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SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5703	1	43

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	PLAN SHEET
4 - 5	PROFILES
6 - 11	BORING LOGS
12 - 43	LABORATORY TEST RESULTS

**STRUCTURE
SUBSURFACE INVESTIGATION**

COUNTY LENOIR

PROJECT DESCRIPTION C.F. HARVEY PARKWAY AND NC 58 TO
INTERSECTION OF NC 11 AND GRANGER STATION ROAD
GRADING, PAVING, DRAINAGE, STRUCTURES AND SIGNALS

SITE DESCRIPTION BRIDGE NO. 210 AND NO. 211 ON -L-
(FELIX HARVEY PARKWAY) OVER -Y3- (HUGO ROAD)

INVENTORY

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

S. LANEY

K. HILL

S. MITCHELL

S. TIERNAN

C. CHANDLER

F. WRIGHT

E. BLONSHINE

J. PEELE

M. RAWLS

INVESTIGATED BY S&ME, INC.

DRAWN BY C. CHANDLER

CHECKED BY S. MITCHELL

SUBMITTED BY S&ME, INC.

DATE APRIL 2017

REFERENCE: R-5703

PROJECT: 46375



SIGNATURE

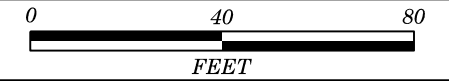
DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

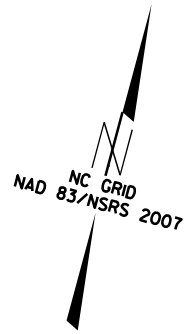
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION. The table contains detailed technical specifications and definitions for geotechnical engineering.

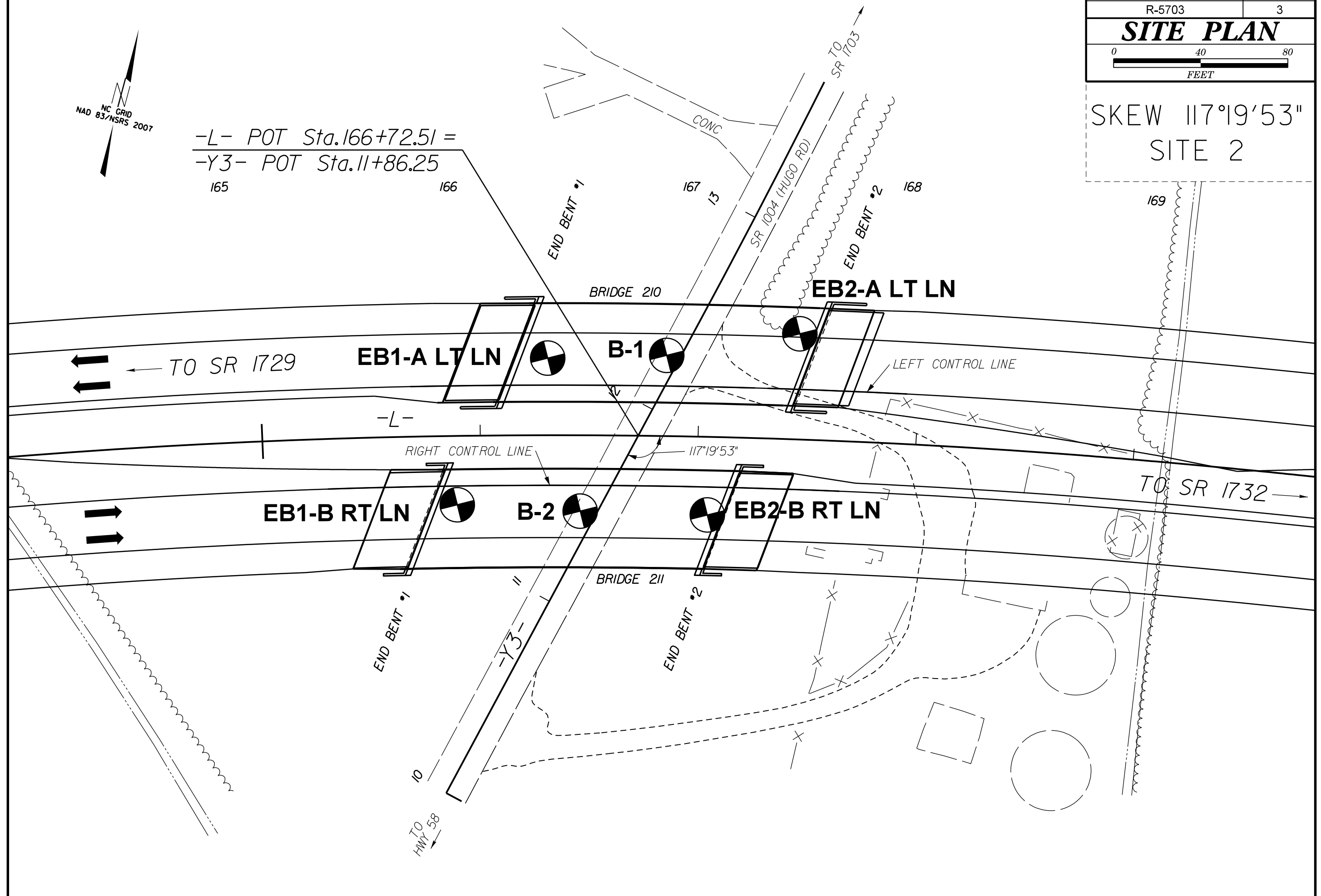
SITE PLAN



SKEW 117°19'53"
SITE 2



-L- POT Sta.166+72.51 =
-Y3- POT Sta.11+86.25
165 166



5/14/99

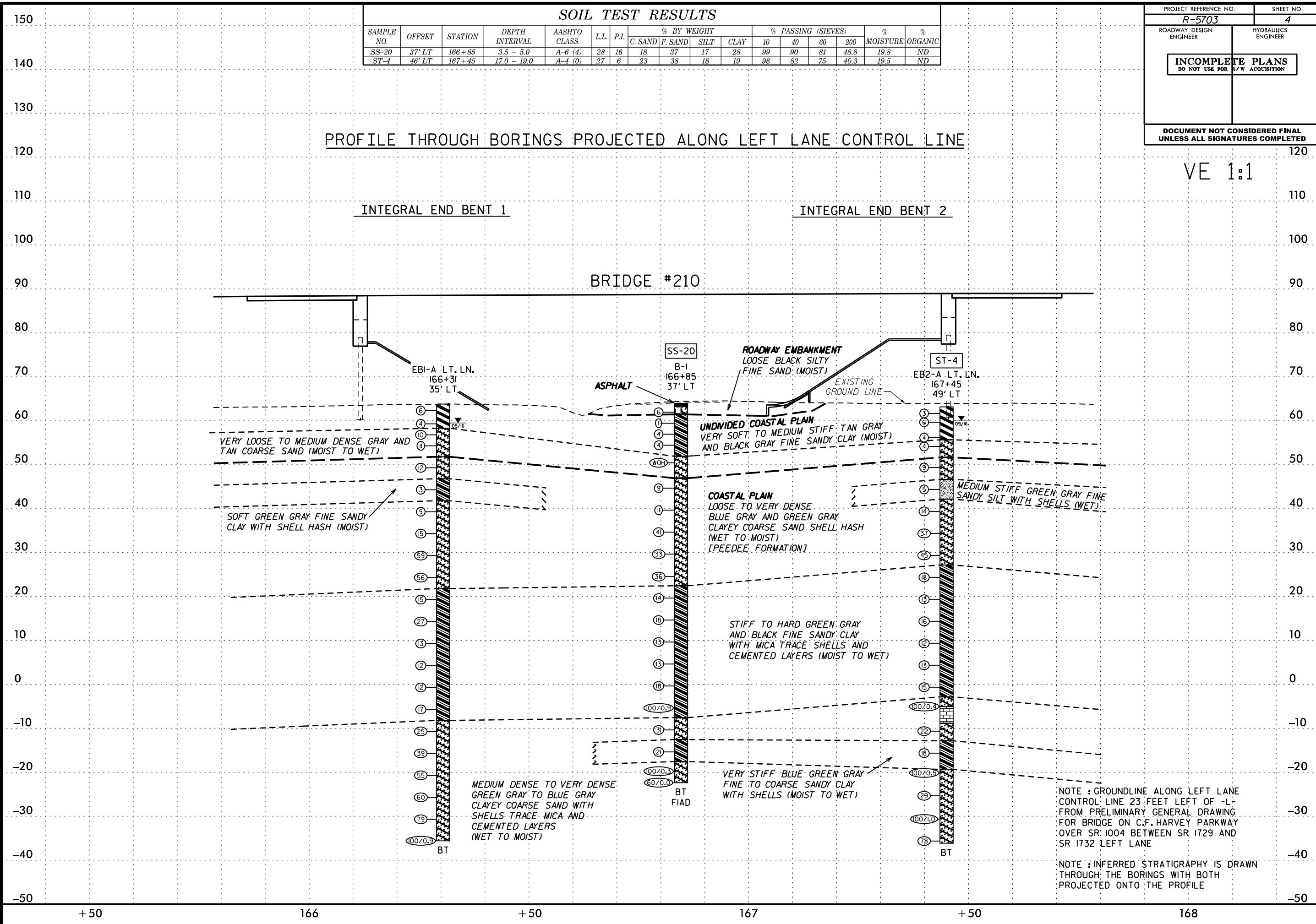
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)				% MOISTURE	% ORGANIC	
							C. SAND	F. SAND	SILT	CLAY	10	40	60			200
SS-20	37' LT	166+85	3.5 - 5.0	A-6 (4)	28	16	18	37	17	28	99	90	81	48.8	19.8	ND
ST-4	46' LT	167+45	17.0 - 19.0	A-4 (0)	27	6	23	38	18	19	98	82	75	40.3	19.5	ND

PROJECT REFERENCE NO. R-5703		SHEET NO. 4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE

VE 1:1



SYTIME\$\$\$\$\$
\$\$\$\$\$
\$\$\$\$\$

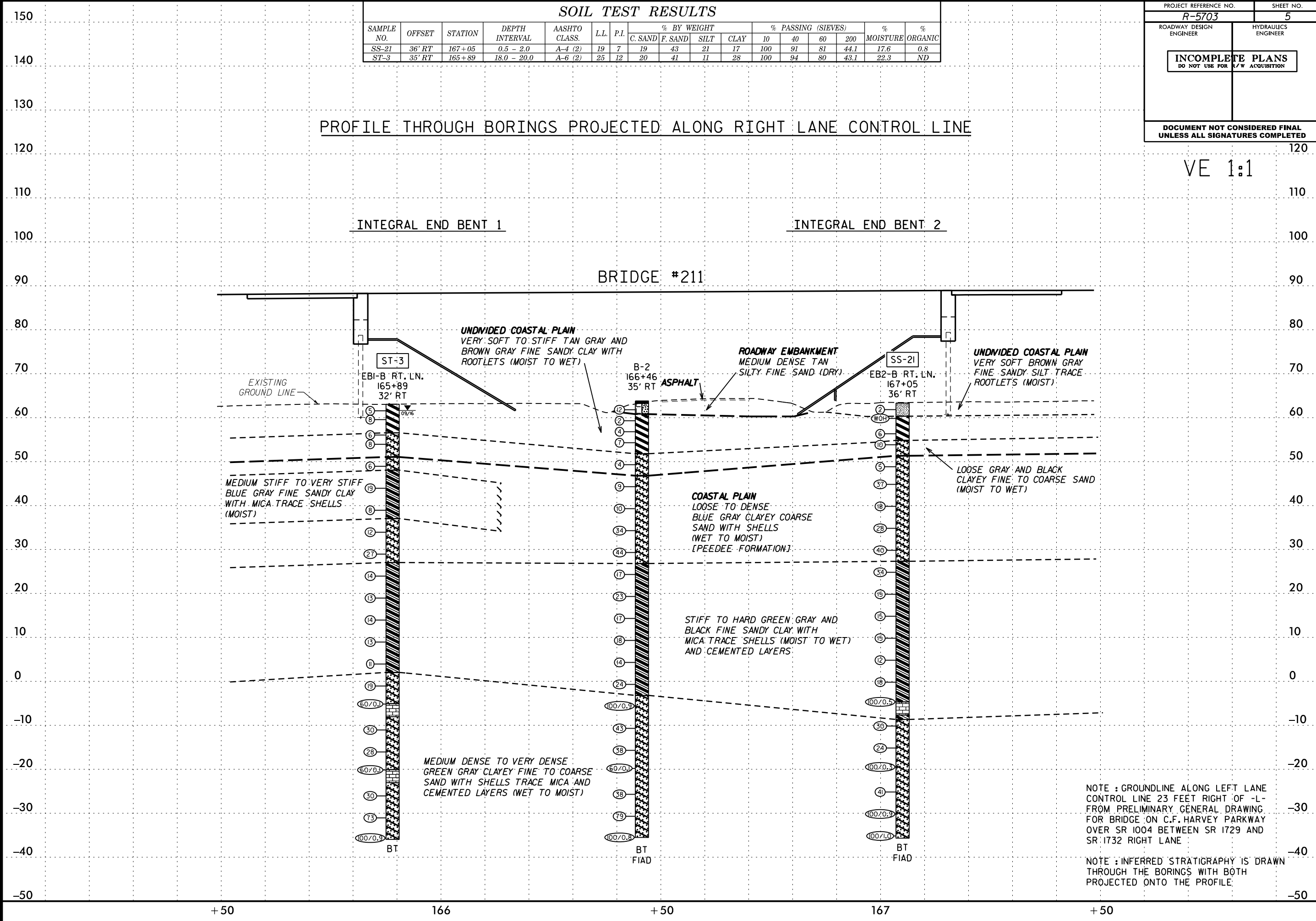
5/14/99

PROJECT REFERENCE NO.		SHEET NO.	
R-5703		5	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			

SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-21	36' RT	167+05	0.5 - 2.0	A-4 (2)	19	7	19	43	21	17	100	91	81	44.1	17.6	0.8
ST-3	35' RT	165+89	18.0 - 20.0	A-6 (2)	25	12	20	41	11	28	100	94	80	43.1	22.3	ND

PROFILE THROUGH BORINGS PROJECTED ALONG RIGHT LANE CONTROL LINE

VE 1:1



MEDIUM STIFF TO VERY STIFF BLUE GRAY FINE SANDY CLAY WITH MICA TRACE SHELLS (MOIST)

UNDIVIDED COASTAL PLAIN VERY SOFT TO STIFF TAN GRAY AND BROWN GRAY FINE SANDY CLAY WITH ROOTLETS (MOIST TO WET)

ROADWAY EMBANKMENT MEDIUM DENSE TAN SILTY FINE SAND (DRY)

COASTAL PLAIN LOOSE TO DENSE BLUE GRAY CLAYEY COARSE SAND WITH SHELLS (WET TO MOIST) [PEEDEE FORMATION]

STIFF TO HARD GREEN GRAY AND BLACK FINE SANDY CLAY WITH MICA TRACE SHELLS (MOIST TO WET) AND CEMENTED LAYERS

UNDIVIDED COASTAL PLAIN VERY SOFT BROWN GRAY FINE SANDY SILT TRACE ROOTLETS (MOIST)

LOOSE GRAY AND BLACK CLAYEY FINE TO COARSE SAND (MOIST TO WET)

MEDIUM DENSE TO VERY DENSE GREEN GRAY CLAYEY FINE TO COARSE SAND WITH SHELLS TRACE MICA AND CEMENTED LAYERS (WET TO MOIST)

NOTE : GROUNDLINE ALONG LEFT LANE CONTROL LINE 23 FEET RIGHT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER SR 1004 BETWEEN SR 1729 AND SR 1732 RIGHT LANE

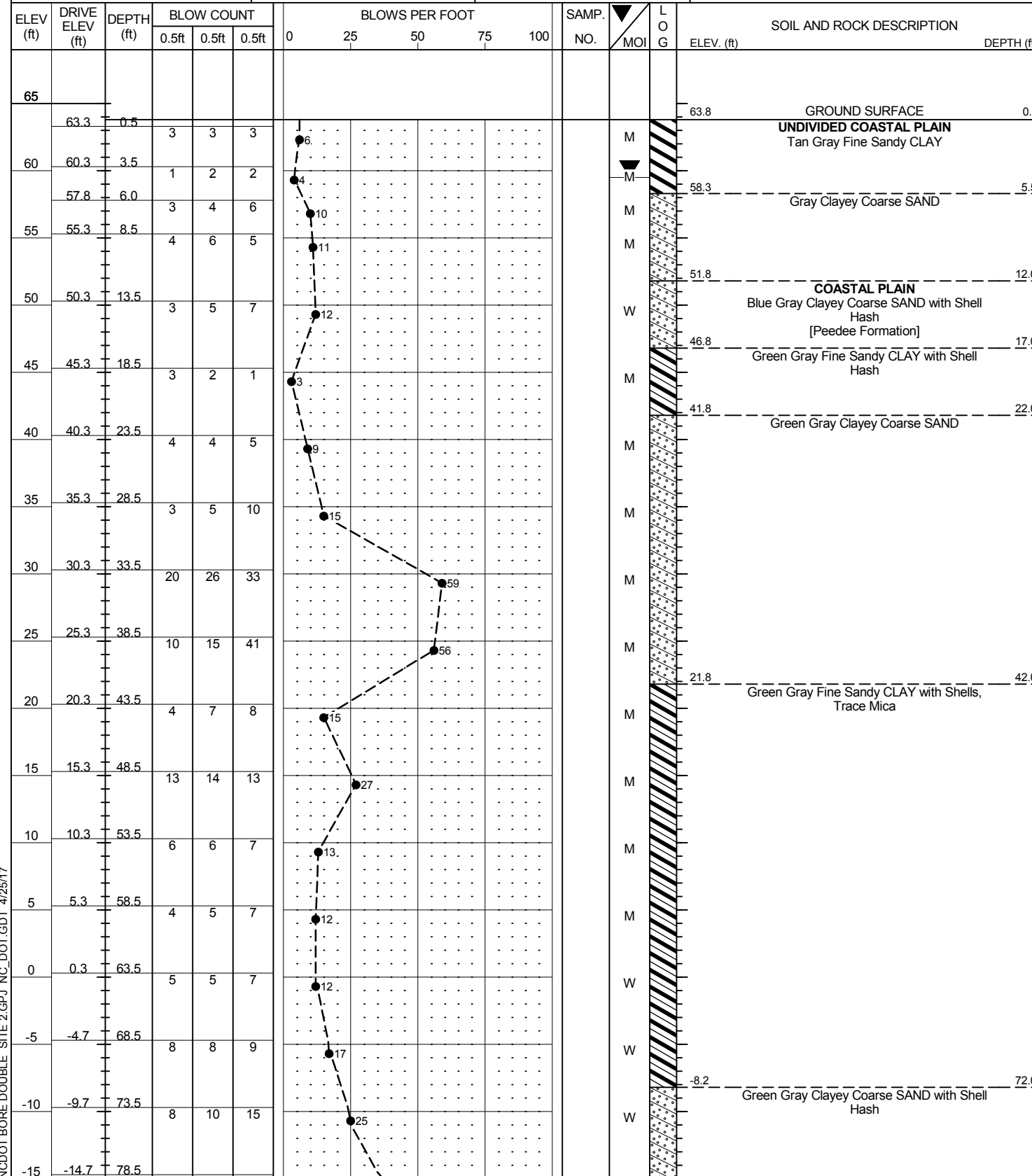
NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

