



Geotechnical Environmental and Water Resources Engineering

#### **Geotechnical Report**

# **National Synchrotron Light Source II**

Conceptual Design Phase Brookhaven National Laboratory Upton, New York

#### Submitted to:

HDR Architecture, Inc. 1101 King Street, Suite 400 Alexandria, VA 22314

#### Submitted by:

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November 9, 2006 Revised from August 30, 2006 Project 062150-\*-1000





Nathan L. Whetten, P.E., C.G. Senior Project Manager

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# 1. Introduction

### 1.1 Summary

This report presents the results of our subsurface explorations and geotechnical design and construction recommendations for conceptual design of the proposed National Synchrotron Light Source II (NSLS II), located within Brookhaven National Laboratory, in Upton, New York.

The subsurface explorations encountered up to 6 feet of fill overlying a sand deposit that extends to more than 100 feet deep. We recommend that foundations be designed as spread footing foundations with slab-on-grade floors. The existing fill should be removed within the building limits.

### 1.2 Scope of Work

GEI performed the following tasks:

- 1. Engaged subsurface exploration contractors to conduct the test borings and cone penetrometer tests.
- 2. Provided a full-time field representative to observe the explorations, and classify the soil samples in the borings.
- 3. Engaged a materials testing laboratory to perform mechanical gradation analyses on representatives soil samples from the borings.
- 4. Evaluated the subsurface conditions and prepared this report containing our geotechnical recommendations for conceptual design.

### 1.3 Project Personnel

The following personnel performed services for this project.

Steven Hawkins	Field Engineer
Nathan Whetten, P.E.	Senior Project Manger
Michael Paster, P.E.	Technical Review



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GEOTECHNICAL REPORT - CONCEPTUAL DESIGN PHASE
NATIONAL SYNCHROTRON LIGHT SOURCE II
BROOKHAVEN NATIONAL LABORATORY
REVISED NOVEMBER 9, 2006
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# 1.4 Authorization

The work was completed in accordance with our agreement dated June 26, 2006.

# 1.5 Project Vertical Datum

Elevations in this report are in feet. The vertical coordinate system is BNL '94. We understand that BNL '94 is substantially equivalent to National Geodetic Vertical Datum of 1929 (NGVD-29).



# 2. Site and Project Description

# 2.1 Site Description

The approximately 50-acre site is bounded by Brookhaven Avenue to the north, Grove Street to the west, Fifth Street to the east, and a former landfill to the southeast. Seventh Street runs through the middle of the site in a north-south direction, and divides the site roughly in half.

The eastern portion of the site is generally a lawn area or is wooded. The western portion is occupied by several buildings, adjacent parking areas, access roads with asphalt, concrete, or gravel pavement, concrete loading docks, at-grade concrete pads, two railroad tracks, and chain link fences. Existing site features are shown on Figure 2.

The ground surface slopes gently downward from east to west. Ground surface elevations range from about El. 83 along Fifth Street to about El. 63 along Grove Street.

# 2.2 Project Description

Brookhaven Science Associates is planning to replace the existing National Synchrotron Light Source with a new facility, referred to as NSLS II. The new facility will be located within the Brookhaven National Laboratory, south and east of the existing NSLS building (Figure 1). NSLS II will be located south of Brookhaven Avenue and east of Grove Street. The proposed facility layout is shown in plan on Figure 2. The NSLS II will include a Ring Building, an Injector Building, an IR Source Building, and a Joint Photon Science Institute Building, with a total footprint area of approximately 400,000 square feet.

We understand that the lowest level floors will generally be at existing site grades, and no basement levels are planned. Proposed floor elevations for the various facility components, provided by HDR, are indicated in the table below.



	Proposed	
Structure	Floor El.	Ground Surface Elevation
Experimental Hall:		
Experimental Floor and Access Corridor	El. 73	El. 69 (SW) to El. 82 (East)
Ring Tunnel	El. 74.33	
Tunnel Mezzanine	El. 86.58	
Lab/Office Building (LOB)	El. 73	El. 73 (N LOB)
		El. 76 to 79 (E LOB)
		El. 80 to 82 (SE LOB)
		El. 72 to 75 (S LOB)
		El. 68 to 72 (SW LOB)
Central Lab/Office Building	El. 73	El. 73 to 75
Service Buildings:		El. 73 (N Svc Bldg)
Lower Level	El. 71.33	El. 77 to 78 (E Svc Bldg)
Ring Tunnel Access	El. 74	El. 81 (SE Svc Bldg)
Upper Level	El. 86.58	El. 75 to 76 (S Svc Bldg)
		El. 71 to 72 (SW Svc Bldg
Linac/RF Building	El. 78	El. 75

Comparing the proposed floor grades with the existing site grades, up to 9 feet of excavation and up to 5 feet of fill will be required below floors.

We understand that the floor slab for the experimental hall will be 18 inches thick, and the adjacent tunnel ring slab will be 36 inches thick. These elements will be constructed as a monolithic slab. The design live load for the floor in these areas is 250 pounds per square foot (psf).



# 3. Subsurface Conditions

### 3.1 Previous Subsurface Explorations

**1977 Explorations** – In 1977, Stone & Webster conducted subsurface explorations for the existing NSLS facility. The explorations included six soil borings and four test pits. The borings were drilled to depths of 100 to 102 feet and the test pits were excavated to a depth of about 12 feet. Approximate exploration locations are shown on Figure 2, and logs of the test pits and borings are presented in Appendix A.

**2003 Explorations** – In 2003, we conducted eleven test borings for the nearby Center for Functional Nanomaterials (CFN) building, advanced to depths of up to 62 feet below ground surface. Drilling activities were monitored by a GEI field technician. Test boring locations are shown on Figure 2, and boring logs prepared by the driller are provided in Appendix B.

# 3.2 Subsurface Explorations for Conceptual Design

During the period July 19 to 21, and August 16, 2006, we conducted four test borings, (B101 through B104) and twelve cone penetrometer soundings (CPT-1 to -6, CPT-8, and CPT-10 to -14). Shear wave velocity measurements were made in CPT-3, -5A, -6, and -12 at 10 foot intervals within the sand. Explorations were monitored by a GEI engineer.

Test borings B101 and B102 were drilled 52 and 62 feet below ground surface, respectively. These borings were drilled using 3-inch diameter driven casing, and Standard Penetration Tests were conducted at 5-foot intervals. Borings B101A and B102A were drilled a few feet away from borings B101 and B102, respectively, with continuous samples taken to a depth of 10 feet. Borings B103 and B104B were drilled to a depth of 32 feet using hollow-stem augers, with semi-continuous samples taken within the top 14 feet. B104 and B104A were terminated after encountering shallow refusals. Logs are presented in Appendix C.

The CPT soundings penetrated to depths typically ranging from 53 to 100 feet, and were terminated at refusal or at a maximum depth of 100 feet. Shallow refusals at depths less than 10 feet were encountered in CPT-5, -7, -13, and -13A. A second sounding was completed a few feet away from CPT-5 (CPT-5A) to a depth of 83 feet, and we plan to conduct a second sounding at CPT-7. CPT-13 encountered two shallow refusals. CPT-7A and CPT-9 were originally proposed, but later deleted from the conceptual design exploration program. Logs of CPT soundings are presented in Appendix D.



# 3.3 Laboratory Testing

GeoTesting Express, of Boxborough, Massachusetts, performed sixteen mechanical gradation analyses on soil samples recovered from borings B101 and B102. Results are presented in Appendix E.

# 3.4 Subsurface Soil Conditions

**Topsoil** – Topsoil ranging in thickness from 2 to 12 inches was encountered in B101, B01A, B102 and B102A, which were drilled in landscaped areas. Topsoil was not encountered in B103 and B104, which were drilled in developed areas.

**Fill** – Each of the borings encountered fill typically described as silty sand (SM), and the thickness ranged from 3.3 to 7 feet. SPT N-Values ranged from 8 to 15 blows per foot (bpf), indicating the fill is loose to medium dense. Fill was also detected within the upper 1 to 5 feet in CPT soundings made near existing buildings and roadways. Explorations B104, B104A, CPT-13, and CPT-13A, located within the southern portion of the ring building, encountered refusals on buried objects within the fill.

**Sand** – A thick layer of stratified sand, sand with silt, and sand with gravel was encountered below the fill in all of the explorations. Subsurface explorations were terminated within the sand at maximum depths of about 100 feet. The sand is light brown to brown. SPT N-values ranged from about 15 bpf (medium dense) to greater than 50 bpf (very dense). The average corrected SPT N-value calculated from the CPTs within the upper 50 feet was about 30 bpf, The CPTs detected some localized zones with equivalent N-values between 10 and 20 bpf.

Shear wave velocity measurements made in CPT-3, -5A, -6, and -12 indicate a uniform to slightly increasing shear wave velocity with depth. Velocities varied from 860 feet per second (fps) to 1,180 fps. The average of 34 shear wave velocity tests in the four CPTs was 975 fps.

A 1999 report on the stratigraphy and hydrogeologic conditions at the lab prepared by the United States Geologic Survey<sup>1</sup> refers to the sand as the "Upper Glacial Aquifer," and the thickness at BNL appears to be about 185 feet. Confining clay units and additional sand and gravel aquifers overlie bedrock, which reportedly occurs at a depth of about 1,500 feet.

# 3.5 Groundwater Conditions

Depths to groundwater range from about 28 to 37 feet below ground surface, depending on the location at the site. This is based on the following observations:

<sup>1 &</sup>quot;Stratigraphy and Hydrogeologic Conditions at the Brookhaven National Laboratory and Vicinity, Suffolk County, New York 1994-1997," prepared by the United States Geologic Survey, dated 1999.



- We measured water in boring B102 at a depth of 36.5 feet below ground surface. This measurement was made in a temporary PVC well installed in the boring, after groundwater was allowed to stabilize overnight. This level may not represent fully stabilized groundwater due to the short stabilization time.
- We measured water in borings B103 and B104 at depths of 28 and 31 feet below ground surface, respectively. These borings were drilled using hollow-stem augers, and water levels were measured during drilling.
- CPT soundings detected water at depths ranging from about 28 to 30 feet below ground surface. These measurements were made using an electronic pore pressure transducer mounted on the cone.

Groundwater level measurements represent conditions at the times and locations the measurements were made. Significantly different groundwater levels may occur at other times and locations.



# 4. Preliminary Foundation Recommendations

### 4.1 Foundation Design

We recommend that the proposed buildings be supported on spread footings bearing directly on the sand deposit, or on compacted structural fill placed after removal of existing fill. We recommend that footings be designed for a maximum allowable bearing pressure of 2.5 tons per square foot, and that footings be at least 3 feet wide.

Exterior footings should bear at least 4 feet below the adjacent finished grade for frost protection. Interior footings should be founded at least 18 inches below the bottom of the floor slab. The top of all footings should be at least 6 inches below the bottom of the overlying floor slab.

### 4.2 Floor Slab Design

Based on a comparison of proposed floor levels with existing site grades, the lowest level floors will range from 9 feet below to 6 feet above existing site grades. The lowest level floor may be designed as a slab-on-grade.

The existing fill is not considered suitable for support of floor slabs due to the low tolerance for settlement of the floor slabs. Therefore, we recommend that all existing fill be removed from within the building limits, and replaced as necessary with compacted structural fill. A minimum of 6 inches of compacted structural fill should be placed below all floors.

Floors are above groundwater levels encountered in the explorations. Underslab drainage will not be required.

# 4.3 Settlement

#### **Column and Wall Settlement**

We estimate that total settlement of spread footings will be less than 1 inch, and differential settlements will be less than 0.75 inch. Settlement will occur as loads are applied. We understand that this settlement is acceptable for column and wall footings



#### **Floor Settlement**

We understand that the floor slab within the experimental hall will support highly sensitive scientific equipment, and that settlement of the floor slab after the equipment has been installed and calibrated must be small. Based on discussions with HDR, we understand that post-construction total and differential settlement may need to be less than about 0.25 inch.

Soils beneath the floor slab will settle in response to dead and live loads. Based on our experience with granular soils similar to those at the site, we anticipate that settlement will be complete within about one to two weeks after load application.

Settlement resulting from floor slab dead loads and fill required beneath the floor slab is expected to occur during construction, and therefore will not contribute to post-construction settlement. However, the 250 psf live load could cause minor post-construction settlement. We calculate the total and differential post-construction settlement from the live load to be less than 0.25 inch. Differential settlement will be less than the total settlement. For particularly sensitive equipment, it may be desirable to allow a two to three week waiting period between installation and final calibration.

### 4.4 Seismic Design

The soil beneath the proposed building is classified as a stiff soil profile for earthquake design purposes as defined by the New York State Building Code. The corresponding site class is D. The soil is not considered to be susceptible to liquefaction.

# 4.5 Reuse of Existing Fill

Based on the results of sieve analyses conducted on soil samples recovered from borings B101 and B102, we anticipate that the natural sand deposit will be suitable for reuse as compacted structural fill below building foundations. The existing fill encountered in the borings is suitable for reuse as common fill outside building limits.

### 4.6 Subsurface Explorations for Final Design

Subsurface explorations conducted for this conceptual design study included a relatively small number of widely-spaced test borings and cone penetrometer tests. Most of these explorations penetrated to depths of 50 to 100 feet, to evaluate general subsurface conditions in the area of the facility.

We recommend that subsurface explorations for final design include additional test borings with continuous SPT sampling, to further evaluate the nature and thickness of fill materials. Hollow-stem auger boring techniques are acceptable because of the low groundwater level.



Shallow refusals were encountered in B104, B104A, CPT-13 and -13A, within the southern portion of the ring building, and may indicate buried foundations or other objects within the fill. We recommend that test pits be excavated in this area to evaluate the nature of these materials.



# 5. Final Design Services and Limitations

#### 5.1 Final Design Engineering Services

We recommend that GEI be engaged during final design to:

- Conduct subsurface explorations, prepare a final geotechnical engineering report, and provide geotechnical consultation to the design team.
- Review plans and specifications to confirm that our recommendations have been interpreted and implemented as intended.

### 5.2 Limitations

This report was prepared for the exclusive use of HDR Architecture, Inc., Brookhaven Science Associates, and the NSLS II design team. Our recommendations are based on the project information provided to us at the time of this report and may require modification if there are any changes in the nature, design, or location of the proposed structure. We cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

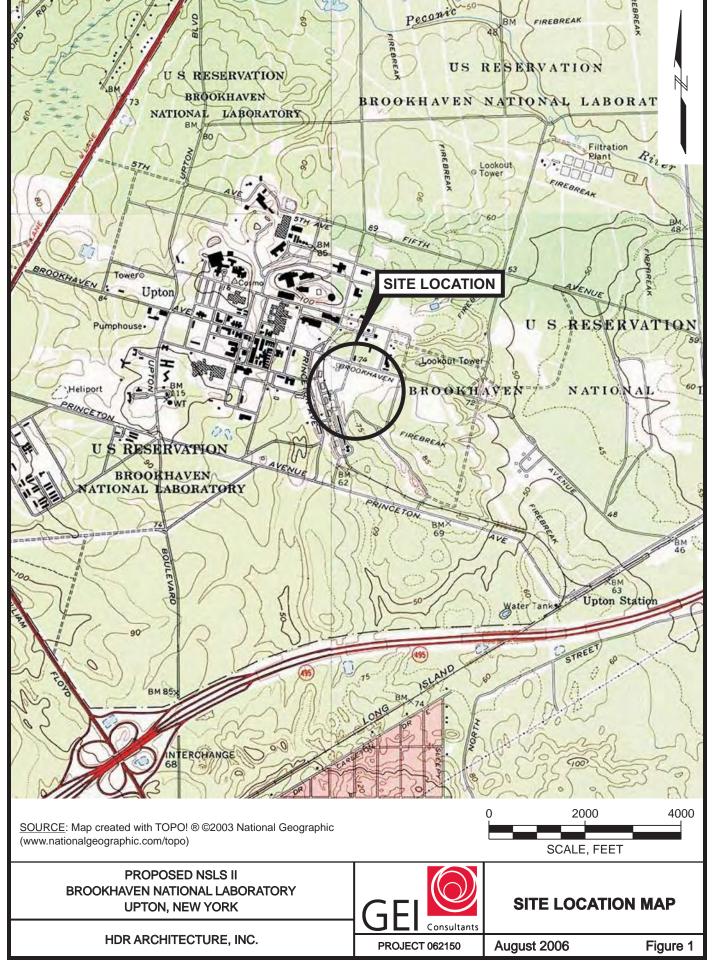
Our professional services for this project have been performed in accordance with generally accepted engineering practices. No warranty, express or implied, is made.



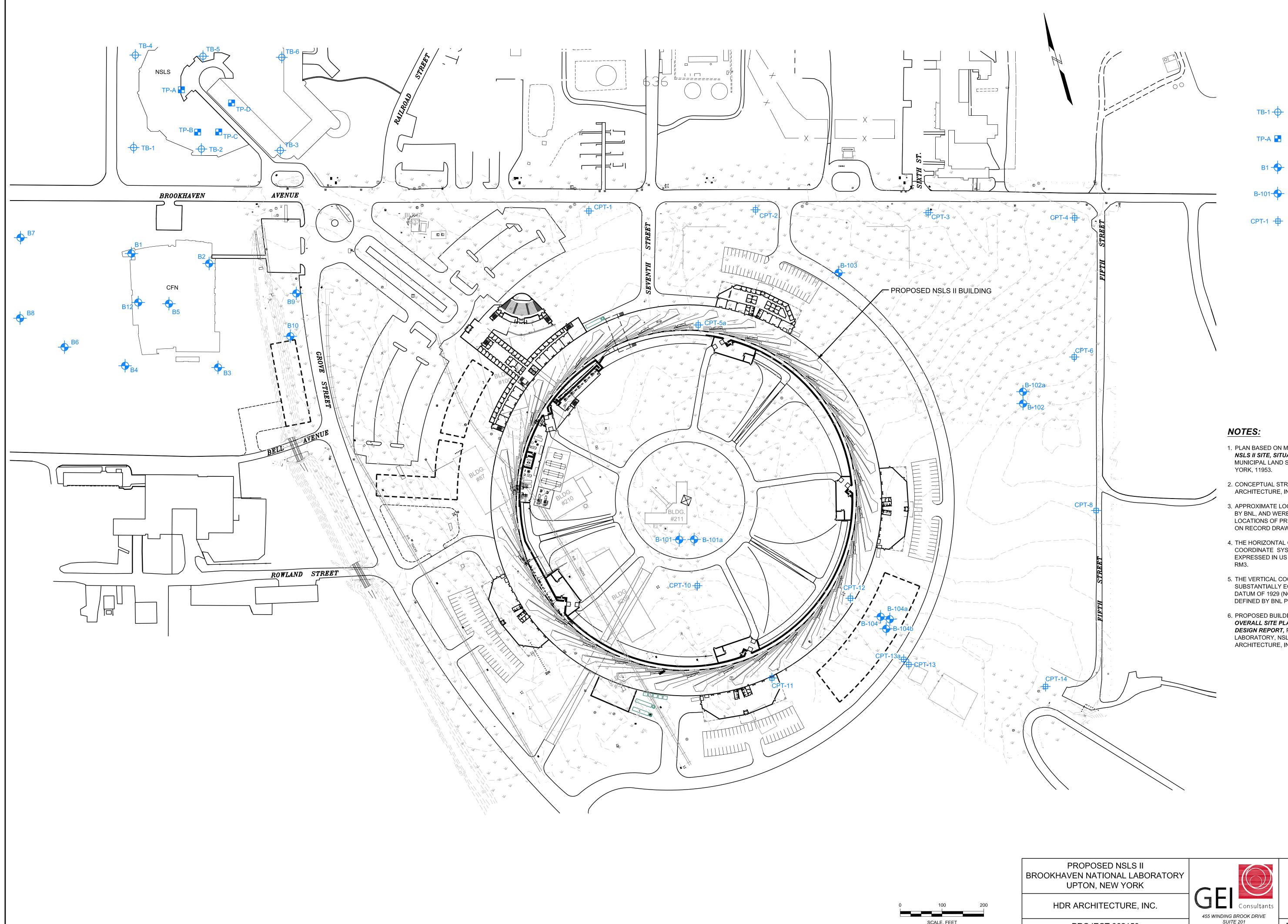
GEOTECHNICAL REPORT - CONCEPTUAL DESIGN PHASE NATIONAL SYNCHROTRON LIGHT SOURCE II BROOKHAVEN NATIONAL LABORATORY REVISED NOVEMBER 9, 2006

# **Figures**





BROOKHAVEN NL\062150\BROOKHAVEN LOCATION MAP.CDR



SCALE, FEET

# LEGEND:

в-1 -	APPROXIMATE LOCATION OF TEST BORING INSTALLED IN 1977

- APPROXIMATE LOCATION OF TEST PIT INSTALLED IN 1977
- APPROXIMATE LOCATION OF TEST BORING INSTALLED IN 2003 B1 ------
- APPROXIMATE LOCATION OF TEST BORING INSTALLED IN JULY AND AUGUST 2006
- APPROXIMATE LOCATION OF CONE PENETROMETER TEST MADE IN JULY 2006

- 1. PLAN BASED ON MAP TITLED TOPOGRAPHIC SURVEY, PROPOSED NSLS II SITE, SITUATED AT BNL, UPTON, NEW YORK, PREPARED BY MUNICIPAL LAND SURVEY P.C., 10 SYLVIA LANE, MIDDLE ISLAND, NEW YORK, 11953.
- 2. CONCEPTUAL STRUCTURE LAYOUT WAS PROVIDED BY HDR ARCHITECTURE, INC.
- 3. APPROXIMATE LOCATIONS OF 2006 EXPLORATIONS WERE PROVIDED BY BNL, AND WERE DETERMINED BY PACING FROM SITE FEATURES. LOCATIONS OF PREVIOUS EXPLORATIONS WERE ESTIMATED BASED ON RECORD DRAWINGS.
- 4. THE HORIZONTAL COORDINATE SYSTEM IS IN THE STATE PLANE COORDINATE SYSTEM, NEW YORK LONG ISLAND ZONE 3104, NAD '83, EXPRESSED IN US SURVEY FEET AS DEFINED BY BNL POINT COSMO
- 5. THE VERTICAL COORDINATE SYSTEM IS BNL '94 WHICH IS SUBSTANTIALLY EQUIVALENT TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 1929), EXPRESSED IN US SURVEY FEET AS DEFINED BY BNL POINT COSMO RM3.
- 6. PROPOSED BUILDING LAYOUT REVISED BASED ON MAP TITLED OVERALL SITE PLAN, 100% CONVENTIONAL FACILITIES CONCEPTUAL DESIGN REPORT, PREPARED FOR BROOKHAVEN NATIONAL LABORATORY, NSLS-2, UPTON, NEW YORK, PREPARED BY HDR ARCHITECTURE, INC., SCALE: 1" = 200', DATED: SEPTEMBER 29, 2006.

