Baffinland Iron Mines Corporation

Mary River Project Quarry Management Plan Tote Road Quarry (Q16)

BAF-PH1-830-P16-0044
Rev 0

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1 INTRODUCTION

The Mary River Iron Ore Project requires a number of separate infrastructure components to be completed and utilized as part of the construction and operation phase of the project. To satisfy the need for aggregate resources for construction and ongoing operations, this document outlines the Site Description, Operations and Reclamation for the Mary River Tote Road Quarry (Q16). The quarry is located at approximately km 50 of the Milne Inlet Tote Road.

1.1 REGULATORY CONTEXT

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:
2. The volume being applied for is greater than 1,000 m3 and/or
3. The quarry site is being operated by multiple users

The proposed quarry along the Tote Road, Q16, will exceed the volume threshold of 1000 m3 and a therefore this Quarry Management Plan represents a Quarry Operations Plan developed in accordance with NIRB and AANDC guidelines. The Quarry Management Plan, Tote Road Quarry (Q16) should be used in conjunction with the Mary River Project Borrow Pit and Quarry Management Plan H349000-1000-07-126-0011, Rev. 0, and other plans referred to in that document. However, the quarry site is on Inuit Owned Lands and the plan is therefore expected to be approved by the QIA under the Quarry Concession Schedule that forms part of the existing Commercial Lease, No. Q13C301

A Quarry Management Plan is required under Section 1 and 19 of Schedule B of the Commercial Lease, No. Q13C301, agreed between Baffinland Iron Mines Corporation (Baffinland) and the Qikiqtani Inuit Association. It also is a requirement under the Amended Type A Water Licence 2AM-MRY1325 (Part D item 7) for the purposes of Construction activities. The Quarry Management Plan, Tote Road Quarry (Q16) has been developed in accordance with requirements of the NIRB Project Certificate No.005 Condition #30 - *The Proponent shall develop site-specific quarry operation and management plans in advance of the development of any potential quarry site or borrow pit.* In the event the Project does not advance, the quarry will be subject to reclamation, as per relevant regulatory and permit obligations.

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. The extent of Quarry (Q16) falls outside of the existing Quarry Concession Agreement under Qikiqtani Inuit Association

Commercial Lease Q13C301. As a result, Baffinland will be submitting an Options Exercise Notice as per Section 3.2 of Commercial Lease Q13C301 to support this quarry management plan. A more detailed plan of the extent of the quarry boundaries as well as the maximum extent of planned quarry development is shown in Drawing H349002-3138-07-015-0002 (Appendix A). The basic quarry specifics are shown in Table 1 below:

Table 1: Tote Road Quarry (Q16) Specifications

Requirement	Description
NTS Map Sheet (1:50,000)	• 37 G/2 Edition 1 ASE Series A 713
Quarry vertices Coordinates (UTM)	• 525304E 7938785N (centre point) • 525183E 7938913N (W extent) • 525444E 7938681N (E extent) • 525274E 7938627N (S extent) • 525302E 7938951N (N extent)
Total Area of Quarry	• 45,545m^2
Volume with Contingency	• 200,000m^3
Area of Existing Clearing	• No clearing is required as site is primarily exposed rock
Area of Proposed Quarrying	• Appendix A shows the quarry extents
Topsoil / Overburden Storage Area	• None is required as site is primarily exposed rock and shallow overburden.
Access Roads/Trails	As part of the project temporary access roads will be constructed as shown in Drawing H349002-3138-07-015-0002 (Appendix A).
Camp Locations	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. Milne Inlet is situated on a relatively broad, deep and flat sand beach and is closed in by steep fjord walls measuring approximately 60 – 600m above sea level. The Milne Inlet Tote Road follows Phillips Creek Valley, which starts near sea level at Milne Inlet and rises to an elevation of 188m above sea level (asl) at the Mine Site. The valley is confined by hills or mountains on both sides. The land to the west of the Project area is equally mountainous with some minor glacial coverage. There are several elevated plateaus to the east of the Project area formed by horizontal sedimentary deposits. Valley walls are generally steep and abrupt, often with distinct terraces.

Based on drill holes, topography, and geological mapping of the area, near surface bedrock is thought to be present throughout the quarry area. Limited overburden is in the form of localized deposits of till with maximum thickness thought to be around 2m. Overburden is thought to thicken to a depth of < 2m of quarry boundary. The surface topography of the area slopes from east to waste with elevations ranging from 250 masl to east along a bedrock ridge to 180 masl along the eastern boundary.

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 is underlain by continuous permafrost.

1.2.1 ENVIRONMENTAL SETTING

The thin surficial deposits within the quarry area consist of glacial till with some surfaces armoured by coarser rock material due to washing by subglacial meltwater. Bedrock is exposed along the quarry boundary in the form of a steep east-facing limestone ridge.

Figure 1, below, is an aerial photo (2007) of the quarry area showing the approximate location of the quarry boundary.

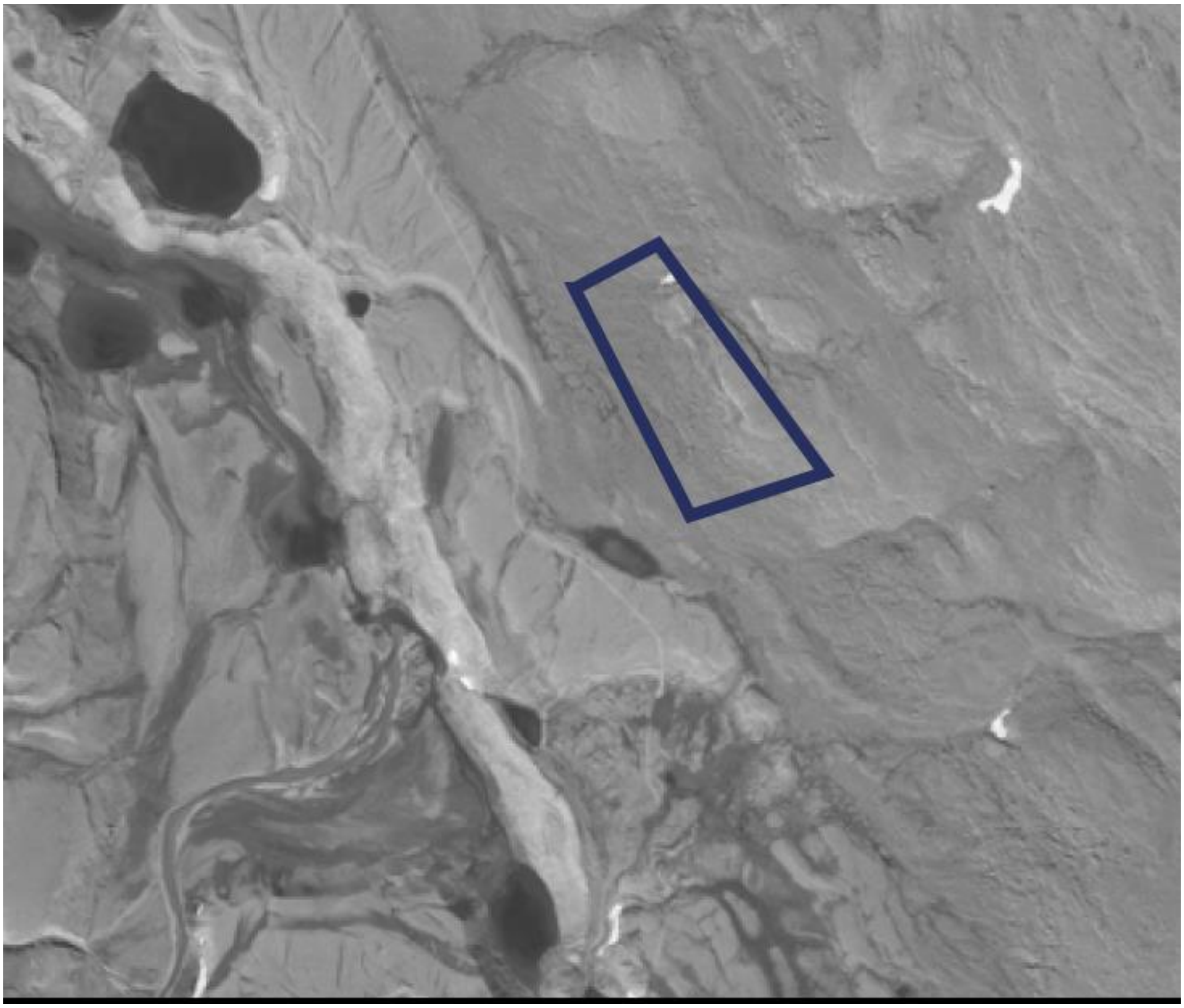


Figure 1: Aerial Photograph showing Marry River Tote Road Quarry Q16)

Vegetation within the Mary River Project area is described in the Vegetation Baseline Study Report in Volume 6 of the FEIS (Appendix 6C). No plant species considered to be "rare" in Canada were found to occur in the survey locations. The exposed soils of the quarry area display patches of thin vegetation typical for the area.

Water crossings between km 15 and km 50 along the Tote Road range from extra-small to extra-large, most of which are in relatively close proximity to Phillips Creek and drain flat terrain. Stream morphology in the area of the proposed quarry Q16 is characterized by a greater abundance of riffle/pool habitat, and natural water velocities are low. Streams in the immediate area of the proposed quarry site consists largely of intermittent or ephemeral drainages that are not fish-bearing. The nearest fish habitat location from the proposed quarry location is Phillips Creek, a distance of approximately 450 m to the west.

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. Bird densities though, are considered to be relatively low. A review of the existing terrestrial baseline data confirmed that there are no active nest sites or any areas of concern surrounding the proposed quarry Q16 site.

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 are not present in the area as the quarry site is located inland from Milne Inlet. No settlements or known hunting camps or areas are located in proximity to the proposed quarry site

All project areas have been assessed to some degree and although a number of archaeological or cultural heritage sites have been identified elsewhere on the Project site, none were identified in the area for Quarry Q16. There is a very low potential to encounter undiscovered cultural heritage or archaeological resources when conducting construction activities such as excavating and site clearing. In the unlikely event cultural heritage and/or, archaeological resources are found or suspected to be found (i.e. Chance Finds), all work will stop and the Environmental Protection Measures outlined in the Environmental Protection Plan (BAF-PH1-830-P16-0008) and Cultural and Heritage Resource Protection Plan (BAF-PH1-830-P16-0006) will be implemented.

It should be noted that Cultural Heritage sites include “Carving stone” resources. "Carving stone”, means uthugighak and sananguagaq in Inuktitut, refers to serpentines, argillite and soapstone as defined pursuant to Article 1.1.1 of the Nunavut Land Claims Agreement. In the event carving stones resources are found, Article 19 of the IIBA with respect to the rights of Inuit to Carving Stone shall be followed

2 ENVIRONMENTAL RESPONSIBILITIES

2.1 ROLES AND RESPONSIBILITIES

Details on the Baffinland’s environmental team and organization charts for project teams are found in the overall Borrow Pit and Quarry Management plan H349000-1000-07-126-0011, rev. 0 for the Project.

3 QUARRY DEVELOPMENT AND OPERATION

The quarry will be accessed from the Tote Road by temporary access roads located west of the quarry area as shown on the drainage drawing found in Appendix A.

The equipment transported to the quarry site will include:

- Crushing and screening (present at Mary River)
- Drilling Equipment
- Rock hauling trucks
- Excavators
- Blasting equipment

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.

3.1 QUARRY DEVELOPMENT

The following steps provide a description of how quarry development will proceed at Q16 and provide details of the different quarry activities associated with development. The following steps apply to each quarry face.

1. **Crusher Pad**: Construct crusher and laydown pads as shown in Appendix A near the Tote Road using fill material from a previously developed borrow/quarry site. The crusher and stockpile pad will subsequently be expanded in size to the appropriate size for crushing and screening operations, stockpiles of finished product, and loading operations to deliver produced rock materials.
2. **Access Road:** Construct access road(s) using fill material from a nearby previously developed borrow/quarry site. This access road is used to transport the blasted quarry rock to the crusher pad and/or the Tote Road.
3. **Pioneer Bench and Loading Pad:** Using a pioneer track drill, the first bench is drilled and blasted at some higher elevation so the bench bottom elevation is similar to the desired loading pad elevation. A portion of the initial blasted quarry rock will be utilized at the quarry face to create a level pad for loading quarry rock into haul trucks. After the loading pad is finished, blasted quarry rock is hauled to the crushing pad for expansion of the crusher pad and as crusher feed material to produce rock products.
4. **Bench Drilling:** As each drill round is blasted out, the drill either stays at this elevation to expand the bench in a longitudinal direction along the face, or the drill climbs up the quarry site to a higher elevation to drill and blast subsequent higher elevation benches. These benches are

expanded in length as required for subsequent blasting of rock at that bench elevation. Benches are created for safety and for efficient drill/blast operations.

5. **Subsequent Bench Development:** Additional benches are created at higher elevations, starting at the open face of the site. Each bench proceeds toward the main body of rock at that elevation. Lower benches follow behind upper benches and drilled and blasted to move toward the main body of rock. Ramps may be constructed to the upper benches for truck loading near the blasted rock. Material is excavated from benches and loaded onto trucks for delivery to the crusher.
6. **Drilling Quarry Rock:** Drilling of the quarry rock is normally completed with the use of one drill rig. The boreholes are laid out by a surveyor to the engineered spacing and burden for each particular rock type, geology, and desired product size. The drill is removed from the area for loading explosives and blasting. The drill can proceed along the bench to continue drilling or proceed to a new bench.
7. **Blasting Operations:** Blasting rock is completed by installing high explosive detonating boosters with initiation wires, followed by dropping pre-packaged sticks of explosives, or pouring from pre-packaged bags, or by pumping bulk explosives from an explosives truck into the boreholes. Detonation and initiation is carried out with the use of delays to time the detonators in a very fast millisecond sequence of smaller blasts for efficient rock breakage. Blasting lags behind the drill as more drilling is completed. As each new drill round is completed, the drill moves on and the drilled round is loaded with explosives and blasted.
8. **Hauling Quarry Rock:** The blasted rock is loaded onto trucks for delivery to the crusher or elsewhere for use.
9. **Crushing Operations:** Quarry rock is fed to the crusher and screening equipment to size and produce the desired rock product, stored in stockpiles and loaded into trucks for delivery to construction sites.

3.2 QUARRYING ACTIVITIES

The following provides detailed description of the general activities associated with quarrying:

3.2.1 EXPLOSIVES MANAGEMENT AND BLASTING

A Blasting Management Framework has been developed and is presented in Annex 3 of the Borrow Pit and Quarry Management Plan. A detailed Contractor's Blasting Operations Management Plan, incorporating the key items in the Blasting Management Framework has been prepared by the blasting contractor and is provided in Appendix B of this document.

The blasting operations will be carried out by an experienced contractor. Blast hole drilling will take place on an appropriate grid pattern, determined by field testing, in an effort to optimize blast rock size and blasting efficiency. Blasting will normally take place at the beginning and end of each shift on a seven days per week basis. An Explosives Management Plan (28 August 2013) for the Project has been developed by the contractor and provided to the NWB on September 9th 2013.

3.2.2 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 presently planned.

Some minor near surface soils are present in the quarry area. If these overburden soils cannot be avoided, then they will be stripped and stored separately at the storage area for later re-use. 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. Blasted rock 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.

Crushing operations and screening operations could potentially be conducted on a 24 hr per day, seven days a week basis for periods of time, depending on where road construction and maintenance operations are focused along the Tote Road. The operation will process 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.

3.2.3 Site Security and Safety

Copies of all safety and management documents will be made available to onsite personnel and mandatory training for operations at the Project Quarry Locations 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. All employees working on the quarry operation will receive bear awareness and deterrent training.

3.3 SITE MANAGEMENT MEASURES

Best management practices for quarry operations will be followed for the Mary River Tote Road Quarry (Q15). The following management activities will be incorporated into the site operations:

3.3.1 ASSESSMENT FOR ACID ROCK DRAINAGE (ARD)

In 2010, AMEC undertook an assessment to identify potential sources of construction aggregate along the existing Tote Road from Mary River to Milne Inlet**.** Drill core and unconsolidated surficial materials were collected from potential quarry and borrow pit locations along the Tote Road alignment during a geotechnical investigation aggregate sourcing program. The Mary River Tote Road Quarry Q16 has been assessed utilizing the Protocol for the Assessment for the Potential for Acid Rock Drainage (Borrow Pit and Quarry Management Plan, Annex 2). The sampling certificates showing these results are presented in Appendix C. Industry standard methods have confirmed that aggregate materials used will have a low potential for ARD/ML.

3.3.1.1 REVIEW OF EXISTING GEOLOGICAL INFORMATION AND SITE RECONNAISSANCE

A review was conducted of existing site information and a visual inspection of surface portions of the proposed quarry development area was undertaken by means of a walk around. A review indicated that the quarry and surrounding areas can be identified as being very fine grained carbonate which in geological literature is known as the Ship Point Formation dolestone. X-ray diffraction analysis of samples collected of this drill core for acid rock drainage determination reveal calcite is the only carbonate phase present. Based on these results, the rock type at Quarry Q16 is identified as a limestone

3.3.1.2 SAMPLING

Borehole BH10-15, located approximately 1.3 km south of the proposed quarry location, was advanced to depth of 16 meters. Based on geological mapping information, this borehole is similar to the geological formation that outcrops at the proposed quarry location. In BH10-15 the dominant lithology is fine grained limestone with minor carbonate shale interbeds and rubble zones infilled with sand. Refer to Appendix C for the borehole location and borehole log. One representative sample of the rock core from BH10-15 was sent for laboratory analysis.

3.3.1.3 ANALYTICAL TESTING METHODS

Analytical tests included the following:

- Acid base accounting (ABA) including paste pH, modified Sobek neutralization potential (NP), total sulphur, sulphate sulphur, sulphide sulphur by difference, total carbon (TC) and total inorganic carbon (TIC)
- Total metals analysis
- Leachable metals by shake flask extraction (SFE)

3.3.1.4 RESULTS

The results of the above analysis for Q16 indicate that the rock type is limestone and Mary River Tote Road Quarry Q15 exhibits the following characteristics:

- Paste pH is weakly alkaline (range of 8.22 to 8.23)
- Sulphide content was less than 0.01%
- The neutralization potential ratio (NPR) is well in excess of three. This material is considered non-acid generating
- Neutralization potential (NP) value was (range) 953 to 965
- In a comparison of total metal results of samples to crustal abundances, no notable elevation of metals were noted
- There were no concerns regarding the results of the SFE tests

3.3.1.5 KEY CONCLUSIONS AND RECOMMENDATIONS

- Based on the results of geochemical and mineralogical analyses and general surface and subsurface geological observations there is negligible potential for ML/ARD and the materials are therefore expected to be a suitable quarry source.
- Based on the work to date, both locally and regionally, in other areas of limestone that have been investigated along the Tote Road, there is no evidence of elevated sulphide.

In consideration that the bedrock material is limestone, there is extremely low risk of ML/ARD. Nevertheless, an operation testing program will be undertake to confirm the above conditions. It is recommended that to start, approximately one composite sample of quarry material representative of a blast (muck or blast hole cuttings sample) be collected per 10,000 m3 of material quarried. The analytical methods to be adopted will be as for the predictive sampling (MEND, 2009) or a defined alternative that has been shown to be predictive of ARD/ML. The sampling frequency should be adjusted to account for ongoing results. The quarried material can also be visually inspected for the presence of sulphides or other rock types.

3.3.1.6 FUTURE REPORTING

Operational testing results will be included in the annual reporting for the project.

3.3.2 SURVEY

Baffinland will submit to QIA periodic Quarry Compensation Calculation Reports in accordance with QIA Commercial Lease Q13C301 and Schedule B, Quarry Concession Agreement. The agreed to form of the report, survey methodologies to be used, as well as deliverables are presented in the Lease Operations Guide Version 1.0, Quarry Compensation Calculation, dated October 2015.

3.3.3 BLASTING OPERATIONAL MANAGEMENT

A Blasting Management Framework has been developed and is presented in Annex 3 of the Borrow Pit and Quarry Management Plan. A detailed Quarry Operations and Blasting Management Plan, incorporating the key items in the Blasting Management Framework as well as general procedures to be used for blasting has been prepared by the blasting contractor and is provided in Appendix B of this document.

3.3.4 DRAINAGE MANAGEMENT

The potential exists to cause minor alteration of drainage patterns of overland flow paths and to cause minor effect on local water quality. The hydrological regime around the quarry site will need to be maintained and appropriate direction of flows from site managed to maintain, to the degree practicable, the natural general pre-development flow patterns. As a general practices, upstream runoff will be diverted to maintain water quality and avoid contact with quarry operations. Poorly developed overland flow paths that intersect with the quarry development area will be modified as required to accommodate flows around the quarry development. This can be accomplished by means of diversion berms or excavation of shallow ditches.

There will only be a discontinuous discharge from quarries, water runoff from quarries will be managed. As required, the quarry runoff collection locations will change over time. The drainage plans showing interpreted flow paths and downstream receivers for Quarry Q16 are presented in Appendix A.

Potential sources of contamination from the operation that could affect water quality include blasting residues from blasting and spills from refuelling of equipment. Blasting residue from explosives will be managed by following best practices to ensure that all material is consumed during the blasting process. Vehicle re-fuelling will be conducted by trained mobile fueling technicians following standard operating procedures that will minimize risk of spills. Strategically placed spill kits will be available at the quarry site to provide sufficient spill response capability.

3.3.5 DUST MANAGEMENT

A primary source of dust at the Mary River Tote Road Quarry (Q16) will be blasting, loading and crushing and screening of aggregate. The management of dust will be accomplished by minimizing the creation of dust at source. Crushing activities will be set back from surface water bodies in accordance with Water Licence requirements. Transport of material will be subject to speed limit restrictions that will reduce dust on the road. Options for dust suppression include the application of water and the application of calcium chlorides on road and pad surfaces.