\$\$\$\$ TIME \$\$\$
 \$\$\$ CDGN \$\$\$
 \$\$\$ STRENGTH \$\$\$
 \$\$\$ \$\$\$

GEOTECHNICAL BORING REPORT

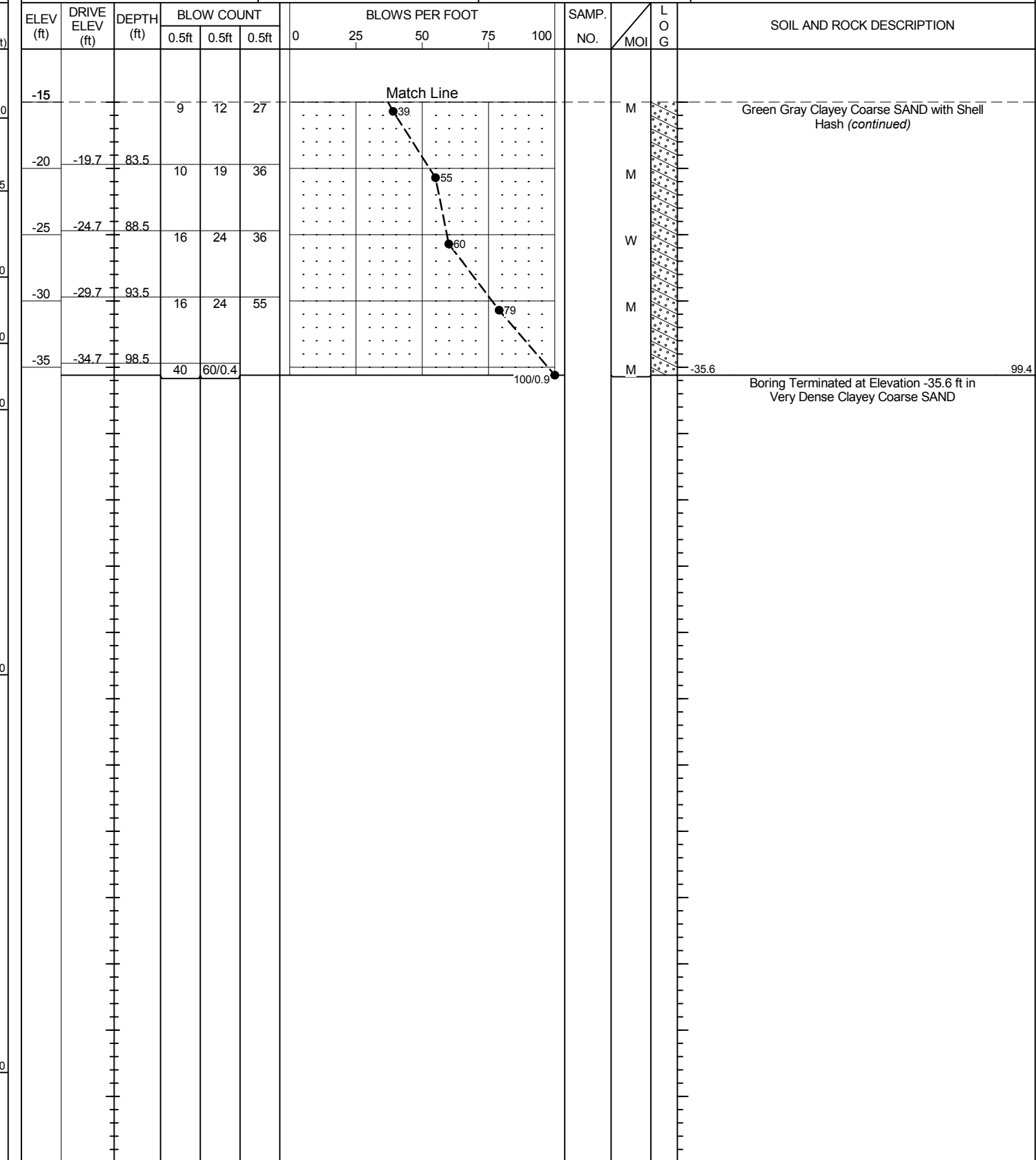
BORE LOG

WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 210 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. EB1-A Lt. Ln.	STATION 166+31	OFFSET 35 ft LT	ALIGNMENT -L-
COLLAR ELEV. 63.8 ft	TOTAL DEPTH 99.4 ft	NORTHING 580,059	EASTING 2,430,326
DRILL RIG/HAMMER EFF./DATE SME2938 CME-750 86% 02/11/2016		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Miller, T.	START DATE 08/31/16	COMP. DATE 08/31/16	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE SITE 2.GPJ NC_DOT_GDT 4/25/17

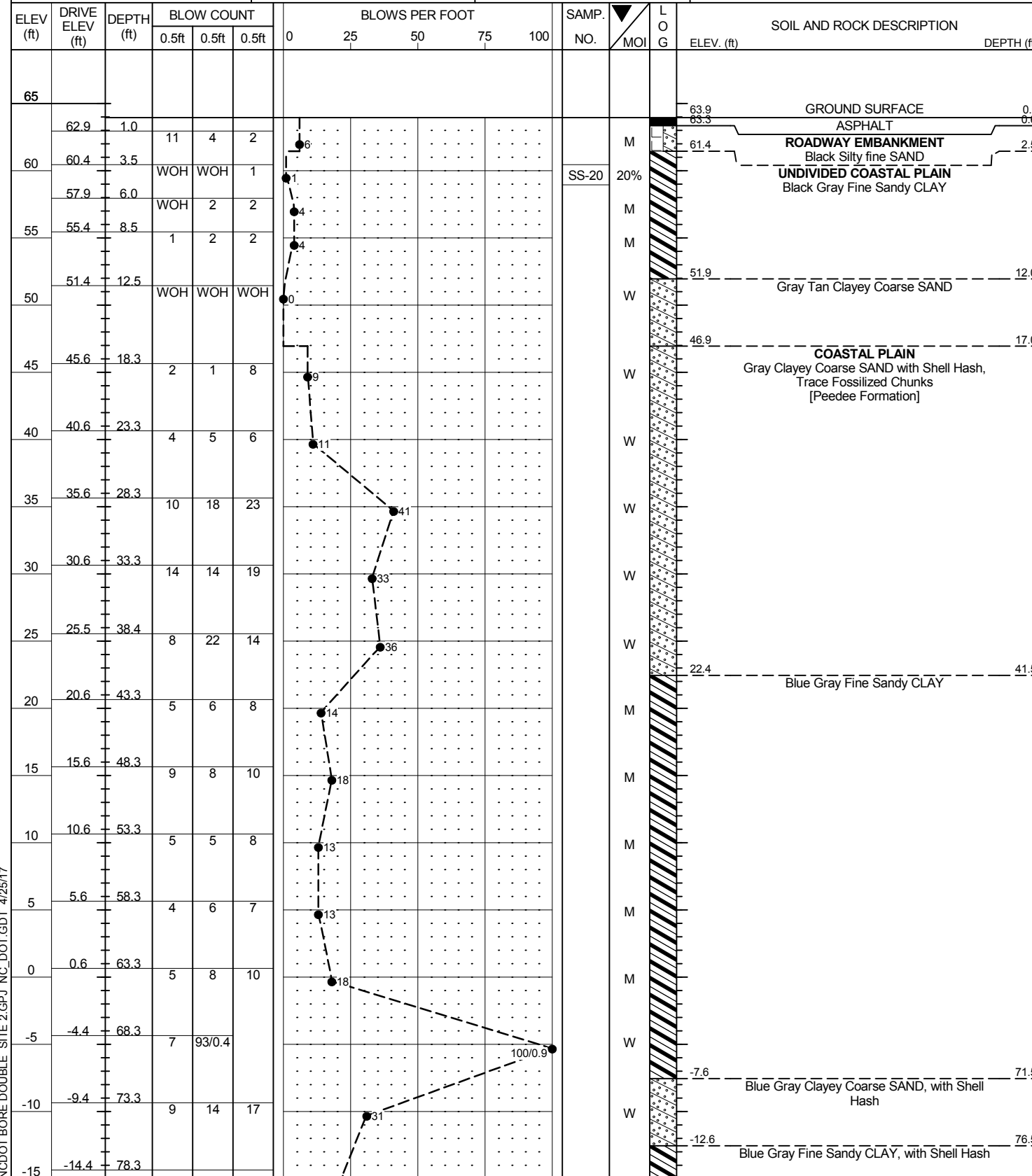
WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 210 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. EB1-A Lt. Ln.	STATION 166+31	OFFSET 35 ft LT	ALIGNMENT -L-
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DRILL RIG/HAMMER EFF./DATE SME2938 CME-750 86% 02/11/2016		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Miller, T.	START DATE 08/31/16	COMP. DATE 08/31/16	SURFACE WATER DEPTH N/A



GEOTECHNICAL BORING REPORT

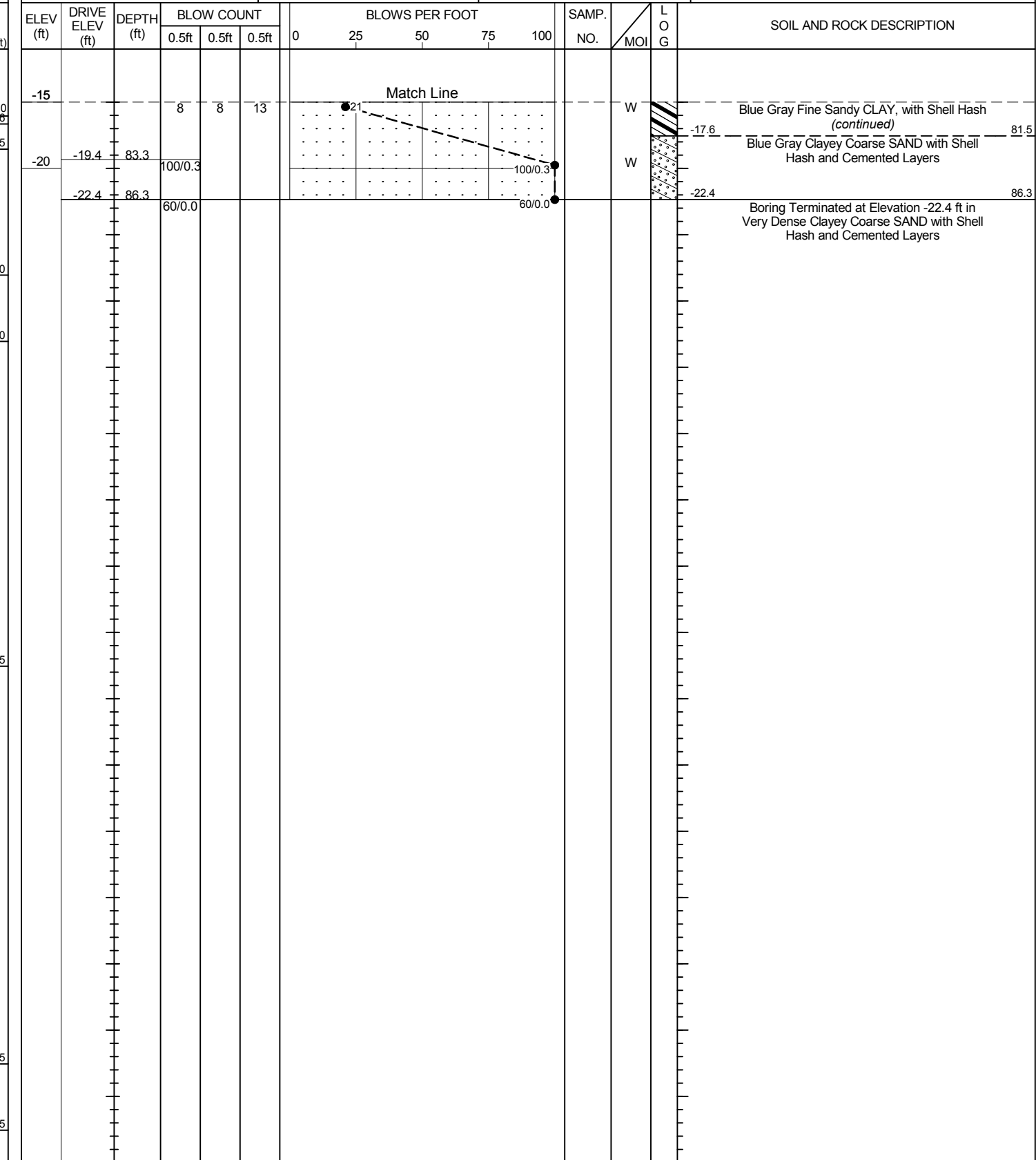
BORE LOG

WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 210 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. B-1	STATION 166+85	OFFSET 37 ft LT	ALIGNMENT -L-
COLLAR ELEV. 63.9 ft	TOTAL DEPTH 86.3 ft	NORTHING 580,047	EASTING 2,430,379
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER White, J.	START DATE 08/04/16	COMP. DATE 08/04/16	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE SITE 2.GPJ NC_DOT.GDT 4/25/17

WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 210 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. B-1	STATION 166+85	OFFSET 37 ft LT	ALIGNMENT -L-
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DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER White, J.	START DATE 08/04/16	COMP. DATE 08/04/16	SURFACE WATER DEPTH N/A

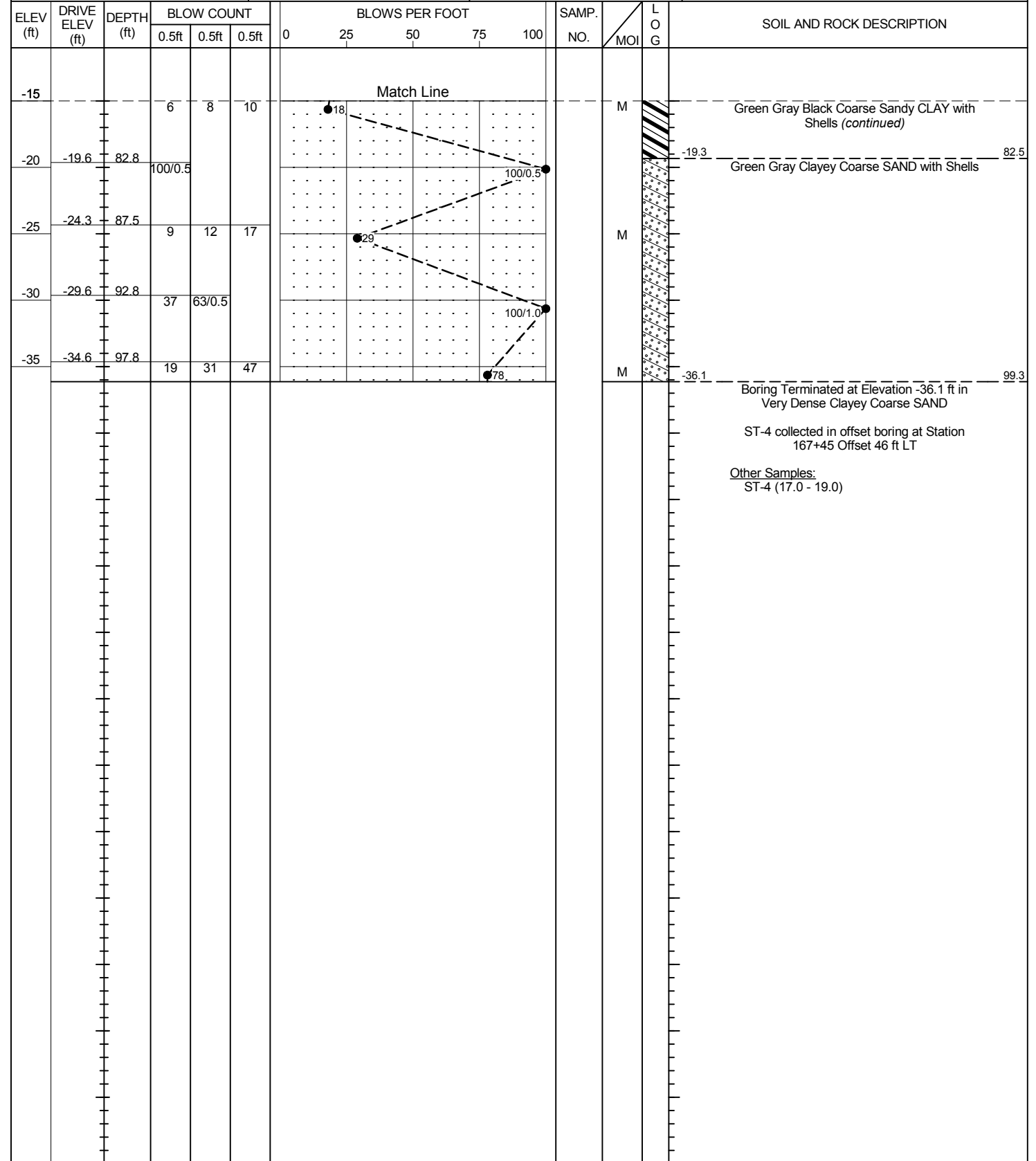
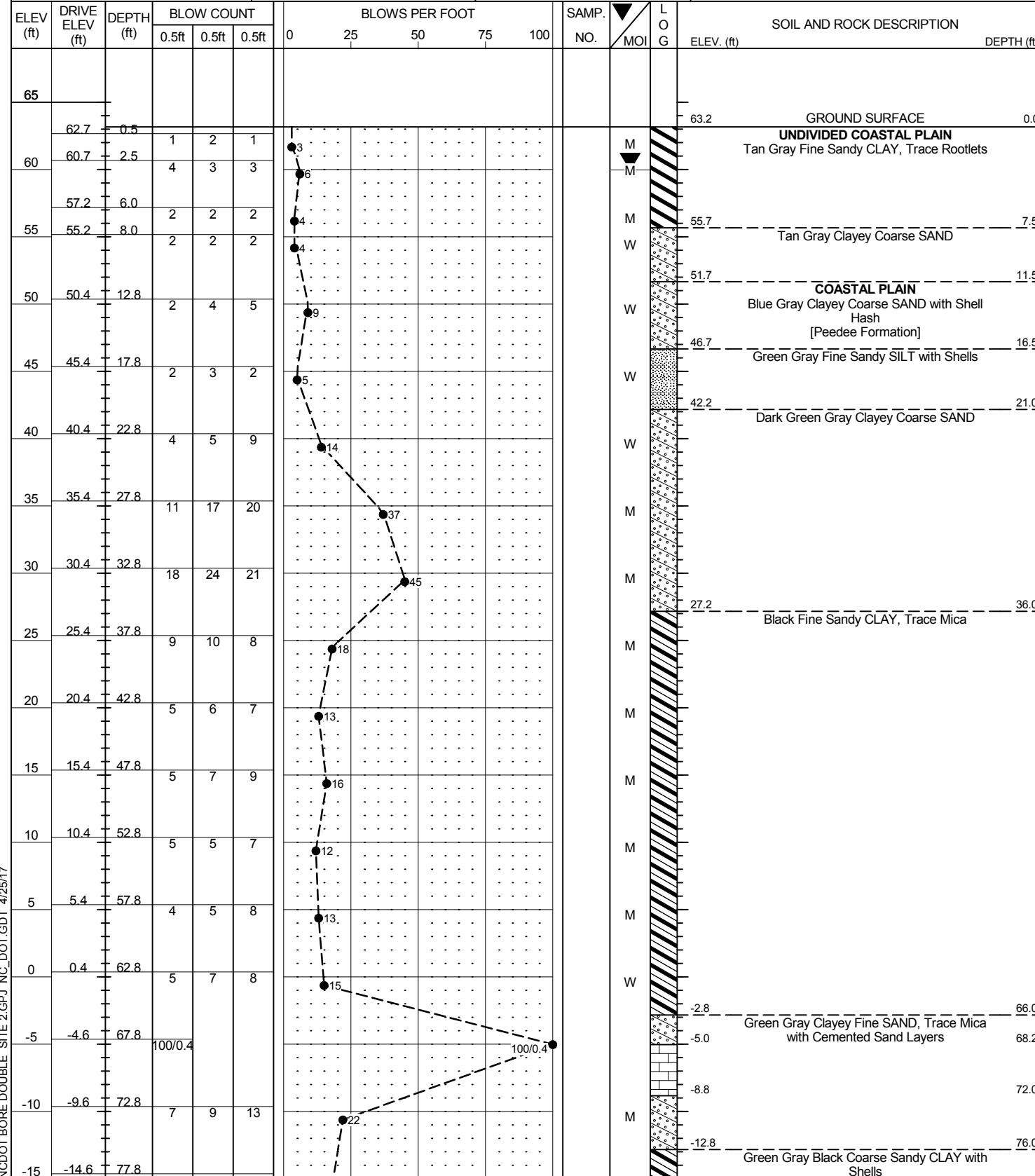


