

# **SOR CONSULTING ENGINEERS, INC.**

*Geotechnical Engineering - Materials Testing - Forensic Studies*  
98 Sand Park Rd., Cedar Grove, NJ 07009  
(973) 239-6001 Fax (973) 239-8380

## **PRELIMINARY GEOTECHNICAL ENGINEERING REPORT PARKING AREA "C", BLOCK 308.01, LOT 3 CITY OF HACKENSACK, NEW JERSEY**

**FOR**

**MID ATLANTIC ENGINEERING PARTNERS, LLC  
BORDENTOWN, NEW JERSEY**

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

**Job No. 14-C-08  
Report No. 14-C-12  
April 4, 2014**

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April 4, 2014  
Job No.: 14-C-08  
Report No.: 14-C-12

Mid Atlantic Engineering Partners  
789 Farnsworth Avenue  
Bordentown, NJ 08505

Attention: Louis L. Zuegner IV, P.E.  
Email: llz@midatlanticeng.com

Re: Preliminary Geotechnical Engineering Report  
Parking Area "C", Block 308.01, Lot 3  
City of Hackensack, New Jersey

## **INTRODUCTION**

This report presents the results of a preliminary subsurface investigation performed for a site located in Hackensack, New Jersey. The site occupies an area of approximately 4.2 acres and is bounded by Midtown Place, Midtown Bridge Approach and the Salem Street extension. The property is currently an asphalt paved on-grade parking lot and will reportedly be made available for redevelopment by the city. The type and scope of potential redevelopment is presently unknown.

## **AVAILABLE SOILS AND GEOLOGIC INFORMATION**

Published soils and geologic information indicates that this site lies near the boundary of two distinctly different soil areas. Marine tidal marsh soils which are characterized by deep deposits of very soft and highly compressible silts and clays with a significant amount of organic material at or near the surface are present along the Hackensack River to the east of the site. Glacial stratified drift deposits attributed to the most recent Wisconsin glacier and characterized by silts and silty sands with a significant amount of gravel are present to the west of the site. Due to the urban nature of the site, fill material of unknown composition and thickness may be present over the tidal marsh and/or drift soils. The underlying bedrock at this site is identified as

sandstone and/or shale of the Brunswick formation. The depth to bedrock may be on the order of 100 feet in the tidal marsh soil area and 10 to 20 feet in the glacial stratified drift area.

### **PURPOSE AND SCOPE OF WORK**

The purpose of this study was to:

- explore on a preliminary basis the subsurface soil and groundwater conditions within the site;
- estimate the geotechnical engineering properties of the encountered subsurface materials;
- evaluate the preliminary foundation requirements for structures which may be constructed on the site including a preliminary assessment of shallow and/or deep foundation requirements; and
- discuss appropriate earthwork operations or considerations consistent with the encountered subsurface conditions.

To accomplish this, Sor Consulting Engineers, Inc. (SCE) performed an exploration program consisting of four standard test borings on March 26, 2014. The borings were advanced using truck mounted hollow stem auger drilling equipment and extended to a maximum depth of 47 feet beneath the existing ground surface. Soil samples suitable for identification and laboratory testing purposes were extracted from the borings in accordance with the procedures of the Standard Penetration Test. Upon completion, the explorations were backfilled so as not to leave any open holes and the surface filled with cold patch asphalt.

The borings were performed by Environmental Technical Drilling, Inc. under the direct technical observation of a licensed geotechnical engineer from Sor Consulting Engineers. Our representative located the borings at the site, prepared logs of the explorations as the drilling 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 Plan contained in

Appendix I of this report. Detailed descriptions of the encountered subsurface conditions are presented on the individual boring logs contained in Appendix II. The soils were visually classified in accordance with the Burmeister Soil Classification System also included in Appendix II.

All soil samples were brought to our office where they were further examined in our soil mechanics laboratory. Moisture content, Atterberg limits and mechanical grain size distribution tests were performed on selected samples to assist in our evaluation of their engineering soil properties. Laboratory tests results are presented in Appendix III.

The results of the subsurface exploration and laboratory testing programs have provided the basis for our engineering analysis and geotechnical recommendations. The following discussions of our findings, conclusions and recommendations are subject to the limitations contained in Appendix IV of this report.

## **SITE CONDITIONS**

Surface Features: The site is presently an on-grade asphalt pavement covered automobile parking lot. The lot is divided into north-south oriented sections with each section containing two rows of parking spaces and a center drive lane. The sections are separated by curbed islands covered with concrete. The pavement surface in each section is generally level and crowned about the center drive lane for stormwater sheet flow toward the curbs. Overall site grades slope down gently from approximate elevation +11 feet in the eastern portion of the parking lot to approximate elevation +6 feet in the western portion of the site adjacent to Midtown Place.

Subsurface Conditions: The subsurface conditions encountered in the borings performed for this study were relatively uniform and consisted of the following generalized strata in order of increasing depth:

- 1) Surface Cover: The pavement section consisted of 4 to 10 inches of bituminous concrete and 4 to 6 inches of aggregate base.
- 2) Fill Material: Very loose to medium dense silty sand fill with inclusions of cinders, brick, wood, wire and steel was encountered in all of the borings.

The fill extended to depths ranging from 9 to 10.5 feet beneath the existing ground surface.

- 3) Peat and Organic Silt: Soft to firm fibrous peat and organic silt was encountered below the fill material. The lower portions of this layer were mixed with silty medium to fine textured sand containing seams, layers and pockets of peat. This layer extended to depths ranging from approximately 25 to 27 feet beneath existing grade.
- 4) Varved Silt and Clay: Natural silt and clay with fine sand varves was encountered beneath the organic materials and extended to the maximum depths explored, 47 feet. Standard Penetration Test (N) values obtained from the borings indicate that the silt and clay soils are in a stiff condition.

Groundwater was encountered in all of the borings performed for this study at a depth of approximately 5 feet below existing grade. Groundwater levels at this site will vary and may be influenced by seasonal variations in rainfall and temperature, water trapped in the existing fill, the water level in the adjacent Hackensack River and other factors.

