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March 11, 2015

Mr. Brian Kagarise, P.E.
Charles County Government
Department of Planning & Growth Management
P.O. Box 2150
200 Baltimore Street
La Plata, Maryland 20646

REF: ADDENDUM I – Report of Subsurface Investigation and Studies for Middletown Road Roundabout and Roadway Extension
Charles County, Maryland
AB Job No. 2013002

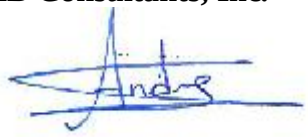
Dear Mr. Kagarise:

The geotechnical report for the above reference project was finished on June, 2014. Per your comments, we are pleased to submit this addendum containing the longitudinal underdrain requirements the subject project.

As revealed from boring logs, clayey fine sand to fine sandy clay material was encountered and extended 5- to 8-ft below existing grade, based on the encountered soil property, longitudinal underdrain located at the shoulder edge of the pavement are recommended on both sides of the roadway. Please refer MD SHA Standard No. MD387.11and MD378.11A for the details.

Should you have any inquiries regarding this addendum, please contact us.

Very truly yours,
AB Consultants, Inc.



Andinet Tolla, P.E.
Project Engineer

GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT

Middletown Road Roundabout and Roadway Extension
Charles County, Maryland

PREPARED FOR:

Charles County Government
Department of Planning & Growth Management
200 Baltimore Street
La Plata, Maryland 20646

PREPARED BY:

AB CONSULTANTS, INC.
9450 ANNAPOLIS ROAD
LANHAM, MARYLAND 20706

September, 2014

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June, 2014
Revised September, 2014

Attn: Mr. Brian Kagarise, P.E.
Charles County Government
Department of Planning & Growth Management
P.O. Box 2150
200 Baltimore Street
La Plata, Maryland 20646

REF: Report of Subsurface Investigation and Studies for
Middletown Road Roundabout and Roadway Extension
Charles County, Maryland
AB Job No. 2013002

Dear Mr. Kagarise:

AB Consultants, Inc. (ABC) is pleased to submit this soil report containing the results of the geotechnical investigation for the above referenced site. To obtain information of the subsurface condition, nine (9) 10-ft deep soil borings were drilled and seven (7) infiltration tests were performed on the site. The purpose of this study was to explore the subsurface conditions for intersection improvement of Middletown Road and Billingsley Road in Charles County, Maryland. This improvement includes the construction of a roadway extension with roundabout at this intersection in conjunction with Stormwater Management (SWM) facilities. The following report sections discuss the results of field and laboratory studies, design recommendations and construction methods for the proposed structures.

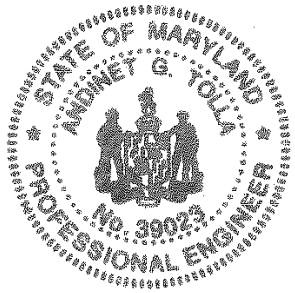
All samples obtained from soil test borings will be retained in our laboratory for a period of thirty (30) days from the date of this report. They will be available for inspection during this period. After that time, the samples will be discarded.

It has been a pleasure serving you on this project. If you have any questions regarding this report, or if we can be of further service in any way, please contact us.

Very truly yours,
AB Consultants, Inc.

Weixi Zeng, E.I.T
Staff Engineer

Andinet Tolla, P.E.
Project Engineer



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1.0 INTRODUCTION

1.1 General

This report presents the results of the subsurface exploration and laboratory tests performed for the intersection improvement of Middletown Road and Billingsley Road in Charles County, Maryland. Per our understanding, intersection improvement will include construction of new alignment on Middletown Road, roundabout and partial roadway widening at Middletown Road and Billingsley Road intersections. Stormwater Management (SWM) facilities are also considered for this intersection improvement project. This study was conducted for Department of Planning & Growth Management of Charles County Government and has been performed in general accordance with our letter proposal dated on January 2013 and subsequent conversations.

1.2 Scope of Work

The investigation of existing subsurface soil conditions at the site consisted of the following:

- Planning and executing subsurface exploration programs to evaluate soil and ground conditions for intersection improvement of Middletown Road and Billingsley Road.
- Planning and performing field infiltration tests.
- Performing soil laboratory tests on soil samples that obtained from the borings.
- Providing geotechnical report that includes results of field, laboratory studies and geotechnical recommendations.

1.3 Site Location

The field study was performed at the intersection of Middletown Road and Billingsley Road in Charles County, Maryland.

2.0 FIELD ACTIVITIES AND SUBSURFACE EXPLORATION

2.1 Soil Borings

For subsurface studies, a total of nine (9) soil borings were performed on May 8 and 9, 2013. Borings were drilled at the referenced site to depths of 10- ft below the existing ground. Soil borings were staked out in the field by ABC. Site location and boring plans are included in the Appendix.

2.2 Subsurface Investigation

Borings were drilled using a truck-mounted drill rig, B-61. Test borings were advanced by using hollow-stem augers and soil samples were obtained using the Standard Penetration Tests (SPT) in accordance with ASTM D1586. SPT samples were obtained for each boring at depth intervals of every 2.5 feet. A representative portion of each split spoon sample was placed in a glass jar and was transported to our laboratory. Bulk samples were also collected at some locations.

In the split-barrel sampling procedure, a 2-inch O.D. split-barrel sampling spoon is driven into the ground with a 140-pound hammer, free falling a distance of 30 inches. The blows required to advance the sampling spoon to a specified distance are reported as the penetration resistance values. The values are shown on boring logs at the depths of their occurrence. The N-value is the sum of standard penetration resistance values that advanced through the last 12-inches of sampling. The N-value is an indication of the relative density of in-place granular soils and, to a lesser degree of accuracy, the consistency of cohesive soils.

Groundwater level was monitored in the boring. The boring locations given on the boring plans are accurate within ±2 ft, and the surface elevations on the boring logs are accurate within ±0.5 ft. Samples obtained from the boring were inspected by a geotechnical engineer and the field logs were edited accordingly. The final logs with correlation of all laboratory test results that indicated the subsurface conditions encountered is included in the Appendix.

2.3 On-site Infiltration Test and Results

Seven (7) infiltration tests were performed in auger borings drilled at 5-ft radius from the soil sample borings. Test holes were drilled with 8-inch diameter auger to a depth of 5-ft below existing ground. 5-inch diameter solid PVC casings were inserted and water was then introduced for an overnight presoak period. Infiltration tests were performed the next day by refilling PVC casings with water to the presoak level and then monitoring water levels for one hour time. Repeat this procedure (refilling the casing each time) three additional times, for a total of four observations. Field in-situ infiltration test data are included in the Appendix and results are summarized in following table.

SUMMARY OF IN-SITU INFILTRATION TEST RESULTS			
Boring No.	Approx. Test Hole Depth, (ft)	Sample Description at Bottom of Test Hole	Suggested Average Infiltration Rate (in./hr)
SB-1	5	Silty sand	0.6
SB-2	5	Fine sandy clay	0.25
SB-3	5	Fine sandy clay	0.5
SB-4	5	Fine sandy clay	0*
SB-5	5	Silty sand	0.8
SB-6	5	Silty sand	2.2
SB-7	5	Silty sand	0.8

* No infiltration was recorded; this may be a result of clayey soil layer at the bottom of testing depth.

3.0 LABORATORY TESTING PROGRAM

3.1 Laboratory Testing Program

Laboratory tests were performed on selected representative samples. Natural moisture contents were performed on all soil samples, and results are included in boring logs. Atterberg limits, sieve analysis, modified proctor and California Bearing Ratio (CBR) tests were conducted on selected samples. Atterberg limits results are shown in boring logs in correspondence with the sample depths and results of sieve analyses, proctors and CBR are presented in the Appendix.

3.2 Laboratory Results

Results of some laboratory tests are summarized in the following table. Other pertinent soil data are presented in the boring logs and the Appendix.

SUMMARY OF LABORATORY TEST RESULTS							
Boring No.	Sample Depth (ft)	- #200 Sieve (%)	Modified Proctor Test		CBR	Percent Swell or Shrink (%)	Classification
			Max. Dry Density (pcf)	Opt. Moist. Content (%)			
SB-5	1 to 5	63.3	123.7	12.2	14.2 @ 0.1”	0.15	CL / A-6
SB-8	1 to 6	58.1	113.8	16.0	-	-	CL / A-7-6
SB-9	1 to 5	71.1	119.2	14.6	24.7 @ 0.1”	0.33	CL / A-6

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 Site Condition

The project site is located in White Plains, Maryland. The subsurface investigation was performed near the intersection of Middletown Road and Billingsley Road. Single family houses and farmland are found in the vicinity area. Existing gravel road, which is not functional during out field study, is found at the east side of intersection. The soil borings SB-1 thru SB-5 were drilled on a farmland at the northeast portion of this intersection. Borings SB-6 thru SB-8 were drilled at the southeast corner of the intersection. Boring SB-9 was drilled at the southwest corner. Utilities in the area include overhead power line, underground water, sewer, and storm drains. No major distress or cracks are noticed in our field visit and therefore existing pavement is considered as a fair condition.

4.2 Site Geology

Geologically, the project site is in the Upland Deposits (Western Shore) of the Costal Plain Province. It is underlain by a wedge of unconsolidated sediments including gravel, sand, silt and clay, which overlaps the rocks of the eastern Piedmont. The major soils found in this area were carried down and deposited from larger rivers during Pleistocene time. The soils in this area are dominantly sandy and gravelly soils, and with some locally limonite-cemented soils from minor silt and clay.

4.3 Subsurface Soil Condition

Various soil types were grouped into the major zones noted on the boring logs. A brief explanation of the terms and notes used in the logs is included with this report. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual. Detailed soil description and depth of various soil strata are given in boring logs, together with SPT blow counts with depth. In general, the encountered soils are grouped into major types and summarized as follows:

Topsoil: Topsoil was encountered at all boring location except SB-5. Topsoil is defined as the more high-organic, weathered surficial soils horizon capable of supporting vegetation.

Type A: *Clayey Fine Sand:* At soil borings SB-4 and SB-8, brown clayey fine sand with gravel was encountered underneath Topsoil and extended to 3-ft below the existing ground. N-values of this layer of soil were ranging from 13 to 16 blows per foot.

Type B: *Fine Sandy Clay:* Underneath Topsoil and Type A soils, material consisting of brown, reddish brown and gray fine sandy clay with trace of gravel was encountered in all borings and extended to 5- to 8-ft below existing grade. N-values of these encountered soils were ranging from 10 to 42 blows per foot.

Type C: *Silty Sand:* Brown and gray silty sand was encountered below Type A and Type B soils and extended to completion depths of all borings. N-values of encountered soils were ranging from 29 to more than 50 blows per foot.

4.4 Groundwater Observations

Groundwater observations were made in every borehole during drilling and after completion of drilling and recorded up to 24 hour. As noted on boring logs, groundwater was encountered in borings SB-7 and SB-8 at 24 hour water reading, this encountered water may be perch water from the surrounding. Water level observations are presented at the lower left hand corner of boring logs. Fluctuations in the level and quantity of ground water will occur due to variations in rainfall, temperature, soil permeability and other factors not evident at the time of the water level measurements recorded on boring logs.

