

**Baffinland Iron Mines Corporation
Mary River Project**

Operations and Management Plan Mary River Mine Site Quarry (QMR2)


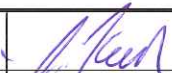


						
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1. Introduction

The Mary River Iron Ore Project requires a number of separate infrastructure components to be completed as part of the construction phase of the project to satisfy the need for aggregate resources for the project. This document outlines the Site Description, Operations and reclamation for the Mary River Mine Site Quarry (QMR2).

1.1 Need for an Operations Plan

The guidelines provided by the Nunavut Impact Review Board (NIRB) and Indian and Northern Affairs Canada (INAC) with regards to a Quarrying Permit Application state:

1. A Quarry Operations Plan is required with (this) application and must be approved by a Land Use Inspector prior to approval and issuance of the quarry permit if:
 - (A) The volume being applied for is greater than 1,000 m³ and / or
 - (B) The quarry site is being operated by multiple users

The proposed quarry at the Mary River Mine Site will exceed the volume threshold of 1000 m³, and a plan is required. This plan should be used in conjunction with the Borrow Pit and Quarries Management Plan, and other plans referred to in the document.

1.2 Site Description

The following physical description and environmental setting are summaries from the Mary River Final Environmental Impact Statement (FEIS). For a more complete description, refer Baffinland Iron Mines Corporation, Final Environmental Impact Statement, 2012, Volumes 6, 7, and 8.

1.2.1 Site Physical Description

The layout for the proposed Mary River Mine Site Quarry (QMR2) is shown in Figure 1. The basic quarry specifics are shown in Table 1 below:

Table 1: Mary River Mine Site Quarry (QMR2) Specifications

Requirement	Description
NTS Map Sheet (1:50,000)	<ul style="list-style-type: none"> 37 G/2 Edition 1 ASE Series A 713
Quarry Coordinates (UTM)	<ul style="list-style-type: none"> 560128E 7914203N (centre point) 559543E 7914062N (W extent) 560643E 7914163N (E extent) 560174E 7913823N (S extent) 560272E 7914372N (N extent)
Total Area of Quarry	<ul style="list-style-type: none"> 252,704 m²
Volume with Contingency	<ul style="list-style-type: none"> 538,130 m³
Area of Existing Clearing	<ul style="list-style-type: none"> No clearing is required as site is primarily exposed rock
Area of Proposed Quarrying	<ul style="list-style-type: none"> Figure 1 shows the quarry extents
Topsoil / Overburden Storage Area	<ul style="list-style-type: none"> None is required as site is primarily exposed rock
Access Roads/Trails	<ul style="list-style-type: none"> No roads currently exist to the site. As part of the PDW temporary access roads will be constructed as shown in Figure 1
Camp Locations	<ul style="list-style-type: none"> No camp will be built specifically for the quarry operation. Personnel will be housed at the existing Mary River camp