Dust monitoring could include sampling for fugitive dust by means of dust collectors which are currently located in a systematic fashion throughout the Project Area.

3.3.6 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, significant wildlife activity will be noted, such as when caribou movements are occurring. Depending on the concentrations and likely effect of the noise generating activity, the quarry manager may temporarily suspend operations.

3.3.7 WASTE MANAGEMENT

Toilet and lunch room facilities will be supplied by means of standard wash trailers that will be serviced by vacuum sewage truck and sewage treated by the Mary River Mine Site or Milne Port sewage treatment plants. Food waste, non-hazardous waste and hazardous waste will be properly labelled, packaged, stored, disposed in accordance with Baffinland’s current Hazardous Waste and Waste Management Plans.

3.4 MONITORING

Operation of the Mary River Tote Road Quarry (Q16) 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
- Volume and quality estimates of the granular resource material produced
- 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 fugitive dust
- Monitoring for fuel management practices
- Monitoring for waste and hazardous waste storage and management practices
- Reporting requirements as outlined in applicable permits

Turbidity/TSS and ammonia will be monitored in accordance with the Amendment No. 1 Type A Water Licence requirements.

4 CLOSURE AND RECLAIMATION ACTIVITIES

4.1 CLOSURE OF ACTIVE QUARRY FACE

The closure and reclamation of the Q16 quarry and access roads has been integrated into the current Interim Closure and Reclamation Plan. Closure of the active quarry face will involve removing all materials, equipment and infrastructure and reclaiming the site to a self-sustaining productive ecosystem.

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.

Mobile washroom and lunch facilities for personnel are expected to be established at the quarry site.

4.3 STOCKPILE REMOVAL

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

- Large rock will be spread out on the landscape or used as rip-rap for erosion control
- 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
- Any collected soils will be spread to allow for the re-establishment of vegetation. The process of natural re-vegetation will be promoted.

4.4 ROAD RECLAMATION

The Mary River Mine Site Quarry (Q16) access road(s) is a relatively short aggregate structure. The road embankment will be contoured to promote a stable landscape.

4.5 SOIL REMEDIATION FOR CONTAMINATED SOILS

A pre-closure inspection of the entire quarry site will be conducted. Any contaminated soils will be identified and characterized. The extent of the contamination will be determined, and the material removed and transported to the Milne Port Landfarm Facility. (refer to Interim Mine Closure & Reclamation Plan).

5 DEFINITIONS

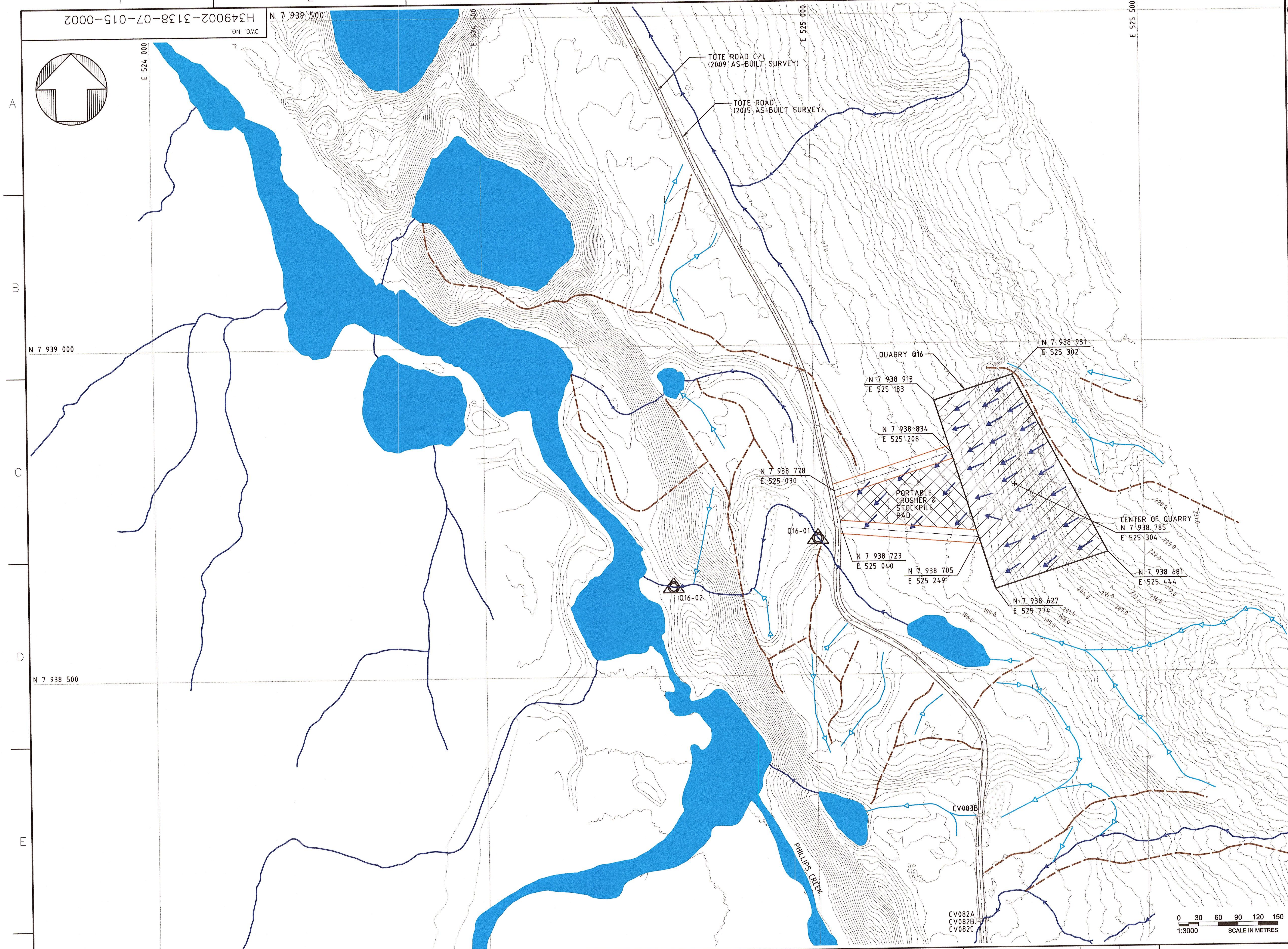
N/A

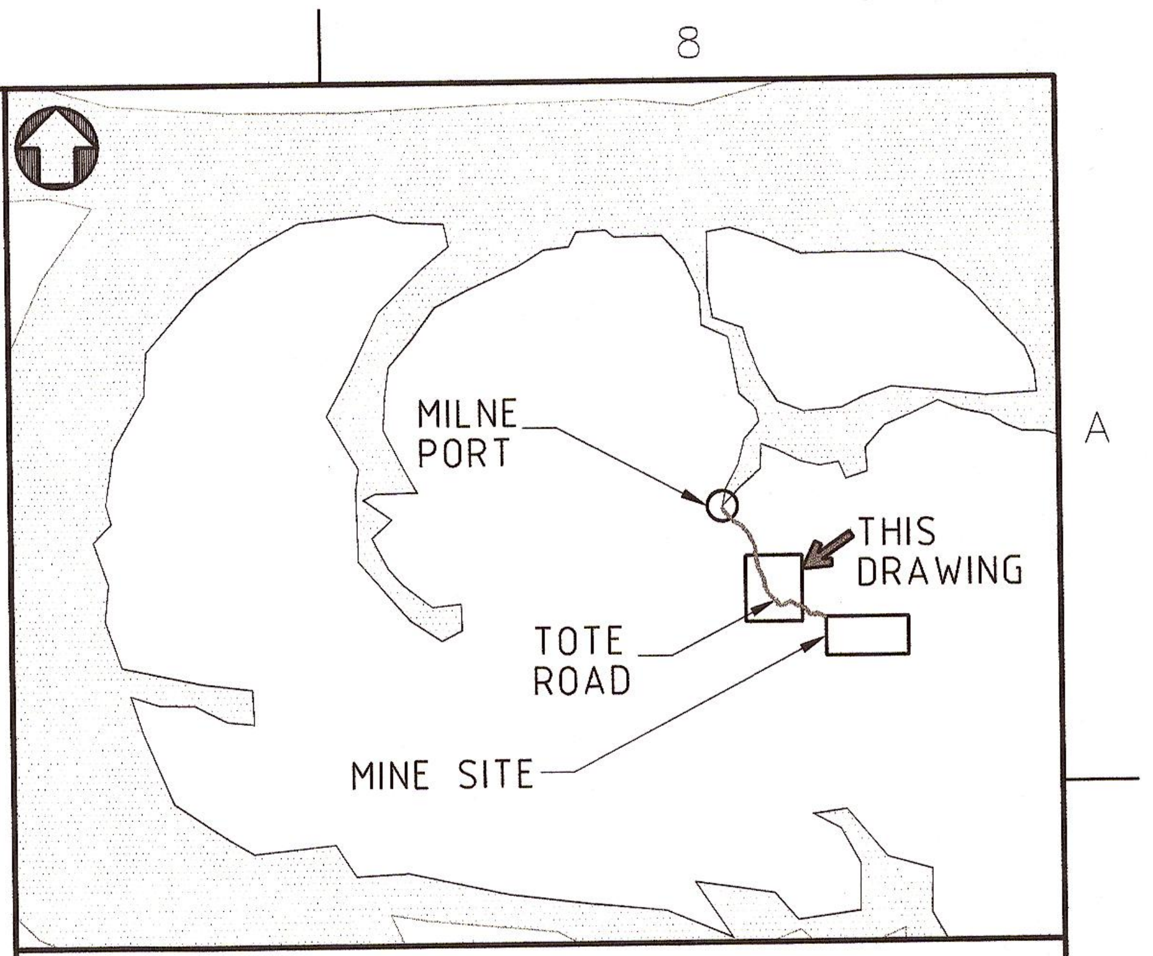
6 REFERENCES AND RECORDS

N/A

APPENDIX A

Tote Road Quarry (Q16) Drainage Drawing





KEY PLAN

LEGEND:

〰	EXISTING CONTOUR
■	EXISTING WATERBODY
▨	PROPOSED FOOTPRINT OF QUARRY AREA
▩	PROPOSED FOOTPRINT OF PORTABLE CRUSHER AND STOCKPILES
→	EXISTING STREAM
→	OVERLAND FLOW PATH
←	INTERNAL SURFACE DRAINAGE
– –	RIDGE LINE (HIGH POINT)
⌶	EXISTING CULVERT
△	PROPOSED WATER QUALITY MONITORING LOCATION
═	EXISTING ROAD
═	PROPOSED ROAD (LOCATION APPROXIMATE)

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1.5 METRES.

PERMITTING

DRAWING NO.	DRAWING TITLE
H349000-3000-10-012-0069	TOTE ROAD STA. 61+150 TO 61+850 PLAN AND PROFILE
H349000-3000-10-012-0068	TOTE ROAD STA. 60+450 TO 61+150 PLAN AND PROFILE
H349000-3000-10-012-0067	TOTE ROAD STA. 59+750 TO 60+450 PLAN AND PROFILE

REFERENCE DRAWINGS

PERMIT TO PRACTICE
HATCH LTD.
Signature
Date 2016-02-10
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

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REVISIONS

M. M. S. HASSAN
LICENSEE
2016-02-

REV.	ISSUE FOR	AUTH. BY		DATE
B	PERMITTING	JG	SH	2016-02-10
A	INTERNAL/CLIENT REVIEW	JG	SH	2016-01-22

ISSUE AUTHORIZATION

HATCH

DESIGNED BY J. GREGORIOS DATE 2016-01-19	DRAWN BY J. GREGORIOS DATE 2016-01-19
CHECKED BY S. HASSAN DATE 2016-02-10	DISCIP. ENGR. S. HASSAN DATE 2016-02-10
PROJ. DES. COORD. T. THERTELL DATE 2016-02-10	PROJ. ENGR. T. BRUCE DATE 2016-02-10
PROJ. MGR. J. CLELAND DATE 2016-02-10	

Baffinland

MARY RIVER PROJECT

TOTE ROAD
QUARRY Q16
DRAINAGE PLAN

SCALE	DWG. NO.	REV.
1:3000 OR AS NOTED	H349002-3138-07-015-0002	B

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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APPENDIX B

Contractors Blasting Operations Management Plan

Quarry Blasting Operations Management Plan

Baffinland Iron Mines Corporation

Mary River Project, NU

October
2013

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1. Purpose of Document

Baffinland Iron Mines Corporation (Baffinland) is committed to implementing best management practices in its use of explosives for quarrying activities at the Mary River Project. To this end, a Quarry Blasting Operations Management Plan has been developed which identifies site specific blasting operational management procedures to limit, control and mitigate the release of undetonated explosives from blasting operations at the quarry sites.

This document covers the site specific blasting operational management procedures to be adopted during quarrying activities, employee responsibilities, as well as mitigation measures and controls for all potential environmental concerns related to blasting and use of explosives. Baffinland will develop quarries in an environmentally acceptable manner that meets the requirements of all obtained permits and authorizations.

2. Environmental Management

2.1. Introduction

For the remainder of 2013 and in 2014, Baffinland will be using pre-packaged explosives for the quarry activities occurring associated with the Mary River Project. The pre-packaged explosives will be stored in sea-containers in secured locations near Mary River, Milne Inlet and along the Tote road that have been approved by the NWT/Nunavut Mines Inspector.

It is recognized that ammonium nitrate (AN) is a soluble inorganic nitrogen compound and that there is a risk that arises from aqueous dissolution which could potentially impact surface waters which may support aquatic life. However, pre-packaged explosives have a benefit, of just that being pre-packaged, so it does eliminate and minimize the release of ammonium nitrate to the environment.

In the future Baffinland's blasting contractor will be constructing an emulsion plant on site that will produce explosives locally for the operations phase of the project, but that facility will not be constructed until late 2014. As a requirement of Type A Water Licence 2AM-MRY1325, Baffinland will submit for approval an Operational Phase Blasting Operations Management Plan that will outline the steps and best management practices that will be implemented to minimize ammonia releases to the environment.

Due to potential environmental concerns related to the introduction of nitrogen compounds at the Mary River Project, operating procedures will implemented to limit, control and mitigate the release of AN from blasting operations. The following section provides details on the environmental controls and mitigation measures that will be employed for the quarrying activities during construction phases of the Project. It includes details on the environmental setbacks, archaeological sites, explosives use, spillage cleanup and containment, training, management of grubbing, till management, storm runoff and snow melts, water sampling, blasting near water and performance monitoring for the operation of quarries.

The information provided, herein, supplements that provided in the related documents:

- Borrow Pit and Quarry Management Plan
- Baffinland Iron Mines: Mary River Project - Explosives Management Plan Nunavut, Canada (August 29, 2013)

2.2. Setbacks

A minimum of thirty-one (31) metre undisturbed buffer zone will be established between the periphery of Quarry sites and the ordinary High Water Mark of any water body unless otherwise approved by the Board in writing. Buffers will be surveyed in before any construction or opening of the quarry can proceed.

2.3. Archaeological Sites

All identified archaeological sites in areas potentially impacted by quarry activities will be surveyed and if required, a buffer zone will be established around the archaeological site as required by the Government of Nunavut’s Archaeological and Paleontological Sites Regulations and as recommended by the archaeologist. No construction is to take place within the buffer zone and no employees will be permitted to enter the site. If a relevant archaeological site is identified during the course of the operations, all work will cease and the archaeologist will be contacted and brought to the site. Work in the area would only proceed based on the recommendations of the archaeologist with input from the Government of Nunavut.

2.4. Explosives Usage, Spillage Cleanup and Containment

For the remainder of 2013 and during 2014, high quality pre-packaged will be used for the blasting operations in the quarries. The pre-packaged explosives utilize an optimally mixed hydrophobic emulsion compound that works to repel water and keep ammonium nitrate out of the surrounding ecosystem. Once again, the use of pre-packaged explosives for blasting in quarries will greatly minimize AN releases to the environment. It is however recognized that ammonium nitrate is highly soluble in water and is difficult to recover once it is in solution. The primary ecological concerns with ammonia include acute end-of-pipe toxicity and chronic toxicity downstream lakes. Ammonia nitrifies to nitrate which can be potentially toxic to aquatic life at elevated concentrations. Nitrate, in the presence of phosphorus, can contribute to the process of freshwater eutrophication. Therefore, best practices for efficient use, containment at source and rapid containment and cleanup of any spills is therefore the primary objective for the protection of aquatic life.

Proactively controlling the release of ammonia at point source has a positive net environmental effect versus managing ammonia after dissolution in water which is much more difficult. Industry best practices will be adopted to maximize source control and to minimize the potential for AN dissolution to downstream waters. The following point source protective measures will be taken:

- When handling, transporting or storing explosives, care will be taken to avoid any spillage. This is greatly reduced or eliminated with the use of pre-packaged explosives. However, if any spillage of product should occur, it will be promptly reported, cleaned up, and properly disposed in accordance to approved site waste management practices. A Spill Report detailing the incident will be submitted to the Baffinland Environment Department. A follow-up report will be provided that details basic cause of the spill and any corrective actions taken to minimize the type of incident from reoccurring.
- Prior to loading explosives, blast holes will be inspected for the presence of water. To limit explosives-water contact, areas that are subject to shallow groundwater flows are identified, and dewatered prior to blasting.
- Selecting, adopting, and manufacturing the optimum explosive mix types and loading procedures for site specific applications.
- Stand time for explosives will be minimized and the lag time between load and blast will be kept to a minimum.
- Holes will be loaded by experienced supervisors/blasters so that the blasting pattern optimizes complete detonation of explosives, and avoiding misfires which will also minimize the release of ammonia residue to the environment.
- If there is a miss hole/misfire resulting in incomplete detonation of explosives, the event will be reported to the Baffinland Mine Engineer and the Environmental Supervisor. If the residual blasted material in the vicinity of the miss hole represents

a potential source of nitrogen compounds, the Engineer will ensure that the material will be appropriately collected/stored and managed to the satisfaction of the Environmental Supervisor so as to minimize the potential for soluble nitrogen compounds from entering fish bearing waters.

- Upstream overland flows that impinge on quarry operations and have the potential to contaminate clean downstream water will be diverted around the active pit area by means of berms, check dams, or minor diversions. Based on the site drainage plan, the upstream flows from the quarry development area are anticipated to be minor.
- In the event that there is the potential for nitrogen compounds to adversely impact downstream fish bearing waters contingency actions will be taken that could include:
    - Storage of impacted water within the pit in constructed sumps.
    - Other treatment options such as the careful discharge to the tundra or where there is abundant surface vegetation (approval may be required) after meeting regulatory requirements for water quality.

2.5. Training

Training is seen as a key element in the safe usage and proper environmental management of explosives and blasting. All employees working on or around blasting operations will undergo rigorous employee orientation and training procedures for: managing, transporting and loading explosives into blast holes. Experienced competent employees are an essential part of blasting best management practices. On-site Environmental staff will regularly audit blasting quarry operations and if as required will conducted further information sessions with staff involved in blasting operations to instill to them the importance of point source control of ammonia to minimize impacts on the environment

2.6. Management of grubbing and disposal of related debris

The principle concerns associated with grubbing and disposal of related debris are:

- Potential effects on water quality caused by erosion and sedimentation;
- Disturbance of the permafrost leading to ground failure (slumping and erosion)

Baffinland is committed to meeting the regulations for maximum allowable concentrations of any grab sample of total suspended solids (TSS) of 100 mg/L and Maximum Average concentration of 50mg/L of Total Suspended solids as outlined in the Type A Water Licence 2AM-MRY1235).

All grubbing and disposal of related debris near watercourses will comply with approvals from respective regulators and the landlord. At a minimum measures to be undertaken to minimize effects on aquatic habitat and resources are as follows:

- Grubbing of the organic vegetation mat and/or the upper soil horizons will be minimized, and left in place where possible;
- If needed, the organic vegetation mat and upper soil horizon material, which has been grubbed, will be spread in a manner that attempts to cover exposed areas. Any surplus of such material will be stored or stockpiled for site rehabilitation and re-vegetation purposes elsewhere in the project area. Topsoil will be stockpiled separately from the overburden. The location of the stockpiles will be recorded and accessible for future rehabilitation purposes;
- During grubbing, care will be taken to ensure that grubbed material will not be pushed into areas which are to be left undisturbed.

2.7. Till Management

Till stripped from the quarries (if required) will be placed in an area approved by the onsite environmental personnel. These areas can be an area currently identified for till/topsoil storage area or an area close to a quarry that is unlikely to erode into any water bodies during spring thaw.

Till can be used for building a berm around quarry as a means to prevent runoffs and snow melts into nearby natural drainage systems. If seepage through a berm wall is occurring, sediment control mats or silt fences will be laid at the foot of the berm wall to minimize transportation of fines into water courses.

2.8. Storm Runoff and Snow Melts

The final quarry configuration will consist of a flat surface graded at approximately 1% in the down slope direction, adjoining a steeper angle rock surface that forms the transition to natural ground on the ridge above. Storm and snow melts water will be diverted away from the quarry by a small 0.5 m berm on the upslope edges of the excavation. All runoff and snow melts will be contained in a lined designated location within the quarry.

2.9. Water Sampling

Water sampling will be conducted at locations and frequency specified by the Baffinland Environmental Supervisor. Water sampling locations will be based on the location of quarry operations, site drainage configuration (refer to site drainage plan), and seasonality. The sampling will be undertaken by the onsite environmental personnel.

2.10. Blasting Near Water

Most if not all of the quarries being excavated are not very near any water. However, particular care must be taken if blasting is undertaken near water bodies. This includes proper explosives handling, selection of the correct explosive (see: Section 2.3), and utilization of best management practices. All quarry blasting on the Mary River Project will adhere to the Department of Fisheries and Oceans (DFO) “Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters”[1] (as per Project Certificate 005 condition no. 44 and 48).