GEOTECHNICAL BORING REPORT

BORE LOG

WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 210 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. EB2-A Lt. Ln	STATION 167+45	OFFSET 49 ft LT	ALIGNMENT -L-
COLLAR ELEV. 63.2 ft	TOTAL DEPTH 99.3 ft	NORTHING 580,042	EASTING 2,430,441
DRILL RIG/HAMMER EFF./DATE SME2938 CME-750 86% 02/11/2016		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Miller, T.	START DATE 09/07/16	COMP. DATE 09/07/16	SURFACE WATER DEPTH N/A

WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 210 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
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DRILL RIG/HAMMER EFF./DATE SME2938 CME-750 86% 02/11/2016		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Miller, T.	START DATE 09/07/16	COMP. DATE 09/07/16	SURFACE WATER DEPTH N/A

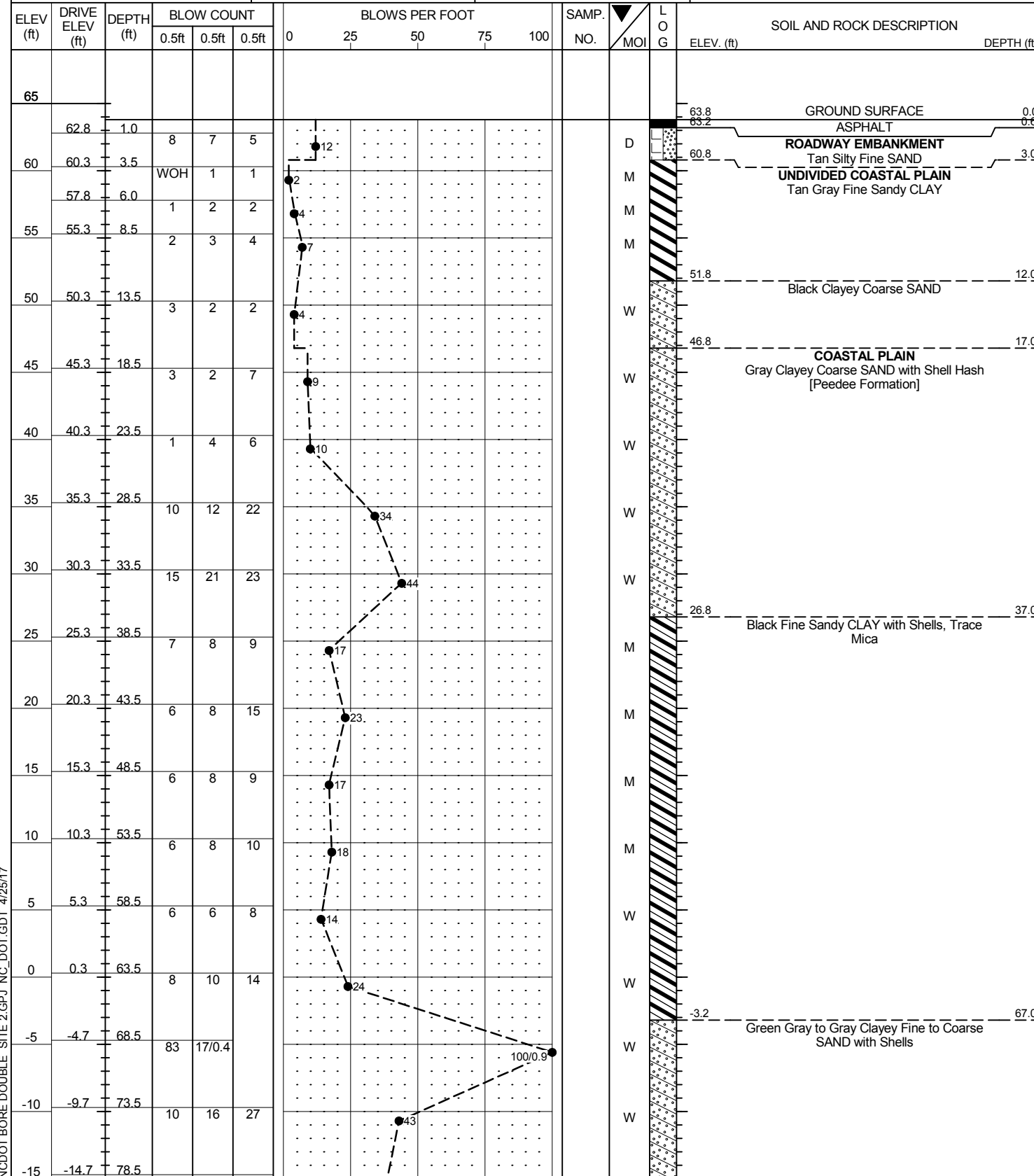


NCDOT BORE DOUBLE SITE 2.GPJ NC_DOT.GDT 4/25/17

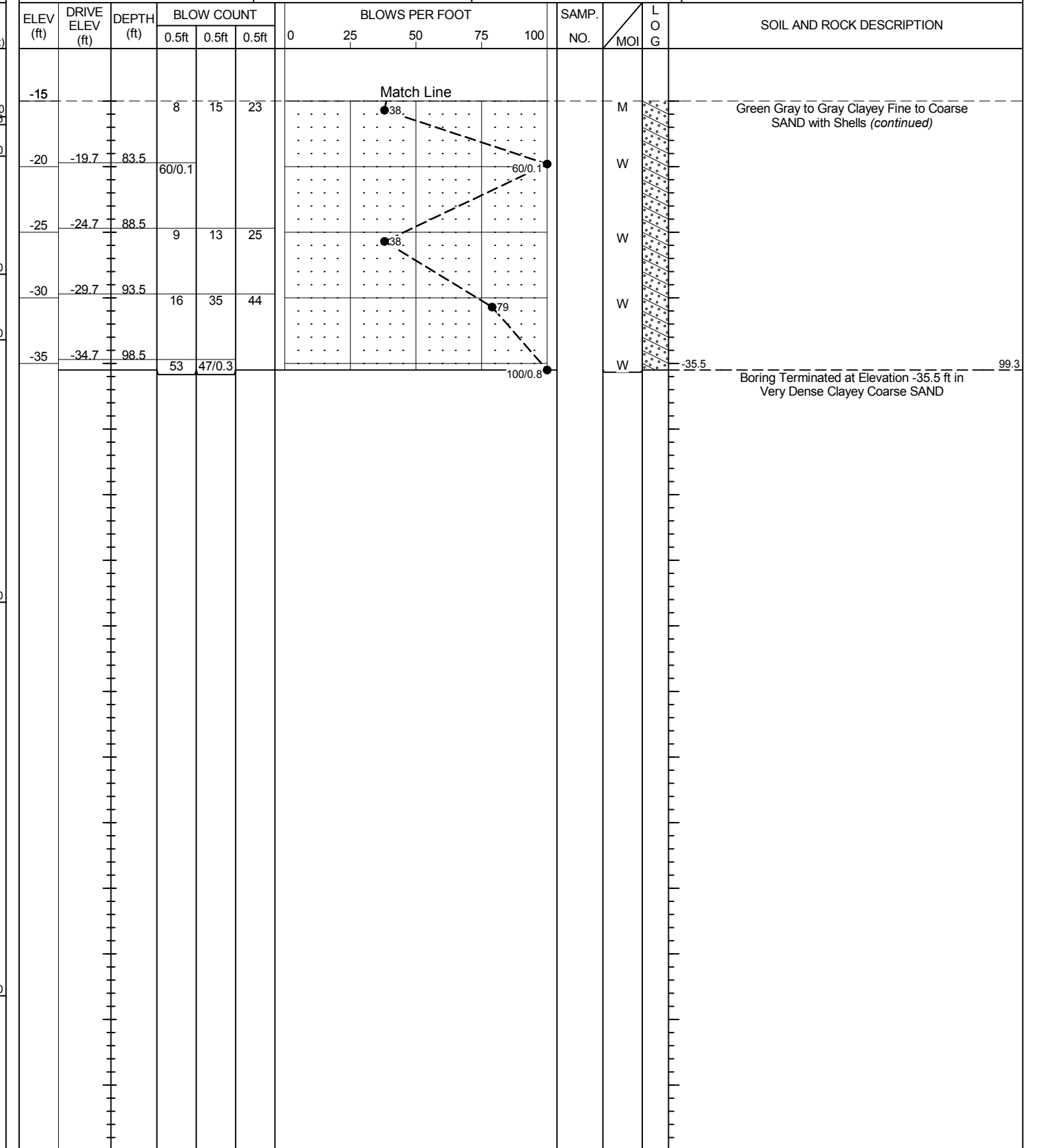
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 211 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. B-2	STATION 166+46	OFFSET 35 ft RT	ALIGNMENT -L-
COLLAR ELEV. 63.8 ft	TOTAL DEPTH 99.3 ft	NORTHING 579,988	EASTING 2,430,324
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 88% 12/09/2015		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Cain, J.	START DATE 08/15/16	COMP. DATE 08/15/16	SURFACE WATER DEPTH N/A



WBS 46375.1.1	TIP R-5703	COUNTY LENOIR	GEOLOGIST Blonshine, E.G.
SITE DESCRIPTION Bridge No. 211 on -L- (Felix Harvey Pkwy) over -Y3- SR 1004 (Hugo Rd)			GROUND WTR (ft)
BORING NO. B-2	STATION 166+46	OFFSET 35 ft RT	ALIGNMENT -L-
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DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 88% 12/09/2015		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Cain, J.	START DATE 08/15/16	COMP. DATE 08/15/16	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE SITE 2.GPJ NC_DOT.GDT 4/25/17

Particle Size Analysis of Soils

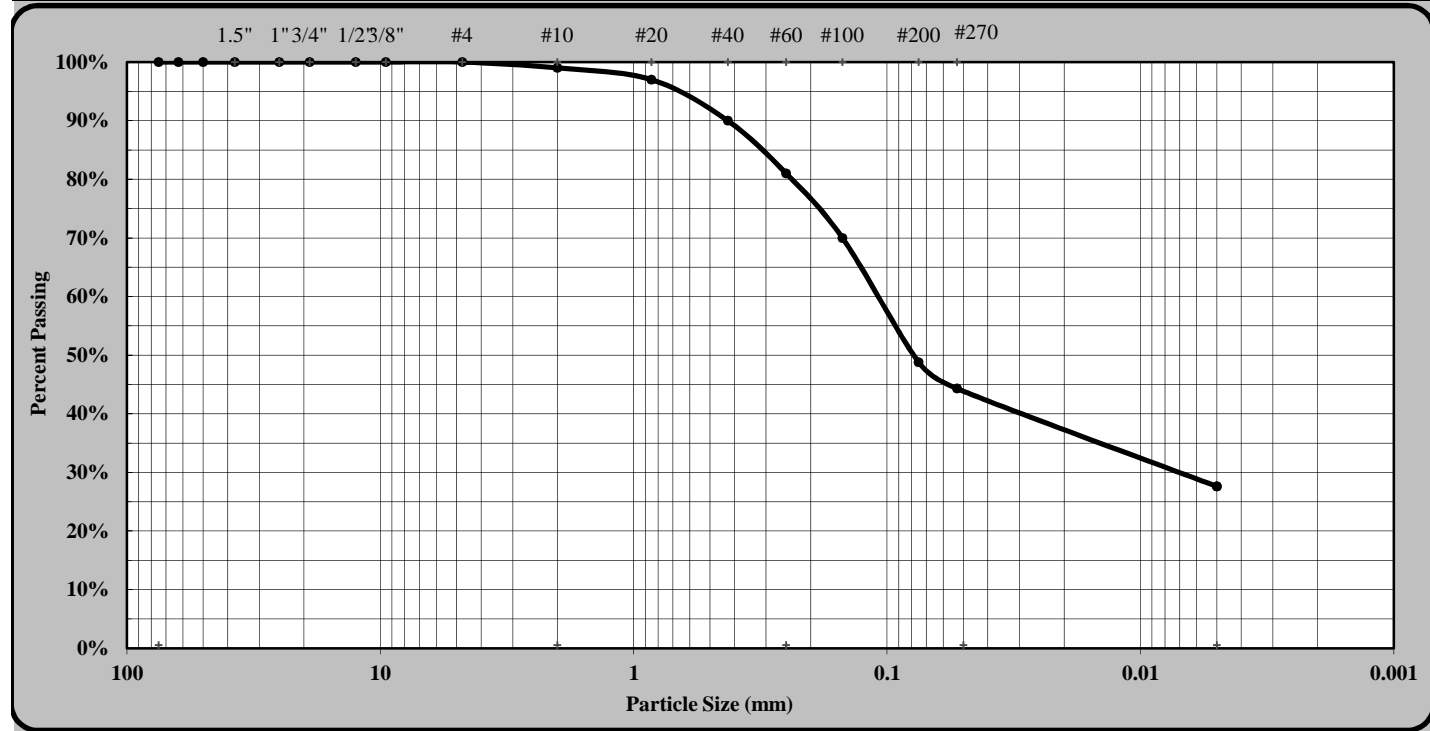
AASHTO T88 as Modified by NCDOT



Quality Assurance

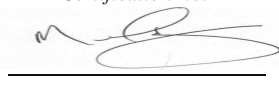
S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1	F.A. Project No:	N/A
		TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B-1	Sample #:	SS-20
		Sample Date:	8/4/16
Location:	166+85	Offset:	37 LT
		Depth (ft):	3.5 - 5.0
Sample Description:	Gray Coarse to Fine Sandy Silty CLAY A-6 (4)		



As Defined by NCDOT		Fine Sand		< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	#4	Coarse Sand	18%	Silt	17%
Gravel	1%	Fine Sand	37%	Clay	28%
Apparent Relative Density	ND	Moisture Content	20%	% Passing #200	48.8%
Liquid Limit	28	Plastic Limit	12	Plastic Index	16
Soil Mortar (-#10 Sieve)					
Coarse Sand	18%	Fine Sand	37%	Silt	17%
				Clay	28%
Description of Sand & Gravel Particles:	Rounded	<input type="checkbox"/>	Angular	<input checked="" type="checkbox"/>	
Hard & Durable	<input checked="" type="checkbox"/>	Soft	<input checked="" type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

References / Comments / Deviations: ND=Not Determined.

<u>Mal Krajan, ET</u> Technician Name	<u>104-01-0703</u> Certification No.	<u>Laboratory Manager</u> Position	<u>9/12/2016</u> Date
<u>Mal Krajan, ET</u> Technical Responsibility	 Signature	<u>Laboratory Manager</u> Position	<u>9/26/2016</u> Date

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Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



Quality Assurance

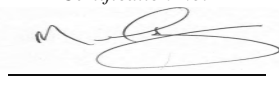
S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	12/27/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	12/24 - 12/27/16
State Project #:	46375.1.1	F.A. Project No:	N/A
		TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	EB2-A LT LN	Sample #:	ST-4
		Sample Date:	9/7/16
Location:	167+45	Offset:	46 LT
		Depth (ft):	17.0 - 19.0 ft.
Sample Description:	Gray Coarse to Fine Sandy Clayey SILT A-4 (0)		



As Defined by NCDOT		Fine Sand		< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	3/8"	Coarse Sand	23%	Silt	18%
Gravel	2%	Fine Sand	38%	Clay	19%
Apparent Relative Density	ND	Moisture Content	19%	% Passing #200	40.3%
Liquid Limit	27	Plastic Limit	21	Plastic Index	6
Soil Mortar (-#10 Sieve)					
Coarse Sand	23%	Fine Sand	39%	Silt	19%
				Clay	19%
Description of Sand & Gravel Particles:	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: ND=Not Determined.

<u>Mal Krajan, ET</u> Technician Name	<u>104-01-0703</u> Certification No.	<u>Laboratory Manager</u> Position	<u>12/27/2016</u> Date
<u>Mal Krajan, ET</u> Technical Responsibility	 Signature	<u>Laboratory Manager</u> Position	<u>9/26/2016</u> Date

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Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample



Depth: 17 - 19 ft.
Description: Gray Coarse to Fine Sandy Clayey SILT (A-4) (0)

Type: Undisturbed
Height H_0 (in): 0.996
Diameter D_0 (in): 2.501
Weight W_0 (gr): 153.13
Bulk Density ρ (PCF): 119.22
Particle Density ρ_s : 2.658 (assumed)

Initial Conditions

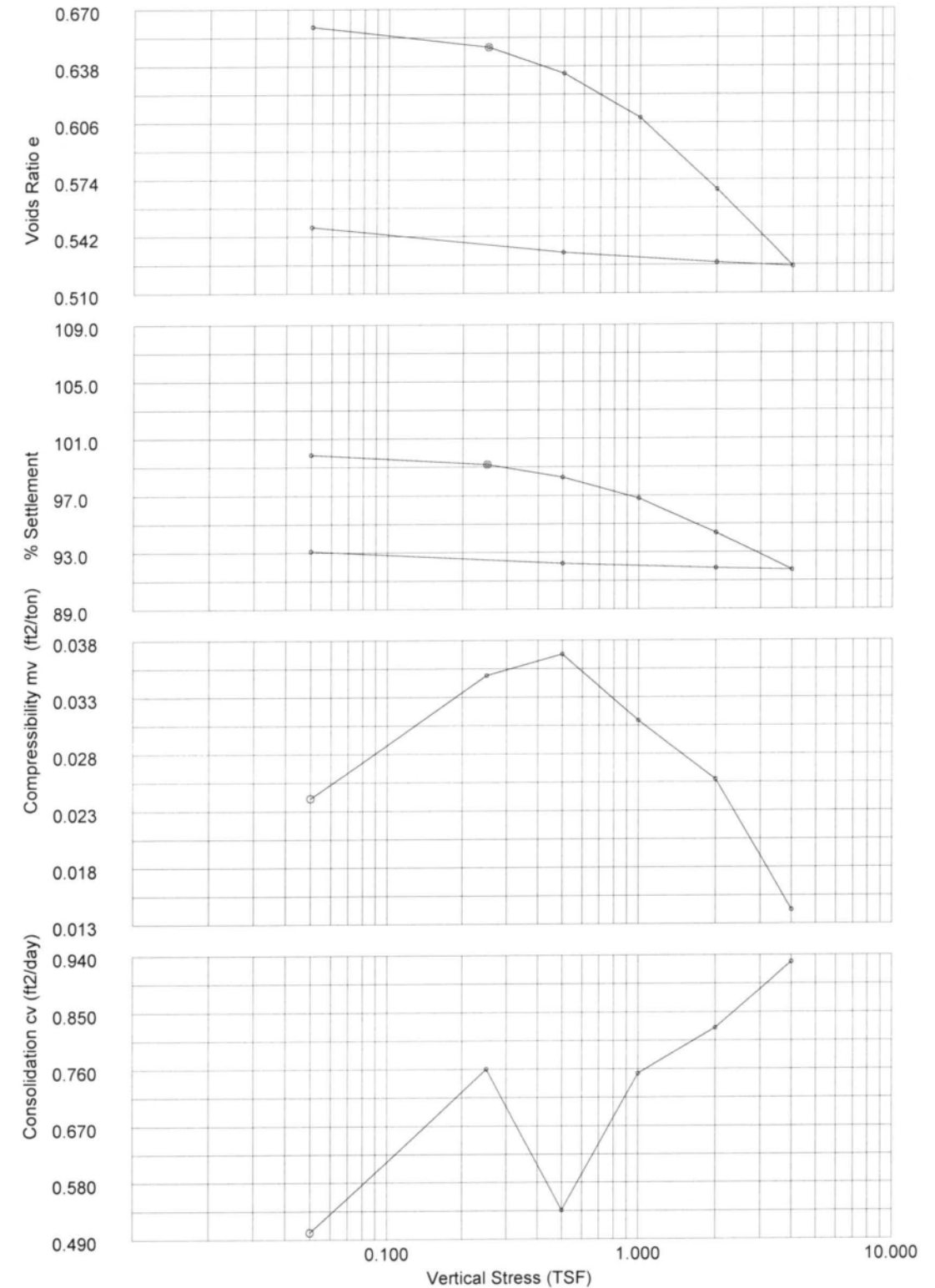
Settlement Channel: 1066
Moisture Content w_0 %: 19.5
Dry Density ρ_d (PCF): 99.78
Voids Ratio e_0 : 0.6622
Deg of Saturation S_0 %: 78.2
Swelling Pressure S_s (TSF): 0.000

Final Conditions

Moisture Content w_f %: 23.5
Dry Density ρ_d (PCF): 107.19
Voids Ratio e_f : 0.5474
Deg of Saturation S_f %: 100.00
Settlement: (in): 0.069
Compression Index C_c : 0.149

Notes: Test specimen taken from the middle portion of UD tube.