## **CONCLUSIONS AND RECOMMENDATIONS**

General: Based on our evaluation of the information obtained for this study, it is our opinion that due to the variable composition and relative density of the existing fill and the potential for consolidation of the underlying soft to firm organic materials under new foundation and slab loads, these materials are unsuitable for support of new structures. Building loads must be transmitted to the suitable bearing natural silt and clay soils below the organic materials. Consideration was given to various methods to accomplish this, including excavation and replacement of the unsuitable materials with new controlled compacted fill and supporting structures on shallow foundations and slabs on-grade, and deep/intermediate foundation and floor slab support systems. These types of systems allow the existing unsuitable bearing materials to remain in-place while they are bypassed or improved. Deep/intermediate systems include driven piles, drilled piers, dynamic compaction and stone filled subsurface columns. The

relatively shallow groundwater level at the site, the composition and thickness of the existing fill and organics and the nature and sensitivity of the underlying natural silts and clays, especially in the presence of water, preclude excavation and replacement and the use of drilled piers, dynamic compaction and stone filled subsurface columns.

Therefore, it is our professional opinion that the most appropriate option for structure support at this site is driven piles. Preliminary discussions of geotechnical items considered relevant to structure support at this site are presented in the following sections of this report. Additional explorations are recommended once site redevelopment plans are finalized and building locations and details are established in order to verify these preliminary findings, provide more detailed geotechnical recommendations and satisfy building code requirements.

Pile Foundation Considerations: This method would allow the existing fill and underlying peat and organic silt to remain in place. Building foundations and floor slabs would be supported on a system of driven piles that extend through the existing unsuitable bearing materials to derive their support from the underlying natural stiff silt and clay. Timber piles would be appropriate for support of light to moderate loads. Timber piles deriving frictional support from the natural silt and clay soils would have typical ultimate capacities on the order of 20 to 25 tons. Pile capacities would have to be reduced by an estimated 5 to 10 tons due to the effects of downdrag. Higher capacity steel pipe or H-piles are feasible if supported on the bedrock below the overburden soils. Deep piles supported on the underlying competent bedrock could typically achieve capacities on the order of 100 tons. However, additional deep borings would be required to further define the bearing materials and evaluate design pile capacities.

SOR CONSULTING ENGINEERS, INC.

Mid Atlantic Engineering Partners  
Parking Area "C", Block 308.01, Lot 3  
City of Hackensack, New Jersey

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Sor Consulting Engineers appreciates the opportunity to be of assistance with this project. Should there be any questions concerning the information or recommendations provided herein, please do not hesitate to call. The following appendices are attached and complete this report:

- Appendix I: Boring Location Plan
- Appendix II: Boring Logs 1 through 4  
Burmeister Soil Classification System
- Appendix III: Laboratory Test Results
- Appendix IV: Limitations

Respectfully submitted,  
SOR CONSULTING ENGINEERS, INC.

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Kenneth J. Rowbotham, P.E.  
Senior Engineer

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Atilla Sencar, P.E.  
Senior Engineer

KJR/AS/jh

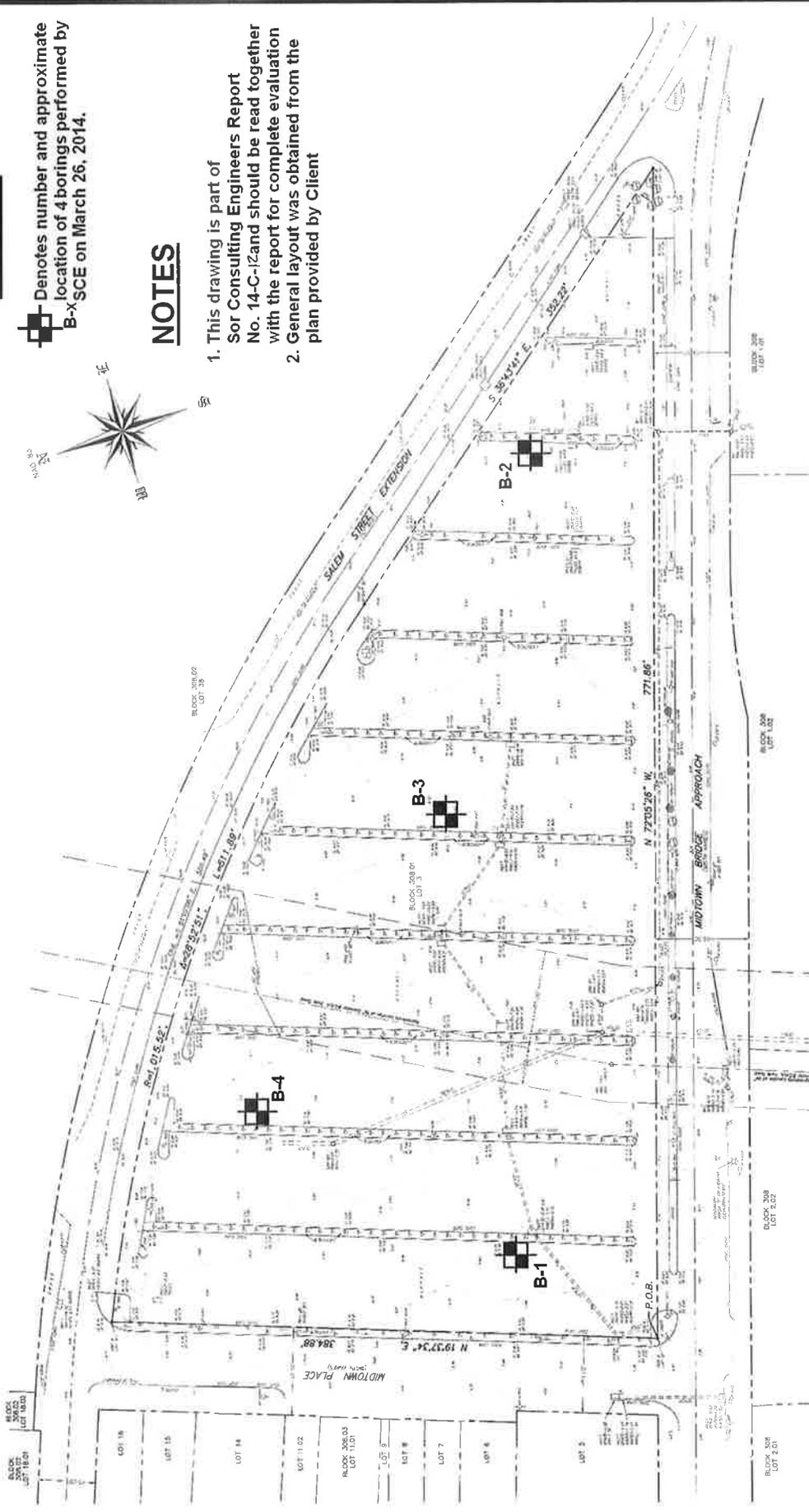
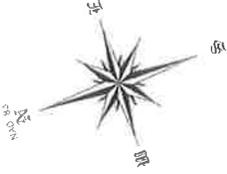
**APPENDIX I**  
**BORING LOCATION PLAN**

# LEGEND

 Denotes number and approximate location of 4 borings performed by B-X-SCE on March 26, 2014.