Project Certificate Condition #44 – “The proponent shall meet or exceed the guidelines set by Fisheries and Oceans Canada for blasting thresholds and implement practical and effective measures to ensure that residue and by-products of blasting do not negatively affect fish and fish habitat.”

Project Certificate Conditions #48 – ‘The Proponent shall engage with Fishereis and oceans Canada and the Qikiqtani Inuit Association in exploring possible Project specific

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[1] Wright and Hopky 1998, Guidelines for the use of Explosives In or Near Canadian Fisheries Waters

thresholds for blasting that would exceed the requirements of Fisheries and Oceans Canada's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (D.G. Wright and G.E. Hopky, 1998)."

2.11. Environmental Monitoring

An environmental performance monitoring program will be implemented to ensure that AN release to receiving waters from AN explosives is minimized and remains within regulatory limits stated in Baffinland's Type A Water Licence (2AM-MRY1325). These targets and methods to monitor performance will be developed during quarry start up. Initially, the following types of monitoring procedures are anticipated:

- Procedure for blast performance monitoring to optimize blasting efficiency and to minimize the potential for unexploded product.
- Procedure for monitoring and auditing of field operations related to explosive storage, handling, any spillages and blast hole loading.
- Procedure for auditing and assessing individual employee environmental awareness and effectiveness of training with regard to blasting operations and the procedures related to environmental management.
- Ammonia and nitrate monitoring of surface water flows to fish bearing waters at identified water monitoring points, as per the drainage drawing.

In the event that performance monitoring indicates that targets are not being met, corrective actions will be taken to improve performance and contingency measures will be taken to prevent the discharge of ammonia exceedances to the aquatic receiving environment.

3. Blast Pattern Design

3.1. *Objective*

To provide the engineering department with a safe procedure for designing blasting patterns.

3.2. *Introduction*

This procedure was developed to ensure that the engineering department, including any sub-contractors, are aware of their safety responsibilities while designing and staking blast patterns at the quarries being developed at the Mary River Project.

3.3. *Definitions*

- None

3.4. *Tasks*

Table a: Requirements and Responsibilities for Blast Pattern Design

Task	**Person Responsible**
All borehole locations designed by engineering are to be placed at a distance of one meter or greater from any bootleg locations	Site Engineer
If any holes designed by engineering cannot be drilled in the design location due to ground conditions, then a new location can be used only if it is picked up by survey and found to be one meter or further away from any bootleg locations	Surveyor / Mine Engineer
No holes are to be designed in a location within five meters of a misfired hole	Mine Engineer
Prior to firing any blast, all borehole locations loaded with explosives are to be picked up by survey, and entered into the engineering database by the mining engineer. This will be called the as-built map	Surveyor / Mine Engineer

3.5. Blasting Parameters – Burden & Spacing

In order to produce a rock gradation profile suitable for specified use, the final blast hole spacing will need to be determined from field testing.

3.6. Blasting Parameters – Bench height and wall slopes

Quarry locations have been selected in areas that present stable geological characteristics. The benches will be designed according the topography of the natural grade at the quarry site. A 5 m bench height with a minimum 8 m catchment will be used based on safety and the capabilities of our loading equipment.

3.7. Typical Blast Pattern Designs

The following table may vary depending on bench height.

Table b: Initial Blasting Parameters - 90 mm Borehole

Product	Emulsion
Density (g/cc)	1.26
Load per meter of borehole (kg)	10.22
Bench Height (m)	5.0
Sub-Drill (m)	1.0
Collar (m)	2.3
Load Column (m)	3.7
Load per hole (kg)	38.0
Pattern Type	Equilateral
Spacing (m)	3.8
Burden (m)	3.3
Rock released per hole (m^3)	62.7
Powder Factor (kg/m3)	0.60

4. Drilling and Loading Procedures

4.1. *Re-Drill and Explosives Loading Procedure*

4.1.1. Objective

To provide Supervisors and workers with a procedure, which will ensure the safety of all personnel on or near a drill pattern where re-drilling of caved or frozen holes on a loaded pattern is necessary.

4.1.2. Scope

The Supervisor shall be responsible to ensure that the workers are trained and follow the procedures.

The driller is responsible to ensure that the procedures are followed as directed by the Supervisor.

4.1.3. Introduction

This procedure was developed to ensure the safety of all personnel involved or close to the blast area.

4.1.4. Definitions

- D&B: Drill & Blast

4.1.5. Preparation

- Requirements: Blasters Certificate, Supervisor Level I
- Tools: Drill, PPE
- Hazards: Charged holes, spillages of explosive material, slips, trips, falls, explosion

4.1.6. Tasks

Table c: Re-Drill and Explosive Loading Procedure

Task	Person Responsible
All holes shall be jigged and visually checked in patterns that have the potential for frozen or caved holes, before loading operations commence.	Blaster / Blast helper / Supervisor
Drill holes that are caved and or frozen and that require re-drilling are to be marked out with flagged stakes.	Blaster / Blast helper / Supervisor
Holes noted for re-drilling will be immediately brought to the attention of the blaster in charge and the Supervisor.	Blaster / Supervisor
The holes requiring re-drilling will be marked in the daily log and noted on the daily blast hole sheets as re-drilled.	Supervisor
No loading of holes closer than 8 meters to the re-drilling operation shall be permitted except under the direct supervision of the Supervisor.	Blaster
The re-drilling shall take place in a retreat direction; all loading operations shall take place away from the travel direction of the drill.	Supervisor
Only personnel directly involved with the drilling and blast hole loading activities are to be within 30 meters of re-drilling operations.	Blaster / Supervisor
No surface delays or detonating cord is to be present within the blast pattern during re-drilling operations.	Supervisor
All down hole Nonel delay detonator ends are to be neatly bundled and tied to the blast hole stake to ensure visibility and minimize the potential of any inadvertent machinery contact.	Blaster
The Supervisor will ensure that the drill operator and blaster walk through the drill pattern prior to moving the drill onto the pattern. The drill operator will be made aware of any loaded blast holes that may come within 2 m of the machine.	Supervisor

The Supervisor will advise the drill operator which blaster will guide the drill onto the loaded pattern, for the purpose of re-drilling	Blaster / Supervisor

4.2. Explosives Management

4.2.1. Objective

To provide Supervisors with a safe and effective standard which will ensure the safety of all employees and equipment. This should be used in conjunction with the Explosives Management Plan (August 29, 2013).

4.2.2. Scope

The Manager shall appoint a person(s) who is/are qualified, certified and authorized under the Mine Health and Safety Act and Regulations of the Northwest Territories / Nunavut to conduct/supervise all blasting operations on the mine site. The Manager shall also be responsible for authorizing persons to enter the explosive magazine for inspection, receiving and issuing of all explosives materials.

4.2.3. Introduction

The NWT / Nunavut Mine, Health & Safety Act and Regulations require a manager to ensure his charges are working safely in a safe environment and in compliance with the regulations, company policy and procedures.

4.2.4. Preparation

- Hazards: Explosives, detonators, delays
- Tools: Blasters Certificate, Supervisor Level I Certificate, Log Book, broom, Magazine key

4.2.5. Tasks

Table d: Explosives Management

Task	Person Responsible
Ensure a copy of the explosives magazine permit is posted inside the magazine.	Area Manager
Carry out a weekly inspection of the magazine and record the results in a logbook.	Blast Supervisor
Ensure a record of all explosives issued and received and the inventory of the magazine is kept, and authorized persons sign all entries.	Blaster/ Supervisor
Ensure the magazine is kept clean, dry and free from grit at all times.	Blaster/ Supervisor
Ensure the stock of explosives is rotated so that the oldest stock is used first.	Blaster/ Supervisor
Ensure all signage is visible and in good condition.	Blaster/ Supervisor
Ensure that the magazine is locked at all times except when an authorized person is present.	Blaster/ Supervisor
Ensure all mobile equipment transporting explosives meets or exceed requirements as set out in the Mine Health and Safety Act and Regulations of the NWT / Nunavut.	Blaster/ Supervisor
Ensure appropriate records of each primary blast are kept.	Blaster/ Supervisor
Ensure all warnings, guarding of access routes and clearance of areas has taken place prior to initiating any blasts.	Blaster/ Supervisor
The appointed person has the authority to safely conduct and direct all activities within the blasting area. All employees must support	Blaster/ Supervisor
Ensure all blasters have a valid blasting certificate issued by the Chief Inspector of Mines.	Blaster/ Supervisor
Ensure all persons who are assisting in the preparation or firing of charges is under the direct supervision of a person who is a valid holder of a blasting	Blaster/ Supervisor

All blasters shall deliver their blasting certificates to the Manager or his designate when commencing employment. The certificate will be returned upon termination with the company.	Blaster/ Supervisor

5. Blasting Protocol and Procedure

5.1. General Protocol

- All blasting operations will follow all protocol of The Northwest Territories / Nunavut Mine Health and Safety Act and Regulations, as well as standard operating procedures from both Baffinland Iron Mines Corporation and subcontractors, whichever is more stringent.
- All records of blasting shall be kept by the Mine Engineering department
- All blasts will be numbered according to location (i.e. quarry number, bench elevation at grade, and individual blast)
- All loaded boreholes will be recorded by survey prior to blasting, and as-built mapping entered into survey database to eliminate possibility of drilling into bootlegs on benches at lower elevations
- The area will be visually surveyed for terrestrial wildlife prior to blasting and the blast delayed, if required, to clear the area of any affected terrestrial wildlife. These include, but are not restricted to caribou, and local carnivores. Nesting birds will be respected according to Baffinland's Terrestrial Environmental Management and Monitoring Plan that abides by Environment Canada's Migratory Birds Act. The Environmental Monitor on-site will be trained in the requirements of the Terrestrial Environmental Management and Monitoring Plan.
- Daily records of all holes loaded and explosive products used will be maintained, recorded, and submitted with blast reports
- All blast design will be subject to change and improvement, as site specific geological conditions dictate
- Wall control issues will be negligible with the plan of day lighting all benches
- Standard Operating Procedures regarding drilling proximity to bootlegs or misfired holes will be reviewed with all drilling and blasting crews and adhered to for all drilling and blasting operations.
- All production holes are to be drilled vertically, to ensure the integrity of projected bootleg locations

5.2. Guarding Typical Quarry Excavation

It is imperative that the guards follow the instructions and not leave their assigned area until told so by the Supervisor. The positions assigned will be outside the Blast Danger Area as determined by the Mine Engineer.

In addition to the guards posted at strategic locations around the blast area, reflective warning signs are recommended to be placed at the outer perimeter of the blasting danger area. The signs shall be deployed prior to the initiation of each blast, and collected afterwards.

While guarding a blast area, the vehicle window facing the “tundra” side must be rolled down slightly. The vehicle must be turned off and put in auxiliary such that the radio remains functional (alternatively: use a hand held radio).

All blasting will be scheduled in the afternoon, around 16h00. A distance of 600m for personnel and 400m for equipment as determined by the Quantity Distance - Explosives Regulatory Division Explosives Safety and Security Branch, Minerals and Metals Sector table of distances. We will not have any blasts with over 11,500 kg of explosives in the blast.

5.3. Guarding Procedure

5.3.1. Objective

To provide the Supervisor with a safe and effective procedure for guarding of a blasting operation.

5.3.2. Scope

The Supervisor is responsible to ensure that all employees engaged in the guarding procedure are trained and understand their duties.

The employees assigned the task of guarding are responsible to follow this procedure as directed by the Supervisor.

5.3.3. Introduction

As per NWT / Nunavut Mine Health and Safety Act and Regulations, these precautions are required.

5.3.4. Definitions

- None

5.3.5. Preparation

- Tools: PPE
- Hazards: Slips, Trips, Falls, Personal injury or death

5.3.6. Tasks

Table e: Requirements and Responsibilities for guarding a blast

Task	Person Responsible
The operations Supervisor will be responsible for appointing all guards and ensuring each guard is fully versed in their responsibilities	Supervisor
The Supervisor is responsible for establishing the limits of the danger zone and the guard post locations.	Supervisor
Upon notification from the Supervisor, all guards will ensure their assigned areas are clear of all personnel, equipment and terrestrial wildlife and proceed to their designated guard posts.	Supervisor / Guards
All guards will notify the Supervisor when they have arrived at their assigned positions, and give a status report of their assigned area.	Supervisor / Guards
No guard shall leave their position or allow any person to enter the blast area until the Supervisor gives the “All Clear”	Supervisor
The Supervisor will ensure all guards are in their assigned location.	Supervisor
The Supervisor will then proceed with the blast.	Supervisor

Following the blast, the Supervisor will announce on the radio, the “All Clear” message. All guards will be removed, crews can return to work in the blast area and regular radio communications can recommence.	Supervisor

5.4. Blasting Procedure

5.4.1. Objective

To provide the Supervisor with a Pre-Blast, Guarding and a Post Blast procedure that will ensure the safety of all personnel and equipment

5.4.2. Scope

The Supervisor shall ensure that all workers who are assigned the duties of a guard during the blasting operations are trained and understand this procedure.

The workers who are assigned guarding duties during the blasting operations will follow this procedure as directed by the Supervisor.

5.4.3. Introduction

This standard operating procedure is to be used to ensure all employees involved, are trained to understand the blasting procedure

5.4.4. Definitions

- None

5.4.5. Preparation

- Tools: PPE, Portable radio, Electric blasting cap, Detonating cord, Blasting wire, Blasting machine
- Hazards: Slips, Trips, Falls, Personal injury of death; Premature detonation

5.4.6. Tasks

Table f: Requirements and Responsibilities for initiation of a Blast Pattern

Task	Person Responsible
The Supervisor will notify all employees of the impending blasting times during the daily crew line up at the beginning of each shift.	Supervisor
The Supervisor will ensure that the daily blasting times are posted at quarry entrances 2 hours before the blasting operation is conducted	Supervisor
The Blaster will give a 2 hour blast warning, by radio, to the following people: Medic, Supervisor, and Security Supervisor. Each of these people will acknowledge, by radio, that they have received and understood the 2 hour blast warning.	Supervisor
The Blaster will contact the Airport Operations Office.	Supervisor
The Supervisor will instruct all workers and equipment operators to evacuate the blasting area at the appropriate time.	Supervisor
The Supervisor, Blaster and Mine Engineer, will determine the “Blast Danger Zone”	Supervisor / Blaster / Mine Engineer
The Supervisor will assign required personnel the duties of guards during the blasting procedure.	Supervisor
The Supervisor will contact the Environmental Supervisor to establish if there have been any significant terrestrial wildlife sightings that the quarry site needs to be aware of.	Supervisor/Environmental Supervisor
The Supervisor will designate the areas to be guarded	Supervisor
The Guards will follow the instructions of the Supervisor.	Guards

The Supervisor will give a 10 minute blast warning, by radio, to the following people: Medic, Security Manager, and Safety Supervisor. Each of these people will acknowledge, by radio, that they have received and understood the 10 minute blast warning.	Supervisor

5.5. Misfires or Cut-off Holes

5.5.1. Objective

To establish a procedure to ensure all misfires/cut-off holes are handled safely and all blasting personnel are fully trained prior to commencing this task.

5.5.2. Scope

The Supervisor shall be responsible for ensuring the blaster follows all safe work practices when performing work on misfired or cut-off holes. These procedures will be reviewed annually or updated when required.

The blaster is responsible to follow this procedure as required by the Supervisor.

5.5.3. Introduction

The NWT / Nunavut Mine Health Safety Act and Regulations require all personnel be adequately trained to do their jobs safely, inspect their worksite or machinery and understand the lock out procedure and fire prevention apparatus and use.

5.5.4. Definitions

- Bootleg: Part of a drilled blast hole that remains when the force of the explosion does not break the rock completely to the bottom of the hole.

5.5.5. Preparation

- Tools: PPE
- Hazards: Slips, trips, and falls, personal injury or death

5.5.6. Tasks

Table g: Misfires or Cut-off Holes

Task	Person Responsible
All workers on a blast pattern will be fully trained in all procedures associated with misfires/cut-off holes.	Workers
Before drilling is commenced, the blaster shall walk the complete pattern to check for any misfire/cut-off holes. The blaster will look for any signs of explosives or lack of ground movement that might indicate a misfire or cut-	Blaster
No person shall drill in loose rock produced by blasting unless the rock has been thoroughly examined by the blaster for explosives, the pattern has been designed to prevent the overlaying of holes and where a hole is discovered containing explosives, drilling will not be closer than 5 m from the hole.	Driller / Blaster
The Supervisor and driller shall not drill or allow drilling to be conducted within 1 m of any part of a bootleg on a blasting pattern or within 5 m of a misfired hole, a cut-off hole or a hole containing explosives.	Supervisor / Blaster
Where an explosive charge has been misfired or cut-off, no work may be performed in the area other than that required making the area safe.	Supervisor / Blaster
All holes must be inspected for detonators or explosives, the blasting area will remain guarded and the hole re-blasted.	Blaster
Once the hole has been cleaned out, the hole may be re-charged, re-stemmed and blasted	Blaster
A hole may be re-drilled for the purpose of re-blasting a missed hole once a Supervisor has determined, after consultation with the driller, the location angle and depth of the hole to be drilled.	Supervisor / Driller
The Supervisor shall supervise the drilling of the hole.	Supervisor

The new hole shall not be closer than 5 m to any part of the missed hole.	Driller
The only explosives that can be removed by washing or lancing from a misfired or cut-off hole include ANFO or slurry/emulsion.	Supervisor / Blaster
The blast pattern shall not be abandoned until it has thoroughly been examined for the presence of explosives in misfired or cut-off holes.	Blaster
Note: If the blaster suspects a misfire, wait ten minutes, and then proceed to check the blast area.	Blaster

6. Excavating Blasted Muck

6.1. Dig Limits for Loading Equipment

6.1.1. Objective

To provide Supervisors and Equipment Operators with a procedure that will enhance safe-working conditions when mucking to a Loaded Blast Face.

6.1.2. Scope

The Supervisor is responsible to ensure that all Loading Equipment Operators are trained and understand this procedure.

All Loading Equipment Operators are responsible to follow the procedure as directed by the Supervisor.

6.1.3. Introduction

NWT / Nunavut Mine Health and Safety Act and Regulations require all personnel be adequately trained to do their jobs safely, inspect their work site or machinery and understand the lock out procedure and fire prevention apparatus and use.

6.1.4. Preparation

- Hazards: Slips, Trips, and Falls
- Tools: Metric measuring tape, red fluorescent paint, survey instrument, stakes, hammer, PPE

6.1.5. Tasks

Table h: Requirements and Responsibilities for mucking into a loaded blast face

Task	Person Responsible
Prior to loading material from any blasted muck pile, the Supervisor will inspect the blasted area. He will consult with the Mine Engineer, to ascertain if there is a charged blast pattern adjacent to the Blasted Material.	Supervisor

The Drill & Blast Supervisor will measure 8 meters perpendicular in front of each charged blast hole in the direction of the blasted material that is to be loaded and position red fluorescent pylons (construction cones) parallel to the charged blast holes.	Supervisor/ Surveyor
The Supervisor is responsible for ensuring that the "Dig Limits" Pylons are in place before loading operations commence.	Supervisor
When facing up the Loading Equipment Operators must stop at the pylons. If a pylon falls down the muck pile the operator must inform the Supervisor immediately. The Loading Equipment will then move laterally to continue progressive loading of the muck pile.	Operator

7. Drill and Blast Employee Responsibilities

7.1. Blast Helpers

7.1.1. Objective

To provide supervisors, blasters and blaster helpers with a procedure for assisting a blaster in the preparation of a blast.

7.1.2. Scope

The Supervisor is responsible to ensure that blast helpers assisting in the preparation of a blast are trained and understand the procedure.

7.1.3. Introduction

This standard operating procedure is to be used for drill and blast operations.

7.1.4. Definitions

- None

7.1.5. Preparation

- Tools: PPE
- Hazards: Slips, trips, and falls, personal injury or death, premature detonation

7.1.6. Tasks

Table i: Requirements and Responsibilities for Blast Helpers

Task	Person Responsible
Before assisting in the preparation of a blast, the blast helper will be trained on the safe handling and preparation of the explosives used during the loading procedure.	Supervisor
Either, Supervisor or the blaster in charge of the blast pattern to be loaded will explain exactly the duties of the blast helper before the work begins.	Supervisor
The blast helper will remain under the direction of the Supervisor or the blaster at all times.	Supervisor
The blast helper will conduct only that part of the blasting operation as directed by the Supervisor or the blaster.	Supervisor

7.2. Drill and Blast Supervisors' Daily Duties

7.2.1. Objective

To provide the Supervisors with a comprehensive inventory of duties to be completed on a daily basis.

7.2.2. Scope

The Superintendent is responsible to ensure all Supervisors are trained and understand this procedure.

The Supervisor is responsible to follow this procedure as directed by the Superintendent.

7.2.3. Introduction

NWT / Nunavut Mine Health and Safety Act and Regulations: require a supervisor to ensure his charges are working safely in a safe environment and in compliance with the regulations, company policy and procedures.

7.2.4. Preparation

- Hazards: Work about charged drill holes, work with explosives, falling rock, slips, trips & falls
- Tools: Blasting Certificate, Supervisor Level I Certificate, PPE

7.2.5. Tasks

Table j: Requirements and Responsibilities of a Supervisor

Task	Person Responsible
The Drill / Blast Supervisor will:	Supervisor
• Do a pre shift site tour.	
• Read and sign the Daily logbook from the previous shift prior to line up.	
• Review maintenance problems and equipment down time with superintendent and previous shifter.	
• Prepare D/B crews work assignments with superintendent.	
• Prepare daily safety toolbox meeting notes	
• Provide instructions to the D/B crew for the daily work assignments	
• Directs the blaster and helper to prepare all explosives for the days activities.	
• Drill crews are transported to the drill locations. Review previous shift with the off-going driller.	
• The area is inspected and the drillers' duties are reviewed.	
• The night shift crews are transported to the line-up area	
• Record all information in the D/B Daily Logbook. Completed the required documentation for the night-shift crews.	
• Participate and provide information during the daily production meeting for all Mine Supervisors and Managers.	

