

# Geotechnical Data Report

**Emergency Bridge Package 6  
Richland County, South Carolina**

May 12, 2016

SCDOT Project ID.: P029942, P029943, P029944

Terracon Project No. 73155050L (Rev. 1)

Prepared for:

South Carolina Department of Transportation  
Columbia, South Carolina

Prepared by:

Terracon Consultants, Inc.  
Columbia, South Carolina

Offices Nationwide  
Employee-Owned

Established in 1965  
[terracon.com](http://terracon.com)

**Terracon**

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

May 12, 2016



South Carolina Department of Transportation  
P.O. Box 191  
Columbia, South Carolina 29202-0191

Attn: Mr. Trapp Harris, P.E.  
Geotechnical Design Engineer – Design-Build Section

Re: Geotechnical Data Report  
Emergency Bridge Package 6  
Richland County, South Carolina  
Project ID.: P029942, P029943, P029944  
Terracon Project Number: 73155050L (Rev. 1)

Dear Mr. Harris:

Terracon Consultants Inc. (Terracon) has completed the geotechnical exploration and testing services for the above referenced project. These services were conducted in general accordance with the SCDOT Scope of Services, dated April 15, 2016. This geotechnical data report presents the findings of the subsurface exploration and laboratory testing along with an overview of testing activities.

## 1.0 INTRODUCTION

The South Carolina Department of Transportation (SCDOT) has contracted Terracon to perform subsurface exploration and laboratory testing for the replacement of three bridges along the SC 48 (Bluff Road) alignment in Richland County, South Carolina. The bridges to be replaced are as follows:

- n Back Swamp (Pin # P029942)
- n Cedar Creek (Pin # P029943)
- n Dry Branch (Pin # P029944)

The purpose this work is to develop information relative to subsurface soil and groundwater conditions at the end bent locations for the aforementioned bridge locations. This report presents the results of that work. No geotechnical recommendations are associated with the requested scope of study.

The following sections of this report contain a summary of the activities our field exploration and laboratory testing. The logs of the soil test borings, CPT soundings, MASW arrays, the Site Location Map and the Boring Location Plans are included in Appendix A of this report. The results of the laboratory testing performed on soil samples obtained from the site during



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the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices.

## **2.0 PROJECT DESCRIPTION**

The project sites are located along SC 48 (Bluff Road) in Richland County, SC and span Back Swamp, Cedar Creek, and Dry Branch. Site location and boring locations plans are presented in Appendix A of this report. It is our understanding that the project will include the demolition/removal of each existing bridge and will be replaced with a new structure on the existing or similar horizontal alignment. The existing bridges are multi-span structures that are supported on a driven pile foundation system. The original structures appears to be supported on driven timber piles whereas subsequent widenings utilized Pre-Stressed Concrete (PSC) piles. At the time of the field exploration, the surface of the stream flow was generally about 10 feet below the existing bridge decks.

## **3.0 GEOTECHNICAL TESTING**

The geotechnical exploration for this project was performed between April 26 and May 3, 2016. The results of our field work and our associated laboratory testing is attached in appendixes A and B of this report.

### **3.1 Field Exploration**

Our field exploration at the site consisted of the following:

- n Six (6) Standard Penetration Test (SPT) Borings (B-1, B-2, B-3, B-4, B-5, and B-6)
- n Six (6) Cone Penetration Test (CPT) Soundings (CPT-1, CPT-2, CPT-3, CPT-4, CPT-5, and CPT-6)
- n Geophysical testing consisting of three (3) Multi-channel Analysis of Surface Waves (MASW) arrays (MASW-1, MASW-2, and MASW-3)

The shear wave velocity profile is provided in Appendix A for each bridge. The 100-foot average shear wave velocity value shown on each profile is based on the data obtained below the fill embankment.

The tests were performed at the locations requested by the SCDOT. A description of our testing methods and graphical logs outlining the soil conditions at each test location are presented in Appendix A. Test locations were established in the field by Terracon and surveyed by Construction Support Services, LLC, after completion. The rig set ups at the boring/sounding locations are provided in photographs in Appendix A.

### **3.2 Laboratory Testing**

The following laboratory tests were performed on the soil samples collected at the site:

- n Thirty (30) Natural Moisture Content Tests (ASTM D2216)
- n Eleven (11) Atterberg Limits Tests (ASTM D4318)
- n Twenty Four (24) Material Finer than No. 200 by Washing (ASTM D1140-14)

The scope of the laboratory testing frequency was determined by the SCDOT. The tested samples were chosen by Terracon to provide lithological information. The laboratory procedures and results of the laboratory tests are presented in Appendix B.

### **4.0 CLOSURE**

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

Kenneth J. Zur, P.E.  
Senior Geotechnical Engineer  
SC Registration No. 25833

Phillip A. Morrison, P.E.  
Geotechnical Department Manager  
SC Registration No. 17275

Attachments

Copies: Addressee (1 via email)  
File (1)

**APPENDIX A  
FIELD EXPLORATION**

- Exhibit A-1 – Site Location Map**
- Exhibits A-2 – A-4 – Boring Location Plans**
- Exhibit A-5 – Field Testing Summary**
- Exhibits A-6 – A-8 – MASW Results**
- Exhibit A-9 – Field Testing Description**
- Exhibit A-10 – Soil Description Terms**
- Exhibit A-11 to A-16 – Boring Logs**
- Exhibits A-17 – A-22 – CPT Sounding Logs**
- Exhibits A-23 to A-28 – CPT Correlative Logs**
- Exhibit A-29 – Photographic Log**

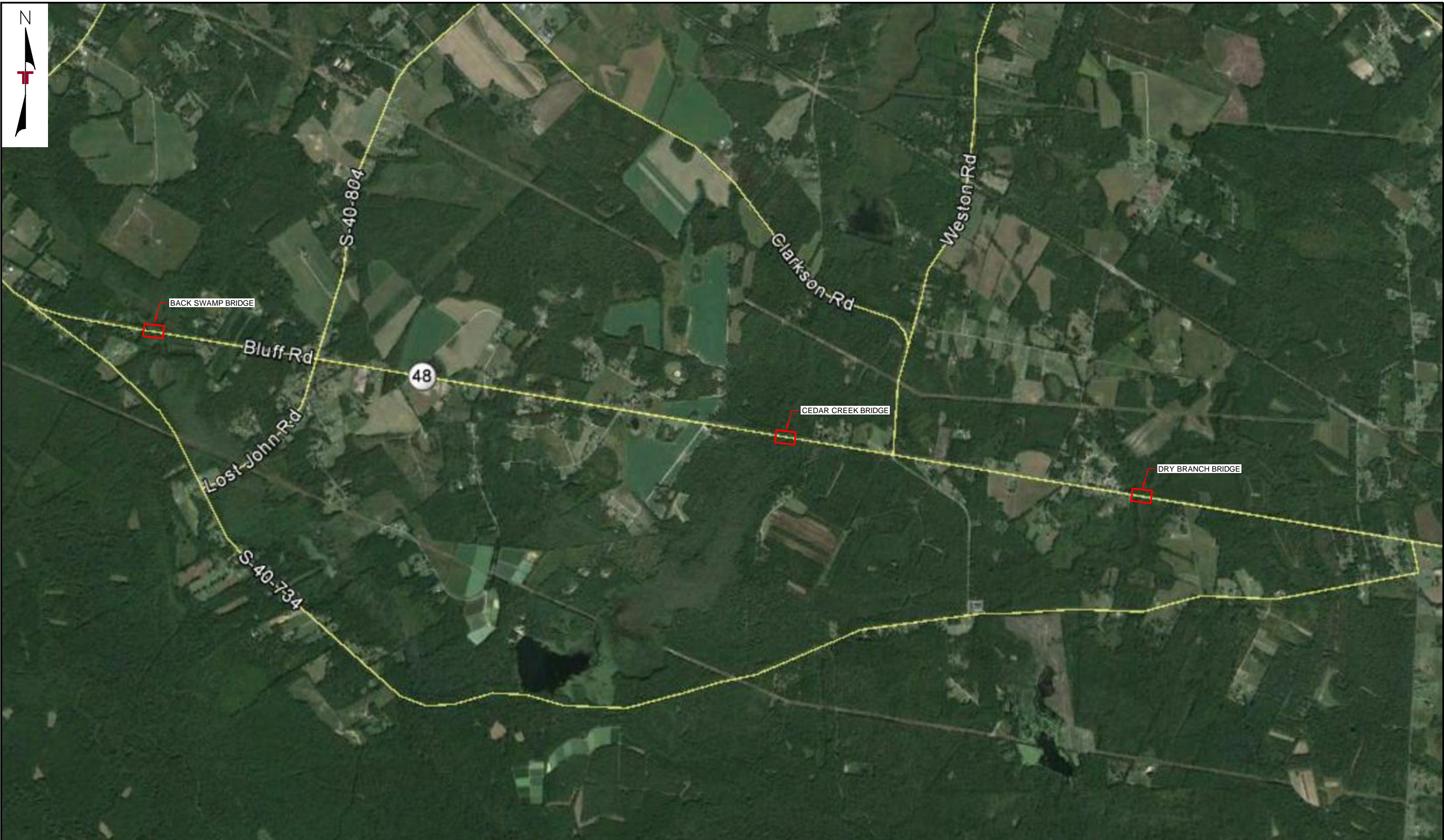
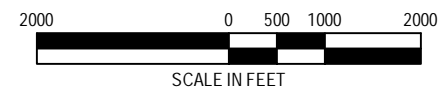


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES






Project Mng:	KJZ	Project No.	73155050L
Drawn By:	PTK	Scale:	AS SHOWN
Checked By:	KJZ	File No.	73155050L
Approved By:	PAM	Date:	MAY 2016

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 Consulting Engineers and Scientists  
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SITE LOCATION MAP  
 Emergency Bridge Package 6  
 SC 48 (Bluff Road)  
 Richland County, South Carolina

Exhibit  
 A-1



<b>EXPLANATION</b>	
	BORING LOCATION
	CONE PENETRATION TEST
	MULTI-CHANNEL ANALYSIS OF SURFACE WAVES



Project Mng:	KJZ	Project No.	73155050L
Drawn By:	PTK	Scale:	AS SHOWN
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BORING LOCATION PLAN
Emergency Bridge Package 6 SC 48 (Bluff Road) - Back Swamp Bridge Richland County, South Carolina

Exhibit  
A-2

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES






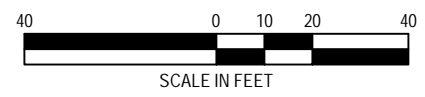
<b>EXPLANATION</b>	
	BORING LOCATION
	CONE PENETRATION TEST
	MULTI-CHANNEL ANALYSIS OF SURFACE WAVES

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES



Project Mngr:	KJZ
Drawn By:	PTK
Checked By:	KJZ
Approved By:	PAM

Project No.	73155050L
Scale:	AS SHOWN
File No.	73155050L
Date:	MAY 2016



BORING LOCATION PLAN	
Emergency Bridge Package 6	
SC 48 (Bluff Road) - Cedar Creek Bridge	
Richland County, South Carolina	

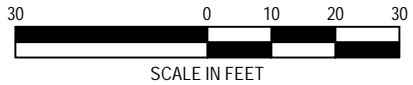
Exhibit
A-3





**EXPLANATION**

	BORING LOCATION
	CONE PENETRATION TEST
	MULTI-CHANNEL ANALYSIS OF SURFACE WAVES



Project Mngr:	KJZ	Project No.:	73155050L
Drawn By:	PTK	Scale:	AS SHOWN
Checked By:	KJZ	File No.:	73155050L
Approved By:	PAM	Date:	MAY 2016

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BORING LOCATION PLAN
Emergency Bridge Package 6 SC 48 (Bluff Road) - Dry Branch Bridge Richland County, South Carolina

Exhibit  
 A-4

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

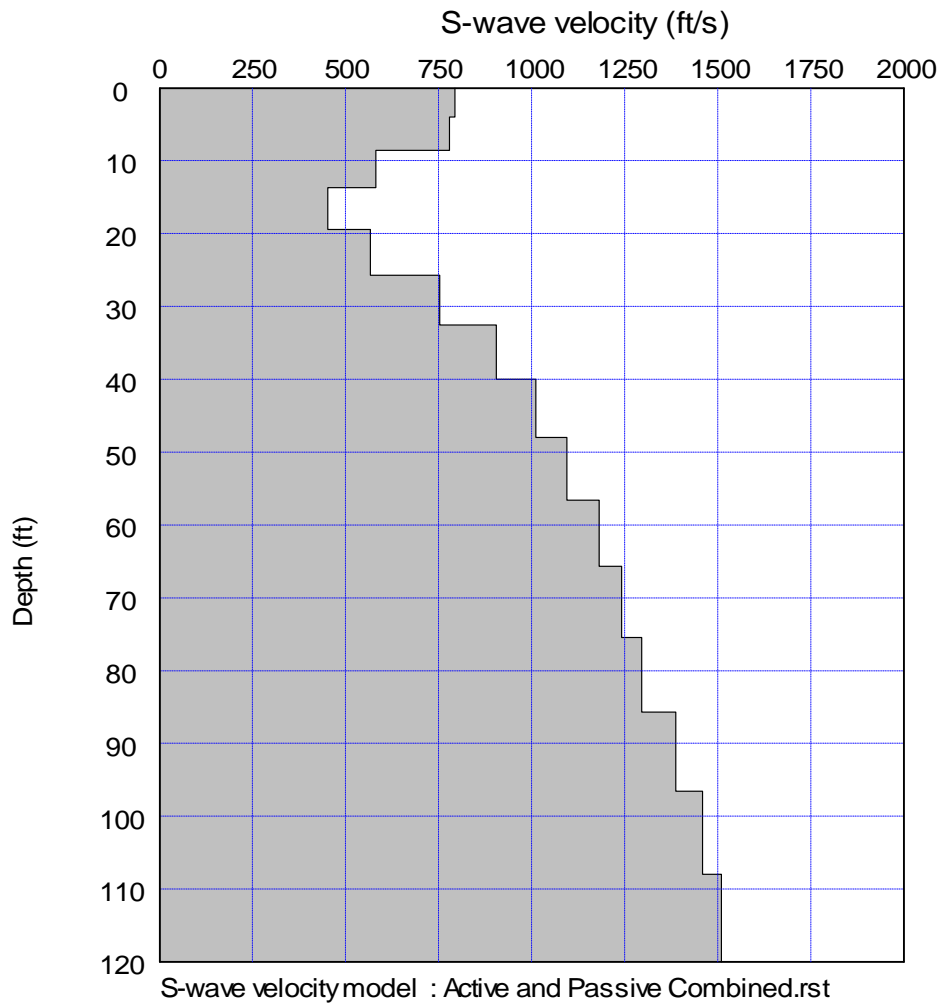
**Geotechnical Data Report**

Emergency Bridge Package 6 ■ Richland County, SC

May 12, 2016 ■ Terracon Project No. 73155050L (Rev. 1)

**Field Testing Summary**

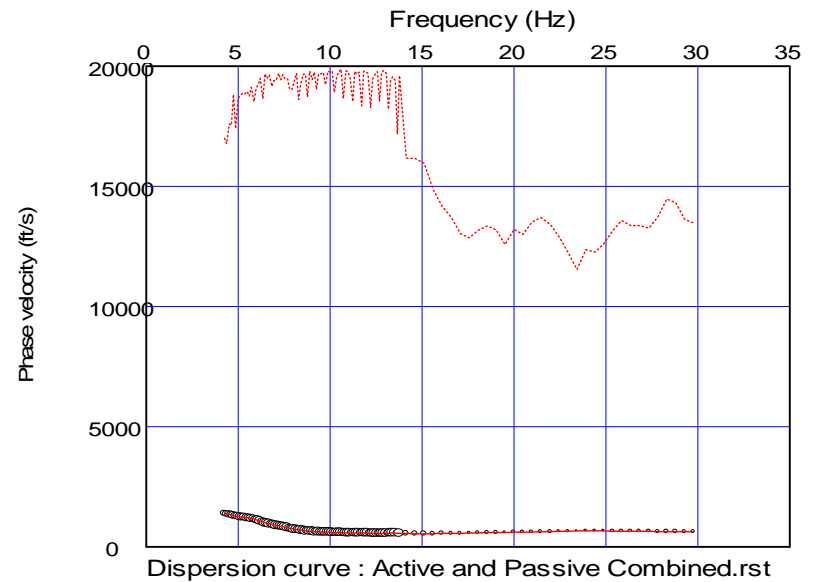
Boring No.	Location	Offset	Ground Elevation (ft)	Test Depth (ft)	Northing	Easting	Latitude	Longitude
B-1	WBL	Lane Center	121.1	100.0	739225.62	2036420.75	33.865054	-80.880004
B-2	EBL	Lane Center	121.4	100.0	739184.78	2036566.17	33.864941	-80.879525
B-3	WBL	Lane Center	132.1	100.0	736293.80	2050977.36	33.856940	-80.832060
B-4	EBL	Lane Center	132.1	100.0	736257.14	2051159.89	33.856838	-80.831459
B-5	WBL	Lane Center	137.9	100.0	734624.32	2059285.09	33.852311	-80.804702
B-6	EBL	Lane Center	137.8	100.0	734592.87	2059373.86	33.852224	-80.804410
CPT-1	EBL	Lane Center	121.2	44.8	739214.76	2036417.90	33.865024	-80.880014
CPT-2	WBL	Lane Center	121.4	39.8	739196.41	2036569.48	33.864973	-80.879514
CPT-3	EBL	Lane Center	131.9	19.3	736281.78	2050976.26	33.856907	-80.832064
CPT-4	WBL	Lane Center	132.1	20.3	736244.89	2051157.48	33.856895	-80.831467
CPT-5	EBL	Lane Center	137.8	33.3	734612.33	2059281.90	33.852278	-80.804712
CPT-6	WBL	Lane Center	137.9	32.0	734605.14	2059375.77	33.852258	-80.804403



Average Weighted Shear Wave Velocity (ft/s)<sup>1</sup> = **950**  
 Seismic Site Classification = **D**

1. Average shear wave velocity based on native soils between 8 ft and 108 ft.

Testing Results	
Depth, top of layer (ft)	S-wave velocity (ft/s)
0.0	793
4.0	778
8.6	582
13.7	451
19.4	566
25.7	753
32.6	905
40.0	1011
48.0	1093
56.6	1181
65.7	1241
75.4	1295
85.7	1386
96.6	1458
108.0	1510



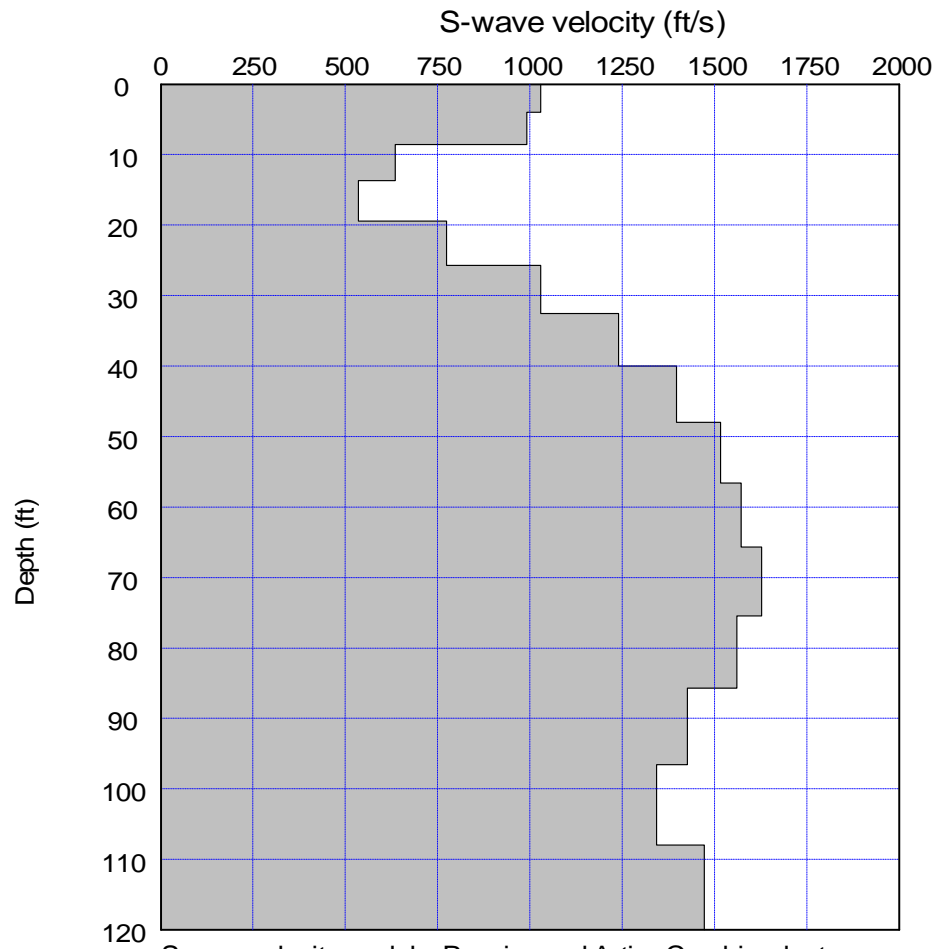
Project Mgr:	PM	Project No.	73155050L
Prepared by:	WB	Scale:	NA
Checked by:	BS	Date:	5/9/2016
Approved by:	PM		

**Terracon**

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**GEOPHYSICAL TESTING RESULTS**  
**MASW SHEAR WAVE VELOCITY**  
**Emergency Bridge Package 6 - Back Swamp Bridge**  
**SC 48 (Bluff Road), Richland County, SC**

**EXHIBIT**  
**A-6**

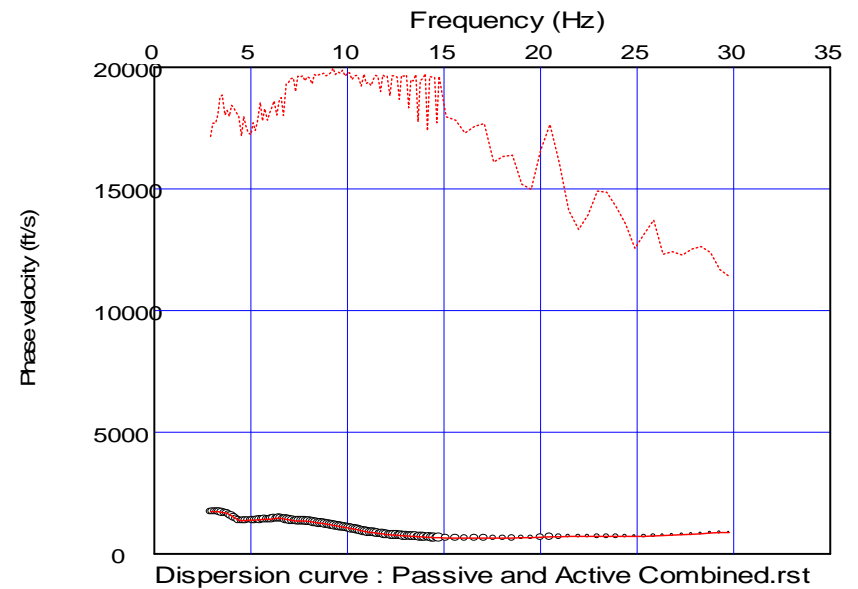


S-wave velocity model : Passive and Active Combined.rst

Average Weighted Shear Wave Velocity (ft/s)<sup>1</sup> = **1231**  
 Seismic Site Classification = **C**

1. Average shear wave velocity based on native soils between 8 ft and 108 ft.

Testing Results	
Depth, top of layer (ft)	S-wave velocity (ft/s)
0.0	1029
4.0	992
8.6	635
13.7	536
19.4	774
25.7	1028
32.6	1239
40.0	1396
48.0	1515
56.6	1571
65.7	1627
75.4	1559
85.7	1426
96.6	1343
108.0	1471



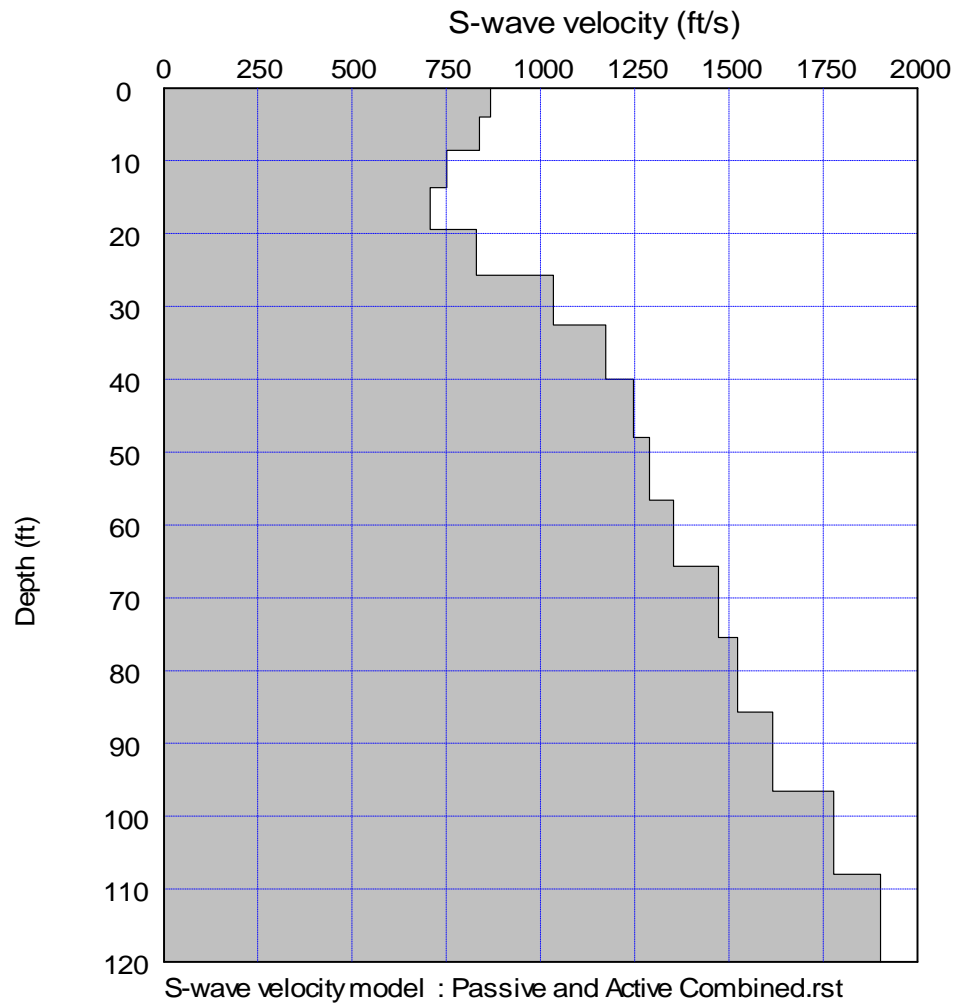
Dispersion curve : Passive and Active Combined.rst

Project Mgr:	PM	Project No.	73155050L
Prepared by:	WB	Scale:	NA
Checked by:	BS	Date:	5/9/2016
Approved by:	PM		

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 PH: (843) 884-1234 Fax: (843) 884-9234

**GEOPHYSICAL TESTING RESULTS**  
**MASW SHEAR WAVE VELOCITY**  
 Emergency Bridge Package 6 - Cedar Creek Bridge  
 SC 48 (Bluff Road), Richland County, SC

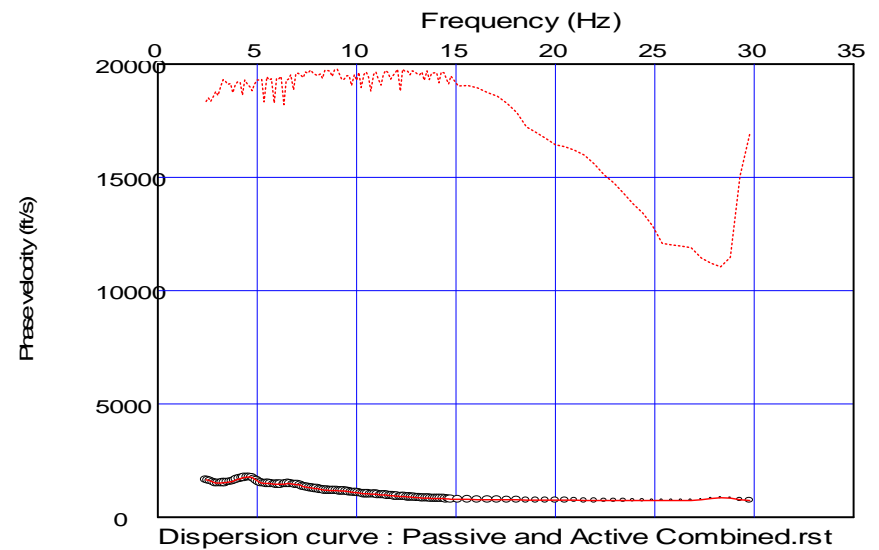
**EXHIBIT**  
**A-7**



Testing Results	
Depth, top of layer (ft)	S-wave velocity (ft/s)
0.0	866
4.0	837
8.6	750
13.7	706
19.4	830
25.7	1034
32.6	1173
40.0	1247
48.0	1289
56.6	1352
65.7	1471
75.4	1522
85.7	1616
96.6	1777
108.0	1901

Average Weighted Shear Wave Velocity (ft/s)<sup>1</sup> = **1217**  
 Seismic Site Classification = **C**

1. Average shear wave velocity based on native soils between 8 ft and 108 ft.



Project Mgr:	PM
Prepared by:	WB
Checked by:	BS
Approved by:	PM

Project No.	73155050L
Scale:	NA
Date:	5/9/2016

**Terracon**

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**GEOPHYSICAL TESTING RESULTS**  
**MASW SHEAR WAVE VELOCITY**  
**Emergency Bridge Package 6 - Dry Branch Bridge**  
**SC 48 (Bluff Road), Richland County, SC**

**EXHIBIT**  
**A-8**

## **FIELD EXPLORATION DESCRIPTION**

### **Overview**

The testing locations were provided by the SCDOT and located in the field by Terracon by taking measurements from existing structures shown on the provided drawings. The borings were surveyed by Construction Support Services, LLC after testing and drilling was complete. The locations as shown in the Exploration Location Plan are shown to the scale indicated.

A field log of each test location was prepared by our engineer. The final boring logs included with this report represent the engineer's description of the encountered conditions modified as necessary based on laboratory test results of the individual samples.

### **Soil Test Borings (STB)**

All boring and sampling operations were conducted in general accordance with the following procedures:

- n SCDOT Geotechnical Design Manual 2010
- n ASTM D5783, "Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geo-environmental Exploration"
- n ASTM D1586 "Test Method for Penetration Test and Split-Barrel Sampling of Soils"
- n ASTM D4220 "Standard Practices for Preserving and Transporting Soil"

Each boring was advanced using rotary wash drilling techniques. Five samples were collected in the upper 10 feet. Below that depth, samples were obtained at 5 foot intervals. Soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-barrel sampler, also known as a standard split-spoon. The sampler is advanced into the soil a total of 18 inches by striking the drill rod using a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler for each of three, 6-inch increments is recorded. The sum of the number of blows for the second and third increments is called the "Standard Penetration Value", or N-value ( $N_{meas}$ , blows per foot). The N-value, when properly evaluated, is an index to the soil strength.

Soil Classification provides a general guide to the engineering properties of various soil types and enables the engineer to apply his experience to current situations. In our exploration, samples obtained during drilling operations are examined and visually classified by a geotechnical engineer using the procedures outlined in ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). Laboratory testing was also performed on select split-spoon samples to evaluate index properties for further classification. The soils are described according to color, texture, and relative density or consistency (based on standard penetration resistance). The designations shown on the logs are described on Exhibit A-10 and Exhibit C-2.

Due to the drilling method (i.e. rotary wash), time-of-drilling water levels were not be recorded. The 24-hour groundwater readings were collected from the borings. These are indicated on the

## Geotechnical Data Report

Emergency Bridge Package 6 ■ Richland County, SC  
May 12, 2016 ■ Terracon Project No. 73155050L (Rev. 1)



boring logs. At the conclusion of the work, the boreholes were backfilled with drill cuttings and capped with cold-patch asphalt.

### **Cone Penetration Test Soundings (CPT)**

Cone Penetration Test soundings were conducted in general accordance with ASTM D5778 Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils. To facilitate CPT testing, the asphalt pavement at each location was pre-drilled exposing the underlying soils.

### **Seismic Surface Wave Testing**

Multi-Channel Analysis of Surface Waves (MASW testing) was performed to determine the shear wave velocity profile of the layered soil system. At the test location both MASW readings (active) and Microtremor Array Measurement (MAM) readings (passive) were recorded. The MASW test was conducted using the 24-channel Geometrics Geode seismographs and 4.5-Hz geophones with a linear geometry at an interval of 10-ft. Surface waves were generated by a 20-pound sledgehammer striking a polyethylene plate at four locations. MAM testing was performed along the same survey line.

MASW (Active) Testing - Multi-Channel Analysis of Surface Waves (MASW) is a seismic method that uses the dispersive characteristics of Rayleigh-type surface waves to determine the variation of the shear-wave velocity of layered soils with depth.

MAM (Passive) Testing - Microtremor Array Measurement (MAM) "for lower frequency surface waves (passive waves) arising from microtremors and/or urban (traffic) noise and recorded them using a linear or two dimensional (triangle, circle, semicircle, and "shapes") array of geophones (Zywicki and Rix, 1999; Lie et al., 2000). Multiple noise records are required for analysis. The data filters out the Rayleigh waves through a technique called spatial auto-correction (SPAC). This allows the development of a dispersion curve that is defined as the lower envelope of the measured energy peaks. MAM testing results in lower peak energy selections than the active testing described above.

## SOIL DESCRIPTION TERMS

### Relative Density/Consistency Terms

<u>Relative Density</u> <sup>1</sup>			<u>Consistency</u> <sup>2</sup>		
Descriptive Term	Relative Density	SPT Blow Count	Descriptive Term	Unconfined Compression Strength (q <sub>u</sub> ) (tsf)	SPT Blow Count
Very Loose	0 to 15%	4 and less	Very Soft	0.25 and less	2 and less
Loose	16 to 35%	5 to 10	Soft	0.26 to 0.50	3 to 4
Medium Dense	36 to 65%	11 to 30	Firm	0.51 to 1.00	5 to 8
Dense	66 to 85%	31 to 50	Stiff	1.01 to 2.00	9 to 15
Very Dense	86 to 100%	51 and more	Very Stiff	2.01 to 4.00	16 to 30
			Hard	4.01 and more	31 and more

### Moisture Condition

<u>Descriptive Term</u>	<u>Criteria</u>
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually in coarse-grained soils below the water table

### Color

Describe the sample color while sample is still moist.

### Angularity<sup>1</sup>

<u>Descriptive Term</u>	<u>Criteria</u>
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

### HCl Reaction<sup>3</sup>

<u>Descriptive Term</u>	<u>Criteria</u>
None Reactive	No visible reaction
Weakly Reactive	Some reaction, with bubbles forming slowly
Strongly Reactive	Violent reaction, with bubbles forming immediately

### Cementation<sup>3</sup>

<u>Descriptive Term</u>	<u>Criteria</u>
Weakly Cemented	Crumbles or breaks with handling or little finger pressure
Moderately Cemented	Crumbles or breaks with considerable finger pressure
Strongly Cemented	Will not crumble or break with finger pressure

### Particle-Size Range<sup>1</sup>

<u>Gravel</u>	Diameter, mm	Sieve Size	<u>Sand</u>	Diameter, mm	Sieve Size
Fine	4.76 to 19.1	#4 to ¾ inch	Fine	0.074 to 0.42	#200 to #40
Coarse	19.1 to 76.2	¾ inch to 3 inch	Medium	0.42 to 2.00	#40 to #10
			Coarse	4.00 to 4.76	#10 to #4

### Primary Soil Type<sup>1,2</sup>

The primary soil type will be shown in all capital letters.

### USCS Soil Designation

Indicate USCS soil designation as defined in ASTM D-2487 and D-2488

### AASHTO Soil Designation

Indicate AASHTO soil designation as defined in AASHTO M-145 and ASTM D-3282

<sup>1</sup> Applies to coarse-grained soils (major portion retained on No. 200 sieve)

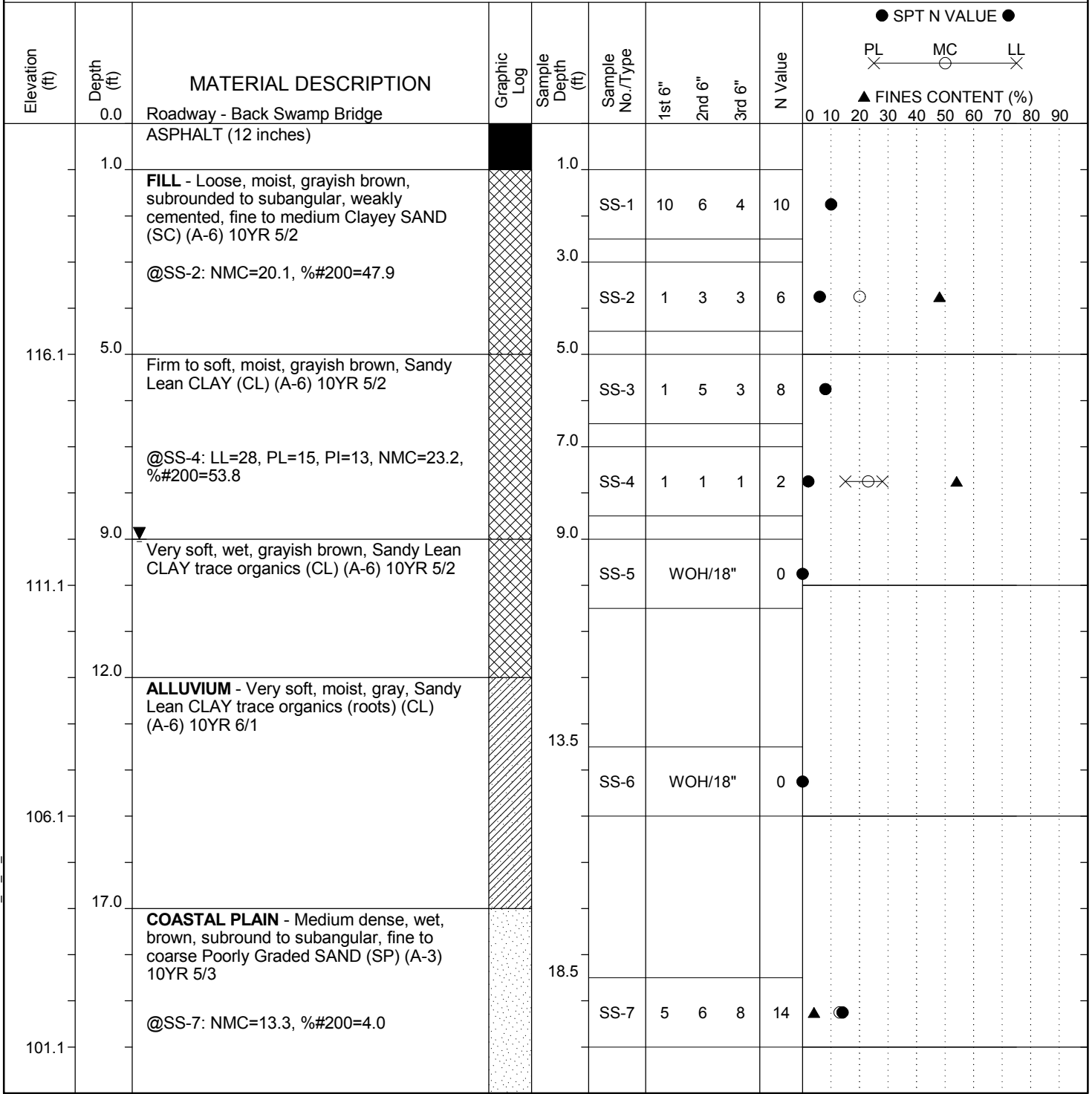
<sup>2</sup> Applies to fine-grained soils (major portion passing No. 200 sieve)

<sup>3</sup> Use as required



# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland		<b>Boring No.:</b> B-1	
<b>Site Description:</b> Emergency Bridge Package 6			<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL		<b>Offset:</b>	Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 121.1 ft	<b>Latitude:</b> 33.865054	<b>Longitude:</b> -80.880004	<b>Date Started:</b> 4/26/2016	
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft	<b>Date Completed:</b> 4/28/2016	
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>		<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic	<b>Energy Ratio:</b> 74.2%	
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB	N.A.	<b>24HR</b> 9 ft



LEGEND

Continued Next Page

<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8" NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing RW - Rotary Wash RC - Rock Core	
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SC\_DOT\_73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-1
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 121.1 ft	<b>Latitude:</b> 33.865054	<b>Longitude:</b> -80.880004
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE										
										PL	MC	LL	FINES CONTENT (%)							
96.1	22.0	Very loose, wet, white, subrounded to subangular, fine to medium Well Graded SAND with silt (SW-SM) (A-3) 10YR 8/1		23.5	SS-8	4	2	2	4	●										
91.1	28.5			SS-9MOH/12"	3	3	●													
86.1	32.0	Loose, wet, white, subrounded to subangular, fine to coarse Well Graded SAND (SW) (A-3) 10YR 8/1		33.5	SS-10	3	2	3	5	●										
81.1	38.5			SS-11	4	3	2	5	●											
42.0																				

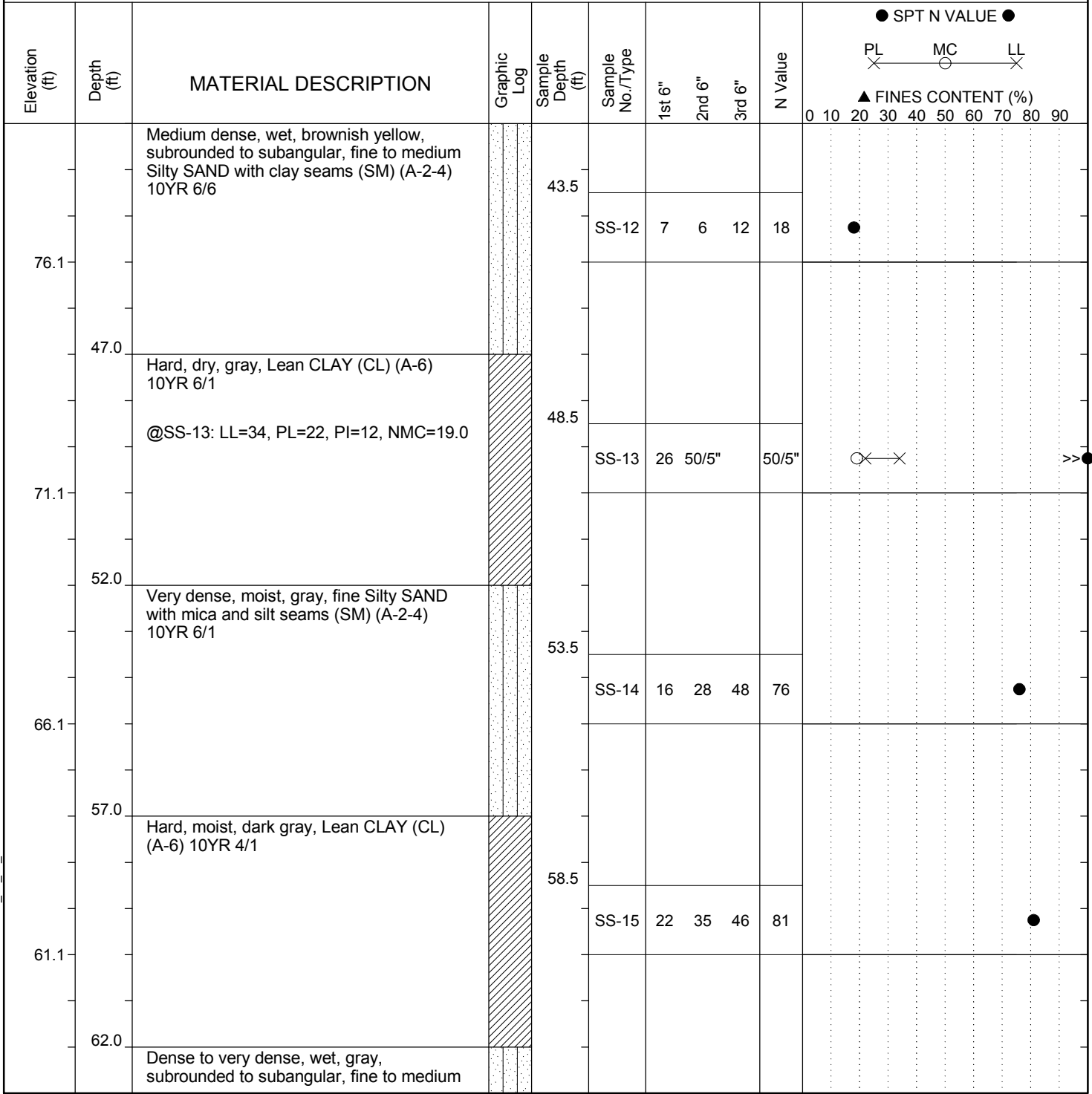
LEGEND Continued Next Page

<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing	
NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC - Rock Core	

SC\_DOT\_73155050L.GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-1
<b>Site Description:</b> Emergency Bridge Package 6	<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr
<b>Elev.:</b> 121.1 ft	<b>Latitude:</b> 33.865054	<b>Longitude:</b> -80.880004
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Energy Ratio:</b> 74.2%
	<b>Groundwater:</b> TOB	<b>24HR:</b> 9 ft



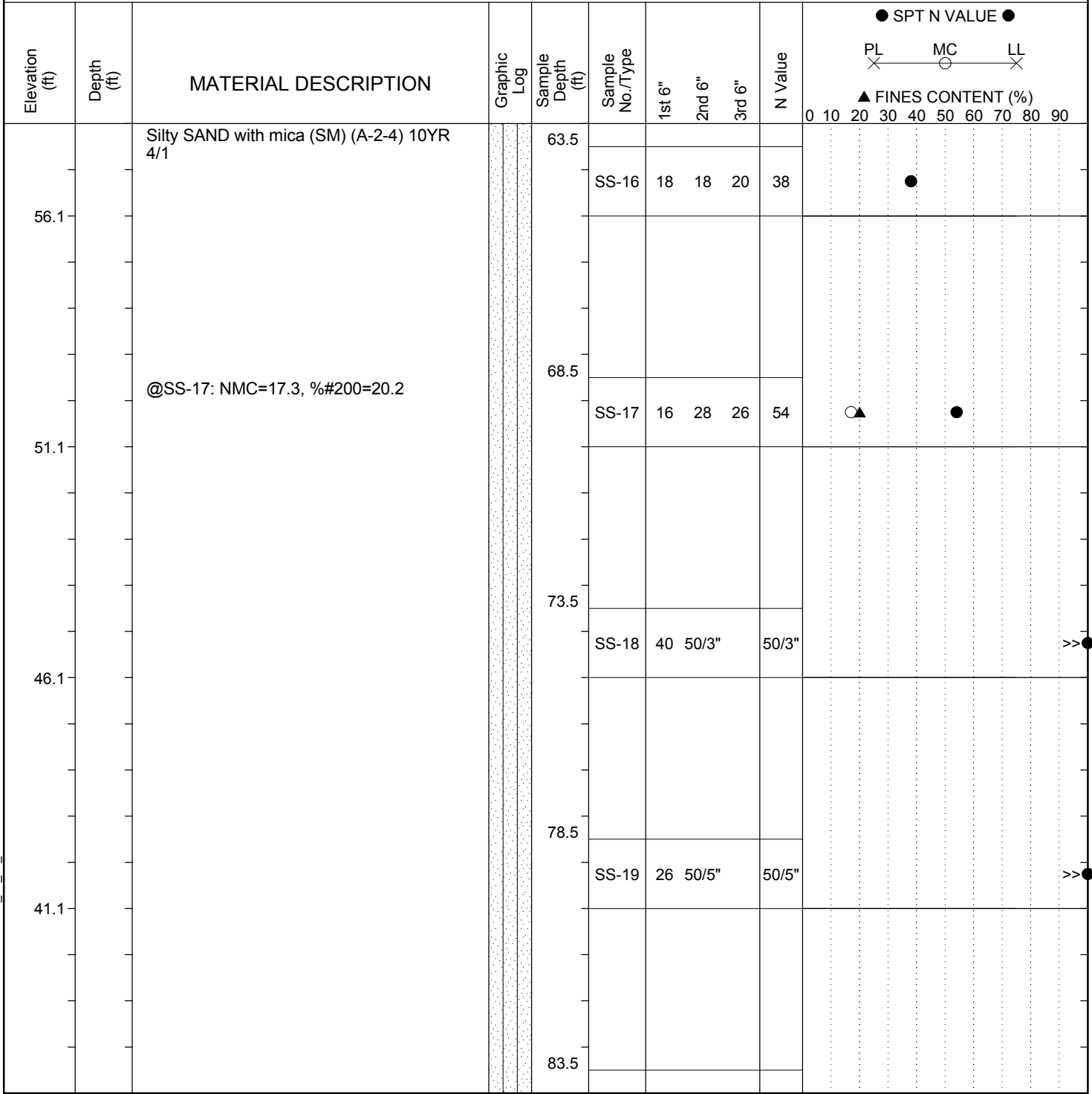
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-1
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 121.1 ft	<b>Latitude:</b> 33.865054	<b>Longitude:</b> -80.880004 <b>Date Started:</b> 4/26/2016
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft <b>Date Completed:</b> 4/28/2016
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



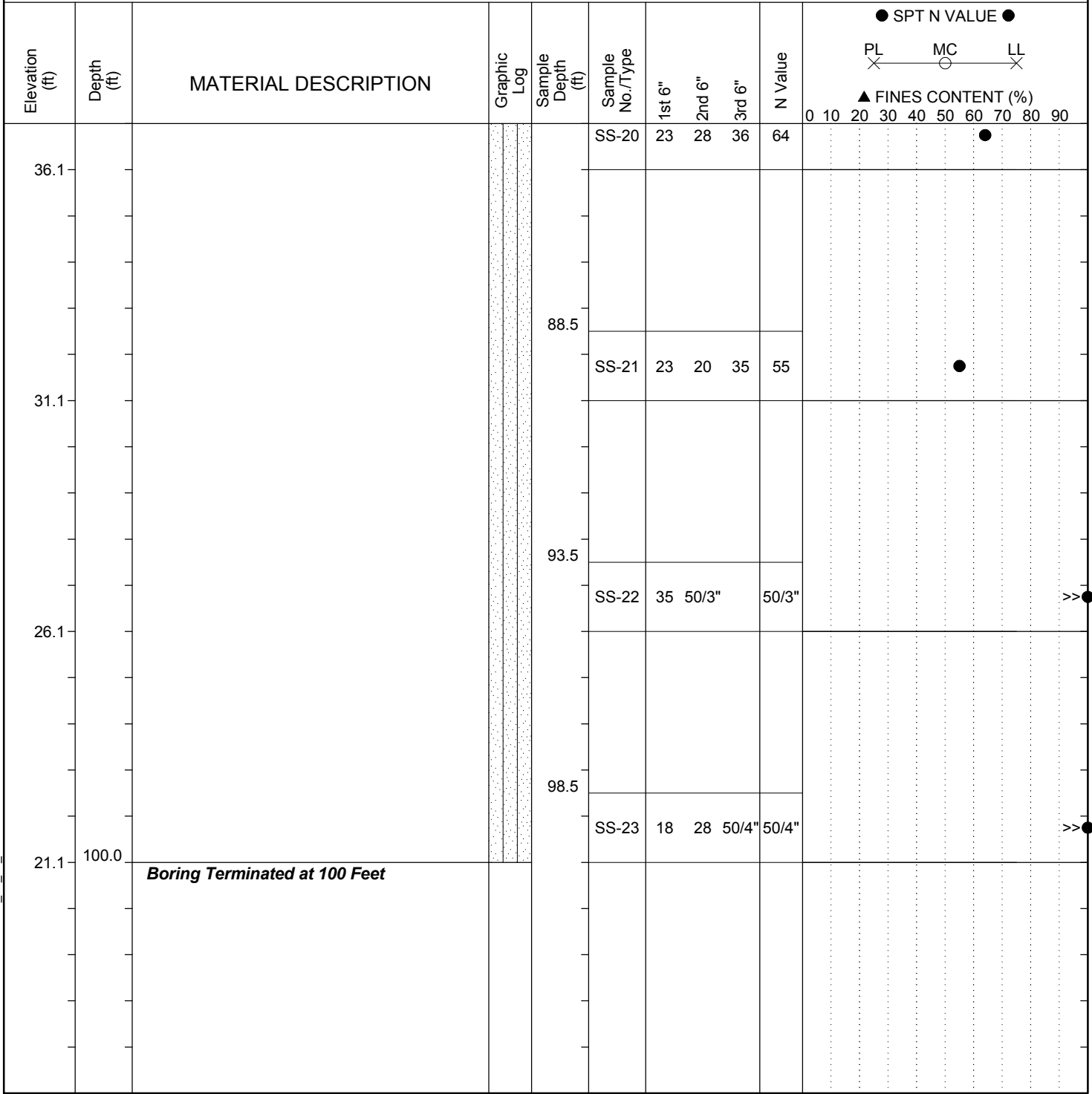
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029942		<b>County:</b> Richland		<b>Boring No.:</b> B-1	
<b>Site Description:</b> Emergency Bridge Package 6				<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar		<b>Boring Location:</b> WBL		<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing	
<b>Elev.:</b> 121.1 ft		<b>Latitude:</b> 33.865054		<b>Longitude:</b> -80.880004	
<b>Total Depth:</b> 100 ft		<b>Soil Depth:</b> 100 ft		<b>Core Depth:</b> 0 ft	
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>		<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)	
<b>Drill Machine:</b> CME-550X		<b>Drill Method:</b> RW		<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%	
<b>Core Size:</b> N.A.		<b>Driller:</b> A. Large		<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft	



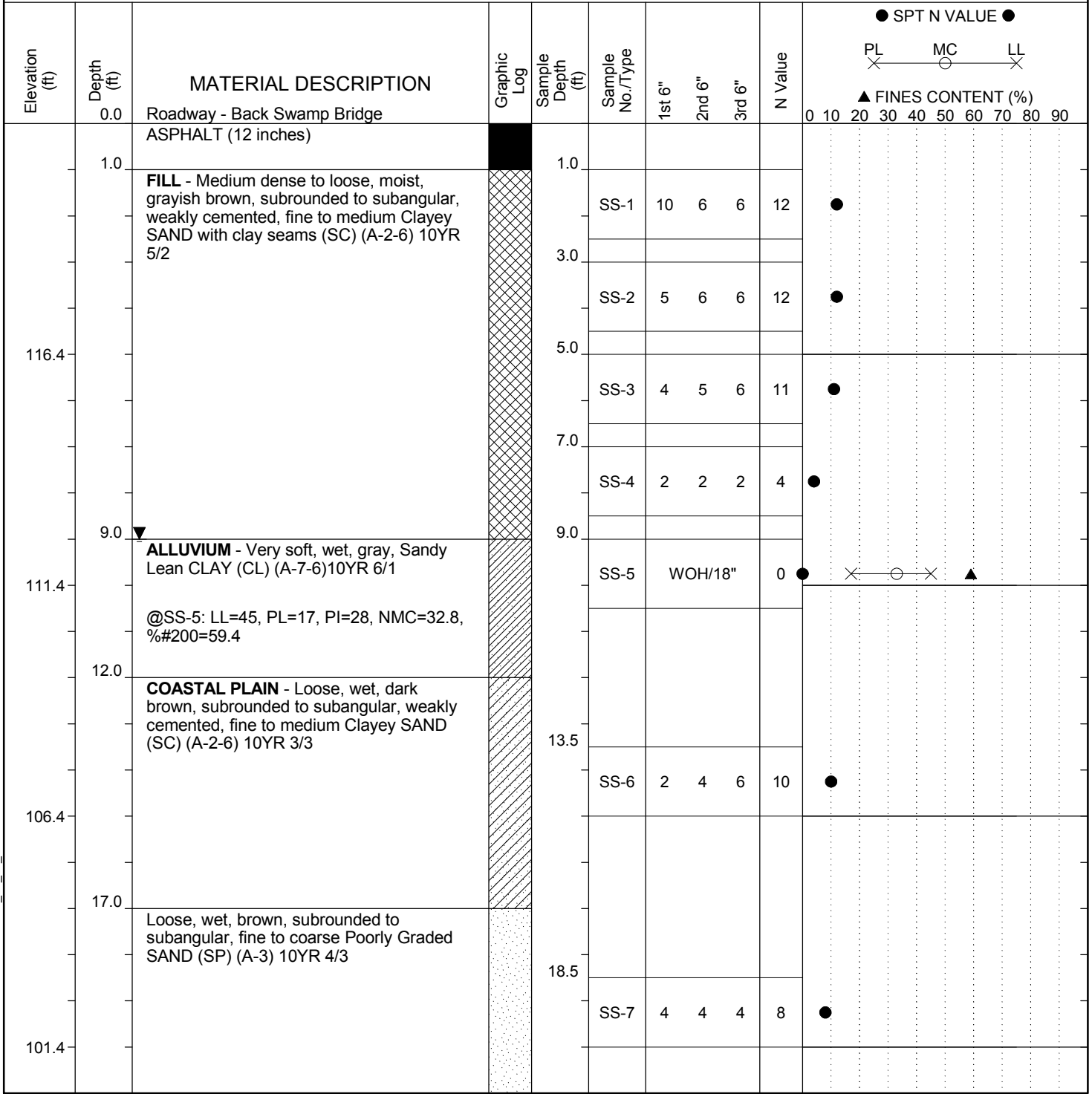
**LEGEND**

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-2
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr
<b>Elev.:</b> 121.4 ft	<b>Latitude:</b> 33.864941	<b>Longitude:</b> -80.879525
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Energy Ratio:</b> 74.2%
	<b>Groundwater:</b> TOB	<b>24HR:</b> 9 ft



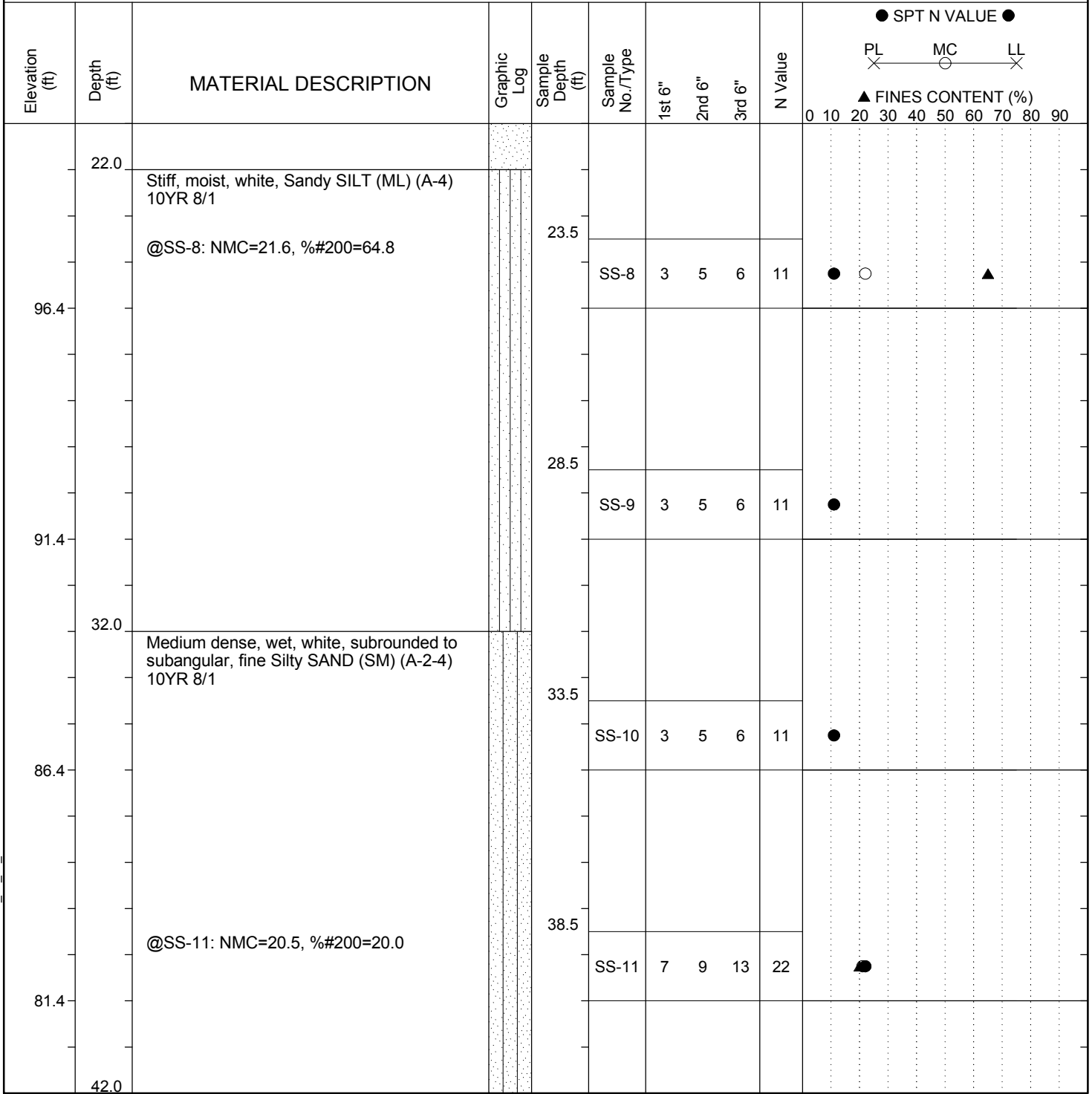
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-2
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 121.4 ft	<b>Latitude:</b> 33.864941	<b>Longitude:</b> -80.879525 <b>Date Started:</b> 4/27/2016
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft <b>Date Completed:</b> 4/28/2016
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



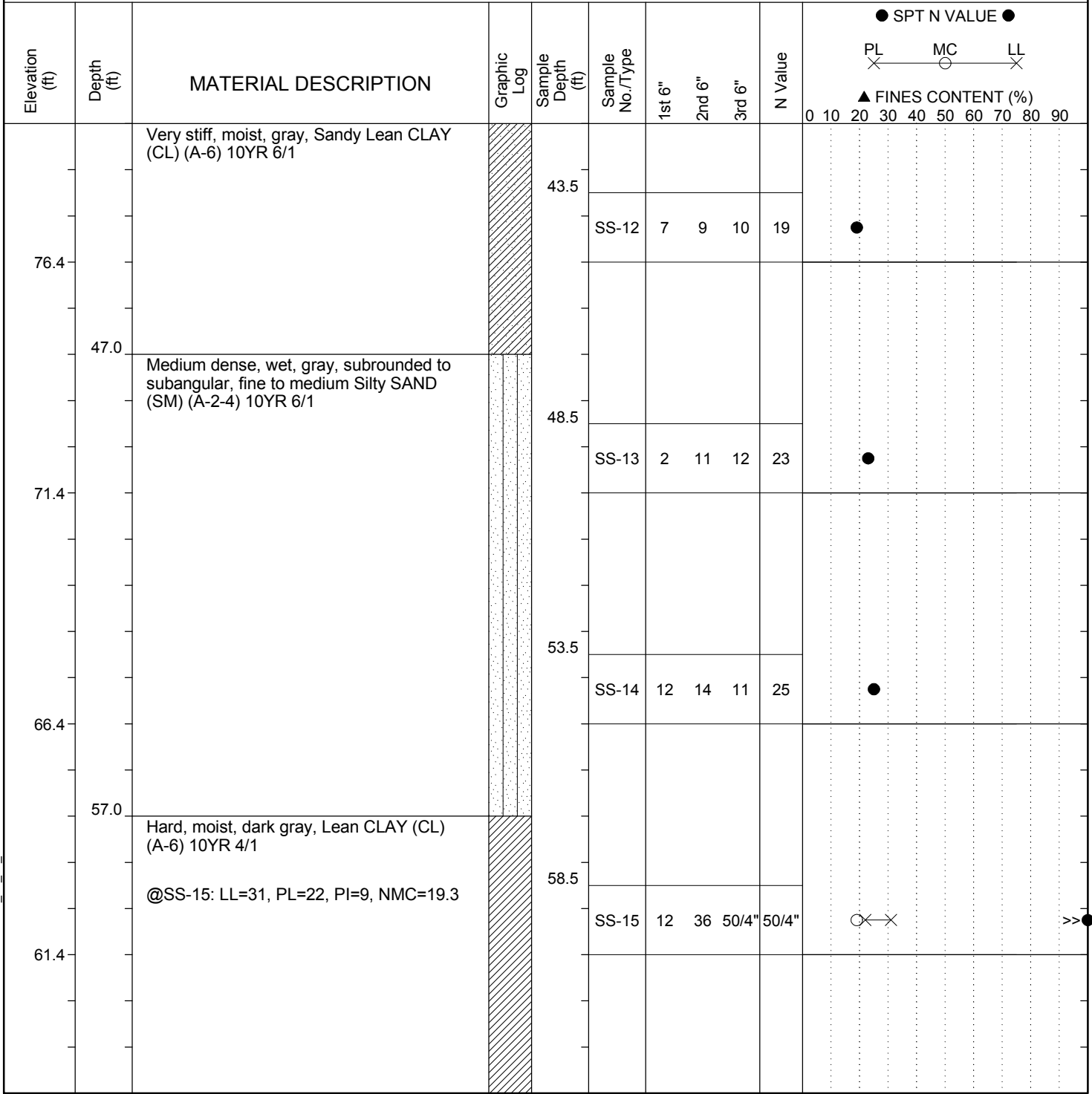
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<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing		NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube RW - Rotary Wash RC - Rock Core	
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# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-2
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 121.4 ft	<b>Latitude:</b> 33.864941	<b>Longitude:</b> -80.879525
<b>Date Started:</b> 4/27/2016	<b>Date Completed:</b> 4/28/2016	
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



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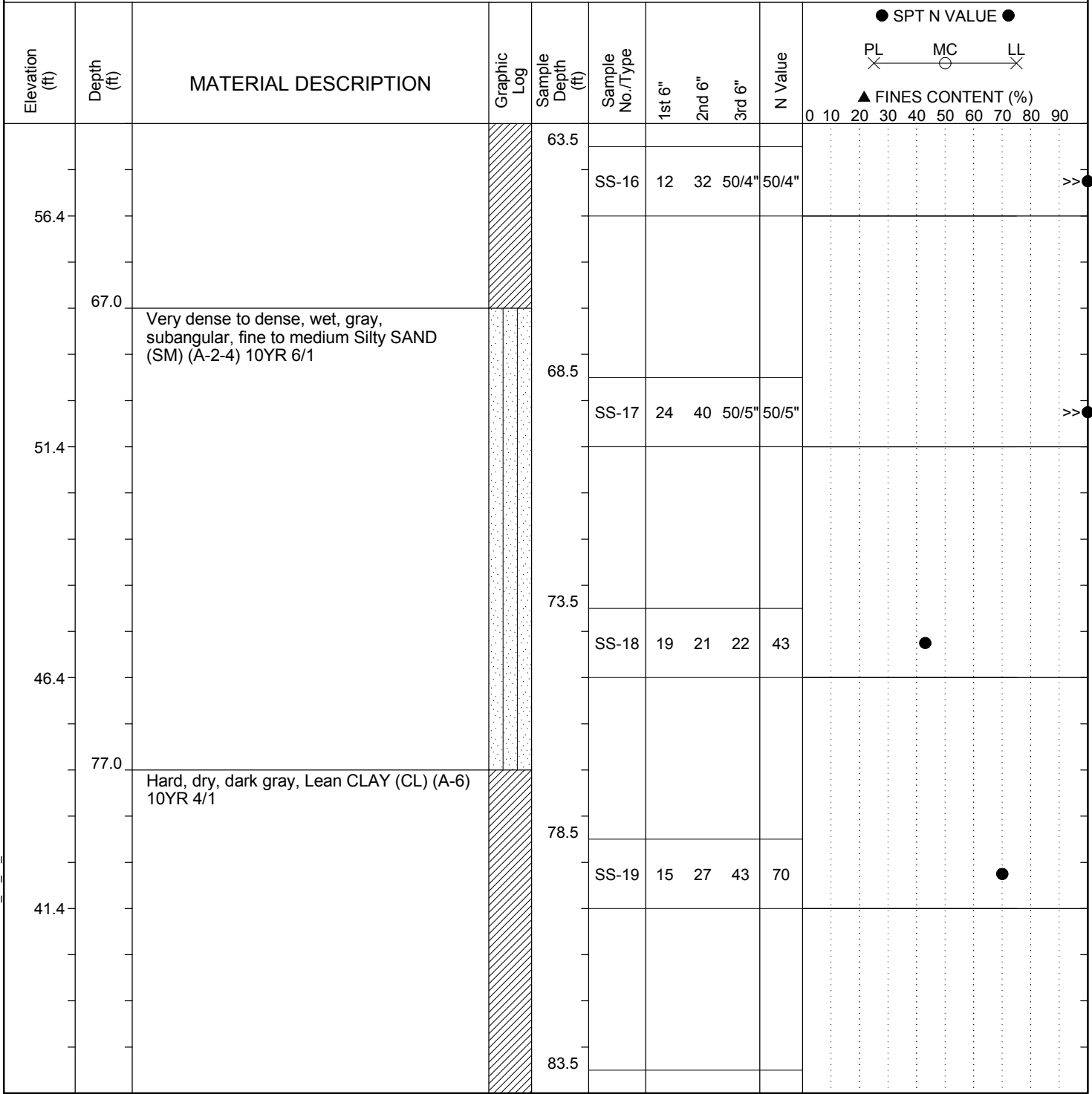
<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-2
<b>Site Description:</b> Emergency Bridge Package 6	<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr
<b>Elev.:</b> 121.4 ft	<b>Latitude:</b> 33.864941	<b>Longitude:</b> -80.879525
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB
		<b>Energy Ratio:</b> 74.2%
		<b>24HR:</b> 9 ft



**LEGEND**

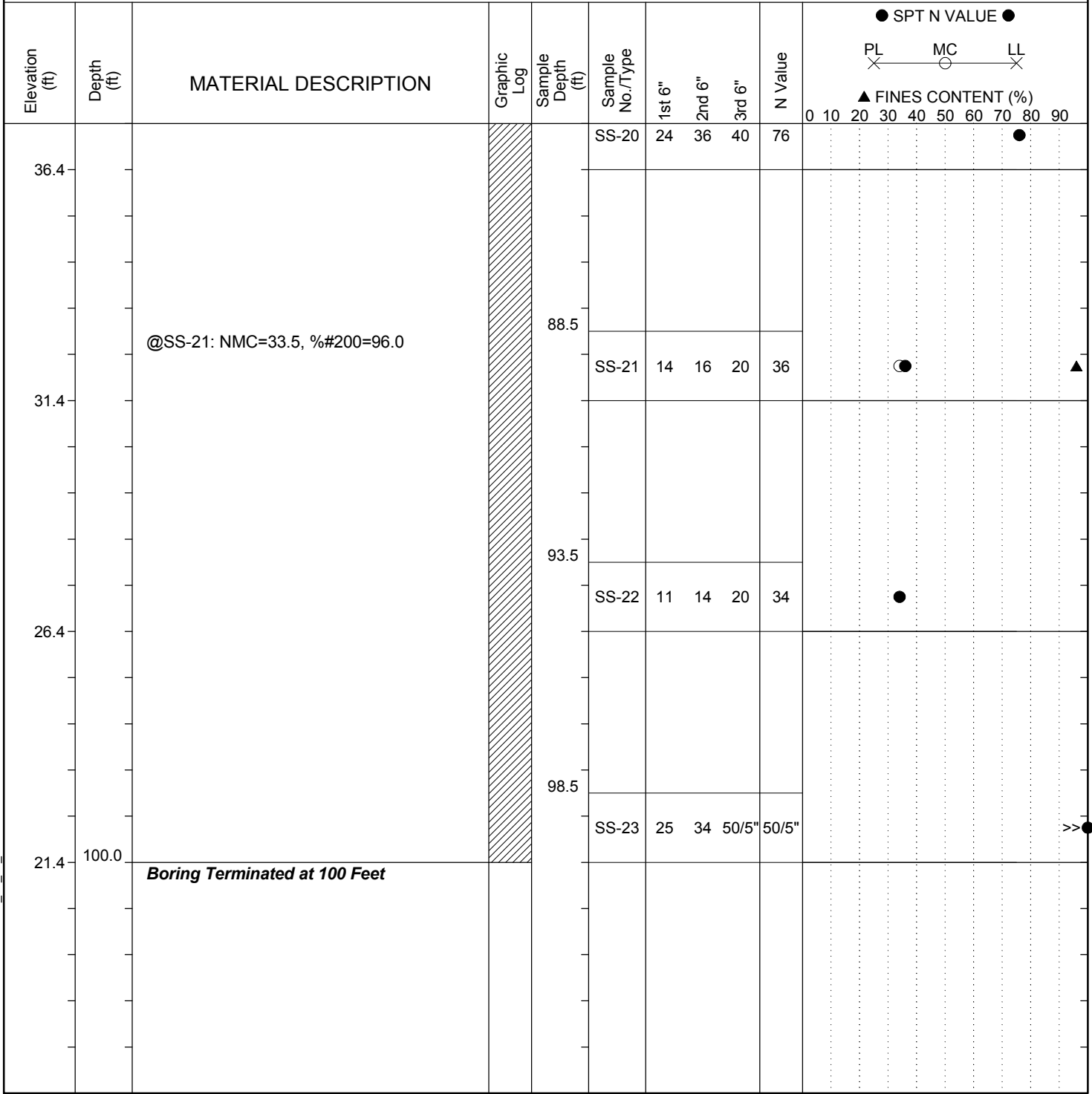
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029942	<b>County:</b> Richland	<b>Boring No.:</b> B-2
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 121.4 ft	<b>Latitude:</b> 33.864941	<b>Longitude:</b> -80.879525
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



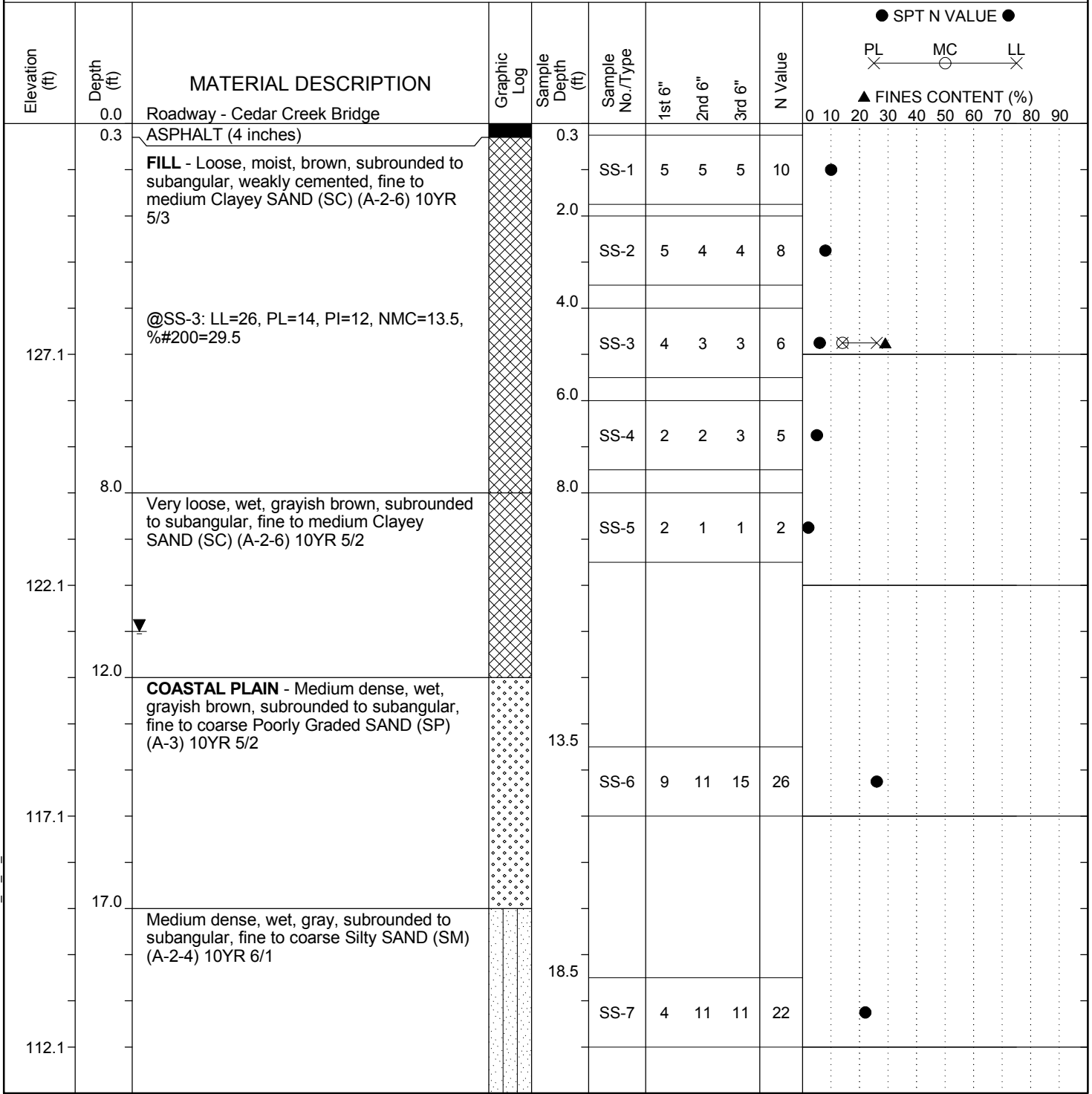
### LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland		<b>Boring No.:</b> B-3	
<b>Site Description:</b> Emergency Bridge Package 6			<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL		<b>Offset:</b>	Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.85694	<b>Longitude:</b> -80.83206	<b>Date Started:</b> 4/28/2016	
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft	<b>Date Completed:</b> 4/29/2016	
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>		<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic	<b>Energy Ratio:</b> 74.2%	
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB	N.A.	<b>24HR:</b> 11 ft



LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland	<b>Boring No.:</b> B-3
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.85694	<b>Longitude:</b> -80.83206
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 11 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE												
										PL	MC	LL	FINES CONTENT (%)									
107.1	22.0	Very loose, wet, white, subrounded to subangular, fine to medium Silty SAND (SM) (A-2-4) 10YR 8/1		23.5	SS-8	1	1	1	2	●	▲	○										
		@SS-8: NMC=26.1, %#200=12.9																				
102.1	27.0	Medium dense, wet, white, subrounded to subangular, fine Silty SAND micaceous (SM) (A-2-4) 10YR 8/1		28.5	SS-9	6	7	10	17		●											
97.1	33.5			33.5	SS-10	5	7	10	17		●											
92.1	37.0	Medium dense, wet, brown, subrounded to subangular, fine to medium Silty SAND (SM) (A-2-4) 10YR 5/3		38.5	SS-11	7	7	12	19		●											

LEGEND

Continued Next Page

<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing		NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC - Rock Core	
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SC\_DOT\_73155050L.GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland	<b>Boring No.:</b> B-3
<b>Site Description:</b> Emergency Bridge Package 6	<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr
<b>Alignment:</b> Existing		
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.85694	<b>Longitude:</b> -80.83206
<b>Date Started:</b> 4/28/2016		
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Date Completed:</b> 4/29/2016		
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N)
<b>Liner Used:</b> Y (N)		
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic
<b>Energy Ratio:</b> 74.2%		
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB
<b>24HR:</b> 11 ft		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE ●									
										PL	MC	LL							
										▲ FINES CONTENT (%)									
										0	10	20	30	40	50	60	70	80	90
87.1	47.0	Medium dense, wet, white, subrounded to subangular, fine Silty SAND with clay seams (SM) (A-2-4) 10YR 8/1		43.5	SS-12	9	10	14	24		●								
82.1	48.5			SS-13	7	6	11	17		●									
77.1	53.5			SS-14	7	7	11	18		●									
72.1	57.0	Hard, dry, dark brown, SILT (ML) (A-7) 10YR 3/3  @SS-15: LL=45, PL=27, PI=18, NMC=24.4		58.5	SS-15	9	22	25	47		○ → ●								

LEGEND

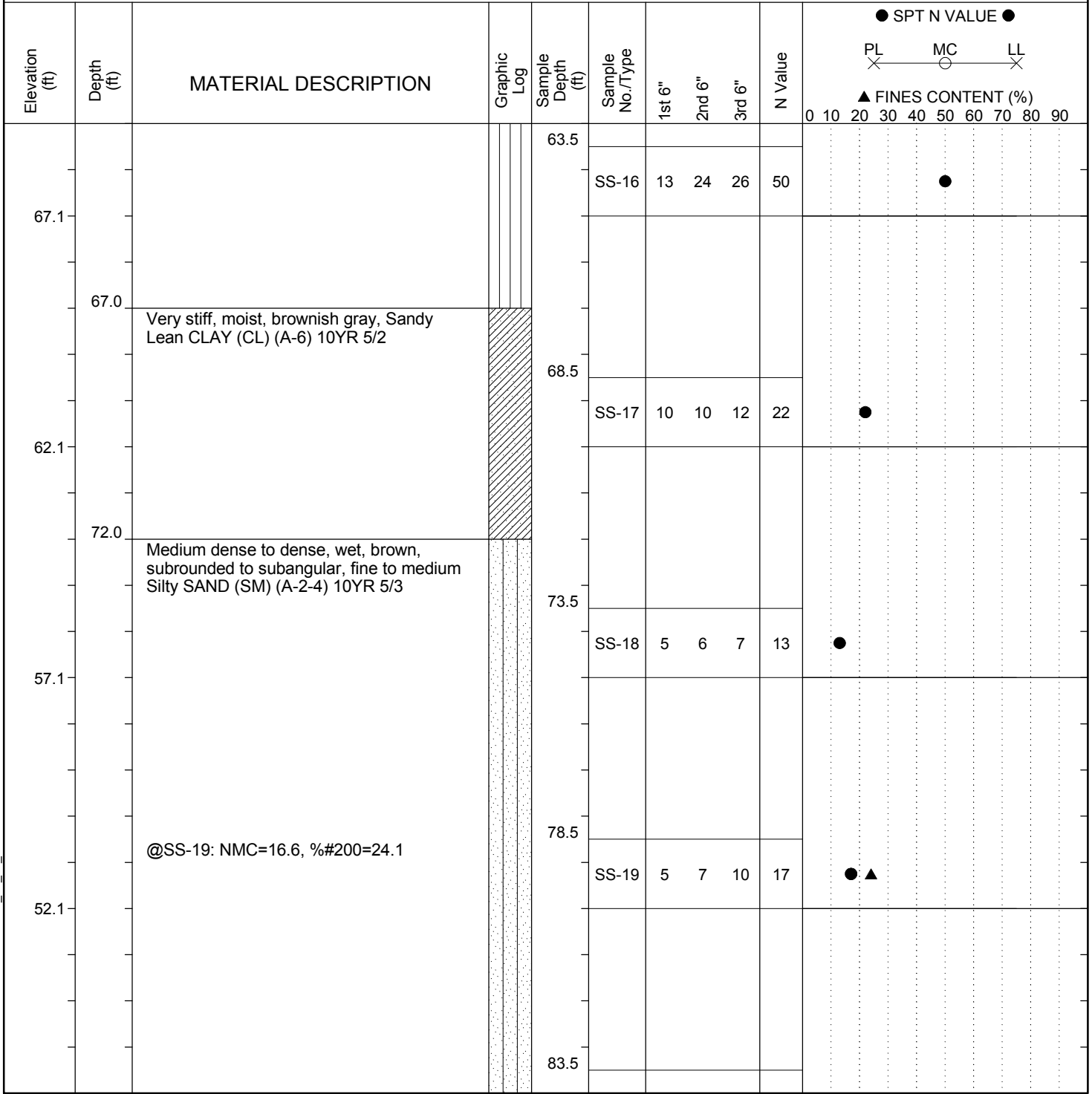
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland	<b>Boring No.:</b> B-3
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> R. Sarkar	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.85694	<b>Longitude:</b> -80.83206 <b>Date Started:</b> 4/28/2016
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft <b>Date Completed:</b> 4/29/2016
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 11 ft



**LEGEND**

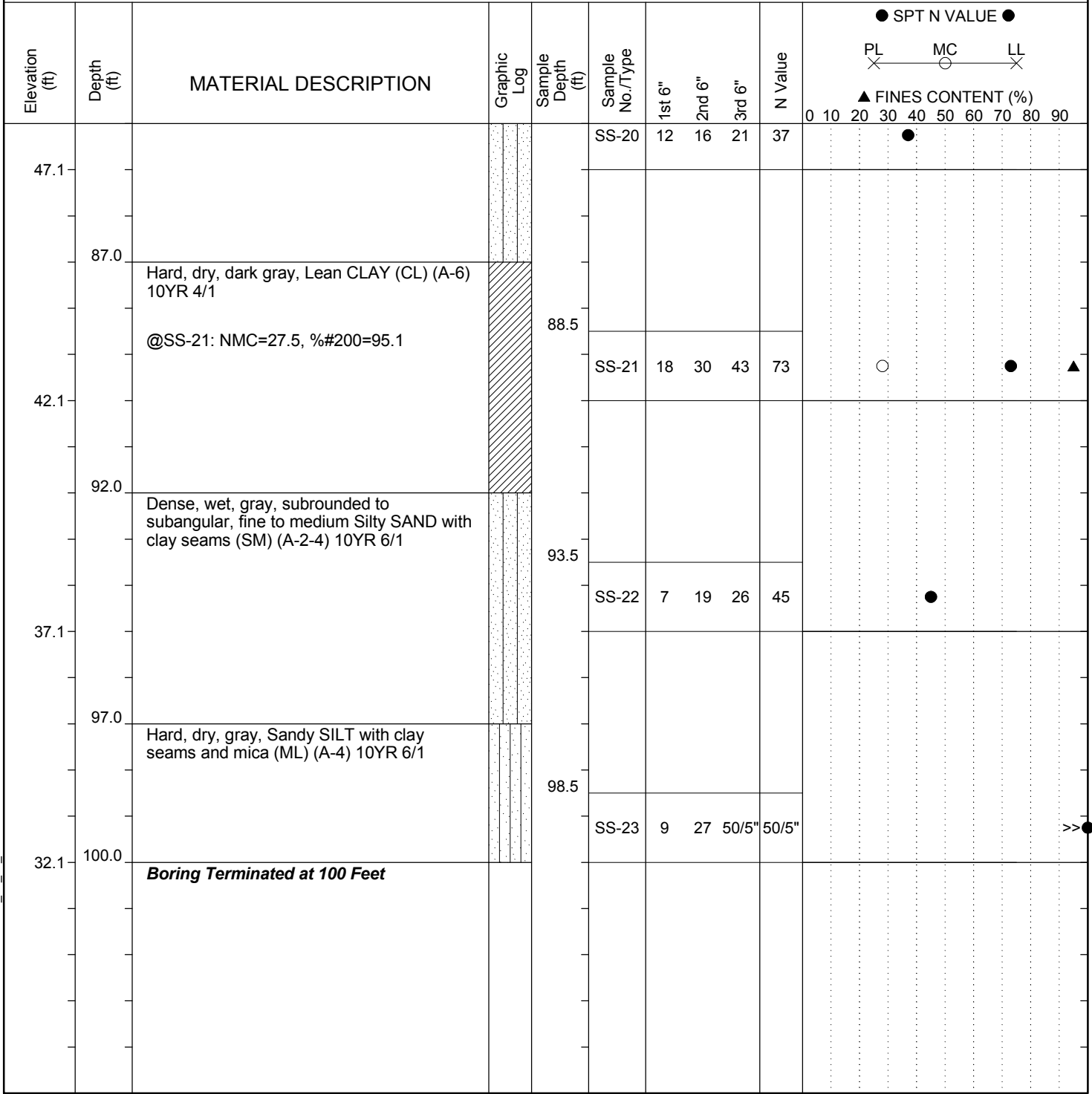
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L.GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029943		<b>County:</b> Richland		<b>Boring No.:</b> B-3	
<b>Site Description:</b> Emergency Bridge Package 6				<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> R. Sarkar		<b>Boring Location:</b> WBL		<b>Offset:</b> Lane Ctr	
<b>Elev.:</b> 132.1 ft		<b>Latitude:</b> 33.85694		<b>Longitude:</b> -80.83206	
<b>Total Depth:</b> 100 ft		<b>Soil Depth:</b> 100 ft		<b>Date Started:</b> 4/28/2016	
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>		<b>Liner Required:</b> Y (N)	
<b>Drill Machine:</b> CME-550X		<b>Drill Method:</b> RW		<b>Energy Ratio:</b> 74.2%	
<b>Core Size:</b> N.A.		<b>Driller:</b> A. Large		<b>Groundwater:</b> TOB N.A. 24HR 11 ft	



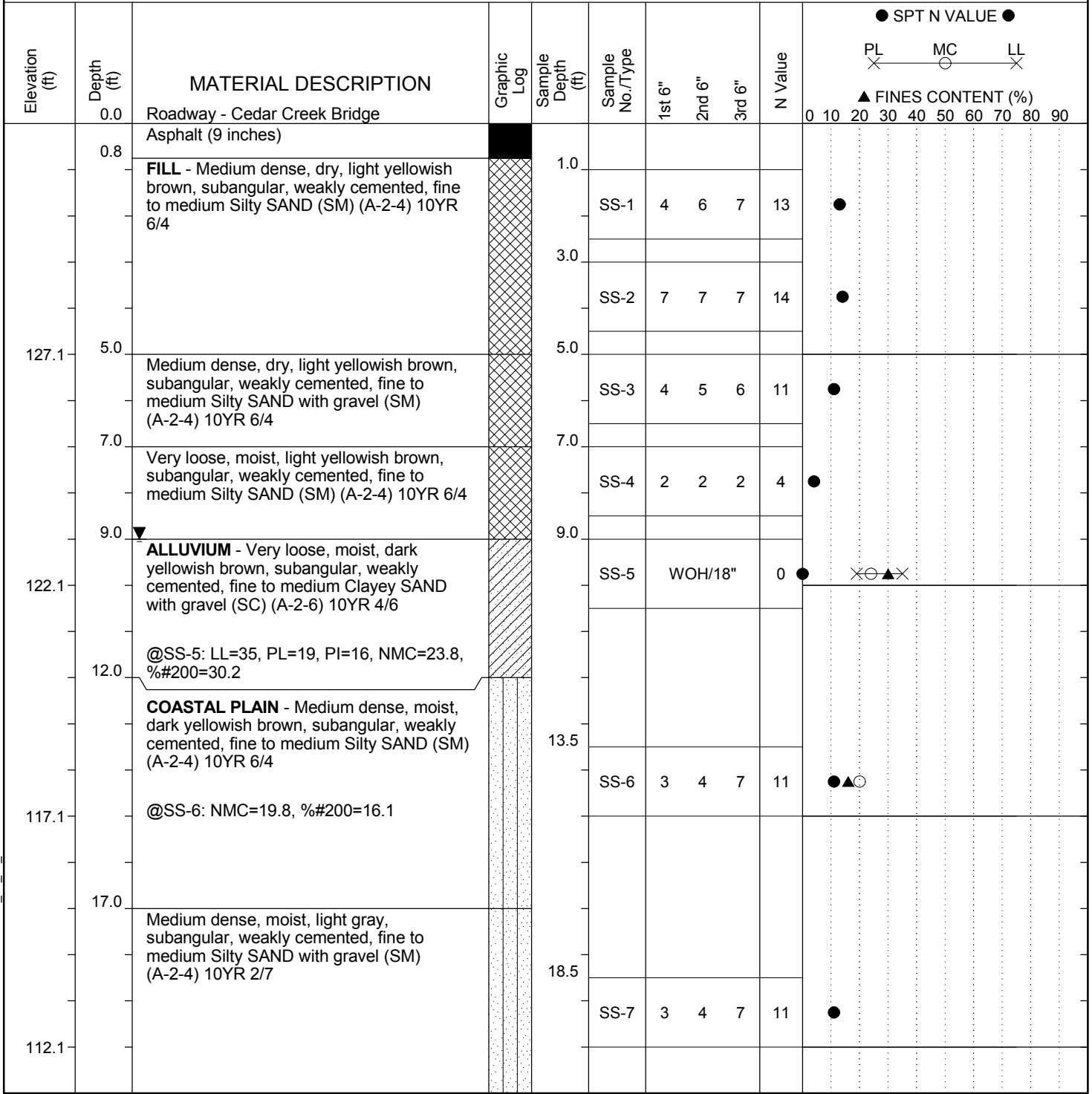
### LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT 73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland		<b>Boring No.:</b> B-4	
<b>Site Description:</b> Emergency Bridge Package 6			<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL		<b>Offset:</b>	Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.856838	<b>Longitude:</b> -80.831459	<b>Date Started:</b> 4/29/2016	
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft	<b>Date Completed:</b> 5/2/2016	
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>		<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic	<b>Energy Ratio:</b> 74.2%	
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB	N.A.	<b>24HR</b> 9 ft



LEGEND Continued Next Page

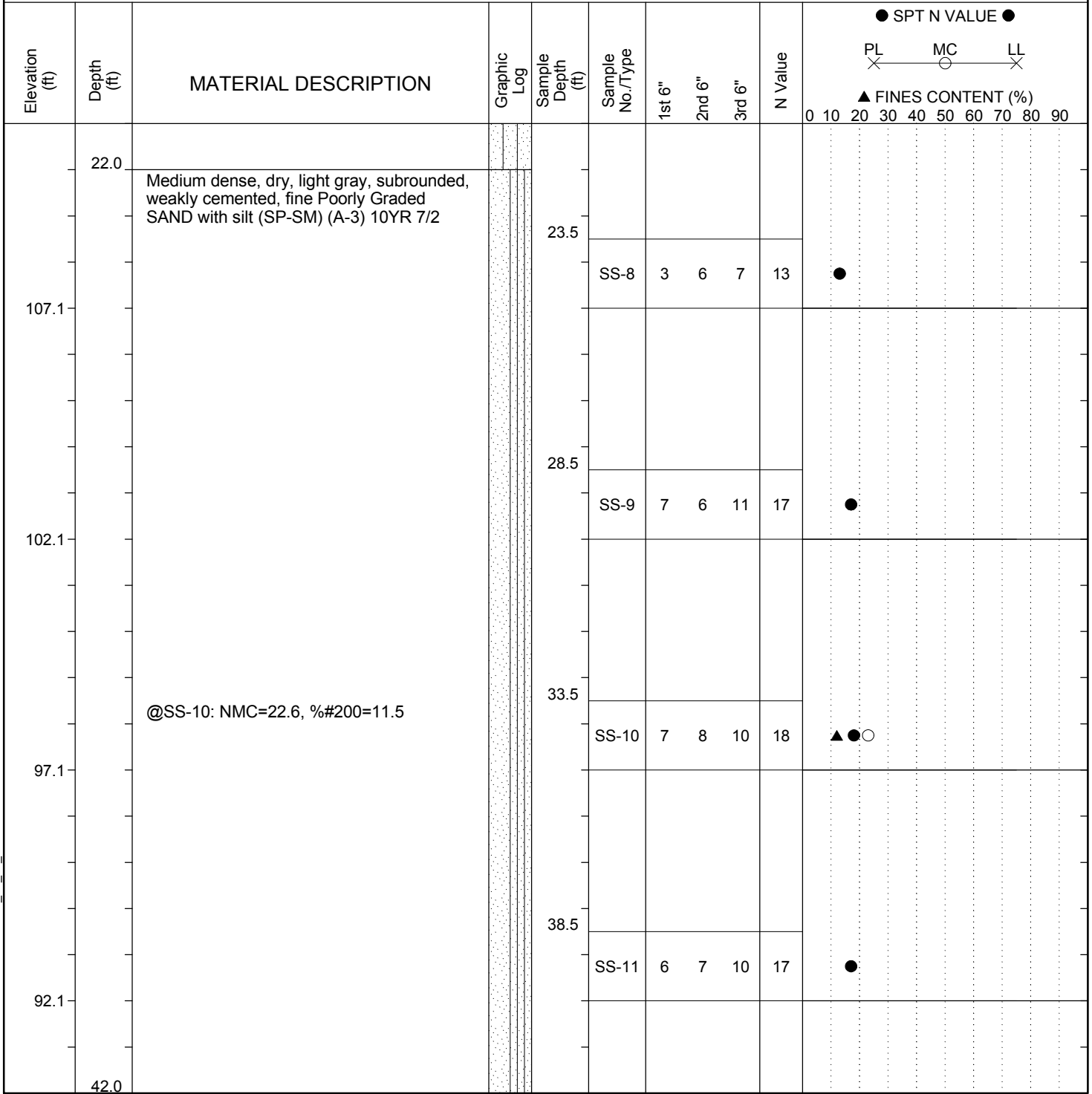
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland	<b>Boring No.:</b> B-4
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.856838	<b>Longitude:</b> -80.831459
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



**LEGEND**

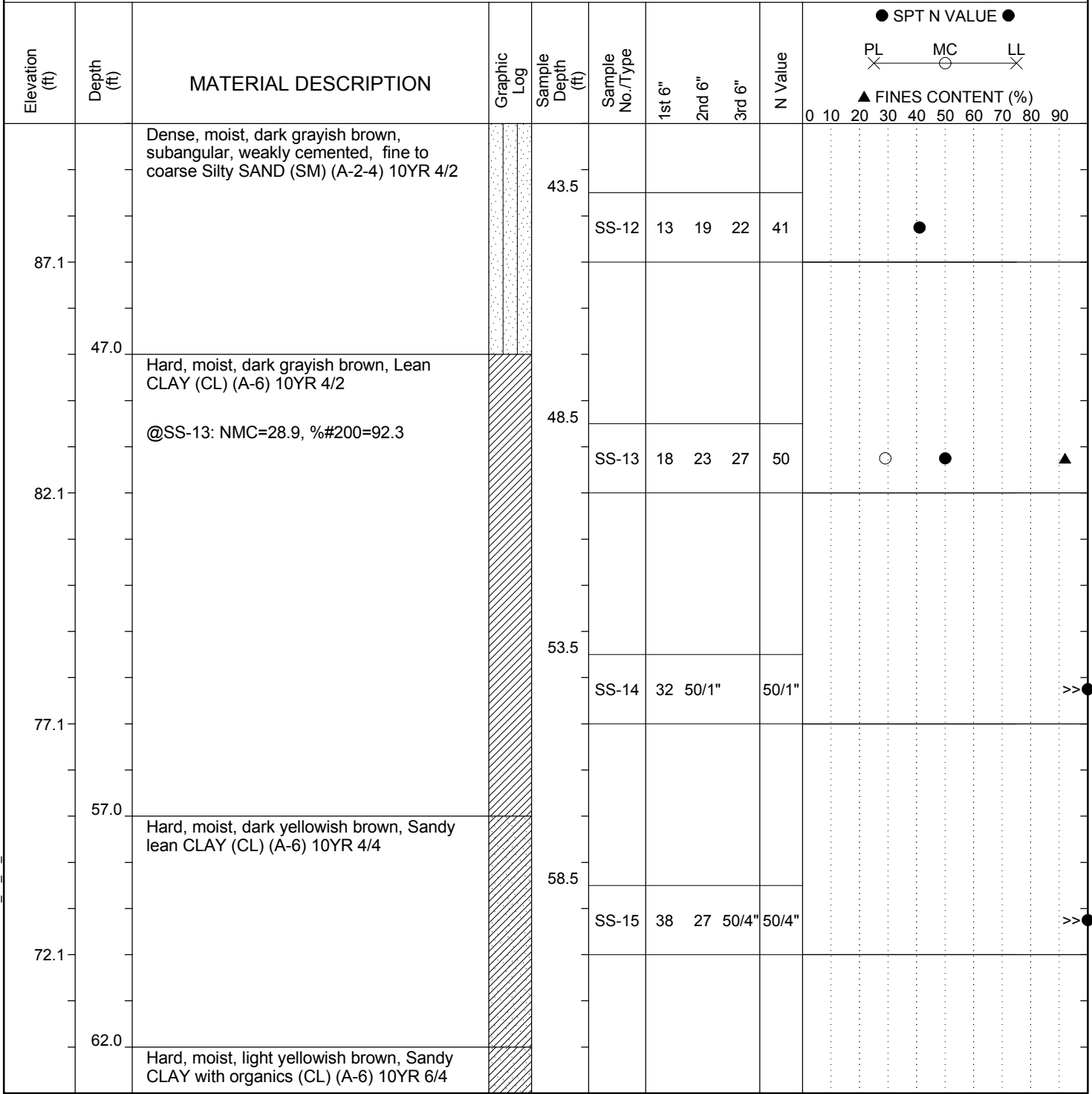
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029943	<b>County:</b> Richland	<b>Boring No.:</b> B-4
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.856838	<b>Longitude:</b> -80.831459
<b>Date Started:</b> 4/29/2016	<b>Date Completed:</b> 5/2/2016	
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



LEGEND

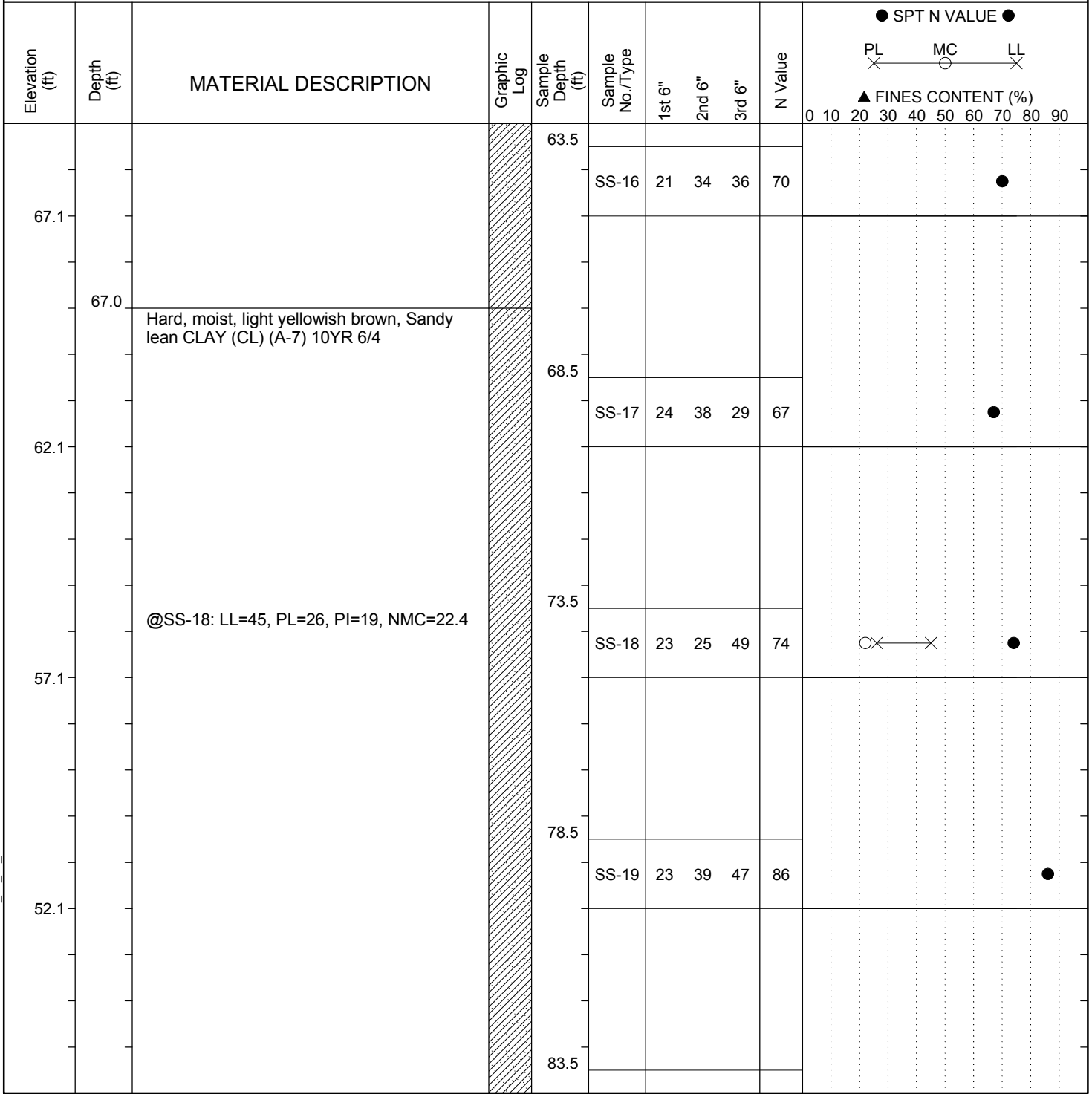
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L\_GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029943			<b>County:</b> Richland			<b>Boring No.:</b> B-4		
<b>Site Description:</b> Emergency Bridge Package 6						<b>Route:</b> SC 48		
<b>Eng./Geo.:</b> J. Fredendall		<b>Boring Location:</b> EBL		<b>Offset:</b>		<b>Lane Ctr</b>	<b>Alignment:</b> Existing	
<b>Elev.:</b> 132.1 ft	<b>Latitude:</b> 33.856838		<b>Longitude:</b> -80.831459		<b>Date Started:</b> 4/29/2016			
<b>Total Depth:</b> 100 ft		<b>Soil Depth:</b> 100 ft		<b>Core Depth:</b> 0 ft		<b>Date Completed:</b> 5/2/2016		
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>			<b>Liner Required:</b> Y (N)		<b>Liner Used:</b> Y (N)	
<b>Drill Machine:</b> CME-550X		<b>Drill Method:</b> RW		<b>Hammer Type:</b> Automatic		<b>Energy Ratio:</b> 74.2%		
<b>Core Size:</b> N.A.		<b>Driller:</b> A. Large		<b>Groundwater:</b> TOB		N.A.	<b>24HR</b>	9 ft



**LEGEND**

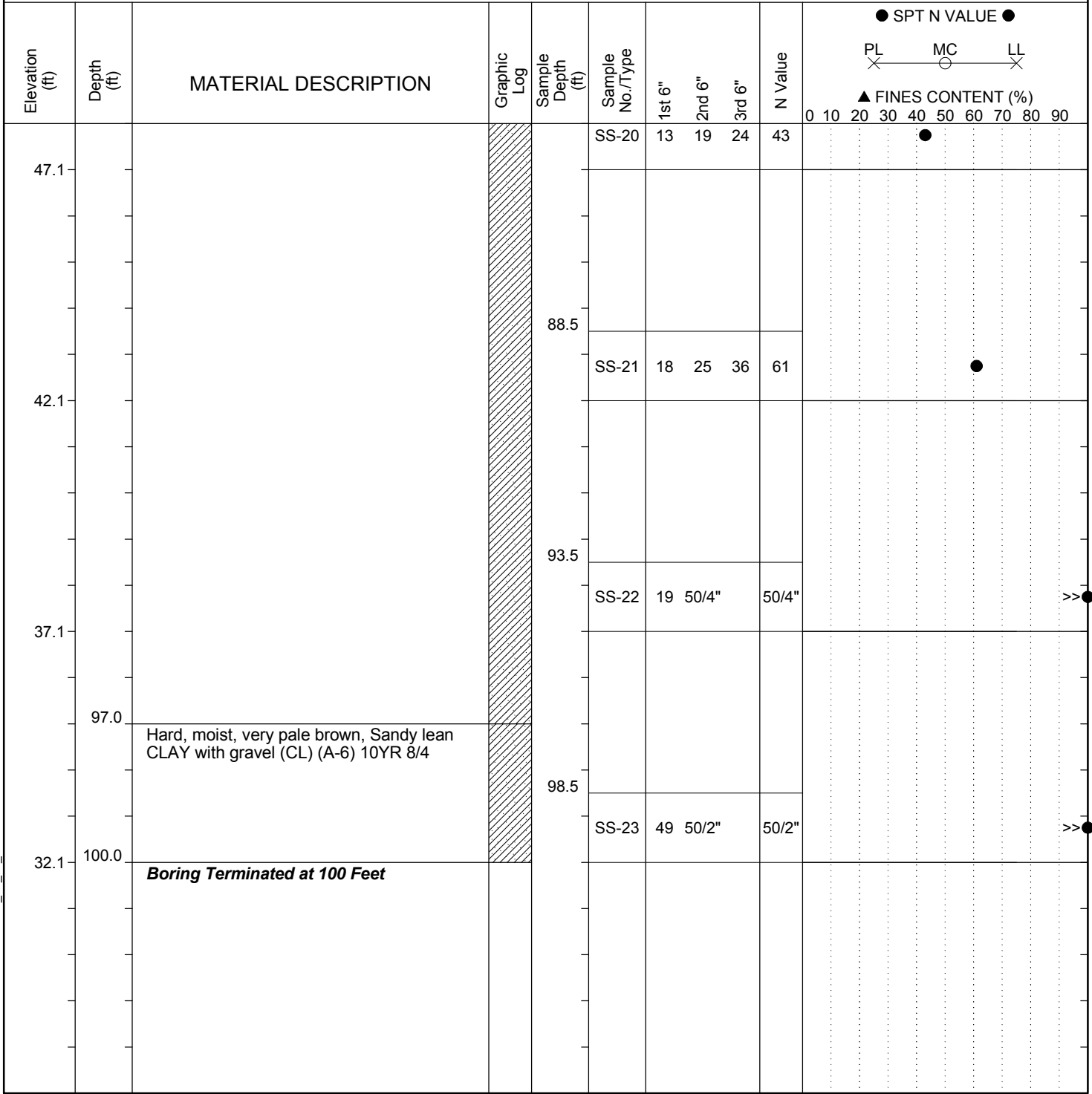
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<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029943				<b>County:</b> Richland		<b>Boring No.:</b> B-4	
<b>Site Description:</b> Emergency Bridge Package 6						<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> J. Fredendall		<b>Boring Location:</b> EBL		<b>Offset:</b>		<b>Alignment:</b> Existing	
<b>Elev.:</b> 132.1 ft		<b>Latitude:</b> 33.856838		<b>Longitude:</b> -80.831459		<b>Date Started:</b> 4/29/2016	
<b>Total Depth:</b> 100 ft		<b>Soil Depth:</b> 100 ft		<b>Core Depth:</b> 0 ft		<b>Date Completed:</b> 5/2/2016	
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration</b>		<b>Liner Required:</b> Y (N)		<b>Liner Used:</b> Y (N)	
<b>Drill Machine:</b> CME-550X		<b>Drill Method:</b> RW		<b>Hammer Type:</b> Automatic		<b>Energy Ratio:</b> 74.2%	
<b>Core Size:</b> N.A.		<b>Driller:</b> A. Large		<b>Groundwater:</b> TOB N.A.		<b>24HR:</b> 9 ft	



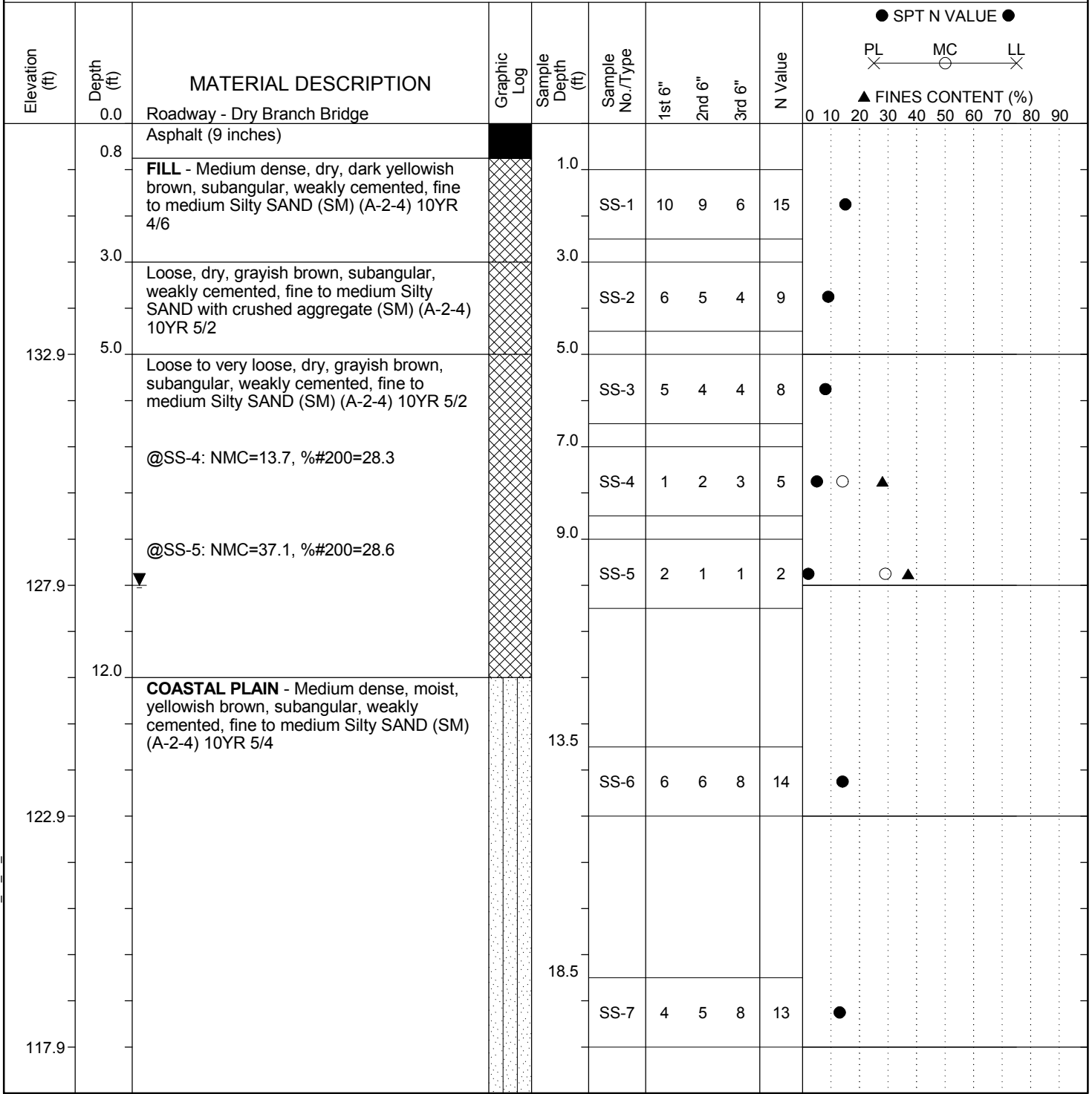
### LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-5
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr
<b>Alignment:</b> Existing	<b>Date Started:</b> 5/2/2016	<b>Date Completed:</b> 5/3/2016
<b>Elev.:</b> 137.9 ft	<b>Latitude:</b> 33.852311	<b>Longitude:</b> -80.804702
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration:</b>	<b>Liner Required:</b> Y (N)
<b>Liner Used:</b> Y (N)	<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW
<b>Hammer Type:</b> Automatic	<b>Energy Ratio:</b> 74.2%	<b>Core Size:</b> N.A.
<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB	<b>24HR:</b> 10 ft



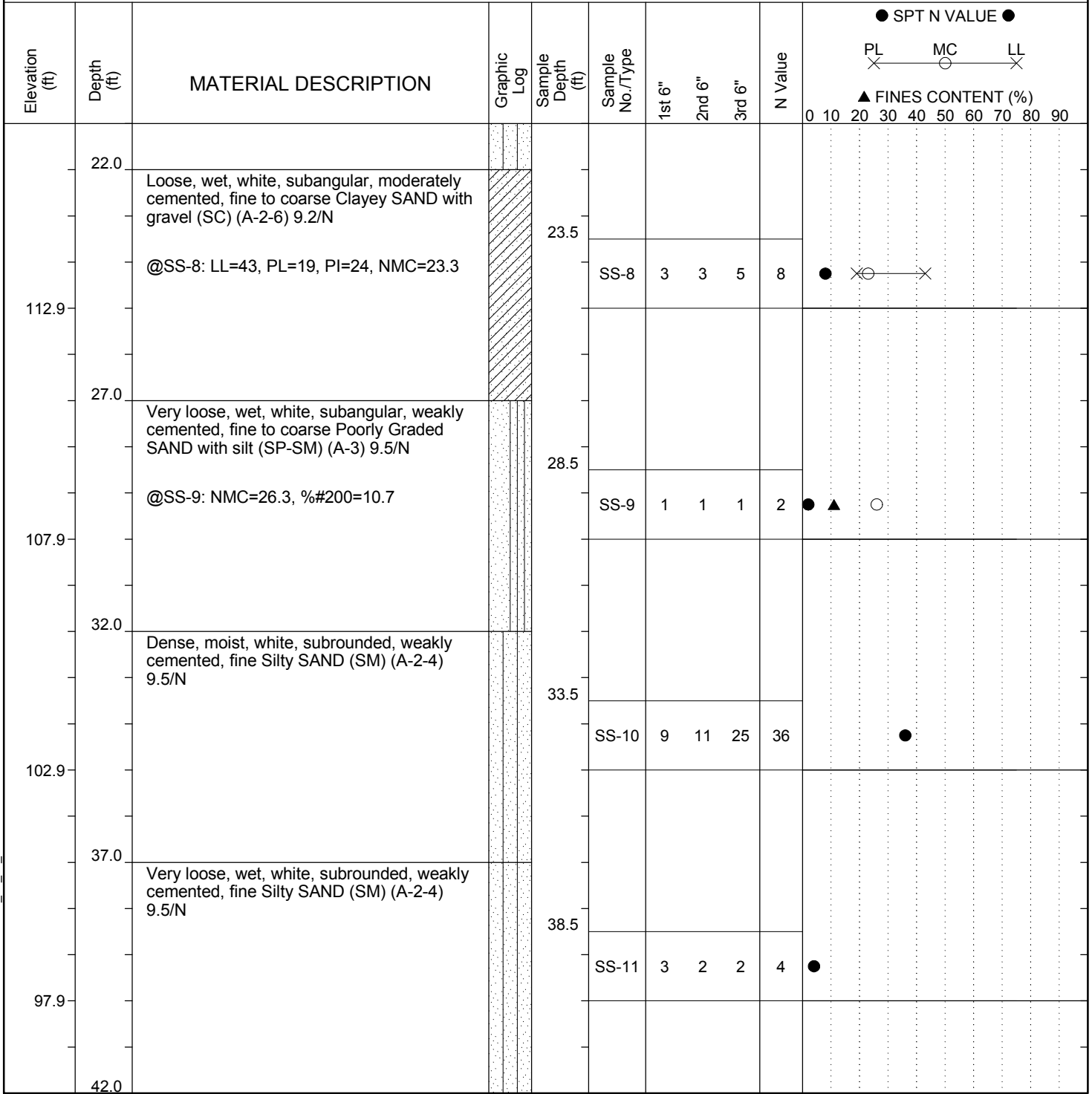
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-5
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr
<b>Elev.:</b> 137.9 ft	<b>Latitude:</b> 33.852311	<b>Longitude:</b> -80.804702
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Energy Ratio:</b> 74.2%
<b>Groundwater:</b> TOB	<b>N.A.</b>	<b>24HR:</b> 10 ft



LEGEND

Continued Next Page

<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8" NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing RW - Rotary Wash RC - Rock Core	
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SC\_DOT\_73155050L.GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-5
<b>Site Description:</b> Emergency Bridge Package 6	<b>Route:</b> SC 48	
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr
<b>Elev.:</b> 137.9 ft	<b>Latitude:</b> 33.852311	<b>Longitude:</b> -80.804702
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Energy Ratio:</b> 74.2%
	<b>Groundwater:</b> TOB	<b>24HR:</b> 10 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE									
										PL	MC	LL	FINES CONTENT (%)						
92.9	43.5	Medium dense to dense, moist, dark yellowish brown, subrounded, weakly cemented, fine Silty SAND (SM) (A-2-4) 10YR 4/4		43.5	SS-12	9	10	12	22	●									
87.9	48.5			48.5	SS-13	9	10	14	24	●									
82.9	53.5			53.5	SS-14	10	11	18	29	●									
77.9	58.5			58.5	SS-15	7	14	19	33	●									
63.0																			

LEGEND

Continued Next Page

<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing		NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC - Rock Core	
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SC\_DOT\_73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-5
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.9 ft	<b>Latitude:</b> 33.852311	<b>Longitude:</b> -80.804702 <b>Date Started:</b> 5/2/2016
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft <b>Date Completed:</b> 5/3/2016
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 10 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE ●									
										PL	MC	LL							
										▲ FINES CONTENT (%)									
										0	10	20	30	40	50	60	70	80	90
72.9		Medium dense, moist, dark yellowish brown, subrounded, weakly cemented, fine to medium Silty SAND (SM) (A-2-4) 10YR 4/4  @SS-16: NMC=28.0, %#200=18.7		63.5	SS-16	9	12	15	27		▲ ●								
67.9				68.5	SS-17	11	12	15	27		●								
62.9				73.5	SS-18	8	10	14	24		●								
57.9				78.5	SS-19	11	14	14	28		●								
				83.5															

LEGEND

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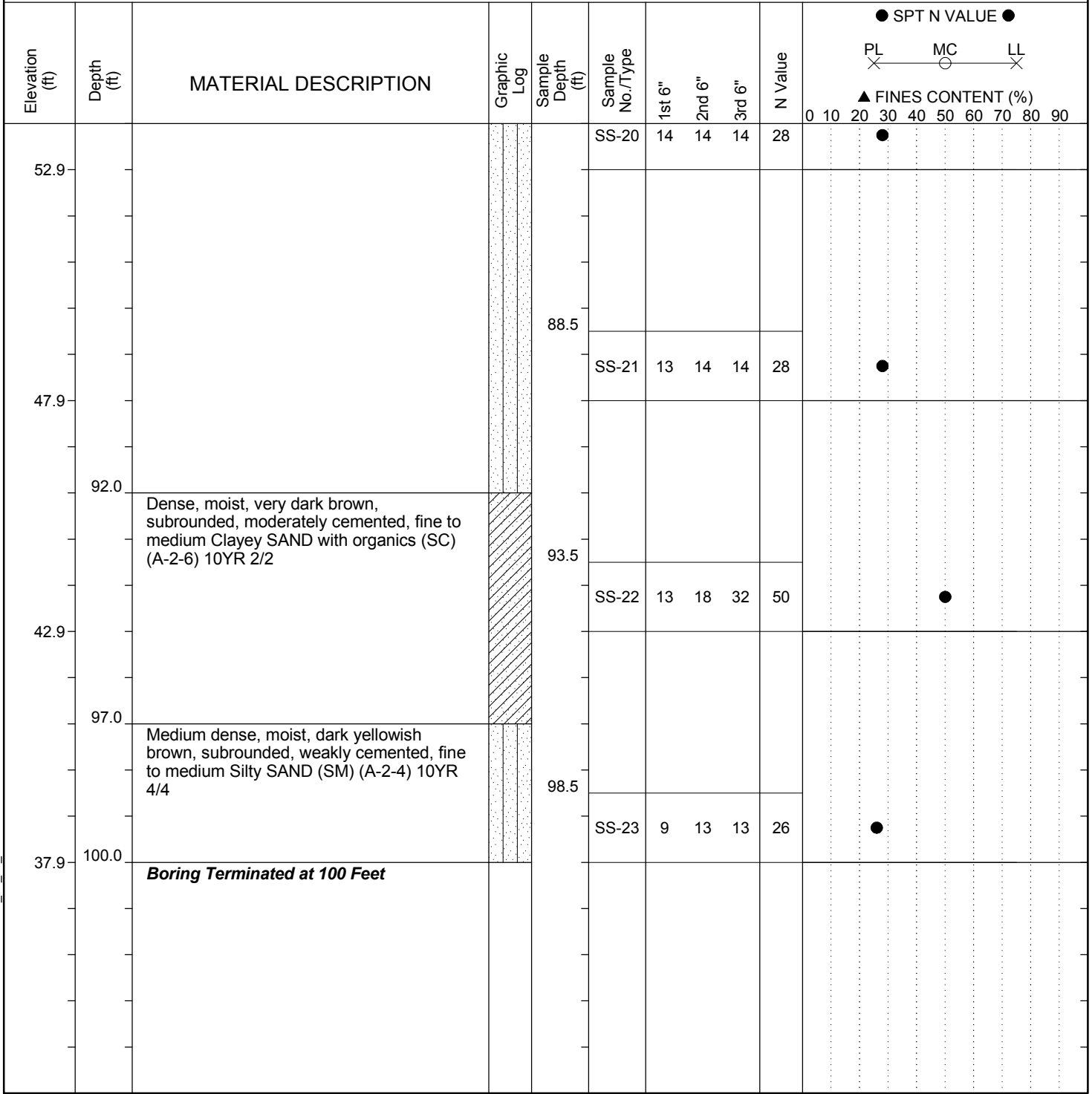
<b>SAMPLER TYPE</b> SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8" NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		<b>DRILLING METHOD</b> HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing RW - Rotary Wash RC - Rock Core	
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SC\_DOT\_73155050L.GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16



# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-5
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> WBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.9 ft	<b>Latitude:</b> 33.852311	<b>Longitude:</b> -80.804702 <b>Date Started:</b> 5/2/2016
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft <b>Date Completed:</b> 5/3/2016
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 10 ft



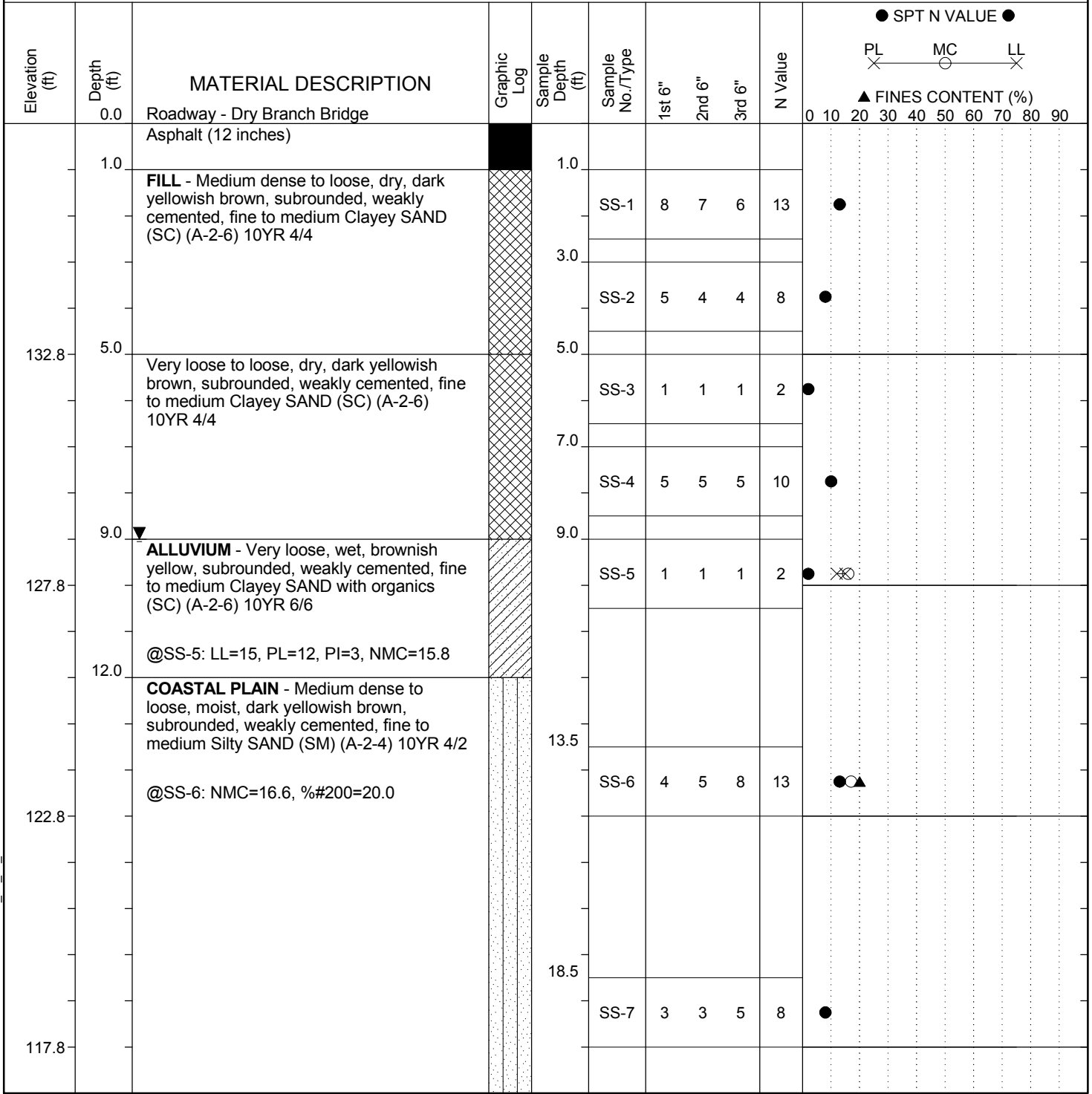
### LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L\_GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-6
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.8 ft	<b>Latitude:</b> 33.852224	<b>Longitude:</b> -80.80441
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



LEGEND Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L\_GPJ\_SCDOT\_DATA\_TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-6
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.8 ft	<b>Latitude:</b> 33.852224	<b>Longitude:</b> -80.80441
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90										
										[Scale for SPT N Value and Fines Content]										
112.8	22.0	Loose, moist, dark grayish brown, subrounded, weakly cemented, fine to medium Silty SAND with gravel (SM) (A-2-4) 10YR 4/2	[Dotted pattern]	23.5	SS-8	5	4	4	8	●	▲									
		@SS-8: NMC=20.1, %#200=17.8																		
107.8	27.0	Loose to medium dense, moist, dark grayish brown, subrounded, weakly cemented, fine to medium Silty SAND (SM) (A-2-4) 10YR 4/2	[Dotted pattern]	28.5	SS-9	5	3	3	6	●										
102.8				33.5	SS-10	7	9	12	21	●										
97.8				38.5	SS-11	6	7	13	20	●										
42.0																				

LEGEND

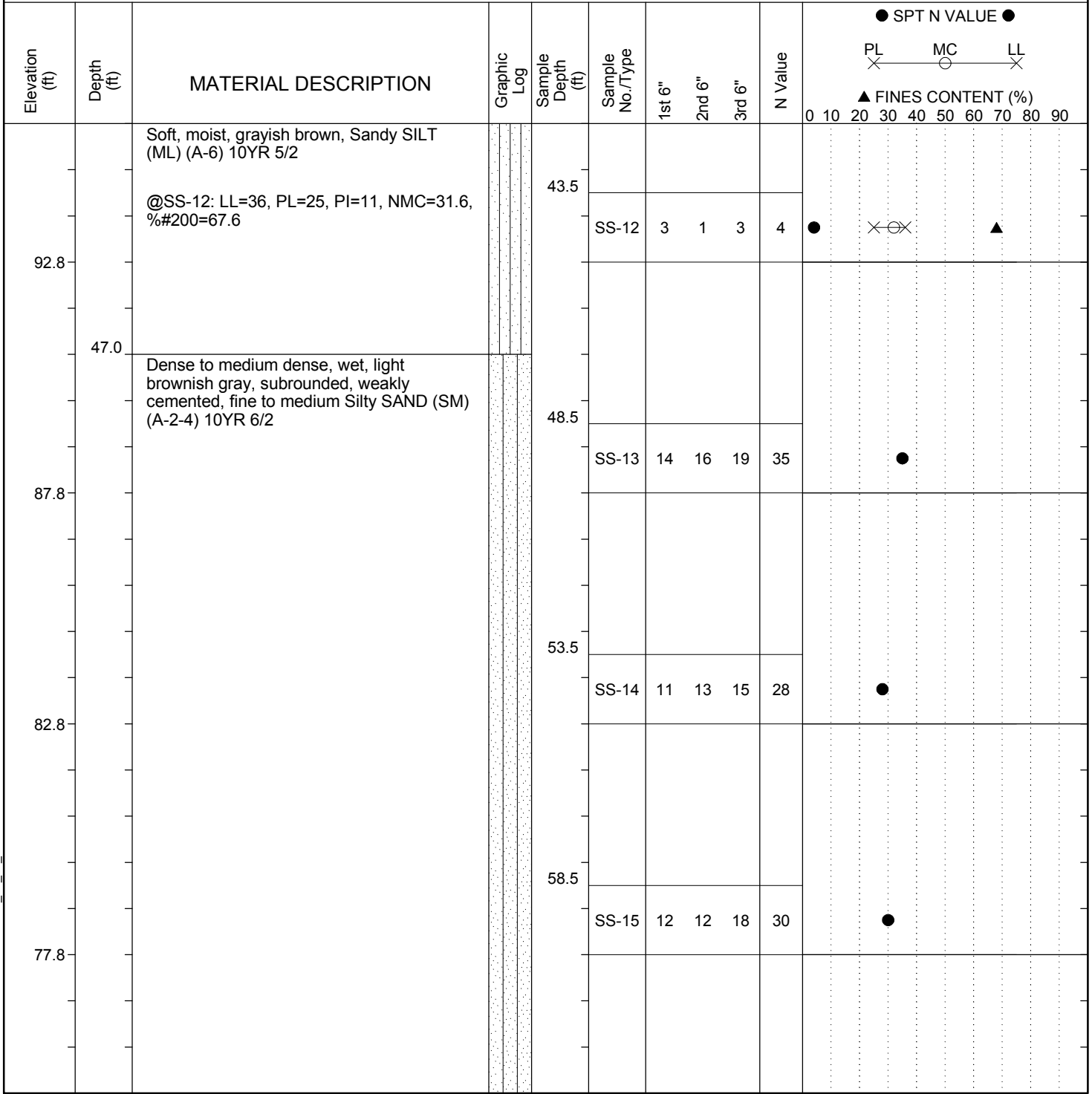
Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-6
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.8 ft	<b>Latitude:</b> 33.852224	<b>Longitude:</b> -80.80441 <b>Date Started:</b> 5/3/2016
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft <b>Date Completed:</b> 5/4/2016
<b>Bore Hole Diameter (in):</b> 2.94	<b>Sampler Configuration</b>	<b>Liner Required:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



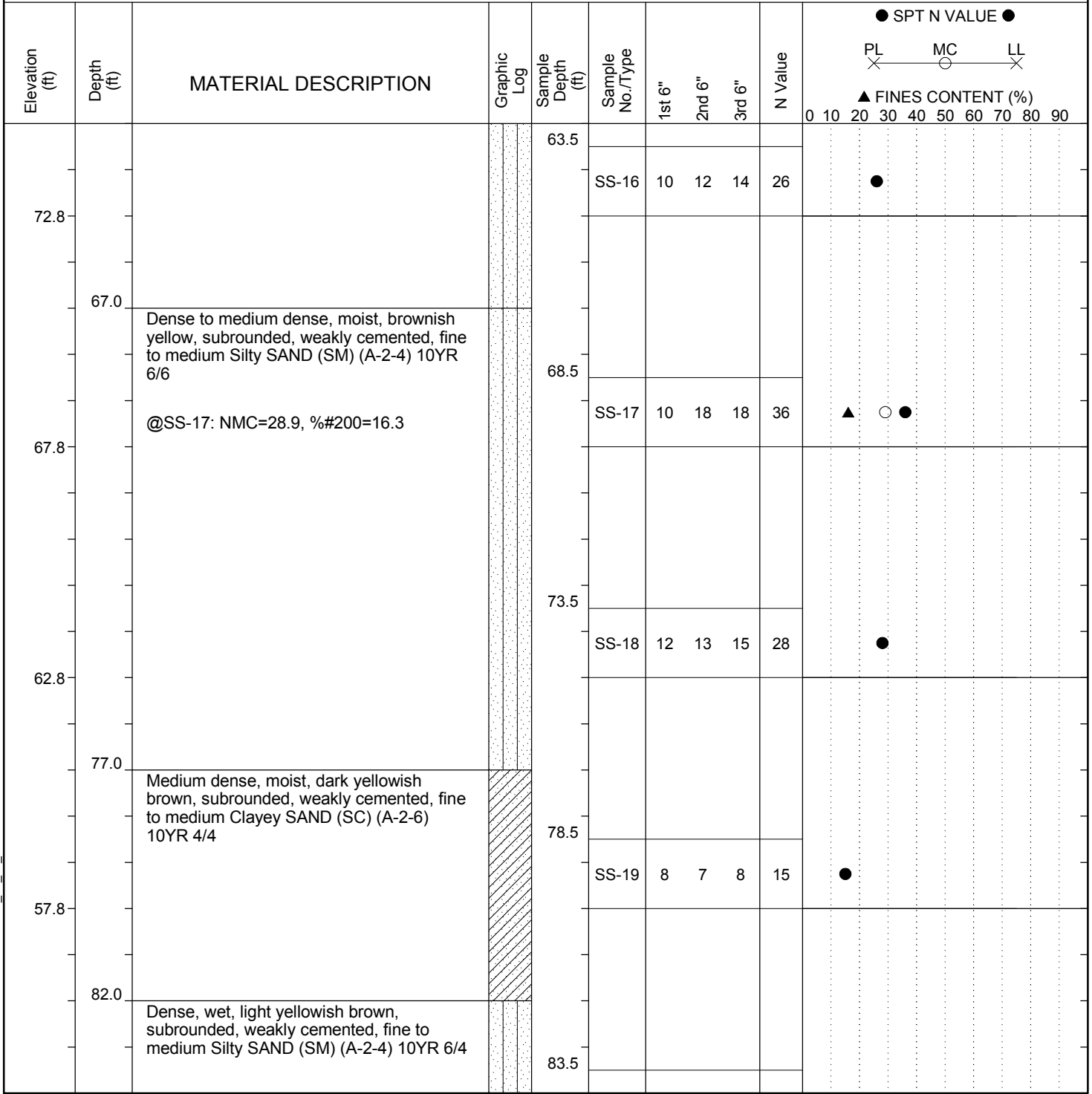
LEGEND Continued Next Page

<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT\_73155050L.GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-6
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.8 ft	<b>Latitude:</b> 33.852224	<b>Longitude:</b> -80.80441
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



**LEGEND**

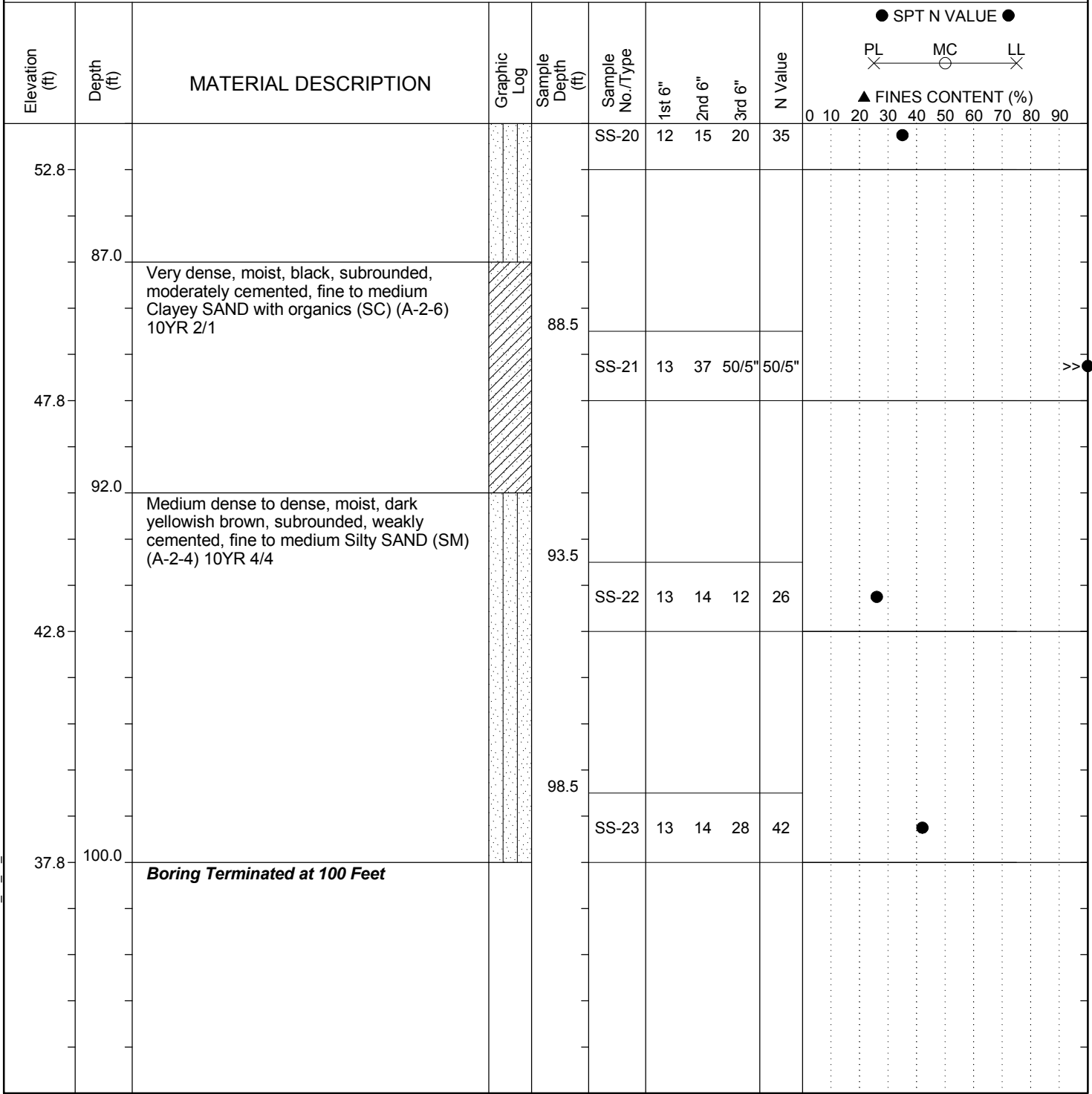
*Continued Next Page*

<b>SAMPLER TYPE</b>		<b>DRILLING METHOD</b>	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT 73155050L\_GPJ\_SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# SCDOT Soil Test Log

<b>Project ID:</b> P029944	<b>County:</b> Richland	<b>Boring No.:</b> B-6
<b>Site Description:</b> Emergency Bridge Package 6		<b>Route:</b> SC 48
<b>Eng./Geo.:</b> J. Fredendall	<b>Boring Location:</b> EBL	<b>Offset:</b> Lane Ctr <b>Alignment:</b> Existing
<b>Elev.:</b> 137.8 ft	<b>Latitude:</b> 33.852224	<b>Longitude:</b> -80.80441
<b>Total Depth:</b> 100 ft	<b>Soil Depth:</b> 100 ft	<b>Core Depth:</b> 0 ft
<b>Bore Hole Diameter (in):</b> 2.94		<b>Sampler Configuration:</b> Y (N) <b>Liner Used:</b> Y (N)
<b>Drill Machine:</b> CME-550X	<b>Drill Method:</b> RW	<b>Hammer Type:</b> Automatic <b>Energy Ratio:</b> 74.2%
<b>Core Size:</b> N.A.	<b>Driller:</b> A. Large	<b>Groundwater:</b> TOB N.A. <b>24HR:</b> 9 ft



### LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC\_DOT 73155050L.GPJ SCDOT DATA TEMPLATE\_12\_30\_2014.GDT 5/12/16

# CPT LOG NO. CPT-1

**PROJECT:** Emergency Bridge Package 6

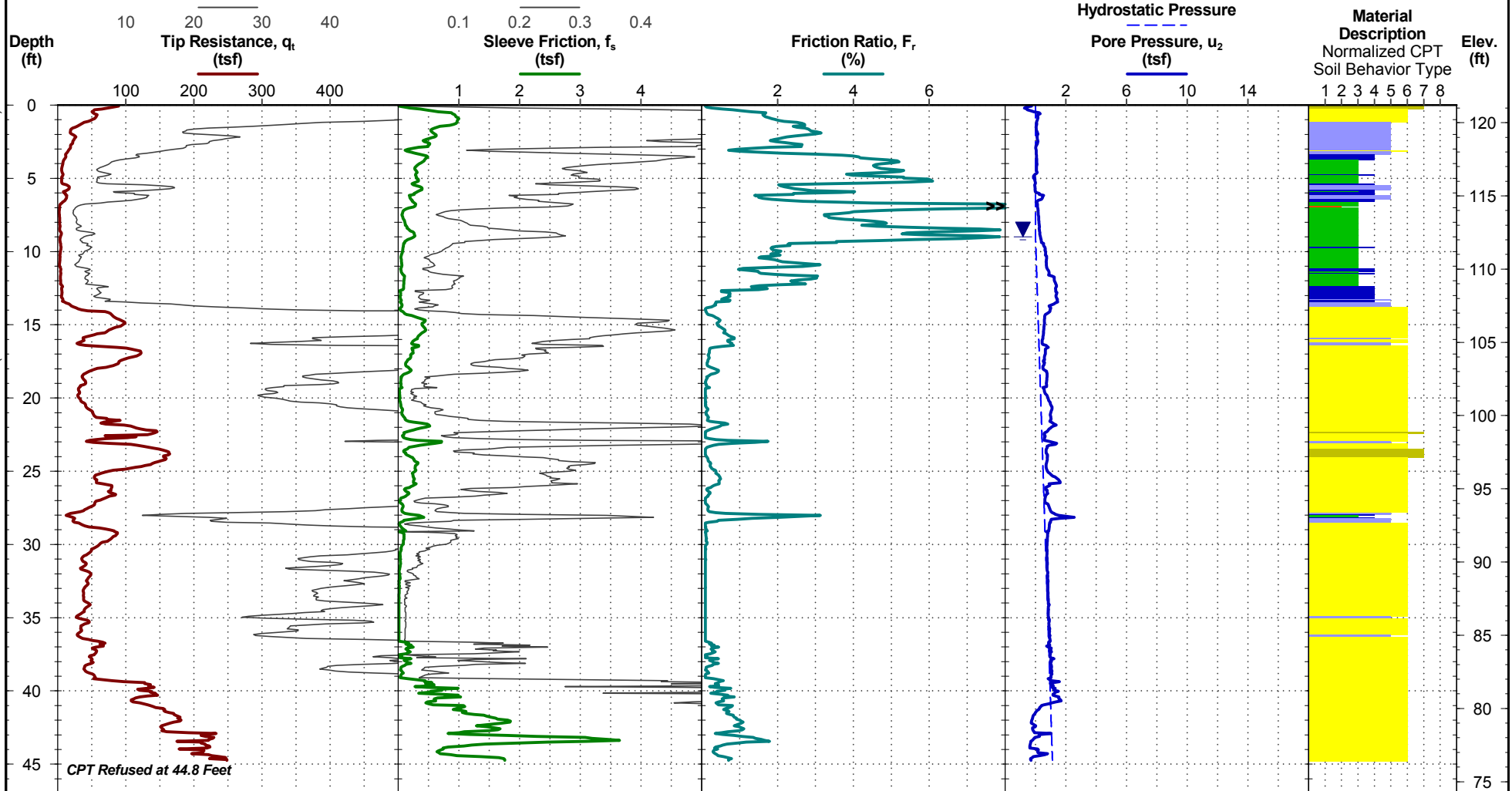
**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-2

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 121.2 ft  
Latitude: 33.865024°  
Longitude: -80.880014°

Station: EBL  
Offset: Lane Ctr



**SCDOT Project # P029942**

See Exhibit A-3 for description of field procedures.  
See Appendix C for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.  
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 9 ft measured water depth  
(used in normalizations and correlations;  
see Appendix C)

Probe no. 4526 with net area ratio of 0.83  
U2 pore pressure transducer location  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/2/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/2/2016

Operator: JB

Exhibit: A-17

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACON2015.GDT 5/12/16

# CPT LOG NO. CPT-2

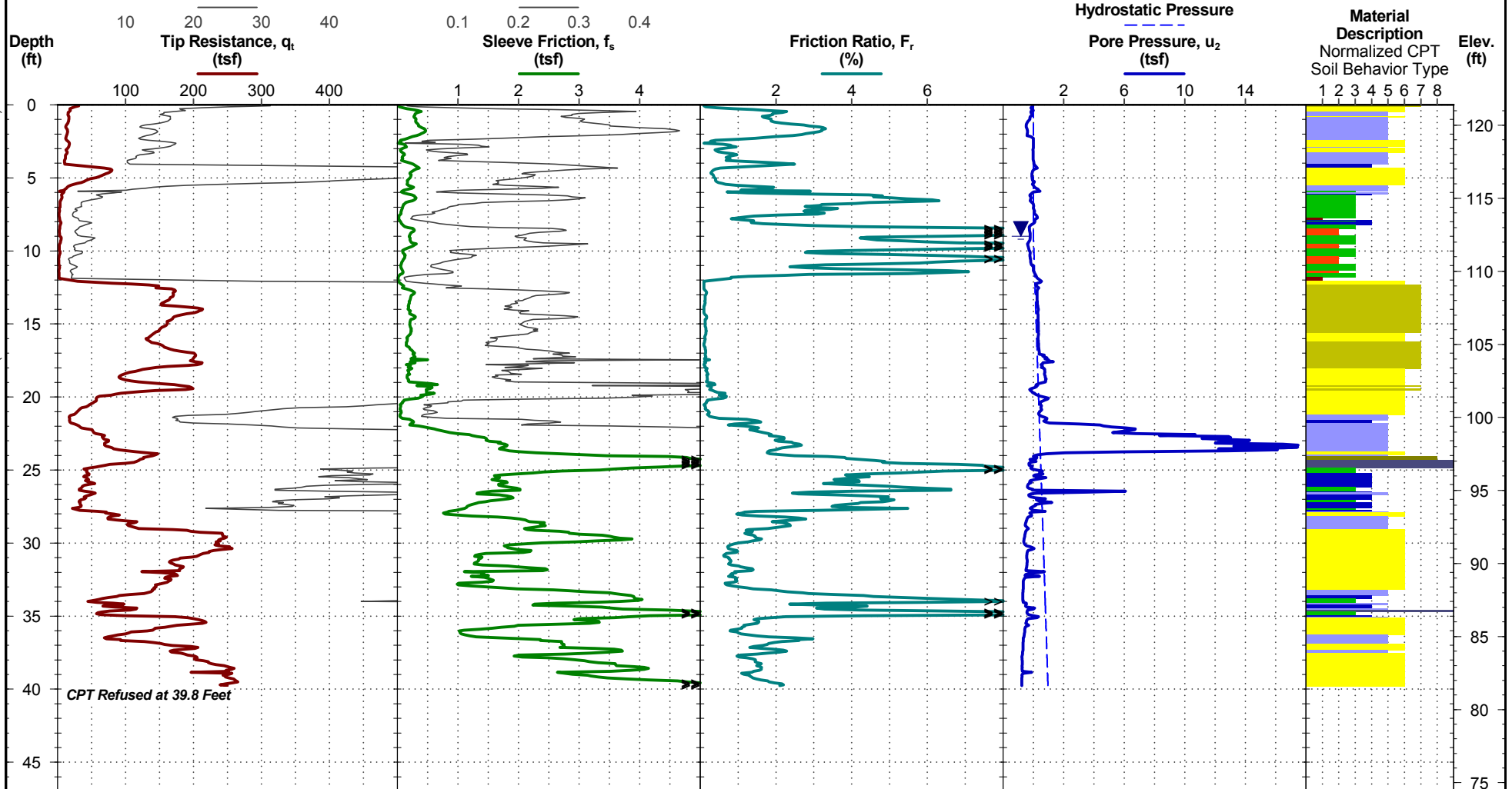
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-2

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 121.4 ft  
Latitude: 33.864973°  
Longitude: -80.879514°  
Station: WBL  
Offset: Lane Ctr



**SCDOT Project # P029942**

See Exhibit A-3 for description of field procedures.  
See Appendix C for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.  
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 9 ft measured water depth  
(used in normalizations and correlations;  
see Appendix C)

Probe no. 4526 with net area ratio of 0.83  
U2 pore pressure transducer location  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/2/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/2/2016

Operator: JB

Exhibit: A-18

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACON2015.GDT 5/12/16



# CPT LOG NO. CPT-3

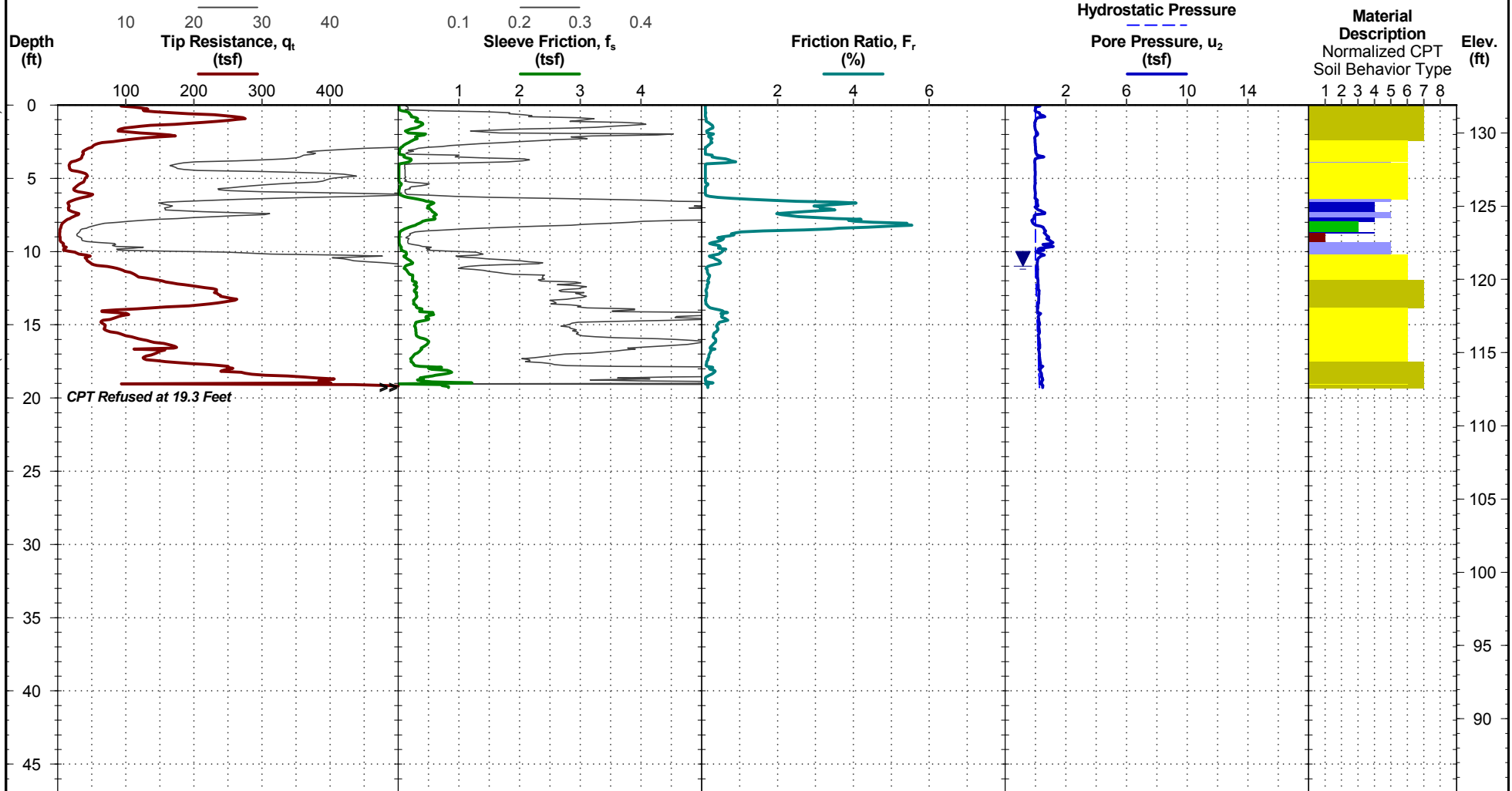
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-3

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 131.9 ft  
Latitude: 33.856907°  
Longitude: -80.832064°  
Station: EBL  
Offset: Lane Ctr



**SCDOT Project # P029943**

See Exhibit A-3 for description of field procedures.  
See Appendix C for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.  
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 11 ft measured water depth  
(used in normalizations and correlations;  
see Appendix C)

Probe no. 4526 with net area ratio of 0.83  
U2 pore pressure transducer location  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-19

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACON2015.GDT 5/12/16

# CPT LOG NO. CPT-4

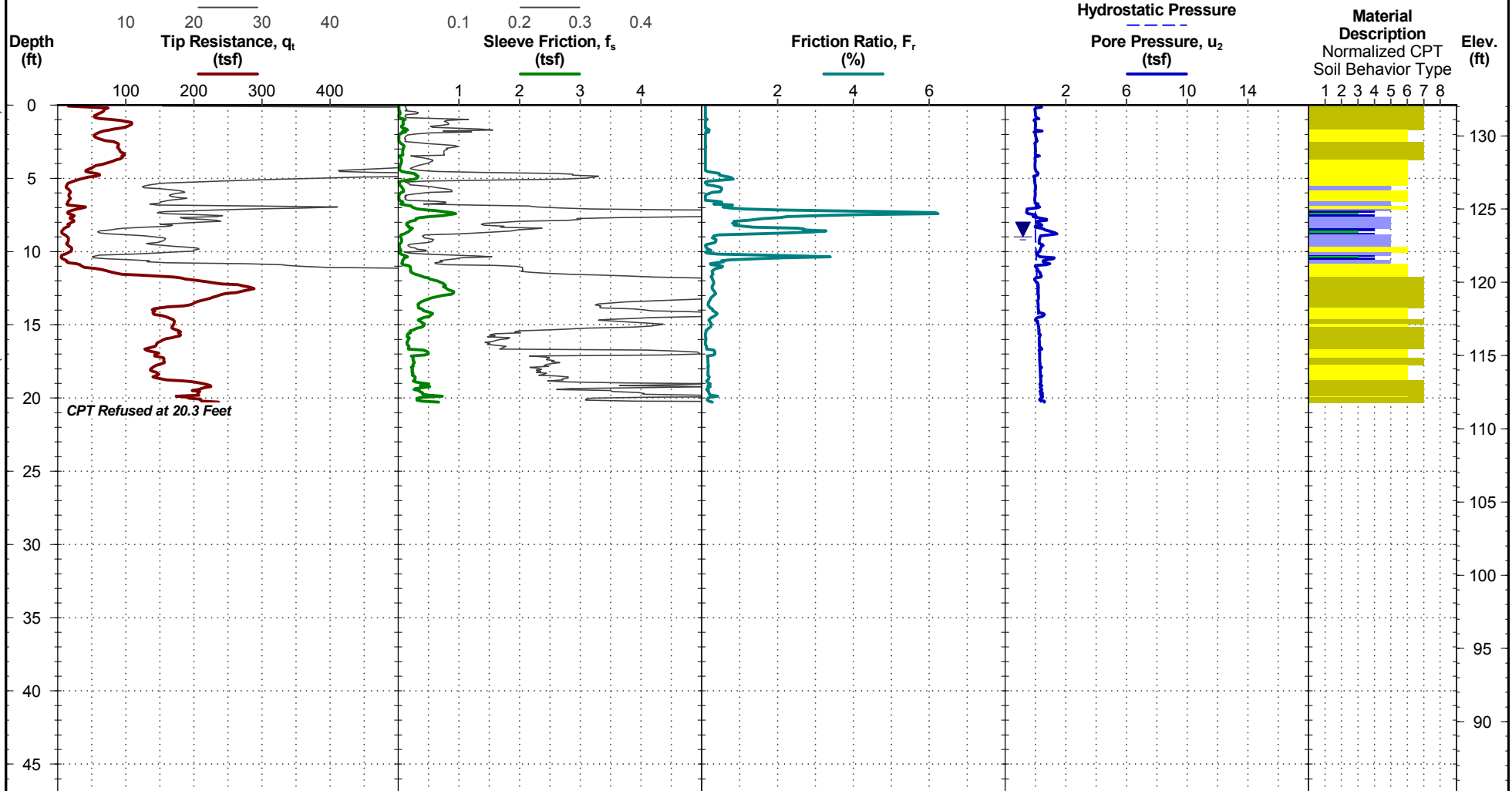
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-3

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 132.1 ft  
Latitude: 33.856895° Station: WBL  
Longitude: -80.831467° Offset: Lane Ctr



**SCDOT Project # P029943**

See Exhibit A-3 for description of field procedures.  
See Appendix C for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.  
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

9 ft measured water depth  
(used in normalizations and correlations;  
see Appendix C)

Probe no. 4526 with net area ratio of 0.83  
U2 pore pressure transducer location  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-20

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACON2015.GDT 5/12/16

# CPT LOG NO. CPT-5

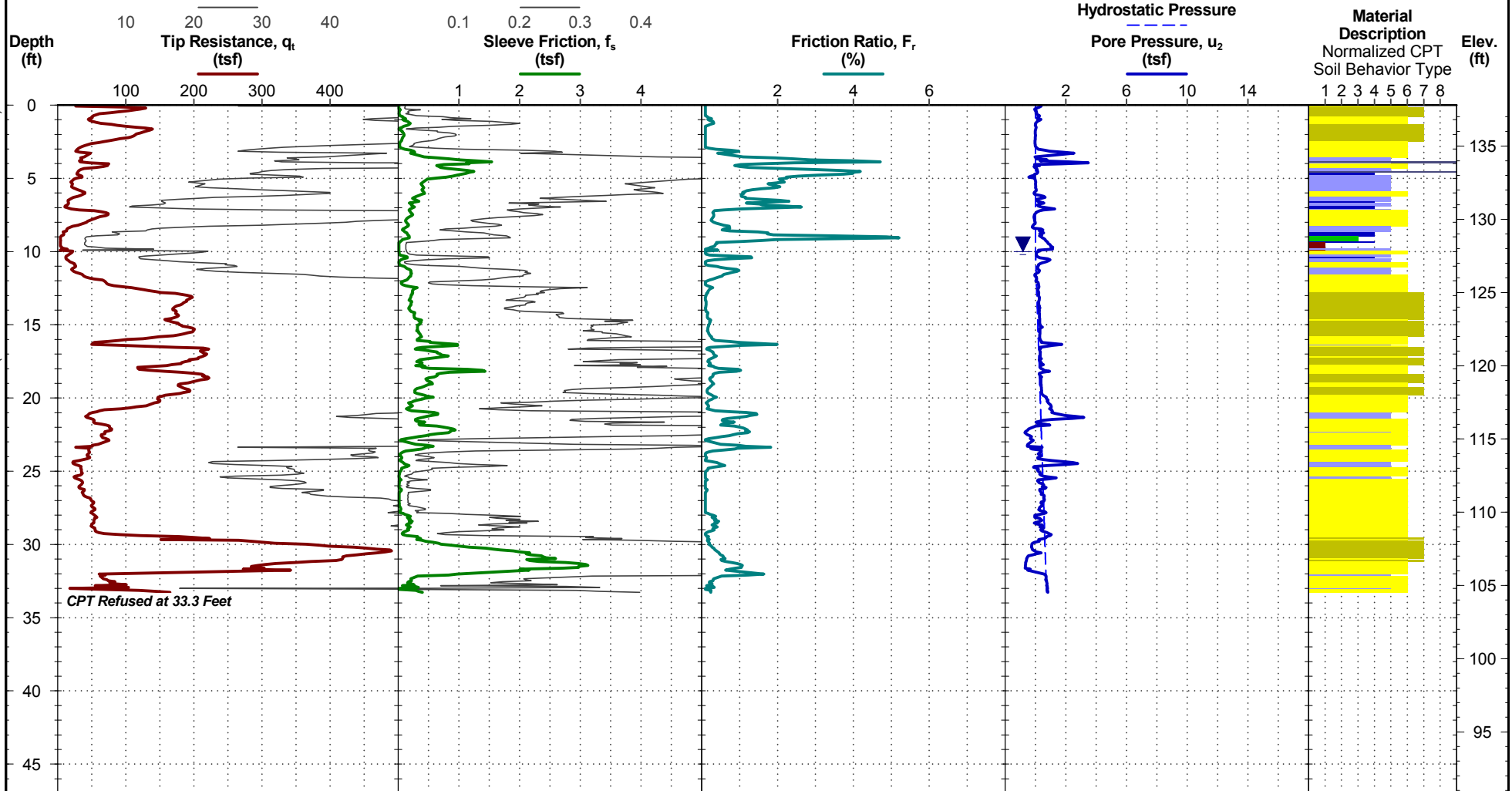
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-4

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 137.8 ft  
Latitude: 33.852278° Station: EBL  
Longitude: -80.804712° Offset: Lane Ctr



**SCDOT Project # P029944**

See Exhibit A-3 for description of field procedures.  
See Appendix C for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.  
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

10 ft measured water depth  
(used in normalizations and correlations;  
see Appendix C)

Probe no. 4526 with net area ratio of 0.83  
U2 pore pressure transducer location  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-21

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACON2015.GDT 5/12/16

# CPT LOG NO. CPT-6

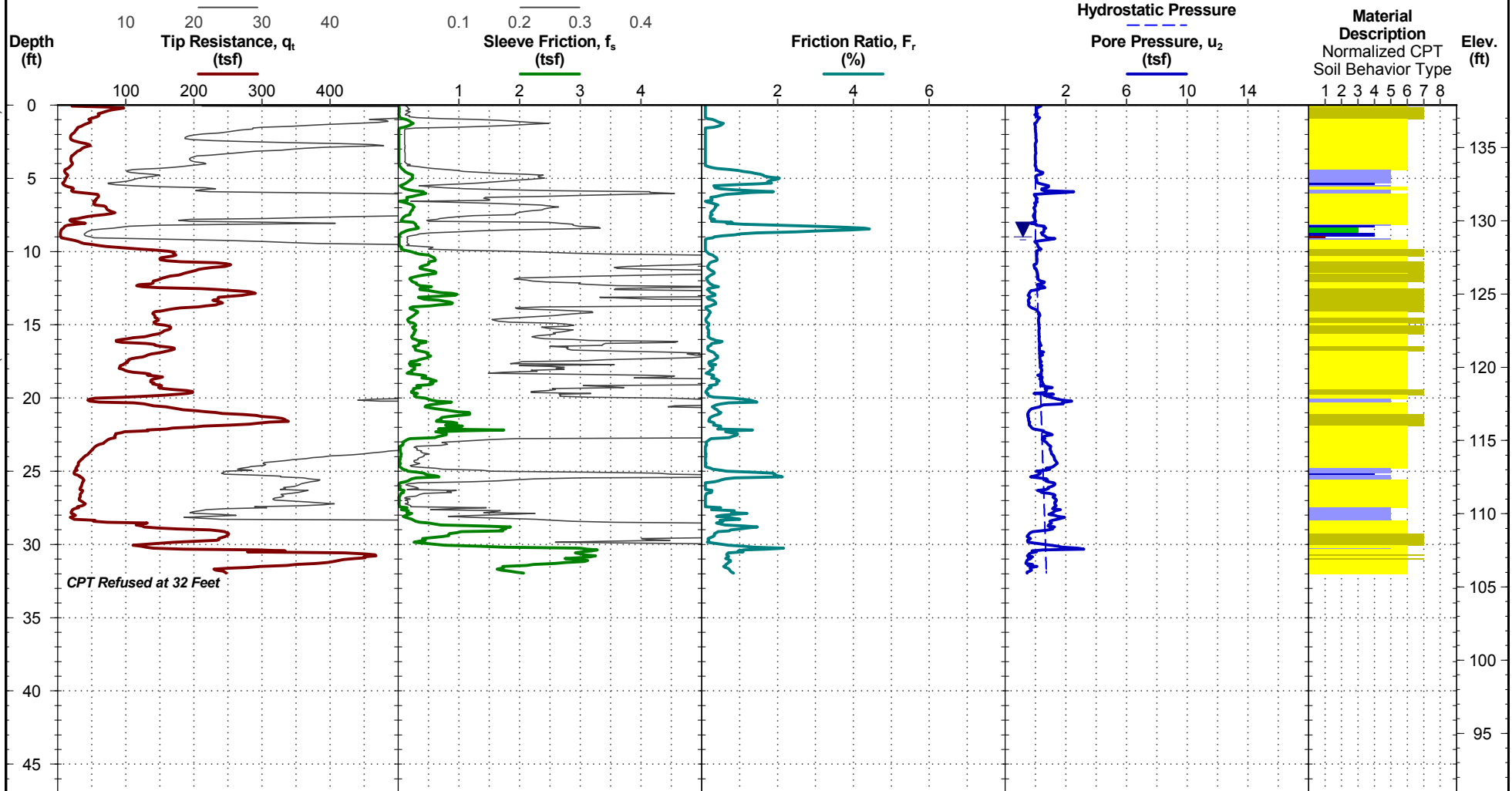
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-4

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 137.9 ft  
Latitude: 33.852258° Station: WBL  
Longitude: -80.804403° Offset: Lane Ctr



**SCDOT Project # P029944**

See Exhibit A-3 for description of field procedures.  
See Appendix C for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.  
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 9 ft estimated water depth  
(used in normalizations and correlations;  
see Appendix C)

Probe no. 4526 with net area ratio of 0.83  
U2 pore pressure transducer location  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-22

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACON2015.GDT 5/12/16

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT CORRELATIVE PARAMETERS REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACONZ

# CPT CORRELATIVE PARAMETER LOG NO. CPT-1

SEE CPT LOG NO. CPT-1 FOR DETAILED TEST RESULTS

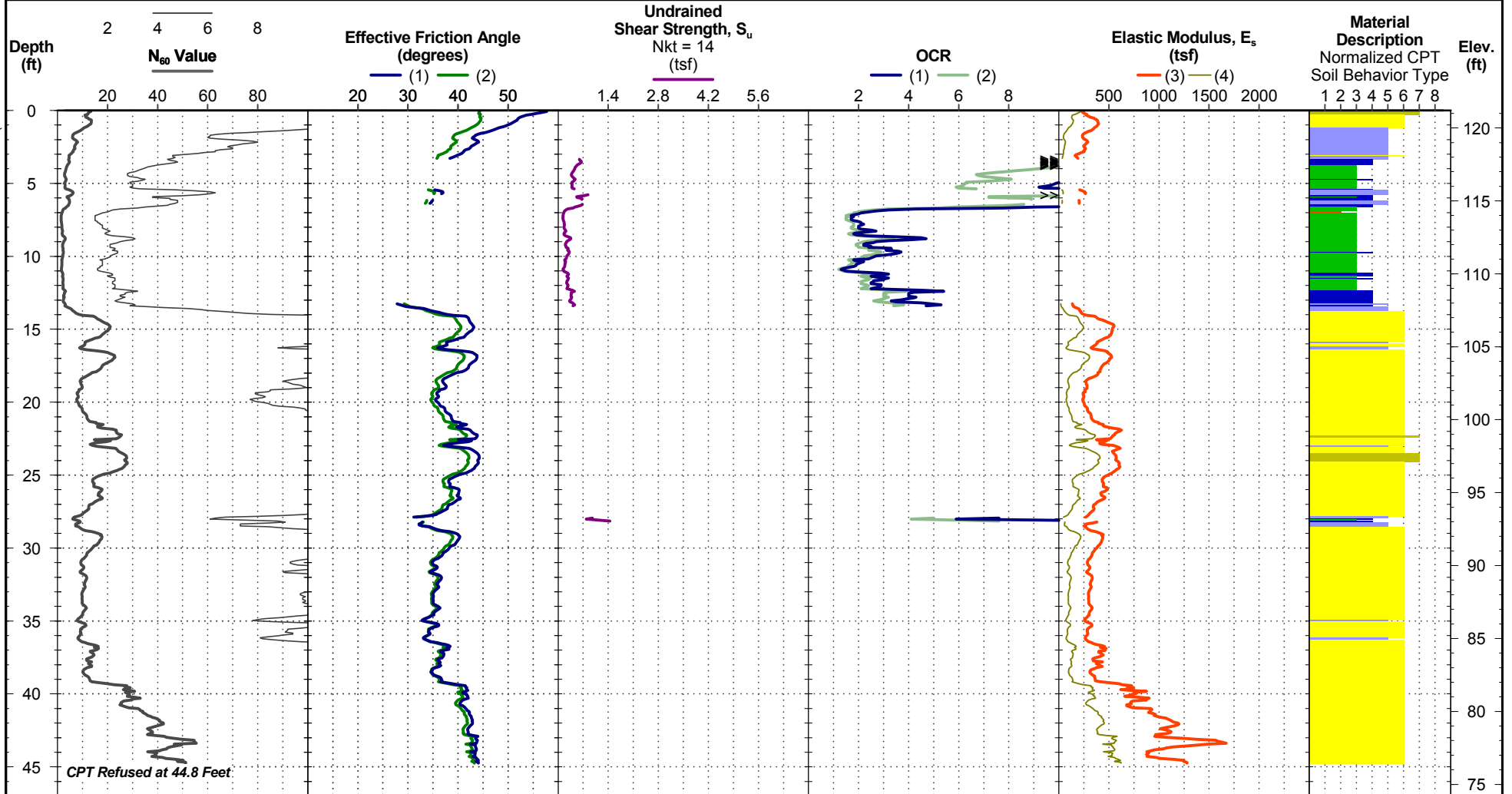
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-2

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 121.2 ft  
Latitude: 33.865024° Station: EBL  
Longitude: -80.880014° Offset: Lane Ctr



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix C provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

**WATER LEVEL OBSERVATION**

9 ft measured water depth  
(used in normalizations and correlations; see Appendix C)

Notes:  
Probe no. 4526 with net area ratio of 0.83  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/2/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/2/2016

Operator: JB

Exhibit: A-23

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT CORRELATIVE PARAMETERS REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE).GPJ TERRACONZ

# CPT CORRELATIVE PARAMETER LOG NO. CPT-2

SEE CPT LOG NO. CPT-2 FOR DETAILED TEST RESULTS

**PROJECT:** Emergency Bridge Package 6

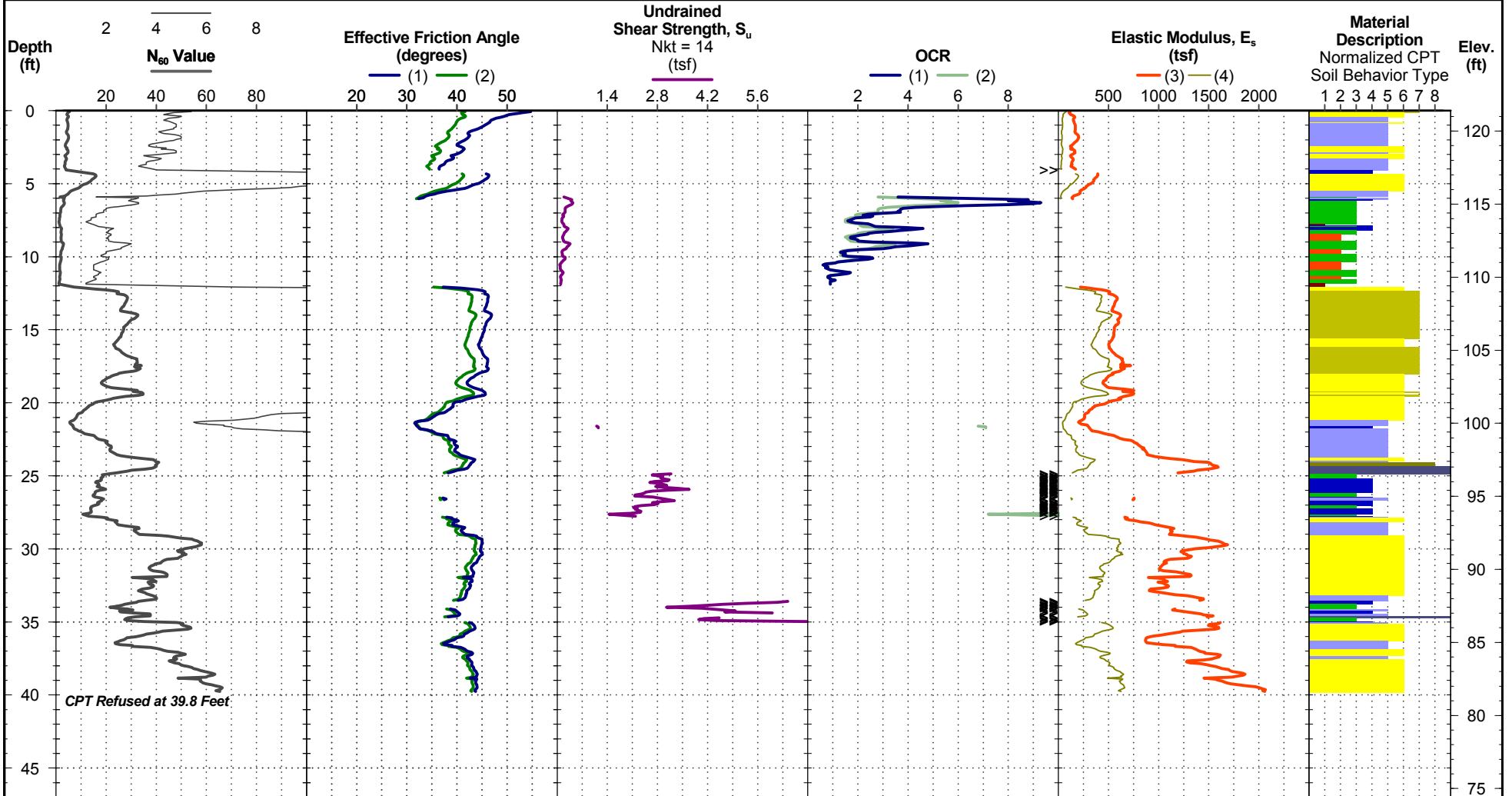
**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-2

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 121.4 ft  
Latitude: 33.864973°  
Longitude: -80.879514°

Station: WBL  
Offset: Lane Ctr



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix C provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

**WATER LEVEL OBSERVATION**

9 ft measured water depth  
(used in normalizations and correlations; see Appendix C)

Notes:  
Probe no. 4526 with net area ratio of 0.83  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/2/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/2/2016

Operator: JB

Exhibit: A-24

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT CORRELATIVE PARAMETERS REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACONZ

# CPT CORRELATIVE PARAMETER LOG NO. CPT-3

SEE CPT LOG NO. CPT-3 FOR DETAILED TEST RESULTS

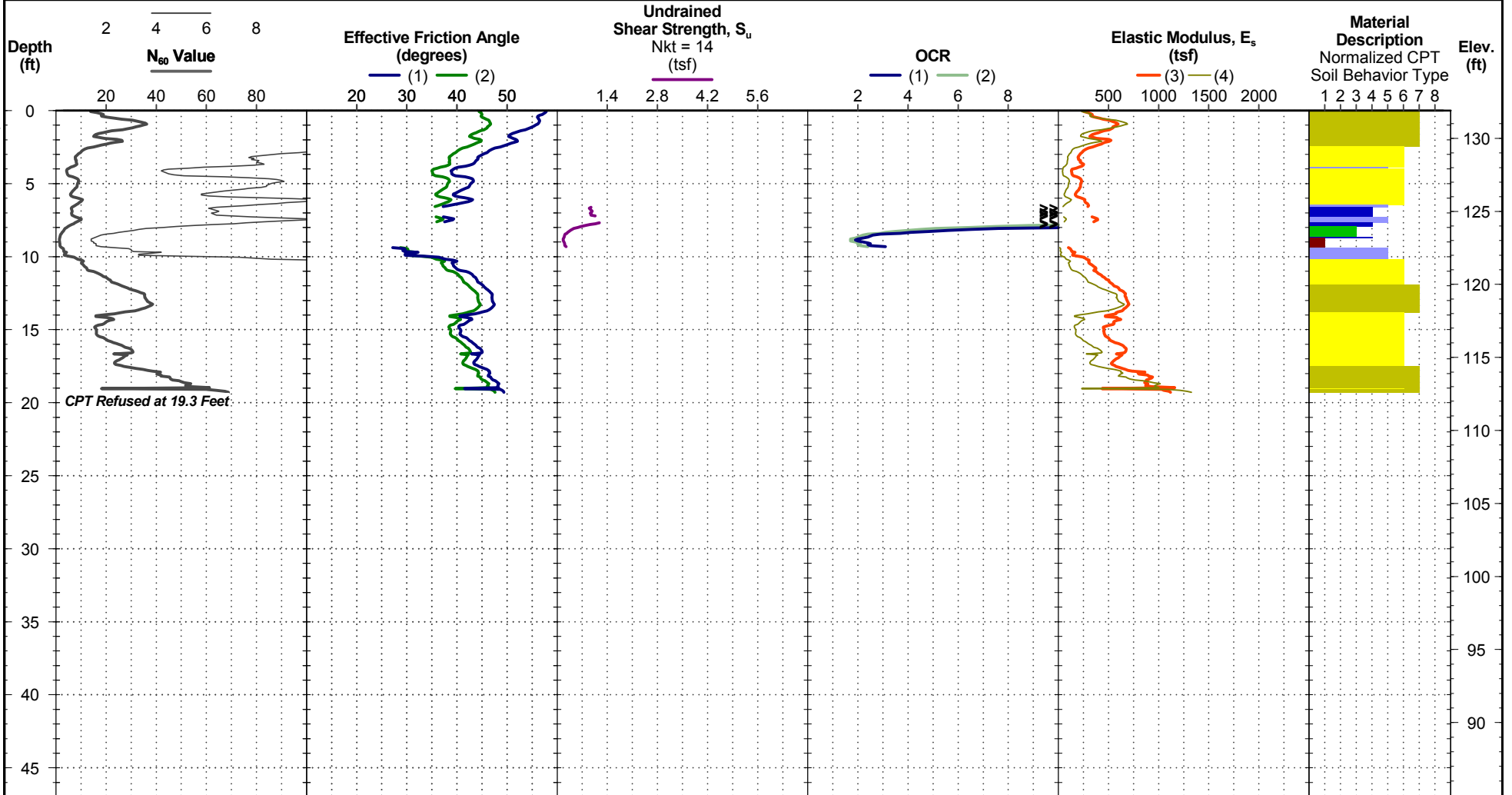
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-3

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 131.9 ft  
Latitude: 33.856907° Station: EBL  
Longitude: -80.832064° Offset: Lane Ctr



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix C provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

**WATER LEVEL OBSERVATION**

11 ft measured water depth  
(used in normalizations and correlations; see Appendix C)

Notes:  
Probe no. 4526 with net area ratio of 0.83  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-25

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT CORRELATIVE PARAMETERS REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACONZ

# CPT CORRELATIVE PARAMETER LOG NO. CPT-4

SEE CPT LOG NO. CPT-4 FOR DETAILED TEST RESULTS

**PROJECT:** Emergency Bridge Package 6

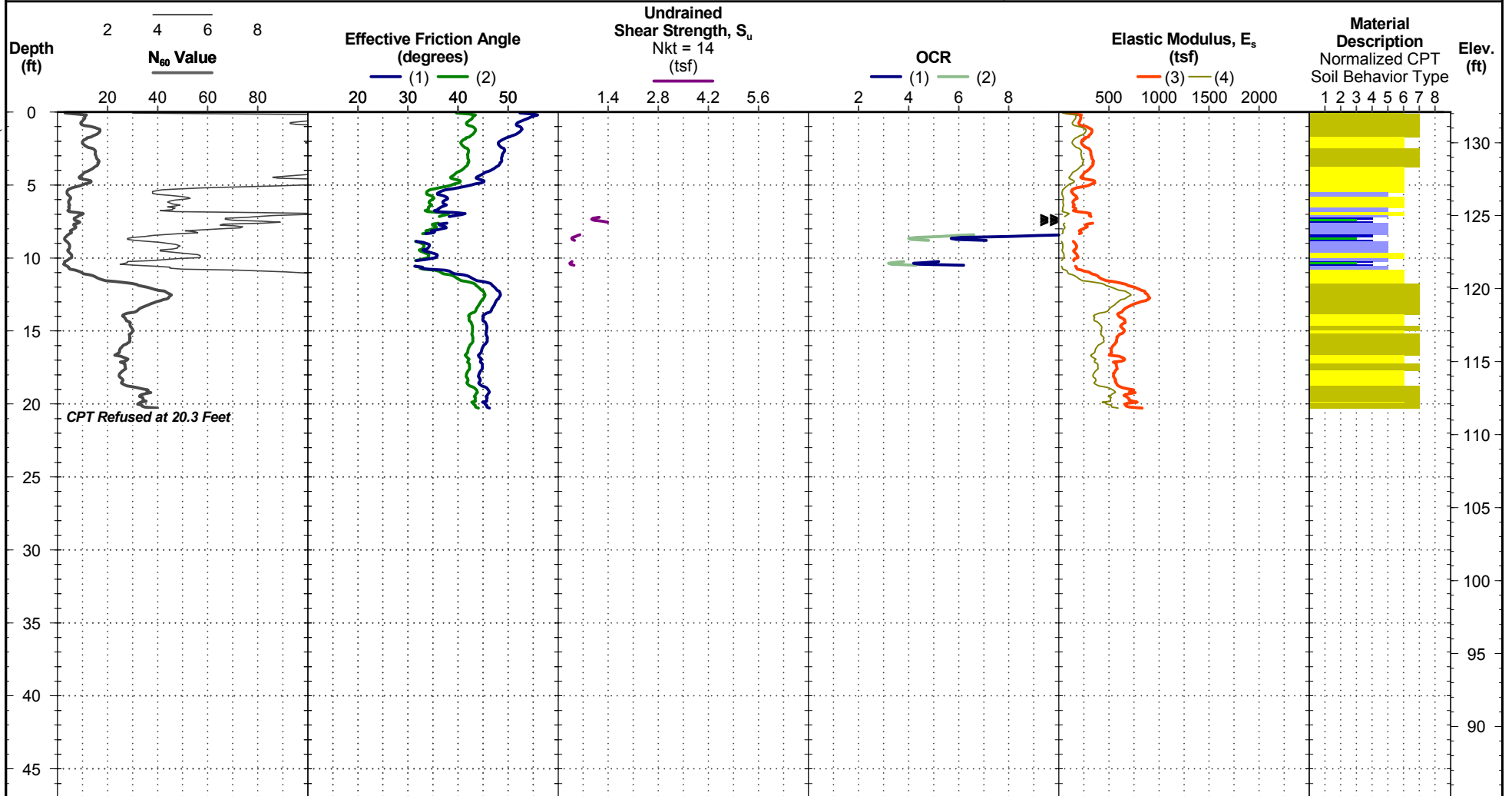
**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-3

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 132.1 ft  
Latitude: 33.856895°  
Longitude: -80.831467°

Station: WBL  
Offset: Lane Ctr



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix C provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

**WATER LEVEL OBSERVATION**

9 ft measured water depth  
(used in normalizations and correlations; see Appendix C)

Notes:  
Probe no. 4526 with net area ratio of 0.83  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-26



THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT CORRELATIVE PARAMETERS REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACONZ

# CPT CORRELATIVE PARAMETER LOG NO. CPT-5

SEE CPT LOG NO. CPT-5 FOR DETAILED TEST RESULTS

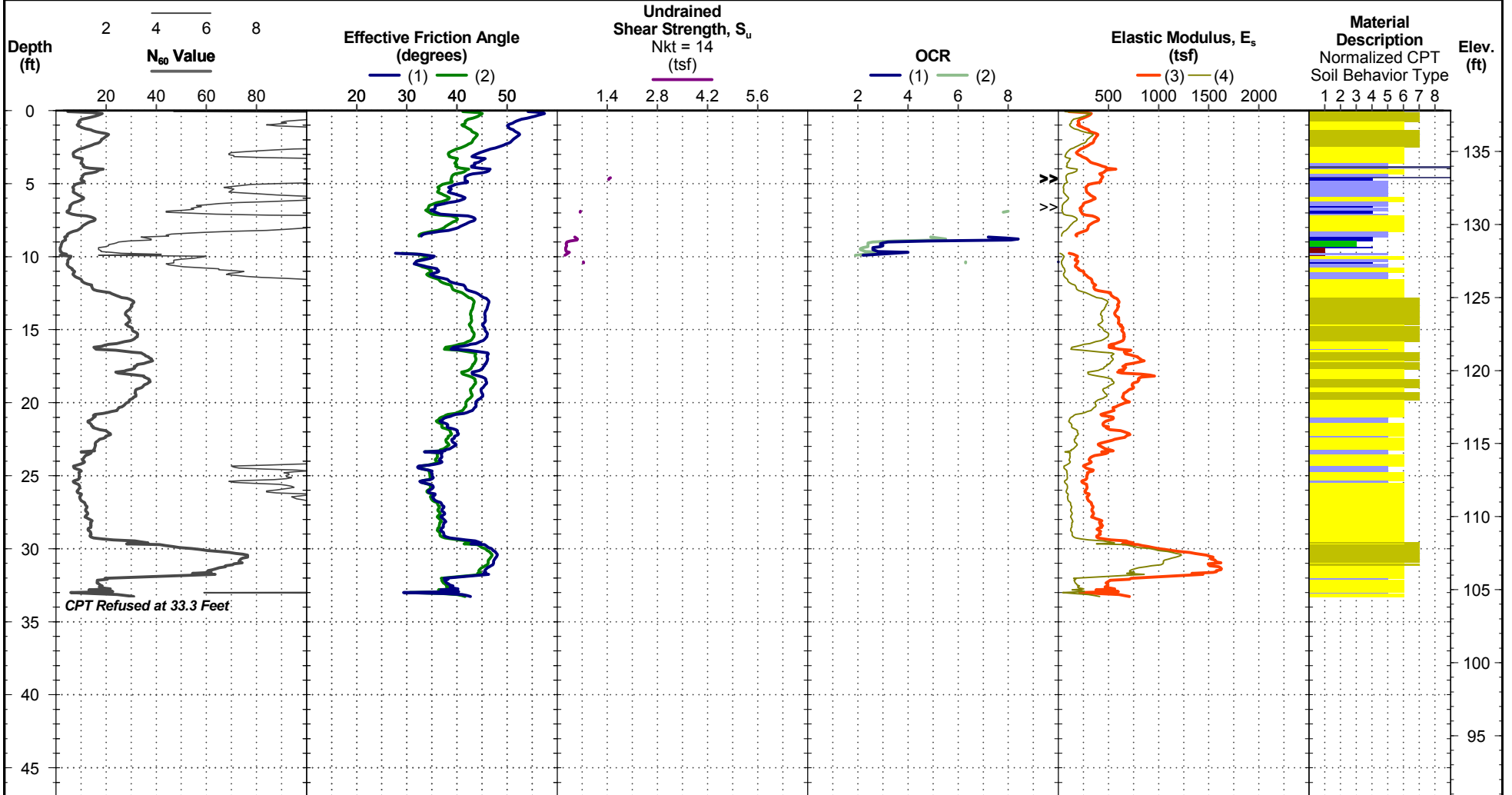
**PROJECT:** Emergency Bridge Package 6

**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-4

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 137.8 ft  
Latitude: 33.852278° Station: EBL  
Longitude: -80.804712° Offset: Lane Ctr



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix C provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

**WATER LEVEL OBSERVATION**

10 ft measured water depth  
(used in normalizations and correlations; see Appendix C)

Notes:  
Probe no. 4526 with net area ratio of 0.83  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-27

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT CORRELATIVE PARAMETERS REPORT EN155050L (COLUMBIA SCDOT EMERGENCY BRIDGE) GPJ TERRACONZ

# CPT CORRELATIVE PARAMETER LOG NO. CPT-6

SEE CPT LOG NO. CPT-6 FOR DETAILED TEST RESULTS

**PROJECT:** Emergency Bridge Package 6

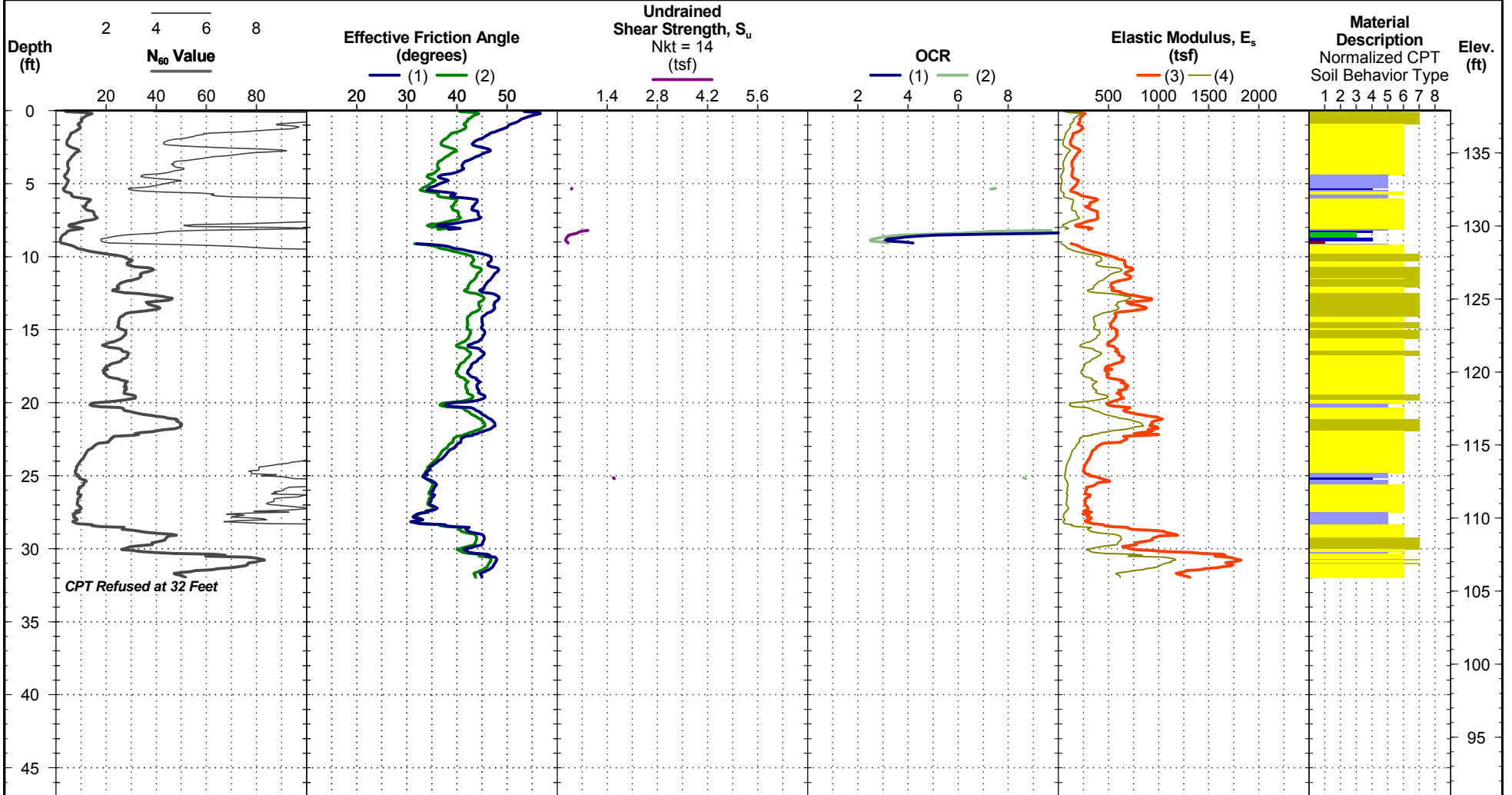
**CLIENT:** SCDOT  
Columbia, SC

**TEST LOCATION:** See Exhibit A-4

**SITE:** SC 48 (Bluff Road)  
Richland County, South Carolina

Surface Elev.: 137.9 ft  
Latitude: 33.852258°  
Longitude: -80.804403°

Station: WBL  
Offset: Lane Ctr



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix C provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

**WATER LEVEL OBSERVATION**

9 ft estimated water depth  
(used in normalizations and correlations; see Appendix C)

Notes:  
Probe no. 4526 with net area ratio of 0.83  
Manufactured by Geotech A.B.; calibrated 12/7/2015  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.875 in



CPT Started: 5/3/2016

Rig: Pagani TG73-200

Project No.: 73155050L

CPT Completed: 5/3/2016

Operator: JB

Exhibit: A-28



1. Photograph of rig on B-1



2. Photograph of rig on B-2



3. Photograph of rig on B-3



4. Photograph of rig on B-4



5. Photograph of rig on B-5



6. Photograph of rig on B-6



7. Photograph of rig on CPT-1



8. Photograph of rig on CPT-2



9. Photograph of rig on CPT-3



10. Photograph of rig on CPT-4



11. Photograph of rig on CPT-5



12. Photograph of rig on CPT-6

**Geotechnical Data Report**

Emergency Bridge Package 6 ■ Richland County, SC  
May 12, 2016 ■ Terracon Project No. 73155050L (Rev. 1)



13. Photograph of MASW Array  
Back Swamp Bridge



14. Photograph of MASW Array  
Cedar Branch Bridge



15. Photograph of MASW Array  
Dry Branch Bridge

**APPENDIX B**  
**LABORATORY TESTING**

- Exhibit B-1 – Laboratory Testing Description**
- Exhibit B-2 – Summary of Laboratory Data**
- Exhibit B-3 - Laboratory Data Sheets**

**Geotechnical Data Report**

Emergency Bridge Package 6 ■ Richland County, SC  
May 12, 2016 ■ Terracon Project No. 73155050L (Rev. 1)



**LABORATORY TESTING DESCRIPTION**

The samples collected during the field exploration were taken to our laboratory for additional testing. The laboratory testing program was developed by Terracon at the request of the SCDOT. Using the determined testing program, the laboratory tests were conducted on selected soil samples to determine lithological information. The test results are presented in this appendix

The laboratory test results were used to confirm the soil descriptions presented on the boring logs in Appendix A. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, SCDOT or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- |   |  |                            |
|---|--|----------------------------|
| n | Material Finer than No. 200 Sieve by Washing | AASHTO T88/(ASTM D1140-14) |
| n | Atterberg Limits                             | AASHTO T89/T90(ASTM D4318) |
| n | Moisture Content Determination               | AASHTO T265/(ASTM D2216)   |

# Summary of Laboratory Results

BORING ID	Depth	USCS Classification and Soil Description	Compressive Strength (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Dry Density (pcf)
B-1	3 - 5						47.9	0.0	0.0			20.1	
B-1	7 - 9	SANDY LEAN CLAY(CL)		28	15	13	53.8	0.0	0.0			23.2	
B-1	18.5 - 20						4.0	0.0	0.0			13.3	
B-1	48.5 - 50			34	22	12						19.0	
B-1	68.5 - 70						20.2	0.0	0.0			17.3	
B-2	9 - 11	SANDY LEAN CLAY(CL)		45	17	28	59.4	0.0	0.0			32.8	
B-2	23.5 - 25						64.8	0.0	0.0			21.6	
B-2	38.5 - 40						20.0	0.0	0.0			20.5	
B-2	58.5 - 60			31	22	9						19.3	
B-2	88.5 - 90						96.0	0.0	0.0			33.5	
B-3	4 - 6	CLAYEY SAND(SC)		26	14	12	29.5	0.0	0.0			13.5	
B-3	23.5 - 25						12.9	0.0	0.0			26.1	
B-3	58.5 - 60			45	27	18						24.4	
B-3	78.5 - 80						24.1	0.0	0.0			16.6	
B-3	88.5 - 90						95.1	0.0	0.0			27.5	
B-4	9 - 11	CLAYEY SAND(SC)		35	19	16	30.2	0.0	0.0			23.8	
B-4	13.5 - 15						16.1	0.0	0.0			19.8	
B-4	33.5 - 35						11.5	0.0	0.0			22.6	
B-4	48.5 - 50						92.3	0.0	0.0			28.9	
B-4	73.5 - 75			45	26	19						22.4	
B-5	7 - 9						28.3	0.0	0.0			13.7	
B-5	9 - 11						37.1	0.0	0.0			28.6	
B-5	23.5 - 25			43	19	24						23.3	
B-5	28.5 - 30						10.7	0.0	0.0			26.3	
B-5	63.5 - 65						18.7	0.0	0.0			28.0	
B-6	9 - 11			15	12	3						15.8	
B-6	13.5 - 15						20.0	0.0	0.0			16.6	
B-6	23.5 - 25						17.8	0.0	0.0			20.1	
B-6	43.5 - 45	SANDY SILT(ML)		36	25	11	67.6	0.0	0.0			31.6	
B-6	68.5 - 70						16.3	0.0	0.0			28.9	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. OLD-LAB SUMMARY: USCS 73155050L LAB TESTING - LENEXA.GPJ TERRACON2012.GDT 5/12/16

PROJECT: Emergency Bridge Package 6	<p style="color: #8B0000; font-weight: bold; margin-top: 10px;">521 Clemson Rd Columbia, SC</p>	PROJECT NUMBER: 73155050L
SITE: SC 48 (Bluff Road) Richland County, South Carolina		CLIENT: SCDOT Columbia, SC
		EXHIBIT: B-2





**APPENDIX C**  
**SUPPORTING DOCUMENTS**

Exhibit C-1 – Unified Soil Classification System  
Exhibit C-2 – CPT General Notes  
Exhibit C-3 – Rig Calibration Report

# UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification			
				Group Symbol	Group Name <sup>B</sup>		
<b>Coarse Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel <sup>F</sup>		
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GP	Poorly graded gravel <sup>F</sup>		
			Fines classify as CL or CH	GM	Silty gravel <sup>F,G,H</sup>		
		<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	GC	Clayey gravel <sup>F,G,H</sup>	
	<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>		$Cu < 6$ and/or $1 > Cc > 3^E$	SW	Well-graded sand <sup>I</sup>		
			Fines classify as ML or MH	SP	Poorly graded sand <sup>I</sup>		
	Fines classify as CL or CH		SM	Silty sand <sup>G,H,I</sup>			
	<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve	<b>Silts and Clays:</b> Liquid limit less than 50	<b>Inorganic:</b>	$PI > 7$ and plots on or above "A" line <sup>J</sup>	SC	Clayey sand <sup>G,H,I</sup>	
$PI < 4$ or plots below "A" line <sup>J</sup>				CL	Lean clay <sup>K,L,M</sup>		
<b>Organic:</b>			Liquid limit - oven dried	< 0.75	ML	Silt <sup>K,L,M</sup>	
			Liquid limit - not dried		OL	Organic clay <sup>K,L,M,N</sup> Organic silt <sup>K,L,M,O</sup>	
<b>Silts and Clays:</b> Liquid limit 50 or more		<b>Inorganic:</b>	$PI$ plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>		
			$PI$ plots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>		
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OH	Organic clay <sup>K,L,M,P</sup> Organic silt <sup>K,L,M,Q</sup>	
			Liquid limit - not dried		PT	Peat	
		<b>Highly organic soils:</b> Primarily organic matter, dark in color, and organic odor				PT	Peat

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

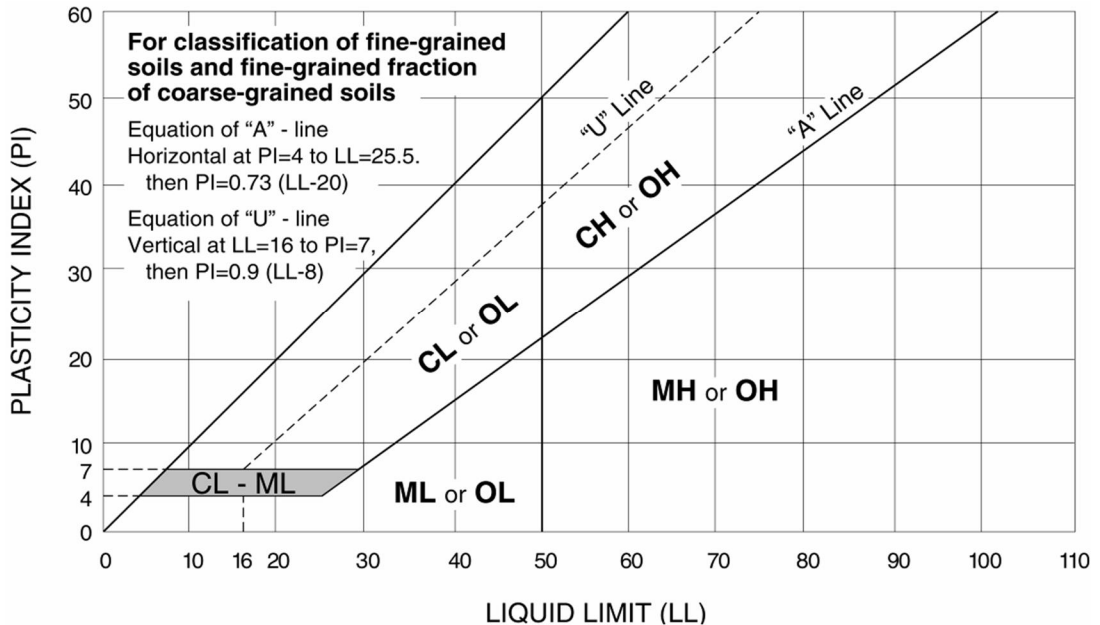
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup>  $PI < 4$  or plots below "A" line.

<sup>P</sup>  $PI$  plots on or above "A" line.

<sup>Q</sup>  $PI$  plots below "A" line.



# CPT GENERAL NOTES

## DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

### To be reported per ASTM D5778:

Uncorrected Tip Resistance,  $q_c$   
Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance,  $q_t$   
Cone resistance corrected for porewater and net area ratio effects  
 $q_t = q_c + U2(1 - a)$

Where  $a$  is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

### Pore Pressure, U1/U2

Pore pressure generated during penetration  
U1 - sensor on the face of the cone  
U2 - sensor on the shoulder (more common)

### Sleeve Friction, $f_s$

Frictional force acting on the sleeve divided by its surface area

### Normalized Friction Ratio, FR

The ratio as a percentage of  $f_s$  to  $q_t$ , accounting for overburden pressure

### To be reported per ASTM D7400, if collected:

Shear Wave Velocity,  $V_s$   
Measured in a Seismic CPT and provides direct measure of soil stiffness

## DESCRIPTION OF GEOTECHNICAL CORRELATIONS

### Normalized Tip Resistance, $Q_t$

$$Q_t = (q_t - \sigma_{v0}) / \sigma'_{v0}$$

### Over Consolidation Ratio, OCR

$$OCR(1) = 0.25(Q_t)^{1.25}$$

$$OCR(2) = 0.33(Q_t)$$

### Undrained Shear Strength, $S_u$

$$S_u = Q_t \times \sigma'_{v0} / N_{kq}$$

$N_{kq}$  is a geographical factor (shown on  $S_u$  plot)

### Sensitivity, $St$

$$St = (q_t - \sigma_{v0} / N_{kq}) \times (1 / fs)$$

### Effective Friction Angle, $\phi'$

$$\phi'(1) = \tan^{-1}(0.373[\log(q_t / \sigma'_{v0}) + 0.29])$$

$$\phi'(2) = 17.6 + 11[\log(Q_t)]$$

### Unit Weight

$$UW = (0.27[\log(FR)] + 0.36[\log(q_t / atm)] + 1.236) \times UW_{water}$$

$\sigma_{v0}$  is taken as the incremental sum of the unit weights

### Small Strain Shear Modulus, $G_0$

$$G_0(1) = \rho V_s^2$$

$$G_0(2) = 0.015 \times 10^{(0.55k + 1.68)} (q_t - \sigma_{v0})$$

### Soil Behavior Type Index, $I_c$

$$I_c = [(3.47 - \log(Q_t))^2 + (\log(FR) + 1.22)^2]^{0.5}$$

### SPT $N_{60}$

$$N_{60} = (q_t / atm) / 10^{(1.1268 - 0.2817k)}$$

Elastic Modulus,  $E_s$  (assumes  $q_t / q_{t,ultimate} \sim 0.3$ , i.e. FS = 3)

$$E_s(1) = 2.6 \Psi G_0 \text{ where } \Psi = 0.56 - 0.33 \log Q_{t, \text{clean sand}}$$

$$E_s(2) = G_0$$

$$E_s(3) = 0.015 \times 10^{(0.55k + 1.68)} (q_t - \sigma_{v0})$$

$$E_s(4) = 2.5q_t$$

### Constrained Modulus, $M$

$$M = \alpha_M (q_t - \sigma_{v0})$$

For  $I_c > 2.2$  (fine-grained soils)

$$\alpha_M = Q_t \text{ with maximum of } 14$$

For  $I_c < 2.2$  (coarse-grained soils)

$$\alpha_M = 0.0188 \times 10^{(0.55k + 1.68)}$$

### Hydraulic Conductivity, $k$

$$\text{For } 1.0 < I_c < 3.27 \quad k = 10^{(0.952 - 3.04k)}$$

$$\text{For } 3.27 < I_c < 4.0 \quad k = 10^{(-4.52 - 1.37k)}$$

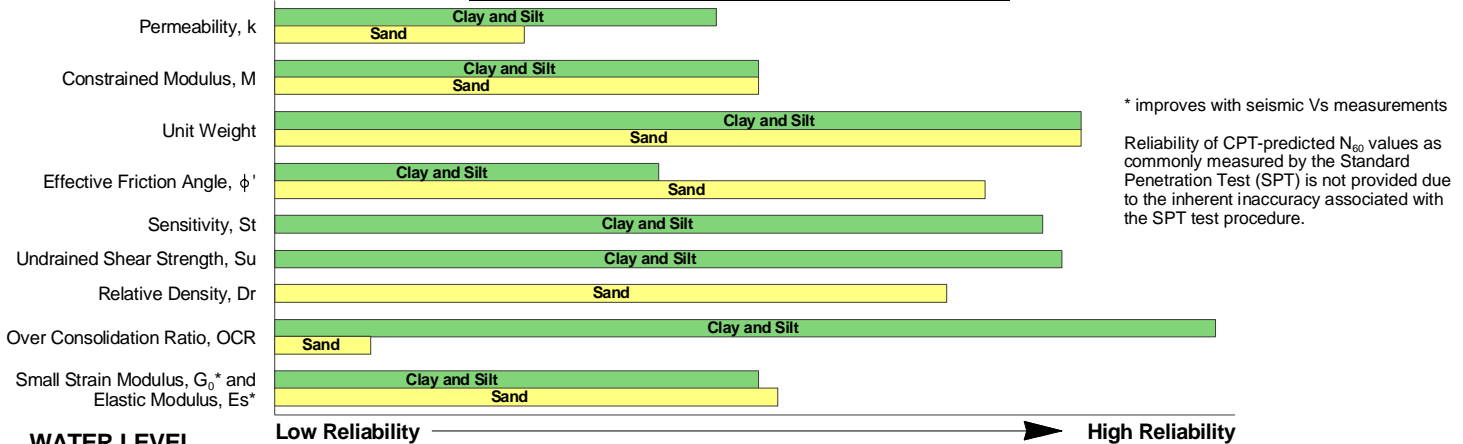
### Relative Density, $Dr$

$$Dr = (Q_t / 350)^{0.15} \times 100$$

## REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include tip resistance, sleeve resistance, and porewater pressure. Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

## RELATIVE RELIABILITY OF CPT CORRELATIONS



## WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated."

*Measured - Depth to water directly measured in the field*

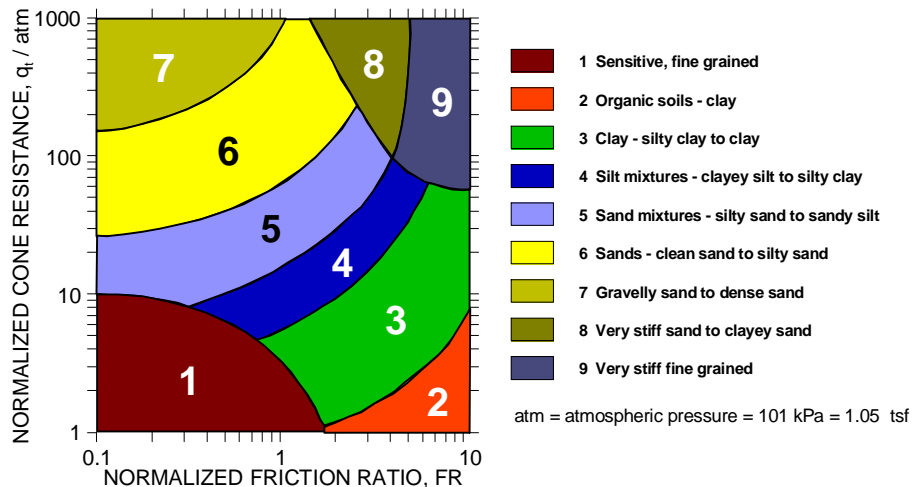
*Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions*

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

## CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance ( $q_t$ ), friction resistance ( $f_s$ ), and porewater pressure (U2). The normalized friction ratio (FR) is used to classify the soil behavior type.

Typically, silts and clays have high FR values and generate large excess penetration porewater pressures; sands have lower FRs and do not generate excess penetration porewater pressures. Negative pore pressure measurements are indicative of fissured fine-grained material. The adjacent graph (Robertson et al.) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



## REFERENCES

- Kulhawy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.
- Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institute of Technology, Atlanta, GA.
- Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.
- Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

# DRILL RIG SPT HAMMER ENERGY CALIBRATION REPORT

**Drill Rig Model CME-550X SN 347863**

**Terracon Drill Rig No. 975**

**Columbia, SC**

October 5, 2015

Project No. 73150500

**Prepared for:**

Terracon Consultants, Inc.

Columbia, SC

**Prepared by:**

Terracon Consultants, Inc.

North Charleston, SC



Offices Nationwide  
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Established in 1965  
[terracon.com](http://terracon.com)

# Terracon

Geotechnical   ■   Environmental   ■   Construction Materials   ■   Facilities

October 5, 2015



Terracon Consultants Inc.  
521 Clemson Road  
Columbia, SC 29229

Attn: Mr. Phillip Morrison  
P: (803) 212-0062  
M: (803) 518-3788  
E: Phillip.Morrison@terracon.com

Re: SPT Rig Calibration Report  
Columbia, SC  
Terracon Project Number: 73150500

Mr. Morrison:

The Charleston office of Terracon Consultants, Inc. (Terracon) has completed the SPT rig calibration for the above referenced rig. This report provides Energy Transfer Ratio (ETR) for the SPT hammer found on CME-550X (Serial Number 347863).

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

A handwritten signature in black ink, appearing to read "Yulian A. Kebede".

Yulian A. Kebede,  
Project Manager  
Geotechnical Services

A handwritten signature in black ink, appearing to read "Bryan T. Shiver".

Bryan T. Shiver, P.E.  
Department Manager  
Geotechnical Services  
SC Registration No. 27816



Terracon Consultants, Inc. 1450 Fifth Street West North Charleston, South Carolina 29405  
P [843] 884 1234 F [843] 884 9234 terracon.com

## 1.0 PROJECT INFORMATION

ITEM	DESCRIPTION
Drill Rig Identification	CME-550X, SN: 347863 (see photograph on cover page)
Drill Rig Owner	Terracon
Drill Rig Operator	Jared Pawless
Testing Date	September 25, 2015
Testing Location	Columbia, SC
Terracon Project Number	73150500
Boring Identification	Test Hole (1)
Energy Measurement Depths	23.5 feet, 28.5 feet, 33.5 feet, and 38.5 feet
Hammer Type	Automatic
Boring Method	Hollow Stem Augers
Drill Rods	<ul style="list-style-type: none"> <li>■ AWJ</li> <li>■ 1¾" outside diameter</li> <li>■ 3/16" wall thickness</li> </ul>
SPT Calibration Testing Equipment	<ul style="list-style-type: none"> <li>■ 2 foot AWJ rod instrumented w/ 2 strain gauges and 2 accelerometers</li> <li>■ Model PAX Pile Driving Analyzer™ (PDA)</li> </ul>
SPT Calibration Personnel	Kenneth Zur

## 2.0 TEST RESULTS

**Table 1:**

SPT Hammer Energy Calibration Testing Summary.

Boring	Start Depth <sup>1</sup> (ft)	Rod Length <sup>2</sup> (ft)	Rod Sections <sup>3</sup>			Measured Blow Counts (blows/6 inches)				SPT N <sub>m</sub> (bpf)	Soil Type <sup>4</sup>
			2 ft	5 ft	10 ft	1 <sup>st</sup> Inc.	2 <sup>nd</sup> Inc.	3 <sup>rd</sup> Inc.	4 <sup>th</sup> Inc.		
Test Hole (1)	23.5	28.8	0	1	2	18	10	11	-	21	Sand
	28.5	33.8	0	0	3	7	8	8	-	16	Sand
	33.5	38.8	0	1	3	5	7	9	-	16	Sand
	38.5	43.8	0	2	3	4	8	11	-	19	Sand

1. Depth from existing ground surface to bottom of drill rods at the beginning of SPT

2. Total rod length measured from instrumentation to bottom of sampler

3. Two foot section is instrumented and is located at top of drill rods

4. Soil type provided by Terracon personnel.

**Table 2:**  
 Energy Measurement and Analysis Summary.

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	EFV (kip-ft) <sup>3</sup>				ETR (%) <sup>3</sup>	
				Max.	Min.	Ave.	Std. Dev.	Ave.	Std. Dev.
Test Hole (1)	23.5	21	38	0.280	0.250	0.262	0.008	74.8	2.29
	28.5	16	22	0.270	0.240	0.256	0.007	73.1	2.10
	33.5	16	19	0.270	0.250	0.254	0.006	72.5	1.71
	38.5	19	21	0.280	0.260	0.268	0.007	76.5	2.00
Average:			25	0.275	0.250	0.260	0.007	74.2	2.02

1. Boring ID and depth from existing ground surface to bottom of drill rods at the beginning of SPT
2. Number of blows used in energy calibration analysis; limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the first increment if refusal were encountered
3. EFV = Measured Transferred Energy, ETR = Energy Transfer Ratio.

**Table 3:**  
 Hammer Blow Rate Summary.

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	BPM <sup>3</sup>			
				Max.	Min.	Ave.	Std. Dev.
Test Hole (1)	23.5	21	38	52.0	48.9	50.2	0.8
	28.5	16	22	54.0	51.0	52.4	0.7
	33.5	16	19	53.0	52.1	52.5	0.2
	38.5	19	21	55.1	52.1	54.1	0.5
Average:			25	53.5	51.0	52.3	0.56

1. Boring ID and depth from existing ground surface to bottom of drill rods at the beginning of SPT.
2. Number of blows used in energy calibration analysis. Limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the 1st increment if refusal conditions were encountered.
3. BPM = Blows per minute

## 3.0 CONCLUSIONS

### 3.1 Energy Transfer Ratio (ETR) and Hammer Efficiency Correction (CE)

Based on our testing and subsequent analysis, CME-55 (Serial Number 347863) has an **ETR of 74.2% ± 2.02%**. Based on this ETR, the hammer efficiency correction (**C<sub>E</sub>**) is **1.24**.