# **EXPLORATION LOCATION PLAN**

PROJECT 062150

GLASTONBURY, CONNECTICUT 06033 Revised: November 2006

# Appendix A

1977 Test Boring and Test Pit Logs



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10     13     53     37     SLAD, UNTFORM; FIRE, LESS TRAN 54 JOHPLASTIC FIRE, LIGHT       10     13     53     37     SLAD, UNTFORM; FIRE, LESS TRAN 54 JOHPLASTIC FIRE, LIGHT       10     13     55     37     SLAD, UNTFORM; MEDIUM TO FIRE, MOSTLE FIRE; LESS TRAN 54 JOHPLASTIC FIRE, LIGHT       10     13     55     57     SLAD, UNTFORM; MEDIUM TO FIRE, MOSTLE FIRE; LESS TRAN 54       10     13     55     57     SLAD, UNTFORM; MEDIUM TO FIRE, MOSTLE FIRE; LESS TRAN 54       13     53     57-5M     SLAD, UNTFORM; MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       14     51     57     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       15     14     57     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       16     17     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       17     16     37     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       16     17     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       17     18     37     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       16     17     SLAD, UNTFORM, MEDIUM TO FIRE, MOSTLE FIRE, LESS TRAN 54       17     18     37     MILLIS SLAD, FORMET SLADDING TO FIRE, MOSTLE FIRE, LESS TRAN 54       16     18     19     SLATE SLAD, FORMET SLADDING TO FIRE, MOSTLE FIRE, MOST	A	1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	· · · ·	52 SS 11	SP	SM <u>Sam</u> Fin Sam Max Hon	D. NORLY GRIDED, LESS TRAF 54 BOURDED GRAVEL TO 0.75 JUNE REM, COART TO FILE SAUD, RESTLY REDUK, 5-45 BORRASTIC ES, TELLOVIER ORM. D. RORLY GRADED, LESS TRAF 36 SUBAROLAR GRAVEL TO 0.5 JUN ROR, COART TO FILE SAUD, RESTLY REDUKE TO FILE; LESS TRAF REASTLE FILES, TELLOVIER GRAV.
10     2     JELLONISH GALE.       10     25     55     31       25     35     32     SLED. UNIFORM, MEDIUM TO FINE, MOSTLY FINE; LESS THAN SE MORPLASTLE FINE, LIGHT THELONISH GALY.       14     33     55     SP-SM       26     30     65     37       30     65     37       31     54     SP-SM       32     57     SUD, UNIFORM, MEDIUM TO FINE, MOSTLY FINE, 5-55 MONPLASTLE       30     65     37       30     65     37       31     54     SAND, UNIFORM, MEDIUM TO FINE, MOSTLY FINE, 5-55 MONPLASTLE       32     54     37       34     37     SAND, UNIFORM, MEDIUM TO FINE, MOSTLY FINE, LESS THAN 55:       35     37     SAND, UNIFORM, MEDIUM TO FINE, MOSTLY FINE, LESS THAN 55:       36     37     SAND, UNIFORM, MEDIUM TO FINE, MOSTLY FINE, LESS THAN 55:       37     35     37       38     37     SAND, UNIFORM, MEDIUM TO FINE, MOSTLY FILM, LANDANISH ORMORE       37     35     37       38     37     SAND, UNIFORM, COLLET GALME, 12-155 SUPROMORED GRAVEL TO TRE, MOSTLY MEDIUM AND FILE, 3-55       38     37     38     37       39     38     37     CANTELLY AND.       30     38     37     CANTELLY AND. <td></td> <td>1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</td> <td></td> <td>52 SS 11</td> <td>SP</td> <td>NAS KON</td> <td>2, AUGUITAN ORAL 9, AUGUITANED, LESS THAN 34 SUBAUCULAR GANTEL TO 0,5 IN 1904, COLREE TO FINE SAND, MUSTLY REDIUM TO FINE; LESS THAT FLASTIC FINES, YELDOVISH GARY.</td>		1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7		52 SS 11	SP	NAS KON	2, AUGUITAN ORAL 9, AUGUITANED, LESS THAN 34 SUBAUCULAR GANTEL TO 0,5 IN 1904, COLREE TO FINE SAND, MUSTLY REDIUM TO FINE; LESS THAT FLASTIC FINES, YELDOVISH GARY.
15     23     55     SP-SM     SAMD, UNIFORM, MEDIUM TO FIME, MOSTLY FIME, 5-65 MEMPEASTLC       20     65     37     SAMD, UNIFORM, MEDIUM TO FIME, MOSTLY FIME, 5-65 MEMPEASTLC       20     65     37     SAMD, UNIFORM, MEDIUM TO FIME, MOSTLY FIME, LESS THAN 35.       20     65     37     SAMD, UNIFORM, MEDIUM TO FIME, MOSTLY FIME, LESS THAN 35.       26     5     97     SAMD, UNIFORM, MEDIUM TO FIME, MOSTLY FIME, LESS THAN 35.       27     35     87     CHANTELY SIME, FOORLY GRADED, 12-155 SUBBOWDED GRAVEL TO.       28     5     87     CHANTELY SIME, FOORLY GRADED, 12-155 SUBBOWDED GRAVEL TO.       29     5     87     CHANTELY SIME, FOORLY GRADED, 12-155 SUBBOWDED GRAVEL TO.       29     5     87     CHANTELY SIME, FOORLY GRADED, 12-155 SUBBOWDED GRAVEL TO.       29     5     87     CHANTELY SIME, FOORLY GRADED, 12-155 SUBBOWDED GRAVEL TO.       20     34     35     87     CHANTELY SIME, TOULDOUT GRAVEL CANDED, TO256 SUBMETING GRAVE		80_ 		[11			and the county and and the county of the cou
20- 30 as 3P SLATE, UNTROMM, NEDTRA TO PIEC, MORTLE PIEC, LISS TALM 35 ROADLASTIC PIECS, LIGHT TRAINONTING GAMES, SHALL AND SHALL SA POCHATS OF SILTY SLAD. 35 aP CHAVELLY SLAD. 36 aP CHAVELLY SLAD. 37 as aP CHAVELLY SLAD. 39 as aP CHAVELLY SLAD. 30 as aP CHAVELLY SLAD.		45		9s	" SF	GRA	
<ul> <li>35</li> <li>39 1 35</li> <li>39 CRAYELLY AND, FORMY GALDED, 12-155 SUPROVIDED GRAVEL TO 0.35 HALL KATERN, COLLEE TO FTM, MOSTER MEDIUM AND FTM, 3-55 POPPLASTIC SHEET, MEDIUM STILL LATER OF REWARDS GALY VERY FIRE STLET SAMD.</li> <li>30 31 32. CRAVELLY SAMD. FORMET GALY, 50-255 SUPROVIDED GALVEL</li> </ul>		90 <sub>-1</sub> -1				1 × 1	VELLY SAME, ROORLY GRADED, 15-208 HOUTDED GRAVEL TO 0.5 3M LNEW, COLSEE TO FINE SAME, HESTLY COLSEE AND FINE, LESS M 75 HOMPLASTIC FINES, TELLONISH GALT.
16     10.35 THEN NUMERATING, COLUME TO FITHE, NOSTLY MEMION AND FILE, 3-56     NOMPLASTLY CONNEX, THLOWISH GAAY, SHALL LATER OF HEAVINGS GAAY     VERY FIRE-SILT SAME, TOLLOWISH GAAY, SHALL LATER OF HEAVINGS GAAY				10 SE		SHL <u>SAM</u> S-6 Alito	O, FOORLY GRADED, COARSE TO FINE, MISTLY MEDIGM AND FINE, # DORRASTIC FIRE, ITLIGUISH GART, SOME TENDISH BENNESTAL A FEY FILLES OF GANLE TO 0.3 INCH MURINMA.
31 43 57. GRAVELLT SLID, JOOLLT GALDED, 20-255 XUNDORNOUS TO BOTTOM ANALY		95-		80. SS	SP-	- SAR	. Monly graded, less tring st. rothogo grader, to 0.5 ince." New, course to piece same, restly rothogo reac, less a 55 margarete field, telloyisg grad.
7 TO I.O THEM HALDOWN, COARSE TO FIME, MOSTLE HEDIUM AND FIME, LISS THAN 35 HOMPLASTIC FIMES, TELLOVISH GAAT.		1100-	* 2000 MILLO	161 18	SIN	SH   SL	D. FORMER CHARED, 5-05 SUBBOUNDED CALVEL TO D. 75 INCH WATH SEE TO FINE SAMD, NOSTLE FIRE, 5-05 MONTLAFTIC FINE, LIGHT
35-104 33 54 STLTT SIND, UNTPORT, HEDIUM TO FINE, HORTLY PUME, 35-405 HORTPLASTIC -			-		1		. ENNO OF HONETHIG AT LOL.S FT
40 52 53 59-59 SAMD, NORLY GRADED, 1 FIECE OF SUMMOUNDED GRAVEL 1.0 INCH MALINGH, 9 9 SCHORE TO FILE, MASTLY MEDIUM AND FILE, 5-58 ROMFLASTIC FINES, 16LLOVISH GRAZ.				1	-		
45 - 57 58 SP <u>DRAVELY SURD</u> , FOORLY GALDED, 10-155-2004DED GRAVEL TO 0:25 1002 HALLINGA, COLREG TO FIRE, MASSIER MEDICA AND FINE, LESS THAN 55 HORPLASTIC FIRES, YELLOVISH GRAV.				ŀ			
20- 31 SS SP SAME, ROBLY GALDED, LESS THAN 55 STREMONERED GALVEL TO 0.25 1803 11 ROMPLASTIC FIRE SAME, SOTTLY MEDICAL, LESS THAN 55 HOMPLASTIC FIRES, TELLORISH GALV.				ŀ			
53 44. 55 5P SAND, FORLY GRADED, 3-55 STREAMCHILAR GRAVEL TO 0.5 INCH MATTHEM, COLESE TO FIRE, HOSTLY MEDIUM, LESS THARSE NUMPLASTIC-FIRES, TELLOWISE GAR.	•			1			
60 - 44 3 35 SP SAND, SINCLAR TO AS 612 KHERT HOSTLY HEDIUM AND FINE SAND.							
55 - 50 35 SP SIND, NOREY CALLED, LESS THAN 35 SURANGULAR GRAVEL TO 0.25 INCH NATIONA, COARSE TO FIRE, MOSTLE MEDIUM, LESS TRAN 32 RUPPLISTIC FINES, TELLOYISH GRAT.		1111			1		
70 - 116 55 5P CANTELLY IND. HOOLT GRADED, 12-15% SUBROUNDES TO ROUNCE GRAVEL 55 LR BLOW OR RECOVERY COLUMN OPPOSITE ARPLE DENOIS THE NUMBER OF BLOW OPPOSITE ARPLE DENOIS THE NUMBER OF BLOWS OF A MANGER FALLING 30° REQUIRED TO DRIVE S SAMPLE SHOW 12° OF THE DISTANCE SHOWN.		11					

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T	-	OVERAL		AMP	ue I	2	SOIL OR ROCK DESCRIPTION	SUMMAR		OVERNL	1 844	RET	9	SOIL OF ROCK DESCRIPTION
	FEET	ROD		RECOV	E	CRAPH DG	איים איים איים איים איים איים איים איים	FEET	PEPTH	RQD.	BLOWS -	TYPE	GRAPHI	. Sterningerster Territien mit Hatthermanner m
T			1	20	3	3	TOP SOIL: <u>SILTT SAND</u> , VIDELY CRACED, 15-205 ANGULA CRAFTL TO -0.7 INCM WAI, COINSE TO FINE, MUSILI KESICH TO FINE SAMO, 15-205 SILTETT FIRSTLE FINES, DARA BROWN MOTHED WITH LIGHT SAMON,	: : · · ]						SAURE POORLY CHARDER, 3-55 CHAVEL, 46 0.5 INCH MAL. COARSE TO
	37	-	ŀ	*	3	52	SAND, NORLY GALDED, TRACT OF 0.4 INCE GALVEL, COURSE TO FERE, POSTELY JUDICH SUND, 474 FINES, LIGHT ENDIN		8-		53	53 16	siyani	SAND, SINGLAR TO ABOVE
	5°.		1	50	#5 ]	57	CRAVELY SURD, FORLY GRADED, 40-438 SUBANOLAR TO SUBROUPERS CRAVEL TO G.E. DICH MAR, COARSE TO TIME, MOSTLY MEDIUM SAND, 155 FIDES, LIGHT BROAD			•	63	33 17	1 37	CRAYELLY SAME, FOORLY CRACKD, 40-455 STRANSFORME TO STRANSFORME CRAYEL TO 0.7 HER. MAX. COLLEGE TO FIRE, MOSTLY MEDICIN TO FIRE SAMD, 455 FURES, CANTER MONT
	21111			24	39-	ie-16	SAND, FOORLY GRADED, )-ES GRAVEL TO 0.5 THEN HAR. COARSE TO FICE, -		81-1-1		12	33	SP	GRAVELLY SAME, SDCLLE TO LEOVE, SECURE 30-355 CAATES
	8 1111		ł	77	35	17-19j	CHAVELLY SAND, FOORLY GALDED, 35-405 SUMBOURDED TO SUMBOURLE - CRAVEL TO C.Y MEN PAILING COARSE TO FIRE, "STLY MEDICA SAND, 5-65 KORTANTIO FIRES, CANYES BOOM		*		65	55 19	5.9	GRAVELY SARD, SDUIAR TO AN
	8	1	ł	J.	35	<b>37-84</b>	CHAVITLET SLEED, FOORLY CHARGED, 40-LOS SUBANCHLAR GRAVEL TO 0.9 DREA -	-				-55 20		CHAVILLY SIND, FORLY GRADED, 10-155 STREAMEDING GRAVE, TO Q.4 MAR. COLLEG TO FINE, MISTLE MEDIUM SAID, 455 FINES, GARLIN ME
	2		- Bidly	23;	- są	ir .	CHAVELLY SLED. FOORLY GRADED, 15-205 SVENERGELAR GRAVEL TO 0.7 INCH MAX. COMMENT TO FILTE, NOSTLY PRODUM SLED, 05 FIRES GUARTING MEDIN	1	100	TRADUTO	76	35	37	SAND, UNIFORM, MEREUM TO FIRE, TRACE OF COADME BAND, CTS-FIRE MODIUM EXC."
	* 11.			741.	1		GRAVELLY SAND, SDULLAR TO ANOTE, EXCEPT 30-358 GAATEL	1	1111					NATE OF BOLIZED AT 101.5 PT
	H	-		*	59	 *	SLAD, FOORLY GRADED; 3-5% GRAVEL TO 0.4 INCH VAL., COLLESE TO FIRE, HOSTLY FYER (HERY LITTLE COARSE) SLAD, 45% FUES, GALVISE MOVE						: : *	
	45	-		ņ	22	all.	GRAVELLY SLAD, NORLY GRAINS, 30-375 SUBBOARD GRAVEL TO 0.7 INC. MUX. COUNSE TO FUEL MOSTLY MEDICA SARD, 458 FIGHS, GRAVISE REGAR		1.1.1				ľ	
1	¥			φ.	33	57-	CRAVELY SIND, SERIAR TO ABOVE							
	8			<b>a</b> :	Ħ	57		1.		1		1		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.
	60			:a:	58	ar	CALVELY GLAD, NOULY GARLED, 40-435 SUBARUTAR TO SUBRIVIERS CALVEL TO 0.8 DOCK MUL, COLKER TO FIRE NOSTLY MEDIUM SAND, 455	1						
	65			\$	\$5 14	S <b>P</b>	CHANGELY SAND, FOORLY GRADED, 35-JDS STRANGULAR TO SUBBOURDED TO 0.7 DICK NAX, CORNER TO FLOR, NOSTLY KROIDS AND, 75 FLORES, CONTERS HOWN					· .		
	20 _	-			335	50-52	-		1 -					

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or I		AUGUST 25		CATIO		SH_ 072	DATE	# BORIN	AUGIST 25.	LOC	NOITA	¥500	SH
LEEL	1331	RQD	-	MPLE JALL	GRAPHIC	SOLL OR ROCK DESCRIPTION	FEET.	DEPTH	OVERALL WEATHERING AND RQD • LI GO TE NO I	BLOWS BLOWS	PLE	GRAPHIC	SOLL OR ROCK DESCRIPTION FILD AND LANGRATORY TAB T REAULTS. DE SAINT THE REDDING AND FAULTING SELECTIFYTONS
Ť	• -		11	12	54	T P 2011, SILTY CART, SISEN TRACK, 20-328 STBARGER GRAVEL TO 1. AND MAXIMEN, SOLARS Y, FINF CARC, MOSTLY FUN, 34-JOS MONIMATIC TONS, SHOW, JONE BALEY F ATTENTS, FOR MOCH, LANS FRAMEWING FLL	-	1		1			CAND, STUPPEN MEDTIN AND AND A STATE PROVIDED CRAVEL TO THE NEW MAXIMUM, (A THATE OF CONFICE SAND) LIST THAT SE MEMORY FUNDS, I LUNISH TAY.
	"		1.12	w.R		SELL, DUTELS FROM, LIGT THAN INCOMMENDING FINEL, LIGHT GAAYISK		71			S. 16	æ	
	10 11 1		14	35	59	SAVE, UPITORY AND THE POSTLY FISE, JAKE NOTPLASTIC PINES, THEORYSA CAR,		19 19		86	5 5	P	CARTELLY FAUD. NOCKLY GALL C., -, 'I SLANDLAR TO SUPPONDED AATE DO GLI INCLANDITY, COAGE TO FISE, MOSTLY NEDTON, LES "ATT & MOVINATIO FINE, Y HOVINI JAAY. CARTELY SAMD, PROBLY GALAGE, 10-145 CHAVEL TO 0.4 INCR MATING CARDE TO FINE SAMD, NOCHLY GOLTH AND FINE, THAGE OF COAGE) LESS THAN 5 SAMD, NOCHLY GOLTH AND FINE, THAGE OF COAGE)
	1111		.\$,	55	SPUS	CRAFTLIT (AND, POOPLY CARLET 14-1'S BUTNED GALVEL TO 0.4 INCH MALENNY, CARLET TO FINF CARD, WATLY CLASSE AND NOTIN, 4-85 ROMPLASTIC FINES, THILDHISH CAR, 2000 FOCUSTS OF FELDOISH GALL		1111			SS	1	TASS, UNITERS THE DUA AND ALT., (TRACT OF GRAVEL TO 0.25 INCH)
	20 11			85	ог-он.	SALVELLY CARD, FOCRLY MEDDED, 12-147 MIRNOUMEND GRAVEL TO 1,0 INCH RALVERT, CORRECT OF DE CARD, NOTEY REDUEN AND FING, 10-155 NORTHANTS CITIES, NACOTHES CARY.		90, 1		42.5	5 51	1.4	CHANNELLY SAYD. FOORLY GLOBED 13-205 SUBROUNDED TO ROUNCED GRAN D.4 THCH MAXIMUM, COLDER TO FIRE SARD, MESTLY REDRIN AND FIRE, THAN 35 ANDHASTIC FIRES, CAN.
	*		52	55 4	28	CANTELLY SAND, POORLY DRADES, 12-315 ROUNDED GRAVEL TO 0.5 INCH MATTING CHASES TO FING, 103-11 MET LUM AND FING, LESS THAN 18 MORTUNET CHART, CANT.		3					THAN AN HOMPLASTIC FIRES, CALL, CRAVELLY SAMD, POORLY CRADED, 15-208 SUBBOUNDED DRAVEL, COARSE FIRE, HOSTLY HEDION, LESS THAN 38 HOMPLASTIC UNICS, TELLOVISH C
	2	•	4	51.	SP	SASS, EWTITEM MALTUM TO FISH (TRACE OF COARSE), LESS THAN 35 NUTRELASTIC FINES, SART, 3 PISCE OF CHAYLE TO 0.25 THEN MUMINE,		100 -		Latir Pa			GAND, UNIFOON HEDINH AND FIRE, (TRACE OF SAAVEL TO 0.25 INCH), ISSS THAN 55 PONFLACTIC FIRES, CRAT,
	2 1 1		21	is r	CP-SK	CALTELLY SAY, FOOLY GASCO, 14-165 SUBROUMORD CAMPLE TO 1.0 INCH WALFTY, CARSON TO FISE, FOSTER CLASS AND HEDING, 10-128 REVELASTIC FIRES, TELLWISS GAY WOTTLE, JIM BAR GAN.		1111	TRANSFER		21		EGD OF DORING AT 101.9 FT
	***		57	. E	39	ANY-ALY SAMD, REARLY GALFED, 12-145 SUBRAINDED TO READED GRAVEL, 10 TACH, COLLER TO FIRE MOSTLY 427UH AND FIRE, LESS THAN 55 							
	***		*	10	5 <b>P</b>	ANALY THE PORTY CALFS, X0-14 SUTAKOLAR TO SUMMERDED DATE TO THE MATHYM, COARD TO FUE, MCTHE RESIDEN AND FINE Har TANK M MARTARTING FUEL THESE TANK					1		
	2 1111		s),	31	57	TANTIN CONTERNO TO THE ACTION OF THE AND THE AND THE AND THE ACTION AND THE AND THE ACTION AND THE AND							
	***		92	12 12	SP	THATTEL Y LAND, POCALY CALING, 15-205 BOUNCES CAUVEL TO 0.5 INCH MATTER M. COLOR TO TINC, HOSIET MESTRY ACT FRAME COMMIT LESS TOUR 36 MONPLISTIC FIRES, VELLOYING CAN.	11						
	21111		1:3	4.	7	LATELY JUL, - MUSEY CRAVEL, IG-128 STITCED CRAFT, TO 0.5 INCH WRATTYN, CURT, CT PTNG GAND, MOCTLY RECITY AND YING, IESS TRAN TO NUMBER TO FINGE.		1111				1	
			4	1.	194. M	TATION LLS JAT. PARELT PRAFEL, 21-10% LUBRITURED GRAVEL TO DUES 1994		11-1-1					
	1-1-		1.					11					
CURCE PILS	B HANDLE B HANDLE DO SAND ES SHOW ERCENT DICATES DICATES IN NO R NIPT RE C. DICATES	BLOW OR AN "DENOTE TH EA FALLING PLE SPOON OF CORE & S LOCATION S LOCATI	12" OF SIL OF SIL	A THE CORUINA THE CORUINA THE CORUINA THE THE THE THE THE THE THE THE THE THE	BLOKS	OF A DRIVE 22 SHOWN. UPLE, WATER WATER WATER WATER	301L 140 A 2= FIGU THE 2. 821 FGI 071 3085 NUMB 3. 1	SAMPLE LB HANNU OD SANG RES SHOW PERCENT NDICATES NDICATES NDICATES NDICATES NDICATES	BLOW OR NEC DENOTE THE EX FALLING THE SPOON 12 OF CORE REC S LOCATION ( S LOCATION	NUMBER 30" ABQ 2" OR T ROCK C COVERED OF UNDI DF SAMP DL INDI DF SAMP DL INDI	OF B UIRED HE OF ORES STURB T-SPO LING CATES RAL G	LOVS C TO DI STANCI DEXOTI DEXOTI DEXOTI DEXOTI SANDI SANDI NO'MO	OF A ATTONAL SUNCHWITTEN LICHT SOURCE MPLE

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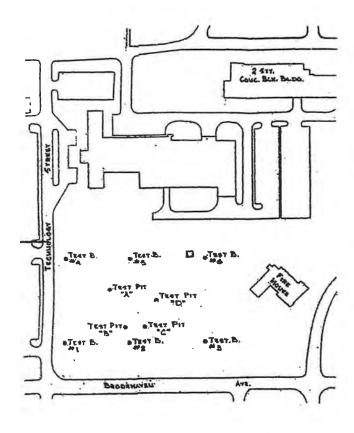
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1	BQD LIIII		TYPE T	GRAPHIC	SOIL OR ROCK DESCRIPTION	ELC.	DEPTH	ROD + 14 OF THE	- 15. <u>5</u> 1 k	- H - E -	SOIL OR ROCK DESCRIP
1111	-1	T		Γ		-			Ť.	Ť	
			\$5 1	sr	TAND, UNLINGUE, VINE TO VINY VINE, MATLE VINE, C 18 SOURASTIC		75-		50		GRIVILLY SAYD, POCALY EMALER, 12-195 SUBROWNED (
		20	, 1	30	SAND, UNITION, PIDION TO LINE, NOTAT VINE, < M. ROWHLATTIC		<b>∞</b> -		109 55		CRAVELY SAVD, POCHY ENADER, 13-15% SUBROWNED C RATERN, RUETER TO VIER, NOSTLY PIRC, C 56 BORTA ORATION TRLOW - DORER JAK.
		26	<u>ຍ</u> າ	57	THE STATEAN TO 55 +2, TETRE TO STATE CARE		»-	Ľ.	16 111 15	37	SUD, FOORLY GRADED, S-AS SUBARQULAR CRAVEL TO C RUDINM, COLAST TO FIRE SAMP, MOSTLY MEDICA TO FT BOYLISTIC FIRES, VELOCISH GRAY.
		42	SS 4	eP.	SAND, USTFORM, VILLEY, & FABY, B. STAT VILLE, C . I SCIPLARTIE ?	Ξ.				ŀ	GRAVELY MAND, TOORLY CALDED, 15-205 GRAVEL TO O. MALTEND, CORESE TO FIRE SARD, MOTTLY-MORETO AND FI MONTLATTC. FIREN, TELLOIDER CAAY, LAYER OF GAAR VI YOLK FIRE SAND.
		4.	\$5	14	CHAPTER SAND, 100-17 -04010, 19-200		*		293. <u>55</u> 18		SAND, UNITON, MEDIEN TO FIRE, MONTLY FIRE (TRACE 35 MONTLATED FIRES, CRAITAN TRALOW.
į.		67	5		GRAVELT SACE, HOWLY AWARD, 14-DOL SUBMORIDED TO ROUTED, TO THE REAL TO THE REAL AND		" - -		196 <u>55</u> 19	-	SARD, FORELY GALDER, COARSE TO FIRE, MARTLE AREALON < 35 RORPLANTIC FIRES, TELLOWISH GRAT WITH SORE A STAINING.
		31	ĩ	39454	CHANNELY SCHER, FOREY TANG, MAD I TUNKURDED GAAVEL TO 0.5 JECH REFTRAM, CALLE "L F.M. LAD, MOSTLE REFTME AND FINE, 1-SE REMELATION FREE, DOLLATION GAT.		100 -	endoatad	213 <sup>20</sup>	-	SLID, GRIPORN, FIRE TO VERY FIRE (TRACE OF COLORE) FIRES, TRILOWISH GAR.
			35	57-5N	2200, 5ku / 21 m.		·109 -				BEB OF BOBIES AT 102.0 PT
	1		ŝ	5 <b>P</b> - SM	SHAVES IT LES, SINK'S GROES, SHORNER GRINNE GRINNE TO A.) INCH MARINAM, MARSA TO FINE SAR, MARY LUNS, SHE'R ROXPLACTIS FIRES, MOTTLEED YALLANDE GRAY AND LINE YELLANDE SHARA.						
		79	, 22	4	TARD, POCALT OPAOLO, COLNIE TO FIM , NATLE MEDIDA LAD PERS, C SR SUMPLASI ) FINES, RECURSES DUT.		T T				
		сı	55 10	34	TAND, C. MARY, BALTICH T. SITE, PARTIN FOR AND PLATE OF GRAVES TO 0.5 TRUES $\leq$ 35 BORLAN TO FUNCT, FEDERATION THAT,						
		a.	55 11	v	SAKD, SAME A., 13 93) (N: GRAVEL).						
	ł			4	TAND, WEIVERN, MEDIUM TO PINT; MESTLE PINE (TRACE OF COARDE AND CONTRICT OF RELATE AND CONTRICT OF MES.						
		N	5		•						
		ľ			SANTISH TELOW.		1.				
LOW			4 I.		to the state of th	1. PIGDA	-	09 08 82000	Pay con		
I S OP	LINC JO POON 12" POSITE R DUE RECO VIE RECO VIE RECO VIE RECO VIE RECO VIE RECO	OR DCK	THE D COALS	DENOT		WP CIERS	A	OW ON RECOV ENOTE THE I FALLING 30 E SFOON 12- OPIOSITE N CORE RECO LOCATION OF LOCATION OF LOCATION OF LOCATION OF	40 100	DISTARC	5-380 W.

581. 072 SH 2 07 2 10. No. 13011,01 SITE \_ MATIONAL STREAMOTHON LIGHT SOURCE BORING No. SITE . NATIONAL SYNCHHOTRON LIGHT SOURCE JO NO. \_\_\_\_\_ BORING ( TIRY\_\_\_\_\_\_ GROUND ELEV.\_\_\_\_ LOGGED BY \_\_\_\_\_ TYPE OF SOR HAD SO LOCATION MODELAVE ATTORNE LABORTON TO TO THE AUGUST 25, 1977 DRILLED BY TOPELS BORING NO. J GROUND ELEV. \_ 2414 TYPE OF BORING 55 LOCATION MODELAVE NATIONAL INDATORY BATE DRILLED AUGUST 25, 1977 DRILLED BY TORELS LOGGED BY DEM SUMMARY OF BORING SUMMARY OF BORING OVERALL WEATHERINE MOD LD BU TH TTPC ANT OVERALL BAMPLE UH O WEATHERING TO UH O ROD OUUH UH O E B OT TANDO D'UH U SUB OT TANDO D'UH UH O SUB OT TANDO D'UH O SUB OT TANDO PEETH FEET SOIL OR ROCK DESCRIPTION FLEV. ELEV. FEET DEPTH SOIL OR ROCK DESCRIPTION THE AND LABORATORY TEST REGULTS: AND FORTA REACHAFTION; LITHOLOG AND TETTAL FIELD AND EABORATORY TEAT REDUCTS; LOL STRATE DESCRIPTION; LITHER DESCRIPTION DESCRIPTIONS AND FAULTING AND FETURE STLTY SAND, WELFORN HEDIGH TO FIRE, HOSTLY FIRE, 12-136 HUMPLASTIC FIRES, TELLOSISH HEDEN. 75 SAMD, ROORLY GRADED, 8-125 GRAVEL TO 0.5 INCH MAL., COARSE TO Fixe, MOSTLY MEDIUM TO FINE SAMD, 5-85 MONPLASTIC FINES, CRATESH MORN m m SS 132 15 57-54 20 SILTY SARD, VIDELT GRADED, 18-235 SUBANGULAR CHAVEL TO 0.7 INCH MAT. COARSE TO FINE, MOSTLY MEDION TO FINE SAND, 18-235 WONFLASTIC FINES AND MAN 35 2 31 SAND, SDITLAR TO ABOVE 48 190/ \$5 9" 16 SP-SH PINES, BROWN 15  $\underline{s_{AND}}$  , roally graded, 10-155 submatchar chavel to 0.6 incr. Mai. Coarse to fire, mostly medium to fire sand, 756 fires, brow 55 CALVELT SAND, POOLT GRADED, 10-195 SUBLHCULAR GRAVEL TO 0.3 INCH MAX. COARSE TO FINE, MOSTLY MEDIUM TO FINE SAND, 5-55 RUNPLASTIC FINES, GRAVISH DROWN 50 3 37 17 206 37-58 20 SANDY CRAVEL, ROOLY CRADED, SUBARGULAR TO O.W THEM MAL. 43-475 COARSE TO FINE, NOSTLY MEDICH TO FINE SAND, 3-55 FINES, GRATISE 35 247 4 GP SAND, UNIFORM, MEDIUM TO FINE, TRACE OF 0.4 INCH GRAVEL, 5-52 WORPLASTIC FINES, CRAYISH BROWN 90 18 57-54 25 55 CRAVELLY SAND, POORLY GRADED, 4D-455 SUBANGULAR TO SUBNOVADED TO 0.7 INCH TAXX. COMPLET DING, MUSTLY MEDICH SAND, 455 FINES, GRAVIST BROWN 95 CRAVELLY SAND, FOORLY GRADED, 15-205 SURANGULA GRAVEL TO  $\overline{0.6}$  INCH WAIT, COARSE TO 7155, MOSTLY NEDIUM TO FINE SAND, <55 FIRTS, GRAVISH BROWN 126 52 116 19 37 30 CRAVELLY, GAND, FOORLY GRADED, 20-255 SUBARCOLAR GRAVEL TO O.8 LICH MAX. COUNSE TO FIRE, MOSTLY MEDIUM TO FIRE SAND, \$55 FIRES, GRAVISE SHOWN 33 6 200 37 SAND, POORLT GRADED; 8-126 CRAVEL TO 0.5 INCH MAL. COARSE TO PTOR. HOSTLE MERIUM BAND, 435 FINES, SRAYISH BROWN 149 177 20 57 CUTANDUS THE OF BORDIE AT 102 PT 35 55 123 30 GRAVELLY SAND, MORLY GRADED, 40-455 JURANGULAR GRAVEL TO 0.7 INCH. MATHERINAN CONTRACTOR DISTLY MEDIUM TO FINE SAND, 158 FIRES, GRATISH BROWN 40 CHAVELLY SAND, FORLY CRADED, 12-MAN SUBMOUTORD GRAVEL TO G. MAI. COARSE TO FINE, MOSTLY MEDIUM TO FINE-GAND, 435 FIRET, GRAVISH BROWN 53 8 31 83 45 ss 9 32 CHAVELLY SAND, SINILAR TO ABOVE, BECEPT 10-155 GRAVEL GRAVELLY SAND, SIDILAR TO ABOVE, VECEPT 15-25% GRAVEL TO D.6 THER MAX. 33 SP 55 \$3 11 SAND, FOORLY MEADED, 5-85 GRAVEL TO 0.4 INCH MAI, COARSE TO FIRE, MOSTLY MEADED TO FIRE SAND, 5-85 DOMFLASTIC FIRES, GATIST BROWN 212 37-51 60 in. 12 SP-SH SAND. SIDELAR TO ABOVE 45 SARD, SDULAR TO ABOVE 72 13 58-95 20 SP-SH SAND, MITTOM, MEDIUM TO FINE, TRACE OF D.4 INCH GRATEL, 5-64 MUSPLASTIC FINES, GRAY 57 14 1. FIGURES IN BLOW OR RECOVERY COLTAN OPPOSITE SOLL SAMPLE DENOIS THE NUMERS OF BLOWS OF A 1'0 LB HANDER FALLING JO" REQUIRED TO DRIVE A 2° OB SAMPLE SPOON 12° OK THE DISTANCE SHOWN FIGURES SHOWN OF OSTER ROCK CORES DENOIS THE PRACENT OF CORE RECOVERED. 2. THE SHORE OF CORE RECOVERED. 3. THE SHORE OF CORE RECOVERED. 3. THE SHORE OF CORE OF CORE AND COMPLEX HUNDER. 3. THE SHORE OF SHORE OF SHORE AND THE SHORE OF COMPLEX TABLE. 4. JON CORE AND LONG THE SHORE OF COMPLEX OF COM FIGURES IN BLOW ON RECOVERY COLUMN OPPOSITE SOLL SAMPLE DENOTE THE NYMER OF BLOWS OF A LOG LS RANGER FALLING 30" RECVINES TO DATE A 2" OD RANGLE SHOW IS? OR THE JISTANCE SHOW FIGURAS. SHOW OFPOSITE ROCK CORES DENTE THE PROCEED OF CORE RECOVERS). B2 INDICATES LOCATION OF SAMPLES. DFINDICATES LOCATION OF SAMPLES. DFINDICATES LOCATION OF SAMPLES. MIT HM RECOVERS. SUBSCRIPT MENT TO SYMBOL INDICATES SAMPLE SUMMER. NATIONAL STREAMOTHON LIGHT SOUNCE MODERAVEN NATIONAL LANDAATONT NATIONAL STRUCTURE LIGHT LOCAUL SROOMAND PATIONAL LABORATORY 3. 5. MOD - ROCK QUALITY DESIGNATION. S. II INDICATES DEPTH & LENGTH OF HE COALING AU A. DATUM IS 4. AND - NOCK QUALITY DESIGNATION. 5. 11 INJICATES DEPTH & LERGTH OF MK COAING AUT 6. DATUM IS STONE & WEBSTER ENGINEERING CONFORATION STONE L.WEBSTER ENGINEERING CONFORATION A



#### LOG OF TEST PITS

TEST Par"	K
EAST	WALL
0 - 2-6	FILL, TOPSON AT TOP
2.4.4.0	SAND, SILTT, FUL UNIFORM, COMPACT,
4-012-0	GAUD, CLEAN, MEDINI FINE, LANFORM FIRM WELL ROUNDED, LIGHT YELLOW GRAY SHOWS

HT YELLOW GRAY SHOWN FORE-SET BEDDING DIPPING SHOTH

- WEST WALL

- West Wall 0 100". File, Sauri Terson FO'-5-3" File, Sauri Terson 3:3"-516" Saud, Silty File, Universe, Carmaca, Madium Brown, Waatherind And Standard, First Well Routings, Light Yellow" Shart Shows Fore-Set Bellowing Differed & W 20"

- TEAT PAT "S" 0-273" TERCEL (FULT) 3-5-8-0" SAUD, SILTY, FUE, UNIVERY, CAUPAIT MEDIUM ECONUM, VILLYINGER AUD STARTO U-26" SAUD, CENAN, MEDIUM FUEL, SUBJECT MEDIUM LONT VELLOW GENY SHOWS FEEL SEDENIES DIPPING SW AT 15"-20" LOWE DE TERCE CEDARS TEXT PAT IN

LITE BACIFILLED TRUCK CROMIN TEXT - Pit In Ever ther Distribut Datting Dattin Or 6.8 Fr. From Suspect

- Test Pit'C" O-T'5" FIL Terson P5-2"-4; Terson Baonia Waathismed And Stamics 5'7-12-0" SAUD, Chana, Hadina Kompan, Fina Rommon, Liner Tellow Sant Show Toss, Gat Baonia Dippic W/SW Liner Tellow Cont Scotts Test Die In Fast -
  - NATE: BACKFILLED TREACH CROSSES TEST DIT IN EAST -

רציד ישי סירים אות האינים אות האינים אות האינים אות האינים הידי ביעה לאנה להידי, דהוד עווודפאא, לפעראבד אותיים שומיע, אובזיאופת אותי לדהול לידים אותיים שומי לווים אותי אובזיאו לידים אותיים אותי להווים באותי לפערמי לבאיל לאמיזה להווי לדו שבטחונה שומי לעורמי לא איז לסי

	Gtouvo	Cook	PATALIK
LOCATION	TLEY.	UDRTH	EAST.
PODUTCON TO	72.8	60100	100,350
21	.71.4	100,100	100,510
	72.3	100,100	100,700
	73:1	100,320.	100,350
	.72.6	100,320	100,510
	74.4	100;320	100,700
LAT PIT A	71.7 .	100,240	100,460
B	71.5	100,140	100,500
2.6	71.7	100,140	100,550
	71.7	100,210	100.580

FOUNDATION INVESTIGATIONS INTIGUAL STUCHEDTEON LIGHT SQUERE DESCRIMANEN UNTIGUAL LABORATORY 1 ..... 10 3 anan's Watterfer Happersten's Conferent 4 Fia: 1

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# **Appendix B**

2003 Test Boring Logs



PROJE	T: GEI CT NAME: B: ION: Long					NEW		ID BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE GLASTONBURY, CT 06033 (860) 633-4649 – (413) 733-1232 FAX (860) 657-8046		T 1 OF	G No. B-1 1
INSPEC	R: <b>T. Roe</b> CTOR: <b>A. S</b> START: <b>10/</b> START: <b>10/</b>	Smart 28/03				HAM	PE E I.D. MMER WT. MMER FALL	Casing Sampler Core Barrel HSA SS 3-1/4" 1-3/8" 140 30"	SURF	ACE ELEV.	LongIsland
No.	DEPTH RANGE IN FEET	SA1		S PER 6 MPLER 12-18		REC.	CASING BLOWS/ CORING TIMES PER FT.	FIELD CLASSIFICATION AND REMARKS		Well Cons.	Installation Details
S1	0'-2'	1	1	2	1	8"		8" Dark Brown Topsoil Gray Brown Fine Sand, Some Silt, Trace of Ro Fill			
S2	5'-7'	5	6	8	9	14"		Light Brown Fine Sand, Stratified	2.5		
S3	10'-12'	7	7	9	12	24"		Light Brown Fine Sand, Some Silt, Stratified			
S4	15'-17'	5	12	14	13	20"		Light Brown Fine Sand, Little Gravel, Stratified Cobble @ 19'-19'6''			
S5	20'-22'	5	7	7	9	24"		Brown Fine-Med. Sand, Trace of Gravel, Strati	fied		
S6	25'-27'	5	6	10	11	24"					
S7	30'-32'	9	11	13	17	20"		Brown MedCrs. Sand, Little Fine Sand End of Boring @ 32' Water @ 31'	32.0		
OTES:	<ol> <li>The stratification approximate bou types. Transition</li> </ol>	indary betwe	en soil	in the condit Fluctu water Ihan ti	drill holes a tions stated lations in th may occur o	ings have been at times and on the boring he level of g due to factors not at the time ade.	under glogs, round- sother	REMARKS:			

	LIENT: GEI NEW ENGLAND BORING CONTRACTORS OF CT., INC. BORING No. B-2													
CLIEN	T: GEI					NEW	Þ				G No. B-2			
PROJE	CT NAME: B	rookh	aven					129 KRIEGER LANE GLASTONBURY, CT 06033		T 1 OF	1			
LOCAT	ION: Long	ation Isla	al La	abs IY				(860) 633-4649 — (413) 733-1232 FAX (860) 657-8046	ARCH	ITECT/				
DRILLE	ER: T. Roe	2			H									
INSPE	CTOR: A. S	mart				TYF	DE	Casing Sampler Core Barrel HSA SS	FILE NO. GEI-LongIsland, NY SURFACE ELEV.					
						SIZ	E I.D.	3-1/4" 1-3/8"		SURFACE ELEV.				
	START: 10/2						MMER WT. MMER FALL			LINE & STATION				
DATE	FINISH: 10/2		MPLE				CASING			OFFSET				
	DEPTH	T	BLOWS	PER 6"			BLOWS/ CORING	FIELD CLASSIFICATION AND REMARKS	1	Well	Installation			
No.	RANGE IN FEET	0-6	6-12	MPLER	18-24	REC.	TIMES	TILLD CLASSIFICATION AND REMARKS	) )	Cons.	Details			
							PER FT.							
S1	0'-2'	2	2	2	2	20"		5" Dark brown Sandy Topsoil	.4					
								Brown Fine Sand, Little Silt, Trace of Roots - F	ill 3.0					
S2	5'-7'	4	7	10	13	18"		Light Brown Fine Sand	0.0					
02	5-7	-	1	10	13	10		Trace of Silt @ S6, Stratified						
						1 6		_						
S3	10'-12'	3	5	5	7	18"		Little Silt @ S7			1			
	10 12	ľ	Ŭ	J	'	10								
S4	15'-17'	3	4	5	5	16"	1							
S5	20'-22'	5	5	6	8	18"								
					0.4						-			
S6	25'-27'	6	8	10	10	20"								
					19									
S7	30'-32'	7	9	10	9	18"								
								End of Poring @ 201	32.0					
								End of Boring @ 32' Water @ 29'						
								Water @ 28' Overnight						
							6							
							1.1.3							
NOTES:	1) The stratification approximate bou	lines repres	sent the	2) Water	level readi	ngs have been	en made	REMARKS: Note: Moved Hole 10' West Due to	o Overi	head Bra	nches			
	types. Transition	ns may be g	radual.	conditi Fluctua	ons slated in the	on the boring e level of g	g logs. round-							
				than th	may occur d ose preser ntswere ma	lue to factors It at the time Ide.	s olher meas-							
						_								

	: GEI CTNAME: B: ION: Long	rookh		ups M		NEW		ID BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE GLASTONBURY, CT 06033 (860) 633-4649 - (413) 733-1232 FAX (860) 657-8046	ARCH	BORING No. B-3 SHEET 1 OF 1 ARCHITECT/ ENGINEER			
INSPEC	R: T. Roe CTOR: A. S START: 10/: NISH: 10/:	<b>mar</b> t 20/03				HAN	E I.D. MMER WT, MMER FALL	Casing Sampler Core Barrel HSA SS 3-1/4" 1-3/8" 140 . 30"	FILE NO. GEI-LongIsland, SURFACE ELEV. LINE & STATION OFFSET				
No.	DEPTH RANGE IN FEET	SAI 0-8	MFLE BLOWS ON SA 6-12	MPLER		REC.	CASING BLOWS/ CORING TIMES PER FT.			Weil Cons.	instaliation Details		
S1	0'-2'	3	3	1	1	14"		1" Asphalt - 2" Dark Brown Topsoil. Brown Fine Sand, Trace of Silt, Possible Fill Light Brown Fine Sand, Stratified	2				
S2	5'-7'	3	6	8	10	20"		Light Brown Fine Sand, Stratined					
53	10'-12'	3	5	5	5	16"							
S4	15'-17'	3	2	3	4	24"							
S5	20'-22'	3	4	5	8	20"							
S6	25'-27'	4	6	6	9	24"							
57	30'-32'	2	5	6	10	24"		End of Boring @ 32' Water @ 31' Water @ 28' Overnight					
NOTES:	1) The straution approximate b types. Transit	oundary bar	- 100 ( I B B	in the cond Fluct Vite Uhan	c drift holes klicks stated wellons in 1 If May occur	Inge heve b at linge and jon line lavel of due te facto ant et the tim rade.	d under Ing legn, 'graund- ors other	REMARKS:					

PROJ	IT: GEI ECT NAME: B TION: Long					NEW		ID BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE GLASTONBURY, CT 06033 (860) 633-4649 (413) 733-1232 FAX (860) 657-8046	BORING No. B-4 SHEET 1 OF 2 ARCHITECT/ ENGINEER		
DRILL INSPE DATE	ER: T. Rod CCTOR: A. S START: 10/ FINISH: 10/	e Smart 27/03	3		-	HAI	PE E I.D. MMER WT. MMER FALL	Casing Sampler Core Barrel NW SS 3" 1-3/8" 300 140	FILE N	IO. <b>GEI -</b> ACE ELEV. & STATION	LongIsland
No.	DEPTH RANGE IN FEET	SA 0-6		S PER 6 AMPLER 12-18		REC.	CASING BLOWS/ CORING TIMES PER FT.	FIELD CLASSIFICATION AND REMARKS		Well Cons.	Installation Details
S1	0'-2'	1	2	2	3	20"		Dark Brown Sandy Topsoil Gray Fine Sand, Little Silt, Trace of Roots - Fill	<u>1.0</u> 3.0		
S2	5'-7'	8	11	13	14	20"		Light Brown Fine-Med. Sand, Stratified			
S3	10'-12'	9	10	9	8	18"					
S4	15'-17'	11	14	17	19	16"		Light Brown Fine-Crs. Sand, Trace of Fine Gravel, Stratified			
S5	20'-22'	3	4	6	9	12"		Light Brown Fine Sand, Some MedCrs. Sand Trace of Fine-Crs. Gravel			
S6 S7	25'-27' 30'-32'	14	16 25	26 25	28	12"					
S8	35'-37'	9	12	15	28 22	12"					
S9	40'-42'	13	25	34	36	12"					
S10	45'-47'	9	22	22	25	14"					
S11	50'-52'	9	15	16	14	12"					
S12	55'-57'	10	14	10	9	12"					
NOTES:	<ol> <li>The stratificatio approximate boo types, Transitio</li> </ol>	undary betw	een soil	In the condi Flucto water than f	drisholes; tionsstated ations in t may occur	tings have be at times and on the borin; he level of g due to factors ant at the time ade.	under glogs. round- solher	REMARKS:			

CLIENT: GEI PROJECT NAME: Brookhave National LOCATION: Long Island,	en 🖉		ID BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE GLASTONBURY, CT 06033 (860) 633-4649 – (413) 733-1232 FAX (860) 657-8046	SHEET	BORING No. B-4 SHEET 2 OF 2 ARCHITECT/ ENGINEER			
DRILLER: T. Roe INSPECTOR: A. Smart DATE START: 10/27/03 DATE FINISH: 10/27/03		TYPE SIZE I.D. HAMMER WT. HAMMER FALL		SURF/	FILE NO. <b>GEI~LongIslar</b> SURFACEÈLEV. LINE & STATION OFFSET			
No. RANGE ON	WS PER 6" SAMPLER 12 12-18 18-24	CASING BLOWS/ CORING TIMES PER FT.			Well Cons,	Installation Details		
S13 60'-62' 8 13	3 17 18 12		End of Boring @ 62' Water @ 18' Overnight Water @ 23' After 60 Hours +/-	62.0				

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PROJE	T: GEI CT NAME: BI ION: Long			abs Y		NEW ENGLAND BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE GLASTONBURY, CT 06033 (860) 633-4649 - (413) 733-1232 FAX (860) 657-8046				BORING No. B-5 SHEET 1 OF 1 ARCHITECT/ ENGINEER			
INSPEC	ER: <b>T. Roe</b> CTOR: <b>A. S</b> START: <b>10/</b> 3 FINISH: <b>10/</b> 3	mart 30/03				HAN	PE E I.D. MMER WT. MMER FALL	Casing Sampler Core Barrel HSA SS 3-1/4" 1-3/8" 140 30"	FILE N SURF/ LINE &	LongIsland,			
No.	DEPTH RANGE IN FEET	SAM	APLE BLOWS	PER 6" MPLER 12-18		REC.	CASING BLOWS/ CORING TIMES PER FT.	FIELD CLASSIFICATION AND REMARKS		Well Cons.	Installation Details		
S1	0'-2'	2	2	2	1	18"		6" Dark Brown Topsoil Brown Fine Sand, Little Silt - Fill	.5				
S2	5'-7'	5	8	9	13	20"		Light Brown Fine Sand, Stratified					
S3	10'-12'	4	5	6	7	24"							
S4	15'-17'	4	4	4	6	20"							
S5	20'-22'	4	7	9	11	24"		Brown Fine Sand, Little Silt, Stratified					
S6	25'-27'	6	10	12	16	18"		Light Brown Fine Sand, Little Fine Gravel, Stra	tified				
S7	30'-32'	5	4	9	8	15"		Light Brown Fine-Med. Sand, Some Gravel, St End of Boring @ 32' Water @ 28' Overnight	ratified 32.0				
NOTES:	<ol> <li>The stratification approximate bou types. Transillo</li> </ol>	indary betwe	en soil	in the conditi Fluctua water i than th	drill holes a onsstated atlons in th may occur o	ngs have be it limes and on the borin he level of g due to factors at at the time ade,	under glogs. pround- sother	REMARKS:					

LOCATI	CT NAME: B:	ation Isla				NEW		SHEET ARCHI ENGIN	BORING No. B-6 EET 1 OF 1 CHITECT/ GINEER			
INSPEC	R: T. ROE TOR: A. S TART: 10/: INISH: 10/:	Smart 29/03 29/03				HAN	e I.D. Mmer Wt. Mmer Fall	Casing Sampler Core Barrel HSA SS 3-1/4" 1-3/8" 140 30"	FILE NO. GEI-LongIsland SURFACE ELEV. LINE & STATION OFFSET			
No.	DEPTH RANGE IN FEET	-		5 PER 6" MPLER 12-18		REC.	CASING BLOWS/ CORING TIMES PER FT.	FIELD CLASSIFICATION AND REMARKS		Well Cons.	Installation Details	
S1	0'-2'	2	7	4	2	24"		4" Dark Brown Topsoil - Fine Sand, Some Silt, Roots	, Little			
S2	5'-7'	9	11	12	19	20"		Brown Fine Sand, Some Silt, Stratified - Fill Light Brown Fine Sand, Stratified	5.5			
S3	10'-12'	9	10	12	15	24"		Trace of Gravel @ S3				
S4	15'-17'	4	9	6	7	24"						
S5	20'-22'	8	18	18	21	24"		Light Brown Fine Sand, Trace of MedCrs. Sa Stratified	ind,			
S6	25'-27'	10	21	25	30	24"						
S7	30'-32'	16	27	25	22	24"		End of Boring @ 32' Water @ 30' +/-	32.0			
NOTES:	<ol> <li>The stratificatio approximate bo types. Transition</li> </ol>	undarv betwo	en soil	in the condi Fluctu water than t	drill holes a tions stated alions in th "may occur o	ings have be at times and on the borin he level of g due to factor rit at the time	under ig logs. ground- s other	REMARKS:				

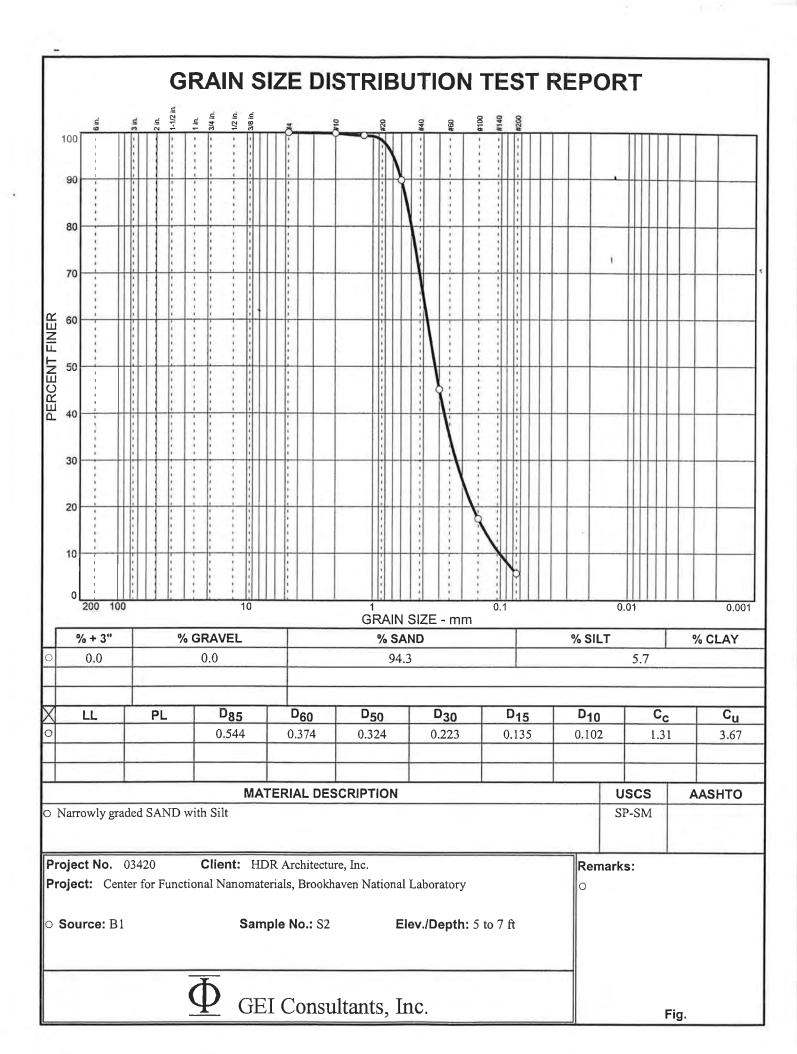
<u> </u>					-			D BORING CONTRACTORS OF OT UNO	T					
CLIEN	T: GEI					NEVV	Þ	ID BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE	BORING No. B-7 SHEET 1 OF 1					
	ECT NAME: B:				-			GLASTONBURY, CT 06033			1			
LOCAT	NON: Long	ation Isla	nd, K	abs IY				(860) 633-4649 — (413) 733-1232 FAX (860) 657-8046	ARCHI	ITECT/ IEER				
DRILLE	ER: T. Roe	•			F					0. GET-	Longieland			
	CTOR: A. S					TYP	Έ	Casing Sampler Core Barrel SA SS	FILE NO. GEI~LongIsland, NY SURFACE ELEV.					
	START: 10/2					SIZ	É I.D.	4" 1-3/8"						
							MMER WT. MMER FALL	140 30"		STATION				
DATE	FINISH: 10/:		MPLE				CASING		OFFSE	T	1			
	DEPTH		BLOWS	PER 6" MPLER			BLOWS/ CORING	FIELD CLASSIFICATION AND REMARKS		Well	Installation			
No.	RANGE IN FEET	0-6	6-12	12-18	18-24	REC.	TIMES PER FT.		•	Cons.	Details			
							PERFI.							
S1	0'-2'	1	2	1	1	24"		Dark Brown Topsoil	1.0					
								Brown Fine Sand, Some Silt - Fill	3.0					
S2	5'-7'	5	8	10	12	24"	2111	Light Brown Fine Sand, Stratified						
	32 J-7 J 5 6 10 1								7.0					
								End of Boring @ 7' No Water						
								NO VALEI						
						6								
		8 m -												
						[1.4]								
							1							
						1.1								
	1													
NOTES:	1) The electric	n lines	oert 4	2)				DEMADIZE						
10120.	<ol> <li>The stratification approximate box types. Transition</li> </ol>	undarv betwe	een soil	in the conditi	level readin drill holes a lons stated o	t times and on the borin	under glogs.	REMARKS:						
				Fluctu: water than th	ations in th may occur d tose preser	e level of g ue to factors it at the time	round- s other							
				ureme	nts were ma	de,								

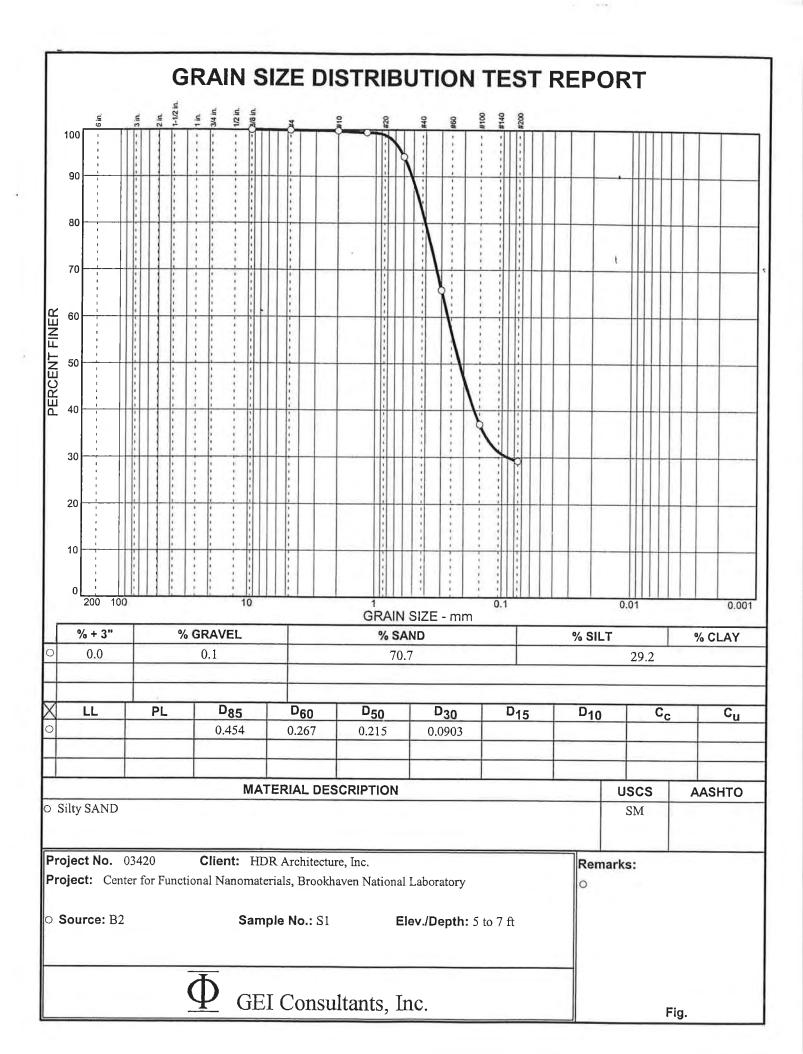
CLIENT	E GEI					NEW		D BORING CONTRACTORS OF CT., INC.		BORIN	G No. B-8	
PROJE		rookh	aven					129 KRIEGER LANE GLASTONBURY, CT 06033		1 OF		
LOCAT	ION: Long	tion Isla	nd, L	abs IY				(860) 633-4649 (413) 733-1232 FAX (860) 657-8046	ARCHI	TECT/ EER	•	
DRILLE	R: T. Roe	•			-	4				O GET-	LongIsland,	
INSPEC	CTOR: A. S	mart				TYP	È	Casing Sampler Core Barrel SA SS		CE ELEV.		
DATE S	START: 10/2	29/03	•			SIZ	E I.D. MMER WT.	4" 1-3/8" 140	LINE & STATION			
	INISH: 10/2						MER FALL			OFFSET		
		_	MPLE			r	CASING BLOWS/					
No.	DEPTH RANGE		BLOWS ON SA	MPLER 6"		REC.	CORING	FIELD CLASSIFICATION AND REMARKS		Well Cons.	Installation Details	
	IN FEET	0-6	6-12	12-18	18-24		PER FT.				Details	
S1	0'-2'	3	2	3	2	18"		Brown Fine Sand, Little Silt - Fill				
	<b>CI T</b> I							Light Brown Fine Sand, Trace of Gravel, Strati	4.0 fied			
S2	5'-7'	3	3	4	4	24"		-	7.0			
								End of Boring @ 7' No Water				
								NO Waler				
1												
											10	
		62										
		1.										
NOTEO	1)	P-		0)				2514.0/2				
NOTES:	<ol> <li>The stratification approximate bout types. Transition</li> </ol>	ndarv betwe	en soil	in the conditi	drill holes at ons stated o	ngs have been t times and on the boring	under togs.	REMARKS:				
				water r than th	nay occur d	te level of gi due to factors nt at the time	other					
				uremer	RS WEIE MA	146.						

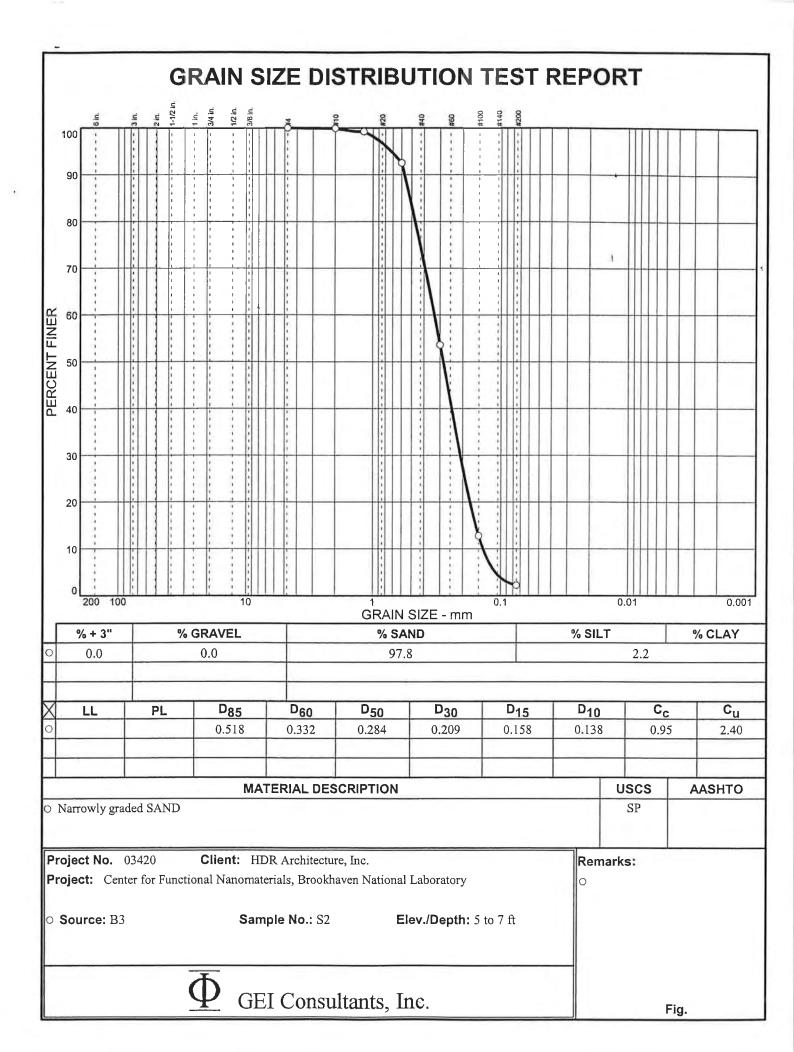
PROJE	T: GEI ECT NAME: B: FION: Long			abs IY		NEW		ID BORING CONTRACTORS OF CT., INC. 129 KRIEGER LANE GLASTONBURY, CT 06033 (860) 633-4649 (413) 733-1232 FAX (860) 657-8046		T 1 OF	G No. B-9 1	
INSPE	ER: <b>T. Roe</b> CTOR: <b>A. S</b> START: <b>10/</b> 2 FINISH: <b>10/</b> 2	Smart 29/03	I			HAN	PE E I.D. MMER WT. MMER FALL	Casing Sampler Core Barrel SA SS 4" 1-3/8" 140 30"	FILE NO. GEI-LongIsland, NY SURFACE ELEV. LINE & STATION OFFSET			
No.	DEPTH RANGE IN FEET	SAI 0-6	MPLE BLOWS ON SA 6-12	PER 6" MPLER 12-18	18-24	REC.	CASING BLOWS/ CORING TIMES PER FT.			Well Cons.	Installation Details	
S1	0'-2'	1	6	6	5	20"		8" Dark Brown Topsoil Black Fine Sand, Trace of Roots, Ash, Brick	6			
S2	5'-7'	1	2	1	1	24"		Brown Fine Sand, Some Silt - Fill Light Brown Fine Sand	7.0			
S3	10'-12'	5	5	4	7	18"		End of Boring @ 12' No Water	12.0			
NOTES:	<ol> <li>The stratification approximate bou types. Transition</li> </ol>	ndary betwe	en soil	in the condition Fluctua water m than the	drill holes at ons stated o llons in the nay occur de	ngs have be t times and on the boring e level of g ue to factors t at the lime de.	under glogs. round- solher	REMARKS:				

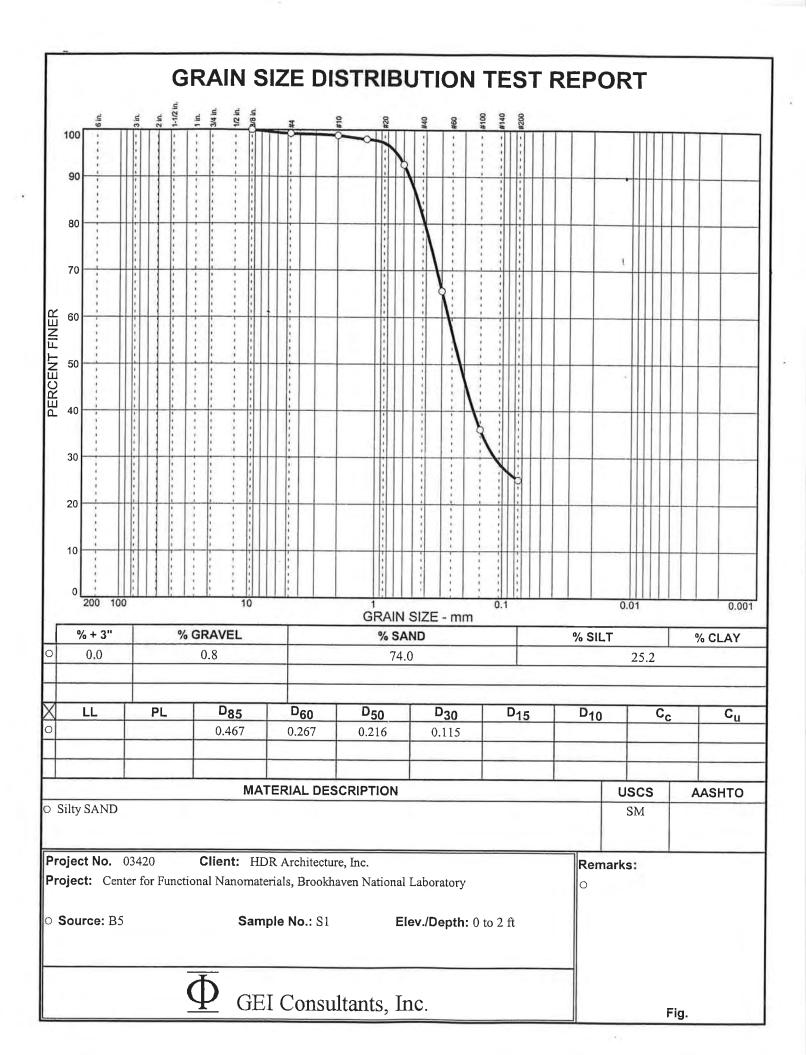
CLIEN	T: GEI				Т	NEW		D BORING CONTRACTORS OF CT., INC.	<b></b>	BORING	∋ No. B-10
PROJE		rookh	aven					129 KRIEGER LANE GLASTONBURY, CT 06033	SHEE	T 1 OF	1
LOCAT	Nation: Long	ation Isla	al, La	abs IY				(860) 633-4649 — (413) 733-1232 FAX (860) 657-8046	ARCH ENGIN	ITECT/ IEER	
DRILLE	ER: T. Roe	2			F				FILE N	O. GEI-	LongIsland,
INSPE	CTOR: A. S	mart				TYP		Casing Sampler Core Barrel SA SS		NY ACE ELEV.	
DATE	START: 10/:	29/03	1				E I.D. MMER WT.	4" 1-3/8" 140	1	STATION	
DATE	FINISH: 10/2	29/03				HAN	MER FALL	30"	OFFSE		
		-					CASING BLOWS/				
No.	DEPTH RANGE IN FEET	0-6	BLOWS ON SA	MPLER 12-18		REC.	CORING TIMES PER FT.	FIELD CLASSIFICATION AND REMARKS		Well Cons.	Installation Details
S1	0'-2'	1	4	3	3	24"		_ Dark Brown Topsoil			
							1	Brown Fine Sand, Some Silt - Fill	1.0		
S2	5'-7'	2	4	6	5	24"		Light Brown Fine Sand, Trace of Gravel, Stratif	5.0 ied		
								End of Boring @ 7'	7.0		
								No Water			
							. 1				
		100									
	1										
NOTES;	1) The stratification approximate bou	indary betwe	en soil	in the	drill holes at	ngs have bee t times and	under	REMARKS:			
	types. Transitio	ns may be g	radual.	condit Fluctu water than th	lons stated o atlons in th may occur d nose presen	on the boring e level of g lue to factors at at the time	round- cound-				
				uremè	nts were ma	ue,					

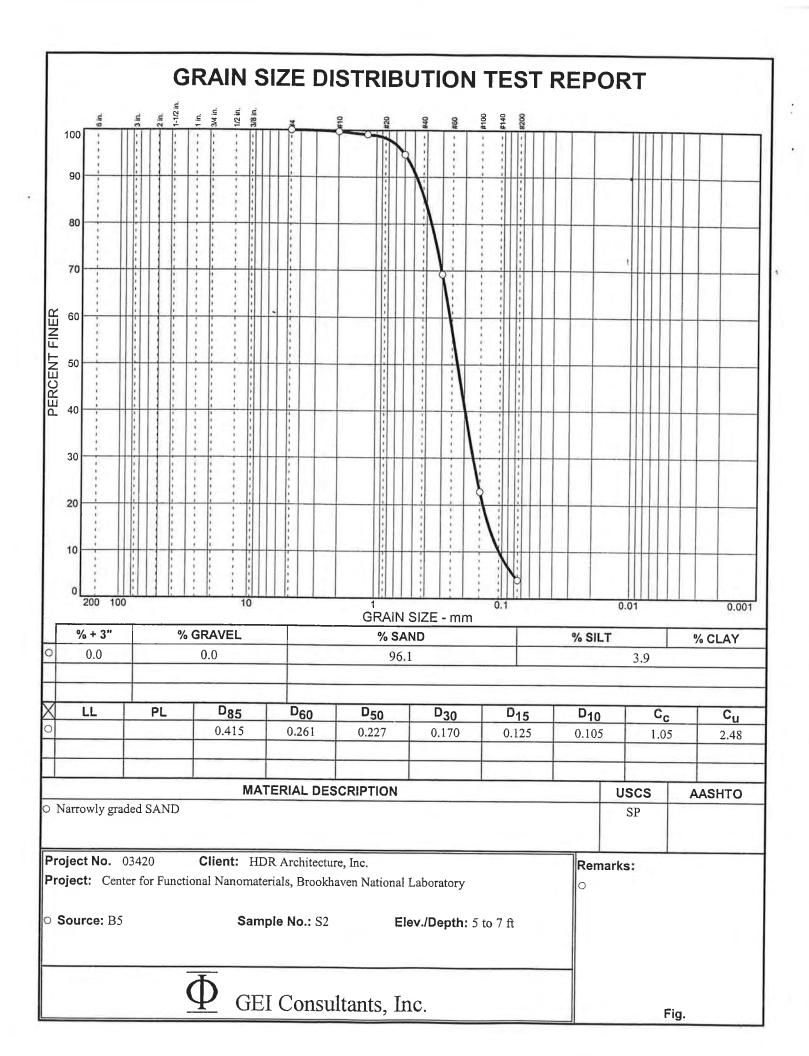
-					T	NITIAL					
CLIEN	T: GEI					NEW	le la	ID BORING CONTRACTORS OF CT., INC.			G No. B-12
PROJE	CT NAME: B	rookh	aven					129 KRIEGER LANE GLASTONBURY, CT 06033	SHEET	F 1 OF	1
LOCAT	ION: Long	ation Isla	hal, L	abs NY				(860) 633-4649 - (413) 733-1232 FAX (860) 657-8046	ARCHI ENGIN		
DRILLE	ER: T. Roe	2			H						T
	CTOR: A. S	mant				TYF		Casing Sampler Core Barrel		NY NCE ELEV.	LongIsland,
						SIZ	E I.D.	HSA SS 3-1/4" 1-3/8"	SURF	ACE ELEV.	
	START: 10/						MMER WT. MMER FALL	. 140 . 30"	LINE &	STATION	
DATE	FINISH: 10/	_	MPLE				CASING		OFFSE	Т	
	DEPTH		_	S PER 6	-	r	BLOWS/			Well	
No,	RANGE IN FEET	0-6	ON SA 6-12	MPLER	1	REC.	CORING TIMES	FIELD CLASSIFICATION AND REMARKS		Cons.	Installation Details
		0-0	0-12	12-18	10-24	-	PER FT.				
S1	0'-2'	1	2	3	2	24"	1	N <sup>8"</sup> Dark Brown Topsoil			
								Brown Fine Sand, Little Silt - Fill	.0		
	-1-1							Brown Fine Sand, Stratified	4.0		
S2	5'-7'	2	5	8	8	24"					
	401.401	-	•								
S3	10'-12'	5	9	9	11	24"					
					- 61						
S4	15'-17'	4	5	5	F	2.4"					
34	13-17	4	5	5	5	24"		Alternating 4"-10" Layers of Brown Fine Sand a Brown Fine Sand, Little Silt	nd		
S5	20'-22'	7	11	18	10	24"					
55	20-22	ľ '	11	10	19	24		Light Brown Fine-Med. Sand, Trace of Gravel, Stratified			
S6	25'-27'	4	5	8	8	16"		Cobbles @ 22' to 24' Depth			
			Ū	U.	U U	10		Light Brown Med. Sand, Little Gravel, Stratified			
S7	30'-32'	9	12	14	18	20"					
									32.0		
								End of Boring @ 32' Water @ 30' +/-			
								Ŭ,			
		i.									
											1
							2				
	18				- 1						
							1				
		r'il T									
NOTES:	1) The stratification approximate box	n lines repre	sent the	2) Water	level readir	ngs have be	en made	REMARKS: Note: B-11 was Omitted			
	types. Transilio	ins may be g	radual.	condit Fluctu	ions stated o atlons in th	t linnes and on the boring a level of g	g logs. round-				
				than th	may occur d nose presen nts were ma	lue to factors at at the time ide.	meas-				
					-				_		











## Appendix C

2006 Test Boring Logs



Boring Location NORTHING: EAS	TING: STATION	ON: OFFSET:	BORING
HORIZONTAL DATUM: NAD 83 VERTICAL DATUM: BNL 94 LOCATION: See Figure 2	GROUND SURF	FACE ELEVATION (FT): 74.0	<b>B-101</b> PAGE 1 of 2
Drilling Information DATE START / END: 7/20/2006 - 7/20 CONTRACTOR: New England Boring EQUIPMENT: Mobile Drill B-53 Truck	/2006 DRILLER: Jeff Leavitt_ mounted Drill Rig	BORING METHOD: Drive and	
AUGER ID/OD: N/A / N/A HAMMER TYPE: Safety Hammer WATER LEVEL DEPTHS (ft):			
GENERAL NOTES: Samples collected ABBREVIATIONS: ID = Inside Diameter OD = Outside Diameter Pen. = Penetration Leng Rec. = Recovery Length	bpf = Blows per Foot         U =           mpf = Minute per Foot         C =           th         S ≈ Split Spoon         V =	Undistrubed Tube Sample     WOR = Weight of Rods       Rock Core     WOH = Weight of Hammer       Field Vane Shear     RQD = Rock Quality Desig       = Sonic Core     OVM = Organic Vapor Met	nation F <sub>v</sub> = Field Vane Shear Strength
Casing SAMP		Sample	
Elev. Depth (ft) (ft) (ft) Core Rate (mpf) Sample (ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)	n Pen./ Blows Count Test (in) RQD Data	Classification	H <sub>3</sub> 0 Depth Remarks
	24/18 4-6-9-9	SILTY SAND (SM); fine to coarse sand, fines, 6% fine gravel, moist, dark brown, (TOPSOIL). Probable Fill, Silty Sand on auger cutting	roots
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	24/12 21-25- 27-30	WIDELY GRADED SAND WITH SILT (S fine to coarse sand, 12% silty fines, 3% f gravel, moist, light brown.	
$\begin{array}{c c} & - & 10 \\ - & 10 \\ - & 12 \end{array}$	24/10 4-8-8-9	WIDELY GRADED SAND (SW); fine to c sand, 8% fine gravel, 1% silty fines, wet, brown.	oarse light
60 - 15 + 15 + 15 + 15 + 17 + 17 + 17 + 17 +	24/10 13-15- 17-17	WIDELY GRADED SAND (SW); fine to c sand, 6% fine gravel, 3% silty fines, wet, brown.	
Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.	24/12 20-25- 32-41	WIDELY GRADED SAND (SW); fine to c sand, 5% fine gravel, 4% silty fines, wet, brown.	
Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.	CLIENT: HDR Architecture, Ir PROJECT NAME: NSLS II Ge CITY/STATE: Upton, New Yo GEI PROJECT NUMBER: 062		GEI Consultants, Inc. 455 Winding Brook Dr Glastonbury, CT 06033 860.368.5408

	ng Loc THING:		<u> </u>		EASTI	NG:		STAT	ON:	OFFSET:		В	ORING
HOR	ZONTA	LDA	TUM: N		83		STA	<b>ATION CEN</b>	TERL	.INE:		В	-101
			M: BNL Figure 2				GR	OUND SUR	FACI	ELEVATION (FT): 74.0		PA	GE 2 of 2
		Casing		_	SAMPL	E INFO	RMATIO	N	8				
Elev. (ft)	Depth (ft)	Pen (bpf) or Core Rate (mpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification		H₂0 Dəpth	Remarks
	25		6	X	25 to 27	24/12	25-27- 29-31			WIDELY GRADED SAND WITH GRAVE fine to coarse sand, 25% fine gravel, 5% fines, wet, light brown.			
45 — - -	30 		7	X	30 to 32	24/10	18-22- 24-29			WIDELY GRADED SAND WITH GRAVE fine to coarse sand, ~30% fine gravel, < fines, wet, light brown.	EL (SW); 5% silty		
40	40		8	X	35 to 37	24/6	14-16- 20-22			WIDELY GRADED SAND WITH GRAVE fine to coarse sand, 27% fine to coarse s 5% silty fines, wet, light brown.			
35 —	- 40 		9	X	40 to 42	24/8	15-16- 20-22			WIDELY GRADED SAND WITH GRAVE fine to coarse sand, ~30% fine gravel, < fines, wet, light brown.			
30 —	45		10	X	45 to 47	24/8	20-26- 35-47			WIDELY GRADED SAND WITH SILT (S fine to coarse sand, 8% silty fines, 1% fin gravel, wet, light brown.			
25 —	- 50		11	X	50 to 52	24/12	29-30- 31-28			WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~1 gravel, wet, brown. End of Boring at 52 feet	SW-SM); 0% fine		
bounda gradual at times Fluctua other fa	ry betweer Water lev and unde tions of gro	n soil typ vel readin r conditio oundwate those pr	nt approxin ngs have b ons stated er may occ resent at th a	ons ieen cur d	may be made P lue to C	ROJEC	T NAME	rchitecture, : NSLS II G oton, New Y UMBER: 06	Geoteo ork	chnical Investigation	2 8	455 Wi Glasto	o <b>nsultants, Inc.</b> inding Brook Dr nbury, CT 06033 8.5408

NORT HORIZ VERT	ZONTA		TUM: N/	ND 83 94		ST	ATION C	ENTER	LINE:	OFFSET: _ 'ION (FT) <u>:_74.(</u>		-	В	ORING - <b>101a</b> GE 1 of 1
DATE S CONTR EQUIP AUGER HAMM WATER GENER	RACTO MENT: R ID/OD ER TYP R LEVE RAL NO	/ END: R: <u>N</u> <u>Mob</u> : <u>4.2</u> : <u>4.2</u> : <u>5</u> : <u>5</u> : <u>5</u> : <u>5</u> : <u>5</u> : <u>10</u> : <u>10</u>	B/16/20 ew Englan ile Drill B- 5 in / N/A iafety Ham <b>THS (ft):</b> Samples = Inside Dia	d Borings 53 truck m nmer collected ameter	Junted dr unted dr using a 2- bpf =	III rig. CASING I HAMMER Inch diam Blows per F	D/OD: _N WEIGHT	I/A / N/A (Ibs): _1 poon. U = Und	40	BORING METH CORE INFO: HAMMER DRO	Steven Hawkin HOD: Hollow St PP (inch): 30 Weight of Rods	tem Auger		Penetrometer Strength
		Pe	D = Outside an. = Penetr ac. = Recove	ation Length	S = S	Minute per olit Spoon Direct Push		SC = So	k Core J Vane Shear nic Core	RQD =	Weight of Hammer Rock Quality Desigr Organic Vapor Mete	nation F,=	Field Var	orvane Shear Strength ne Shear Strength It Applicable, Not Measured
Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	Sample No.		E INFO Pen./ Rec. (in)	RMATIC Blows Count or RQD	Field	₫		Sam Descrip Classifi	tion &		H₂0 Depth	Remarks
70	- 5		S-1 S-2 S-3 S-4 S-5	0 to 2 to 4 to 6 to 8 to 10	24/20 24/12 24/12	3-3-4-4 4-9-9- 10			Silty fines organics, silty fines inches cc WIDELY fine to co gravel, dr WIDELY sand, ~5 <sup>4</sup> dry, brow WIDELY sand, ~5 <sup>5</sup> brown.	, ~5% fine grave 4 inches of tops ND (SM); fine to nsists of fine to GRADED SANE arse sand, ~10% y, brown. GRADED SANE 6 silty fines, ~5% n. GRADED SANE	o coarse sand, - el, dry, brown, B <u>coarse sand, Fi</u> WITH SILT (S <sup>1</sup> Sitty fines, ~5% (SW); fine to c fine to coarse (SW); fine to c (SW); fine to c	-25% ottom 5 LL. W-SM); 6 fine oarse gravel, oarse	6	Strata change estimated at 3.3 feet
			nt approxima		CLIENT:	HDR A	vrchitecht	ure, Inc.					GEI Co	onsultants, Inc.
boundary gradual. \ at times a Fluctuatio other fact measurer	Water lev and under ons of gro ors than	el readin condition undwate those pr	es, transitior ngs have be ons stated er may occu resent at the	en made r due to	PROJEC	T NAME		II Geote v York	chnical Inv )-*-1000	estigation	GEI		155 Wi Glastor	nding Brook Dr hbury, CT 06033 8.5408

NORT	ng Loo THING:				EASTI	NG:			OFFSET:		BORING
			TUM: N		83		ST	ATION CENTE	RLINE: CE ELEVATION (FT): 81.0		B-102
			Figure 2								PAGE 1 of 3
DATE CONTI EQUIP AUGE	RACTO MENT: R ID/OC	/ END: R: _N 	: _7/19/2 ew Engla ille Drill B A / N/A	and    -53	Truck m	ounted D	rill Rig CASING I	: _Jeff Leavitt	BORING METHOD: Drive and W.	ash	
					er			WEIGHT (Ibs):			
				-				¥ 36.50 7/20/2 er split spoon	1.55 pm		
ABBRE	EVIATION	O Pe	) = Inside [ D = Outsid en. = Pene ec. = Reco	le Dia tratio	ameter on Length	mpf = S = Sp	Blows per F Minute per blit Spoon Direct Push	Foot C = R V = F	istrubed Tube Sample WOR = Weight of Rods k Core WOH = Weight of Hammer d Vane Shear RQD = Rock Quality Designatio onic Core OVM = Organic Vapor Meter	S <sub>v</sub> = Poo n F <sub>v</sub> = Fiel	cket Penetrometer Strength cket Torvane Shear Strength Id Vane Shear Strength I = Not Applicable, Not Measu
Elev. (ft)	Depth (ft)	Pen. (bpf) or Core Rate (mpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	Sample Description & Classification		H <sub>2</sub> 0 epth Remarks
80 —	-		1	X	0 to 2	24/8	3-13-5- 4		SILTY SAND (SM); fine to coarse sand, 27% fines, 11% fine gravel, dry, brown, Contains roots, TOPSOIL Probable Fill, Silty Sand on auger cuttings.	isilty	
75	- - - -		2	X	5 to 7	24/12	8-14- 15-16		WIDELY GRADED SAND (SW); fine to coar sand, 13% fine gravel, 5% silty fines, moist, brown.		Strata change estimated at 5.0 feet
70 —	10 		3	X	10 to 12	24/10	8-10- 13-13		WIDELY GRADED SAND (SW); fine to coar sand, 9% fine gravel, 3% silty fines, moist, lig brown.		
- 65 —	- - 15 -		4	X	15 to 17	24/12	4-9-18- 18		WIDELY GRADED SAND WITH SILT (SW-S fine to coarse sand, 7% fine gravel, 7% silty fines, moist, light brown.	SM);	
- - 60	- 20 - -		5	X	20 to 22	24/12	12-18- 24-22		WIDELY GRADED SAND WITH SILT (SW-S fine to medium sand, 6% silty fines, 1% fine gravel, moist, light brown.	SM);	
boundary gradual at times Fluctuation other fac	y belweer Water lev and unde ons of gro	n soil typ vel readi r conditi oundwat those p	int approximations transitions that the set of the set	ions i been cur d	may be C made P ue to C	ROJEC	T NAME ATE:U	rrchitecture, Inc E: NSLS II Geo pton, New York	echnical Investigation D-*-1000	455 Gla	E Consultants, In 5 Winding Brook E astonbury, CT 060 0.368.5408

IORIZONT	ALDA	TUM: N	JAD	83		STA	TION CENTER	OFFSET: LINE: E ELEVATION (FT): 81.0			ORING -102
OCATION							JUND SURFAC	E ELEVATION (FT): 81.0		PA	GE 2 of 3
	Casing Pen.			SAMPL	E INFO	RMATION	0				
Elev. Depti (ft) (ft)	h (bpf) or Core Rate (mpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	Sample Description & Classification		H₂0 Depth	Remarks
55 <u>-</u> 28	5	6	X	25 to 27	24/12	27-36- 46-45		WIDELY GRADED SAND WITH SILT fine to medium sand, 10% silty fines, 3 gravel, moist, light brown.			Begins washing out ahead of casing advancement. Material too dense to drive
	D	7	X	30 to 32	24/10	37-45- 47-61		WIDELY GRADED SAND (SW); fine to sand, ~10% fine gravel, ~5% silty fines brown.	) coarse ;, wet, light		casing.
45	5	8	X	35 to 37	24/10	31-47- 61-73		WIDELY GRADED SAND WITH SILT ( fine to coarse sand, 7% silty fines, 5% gravel, wet, light brown.		¥	
40	D	9	X	40 to 41.5	18/10	39-62- 100		WIDELY GRADED SAND (SW); fine to sand, ~5% fine gravel, ~5% silty fines, brown.			
35 - 4	5	10	X	45 to 47	24/12	31-42- 49-55		WIDELY GRADED SAND WITH SILT ( fine to coarse sand, 9% fine gravel, 8% fines, wet, brown.	(SW-SM); silty		
30 - 50	0	11	X	50 to 52	24/14	29-37- 40-46		WIDELY GRADED SAND WITH GRAV fine to coarse sand, ~20% fine gravel, fines, wet, light brown.			

	ng Loo THING:		<u>1</u>		FASTI	NG:		STATI	ON:	OFFSET:		В	ORING
HORE	ZONTA	L DA	TUM: N		83		ST	ATION CEN	TERI	INE:	_	B	-102
			M: BNL Figure 2				GF	OUND SUR	FAC	E ELEVATION (FT): 81.0	-		GE 3 of 3
	[	Casing	1	_	SAMPI	F INFO	RMATIO	N	Q		_		
Elev. (ft)	Depth (ft)	Pen	Sample No.	П		Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification		H₂0 Depth	Remarks
25 —	-		12	X	55 to 57	24/14	27-32- 39-48			WIDELY GRADED SAND WITH GR fine to coarse sand, ~20% fine grave fines, wet, light brown.	AVEL (SW); el, ~5% silty		
- - 20—	60		13	X	60 to 62	24/10	30-36- 39-45			WIDELY GRADED SAND WITH GR fine to coarse sand, ~20% fine grave fines, wet, light brown.			
	65 70 75 80 80 85									End of Boring at 62 feet			
boundar gradual at times Fluctuat other fac	ry belwee Water le and unde tions of gr	n soil lyp vel readi er conditi oundwal i those p	ent approxi bes, transit ons have t ons stated ler may occur resent at the	ions been Lur d	may be made fue to	PROJEC	T NAME	L Architecture, I E: NSLS II G pton, New Yo IUMBER: 06	eote ork	chnical Investigation -*-1000	Consultants	455 W Glasto	onsultants, Inc. inding Brook Dr nbury, CT 06033 8.5408

NORT	ng Loc THING: ZONTA		_	AD	<b>EASTI</b> 83	NG:	ST			OFFSET:			oring -102a
VERT	ICAL D	ATU	N: BNL Figure 2	94			GF	ROUND SUP	RFACI	E ELEVATION (FT): 81.0			GE 1 of 1
_	ng Info												
DATE CONT EQUIP AUGE HAMM WATE GENE	START RACTOF MENT: R ID/OD IER TYP R LEVE RAL NO	/ END: R: _Nob : _4.2 E: _S L DEP TES:	8/16/2 ew Engla ile Drill B 5 in / N/A afety Hau THS (ft): Sample	nd -53 mm s co	truck mo	punted dri C	II rig. CASING II HAMMER inch diam	Jeff Leavit	/ N/A s): <u>14</u> on.	BORING METHOD: Hollow S CORE INFO: 0 HAMMER DROP (inch): _30	tem Auger		
ADDRI		O[ Pe	= Inside D D = Outside n. = Penel ec. = Reco	e Di trati	iameter on Length	mpf = S = Sp	Blows per F Minute per blit Spoon Direct Push	Foot C	C = Rock	Vane Shear RQD = Rock Quality Desig	S <sub>v</sub> = nation F <sub>v</sub> =	Pocket T Field Va	Penetrometer Strength Torvane Shear Strength The Shear Strength The Applicable, Not Measured
		Casing Pen.			SAMPL			N	LOG	Comple			
Elev. (ft)	Depth (ft)	(bpf) or Core Rate (mpf)	Sample No.	Type		Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC	Sample Description & Classification		H₂0 Depth	Remarks
80 —			S-1	M	0 to 2	24/24	4-3-2-2			SILTY SAND (SM); fine to coarse sand, silty fines, ~10% fine to coarse gravel, dr brown, Organics, 4 inches of Topsoil.	~20% y,		
-	_		S-2	M	2 to 4	24/12	3-3-3-4			SILTY SAND (SM); fine to coarse sand, silty fines, ~5% fine to coarse gravel, dry FILL.			
-	- 5		S-3	M	4 to 6	24/12	4-5-6-6			WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~50 gravel, dry, light brown.	W-SM); % fine		Strata change estimated at 4 feet
75 —	-		S-4	X	6 to 8	24/13	8-10- 11-6			WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~50 gravel, dry, light brown.			
-	- 10		S-5	M	8 to 10	24/17	8-12- 12-14			WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~50 gravel, dry, light brown.			
70	-									End of Boring at 10 feet Fill with cuttings upon completion			
- 65 —	- 15 -												
-	-												
- 60	20 												
boundar gradual, at times Fluctuati	Value Violater level readings have been made mes and under conditions stated. ctuations of groundwater may occur due to or factors than those present at the time												onsultants, Inc. inding Brook Dr nbury, CT 06033 8.5408

	ng Loc THING:		<u>1</u>		EASTI			STATION	OFFRET.		BORING
HORE	ZONTA	LDA	TUM: N	AD	83	_	ST	ATION CENTER	OFFSET:		B-103
VERT		DATU	M: BNL Figure 2	94			GF	ROUND SURFAC	E ELEVATION (FT): 73.0		PAGE 1 of 2
			- /		_		_				
DATE	RACTOF	/ END: R: <u>N</u>	8/16/2 ew Engla ile Drill B	nd E	Borings	[		_Jeff Leavitt	TOTAL DEPTH (FT): <u>32.0</u> LOGGED BY: <u>Steven Hawkin</u> BORING METHOD: Hollow S		
			5 in / N/A			(	CASING I	D/OD: N/A / N/A	CORE INFO:	tonn tugor	
			afety Ha				HAMMER 6 10:19 ai	WEIGHT (Ibs): 1	40 HAMMER DROP (inch): 30		
								eter split spoon.			
ABBRE	EVIATION	OI Pe	= Inside E D = Outsid en. = Pene ec. = Reco	e Dia tratic	ameter on Length	mpf = S = Sp	Blows per F Minute per blit Spoon Direct Push	Foot C = Roc V = Field		· S <sub>v</sub> = nation F <sub>v</sub> =	Pocket Penetrometer Strength Pocket Torvane Shear Strength Field Vane Shear Strength NM = Not Applicable, Not Measured
		Casing Pen.			SAMPL	E INFO	RMATIO	LOG V			
Elev. (ft)	Depth (ft)	(bpf) or Core Rate (mpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	Sample Description & Classification		H <sub>2</sub> 0 Depth Remarks
-	-		S-1	M	0 to 2	24/12	4-7-8-8		WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~5 gravel, dry, light brown, roots, topsoil, FI	% fine	ſ
70-	-		S-2	M	2 to 4	24/12	7-4-5-9		SILTY SAND (SM); fine to coarse sand, silty fines, ~5% fine gravel, moist, brown		
-	- 5		S-3	M	5 to	24/24	5-9-25- 46		4-5 ft: Soil cuttings similar to material ob in S-2, FILL. WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~10	W-SM);	Strata change estimated at 5
_	_		S-4	M	7 7 to	24/18	16-29- 30-35		gravel, moist, brown. SILTY SAND (SM); fine to coarse sand, silty fines, ~5% fine gravel, moist, reddis		feet
65-	-			Λ	9				9-10 ft: Soil cuttings similar to material c in S-4.	bserved	
	- 10		S-5	M	10 to 12	24/20	13-16- 16-17		WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~10% silty fines, ~5' gravel, dry, brown.		
60-	-		S-6	X	12 to 14	24/14	17-19- 19-20		WIDELY GRADED SAND WITH SILT (S fine to coarse sand, ~15% fine to coarse ~10% silty fines, dry, brown.		
-	— 15 —		S-7	V	15 to 17	24/15	4-5-6-9		WIDELY GRADED SAND (SW); fine to o sand, ~5% silty fines, ~5% fine gravel, do		
60	- - - 20 -		S-8	X	20 to 22	24/15	7-9-13- 13		WIDELY GRADED SAND (SW); fine to c sand, ~10% fine to coarse gravel, ~5% s moist, tan.		
boundar gradual at times Fluctuati other fac	y between Water lev and under ions of gro	n soil typ el readi r conditi oundwat those p	nt approxim bes, transitiongs have to ons stated er may occorresent at the s.	ions been cur d	may be made ue to	ROJEC	T NAME	rchitechture, Inc. E: NSLS II Geote pton, New York IUMBER: 062150	chnical Investigation D-*-1000		<b>GEI Consultants, Inc.</b> 455 Winding Brook Dr Glastonbury, CT 06033 860.368.5408

	ng Loc rHING:		<u> </u>		EASTI	NG:		STATI	ON:	OFFSET:		В	ORING
HORE	ZONTA	LDA	TUM: N		83	10	ST	ATION CEN	TERI	_INE:		B	-103
			I: BNL Figure 2				GR		FAC	E ELEVATION (FT): 73.0	-		GE 2 of 2
		Casing	-	_	SAMPI		RMATIO	N	0				
Elev. (ft)	Depth (ft)	Pen. (bpf) or Core Rate (mpf)	Sample No.	П		Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification		H₂0 Depth	Remarks
-	- 25		S-9	X	25 to 27	24/15	9-12- 16-17			WIDELY GRADED SAND (SW); fine to sand, ~5% silty fines, ~5% fine gravel, r	coarse noist, tan.		
45	- - 30		S-10	M	30 to 32	24/18	13-16- 19-39			WIDELY GRADED SAND (SW); fine to sand, ~5% silty fines, wet, brown.	coarse	Ţ	
-	t I			Ħ						End of Boring at 32 feet Fill with cuttings upon completion			
40	- 35 - 40 - 45 - 45												
	- 50												
Stratifica boundar gradual at times Fluctuat other fac measure	y belweer Water lev and under ions of gro	n soil lyp rel readir r conditio oundwate those pr	nt approxir es, transiti ngs have b ons stated er may occ esent at th	ions been cur d	may be made lue to	ROJEC	T NAME	rchitechture, : NSLS II G oton, New Yo UMBER: 06	eote ork	chnical Investigation -*-1000		455 W Glasto	onsultants, Inc. inding Brook Dr nbury, CT 06033 8.5408

	ng Loc THING:		1		EASTI			CTAT		OFFRET			В	ORING
HORE	ZONTA	L DA	TUM: N	IAC	83	NG:	ST	ATION CEN	ITERI	OFFSET:			R	-104
VERT		ATU	M: BNL	94			GF		RFAC	E ELEVATION (FT): 76.0	-		_	GE 1 of 1
LOCA	TION:	See	Figure 2	2									PAV	JE TOTT
	ng Info													
			-		5 - 8/16/2 Decise					TOTAL DEPTH				
			ew Engla ile Drill B			unted dri		: Jeff Leavit			Steve Hawkins OD: Hollow Stem	Auger		
								D/OD: N/A /	N/A		-			
					ier	I	HAMMER	WEIGHT (Ibs	s): <u>14</u>	HAMMER DRO	P (inch): 30			
			THS (ft): Sample	-		using a 2-	inch diam	neter split spoo	m.					
-		S: ID	) = Inside D	Diam	neter	bpf = I	Blows per F	Foot U	≈ Undi	strubed Tube Sample WOR = 1	Weight of Rods			enetrometer Strength
		P	D = Outsid en. = Pene ec. = Reco	trati	on Length	S = Sp	Minute per plit Spoon Direct Push	V		Vane Shear RQD = F	Weight of Hammer Rock Quality Designatio Drganic Vapor Meter	n Fv=Fi	ield Var	orvane Shear Strength he Shear Strength t Applicable, Not Measured
		Casing Pen		n	SAMPL	E INFO	RMATIC	)N	. OC					
Elev. (ft)	Depth (ft)	(bpf) or Core Rate	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC L	Sam Descripi Classific	tion &		H₂0 Depth	Remarks
		(mpf)	S-1		0	24/12	3-4-4-3			SILTY SAND (SM); fine to	coarse sand. ~25	%	1	
75-	-			X	to 2				$\otimes$	silty fines, slight petroleun brown, organics, FILL.				
-	_			Д										
			S-2	M	2 to	24/15	3-4-6- 16			SILTY SAND (SM); fine to silty fines, ~10% fine grav				
				M	4				$\otimes$					
-	-			H					$\otimes$	4-5 ft: Soil cuttings similar	r to material obser	ved		
	- 5		S-3	H	5	24/10	16-19-			in S-2, FILL. SILTY SAND (SM); fine to	coarse sand ~15	%		
70-	L			M	to 7		30-30			silty fines, ~5% fine grave				
				M	/				$\otimes$	FILL.				
-	-									Auger refusal encountered Fill with cuttings upon con				
-	-									i in with cuttings upon con	piction			
-	-													
-	- 10													
65-														
-	-													
-	-													
	- 15													
	15													
60 -	-													
-	-													
-	_													
1														
-	- 20													
55 —	-													
_	-													
-														
			nt approxim					l Architechture				G	El Co	onsultants, Inc.
gradual.	Water lev	el readi	oes, transiti ngs have b ions stated	been						chnical Investigation		45	55 Wi	nding Brook Dr
Fluctuati	ions of gro	undwat	er may occ resent at lt	cur c	due to	CITY/ST	ATE: U	pton, New Y	ork		IGFI 🚩			nbury, CT 06033
	ements we			าฮ เป	""  C	SEI PRO	JECT N	IUMBER: 06	\$2150	-*-1000		nts 86	60.36	8.5408

VERTICAL DATUM: BNL 94 LOCATION: ~5 feet North of B-104	TING:STATION: STATION CENTERLINE: GROUND SURFACE ELEVATION 4; See Figure 2	_ OFFSET: ON (FT): 76.0 PAGE	04a
Drilling Information DATE START / END: 8/16/2006 - 8/16 CONTRACTOR: New England Boring EQUIPMENT: Mobile Drill B-53 truck m AUGER ID/OD: 4.25 in / N/A HAMMER TYPE: Safety Hammer WATER LEVEL DEPTHS (ft): GENERAL NOTES: Samples collected ABBREVIATIONS: ID = Inside Diameter OD = Outside Diameter	DRILLER:         Jeff Leavitt           mounted drill rig.	WOH = Weight of Hammer S. = Pocket Torva	ne Shear Strength
Pen. = Penetration Leng Rec. = Recovery Length	th S = Split Spoon V = Field Vane Shear	RQD = Rock Quality Designation F <sub>v</sub> = Field Vane Sh	near Strength blicable, Not Measured
Elev. Depth (ft) (ft) (ft) Casing Pen. (bpf) or Core Rate (mpf) No. (ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)	PLE INFORMATION 00 Pen./ Blows Rec. or Data 00 (in) RQD Data	Sample Description & Depth Classification	Remarks
75	Soil cutting	is similar to B-104a S-1, FILL.	
	refusal at ~	vire encountered ~3-feet bgs. Auger -3 feet bgs. ttings upon completion	
Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.	CLIENT: HDR Architechture, Inc. PROJECT NAME: NSLS II Geotechnical Inves CITY/STATE: Upton, New York GEI PROJECT NUMBER: 062150-*-1000	stigation 455 Windi	ultants, Inc. ng Brook Dr iry, CT 06033 408

VERTICAL DATUM: BNL 94 LOCATION: ~5 feet West of B-104 Drilling Information DATE START / END: 8/16/2006 - 8/16	GROUND SURFAC	TOTAL DEPTH (FT): 32.0	BORING <b>B-104b</b> PAGE 1 of 2					
CONTRACTOR:       New England Borings         EQUIPMENT:       Mobile Drill B-53 truck m         AUGER ID/OD:       4.25 in / N/A         HAMMER TYPE:       Safety Hammer         WATER LEVEL DEPTHS (ft):       ¥ 31.00	DRILLER: Jeff Leavitt      ounted drill rig.     CASING ID/OD: N/A / N/A      HAMMER WEIGHT (Ibs): 1	LOGGED BY: Steven Hawkins BORING METHOD: Hollow Stem Auge CORE INFO:						
ABBREVIATIONS: ID = Inside Diameter OD = Outside Diameter Pen. = Penetration Lengt								
Elev. Depth (ft) Depth (ft) Elev. Depth (ft)	LE INFORMATION 90 Pen./ Blows Count Test (in) RQD Data 99	Sample Description & Classification	H <sub>2</sub> 0 Depth Remarks					
75     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       -     -       - </td <td>24/6       15-22-         27-39         24/19       9-17-         19-15         24/20       13-14-         16-16         24/12       3-4-8-7</td> <td>See boring log B-104a for sample information and description of material from 0 to 7-feet bgs. SILTY SAND (SM); fine to coarse sand, ~15% silty fines, ~5% fine gravel, dry, brown. 9-10: Soil cuttings similar to material observed in S-4. SILTY SAND (SM); fine to coarse sand, ~15% silty fines, ~5% fine gravel, moist, brown. WIDELY GRADED SAND (SW); fine to coarse sand, ~5% silty fines, ~5% fine gravel, moist, brown. WIDELY GRADED SAND (SW); fine to coarse sand, ~10% fine to coarse gravel, ~5% silty fines, dry, tan.</td> <td></td>	24/6       15-22-         27-39         24/19       9-17-         19-15         24/20       13-14-         16-16         24/12       3-4-8-7	See boring log B-104a for sample information and description of material from 0 to 7-feet bgs. SILTY SAND (SM); fine to coarse sand, ~15% silty fines, ~5% fine gravel, dry, brown. 9-10: Soil cuttings similar to material observed in S-4. SILTY SAND (SM); fine to coarse sand, ~15% silty fines, ~5% fine gravel, moist, brown. WIDELY GRADED SAND (SW); fine to coarse sand, ~5% silty fines, ~5% fine gravel, moist, brown. WIDELY GRADED SAND (SW); fine to coarse sand, ~10% fine to coarse gravel, ~5% silty fines, dry, tan.						
55 - 20 S-5 20 to 222	24/18 6-9-12- 10	WIDELY GRADED SAND (SW); fine to coarse sand, ~10% fine to coarse grave!, ~5% silty fines, dry, tan.						
Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.	CLIENT: HDR Architechture, Inc. PROJECT NAME: NSLS II Geote CITY/STATE: Upton, New York GEI PROJECT NUMBER: 062150		<b>GEI Consultants, Inc.</b> 455 Winding Brook Dr Glastonbury, CT 06033 860.368.5408					

			<u> </u>		FASTI	NG		STAT		OFESET			B	DRING
NORTHING:         EASTING:         STATION:         OFFSET:           HORIZONTAL DATUM:         NAD 83         STATION CENTERLINE:						B-104b								
VERTICAL DATUM: BNL 94 GROUND SURFACE ELEVATION (FT): 76.0							PAGE 2 of 2							
								N	0				TT	
Elev. (ft)	Depth (ft)	Pen (bpf) or Core Rate (mpf)	Sample No.	Π		Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Descriptio Classificat	n &		H <sub>z</sub> 0 Depth	Remarks
	- 25		S-6	X	25 to 27	24/12	10-15- 19-17			WIDELY GRADED SAND W fine to coarse sand, ~15% fi ~5% silly fines, dry, tan.				
45	- 30 -		S-7	X	30 to 32	24/16	7-11- 11-10			WIDELY GRADED SAND (S sand, ~10% fine to coarse g moist, tan.	SW); fine to c ravel, ~5% s	coarse ilty fines,	Ā	
										End of Boring at 32 feet Fill with cuttings upon compl	etion			
40	- 35 - 40 - 45 - 50 													
Stratific	ation lines	IADreeo	nt approxin	nate										
boundar gradual	y betweer Water lev	soil typ	es, transiti ngs have b	ons een	may be			chitechture			1			nsultants, Inc. Inding Brook Dr
at times and under conditions stated. Fluctuations of groundwater may occur due to				ue to	PROJECT NAME: <u>NSLS II Geotechnical Investigatio</u> CITY/STATE: <u>Upton, New York</u>					GEI 🕻		Glaston	bury, CT 06033	
				GEI PROJECT NUMBER: 062150-*-1000							860.368.5408			

GEOTECHNICAL BORING LOG 02 BNL NSLSII ADDITONAL BORING LOGS.GPJ GEI DATA TEMPLATE GDT 8/24/05



## Appendix D

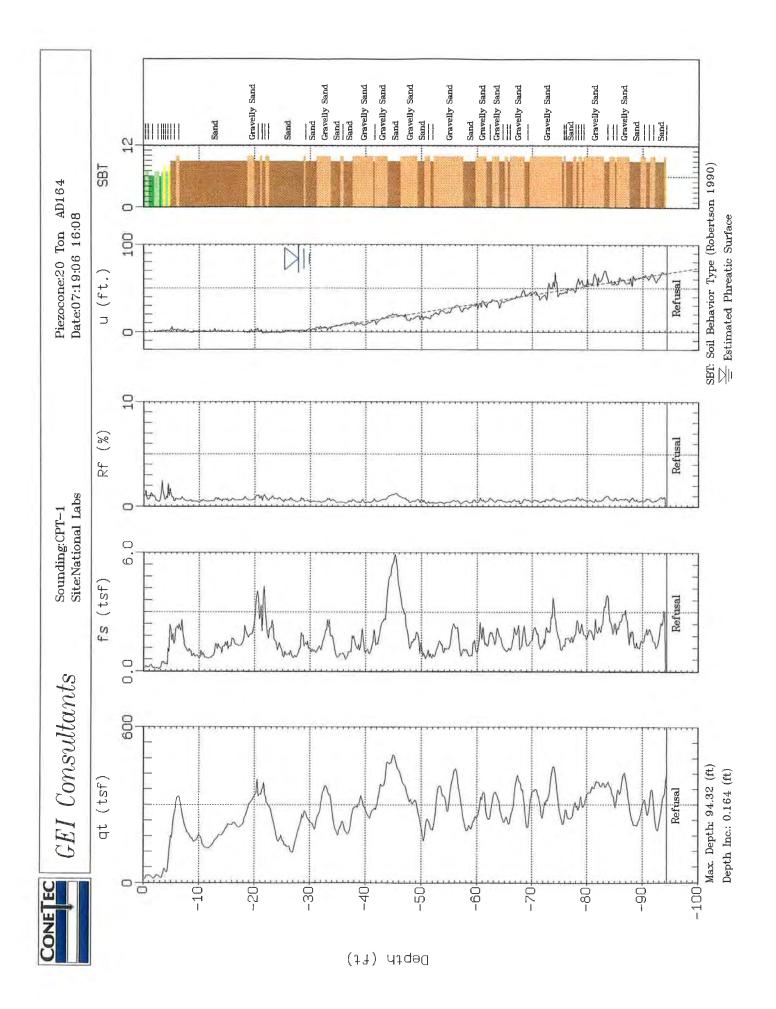
2006 Cone Penetrometer Test (CPT) Logs

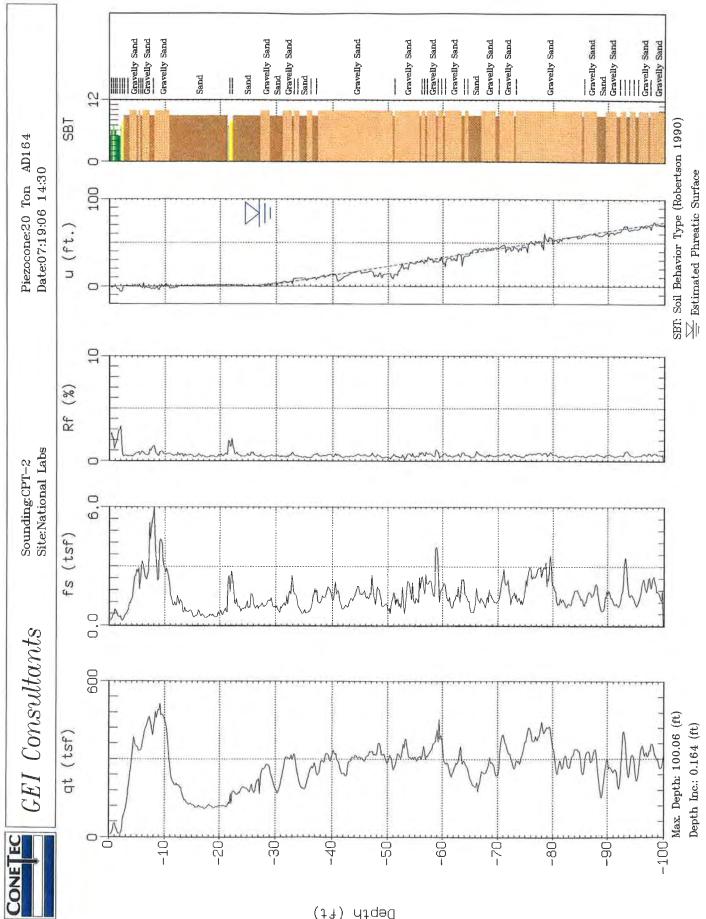


## CONETEC

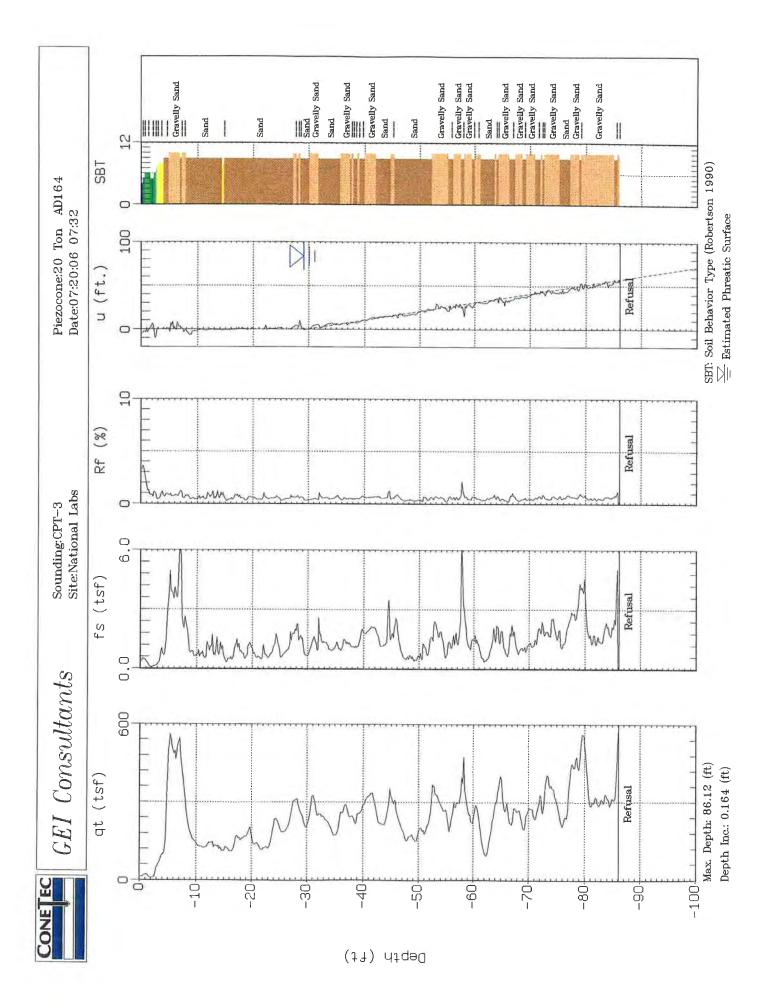
## TABLE 1 - SUMMARY OF CPTU SOUNDINGS

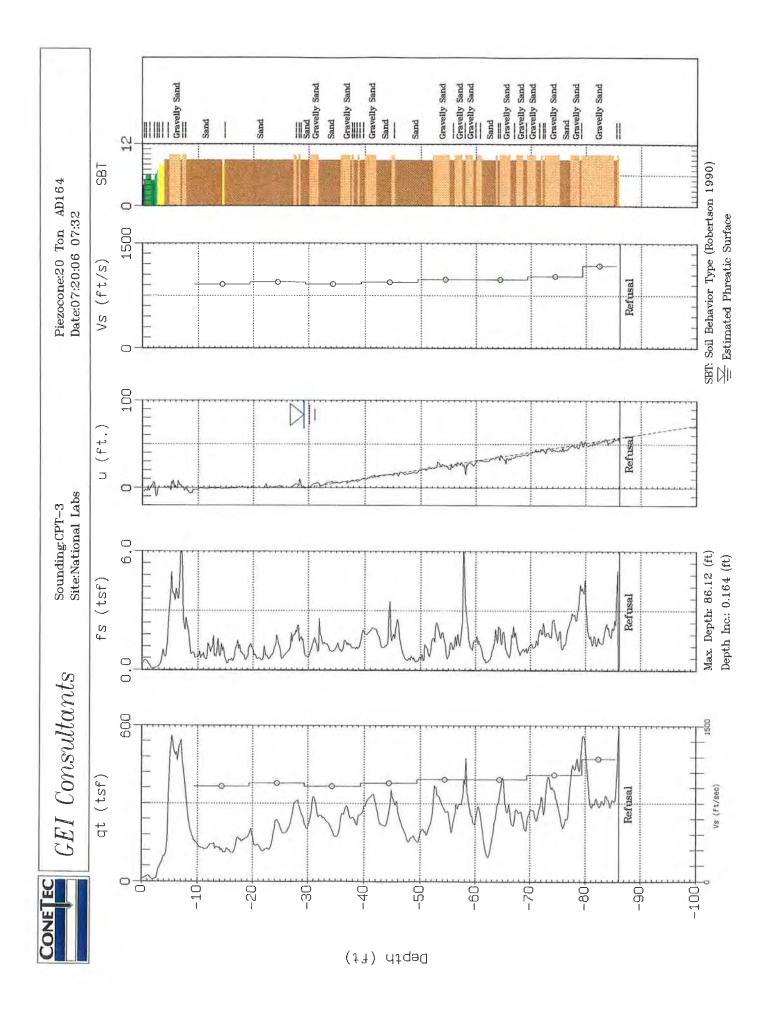
Job No.: Location: Client: Date:	06-773 Brookhaven National GEI Consultants July 19, 20, 21, 2006				
Date	CPTU Sounding	File Name	CPT Total Depth (ft)	Shear wave Velocity Tests	Comments
19-Jul-06	CPT-1	773cp01.cor	94.32		refusal
19-Jul-06	CPT-2	773cp02.cor	100.06		
20-Jul-06	CPT-3	773cp03.cor	86.12	9	refusal
19-Jul-06	CPT-4	773cp04.cor	95.14		refusal
20-Jut-06	CPT-5	773cp05.cor	7.87		refusal
20-Jul-06	CPT-5A	773cp05a.cor	82.68	9	refusal
20-Jul-06	CPT-6	773cp06.cor	100.06	10	
21-Jul-06	CPT-7	773cp07.cor	6.40		refusal
20-Jul-06	CPT-8	773cp08.cor	52.98		refusal
21-Jul-06	CPT-10	773cp10.cor	61.02		
21-Jul-06	CPT-11	773cp11.cor	73.49		
20-Jul-06	CPT-12	773cp12.cor	100.06	10	
20-Jul-06	CPT-13	773cp13.cor	6.73		refusal
20-Jul-06	CPT-13A	773cp13a.cor	5.58		refusal
21-Jul-06	CPT-14	773cp14.cor	95.80		refusal
Job Totals:		15	968.31	38	

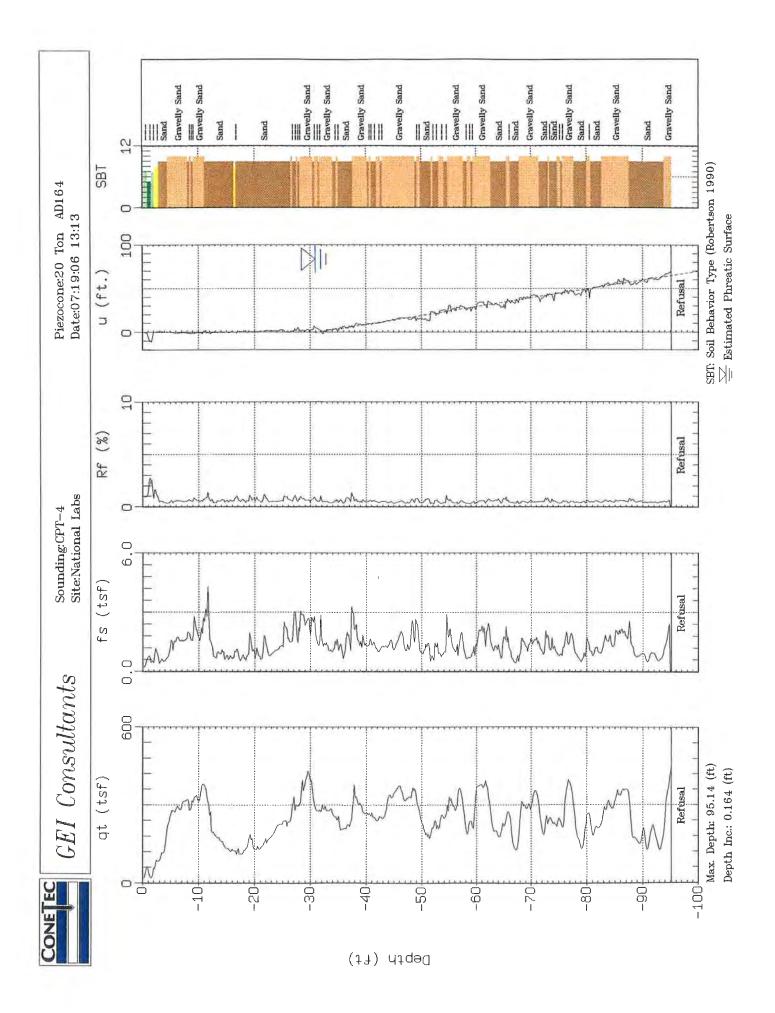


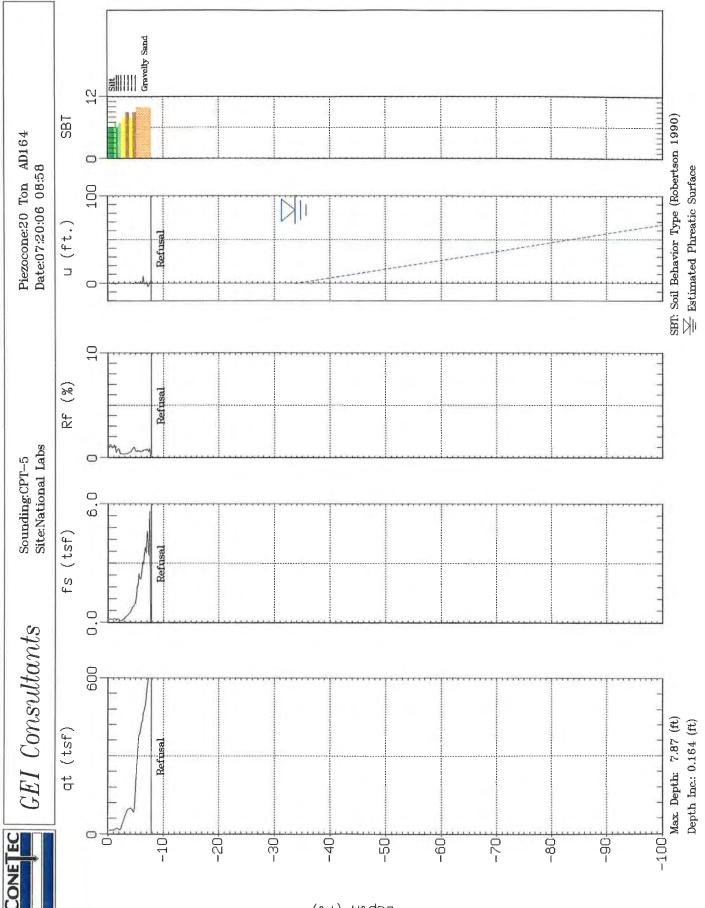


<sup>(14)</sup> AlqeQ

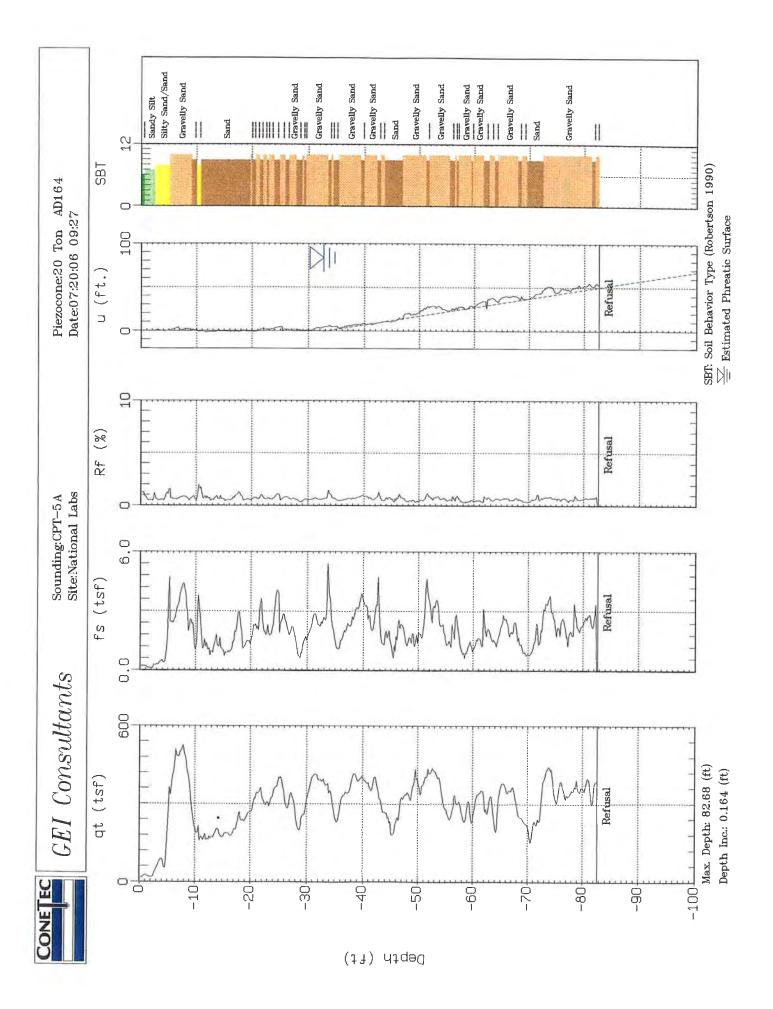


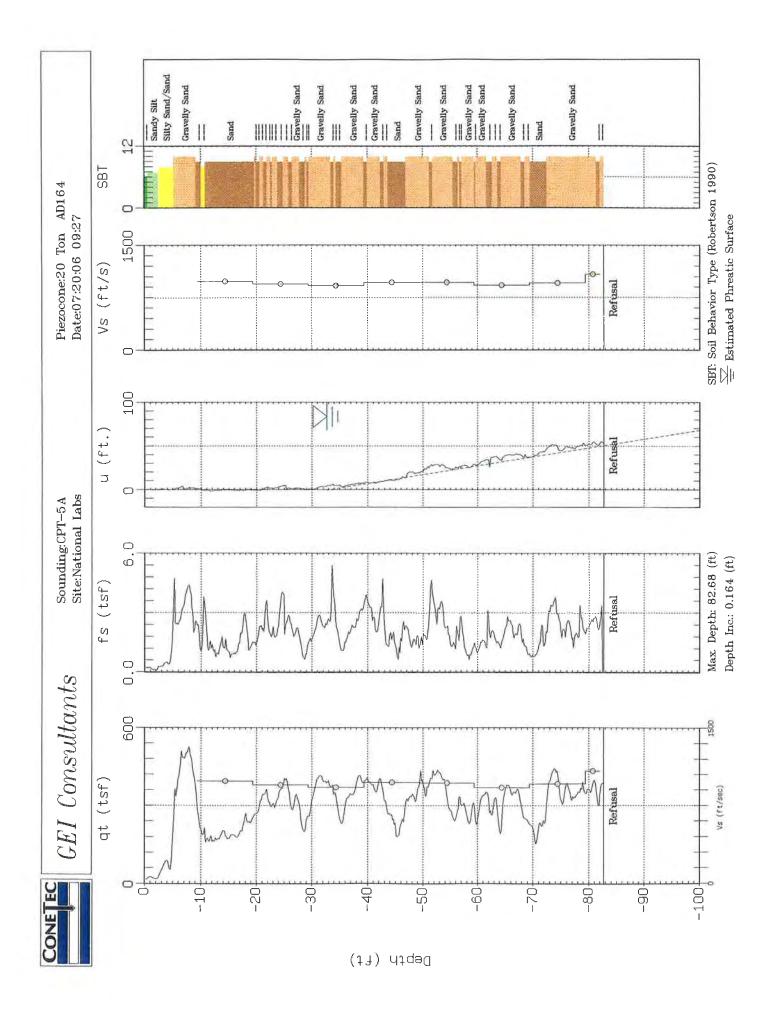


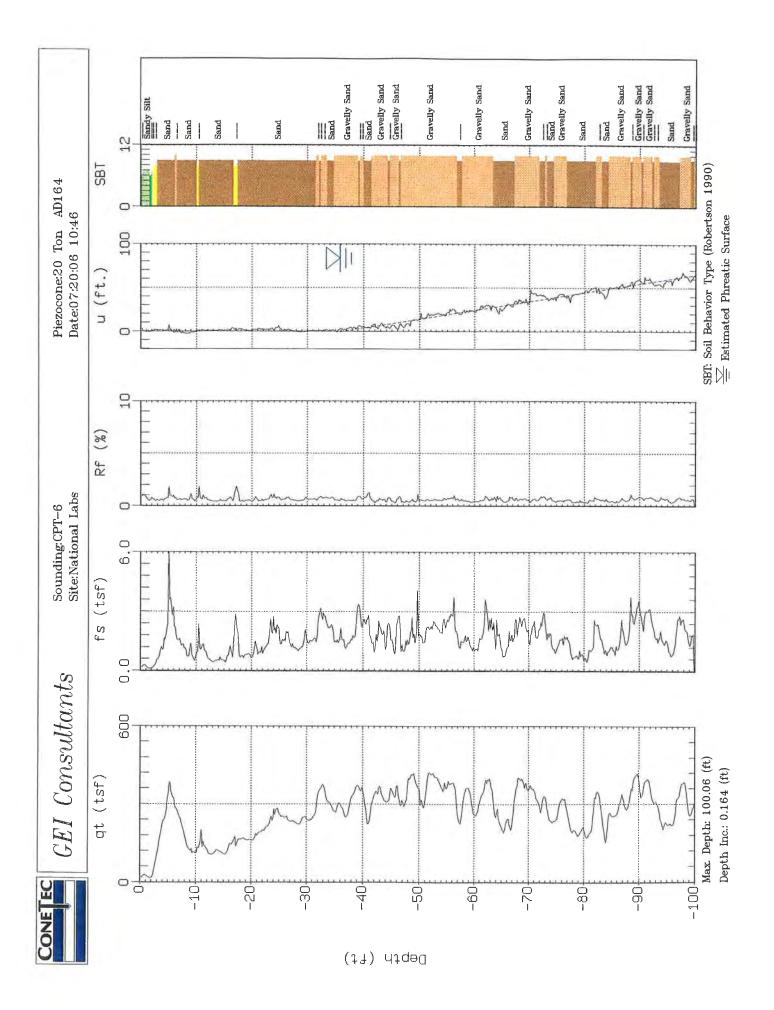


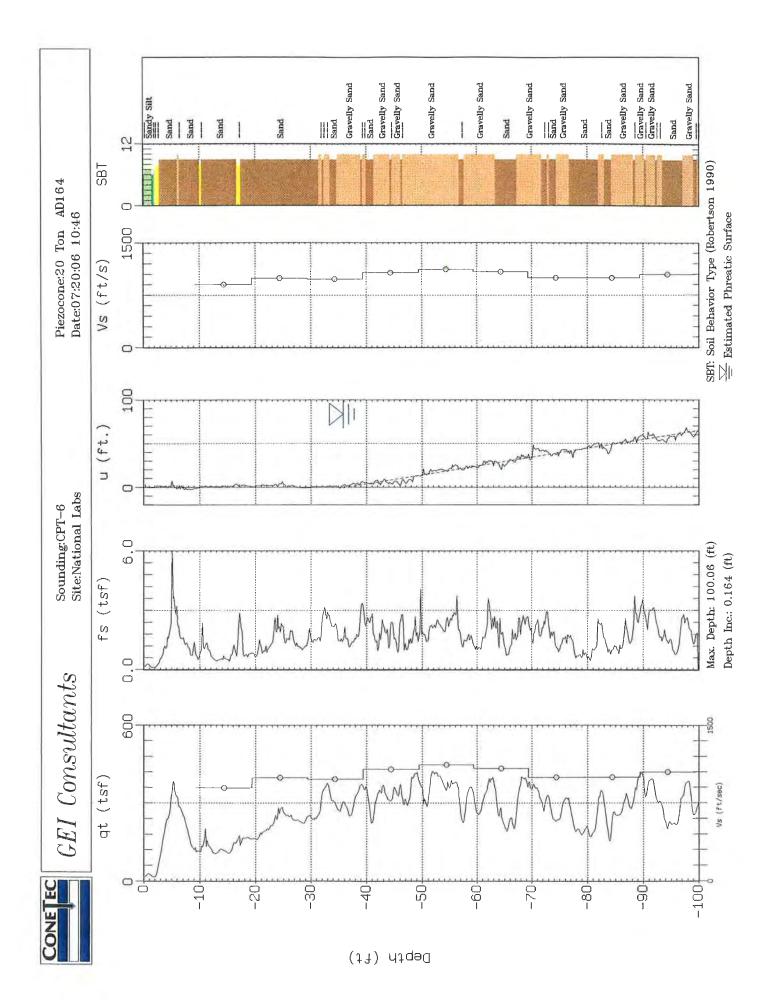


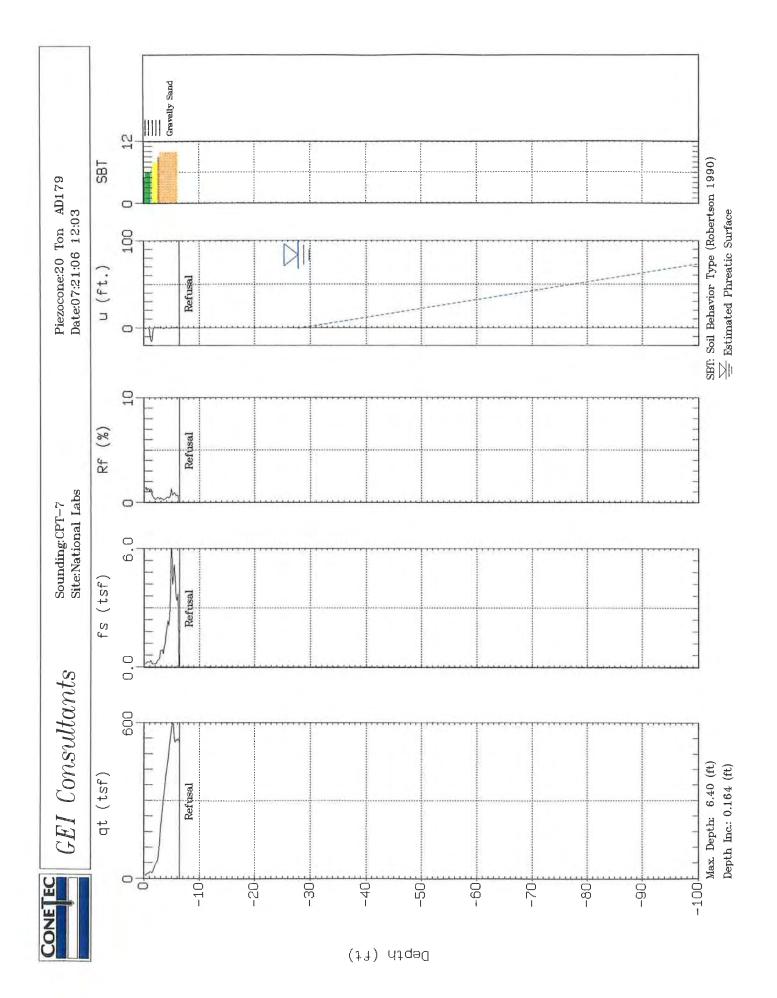
(11) И1Д9О

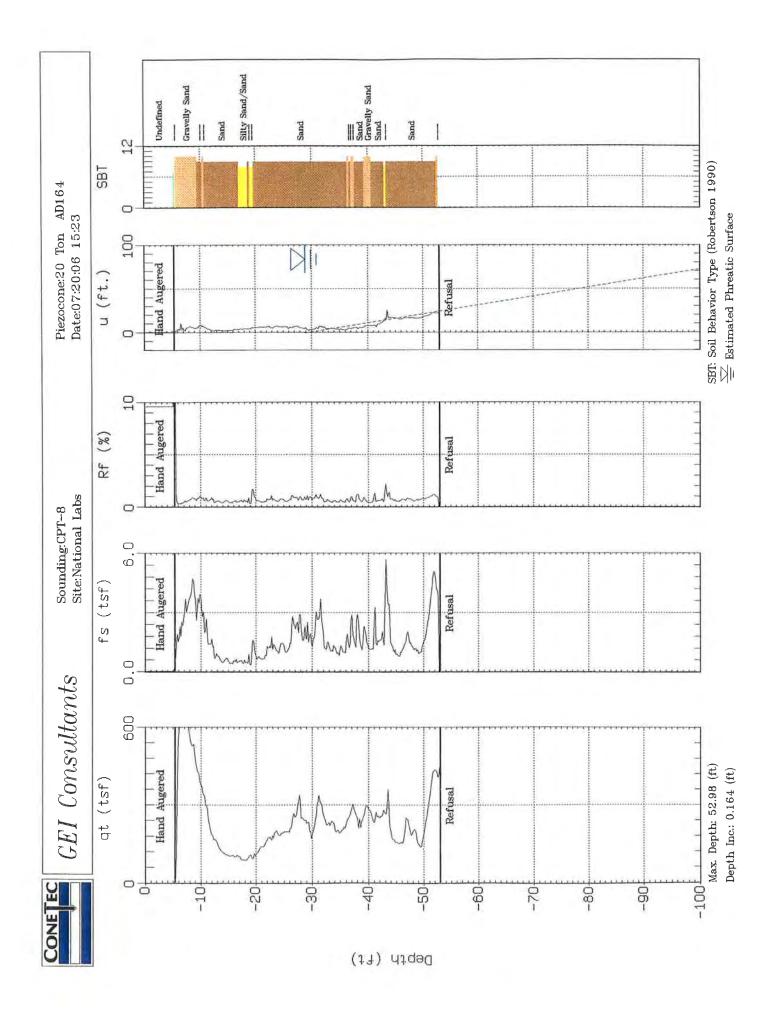


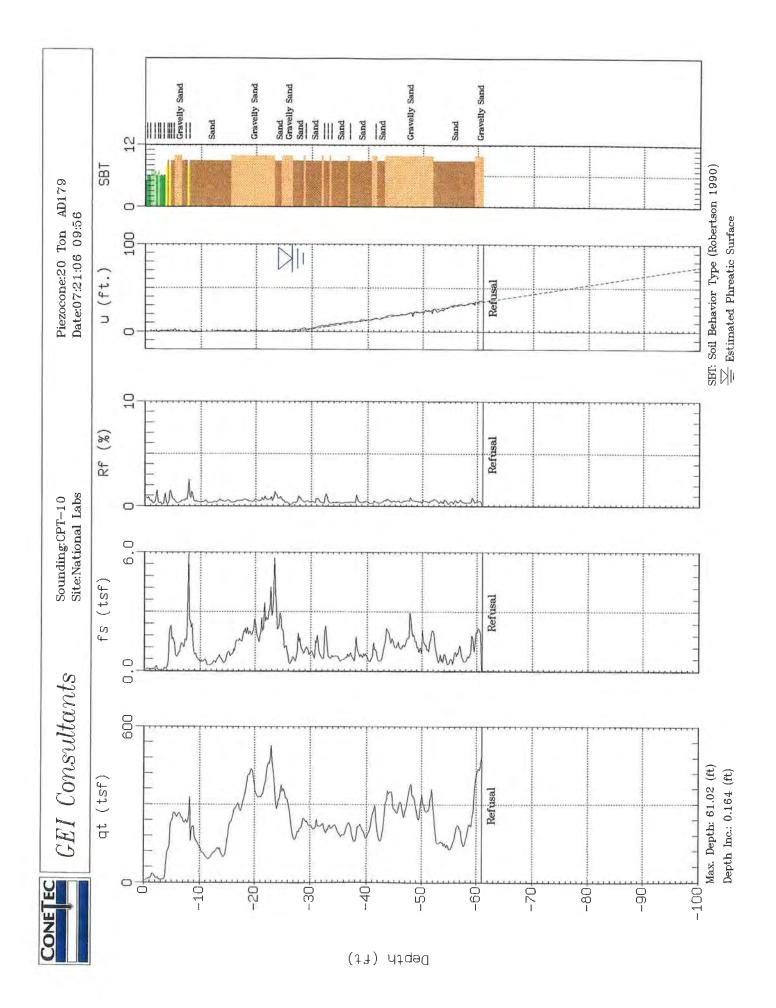


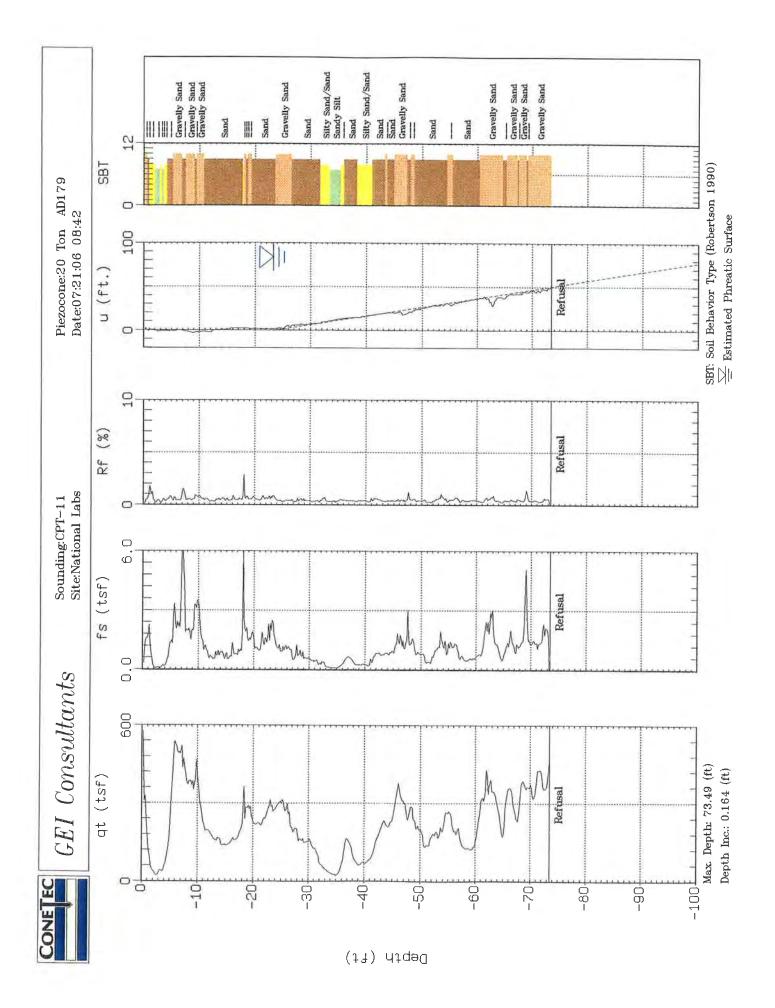


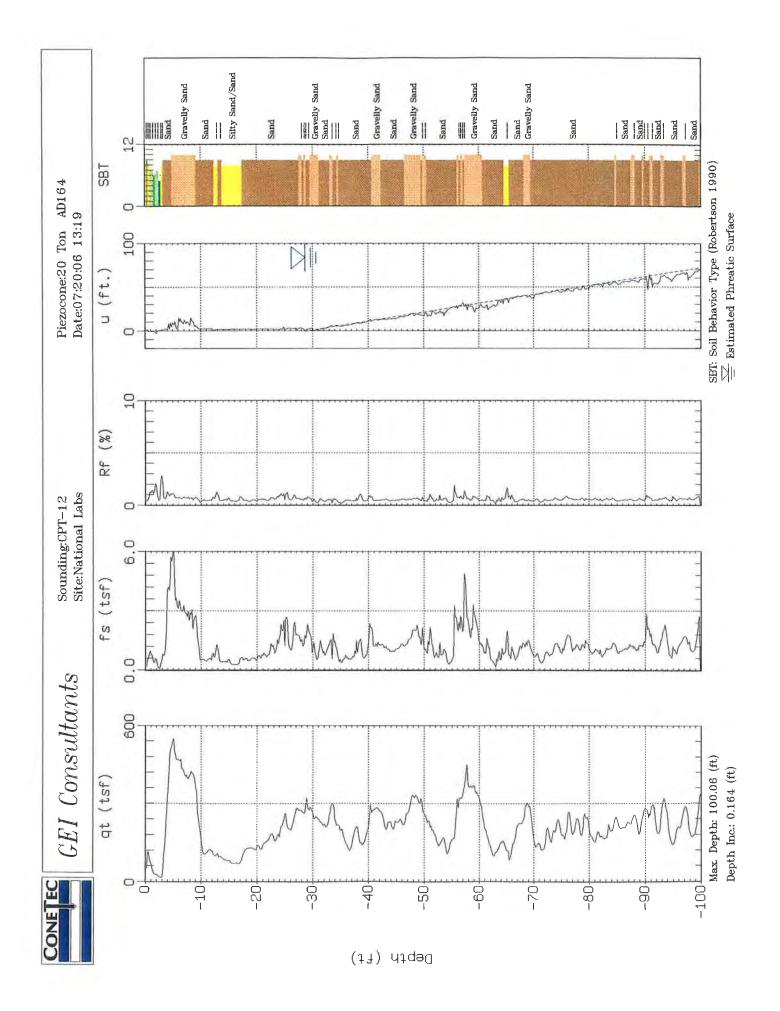


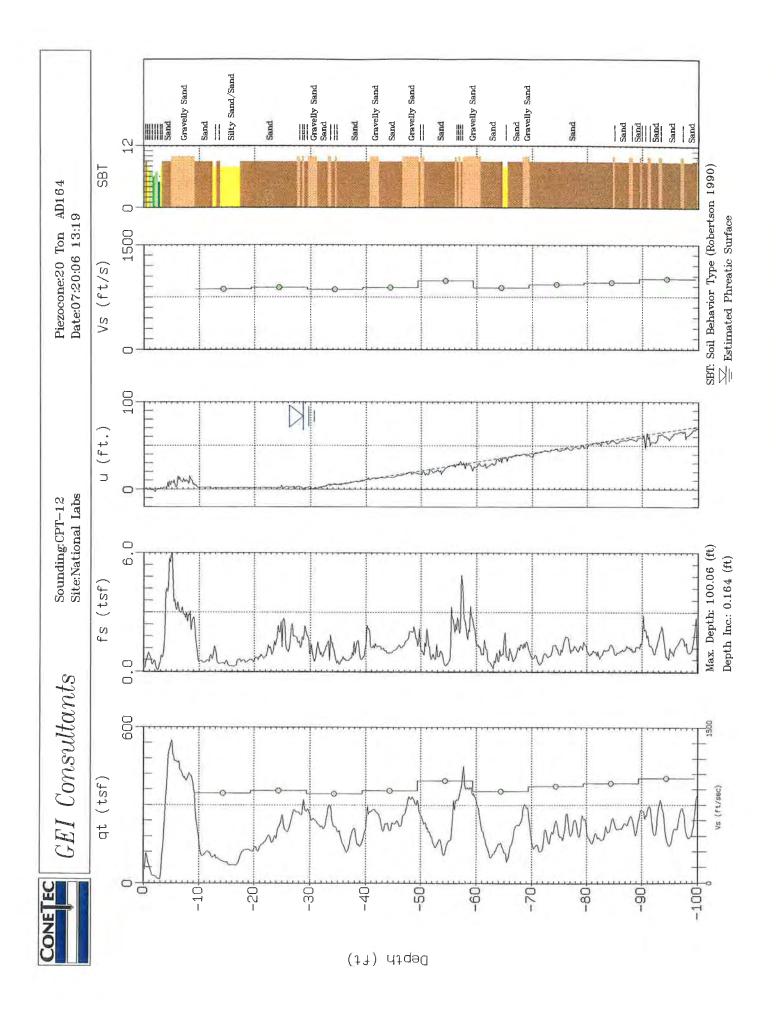


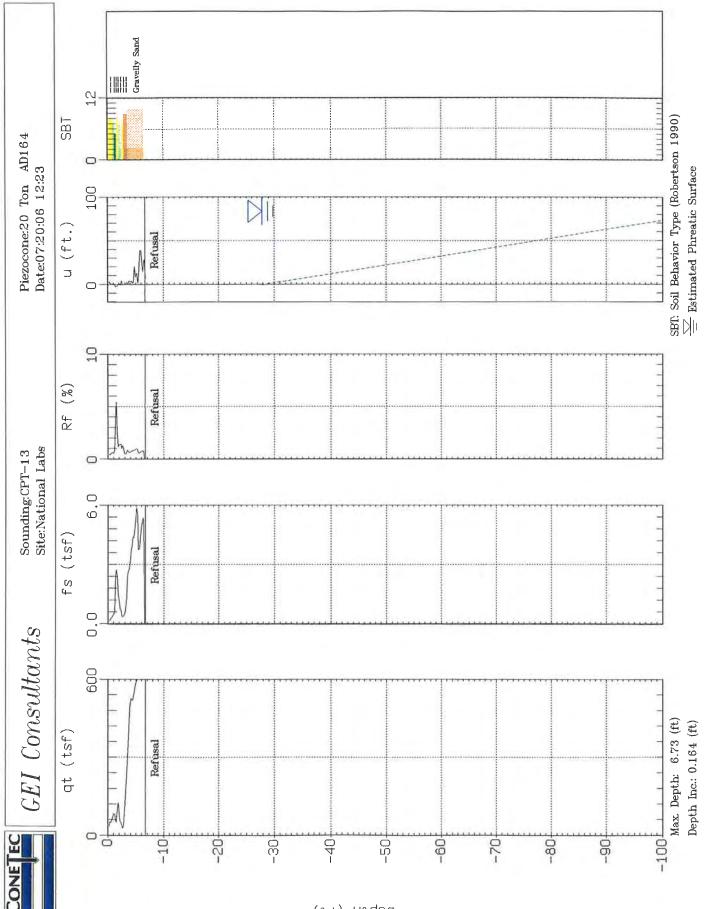




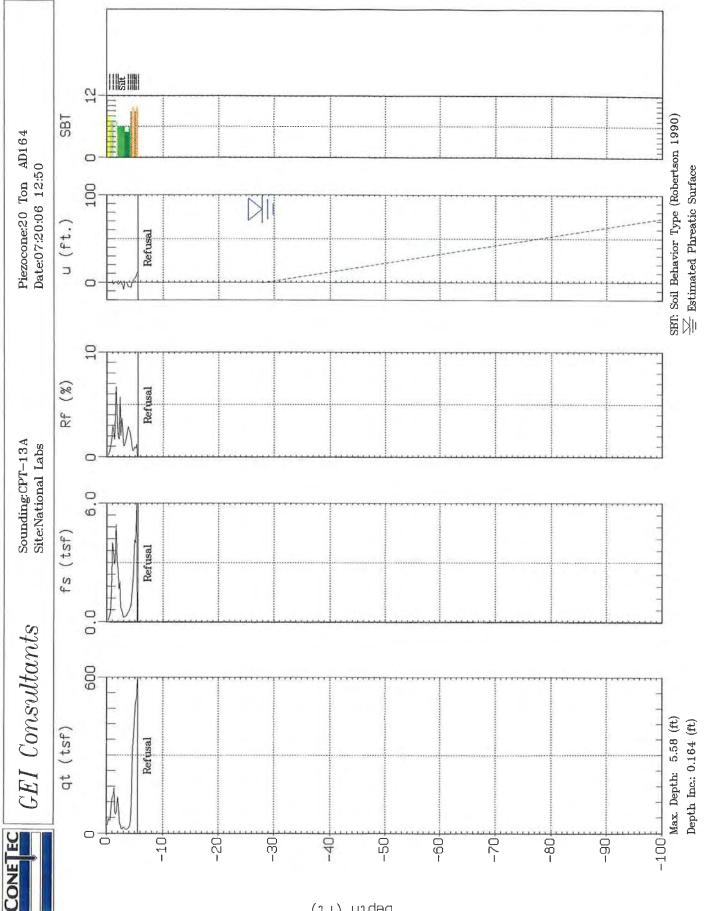




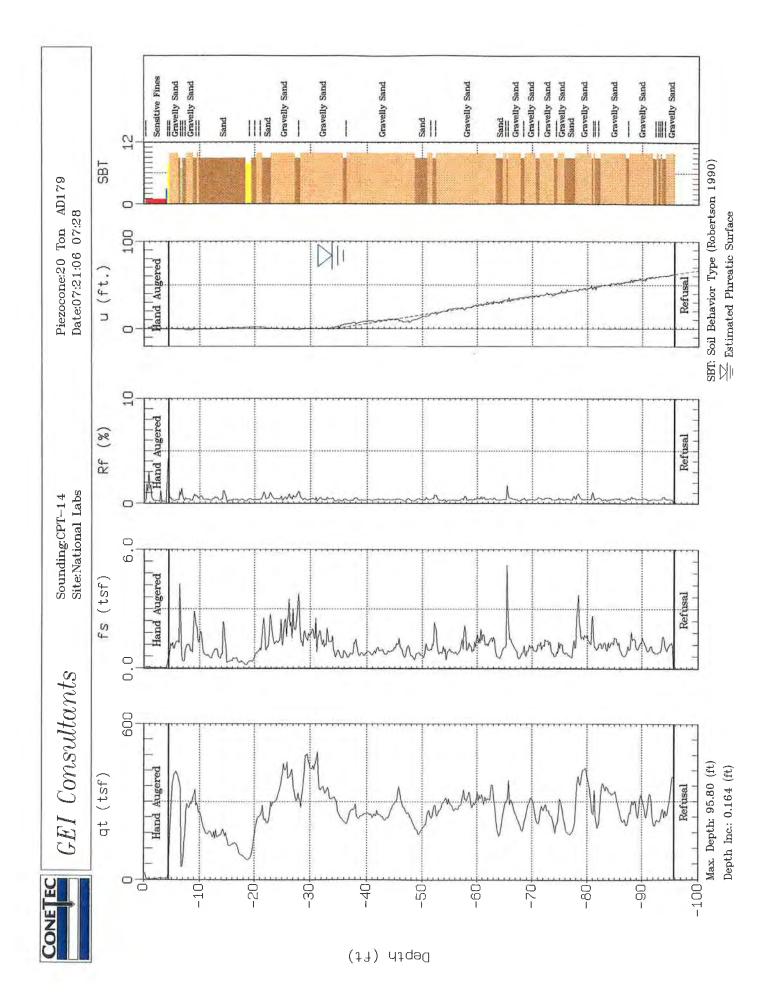




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<sup>(11)</sup> Algeb



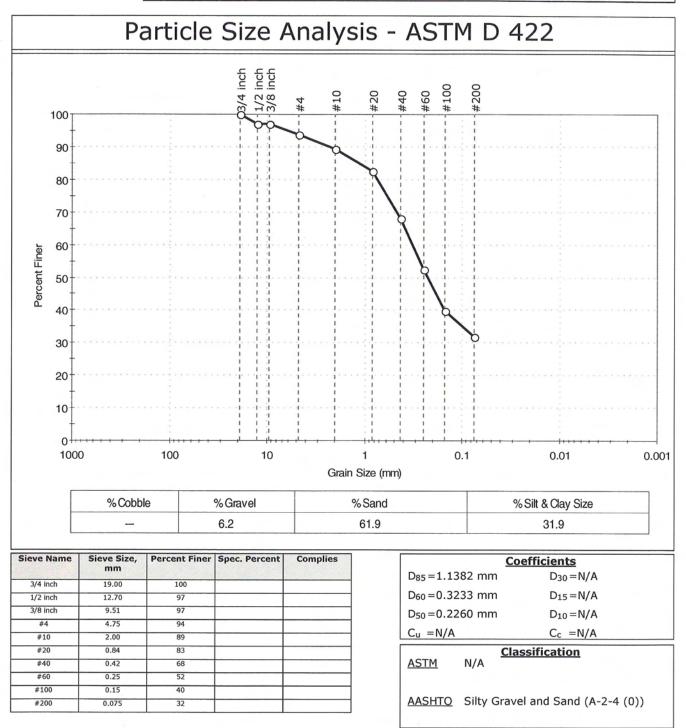
## Appendix E

Laboratory Test Results





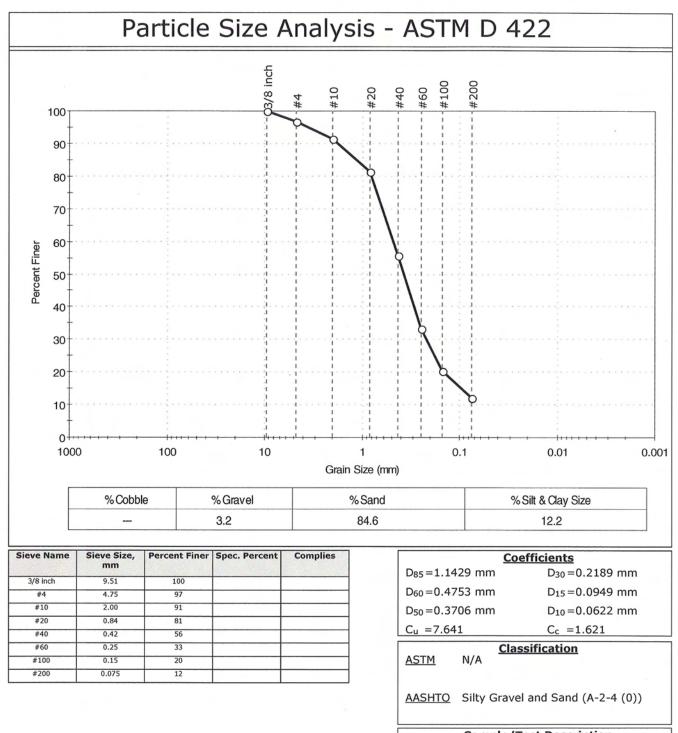
Client: GEI C	GEI Consultants			
Project: Brook	aven National Laboratory			
Location: Upton	NY Project No: GTX-6864			
Boring ID: B-101	Sample Type: jar Tested By: pcs			
Sample ID:S-1	Test Date: 08/04/06 Checked By: jdt			
Depth: 0-2 ft	Test Id: 94474			
Test Comment:	sieve stack 6			
Sample Descriptio	le Description: Moist, yellowish brown silty sand			
Sample Comment				



Sample/Test Description Sand/Gravel Particle Shape : ROUNDED Sand/Gravel Hardness : HARD



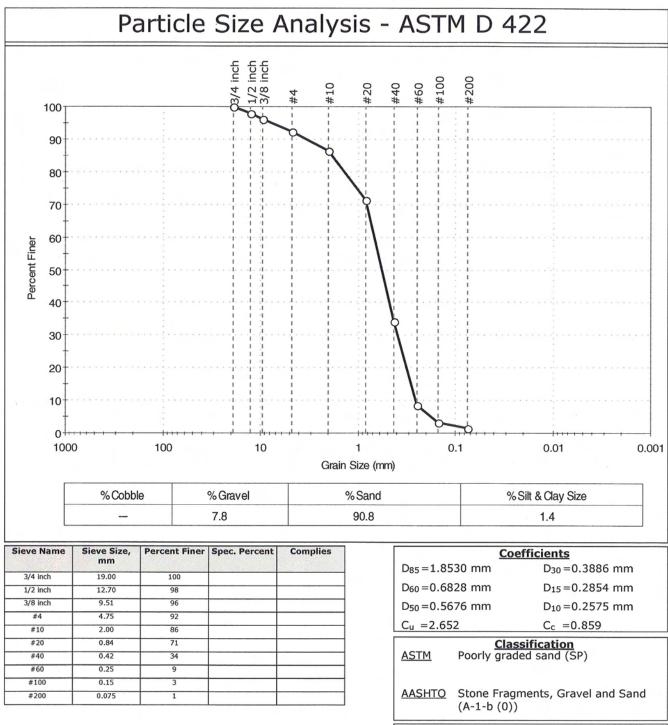
Client:	GEI Consu	ultants				
Project:	Brookhave	en National Lab	oratory			
Location:	Upton, NY	,			Project No:	GTX-6864
Boring ID:	B-101		Sample Type	: jar	Tested By:	pcs
Sample ID			Test Date:	08/04/06	Checked By:	jdt
Depth :	5-7 ft		Test Id:	94475		
Test Comm	nent:	sieve stack 6				
Sample De	scription:	Moist, light gr	ay silty sand			
Sample Co	mment:					



Sample/Test Description Sand/Gravel Particle Shape : ANGULAR Sand/Gravel Hardness : HARD



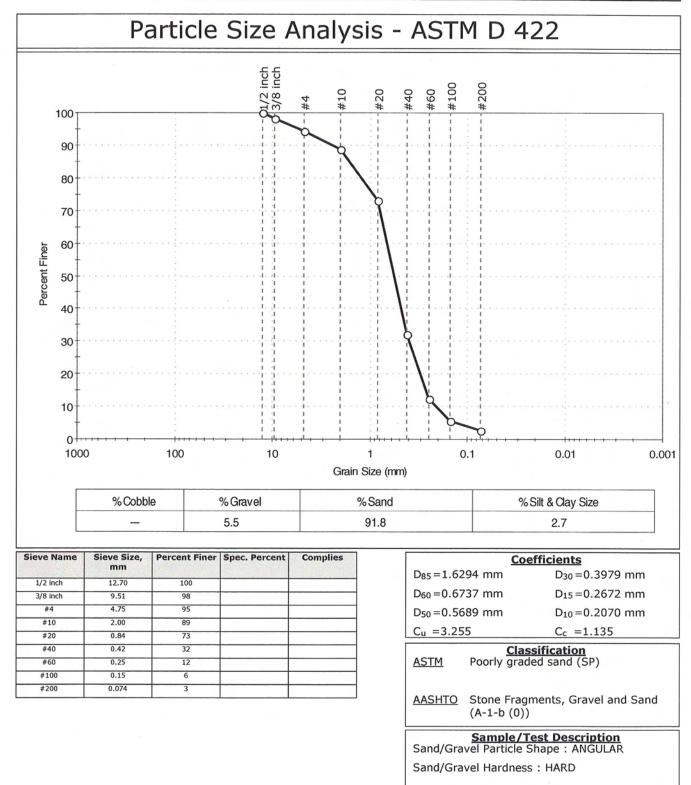
Client:	GEI Consu	ltants				
Project:	Brookhave	n National Lab	oratory			
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-101		Sample Type	: jar	Tested By:	pcs
Sample ID:	S-3		Test Date:	08/04/06	Checked By:	jdt
Depth :	10-12 ft		Test Id:	94476		
Test Commo	ent:	sieve stack 6				
Sample Description: Moist, light g		ay sand				
Sample Con	nment:					



Sample/Test Description Sand/Gravel Particle Shape : ANGULAR Sand/Gravel Hardness : HARD

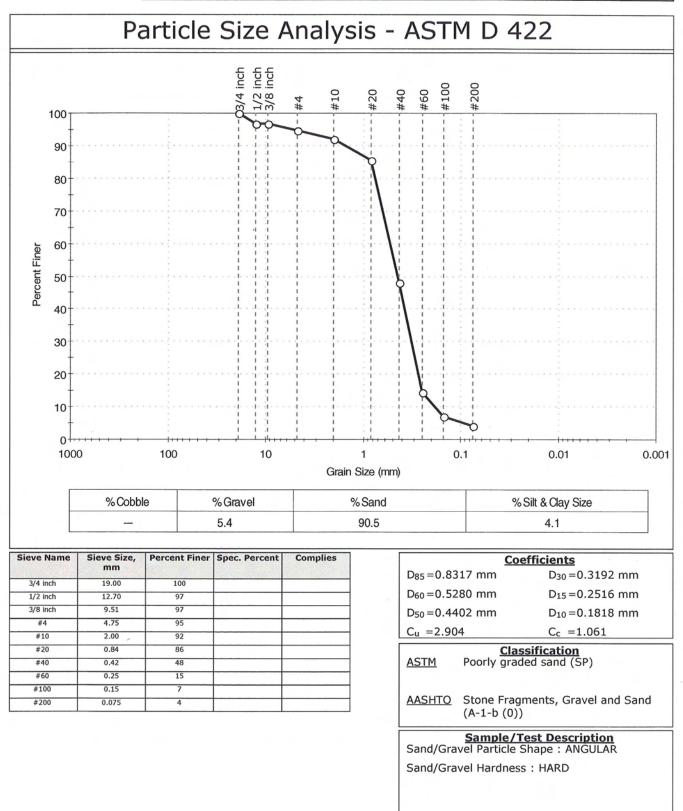


Client:	GEI Consu	GEI Consultants				
Project:	Brookhave	n National Lab	oratory			
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-101		Sample Type:	jar	Tested By:	pcs
Sample ID	:S-4		Test Date:	08/04/06	Checked By:	jdt
Depth :	15-17 ft		Test Id:	94477		
Test Comm	nent:	sieve stack 1				
Sample De	scription:	Moist, light gr	ay sand			
Sample Co	mment:					



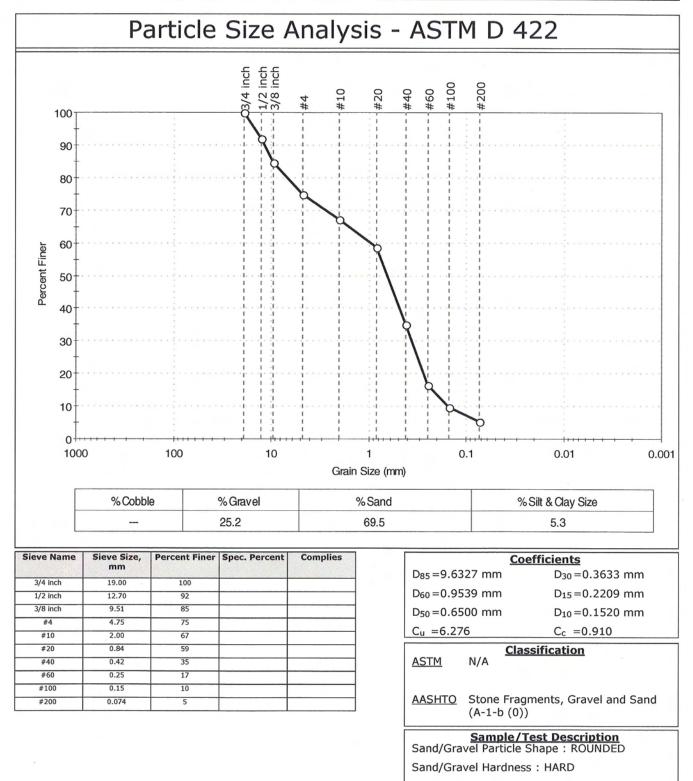


Client:	GEI Consu	GEI Consultants				
Project:	Brookhave	Brookhaven National Laboratory				
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-101		Sample Type:	jar	Tested By:	pcs
Sample ID:	):S-5		Test Date:	08/02/06	Checked By:	jdt
Depth :	20-22 ft		Test Id:	94478		
Test Comm	nent:	sieve stack 6				
Sample Description: Moist, white s		and				
Sample Co	mment:					



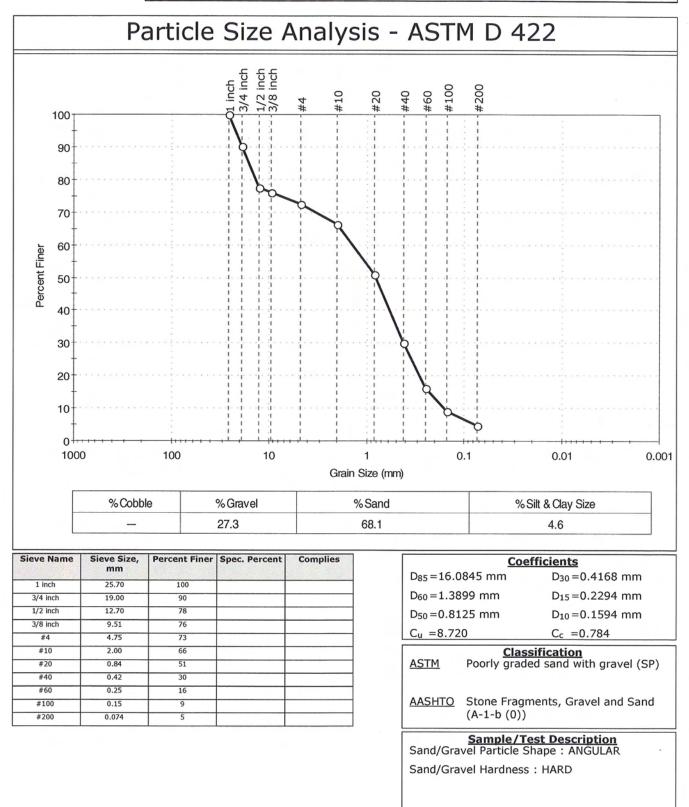


Client:	GEI Consu	ltants				
Project:	Brookhave	n National Lab	oratory			
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-101		Sample Type:	jar	Tested By:	pcs
Sample ID	:S-6		Test Date:	08/02/06	Checked By:	jdt
Depth :	25-27 ft		Test Id:	94479		
Test Comm	nent:	sieve stack 1				
Sample Description: Moist, very pale brown sand with silt and gravel						
Sample Co	mment:					



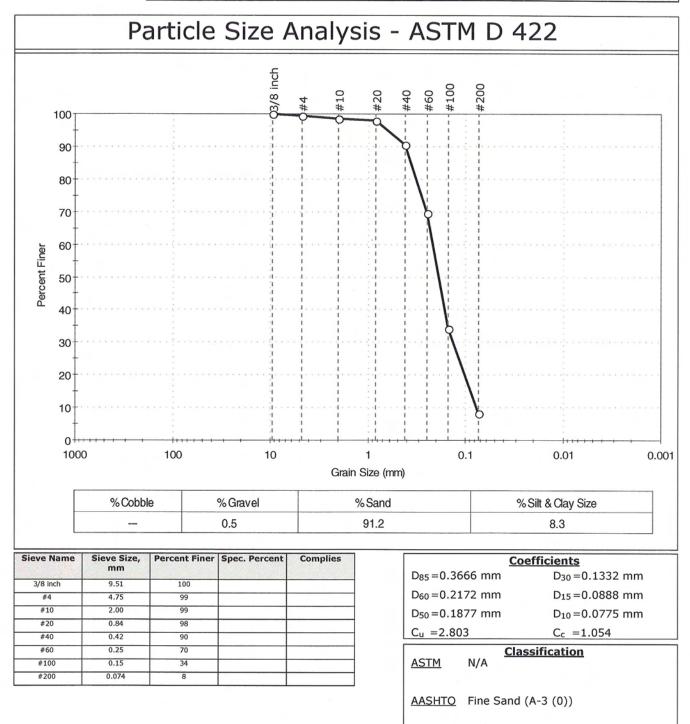


Client:	GEI Consu	Iltants				
Project:	Brookhave	en National Lab	oratory			
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-101		Sample Type:	jar	Tested By:	pcs
Sample ID	:S-8		Test Date:	08/04/06	Checked By:	jdt
Depth :	35-37 ft		Test Id:	94480		
Test Comm	nent:	sieve stack 1				
Sample Description: Moist, pale bro		own sand with	gravel			
Sample Co	mment:					





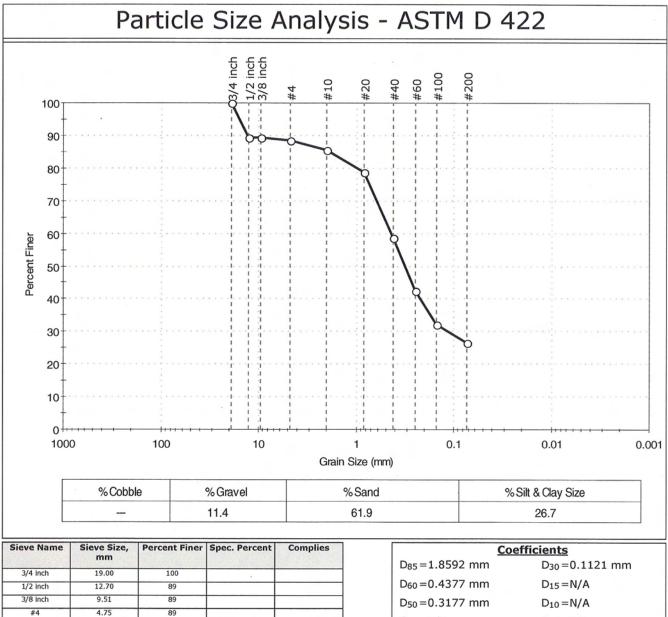
Client:	GEI Consu	GEI Consultants				
Project:	Brookhave	en National Lab	oratory			
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-101		Sample Type:	jar	Tested By:	pcs
Sample ID:	:S-10		Test Date:	08/04/06	Checked By:	jdt
Depth :	45-47 ft		Test Id:	94481		
Test Comment: sieve stack 1						
Sample Description: Moist, light yellowish brown sand with silt						
Sample Comment:						



Sample/Test Description
Sand/Gravel Particle Shape :
Sand/Gravel Hardness :



Client:	GEI Consu	ltants				
Project:	Brookhave	en National Lab	oratory			
Location:	Upton, NY				Project No:	GTX-6864
Boring ID:	B-102		Sample Type:	jar	Tested By:	pcs
Sample ID:	:S-1		Test Date:	08/04/06	Checked By:	jdt
Depth :	0-2 ft		Test Id:	94482		
Test Comm	nent:	sieve stack 1				
Sample Description: Moist, Dark yellowish brown silty sand						
Sample Co	mment:					

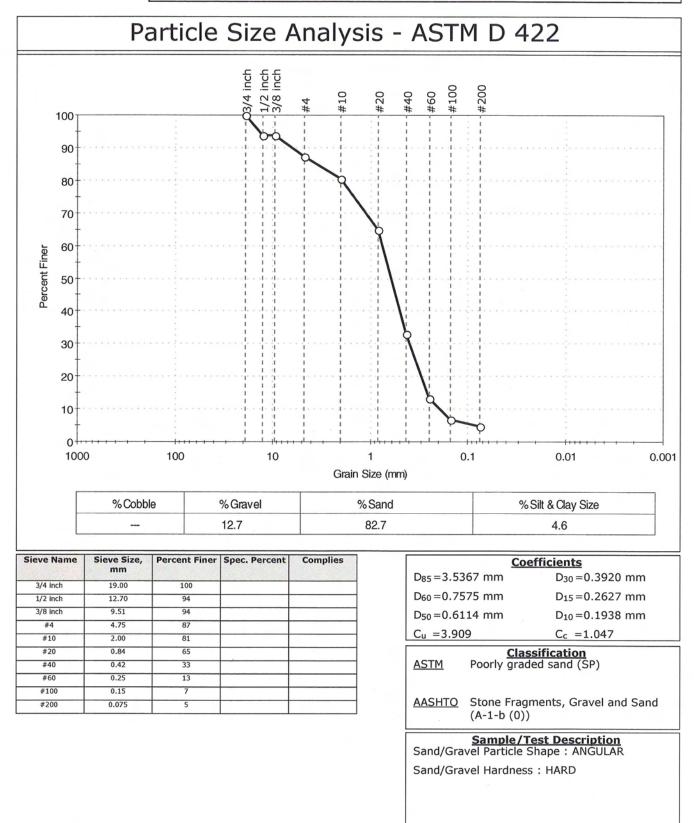


Γ	1/2 inch	12.70	89	
h	3/8 inch	9.51	89	
h	#4	4.75	89	
h	#10	2.00	86	
F	#20	0.84	79	
F	#40	0.42	59	
F	#60	0.25	42	
F	#100	0.15	32	
F	#200	0.074	27	

	coem	cients			
D <sub>85</sub> =1.85	92 mm	D <sub>30</sub> =0.1121 mm			
D <sub>60</sub> =0.43	77 mm	D15=N/A			
D <sub>50</sub> =0.31	.77 mm	D <sub>10</sub> =N/A			
$C_u = N/A$		C <sub>c</sub> =N/A			
ASTM	<u>Classif</u> N/A	ication			
<u>AASHTO</u>	Silty Gravel an	nd Sand (A-2-4 (0))			
Sample/Test Description					
Sand/Gravel Particle Shape : ANGULAR					
Sand/Gra	Sand/Gravel Hardness : HARD				

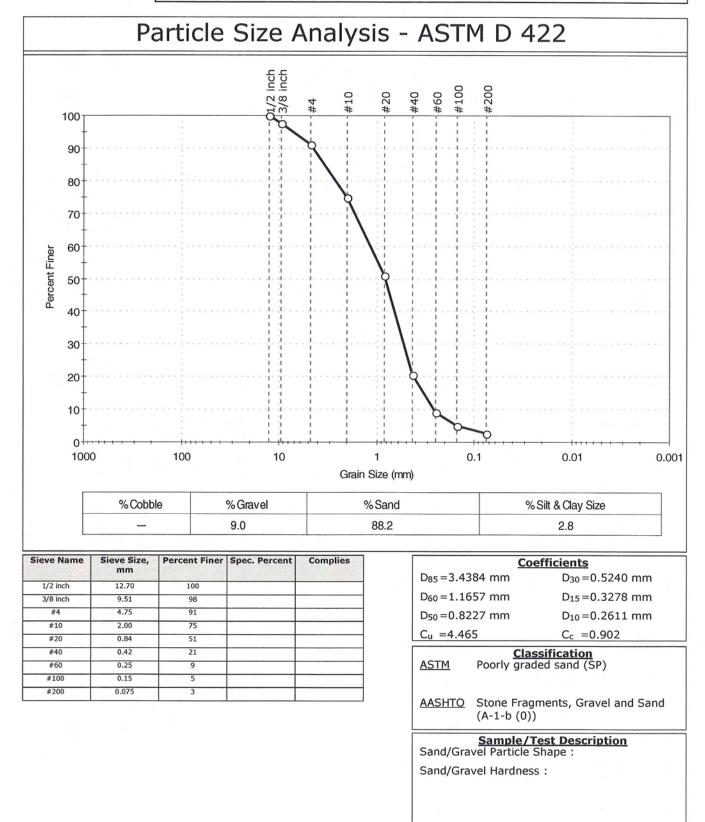


Client:	GEI Consu	ltants					
Project:	Brookhave	Brookhaven National Laboratory					
Location:	Upton, NY				Project No:	GTX-6864	
Boring ID:	B-102		Sample Type:	jar	Tested By:	pcs	
Sample ID:S-2		Test Date:	08/04/06	Checked By:	jdt		
Depth :	5-7 ft		Test Id:	94483			
Test Comm	nent:	sieve stack 6					
Sample Description: Moist, light oli			ive brown sand				
Sample Co	mment:						



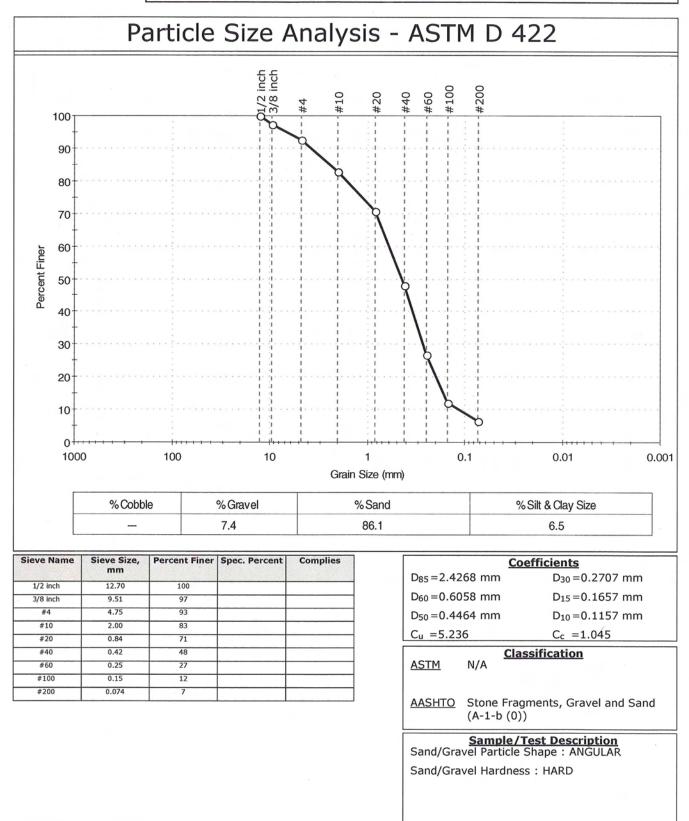


Client:	GEI Consu	ltants					
Project:	Brookhave	Brookhaven National Laboratory					
Location:	Upton, NY	•			Project No:	GTX-6864	
Boring ID:	B-102		Sample Type:	jar	Tested By:	pcs	
Sample ID	:S-3		Test Date:	08/04/06	Checked By:	jdt	
Depth :	10-12 ft		Test Id:	94484			
Test Comn	nent:	sieve stack 6					
Sample Description: Moist, light ye		ellowish brown	sand				
Sample Comment:							



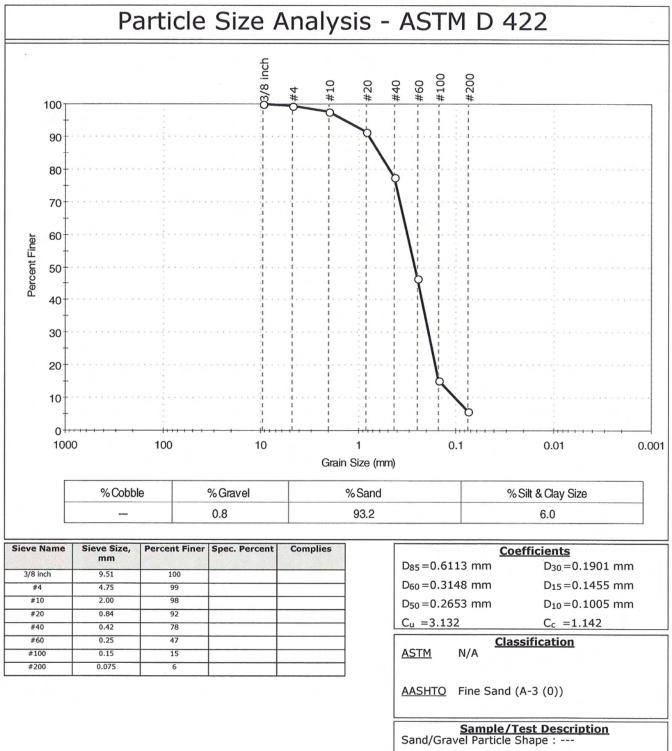


Client:	GEI Consu	ltants					
Project:	Brookhave	Brookhaven National Laboratory					
Location:	Upton, NY				Project No:	GTX-6864	
Boring ID:	B-102		Sample Type:	jar	Tested By:	pcs	
Sample ID:	:S-4		Test Date:	08/02/06	Checked By:	jdt	
Depth :	15-17 ft		Test Id:	94485			
Test Comm	nent:	sieve stack 1					
Sample Description: Moist, brown s		sand with silt					
Sample Co	mment:						





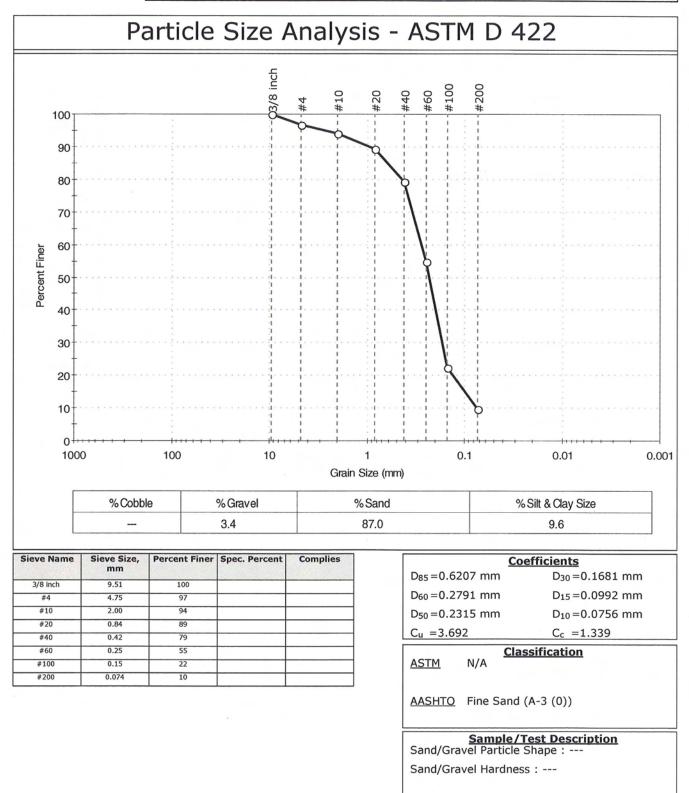
Client:	GEI Consu	Iltants						
Project:	Brookhave	Brookhaven National Laboratory						
Location:	Upton, NY				Project No:	GTX-6864	ŀ	
Boring ID:	B-102		Sample Type	: jar	Tested By:	pcs		
Sample ID:S-5		Test Date:	08/02/06	Checked By:	jdt			
Depth :	20-22 ft		Test Id:	94486				
Test Comm	nent:	sieve stack 6						
Sample Description: Moist, light br			own sand with	silt				
Sample Co	mment:							



Sand/Gravel Hardness : ---

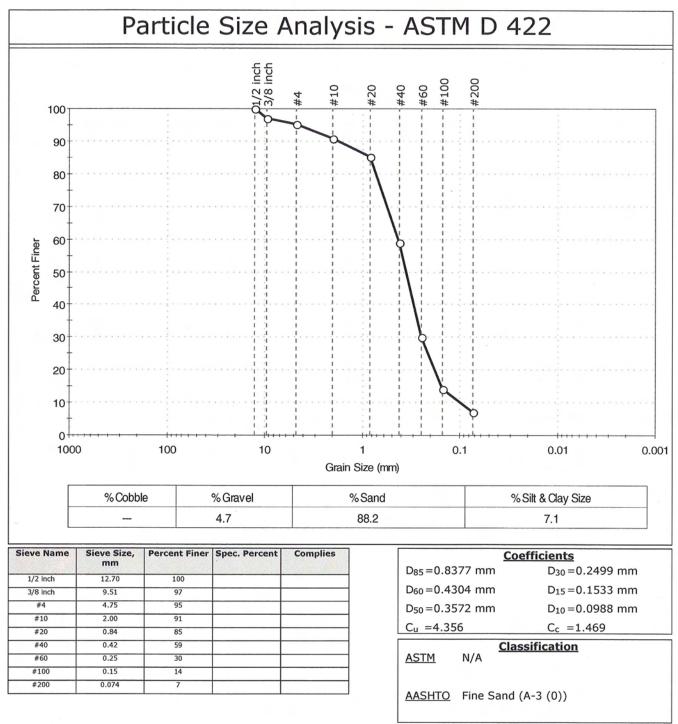


Client:	GEI Consu	GEI Consultants						
Project:	Brookhave	Brookhaven National Laboratory						
Location:	Upton, NY				Project No:	GTX-6864		
Boring ID:	B-102		Sample Type	e: jar	Tested By:	pcs		
Sample ID:	:S-6		Test Date:	08/04/06	Checked By:	jdt		
Depth :	25-27 ft		Test Id:	94487				
Test Comm	nent:	sieve stack	1					
Sample Description:		Moist, light	yellowish brown	sand with si	lt			
Sample Co	mment:							





Client:	GEI Consultants								
Project:	Brookhave	Brookhaven National Laboratory							
Location:	Upton, NY		Project No:	GTX-6864					
Boring ID: B-102			Sample Type:	jar	Tested By:	pcs			
Sample ID:S-8			Test Date:	08/04/06	Checked By:	jdt			
Depth :	35-37 ft		Test Id:	94488					
Test Comm	nent:	sieve stack 1							
Sample Description: Moist, pale br		own sand with	silt			4			
Sample Co	Sample Comment:								



Sample/Test Description
Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD



Client:	GEI Consu	ltants						
Project:	Brookhave	Brookhaven National Laboratory						
Location:	Upton, NY				Project No:	GTX-6864		
Boring ID: B-102			Sample Type: jar		Tested By:	pcs		
Sample ID:S-10		Test Date:	08/04/06	Checked By:	jdt			
Depth :	45-47 ft		Test Id:	94489				
Test Comm	nent:	sieve stack 6						
Sample Description: Moist, light of		ve brown sand	with silt					
Sample Co	Sample Comment:							