DUTIES IN THE MINE: **The Supervisor will:** • Inspect the area of his/her responsibility, identifying and correcting hazards, sub-standard conditions or non-compliance of procedures, or the NWT / Nunavut Mine Regulations or client.	Supervisor
• Provide on the job observations and instructions to the drill/blast crews.	
• Ensure the mining / quarrying plan is followed regarding drill and blast patterns, as directed by the Superintendent.	
• Ensure the drill/blast crew has the required supplies to complete their daily tasks.	
• Ensure the Mine Supervisor is informed of any hazards that may affect the safety of the mine employees or equipment.	
• Provide directions and instructions to all employees during the blasting operations regarding the notification and guarding during the blast.	
MISCELLANEOUS DUTIES:	Superintendent/ Supervisor/ Safety
• Develop and present timely safety topics at the regular crew Safety meetings.	
• Provide developmental training for drill/blast crews.	
• Under the direction of the Superintendent, provide up-to-date information regarding manpower, production targets or delays, order and track consumables, complete special assignments, ensure that explosives are handled properly and security is maintained.	

APPENDIX C

Analytical Certificates – ABA Results, Metals Results, NAG Leachate Results and Borehole Log

TABLE 1
Summary of 2010 Borehole Locations

Borehole	Northings (m)	Eastings (m)	Purpose of Borehole	Approximate Tote Road Chainage (m)	Depth to Bedrock (where encountered) (m)	Final Drilling Depth* (m)
BH10-01	7,975,989	503,772	Foundations	0+000	-	15
BH10-02	7,976,127	503,921	Foundations	1+000	-	15
BH10-03	7,975,758	503,693	Aggregate Source	1+500	-	10
BH10-04	7,975,352	503,969	Aggregate Source	2+100	0	15
BH10-05	7,974,412	504,123	Aggregate Source	3+100	1.2	15
BH10-06	7,973,659	504,528	Aggregate Source	4+100	0	15.5
BH10-07	7,972,753	505,216	Aggregate Source	5+000	1.6	15.5
BH10-08	7,972,369	505,883	Aggregate Source	6+000	0	15
BH10-09	7,971,937	506,306	Aggregate Source	7+000	0	15
BH10-10	7,965,955	513,598	Proposed Bridge	17+000	13.5	15
BH10-11	7,965,850	513,542	Proposed Bridge	17+300	9.5	15
BH10-12	7,962,529	516,753	Aggregate Source	22+000	0	15.5
BH10-13	7,947,246	522,846	Aggregate Source	39+100	3	16
BH10-14	7,941,896	524,015	Aggregate Source	45+200	0	16
BH10-15	7,937,592	525,949	Aggregate Source	50+000	1	16
BH10-16	7,927,575	529,333	Aggregate Source	61+500	0	15
BH10-17	7,926,886	529,321	Proposed Bridge	62+000	7.1	12
BH10-18	7,926,803	529,365	Proposed Bridge	62+300	7.1	15
BH10-19	7,922,241	542,169	Proposed Bridge	79+700	-	21
BH10-20	7,922,127	542,346	Proposed Bridge	80+000	-	15
BH10-21	7,915,012	554,243	Aggregate Source	85+000	3.3	15
BH10-22	7,914,637	555,665	Proposed Bridge	96+900	9.2	15
BH10-23	7,914,798	555,877	Proposed Bridge	97+300	6	12

* The thickness of the active zone will vary depending on the time of the investigation. Therefore, the depth to permafrost encountered at the tim of the investigation may not represent the maximum depth to permafrost which may occur during the year.

amec

DRAFT

RECORD OF BOREHOLE No. BH10-15

PAGE 1 OF 1

PROJECT Mary River Project Trucking Feasibility Study
ENGINEER
PROJECT NO. TC101510
DRILLER
BORING METHOD
LOGGED BY
CLIENT Baffinland Iron Mines Corp.
LOCATION 7937592m N 525949m E
COMPILED BY KS
ELEVATION m
COORD.
BORING DATE Start: Aug 28, 10 End: Aug 28, 10
CHECKED BY BL

SAMPLE TYPES					
AU	Auger	RC	Rock Core	GS	Grab
BU	Bulk	SS	Split Spoon		
GS	Grab	TW	Thin Walled Open (Shelby)		
		WS	Wash Sample		

ABBREVIATIONS					
P.P.	Pocket Penetrometer	P.L.	Point Load Strength Index (I_{50})	C	Consolidation
U.W.	Wet Unit Weight	RQD	Rock Quality Designation	DS	Direct Shear
PT	Standard Proctor Test	SCR	Solid Core Recovery	GS	Grain Size Analysis
		k	Permeability		

ELEV DEPTH (m)	SOIL PROFILE DESCRIPTION	SAMPLES STRAT PLOT	NUMBER	TYPE	RECOVERY (%)	SPT "N" VALUES or RQD	WELL / PIEZOMETER INSTALLATION	DEPTH (m)	ELEVATION (m)	DYNAMIC CONE PENETRATION RESISTANCE PLOT —×— 20 40 60 80 100 MTO VANE ☐ INTACT ■ REMOULDED NILCON VANE △ INTACT ▲ REMOULDED UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 100	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	PERMEABILITY (cm/s)	REMARKS
0.0	**SAND AND GRAVEL,** containing frequent cobbles and boulders See Rock Log for detailed logging.	▤						1					
1.0	**CARBONATE BEDROCK** See Rock Log for detailed logging.	▨						2 3 4 5 6 7 8 9 10 11 12 13 14 15 16					
16.0	**End of Borehole.**												

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

November 3, 2010

Baffinland Iron Mines Corp
Attn : Michael Zurowski

1016-120 Adelaide Street West
Toronto, ON, M5H 1T1
Canada

Phone: 416-364-8820
Fax:pdf

Date Rec. : 27 October 2010
LR Report: **CA11412-OCT10**
Reference: PO#11758

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**25: 10-TR-021 BH10-12**	**26: 10-TR-022 BH10-13**	**27: 10-TR-023 BH10-13**	**28: 10-TR-024 BH10-13**	**29: 10-TR-025 BH10-14**	**30: 10-TR-026 BH10-14**	**31: 10-TR-027 BH10-14**	**32: 10-TR-028 BH10-15**	**33: 10-TR-029 BH10-15**	**34: 10-TR-030 BH10-15**
Mercury [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aluminum [µg/g]	4900	500	3100	2300	800	1600	800	800	1200	1300
Arsenic [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.7	0.5	0.6	1.8	1.2
Barium [µg/g]	24	5.5	16	13	3.0	5.3	2.7	3.4	4.5	4.2
Beryllium [µg/g]	0.15	0.06	0.32	0.22	0.06	0.14	0.06	0.07	0.08	0.08
Bismuth [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	1900	39000	41000	48000	288000	283000	270000	282000	267000	284000
Cadmium [µg/g]	< 0.02	< 0.02	0.03	0.02	< 0.02	0.06	< 0.02	< 0.02	< 0.02	< 0.02
Cobalt [µg/g]	2.8	1.3	2.1	1.5	1.6	2.1	1.6	1.7	1.9	2.0
Chromium [µg/g]	100	99	96	82	2.2	3.4	2.6	4.1	2.2	2.6
Copper [µg/g]	8.8	5.0	6.1	2.0	4.0	3.9	4.3	2.2	4.5	5.4
Iron [µg/g]	14000	4000	7300	5800	1600	2800	1700	1900	2500	2500
Potassium [µg/g]	2700	360	1700	1400	290	350	300	330	400	440
Lithium [µg/g]	9	< 2	18	13	< 2	< 2	< 2	< 2	2	3
Magnesium [µg/g]	3000	22000	26000	28000	6500	4100	13000	9500	5700	6600
Manganese [µg/g]	140	270	280	340	70	120	71	77	170	120
Molybdenum [µg/g]	3.4	0.5	0.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sodium [µg/g]	460	120	130	150	150	140	140	160	160	150
Nickel [µg/g]	5.0	5.0	8.9	7.0	14	15	14	14	15	15

OnLine LIMS

Analysis	**25: 10-TR-021 BH10-12**	**26: 10-TR-022 BH10-13**	**27: 10-TR-023 BH10-13**	**28: 10-TR-024 BH10-13**	**29: 10-TR-025 BH10-14**	**30: 10-TR-026 BH10-14**	**31: 10-TR-027 BH10-14**	**32: 10-TR-028 BH10-15**	**33: 10-TR-029 BH10-15**	**34: 10-TR-030 BH10-15**
Phosphorus [µg/g]	250	370	540	1090	21	43	42	78	85	86
Lead [µg/g]	12	0.83	0.98	0.89	1.0	1.6	1.1	1.3	2.0	1.6
Antimony [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Selenium [µg/g]	< 0.7	< 0.7	< 0.7	1.0	< 0.7	< 0.7	0.9	0.9	1.0	1.0
Silica [µg/g]	600	270	590	450	390	420	350	530	340	430
Tin [µg/g]	0.8	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Strontium [µg/g]	17	14	24	22	290	300	280	270	240	290
Titanium [µg/g]	680	23	180	140	10	21	8.9	11	11	13
Thallium [µg/g]	0.13	0.02	0.04	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Uranium [µg/g]	4.9	0.31	0.40	0.41	0.30	0.34	0.34	0.34	0.39	0.33
Vanadium [µg/g]	12	7	11	7	4	5	4	4	5	5
Yttrium [µg/g]	8.2	2.3	5.0	9.1	1.5	4.0	1.6	2.2	2.8	2.9
Zinc [µg/g]	31	2.2	9.9	5.8	4.0	6.4	4.5	3.3	6.1	6.2

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Project Specialist
Environmental Services, Analytical

OnLine LIMS

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LR Report: **CA11410-OCT10**
Reference: PO#11758

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Paste pH units	Fizz Rate ---	Sample weight(g)	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
1: Analysis Start Date	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10
2: Analysis Start Time	14:10	14:10	14:10	14:10	14:10	14:10	14:10	14:10
3: Analysis Approval Date	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10
4: Analysis Approval Time	14:12	14:12	14:12	14:12	14:12	14:12	14:12	14:12
5: 10-TR-001 BH10-04	9.56	1	2.05	20.00	0.10	0.10	16.77	1.36
6: 10-TR-002 BH10-04	9.92	1	2.01	20.00	0.10	0.10	16.75	1.39
7: 10-TR-003 BH10-04	9.58	1	1.98	20.00	0.10	0.10	16.50	1.39
8: 10-TR-004 BH10-05	9.79	1	2.03	20.00	0.10	0.10	17.00	1.40
9: 10-TR-005 BH10-05	9.76	1	1.97	20.00	0.10	0.10	17.41	1.38
10: 10-TR-006 BH10-05	9.73	1	2.03	20.00	0.10	0.10	17.48	1.38
11: 10-TR-007 BH10-06	9.78	1	1.98	20.00	0.10	0.10	17.03	1.39
12: 10-TR-008 BH10-06	9.65	1	2.01	20.00	0.10	0.10	17.05	1.42
13: 10-TR-009 BH10-06	9.90	1	1.98	20.00	0.10	0.10	16.95	1.41
14: 10-TR-010 BH10-07	9.98	1	2.00	20.00	0.10	0.10	16.18	1.46
15: 10-TR-011 BH10-07	9.66	1	1.98	20.00	0.10	0.10	15.37	1.50
16: 10-TR-012 BH10-07	9.90	1	1.96	20.00	0.10	0.10	15.48	1.43

Sample ID	NP t CaCO3/1000t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Total Sulphur %	Acid Leachable SO4-S %	Sulphide-S %	Total Carbon %	Carbonate (CO3) %
1: Analysis Start Date	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	01-Nov-10	02-Nov-10	02-Nov-10	01-Nov-10	01-Nov-10
2: Analysis Start Time	14:10	14:10	14:10	14:10	13:17	09:44	09:42	13:17	14:28
3: Analysis Approval Date	03-Nov-10	03-Nov-10	03-Nov-10	03-Nov-10	01-Nov-10	02-Nov-10	02-Nov-10	01-Nov-10	01-Nov-10
4: Analysis Approval Time	14:12	14:11	14:11	14:11	16:46	10:33	10:33	16:46	16:45
5: 10-TR-001 BH10-04	7.9	0.31	7.59	25.5	0.014	0.01	< 0.01	0.059	0.103
6: 10-TR-002 BH10-04	8.1	0.31	7.79	26.1	< 0.005	< 0.01	< 0.01	0.050	0.101
7: 10-TR-003 BH10-04	8.8	0.31	8.49	28.4	< 0.005	< 0.01	< 0.01	0.064	0.137
8: 10-TR-004 BH10-05	7.4	0.31	7.09	23.9	0.020	0.02	< 0.01	0.041	0.059
9: 10-TR-005 BH10-05	6.6	0.31	6.29	21.3	0.015	0.01	< 0.01	0.032	0.033
10: 10-TR-006 BH10-05	6.2	0.44	5.76	14.2	0.038	0.02	0.01	0.029	0.028
11: 10-TR-007 BH10-06	7.5	0.31	7.19	24.2	< 0.005	< 0.01	< 0.01	0.036	0.048
12: 10-TR-008 BH10-06	7.3	0.31	6.99	23.5	0.008	< 0.01	< 0.01	0.028	0.025
13: 10-TR-009 BH10-06	7.7	0.31	7.39	24.8	0.006	< 0.01	< 0.01	0.035	0.075
14: 10-TR-010 BH10-07	9.5	0.36	9.14	26.2	0.035	0.02	0.01	0.027	0.014
15: 10-TR-011 BH10-07	11.7	0.31	11.4	37.7	0.036	0.04	< 0.01	0.038	0.027
16: 10-TR-012 BH10-07	11.5	0.31	11.2	37.1	0.019	0.02	< 0.01	0.036	0.052

Modified ABA (Price 1997)

LR Report : **CA11410-OCT10**

Sample ID	Paste pH units	Fizz Rate ---	Sample weight(g)	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
17: 10-TR-013 BH10-08	9.68	1	2.00	20.00	0.10	0.10	17.47	1.38
18: 10-TR-014 BH10-08	9.46	1	2.04	20.00	0.10	0.10	16.10	1.44
19: 10-TR-015 BH10-08	9.52	1	2.04	20.00	0.10	0.10	15.75	1.46
20: 10-TR-016 BH10-09	10.00	1	1.98	20.00	0.10	0.10	17.53	1.40
21: 10-TR-017 BH10-09	9.91	1	2.04	20.00	0.10	0.10	17.10	1.41
22: 10-TR-018 BH10-09	9.99	1	1.99	20.00	0.10	0.10	17.36	1.37
23: 10-TR-019 BH10-12	9.94	1	2.05	20.00	0.10	0.10	16.74	1.42
24: 10-TR-020 BH10-12	9.93	1	1.98	20.00	0.10	0.10	15.89	1.44
25: 10-TR-021 BH10-12	9.84	1	2.04	20.00	0.10	0.10	16.43	1.42
26: 10-TR-022 BH10-13	9.43	3	2.01	118.20	0.10	0.10	26.10	1.70
27: 10-TR-023 BH10-13	9.34	3	2.00	127.75	0.10	0.10	27.00	1.76
28: 10-TR-024 BH10-13	9.38	3	1.95	135.60	0.10	0.10	29.10	1.75
29: 10-TR-025 BH10-14	8.27	4	2.03	589.90	0.10	0.10	200	1.51
30: 10-TR-026 BH10-14	8.07	4	2.02	643.90	0.10	0.10	268	1.52
31: 10-TR-027 BH10-14	8.22	4	2.00	641.20	0.10	0.10	259	1.50
32: 10-TR-028 BH10-15	8.22	4	1.97	685.90	0.10	0.10	301	1.50
33: 10-TR-029 BH10-15	8.38	4	1.96	640.00	0.10	0.10	266	1.50
34: 10-TR-030 BH10-15	8.23	4	1.98	490.00	0.10	0.10	116	1.71
35: 10-TR-031 BH10-16	8.23	4	1.99	490.00	0.10	0.10	106	1.74
36: 10-TR-032 BH10-16	8.27	4	1.98	474.20	0.10	0.10	93.80	1.78
37: 10-TR-033 BH10-16	8.26	4	1.96	470.00	0.10	0.10	96.20	1.76
38: 10-TR-034 BH10-21	9.97	2	1.97	20.00	0.10	0.10	15.09	1.26
39: 10-TR-035 BH10-12	9.80	1	2.02	20.00	0.10	0.10	15.86	1.26
40: 10-TR-036 BH10-12	9.67	1	2.03	20.00	0.10	0.10	15.76	1.17
41: S449-10	8.75	4	2.00	393.20	0.10	0.10	122	1.60
42: S450-10	8.38	4	2.01	338.10	0.10	0.10	57.00	1.85

Sample ID	NP t CaCO3/1000t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Total Sulphur %	Acid Leachable SO4-S %	Sulphide-S %	Total Carbon %	Carbonate (CO3) %
17: 10-TR-013 BH10-08	6.3	0.31	5.99	20.3	< 0.005	< 0.01	< 0.01	0.028	0.035
18: 10-TR-014 BH10-08	9.6	0.31	9.29	31.0	0.020	0.02	< 0.01	0.044	0.380
19: 10-TR-015 BH10-08	10.4	0.31	10.1	33.5	0.028	0.03	< 0.01	0.043	0.062
20: 10-TR-016 BH10-09	6.2	0.31	5.89	20.0	0.012	0.01	< 0.01	0.020	0.034
21: 10-TR-017 BH10-09	7.1	0.31	6.79	22.9	0.012	0.01	< 0.01	0.070	0.048
22: 10-TR-018 BH10-09	6.6	0.31	6.29	21.3	0.038	0.04	< 0.01	0.023	< 0.005
23: 10-TR-019 BH10-12	8.0	0.31	7.69	25.8	0.029	0.03	< 0.01	0.035	0.018
24: 10-TR-020 BH10-12	10.4	0.40	10.0	26.0	0.028	0.02	0.01	0.051	0.071
25: 10-TR-021 BH10-12	8.8	0.31	8.49	28.4	0.006	< 0.01	< 0.01	0.046	0.065
26: 10-TR-022 BH10-13	229	0.31	229	739	< 0.005	< 0.01	< 0.01	2.77	12.0
27: 10-TR-023 BH10-13	252	0.31	252	813	< 0.005	< 0.01	< 0.01	2.98	12.5
28: 10-TR-024 BH10-13	273	0.31	273	881	< 0.005	< 0.01	< 0.01	3.25	14.0
29: 10-TR-025 BH10-14	959	0.31	959	3095	< 0.005	< 0.01	< 0.01	11.1	54.3
30: 10-TR-026 BH10-14	930	0.31	929	2998	< 0.005	< 0.01	< 0.01	10.8	52.3
31: 10-TR-027 BH10-14	956	1.29	955	742	0.071	0.03	0.04	11.2	54.0
32: 10-TR-028 BH10-15	978	0.31	978	3155	0.014	0.01	< 0.01	10.9	53.2
33: 10-TR-029 BH10-15	953	0.77	952	1245	0.041	0.02	0.02	10.7	51.3
34: 10-TR-030 BH10-15	945	0.34	945	2749	0.020	< 0.01	0.01	10.7	51.5
35: 10-TR-031 BH10-16	965	0.31	965	3114	< 0.005	< 0.01	< 0.01	10.8	53.5
36: 10-TR-032 BH10-16	961	0.31	960	3099	< 0.005	< 0.01	< 0.01	10.7	52.9
37: 10-TR-033 BH10-16	954	0.31	953	3076	< 0.005	< 0.01	< 0.01	10.7	52.1
38: 10-TR-034 BH10-21	12.5	0.31	12.2	40.3	0.015	0.02	< 0.01	0.096	0.282
39: 10-TR-035 BH10-12	10.2	0.77	9.43	13.3	0.060	0.04	0.02	0.052	0.054
40: 10-TR-036 BH10-12	10.4	0.41	9.99	25.6	0.023	0.01	0.01	0.049	0.023
41: S449-10	678	0.31	677	2185	0.011	0.01	< 0.01	7.86	33.9
42: S450-10	699	0.31	699	2256	< 0.005	< 0.01	< 0.01	8.02	36.0

Modified ABA (Price 1997)

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA11410-OCT10**

Sample ID	Paste pH units	Fizz Rate ---	Sample weight(g)	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
43: S451-10	8.55	4	1.97	131.70	0.10	0.10	38.20	1.55
44: S452-10	8.97	4	1.97	146.40	0.10	0.10	48.00	1.59
45: S453-10	8.87	4	1.99	135.30	0.10	0.10	29.10	1.69
46: S454-10	8.42	1	1.95	20.00	0.10	0.10	17.94	1.11
47: S455-10	9.51	1	1.96	26.00	0.10	0.10	11.31	1.57
48: S456-10	8.99	3	1.97	79.10	0.10	0.10	20.21	1.75
49: S457-10	9.07	3	2.00	83.90	0.10	0.10	15.24	1.85
50: S458-10	9.24	3	1.97	55.40	0.10	0.10	21.25	1.58
51: S459-10	8.86	4	2.03	154.20	0.10	0.10	28.60	1.83
52: S460-10	8.93	4	1.96	77.40	0.10	0.10	23.81	1.65
53: S461-10	9.14	3	1.99	97.90	0.10	0.10	21.30	1.78
54: S462-10	8.95	3	2.01	153.10	0.10	0.10	28.40	1.82

Sample ID	NP t CaCO3/1000t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Total Sulphur %	Acid Leachable SO4-S %	Sulphide-S %	Total Carbon %	Carbonate (CO3) %
43: S451-10	237	0.31	237	765	< 0.005	< 0.01	< 0.01	2.92	11.7
44: S452-10	250	0.31	249	805	0.014	0.01	< 0.01	2.89	12.4
45: S453-10	267	0.31	266	861	< 0.005	< 0.01	< 0.01	3.22	13.9
46: S454-10	5.3	0.31	4.99	17.1	< 0.005	< 0.01	< 0.01	0.061	0.016
47: S455-10	37.5	0.31	37.2	121	< 0.005	< 0.01	< 0.01	0.410	0.255
48: S456-10	150	0.31	149	482	0.007	< 0.01	< 0.01	1.82	6.20
49: S457-10	172	0.31	171	554	< 0.005	< 0.01	< 0.01	1.44	5.37
50: S458-10	86.7	0.31	86.4	280	0.007	< 0.01	< 0.01	1.12	4.17
51: S459-10	309	0.31	309	998	< 0.005	< 0.01	< 0.01	3.87	16.2
52: S460-10	137	0.31	136	441	< 0.005	< 0.01	< 0.01	1.71	7.29
53: S461-10	192	0.31	192	621	0.005	< 0.01	< 0.01	2.33	10.2
54: S462-10	310	0.31	310	1001	0.007	< 0.01	< 0.01	3.75	16.7

```
*NP (Neutralization Potential)
 = 50 x (N of HCL x Total HCL added - N NaOH x NaOH added)
   ------------------------------------------------------
                        Weight of Sample
```

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.01 will be calculated using a 0.01 value.