# NOTES

1. This drawing is part of Sor Consulting Engineers Report No. 14-C-12 and should be read together with the report for complete evaluation
2. General layout was obtained from the plan provided by Client



## BORING LOCATION PLAN

Parking Lot "C"  
Hackensack, New Jersey

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Certificate of Authorization # 24GA2786260

Prepared By : A.W	Approved By : K.J.R	DRAWING NO.
Date: 4/1/2014	Job No.: 14-C-08	14-C-12-cl
Scale: N.T.S	Report No.: 14-C-12	Sheet No. 1 of 1

**APPENDIX II**  
**BORING LOGS 1 THROUGH 4**  
**BURMEISTER SOIL CLASSIFICATION SYSTEM**

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 1	
CLIENT Mid Atlantic Engineering Partners							GSE	+ 6.5' +/-	
PROJECT Parking Lot "C", Block 308.01 Lot 3							DATUM	Ground Surface	
LOCATION Hackensack, New Jersey							DATE START	3/26/14	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH	3/26/14
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
3/26/14		4' (collapsed)		DIA.	4-1/4"	2" OD			JOB NO. 14-C-08
				WT.		140 lbs			REPORT NO. 14-C-12
				FALL		30"			SHEET NO. 1 of 2
depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION			REMARKS
1						10" Asphalt Pavement and 4" Aggregate Base (3 layers)			
2		S-1	1' - 3'	8	26	Fill: Gray brown coarse to fine SAND, little Clayey Silt w/brick, asphalt fragments			Moist
3				10					
4		S-2	3' - 5'	16	6	Fill: Same w/burnt wood fragments			Pieces of steel In auger cuttings
5				18					* Wet at 5'
6				10					
7		S-3	5' - 7'	4	3	Fill: Gray medium to fine SAND, little Silt			
8				2					
9		S-4	7' - 9'	2	3	Fill: Same w/pieces of gravel in spoon tip			Steel strap wrapped on auger
10				2					
11		S-5	10' - 12'	1	2	Black organic SILT w/fibrous peat			
12				1					
13				1					
14									
15									
16		S-6	15' - 17'	2	5	Same w/pieces of glass			9'
17				3		Gary medium to fine SAND, trace Silt w/peat seams			16'
18				2					
19									
20									
21		S-7	20' - 22'	3	6	Gray medium to fine SAND, little Clayey Silt w/peat seams & layers			
22				3					
23				3					
24				3					
25									25'

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
 DRILLING EQUIPMENT: CME-75 Truck Rig  
 SCE REPRESENTATIVE: K. Rowbotham

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 1	
CLIENT Mid Atlantic Engineering Partners							GSE	+ 6.5' +/-	
PROJECT Parking Lot "C", Block 308.01 Lot 3							DATUM	Ground Surface	
LOCATION Hackensack, New Jersey							DATE START	3/26/14	
GROUND WATER					CAS.	SAMP.	CORE	TUBE	DATE FINISH 3/26/14
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
		*		DIA.	4-1/4"	2" OD			JOB NO. 14-C-08
				WT.	---	140 lbs			REPORT NO. 14-C-12
				FALL	---	30"			SHEET NO. 2 of 2
depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION			REMARKS
26		S-8	25' - 27'	7 6	13	Gray SILT & CLAY, some fine Sand			
27			7 6						
28									
29									
30						Dark gray Clayey SILT			
31		S-9	30' - 32'	7 6 6	12				
32				7					
33									
34						Same w/fine Sand varves			
35									
36		S-10	35' - 37'	4 6 7 7	13				
37									
38						Same w/fine Sand varves			
39									
40									
41		S-11	40' - 42'	5 6 7 8	13				
42						Gray brown SILT & CLAY w/fine Sand varves			
43									
44									
45									
46		S-12	45' - 47'	4 5 4 5	9	Bottom of Boring at 47'			
47									
48									
49									
50									

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
DRILLING EQUIPMENT: CME-75 Truck Rig  
SCE REPRESENTATIVE: K. Rowbotham

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 2	
CLIENT Mid Atlantic Engineering Partners							GSE + 9.5' +/-		
PROJECT Parking Lot "C", Block 308.01 Lot 3							DATUM Ground Surface		
LOCATION Hackensack, New Jersey							DATE START 3/26/14		
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 3/26/14	
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
		*		DIA.	4-1/4"	2" OD		JOB NO. 14-C-08	
				WT.		140 lbs		REPORT NO. 14-C-12	
				FALL		30"		SHEET NO. 1 of 2	
depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION		REMARKS	
1						4" Asphalt Pavement and 5" Aggregate Base			
2		S-1	1' - 3'	5 3 2	5	Fill: Dark gray coarse to fine SAND, little Clayey Silt w/cinder fragments		Moist	
3				2					
4		S-2	3' - 5'	5 4 2	6	Fill: Same w/black organics, Silt in spoon tip w/gravel, wire			
5				3				* Wet at 5' Steel wire wrapped on auger	
6		S-3	5' - 7'	2 13 14	27	Fill: Dark gray medium to fine SAND, little Clayey Silt w/cinders & pieces of gravel			
7				3					
8		S-4	7' - 9'	2 1 1	3	Fill: Cinders			
9									
10									
11		S-5	10' - 12'	6 4 4	8	Dark brown black organic SILT w/peat			
12									
13									
14									
15									
16		S-6	15' - 17'	1 1 2 3	3	NR (Peat fragments in spoon tip)			
17									
18									
19									
20									
21		S-7	20' - 22'	1 1 1 2	2	Dark brown Peat			
22									
23									
24									
25									

