



Nobis Engineering  
18 Chenell Drive  
Concord, New Hampshire 03301

**PROJECT**  
Remedial Design For Operable Unit 01  
New Bedford Harbor Superfund Site  
New Bedford, Massachusetts

BORING NO. FD-109  
SHEET 1 of 12  
FILE NO. 48138.27  
CHKD. BY J. Trotter

Boring Co. Warren George, Inc. Boring Location northing 2696353 easting 814480  
Driller E. Thomas Mudline El. -33.04 Datum NGVD  
Logged By E. Thibodeau Date Start 12/20/00 Date End 12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.  
Drill Rig: Acker AD II Truck Rig  
Drilling Method: 5-inch (PW) flush joint drill casing, 4-inch (HW) flush joint drill casing. Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

D E P T H	Casing Blows (R)	SAMPLE INFORMATION					SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	R E M A R K S
		Type & No.	PENREC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value			
							Advance PW drill casing to 2 ft.		
1	WOC								
2	WOC								
		S-1	24/6	2-4	WOR/24		Organic soil (OH); 95% organic clay/silt, 5% fine sand, strong organic odor, black to dark gray.	ORGANIC CLAY	
3	WOC						Advance PW drill casing to 4 ft.		
4	WOC								
		S-2	24/18	4-6	WOR/18-8		S-2A: Organic soil (OH); similar to S-1. (12 in.) S-2B: Silty sand (SM); 10% coarse sand, 35% medium sand, 35% fine sand, 5% gravel, 15% silt, subround sand and gravel, gray. (6 in.)		
5	WOC						Advance PW drill casing to 6 ft. Advance 3-7/8 in. roller bit to 6 ft.		
								5.5 ft.	
6	WOC						Perform falling head permeability test at 6 ft.	MARINE SAND	
		S-3	24/6	6-8	15-12-10-11	22	<b>Silty sand with gravel (SM); 10% coarse sand, 20% medium sand, 19% fine sand, 33% gravel, 18% silt, light brown.</b> Subround to subangular sand and gravel.		
7	37						Advance PW drill casing to 11 ft. Advance 3-7/8 in. roller bit to 11 ft.		
8	35							GLACIO FLUVIAL	
9	21								
10	23								

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test.	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.
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REMARKS:  
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BORING NO. FD-109

SHEET 2 of 12

FILE NO. 48138.27

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Boring Co. Warren George, Inc.  
Driller E. Thomas  
Logged By E. Thibodeau

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Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing	SAMPLE INFORMATION					SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS	
		Type & No.	PENREC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value				
11	20	S-4	24/10	11-13	8-8-6-14	14	<b>Well-graded gravel with silt and sand (GW-GM); 50% gravel, 13% coarse sand, 18% medium sand, 12% fine sand, 7% silt, brown. Subangular sand and gravel.</b> Advance PW drill casing to 16 ft. Advance 3-7/8 in. roller bit to 16 ft.  Approximately 12 in. of material in bottom of casing. Mix bentonite drilling mud to remove material, specific gravity = 1.08. Flush casing with water to remove drilling mud.  Perform falling head permeability test at 16 ft. Poor recovery; spoon refusal on probable cobble. Advance PW drill casing to 16.5 ft. Advance 3-7/8 in. roller bit to 17.5 ft. Probable cobble from 17 to 17.5 ft.	GLACIO FLUVIAL	1	
12	22									
13	35									
14	29									
15	27									
16	28									
17	109/6	S-5	11/2	16-16.9	18-75/5					17.0 ft. COBBLE 17.5 ft.
18	40									GLACIO FLUVIAL
19	57									
20	54									

- |   |  |  |  |
|---|--|--|--|
| 0 to 4 - Very Loose<br>5 to 10 - Loose<br>11 to 30 - Medium Dense<br>31 to 50 - Dense<br>Over 50 - Very Dense | 0 to 2 - Very Soft<br>3 to 4 - Soft<br>5 to 8 - Medium Stiff<br>9 to 15 - Stiff<br>16 to 30 - Very Stiff<br>Over 30 - Hard | 1. S denotes split-barrel sampler.<br>2. U denotes 3-inch O.D. undisturbed sample.<br>3. UO denotes 3-inch Osterberg undisturbed sample.<br>4. PEN denotes penetration length of sampler.<br>5. REC denotes recovered length of sample.<br>6. SPT denotes Standard Penetration Test. | 7. PID denotes Photoionization Detector<br>8. PPM denotes parts per million.<br>9. PP denotes Pocket Penetrometer.<br>10. FVST denotes field vane shear test.<br>11. RQD denotes Rock Quality Designation.<br>12. R denotes core run number. |
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SHEET 3 of 12