Sulphur analysis performed following BC ARD Guidelines (Price 1997)

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Shake Flask DI Leach-24hr 3:1 L/S ratio

Baffinland Iron Mines Corp
Attn : Michael Zurowski

1016-120 Adelaide Street West
Toronto, ON, M5H 1T1
Canada

Phone: 416-364-8820
Fax:pdf

Thursday, November 04, 2010

Date Rec. : 28 October 2010
LR Report: **CA11411-OCT10**
Reference: PO#11758

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 10-TR-001 BH10-04	6: 10-TR-005 BH10-05	7: 10-TR-009 BH10-06	8: 10-TR-014 BH10-08	9: 10-TR-017 BH10-09	10: 10-TR-019 BH10-12	11: 10-TR-024 BH10-13	12: 10-TR-025 BH10-14
Sample Date & Time			Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Sample [weight(g)]	01-Nov-10	07:41	250	250	250	250	250	250	250	250
Volume mL [D.I. H2O]	01-Nov-10	07:41	750	750	750	750	750	750	750	750
InitialpH [units]	01-Nov-10	07:41	9.51	9.41	9.63	9.63	9.59	9.58	9.66	9.52
Final pH [units]	01-Nov-10	07:41	9.45	9.64	9.73	9.67	9.69	9.73	9.38	9.11
Mercury [mg/L]	03-Nov-10	08:13	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum [mg/L]	03-Nov-10	09:21	0.97	0.84	0.98	0.58	0.91	0.75	0.04	0.23
Arsenic [mg/L]	03-Nov-10	16:42	0.0013	0.0004	0.0009	0.0005	0.0005	< 0.0002	0.0013	0.0003
Barium [mg/L]	03-Nov-10	16:42	0.00450	0.00444	0.00438	0.00420	0.00340	0.00309	0.00385	0.00167
Beryllium [mg/L]	03-Nov-10	16:42	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth [mg/L]	03-Nov-10	16:42	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	03-Nov-10	09:21	2.95	3.01	2.86	2.96	2.59	2.25	8.32	10.8
Cadmium [mg/L]	03-Nov-10	16:42	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	03-Nov-10	16:42	0.000028	0.000030	0.000049	0.000060	0.000053	0.000122	0.000039	0.000051
Chromium [mg/L]	03-Nov-10	16:42	< 0.0005	0.0009	0.0010	< 0.0005	0.0011	0.0013	0.0013	0.0007
Copper [mg/L]	03-Nov-10	16:42	0.0009	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005
Iron [mg/L]	03-Nov-10	09:21	0.069	0.094	0.115	0.127	0.116	0.186	< 0.002	< 0.002
Potassium [mg/L]	03-Nov-10	09:21	6.75	6.51	8.50	8.88	7.66	8.41	8.56	2.03
Lithium [mg/L]	03-Nov-10	16:42	0.006	0.006	0.011	0.016	0.012	0.010	0.009	0.004

OnLine LIMS

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: 10-TR-001 BH10-04**	**6: 10-TR-005 BH10-05**	**7: 10-TR-009 BH10-06**	**8: 10-TR-014 BH10-08**	**9: 10-TR-017 BH10-09**	**10: 10-TR-019 BH10-12**	**11: 10-TR-024 BH10-13**	**12: 10-TR-025 BH10-14**
Magnesium [mg/L]	03-Nov-10	09:21	0.245	0.477	0.370	0.788	0.345	0.422	7.40	2.55
Manganese [mg/L]	03-Nov-10	16:42	0.00225	0.00268	0.00279	0.00265	0.00308	0.00364	0.00037	0.00030
Molybdenum [mg/L]	03-Nov-10	16:42	0.00125	0.00096	0.00039	0.00084	0.00073	0.00432	0.00073	0.00048
Sodium [mg/L]	03-Nov-10	09:21	5.94	5.21	5.39	6.26	5.53	3.75	0.94	1.38
Nickel [mg/L]	03-Nov-10	16:42	0.0001	< 0.0001	0.0002	0.0002	0.0002	0.0006	0.0001	< 0.0001
Lead [mg/L]	03-Nov-10	16:42	0.00083	0.00029	0.00043	0.00013	0.00053	0.00046	< 0.00002	0.00002
Antimony [mg/L]	03-Nov-10	16:42	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	03-Nov-10	16:42	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin [mg/L]	03-Nov-10	16:42	0.00003	0.00004	0.00003	0.00003	0.00004	0.00002	< 0.00001	< 0.00001
Strontium [mg/L]	03-Nov-10	09:21	0.0105	0.0109	0.0123	0.0190	0.0109	0.0077	0.0224	0.139
Titanium [mg/L]	03-Nov-10	16:42	0.0037	0.0047	0.0118	0.0138	0.0134	0.0185	0.0003	< 0.0001
Thallium [mg/L]	03-Nov-10	16:42	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	03-Nov-10	16:42	0.00940	0.00860	0.00817	0.00277	0.00528	0.00242	0.000234	0.000071
Vanadium [mg/L]	03-Nov-10	16:42	0.00200	0.00268	0.00547	0.0111	0.00557	0.0129	0.00494	0.00084
Zinc [mg/L]	03-Nov-10	16:42	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.001	< 0.001	< 0.001

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Shake Flask DI Leach-24hr 3:1 L/S ratio

Thursday, November 04, 2010

Baffinland Iron Mines Corp
Attn : Michael Zurowski

1016-120 Adelaide Street West
Toronto, ON, M5H 1T1
Canada

Phone: 416-364-8820
Fax:pdf

Date Rec. : 28 October 2010
LR Report: **CA11411-OCT10**
Reference: PO#11758

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**13: 10-TR-029 BH10-15**	**14: 10-TR-033 BH10-16**	**15: 10-TR-035 BH10-12**	**16: S449-10**	**17: S454-10**	**18: S458-10**	**19: S461-10**
Sample Date & Time	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Sample [weight(g)]	250	250	250	250	250	250	250
Volume mL [D.I. H2O]	750	750	750	750	750	750	750
InitialpH [units]	9.60	9.64	9.74	9.46	7.44	9.53	9.31
Final pH [units]	8.95	9.03	9.67	8.94	7.90	9.30	9.27
Mercury [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum [mg/L]	0.16	0.10	1.42	0.04	0.50	0.21	0.25
Arsenic [mg/L]	0.0004	< 0.0002	0.0012	0.0008	0.0003	0.0014	0.0007
Barium [mg/L]	0.00170	0.00144	0.00449	0.00376	0.00406	0.00324	0.00388
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	12.2	11.4	1.29	11.3	4.61	9.28	13.0
Cadmium [mg/L]	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	0.000059	0.000054	0.000062	0.000080	0.000137	0.000045	0.000099
Chromium [mg/L]	0.0006	0.0006	0.0010	0.0027	0.0014	0.0006	0.0008
Copper [mg/L]	< 0.0005	< 0.0005	< 0.0005	0.0011	0.0023	0.0015	0.0484
Iron [mg/L]	< 0.002	< 0.002	0.233	0.010	0.169	0.004	0.059
Potassium [mg/L]	2.27	2.51	13.8	6.90	0.818	7.14	4.94
Lithium [mg/L]	0.005	0.006	0.003	0.028	< 0.001	0.004	0.010

OnLine LIMS

Shake Flask DI Leach-24hr 3:1 L/S ratio

LR Report : **CA11411-OCT10**

Analysis	**13: 10-TR-029 BH10-15**	**14: 10-TR-033 BH10-16**	**15: 10-TR-035 BH10-12**	**16: S449-10**	**17: S454-10**	**18: S458-10**	**19: S461-10**
Magnesium [mg/L]	2.74	3.71	0.321	11.3	1.73	3.42	3.83
Manganese [mg/L]	0.00065	0.00023	0.00330	0.00064	0.00898	0.00024	0.00165
Molybdenum [mg/L]	0.00207	0.00069	0.00118	0.00390	0.00053	0.00177	0.00226
Sodium [mg/L]	1.82	1.65	11.7	1.85	0.15	4.06	2.35
Nickel [mg/L]	0.0002	0.0001	0.0003	0.0004	0.0006	0.0002	0.0004
Lead [mg/L]	< 0.00002	< 0.00002	0.00032	< 0.00002	0.00079	< 0.00002	0.00015
Antimony [mg/L]	< 0.0002	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002	0.0013
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	0.00006
Strontium [mg/L]	0.121	0.120	0.0037	0.0422	0.0073	0.0217	0.0202
Titanium [mg/L]	0.0003	0.0001	0.0126	0.0008	0.0111	0.0001	0.0037
Thallium [mg/L]	0.00006	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	0.000095	0.000107	0.00143	0.000486	0.000243	0.000974	0.00225
Vanadium [mg/L]	0.00068	0.00042	0.00299	0.00112	0.00109	0.00456	0.00417
Zinc [mg/L]	< 0.001	0.001	< 0.001	< 0.001	0.001	< 0.001	0.001

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

Quantitative X-Ray Diffraction by Reitveld Refinement

Report Prepared for: *Enviromental - Analytical*

Project Number/ LIMS No. *Custom XRD/MI4500-NOV10*

Reporting Date: *November 10, 2010*

Instrument: BRUKER AXS D8 Advance Diffractometer

Test Conditions: Co radiation, 40 kV, 35 mA
Regular Scanning: Step: 0.02°, Step time: 1s, 2θ range: 3-80°

Interpretations : PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.

Detection Limit : 0.5-2%. Strongly dependent on crystallinity.

Contents:

Anita Coppaway
Mineralogical Technologist

Huyun Zhou, Ph.D.
Senior Mineralogist

Method Summary

Mineral Identification and Interpretation:

Mineral identification and interpretation involve matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Minerals or compounds identification and quantitative analysis results should be accompanied by supporting chemical assay data or other tests.

Rietveld Method Quantitative Analysis:

Whole-pattern Rietveld Method Quantitative Analysis is performed by using Topas 4.1 (Bruker AXS), a graphics based profile analysis program built around a general non-linear least squares fitting system, to determine the amount of different phases in a multicomponents sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental factors and specimen. Instead other peak intensity-based methods, the Rietveld method uses a least square approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Summary of Rietveld Quantitative Analysis X-ray Diffraction Results

Quantitative X-ray Diffraction Results

Mineral/Compound	**10-TR-001** **BH10-4** *NOV4500-1* (wt %)	**10-TR-005** **BH10-5** *NOV4500-2* (wt %)	**10-TR-009** **BH10-6** *NOV4500-3* (wt %)	**10-TR-014** **BH10-8** *NOV4500-4* (wt %)	**10-TR-017** **BH10-9** *NOV4500-5* (wt %)	**10-TR-019** **BH10-12** *NOV4500-6* (wt %)	**10-TR-024** **BH10-13** *NOV4500-7* (wt %)	**10-TR-025 BH10-14** *NOV4500-8* (wt %)
Quartz	34.4	38.1	34.2	33.6	32.5	30.4	56.3	0.3
Phlogopite	0.4	0.8	3.1	4.3	3.1	5.2	--	--
Biotite	--	--	--	--	--	--	--	--
Chlorite	1.3	1.4	0.0	0.0	0.0	0.9	--	--
Albite	33.4	30.9	35.0	29.7	36.6	27.7	1.2	--
Anorthite	4.2	4.7	5.7	7.4	5.4	8.4	--	--
Orthoclase	2.5	1.8	1.6	4.5	1.8	2.6	1.4	--
Microcline	21.8	20.7	16.5	16.8	16.2	10.8	15.2	--
Diopside	--	--	2.9	2.8	3.1	3.0	--	--
Magnetite	0.8	0.9	0.9	0.9	0.9	--	--	--
Actinolite	--	--	--	--	--	9.5	--	--
Calcite	1.2	0.6	0.1	0.0	0.3	0.2	--	99.3
Dolomite	--	--	--	--	--	0.5	25.9	0.3
Ankerite	--	--	--	--	--	--	--	0.1
Rhodochrosite	--	--	--	--	--	0.7	--	--
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Mineral/Compound	**10-TR-029** **BH10-15** *NOV4500-9* (wt %)	**10-TR-033** **BH10-16** *NOV4500-10* (wt %)	**10-TR-035** **BH10-12** *NOV4500-11* (wt %)	**S449-10** *NOV4500-12* (wt %)	**S454-10** *NOV4500-13* (wt %)	**S458-10** *NOV4500-14* (wt %)	**S461-10** *NOV4500-15* (wt %)
Quartz	0.7	0.8	42.6	9.7	98.8	33.0	28.5
Phlogopite	--	--	3.9	--	--	3.7	3.4
Biotite	--	--	3.4	--	--	--	--
Chlorite	--	--	4.1	2.6	0.3	0.5	1.6
Albite	--	--	12.4	1.1	0.7	22.7	25.2
Anorthite	--	--	5.7	--	--	5.1	3.5
Orthoclase	--	--	4.1	1.3	--	3.9	4.1
Microcline	--	--	19.5	4.6	--	18.3	12.8
Diopside	--	--	4.3	--	--	2.8	3.1
Magnetite	--	--	0.1	--	--	0.4	0.5
Actinolite	--	--	--	--	--	--	--
Calcite	98.9	98.3	--	22.6	0.2	0.1	2.2
Dolomite	0.3	0.6	--	46.4	--	6.2	11.5
Ankerite	0.1	0.3	--	11.7	--	3.3	3.0
Rhodochrosite	--	--	--	--	--	--	0.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Mineral/Compound	**Formula**
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$
Albite	$NaAlSi_3O_8$
Ankerite	$Ca(Mg, Fe)(CO_3)_2$
Anorthite	$CaAl_2Si_2O_8$
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$
Calcite	$CaCO_3$
Clinochlore	$(Mg, Fe)_5 (Si_3Al)O_{10}(OH)_8$
Diopside	$CaMgSi_2O_6$
Dolomite	$CaMg(CO_3)_2$
Magnetite	Fe_3O_4
Microcline	$KAlSi_3O_8$
Orthoclase	$KAlSi_3O_8$
Phlogopite	$KMg_3(AlSi_3O_{10})(OH)_3$
Quartz	SiO_2
Rhodochrosite	$MnCO_3$

Table 1 Acid Base Accounting Results

Sample ID	Drill Log Lithology	Sample weight(g)	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units	Fizz Rate ---	Paste pH units
10-TR-001 BH10-04	gneiss	2.05	20.00	0.10	0.10	16.77	1.36	1	9.56
10-TR-002 BH10-04	gneiss	2.01	20.00	0.10	0.10	16.75	1.39	1	9.92
10-TR-003 BH10-04	gneiss	1.98	20.00	0.10	0.10	16.50	1.39	1	9.58
10-TR-004 BH10-05	gneiss	2.03	20.00	0.10	0.10	17.00	1.40	1	9.79
10-TR-005 BH10-05	gneiss	1.97	20.00	0.10	0.10	17.41	1.38	1	9.76
10-TR-006 BH10-05	gneiss	2.03	20.00	0.10	0.10	17.48	1.38	1	9.73
10-TR-007 BH10-06	gneiss	1.98	20.00	0.10	0.10	17.03	1.39	1	9.78
10-TR-008 BH10-06	gneiss	2.01	20.00	0.10	0.10	17.05	1.42	1	9.65
10-TR-009 BH10-06	gneiss	1.98	20.00	0.10	0.10	16.95	1.41	1	9.90
10-TR-010 BH10-07	gneiss	2.00	20.00	0.10	0.10	16.18	1.46	1	9.98
10-TR-011 BH10-07	gneiss	1.98	20.00	0.10	0.10	15.37	1.50	1	9.66
10-TR-012 BH10-07	gneiss	1.96	20.00	0.10	0.10	15.48	1.43	1	9.90
10-TR-013 BH10-08	gneiss	2.00	20.00	0.10	0.10	17.47	1.38	1	9.68
10-TR-014 BH10-08	gneiss	2.04	20.00	0.10	0.10	16.10	1.44	1	9.46
10-TR-015 BH10-08	gneiss	2.04	20.00	0.10	0.10	15.75	1.46	1	9.52
10-TR-016 BH10-09	gneiss	1.98	20.00	0.10	0.10	17.53	1.40	1	10.00
10-TR-017 BH10-09	gneiss	2.04	20.00	0.10	0.10	17.10	1.41	1	9.91
10-TR-018 BH10-09	gneiss	1.99	20.00	0.10	0.10	17.36	1.37	1	9.99
10-TR-019 BH10-12	gneiss	2.05	20.00	0.10	0.10	16.74	1.42	1	9.94
10-TR-020 BH10-12	gneiss	1.98	20.00	0.10	0.10	15.89	1.44	1	9.93
10-TR-021 BH10-12	gneiss	2.04	20.00	0.10	0.10	16.43	1.42	1	9.84
10-TR-034 BH10-21	schist	1.97	20.00	0.10	0.10	15.09	1.26	2	9.97
10-TR-035 BH10-12	schist	2.02	20.00	0.10	0.10	15.86	1.26	1	9.80
10-TR-036 BH10-12	schist	2.03	20.00	0.10	0.10	15.76	1.17	1	9.67
10-TR-022 BH10-13	sandstone	2.01	118.20	0.10	0.10	26.10	1.70	3	9.43
10-TR-023 BH10-13	sandstone	2.00	127.75	0.10	0.10	27.00	1.76	3	9.34
10-TR-024 BH10-13	sandstone	1.95	135.60	0.10	0.10	29.10	1.75	3	9.38
10-TR-025 BH10-14	sandy carbonate	2.03	589.90	0.10	0.10	200	1.51	4	8.27
10-TR-026 BH10-14	sandy carbonate	2.02	643.90	0.10	0.10	268	1.52	4	8.07
10-TR-027 BH10-14	sandy carbonate	2.00	641.20	0.10	0.10	259	1.50	4	8.22
10-TR-028 BH10-15	carbonate	1.97	685.90	0.10	0.10	301	1.50	4	8.22
10-TR-029 BH10-15	carbonate	1.96	640.00	0.10	0.10	266	1.50	4	8.38
10-TR-030 BH10-15	carbonate	1.98	490.00	0.10	0.10	116	1.71	4	8.23
10-TR-031 BH10-16	carbonate	1.99	490.00	0.10	0.10	106	1.74	4	8.23
10-TR-032 BH10-16	carbonate	1.98	474.20	0.10	0.10	93.80	1.78	4	8.27
10-TR-033 BH10-16	carbonate	1.96	470.00	0.10	0.10	96.20	1.76	4	8.26
S449-10	sand/gravel	2.00	393.20	0.10	0.10	122	1.60	4	8.75
S450-10	sand/gravel	2.01	338.10	0.10	0.10	57.00	1.85	4	8.38
S451-10	sand/gravel	1.97	131.70	0.10	0.10	38.20	1.55	4	8.55
S452-10	sand/gravel	1.97	146.40	0.10	0.10	48.00	1.59	4	8.97
S453-10	sand/gravel	1.99	135.30	0.10	0.10	29.10	1.69	4	8.87
S454-10	sand/gravel	1.95	20.00	0.10	0.10	17.94	1.11	1	8.42
S455-10	sand/gravel	1.96	26.00	0.10	0.10	11.31	1.57	1	9.51
S456-10	sand/gravel	1.97	79.10	0.10	0.10	20.21	1.75	3	8.99
S457-10	sand/gravel	2.00	83.90	0.10	0.10	15.24	1.85	3	9.07
S458-10	sand/gravel	1.97	55.40	0.10	0.10	21.25	1.58	3	9.24
S459-10	sand/gravel	2.03	154.20	0.10	0.10	28.60	1.83	4	8.86
S460-10	sand/gravel	1.96	77.40	0.10	0.10	23.81	1.65	4	8.93
S461-10	sand/gravel	1.99	97.90	0.10	0.10	21.30	1.78	3	9.14
S462-10	sand/gravel	2.01	153.10	0.10	0.10	28.40	1.82	3	8.95

Table 1 Acid Base Accounting Results (Continued)

