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NC Firm No. C-3833
SC Firm No. 5201

Geotechnical Engineering
Environmental Services
CMT/Special Inspections

March 11, 2019

Mr. Steve Rogers
S & S Retaining Walls
4107 Cahnnas Way
Waxhaw, North Carolina 28173
steverogers@windstream.net

Re: Geotechnical Engineering Evaluation
Chester County Parcel #060-00-02-010-000
1047 Pinckney Road
Chester, Chester County, South Carolina
CVET Project No. 19-509

Dear Mr. Rogers:

Per your request, Catawba Valley Engineering and Testing (CVET) is providing this letter summarizing our services performed for the proposed soil borrow pit on an undeveloped site located at 1047 Pinckney Road in Chester, South Carolina. This report presents the findings of our subsurface exploration.

PROJECT DESCRIPTION

At the time of this report we understand that this project consists of the evaluation of the subsurface soil conditions at the subject site to facilitate a proposed soil borrow pit. Existing site grades generally slopes down gradient from northeast to southwest with elevations ranging from approximately 457 to 394 feet above mean sea level (amsl).

FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling ten (10) soil test borings (denoted as B-1 through B-10) at the locations indicated on Figure 2 – Boring Location Plan appended to this report. The soil test borings were performed on February 13 through February 15, 2019 and were extended to depths ranging from approximately 6.7 to 30.0 feet below existing site grades.

Drilling was performed with a Geoprobe 7822DT atv-mounted drill rig using continuous-flight hollow stem augers (HSA). Soil samples were obtained by means of the split-barrel sampling procedures (ASTM D1586). A 2-inch O.D., split-barrel sampler was driven into the soil a distance of 18 inches by means of an automatic hammer. The number

of blows required to drive the sampler through the final 12-inch interval is termed the Standard Penetration Test (SPT) "N" value and is indicated for each sample on the boring logs. This value can be used to provide an indication of the in-place relative density of cohesionless soils, but is a less reliable indicator of the consistency of cohesive soils. For cohesive soils, the measurement of unconfined compressive strength Q_u is a better indicator of consistency; this value is also listed on the boring logs. The SPT Boring logs are appended to this report.

LABORATORY TESTING

Representative samples of soil obtained during the field exploration were transported to CVET's laboratory in Hickory, North Carolina, where they were examined and classified by a geotechnical engineer. The soil samples were visually classified in general accordance with the Unified Soil Classification System (USCS), per ASTM D2487. Laboratory testing including Soil Moisture (ASTM D2216), Grain Size Distribution (ASTM D422), and Atterberg Limits for Plasticity were performed on selected SPT samples from the soil test boring. Laboratory results are appended to this report.

FINDINGS

The soil test borings encountered surficial topsoil in all ten (10) borings ranging in thickness from 2 to 12 inches. Fill soils were encountered underlying the topsoil in borings B-1, B-2, B-8 and B-10 to depths ranging from 2.5 to 4.0 feet below existing site grades. The fill soils mainly consist of moist, micaceous, silty sand (SM) and sandy silt (ML) with sandy elastic silt (MH) encountered in boring B-8. SPT N-values within the fill soils ranges from 12 to 22 bpf, indicating stiff to very stiff cohesive soil consistency and 12 to 14 bpf, indicating medium dense cohesionless soil consistency. Residual soils were encountered in all test borings except B-3 and B-4. The residual soils mainly consist of moist sandy silt (ML) and silty sand (SM) with sporadic rock fragments. SPT N-values within the residuum range from 12 to 50+ blows per foot (bpf) in the cohesionless soils, indicating medium dense to very dense soil consistencies and 9 to 58 bpf in the cohesive soils, indicating stiff to very hard soil consistencies. Partially weathered rock (PWR) material was encountered in borings B-1, B-3, B-4, B-5, B-6, B-7, B-8, and B-10 at depths ranging from approximately 1.0 to 22.7 feet below existing site grades. Groundwater was not encountered in this exploration. The boring cave-in depths were documented to range from 2.9 to 20.0 feet below existing site grades.

CONCLUSIONS, AND RECOMMENDATIONS

Based upon the encountered subsurface soil conditions, we conclude that the site soils are likely suitable for use as structural fill material. We recommend that more comprehensive laboratory testing be performed to determine actual design

parameters prior to use as reinforced soil backfill in a mechanically stabilized earth retaining wall (MSEW) system.

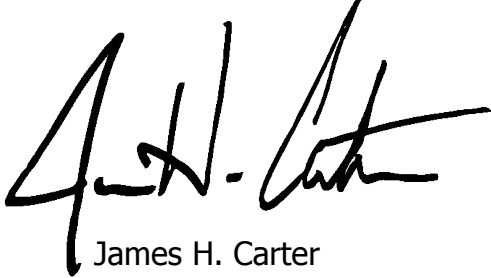
PWR was encountered at depths ranging from 1.0 to 22.7 feet below existing site grades. Unweathered bedrock (Auger refusal conditions) were encountered at depths ranging from 6.7 to 23.7 feet below existing site grades. Based on the encountered partially weathered rock we anticipate that it should be possible to excavate the residual soils and the fractured partially weathered rock materials with conventional earthwork equipment. However, the underlying harder bedrock (auger refusal materials or materials with SPT N-values of 50/2" or less) may require ripping. We recommend ripping operations to be performed by a CAT D-8 bulldozer with a single tooth ripper (or equivalent machinery). Rock not able to be removed by ripping will require the use of pneumatic hammers or blasting to excavate. We define un-excavatable rock as material that cannot be removed with a CAT 330 excavator or equivalent (approximately a 75,000 pound machine) utilizing rock teeth. As a result of shallow partially weathered rock and bedrock, we expect that ripping and the use of pneumatic tools may be necessary within portions of the site to achieve foundation bearing elevation and for utility trench excavation.

This report has been prepared for the exclusive use of Steve Rogers for specific application to the referenced property, in accordance with generally accepted soils and foundation engineering practices. No warranties, expressed or implied, are intended or made. The conclusions and recommendations presented in this report are based on the specific laboratory testing, visual observations, and testing performed as part of our scope of work and do not reflect variations in subsurface conditions that may exist between test locations or in unexplored portions of the site. Site safety, excavation support related to OSHA requirements, and construction dewatering requirements are the responsibility of others, not CVET. In the event changes are made to the proposed construction plans, design or location of the project as described within this report, the conclusions and recommendations provided in this report shall not be considered valid unless CVET is given the opportunity to review the changes, and either verifies or modifies the conclusions and recommendations contained in this report in writing.

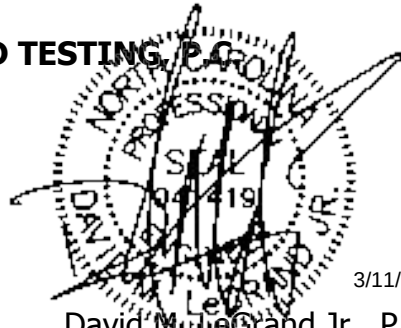
CVET appreciates the opportunity to provide our geotechnical engineering services for this project. If you have any questions regarding the contents of this report, or if we can provide additional services for the project, please do not hesitate to contact us.

Sincerely,

CATAWBA VALLEY ENGINEERING AND TESTING, P.A.