5.0 ANALYSIS AND RECOMMENDATIONS

5.1 Pavement Considerations

The improvement of this roadway project may include milling and resurfacing of existing pavement and widening and a full lane construction. This roadway improvement included a portion of Billingsley Road approximately between Sta. 33+00 to Sta. 34+50, a portion of Middletown Road between Sta. 20+50 to Sta. 23+20 and Sta. 10+50 to 19+70. Lane configurations and alignment of existing intersection expected to be modified. Site grading is expected to be minor. Asphalt concrete pavements are anticipated. The pavement design is based on traffic data provided by Charles County Department of

Planning and Growth Management in June 2014. The current and forecasted Annual Average Daily Traffic (AADT) is summarized here under:

ANNUAL AVERAGE DAILY TRAFFIC SUMMARY		
Traffic Lanes	AADT (Year 2013)	AADT (Year 2033)
West Leg of Intersection: Billingsley Road (WB+EB)	7,560	11,200
North Leg of Intersection: Middletown Road (NB+SB)	7,600	11,300
South Leg of Intersection: Middletown Road (NB+SB)	3,700	5,500

WB (West Bound), EB (East Bound), NB (North Bound), SB (South Bound)

5.0% of trucks are assumed and used for the traffic analysis. The 18-kip equivalent value based on the furnished data for design life of 20-years is about 3,200,000.

As revealed from boring logs in the roadway alignment, predominate subsurface soil encountered in the upper portion of borings are Fine Sandy Clay (Type A) and Clayey Fine Sand (Type B). Based on the field data and laboratory tests results of these encountered soils, CBR is expected to be ranging from 14 to 25. The encountered subgrade material considered as fair to good subgrade material. However, localized unsuitable materials may be encountered during site grading operation and subgrade improvement may be required. Before commence of any backfills, embankment foundations and roadway subgrade shall be proof rolled. Any poor subgrade shall be undercut on the order of 12 inch or more and shall be backfilled with suitable material as per the county requirements.

A properly-prepared subgrade of existing soils or undercutting the weaker subgrade soils and backfilling with selected fill are utilized in the assumption of pavement design. Pavement sections have been selected using AASHTO methods[1]. . Parameters utilized for pavement design are summarized below:

[1] Guide for the Design of Pavement Structures; American Association of State Highway and Transportation Officials; 1993.

REVISED PAVEMENT DESIGN PARAMETERS	
Design period	20 years
Design E-18	3,200,000
Reliability	85%
Overall standard deviation	0.49
Design subgrade resilient modulus (M_R)	5,000 psi
Initial serviceability	4.2
Terminal serviceability	2.5

Based on estimated traffic data and encountered subsoil information, an Asphalt pavement structural number (SN) of 5.12 has been determined and two (2) pavement sections which included 1) the full-depth pavement construction, and 2) overlay of existing pavement.

Per the preliminary information provided the road was is classified as Minor Arterial with a design speed of 50 MPH. Based on Charles County standard for Minor Arterial and design traffic data pavement sections are determined for full depth pavement sections. Pavement sections are summarized in the following table.

REVISED PAVEMENT SECTIONS SUMMARY		
Section Thickness	Pavement Section per Traffic Data	Pavement Section per County Requirement
Surface Coarse - Hot Mix Asphalt Superpave 9.5 mm, PG 76-22	1.5 inches	1.5 inches
Intermediate Surface Coarse - Hot Mix Asphalt Superpave 19 mm, PG 64-22	1 inches	1 inches
Base Coarse - Hot Mix Asphalt Superpave 19 mm, PG 64-22, (two 3.5” lift)	7 inches	4.5 inches
Bank Run Gravel (two 5” lifts)	10 inches	10 inches
	Total SN = 5.20	Total SN = 4.48

As per provided information, with fair condition and pavement thickness of 7.5 inches of bituminous asphalt concrete and 10 inches of bank run gravel, an average SN about 3.5 was calculated for the **existing pavement**. Existing pavement sections at these areas are **not adequate** to accommodate the forecasted design traffic. Therefore, overlay with 3.5 inches asphalt on the existing pavement is proposed. The following overlay pavement sections can be considered.

OVERLAY PAVEMENT SECTIONS SUMMARY	
Section Thickness	Pavement Section
Surface Coarse - Hot Mix Asphalt Superpave 9.5 mm, PG 76-22	1.5 inches
Wedge/Level Course - Hot Mix Asphalt Superpave 19.0 mm, PG 64-22	2 inches

For the new pavement construction areas, aggregate base should be compacted to a minimum of 97 percent of the maximum Modified Proctor dry density (ASTM D1557) within minus 2 percent to plus 2 percent of optimum moisture content.

5.2 SWM Facilities Considerations

The infiltration design criteria established by the Maryland Department of the Environment (MDE) Water Management Administration advises that infiltration practices are not recommended to be utilized: (a) in regions where the bottom of the infiltration facility is in existing or newly placed fill, or (b) in materials that exhibit an infiltration rates less than 0.52 inches per hour, or (c) where the groundwater table or bedrock is within 4 feet of the bottom of the infiltration facility.

Bottom of infiltration faculties are anticipated to be 5-ft below existing ground. Based on information revealed from borings, laboratory results, and our visual classification of the recovered soil samples, the encountered sub-soils are classified per the USDA classification system and are summarized in following table.

SUMMARY OF SOIL PROPERTIES OF SWM FACILITY				
Boring No.	Sample Depth (ft)	USDA Textural Classification	Minimum Infiltration Rate (in/hr)	Hydrologic Soil Grouping
SB-1	0.5 to 5	Clay	0.02	D
	5 to 10	Sandy loam	1.02	B
SB-2	0.5 to 5.5	Clay	0.02	D
	5.5 to 10	Sandy loam	1.02	B
SB-3	0.5 to 5.5	Clay	0.02	D
	5.5to 10	Sandy loam	1.02	B
SB-4	0.5 to 3	Sandy loam	1.02	B
	3 to 8	Clay	0.02	D
	8 to 10	Sandy loam	1.02	B

SUMMARY OF SOIL PROPERTIES OF SWM FACILITY				
Boring No.	Sample Depth (ft)	USDA Textural Classification	Minimum Infiltration Rate (in/hr)	Hydrologic Soil Grouping
SB-5	0.5 to 5	Clay	0.02	D
	5 to 10	Sandy loam	1.02	B
SB-6	0.5 to 5	Clay	0.02	D
	5 to 10	Sandy loam	1.02	B
SB-7	0.5 to 5	Clay	0.02	D
	5 to 10	Sandy loam	1.02	B

* Silty sandy material was encountered and extended to end of the borings. Depth of encountered sandy soil layer may vary from place to place and shall be verified during construction.

Considering the USDA classification, boring information, on-site infiltration tests and groundwater observation, the proposed SWM in most of the areas, in general, are considered suitable for infiltration design in accordance with general design criteria at most of infiltration boring locations. Results of our findings are summarized in the following table.

SUMMARY OF SWM CONSIDERATIONS AT 5-ft BELOW GROUND				
Boring No.	Facility Bottom Below Excising Ground	On-site Infiltration Rate (in/hr)	Infiltration Rate per USDA (in/hr)	Infiltration SWM Facility
SB-1	5	0.6	1.02	Acceptable
SB-2	5	0.25	1.02	Marginal
SB-3	5	0.5	0.02	Marginal
SB-4	5	0	0.02	Not acceptable
SB-5	5	0.8	1.02	Acceptable
SB-6	5	2.2	1.02	Acceptable
SB-7	5	0.8	1.02	Acceptable

At infiltration borings SB-1, SB-5, SB-6 and SB-7, it is our opinion that an infiltration system will be feasible if the proposed SWM bottom elevation on the order of 5-ft below the existing ground.

Marginal to low infiltration rates were recorded at SB-2, SB-3 and SB-4 infiltration borings; this may be a result of encountered clayey soil layer at the testing depth. Based on the soil information revealed from soil boring, sandy loam material was

encountered underneath the clay layer and extended to completion of the boring. Infiltration rate on the order of 0.52 in/hr or more is anticipated for sandy loam material. Therefore, it is our opinion that an infiltration system may be feasible if the proposed SWM bottom elevation on the order of 6-ft below the ground for SB-2 and SB-3 area and 8-ft below existing below the ground for SB-4 area. It is also recommended that during construction of the SWM facility, the soil encountered at and below the planned elevation, to be verified along with their infiltration characteristics.

6.0 SITE GRADING

6.1 Site Grading

Grading preparation should include clearing within the limits of construction, grubbing, removal of the organic surficial soils and existing pavement. Depth of stripping and undercutting will be determined at site during construction. Following stripping and any cut, and before any fill is placed, subgrade should be proof rolled and verified by geotechnical engineer. Areas identified during the verification process as soft or exhibiting "pumping" tendencies should be undercut, processed and recompacted or removed and replaced with suitable fills, whichever is appropriate. Design and construction should include provisions for temporary storage, hauling, and disposal of stripped materials at an approved off-site location.

6.2 Suitable Fill Material

Fill and backfill for general areas should be free of organics and debris and rock fragments in excess of 3-in. in any dimension. In the upper 18 inches of fill, maximum particle size should be limited to about 1.5 inches. As per ASTM D2478 classification, imported select fill should consist of sandy gravel (GM), clayey gravel (GC), gravelly sand (SP), silty sand (SM), clayey sand (SC), or low-plasticity sandy clay (CL) with a liquid limit and plasticity index of less than 40 and 15 respectively, or an approved alternate.

6.3 Compaction Requirement for Roadway

Fill soils should be compacted to a minimum of 95 percent of maximum Modified Proctor dry density (ASTM D1557), with a moisture content range of minus to plus 2

percent of optimum. Fill should be placed in nominal 8-inch-thick loose lifts. Each lift of fill should be properly compacted, tested and approved prior to placing subsequent lifts.

7.0 CONSTRUCTION CONSIDERATIONS

Positive surface drainage should be established at the start of work, be maintained during construction and following completion of the project to prevent surface water ponding and subsequent saturation of subgrade soils. Prolonged exposure or saturation of subgrade soils by ponding or runoff water may result in significant changes in strength and compressibility characteristics. Saturated subgrade soils should be excavated and replaced with suitable materials.

Geotechnical engineer or designated representative should monitor the site preparation and grading work. Subsurface conditions significantly at variance with those encountered in the borings should be brought to the attention of the ABC geotechnical engineer.

8.0 GENERAL COMMENTS

The soil classifications presented in this report are based upon the data obtained from the soil borings performed at indicated locations and from any other information discussed in this report. This report does not reflect any variations that may occur across the site. The nature and extent of such variations may not become evident until construction. If variations appear evident, the conclusion and recommendations of this report should then be reviewed by ABC geotechnical engineer in light of the new information.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are intended or made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by ABC geotechnical engineer of record.

APPENDIX

A. General Notes

B. Vicinity Map

C. Boring Plan

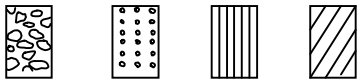
D. Boring Logs

E. Lab Test Results

F. Infiltration Test Results

A. GENERAL NOTES

Drilling and Sampling Symbols



Gravel Sand Silt Clay

Split Spoon (SS) Auger Cutting (AU) Shelby Tube (ST) Rock Core (RC)

N = Standard penetration, blows per foot of a 140 lbs hammer for 30" drop
RQD = Rock Quality Designation
LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index

Cohesionless Soils

If the sand or silt content of a soil is great enough, the soil becomes non-cohesive or semi-cohesive. The soil classification becomes SAND or SILT with the other soil constituents being modifying.

