ATTACHMENT 27

Blasting Management Plan

(44 Pages)

Baffinland Iron Mines Corporation

BLASTING MANAGEMENT PLAN

BAF-PH1-830-P16-0003

< PHASE 2 PROPOSAL REVISIONS – FOR REVIEW PURPOSES ONLY >

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1.0 INTRODUCTION

This Blasting Management Plan (BMP) describes Baffinland Iron Mines Corporation's (Baffinland's) procedures for the safe and environmentally responsible use of explosives associated with the Mary River Project (the Project).

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. This Blasting Management Plan identifies site specific blasting operational management procedures to limit, control and mitigate the release of undetonated explosives from blasting operations at quarries and rock cuts.

1.1 PURPOSE AND SCOPE

This document covers the site-specific blasting operational management procedures to be adopted during blasting activities, employee responsibilities, as well as mitigation measures and controls for potential environmental concerns related to blasting and use of explosives. Mitigation measures associated with the broader activity of quarrying (and rock cuts) are addressed in the Borrow Pit and Quarry Management Plan as well as borrow pit and quarry-specific management plans developed in accordance with the Borrow Pit and Quarry Management Plan.

This Plan supersedes a previous version of this plan, Quarry Blasting Operations Management Plan (Baffinland, 2013).

1.2 RELATIONSHIP TO OTHER MANAGEMENT PLANS

Other management plans relevant to blasting operations at quarries are described in Table 1.1.

TABLE 1.1 RELATIONSHIP TO OTHER MANAGEMENT PLANS

Referenced Management Plan/Procedure/Policy	Document No.	Information Provided by Referenced Plan(s)
Borrow Pits and Quarry Management Plan	BAF-PH1-830-P16-0004	General mitigation measures related to the development and operation quarries and borrow pits, and requirements for borrow pit and quarry-specific management plans
Environmental Protection Plan (EPP)	BAF-PH1-830-P16-0008	Provides relevant environmental protection measures: • Section 4.6 Drilling, Blasting and Crushing • Section 4.12 Blasting In or Near Water
Surface Water and Aquatic Ecosystems Management Plan (SWAEMP)	BAF-PH1-830-P16-0026	Identifies the management strategies and general mitigation measures related to minimizing effects on aquatic ecosystems, and monitoring programs focused on the local aquatic environment
Aquatic Effects Monitoring Plan (AEMP)	BAF-PH1-830-P16-0039	Aquatic effects monitoring that may detect road-related impacts from dust, sedimentation and water use to the aquatic environment within the Mine Site area
Emergency Response Plan (ERP)	BAF-PH1-830-P16-0007	Describes the process for responding to emergencies
Spill Contingency Plan (SCP)	BAF-PH1-830-P16-0036	Describes response measures associated with spills

Referenced Management Plan/Procedure/Policy	Document No.	Information Provided by Referenced Plan(s)
Explosives Management Plan	By Dyno Nobel Baffin Island (DNBI)	Describes the safe manufacture and handling of explosives and related reagents

Blasting in the open pit is described in the Operations Blasting Procedure (BAF-PH1-340-PRO-0003).

1.3 CORPORATE POLICIES

Baffinland has two corporate policies that apply to environmental management:

- **Sustainable Development (SD) Policy -** identifies Baffinland's commitment internally and to the public to operate in a manner that is environmentally responsible, safe, fiscally responsible and respectful of the cultural values and legal rights of Inuit.
- **Health, Safety and Environment (HSE) Policy -** describes the company's commitment to achieve a safe, healthy, and environmentally responsible workplace.

All employees and contractors must comply with the contents of both above mentioned policies, which are included in Appendix A.

1.4 REGULATORY REQUIREMENTS

This Plan outlines the Project's policies and procedures to ensure compliance with the relevant terms, conditions and regulations outlined in the following regulatory instruments:

- Type A Water Licence No. 2AM-MRY1325 issued by the Nunavut Water Board (NWB or the Board)
- Commercial Lease - Q13C301 (Commercial Lease) with the Qikiqtani Inuit Association (QIA)
- Project Certificate No. 005 issued by the Nunavut Impact Review Board (NIRB)
- *Fisheries Act* Authorization No. NU-06-0084 (DFO, 2007), and subsequent amendments applicable to fish-bearing water crossings along the Tote Road

Tables of concordance with the first three of these regulatory approvals are provided in Appendix B. Compliance to the terms and conditions included in the Tote Road *Fisheries Act* Authorization is documented in an annual report submitted to DFO each year.

Additionally, Baffinland will seek an Authorization under Paragraph 35(2)(b) of the *Fisheries Act* for interactions of the North Railway with fish and fish habitat. A further update to this Plan may be necessary to incorporate any additional mitigation or monitoring requirements specified in the future *Fisheries Act* Authorization.

The following legislation place specific requirements on the Project with respect to the use of explosives:

- *Explosives Act* and regulations
- *Explosives Use Act* and regulations
- *Canadian Environmental Protection Act*
- *Safety Act* and Occupational Health and Safety Regulations
- *Fisheries Act*
- *Mine Health and Safety Act* and Regulations

1.5 DEFINITIONS

The following terminology is unique to drilling and blasting:

- **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.
- **Inspector**: As per the *Mine Health and Safety Act*, means a person appointed as an inspector under subsection 35(1) of the Act.

Supervisor: As per the *Mine Health and Safety Act*, means a person who (a) has charge of a worksite or worksites; (b) instructs, directs or controls employees in the performance of their duties; or (c) is authorized by the manager to take or recommend disciplinary action against employees.

2.0 PLANNING

2.1 OBJECTIVES

The objectives and targets of this Plan are identified in Table 2.1.