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
DRILLING EQUIPMENT: CME-75 Truck Rig  
SCE REPRESENTATIVE: K. Rowbotham

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 2	
CLIENT Mid Atlantic Engineering Partners							GSE	+ 9.5' +/-	
PROJECT Parking Lot "C", Block 308.01 Lot 3							DATUM	Ground Surface	
LOCATION Hackensack, New Jersey							DATE START	3/26/14	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 3/26/14	
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
		*		DIA.	4-1/4"	2" OD		JOB NO. 14-C-08	
				WT.	---	140 lbs		REPORT NO. 14-C-12	
				FALL	---	30"		SHEET NO. 2 of 2	
depth, ft	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION		REMARKS	
26		S-8	25' - 27'	1	4	Same, mixed with sand layers 26.5' - 27'			
				2					
27				2					
				4					
28						----- 27'			
29									
30									
31		S-9	30' - 32'	4	11	Dark gray Clayey SILT w/fine Sand varves			
				5					
32				6					
				7					
33									
34									
35									
36		S-10	35' - 37'	4	11	Same			
				5					
37				6					
				6					
38						Bottom of Boring at 37'			
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
 DRILLING EQUIPMENT: CME-75 Truck Rig  
 SCE REPRESENTATIVE: K. Rowbotham

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 3	
CLIENT Mid Atlantic Engineering Partners						GSE + 8.5' +/-			
PROJECT Parking Lot "C", Block 308.01 Lot 3						DATUM Ground Surface			
LOCATION Hackensack, New Jersey						DATE START 3/26/14			
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 3/26/14	
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
		*		DIA.	4-1/4"	2" OD		JOB NO. 14-C-08	
				WT.		140 lbs		REPORT NO. 14-C-12	
				FALL		30"		SHEET NO. 1 of 2	
depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION		REMARKS	
1				11		4" Asphalt Pavement and 6" Aggregate Base		Moist * Spoon tip wet at 5'	
2		S-1	1' - 3'	8	13	Fill: Dark gray brown coarse to fine SAND, some Clayey Silt, trace medium to fine Gravel w/cinders			
3				5					
4		S-2	3' - 5'	6	11	Fill: Same			
5				4					
6		S-3	5' - 7'	7	12	Fill: NR (piece gravel in spoon tip)			
7				4					
8		S-4	7' - 9'	5	5	Fill: Black coarse to fine SAND, little Clayey Silt w/cinders			
9				3					
10				3					
11		S-5	10' - 12'	4	4	Dark brown organic SILT w/fibrous peat			
12				2					
13				2					
14									
15				2					
16		S-6	15' - 17'	1	3	Same w/medium to fine Sand layers, 2" wood layer			
17				2					
18				2					
19									
20									
21		S-7	20' - 22'	4	7	Gray medium to fine SAND, little Silt w/peat seams and layers			
22				4					
23				3					
24				3					
25						25'			

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
DRILLING EQUIPMENT: CME-75 Truck Rig  
SCE REPRESENTATIVE: K. Rowbotham

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 3	
CLIENT Mid Atlantic Engineering Partners						GSE		+ 8.5' +/-	
PROJECT Parking Lot "C", Block 308.01 Lot 3						DATUM		Ground Surface	
LOCATION Hackensack, New Jersey						DATE START		3/26/14	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 3/26/14	
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
		*		DIA.	4-1/4"	2" OD			JOB NO. 14-C-08
				WT.	---	140 lbs			REPORT NO. 14-C-12
				FALL	---	30"			SHEET NO. 2 of 2
depth, ft	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION			REMARKS
26		S-8	25' - 27'	4	11	Dark gray SILT, w/fine Sand varves			
27		5							
28		6							
29		7							
30									
31		S-9	30' - 32'	4	12	Same w/fine Sand varves			
32		5							
33		7							
34		8							
35						Bottom of Boring at 32'			
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
 DRILLING EQUIPMENT: CME-75 Truck Rig  
 SCE REPRESENTATIVE: K. Rowbotham

SOR CONSULTING ENGINEERING, INC.				TEST BORING LOG				BORING 4	
CLIENT Mid Atlantic Engineering Partners							GSE	+ 8.0' +/-	
PROJECT Parking Lot "C", Block 308.01 Lot 3							DATUM	Ground Surface	
LOCATION Hackensack, New Jersey							DATE START	3/26/14	
GROUND WATER				CAS.	SAMP.	CORE	TUBE	DATE FINISH 3/26/14	
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			
		*		DIA.	4-1/4"	2" OD		JOB NO. 14-C-08	
				WT.	---	140 lbs		REPORT NO. 14-C-12	
				FALL	---	30"		SHEET NO. 1 of 1	
depth, ft.	casing blows	sample type/no.	depth	sampler blows per 6"	N value	DESCRIPTION		REMARKS	
1						6" Asphalt Pavement and 4" Aggregate Base (2 layers)		Moist	
2		S-1	1' - 3'	11	18	Fill: Gray and red brown coarse to fine SAND, little medium to fine Gravel, little Silt			
3				10					
4				8					
5				9					
6		S-2	5' - 7'	4	8	Fill: NR, pieces of gravel in spoon tip		* Wet at 5'	
7				4					
8				4					
9				5					
10						----- 10'			
11		S-3	10' - 12'	2	4	Brown fibrous Peat			
12				1					
13				3					
14				2					
15									
16		S-4	15' - 17'	4	5	Dark gray brown medium to fine SAND, some Silt & Clay w/peat seams and pockets			
17				3					
18				2					
19				2					
20									
21		S-5	20' - 22'	3	7	Dark gray medium to fine SAND, trace Silt w/peat seams			
22				3					
23				4					
24				5					
25						----- 25'			
26		S-6	25' - 27'	7	13	Gray SILT & CLAY, trace fine Sand			
27				7					

Bottom of Boring at 27'

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

DRILLING CONTRACTOR: Environmental Technical Drilling, Inc.  
 DRILLING EQUIPMENT: CME-75 Truck Rig  
 SCE REPRESENTATIVE: K. Rowbotham

### VISUAL IDENTIFICATION OF SAMPLES

The samples were identified in accordance with the American Society for Engineering Education System of Definition described by Professor Donald M. Burmister in ASTM Special Technical Publication 479, 5th Edition, 1970.