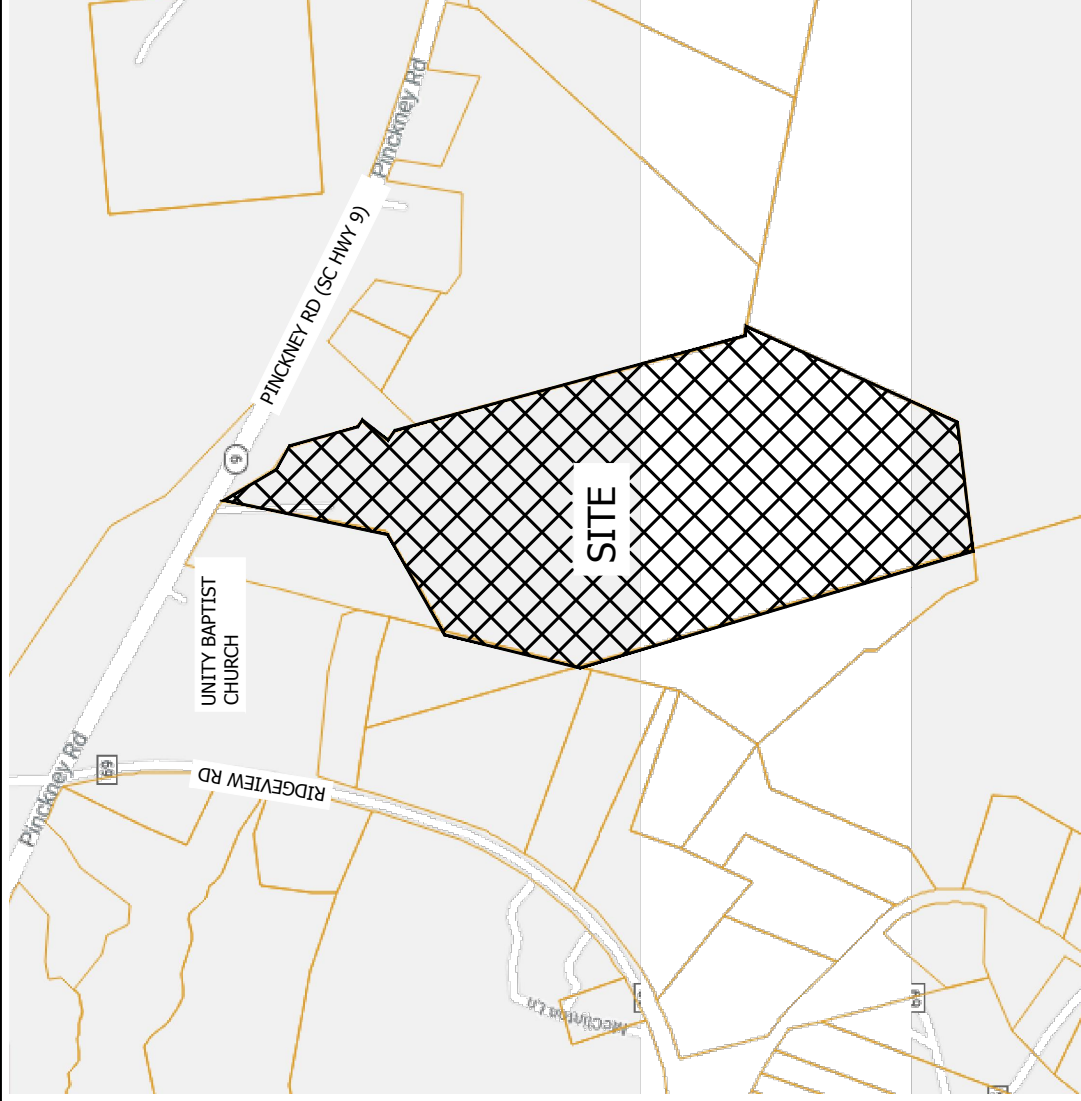
James H. Carter
Senior Geologist



3/11/19

David M. LeGrand Jr., P.E.
Principal Engineer
NC #041419

Attachments: Figures 1, 2, and 3
 Soil Boring Logs
 Soil Laboratory Results



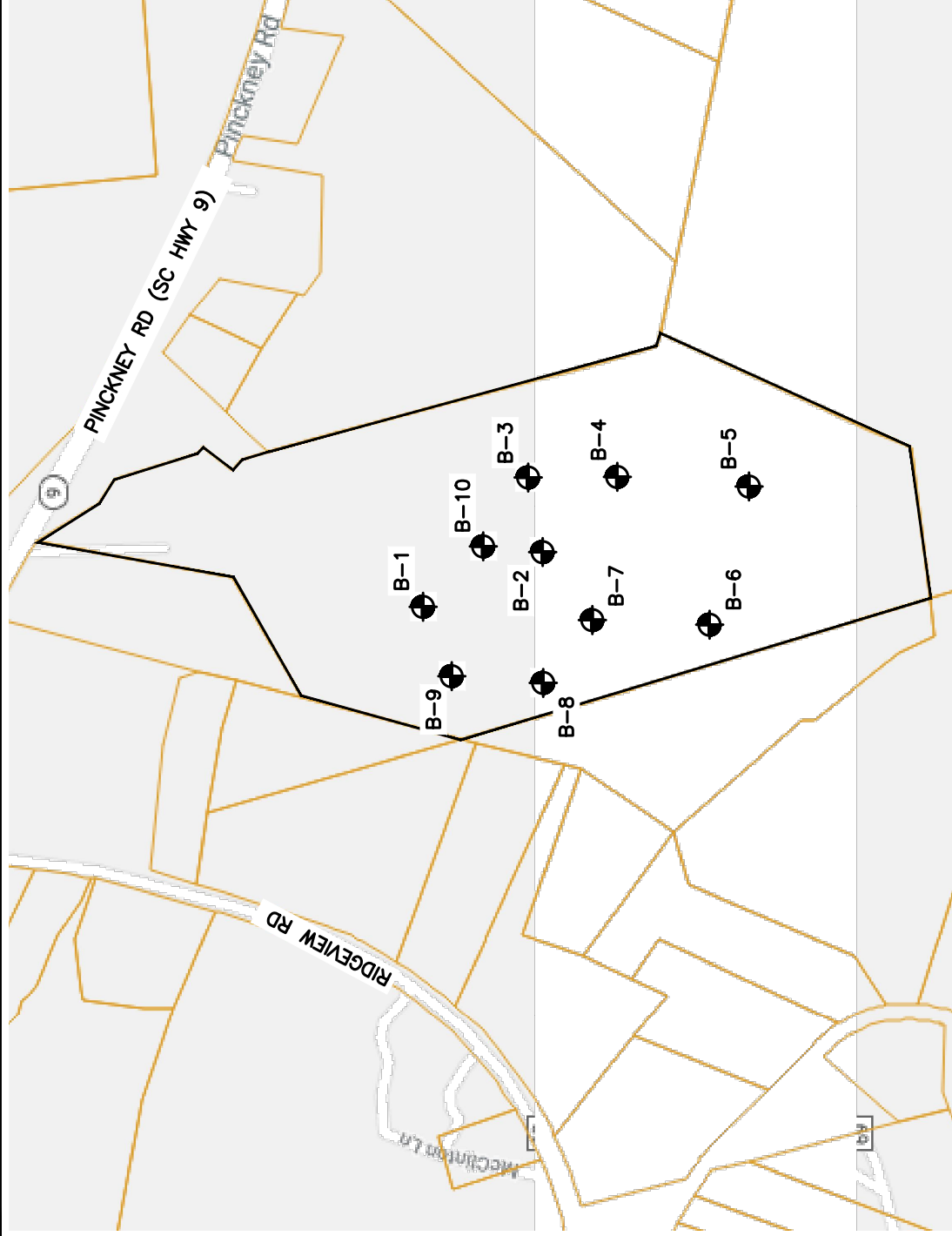
SITE MAP SCHEMATIC

**CATAWBA VALLEY
ENGINEERING & TESTING**
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TELE: 828-578-5972 FAX: 828-322-1801

CHESTER COUNTY
PARCEL # 060-00-02-010-000
1047 PINCKNEY RD
CHESTER, SOUTH CAROLINA

DRAWN BY EMB	PROJECT NO. 19-509
DATE 03-11-19	SHEET NO. FIG. 1





BORING LOCATIONS SCHEMATIC

**CATAWBA VALLEY
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P.O.B. 147 HICKORY, NORTH CAROLINA 28603
TELE: 828-578-5972 FAX: 828-322-1801



CHESTER COUNTY
PARCEL # 060-00-02-010-000
1047 PICKNEY RD
CHESTER, SOUTH CAROLINA

DRAWN BY EMB	PROJECT NO. 19-509
DATE 03-11-19	SHEET NO. FIG. 2



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Hickory, NC 28702
ENGINEERING & TESTING Telephone: 828 578 9972

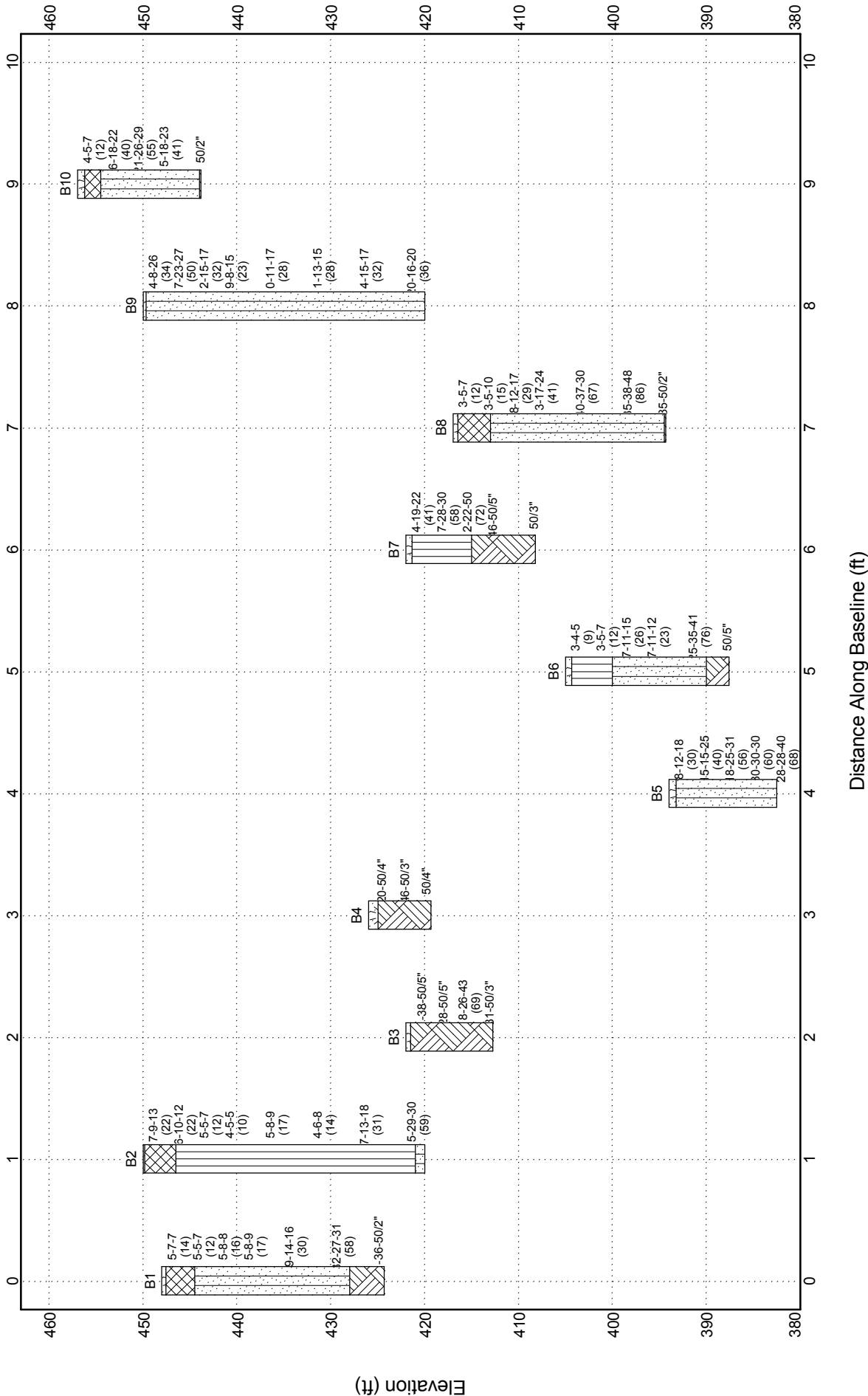
SUBSURFACE DIAGRAM

CLIENT Steve Rogers

PROJECT NAME Chester Property

PROJECT NUMBER 19-509

PROJECT LOCATION Chester, South Carolina





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KEY TO SYMBOLS

CLIENT Steve Rogers

PROJECT NAME Chester SC

PROJECT NUMBER 19-509

PROJECT LOCATION Chester, South Carolina

LITHOLOGIC SYMBOLS (Unified Soil Classification System)



