

SOR CONSULTING ENGINEERS, INC.

Geotechnical Engineering - Materials Testing - Forensic Studies
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GEOTECHNICAL INVESTIGATION REPORT KEARNY HIGH SCHOOL KEARNY, NEW JERSEY

FOR

KEARNY BOARD OF EDUCATION
KEARNY, NEW JERSEY

Prepared by: Sor Consulting Engineers, Inc.
98 Sand Park Road
Cedar Grove, New Jersey 07009

Report No. 06-C-50
Job No. 06-C-19
Dated: May 10, 2006

KEARNY
FILE
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May 10, 2006
Job No.:06-C-19
Report No.:06-C-50

Kearny Board of Education
100 Davis Avenue
Kearny, New Jersey 07032

Attention: Mr. Thomas J. Macfie
Director of Plant Operations

Re: Geotechnical Investigation Report
Kearny High School
Kearny, New Jersey

INTRODUCTION

This report presents the results of a geotechnical investigation performed at Kearny High School in Kearny, New Jersey. The school is located at 336 Devon Street. The proposed construction is to include the installation of four temporary classroom units in the lawn area at the front of the school as well as renovating the pool and auto shop areas within the existing building. The existing pool will be filled to the existing floor level.

PURPOSE AND SCOPE OF WORK

The purpose of this study was to:

- explore the subsurface conditions within the proposed areas of construction;
- estimate the geotechnical engineering properties of the encountered subsurface materials;
- evaluate the foundation requirements for the proposed construction considering the anticipated structural loads and encountered subsurface conditions;

- recommend an appropriate type of foundation for support of the proposed facilities and present geotechnical related foundation design and installation criteria;
- present recommendations relative to the support of slabs to be constructed on-grade;
- estimate the post-construction performance of the recommended floor and foundation systems; and
- discuss appropriate earthwork operations or considerations consistent with the proposed construction and encountered subsurface conditions.

To accomplish this, a subsurface exploration program consisting of seven test borings was conducted at the school. Four borings were performed at the proposed temporary classroom locations on April 3, 2006, and three borings were performed in the pool and auto shop areas on April 20 and 21, 2006. The borings were advanced by Environmental Technical Drilling using portable drilling equipment. Soil samples suitable for identification purposes were continuously extracted from the borings in accordance with the procedures of the Standard Penetration Test (ASTM D-1586). Upon completion, the explorations were backfilled so as not to leave any open holes. In the auto shop, the floor slab was patched with Portland cement grout.

The borings were performed under the direct technical supervision of a geotechnical engineer from Sor Consulting Engineers. Our representative located the borings at the site, prepared logs of the explorations as the work proceeded, and supervised the soil sampling operations so as to obtain the appropriate subsurface information. The locations of the explorations are shown relative to the existing site features on the Boring Location Plans included in Appendix I of this report. Detailed descriptions of the encountered subsurface conditions are presented on the individual boring logs included in Appendix II. All soil samples were brought to our office where they were visually identified in our soil mechanics laboratory in accordance with the Burmeister Classification System also contained in Appendix II.

The results of the subsurface investigation program along with our visual identification of the soil samples have provided the basis for our engineering analyses and geotechnical recommendations. The following discussions of our findings and recommendations are subject to the limitations included in Appendix III of this report.

SITE CONDITIONS

Surface Features: The proposed temporary classrooms are to be located in lawn areas on both sides of the main entrance walkway between the front of the school and Devon Street. In general, the areas are relatively level except for the extreme northern and southern areas which slope down toward the east.

The pool is located in an interior area of the school building. The bottom of the pool varies from approximately 4.25 feet to 8.75 feet below the finished floor level.

Subsurface Conditions: The borings (B-1 through B-4) performed for the proposed temporary classrooms encountered a 5 to 6 inch thick layer of topsoil underlain by fill consisting of silty sand with cinders and sandstone rock fragments. The fill varied from a loose to medium dense condition and extended to depths ranging from 4 to 5 feet beneath the ground surface. Natural dense to very dense silty sand and gravel were encountered beneath the fill and extended to the maximum depths explored. Groundwater was not encountered within any of the temporary classroom borings.