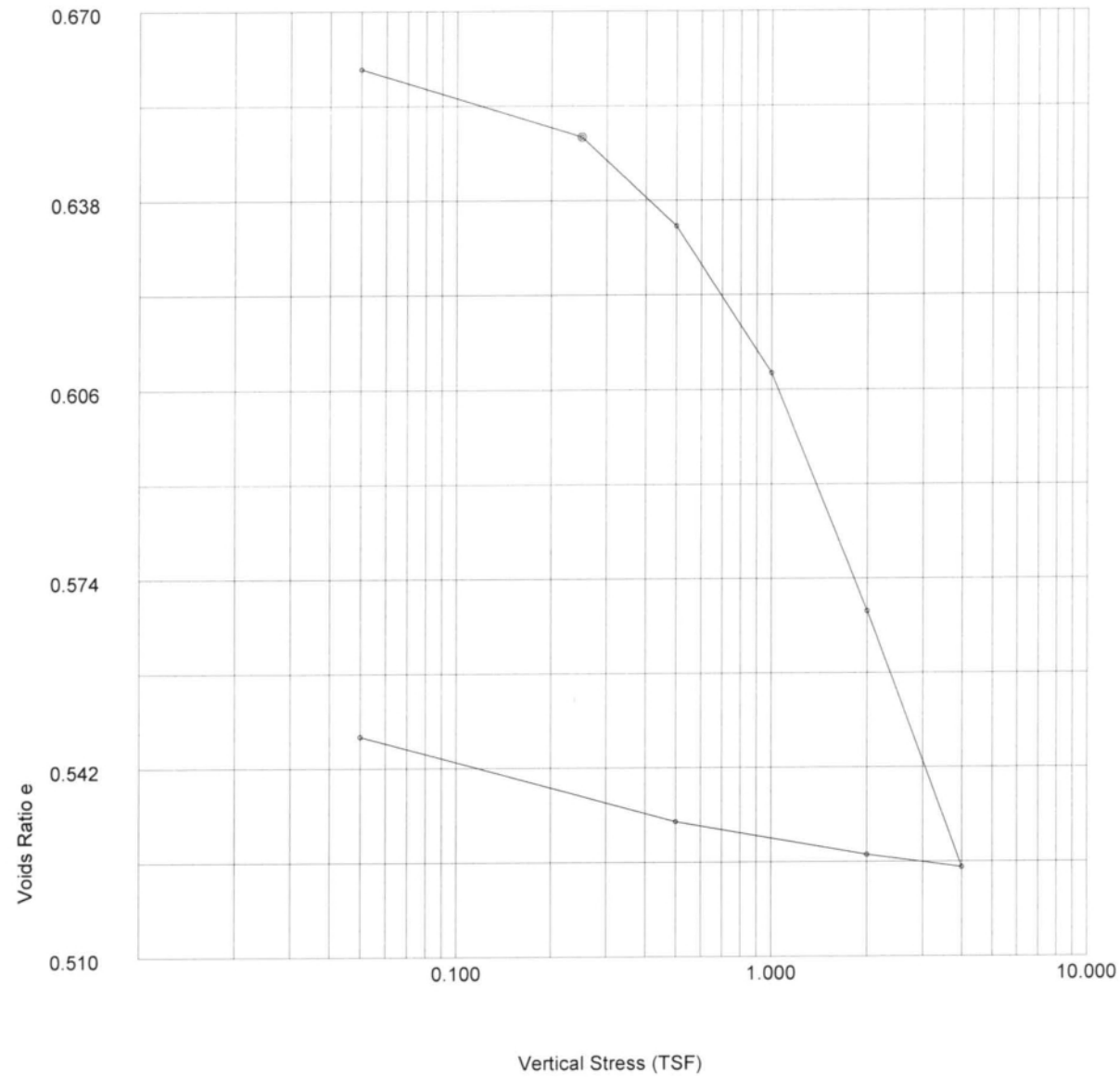
Oedometer Settlement Tests



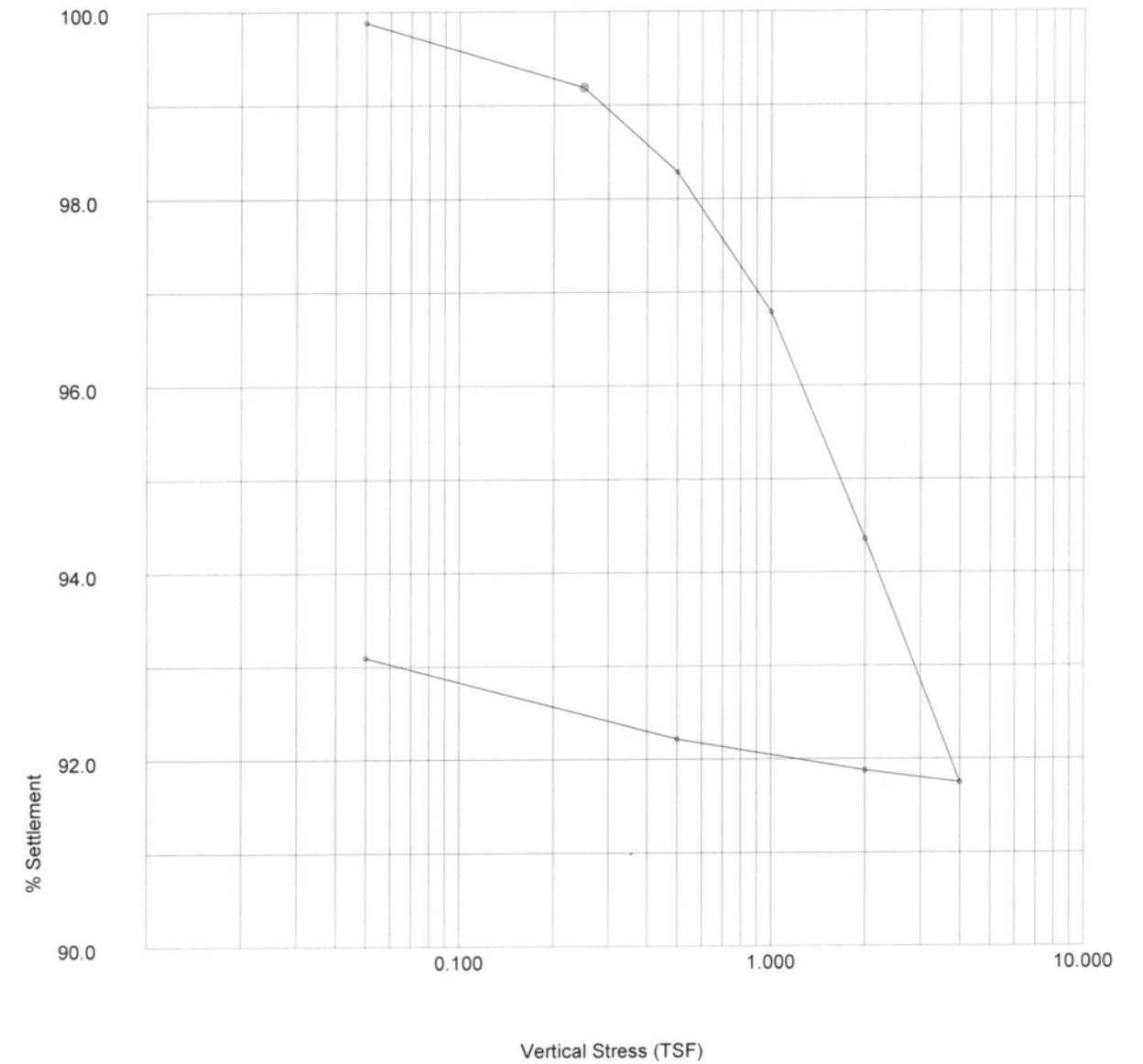
	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>MLK</i>	Borehole: EB2-A LT LN
	Checked: <i>MLK</i>	Approved:

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>MLK</i>	Borehole: EB2-A LT LN
	Checked: <i>MLK</i>	Approved:

Oedometer Settlement Tests



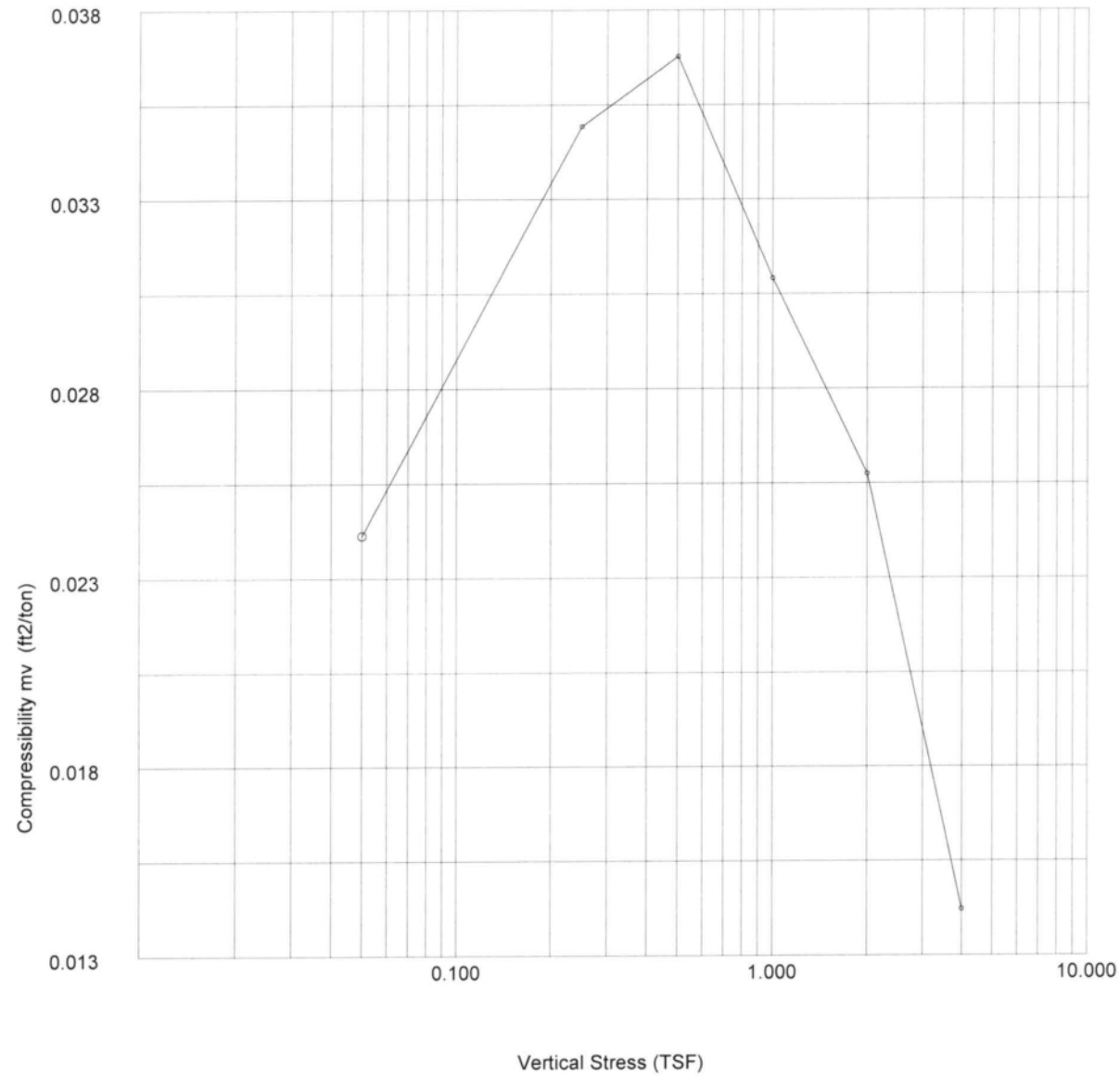
Oedometer Settlement Tests



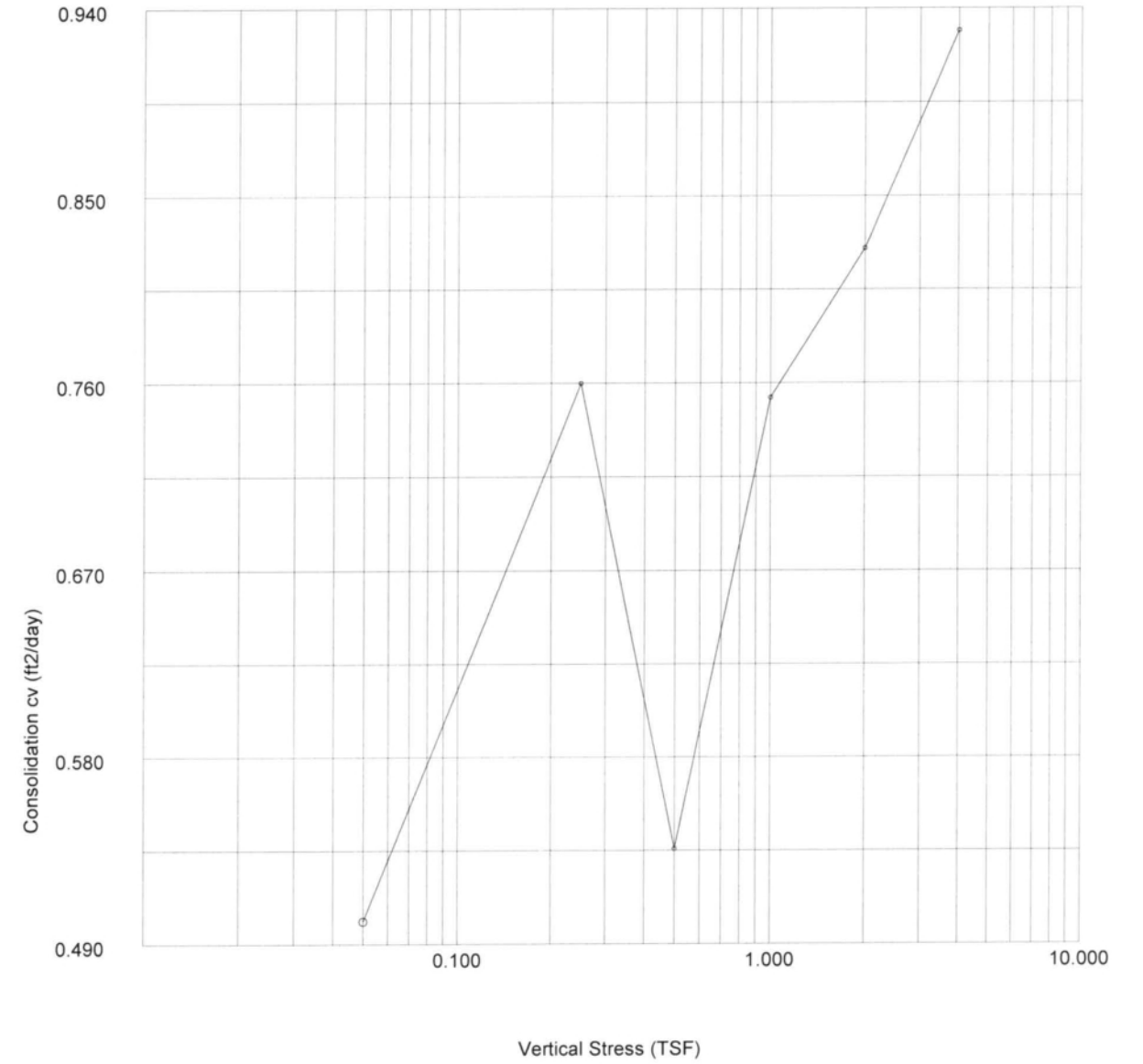
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	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests



Oedometer Settlement Tests



	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Void Ratio e_f	t_{sn} (mins)	Secondary Compr C_{sec}	c_v (ft ² /day)	m_v (ft ² /ton)
0.050	21.6	0.0012	0.0	21.6	0.6602	0.989	0.0001	0.501	0.024
0.250	21.6	0.0081	0.0	21.6	0.6487	0.647	0.0008	0.760	0.035
0.500	21.6	0.0171	0.0	21.6	0.6337	0.902	0.0009	0.536	0.037
1.000	21.6	0.0320	0.0	21.6	0.6088	0.627	0.0006	0.753	0.031
2.000	21.6	0.0562	0.0	21.6	0.5684	0.549	0.0011	0.825	0.026
4.000	21.6	0.0822	0.0	21.6	0.5250	0.462	0.0019	0.929	0.014
2.000	21.6	0.0809	0.0	21.6	0.5272				0.001
0.500	21.6	0.0775	0.0	21.6	0.5329				0.002
0.050	21.6	0.0688	0.0	21.6	0.5474				0.021