BEDROCK: Bedrock



FILL: Fill (made ground)



ML: USCS Silt



SM: USCS Silty Sand



TOPSOIL: Topsoil

SAMPLER SYMBOLS



Split Spoon

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION
▽ Water Level at Time
Drilling, or as Shown
▼ Water Level at End of
Drilling, or as Shown
▽ Water Level After 24
Hours, or as Shown

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressure meter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash Sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistance to Soil Properties

Standard penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

<i>Density</i>	<i>Adjective Form</i>
Under 4 blows/ft	Very Loose
5 to 10 blows/ft	Loose
11 to 30 blows/ft	Medium Dense
31 to 50 blows/ft	Dense
Over 51 blows/ft	Very Dense

<i>Particle Size Identification</i>		
Boulders		8 inches and larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch
	Medium	0.42 to 2.0 mm
	Fine	0.074 to 0.42 mm
Silt and Clay		0.0 to 0.074 mm

B. Cohesive Soils (Clay, Silt, and Combinations)

<i>Blows/ft</i>	<i>Consistency</i>	<i>Unconfined Comp. Strength Q_p (tsf)</i>	<i>Degree of Plasticity</i>	<i>Plasticity Index</i>
Under 2	Very Soft	Under 0.25	None to Slight	0-4
3 to 4	Soft	0.25-0.49	Slight	5-7
5 to 8	Medium Stiff	0.50-0.99	Medium	8-22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00-8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL Water Level	BCR Before Casing Removal	DCI Dry Cave-in
WS While Sampling	ACR After Casing Removal	WCI Wet Cave-in
WD While Drilling	▽ Est. Groundwater Level	▼ Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.



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BORING NUMBER B1

PAGE 1 OF 1

CLIENT Steve Rogers

PROJECT NAME Chester Property

PROJECT NUMBER 19-509

PROJECT LOCATION Chester, South Carolina

DATE STARTED 2/13/19 COMPLETED 2/13/19

GROUND ELEVATION 448 ft MSL HOLE SIZE 2.25 inches

DRILLING CONTRACTOR CVET

GROUND WATER LEVELS:

DRILLING METHOD 2.25 Hollow Stem Auger

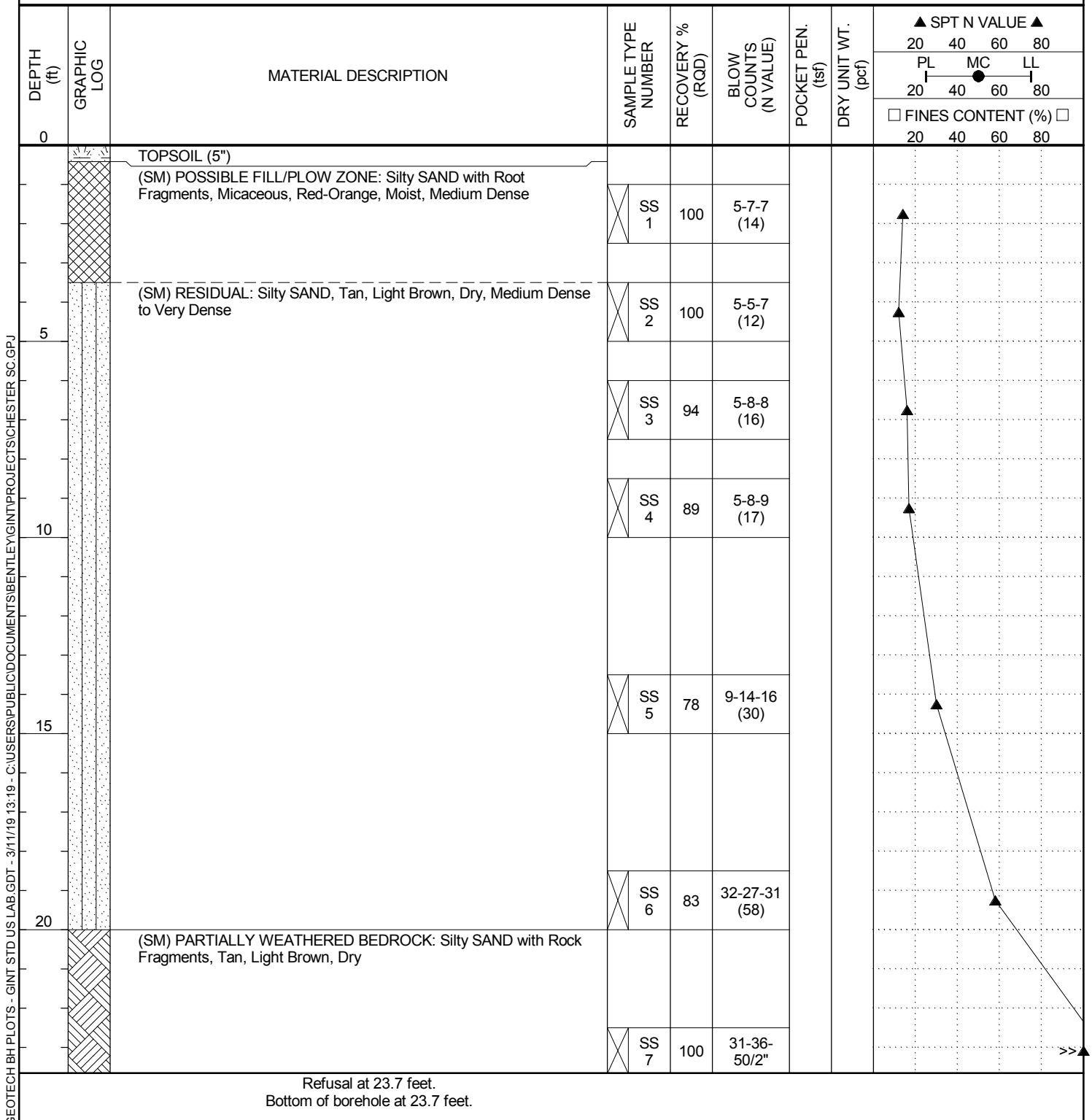
AT TIME OF DRILLING --- Cave at 12.17 ft.

LOGGED BY TV CHECKED BY CBD

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---



GEOTECH BH PLOTS - GINT STD US LAB.GDT - 3/11/19 13:19 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\CHESTER SC.GPJ



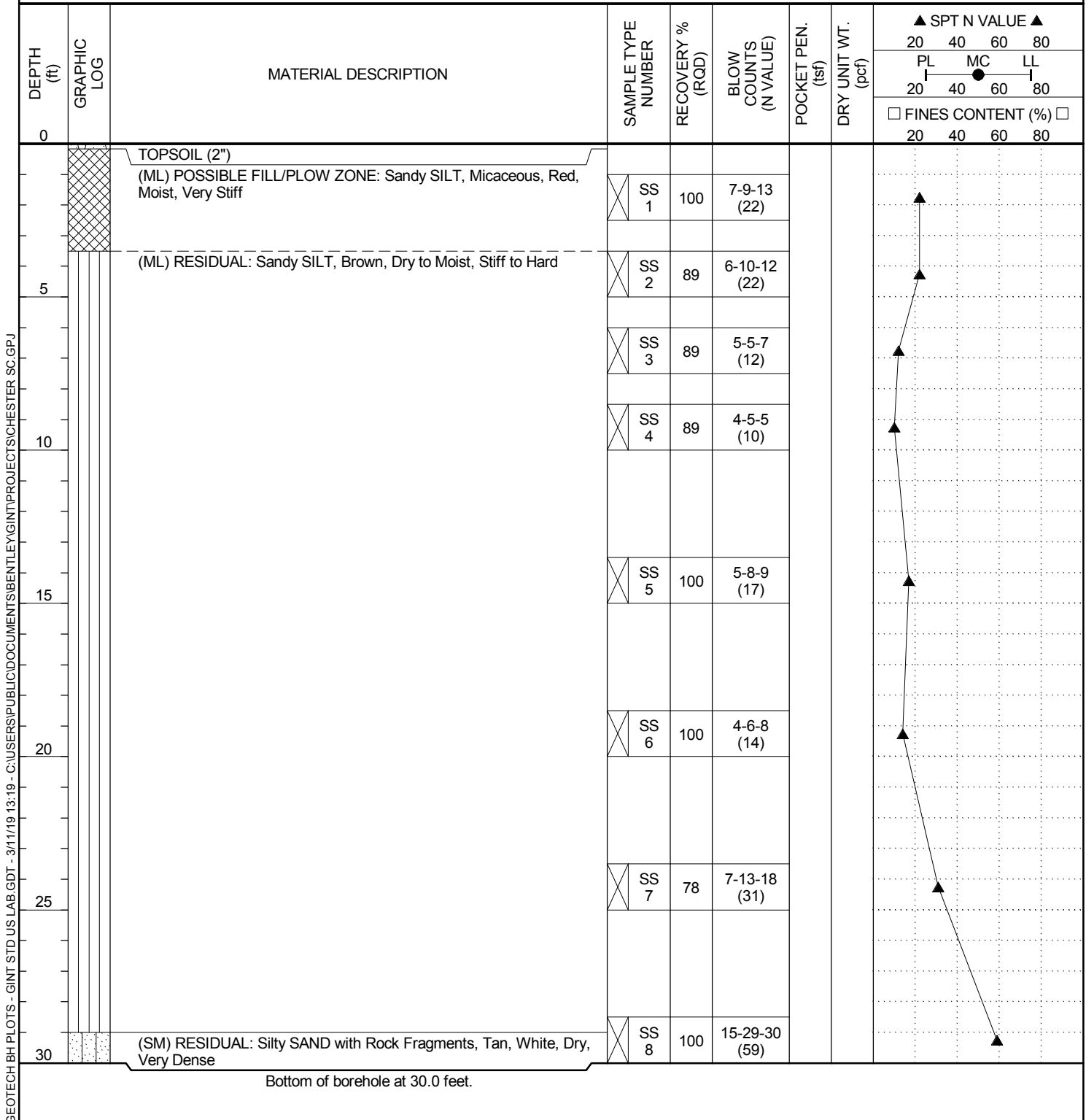
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Telephone: 828 578 9972