#### I. Definition of Soil Components and Fractions

MATERIAL	SYMBOL	FRACTION	SIEVE SIZE	DEFINITION
Boulders	Bldr	--	9" +	Material retained on 9" sieve.
Cobbles	Cbl	--	3" to 9"	Material passing the 9" sieve and retained on the 3" sieve.
Gravel	G	Coarse (c) Medium (m) Fine (f)	1" to 3" 3/8" to 1" No. 10 to 3/8"	Material passing the 3" sieve and retained on the No. 10 sieve.
Sand	S	Coarse (c) Medium (m) Fine (f)	No.30 to No. 10 No.60 to No. 30 No.200 to No. 60	Material passing the No. 10 sieve and retained on the No. 200 sieve.
Silt	\$	--	Passing No. 200 (0.074 mm)	Material passing the No. 200 sieve that is non-plastic in character and exhibits little or no strength when air dried.

#### Organic Silt (O\$)

Material passing the No. 200 sieve which exhibits plastic properties within a certain range of moisture content, and exhibits fine granular and organic characteristics.

		PLASTICITY	PLASTICITY INDEX	CLAY-SOIL
Clayey SILT	Cy\$	Slight (sl)	1 to 5	Material passing the No. 200 sieve which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.
SILT & CLAY	\$&C	Low (l)	5 to 10	
CLAY & SILT	C&\$	Medium (m)	10 to 20	
Silty CLAY	\$yC	High (h)	20 to 40	
CLAY	C	Very High (vh)	40 plus	

11. DEFINITION OF COMPONENT PROPORTIONS

COMPONENT	WRITTEN	PROPORTIONS	SYMBOL	PERCENTAGE RANGE BY WEIGHT*
Principal	CAPITALS	--		50 or more
Minor	Lower Case	and some little trace	a.	35 to 50
			s.	20 to 35
			l.	10 to 20
			t.	1 to 10

\*Minus sign (-) lower limit, plus sign (+) upper limit, no sign middle range.

III. Glossary of Modifying Abbreviations

CATEGORY	SYMBOL	TERM	SYMBOL	TERM	SYMBOL	TERM
A. Borings	U/D	Undisturbed	B	Exploratory	A	Auger
B. Samples	C D O.E.	Casing Denison Open End	L S	Lost Spoon	U W	Undisturbed Wash
C. Colors	bk bl br gr	black blue brown gray	gn or rd tn	green orange red tan	wh yw dk lt	white yellow dark light
D. Organic Soils	dec dec'g lig	decayed decaying lignite	o rts ts	organic roots topsoil	veg pt	Vegetation peat
E. Rocks	LS Gns	Limestone Gneiss	rk SS	rock Sandstone	Shst Sh	Schist Shale
F. Fill and Misc. Material	bldr(s) brk(s) cndr(s)	boulder(s) brick(s) cinder(s)	cbl (s) wd dbr	cobble (s) wood debris	gls misc rbl	glass miscellaneo us rubble
G. Misc. Terms	do el, El fgmt (s) frqt lrg mtld no rec pen	ditto elevation fragment(s) frequent large mottled no recovery penetration	pp  P.I.  P  pc(s) rec or R	pocket penetrometer Plasticity Index pushed pressed piece(s) recovered	ref sm W.L. W.H. W.R.	refusal small water level weight of hammer weight of rods
H. Stratified Soils	alt thk thn w prt seam lyr stra vvd c pkt Ins occ freq	alternating thick thin with parting seam layer stratum varved Clay pocket lens occasional frequent	<ul style="list-style-type: none"> <li>- ) to 1/16" thickness</li> <li>- 1/16 to 1/2" thickness</li> <li>- 1/2 to 12" thickness</li> <li>- greater than 12" thickness</li> <li>- alternating seams or layers of sand, silt and clay</li> <li>- small, erratic deposit, usually less than 1 foot</li> <li>- lenticular deposit</li> <li>- one or less per foot of thickness</li> <li>- more than one per foot of thickness</li> </ul>			

IV. Other Descriptive Criteria

A. Relative density of coarse-grained soils and non-plastic silts.

N-VALUE	DESCRIPTIVE TERM	RELATIVE DENSITY (%)
0-4	Very Loose	0-15
4-10	Loose	15-45
10-30	Medium Dense	45-70
30-50	Dense	70-85
50+	Very Dense	85-100

B. Consistency of fine-grained soils with some plasticity.

N-VALUE	DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (tsf)
0-2	Very Soft	Less than 0.25
2-4	Soft	0.25-0.50
4-8	Medium	0.50-1.00
8-16	Stiff	1.00-2.00
16-32	Very Stiff	2.00-4.00
32+	Hard	4.00+