Based on N-Value

0 to 4 Blows…….Very Loose	30 to 59 Blows…….Dense
5 to 9 Blows…….Loose	Over 60 Blows…….Very Dense
10 to 29 Blows…….Medium Dense	

Cohesive Soils

If clay content is sufficient so that clay dominates soil properties, then CLAY becomes the major soil constituent as modifier. Other minor soil constituents may be added according to classification breakdown for cohesion less soils: i.e. silty clay, trace of some sand, trace of gravel.

Based on N-Value

0 to 3 Blows…….Very Soft	16 to 30 Blows……..Stiff
4 to 5 Blows…….Soft	30 to 60 Blows……..Very Stiff
6 to 16 Blows……...Firm	Over 61 Blows……..Hard

Based on Penetrometer Value

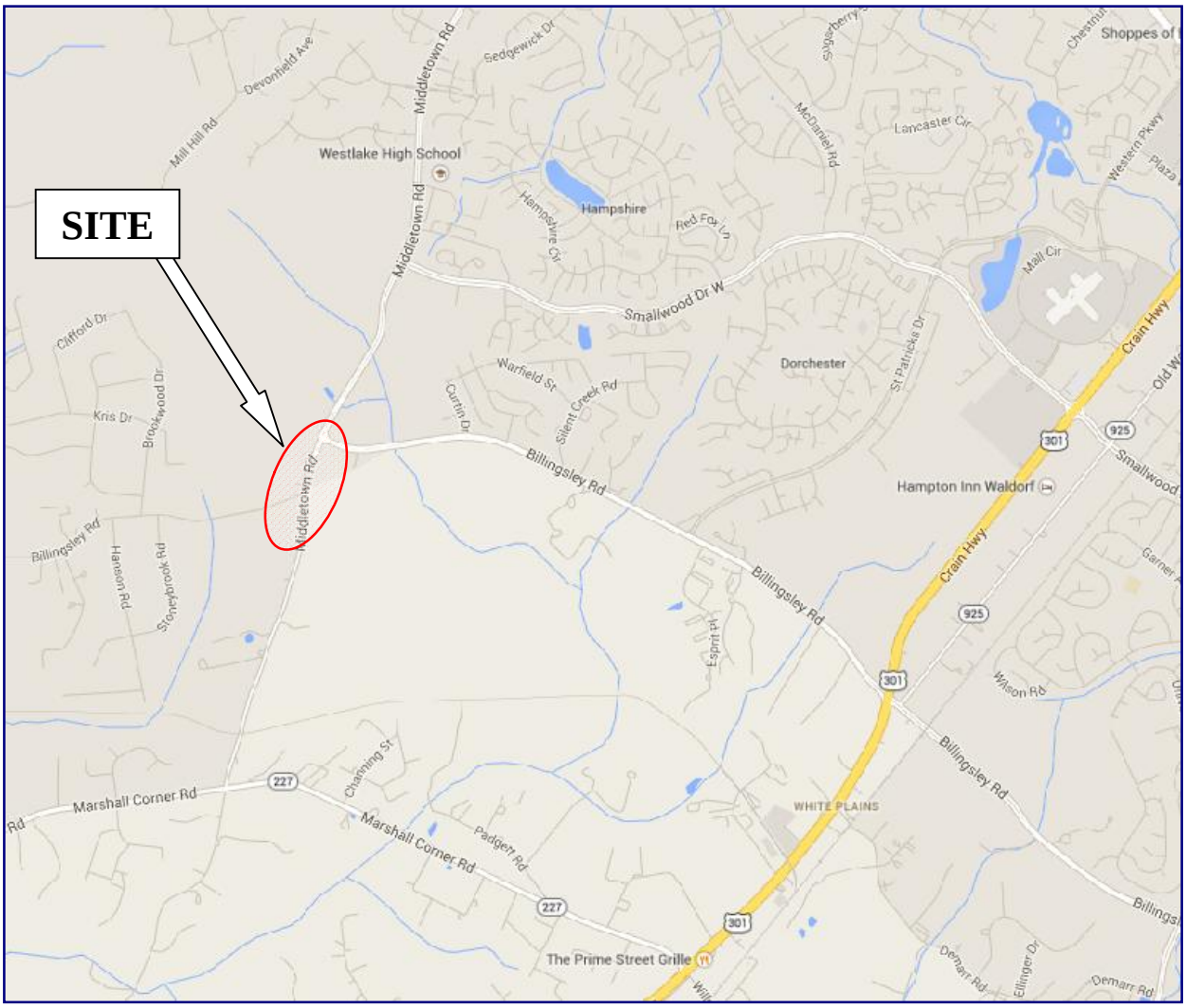
Below 0.25……...Very Soft	1.00 to 1.99……...Stiff
0.25 to 0.49……...Soft	2.00 to 3.99……...Very Stiff
0.50 to 0.99……..Firm	Over 4.00……..Hard

Quantity Modifiers

Term	% of Dry Weight
trace	0 to 10
little	11 to 20
some	21 to 35
and/with	36 to 50

Particle Size Identifications

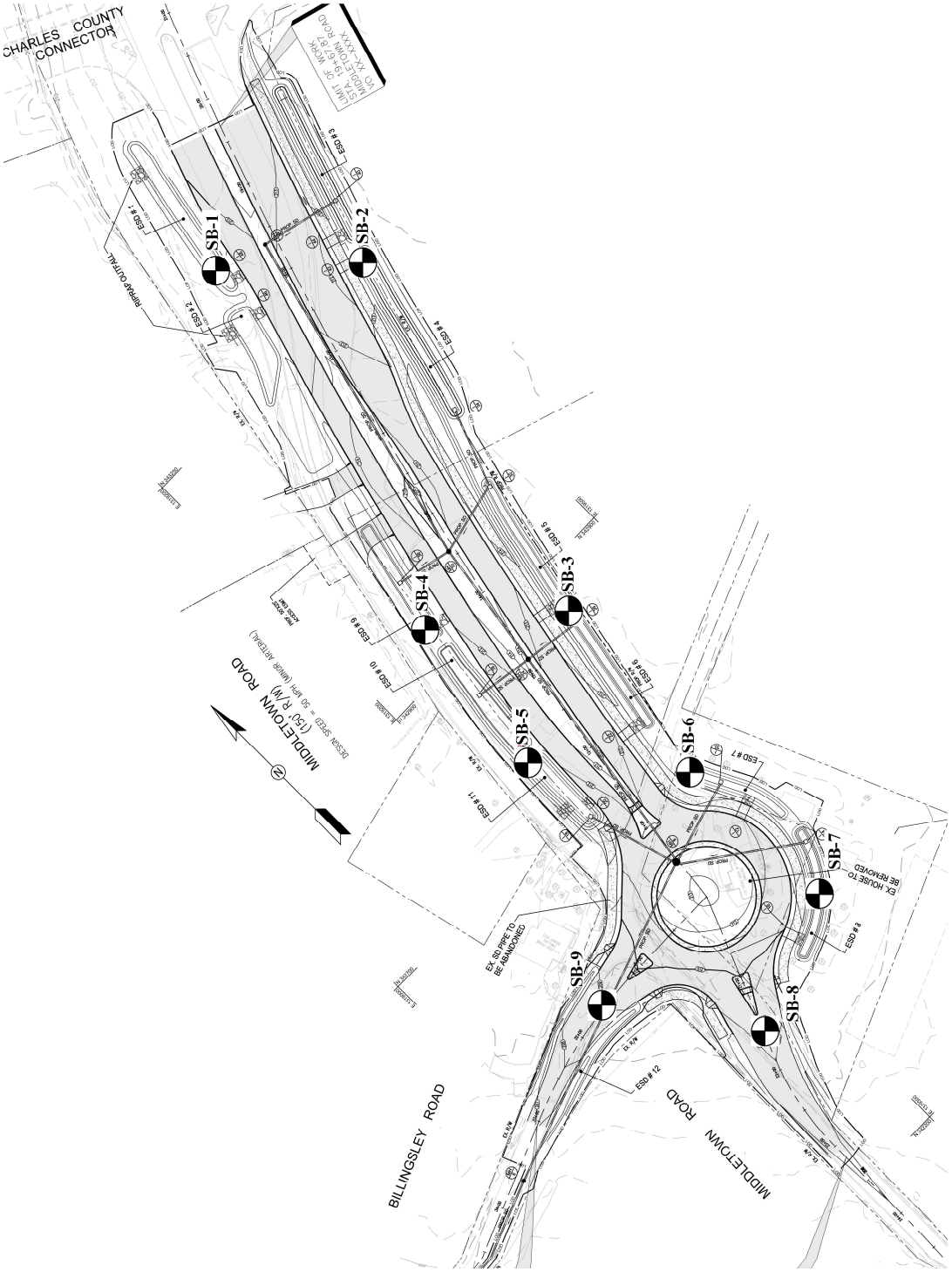
Boulder ……..Over 8 inch diameter
Cobbles……...3 inch to 8 inch
Gravel……...Coarse……1 inch to 3 inch
Medium……1/2 inch to 1 inch
Fine……....4.75 mm to 1/2 inch
Sand……....Coarse……....2 mm to 4.75 mm
Medium……..0.425 mm to 2 mm
Fine……....0.075 mm to 0.425 mm
Silt/Clay…….....Below 0.075 mm



B. VICINITY MAP

Middletown Road Roundabout and Road Extension
Charles County, Maryland

JOB NO.: 2013002
SCALE: N.T.S.
DATE: 5/13/2014



C. BORING PLAN

Middletown Road Roundabout and Road Extension
Charles County, Maryland

JOB NO.: 2013002
SCALE: N.T.S.
DATE: 5/13/2014

D. BORING LOGS

Project No. 2013002

LOG OF BOREHOLE SB-1

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:	GRAPHIC LOG	DEPTH (FT)	SAMPLES: BLOWS/6" N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	TESTS: DRY DENSITY (PCF)	TESTS: Qu (TSF)	TESTS: % PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3 4" Topsoil Firm to very stiff brown FINE SANDY CLAY (CL) with trace of gravel			3-5-7 N=12	1	SS	11/18 61%	12			77	
			6-9-12 N=21	2	SS	18/18 100%	16				
5.0 Very dense brown SILTY SAND (SM) with gravel		5	9-14-19 N=33	3	SS	18/18 100%	21				
			17-28-48 N=76	4	SS	16/18 89%	11				
10.0 End of Boring @ 10 ft Borehole was backfilled after 24 hour water reading		10									

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 5.5 ft	@ 0 Hrs
WL	Dry, Caved-in 5.5 ft	@ 24 Hrs

AB Consultants, Inc.
9450 Annapolis Road
Lanham, MD 20706
Phone: 301-306-3091
Fax: 301-306-3092

STARTED:	5/8/14	FINISHED:	5/8/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

Project No. 2013002

LOG OF BOREHOLE SB-2

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:

DEPTH (FT)	GRAPHIC LOG	SAMPLES: BLOWS/6" N - VALUE RQD	NUMBER	TYPE	IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	DRY DENSITY (PCF)	Qu (TSF)	% PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3		4" Topsoil								
		Firm to stiff brown and gray FINE SANDY CLAY (CL) with trace of gravel								
		2-3-8 N=11	1	SS	13/18 72%	19				
		6-10-17 N=27	2	SS	18/18 100%	22				LL = 40 PL = 26 PI = 14
5										
5.5		Dense to very dense brown SILTY SAND (SM) with gravel and clay								
		14-28-37 N=65	3	SS	17/18 94%	11			24	
		16-24-28 N=52	4	SS	18/18 100%	10				
10										
10.0		End of Boring @ 10 ft								
		Borehole was backfilled after 24 hour water reading								

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 5.5 ft	@ 0 Hrs
WL	Dry, Caved-in 5.5 ft	@ 24 Hrs

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9450 Annapolis Road
Lanham, MD 20706
Phone: 301-306-3091
Fax: 301-306-3092

STARTED:	5/8/14	FINISHED:	5/8/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-3

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:

DEPTH (FT)	GRAPHIC LOG	SAMPLES: BLOWS/6" N - VALUE ROD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	TESTS: DRY DENSITY (PCF)	TESTS: Qu (TSF)	TESTS: % PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3 4" Topsoil Firm to very stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel		1-3-7 N=10	1	SS	15/18 83%	10				
		7-16-26 N=42	2	SS	18/18 100%	15			67	
5										
5.5 Very dense brown and gray SILTY SAND (SM) with gravel with trace of clay		12-31-39 N=70	3	SS	18/18 100%	9				
		13-25-35 N=60	4	SS	16/18 89%	7				
10										
10.0 End of Boring @ 10 ft Borehole was backfilled after 24 hour water reading										

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 8 ft	@ 0 Hrs
WL	Dry, Caved in 8 ft	@ 24 Hrs

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STARTED:	5/8/14	FINISHED:	5/8/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-4

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:	GRAPHIC LOG	DEPTH (FT)	SAMPLES: BLOWS/6" N - VALUE RQD	NUMBER	TYPE	IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	DRY DENSITY (PCF)	Qu (TSF)	% PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3 4" Topsoil											
Medium dense brown and reddish CLAYEY FINE SAND (SC) with gravel			4-8-8 N=16	1	SS	10/18 56%	16			23	
3.0											
Firm to very stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel		5	3-7-9 N=16	2	SS	18/18 100%	17			66	
			6-12-22 N=34	3	SS	18/18 100%	12				
8.0											
Dense brown and light gray SILTY SAND (SM) with gravel and clay			9-19-34 N=53	4	SS	18/18 100%	11				
10.0		10									
End of Boring @ 10 ft											
Borehole was backfilled after 24 hour water reading											

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 5.5 ft	@ 0 Hrs
WL	Dry, Caved in 5.5 ft	@ 24 Hrs

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STARTED:	5/8/14	FINISHED:	5/8/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-5

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:	GRAPHIC LOG	DEPTH (FT)	SAMPLES: BLOWS/6" N - VALUE RQD	NUMBER	TYPE	IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	DRY DENSITY (PCF)	Qu (TSF)	% PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3 4" Asphalt											
Firm to stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel			6-8-12 N=20	1	SS	17/18 94%	18				
			5-9-15 N=24	2	SS	18/18 100%	23				LL = 42 PL = 24 PI = 18
5.0 Very dense to dense brown SILTY SAND (SM) with gravel		5									
			16-25-27 N=52	3	SS	17/18 94%	10				
			8-15-22 N=37	4	SS	16/18 89%	10				
10.0		10									
End of Boring @ 10 ft											
Borehole was backfilled upon completion											

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 7.5 ft	@ 0 Hrs

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STARTED:	5/8/14	FINISHED:	5/8/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-6

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:

DEPTH (FT)	GRAPHIC LOG	SAMPLES: BLOWS/6" N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	TESTS: DRY DENSITY (PCF)	TESTS: Qu (TSF)	TESTS: % PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
		9" Topsoil								
0.7		Firm to very stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel								
		1-4-7 N=11	1	SS	14/18 78%	15				
		5-9-12 N=21	2	SS	18/18 100%	17			68	
5.0		Very dense brown SILTY SAND (SM) with gravel and clay								
5										
		10-17-26 N=43	3	SS	18/18 100%	23				
		19-26-29 N=55	4	SS	16/18 89%	9				
10.0										
10		End of Boring @ 10 ft Borehole was backfilled after 24 hour water reading								

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 8 ft	@ 0 Hrs
WL	Dry, Caved in 7.5 ft	@ 24 Hrs

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STARTED:	5/9/14	FINISHED:	5/9/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-7

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:

DEPTH (FT)	GRAPHIC LOG	SAMPLES: BLOWS/6" N - VALUE RQD	NUMBER	TYPE	IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	DRY DENSITY (PCF)	Qu (TSF)	% PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3		4" Topsoil								
		Firm to very stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel								
		2-6-9 N=15	1	SS	16/18 89%	16				
		7-12-20 N=32	2	SS	18/18 100%	19				
5.0										
5		Midium dense brown SILTY SAND (SM) with gravel and trace of clay								
		11-17-25 N=42	3	SS	18/18 100%	20				
		7-13-16 N=29	4	SS	16/18 89%	11			20	
10.0										
10		End of Boring @ 10 ft								
		Borehole was backfilled after 24 hour water reading								

WATER LEVEL OBSERVATIONS

WL	Dry	@ Drilling
WL	Dry, Caved-in 8 ft	@ 0 Hrs
WL	▼ 7.5	@ 24 Hrs

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STARTED:	5/9/14	FINISHED:	5/9/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-8

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:	GRAPHIC LOG	DEPTH (FT)	SAMPLES: BLOWS/6" N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	TESTS: DRY DENSITY (PCF)	TESTS: Qu (TSF)	TESTS: % PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.4 5" Topsoil Medium dense brown CLAYEY FINE SAND (SC) with trace of gravel			4-6-7 N=13	1	SS	7/18 39%	12				
3.0 Stiff to very stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel		5	5-11-18 N=29	2	SS	18/18 100%	17				LL = 49 PL = 30 PI = 19
▼			8-14-21 N=35	3	SS	17/18 94%	21				
8.0 Dense brown SILTY SAND (SM) with trace of gravel		10	7-18-20 N=38	4	SS	16/18 89%	10				
10.0 End of Boring @ 10 ft Borehole was backfilled after 24 hour water reading											

WATER LEVEL OBSERVATIONS		
WL	Dry	@ Drilling
WL	Dry, Caved-in 7.5 ft	@ 0 Hrs
WL	▼ 6.5	@ 24 Hrs

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STARTED:	5/9/14	FINISHED:	5/9/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

Project No. 2013002

LOG OF BOREHOLE SB-9

CLIENT: Charles County Government

PROJECT: **Middletown Road Roundabout and Road Extension**

ARCHITECT/ENGINEER:

SITE: **Charles County, Maryland**

SURFACE ELEV.:	GRAPHIC LOG	DEPTH (FT)	SAMPLES: BLOWS/6" N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: IN. RECOVERED IN. DRIVEN	TESTS: MOISTURE (%)	TESTS: DRY DENSITY (PCF)	TESTS: Qu (TSF)	TESTS: % PASSING #200 SIEVE	REMARKS/ ADDITIONAL DATA
0.3 4" Topsoil Firm to stiff brown, reddish brown and gray FINE SANDY CLAY (CL) with trace of gravel			2-3-7 N=10	1	SS	16/18 89%	18				
			5-8-15 N=23	2	SS	18/18 100%	23				
5.5 Dense brown and reddish brown SILTY SAND (SM) with trace of gravel		5	14-26-40 N=66	3	SS	18/18 100%	10				
			10-17-17 N=34	4	SS	15/18 83%	10				
10.0 End of Boring @ 10 ft Borehole was backfilled after 24 hour water reading		10									

WATER LEVEL OBSERVATIONS

WL	Dry	@ Drilling
WL	Dry, Caved in 8 ft	@ 0 Hrs
WL	Dry, Caved in 8 ft	@ 24 Hrs

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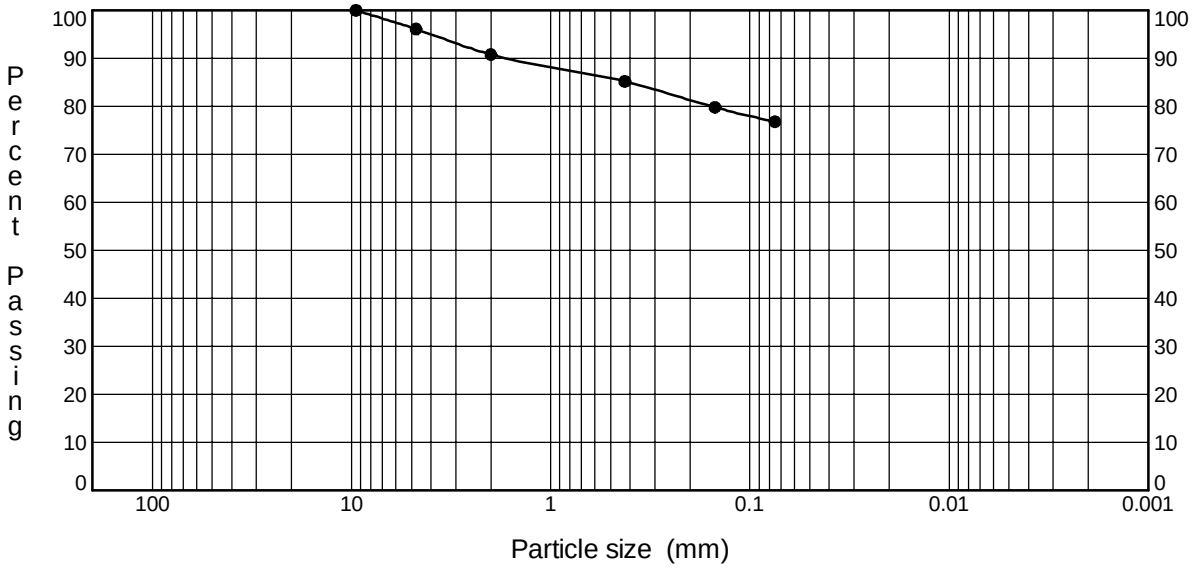
STARTED:	5/9/14	FINISHED:	5/9/14
DRILL CO.:	ABC	DRILL RIG:	B-61
DRILLER:	PS	ASS'T DRILLER:	
LOGGED BY:		APPROVED:	

