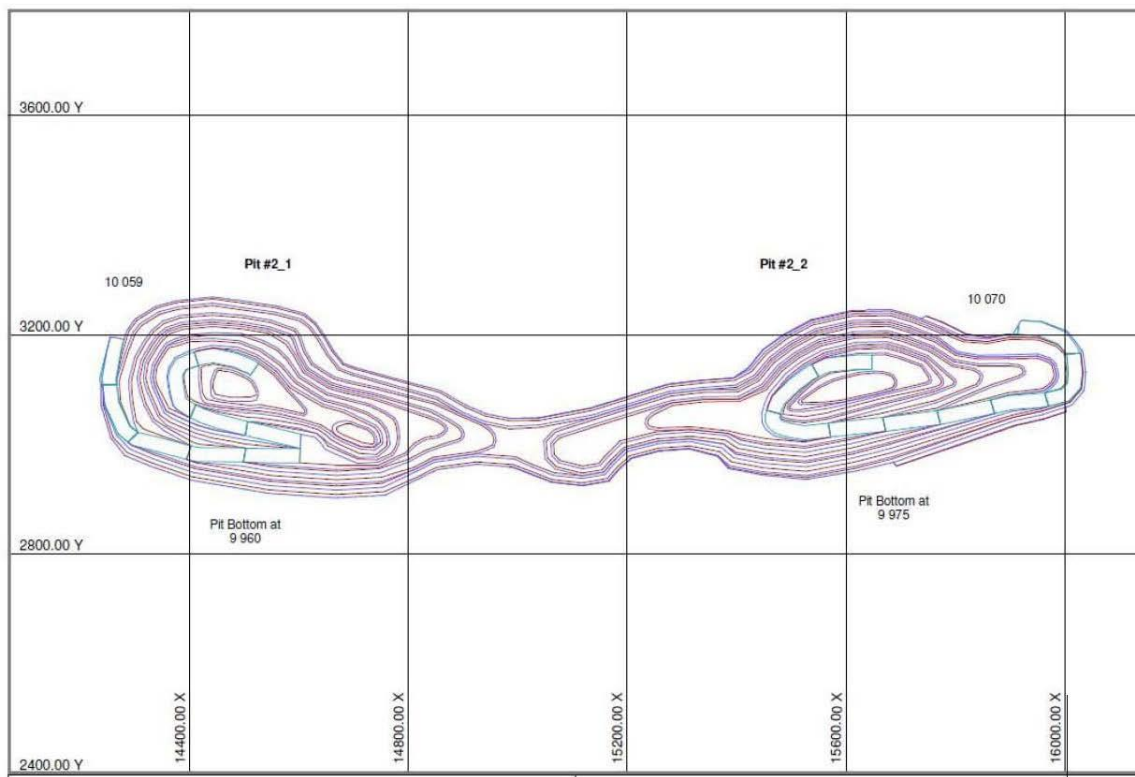


Figure A4. Pump pit design

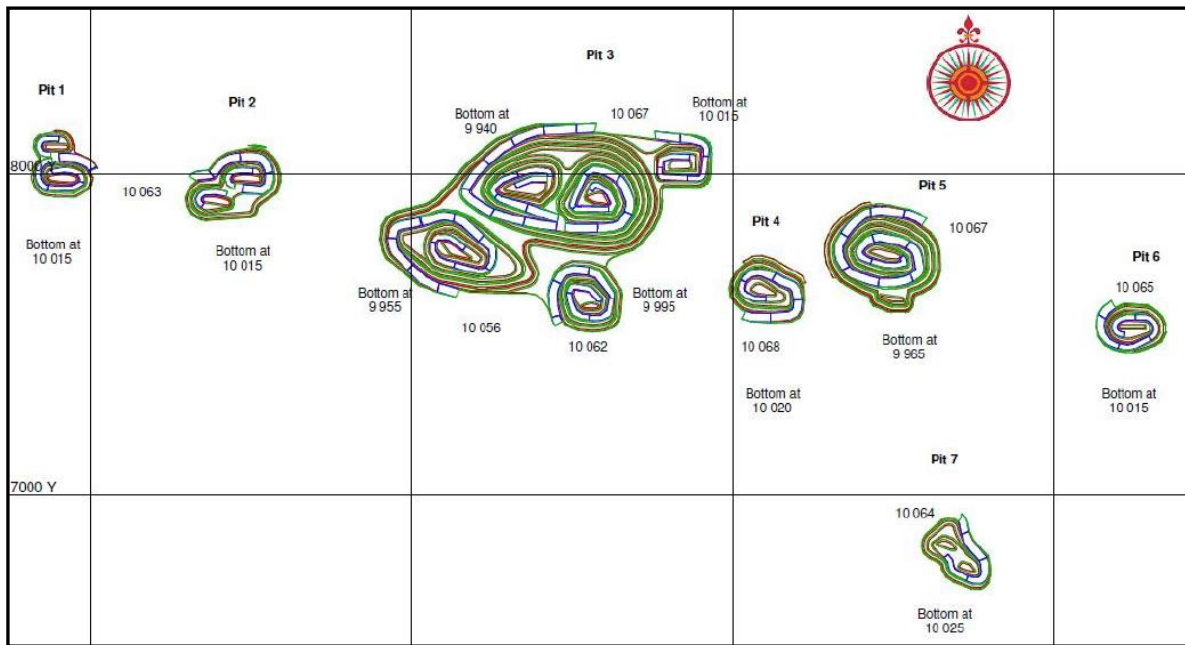


Figure A5. Wesmeg pit design

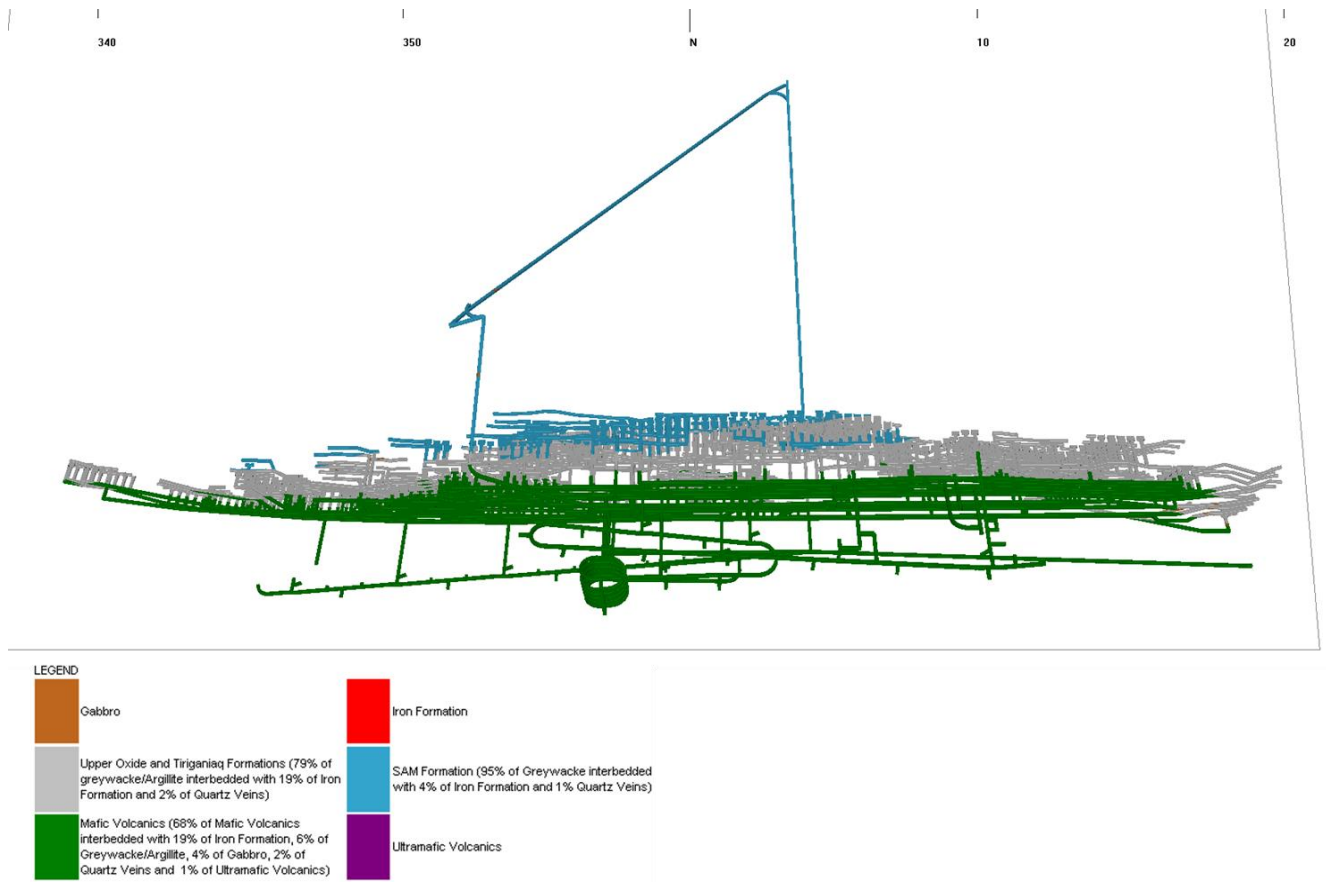


Figure A6. Tiriganiaq underground mine design

APPENDIX B • EXPLORATION PROCEDURES



TECHNICAL MEMORANDUM

DATE: June 27, 2012

TO: All Pilots of Helicopter and Fixed Wing Aircraft Operating Near the Meliadine Site

RE: Air Traffic Management Plan – Meliadine Project

FROM: Environment Department

Please be advised that AEM is required to implement an air traffic management plan in the immediate vicinity of the Meliadine Project. The objective of this Air Traffic Management Plan is to minimize to the greatest extent possible all potential impacts to wildlife from low flying aircraft and helicopters.

Under this Air Traffic Management Plan asks that all pilots of helicopter and fixed wing aircraft abide by the guidelines set forth in this memorandum when flying to/from the Meliadine Project or in the vicinity of the project area wherever possible (from a safety perspective).