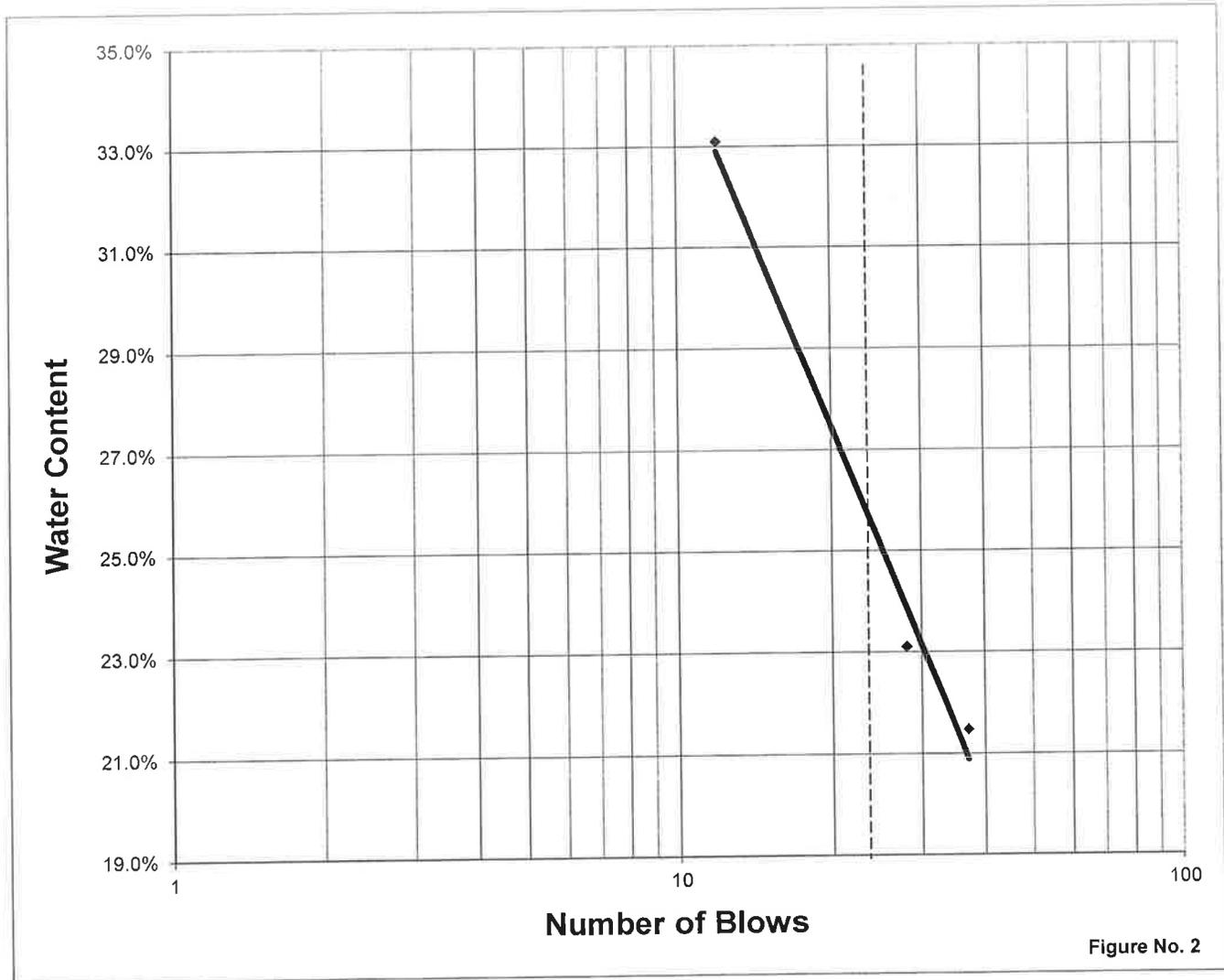
**APPENDIX III**  
**LABORATORY TEST RESULTS**

# SOR TESTING LABORATORIES, INC.

*Geotechnical Engineering - Materials Testing - Forensic Studies*

<b>CLIENT</b>	<u>Mid Atlantic Engineering Partners</u>	<b>PROJECT NO.</b>	<u>14-C-08</u>
<b>SAMPLE LOCATION</b>	<u>Parking Lot 'C', Block 308.01, Lot 3, Hackensack, NJ</u>	<b>LAB NO.</b>	<u>A14-042-02</u>
<b>SAMPLE NO.</b>	<u>B-1, S-9</u>	<b>DEPTH</b>	<u>30'-32'</u>
		<b>REPORT NO.</b>	<u>14-C-12</u>

## ATTERBERG LIMITS TEST



**Remarks :** V.D.Gray Clayey SILT  
Moisture Content (as received): 29.2%

**Technician :** MG **Date :** 03/31/14

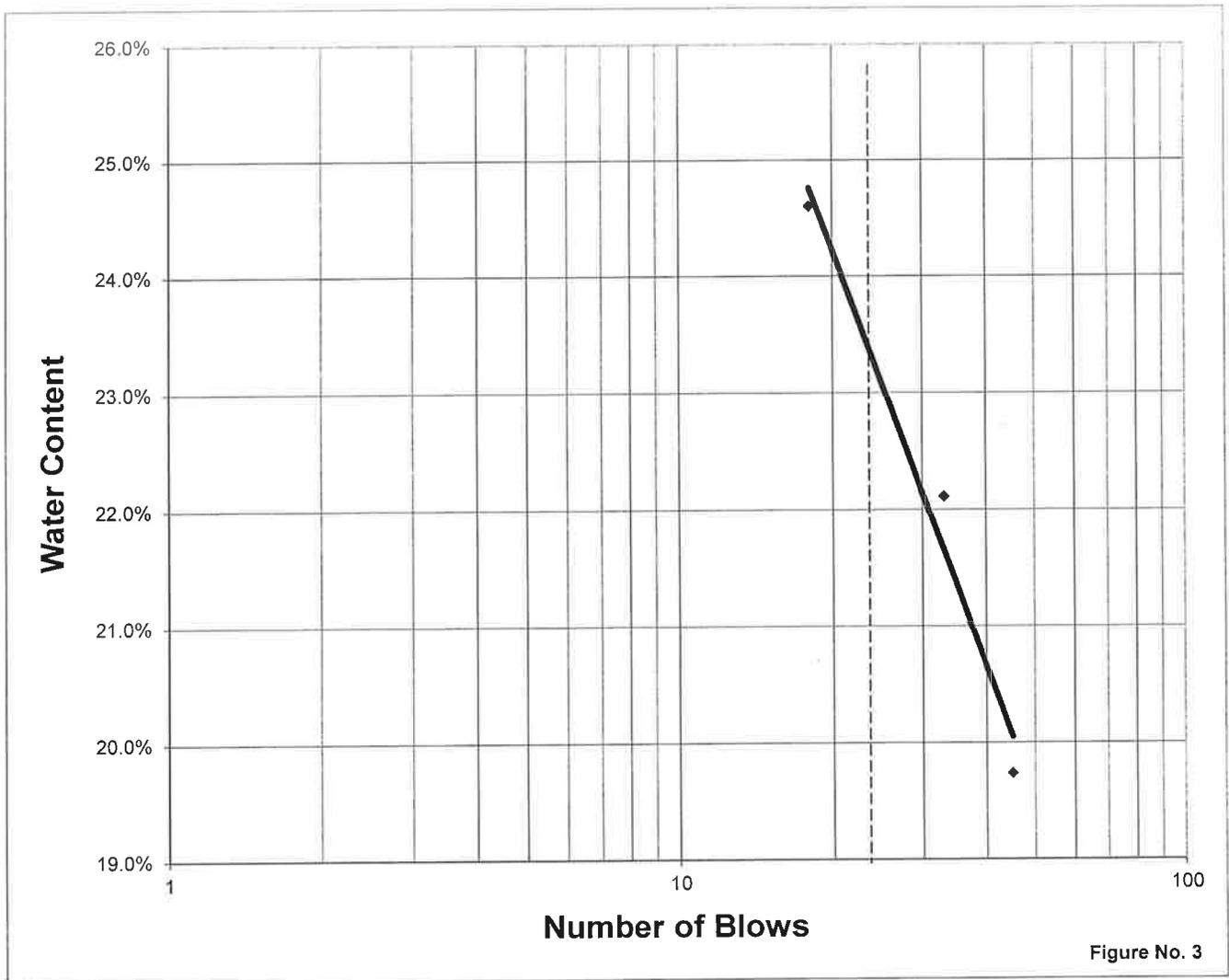
LL	25
PL	21
PI	4

# SOR TESTING LABORATORIES, INC.

*Geotechnical Engineering - Materials Testing - Forensic Studies*

<b>CLIENT</b>	<u>Mid Atlantic Engineering Partners</u>	<b>PROJECT NO.</b>	<u>14-C-08</u>
<b>SAMPLE LOCATION</b>	<u>Parking Lot 'C', Block 308.01, Lot 3, Hackensack, NJ</u>	<b>LAB NO.</b>	<u>A14-042-03</u>
<b>SAMPLE NO.</b>	<u>B-2, S-9</u>	<b>DEPTH</b>	<u>30'-32'</u>
		<b>REPORT NO.</b>	<u>14-C-12</u>

## ATTERBERG LIMITS TEST



**Remarks :** V.D.Gray Clayey SILT  
Moisture Content (as received): 28.1%

**Technician :** MG **Date :** 03/31/14

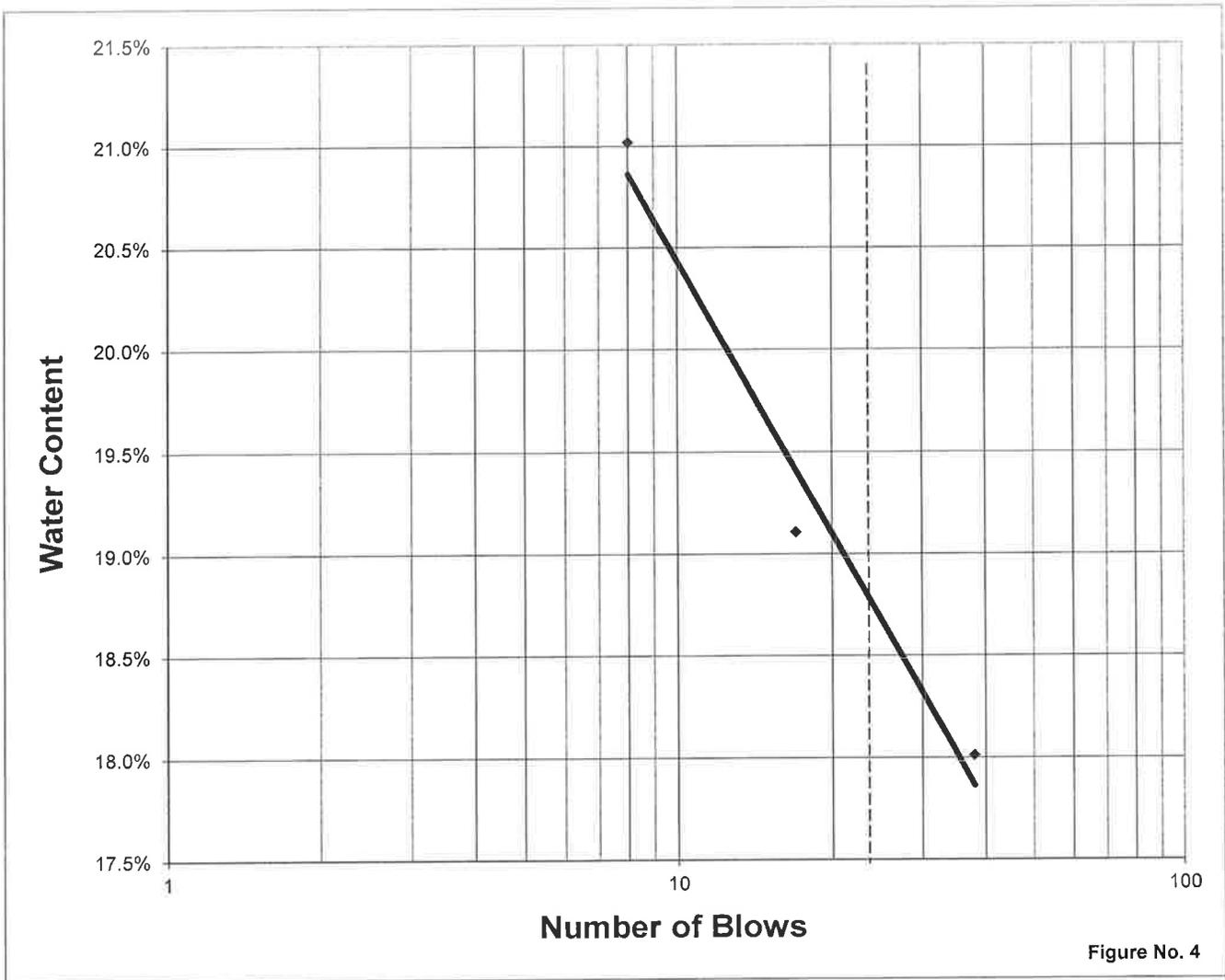
LL	23
PL	20
PI	3

# SOR TESTING LABORATORIES, INC.

*Geotechnical Engineering - Materials Testing - Forensic Studies*

<b>CLIENT</b>	<u>Mid Atlantic Engineering Partners</u>	<b>PROJECT NO.</b>	<u>14-C-08</u>
<b>SAMPLE LOCATION</b>	<u>Parking Lot 'C', Block 308.01, Lot 3, Hackensack, NJ</u>	<b>LAB NO.</b>	<u>A14-042-04</u>
<b>SAMPLE NO.</b>	<u>B-3, S-8</u>	<b>DEPTH</b>	<u>25'-27'</u>
		<b>REPORT NO.</b>	<u>14-C-12</u>