BORING LOG AB09 2013002 MIDDLETOWN ROAD ROUNDABOUT AND ROAD EXTENSION.GPJ AB_CONS.GDT 6/12/14

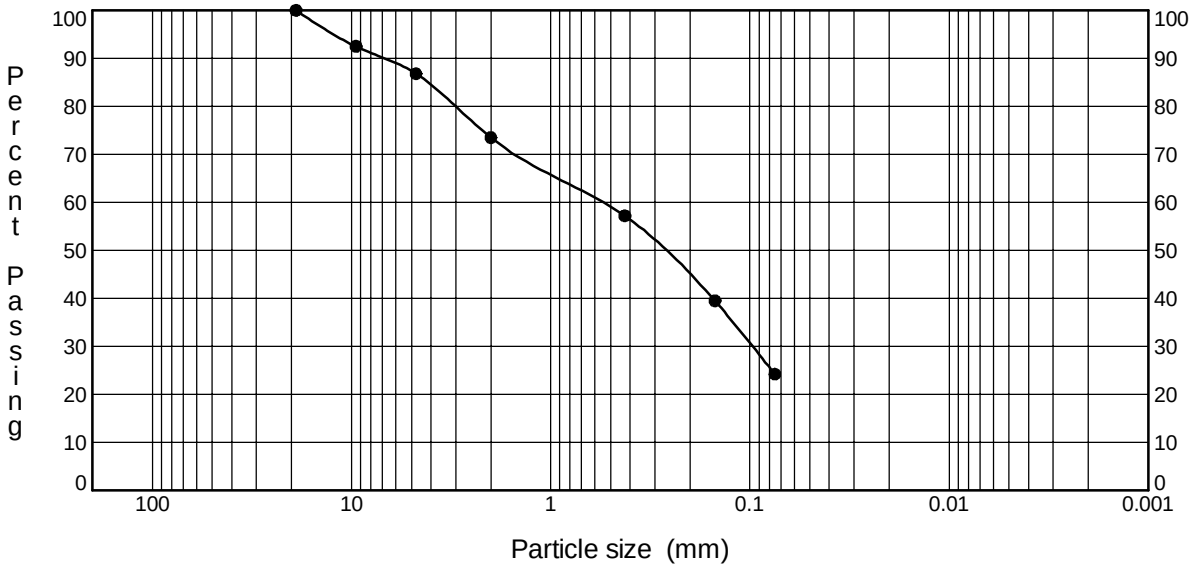
E. LAB TEST RESULTS

BOREHOLE NO. **SB-1** DEPTH **1.0**



Cobbles	Gravel: coarse	Gravel: fine	Sand: coarse	Sand: medium	Sand: fine	Silt	Clay

BOREHOLE NO. **SB-2** DEPTH **6.0**



Cobbles	Gravel: coarse	Gravel: fine	Sand: coarse	Sand: medium	Sand: fine	Silt	Clay

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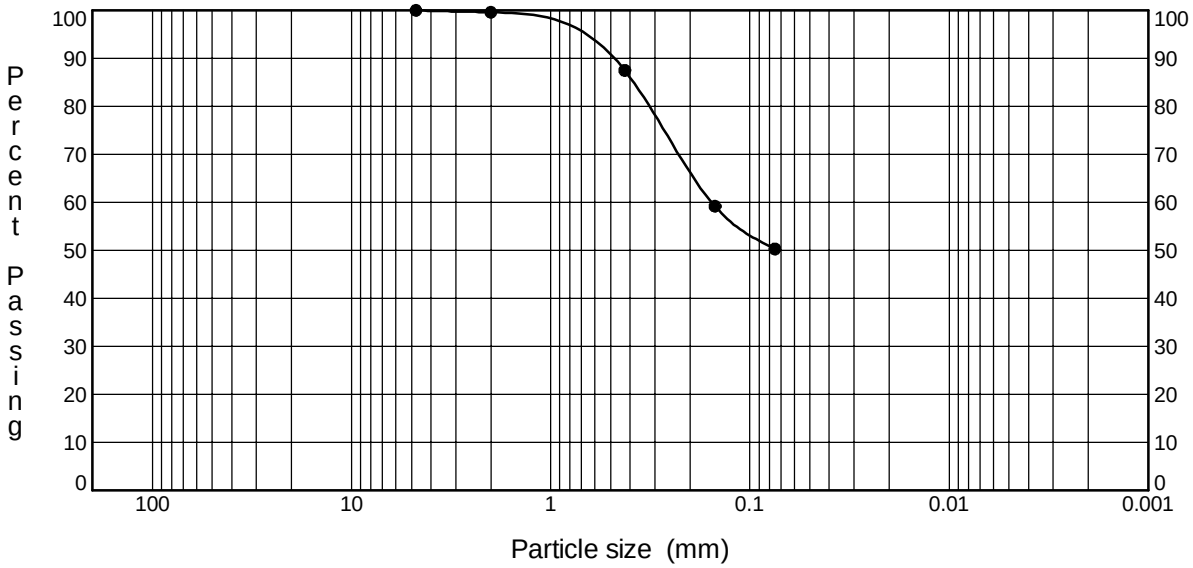
GRAIN SIZE DISTRIBUTION

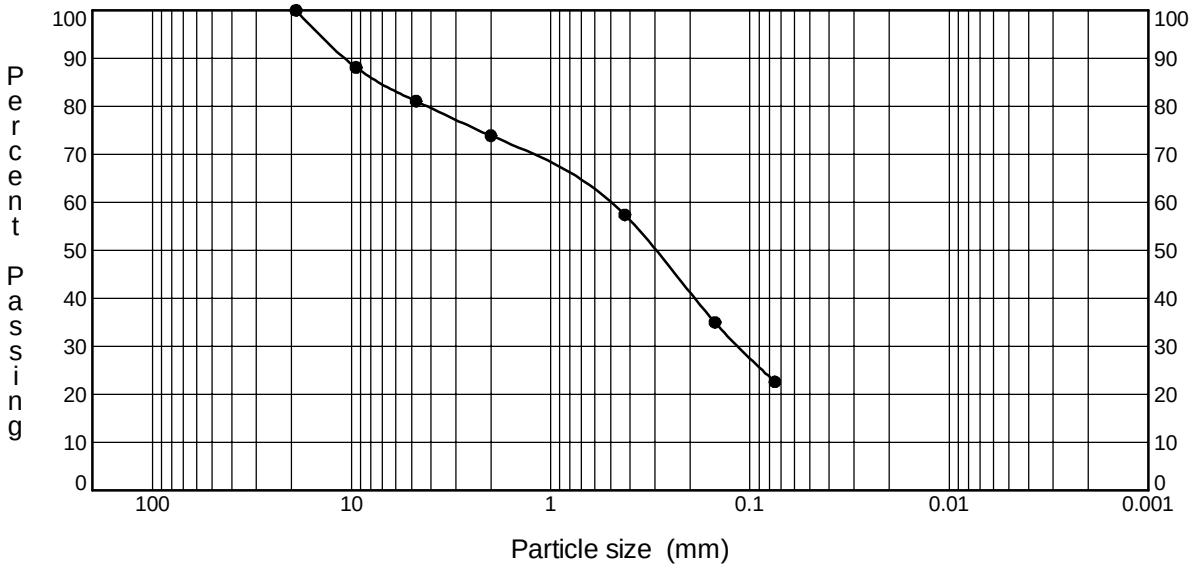
CLIENT: Charles County Government
PROJECT NO.: 2013002
PROJECT: Middletown Road Roundabout and Road Extension
SITE:
Charles County, Maryland

BOREHOLE NO. **SB-2** DEPTH **53.5**



Cobbles	Gravel: coarse	Gravel: fine	Sand: coarse	Sand: medium	Sand: fine	Silt	Clay

BOREHOLE NO. **SB-4** DEPTH **1.0**



Cobbles	Gravel: coarse	Gravel: fine	Sand: coarse	Sand: medium	Sand: fine	Silt	Clay

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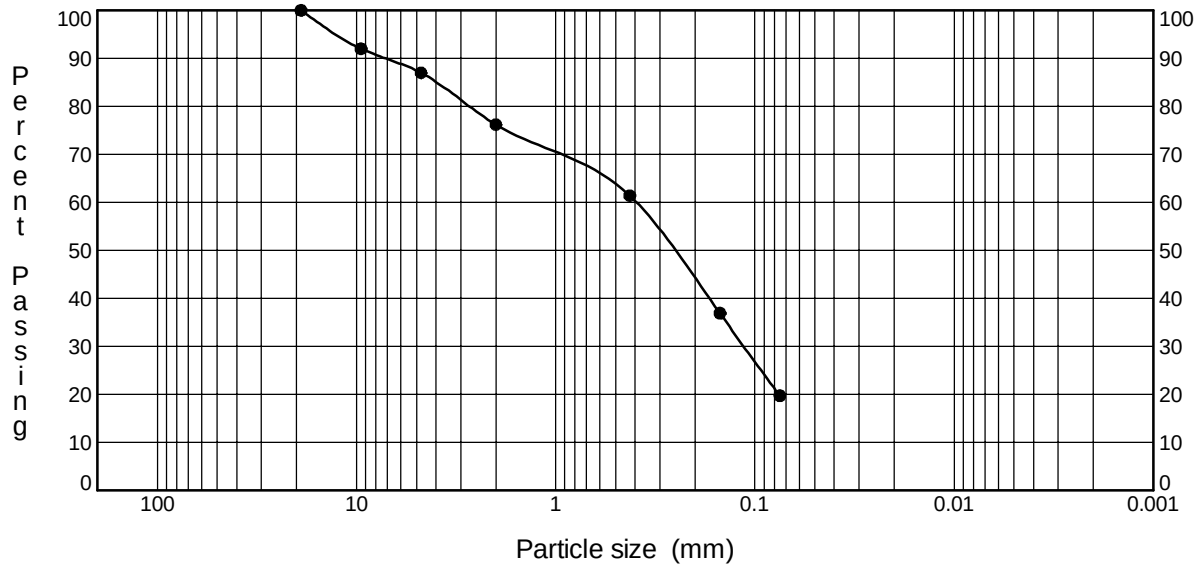
GRAIN SIZE DISTRIBUTION

CLIENT: Charles County Government
PROJECT NO.: 2013002
PROJECT: Middletown Road Roundabout and Road Extension
SITE:
Charles County, Maryland