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Date	Time	Depth	Elev.	Stabilization Time

DEPTH (ft)	Casing Blows (ft)	SAMPLE INFORMATION					SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		Type & No.	PENREC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value			
21	53	S-6	24/10	21-23	12-14-15-17	29	<b>Well-graded gravel with silt and sand (GW-GM); 62% gravel, 6% coarse sand, 13% medium sand, 12% fine sand, 7% silt, brown.</b> Subangular sand and gravel. Advance PW drill casing to 23 ft. Advance 3-7/8 in. roller bit to 23 ft. with bentonite drilling mud to remove material from casing. Flush casing with water to remove drilling mud.	GLACIO FLUVIAL	1
22	57						Perform constant head permeability test at 23 ft.		
23	63	S-7	24/6	23-25	40-59-16-14	75	<b>Poorly graded gravel with silt and sand (GP-GM); 12% coarse sand, 16% medium sand, 15% fine sand, 48% gravel, 9% silt, brown.</b> Subround to subangular sand and gravel. Advanced sampler past probable cobble from 23 to 24 ft. Advanced PW drill casing to 25 ft. Pushed probable cobble with casing. Mix additional bentonite drilling mud. Advance 3-7/8 in. roller bit to 26 ft. past cobble.	GLACIO FLUVIAL	1
24	100						Unable to keep hole open, Advance PW drill casing to 27 ft. Mix additional bentonite drilling mud, specific gravity = 1.09. Advance 3-7/8 in. roller bit to 27 ft.		
25	95								
26	64								
27	113	S-8	24/10	27-29	14-14-14-12	28	<b>Poorly graded sand with silt and gravel (SP-SM); medium dense, 10% coarse sand, 40% medium sand, 20% fine sand, 20% gravel, 10% silt, subrounded to subangular sand and gravel, brown.</b> Advance PW drill casing to 31.5 ft; casing refusal. Top of bedrock 31.5 ft. Advance 3-7/8 in. roller bit to 32 ft.		
28	60								
29	52								
30	58								

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test.	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.
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Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION			ROCK CORE DESCRIPTION	REMARKS
		CORE RUN	CORE INTERVAL	CORE TIME		
33.0		R1	32.5-33.5	6.5 min.	Begin R1 at 32.5 ft. Fresh, hard, gray medium to fine grained GNEISS. Low angle foliation (approx. 10-15 degrees). REC = 92%; RQD = 80% (good). Water return color: rust.	
33.5					33.4 ft.: Mechanical break in rock core.	
34.0			33.5-34.5	5 min.	33.5 ft.: Pause advancement of core R1 to advance HW drill casing to achieve better casing seal.	
34.5					34.2 ft.: Mechanical break in rock core.	
35.0			34.5-35.5	4.5 min.	34.4 and 34.5 ft.: Primary joints: low angle, rough, planar, discolored, and open. 34.5 ft.: Loss of water return noted. 34.4 to 34.8 ft.: Discoloration of rock core noted.	
35.5					35.1 ft.: Primary joint: low angle, rough, planar, partially discolored, and tight. Possible mechanical break.	
36.0			35.5-36.5	4 min.	35.5 ft.: Primary joint: horizontal, rough, planar, discolored, and open. 35.5 to -35.7 ft.: Secondary joint: moderately dipping to high angle, smooth, planar, discolored, and open. 35.6 to 36.1 ft.: Distinct discoloration and slight weathering of core noted. 36.0 ft.: Primary joint: low angle, rough, stepped, discolored, and open. Possible mechanical break.	
36.5					36.2 and 36.3 ft.: Mechanical break in rock core.	
37.0			36.5-37.5	5.5 min.	36.6 to 37.2 ft.: Quartz/feldspar vein. Dark gray to milky white/pink in color. (pegmatic)	
37.5					37.2 ft.: Primary joint: low angle, rough, undulating, discolored, and tight. End R1 at 37.5 ft.	

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test.	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.
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Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION			ROCK CORE DESCRIPTION	REMARKS	
		CORE RUN	CORE INTERVAL	CORE TIME			
38.0		R2	37.5-38.5	4.5 min.	Begin R2 at 37.5 ft. Fresh, hard, gray, medium to fine grained GNEISS. Low angle foliation (approx. 10-20 degrees). No natural joints/fractures or mechanical breaks noted. REC = 93%; RQD = 93% (excellent). No water return noted during R2.	2	
38.5			38.5-39.5	4 min.			
39.0							
39.5			39.5-40.5	3.5 min.			
40.0							
40.5			40.5-41.5	4 min.			
41.0							
41.5							
42.0			41.5-42.5	2.5 min.			
42.5					End R2 at 42.5 ft.		

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test.	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.
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SHEET 7 of 12

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DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION			ROCK CORE DESCRIPTION	R E M A R K S
		CORE RUN	CORE INTERVAL	CORE TIME		
43.0		R3	42.5-43.5	4.5 min.	Begin R3 at 42.4 ft. Fresh to slightly weathered, hard, gray, medium to fine grained, GNEISS. Low angle foliation (approx. 10 degrees). REC = 90%; RQD = 90% (good/excellent). No water return noted during R2.	2
43.5					43.4 ft.: Mechanical break in rock core.	
44.0			43.5-44.5	4 min.	43.6 ft.: Mechanical break in rock core.	
44.5					43.8 ft.: Mechanical break in rock core.	
45.0					44.0 ft.: Primary joint: low angle, smooth, planar, discolored, and open.	
45.5			44.5-45.5	5 min.	44.9 ft.: Mechanical break in rock core.	
46.0					45.6 to 47.0 ft.: Slightly weathered zone; minor discoloration noted.	
46.5					45.7 ft.: Primary joint: low angle, smooth, planar, discolored, and open.	
47.0				46.2 ft.: Mechanical break in rock core.		
47.5				46.3 and 46.4 ft.: Mechanical breaks in rock core.		
47.5				46.5-47.5	4.5 min.	47.0 ft.: Mechanical break in rock core.
47.5					47.0 to 47.1 ft.: Quartz/feldspar vein. Dark gray to pink in color.	
47.5					End R3 at 47.5 ft.	

0 to 4 - Very Loose  
5 to 10 - Loose  
11 to 30 - Medium Dense  
31 to 50 - Dense  
Over 50 - Very Dense

0 to 2 - Very Soft  
3 to 4 - Soft  
5 to 8 - Medium Stiff  
9 to 15 - Stiff  
16 to 30 - Very Stiff  
Over 30 - Hard

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SHEET 8 of 12

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DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION			ROCK CORE DESCRIPTION	REMARKS				
		CORE NUM	CORE INTERVAL	CORE TIME						
48.0		R4	47.5-48.5	5.5 min.	Begin R4 at 47.5 ft. Fresh to slightly weathered, hard, gray, medium to fine grained GNEISS. REC = 100%; RQD = 85% (good). No water return noted during R4. 47.5 to 47.6 ft.: Weathered zone; discoloration noted. 48.4 ft.: Mechanical break in rock core.					
48.5			48.5-49.5	3.5 min.	48.9 ft.: Primary joint: low angle, rough, planar, discolored, and tight. 48.9 to 49.5 ft.: Weathered zone. Mechanical break at 49.1 ft. Rock has been weathered to a residual soil along mechanical break; material is friable.					
49.0				49.5-50.0	5.5 min.		49.6 ft.: Primary joint: low angle, to horizontal, smooth, planar, discolored, and tight. Possible mechanical break.			
49.5					50.0-50.5		5 min.	50.2 ft.: Mechanical break in rock core.		
50.0							50.5-51.0	5 min.	51.3 ft.: Mechanical break in rock core.	
50.5								51.5-52.0	5 min.	52.3 ft.: Mechanical break in rock core.
51.0									52.4 to 52.5 ft.: Quartz/feldspar vein. Dark gray/pink in color.	
51.5									52.5 ft.: Primary joint: low angle, smooth, planar, discolored, and open. End R4 at 52.5 ft.	
52.0										
52.5										

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SHEET 9 of 12

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		CORE RUN	CORE INTERVAL	CORE TIME			
53.0		R5	52.5-53.5	6 min.	Begin R5 at 52.5 ft. Fresh, very hard, gray, medium to fine grained GNEISS. Low angle foliation (approx. 10 degrees). REC = 97%; RQD = 93% (excellent). No water return noted during R5. 52.5 to 52.7 ft.: Secondary joint: moderately dipping, rough, planar, discolored, and open. 53.0 to 53.2 ft.: Quartz/feldspar vein. Dark gray/pink in color. 53.2 ft.: Mechanical break in rock core.	2	
53.5			53.5-54.5	5.5 min.	53.9 ft.: Mechanical break in rock core.		
54.0					54.3 ft.: Mechanical break in rock core.		
54.5							
55.0				54.5-55.5	6 min.		55.0 ft.: Mechanical break in rock core. 55.0 to 55.1 ft.: Quartz/feldspar vein. Dark gray/pink in color.
55.5							55.3 ft.: Mechanical break in rock core.
56.0				55.5-56.5	7 min.		55.7 ft.: Mechanical break in rock core
56.5							56.0 to 56.1 ft.: Quartz/feldspar vein. Dark gray/pink in color. 56.4 to 56.5 ft.: Quartz/feldspar vein. Dark gray/pink in color.
57.0			56.5-57.5	6.5 min.	Perform single packer test from 47.5 to 57.5 ft. Perform single packer test from 37.5 to 57.5 ft. End R5 at 57.5 ft. Bottom of exploration at 57.5 ft; boring terminated in bedrock.		
57.5					Grout completed boring to mudline with cement/bentonite slurry, specific gravity = 1.40.		