The borings performed within the pool (B-5 and B-6) encountered an 8 inch thick concrete slab. Boring 5, performed in the shallow end encountered fill consisting of silty sand and gravel. Standard Penetration Test (N) values obtained from the boring indicate that the fill is in a loose to medium dense condition. The fill extended to a depth of 8 feet beneath the bottom of the pool and was underlain by dense natural silty sand. Boring 6, performed in the deep end, encountered medium dense to dense clayey silty sand which extended to the maximum depth explored. Refusal to further penetration with the soil sampler was encountered at depths of 19 feet and 13 feet in Borings 5 and 6, respectively. Groundwater was encountered at depths of 16 and 10 feet below the bottom of the pool in Borings 5 and 6, respectively.

The boring performed in the auto shop area encountered a 6 inch thick slab underlain by very dense natural silty sand. Refusal to further penetration with the soil sampler was encountered at a depth of 7 feet beneath the floor slab. Groundwater was not encountered within the maximum depth explored.

CONCLUSIONS AND RECOMMENDATIONS

General: The undisturbed natural silty sand encountered beneath the fill was found to be in a dense to very dense condition and is suitable to directly support new columns and walls of the proposed renovation. However, the existing fill overlying the natural soils is variable in density and cannot be relied upon to provide uniform support for new wall or column foundations without the potential for unacceptable post-construction settlements. Consequently, all new foundation excavations should extend through the fill to derive their support from the undisturbed natural soils or the fill should be removed and replaced with controlled compacted fill. For the temporary classrooms where the existing fill was found to be relatively limited and uniform in thickness, we believe that extending the foundation excavations through the fill and constructing the footings on the dense natural soils would be appropriate. However, in the pool area, the fill extends somewhat deeper. Furthermore, we understand that the pool is to be infilled to the existing floor slab subgrade level. Therefore, we recommend that the existing fill encountered in the shallow end of the pool be partially removed, the remainder densified, and the excavation subsequently backfilled with controlled compacted fill up to the design floor slab subgrade level. New foundations could then be established at nominal levels on the controlled fill. Further discussions of these and other geotechnical items considered relevant to the proposed construction are included in the following sections of this report.

Temporary Classroom Units: As previously mentioned, all foundation excavations for the temporary classroom units should extend through the surficial fill to expose the competent natural dense silty sands. The borings performed for this study indicate that excavations ranging from 4 to 5 feet in depth below the existing ground surface would be required to reach the competent soils. After excavation, the foundations could be

established directly on the natural soils or the excavations could be backfilled to a more convenient level with either $\frac{3}{4}$ inch crushed stone or lean concrete. Foundations deriving their support from the natural soils may be proportioned to impose a maximum soil bearing pressure of up to 2 tons per square foot. The bottoms of all foundations should be established at least 3.5 feet below grade to provide protection from frost penetration. We estimate that post-construction settlements of foundations supported on the natural soils and/or crushed stone/lean concrete backfill would be negligible.

Pool/Auto Shop Infill Area: In its present condition, the fill encountered in the shallow end of the pool cannot support new foundations without the potential for unacceptable post-construction settlements. In as much as the fill extends to a depth of 8 feet and is variable in density, significant differential settlements could occur if foundations are supported on or above the existing fill. In order to provide suitable support, foundation excavations could extend through the fill to place the foundations on the competent natural soils. Alternatively, a portion of the fill could be removed, the remaining fill densified in place, and the pool area backfilled to the proposed floor slab subgrade level with controlled compacted fill. New foundations could then be established at nominal depths on the controlled compacted fill.