- For long-range transportation flights (i.e. to and from Rankin Inlet), we ask all pilots to follow a practice that sees the aircraft fly at a minimum of 600 m above ground level. Exceptions may exist during take off and landing, low-level ceiling conditions, high winds, or other risks to flight safety.
- For relatively shorter transportation flights (e.g., movement of staff and equipment between camp and ore bodies within the Meliadine lease), we ask that all pilots follow a practice that sees all aircraft (including helicopters) flying at a minimum of 300 m above ground level. Exceptions may exist during take off and landing, low-level ceiling conditions, high winds, or other risks to flight safety.
- The Environment Department must be notified if caribou, muskox or other animals are within 1 km of the heli pad. If necessary, the team will herd or scare off animals from the airstrip prior to aircraft landing and departure. The pilot should radio the Meliadine designated camp aircraft frequency and request that the camp radio operator call out the wildlife team to herd animals away from the strip before landing.
- At remote landing areas, we ask that helicopters not land within 1 km of individual or large aggregations of wildlife.
- We ask that when flying over large concentrations of caribou (50 or more individuals in close proximity to one another), a 1,000 m vertical and 1,500 m horizontal distance from the herd be observed whenever possible. We ask that all pilots avoid helicopter flights over known areas of raptor nests and waterfowl and shorebird staging areas during critical seasons (when birds are present –Spring and summer months). The Environment Department can inform pilots of these areas.

- Harassment of wildlife (flying below 300 m), especially grizzly bear, muskoxen, caribou, wolves, and wolverine, is expressly forbidden. Exceptions exist only in the rare instance the animal(s) poses an immediate danger to a person in the field.

Thank you for helping AEM protect the natural resources of Nunavut and for helping demonstrate that mineral exploration and mining can co-exist with the wildlife without causing a significant adverse impact.

Agnico Eagle Mines Ltd. – Meliadine Project



Winter Drilling on Land and on Ice



		PROCEDURE NUMBER: MEL-ENV-0002	
Date in effect:	2012-04-01	Prepared by	Philip Roy
		Page	1 of 3
Revision Date	2012-04-02	Revision	Stephane Villeneuve
<i>This procedure corresponds to the required minimum standard. Each and every one also has to comply with the rules and regulations of the Nunavut Government.</i>			

1. Purpose

To provide a specific, clear understanding on the procedure to follow during drilling in winter.

2. Scope

This standard applies to AEM employees and all contractors who are completing drilling activities during the winter season. These drilling sites can be situated over land or on lake ice.

3. Description

- Agnico-Eagle Mines Ltd. is committed to ensuring the protection of the environment and ensures best practice during working activities.
- Adverse impact to the land (Tundra soil and ground) is not permitted as stipulated in Commercial Lease for Inuit Owned Lands Lease #KVCL102J168. For transport to and from the drill sites land based machinery will be used only when frozen snow cover exists to protect the ground. Transport to and from the drill site will use helicopter during thawed (spring, summer) conditions.
- For non-submersible pumps that use a hydrocarbon based fuel, the pump must be placed in a secondary containment tray to capture any unexpected fuel/oil leaks or spills.
- Waste oil is to be transported back to the camp and stored at the HAZMAT Management Center (HMC) or disposed of at an off-site, approved facility.
- Every effort must be made to control fluid use during drilling operations. All wastes from on lake ice drilling, including water, cuttings, muds and salts (CaCl₂), in any quantity or concentration, shall be disposed of in proper containment or in an appropriate natural depression located at a distance of at least thirty one (31) meters from the ordinary high water mark of any adjacent water body and where direct flow into a water body is not possible and no additional impacts are created.
- Every effort must be made to control water use during drilling operations. Drill cuttings shall be removed from the lake ice using accessible means on site such as submersible electric pumps connected to sludge lines pushing the drill cuttings on land as described in the paragraph "e" above. Other means such as recirculating water tanks at drill sites and portable vacuum sludge tanks are to be



Winter Drilling on Land and on Ice



used to manage drill cuttings. Delivery of this specialized equipment is expected on the 2012 sea-lift campaign and operational in 2013.

- g. All drill sites are to be inspected by AEM personnel before, during and after drilling operations to ensure proper installation of a clean, safe and secure work site. If a modification to the approved installation is made, AEM must re-inspect the site before drilling can resume.
- h. Water quality monitoring shall be completed by the environmental department before, during and after completion of any on ice drilling activities. Water sampling shall be completed when there is free water under the drilling site.
- i. All garbage and solid waste will be removed from the drill site and disposed of in an appropriate manner; sorted and brought to the main Meliadine Recycling Center (RC) for treatment and appropriate disposal.
- j. All drill rigs require an emergency spill kit with oil absorbent material in readiness in the event of a leak or spill.
- k. All spills are to be reported to AEM environmental staff and internal spill reports shall be completed according to the Meliadine spill procedures.



Winter Drilling on Land and on Ice



Environmental representative

Mine Manager

Date

**I, undersigned, have read and understood this procedure and
I will conform at all time.**

Date	Company	Name	Signature
Date	Company	Name	Signature
Date	Company	Name	Signature
Date	Company	Name	Signature
Date	Company	Name	Signature
Date	Company	Name	Signature
Date	Company	Name	Signature