Sample ID	Drill Log Lithology	Total Carbon	CO3	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur	Neutralization Potential	Acid Potential
		%	%	%	%	%	kg $CaCO_3$/t	kg $CaCO_3$/t
10-TR-001 BH10-04	gneiss	0.059	0.103	0.014	0.01	<0.01	7.9	0.31
10-TR-002 BH10-04	gneiss	0.050	0.101	<0.005	<0.01	<0.01	8.1	0.31
10-TR-003 BH10-04	gneiss	0.064	0.137	<0.005	<0.01	<0.01	8.8	0.31
10-TR-004 BH10-05	gneiss	0.041	0.059	0.020	0.02	<0.01	7.4	0.31
10-TR-005 BH10-05	gneiss	0.032	0.033	0.015	0.01	<0.01	6.6	0.31
10-TR-006 BH10-05	gneiss	0.029	0.028	0.038	0.02	0.01	6.2	0.44
10-TR-007 BH10-06	gneiss	0.036	0.048	<0.005	<0.01	<0.01	7.5	0.31
10-TR-008 BH10-06	gneiss	0.028	0.025	0.008	<0.01	<0.01	7.3	0.31
10-TR-009 BH10-06	gneiss	0.035	0.075	0.006	<0.01	<0.01	7.7	0.31
10-TR-010 BH10-07	gneiss	0.027	0.014	0.035	0.02	0.01	9.5	0.36
10-TR-011 BH10-07	gneiss	0.038	0.027	0.036	0.04	<0.01	11.7	0.31
10-TR-012 BH10-07	gneiss	0.036	0.052	0.019	0.02	<0.01	11.5	0.31
10-TR-013 BH10-08	gneiss	0.028	0.035	<0.005	<0.01	<0.01	6.3	0.31
10-TR-014 BH10-08	gneiss	0.044	0.380	0.020	0.02	<0.01	9.6	0.31
10-TR-015 BH10-08	gneiss	0.043	0.062	0.028	0.03	<0.01	10.4	0.31
10-TR-016 BH10-09	gneiss	0.020	0.034	0.012	0.01	<0.01	6.2	0.31
10-TR-017 BH10-09	gneiss	0.070	0.048	0.012	0.01	<0.01	7.1	0.31
10-TR-018 BH10-09	gneiss	0.023	<0.005	0.038	0.04	<0.01	6.6	0.31
10-TR-019 BH10-12	gneiss	0.035	0.018	0.029	0.03	<0.01	8.0	0.31
10-TR-020 BH10-12	gneiss	0.051	0.071	0.028	0.02	0.01	10.4	0.40
10-TR-021 BH10-12	gneiss	0.046	0.065	0.006	<0.01	<0.01	8.8	0.31
10-TR-034 BH10-21	schist	0.096	0.282	0.015	0.02	<0.01	12.5	0.31
10-TR-035 BH10-12	schist	0.052	0.054	0.060	0.04	0.02	10.2	0.77
10-TR-036 BH10-12	schist	0.049	0.023	0.023	0.01	0.01	10.4	0.41
10-TR-022 BH10-13	sandstone	2.77	12.0	<0.005	<0.01	<0.01	229	0.31
10-TR-023 BH10-13	sandstone	2.98	12.5	<0.005	<0.01	<0.01	252	0.31
10-TR-024 BH10-13	sandstone	3.25	14.0	<0.005	<0.01	<0.01	273	0.31
10-TR-025 BH10-14	sandy carbonate	11.1	54.3	<0.005	<0.01	<0.01	959	0.31
10-TR-026 BH10-14	sandy carbonate	10.8	52.3	<0.005	<0.01	<0.01	930	0.31
10-TR-027 BH10-14	sandy carbonate	11.2	54.0	0.071	0.03	0.04	956	1.29
10-TR-028 BH10-15	carbonate	10.9	53.2	0.014	0.01	<0.01	978	0.31
10-TR-029 BH10-15	carbonate	10.7	51.3	0.041	0.02	0.02	953	0.77
10-TR-030 BH10-15	carbonate	10.7	51.5	0.020	<0.01	0.01	945	0.34
10-TR-031 BH10-16	carbonate	10.8	53.5	<0.005	<0.01	<0.01	965	0.31
10-TR-032 BH10-16	carbonate	10.7	52.9	<0.005	<0.01	<0.01	961	0.31
10-TR-033 BH10-16	carbonate	10.7	52.1	<0.005	<0.01	<0.01	954	0.31
S449-10	sand/gravel	7.86	33.9	0.011	0.01	<0.01	678	0.31
S450-10	sand/gravel	8.02	36.0	<0.005	<0.01	<0.01	699	0.31
S451-10	sand/gravel	2.92	11.7	<0.005	<0.01	<0.01	237	0.31
S452-10	sand/gravel	2.89	12.4	0.014	0.01	<0.01	250	0.31
S453-10	sand/gravel	3.22	13.9	<0.005	<0.01	<0.01	267	0.31
S454-10	sand/gravel	0.061	0.016	<0.005	<0.01	<0.01	5.3	0.31
S455-10	sand/gravel	0.410	0.255	<0.005	<0.01	<0.01	37.5	0.31
S456-10	sand/gravel	1.82	6.20	0.007	<0.01	<0.01	150	0.31
S457-10	sand/gravel	1.44	5.37	<0.005	<0.01	<0.01	172	0.31
S458-10	sand/gravel	1.12	4.17	0.007	<0.01	<0.01	86.7	0.31
S459-10	sand/gravel	3.87	16.2	<0.005	<0.01	<0.01	309	0.31
S460-10	sand/gravel	1.71	7.29	<0.005	<0.01	<0.01	137	0.31
S461-10	sand/gravel	2.33	10.2	0.005	<0.01	<0.01	192	0.31
S462-10	sand/gravel	3.75	16.7	0.007	<0.01	<0.01	310	0.31

Table 1 Acid Base
Accounting Results (Continued)

Sample ID	Drill Log Lithology	Maximum Potential Acidity kg $CaCO_3$/t	Carbonate Neutralization Potential kg $CaCO_3$/t	Ratio NP/AP ratio	Ratio NP/MPA ratio	Ratio CaNP/AP ratio	Net NP kg $CaCO_3$/t
10-TR-001 BH10-04	gneiss	0.44	4.92	25.5	18.1	15.9	7.59
10-TR-002 BH10-04	gneiss	0.16	4.17	26.1	51.8	13.4	7.79
10-TR-003 BH10-04	gneiss	0.16	5.33	28.4	56.3	17.2	8.49
10-TR-004 BH10-05	gneiss	0.63	3.42	23.9	11.8	11.0	7.09
10-TR-005 BH10-05	gneiss	0.47	2.67	21.3	14.1	8.6	6.29
10-TR-006 BH10-05	gneiss	1.19	2.42	14.2	5.2	5.5	5.76
10-TR-007 BH10-06	gneiss	0.16	3.00	24.2	48.0	9.7	7.19
10-TR-008 BH10-06	gneiss	0.25	2.33	23.5	29.2	7.5	6.99
10-TR-009 BH10-06	gneiss	0.19	2.92	24.8	41.1	9.4	7.39
10-TR-010 BH10-07	gneiss	1.09	2.25	26.2	8.7	6.3	9.14
10-TR-011 BH10-07	gneiss	1.13	3.17	37.7	10.4	10.2	11.4
10-TR-012 BH10-07	gneiss	0.59	3.00	37.1	19.4	9.7	11.2
10-TR-013 BH10-08	gneiss	0.16	2.33	20.3	40.3	7.5	5.99
10-TR-014 BH10-08	gneiss	0.63	3.67	31.0	15.4	11.8	9.29
10-TR-015 BH10-08	gneiss	0.88	3.58	33.5	11.9	11.6	10.1
10-TR-016 BH10-09	gneiss	0.38	1.67	20.0	16.5	5.4	5.89
10-TR-017 BH10-09	gneiss	0.38	5.83	22.9	18.9	18.8	6.79
10-TR-018 BH10-09	gneiss	1.19	1.92	21.3	5.6	6.2	6.29
10-TR-019 BH10-12	gneiss	0.91	2.92	25.8	8.8	9.4	7.69
10-TR-020 BH10-12	gneiss	0.88	4.25	26.0	11.9	10.6	10.0
10-TR-021 BH10-12	gneiss	0.19	3.83	28.4	46.9	12.4	8.49
10-TR-034 BH10-21	schist	0.47	8.00	40.3	26.7	25.8	12.2
10-TR-035 BH10-12	schist	1.88	4.33	13.3	5.4	5.6	9.43
10-TR-036 BH10-12	schist	0.72	4.08	25.6	14.5	10.0	9.99
10-TR-022 BH10-13	sandstone	0.16	230.85	739	1465.6	744.7	229
10-TR-023 BH10-13	sandstone	0.16	248.35	813	1612.8	801.1	252
10-TR-024 BH10-13	sandstone	0.16	270.85	881	1747.2	873.7	273
10-TR-025 BH10-14	sandy carbonate	0.16	925.06	3095	6137.6	2984.1	959
10-TR-026 BH10-14	sandy carbonate	0.16	900.06	2998	5952.0	2903.4	929
10-TR-027 BH10-14	sandy carbonate	2.22	933.40	742	430.9	723.6	955
10-TR-028 BH10-15	carbonate	0.44	908.39	3155	2235.4	2930.3	978
10-TR-029 BH10-15	carbonate	1.28	891.73	1245	743.8	1158.1	952
10-TR-030 BH10-15	carbonate	0.63	891.73	2749	1512.0	2622.7	945
10-TR-031 BH10-16	carbonate	0.16	900.06	3114	6176.0	2903.4	965
10-TR-032 BH10-16	carbonate	0.16	891.73	3099	6150.4	2876.5	960
10-TR-033 BH10-16	carbonate	0.16	891.73	3076	6105.6	2876.5	953
S449-10	sand/gravel	0.34	655.04	2185	1972.4	2113.0	677
S450-10	sand/gravel	0.16	668.38	2256	4473.6	2156.1	699
S451-10	sand/gravel	0.16	243.35	765	1516.8	785.0	237
S452-10	sand/gravel	0.44	240.85	805	571.4	776.9	249
S453-10	sand/gravel	0.16	268.35	861	1708.8	865.6	266
S454-10	sand/gravel	0.16	5.08	17.1	33.9	16.4	4.99
S455-10	sand/gravel	0.16	34.17	121	240.0	110.2	37.2
S456-10	sand/gravel	0.22	151.68	482	685.7	489.3	149
S457-10	sand/gravel	0.16	120.01	554	1100.8	387.1	171
S458-10	sand/gravel	0.22	93.34	280	396.3	301.1	86.4
S459-10	sand/gravel	0.16	322.52	998	1977.6	1040.4	309
S460-10	sand/gravel	0.16	142.51	441	876.8	459.7	136
S461-10	sand/gravel	0.16	194.18	621	1228.8	626.4	192
S462-10	sand/gravel	0.22	312.52	1001	1417.1	1008.1	310

Note:

CaNP = Carbonate neutralization potential was calculated based on total carbon content (%C)

MPA = Maximum potential acidity was calculated based on total sulphur content (%S)

Table 2 Statistical Summary of Acid Base Accounting Results

	Paste pH	Total Carbon %	Total Sulphur %	Sulphate Sulphur %	Sulphide Sulphur %	Neutral-ization Potential kg $CaCO_3$/t	Acid Potential kg $CaCO_3$/t	CaNP kg $CaCO_3$/t	Maximum Potential Acidity kg $CaCO_3$/t	Ratio NP/AP (NPR) calculated ratio	Ratio NP/MPA calculated ratio	Ratio CaNP/AP calculated ratio
All Quarry Pit Rock (gneiss, schist, carbonate rocks)												
Min	8.1	0.02	<0.005	<0.01	<0.01	6.2	0.31	1.7	0.16	13	5.2	5.4
Max	10	11	0.071	0.04	0.04	978	1.29	933	2.2	3155	6176	2984
Mean	-	2.99	0.019	0.02	0.01	266	0.37	249	0.58	710	458	666
Median	9.7	0.1	<0.014	<0.01	<0.01	10.3	0.31	4.2	0.44	33	24	13.6
Standard Deviation	0.7	4.7	0.016	0.01	0.01	410	0.19	389	0.51	1191	2111	1130
No. of Samples	36	36	36	36	36	36	36	36	36	36	36	36
5th Percentile	8.2	0.026	0.005	0.01	0.01	6.3	0.31	2.2	0.16	19	5.5	5.6
25th Percentile	9.1	0.036	0.005	0.01	0.01	7.7	0.31	3.0	0.16	24	14	9.4
75th Percentile	9.9	5.1	0.028	0.02	0.01	437	0.31	426	0.88	830	1477	819
95th Percentile	10	11	0.046	0.04	0.02	962	0.77	913	1.43	3103	6141	2910
Gneiss												
Min	9.5	0.02	<0.005	<0.01	<0.01	6.2	0.31	1.7	0.16	14	5.2	5.4
Max	10	0.07	0.038	0.04	0.01	11.7	0.44	5.8	1.19	38	56	19
Mean	-	0.04	0.018	0.02	0.01	8.3	0.32	3.3	0.57	26	14	10
Median	9.8	0.04	0.015	<0.01	<0.01	7.9	0.31	3.0	0.47	25	17	9.7
Standard Deviation	0.17	0.01	0.012	0.01	0.00	1.7	0.03	1.1	0.38	5.6	17	3.7
No. of Samples	21	21	21	21	21	21	21	21	21	21	21	21
5th Percentile	9.5	0.02	0.005	0.01	0.01	6.2	0.31	1.9	0.16	20	5.6	5.5
25th Percentile	9.7	0.03	0.006	0.01	0.01	7.1	0.31	2.4	0.19	23	12	7.5
75th Percentile	9.9	0.05	0.028	0.02	0.01	9.5	0.31	3.8	0.88	28	40	12
95th Percentile	10	0.06	0.038	0.04	0.01	12	0.40	5.3	1.19	37	52	17
Schist												
Min	9.7	0.05	0.015	<0.01	<0.01	10	0.31	4.1	0.47	13.3	5.4	5.6
Max	10	0.10	0.060	0.04	0.02	13	0.77	8.0	1.88	40	27	26
Median	9.8	0.05	0.023	0.02	0.01	10	0.41	4.3	0.72	26	14	10
No. of Samples	3	3	3	3	3	3	3.00	3	3.00	3	3	3

Table 2 Statistical Summary of Acid Base Accounting Results (Continued)

	Paste pH	Total Carbon	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur	Neutral-ization Potential	Acid Potential	CaNP	Maximum Potential Acidity	Ratio NP/AP (NPR)	Ratio NP/MPA	Ratio CaNP/AP
		%	%	%	%	kg $CaCO_3$/t	kg $CaCO_3$/t	kg $CaCO_3$/t	kg $CaCO_3$/t	calculated ratio		
Carbonate Rocks												
Min	8.1	2.8	<0.005	<0.01	<0.01	229	0.31	231	0.16	739	431	724
Max	9.4	11	0.071	0.03	0.04	978	1.29	933	2.2	3155	6176	2984
Mean	-	8.9	0.016	0.01	0.01	780	0.43	740	0.48	1803	1609	1712
Median	8.3	11	<0.005	<0.01	<0.01	954	0.31	892	0.16	3076	6102	2877
Standard Deviation	0.5	3.6	0.021	0.01	0.01	319	0.30	296	0.64	1122	2469	1044
No. of Samples	12	12	12	12	12	12	12	12	12	12	12	12
5th Percentile	8.2	2.9	0.005	0.01	0.01	242	0.31	240	0.16	741	603	735
25th Percentile	8.2	8.8	0.005	0.01	0.01	766	0.31	737	0.16	864	1500	856
75th Percentile	8.2	11	0.005	0.01	0.01	932	0.31	892	0.16	930	1526	912
95th Percentile	9.4	11	0.055	0.02	0.03	971	1.00	929	1.70	3132	6162	2954
Unconsolidated Borrow Material												
Min	8.4	0.1	<0.005	<0.01	<0.01	5.3	0.31	5.1	0.16	17	34	16
Max	9.5	8.0	0.014	0.01	0.01	699	0.31	668	0.44	2256	4474	2156
Mean	-	3.0	0.0065	0.01	0.01	252	0.31	247	0.20	813	1241	795
Median	8.9	2.6	<0.005	<0.01	<0.01	215	0.31	218	0.16	692	1373	702
Standard Deviation	0.3	2.4	0	0	0	207	0	200	0.09	667	1105	646
No. of Samples	14	14	14	14	14	14	14	14	14	14	14	14
5th Percentile	8.4	0.3	0.005	0.01	0.01	26	0.31	24	0.16	85	168	77
25th Percentile	8.8	1.5	0.005	0.01	0.01	140	0.31	126	0.16	451	600	405
75th Percentile	8.9	2.2	0.005	0.01	0.01	185	0.31	180	0.16	598	1024	579
95th Percentile	9.3	7.9	0.012	0.01	0.01	685	0.31	660	0.38	2210	2851	2128

Note:

CaNP = Carbonate neutralization potential was calculated based on total carbon content (%C)

MPA = Maximum potential acidity was calculated based on total sulphur content (%S)

Table 3 Results of Metals Analyses

Sample ID	Drill Log Lithology	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
		%	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g
Average Crustal Abundance		8.23	1.8	425	3	0.0085	4.15	0.15	25	102	60
10x Average Crustal Abundance		82.3	18	4250	30	0.085	41.5	1.5	250	1020	600
10-TR-001 BH10-04	gneiss	0.33	<0.5	21	0.13	<0.09	0.12	<0.02	1.2	100	18
10-TR-002 BH10-04	gneiss	0.36	<0.5	23	0.15	<0.09	0.13	<0.02	1.1	99	5.0
10-TR-003 BH10-04	gneiss	0.35	<0.5	24	0.13	<0.09	0.14	<0.02	1.1	110	8.5
10-TR-004 BH10-05	gneiss	0.41	<0.5	23	0.17	<0.09	0.11	<0.02	1.5	91	2.9
10-TR-005 BH10-05	gneiss	0.39	<0.5	27	0.15	<0.09	0.07	<0.02	1.3	110	8.1
10-TR-006 BH10-05	gneiss	0.37	<0.5	20	0.18	<0.09	0.06	<0.02	1.3	87	3.2
10-TR-007 BH10-06	gneiss	0.43	<0.5	23	0.20	<0.09	0.10	<0.02	2.0	110	5.2
10-TR-008 BH10-06	gneiss	0.50	<0.5	25	0.29	<0.09	0.10	<0.02	2.3	110	6.6
10-TR-009 BH10-06	gneiss	0.49	<0.5	39	0.19	<0.09	0.14	<0.02	2.5	94	8.4
10-TR-010 BH10-07	gneiss	0.78	<0.5	68	0.25	<0.09	0.29	<0.02	5.2	92	17
10-TR-011 BH10-07	gneiss	1.20	<0.5	110	0.40	0.09	0.36	<0.02	8.0	75	17
10-TR-012 BH10-07	gneiss	1.10	<0.5	57	0.27	0.10	0.36	<0.02	9.9	110	16
10-TR-013 BH10-08	gneiss	0.32	<0.5	23	0.16	<0.09	0.07	<0.02	1.4	110	5.3
10-TR-014 BH10-08	gneiss	0.85	<0.5	64	0.49	<0.09	0.21	<0.02	4.4	79	10
10-TR-015 BH10-08	gneiss	1.00	<0.5	78	0.48	<0.09	0.23	<0.02	5.9	78	12
10-TR-016 BH10-09	gneiss	0.43	<0.5	33	0.14	<0.09	0.09	<0.02	2.4	82	4.3
10-TR-017 BH10-09	gneiss	0.45	<0.5	33	0.17	<0.09	0.14	<0.02	2.6	100	7.2
10-TR-018 BH10-09	gneiss	0.39	<0.5	32	0.14	0.13	0.11	0.05	4.9	81	12
10-TR-019 BH10-12	gneiss	0.59	<0.5	30	0.17	<0.09	0.26	<0.02	5.7	100	28
10-TR-020 BH10-12	gneiss	0.83	<0.5	51	0.18	<0.09	0.23	<0.02	6.1	100	14
10-TR-021 BH10-12	gneiss	0.49	<0.5	24	0.15	<0.09	0.19	<0.02	2.8	100	8.8
10-TR-034 BH10-21	schist	0.74	<0.5	36	0.17	<0.09	0.30	<0.02	2.2	67	6.3
10-TR-035 BH10-12	schist	1.10	<0.5	35	0.27	0.09	0.18	0.03	3.6	69	13
10-TR-036 BH10-12	schist	1.30	1.1	37	0.41	<0.09	0.14	<0.02	3.6	70	8.0
10-TR-022 BH10-13	carbonate rocks	0.05	<0.5	5.5	0.06	<0.09	3.9	<0.02	1.3	99	5.0
10-TR-023 BH10-13	carbonate rocks	0.31	<0.5	16	0.32	<0.09	4.1	0.03	2.1	96	6.1
10-TR-024 BH10-13	carbonate rocks	0.23	<0.5	13	0.22	<0.09	4.8	0.02	1.5	82	2.0
10-TR-025 BH10-14	carbonate rocks	0.08	<0.5	3.0	0.06	<0.09	28.8	<0.02	1.6	2.2	4.0
10-TR-026 BH10-14	carbonate rocks	0.16	0.7	5.3	0.14	<0.09	28.3	0.06	2.1	3.4	3.9
10-TR-027 BH10-14	carbonate rocks	0.08	0.5	2.7	0.06	<0.09	27.0	<0.02	1.6	2.6	4.3
10-TR-028 BH10-15	carbonate rocks	0.08	0.6	3.4	0.07	<0.09	28.2	<0.02	1.7	4.1	2.2
10-TR-029 BH10-15	carbonate rocks	0.12	1.8	4.5	0.08	<0.09	26.7	<0.02	1.9	2.2	4.5
10-TR-030 BH10-15	carbonate rocks	0.13	1.2	4.2	0.08	<0.09	28.4	<0.02	2.0	2.6	5.4
10-TR-031 BH10-16	carbonate rocks	0.08	<0.5	3.2	0.06	<0.09	27.4	<0.02	1.7	2.1	2.0
10-TR-032 BH10-16	carbonate rocks	0.08	1.2	3.1	0.07	<0.09	27.3	<0.02	1.7	2.2	3.9
10-TR-033 BH10-16	carbonate rocks	0.13	1.1	3.9	0.07	<0.09	27.5	<0.02	1.9	2.6	2.4
S449-10	borrow pit material	0.26	1.7	11	0.18	<0.09	13.4	0.03	2.9	39	8.1
S450-10	borrow pit material	0.12	<0.5	6.7	0.09	<0.09	17.2	<0.02	1.9	30	3.5
S451-10	borrow pit material	0.29	0.8	16	0.20	<0.09	4.0	0.03	3.0	89	12
S452-10	borrow pit material	0.39	<0.5	29	0.18	<0.09	5.0	<0.02	3.2	64	8.3
S453-10	borrow pit material	0.20	1.2	16	0.27	<0.09	4.8	0.02	3.4	79	7.5
S454-10	borrow pit material	0.08	<0.5	5.0	0.03	<0.09	0.1	<0.02	0.73	110	2.0
S455-10	borrow pit material	0.24	<0.5	20	0.12	<0.09	0.6	0.02	7.0	170	10
S456-10	borrow pit material	0.35	<0.5	16	0.21	<0.09	3.6	<0.02	2.0	75	6.9
S457-10	borrow pit material	0.39	<0.5	25	0.25	<0.09	2.4	<0.02	2.5	90	4.3
S458-10	borrow pit material	0.38	0.7	25	0.21	<0.09	1.8	<0.02	2.0	82	6.7
S459-10	borrow pit material	0.18	<0.5	9.6	0.14	<0.09	7.4	<0.02	1.7	68	4.2
S460-10	borrow pit material	0.20	<0.5	12	0.13	<0.09	3.6	<0.02	1.5	93	19
S461-10	borrow pit material	0.29	<0.5	15	0.17	<0.09	3.6	<0.02	1.8	74	38
S462-10	borrow pit material	0.25	<0.5	14	0.19	<0.09	6.2	<0.02	1.8	73	8.7