BOREHOLE NO. **SB-7** DEPTH **8.5**



Cobbles	Gravel		Sand			Silt	Clay
	coarse	fine	coarse	medium	fine		

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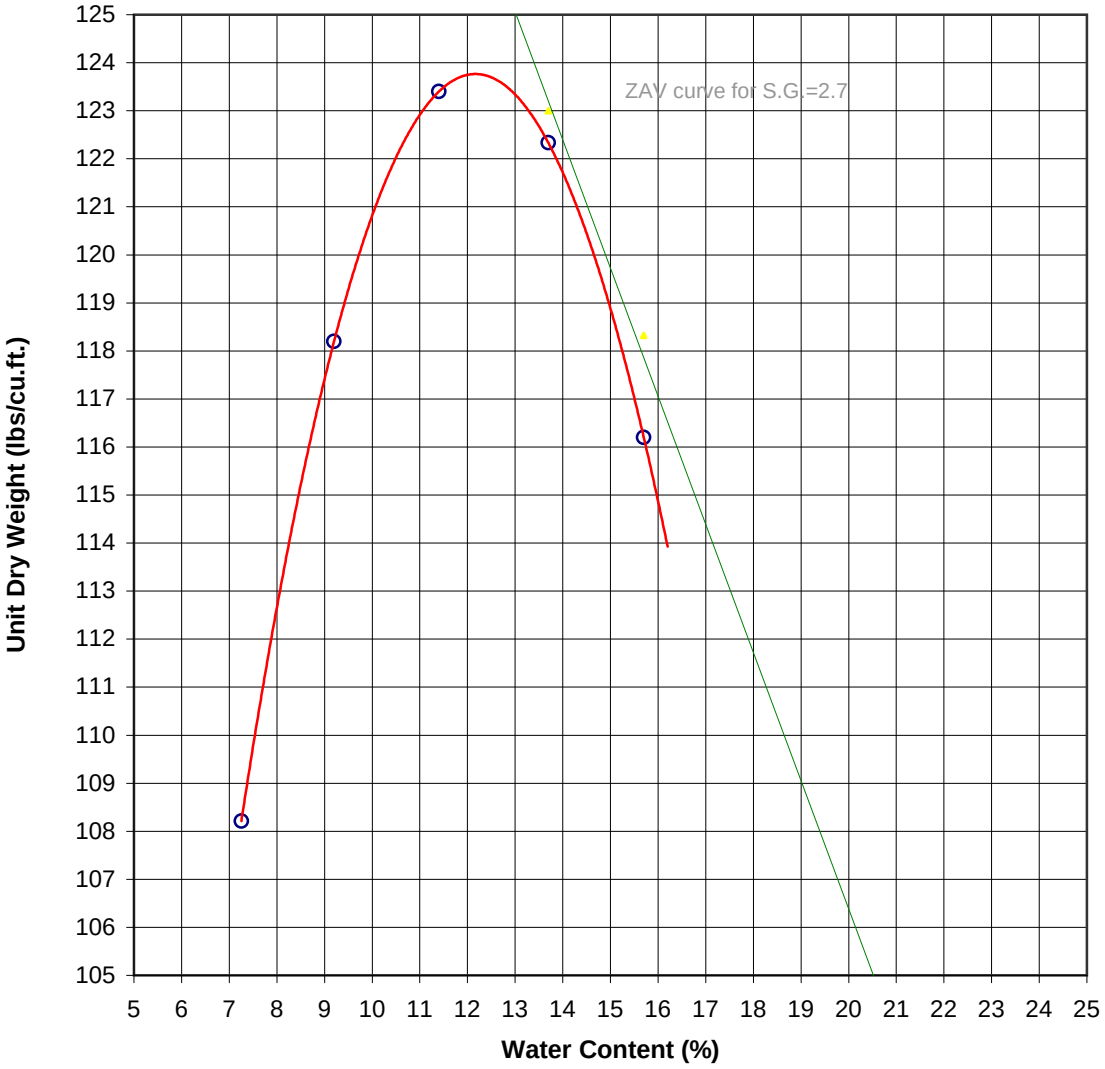
GRAIN SIZE DISTRIBUTION

CLIENT: Charles County Government
PROJECT NO.: 2013002
PROJECT: Middletown Road Roundabout and Road Extension
SITE:
Charles County, Maryland

LABORATORY COMPACTION TEST RESULT

Modified Effort (ASTM D1557 / AASHTO T180)



Sample Description:	Brown and reddish brown fine sandy clay with trace of gravel	
Classification:	CL/A-6	
Test Method:	A	
Soil Engineering Properties		
Liquid Limit:	40	
Plastic Limit:	24	
Plasticity Index:	16	
Proctor Data and Results		
Max. Unit Dry Weight	123.7	lbs/cu.ft.
Opt. Water Content	12.2	%
Corr. Max. Unit Dry Weight	n/a	
Corr. Opt. Water Content	n/a	

Gradation	
Sieve No.	% Passing
3"	
1 1/2"	
3/4"	100.0
3/8"	99.0
4	96.1
10	92.5
40	85.1
200	63.3

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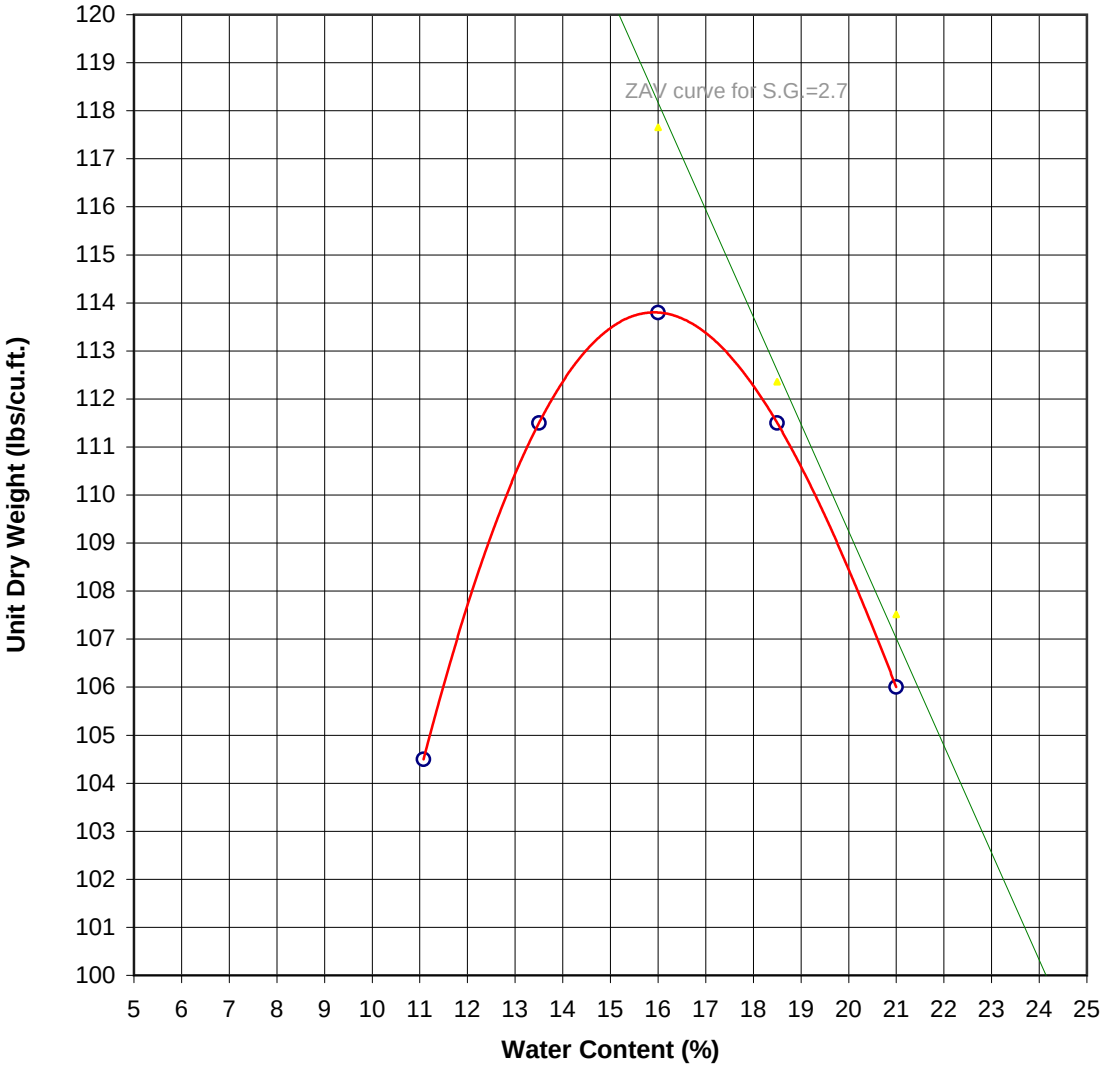
Job No.:	2013002
Project:	Middletown Road Roundabout
Sample No.:	Bag
Sample Location:	SB-5 (1 to 5 ft)
Test Date:	5/12/2014

LABORATORY COMPACTION TEST RESULT

Modified Effort (ASTM D1557 / AASHTO T180)



Sample Description:	Brown and reddish brown fine sandy clay	
Classification:	CL/A-7-6	
Test Method:	A	
Soil Engineering Properties		
Liquid Limit:	43	
Plastic Limit:	24	
Plasticity Index:	19	
Proctor Data and Results		
Max. Unit Dry Weight	**113.8**	lbs/cu.ft.
Opt. Water Content	**16.0**	%
Corr. Max. Unit Dry Weight	**n/a**	
Corr. Opt. Water Content	**n/a**	

Gradation	
Sieve No.	% Passing
3"	
1 1/2"	
3/4"	
3/8"	100.0
4	96.0
10	88.4
40	76.4
200	58.1

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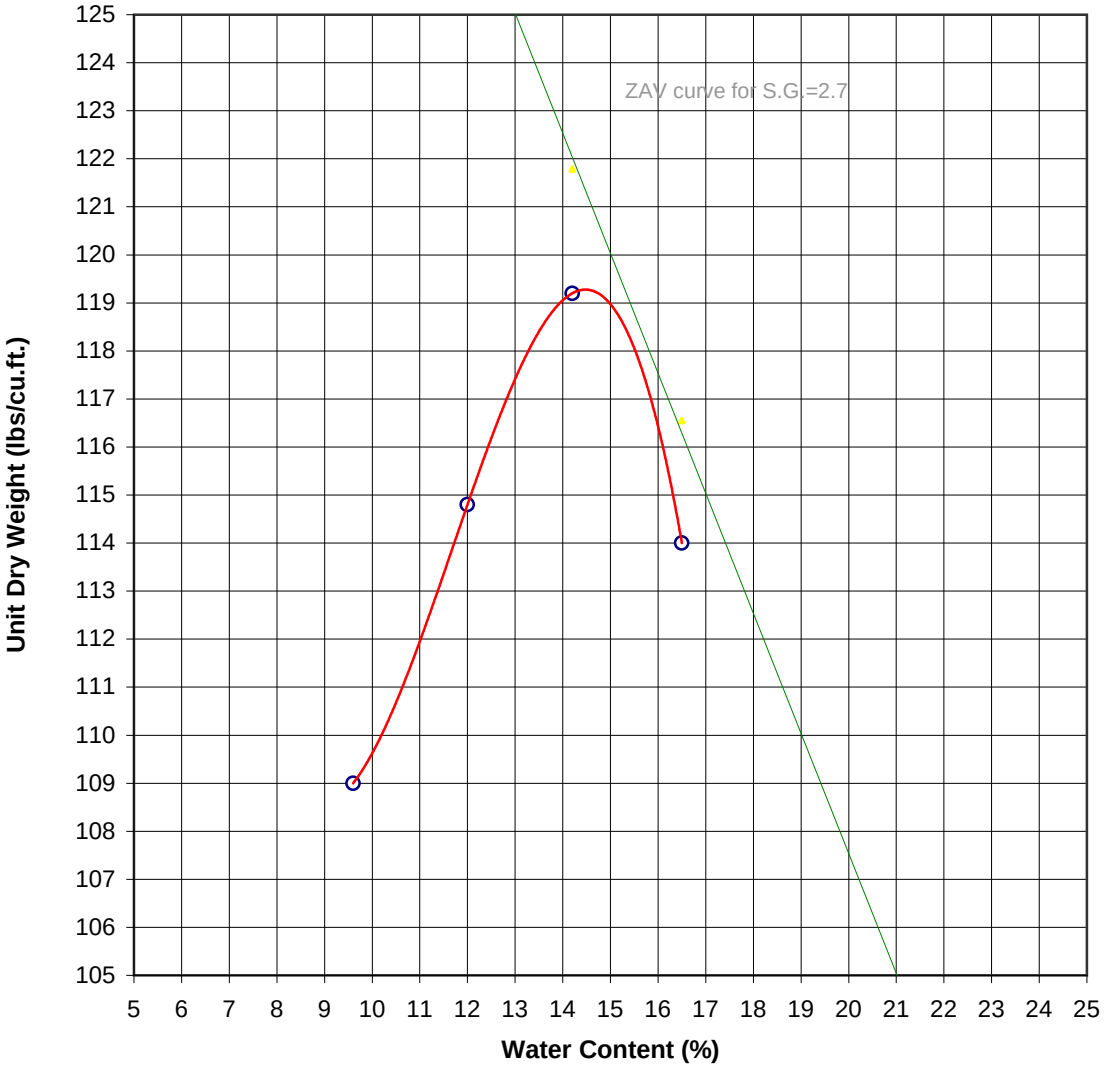
Job No.:	2013002
Project:	Middletown Road Roundabout
Sample No.:	Bag
Sample Location:	SB-8 (1 to 6 ft)
Test Date:	5/12/2014