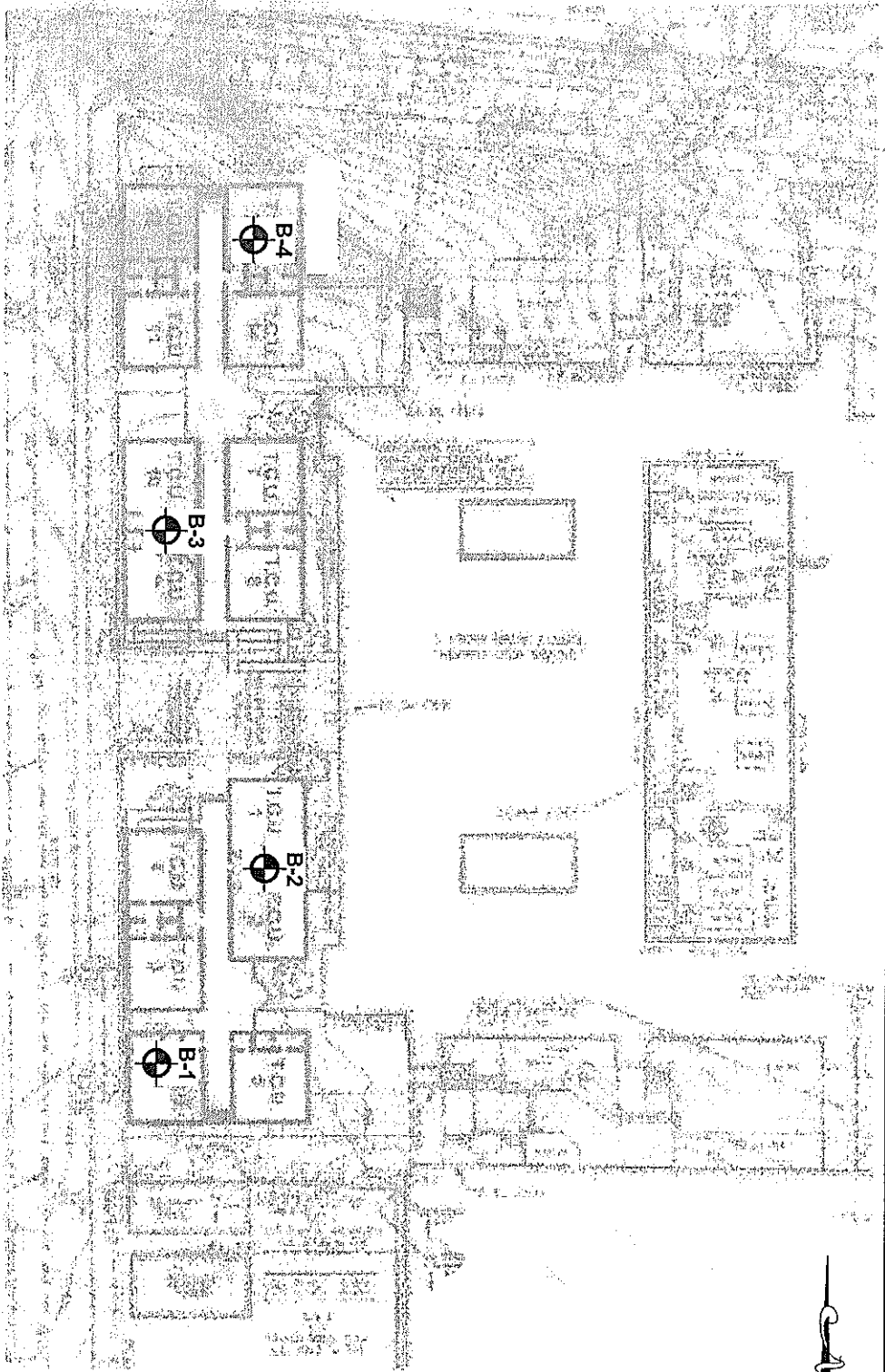
Since the proposed renovation requires the pool to be backfilled, we believe that partial removal of the existing fill followed by backfilling the pool with controlled compacted fill and establishing the foundations at nominal depths within the fill would be the more appropriate solution. Hence, we recommend that after removal of the pool slab, the upper 5 feet of the existing fill in the shallow end be removed. The fill that remains should be compacted to a dense and stable condition by numerous passes of a double-drum vibratory roller (Wacker Model RD-7H, or equivalent). After densification, the pool area should be backfilled with controlled fill placed in 8 to 12 inch thick layers and compacted to at least 95 percent of maximum dry density as determined by the ASTM D-1557 test procedure. Controlled fill may consist of either the existing fill, a well-graded sand and gravel, dense-graded aggregate or recycled concrete aggregate having a maximum particle size of 3 inches and containing less than 15 percent by weight passing a U.S. Standard No. 200 sieve.