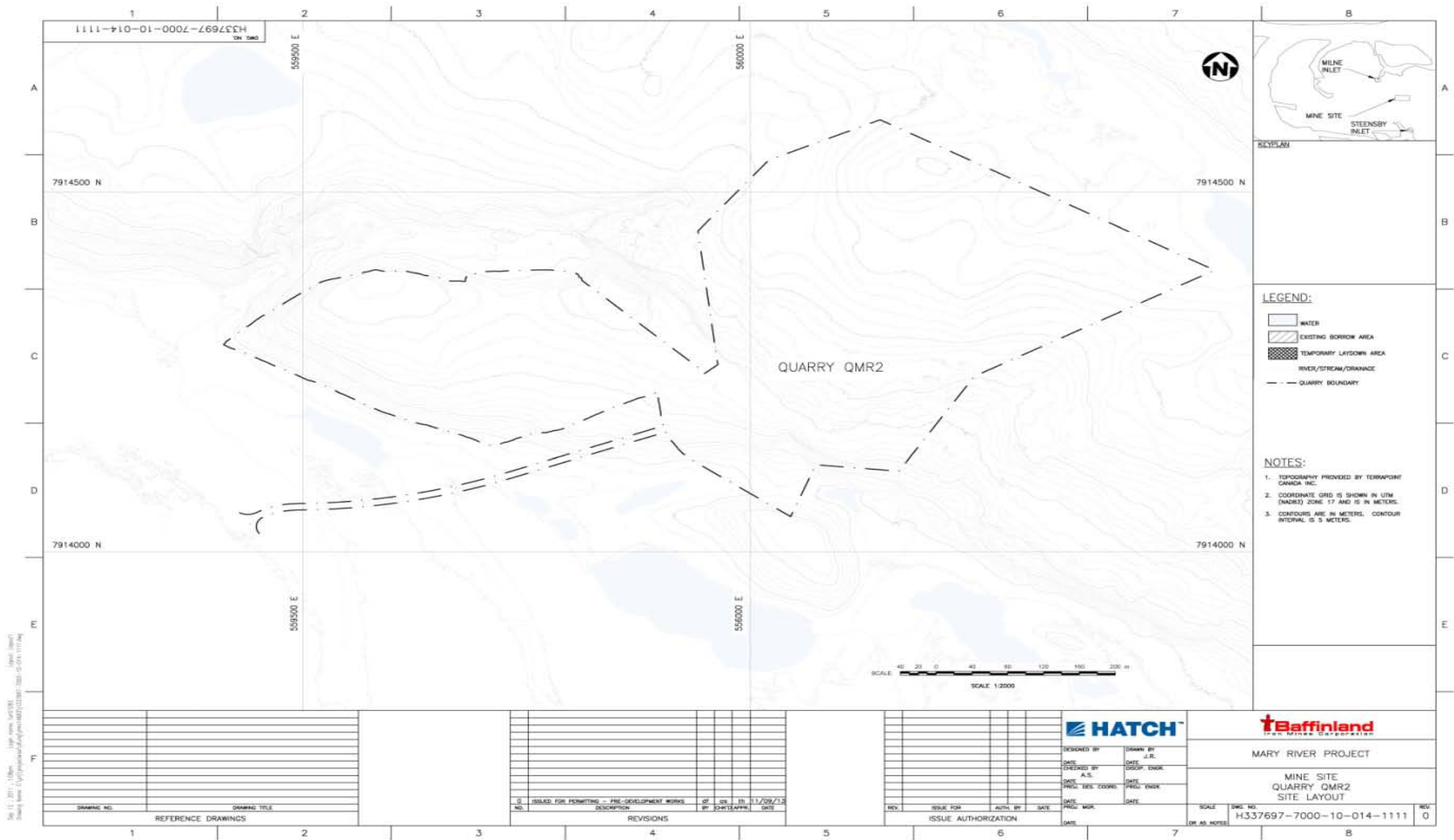
Topography varies considerably across the Project area. Topography at the Mary River Site in the vicinity of the proposed quarry is described as quickly rising to 679 m asl from the fairly flat and sandy outwash plain at 188 m asl where the exploration camp is currently located. The land to the west is equally mountainous with some minor coverage of glaciers. There are several elevated plateaus to the east formed by horizontal sedimentary deposits.

Valley walls are generally steep and abrupt, often with distinct terraces.

Near surface bedrock is dominant in the quarry area. Limited overburden is in the form of marine sediments and localized deposits of till. The majority of the overburden is located in depressions between the numerous bedrock outcrops and is typically overlain by a layer of vegetation and boulders. This is evident along the base of the rock outcrops at the quarry site.

The Project is located in a zone of continuous permafrost. The active layer through the Project area typically ranges from approximately 1 m to 2 m but may be greater in areas where there is loose, sandy soil at the edges of lakes or ponds and less in areas with a substantial surface layer of wet organics. The proposed quarry site has areas where permafrost would be encountered. These are primarily in the deposition areas and deposits to the south of the actual site can range up to 30 m in depth with ice rich deposits. Other Project-related infrastructure in the Mine Site area will be located on areas of glaciofluvial terrace.

Figure 1: Mary River Mine Site - Quarry QMR2 Site Layout



1.2.2 Environmental Setting

In general, the proposed quarry area at the proposed Mary River quarry was found to be primarily either exposed bedrock hills or bedrock very close to surface (see Figure 2 and Figure 3). Lower depressions between the hills generally have a moderate layer of wet organics at surface and drainage is poor. These lower areas have a range of materials present from colluvial/alluvial type deposits to till with significant fines present. In areas where overburden was present, this generally comprised of a thin layer of organics, underlain by moist gravely sand with some silt.

At least 10 different surface water bodies exist within 200 m of the quarry boundary. All of these are relatively small (< 2 ha) with several being less than .1 ha in size. None of these lakes were found to contain fish species, due to the shallow nature of the basins. Camp Lake located 2 km to the west, and the north basin of Sheardown Lake, 500 m to the south east are known to contain arctic char. For this reason, the quarry extents were located to avoid any interaction with run-off channels or streams that access these water bodies.

Figure 2: Mary River Mine Site Quarry (QMR2) showing bedrock outcroppings



Figure 3: Proposed Mary River Mine Site Quarry (QMR2) looking west

Vegetation within the Mary River Project area is described in the Vegetation Baseline Study Report in Volume 6 of the FEIS (Appendix 6C). A total of 155 vascular plant species were recorded through the total Project area, a vegetation classification system was developed and a species list was compiled. No plant species considered to be “rare” in Canada were found to occur in the survey locations. Vegetation is extremely limited in the area of the proposed quarry, and exists in small patches where organic deposits occur around the base of the rock outcroppings, and in the valleys in between large boulders. Several species of songbirds and shorebirds migrate to this area annually to breed, and were predominately found in the various types of lowland habitats (river deltas, coastal plains, tundra, and near wetlands) that offer an abundant source of insects and vegetation for foraging and nesting habitat. This type of habitat is present within and near the proposed quarry site. Bird densities though, are considered to be relatively low.

Terrestrial wildlife on north Baffin Island is described in the terrestrial wildlife baseline report (Volume 6: Terrestrial, Appendix 6F). Terrestrial wildlife includes caribou, wolves, foxes, arctic hares, ermine, and small mammals. Occurrence of most wildlife species on north Baffin Island is relatively sparse, and this is expected to be especially true at the quarry site given the type of terrain.

Marine mammals present are not present in the area as the quarry site is displaced from shoreline habitat sufficiently to avoid being regarded as suitable habitat. However, polar bears are occasionally known to move through the area.

No settlements or known hunting camps or areas are located in proximity to the proposed quarry site. There are currently no roads, buildings or structures at the site.

2. Operation

The following outlines the operational activities for the proposed quarry at the Mary River Mine site.

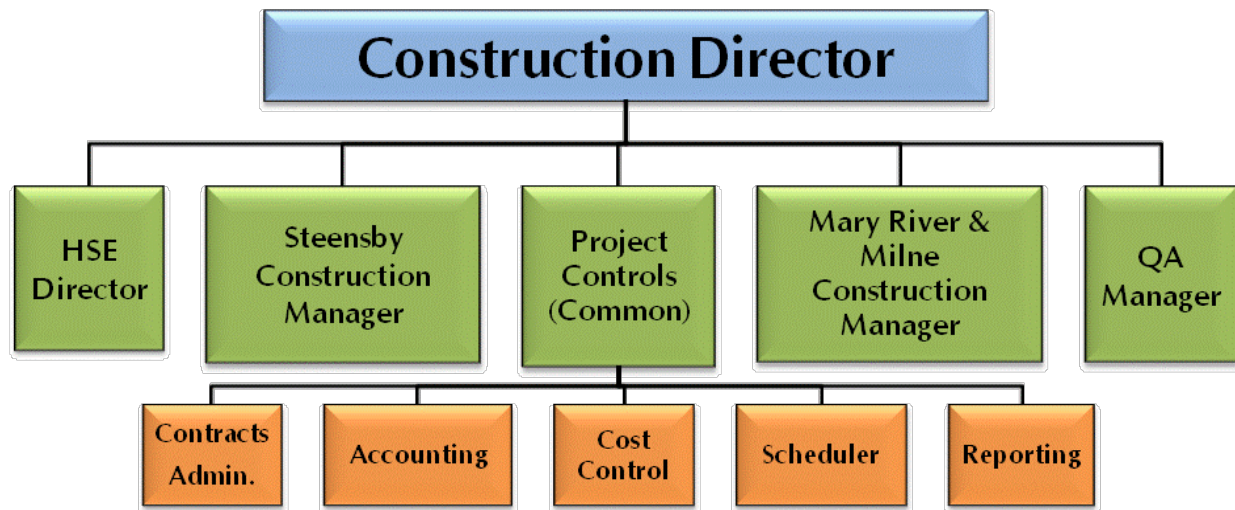
2.1 Organization and Reporting

Figure 4 shows the Site Organization Chart. The entire Project will be under control of a Construction Director, with a Mary River Mine Site Quarry (QMR2) Construction Manager directly reporting to him. The Civil Coordinator, who reports to Mary River Mine Site Construction Manager, will be directly responsible for quarry development and operations.

Common to all aspects of the Mary River Mine Site Quarry (QMR2) construction will be a Project Administrator, a Safety Manager, and Engineering Site Lead, and an Environmental Lead.

All names and contact numbers for the above positions will be provided prior to the commencement of quarrying activities.

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Figure 4: Site Management Organization Chart

2.2 Quarry Set Up and Operation

The quarry will be accessed by a temporary road from the main staging area road, and will be approximately 150 m in length and constructed of granular material. Equipment transported to the quarry site will include:

- Crushing, screening and cleaning plants (present at Mary River)
- Drilling Equipment
- Rock hauling trucks
- Scrapers
- Excavators
- Blasting Gear.

A small (< 50 m²) portable field office trailer will be placed at the quarry site. Equipment will be serviced at maintenance facilities located at the nearby laydown area.

2.3 Quarrying Activities

The following describes the general activities:

2.3.1 Explosives Management and Blasting

Blasting operations will be carried out by Orica, an independent engineering firm specializing in blast monitoring and design. Orica will eventually be manufacturing and using an Ammonium Nitrate Emulsion (ANE). However, explosives for the development of the Mary River Mine Site Quarry (QMR2) will initially consist of pre-packaged explosives with up to 100,000 kg stored within the Mary River Mine Site area. Pre-packaged explosives will gradually be replaced by AN mixtures once a temporary plant is erected and made operational. Transportation of explosives to and from the quarry site will occur from the temporary magazine storage area via road.

Drilling for the blasting will take place on a 5 foot grid pattern in an effort to minimize the rock size resulting from the blasting. Blasting management will be coordinated with the Area Coordinator responsible for quarries and borrow pits.

Blasting will take place on a day shift, seven days per week. An Explosives Management Plan for the Project, and an ANE Bulk Temporary Plant document have been developed by Orica and are available for review in FEIS, Appendix 10C-4.

2.3.2 Excavation and Crushing

The entire operation takes place in an area of permafrost, and groundwater is therefore not an issue. Drilling will be monitored to avoid creating run off and drainage issues. Washing of aggregate is not required, as the material will be used for site preparation only. Quarrying will work along the exposed rock faces and will be terraced to minimize run off from the site. Efforts will be made during blasting operations to avoid creating depressions which might collect run off or melt waters.

Drilling and extraction exercises may occur concurrently, depending on issues of safety and schedule.

Blast areas will be cleared by loader and / or scraper and put into rock trucks for transport to the crusher/screener facility. Loaders will feed rock to the crushing and screening operation.

Crushing and stockpiling areas will be located as near as practical to the southern extent of the quarry within easy access to the road location. Very little topsoil is present at the site, and would be considered as incidental material. As a result, no stockpiling area for topsoil will be required.

Crushing operations and screening operations will take place during the day shift, seven days per week. The operation will process all rock from the quarry, and may also process rock from other areas if required. Final material will be cleaned and stored by aggregate size in stockpiles for transport to the appropriate construction sites.

2.3.3 Site Security and Safety

Copies of all safety and management documents will be made available to on site personnel and mandatory training for operations at the Mary River Mine Site Quarry (QMR2) will take place. The Area Coordinator will ensure that operations are consistent with other management plans, terms and conditions of the issued permits, and safety procedures for the Project.

Security signage will be posted at the entrance to the quarry. The remoteness of the quarry and the onsite presence of operations personnel will make perimeter fencing unnecessary. Audible warning systems will be employed for all blasting operations at posted intervals prior to any detonations.

Blasting and processing operations will be suspended if incursions into the quarry occur, or if observations of wildlife in the immediate quarry area are made. On site monitors for bears will provide warnings if approach by any animals is noted.

2.4 Site Management Measures

Best management practices for quarry operations will be followed for the Mary River Mine Site Quarry (QMR2). The following management activities will be incorporated into the site operations:

2.4.1 Drainage Management

The potential to alter drainage patterns and affect local water quality exists. Prior to quarry operation, the hydro-geological regime around the quarry site will need to be defined, and appropriate direction of flows from site managed to maintain the natural flow patterns as much as possible. The quarry is currently designed to avoid surface water courses and drainage channels by a minimum of 30 meters.

Sources of contamination from the operation that could affect water quality include dust from blasting and refueling of equipment. Blasting residue from explosives will be managed by following best practices to ensure that all material is ignited during the blasting process. Vehicle re-fueling will be conducted at a centralized fueling facility off site that has proper containment and spill response capability. Re-fueling of stationary onsite equipment, such as generators, will take place in a secured area with approved spill containment.

2.4.2 Dust Management

The primary sources of dust at the Mary River Mine Site Quarry (QMR2) are blasting, loading and crushing and screening of aggregates. Very little topsoil exists at the quarry site, and is not considered a primary source of dust. The management of dust will be accomplished by minimizing the creation of dust at source. Crushing activity will take place as far from surface water or dust sensitive areas as is practical at the site. If possible, protection from prevailing winds will be accomplished by situating the crushing operation to take advantage of the local topography for shelter. Transport of material will be subject to speed limit restrictions to help reduce dust.

Dust management activities will include monitoring surrounding snow for accumulations of quarry dust. If such deposits are noted, the snow layer will be removed prior to melting, and transported to the land farm.

2.4.3 Noise Management

Quarry activities will generate noise from equipment operation, blasting and crushing and screening operations. Noise receptors within the area are restricted to wildlife, as no dwellings or other land use that is sensitive to noise occur nearby.

During quarry operations, monitors will inform the quarry manager if significant wildlife activity, such as caribou movement or seal pull outs, is occurring. Depending on the concentrations and likely effect of the noise generating activity, the quarry manager may temporarily suspend operations.

2.5 Monitoring

Operation of the Mary River Mine Site Quarry (QMR2) must be monitored to ensure compliance with the Borrow Pit and Quarry Management Plan and to meet the terms and conditions of the regulations and land-use permits granted for the Project. Monitoring will focus on:

- Regular inspection of site-preparation measures;
- Regular inspection of drainage from the quarry site;
- Quantification and quality estimates of the granular resource material;
- Monitoring for ground-ice presence;
- Monitoring for presence of avian, terrestrial and marine mammals in the area;
- Monitoring of water quality for changes;
- Monitoring of snow surrounding quarries for dust deposition;
- Reporting requirements as outlined in any permits.

3. Supporting Management Plans

This plan should be viewed in concert with the following additional plans prepared for the pre-development works:

- Emergency Response & Spill Contingency Plan – FEIS, Appendix 10C-1
- Surface Water and Aquatic Ecosystems Management Plan –FEIS, Appendix 10D-2;
- Explosives Management Plan – FEIS, Appendix 10C-4

4. Closure and Reclamation Activities

The closure and reclamation will be integrated into the overall Project Closure plan. However, separate closure plans for Mary River Mine Site Quarry (QMR2) and borrow pit operations are required. Closure and reclamation of the quarry will involve removing all materials, equipment and infrastructure and reclaiming the site to self sustaining productive ecosystem.

4.1 Closure of Active Quarry Face

The active quarry face will be terraced during operation to closely manage issues related to drainage and will not be altered for closure. The quarry development will preclude the creation of pits and depressions as much as possible.

4.2 Waste Disposal

All site waste will be collected and placed in appropriate containers for removal. Pre and post waste removal inspections will be made to ensure the thoroughness of the program. Waste will include metallic waste, construction material waste and domestic waste.

At the current time, no washroom facilities for personnel are expected at the quarry site. Any requirement for such facilities will be met by easily removable portable toilets. These will be operated in a manner consistent with regulations, and disposal will be in accordance to the waste management plans.

4.3 Stockpile Removal

Quarrying activities will be closely managed to avoid the accumulation of unnecessary stockpiles of aggregate. Any stockpiles that do remain will be dealt with as follows:

- Large rock will be spread out on the landscape.
- Medium sized rock will be used to re-contour affected areas to re-establish a more natural appearance to the area.
- Small crushed rock will be used to assist in drainage restoration, and spread on the landscape to re-establish more natural contours.

4.4 Road Reclamation

The Mary River Mine Site Quarry (QMR2) road is a relatively short (< 300 m) aggregate structure. The entire road bed will be removed, and the material utilized in re-establishing natural contours throughout the area.

4.5 Soil Remediation for Contaminated Soils

A pre-closure inspection of the entire quarry site will be made. Any contaminated soils, snow or ice packs, or overburden will be flagged. The extent of the contamination will be determined, and the material removed. Hydrocarbon contaminated soils or overburden will be transported to the land farm established on site. Other contamination, such as heavy metals or toxins, will require containerization for shipping off site to an appropriate facility (refer to Preliminary Mine Closure & Reclamation Plan, FEIS Volume 10: Appendix 10G).