TABLE 2.1 OBJECTIVES AND TARGETS

Objective	Performance Indicator(s) / Key Desired Outcomes
Minimize fugitive dust emissions	Avoid or minimize significant dust emissions (dust that is visibly being carried as a cloud from the blasting area)
Protect the health and safety of workers and other land users	Zero harm; disruption to other land users is minimized
Protect the environment from emergencies including accidental releases of hazardous materials	Rapid and effective response to emergencies including spills
Mitigate potential impacts to water and protect aquatic ecosystems by controlling runoff of sediment and blasting residues (particularly nitrogen containing compounds) from running off into local watercourses	Comply with Section 36(3) of the *Fisheries Act* and discharge limits specified in the Type A Water Licence
Protect fish when blasting near or in water	Comply with DFO-recommended blasting overpressure threshold of 50 kPa
Comply with regulatory requirements	Provide clear guidance to blasting and quarry personnel regarding regulatory compliance requirements
Mitigate potential impacts to wildlife	Disturbance to wildlife (particularly caribou) is minimized

Monitoring plans and applicable thresholds are described in Section 5.

2.2 CONSIDERATION OF INUIT QAUJIMAJATUQANGIT

Baffinland recently developed a draft Inuit Qaujimajatuqangit (IQ) Management Framework to support increased collaboration with Inuit and the integration of IQ into the Company's operations, where reasonable to do so (Baffinland, 2019a). Specifically, the IQ Management Framework identifies the procedures and provides guidance on the following:

- The processes through which IQ can be shared with Baffinland
- Schedule and timing for gathering and integration of IQ
- Roles and responsibilities of parties involved
- Processes and mechanisms through which IQ informs Project related decision-making

Implementation of the IQ Management Framework is expected to include the establishment of an Inuit Committee to involve Inuit in the full life cycle of Project development, from planning to reporting. The Terms of Reference (TOR) for the Inuit Committee and mandate to implement the IQ Management Framework is subject to ongoing discussion between the QIA and Baffinland. At present, Baffinland believes that the Inuit Committee's role on the Project may include providing advice on the integration of IQ into the Project in the following areas:

- Identification or refinement of mitigation measures in management plans
- Design of monitoring programs and the interpretation of monitoring results

- Development of Implementation of adaptive management strategies, as necessary
- Development of future modifications to the project and subsequent application materials

Table 2.2 identifies the opportunities that Baffinland has explored to incorporate IQ into this Plan.

TABLE 2.2 INCORPORATION OF IQ INTO THIS MANAGEMENT PLAN

Element	Description
Environmental sensitivities and receptors	Incorporate new information on environmental sensitivities or receptors (identified by the Inuit Committee or results of the CRLUM Monitoring Program into the mitigation measures identified in this plan
Indicators and thresholds	To be discussed with Inuit Committee
Mitigation measures	To be discussed with Inuit Committee
Monitoring	To be discussed with Inuit Committee
Adaptive management	To be discussed with Inuit Committee
Validation of IQ Integration	To be driven by IQ Management Framework
Management review	To be driven by IQ Management Framework

An important aspect of integrating IQ is validating such integration with Inuit. For this reason, only potential opportunities for IQ integration have been identified. A more fulsome effort to incorporate IQ into this draft plan will be undertaken in the future, consistent with Baffinland's IQ Management Framework and the TOR for the Inuit Committee. Given the intersection of Project roads with Inuit land use, Baffinland expects that this is a plan that Inuit may have considerable input into.

2.3 PRINCIPLES OF ADAPTIVE MANAGEMENT

2.3.1 DEFINING THE ADAPTIVE MANAGEMENT PROCESS

Adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes (Canadian Environmental Assessment Agency, 2016). Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project.

Baffinland has developed an Adaptive Management Plan (AMP) that provides the framework by which adaptive management is to be incorporated into Project operations (Baffinland, 2019b). The adaptive management process is iterative and starts with a planning phase; followed by implementation of monitoring; ongoing evaluation of the effectiveness of the plans based on monitoring results; and adjustment of the management strategies and responses as needed. The process is described further in Appendix C.

2.3.2 ADAPTIVE MANAGEMENT CHECKLIST FOR ENVIRONMENTAL MANAGEMENT

Table 23 presents an adaptive management checklist developed for the Roads Management Plan, identifying how adaptive management has been incorporated into the current revision of the Plan.

TABLE 2.3 ADAPTIVE MANAGEMENT IN THE ROADS MANAGEMENT PLAN

Adaptive Management Phases	Components	Proposed Adaptive Management Mechanisms	Status of Management Plan
Plan	Objectives	Are objectives clear and key desired outcomes defined?	Objectives are identified in Section 2.1.
	Indicators	Are performance indicators adequately identified?	Performance indicators are identified in Sections 2.1.
	Identification of Thresholds	Are thresholds for specific responses identified (e.g., early warning triggers, action levels, quantitative metrics or qualitative descriptions)?	Thresholds are identified in Section 2.1.
	IQ Integration / Influence	Are mechanisms for IQ integration/influence identified?	Potential integration of IQ will be discussed with the Inuit Committee.
Implement and Monitor	Management Strategies and Responses	Are management strategies and response options clearly identified?	Management strategies are described in Section 3.
	Monitoring	Does the monitoring program provide the information needed to determine the effectiveness of management strategies and responses?	Section 5 presents monitoring activities related to blasting. Blasting monitoring programs near fish habitat are not articulated in this plan and will need to be developed on a site-specific basis if/when needed.
Evaluate and Learn	Review Data and Feedback	Is the process for reviewing and evaluating management effectiveness (based on monitoring data and feedback) articulated?	Section 5 describes monitoring programs, and Section 6 describes the process for triggering plan review.
	Additional Mitigation	Are mechanisms for determining the need for additional mitigation described?	Section 5.1 identifies mitigation to be implemented at various response levels.
	Input of IQ Holders	Are opportunities identified for IQ holders to review results and provide input into adaptive management responses / mitigations?	To be discussed with Inuit Committee.
Adjust	Unanticipated Effects or Issues	Is it apparent how unanticipated effects or issues will be actioned and resolved?	Section 6 describes the process for incorporating repeat non-compliance and unanticipated effects into future plan updates.
	Reporting	Are reporting mechanisms for new / revised strategies and response actions established?	
	Scheduled Updates	Is the frequency of scheduled updates to the management plan identified?	Section 6 describes the basis for conducting plan reviews.

Implementation of adaptive management will be an iterative process; not all elements have been addressed in the current plan. These will evolve through ongoing engagement as described below.