Once the area is backfilled, new foundations and slabs constructed on-grade may derive their support from either the newly installed fill placed within the pool or the natural soils encountered beneath the auto shop area. Foundations supported on these materials may be proportioned to impose a maximum soil bearing pressure of up to 4 tons per square foot. We estimate that post-construction settlements of foundations supported on these materials would be less than ½ of 1 inch. Floor slab settlements are anticipated to be negligible.


Seismic Design Criteria: Based on the subsurface conditions encountered in the explorations performed for this study as well as our knowledge of the local geologic conditions, the site is considered to have a "very dense soil/soft rock" profile as defined in Table 1615.1.1 of the New Jersey edition of the 2000 International Building Code. In accordance with the Code, the soil profile can be classified as site class "C".

RECOMMENDED SERVICES

We recommend that Sor Consulting Engineers be retained to provide on-site observation and testing services during the subgrade preparation and foundation construction phases of the project. This would be to assure compliance with the project specifications as well as to identify and address field conditions that differ significantly from those encountered in the borings performed for this study.



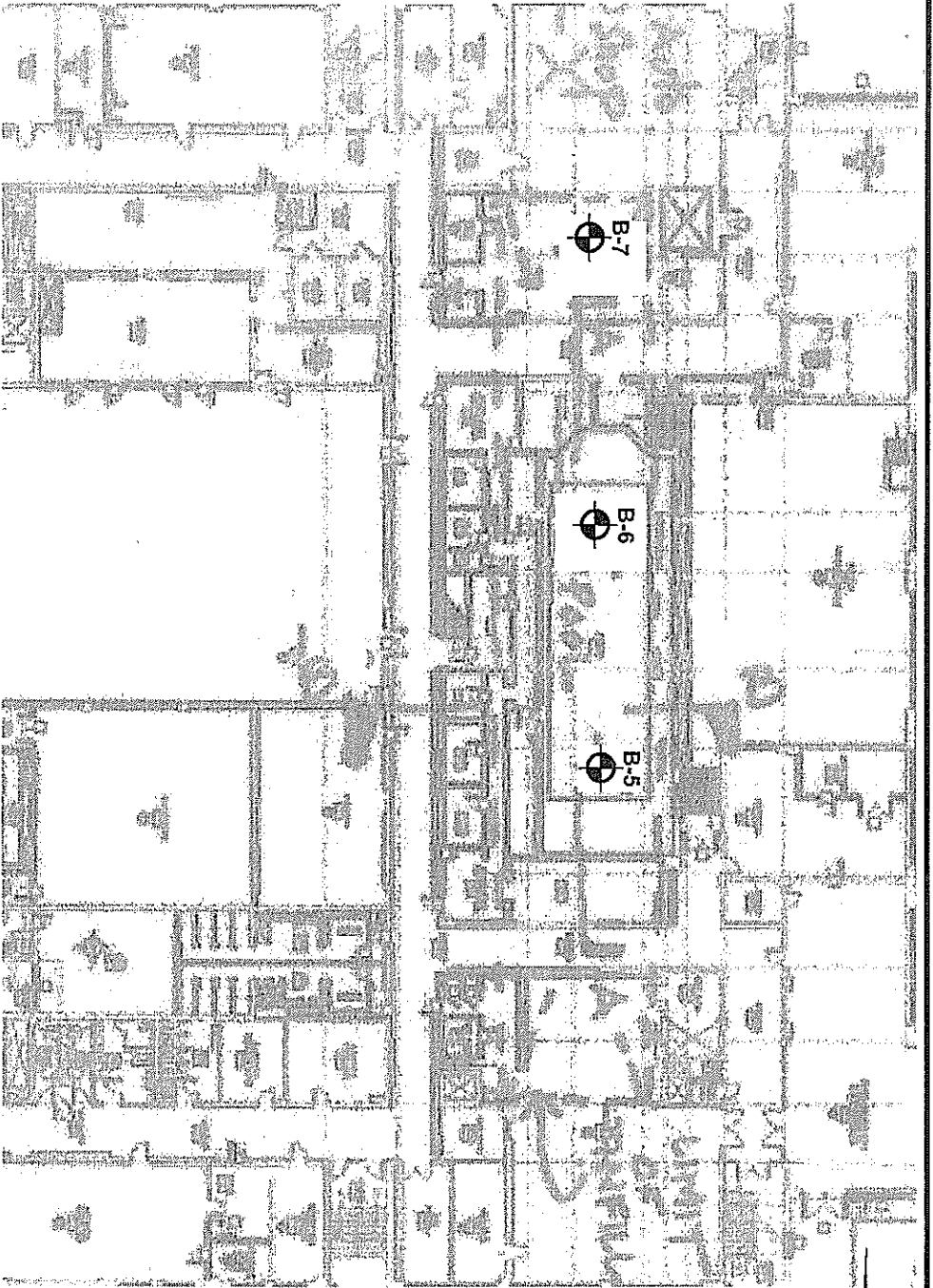