## ATTERBERG LIMITS TEST



**Remarks :** V.D.Gray SILT  
Moisture Content (as received): 22.1%

**Technician :** MG **Date :** 03/31/14

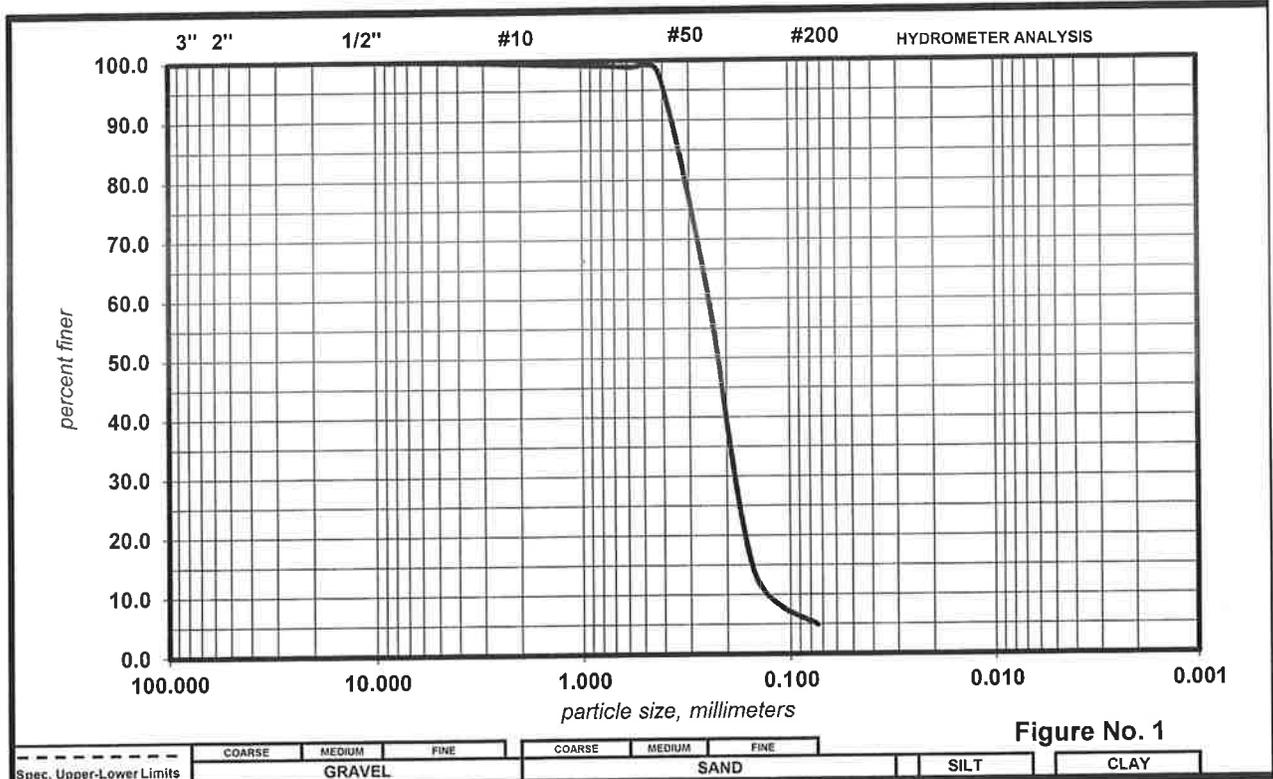
LL	18
PL	20
PI	NP

# SOR TESTING LABORATORIES, INC.

98 Sand Park Road - Cedar Grove, NJ 07009

Tel.: (973) 239-6001 Fax: (973) 239-8380 <http://www.sorlabs.com>

## PARTICLE SIZE DISTRIBUTION TEST REPORT



### Specification\*

Sieve Size	% Finer	Min.(%)	Max.(%)	Sample Identification		
3" (75 mm)				Sample No.:	B-4, S-5	
2 1/2" (63 mm)				Lab No.:	A14-042-01	
2" (50 mm)				Source/Location:	20'-22'	
1 1/2" (38.1 mm)				Description:	V.D.Gray mf SAND, trace Silt	
1" (25 mm)				<i>sample description in accordance with Burmister System</i>		
3/4" (19 mm)				LL :	PL :	PI :
5/8" (16 mm)				As received Moisture Content: 25.6 %		
1/2" (12.5 mm)				Classification:		
3/8" (9.5 mm)	100.0			USCS: [SP]		
5/16" (8 mm)				AASHTO:		
1/4" (6.3 mm)				Remarks:		
#4 (4.75 mm)	99.9			Sample received in lab on March 27, 2014		
#6 (3.35 mm)				Client: Mid Atlantic Engineering Partners		
#8 (2.36 mm)				Project: Parking Lot 'C', Block 308.01, Lot 3		
#10 (2 mm)	99.6			Location: Hackensack, New Jersey		
#14 (1.4 mm)				Date: 27-Mar-14		
#16 (1.18 mm)				Job No.: 14-C-08 Report No.: 14-C-12		
#20 (850 µm)						
#30 (600 µm)	98.9					
#40 (425 µm)	98.0					
#50 (300 µm)						
#60 (250 µm)	62.4					
#100 (150 µm)	13.8					
#200 (75 µm)	4.9					

\* -

**APPENDIX IV**  
**LIMITATIONS**

# SOR TESTING LABORATORIES, INC

## LIMITATIONS

The conclusions and recommendations contained in this geotechnical report no. 14-C-12 are based upon the applicable standards of our profession at the time this report was prepared.

The analyses and preliminary recommendations submitted in this report are based in part upon the data obtained from four widely-spaced test borings performed for this study. The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundaries between soil types. However, the transition between soil types may be gradual.

In our opinion, the number of explorations performed for this study are adequate for a general understanding of the site subsurface conditions. However, the nature and extent of variations between the explorations may not become evident until construction. If, during construction, variations become evident, it will be necessary to re-evaluate the recommendations of this report.

This preliminary geotechnical engineering report was prepared for the project by Sor Consulting Engineers, Inc. for design purposes only, and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the express understanding that its scope is limited to design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.

This report has been prepared in accordance with generally accepted geotechnical engineering practices for the exclusive use of Mid Atlantic Engineering Partners, LLC and/or their authorized representatives for specific application to the proposed redevelopment of parking lot "C", Block 308.01 Lot 3, City of Hackensack, New Jersey. No other warranty, expressed or implied, is made.