Table 3 Results of Metals Analyses
(Continued)

Sample ID	Drill Log	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb
	Lithology	%	%	µg/g	%	µg/g	µg/g	%	µg/g	µg/g	µg/g
Average Crustal Abundance		5.63	2.085	20	2.33	950	1.2	2.355	84	1050	14
10x Average Crustal Abundance		56.3	20.85	200	23.3	9500	12	23.55	840	10500	140
10-TR-001 BH10-04	gneiss	0.71	0.15	15	0.12	150	0.4	0.05	3.9	25	11
10-TR-002 BH10-04	gneiss	0.66	0.17	18	0.13	180	0.4	0.05	4.1	28	9.3
10-TR-003 BH10-04	gneiss	0.76	0.17	14	0.13	160	0.4	0.05	3.9	47	7.1
10-TR-004 BH10-05	gneiss	0.88	0.17	13	0.20	200	0.4	0.05	3.8	140	5.4
10-TR-005 BH10-05	gneiss	0.82	0.16	11	0.16	190	0.3	0.05	4.3	67	4.1
10-TR-006 BH10-05	gneiss	0.75	0.11	10	0.16	170	0.6	0.05	3.7	61	4.0
10-TR-007 BH10-06	gneiss	0.88	0.24	15	0.22	140	0.3	0.05	3.8	210	4.2
10-TR-008 BH10-06	gneiss	0.93	0.19	15	0.29	160	0.2	0.05	3.7	230	3.8
10-TR-009 BH10-06	gneiss	1.20	0.33	19	0.24	160	0.2	0.05	4.3	270	6.5
10-TR-010 BH10-07	gneiss	1.90	0.56	23	0.50	280	0.4	0.06	5.6	630	9.3
10-TR-011 BH10-07	gneiss	2.60	0.71	36	0.93	300	0.5	0.05	7.1	1000	2.8
10-TR-012 BH10-07	gneiss	1.86	0.72	34	1.10	290	2.1	0.06	25	440	3.2
10-TR-013 BH10-08	gneiss	0.83	0.17	11	0.16	150	0.3	0.05	3.4	92	5.3
10-TR-014 BH10-08	gneiss	1.40	0.49	26	0.59	240	0.4	0.04	4.9	490	2.5
10-TR-015 BH10-08	gneiss	1.70	0.70	29	0.76	320	0.2	0.04	5.3	670	2.0
10-TR-016 BH10-09	gneiss	1.00	0.28	17	0.23	150	2.5	0.05	3.2	230	6.6
10-TR-017 BH10-09	gneiss	1.20	0.30	20	0.25	180	1.1	0.05	4.2	260	5.8
10-TR-018 BH10-09	gneiss	0.95	0.28	13	0.20	140	1.5	0.05	3.4	220	29
10-TR-019 BH10-12	gneiss	1.10	0.35	10	0.46	180	1.0	0.06	20	160	5.0
10-TR-020 BH10-12	gneiss	1.90	0.54	20	0.64	280	6.8	0.05	15	220	6.8
10-TR-021 BH10-12	gneiss	1.40	0.27	9	0.30	140	3.4	0.05	5.0	250	12
10-TR-034 BH10-21	schist	1.10	0.54	8	0.41	250	0.4	0.03	2.9	120	3.2
10-TR-035 BH10-12	schist	1.60	0.60	12	0.74	280	0.2	0.03	3.1	260	3.3
10-TR-036 BH10-12	schist	1.80	0.50	17	1.00	280	0.4	0.03	3.8	120	1.7
10-TR-022 BH10-13	carbonate rocks	0.40	0.04	<2	2.20	270	0.5	0.01	5.0	370	0.83
10-TR-023 BH10-13	carbonate rocks	0.73	0.17	18	2.60	280	0.4	0.01	8.9	540	0.98
10-TR-024 BH10-13	carbonate rocks	0.58	0.14	13	2.80	340	<0.1	0.02	7.0	1090	0.89
10-TR-025 BH10-14	carbonate rocks	0.16	0.03	<2	0.65	70	<0.1	0.02	14	21	1.0
10-TR-026 BH10-14	carbonate rocks	0.28	0.04	<2	0.41	120	<0.1	0.01	15	43	1.6
10-TR-027 BH10-14	carbonate rocks	0.17	0.03	<2	1.30	71	<0.1	0.01	14	42	1.1
10-TR-028 BH10-15	carbonate rocks	0.19	0.03	<2	0.95	77	<0.1	0.02	14	78	1.3
10-TR-029 BH10-15	carbonate rocks	0.25	0.04	2	0.57	170	<0.1	0.02	15	85	2.0
10-TR-030 BH10-15	carbonate rocks	0.25	0.04	3	0.66	120	<0.1	0.02	15	86	1.6
10-TR-031 BH10-16	carbonate rocks	0.17	0.03	<2	0.98	66	<0.1	0.02	14	57	1.2
10-TR-032 BH10-16	carbonate rocks	0.18	0.03	<2	0.98	62	<0.1	0.02	14	70	1.4
10-TR-033 BH10-16	carbonate rocks	0.26	0.05	3	0.86	89	<0.1	0.02	15	92	1.8
S449-10	borrow pit material	0.59	0.18	24	4.90	140	0.5	0.02	11	130	4.3
S450-10	borrow pit material	0.34	0.07	<2	2.90	100	0.2	0.02	10	120	1.9
S451-10	borrow pit material	0.74	0.12	5	2.50	130	0.3	0.02	10	230	7.0
S452-10	borrow pit material	0.99	0.24	10	2.10	140	0.2	0.03	6.9	200	3.8
S453-10	borrow pit material	0.89	0.09	4	2.80	270	0.1	0.02	8.6	830	2.1
S454-10	borrow pit material	0.30	0.03	<2	0.03	25	0.4	0.01	3.4	16	0.75
S455-10	borrow pit material	1.10	0.09	2	1.20	120	0.3	0.02	110	130	2.7
S456-10	borrow pit material	0.79	0.13	9	1.10	140	0.5	0.03	5.2	140	3.5
S457-10	borrow pit material	0.81	0.15	11	1.20	130	0.2	0.03	5.7	140	3.7
S458-10	borrow pit material	0.87	0.16	9	1.00	130	0.4	0.03	5.1	240	4.5
S459-10	borrow pit material	0.50	0.07	5	2.00	94	0.3	0.02	6.3	120	2.2
S460-10	borrow pit material	0.53	0.09	3	0.77	74	0.6	0.02	5.5	140	2.0
S461-10	borrow pit material	0.70	0.12	8	1.90	130	0.3	0.03	4.6	170	3.8
S462-10	borrow pit material	0.63	0.11	7	2.70	100	0.3	0.02	6.6	110	3.3

Table 3 Results of Metals Analyses
(Continued)

Sample ID	Drill Log Lithology	Sb µg/g	Se µg/g	Si µg/g	Sn µg/g	Sr µg/g	Ti %	Tl µg/g	U µg/g	V µg/g	Y µg/g	Zn µg/g
Average Crustal Abundance		0.2	0.05	281500	2.3	370	0.565	0.85	2.7	120	33	70
10x Average Crustal Abundance		2	0.5	2815000	23	3700	5.65	8.5	27	1200	330	700
10-TR-001 BH10-04	gneiss	<0.8	0.8	530	<0.5	6.6	0.02	0.07	4.8	3	2.0	20
10-TR-002 BH10-04	gneiss	<0.8	<0.7	450	<0.5	6.6	0.02	0.09	5.2	3	2.2	20
10-TR-003 BH10-04	gneiss	<0.8	<0.7	480	<0.5	6.2	0.02	0.08	4.4	3	2.4	21
10-TR-004 BH10-05	gneiss	<0.8	<0.7	440	<0.5	5.6	0.02	0.10	5.2	5	4.1	21
10-TR-005 BH10-05	gneiss	<0.8	<0.7	460	<0.5	6.3	0.02	0.07	2.8	3	2.7	22
10-TR-006 BH10-05	gneiss	<0.8	<0.7	440	<0.5	5.6	0.01	0.06	13	3	3.9	18
10-TR-007 BH10-06	gneiss	<0.8	<0.7	490	<0.5	6.5	0.04	0.12	2.1	9	4.1	24
10-TR-008 BH10-06	gneiss	<0.8	<0.7	560	<0.5	6.2	0.03	0.10	2.7	10	4.9	27
10-TR-009 BH10-06	gneiss	<0.8	<0.7	530	0.6	7.6	0.06	0.23	6.0	14	6.7	31
10-TR-010 BH10-07	gneiss	<0.8	<0.7	700	1.2	13	0.17	0.38	4.5	32	16	46
10-TR-011 BH10-07	gneiss	<0.8	<0.7	650	0.8	14	0.19	0.44	4.0	48	14	49
10-TR-012 BH10-07	gneiss	<0.8	<0.7	780	<0.5	7.3	0.14	0.48	3.5	43	9.8	36
10-TR-013 BH10-08	gneiss	<0.8	<0.7	500	<0.5	6.6	0.03	0.07	2.5	5	3.3	19
10-TR-014 BH10-08	gneiss	<0.8	<0.7	690	<0.5	8.5	0.09	0.31	4.7	22	7.1	34
10-TR-015 BH10-08	gneiss	<0.8	<0.7	610	<0.5	8.2	0.13	0.46	3.1	28	8.2	50
10-TR-016 BH10-09	gneiss	<0.8	<0.7	470	<0.5	6.6	0.06	0.17	2.6	13	3.7	23
10-TR-017 BH10-09	gneiss	<0.8	<0.7	460	0.6	7.1	0.07	0.19	4.2	15	4.7	31
10-TR-018 BH10-09	gneiss	<0.8	<0.7	520	<0.5	8.1	0.06	0.22	9.6	12	5.5	29
10-TR-019 BH10-12	gneiss	<0.8	<0.7	470	<0.5	6.8	0.08	0.19	2.9	19	3.5	24
10-TR-020 BH10-12	gneiss	<0.8	<0.7	600	1.2	9.7	0.12	0.31	4.0	30	3.4	38
10-TR-021 BH10-12	gneiss	<0.8	<0.7	600	0.8	17	0.07	0.13	4.9	12	8.2	31
10-TR-034 BH10-21	schist	<0.8	1.5	540	<0.5	5.8	0.06	0.21	2.2	6	3.9	23
10-TR-035 BH10-12	schist	<0.8	2.2	590	<0.5	4.8	0.06	0.21	2.3	6	7.4	26
10-TR-036 BH10-12	schist	<0.8	0.9	630	<0.5	3.4	0.03	0.15	2.2	7	5.2	28
10-TR-022 BH10-13	carbonate rocks	<0.8	<0.7	270	<0.5	14	0.00	0.02	0.31	7	2.3	2.2
10-TR-023 BH10-13	carbonate rocks	<0.8	<0.7	590	<0.5	24	0.02	0.04	0.40	11	5.0	9.9
10-TR-024 BH10-13	carbonate rocks	<0.8	1.0	450	<0.5	22	0.01	0.02	0.41	7	9.1	5.8
10-TR-025 BH10-14	carbonate rocks	<0.8	<0.7	390	<0.5	290	0.00	<0.02	0.30	4	1.5	4.0
10-TR-026 BH10-14	carbonate rocks	<0.8	<0.7	420	<0.5	300	0.00	<0.02	0.34	5	4.0	6.4
10-TR-027 BH10-14	carbonate rocks	<0.8	0.9	350	<0.5	280	0.00	<0.02	0.34	4	1.6	4.5
10-TR-028 BH10-15	carbonate rocks	<0.8	0.9	530	<0.5	270	0.00	<0.02	0.34	4	2.2	3.3
10-TR-029 BH10-15	carbonate rocks	<0.8	1.0	340	<0.5	240	0.00	<0.02	0.39	5	2.8	6.1
10-TR-030 BH10-15	carbonate rocks	<0.8	1.0	430	<0.5	290	0.00	<0.02	0.33	5	2.9	6.2
10-TR-031 BH10-16	carbonate rocks	<0.8	1.5	440	<0.5	270	0.00	<0.02	0.28	4	1.8	3.0
10-TR-032 BH10-16	carbonate rocks	<0.8	1.8	400	<0.5	260	0.00	<0.02	0.32	4	2.2	5.0
10-TR-033 BH10-16	carbonate rocks	<0.8	1.0	420	<0.5	270	0.00	<0.02	0.34	5	2.7	3.9
S449-10	borrow pit material	<0.8	2.1	520	<0.5	85	0.01	0.05	0.37	12	3.5	9.6
S450-10	borrow pit material	<0.8	0.9	350	<0.5	130	0.01	0.03	0.36	7	2.1	4.4
S451-10	borrow pit material	<0.8	1.2	470	<0.5	18	0.03	0.07	0.47	13	4.4	14
S452-10	borrow pit material	<0.8	1.1	530	0.7	31	0.05	0.11	1.2	15	3.2	18
S453-10	borrow pit material	<0.8	1.7	430	<0.5	21	0.01	<0.02	0.57	10	3.4	7.7
S454-10	borrow pit material	<0.8	1.9	310	<0.5	2.2	0.00	<0.02	0.24	1	0.60	1.7
S455-10	borrow pit material	<0.8	2.0	610	<0.5	5.3	0.02	0.03	0.71	8	2.2	13
S456-10	borrow pit material	<0.8	1.8	370	0.6	27	0.02	0.06	1.7	9	3.8	17
S457-10	borrow pit material	<0.8	1.4	440	<0.5	18	0.02	0.07	2.3	10	4.3	14
S458-10	borrow pit material	<0.8	2.0	520	0.6	13	0.03	0.08	2.6	9	4.8	18
S459-10	borrow pit material	<0.8	2.0	380	<0.5	47	0.01	<0.02	0.68	7	2.4	6.9
S460-10	borrow pit material	<0.8	1.7	370	<0.5	27	0.01	<0.02	0.62	6	2.0	12
S461-10	borrow pit material	<0.8	1.9	400	0.8	21	0.02	0.04	1.8	8	3.4	20
S462-10	borrow pit material	<0.8	1.8	400	<0.5	36	0.02	0.03	1.3	8	2.8	13

*Price (1997)

Table 4 Statistical Summary of Metals Analyses

	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg	Mn
	%	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	%	%	µg/g	%	µg/g
Average Concentration (Continental Crust)*	8.2	1.8	425	3	0.0085	4.15	0.15	25	102	60	5.63	2.09	20	2.33	950
Ten Times Average Concentration (Continental Crust)*	82	18	4250	30	0.085	42	1.5	250	1020	600	56	21	200	23.3	9500
All Quarry Pit Rock (gneiss, schist, carbonate rocks)															
Min	0.05	0.50	2.7	0.1	0.09	0.06	0.02	1.1	2.1	2.0	0.16	0.03	2.0	0.12	62
Max	1.30	1.8	110	0.5	0.13	29	0.06	9.9	110	28	2.60	0.72	36	2.80	340
Mean	0.46	0.62	28	0.2	0.09	7.40	0.02	2.9	70	8.1	0.93	0.26	13	0.69	186
Median	0.39	0.50	24	0.2	0.09	0.23	0.02	2.1	85	6.2	0.86	0.17	13	0.54	170
Standard Deviation	0.35	0.29	24	0.1	0.01	12	0.01	2.1	41	5.7	0.62	0.22	9.2	0.66	80
No. of Samples	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
5th Percentile	0.08	0.5	3.1	0.06	0.09	0.07	0.02	1.2	2.2	2.2	0.17	0.03	2.0	0.13	69
25th Percentile	0.15	0.5	5.5	0.12	0.09	0.13	0.02	1.6	51	4.2	0.37	0.05	3.0	0.23	140
75th Percentile	0.63	0.5	35	0.23	0.09	10	0.02	3.6	100	11	1.25	0.39	18	0.94	273
95th Percentile	1.13	1.2	71	0.43	0.09	28	0.04	6.6	110	17	1.90	0.70	30	2.30	305
Gneiss															
Min	0.32	0.5	20	0.13	0.09	0.06	0.02	1.1	75	2.9	0.66	0.11	9.0	0.12	140
Max	1.20	0.5	110	0.49	0.13	0.36	0.1	9.9	110	28	2.60	0.72	36	1.10	320
Mean	0.57	0.5	39	0.22	0.09	0.17	0.02	3.5	96	10	1.21	0.34	18	0.37	198
Median	0.45	0.5	30	0.17	0.09	0.14	0.02	2.5	100	8.5	1.00	0.28	15	0.24	180
Standard Deviation	0.27	0.0	24	0.11	0.01	0.09	0.01	2.5	12	6.2	0.51	0.20	7.7	0.28	60
No. of Samples	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
5th Percentile	0.33	0.5	21	0.13	0.09	0.07	0.02	1.1	78	3.2	0.71	0.15	10	0.13	140
25th Percentile	0.39	0.5	23	0.15	0.09	0.10	0.02	1.4	87	5.3	0.83	0.17	13	0.16	150
75th Percentile	0.78	0.5	51	0.25	0.09	0.23	0.02	5.2	110	14	1.40	0.49	20	0.50	240
95th Percentile	1.10	0.5	78	0.48	0.10	0.36	0.02	8.0	110	18	1.90	0.71	34	0.93	300
Schist															
Min	0.74	0.5	35	0.2	0.09	0.14	0.02	2.2	67	6.3	1.10	0.50	8.0	0.41	250
Max	1.30	1.1	37	0.4	0.09	0.30	0.03	3.6	70	13	1.80	0.60	17.0	1.00	280
Median	1.10	0.5	36	0.3	0.09	0.18	0.02	3.6	69	8.0	1.60	0.54	12.0	0.74	280
No. of Samples	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Table 4 Statistical Summary of Metals Analyses (Continued)

	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg	Mn
	%	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	%	%	µg/g	%	µg/g
Average Concentration (Continental Crust)*	8.2	1.8	425	3	0.0085	4.15	0.15	25	102	60	5.63	2.09	20	2.33	950
Ten Times Average Concentration (Continental Crust)*	82	18	4250	30	0.085	42	1.5	250	1020	600	56	21	200	23.3	9500
Carbonate Rocks															
Min	0.05	0.5	2.7	0.06	0.09	3.90	0.02	1.3	2.1	2.0	0.16	0.03	2.0	0.41	62
Max	0.31	1.8	16	0.32	0.09	29	0.06	2.1	99	6.1	0.73	0.17	18	2.80	340
Mean	0.13	0.8	5.7	0.11	0.09	22	0.02	1.8	25	3.8	0.30	0.06	4.4	1.25	145
Median	0.10	0.6	4.1	0.07	0.09	27	0.02	1.7	2.6	4.0	0.25	0.04	2.0	0.97	105
Standard Deviation	0.08	0.4	4.3	0.08	0	11	0.01	0.2	41	1.4	0.18	0.05	5.3	0.82	98
No. of Samples	12.0	12	12	12	12	12	12	12	12	12	12	12	12	12	12
5th Percentile	0.07	0.5	2.9	0.06	0.09	4.01	0.02	1.4	2.2	2.0	0.17	0.03	2.0	0.50	64
25th Percentile	0.08	0.5	3.2	0.06	0.09	21	0.02	1.6	2.2	2.4	0.18	0.03	2.0	0.66	71
75th Percentile	0.14	1.1	5.4	0.10	0.09	28	0.02	1.9	24	4.6	0.31	0.04	3.0	1.53	195
95th Percentile	0.27	1.5	14	0.27	0.09	29	0.04	2.1	97	5.7	0.65	0.15	15	2.69	307
Unconsolidated Borrow Material															
Min	0.08	0.5	5.0	0.03	0.09	0.05	0.02	0.7	30	2.0	0.30	0.03	2.0	0.03	25
Max	0.39	1.7	29	0.27	0.09	17	0.03	7.0	170	38.0	1.10	0.24	24	4.90	270
Mean	0.26	0.7	16	0.17	0.09	5.3	0.02	2.5	81	9.9	0.70	0.12	7.2	1.94	123
Median	0.26	0.5	16	0.18	0.09	3.8	0.02	2.0	77	7.8	0.72	0.12	6.0	1.95	130
Standard Deviation	0.10	0.4	7.0	0.06	0	4.8	0.004	1.5	33	9.1	0.23	0.05	5.8	1.21	53
No. of Samples	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
5th Percentile	0.11	0.5	6.1	0.07	0.09	0.41	0.02	1.2	36	3.0	0.33	0.05	2.0	0.51	57
25th Percentile	0.20	0.5	11	0.13	0.09	2.7	0.02	1.8	69	4.9	0.55	0.09	3.3	1.13	100
75th Percentile	0.34	0.7	19	0.21	0.09	5.9	0.02	3.0	90	9.7	0.86	0.15	9.0	2.65	138
95th Percentile	0.39	1.4	26	0.26	0.09	15	0.03	4.7	131	26	1.03	0.20	16	3.60	186