LABORATORY COMPACTION TEST RESULT

Modified Effort (ASTM D1557 / AASHTO T180)



Sample Description:	Brown, reddish brown and gray fine sandy clay	
Classification:	CL/A-6	
Test Method:	A	
Soil Engineering Properties		
Liquid Limit:	39	
Plastic Limit:	24	
Plasticity Index:	15	
Proctor Data and Results		
Max. Unit Dry Weight	**119.2**	lbs/cu.ft.
Opt. Water Content	**14.6**	%
Corr. Max. Unit Dry Weight	**n/a**	
Corr. Opt. Water Content	**n/a**	

Gradation	
Sieve No.	% Passing
3"	
1 1/2"	
3/4"	
3/8"	100.0
4	99.5
10	94.9
40	84.6
200	71.1

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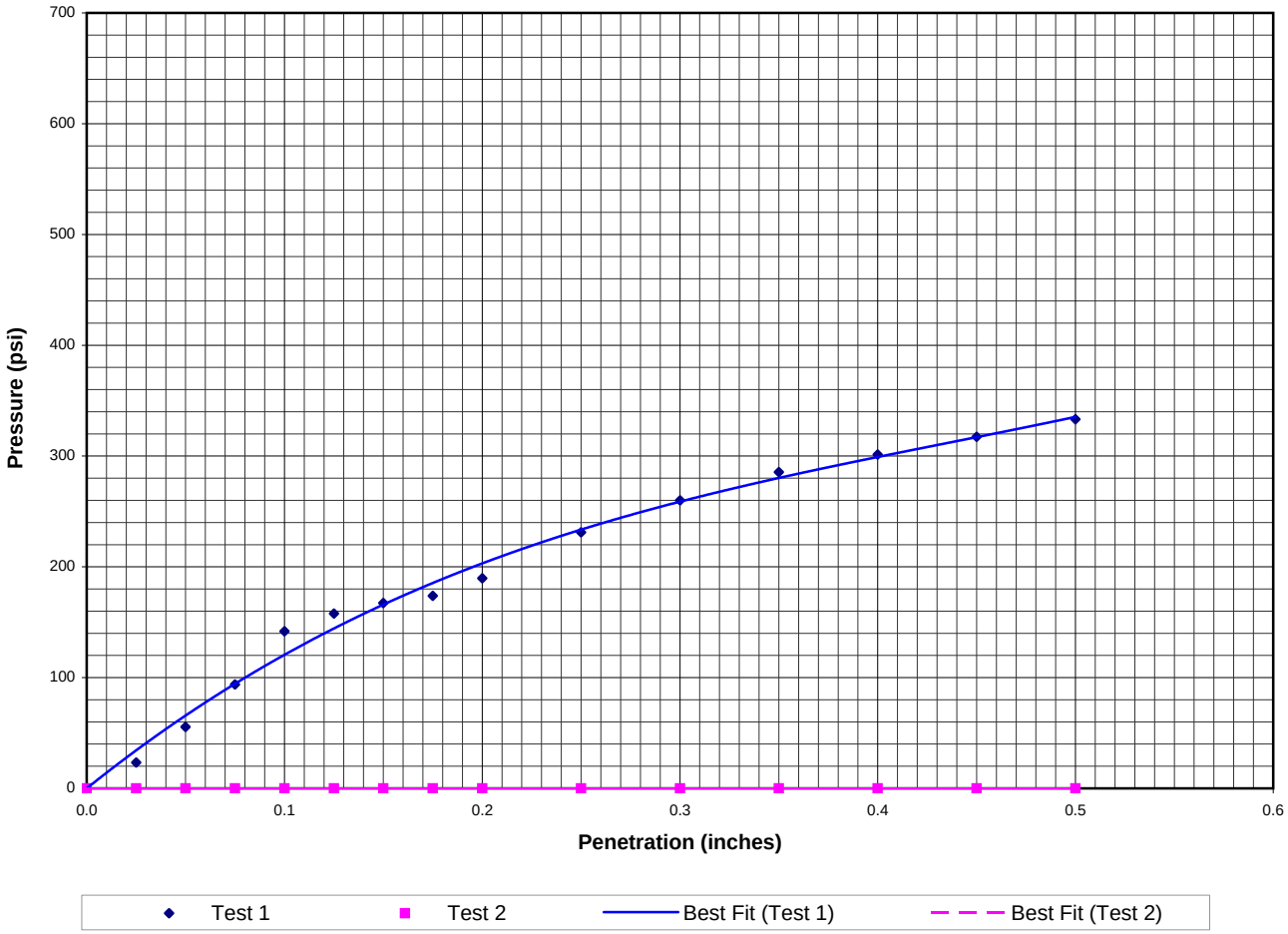
Job No.:	2013002
Project:	Middletown Road Roundabout
Sample No.:	SB-9
Sample Location:	SB-9 (1 to 5 ft)
Test Date:	5/12/2014

CALIFORNIA BEARING RATIO (CBR) TEST RESULT

(ASTM D1883 / AASHTO T193)



Sample Description: Brown and reddish brown FINE SANDY CLAY with trace of gravel

Classification: CL/A-6

Soil Engineering Properties

Specific Gravity =	2.7
Liquid Limit =	40
Plasticity Index =	16
% Passing #4 =	96
% Passing #200 =	63

Proctor Test Results

Compaction Effort =	Modified	
Max. Unit Dry Weight =	123.6	lbs/cu.ft.
Opt. Water Content =	12.2	%

CBR Results:	Test 1	Test 2
CBR @ 0.1" =	**14.2**	
CBR @ 0.2" =	**12.6**	

Swell/Shrink:	Test 1	Test 2
% Swell =	0.15	
% Shrink =		

As Molded:	Test 1	Test 2	
Unit Dry Weight =	120.2		lbs/cu.ft
Water Content =	13.1		%

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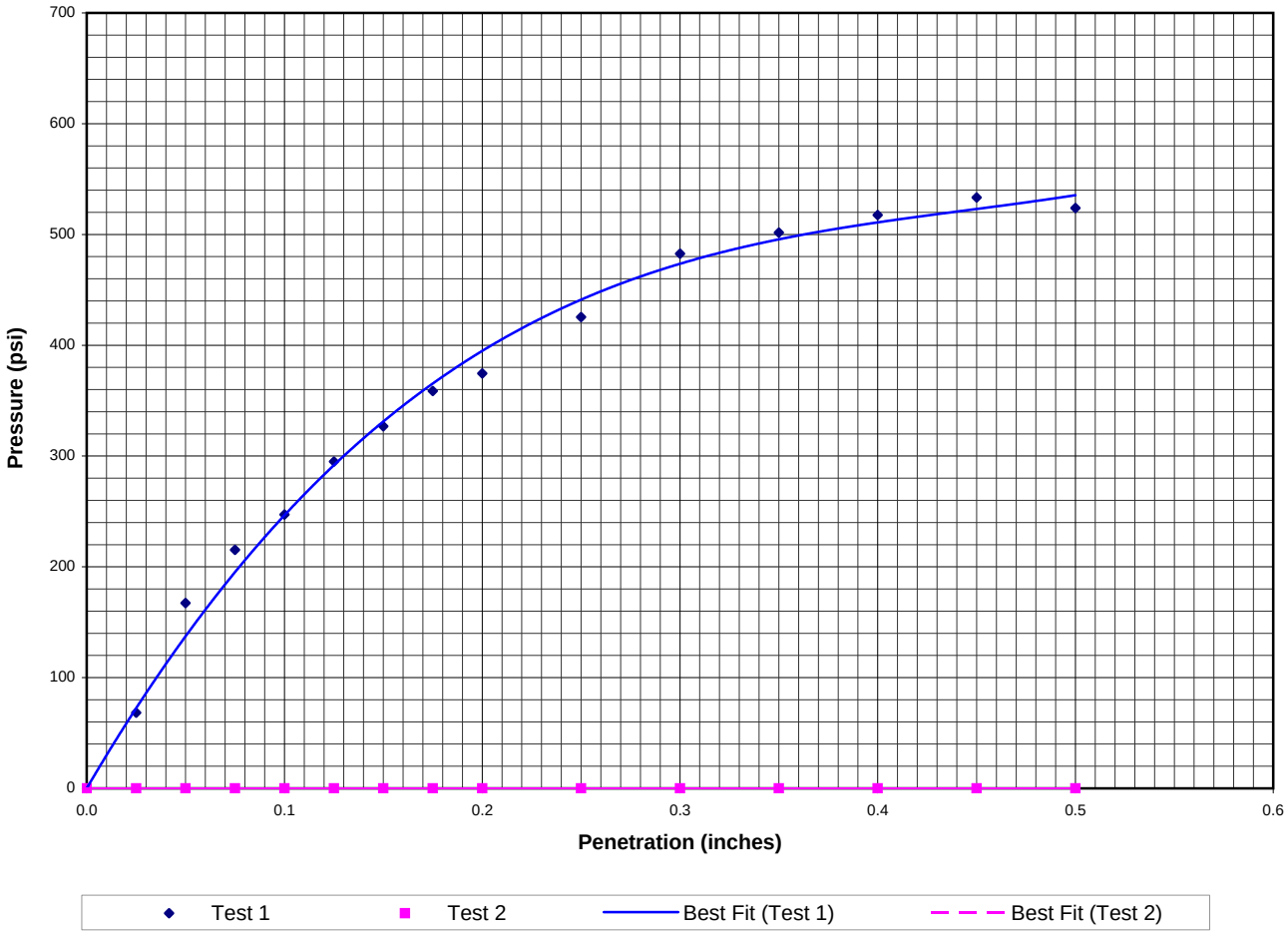
Job No.:	2013002
Project:	Middletown Road Roundabout
Sample No.:	Bag
Sample Location:	SB-5 (1 to 5 ft)
Test Date:	5/12/2014

CALIFORNIA BEARING RATIO (CBR) TEST RESULT

(ASTM D1883 / AASHTO T193)



Sample Description: Brown and reddish brown FINE SANDY CLAY

Classification: CL/A-6

Soil Engineering Properties

Specific Gravity =	2.7
Liquid Limit =	39
Plasticity Index =	15
% Passing #4 =	99
% Passing #200 =	71