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1: S denotes split-barrel sampler. 2: U denotes 3-inch O.D. undisturbed sample. 3: UO denotes 3-inch Osterberg undisturbed sample. 4: PEN denotes penetration length of sampler. 5: REC denotes recovered length of sample. 6: SPT denotes Standard Penetration Test.	7: PID denotes Photoionization Detector 8: PPM denotes parts per million. 9: PP denotes Pocket Penetrometer. 10: FVST denotes field vane shear test. 11: RQD denotes Rock Quality Designation. 12: R denotes core run number.
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REMARKS:  
 1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.  
 2) RQD biased low due to recovery of less than 100%.  
 3)  
 4)



Nobis Engineering  
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**PROJECT**

Remedial Design For Operable Unit 01  
New Bedford Harbor Superfund Site  
New Bedford, Massachusetts

BORING NO. FD-109  
SHEET 10 of 12  
FILE NO. 48138.27  
CHKD. BY J. Trotter

Boring Co. Warren George, Inc. Boring Location northing 2696353 easting 814480  
Driller E. Thomas Mudline El. -33.04 Datum NGVD  
Logged By E. Thibodeau Date Start 12/20/00 Date End 12/27/00

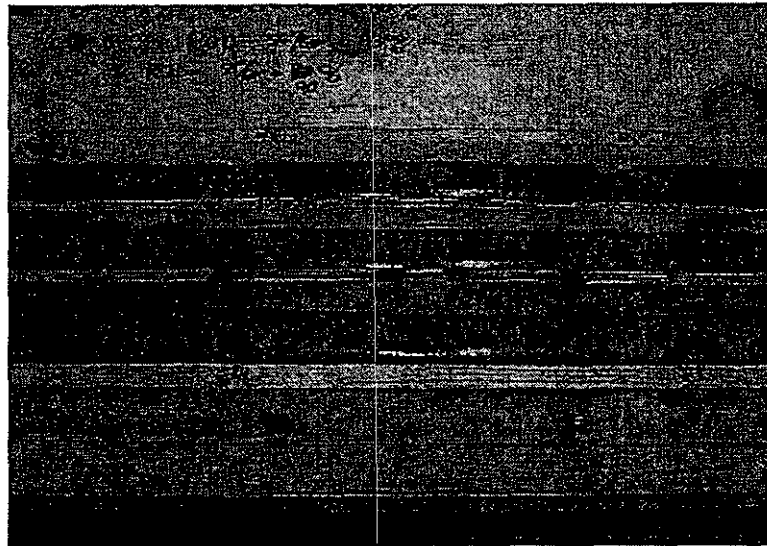
Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.  
Drill Rig: Acker AD II Truck Rig  
Drilling Method: 5-inch (PW) flush joint drill casing, 4-inch (HW) flush joint drill casing.  
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

**ROCK CORE PICTURES**



Core Runs R1 through R3



Core Runs R1 through R3

**POOR ORIGINAL**

**REMARKS:**

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Remedial Design For Operable Unit 01  
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New Bedford, Massachusetts

BORING NO. FD-109

SHEET 11 of 12

FILE NO. 48138.27

CHKD. BY J. Trottier

Boring Co. Warren George, Inc.  
Driller E. Thomas  
Logged By E. Thibodeau

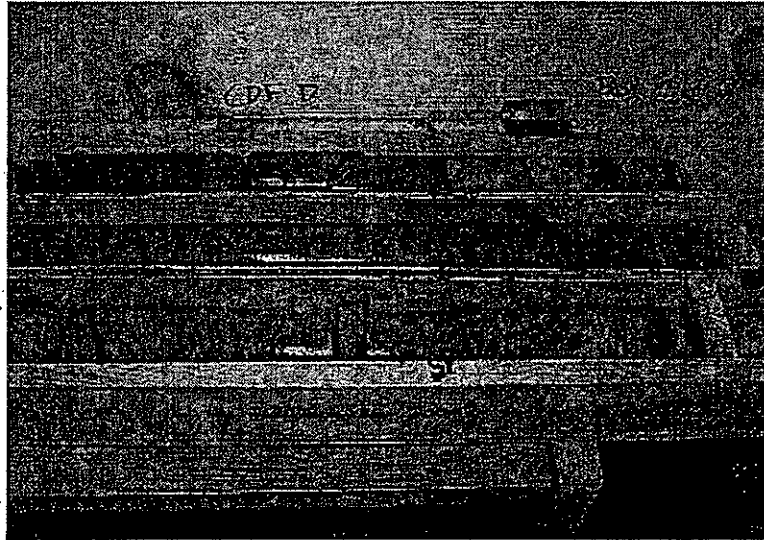
Boring Location northing 2696353 easting 814480  
Mudline El. -33.04 Datum NGVD  
Date Start 12/20/00 Date End 12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.  
Drill Rig: Acker AD II Truck Rig  
Drilling Method: 5-inch (PW) flush joint drill casing, 4-inch (HW) flush joint drill casing.  
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3



Quartz/feldspar vein (pegmatite) noted in bottom of R1

POOR ORIGINAL

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PROJECT

Remedial Design For Operable Unit 01

New Bedford Harbor Superfund Site

New Bedford, Massachusetts

BORING NO. FD-109

SHEET 12 of 12

FILE NO. 48138.27

CHKD. BY J. Trotter

Boring Co. Warren George, Inc.  
Driller E. Thomas  
Logged By E. Thibodeau

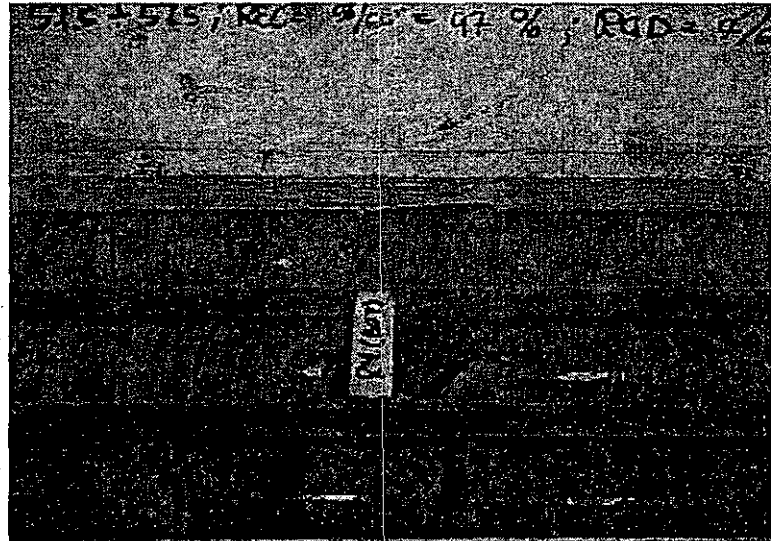
Boring Location northing 2696353 easting 814480  
Mudline El. -33.04 Datum NGVD  
Date Start 12/20/00 Date End 12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.  
Drill Rig: Acker AD II Truck Rig  
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Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

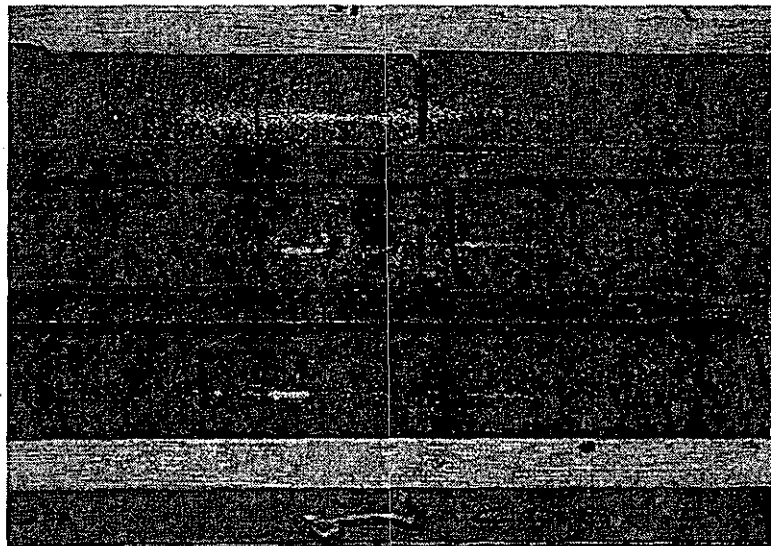
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Weathered zone noted in top of R4



Quartz/feldspar vein noted in R5

POOR ORIGINAL

REMARKS:

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