

**WHITES POINT QUARRY**  
**BLASTING PLAN**

**Nova Stone Exporters Inc.**  
**November 18, 2002**

## WHITES POINT QUARRY - BLASTING PLAN

### Introduction.

An initial blast is proposed to be conducted by Nova Stone Exporters Inc. on the approved 4 hectare quarry site (NSDOE&L Approval No. 2002-026397) at Whites Point, Digby Neck, Digby County in the community of Little River. The approved 4 hectare quarry site is within a larger 155 hectare site as shown on **Map 1**. The location of the specific land blast area is shown on **Drawing 1**. No blasting is proposed in marine waters.

### Site Description

The land is composed of the Jurassic North Mountain Basalt along the Bay of Fundy. The basalt rock is well exposed along the coastline and continues seaward into the Bay of Fundy. Outcrops of basalt rock are evident throughout the steeply sloping site. Vegetative cover consists mainly of softwoods. An intermittent watercourse flows down the slope of the North Mountain into a coastal bog and into the Bay of Fundy. This intermittent watercourse is approximately 700 meters north of the four hectare quarry site. This particular watercourse was determined by the Department of Fisheries and Oceans not suitable as fish habitat.

The following description of the intertidal zone is extracted from Michael Brylinsky's report entitled "Results of a Survey of the Intertidal Marine Habitats and Communities at a Proposed Quarry Site Located in the Vicinity of Whites Cove, Digby Neck, Nova Scotia" 30 June 2002. The intertidal zone along the Bay of Fundy shore bordering the property is approximately 3.1 km and consists of a predominately rocky shoreline dominated by basaltic bedrock. Fine sediments are scarce resulting in a lack of sandy beaches and mudflats. An exception to this is the beach within Whites Cove comprised of small boulders at the low tide mark to cobble along the high tide mark. The lack of sediment and the presence of hard substrate provides ideal conditions for the establishment of macroalgal communities which are very well developed along the entire shoreline of the property. Three transects (see **Map 1**) were conducted within the intertidal zone, with one of the transects in Whites Cove. The results of the survey indicate that the intertidal marine communities and habitats present along the shoreline of the property are typical of the rocky shoreline areas of the Lower Bay of Fundy. The predominant habitat and community type is a rockweed community dominated by *Fucus* and *Ascophyllum*. This community is very well developed along the entire shoreline and appears to be in a healthy, prolific condition. There does not appear to be any particularly unique or extraordinary characteristics associated with this shoreline. Local harvesting of periwinkles was observed but no commercial rockweed leases are known to be in place for this area.

The nearshore surficial geology (see **Map 1**) and bathymetry off Whites Cove and Whites Point was investigated in June 2002. Canadian Seabeds Research Ltd. conducted

the investigations. Side scan sonar, video transects and bottom samples were taken in this area. Following are descriptions of the bottom characteristics. As shown on **Map 1**, the area with a thin veneer of sand overlying bedrock also has outcrops of bedrock and boulders observed. The area of surficial sediments consists mainly of coarse to very coarse grained sand. Grab samples in the area contained sand and 15% shell fragments. No sediment bedforms were visible. This area is characterized by a high abundance of boulders ranging in size from less than 1 meter to five meters in diameter. The majority of the area is comprised of bedrock. The bedrock observed is a massive, irregular type with occasional joints and fractures. Boulders are also common throughout this area. Water depths below Chart Datum (LLWLT) in the area of investigation range to over 30 meters. These bottom conditions provide good habitat for lobster which generally occur from 1 meter below low tide seaward. Bottom samples and video transects also revealed the presence of sea cucumbers, sea urchins, crabs, and starfish, all food sources for lobster. Pelagic fish such as Herring are also present in the nearshore shallow waters (less than ten meters) and offshore to depths of 200 meters. Herring nets along the nearshore waters were observed during the summer of 2002.

Marine mammal and seabird surveys were conducted during July and August along the coast and nearshore (approximately 1 nautical mile offshore). The surveys extended from East Ferry to Sandy Cove along the Bay of Fundy coast and nearshore. Frequency of the surveys was once a week for a total of nine trips. No endangered Right Whales were observed during these trips, however, three Minke Whales were sighted south of Whites Cove. A significant seal colony was observed in the vicinity of Crowells Cove north of the quarry site and Harbour Seals were frequently observed in the waters along the shoreline in Whites Cove and off Whites Point. Records from a local whale watching cruise vessel indicate little whale watching activity along the coast near the quarry site. However, an area approximately five nautical miles offshore just east of the existing inbound shipping lane produced good whale sightings comprising approximately 60% Finback, 30% Humpback, and 10% Right Whales during the first weeks of August 2002. Seabirds observed along the coastline were mainly Double-crested Cormorants, Common Eider, and Black and White-winged Scooters.