BORING NUMBER B2

PAGE 1 OF 1

CLIENT Steve Rogers	PROJECT NAME Chester Property
PROJECT NUMBER 19-509	PROJECT LOCATION Chester, South Carolina
DATE STARTED 2/13/19	COMPLETED 2/13/19
DRILLING CONTRACTOR CVET	GROUND ELEVATION 450 ft MSL
DRILLING METHOD 2.25 Hollow Stem Auger	HOLE SIZE 2.25 inches
LOGGED BY TV	CHECKED BY CBD
NOTES	GROUND WATER LEVELS:
	AT TIME OF DRILLING --- Cave at 19.0 ft.
	AT END OF DRILLING ---
	AFTER DRILLING ---





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BORING NUMBER B3

PAGE 1 OF 1

CLIENT <u>Steve Rogers</u>	PROJECT NAME <u>Chester Property</u>
PROJECT NUMBER <u>19-509</u>	PROJECT LOCATION <u>Chester, South Carolina</u>
DATE STARTED <u>2/13/19</u> COMPLETED <u>2/13/19</u>	GROUND ELEVATION <u>422 ft MSL</u> HOLE SIZE <u>2.25 inches</u>
DRILLING CONTRACTOR <u>CVET</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>2.25 Hollow Stem Auger</u>	AT TIME OF DRILLING <u>--- Cave at 3.4 ft.</u>
LOGGED BY <u>TV</u> CHECKED BY <u>CBD</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
0.0		TOPSOIL(6")						20	40	60	80
		(SM) PARTIALLY WEATHERED BEDROCK: Silty SAND, Dark Brown, Black, Moist									
2.5			SS 1	100	21-38-50/5"						>>▲
			SS 2	100	28-50/5"						>>▲
5.0			SS 3	100	18-26-43 (69)						
7.5			SS 4	100	31-50/3"						>>▲
Refusal at 9.3 feet. Bottom of borehole at 9.3 feet.											

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BORING NUMBER B4

PAGE 1 OF 1

CLIENT <u>Steve Rogers</u>	PROJECT NAME <u>Chester Property</u>
PROJECT NUMBER <u>19-509</u>	PROJECT LOCATION <u>Chester, South Carolina</u>
DATE STARTED <u>2/13/19</u> COMPLETED <u>2/13/19</u>	GROUND ELEVATION <u>426 ft MSL</u> HOLE SIZE <u>2.25 inches</u>
DRILLING CONTRACTOR <u>CVET</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>2.25 Hollow Stem Auger</u>	AT TIME OF DRILLING <u>--- Cave at 2.9 ft.</u>
LOGGED BY <u>TV</u> CHECKED BY <u>CBD</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
0.0								20	40	60	80
		TOPSOIL (12")									
		PARTIALLY WEATHERED BEDROCK: Silty SAND with Large Rock Fragments, Tan, White, Moist to Wet	SS 1	100	20-50/4"						>>▲
2.5											
			SS 2	100	46-50/3"						>>▲
5.0											
			SS 3	100	50/4"						>>▲

Refusal at 6.7 feet.
Bottom of borehole at 6.7 feet.



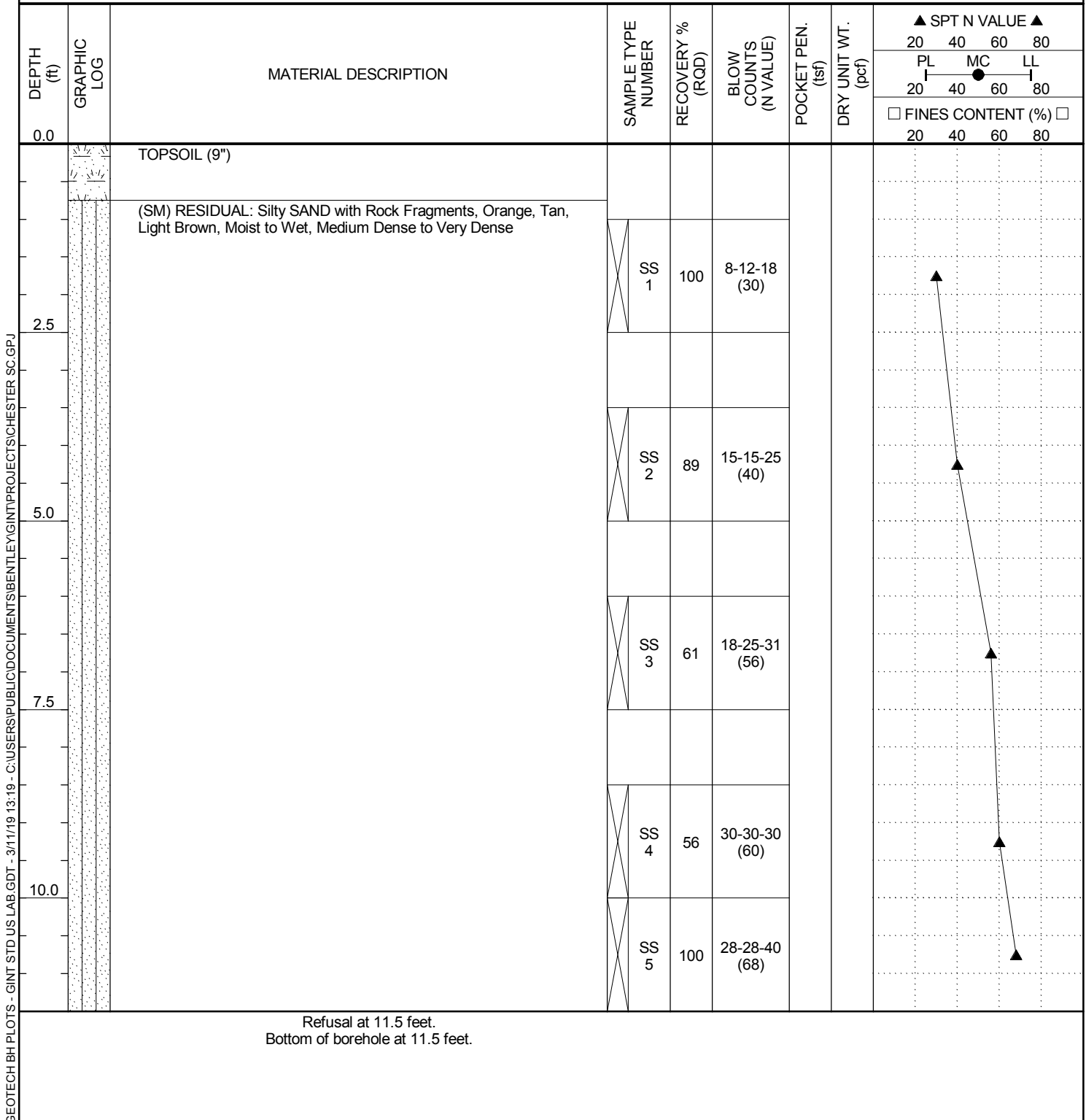
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BORING NUMBER B5

PAGE 1 OF 1

CLIENT <u>Steve Rogers</u>	PROJECT NAME <u>Chester Property</u>
PROJECT NUMBER <u>19-509</u>	PROJECT LOCATION <u>Chester, South Carolina</u>
DATE STARTED <u>2/14/19</u> COMPLETED <u>2/14/19</u>	GROUND ELEVATION <u>394 ft MSL</u> HOLE SIZE <u>2.25 inches</u>
DRILLING CONTRACTOR <u>CVET</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>2.25 Hollow Stem Auger</u>	AT TIME OF DRILLING <u>--- Cave at 3.33 ft.</u>
LOGGED BY <u>TV</u> CHECKED BY <u>CBD</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>