Table 4 Statistical Summary of Metals Analyses (Continued)

	Mo	Na	Ni	P	Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	U	V	Y	Zn
	µg/g	%	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	µg/g
Average Concentration (Continental Crust)*	1.2	2.4	84	1050	14	0.2	0.05	281500	2.3	370	0.57	0.85	2.7	120	33	70
Ten Times Average Concentration (Continental Crust)*	12	24	840	10500	140	2	0.5	2815000	23	3700	5.7	8.5	27	1200	330	700
All Quarry Pit Rock (gneiss, sch																
Min	0.10	0.012	2.9	21	0.8	0.8	0.7	270	0.5	3.4	0.001	0.02	0.3	3.0	1.5	2.2
Max	6.8	0.062	25	1090	29.0	0.8	2.2	780	1.2	300	0.19	0.48	13.0	48.0	16	50.0
Mean	0.73	0.038	8.3	245	4.7	0.8	0.9	506	0.6	75.4	0.05	0.14	3.0	11.6	4.9	20.9
Median	0.40	0.047	5.0	150	3.3	0.8	0.7	485	0.5	8.2	0.03	0.10	2.7	6.5	3.9	21.5
Standard Deviation	1.3	0.017	5.8	261	5.1	0.0	0.3	108	0.2	117	0.05	0.14	2.8	11	3.3	14
No. of Samples	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
5th Percentile	0.10	0.014	3.2	27	1.0	0.8	0.7	348	0.5	5.4	0.001	0.02	0.3	3.0	1.8	3.2
25th Percentile	0.10	0.016	3.8	69	1.6	0.8	0.7	440	0.5	6.6	0.002	0.02	0.4	4.0	2.6	6.2
75th Percentile	0.50	0.052	14	263	6.0	0.8	0.9	590	0.5	78	0.06	0.21	4.4	13.3	5.8	29.5
95th Percentile	2.7	0.056	16	753	11.3	0.8	1.6	693	0.9	290	0.15	0.45	6.9	34.8	10.9	46.8
Gneiss																
Min	0.20	0.040	3.2	25	2.0	0.8	0.7	440	0.5	5.6	0.01	0.06	2.1	3.0	2.0	18.0
Max	6.8	0.062	25	1000	29.0	0.8	0.8	780	1.2	17	0.19	0.48	13.0	48.0	16	50.0
Mean	1.1	0.051	6.6	273	6.9	0.8	0.7	544	0.6	8.1	0.07	0.20	4.6	15.8	5.7	29.2
Median	0.40	0.051	4.2	220	5.4	0.8	0.7	520	0.5	6.8	0.06	0.17	4.2	12.0	4.1	27.0
Standard Deviation	1.6	0.005	5.9	248	5.7	0.0	0.0	97	0.2	3.0	0.05	0.14	2.5	13.4	3.8	9.9
No. of Samples	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
5th Percentile	0.20	0.042	3.4	28	2.5	0.8	0.7	440	0.5	5.6	0.02	0.07	2.5	3.0	2.2	19.0
25th Percentile	0.30	0.049	3.8	92	4.0	0.8	0.7	470	0.5	6.5	0.02	0.09	2.9	5.0	3.4	21.0
75th Percentile	1.1	0.053	5.3	270	7.1	0.8	0.7	600	0.6	8.2	0.09	0.31	4.9	22.0	7.1	34.0
95th Percentile	3.4	0.056	20	670	12.0	0.8	0.7	700	1.2	14	0.17	0.46	9.6	43.0	14.0	49.0
Schist																
Min	0.20	0.031	2.9	120	1.7	0.8	0.9	540	0.5	3.4	0.03	0.2	2.2	6.0	3.9	23.0
Max	0.40	0.033	3.8	260	3.3	0.8	2.2	630	0.5	5.8	0.06	0.2	2.3	7.0	7.4	28.0
Median	0.40	0.033	3.1	120	3.2	0.8	1.5	590	0.5	4.8	0.06	0.2	2.2	6.0	5.2	26
No. of Samples	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Table 4 Statistical Summary of Metals Analyses (Continued)

	Mo	Na	Ni	P	Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	U	V	Y	Zn
	µg/g	%	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	µg/g
Average Concentration (Continental Crust)*	1.2	2.4	84	1050	14	0.2	0.05	281500	2.3	370	0.57	0.85	2.7	120	33	70
Ten Times Average Concentration (Continental Crust)*	12	24	840	10500	140	2	0.5	2815000	23	3700	5.7	8.5	27	1200	330	700
Carbonate Rocks																
Min	0.10	0.012	5	21	0.8	0.8	0.7	270	0.5	14	0.001	0.02	0.3	4.0	1.5	2.2
Max	0.50	0.018	15	1090	2.0	0.8	1.8	590	0.5	300	0.02	0.04	0.4	11.0	9.1	9.9
Mean	0.16	0.015	13	215	1.3	0.8	1.0	419	0.5	211	0.004	0.02	0.3	5.4	3.2	5.0
Median	0.10	0.015	14	82	1.3	0.8	1.0	420	0.5	270	0.001	0.02	0.3	5.0	2.5	4.8
Standard Deviation	0.14	0.002	3.5	317	0.4	0	0.3	84	0	116	0.01	0.01	0.0	2.1	2.1	2.1
No. of Samples	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
5th Percentile	0.10	0.013	6.1	33	0.9	0.8	0.7	309	0.5	18	0.001	0.02	0.3	4.0	1.6	2.6
25th Percentile	0.10	0.014	13	54	1.0	0.8	0.7	380	0.5	186	0.001	0.02	0.3	4.0	2.1	3.8
75th Percentile	0.10	0.016	15	162	1.6	0.8	1.0	443	0.5	283	0.002	0.02	0.4	5.5	3.2	6.1
95th Percentile	0.45	0.017	15	788	1.9	0.8	1.6	557	0.5	295	0.02	0.03	0.4	8.8	6.8	8.0
Unconsolidated Borrow Materia																
Min	0.10	0.011	3.4	16	0.8	0.8	0.9	310	0.5	2.2	0.004	0.02	0.2	1.0	0.6	1.7
Max	0.60	0.031	110	830	7.0	0.8	2.1	610	0.8	130	0.05	0.11	2.6	15.0	4.8	20.0
Mean	0.33	0.021	14	194	3.3	0.8	1.7	436	0.6	34	0.02	0.05	1.1	8.8	3.1	12.1
Median	0.30	0.020	6.5	140	3.4	0.8	1.8	415	0.5	24	0.02	0.04	0.7	8.5	3.3	13.0
Standard Deviation	0.14	0.006	28	191	1.5	0.0	0.4	84	0.1	34	0.01	0.03	0.8	3.4	1.1	5.4
No. of Samples	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
5th Percentile	0.17	0.014	4.2	77	1.5	0.8	1.0	336	0.5	4.2	0.01	0.02	0.3	4.3	1.5	3.5
25th Percentile	0.23	0.017	5.3	123	2.1	0.8	1.5	373	0.5	18	0.01	0.02	0.5	7.3	2.3	8.2
75th Percentile	0.40	0.026	9.7	193	3.8	0.8	2.0	508	0.6	35	0.02	0.07	1.6	10.0	3.7	16.3
95th Percentile	0.54	0.030	46	447	5.4	0.8	2.0	558	0.7	101	0.03	0.09	2.4	13.7	4.5	18.7

*Price (1997)

Table 5 Results of Shake Flask Extraction Test

	Units	MMER	CWQG (PAL)	CDWQ	10-TR-001 BH10-04	10-TR-005 BH10-05	10-TR-009 BH10-06	10-TR-014 BH10-08	10-TR-017 BH10-09	10-TR-019 BH10-12	10-TR-035 BH10-12
					Gneiss	**Gneiss**	**Gneiss**	**Gneiss**	**Gneiss**	**Gneiss**	**Schist**
Sample Weight	g				250	250	250	250	250	250	250
Volume mL	D.I. H_2O				750	750	750	750	750	750	750
InitialpH	units				9.51	9.41	9.63	9.63	9.59	9.58	9.74
Final pH	units	6.0 - 9.5	6.5 - 9.0	6.5 - 8.5	9.45	**9.64**	**9.73**	**9.67**	**9.69**	**9.73**	**9.67**
Mercury (Hg)	mg/L	-	0.026	0.001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum (Al)	mg/L	-	0.005-0.1[a]	-	0.97	0.84	0.98	0.58	0.91	0.75	1.42
Arsenic (As)	mg/L	0.5	0.005	0.005	0.0013	0.0004	0.0009	0.0005	0.0005	<0.0002	0.0012
Barium (Ba)	mg/L	-	-	1	0.00450	0.00444	0.00438	0.00420	0.00340	0.00309	0.00449
Beryllium (Be)	mg/L	-	-	-	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth (Bi)	mg/L	-	-	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (Ca)	mg/L	-	-	-	2.95	3.01	2.86	2.96	2.59	2.25	1.29
Cadmium (Cd)	mg/L	-	0.000017	0.005	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Cobalt (Co)	mg/L	-	-	-	0.000028	0.000030	0.000049	0.000060	0.000053	0.000122	0.000062
Chromium (Cr)	mg/L	-	0.001	0.051	<0.0005	0.0009	0.0010	<0.0005	0.0011	0.0013	0.0010
Copper (Cu)	mg/L	0.3	0.002-0.004[b]	≤1.0[c]	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005
Iron (Fe)	mg/L	-	0.3	<0.3[c]	0.069	0.094	0.115	0.127	0.116	0.186	0.233
Potassium (K)	mg/L	-	-	-	6.75	6.51	8.50	8.88	7.66	8.41	13.8
Lithium (Li)	mg/L	-	-	-	0.006	0.006	0.011	0.016	0.012	0.010	0.003
Magnesium (Mg)	mg/L	-	-	-	0.245	0.477	0.370	0.788	0.345	0.422	0.321
Manganese (Mn)	mg/L	-	-	≤0.05	0.00225	0.00268	0.00279	0.00265	0.00308	0.00364	0.00330
Molybdenum (Mo)	mg/L	-	0.073	-	0.00125	0.00096	0.00039	0.00084	0.00073	0.00432	0.00118
Sodium (Na)	mg/L	-	-	-	5.94	5.21	5.39	6.26	5.53	3.75	11.7
Nickel (Ni)	mg/L	0.5	0.025-0.15[b]	-	0.0001	< 0.0001	0.0002	0.0002	0.0002	0.0006	0.0003
Lead (Pb)	mg/L	0.2	0.001-0.007[b]	0.01	0.00083	0.00029	0.00043	0.00013	0.00053	0.00046	0.00032
Antimony (Sb)	mg/L	-	-	0.006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003
Selenium (Se)	mg/L	-	0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin (Sn)	mg/L	-	-	-	0.00003	0.00004	0.00003	0.00003	0.00004	0.00002	< 0.00001
Strontium (Sr)	mg/L	-	-	-	0.0105	0.0109	0.0123	0.0190	0.0109	0.0077	0.0037
Titanium (Ti)	mg/L	-	-	-	0.0037	0.0047	0.0118	0.0138	0.0134	0.0185	0.0126
Thallium (Tl)	mg/L	-	-	-	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium (U)	mg/L	-	-	-	0.00940	0.00860	0.00817	0.00277	0.00528	0.00242	0.00143
Vanadium (V)	mg/L	-	-	-	0.00200	0.00268	0.00547	0.0111	0.00557	0.0129	0.00299
Zinc (Zn)	mg/L	0.5	0.03	≤5.0	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.001	< 0.001

Table 5 Results of Shake Flask Extraction Test (Continued)

	Units	MMER	CWQG (PAL)	CDWQ	10-TR-024 BH10-13	10-TR-025 BH10-14	10-TR-029 BH10-15	10-TR-033 BH10-16	S449-10	S454-10	S458-10	S461-10
					Sand-stone	Sandy Carbonate	Carb-onate	Carb-onate	Sand/ Gravel	Sand/ Gravel	Sand/ Gravel	Sand/ Gravel
Sample Weight	g				250	250	250	250	250	250	250	250
Volume mL	D.I. H_2O				750	750	750	750	750	750	750	750
InitialpH	units				9.66	9.52	9.60	9.64	9.46	7.44	9.53	9.31
Final pH	units	6.0 - 9.5	6.5 - 9.0	6.5 - 8.5	9.38	9.11	8.95	9.03	8.94	7.90	9.30	9.27
Mercury (Hg)	mg/L	-	0.026	0.001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum (Al)	mg/L	-	0.005-0.1[a]	-	0.04	0.23	0.16	0.10	0.04	0.50	0.21	0.25
Arsenic (As)	mg/L	0.5	0.005	0.005	0.0013	0.0003	0.0004	<0.0002	0.0008	0.0003	0.0014	0.0007
Barium (Ba)	mg/L	-	-	1	0.00385	0.00167	0.00170	0.00144	0.00376	0.00406	0.00324	0.00388
Beryllium (Be)	mg/L	-	-	-	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth (Bi)	mg/L	-	-	-	< 0.00001	< 0.00001	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (Ca)	mg/L	-	-	-	8.32	10.8	12.2	11.4	11.3	4.61	9.28	13.0
Cadmium (Cd)	mg/L	-	0.000017	0.005	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Cobalt (Co)	mg/L	-	-	-	0.000039	0.000051	0.000059	0.000054	0.000080	0.000137	0.000045	0.000099
Chromium (Cr)	mg/L	-	0.001	0.051	0.0013	0.0007	0.0006	0.0006	0.0027	0.0014	0.0006	0.0008
Copper (Cu)	mg/L	0.3	0.002-0.004[b]	≤1.0[c]	<0.0005	<0.0005	<0.0005	<0.0005	0.0011	0.0023	0.0015	0.0484
Iron (Fe)	mg/L	-	0.3	<0.3[c]	< 0.002	< 0.002	< 0.002	< 0.002	0.010	0.169	0.004	0.059
Potassium (K)	mg/L	-	-	-	8.56	2.03	2.27	2.51	6.90	0.818	7.14	4.94
Lithium (Li)	mg/L	-	-	-	0.009	0.004	0.005	0.006	0.028	< 0.001	0.004	0.010
Magnesium (Mg)	mg/L	-	-	-	7.40	2.55	2.74	3.71	11.3	1.73	3.42	3.83
Manganese (Mn)	mg/L	-	-	≤0.05	0.00037	0.00030	0.00065	0.00023	0.00064	0.00898	0.00024	0.00165
Molybdenum (Mo)	mg/L	-	0.073	-	0.00073	0.00048	0.00207	0.00069	0.00390	0.00053	0.00177	0.00226
Sodium (Na)	mg/L	-	-	-	0.94	1.38	1.82	1.65	1.85	0.15	4.06	2.35
Nickel (Ni)	mg/L	0.5	0.025-0.15[b]	-	0.0001	< 0.0001	0.0002	0.0001	0.0004	0.0006	0.0002	0.0004
Lead (Pb)	mg/L	0.2	0.001-0.007[b]	0.01	< 0.00002	0.00002	< 0.00002	< 0.00002	< 0.00002	0.00079	< 0.00002	0.00015
Antimony (Sb)	mg/L	-	-	0.006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0013
Selenium (Se)	mg/L	-	0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin (Sn)	mg/L	-	-	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	0.00006
Strontium (Sr)	mg/L	-	-	-	0.0224	0.139	0.121	0.120	0.0422	0.0073	0.0217	0.0202
Titanium (Ti)	mg/L	-	-	-	0.0003	< 0.0001	0.0003	0.0001	0.0008	0.0111	0.0001	0.0037
Thallium (Tl)	mg/L	-	-	-	< 0.00002	< 0.00002	0.00006	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium (U)	mg/L	-	-	-	0.000234	0.000071	0.000095	0.000107	0.000486	0.000243	0.000974	0.00225
Vanadium (V)	mg/L	-	-	-	0.00494	0.00084	0.00068	0.00042	0.00112	0.00109	0.00456	0.00417
Zinc (Zn)	mg/L	0.5	0.03	≤5.0	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001

Note:

MMER = Metals, Mining Effluent (SOR 2002 - 222)

Bold values indicate parameters above the MMER value.

** Lab data reported for total chromium.

CWQG (PAL) and CDWQ provided for reference only (see text)

CWQG (PAL) = Canadian Water Quality Guidelines Protection of Aquatic Life, 2007

CDWQ = Health Canada - Canadian Drinking Water Guideline

a) varies with pH

b) varies with hardness

c) Aesthetic objective

Table 6 - Rietveld Quantitative Analysis X-ray Diffraction Results

Mineral/Compound		**Ideal Formula**	**10-TR-001**	**10-TR-005**	**10-TR-009**	**10-TR-014**	**10-TR-017**	**10-TR-019**	**10-TR-035**
			BH10-4	**BH10-5**	**BH10-6**	**BH10-8**	**BH10-9**	**BH10-12**	**BH10-12**
			granitic gneiss	*granitic gneiss*	*granitic gneiss*	*granitic gneiss*	*granitic gneiss*	*granitic gneiss*	*schist*
			(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Calcite	Carbonates	$CaCO_3$	1.2	0.6	0.1	--	0.3	0.2	--
Rhodochrosite		$MnCO_3$	--	--	--	--	--	0.7	--
Dolomite		$CaMg(CO_3)_2$	--	--	--	--	--	0.5	--
Ankerite		$Ca(Mg, Fe)(CO_3)_2$	--	--	--	--	--	--	--
Quartz		SiO_2	34.4	38.1	34.2	33.6	32.5	30.4	42.6
Albite	Feldspars	$NaAlSi_3O_8$	33.4	30.9	35.0	29.7	36.6	27.7	12.4
Anorthite		$CaAl_2Si_2O_8$	4.2	4.7	5.7	7.4	5.4	8.4	5.7
Orthoclase		$KAlSi_3O_8$	2.5	1.8	1.6	4.5	1.8	2.6	4.1
Microcline		$KAlSi_3O_8$	21.8	20.7	16.5	16.8	16.2	10.8	19.5
Diopside (clinopyroxene)		$CaMgSi_2O_6$	--	--	2.9	2.8	3.1	3.0	4.3
Actinolite (amphibole)		$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	--	--	--	--	--	9.5	--
Phlogopite	Phyllo-silicates	$KMg_3(AlSi_3O_{10})(OH)_2$	0.4	0.8	3.1	4.3	3.1	5.2	3.4
Biotite		$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	--	--	--	--	--	--	3.9
Clinochlore (chlorite)		$(Mg, Fe)_5 (Si_3Al)O_{10}(OH)_8$	1.3	1.4	0.01	0.01	0.01	0.9	4.1
Magnetite		Fe_3O_4	0.8	0.9	0.9	0.9	0.9	--	0.1
TOTAL			100	100	100	100	100	100	100

Mineral/Compound		**Ideal Formula**	**10-TR-024**	**10-TR-025**	**10-TR-029**	**10-TR-033**	**S449-10**	**S454-10**	**S458-10**	**S461-10**
			BH10-13	**BH10-14**	**BH10-15**	**BH10-16**				
			carbonate cemented sandstone	*carbonate*	*carbonate*	*carbonate*	*borrow material*	*borrow material*	*borrow material*	*borrow material*
			(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Calcite	Carbonates	$CaCO_3$	--	99.3	98.9	98.3	22.6	0.2	0.1	2.2
Rhodochrosite		$MnCO_3$	--	--	--	--	--	--	--	0.6
Dolomite		$CaMg(CO_3)_2$	25.9	0.3	0.3	0.6	46.4	--	6.2	11.5
Ankerite		$Ca(Mg, Fe)(CO_3)_2$	--	0.1	0.1	0.3	11.7	--	3.3	3.0
Quartz		SiO_2	56.3	0.3	0.7	0.8	9.7	98.8	33.0	28.5
Albite	Feldspars	$NaAlSi_3O_8$	1.2	--	--	--	1.1	0.7	22.7	25.2
Anorthite		$CaAl_2Si_2O_8$	--	--	--	--	--	--	5.1	3.5
Orthoclase		$KAlSi_3O_8$	1.4	--	--	--	1.3	--	3.9	4.1
Microcline		$KAlSi_3O_8$	15.2	--	--	--	4.6	--	18.3	12.8
Diopside (clinopyroxene)		$CaMgSi_2O_6$	--	--	--	--	--	--	2.8	3.1
Actinolite (amphibole)		$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	--	--	--	--	--	--	--	--
Phlogopite	Phyllo-silicates	$KMg_3(AlSi_3O_{10})(OH)_2$	--	--	--	--	--	--	3.7	3.4
Biotite		$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	--	--	--	--	--	--	--	--
Clinochlore (chlorite)		$(Mg, Fe)_5 (Si_3Al)O_{10}(OH)_8$	--	--	--	--	2.6	0.3	0.5	1.6
Magnetite		Fe_3O_4	--	--	--	--	--	--	0.4	0.5
TOTAL			100	100	100	100	100	100	100	100