2.3.3 ENVIRONMENTAL PROTECTION MEASURES DURING THE PLANNING PHASE

2.3.3.1 SETBACKS

A minimum 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 and identified before any construction or opening of the quarry can proceed.

2.3.3.2 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.

2.3.3.3 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 best blasting 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.

3.0 IMPLEMENTATION

This section of the Plan describes the general mitigation measures implemented to minimize health and safety risks, and environmental effects associated with blasting operations at quarries.

3.1 SPILLAGE CLEAN-UP AND CONTAINMENT

Blasting will be undertaken using one of two explosives products:

- Pre-packaged emulsion explosives
- Emulsion explosives manufactured onsite at the existing DNBI plant

Both explosives products are high quality and utilize an optimally mixed hydrophobic emulsion compound that works to repel water and keep ammonium nitrate (AN) out of the surrounding ecosystem. The use of emulsion explosives greatly minimizes ammonium nitrate (AN) releases to the environment.

However, the ammonium nitrate used to manufacture the explosives onsite 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 in 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 the point source has a positive net environmental effect versus managing ammonia after dissolution in water which is much more difficult to control. 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 spillage. This is greatly reduced or eliminated with the use of pre-packaged explosives. However, if spillage of product should occur, it will be promptly reported, cleaned up, and 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 corrective actions taken to minimize this 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.
- Standby 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 avoids 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 may 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

3.2 BLASTING NEAR WATER

Blasting in or near water produces shock waves and vibrations that may have a potential impact on fish and marine mammals. Because of this, it is important that the appropriate and safe vibration limits are implemented to minimize the impact to the surrounding environment.

Most, if not all, of the quarries to be excavated are not near 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 3.3), 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*" (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 Fisheries and Oceans Canada and the Qikiqtani Inuit Association in exploring possible Project specific 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).

During the review of the Phase 2 Proposal, Baffinland committed to meeting a lower overpressure threshold of 50 kPa. Therefore, no explosive will be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e. overpressure) greater than 50 kPa in the swim bladder of a fish.

Blasting associated with quarry operations and railway construction is unlikely to occur near fish-bearing waters. If it does occur, it is likely to be nearby streams that are occupied only seasonally by fish, rather than near to lakes that support fish populations year-round. Hence, the first line of mitigation if blasting near to seasonally occupied fish-bearing waters will be to conduct such blasting during winter periods when fish are not present. If blasting near waterbodies with fish must occur, a site-specific blasting plan will be developed that includes appropriate monitoring of blasting overpressure in the potentially affected waterbodies.

Blasting may be required during construction of the ore dock. A construction environmental management plan will be developed for the ore dock, and if blasting is required, appropriate mitigation measures and monitoring will be detailed in that plan.

Additionally, potential silt and sediment production resulting from blasting activities may also have negative effects on fish and fish habitat. Silt and sediment can be transported in the water, which may cause turbidity and a variety of other harmful effects on fish. Some of these negative effects include:

- Clogging and abrasion of the gills of fish and other aquatic organisms
- Behavioural changes such as movement and migration
- Decreased resistance to disease
- Impairment of feeding (turbidity interferes with feeding for visual feeders and poor egg and fry development)

These are just a few of the potential harmful effects that silt, sediment, and turbidity can have on the surrounding marine and freshwater environment. Therefore, it is important that appropriate precautions are put in place when blasting is essential.

The following protection measures shall be implemented:

- Explosives use at the site and worker safety is governed by the *NWT/Nunavut Occupational Health and Safety Act* and Regulations. This Act and Regulation will be followed.
- Project Personnel using explosives shall have all the required certifications, including blasters' certificates.
- Modern explosive materials (i.e., emulsions) and blasting methods will reduce the risk of ammonia contaminating the water.
- The production of silt in the water from the use of explosives will be minimized by applying the mitigation measures identified in this Plan, including the installation of silt fences and turbidity curtains.
- Precautions shall be taken to safely handle the explosives and to minimize spillage during blasting operations.
- Adaptive Management will be implemented in all phases of the Project to ensure that the precautionary measures are in place to reduce the environmental impact of the associated activities.
- DFO has produced the "*Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters*" (DFO, 1998) to protect marine wildlife, including fish and marine mammals, from underwater vibrations. Highlights of the guideline include the following:
    - No explosive is to be knowingly detonated within 500 m of any marine mammal (or no visual contact from an observer using 7 x 35 power binocular).
    - No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e. overpressure) greater than 50 kPa in the swim bladder of a fish.
    - No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation.
    - The guideline also presents tables of weight of explosive charge versus distance and other estimation methods to determine the potential impacts.
    - This guideline is relevant mostly for the Construction Phase of the Project with regards to port and river crossing construction.

Borrow pit and quarry-specific management plans will identify whether blasting will be required, and if that blasting will occur near fish-bearing waters. None of the currently proposed quarries or borrow pits are located near lakes. As such, the primary mitigation for blasting effects to fish will be to schedule blasting during periods when fish are not present (the fish are overwintering in nearby lakes or ponds).

Blast monitoring will form part of borrow pit and quarry-specific management plans in instances where this may occur.

3.3 BLAST PATTERN DESIGN

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 developed at the Mary River Project.

The requirements and responsibilities for blast pattern design are identified in Table 3.1.

TABLE 3.1 REQUIREMENTS AND RESPONSIBILITIES FOR BLAST PATTERN DESIGN

Task	Person Responsible
Borehole locations designed by engineering are to be placed at a distance of one meter or greater from bootleg locations.	Site Engineer
If 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, borehole locations loaded with explosives are to be surveyed and entered into the engineering database by the mining engineer. This will be called the as-built map.	Surveyor / Mine Engineer

3.3.1 BLASTING PARAMETERS - BURDEN & SPACING

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

3.3.2 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.

3.3.3 TYPICAL BLAST PATTERN DESIGNS

The following table may vary depending on bench height.

TABLE 3.2 INITIAL BLASTING PARAMETERS - 90 MM BOREHOLE

Product	Units	Emulsion
Density	g/cc	1.26
Load per meter of borehole	kg	10.22
Bench height	m	5.0
Sub-drill	m	1
Collar	m	2.3
Load Column	m	3.7
Load per hole	Kg	38.0
Pattern Type		Equilateral

Product	Units	Emulsion
Spacing	m	3.8
Burden	m	3.3
Rock released per hole	m3	62.7
Powder Factor	kg/m3	0.60
Collar	m	2.3

3.4 DRILLING AND LOADING PROCEDURES

3.4.1 RE-DRILL AND EXPLOSIVES LOADING PROCEDURE

The objective is to provide Supervisors and workers with a procedure that 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.

The Supervisor shall be responsible to ensure that the workers are trained and follow these procedures. The driller is responsible to ensure that the procedures are followed as directed by the Supervisor.

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

3.4.1.1 PREPARATION

The following preparation is required:

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

3.4.1.2 TASKS

The tasks associated with re-drill and explosives loading are identified in Table 3.3.

TABLE 3.3 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 identified 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

Task	Person Responsible
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
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 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

3.4.2 EXPLOSIVES MANAGEMENT

The objective of this procedure is 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 (DNBI, 2019).

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 explosives materials.

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

3.4.2.1 PREPARATION

The following preparation is required:

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

3.4.2.2 TASKS

The requirements and responsibilities associated with explosives management are identified in Table 3.4.

TABLE 3.4 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 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

Task	Person Responsible
Ensure the stock of explosives is rotated so that the oldest stock is used first.	Blaster / Supervisor
Ensure 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 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 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 activities within the blasting area. All employees must support the blaster in exercising this authority.	Blaster / Supervisor
Ensure all blasters have a valid blasting certificate issued by the Chief Inspector of Mines.	Blaster / Supervisor
Ensure 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 certificate.	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

3.5 BLASTING PROTOCOL AND PROCEDURE

3.5.1 GENERAL PROTOCOL

The general protocol for blasting is as follows:

- Blasting operations will follow the protocols 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.
- Records of blasting shall be kept by the Mine Engineering department.
- Blasts will be numbered according to location (i.e. quarry number, bench elevation at grade, and individual blast).
- Loaded boreholes will be recorded by survey prior to blasting, and as-built mapping entered into a survey database to eliminate the 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 holes loaded and explosive products used will be maintained, recorded, and submitted with blast reports.
- The 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 drilling and blasting crews and adhered to for all drilling and blasting operations.
- Production holes are to be drilled vertically, to ensure the integrity of projected bootleg locations.

3.5.2 GUARDING TYPICAL QUARRY EXCAVATION

It is imperative that the security guards follow 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 security 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 handheld radio).

Blasting will be scheduled in the afternoon, around 16h00. A distance of 600m for personnel and 400 m for equipment is required as determined by the Quantity Distance - Explosives Regulatory Division Explosives Safety and Security Branch, Minerals and Metals Sector table of distances. There will be no blasts with over 11,500 kg of explosives in the blast.

3.5.3 GUARDING PROCEDURE

The objective is to provide the Supervisor with a safe and effective procedure for guarding of a blasting operation.

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.

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

3.5.3.1 PREPARATION

- The following preparation is required: Tools: PPE
- Hazards: Slips, Trips, Falls, Personal injury or death

3.5.3.2 TASKS

The requirements and responsibilities for guarding a blast are identified in Table 3.5.

TABLE 3.5 REQUIREMENTS AND RESPONSIBILITIES FOR GUARDING A BLAST

Task	Person Responsible
The operations Supervisor will be responsible for appointing all security 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

Task	Person Responsible
Upon notification from the Supervisor, guards will ensure their assigned areas are clear of all personnel, equipment and terrestrial wildlife and proceed to their designated guard posts.	Supervisor / Guards
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 security 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.	Blaster / Supervisor

3.5.4 BLASTING PROCEDURE

The objective is to provide the Supervisor with a Pre-Blast, Guarding and a Post Blast procedure that will ensure the safety of all personnel and equipment.

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.

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

3.5.4.1 PREPARATION

The following preparation is required:

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

3.5.4.2 TASKS

The requirements and responsibilities for initiating a blast are identified in Table 3.6.

TABLE 3.6 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 Supervisor will give a 2-hour blast warning, by radio, to the following people: Medic, Operations Supervisor, and Safety Supervisor. Each of these people will acknowledge, by radio, that they have received and understood the 2-hour blast warning.	Supervisor

Task	Person Responsible
The Blaster will contact the Airport Operations Office.	Supervisor / Guards
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

3.5.5 MISFIRES OR CUT-OFF HOLES

The objective is 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.

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.

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.

3.5.5.1 PREPARATION

The following preparation is required:

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

3.5.5.2 TASKS

The requirements and responsibilities for misfires or cut-off holes are identified in Table 3.7.

TABLE 3.7 REQUIREMENTS AND RESPONSIBILITIES FOR MISFIRES OR CUT-OFF HOLES

Task	Person Responsible
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-off hole.	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 recharged, 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

3.6 EXCAVATING BLASTED MUCK

3.6.1 DIG LIMITS FOR LOADING EQUIPMENT

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

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.

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.

3.6.1.1 PREPARATION

The following preparation is required:

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

3.6.1.2 TASKS

The requirements and responsibilities for mucking into a loaded blast face are identified in Table 3.8.

TABLE 3.8 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

3.7 EMERGENCIES INCLUDING SPILLS

The Emergency Response Plan contemplates response actions for a number of emergencies that could occur in relation to blasting:

- Serious injury
- Fatality
- Missing persons (employee or member of the public)
- Extreme weather conditions
- Fires and explosions
- Vehicle instances
- Fuel and other chemical spills

Incidents will be reported to the Health and Safety Superintendent and/or the Environmental Superintendent, depending on the nature of the incident, who will in turn communicate the incident to senior management. All incidents are reported, using the Baffinland Incident Investigation Form, and investigated to determine the cause(s) of the incident as well as the corrective actions necessary to prevent the reoccurrence of the incident.

To effectively manage emergency responses, Baffinland has adopted a tiered emergency classification (Figure 3.1). Each level of emergency, based on its severity, require varying degrees of response, effort, and support. Each level has distinct effects on normal business operations, as well as requirements for investigation and reporting. Levels of classification specific to spill response are as follows:

- Level 1 (Low) - Minor accidental release of a deleterious substance with:
  - No threat to public safety
  - Negligible environmental impact to receiving environment
- Level 2 (Medium) - Major accidental release of a deleterious substance with:
  - Some threat to public safety
  - Potential Moderate environmental impact to receiving environment
- Level 3 (High) - Uncontrolled hazard which:
  - Jeopardizes project personnel safety
  - Potential significant environmental impacts to receiving environment

Baffinland will follow the procedures in its Spill Contingency Plan and Emergency Response Plans. For Spill Response Level 1 the Spill Contingency Plan will be triggered, while for Spill Response Levels 2 and 3 the Spill Contingency Plan and Emergency Response Plan will be triggered. Sewage spills are treated the same as more immediately hazardous hydrocarbon-based spills.

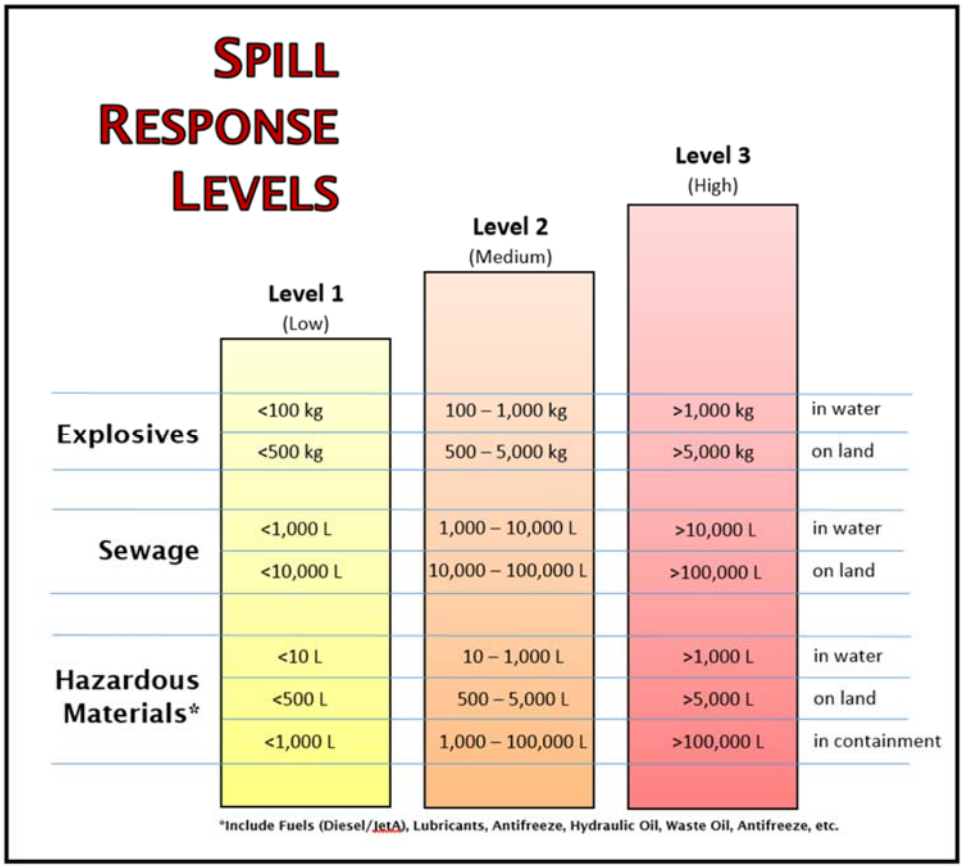

FIGURE 3.1 EMERGENCY SPILL RESPONSE LEVELS

4.0 ROLES AND RESPONSIBILITIES

The personnel responsible for implementing this plan and their respective roles are described in Table 4.1.

TABLE 4.1 ROLES AND RESPONSIBILITIES FOR QUARRY BLASTING OPERATIONS

Position	Responsibilities
Chief Operations Officer (COO)/ General Manager	• Reports to the Chief Executive Officer • Responsible for providing oversight for all Project operations and allocating the necessary resources for the operation, maintenance, and management of the Project road network
Mine Operations Manager / Superintendent	• Reports to the COO / General Manager • Provides oversight for all Mine operations
Superintendent	• Reports to the COO / General Manager • Responsible to ensure all Supervisors are trained and understand the procedures in this Plan
Drill and Blast Supervisor	• Reports to the Superintendent • Will hold a current Supervisor Level I Certificate • Responsible to ensure that blast helpers assisting in the preparation of a blast are trained and understand the procedure • Responsible to follow the procedure as in this Plan as directed by the Superintendent • Ensure his/her charges are working safely in a safe environment and in compliance with the regulations, company policy and procedures (a requirement of the *NWT / Nunavut Mine Health and Safety Act* and Regulations) • 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 (or this is done by the blaster in charge) • 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

Position	Responsibilities
Drill and Blast Supervisor	**Duties in the Mine:** • 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 • 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:** • 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
Blaster	• Explain exactly the duties of the blast helper before the work begins (or this is done by the Supervisor) • Undertake blasting duties as outlined in Tables 3.1 to 3.8
Blast Helper	• Will be trained on the safe handling and preparation of the explosives used during the loading procedure before assisting in the preparation of a blast • Will remain under the direction of the Supervisor or the blaster at all times • Will conduct only that part of the blasting operation as directed by the Supervisor or the blaster • 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 • Undertake duties as outlined in Tables 3.1 to 3.8
Security Guard	• Undertake duties as outlined in Tables 3.1 to 3.8
Health, Safety & Environment (Sustainable Development) Departments	• Support the management of the Project road network regarding health, safety and environmental concerns and obtaining the appropriate regulatory approvals • Report incidents to senior management and the appropriate regulatory agencies and stakeholders • Conduct inspections and monitoring to ensure compliance with applicable regulations and commitments

5.0 MONITORING

This Plan identifies a number of procedures by which blasting will be undertaken. Routine inspections will be conducted by blasting supervisors and environmental staff, as described in Section 5.1. Relevant environmental monitoring is identified in Section 5.2.

5.1 ROUTINE INSPECTIONS

Blasting operations at quarries are inspected regularly by area management and by the Environmental Department.

External inspections are also conducted by the landowners (QIA and CIRNAC). Baffinland prioritizes responding to instances of non-compliance.

5.2 ENVIRONMENTAL MONITORING

The primary environmental issues related to blasting at quarries include:

- Potential runoff of nitrogen-containing blasting residues and sediment into local watercourses
- Blasting in or near fish habitat can produce instantaneous pressure changes (overpressure) that can rupture the swim bladder of fish, resulting in fish kills
- Disturbance to wildlife (caribou and birds) from blasting

Borrow pit and quarry-specific management plans will detail plans for monitoring runoff from quarries in relation to discharge limits specified in the Type A Water Licence. If that monitoring detects exceedances including elevated ammonia concentrations, the Environmental Department will notify the quarry supervisor and/or the blasting crew to address the issue. 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. Blasting associated with quarry operations and railway construction is unlikely to occur near fish-bearing waters (Section 3.5). If it does occur, a site-specific blasting plan will be developed that includes appropriate monitoring of blasting overpressure in the potentially affected waterbodies.

Pre-development bird nest surveys will be conducted prior to quarry development in accordance with the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP). As described in the EPP, blasting operations will stop if caribou move into the area.

5.3 REPORTING

Results from monitoring runoff water quality are reported in monthly reports to the NWB, and in annual reports to the NWB and the QIA.

6.0 REVIEW OF PLAN EFFECTIVENESS

An important element of Baffinland's management system is reviewing the continued suitability, adequacy and effectiveness of each management plan. This will occur through an annual review process as well as scheduled updates.

6.1 ANNUAL REVIEW OF COMPLIANCE AND UNANTICIPATED EFFECTS

Baffinland conducts internal inspections and audits throughout the year, as described in Section 5. In addition, the Project is subject to external audits as noted in Section 5.1. Throughout the year, immediate corrective actions are taken as appropriate to address instances of non-compliance, as well as unanticipated effects observed. Follow-up corrective actions may also be required. These immediate and follow-up corrective actions are documented in the annual report.

One follow-up corrective action may be to revise mitigation measures or monitoring programs described in the applicable management plans. During the annual reporting cycle, Baffinland staff will review instances of non-compliance as well as unanticipated effects and determine if a review of plan effectiveness is appropriate. This process is articulated on Figure 6.1. The results of this annual review will be reported in the annual report. Management plan updates that result from this process will also be filed with the annual report.

6.2 SCHEDULED UPDATES

In addition to the annual review cycle described above, scheduled Plan reviews will occur according to the schedule presented in Table 6.1.

TABLE 6.1 PLAN REVIEW SCHEDULE

Review Event	Description
Prior to construction	Incorporate the appropriate elements of: • Safety Protocol and Communication Plan • Controlled Access Policy • CRLU Monitoring Plan
Post-construction	Mandatory management review
Every 3 years during operation	Mandatory management review

Plan updates will be recorded in the Document Revision Record located at the front of the Plan.

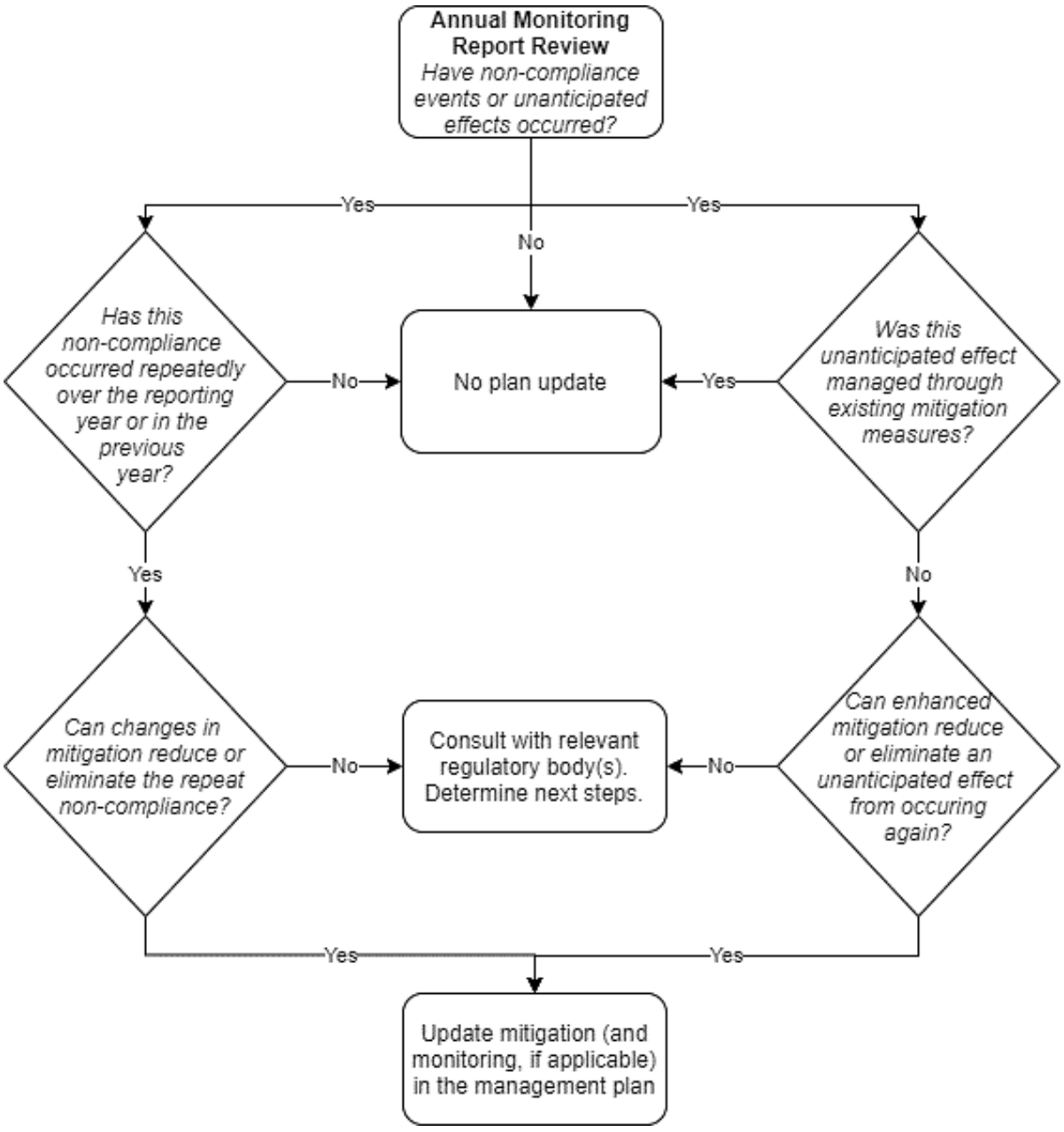

FIGURE 6.1 ANNUAL REVIEW OF PLAN EFFECTIVENESS

7.0 REFERENCES

Baffinland Iron Mines Corporation (Baffinland), 2013. *Quarry Operations Blasting Management Plan.* October.

Baffinland Iron Mines Corporation (Baffinland), 2019a. I*nuit Qaujimanituqangit Management Framework - Phase 2 Proposal - Mary River Project - Baffinland Iron Mines Corporation - NIRB File No. 08MN053*. September.

Baffinland Iron Mines Corporation (Baffinland), 2019b. *Adaptive Management Plan (Draft)*. August 23.

Canadian Environmental Assessment Agency, 2016. *Operational Policy Statement* - Adaptive Management Measures under the *Canadian Environmental Assessment Act.* Retrieved from: https://www.ceaa.gc.ca/default.asp?lang=En&n=F1F30EEF-1. Last modified: July 6, 2016.

Dyno Nobel Baffin Island Inc. (DNBI), 2019. *Baffinland Iron Mines: Mary River Project - Explosives Management Plan - REVISED*. February 15.

Fisheries and Oceans Canada (DFO), 2007. *Authorization for Works or Undertakings Affecting Fish Habitat*. Authorization issued to Baffinland Iron Mines Corporation. DFO Ref. No. NU-06-0084, August 3.

Fisheries and Oceans Canada (DFO), 2019a. *Fish and Fish Habitat Protection Policy Statement.*

Wright, D.G. and G.E. Hopky, 1998. *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters*. Department of Fisheries and Oceans. Canadian Technical Report of Fisheries and Aquatic Sciences 2107.

Appendix A
Corporate Policies

Baffinland Iron Mines Corporation

Health, Safety and Environment Policy

BAF-PH1-800-POL-0001

Rev 2

Approved By: **Brian Penney**

Title: **Chief Executive Officer**

Date: **April 20th, 2018**

Signature: 

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
05/07/15	0	EM	TP	For Use
03/07/16	1	JS	BP	Minor edits
04/20/18	2	TS	SA/BP	Minor edits

This Baffinland Iron Mines Corporation Policy on Health, Safety and Environment is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goals.

We implement this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance
- Meeting or exceeding the requirements of regulations and company policies
- Integrating sustainable development principles into our decision-making processes
- Maintaining an effective Health, Safety and Environmental Management System
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Reclamation of lands to a condition acceptable to stakeholders.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- As evidenced by our motto “Safety First, Always” and our actions Health and Safety of personnel and protection of the environment are values not priorities.
- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution through courageous leadership is essential for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The health and safety of all people working at our operation and responsible management of the environment are core values to Baffinland. In ensuring our overall profitability and business success every Baffinland and business partner employee working at our work sites is required to adhere to this Policy.

Brian Penney
Chief Executive Officer
April 2018

Sustainable Development Policy

At Baffinland Iron Mines Corporation (Baffinland), we are committed to conducting all aspects of our business in accordance with the principles of sustainable development & corporate responsibility and always with the needs of future generations in mind. Baffinland conducts its business in accordance with the Universal Declaration of Human Rights.

Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and with utmost respect for the cultural values and legal rights of Inuit. We expect each and every employee, contractor, and visitor to demonstrate courageous leadership in personally committing to this policy through their actions. The four pillars of our corporate responsibility strategy are:

1. Health and Safety
2. Environment
3. Upholding Human Rights of Stakeholders
4. Transparent Governance

Health and Safety

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness, where everyone goes home safe everyday of their working life. Why? Because our people are our greatest asset. Nothing is as important as their health and safety. Our motto is “Safety First, Always”
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour, awareness and promoting active courageous leadership. We allow our employees and contractors the right to stop any work if and when they see something that is not safe

Environment

- Baffinland employs a balance of the best scientific and traditional Inuit knowledge to safeguard the environment
- We apply the principles of pollution prevention, waste reduction and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop more sustainable practices. We strive to develop more sustainable practices
- Baffinland ensures that an effective closure strategy is in place at all stages of project development to ensure reclamation objectives are met

Upholding Human Rights of Stakeholders

- We respect human rights, the dignity of others and the diversity in our workforce. Baffinland honours and respects the unique cultural values and traditions of Inuit
- Baffinland does not tolerate discrimination against individuals on the basis of race, colour, gender, religion, political opinion, nationality or social origin, or harassment of individuals freely employed
- Baffinland contributes to the social, cultural and economic development of sustainable communities in the North Baffin Region

Sustainable Development Policy

- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions
- We expect our employees and contractors, as well as community members, to bring human rights concerns to our attention through our external grievance mechanism and internal human resources channels. Baffinland is committed to engaging with our communities of interest on our human rights impacts and to reporting on our performance

Transparent Governance

- Baffinland will take steps to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, customers and shareholders.
- Baffinland endeavours to ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- Baffinland conducts all activities in compliance with the highest applicable legal & regulatory requirements and internal standards.
- We strive to employ our shareholder's capital effectively and efficiently and demonstrate honesty and integrity by applying the highest standards of ethical conduct.

Brian Penney
Chief Executive Officer
March 2016

Appendix B
Concordance Table with Applicable Permits and Licences

TABLE B.1 NIRB PROJECT CERTIFICATE NO.005 CONDITIONS RELEVANT TO THIS PLAN

Number	Condition	Section
20	To ensure that the effects associated with the manufacturing, storage, transportation and use of explosives do not negatively impact the areas surrounding the Project.	This Plan Explosives Management Plan (DNBI, 2019) Borrow Pit and Quarry Management Plan Hazardous Materials and Hazardous Waste Management Plan Aquatic Effects Monitoring Plan QA/QC Sampling Plan
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.	3.2, Borrow Pit and Quarry Management Plan; Environmental Protection Plan
48	The Proponent shall engage with Fisheries and Oceans Canada and the Qikiqtani Inuit Association in exploring possible Project specific 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).	The Project-specific threshold of 50 kPa has been adopted based on DFO recommendation
60	Prior to construction, the Proponent shall develop a detailed blasting program to minimize the effects of blasting on terrestrial wildlife that includes but is not limited to the restriction of blasting when migrating caribou, sensitive local carnivores or birds may be negatively affected.	Borrow Pit and Quarry Mngt Plan Environmental Protection Plan
65	The Proponent shall ensure all employees working at project sites receive awareness training regarding the importance of avoiding known nests and nesting areas and large concentrations of foraging and moulting birds.	Environmental Protection Plan
66	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance on the basis of the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.	Terrestrial Environment Mitigation and Monitoring Plan; Borrow Pit and Quarry Management Plan
70	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan, until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.	Terrestrial Environment Mitigation and Monitoring Plan; Borrow Pit and Quarry Management Plan

Appendix C
Adaptive Management

C ADAPTIVE MANAGEMENT

C.1 PRINCIPLES OF ADAPTIVE MANAGEMENT

C.1.1 DEFINING THE ADAPTIVE MANAGEMENT PROCESS

Adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes (Canadian Environmental Assessment Agency, 2016). Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project.

Baffinland has developed an Adaptive Management Plan (AMP) that provides the framework by which adaptive management is to be incorporated into Project operations (Baffinland, 2019). The adaptive management process is iterative and starts with a planning phase; followed by implementation of monitoring; ongoing evaluation of the effectiveness of the plans based on monitoring results; and adjustment of the management strategies and responses as needed. This process is illustrated on Figure C.1.

C.1.2 CONCEPTUAL RESPONSE FRAMEWORK

The AMP establishes a systematic approach to respond to monitoring results through the establishment of a conceptual response framework that includes:

- Establishment of thresholds, and in some instances, early warning triggers
- Monitoring of key indicators relative to triggers and thresholds
- Specific pre-defined actions to be implemented if triggers or thresholds are exceeded
- A required follow-up process to evaluate, learn and adjust plans

The thresholds are defined in the individual management plans and may be qualitative or quantitative. For key indicators with quantitative thresholds, early warning triggers may be defined to initiate precautionary actions.

The response framework identifies the following action levels to be taken in response to exceedances of thresholds:

- **Low Action -** Implemented if monitoring shows that indicators are moving away from baseline conditions or predicted levels; actions could include investigating the change to determine a cause and/or assessing if additional monitoring is needed.
- **Moderate Action -** Implemented if there is a significant difference between reference and exposure areas or if effects appear to be trending toward a defined threshold; actions could include confirming and investigating the effect or evaluating the effectiveness of mitigation.
- **High Action -** When effects are well above those predicted and beyond defined thresholds; in this case actions could include applying more intensive mitigation measures or implementing restoration measures to reverse the effects.

FIGURE C.1 BAFFINLAND'S ADAPTIVE MANAGEMENT PROCESS

C.1.3 ADAPTIVE MANAGEMENT CHECKLIST FOR ENVIRONMENTAL MANAGEMENT

Checklists have been developed and populated for each management plan that describe how adaptive management has been incorporated into each management plan. Implementation of adaptive management will be an iterative process; not all elements have been addressed in the current plan. These will evolve through ongoing engagement as described below.

C.1.4 ENGAGEMENT IN THE ADAPTIVE MANAGEMENT PROCESS

An effective AMP relies on ongoing communication with the appropriate external parties. A key part of Baffinland's approach to adaptive management is incorporation of community review and feedback to improve or extend the effectiveness of the Environmental Management System (EMS) for the Project. Baffinland's recently developed Inuit Qaujimanituqangit (IQ) Management Framework proposes the establishment of an Inuit Committee to participate in the adaptive management process of environmental management on the Project. The interaction of the Inuit Committee with the Adaptive Management Plan and the EMS centres around the integration of IQ to the extent possible, as shown on Figure C.2.

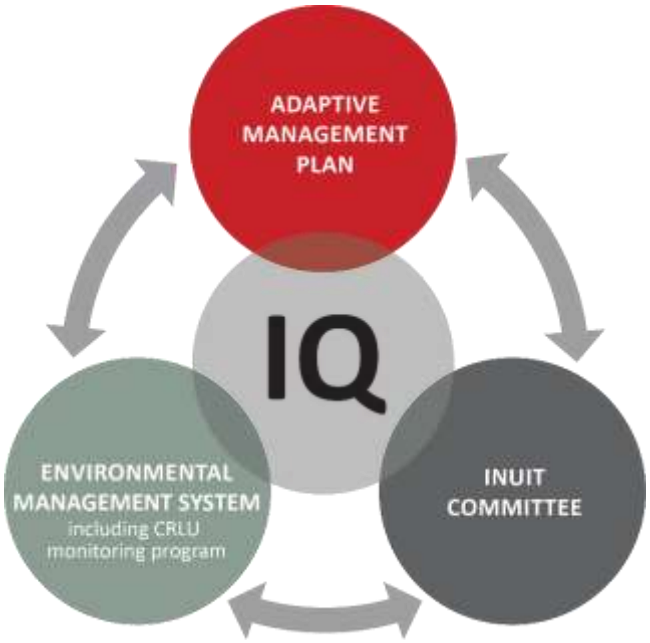

FIGURE C.2 INCORPORATION OF IQ IN ADAPTIVE MANAGEMENT

Existing advisory groups will also contribute to the adaptive management process; this includes:

- Marine Environment Working Group (MEWG)
- Terrestrial Environment Working Group (TEWG)
- Socio-economic Working Group (SEWG)

These advisory groups already review and discuss monitoring results with Baffinland on an annual or semi-annual basis and have provided important feedback that have resulted in modifications to mitigation measures and/or monitoring programs.