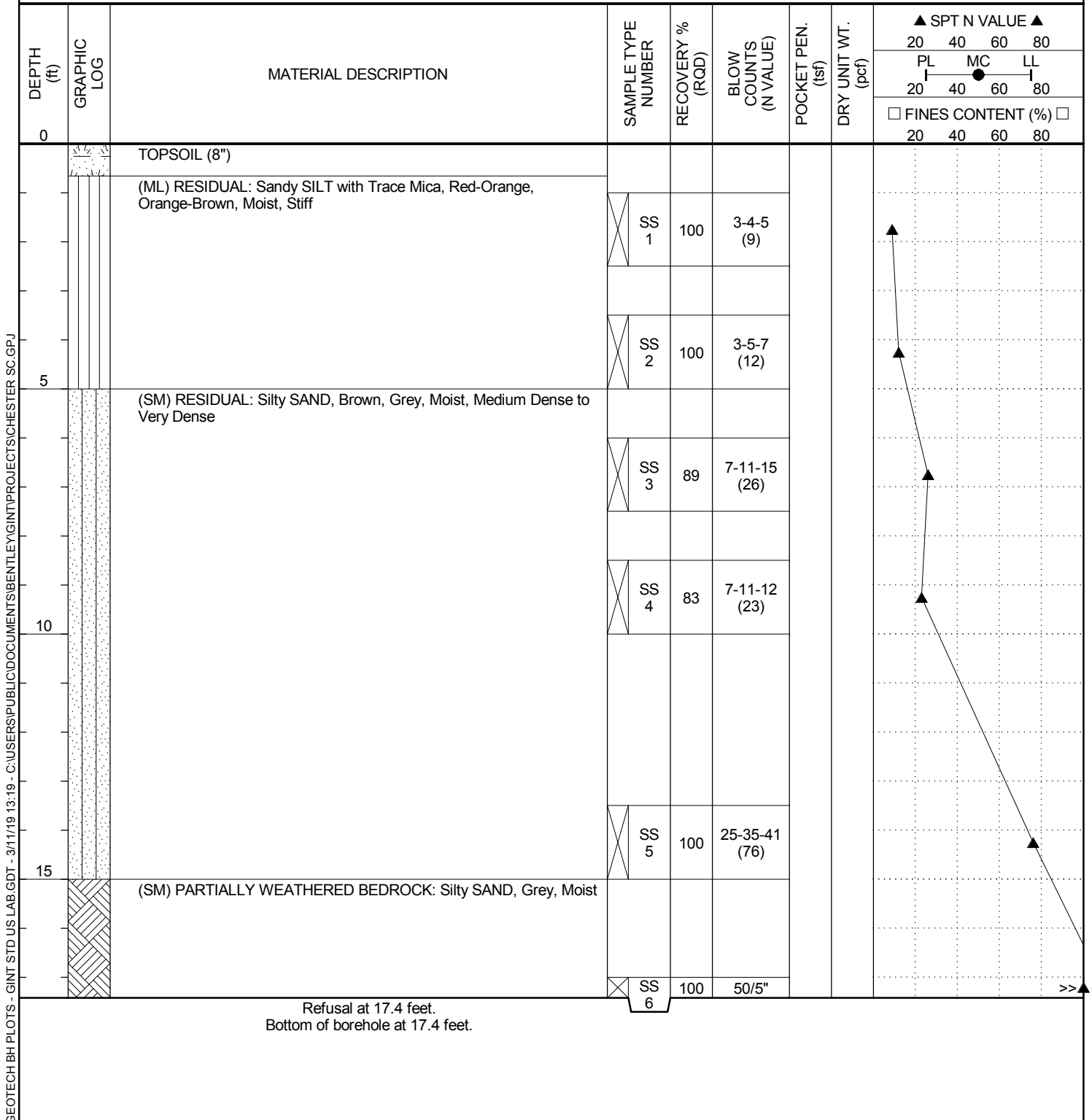
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Telephone: 828 578 9972

BORING NUMBER B6

PAGE 1 OF 1

CLIENT <u>Steve Rogers</u>	PROJECT NAME <u>Chester Property</u>
PROJECT NUMBER <u>19-509</u>	PROJECT LOCATION <u>Chester, South Carolina</u>
DATE STARTED <u>2/14/19</u> COMPLETED <u>2/14/19</u>	GROUND ELEVATION <u>405 ft MSL</u> HOLE SIZE <u>2.25 inches</u>
DRILLING CONTRACTOR <u>CVET</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>2.25 Hollow Stem Auger</u>	AT TIME OF DRILLING <u>--- Cave at 6.0 ft.</u>
LOGGED BY <u>TV</u> CHECKED BY <u>CBD</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>





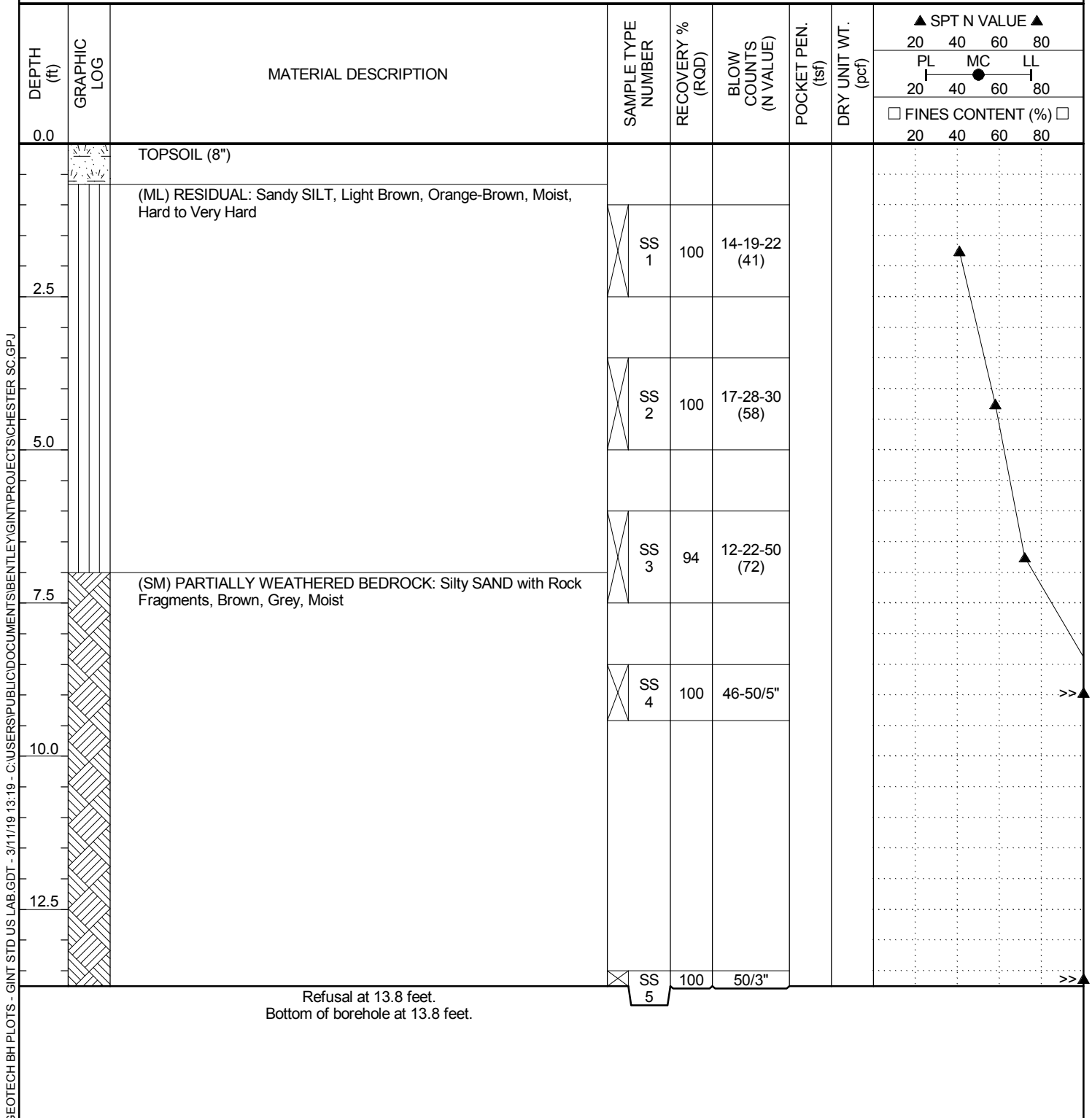
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Hickory, NC 28702
Telephone: 828 578 9972

BORING NUMBER B7

PAGE 1 OF 1

CLIENT <u>Steve Rogers</u>	PROJECT NAME <u>Chester Property</u>
PROJECT NUMBER <u>19-509</u>	PROJECT LOCATION <u>Chester, South Carolina</u>
DATE STARTED <u>2/14/19</u> COMPLETED <u>2/14/19</u>	GROUND ELEVATION <u>422 ft MSL</u> HOLE SIZE <u>2.25 inches</u>
DRILLING CONTRACTOR <u>CVET</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>2.25 Hollow Stem Auger</u>	AT TIME OF DRILLING <u>--- Cave at 9.0 ft.</u>
LOGGED BY <u>TV</u> CHECKED BY <u>CBD</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>





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BORING NUMBER B8

PAGE 1 OF 1

CLIENT Steve Rogers

PROJECT NAME Chester Property

PROJECT NUMBER 19-509

PROJECT LOCATION Chester, South Carolina

DATE STARTED 2/15/19 COMPLETED 2/15/19

GROUND ELEVATION 417 ft MSL HOLE SIZE 2.25 inches

DRILLING CONTRACTOR CVET

GROUND WATER LEVELS:

DRILLING METHOD 2.25 Hollow Stem Auger

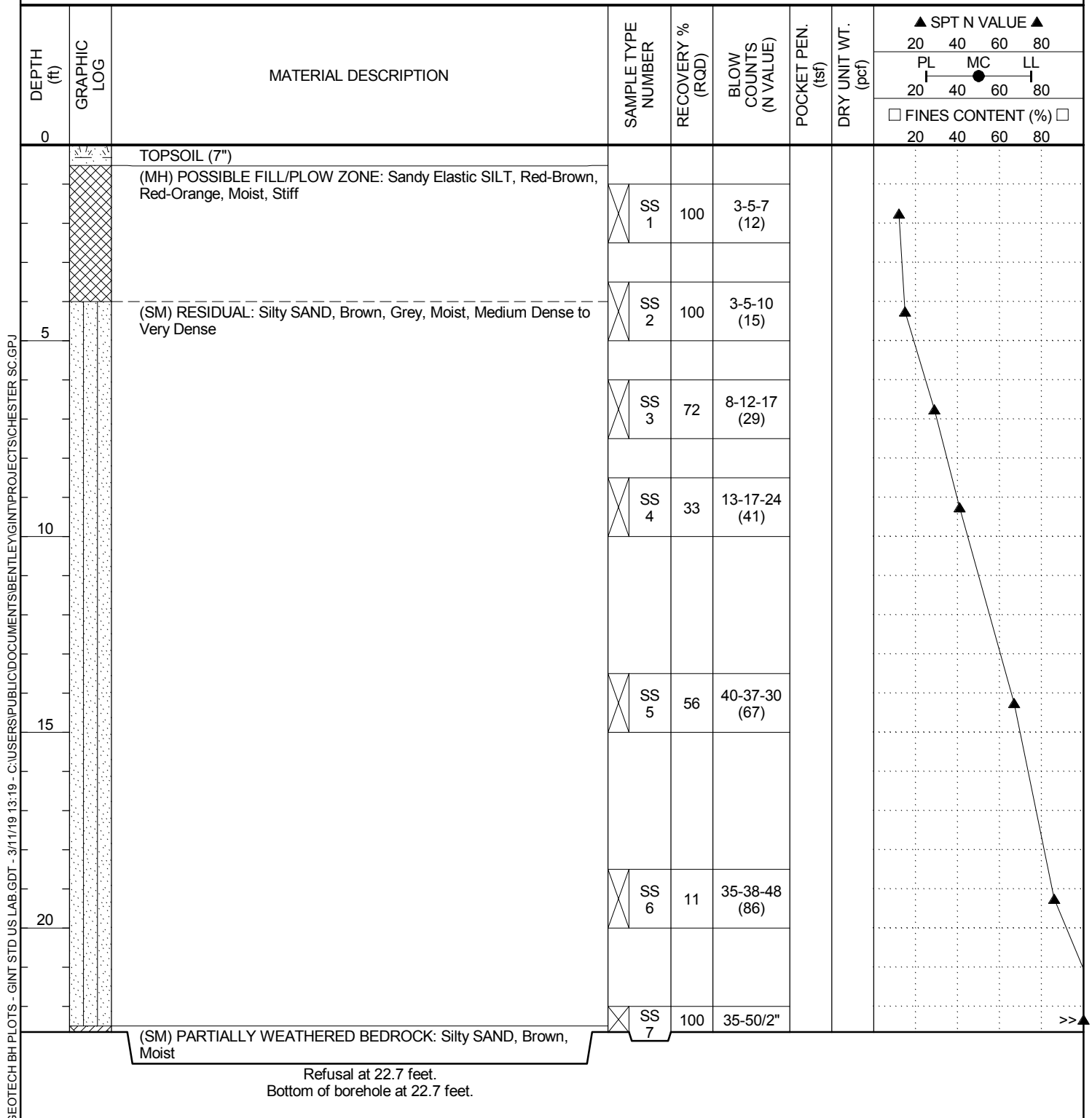
AT TIME OF DRILLING --- Cave at 16.25 ft.

LOGGED BY TV CHECKED BY CBD

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---





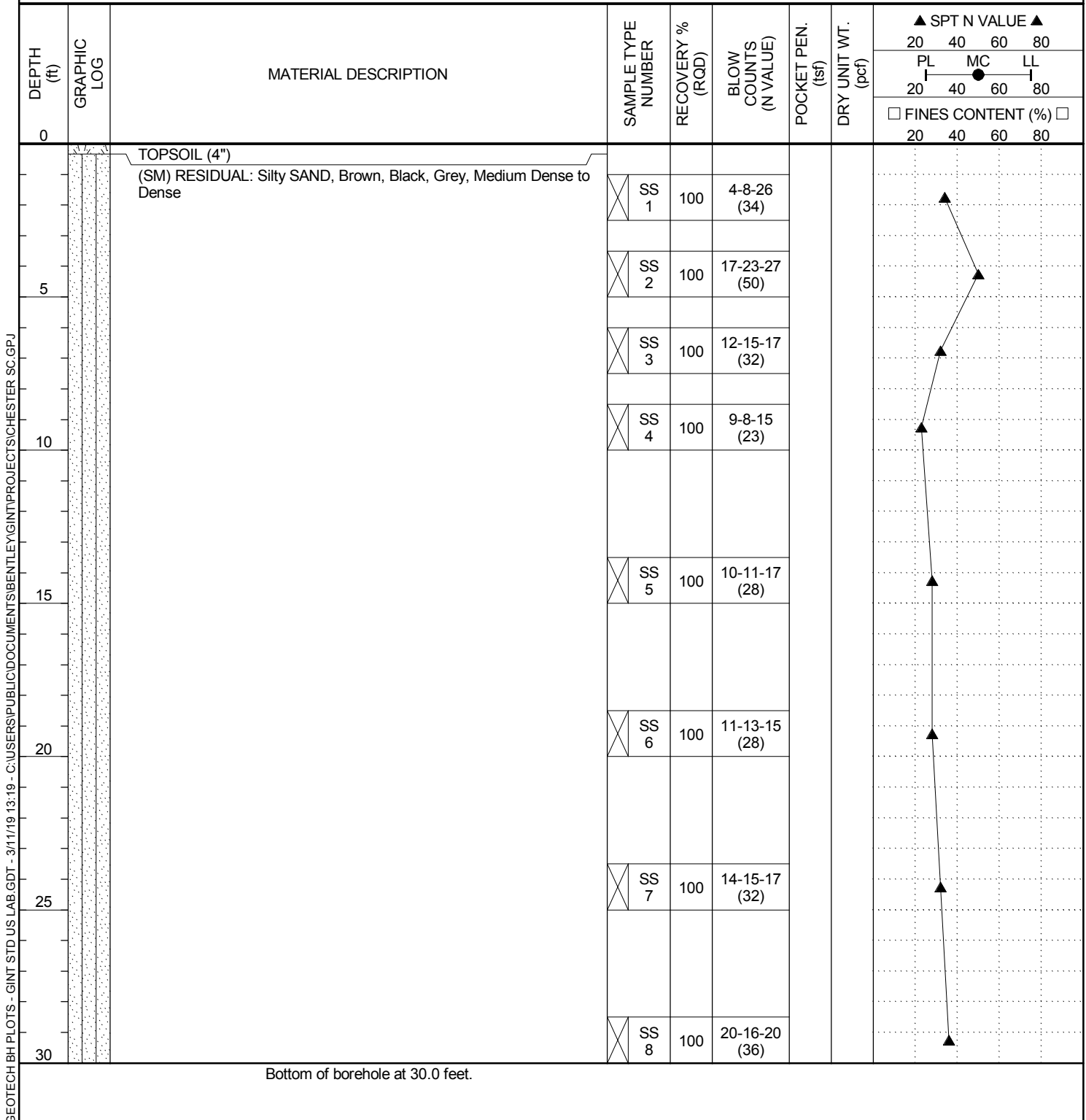
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Hickory, NC 28702
Telephone: 828 578 9972

BORING NUMBER B9

PAGE 1 OF 1

CLIENT <u>Steve Rogers</u>	PROJECT NAME <u>Chester Property</u>
PROJECT NUMBER <u>19-509</u>	PROJECT LOCATION <u>Chester, South Carolina</u>
DATE STARTED <u>2/15/19</u> COMPLETED <u>2/15/19</u>	GROUND ELEVATION <u>450 ft MSL</u> HOLE SIZE <u>2.25 inches</u>
DRILLING CONTRACTOR <u>CVET</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>2.25 Hollow Stem Auger</u>	AT TIME OF DRILLING <u>--- Cave at 20.0 ft.</u>
LOGGED BY <u>TV</u> CHECKED BY <u>CBD</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>





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Telephone: 828 578 9972

BORING NUMBER B10

PAGE 1 OF 1

CLIENT Steve Rogers

PROJECT NAME Chester Property

PROJECT NUMBER 19-509

PROJECT LOCATION Chester, South Carolina

DATE STARTED 2/14/19 COMPLETED 2/14/19

GROUND ELEVATION 457 ft MSL HOLE SIZE 2.25 inches

DRILLING CONTRACTOR CVET

GROUND WATER LEVELS:

DRILLING METHOD 2.25 Hollow Stem Auger

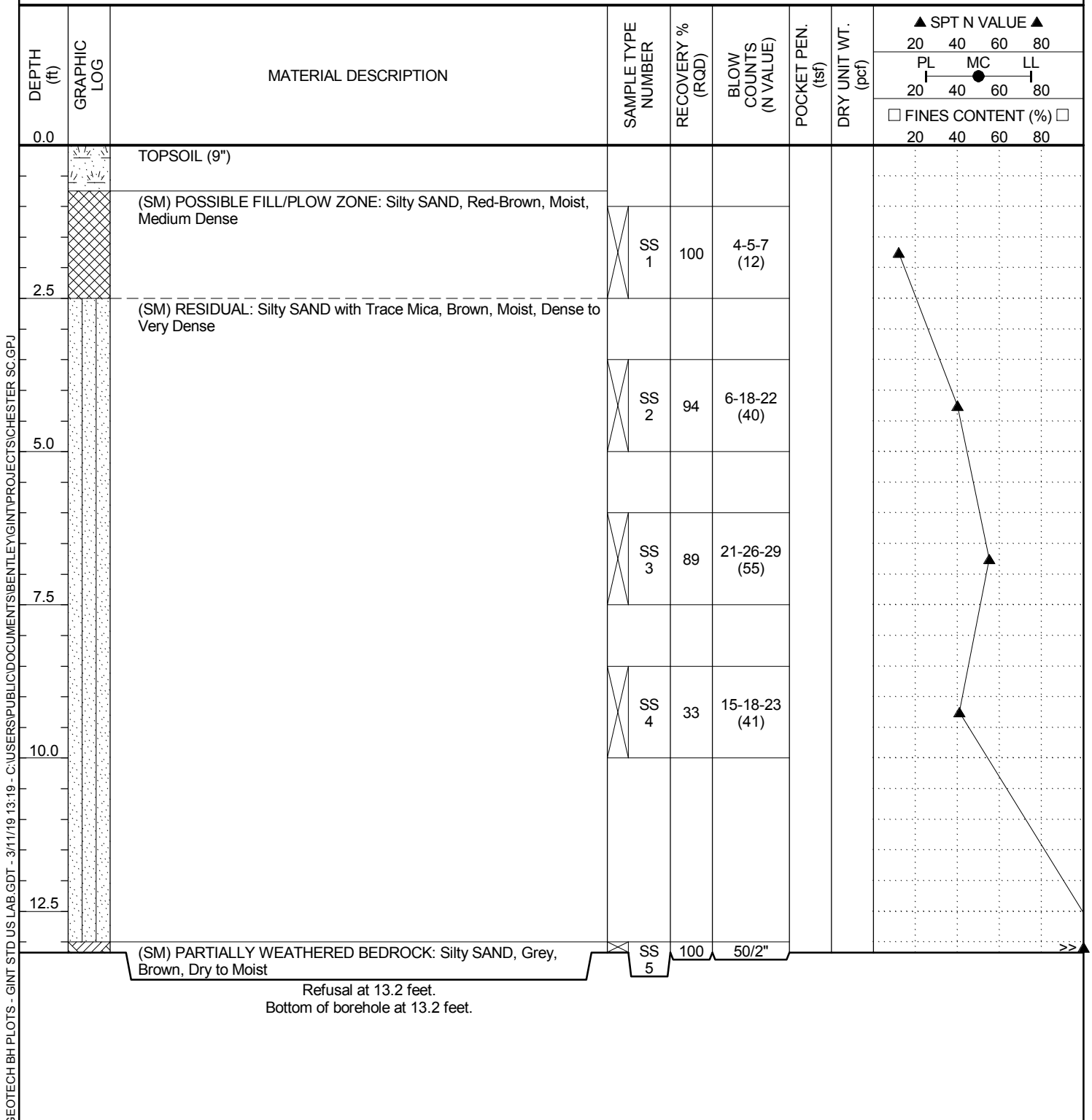
AT TIME OF DRILLING --- Cave at 6.0 ft.

