



Geotechnical Subsurface Data Report (GSDR)
I-77 Panthers Interchange
Rock Hill, York County, South Carolina
SCDOT Project ID P038652
S&ME Project No. 1461-19-069

PREPARED FOR:

RS&H

**4000 Faber Place Drive, Suite 130
North Charleston, South Carolina 29405**

PREPARED BY:

S&ME, Inc.

**134 Suber Road
Columbia, South Carolina 29210**

October 12, 2020



October 12, 2020

RS&H
4000 Faber Place Drive, Suite 130
North Charleston, South Carolina 29405

Attention: Mr. Andrew Smith, PE, SE – Office Leader

Reference: **Geotechnical Subsurface Data Report (GSDR)**
I-77 Panthers Interchange
Rock Hill, York County, South Carolina
SCDOT Project ID P038652
S&ME Project No. 1461-19-069


Dear Mr. Smith:

The purpose of this geotechnical subsurface data report (GSDR) is only to convey geotechnical information to the South Carolina Department of Transportation (SCDOT) and design/build team. Our services were performed in general accordance with the Subcontract for Professional Services between RS&H and S&ME, Inc. dated December 9, 2019, including the associated scope of services for geotechnical investigations in general accordance with the SCDOT *Geotechnical Design Manual (GDM)*, Version 2.0, 2019 version.

We look forward to continuing our geotechnical engineering services on this important project. If you or your design team has specific questions regarding any geotechnical aspects of this project, please call at any time.

Sincerely,

S&ME, Inc.


Robert C. Bruorton, P.E.
Senior Engineer/Project Manager



John C. Lessley, P.E.
Technical Principal/Vice President



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1.0 Introduction

This report summarizes results of the geotechnical investigation conducted for the proposed I-77 Panthers Interchange. The general configuration of the interchange is shown on the *Site Location Plan*, attached as Figure 1 in Appendix I. Our scope of work relevant to the roadway embankment and bridge portions of the project included:

- Visits to the site by geotechnical personnel,
- Coordinating clearing activities for drill rig access,
- Coordinating coring and drilling activities,
- Performing geotechnical and geophysical subsurface investigations,
- Conducting laboratory testing,
- Preparing this report conforming to Section 21 of the GDM.

2.0 Project Description

Our understanding of the project is based on review of the following plans, provided by RS&H:

- Proposed Plans for South Carolina Department of Transportation – SCDOT Project ID P038652 – “York County I-77 Interchange at Exit 81 (Panthers Interchange)”, prepared by Neel-Schaffer, dated 6-9-2020, and
- Proposed Plans for York County – Project ID P038652 – “I-77 Interchange near Exit 82 – Construct Overpass over I-77”, prepared by RS&H, dated 6-15-2020.

The proposed construction for this project includes a new folded diamond interchange that is summarized as follows:

- Ramp 1 – An approximately 1,948 linear foot exit ramp from I-77 southbound to a signaled intersection with One Carolina Drive approximately 512 feet west of the overpass structure. The ramp will consist of two traffic lanes splitting to up to six lanes approaching the intersection. Longitudinally along this alignment, fills of up to roughly 21 feet and cuts of up to roughly 15 feet are planned. Transversely along this alignment, fills of up to roughly 20 feet and cuts of up to roughly 25 feet are planned.
- Ramp 2 – An approximately 2,870 linear foot entrance ramp from a signaled intersection with One Carolina Drive to I-77 northbound approximately 454 feet east of the overpass structure. The ramp extends south from the intersection and loops under the overpass to merge with I-77 north of the overpass. The ramp consists of two traffic lanes near the intersection with One Carolina Drive merging to a single lane. Longitudinally along this alignment, fills of up to roughly 32 feet and cuts of up to roughly 2 feet are planned. Transversely along this alignment, fills of up to roughly 36 feet and cuts of up to roughly 17 feet are planned.
- Ramp 3 – An approximately 3,003 linear foot exit ramp from I-77 northbound to a signaled intersection with One Carolina Drive approximately 454 feet east of the overpass structure. The ramp consists of one

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traffic lane splitting to up to three lanes approaching the intersection. Longitudinally along this alignment, fills of up to roughly 43 feet and cuts of up to roughly 12 feet are planned. Transversely along this alignment, fills of up to roughly 42 feet and cuts of up to roughly 26 feet are planned. An MSE retaining wall is planned from roughly Station 562+00 to 565+00.

- Ramp 4 – An approximately 4,240 linear foot entrance ramp from a signaled intersection with One Carolina Drive to I-77 southbound, approximately 512 feet west of the overpass structure. The ramp extends north from the intersection and loops under the overpass to merge with I-77 south of the overpass. The ramp consists of two traffic lanes near the intersection with One Carolina Drive merging to a single lane. Longitudinally along this alignment, fills of up to roughly 20 feet and cuts of up to roughly 8 feet are planned. Transversely along this alignment, fills of up to roughly 22 feet and cuts of up to roughly 21 feet are planned.
- One Carolina Drive – East – Approximately 2,018 linear feet of new roadway, extending from the new bridge (overpass) east through the Ramp 2/Ramp 3 intersection and extending east to merge into existing Paragon Way. The alignment is depicted to have five traffic lanes near the overpass that merge down to two lanes at existing Paragon Way with appropriate shoulders and median. Longitudinally along this alignment, fills of up to roughly 36 feet and cuts of up to roughly 1 foot are planned. Transversely along this alignment, fills of up to roughly 37 feet and cuts of up to roughly 5 feet are planned. A roughly 275-foot long MSE abutment wall is planned at the bridge/overpass end slope. An additional MSE retaining walls is planned from roughly Station 42+00 to 46+00.
- One Carolina Drive – West – Approximately 1,184 linear feet of new roadway, extending from the new bridge (overpass) west through the Ramp 1/Ramp 4 intersection to stub into planned development west of the intersection. The roadway is depicted with eight traffic lanes near the overpass that merge down to six lanes at the tie-in to the planned development with appropriate shoulders and median. Longitudinally along this alignment, fills of up to roughly 38 feet and cuts of up to roughly 4 feet are planned. Transversely along this alignment, fills of up to roughly 37 feet and cuts of up to roughly 4 feet are planned. A roughly 275-foot long MSE abutment wall is planned at the bridge/overpass end slope.
- One Carolina Drive Bridge/Overpass – An approximately 285 linear foot long, 126-foot, 4-inch wide bridge (overpass) structure over Interstate 77 with center median, sidewalk, and shared use path. The bridge is planned to consist of three spans in a 71-foot, 3-inch/142-foot, 6-inch/71-foot, 3-inch configuration with 20-foot approach slabs. The bridge is planned to be constructed of thirteen rows of pre-cast/pre-stressed (PCPS) concrete beams supported on four PCPS or cast-in-place concrete bent caps on each at each of the four bents. Each bent (end and interior) is planned to be supported by six columns, each supported by a deep foundation system.

3.0 Objective

The objective of this project was to explore the subsurface conditions along the proposed alignment as they pertain to the proposed improvements, and in conjunction with field and laboratory testing, to provide geotechnical data to be utilized for project design.



4.0 Subsurface Exploration Work

As requested, representatives of S&ME, Inc. were present at the above referenced site between January 6 and 17, 2020 and again between May 18 and 26, 2020, to conduct the following preliminary phase testing:

- Forty-five (45) Standard Penetration Test (SPT) borings,
- Three (3) bulk samples,
- Four (4) undisturbed samples, and
- One (1) MASW/MAM shear wave velocity test.

Boring designations reflect the purpose of the borings, as follows:

Table 4-1 – Boring Summary

Purpose	Boring No.
End Bent	EB-1 through EB-4
Interior Bent	IB-1 through IB-4
Embankment	EM-1 through EM-21
Retaining Wall	RW-1 through RW-14
Culvert	C-1 through C-2

Initial project information provided for the alignment showed a retaining wall in the vicinity of Station 49+00 to 51+00 along One Carolina Drive where borings RW-5 and RW-6 were performed, however, the provided plans show a retaining wall from Station 42+00 to 46+00.

The boring locations were initially established in the field by representatives of S&ME at the locations submitted to and approved by SCDOT using our hand-held sub-meter GPS unit. Borings were performed in reasonable proximity to marked location stakes unless they were offset because of slopes, ditches, overhead power or other obstructions. Where appropriate, offset distances and relative direction were noted on the field boring records. Subsequent to drilling and abandonment, boring coordinates and elevations were surveyed by Glenn and Associates, under subcontract to S&ME. Boring positions were located in the field at reported coordinates by hand-held GPS unit, then the actual boring location determined by visual observation and probing with a small-diameter steel probe rod. The coordinates and elevations of the borings tabulated in this report and indicated on the boring records may be considered accurate to the degree of surveying accuracy used by the surveyor. Station and offset were interpreted from the digital files provided by RS&H. Boring locations are attached in tabular format as Table 1 in Appendix II and are presented in graphical format on the *Boring Location Plans*, Figures 2 through 8 in Appendix I.

The following sections summarize the general outline of each test. The field testing data are organized into appendices of this report as follows:

- ◆ Appendix III – Soil and Rock Core Boring Records
- ◆ Appendix IV – Rock Core Box Photographs



- ◆ Appendix V – SPT Hammer Energy Reports
- ◆ Appendix VI – MASW/MAM Seismic Data

4.1 Encroachment Permit

S&ME applied for encroachment along the SCDOT right-of-way on December 13, 2019 and received the approved encroachment permit No. 230664 on January 3, 2020.

4.2 Traffic Control

Traffic control for the project was provided by Area Wide Protective (AWP) for borings within the existing travel lanes and along the existing shoulders. Traffic control within the existing SCDOT right-of-way along Interstate 77 was performed in accordance with SCDOT requirements for Lane Closure, Daytime, Multiline Components, Interstate Routes – SCDOT Standard Drawing 610-105-01 and Right Shoulder Closure (Case I/Case II) Interstate Routes) – SCDOT Standard Drawing 610-305-00. Traffic control within the travel lanes of existing Paragon Way was performed in accordance with SCDOT requirements for Flagging Operations, Two-Lane, Two-Way Roadway without Intersections – SCDOT Standard Drawing 610-005-10.

4.3 Site Clearing

Clearing was performed by Carolina BrushCutters under subcontract to S&ME. Carolina BrushCutters used a skid steer-mounted forestry grinder on January 3 through 7, 2020 and again on May 18, 2020 to create drill rig access pathways to several of the boring locations located in overgrown fields and wooded areas. Trails of approximately 12 to 15 feet wide were cleared with trees chipped in-place. No attempt was made to stack or remove downed trees from the site. Care was taken to limit site disturbance during this process.

4.4 Standard Penetration Test (SPT) Borings

Forty-five (45) soil test borings with SPT sampling were performed for this project between the dates of January 6 and 20, 2020 and again between May 18 and 26, 2020, using three drill rigs, as follows:

Table 4-2 –Drilling Equipment Summary

Rig Make/Model	Driller	Carrier Type	Average SPT Energy Transfer Ratio (ETR), %
CME-55	Independence Drilling, Inc.	Truck	75.9
CME-550	Metro Drill, Inc.	ATV	85.5
CME-550	S&ME, Inc.	ATV	85.9

Borings were performed using hollow-stem auger drilling techniques. The borings were extended to termination or drill bit refusal depths ranging from 9.2 to 70.3 feet below the existing ground surface, followed by wireline rock coring, where applicable.

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Soil sampling and penetration testing were performed in general accordance with ASTM D1586 *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*. SPT was performed in each boring continuously in the upper 10 feet, followed by approximate 5-foot centers, thereafter. The split-barrel sampler was opened at the drill site and sloughed material was identified and separated from the recovered sample. The recovered sample was visually described and classified by S&ME's rig geologist or engineer. A selected portion of the sample was placed in a glass jar with a moisture-proof lid or sealed plastic bags. Where materials changed over the sample drive length, a sample of each material was retained. The sample jars/bags were labeled, placed in cardboard boxes, and transported to the S&ME Columbia Office at the end of each work day.

Water level measurements were attempted immediately after completion of drilling and, were repeated after a period of 24 hours in select borings. After ground water measurements were complete, borings conducted within the existing SCDOT right-of-way were backfilled with Portland cement/bentonite grout, and the surface pavements were patched with commercially available bagged asphalt cold patch materials. Borings conducted outside of the existing SCDOT right-of-way were backfilled with auger cuttings and a plastic hole plug was placed within the borehole.

SPT hammer energy measurements with a Pile Driving Analyzer (PDA) were performed by S&ME at off-site locations for the drill rigs used on the project in general accordance with ASTM D4633 *Standard Test Method for Energy Measurement for Dynamic Penetrometers*. The SPT Energy test results are provided in Appendix V. The N-values indicated on the logs are field values and were not corrected for overburden stress, rod length, borehole diameter or hammer efficiency. Hammer energy ratios are provided on the individual soil test boring records in Appendix II.

4.5 Wireline Rock Coring

At the bridge (EB and IB) boring locations, wireline rock coring was performed to termination depths of 55.4 to 70.3 feet below the existing ground surface to explore the refusal materials in general accordance with ASTM D2113 *Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration*. Rock coring was performed using an NQ-size core barrel and wireline retrieval system. The recovered rock cores were visually logged by the S&ME rig geologist or engineer. The rock core samples were placed in wooden/cardboard core boxes and the boxes were labeled. Photographs were taken of each completed core box prior to core being removed for laboratory testing. Completed core boxes were transported to the S&ME Columbia Office at the end of each work day. The rock cores were preserved, handled and transported in general accordance with ASTM D5079.

4.6 Bulk Samples

Three (3) bulk samples were obtained from the site at selected borings. The representative bulk samples of near-surface soils were obtained by randomly taking shovel loads of auger cutting spoils from borings until a sample of 75 to 100 pounds was obtained. The samples were placed in plastic buckets/bags and marked with appropriate descriptive information.



4.7 Undisturbed Samples (Shelby Tubes)

Undisturbed samples (Shelby tubes) were obtained in companion off-set borings adjacent to selected boring locations. Four (4) relatively undisturbed (UD) samples, or Shelby Tubes, were performed on January 21, 2020, in general accordance with ASTM D1587 *Standard Practice for Thin-Walled Tube Sampling of Fine Grained Soils for Geotechnical Purposes*. Shelby tube sample depths were selected by S&ME upon review of the SPT logs and assigned accordingly.

Shelby Tubes provide sufficiently intact samples for quantitative laboratory testing. Samples were obtained by pushing a 3-inch outer diameter, 16-gauge, steel tube into the soil at the desired sampling intervals in hollow stem augered boreholes adjacent to the original SPT location. The tube, together with the encased soil, was carefully removed from the ground and length of the recovered soil measured. The ends of the tube were sealed with microcrystalline wax and labeled with applicable project information before being transported to our laboratory. Shelby tube samples were transported and stored in general accordance with ASTM D4220 for Group C samples.

4.8 Shear Wave Velocity Test by MASW/MAM Method

On December 31, 2019, we completed a seismic surface wave survey at the site. Analysis of surface waves (Rayleigh waves) can be used to determine shear wave velocities. Surface waves propagate to depths that are inversely proportional to their frequencies (i.e. dispersion) and are recorded at the ground surface along a spread of low-frequency geophones. Measurements are then transformed from time domain into frequency domain from which the phase characteristics of the surface waves can be calculated. A dispersion curve (i.e. phase velocity curve) is developed allowing the phase velocity (C_f) of particular frequency waves to be calculated. The dispersion curve is then transformed into a one-dimensional (1D) shear wave velocity profile through an inversion and iterative process.

We performed a combination of Multi-Channel Analysis of Surface Waves (MASW) and Microtremor Array Measurements (MAM) surveys at the requested location as presented in Appendix XI. Performing both surveys generally provides greater penetration depth using low frequency surface waves (MAM) without sacrificing resolution at shallower depths by using higher frequency surface waves (MASW). The MASW survey consisted of recording different frequency surface waves generated from an active energy source (sledgehammer striking a metal plate) traveling across a linear array using a Geometrics ES3000 seismograph equipped with sixteen (16) 4.5 Hz vertical geophones. Measurements for the MASW survey were collected with geophones at set spacings of both 5 feet and 10 feet. The MAM survey consisted of recording different frequency surface waves generated from a passive energy source (e.g. background noise, vehicles, etc.) traveling across a non-linear array using a Geometrics ES3000 seismograph equipped with eleven (11) 4.5 Hz vertical geophones. Measurements for the MAM survey were conducted along an "L-shaped" array using geophones at a set spacing of 30 feet. Data analysis was conducted using the OYO Corporation's SeisImager/SWTM software (PickwinTM and WaveEqTM).

Geophysical Methodology Limitations

Regardless of the thoroughness of a geophysical study, there is always a possibility that actual conditions may not match the interpretations. The results should be considered accurate only to the degree implied by the methods used and the method's limitations and data coverage. Accordingly, the possibility exists that not all features at a

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project site will be located due to either subsurface soil conditions or the occurrence of features outside the lateral limits and below the depth of penetration of the methods used.

The geophysical methods used for this survey also has inherent limitations. Site activity (e.g. generators, heavy equipment, traffic, etc.) can cause noise/interference in the seismic data sets. Depth restrictions are also associated with the MASW/MAM methods and energy source. Depth of penetration using surface wave methods is mainly controlled by the shear properties of the subsurface materials and frequency range of site surface waves (generated active or ambient passive). Generally, penetration depth is greater for stiffer profiles as the signal does not attenuate as rapidly. However, because very small strain is required to determine shear properties, sometimes velocities of very stiff materials are difficult to obtain using traditional active or ambient sources.

5.0 Classification of Recovered Soil and Rock Samples

Recovered split spoon and bulk samples were initially classified in general accordance with ASTM D2488 *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. After laboratory testing was completed, provisional field classifications were revised as necessary to provide a soil description that generally follows the terminology given by ASTM D2487 *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)* and AASHTO M145 *Recommended Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes*.

Recovered rock core samples were reviewed and classified in general accordance with the SCDOT GDM Chapter 6, Section 6.3. Upon return to our laboratory, the rock core samples were reviewed and classified by a Professional Geologist (PG). Recovered cores examined in the laboratory were assigned descriptive terms using tables 6-16 through 6-22 of the GDM where applicable to the rock type. Rock lithologic descriptions, and applicable descriptive information are included on the Soil Test Boring Records in Appendix III. Discontinuities in the recovered cores were evaluated using the terminology in GDM Table 6-24. After logging, selected sections of rock core were removed and prepared for laboratory compressive strength testing.

After laboratory testing was completed, the Rock Mass Rating (RMR) was computed in general accordance with the GDM and Section 10 of the 2012 AASHTO LRFD *Bridge Design Specifications*. Additionally, the Geological Strength Index (GSI) was determined in general accordance with the 2014 AASHTO LRFD *Bridge Design Specifications*. A summary of the Rock Core Testing is provided in Appendix IX.

Interpreted subsurface conditions encountered by the SPT borings are shown on the soil test boring records in Appendix III. Soil test boring records were compiled in gINT using standard SCDOT template. These records represent our interpretation of the subsurface conditions based on the test data. Stratification lines on the boring records represent approximate boundaries between soil types; however, the actual transition may be gradual and the thicknesses of the strata will vary across the site. The soil samples will be retained at our laboratory for a period of seven years, or until completion of substructure installation, whichever is earlier.



6.0 Laboratory Physical Tests

Index property testing consisting of Atterberg limits, particle-size distribution, percent finer #200 sieve, and natural moisture content tests were performed on split-spoon, bulk and undisturbed soil samples to assist in classifying the soils. Additionally, organic content and corrosion series (pH, chloride, sulfate, and resistivity) testing were performed on selected split-spoon samples. Furthermore, standard Proctor moisture-density and California Bearing Ratio testing were performed on bulk samples. Finally, one-dimensional consolidation and consolidated undrained triaxial shear testing were performed on undisturbed samples. Uniaxial compressive strength testing was performed on selected rock core specimen.

Table 6-1 – Laboratory Testing Table

Test Type	Quantity
Atterberg limits	54
Particle-size distribution	5
Percent-finer 200 sieve	49
Natural moisture content	55
Organic content	4
Corrosion Series	2
Standard Proctor moisture-density	3
California Bearing Ratio	3
One-dimensional consolidation	2
Consolidated undrained triaxial shear	2
Compressive strength of rock cores	17

Tables summarizing the laboratory test results are provided after this report as follows:

- ◆ Table 2: Split Spoon Samples – Laboratory Classification Testing Summary
- ◆ Table 3: Corrosion Series Testing Summary
- ◆ Table 4: Undisturbed Samples – Laboratory Classification & Shear Strength Testing Summary
- ◆ Table 5: Bulk Samples – Laboratory Classification & Proctor Testing Summary
- ◆ Table 6: Bulk Samples – Laboratory Proctor and CBR Testing Summary
- ◆ Table 7: Undisturbed Samples – Laboratory Classification & Consolidation Testing Summary
- ◆ Table 8: Rock Core Samples – Laboratory Testing Summary

Testing was performed in general accordance with ASTM, AASHTO, or SC state test procedures as follows:

- Atterberg limits – ASTM D4318 / AASHTO T89/90
- Particle-size distribution – ASTM D422 / AASHTO T88
- Percent-finer 200 sieve – ASTM D1140 / AASHTO T11
- Natural moisture content – ASTM D2216 / AASHTO T265
- Organic content – ASTM D2974 / AASHTO T267

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- Corrosion Series:
 - pH – ASTM G51 / AASHTO T289
 - Chloride – AASHTO T291
 - Sulfate – ASTM C1580 / AASHTO T290
 - Resistivity – AASHTO T288
- Standard Proctor moisture-density – ASTM D698 / AASHTO T99
- California Bearing Ratio – ASTM D1883
- One-dimensional consolidation – ASTM D2435
- Consolidated undrained triaxial shear – ASTM D4767
- Compressive strength of rock cores – ASTM D7012 (Methods C&D)

The individual laboratory test data sheets are organized into appendices of this report as summarized below:

- ◆ Appendix VIII – Laboratory Test Data Sheets – Split Spoon Samples
- ◆ Appendix IX – Laboratory Test Data Sheets – Rock Core Samples
- ◆ Appendix X – Laboratory Test Data Sheets – Bulk Samples
- ◆ Appendix XI – Laboratory Test Data Sheets – Undisturbed Samples
- ◆ Appendix XII – Laboratory Test Data Sheets – Corrosion Series

7.0 Closing

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

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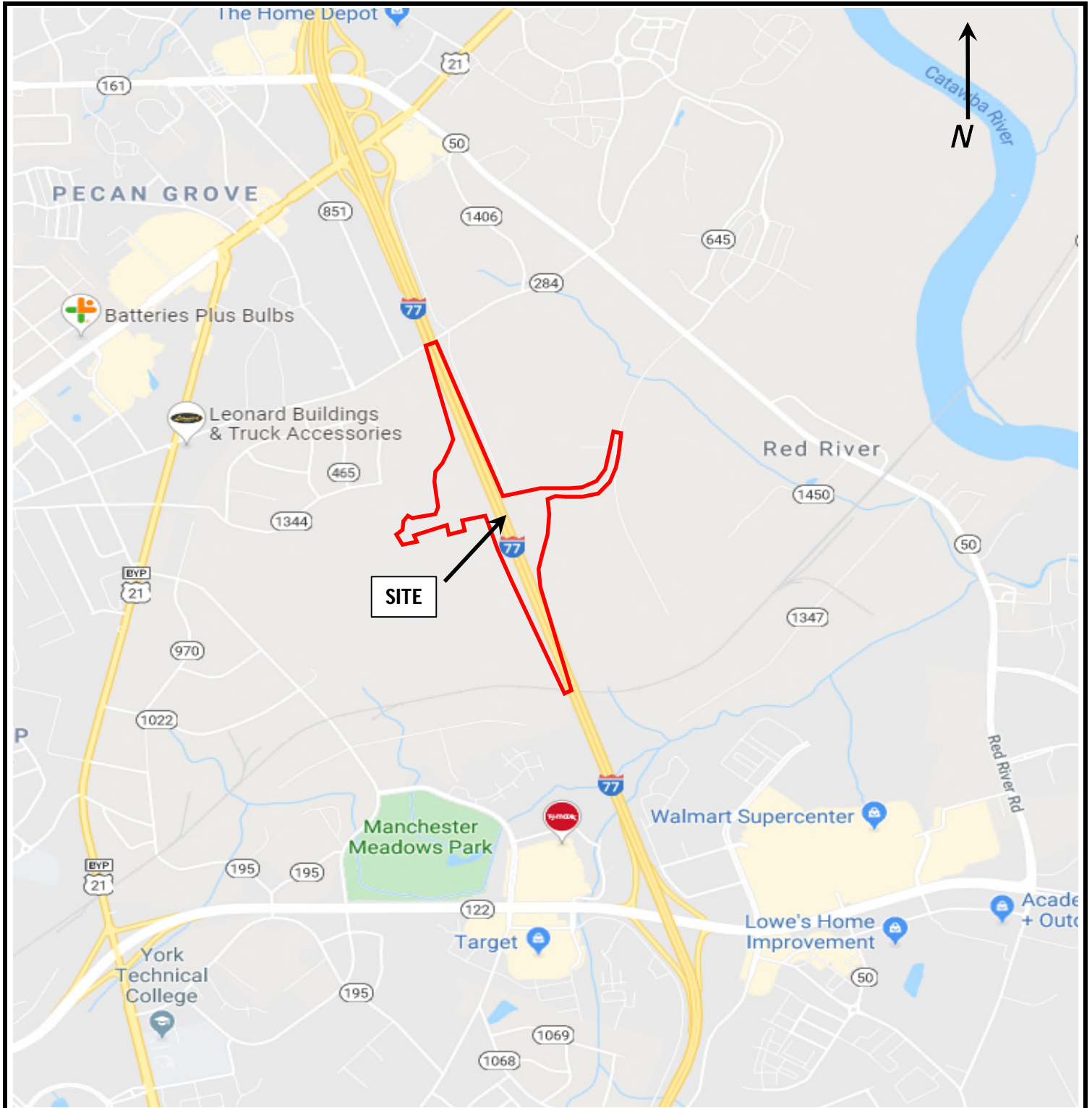
S&ME Project No. 1461-19-069



S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendices

Appendix I – Figures



SOURCE: Google Maps



SITE LOCATION PLAN

JOB NAME: I-77 Panthers Interchange
LOCATION: I-77 between Eden Terrace and RR overpasses
CITY, STATE: Rock Hill, South Carolina
JOB NO.: 1461-19-069

FIGURE NO.

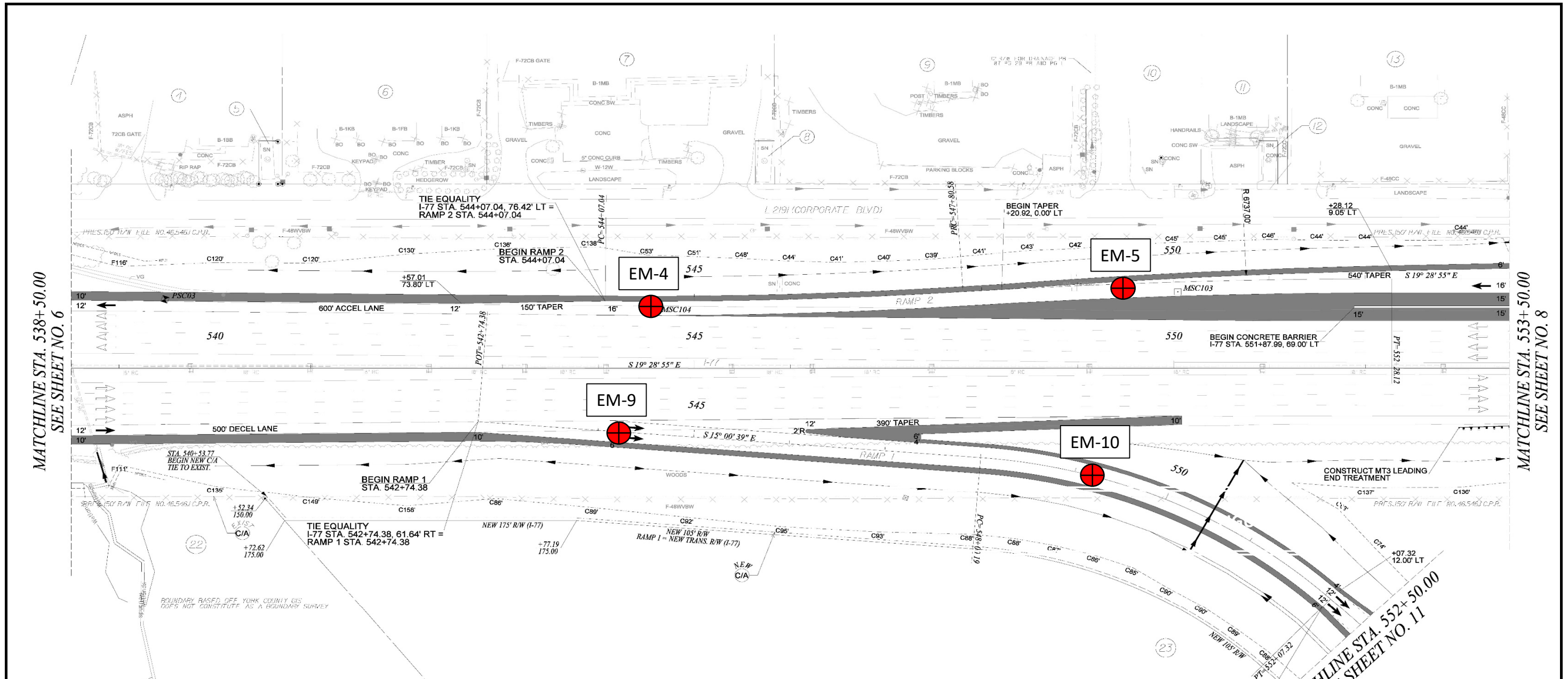
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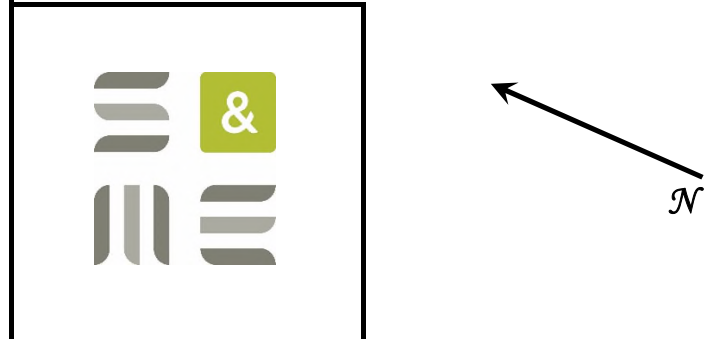
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DATE: 8/11/2020

DRAWN BY: RCB

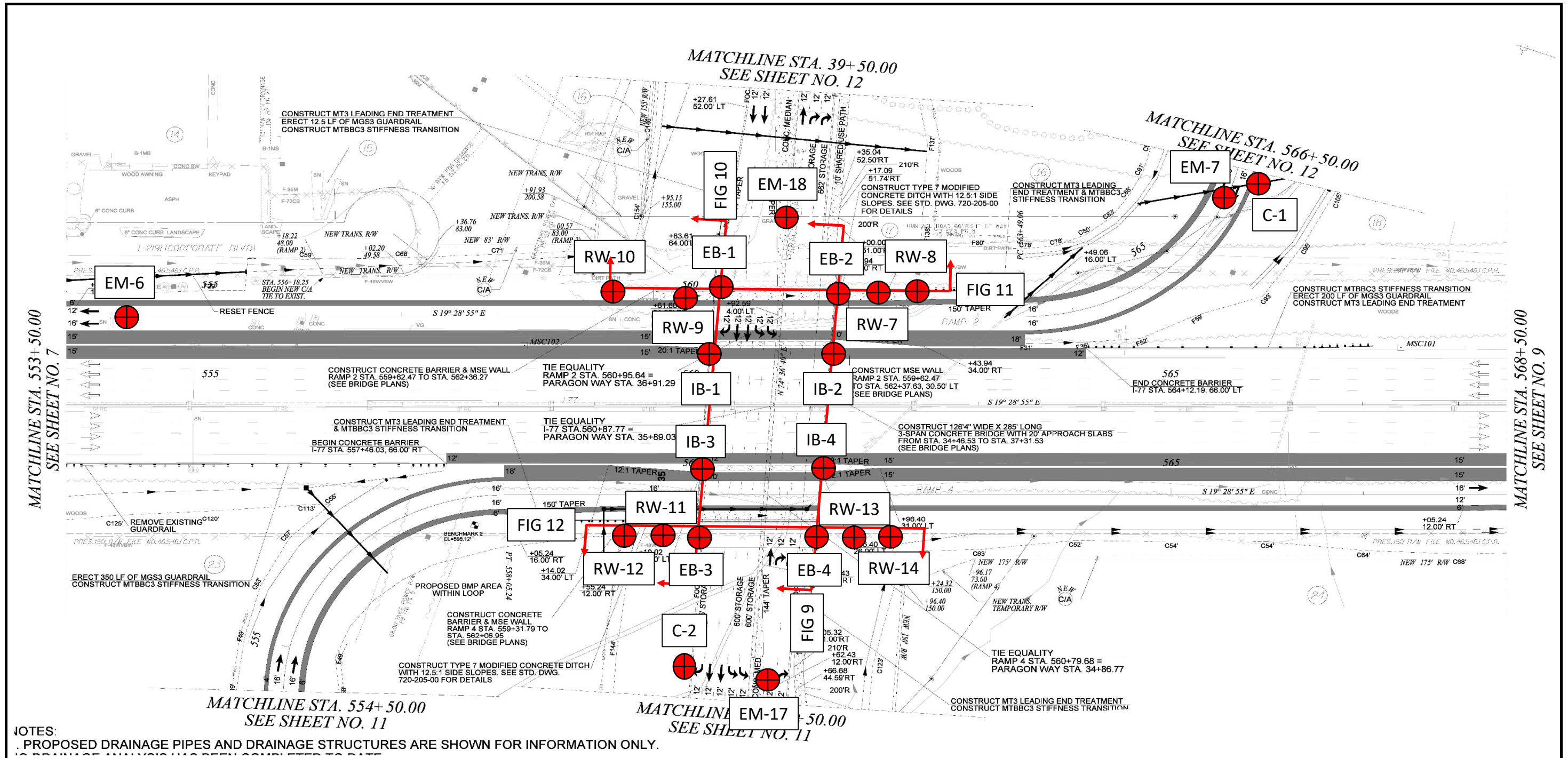


NOTES:
 1. PROPOSED DRAINAGE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY.
 NO DRAINAGE ANALYSIS HAS BEEN COMPLETED TO DATE



SOURCE: YORK County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN			
JOB NAME: I-77 Panthers Interchange		FIGURE NO.	
LOCATION: I-77 between Eden Terrace and RR Overpasses		2	
CITY, STATE: Rock Hill, South Carolina			
JOB NO.: 1461-19-069			
SCALE: NTS	CHECKED BY: MFC		
DATE: 10/12/2020	DRAWN BY: RCB		



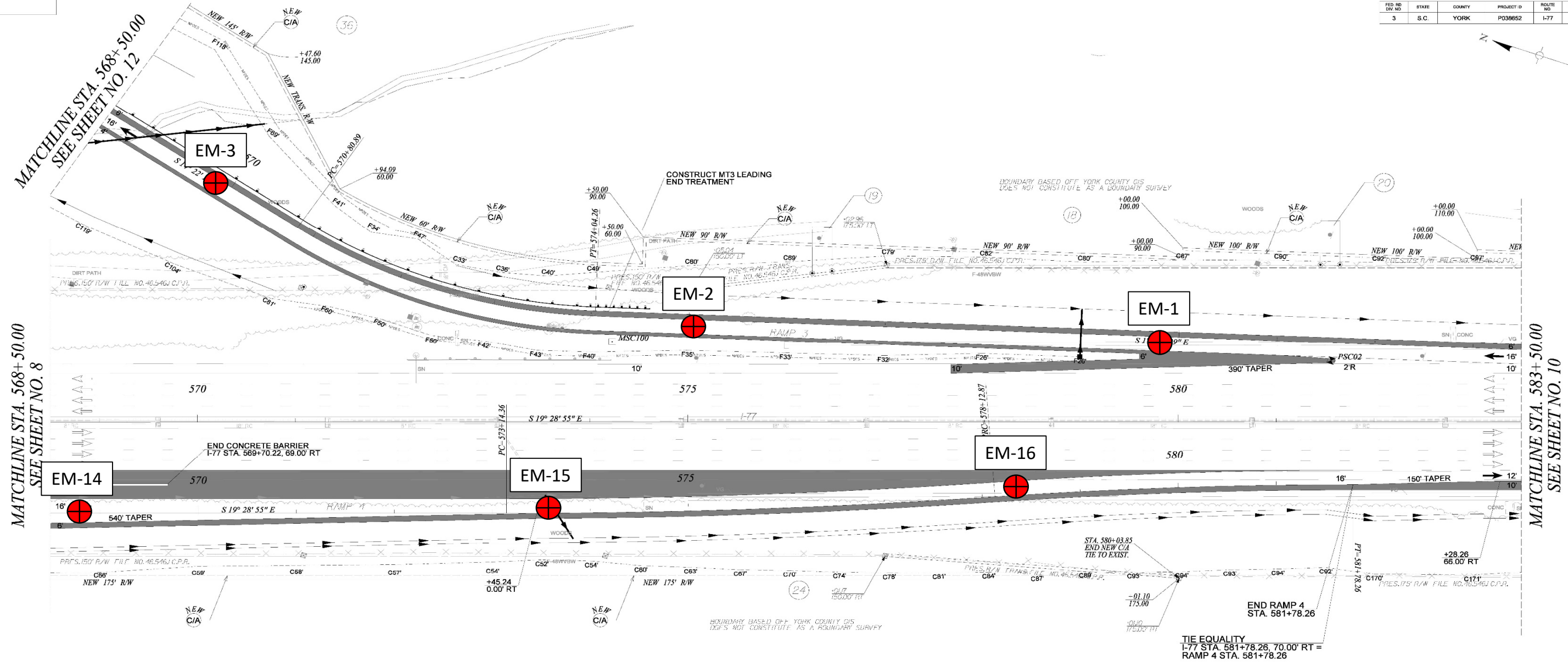
NOTES:
 1. PROPOSED DRAINAGE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY.
 2. DRAINAGE ANALYSIS HAS BEEN COMPLETED TO DATE.



SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

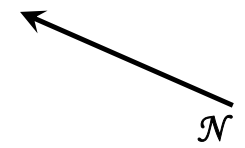
BORING LOCATION PLAN			
JOB NAME: I-77 Panthers Interchange		FIGURE NO.	
LOCATION: I-77 between Eden Terrace and RR Overpasses		3	
CITY, STATE: Rock Hill, South Carolina			
JOB NO.: 1461-19-069			
SCALE: NTS	CHECKED BY: MFC		
DATE: 10/12/2020	DRAWN BY: RCB		

FED. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.
3	S.C.	YORK	P038652	I-77



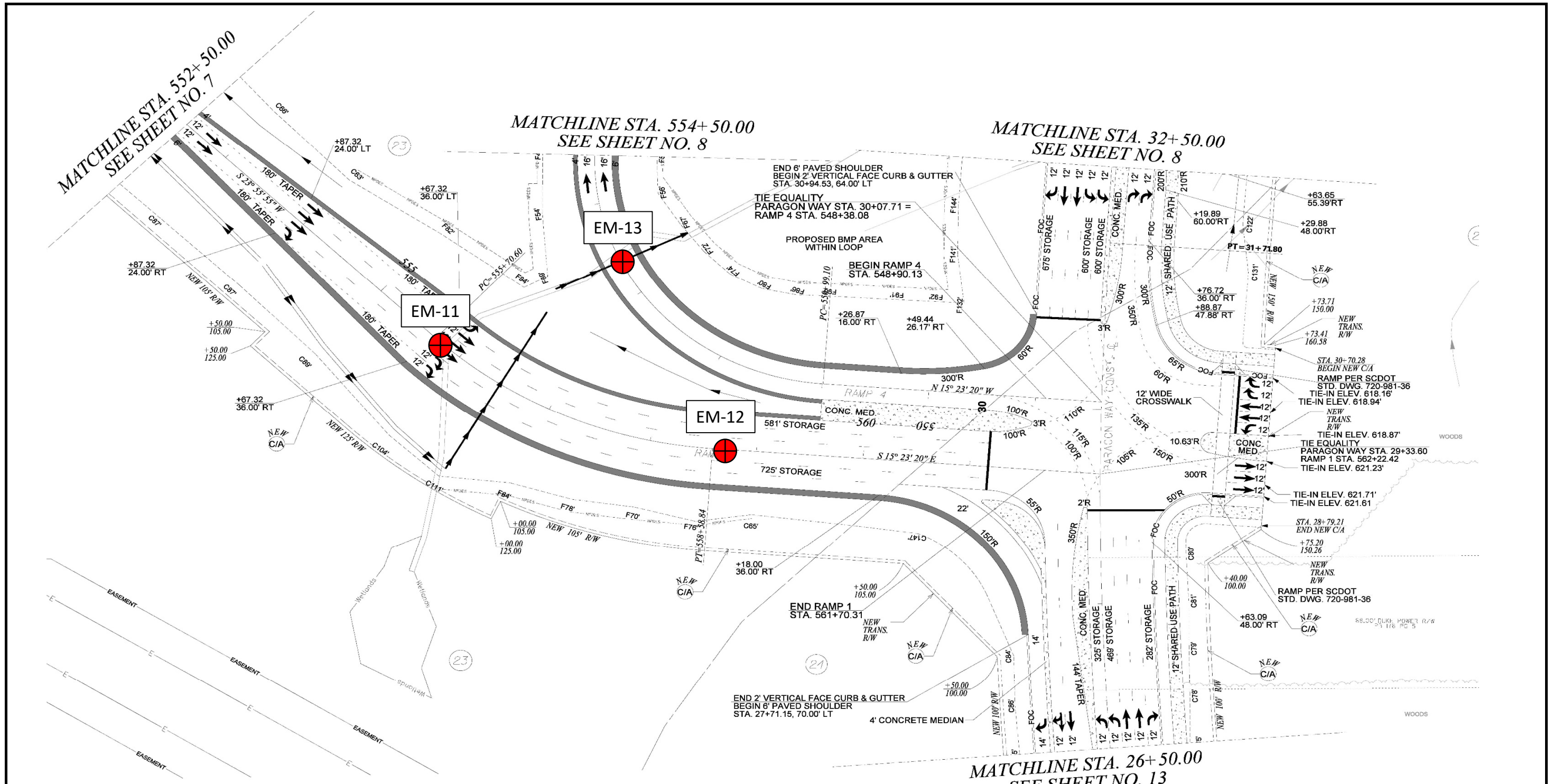
MATCHLINE STA. 568+50.00
SEE SHEET NO. 8

MATCHLINE STA. 583+50.00
SEE SHEET NO. 10

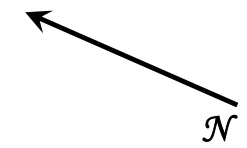


SOURCE: YORK County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN				FIGURE NO.
JOB NAME:		I-77 Panthers Interchange		4
LOCATION:		I-77 between Eden Terrace and RR Overpasses		
CITY, STATE:		Rock Hill, South Carolina		
JOB NO.:		1461-19-069		
SCALE:	NTS	CHECKED BY:	MFC	
DATE:	10/12/2020	DRAWN BY:	RCB	

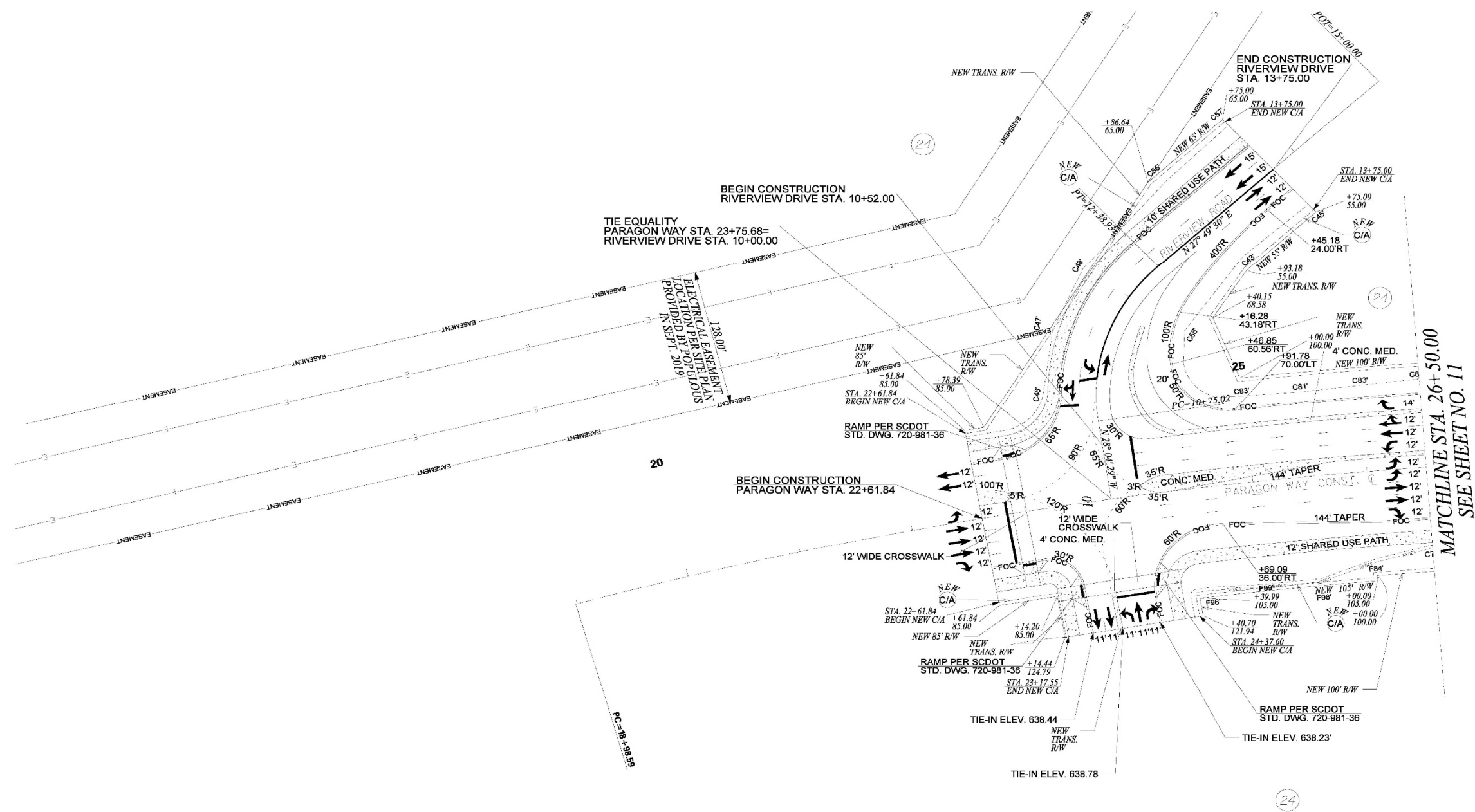


PROPOSED DRAINAGE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY. NO HYDROLOGIC ANALYSIS HAS BEEN COMPLETED TO DATE



SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN			FIGURE NO.
JOB NAME:		I-77 Panthers Interchange	
LOCATION:		I-77 between Eden Terrace and RR Overpasses	
CITY, STATE:		Rock Hill, South Carolina	
JOB NO.:		1461-19-069	
SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB
			5



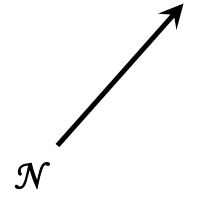
MATCHLINE STA. 26+50.00
SEE SHEET NO. 11

SOURCE: YORK County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN			
JOB NAME:		I-77 Panthers Interchange	
LOCATION:		I-77 between Eden Terrace and RR Overpasses	
CITY, STATE:		Rock Hill, South Carolina	
JOB NO.:		1461-19-069	
SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB

FIGURE NO.

7



Appendix II – Tables



Table 1: Test Location Summary

Test ID	Test/SampleType(s)				SC State Plane Northing (ft.)	SC State Plane Easting (ft.)	Latitude (degrees)	Longitude (degrees)	Elevation (ft-msl)	Alignment	Station	Offset (ft)
	SPT	RC	Bulk	UD								
EB-1	X	X			1137186.1	2006041.6	34.9587	-80.9798	578.79	Paragon	37+16.14	68.2 LT
EB-2	X	X			1137083.8	2006071.4	34.9584	-80.9797	575.66	Paragon	37+17.75	38.4 RT
EB-3	X	X			1137113.2	2005754.8	34.9585	-80.9808	595.78	Paragon	34+20.27	74.0 LT
EB-4	X	X			1136993.3	2005796.2	34.9582	-80.9806	578.49	Paragon	34+28.41	52.6 RT
IB-1	X	X			1137171.7	2005972.3	34.9587	-80.9801	585.87	Paragon	36+45.52	72.7 LT
IB-2	X				1137071.5	2006007.8	34.9584	-80.9799	584.20	Paragon	36+53.17	33.3 RT
IB-2A	X		X									
IB-2B	X	X										
IB-3	X	X	X		1137125.9	2005838.5	34.9585	-80.9805	583.98	Paragon	35+04.31	64.1 LT
IB-4	X				1137041.3	2005864.2	34.9583	-80.9804	582.56	Paragon	35+06.63	24.4 RT
IB-4A	X	X										
EM-1	X				1135299.7	2006648.0	34.9535	-80.9778	549.01	Ramp 3	580+08.81	1.4 RT
EM-2	X				1135781.9	2006479.5	34.9548	-80.9784	559.64	Ramp 3	574+99.20	35.1 RT
EM-3	X				1136264.7	2006499.5	34.9562	-80.9783	551.91	Ramp 3	570+15.26	3.4 LT
EM-4	X				1138643.5	2005469.7	34.9627	-80.9817	603.60	Ramp 2	544+64.12	2.4 LT
EM-5	X				1138221.6	2005615.0	34.9615	-80.9812	599.67	Ramp 2	549+09.87	19.7 RT
EM-6	X				1137762.0	2005812.6	34.9603	-80.9806	593.86	Ramp 2	554+10.13	5.8 LT
EM-7	X				1136741.2	2006311.5	34.9575	-80.9789	560.88	Ramp 2	566+04.26	18.1 LT
EM-8	X				1136871.8	2006548.4	34.9578	-80.9781	570.93	Ramp 2	569+10.42	4.1 LT
EM-9	X				1138639.9	2005301.1	34.9627	-80.9823	606.31	Ramp 1	544+12.4	9.2 RT
EM-10	X				1138108.3	2005430.8	34.9612	-80.9819	630.13	Ramp 1	549+61.5	0.1 RT
EM-11	X		X		1137545.1	2005202.7	34.9597	-80.9826	596.38	Ramp 1	555+75.1	17.6 RT
EM-12	X				1137161.1	2005225.8	34.9586	-80.9825	623.95	Ramp 1	559+58.8	10.8 RT
EM-13	X				1137394.7	2005381.1	34.9593	-80.9820	586.90	Ramp 4	553+44.62	16.2 RT
EM-14	X				1136320.8	2006121.6	34.9563	-80.9796	570.50	Ramp 4	568+70.51	20.5 LT
EM-15	X				1135854.5	2006299.1	34.9550	-80.9790	563.69	Ramp 4	573+69.56	32.1 LT
EM-16	X				1135388.7	2006457.8	34.9538	-80.9784	551.65	Ramp 4	578+62.23	4.7 LT
EM-17	X				1137023.6	2005729.2	34.9583	-80.9809	592.50	Paragon	33+71.77	5.6 RT
EM-18	X				1137150.6	2006187.7	34.9586	-80.9793	577.36	Paragon	38+47.60	4.8 RT
EM-19	X				1137279.7	2006655.5	34.9590	-80.9778	581.55	Paragon	43+31.73	14.0 LT
EM-20	X				1137588.2	2007515.0	34.9598	-80.9749	580.96	Paragon	53+02.35	17.7 RT
EM-21	X				1137852.3	2007559.9	34.9605	-80.9748	578.11	Paragon	55+66.53	16.3 RT
RW-1	X				1136705.0	2006675.7	34.9574	-80.9777	564.23	Ramp 3	565+44.97	64.8 LT
RW-2	X				1136773.4	2006641.8	34.9576	-80.9778	563.35	Ramp 3	564+88.25	16.5 LT
RW-3	X				1136864.2	2006657.7	34.9578	-80.9778	570.34	Ramp 3	563+99.06	22.5 LT
RW-4	X				1136943.8	2006646.8	34.9580	-80.9778	572.07	Ramp 3	563+21.43	13.7 LT
RW-5	X				1137321.8	2007153.5	34.9591	-80.9761	579.04	Paragon	48+34.79	22.0 LT
RW-6	X				1137418.3	2007354.0	34.9593	-80.9754	583.04	Paragon	50+68.62	16.5 LT



Table 1: Test Location Summary

Test ID	Test/SampleType(s)				SC State Plane Northing (ft.)	SC State Plane Easting (ft.)	Latitude (degrees)	Longitude (degrees)	Elevation (ft-msl)	Alignment	Station	Offset (ft)
	SPT	RC	Bulk	UD								
RW-7	X				1136985.1	2006108.4	34.9582	-80.9796	572.61	Ramp 2	562+41.20	25.6 LT
RW-8	X				1136890.6	2006142.9	34.9579	-80.9795	565.36	Ramp 2	563+41.78	26.6 LT
RW-9	X				1137263.2	2005989.2	34.9589	-80.9800	584.27	Ramp 2	559+39.25	5.9 LT
RW-10	X			X	1137414.4	2005946.2	34.9593	-80.9801	586.59	Ramp 2	557+82.35	15.9 LT
RW-11	X				1137205.4	2005730.1	34.9588	-80.9809	585.34	Ramp 4	559+05.99	53.6 RT
RW-12	X			X	1137291.5	2005688.4	34.9590	-80.9810	606.07	Ramp 4	558+10.92	64.1 RT
RW-13	X				1136898.7	2005834.7	34.9579	-80.9805	585.34	Ramp 4	562+29.94	57.3 RT
RW-14	X				1136814.5	2005867.4	34.9577	-80.9804	586.35	Ramp 4	563+20.29	54.5 RT
C-1	X				1136689.5	2006364.6	34.9573	-80.9787	559.89	Ramp 2	566+56.16	33.5 RT
C-2	X				1137098.9	2005713.6	34.9585	-80.9809	579.76	Paragon	33+76.74	71.2 LT



Table 2: Split Spoon Samples – Laboratory Classification Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Natural Moisture (%)	Atterberg Limits			Percent Finer #10 (%)	Percent Finer #40 (%)	Percent Finer #200 (%)	Organic Content (%)	Soil Classification	
				LL	PL	PI					AASHTO	USCS
IB-1	SS-1	2-4	33.4	67	26	41	TNP	TNP	83.2	TNP	A-7-6	CH
	SS-3	6-8	21.1	30	18	12	TNP	TNP	58.8	TNP	A-6	CL
	SS-4	8-10	29.1	59	24	35	TNP	TNP	65.5	TNP	A-7-6	CH
	SS-5	13.5-15	20.6	29	23	6	TNP	TNP	38.4	TNP	A-4	SC-SM
	SS-6	18.5-20	26.6	32	26	6	TNP	TNP	38.7	TNP	A-4	SM
	SS-7	23.5-25	11.8	25	22	3	TNP	TNP	30.1	TNP	A-2-4	SM
	SS-8	28.5-30	14.9	28	25	3	TNP	TNP	33.6	TNP	A-2-4	SM
	SS-9	33.5-34.2	12.3	20	19	1	TNP	TNP	23.3	TNP	A-2-4	SM
IB-3	SS-1	0-2	21.1	47	25	22	TNP	TNP	62.3	TNP	A-7-6	CL
	SS-2	2-4	27.3	54	34	20	TNP	TNP	65.9	TNP	A-7-5	MH
	SS-3	4-6	27.8	69	29	40	TNP	TNP	85.8	TNP	A-7-6	CH
	SS-4	6-8	24.6	53	25	28	TNP	TNP	70.9	TNP	A-7-6	CH
	SS-5	8-10	38.5	66	37	29	TNP	TNP	70.7	TNP	A-7-5	MH
	SS-6	13.5-15	52.6	46	26	20	TNP	TNP	52.4	TNP	A-7-6	CL
	SS-7	18.5-20	27.8	41	29	12	TNP	TNP	28.3	TNP	A-2-7	SM
	SS-8	23.5-25	23.5	36	28	8	TNP	TNP	31.1	TNP	A-2-4	SM
	SS-9	28.5-30	TNP	34	29	5	TNP	TNP	63.2	TNP	A-4	ML
EM-1	SS-1	0-2	25.1	51	23	28	TNP	TNP	70.7	TNP	A-7-6	CH
EM-2	SS-1	0-2	28.3	49	39	10	TNP	TNP	50.2	TNP	A-5	ML
EM-4	SS-1	0-2	54.1	54	38	16	TNP	TNP	71.2	TNP	A-7-5	MH
EM-5	SS-1	0-2	27.6	57	36	21	TNP	TNP	80.2	TNP	A-7-5	MH
EM-6	SS-1	0-2	22.1	50	24	26	TNP	TNP	60.8	TNP	A-7-6	CH
EM-9	SS-1	0-2	30.2	48	29	19	TNP	TNP	64.0	TNP	A-7-6	ML
EM-10	SS-1	0-2	24.3	57	23	34	TNP	TNP	78.8	TNP	A-7-6	CH
EM-11	SS-1	0-2	32.7	63	28	35	TNP	TNP	83.0	TNP	A-7-6	CH
	SS-2	2-4	34.2	TNP	TNP	TNP	TNP	TNP	TNP	5.8	--	--
EM-12	SS-1	0-2	28.5	64	27	37	TNP	TNP	81.7	TNP	A-7-6	CH
EM-13	SS-1	0-2	33.0	60	25	35	TNP	TNP	80.9	TNP	A-7-6	CH
EM-14	SS-1	0-2	23.0	40	34	6	TNP	TNP	35.0	TNP	A-2-4	SM
EM-15	SS-1	0-2	28.7	52	25	27	TNP	TNP	70.1	TNP	A-7-6	CH
EM-16	SS-1	0-2	26.6	55	37	18	TNP	TNP	32.1	TNP	A-2-7	SM
EM-17	SS-1	0-2	31.9	61	25	36	TNP	TNP	82.2	TNP	A-7-6	CH
	SS-2	2-4	30.0	TNP	TNP	TNP	TNP	TNP	TNP	3.5	--	--
EM-20	SS-1	1.3-3.3	34.7	63	42	21	TNP	TNP	82.8	TNP	A-7-5	MH
EM-21	SS-1	1.3-3.3	18.7	39	23	16	TNP	TNP	31.9	TNP	A-2-6	SC
RW-7	SS-1	0-2	37.7	53	29	24	TNP	TNP	80.9	TNP	A-7-6	CH
	SS-2	2-4	24.2	32	26	6	TNP	TNP	39.3	TNP	A-4	SM
RW-8	SS-2	2-4	31.7	TNP	TNP	TNP	TNP	TNP	TNP	3.3	--	--
	SS-3	4-6	19.5	31	17	14	TNP	TNP	23.5	TNP	--	SC
RW-9	SS-2	2-4	18.1	36	18	18	TNP	TNP	66.6	TNP	A-6	CL
	SS-4	6-8	30.5	41	32	9	TNP	TNP	61.0	TNP	A-5	ML
	SS-5	8-10	22.9	31	21	10	TNP	TNP	84.4	TNP	A-4	SC
RW-10	SS-1	0-2	17.9	TNP	TNP	TNP	TNP	TNP	TNP	4.2	--	--
	SS-2	2-4	24.1	33	19	14	TNP	TNP	50.9	TNP	A-6	CL
	SS-3	4-6	30.0	47	20	27	TNP	TNP	65.1	TNP	A-7-6	CL



Table 2: Split Spoon Samples – Laboratory Classification Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Natural Moisture (%)	Atterberg Limits			Percent Finer #10 (%)	Percent Finer #40 (%)	Percent Finer #200 (%)	Organic Content (%)	Soil Classification	
				LL	PL	PI					AASHTO	USCS
RW-11	SS-2	2-4	39.3	59	30	29	TNP	TNP	70.1	TNP	A-7-5	CH
	SS-3	4-6	27.4	39	21	18	TNP	TNP	66.5	TNP	A-6	CL
RW-12	SS-2	2-4	35.4	71	33	38	TNP	TNP	88.9	TNP	A-7-5	CH
	SS-4	6-8	44.7	49	30	19	TNP	TNP	80.6	TNP	A-7-5	ML
	SS-8	23.5-25	19.5	--	NP	NP	TNP	TNP	33.4	TNP	A-2-4	SM
RW-13	SS-1	0-2	33.1	68	32	36	TNP	TNP	80.8	TNP	A-7-5	CH
RW-13	SS-4	6-8	14.0	35	27	8	TNP	TNP	39.9	TNP	A-4	SM
RW-14	SS-3	4-6	23.2	42	30	12	TNP	TNP	49.8	TNP	A-7-5	SM

NP = Nonplastic

TNP = Test Not Performed

⁽¹⁾ Classification estimated based on test results and ASTM D2488 Visual Manual Procedure



Table 3: Corrosion Series Testing Summary

Boring Number	Sample Depth (ft)	Sample No(s).	As-Rec'd Resistivity (Ohm-cm)	Min- Resistivity (Ohm-cm)	Sulfates		Chlorides		pH
					(mg/kg)	(wt%)	(mg/kg)	(wt%)	
EB-2	4.0-6.0	SS-3	12,730	5,025	66.8	0.0067	76.2	0.0076	7.3
IB-4	8.0-10.0	SS-5	5,360	4,824	3.0	0.0003	28.4	0.0028	6.7



Geotechnical Base Line Report (GBLR)

I-77 Panthers Interchange

Rock Hill, York County, South Carolina

SCDOT Project ID P038652

Project No. 1461-19-069

Table 4: Undisturbed Samples - Laboratory Classification & Shear Strength Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Sample Type	Test Type	Atterberg Limits		Percent Finer #200 (%)	USCS	AASHTO	Specific Gravity	Test Specimen Number	Initial Dry Unit Weight (pcf)	Initial Moisture Content (%)	Shear Strength Parameters			
					LL	PI								Total		Effective	
														c (ksf)	ϕ (degrees)	c' (ksf)	ϕ' (degrees)
RW-10	UD-2	10-11.2	Shelby Tube	CU Triaxial (ASTM D4767)	--	NP	30.2	SM	A-2-4	2.768	1	111.1	15.8	0.17	25	0.000	45
											2	120.4	15.2				
											3	120.1	15.2				
RW-12	UD-4	19-21	Shelby Tube	CU Triaxial (ASTM D4767)	TNP	TNP	TNP	ML	--	2.786	1	93.9	30.3	0.389	18	0.069	38
											2	98.3	27.2				
											3	98.5	27.0				

TNP= Test Not Performed



Geotechnical Base Line Report (GBLR)

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Rock Hill, York County, South Carolina

SCDOT Project ID P038652

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Table 5: Bulk Samples – Laboratory Classification & Proctor Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Natural Moisture (%)	Atterberg Limits		Percent Finer #200 (%)	Soil Classification		Max. Dry Density (pcf)	Optimum Moisture (%)
				LL	PI		AASHTO	USCS		
IB-2A	BS-1	0-5	33.4	57	30	71.6	A-7-6	CH	102.9	20.8
IB-3	BS-2	0-5	27.0	61	29	69.7	A-7-5	MH	103.9	19.4
EM-11	BS-3	0-5	34.0	58	27	77.8	A-7-5	MH	92.7	29.6

TNP= Test Not Performed



Geotechnical Base Line Report (GBLR)

I-77 Panthers Interchange

Rock Hill, York County, South Carolina

SCDOT Project ID P038652

Project No. 1461-19-069

Table 6: Bulk Samples – Laboratory Proctor and CBR Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Max. Dry Density (pcf)	Optimum Moisture (%)	% Compaction	Corrected CBR Value at 0.1 in.
IB-2A	BS-1	0-5	102.9	20.8	91.6	1.7
					97.9	2.8
IB-3	BS-2	0-5	103.9	19.4	92.8	0.9
					99.5	1.2
EM-11	BS-3	0-5	92.7	29.6	91.7	3.7
					98.9	9.9



Table 7: Undisturbed Samples - Laboratory Classification & Consolidation Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Atterberg Limits		Percent Finer #200 (%)	USCS	AASHTO	Specific Gravity	Initial Void Ratio (%)	Final Void Ratio (%)	Initial Dry Unit Weight (pcf)	Initial Moisture Content (%)
			LL	PI								
RW-10	UD-1	4-6	79	48	83.5	CH	A-7-5	2.784	0.979	0.796	87.8	35.1



Table 8: Rock Core Samples – Laboratory Testing Summary

Boring Number	Total Boring Depth (ft)	Core Run	Core Interval	Recovery (%)	RQD	No. of Sample Tested	Approx. Depth (ft)	Compressive Strength (psi)	RMR	GSI
EB-1	63.5	RC-1	32.9-35.5	100	14	---	---	---	---	50
		RC-2	35.5-40.5	36	8	---	---	---	---	65
		RC-3	40.5-45.5	100	42	RS-1	42.6-43.0	2,162	4	70
		RC-4	45.5-50.5	100	60	---	---	---	---	60
		RC-5	50.5-55.5	100	100	---	---	---	---	85
		RC-6	55.5-60.5	100	100	RS-2	57.5-57.9	22,416	66	90
		RC-7	60.5-63.5	100	100	---	---	---	---	95
EB-2	55.0	RC-1	25-30	90	88	RS-3	25.3-25.7	34,032	66	85
		RC-2	30-35	100	100	---	---	---	---	90
		RC-3	35-40	100	100	---	---	---	---	90
		RC-4	40-45	100	100	---	---	---	---	90
		RC-5	45-50	100	100	RS-4	46.7-47.1	39,834	74	90
		RC-6	50-55	100	100	---	---	---	---	90
EB-3	70.3	RC-1	35.0-35.3	67	0	---	---	---	---	40
		RC-2	35.3-40.3	44	0	---	---	---	---	40
		RC-3	40.3-45.3	64	0	---	---	---	---	40
		RC-4	45.3-50.3	74	6	---	---	---	---	45
		RC-5	50.3-55.3	100	56	---	---	---	---	60
		RC-6	55.3-60.3	83	62	RS-14	55.0-55.35	41,162	47	60
		RC-7	60.3-65.3	94	92	RS-15	62.6-62.95	21,672	61	80
		RC-8	65.3-70.3	100	98	---	---	---	---	90
EB-4	60.5	RC-1	25.2-25.5	100	0	---	---	---	---	45
		RC-2	25.5-30.5	94	20	---	---	---	---	45
		RC-3	30.5-35.5	84	0	---	---	---	---	50
		RC-4	35.5-40.5	58	18	---	---	---	---	40
		RC-5	40.5-45.5	100	20	RS-16	44.0-44.4	23,952	9	35
		RC-6	45.5-50.5	100	68	---	---	---	---	70
		RC-7	50.5-55.5	100	100	---	---	---	---	90
		RC-8	55.5-60.5	100	100	RS-17	55.5-55.9	45,581	74	90
IB-1	65.5	RC-1	34.6-35.5	100	100	---	---	---	---	90
		RC-2	35.5-40.5	100	100	---	---	---	---	85
		RC-3	40.5-45.5	100	100	---	---	---	---	90
		RC-4	45.5-50.5	100	100	RS-5	45.7-46.2	35,620	69	95
		RC-5	50.5-55.5	100	100	---	---	---	---	85
		RC-6	55.5-60.5	100	100	---	---	---	---	85
		RC-7	60.5-65.5	100	100	RS-6	65.0-65.5	32,845	69	85
		RC-1	28.1-33.0	63	25	---	---	---	---	55
		RC-2	33.0-38.0	48	28	---	---	---	---	75



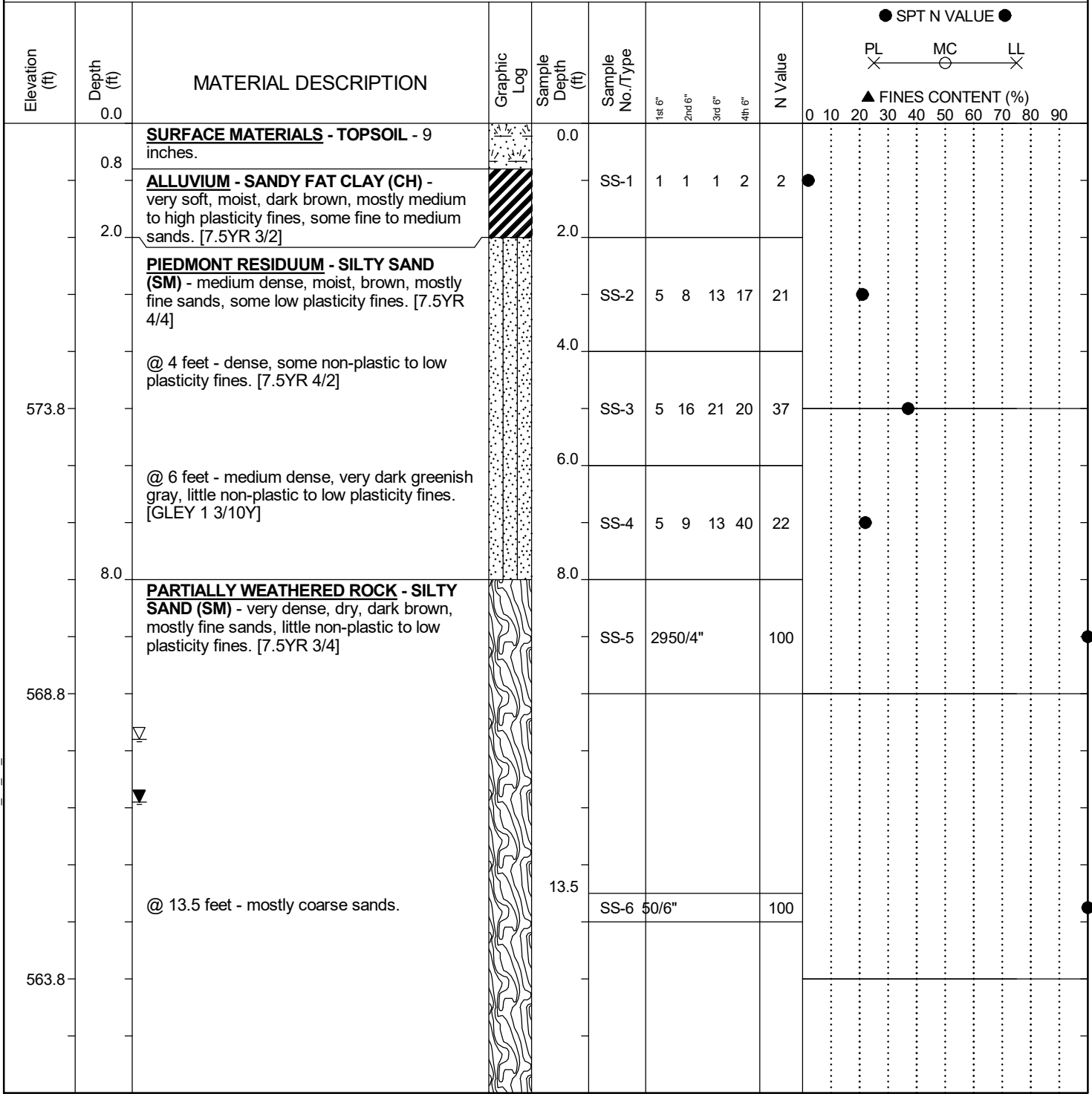
Table 8: Rock Core Samples – Laboratory Testing Summary

Boring Number	Total Boring Depth (ft)	Core Run	Core Interval	Recovery		No. of Sample Tested	Approx. Depth (ft)	Compressive Strength (psi)	RMR	GSI
				(%)	RQD					
IB-2B	63	RC-3	38.0-43.0	30	20	---	---	---	---	95
		RC-4	43.0-48.0	100	100	RS-7	43.3-43.8	35,638	64	90
		RC-5	48.0-53.0	100	96	---	---	---	---	95
		RC-6	53.0-58.0	100	100	RS-8	57.5-57.9	28,662	76	95
		RC-7	58.0-63.0	100	100	---	---	---	---	95
IB-3	70.1	RC-1	38.1-40.1	70	0	---	---	---	---	65
		RC-2	40.1-45.1	78	14	---	---	---	---	65
		RC-3	45.1-50.1	46	30	---	---	---	---	70
		RC-4	50.1-55.1	84	36	RS-9	53.7-54.1	21,042	14	70
		RC-5	55.1-60.1	100	100	---	---	---	---	95
		RC-6	60.1-65.1	100	90	RS-10	60.5-60.9	40,273	79	90
		RC-7	65.1-70.1	100	100	---	---	---	---	95
IB-4A	55.4	RC-1	20.5-21.1	100	14	---	---	---	---	75
		RC-2	21.1-23.0	80	50	---	---	---	---	70
		RC-3	24.6-25.4	100	88	RS-11	24.7-25.1	33,534	37	75
		RC-4	25.4-30.4	84	66	---	---	---	---	80
		RC-5	30.4-35.4	62	13	RS-12	34.8-35.2	36,589	12	40
		RC-6	35.4-40.4	90	60	---	---	---	---	70
		RC-7	40.4-45.4	100	100	---	---	---	---	90
		RC-8	45.4-50.4	100	100	---	---	---	---	95
		RC-9	50.4-55.4	100	100	RS-13	54.3-54.7	25,959	79	95

Appendix III – Boring Logs

SCDOT Soil Test Log

Project ID: P038652		County: York		Boring No.: EB-1	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS		Boring Location: 37+16.14		Offset: 68.2 LT	
Elev.: 578.8 ft		Latitude: 34.9587		Longitude: -80.9798	
Total Depth: 63.5 ft		Soil Depth: 32.9 ft		Core Depth: 30.6 ft	
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	
Drill Machine: CME 550X		Drill Method: H.S.A.		Hammer Type: Automatic	
Core Size: NQ		Driller: F. Johnson		Energy Ratio: 85.9%	
		Groundwater: TOB		24HR: 10.8 ft	
				11.9 ft	



LEGEND

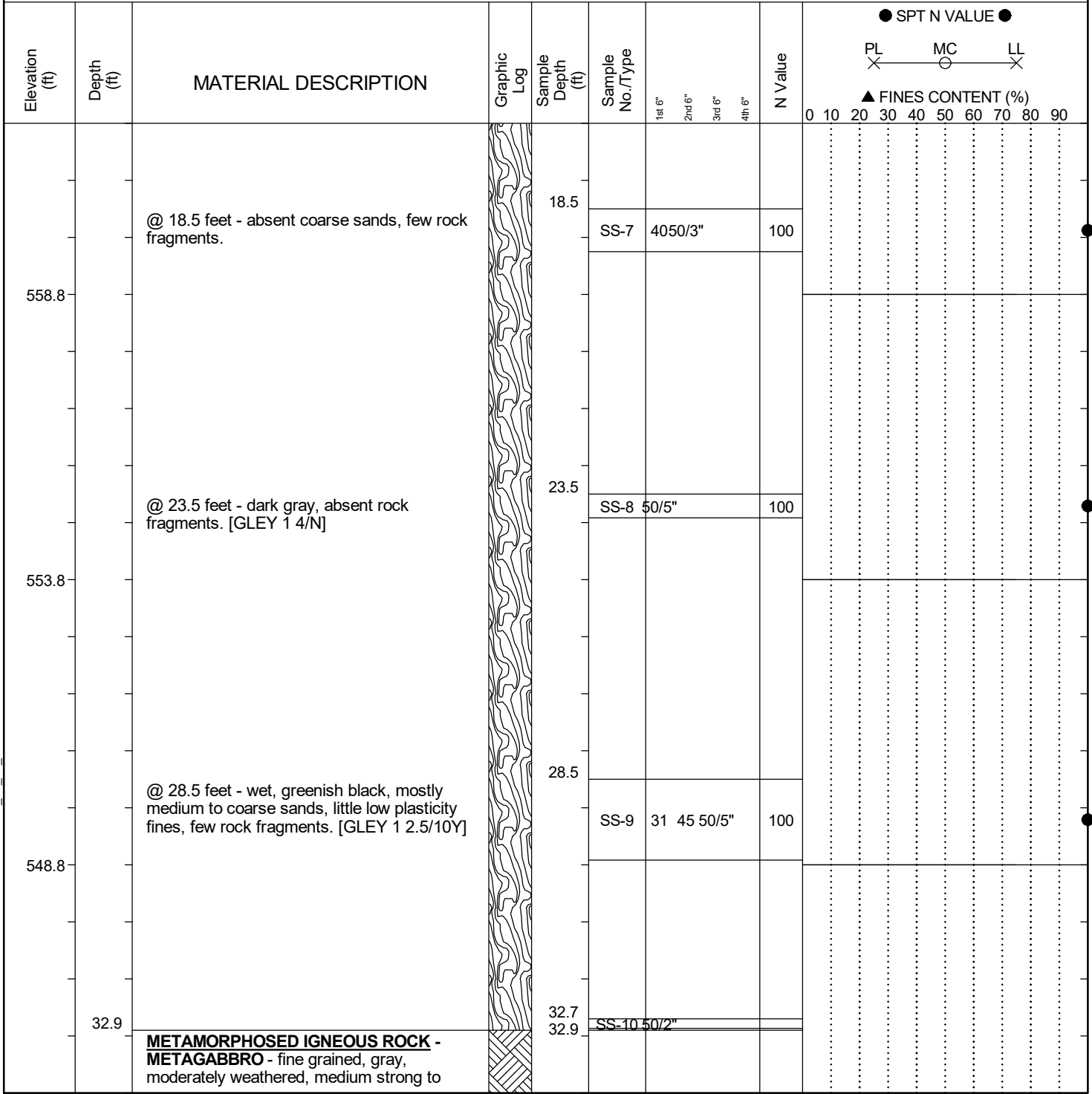
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 37+16.14	Offset: 68.2 LT Alignment: Paragon
Elev.: 578.8 ft	Latitude: 34.9587	Longitude: -80.9798 Date Started: 1/9/2020
Total Depth: 63.5 ft	Soil Depth: 32.9 ft	Core Depth: 30.6 ft Date Completed: 1/10/2020
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N) Liner Used: Y (N)
Drill Machine: CME 550X	Drill Method: H.S.A.	Hammer Type: Automatic Energy Ratio: 85.9%
Core Size: NQ	Driller: F. Johnson	Groundwater: TOB 10.8 ft 24HR: 11.9 ft



LEGEND

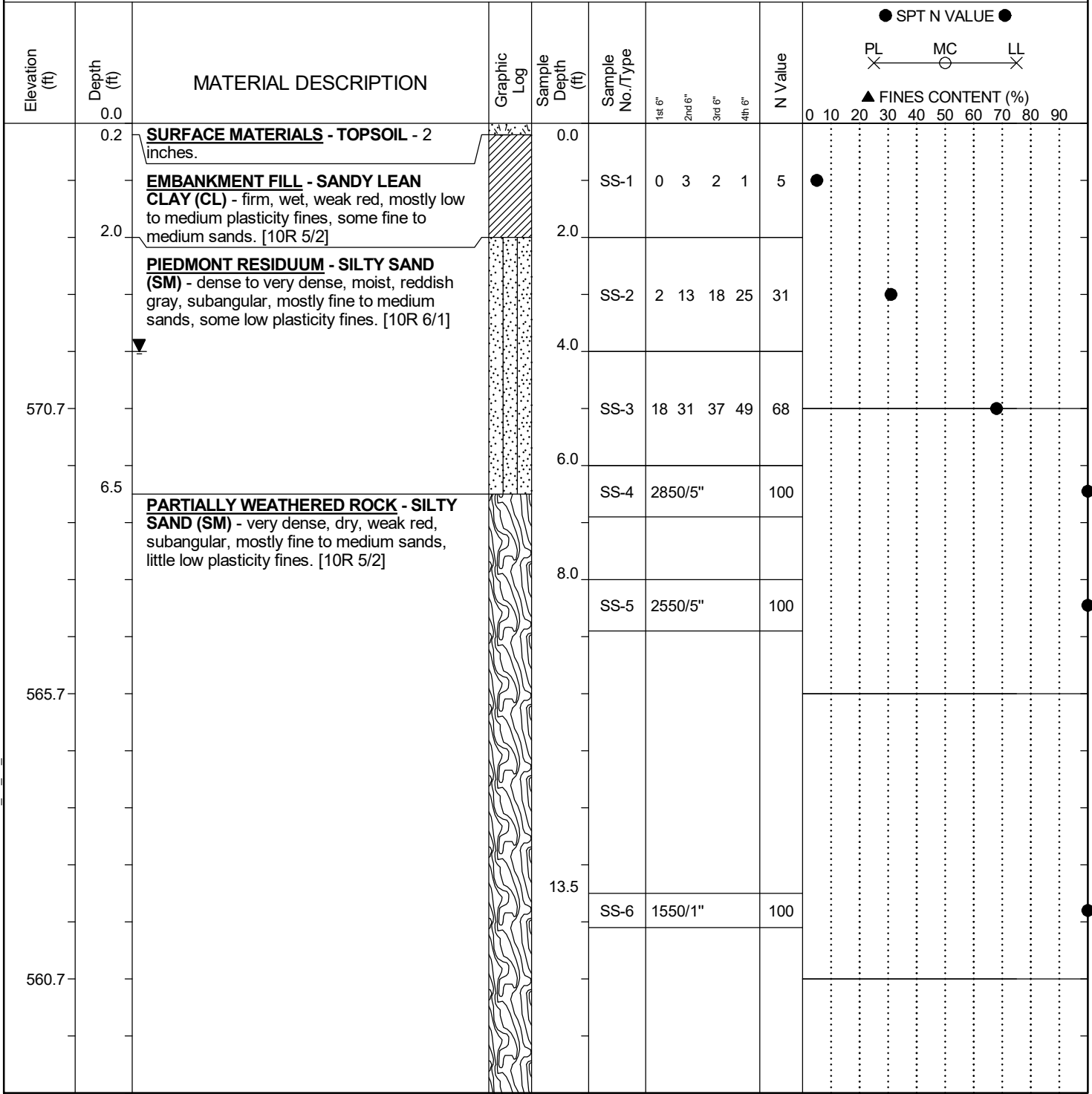
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-2
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 37+17.75	Offset: 38.4 RT
Alignment: Paragon	Date Started: 1/7/2020	
Elev.: 575.7 ft	Latitude: 34.9584	Longitude: -80.9797
Total Depth: 55 ft	Soil Depth: 25 ft	Core Depth: 55 ft
Date Completed: 1/7/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: T. Brown	Groundwater: TOB N/A
24HR: 4 ft		



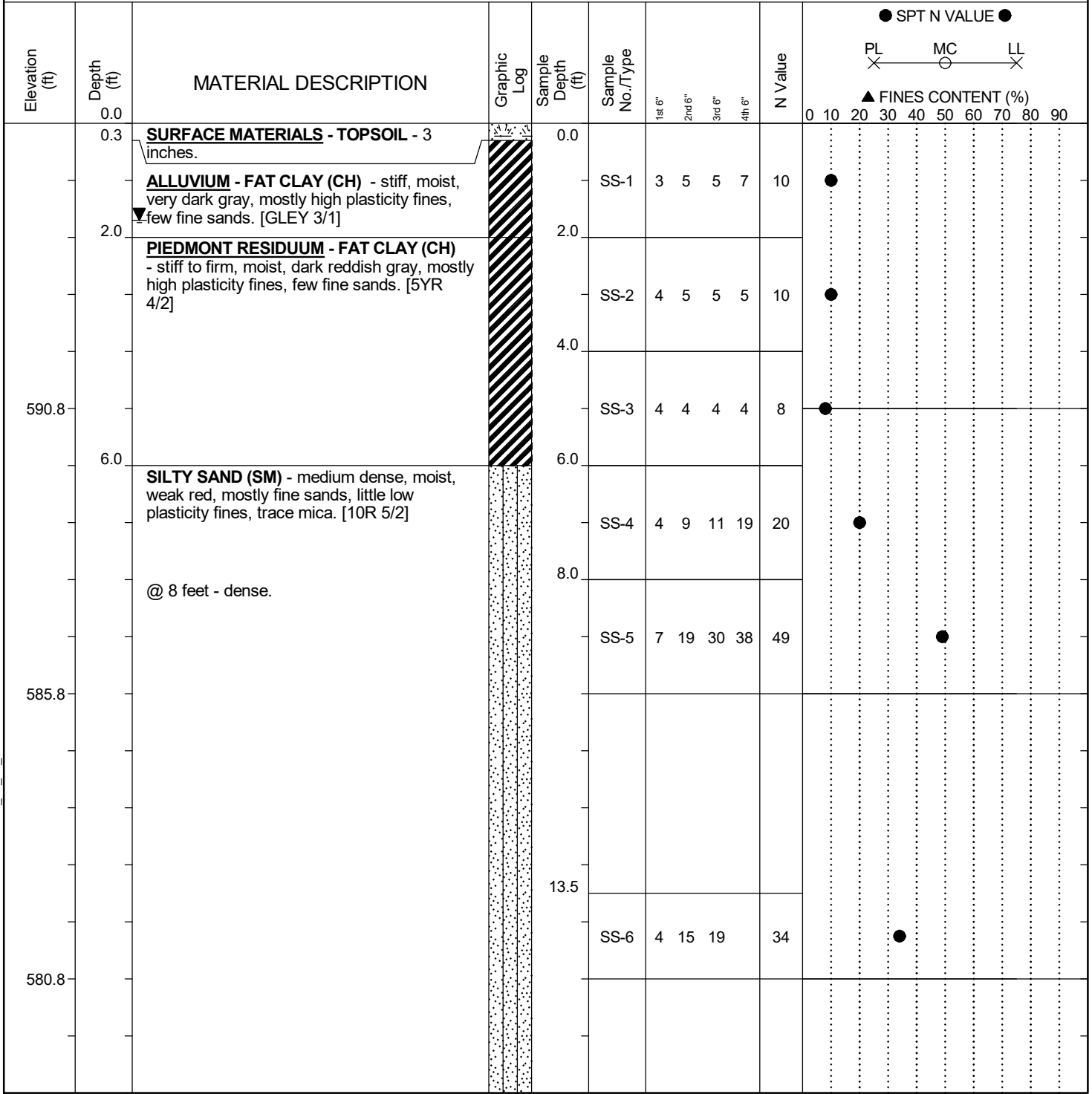
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-3
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 34+20.27	Offset: 74.0 LT
Alignment: Paragon		
Elev.: 595.8 ft	Latitude: 34.9585	Longitude: -80.9808
Date Started: 1/14/2020		
Total Depth: 70.3 ft	Soil Depth: 35 ft	Core Depth: 70.3 ft
Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: T. Brown	Groundwater: TOB N/A
24HR: 1.7 ft		



LEGEND

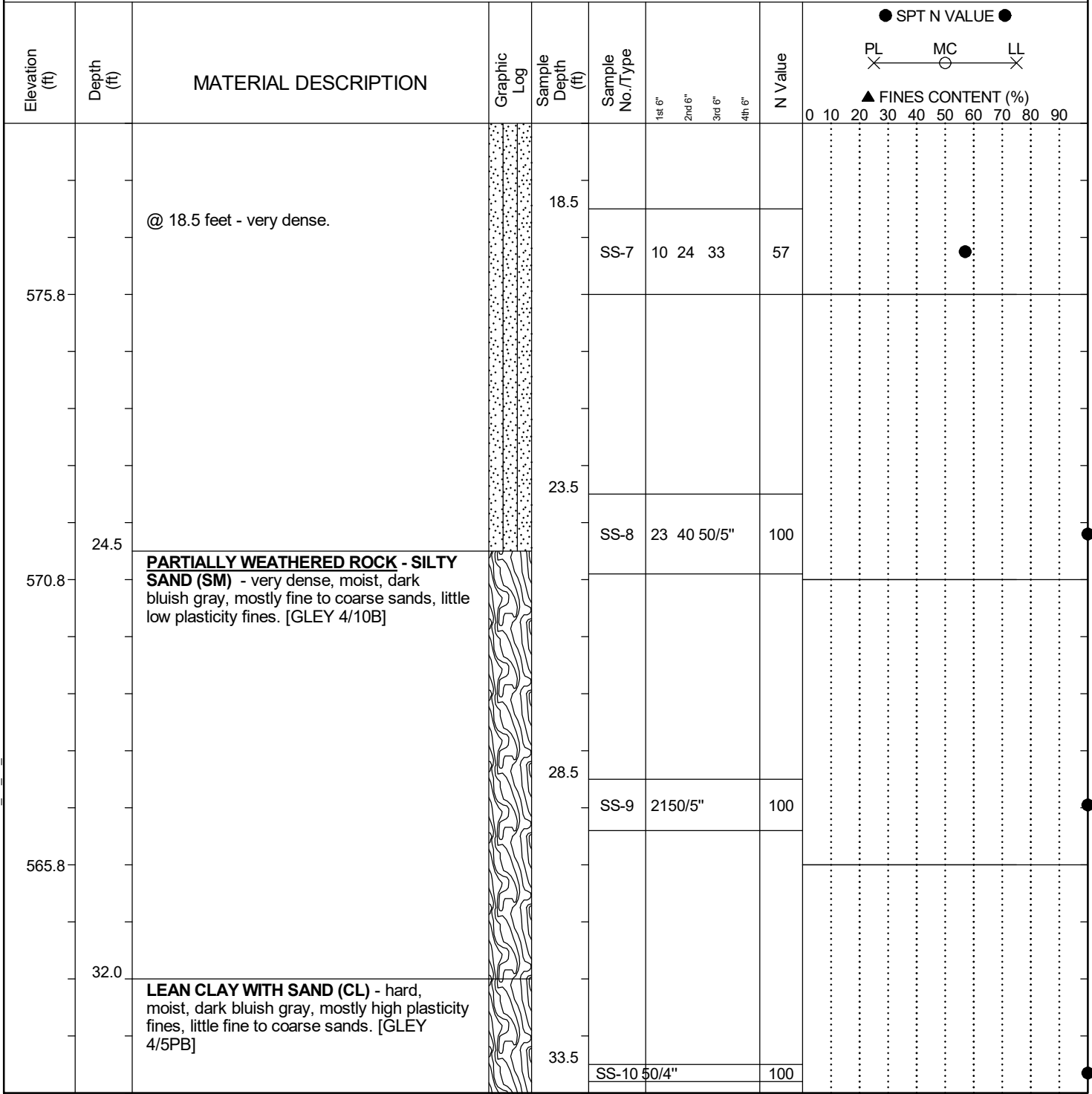
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-3
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 34+20.27	Offset: 74.0 LT
Alignment: Paragon		
Elev.: 595.8 ft	Latitude: 34.9585	Longitude: -80.9808
Date Started: 1/14/2020		
Total Depth: 70.3 ft	Soil Depth: 35 ft	Core Depth: 70.3 ft
Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: T. Brown	Groundwater: TOB N/A
24HR: 1.7 ft		



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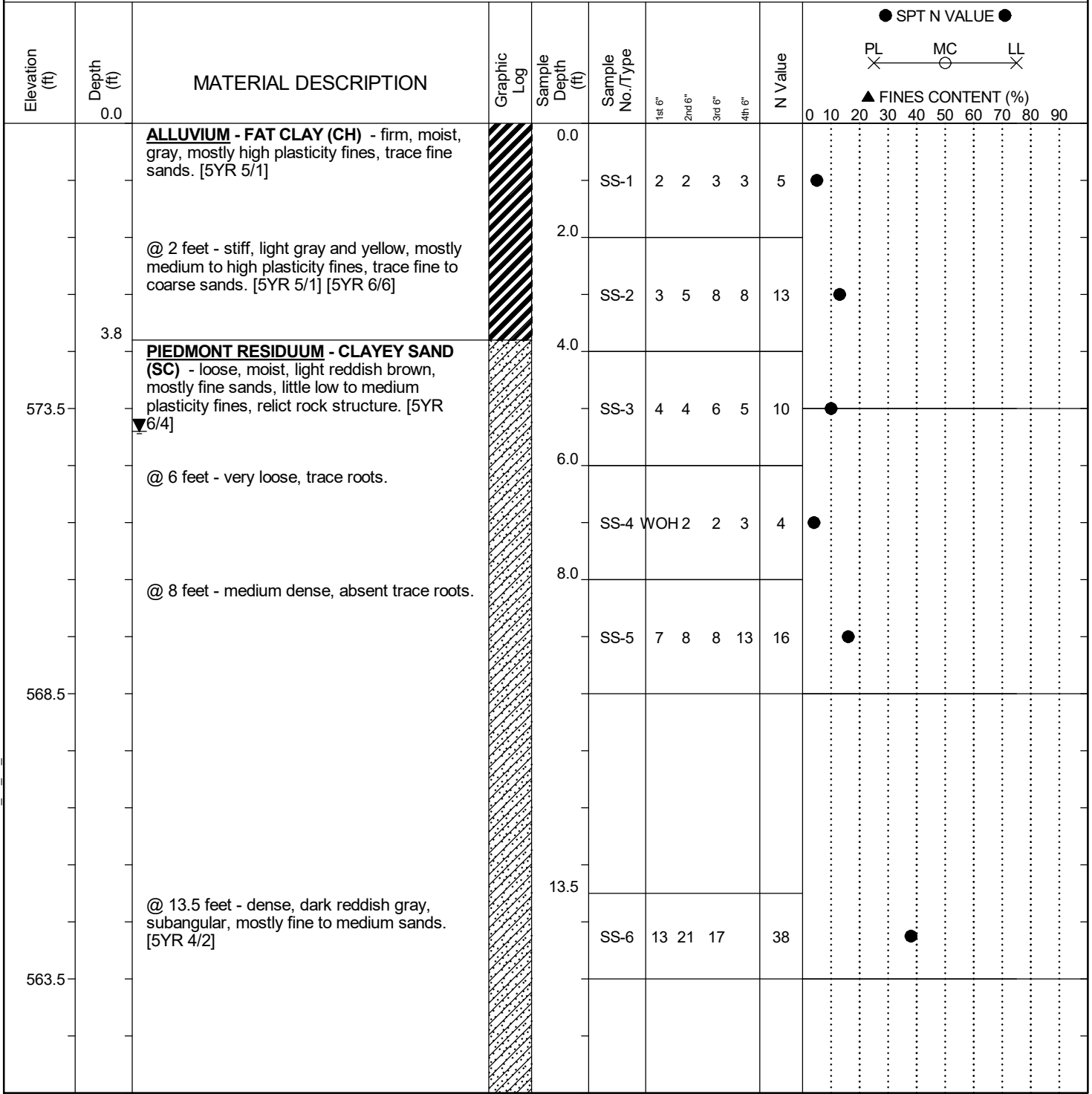
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-4
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 34+28.41	Offset: 52.6 RT
Alignment: Paragon		
Elev.: 578.5 ft	Latitude: 34.9582	Longitude: -80.9806
Date Started: 1/15/2020		
Total Depth: 60.5 ft	Soil Depth: 25.2 ft	Core Depth: 60.5 ft
Date Completed: 1/15/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: J. Little	Groundwater: TOB N/A
24HR: 5.4 ft		



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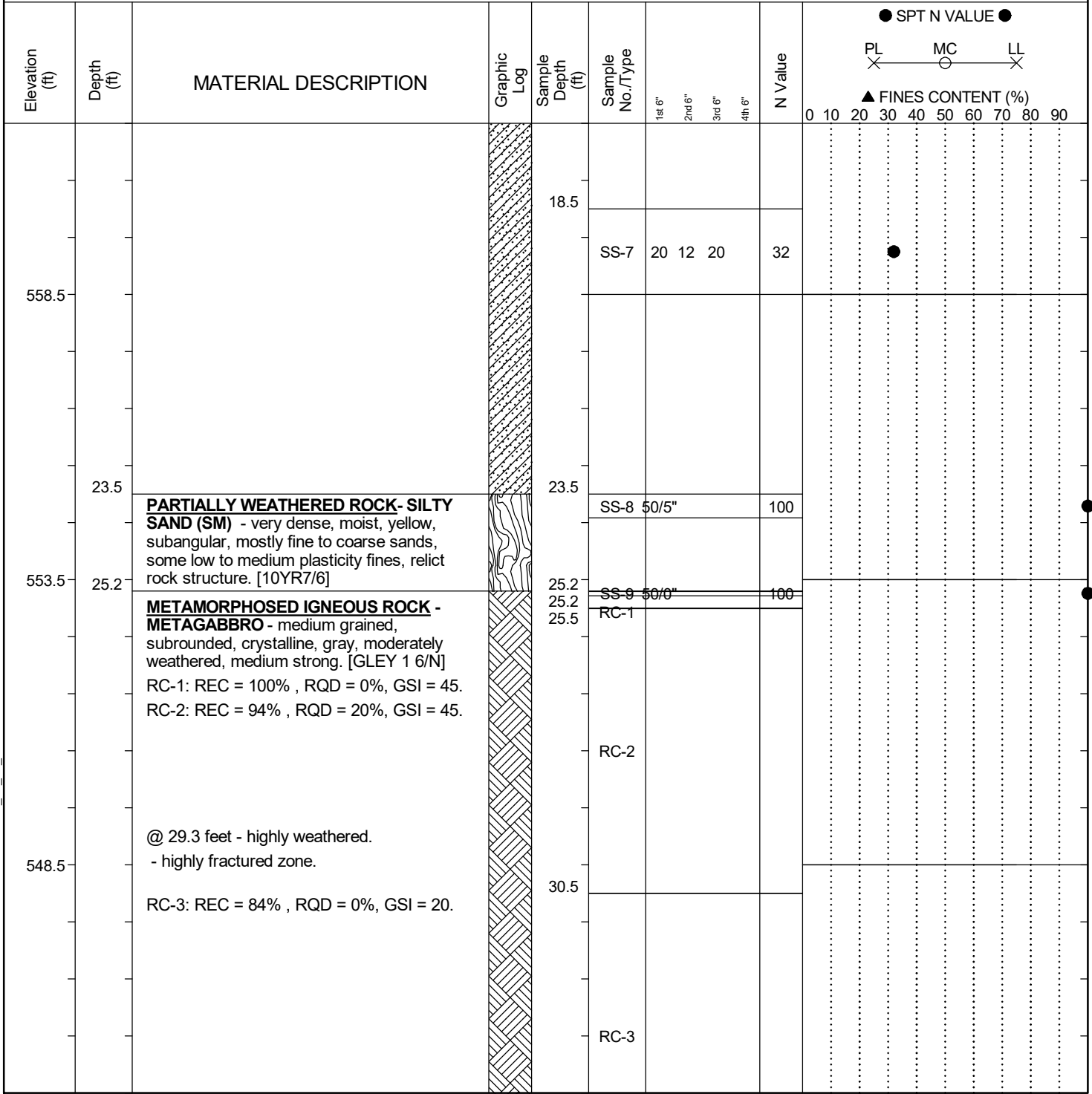
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-4
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 34+28.41	Offset: 52.6 RT
Alignment: Paragon		
Elev.: 578.5 ft	Latitude: 34.9582	Longitude: -80.9806
Date Started: 1/15/2020		
Total Depth: 60.5 ft	Soil Depth: 25.2 ft	Core Depth: 60.5 ft
Date Completed: 1/15/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: J. Little	Groundwater: TOB N/A
24HR: 5.4 ft		



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	

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-4
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 34+28.41	Offset: 52.6 RT
Alignment: Paragon		
Elev.: 578.5 ft	Latitude: 34.9582	Longitude: -80.9806
Date Started: 1/15/2020		
Total Depth: 60.5 ft	Soil Depth: 25.2 ft	Core Depth: 60.5 ft
Date Completed: 1/15/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: J. Little	Groundwater: TOB N/A
24HR: 5.4 ft		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N VALUE				FINES CONTENT (%)									
						1st 6"	2nd 6"	3rd 6"	4th 6"	PL	MC	LL	▲ FINES CONTENT (%)						
543.5		RC-4: REC = 58% , RQD = 18%, GSI = 40.		35.5	RC-4														
538.5		RC-5: REC = 100% , RQD = 20%, GSI = 35, RMR = 9.		40.5	RC-5														
533.5		@ 43.5 feet - slightly weathered. - fractures with 10-50 degree dips, narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.		45.5	RC-6														
528.5		@ 47.2 feet - coarse grained, moderately weathered.																	
		@ 48.3 feet - medium grained, slightly weathered.																	
		@ 49.5 feet - fresh.																	
		@ 50.2 feet - end of fractures.																	
		RC-7: REC = 100% , RQD = 100%, GSI =		50.5															

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	

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EB-4
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 34+28.41	Offset: 52.6 RT
Alignment: Paragon		
Elev.: 578.5 ft	Latitude: 34.9582	Longitude: -80.9806
Date Started: 1/15/2020		
Total Depth: 60.5 ft	Soil Depth: 25.2 ft	Core Depth: 60.5 ft
Date Completed: 1/15/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: J. Little	Groundwater: TOB N/A
24HR: 5.4 ft		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N VALUE				FINES CONTENT (%)	
						1st 6"	2nd 6"	3rd 6"	4th 6"	PL	LL
90.											
523.5					RC-7						
518.5	60.5	RC-8: REC = 100% , RQD = 100%, GSI = 90, RMR = 74.		55.5	RC-8						
513.5		Boring terminated at 60.5 feet.									

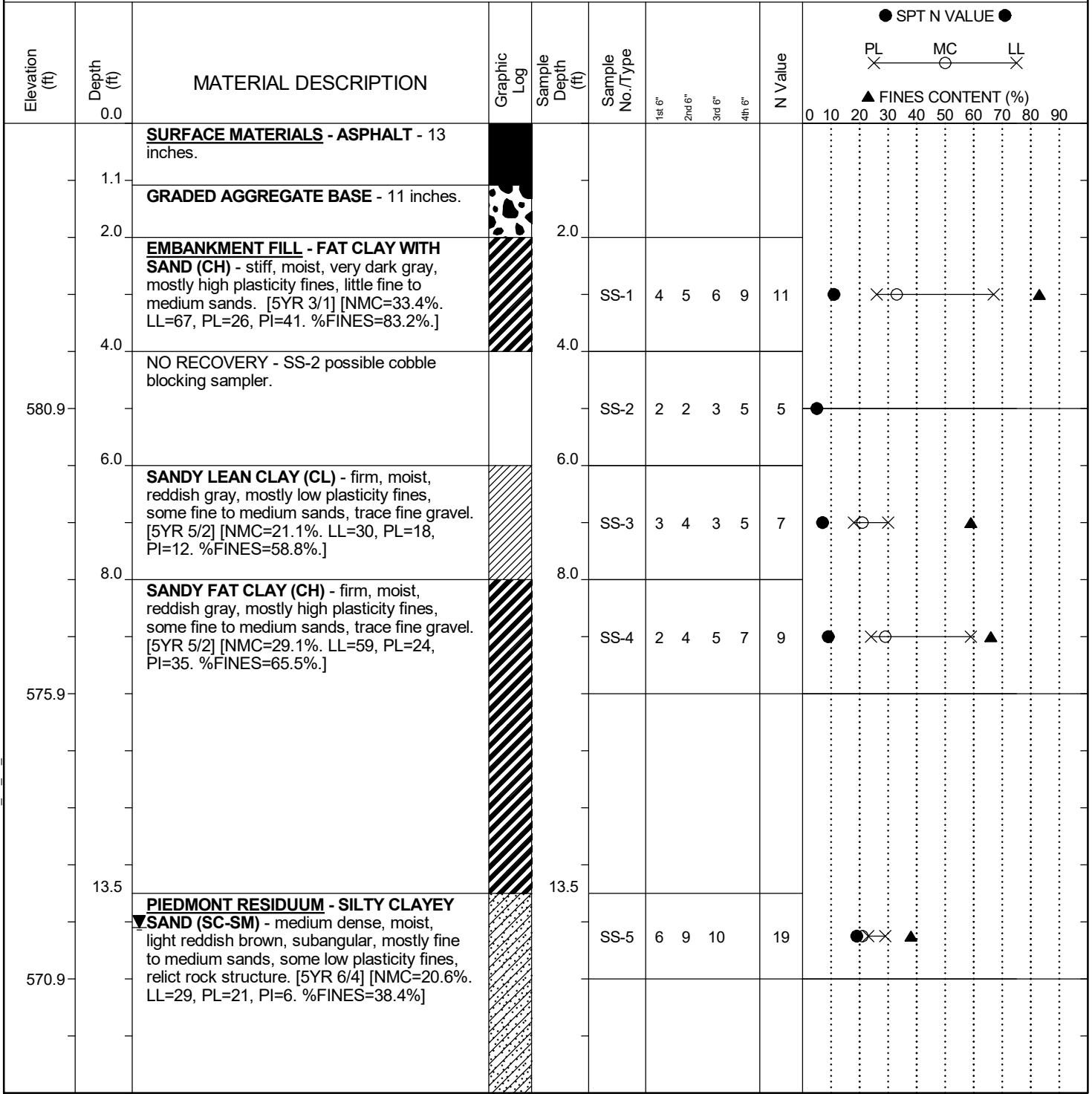
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+45.52	Offset: 72.7 LT
Alignment: Paragon		
Elev.: 585.9 ft	Latitude: 34.9587	Longitude: -80.9801
Date Started: 1/6/2020		
Total Depth: 65.5 ft	Soil Depth: 34.6 ft	Core Depth: 30.9 ft
Date Completed: 1/7/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 550X	Drill Method: Mud Rotary	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ	Driller: J. Little	Groundwater: TOB 20.7 ft
24HR: 14.1 ft		



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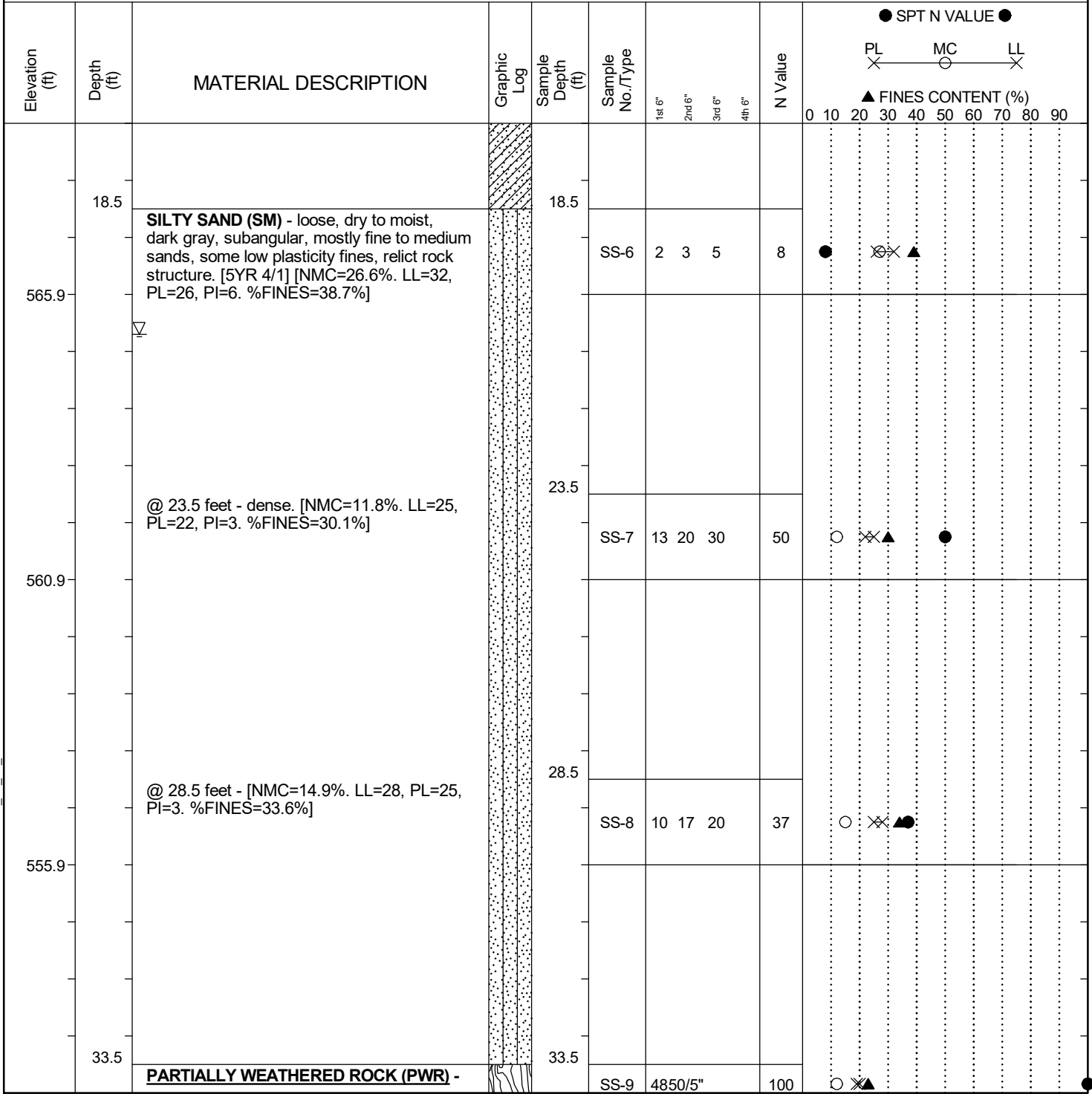
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York		Boring No.: IB-1	
Site Description: I-77 Panthers Interchange			Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+45.52		Offset: 72.7 LT	Alignment: Paragon
Elev.: 585.9 ft	Latitude: 34.9587	Longitude: -80.9801	Date Started: 1/6/2020	
Total Depth: 65.5 ft	Soil Depth: 34.6 ft	Core Depth: 30.9 ft	Date Completed: 1/7/2020	
Bore Hole Diameter (in): 5		Sampler Configuration	Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME 550X	Drill Method: Mud Rotary	Hammer Type: Automatic	Energy Ratio: 85.9%	
Core Size: NQ	Driller: J. Little	Groundwater: TOB	20.7 ft	24HR: 14.1 ft



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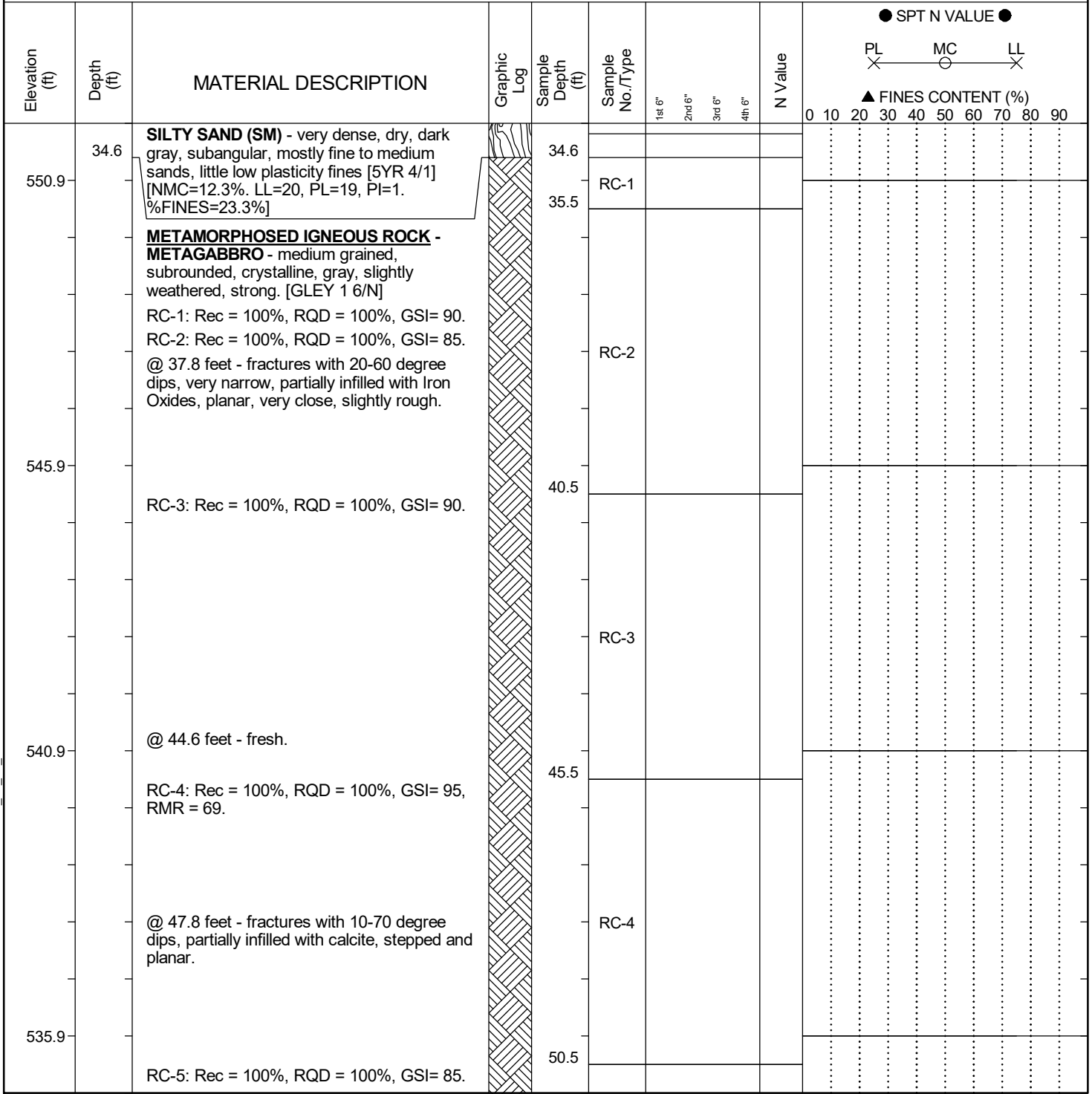
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+45.52	Offset: 72.7 LT
Alignment: Paragon		
Elev.: 585.9 ft	Latitude: 34.9587	Longitude: -80.9801
Date Started: 1/6/2020		
Total Depth: 65.5 ft	Soil Depth: 34.6 ft	Core Depth: 30.9 ft
Date Completed: 1/7/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 550X	Drill Method: Mud Rotary	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ	Driller: J. Little	Groundwater: TOB
		20.7 ft
		24HR
		14.1 ft



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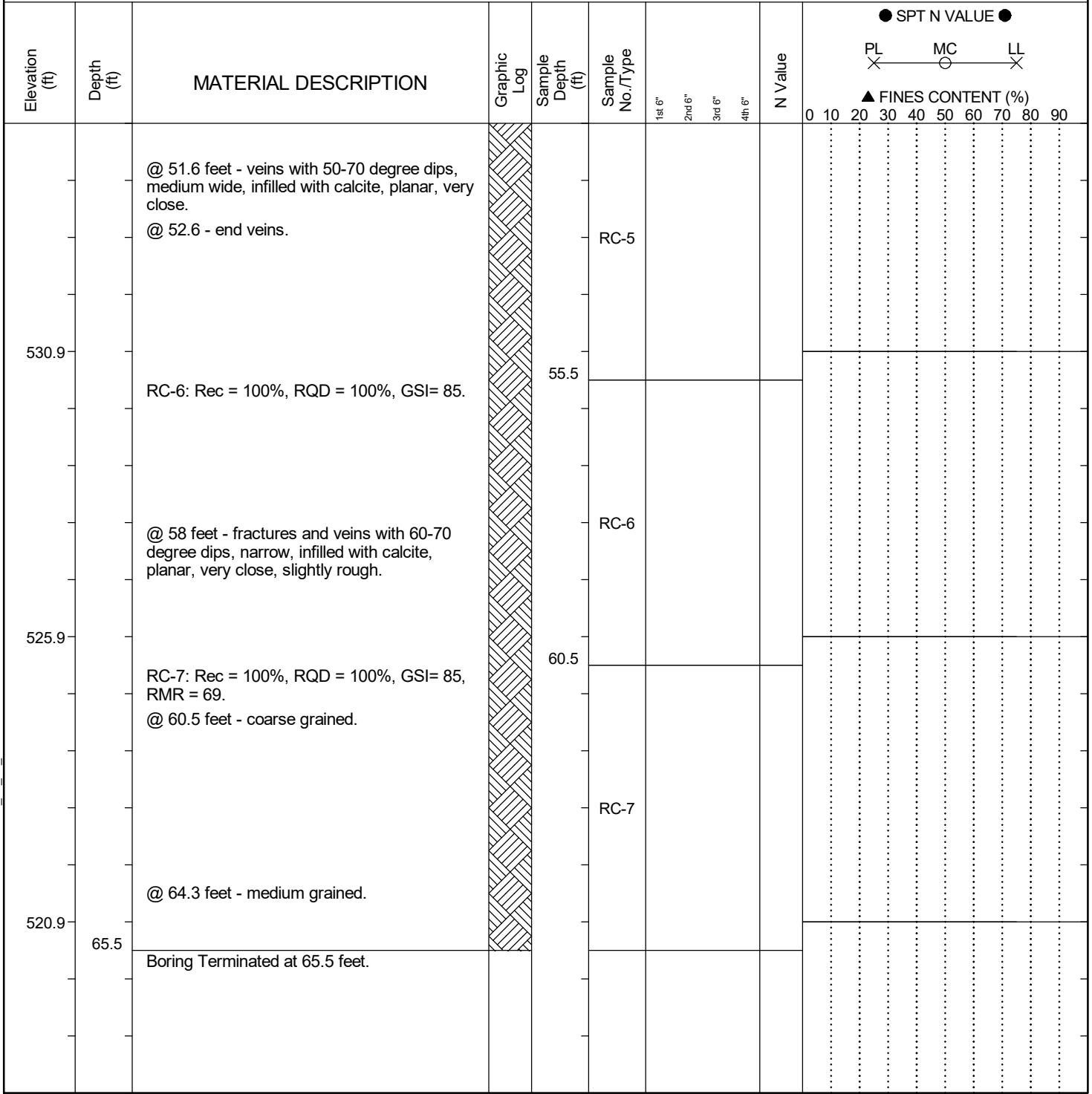
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+45.52	Offset: 72.7 LT
Alignment: Paragon		
Elev.: 585.9 ft	Latitude: 34.9587	Longitude: -80.9801
Date Started: 1/6/2020		
Total Depth: 65.5 ft	Soil Depth: 34.6 ft	Core Depth: 30.9 ft
Date Completed: 1/7/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 550X	Drill Method: Mud Rotary	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ	Driller: J. Little	Groundwater: TOB
20.7 ft	24HR	14.1 ft



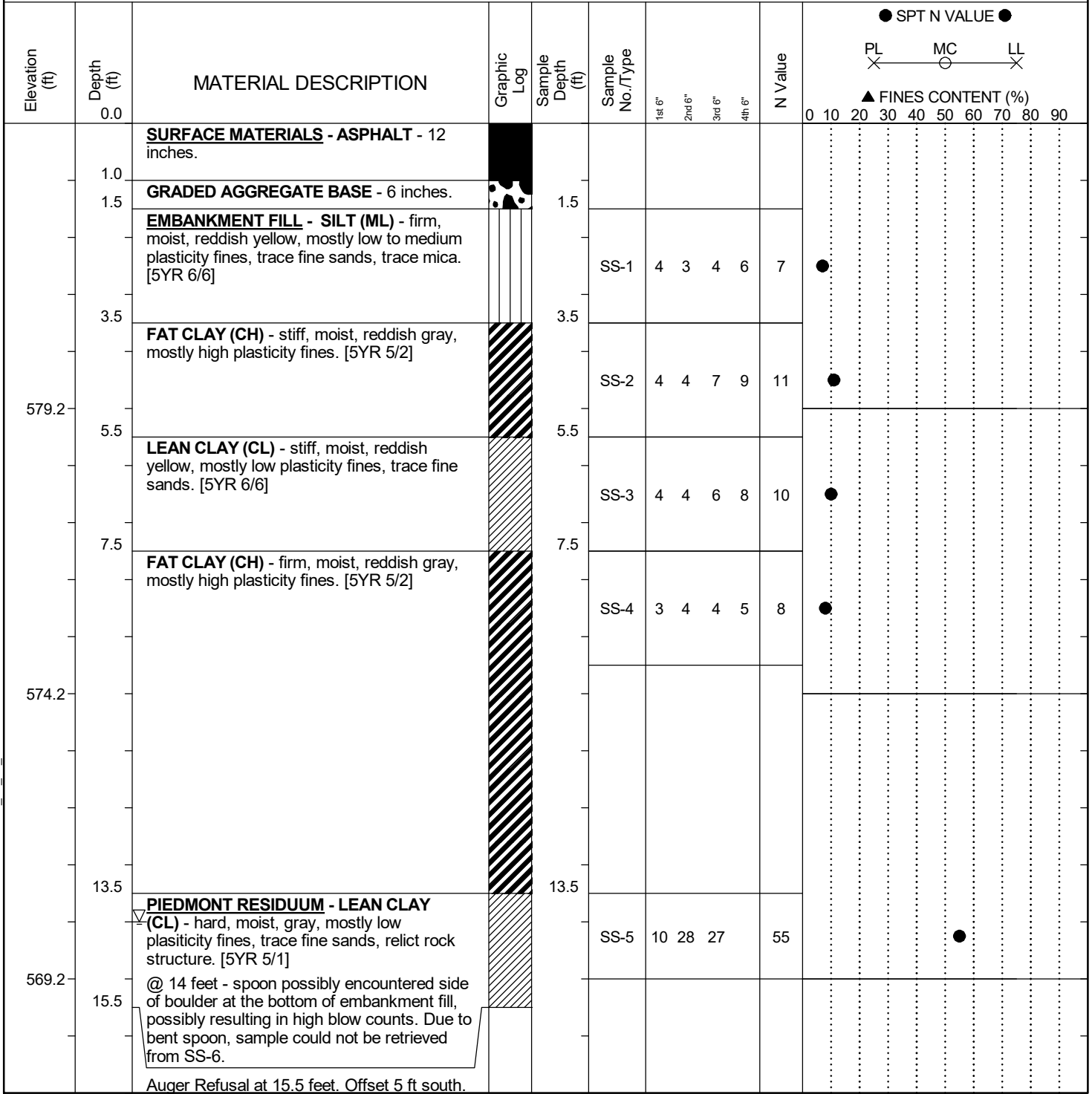
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: IB-2
Site Description: I-77 Panthers Interchange	Route: I-77			
Eng./Geo.: AKS	Boring Location: 36+53.17	Offset: 33.3 RT	Alignment: Paragon	
Elev.: 584.2 ft	Latitude: 34.9584	Longitude: -80.9799	Date Started: 1/8/2020	
Total Depth: 15.5 ft	Soil Depth: 15.5 ft	Core Depth: N/A ft	Date Completed: 1/8/2020	
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 550X	Drill Method: H.S.A.	Hammer Type: Automatic	Energy Ratio: 85.9%	
Core Size: N/A	Driller: J. Little	Groundwater: TOB 14.0 ft	24HR: N/A	



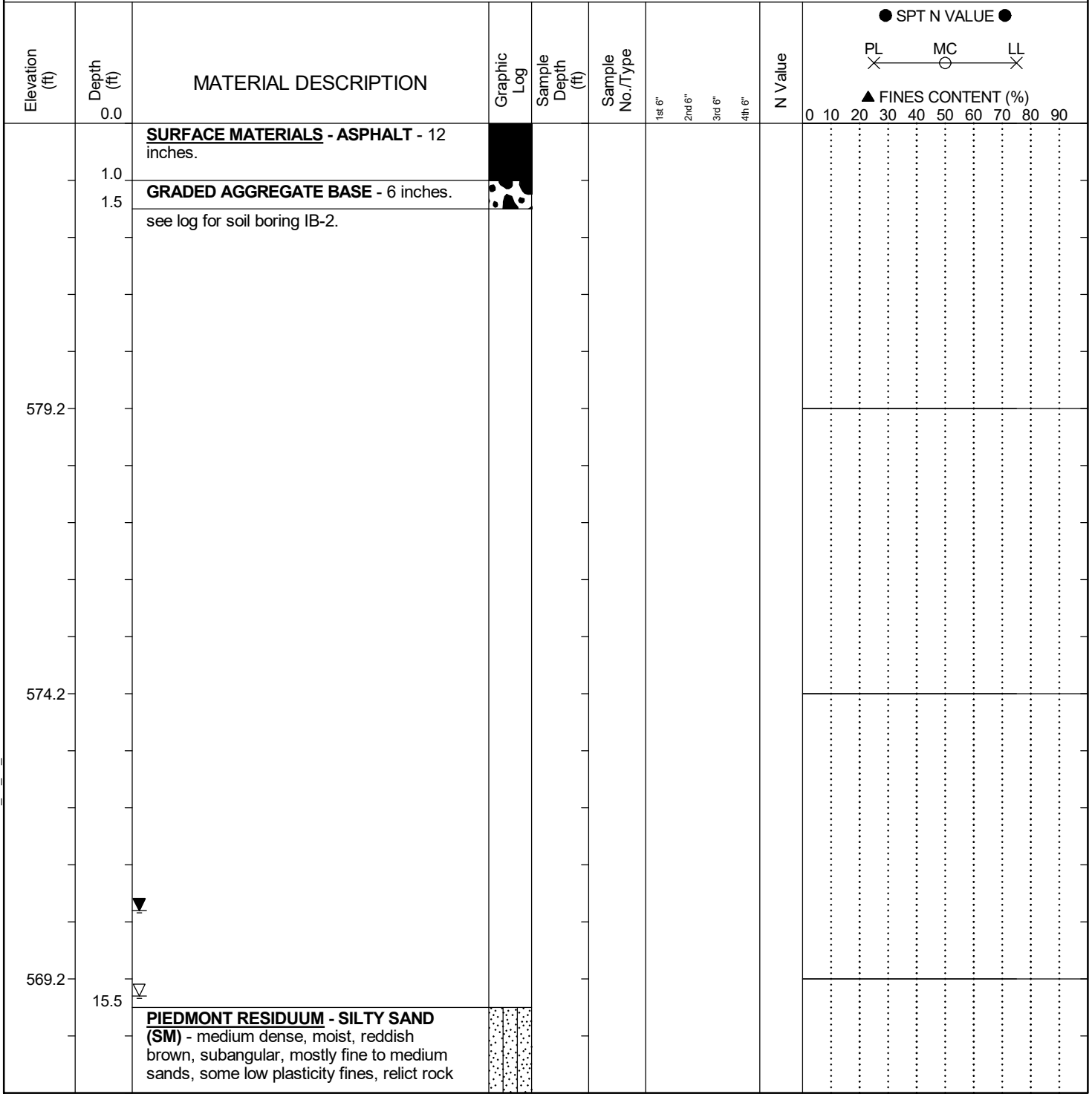
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652		County: York		Boring No.: IB-2A	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS		Boring Location: 36+53.17		Offset: 33.3 RT	Alignment: Paragon
Elev.: 584.2 ft	Latitude: 34.9584	Longitude: -80.9799	Date Started: 1/8/2020		
Total Depth: 38 ft	Soil Depth: 38 ft	Core Depth: N/A ft	Date Completed: 1/8/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME 550X	Drill Method: H.S.A.	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: J. Little	Groundwater: TOB	15.3 ft	24HR	13.8 ft



LEGEND

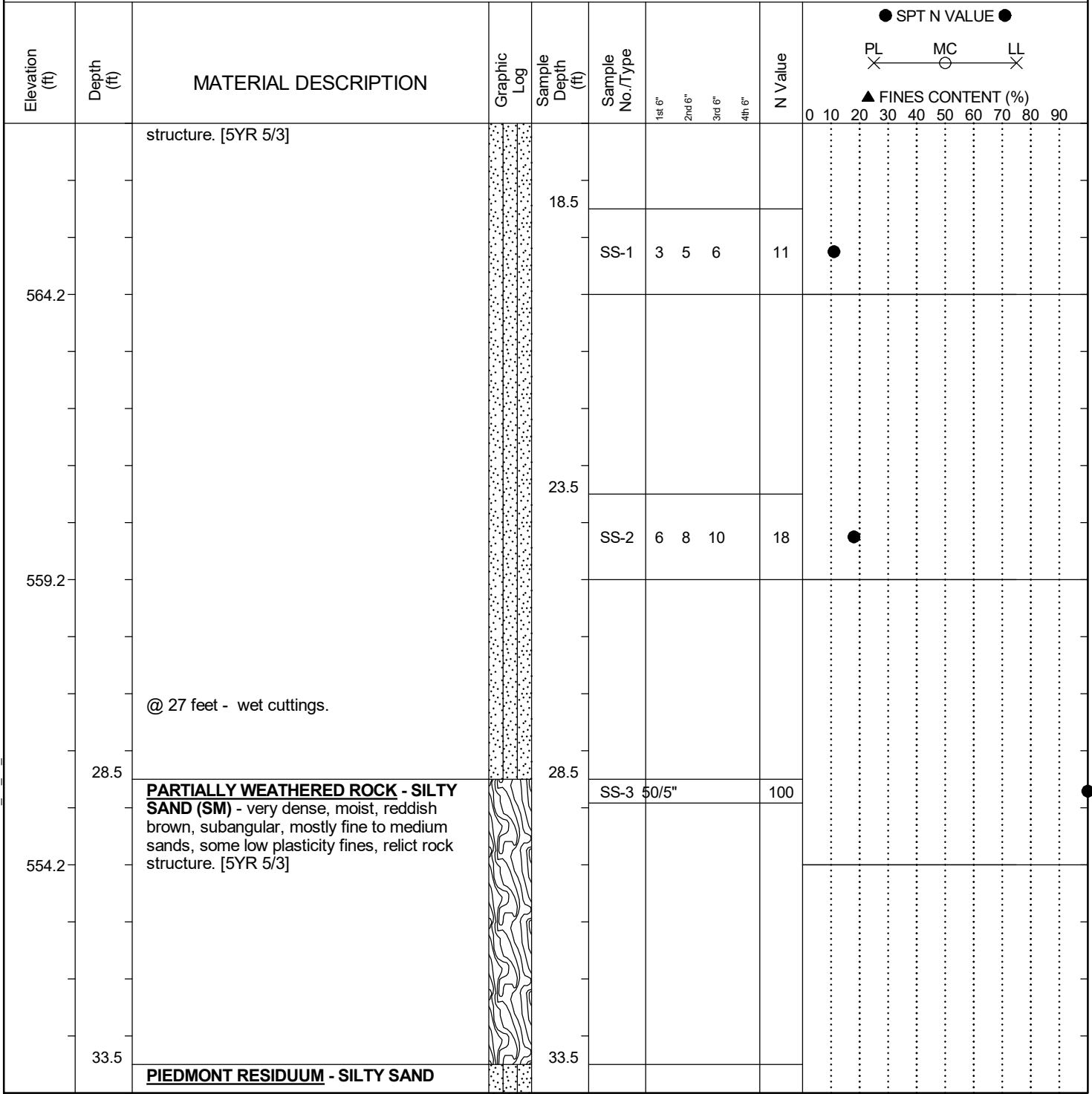
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-2A
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+53.17	Offset: 33.3 RT Alignment: Paragon
Elev.: 584.2 ft	Latitude: 34.9584	Longitude: -80.9799 Date Started: 1/8/2020
Total Depth: 38 ft	Soil Depth: 38 ft	Core Depth: N/A ft Date Completed: 1/8/2020
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N) Liner Used: Y (N)
Drill Machine: CME 550X	Drill Method: H.S.A.	Hammer Type: Automatic Energy Ratio: 85.9%
Core Size: N/A	Driller: J. Little	Groundwater: TOB 15.3 ft 24HR: 13.8 ft



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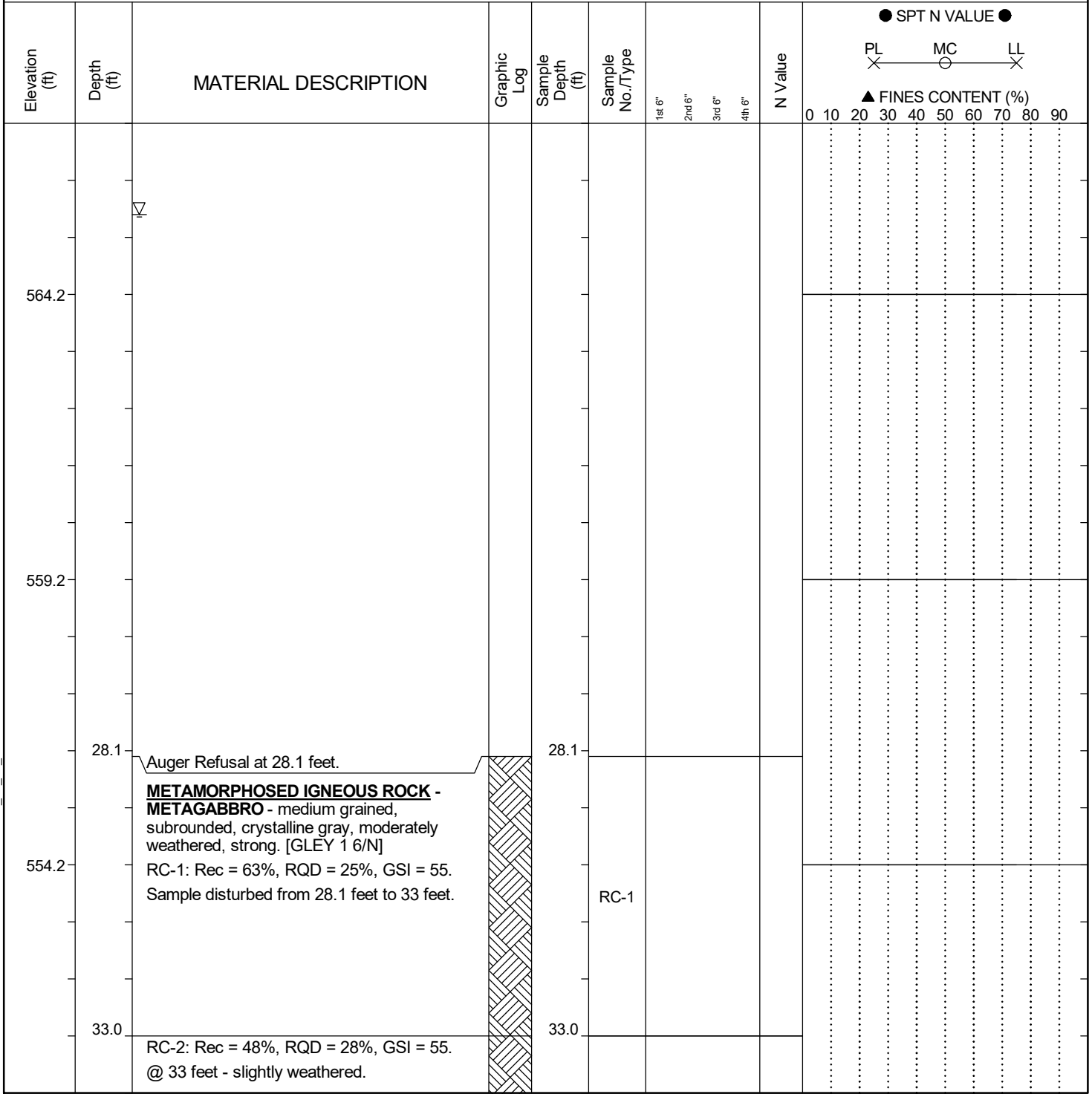
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-2B
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+53.17	Offset: 33.3 RT Alignment: Paragon
Elev.: 584.2 ft	Latitude: 34.9584	Longitude: -80.9799 Date Started: 1/8/2020
Total Depth: 63 ft	Soil Depth: 28.1 ft	Core Depth: 34.9 ft Date Completed: 1/9/2020
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N) Liner Used: Y (N)
Drill Machine: CME 550X	Drill Method: H.S.A.	Hammer Type: Automatic Energy Ratio: 85.9%
Core Size: NQ	Driller: F. Johnson	Groundwater: TOB 18.6 ft 24HR: 14.1 ft



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	

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-2B
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 36+53.17	Offset: 33.3 RT Alignment: Paragon
Elev.: 584.2 ft	Latitude: 34.9584	Longitude: -80.9799 Date Started: 1/8/2020
Total Depth: 63 ft	Soil Depth: 28.1 ft	Core Depth: 34.9 ft Date Completed: 1/9/2020
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N) Liner Used: Y (N)
Drill Machine: CME 550X	Drill Method: H.S.A.	Hammer Type: Automatic Energy Ratio: 85.9%
Core Size: NQ	Driller: F. Johnson	Groundwater: TOB 18.6 ft 24HR: 14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N VALUE				N Value	FINES CONTENT (%)									
						1st 6"	2nd 6"	3rd 6"	4th 6"		PL	MC	LL	▲ FINES CONTENT (%)						
529.2		RC-6: Rec = 100%, RQD = 100%, GSI = 95, RMR = 79.	[Hatched Pattern]	53.0																
						RC-6														
524.2		RC-7: Rec = 100%, RQD = 100%, GSI = 95.	[Hatched Pattern]	58.0																
						RC-7														
63.0		Boring Terminated at 63 feet.																		
519.2																				

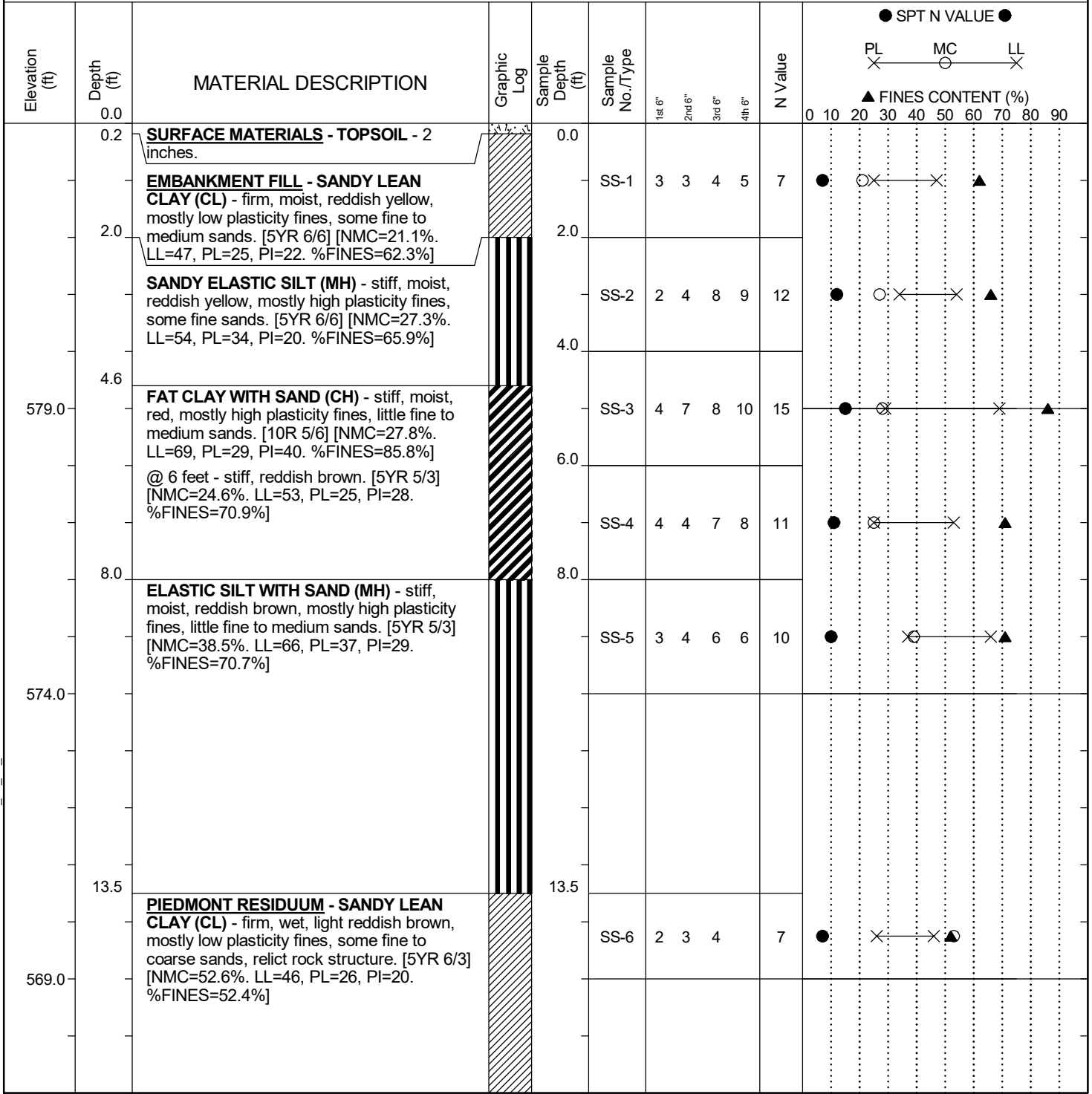
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: IB-3	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS	Boring Location: 35+04.31		Offset: 64.1 LT	Alignment: Paragon	
Elev.: 584.0 ft	Latitude: 34.9585	Longitude: -80.9805	Date Started: 1/17/2020		
Total Depth: 70.1 ft	Soil Depth: 38.1 ft	Core Depth: 70.1 ft	Date Completed: 1/17/2020		
Bore Hole Diameter (in): 5		Sampler Configuration	Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic	Energy Ratio: 85.9%		
Core Size: NQ2	Driller: F. Johnson	Groundwater: TOB	12.5 ft	24HR	



LEGEND

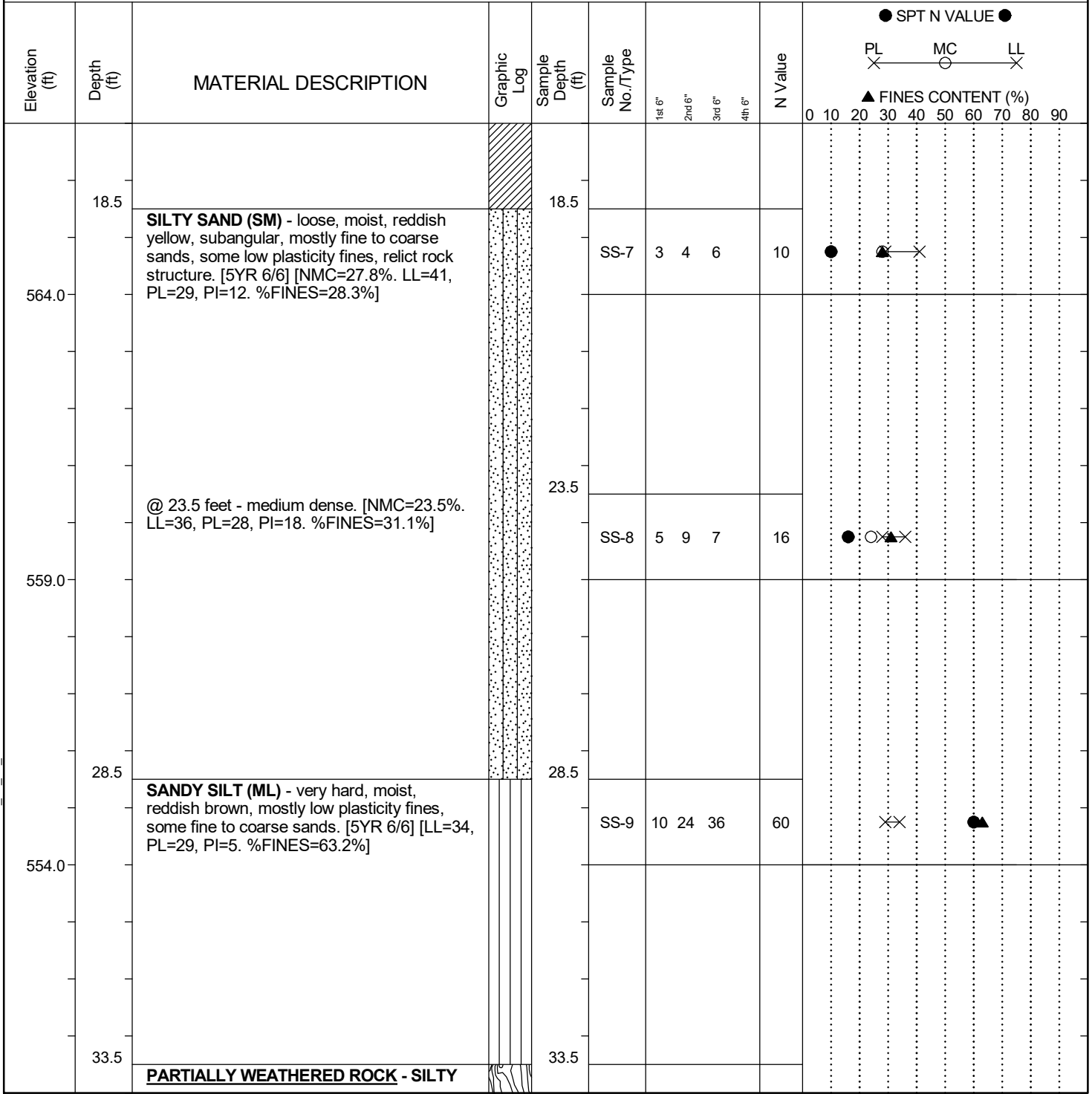
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing	
NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York		Boring No.: IB-3	
Site Description: I-77 Panthers Interchange			Route: I-77	
Eng./Geo.: AKS	Boring Location: 35+04.31		Offset: 64.1 LT	Alignment: Paragon
Elev.: 584.0 ft	Latitude: 34.9585	Longitude: -80.9805	Date Started: 1/17/2020	
Total Depth: 70.1 ft	Soil Depth: 38.1 ft	Core Depth: 70.1 ft	Date Completed: 1/17/2020	
Bore Hole Diameter (in): 5		Sampler Configuration	Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic	Energy Ratio: 85.9%	
Core Size: NQ2	Driller: F. Johnson	Groundwater: TOB	12.5 ft	24HR



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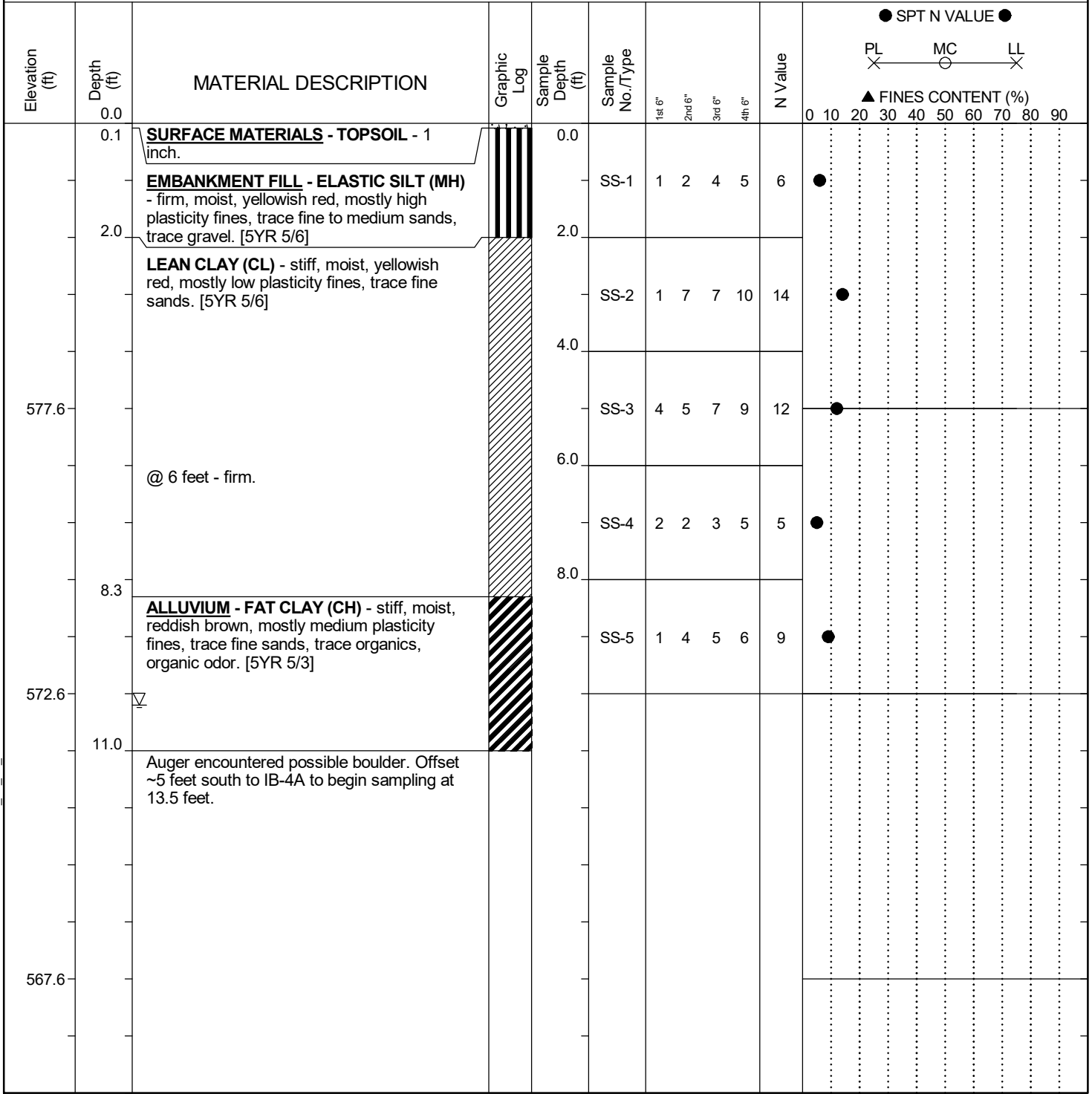
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: IB-4	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS	Boring Location: 35+06.63		Offset: 24.4 RT	Alignment: Paragon	
Elev.: 582.6 ft	Latitude: 34.9583	Longitude: -80.9804	Date Started: 1/16/2020		
Total Depth: 11 ft	Soil Depth: 11 ft	Core Depth: N/A ft	Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5		Sampler Configuration	Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic	Energy Ratio: 85.9%		
Core Size: N/A	Driller: F. Johnson	Groundwater: TOB	10.2 ft	24HR: FIAD	



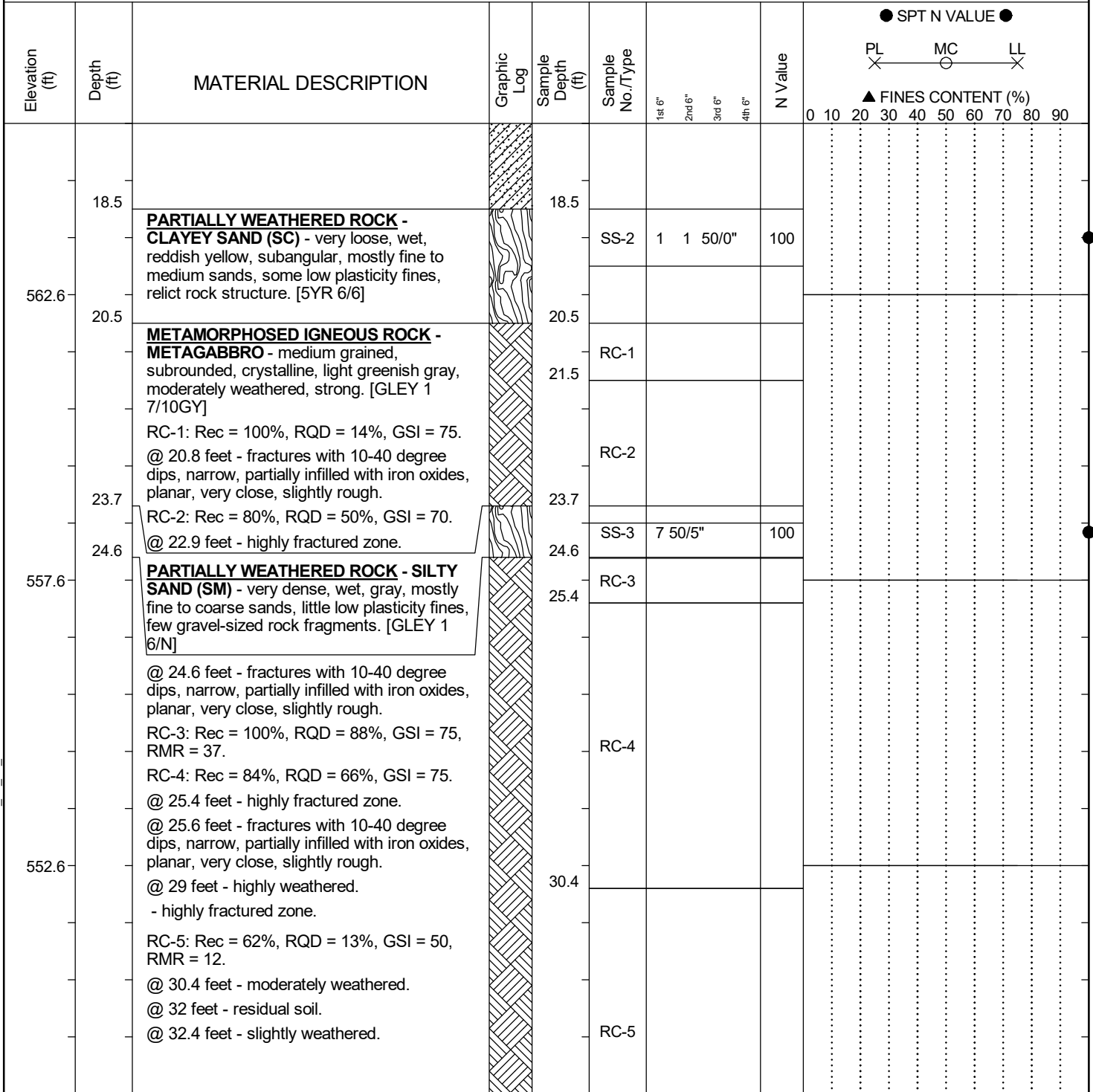
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: IB-4A	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS		Boring Location: 35+06.63		Offset: 24.4 RT	Alignment: Paragon
Elev.: 582.6 ft	Latitude: 34.9583	Longitude: -80.9804	Date Started: 1/16/2020		
Total Depth: 55.4 ft	Soil Depth: 24.6 ft	Core Depth: 55.4 ft	Date Completed: 1/17/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: NQ2	Driller: J. Little	Groundwater: TOB	11.2 ft	24HR	12 ft



LEGEND

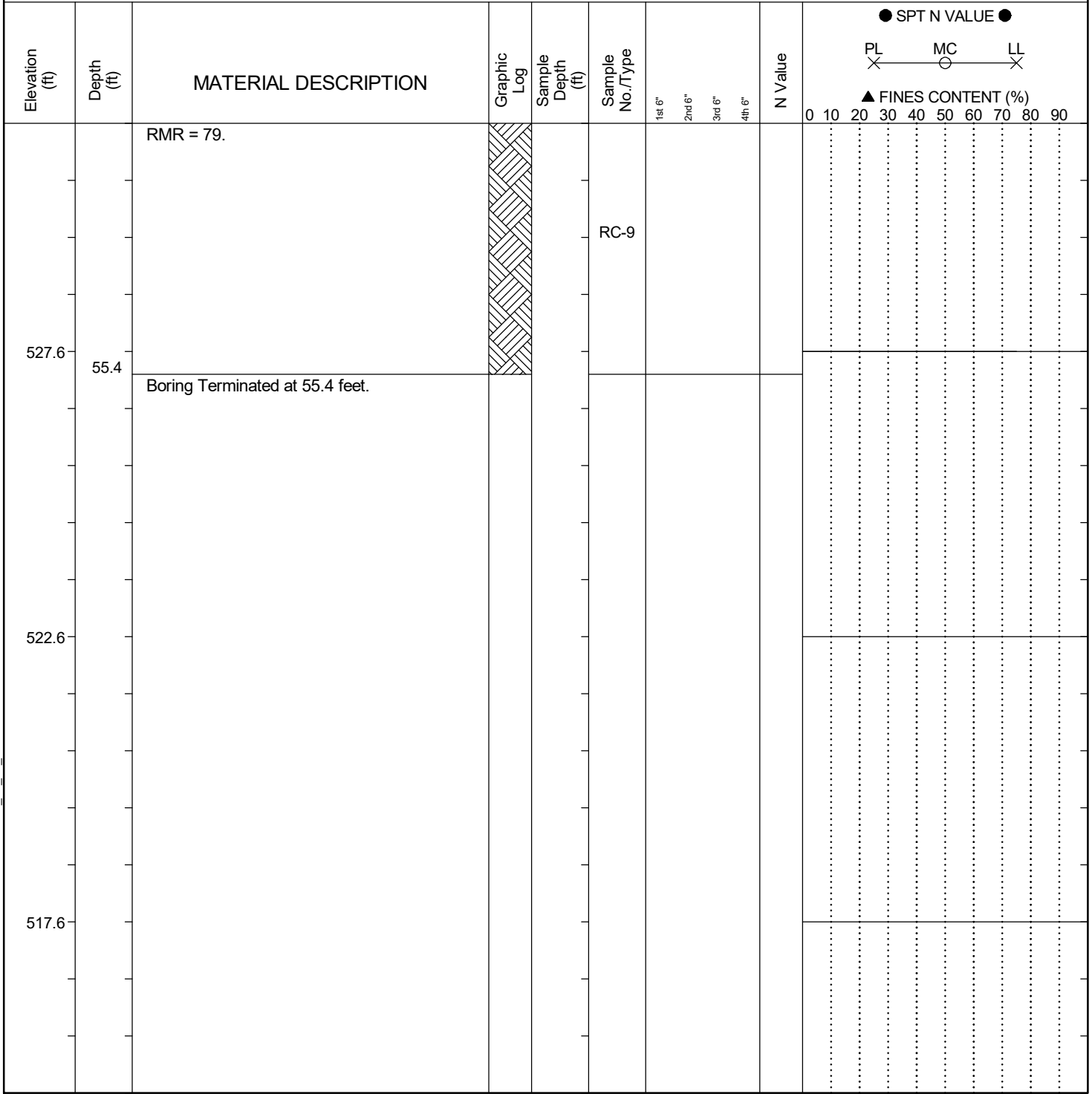
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: IB-4A
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 35+06.63	Offset: 24.4 RT
Alignment: Paragon		
Elev.: 582.6 ft	Latitude: 34.9583	Longitude: -80.9804
Date Started: 1/16/2020		
Total Depth: 55.4 ft	Soil Depth: 24.6 ft	Core Depth: 55.4 ft
Date Completed: 1/17/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: NQ2	Driller: J. Little	Groundwater: TOB 11.2 ft
24HR: 12 ft		



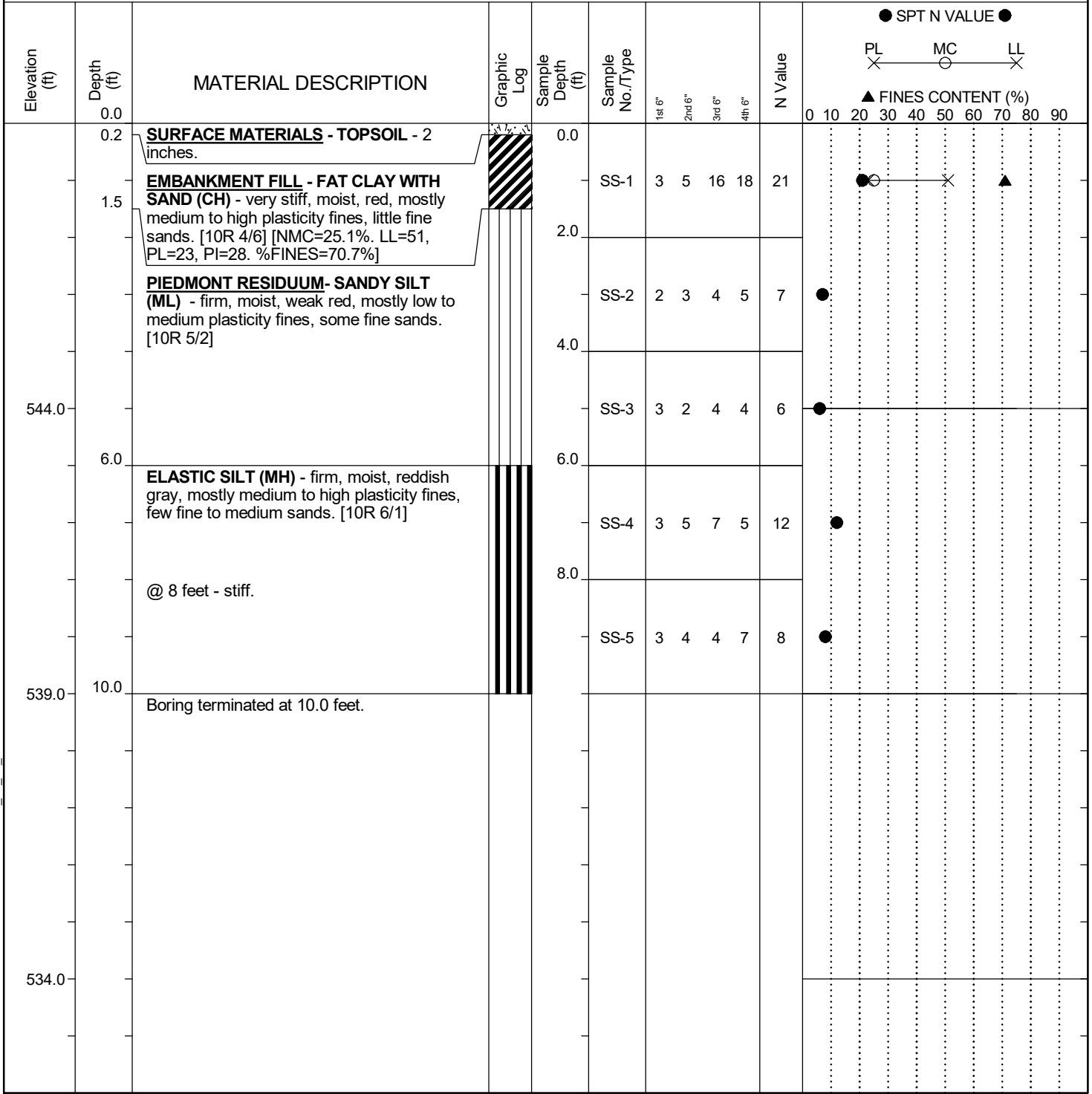
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 580+08.81	Offset: 1.4 RT
Alignment: Ramp 3		
Elev.: 549.0 ft	Latitude: 34.9535	Longitude: -80.9778
Date Started: 1/6/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/6/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-55	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 80.3%		
Core Size: N/A	Driller: H. Lewis	Groundwater: TOB Dry
24HR: FIAD		



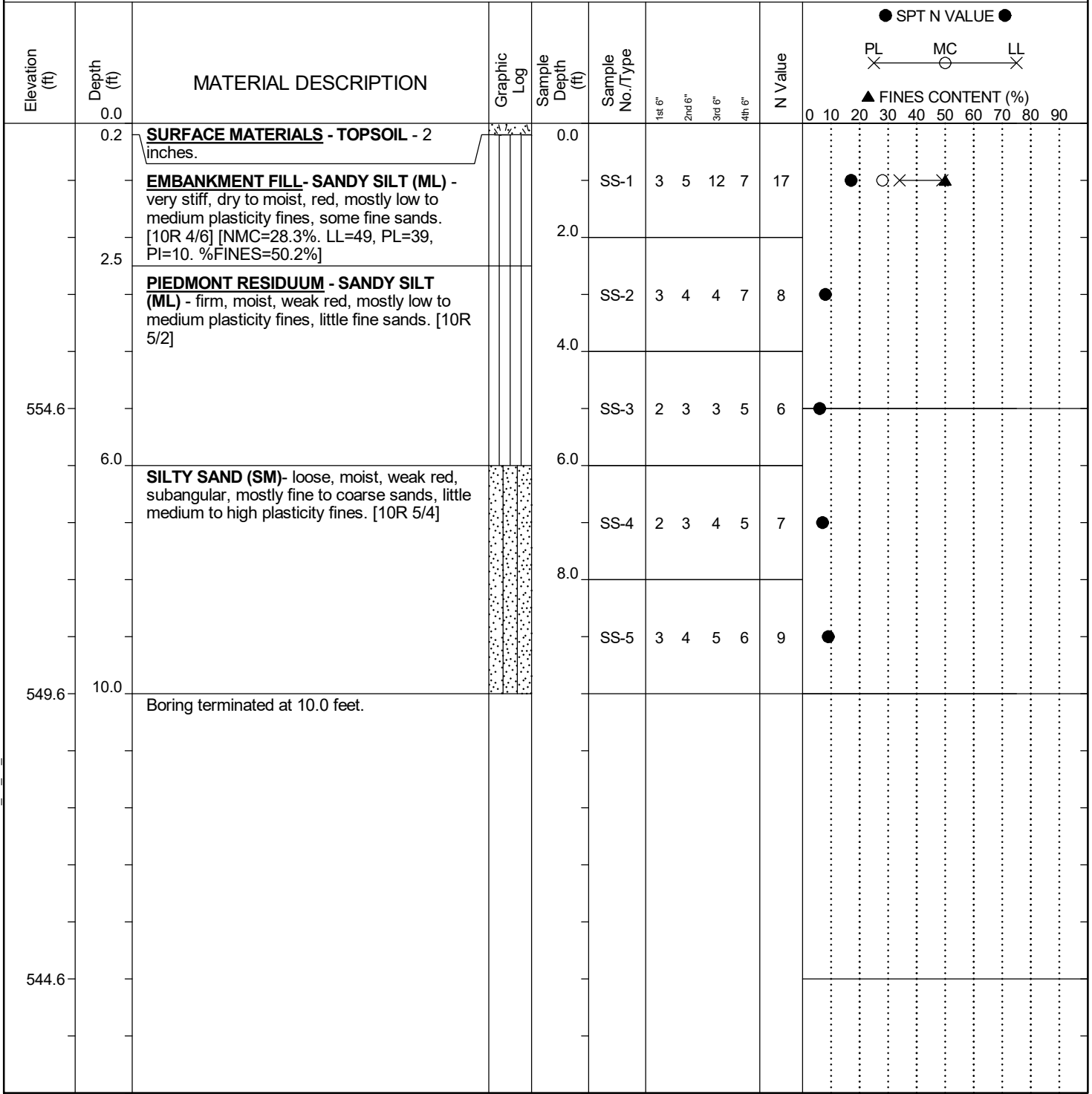
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing RW - Rotary Wash RC - Rock Core	
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SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-2
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 574+99.20	Offset: 35.1 RT
Alignment: Ramp 3		
Elev.: 559.6 ft	Latitude: 34.9548	Longitude: -80.9784
Date Started: 1/6/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/6/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-55	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 80.3%		
Core Size: N/A	Driller: H. Lewis	Groundwater: TOB Dry
24HR: FIAD		



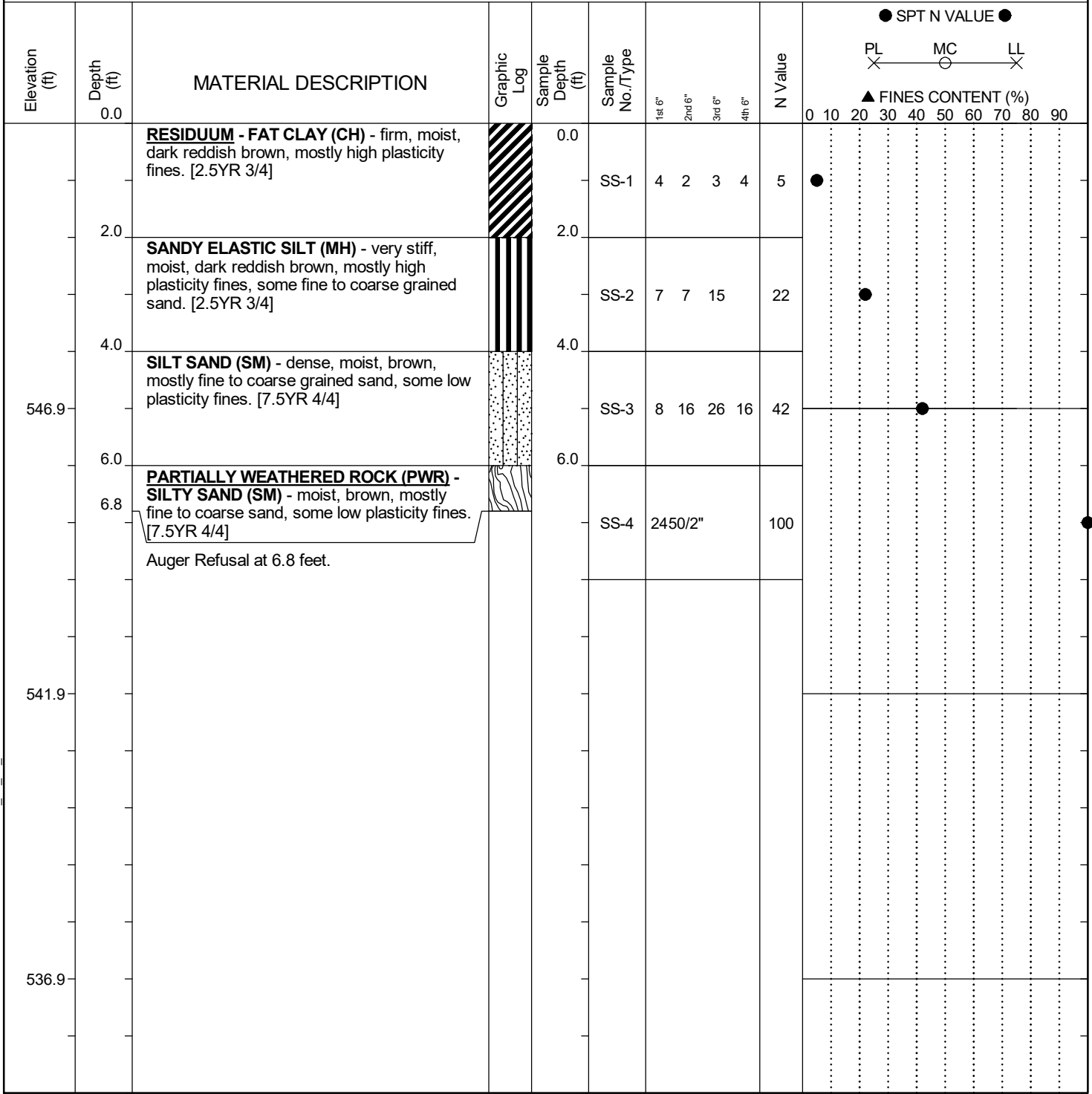
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-3
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 570+15.26	Offset: 3.4 LT
Alignment: Ramp 3		
Elev.: 551.9 ft	Latitude: 34.9562	Longitude: -80.9783
Date Started: 5/26/2020		
Total Depth: 6.8 ft	Soil Depth: 20 ft	Core Depth: N/A ft
Date Completed: 5/26/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



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 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-5
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 549+09.87	Offset: 19.7 RT
Alignment: Ramp 2		
Elev.: 599.7 ft	Latitude: 34.9615	Longitude: -80.9812
Date Started: 1/6/2020		
Total Depth: 15 ft	Soil Depth: 15 ft	Core Depth: N/A ft
Date Completed: 1/6/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-55	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 80.3%		
Core Size: N/A	Driller: H. Lewis	Groundwater: TOB Dry
24HR: Dry		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N VALUE				FINES CONTENT (%)		
						1st 6"	2nd 6"	3rd 6"	4th 6"	PL	MC	LL
	0.0	SURFACE MATERIALS - TOPSOIL - 3 inches.		0.0								
	2.0	EMBANKMENT FILL - ELASTIC SILT WITH SAND (MH) - firm, moist, red, mostly medium to high plasticity fines, little fine sands. [10R 4/6] [NMC=27.6%. LL=57, PL=36, PI=21. %FINES=80.2%]		2.0	SS-1	2	3	4	6	7	●	○ X — X: ▲
	4.0	PIEDMONT RESIDUUM - ELASTIC SILT (MH) - firm, moist, weak red, mostly high plasticity fines, trace fine sands. [10R 5/2]		4.0	SS-2	3	4	4	6	8	●	
594.7	4.0	SANDY SILT (ML) - firm, moist to wet, weak red, mostly low to medium plasticity fines, little fine to medium sands. [10R 5/2]		4.0	SS-3	3	4	3	7	7	●	
	6.0			6.0	SS-4	3	2	3	5	5	●	
	8.0			8.0	SS-5	2	2	3	3	5	●	
589.7												
	13.5	@ 13.5 feet - soft.		13.5								
	15.0	Boring terminated at 15.0 feet.		15.0	SS-6	2	2	2		4	●	

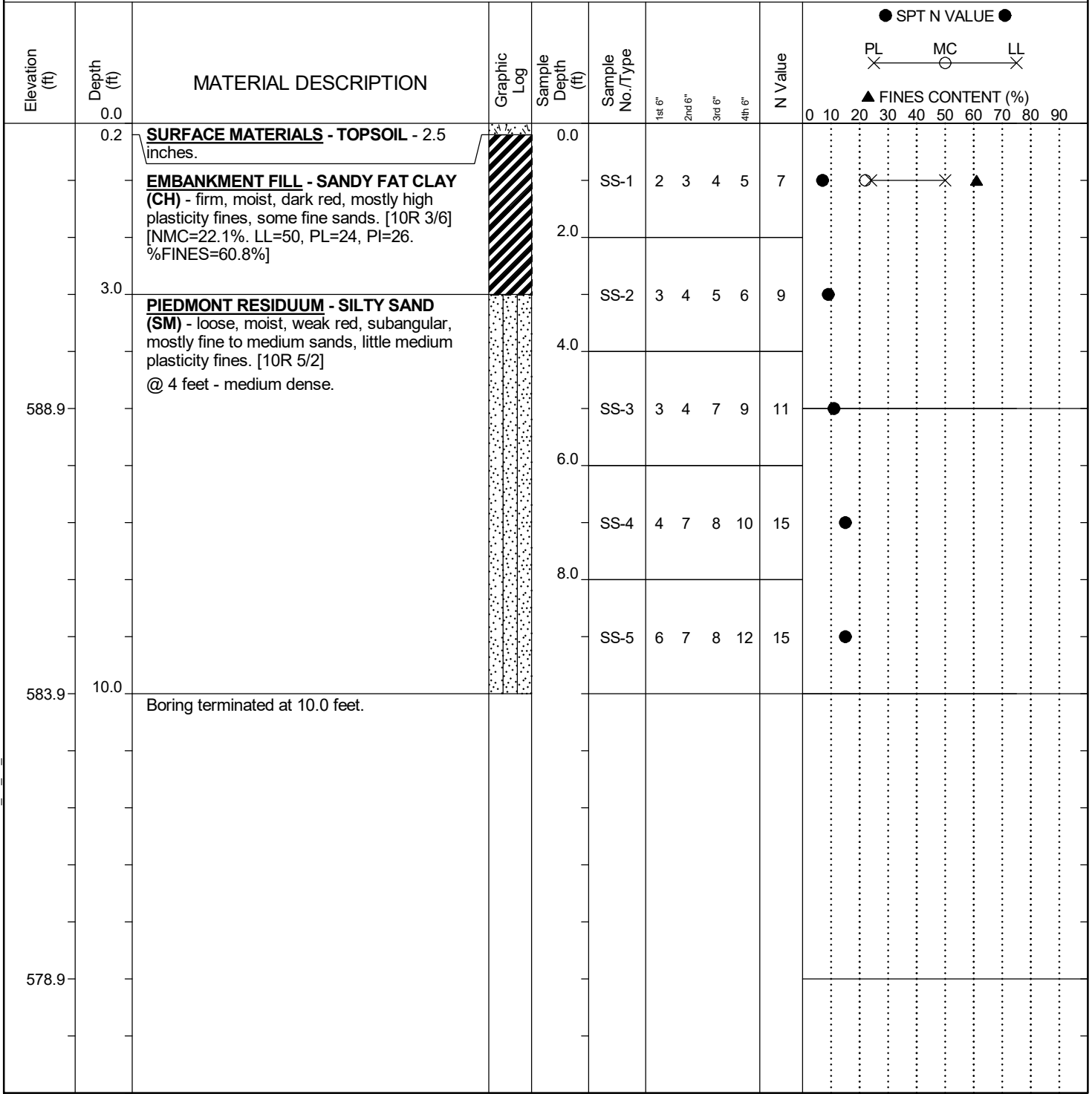
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-6
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 554+10.13	Offset: 5.8 LT
Alignment: Ramp 2		
Elev.: 593.9 ft	Latitude: 34.9603	Longitude: -80.9806
Date Started: 1/6/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/6/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-55	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 80.3%		
Core Size: N/A	Driller: H. Lewis	Groundwater: TOB Dry
24HR: Dry		



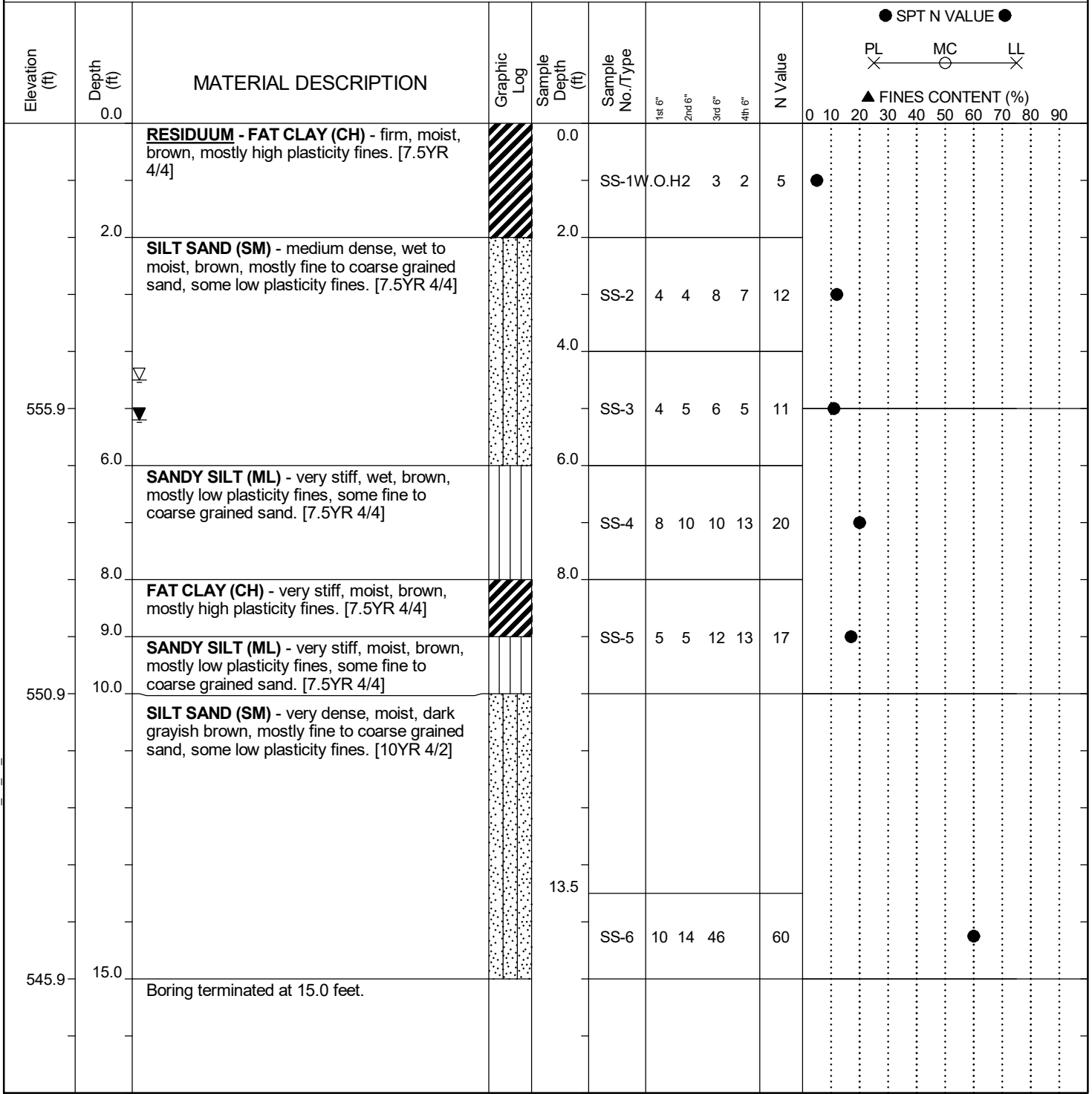
LEGEND

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 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-7
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 566+04.26	Offset: 18.1 LT
Alignment: Ramp 2		
Elev.: 560.9 ft	Latitude: 34.9575	Longitude: -80.9789
Date Started: 5/26/2020		
Total Depth: 15 ft	Soil Depth: 15 ft	Core Depth: N/A ft
Date Completed: 5/26/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB 4.5 ft
24HR: 5.2 ft		



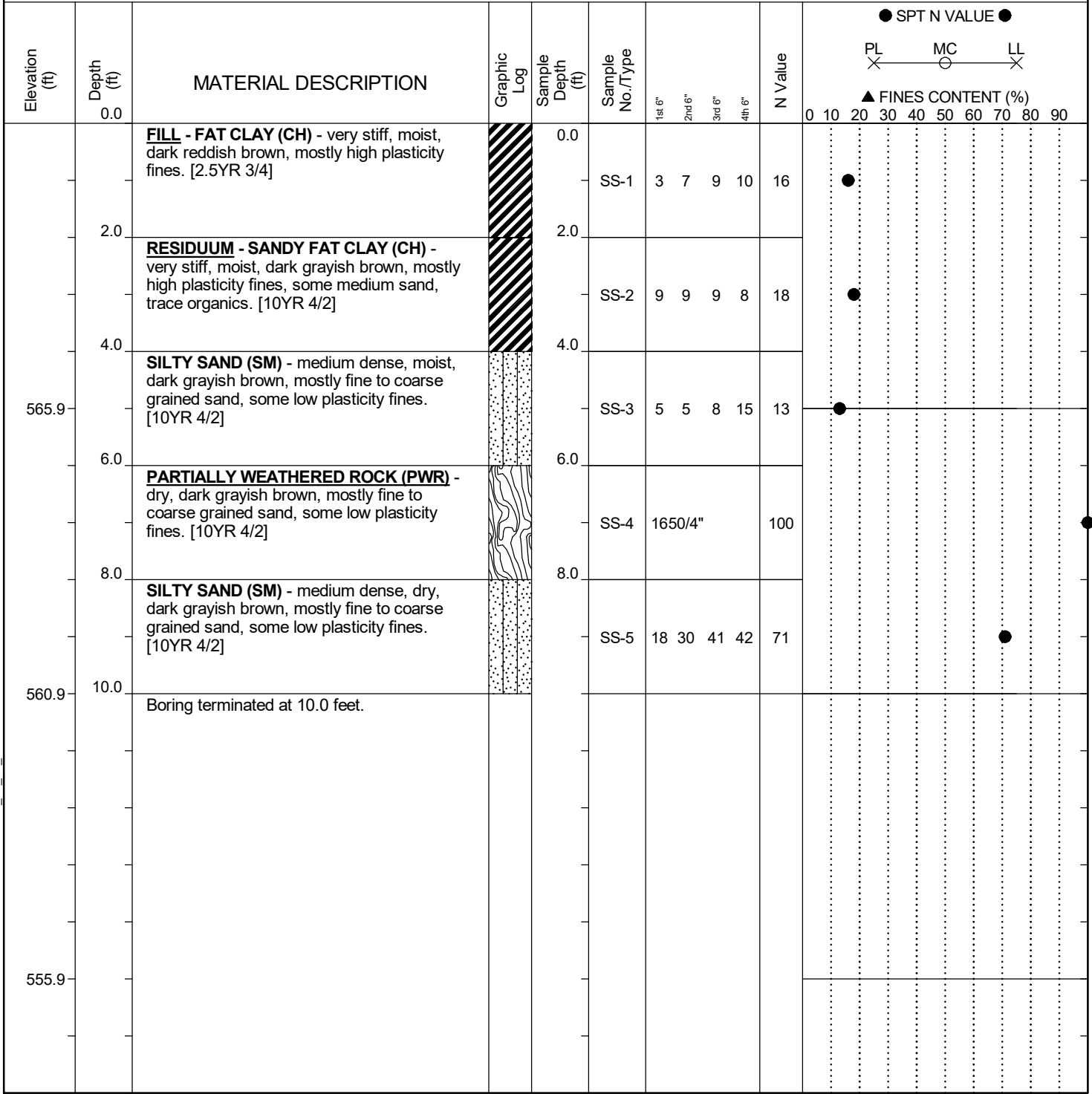
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: EM-8
Site Description: I-77 Panthers Interchange	Route: I-77			
Eng./Geo.: JCP	Boring Location: 569+10.42	Offset: 4.1 LT	Alignment: Ramp 2	
Elev.: 570.9 ft	Latitude: 34.9578	Longitude: -80.9781	Date Started: 5/26/2020	
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft	Date Completed: 5/26/2020	
Bore Hole Diameter (in): 5	Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic	Energy Ratio: 85.9%	
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry	24HR: Dry	



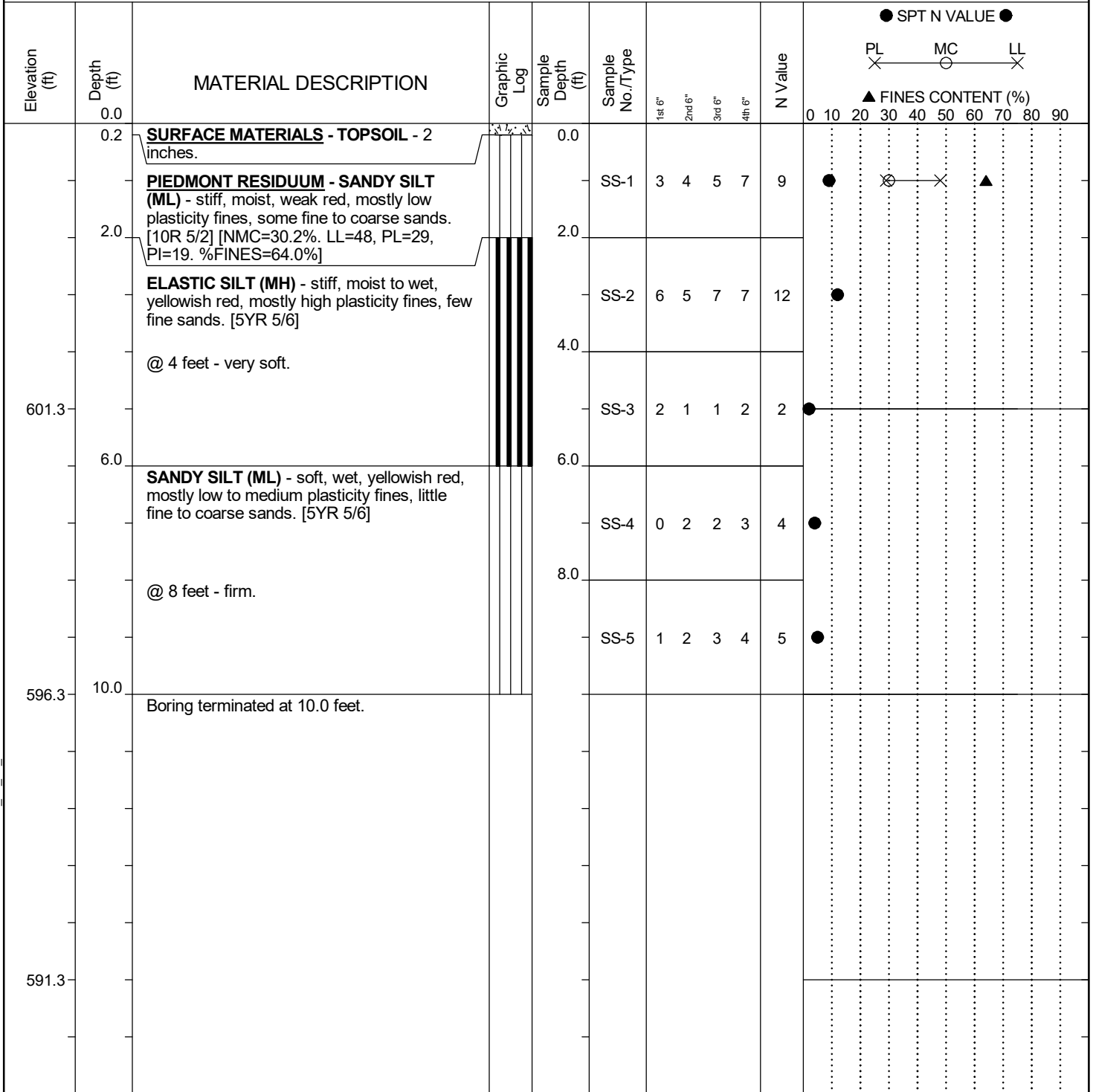
LEGEND

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 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-9
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 544+12.4	Offset: 9.2 RT
Alignment: Ramp 1		
Elev.: 606.3 ft	Latitude: 34.9627	Longitude: -80.9823
Date Started: 1/16/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
		24HR



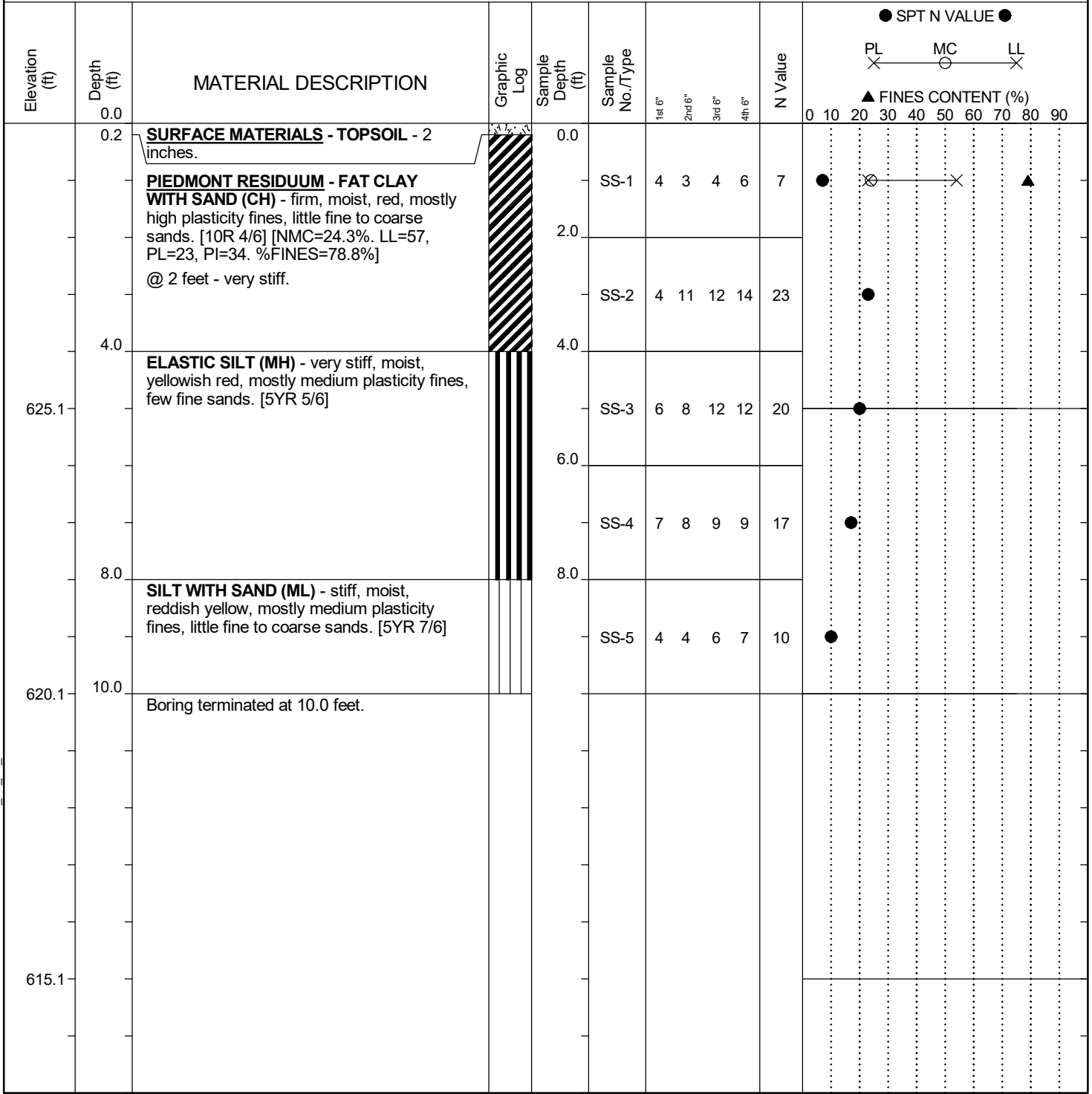
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: EM-10
Site Description: I-77 Panthers Interchange			Route: I-77	
Eng./Geo.: AMR	Boring Location: 549+61.5		Offset: 0.1 RT	Alignment: Ramp 1
Elev.: 630.1 ft	Latitude: 34.9612	Longitude: -80.9819	Date Started: 1/16/2020	
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft	Date Completed: 1/16/2020	
Bore Hole Diameter (in): 5		Sampler Configuration	Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic	Energy Ratio: 85.9%	
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry	24HR: Dry	



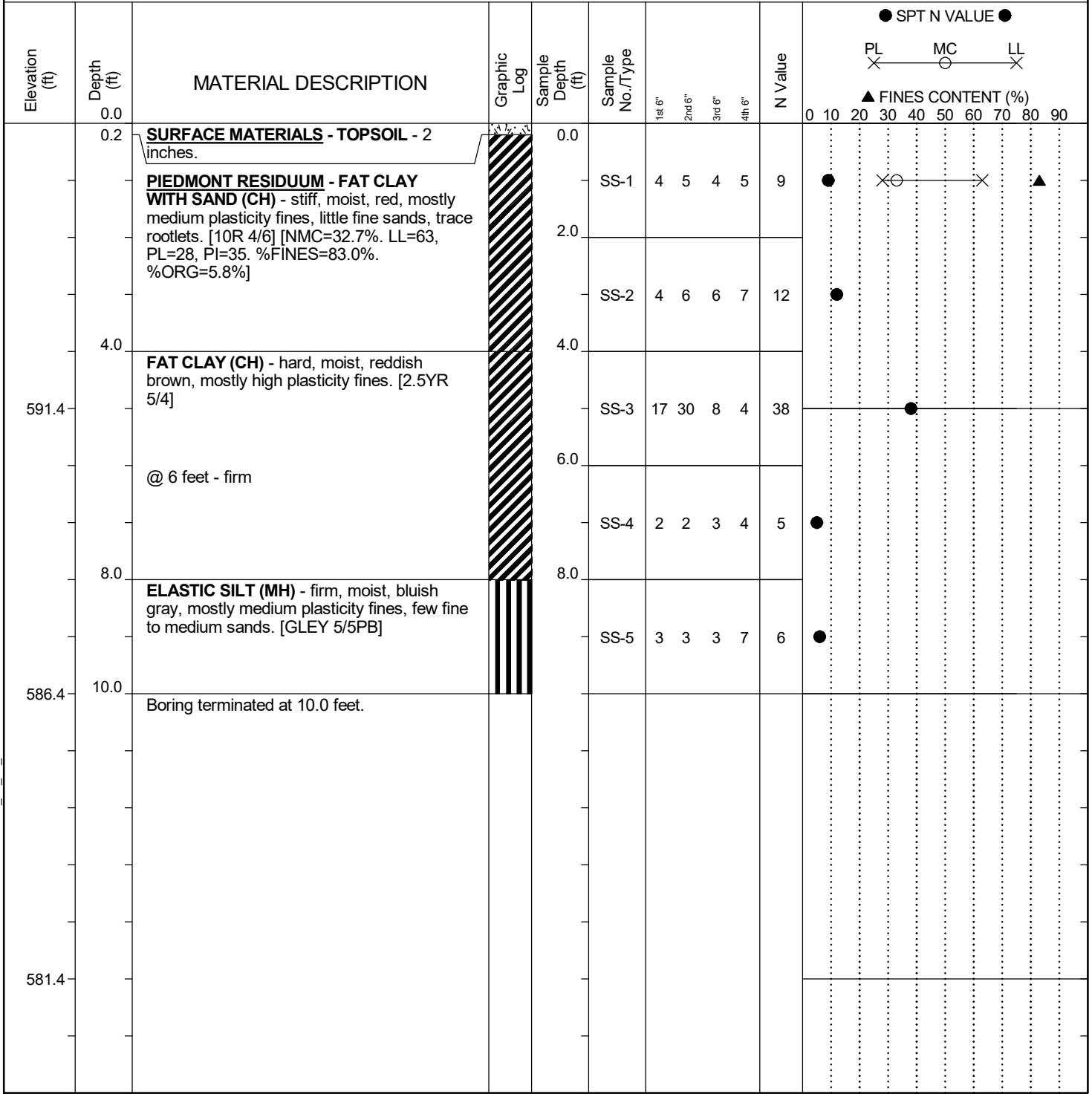
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-11
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 555+75.1	Offset: 17.6 RT
Alignment: Ramp 1		
Elev.: 596.4 ft	Latitude: 34.9597	Longitude: -80.9826
Date Started: 1/10/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/10/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
		24HR



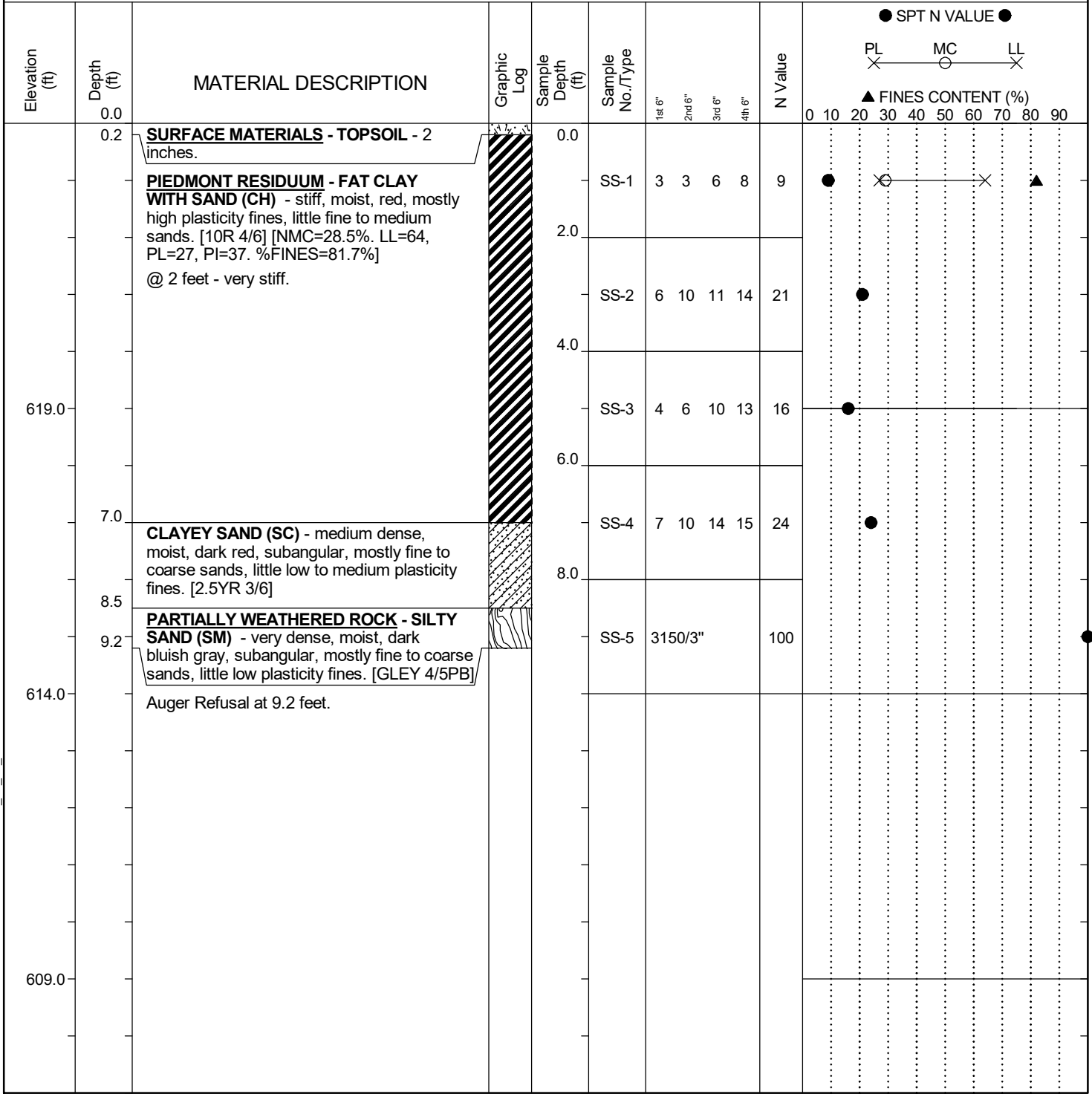
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: EM-12	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AMR		Boring Location: 559+58.8		Offset: 10.8 RT	Alignment: Ramp 1
Elev.: 624.0 ft	Latitude: 34.9586	Longitude: -80.9825	Date Started: 1/10/2020		
Total Depth: 9.2 ft	Soil Depth: 9.2 ft	Core Depth: N/A ft	Date Completed: 1/10/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry		24HR: Dry	



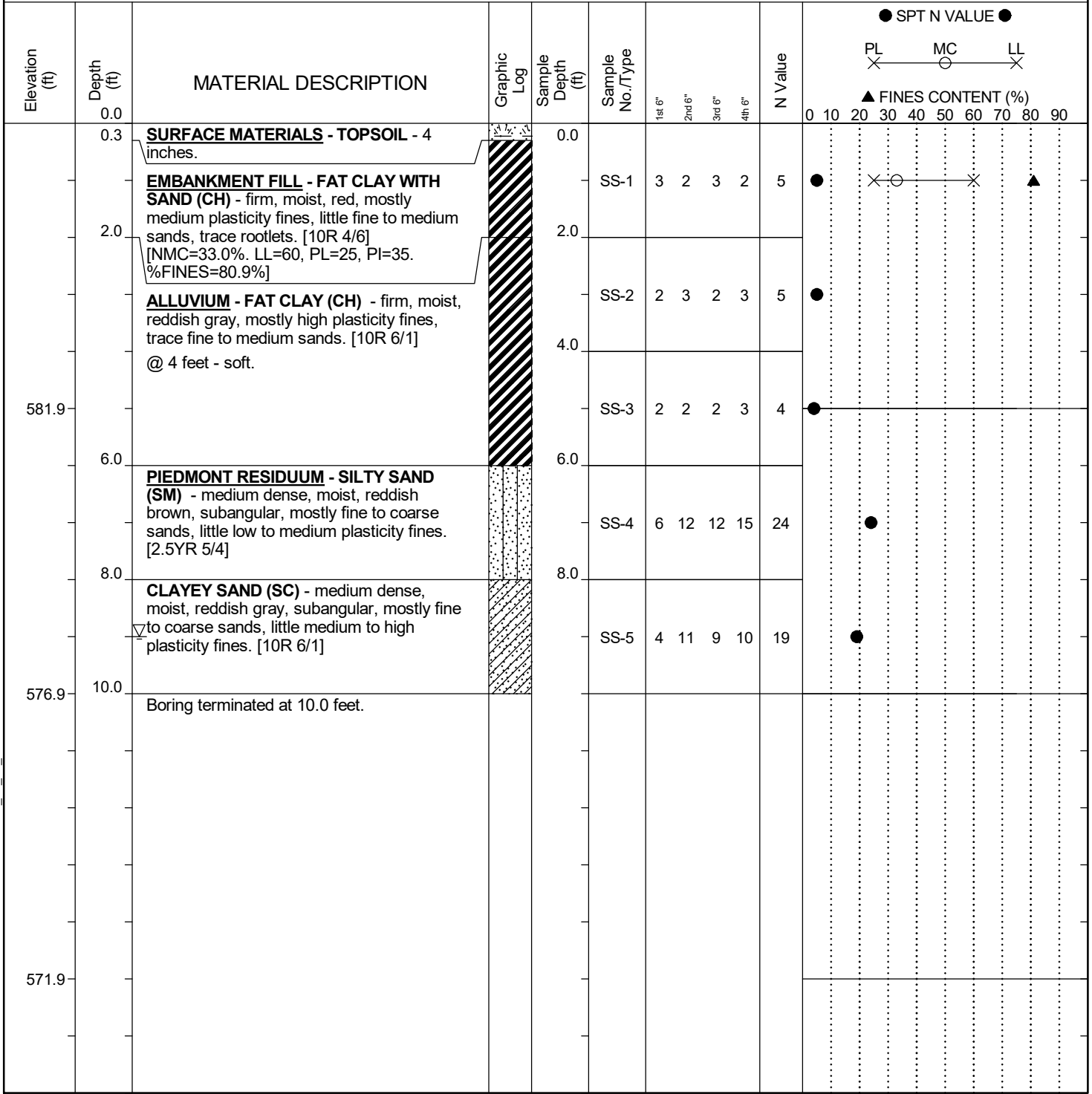
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-13
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 553+44.62	Offset: 16.2 RT
Alignment: Ramp 4		
Elev.: 586.9 ft	Latitude: 34.9593	Longitude: -80.982
Date Started: 1/10/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/10/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB 9 ft
		24HR



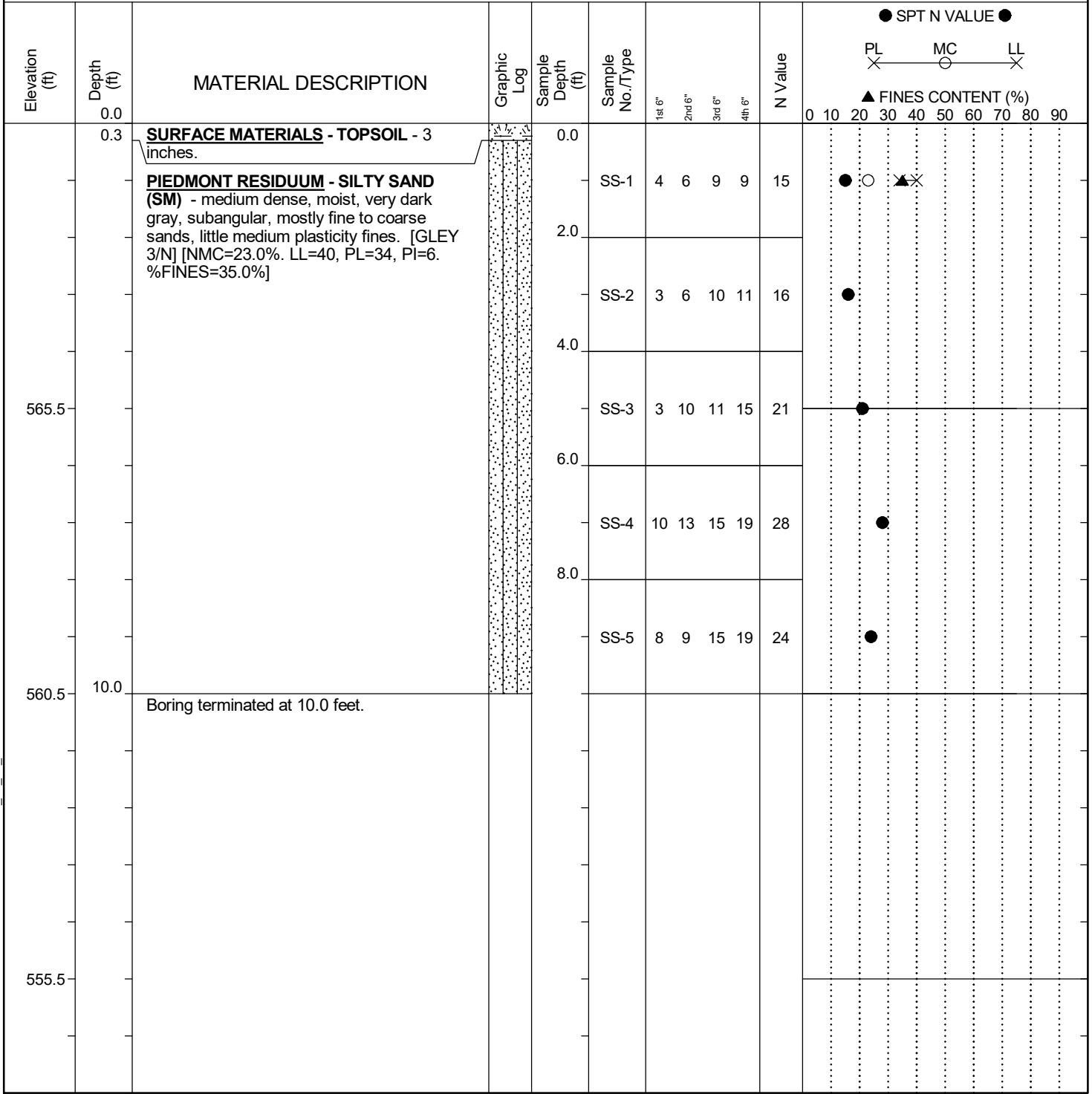
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-14
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 568+70.51	Offset: 20.5 LT
Alignment: Ramp 4		
Elev.: 570.5 ft	Latitude: 34.9563	Longitude: -80.9796
Date Started: 1/16/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



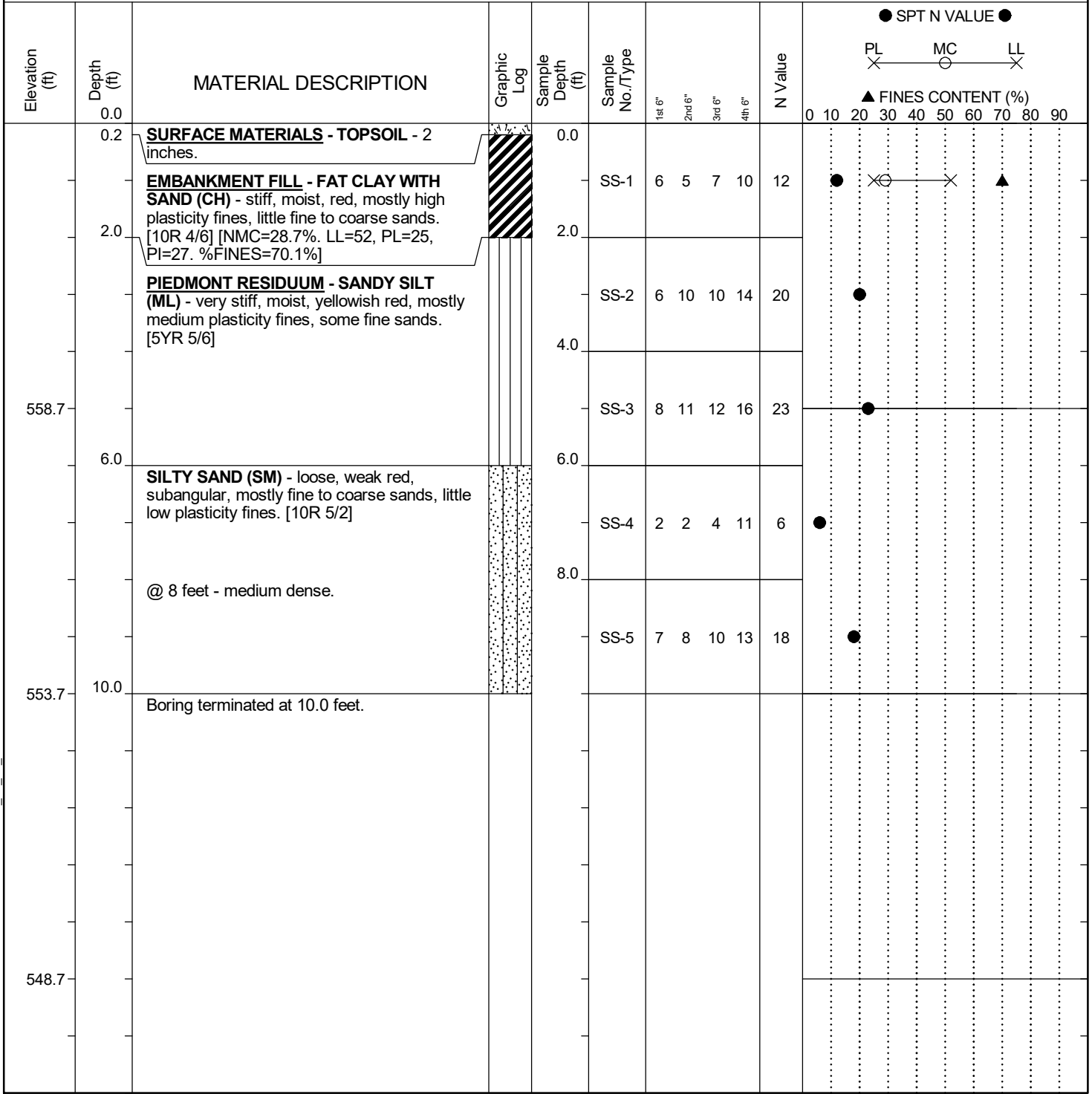
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-15
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 573+69.56	Offset: 32.1 LT
Alignment: Ramp 4		
Elev.: 563.7 ft	Latitude: 34.955	Longitude: -80.979
Date Started: 1/16/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



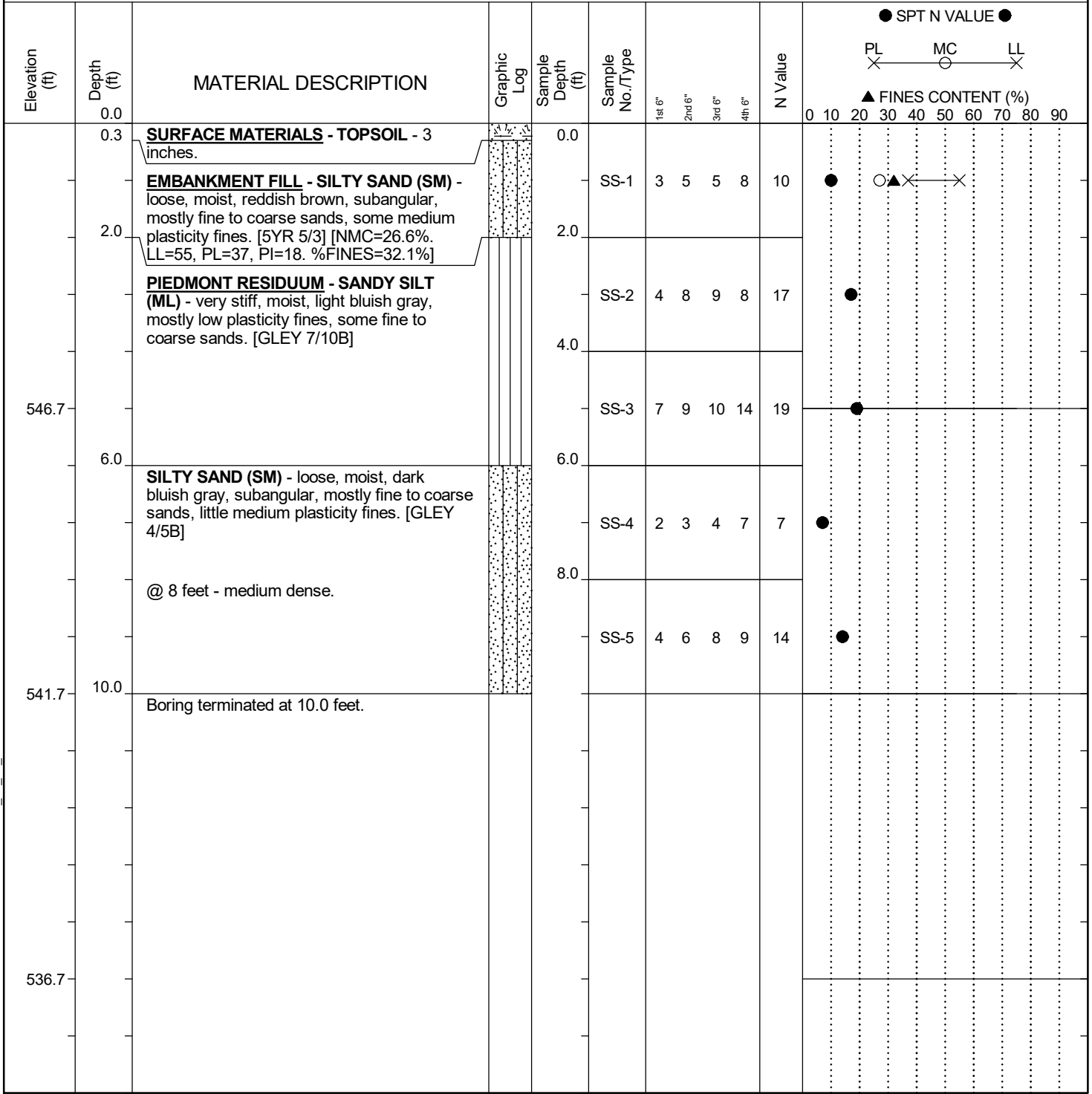
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-16
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 578+62.23	Offset: 4.7 LT
Alignment: Ramp 4		
Elev.: 551.7 ft	Latitude: 34.9538	Longitude: -80.9784
Date Started: 1/16/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/16/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



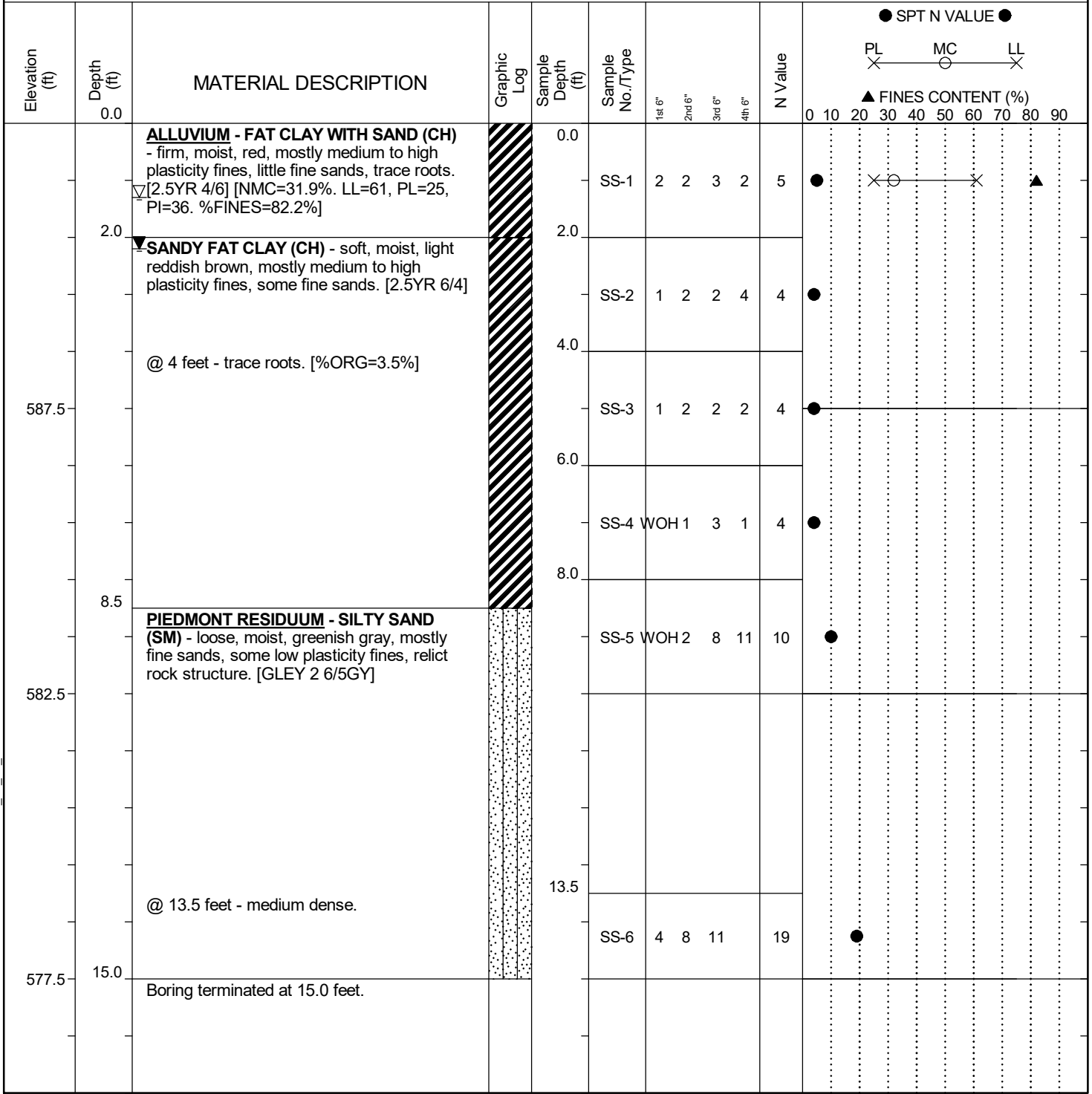
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: EM-17	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS		Boring Location: 33+71.77		Offset: 5.6 RT	Alignment: Paragon
Elev.: 592.5 ft	Latitude: 34.9583	Longitude: -80.9809	Date Started: 1/14/2020		
Total Depth: 15 ft	Soil Depth: 15 ft	Core Depth: N/A ft	Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: J. Little	Groundwater: TOB	1.3 ft	24HR	2.2 ft



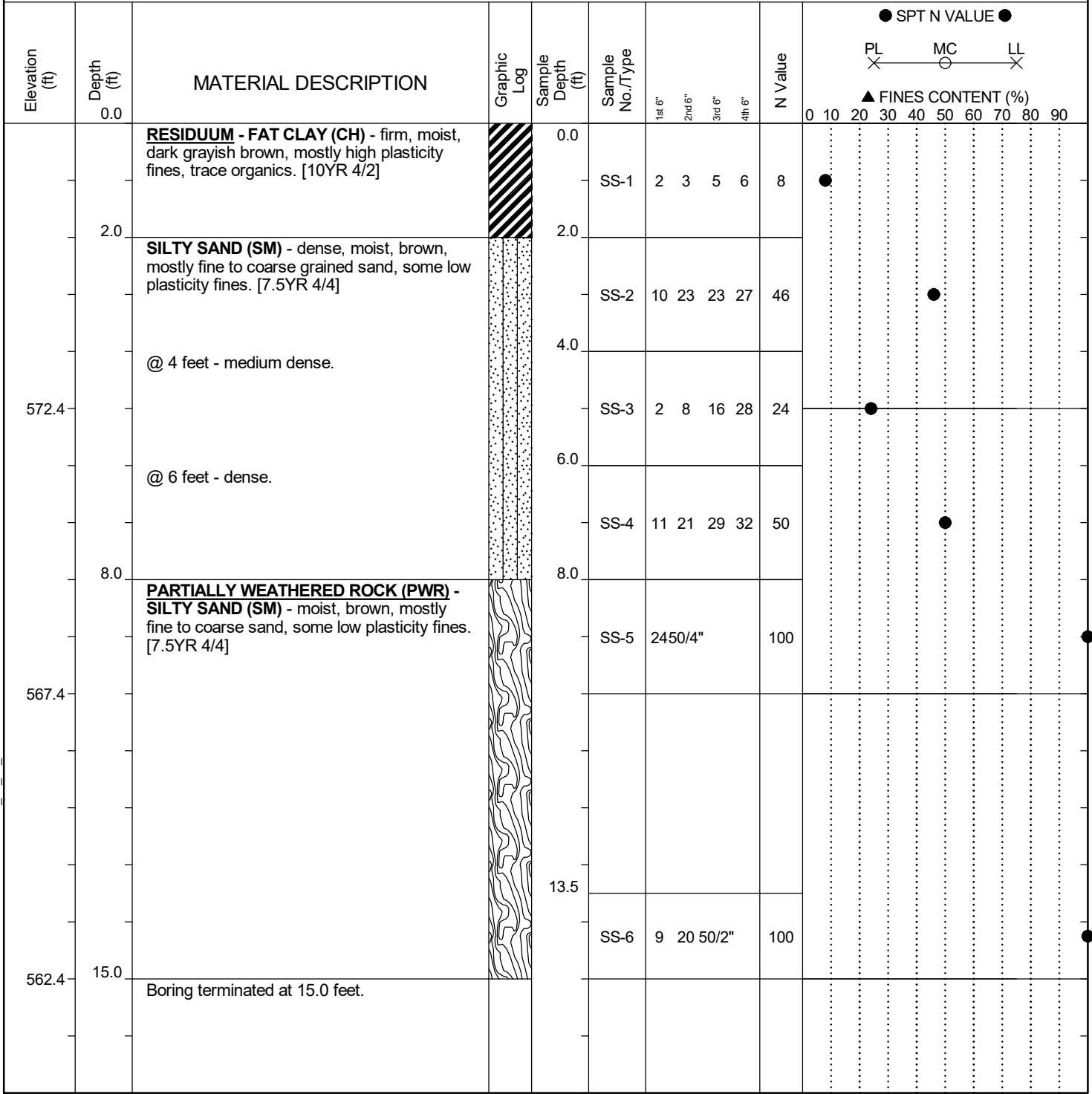
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: EM-18	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: JCP		Boring Location: 38+47.60		Offset: 4.8 RT	Alignment: Paragon
Elev.: 577.4 ft	Latitude: 34.9586	Longitude: -80.9793	Date Started: 5/21/2020		
Total Depth: 15 ft	Soil Depth: 15 ft	Core Depth: N/A ft	Date Completed: 5/21/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry		24HR: Dry	



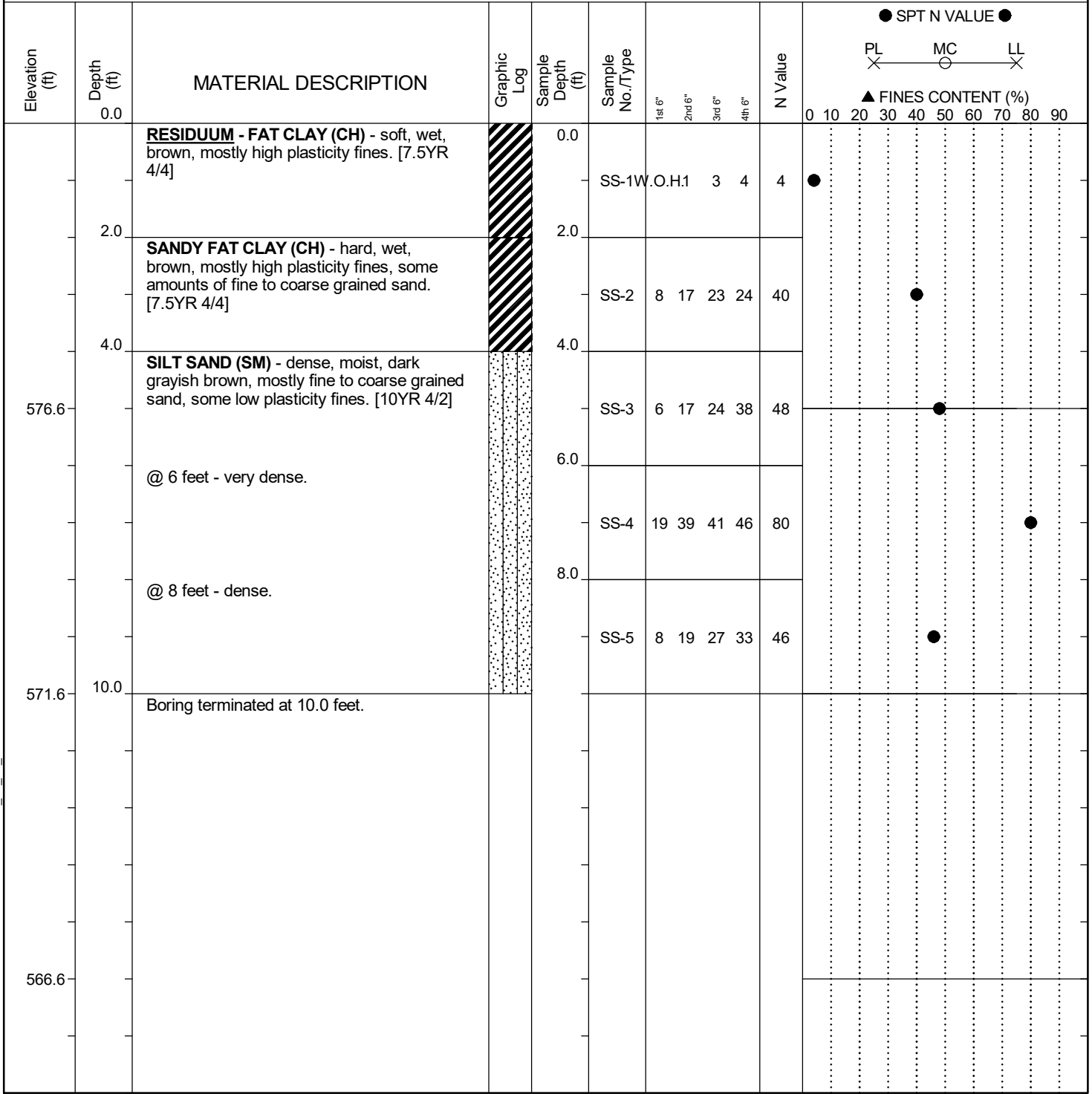
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-19
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 43+31.73	Offset: 14.0 LT
Alignment: Paragon		
Elev.: 581.6 ft	Latitude: 34.959	Longitude: -80.9778
Date Started: 5/21/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 5/21/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



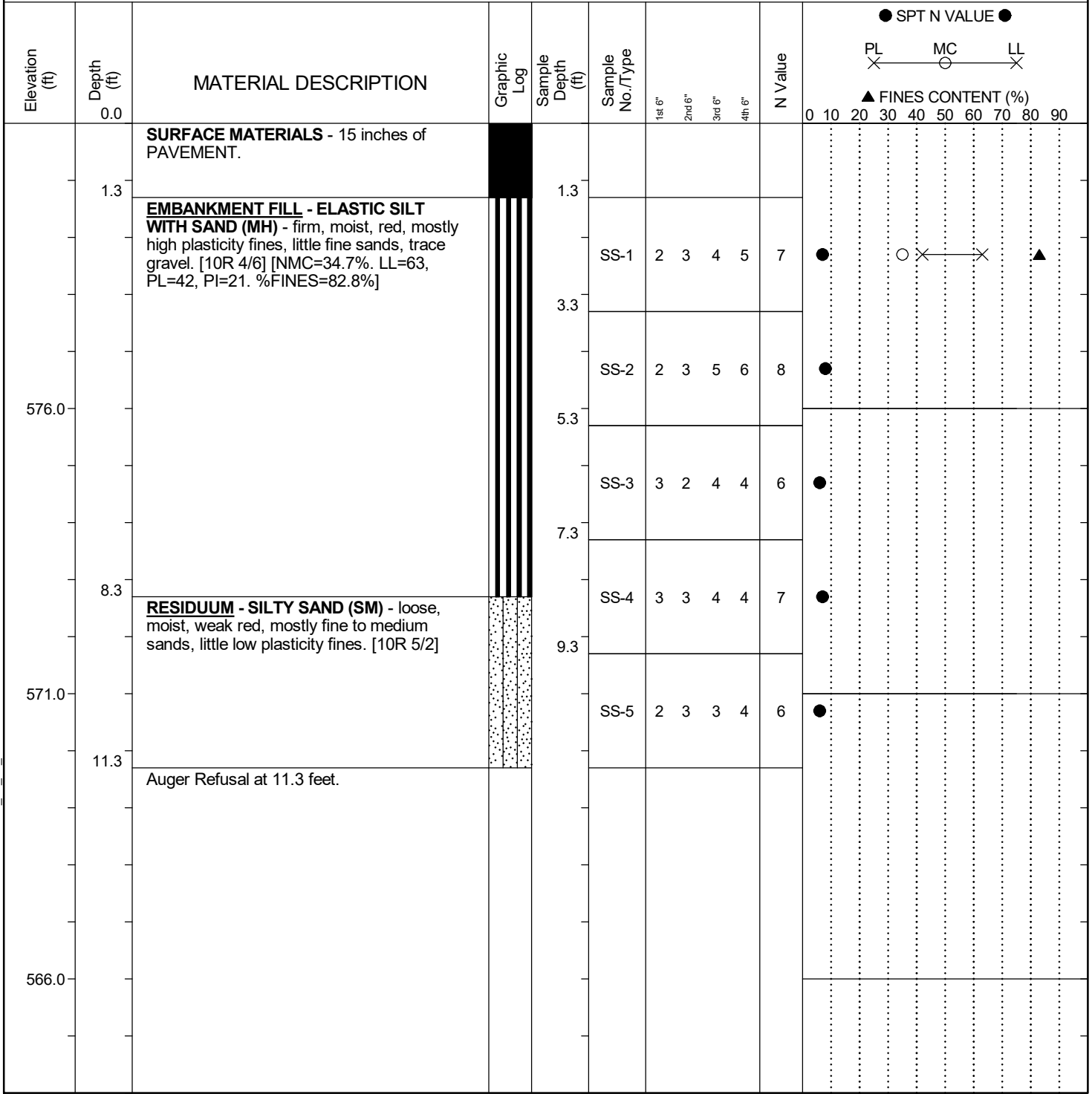
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: EM-20	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AMR		Boring Location: 53+02.35		Offset: 17.7 RT	Alignment: Paragon
Elev.: 581.0 ft	Latitude: 34.9598	Longitude: -80.9749	Date Started: 1/7/2020		
Total Depth: 11.3 ft	Soil Depth: 11.3 ft	Core Depth: N/A ft	Date Completed: 1/7/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-55	Drill Method: H.S.A.	Hammer Type: Automatic		Energy Ratio: 80.3%	
Core Size: N/A	Driller: H. Lewis	Groundwater: TOB	Dry	24HR	FIAD



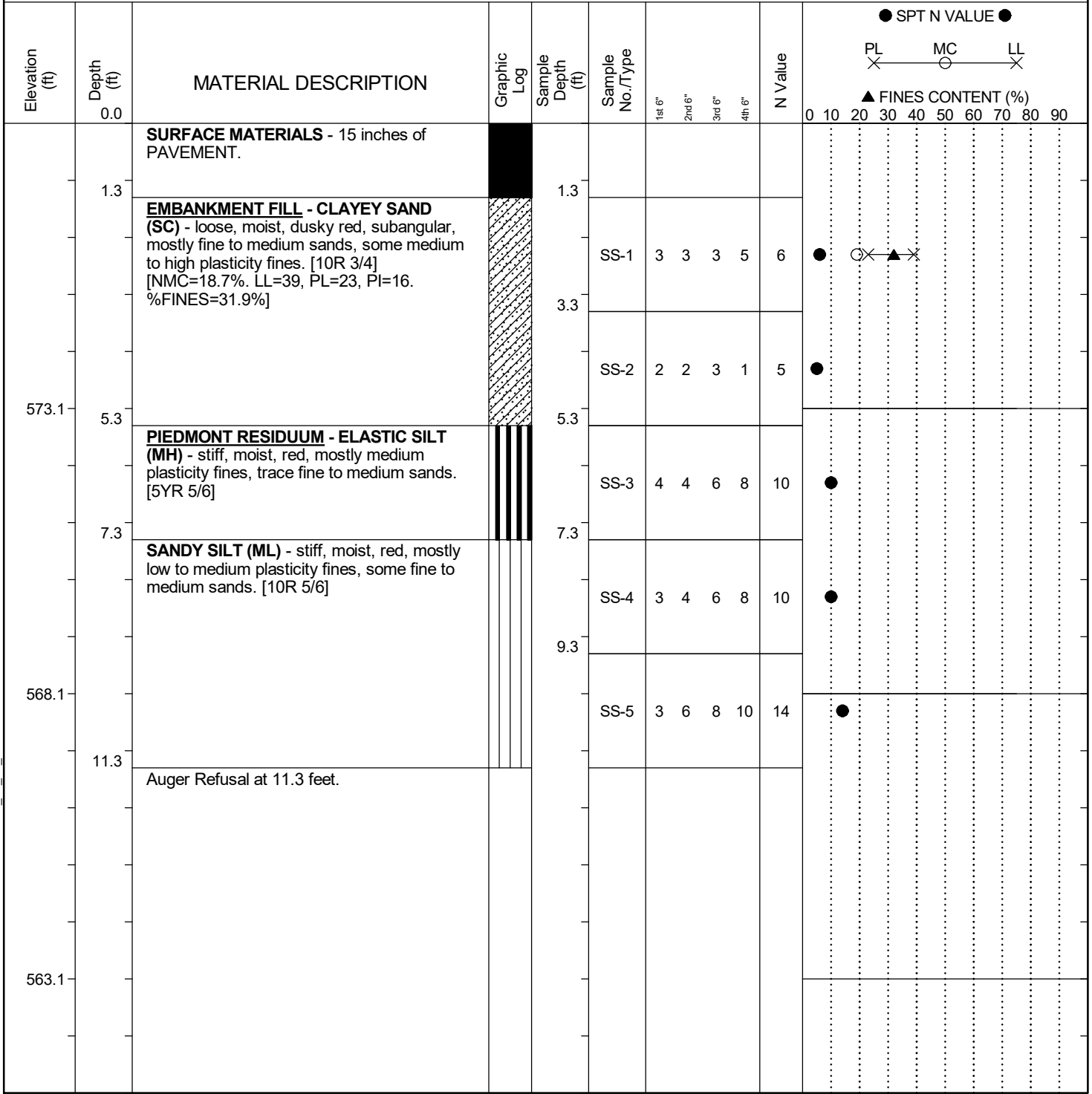
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: EM-21
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 55+66.53	Offset: 16.3 RT
Alignment: Paragon		
Elev.: 578.1 ft	Latitude: 34.9605	Longitude: -80.9748
Date Started: 1/7/2020		
Total Depth: 11.3 ft	Soil Depth: 11.3 ft	Core Depth: N/A ft
Date Completed: 1/7/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-55	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 80.3%		
Core Size: N/A	Driller: H. Lewis	Groundwater: TOB Dry
24HR: FIAD		



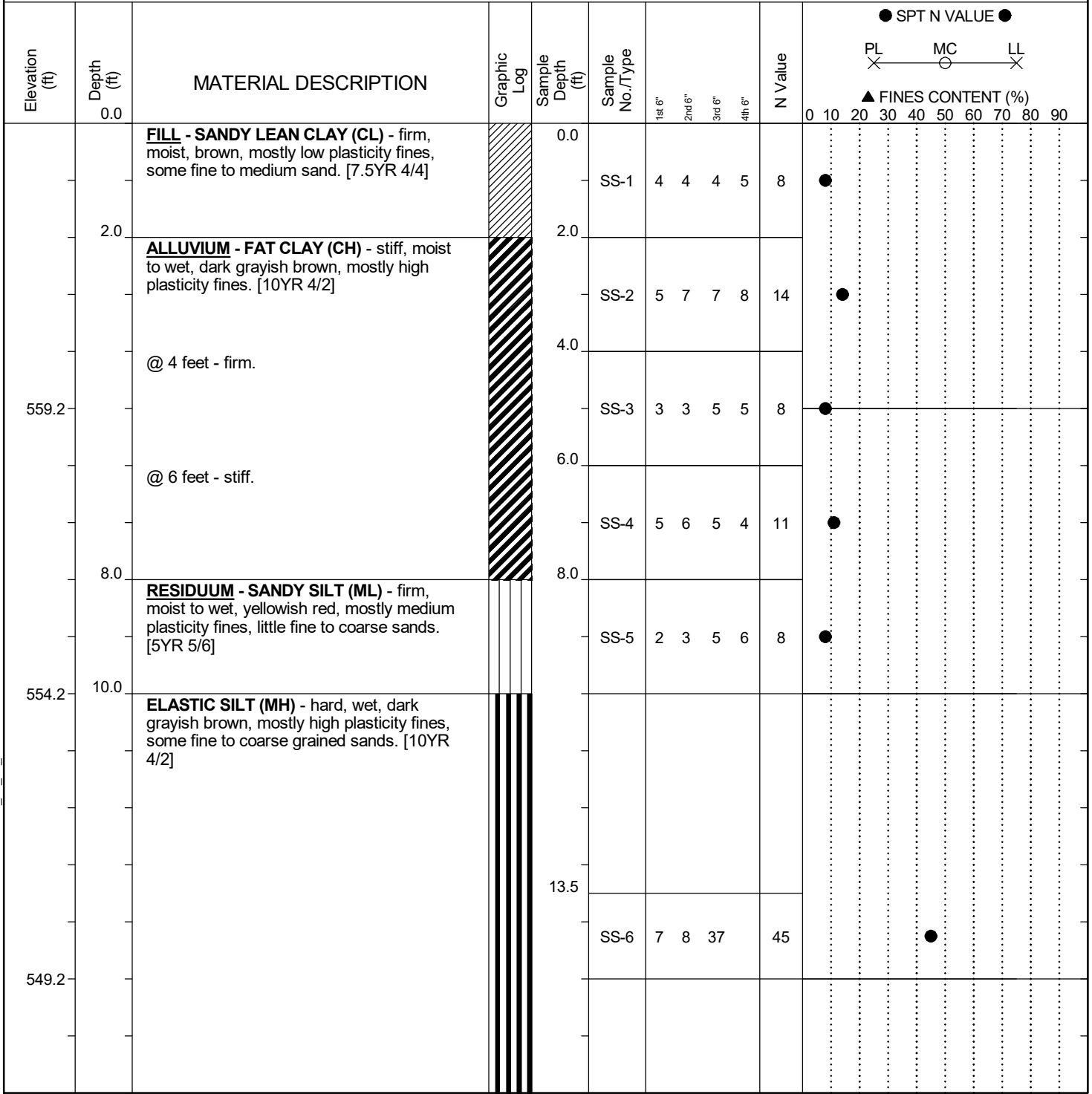
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 565+44.97	Offset: 64.8 LT
Alignment: Ramp 3		
Elev.: 564.2 ft	Latitude: 34.9574	Longitude: -80.9777
Date Started: 5/18/2020		
Total Depth: 23.2 ft	Soil Depth: 23.2 ft	Core Depth: N/A ft
Date Completed: 5/18/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
		24HR



LEGEND

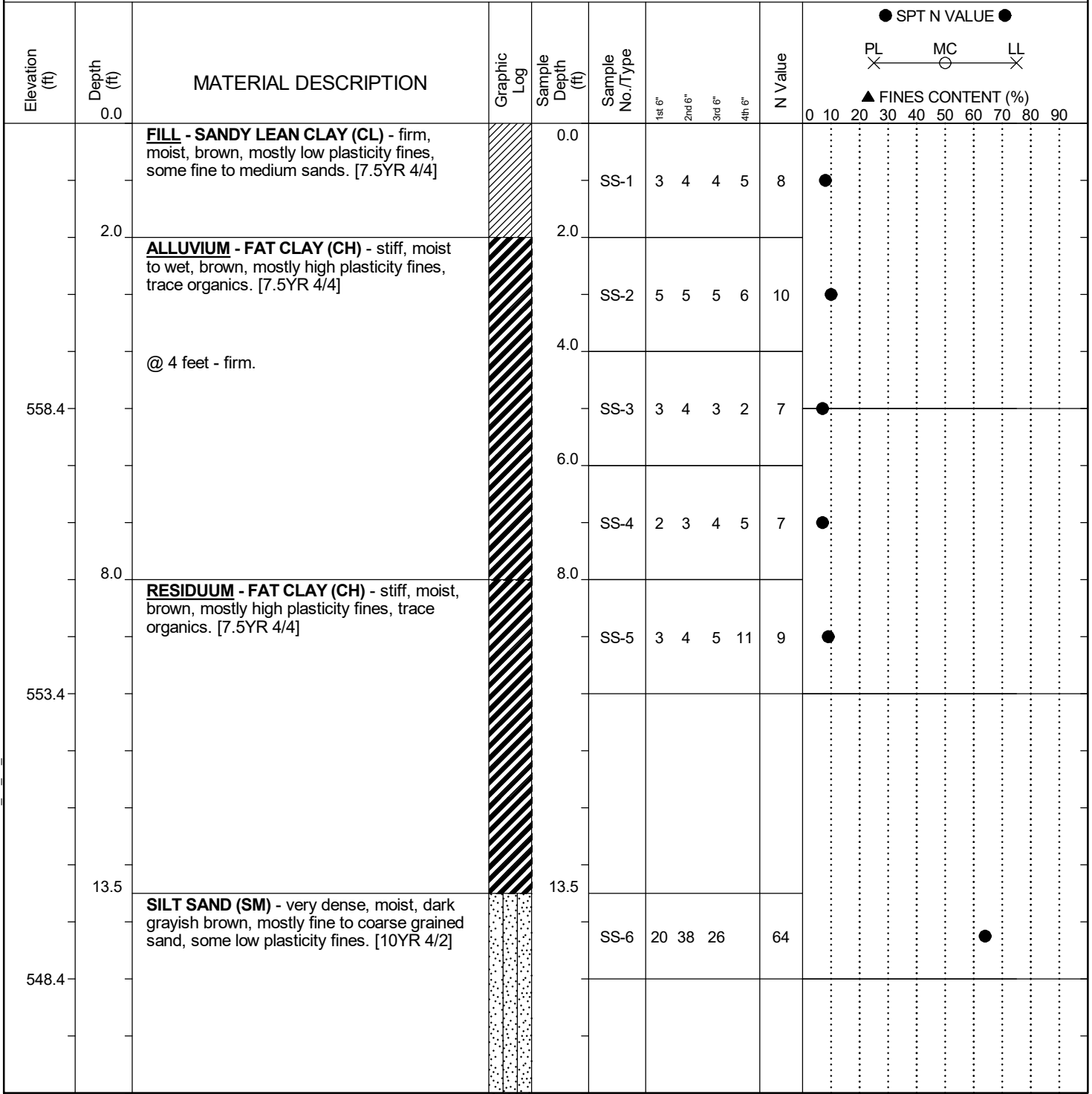
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing	
NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-2
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 564+88.25	Offset: 16.5 LT
Alignment: Ramp 3		
Elev.: 563.4 ft	Latitude: 34.9576	Longitude: -80.9778
Date Started: 5/18/2020		
Total Depth: 18.4 ft	Soil Depth: 18.4 ft	Core Depth: N/A ft
Date Completed: 5/18/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



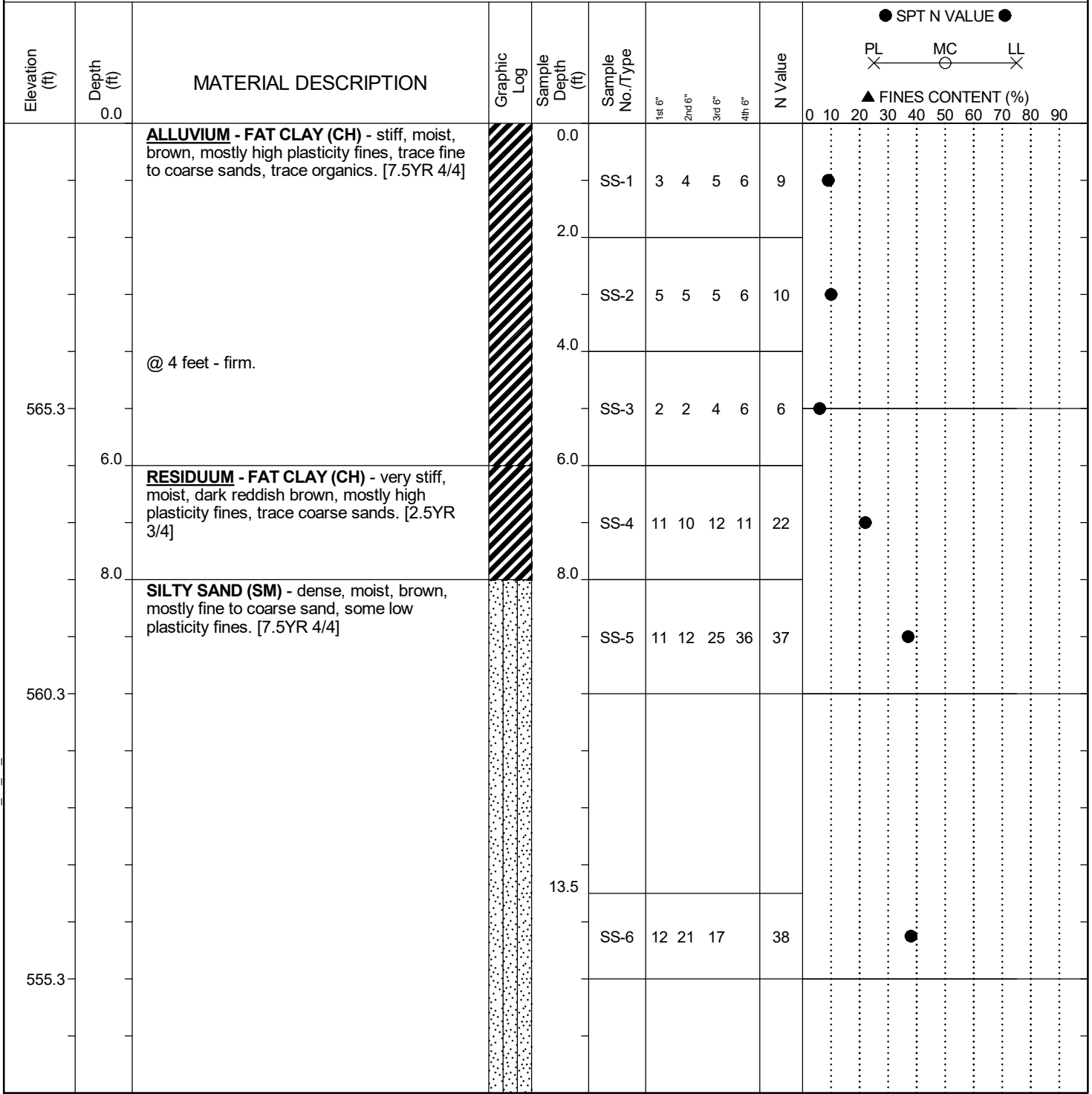
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing	
NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-3
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 563+99.06	Offset: 22.5 LT
Alignment: Ramp 3		
Elev.: 570.3 ft	Latitude: 34.9578	Longitude: -80.9778
Date Started: 5/18/2020		
Total Depth: 20.6 ft	Soil Depth: 20.6 ft	Core Depth: N/A ft
Date Completed: 5/18/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



LEGEND

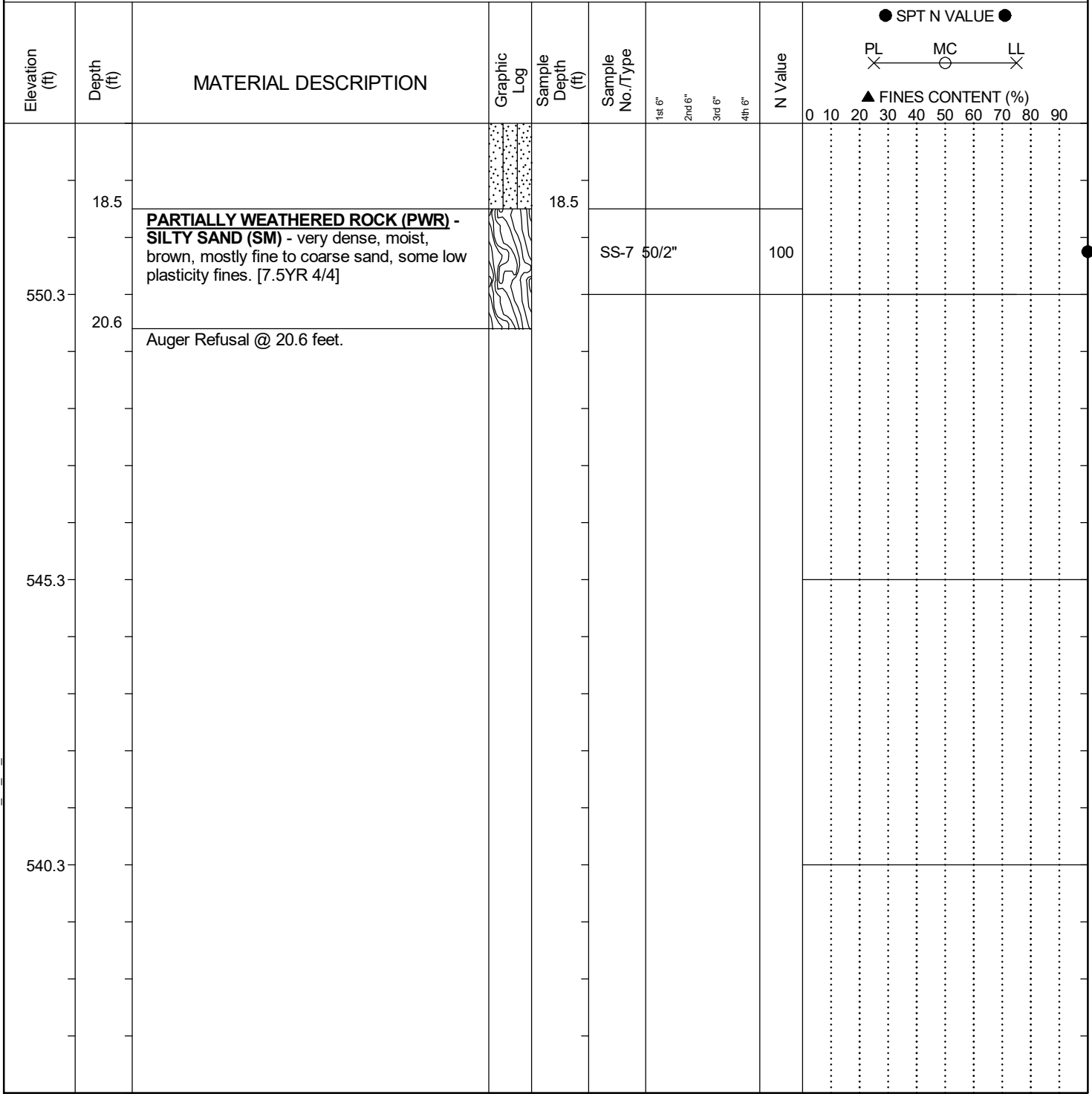
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing		NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC - Rock Core	
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SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-3
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 563+99.06	Offset: 22.5 LT
Alignment: Ramp 3		
Elev.: 570.3 ft	Latitude: 34.9578	Longitude: -80.9778
Date Started: 5/18/2020		
Total Depth: 20.6 ft	Soil Depth: 20.6 ft	Core Depth: N/A ft
Date Completed: 5/18/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



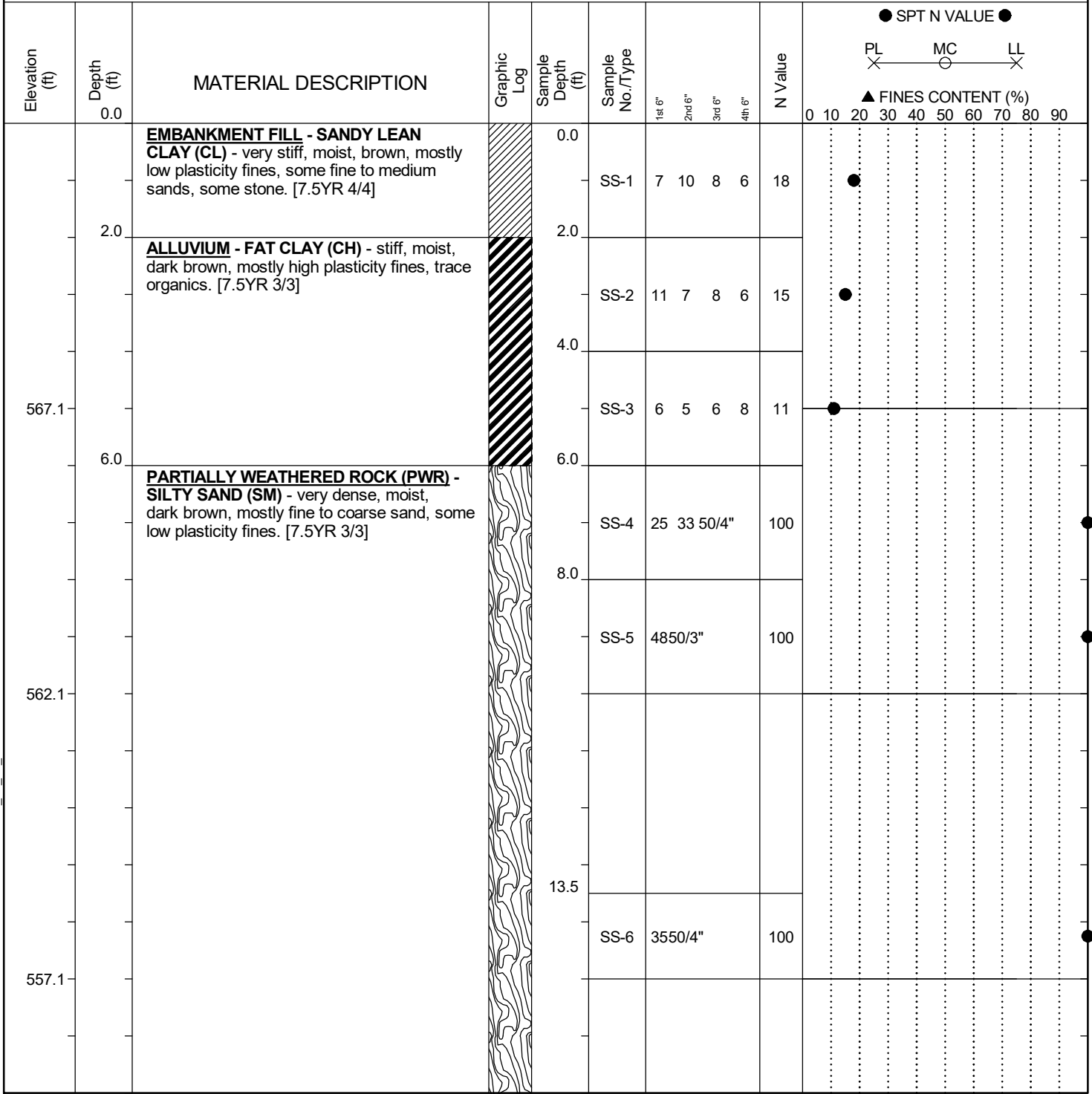
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-4
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 563+21.43	Offset: 13.7 LT
Alignment: Ramp 3		
Elev.: 572.1 ft	Latitude: 34.958	Longitude: -80.9778
Date Started: 5/18/2020		
Total Depth: 23.4 ft	Soil Depth: 23.4 ft	Core Depth: N/A ft
Date Completed: 5/18/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



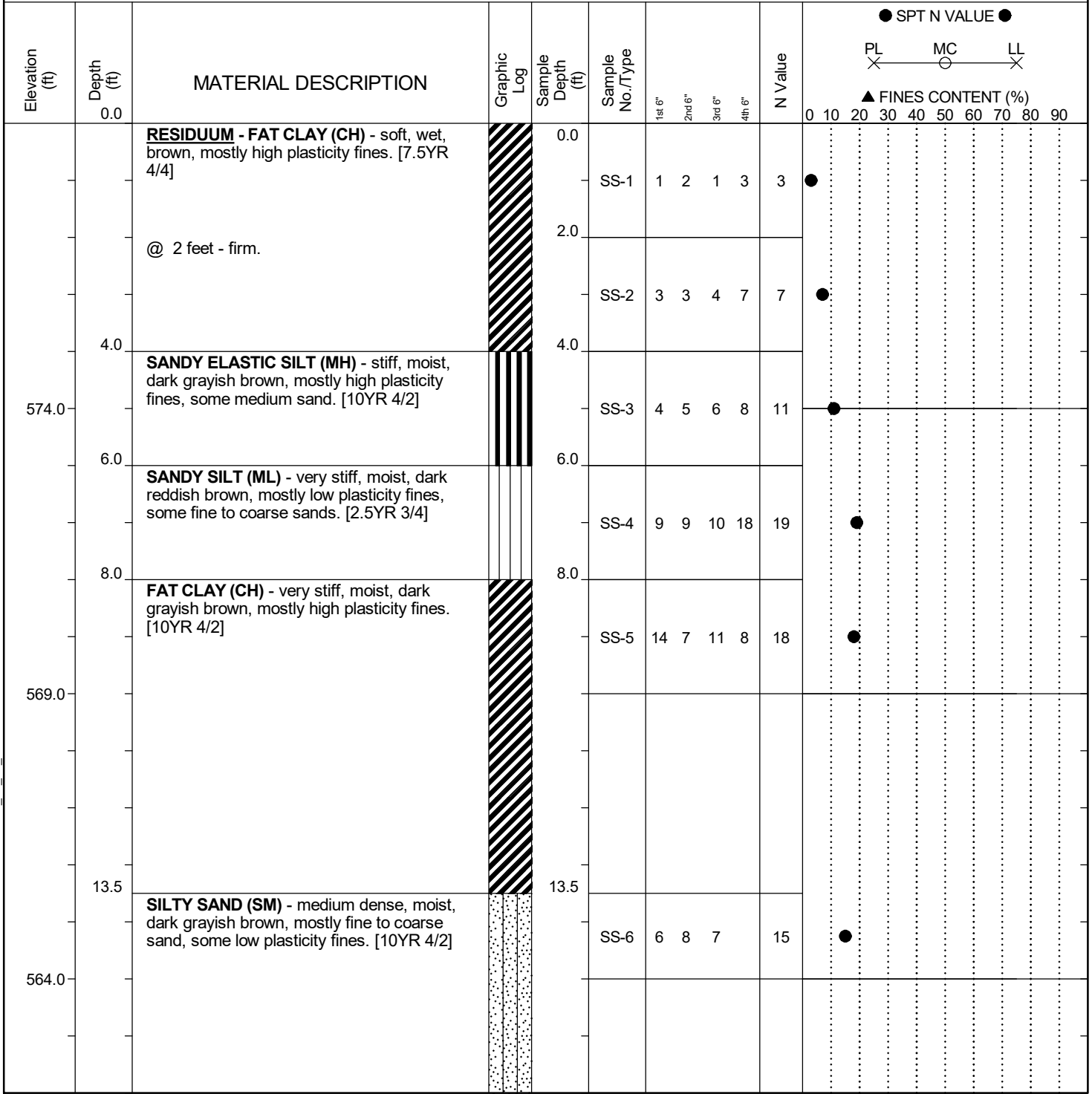
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing		DRILLING METHOD RW - Rotary Wash RC - Rock Core	
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SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: RW-5	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: JCP		Boring Location: 48+34.79		Offset: 22.0 LT	Alignment: Paragon
Elev.: 579.0 ft	Latitude: 34.9591	Longitude: -80.9761	Date Started: 5/21/2020		
Total Depth: 30 ft	Soil Depth: 30 ft	Core Depth: N/A ft	Date Completed: 5/21/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: T. Brown	Groundwater: TOB	Dry	24HR: Dry	



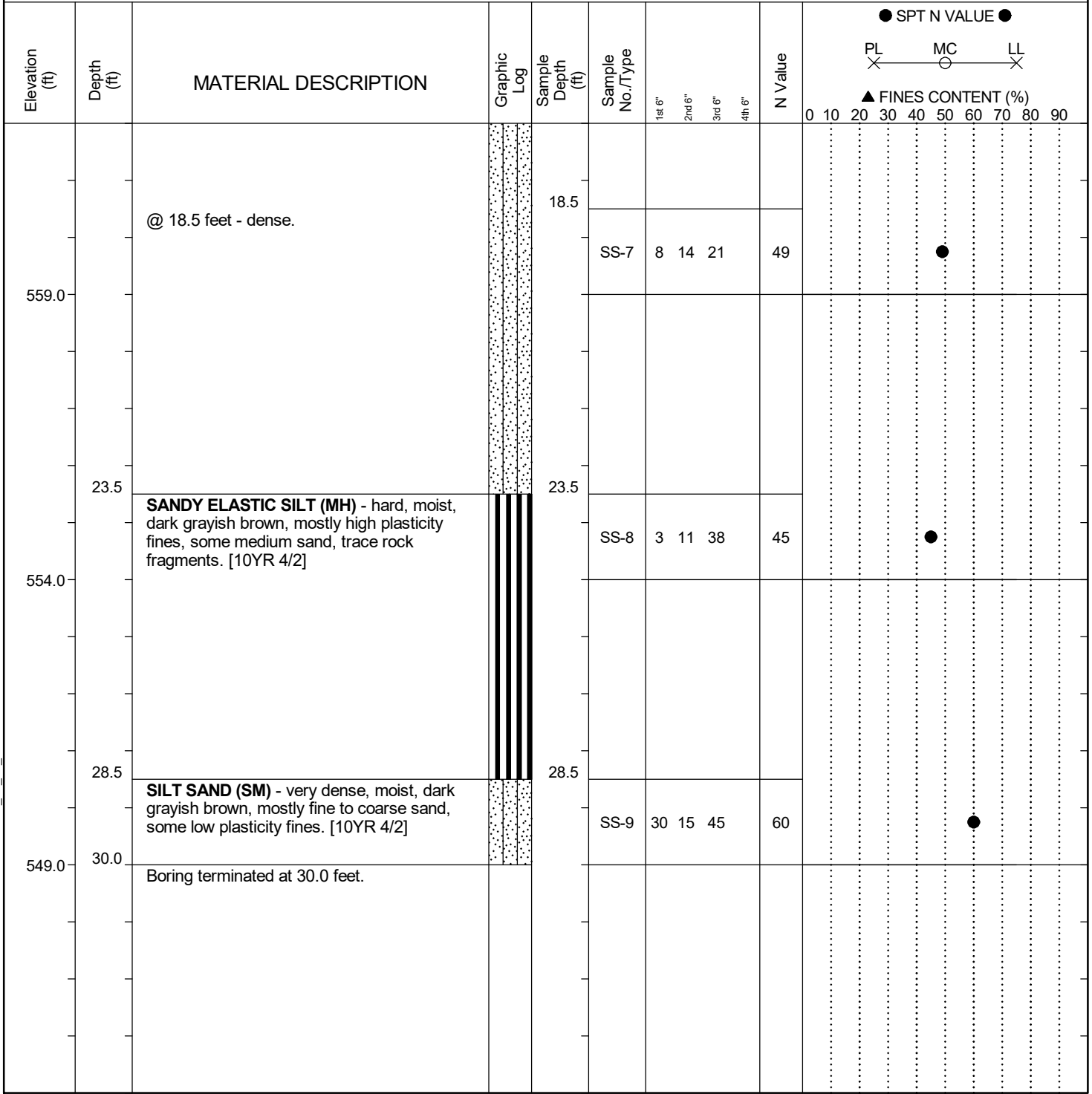
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing		NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC - Rock Core	
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SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-5
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 48+34.79	Offset: 22.0 LT
Alignment: Paragon		
Elev.: 579.0 ft	Latitude: 34.9591	Longitude: -80.9761
Date Started: 5/21/2020		
Total Depth: 30 ft	Soil Depth: 30 ft	Core Depth: N/A ft
Date Completed: 5/21/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



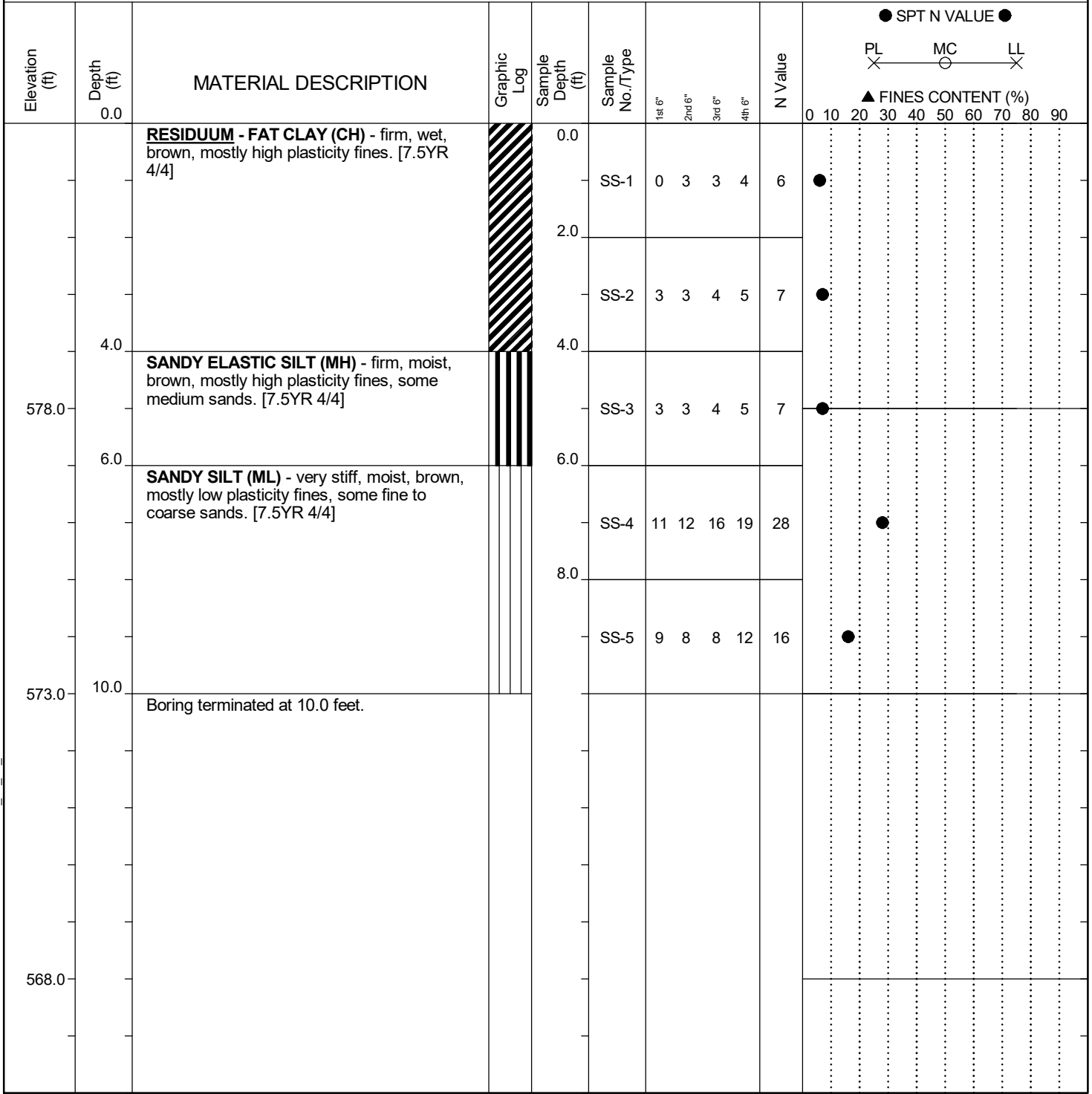
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-6
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 50+68.62	Offset: 16.5 LT
Alignment: Paragon		
Elev.: 583.0 ft	Latitude: 34.9593	Longitude: -80.9754
Date Started: 5/21/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 5/21/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: Dry		



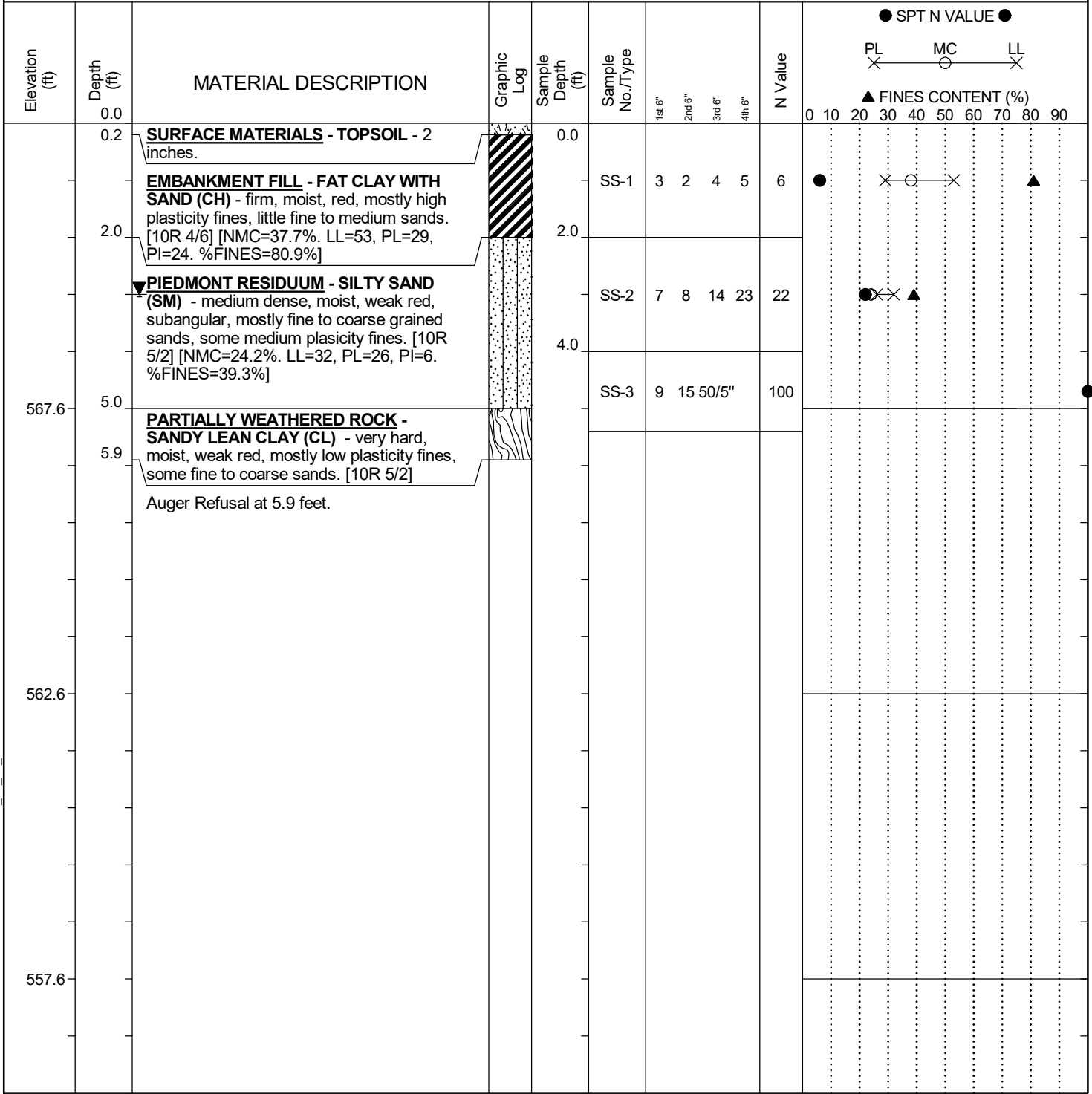
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8" NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing RW - Rotary Wash RC - Rock Core	
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SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652		County: York		Boring No.: RW-7	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AMR		Boring Location: 562+41.20		Offset: 25.6 LT	Alignment: Ramp 2
Elev.: 572.6 ft	Latitude: 34.9582	Longitude: -80.9796	Date Started: 1/8/2020		
Total Depth: 5.9 ft	Soil Depth: 5.9 ft	Core Depth: N/A ft	Date Completed: 1/8/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: T. Brown	Groundwater: TOB	Dry	24HR	3.0 ft



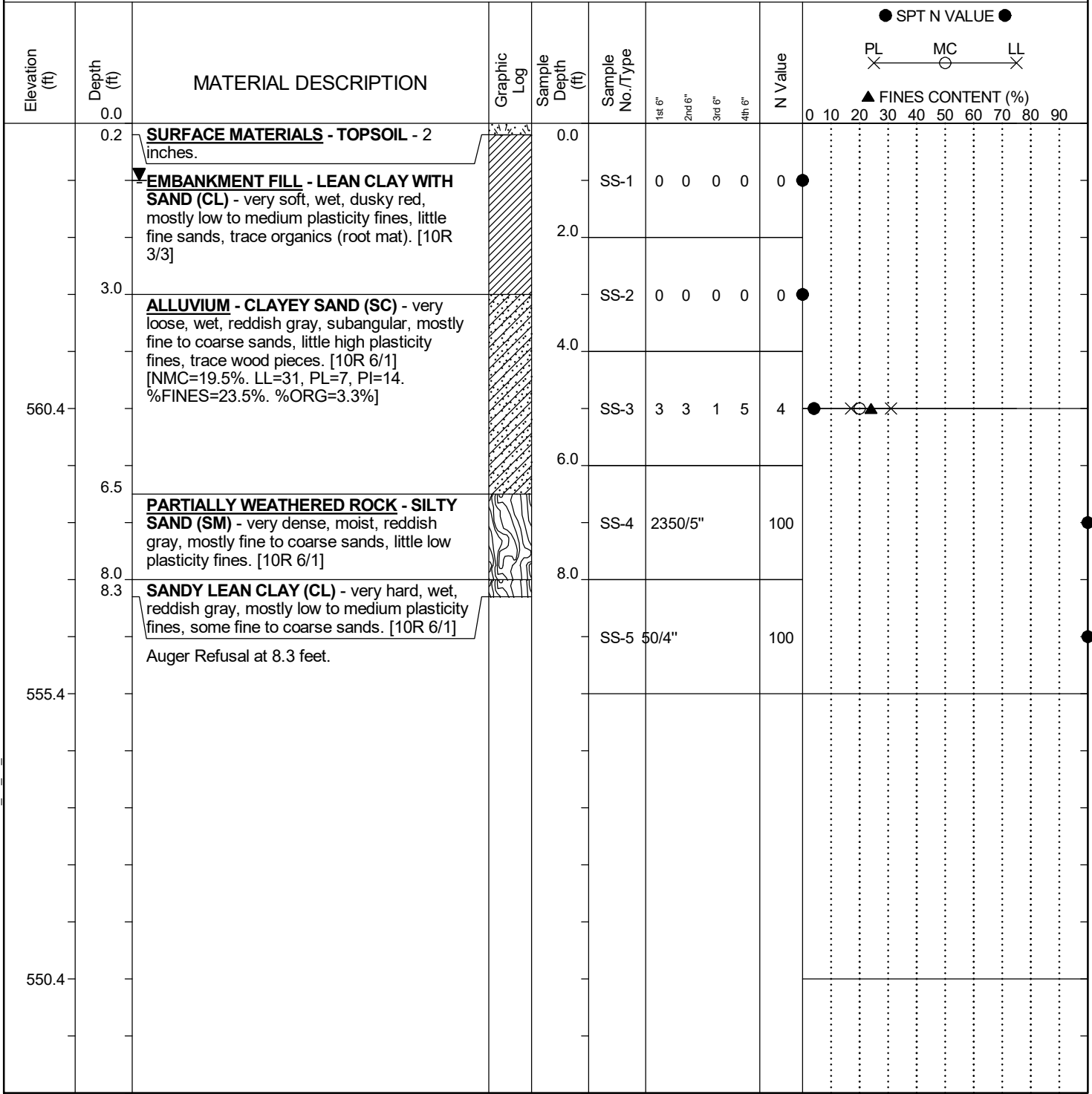
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-8
Site Description: I-77 Panthers Interchange		Route: I-77
Eng./Geo.: AMR	Boring Location: 563+41.78	Offset: 26.6 LT
Alignment: Ramp 2	Date Started: 1/7/2020	Date Completed: 1/7/2020
Elev.: 565.4 ft	Latitude: 34.9579	Longitude: -80.9795
Total Depth: 8.3 ft	Soil Depth: 8.3 ft	Core Depth: N/A ft
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME-550X	Drill Method: H.S.A.
Hammer Type: Automatic	Energy Ratio: 85.9%	Core Size: N/A
Driller: T. Brown	Groundwater: TOB	24HR: 1.0 ft



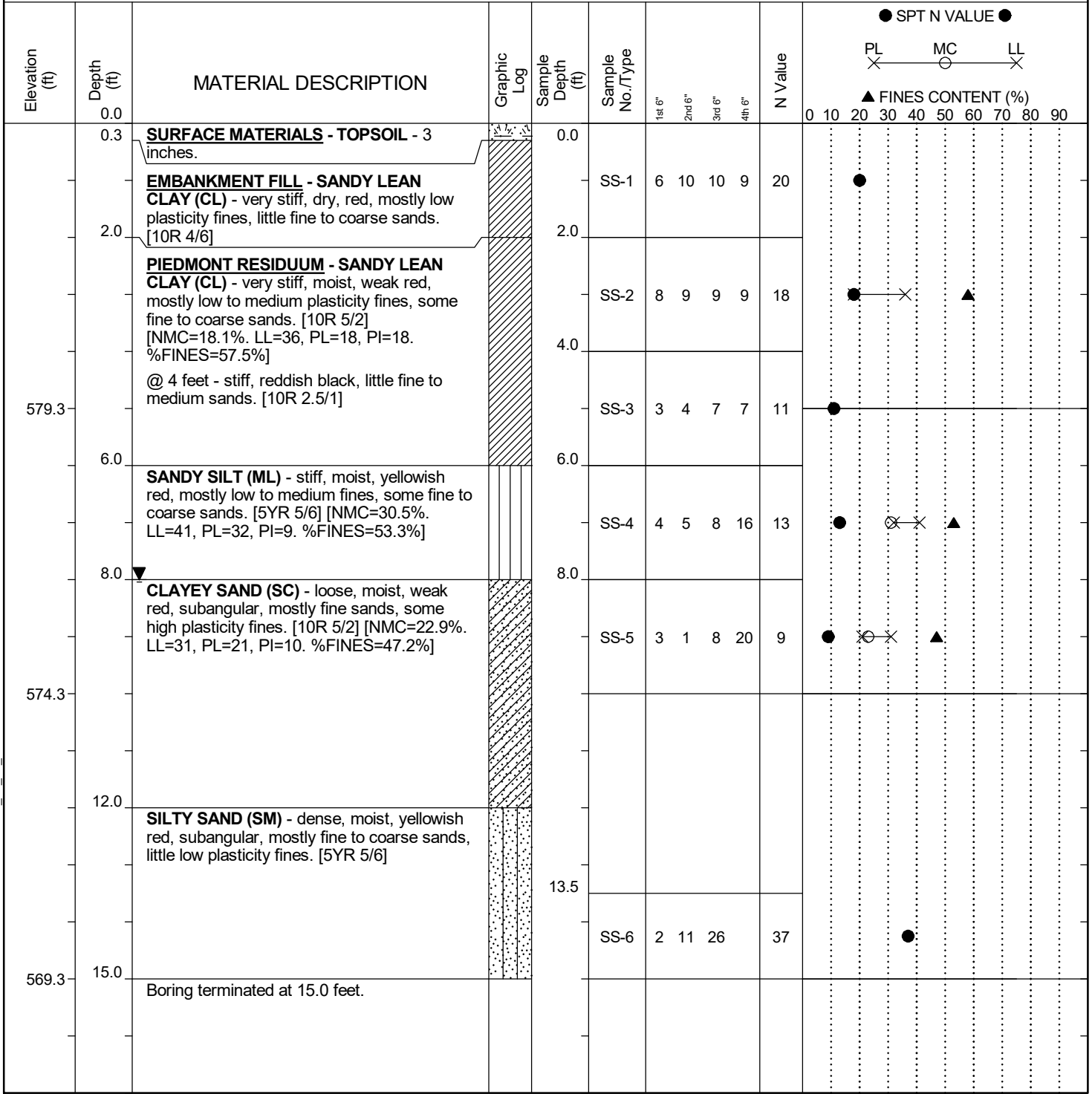
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-9
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 559+39.25	Offset: 5.9 LT
Alignment: Ramp 2		
Elev.: 584.3 ft	Latitude: 34.9589	Longitude: -80.98
Date Started: 1/9/2020		
Total Depth: 15 ft	Soil Depth: 15 ft	Core Depth: N/A ft
Date Completed: 1/9/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: 8.0 ft		



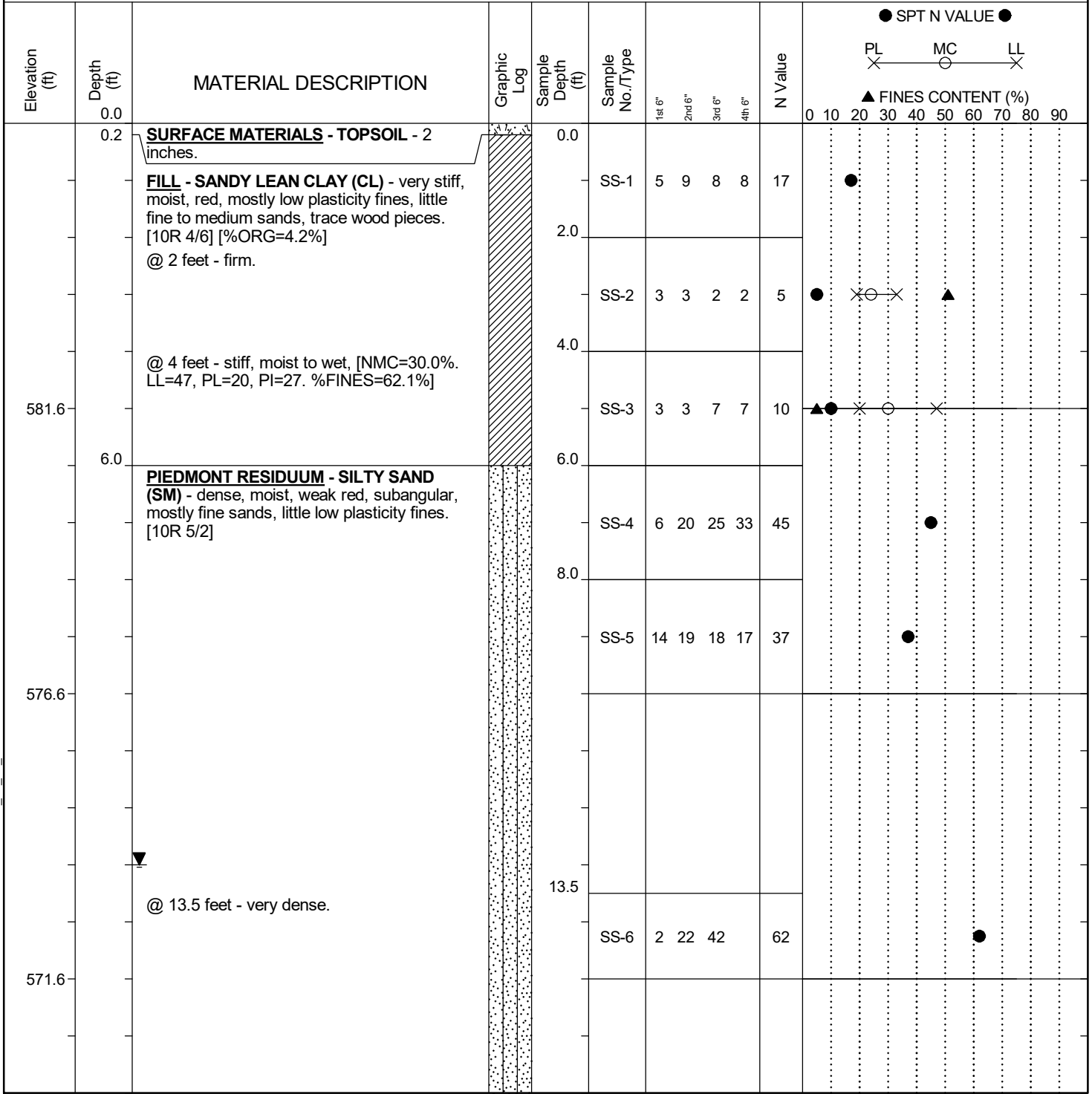
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-10
Site Description: I-77 Panthers Interchange		Route: I-77
Eng./Geo.: AMR	Boring Location: 557+82.35	Offset: 15.9 LT
Alignment: Ramp 2	Date Started: 1/9/2020	
Elev.: 586.6 ft	Latitude: 34.9593	Longitude: -80.9801
Total Depth: 18.8 ft	Soil Depth: 18.8 ft	Core Depth: N/A ft
Date Completed: 1/9/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: 13.0 ft		



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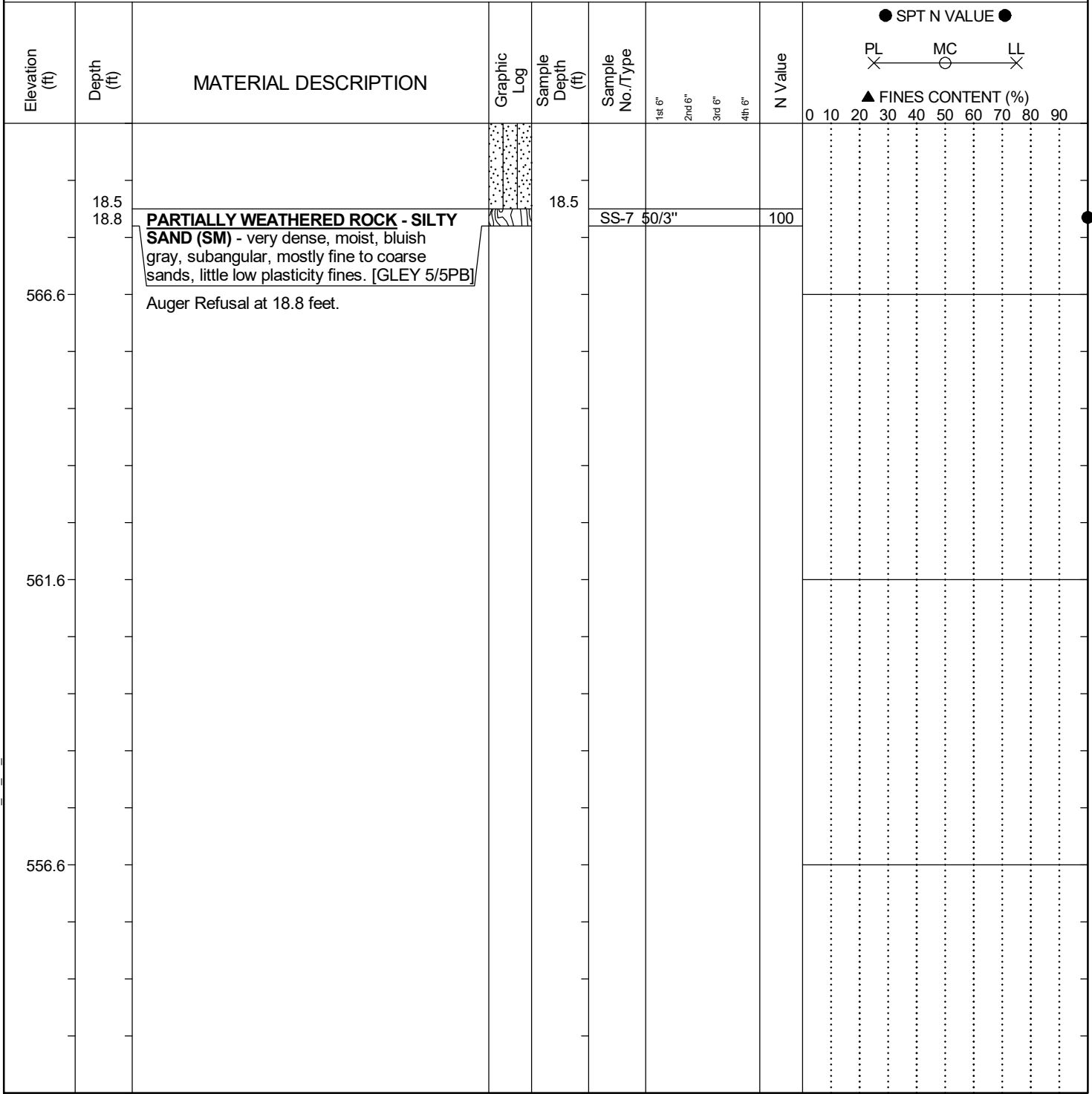
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-10
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 557+82.35	Offset: 15.9 LT
Alignment: Ramp 2		
Elev.: 586.6 ft	Latitude: 34.9593	Longitude: -80.9801
Date Started: 1/9/2020		
Total Depth: 18.8 ft	Soil Depth: 18.8 ft	Core Depth: N/A ft
Date Completed: 1/9/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB Dry
24HR: 13.0 ft		



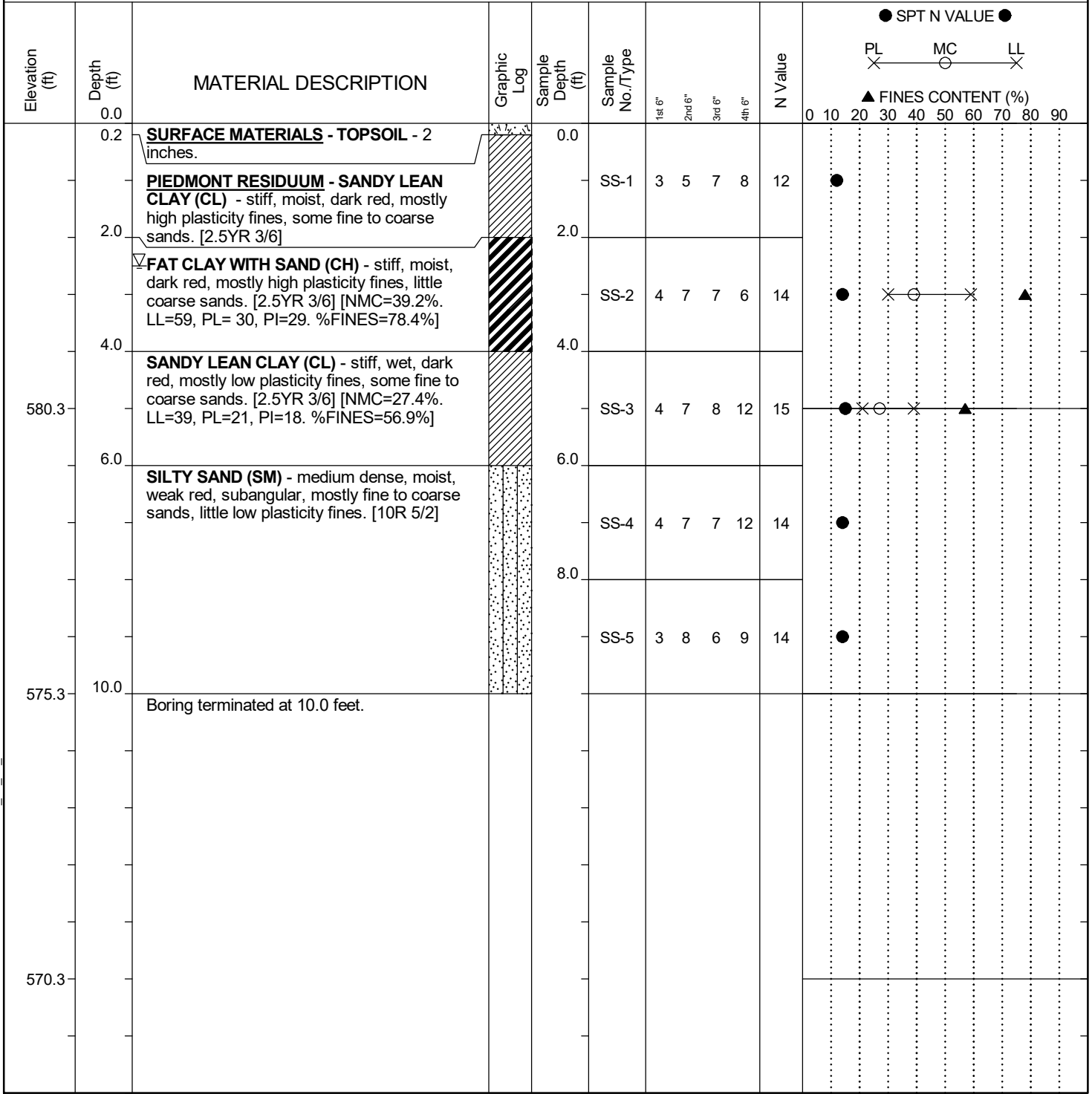
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-11
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 559+05.99	Offset: 53.6 RT
Alignment: Ramp 4		
Elev.: 585.3 ft	Latitude: 34.9588	Longitude: -80.9809
Date Started: 1/14/2020		
Total Depth: 10 ft	Soil Depth: 10 ft	Core Depth: N/A ft
Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB 2.5 ft
24HR: Dry		



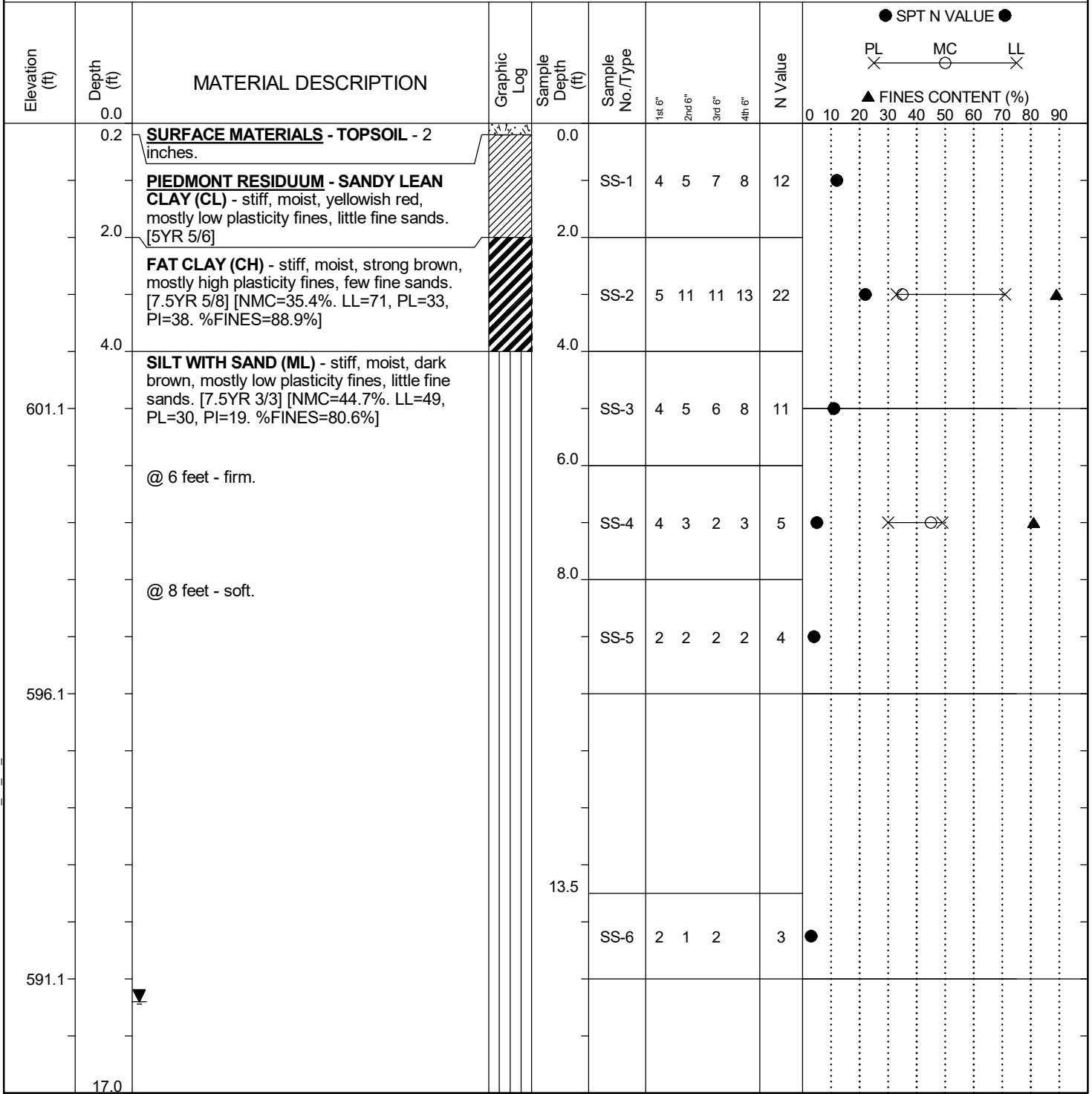
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-12
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 558+10.92	Offset: 64.1 RT
Alignment: Ramp 4		
Elev.: 606.1 ft	Latitude: 34.959	Longitude: -80.981
Date Started: 1/14/2020		
Total Depth: 34.9 ft	Soil Depth: 34.9 ft	Core Depth: N/A ft
Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB 22.3 ft
24HR: 15.4 ft		



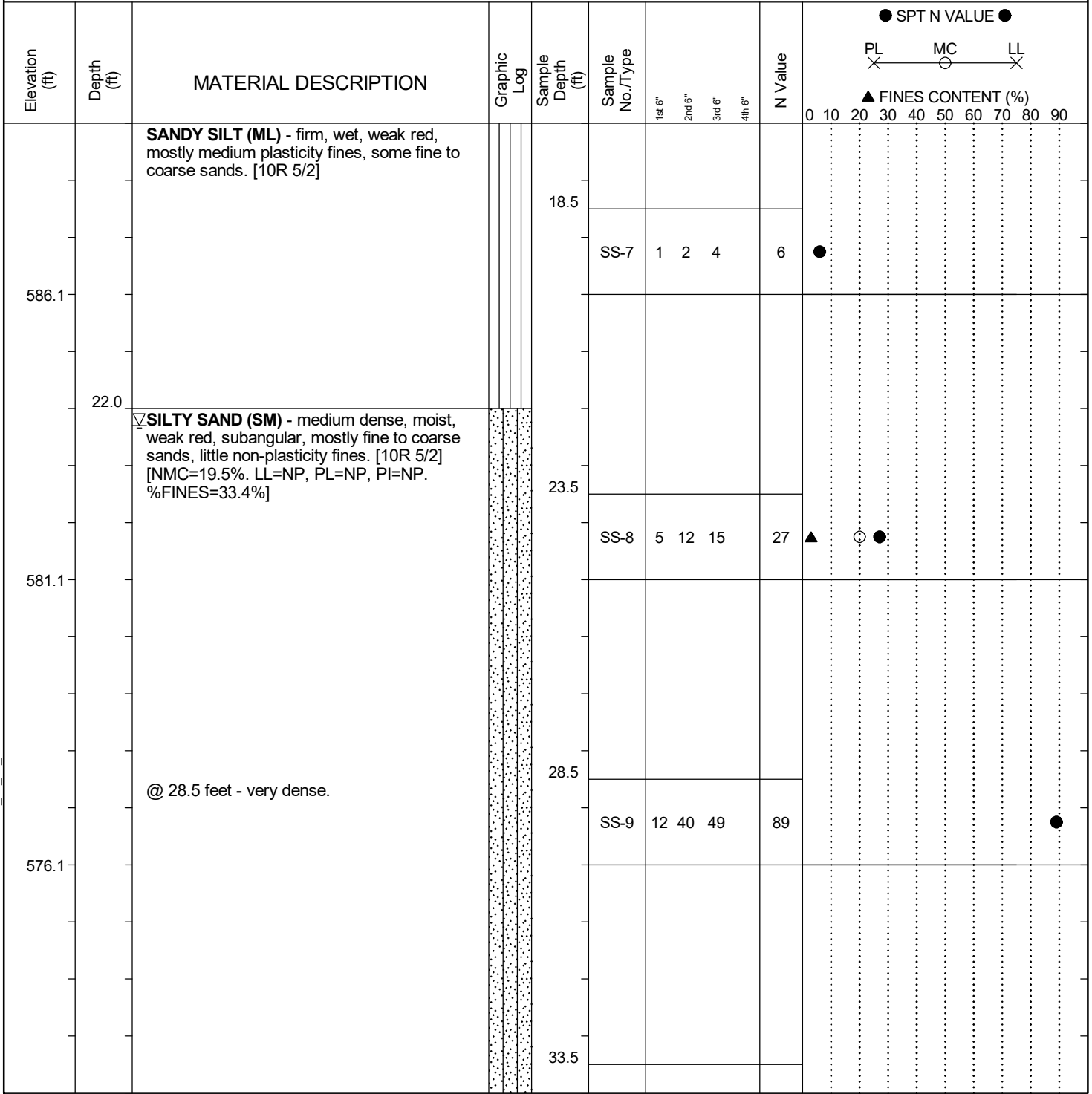
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

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SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-12
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AMR	Boring Location: 558+10.92	Offset: 64.1 RT
Alignment: Ramp 4		
Elev.: 606.1 ft	Latitude: 34.959	Longitude: -80.981
Date Started: 1/14/2020		
Total Depth: 34.9 ft	Soil Depth: 34.9 ft	Core Depth: N/A ft
Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB 22.3 ft
24HR: 15.4 ft		



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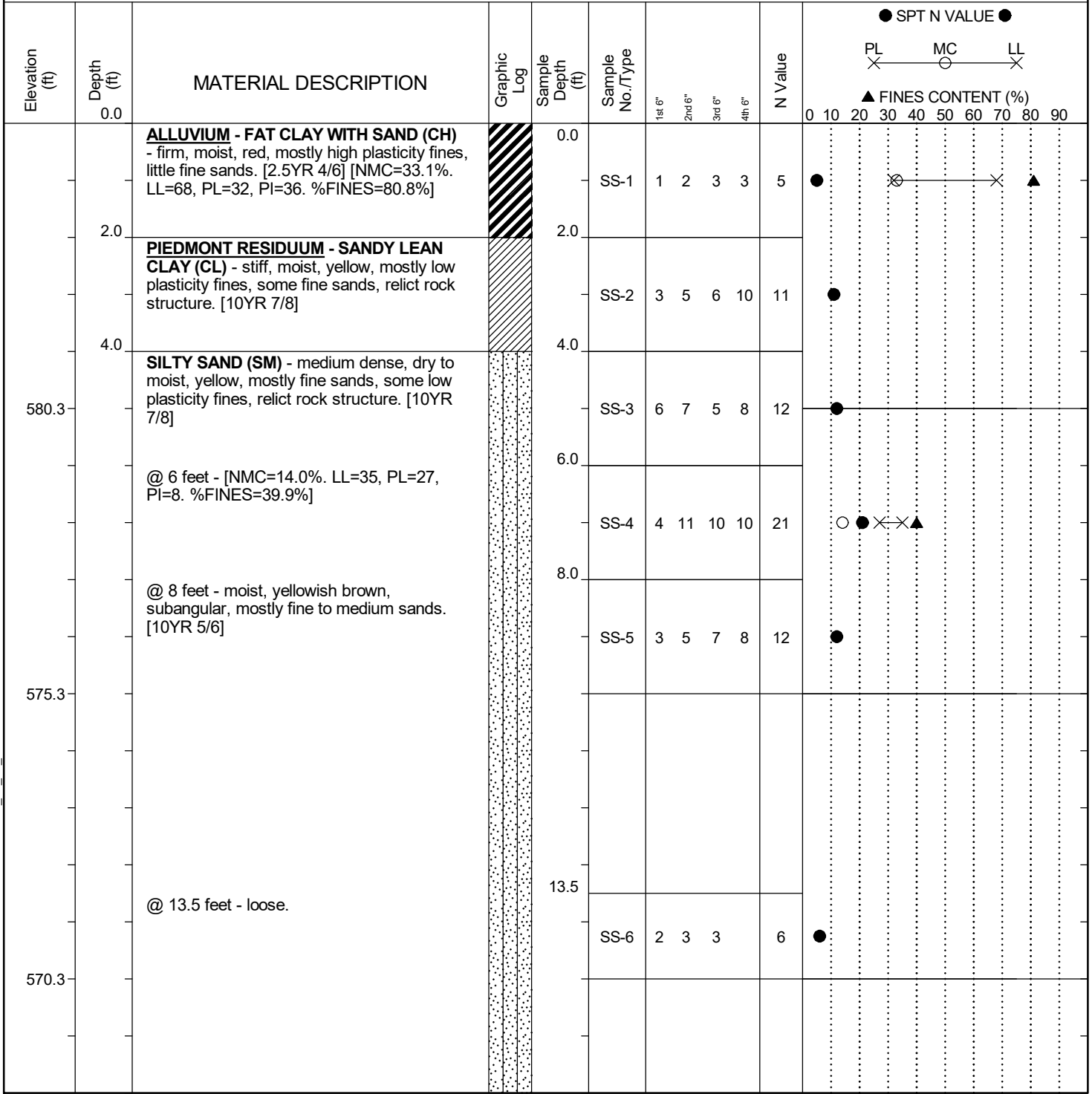
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SAMPLER TYPE SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8"		DRILLING METHOD HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing	
NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube		RW - Rotary Wash RC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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-13
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 562+29.94	Offset: 57.3 RT
Alignment: Ramp 4		
Elev.: 585.3 ft	Latitude: 34.9579	Longitude: -80.9805
Date Started: 1/14/2020		
Total Depth: 20 ft	Soil Depth: 20 ft	Core Depth: N/A ft
Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: J. Little	Groundwater: TOB Dry
24HR: Dry		



LEGEND

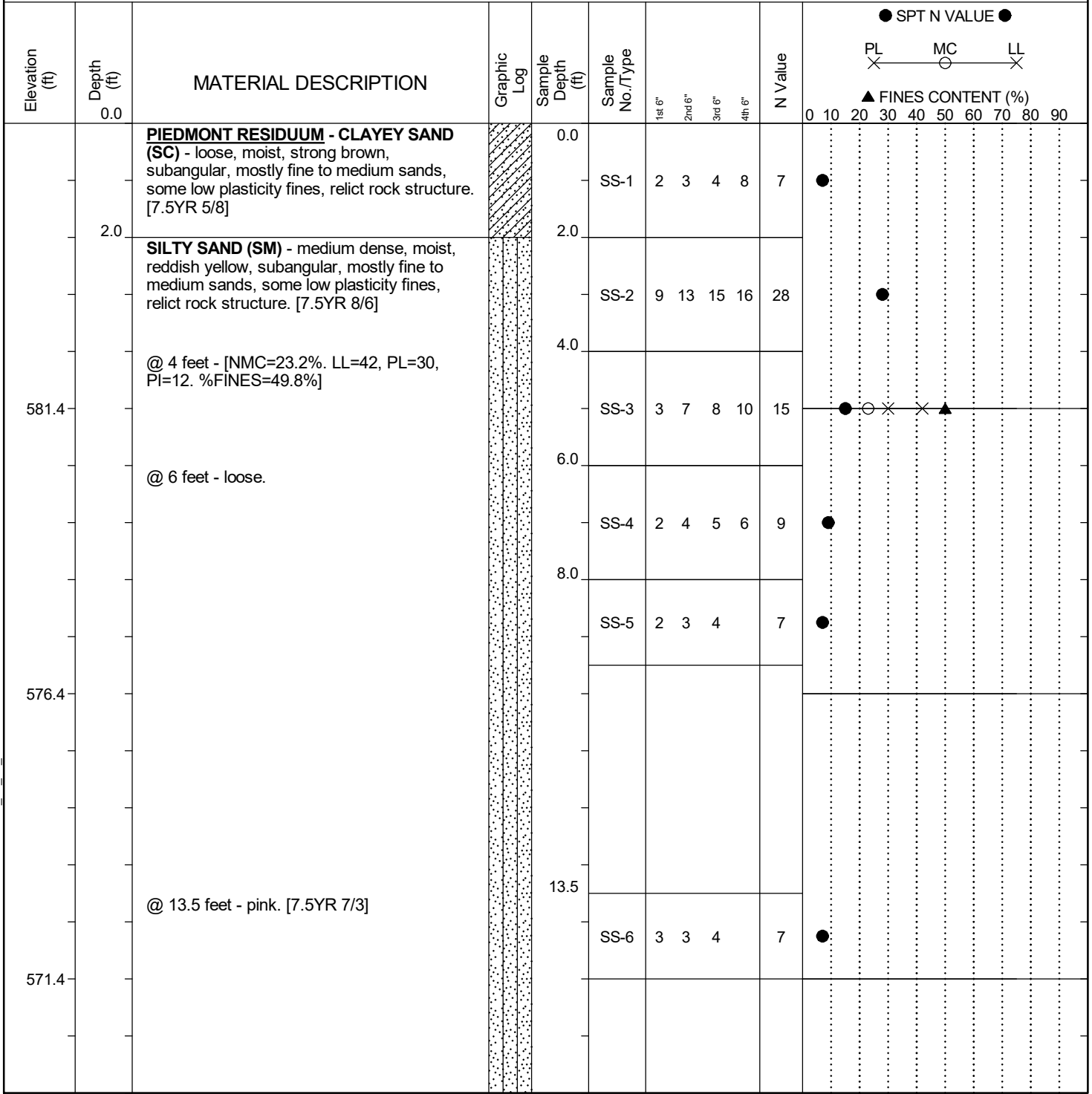
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York			Boring No.: RW-14	
Site Description: I-77 Panthers Interchange			Route: I-77		
Eng./Geo.: AKS	Boring Location: 563+20.29		Offset: 54.5 RT	Alignment: Ramp 4	
Elev.: 586.4 ft	Latitude: 34.9577	Longitude: -80.9804	Date Started: 1/14/2020		
Total Depth: 25 ft	Soil Depth: 25 ft	Core Depth: N/A ft	Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5		Sampler Configuration		Liner Required: Y (N)	Liner Used: Y (N)
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic		Energy Ratio: 85.9%	
Core Size: N/A	Driller: J. Little	Groundwater: TOB Dry		24HR: Dry	



LEGEND

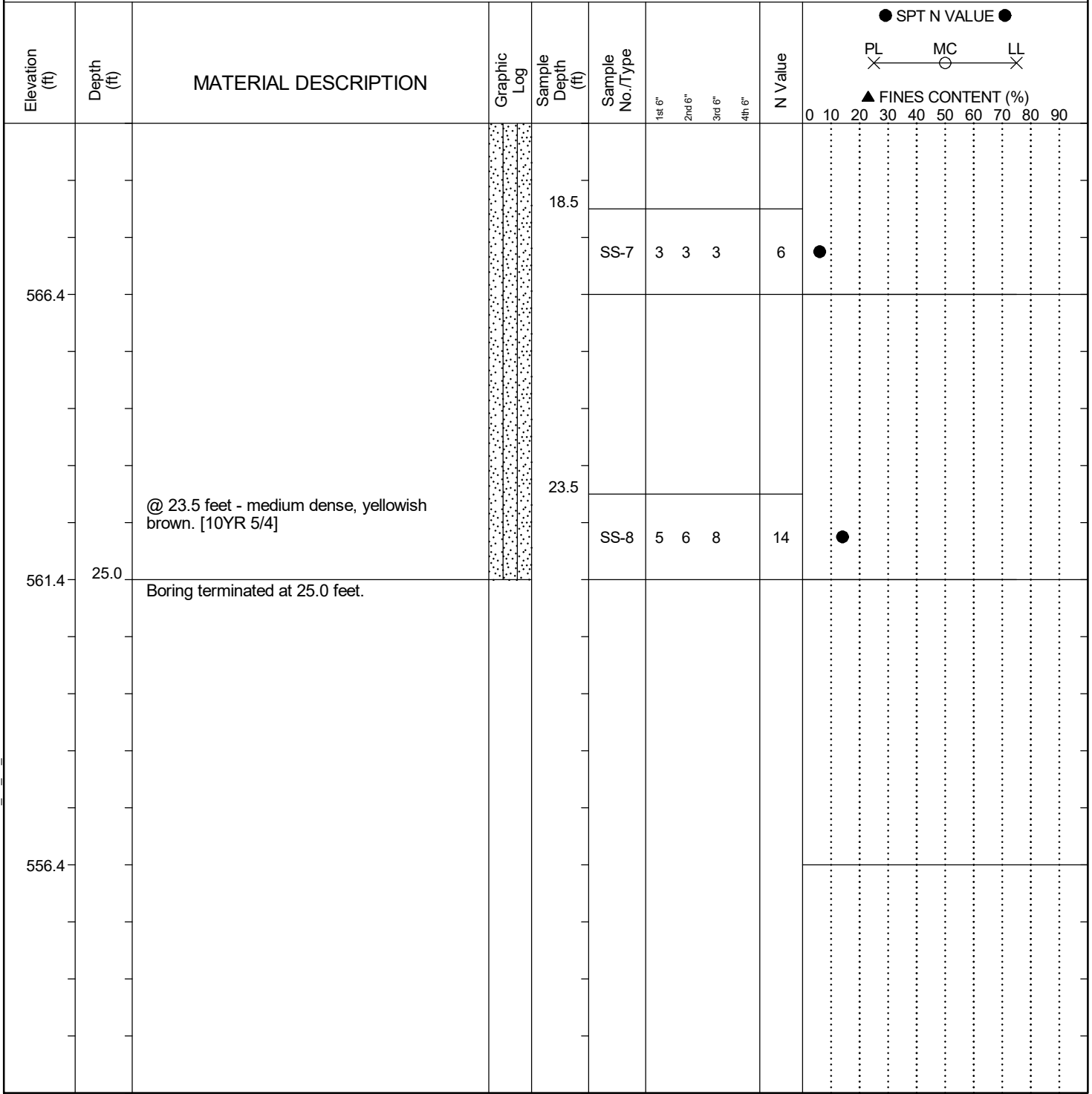
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SC.DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: RW-14
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: AKS	Boring Location: 563+20.29	Offset: 54.5 RT
Alignment: Ramp 4		
Elev.: 586.4 ft	Latitude: 34.9577	Longitude: -80.9804
Date Started: 1/14/2020		
Total Depth: 25 ft	Soil Depth: 25 ft	Core Depth: N/A ft
Date Completed: 1/14/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: J. Little	Groundwater: TOB Dry
24HR: Dry		



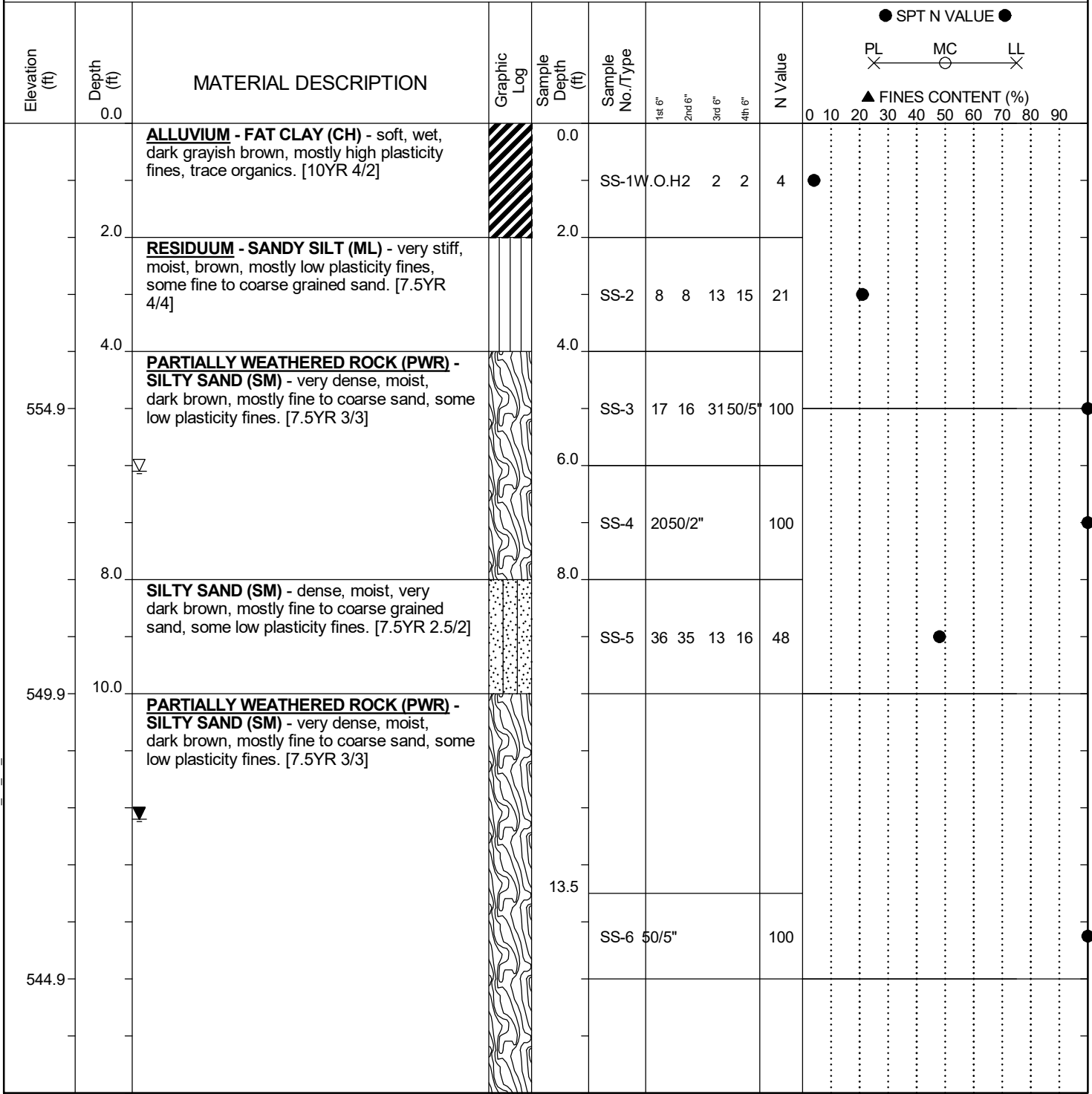
LEGEND

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 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID: P038652	County: York	Boring No.: C-1
Site Description: I-77 Panthers Interchange	Route: I-77	
Eng./Geo.: JCP	Boring Location: 566+56.16	Offset: 33.5 RT
Alignment: Ramp 2		
Elev.: 559.9 ft	Latitude: 34.9573	Longitude: -80.9787
Date Started: 5/21/2020		
Total Depth: 21 ft	Soil Depth: 21 ft	Core Depth: N/A ft
Date Completed: 5/21/2020		
Bore Hole Diameter (in): 5	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME-550X	Drill Method: H.S.A.	Hammer Type: Automatic
Energy Ratio: 85.9%		
Core Size: N/A	Driller: T. Brown	Groundwater: TOB 6.1 ft
24HR: 12.2 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 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

Appendix IV – Rock Core Photographs



Boring IB-1, Box 1 & 2

	
1	Remarks: Boring IB-1, Box 1

	
2	Remarks: Boring IB-1, Box 2



Boring IB-1, Box 3 & 4

3	Remarks:	Boring IB-1, Box 3	

4	Remarks:	Boring IB-1, Box 4	



Boring IB-2B, Box 1 & 2

Run	Length	Depth Int	Kc	K ₆₀
1-1	4.8	281-33.0	3.1	27%
1-2	5.0	30-38.0	2.4	78%
1-3	5.0	38-44.0	1.5	20%

I-77 Exit 80
 466-11-388
 Run 4 to 5
 45.0-52.0 ft
 Box 1

1	Remarks:	Boring IB-2B, Box 1
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Run	Length	Depth Int	Kc	K ₆₀
2-1	48.75-48.75	5.0	5.0	100%
2-5	48.0-52.0	5.0	5.0	96%

I-77 Exit 80
 466-11-388
 Run 4 to 5
 45.0-52.0 ft
 Box 2

2	Remarks:	Boring IB-2B, Box 2
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Boring IB-2B, Box 3 & 4

3	Remarks:	Boring IB-2B, Box 3

Run	Length	Depth Int.	Rate	Revol.
RL-7	5.0	58.0 - 59.0	5.0	100%
RL-7	5.0	58.0 - 63.0	5.0	100%

I-77 Exit 80
 1461-19-069
 EB-2B
 Run 7
 5.0 to 6.5 ft
 Box 3

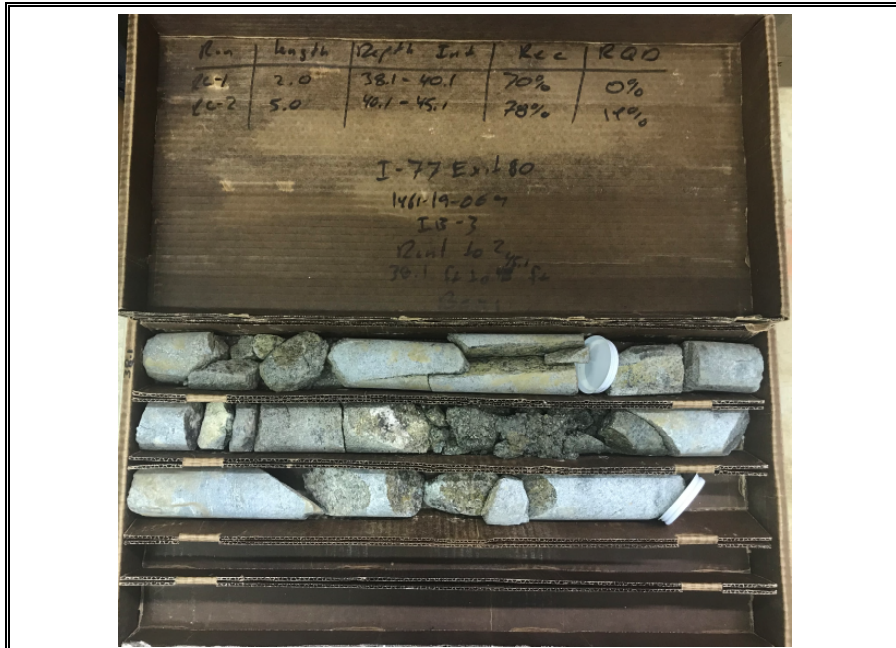
4	Remarks:	Boring IB-2B, Box 4

Run	Length	Depth Int.	Rate	Revol.
RL-7	5.0	58.0 - 63.0	5.0	100%

I-77 Exit 80
 1461-19-069
 IB-2B
 Run 7
 6.25 to 6.50 ft
 Box 4



Boring IB-3, Box 1 & 2



1	Remarks:	Boring IB-3, Box 1
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2	Remarks:	Boring IB-3, Box 2
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Boring IB-3, Box 3 & 4



3	Remarks:	Boring IB-3, Box 3
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4	Remarks:	Boring IB-3, Box 4
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Boring IB-4A, Box 1 & 2



1 Remarks: Boring IB-4A, Box 1



2 Remarks: Boring IB-4A, Box 2



Boring IB-4A, Box 3 & 4



3	Remarks:	Boring IB-4A, Box 3
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4	Remarks:	Boring IB-4A, Box 4
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Boring EB-1, Box 1 & 2

Run	Length	Depth	Rec	RQD
10-1	5.0	38.9-43.5	100%	14%
10-2	5.0	35.0-40.5	76%	8%
10-3	5.0	45.0-50.5	700%	42%

I-77 Exit 80
 11/12/19-069
 Boring EB-1
 15037

1

Remarks: Boring EB-1, Box 1

Run	Length	Depth	Rec	RQD
10-4	5.0	45.5-50.5	5.0	60%
10-5	5.0	50.5-55.5	5.0	100%

I-77 Exit 80
 11/12/19-069
 Boring EB-1
 15037

2

Remarks: Boring EB-1, Box 2



Boring EB-1, Box 3

3	Remarks: Boring EB-1, Box 3





Boring EB-2, Box 1 & 2



1	Remarks:	Boring EB-2, Box 1
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2	Remarks:	Boring EB-2, Box 2
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Boring EB-2, Box 3 & 4



3	Remarks:	Boring EB-2, Box 3
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4	Remarks:	Boring EB-2, Box 4
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Boring EB-3, Box 1 & 2



1	Remarks:	Boring EB-3, Box 1
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2	Remarks:	Boring EB-3, Box 2
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Boring EB-3, Box 3 & 4



3	Remarks:	Boring EB-3, Box 3
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4	Remarks:	Boring EB-3, Box 4
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Boring EB-4, Box 1 & 2



1 Remarks: Boring EB-4, Box 1



2 Remarks: Boring EB-4, Box 2



Boring EB-4, Box 3 & 4



3	Remarks:	Boring EB-4, Box 3
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4	Remarks:	Boring EB-4, Box 4
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Appendix V – SPT Hammer Energy Reports

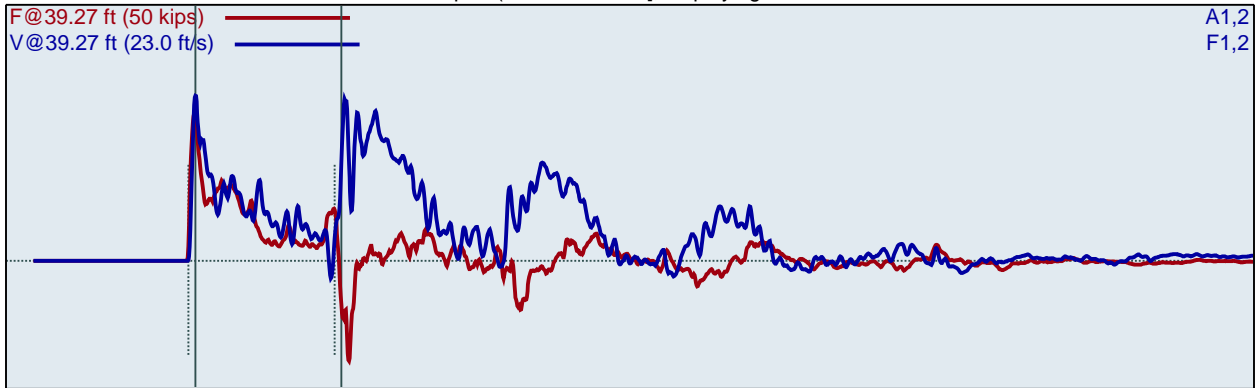
CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring

33.5 to 35 ft
Test date: 2/13/2019

AR: 1.22 in²
LE: 39.27 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (33.50 - 35.00 ft), displaying BN: 10



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

DFN: Final Displacement

FMX: Maximum Force

CSX: Compression Stress Maximum

VMX: Maximum Velocity

EFV: Maximum Energy

DMX: Maximum Displacement

ETR: Energy Transfer Ratio - Rated

BL#	LP	BC	BPM	FMX	VMX	DMX	DFN	CSX	EFV	ETR
	ft	/6"	bpm	kips	ft/s	in	in	ksi	ft-lb	%
1	33.58	6	1.9	30	14.7	1.05	1.00	24.6	271	77.4
2	33.67	6	42.4	30	14.8	1.00	1.00	24.5	273	78.1
3	33.75	6	42.5	30	14.7	1.05	1.00	24.5	269	76.9
4	33.83	6	42.3	30	14.8	1.28	1.00	24.6	270	77.1
5	33.92	6	42.5	30	14.8	1.36	1.00	24.4	271	77.3
6	34.00	6	42.4	30	14.7	1.23	1.00	24.8	271	77.5
7	34.10	5	42.4	30	14.7	1.26	1.20	24.5	272	77.6
8	34.20	5	42.5	30	14.6	1.20	1.20	24.5	270	77.3
9	34.30	5	42.4	30	14.9	1.20	1.20	24.3	273	77.9
10	34.40	5	42.5	30	14.8	1.20	1.20	24.5	271	77.4
11	34.50	5	42.4	30	14.9	1.20	1.20	24.6	271	77.3
12	34.56	8	42.5	30	14.9	0.91	0.75	24.5	270	77.2
13	34.63	8	42.3	29	15.0	0.87	0.75	24.0	275	78.6
14	34.69	8	42.5	30	14.9	0.80	0.75	24.3	268	76.5
15	34.75	8	42.3	30	15.1	0.81	0.75	24.5	274	78.2
16	34.81	8	42.5	30	15.0	0.75	0.75	24.5	267	76.3
17	34.88	8	42.4	30	15.2	0.75	0.75	24.4	271	77.4
18	34.94	8	42.4	30	15.2	0.76	0.75	24.5	272	77.6
19	35.00	8	42.5	30	15.3	0.75	0.75	24.4	272	77.8
Average			42.4	30	15.0	0.96	0.92	24.4	271	77.5
Std Dev			0.1	0	0.2	0.21	0.22	0.1	2	0.6
Maximum			42.5	30	15.3	1.26	1.20	24.6	275	78.6
Minimum			42.3	29	14.6	0.75	0.75	24.0	267	76.3

N-value: 13

Sample Interval Time: 25.42 seconds.

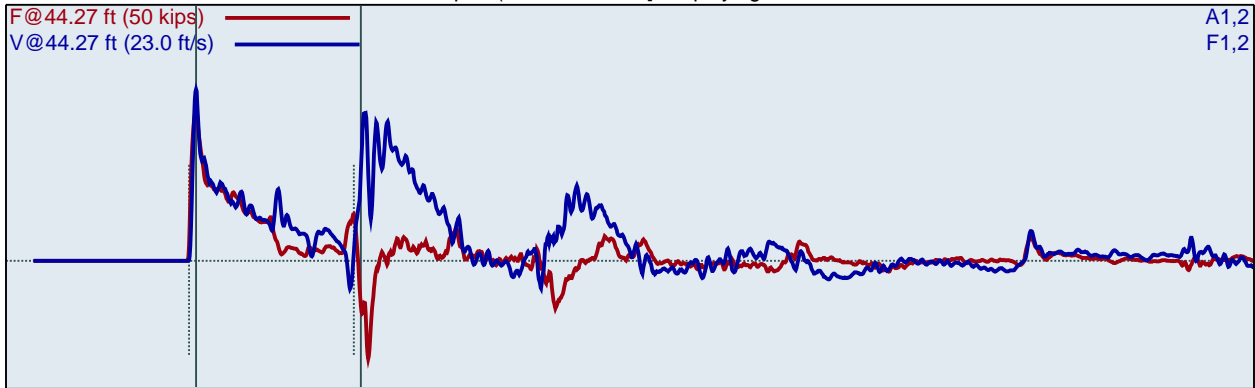
CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring

33.5 to 35 ft
Test date: 2/13/2019

AR: 1.22 in²
LE: 44.27 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.50 - 40.00 ft), displaying BN: 17



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

DFN: Final Displacement

FMX: Maximum Force

CSX: Compression Stress Maximum

VMX: Maximum Velocity

EFV: Maximum Energy

DMX: Maximum Displacement

ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	38.56	8	1.9	30	15.1	1.44	0.75	24.9	267	76.2
2	38.63	8	38.3	30	15.1	0.75	0.75	24.5	268	76.7
3	38.69	8	38.3	30	15.3	0.75	0.75	24.4	270	77.2
4	38.75	8	38.4	30	15.2	0.75	0.75	24.3	267	76.3
5	38.81	8	38.3	30	15.1	0.75	0.75	24.3	268	76.6
6	38.88	8	38.3	30	15.3	0.77	0.75	24.3	268	76.7
7	38.94	8	38.4	30	15.3	0.82	0.75	24.2	269	76.8
8	39.00	8	38.3	30	15.3	0.76	0.75	24.3	268	76.6
9	39.05	10	38.3	29	15.4	0.64	0.60	24.1	271	77.5
10	39.10	10	38.4	29	15.3	0.60	0.60	24.2	266	76.1
11	39.15	10	38.3	29	15.4	0.62	0.60	24.1	268	76.6
12	39.20	10	38.3	30	15.4	0.61	0.60	24.2	268	76.5
13	39.25	10	38.4	30	15.3	0.61	0.60	24.3	266	75.9
14	39.30	10	38.3	29	15.5	0.64	0.60	24.0	268	76.5
15	39.35	10	38.4	30	15.3	0.65	0.60	24.3	267	76.4
16	39.40	10	38.4	30	15.2	0.65	0.60	24.4	267	76.3
17	39.45	10	38.3	30	15.4	0.68	0.60	24.3	269	76.8
18	39.50	10	38.4	30	15.5	0.67	0.60	24.2	268	76.5
19	39.56	9	38.3	30	15.3	0.68	0.67	24.5	269	76.7
20	39.61	9	38.3	30	15.4	0.70	0.67	24.3	266	76.1
21	39.67	9	38.3	30	15.4	0.74	0.67	24.2	268	76.6
22	39.72	9	38.4	30	15.7	0.73	0.67	24.2	268	76.5
23	39.78	9	38.3	29	15.9	0.75	0.67	24.1	273	78.1
24	39.83	9	38.3	29	15.6	0.73	0.67	24.2	274	78.2
25	39.89	9	38.4	29	15.6	0.69	0.67	24.1	271	77.6
26	39.94	9	38.3	30	15.6	0.69	0.67	24.3	271	77.5
27	40.00	9	38.4	29	16.1	0.68	0.67	23.6	271	77.3

Average	38.3	30	15.5	0.67	0.63	24.2	269	76.8
Std Dev	0.0	0	0.2	0.04	0.03	0.2	2	0.6
Maximum	38.4	30	16.1	0.75	0.67	24.5	274	78.2
Minimum	38.3	29	15.2	0.60	0.60	23.6	266	75.9

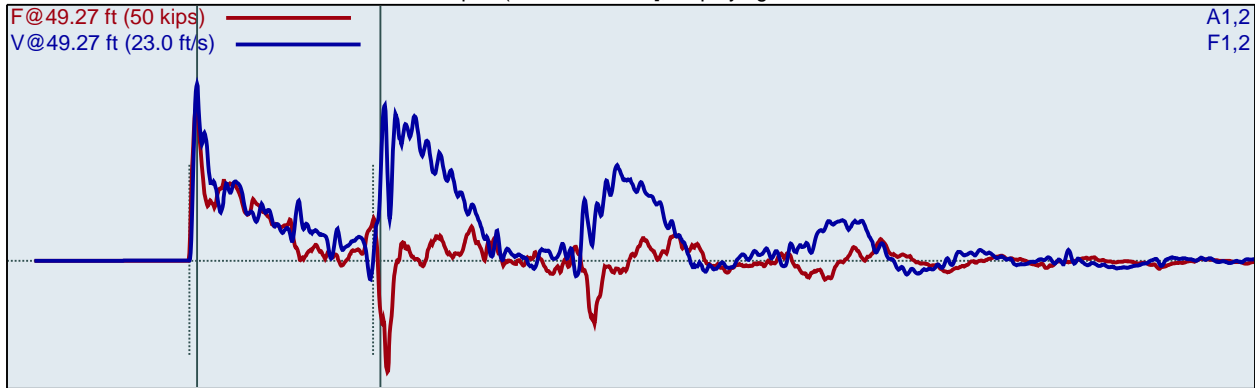
N-value: 19

Sample Interval Time: 40.63 seconds.

CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring
AR: 1.22 in²
LE: 49.27 ft
WS: 16807.9 ft/s

33.5 to 35 ft
Test date: 2/13/2019
SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (43.50 - 45.00 ft), displaying BN: 7



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

FMX: Maximum Force

VMX: Maximum Velocity

DMX: Maximum Displacement

DFN: Final Displacement

CSX: Compression Stress Maximum

EFV: Maximum Energy

ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	43.67	3	1.9	30	15.7	2.08	2.00	24.6	288	82.3
2	43.83	3	46.3	30	15.9	2.00	2.00	24.6	286	81.6
3	44.00	3	46.1	30	15.8	2.00	2.00	24.7	289	82.5
4	44.08	6	46.3	30	15.8	1.33	1.00	24.6	287	81.9
5	44.17	6	46.0	30	15.8	1.14	1.00	24.9	287	82.0
6	44.25	6	46.2	30	15.9	1.06	1.00	24.5	288	82.2
7	44.33	6	46.2	30	15.9	1.02	1.00	24.6	289	82.4
8	44.42	6	46.2	30	15.8	1.00	1.00	24.4	289	82.6
9	44.50	6	46.2	30	16.0	1.00	1.00	24.5	290	82.7
10	44.56	9	46.2	30	16.1	0.92	0.67	24.5	291	83.1
11	44.61	9	46.3	30	16.0	0.88	0.67	24.4	288	82.1
12	44.67	9	46.2	30	16.2	0.86	0.67	24.2	290	82.8
13	44.72	9	46.3	30	16.0	0.81	0.67	24.2	287	82.0
14	44.78	9	46.1	30	16.1	0.71	0.67	24.3	288	82.4
15	44.83	9	46.1	30	16.3	0.70	0.67	24.5	290	82.9
16	44.89	9	46.3	30	16.3	0.69	0.67	24.2	289	82.6
17	44.94	9	46.1	30	16.4	0.69	0.67	24.3	289	82.6
18	45.00	9	46.2	29	16.3	0.69	0.67	23.9	290	82.8
Average			46.2	30	16.0	0.90	0.80	24.4	289	82.5
Std Dev			0.1	0	0.2	0.19	0.16	0.2	1	0.3
Maximum			46.3	30	16.4	1.33	1.00	24.9	291	83.1
Minimum			46.0	29	15.8	0.69	0.67	23.9	287	81.9

N-value: 15

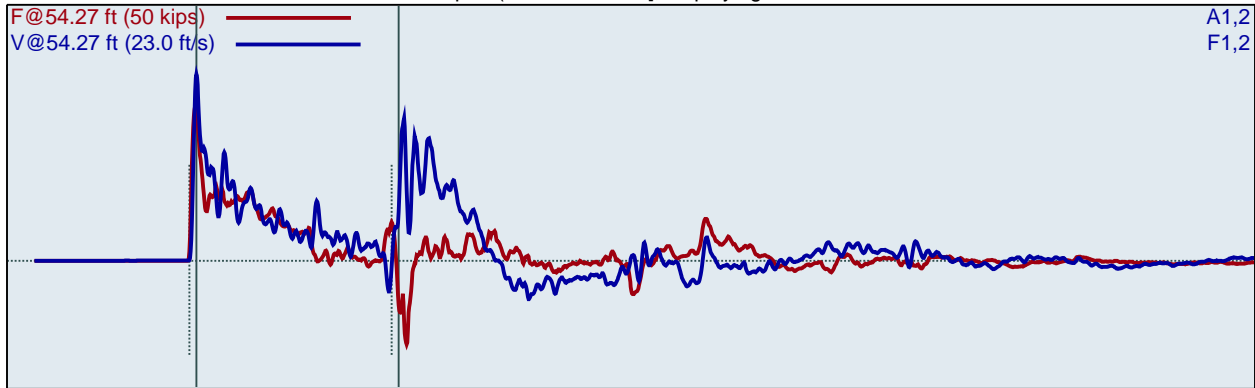
Sample Interval Time: 22.04 seconds.

CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring
AR: 1.22 in²
LE: 54.27 ft
WS: 16807.9 ft/s

33.5 to 35 ft
Test date: 2/13/2019

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (48.50 - 50.00 ft), displaying BN: 16



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

FMX: Maximum Force

VMX: Maximum Velocity

DMX: Maximum Displacement

DFN: Final Displacement

CSX: Compression Stress Maximum

EFV: Maximum Energy

ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	48.60	5	1.9	30	16.3	1.65	1.20	24.6	293	83.8
2	48.70	5	46.2	30	16.6	1.39	1.20	24.8	292	83.5
3	48.80	5	46.0	31	16.6	1.20	1.20	25.5	295	84.3
4	48.90	5	46.2	30	16.6	1.20	1.20	24.6	294	84.0
5	49.00	5	46.1	30	16.4	1.20	1.20	24.8	295	84.3
6	49.05	11	46.2	31	16.8	0.85	0.55	25.3	290	82.9
7	49.09	11	46.2	31	16.9	0.75	0.55	25.4	292	83.5
8	49.14	11	46.2	30	16.6	0.67	0.55	24.8	291	83.1
9	49.18	11	46.2	30	16.6	0.62	0.55	25.0	293	83.6
10	49.23	11	46.2	30	16.5	0.62	0.55	24.8	295	84.3
11	49.27	11	46.2	30	16.3	0.58	0.55	24.7	294	84.0
12	49.32	11	46.1	30	16.6	0.56	0.55	24.9	290	82.9
13	49.36	11	46.3	30	16.4	0.58	0.55	24.8	293	83.7
14	49.41	11	46.1	30	16.3	0.57	0.55	24.5	293	83.6
15	49.45	11	46.2	30	16.5	0.55	0.55	24.9	292	83.4
16	49.50	11	46.2	30	16.7	0.55	0.55	24.8	289	82.6
17	49.53	20	46.2	30	16.3	0.50	0.30	24.8	287	82.0
18	49.55	20	46.1	30	16.6	0.50	0.30	24.6	290	82.8
19	49.58	20	46.1	30	16.3	0.49	0.30	24.8	290	82.8
20	49.60	20	46.2	30	16.3	0.49	0.30	24.2	289	82.5
21	49.63	20	46.2	30	16.6	0.46	0.30	24.5	286	81.6
22	49.65	20	46.2	30	16.5	0.48	0.30	24.3	289	82.4
23	49.68	20	46.0	30	16.5	0.46	0.30	25.0	288	82.2
24	49.70	20	46.3	30	16.6	0.45	0.30	24.6	286	81.8
25	49.73	20	46.1	30	16.3	0.44	0.30	24.4	287	82.1
26	49.75	20	46.2	30	16.7	0.43	0.30	24.9	286	81.8
27	49.78	20	46.2	31	16.8	0.43	0.30	25.1	286	81.8

28	49.80	20	46.1	30	16.5	0.43	0.30	24.5	286	81.6
29	49.83	20	46.3	30	16.4	0.44	0.30	24.5	286	81.6
30	49.85	20	46.0	31	16.8	0.45	0.30	25.4	290	82.8
31	49.88	20	46.3	30	16.8	0.44	0.30	24.6	285	81.3
32	49.90	20	46.1	30	16.7	0.46	0.30	24.4	288	82.2
33	49.93	20	46.2	30	16.6	0.47	0.30	24.4	286	81.8
34	49.95	20	46.1	31	17.0	0.47	0.30	25.1	287	82.1
35	49.98	20	46.0	30	16.4	0.47	0.30	24.3	284	81.3
36	50.00	20	46.4	30	16.7	0.50	0.30	24.4	289	82.6
Average			46.2	30	16.6	0.52	0.39	24.7	289	82.6
Std Dev			0.1	0	0.2	0.10	0.12	0.3	3	0.8
Maximum			46.4	31	17.0	0.85	0.55	25.4	295	84.3
Minimum			46.0	30	16.3	0.43	0.30	24.2	284	81.3
N-value: 31										

Sample Interval Time: 45.42 seconds.

Summary of SPT Test Results

Project: CME-55 Truck (SN331845), Test Date: 2/13/2019

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	N Value	N60 Value	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average DFN in	Average CSX ksi	Average EFV ft-lb	Average ETR %
39.27	33.50	35.00	6-5-8	13	17	42.4	30	15.0	0.96	0.92	24.4	271	77.5
44.27	38.50	40.00	8-10-9	19	25	38.3	30	15.5	0.67	0.63	24.2	269	76.8
49.27	43.50	45.00	3-6-9	15	20	46.2	30	16.0	0.90	0.80	24.4	289	82.5
54.27	48.50	50.00	5-11-20	31	41	46.2	30	16.6	0.52	0.39	24.7	289	82.6
Overall Average Values:						43.6	30	15.9	0.70	0.62	24.5	281	80.3
Standard Deviation:						3.3	0	0.6	0.22	0.25	0.3	10	2.8
Overall Maximum Value:						46.4	31	17.0	1.33	1.20	25.4	295	84.3
Overall Minimum Value:						38.3	29	14.6	0.43	0.30	23.6	266	75.9

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

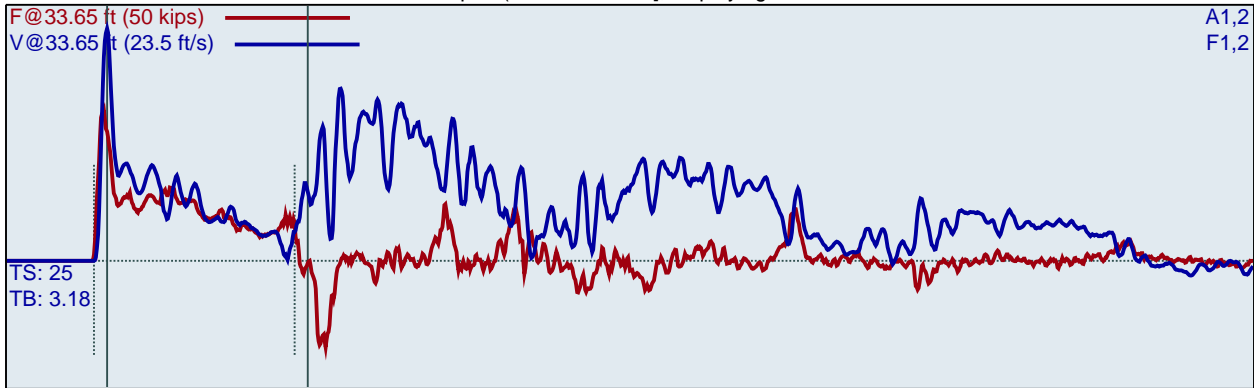
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in²
LE: 33.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (28.50 - 30.00 ft), displaying BN: 9



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

DFN: Final Displacement

FMX: Maximum Force

CSX: Compression Stress Maximum

VMX: Maximum Velocity

EFV: Maximum Energy

DMX: Maximum Displacement

ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	28.67	3	1.9	29	20.9	2.72	2.00	24.3	303	86.7
2	28.83	3	21.3	29	21.1	2.54	2.00	24.4	303	86.5
3	29.00	3	21.1	29	21.3	2.44	2.00	24.4	304	87.0
4	29.17	3	21.1	29	21.2	2.18	2.00	24.3	303	86.5
5	29.33	3	21.0	29	21.2	2.04	2.00	24.0	304	86.8
6	29.50	3	21.0	30	21.5	2.01	2.00	24.9	304	86.8
7	29.60	5	21.1	29	21.5	1.57	1.20	24.7	301	86.1
8	29.70	5	21.0	29	21.4	1.45	1.20	24.4	299	85.4
9	29.80	5	21.1	29	21.3	1.41	1.20	24.7	302	86.2
10	29.90	5	21.1	30	21.8	1.40	1.20	25.0	304	86.9
11	30.00	5	21.1	29	21.4	1.32	1.20	24.3	302	86.2
Average			21.1	29	21.4	1.67	1.50	24.5	302	86.4
Std Dev			0.0	0	0.2	0.32	0.39	0.3	2	0.5
Maximum			21.1	30	21.8	2.18	2.00	25.0	304	86.9
Minimum			21.0	29	21.2	1.32	1.20	24.0	299	85.4

N-value: 8

Sample Interval Time: 28.39 seconds.

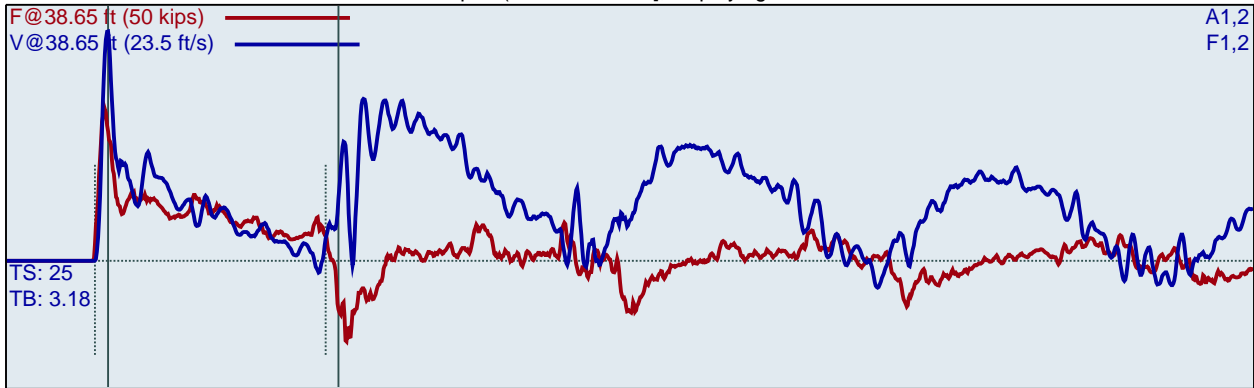
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in²
LE: 38.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (33.50 - 35.00 ft), displaying BN: 4



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	33.67	3	1.9	30	21.4	2.19	1.99	24.9	281	80.1
2	33.83	3	21.4	30	21.1	2.25	2.00	25.2	286	81.7
3	34.00	3	21.2	29	20.7	2.00	2.00	24.3	310	88.5
4	34.10	5	21.1	30	21.1	1.67	1.20	24.9	295	84.3
5	34.20	5	21.2	30	21.2	1.35	1.19	24.8	283	81.0
6	34.30	5	21.2	30	21.0	1.19	1.19	24.9	287	81.9
7	34.40	5	21.2	30	21.1	1.22	1.20	25.0	298	85.2
8	34.50	5	21.2	30	21.2	1.23	1.20	25.0	301	86.1
9	34.58	6	21.2	30	21.0	1.07	1.00	24.8	296	84.6
10	34.67	6	21.1	30	21.2	1.07	1.00	24.8	299	85.4
11	34.75	6	21.2	30	21.5	1.09	1.00	25.2	303	86.6
12	34.83	6	21.2	30	21.5	1.07	1.00	25.0	300	85.8
13	34.92	6	21.2	29	21.2	1.09	1.00	24.7	299	85.4
14	35.00	6	21.2	29	21.3	1.08	1.00	24.4	291	83.1
Average			21.2	30	21.2	1.19	1.09	24.9	296	84.5
Std Dev			0.0	0	0.2	0.17	0.10	0.2	6	1.7
Maximum			21.2	30	21.5	1.67	1.20	25.2	303	86.6
Minimum			21.1	29	21.0	1.07	1.00	24.4	283	81.0

N-value: 11

Sample Interval Time: 36.73 seconds.

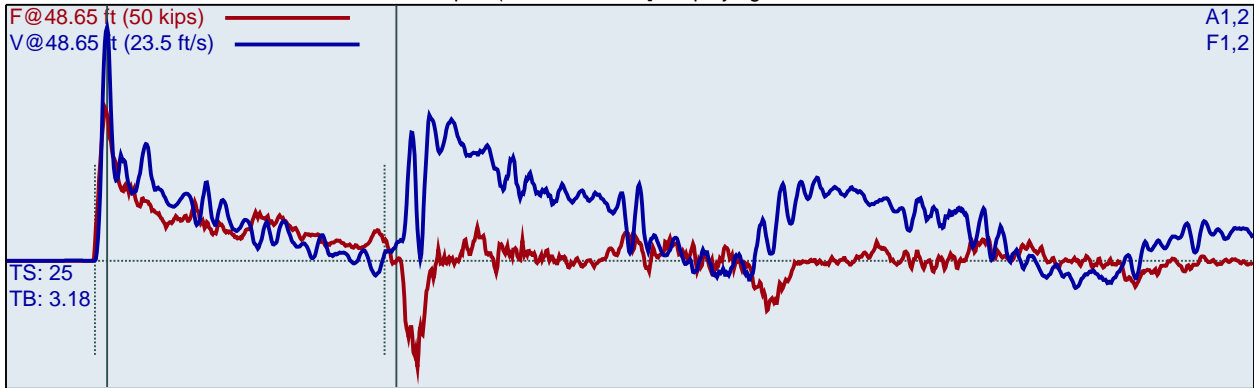
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in²
LE: 48.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (43.50 - 45.00 ft), displaying BN: 11



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	43.63	4	1.9	29	20.4	1.72	1.50	24.4	267	76.1
2	43.75	4	21.3	29	21.2	1.56	1.50	24.4	298	85.1
3	43.88	4	21.2	29	21.6	1.57	1.50	24.7	298	85.1
4	44.00	4	21.1	28	22.9	1.57	1.50	23.9	291	83.0
5	44.13	4	21.1	30	21.7	1.57	1.50	25.1	286	81.8
6	44.25	4	21.2	30	21.3	1.58	1.50	25.3	298	85.2
7	44.38	4	21.2	30	21.4	1.56	1.50	25.2	303	86.6
8	44.50	4	21.2	29	22.0	1.51	1.50	24.8	309	88.2
9	44.60	5	21.1	30	21.1	1.20	1.20	24.9	292	83.5
10	44.70	5	21.2	30	21.4	1.20	1.20	25.5	294	83.9
11	44.80	5	21.2	30	21.5	1.20	1.20	25.2	296	84.5
12	44.90	5	21.2	30	21.6	1.20	1.20	25.2	294	83.9
13	45.00	5	21.2	30	21.9	1.22	1.20	24.9	303	86.6
Average			21.2	30	21.5	1.36	1.33	25.1	297	84.9
Std Dev			0.0	0	0.3	0.18	0.15	0.2	6	1.8
Maximum			21.2	30	22.0	1.58	1.50	25.5	309	88.2
Minimum			21.1	29	21.1	1.20	1.20	24.8	286	81.8

N-value: 9

Sample Interval Time: 33.94 seconds.

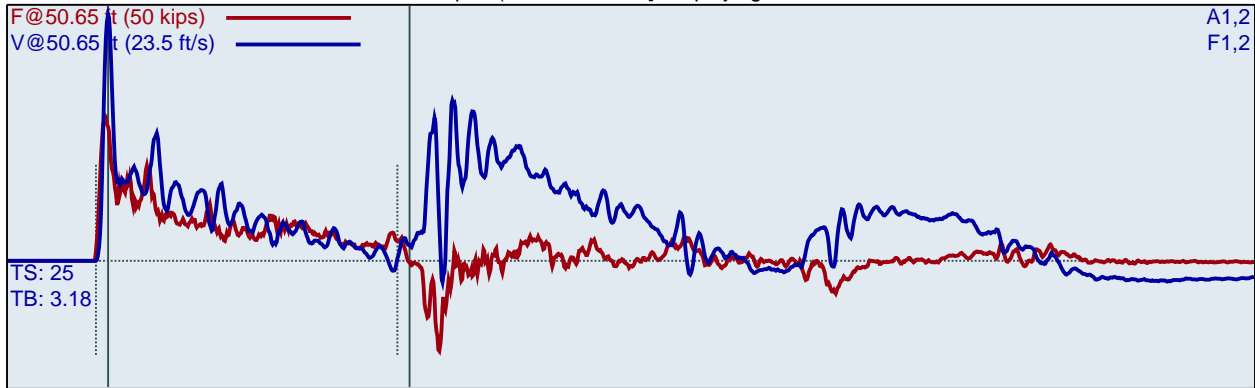
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in²
LE: 50.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (46.00 - 47.50 ft), displaying BN: 12



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	46.13	4	1.9	29	21.4	1.69	1.49	24.6	267	76.4
2	46.25	4	21.5	30	21.9	1.72	1.50	25.0	289	82.4
3	46.38	4	21.2	29	21.9	1.58	1.50	24.7	290	82.9
4	46.50	4	21.1	30	22.4	1.69	1.50	25.1	313	89.6
5	46.60	5	21.1	29	22.2	1.48	1.20	24.6	312	89.1
6	46.70	5	21.2	29	22.6	1.33	1.20	24.6	305	87.1
7	46.80	5	21.2	29	22.5	1.25	1.20	24.4	300	85.7
8	46.90	5	21.2	28	22.6	1.20	1.20	23.9	293	83.8
9	47.00	5	21.2	28	22.8	1.20	1.20	23.4	296	84.7
10	47.07	7	21.2	28	22.4	0.88	0.85	23.6	288	82.1
11	47.14	7	21.2	28	22.7	0.90	0.85	23.4	293	83.7
12	47.21	7	21.2	28	22.7	0.93	0.86	23.8	303	86.5
13	47.29	7	21.2	29	22.5	0.91	0.86	24.0	304	87.0
14	47.36	7	21.2	29	22.6	0.93	0.86	24.1	308	87.9
15	47.43	7	21.2	28	22.3	0.93	0.86	23.9	309	88.2
16	47.50	7	21.2	28	22.3	0.92	0.86	23.8	309	88.4
Average			21.2	29	22.5	1.07	1.00	24.0	302	86.2
Std Dev			0.0	0	0.2	0.20	0.17	0.4	7	2.1
Maximum			21.2	29	22.8	1.48	1.20	24.6	312	89.1
Minimum			21.1	28	22.2	0.88	0.85	23.4	288	82.1

N-value: 12

Sample Interval Time: 42.35 seconds.

Summary of SPT Test Results

Project: METRO CME-550 (SN191273), Test Date: 1/23/2020

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	N Value	N60 Value	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average DFN in	Average CSX ksi	Average EFV ft-lb	Average ETR %
33.65	28.50	30.00	3-3-5	8	11	21.1	29	21.4	1.67	1.50	24.5	302	86.4
38.65	33.50	35.00	3-5-6	11	15	21.2	30	21.2	1.19	1.09	24.9	296	84.5
48.65	43.50	45.00	4-4-5	9	12	21.2	30	21.5	1.36	1.33	25.1	297	84.9
50.65	46.00	47.50	4-5-7	12	17	21.2	29	22.5	1.07	1.00	24.0	302	86.2
Overall Average Values:						21.2	29	21.7	1.29	1.20	24.6	299	85.5
Standard Deviation:						0.1	1	0.6	0.31	0.29	0.5	7	1.9
Overall Maximum Value:						21.2	30	22.8	2.18	2.00	25.5	312	89.1
Overall Minimum Value:						21.0	28	21.0	0.88	0.85	23.4	283	81.0

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated



Report of SPT Energy Measurements
S&ME CME-550X ATV (Serial No. 290593)
Charlotte, North Carolina
S&ME Project No. 6235-17-020

PREPARED FOR:

**North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699**

PREPARED BY:

**S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273**

June 3, 2019



June 3, 2019

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

Attention: Dr. Shunyi (Chris) Chen, Ph.D., P.E.

Cc: Ms. Cheryl A. Youngblood, L.G.

Reference: **Report of SPT Energy Measurements**
S&ME CME-550X ATV (Serial No. 290593)
Charlotte, North Carolina
S&ME Project No. 6235-17-020
NC PE Firm License No. F-0176

Dear Dr. Chen:

We have completed the Standard Penetration Test (SPT) energy measurements on the automatic hammer used with our CME-550X ATV-mounted drill rig (Serial No. 290593). This service was performed by Mr. Joseph Williamson, P.E. of our firm on May 1, 2019, in general accordance with ASTM D4633 and the most recent revision of the North Carolina Department of Transportation (NCDOT) Geotechnical Engineering Unit's requirements. Review of the data quality and analyses was performed by Mr. Gregory Canivan, P.E. of our firm. Copies of the Certificates of Proficiency issued by Pile Dynamics based on the Dynamic Measurement and Analysis Proficiency Test for Mr. Williamson and Mr. Canivan are included in the Appendix. The testing procedures, equipment used during testing, and detailed results are presented in this report.

1.0 Dynamic Testing Methodology

Testing was performed using a model PAX (Serial No. 3733L) Pile Driving Analyzer™ (PDA) manufactured by Pile Dynamics, Inc. The PDA was used to record and interpret data from two piezoresistive accelerometers (Serial Nos. K10181 and K10182) bolted to a 2.0-foot long AWJ drill rod (Serial No. 203) internally instrumented with two strain transducers. Calibration sheets for the accelerometers and the instrumented rod are included in the Appendix. The instrumented AWJ drill rod has a cross-sectional area of 1.19 square inches and an outside diameter of approximately 1.75 inches. Therefore, we calculate the inside diameter to be approximately 1.25 inches at the gauge location. The accelerometers and strain gauges, which are diametrically opposed near the middle of the instrumented rod, monitor acceleration and strain for each hammer blow. The analyzer converts the data to velocities and forces and computes the maximum transferred hammer energies with the "EFV" method described in ASTM D4633. Preliminary results are recorded and displayed in real time for each blow.



2.0 Testing and Observations

S&ME personnel were on site May 1, 2019, to observe and perform high-strain dynamic testing during SPT sampling on the CME-550X ATV-mounted drill rig operated by Fred Johnson of S&ME. The measurements were taken during drilling and sampling of a soil test boring at S&ME's office in Charlotte, North Carolina. SPT energy measurements were recorded during four sampling intervals at depths of approximately 28.5, 33.5, 38.5, and 43.5, ft below the ground surface. The 43.5-ft sample interval did not meet the NCDOT blow count requirements and was not included in the data analysis. The information presented in the tables below summarizes the equipment and tooling used during the SPT energy measurements.

Table 2-1: Drill Rig Information

Manufacturer	CME
Model	550X
Serial Number	290593
Operator	F. Johnson
Carrier	ATV

Table 2-2: Hammer Information

Model / Type	CME / Auto
Serial Number	290593
Anvil Height (inches)	12
Anvil Diameter (inches)	2.5
Typical Drop Height (inches)	30
Typical Ram Weight (pounds)	140
Ram Serial Number	N/A

Table 2-3: Drilling and Instrumented Rod Information

Drill Rod Type	AWJ
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in²)	1.19
Typical Lengths (feet)	5
Instrumented Rod Type	AWJ (Serial No. 203)
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in²)	1.19
Total Instrumented Rod Length (feet)	2.0
Length Below Gages (feet)	0.8
Split-Spoon Length (feet)	2.85



3.0 Dynamic Testing Results

The total rod length from the instrumentation to the tip of the split-spoon sampler was determined by adding 3.65 ft to the drill rod length at each sample depth. The SPT Energy Measurement Data Summary tables in the Appendix present the test data from every hammer blow at each sampling interval, along with representative force and velocity traces for each test interval. Per ASTM D4633, only the blows from the final foot of each sample interval (i.e. the blows that determine the N-value) are considered when computing the average measurement values of each test interval.

The reported blow counts obtained by the drill rig personnel, a summary of the test data, and average computed hammer energy and transfer ratio values are provided in Table 3-1. Based on the test data, the automatic hammer on the CME-550X operated at an average rate of about 53 blows per minute (bpm) during dynamic testing. The measured average transferred hammer energy (EFV) of the three sample intervals tested ranged from 295 to 305 ft-lbs, which corresponds to Energy Transfer Ratio (ETR) values of 84.2 to 87.0%, respectively. Plots and tables of the following are also included in the Appendix and present the test data with depth for each test interval:

- Penetration vs. BLC¹
- Penetration vs. FMX²
- Penetration vs. EFV³
- Penetration vs. CSX⁴
- Penetration vs. VMX⁵
- Penetration vs. ETR⁶
- ETR vs. Rod Length
- Average ETR vs. Rod Length

Table 3-1: Summary of Dynamic Testing Results

Data Set ID	Sample Depth (ft)	Drill Rod Length (ft)	Instrumentation to Sampler Tip Length (ft)	Blows per 6" Increment / N-value	Soil Sample Description (Piedmont Residual)	Avg. BPM	Avg. EFV (ft-lbs)	Avg. ETR (%)
1	28.5 – 30.0	30.0	33.65	3-4-5 / 9	SANDY SILT	53.8	295	84.2
2	33.5 – 35.0	35.0	38.65	3-6-10 / 16	SANDY SILT	53.7	305	87.0
3	38.5 – 40.0	40.0	43.65	9-13-24 / 37	SILTY SAND	53.2	300	85.9
Overall Average						53.4	301	85.9

The overall average transferred hammer energy for the automatic hammer on the CME-550X ATV-mounted drill rig was 301 foot-pounds, with an average ETR of 85.9%.

¹ BLC - Blow Count per 6-in. increment
² FMX - Maximum Compressive Force
³ EFV – Maximum Transferred Energy

⁴ CSX – Maximum Compressive Stress
⁵ VMX – Maximum Velocity

⁶ ETR – Energy Transfer Ratio – Ratio of Calculated Energy to Theoretical Energy of 140 lb hammer falling 30 inches



4.0 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of our profession in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

5.0 Closing

S&ME appreciates the opportunity to provide this report to the North Carolina Department of Transportation, Geotechnical Engineering Unit. Please let us know if you have any questions concerning this report.

Sincerely,

S&ME, Inc.

Joseph R. Williamson, P.E.
Project Engineer
N.C. Registration No. 042168

DocuSigned by:

8C4BAC9729DB487...

Gregory J. Canivan, P.E.
Technical Principal
N.C. Registration No. 028593



Appendices:

- Appendix I - Certificates of Proficiency
- Appendix II - Instrumented Rod and Accelerometer Calibration Sheets
- Appendix III - CME-550X ATV (SN 290593) SPT Energy Measurements Summary Plots and Tables
- Appendix IV - SPT Energy Evaluation Form (Field Log)

Appendices

Appendix I



This documents that

**Joseph Williamson
S&ME**

has on October 31, 2017 achieved the rank of

INTERMEDIATE


on the **Dynamic Measurement and Analysis Proficiency Test.**

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended that individuals at the Intermediate level seek Advanced, Master or Expert levels through additional study within four years of the date of this document.***

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate. This certificate can be verified at www.PDAproficiencytest.com.


Steven A. Hall, Executive Director
Pile Driving Contractors Association




Garland Likins, Senior Partner
Pile Dynamics, Inc.

No. 2426



This documents that

**Greg Canivan
S&ME Inc.**

has on October 8, 2014 achieved the rank of

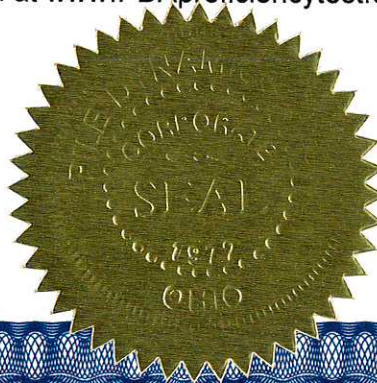
MASTER


on the Dynamic Measurement and Analysis Proficiency Test.

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended that individuals at the Master level seek to attain Expert level through additional study within five years of the date of this document***

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate. This certificate can be verified at www.PDAproficiencytest.com.


Steven A. Hall, Executive Director
Pile Driving Contractors Association




Garland Likins, President
Pile Dynamics, Inc

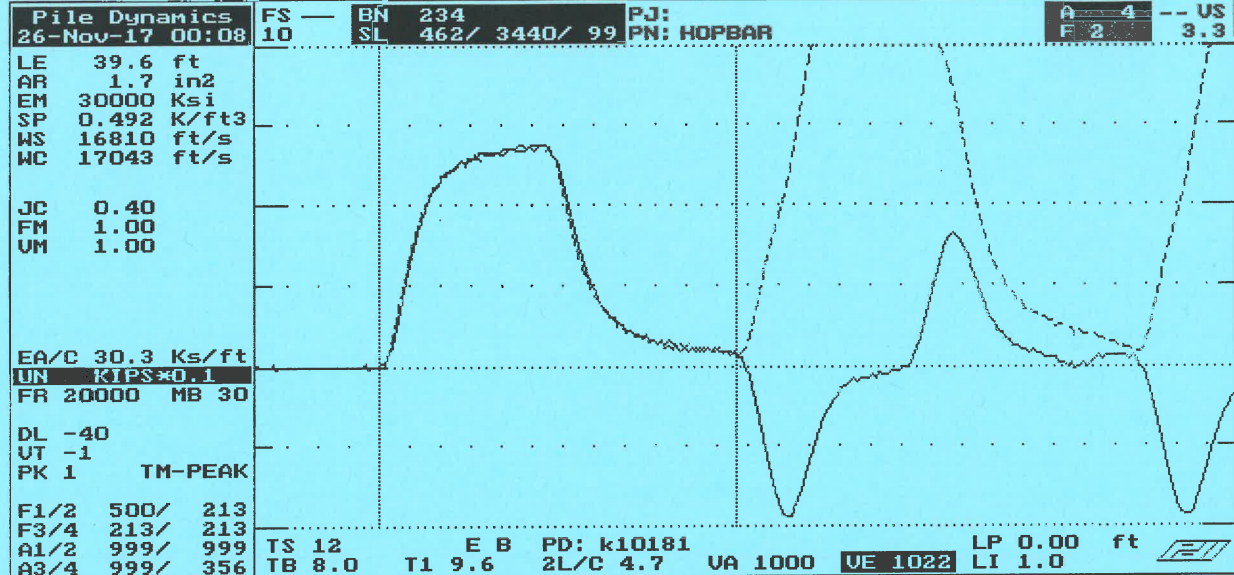
No. 721

Appendix II

QBTA: ON [ALT-F1/B8=60]

File Dynamics, Inc.

TG F2 DPF



ACCEPT SQ-OFF FL-OFF PR-OFF

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

Smart Sensor

Smart Chip Programmed By R.M.W. on 4 DEC 17 CRC Value 6A07

QBTA: ON [ALT-F1/BB=60]

Pile Dynamics, Inc.

TG E2 DPF

Pile Dynamics 26-Nov-17 00:18	FS — 10	BN 250 SL 462/ 3440/ 99	PJ: PN: HOPBAR	A 4 -- US F 2 3.3			
LE 39.6 ft AR 1.7 in2 EM 30000 Ksi SP 0.492 K/ft3 WS 16810 ft/s WC 17043 ft/s							
JC 0.40 FM 1.00 UM 1.00							
EA/C 30.3 Ks/ft UN KIPS*0.1 FR 20000 MB 30							
DL -42 UT -1 PK 1 TM-PEAK							
F1/2 500/ 213 F3/4 213/ 213 A1/2 999/ 999 A3/4 999/ 368							
TS 12 TB 8.0					E B PD: k10182 T1 9.6 2L/C 4.7	VA 1000 UE 1022	LP 0.00 ft LI 1.0
UMX= 4.4 FMX= 68 AMX= 149 EMX= 0.3 MEX= 133 FUP= 0.99							
ACCEPT SQ-OFF FL-OFF PR-OFF							
ACCELEROMETER CALIBRATION N.I.S.T. Traceable SERIAL NUMBER: K10182 CALIBRATION FACTOR: .0736 MV/G PAK (*5000): 368 DATE: 4DEC17 PDA OPERATOR: <i>[Signature]</i>							
<-AT:PIEZORESISTIVE OP: laine [ver:4.05] AT:PIEZOELECTRIC->							



contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

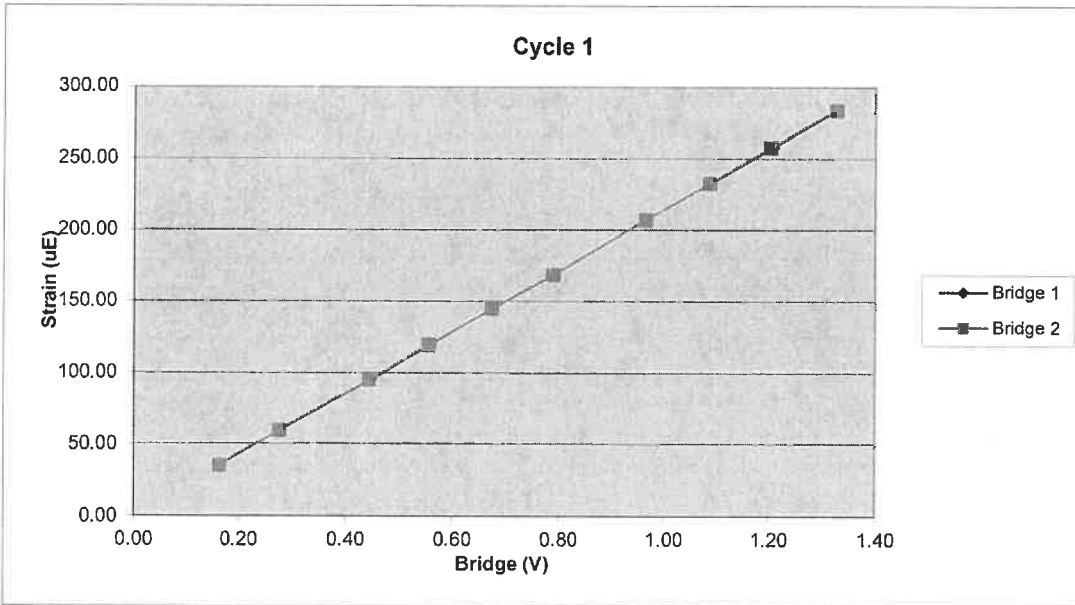
Smart Sensor

Smart Chip Programmed By J.M.W. on 4DEC17 CRC Value 1798

203AWJ		Cycle 1		
Sample	Force (lb)	Strain (μE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1238.45	35.09	0.16	0.16
3	2101.82	59.39	0.28	0.28
4	3386.54	94.77	0.44	0.44
5	4235.08	119.35	0.56	0.56
6	5136.73	144.58	0.67	0.67
7	6021.00	168.91	0.79	0.79
8	7359.61	207.34	0.97	0.97
9	8298.94	232.84	1.09	1.09
10	9187.31	257.76	1.21	1.20
11	10120.00	284.12	1.33	1.33

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7630.77	Force Calibration (lb/V)	7630.97
Offset	-7.83	Offset	-3.17
Correlation	1.000000	Correlation	0.999999
Strain Calibration ($\mu\text{E}/\text{V}$)	213.97	Strain Calibration ($\mu\text{E}/\text{V}$)	213.98
Offset	0.12	Offset	0.25
Correlation	0.999992	Correlation	0.999995

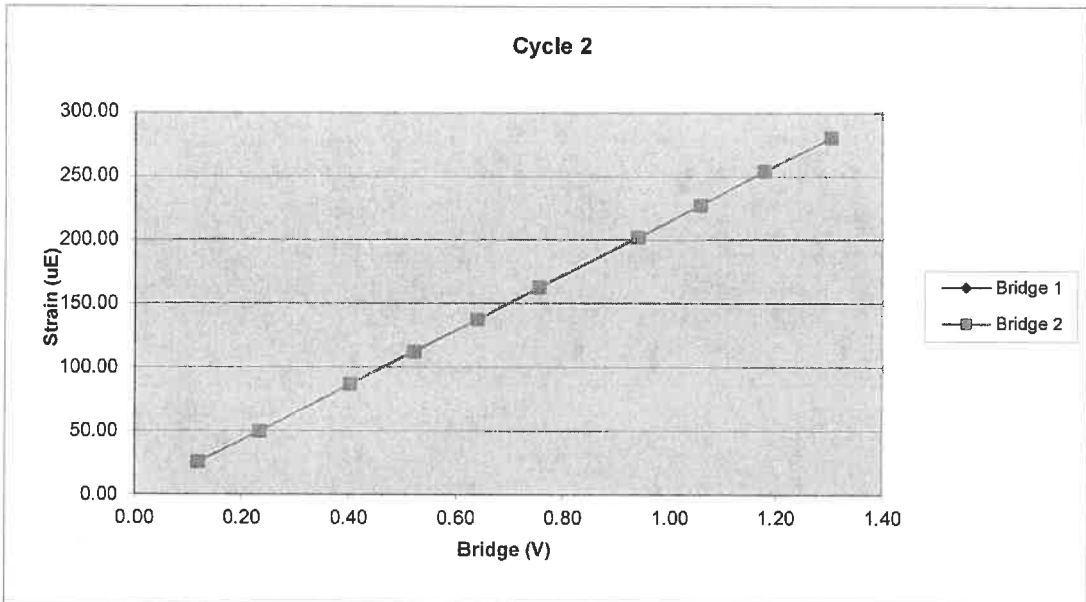
Force Strain Calibration	
EA (Kips)	35662.28
Offset	-12.17
Correlation	0.999993



203AWJ		Cycle 2		
Sample	Force (lb)	Strain (μE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	883.29	25.21	0.12	0.12
3	1765.61	49.65	0.23	0.23
4	3049.75	86.59	0.40	0.40
5	3958.42	112.20	0.52	0.52
6	4857.33	137.43	0.64	0.64
7	5743.75	162.78	0.76	0.76
8	7145.42	202.15	0.94	0.94
9	8044.14	227.44	1.06	1.06
10	8969.22	253.99	1.18	1.18
11	9924.95	280.34	1.30	1.30

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7617.86	Force Calibration (lb/V)	7627.07
Offset	-11.91	Offset	-18.36
Correlation	0.999998	Correlation	1.000000
Strain Calibration ($\mu\text{E}/\text{V}$)	215.30	Strain Calibration ($\mu\text{E}/\text{V}$)	215.56
Offset	-0.14	Offset	-0.33
Correlation	0.999995	Correlation	0.999996

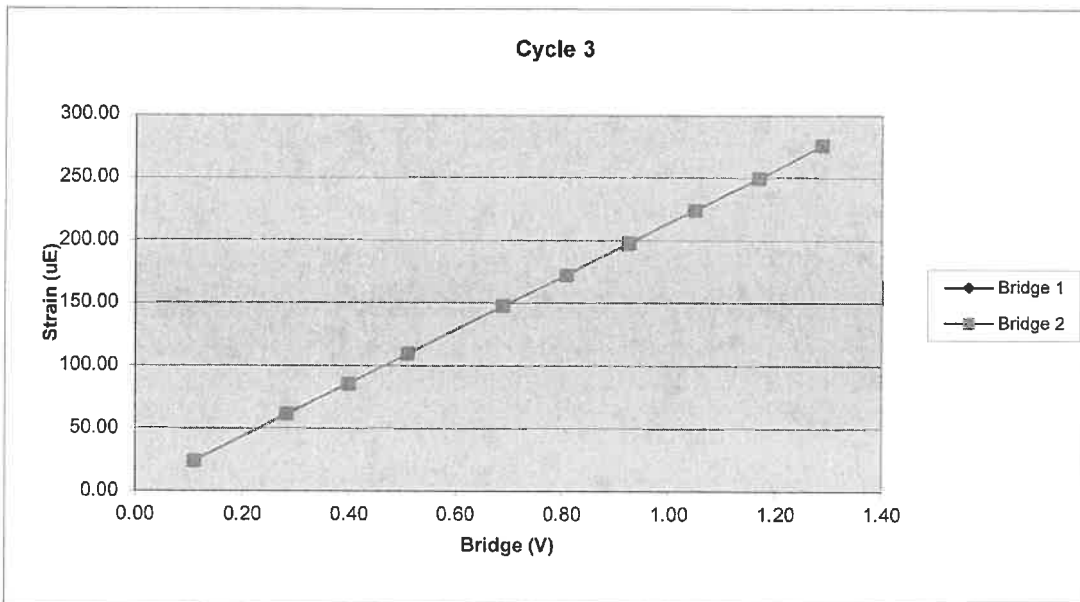
Force Strain Calibration	
EA (Kips)	35381.61
Offset	-6.76
Correlation	0.999996



203AWJ		Cycle 3		
Sample	Force (lb)	Strain (μ E)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	843.85	23.93	0.11	0.11
3	2145.36	61.00	0.28	0.28
4	3029.63	85.25	0.40	0.40
5	3880.71	109.47	0.51	0.51
6	5241.19	147.71	0.69	0.69
7	6147.33	172.47	0.81	0.81
8	7034.72	198.06	0.92	0.92
9	7979.71	224.33	1.05	1.05
10	8906.15	249.58	1.17	1.17
11	9817.56	275.86	1.29	1.29


Bridge 1		Bridge 2	
Force Calibration (lb/V)	7623.93	Force Calibration (lb/V)	7629.88
Offset	-3.49	Offset	-9.59
Correlation	0.999999	Correlation	0.999999
Strain Calibration (μ E/V)	213.65	Strain Calibration (μ E/V)	213.81
Offset	0.47	Offset	0.30
Correlation	0.999992	Correlation	0.999991

Force Strain Calibration	
EA (Kips)	35684.19
Offset	-20.08
Correlation	0.999992



Bridge Excitation (V) 5
Shunt Resistor (ohm) 60.4k

Calibration Factors	203AWJ		
Bridge 1 ($\mu\text{E/V}$)	214.31	Bridge 2 ($\mu\text{E/V}$)	214.45
EA Factor (Kips)	35576.02	Area (in²)	1.19

Calibrated by: 
Calibrated Date: 2/26/2019

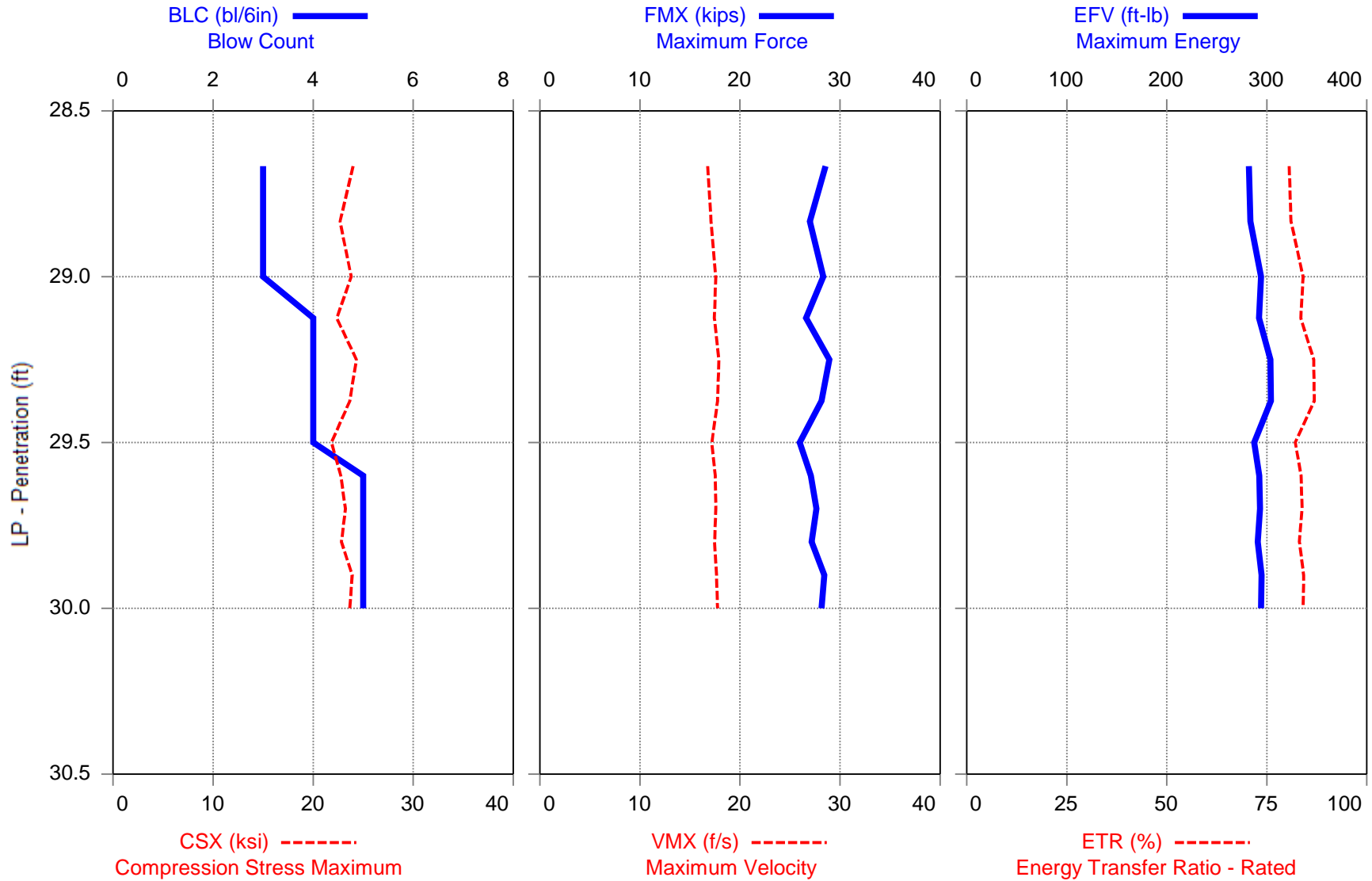
Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

Appendix III



CME-550X (SN 290593) - 28.5-30.0 FEET
TEST HOLE



CME-550X (SN 290593)

28.5-30.0 FEET

JRW

Test date: 5/1/2019

TEST HOLE

AR: 1.19 in²

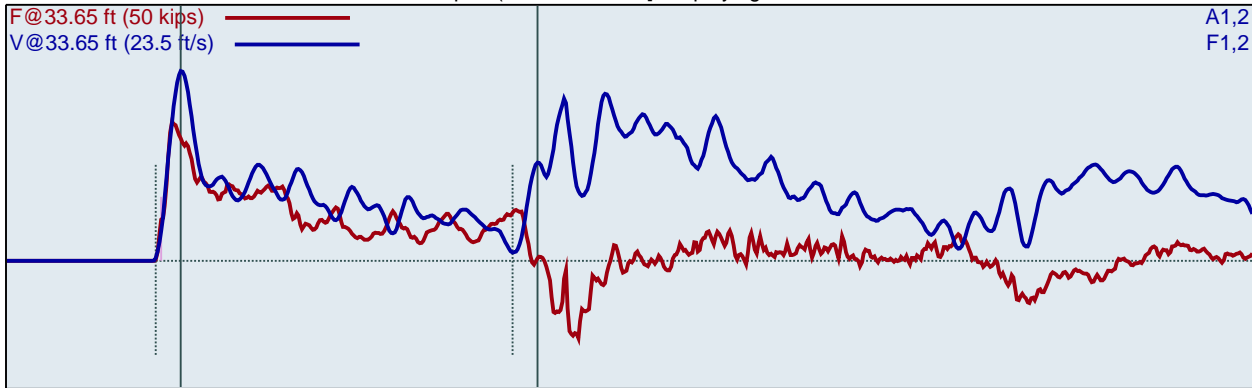
SP: 0.492 k/ft³

LE: 33.65 ft

EM: 30000 ksi

WS: 16807.9 ft/s

Depth: (28.50 - 30.00 ft), displaying BN: 10



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

CSX: Compression Stress Maximum

FMX: Maximum Force

DFN: Final Displacement

VMX: Maximum Velocity

EFV: Maximum Energy

DMX: Maximum Displacement

ETR: Energy Transfer Ratio - Rated

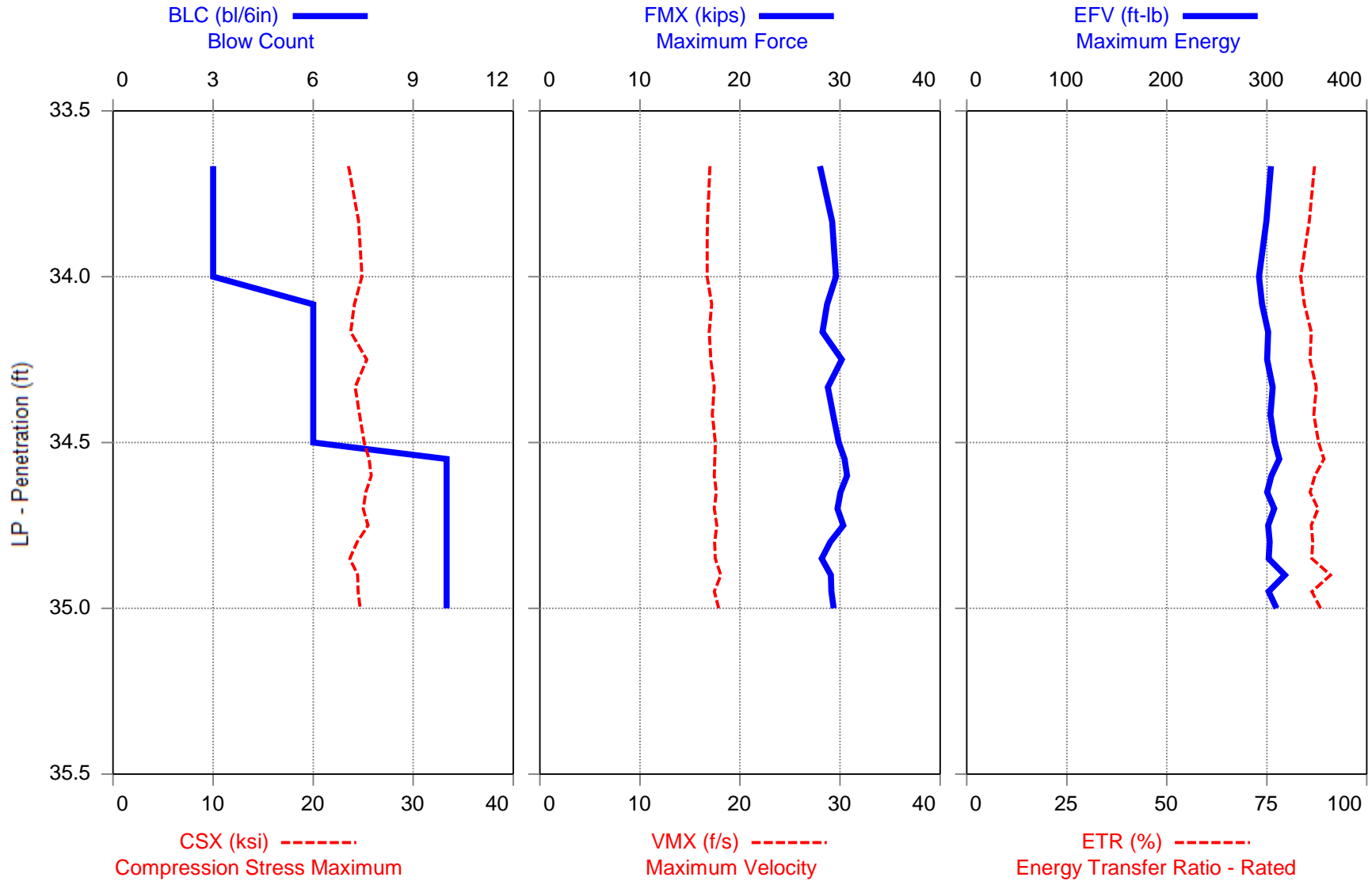
BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
1	28.67	3	1.9	29	16.8	2.21	24.0	2.02	282	80.6
2	28.83	3	55.5	27	17.1	2.03	22.7	2.00	284	81.1
3	29.00	3	52.9	28	17.6	2.01	23.8	2.00	294	84.1
4	29.13	4	54.0	27	17.4	1.66	22.4	1.50	292	83.5
5	29.25	4	53.7	29	17.9	1.66	24.3	1.50	304	86.7
6	29.38	4	53.6	28	17.8	1.61	23.7	1.50	304	86.9
7	29.50	4	53.9	26	17.2	1.51	21.8	1.50	287	82.1
8	29.60	5	53.5	27	17.5	1.38	22.8	1.20	293	83.6
9	29.70	5	53.7	28	17.6	1.33	23.2	1.20	293	83.8
10	29.80	5	53.8	27	17.5	1.29	22.8	1.20	291	83.1
11	29.90	5	54.0	28	17.7	1.24	23.9	1.20	295	84.2
12	30.00	5	53.8	28	17.7	1.20	23.7	1.20	294	84.1
Average			53.8	28	17.6	1.43	23.2	1.33	295	84.2
Std Dev			0.2	1	0.2	0.17	0.8	0.15	5	1.5
Maximum			54.0	29	17.9	1.66	24.3	1.50	304	86.9
Minimum			53.5	26	17.2	1.20	21.8	1.20	287	82.1

N-value: 9

Sample Interval Time: 12.24 seconds.



CME-550X (SN 290593) - 33.5-35.0 FEET
TEST HOLE



CME-550X (SN 290593)

33.5-35.0 FEET

JRW

Test date: 5/1/2019

TEST HOLE

AR: 1.19 in²

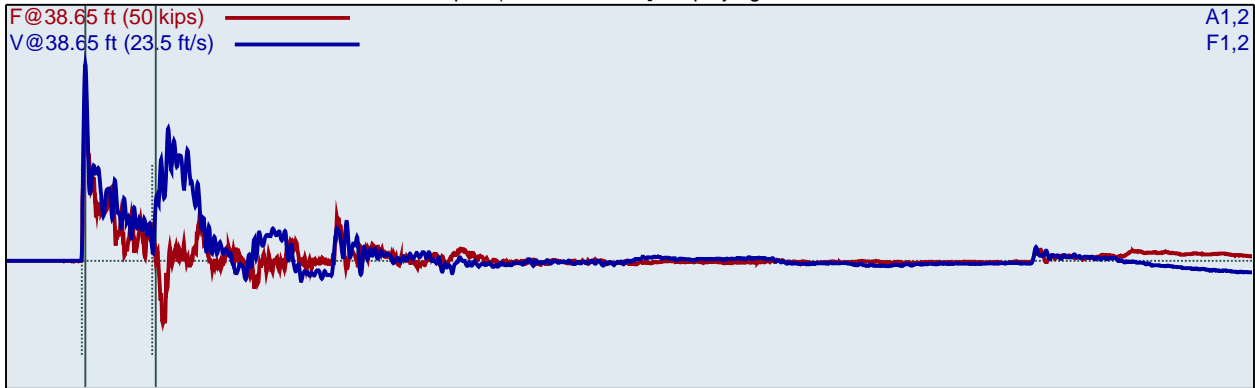
SP: 0.492 k/ft³

LE: 38.65 ft

EM: 30000 ksi

WS: 16807.9 ft/s

Depth: (33.50 - 35.00 ft), displaying BN: 17



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

CSX: Compression Stress Maximum

FMX: Maximum Force

DFN: Final Displacement

VMX: Maximum Velocity

EFV: Maximum Energy

DMX: Maximum Displacement

ETR: Energy Transfer Ratio - Rated

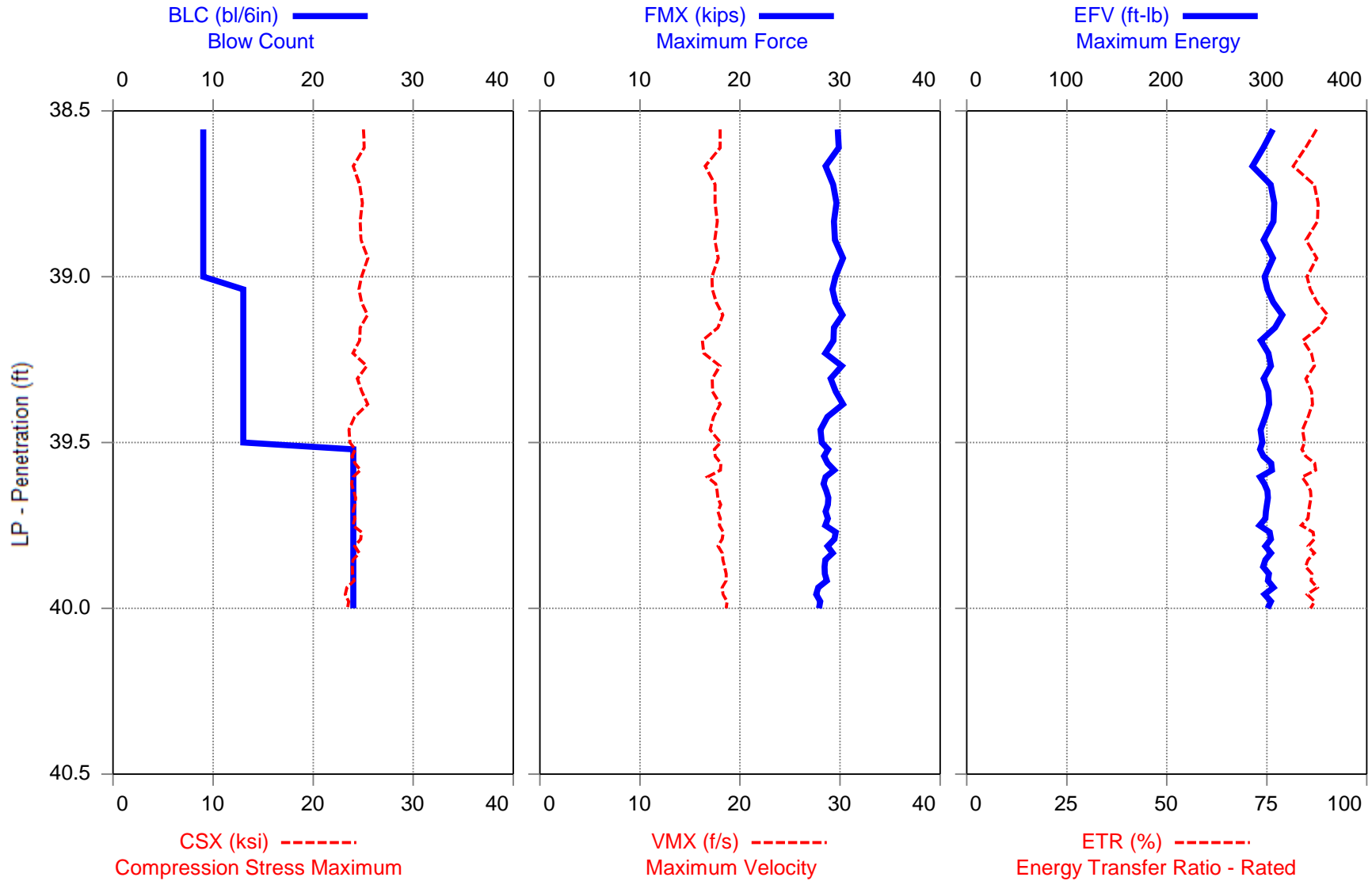
BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
1	33.67	3	1.9	28	17.0	2.12	23.5	2.02	304	86.9
2	33.83	3	54.8	29	16.7	2.01	24.5	2.00	300	85.6
3	34.00	3	53.2	30	16.7	2.00	24.9	2.00	292	83.5
4	34.08	6	53.3	29	17.2	1.35	24.1	1.00	295	84.4
5	34.17	6	53.6	28	16.9	1.26	23.7	1.00	301	86.1
6	34.25	6	53.8	30	17.1	1.15	25.4	1.00	300	85.8
7	34.33	6	53.2	29	17.4	1.12	24.2	1.00	306	87.4
8	34.42	6	54.0	29	17.2	1.07	24.6	1.03	304	86.7
9	34.50	6	53.5	30	17.5	1.01	25.1	0.99	308	87.9
10	34.55	10	53.8	30	17.5	0.92	25.6	0.60	312	89.3
11	34.60	10	53.7	31	17.4	0.86	25.8	0.60	305	87.0
12	34.65	10	53.3	30	17.6	0.80	25.3	0.60	300	85.8
13	34.70	10	53.8	30	17.4	0.79	25.0	0.59	307	87.8
14	34.75	10	53.8	30	17.7	0.76	25.5	0.60	301	86.1
15	34.80	10	53.8	29	17.5	0.75	24.4	0.60	303	86.5
16	34.85	10	53.8	28	17.5	0.72	23.7	0.60	302	86.2
17	34.90	10	53.9	29	18.1	0.71	24.4	0.60	318	90.9
18	34.95	10	53.8	29	17.4	0.66	24.5	0.60	302	86.3
19	35.00	10	53.5	29	17.9	0.68	24.7	0.61	310	88.4
Average			53.7	29	17.5	0.91	24.7	0.75	305	87.0
Std Dev			0.2	1	0.3	0.21	0.6	0.20	5	1.5
Maximum			54.0	31	18.1	1.35	25.8	1.03	318	90.9
Minimum			53.2	28	16.9	0.66	23.7	0.59	295	84.4

N-value: 16

Sample Interval Time: 20.08 seconds.



CME-550X (SN 290593) - 38.5-40.0 FEET
TEST HOLE



CME-550X (SN 290593)

38.5-40.0 FEET

JRW

Test date: 5/1/2019

TEST HOLE

AR: 1.19 in²

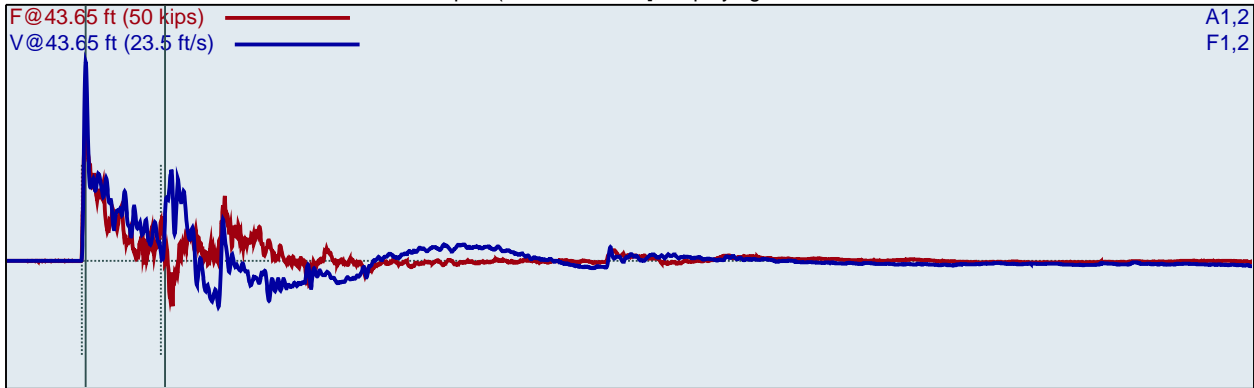
SP: 0.492 k/ft³

LE: 43.65 ft

EM: 30000 ksi

WS: 16807.9 ft/s

Depth: (38.50 - 40.00 ft), displaying BN: 44



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

CSX: Compression Stress Maximum

FMX: Maximum Force

DFN: Final Displacement

VMX: Maximum Velocity

EFV: Maximum Energy

DMX: Maximum Displacement

ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
1	38.56	9	1.9	30	18.0	1.15	25.0	0.67	306	87.4
2	38.61	9	54.5	30	18.0	0.78	25.1	0.66	296	84.7
3	38.67	9	53.4	29	16.5	0.79	24.0	0.67	285	81.6
4	38.72	9	54.0	29	17.5	0.77	24.6	0.67	304	86.8
5	38.78	9	53.2	30	17.5	0.73	24.9	0.67	307	87.8
6	38.83	9	53.8	29	17.7	0.73	24.7	0.67	307	87.6
7	38.89	9	53.7	29	17.5	0.73	24.8	0.69	297	84.8
8	38.94	9	53.6	30	17.8	0.74	25.5	0.66	306	87.5
9	39.00	9	53.4	30	17.2	0.73	24.8	0.67	298	85.0
10	39.04	13	53.9	29	17.2	0.74	24.6	0.46	301	85.9
11	39.08	13	53.6	30	17.6	0.71	24.8	0.46	306	87.6
12	39.12	13	53.4	30	18.3	0.66	25.4	0.46	316	90.2
13	39.15	13	53.6	29	17.8	0.61	24.7	0.46	308	88.0
14	39.19	13	54.0	29	16.2	0.56	24.6	0.46	294	84.0
15	39.23	13	53.6	29	16.4	0.59	24.0	0.46	301	86.1
16	39.27	13	53.5	30	18.0	0.59	25.4	0.46	304	86.9
17	39.31	13	53.4	29	17.2	0.57	24.4	0.46	297	84.8
18	39.35	13	53.1	30	17.2	0.58	24.9	0.46	302	86.2
19	39.38	13	53.6	30	18.0	0.57	25.5	0.46	302	86.4
20	39.42	13	53.5	29	17.4	0.57	24.1	0.46	298	85.3
21	39.46	13	53.6	28	17.0	0.56	23.6	0.46	294	83.9
22	39.50	13	53.2	28	18.1	0.54	23.7	0.46	296	84.5
23	39.52	24	53.6	29	17.4	0.50	24.2	0.25	293	83.8
24	39.54	24	52.5	28	17.5	0.50	23.9	0.25	297	84.7
25	39.56	24	53.8	29	18.1	0.50	24.2	0.25	304	86.9
26	39.58	24	53.2	29	18.0	0.50	24.7	0.25	305	87.2
27	39.60	24	53.0	29	16.7	0.49	24.0	0.25	293	83.8

28	39.63	24	53.8	28	17.6	0.49	23.8	0.25	298	85.0	
29	39.65	24	53.6	29	17.7	0.49	24.0	0.25	301	85.9	
30	39.67	24	52.3	29	17.8	0.49	24.2	0.25	301	86.0	
31	39.69	24	53.7	29	18.1	0.48	24.2	0.25	300	85.7	
32	39.71	24	53.8	29	17.8	0.48	24.0	0.25	299	85.5	
33	39.73	24	53.4	29	18.0	0.48	24.2	0.25	298	85.3	
34	39.75	24	53.1	29	17.9	0.47	24.0	0.25	293	83.6	
35	39.77	24	53.8	30	18.3	0.47	24.8	0.25	303	86.6	
36	39.79	24	53.2	29	18.2	0.47	24.7	0.24	304	86.9	
37	39.81	24	53.0	29	17.8	0.45	24.2	0.25	299	85.3	
38	39.83	24	53.3	29	18.2	0.45	24.6	0.25	304	86.9	
39	39.85	24	53.1	29	18.3	0.44	24.0	0.25	299	85.3	
40	39.88	24	53.9	28	18.5	0.44	23.9	0.25	296	84.7	
41	39.90	24	53.4	28	18.6	0.44	23.9	0.25	302	86.3	
42	39.92	24	52.7	29	18.6	0.44	24.1	0.25	301	86.0	
43	39.94	24	43.7	28	18.2	0.43	23.4	0.25	307	87.6	
44	39.96	24	55.8	28	18.3	0.43	23.2	0.25	298	85.1	
45	39.98	24	52.6	28	18.7	0.44	23.5	0.25	304	86.9	
46	40.00	24	54.0	28	18.6	0.43	23.4	0.25	301	85.9	
			Average	53.2	29	17.8	0.51	24.2	0.32	300	85.9
			Std Dev	1.7	1	0.6	0.08	0.5	0.10	5	1.3
			Maximum	55.8	30	18.7	0.74	25.5	0.46	316	90.2
			Minimum	43.7	28	16.2	0.43	23.2	0.24	293	83.6
N-value: 37											

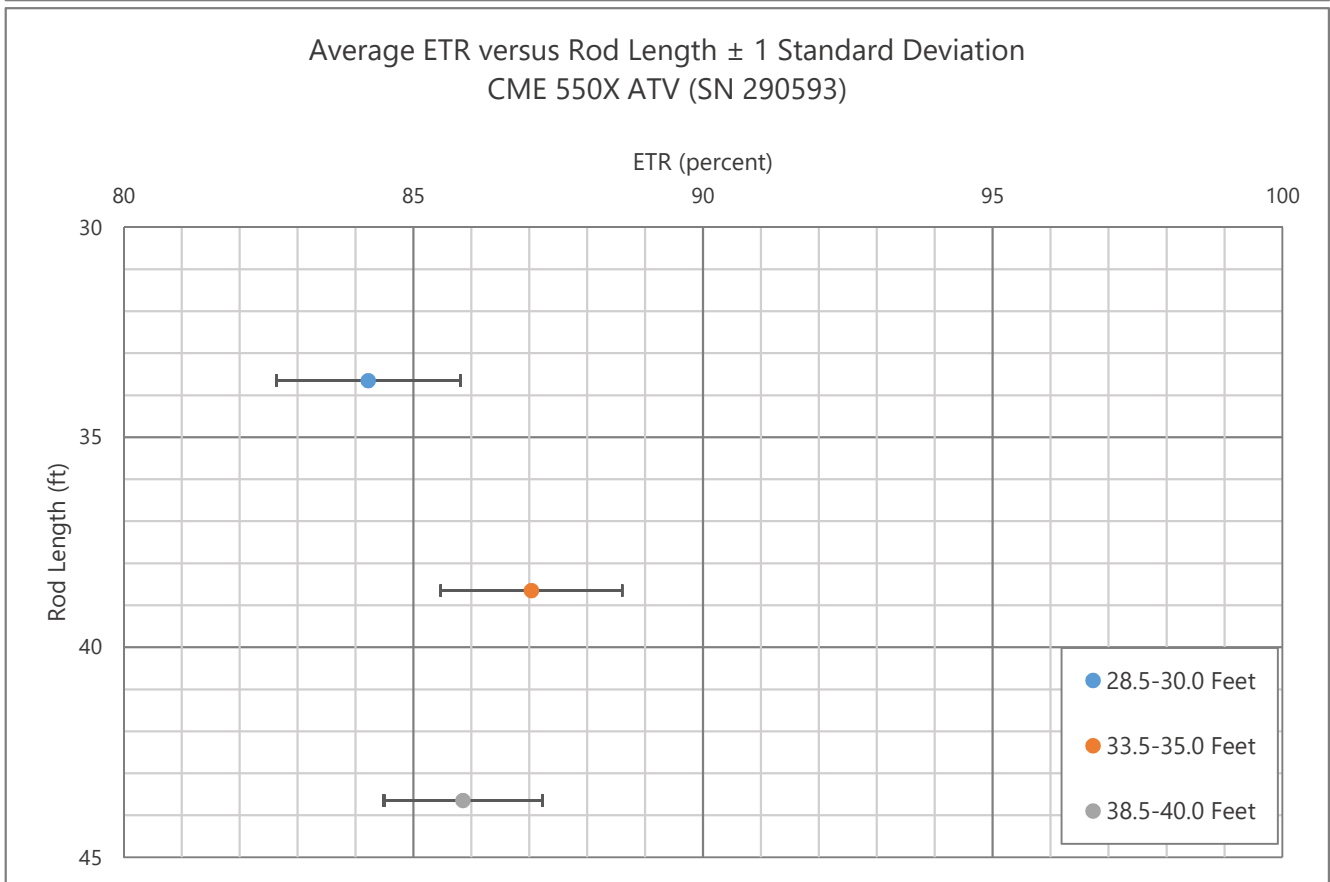
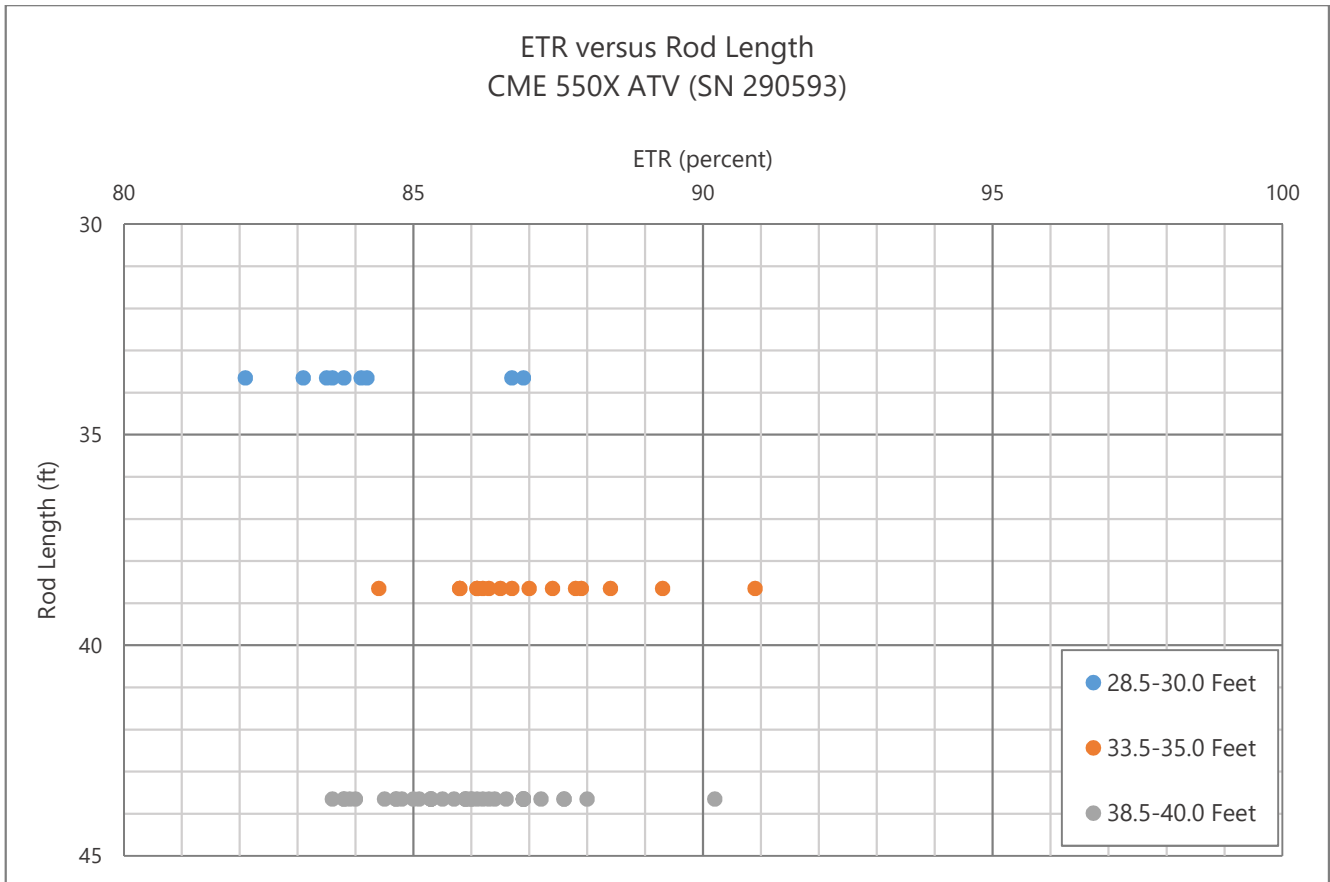
Sample Interval Time: 50.63 seconds.

Summary of SPT Test Results

Project: CME-550X (SN 290593), Test Date: 5/1/2019

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	N Value	N60 Value	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR %
33.65	28.50	30.00	3-4-5	9	12	53.8	28	17.6	1.43	23.2	1.33	295	84.2
38.65	33.50	35.00	3-6-10	16	22	53.7	29	17.5	0.91	24.7	0.75	305	87.0
43.65	38.50	40.00	9-13-24	37	52	53.2	29	17.8	0.51	24.2	0.32	300	85.9
Overall Average Values:						53.4	29	17.7	0.75	24.2	0.58	301	85.9
Standard Deviation:						1.3	1	0.5	0.36	0.8	0.39	6	1.7
Overall Maximum Value:						55.8	31	18.7	1.66	25.8	1.50	318	90.9
Overall Minimum Value:						43.7	26	16.2	0.43	21.8	0.24	287	82.1

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated



Appendix IV



SPT Energy Evaluation Form

Project: SPT ENERGY TESTING
Project No.: 6235-17-020
Boring No.: Test Hole

Date: 5/1/2019
Weather: CLEAR / 80s
Drill Rod Type: 5' LONG AWJ

On-site Personnel

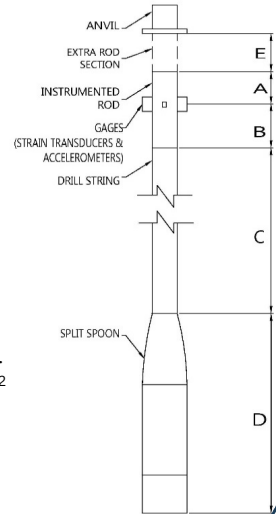
Drilling Company: S&ME, INC.
 Rig Operator: F. JOHNSON
 Engr/Geologist: N/A
 Client Rep.: N/A
 Analyzer Oper.: J. WILLIAMSON

Rig/Hammer Info

Drill Rig Make/Model: CME-550X
 Carrier Type: ATV
 Rig Serial No.: 290593
 Hammer Type/Model: CME-550X
 Hammer Serial No.: N/A - BUILT IN
 Hammer Drop System: AUTOMATIC
 Lubrication Condition: PER MANUFACTURER
 Manufacturer Recommended
 Operation Rate (bpm): 50
 Typical Drop Height (in.): 30
 Typical Hammer Weight (lbs): 140
 Anvil Dimension (in.): 12
 Drilling Method: 3-1/4" HSA

Rod Info

(A + E) Impact Surface to Gages Length: 1.2 ft
(B) Instr. Rod Length below Gages: 0.8 ft
(A) + (B) Instr. Rod Length: 2.0 ft
(D) Spoon Length: 2.85 ft
(E) Rod Length Above Instr. Rod (if applicable): N/A ft
 Instr. Rod S/N: 203AWJ
 Instr. Rod Outside Dia.: 1.75 in.
 Instr. Rod Area: 1.19 in²
 PDA Make/Model: PDI/PAX
 PDA Serial No.: 3733L
 Calib. Pulse Test (y/n): Y



Gage Info

Gage		Serial No.	Calibration No.
Accel.	A3	K10181	356.0
	A4	K10182	368.0
Strain	F3	203AWJ-1	214.31
	F4	203AWJ-2	214.45

Date of Test	Test Depth Increment (ft to ft)	Test Time Start / Stop (military)	Length of Drill String (ft) (C)	(LE) Length below Gages (ft) (B) + (C) + (D)	Avg. Meas. Hammer Rate (BPM)	SPT Blow Counts				Drop Height in Tolerance (y/n)	
						6"	12"	18"	N-Value		
5/1/2019	28.5-30.0	15:00	30	33.65	54	3	4	5	9	Y	SA SI
	33.5-35.0	15:08	35	38.65	54	3	6	10	16	Y	SA SI
	38.5-40.0	15:19	40	43.65	53	9	13	24	37	Y	SI SA
	43.5-45.0	15:33	45	48.65	54	44	50/0.2	-	100+	Y	WR

Notes: Auger refusal encountered at 46 feet.

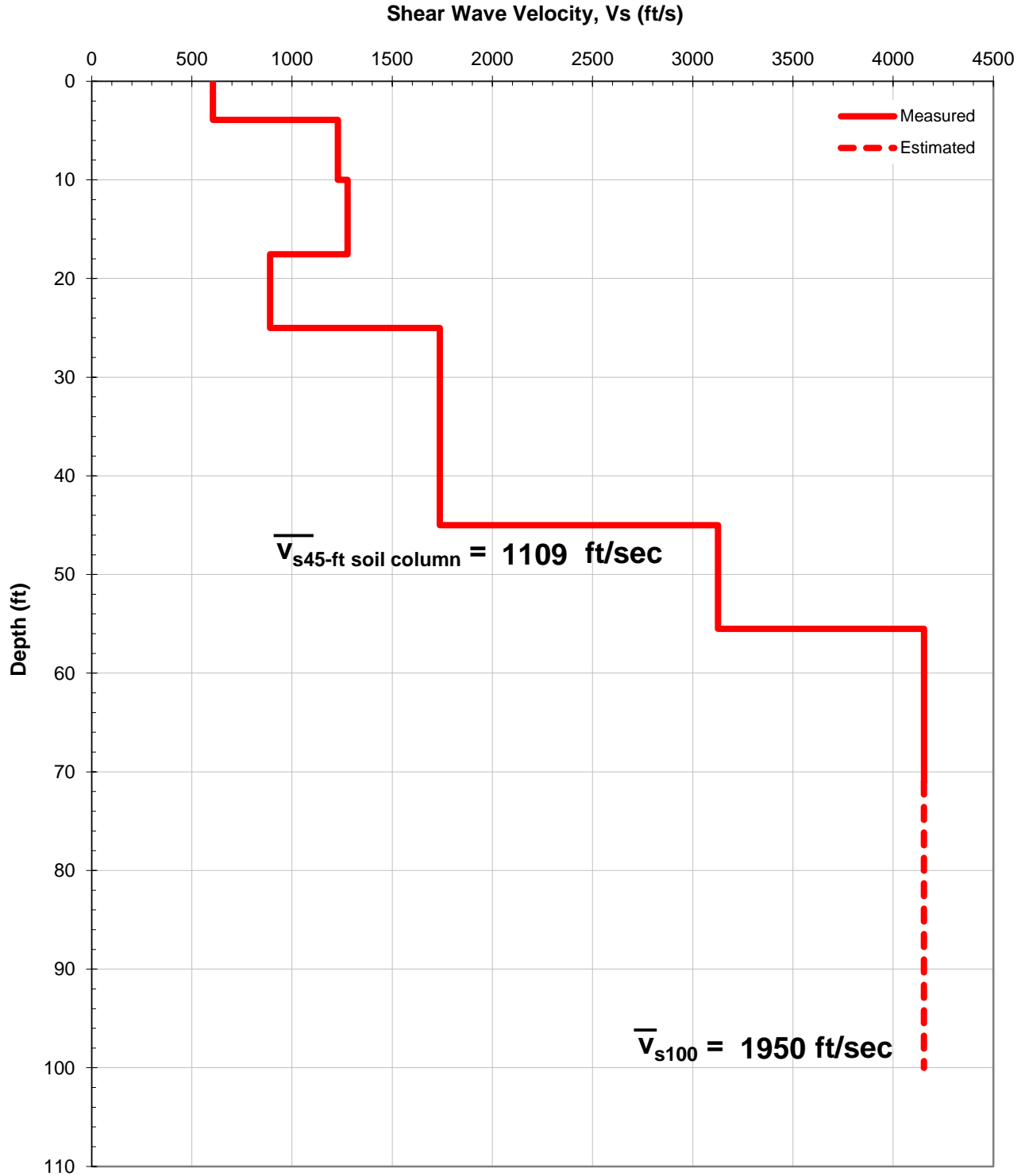
NOTE: (1) Note any unusual hammer operating conditions that affect the hammer performance, or changes in operating conditions (e.g. verticality, weather, or lubrication between trials). (2) Note any changes in rod diameter along drill string and record locations of short rod sections.

Prepared By (print/signature) Joseph Williamson Date 5/1/2019

Appendix VI – Shear Wave Velocity Measurements



Shear Wave Velocity Profile SW-1
I-77 Panthers Interchange
Rock Hill, South Carolina
1461-19-069



Appendix VII – Split-spoon Sample Laboratory Test Results

LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/04 - 2/05/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sampled by:	S&ME/Metro	Sample Date(s):	1-6/8-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Method:	A (1%) <input type="checkbox"/>	B (0.1%) <input checked="" type="checkbox"/>	Balance ID. 28686	Calibration Date: 10/1/19
			Oven ID. 25722	Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
IB-1	SS-1	2 - 4'	YM-6	93.70	193.89	168.81	25.08	33.4%
IB-1	SS-3	6 - 8'	D-22	92.86	250.34	222.87	27.47	21.1%
IB-1	SS-4	8 - 10'	YM-2	90.97	250.61	214.62	35.99	29.1%
IB-1	SS-5	13.5 - 15'	D-11	93.30	250.58	223.70	26.88	20.6%
IB-1	SS-6	18.5 - 20'	D-9	91.01	210.07	185.05	25.02	26.6%
IB-1	SS-7	23.5 - 25'	D-17	99.93	204.96	193.90	11.06	11.8%
IB-1	SS-8	28.5 - 30'	D-16	97.75	251.00	231.07	19.93	14.9%
IB-1	SS-9	33.5 - 34.2'	D-10	95.41	252.42	235.28	17.14	12.3%

Notes / Deviations / References

Benjamin Kovaleski

Technician Name

Robert C. Bruorton, P.E.

Technical Responsibility

NICET Lab Level III / 117226

Certification Type / No.

Senior Engineer

Position

2/18/2020

Date

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LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence	Sample Date(s):	1/6-17/20
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method:	A (1%) <input type="checkbox"/>	B (0.1%) <input checked="" type="checkbox"/>	Balance ID. 28686	Calibration Date: 10/1/19
			Oven ID. 25722	Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
IB-3	SS-1	0 - 2	314	128.89	272.98	247.83	25.15	21.1%
IB-3	SS-2	2 - 4	305	130.46	236.86	214.03	22.83	27.3%
IB-3	SS-3	4 - 6	301	129.07	209.88	192.31	17.57	27.8%
IB-3	SS-4	6 - 8	40	124.15	224.07	204.33	19.74	24.6%
IB-3	SS-5	8 - 10	313	131.62	218.78	194.54	24.24	38.5%
IB-3	SS-6	13.5 - 15	300	130.41	262.26	216.82	45.44	52.6%
IB-3	SS-7	18.5 - 20	43	123.50	266.90	235.74	31.16	27.8%
IB-3	SS-8	23.5 - 25	311	129.51	324.67	287.58	37.09	23.5%
IB-3	SS-9	28.5 - 30	50	123.87	*	284.69	*	*

Notes / Deviations / References *Wet weight and tare of the sample was recorded incorrectly. The moisture content was not determined.

<p><u>Matthew Wolfe</u> <i>Technician Name</i></p> <p><u>Robert C. Bruorton, P.E.</u> <i>Technical Responsibility</i></p>	<p><u>NICET 123218</u> <i>Certification Type / No.</i></p> <p><u>Senior Engineer</u> <i>Position</i></p> <p style="text-align: right;"><u>2/13/2020</u> <i>Date</i></p>
---	---

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MATERIAL FINER THAN THE #200 SIEVE



ASTM D1140

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project No:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence	Sample Dates:	1/6-17/20
Sampling Method:	Split Spoon	Drill Rig :	CME 55/550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.		grams	grams	grams	grams	%
IB-3 SS-1	0 - 2	314	128.9	273.0	247.8	173.7	62.3%
IB-3 SS-2	2 - 4	305	130.5	236.9	214.0	159.0	65.9%
IB-3 SS-3	4 - 6	301	129.1	209.9	192.3	138.1	85.8%
IB-3 SS-4	6 - 8	40	124.2	224.1	204.3	147.5	70.9%
IB-3 SS-5	8 - 10	313	131.6	218.8	194.5	150.0	70.7%
IB-3 SS-6	13.5 - 15	300	130.4	262.3	216.8	171.5	52.4%
IB-3 SS-7	18.5 - 20	43	123.5	266.9	235.7	204.0	28.3%
IB-3 SS-8	23.5 - 25	311	129.5	324.7	287.6	238.4	31.1%
IB-3 SS-9	28.5 - 30	50	123.9	*	284.7	183.1	63.2%

Balance ID: 25722 Calibration Date: 8/5/19 #200 Sieve 28632 Calibration Date: 1/2/20

References / Comments / Deviations: *Wet weight and tare of sample was recorded incorrectly. The moisture content was not determined.

Samples are washed using Method B, "Washing Using a Wetting Agent."

Matthew Wolfe
 Technician Name

NICET 123218
 Certification Type/No.

Robert C. Bruorton, P.E.
 Technical Responsibility

Senior Engineer
 Position

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/12/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-1
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	2 - 4'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Tare #:	Liquid Limit				Plastic Limit				
			P-1	P-2	P-3			1			
A	Tare Weight		16.33	15.22	16.52				12.11		
B	Wet Soil Weight + A		34.81	33.66	33.97				22.24		
C	Dry Soil Weight + A		27.70	26.28	26.71				20.13		
D	Water Weight (B-C)		7.11	7.38	7.26				2.11		
E	Dry Soil Weight (C-A)		11.37	11.06	10.19				8.02		
F	% Moisture (D/E)*100		62.5%	66.7%	71.2%				26.3%		
N	# OF DROPS		35	26	17				Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR										
Ave.	Average								26.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	67
Plastic Limit	26
Plastic Index	41
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 83.2%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/17/20
Date

Robert C. Brounion, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



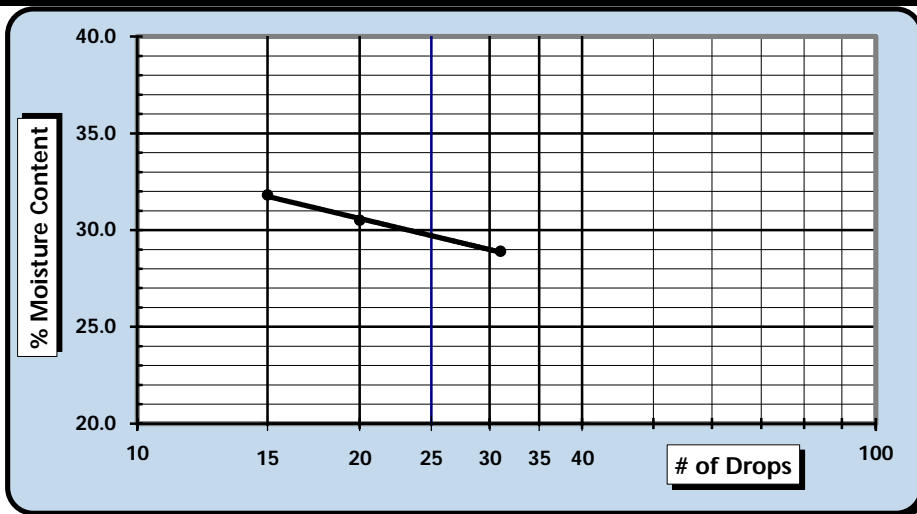
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/12/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-3
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	6 - 8'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Tare #:	Liquid Limit				Plastic Limit			
			Q-1	Q-2	Q-3			2		
A	Tare Weight		16.66	16.60	15.72				12.16	
B	Wet Soil Weight + A		39.70	39.85	38.91				22.43	
C	Dry Soil Weight + A		34.54	34.42	33.31				20.89	
D	Water Weight (B-C)		5.16	5.43	5.60				1.54	
E	Dry Soil Weight (C-A)		17.88	17.82	17.59				8.73	
F	% Moisture (D/E)*100		28.9%	30.5%	31.8%				17.6%	
N	# OF DROPS		31	20	15				Moisture Contents determined by AASHTO T 265	
LL	LL = F * FACTOR									
Ave.	Average								17.6%	



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	30
Plastic Limit	18
Plastic Index	12
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 58.8%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/17/20
Date

Robert C. Brounion, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



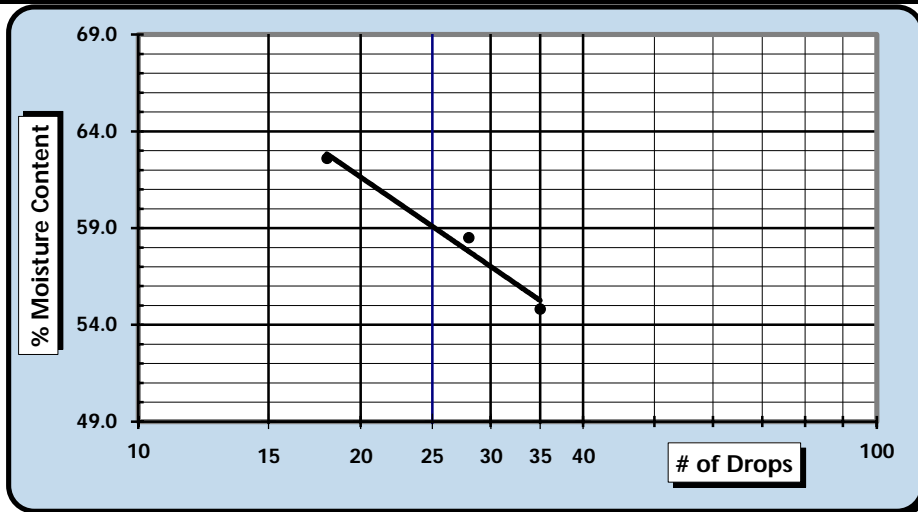
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/12/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-4
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	8 - 10'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		Y-1	Y-2	Y-3			3		
A	Tare Weight	16.41	16.44	16.99			11.59		
B	Wet Soil Weight + A	37.89	35.98	36.57			21.98		
C	Dry Soil Weight + A	30.29	28.77	29.03			19.95		
D	Water Weight (B-C)	7.60	7.21	7.54			2.03		
E	Dry Soil Weight (C-A)	13.88	12.33	12.04			8.36		
F	% Moisture (D/E)*100	54.8%	58.5%	62.6%			24.3%		
N	# OF DROPS	35	28	18			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						24.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	59
Plastic Limit	24
Plastic Index	35
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 65.5%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/17/20
Date

Robert C. Broun, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



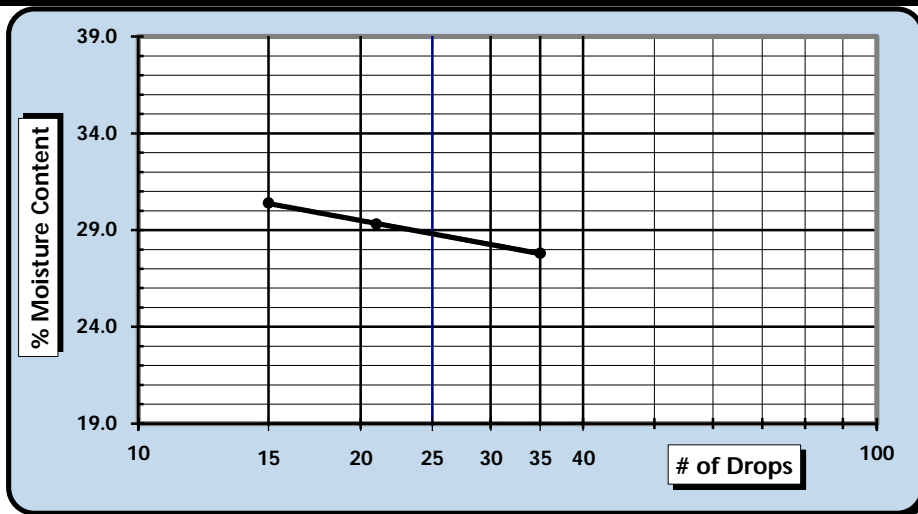
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/14/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-5
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	13.5 - 15'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Tare #:	Liquid Limit				Plastic Limit			
			Z-1	Z-2	Z-3		4			
A	Tare Weight		15.90	16.59	16.77			12.27		
B	Wet Soil Weight + A		39.52	41.80	40.62			22.58		
C	Dry Soil Weight + A		34.38	36.09	35.06			20.66		
D	Water Weight (B-C)		5.14	5.71	5.56			1.92		
E	Dry Soil Weight (C-A)		18.48	19.50	18.29			8.39		
F	% Moisture (D/E)*100		27.8%	29.3%	30.4%			22.9%		
N	# OF DROPS		35	21	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR									
Ave.	Average							22.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic
 Liquid Limit **29**
 Plastic Limit **23**
 Plastic Index **6**
 Group Symbol **CL-ML**

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 38.4%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/17/20
Date

Robert C. Brounion, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-6
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	18.5 - 20'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		P-4	P-5	P-6			5		
A	Tare Weight	16.60	16.59	15.97			12.10		
B	Wet Soil Weight + A	39.00	39.91	38.13			22.54		
C	Dry Soil Weight + A	33.59	34.11	32.51			20.38		
D	Water Weight (B-C)	5.41	5.80	5.62			2.16		
E	Dry Soil Weight (C-A)	16.99	17.52	16.54			8.28		
F	% Moisture (D/E)*100	31.8%	33.1%	34.0%			26.1%		
N	# OF DROPS	30	20	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						26.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	32
Plastic Limit	26
Plastic Index	6
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 38.7%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/18/20
Date

Robert C. Broun, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



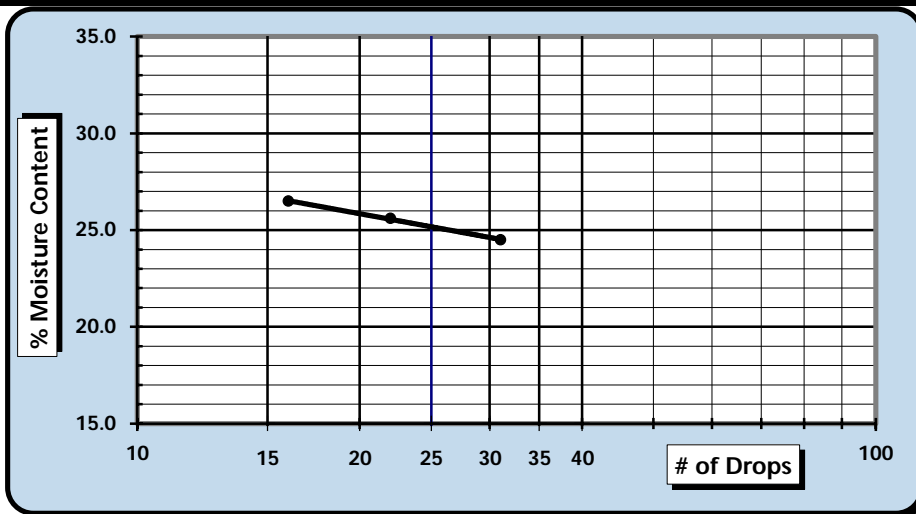
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-7
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	23.5 - 25'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		Q-4	Q-5	Q-6			6		
A	Tare Weight	16.68	16.83	16.80			12.29		
B	Wet Soil Weight + A	41.14	41.43	39.95			23.14		
C	Dry Soil Weight + A	36.32	36.41	35.10			21.19		
D	Water Weight (B-C)	4.82	5.02	4.85			1.95		
E	Dry Soil Weight (C-A)	19.64	19.58	18.30			8.90		
F	% Moisture (D/E)*100	24.5%	25.6%	26.5%			21.9%		
N	# OF DROPS	31	22	16			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						21.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	25
Plastic Limit	22
Plastic Index	3
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 30.1%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/18/20
Date

Robert C. Brounion, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



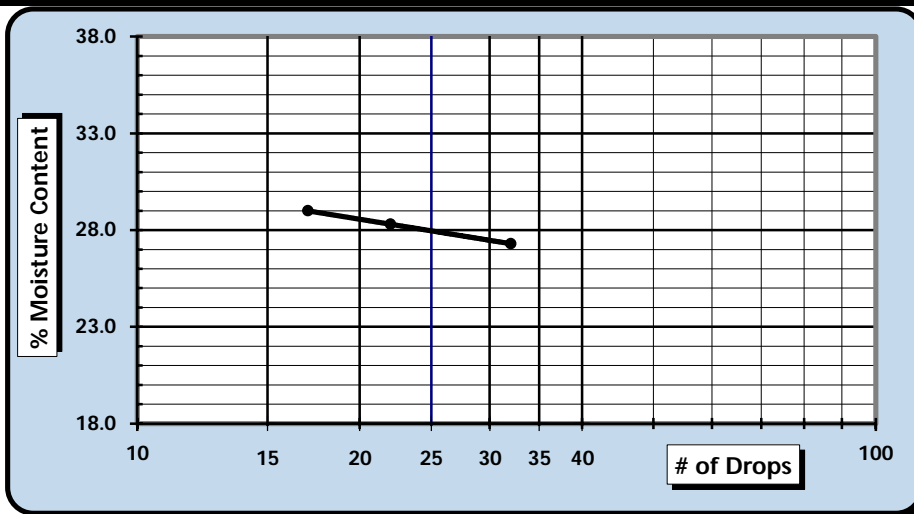
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-8
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	28.5 - 30'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		Y-4	Y-5	Y-6		7		
A	Tare Weight	16.81	16.73	15.92		12.00		
B	Wet Soil Weight + A	44.01	43.91	42.73		23.72		
C	Dry Soil Weight + A	38.17	37.91	36.70		21.37		
D	Water Weight (B-C)	5.84	6.00	6.03		2.35		
E	Dry Soil Weight (C-A)	21.36	21.18	20.78		9.37		
F	% Moisture (D/E)*100	27.3%	28.3%	29.0%		25.1%		
N	# OF DROPS	32	22	17		Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR							
Ave.	Average					25.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	28
Plastic Limit	25
Plastic Index	3
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 33.6%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/18/20
Date

Robert C. Brounion, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



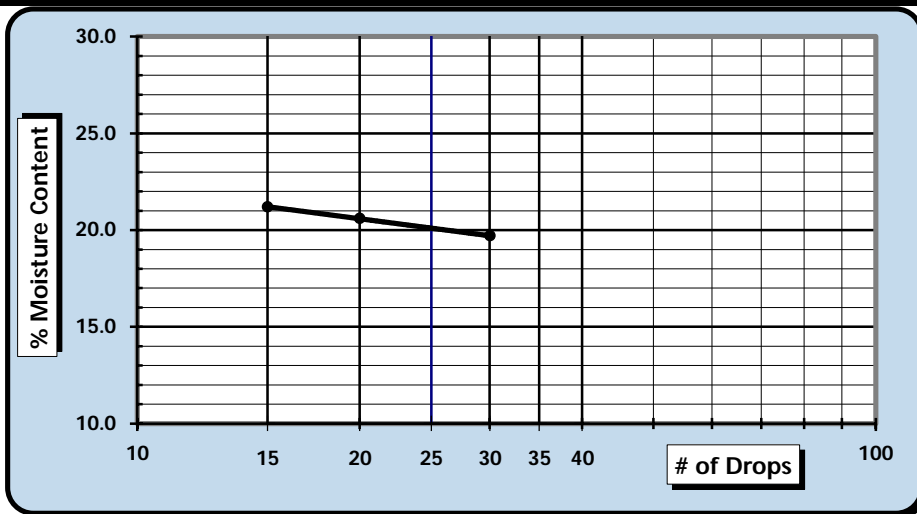
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #:	SS-9
		Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a
		Depth:	33.5 - 34.2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		Z-4	Z-5	Z-6		9		
A	Tare Weight	15.74	15.55	16.92		12.24		
B	Wet Soil Weight + A	40.29	40.90	41.36		24.52		
C	Dry Soil Weight + A	36.25	36.57	37.08		22.53		
D	Water Weight (B-C)	4.04	4.33	4.28		1.99		
E	Dry Soil Weight (C-A)	20.51	21.02	20.16		10.29		
F	% Moisture (D/E)*100	19.7%	20.6%	21.2%		19.3%		
N	# OF DROPS	30	20	15		Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR							
Ave.	Average					19.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	20
Plastic Limit	19
Plastic Index	1
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 23.3%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/18/20
Date

Robert C. Broun, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



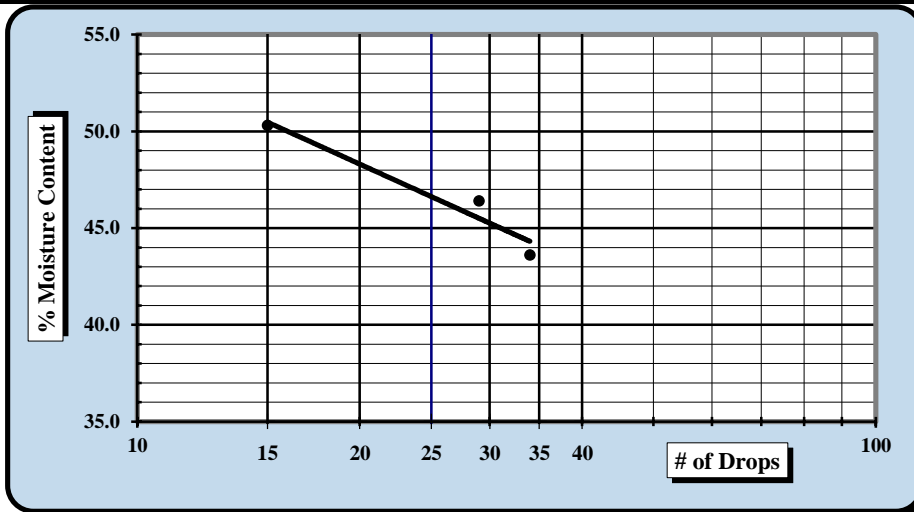
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-1
		Sample Date:	1/17/20
Location:	Interior bent	Offset:	n/a
		Depth:	0 - 2 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		16	3	1			9		
A	Tare Weight	20.70	20.81	20.66			20.81		
B	Wet Soil Weight + A	27.32	26.77	26.43			31.04		
C	Dry Soil Weight + A	25.31	24.88	24.50			28.99		
D	Water Weight (B-C)	2.01	1.89	1.93			2.05		
E	Dry Soil Weight (C-A)	4.61	4.07	3.84			8.18		
F	% Moisture (D/E)*100	43.6%	46.4%	50.3%			25.1%		
N	# OF DROPS	34	29	15			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						25.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	47
Plastic Limit	25
Plastic Index	22
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 62%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-2
		Sample Date:	1/17/20
Location:	Interior bent	Offset:	n/a
		Depth:	2 - 4 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		13	4	195			210		
A	Tare Weight	20.74	20.56	20.52			20.94		
B	Wet Soil Weight + A	27.22	26.19	26.19			31.52		
C	Dry Soil Weight + A	24.99	24.17	24.11			28.81		
D	Water Weight (B-C)	2.23	2.02	2.08			2.71		
E	Dry Soil Weight (C-A)	4.25	3.61	3.59			7.87		
F	% Moisture (D/E)*100	52.5%	56.0%	57.9%			34.4%		
N	# OF DROPS	29	20	16			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						34.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	54
Plastic Limit	34
Plastic Index	20
Group Symbol	MH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 66%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



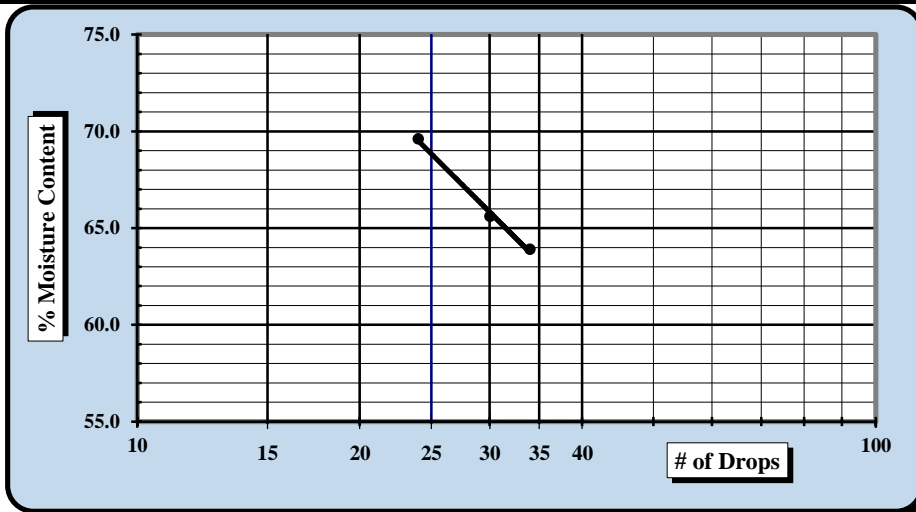
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-3
		Sample Date:	1/17/20
Location:	Interior bent	Offset:	n/a
		Depth:	4 - 6 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		246	23	214			134		
A	Tare Weight	20.66	20.72	20.83			20.60		
B	Wet Soil Weight + A	27.48	26.50	26.12			30.75		
C	Dry Soil Weight + A	24.82	24.21	23.95			28.47		
D	Water Weight (B-C)	2.66	2.29	2.17			2.28		
E	Dry Soil Weight (C-A)	4.16	3.49	3.12			7.87		
F	% Moisture (D/E)*100	63.9%	65.6%	69.6%			29.0%		
N	# OF DROPS	34	30	24			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						29.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	69
Plastic Limit	29
Plastic Index	40
Group Symbol	CH
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 86%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



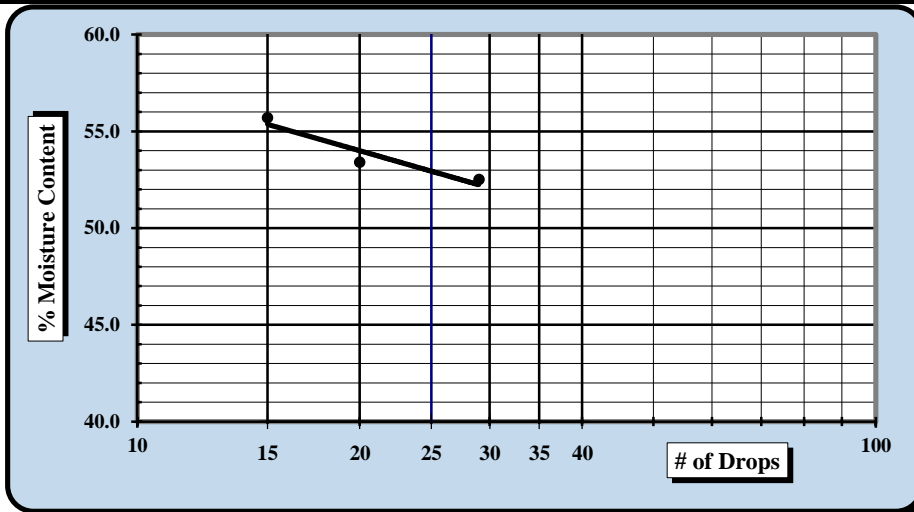
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-4
		Sample Date:	1/17/20
Location:	Interior bent	Offset:	n/a
		Depth:	6 - 8 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		43	7	35			243		
A	Tare Weight	20.82	20.81	20.90			20.75		
B	Wet Soil Weight + A	26.08	27.39	27.50			30.79		
C	Dry Soil Weight + A	24.27	25.10	25.14			28.77		
D	Water Weight (B-C)	1.81	2.29	2.36			2.02		
E	Dry Soil Weight (C-A)	3.45	4.29	4.24			8.02		
F	% Moisture (D/E)*100	52.5%	53.4%	55.7%			25.2%		
N	# OF DROPS	29	20	15			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						25.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	53
Plastic Limit	25
Plastic Index	28
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 71%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
 Technician Name

2/10/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #: 1461-19-069	Report Date: 2/10/2020
Project Name: I-77 Panthers Interchange	Test Date(s) 2/3 - 2/6/20
Client Name: RS&H	
Client Address: 4000 Faber Place Dr., Suite 130, N. Charleston, SC	
Boring #: IB-3	Sample #: SS-5
	Sample Date: 1/17/20
Location: Interior bent	Offset: n/a
	Depth: 8 - 10 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		15	24	29			245		
A	Tare Weight	20.81	20.77	20.84			20.76		
B	Wet Soil Weight + A	26.89	26.33	27.15			30.86		
C	Dry Soil Weight + A	24.53	24.11	24.57			28.12		
D	Water Weight (B-C)	2.36	2.22	2.58			2.74		
E	Dry Soil Weight (C-A)	3.72	3.34	3.73			7.36		
F	% Moisture (D/E)*100	63.4%	66.5%	69.2%			37.2%		
N	# OF DROPS	33	24	15			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						37.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	66
Plastic Limit	37
Plastic Index	29
Group Symbol	MH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 71%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
 Technician Name

2/10/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



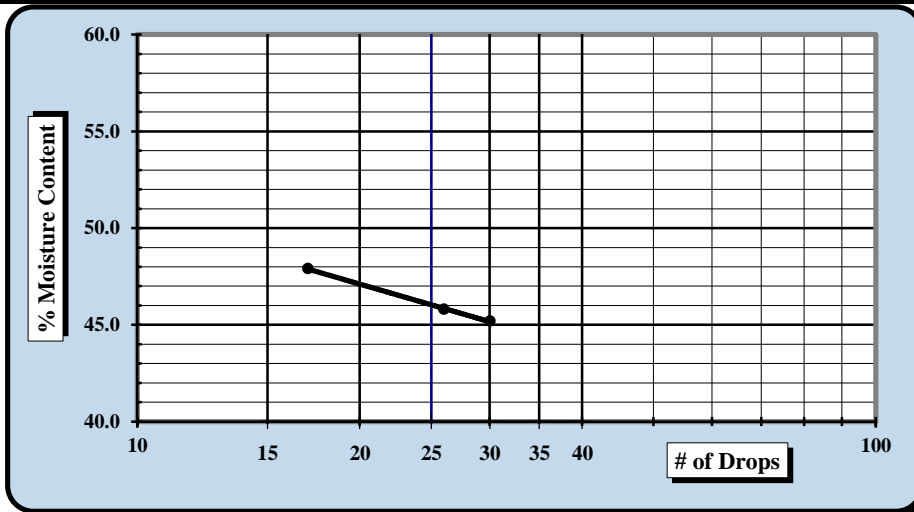
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #: 1461-19-069	Report Date: 2/10/2020
Project Name: I-77 Panthers Interchange	Test Date(s) 2/3 - 2/6/20
Client Name: RS&H	
Client Address: 4000 Faber Place Dr., Suite 130, N. Charleston, SC	
Boring #: IB-3	Sample #: SS-6
Sample Date: 1/17/20	
Location: Interior bent	Offset: n/a
Depth: 13.5 - 15 ft.	

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		5	44	17			31		
A	Tare Weight	20.74	20.74	20.73			20.81		
B	Wet Soil Weight + A	27.42	27.04	25.76			31.48		
C	Dry Soil Weight + A	25.34	25.06	24.13			29.26		
D	Water Weight (B-C)	2.08	1.98	1.63			2.22		
E	Dry Soil Weight (C-A)	4.60	4.32	3.40			8.45		
F	% Moisture (D/E)*100	45.2%	45.8%	47.9%			26.3%		
N	# OF DROPS	30	26	17			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						26.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	46
Plastic Limit	26
Plastic Index	20
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 52%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



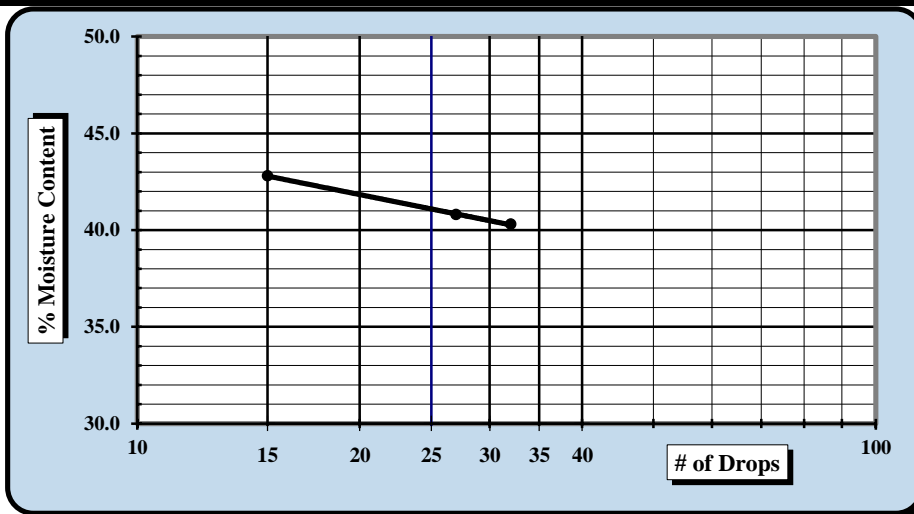
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-7
		Sample Date:	1/17/20
Location:	Interior bent	Offset:	n/a
		Depth:	18.5 - 20 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		6	37	200			36		
A	Tare Weight	20.69	20.80	20.86			20.96		
B	Wet Soil Weight + A	28.90	27.74	27.00			31.28		
C	Dry Soil Weight + A	26.54	25.73	25.16			28.95		
D	Water Weight (B-C)	2.36	2.01	1.84			2.33		
E	Dry Soil Weight (C-A)	5.85	4.93	4.30			7.99		
F	% Moisture (D/E)*100	40.3%	40.8%	42.8%			29.2%		
N	# OF DROPS	32	27	15			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						29.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	41
Plastic Limit	29
Plastic Index	12
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 28%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



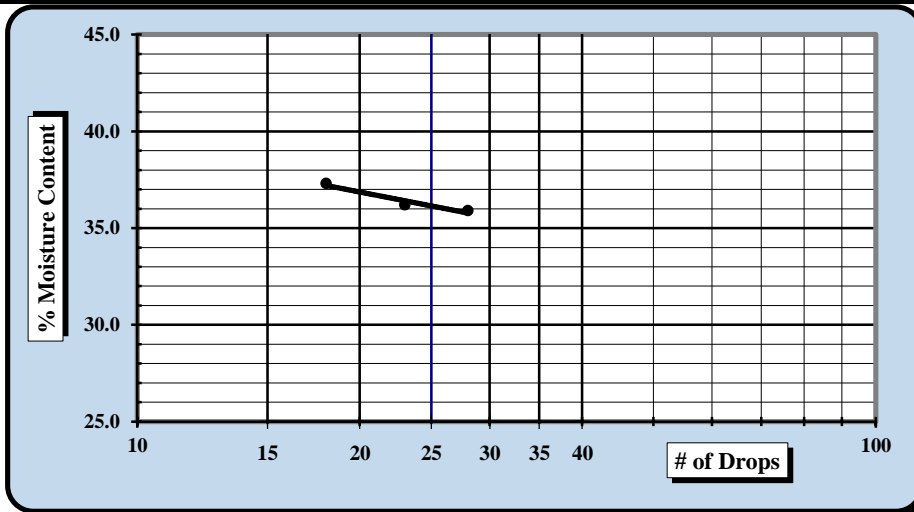
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-8
		Sample Date:	1/17/20
Location:	Interior Bent	Offset:	n/a
		Depth:	23.5 - 25 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		45	40	39			222		
A	Tare Weight	20.77	20.85	20.82			20.82		
B	Wet Soil Weight + A	28.23	28.08	26.86			31.71		
C	Dry Soil Weight + A	26.26	26.16	25.22			29.35		
D	Water Weight (B-C)	1.97	1.92	1.64			2.36		
E	Dry Soil Weight (C-A)	5.49	5.31	4.40			8.53		
F	% Moisture (D/E)*100	35.9%	36.2%	37.3%			27.7%		
N	# OF DROPS	28	23	18			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						27.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	36
Plastic Limit	28
Plastic Index	8
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 31%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
 Technician Name

2/10/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



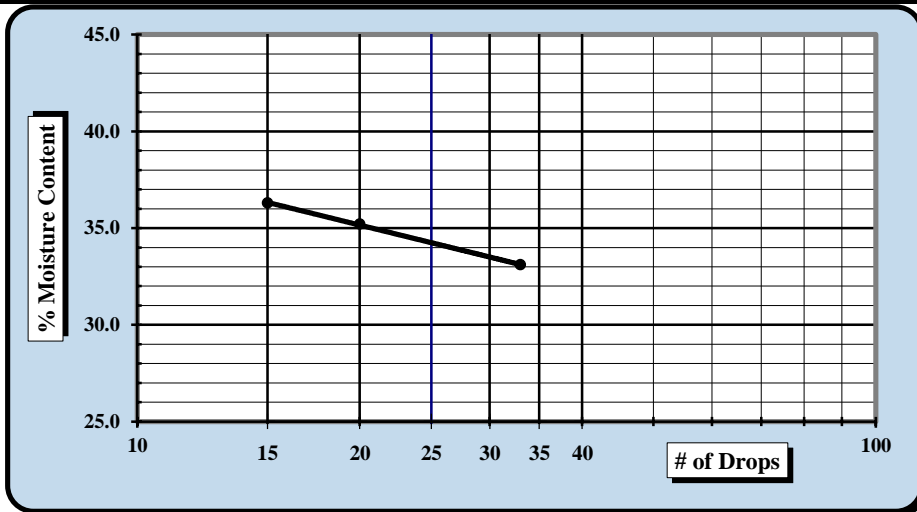
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	SS-9
		Sample Date:	1/17/20
Location:	Interior Bent	Offset:	n/a
		Depth:	28.5 - 30 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		32	219	209			30		
A	Tare Weight	20.43	20.80	21.10			20.82		
B	Wet Soil Weight + A	28.47	28.02	29.29			30.90		
C	Dry Soil Weight + A	26.47	26.14	27.11			28.66		
D	Water Weight (B-C)	2.00	1.88	2.18			2.24		
E	Dry Soil Weight (C-A)	6.04	5.34	6.01			7.84		
F	% Moisture (D/E)*100	33.1%	35.2%	36.3%			28.6%		
N	# OF DROPS	33	20	15			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						28.6%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	34
Plastic Limit	29
Plastic Index	5
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 63%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/14-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method:	A (1%) <input type="checkbox"/>	B (0.1%) <input checked="" type="checkbox"/>	Balance ID. 33084	Calibration Date: 11/21/19
			Oven ID. 31332	Calibration Date: 10/21/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-1	SS-1	0'-2'	NP4	103.95	251.54	221.91	29.63	25.1%
EM-2	SS-1	0'-2'	NP2	104.74	388.03	325.55	62.48	28.3%
EM-11	SS-1	0'-2'	J13	95.04	211.27	182.63	28.64	32.7%
EM-17	SS-1	0'-2'	J13	90.12	209.74	180.78	28.96	31.9%

Notes / Deviations / References

<u>Jimmy Hanson</u>	<u>Geotechnical Lab Supervisor</u>	<u>2/10/2020</u>
<i>Technical Responsibility</i>	<i>Position</i>	<i>Date</i>

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LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/16-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method:	A (1%) <input checked="" type="checkbox"/>	B (0.1%) <input type="checkbox"/>	Balance ID. 28686	Calibration Date: 10/1/19
			Oven ID. 25722	Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-5	SS-1	0-2	Mo	30.70	53.80	48.81	4.99	27.6%
EM-6	SS-1	0-2	J3	17.40	26.40	24.77	1.63	22.1%
EM-14	SS-1	0-2	SD	30.60	39.80	38.08	1.72	23.0%
EM-16	SS-1	0-2	Hh	17.40	29.30	26.80	2.50	26.6%
EM-20	SS-1	1.3-3.3	Ss	17.40	33.40	29.28	4.12	34.7%
EM-21	SS-1	1.3-3.3	KS	30.60	48.00	45.26	2.74	18.7%

Notes / Deviations / References

<u>Ashley Parkans</u> <i>Technician Name</i>	<u>Robert C. Bruorton, P.E.</u> <i>Technical Responsibility</i>	<u>Senior Engineer</u> <i>Position</i>
		<u>2/13/2020</u> <i>Date</i>

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LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/5/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	Metro	Sample Date(s):	1-9/16-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Method:	A (1%) <input type="checkbox"/>	B (0.1%) <input checked="" type="checkbox"/>	Balance ID.	14862	Calibration Date:	7/1/19
			Oven ID.	14603	Calibration Date:	7/17/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-9	SS-1	0-2'	H	0.00	95.06	73.02	22.04	30.2%
EM-10	SS-1	0-2'	A	0.00	101.27	81.48	19.79	24.3%
EM-12	SS-1	0-2'	T	0.00	93.15	72.51	20.64	28.5%
EM-13	SS-1	0-2'	E	0.00	92.76	69.75	23.01	33.0%
EM-15	SS-1	0-2'	S	0.00	109.16	84.81	24.35	28.7%

Notes / Deviations / References

<u>J. Faucette</u>	<u>2/7/2020</u>
<i>Technician Name</i>	<i>Date</i>
<u>Robert C. Bruorton, P.E.</u>	<u>2/13/2020</u>
<i>Technical Responsibility</i>	<i>Date</i>
<u>Senior Engineer</u>	
<i>Position</i>	

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



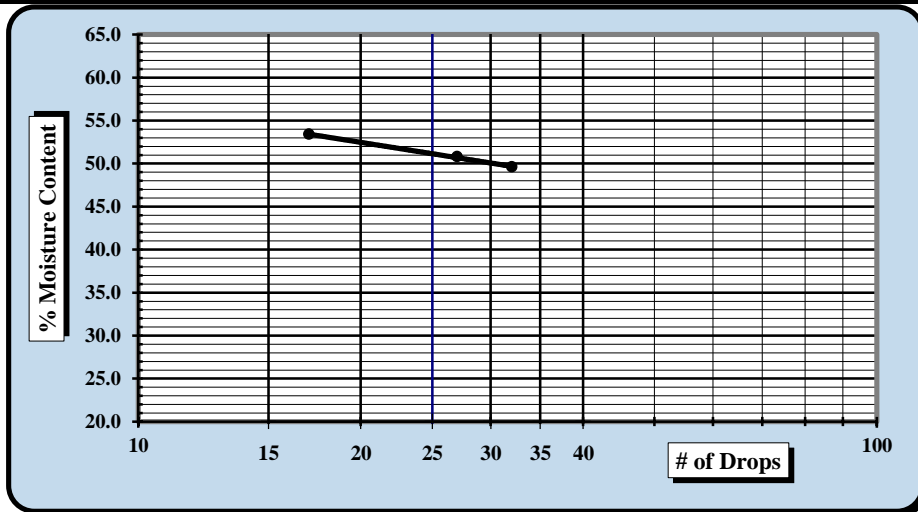
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-1	Sample #:	SS-1
		Sample Date:	1-6-2020
Location:	Embankment	Offset:	n/a
		Depth:	0'-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		6	7	8			9		
A	Tare Weight	16.59	16.61	16.79			16.84		
B	Wet Soil Weight + A	28.77	30.45	29.46			25.82		
C	Dry Soil Weight + A	24.73	25.79	25.05			24.15		
D	Water Weight (B-C)	4.04	4.66	4.41			1.67		
E	Dry Soil Weight (C-A)	8.14	9.18	8.26			7.31		
F	% Moisture (D/E)*100	49.6%	50.8%	53.4%			22.8%		
N	# OF DROPS	32	27	17			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						22.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	51
Plastic Limit	23
Plastic Index	28
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 71%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



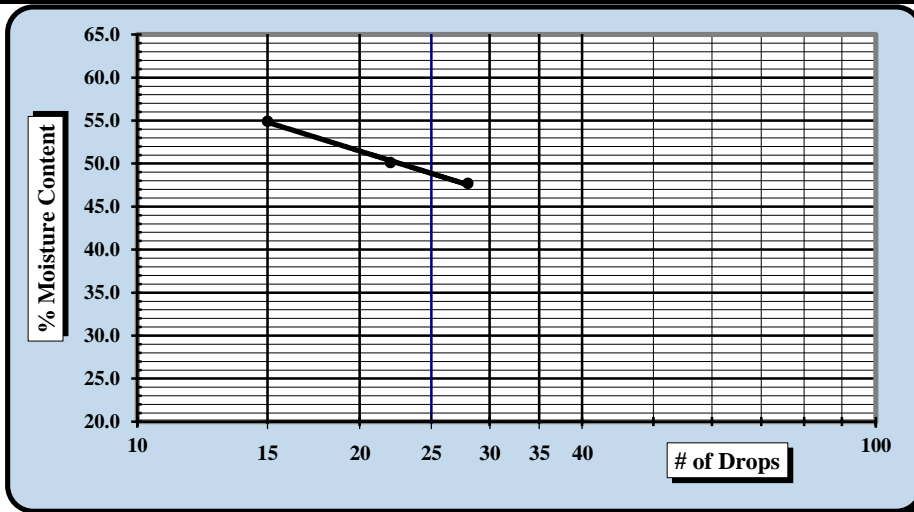
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-2	Sample #:	SS-1
		Sample Date:	1-6-2020
Location:	Embankment	Offset:	n/a
		Depth:	0'-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		16	17	18			19		
A	Tare Weight	16.80	16.84	16.80			15.77		
B	Wet Soil Weight + A	30.92	30.63	33.22			24.73		
C	Dry Soil Weight + A	26.36	26.03	27.40			22.22		
D	Water Weight (B-C)	4.56	4.60	5.82			2.51		
E	Dry Soil Weight (C-A)	9.56	9.19	10.60			6.45		
F	% Moisture (D/E)*100	47.7%	50.1%	54.9%			38.9%		
N	# OF DROPS	28	22	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						38.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	49
Plastic Limit	39
Plastic Index	10
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 50%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
 Technician Name

2/10/2020
 Date

Jimmy Hanson
 Technical Responsibility

2/10/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-4	Sample #:	SS-1
		Sample Date:	1/6/2020
Location:	Embankment	Offset:	n/a
		Depth:	0 - 2 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit					Plastic Limit		
Tare #:		19	204	216			235		
A	Tare Weight	20.53	20.86	20.67			20.77		
B	Wet Soil Weight + A	26.09	26.72	26.20			30.93		
C	Dry Soil Weight + A	24.18	24.64	24.17			28.11		
D	Water Weight (B-C)	1.91	2.08	2.03			2.82		
E	Dry Soil Weight (C-A)	3.65	3.78	3.50			7.34		
F	% Moisture (D/E)*100	52.3%	55.0%	58.0%			38.4%		
N	# OF DROPS	34	20	12			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						38.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	54
Plastic Limit	38
Plastic Index	16
Group Symbol	MH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 71%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
 Technician Name

2/10/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



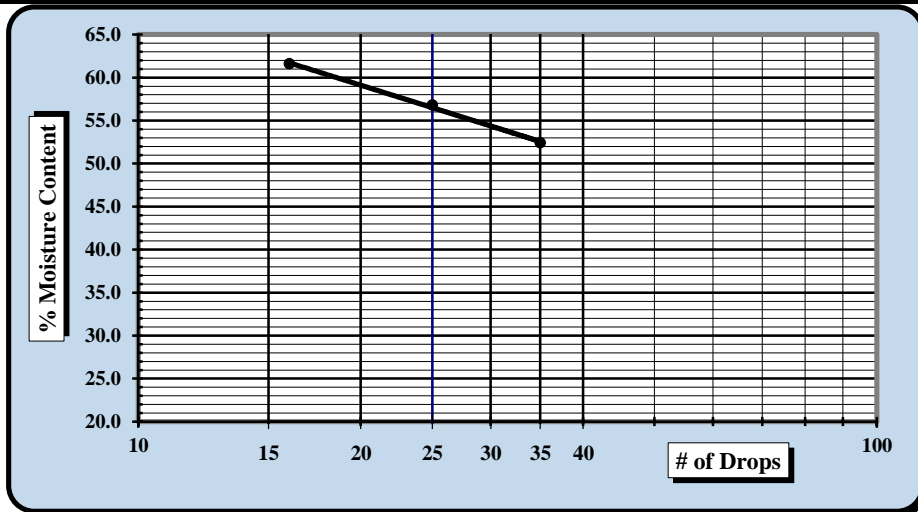
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-5	Sample #:	SS-1
		Sample Date:	1-6-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		Gale	Strike	Mo		Ss	Hh	
A	Tare Weight	30.78	30.54	30.66		17.34	17.34	
B	Wet Soil Weight + A	39.07	39.95	40.05		24.37	25.36	
C	Dry Soil Weight + A	36.22	36.54	36.47		22.55	23.23	
D	Water Weight (B-C)	2.85	3.41	3.58		1.82	2.13	
E	Dry Soil Weight (C-A)	5.44	6.00	5.81		5.21	5.89	
F	% Moisture (D/E)*100	52.4%	56.8%	61.6%		34.9%	36.2%	
N	# OF DROPS	35	25	16		Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR							
Ave.	Average					35.6%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	57
Plastic Limit	36
Plastic Index	21
Group Symbol	MH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
 Technician Name

2/11/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



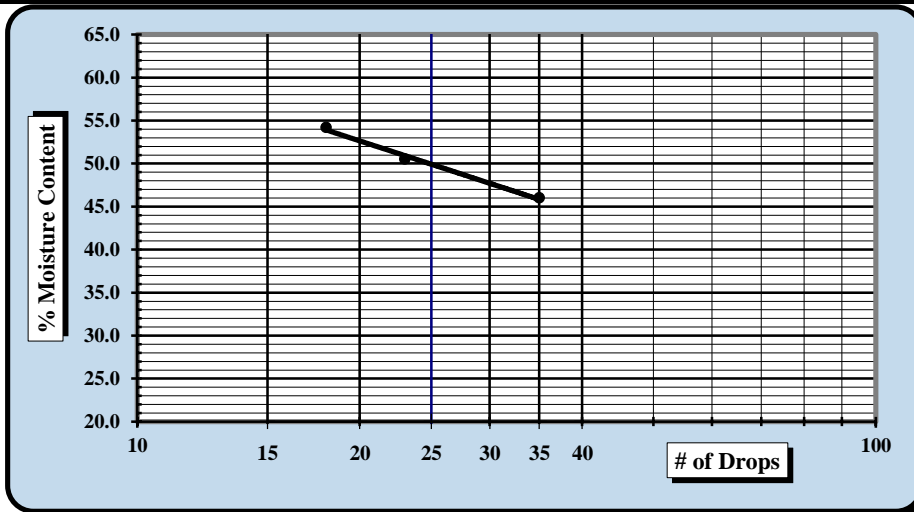
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-6	Sample #:	SS-1
		Sample Date:	1-6-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		Ms	Ks	NY			A-9	J3	
A	Tare Weight	30.74	30.62	30.55			16.81	17.35	
B	Wet Soil Weight + A	40.68	38.76	37.04			24.74	24.92	
C	Dry Soil Weight + A	37.55	36.03	34.76			23.21	23.45	
D	Water Weight (B-C)	3.13	2.73	2.28			1.53	1.47	
E	Dry Soil Weight (C-A)	6.81	5.41	4.21			6.40	6.10	
F	% Moisture (D/E)*100	46.0%	50.5%	54.2%			23.9%	24.1%	
N	# OF DROPS	35	23	18			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						24.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	50
Plastic Limit	24
Plastic Index	26
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
 Technician Name

2/11/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



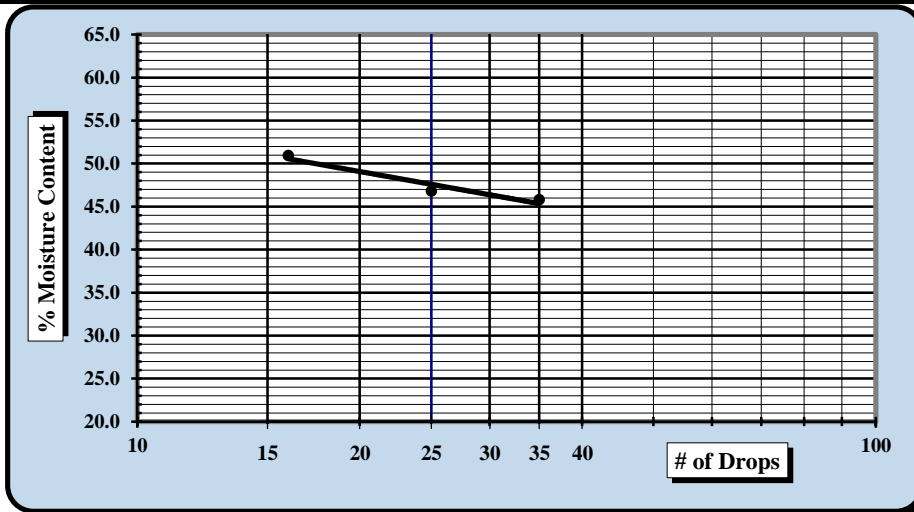
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-9	Sample #:	SS-1
		Sample Date:	1-16-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		1	2	3			4	5	
A	Tare Weight	11.07	10.65	11.62			11.34	10.73	
B	Wet Soil Weight + A	21.76	20.63	22.24			21.05	20.48	
C	Dry Soil Weight + A	18.40	17.45	18.66			18.86	18.28	
D	Water Weight (B-C)	3.36	3.18	3.58			2.19	2.20	
E	Dry Soil Weight (C-A)	7.33	6.80	7.04			7.52	7.55	
F	% Moisture (D/E)*100	45.8%	46.8%	50.9%			29.1%	29.1%	
N	# OF DROPS	35	25	16			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						29.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	48
Plastic Limit	29
Plastic Index	19
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 64.0%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



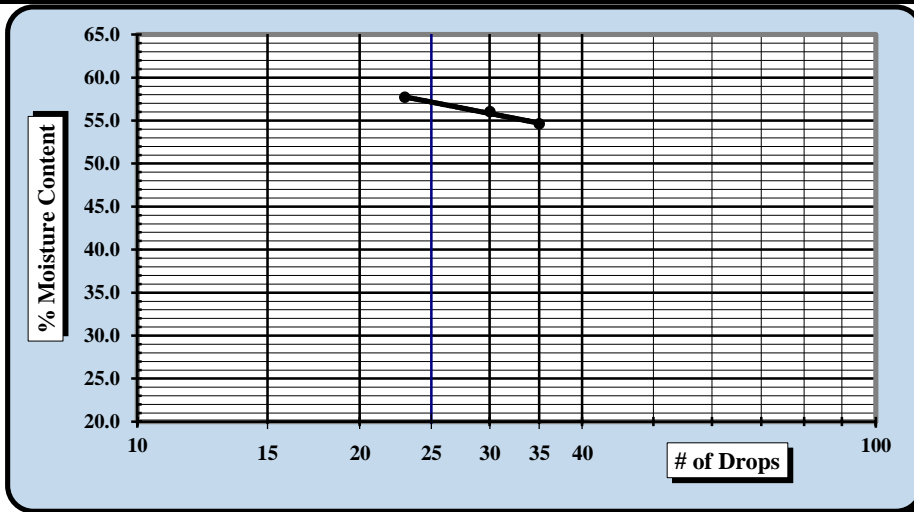
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-10	Sample #:	SS-1
		Sample Date:	1-16-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		6	7	8	9	10		
A	Tare Weight	11.24	11.70	10.90				
B	Wet Soil Weight + A	21.23	20.98	19.73				
C	Dry Soil Weight + A	17.70	17.65	16.50				
D	Water Weight (B-C)	3.53	3.33	3.23				
E	Dry Soil Weight (C-A)	6.46	5.95	5.60				
F	% Moisture (D/E)*100	54.6%	56.0%	57.7%				
N	# OF DROPS	35	30	23				
LL	LL = F * FACTOR							Moisture Contents determined by AASHTO T 265
Ave.	Average							22.8%



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	57
Plastic Limit	23
Plastic Index	34
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 78.8%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



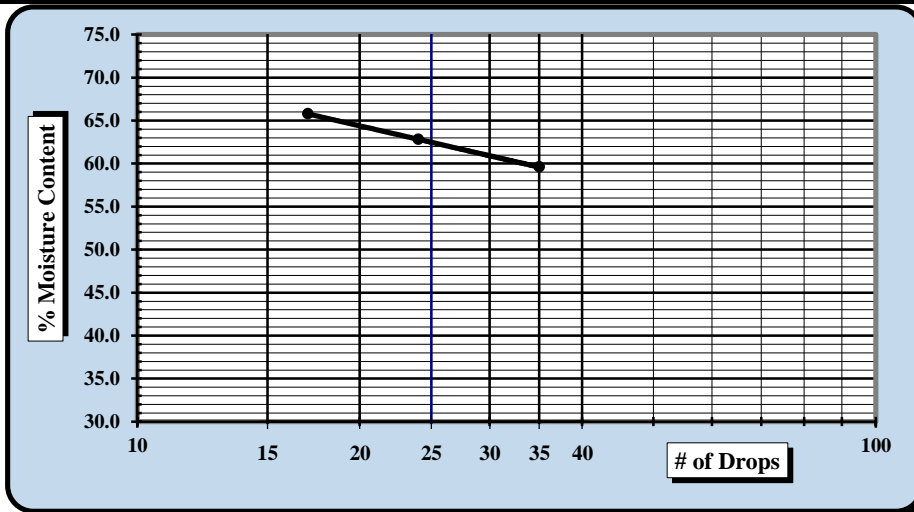
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-11	Sample #:	SS-1
		Sample Date:	1-10-2020
Location:	Embankment	Offset:	n/a
		Depth:	0'-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		11	12	13			14		
A	Tare Weight	16.74	16.71	16.75			16.90		
B	Wet Soil Weight + A	29.73	31.77	30.53			25.78		
C	Dry Soil Weight + A	24.88	25.96	25.06			23.83		
D	Water Weight (B-C)	4.85	5.81	5.47			1.95		
E	Dry Soil Weight (C-A)	8.14	9.25	8.31			6.93		
F	% Moisture (D/E)*100	59.6%	62.8%	65.8%			28.1%		
N	# OF DROPS	35	24	17			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						28.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	63
Plastic Limit	28
Plastic Index	35
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 83%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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**MOISTURE, ASH, AND
 ORGANIC MATTER**



ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		
Boring No.	EM-11	Sample No.	SS-2
		Sample Date:	1-10-2020
Location:	Embankment	Sampled by:	Metro
		Depth:	2'-4'
Sample Description:	Dark reddish brown clay with some sand		
Equipment:	Balance: 0.01 g. Readability, 500g. Minimum Capacity		
Balance:	S&ME ID #: 33084	Cal. Date: 11/21/19	Due: 11/21/20

Method A: Moisture Content Determination

Required Oven Temperature: $105 \pm 5^\circ \text{C}$

Oven Temperature: 105°C		Tare #	S-24
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	123.23
a	Mass of As-Received Specimen + Tare Wt.	grams	302.38
b	Mass of Oven Dry Specimen + Tare Wt.	grams	256.70
w	Water Weight	(a-b)	45.68
A	Mass of As-Received Specimen	(a-t)	179.15
B	Mass of Oven Dry Specimen	(b-t)	133.47
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	25.5%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	34.2%

Oven	S&ME ID #:	Cal. Date:	Due:
------	------------	------------	------

Method C (440° C) or D (750° C): Ash Content and Organic Matter Determination

Muffle Furnace: 440°C		Tare #	1
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	113.57
b	Mass of Oven Dry Specimen + Tare Wt.	grams	247.27
c	Ash Weight + Tare Wt.	grams	239.46
C	Ash Weight	c-t	125.89
B	Mass of Oven Dry Specimen	(b-t)	133.70
D	% Ash Content	(C/B)*100	94.2%
	% Organic Matter	100-D	5.8%

Muffle Furnace:	S&ME ID #: 26317	Cal. Date: 9/23/19	Due: 9/23/20
-----------------	------------------	--------------------	--------------

Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Jimmy Hanson
 Technical Responsibility

Signature

Geotechnical Lab Supervisor
 Position

2/10/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



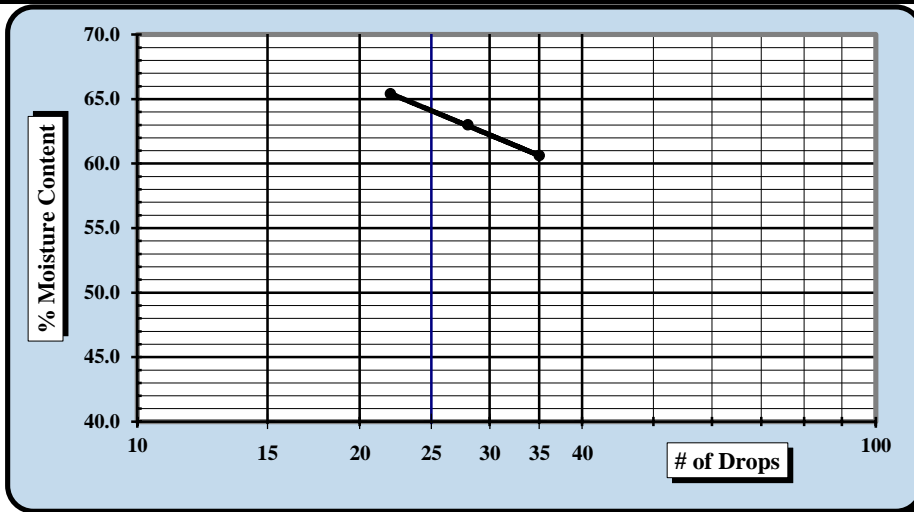
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-12	Sample #:	SS-1
		Sample Date:	1-10-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit					Plastic Limit		
		11	12	13			14	15	
A	Tare Weight	11.05	10.76	12.04			11.79	11.82	
B	Wet Soil Weight + A	20.46	20.28	21.27			20.40	20.74	
C	Dry Soil Weight + A	16.91	16.60	17.62			18.57	18.88	
D	Water Weight (B-C)	3.55	3.68	3.65			1.83	1.86	
E	Dry Soil Weight (C-A)	5.86	5.84	5.58			6.78	7.06	
F	% Moisture (D/E)*100	60.6%	63.0%	65.4%			27.0%	26.3%	
N	# OF DROPS	35	28	22			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						26.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	64
Plastic Limit	27
Plastic Index	37
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 81.1%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



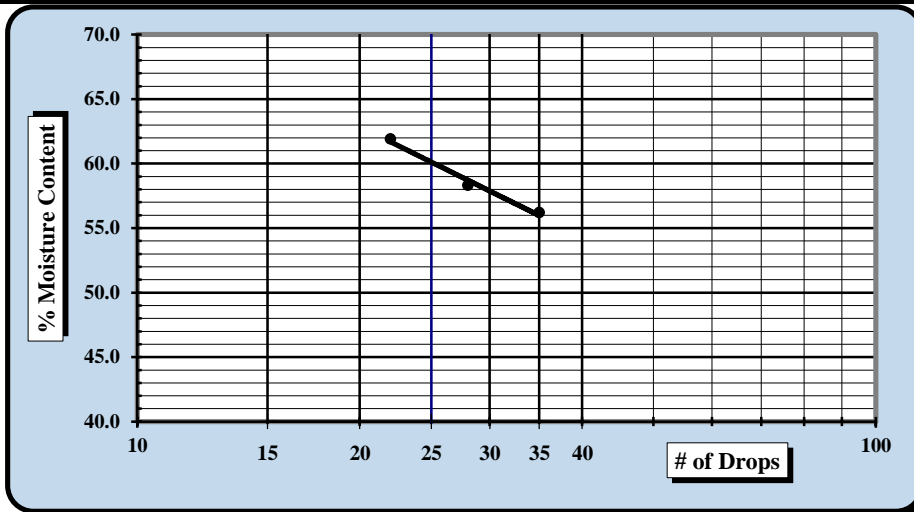
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-13	Sample #:	SS-1
		Sample Date:	1-10-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		16	17	18	19	20		
A	Tare Weight	11.88	11.90	11.91				
B	Wet Soil Weight + A	20.52	21.27	21.33				
C	Dry Soil Weight + A	17.41	17.82	17.73				
D	Water Weight (B-C)	3.11	3.45	3.60				
E	Dry Soil Weight (C-A)	5.53	5.92	5.82				
F	% Moisture (D/E)*100	56.2%	58.3%	61.9%				
N	# OF DROPS	35	28	22				
LL	LL = F * FACTOR							Moisture Contents determined by AASHTO T 265
Ave.	Average							25.2%



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	60
Plastic Limit	25
Plastic Index	35
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 80.9%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-14	Sample #:	SS-1
		Sample Date:	1-16-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		NB	443	NH		Z-5	44	
A	Tare Weight	30.67	25.14	30.65		17.30	11.97	
B	Wet Soil Weight + A	38.45	31.51	37.39		24.35	18.94	
C	Dry Soil Weight + A	36.24	29.71	35.42		22.57	17.18	
D	Water Weight (B-C)	2.21	1.80	1.97		1.78	1.76	
E	Dry Soil Weight (C-A)	5.57	4.57	4.77		5.27	5.21	
F	% Moisture (D/E)*100	39.7%	39.4%	41.3%		33.8%	33.8%	
N	# OF DROPS	25	23	15		Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR							
Ave.	Average					33.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	40
Plastic Limit	34
Plastic Index	6
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
 Technician Name

2/11/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



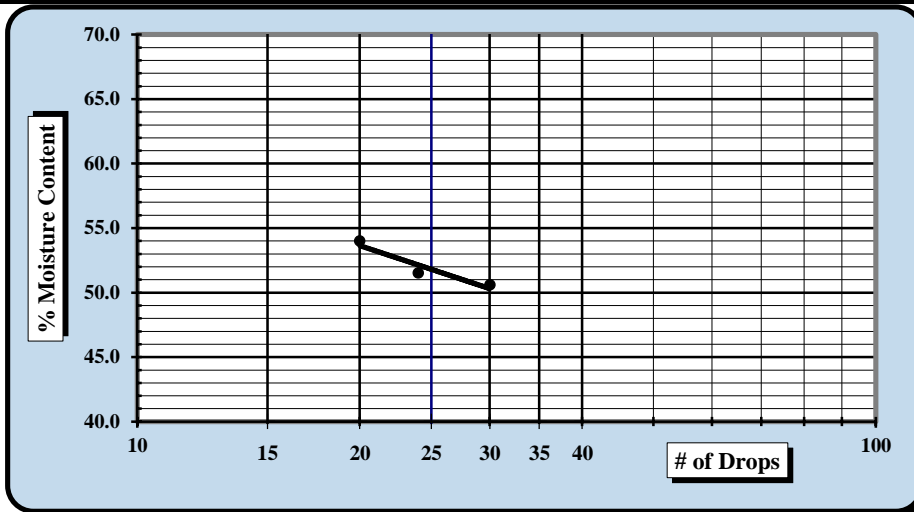
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-15	Sample #:	SS-1
		Sample Date:	1-16-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		21	22	23			21D	22D	
A	Tare Weight	11.97	11.69	11.86			17.06	17.06	
B	Wet Soil Weight + A	21.52	21.72	21.96			26.12	26.37	
C	Dry Soil Weight + A	18.31	18.31	18.42			24.29	24.50	
D	Water Weight (B-C)	3.21	3.41	3.54			1.83	1.87	
E	Dry Soil Weight (C-A)	6.34	6.62	6.56			7.23	7.44	
F	% Moisture (D/E)*100	50.6%	51.5%	54.0%			25.3%	25.1%	
N	# OF DROPS	30	24	20			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						25.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	52
Plastic Limit	25
Plastic Index	27
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 70.1%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



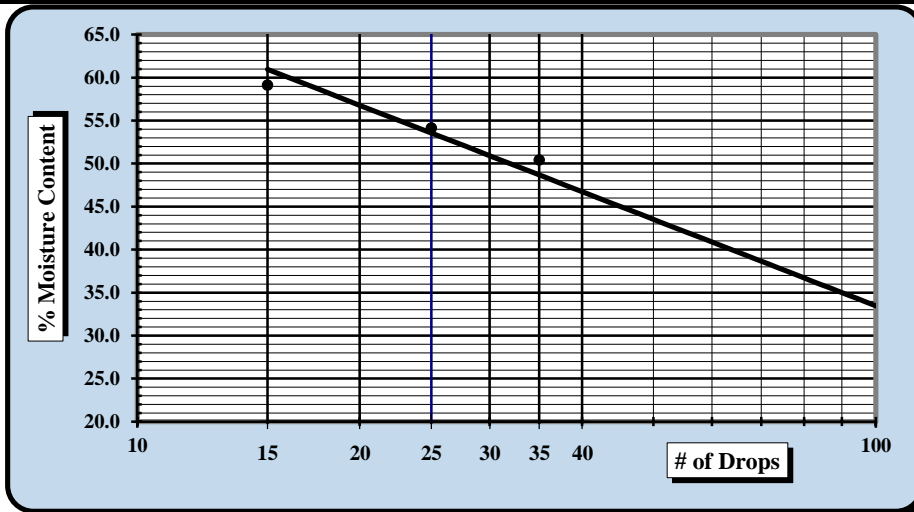
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-16	Sample #:	SS-1
		Sample Date:	1-16-2020
Location:	Embankment	Offset:	n/a
		Depth:	0-2

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		NY	Ks	Ms			A-9	J3	
A	Tare Weight	30.54	30.62	30.73			16.81	17.35	
B	Wet Soil Weight + A	37.70	37.63	38.40			23.49	25.52	
C	Dry Soil Weight + A	35.30	35.17	35.55			21.71	23.33	
D	Water Weight (B-C)	2.40	2.46	2.85			1.78	2.19	
E	Dry Soil Weight (C-A)	4.76	4.55	4.82			4.90	5.98	
F	% Moisture (D/E)*100	50.4%	54.1%	59.1%			36.3%	36.6%	
N	# OF DROPS	35	25	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						36.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	55
Plastic Limit	37
Plastic Index	18
Group Symbol	MH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
 Technician Name

2/11/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



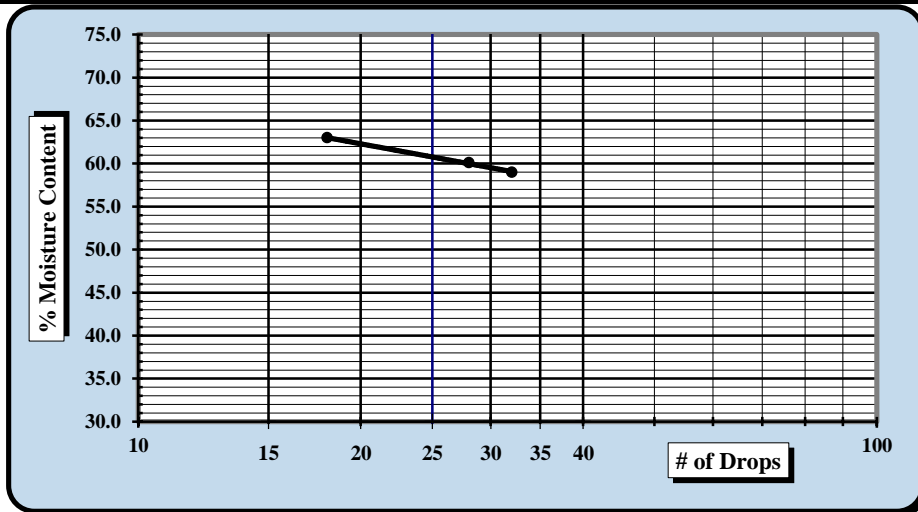
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-17	Sample #:	SS-1
		Sample Date:	1-14-2020
Location:	Embankment	Offset:	n/a
		Depth:	0'-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		1	2	3			4		
A	Tare Weight	16.57	16.52	16.81			16.72		
B	Wet Soil Weight + A	29.70	31.06	30.88			25.58		
C	Dry Soil Weight + A	24.83	25.60	25.44			23.82		
D	Water Weight (B-C)	4.87	5.46	5.44			1.76		
E	Dry Soil Weight (C-A)	8.26	9.08	8.63			7.10		
F	% Moisture (D/E)*100	59.0%	60.1%	63.0%			24.8%		
N	# OF DROPS	32	28	18			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						24.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	61
Plastic Limit	25
Plastic Index	36
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 82%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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MOISTURE, ASH, AND ORGANIC MATTER



ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		
Boring No.	EM-17	Sample No.	SS-2
		Sample Date:	1-14-2020
Location:	Embankment	Sampled by:	S&ME
		Depth:	2'-4'
Sample Description:	Very dark grayish brown clay		
Equipment:	Balance: 0.01 g. Readability, 500g. Minimum Capacity		
Balance:	S&ME ID #: 33084	Cal. Date: 11/21/19	Due: 11/21/20

Method A: Moisture Content Determination

Required Oven Temperature: 105 ± 5 °C

Oven Temperature: 105 °C		Tare #	S-5
<i>t</i>	Tare Weight (Dish plus Aluminum Foil Cover)	grams	122.49
<i>a</i>	Mass of As-Received Specimen + Tare Wt.	grams	435.01
<i>b</i>	Mass of Oven Dry Specimen + Tare Wt.	grams	362.97
<i>w</i>	Water Weight	(a-b)	72.04
<i>A</i>	Mass of As-Received Specimen	(a-t)	312.52
<i>B</i>	Mass of Oven Dry Specimen	(b-t)	240.48
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	23.1%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	30.0%

Oven	S&ME ID #:	Cal. Date:	Due:
------	------------	------------	------

Method C (440 °C) or D (750 °C): Ash Content and Organic Matter Determination

Muffle Furnace: 440 °C		Tare #	2
<i>t</i>	Tare Weight (Dish plus Aluminum Foil Cover)	grams	111.93
<i>b</i>	Mass of Oven Dry Specimen + Tare Wt.	grams	253.63
<i>c</i>	Ash Weight + Tare Wt.	grams	248.60
<i>C</i>	Ash Weight	c-t	136.67
<i>B</i>	Mass of Oven Dry Specimen	(b-t)	141.70
<i>D</i>	% Ash Content	(C/B)*100	96.5%
	% Organic Matter	100-D	3.5%

Muffle Furnace:	S&ME ID #: 26317	Cal. Date: 9/23/19	Due: 9/23/20
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Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Jimmy Hanson
 Technical Responsibility

Signature

Geotechnical Lab Supervisor
 Position

2/10/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-20	Sample #:	SS-1
		Sample Date:	1-7-2020
Location:	Embankment	Offset:	n/a
		Depth:	1.3-3.3

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		MICH	Mo	Strike			Ss	Hh	
A	Tare Weight	30.77	30.68	30.56			17.35	17.35	
B	Wet Soil Weight + A	37.74	37.32	37.93			24.98	25.30	
C	Dry Soil Weight + A	35.11	34.76	35.03			22.73	22.95	
D	Water Weight (B-C)	2.63	2.56	2.90			2.25	2.35	
E	Dry Soil Weight (C-A)	4.34	4.08	4.47			5.38	5.60	
F	% Moisture (D/E)*100	60.6%	62.7%	64.9%			41.8%	42.0%	
N	# OF DROPS	34	25	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						41.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	63
Plastic Limit	42
Plastic Index	21
Group Symbol	MH
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
Technician Name

2/11/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



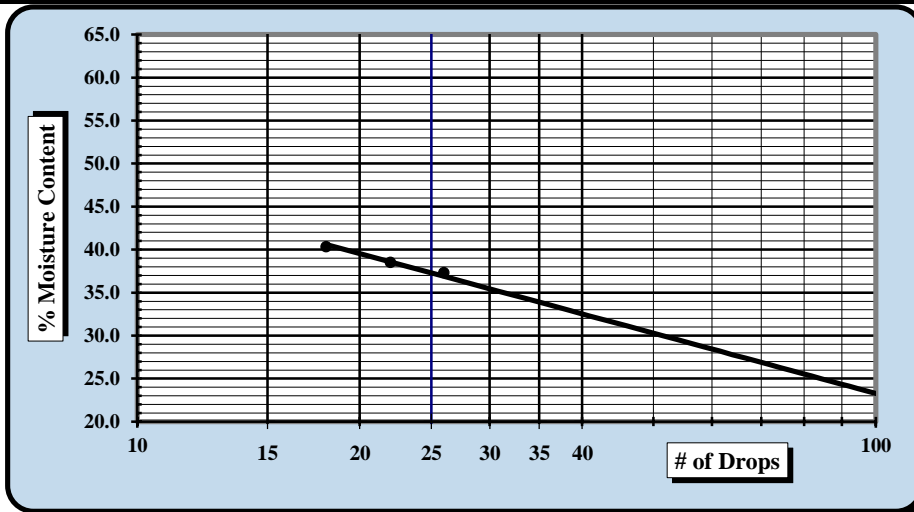
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-21	Sample #:	SS-1
		Sample Date:	1-7-2020
Location:	Embankment	Offset:	n/a
		Depth:	1.3-3.3

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		Gale	SD	FLA			10	B-3	
A	Tare Weight	30.67	30.64	30.58			14.29	17.32	
B	Wet Soil Weight + A	41.89	39.67	39.53			23.07	25.94	
C	Dry Soil Weight + A	38.84	37.16	36.96			21.41	24.31	
D	Water Weight (B-C)	3.05	2.51	2.57			1.66	1.63	
E	Dry Soil Weight (C-A)	8.17	6.52	6.38			7.12	6.99	
F	% Moisture (D/E)*100	37.3%	38.5%	40.3%			23.3%	23.3%	
N	# OF DROPS	26	22	18			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						23.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	39
Plastic Limit	23
Plastic Index	16
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
 Technician Name

2/11/2020
 Date

Robert C. Bruorton, P.E.
 Technical Responsibility

2/13/2020
 Date

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LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/14-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method:	A (1%) <input type="checkbox"/>	B (0.1%) <input checked="" type="checkbox"/>	Balance ID. 33084	Calibration Date: 11/21/19
			Oven ID. 31332	Calibration Date: 10/21/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-8	SS-3	4'-6'	J7	89.25	193.37	176.41	16.96	19.5%
RW-10	SS-2	2'-4'	M6	94.07	135.35	127.33	8.02	24.1%
RW-10	SS-3	4'-6'	G4	95.89	209.46	183.26	26.20	30.0%
RW-12	SS-2	2'-4'	P100	88.92	213.48	180.92	32.56	35.4%
RW-12	SS-4	6'-8'	J9	88.29	185.27	155.29	29.98	44.7%
RW-12	SS-8	23.5'-25'	J17	87.68	230.87	207.55	23.32	19.5%

Notes / Deviations / References

<u>Jimmy Hanson</u>	<u>Geotechnical Lab Supervisor</u>	<u>2/10/2020</u>
<i>Technical Responsibility</i>	<i>Position</i>	<i>Date</i>

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LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 AASHTO T 265

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/16-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method:	A (1%) <input checked="" type="checkbox"/>	B (0.1%) <input type="checkbox"/>	Balance ID. 28686	Calibration Date: 10/1/19
			Oven ID. 25722	Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt. + Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-13	SS-4	6-8	Gale	30.90	43.70	42.13	1.57	14.0%
RW-14	SS-3	4-6	Strike	30.60	47.00	43.91	3.09	23.2%

Notes / Deviations / References

<u>Ashley Parkans</u> <i>Technician Name</i>	<u>Robert C. Bruorton, P.E.</u> <i>Technical Responsibility</i>	<u>Senior Engineer</u> <i>Position</i>
		<u>2/13/2020</u> <i>Date</i>

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	RW-7	Sample #:	SS-1
		Sample Date:	1/8/20
Location:	Retaining Wall	Offset:	n/a
		Depth:	0 - 2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Tare #:	Liquid Limit				Plastic Limit				
			P-7	P-8	P-9			12			
A	Tare Weight		15.77	15.64	15.94				11.16		
B	Wet Soil Weight + A		33.42	36.25	34.81				21.40		
C	Dry Soil Weight + A		27.54	29.16	28.10				19.10		
D	Water Weight (B-C)		5.88	7.09	6.71				2.30		
E	Dry Soil Weight (C-A)		11.77	13.52	12.16				7.94		
F	% Moisture (D/E)*100		50.0%	52.4%	55.2%				29.0%		
N	# OF DROPS		35	28	19				Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR										
Ave.	Average								29.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	53
Plastic Limit	29
Plastic Index	24
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 80.9%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/18/20
Date

Robert C. Broun, P.E.
Technical Responsibility

2/18/20
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



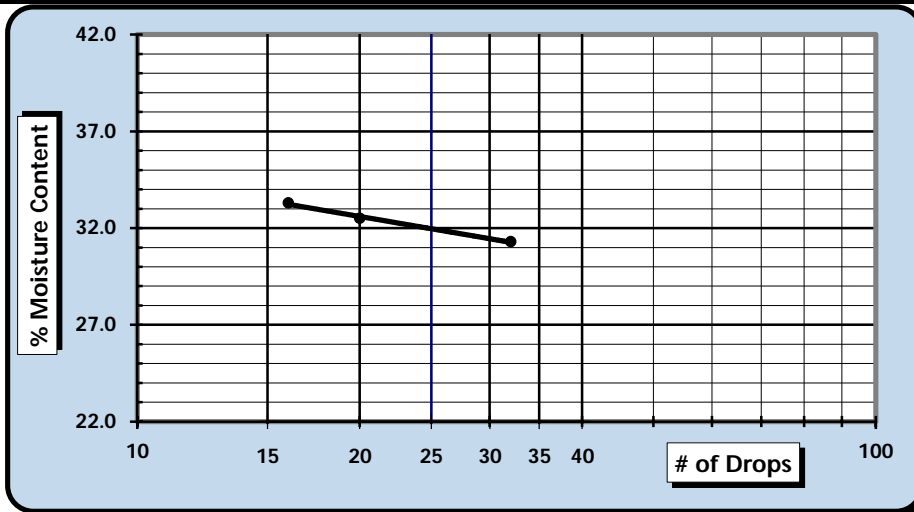
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	RW-7	Sample #:	SS-2
		Sample Date:	1/8/20
Location:	Retaining Wall	Offset:	n/a
		Depth:	2 - 4'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		Q-7	Q-8	Q-9			13		
A	Tare Weight	16.89	16.90	16.77			12.10		
B	Wet Soil Weight + A	38.64	39.55	38.21			23.08		
C	Dry Soil Weight + A	33.46	33.99	32.85			20.79		
D	Water Weight (B-C)	5.18	5.56	5.36			2.29		
E	Dry Soil Weight (C-A)	16.57	17.09	16.08			8.69		
F	% Moisture (D/E)*100	31.3%	32.5%	33.3%			26.4%		
N	# OF DROPS	32	20	16			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						26.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	32
Plastic Limit	26
Plastic Index	6
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 Sieve: 39.3%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
Technician Name

2/18/20
Date

Robert C. Brounion, P.E.
Technical Responsibility

2/18/20
Date

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**MOISTURE, ASH, AND
 ORGANIC MATTER**



ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		
Boring No.	RW-8	Sample No.	SS-2
		Sample Date:	1-7-2020
Location:	Retaining Wall	Sampled by:	Metro
		Depth:	2'-4'
Sample Description:	Very dark grayish brown clay with some sand and gravel		
Equipment:	Balance: 0.01 g. Readability, 500g. Minimum Capacity		
Balance:	S&ME ID #: 33084	Cal. Date: 11/21/19	Due: 11/21/20

Method A: Moisture Content Determination

Required Oven Temperature: $105 \pm 5^\circ \text{C}$

Oven Temperature: 105°C		Tare #	S-4
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	122.46
a	Mass of As-Received Specimen + Tare Wt.	grams	382.87
b	Mass of Oven Dry Specimen + Tare Wt.	grams	320.21
w	Water Weight	(a-b)	62.66
A	Mass of As-Received Specimen	(a-t)	260.41
B	Mass of Oven Dry Specimen	(b-t)	197.75
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	24.1%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	31.7%

Oven	S&ME ID #:	Cal. Date:	Due:
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Method C (440° C) or D (750° C): Ash Content and Organic Matter Determination

Muffle Furnace: 440°C		Tare #	3
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	111.77
b	Mass of Oven Dry Specimen + Tare Wt.	grams	231.82
c	Ash Weight + Tare Wt.	grams	227.90
C	Ash Weight	c-t	116.13
B	Mass of Oven Dry Specimen	(b-t)	120.05
D	% Ash Content	(C/B)*100	96.7%
	% Organic Matter	100-D	3.3%

Muffle Furnace:	S&ME ID #:	26317	Cal. Date:	9/23/19	Due:	9/23/20
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Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Jimmy Hanson
 Technical Responsibility

Signature

Geotechnical Lab Supervisor
 Position

2/10/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



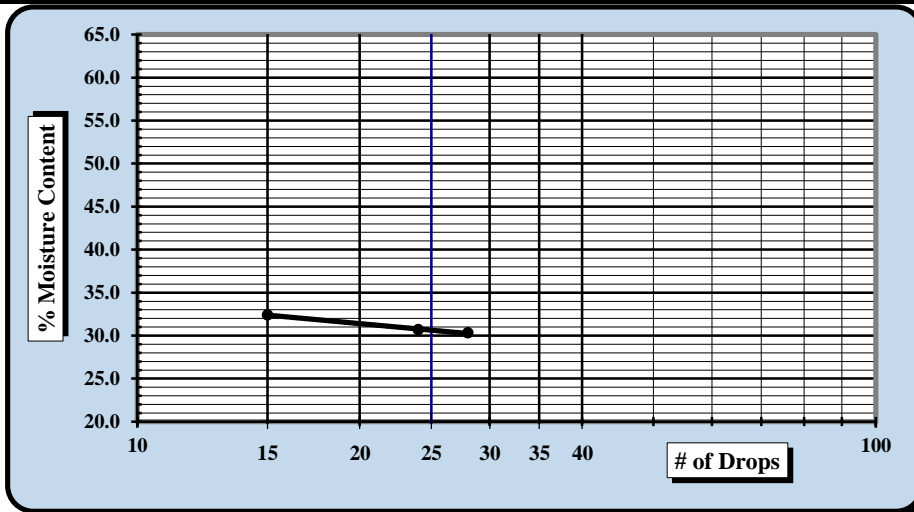
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-8	Sample #:	SS-3
		Sample Date:	1-7-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	4'-6'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		21	22	23		24			
A	Tare Weight	16.52	16.86	15.81		16.75			
B	Wet Soil Weight + A	31.90	31.33	30.21		25.64			
C	Dry Soil Weight + A	28.32	27.93	26.69		24.38			
D	Water Weight (B-C)	3.58	3.40	3.52		1.26			
E	Dry Soil Weight (C-A)	11.80	11.07	10.88		7.63			
F	% Moisture (D/E)*100	30.3%	30.7%	32.4%		16.5%			
N	# OF DROPS	28	24	15		Moisture Contents determined by AASHTO T 265			
LL	LL = F * FACTOR								
Ave.	Average						16.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	31
Plastic Limit	17
Plastic Index	14
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 24%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
 Technician Name

2/10/2020
 Date

Jimmy Hanson
 Technical Responsibility

2/10/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



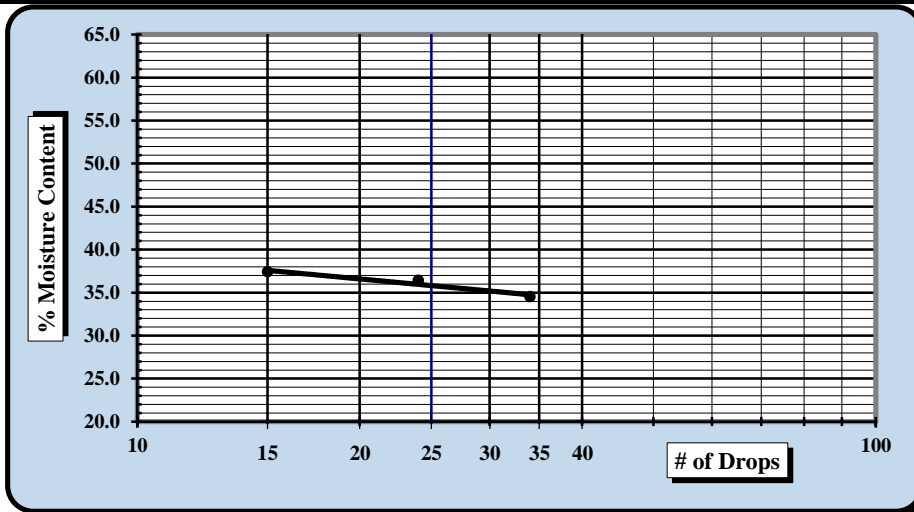
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-9	Sample #:	SS-2
		Sample Date:	1-9-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	2'-4'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit			
		1	2	3			4	5		
A	Tare Weight	11.07	10.64	11.61				11.34	10.73	
B	Wet Soil Weight + A	25.23	23.83	24.50				21.00	20.39	
C	Dry Soil Weight + A	21.60	20.31	20.99				19.54	18.90	
D	Water Weight (B-C)	3.63	3.52	3.51				1.46	1.49	
E	Dry Soil Weight (C-A)	10.53	9.67	9.38				8.20	8.17	
F	% Moisture (D/E)*100	34.5%	36.4%	37.4%				17.8%	18.2%	
N	# OF DROPS	34	24	15				Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR									
Ave.	Average							18.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	36
Plastic Limit	18
Plastic Index	18
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 57.5%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



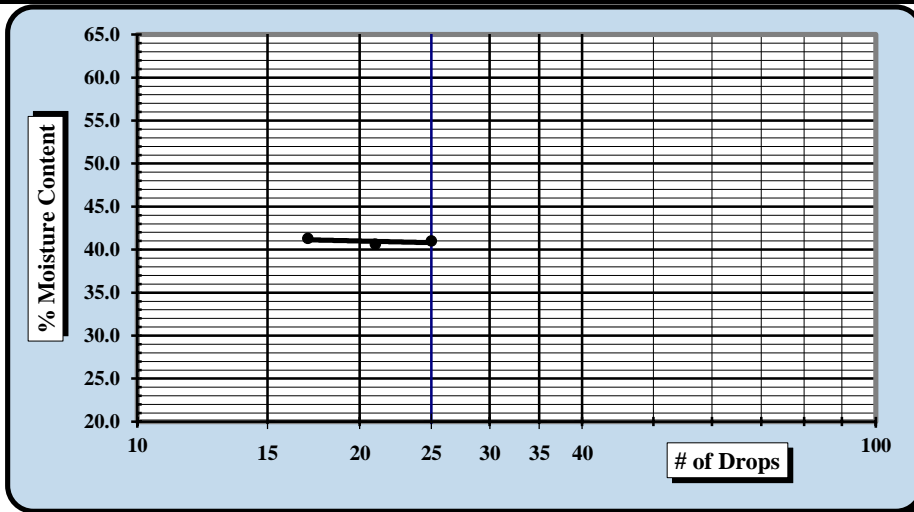
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-9	Sample #:	SS-4
		Sample Date:	1-9-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	6'-8'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit			
		6	7	8			9	10		
A	Tare Weight	11.23	11.69	10.88				11.97	11.74	
B	Wet Soil Weight + A	22.07	22.91	23.50				21.74	21.26	
C	Dry Soil Weight + A	18.92	19.67	19.81				19.41	18.97	
D	Water Weight (B-C)	3.15	3.24	3.69				2.33	2.29	
E	Dry Soil Weight (C-A)	7.69	7.98	8.93				7.44	7.23	
F	% Moisture (D/E)*100	41.0%	40.6%	41.3%				31.3%	31.7%	
N	# OF DROPS	25	21	17				Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR									
Ave.	Average							31.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	41
Plastic Limit	32
Plastic Index	9
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 53.3%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



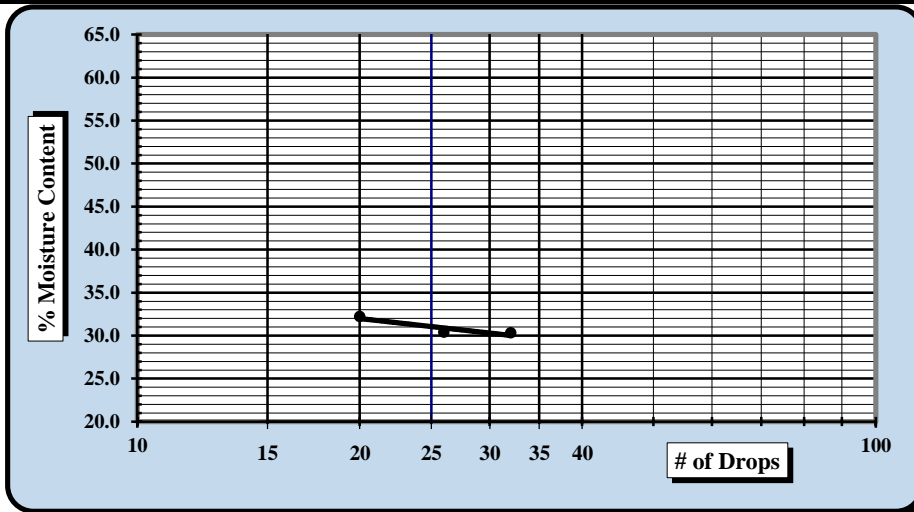
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-9	Sample #:	SS-5
		Sample Date:	1-9-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	8'-10'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		11	12	13			14	15	
A	Tare Weight	11.03	10.75	12.04			11.79	11.83	
B	Wet Soil Weight + A	23.47	22.64	24.60			21.30	21.32	
C	Dry Soil Weight + A	20.58	19.87	21.54			19.63	19.74	
D	Water Weight (B-C)	2.89	2.77	3.06			1.67	1.58	
E	Dry Soil Weight (C-A)	9.55	9.12	9.50			7.84	7.91	
F	% Moisture (D/E)*100	30.3%	30.4%	32.2%			21.3%	20.0%	
N	# OF DROPS	32	26	20			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						20.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	31
Plastic Limit	21
Plastic Index	10
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 47.2%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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**MOISTURE, ASH, AND
 ORGANIC MATTER**



ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		
Boring No.	RW-10	Sample No.	SS-1
		Sample Date:	1-9-2020
Location:	Retaining Wall	Sampled by:	Metro
		Depth:	0'-2'
Sample Description:	Dark reddish brown sandy clay		
Equipment:	Balance: 0.01 g. Readability, 500g. Minimum Capacity		
Balance:	S&ME ID #: 33084	Cal. Date: 11/21/19	Due: 11/21/20

Method A: Moisture Content Determination

Required Oven Temperature: 105 ± 5 °C

Oven Temperature: 105 °C		Tare #	S-23
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	121.85
a	Mass of As-Received Specimen + Tare Wt.	grams	388.83
b	Mass of Oven Dry Specimen + Tare Wt.	grams	348.23
w	Water Weight	(a-b)	40.60
A	Mass of As-Received Specimen	(a-t)	266.98
B	Mass of Oven Dry Specimen	(b-t)	226.38
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	15.2%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	17.9%

Oven	S&ME ID #:	Cal. Date:	Due:
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Method C (440 °C) or D (750 °C): Ash Content and Organic Matter Determination

Muffle Furnace: 440 °C		Tare #	4
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	114.67
b	Mass of Oven Dry Specimen + Tare Wt.	grams	268.24
c	Ash Weight + Tare Wt.	grams	261.80
C	Ash Weight	c-t	147.13
B	Mass of Oven Dry Specimen	(b-t)	153.57
D	% Ash Content	(C/B)*100	95.8%
	% Organic Matter	100-D	4.2%

Muffle Furnace:	S&ME ID #: 26317	Cal. Date: 9/23/19	Due: 9/23/20
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Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Jimmy Hanson
 Technical Responsibility

Signature

Geotechnical Lab Supervisor
 Position

2/10/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



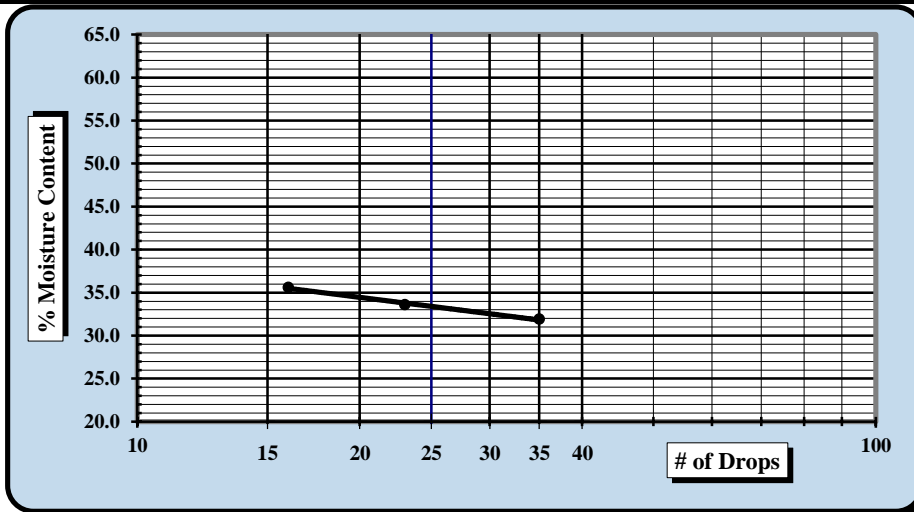
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #:	SS-2
		Sample Date:	1-9-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	2'-4'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		26	27	28			29		
A	Tare Weight	16.67	16.76	16.72			16.60		
B	Wet Soil Weight + A	28.09	27.37	31.20			25.63		
C	Dry Soil Weight + A	25.33	24.70	27.40			24.17		
D	Water Weight (B-C)	2.76	2.67	3.80			1.46		
E	Dry Soil Weight (C-A)	8.66	7.94	10.68			7.57		
F	% Moisture (D/E)*100	31.9%	33.6%	35.6%			19.3%		
N	# OF DROPS	35	23	16			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						19.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	33
Plastic Limit	19
Plastic Index	14
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 51%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



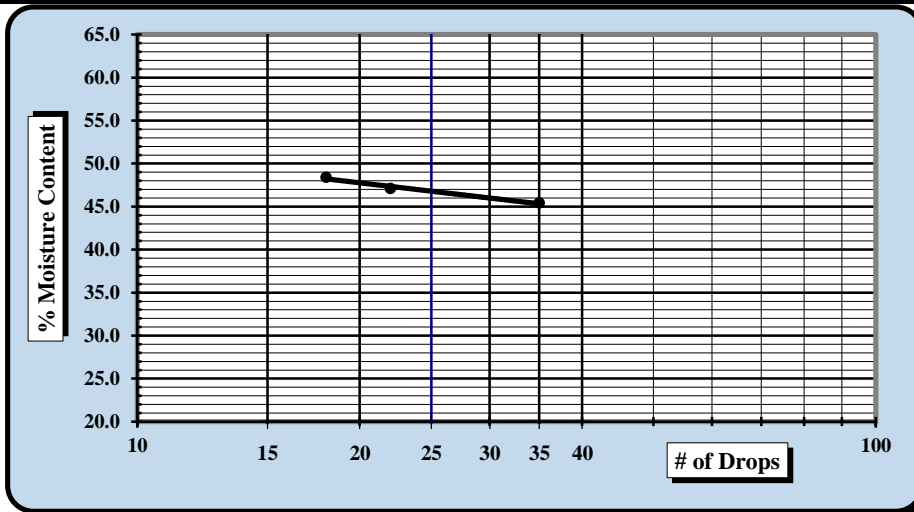
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #:	SS-3
		Sample Date:	1-9-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	4'-6'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		46	47	48			49		
A	Tare Weight	15.88	15.68	14.96			15.30		
B	Wet Soil Weight + A	27.45	26.46	27.40			24.16		
C	Dry Soil Weight + A	23.84	23.01	23.34			22.69		
D	Water Weight (B-C)	3.61	3.45	4.06			1.47		
E	Dry Soil Weight (C-A)	7.96	7.33	8.38			7.39		
F	% Moisture (D/E)*100	45.4%	47.1%	48.4%			19.9%		
N	# OF DROPS	35	22	18			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						19.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	47
Plastic Limit	20
Plastic Index	27
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 65%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



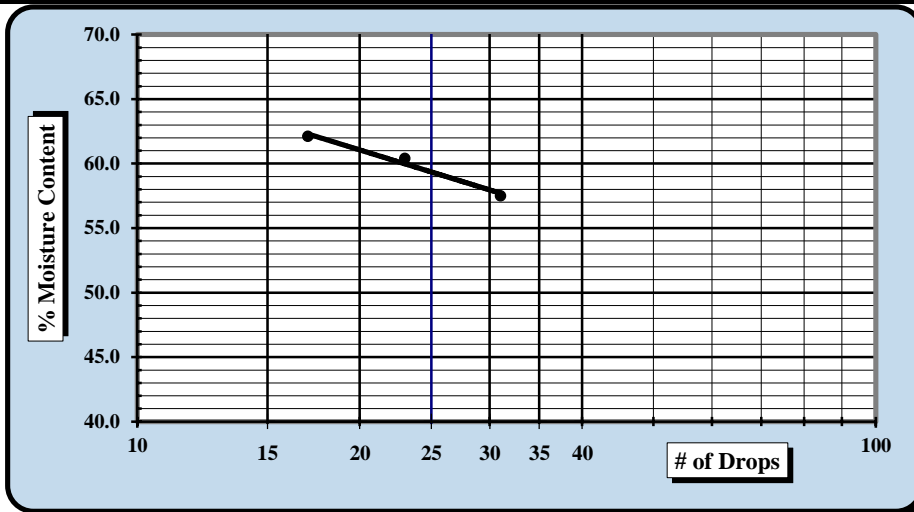
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-11	Sample #:	SS-2
		Sample Date:	1-14-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	2'-4'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		16	17	18		19	20	
A	Tare Weight	11.87	11.89	11.89		11.83	11.89	
B	Wet Soil Weight + A	20.58	21.53	21.29		20.38	21.08	
C	Dry Soil Weight + A	17.40	17.90	17.69		18.46	18.90	
D	Water Weight (B-C)	3.18	3.63	3.60		1.92	2.18	
E	Dry Soil Weight (C-A)	5.53	6.01	5.80		6.63	7.01	
F	% Moisture (D/E)*100	57.5%	60.4%	62.1%		29.0%	31.1%	
N	# OF DROPS	31	23	17		Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR							
Ave.	Average					30.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	59
Plastic Limit	30
Plastic Index	29
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 78.4%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



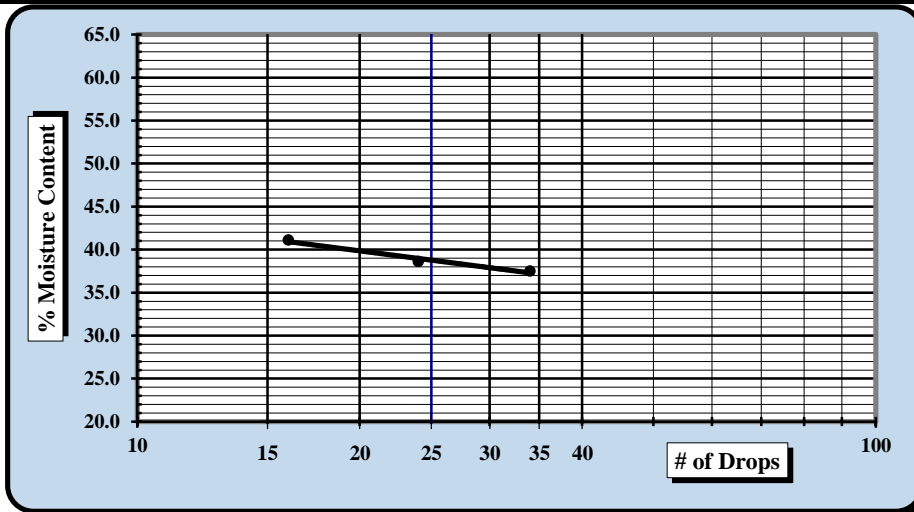
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-11	Sample #:	SS-3
		Sample Date:	1-14-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	4'-6'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		21	22	23			21D	22D	
A	Tare Weight	11.99	11.68	11.86			17.04	17.04	
B	Wet Soil Weight + A	22.99	22.66	22.70			25.98	26.35	
C	Dry Soil Weight + A	19.99	19.60	19.54			24.42	24.69	
D	Water Weight (B-C)	3.00	3.06	3.16			1.56	1.66	
E	Dry Soil Weight (C-A)	8.00	7.92	7.68			7.38	7.65	
F	% Moisture (D/E)*100	37.5%	38.6%	41.1%			21.1%	21.7%	
N	# OF DROPS	34	24	16			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						21.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	39
Plastic Limit	21
Plastic Index	18
Group Symbol	CL

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 56.9%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

J. Faucette
Technician Name

2/7/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



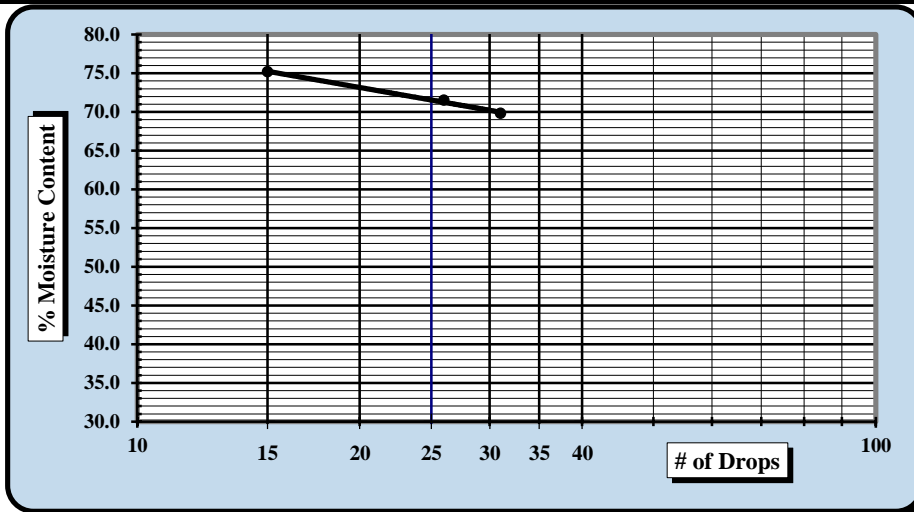
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-12	Sample #:	SS-2
		Sample Date:	1-14-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	2'-4'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		41	42	43			44		
A	Tare Weight	15.10	15.03	14.95			15.09		
B	Wet Soil Weight + A	27.51	27.43	29.05			23.89		
C	Dry Soil Weight + A	22.41	22.26	23.00			21.70		
D	Water Weight (B-C)	5.10	5.17	6.05			2.19		
E	Dry Soil Weight (C-A)	7.31	7.23	8.05			6.61		
F	% Moisture (D/E)*100	69.8%	71.5%	75.2%			33.1%		
N	# OF DROPS	31	26	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						33.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	71
Plastic Limit	33
Plastic Index	38
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 89%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



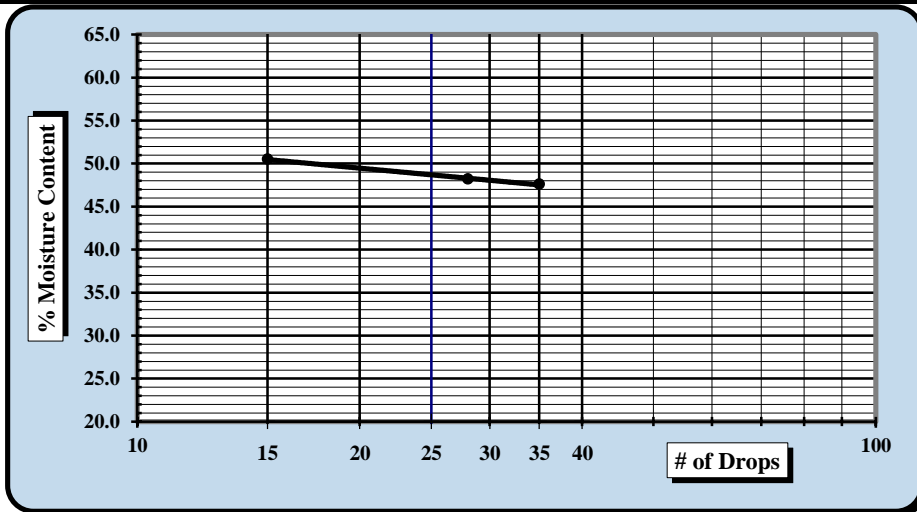
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-12	Sample #:	SS-4
		Sample Date:	1-14-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	6'-8'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan #		Liquid Limit					Plastic Limit		
Tare #:		5	10	15			20		
A	Tare Weight	16.63	16.82	16.83			16.65		
B	Wet Soil Weight + A	28.35	27.18	29.43			24.91		
C	Dry Soil Weight + A	24.57	23.81	25.20			23.02		
D	Water Weight (B-C)	3.78	3.37	4.23			1.89		
E	Dry Soil Weight (C-A)	7.94	6.99	8.37			6.37		
F	% Moisture (D/E)*100	47.6%	48.2%	50.5%			29.7%		
N	# OF DROPS	35	28	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						29.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	49
Plastic Limit	30
Plastic Index	19
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 81%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



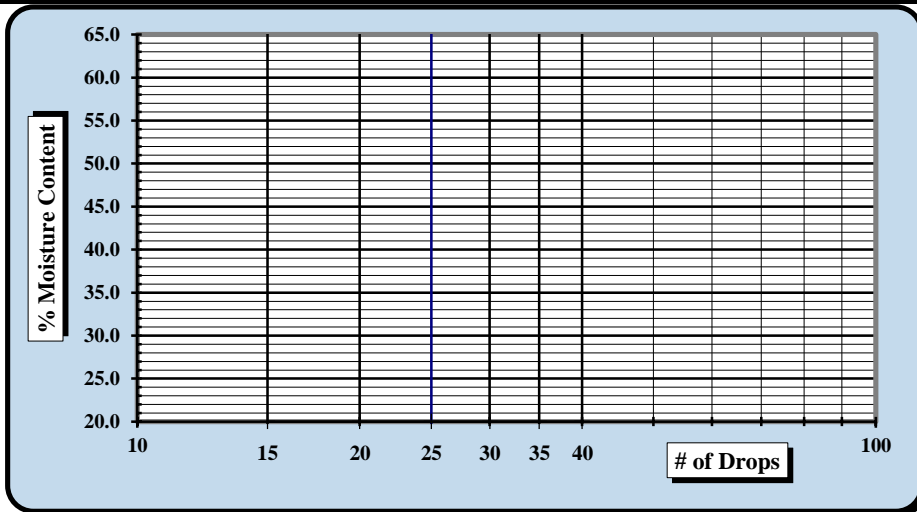
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-12	Sample #:	SS-8
		Sample Date:	1-14-2020
Location:	Retaining Wall	Offset:	n/a
		Depth:	23.5'-25'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan # 112		Liquid Limit					Plastic Limit		
Tare #:		25	30	45			50		
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS								
LL	LL = F * FACTOR								Moisture Contents determined by AASHTO T 265
Ave.	Average								



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic

Liquid Limit **NP**

Plastic Limit **NP**

Plastic Index **NP**

Group Symbol **ML**

Multipoint Method

One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 33%

Notes / Deviations / References: Specimen was found to be non-plastic

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Jimmy Hanson
Technician Name

2/10/2020
Date

Jimmy Hanson
Technical Responsibility

2/10/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



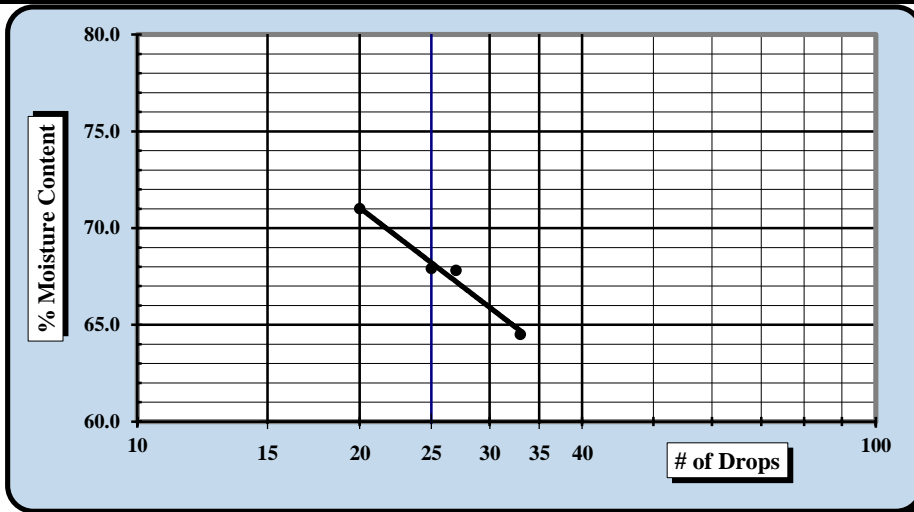
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-13	Sample #:	SS-1
		Sample Date:	1/14/20
Location:	Retaining wall	Offset:	n/a
		Depth:	0 - 2 ft.

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
Tare #:		229	211	46	207			10		
A	Tare Weight	20.70	20.86	20.73	20.94			20.80		
B	Wet Soil Weight + A	26.77	27.05	27.01	26.84			30.83		
C	Dry Soil Weight + A	24.39	24.55	24.47	24.39			28.43		
D	Water Weight (B-C)	2.38	2.50	2.54	2.45			2.40		
E	Dry Soil Weight (C-A)	3.69	3.69	3.74	3.45			7.63		
F	% Moisture (D/E)*100	64.5%	67.8%	67.9%	71.0%			31.5%		
N	# OF DROPS	33	27	25	20			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR									
Ave.	Average							31.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	68
Plastic Limit	32
Plastic Index	36
Group Symbol	CH

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 81%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/10/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-13	Sample #:	SS-4
		Sample Date:	1-14-2020
Location:	Retaining wall	Offset:	n/a
		Depth:	6 to 8

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		RICO	452	459			A-1	PEPE	
A	Tare Weight	30.60	25.16	25.12			16.83	17.42	
B	Wet Soil Weight + A	39.10	35.12	34.01			25.30	26.24	
C	Dry Soil Weight + A	36.93	32.51	31.65			23.53	24.39	
D	Water Weight (B-C)	2.17	2.61	2.36			1.77	1.85	
E	Dry Soil Weight (C-A)	6.33	7.35	6.53			6.70	6.97	
F	% Moisture (D/E)*100	34.3%	35.5%	36.1%			26.4%	26.5%	
N	# OF DROPS	28	22	19			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						26.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	35
Plastic Limit	27
Plastic Index	8
Group Symbol	ML

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
Technician Name

2/11/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



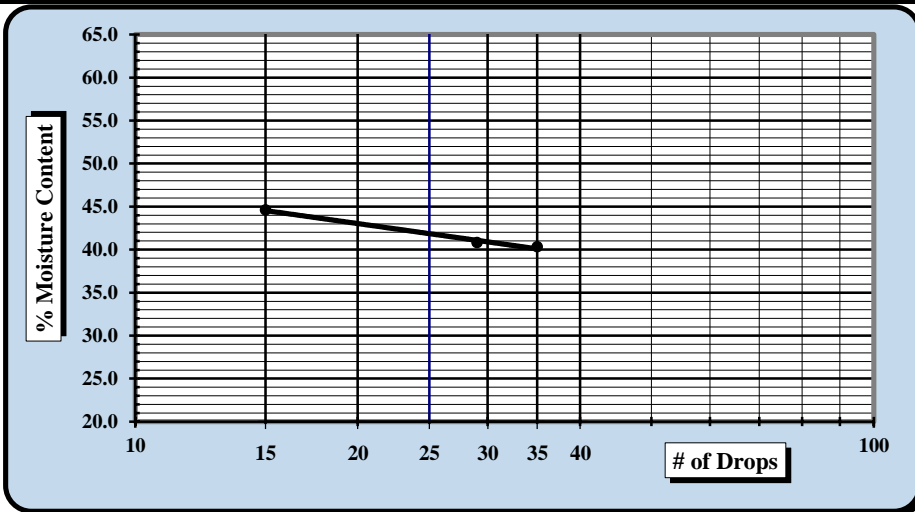
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-14	Sample #:	SS-3
		Sample Date:	1-14-2020
Location:	Retaining wall	Offset:	n/a
		Depth:	4 to 6

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		FLA	MICH	SD			10	B-3	
A	Tare Weight	30.57	30.72	30.60			14.29	17.31	
B	Wet Soil Weight + A	39.34	39.86	38.16			21.60	24.06	
C	Dry Soil Weight + A	36.82	37.21	35.83			19.93	22.52	
D	Water Weight (B-C)	2.52	2.65	2.33			1.67	1.54	
E	Dry Soil Weight (C-A)	6.25	6.49	5.23			5.64	5.21	
F	% Moisture (D/E)*100	40.3%	40.8%	44.6%			29.6%	29.6%	
N	# OF DROPS	35	29	15			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						29.6%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	42
Plastic Limit	30
Plastic Index	12
Group Symbol	ML
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T89: Determining the Liquid Limit of Soils

Kenneth Mitchell
Technician Name

2/11/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/13/2020
Date

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Appendix VIII – Rock Core Sample Laboratory Test Results

**UNCONFINED COMPRESSION
(ASTM D7012 Method C)**



S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Project Name: I-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in ²)	Unit Weight (lbs/ft ³)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
EB-1	RC-1	42.6 - 43.0	3.78 ¹	1.98	A	3.08	174.0	48	6,659	2,162	0.7
EB-1	RC-2	57.5 - 57.9	4.30	1.98	A	3.08	190.2	79	69,041	22,416	0.0
EB-2	RC-3	25.3 - 25.7	3.95	1.86	A	2.72	171.6	79	92,568	34,032	0.1
EB-2	RC-4	46.7 - 47.1	4.05	1.87	A	2.75	175.8	77	109,544	39,834	0.0
IB-1	RC-5	45.7 - 46.2	4.34	1.98	A	3.08	191.4	69	100,469	32,620	0.1

- NOTES:
1. The length to diameter ratio is 1.9:1 and does not meet the requirements of ASTM D7012e1, Sec. 8.1.1, therefore the results may differ from a test specimen that meets the requirements of ASTM D7012.
 2. Effective (as received) unit weight as determined by RTH 109-93.
 3. Loading rates were selected to target reaching failure between 2 and 15 minutes.
 4. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial and error that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

- A Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.
- C Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- D Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- E Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

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**UNCONFINED COMPRESSION
(ASTM D7012 Method C)**



S&ME, Inc. - Knoxville 3313 Topside Road, Louisville, TN 37777

Project Name: I-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in ²)	Unit Weight (lbs/ft ³)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
IB-1	RC-6	65.0 - 65.5	4.21	1.98	A	3.08	192.8	67	101,164	32,845	0.1
IB-2B	RC-7	43.3 - 43.8	4.38	1.98	A	3.08	189.7	68	109,764	35,638	0.0
IB-2B	RC-8	57.5 - 57.9	4.38	1.98	A	3.08	194.9	64	88,279	28,662	0.1
IB-3	RC-9	53.7 - 54.1	4.45	1.98	A	3.08	181.8	63	64,809	21,042	0.2
IB-3	RC-10	60.5 - 60.9	4.30	1.98	A	3.08	187.8	71	124,042	40,273	0.1

- NOTES:
1. Effective (as received) unit weight as determined by RTH 109-93.
 2. Loading rates were selected to target reaching failure between 2 and 15 minutes.
 3. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial and error that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

- A Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.
- C Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- D Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- E Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

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**UNCONFINED COMPRESSION
(ASTM D7012 Method C)**



S&ME, Inc. - Knoxville 3313 Topside Road, Louisville, TN 37777

Project Name: I-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in ²)	Unit Weight (lbs/ft ³)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
IB-4A	RC-11	24.7 - 25.1	4.38	1.98	A	3.08	186.3	71	103,284	33,534	0.4
IB-4A	RC-12	34.8 - 35.2	4.35	1.98	A	3.08	187.5	75	112,693	36,589	0.0
IB-4A	RC-13	54.3 - 54.7	4.37	1.98	A	3.08	187.7	67	79,955	25,959	0.0
EB-3	RC-14	55.0 - 55.35	3.95	1.84	A	2.66	197.5	86	109,492	41,162	0.0
EB-3	RC-15	62.6 - 62.95	4.12	1.85	A	2.69	189.7	80	58,298	21,672	0.1

- NOTES:
1. Effective (as received) unit weight as determined by RTH 109-93.
 2. Loading rates were selected to target reaching failure between 2 and 15 minutes.
 3. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial and error that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

- A Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.
- C Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- D Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- E Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

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**UNCONFINED COMPRESSION
(ASTM D7012 Method C)**



S&ME, Inc. - Knoxville 3313 Topside Road, Louisville, TN 37777

Project Name: I-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in ²)	Unit Weight (lbs/ft ³)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
EB-4	RC-16	44.0 - 44.4	3.97	1.98	A	3.08	193.2	72	73,772	23,952	0.1
EB-4	RC-17	55.5 - 55.9	4.16	1.98	A	3.08	186.5	74	140,391	45,581	0.0

- NOTES:
1. Effective (as received) unit weight as determined by RTH 109-93.
 2. Loading rates were selected to target reaching failure between 2 and 15 minutes.
 3. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

- A Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.
- C Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- D Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- E Test specimen measurements met the desired shape tolerances of ASTM D4543-19 for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

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**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

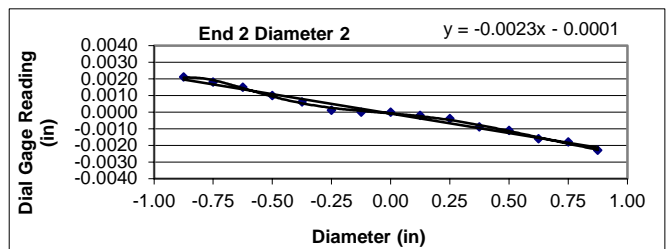
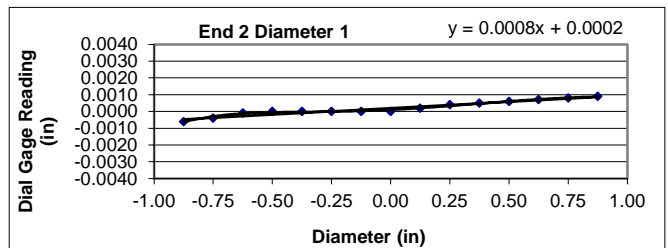
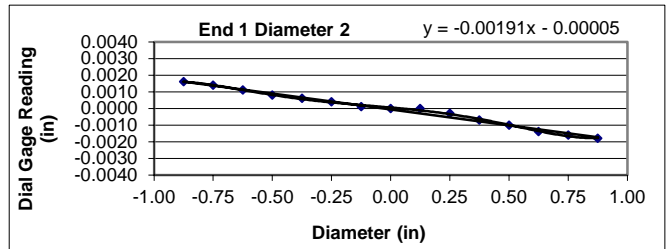
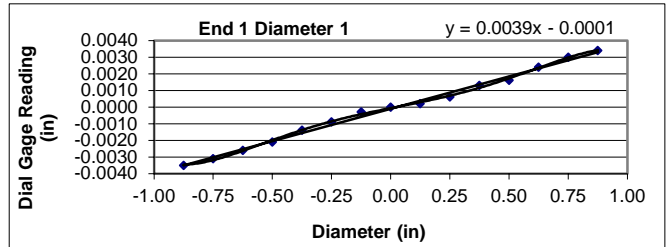
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 3.78	Tested by: Tori Igoue
Boring Id: EB-1	Unit Weight (pcf): 174.0	Reviewed by: John Pearson
Sample No.: RC-1	Moisture Content (%): 0.7	
Depth (ft): 42.6 - 43.0		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0035	0.0016	-0.0006	0.0021
- 6/8	-0.0031	0.0014	-0.0004	0.0018
- 5/8	-0.0026	0.0011	-0.0001	0.0015
- 4/8	-0.0021	0.0008	0.0000	0.0010
- 3/8	-0.0014	0.0006	0.0000	0.0006
- 2/8	-0.0009	0.0004	0.0000	0.0001
- 1/8	-0.0003	0.0001	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0002	-0.0002
2/8	0.0006	-0.0003	0.0004	-0.0004
3/8	0.0013	-0.0007	0.0005	-0.0009
4/8	0.0016	-0.0010	0.0006	-0.0011
5/8	0.0024	-0.0014	0.0007	-0.0016
6/8	0.0030	-0.0016	0.0008	-0.0018
7/8	0.0034	-0.0018	0.0009	-0.0023



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00389
	Angle of Best Fit Line:	0.22313
End 2:	Slope of Best Fit Line:	0.00076
	Angle of Best Fit Line:	0.04354
	Max Angular Difference:	0.18

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00191
	Angle of Best Fit Line:	-0.10952
End 2:	Slope of Best Fit Line:	-0.00234
	Angle of Best Fit Line:	-0.13424
	Max Angular Difference:	0.02

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0069	0.0035	YES
End 1 Diam 2	0.0034	0.0017	YES
End 2 Diam 1	0.0015	0.0008	YES
End 2 Diam 2	0.0044	0.0022	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

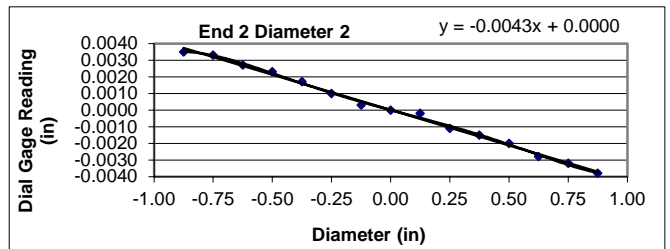
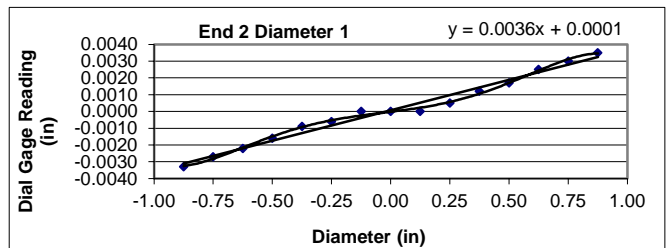
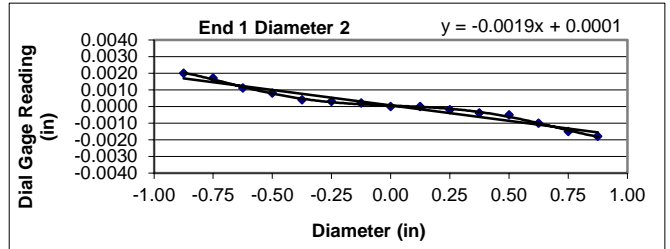
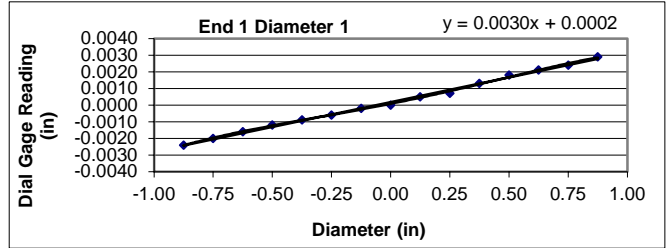
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.30	Tested by: Tori Igoue
Boring Id: EB-1	Unit Weight (pcf): 190.2	Reviewed by: John Pearson
Sample No.: RC-2	Moisture Content (%): 0.0	
Depth (ft): 57.5 - 57.9		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0024	0.0020	-0.0033	0.0035
- 6/8	-0.0020	0.0017	-0.0027	0.0033
- 5/8	-0.0016	0.0011	-0.0022	0.0027
- 4/8	-0.0012	0.0008	-0.0016	0.0023
- 3/8	-0.0009	0.0004	-0.0009	0.0017
- 2/8	-0.0006	0.0003	-0.0006	0.0010
- 1/8	-0.0002	0.0002	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0005	0.0000	0.0000	-0.0002
2/8	0.0007	-0.0002	0.0005	-0.0011
3/8	0.0013	-0.0004	0.0012	-0.0015
4/8	0.0018	-0.0005	0.0017	-0.0020
5/8	0.0021	-0.0010	0.0025	-0.0028
6/8	0.0024	-0.0015	0.0030	-0.0032
7/8	0.0029	-0.0018	0.0035	-0.0038



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00297
	Angle of Best Fit Line:	0.17009
End 2:	Slope of Best Fit Line:	0.00363
	Angle of Best Fit Line:	0.20790
	Max Angular Difference:	-0.04

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00186
	Angle of Best Fit Line:	-0.10657
End 2:	Slope of Best Fit Line:	-0.00426
	Angle of Best Fit Line:	-0.24408
	Max Angular Difference:	0.14

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0053	0.0027	YES
End 1 Diam 2	0.0038	0.0019	YES
End 2 Diam 1	0.0068	0.0034	YES
End 2 Diam 2	0.0073	0.0037	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

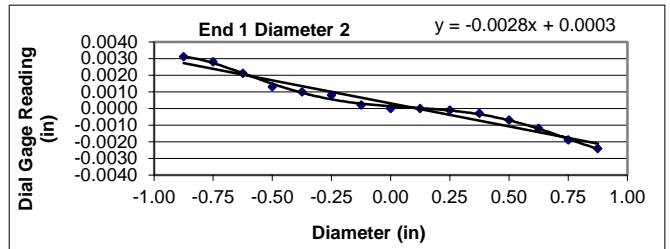
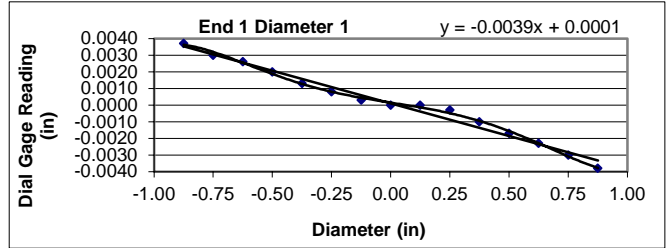
Project: I-77 Panthers Interchange	Diameter (in): 1.86	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 3.95	Tested by: Tori Igoe
Boring Id: EB-2	Unit Weight (pcf): 171.6	Reviewed by: John Pearson
Sample No.: RC-3	Moisture Content (%): 0.1	
Depth (ft): 22.3 - 25.7		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

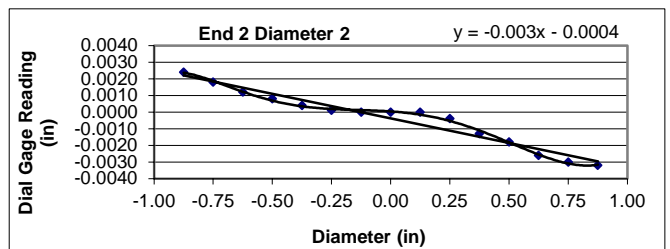
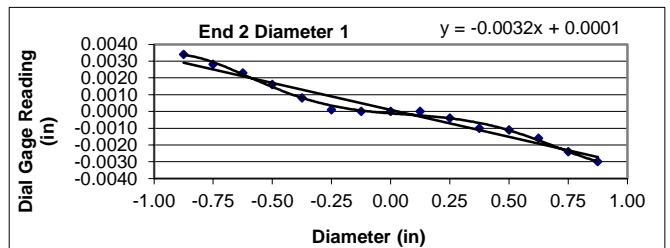
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0037	0.0031	0.0034	0.0024
- 6/8	0.0030	0.0028	0.0028	0.0018
- 5/8	0.0026	0.0021	0.0023	0.0012
- 4/8	0.0020	0.0013	0.0016	0.0008
- 3/8	0.0013	0.0010	0.0008	0.0004
- 2/8	0.0008	0.0008	0.0001	0.0001
- 1/8	0.0003	0.0002	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	-0.0003	-0.0001	-0.0004	-0.0004
3/8	-0.0010	-0.0003	-0.0010	-0.0013
4/8	-0.0017	-0.0007	-0.0011	-0.0018
5/8	-0.0023	-0.0012	-0.0016	-0.0026
6/8	-0.0030	-0.0019	-0.0024	-0.0030
7/8	-0.0038	-0.0024	-0.0030	-0.0032



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES



Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00392
	Angle of Best Fit Line:	-0.22460
End 2:	Slope of Best Fit Line:	-0.00322
	Angle of Best Fit Line:	-0.18449
	Max Angular Difference:	-0.04

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00277
	Angle of Best Fit Line:	-0.15895
End 2:	Slope of Best Fit Line:	-0.00296
	Angle of Best Fit Line:	-0.16943
	Max Angular Difference:	0.01

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0075	0.0040	YES
End 1 Diam 2	0.0055	0.0030	YES
End 2 Diam 1	0.0064	0.0034	YES
End 2 Diam 2	0.0056	0.0030	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

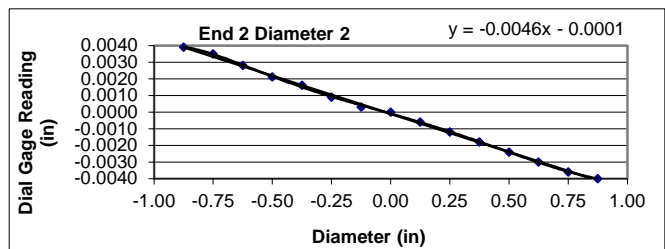
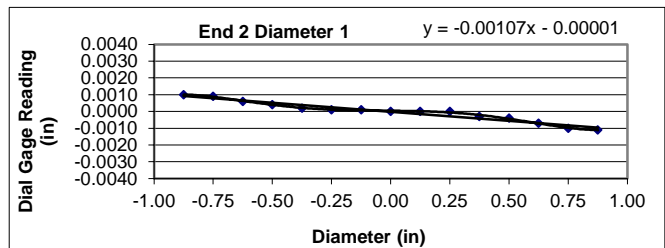
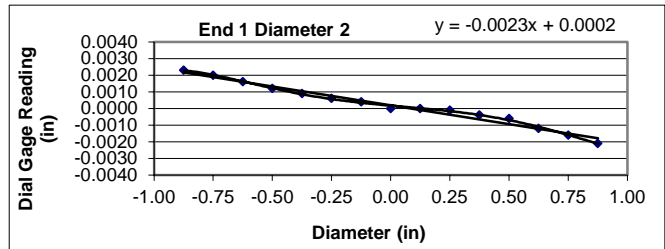
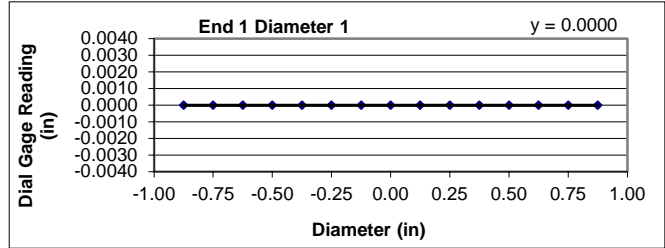
Project: I-77 Panthers Interchange	Diameter (in): 1.87	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.05	Tested by: Tori Igoe
Boring Id: EB-2	Unit Weight (pcf): 175.8	Reviewed by: John Pearson
Sample No.: RC-4	Moisture Content (%): 0.0	
Depth (ft): 46.7 - 47.1		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0023	0.0010	0.0039
- 6/8	0.0000	0.0020	0.0009	0.0035
- 5/8	0.0000	0.0016	0.0006	0.0028
- 4/8	0.0000	0.0012	0.0004	0.0021
- 3/8	0.0000	0.0009	0.0002	0.0016
- 2/8	0.0000	0.0006	0.0001	0.0009
- 1/8	0.0000	0.0004	0.0001	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0006
2/8	0.0000	-0.0001	0.0000	-0.0012
3/8	0.0000	-0.0004	-0.0003	-0.0018
4/8	0.0000	-0.0006	-0.0004	-0.0024
5/8	0.0000	-0.0012	-0.0007	-0.0030
6/8	0.0000	-0.0016	-0.0010	-0.0036
7/8	0.0000	-0.0021	-0.0011	-0.0040



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	-0.00107
	Angle of Best Fit Line:	-0.06155
	Max Angular Difference:	0.06

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00227
	Angle of Best Fit Line:	-0.12982
End 2:	Slope of Best Fit Line:	-0.00458
	Angle of Best Fit Line:	-0.26225
	Max Angular Difference:	0.13

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	YES
End 1 Diam 2	0.0044	0.0024	YES
End 2 Diam 1	0.0021	0.0011	YES
End 2 Diam 2	0.0079	0.0042	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

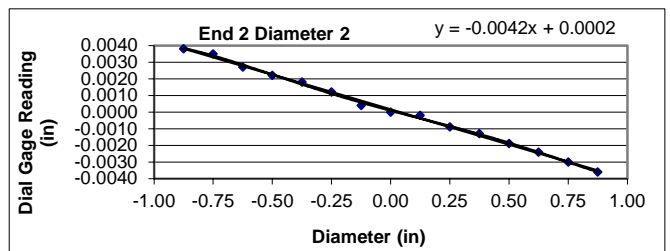
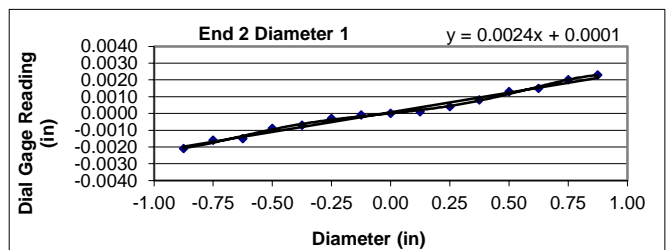
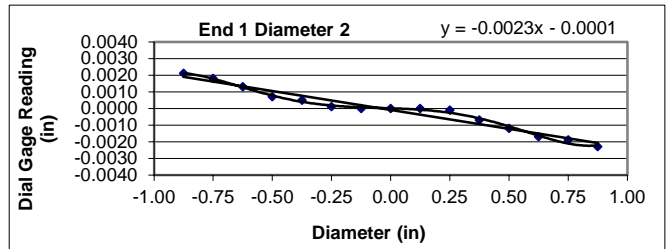
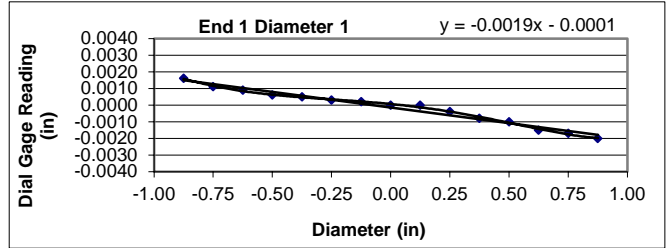
Project: I-77 Panthers Interchange	Diameter (in): 1.84	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 3.95	Tested by: Tori Igoe
Boring Id: EB-3	Unit Weight (pcf): 197.5	Reviewed by: John Pearson
Sample No.: RC-14	Moisture Content (%): 0.0	
Depth (ft): 55.0 - 55.35		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0016	0.0021	-0.0021	0.0038
- 6/8	0.0011	0.0018	-0.0016	0.0035
- 5/8	0.0009	0.0013	-0.0015	0.0027
- 4/8	0.0006	0.0007	-0.0009	0.0022
- 3/8	0.0005	0.0005	-0.0007	0.0018
- 2/8	0.0003	0.0001	-0.0003	0.0012
- 1/8	0.0002	0.0000	-0.0001	0.0004
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0001	-0.0002
2/8	-0.0004	-0.0001	0.0004	-0.0009
3/8	-0.0008	-0.0007	0.0008	-0.0013
4/8	-0.0010	-0.0012	0.0013	-0.0019
5/8	-0.0015	-0.0017	0.0015	-0.0024
6/8	-0.0017	-0.0019	0.0020	-0.0030
7/8	-0.0020	-0.0023	0.0023	-0.0036



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00188
	Angle of Best Fit Line:	-0.10788
End 2:	Slope of Best Fit Line:	0.00235
	Angle of Best Fit Line:	0.13473
	Max Angular Difference:	-0.24

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00227
	Angle of Best Fit Line:	-0.13031
End 2:	Slope of Best Fit Line:	-0.00419
	Angle of Best Fit Line:	-0.24031
	Max Angular Difference:	0.11

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0036	0.0020	YES
End 1 Diam 2	0.0044	0.0024	YES
End 2 Diam 1	0.0044	0.0024	YES
End 2 Diam 2	0.0074	0.0040	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

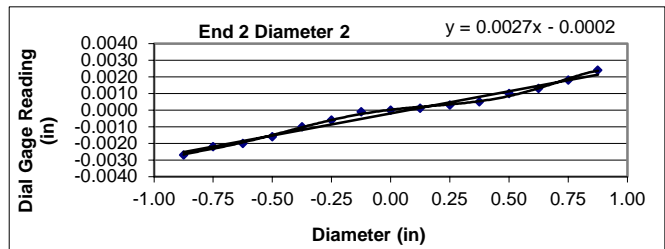
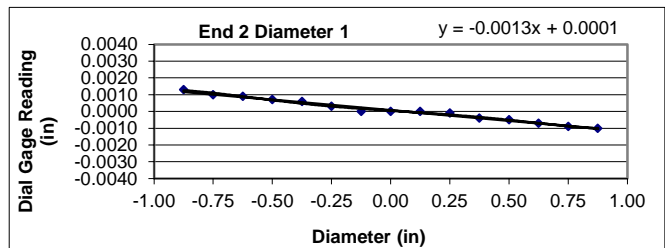
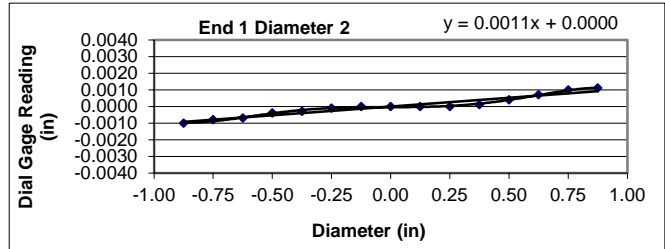
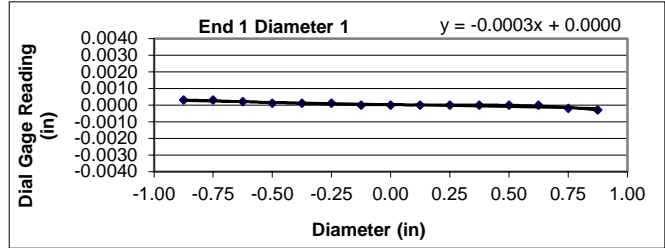
Project: I-77 Panthers Interchange	Diameter (in): 1.85	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.12	Tested by: Tori Igoo
Boring Id: EB-3	Unit Weight (pcf): 189.7	Reviewed by: John Pearson
Sample No.: RC-15	Moisture Content (%): 0.1	
Depth (ft): 62.6 - 62.95		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0003	-0.0010	0.0013	-0.0027
- 6/8	0.0003	-0.0008	0.0010	-0.0022
- 5/8	0.0002	-0.0007	0.0009	-0.0020
- 4/8	0.0001	-0.0004	0.0007	-0.0016
- 3/8	0.0001	-0.0003	0.0006	-0.0010
- 2/8	0.0001	-0.0001	0.0003	-0.0006
- 1/8	0.0000	0.0000	0.0000	-0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0001
2/8	0.0000	0.0000	-0.0001	0.0003
3/8	0.0000	0.0001	-0.0004	0.0005
4/8	0.0000	0.0004	-0.0005	0.0010
5/8	0.0000	0.0007	-0.0007	0.0013
6/8	-0.0002	0.0010	-0.0009	0.0018
7/8	-0.0003	0.0011	-0.0010	0.0024



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00026
	Angle of Best Fit Line:	-0.01490
End 2:	Slope of Best Fit Line:	-0.00126
	Angle of Best Fit Line:	-0.07219
	Max Angular Difference:	0.06

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00106
	Angle of Best Fit Line:	0.06073
End 2:	Slope of Best Fit Line:	0.00266
	Angle of Best Fit Line:	0.15241
	Max Angular Difference:	-0.09

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0006	0.0003	YES
End 1 Diam 2	0.0021	0.0011	YES
End 2 Diam 1	0.0023	0.0012	YES
End 2 Diam 2	0.0051	0.0028	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

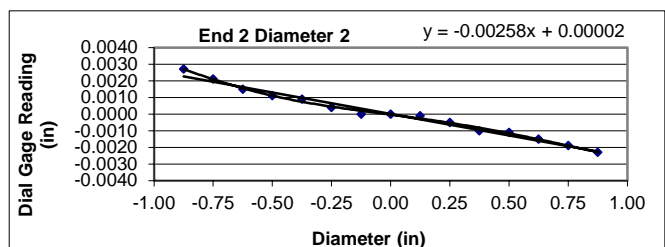
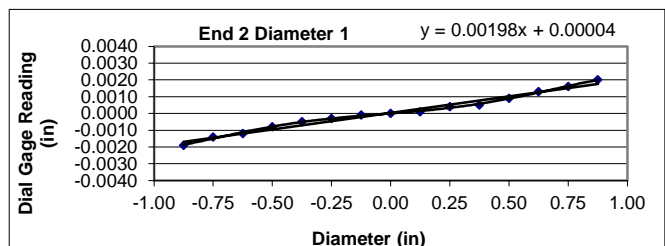
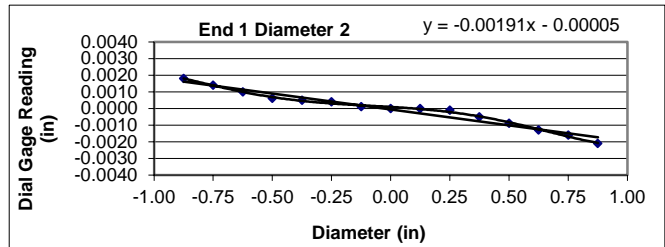
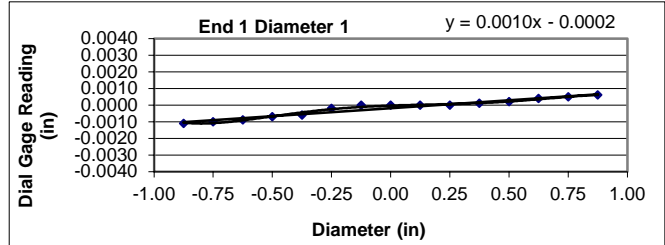
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 3.97	Tested by: Tori Igoe
Boring Id: EB-4	Unit Weight (pcf): 193.2	Reviewed by: John Pearson
Sample No.: RC-16	Moisture Content (%): 0.1	
Depth (ft): 44.0 - 44.4		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0011	0.0018	-0.0019	0.0027
- 6/8	-0.0010	0.0014	-0.0014	0.0021
- 5/8	-0.0009	0.0010	-0.0012	0.0015
- 4/8	-0.0007	0.0006	-0.0008	0.0011
- 3/8	-0.0006	0.0005	-0.0005	0.0009
- 2/8	-0.0002	0.0004	-0.0003	0.0004
- 1/8	0.0000	0.0001	-0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0001	-0.0001
2/8	0.0000	-0.0001	0.0004	-0.0005
3/8	0.0001	-0.0005	0.0005	-0.0010
4/8	0.0002	-0.0009	0.0009	-0.0011
5/8	0.0004	-0.0013	0.0013	-0.0015
6/8	0.0005	-0.0016	0.0016	-0.0019
7/8	0.0006	-0.0021	0.0020	-0.0023



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00096
	Angle of Best Fit Line:	0.05484
End 2:	Slope of Best Fit Line:	0.00198
	Angle of Best Fit Line:	0.11328
	Max Angular Difference:	-0.06

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00191
	Angle of Best Fit Line:	-0.10952
End 2:	Slope of Best Fit Line:	-0.00258
	Angle of Best Fit Line:	-0.14799
	Max Angular Difference:	0.04

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0017	0.0009	YES
End 1 Diam 2	0.0039	0.0020	YES
End 2 Diam 1	0.0039	0.0020	YES
End 2 Diam 2	0.0050	0.0025	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

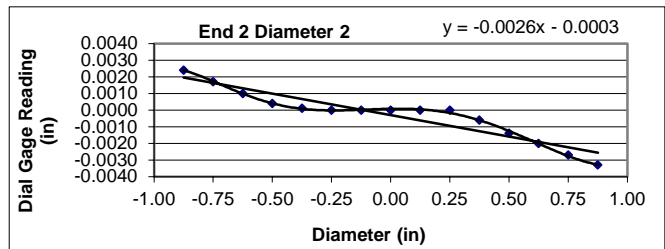
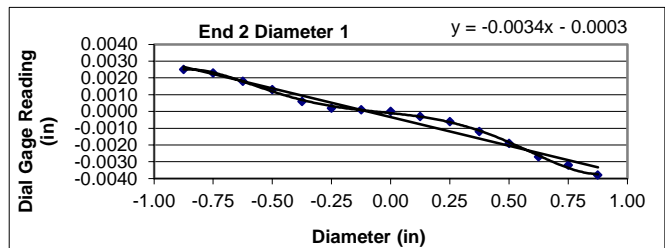
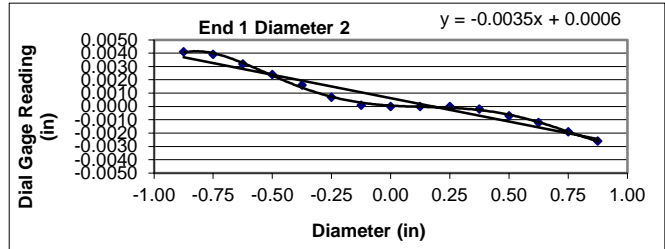
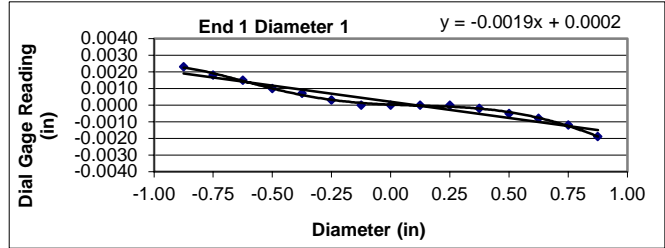
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.16	Tested by: Tori Igoe
Boring Id: EB-4	Unit Weight (pcf): 186.5	Reviewed by: John Pearson
Sample No.: RC-17	Moisture Content (%): 0.0	
Depth (ft): 55.5 - 55.9		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0023	0.0041	0.0025	0.0024
- 6/8	0.0018	0.0039	0.0023	0.0017
- 5/8	0.0015	0.0032	0.0018	0.0010
- 4/8	0.0010	0.0024	0.0013	0.0004
- 3/8	0.0007	0.0016	0.0006	0.0001
- 2/8	0.0003	0.0007	0.0002	0.0000
- 1/8	0.0000	0.0001	0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	-0.0003	0.0000
2/8	0.0000	0.0000	-0.0006	0.0000
3/8	-0.0002	-0.0002	-0.0012	-0.0006
4/8	-0.0005	-0.0007	-0.0019	-0.0014
5/8	-0.0008	-0.0012	-0.0027	-0.0020
6/8	-0.0012	-0.0019	-0.0032	-0.0027
7/8	-0.0019	-0.0026	-0.0038	-0.0033



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00195
	Angle of Best Fit Line:	-0.11164
End 2:	Slope of Best Fit Line:	-0.00342
	Angle of Best Fit Line:	-0.19612
	Max Angular Difference:	0.08

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00351
	Angle of Best Fit Line:	-0.20135
End 2:	Slope of Best Fit Line:	-0.00259
	Angle of Best Fit Line:	-0.14831
	Max Angular Difference:	-0.05

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0042	0.0021	YES
End 1 Diam 2	0.0067	0.0034	YES
End 2 Diam 1	0.0063	0.0032	YES
End 2 Diam 2	0.0057	0.0029	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

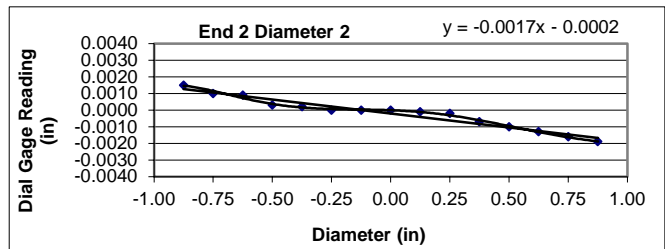
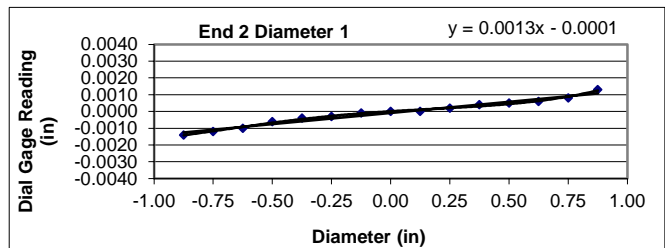
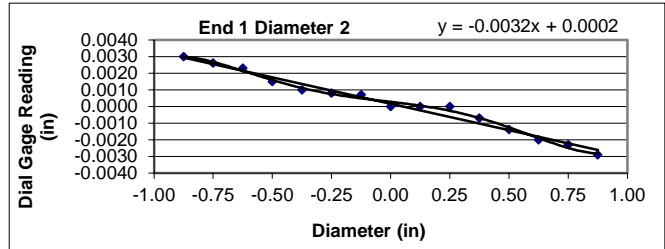
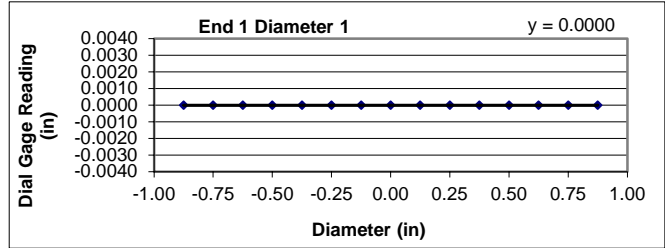
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.34	Tested by: Tori Igoe
Boring Id: IB-1	Unit Weight (pcf): 191.4	Reviewed by: John Pearson
Sample No.: RC-5	Moisture Content (%): 0.1	
Depth (ft): 45.7 - 46.2		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0030	-0.0014	0.0015
- 6/8	0.0000	0.0026	-0.0012	0.0010
- 5/8	0.0000	0.0023	-0.0010	0.0009
- 4/8	0.0000	0.0015	-0.0006	0.0003
- 3/8	0.0000	0.0010	-0.0004	0.0002
- 2/8	0.0000	0.0008	-0.0003	0.0000
- 1/8	0.0000	0.0007	-0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0001
2/8	0.0000	0.0000	0.0002	-0.0002
3/8	0.0000	-0.0007	0.0004	-0.0007
4/8	0.0000	-0.0014	0.0005	-0.0010
5/8	0.0000	-0.0020	0.0006	-0.0013
6/8	0.0000	-0.0023	0.0008	-0.0016
7/8	0.0000	-0.0029	0.0013	-0.0019



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	0.00134
	Angle of Best Fit Line:	0.07661
	Max Angular Difference:	-0.08

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00318
	Angle of Best Fit Line:	-0.18204
End 2:	Slope of Best Fit Line:	-0.00168
	Angle of Best Fit Line:	-0.09626
	Max Angular Difference:	-0.09

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	YES
End 1 Diam 2	0.0059	0.0030	YES
End 2 Diam 1	0.0027	0.0014	YES
End 2 Diam 2	0.0034	0.0017	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

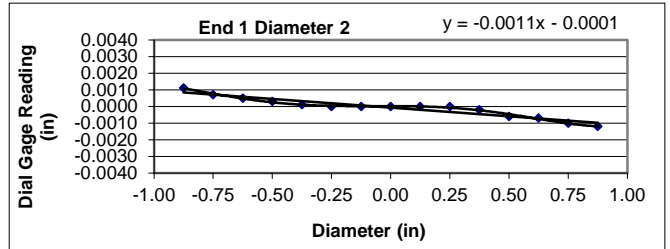
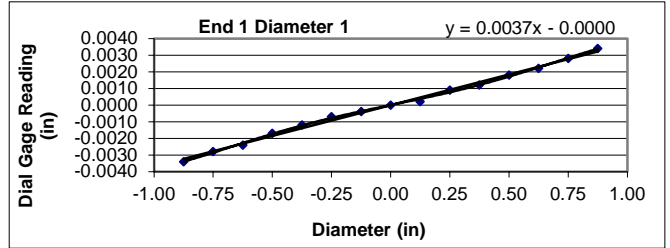
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.21	Tested by: Tori Igoe
Boring Id: IB-1	Unit Weight (pcf): 192.8	Reviewed by: John Pearson
Sample No.: RC-6	Moisture Content (%): 0.1	
Depth (ft): 65.0 - 65.5		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

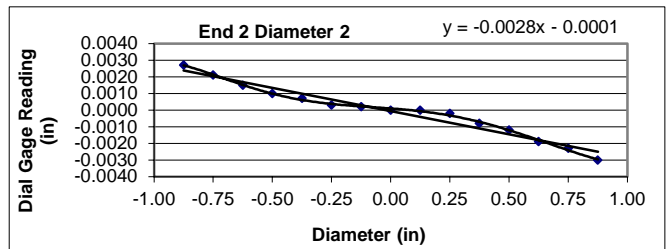
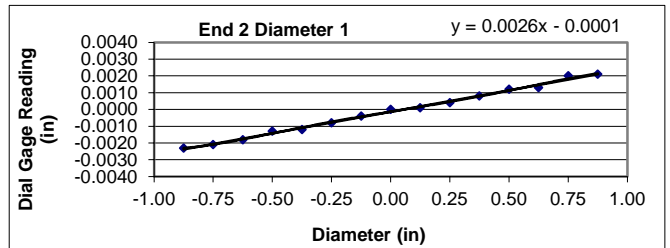
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0034	0.0011	-0.0023	0.0027
- 6/8	-0.0028	0.0007	-0.0021	0.0021
- 5/8	-0.0024	0.0005	-0.0018	0.0015
- 4/8	-0.0017	0.0003	-0.0013	0.0010
- 3/8	-0.0012	0.0001	-0.0012	0.0007
- 2/8	-0.0007	0.0000	-0.0008	0.0003
- 1/8	-0.0004	0.0000	-0.0004	0.0002
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0001	0.0000
2/8	0.0009	0.0000	0.0004	-0.0002
3/8	0.0012	-0.0002	0.0008	-0.0008
4/8	0.0018	-0.0006	0.0012	-0.0012
5/8	0.0022	-0.0007	0.0013	-0.0019
6/8	0.0028	-0.0010	0.0020	-0.0023
7/8	0.0034	-0.0012	0.0021	-0.0030



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES



Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00369
	Angle of Best Fit Line:	0.21150
End 2:	Slope of Best Fit Line:	0.00257
	Angle of Best Fit Line:	0.14700
	Max Angular Difference:	0.06

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00105
	Angle of Best Fit Line:	-0.06024
End 2:	Slope of Best Fit Line:	-0.00279
	Angle of Best Fit Line:	-0.16010
	Max Angular Difference:	0.10

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0068	0.0034	YES
End 1 Diam 2	0.0023	0.0012	YES
End 2 Diam 1	0.0044	0.0022	YES
End 2 Diam 2	0.0057	0.0029	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

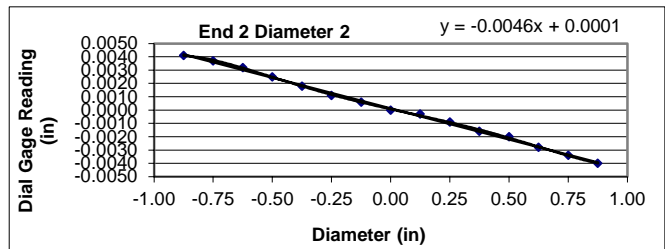
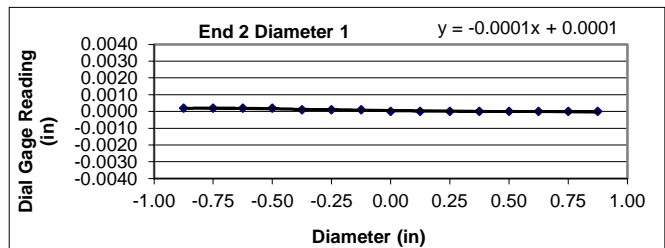
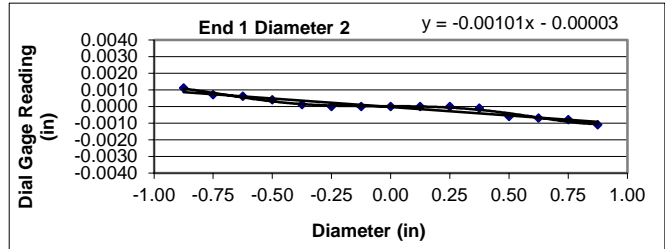
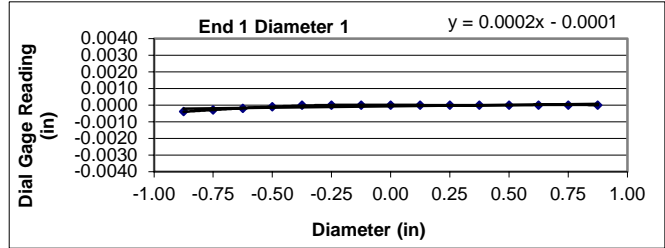
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.38	Tested by: Tori Igoe
Boring Id: IB-2	Unit Weight (pcf): 189.7	Reviewed by: John Pearson
Sample No.: RC-7	Moisture Content (%): 0.0	
Depth (ft): 43.3 - 43.8		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0004	0.0011	0.0002	0.0041
- 6/8	-0.0003	0.0007	0.0002	0.0037
- 5/8	-0.0002	0.0006	0.0002	0.0032
- 4/8	-0.0001	0.0004	0.0002	0.0025
- 3/8	0.0000	0.0001	0.0001	0.0018
- 2/8	0.0000	0.0000	0.0001	0.0011
- 1/8	0.0000	0.0000	0.0001	0.0006
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0003
2/8	0.0000	0.0000	0.0000	-0.0009
3/8	0.0000	-0.0001	0.0000	-0.0016
4/8	0.0000	-0.0006	0.0000	-0.0020
5/8	0.0000	-0.0007	0.0000	-0.0028
6/8	0.0000	-0.0008	0.0000	-0.0034
7/8	0.0000	-0.0011	0.0000	-0.0040



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00017
	Angle of Best Fit Line:	0.00982
End 2:	Slope of Best Fit Line:	-0.00014
	Angle of Best Fit Line:	-0.00819
	Max Angular Difference:	0.02

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00101
	Angle of Best Fit Line:	-0.05811
End 2:	Slope of Best Fit Line:	-0.00464
	Angle of Best Fit Line:	-0.26585
	Max Angular Difference:	0.21

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0004	0.0002	YES
End 1 Diam 2	0.0022	0.0011	YES
End 2 Diam 1	0.0002	0.0001	YES
End 2 Diam 2	0.0081	0.0041	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

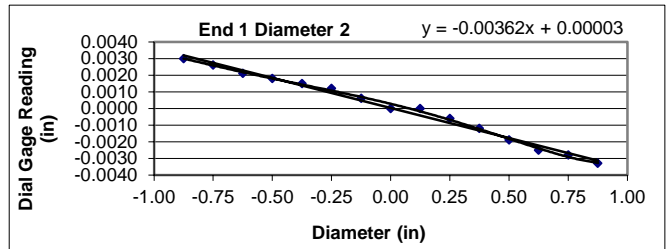
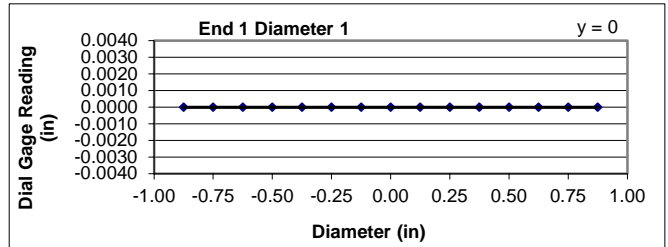
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.38	Tested by: Tori Igoe
Boring Id: IB-2B	Unit Weight (pcf): 194.9	Reviewed by: John Pearson
Sample No.: RC-8	Moisture Content (%): 0.1	
Depth (ft): 57.5 - 57.9		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

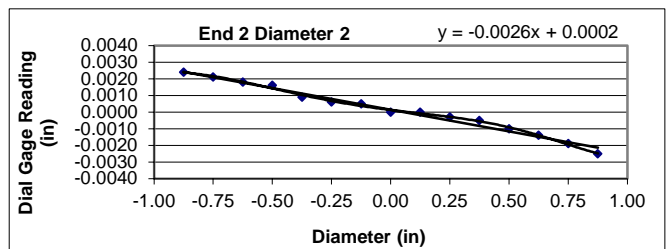
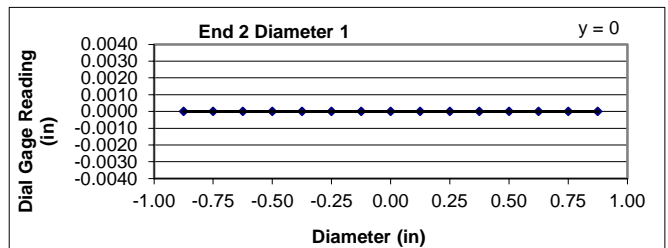
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0030	0.0000	0.0024
- 6/8	0.0000	0.0026	0.0000	0.0021
- 5/8	0.0000	0.0021	0.0000	0.0018
- 4/8	0.0000	0.0018	0.0000	0.0016
- 3/8	0.0000	0.0015	0.0000	0.0009
- 2/8	0.0000	0.0012	0.0000	0.0006
- 1/8	0.0000	0.0006	0.0000	0.0005
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	-0.0006	0.0000	-0.0003
3/8	0.0000	-0.0012	0.0000	-0.0005
4/8	0.0000	-0.0019	0.0000	-0.0010
5/8	0.0000	-0.0025	0.0000	-0.0014
6/8	0.0000	-0.0028	0.0000	-0.0019
7/8	0.0000	-0.0033	0.0000	-0.0025



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES



Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	0.00

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00362
	Angle of Best Fit Line:	-0.20725
End 2:	Slope of Best Fit Line:	-0.00261
	Angle of Best Fit Line:	-0.14930
	Max Angular Difference:	-0.06

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	YES
End 1 Diam 2	0.0063	0.0032	YES
End 2 Diam 1	0.0000	0.0000	YES
End 2 Diam 2	0.0049	0.0025	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



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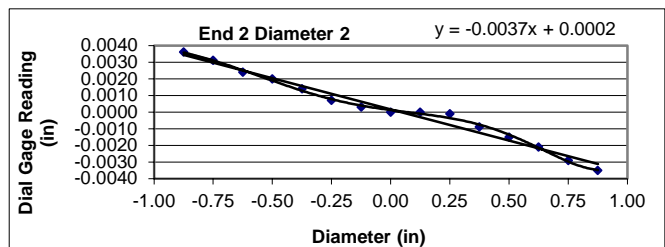
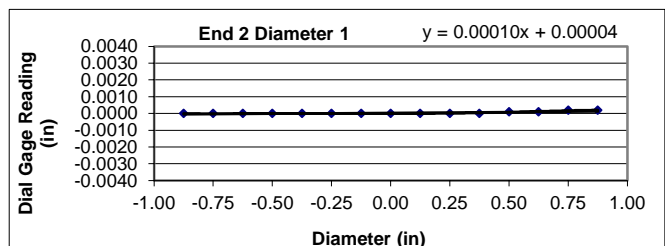
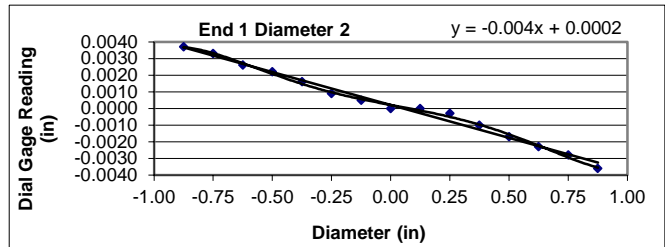
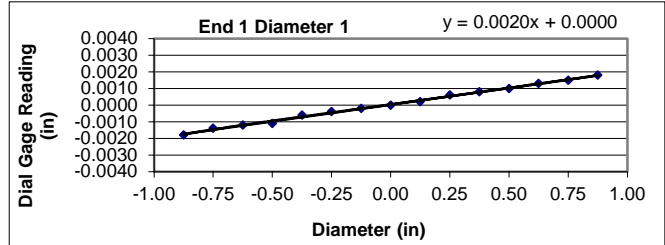
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.45	Tested by: Tori Igoe
Boring Id: IB-3	Unit Weight (pcf): 181.8	Reviewed by: John Pearson
Sample No.: RC-9	Moisture Content (%): 0.2	
Depth (ft): 53.7 - 54.1		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0018	0.0037	0.0000	0.0036
- 6/8	-0.0014	0.0033	0.0000	0.0031
- 5/8	-0.0012	0.0026	0.0000	0.0024
- 4/8	-0.0011	0.0022	0.0000	0.0020
- 3/8	-0.0006	0.0016	0.0000	0.0014
- 2/8	-0.0004	0.0009	0.0000	0.0007
- 1/8	-0.0002	0.0005	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0000	0.0000
2/8	0.0006	-0.0003	0.0000	-0.0001
3/8	0.0008	-0.0010	0.0000	-0.0009
4/8	0.0010	-0.0017	0.0001	-0.0015
5/8	0.0013	-0.0023	0.0001	-0.0021
6/8	0.0015	-0.0028	0.0002	-0.0029
7/8	0.0018	-0.0036	0.0002	-0.0035



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00200
	Angle of Best Fit Line:	0.11476
End 2:	Slope of Best Fit Line:	0.00010
	Angle of Best Fit Line:	0.00573
	Max Angular Difference:	0.11

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00396
	Angle of Best Fit Line:	-0.22673
End 2:	Slope of Best Fit Line:	-0.00374
	Angle of Best Fit Line:	-0.21445
	Max Angular Difference:	-0.01

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0036	0.0018	YES
End 1 Diam 2	0.0073	0.0037	YES
End 2 Diam 1	0.0002	0.0001	YES
End 2 Diam 2	0.0071	0.0036	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



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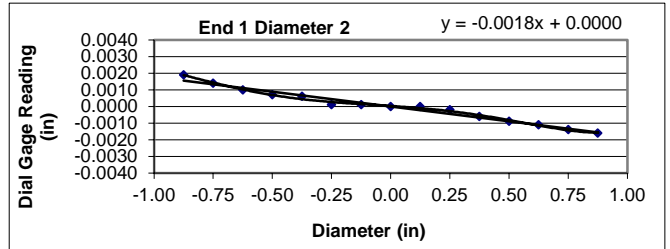
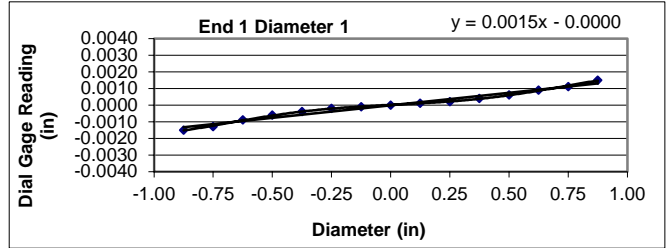
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.30	Tested by: Tori Igoe
Boring Id: IB-3	Unit Weight (pcf): 187.8	Reviewed by: John Pearson
Sample No.: RC-10	Moisture Content (%): 0.1	
Depth (ft): 60.5 - 60.9		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

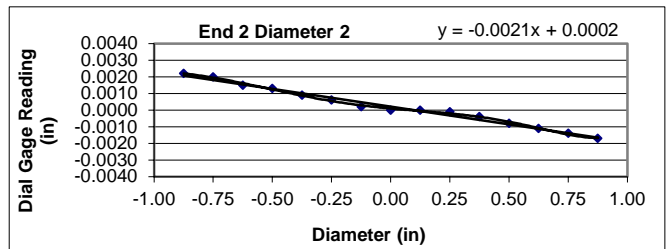
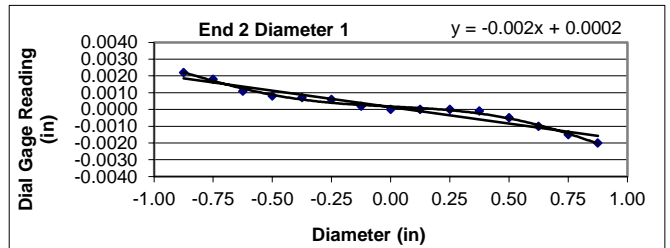
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0015	0.0019	0.0022	0.0022
- 6/8	-0.0013	0.0014	0.0018	0.0020
- 5/8	-0.0009	0.0010	0.0011	0.0015
- 4/8	-0.0006	0.0007	0.0008	0.0013
- 3/8	-0.0004	0.0006	0.0007	0.0009
- 2/8	-0.0002	0.0001	0.0006	0.0006
- 1/8	-0.0001	0.0001	0.0002	0.0002
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0001	0.0000	0.0000	0.0000
2/8	0.0002	-0.0002	0.0000	-0.0001
3/8	0.0004	-0.0006	-0.0001	-0.0004
4/8	0.0006	-0.0009	-0.0005	-0.0008
5/8	0.0009	-0.0011	-0.0010	-0.0011
6/8	0.0011	-0.0014	-0.0015	-0.0014
7/8	0.0015	-0.0016	-0.0020	-0.0017



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES



Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00150
	Angle of Best Fit Line:	0.08611
End 2:	Slope of Best Fit Line:	-0.00196
	Angle of Best Fit Line:	-0.11246
	Max Angular Difference:	0.20

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00179
	Angle of Best Fit Line:	-0.10231
End 2:	Slope of Best Fit Line:	-0.00213
	Angle of Best Fit Line:	-0.12212
	Max Angular Difference:	0.02

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0030	0.0015	YES
End 1 Diam 2	0.0035	0.0018	YES
End 2 Diam 1	0.0042	0.0021	YES
End 2 Diam 2	0.0039	0.0020	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

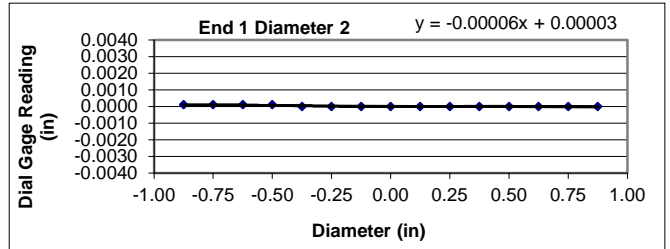
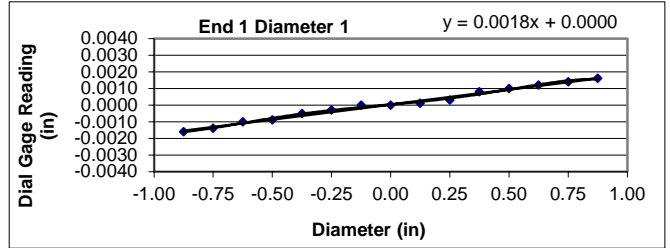
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.38	Tested by: Tori Igoe
Boring Id: IB-4A	Unit Weight (pcf): 186.3	Reviewed by: John Pearson
Sample No.: RC-11	Moisture Content (%): 0.4	
Depth (ft): 24.7 - 25.1		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

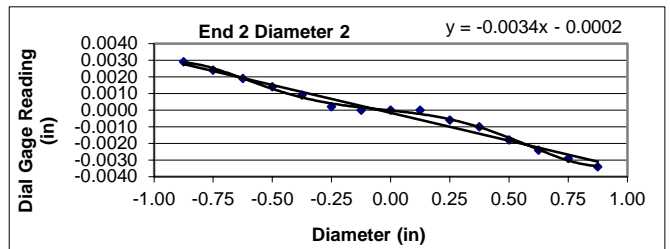
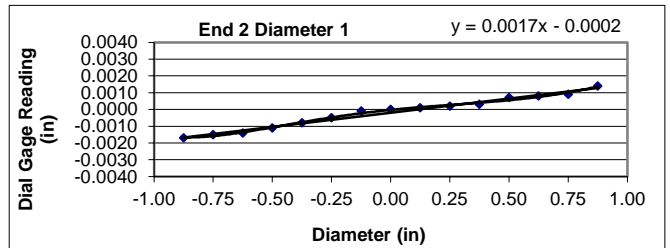
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0016	0.0001	-0.0017	0.0029
- 6/8	-0.0014	0.0001	-0.0015	0.0024
- 5/8	-0.0010	0.0001	-0.0014	0.0019
- 4/8	-0.0009	0.0001	-0.0011	0.0014
- 3/8	-0.0005	0.0000	-0.0008	0.0009
- 2/8	-0.0003	0.0000	-0.0005	0.0002
- 1/8	0.0000	0.0000	-0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0001	0.0000	0.0001	0.0000
2/8	0.0003	0.0000	0.0002	-0.0006
3/8	0.0008	0.0000	0.0003	-0.0010
4/8	0.0010	0.0000	0.0007	-0.0018
5/8	0.0012	0.0000	0.0008	-0.0024
6/8	0.0014	0.0000	0.0009	-0.0029
7/8	0.0016	0.0000	0.0014	-0.0034



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES



Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00180
	Angle of Best Fit Line:	0.10313
End 2:	Slope of Best Fit Line:	0.00169
	Angle of Best Fit Line:	0.09691
	Max Angular Difference:	0.01

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00006
	Angle of Best Fit Line:	-0.00360
End 2:	Slope of Best Fit Line:	-0.00336
	Angle of Best Fit Line:	-0.19235
	Max Angular Difference:	0.19

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0032	0.0016	YES
End 1 Diam 2	0.0001	0.0001	YES
End 2 Diam 1	0.0031	0.0016	YES
End 2 Diam 2	0.0063	0.0032	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



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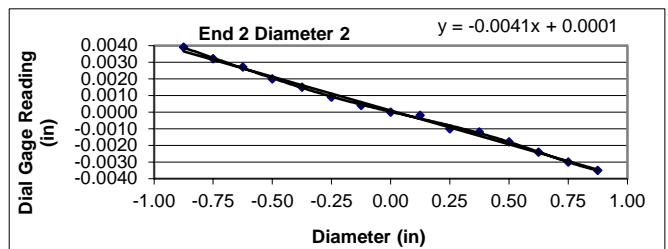
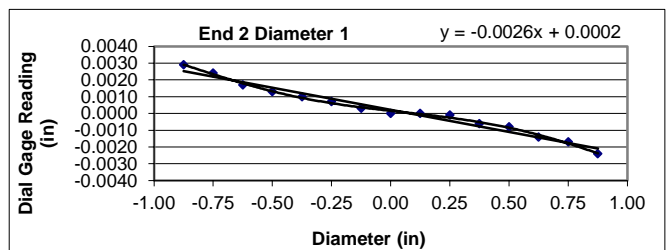
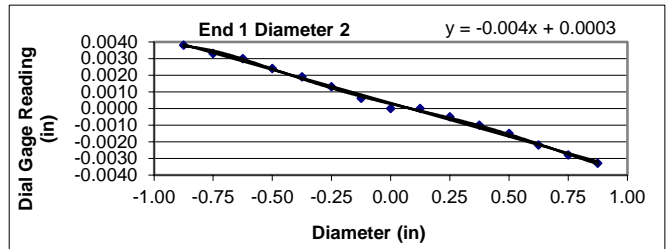
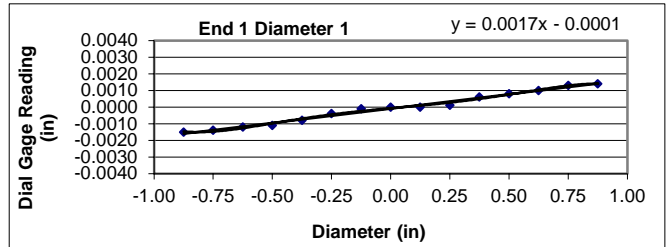
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.35	Tested by: Tori Igoe
Boring Id: IB-4A	Unit Weight (pcf): 187.5	Reviewed by: John Pearson
Sample No.: RC-12	Moisture Content (%): 0.0	
Depth (ft): 34.8 - 35.2		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0015	0.0038	0.0029	0.0039
- 6/8	-0.0014	0.0033	0.0024	0.0032
- 5/8	-0.0012	0.0030	0.0017	0.0027
- 4/8	-0.0011	0.0024	0.0013	0.0020
- 3/8	-0.0008	0.0019	0.0010	0.0015
- 2/8	-0.0004	0.0013	0.0007	0.0009
- 1/8	-0.0001	0.0006	0.0003	0.0004
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0002
2/8	0.0001	-0.0005	-0.0001	-0.0010
3/8	0.0006	-0.0010	-0.0006	-0.0012
4/8	0.0008	-0.0015	-0.0008	-0.0018
5/8	0.0010	-0.0022	-0.0014	-0.0024
6/8	0.0013	-0.0028	-0.0017	-0.0030
7/8	0.0014	-0.0033	-0.0024	-0.0035



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00173
	Angle of Best Fit Line:	0.09888
End 2:	Slope of Best Fit Line:	-0.00264
	Angle of Best Fit Line:	-0.15110
	Max Angular Difference:	0.25

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00402
	Angle of Best Fit Line:	-0.23049
End 2:	Slope of Best Fit Line:	-0.00406
	Angle of Best Fit Line:	-0.23278
	Max Angular Difference:	0.00

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0029	0.0015	YES
End 1 Diam 2	0.0071	0.0036	YES
End 2 Diam 1	0.0053	0.0027	YES
End 2 Diam 2	0.0074	0.0037	YES

Perpendicularity Tolerance Met? YES

**PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING
CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES
(ASTM D4543)**



1413 Topside Road, Louisville, TN 37777

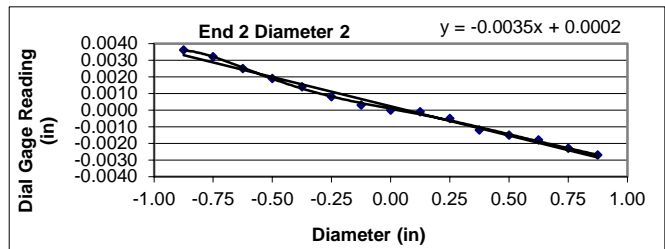
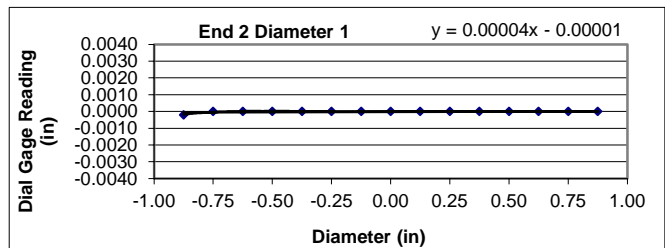
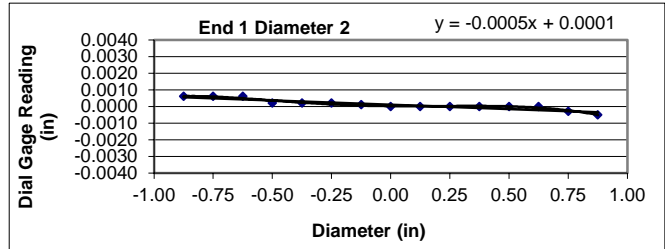
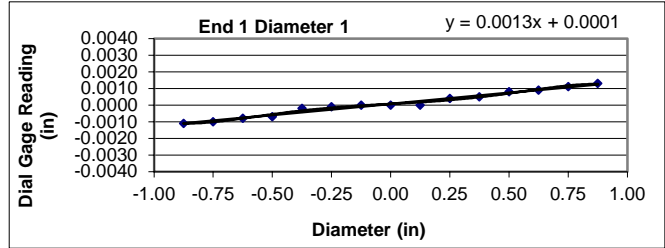
Project: I-77 Panthers Interchange	Diameter (in): 1.98	Date: 2/4/2020
Project No.: 1461-19-069	Length (in): 4.37	Tested by: Tori Igoe
Boring Id: IB-4A	Unit Weight (pcf): 187.7	Reviewed by: John Pearson
Sample No.: RC-13	Moisture Content (%): 0.0	
Depth (ft): 54.3 - 54.7		

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0011	0.0006	-0.0002	0.0036
- 6/8	-0.0010	0.0006	0.0000	0.0032
- 5/8	-0.0008	0.0006	0.0000	0.0025
- 4/8	-0.0007	0.0002	0.0000	0.0019
- 3/8	-0.0002	0.0002	0.0000	0.0014
- 2/8	-0.0001	0.0002	0.0000	0.0008
- 1/8	0.0000	0.0001	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0001
2/8	0.0004	0.0000	0.0000	-0.0005
3/8	0.0005	0.0000	0.0000	-0.0012
4/8	0.0008	0.0000	0.0000	-0.0015
5/8	0.0009	0.0000	0.0000	-0.0018
6/8	0.0011	-0.0003	0.0000	-0.0023
7/8	0.0013	-0.0005	0.0000	-0.0027



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00134
	Angle of Best Fit Line:	0.07694
End 2:	Slope of Best Fit Line:	0.00004
	Angle of Best Fit Line:	0.00229
	Max Angular Difference:	0.07

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00051
	Angle of Best Fit Line:	-0.02947
End 2:	Slope of Best Fit Line:	-0.00351
	Angle of Best Fit Line:	-0.20135
	Max Angular Difference:	0.17

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0024	0.0012	YES
End 1 Diam 2	0.0011	0.0006	YES
End 2 Diam 1	0.0002	0.0001	YES
End 2 Diam 2	0.0063	0.0032	YES

Perpendicularity Tolerance Met? YES

UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

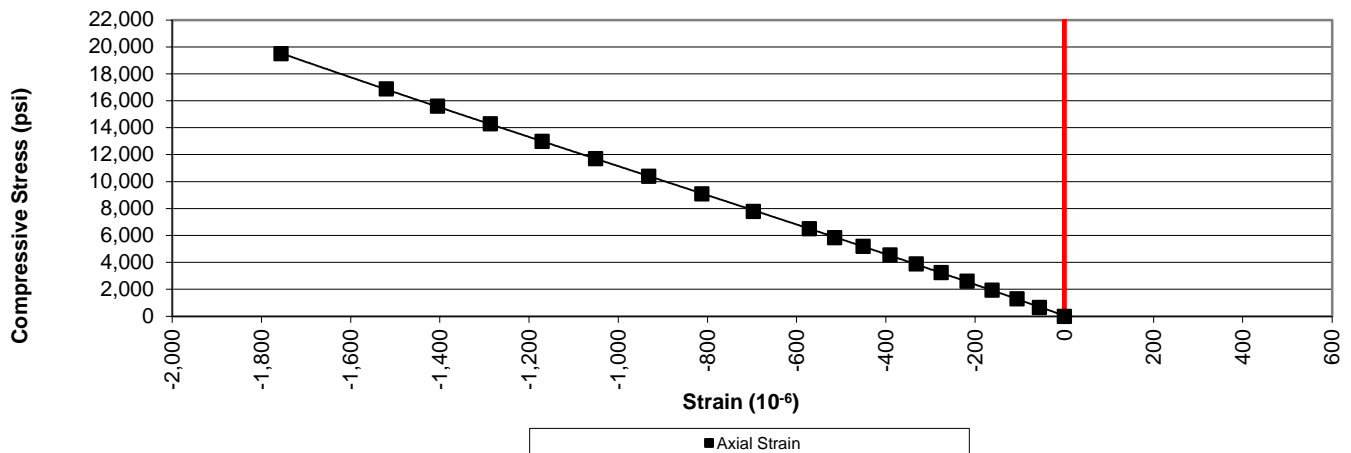
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.30	Tested by:	VLI
Boring Id:	EB-1	Unit Weight, pcf:	190.2	Reviewed by:	NRR
Sample No:	RC-2	Moisture Content, %:	0.0		
Depth (ft):	57.5 - 57.9	Load Rate, psi/sec:	79		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-56	TNR	2,000	649	11.59	TNR	
3	-106	TNR	4,000	1,299	12.25	TNR	
4	-162	TNR	6,000	1,948	12.02	TNR	
5	-218	TNR	8,000	2,597	11.91	TNR	
6	-276	TNR	10,000	3,247	11.76	TNR	
7	-332	TNR	12,000	3,896	11.73	TNR	
8	-391	TNR	14,000	4,545	11.62	TNR	
9	-451	TNR	16,000	5,195	11.52	TNR	
10	-515	TNR	18,000	5,844	11.35	TNR	
11	-572	TNR	20,000	6,494	11.35	TNR	
12	-697	TNR	24,000	7,792	11.18	TNR	
13	-813	TNR	28,000	9,091	11.18	TNR	
14	-932	TNR	32,000	10,390	11.15	TNR	
15	-1,051	TNR	36,000	11,688	11.12	TNR	
16	-1,171	TNR	40,000	12,987	11.09	TNR	
17	-1,287	TNR	44,000	14,286	11.10	TNR	
18	-1,405	TNR	48,000	15,584	11.09	TNR	
19	-1,520	TNR	52,000	16,883	11.11	TNR	
20	-1,756	TNR	60,000	19,481	11.09	TNR	
21			69,041	22,416			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



**UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)**



1413 Topside Road, Louisville, TN 37777

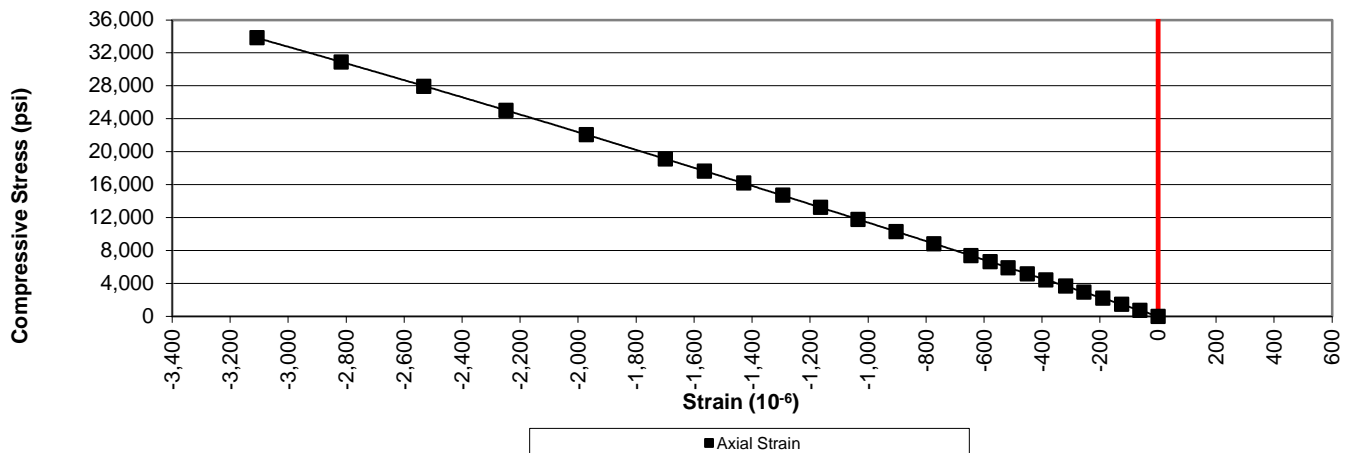
Project:	I-77 Panthers Interchange	Diameter, in.:	1.86	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	3.95	Tested by:	VLJ
Boring Id:	EB-2	Unit Weight, pcf:	171.6	Reviewed by:	NRR
Sample No:	RC-3	Moisture Content, %:	0.1		
Depth (ft):	25.3 - 25.7	Load Rate, psi/sec:	79		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-63	TNR	2,000	735	11.67	TNR	
3	-125	TNR	4,000	1,471	11.77	TNR	
4	-191	TNR	6,000	2,206	11.55	TNR	
5	-256	TNR	8,000	2,941	11.49	TNR	
6	-318	TNR	10,000	3,676	11.56	TNR	
7	-387	TNR	12,000	4,412	11.40	TNR	
8	-451	TNR	14,000	5,147	11.41	TNR	
9	-517	TNR	16,000	5,882	11.38	TNR	
10	-579	TNR	18,000	6,618	11.43	TNR	
11	-645	TNR	20,000	7,353	11.40	TNR	
12	-773	TNR	24,000	8,824	11.42	TNR	
13	-904	TNR	28,000	10,294	11.39	TNR	
14	-1,035	TNR	32,000	11,765	11.37	TNR	
15	-1,164	TNR	36,000	13,235	11.37	TNR	
16	-1,294	TNR	40,000	14,706	11.36	TNR	
17	-1,429	TNR	44,000	16,176	11.32	TNR	
18	-1,564	TNR	48,000	17,647	11.28	TNR	
19	-1,699	TNR	52,000	19,118	11.25	TNR	
20	-1,972	TNR	60,000	22,059	11.19	TNR	
21	-2,249	TNR	68,000	25,000	11.12	TNR	
22	-2,532	TNR	76,000	27,941	11.04	TNR	
23	-2,817	TNR	84,000	30,882	10.96	TNR	
24	-3,108	TNR	92,000	33,824	10.88	TNR	
25			92,568	34,032			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



**UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)**



1413 Topside Road, Louisville, TN 37777

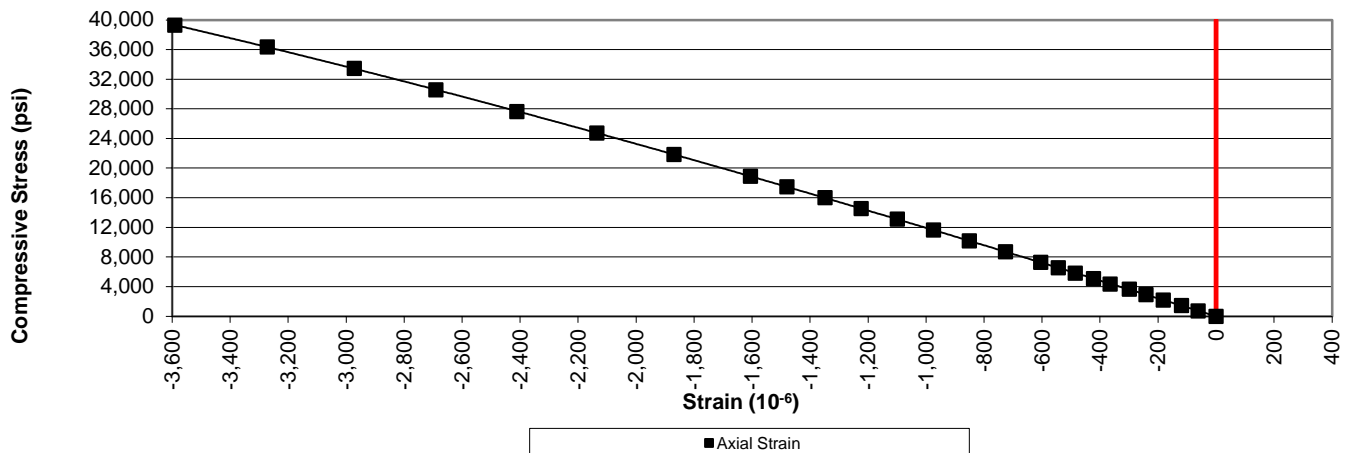
Project:	I-77 Panthers Interchange	Diameter, in.:	1.87	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.05	Tested by:	VL I
Boring Id:	EB-2	Unit Weight, pcf:	175.8	Reviewed by:	NRR
Sample No:	RC-4	Moisture Content, %:	0.0		
Depth (ft):	46.7 - 47.1	Load Rate, psi/sec:	77		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-62	TNR	2,000	727	11.73	TNR	
3	-119	TNR	4,000	1,455	12.23	TNR	
4	-182	TNR	6,000	2,182	11.99	TNR	
5	-242	TNR	8,000	2,909	12.02	TNR	
6	-299	TNR	10,000	3,636	12.16	TNR	
7	-365	TNR	12,000	4,364	11.96	TNR	
8	-422	TNR	14,000	5,091	12.06	TNR	
9	-485	TNR	16,000	5,818	12.00	TNR	
10	-544	TNR	18,000	6,545	12.03	TNR	
11	-605	TNR	20,000	7,273	12.02	TNR	
12	-726	TNR	24,000	8,727	12.02	TNR	
13	-851	TNR	28,000	10,182	11.96	TNR	
14	-974	TNR	32,000	11,636	11.95	TNR	
15	-1,099	TNR	36,000	13,091	11.91	TNR	
16	-1,224	TNR	40,000	14,545	11.88	TNR	
17	-1,349	TNR	44,000	16,000	11.86	TNR	
18	-1,480	TNR	48,000	17,455	11.79	TNR	
19	-1,606	TNR	52,000	18,909	11.77	TNR	
20	-1,869	TNR	60,000	21,818	11.67	TNR	
21	-2,135	TNR	68,000	24,727	11.58	TNR	
22	-2,411	TNR	76,000	27,636	11.46	TNR	
23	-2,690	TNR	84,000	30,545	11.36	TNR	
24	-2,972	TNR	92,000	33,455	11.26	TNR	
25	-3,272	TNR	100,000	36,364	11.11	TNR	
26	-3,591	TNR	108,000	39,273	10.94	TNR	
27			109,544	39,834			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

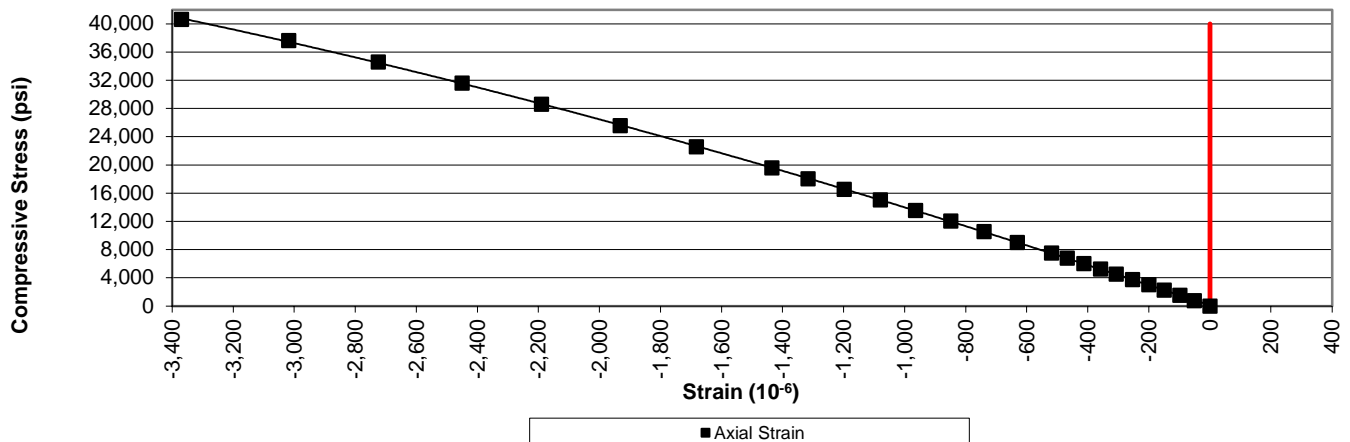
Project:	I-77 Panthers Interchange	Diameter, in.:	1.84	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	3.95	Tested by:	VL I
Boring Id:	EB-3	Unit Weight, pcf:	197.5	Reviewed by:	NRR
Sample No:	RC-14	Moisture Content, %:	0.0		
Depth (ft):	55.0 - 55.35	Load Rate, psi/sec:	86		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-51	TNR	2,000	752	14.75	TNR	
3	-98	TNR	4,000	1,504	15.35	TNR	
4	-150	TNR	6,000	2,256	15.04	TNR	
5	-200	TNR	8,000	3,008	15.04	TNR	
6	-253	TNR	10,000	3,759	14.86	TNR	
7	-307	TNR	12,000	4,511	14.69	TNR	
8	-358	TNR	14,000	5,263	14.70	TNR	
9	-413	TNR	16,000	6,015	14.56	TNR	
10	-467	TNR	18,000	6,767	14.49	TNR	
11	-519	TNR	20,000	7,519	14.49	TNR	
12	-631	TNR	24,000	9,023	14.30	TNR	
13	-740	TNR	28,000	10,526	14.22	TNR	
14	-849	TNR	32,000	12,030	14.17	TNR	
15	-964	TNR	36,000	13,534	14.04	TNR	
16	-1,080	TNR	40,000	15,038	13.92	TNR	
17	-1,198	TNR	44,000	16,541	13.81	TNR	
18	-1,317	TNR	48,000	18,045	13.70	TNR	
19	-1,435	TNR	52,000	19,549	13.62	TNR	
20	-1,683	TNR	60,000	22,556	13.40	TNR	
21	-1,932	TNR	68,000	25,564	13.23	TNR	
22	-2,190	TNR	76,000	28,571	13.05	TNR	
23	-2,450	TNR	84,000	31,579	12.89	TNR	
24	-2,725	TNR	92,000	34,586	12.69	TNR	
25	-3,018	TNR	100,000	37,594	12.46	TNR	
26	-3,370	TNR	108,000	40,602	12.05	TNR	
27			109,492	41,162			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

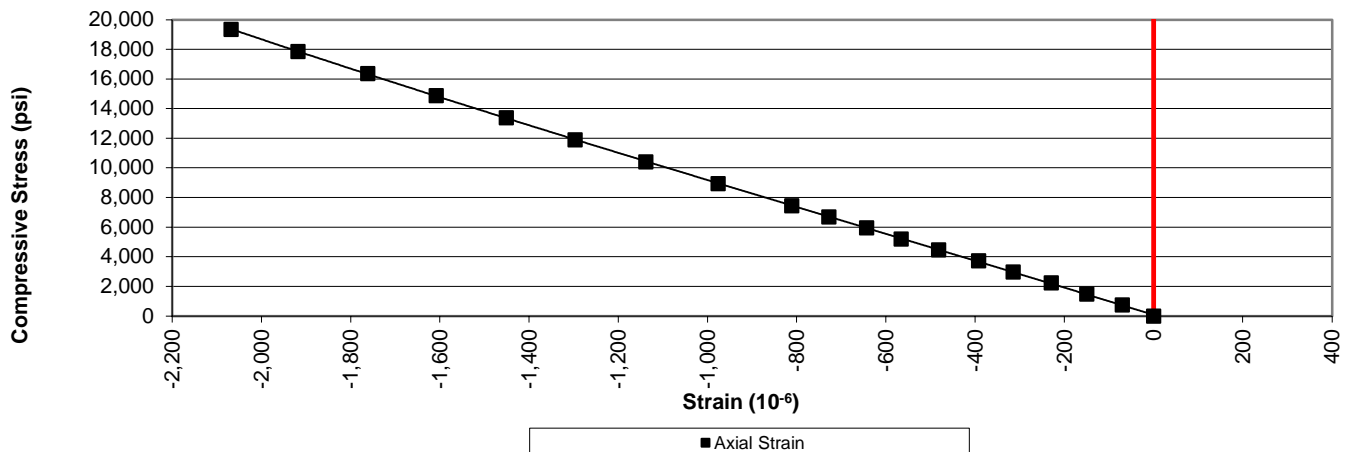
Project:	I-77 Panthers Interchange	Diameter, in.:	1.85	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	4.12	Tested by:	VLI
Boring Id:	EB-3	Unit Weight, pcf:	189.7	Reviewed by:	NRR
Sample No:	RC-15	Moisture Content, %:	0.1		
Depth (ft):	62.6 - 62.95	Load Rate, psi/sec:	80		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-70	TNR	2,000	743	10.61	TNR	
3	-150	TNR	4,000	1,487	9.91	TNR	
4	-229	TNR	6,000	2,230	9.74	TNR	
5	-315	TNR	8,000	2,974	9.44	TNR	
6	-392	TNR	10,000	3,717	9.48	TNR	
7	-482	TNR	12,000	4,461	9.26	TNR	
8	-566	TNR	14,000	5,204	9.19	TNR	
9	-643	TNR	16,000	5,948	9.25	TNR	
10	-728	TNR	18,000	6,691	9.19	TNR	
11	-811	TNR	20,000	7,435	9.17	TNR	
12	-976	TNR	24,000	8,922	9.14	TNR	
13	-1,138	TNR	28,000	10,409	9.15	TNR	
14	-1,297	TNR	32,000	11,896	9.17	TNR	
15	-1,451	TNR	36,000	13,383	9.22	TNR	
16	-1,608	TNR	40,000	14,870	9.25	TNR	
17	-1,762	TNR	44,000	16,357	9.28	TNR	
18	-1,918	TNR	48,000	17,844	9.30	TNR	
19	-2,068	TNR	52,000	19,331	9.35	TNR	
20			58,298	21,672			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

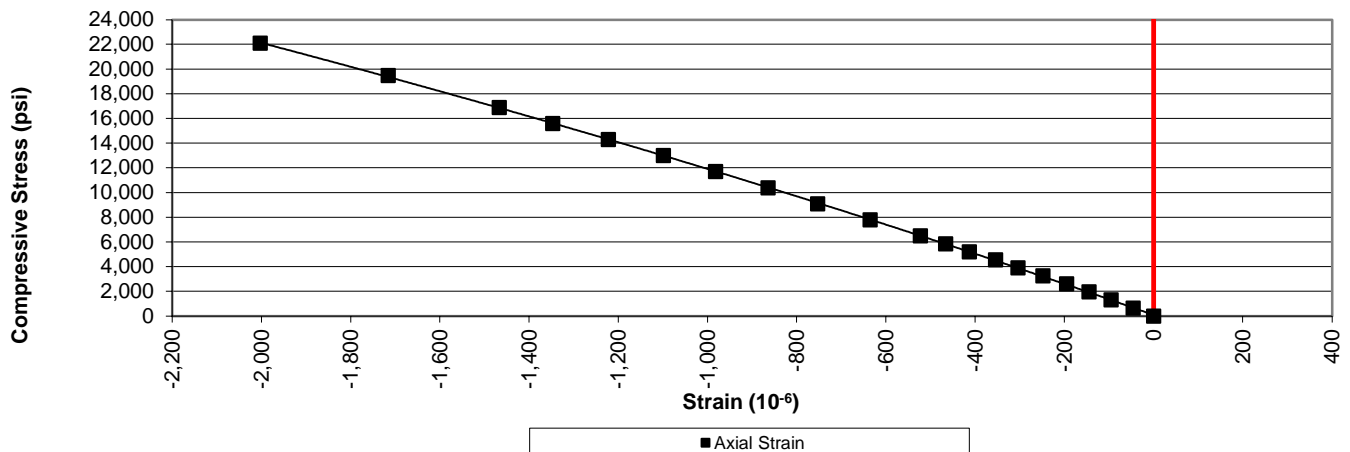
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	3.97	Tested by:	VLJ
Boring Id:	EB-4	Unit Weight, pcf:	193.2	Reviewed by:	NRR
Sample No:	RC-16	Moisture Content, %:	0.1		
Depth (ft):	44.0 - 44.4	Load Rate, psi/sec:	72		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-46	TNR	2,000	649	14.11	TNR	
3	-95	TNR	4,000	1,299	13.67	TNR	
4	-145	TNR	6,000	1,948	13.43	TNR	
5	-195	TNR	8,000	2,597	13.32	TNR	
6	-248	TNR	10,000	3,247	13.09	TNR	
7	-304	TNR	12,000	3,896	12.82	TNR	
8	-354	TNR	14,000	4,545	12.84	TNR	
9	-413	TNR	16,000	5,195	12.58	TNR	
10	-466	TNR	18,000	5,844	12.54	TNR	
11	-523	TNR	20,000	6,494	12.42	TNR	
12	-635	TNR	24,000	7,792	12.27	TNR	
13	-753	TNR	28,000	9,091	12.07	TNR	
14	-864	TNR	32,000	10,390	12.03	TNR	
15	-982	TNR	36,000	11,688	11.90	TNR	
16	-1,099	TNR	40,000	12,987	11.82	TNR	
17	-1,222	TNR	44,000	14,286	11.69	TNR	
18	-1,347	TNR	48,000	15,584	11.57	TNR	
19	-1,467	TNR	52,000	16,883	11.51	TNR	
20	-1,716	TNR	60,000	19,481	11.35	TNR	
21	-2,003	TNR	68,000	22,078	11.02	TNR	
22		TNR	73,772	23,952			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

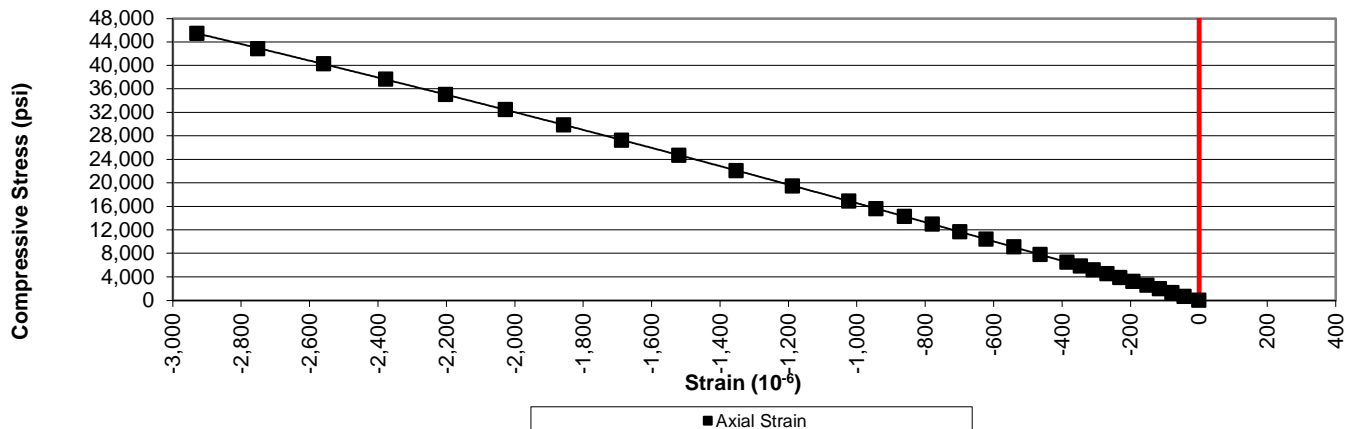
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	4.16	Tested by:	VLJ
Boring Id:	EB-4	Unit Weight, pcf:	186.5	Reviewed by:	NRR
Sample No:	RC-17	Moisture Content, %:	0.0		
Depth (ft):	55.5 - 55.9	Load Rate, psi/sec:	74		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-43	TNR	2,000	649	15.09	TNR	
3	-79	TNR	4,000	1,299	16.44	TNR	
4	-115	TNR	6,000	1,948	16.94	TNR	
5	-152	TNR	8,000	2,597	17.09	TNR	
6	-193	TNR	10,000	3,247	16.82	TNR	
7	-231	TNR	12,000	3,896	16.87	TNR	
8	-269	TNR	14,000	4,545	16.90	TNR	
9	-309	TNR	16,000	5,195	16.81	TNR	
10	-346	TNR	18,000	5,844	16.89	TNR	
11	-386	TNR	20,000	6,494	16.82	TNR	
12	-464	TNR	24,000	7,792	16.79	TNR	
13	-541	TNR	28,000	9,091	16.80	TNR	
14	-622	TNR	32,000	10,390	16.70	TNR	
15	-699	TNR	36,000	11,688	16.72	TNR	
16	-780	TNR	40,000	12,987	16.65	TNR	
17	-861	TNR	44,000	14,286	16.59	TNR	
18	-944	TNR	48,000	15,584	16.51	TNR	
19	-1,024	TNR	52,000	16,883	16.49	TNR	
20	-1,188	TNR	60,000	19,481	16.40	TNR	
21	-1,353	TNR	68,000	22,078	16.32	TNR	
22	-1,521	TNR	76,000	24,675	16.22	TNR	
23	-1,688	TNR	84,000	27,273	16.16	TNR	
24	-1,857	TNR	92,000	29,870	16.09	TNR	
25	-2,028	TNR	100,000	32,468	16.01	TNR	
26	-2,203	TNR	108,000	35,065	15.92	TNR	
27	-2,378	TNR	116,000	37,662	15.84	TNR	
28	-2,559	TNR	124,000	40,260	15.73	TNR	
29	-2,752	TNR	132,000	42,857	15.57	TNR	
30	-2,930	TNR	140,000	45,455	15.51	TNR	
31			140,391	45,581			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



**UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)**



1413 Topside Road, Louisville, TN 37777

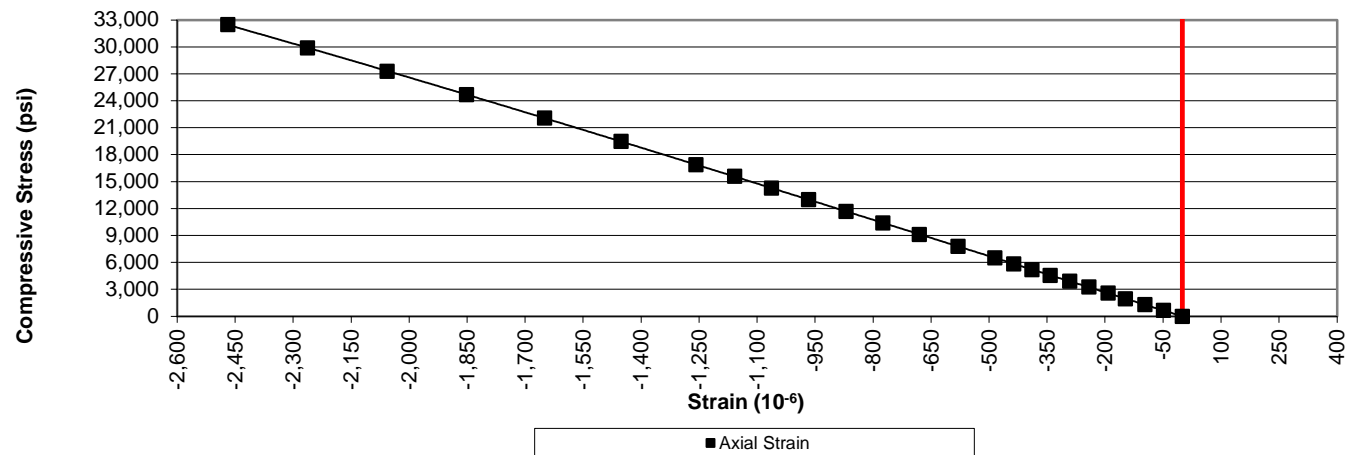
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.34	Tested by:	VLJ
Boring Id:	IB-1	Unit Weight, pcf:	191.4	Reviewed by:	NRR
Sample No:	RC-5	Moisture Content, %:	0.1		
Depth (ft):	45.7 - 46.2	Load Rate, psi/sec:	69		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-49	TNR	2,000	649	13.24	TNR	
3	-97	TNR	4,000	1,299	13.39	TNR	
4	-147	TNR	6,000	1,948	13.25	TNR	
5	-192	TNR	8,000	2,597	13.53	TNR	
6	-242	TNR	10,000	3,247	13.42	TNR	
7	-291	TNR	12,000	3,896	13.39	TNR	
8	-342	TNR	14,000	4,545	13.29	TNR	
9	-389	TNR	16,000	5,195	13.35	TNR	
10	-436	TNR	18,000	5,844	13.40	TNR	
11	-485	TNR	20,000	6,494	13.39	TNR	
12	-580	TNR	24,000	7,792	13.43	TNR	
13	-680	TNR	28,000	9,091	13.37	TNR	
14	-775	TNR	32,000	10,390	13.41	TNR	
15	-870	TNR	36,000	11,688	13.43	TNR	
16	-967	TNR	40,000	12,987	13.43	TNR	
17	-1,063	TNR	44,000	14,286	13.44	TNR	
18	-1,158	TNR	48,000	15,584	13.46	TNR	
19	-1,258	TNR	52,000	16,883	13.42	TNR	
20	-1,452	TNR	60,000	19,481	13.42	TNR	
21	-1,650	TNR	68,000	22,078	13.38	TNR	
22	-1,852	TNR	76,000	24,675	13.32	TNR	
23	-2,057	TNR	84,000	27,273	13.26	TNR	
24	-2,263	TNR	92,000	29,870	13.20	TNR	
25	-2,469	TNR	100,000	32,468	13.15	TNR	
26			100,469	32,620			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

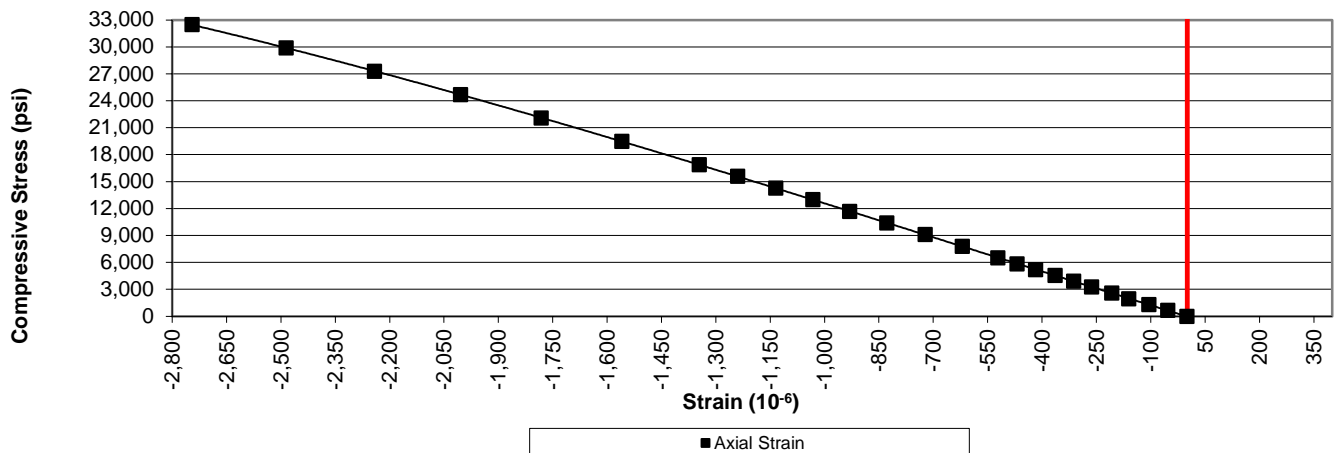
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.21	Tested by:	VLJ
Boring Id:	IB-1	Unit Weight, pcf:	192.8	Reviewed by:	NRR
Sample No:	RC-6	Moisture Content, %:	0.1		
Depth (ft):	65.0 - 65.5	Load Rate, psi/sec:	67		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-53	TNR	2,000	649	12.25	TNR	
3	-105	TNR	4,000	1,299	12.37	TNR	
4	-161	TNR	6,000	1,948	12.10	TNR	
5	-208	TNR	8,000	2,597	12.49	TNR	
6	-263	TNR	10,000	3,247	12.35	TNR	
7	-313	TNR	12,000	3,896	12.45	TNR	
8	-364	TNR	14,000	4,545	12.49	TNR	
9	-418	TNR	16,000	5,195	12.43	TNR	
10	-469	TNR	18,000	5,844	12.46	TNR	
11	-522	TNR	20,000	6,494	12.44	TNR	
12	-620	TNR	24,000	7,792	12.57	TNR	
13	-722	TNR	28,000	9,091	12.59	TNR	
14	-828	TNR	32,000	10,390	12.55	TNR	
15	-931	TNR	36,000	11,688	12.55	TNR	
16	-1,032	TNR	40,000	12,987	12.58	TNR	
17	-1,135	TNR	44,000	14,286	12.59	TNR	
18	-1,240	TNR	48,000	15,584	12.57	TNR	
19	-1,346	TNR	52,000	16,883	12.54	TNR	
20	-1,559	TNR	60,000	19,481	12.50	TNR	
21	-1,782	TNR	68,000	22,078	12.39	TNR	
22	-2,004	TNR	76,000	24,675	12.31	TNR	
23	-2,242	TNR	84,000	27,273	12.16	TNR	
24	-2,486	TNR	92,000	29,870	12.02	TNR	
25	-2,745	TNR	100,000	32,468	11.83	TNR	
26			101,164	32,845			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

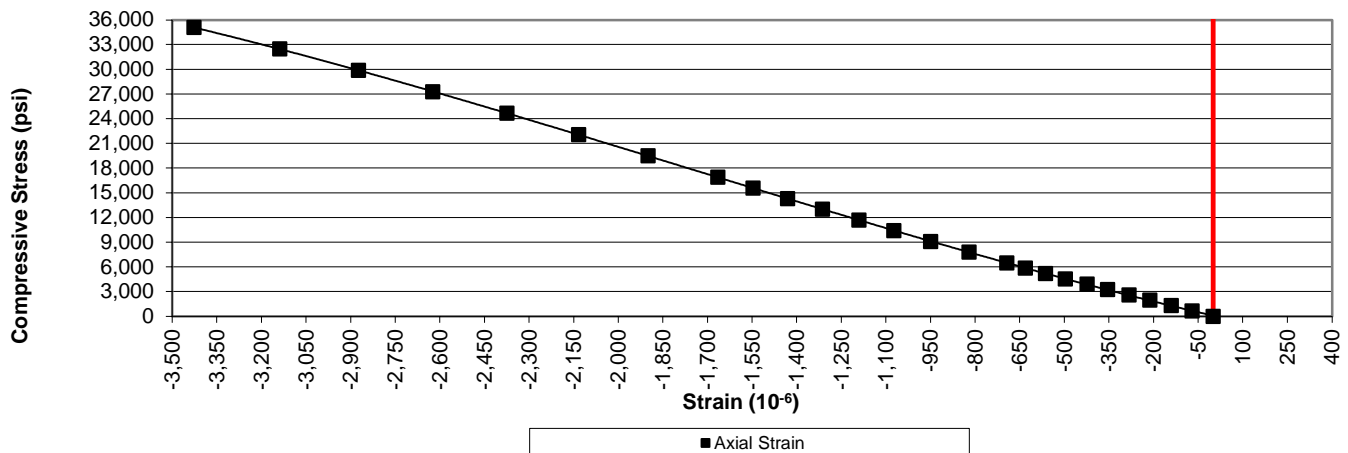
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.38	Tested by:	VLJ
Boring Id:	IB-1	Unit Weight, pcf:	189.7	Reviewed by:	NRR
Sample No:	RC-7	Moisture Content, %:	0.0		
Depth (ft):	43.3 - 43.8	Load Rate, psi/sec:	68		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-71	TNR	2,000	649	9.14	TNR	
3	-140	TNR	4,000	1,299	9.28	TNR	
4	-212	TNR	6,000	1,948	9.19	TNR	
5	-283	TNR	8,000	2,597	9.18	TNR	
6	-355	TNR	10,000	3,247	9.15	TNR	
7	-423	TNR	12,000	3,896	9.21	TNR	
8	-497	TNR	14,000	4,545	9.14	TNR	
9	-563	TNR	16,000	5,195	9.23	TNR	
10	-631	TNR	18,000	5,844	9.26	TNR	
11	-694	TNR	20,000	6,494	9.36	TNR	
12	-820	TNR	24,000	7,792	9.50	TNR	
13	-950	TNR	28,000	9,091	9.57	TNR	
14	-1,073	TNR	32,000	10,390	9.68	TNR	
15	-1,191	TNR	36,000	11,688	9.81	TNR	
16	-1,313	TNR	40,000	12,987	9.89	TNR	
17	-1,431	TNR	44,000	14,286	9.98	TNR	
18	-1,547	TNR	48,000	15,584	10.07	TNR	
19	-1,665	TNR	52,000	16,883	10.14	TNR	
20	-1,900	TNR	60,000	19,481	10.25	TNR	
21	-2,133	TNR	68,000	22,078	10.35	TNR	
22	-2,374	TNR	76,000	24,675	10.39	TNR	
23	-2,624	TNR	84,000	27,273	10.39	TNR	
24	-2,874	TNR	92,000	29,870	10.39	TNR	
25	-3,138	TNR	100,000	32,468	10.35	TNR	
26	-3,427	TNR	108,000	35,065	10.23	TNR	
27			109,764	35,638	#DIV/0!		Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

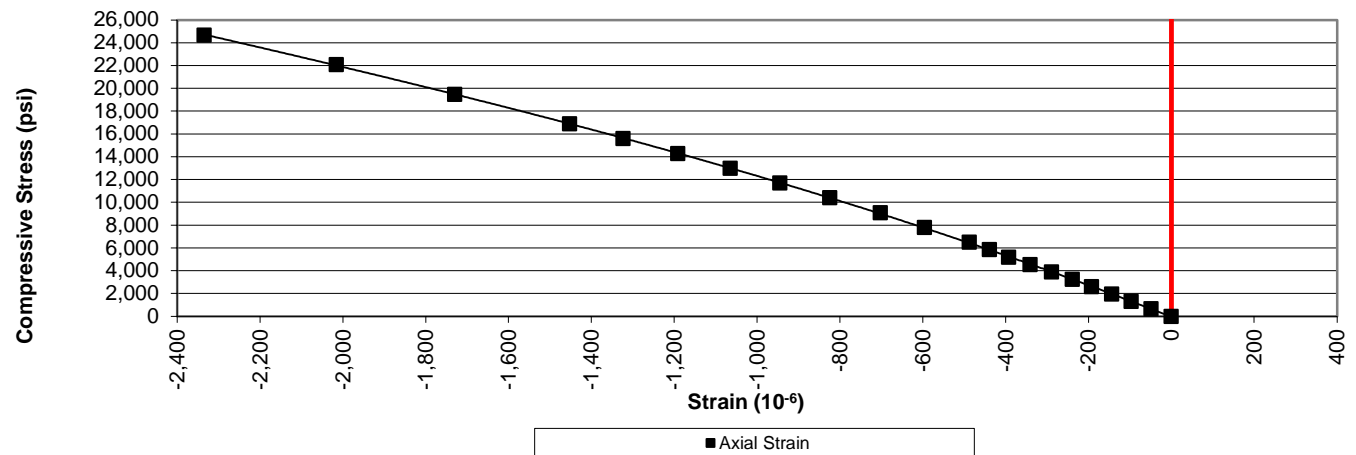
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.38	Tested by:	VLJ
Boring Id:	IB-2B	Unit Weight, pcf:	194.9	Reviewed by:	NRR
Sample No:	RC-8	Moisture Content, %:	0.0		
Depth (ft):	57.5 - 57.9	Load Rate, psi/sec:	64		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-49	TNR	2,000	649	13.24	TNR	
3	-97	TNR	4,000	1,299	13.39	TNR	
4	-144	TNR	6,000	1,948	13.53	TNR	
5	-193	TNR	8,000	2,597	13.46	TNR	
6	-239	TNR	10,000	3,247	13.59	TNR	
7	-289	TNR	12,000	3,896	13.48	TNR	
8	-341	TNR	14,000	4,545	13.33	TNR	
9	-393	TNR	16,000	5,195	13.22	TNR	
10	-439	TNR	18,000	5,844	13.31	TNR	
11	-488	TNR	20,000	6,494	13.31	TNR	
12	-596	TNR	24,000	7,792	13.07	TNR	
13	-703	TNR	28,000	9,091	12.93	TNR	
14	-825	TNR	32,000	10,390	12.59	TNR	
15	-945	TNR	36,000	11,688	12.37	TNR	
16	-1,065	TNR	40,000	12,987	12.19	TNR	
17	-1,192	TNR	44,000	14,286	11.98	TNR	
18	-1,324	TNR	48,000	15,584	11.77	TNR	
19	-1,453	TNR	52,000	16,883	11.62	TNR	
20	-1,730	TNR	60,000	19,481	11.26	TNR	
21	-2,016	TNR	68,000	22,078	10.95	TNR	
22	-2,335	TNR	76,000	24,675	10.57	TNR	
23			88,279	28,662			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



**UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)**



1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.45	Tested by:	VLI
Boring Id:	IB-3	Unit Weight, pcf:	181.8	Reviewed by:	NRR
Sample No:	RC-9	Moisture Content, %:	0.2		
Depth (ft):	53.7 - 54.1	Load Rate, psi/sec:	63		

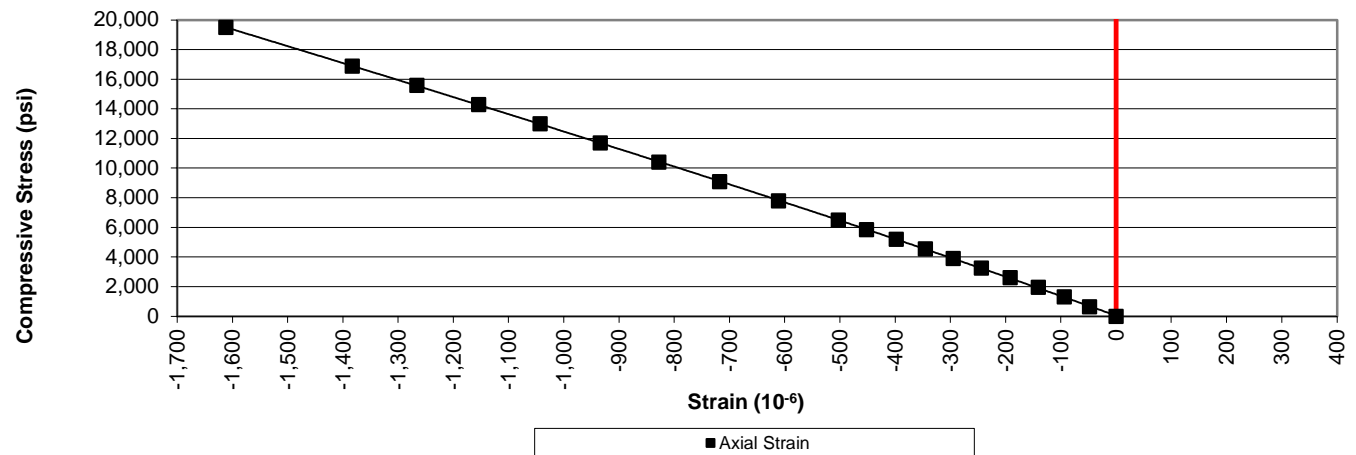
Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-48	TNR	2,000	649	13.52	TNR	
3	-94	TNR	4,000	1,299	13.82	TNR	
4	-141	TNR	6,000	1,948	13.82	TNR	
5	-192	TNR	8,000	2,597	13.53	TNR	
6	-244	TNR	10,000	3,247	13.31	TNR	
7	-295	TNR	12,000	3,896	13.21	TNR	
8	-345	TNR	14,000	4,545	13.17	TNR	
9	-398	TNR	16,000	5,195	13.05	TNR	
10	-452	TNR	18,000	5,844	12.93	TNR	
11	-503	TNR	20,000	6,494	12.91	TNR	
12	-611	TNR	24,000	7,792	12.75	TNR	
13	-718	TNR	28,000	9,091	12.66	TNR	
14	-828	TNR	32,000	10,390	12.55	TNR	
15	-934	TNR	36,000	11,688	12.51	TNR	
16	-1,043	TNR	40,000	12,987	12.45	TNR	
17	-1,154	TNR	44,000	14,286	12.38	TNR	
18	-1,266	TNR	48,000	15,584	12.31	TNR	
19	-1,383	TNR	52,000	16,883	12.21	TNR	
20	-1,612	TNR	60,000	19,481	12.08	TNR	
21			64,809	21,042			Failure

TNR - Test Not Requested

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

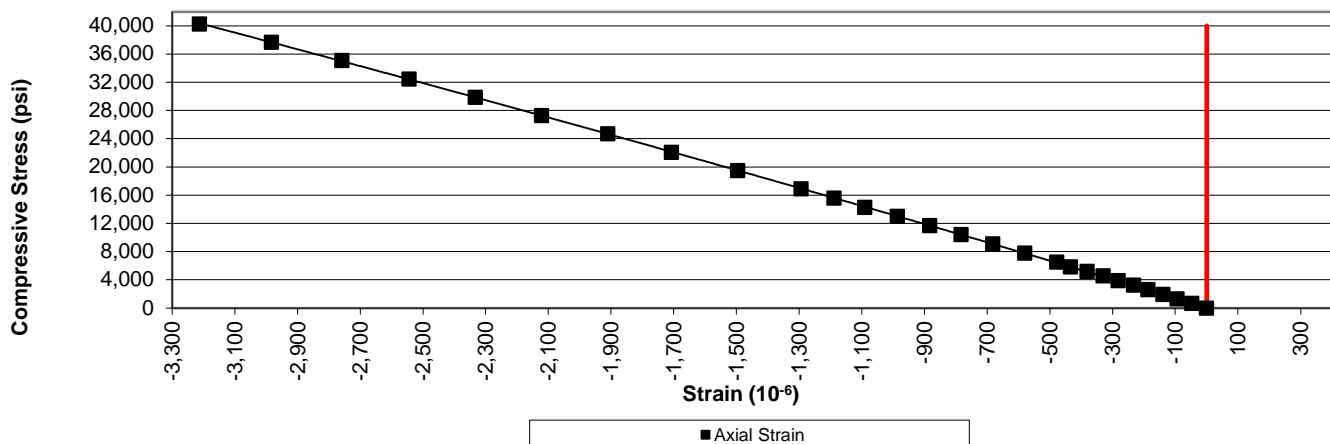
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/10/2020
Project No.:	1461-19-069	Length, in.:	4.30	Tested by:	VL I
Boring Id:	IB-3	Unit Weight, pcf:	187.8	Reviewed by:	NRR
Sample No:	RC-10	Moisture Content, %:	0.1		
Depth (ft):	60.5 - 60.9	Load Rate, psi/sec:	71		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-47	TNR	2,000	649	13.81	TNR	
3	-94	TNR	4,000	1,299	13.82	TNR	
4	-139	TNR	6,000	1,948	14.01	TNR	
5	-187	TNR	8,000	2,597	13.89	TNR	
6	-233	TNR	10,000	3,247	13.94	TNR	
7	-282	TNR	12,000	3,896	13.82	TNR	
8	-330	TNR	14,000	4,545	13.77	TNR	
9	-381	TNR	16,000	5,195	13.64	TNR	
10	-434	TNR	18,000	5,844	13.47	TNR	
11	-478	TNR	20,000	6,494	13.59	TNR	
12	-580	TNR	24,000	7,792	13.43	TNR	
13	-682	TNR	28,000	9,091	13.33	TNR	
14	-783	TNR	32,000	10,390	13.27	TNR	
15	-884	TNR	36,000	11,688	13.22	TNR	
16	-987	TNR	40,000	12,987	13.16	TNR	
17	-1,091	TNR	44,000	14,286	13.09	TNR	
18	-1,189	TNR	48,000	15,584	13.11	TNR	
19	-1,294	TNR	52,000	16,883	13.05	TNR	
20	-1,496	TNR	60,000	19,481	13.02	TNR	
21	-1,707	TNR	68,000	22,078	12.93	TNR	
22	-1,911	TNR	76,000	24,675	12.91	TNR	
23	-2,122	TNR	84,000	27,273	12.85	TNR	
24	-2,333	TNR	92,000	29,870	12.80	TNR	
25	-2,545	TNR	100,000	32,468	12.76	TNR	
26	-2,759	TNR	108,000	35,065	12.71	TNR	
27	-2,983	TNR	116,000	37,662	12.63	TNR	
28	-3,213	TNR	124,000	40,260	12.53	TNR	
29			124,042	40,273			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

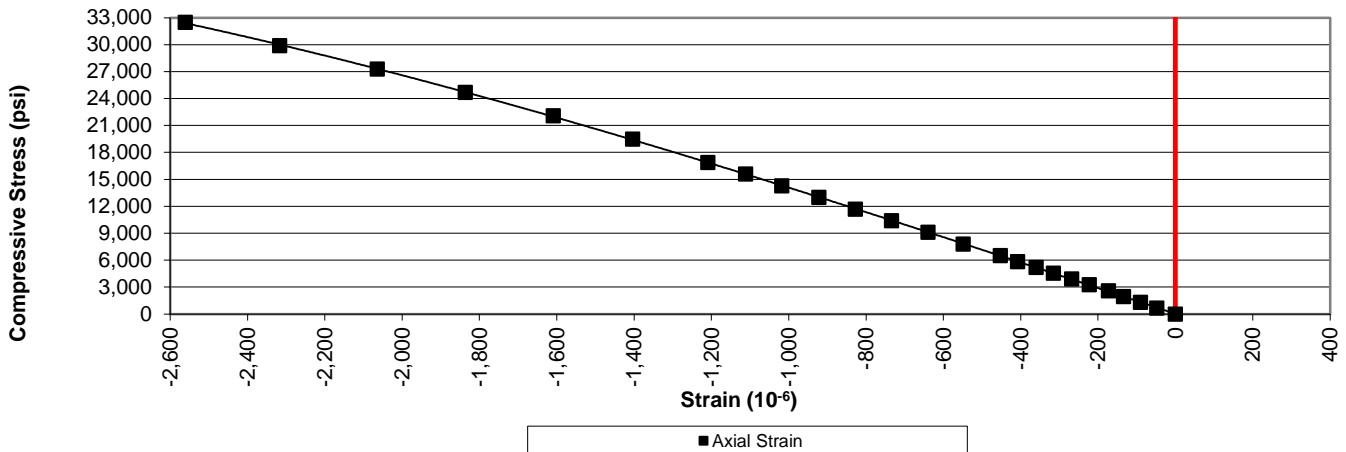
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	4.38	Tested by:	VLI
Boring Id:	IB-4A	Unit Weight, pcf:	186.3	Reviewed by:	NRR
Sample No:	RC-11	Moisture Content, %:	0.4		
Depth (ft):	24.7 - 25.1	Load Rate, psi/sec:	71		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-48	TNR	2,000	649	13.52	TNR	
3	-90	TNR	4,000	1,299	14.43	TNR	
4	-134	TNR	6,000	1,948	14.54	TNR	
5	-173	TNR	8,000	2,597	15.01	TNR	
6	-223	TNR	10,000	3,247	14.56	TNR	
7	-268	TNR	12,000	3,896	14.54	TNR	
8	-315	TNR	14,000	4,545	14.43	TNR	
9	-360	TNR	16,000	5,195	14.43	TNR	
10	-408	TNR	18,000	5,844	14.32	TNR	
11	-453	TNR	20,000	6,494	14.34	TNR	
12	-549	TNR	24,000	7,792	14.19	TNR	
13	-640	TNR	28,000	9,091	14.20	TNR	
14	-734	TNR	32,000	10,390	14.16	TNR	
15	-828	TNR	36,000	11,688	14.12	TNR	
16	-922	TNR	40,000	12,987	14.09	TNR	
17	-1,018	TNR	44,000	14,286	14.03	TNR	
18	-1,112	TNR	48,000	15,584	14.01	TNR	
19	-1,209	TNR	52,000	16,883	13.96	TNR	
20	-1,404	TNR	60,000	19,481	13.88	TNR	
21	-1,609	TNR	68,000	22,078	13.72	TNR	
22	-1,837	TNR	76,000	24,675	13.43	TNR	
23	-2,064	TNR	84,000	27,273	13.21	TNR	
24	-2,317	TNR	92,000	29,870	12.89	TNR	
25	-2,561	TNR	100,000	32,468	12.68	TNR	
26			103,284	33,534			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

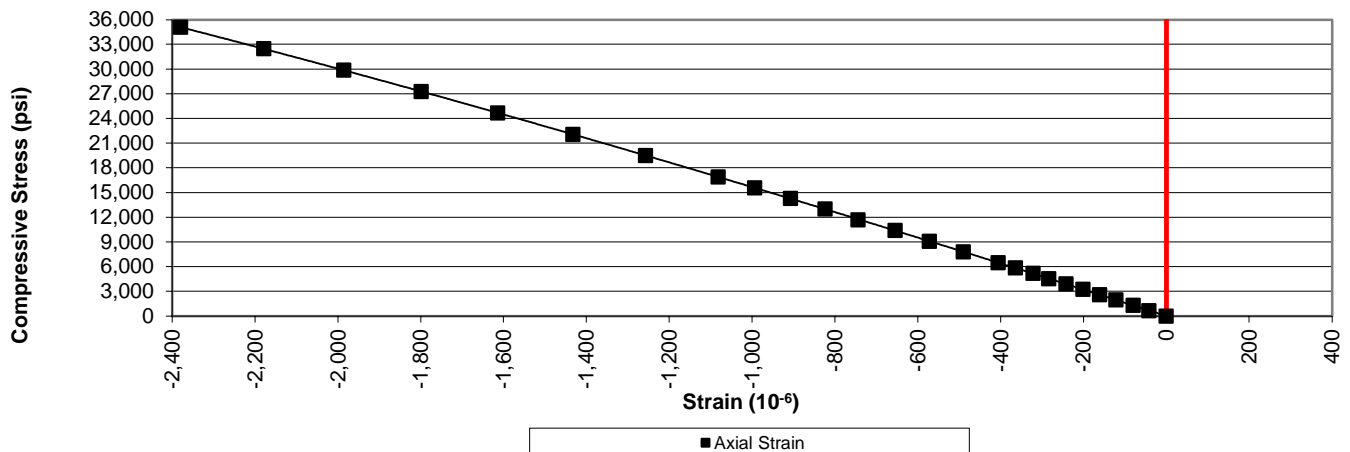
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	4.35	Tested by:	VLJ
Boring Id:	IB-4A	Unit Weight, pcf:	187.5	Reviewed by:	NRR
Sample No:	RC-12	Moisture Content, %:	0.0		
Depth (ft):	34.8 - 35.2	Load Rate, psi/sec:	75		

Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-42	TNR	2,000	649	15.45	TNR	
3	-80	TNR	4,000	1,299	16.24	TNR	
4	-122	TNR	6,000	1,948	15.97	TNR	
5	-161	TNR	8,000	2,597	16.13	TNR	
6	-201	TNR	10,000	3,247	16.15	TNR	
7	-242	TNR	12,000	3,896	16.10	TNR	
8	-284	TNR	14,000	4,545	16.00	TNR	
9	-322	TNR	16,000	5,195	16.13	TNR	
10	-364	TNR	18,000	5,844	16.05	TNR	
11	-406	TNR	20,000	6,494	16.00	TNR	
12	-490	TNR	24,000	7,792	15.90	TNR	
13	-572	TNR	28,000	9,091	15.89	TNR	
14	-655	TNR	32,000	10,390	15.86	TNR	
15	-744	TNR	36,000	11,688	15.71	TNR	
16	-824	TNR	40,000	12,987	15.76	TNR	
17	-907	TNR	44,000	14,286	15.75	TNR	
18	-994	TNR	48,000	15,584	15.68	TNR	
19	-1,082	TNR	52,000	16,883	15.60	TNR	
20	-1,257	TNR	60,000	19,481	15.50	TNR	
21	-1,433	TNR	68,000	22,078	15.41	TNR	
22	-1,614	TNR	76,000	24,675	15.29	TNR	
23	-1,799	TNR	84,000	27,273	15.16	TNR	
24	-1,986	TNR	92,000	29,870	15.04	TNR	
25	-2,179	TNR	100,000	32,468	14.90	TNR	
26	-2,380	TNR	108,000	35,065	14.73	TNR	
			112,693	36,589			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)



1413 Topside Road, Louisville, TN 37777

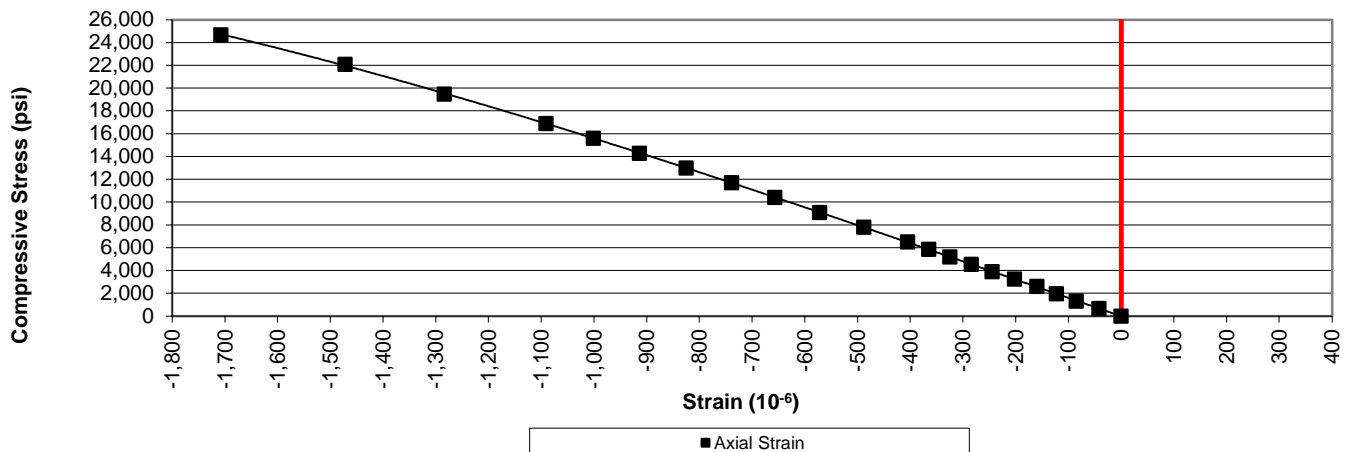
Project:	I-77 Panthers Interchange	Diameter, in.:	1.98	Date:	2/11/2020
Project No.:	1461-19-069	Length, in.:	4.37	Tested by:	VLI
Boring Id:	IB-4A	Unit Weight, pcf:	187.7	Reviewed by:	NRR
Sample No:	RC-13	Moisture Content, %:	0.0		
Depth (ft):	54.3 - 54.7	Load Rate, psi/sec:	67		

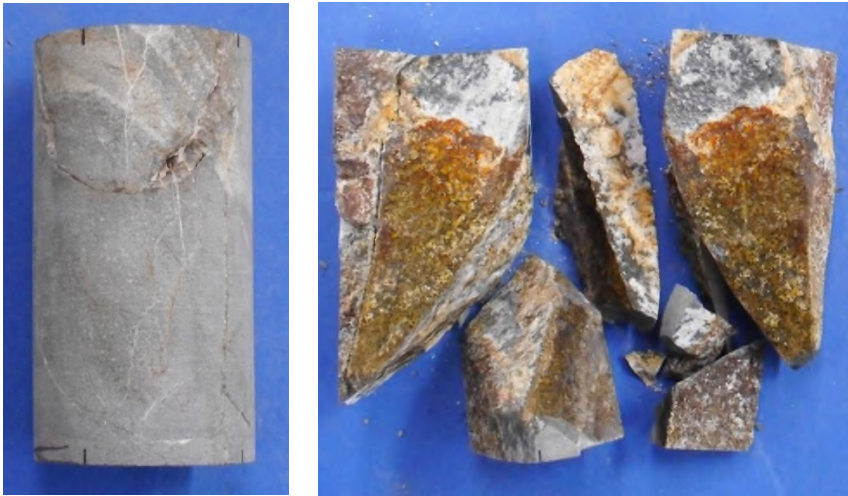
Data Point	Strain (10 ⁻⁶)		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-42	TNR	2,000	649	15.45	TNR	
3	-85	TNR	4,000	1,299	15.28	TNR	
4	-123	TNR	6,000	1,948	15.84	TNR	
5	-160	TNR	8,000	2,597	16.23	TNR	
6	-202	TNR	10,000	3,247	16.07	TNR	
7	-245	TNR	12,000	3,896	15.90	TNR	
8	-284	TNR	14,000	4,545	16.00	TNR	
9	-325	TNR	16,000	5,195	15.98	TNR	
10	-365	TNR	18,000	5,844	16.01	TNR	
11	-405	TNR	20,000	6,494	16.03	TNR	
12	-488	TNR	24,000	7,792	15.97	TNR	
13	-572	TNR	28,000	9,091	15.89	TNR	
14	-657	TNR	32,000	10,390	15.81	TNR	
15	-739	TNR	36,000	11,688	15.82	TNR	
16	-825	TNR	40,000	12,987	15.74	TNR	
17	-914	TNR	44,000	14,286	15.63	TNR	
18	-1,001	TNR	48,000	15,584	15.57	TNR	
19	-1,091	TNR	52,000	16,883	15.47	TNR	
20	-1,284	TNR	60,000	19,481	15.17	TNR	
21	-1,472	TNR	68,000	22,078	15.00	TNR	
22	-1,708	TNR	76,000	24,675	14.45	TNR	
23			79,955	25,959			Failure

TNR - Test Not Requested



Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

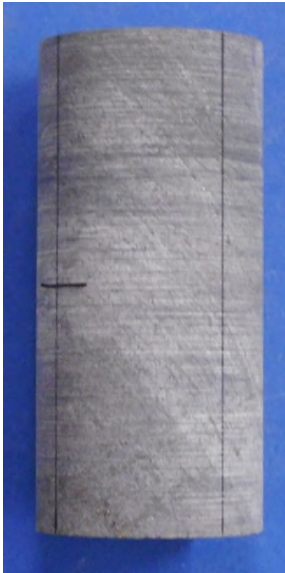

Stress vs. Strain





		Date: 2/3 & 10/2020
		Photographer: Stan Helton
1	Location / Orientation	EB-1, RC-1 (42.6' – 43.0')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)


		Date: 2/3 & 10/2020
		Photographer: Stan Helton
2	Location / Orientation	EB-1, RC-2 (57.5' – 57.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)


 		Date: 2/3 & 10/2020
		Photographer: Stan Helton
3	Location / Orientation	EB-2, RC-3 (25.3' – 25.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

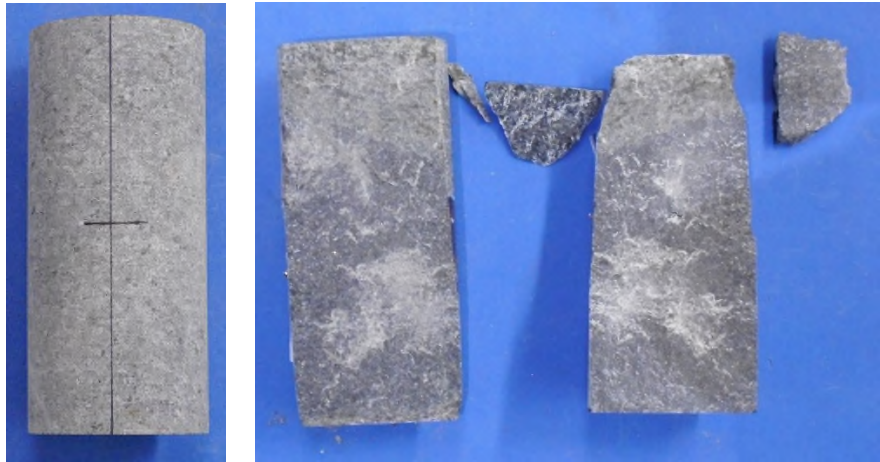
 		Date: 2/3 & 10/2020
		Photographer: Stan Helton
4	Location / Orientation	EB-2, RC-4 (46.7' – 47.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

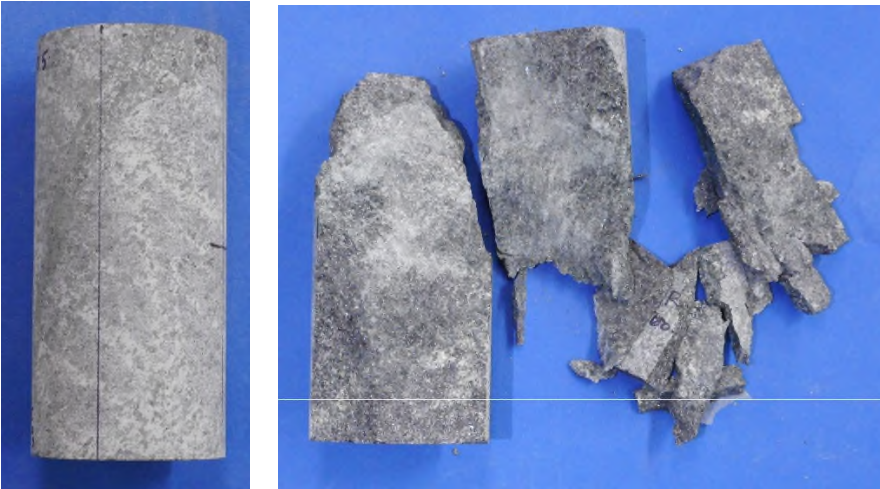
		Date: 2/3 & 10/2020
		Photographer: Stan Helton
5	Location / Orientation	IB-1, RC-5 (45.7' – 46.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)



		Date: 2/3 & 10/2020
		Photographer: Stan Helton
6	Location / Orientation	IB-1, RC-6 (65.0' – 65.5')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)


		Date: 2/3 & 10/2020
		Photographer: Stan Helton
7	Location / Orientation	IB-2B, RC-7 (43.3' – 43.8')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)


		Date: 2/3 & 10/2020
		Photographer: Stan Helton
8	Location / Orientation	IB-2B, RC-8 (57.5' – 57.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

		Date: 2/3 & 10/2020
		Photographer: Stan Helton
9	Location / Orientation	IB-3, RC-9 (53.7' – 54.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

		Date: 2/3 & 10/2020
		Photographer: Stan Helton
10	Location / Orientation	IB-3, RC-10 (60.5' – 60.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

 		Date: 2/3 & 10/2020
		Photographer: Stan Helton
11	Location / Orientation	IB-4A, RC-11 (24.7' – 25.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

 		Date: 2/3 & 10/2020
		Photographer: Stan Helton
12	Location / Orientation	IB-4A, RC-12 (34.8' – 35.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

		Date: 2/3 & 10/2020
		Photographer: Stan Helton
13	Location / Orientation	IB-4A, RC-13 (54.3' – 54.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

		Date: 2/3 & 10/2020
		Photographer: Stan Helton
14	Location / Orientation	EB-3, RC-14 (55.0' – 55.35')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

15	Location / Orientation	EB-3, RC-15 (62.6' – 62.95')	Photographer: Stan Helton	Date: 2/3 & 10/2020
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)		



16	Location / Orientation	EB-4, RC-16 (44.0' – 44.4')	Photographer: Stan Helton	Date: 2/3 & 10/2020
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)		



		Date: 2/3 & 10/2020
		Photographer: Stan Helton
17	Location / Orientation	EB-4, RC-17 (55.5' – 55.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Appendix IX – Bulk Sample Laboratory Test Results

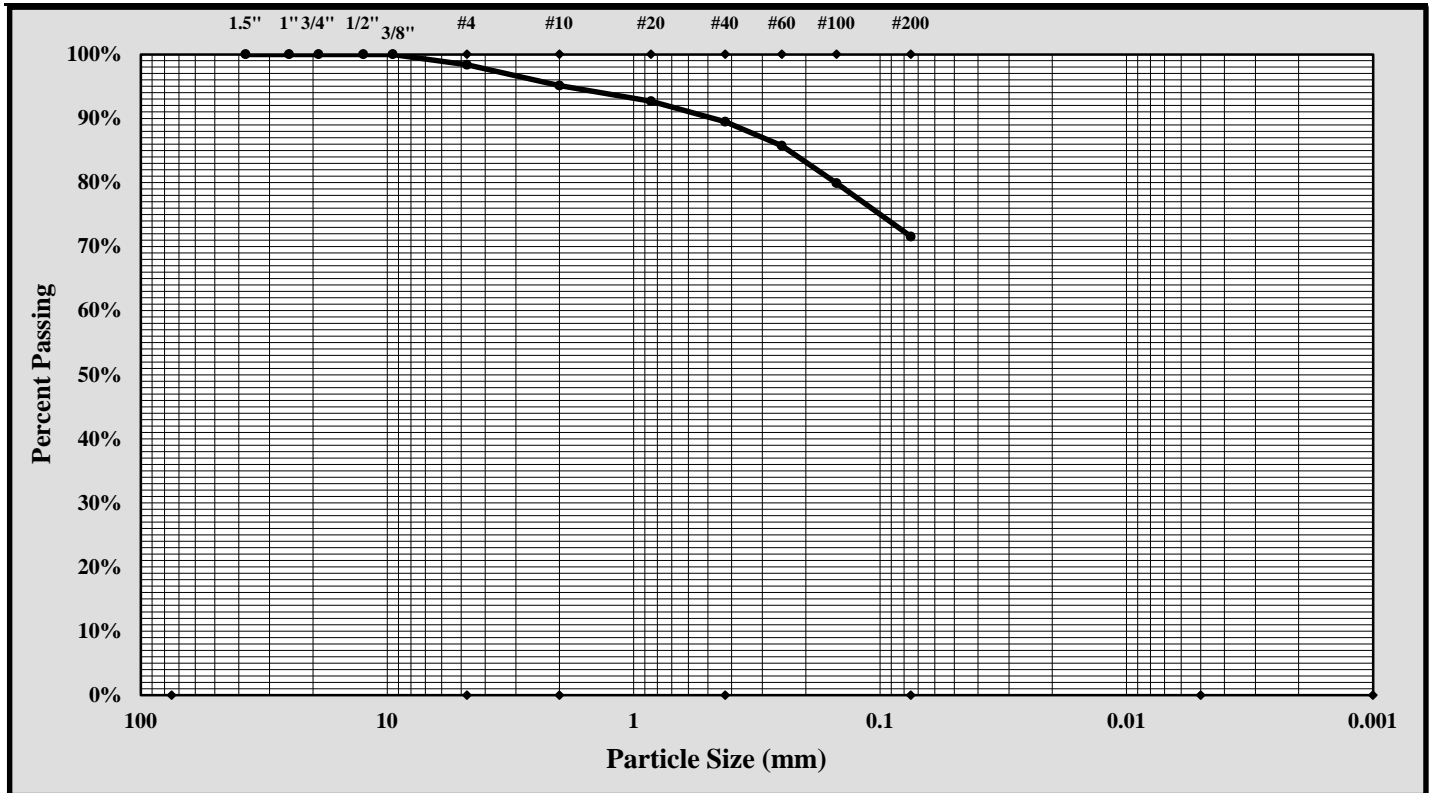
Mechanical Analysis of Soils (Elutriation Method)



SC-T-34

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/20 - 1/22/20
Client Name:	RS&H		
Address:	4000 Faber Pl. Dr., Ste. 130, N. Char.		
Boring #:	IB-2A	Sample #:	BS-1
		Sample Date:	1/7/2020
Station:	36+74.0 (paragon)	Offset:	42.24RT
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#4	Gravel:	2%	Silt:	18%
Silt & Clay (% Passing #200):	72%	Total Sand:	27%	Clay by Elutriation:	53%
		Passing #10 & Retained #60:	9%		
Liquid Limit	57	Plastic Limit	27	Plastic Index	30

Coarse Sand:	9%	Fine Sand:	18%
Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>
	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>	

References / Comments / Deviations: SC-T-34, AASHTO T89, T90.

Material passing the #200 sieve not shown on the graph. NP: Non-plastic.

Robert C. Bruorton, P.E.

Technical Responsibility

Senior Engineer

Position

5/5/2020

Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



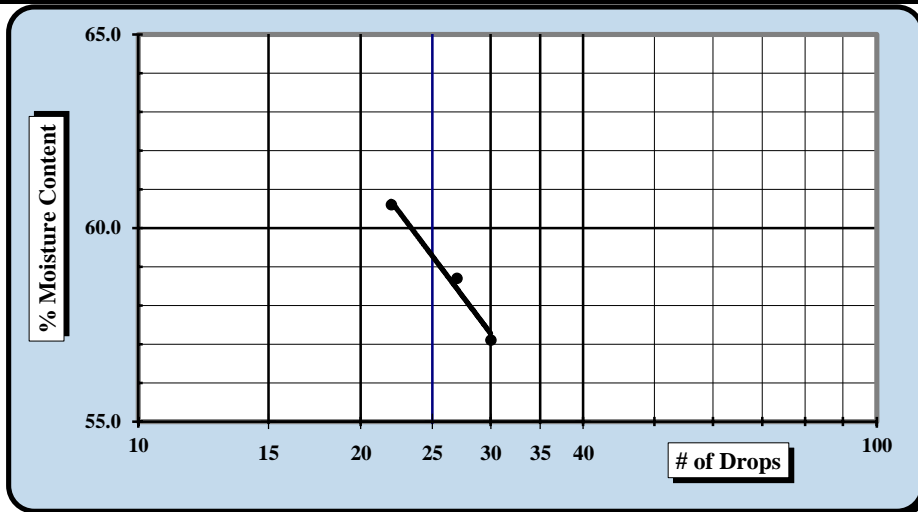
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/21 - 1/24/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-2A	Sample #:	BS-1
Station:	36+74.0 (paragon)	Offset:	42.24RT
		Sample Date:	1/7/2020
		Depth:	0 - 5 ft.

Sample Description: Fat CLAY with Sand (CH, A-7-6[22])					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 603		Liquid Limit					Plastic Limit		
Tare #:		36	214	1			243	43	
A	Tare Weight	20.94	20.81	20.64			20.75	20.82	
B	Wet Soil Weight + A	26.50	25.73	25.89			27.66	30.15	
C	Dry Soil Weight + A	24.48	23.91	23.91			26.19	28.14	
D	Water Weight (B-C)	2.02	1.82	1.98			1.47	2.01	
E	Dry Soil Weight (C-A)	3.54	3.10	3.27			5.44	7.32	
F	% Moisture (D/E)*100	57.1%	58.7%	60.6%			27.0%	27.5%	
N	# OF DROPS	30	27	22			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						27.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	57
Plastic Limit	27
Plastic Index	30
Group Symbol	CH
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 72%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

1/28/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

5/5/2020
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



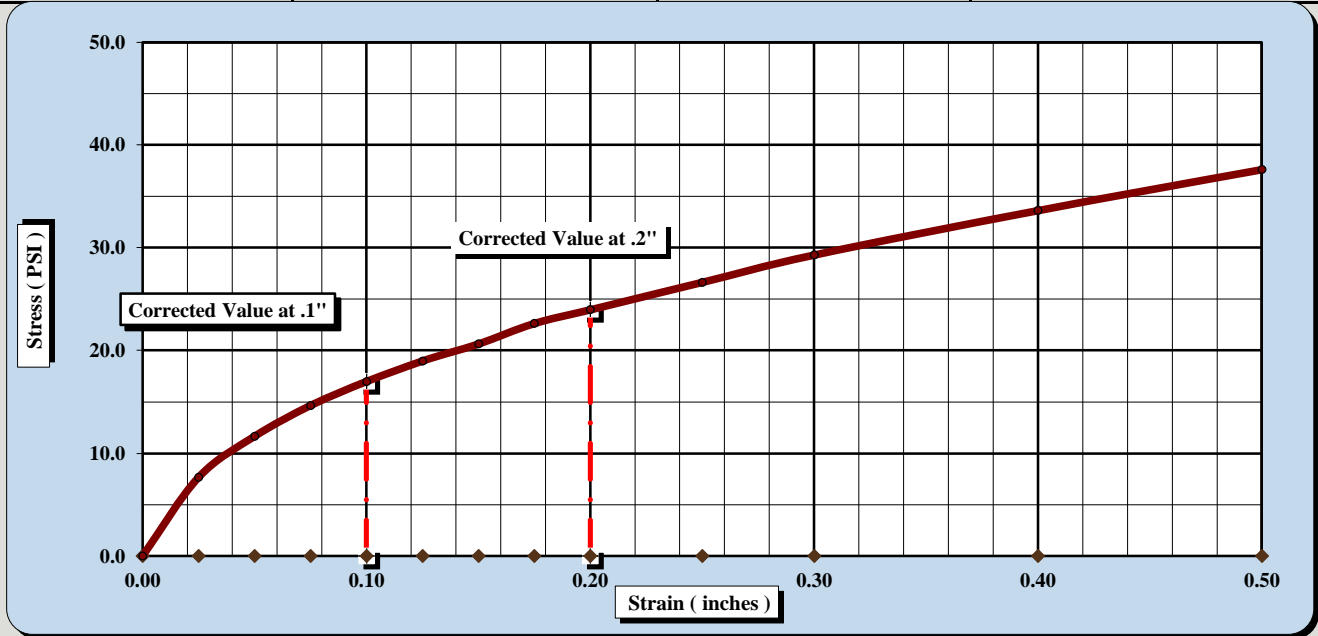
AASHTO T 193

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/23 - 1/27/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-2A	Sample #:	BS-1
		Sample Date:	1/7/20
Station:	36+74.0 (paragon)	Offset:	42.24RT
		Depth:	0 - 5 ft.
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		

AASHTO T99 Method D	Maximum Dry Density: 102.9 PCF	Optimum Moisture Content: 20.8%	
Compaction Test performed on grading complying with CBR spec.		% Retained on the 3/4" sieve:	*

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	1.7	CBR at 0.1 in.	1.7
CBR at 0.2 in.	1.6	CBR at 0.2 in.	1.6



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	27		
Initial Dry Density (PCF)	94.3	Final Dry Density (PCF)	89.6
Moisture Content of the Compacted Specimen	21.0%	Moisture Content (top 1" after soaking)	37.2%
Percent Compaction	91.6%	Percent Swell	5.2%

Soak Time:	96 hrs	Surcharge Weight	10.0
Liquid Limit	57	Surcharge Wt. per sq. Ft.	50.8
		Plastic Index	30

Notes/Deviations/References:

*Organics.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer

5/5/2020
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



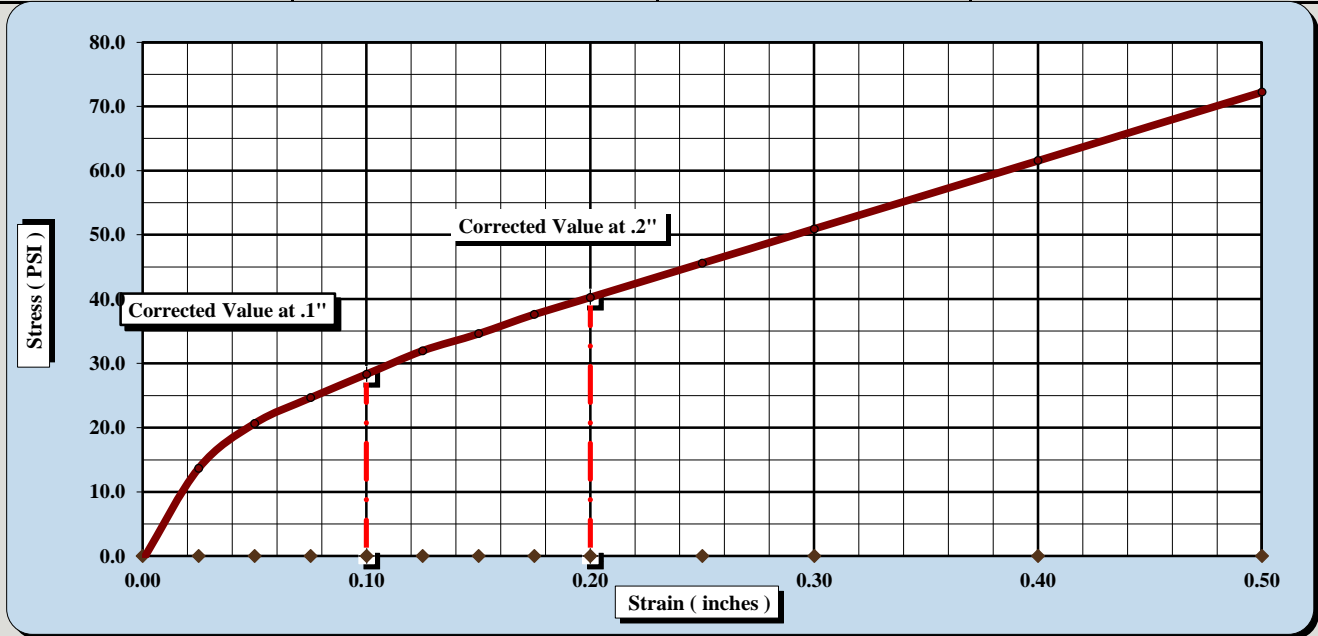
ASTM D 1883

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-9-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/23 - 1/27/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-2A	Sample #:	BS-1
		Sample Date:	1/7/20
Station:	36+74.0 (paragon)	Offset:	42.24RT
		Depth:	0 - 5 ft.
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		

AASHTO T99 Method D	Maximum Dry Density: 102.9 PCF	Optimum Moisture Content: 20.8%	
Compaction Test performed on grading complying with CBR spec.		% Retained on the 3/4" sieve:	*

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	2.8	CBR at 0.1 in.	2.8
CBR at 0.2 in.	2.7	CBR at 0.2 in.	2.7



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	50	Final Dry Density (PCF)	96.1
Initial Dry Density (PCF)	100.7	Moisture Content (top 1" after soaking)	34.3%
Moisture Content of the Compacted Specimen	20.0%	Percent Swell	4.7%
Percent Compaction	97.9%		

Soak Time:	96 hrs	Surcharge Weight	10.0
Liquid Limit	57	Surcharge Wt. per sq. Ft.	50.8
		Plastic Index	30

Notes/Deviations/References:

*Organics.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer

5/5/2020
Date

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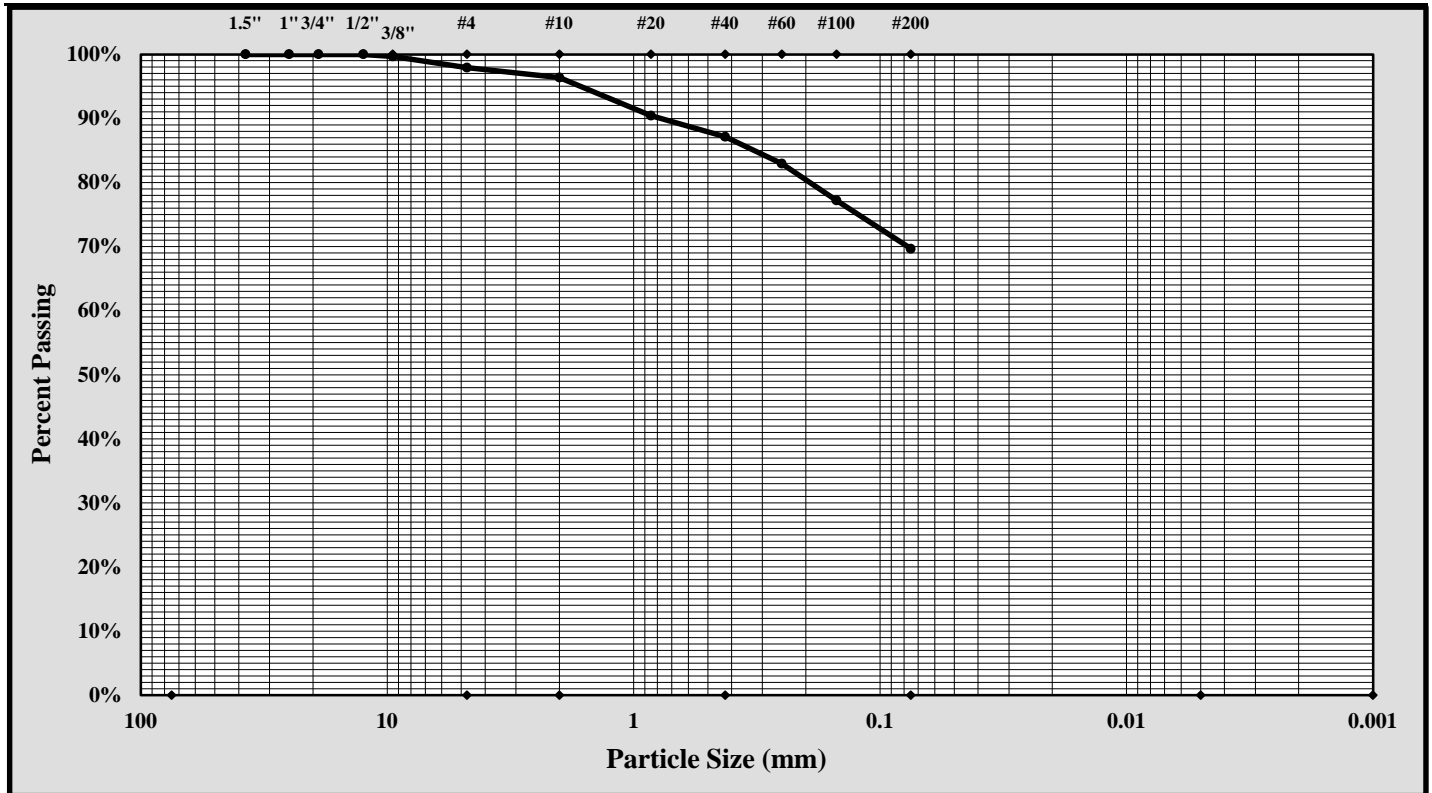
Mechanical Analysis of Soils (Elutriation Method)



SC-T-34

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/29/20
Client Name:	RS&H		
Address:	4000 Faber Pl. Dr., Ste. 130, N. Char.		
Boring #:	IB-3	Sample #:	BS-2
		Sample Date:	1/17/20
Station:	35+19.5 (paragon)	Offset:	72.23LT
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	3/8"	Gravel:	2%	Silt:	TNP
Silt & Clay (% Passing #200):	70%	Total Sand:	28%	Clay by Elutriation:	TNP
		Passing #10 & Retained #60:	13%		
Liquid Limit	61	Plastic Limit	32	Plastic Index	29
Coarse Sand:	11%	Fine Sand:	17%		

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input type="checkbox"/>	Soft <input checked="" type="checkbox"/>	Weathered & Friable <input checked="" type="checkbox"/>
References / Comments / Deviations: SC-T-34, AASHTO T89, T90.					
Material passing the #200 sieve not shown on the graph. NP: Non-plastic.					

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

5/5/2020
Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



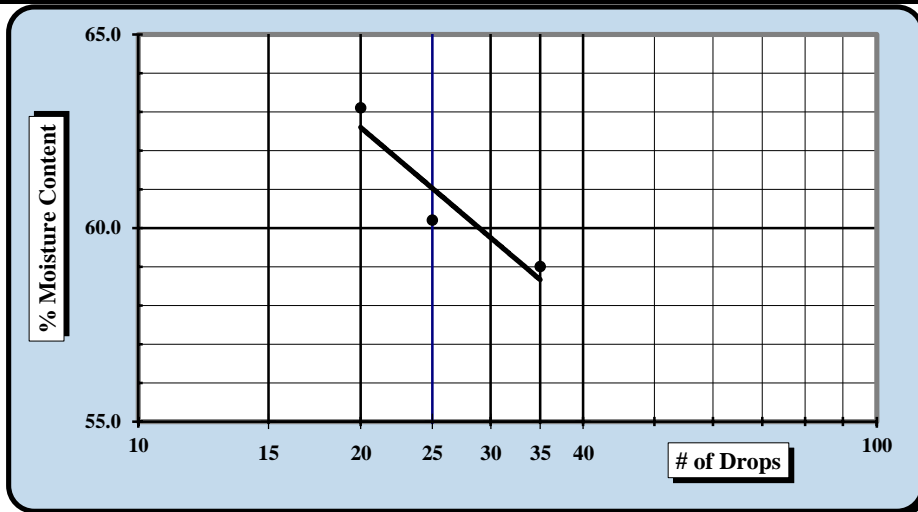
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/24 - 1/31/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	NBS-2
Station:	35+19.5 (paragon)	Sample Date:	1/17/20
	Offset: 72.23LT	Depth:	0 - 5 ft.

Sample Description: Sandy Elastic SILT (MH, A-7-5[21])					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 606		Liquid Limit					Plastic Limit		
Tare #:		6	45	39			40		
A	Tare Weight	20.69	20.76	20.82			20.85		
B	Wet Soil Weight + A	26.32	26.64	27.23			30.94		
C	Dry Soil Weight + A	24.23	24.43	24.75			28.47		
D	Water Weight (B-C)	2.09	2.21	2.48			2.47		
E	Dry Soil Weight (C-A)	3.54	3.67	3.93			7.62		
F	% Moisture (D/E)*100	59.0%	60.2%	63.1%			32.4%		
N	# OF DROPS	35	25	20			Moisture Contents determined by AASHTO T 245		
LL	LL = F * FACTOR								
Ave.	Average						32.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	61
Plastic Limit	32
Plastic Index	29
Group Symbol	MH
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve:
 Notes / Deviations / References: Group Symbol refers only to material passing the No. 40 sieve.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/3/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

5/5/2020
Date

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MOISTURE - DENSITY REPORT

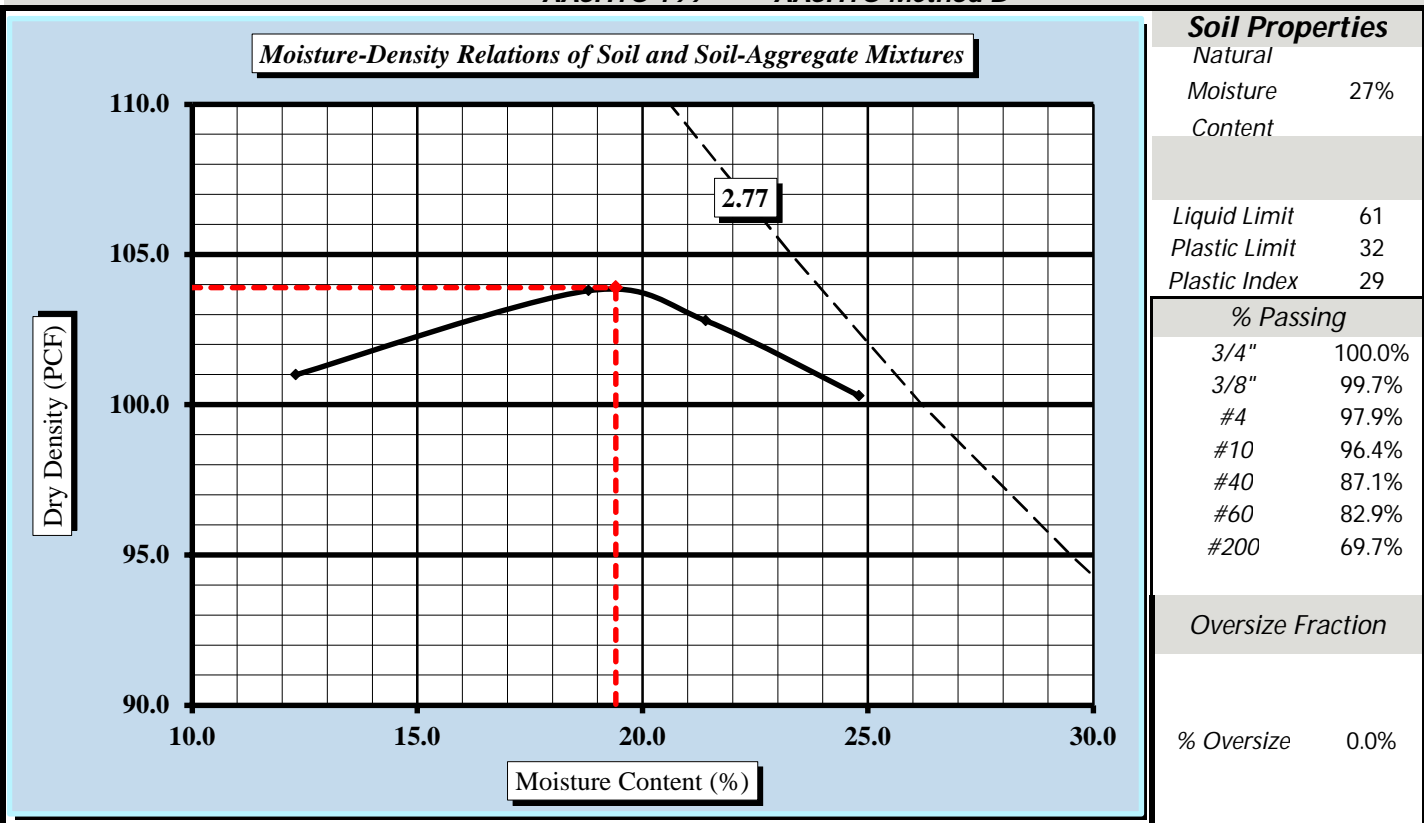


Quality Assurance

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210			
S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/29/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	BS-2
Station:	35+19.5 (paragon)	Offset:	72.23LT
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		

Maximum Dry Density 103.9 PCF. Optimum Moisture Content 19.4%

AASHTO T99 - - AASHTO Method D



Moisture-Density Curve Displayed: Fine Fraction Corrected for Oversize Fraction (ASTM D 4718)
 Sieve Size used to separate the Oversize Fraction: #4 Sieve 3/8 inch Sieve 3/4 inch Sieve
 Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation

References / Comments / Deviations:

AASHTO T265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 99: Moisture-Density Relations of Soil Using a 5.5 Lb. Rammer and a 12" Drop

Robert C. Bruorton, P.E.
 Technical Responsibility

Senior Engineer
 Position

5/5/2020
 Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



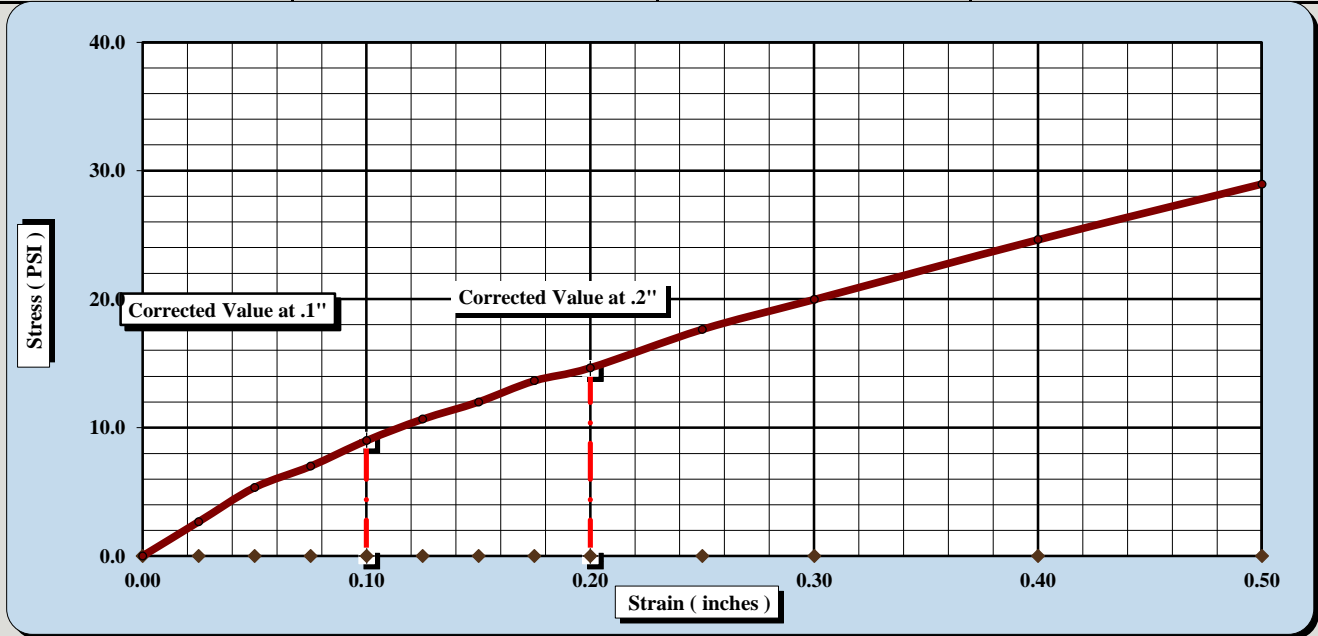
AASHTO T 193

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/30 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	BS-2
		Sample Date:	1/17/20
Station:	35+19.5 (paragon)	Offset:	72.23LT
		Depth:	0 - 5 ft.
Sample Description: Sandy Elastic SILT (MH, A-7-5[21])			

AASHTO T99 Method D	Maximum Dry Density: 103.9 PCF	Optimum Moisture Content: 19.4%	
Compaction Test performed on grading complying with CBR spec.		% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	0.9	CBR at 0.1 in.	0.9
CBR at 0.2 in.	1.0	CBR at 0.2 in.	1.0



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	25	Final Dry Density (PCF)	89.8
Initial Dry Density (PCF)	96.4	Moisture Content (top 1" after soaking)	37.5%
Moisture Content of the Compacted Specimen	20.8%	Percent Swell	7.3%
Percent Compaction	92.8%		

Soak Time: 96 hrs	Surcharge Weight: 10.0	Surcharge Wt. per sq. Ft.: 50.8	
Liquid Limit: 61	Plastic Index: 20	Apparent Relative Density: TNP	

Notes/Deviations/References:

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

5/5/2020
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



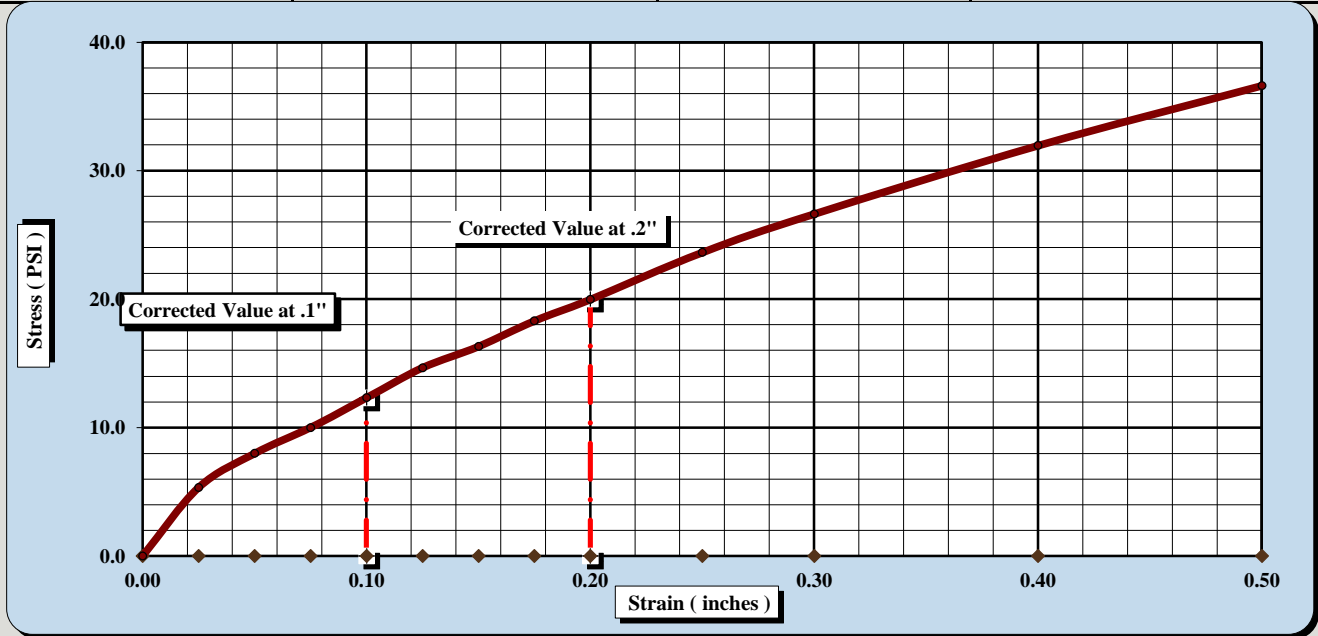
AASHTO T 193

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/23 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-3	Sample #:	BS-2
		Sample Date:	1/17/20
Station:	35+19.5 (paragon)	Offset:	72.23LT
		Depth:	0 - 5 ft.
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		

AASHTO T99	Method D	Maximum Dry Density:	103.9 PCF	Optimum Moisture Content:	19.4%
Compaction Test performed on grading complying with CBR spec.				% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	1.2	CBR at 0.1 in.	1.2
CBR at 0.2 in.	1.3	CBR at 0.2 in.	1.3



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	50	Final Dry Density (PCF)	97.3
Initial Dry Density (PCF)	103.4	Moisture Content (top 1" after soaking)	36.8%
Moisture Content of the Compacted Specimen	18.2%	Percent Swell	6.2%
Percent Compaction	99.5%		

Soak Time:	96 hrs	Surcharge Weight	10.0
Liquid Limit	61	Surcharge Wt. per sq. Ft.	50.8
		Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

5/5/2020
Date

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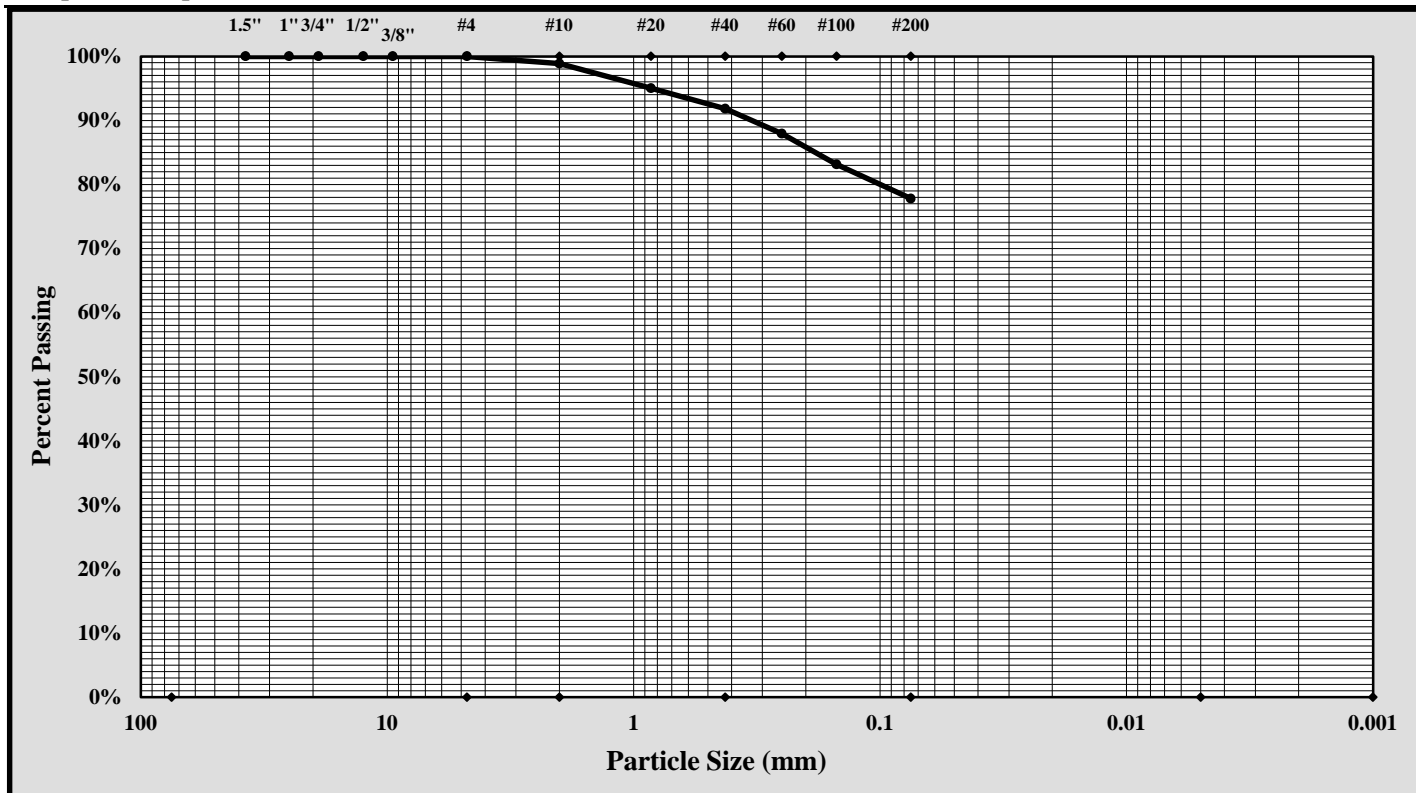
Mechanical Analysis of Soils (Elutriation Method)



SC-T-34

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/30/20
Client Name:	RS&H		
Address:	4000 Faber Pl. Dr., Ste. 130, N. Char.		
Boring #:	EM-11	Sample #:	BS-3
		Sample Date:	1/10/20
Station:	555+77.0 (ramp 1)	Offset:	10.05RT
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#20)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0%	Silt:	TNP
Silt & Clay (% Passing #200):	78%	Total Sand:	22%	Clay by Elutriation:	TNP
		Passing #10 & Retained #60:	11%		
Liquid Limit	58	Plastic Limit	31	Plastic Index	27
Coarse Sand:	8%	Fine Sand:	14%		

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input checked="" type="checkbox"/>
--------------------------------	----------------------------------	---	--	-------------------------------	---

References / Comments / Deviations: SC-T-34, AASHTO T89, T90.

Material passing the #200 sieve not shown on the graph. NP: Non-plastic.

Robert C. Bruorton, P.E.
 Technical Responsibility

Senior Engineer
 Position

5/5/2020
 Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



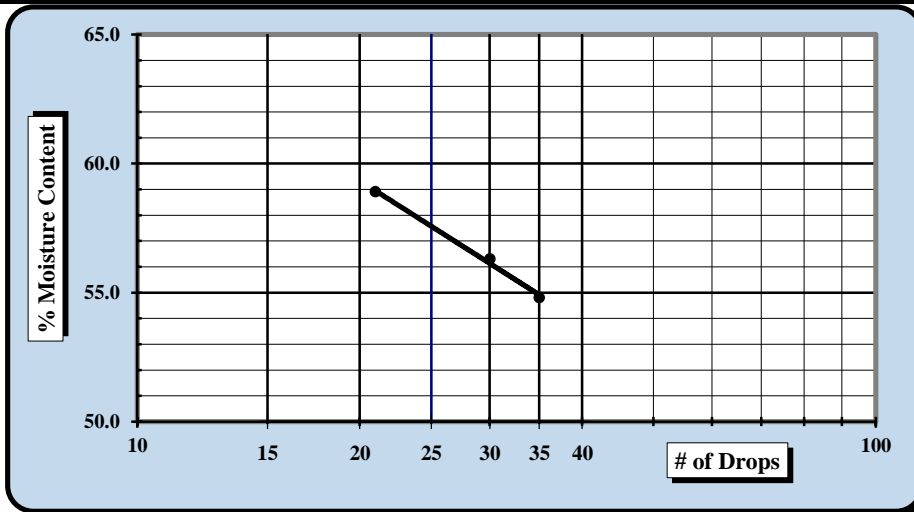
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/24 - 1/31/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-11	Sample #:	BS-3
		Sample Date:	1/7/2020
Station:	555+77.0 (ramp 1)	Offset:	10.05RT
		Depth:	0 - 5 ft.

Sample Description: Elastic SILT with Sand (MH, A-7-5[23])					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 600		Liquid Limit					Plastic Limit		
Tare #:		32	235	204			216		
A	Tare Weight	20.44	20.78	20.86			20.68		
B	Wet Soil Weight + A	25.78	27.11	26.96			32.09		
C	Dry Soil Weight + A	23.89	24.83	24.70			29.40		
D	Water Weight (B-C)	1.89	2.28	2.26			2.69		
E	Dry Soil Weight (C-A)	3.45	4.05	3.84			8.72		
F	% Moisture (D/E)*100	54.8%	56.3%	58.9%			30.8%		
N	# OF DROPS	35	30	21			Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR								
Ave.	Average						30.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	58
Plastic Limit	31
Plastic Index	27
Group Symbol	MH
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 78%

Notes / Deviations / References: Group Symbol refers only to material passing the No. 40 sieve.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Matthew Wolfe
Technician Name

2/3/2020
Date

Robert C. Bruorton, P.E.
Technical Responsibility

5/5/2020
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



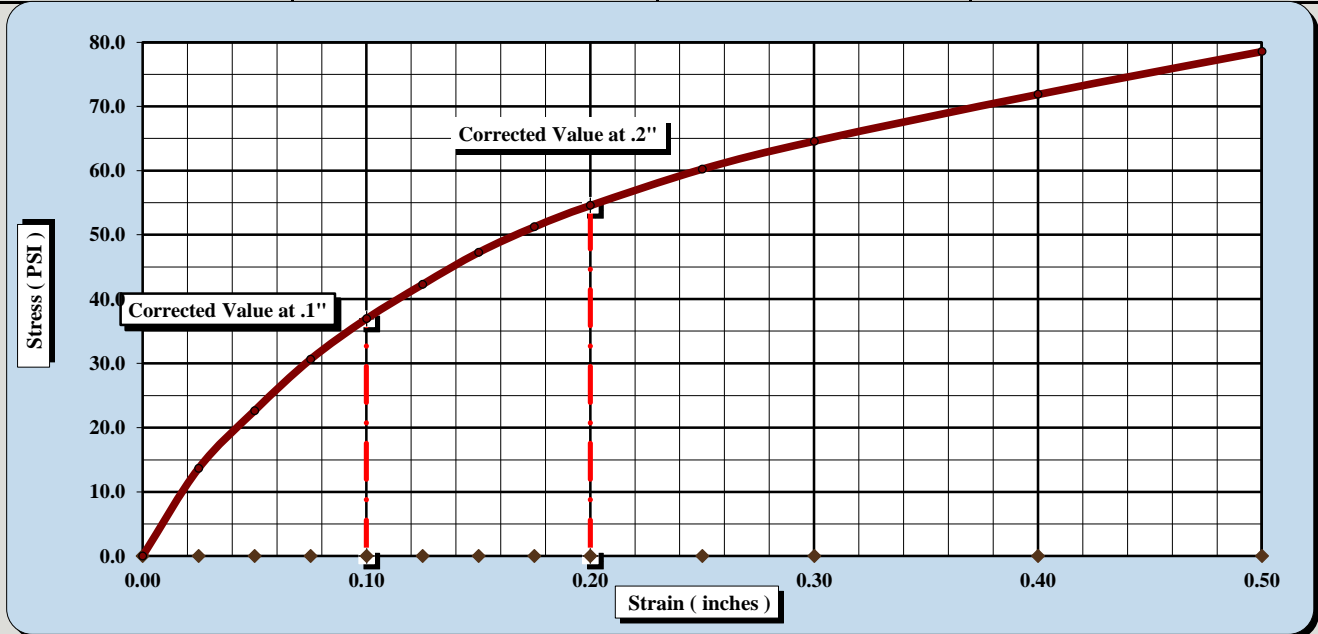
AASHTO T 193

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/30 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	EM-11	Sample #:	BS-3
		Sample Date:	1/10/20
Station:	555+77.0 (ramp 1)	Offset:	10.05RT
		Depth:	0 - 5 ft.
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		

AASHTO T99	Method D	Maximum Dry Density:	92.7 PCF	Optimum Moisture Content:	29.6%
Compaction Test performed on grading complying with CBR spec.				% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	3.7	CBR at 0.2 in.	3.6
CBR at 0.1 in.	3.7	CBR at 0.2 in.	3.6



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	18	Final Dry Density (PCF)	84.3
Initial Dry Density (PCF)	85.0	Moisture Content (top 1" after soaking)	39.5%
Moisture Content of the Compacted Specimen	28.9%	Percent Swell	0.9%
Percent Compaction	91.7%		

Soak Time:	96 hrs	Surcharge Weight	10.0
Liquid Limit	58	Surcharge Wt. per sq. Ft.	50.8
		Plastic Index	27
		Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

5/5/2020
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



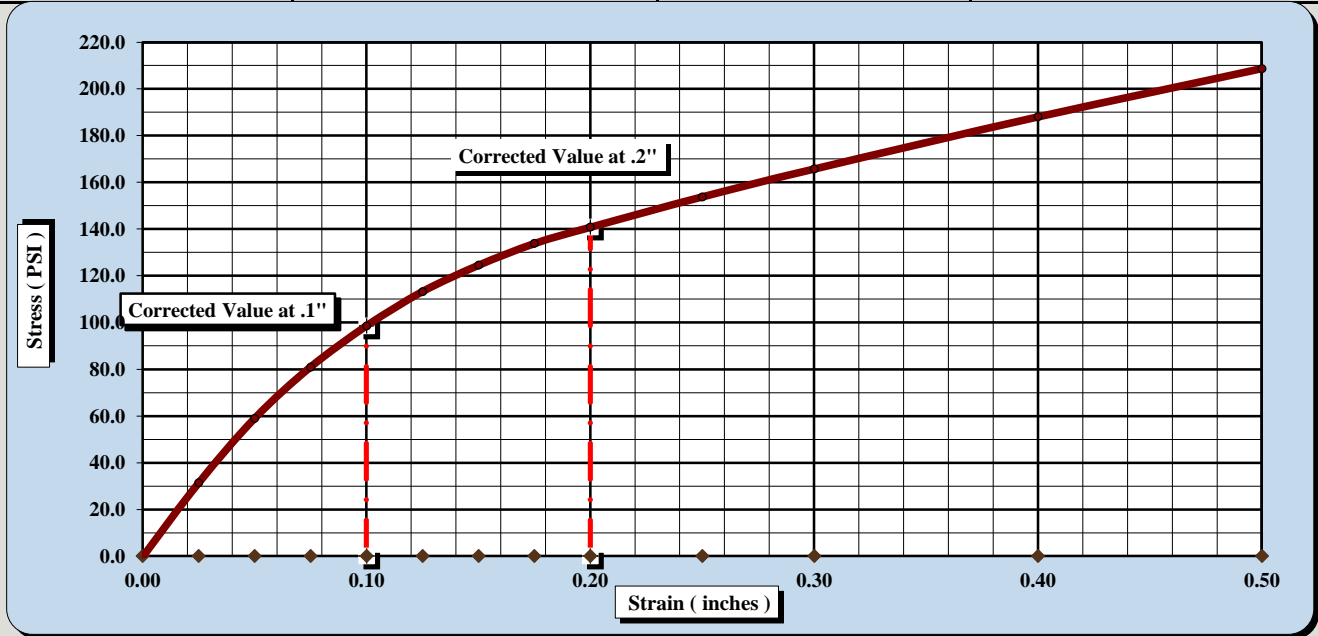
ASTM D 1883

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-9-069	Report Date:	2/3/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/30 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	EM-11	Sample #:	BS-3
		Sample Date:	1/10/20
Station:	555+77.0 (ramp 1)	Offset:	10.05RT
		Depth:	0 - 5 ft.
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		

AASHTO T99 Method D	Maximum Dry Density: 92.7 PCF	Optimum Moisture Content: 29.6%	
Compaction Test performed on grading complying with CBR spec.		% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	9.9	CBR at 0.2 in.	9.4
CBR at 0.1 in.	9.9	CBR at 0.2 in.	9.4



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	50	Final Dry Density (PCF)	
Initial Dry Density (PCF)	91.7	Moisture Content (top 1" after soaking)	34.8%
Moisture Content of the Compacted Specimen	29.3%	Percent Swell	0.5%
Percent Compaction	98.9%		

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	58	Plastic Index	27	Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

5/5/2020
Date

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Appendix X – Undisturbed Sample Laboratory Test Results

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



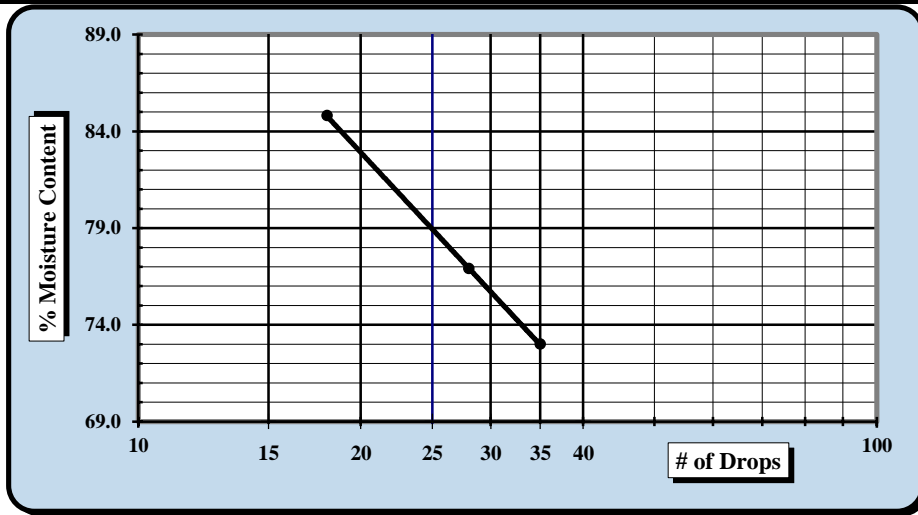
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/13/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #:	UD-1
		Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed
		Depth:	4 - 6'

Sample Description: Fat Clay with Sand (CH / A-7-5)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	13942	9/10/2019	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/7/2019			

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		6	7	8	9			
A	Tare Weight	27.79	26.30	27.31			26.84	
B	Wet Soil Weight + A	41.13	40.68	43.02			39.92	
C	Dry Soil Weight + A	35.50	34.43	35.81			36.85	
D	Water Weight (B-C)	5.63	6.25	7.21			3.07	
E	Dry Soil Weight (C-A)	7.71	8.13	8.50			10.01	
F	% Moisture (D/E)*100	73.0%	76.9%	84.8%			30.7%	
N	# OF DROPS	35	28	18			Moisture Contents determined by AASHTO T 265	
LL	LL = F * FACTOR							
Ave.	Average						30.7%	



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic	<input type="checkbox"/>
Liquid Limit	79
Plastic Limit	31
Plastic Index	48
Group Symbol	CH
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 83.5%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Benjamin Kovaleski
Technician Name

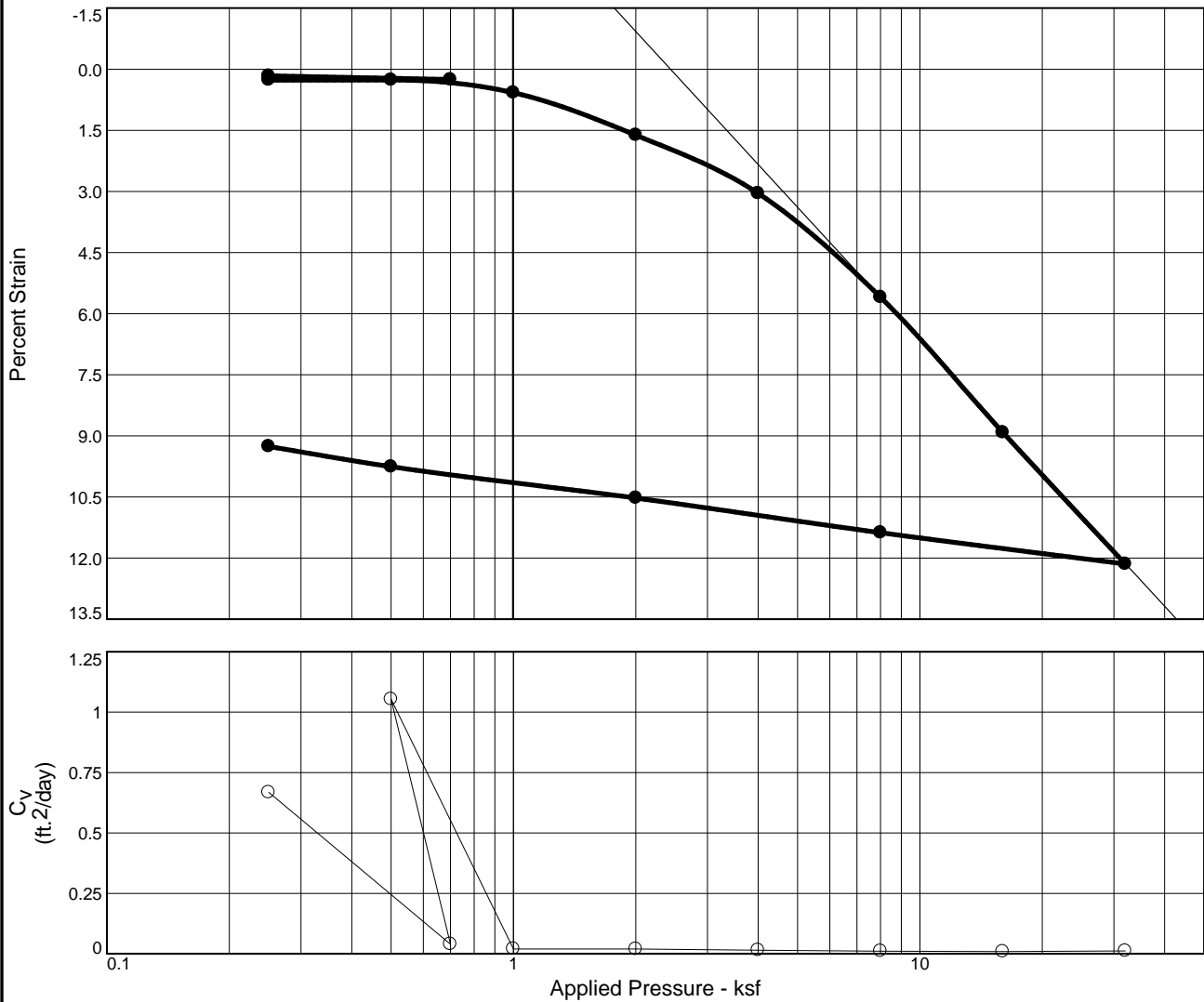
2/14/20
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/14/20
Date

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CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION										USCS	AASHTO		
Fat Clay with Sand (CH / A-7-5)										CH	A-7-5		
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
79	48	2.784	0.7	87.8	96.9	35.1 %	31.9 %	99.9 %	100.0 %	0.979	0.796	3.2	0.21
Preparation Process: ASTM D2435 - Sec. 9										D2435 Method	C_r	Swell Press. (ksf)	Swell %
Condition of Test: Unsaturated										B	0.05		
Project No. 1461-19-069 Client: RS&H Project: I-77 Panthers Interchange										Remarks: Checked By: Robert C. Bruorton, P.E. Title: Senior Engineer			
Loc.: Retaining Walls - UD-1 Depth: 4 - 6' Sample No.: RW-10													
S&ME, Inc. Greenville, SC													

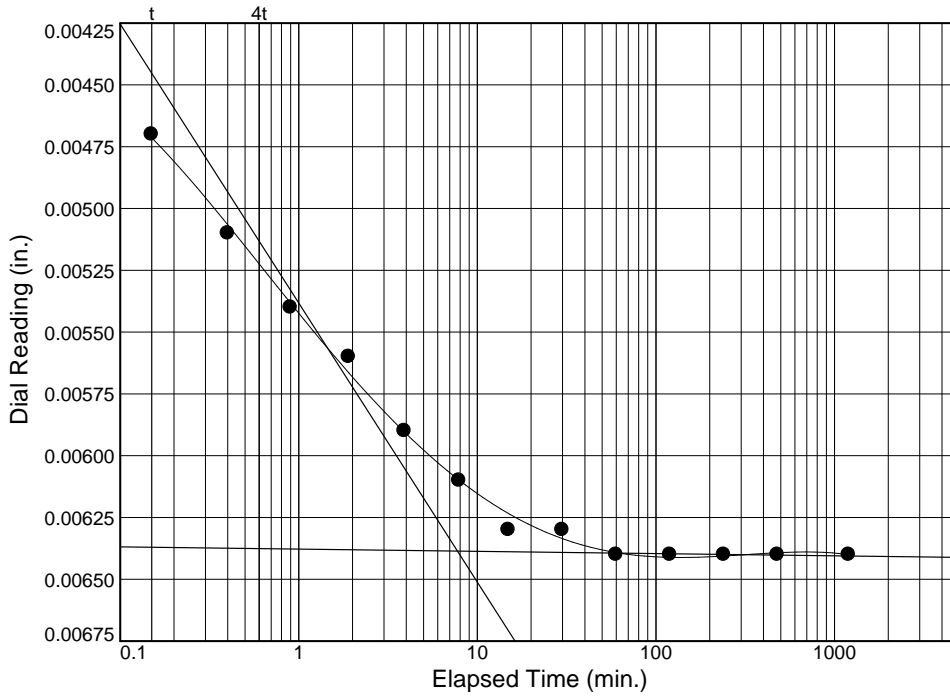
Figure 1

Tested By: Benjamin Kovaleski 2/16/20

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

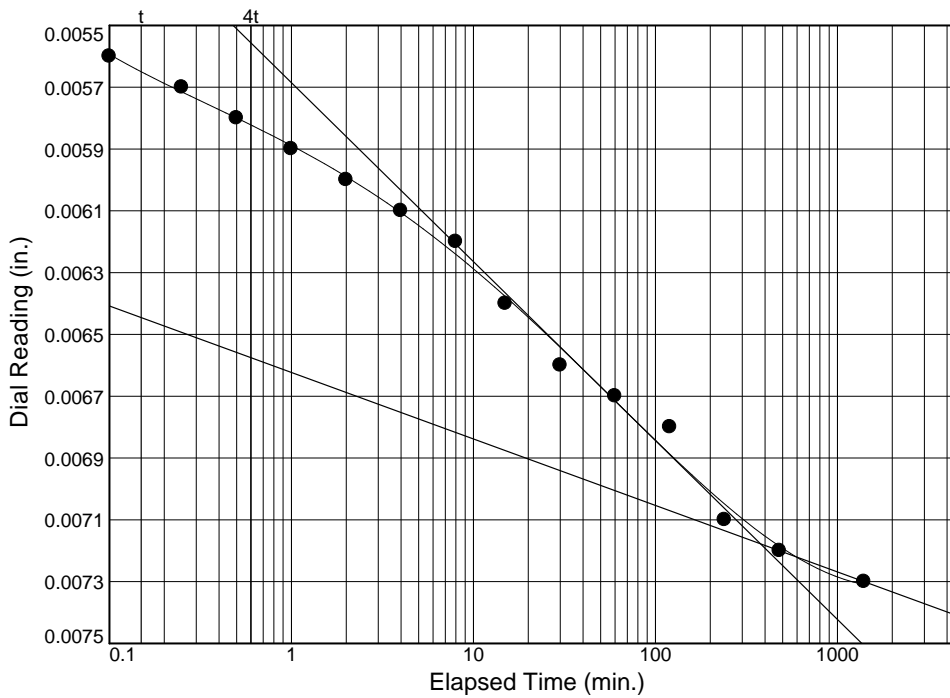
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 1
 Load= 0.25 ksf
 $D_0 = 0.0042$
 $D_{50} = 0.0053$
 $D_{100} = 0.0064$
 $T_{50} = 0.72 \text{ min.}$

$C_v @ T_{50}$
 0.668 ft.²/day

$C_\alpha = 0.000$



Load No.= 2
 Load= 0.70 ksf
 $D_0 = 0.0055$
 $D_{50} = 0.0063$
 $D_{100} = 0.0072$
 $T_{50} = 12.01 \text{ min.}$

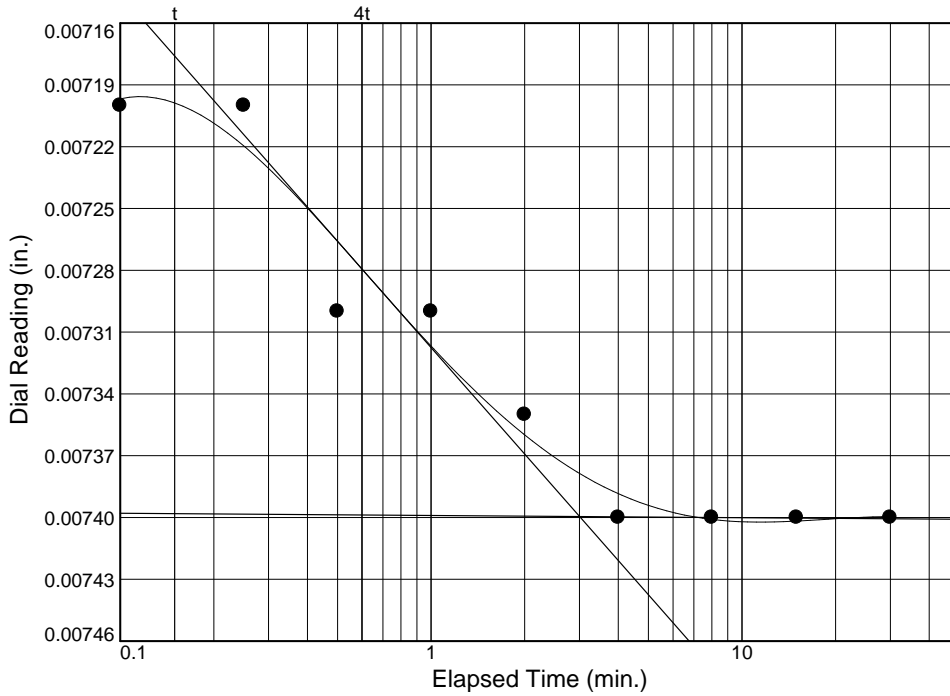
$C_v @ T_{50}$
 0.040 ft.²/day

$C_\alpha = 0.000$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

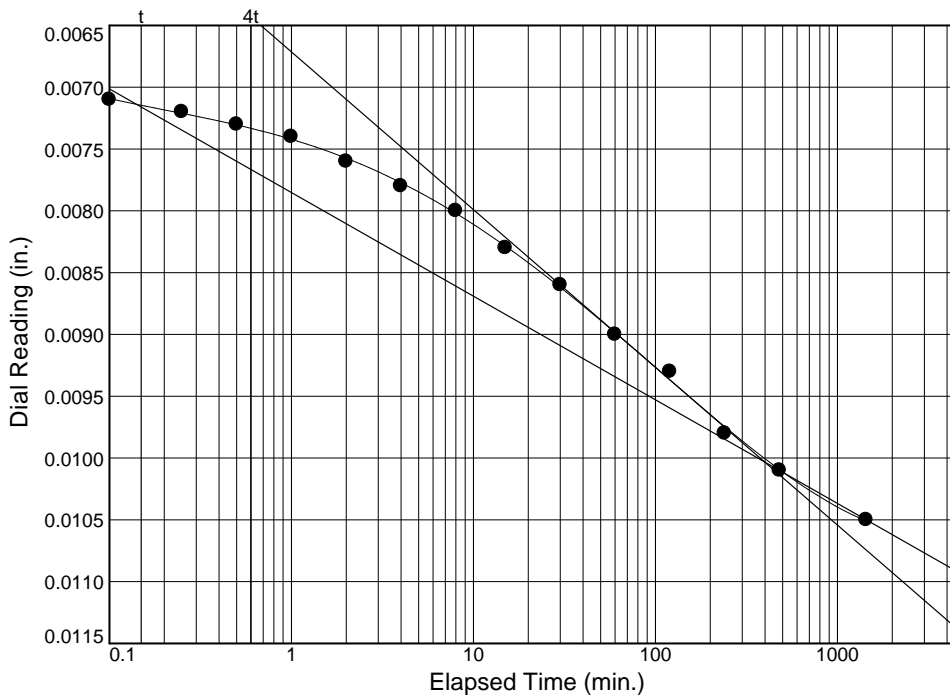
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 4
 Load= 0.50 ksf
 $D_0 = 0.0071$
 $D_{50} = 0.0073$
 $D_{100} = 0.0074$
 $T_{50} = 0.45 \text{ min.}$

$C_v @ T_{50}$
 1.053 ft.²/day

$C_\alpha = 0.000$



Load No.= 5
 Load= 1.00 ksf
 $D_0 = 0.0070$
 $D_{50} = 0.0085$
 $D_{100} = 0.0100$
 $T_{50} = 23.45 \text{ min.}$

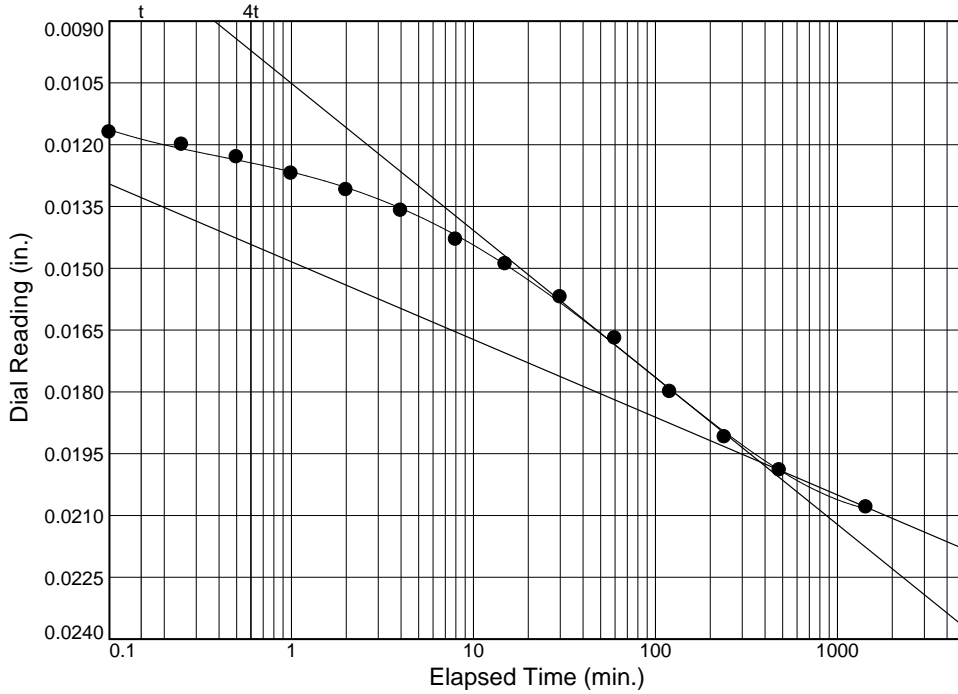
$C_v @ T_{50}$
 0.020 ft.²/day

$C_\alpha = 0.001$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

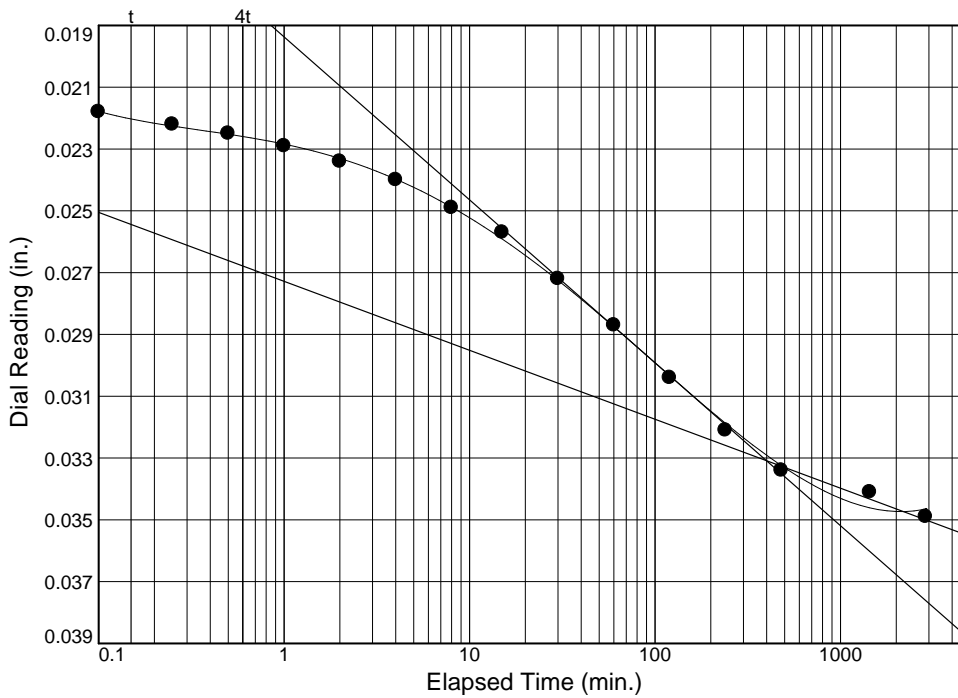
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 6
 Load= 2.00 ksf
 $D_0 = 0.0113$
 $D_{50} = 0.0155$
 $D_{100} = 0.0197$
 $T_{50} = 23.43 \text{ min.}$

$C_v @ T_{50}$
 0.020 ft.²/day

$C_\alpha = 0.002$



Load No.= 7
 Load= 4.00 ksf
 $D_0 = 0.0215$
 $D_{50} = 0.0273$
 $D_{100} = 0.0331$
 $T_{50} = 30.32 \text{ min.}$

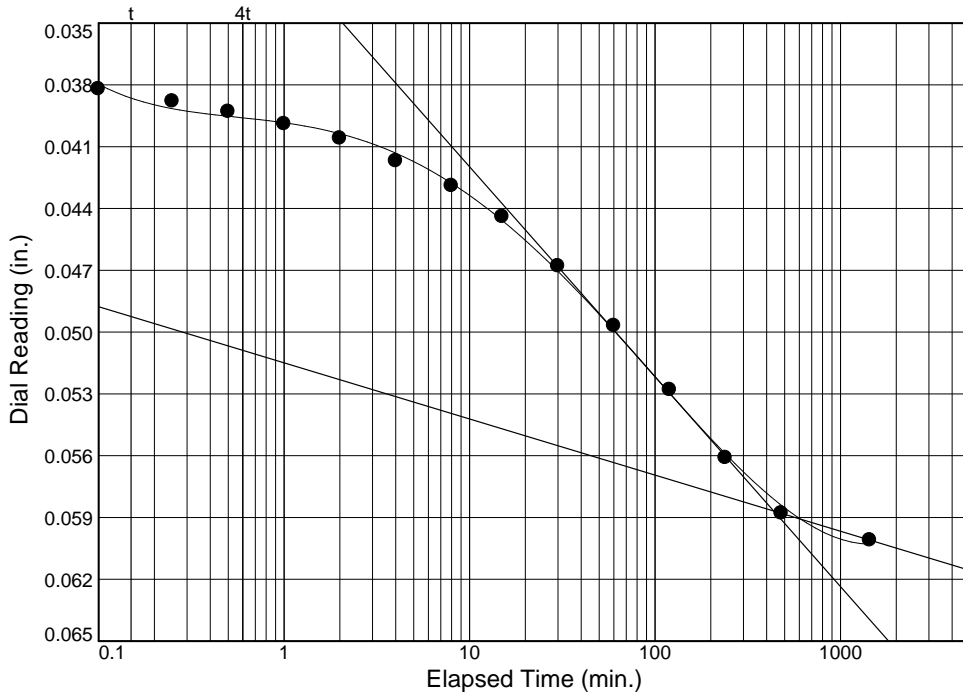
$C_v @ T_{50}$
 0.015 ft.²/day

$C_\alpha = 0.002$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

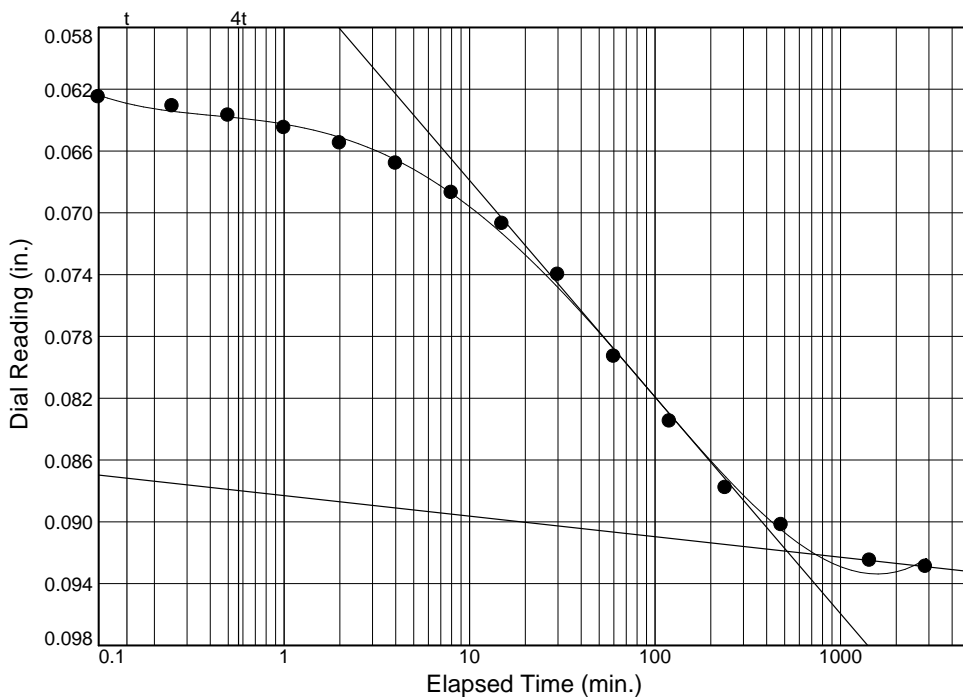
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 8
 Load= 8.00 ksf
 $D_0 = 0.0377$
 $D_{50} = 0.0482$
 $D_{100} = 0.0587$
 $T_{50} = 39.80 \text{ min.}$

$C_v @ T_{50}$
 0.011 ft.²/day

$C_\alpha = 0.003$



Load No.= 9
 Load= 16.00 ksf
 $D_0 = 0.0620$
 $D_{50} = 0.0769$
 $D_{100} = 0.0919$
 $T_{50} = 43.57 \text{ min.}$

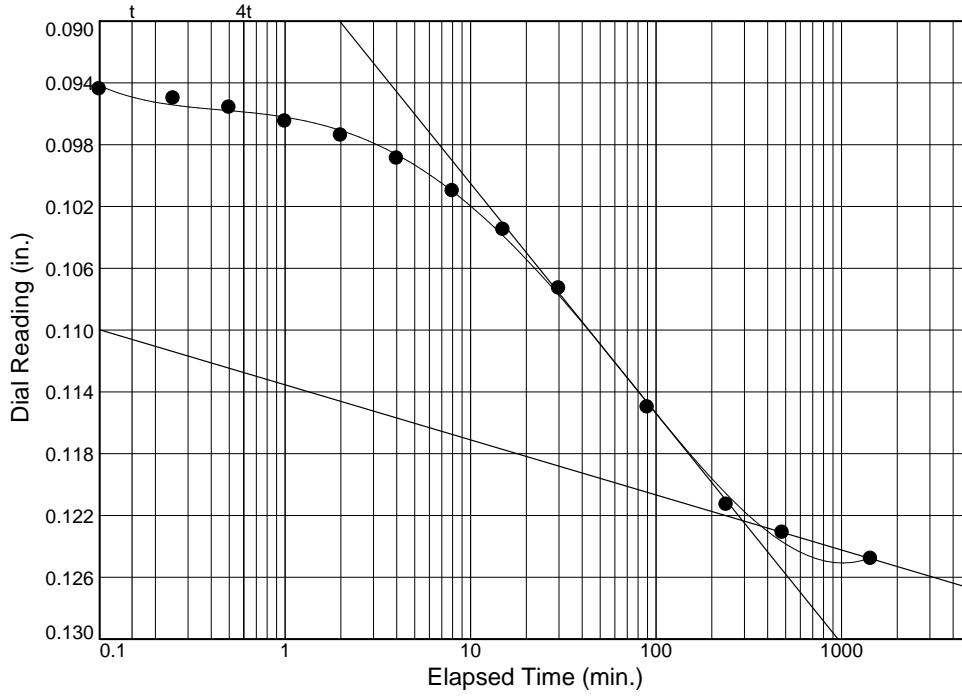
$C_v @ T_{50}$
 0.009 ft.²/day

$C_\alpha = 0.001$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 10
 Load= 32.00 ksf
 $D_0 = 0.0940$
 $D_{50} = 0.1081$
 $D_{100} = 0.1223$
 $T_{50} = 32.00$ min.

$C_v @ T_{50}$
 0.012 ft.²/day

$C_\alpha = 0.004$

CONSOLIDATION TEST DATA

8/11/2020

Client: RS&H
Project: I-77 Panthers Interchange
Project Number: 1461-19-069
Location: Retaining Walls - UD-1
Depth: 4 - 6'

Sample Number: RW-10

Material Description: Fat Clay with Sand (CH / A-7-5)

Sample Date: 1/09 & 1/14/20

Liquid Limit: 79

Plasticity Index: 48

USCS: CH

AASHTO: A-7-5

Preparation Process: ASTM D2435 - Sec. 9

Condition of Test: Unsaturated

Test Method: B

Final Density: 96.9

Figure No.: 1

Tested By: Benjamin Kovaleski 2/16/20 **Checked by:** Robert C. Bruorton, P.E. **Title:** Senior Engineer

Test Specimen Data

NATURAL MOISTURE		VOID RATIO		AFTER TEST	
Wet w+t =	155.28 g.	Spec. Gr. =	2.784	Wet w+t =	293.67 g.
Dry w+t =	114.92 g.	Est. Ht. Solids =	0.499 in.	Dry w+t =	257.95 g.
Tare Wt. =	0.00 g.	Init. V.R. =	0.979	Tare Wt. =	146.03 g.
Moisture =	35.1 %	Init. Sat. =	99.9 %	Moisture =	31.9 %
UNIT WEIGHT		TEST START		Dry Wt. = 111.92 g.	
Height =	0.988 in.	Height =	0.988 in.		
Diameter =	2.499 in.	Diameter =	2.499 in.		
Weight =	151.00 g.				
Dry Dens. =	87.8 pcf				

End-Of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	Deformation (in.)	C _v (ft. ² /day)	C _α	Void Ratio	% Strain
start	0.00480		0.00000			0.979	
0.25	0.00680	0.00040	0.00160	0.668	0.000	0.976	0.2 Compr.
0.70	0.00870	0.00140	0.00250	0.040	0.000	0.974	0.3 Compr.
0.25	0.00830	0.00090	0.00260			0.974	0.3 Compr.
0.50	0.00880	0.00140	0.00260	1.053	0.000	0.974	0.3 Compr.
1.00	0.01290	0.00240	0.00570	0.020	0.001	0.968	0.6 Compr.
2.00	0.02400	0.00320	0.01600	0.020	0.002	0.947	1.6 Compr.
4.00	0.03900	0.00410	0.03010	0.015	0.002	0.919	3.0 Compr.
8.00	0.06530	0.00520	0.05530	0.011	0.003	0.868	5.6 Compr.
16.00	0.09920	0.00630	0.08810	0.009	0.001	0.803	8.9 Compr.
32.00	0.13230	0.00750	0.12000	0.012	0.004	0.739	12.1 Compr.
8.00	0.12340	0.00620	0.11240			0.754	11.4 Compr.
2.00	0.11360	0.00480	0.10400			0.771	10.5 Compr.
0.50	0.10470	0.00350	0.09640			0.786	9.8 Compr.
0.25	0.09840	0.00210	0.09150			0.796	9.3 Compr.

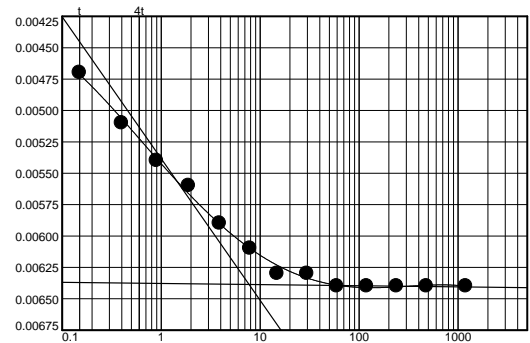
Compression index (C_c), ksf = 0.21 Preconsolidation pressure (P_p), ksf = 3.2 Void ratio at P_p (e_m) = 0.930
Overburden (σ_{vo}), ksf = 0.7 Void ratio at σ_{vo} (e_o) = 0.974 Recompression index (C_r) = 0.05

Pressure: 0.25 ksf

TEST READINGS

Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	.1	0.00480	11	120	0.00680
2	.25	0.00510	12	240	0.00680
3	.5	0.00550	13	480	0.00680
4	1	0.00580	14	1200	0.00680
5	2	0.00600			
6	4	0.00630			
7	8	0.00650			
8	15	0.00670			
9	30	0.00670			
10	60	0.00680			



Void Ratio = 0.976 Compression = 0.2%

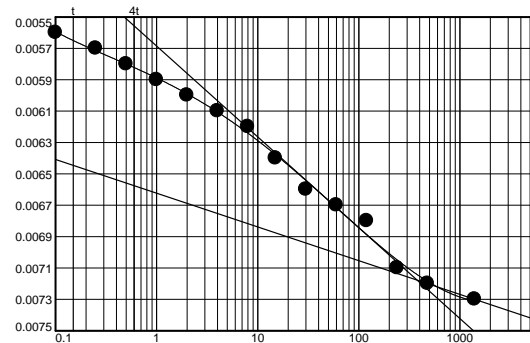
$D_0 = 0.0042$ $D_{50} = 0.0053$ $D_{100} = 0.0064$ C_v at 0.72 min. = 0.668 ft.²/day $C_\alpha = 0.000$

Pressure: 0.70 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.00680	11	60	0.00810
2	.1	0.00700	12	120	0.00820
3	.25	0.00710	13	240	0.00850
4	.5	0.00720	14	480	0.00860
5	1	0.00730	15	1400	0.00870
6	2	0.00740			
7	4	0.00750			
8	8	0.00760			
9	15	0.00780			
10	30	0.00800			



Void Ratio = 0.974 Compression = 0.3%

$D_0 = 0.0055$ $D_{50} = 0.0063$ $D_{100} = 0.0072$ C_v at 12.01 min. = 0.040 ft.²/day $C_\alpha = 0.000$

Pressure: 0.25 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading
1	0	0.00870
2	(final)	0.00830

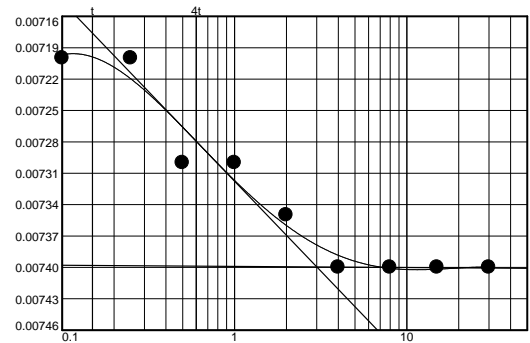
Void Ratio = 0.974 Compression = 0.3%

Pressure: 0.50 ksf

TEST READINGS

Load No. 4

No.	Elapsed Time	Dial Reading
1	0	0.00830
2	.1	0.00860
3	.25	0.00860
4	.5	0.00870
5	1	0.00870
6	2	0.00875
7	4	0.00880
8	8	0.00880
9	15	0.00880
10	30	0.00880



Void Ratio = 0.974 Compression = 0.3%

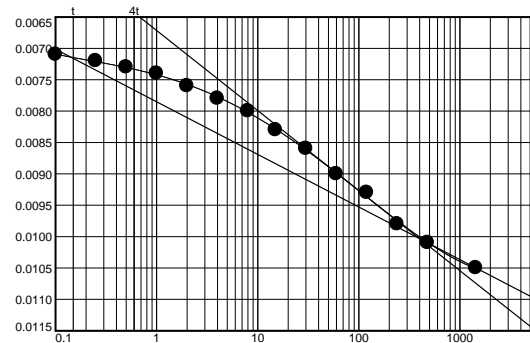
$D_0 = 0.0071$ $D_{50} = 0.0073$ $D_{100} = 0.0074$ C_v at 0.45 min. = 1.053 ft.²/day $C_\alpha = 0.000$

Pressure: 1.00 ksf

TEST READINGS

Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.00880	11	60	0.01140
2	.1	0.00950	12	120	0.01170
3	.25	0.00960	13	240	0.01220
4	.5	0.00970	14	480	0.01250
5	1	0.00980	15	1440	0.01290
6	2	0.01000			
7	4	0.01020			
8	8	0.01040			
9	15	0.01070			
10	30	0.01100			



Void Ratio = 0.968 Compression = 0.6%

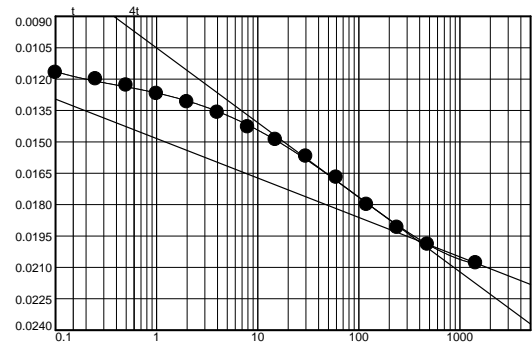
$D_0 = 0.0070$ $D_{50} = 0.0085$ $D_{100} = 0.0100$ C_v at 23.45 min. = 0.020 ft.²/day $C_\alpha = 0.001$

Pressure: 2.00 ksf

TEST READINGS

Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.01290	11	60	0.01990
2	.1	0.01490	12	120	0.02120
3	.25	0.01520	13	240	0.02230
4	.5	0.01550	14	480	0.02310
5	1.0	0.01590	15	1440	0.02400
6	2	0.01630			
7	4	0.01680			
8	8	0.01750			
9	15	0.01810			
10	30	0.01890			



Void Ratio = 0.947 Compression = 1.6%

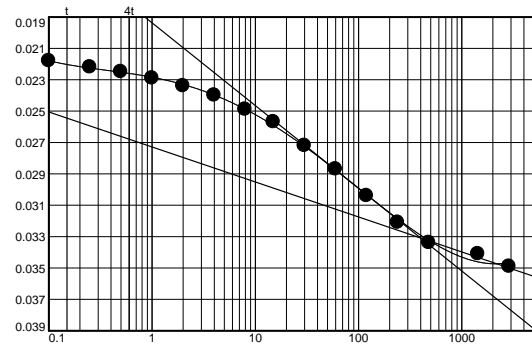
$D_0 = 0.0113$ $D_{50} = 0.0155$ $D_{100} = 0.0197$ C_v at 23.43 min. = 0.020 ft.²/day $C_\alpha = 0.002$

Pressure: 4.00 ksf

TEST READINGS

Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.02400	11	60	0.03280
2	.1	0.02590	12	120	0.03450
3	.25	0.02630	13	240	0.03620
4	.5	0.02660	14	480	0.03750
5	1.0	0.02700	15	1440	0.03820
6	2.0	0.02750	16	2880	0.03900
7	4	0.02810			
8	8.0	0.02900			
9	15	0.02980			
10	30	0.03130			



Void Ratio = 0.919 Compression = 3.0%

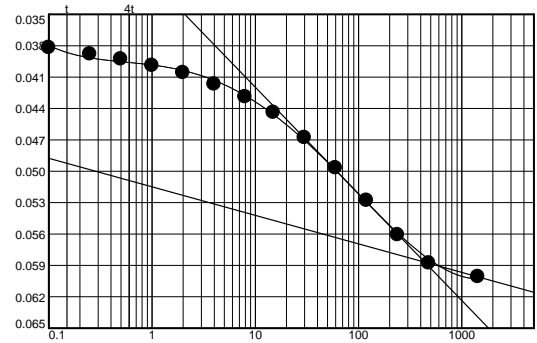
$D_0 = 0.0215$ $D_{50} = 0.0273$ $D_{100} = 0.0331$ C_v at 30.32 min. = 0.015 ft.²/day $C_\alpha = 0.002$

Pressure: 8.00 ksf

TEST READINGS

Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.03900	11	60	0.05490
2	.1	0.04340	12	120	0.05800
3	.25	0.04400	13	240	0.06130
4	.5	0.04450	14	480	0.06400
5	1.0	0.04510	15	1440	0.06530
6	2.0	0.04580			
7	4	0.04690			
8	8	0.04810			
9	15	0.04960			
10	30	0.05200			



Void Ratio = 0.868 Compression = 5.6%

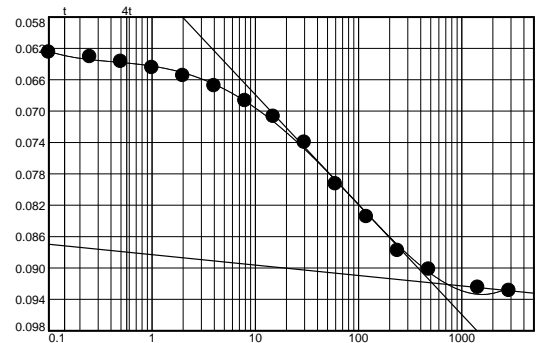
$D_0 = 0.0377$ $D_{50} = 0.0482$ $D_{100} = 0.0587$ C_v at 39.80 min. = 0.011 ft.²/day $C_\alpha = 0.003$

Pressure: 16.00 ksf

TEST READINGS

Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.06530	11	60	0.08560
2	.1	0.06880	12	120	0.08980
3	.25	0.06940	13	240	0.09410
4	.5	0.07000	14	480	0.09650
5	1	0.07080	15	1440	0.09880
6	2	0.07180	16	2880	0.09920
7	4	0.07310			
8	8	0.07500			
9	15	0.07700			
10	30	0.08030			



Void Ratio = 0.803 Compression = 8.9%

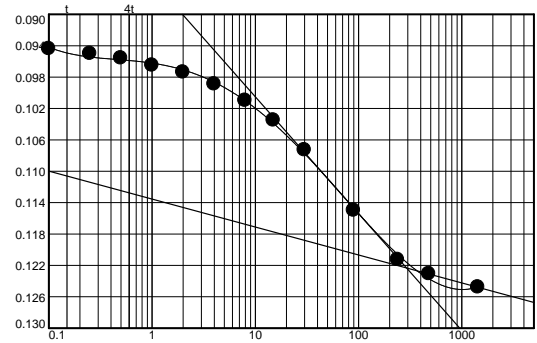
$D_0 = 0.0620$ $D_{50} = 0.0769$ $D_{100} = 0.0919$ C_v at 43.57 min. = 0.009 ft.²/day $C_\alpha = 0.001$

Pressure: 32.00 ksf

TEST READINGS

Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.09920	11	90	0.12250
2	.1	0.10190	12	240	0.12880
3	.25	0.10250	13	480	0.13060
4	.5	0.10310	14	1440	0.13230
5	1.0	0.10400			
6	2.0	0.10490			
7	4.0	0.10640			
8	8.0	0.10850			
9	15	0.11100			
10	30	0.11480			



Void Ratio = 0.739 Compression = 12.1%

$D_0 = 0.0940$ $D_{50} = 0.1081$ $D_{100} = 0.1223$ C_v at 32.00 min. = 0.012 ft.²/day $C_\alpha = 0.004$

Pressure: 8.00 ksf

TEST READINGS

Load No. 11

No.	Elapsed Time	Dial Reading
1	0	0.13230
2	(final)	0.12340

Void Ratio = 0.754 Compression = 11.4%

Pressure: 2.00 ksf

TEST READINGS

Load No. 12

No.	Elapsed Time	Dial Reading
1	0	0.12340
2	(final)	0.11360

Void Ratio = 0.771 Compression = 10.5%

Pressure: 0.50 ksf

TEST READINGS

Load No. 13

No.	Elapsed Time	Dial Reading
1	0	0.11360
2	(final)	0.10470

Void Ratio = 0.786 Compression = 9.8%

Pressure: 0.25 ksf

TEST READINGS

Load No. 14

No.	Elapsed Time	Dial Reading
1	0	0.10470
2	(final)	0.09840

Void Ratio = 0.796 Compression = 9.3%

SIEVE ANALYSIS OF SOIL



Single sieve set

ASTM D6913

S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607			
Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/04 - 2/13/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #:	UD-2
		Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed
		Depth:	10 - 11.2'
Sample Description:	Silty Sand (SM / A-2-4)		



LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



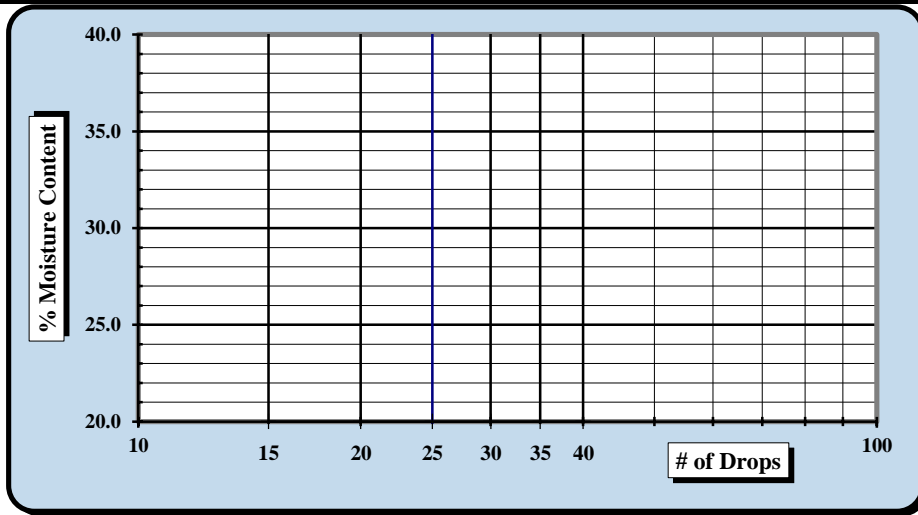
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/13/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #:	UD-2
		Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed
		Depth:	10 - 11.2'

Sample Description: Silty Sand (SM / A-2-4)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	13942	9/10/2019	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/7/2019			

Pan #		Liquid Limit				Plastic Limit		
Tare #:								
A	Tare Weight							
B	Wet Soil Weight + A							
C	Dry Soil Weight + A							
D	Water Weight (B-C)							
E	Dry Soil Weight (C-A)							
F	% Moisture (D/E)*100							
N	# OF DROPS					Moisture Contents determined by AASHTO T 265		
LL	LL = F * FACTOR							
Ave.	Average							



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol

Multipoint Method

One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 30.2%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T89: Determining the Liquid Limit of Soils

Benjamin Kovaleski
Technician Name

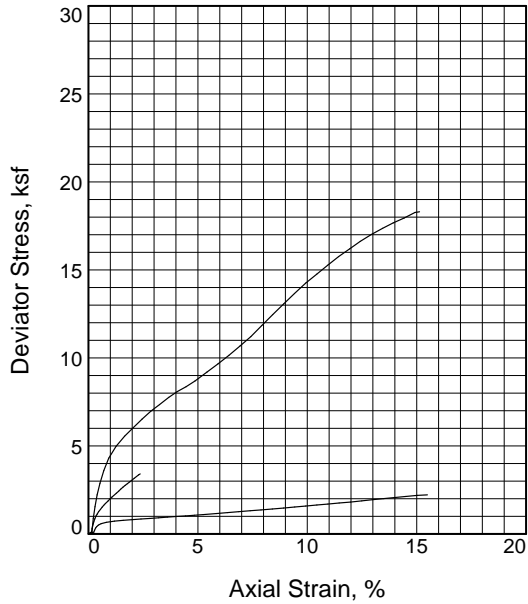
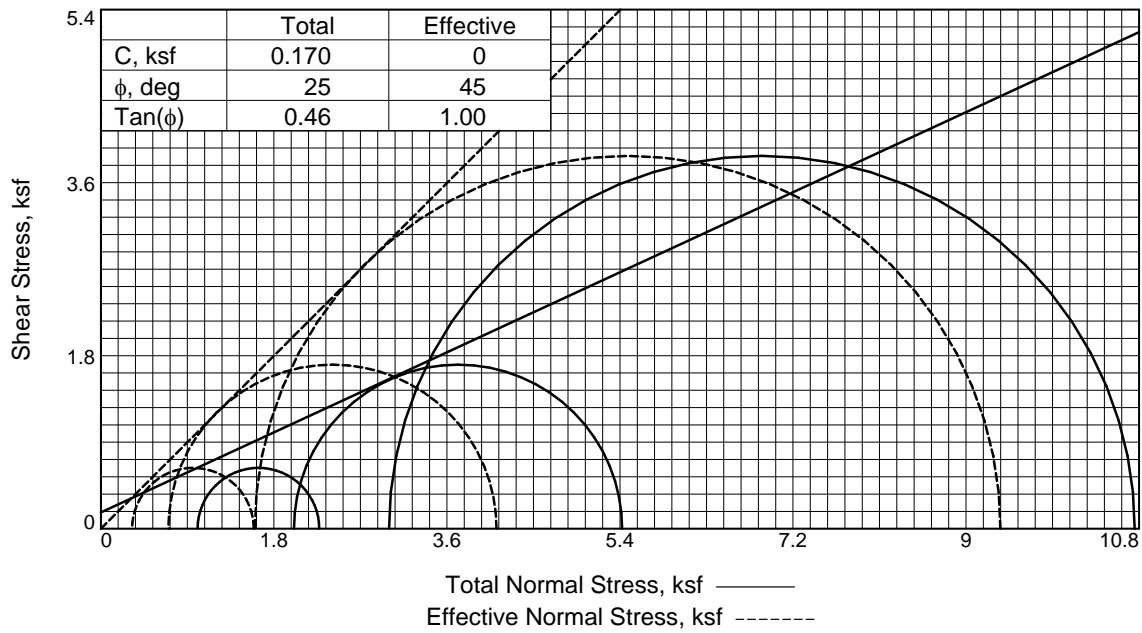
2/14/20
Date

Robert C. Bruorton, P.E.
Technical Responsibility

2/14/20
Date

This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.



Specimen No.		1	2	3
Initial	Water Content, %	15.8	15.2	15.2
	Dry Density, pcf	111.1	120.4	120.1
	Saturation, %	78.7	96.6	95.8
	Void Ratio	0.5555	0.4357	0.4392
	Diameter, in.	2.852	2.863	2.900
At Test	Height, in.	5.562	5.650	5.520
	Water Content, %	18.0	13.8	13.8
	Dry Density, pcf	115.4	124.9	123.6
	Saturation, %	100.5	99.6	96.0
	Void Ratio	0.4970	0.3835	0.3978
Strain rate, %/min.	Diameter, in.	2.817	2.831	2.858
	Height, in.	5.485	5.570	5.520
	Eff. Cell Pressure, ksf	0.34	0.35	0.33
	Fail. Stress, ksf	1.007	2.009	2.998
	Total Pore Pr., ksf	1.265	3.414	7.757
Ult. Stress, ksf	Strain, %	8.601	9.226	9.317
	Total Pore Pr., ksf	6.9	2.4	3.7
	Strain, %	2.225	3.414	18.303
	Strain, %	8.291	9.226	5.623
	Strain, %	15.5	2.4	15.1
$\bar{\sigma}_1$ Failure, ksf		1.590	4.116	9.358
$\bar{\sigma}_3$ Failure, ksf		0.325	0.702	1.601

Type of Test:

CU with Pore Pressures

Sample Type: Undisturbed

Description: Silty Sand (SM / A-2-4)

LL= N/A

PI= NP

Specific Gravity= 2.768

Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767. Due to lack of recovery, a staged specimen was performed on specimen #2. See Figure 1

Client: RS&H

Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-2

Sample Number: RW-10

Depth: 10 - 11.2'

Proj. No.: 1461-19-069

Date Sampled: 1/09 & 1/14/20

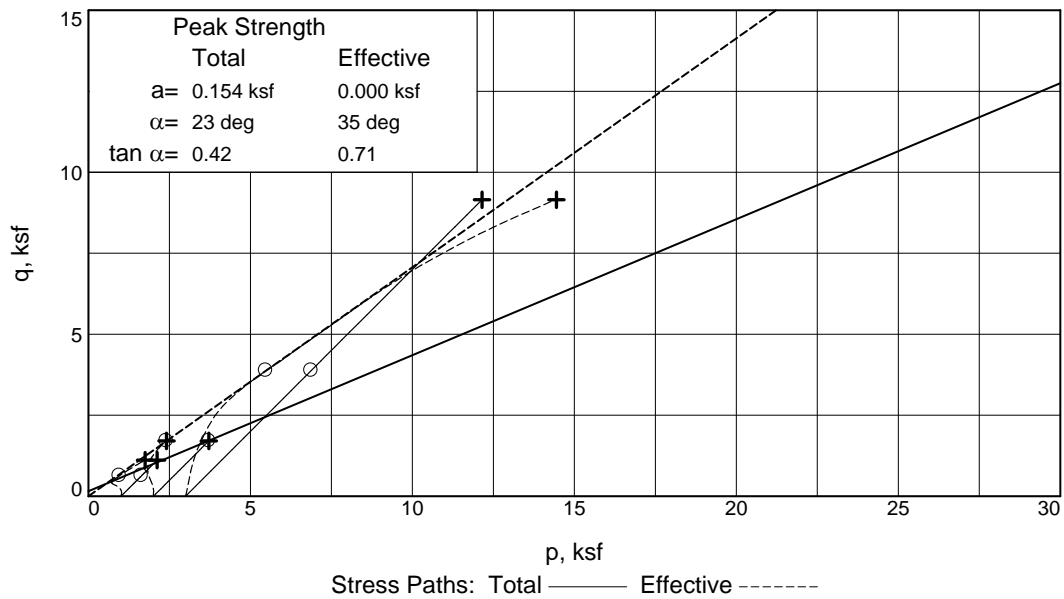
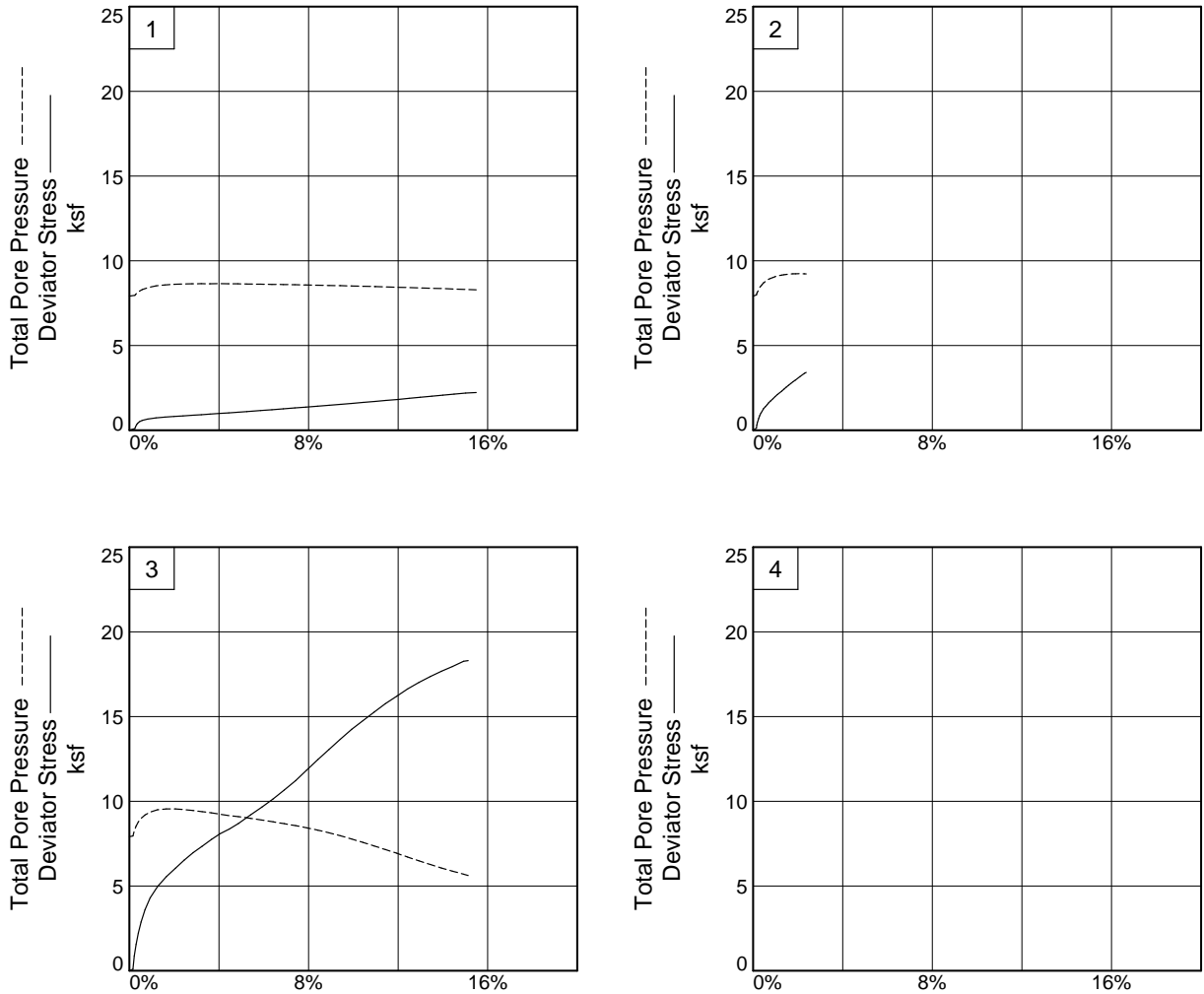
TRIAXIAL SHEAR TEST REPORT

S&ME, Inc.

Greenville, SC

Tested By: Benjamin Kovalski - 2/14/20 **Checked By:** Robert C. Bruorton, P.E.

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.



Client: RS&H

Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-2

Project No.: 1461-19-069

Depth: 10 - 11.2'

Figure 2

Sample Number: RW-10

S&ME, Inc.

Tested By: Benjamin Kovaleski - 2/14/20 **Checked By:** Robert C. Bruorton, P.E.

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

8/11/2020
9:16 AM

Date: 1/09 & 1/14/20
Client: RS&H
Project: I-77 Panthers Interchange
Project No.: 1461-19-069
Location: Retaining Walls - UD-2
Depth: 10 - 11.2' **Sample Number:** RW-10
Description: Silty Sand (SM / A-2-4)
Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767. Due to lack of recovery, a staged specimen was performed on specimen #2. See photographs.
Type of Sample: Undisturbed
Specific Gravity=2.768 **LL**=N/A **PL**= **PI**=NP
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	22.940			1214.580
Moisture content: Dry soil+tare, gms.	19.810			1028.960
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.8	18.7	18.0	18.0
Moist specimen weight, gms.	1199.87			
Diameter, in.	2.852	2.827	2.817	
Area, in. ²	6.388	6.275	6.235	
Height, in.	5.562	5.513	5.485	
Net decrease in height, in.		0.049	0.028	
Net decrease in water volume, cc.			6.500	
Wet density, pcf	128.6	135.4	136.3	
Dry density, pcf	111.1	114.1	115.4	
Void ratio	0.5555	0.5144	0.4970	
Saturation, %	78.7	100.5	100.5	

Test Readings for Specimen No. 1

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 61.990 psi (8.927 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 1.007 ksf
Strain rate, %/min. = 0.34
Fail. Stress = 1.265 ksf at reading no. 21
Ult. Stress = 2.225 ksf at reading no. 38

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	1.007	1.007	1.00	55.000	1.007	0.000
1	0.0135	4.440	4.4	0.2	0.102	0.966	1.068	1.11	55.284	1.017	0.051
2	0.0153	9.316	9.3	0.3	0.215	0.916	1.131	1.23	55.626	1.024	0.107
3	0.0179	14.929	14.9	0.3	0.344	0.841	1.185	1.41	56.150	1.013	0.172
4	0.0208	18.375	18.4	0.4	0.423	0.782	1.205	1.54	56.557	0.994	0.211
5	0.0247	21.870	21.9	0.5	0.503	0.712	1.215	1.71	57.044	0.964	0.251
6	0.0316	25.453	25.5	0.6	0.585	0.624	1.208	1.94	57.660	0.916	0.292
7	0.0447	28.957	29.0	0.8	0.663	0.515	1.179	2.29	58.411	0.847	0.332
8	0.0652	32.038	32.0	1.2	0.731	0.408	1.139	2.79	59.157	0.773	0.366
9	0.0869	34.212	34.2	1.6	0.778	0.349	1.127	3.23	59.564	0.738	0.389
10	0.1095	36.020	36.0	2.0	0.815	0.314	1.130	3.59	59.806	0.722	0.408
11	0.1317	37.726	37.7	2.4	0.850	0.294	1.145	3.89	59.947	0.719	0.425
12	0.1534	39.351	39.4	2.8	0.883	0.283	1.166	4.12	60.026	0.725	0.442
13	0.1761	41.065	41.1	3.2	0.918	0.278	1.196	4.30	60.060	0.737	0.459
14	0.1977	43.037	43.0	3.6	0.958	0.279	1.237	4.44	60.054	0.758	0.479
15	0.2209	44.852	44.9	4.0	0.994	0.275	1.269	4.61	60.079	0.772	0.497
16	0.2434	46.589	46.6	4.4	1.028	0.282	1.311	4.64	60.029	0.797	0.514
17	0.2655	48.429	48.4	4.8	1.064	0.286	1.350	4.73	60.007	0.818	0.532
18	0.2878	50.450	50.5	5.2	1.104	0.294	1.398	4.75	59.947	0.846	0.552
19	0.3211	53.456	53.5	5.9	1.162	0.309	1.471	4.77	59.846	0.890	0.581
20	0.3490	55.995	56.0	6.4	1.211	0.320	1.531	4.78	59.767	0.926	0.606
21	0.3771	58.817	58.8	6.9	1.265	0.325	1.590	4.89	59.731	0.958	0.633
22	0.4053	61.642	61.6	7.4	1.319	0.339	1.658	4.89	59.634	0.999	0.659
23	0.4326	64.390	64.4	7.9	1.370	0.354	1.724	4.87	59.532	1.039	0.685
24	0.4608	67.144	67.1	8.4	1.421	0.369	1.790	4.85	59.426	1.079	0.710
25	0.4891	70.086	70.1	8.9	1.474	0.385	1.860	4.83	59.315	1.122	0.737
26	0.5172	73.110	73.1	9.4	1.529	0.394	1.923	4.89	59.256	1.158	0.765
27	0.5445	76.049	76.0	9.9	1.582	0.410	1.992	4.86	59.144	1.201	0.791
28	0.5726	79.417	79.4	10.4	1.643	0.428	2.071	4.84	59.020	1.249	0.821
29	0.6004	82.753	82.8	10.9	1.702	0.445	2.147	4.83	58.900	1.296	0.851
30	0.6284	85.987	86.0	11.5	1.759	0.466	2.224	4.78	58.755	1.345	0.879
31	0.6570	89.351	89.4	12.0	1.817	0.487	2.304	4.73	58.605	1.396	0.908
32	0.6851	93.192	93.2	12.5	1.884	0.502	2.385	4.75	58.506	1.444	0.942
33	0.7124	96.988	97.0	13.0	1.949	0.526	2.476	4.70	58.334	1.501	0.975
34	0.7404	100.539	100.5	13.5	2.009	0.550	2.559	4.65	58.172	1.554	1.004
35	0.7679	104.217	104.2	14.0	2.070	0.566	2.636	4.66	58.059	1.601	1.035
36	0.7953	107.999	108.0	14.5	2.133	0.595	2.728	4.58	57.857	1.662	1.066
37	0.8239	111.749	111.7	15.0	2.193	0.613	2.806	4.58	57.735	1.709	1.097
38	0.8496	113.988	114.0	15.5	2.225	0.636	2.861	4.50	57.573	1.749	1.113

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	53.280			1362.300
Moisture content: Dry soil+tare, gms.	46.250			1197.140
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.2	14.7	13.8	13.8
Moist specimen weight, gms.	1323.80			
Diameter, in.	2.863	2.845	2.831	
Area, in. ²	6.438	6.357	6.293	
Height, in.	5.650	5.615	5.570	
Net decrease in height, in.		0.035	0.045	
Net decrease in water volume, cc.			10.600	
Wet density, pcf	138.6	140.7	142.1	
Dry density, pcf	120.4	122.6	124.9	
Void ratio	0.4357	0.4091	0.3835	
Saturation, %	96.6	99.6	99.6	

Test Readings for Specimen No. 2

Membrane modulus = 0.14 kN/cm²

Membrane thickness = 0.03 cm

Consolidation cell pressure = 68.950 psi (9.929 ksf)

Consolidation back pressure = 55.000 psi (7.920 ksf)

Consolidation effective confining stress = 2.009 ksf

Strain rate, %/min. = 0.35

Fail. Stress = 3.414 ksf at reading no. 26

Ult. Stress = 3.414 ksf at reading no. 26

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	2.009	2.009	1.00	55.000	2.009	0.000
1	0.0082	5.558	5.6	0.1	0.127	1.943	2.070	1.07	55.460	2.006	0.064
2	0.0091	13.479	13.5	0.2	0.308	1.858	2.166	1.17	56.048	2.012	0.154
3	0.0104	19.855	19.9	0.2	0.454	1.779	2.232	1.25	56.599	2.005	0.227
4	0.0123	25.575	25.6	0.2	0.584	1.700	2.284	1.34	57.142	1.992	0.292
5	0.0136	30.454	30.5	0.2	0.695	1.630	2.325	1.43	57.633	1.977	0.348
6	0.0163	37.976	38.0	0.3	0.866	1.511	2.378	1.57	58.455	1.944	0.433
7	0.0191	44.182	44.2	0.3	1.008	1.412	2.420	1.71	59.143	1.916	0.504
8	0.0220	49.249	49.2	0.4	1.123	1.329	2.452	1.84	59.719	1.891	0.561
9	0.0258	55.819	55.8	0.5	1.271	1.227	2.498	2.04	60.432	1.862	0.636
10	0.0306	61.513	61.5	0.5	1.400	1.144	2.544	2.22	61.008	1.844	0.700
11	0.0348	66.748	66.7	0.6	1.518	1.074	2.592	2.41	61.493	1.833	0.759
12	0.0387	71.593	71.6	0.7	1.627	1.015	2.642	2.60	61.899	1.829	0.813
13	0.0433	76.208	76.2	0.8	1.730	0.965	2.696	2.79	62.246	1.831	0.865
14	0.0494	82.020	82.0	0.9	1.860	0.909	2.769	3.05	62.637	1.839	0.930
15	0.0546	87.692	87.7	1.0	1.987	0.862	2.849	3.30	62.961	1.856	0.994
16	0.0603	93.122	93.1	1.1	2.108	0.824	2.932	3.56	63.226	1.878	1.054
17	0.0711	102.338	102.3	1.3	2.312	0.773	3.085	3.99	63.582	1.929	1.156
18	0.0767	107.566	107.6	1.4	2.428	0.751	3.179	4.23	63.732	1.965	1.214
19	0.0819	112.625	112.6	1.5	2.539	0.734	3.273	4.46	63.853	2.004	1.270
20	0.0877	117.668	117.7	1.6	2.650	0.720	3.370	4.68	63.952	2.045	1.325
21	0.0932	122.541	122.5	1.7	2.757	0.707	3.464	4.90	64.040	2.086	1.379
22	0.0990	127.238	127.2	1.8	2.860	0.699	3.558	5.09	64.099	2.129	1.430

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.1052	132.063	132.1	1.9	2.965	0.693	3.658	5.28	64.137	2.176	1.483
24	0.1163	141.193	141.2	2.1	3.164	0.689	3.853	5.59	64.163	2.271	1.582
25	0.1275	150.140	150.1	2.3	3.357	0.694	4.052	5.83	64.127	2.373	1.679
26	0.1319	152.785	152.8	2.4	3.414	0.702	4.116	5.86	64.072	2.409	1.707

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	53.280			1362.300
Moisture content: Dry soil+tare, gms.	46.250			1197.140
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.2	15.3	13.8	13.8
Moist specimen weight, gms.	1323.80			
Diameter, in.	2.900	2.900	2.858	
Area, in. ²	6.605	6.605	6.415	
Height, in.	5.520	5.520	5.520	
Net decrease in height, in.		0.000	0.000	
Net decrease in water volume, cc.			17.200	
Wet density, pcf	138.3	138.4	140.7	
Dry density, pcf	120.1	120.1	123.6	
Void ratio	0.4392	0.4392	0.3978	
Saturation, %	95.8	96.4	96.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.14 kN/cm²

Membrane thickness = 0.03 cm

Consolidation cell pressure = 75.820 psi (10.918 ksf)

Consolidation back pressure = 55.000 psi (7.920 ksf)

Consolidation effective confining stress = 2.998 ksf

Strain rate, %/min. = 0.33

Fail. Stress = 7.757 ksf at reading no. 14

Ult. Stress = 18.303 ksf at reading no. 38

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	2.998	2.998	1.00	55.000	2.998	0.000
1	0.0089	4.361	4.4	0.2	0.098	2.964	3.061	1.03	55.239	3.013	0.049
2	0.0121	38.899	38.9	0.2	0.871	2.656	3.527	1.33	57.374	3.092	0.436
3	0.0164	69.291	69.3	0.3	1.551	2.383	3.934	1.65	59.268	3.159	0.775
4	0.0219	99.550	99.5	0.4	2.226	2.134	4.360	2.04	61.001	3.247	1.113
5	0.0289	128.786	128.8	0.5	2.876	1.921	4.797	2.50	62.477	3.359	1.438
6	0.0386	161.644	161.6	0.7	3.603	1.722	5.325	3.09	63.860	3.524	1.802
7	0.0511	193.474	193.5	0.9	4.303	1.551	5.854	3.77	65.046	3.703	2.151
8	0.0698	224.744	224.7	1.3	4.981	1.416	6.397	4.52	65.988	3.906	2.491
9	0.0912	251.539	251.5	1.7	5.553	1.363	6.916	5.07	66.354	4.140	2.777
10	0.1133	275.230	275.2	2.1	6.051	1.369	7.420	5.42	66.313	4.395	3.026
11	0.1351	298.042	298.0	2.4	6.526	1.405	7.932	5.64	66.061	4.669	3.263
12	0.1571	319.809	319.8	2.8	6.974	1.461	8.435	5.77	65.675	4.948	3.487
13	0.1795	338.345	338.3	3.3	7.348	1.527	8.875	5.81	65.217	5.201	3.674
14	0.2024	358.706	358.7	3.7	7.757	1.601	9.358	5.84	64.700	5.480	3.878

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
15	0.2236	375.500	375.5	4.0	8.088	1.682	9.770	5.81	64.138	5.726	4.044
16	0.2464	389.931	389.9	4.5	8.362	1.761	10.123	5.75	63.593	5.942	4.181
17	0.2688	407.179	407.2	4.9	8.695	1.824	10.519	5.77	63.153	6.172	4.347
18	0.2990	433.352	433.4	5.4	9.201	1.921	11.122	5.79	62.479	6.521	4.600
19	0.3267	457.324	457.3	5.9	9.658	2.023	11.681	5.77	61.771	6.852	4.829
20	0.3542	482.838	482.8	6.4	10.143	2.127	12.270	5.77	61.046	7.199	5.071
21	0.3817	510.455	510.5	6.9	10.666	2.238	12.904	5.77	60.276	7.571	5.333
22	0.4096	539.730	539.7	7.4	11.216	2.352	13.569	5.77	59.484	7.961	5.608
23	0.4373	573.153	573.2	7.9	11.847	2.479	14.326	5.78	58.604	8.402	5.923
24	0.4648	606.295	606.3	8.4	12.464	2.620	15.084	5.76	57.624	8.852	6.232
25	0.4922	638.779	638.8	8.9	13.060	2.776	15.836	5.71	56.544	9.306	6.530
26	0.5198	671.923	671.9	9.4	13.663	2.948	16.611	5.63	55.345	9.780	6.831
27	0.5479	704.893	704.9	9.9	14.252	3.140	17.393	5.54	54.012	10.267	7.126
28	0.5757	733.975	734.0	10.4	14.757	3.344	18.101	5.41	52.599	10.722	7.379
29	0.6034	763.487	763.5	10.9	15.265	3.553	18.818	5.30	51.143	11.186	7.632
30	0.6309	792.620	792.6	11.4	15.759	3.764	19.523	5.19	49.681	11.643	7.879
31	0.6589	819.596	819.6	11.9	16.202	3.982	20.184	5.07	48.168	12.083	8.101
32	0.6856	845.651	845.7	12.4	16.625	4.205	20.830	4.95	46.616	12.518	8.312
33	0.7138	870.758	870.8	12.9	17.019	4.431	21.449	4.84	45.052	12.940	8.509
34	0.7420	893.854	893.9	13.4	17.368	4.648	22.016	4.74	43.540	13.332	8.684
35	0.7689	914.720	914.7	13.9	17.673	4.850	22.523	4.64	42.137	13.687	8.836
36	0.7963	934.571	934.6	14.4	17.952	5.037	22.990	4.56	40.838	14.013	8.976
37	0.8238	956.313	956.3	14.9	18.263	5.219	23.482	4.50	39.577	14.351	9.132
38	0.8350	960.700	960.7	15.1	18.303	5.295	23.598	4.46	39.049	14.446	9.151



Project Name: I-77 Panthers Interchange

Project #: 1461-19-069

Boring #: RW-10

Depth: 10.0' – 11.2' (UD-2)

Sample Date: 1/09 & 1/14/20

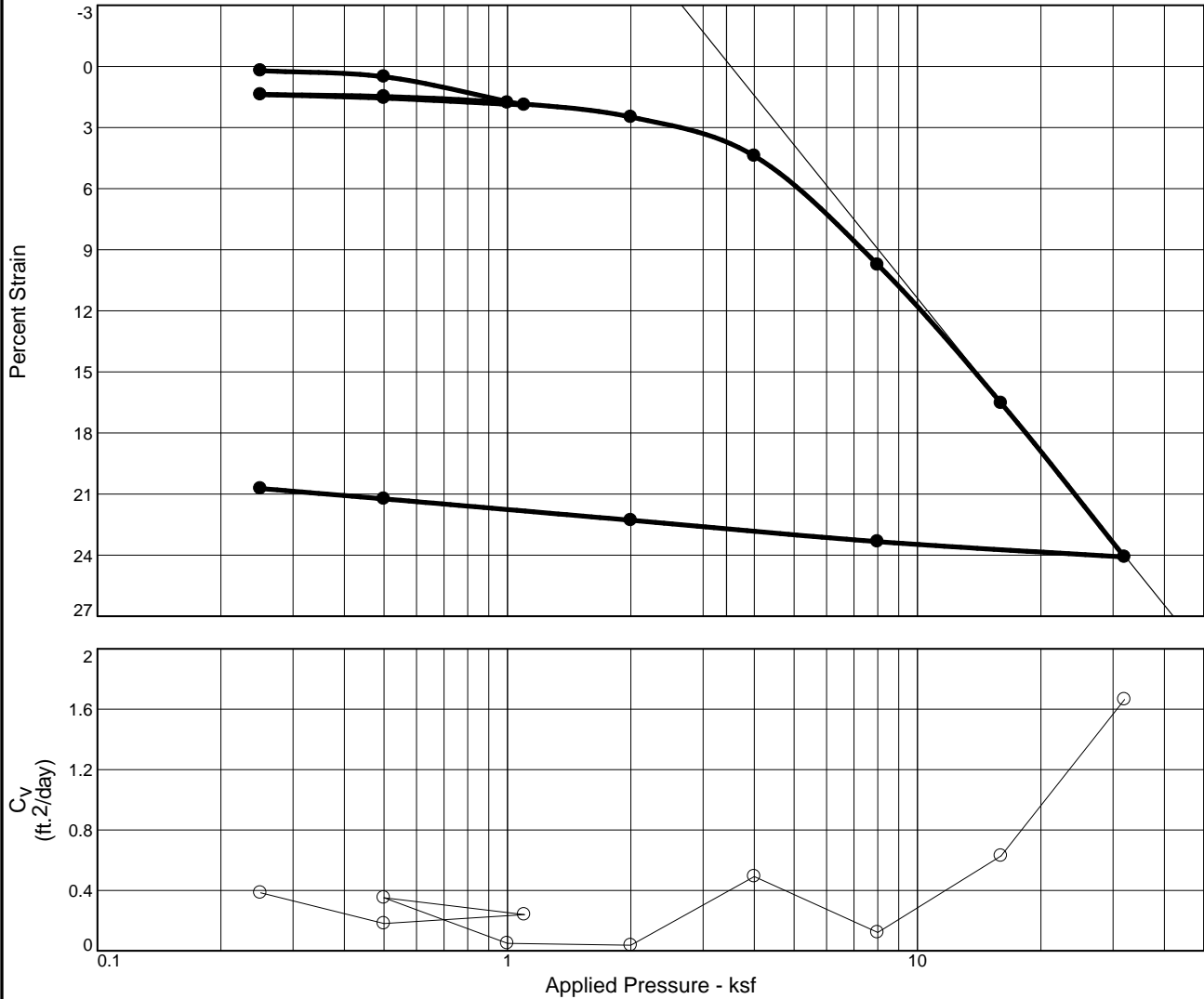
Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)



Specimen #1

Specimen #2
&
Specimen #3

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION										USCS	AASHTO		
Sandy Silt (ML)										ML	N/A		
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
N/A	N/A	2.653	1.1	76.6	96.2	43.1 %	36.6 %	98.4 %	100.0 %	1.161	0.713	5.3	0.54
Preparation Process: ASTM D2435 - Sec. 9										D2435 Method	C _r	Swell Press. (ksf)	Swell %
Condition of Test: Unsaturated										B	0.09		
Project No. 1461-19-069 Client: RS&H Project: I-77 Panthers Interchange										Remarks: Checked By: Robert C. Bruorton, P.E. Title: Senior Engineer			
Loc.: Retaining Walls - UD-3 Depth: 8 - 10' Sample No.: RW-12 S&ME, Inc.													
Greenville, SC													

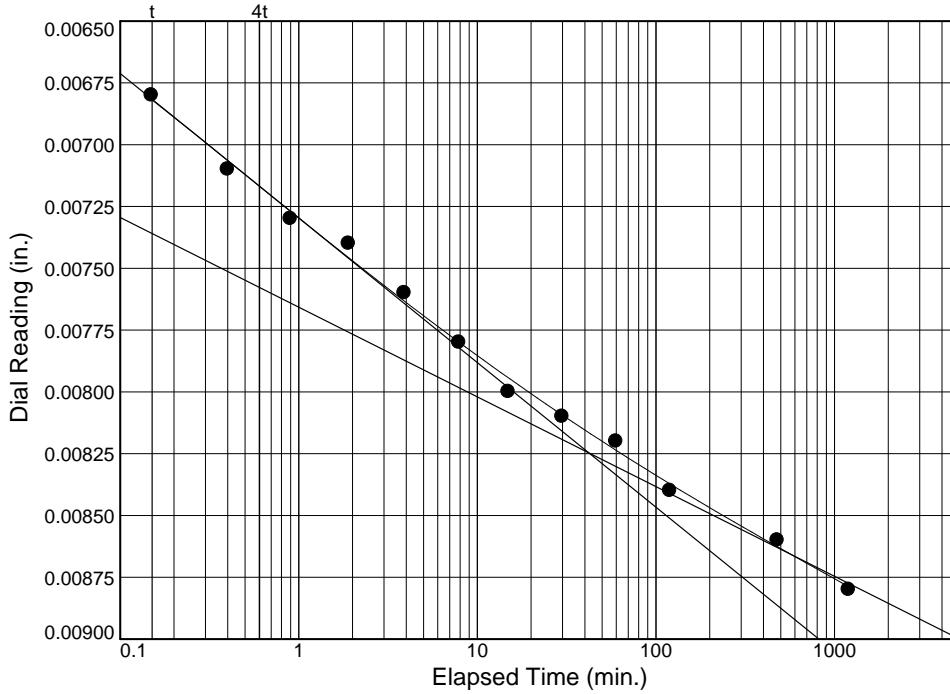
Figure 1

Tested By: Benjamin Kovaleski 2/16/20

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

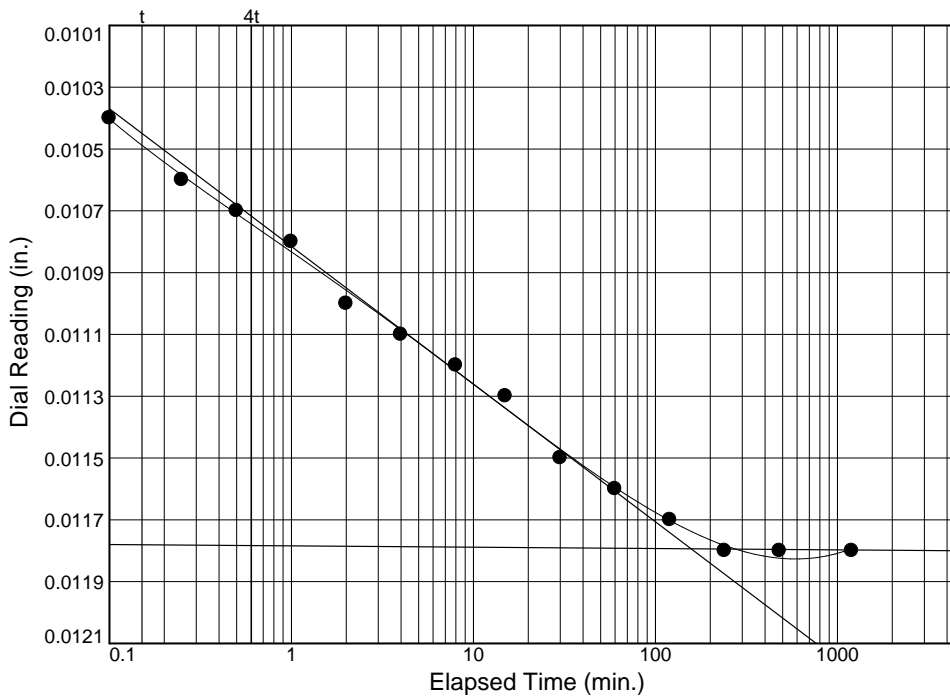
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 1
 Load= 0.25 ksf
 $D_0 = 0.0065$
 $D_{50} = 0.0074$
 $D_{100} = 0.0082$
 $T_{50} = 1.28 \text{ min.}$

$C_v @ T_{50}$
 0.385 ft.²/day

$C_\alpha = 0.000$



Load No.= 2
 Load= 0.50 ksf
 $D_0 = 0.0102$
 $D_{50} = 0.0110$
 $D_{100} = 0.0118$
 $T_{50} = 2.71 \text{ min.}$

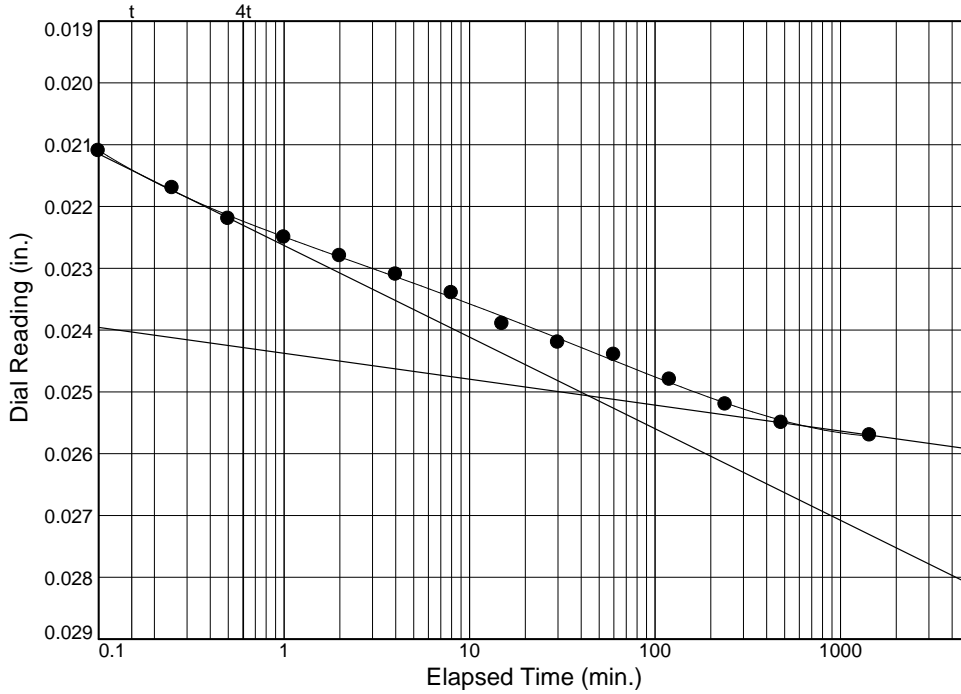
$C_v @ T_{50}$
 0.181 ft.²/day

$C_\alpha = 0.000$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

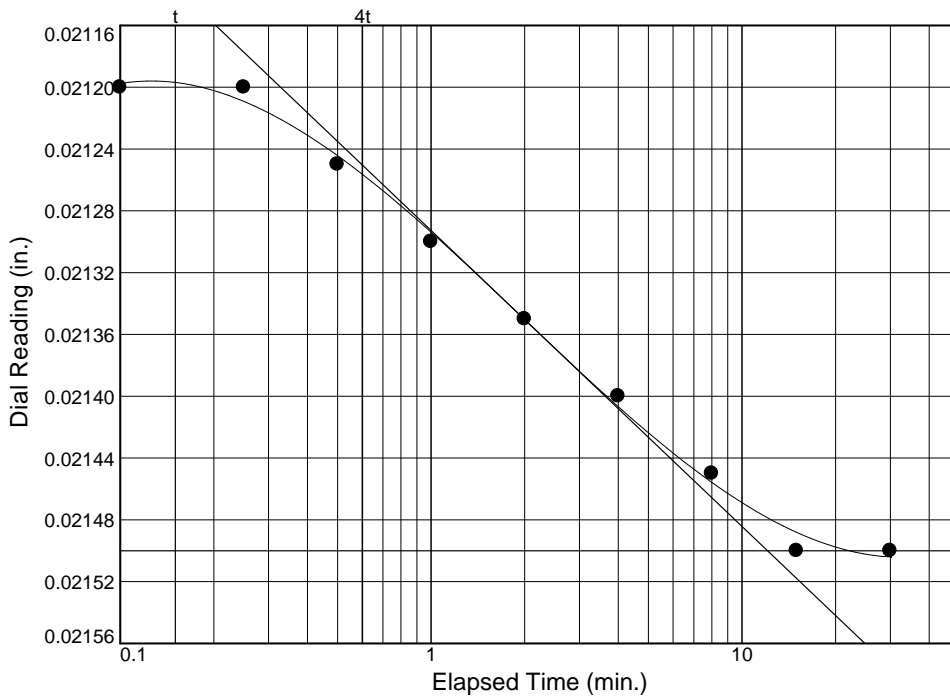
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 3
 Load= 1.10 ksf
 $D_0 = 0.0206$
 $D_{50} = 0.0228$
 $D_{100} = 0.0251$
 $T_{50} = 2.01 \text{ min.}$

$C_v @ T_{50}$
 0.240 ft.²/day

$C_\alpha = 0.000$



Load No.= 6
 Load= 0.50 ksf
 $D_0 = 0.0211$
 $D_{50} = 0.0213$
 $D_{100} = 0.0215$
 $T_{50} = 1.36 \text{ min.}$

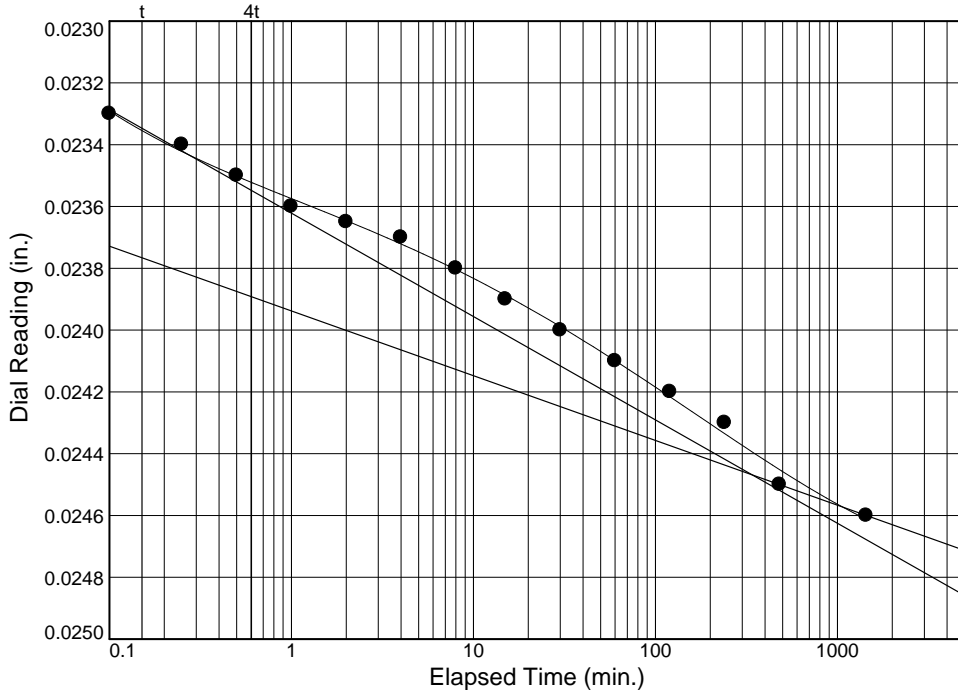
$C_v @ T_{50}$
 0.352 ft.²/day

$C_\alpha = 0.000$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

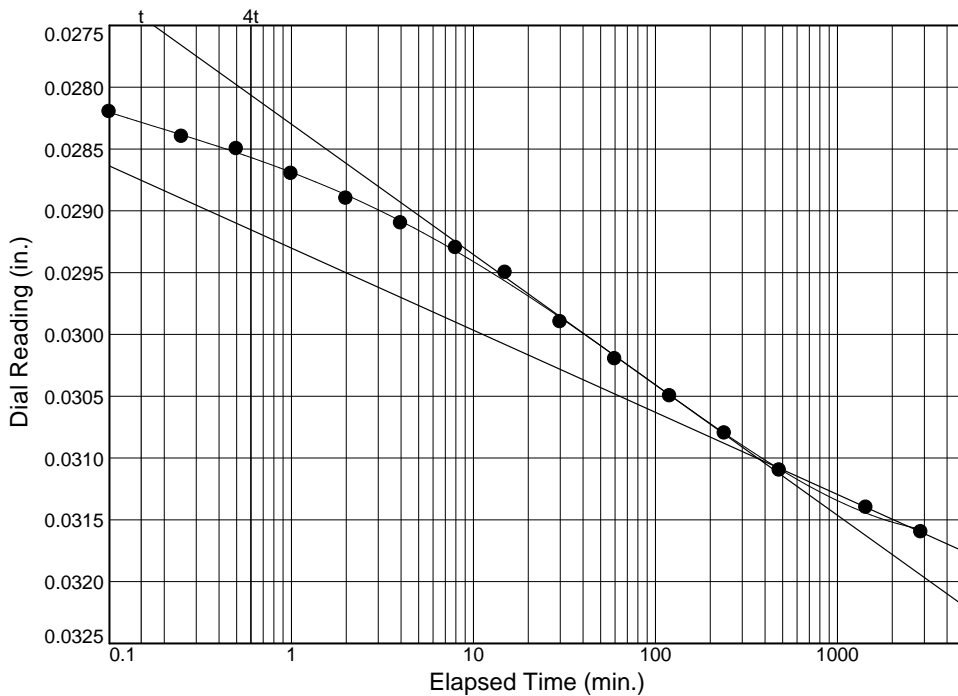
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 7
 Load= 1.00 ksf
 $D_0 = 0.0232$
 $D_{50} = 0.0238$
 $D_{100} = 0.0245$
 $T_{50} = 9.65 \text{ min.}$

$C_v @ T_{50}$
 0.049 ft.²/day

$C_\alpha = 0.000$



Load No.= 8
 Load= 2.00 ksf
 $D_0 = 0.0280$
 $D_{50} = 0.0295$
 $D_{100} = 0.0310$
 $T_{50} = 12.72 \text{ min.}$

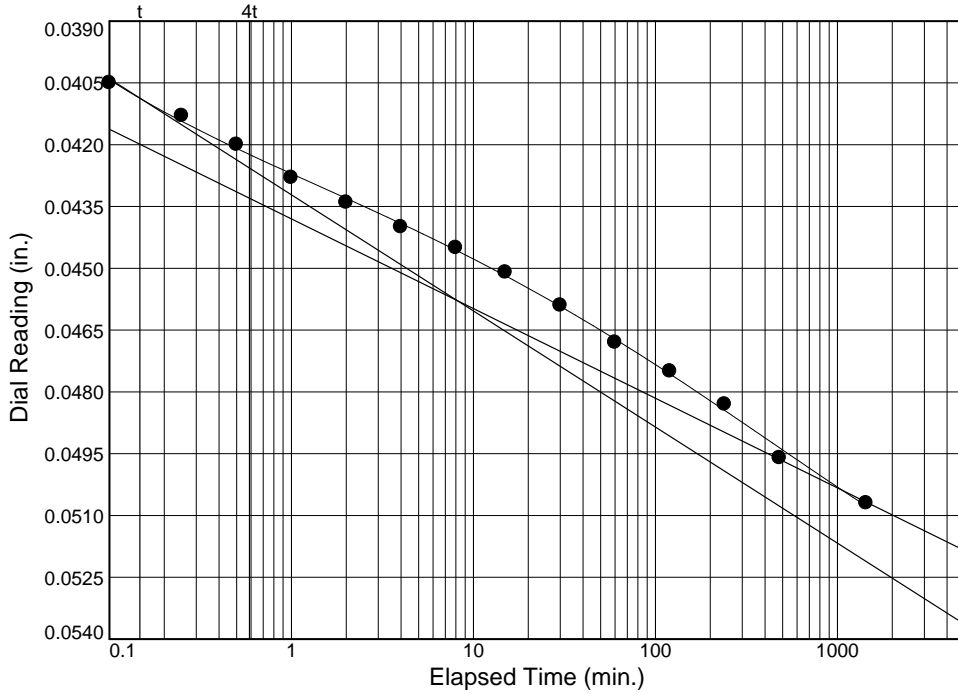
$C_v @ T_{50}$
 0.037 ft.²/day

$C_\alpha = 0.001$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

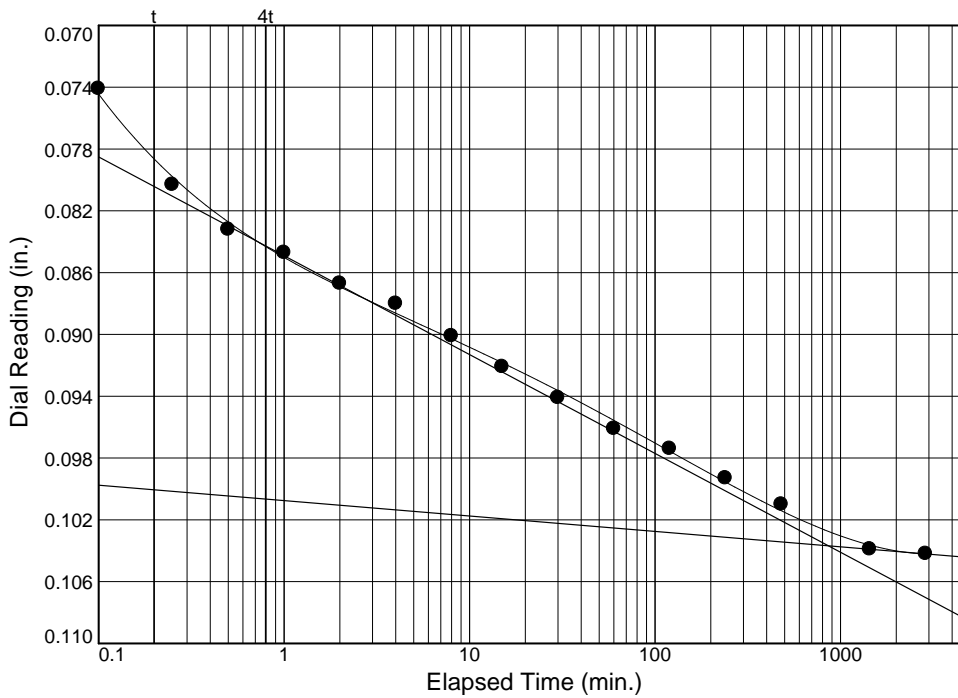
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 9
 Load= 4.00 ksf
 $D_0 = 0.0395$
 $D_{50} = 0.0426$
 $D_{100} = 0.0458$
 $T_{50} = 0.94 \text{ min.}$

$C_v @ T_{50}$
 0.492 ft.²/day

$C_\alpha = 0.002$



Load No.= 10
 Load= 8.00 ksf
 $D_0 = 0.0729$
 $D_{50} = 0.0883$
 $D_{100} = 0.1037$
 $T_{50} = 3.51 \text{ min.}$

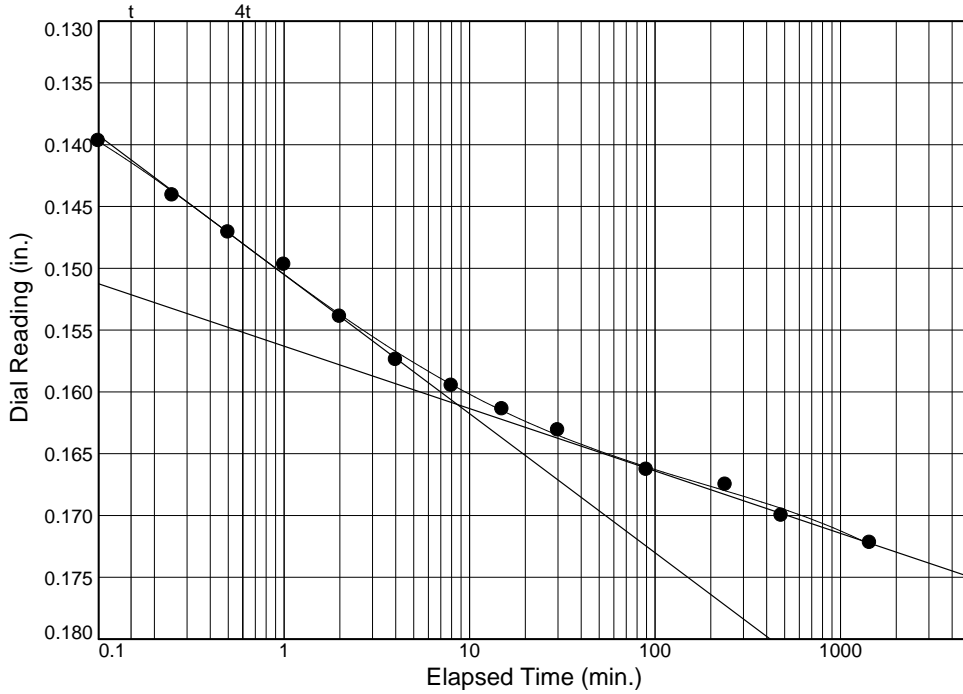
$C_v @ T_{50}$
 0.122 ft.²/day

$C_\alpha = 0.001$

Dial Reading vs. Time

Project No.: 1461-19-069
 Project: I-77 Panthers Interchange

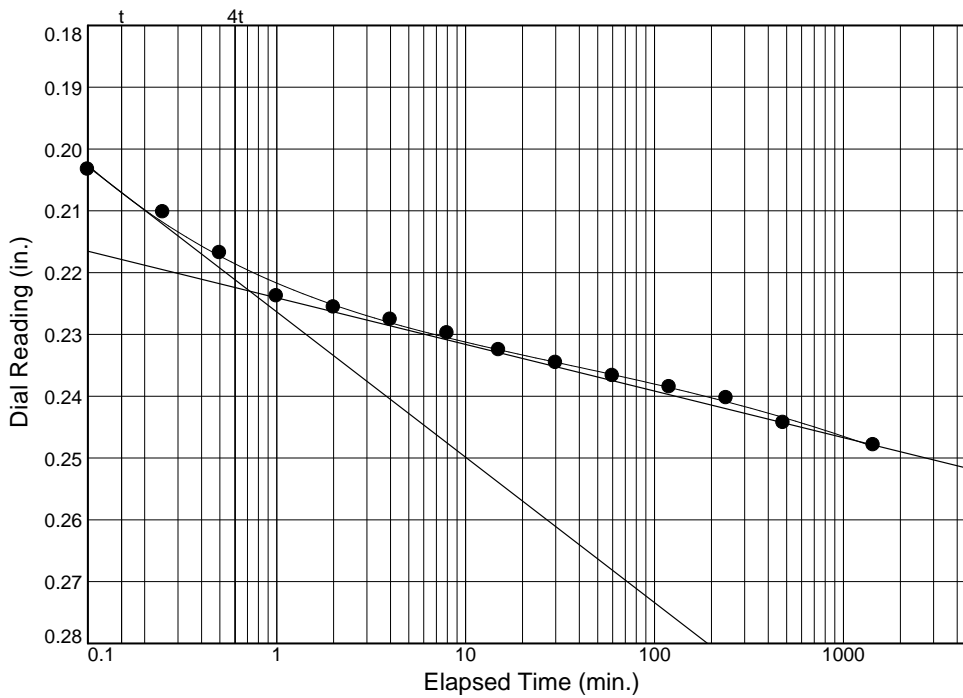
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 11
 Load= 16.00 ksf
 $D_0 = 0.1349$
 $D_{50} = 0.1479$
 $D_{100} = 0.1610$
 $T_{50} = 0.59$ min.

$C_v @ T_{50}$
 0.629 ft.²/day

$C_\alpha = 0.005$



Load No.= 12
 Load= 32.00 ksf
 $D_0 = 0.1956$
 $D_{50} = 0.2093$
 $D_{100} = 0.2230$
 $T_{50} = 0.19$ min.

$C_v @ T_{50}$
 1.665 ft.²/day

$C_\alpha = 0.008$

CONSOLIDATION TEST DATA

8/11/2020

Client: RS&H
Project: I-77 Panthers Interchange
Project Number: 1461-19-069
Location: Retaining Walls - UD-3
Depth: 8 - 10'

Sample Number: RW-12

Material Description: Sandy Silt (ML)

Sample Date: 1/09 & 1/14/20

Liquid Limit: N/A

Plasticity Index: N/A

USCS: ML

AASHTO: N/A

Preparation Process: ASTM D2435 - Sec. 9

Condition of Test: Unsaturated

Test Method: B

Final Density: 96.2

Figure No.: 1

Tested By: Benjamin Kovaleski 2/16/20 **Checked by:** Robert C. Bruorton, P.E. **Title:** Senior Engineer

Test Specimen Data

NATURAL MOISTURE		VOID RATIO		AFTER TEST	
Wet w+t =	163.37 g.	Spec. Gr. =	2.653	Wet w+t =	282.89 g.
Dry w+t =	114.17 g.	Est. Ht. Solids =	0.463 in.	Dry w+t =	246.98 g.
Tare Wt. =	0.00 g.	Init. V.R. =	1.161	Tare Wt. =	148.81 g.
Moisture =	43.1 %	Init. Sat. =	98.4 %	Moisture =	36.6 %
UNIT WEIGHT		TEST START		Dry Wt. = 98.17 g.	
Height =	1.001 in.	Height =	1.001 in.		
Diameter =	2.498 in.	Diameter =	2.498 in.		
Weight =	141.16 g.				
Dry Dens. =	76.6 pcf				

End-Of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	Deformation (in.)	C _v (ft. ² /day)	C _α	Void Ratio	% Strain
start	0.00670		0.00000			1.161	
0.25	0.00900	0.00020	0.00210	0.385	0.000	1.157	0.2 Compr.
0.50	0.01240	0.00060	0.00510	0.181	0.000	1.150	0.5 Compr.
1.10	0.02720	0.00150	0.01900	0.240	0.000	1.120	1.9 Compr.
0.50	0.02320	0.00090	0.01560			1.128	1.6 Compr.
0.25	0.02080	0.00030	0.01380			1.132	1.4 Compr.
0.50	0.02240	0.00090	0.01480	0.352	0.000	1.129	1.5 Compr.
1.00	0.02610	0.00150	0.01790	0.049	0.000	1.123	1.8 Compr.
2.00	0.03400	0.00240	0.02490	0.037	0.001	1.108	2.5 Compr.
4.00	0.05410	0.00340	0.04400	0.492	0.002	1.066	4.4 Compr.
8.00	0.10870	0.00450	0.09750	0.122	0.001	0.951	9.7 Compr.
16.00	0.17780	0.00560	0.16550	0.629	0.005	0.804	16.5 Compr.
32.00	0.25460	0.00670	0.24120	1.665	0.008	0.641	24.1 Compr.
8.00	0.24480	0.00450	0.23360			0.657	23.3 Compr.
2.00	0.23300	0.00320	0.22310			0.680	22.3 Compr.
0.50	0.22140	0.00210	0.21260			0.702	21.2 Compr.
0.25	0.21540	0.00120	0.20750			0.713	20.7 Compr.

TEST RESULTS SUMMARY

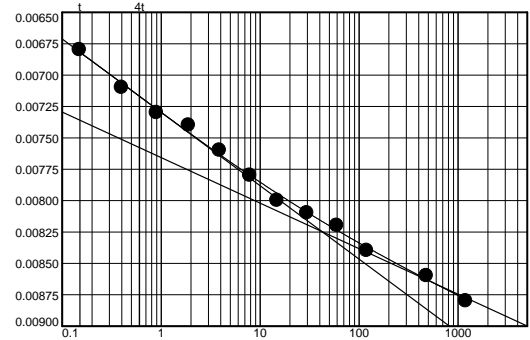
Compression index (C_c), ksf = 0.54 Preconsolidation pressure (P_p), ksf = 5.3 Void ratio at P_p (e_m) = 1.026
 Overburden (σ_{VO}), ksf = 1.1 Void ratio at σ_{VO} (e_o) = 1.120 Recompression index (C_r) = 0.09

Pressure: 0.25 ksf

TEST READINGS

Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	.1	0.00670	11	120	0.00860
2	.25	0.00700	12	480	0.00880
3	.5	0.00730	13	1200	0.00900
4	1	0.00750			
5	2	0.00760			
6	4	0.00780			
7	8	0.00800			
8	15	0.00820			
9	30	0.00830			
10	60	0.00840			



Void Ratio = 1.157 Compression = 0.2%

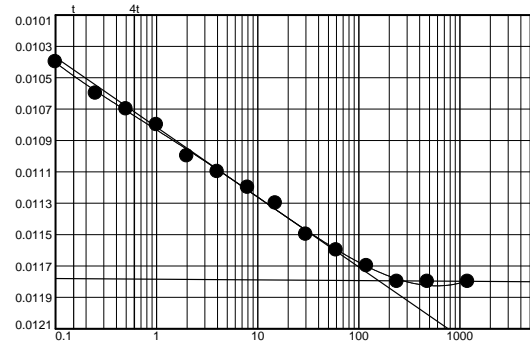
$D_0 = 0.0065$ $D_{50} = 0.0074$ $D_{100} = 0.0082$ C_v at 1.28 min. = 0.385 ft.²/day $C_\alpha = 0.000$

Pressure: 0.50 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.00900	11	60	0.01220
2	.1	0.01100	12	120	0.01230
3	.25	0.01120	13	240	0.01240
4	.5	0.01130	14	480	0.01240
5	1	0.01140	15	1200	0.01240
6	2	0.01160			
7	4	0.01170			
8	8	0.01180			
9	15	0.01190			
10	30	0.01210			



Void Ratio = 1.150 Compression = 0.5%

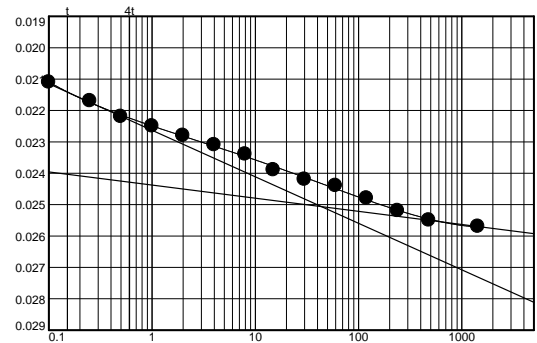
$D_0 = 0.0102$ $D_{50} = 0.0110$ $D_{100} = 0.0118$ C_v at 2.71 min. = 0.181 ft.²/day $C_\alpha = 0.000$

Pressure: 1.10 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.01240	11	60	0.02590
2	.1	0.02260	12	120	0.02630
3	.25	0.02320	13	240	0.02670
4	.5	0.02370	14	480	0.02700
5	1.0	0.02400	15	1440	0.02720
6	2.0	0.02430			
7	4	0.02460			
8	8	0.02490			
9	15	0.02540			
10	30	0.02570			



Void Ratio = 1.120 Compression = 1.9%

$D_0 = 0.0206$ $D_{50} = 0.0228$ $D_{100} = 0.0251$ C_v at 2.01 min. = 0.240 ft.²/day $C_\alpha = 0.000$

Pressure: 0.50 ksf

TEST READINGS

Load No. 4

No.	Elapsed Time	Dial Reading
1	0	0.02720
2	(final)	0.02320

Void Ratio = 1.128 Compression = 1.6%

Pressure: 0.25 ksf

TEST READINGS

Load No. 5

No.	Elapsed Time	Dial Reading
1	0	0.02320
2	(final)	0.02080

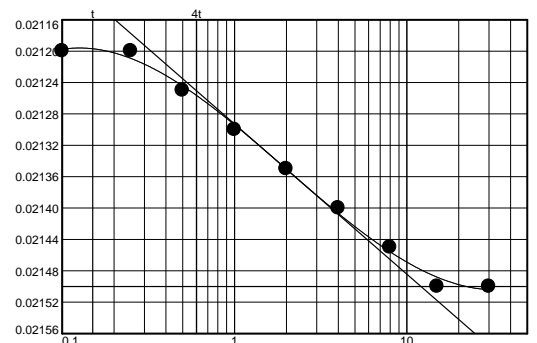
Void Ratio = 1.132 Compression = 1.4%

Pressure: 0.50 ksf

TEST READINGS

Load No. 6

No.	Elapsed Time	Dial Reading
1	0	0.02080
2	.1	0.02210
3	.25	0.02210
4	.5	0.02215
5	1	0.02220
6	2	0.02225
7	4	0.02230
8	8	0.02235
9	15	0.02240
10	30	0.02240



Void Ratio = 1.129 Compression = 1.5%

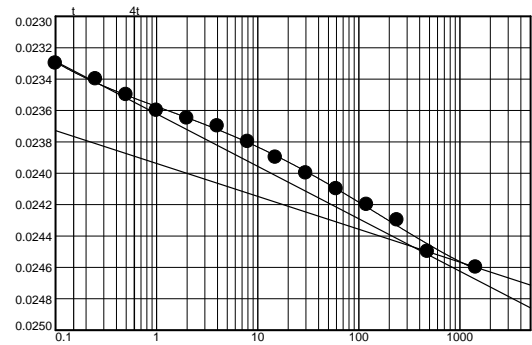
$D_0 = 0.0211$ $D_{50} = 0.0213$ $D_{100} = 0.0215$ C_v at 1.36 min. = 0.352 ft.²/day $C_\alpha = 0.000$

Pressure: 1.00 ksf

TEST READINGS

Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.02240	11	60	0.02560
2	.1	0.02480	12	120	0.02570
3	.25	0.02490	13	240	0.02580
4	.5	0.02500	14	480	0.02600
5	1.0	0.02510	15	1440	0.02610
6	2.0	0.02515			
7	4	0.02520			
8	8	0.02530			
9	15	0.02540			
10	30	0.02550			



Void Ratio = 1.123 Compression = 1.8%

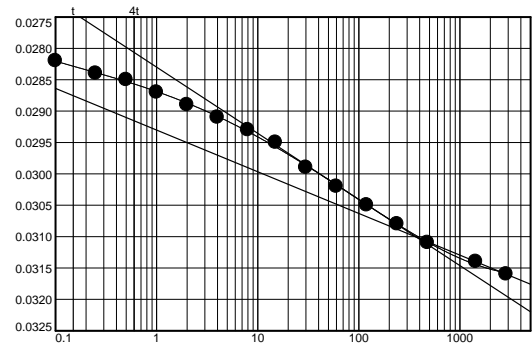
$D_0 = 0.0232$ $D_{50} = 0.0238$ $D_{100} = 0.0245$ C_v at 9.65 min. = 0.049 ft.²/day $C_\alpha = 0.000$

Pressure: 2.00 ksf

TEST READINGS

Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.02610	11	60	0.03260
2	.1	0.03060	12	120	0.03290
3	.25	0.03080	13	240	0.03320
4	.5	0.03090	14	480	0.03350
5	1	0.03110	15	1440	0.03380
6	2	0.03130	16	2880	0.03400
7	4	0.03150			
8	8	0.03170			
9	15	0.03190			
10	30	0.03230			



Void Ratio = 1.108 Compression = 2.5%

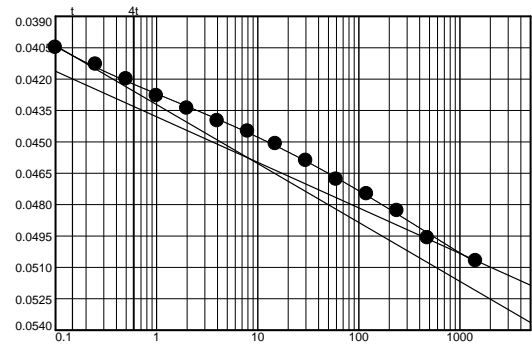
$D_0 = 0.0280$ $D_{50} = 0.0295$ $D_{100} = 0.0310$ C_v at 12.72 min. = 0.037 ft.²/day $C_\alpha = 0.001$

Pressure: 4.00 ksf

TEST READINGS

Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.03400	11	60	0.05020
2	.1	0.04390	12	120	0.05090
3	.25	0.04470	13	240	0.05170
4	.5	0.04540	14	480	0.05300
5	1.0	0.04620	15	1440	0.05410
6	2.0	0.04680			
7	4.0	0.04740			
8	8	0.04790			
9	15	0.04850			
10	30	0.04930			



Void Ratio = 1.066 Compression = 4.4%

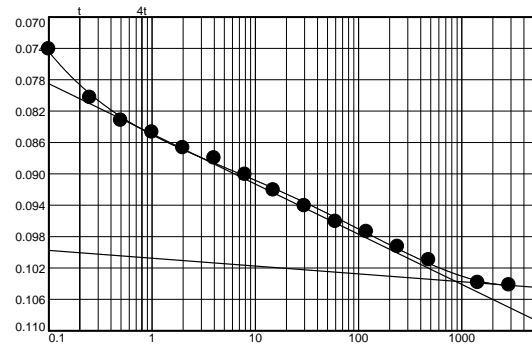
$D_0 = 0.0395$ $D_{50} = 0.0426$ $D_{100} = 0.0458$ C_v at 0.94 min. = 0.492 ft.²/day $C_\alpha = 0.002$

Pressure: 8.00 ksf

TEST READINGS

Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.05410	11	60	0.10060
2	.1	0.07860	12	120	0.10190
3	.25	0.08480	13	240	0.10380
4	.5	0.08770	14	480	0.10550
5	1.0	0.08920	15	1440	0.10840
6	2	0.09120	16	2880	0.10870
7	4	0.09250			
8	8	0.09460			
9	15	0.09660			
10	30	0.09860			



Void Ratio = 0.951 Compression = 9.7%

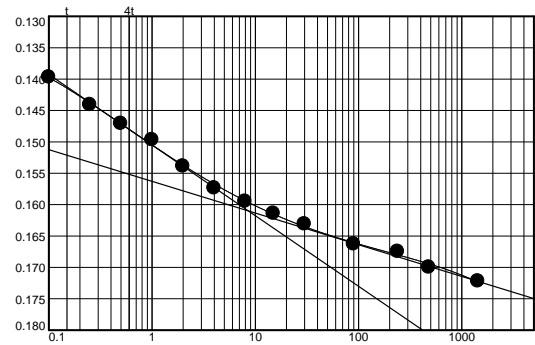
$D_0 = 0.0729$ $D_{50} = 0.0883$ $D_{100} = 0.1037$ C_v at 3.51 min. = 0.122 ft.²/day $C_\alpha = 0.001$

Pressure: 16.00 ksf

TEST READINGS

Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.10870	11	90	0.17190
2	.1	0.14530	12	240	0.17310
3	.25	0.14970	13	480	0.17560
4	.5	0.15270	14	1440	0.17780
5	1	0.15530			
6	2	0.15950			
7	4	0.16300			
8	8	0.16510			
9	15	0.16700			
10	30	0.16870			



Void Ratio = 0.804 Compression = 16.5%

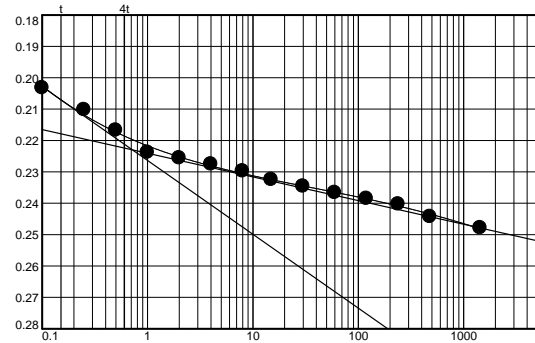
$D_0 = 0.1349$ $D_{50} = 0.1479$ $D_{100} = 0.1610$ C_v at 0.59 min. = 0.629 ft.²/day $C_\alpha = 0.005$

Pressure: 32.00 ksf

TEST READINGS

Load No. 12

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.17780	11	60	0.24340
2	.1	0.21000	12	120	0.24520
3	.25	0.21690	13	240	0.24700
4	.5	0.22350	14	480	0.25100
5	1	0.23050	15	1440	0.25460
6	2	0.23230			
7	4	0.23430			
8	8	0.23650			
9	15	0.23920			
10	30	0.24130			



Void Ratio = 0.641 Compression = 24.1%

$D_0 = 0.1956$ $D_{50} = 0.2093$ $D_{100} = 0.2230$ C_v at 0.19 min. = 1.665 ft.²/day $C_\alpha = 0.008$

Pressure: 8.00 ksf

TEST READINGS

Load No. 13

No.	Elapsed Time	Dial Reading
1	0	0.25460
2	(final)	0.24480

Void Ratio = 0.657 Compression = 23.3%

Pressure: 2.00 ksf

TEST READINGS

Load No. 14

No.	Elapsed Time	Dial Reading
1	0	0.24480
2	(final)	0.23300

Void Ratio = 0.680 Compression = 22.3%

Pressure: 0.50 ksf

TEST READINGS

Load No. 15

No.	Elapsed Time	Dial Reading
1	0	0.23300
2	(final)	0.22140

Void Ratio = 0.702 Compression = 21.2%

Pressure: 0.25 ksf

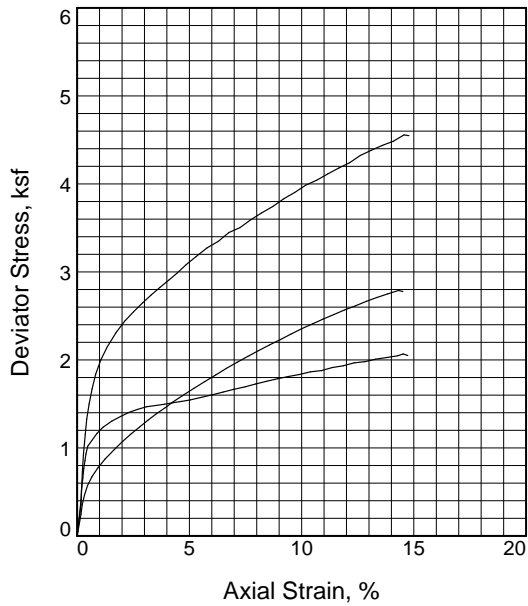
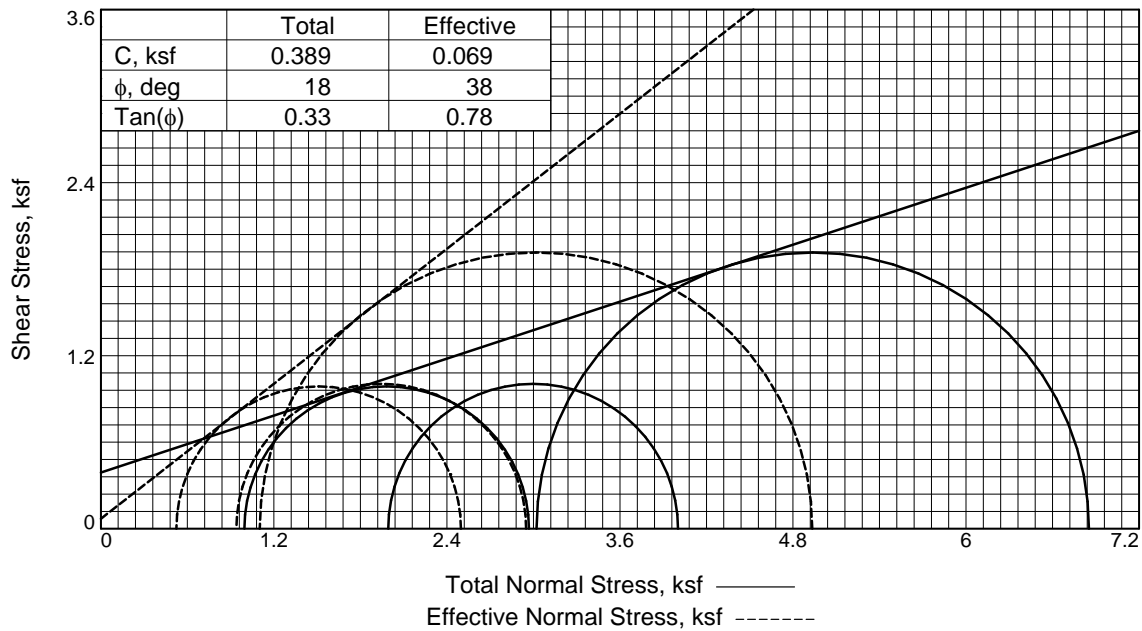
TEST READINGS

Load No. 16

No.	Elapsed Time	Dial Reading
1	0	0.22140
2	(final)	0.21540

Void Ratio = 0.713 Compression = 20.7%

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.



	1	2	3	
Specimen No.				
Initial	Water Content, %	30.3	27.2	27.0
	Dry Density, pcf	93.9	98.3	98.5
	Saturation, %	99.1	98.4	98.3
	Void Ratio	0.8524	0.7700	0.7652
	Diameter, in.	2.867	2.865	2.869
	Height, in.	5.984	5.989	5.995
At Test	Water Content, %	29.5	25.9	24.8
	Dry Density, pcf	95.0	101.4	102.9
	Saturation, %	99.0	100.8	100.3
	Void Ratio	0.8301	0.7155	0.6895
	Diameter, in.	2.856	2.839	2.831
	Height, in.	5.957	5.913	5.895
Strain rate, %/min.	0.44	0.44	0.44	
Eff. Cell Pressure, ksf	0.995	1.993	3.021	
Fail. Stress, ksf	1.973	2.010	3.832	
Total Pore Pr., ksf	6.231	6.813	7.679	
Strain, %	7.1	13.3	9.2	
Ult. Stress, ksf	2.778	2.051	4.549	
Total Pore Pr., ksf	5.929	6.779	7.394	
Strain, %	14.5	14.7	14.8	
$\bar{\sigma}_1$ Failure, ksf	2.497	2.949	4.933	
$\bar{\sigma}_3$ Failure, ksf	0.524	0.940	1.102	

Type of Test:

CU with Pore Pressures

Sample Type: Undisturbed

Description: Silty Sand (SM)

LL= N/A

PI= N/A

Specific Gravity= 2.786

Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767,

Client: RS&H

Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-4

Sample Number: RW-12

Depth: 19 - 21'

Proj. No.: 1461-19-069

Date Sampled: 1/09 & 1/14/20

TRIAXIAL SHEAR TEST REPORT

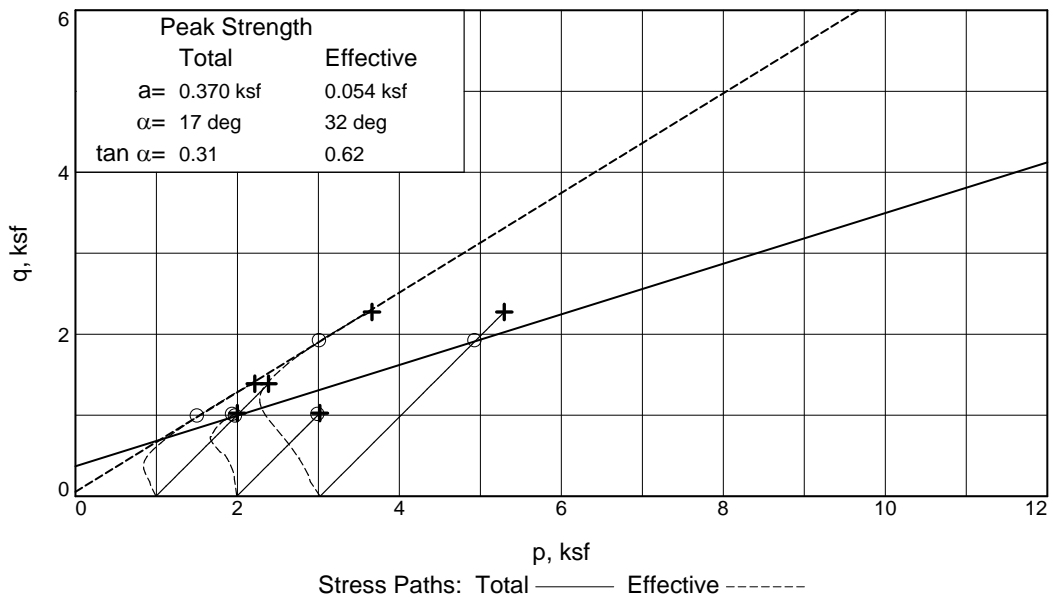
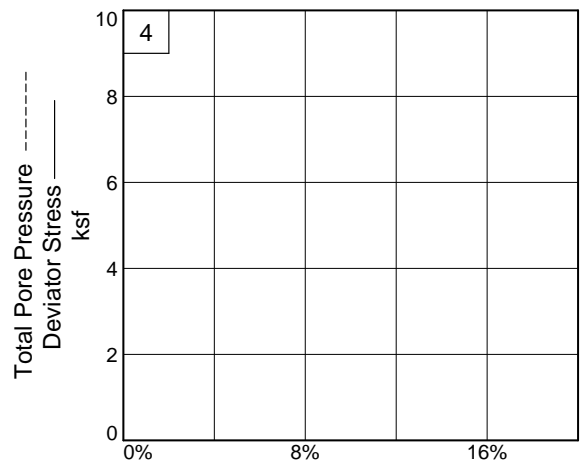
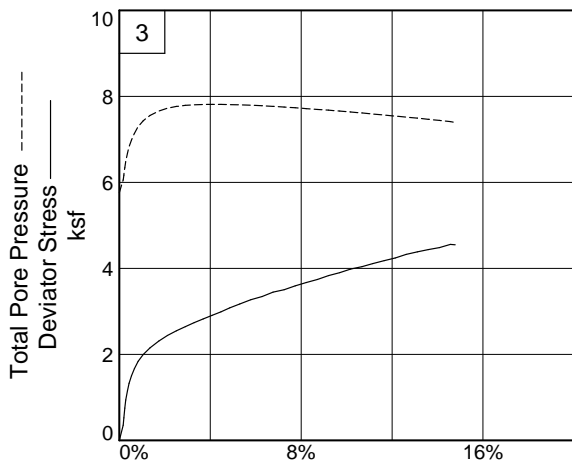
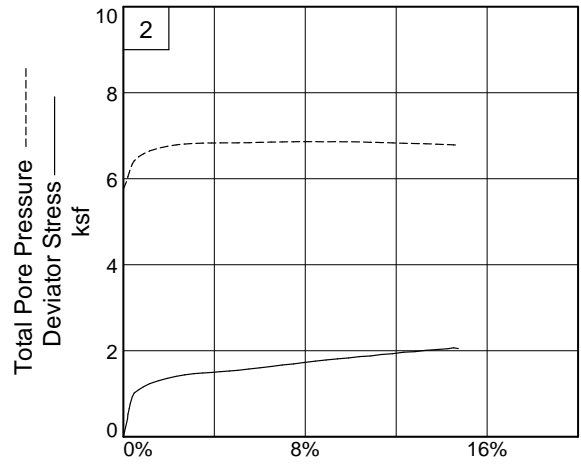
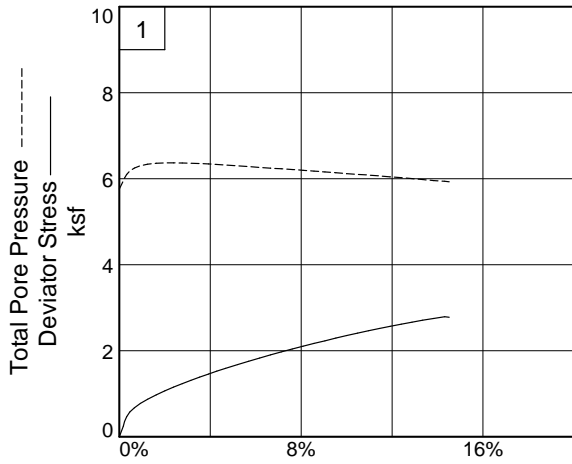
S&ME, Inc.

Greenville, SC

Figure 1

Tested By: Benjamin Kovalski - 2/15/20 **Checked By:** Robert C. Bruorton, P.E.

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.



Client: RS&H

Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-4

Project No.: 1461-19-069

Depth: 19 - 21'

Figure 2

Sample Number: RW-12

S&ME, Inc.

Tested By: Benjamin Kovalski - 2/15/20 **Checked By:** Robert C. Bruorton, P.E.

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

8/11/2020
9:17 AM

Date: 1/09 & 1/14/20
Client: RS&H
Project: I-77 Panthers Interchange
Project No.: 1461-19-069
Location: Retaining Walls - UD-4
Depth: 19 - 21' **Sample Number:** RW-12
Description: Silty Sand (SM)
Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767,
Type of Sample: Undisturbed
Specific Gravity=2.786 **LL**=N/A **PL**= **PI**=N/A
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	65.270			1232.080
Moisture content: Dry soil+tare, gms.	50.080			951.530
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	30.3	30.2	29.5	29.5
Moist specimen weight, gms.	1240.87			
Diameter, in.	2.867	2.866	2.856	
Area, in. ²	6.456	6.451	6.407	
Height, in.	5.984	5.982	5.957	
Net decrease in height, in.		0.002	0.025	
Net decrease in water volume, cc.			7.000	
Wet density, pcf	122.4	122.4	123.1	
Dry density, pcf	93.9	94.0	95.0	
Void ratio	0.8524	0.8506	0.8301	
Saturation, %	99.1	99.0	99.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 46.910 psi (6.755 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 0.995 ksf
Strain rate, %/min. = 0.44
Fail. Stress = 1.973 ksf at reading no. 21
Ult. Stress = 2.778 ksf at reading no. 37

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	0.995	0.995	1.00	40.000	0.995	0.000
1	0.0104	11.035	11.0	0.2	0.248	0.808	1.055	1.31	41.302	0.931	0.124
2	0.0136	15.787	15.8	0.2	0.354	0.740	1.094	1.48	41.772	0.917	0.177
3	0.0194	20.741	20.7	0.3	0.465	0.655	1.120	1.71	42.361	0.887	0.232
4	0.0274	25.627	25.6	0.5	0.573	0.574	1.147	2.00	42.923	0.861	0.287
5	0.0395	30.151	30.2	0.7	0.673	0.507	1.180	2.33	43.392	0.843	0.337
6	0.0552	34.797	34.8	0.9	0.775	0.452	1.227	2.71	43.770	0.840	0.387
7	0.0740	39.360	39.4	1.2	0.874	0.417	1.290	3.10	44.017	0.853	0.437
8	0.0969	44.108	44.1	1.6	0.975	0.395	1.370	3.47	44.168	0.882	0.488
9	0.1191	48.503	48.5	2.0	1.068	0.386	1.455	3.77	44.228	0.920	0.534
10	0.1419	52.616	52.6	2.4	1.154	0.385	1.540	4.00	44.234	0.962	0.577
11	0.1649	56.543	56.5	2.8	1.236	0.390	1.625	4.17	44.204	1.007	0.618
12	0.1876	60.358	60.4	3.1	1.314	0.396	1.710	4.31	44.157	1.053	0.657
13	0.2103	64.030	64.0	3.5	1.388	0.402	1.791	4.45	44.116	1.097	0.694
14	0.2338	67.527	67.5	3.9	1.458	0.412	1.870	4.54	44.052	1.141	0.729
15	0.2556	70.979	71.0	4.3	1.527	0.424	1.951	4.60	43.967	1.187	0.763
16	0.2785	74.277	74.3	4.7	1.591	0.437	2.028	4.64	43.876	1.233	0.796
17	0.3101	78.728	78.7	5.2	1.677	0.455	2.133	4.68	43.748	1.294	0.839
18	0.3389	82.814	82.8	5.7	1.755	0.473	2.228	4.71	43.625	1.351	0.878
19	0.3676	86.752	86.8	6.2	1.830	0.491	2.321	4.72	43.498	1.406	0.915
20	0.3963	90.788	90.8	6.7	1.905	0.510	2.415	4.73	43.367	1.463	0.952
21	0.4241	94.531	94.5	7.1	1.973	0.524	2.497	4.77	43.274	1.510	0.987
22	0.4532	98.299	98.3	7.6	2.041	0.540	2.581	4.78	43.159	1.561	1.021
23	0.4817	101.980	102.0	8.1	2.107	0.559	2.666	4.77	43.030	1.612	1.053
24	0.5101	105.605	105.6	8.6	2.170	0.578	2.748	4.76	42.898	1.663	1.085
25	0.5390	109.133	109.1	9.0	2.231	0.597	2.828	4.74	42.767	1.712	1.115
26	0.5674	112.801	112.8	9.5	2.294	0.616	2.910	4.72	42.632	1.763	1.147
27	0.5960	116.390	116.4	10.0	2.354	0.636	2.991	4.70	42.491	1.813	1.177
28	0.6244	119.742	119.7	10.5	2.409	0.654	3.063	4.69	42.371	1.858	1.205
29	0.6531	123.187	123.2	11.0	2.465	0.670	3.135	4.68	42.260	1.902	1.233
30	0.6819	126.489	126.5	11.4	2.518	0.690	3.207	4.65	42.121	1.948	1.259
31	0.7099	129.728	129.7	11.9	2.568	0.710	3.278	4.62	41.978	1.994	1.284
32	0.7389	132.883	132.9	12.4	2.616	0.731	3.347	4.58	41.835	2.039	1.308
33	0.7672	136.126	136.1	12.9	2.666	0.753	3.418	4.54	41.684	2.085	1.333
34	0.7949	139.141	139.1	13.3	2.710	0.774	3.484	4.50	41.533	2.129	1.355
35	0.8241	141.982	142.0	13.8	2.750	0.797	3.547	4.45	41.375	2.172	1.375
36	0.8527	144.860	144.9	14.3	2.790	0.814	3.604	4.43	41.254	2.209	1.395
37	0.8644	144.578	144.6	14.5	2.778	0.826	3.604	4.37	41.177	2.215	1.389

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	57.430			1247.420
Moisture content: Dry soil+tare, gms.	45.150			990.800
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	27.2	27.7	25.9	25.9
Moist specimen weight, gms.	1266.72			
Diameter, in.	2.865	2.863	2.839	
Area, in. ²	6.447	6.438	6.329	
Height, in.	5.989	5.985	5.913	
Net decrease in height, in.		0.004	0.072	
Net decrease in water volume, cc.			18.200	
Wet density, pcf	125.0	125.8	127.6	
Dry density, pcf	98.3	98.5	101.4	
Void ratio	0.7700	0.7665	0.7155	
Saturation, %	98.4	100.8	100.8	

Test Readings for Specimen No. 2

Membrane modulus = 0.14 kN/cm²

Membrane thickness = 0.03 cm

Consolidation cell pressure = 53.840 psi (7.753 ksf)

Consolidation back pressure = 40.000 psi (5.760 ksf)

Consolidation effective confining stress = 1.993 ksf

Strain rate, %/min. = 0.44

Fail. Stress = 2.010 ksf at reading no. 37

Ult. Stress = 2.051 ksf at reading no. 41

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	1.993	1.993	1.00	40.000	1.993	0.000
1	0.0107	18.276	18.3	0.2	0.415	1.756	2.171	1.24	41.647	1.963	0.208
2	0.0117	23.049	23.0	0.2	0.523	1.699	2.222	1.31	42.043	1.960	0.262
3	0.0153	29.039	29.0	0.3	0.659	1.609	2.268	1.41	42.665	1.939	0.330
4	0.0177	33.827	33.8	0.3	0.767	1.532	2.299	1.50	43.202	1.916	0.384
5	0.0207	37.875	37.9	0.3	0.859	1.465	2.324	1.59	43.668	1.894	0.429
6	0.0233	41.075	41.1	0.4	0.931	1.408	2.339	1.66	44.062	1.873	0.465
7	0.0278	44.950	44.9	0.5	1.018	1.337	2.355	1.76	44.555	1.846	0.509
8	0.0403	48.456	48.5	0.7	1.095	1.237	2.332	1.88	45.247	1.785	0.548
9	0.0522	51.663	51.7	0.9	1.165	1.172	2.338	1.99	45.698	1.755	0.583
10	0.0683	54.915	54.9	1.2	1.235	1.106	2.342	2.12	46.156	1.724	0.618
11	0.0912	58.239	58.2	1.5	1.305	1.043	2.348	2.25	46.595	1.696	0.652
12	0.1145	60.895	60.9	1.9	1.359	1.000	2.359	2.36	46.894	1.680	0.679
13	0.1371	63.200	63.2	2.3	1.405	0.966	2.371	2.45	47.131	1.669	0.702
14	0.1591	64.956	65.0	2.7	1.438	0.945	2.384	2.52	47.275	1.665	0.719
15	0.1830	66.626	66.6	3.1	1.469	0.932	2.401	2.58	47.370	1.666	0.735
16	0.2063	67.505	67.5	3.5	1.482	0.925	2.408	2.60	47.414	1.666	0.741
17	0.2291	68.378	68.4	3.9	1.496	0.922	2.418	2.62	47.435	1.670	0.748
18	0.2521	69.492	69.5	4.3	1.514	0.920	2.434	2.65	47.453	1.677	0.757
19	0.2753	70.481	70.5	4.7	1.529	0.919	2.448	2.66	47.458	1.684	0.765
20	0.2977	71.558	71.6	5.0	1.546	0.918	2.464	2.68	47.465	1.691	0.773
21	0.3265	73.274	73.3	5.5	1.575	0.914	2.490	2.72	47.490	1.702	0.788
22	0.3553	74.968	75.0	6.0	1.603	0.907	2.510	2.77	47.540	1.709	0.802

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.3846	76.864	76.9	6.5	1.635	0.901	2.536	2.81	47.581	1.719	0.818
24	0.4133	78.801	78.8	7.0	1.668	0.896	2.564	2.86	47.618	1.730	0.834
25	0.4420	80.473	80.5	7.5	1.694	0.893	2.587	2.90	47.637	1.740	0.847
26	0.4707	82.472	82.5	8.0	1.727	0.890	2.617	2.94	47.658	1.754	0.864
27	0.4993	84.387	84.4	8.4	1.758	0.891	2.648	2.97	47.656	1.769	0.879
28	0.5280	86.222	86.2	8.9	1.787	0.893	2.680	3.00	47.635	1.787	0.893
29	0.5569	87.967	88.0	9.4	1.813	0.892	2.705	3.03	47.643	1.799	0.907
30	0.5859	89.512	89.5	9.9	1.835	0.894	2.729	3.05	47.632	1.811	0.917
31	0.6149	91.470	91.5	10.4	1.865	0.899	2.764	3.08	47.599	1.831	0.932
32	0.6435	92.640	92.6	10.9	1.878	0.905	2.784	3.08	47.555	1.844	0.939
33	0.6723	94.886	94.9	11.4	1.914	0.912	2.825	3.10	47.507	1.869	0.957
34	0.7010	96.435	96.4	11.9	1.934	0.920	2.854	3.10	47.449	1.887	0.967
35	0.7295	98.590	98.6	12.3	1.967	0.928	2.894	3.12	47.398	1.911	0.983
36	0.7584	99.839	99.8	12.8	1.980	0.935	2.915	3.12	47.348	1.925	0.990
37	0.7869	101.885	101.9	13.3	2.010	0.940	2.949	3.14	47.315	1.944	1.005
38	0.8157	103.363	103.4	13.8	2.027	0.951	2.978	3.13	47.239	1.964	1.014
39	0.8443	104.942	104.9	14.3	2.047	0.961	3.008	3.13	47.169	1.984	1.023
40	0.8589	106.334	106.3	14.5	2.068	0.966	3.034	3.14	47.129	2.000	1.034
41	0.8711	105.714	105.7	14.7	2.051	0.974	3.025	3.11	47.074	2.000	1.026

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	45.580			1240.380
Moisture content: Dry soil+tare, gms.	35.890			993.620
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	27.0	27.1	24.8	24.8
Moist specimen weight, gms.	1272.98			
Diameter, in.	2.869	2.863	2.831	
Area, in. ²	6.465	6.437	6.293	
Height, in.	5.995	5.982	5.895	
Net decrease in height, in.		0.013	0.087	
Net decrease in water volume, cc.			23.100	
Wet density, pcf	125.1	126.1	128.5	
Dry density, pcf	98.5	99.2	102.9	
Void ratio	0.7652	0.7537	0.6895	
Saturation, %	98.3	100.3	100.3	

Test Readings for Specimen No. 3

Membrane modulus = 0.14 kN/cm²

Membrane thickness = 0.03 cm

Consolidation cell pressure = 60.980 psi (8.781 ksf)

Consolidation back pressure = 40.000 psi (5.760 ksf)

Consolidation effective confining stress = 3.021 ksf

Strain rate, %/min. = 0.44

Fail. Stress = 3.832 ksf at reading no. 29

Ult. Stress = 4.549 ksf at reading no. 41

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	3.021	3.021	1.00	40.000	3.021	0.000
1	0.0100	15.499	15.5	0.2	0.354	2.725	3.079	1.13	42.058	2.902	0.177
2	0.0116	22.961	23.0	0.2	0.524	2.613	3.138	1.20	42.832	2.876	0.262
3	0.0142	32.884	32.9	0.2	0.751	2.440	3.191	1.31	44.032	2.816	0.375
4	0.0168	41.179	41.2	0.3	0.940	2.288	3.228	1.41	45.089	2.758	0.470
5	0.0212	50.673	50.7	0.4	1.155	2.104	3.259	1.55	46.369	2.682	0.578
6	0.0251	58.321	58.3	0.4	1.329	1.954	3.283	1.68	47.413	2.618	0.664
7	0.0315	65.910	65.9	0.5	1.500	1.797	3.297	1.83	48.501	2.547	0.750
8	0.0391	73.439	73.4	0.7	1.669	1.643	3.313	2.02	49.567	2.478	0.835
9	0.0486	80.999	81.0	0.8	1.838	1.487	3.326	2.24	50.650	2.407	0.919
10	0.0619	88.265	88.3	1.0	1.999	1.348	3.346	2.48	51.622	2.347	0.999
11	0.0795	95.344	95.3	1.3	2.152	1.225	3.377	2.76	52.474	2.301	1.076
12	0.1024	102.794	102.8	1.7	2.312	1.121	3.432	3.06	53.197	2.277	1.156
13	0.1248	108.909	108.9	2.1	2.440	1.055	3.495	3.31	53.651	2.275	1.220
14	0.1482	114.215	114.2	2.5	2.548	1.015	3.563	3.51	53.932	2.289	1.274
15	0.1713	119.083	119.1	2.9	2.646	0.991	3.637	3.67	54.101	2.314	1.323
16	0.1941	123.680	123.7	3.3	2.737	0.976	3.713	3.80	54.200	2.345	1.369
17	0.2174	128.168	128.2	3.7	2.825	0.969	3.793	3.92	54.254	2.381	1.412
18	0.2408	132.478	132.5	4.1	2.908	0.966	3.874	4.01	54.269	2.420	1.454
19	0.2634	136.730	136.7	4.5	2.989	0.967	3.957	4.09	54.262	2.462	1.495
20	0.2864	141.658	141.7	4.9	3.084	0.972	4.056	4.17	54.231	2.514	1.542
21	0.3124	146.454	146.5	5.3	3.174	0.978	4.152	4.25	54.190	2.565	1.587
22	0.3411	151.814	151.8	5.8	3.273	0.985	4.259	4.32	54.137	2.622	1.637

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.3704	156.083	156.1	6.3	3.347	0.998	4.346	4.35	54.049	2.672	1.674
24	0.3988	161.642	161.6	6.8	3.449	1.013	4.462	4.40	53.946	2.737	1.724
25	0.4274	165.079	165.1	7.2	3.504	1.029	4.533	4.40	53.831	2.781	1.752
26	0.4562	170.207	170.2	7.7	3.594	1.046	4.640	4.43	53.713	2.843	1.797
27	0.4847	174.826	174.8	8.2	3.672	1.066	4.737	4.45	53.580	2.901	1.836
28	0.5139	179.241	179.2	8.7	3.744	1.085	4.829	4.45	53.447	2.957	1.872
29	0.5426	184.404	184.4	9.2	3.832	1.102	4.933	4.48	53.329	3.018	1.916
30	0.5715	188.853	188.9	9.7	3.903	1.122	5.025	4.48	53.189	3.073	1.951
31	0.5999	193.860	193.9	10.2	3.985	1.144	5.129	4.48	53.037	3.136	1.992
32	0.6293	197.740	197.7	10.7	4.042	1.167	5.209	4.46	52.878	3.188	2.021
33	0.6575	202.277	202.3	11.2	4.113	1.190	5.303	4.45	52.713	3.247	2.056
34	0.6869	206.743	206.7	11.7	4.180	1.215	5.395	4.44	52.542	3.305	2.090
35	0.7155	210.941	210.9	12.1	4.241	1.239	5.481	4.42	52.373	3.360	2.121
36	0.7440	216.274	216.3	12.6	4.325	1.263	5.587	4.43	52.212	3.425	2.162
37	0.7728	220.480	220.5	13.1	4.384	1.286	5.670	4.41	52.048	3.478	2.192
38	0.8014	224.472	224.5	13.6	4.439	1.313	5.752	4.38	51.861	3.532	2.219
39	0.8303	228.118	228.1	14.1	4.485	1.341	5.826	4.35	51.670	3.583	2.243
40	0.8586	233.107	233.1	14.6	4.558	1.369	5.926	4.33	51.476	3.647	2.279
41	0.8712	233.271	233.3	14.8	4.549	1.387	5.936	4.28	51.348	3.662	2.275



Project Name: I-77 Panthers Interchange

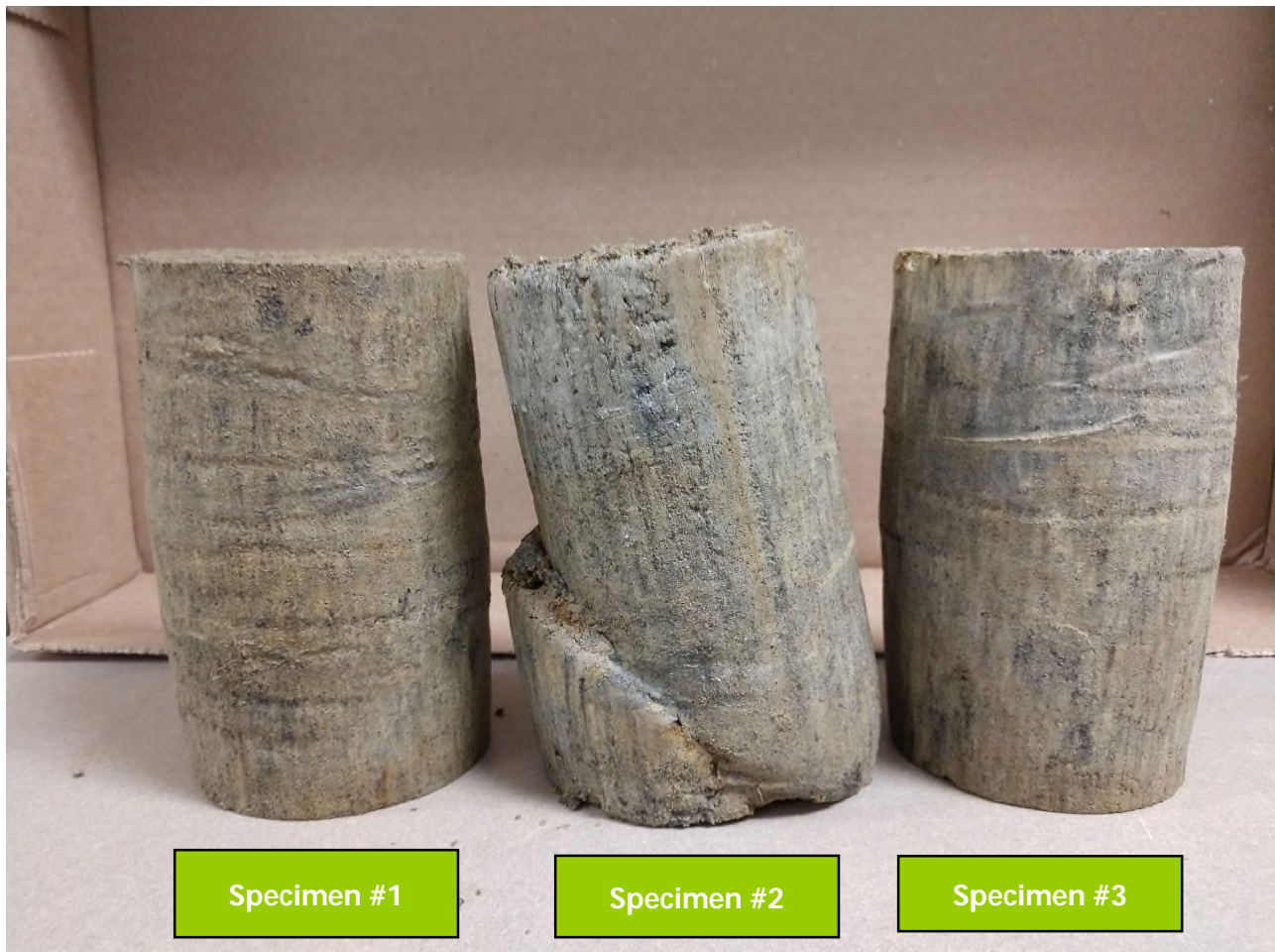
Project #: 1461-19-069

Boring #: RW-12

Depth: 19.0' – 21.0' (UD-4)

Sample Date: 1/09 & 1/14/20

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)



Appendix XI – Corrosion Series Laboratory Test Results



Results Only Soil Testing for I-77 Panthers Interchange

February 7, 2020

**Prepared for:
Chad Bruorton
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134 Suber Road
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**Project X Job#: S200204F
Client Job or PO#: 1461-19-069**

Respectfully Submitted,

Eduardo Hernandez, M.Sc., P.E.
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Soil Analysis Lab Results

Client: S&ME, Inc.
 Job Name: I-77 Panthers Interchange
 Client Job Number: 1461-19-069
 Project X Job Number: S200204F
 February 7, 2020

Bore# / Description	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51
	Depth	Sulfates		Chlorides		Resistivity		pH
	(ft)	SO ₄ ²⁻		Cl ⁻		As Rec'd	Minimum	
		(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)	
EB-2 to SS-3	4.0-6.0	66.8	0.0067	76.2	0.0076	12,730	5,025	7.3
IB-4 to SS-5	8.0-10.0	3.0	0.0003	28.4	0.0028	5,360	4,824	6.7

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
 mg/kg = milligrams per kilogram (parts per million) of dry soil weight
 ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
 Chemical Analysis performed on 1:3 Soil-To-Water extract