Proctor Test Results

Compaction Effort =	Modified	
Max. Unit Dry Weight =	119.2	lbs/cu.ft.
Opt. Water Content =	14.8	%

CBR Results:	Test 1	Test 2
CBR @ 0.1" =	**24.7**	
CBR @ 0.2" =	**25.0**	

Swell/Shrink:	Test 1	Test 2
% Swell =	0.33	
% Shrink =		

As Molded:	Test 1	Test 2	
Unit Dry Weight =	117.1		lbs/cu.ft
Water Content =	15.1		%

AB CONSULTANTS, INC.
9450 Annapolis Road
Lanham, Maryland 20706
Tel: 301-306-3091
Fax: 301-306-3092

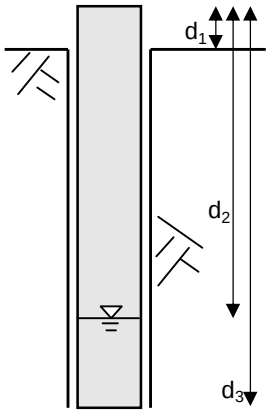
Job No.:	2013002
Project:	Middletown Road Roundabout
Sample No.:	Bag
Sample Location:	SB-9 (1 to 5 ft)
Test Date:	5/12/2014

F. INFILTRATION TEST RESULTS

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/9/2014
LOCATION:			

HOLE NO.:	SB-1		**Measurements (in.)**
HOLE DEPTH:	4.860	Feet	d_1 12 4/16
HOLE DIAMETER:	8	Inch	
PRE-SOAK DATE:	5/8/2014		
			d_2 51 6/16
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RO		
TESTED DATE:	5/9/2014		d_3 70 9/16



Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 19 3/16

Time of Reading (Hr : Min)		Time Escaped	Water Level (Below Reference		Drop in Level	Infiltration Rate
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
9:02	10:02	60	45 13/16	46 11/16	0.840	0.84
10:05	11:10	65	45 10/16	46 7/16	0.840	0.78
11:12	12:17	65	45 13/16	46 3/16	0.360	0.33
12:17	1:12	55	45 6/16	45 12/16	0.360	0.39

NOTE: * Reading accuracy to 1/16"

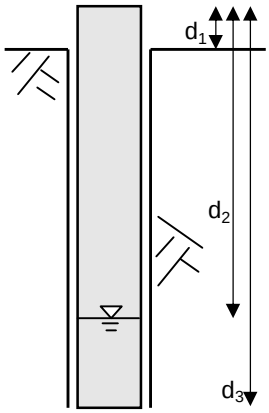
Average of 4-hr Monitoring Period:	**0.59**	**in./hr**
Recommended Infiltration Rate:	**0.60**	**in./hr**
Report Reviewed and Prepared By:		

REMARKS:

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/9/2014
LOCATION:			

HOLE NO.:	SB-2		**Measurements (in.)**
HOLE DEPTH:	5.083	Feet	
HOLE DIAMETER:	8	Inch	
PRE-SOAK DATE:	5/8/2014		
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RO		
TESTED DATE:	5/9/2014		



d_1	13
d_2	43 7/16
d_3	74

Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 30 9/16

Time of Reading (Hr : Min)		**Time Escaped**	**Water Level (Below Reference**		**Drop in Level**	**Infiltration Rate**
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
8:55	9:55	60	34 13/16	35 3/16	0.360	0.36
9:55	10:55	60	35 3/16	35 6/16	0.240	0.24
10:55	11:55	60	35 3/16	35 6/16	0.240	0.24
11:55	12:55	60	34 9/16	34 13/16	0.240	0.24

NOTE: * Reading accuracy to 1/16"

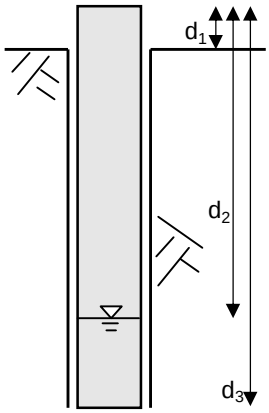
Average of 4-hr Monitoring Period:	**0.27**	**in./hr**
Recommended Infiltration Rate:	**0.25**	**in./hr**
Report Reviewed and Prepared By:		

REMARKS:

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/10/2014
LOCATION:			

			Measurements (in.)
HOLE NO.:	SB-3	d_1	0
HOLE DEPTH:	4.840 Feet		
HOLE DIAMETER:	8 Inch		
PRE-SOAK DATE:	5/9/2014	d_2	39 10/16
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RJ		
TESTED DATE:	5/9/2014	d_3	58 1/16



Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 18 8/16

Time of Reading (Hr : Min)		**Time Escaped**	**Water Level (Below Reference**		**Drop in Level**	**Infiltration Rate**
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
8:50	9:50	60	33 15/16	34 11/16	0.720	0.72
9:50	10:50	60	34 1/16	34 9/16	0.480	0.48
10:50	11:50	60	34 3/16	34 11/16	0.480	0.48
11:50	12:50	60	33 15/16	34 5/16	0.360	0.36

NOTE: * Reading accuracy to 1/16"

Average of 4-hr Monitoring Period: **0.51** **in./hr**

Recommended Infiltration Rate: **0.50** **in./hr**

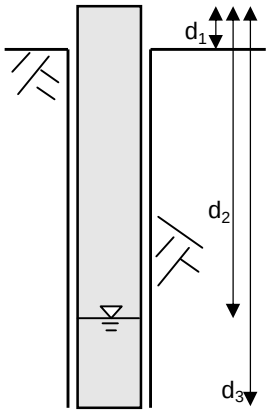
Report Reviewed and Prepared By:

REMARKS:

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/9/2014
LOCATION:			

			Measurements (in.)
HOLE NO.:	SB-4		19 7/16
HOLE DEPTH:	4.680	Feet	
HOLE DIAMETER:	8	Inch	
PRE-SOAK DATE:	5/8/2014		
			39 13/16
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RO		
TESTED DATE:	5/9/2014		75 10/16



Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 35 12/16

Time of Reading (Hr : Min)		**Time Escaped**	**Water Level (Below Reference**		**Drop in Level**	**Infiltration Rate**
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
9:10	10:10	60	39 13/16	39 13/16	0.000	0.00
10:10	11:10	60	39 13/16	39 13/16	0.000	0.00

NOTE: * Reading accuracy to 1/16"

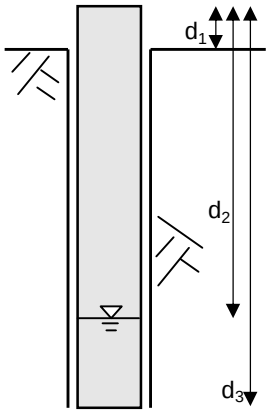
Average of 4-hr Monitoring Period:	**0.00**	**in./hr**
Recommended Infiltration Rate:	**0.00**	**in./hr**
Report Reviewed and Prepared By:		

REMARKS: Groundwater/perched water was observed at 1.70-ft below existing ground

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/9/2014
LOCATION:			

			Measurements (in.)
HOLE NO.:	SB-5		2
HOLE DEPTH:	4.843	Feet	
HOLE DIAMETER:	8	Inch	
PRE-SOAK DATE:	5/8/2014		
			44 10/16
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RO		
TESTED DATE:	5/9/2014		60 2/16



Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 15 8/16

Time of Reading (Hr : Min)		**Time Escaped**	**Water Level (Below Reference**		**Drop in Level**	**Infiltration Rate**
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
9:15	10:15	60	36 2/16	37 5/16	1.200	1.20
10:15	11:15	60	37 13/16	38 12/16	0.960	0.96
11:15	12:15	60	38 3/16	38 12/16	0.600	0.60
12:15	1:15	60	36 15/16	37 9/16	0.600	0.60

NOTE: * Reading accuracy to 1/16"

Average of 4-hr Monitoring Period: **0.84** **in./hr**

Recommended Infiltration Rate: **0.80** **in./hr**

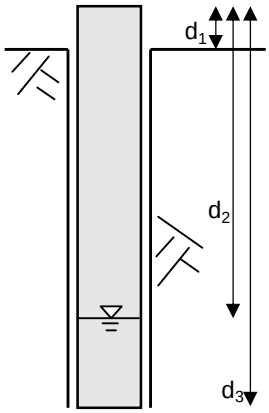
Report Reviewed and Prepared By:

REMARKS:

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/9/2014
LOCATION:			

HOLE NO.:	SB-6		
HOLE DEPTH:	4.950	Feet	
HOLE DIAMETER:	8	Inch	
PRE-SOAK DATE:	5/9/2014		
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RO		
TESTED DATE:	5/8/2014		



Measurements (in.)

d_1	0
d_2	45
d_3	59 6/16

Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 14 6/16

Time of Reading (Hr : Min)		**Time Escaped**	**Water Level (Below Reference**		**Drop in Level**	**Infiltration Rate**
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
9:40	10:40	60	36	39 4/16	3.240	3.24
10:40	11:40	60	35 6/16	38 8/16	3.120	3.12
11:40	12:40	60	36 2/16	38 6/16	2.280	2.28
12:41	1:41	60	36	38 3/16	2.160	2.16

NOTE: * Reading accuracy to 1/16"

Average of 4-hr Monitoring Period: **2.70** **in./hr**

Recommended Infiltration Rate: **2.20** **in./hr**

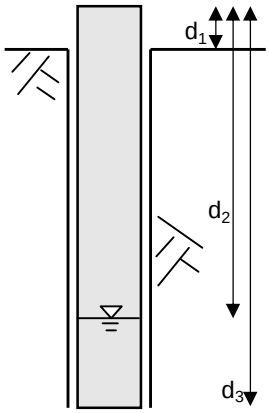
Report Reviewed and Prepared By:

REMARKS:

ON-SITE INFILTRATION TEST

JOB NO.:	2013002	**DRILLED BY:**	PS
PROJECT:	Middletown Road Billingsley Road Roundabo	**DATE:**	5/10/2014
LOCATION:			

			Measurements (in.)
HOLE NO.:	SB-7	d_1	1
HOLE DEPTH:	4.887 Feet		
HOLE DIAMETER:	8 Inch		
PRE-SOAK DATE:	5/9/2014		
		d_2	44 8/16
PIPE DIAMETER:	5 inch		
PIPE MATERIAL:	PVC		
TESTED BY:	WZ/RJ		
TESTED DATE:	5/9/2014	d_3	59 10/16



Pre-soak water remaining in the hole: Yes / No **Depth:** (from bottom) 15 2/16

Time of Reading (Hr : Min)		Time Escaped	Water Level (Below Reference		Drop in Level	Infiltration Rate
Initial	final	(min)	Initial	Final	(in.)	(in./hr)
8:40	9:40	60	34 1/16	37 7/16	3.360	3.36
10:40	11:40	60	34 7/16	35 6/16	0.960	0.96
11:40	12:40	60	34 5/16	35 3/16	0.840	0.84
12:41	1:41	60	34 7/16	35 3/16	0.720	0.72

NOTE: * Reading accuracy to 1/16"

Average of 4-hr Monitoring Period: **1.47** **in./hr**

Recommended Infiltration Rate: **0.80** **in./hr**

Report Reviewed and Prepared By:

REMARKS: