

YOUR TRUSTED BREED

making it happen

**Maine Drilling
& Blasting**

Blasting Plan

for

Nordic Aquafarms, Inc.

285 Northport Avenue
Belfast, ME

Date: April 18, 2019

Prepared For:

CIANBRO Corporation

101 Cianbro Square
Pittsfield, ME 04967

Prepared By: Brett Doyon



Maine Drilling & Blasting, Inc.
P.O. Box 1140
423 Brunswick Avenue
Gardiner, ME 04345
207.582.2338
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Divisional Offices
Connecticut 860.242.7419
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General

Maine Drilling & Blasting considers safety as the priority during all phases of blasting operations. We are knowledgeable of and will follow all local, state and federal regulations related to transportation and use of explosives. The project specifications and conditions have been reviewed. Details of procedures for pre-blast surveys, explosives use, blast security, monitoring and documentation are enclosed. Blasting will be in accordance with blasting law for site location of development projects: 38 MRSA paragraph 490-Z(14)(Blasting).

Pre-Blast Surveys / Notifications

Pre-blast surveys will be offered to all property owners within a 2,000 foot radius of the blast site. Appropriate notices will be given and appointments arranged for those owners who desire a survey. Pre-blast surveys will be conducted by a Company Representative. Results of those surveys will be documented through video or still photographs and appropriate narration or written reports. The property owner will be offered to have their well water tested for quantity and quality of water. These results will be submitted to the Department at the property owner's authorization.

Property owners within 2,000 feet of the blast area will be provided a blasting schedule. The blasting schedule shall contain, at a minimum - (1) Name, address, and telephone number of the operator, (2) Identification of the specific areas in which blasting will take place, (3) Dates and time periods when explosives are to be detonated, (4) Methods to be used to control access to the blasting areas, and (5) Type and patterns of audible warning and all-clear signals to be used before and after blasting.

Blast Monitoring

All blasts will be monitored by a representative of Maine Drilling & Blasting, Inc. who has been properly trained in the setup and use of seismic monitoring equipment. At least one seismograph will be in use at all times. Placement of monitoring equipment will be at the nearest structure to the blast site with the instrument's transducer firmly coupled to the ground. Maine Drilling & Blasting, Inc. monitoring equipment will consist of InstanTel type seismographs. Details are enclosed. Seismographs meet all requirements outlined in subsection M of 28 MRSA paragraph 490-Z(14). Results of blast monitoring will typically be available before the next blast, usually immediately following a blast. Results can be reviewed and modifications can be made to the blast design for the next blast if necessary.

Sequence of Blasting

All blasting operations will be strictly coordinated with Engineers, and Fire Department. Emphasis will be on the safe and efficient removal of the rock existing on this project without impact to surrounding structures. Blasts will be developed so as to create adequate relief which will minimize ground vibrations and offer the greatest protection possible to the surrounding structures.

Blasting Procedures

1. Blasting may not occur in the period between sundown and sunrise the following day or in the period between 7:00 p.m. and 7:00 a.m., whichever is greater. Blasting will not occur more frequently than 4 times per day. Blasting will not be allowed on Saturday and Sunday.
2. Blasting cannot be conducted at times different from those announced in the blasting schedule except in emergency situations, such as electrical storms or public safety required unscheduled detonation.
3. Warning and all-clear signals of different character that are audible within a range of one-quarter mile from the point of the blast shall be given. All persons within the permit area shall be notified of the meaning of the signals through appropriate instructions and signs posted.
4. Access to blasting area shall be regulated to protect the public from the effects of blasting. Access to the blasting area shall be controlled to prevent unauthorized entry before each blast and until the perimeter's authorized representative has determined that no unusual circumstances exist after the blast. Access to and travel in or through the area can then safely resume.
5. Areas in which charged holes are awaiting firing shall be guarded, barricaded and posted, or flagged against unauthorized entry.
6. All blasts shall be made in the direction of the stress relieved face previously marked out or previously blasted.
7. All stemming shall be minimum as specified using clean, dry 3/8" crushed stone.
8. Blasting mats shall be used as necessary to cover blasts.
9. The Blasting Contractor shall insure that extra safety and judgment is exercised by his blaster to prevent the simultaneous blasting of numerous holes.
10. If a blast is initiated by a detonating cord, the detonating cord will be covered by crushed stone or other suitable cover to reduce noise and other concussion effects.

Blasting Mats

Blasting mats and backfill will be used to control excessive amounts of rock movement when blasting in close proximity to structures. Placement and number of mats are typically determined by the blaster. Mats will be placed so as to protect all people and structures on, or surrounding the blast site and property, the mats will prevent flyrock from entering protected natural resources or natural buffer strips. Rubber tire type blasting mats will be utilized on this project and will be approximately 12' x 24' in size; Rubber mat @ 12' x 24' 38 lbs/sqft = 10,944 lbs/ea.

Blast Security and Warning Whistles

Each blast will be preceded by a security check of the affected area and then a series of warning whistles. Communications will be made with job site supervisors and local officials as required to ensure the safest possible operation. All personnel in the vicinity closest to the blast area will be warned. The warning whistles will follow the following sequence:

3 Audible Signal Pulses - 5 Minutes to Blast

2 Audible Signal Pulses - 1 Minute to Blast

1 Audible Signal Pulses - All Clear

No blast will be fired until the area has been secured and determined safe. The blast site will be examined by the blaster prior to the all-clear signal to determine that it is safe to resume work.

Explosives

All explosives will be delivered to the job site on a daily basis. Overnight storage will be a licensed secure magazine site. Only the amount of explosives required to perform the day's work will be brought to the site. All explosives will be stored in approved magazines when not in use.

Enclosed are Technical Data and MSDS sheets for the explosive products proposed for use on this project. Any one of, or a combination of these products may be in use at any one time on the site.

Blaster Qualifications

All Maine Drilling & Blasting, Inc blasters on this job will be licensed in the State of Maine and have received various amounts of training in the safe use and handling of explosives. Additionally, Maine Drilling & Blasting, Inc. blasters are familiar with all OSHA Regulations, State Regulations, and Federal Regulations regarding construction site safety, including transportation, use, and handling of explosive materials. Weekly safety meetings are to be held on site by the Maine Drilling & Blasting, Inc. job foreman, with a record of that meeting returned to the Maine Drilling & Blasting, Inc. office.

Blasting Personnel

All blasting operations shall be conducted by experienced, trained and competent persons who understand the hazards involved. Persons working with explosive materials shall:

1. Have demonstrated knowledge of, and a willingness to comply with, safety and security requirements.
2. Be capable of using mature judgment in all situations.
3. Be of good physical condition and not addicted to intoxicants, narcotics, or other similar type of drugs.
4. The person(s) responsible for the explosives shall possess current knowledge of the local, State and Federal laws and regulations applicable to his work.
5. The person(s) responsible for the explosives shall have obtained a Certificate of Competency or a license as required by State law.

Licenses and Permits

Maine Drilling & Blasting, Inc. is fully licensed and insured for the transportation, use, and handling of explosives. Evidence of insurance is available. Blasting permits will be applied for as required from the local authorities by the Maine Drilling & Blasting, Inc.

Blaster/Foreman when blasting is about to begin.

Blast Vibration & Air-Blast

The maximum allowable air-blast at an inhabited building not owned or controlled by the developer may not exceed 129 decibels peak when measured by an instrument having a flat response (+ or - 3 decibels) over the range of 5 to 200 hertz. Additionally, sound from blasting may not exceed the following limits at any inhabited building not owned or controlled by the developer.

- Blast 1: Less than 129 decibel
- Blast 2: Less than 126 decibel
- Blast 3: Less than 124 decibel
- Blast 4: Less than 123 decibel

The maximum allowable air-blast at an uninhabited building not owned or controlled by the developer may not exceed 140 decibels peak when measured by an instrument having a flat response (+ or - 3 decibels) over a range of 5 to 200 hertz.

Blast vibration will be monitored at the blast site, typically at the structure(s) closest to the blast site. Vibration limits will closely follow limits described in the project specifications and the State Regulations. Blast designs will be modified as required to stay within the guidelines and meet project schedules as well. Blasting operations will be modified accordingly when approaching buildings and utilities. Enclosed are preliminary vibration

calculations based on known distances to the structures of concern and anticipated initial blast designs.

Ground Vibration peak particle velocity limits shall not exceed:

Refer to Appendix B, Figure B-1, U.S. Bureau of Mines RI 8507.

In addition, the maximum peak particle velocity at inhabitable structures not owned or controlled by the developer will not exceed the levels established below:

Distance from the Blast (ft.)	Max PPV
0 to 300 feet	1.25 in/sec
301 5000 feet	1.00 in/sec
Greater than 5000 feet	0.75 in/sec

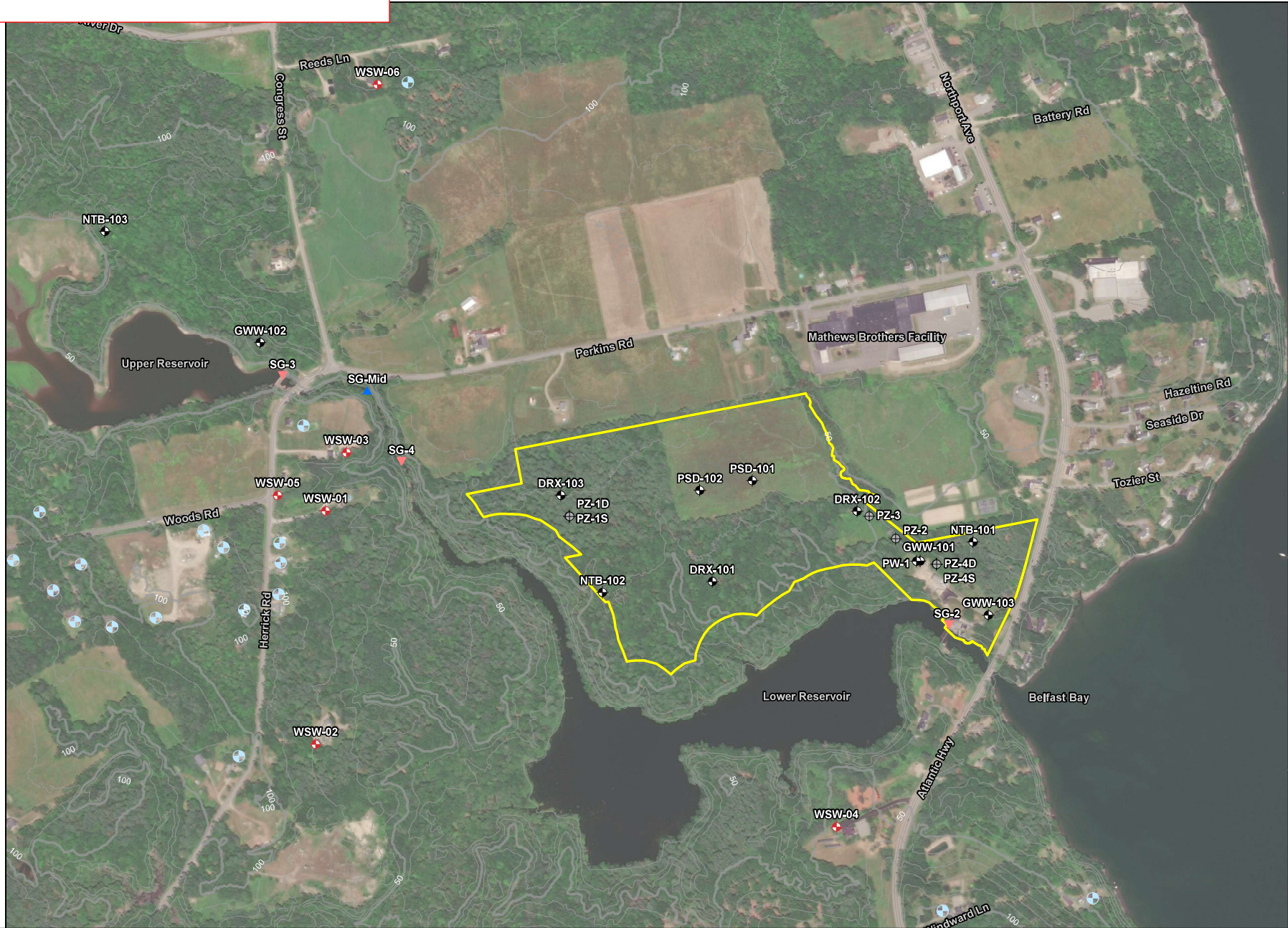
Blast Reports

Enclosed is a sample of a Maine Drilling & Blasting, Inc last Report. This report will be filled out for each blast and copies supplied as needed. The reports will be kept for at least one year and will be available for inspection. The Maine DEP will be notified within 48 hours of any blast which exceeds the standards of 38 MRSA paragraph 490 Z-(14), the information in subsection N will be provided with the notification.

Typical Blast Design

Enclosed is what would be considered typical blast designs for this project. Hole sizes, depths, spacing and loading information is provided. These designs are to be considered a good starting point. Modifications are usually made, if necessary, following the first blast to meet control and seismic considerations.

Well Locations



Legend & Notes

- Site Boundary
- Staff Gage
- Stream Gage-Manual
- Wetland Piezometer
- Monitoring Well
- Private Well-Monitored
- Private Well-Not Monitored Assumed Location

Notes

1. Site Plan based on available orthomography
2. Some features are approximate in location and scale.
3. This plan has been prepared for Nordic Aquafarms Inc. All other uses are not authorized unless written permission is obtained from Ransom Consulting, Inc.

Scale & Orientation

0 250 500

1 inch = 500 feet

Prepared For

Nordic Aquafarms, Inc.
159 High Street
Belfast, Maine

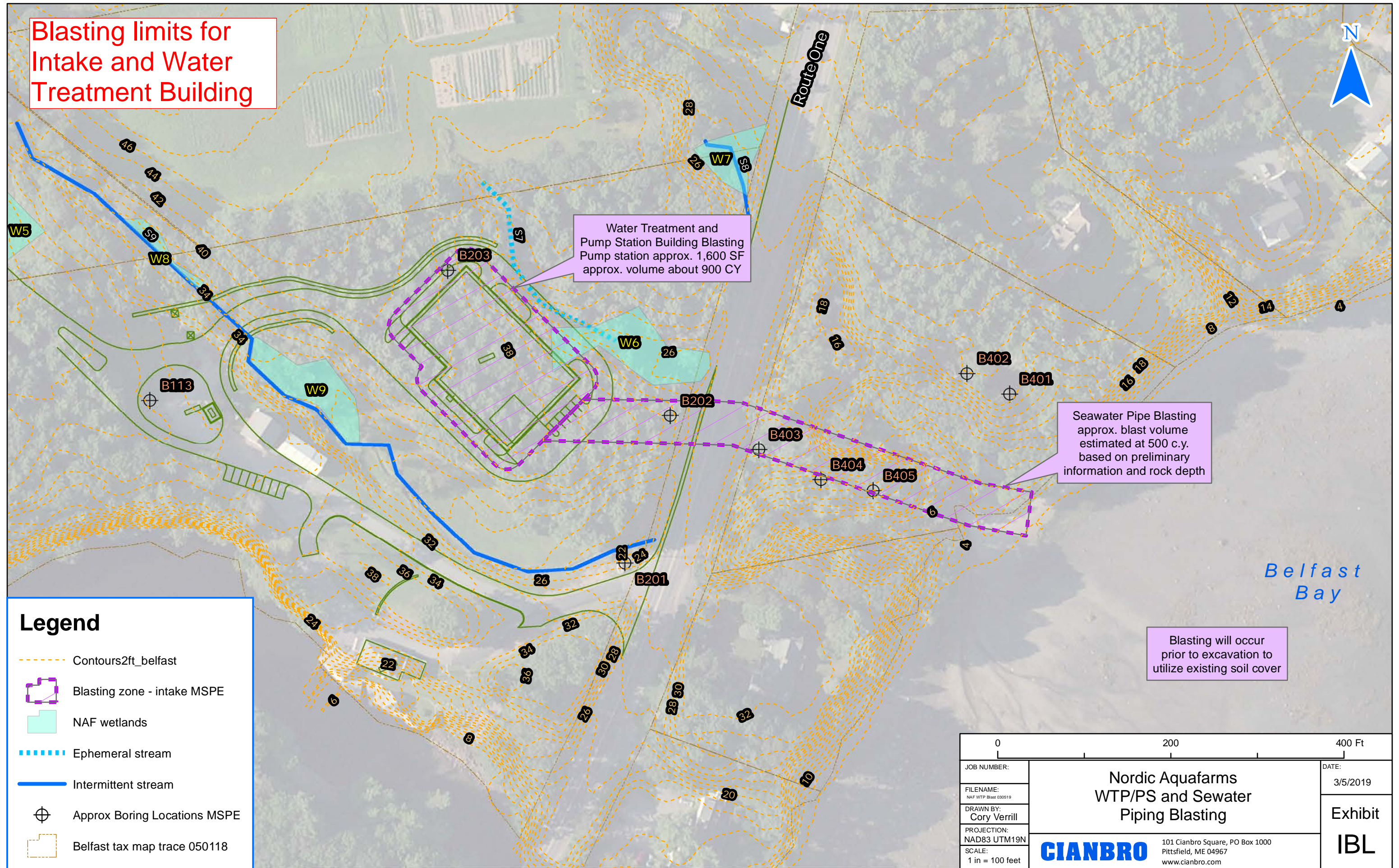
Site Address

Belfast Water District Property
285 Northport Avenue
Belfast, Maine

171.05027 | Apr 2019

Figure 1:
Existing Monitoring Points

Blasting limits for Intake and Water Treatment Building



Seawater Pipe Blasting
 approx. blast volume estimated at 500 c.y.
 based on preliminary information and rock depth

Blasting will occur prior to excavation to utilize existing soil cover








Legend

- Contours2ft_belfast
- Blasting zone - intake MSPE
- NAF wetlands
- Ephemeral stream
- Intermittent stream
- Approx Boring Locations MSPE
- Belfast tax map trace 050118

Belfast Bay

0		200		400 Ft	
JOB NUMBER:	Nordic Aquafarms WTP/PS and Sewater Piping Blasting				DATE:
FILENAME: <small>NAF WTP Blast 030519</small>					3/5/2019
DRAWN BY: Cory Verrill					Exhibit
PROJECTION: NAD83 UTM19N					IBL
SCALE: 1 in = 100 feet			101 Cianbro Square, PO Box 1000 Pittsfield, ME 04967 www.cianbro.com		

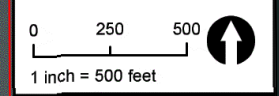
Legend & Notes

-  Site Boundary
-  Staff Gage
-  Stream Gage-
Manual
-  Wetland
Piezometer
-  Monitoring Well
-  Private Well-
Monitored
-  Private Well-
Not Monitored
Assumed Location

Notes

1. Site Plan based on available orthoimagery
2. Some features are approximate in location and scale.
3. This plan has been prepared for Nordic Aquafarms Inc. All other uses are not authorized unless written permission is obtained from Ransom Consulting, Inc.

Scale & Orientation



Prepared For

Nordic Aquafarms, Inc.
159 High Street
Belfast, Maine

Site Address

Belfast Water District Property
285 Northport Avenue
Belfast, Maine

171.05027 | Apr 2019

Figure 1:
Existing Monitoring
Points

REV	DATE	DESCRIPTION

NORDIC AQUAFARMS
NORTHPORT AVE
BELFAST, ME

PRE-BLAST
SURVEY
DRAWING



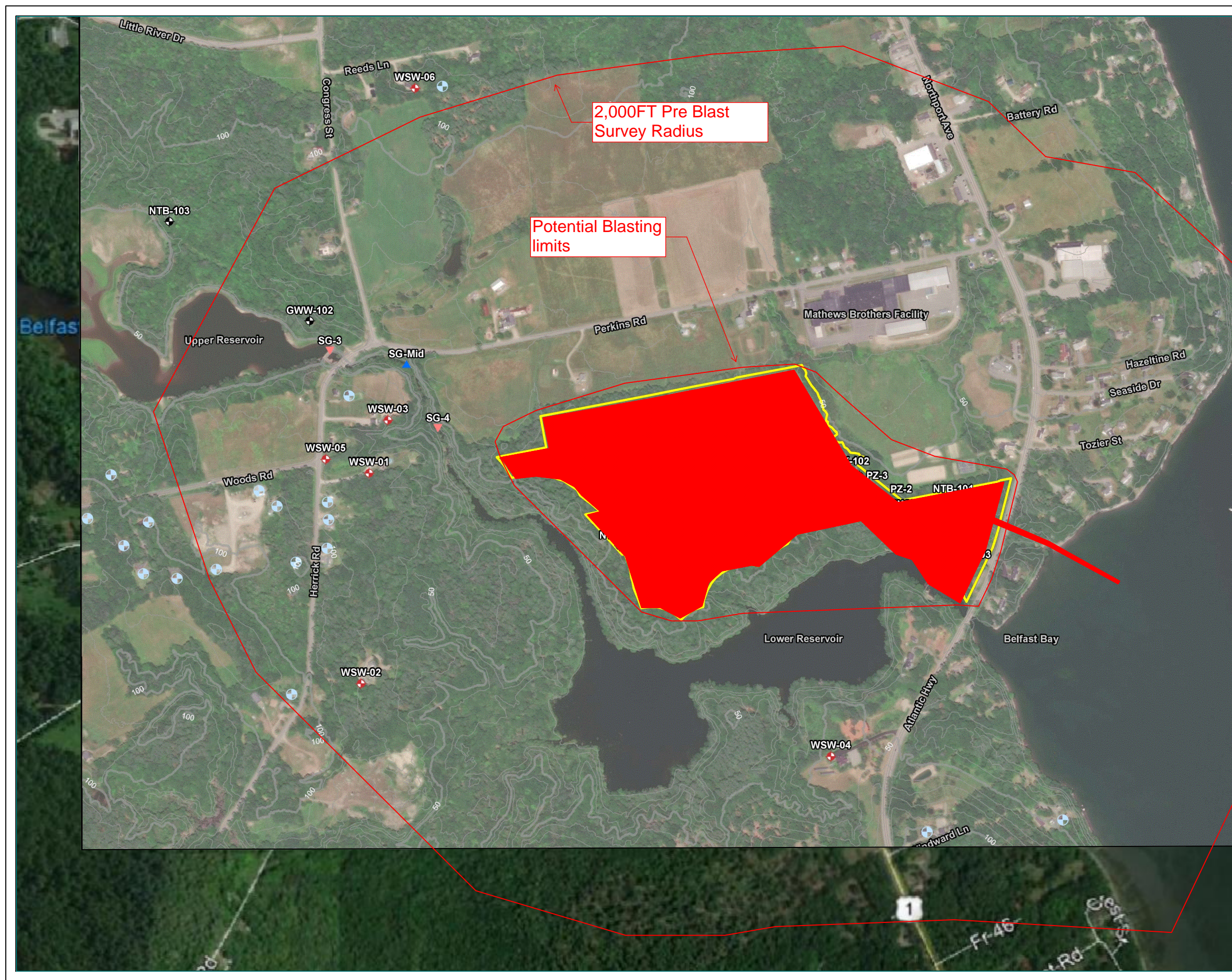
DRAWN: BJD

DATE: 04/18/19

SCALE: N.T.S

2,000FT Pre Blast
Survey Radius

Potential Blasting
limits



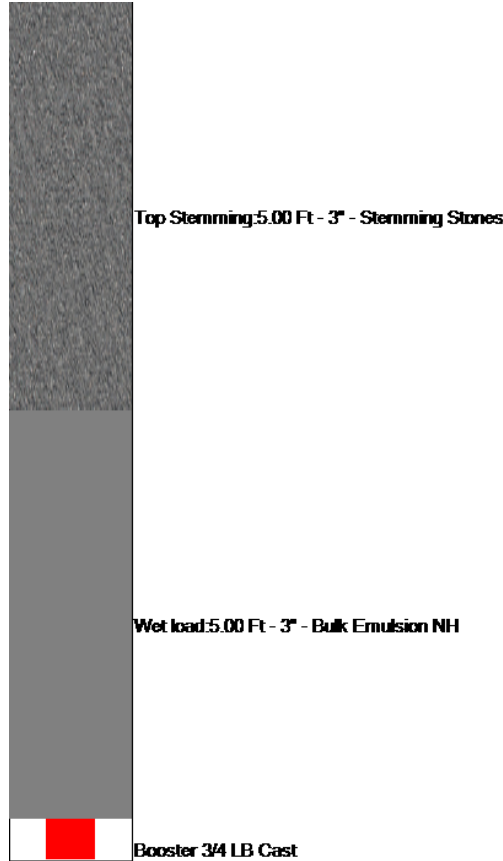


7/30/2018 9:00 AM

APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	50
Hole Depth:	10.00 Ft
Hole Diameter:	3 in
Burden:	6.00 Ft
Spacing:	6.00 Ft
Holes per Delay:	1
Pounds Per Delay:	19.43 Lbs
Pounds Per Hole:	19.43 Lbs
Total est. Pounds:	971.50 Lbs
Powder Factor:	1.46 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160	Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	100	Distance to Structure
Lbs per Delay (w)	19.43	Lbs explosives per 8 millisecond delay
Scaled Distance (sd)	22.69	($sd = d / \text{square root of } w$)
Estimated PPV	1.08	($ppv = k * sd^{-1.6}$)

Typical for Production work consistent with holes 10 Ft deep at 100 from a structure utilizing 3' In diameter at a 6 Ft by 6 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

Timing Diagram



Date: _____ Blaster: _____ Blast Plan _____
 Job #: _____ License: _____
 Customer Name : _____ Job Address: _____ State: Maine
 Shot Number _____ Blast Plan _____

Note- Typical timing design. Adjustments will be made pursuant to previous results.
 *All numbers are in milliseconds (ms)

0	25	50	75	100	125	150	175	200	225	250	275	300
42	67	92	117	142	167	192	217	242	267	292	317	342
84	109	134	159	184	209	234	259	284	309	334	359	384

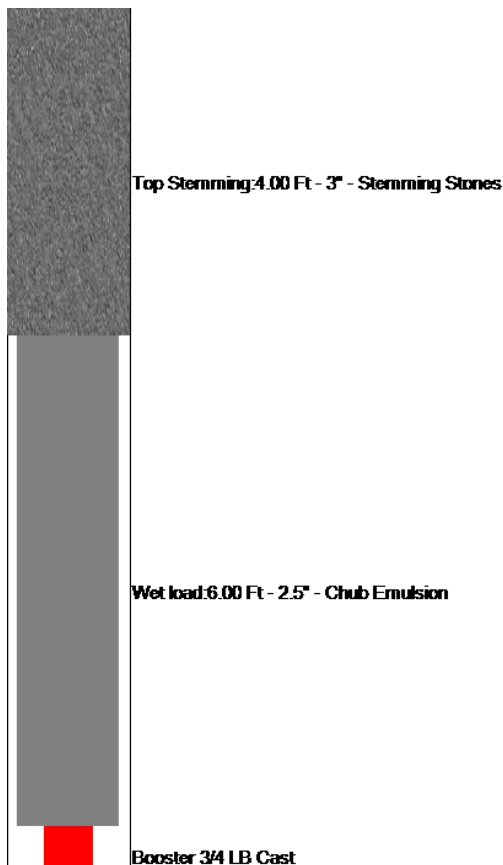


7/30/2018 8:59 AM

APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	50
Hole Depth:	10.00 Ft
Hole Diameter:	3 in
Burden:	5.00 Ft
Spacing:	6.00 Ft
Holes per Delay:	1
Pounds Per Delay:	16.07 Lbs
Pounds Per Hole:	16.07 Lbs
Total est. Pounds:	803.50 Lbs
Powder Factor:	1.45 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160	Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	100	Distance to Structure
Lbs per Delay (w)	16.07	Lbs explosives per 8 millisecond delay
Scaled Distance (sd)	24.95	(sd = d/ square root of w)
Estimated PPV	0.93	(ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 10 Ft deep at 100 from a structure utilizing 3' In diameter at a 5 Ft by 6 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

Timing Diagram



Date: _____ Blaster: _____ Blast Plan _____
 Job #: _____ License: _____
 Customer Name : _____ Job Address: _____ State: Maine
 Shot Number _____ Blast Plan _____

Note- Typical timing design. Adjustments will be made pursuant to previous results.
 *All numbers are in milliseconds (ms)

0	25	50	75	100	125	150	175	200	225	250	275	300
42	67	92	117	142	167	192	217	242	267	292	317	342
84	109	134	159	184	209	234	259	284	309	334	359	384

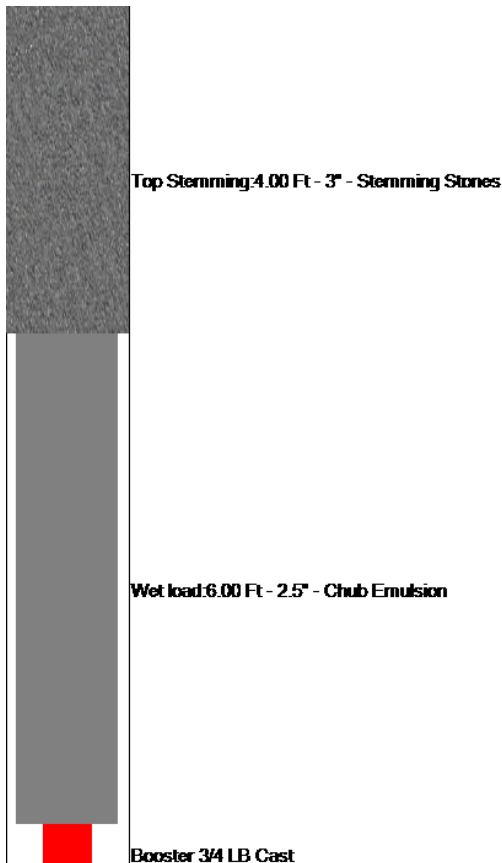


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	50
Hole Depth:	10.00 Ft
Hole Diameter:	3 in
Burden:	5.00 Ft
Spacing:	4.00 Ft
Holes per Delay:	1
Pounds Per Delay:	16.07 Lbs
Pounds Per Hole:	16.07 Lbs
Total est. Pounds:	803.50 Lbs
Powder Factor:	4.33 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160	Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	100	Distance to Structure
Lbs per Delay (w)	16.07	Lbs explosives per 8 millisecond delay
Scaled Distance (sd)	24.95	(sd = d/ square root of w)
Estimated PPV	0.93	(ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 10 Ft deep at 100 from a structure utilizing 3' In diameter at a 5 Ft by 4 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

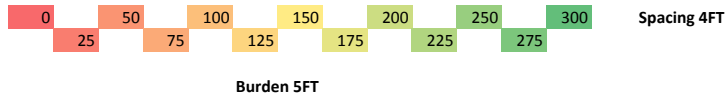
Timing Diagram



Date: _____ Blaster: _____ Blast Plan _____
Job #: Mountaineer Xpress Pipeline License: _____
Customer Name : _____ Job Address: _____ State: Maine
Shot Number _____ Blast Plan _____

Trench Blasting Diagram

Note- Typical timing design. Adjustments will be made pursuant to previous results.
*All numbers are in milliseconds (ms)



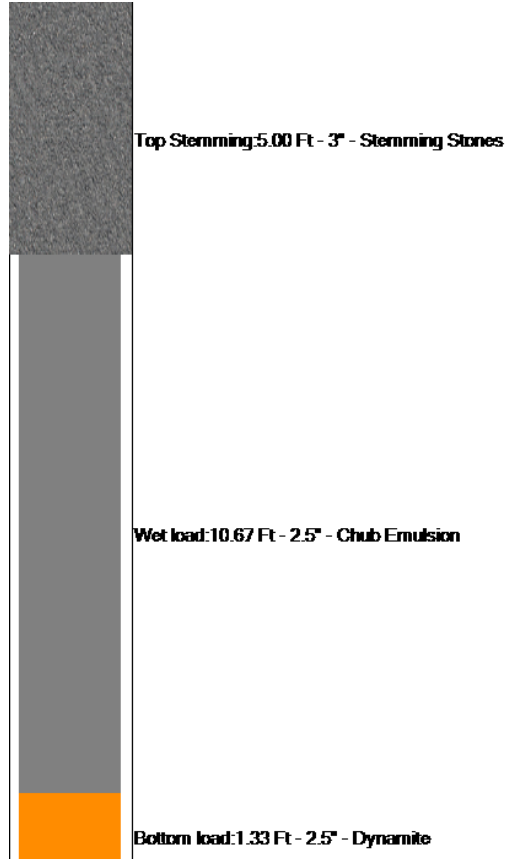


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	50
Hole Depth:	17.00 Ft
Hole Diameter:	3 in
Burden:	4.00 Ft
Spacing:	5.00 Ft
Holes per Delay:	1
Pounds Per Delay:	32.84 Lbs
Pounds Per Hole:	32.84 Lbs
Total est. Pounds:	1,642.00 Lbs
Powder Factor:	5.21 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160	Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	200	Distance to Structure
Lbs per Delay (w)	32.84	Lbs explosives per 8 millisecond delay
Scaled Distance (sd)	34.90	(sd = d/ square root of w)
Estimated PPV	0.54	(ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 17 Ft deep at 200 from a structure utilizing 3' In diameter at a 4 Ft by 5 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

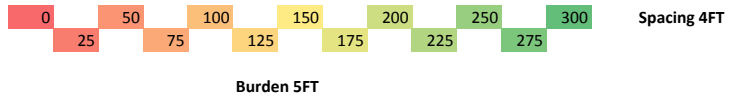
Timing Diagram



Date: _____ Blaster: _____ Blast Plan _____
Job #: Mountaineer Xpress Pipeline License: _____
Customer Name : _____ Job Address: _____ State: Maine
Shot Number _____ Blast Plan _____

Trench Blasting Diagram

Note- Typical timing design. Adjustments will be made pursuant to previous results.
*All numbers are in milliseconds (ms)



Company Qualifications

Company Information & Qualifications

YOUR TRUSTED BREED

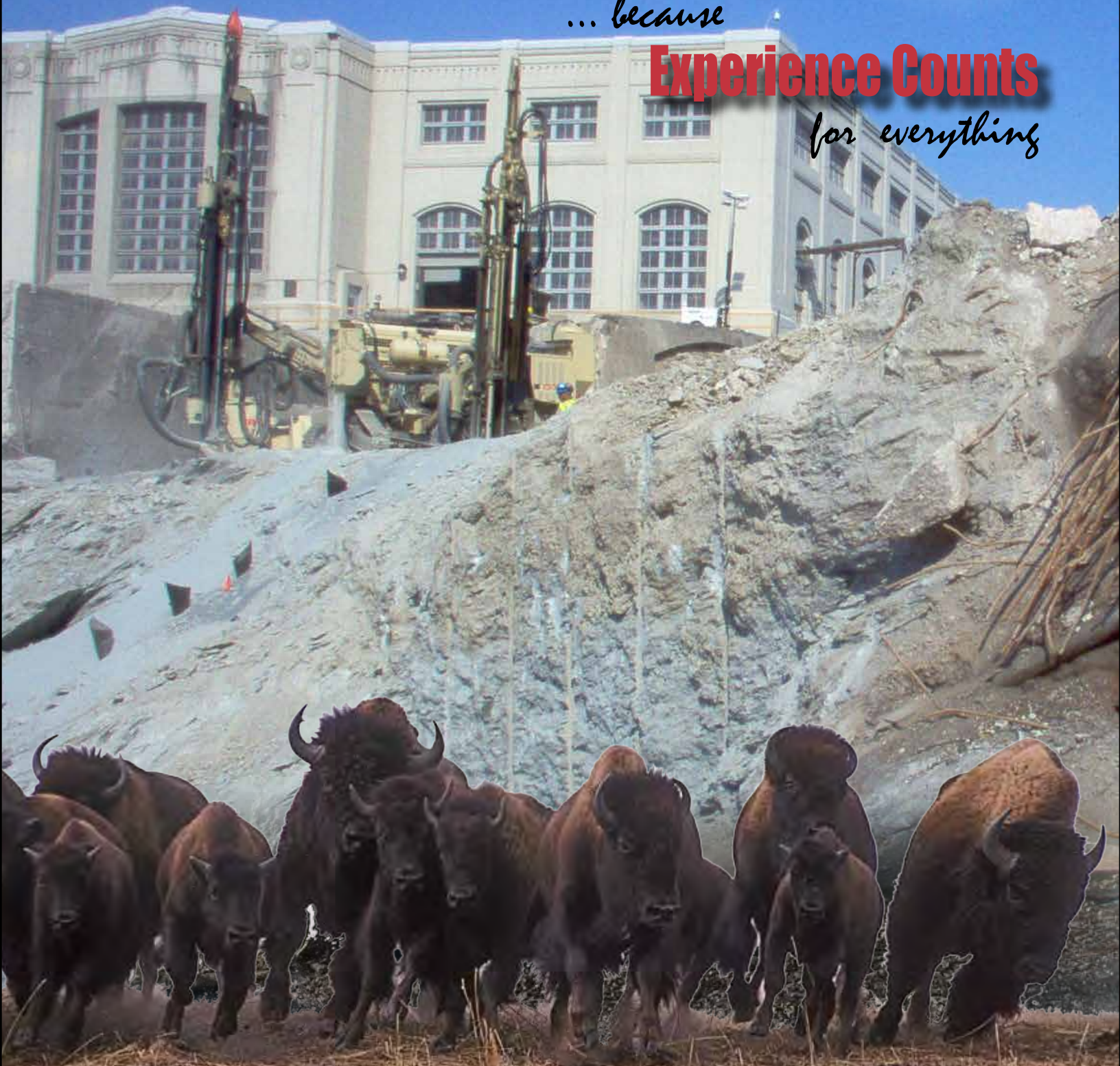
making it happen

Maine Drilling
& Blasting

... because

Experience Counts

for everything



A T R U S T E D B R E E D • A T R U S T E D B R E E D

Maine Drilling & Blasting: Your Trusted Breed Making it Happen



- Need to make way for underground utilities?
- Building a project in an extremely remote location with difficult access?
- Does your project call for rock bolting or hoe rams?
- Need to remove rock in very tight quarters adjacent to existing structures?
- Have hundreds of thousand of cubic yards of rock to move in a tight deadline, under less than ideal conditions?
- Need drilling and blasting for a pipeline, wind farm, or transmission lines?
- Need rock stabilized on a heavily trafficked highway?
- Have new interstate ramp systems to install through granite bedrock?

Whatever your needs, Maine Drilling & Blasting can get the job done skillfully and smoothly. Whether you are a general contractor, commercial contractor, municipality, or homeowner, we can provide you with the professional experience you need to get your job done right, on schedule and in budget. Maine Drilling & Blasting is nearby and at the ready.



It's all about having the resources when you need them and working with someone who offers you proven results on demanding schedules.

- Local resources throughout the Northeast
- Full service company ... your true one-stop source.
- Remote access capability for almost all terrains including a proven system for underwater drilling and blasting, and an internally-engineered bulk skid to deliver product to backwoods mountain terrains.
- We optimize drill types and explosive options from in-house sources.



Since 1966, our standards are steeped in the tradition of being family-owned and operated. We're a close and cohesive group. We're also owners. Maine Drilling & Blasting began the transition to employee ownership in 2004, resulting in progressively greater individual responsibility in the work produced. We work with the unity of a family and the determination of business owners. Qualified employees now own 51% of the Company.

Our employees are proud of our past 51 years. We've persevered, adapted, and grown stronger and smarter, all the while holding true to our founding principles of hard work, honesty and quality of services. That's why MD&B is the Trusted Breed for so many throughout the Northeast. Maine Drilling & Blasting: cost competitive AND expert source for your project needs.

Maine Drilling & Blasting Information & Qualifications

This comprehensive package is offered to evidence our Company's ability to perform drilling and blasting work on various projects throughout the Northeast, New York, and Pennsylvania. It includes general corporate information, experience, performance, safety, quality, and environmental management capacity.



COMPANY INFORMATION:

Name of Company: Maine Drilling & Blasting, Inc.

Address: 542 Brunswick Avenue, Gardiner, ME 04345

Phone: 207-582-2338

Fax: 207-582-8794

Primary Contacts: Aaron Flewelling

Phone: 603-647-0299

Cell: 603-454-8385

Email Address: aflewelling@mdandb.com

Company Website: www.mainedrilling.com



Ownership/Management: Maine Drilling & Blasting is an employee-owned company started by Ted Purington, Sr. in 1966. Two generations of blasters preceded him. Ted Sr. retired in 1996. Today, Bill Purington is Company Chairman and CEO working out of the corporate office in Gardiner, ME. Ted, Jr. is the Executive V.P. heading up Operations from the Auburn, NH office.

Nature of Business: The Company is one of the largest of its kind in North America, with the majority of the volume of explosives utilized in New England and New York. Core services are drilling and blasting and hoe ram services for construction, quarry and energy markets throughout the Northeast, New York, Pennsylvania, Maryland, Delaware, Virginia and West Virginia. Specialty services include rock anchors, laser profiling, boretraking, training, and public relations.

Years in Business: Maine Drilling and Blasting, Inc. has been in business for 51 years.

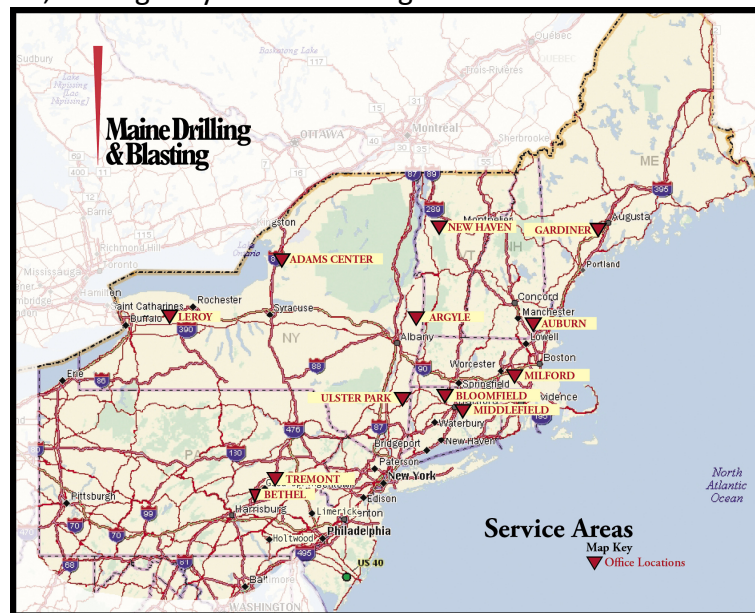




Service Areas/Facilities: MD&B is currently registered to do business in the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Vermont, New York, Connecticut, New Jersey, Pennsylvania, Maryland, Delaware, Virginia and West Virginia, and has no limitations within our area of expertise.

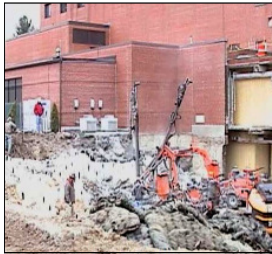
Local crews operate throughout the Northeast, and Mid Atlantic area with eight operating divisions: six construction – Eastern (Maine), Central (New Hampshire), Southern (Connecticut/Southern Massachusetts/Western Rhode Island, Southeast New York), Northern (Massachusetts/Rhode Island/Eastern Connecticut), Western (Vermont/Eastern New York), Mid Atlantic (Western NY, Pennsylvania New Jersey, Maryland, Delaware, Virginia and West Virginia), and two Mine/Quarry divisions that service New England and New York along with the Mid Atlantic area.

Regional operations are strategically supported with local offices: Our operating hub is in Auburn, NH housing Central and N.E. Quarry North Division, as well as Equipment Services, Purchasing, Engineering and Safety Departments; Western Construction and Quarry Divisions are headquartered in Hartford, NY; Southern Division is headquartered in Bloomfield, CT; Northern Division, N.E. Quarry North Division, and Technical Services in Milford, MA; Mid Atlantic Construction and Quarry Divisions operate out of Bethel, PA, and Eastern Division and the Corporate Office are located in Gardiner, ME. Additionally, the Company is supported with 9 permanent explosive distribution facilities, and 12 to 15 remote sites, strategically located throughout our service areas.



List Professional Affiliations & Licenses:

- International Society of Explosives
- Associated General Contractors of Maine, Vermont, NH, NY, Mass
- Milford Area Chamber of Commerce
- Northern NE Concrete Producers Association
- Associated Builders & Contractors, Inc. – Maine Chapter
- Maine Better Transport Association
- Maine Motor Transport Association
- Maine State Chamber of Commerce
- New Hampshire Good Roads
- Construction Financial Management Association
- National Association of Women in Construction
- Tug Users Group
- BA of Greater Boston
- Maine Aggregate Association
- Kennebec Valley Chamber of Commerce
- Construction Industry of MA (CCIA)
- MA Aggregate & Asphalt Pavement Association
- American Society of Civil Engineers (ASCE)
- Society for Human Resources Management (SHRM)
- New Hampshire Motor Transport Association
- Institute of Makers of Explosives
- National Ski Areas Association
- New York Construction Materials Association
- Maine Economic Research Institute
- The ESOP Association
- National Center for Employee Ownership
- Associated Builders & Contractors, Inc. – Eastern Pennsylvania
- American Society of Civil Engineers



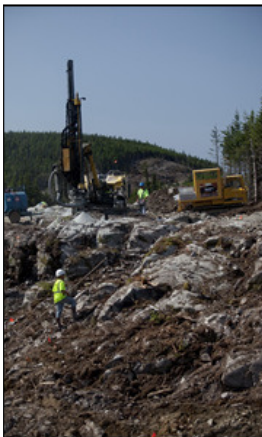
Construction Marketing Association

Status of Business/Company: Corporation

Labor Relations: Both Open Shop, and Union served by Maine Drilling & Blasting.

SAFETY CREDENTIALS:

MD&B has an aggressive Safety Program in place with a designated safety officer and support Department: **Michael Weider, Safety Manager, 603-647-0299, mweider@mdandb.com**

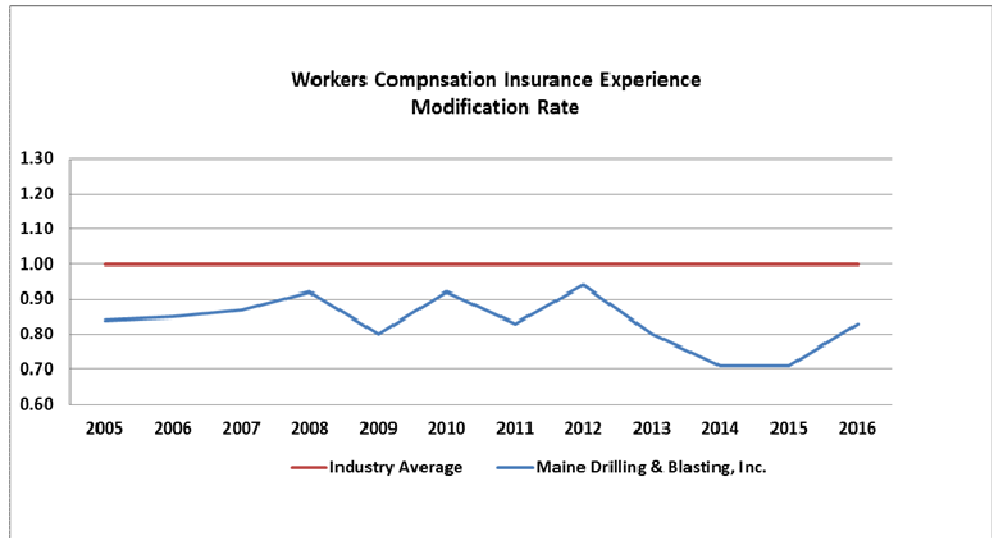


- **Safety is the bedrock of our training, the cornerstone of our technology.** Safety-specific training includes: Dupont's Safety Training Observation Program (STOP), MSHA Part 46 Training, OSHA 10-hour Training, Job Hazard Analysis, Division Meeting Safety Topics, Daily Safety Meetings, Lessons Learned. In addition to training specifically related to safety, an array of mandatory, formal job skill training courses ensures the best practices on the job. All MD&B Drillers and Blasters undergo rigorous training and company certification. MD&B Blasters also hold state-specific industry licenses for operation.
- **Seismic Monitoring is performed on every project.** MD&B holds itself accountable for the seismic monitoring. We objectively measure vibrations caused by our blasts with state of the art equipment, and make those measurements available for analysis.
- **Job Hazard Analysis on each and every project.** MD&B performs a thorough site-specific Job Hazard Analysis on every project, and we reassess for every change in project parameters. Maine Drilling & Blasting instituted this non-industry-mandated process company-wide years ago.

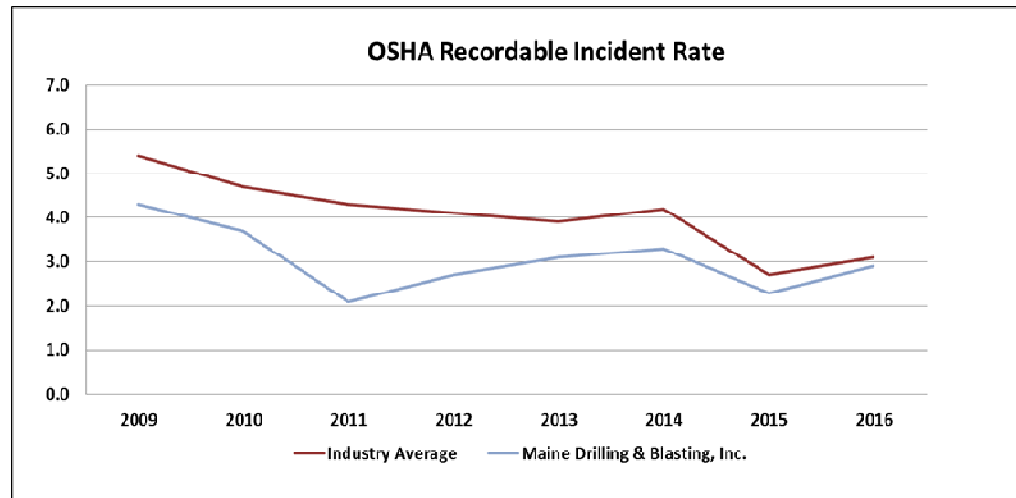


<u>EMR</u>	MD	Ind.Avg
2005	0.84	1.00
2006	0.85	1.00
2007	0.87	1.00
2008	0.92	1.00
2009	0.80	1.00
2010	0.92	1.00
2011	0.83	1.00
2012	0.94	1.00
2013	0.80	1.00
2014	0.71	1.00
2015	0.71	1.00
2016	0.83	1.00

- **Beating the Workers Compensation MOD rate 10+ years running.** For the last 10+ years, our incident rate and subsequent costs for workers compensation claims are lower than industry averages for our workforce.



OSHA RIR below industry average for the past 7 years. As illustrated in our graph, Maine Drilling & Blasting has been below the industry average for Recordable Injury Rates (RIR) over the last seven years. The Company has shown an average reduction in our RIR of 13% for the 7-year period as compared to the industry trend of 10% for the same period. This illustrates a 3% greater improvement rate than that of the industry.



QUALITY ASSURANCE:

MD&B has a Quality Assurance Program with training manuals and programs for both Drilling and Blasting.

Designated QA manager and Regional Technical Supervisor: **Ken Smith**, 508-478-0273, ksmith@mdandb.com



Maine Drilling & Blasting is on the cutting edge, from types of explosive product, to delivery systems, to digital technologies for drilling and blast initiation.

- **Non-electric blasting** techniques permit the blaster to program a series of small explosions, thousandths of a second apart, reducing risk and increasing control.
- **Programmable electronic detonators** deliver even more precise timing. The electronic initiation system allows for better energy usage, resulting in better breakage and decreased vibration.
- **PACKAGED EXPLOSIVE GELS**, water resistant ammonium nitrate and fuel oil (ANFO WR), and **BULK EMULSION**, which is pumped directly into holes and has become the product of choice today, provides our blasters with powerful precision tools to perform their task under any conditions. Properly utilized, Bulk Emulsion



reduces drilling cost in all applications, allowing for efficient use of hole diameters and hole patterns, minimizing loading labor.



- **Computer-aided blast design** and test-blast practices have replaced trial-and-error, providing for a controlled blasting environment.

- **Laser Profiling** a rock face provides a 3 dimensional view of the blast area for use in the proper design and layout of the borehole locations for the drilling and blasting operation.

- **Boretrak System:** “BoreTraking” provides a 3 dimensional view of each borehole as it relates to every other borehole in the blast. When it is matched with the laser profile it will show how each borehole relates to the rock face so the blaster will be able to distribute the explosives where they will perform the best.



- **In House Engineering Services** provide added value for our customers. We provide accurate estimates of rock quantities, determine the scope of work, verify the topographical accuracy of the engineering, and provide value engineering to maintain efficiencies and blasting cost reductions. Our engineering department also provides us with the ability to perform Engineer, Perform, and Construct projects, which we have performed successfully.

- **Remote Project Efficiencies:** Maine Drilling & Blasting has the experience, expertise and equipment necessary for any terrain and the most isolated locations commonly found at wind farms, pipelines, transmission lines, substations, and hydroelectric facilities. Maine Drilling & Blasting has adapted and even engineered our own transports capable of bringing our crews, products and supplies to very hard-to-reach places with terrain many consider impassable.



- **Congested/Close Shooting Expertise:** Maine Drilling & Blasting is very experienced performing controlled blasting in areas with very close adjacencies to existing structures, operating railroads, operating power plants, live transmission lines, open hospitals and in-session schools, etc. Maine Drilling & Blasting understands these challenges and delivers based upon 1) our resources and experience with electronic detonator technology and bulk

explosive application, and 2) our strong Safety Culture including our Zero Tolerance policies.



- **Foundation Services:** MD&B utilizes our fleet of drills and experienced craftspeople to install rock anchors, dowels, guy anchors and micro-piles for a variety of construction needs. Foundation components requiring structural connections to bedrock is a specialty that compliments our fundamental service of drilling and blasting. Over the past 20 years, Maine Drilling & Blasting has become recognized as a leader in the installation of rock anchors throughout the Northeast. Our engineers routinely work with customers at the design phase to assist in development of cost-effective and constructible solutions. We perform in diverse conditions from remote access transmission line ROWs and wind site ridgelines to the tight work areas of existing communication tower sites. From atop mountains to on water, from inside cofferdams to the complexities of urban work, we've provided routine and unique rock bolting and ground anchor services for hundreds of projects, installing over 10,000 post tension anchors and reinforcement dowels. We self-perform rock anchor activities starting with the drilling, through the grouting and tensioning activities. Each anchor is tested well above design load. Our experience ranges from small diameter to 3-inch with 700kips.



- **In House Distribution:** Maine Drilling & Blasting has instituted an in-house distribution network with the ability to supply all regions without depending on outside suppliers and distributors.
- **Schedules & Liquidated Damages:** With Maine Drilling & Blasting's access to over 80 drills and specialty equipment, we meet or exceed schedule deadlines, and we will accept liquidated damages in our contracts.
- **Public Relations:** Maine Drilling & Blasting utilizes the Safety and Technical departments to give presentations to towns, neighbors and public safety departments who have concerns about blasting to help with the permitting and approval process.

ENVIRONMENTAL:

- MD&B has an Environmental Management Program in place. We have taken a leadership role within our industry to improve environmental stewardship. We recognize and accept our own responsibility to proactively apply environmental best practices to all aspects of our business, and work with suppliers and customers to promote environmentally responsible actions and products. In all cases, our aim is to optimize our environmental performance up to the technical limits practically achievable, and to explore environmentally-driven innovations, technologies and business opportunities to expand those limits to achieve nothing less than environmental excellence.



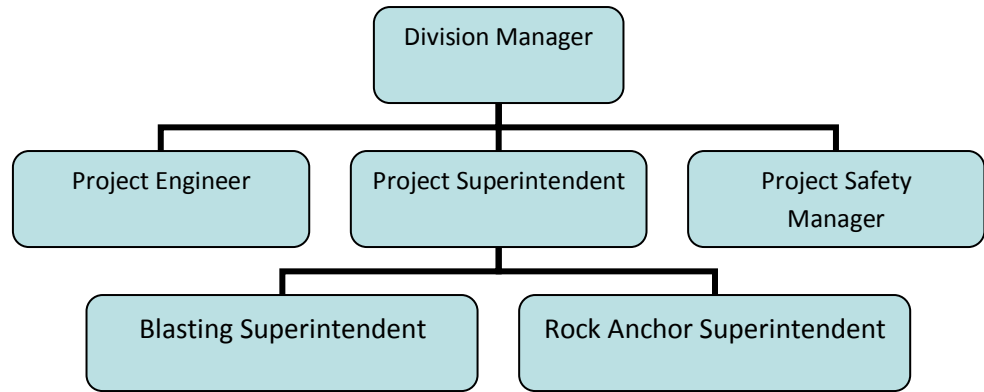
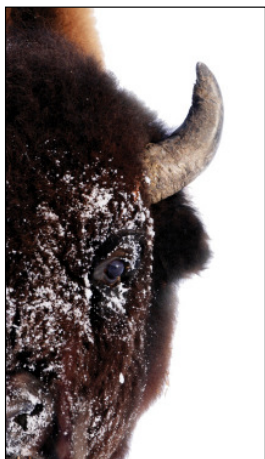
MANAGEMENT, EMPLOYEES, AND RESOURCES:

Principal Officers of our Company:

NAME	TITLE	YEARS W/ FIRM
Dan Werner	President & CEO	15
William Purington	Chairman of the Board	35
Ted Purington, Jr.	Executive Vice President	39
Mitchell Green	Regional Vice President	14
Aaron Flewelling	Engineering Manager	6
Todd Barrett	Senior Vice President	21
Timothy Maynard	Chief Financial Officer	9



Typical Project Organizational Chart



Project Responsibility:

- Our Supervisory and Management team are all Company employees.
- The Division Manager accepts the Project Manager responsibilities. The principal officers have authorized all construction signatures. The decision-making is done with the division manager or the principals as needed. The Project Manager handles as many as five projects. Assistance from the company departments, the engineering group, and the Division Manager spread the workload.
- The Division Manager provides leadership to the construction team in the areas of safety, resource leveling, scheduling and management of the project. This position is further supported by Regional Superintendents and Project Superintendents, who run the larger jobs for the Company.

Software Support:

- As a specialty contractor, our estimating and contracts software is a proprietary program. GPS, Total Station, Carlson Software and Paydirt software are utilized to predict rock quantities and complexities. This data is used to estimate resources needed for each cut area. As redesigns are considered, the CAD input is

digitized to generate updated input for an updated resource estimate. Our accounting software is Sage Timberline Office.

Number of Employees:

Main Office Staff	43
Support Staff (mechanics, safety, engineering, etc.)	51
Field Supervisory Staff	47
Craft Workers	119 Blasters, Laborers & Drivers
Equipment Operators	81 Drillers & Hoe Ram Operators



Major Construction Equipment: MD&B currently owns over 80 hydraulic drills and specialty equipment, and 12 excavators. Additional drills are rented during peak season as needed. Maine Drilling & Blasting owns approximately 190 vehicles in its fleet including pickups, tractor/trailer vehicles, box trucks and bulk trucks.

Project Profile:

ANDROSCOGGIN VALLEY HOSPITAL BIOMASS EXPANSION, BERLIN, NH

Completion – November 2013

Owner – Androscoggin Valley Hospital

GC – Langford & Low – A&B Logging

Scope: To drill and blast approximately 600 cubic yards of rock for the construction of a new biomass plant to convert the hospital's energy source.

Challenges: The Berlin NH AVH Biomass project entailed blasting within 20 feet of the occupied hospital. We blasted approximately 600 cubic yards ranging from 2 feet to 12 feet in cut depth. Each blast had to be coordinated with the Site Contractor, General Contractor and Facility Manager of the Hospital. The concerns were coordinating the blasts so that the hospital could still function on a daily basis, and that the ambulance entrance road be accessible at any moment.



Outcome-Summary: Our team met weeks prior to the start and discussed the site security issues and the Hospitals concerns in depth. We were able to

have a plan in place that was suitable for all of us. At the end of the project, the Hospital managers and the customer were very pleased with a job well done.

Customer Testimonial: "Recently we had the pleasure of working with Maine Drilling & Blasting on our jobsite at Androscoggin Valley Hospital in Berlin, New Hampshire. The blasting portion of the project was unique being within such a close proximity to the hospital, and was executed without incident and with minimal impact to the hospital's operations. MD&B had excellent communication with project management and hospital staff. In addition, they were reliable and flexible with the hospital's schedule and made safety of the general public and onsite personnel a first priority."

*Robert Grafton
Superintendent
Langford and Low, Inc.*

Project Profile:

MANSFIELD HOLLOW HYDRO ELECTRIC, MANSFIELD, CT

Completion – September 2013

Owner – Mansfield Hollow Hydro

GC – Sealand Environmental;

Scope: To drill and blast for a new waterway and turbine building in close proximity to a river and existing dam.

Challenges: Rock needed to be blasted to allow for the installation of large diameter pipe to feed a new turbine building. The integrity of the rock remaining between the excavation and existing river needed to be maintained to prevent the river from coming into the new trench. As a further challenge, the head wall for the intake of the new waterway was located 6 feet from the crest of a dam built in the 1800's. The crest of the dam could not be disturbed as it would lower the height of the existing river and change the dynamic for the function of the turbine. The last piece of blasting was within 10 feet of a Portadam that was constructed to hold the river back from flooding the work site.



Outcome-Summary: With good communication between the blasting crew and site contractor, potential risks were identified and a plan was put into place to mitigate the risk. By using a combination of methods including line drilling, controlled blasting, rock dowels and mechanical removal of rock, the team was able to successfully complete the project on time and without incident.

Testimonial: "The crew who performed the drilling and blasting work at the Mansfield Hollow project exceeded all of our expectations. Their hard work, attention to detail and ability to adjust to changing conditions kept our project on schedule and completed the rock removal portion without incident. The professionalism and safety-first mindset demonstrated by the crew made them a pleasure to work with. Thanks again for the hard work and we will be calling MD for all of our drilling and blasting needs."

*Steve Gordon
Sealand Environmental*

Project Profile:

UNH DORMITORY, WEST HAVEN, CT

Completion – October 2013

Owner – University of New Haven

GC – Mather Corp. – Consigli Construction

Scope: To drill and blast for a new dormitory for the University of New Haven.

Challenges: The rock that needed to be removed for the new dormitory was within 30 feet of the existing dormitory and neighboring houses. It also



abutted the parking lot for the students, the athletic field for the University, and a town road with active underground utilities. The fact that we were working on an active campus with the athletic field in constant use, made site security a challenge.

Outcome-Summary: By starting with a conservative test blast plan, our blast crew was able to analyze the existing conditions of the site and adjust design to meet actual conditions. All blasting

was completed well within the vibration specs provided for the project. The use of a well-planned and communicated site security plan insured the safety of the general public and campus population. The project was completed ahead of schedule and without incident.

Testimonial: "I want to thank you for sending your crew to the UNH Dormitory project. The crew conducted themselves as true professionals and always kept safety in the forefront. One of the many things that impressed me was the ability to react to changing circumstances and keep the schedule intact. On a project where your men were drilling and blasting next to an occupied dormitory in a residential neighborhood, finishing on time and without incident is what will have Mather Corporation calling MD Drilling again."

*Pierre Bastien
Superintendent
Mather Corporation*

Project Profile:

HARBOR POINT, STAMFORD, CT

Completion – November 2013

Owner – Androscoggin Valley Hospital

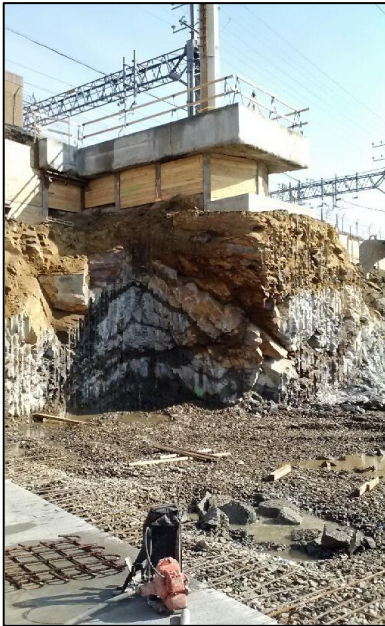
GC – Langford & Low – A&B Logging

Scope: To drill and blast approximately 30,000 cubic yards of rock for the construction of a new underground parking garage.



Challenges: The excavation limit was 20 feet from the edge of MNR tracks and went around three sides of UI's transmission lines. The cut from top of ground averaged 45 feet and was a combination of earth and rock. Soldier piles and lagging was installed along the property line prior to excavation.

Once the soldier piles were completed, the overburden on top of the ledge was removed. Ledge needed to be removed within 5 feet of the soldier piles. Line drilling was performed at the rock excavation limit prior to blasting within 25 feet of the soldier piles. The line drilling prevented back break from



undermining the soldier piles and reduced the vibration limits at MNR and UI facilities. Two geotechnical companies were on site to inspect the blasting activities and monitor the soldier pile wall and surrounding facilities. Six seismographs were used to monitor all blasting vibration. In addition to seismographs, prisms were installed on all the soldier piles and monitored after every blast for deflection. The blasting schedule was regulated by a flagger from MNR. A temporary hold was placed on the tracks for the actual blast. All holds on the tracks and blast times were coordinated between the flagger and MD's foreman.

Outcome-Summary: To drill and blast 30,000 yards of rock in downtown Stamford poses its own challenges. Add the challenge of deep cuts abutting a major rail line as well as electric transmission towers, and you have a challenge with no room for error. Through careful planning and communication, the blasting crew was able to successfully complete their scope of work without incident and ahead of schedule.

Customer Testimonial: "Excellent job, very professional. Job well done, guys. I expected two months of drilling and you got it done in 31 days. Well appreciated."

Steve Holmes

Senior Superintendent, Building and Land Technology (BLT)

Project Profile:**FAIRFIELD METRO NORTH CENTER, FAIRFIELD, CT***Completion – November 2011**Owner- Town of Fairfield, CT**GC - Guerrero Construction*

Scope: To drill and blast approximately 90,000 yards of mass rock and 4,000 yards of structure rock for a new train station parking lot and future building pad.

Challenges: The blasting was located anywhere from 400 feet to 20 feet from the tracks. There were 45-foot cuts within 100 feet of the tracks. There were 30-foot cuts within 12 feet of a new bridge abutment. All of the work had to take place without any disturbance to the train traffic. In this area of Connecticut, an estimated 225-250 trains pass by daily. Obviously, all work had to be done without damaging any of Metro-North's structures, UI's towers, or the new bridge.



Schedule: The blasting schedule was driven by concrete being poured on the site. There were two separate general contractors working on the site with different agendas and working in different areas. This required certain areas of the job to be blasted by specific dates. Because blasting was not allowed within 300 feet of fresh concrete, we had to have multiple areas ready to blast, changing from day to day depending on where the two companies

were pouring.

Outcome-Summary: The project was completed ahead of schedule and without incident.

Testimonial: "We've worked with other drilling and blasting companies, but when Metro North hears that MD Drilling & Blasting is the d&b contractor on a project, we're very happy to hear it. The procedures they submit for our review and approval are always timely and complete. More importantly, they've always kept us well informed of progress on a day-to-day basis, and we know the quality of their work will be top-notch. We rely on MD Drilling & Blasting's expertise, and we value our good working relationship with them."

Dave Willard, P.E.

*Assistant Director – Structural Engineering
Metro North Railroad*

Project Profile:

MIXED-USE BUILDING, OLD TRACK ROAD, GREENWICH, CT

Completion – December 2010

Owner- Gateway Development

GC – F & G Construction

Scope: To drill and blast approximately 11,000 cubic yards of rock for the construction of a new mixed-use building.

Challenges: The rock that needed to be removed was a large outcrop sandwiched in between the overflow lot of a car dealership, a congested parking lot for an existing gym, and bordered MNR's tracks. The rock out-crop was 30 feet higher than MNR's tracks. There was zero room for fly rock, and vibration had to be controlled for MNR's facilities and the existing buildings.



Outcome-Summary: Communication with the abutters prior to starting the project was key. Vehicles were moved and parking spots were blocked to allow for more room for the blasting operation. Representatives from MNR were contacted and a game plan was put in place prior to trees being cleared. As an added safety precaution, a flagger was utilized for the blasting closest to the tracks. Through good communication and execution, the project was completed ahead of schedule and without incident.

Testimonial: "From day one on the job, MD Drilling & Blasting has acted with complete professionalism and an exemplary attitude on the Old Track Road project. The Blaster-in-Charge is a self-assured individual who is not afraid of a difficult situation or task. His demeanor and willingness to help is exemplary. He always dutifully considered all of our requests and worked closely with us

to work through a challenging terrain and very tight site conditions. This BIC showed great thoughtfulness and resourcefulness throughout the entire project. He also shows tremendous efficiency and dedication to getting the job done in an effective and safe manner."

*Jim Carnicelli
Vice President
Gateway Development*

Project Profile:

CADET BARRACKS – US MILITARY ACADEMY – WEST POINT, NY

Completion – April 2014

Owner- The U. S. Army Core of Engineers

GC – Walsh Construction



Scope: Controlled blasting for 135,000 yards of mass rock and 60,000 sqft of line drilling/presplit to make way for the construction of a new Cadet Barracks at West Point Military Academy Campus, New York.

Challenges: The work required up to 80 feet of rock cut within 60 feet from the 100+ year-old Campus Chapel. The Chapel's age and condition required vibration and displacement levels well under the normal thresholds. To complicate our work further, the more modern Barracks and Campus structures had rooflines below eye level during most of the work creating additional exposure level for the throw of our blasts.

MD&B implemented state-of-the-art electronic detonation systems to have precise controls on the charges.

Very tight horizontal and vertical grade controls were also required to avoid fill concrete for footings and excess shotcrete for rock nail/shotcrete finish on the high walls. MD&B implemented boretraking and GPS Survey technologies to



ensure the position and quality of our drilled holes prior to the loading. It took a team effort with all the trades/GC to orchestrate the 175+ blasts. Each one involved operating over 15 seismographs to be maintained and 14 personnel for site security before each blast was initiated.

Outcome-Summary: The work was completed in 9 months and ahead of schedule. We worked in sync with the benched installations of horizontal rock dowels, shotcrete, and soldier pile wall installations at

the top of slope. We completed the job without any serious incident, injury, or fly rock to the satisfaction of the General Contractor – Walsh Construction, and Owner – The U.S. Army Core of Engineers.

Testimonial: "During your time here working on this project, the cooperation, effectiveness and overall management was highly noted not only by me but my entire team. Your team proved to be diligent and continually progressed the project during a difficult winter and allowed us to keep the project on track. Your staff on site speaks loudly of your company and I look forward to the chance to work with you and your team again."

Matthew A. Ludwig

PE Team Leader NCB/Administrative Contracting Officer, Dept. of the Army



Maine Drilling & Blasting

A T R U S T E D B R E E D • A T R U S T E D B R E E D

Misfire Prevention Guidelines, Fly Rock Prevention Guidelines & IME Blasting Best Practices

Misfire Prevention Guidelines

Prevention of Misfires

These guidelines were established to provide good work practices that will greatly reduce the possibility of a misfire due to self-induced causes.

Shot Design Nonelectric

1. Use proper hookup procedures as found in the MD&B published guidelines
2. The Blaster-In-Charge may determine the need for extra surface delays to create a dual path system to enhance reliability
3. Ensure that there is enough slack in the shock tube
4. Ensure shot design allows for complete energization or in cases of larger shots appropriate advancement of the initiation sequence.

Shot Design Electric

5. Ensure shot design allows for complete energization
6. Tape connections in wet locations
7. Monitor meter while matting
8. Test equipment regularly
9. Perform stray current tests

Loading

10. "Tape" all non-electric connections to ensure there is a proper connection
11. The Blaster-In-Charge must walk the shot completely and verify all connections prior to shooting
12. The Blaster-In-Charge will have additional competent person(s) walk the shot to ensure all connections are made properly
13. Use caution whenever sticking a loading pole or stemming rod into a loaded hole as it can damage shock tube
14. Re-prime any hole where separation is suspected
15. Re-prime any hole where you have used a powder retriever
16. Do not step on shock tube

Matting

17. Matting shall only be performed under the direction of the Blaster-In-Charge, or their competent designee
18. Ensure that the excavator on the project is sufficient in size to handle the mats in an efficient manner
19. Communicate the matting procedure clearly with the excavator operator, discuss hand signals also.
20. Design the shot with the excavators reach in mind
21. Clean mats by "shaking" them with an excavator. This is more effective when the tire "grain" is sloping downward
22. Do not drag mats over a shot
23. Do not set mats with a front-end loader or other equipment that cannot properly hoist the mat over the shot
24. Place ANFO bags under shock tube exposed to jagged surfaces
25. Utilize sand cover whenever geological conditions warrant extra coverage

General Prevention Techniques

26. Do not cut open detonator boxes with a knife
 27. Do not allow your powder knife to swing from a lanyard (strap) unless the blade is protected
 28. Document and calculate timing before loading the shot
 28. After the shot has been tied in – GET OFF THE SHOT!
-
-

Fly-Rock Prevention Plan

Prevention of Fly-Rock

Fly-rock prevention is most effective through good planning, attention to detail on drilling, loading and site security. Each category below contains items that are known to be effective in preventing fly-rock.

Planning

1. It must be clearly established who the (BIC) is and then clearly communicated to the entire crew.
2. The BIC must clearly communicate what the responsibilities are for each crew member.
3. BIC must understand the abilities of the crew. Trainees must be trained and supervised on all job functions, (assign a trainer).
4. Through the use of the Job Hazard Analysis the crew must become familiar with the blast environment and clearly identify all hazards on and around the job site.
5. The BIC must communicate with the drill operators and other blasters with experience to fully understand the geology on site.
6. The blast design must take into consideration all the relevant parameters, blast geometry, hazards, type of products, timing and type and amount of cover in use.
7. All pre-blast calculations must be done prior to the blast and adjusted should conditions change on the site or drilling conditions dictate a modification of the plan. Powder factor should be determined prior to loading the first hole.
8. Each blast should be designed according to the direction of least danger.
9. Start each project with a conservatively designed test blast. that will not only provide information on the geology but will provide relief for the next shot.
10. When location or conditions on the job site change consider your next blast as a test blast. Document your blast plan and have it reaffirmed.
11. Request hold harmless on shots that may cause damage or takes unnecessary risks.

Drilling

12. Carefully monitor and record hole depths, amount of overburden, and any drill hole anomalies with light colored crayons on the cones or another effective method.
13. Use flashlights attached to tapes to determine straightness of holes. If deviation is even slightly suspected, have holes bore tracked.
14. Arrange for Laser Profiling and Bore Tracking for high wall faces with exposures to property.

Loading the Shot

15. Have hole sheets and timing patterns on paper before loading.
16. Profile all faces before loading front row of holes.
17. Have blaster-in-charge load first and second rows of holes.
18. When using pourables (Bulk or ANFO):
 - a. Have an appropriate plan to deal with seams, voids, faces, and overloaded holes.

- b. Make the appropriate design modifications for the use of bulk.
- c. Keep the increased hazards in mind.
- 19. Take the time necessary to work safely and do not take shortcuts, or unnecessary risks. (DO NOT RUSH!)
- 20. Know the exact amount of burden on the face and load and cover accordingly, if face is bermed and you're uncertain of face location, excavate to find the face and then reberm.
- 21. Utilize berms for faces as appropriate.
- 22. If questioning the necessity to or the amount of cover, add cover.

- 23. Know the exact amount of overburden over the rock and load and cover accordingly.
- 24. Use offsets properly.
- 25. Train the blast crew on proper stemming techniques, what stemming anomalies may look like, why, and how to report them.
- 26. Monitor the stemming to make certain that all holes are properly stemmed.
- 27. Use only appropriate crushed stone and non-sparking stemming rods to compact the stone in each hole.
- 28. Pay attention when using bulk as it can coat the sides of the hole reducing the effectiveness of the stemming.
- 29. BIC must walk the shot twice and check power, double-up on power and down hole caps when necessary (critical shots).
- 30. Ensure 100% safe detonation! Misfires can be a source for flyrock. Follow all Misfire Prevention Guidelines!
- 31. If there is a remote possibility of fly rock from a blast, take the necessary additional precautions.
- 32. Never make assumptions. If unfamiliar with the situation; figure it out, then get another opinion to confirm your decision.
- 33. Always communicate with supervisors when safety issues are compromised.

Site Security

- 34. Secure loading area before, during, and after loading.
- 35. Have a thorough, written Blast Zone Security Plan:
 - a. Design an over cautious plan.
 - b. Communicate the plan with our crew, the Contractor and his crew.
 - c. Have all blast guards use hand-held radios on the same frequency or another acceptable means of communication.
- 36. Secure the blast zone by removing people from the blast area (especially keeping them away from the face of the blast) and have them stay at an overly safe distance behind the blast and put them under cover.
- 37. Blaster must have proper cover.
- 38. Execute the Blast Zone Security plan to the "T".



Blasting; Best Practices

The potential to impact surface or groundwater with the substances used in commercial explosives can be controlled through the implementation of certain measures. Implementing such measures as part of a standard operating procedure will eliminate or minimize the potential for these substances to dissolve in or become associated with water. The specific measures included can be grouped into the following four (4) basic categories:

1. Education/Training of Explosive Users
2. Selection of Appropriate Explosives for the Job and Conditions
3. Explosives Loading and Handling
4. Attention to Technical Matters

1. Education/Training of Explosive Users

Both the owners/operators of the location where explosives are being used and the personnel working with commercial explosives should be well informed of all applicable regulations as well as any potential consequences associated with the products' exposure to water. The federal Clean Water Act, or the equivalent state statute, regulates the release of substances, in particular those that can cause an undue risk to human health or the environment. In addition, the Resource Conservation and Recovery Act, governs the disposal of hazardous wastes.

2. Selection of Appropriate Explosive for the Job and Conditions

Selecting the proper explosive for the particular job is critical to the prevention of surface or groundwater impact.

- ANFO (ammonium nitrate - fuel oil) is not water-resistant and should be avoided if contact with water is likely.
- Various types of commercial explosives are available to withstand exposure to water. Water-resistant explosives include the cartridge forms of gelatinous nitroglycerin, watergels and emulsions and the bulk forms of emulsions which are: 1) Site Mixed Emulsion (ammonium nitrate - fuel oil - emulsifier) is a water-resistant explosive, semi-solid. This is manufactured on site and detonated while still warm assuring complete detonation. 2) Repump Emulsion (ammonium nitrate - fuel oil - emulsifier) is a water-resistant explosive, semi solid, manufactured off site, transported and pumped into the borehole as needed.

3. Explosives Loading and Handling

- All excess product in augers or hoses is to be recovered and used either in the next blasthole or recycled in the mixer/holding tank.
- Explosive spillage around the blasthole collar is to be controlled and any such spillage should be placed into the blasthole before stemming
- Water contacting explosives during cleanup is to be contained and managed in accordance with applicable regulations
- Minimize the amount of time that explosives are exposed to wet conditions within the blasthole. The blast should be initiated as near the time the loading is completed as safety and operational procedures allow.
- Avoid having explosives exposed to precipitation.
- To assure complete detonation of explosives placed into the ground, a sufficient number of boosters must be used.

4. Attention to Technical Matters

- The actual physical conditions into which explosives are being placed must be taken into account.
- Personnel responsible for loading explosives into the boreholes should be in continuous communication with the drillers of those boreholes or supplied with adequate drill logs, so that any knowledge regarding fractures, crevices or cavities is obtained.
- Where Bulk ANFO or Emulsion is used in fractured, creviced or cavitied boreholes, plastic borehole sleeves and/or positioned inert stemming decks will be used to ensure total detonation of the explosives and avoidance of excessive charges.
- Choosing and placing the correct drilling patterns that results in the optimal use of explosives with all the explosives undergoing complete detonation.
- Quality assurance/quality control measures to maintain drilling accuracy that prevents the detonation in one blasthole from impacting the proper detonation in a nearby blasthole.
- Selecting the appropriate drilling equipment so that adequate borehole quality is maintained.
- Where appropriate to ensure complete detonation, two (2) primers will be used in each blasthole; one near the top and one near the bottom of the explosive column.
- Correct selection of delay timing for each blasthole to ensure detonation of the entire pattern, and the prevention of cut-off blastholes.

Blasting Mats Cut Sheet



Blasting mats

Popular Products :

- 8 ft. x 16 ft. (2.43m x 4.87m)
- 10 ft. x 15 ft. (3m x 4.5m)
- 12 ft. x 24 ft. (3.65m x 7.3m)

Custom Made Products

Our equipment enables us to produce blasting mats to your particular specifications in sizes ranging from 4 x 4 ft. (1.2 x 1.2m.) to 16 x 28 ft. (4.87 x 8.53m.). A flexibility that is unique in the industry.



WHY CHOOSE DYNAMAT BLASTING MATS?		
Our Innovative Processes		
The Dynamat Advantage		Our Goals
Automated processes	We have developed automated processes that let us measure the compaction of the blasting mats.	To ensure consistent quality.
Meticulous tire selection	Our manufacturing processes demand it.	
Our Added Value		
The Dynamat Advantage		Our Goals
Blasting mats over 12 feet (3.66 m) wide	We are the only manufacturer in North America to make products of such widths.	To match our client's needs.
12 inches (30 cm) between each cable	We have always spaced them this way. All our competitors, on the other hand, leave a gap of 14 to 16 inches (35 to 41 cm) between their cables.	To produce safe blasting mats that control flying debris better.
Forged circular rings	We used forged rings, while the competition used welded ones.	To make blasting mats easier to handle.
Two dimensions of rings	We use 10 and 13-inch (25and 33 cm) rings.	To obtain the resistance required for hoisting.
The benefits of traditional blasting mats vs. blasting mats made of truck tires (transport mat)	<ul style="list-style-type: none"> • greater flexibility and adaptability to the terrain. • maximal absorption of the energy released by dynamiting. • reduced possibilities of a partial blast. • unequalled ease in handling. 	To provide a safe product that not only eliminates all risk of flying debris when dynamiting, but also ensures optimal performance.

Superior quality = safety

Our products are subject to rigorous quality control at every step of the manufacturing process. Carefully selected, the recovered tires that make up our blasting mats are tied together with new cables, and that translates into solidity and resistance. All the rubber pieces are perforated in order to minimize tears. This means that clients can use our blasting mats in total safety.

Traceability

In a process that's unique to Dynamat, blasting mats are individually numbered to allow them to be easily traced and identified wherever they are on a project involving dynamiting. Now that's an advantage that's undeniably Dynamat!

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Laval, Québec
H7M 3H7

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Printed on : July 20th 2016

Blastmate 3 Seismograph Cut Sheet

Blastmate III™

Full-Featured, Advanced Vibration and Overpressure Monitor

Range of Applications:

- Blast-monitoring for compliance
- Near-field blast analysis
- Pile driving
- Construction activity
- Demolition activity
- Heavy transportation
- Bridge monitoring
- Structural analysis
- Underwater blast monitoring
- 4 or 8 channel data acquisition
- Remote monitoring - Auto Call Home™

Consultants, engineers and contractors the world over recognize the **Instantel® Blastmate III™** vibration and overpressure monitor as the most versatile and most reliable full featured monitor available. It provides all of the industry-leading features of the **Instantel Minimate Plus™** monitor, conveniently packaged with a full keyboard and a high-resolution printer. This allows you to setup, add notes and print complete event reports in the field, without a computer.

Versatile

With standard features like the **Instantel Histogram Combo™** monitoring mode, zero dead-time between events, and flexible sample rates up to 65,536 S/s, the **Blastmate III** system provides you with control and confidence to monitor reliably in any situation. For added versatility, you have the option to add 4 more channels and extra memory, providing two complete standard monitors in a single package.

For more demanding monitoring applications, the **Instantel Blastware® Advanced Module** software provides the capability to monitor a broad selection of vibration and overpressure sensors, as well as sensors for related structural and environmental measurements. Monitor vibration, ambient environmental conditions, and the movement of structural cracks, all at the same time, all using the same **Blastmate III** monitor.

Easy to use

The features and versatility of the **Blastmate III** monitor set it apart, but the fact that it is also easy to use makes it truly revolutionary. The dedicated single use function keys, backlit LCD and simple menu-driven operation make setup and operation quick and easy, even for inexperienced personnel.

Tough

The **Blastmate III** monitor has been built to survive, with a fully sealed top panel, non-corrosive industrial grade connectors and sealed electronics, all packed in a rugged, water-resistant case.

Blastmate III - Reliability and versatility for any monitoring application.



Key Features

- Fast high-resolution thermal printer for event reports in the field without the need for a computer.
- Full keyboard simplifies entry of job-specific notes and information.
- Dedicated function keys and intuitive menu-driven operation enable quick and easy setup.
- **Histogram Combo** mode allows capture of full waveform records while recording in histogram mode.
- Sample rates from 1,024 to 16,384 S/s per channel - up to 65,536 S/s available on a single channel.
- Available 8-channel option allows for 2 standard triaxial geophones and 2 microphones to be used on a single **Blastmate III** monitor.
- Continuous monitoring means zero dead time, even while the unit is processing.
- Any channel can be matched to a wide variety of sensors - geophones, accelerometers, or hydrophones.