LOGGED BY TV CHECKED BY CBD

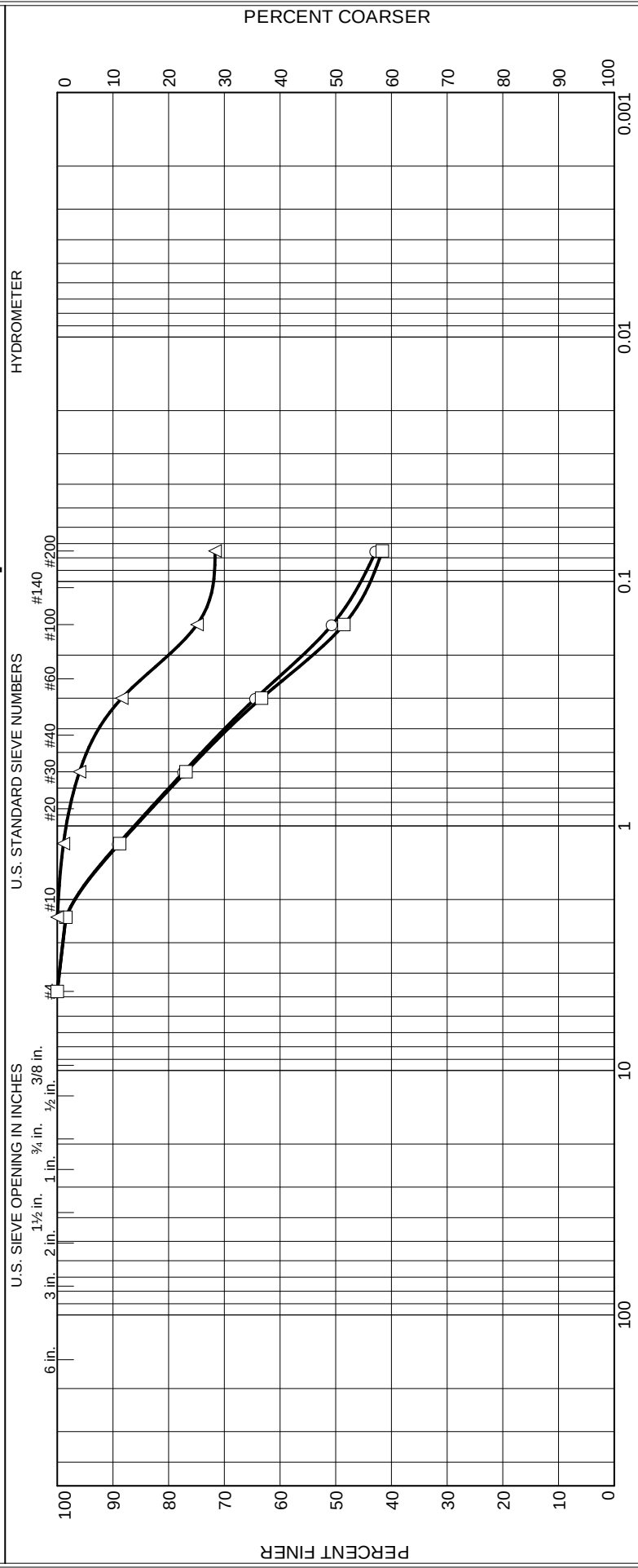
AT END OF DRILLING ---

NOTES ---

AFTER DRILLING ---



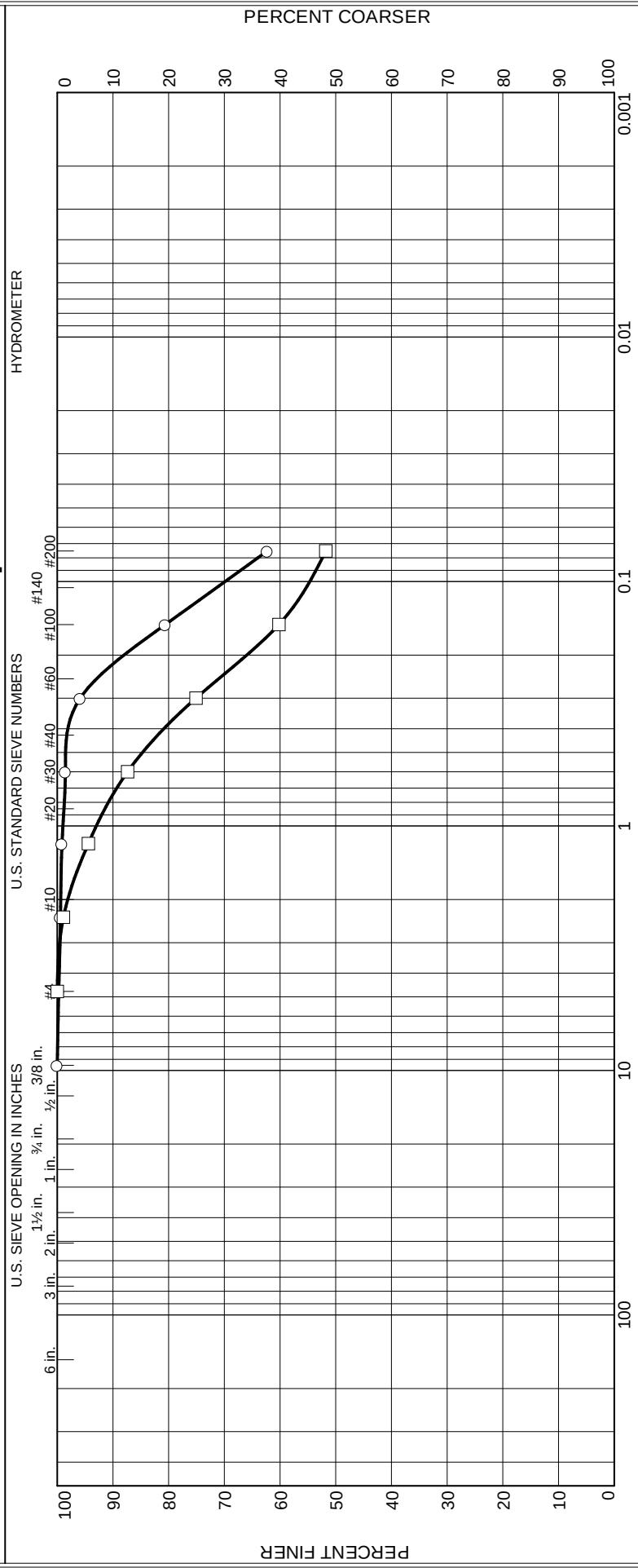
Particle Size Distribution Report



% +3"		% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	0	3	26	28	43	
□	0	0	0	3	27	28	42	
△	0	0	0	0	7	21	72	
Source		Sample #	Depth/Elev.	Date Sampled	USCS			
○	Test Borings	3465	B1 1-2.5'		SM			
□	Test Borings	3466	B1 3.5-5'		SM			
△	Test Borings	3467	B2 1-2.5'		ML			
					Material Description			
					Red Silty SAND			
					Red Silty SAND			
					Red SILT with Sand			
					NM %	LL	PL	
					23.6	NV	NP	
					23.3	NV	NP	
					27.1	NV	NP	