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	1	0.0001	0.0001
3	0.033	1	0.0001	0.0001
4	0.050	1	0.0001	0.0001
5	0.067	1	0.0001	0.0001
6	0.083	1	0.0001	0.0001
7	0.100	1	0.0001	0.0001
8	0.200	2	0.0002	0.0002
9	0.400	3	0.0003	0.0003
10	0.800	5	0.0005	0.0005
11	1.000	5	0.0005	0.0005
12	2.000	7	0.0007	0.0007
13	4.000	8	0.0008	0.0008
14	8.000	9	0.0009	0.0009
15	10.000	9	0.0009	0.0009
16	20.000	11	0.0011	0.0011
17	40.000	11	0.0011	0.0011
18	80.000	12	0.0012	0.0012
19	100.000	12	0.0012	0.0012
20	133.330	12	0.0012	0.0012

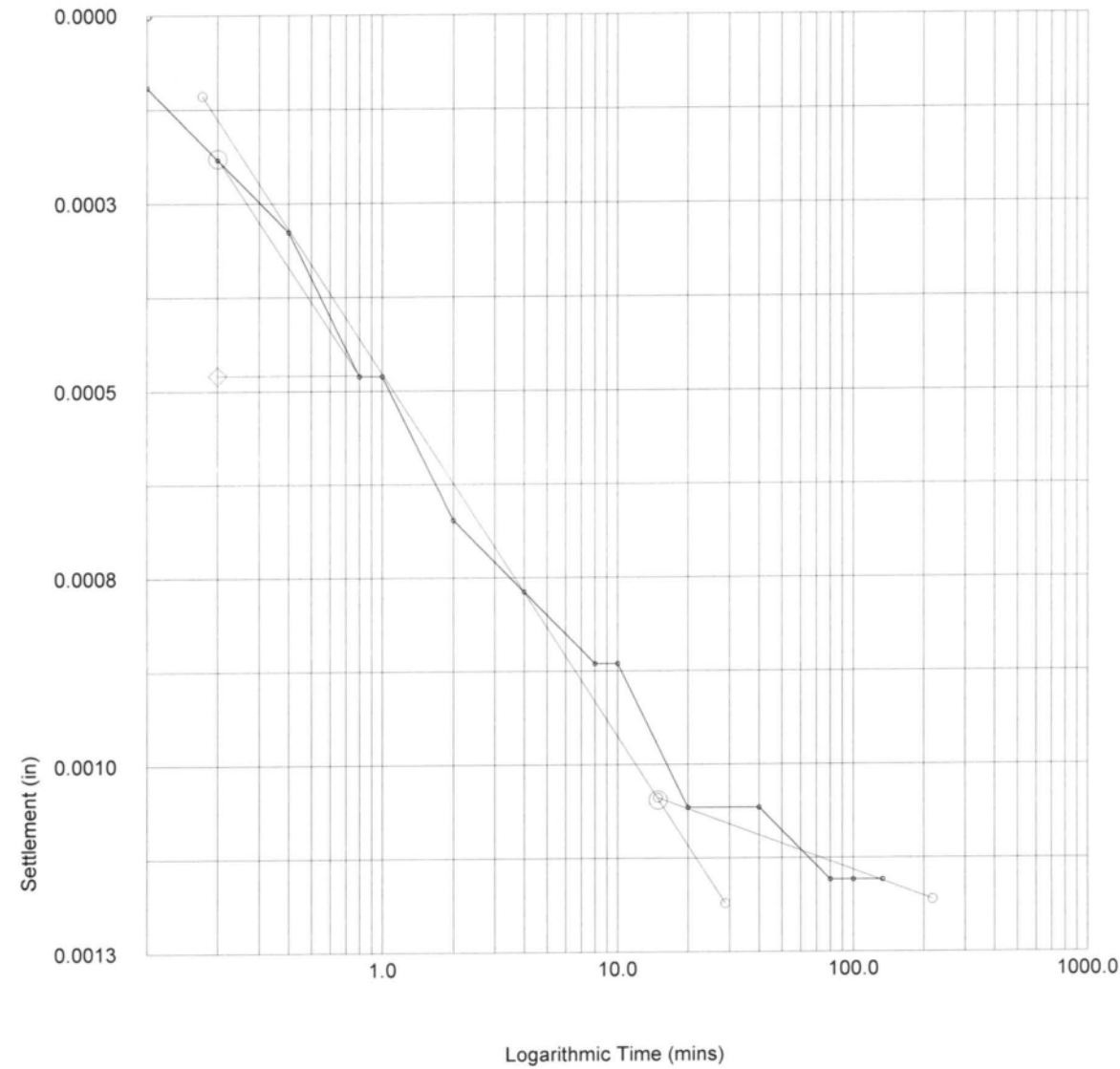
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		Date of Test: 12-13-16
	Site Reference: C.F. Harvey	Sample: ST-4
	Jobfile: E:\16010.JOB	Borehole: EB2-A LT LN
Operator: <i>mlk</i>	Checked: <i>mlk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.050 (TSF)
		Date of Test: 12-13-16
	Site Reference: C.F. Harvey	Sample: ST-4
	Jobfile: E:\16010.JOB	Borehole: EB2-A LT LN
Operator: <i>mlk</i>	Checked: <i>mlk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0012
Voids Ratio e	0.6602
Final Temp oC	0.0
t ₅₀ (mins)	0.99
c _v (ft ² /day)	0.501
m _v (ft ² /ton)	0.024
Sec Compression C _{sec}	0.0001



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	12	0.0012	0.0012
2	0.017	14	0.0014	0.0014
3	0.033	25	0.0025	0.0025
4	0.050	29	0.0029	0.0029
5	0.067	31	0.0031	0.0031
6	0.083	32	0.0032	0.0032
7	0.100	34	0.0034	0.0034
8	0.200	39	0.0039	0.0039
9	0.400	46	0.0046	0.0046
10	0.800	52	0.0052	0.0052
11	1.000	54	0.0054	0.0054
12	2.000	61	0.0061	0.0061
13	4.000	67	0.0067	0.0067
14	8.000	72	0.0072	0.0072
15	10.000	73	0.0073	0.0073
16	20.000	77	0.0077	0.0077
17	40.000	80	0.0080	0.0080
18	69.817	81	0.0081	0.0081

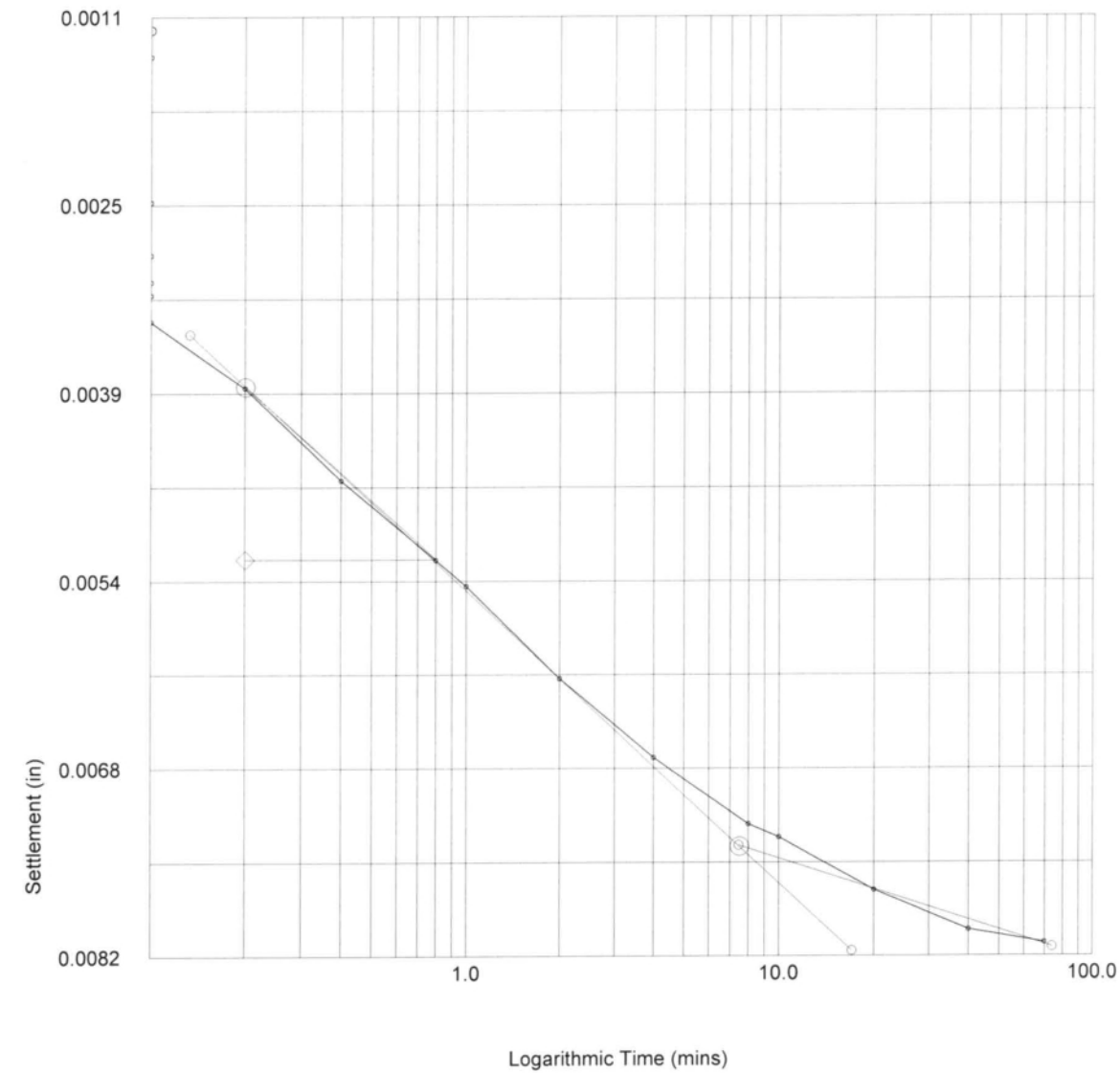
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	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.250 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0069
Voids Ratio e	0.6487
Final Temp oC	0.0
t ₅₀ (mins)	0.65
c _v (ft ² /day)	0.76
m _v (ft ² /ton)	0.035
Sec Compression C _{sec}	0.0008



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	81	0.0081	0.0081
2	0.017	82	0.0082	0.0082
3	0.033	96	0.0096	0.0096
4	0.050	101	0.0101	0.0101
5	0.067	104	0.0104	0.0104
6	0.083	108	0.0108	0.0108
7	0.100	110	0.0110	0.0110
8	0.200	118	0.0118	0.0118
9	0.400	125	0.0125	0.0125
10	0.800	132	0.0132	0.0132
11	1.000	135	0.0135	0.0135
12	2.000	143	0.0143	0.0143
13	4.000	150	0.0150	0.0150
14	8.000	156	0.0156	0.0156
15	10.000	158	0.0158	0.0158
16	20.000	161	0.0161	0.0161
17	40.000	166	0.0166	0.0166
18	80.000	168	0.0168	0.0168
19	100.000	169	0.0169	0.0169
20	139.583	171	0.0171	0.0171

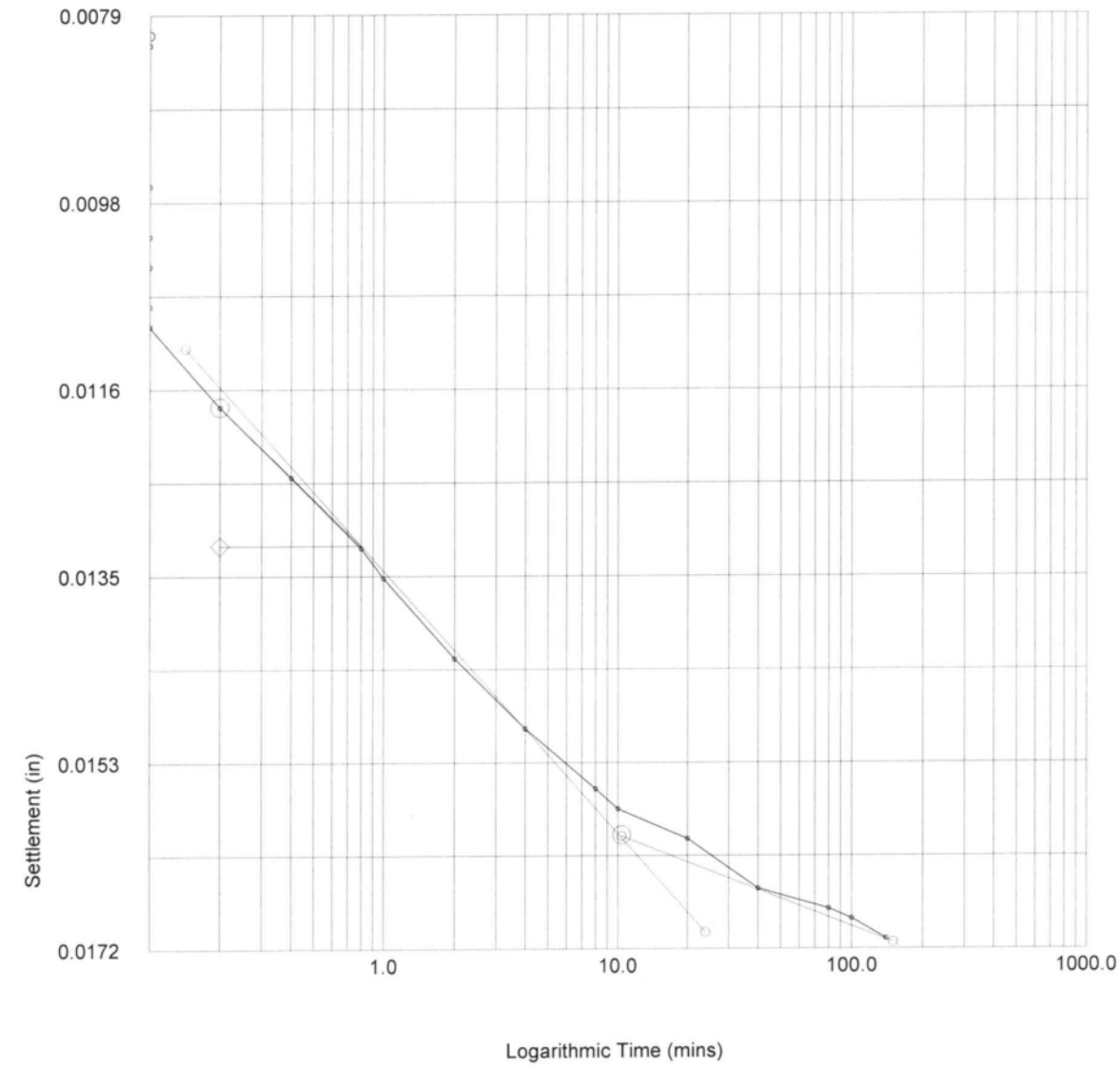
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	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mlc</i>	Borehole: EB2-A LT LN
	Checked: <i>mlc</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.500 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mlc</i>	Borehole: EB2-A LT LN
	Checked: <i>mlc</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.009
Void Ratio e	0.6337
Final Temp oC	0.0
t ₅₀ (mins)	0.90
c _v (ft ² /day)	0.536
m _v (ft ² /ton)	0.037
Sec Compression C _{sec}	0.0009



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	171	0.0171	0.0171
2	0.017	172	0.0172	0.0172
3	0.033	172	0.0172	0.0172
4	0.050	210	0.0210	0.0210
5	0.067	222	0.0222	0.0222
6	0.083	224	0.0224	0.0224
7	0.100	228	0.0228	0.0228
8	0.200	242	0.0242	0.0242
9	0.400	256	0.0256	0.0256
10	0.800	270	0.0270	0.0270
11	1.000	273	0.0273	0.0273
12	2.000	287	0.0287	0.0287
13	4.000	297	0.0297	0.0297
14	8.000	305	0.0305	0.0305
15	10.000	308	0.0308	0.0308
16	20.000	313	0.0313	0.0313
17	40.000	318	0.0318	0.0318
18	80.000	320	0.0320	0.0320
19	96.330	320	0.0320	0.0320

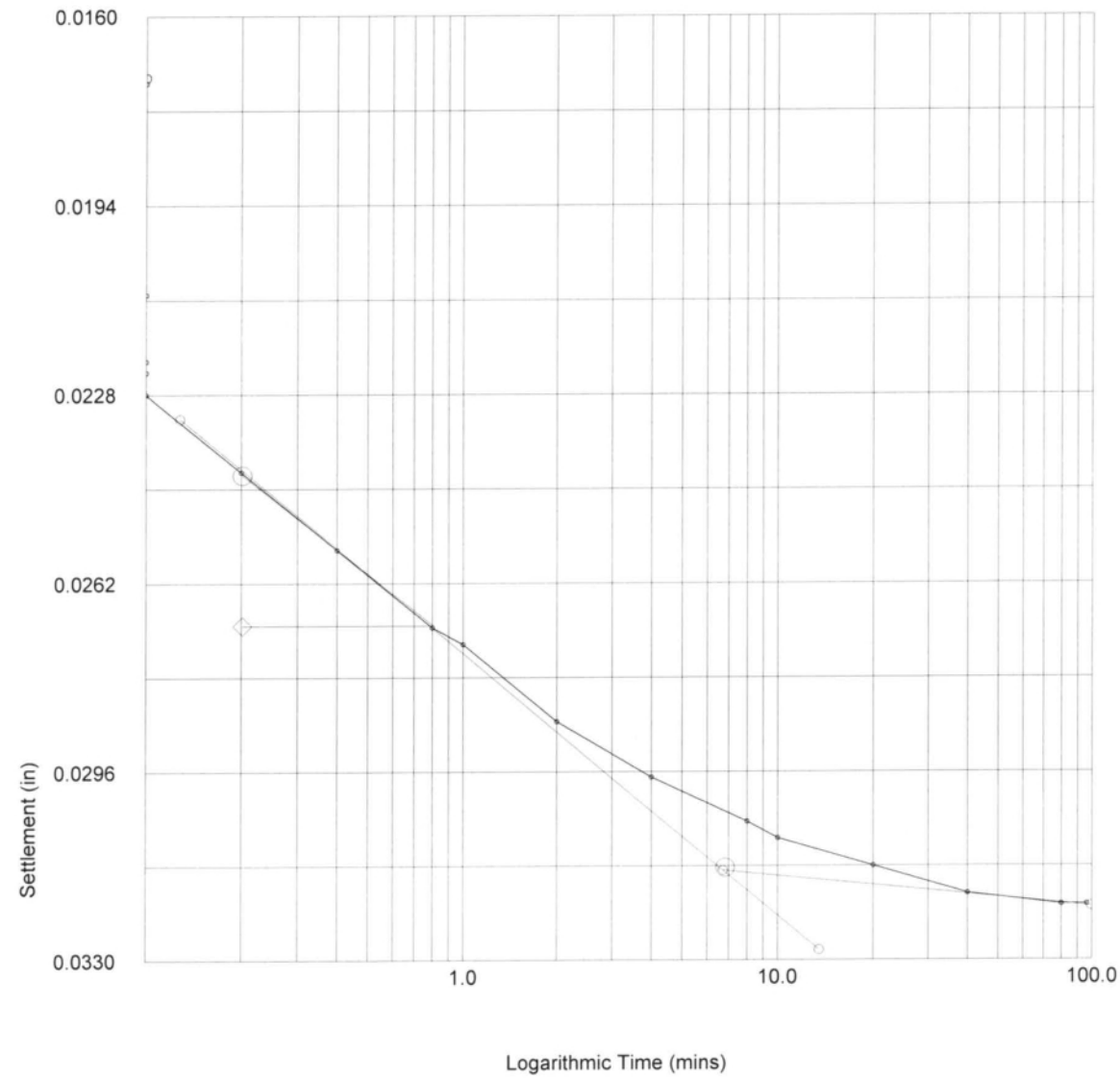
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	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mlc</i>	Borehole: EB2-A LT LN
	Checked: <i>mlc</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 1.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mlc</i>	Borehole: EB2-A LT LN
	Checked: <i>mlc</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0149
Voids Ratio e	0.6088
Final Temp oC	0.0
t ₅₀ (mins)	0.63
c _v (ft ² /day)	0.753
m _v (ft ² /ton)	0.031
Sec Compression C _{sec}	0.0006