As indicated on **Drawing 1**, an initial blast is proposed within the approved four hectare quarry site. Following are particulars relating to the initial blast.

### **Technical Design**

The technical blast design (**Appendix A**) was prepared by Paul Caza, Site Manager for Dyno Nobel Ltd. All Dyno Nobel blasters receive intensive training in safety, blast design, handling of explosives, etc. Dyno Nobel blasters have a minimum of Class 2 certification for the province of Nova Scotia. As shown in Appendix A, **Figure 1**, the drill pattern for the proposed initial shot 1 would be 9 feet by 9 feet with hole depths as shown. Explosives would be mostly An/FO with a primer and initiated with 25/500 Snapdets and delayed with Snaplines. Initiation sequence is shown on **Figure 2**, Appendix A. The load per hole or delay is about 100 lbs or 45kg. An/FO loads at 4.6 lbs/ft. As shown in **Table 1**, Appendix A. Using the Holmberg Equation, and a K factor

of 400 (based on actual blast results in a basalt quarry in the Digby area), with the nearest structure over 1120 meters from the blast area and a slightly larger weight of explosive, the predicted ground vibration would be 1 mm/s. This is within the 12.5 mm/s limit set forth in Table 2 of the Approval document at the nearest structure not located on the site.

Also, concussion is estimated to be 128 dBA or less within 7 meters of the nearest structure not located on the site as set forth in Table 2 of the Approval document. Dyno Nobel's experience at other rock quarries indicates noise levels of less than 128 dBA from the area of detonation are routinely achieved, even with more significant explosive charges. More specifically, a recent rock blast using a 4 inch hole loaded at 214 kg/delay with an average collar of 7 feet produced 88 decibels at 1,460 meters and 122.4 decibels at 420 meters. In this case, the location of the blast area is approximately 1120 meters from the nearest structure. Existing site conditions will further reduce sound levels from the source to receiver. Noise will be attenuated by the distance from the source, the upslope change in elevation (over 65 meters), and the predominate evergreen tree cover. Under certain conditions, research indicates a reduction of 40 decibels can occur over a distance of 300 meters from the source. Also, since the site is made up of predominately evergreen vegetation, the characteristics of evergreen trees have the ability to screen out the sound levels most sensitive to human ears. Studies indicate noise can be reduced by 7 decibels by a 30 meter width of tree planting. Finally, as the quarry operation progresses, the rock faces will deflect sound waves upward thus dissipating the noise as compared to a more direct horizontal transmission of sound waves.

The frequency of monitoring will be every blast for ground vibration and concussion.

### **Pre-Blast Survey**

The proposed Facility (four hectare quarry) including the initial blast area, is not located within 800 meters of any structure as defined in 1j) of the Approval document (see **Map 2**). Therefore, a pre-blast survey, including a water quality analysis of all structures within 800 meters of the initial blast and subsequent blasts within the four hectare quarry will not be conducted at this time. Also, paragraph 9biii) of the Approval document indicates the Approval Holder shall not blast within 800 meters of the foundation or base of a structure located off site. This was mentioned to a NSDOE&L inspector while on-site and agreed a pre-blast survey was not required for the four hectare quarry.

### **Climate Conditions**

Before conducting any blasting, an assessment of climatic conditions will be carried out by calling the Greenwood Weather Service (902) 765-5040. Also, since weather conditions on-site can change rapidly along the Bay of Fundy, no blasting will be conducted if there is a thermal atmospheric inversion, low cloud cover, or fog conditions present or seen to be approaching.

## **Time of Blasting**

No blasting will be conducted on Sunday, on a statutory holiday prescribed by the Province, or on any day between 1800 and 0800 hours.

## **Monitoring**

Nova Stone Exporters Inc. (the Approval Holder) will have a third party monitor the initial blast and all subsequent blasts for concussion and ground vibration to ensure the limits in Table 2 paragraph 10 of the Approval document are not exceeded. Proposed monitoring stations for the initial blast will be located as indicated in Table 2. Two additional monitoring stations are proposed for the initial blast. The location of the three proposed monitoring stations are shown on **Map 2**.

## **Reporting**

A monthly summary of results of monitoring for concussion and ground vibration will be submitted to the NSDOE&L.

## **Guidelines – Fishery Waters**

All blasting will be conducted in accordance with the Department of Fisheries and Oceans (DFO) “Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters” – 1998. As shown on **Drawing 1**, the proposed minimum setback is 35.6 meters from fish habitat (ordinary high water line) and indicated as a “no blast zone”. This is based on Table 1 page 15 of the aforementioned “Guidelines” for an explosive charge of 50 kg confined in rock substrate. Actually, the proposed weight of explosive is less than 50 kg per delay and the setback distance is greater than 35.6 meters from fish habitat to the centre of detonation. Using Table 1 and the equation in Appendices II and III of the “Guidelines” to calculate the pressure transmitted to the water medium by the explosive charge (less than 50kg and at a distance of over 35.6 meters), the pressure generated would be less than 100kPa. Any blasting during spawning season for species such as lobster and herring will be conducted in accordance with Table 2 of the “Guidelines”. This procedure will be used for all subsequent blasts to ensure pressure of less than 100kPa is transmitted to the fishery waters.

## **Marine Mammals**

Some studies indicate excessive noise may have adverse effects on marine mammals, especially whales. Effects on hearing which in turn can interfere with breeding activities, locating food, detecting predators, communication, migratory paths, and abnormal behavior have been reported when whales are exposed to high sound levels. Other studies such as those conducted by the U.S. Navy on Low Frequency Active Sonar contend sound pressure levels of 180 decibels are acceptable. Also, experiments have been conducted to induce noise of up to 200 decibels to deter marine mammals from

finfish aquaculture sites and certain types of fishing nets. Thus, the scientific debate continues concerning the effect of noise on marine mammals and appears to be inclusive. *incomplete?*

To address potential concerns regarding noise and marine mammals, in relation to the proposed blasting activities, a 500 meter observation zone (500 meter safety radius from the detonation area) – see **Map 2** shall be established as suggested in “Factsheet – Blasting- Fish and Fish Habitat Protection” Department of Fisheries and Oceans – Newfoundland Region, 10/12/2002 in relation to marine mammals. An onshore observer shall be in place at least one hour prior to the start of the scheduled blasting to identify the possible presence of marine mammals within this zone. This observer shall remain in place until at least one half hour after detonations are complete. The observer will wear polarized sunglasses, be equipped with binoculars, and a two way radio or cellular phone to communicate with the blast coordinator. If threatened or endangered marine mammals are sighted in the safety zone, the blast coordinator will be notified and the detonation will not take place until the animals move out of the safety radius under their own volition and an “all-clear” call is given. If the animal/animals are not sighted a second time, the blast would resume thirty minutes after the last sighting.

As research continues regarding possible effects of noise on marine mammals, the above procedure will be reviewed from time to time with the Habitat Management Division of the Department of Fisheries and Oceans.

### **Environmental Protection**

An environmental protection plan specific to the initial blast area is shown on **Drawing 2**. Prior to drilling or blasting, environmental controls including an earth berm and straw bales will be installed as shown on the drawing. Any runoff from the blast area will be directed to the controlled drainage flow and into a sediment retention area. Any effluent from the sediment retention area discharged into the natural surface drainage will be monitored at the location indicated on the drawing. Monitoring will be conducted as outlined in Table 1 page 7 of the Approval document for Total Suspended Solids (TSS) and pH. Maximum TSS will be 50 mg/l (grab sample) and pH within levels of 5 – 9. Frequency of monitoring will be weekly at the settling pond outlet. A monthly summary of results will be submitted to the NSDOE&L.

WHITES COVE

LEGEND

- FOUR HECTRE QUARRY BOUNDRY
- ▣ INITIAL BLAST AREA
- ⊙ BORE HOLE #4 ELEV. 12.4m
- NATURAL SURFACE DRAINAGE FLOW
- ▬ EARTH BERM
- ▬ STRAW BALES
- ⋯→ CONTROLLED DRAINAGE FLOW
- ⌒ CULVERT
- EQUIPMENT ACCESS
- MONITORING LOCATION

ORDINARY HIGH WATER MARK

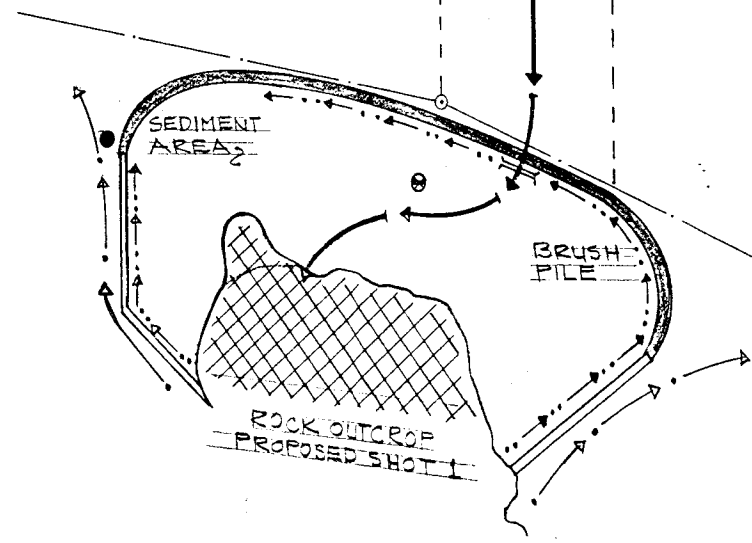
66'

WHITES COVE ROAD

8.3m

RIGHT OF WAY

66'



SCALE: 1"=50'

ENVIRONMENTAL PROTECTION

INITIAL BLAST PLAN

WHITES POINT QUARRY

NOVEMBER 18, 2002

DWG. 2

SURVEY DATA: SCOTIA SURVEYS LTD  
PLAN NO. D6153-02 9/20/02





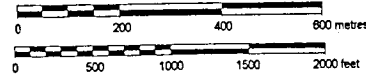
4 925

4 926 000m

4 927 000m

WHITES F IT QUARRY  
LITTLE RIVER, DIGBY CO.  
NOVA SCOTIA

Scale 1 : 10000










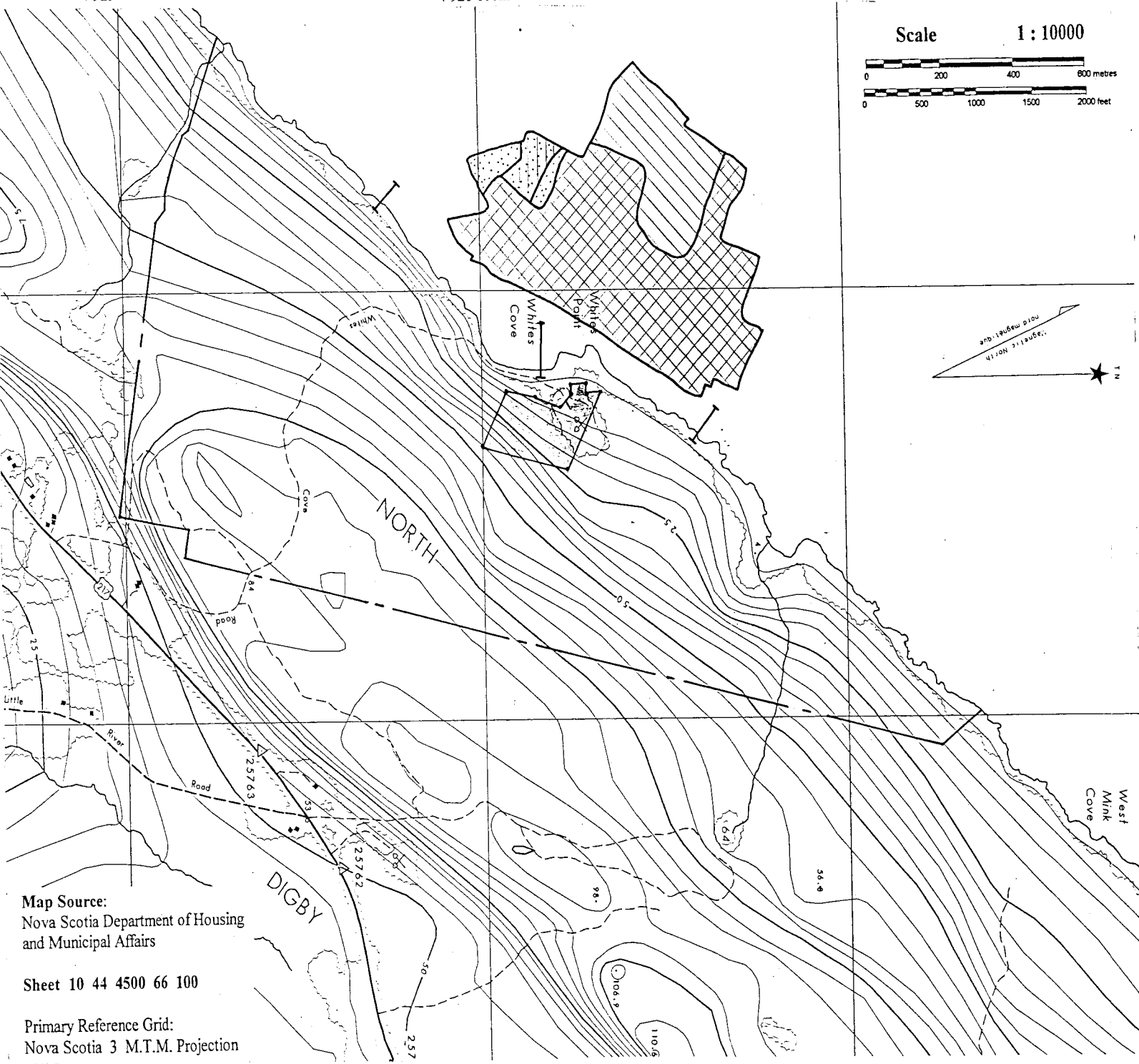
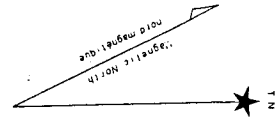
BLASTING PLAN

5 369 000m

5 370 000m

LEGEND

-  BEDROCK
-  THIN VENEER OF SAND OVERLYING BEDROCK
-  SURFICIAL SEDIMENTS
-  CONCENTRATED BOULDERS
-  TIDAL ZONE TRANSECTS
-  PROPERTY LINE
-  4 HECTARE QUARRY



Map Source:  
Nova Scotia Department of Housing  
and Municipal Affairs

Sheet 10 44 4500 66 100

Primary Reference Grid:  
Nova Scotia 3 M.T.M. Projection

MAP 1







NEAR SHORE  
SURFICIAL GEOLOGY

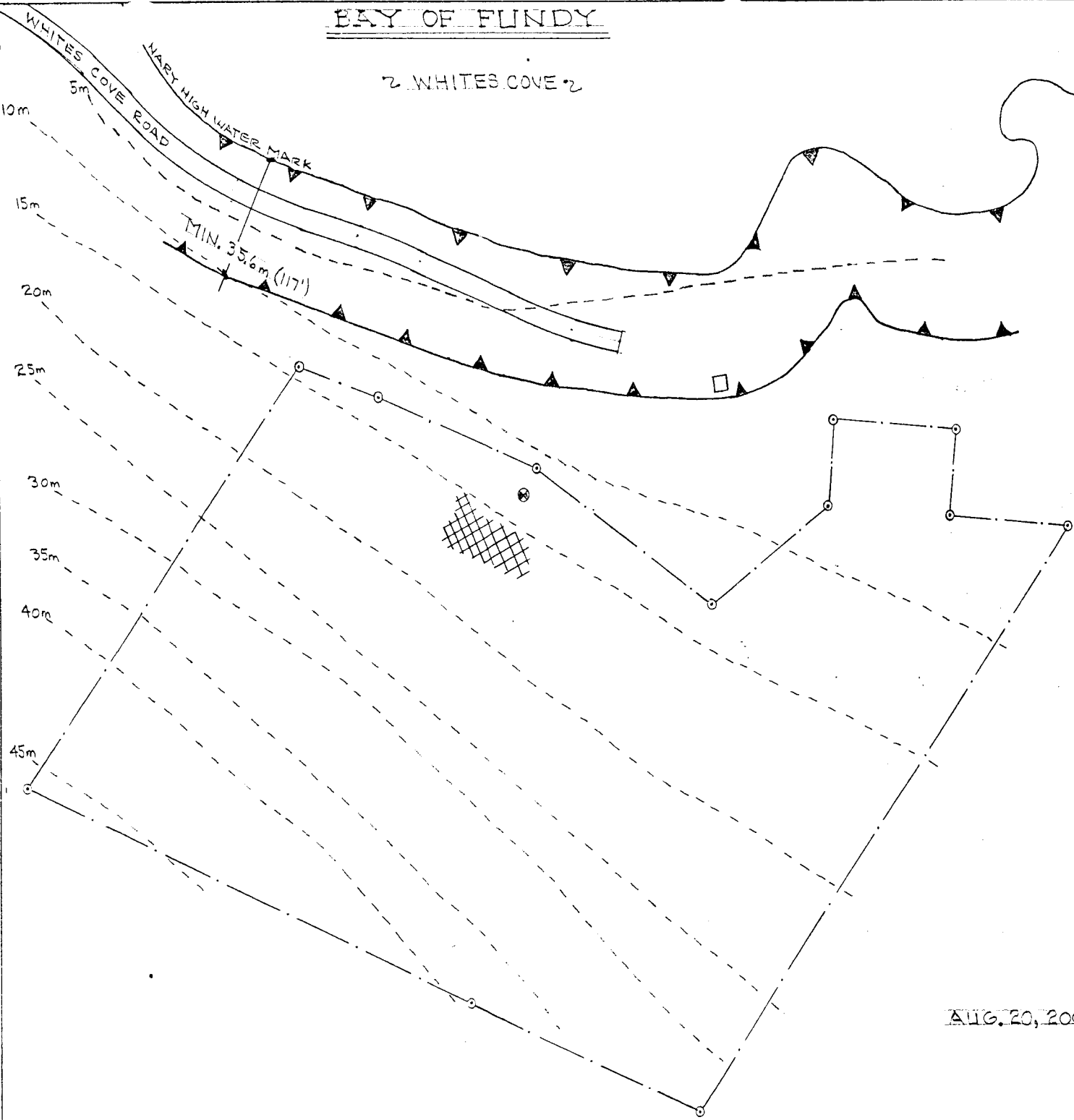
SOURCE: CANADIAN SEABED  
RESEARCH LTD. JUNE 2002  
NOVEMBER 18, 2002

# BAY OF FLINDY

2 WHITES COVE 2

## LEGEND

-  FOUR HECTRE QUARRY BOUNDRY
-  CONTOUR LINE (METERS)
-  BORE HOLE #4 ELEV. 12.4 m
-  NO BLAST ZONE
- 
-  INITIAL BLAST AREA



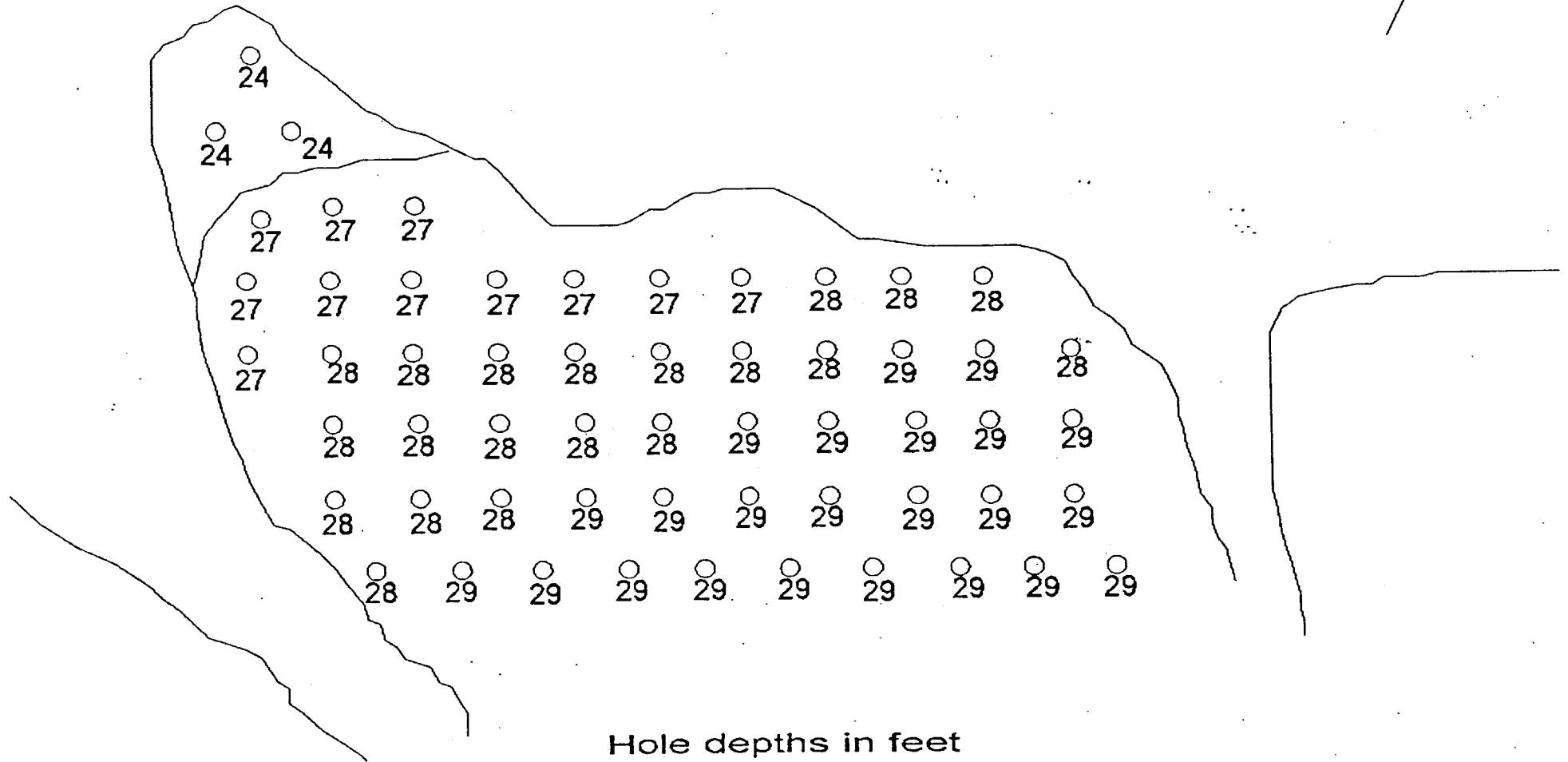
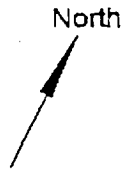
INITIAL BLAST PLAN  
 WHITES POINT QUARRY

AUG. 20, 2002 REV. NOVEMBER 18, 2002

DWG. 1

**APPENDIX 1**

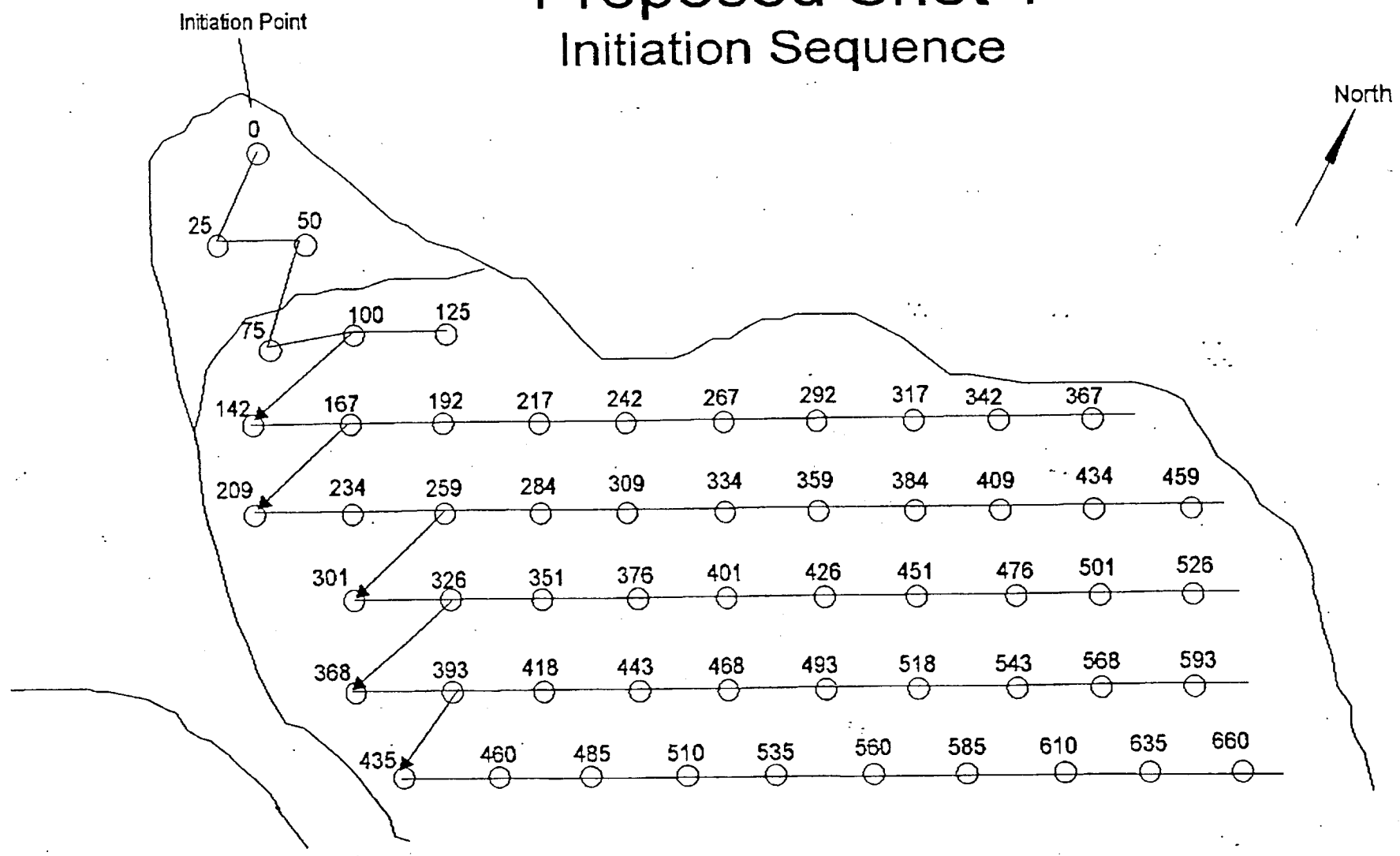
# Proposed Shot 1 Hole Depths



Hole depths in feet  
 3 feet subdrill included in cut  
 Approximately 56 Holes  
 Drill Pattern 9 feet x 9 feet  
 Hole diameter 4 inches

Figure 1

# Proposed Shot 1 Initiation Sequence



Surface timing in milliseconds

—— Nonel Snapdet 25/500ms

← Nonel Snapline 42ms

penne = 1.3

Diamètre du trou mm	Diamètre du produit mm	Densité g/cc	Charge/m Kg	Charge m	Charge totale Kg	Distance Horizontale m	Profondeur trou m	Profondeur géo. m	K	Phi	Vibration mm/s
102	102	0.85	6.95	10.0	69.46	1120	9	0	400	0.01	1
102	102	0.85	6.95	10.5	72.93	1120	9	0	400	0.01	1
102	102	0.85	6.95	11.0	76.40	1120	9	0	400	0.01	1
102	102	0.85	6.95	11.5	79.87	1120	9	0	400	0.01	1
102	102	0.85	6.95	12.0	83.35	1120	9	0	400	0.01	1
102	102	0.85	6.95	12.5	86.82	1120	9	0	400	0.01	1
102	102	0.85	6.95	13.0	90.29	1120	9	0	400	0.01	1
102	102	0.85	6.95	13.5	93.77	1120	9	0	400	0.01	1
102	102	0.85	6.95	14.0	97.24	1120	9	0	400	0.01	1
102	102	0.85	6.95	14.5	100.71	1120	9	0	400	0.01	1
102	102	0.85	6.95	15.0	104.18	1120	9	0	400	0.01	1
102	102	0.85	6.95	15.5	107.66	1120	9	0	400	0.01	1
102	102	0.85	6.95	16.0	111.13	1120	9	0	400	0.01	1
102	102	0.85	6.95	16.5	114.60	1120	9	0	400	0.01	1
102	102	0.85	6.95	17.0	118.08	1120	9	0	400	0.01	1
102	102	0.85	6.95	17.5	121.55	1120	9	0	400	0.01	1
102	102	0.85	6.95	18.0	125.02	1120	9	0	400	0.01	1
102	102	0.85	6.95	18.5	128.49	1120	9	0	400	0.01	1

1120 meter Horizontal distance is the approximate distance to the nearest house.