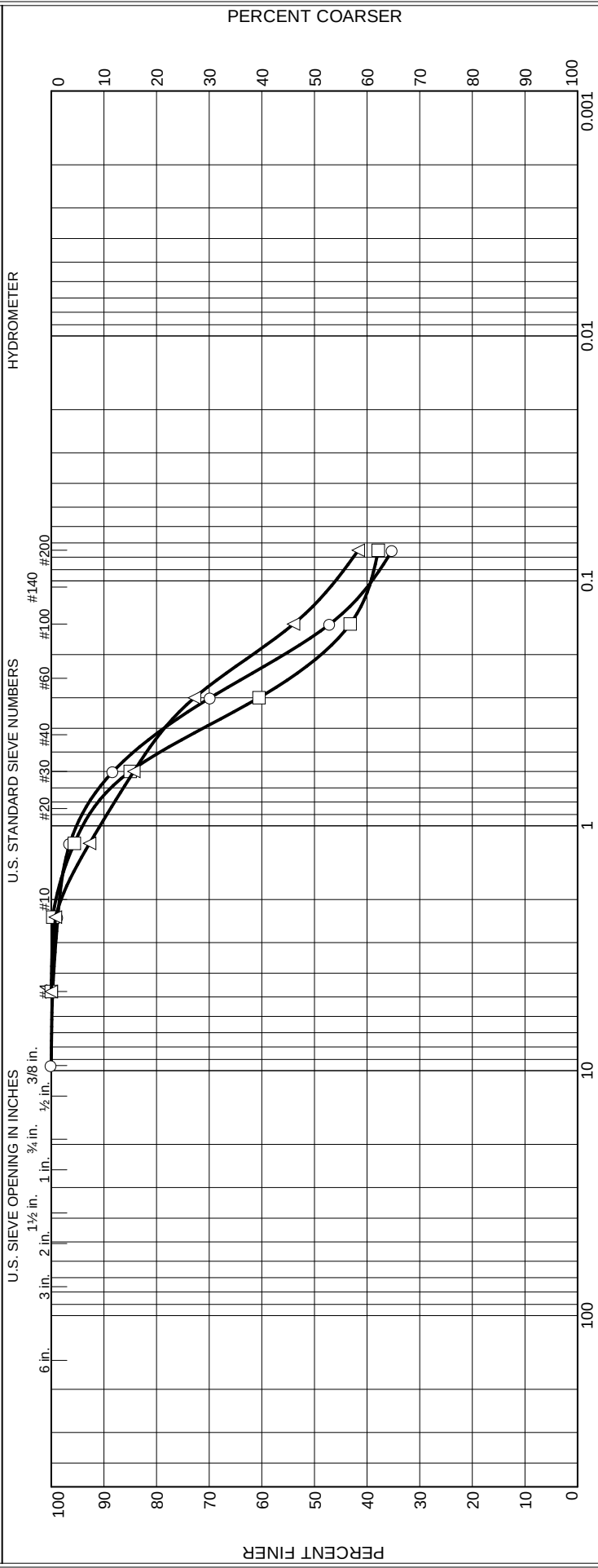
Client	Steve Rogers	Catawba Valley Engineering & Testing, P.C.
Project	Chester SC	
Project No.	19509	
	Figure	Hickory, North Carolina

Particle Size Distribution Report

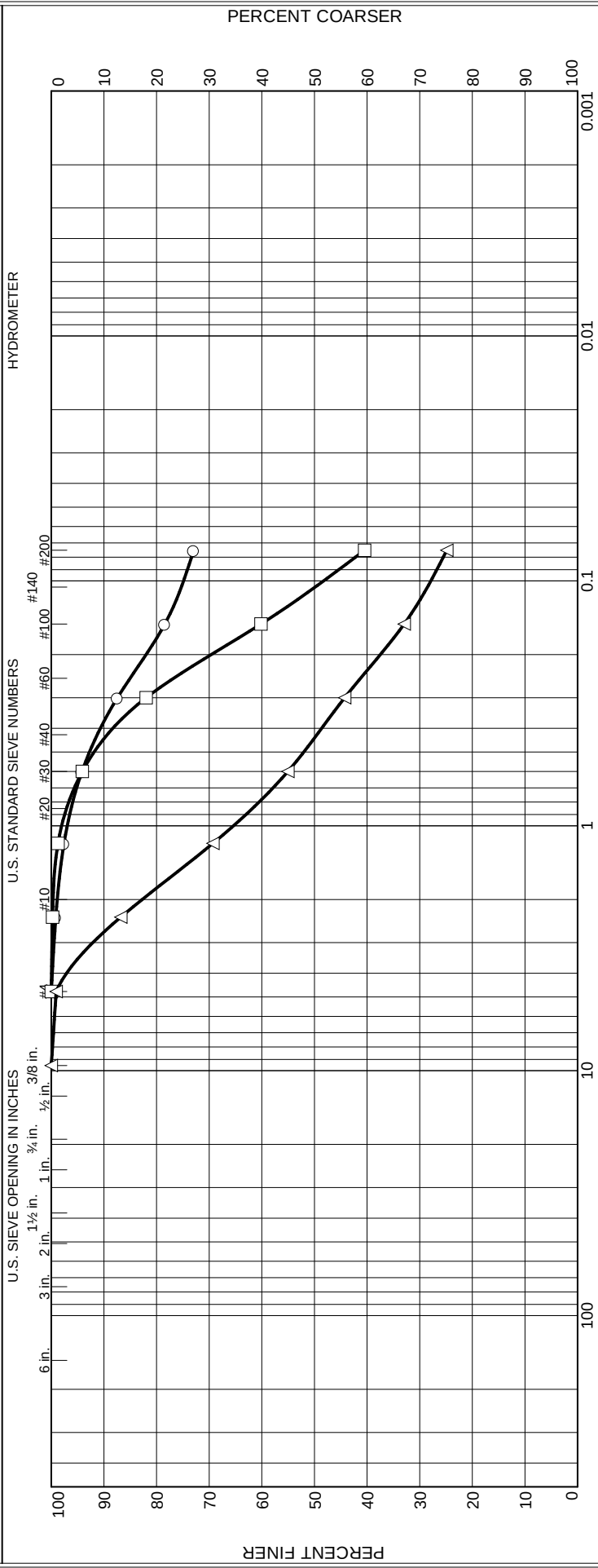


GRAIN SIZE - mm.									
% +3"		% Gravel		% Sand			% Fines		
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	
○	0	0	0	1	1	36		62	
□	0	0	0	2	16	30		52	
							</		

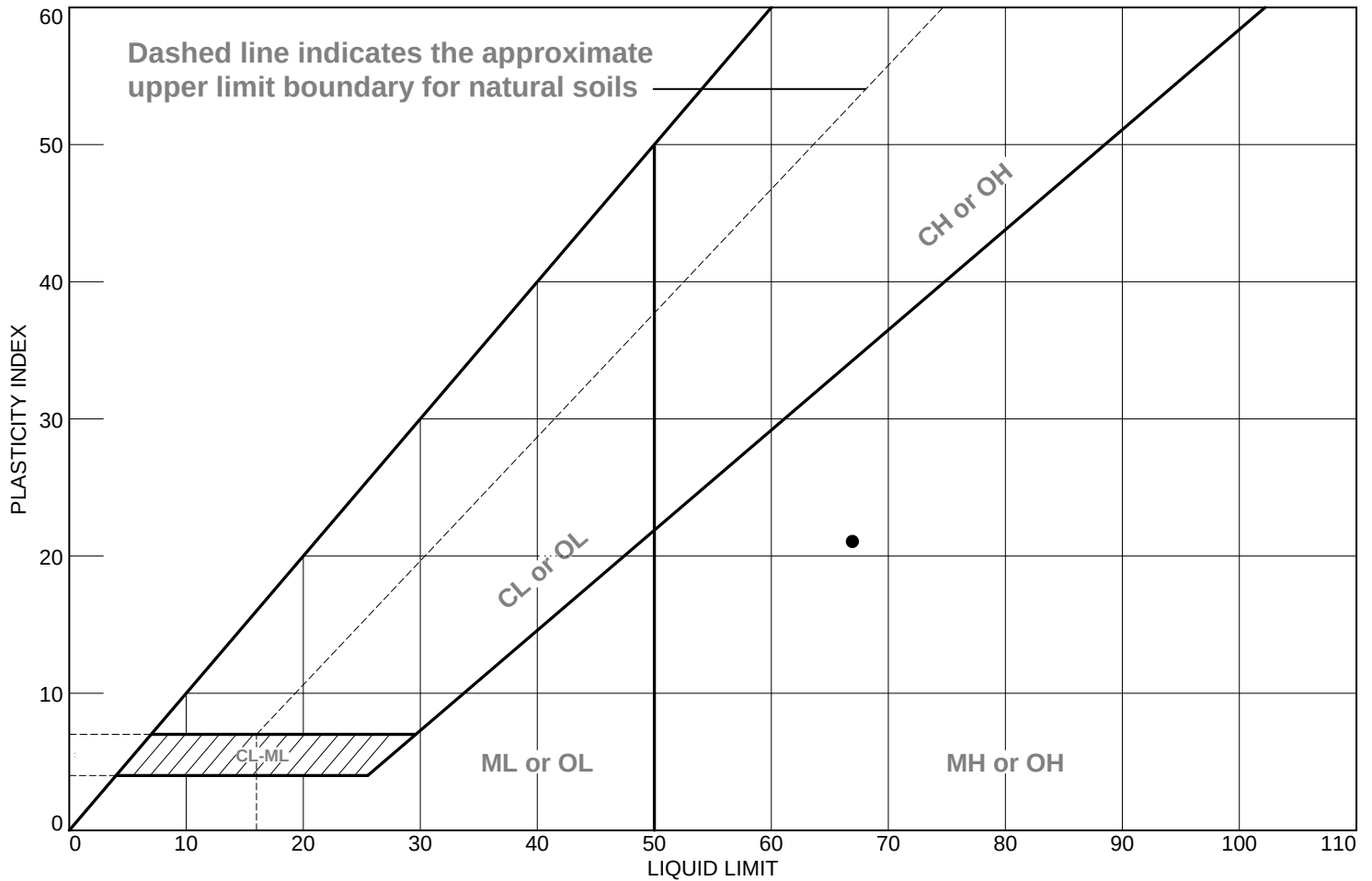
Particle Size Distribution Report



Particle Size Distribution Report



LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	Test Borings	3480	B8 1-2.5'	33.8	46	67	21	MH

**Catawba Valley
Engineering & Testing, P.C.
Hickory, North Carolina**

Client: Steve Rogers
Project: Chester SC

Project No.: 19509

Figure

Tested By: CR