Blastmate III™

General Specifications

Blastmate III

Channels	Microphone and Triaxial Geophone or 4 independent user-configurable channels (two Microphones and two Triaxial Geophones or 8 independent channels with optional 8-channel upgrade)
Vibration Monitoring (with Standard Triaxial Geophone)	
Range	Up to 254 mm/s (10 in/s)
Resolution	0.127 mm/s (0.005 in/s) or 0.0159 mm/s (0.000625 in/s) with built-in preamp
Accuracy (ISEE / DIN)	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
Transducer Density	2.13 g/cc (133 lbs/ft ³)
Frequency Range (ISEE / DIN)	2 to 250 Hz, within zero to -3 dB of an ideal flat response / 1 to 315 Hz
Maximum Cable Length (ISEE / DIN)	75 m (250 ft) / 1,000 m (3,280 ft)
Air Overpressure Monitoring	
Weighting Scales	Linear or A-weight
Linear Range	88 to 148 dB (500 Pa (0.072 PSI) Peak)
Linear Resolution	0.25 Pa (0.0000363 PSI)
Linear Accuracy	+/- 10% or +/- 1 dB, whichever is larger, between 4 and 125 Hz
Linear Frequency Response	2 to 250 Hz between -3 dB roll off points
A-weight Range	50 to 110 dBA
A-weight Resolution	0.1 dBA

Waveform Recording

Record Modes	Manual, Single-shot, Continuous
Seismic Trigger	0.125 to 254 mm/s (0.005 to 10 in/s)
Acoustic Triggers	
Linear	100 to 148 dB
A-weight	55 to 110 dBA
Sample Rate	1,024 to 16,384 S/s per channel (independent of record time), up to 65,536 S/s in single-channel mode with advanced software (maximum 8,192 S/s per channel for 8 channels)
Record Stop Mode	Fixed record time, Instantel® AutoRecord™ record stop mode
Record Time	1 to 100 seconds (programmable in one-second steps) or 500 seconds plus 0.25 seconds pre-trigger
AutoRecord Time	Auto window programmable from 1 to 9 seconds, plus a 0.25 second pre-trigger. Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled. Recording uninterrupted by event processing - No dead time
Cycle Time	
Storage Capacity	
Full Waveform Events	300 one-second events at 1,024 S/s sample rate (1,500 event capacity with optional memory upgrade)
Event Summaries	1,750 (8,750 event capacity with optional memory upgrade)

Histogram Recording

Record Modes	Histogram and Instantel Histogram Combo™ (monitor captures triggered waveforms while recording in Histogram mode)
Recording Interval	2, 5 or 15 seconds; 1, 5 or 15 minutes
Storage Capacity	46,656 intervals - 3 days at 5-second intervals or 102 days at 15 minute intervals (with memory upgrade - 15 days at 5-second intervals or 540 days at 15 minute intervals)

Physical Specifications

Dimensions	269 x 355 x 165 mm (10.6 x 14.0 x 6.5 in)
Weight	6.4 kg (14 lbs)
Battery	Rechargeable 6 V sealed gel cell - capacity for 30 days of continuous monitoring
User Interface	63 domed tactile keys including full keyboard and dedicated keys for common functions
Display	4-line x 20 character, high contrast, backlit LCD with online help
Printer	High resolution thermal plotter
PC Interface	RS-232
Auxillary Inputs and Outputs	External Trigger, Remote Alarm, coordinate download from GPS
Environmental	
Printer/LCD Operating Temperature	-10 to 50°C (14 to 122°F)
Electronics Operating Temperature	-20 to 60°C (-4 to 140°F)
Remote Communications	Compatible with Telephone, GSM, Cellular, RF, Satellite, Short-haul modems, and Ethernet® device servers. Automatically transfers events when they occur through Instantel Auto Call Home™ feature.
Additional Features	Monitor start/stop timer

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**Explosive Data Sheets
(SDS Sheets Available Upon Request)**

NONEL[®] Lead Line

Technical Information



Application Recommendations (continued)

NONEL LEAD LINE as the primary initiator for NONEL blast rounds.

- **ALWAYS** trim at least 3 m [10 ft] of tubing before inserting into a nonelectric shock tube starting device or whenever dirt and/or moisture may have compromised the open tube ends before making a splice connection.
- **ALWAYS** replace the plastic tube closure over the open end of any NONEL LEAD LINE that remains on the spool and is intended to be used to make up another nonelectric starter assembly.
- **ALWAYS** make the final hook-up of the nonelectric starter assembly to the blast round only after all equipment and non-essential personnel are clear of the blast area.
- **ALWAYS** unspool NONEL LEAD LINE by hand if the starter assembly has been spliced to it and is attached to the blast round.
- **ALWAYS** keep any NONEL LEAD LINE tube ends sealed and free from dirt and moisture since dirt or moisture in the shock tube may cause a misfire.
- **NEVER** use NONEL LEAD LINE for in-hole use. NONEL LEAD LINE is for use outside the borehole only.
- **NEVER** attempt to knot different lengths of shock tube together. Shock tube will not initiate itself through knot connections. It must be spliced.
- **NEVER** remove the plastic tube closure from the NONEL LEAD LINE shock tube until just before splicing.
- **NEVER** attach the starter assembly to the blast round until after the LEAD LINE deployment is complete whenever NONEL LEAD LINE is to be unspooled by any method other than by hand,

Application Recommendations (continued)

- **NEVER** run over NONEL LEAD LINE with equipment. This may damage the shock tube and may cause a misfire. **ALWAYS** replace the NONEL LEAD LINE if it is damaged.
- When making a nonelectric starter assembly using NONEL LEAD LINE, **ALWAYS** remove the plastic tube closure and save for later use. Splice two freshly-cut ends of NONEL shock tube together (one from the NONEL LEAD LINE and the other from the NONEL detonator) by inserting them into opposite ends of the plastic connector sleeve and pushing them toward one another until they are both at least ½ cm (¼ in) in the splice.

Transportation, Storage and Handling

- NONEL LEAD LINE must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL LEAD LINE must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Case Dimensions

51 x 25 x 28 cm 20 x 9 7/8 x 10 7/8 in

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Groundbreaking Performance

NONEL[®] EZ DET[®] 1.4B

Technical Information



Application Recommendations (continued)

- **ALWAYS** protect the plastic EZ Connector block and all shock tube leads from impact or damage during the loading and stemming operations. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ Connector block contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.
- **ALWAYS** be sure that the shock tube(s) are securely inserted, one at a time, into the EZ Connector block. The head of the EZ Connector block should rise to accept the shock tube and return to a closed position with an audible click.
- **ALWAYS** ensure that individual shock tubes remain aligned side by side in the connector channel and do not cross one over the another on insertion.
- **NEVER** use NONEL EZ DET units with detonating cord. The low strength surface detonator will not initiate detonating cord and may cause misfires.
- **NEVER** attempt to disassemble the delay detonator from the plastic EZ Connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into the plastic EZ Connector block. Misfires may result.
- **NEVER** pull, stretch, kink or put tension on shock tube such that the tube could break.
- **NEVER** splice NONEL EZ DET shock tube together to extend between holes.
- **NEVER** connect NONEL EZ DET units together until all holes have been primed, loaded and stemmed and the blast site has been cleared.

Transportation, Storage and Handling

- NONEL EZ DET must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL EZ DET must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives

Packaging

Length		Case Type	Quantity / Case	
m	ft		case	subpack
3.5	12	D	180	90
4.5	16	D	120	60
7	24	D	120	60
9	30	D	80	40
12	40	D	60	30
15	50	D	60	30
18	60	D	50	25
24	80	DC	50	--
30	100	DC	40	--
37	120	DC	30	--

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.

Note: This product is also available with a High Strength cap. For more information, please contact your local Dyno Nobel sales representative.

Case Dimensions

Detpak Case (DC)	48 x 45 x 26 cm	18¾ x 17¾ x 10¼ in
Detpak (D)		
subpack	44 x 22 x 25 cm	17 ½ x 8 ¾ x 10 in
strapped case	44 x 45 x 25 cm	17 ½ x 17 ⅝ x 10 in

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Groundbreaking Performance



Application Recommendations (continued)

damage. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ connector contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.

- **NEVER** use NONEL EZTL detonators with detonating cord. The low strength surface detonator will not initiate detonating cord.
- **NEVER** attempt to disassemble the delay detonator from the EZ connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into an EZ connector block. Misfires may result.
- **NEVER** tie-in NONEL EZTL units until all holes have been primed, loaded, stemmed and the blast site has been cleared.

Transportation, Storage and Handling

- NONEL EZTL must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL EZTL must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Packaging

Length		Case Type	Quantity / Case	
m	ft		case	subpack
2.5	10	D	180	90
3.5	12	D	180	90
6	20	D	150	75
9	30	D	120	60
12	40	D	100	50
15	50	D	90	45
18	60	D	70	35

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.

Case Dimensions

Detpak (D)

subpack	44 x 22 x 25 cm	17½ x 8¾ x 10 in
strapped case	44 x 45 x 25 cm	17½ x 17⅝ x 10 in

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TROJAN[®] SPARTAN[®] SR[™]

Technical Information



Shock Resistant Cast Booster



Product Description

TROJAN SPARTAN SR cast boosters are detonator sensitive, high density, high energy molecular explosives available in three sizes designed to optimize initiation of all booster detonator sensitive explosives.

In addition to the internal through-tunnel and detonator well, the TROJAN SPARTAN SR (Shock Resistant) cast booster has an internal sleeve to protect the circuit board in electronic detonators and is designed specifically for use with Dyno Nobel's DigiShot[®], DigiShot Plus and SmartShot[®] electronic detonators. The Trojan Spartan SR can, however, also be used with any detonator (minimum length = 8.89 cm / 3.5 in) that may require additional protection from high shock, water hammer, effects during decking, corner operations or in certain geologies

The TROJAN SPARTAN SR (Shock Resistant) cast booster also incorporates the unique Caplock[™] feature which holds the detonator in place more securely and makes it more difficult for the detonator to be pulled out of capwell position while it is being lowered into the borehole. Even with this new Caplock feature, the detonator can still be removed if necessary.

Properties

MSDS
#1108

Density	(g/cc) Avg	1.65
Velocity	(m/sec)	7,550
	(ft/s)	24,800
Detonation Pressure	(Kbars)	235
Water Resistance	6 months with no loss of sensitivity	
Shelf Life Maximum	5 years (from date of production)	
Maximum Usage Temperature	65°C (150°F)	

All Dyno Nobel Inc. energy and gas volume values except Velocity and Detonation Pressure are calculated using PRODET[™] the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

Velocity and Detonation Pressure are the result of empirical methods during May 2009.

IMPORTANT!!! WARNING!!!! IMPORTANT!!!!

NEVER USE A DETONATOR LESS THAN
8.89 CM / 3.5 in LONG WITH THE
TROJAN SPARTAN SR CAST BOOSTER.
MISFIRES MAY RESULT.

Product Description continued

TROJAN SPARTAN SR cast boosters are formulated from the highest quality PETN and other high explosive materials ensuring reliability, consistency and durability in all blasting environments.

The fluorescent yellow container makes the TROJAN SPARTAN booster more visible on the blast site and reduces the possibility of misplaced charges.

Hazardous Shipping Description

UN 0042 Boosters, 1.1D PG II



TROJAN® SPARTAN® SR™

Technical Information



Application Recommendations

- **NEVER** force the detonator into the through-tunnel, the detonator-well or otherwise attempt to clear these areas if obstructed. If the through-tunnel or detonator-well does not accommodate the detonator, do not use the booster. Notify your Dyno Nobel representative.
- **ALWAYS** use a detonator with a minimum length of 8.89 cm (3.5 in). The detonator well length is 10.2 cm (4.0 in).
- Extremely low temperatures do not affect the performance of cast boosters with commercial detonators. Low temperatures do affect detonators and detonating cord. Be certain your initiation system is suitable for your application in extremely low temperatures. Cast boosters are more susceptible to breakage during handling in extremely cold temperatures.

Transportation, Storage and Handling

- Dyno Nobel cast boosters must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (5 years), Dyno Nobel cast boosters must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old.

Packaging

Unit Weight		Unit Dimensions				Case Quantity	Gross Weight/Case	
g	oz	Length		Diameter			kg	lbs
		cm	in	cm	in			
350	12	11.9	4.7	5.0	2.0	49	16.9	39.5
400	14	11.9	4.7	5.5	2.2	40	16.7	36.8
450	16	11.9	4.7	5.8	2.3	36	16.9	37.3

Note: All weights and dimensions are approximate.

Case Dimensions

42 x 33 x 14 cm

16 ½ x 13 x 5 ½ in

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TROJAN SPARTAN®

Technical Information



Cast Booster



Product Description

TROJAN SPARTAN cast boosters are detonator sensitive, high density, high energy molecular explosives available in various sizes designed to optimize initiation of all booster sensitive explosives. All TROJAN SPARTAN boosters are manufactured with an internal through-tunnel and detonator well for easy application with either electric, electronic or nonelectric detonators or 10.6 g/m (50 gr/ft) minimum strength detonating cord.

TROJAN SPARTAN boosters are formulated from the highest quality PETN and other high explosive materials ensuring reliability, consistency and durability in all blasting environments. The fluorescent green container and clear printing makes the TROJAN SPARTAN booster more visible on the blast site (as well as in low light situations) and reduces the possibility of misplaced charges. The redesigned Caplock™ holds the detonator in place more securely and makes it more difficult for the detonator to be pulled out of the capwell position while it is being lowered into the borehole.

Application Recommendations

- **NEVER** force the detonator into the through-tunnel, the detonator-well or otherwise attempt to clear these areas if obstructed. If the through-tunnel or detonator-well does not accommodate the detonator, do not use the booster. Notify your Dyno Nobel representative.

Properties

MSDS
#1108

Density	(g/cc) Avg	1.65
Velocity	(m/sec)	7,550
	(ft/s)	24,800
Detonation Pressure	(Kbars)	235
Water Resistance	6 months with no loss of sensitivity	
Shelf Life Maximum	5 years (from date of production)	
Maximum Usage Temperature	60°C (150°F)	

All Dyno Nobel Inc. energy and gas volume values except Velocity and Detonation Pressure are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

Velocity and Detonation Pressure are the result of empirical methods during May 2009.

Hazardous Shipping Description
UN 0042 Boosters, 1.1D PG II



TROJAN® SPARTAN®

Technical Information



Application Recommendations (continued)

- **ALWAYS** use detonating cord with a coreload of 10.6 g/m (50 gr/ft) or higher when initiating the TROJAN SPARTAN booster with detonating cord.
- Minimum detonator is No. 8 strength for temperatures above -40° C (-40° F). A high strength detonator is recommended for temperatures below -40° C (-40° F).
- Extremely low temperatures do not affect the performance of cast boosters with commercial detonators. Low temperatures do affect detonators and detonating cord. Be certain your initiation system is suitable for your application in extremely low temperatures. Cast boosters are more susceptible to breakage during handling in extremely cold temperatures.

Transportation, Storage and Handling

- Dyno Nobel cast boosters must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (5 years), Dyno Nobel cast boosters must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old.

Packaging

Unit Weight		Unit Dimensions				Case Quantity	Gross Weight/ Case	
g	oz	Length		Diameter			kg	lbs
		cm	in	cm	in			
90	3.2	11.9	4.7	2.7	1.1	150	14.0	30.8
150	5.5	11.9	4.7	3.6	1.4	95	16.7	36.7
200	7	11.7	4.6	4.1	1.6	72	16.5	36.4
350	12	11.9	4.7	5.0	2.0	49	17.9	39.5
400	14	11.9	4.7	5.5	2.2	40	17.6	38.8
450	16	11.9	4.7	5.8	2.3	36	17.8	39.2
900	32	12.9	5.1	7.9	3.1	18	17.8	39.2

Note: All weights and dimensions are approximate.

Case Dimensions

42 x 33 x 14 cm

16 ½ x 13 x 5 ½ in

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Groundbreaking Performance

DYNOMAX™ PRO

Technical Information



Extra Gelatin Nitroglycerin Dynamite



Product Description

DYNOMAX PRO is desensitized extra gelatin dynamite designed to satisfy the majority of explosive application requirements. DYNOMAX PRO is formulated to consistently deliver high detonation velocity and excellent water resistance while reducing cartridge to cartridge gap sensitivity and hole-to-hole propagation problems. DYNOMAX PRO is recommended for bottom loading and as the main explosive charge where high density and energy is required. DYNOMAX PRO is recommended for use as booster, bottom load or floor control solution.

Application Recommendations

- DYNOMAX PRO is an excellent primer for Dynamix (ANFO), Dynamix WR (WR ANFO) or other detonator sensitive packaged product and can be used as a secondary primer in hard seams or at the top of the explosive column.
- Minimum diameter is 32 mm (1¼ in).
- Minimum detonator is No. 8 strength.
- DYNOMAX PRO has been formulated to reduce susceptibility to sympathetic detonation when applied in very wet conditions where boreholes are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for product recommendations where these conditions exist.
- Storage at elevated temperatures and/or high humidity for 12-18 months can reduce the performance of DYNOMAX PRO depending on the diameter. Consult your Dyno Nobel representative for specific recommendations.

Properties

MSDS
#1019

Density (g/cc) Avg	1.45
Energy^a (cal/g)	1,055
(cal/cc)	1,510
Relative Weight Strength^a	1.20
Relative Bulk Strength^{a,b}	2.10
Velocity^c (m/s)	6,000
(ft/s)	19,700
Detonation Pressure^c (Kbars)	130
Gas Volume^a (moles/kg)	32
Water Resistance	Excellent
Fume Class^d	IME1

^a All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

^b ANFO = 1.00 @ 0.82 g/cc

^c Unconfined @ 50 mm (2 in) diameter.

^d IME Fume Class 1 in convolute paper shell only. Not Fume Class 1 in paper tube shell. Natural Resources Canada Fume Class approvals pending.

Hazardous Shipping Description

Explosive, Blasting, Type A 1.1D UN 0081 II



DYNOMAX™ PRO

Technical Information



Transportation, Storage and Handling

- For maximum shelf-life, DYNOMAX PRO dynamite must be stored in cool, dry and well-ventilated magazines. Explosive inventory should always be rotated by using the oldest materials first. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.
- DYNOMAX PRO must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.

Packaging

Diameter x Length		Qty / Case	Case Type	Nominal Case Weight	
mm	in			kg	lbs
32 x 200	1 1/4 x 8	88	DA	20	44
32 x 400	1 1/4 x 16	44	DA	20	44
40 x 200	1 1/2 x 8	60	DA	20	44
50 x 200	2 x 8	34	DB	20	43
50 x 400 ^a	2 x 16 ^a	17	DB	20	43
65 x 400 ^a	2 1/2 x 16 ^a	10	DB	19	41
75 x 200	3 x 8 ^a	16	DE	20	44
75 x 400 ^a	3 x 16 ^a	8	DE	20	44

^a Available in spiral tube shell with tapered end.

• Note: All weights are approximate.

- **Available upon request. Check with your Dyno Nobel representative should you have any questions.
- Product density is 1.40 g/cc for package diameters less than 50mm (2 in). Use cartridge count to determine actual explosive charge weight.
- DYNOMAX PRO is available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.

Case Dimensions

DA	17 ³ / ₄ x 13 ³ / ₈ x 6 ³ / ₈ in	34 x 34 x 17 cm
DB	17 ⁷ / ₈ x 13 ³ / ₈ x 5 ⁷ / ₈ in	45 x 34 x 15 cm
DE	17 ⁵ / ₈ x 13 ⁵ / ₁₆ x 6 ³ / ₄ in	45 x 34 x 17 cm

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DYNO
Dyno Nobel

Groundbreaking Performance™



Extra Gelatin Nitroglycerin Dynamite



Product Description

UNIMAX is an extra gelatin dynamite formulated to consistently deliver high detonation velocity and excellent water resistance. UNIMAX is designed to satisfy the vast majority of explosive applications in hard rock and may be used as the main explosive charge where high density and energy is required or as a primer for ANFO.

Application Recommendations

- UNIMAX is an excellent primer for Dynamix (ANFO), Dynamix-WR (WR ANFO) or other detonator sensitive packaged product and can be used as a secondary primer in hard seams or at the top of the explosive column.
- Minimum diameter is 25 mm (1 in).
- Minimum detonator is No. 8 strength.
- Storage at elevated temperatures and/or high humidity for 1 to 6 months can reduce the performance of Unimax depending on the diameter. Consult your Dyno Nobel representative for specific recommendations.
- Dynamites are susceptible to sympathetic detonation when applied in very wet conditions where boreholes are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for recommendations where these conditions exist.

Properties

MSDS #1019

Density (g/cc) Avg	1.51
Energy^a (cal/g)	1,055
(cal/cc)	1,510
Relative Weight Strength^a	1.20
Relative Bulk Strength^{a,b}	2.10
Velocity^c (m/s)	5,300
(ft/s)	17,400
Detonation Pressure^c (Kbars)	106
Gas Volume^a (moles/kg)	32
Water Resistance	Excellent
Fume Class	IME1 & NRCan1 ^d

^a All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

^b ANFO = 1.00 @ 0.82 g/cc

^c Unconfined @ 50 mm (2 in) diameter.

^d Approved by Natural Resources Canada as Fume Class 1.

Hazardous Shipping Description

Explosive, Blasting, Type A, 1.1D, UN 0081 II





Transportation, Storage and Handling

- UNIMAX must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- For maximum shelf-life, dynamite must be stored in cool, dry and well-ventilated magazines. Dynamite inventory should always be rotated by using the oldest materials first. For recommended good practices in transporting, storing, handling and using this product, see the booklet “Prevention of Accidents in the Use of Explosive Materials” packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Diameter x Length		Quantity / Case	Case Type	Nominal Case Weight	
mm	in			kg	lbs
25 x 200	1 x 8	140	DA	20.4	44.8
32 x 200	1 1/4 x 8	88	DA	20.0	44.0
32 x 400	1 1/4 x 16	44	DA	20.0	44.0
40 x 200	1 1/2 x 8	60	DA	19.4	42.6
40 x 400	1 1/2 x 16	30	DA	20.5	45.0
50 x 200	2 x 8	34	DB	19.3	42.5
50 x 400 ^a	2 x 16 ^a	17	DB	19.3	42.5
60 x 400 ^a	2 1/4 x 16 ^a	13	DA	18.1	39.8
65 x 400 ^a	2 1/2 x 16 ^a	10	DB	18.6	41.0
75 x 200	3 x 8	16	DE	19.9	43.7
75 x 400 ^a	3 x 16 ^a	8	DE	20.4	44.8

^a Available in spiral tube shell with tapered end.

• Note: all weights are approximate.

• Product density is 1.50 g/cc for package diameters less than 50 mm (2 in). Use cartridge count to determine actual explosive charge weight.

• UNIMAX is available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.

**Available upon request. Check with your Dyno Nobel representative should you have any questions.

Case Dimensions

DA	45 x 34 x 17 cm	17 ³ / ₈ x 13 ³ / ₈ x 6 ³ / ₈ in
DB	45 x 34 x 15 cm	17 ⁷ / ₈ x 13 ³ / ₈ x 5 ⁷ / ₈ in
DE	45 X 34 X 17 cm	17 ⁵ / ₈ x 13 ⁵ / ₁₆ x 6 ³ / ₄ in

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Small & Large Diameter Cast Booster Sensitive Emulsion



Product Description

BLASTEX is a booster sensitive, water resistant, packaged emulsion explosive designed to satisfy a majority of medium diameter explosive applications for quarry and construction blasting. It is a cost effective alternative to most detonator sensitive, water resistant, packaged emulsion explosives. BLASTEX is available in two grades with increasing energy level for each.

Application Recommendations

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- Ensure continuous column loading. For column lengths in excess of 6 m (20 ft) or whenever column separation is suspected, multiple priming is recommended.
- Emulsion explosives are susceptible to “dynamic shock” and may detonate at low order or fail completely when applied in very wet conditions, where explosive charges or decks are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for alternate product recommendations when these conditions exist.
- **ALWAYS** use a cast booster as a primer for BLASTEX to ensure maximum performance.
- **ALWAYS** use a 340 g (12 oz) or larger cast booster at internal product temperatures higher than -18° C (0° F). At internal product temperatures below -18° C (0° F) and higher than -34° C (-30° F) use a 454 g (16 oz) or larger cast booster.
- **NEVER** use BLASTEX at internal product temperatures below -34° C (-30° F). At internal product temperatures below -34° C (-30° F), adequate product warm-up time must be allowed after loading into boreholes and before initiation.
- Use with detonating cord is not recommended.

Properties

MSDS
#1063

	BLASTEX	BLASTEX PLUS
Density (g/cc) Avg	1.26	1.26
Energy^a (cal/g)	740	800
(cal/cc)	930	1,010
Relative Weight Strength^a	0.84	0.91
Relative Bulk Strength^{a,b}	1.29	1.40
Velocity^c (m/s)	5,000	4,900
(ft/s)	16,400	16,100
Detonation Pressure^c (Kbars)	79	76
Gas Volume^a (moles/kg)	44	39
Fume Class	IME1 & NRCAN ^d	IME1
Shelf Life Maximum	1 year (from date of production)	
Maximum Water Depth	45 m (150 ft)	
Water Resistance	Excellent	

^a All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

^b ANFO = 1.00 @ 0.82 g/cc

^c Unconfined @ 75 mm (3 in) diameter

^d Approved by Natural Resources Canada as Fume Class 1 in:

*valeron chub 50 mm (2 in) diameter and greater

*shot bag 125 mm (5 in) diameter and greater

Hazardous Shipping Description

Explosive, Blasting, Type E, 1.5D, UN 0332 II





Transportation, Storage and Handling

- BLASTEX and BLASTEX PLUS must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- Packaged emulsions have a shelf life of one (1) year when stored at temperatures between -18° C and 38° C (0° F and 100° F). Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Packaging Details

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- All weights are approximate.
- BLASTEX and BLASTEX PLUS are available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.
- Check with your Dyno Nobel representative should you have any questions.

Packaging = Chub

Diameter x Length		Blastex	Blastex Plus	Case Quantity	Pallet Box Quantity	Case Weight		Net Explosive Weight / Chub	
mm	in					kg	lbs	kg	lbs
50 x 400	2 x 16	■	■	18	N/A	18.0	40	1.00	2.20
57 x 400	2¼ x 16	■	■	14	N/A	17.7	39	1.26	2.78
65 x 400	2½ x 16	■	■	12	N/A	18.1	40	1.51	3.33
65 x 862	2½ x 34	■		N/A	250	909	2,000	3.63	8.00
70 x 400	2¾ x 16	■	■	9	N/A	17.3	38	1.92	4.23
70 x 862	2¾ x 34	■		N/A	222	908	1,998	4.09	9.00
75 x 400	3 x 16	■	■	8	N/A	18.2	40	2.27	5.00
75 x 862	3 x 34	■		N/A	200	909	2,000	4.54	10.00
89 x 400	3½ x 16	■	■	6	N/A	16.7	37	2.77	6.11

Case Dimensions

44 x 35 x 20 cm 17.25 x 13.875 x 7.875 in

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Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Maine Drilling & Blasting
88 Gold Ledge Ave,
Auburn, NH 03032

Date: 03/16/2018

Supersedes: 08/24/2015 & 09/2005

Phone: (207) 582-2338 Toll Free: (800) 370-2338

Product Identifier

Product Form: Mixture

Product Name: 1966 Emulsion Blend

Other Means of Identification

Product Class: Emulsion

Trade Names:

1966 Emulsion Blend

Intended Use of the Product

Industrial applications

Emergency Telephone Numbers: DAY: 603-647-0299

FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300

CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture

Classification (GHS-US)

Expl. 1.5	H205
Eye Irrit. 2A	H319
Carc. 2	H351
STOT RE 2	H373

Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US)



Signal Word (GHS-US)

: Danger

Hazard Statements (GHS-US)

: H205 - May mass explode in fire.
H319 - Causes serious eye irritation.
H351 - Contains materials suspected of causing cancer.
H373 - May cause damage to organs through prolonged or repeated exposure.

Precautionary Statements (GHS-US)

: P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
P220 - Keep/Store away from combustible materials.
P221 - Take any precaution to avoid mixing with combustible materials.

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P240 - Ground/bond container and receiving equipment. Consult manufacturer for detailed guidance on appropriate grounding/bonding.
 P260 - Do not breathe dust, mist, vapors.
 P264 - Wash hands, forearms and exposed areas thoroughly after handling.
 P273 - Avoid release to the environment.
 P280 - Wear eye protection, protective clothing, protective gloves.
 P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P308+P313 - If exposed or concerned: Get medical advice/attention.
 P314 - Get medical advice/attention if you feel unwell.
 P337+P313 - If eye irritation persists: Get medical advice/attention.
 P370+P378 - In case of fire: Do NOT attempt to fight fire.
 P370+P380 - In case of fire: Evacuate area.
 P372 - Explosion risk in case of fire.
 P373 - DO NOT fight fire when fire reaches explosives.
 P401 - Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555..
 P405 - Store locked up.
 P501 - Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	65 - 90	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Fuel oil / mineral oil blend	(CAS No) 68476-30-2	3 - 9	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation:dust,mist), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304 Aquatic Acute 3, H402 Aquatic Chronic 2, H411
Polymeric Surfactant	NA	0.5 - 2	Not available

More than one of the ranges of concentration prescribed by Controlled Products Regulations has been used where necessary, due to varying composition.
 Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing and wash before reuse. Gently wash with plenty of soap and water.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

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Ingestion: Rinse mouth. Do not induce vomiting. Immediately call a POISON CENTER or doctor/physician.

Most Important Symptoms and Effects Both Acute and Delayed

General: May cause serious eye irritation. Contains material suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause serious eye irritation.

Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: Contains material suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If ingested, causes methemoglobinemia – emergency response should treat appropriately, such as by intravenous administration of methylene blue.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.

Unsuitable Extinguishing Media: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

Explosion Hazard: Explosion risk in case of fire. This product is an explosive with mass detonation hazard. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity: Stable under normal conditions. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Advice for Firefighters

Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

Hazardous Combustion Products: Carbon Monoxide (CO) and Nitrogen Oxides (NOx)

Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Avoid all contact with skin, eyes, or clothing. Avoid breathing (vapor, mist, dust).

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Stop release if safe to do so. Eliminate ignition sources. Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up

For Containment: Contain any spills with dikes to prevent migration and entry into sewers or streams. Do not use combustible absorbents and do not mix with other materials.

Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate Federal, State and local regulations.

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

Safety Data Sheet

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling

General: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications. Comply with the safety library publication No. 4 "Warnings and Instructions" as adopted by the Institute of Makers of Explosives.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and forearms thoroughly after handling. Do not eat, drink or smoke when using this product.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Contact manufacturer for appropriate grounding/bonding guidance. Comply with applicable regulations.

Storage Conditions: Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555. Store in a dry, cool and well-ventilated place. Keep/Store away from direct sunlight, extremely high or low temperatures, heat sources, ignition sources. Keep container closed when not in use. Store locked up.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Zinc. Copper and its alloys. Organic materials. Combustible materials.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), NIOSH (REL), or OSHA (PEL).

Fuels, diesel, no. 2 (68476-30-2)

USA ACGIH	ACGIH TWA (mg/m ³)	100 mg/m ³ (inhalable fraction and vapor, as total hydrocarbons) 8 h (skin)
USA ACGIH	ACGIH chemical category	Skin - potential significant contribution to overall exposure by the cutaneous route, Confirmed Animal Carcinogen with Unknown Relevance to Humans

Exposure Controls

Appropriate Engineering Controls: Ventilation System: Indoors: A system of local and / or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details. Use explosion-proof equipment. / Outdoors: Work upwind.

Personal Protective Equipment: Personal Respirators (NIOSH Approved): A respirator is not needed under normal and intended conditions of use. If the exposure limit is exceeded and engineering controls are not feasible, use a mask with an organic vapor cartridge or positive pressure air supplied (SCBA) unit. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).



Skin Protection: Gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure - Neoprene, PVC.

Eye Protection: Use chemical safety goggles and / or a full face shield where splashing is possible.

Hygiene Measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

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SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	: Solid
Appearance	: White to tan colored thick cream. If aluminum is present, gray metal particles will be visible. If ammonium nitrate prill is present, white to tan colored granules will be visible.
Odor	: Slight odor of fuel oil
Odor Threshold	: Not available
pH	: Not available
Evaporation Rate	: Not available
Melting Point	: Not available
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: 165 °F (74 °C) (PMCC)
Auto-ignition Temperature	: Not available
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not available
Lower Flammable Limit	: Not available
Upper Flammable Limit	: Not available
Vapor Pressure	: Not available
Relative Vapor Density at 20 °C	: Not available
Density	: Not available
Specific Gravity	: 1.20 – 1.30
Solubility	: Not available
Partition Coefficient: N-Octanol/Water	: Not available
Viscosity	: Not available
Explosive properties	: Explosive; fire, blast or projection hazard
Explosion Data – Sensitivity to Mechanical Impact	: Not expected to present an explosion hazard due to mechanical impact.
Explosion Data – Sensitivity to Static Discharge	: Not expected to present an explosion hazard due to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials. Contact with organic material or combustible material may cause an explosive situation.

Chemical Stability: Stable under recommended handling and storage conditions (see section 7). May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Avoid temperatures above (212°F (100°C)).

Incompatible Materials: Avoid all contamination, especially peroxides and chlorates. Alkaline contamination may liberate ammonia fumes.

