

Appendix D

Conceptual Blasting Plan Offloading Facility

CONCEPTUAL BLASTING PLAN FOR CONSTRUCTION OF THE GALLOO ISLAND OFFLOADING FACILITY

HOUNSFIELD WIND FARM PROJECT
JEFFERSON COUNTY, NEW YORK



OCTOBER 2009
REVISED DECEMBER 2009

PREPARED FOR:

**UPSTATE NEW YORK
POWER CORPORATION**

950-A UNION ROAD, SUITE 20
WEST SENECA, NEW YORK 14224

PREPARED BY:

URS CORPORATION - NEW YORK

77 GOODELL STREET
BUFFALO, NEW YORK 14203-1243

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TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	1
2.0 REGULATIONS AND GUIDELINES	1
3.0 CONTRACTOR QUALIFICATIONS	1
4.0 DETAILED BLASTING PLAN	2
5.0 ONSHORE STRUCTURAL/ OFFSHORE AQUATIC MONITORING	3
6.0 VIBRATION/OVERPRESSURE MONITORING AND DAMAGE CONTROL	3
7.0 TRANSPORTATION AND STORAGE OF EXPLOSIVES	5
8.0 ONSHORE BLASTING	5
9.0 OFFSHORE BLASTING	7
10.0 BLASTING RECORDS	9
11.0 SAFETY	9

FIGURES (Following Text)

- Figure 1 Borehole Pattern and Decked Delay-Timing
- Figure 2 Loaded Borehole Cross-Section

1.0 INTRODUCTION

This Conceptual Blasting Plan was prepared by URS Corporation (URS) and Rock Management Service, LLC. The technical information contained in this report pertaining to the proposed blasting operations was provided by Rock Management Service, LLC who has significant blasting experience.

The intent of this “Conceptual Blasting Plan” is to establish guidelines for onshore and offshore blasting associated with rock excavation for the Galloo Island Offloading Facility. Excavation for the facility will include the primary slip area, an off-loading ramp and a small crew boat alcove. The total volume of excavation required is approximately 80,000 cubic yards (cy), with 70 percent (56,000 cy) of the excavation onshore, and 30 percent (24,000 cy) offshore. Based on existing topographic, bathymetric, and geologic information, as well as the depth of required excavation, blasting is expected to be required in order to complete this work. It is anticipated that blasting shall commence onshore, and proceed offshore until complete.

2.0 REGULATIONS & GUIDELINES

All blasting shall be performed in accordance with the laws and regulations governing blasting and the use of explosives in the State of New York. These regulations are contained in the New York State Industrial Code Rule 39 (12 NYCRR 39). Additionally, the following safety guidelines shall be adhered to:

- Federal Explosives Law and Regulations (ATF P 5400.7)
- NFPA 495 Explosive Material Code
- OSHA Standards, 29 CFR 1926 Subpart U – Blasting and the Use of Explosives
- CFR Title 49 Transportation - Parts 176 & 177 (USDOT)

Reference guidelines include the following:

- Guidelines for the use of Explosives in or near Canadian Fisheries Waters (1998)
- Alaska Department of Fish and Game – Blasting Standards for the Protection of Fish (Draft February 15, 1991)
- USACE Safety Manual EM 385-1-1 Section 29 – Blasting (September 15, 2008)

3.0 CONTRACTOR QUALIFICATIONS

A blasting contractor, with a minimum of ten years of blasting experience on similar projects, shall be employed to complete this work. The Blaster-in-Charge (BIC) shall also possess similar experience, as well as a valid blaster’s license issued in the State of New York.

4.0 DETAILED BLASTING PLAN

Sixty days prior to commencing blasting operations, the blasting contractor shall submit a “Detailed Blasting Plan” for review and approval. The Detailed Blasting Plan will incorporate the findings of a detailed geotechnical investigation and other engineering studies including a structures survey. The plan will be submitted to NYSDEC for approval prior to the start of construction and shall include, as a minimum, the following information:

- Documented blasting experience on past projects of similar size and scope.
- Resume(s) of the intended BIC and supporting personnel.
- Copies of all blasting licenses, blasting permits, storage certificates, etc. required by the State of New York and all other affected agencies.
- Intended plan for transportation, storage and handling of explosives, as well as the types and quantities of explosives to be stored.
- Technical data sheets, and associated Material Safety Data Sheets, for all explosives products intended to be used.
- Findings of the detailed geotechnical investigation completed for the project.
- Findings of the pre-construction aquatic survey completed for the project and any impacts on the blasting design.
- Findings of an investigation as to the potential effects of working in a seismic “zone of moderate risk” including identification of the risks and the protective measures to be employed.
- Findings/data associated with the bathymetric survey completed for the project and contained as Appendix K of the Draft Environmental Impact Study (DEIS), as appropriate and, any impacts on the blasting design.
- Detailed design information, for each type of blasting technique intended to be utilized (i.e. production blasting, underwater blasting, pre-splitting), including but not limited to bore hole diameters, burden and spacing, depth(s) of boreholes and intended sub-drill, loading diagrams, charge weights, decking, delay intervals and method(s) of initiation.
- Proposed methods of drilling, loading, dredging and disposal including a description of the equipment to be utilized and its intended use and operation.
- A blasting schedule indicating the sequence, direction of advance and expected duration of the blasting program.
- Pre-blast survey including all onshore structures affected.
- Proposed monitoring by an aquatic ecologist during blasting and excavation.
- Proposed method of monitoring vibration and overpressure, both onshore and offshore, including type and location of both fixed and portable monitoring equipment.
- Safety plan identifying all access points to the blasting area(s); the location of all signage and flags; the procedure for clearing the blast area before firing and safety signaling to be used.
- Post-blast inspection procedures to be implemented, both onshore and offshore, including the handling of misfires.

5.0 ONSHORE STRUCTURAL/OFFSHORE AQUATIC MONITORING

An onshore pre-blast survey shall be conducted for all structures within a 1,000-foot radius of the blast area. This survey shall be completed prior to the submission of the Detailed Blasting Plan. Written notification must be provided to affected property owners requesting permission to conduct the survey. The notification must also include pertinent information detailing the blasting activity planned; the expected duration of the blasting, and the blasting contractor's contact information.

In addition to the onshore pre-blast survey, a preconstruction aquatic survey will be performed by an Aquatic Ecologist in order to determine the fish community at the site. The parameters of the preconstruction aquatic survey are presented below and were designed to sample both adult and juvenile species of fish. Sampling will be performed during the spring spawning period. The sampling will include gill netting and bottom trawls at depths of 10-feet, 20-feet, and 30-feet during mid-April (or ice out), mid-May and mid-June. Due to the steep drop-off at the proposed location of the slip, seine netting at shore would be difficult to accomplish. Captured adults from gill net surveys will be checked for spawning condition by the Aquatic Ecologist. The preconstruction aquatic survey along with existing surveys in the literature will be used to identify potential species spawning habitat at or near the proposed blasting area. The pre-construction aquatic survey will be documented in a report by the Aquatic Ecologist and submitted to NYSDEC prior to construction. The Detailed Blasting Plan will utilize the findings of the pre-construction aquatic survey to the extent possible during development of specific blasting protocols.

During and after blasting, the Aquatic Ecologist will conduct aquatic surveys to determine the number of adult and juvenile fish that suffer mortality from blasting. Monitoring of the effects of the blasting such as the water overpressure levels will be performed at key sensitive spawning areas such as Little Galloo Island and Stoney Island. In addition, monitoring the effects of the blasting on colonial nesting birds on Little Galloo Island will be performed in the event initial blasting causes disturbance to high priority nesting birds such as the Caspian Tern. Observations and collection of stunned and killed fish by hand-net will be made from a small craft. It should be noted that heavy gull predation after the blasts could make it difficult to collect and count killed and stunned fish. Since many species of fish that suffer mortality would remain at the bottom, occasional diver surveys will be performed to determine if losses occurred from the blasting. Divers will recover any dead fish found at the bottom after blasting for analysis by the Aquatic Ecologist. The post-blasting aquatic survey will be documented in a report by the Aquatic Ecologist and submitted to NYSDEC after blasting is complete.

Since there would be seasonal and annual variations in community composition and abundance even without project impacts, it is not likely that conducting gill netting following completion of construction would provide any useful comparison between pre-construction and post-construction conditions. These types of post construction surveys could only provide some useful information in the unlikely event that massive losses of fish occur and are observed during the blasting phase of the work.

6.0 VIBRATION/OVERPRESSURE MONITORING AND DAMAGE CONTROL

Upon review of the pre-blast survey information, the blasting contractor shall make any necessary changes to the planned deployment and locations of onshore seismic equipment.

Onshore seismic and overpressure monitoring equipment shall be of the type, and at those locations, indicated in the approved Detailed Blasting Plan. For onshore blasting, the maximum peak particle velocity shall not exceed 2.0 in/sec at a distance of 1,000-feet from the blast area, nor shall it exceed 1.0 in/sec at the nearest property line or protected structure. The maximum allowable air overpressure level at the nearest property line shall not exceed 133 dB (0.013 psi).

As blasting approaches the shoreline and then moves offshore, mitigating the effect on aquatic wildlife becomes a concern. Therefore, an “exclusion zone” shall be defined for this project, establishing a boundary around the blasting area outside of which the aquatic habitat shall be protected. Applying the calculations contained in the document entitled, “Alaska Department of Fish and Game – Blasting Standards for the Protection of Fish (Draft February 15, 1991)” to the project, the maximum allowable charge weight and minimum setback distance were determined. These calculations are presented on pages 15 through 19 in the above referenced document. The maximum allowable charge weight shall be used to limit the total weight of explosives detonated per 25 millisecond period. The minimum setback distance shall be used to define the distance, from the nearest maximum allowable charge detonated, to the boundary of the exclusion zone. The exclusion zone setback distance was calculated using the following relationship identified as Equation D on Page 17 of the above referenced document:

$$R = W^{0.5} \text{Cos}\theta (V_r/160)^{-0.625}$$

where...

R = Exclusion zone setback distance (feet)

W = Charge weight (pounds, designated to be 55 pounds)

θ = Angle between valley floor and blast point (degrees, assumed to be zero)

V_r = peak particle velocity (in/sec, calculated to be 0.56 in/sec based on a maximum overpressure of 2.7 psi, see pages 18 and 19 of the above referenced document)

Based on this calculation, the limits for this project shall be as follows:

- The maximum charge weight detonated within the exclusion zone shall be 55 pounds (25 kg).
- The minimum setback distance from the exclusion zone boundary shall be 252 feet (75.5 m).

Based on these parameters, a minimum Scale Distance Factor (SD), for shoreline and offshore blasting, can be derived. Given the scale distance equation:

$$SD = R/W^{.5}$$

A minimum scale distance factor of 34 feet is then calculated. All blast designs, for shoreline and offshore blasting shall have a scale distance factor of 34 or greater.

Accordingly, using the minimum setback distance of 252 feet, the exclusion zone boundary, around the blasting limits, shall be defined as:

Beginning approximately 252 feet northeast of the shoreline rock removal limits; then proceeding southeast to a point approximately 500 feet offshore; then proceeding southwest for approximately 900 feet; then proceeding northwest for approximately 500 feet before returning to the shoreline. It should be noted that these boundary limits may be further refined based on observances made during the aquatic monitoring. Precise exclusion zone limits shall be established and submitted in the Detailed Blasting Plan.

Offshore seismic and overpressure monitoring equipment shall be of the type, and at those locations, indicated in the approved Detailed Blasting Plan. For this project, the maximum peak particle velocity shall not exceed 0.5 in/sec at any point outside of the exclusion zone. The maximum allowable water overpressure level shall not exceed 2.7 psi at any point outside of the exclusion zone.

7.0 TRANSPORTATION AND STORAGE OF EXPLOSIVES

Transportation of explosives offshore by vessel shall be in accordance with the regulations set forth in 49 CFR Part 176. All port security and safety regulations must be abided by. All transport vessels must be in good operating condition and properly equipped with all required safety equipment. All explosive material must be properly stowed and secured. All operating personnel must possess the necessary license, certificate or other documentation required to operate or man the vessel. All shipments must be accompanied by the required shipping papers and cargo manifest.

Transportation of explosives onshore by vehicle shall be in accordance with the regulations set forth in 49 CFR Part 177 and more specifically in accordance with 177.835 as it pertains to Class 1 Materials. All vehicles shall be maintained in proper working conditions. All vehicles shall be equipped with the required safety equipment and properly placarded for the material being transported. Detonators shall be kept separate from all other Class 1 Material on the vehicle.

Storage of all explosive material onshore shall be in approved Type 2 and Type 5 portable magazines. The magazines shall be sited in a safe location, properly grounded and adequate signage posted indicating an explosive storage area. A valid certificate of storage, issued by the State of New York, shall be on file on site. The blasting contractor shall notify the authority having jurisdiction for fire safety of the type of explosives being stored; magazine number(s) and capacity; a mapping arrangement indicating magazine locations, separation distances; site location(s) and GPS coordinates. Such notification shall be made orally before the end of the day on which storage of the explosives materials commenced and in writing within 48 hours from the time such storage commenced. Duplicate correspondence shall also be forwarded to the BATF district office having jurisdiction. Magazine inventory records shall be accurately maintained and kept at the magazine site. A duplicate record(s) shall also be kept separate from the magazine site.

8.0 ONSHORE BLASTING

All design, layout, loading and detonation of explosives shall be supervised by an experienced, qualified, licensed blaster assigned as the "Blaster in Charge" (BIC). The BIC shall also be responsible

for blast site safety; explosive inventory maintenance and record keeping; generation of shot reports and the evaluation of seismic data for each shot detonated.

The onshore rock excavation consists of a surface area, of roughly 60,000 square feet (sf), ranging in depth from 14 to 26 feet. Conventional production blasting methods shall be implemented to fracture the rock to be excavated. In addition to these methods, controlled blasting techniques (i.e. pre-splitting, line drilling, etc.) may also be employed in order to maintain the integrity of the vertical sidewalls during the advance of the production blasting.

Drilling Procedures: Conventional self-contained hydraulic drills shall be used to drill the required borehole diameters. The drills shall be equipped with dry suction dust collector systems for dust control. The drillers shall be required to use all safety equipment necessary to minimize risk to the workers.

All engineering, layout and control shall be provided by qualified personnel. Hole placement and depth of drilling shall be dictated by the field information provided. Upon confirmation of the subgrade depth required, an appropriate amount of sub-drill (10 to 15%) shall be added to assure that the required subgrade depth is achieved during excavation. Drilling shall be conducted at the locations, and to the specified depth, as instructed by the BIC. Drilling logs shall be generated for all shots drilled. These logs shall be evaluated by the BIC prior to commencement of the loading operation.

Blast Design: It shall be the intent to design the majority of the production blasting utilizing a common borehole diameter and pattern (burden & spacing). It should be noted however, that as vibration criteria becomes either more or less restrictive, the borehole diameter and patterns shall be increased or decreased as required. In addition, due to the potential safety hazards associated with magnetic anomalies, only non-electric detonators and initiation systems shall be permitted to be used on this project.

The “Powder Factor” (lbs/cy), defined as the quantity of explosives required to fracture a given volume of rock, shall be developed based on further field investigation, and the additional geotechnical information obtained. Once determined, the borehole diameter and patterns shall be selected. The borehole diameter shall be selected based on the “Loading Density” (lbs/ft). The burden and spacing shall be design in conjunction with a determined amount of explosives per hole. The “Power Column Height”, defined as the level to which the explosives are loaded in the borehole, shall be such that the remainder of the borehole may be safely stemmed without the need to cover the shots. Shots, however, shall be covered if necessary. Stemming shall be an angular gravel with a particle size of approximately 1/12th the diameter of the borehole.

In order to stay within acceptable vibration limits, decking of charges in the boreholes shall be employed where necessary. Decking is the separation of the total charge weight in a borehole, into smaller charges allowing a discrete time-delayed detonation of each individual charge. The maximum charge weight, per any given 8 milli second (ms) period, can then be limited by decking of charges in production holes.

The following calculation is offered as an “example only” using the design parameters just discussed:

GIVEN: A 3-1/2" diameter hole is drilled 40'-0" deep on a 7' x 10' pattern. The total charge weight detonated, per 8 ms delay period, shall not exceed 60 pounds.

The volume calculation is: $(7 \times 10) \times 40 / 27 = 104 \text{ cy (ROCK)}$

Applying a powder factor of 1.0 lbs/cy the charge weight is: $104 \text{ cy} \times 1.0 \text{ lbs/cy} = 104 \text{ lbs}$

The loading density for a 3-1/2" diameter hole is 3.5 lbs/lf

Therefore the powder column height required in the borehole would be: $104 \text{ lbs} / 3.5 \text{ lbs/lf} = 30 \text{ lf}$

Given that the maximum charge weight detonated shall not exceed 60 pounds per 8 ms delay period, the borehole shall be loaded as follows:

15'-0" of the bottom of the hole will be charged with 52 pounds of explosives. A 2'-0" stemming column (deck) will then separate the next charge. The next 15'-0" of the hole will be charged with an additional 52 pounds of explosives, and the remaining 8'-0" of the hole would be stemmed to grade. The individual charges shall then be detonated by a delay period of 8 ms or greater.

This example is illustrated in Figures 1 and 2 attached to the end of this document.

Loading Procedures: All handling and loading of explosives shall be under the supervision of the BIC. Product selection shall be of the type or size required to effectively load the boreholes. Transportation of the explosives shall be by an approved means of conveyance. The borehole logs shall be reviewed, and the depth of the boreholes confirmed prior to loading. All personnel working with explosives shall be in good physical condition, and able to understand and give written and verbal orders. Primers shall not be made up in excess of immediate need for holes to be loaded. After loading is complete, all excess explosive materials and detonators shall be move to a safe location. Firing of the shot shall be directed by the BIC.

9.0 OFFSHORE BLASTING

All design, layout, loading and detonation of explosives shall be supervised by an experienced, qualified, licensed blaster designated as the "Blaster in Charge" (BIC). The BIC shall also be responsible for blast site safety; explosive inventory maintenance and record keeping; generation of shot reports and the evaluation of seismic data for each shot detonated.

The offshore rock excavation consists of a surface area, of roughly 70,000 sf, ranging from a depth at the shoreline of 26 feet, diminishing then until an existing lake bed elevation of 229' is reached approximately 230 feet offshore. Alternatively, the bathymetry increases gradually from the shoreline to an average depth of 16 feet above the lakebed surface. Due to the shallow nature of the lakebed offshore, blasting of the entire surface area utilizing barge supported equipment shall not be possible due to draft limitations. Therefore several other options may be considered.

One option may be to construct a cofferdam system around the blast area, to a point offshore, where conventional barge supported drilling and blasting methods would be employed. Upon completion of blasting operations in the dry, the cofferdam system would be removed and the offshore blasting operation would then commence.

A second, more practical approach, may be to use the shot rock generated from the onshore blasting, and fill offshore into lake. Drilling through the shot rock, into the lake bed, could then be done in the dry. This would allow the progression of the blasting program to proceed offshore to a point where offshore blasting could then commence.

A definitive means of progressing from onshore to offshore shall be determined and described in the Detailed Blasting Plan. Therefore, where conventional barge supported drilling and blasting methods are implemented to fracture the rock offshore, the following shall apply:

Drilling Procedures: Conventional barge supported drilling equipment shall be used to drill the required borehole diameters. The drills shall be equipped as necessary for offshore operation. The drillers shall be required to use all safety equipment necessary to safely perform the work. All engineering, layout and control shall be provided by qualified personnel. Hole placement and depth control will be dictated by the field information provided. Upon confirmation of the subgrade depth required, an appropriate amount of sub-drill (20 to 30%) shall be added to assure that the required subgrade depth is achieved during excavation. Drilling shall be conducted at the locations, and to the specified depth, as instructed by the BIC. Drilling logs shall be generated for all shots drilled. These logs shall be evaluated by the BIC prior to commencement of the loading operation.

Blast Design: It shall be the intent to design the majority of the production blasting utilizing the same borehole diameter and pattern. It should be noted however, that as vibration criteria becomes either more or less restrictive, the borehole diameter and patterns shall be increased or decreased as required. In addition, due to the potential safety hazards associated with magnetic anomalies, only non-electric detonators and initiation systems shall be permitted to be used on this project.

The powder factor shall be higher than that use for onshore blasting due to expected energy loss to the surrounding water. Once determined, the borehole diameter and patterns shall be selected. The borehole diameter shall be selected based on the type of explosive product to be used. The burden and spacing shall be designed in conjunction with a determined amount of explosives per hole. The level to which the explosives are loaded in the borehole, shall be such that the remainder of the borehole may be adequately stemmed to the level of the substrate/water interface. Stemming shall be an angular gravel with a particle size of approximately $1/12^{\text{th}}$ the diameter of the borehole.

In order to stay within acceptable vibration limits, decking of charges in the boreholes shall be employed where necessary. Decking is the separation of the total charge weight in the hole, into smaller charges allowing a discrete time-delayed detonation of each individual charges. The maximum charge weight, per any given 25 ms period, can then be limited by decking of charges in production holes.

Loading Procedures: All handling and loading of explosives will be under the supervision of the BIC. Product selection shall be of the type or size required to effectively load the boreholes. Transportation of the explosives shall be in accordance with the provisions herein. The borehole logs shall be

reviewed, and the depth of the boreholes confirmed prior to loading. All personnel working with explosives shall be in good physical condition, and able to understand and give written and verbal orders. Blasting flags shall be displayed at all times during the loading process. Loading tubes and casings of dissimilar metals shall not be used. Loading shall be done through non-sparking metal tubes when necessary. The detonation downlines for each hole shall be tied to a shotline that is anchored and floated over the row of loaded holes. After loading is complete, all excess explosive materials and detonators shall be moved to a safe location. Firing of the shot shall be directed by the BIC. All “shock-tubes” are to be recovered and removed after each blast.

10.0 BLASTING RECORDS

A record of each blast shall be prepared and available for review within 24 hours after detonation. As a minimum the blast record shall contain the following data:

- Name of company or contractor.
- Exact location of the blast, date and time of detonation.
- Name, signature and license number of the Blaster in Charge.
- Type of material blasted.
- Number of holes, burden and spacing.
- Diameter and depth of holes.
- Type of detonators used.
- Type of explosives used.
- Type and height of stemming column.
- Total amount of explosives detonated.
- Loading profile if decking is used.
- Maximum charge weight detonated per 8 millisecond, or greater, delay period.
- Maximum number of charges detonated per 8 millisecond, or greater, delay period.
- Scale Distance Factor calculated.
- Method of initiation.
- Type of circuit, if applicable.
- Distance, direction and identification of the nearest affected structure or boundary.
- Weather conditions and wind direction.
- Type of blasting mats or other protective covering used.
- An accurate sketch of the blast area indicating the location of the shot, and the distance and directional relationship between all seismic equipment and the nearest affected structure or limiting boundary.
- Seismic record(s).
- Plan view of the borehole layout and delay pattern.

11.0 SAFETY

Firing: Prior to the firing of a shot, all persons in the danger area shall be warned of the blast and ordered to a safe distance from the area. Blasts shall not be fired until it is certain that every person has

retreated to a safe distance and no one remains in a dangerous location. The following safety protocols will be adhered to:

- Prior to the firing of a shot, a competent flag person shall be posted at all access points to the blast area.
- Prior to the firing of a shot, drill boats and other vessels shall be moved a safe distance from the blast area.
- Prior to and while the drill boat or vessel is being moved from the blast area, a series of short signals by horn or whistle similar to the usual navigation warning signals shall be given.
- No blast shall be fired while any vessel under way is closer than 1,500 feet to the underwater blasting area. Those on board vessels or craft moored or anchored within 1,500 feet must be notified before a blast is fired.
- No blast shall be fired closer than 250 feet to a boat or vessel containing an explosive magazine; personnel engaged in drilling operations on another drill boat within 500 feet shall leave the drill frames for cover if any holes have been loaded.
- No blast shall be fired while any swimming or diving is in progress near the blasting area.
- Whenever a drill boat is moved from the drilling setting, all loaded under water holes shall be fired.

Safety Signals: All blasting operations shall use the following safety signals:

(1) **WARNING SIGNAL** - a one-minute series of long audible signals 5 minutes prior to blast signal;

(2) **BLAST SIGNAL** - a series of short audible signals 1 minute prior to the shot; and

(3) **ALL CLEAR SIGNAL** - a prolonged audible signal following the inspection of blast area.

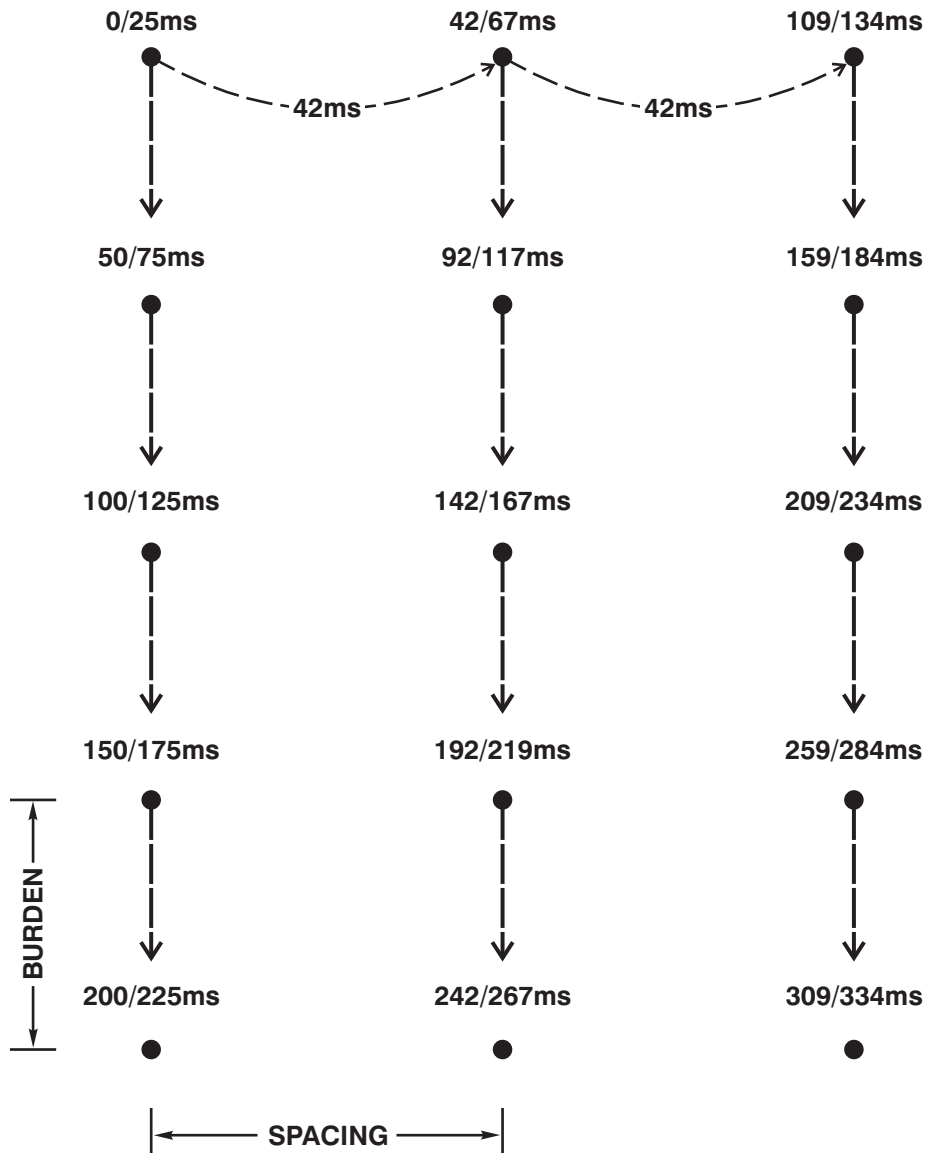
- The safety signals shall be given by use of a compressed air whistle, a horn, or equivalent means, and shall be clearly audible at the most distant point in the blast area. The boat whistle on a drill boat shall not be used as a blasting signal.
- The code for safety signals and warning signs and flags shall be posted at all access points.
- All personnel shall be made familiar with the signals and instructed accordingly.

Post-Blast Procedures: Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine or power source.

- An inspection shall be made by the blaster to determine that all charges have been exploded. All wires/tubes shall be traced and a search conducted for unexploded cartridges.
- Other persons shall not be allowed to return to the area of the blast until an "all clear" signal is given.
- Loose pieces of rock and other debris shall be scaled down from the sides of the face of excavation and the area made safe before proceeding with the work.

Misfires: Misfires shall be handled under the direction of the BIC. The BIC shall determine the safest method for handling the hazards of misfire.

- When a misfire is declared, the BIC shall wait 15 minutes before inspecting the site and provide proper safeguards for excluding all employees, except those necessary to do the work, from the danger zone.
- No other work shall be done except that necessary to remove the hazard of the misfire. Only those employees necessary to do the work shall remain in the danger zone.
- No drilling, digging, or picking shall be permitted until all misfire holes have been detonated or the blaster has approved that work can proceed.



HOLE DIAMETER: 3.5 INCHES
HOLE DEPTH: 40 FEET
BURDEN: 7 FEET
SPACING: 10 FEET

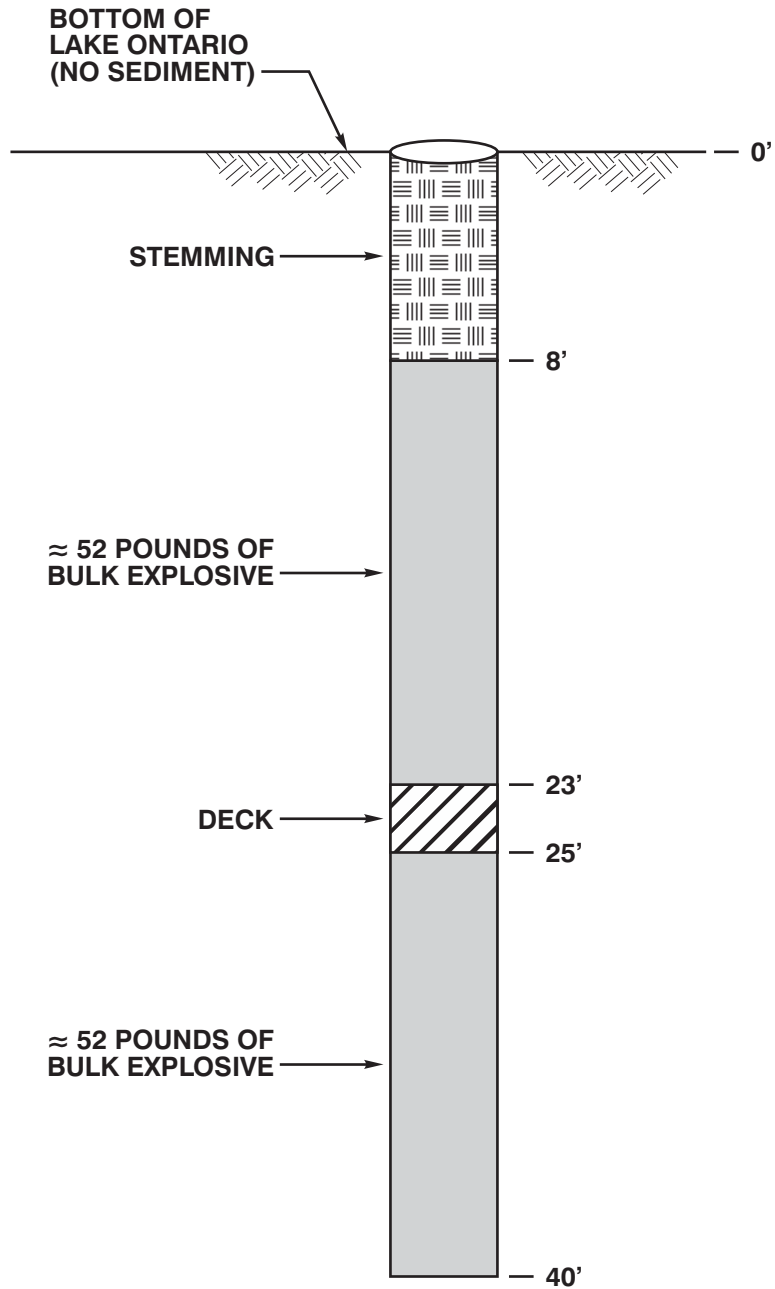
DELAY-TIMING BETWEEN DECKS EQUALS 25 MILLISECONDS (MS).
NO (2) DISCRETE DECKS ARE DETONATED ANY CLOSER THAN 8MS
APART. THEREFORE, THE MAXIMUM EXPLOSIVE CHARGE WEIGHT
DETONATED PER 8MS PERIOD IS 52 POUNDS (LESS THAN 60 POUNDS).

AG20331-11176101-100809-GCM



BOREHOLE PATTERN AND
DECKED DELAY-TIMING

FIGURE 1



HOLE DIAMETER: 3.5 INCHES
 HOLE DEPTH: 40 FEET
 BURDEN: 7 FEET
 SPACING: 10 FEET

DELAY-TIMING BETWEEN DECKS EQUALS 25 MILLISECONDS (MS).
 NO (2) DISCRETE DECKS ARE DETONATED ANY CLOSER THAN 8MS
 APART. THEREFORE, THE MAXIMUM EXPLOSIVE CHARGE WEIGHT
 DETONATED PER 8MS PERIOD IS 52 POUNDS (LESS THAN 60 POUNDS).

AG20332-11176101-100809-GCM



LOADED BOREHOLE
 CROSS-SECTION

FIGURE 2