LEGEND

B-1  Number and approximate location of boring performed by SCE for this study.


NOTES

1. This drawing is part of Sor Consulting Engineers, Inc. Report No.06-C-5b and should be read together with the report for complete evaluation.
2. General Layout was obtained from a plan provided by the Client.

BORING LOCATION PLAN KEARNY BOARD OF EDUCATION KEARNY HIGH SCHOOL RENOVATION KEARNY, NEW JERSEY			
SOR CONSULTING ENGINEERS, INC. Geotechnical Engineering – Materials Testing – Forensic Studies 98 Sand Park Road, Cedar Grove, New Jersey 07009			
Prepared By : M.O.	Approved By : P.G.M.	DRAWING NO.	
Date : 05/09/2006	Date : 05/09/2006	06-C-19-01	
Scale : N.T.S.	Report No. : 06-C-5b	Sheet No. 1 of 1	



LEGEND

B-1  Number and approximate location of boring performed by SCE for this study.

NOTES

1. This drawing is part of Sor Consulting Engineers, Inc. Report No.06-C-50 and should be read together with the report for complete evaluation.
2. General Layout was obtained from a plan provided by the Client.

BORING LOCATION PLAN
 KEARNY BOARD OF EDUCATION
 KEARNY HIGH SCHOOL RENOVATION
 KEARNY, NEW JERSEY

SOR CONSULTING ENGINEERS, INC.

Geotechnical Engineering – Materials Testing – Forensic Studies
 98 Sand Park Road, Cedar Grove, New Jersey 07009

Prepared By : M.O.	Approved By : P.G.M.	DRAWING NO.
Date : 05/09/2006	Date : 05/09/2006	06-C-19-02
Scale : N.T.S.	Report No. : 06-C-50	Sheet No. 1 of 1

APPENDIX II
BORING LOGS 1 THROUGH 7
BURMEISTER SOIL CLASSIFICATION SYSTEM

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 1	
CLIENT KEARNY BOARD OF EDUCATION						GSE		N/A	
PROJECT KEARNY HIGH SCHOOL ADDITIONS AND ALTERATIONS						DATUM		Ground Surface	
LOCATION KEARNY, NEW JERSEY						DATE START		4-3-06	
GROUND WATER						CAS.			
DATE		TIME		DEPTH		CASING		TYPE	
								SS	
								DIA.	
								2" OD	
								WT.	
								140 lb	
								FALL	
								30"	
						DATE FINISH		4-3-06	
						JOB NO.		06-C-19	
						REPORT NO.		06-C-50	

depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION	REMARKS
1		S-1	0-2'	4	8	6" Topsoil FILL: Brown and dark brown medium to fine SAND, some Clayey Silt with fine roots	Moist
2				4			
3				4			
4		S-2	2'-4'	5	12	FILL: Brown and red brown medium to fine SAND, little Clayey Silt	
5				3			
6				4			
7		S-3	4'-6'	4	13	4.5' ----- Red brown coarse to fine SAND, little Silt, trace medium to fine Gravel	
8				6			
9				7			
10		S-4	6'-8'	15	44	Same	
11				8			
12				19			
13		S-5	8'-9.3'	25	44	Same with piece of sandstone gravel in spoon tip	
14				20			
15				16			
16				60/4"			
17						Bottom of Boring @ 9.3'	
18						Split spoon refusal	
19						* No Water Observed	
20							
21							
22							
23							
24							
25							

S - SPLIT SPOON SAMPLER
 U - UNDISTURBED SAMPLE
 C - CORE DRILLED

DRILLING CONTRACTOR: ENVIRONMENTAL TECHNICAL DRILLING, INC.
 DRILLING EQUIPMENT: PORTABLE TRI-POD
 STL REPRESENTATIVE: K. ROWBOTHAM

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 2	
CLIENT KEARNY BOARD OF EDUCATION						GSE		N/A	
PROJECT KEARNY HIGH SCHOOL ADDITIONS AND ALTERATIONS						DATUM		Ground Surface	
LOCATION KEARNY, NEW JERSEY						DATE START		4-3-06	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 4-3-06	
DATE	TIME	DEPTH	CASING	TYPE		SS			
		*		DIA.		2" OD		JOB NO.	06-C-19
				WT.		140 lb		REPORT NO.	06-C- 50
				FALL		30"			

depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION	REMARKS
1		S-1	0-2'	2	9	5" Topsoil FILL: Brown and dark brown coarse to fine SAND, little Clayey Silt with fine roots	Moist
				4			
				5			
2				5			
				2	4	FILL: Brown and red brown coarse to fine SAND, little Clayey Silt with trace cinders and layer of dark brown Clayey Silt (slightly organic)	
3		S-2	2'-4'	2			
				2			
4				5			
				3	11	5' Red brown coarse to fine SAND, little medium to fine Gravel, little Silt	
5		S-3	4'-6'	4			
				7			
6				11			
				17	31	Same	
7		S-4	6'-8'	14			
				17			
8				22			
				23	66	Same with sandstone fragments	
9		S-5	8'-10'	30			
				36			
10				32			
11						Bottom of Boring @ 10'	
12							
13							
14						* No Water Observed	
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

S - SPLIT SPOON SAMPLER
 U - UNDISTURBED SAMPLE
 C - CORE DRILLED

DRILLING CONTRACTOR: ENVIRONMENTAL TECHNICAL DRILLING, INC.
 DRILLING EQUIPMENT: PORTABLE TRI-POD
 STL REPRESENTATIVE: K. ROWBOTHAM

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 3	
CLIENT KEARNY BOARD OF EDUCATION						GSE		N/A	
PROJECT KEARNY HIGH SCHOOL ADDITIONS AND ALTERATIONS						DATUM		Ground Surface	
LOCATION KEARNY, NEW JERSEY						DATE START		4-3-06	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 4-3-06	
DATE	TIME	DEPTH	CASING	TYPE	-	SS	-	-	
		*		DIA.		2" OD			JOB NO. 06-C-19
				WT.		140 lb			REPORT NO. 06-C-56
				FALL		30"			

depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION	REMARKS
1		S-1	0-2'	2	9	6" Topsoil FILL: Brown and red brown coarse to fine SAND, little Silt with sandstone fragments	Moist
				4			
				5			
2				7	22	FILL: Dark brown coarse to fine SAND, some Clayey Silt with layer of cinders and trace dark brown Clayey Silt (slightly organic) 4.5'	
		S-2	2'-4'	6			
3				8			
				14			
4				9	17	Red brown coarse to fine SAND, little medium to fine Gravel, little Silt	
		S-3	4'-6'	6			
5				7			
6				10	34	Same with sandstone fragments in spoon tip	
		S-4	6'-8'	10			
7				12			
				15			
8				19		Bottom of Boring @ 8' No penetration @ 8'. Split spoon refusal. * No Water Observed	
				59			
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

S - SPLIT SPOON SAMPLER
 U - UNDISTURBED SAMPLE
 C - CORE DRILLED

DRILLING CONTRACTOR: ENVIRONMENTAL TECHNICAL DRILLING, INC.
 DRILLING EQUIPMENT: PORTABLE TRI-POD
 STL REPRESENTATIVE: K. ROWBOTHAM

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 4	
CLIENT KEARNY BOARD OF EDUCATION						GSE		N/A	
PROJECT KEARNY HIGH SCHOOL ADDITIONS AND ALTERATIONS						DATUM		Ground Surface	
LOCATION KEARNY, NEW JERSEY						DATE START		4-3-06	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 4-3-06	
DATE	TIME	DEPTH	CASING	TYPE	-	SS	-	-	
				DIA.		2" OD			JOB NO. 06-C-19
				WT.		140 lb			REPORT NO. 06-C-50
				FALL		30"			

depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION	REMARKS
1		S-1	0-2'	2	11	6" Topsoil FILL: Brown and red brown medium to fine SAND, some Clayey Silt	Moist
				4			
				7			
2				7	8	FILL: Brown and dark brown coarse to fine SAND, and Clayey Silt with trace fine roots	
		S-2	2'-4'	4			
				4			
3				4	27	Red brown coarse to fine SAND, little medium to fine Gravel, little Silt	
		S-3	4'-6'	4			
				5			
4				7	54	Same with sandstone fragments	
				12			
		S-4	6'-8'	15			
5				18		Bottom of Boring @ 8'	
				14			
				29			
6				25		* No Water Observed	
				32			
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

S - SPLIT SPOON SAMPLER
 U - UNDISTURBED SAMPLE
 C - CORE DRILLED

DRILLING CONTRACTOR: ENVIRONMENTAL TECHNICAL DRILLING, INC.
 DRILLING EQUIPMENT: PORTABLE TRI-POD
 STL REPRESENTATIVE: K. ROWBOTHAM

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 5	
CLIENT Kearny Board of Education							GSE -4.25 ft. below FFE		
PROJECT Kearny High School Renovations							DATUM FFE @ 0.0 ft		
LOCATION Kearny, New Jersey							DATE START 4-20-06		
GROUND WATER							DATE FINISH 4-20-06		
DATE	TIME	DEPTH	CASING	TYPE	CAS.	SAMP.	CORE	TUBE	
4-20-06		16'		DIA.		2"			
				WT.		140 lb.			
				FALL		30"			
							JOB NO. 06-C-19		
							REPORT NO. 06-C-50		

depth, ft.	casing blows	sample type/no.	Depth	sampler blows per 6'3"	N value	DESCRIPTION	REMARKS
1						8" Concrete Slab & 1" Asphalt Membrane	
2				4			
3		S-1	1'-3'	3	7		
4				4			
5		S-2	3'-5'	2	5	Fill- Brown fine to coarse Sand, some Silt, little Gravel	
6				4			
7		S-3	5'-7'	6	12		
8				8			
9		S-4	7'-9'	7	21		
10				14			
11		S-5	9'-11'	11	29	Red brown fine to medium SAND, little Silt	
12				10			
13		S-6	11'-13'	15	26	Same	
14				14			
15		S-7	13'-15'	11	26	Same w/Sandstone Fragments	
16				13			
17		S-8	15'-17'	9	40	-grd to fine to coarse SAND, little Silt w/Sandstone Fragments	Very moist @ 16'
18				14			
19		S-9	17'-19'	12	57	Sandstone bedrock @ 18'-6"	
20				12			
21				28		Boring complete @ 19'-0"	
22				16			
23				20			
24				26			
25				31			
				100			

S - SPLIT SPOON SAMPLER

U - UNDISTURBED SAMPLE

C - CORE DRILLED

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.

DRILLING EQUIPMENT: Tripod w/Electric Motor

STL REPRESENTATIVE: P. Micklus

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 6		
CLIENT Kearny Board of Education						GSE -8.75 ft. below FFE				
PROJECT Kearny High School Renovations						DATUM FFE @ 0.0 ft				
LOCATION Kearny, New Jersey						DATE START 4-20-06				
GROUND WATER						CAS.	SAMP.	CORE	TUBE	DATE FINISH 4-20-06
DATE	TIME	DEPTH	CASING	TYPE		SS				
4-20-06		10'		DIA.		2"				JOB NO. 06-C-19
				WT.		140 lb.				REPORT NO. 06-C-50
				FALL		30"				

depth, ft.	casing blows	sample type/no.	Depth	sampler blows p4er 6"3	N value	DESCRIPTION	REMARKS
1						8" Concrete Slab & 1" Asphalt Membrane	
2		S-1	1'-3'	6	23	Red brown fine to coarse Sand, some Clayey Silt, and Gravel	Very moist @ 10'
3				15			
4				8			
5				8			
6		S-2	3'-5'	6	18	Same	
7				6			
8				12			
9				15			
10		S-3	5'-7'	8	40	Red brown fine to coarse Sand, and Clayey SILT, little Gravel	
11				17			
12				33			
13				42			
14		S-4	7'-9'	25	45		
15				20			
16				25			
17				17			
18		S-5	9'-11'	12	23	Red brown fine SAND, and Silt	
19				11			
20				37			
21				18			
22		S-6	11'-13'	40	100		
23				60			
24				120			
25						Boring completed @ 13'-0"	

S - SPLIT SPOON SAMPLER

U - UNDISTURBED SAMPLE

C - CORE DRILLED

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.

DRILLING EQUIPMENT: Tripod w/Electric Motor

STI REPRESENTATIVE: P. Micklus

SOR CONSULTING ENGINEERS, INC.				TEST BORING LOG				BORING 7	
CLIENT Kearny Board of Education				PROJECT Kearny High School Renovations				GSE @ FFE	
LOCATION Kearny, New Jersey				GROUND WATER				DATUM FFE @ 0.0 ft	
				CAS.				DATE START 4-20-06	
DATE		TIME		DEPTH		CASING		DATE FINISH 4-20-06	
4-21-06				NE					
						TYPE		JOB NO. 06-C-19	
						DIA.		REPORT NO. 06-C-50	
						WT.			
						FALL			
						SAMP.			
						CORE			
						TUBE			
						SS			
						2"			
						140 lb.			
						30"			

depth, ft.	casing blows	sample type/no.	Depth	sampler blows per 6'3"	N value	DESCRIPTION	REMARKS
1						6" Concrete Slab	
2				8			
3		S-1	1'-3'	14	35	Red brown fine to coarse Sand, and Silt, little Gravel	
4				21			
5		S-2	3'-5'	30	59	-grd to fine to coarse Sand, little Silt w/Sandstone Fragments	
6				57			
7		S-3	5'-7'	31	57	Same	
8				28		-Sandstone bedrock @ 6'-6"	
9				27			
10				18			
11				17			
12				40			
13				120			
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

S - SPLIT SPOON SAMPLER
 U - UNDISTURBED SAMPLE
 C - CORE DRILLED

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.
 DRILLING EQUIPMENT: Tripod w/Electric Motor