Hazardous Decomposition Products: Gaseous nitrogen oxides and carbon oxides: Toxic decomposition products including carbon monoxide (CO) may migrate to off blast-site areas.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

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Skin Corrosion/Irritation: Not classified
Serious Eye Damage/Irritation: Causes serious eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not classified
Carcinogenicity: Contains an ingredient suspected of causing cancer.
Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.
Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: Not classified
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: May cause serious eye irritation.
Symptoms/Injuries After Ingestion: Ingestion is likely to be harmful or have adverse effects. Overexposure to this material may result in methemoglobinemia. Methemoglobinemia decreases the blood's ability to carry oxygen and results in symptoms such as dizziness, drowsiness, headache, shortness of breath, blue skin and lips, rapid heart rate, unconsciousness, and possibly death.
Chronic Symptoms: Contains an ingredient suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Fuels, diesel, no. 2 (68476-30-2)	
LD50 Oral Rat	18.7 - 24.9 ml/kg
LD50 Dermal Rabbit	> 4300 mg/kg
ATE US (dust, mist)	3.60 mg/l/4h
Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

Ecology - Water: Harmful to aquatic life with long lasting effects.

Fuels, diesel, no. 2 (68476-30-2)

LC50 Fish 1	57 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
-------------	---

Persistence and Degradability Not available

Bioaccumulative Potential

Ammonium nitrate (6484-52-2)

BCF fish 1	(no bioaccumulation expected)
------------	-------------------------------

Log Pow	-3.1 (at 25 °C)
---------	-----------------

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Uncontaminated and contaminated material may be placed in large diameter boreholes and detonated so that the explosive energy is utilized as originally intended. Dispose of under direct supervision of a qualified person according to local, state and federal regulations. Call Maine Drilling & Blasting Safety and Compliance

Safety Data Sheet

Department for recommendations and assistance.

Additional Considerations: This material may become a hazardous waste under certain conditions and must be collected, labeled and disposed of per state and federal hazardous waste regulations.

SECTION 14 - TRANSPORT INFORMATION

In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)
 Hazard Class : 1.5D
 Identification Number : NA0332
 Label Codes : 1.5D



Packing Group : II
 ERG Number : 140

In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)
 Hazard Class : 1
 Identification Number : UN0332
 Label Codes : 1.5D
 EmS-No. (Fire) : F-B
 EmS-No. (Spillage) : S-Y



In Accordance with IATA

Proper Shipping Name : AGENT, BLASTING TYPE E
 Identification Number : UN0332
 Hazard Class : 1
 Label Codes : 1.5D



ERG Code (IATA) : 1L

In Accordance with TDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
 Packing Group : II
 Hazard Class : 1.5D
 Identification Number : UN0332
 Label Codes : 1.5D



SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

MDB Blend 1966

SARA Section 311/312 Hazard Classes

Immediate (acute) health hazard
 Delayed (chronic) health hazard
 Sudden release of pressure hazard
 Fire hazard

Fuels, diesel, no. 2 (68476-30-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

SARA Section 313 - Emission Reporting

Safety Data Sheet

US State Regulations

Fuels, diesel, no. 2 (68476-30-2)

U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
 U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
 U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
 U.S. - New Jersey - Environmental Hazardous Substances List
 RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
 U.S. - California - Safer Consumer Products - Initial List of Candidate Chemicals and Chemical Groups
 U.S. - Texas - Effects Screening Levels - Long Term
 U.S. - Texas - Effects Screening Levels - Short Term

Ammonium nitrate (6484-52-2)

U.S. - Massachusetts - Right To Know List
 U.S. - New Jersey - Right to Know Hazardous Substance List
 U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
 U.S. - Pennsylvania - RTK (Right to Know) List

Canadian Regulations 1966 Emulsion Blend

WHMIS Classification

Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.

Canadian Regulations MDB Blend 1966

WHMIS Classification

Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.

Fuels, diesel, no. 2 (68476-30-2)

Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification

Class B Division 3 - Combustible Liquid
 Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
 Class D Division 2 Subdivision B - Toxic material causing other toxic effects
 Class D Division 1 Subdivision B - Toxic material causing immediate and serious toxic effects

Ammonium nitrate (6484-52-2)

Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification

Class C - Oxidizing Material
 Class D Division 2 Subdivision B - Toxic material causing other toxic effects

WHMIS Classification

Class B Division 6 - Reactive Flammable Material
 Class B Division 4 - Flammable Solid

Safety Data Sheet

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision Date : 08/24/2015
Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

Party Responsible for the Preparation of This Document**Maine Drilling & Blasting**

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Auburn, NH 03032

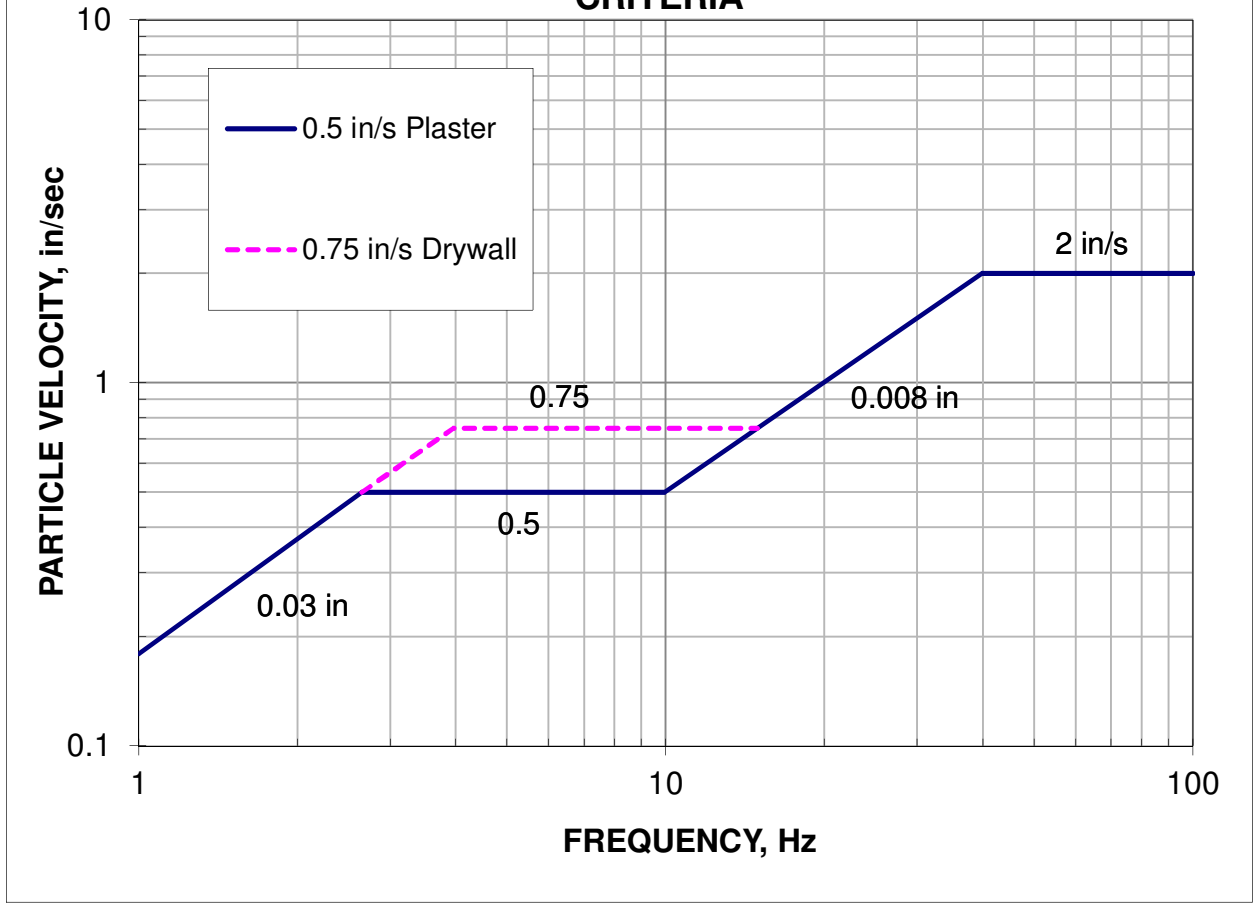
Phone: (603) 647-0299 Toll Free: (800) 370-0299

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USBM Appendix B Alternative Blasting Level Criteria

RI 8507 APPENDIX B. -- ALTERNATE BLASTING LEVEL CRITERIA



APPENDIX B.-ALTERNATIVE BLASTING LEVEL CRITERIA

Safe blasting vibration criteria were developed for residential structures, having two frequency ranges and a sharp discontinuity at 40 Hz (table 13). There are blasts that represent an intermediate frequency case, being higher than the structure resonance (4 to 12 Hz) and lower than 40 Hz. The criteria of table 13 apply equally to a 35-Hz and a 10-Hz ground vibration, although the responses and damage potentials are very much different.

Using both the measured structure amplifications (fig. 39) and damage summaries (figs. 52 and 54), a smoother set of criteria was developed. These criteria have more severe measuring requirements, involving both displacement and velocity (fig. B-1).

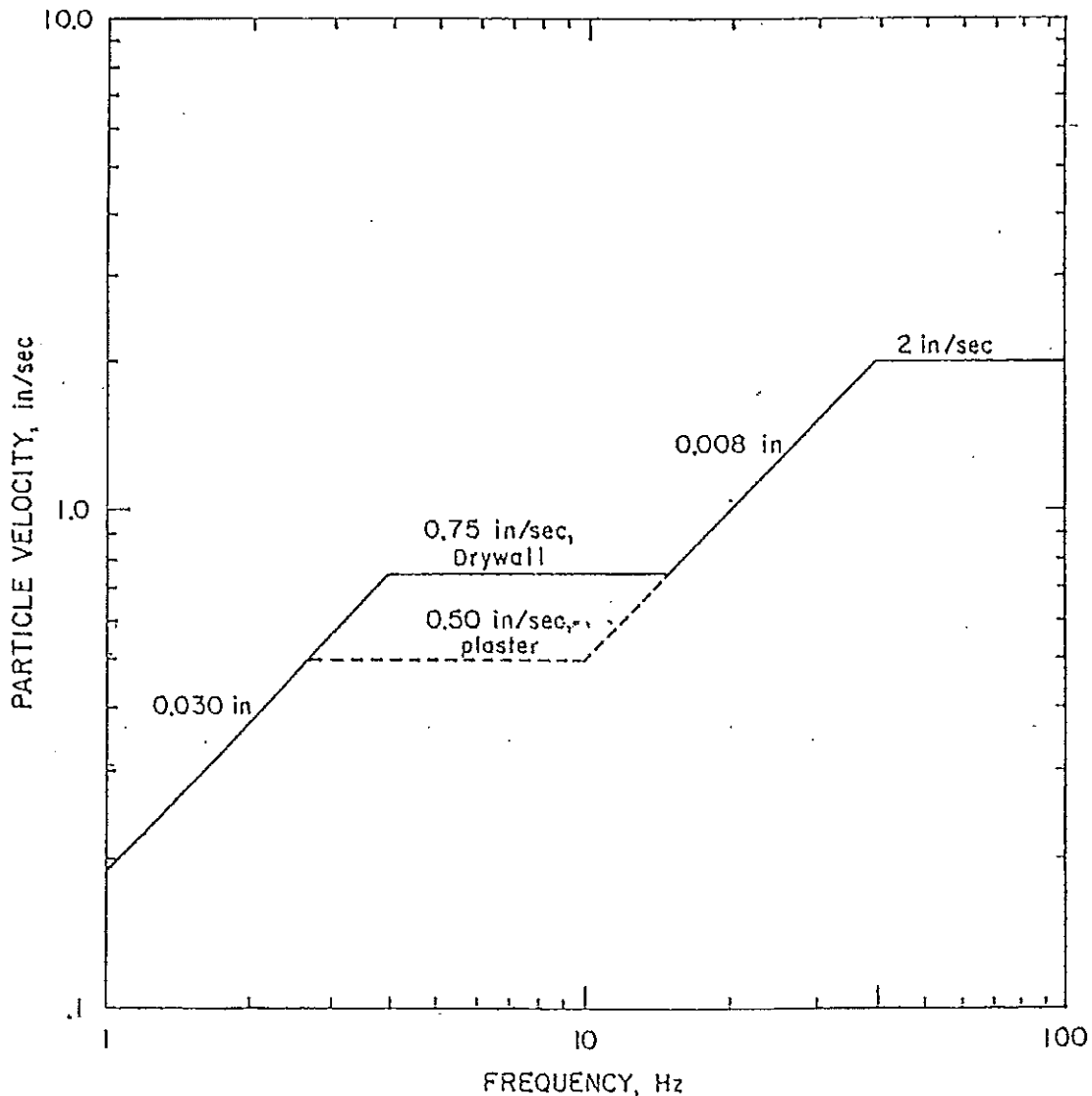


Figure B-1.—Safe levels of blasting vibration for houses using a combination of velocity and displacement.

Sample Blast Report



Job#	_____	Cust. PO#	N/A	
Date	_____	Cust. Supt. Name	0	
Customer Name	_____	Pick Tkts#	0	N/A
Job Address	_____		N/A	N/A
			N/A	N/A

State _____ Permit No. _____ Identify Hazards _____

Pre Shift Insp. Time (24hrs): _____ 0
 Post Shift Insp. Time (24hrs): _____

Blaster: _____ Precautions Taken: _____
 License #: _____ 0
 Signature: _____

Weather Comments: _____
 0

No. of Crew Members _____ 0
 Crew Members Names :
 N/A _____ N/A _____ N/A _____ N/A _____
 N/A _____ N/A _____ N/A _____ N/A _____
 N/A _____ N/A _____ N/A _____ N/A _____

Seismograph Monitoring Plan (Not to Scale):

Shot # 0 Shot Time (24hrs) 0:00 Shot VideoTaped: N

Weather

Notes: N/A

Weather Conditions: N/A
 Temp (°F): 0-0
 Wind Direction: North
 Wind Spd: 0-0 MPH

Preblast

Blast Direction: North Max Holes/Delay: 1 Predicted K Factor: 1
 Blast Location: 0 Scale Dist.: 1.00
 Location of Structure: 0 Max Weight/Delay: 1 Lbs Predicted PPV: 1.00
 Measurement Physical Measurement Dist. to Closest (Ft) Structure 1 Railroad/Highway N/A Overhead Util N/A Underground Util N/A

Pay Quantities

Fire Detail # of Hrs: N/A
 Pay Running Length 0 Feet
 N/A N/A N/A
 N/A N/A N/A

Pay Calculations Notes
0

Shot Info

Configuration

1 - Trench

Total Drill Depth(Ft)	<u>1.00</u>	Total SqFt	<u>1.00</u>	Powder Factor	<u>N/A</u>	Lbs/Cyd	Total Product Weight (Lbs) :	<u>N/A</u>
Total Tons	<u>N/A</u>	Total Yards	<u>0.04</u>		<u>N/A</u>	Cyd/Lbs	Avg Weight / Hole (Lbs):	<u>N/A</u>

Cal Method	Pattern	Cover Used/No	<u>N/A</u>					
# Holes	<u>1</u>	AVG	<u>1</u>	Min	<u>1</u>	Max	<u>1</u>	<u>1</u>
Drill Depth	<u>1</u>							
Burden(Feet)	<u>1</u> Feet		<u>1</u>		<u>1</u>			
Spacing (Feet)	<u>1</u> Feet		<u>1</u>		<u>1</u>			
Hole Diameter	<u>1</u>							
OverBurden (Feet)	<u>1</u>		<u>1</u>		<u>1</u>			
Control Row Taped	<u>N</u>							
				Angled Holes /Face Bermed	<u>N/N</u>		Laser/BoreTracking	<u>N</u>

Total Pounds 0 Lbs

Type Of Initiation: Non-Electric

WoodsCan Electric Air Horn- Audible Device for Blast Notification



WoodsCan Hornet

Rechargeable Electric Air Horn

The world's most advanced portable signaling device for industrial and commercial safety

I have been using the WoodsCan blasting horn on a daily basis for urban and downtown blasting procedures since it was first introduced. Never would I want to go back to an aerosol device. With the in-truck quick charge, I have never yet been in a position where my signal warning device fails to work. In my line of work this is imperative. Every blaster that I come in contact with either has one or wants one...they work!

Bruce Rowell - Western Grater Contracting, Ltd.



Reliable

- A consistent 120+ decibels of sound
- Reliable even in cold weather
- Improves crew productivity over disposable compressed gas air horns

Safe

- No frostbite from leaking gas cans
- No more explosion risks in hot weather
- Transportable on an airplane

Cost Effective

- Pays for itself within a few months
- Save hundreds the first year alone
- Save more each year thereafter

Go Green

- No more metal cans to dispose of
- No more tetrafluoroethane (potent greenhouse gas) discharged into the atmosphere
- Ozone friendly

WoodsCan Hornet product highlights:

- Cost-effective signaling device
- Extremely reliable – no more leaky gas cans
- Consistent 120 decibels of sound
- High intensity LED light
- Patented design
- Over 500 one-second pulls per charge
- Rechargeable 14 volt lithium-ion battery
- 30 minute charge time
- Easy to operate
- Environmentally friendly with no greenhouse gas discharged
- Six month limited warranty



Each WoodsCan Hornet kit includes:

- WoodsCan Hornet electric air horn
- 14 volt rechargeable lithium-ion battery
- Charger (120 or 230 VAC)
- 12 volt inverter
- Durable carrying case
- (Optional) second lithium-ion battery
- User's manual

Regardless of your application, the WoodsCan Hornet will meet your signaling needs:

- Mining
- Quarrying
- Construction
- Seismic Exploration
- Animal Control
- Special Events
- Many more...



For more information, contact us at info@woodscan.com or visit: www.woodscan.com