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	320	0.0320	0.0320
2	0.017	328	0.0328	0.0328
3	0.033	343	0.0343	0.0343
4	0.050	395	0.0395	0.0395
5	0.067	416	0.0416	0.0416
6	0.083	421	0.0421	0.0421
7	0.100	428	0.0428	0.0428
8	0.200	447	0.0447	0.0447
9	0.400	464	0.0464	0.0464
10	0.800	484	0.0484	0.0484
11	1.000	488	0.0488	0.0488
12	2.000	502	0.0502	0.0502
13	4.000	519	0.0519	0.0519
14	8.000	528	0.0528	0.0528
15	10.000	531	0.0531	0.0531
16	20.000	538	0.0538	0.0538
17	40.000	544	0.0544	0.0544
18	80.000	549	0.0549	0.0549
19	100.000	551	0.0551	0.0551
20	200.000	554	0.0554	0.0554
21	400.000	558	0.0558	0.0558
22	800.000	561	0.0561	0.0561
23	950.200	562	0.0562	0.0562

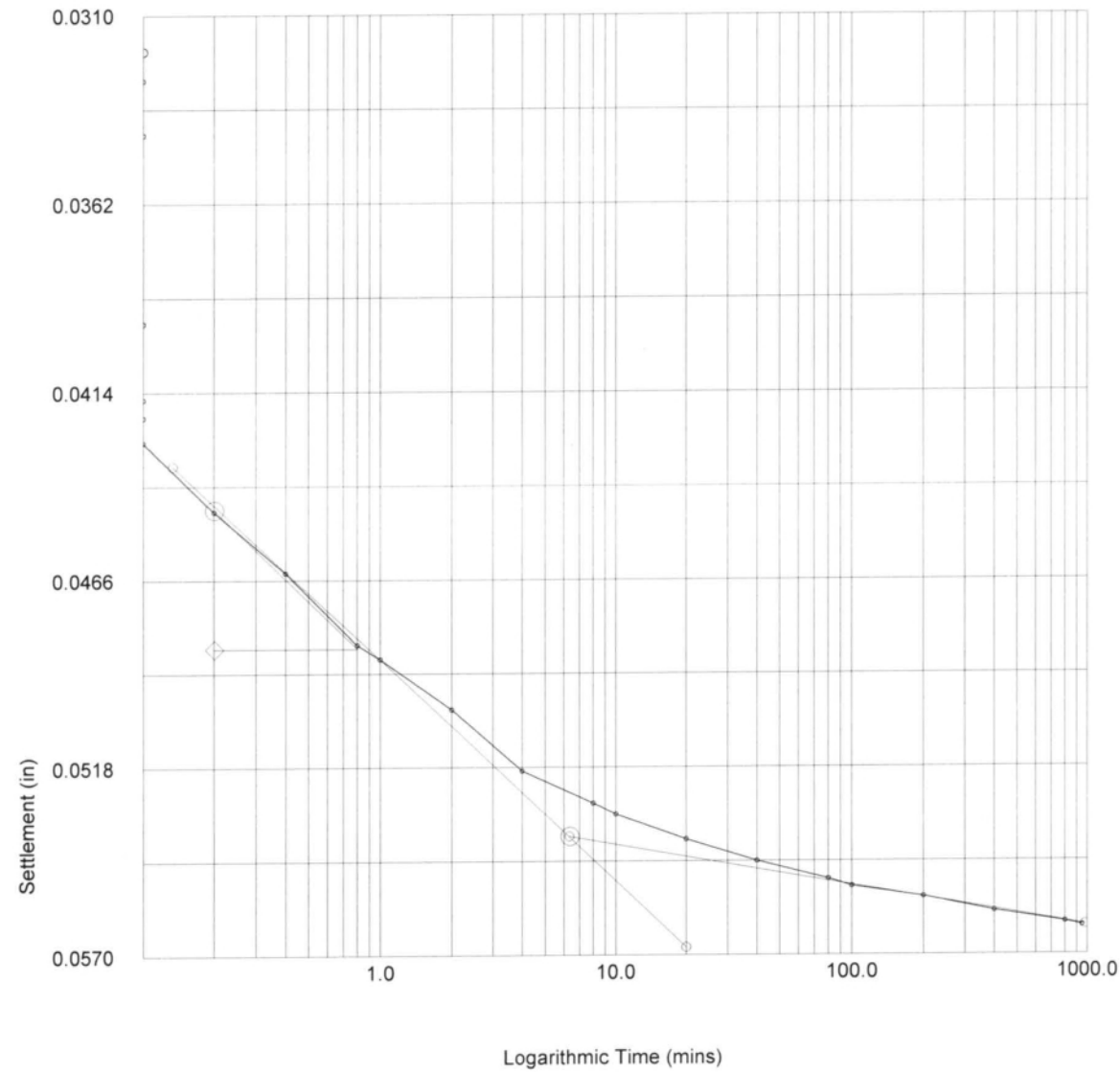
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	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 2.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0242
Voids Ratio e	0.5684
Final Temp oC	0.0
t ₅₀ (mins)	0.55
c _v (ft ² /day)	0.825
m _v (ft ² /ton)	0.026
Sec Compression C _{sec}	0.0011



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	562	0.0562	0.0562
2	0.017	570	0.0570	0.0570
3	0.033	589	0.0589	0.0589
4	0.050	629	0.0629	0.0629
5	0.067	643	0.0643	0.0643
6	0.083	658	0.0658	0.0658
7	0.100	663	0.0663	0.0663
8	0.200	688	0.0688	0.0688
9	0.400	712	0.0712	0.0712
10	0.800	735	0.0735	0.0735
11	1.000	742	0.0742	0.0742
12	2.000	761	0.0761	0.0761
13	4.000	776	0.0776	0.0776
14	8.267	788	0.0788	0.0788
15	10.267	791	0.0791	0.0791
16	20.267	799	0.0799	0.0799
17	40.267	806	0.0806	0.0806
18	80.267	813	0.0813	0.0813
19	100.267	815	0.0815	0.0815
20	200.267	820	0.0820	0.0820
21	240.767	822	0.0822	0.0822

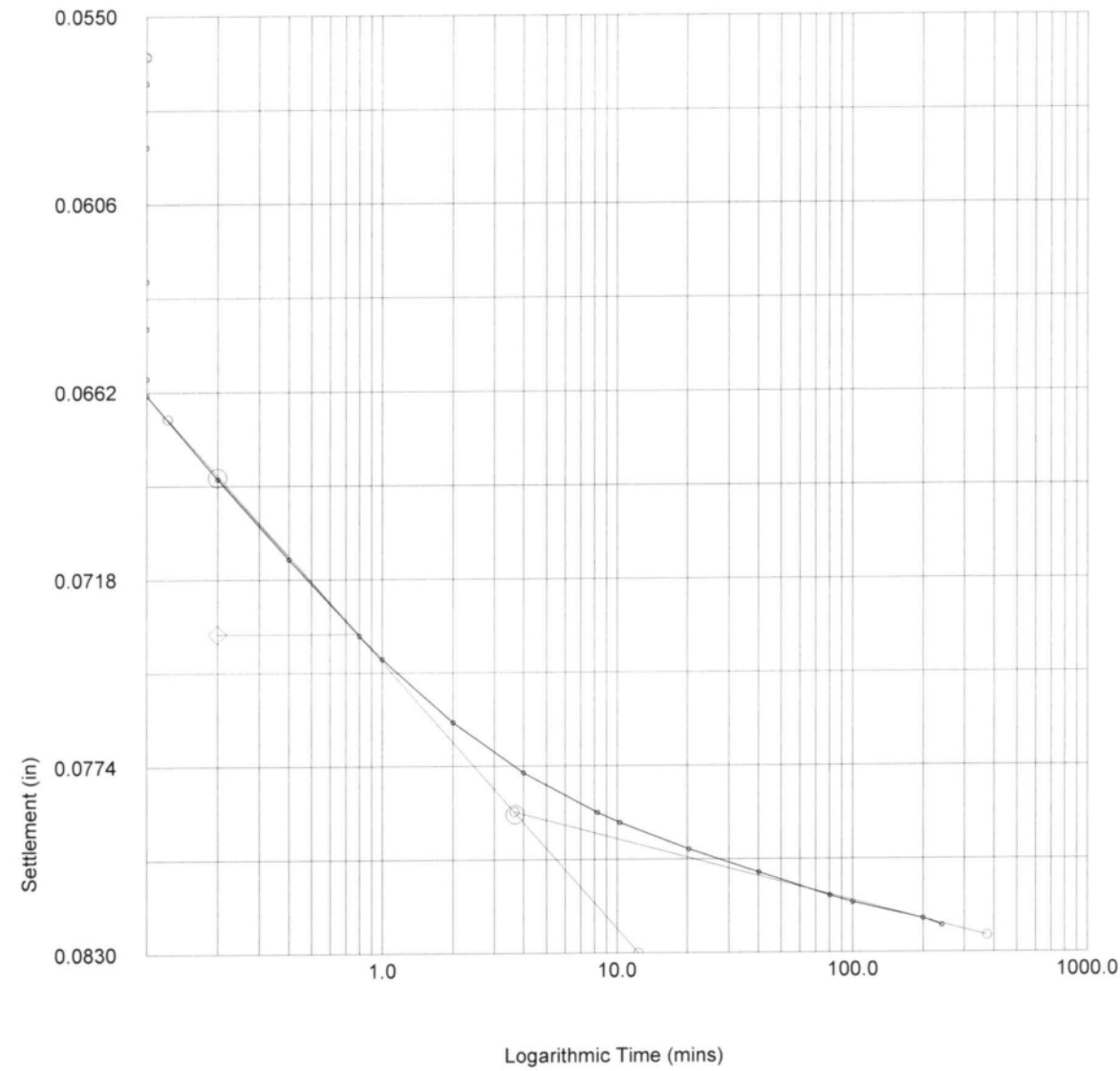
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	Site Reference: C.F. Harvey	Date of Test:	12-13-16
	Jobfile: E:\16010.JOB	Sample:	ST-4
	Operator: <i>mk</i>	Borehole:	EB2-A LT LN
	Checked: <i>mk</i>	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 4.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test:	12-13-16
	Jobfile: E:\16010.JOB	Sample:	ST-4
	Operator: <i>mk</i>	Borehole:	EB2-A LT LN
	Checked: <i>mk</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.026
Void Ratio e	0.5250
Final Temp oC	0.0
t ₅₀ (mins)	0.46
c _v (ft ² /day)	0.929
m _v (ft ² /ton)	0.014
Sec Compression C _{sec}	0.0019



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	822	0.0822	0.0822
2	0.017	820	0.0820	0.0820
3	0.033	814	0.0814	0.0814
4	0.050	813	0.0813	0.0813
5	0.067	813	0.0813	0.0813
6	0.083	813	0.0813	0.0813
7	0.100	813	0.0813	0.0813
8	0.200	812	0.0812	0.0812
9	0.400	812	0.0812	0.0812
10	0.800	812	0.0812	0.0812
11	1.000	812	0.0812	0.0812
12	2.000	811	0.0811	0.0811
13	4.000	811	0.0811	0.0811
14	8.000	811	0.0811	0.0811
15	10.000	811	0.0811	0.0811
16	20.000	811	0.0811	0.0811
17	40.000	810	0.0810	0.0810
18	80.000	809	0.0809	0.0809
19	100.000	809	0.0809	0.0809
20	117.150	809	0.0809	0.0809

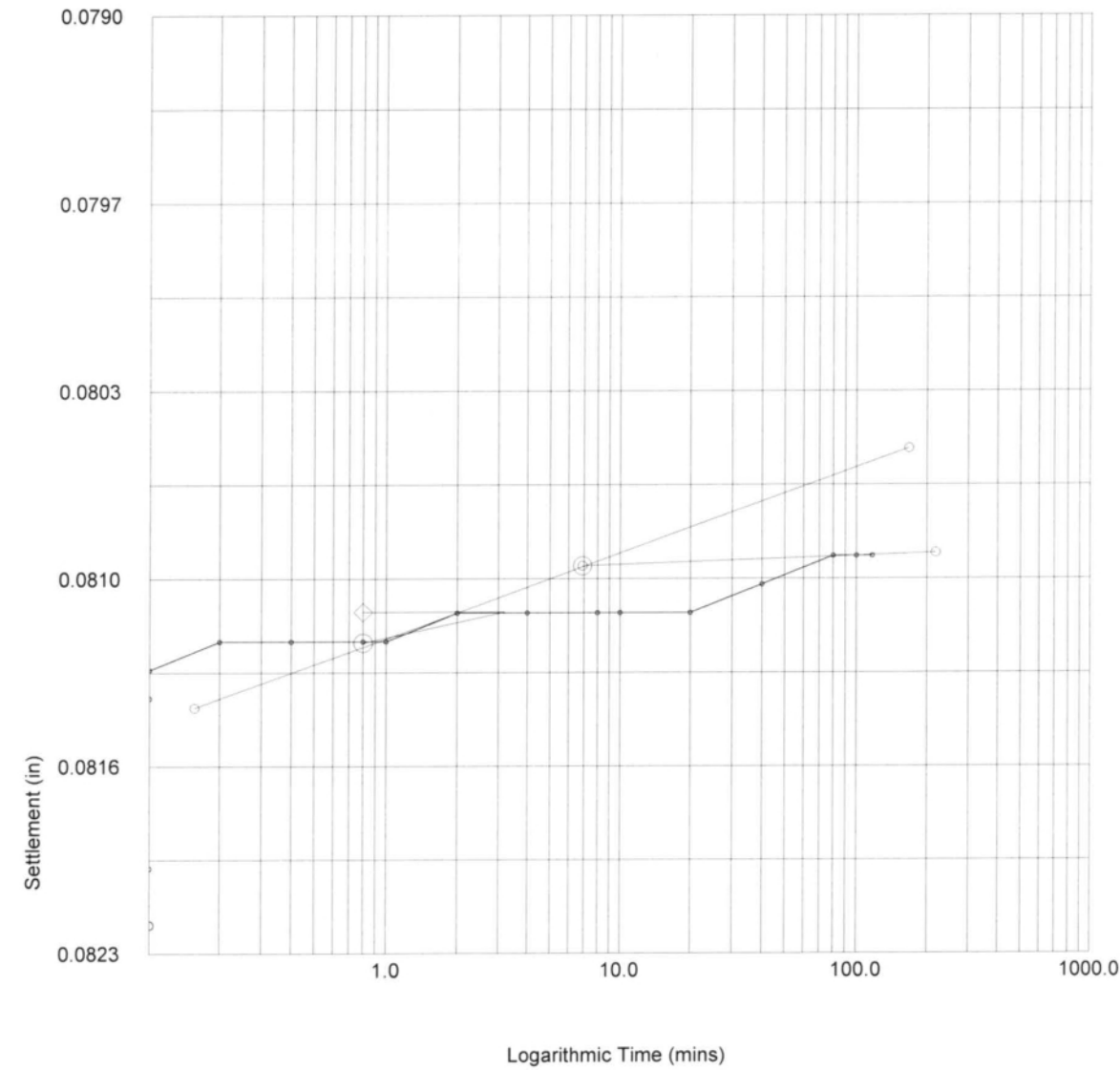
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	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 2.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 2.000
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0013
 Voids Ratio e 0.5272
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	809	0.0809	0.0809
2	0.017	807	0.0807	0.0807
3	0.033	800	0.0800	0.0800
4	0.050	794	0.0794	0.0794
5	0.067	793	0.0793	0.0793
6	0.083	792	0.0792	0.0792
7	0.100	792	0.0792	0.0792
8	0.200	790	0.0790	0.0790
9	0.400	786	0.0786	0.0786
10	0.800	783	0.0783	0.0783
11	1.000	783	0.0783	0.0783
12	2.000	780	0.0780	0.0780
13	4.000	778	0.0778	0.0778
14	8.000	777	0.0777	0.0777
15	10.000	776	0.0776	0.0776
16	20.000	776	0.0776	0.0776
17	40.000	775	0.0775	0.0775
18	69.850	775	0.0775	0.0775

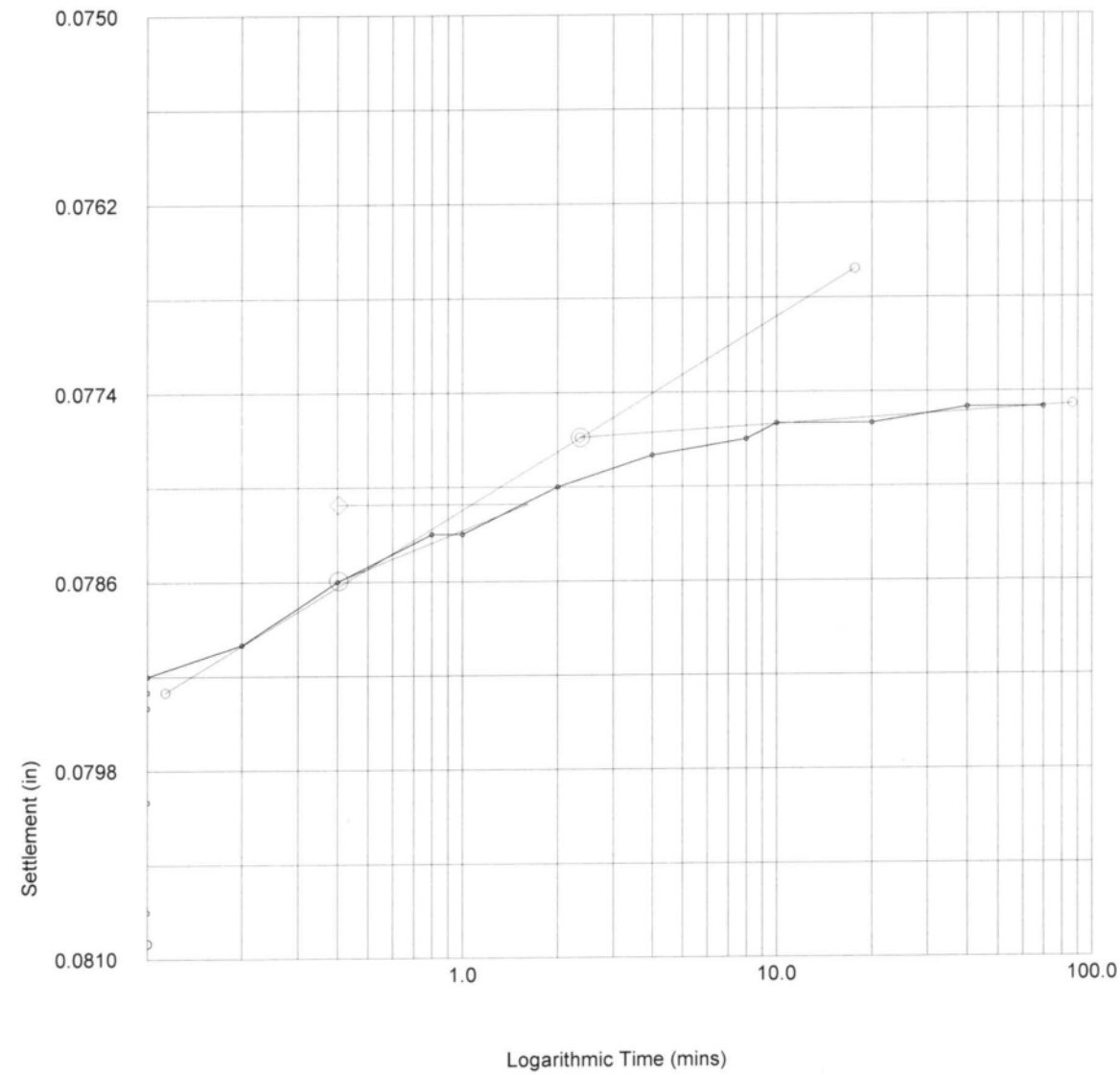
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	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>MLC</i>	Borehole: EB2-A LT LN
	Checked: <i>MLC</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.500 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>MLC</i>	Borehole: EB2-A LT LN
	Checked: <i>MLC</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.500
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0034
 Voids Ratio e 0.5329
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	775	0.0775	0.0775
2	0.017	767	0.0767	0.0767
3	0.033	764	0.0764	0.0764
4	0.050	761	0.0761	0.0761
5	0.067	760	0.0760	0.0760
6	0.083	760	0.0760	0.0760
7	0.100	759	0.0759	0.0759
8	0.200	754	0.0754	0.0754
9	0.400	750	0.0750	0.0750
10	0.800	743	0.0743	0.0743
11	1.000	740	0.0740	0.0740
12	2.000	730	0.0730	0.0730
13	4.000	720	0.0720	0.0720
14	8.000	712	0.0712	0.0712
15	10.000	710	0.0710	0.0710
16	20.000	703	0.0703	0.0703
17	40.000	698	0.0698	0.0698
18	80.000	693	0.0693	0.0693
19	100.000	692	0.0692	0.0692
20	200.000	691	0.0691	0.0691
21	400.000	689	0.0689	0.0689
22	800.000	688	0.0688	0.0688
23	925.633	688	0.0688	0.0688

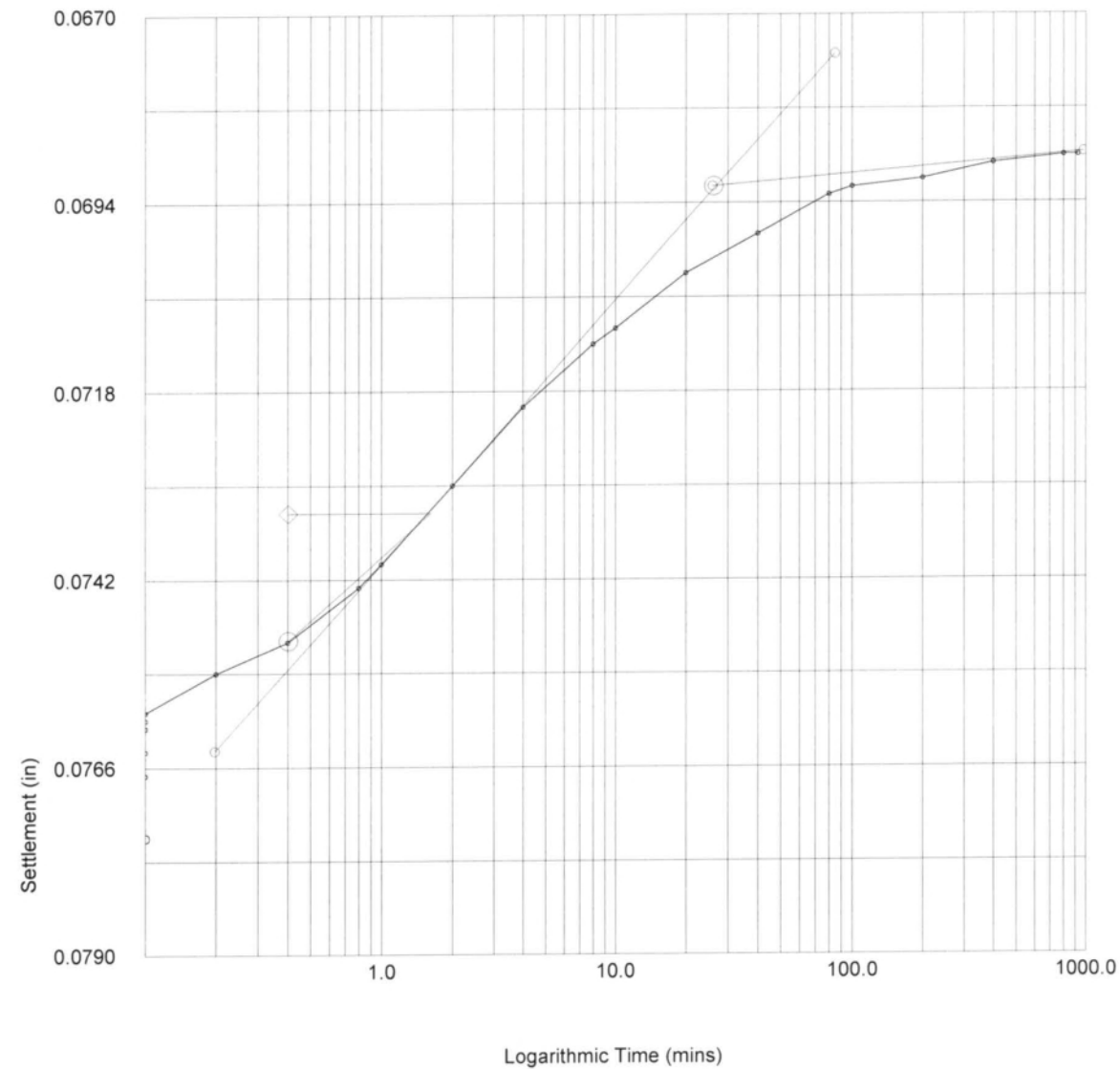
	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.050 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-13-16
	Jobfile: E:\16010.JOB	Sample: ST-4
	Operator: <i>mk</i>	Borehole: EB2-A LT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.050
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0087
 Voids Ratio e 0.5474
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



	ASTM D2435-96	Test name	Consolidation
	Site Reference: C.F. Harvey	Date of Test:	12-13-16
	Jobfile: E:\16010.JOB	Sample:	ST-4
Operator: <i>mk</i>	Checked: <i>mk</i>	Borehole:	EB2-A LT LN
		Approved:	

Form No. TR-T88

Revision No. 0

Revision Date: 12/20/09

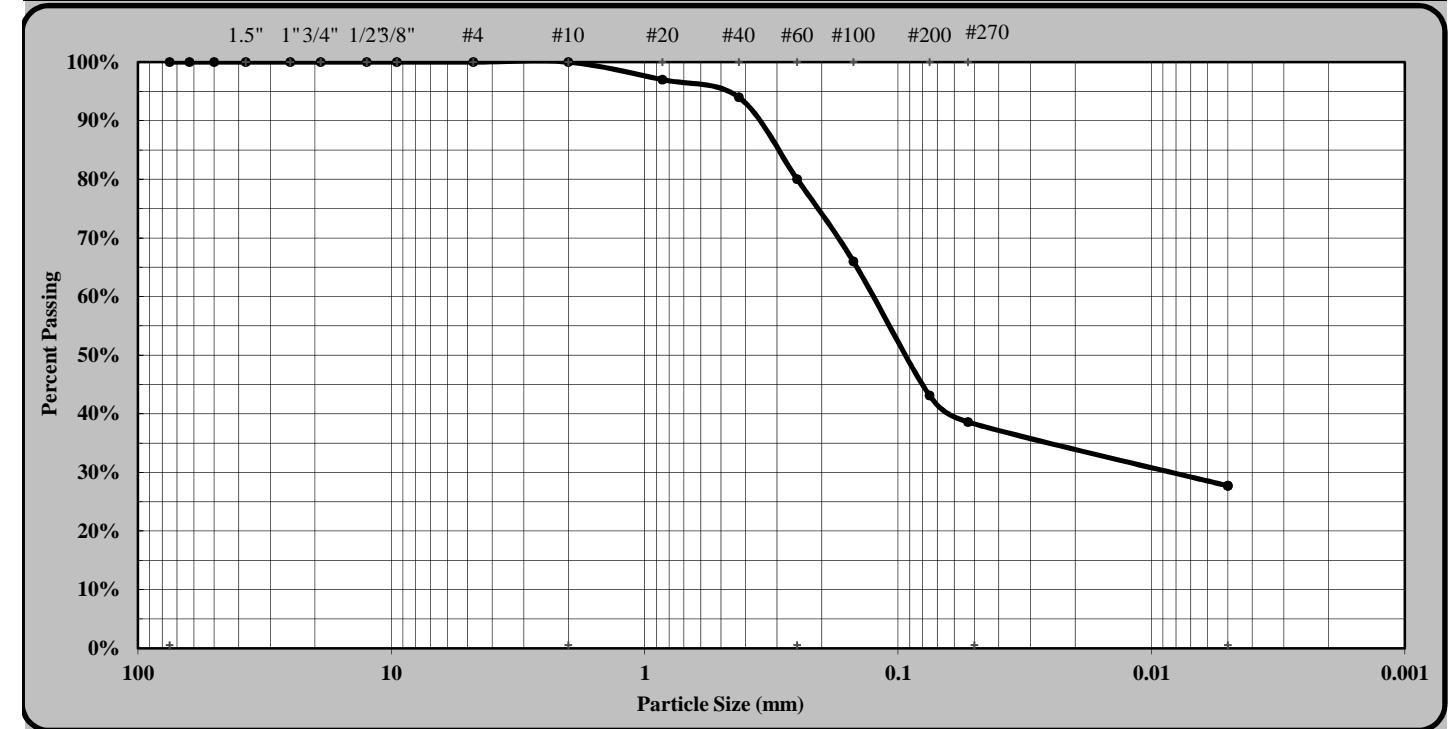
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616			
S&ME Project #:	6235-16-010	Report Date:	12/27/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	12/24 - 12/27/16
State Project #:	46375.1.1	F.A. Project No:	N/A
Client Name:	Michael Baker Engineering	TIP NO:	R-5703
Address:	Raleigh, NC		
Boring #:	EB1-B RT LN	Sample #:	ST-3
Location:	165+89	Sample Date:	9/1/16
		Offset:	35 RT
		Depth (ft):	18.0 - 20.0 ft.
Sample Description:	Gray Coarse to Fine Sandy Silty CLAY A-6 (2)		



As Defined by NCDOT		Fine Sand		< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	#4	Coarse Sand	20%	Silt	11%
Gravel	0%	Fine Sand	41%	Clay	28%
Apparent Relative Density	ND	Moisture Content	22%	% Passing #200	43.1%
Liquid Limit	25	Plastic Limit	13	Plastic Index	12
Soil Mortar (-#10 Sieve)					
Coarse Sand	20%	Fine Sand	41%	Silt	11%
				Clay	28%
Description of Sand & Gravel Particles:		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: ND=Not Determined.

Mal Krajan, ET

Technician Name

104-01-0703

Certification No.

Laboratory Manager

Position

12/27/2016

Date

Mal Krajan, ET

Technical Responsibility

Signature

Laboratory Manager

Position

9/26/2016

Date

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Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample



Depth: 18.0 - 20.0 ft.
Description: Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)

Type: Undisturbed
Height H_0 (in): 0.996
Diameter D_0 (in): 2.501
Weight W_0 (gr): 160.41
Bulk Density ρ (PCF): 124.89
Particle Density ρ_s : 2.663 (measured)

Initial Conditions

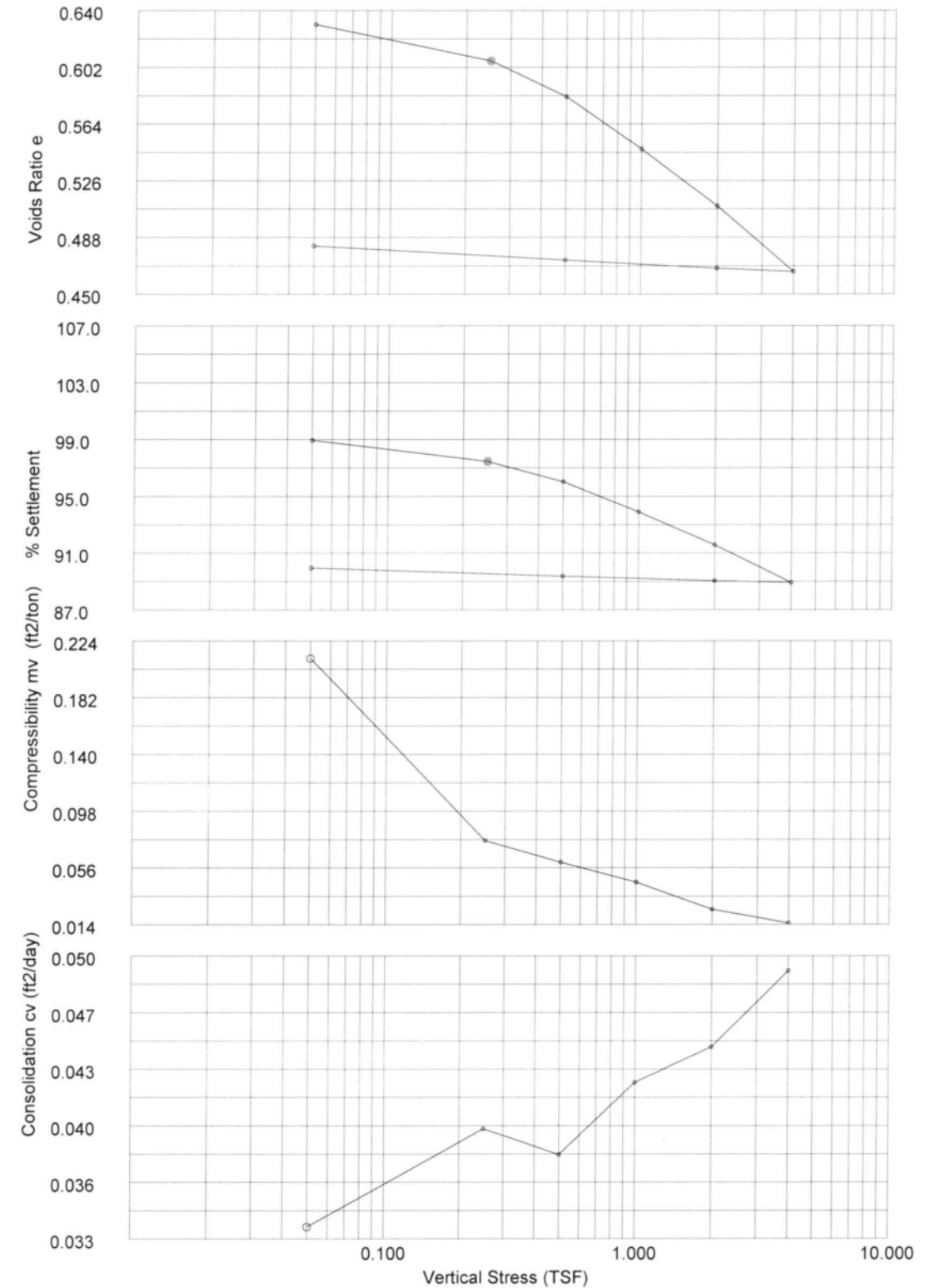
Settlement Channel: 1942
Moisture Content w_0 (%): 23.8
Dry Density ρ_d (PCF): 100.84
Voids Ratio e_0 : 0.6478
Deg of Saturation S_0 (%): 98.0
Swelling Pressure S_s (TSF): 0.000

Final Conditions

Moisture Content w_f (%): 19.5
Dry Density ρ_d (PCF): 112.10
Voids Ratio e_f : 0.4824
Deg of Saturation S_f (%): 100.00
Settlement: (in): 0.10
Compression Index C_c : 0.162

Notes: Test specimen taken from the middle portion of UD tube.

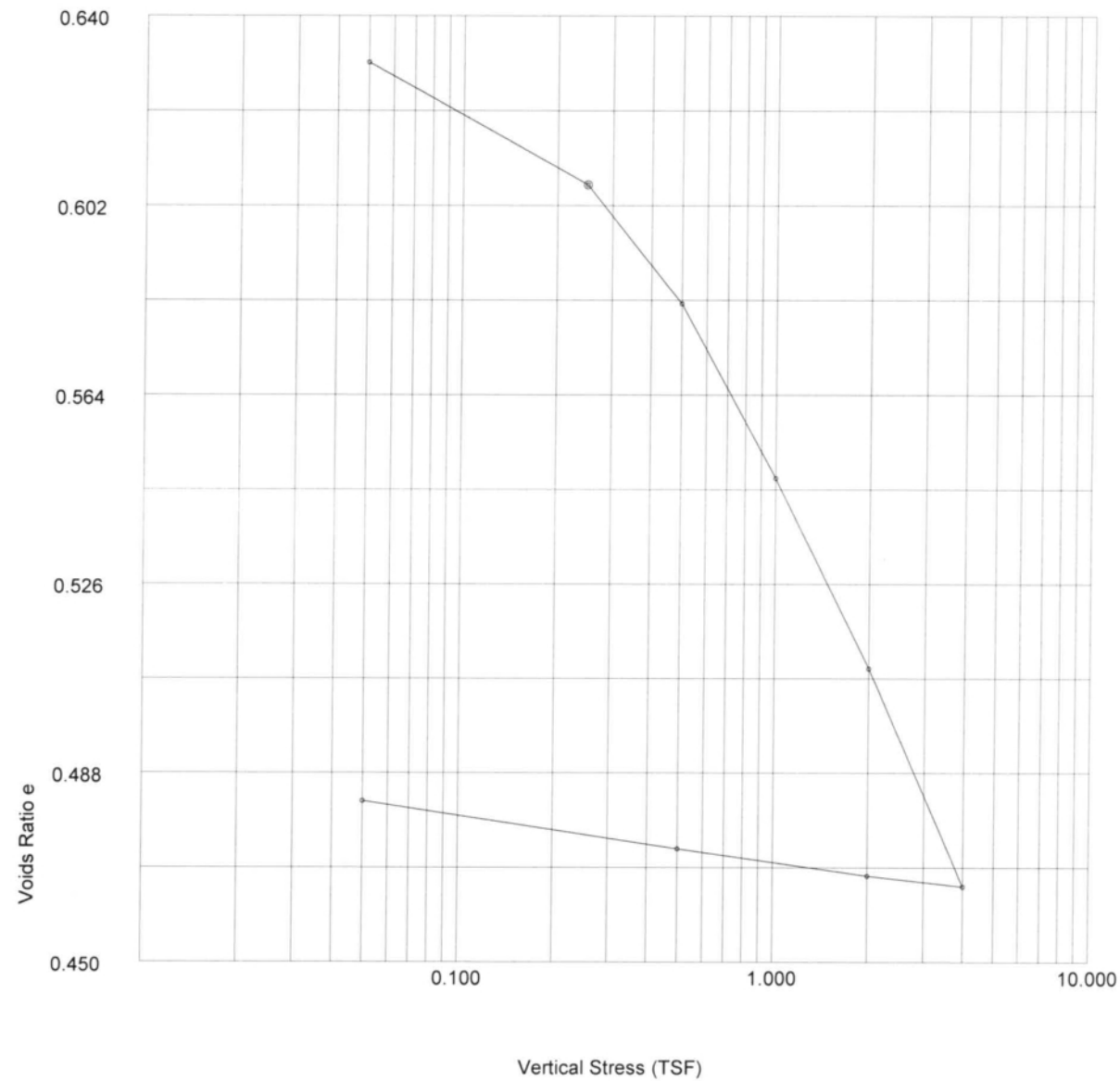
Oedometer Settlement Tests



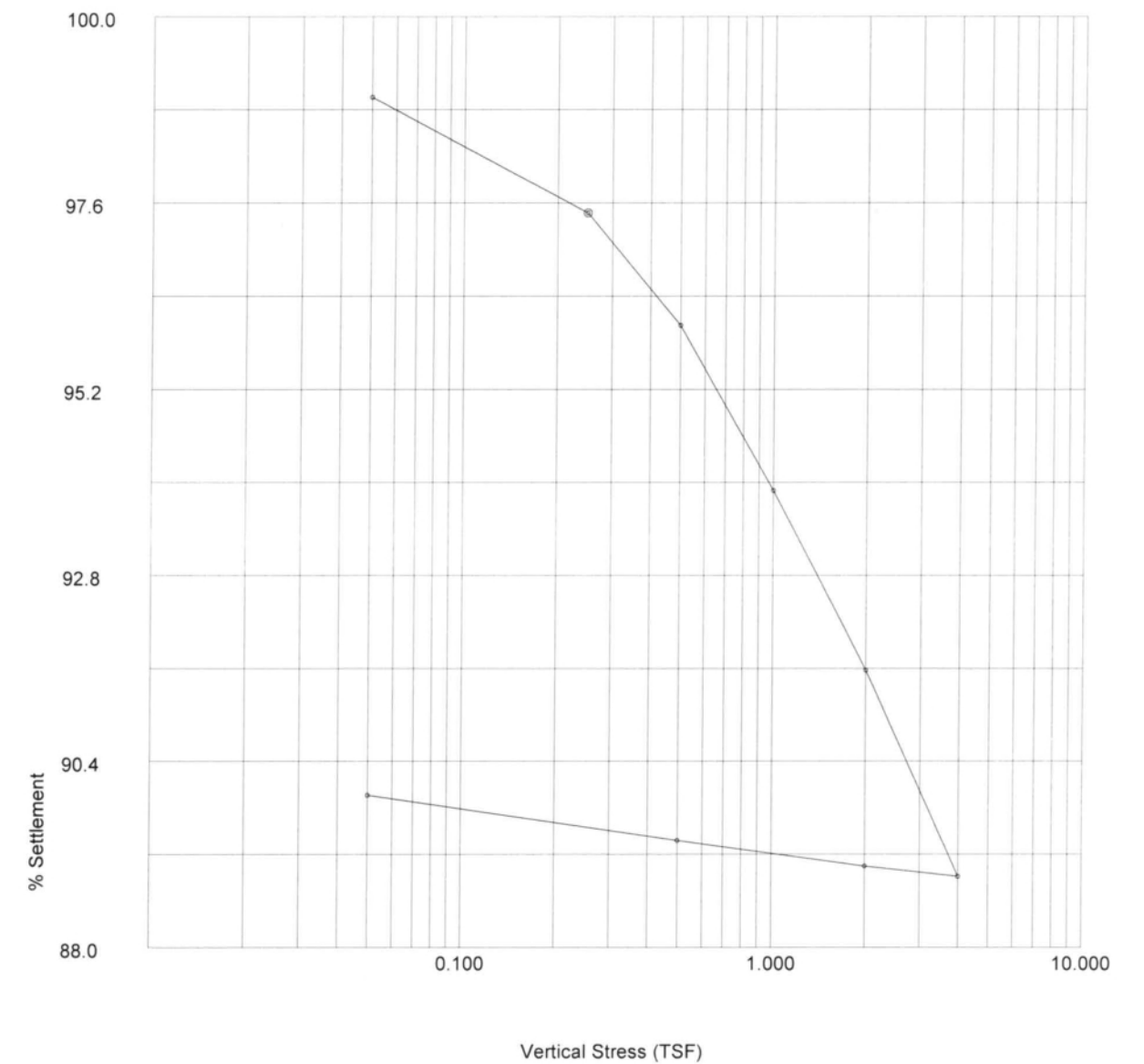
	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>MLC</i>	Borehole: EB1-B RT LN
	Checked: <i>MLC</i>	Approved:

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>MLC</i>	Borehole: EB1-B RT LN
	Checked: <i>MLC</i>	Approved:

Oedometer Settlement Tests



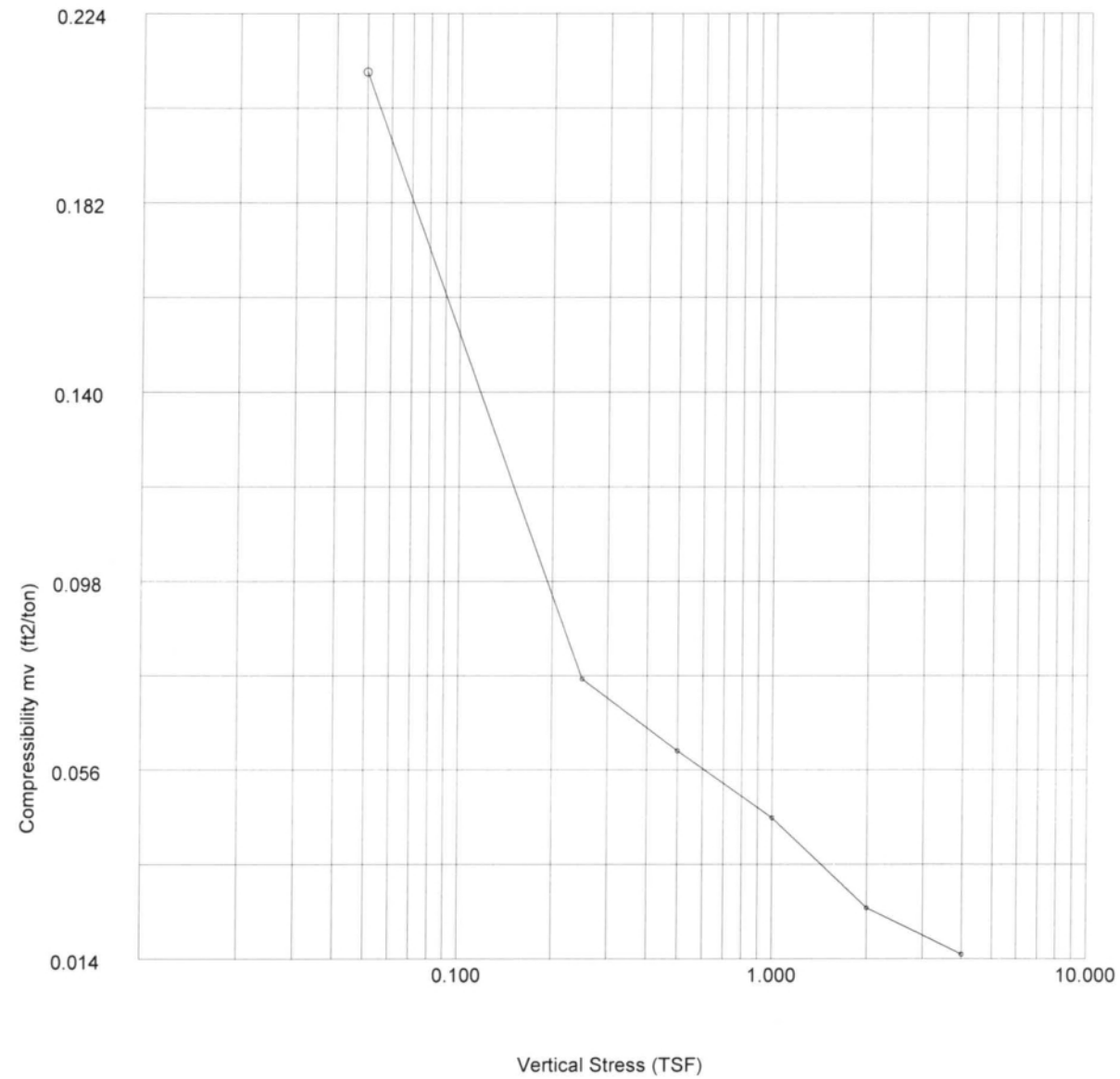
Oedometer Settlement Tests



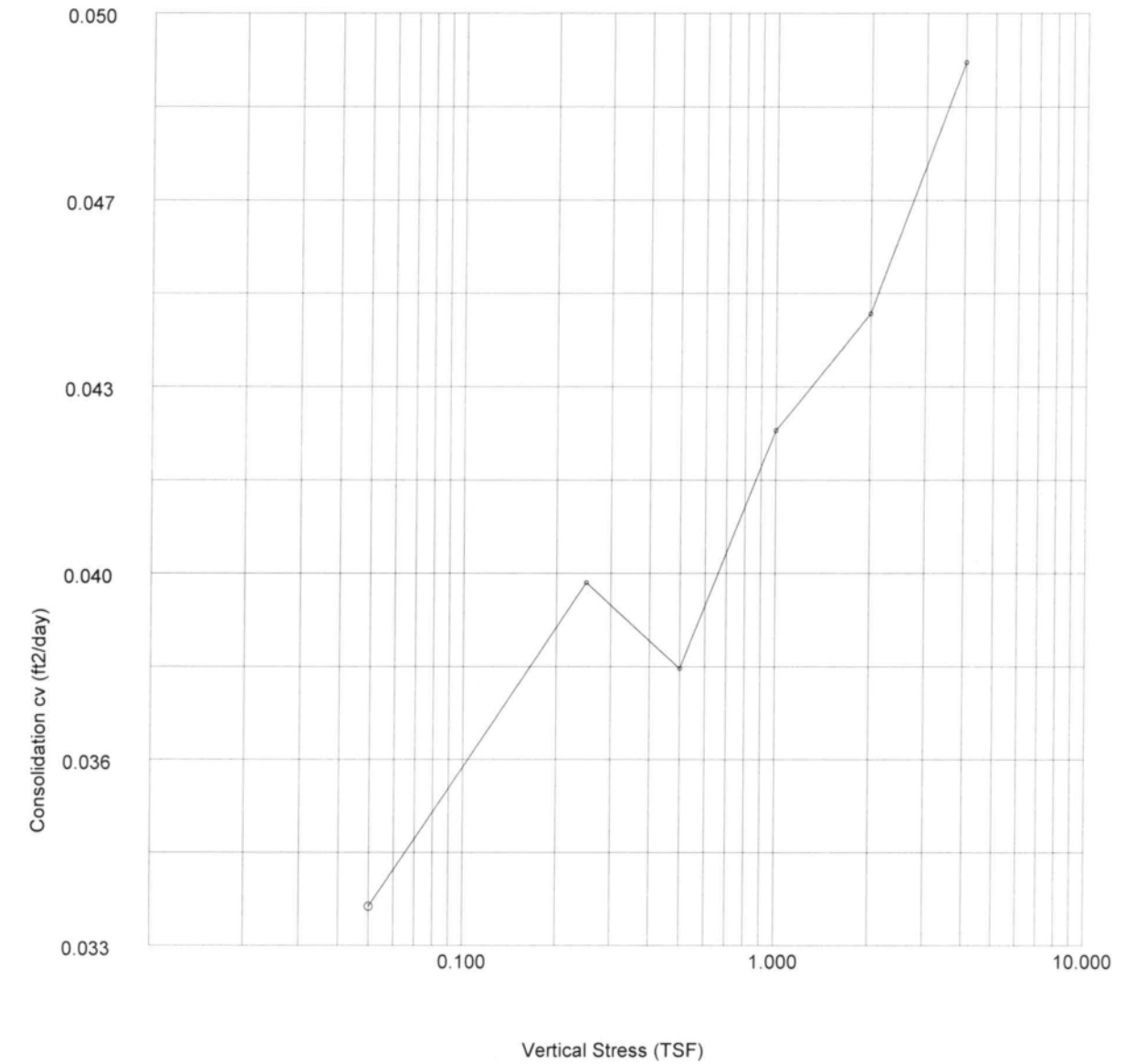
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	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests



Oedometer Settlement Tests



	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{50} (mins)	Secondary Compr C_{sec}	c_v (ft ² /day)	m_v (ft ² /ton)
0.050	21.6	0.0104	0.0	21.6	0.6306	14.559	0.0005	0.034	0.211
0.250	21.6	0.0252	0.0	21.6	0.6061	12.073	0.0074	0.040	0.076
0.500	21.6	0.0396	0.0	21.6	0.5823	12.195	0.0023	0.038	0.060
1.000	21.6	0.0608	0.0	21.6	0.5472	10.547	0.0107	0.042	0.045
2.000	21.6	0.0839	0.0	21.6	0.5090	9.578	0.0022	0.045	0.025
4.000	21.6	0.1104	0.0	21.6	0.4652	8.227	0.0027	0.049	0.015
2.000	21.6	0.1091	0.0	21.6	0.4673				0.001
0.500	21.6	0.1058	0.0	21.6	0.4728				0.002
0.050	21.6	0.1000	0.0	21.6	0.4824				0.014

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	4	0.0004	0.0004
3	0.033	4	0.0004	0.0004
4	0.050	5	0.0005	0.0005
5	0.067	5	0.0005	0.0005
6	0.083	5	0.0005	0.0005
7	0.100	5	0.0005	0.0005
8	0.200	6	0.0006	0.0006
9	0.400	7	0.0007	0.0007
10	0.800	9	0.0009	0.0009
11	1.000	10	0.0010	0.0010
12	2.000	15	0.0015	0.0015
13	4.000	22	0.0022	0.0022
14	8.000	32	0.0032	0.0032
15	10.000	39	0.0039	0.0039
16	20.000	56	0.0056	0.0056
17	40.000	80	0.0080	0.0080
18	80.000	92	0.0092	0.0092
19	100.000	96	0.0096	0.0096
20	200.000	101	0.0101	0.0101
21	400.000	104	0.0104	0.0104
22	800.000	104	0.0104	0.0104
23	1028.783	104	0.0104	0.0104

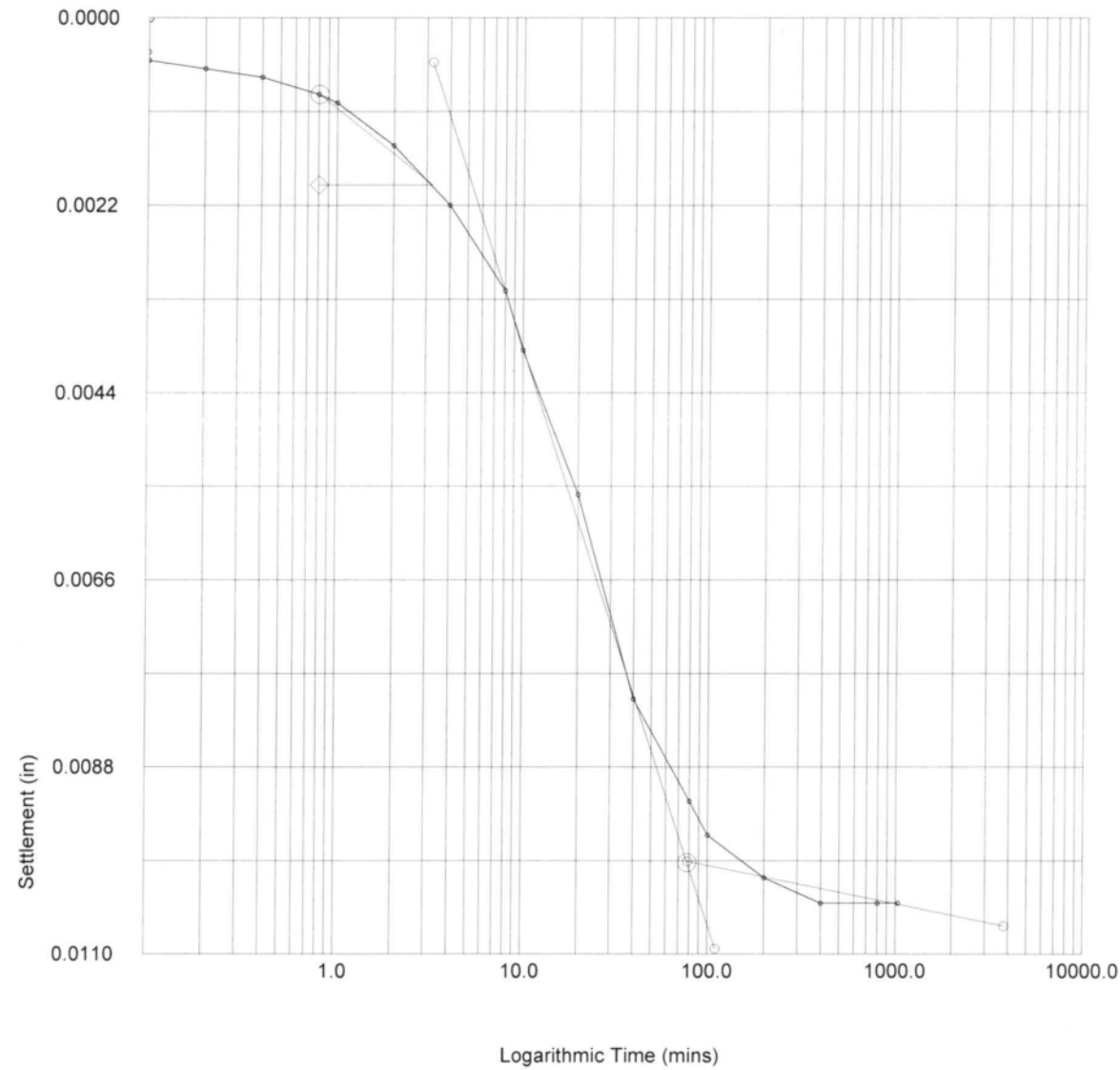
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			Date of Test: 12-14-16
	Site Reference: C.F. Harvey	Sample: ST-3	
	Jobfile: E:\16010.JOB	Borehole: EB1-B RT LN	
Operator: <i>ml</i>	Checked: <i>ml</i>	Approved:	

	ASTM D2435-96		Test name: Consolidation Load: 0.050 (TSF)
			Date of Test: 12-14-16
	Site Reference: C.F. Harvey	Sample: ST-3	
	Jobfile: E:\16010.JOB	Borehole: EB1-B RT LN	
Operator: <i>ml</i>	Checked: <i>ml</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0104
Voids Ratio e	0.6306
Final Temp oC	0.0
t ₅₀ (mins)	14.56
c _v (ft ² /day)	0.034
m _v (ft ² /ton)	0.211
Sec Compression C _{sec}	0.0005



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	104	0.0104	0.0104
2	0.017	108	0.0108	0.0108
3	0.033	117	0.0117	0.0117
4	0.050	119	0.0119	0.0119
5	0.067	120	0.0120	0.0120
6	0.083	120	0.0120	0.0120
7	0.100	124	0.0124	0.0124
8	0.200	127	0.0127	0.0127
9	0.400	128	0.0128	0.0128
10	0.800	135	0.0135	0.0135
11	1.000	136	0.0136	0.0136
12	2.000	143	0.0143	0.0143
13	4.000	152	0.0152	0.0152
14	8.000	167	0.0167	0.0167
15	10.000	172	0.0172	0.0172
16	20.000	192	0.0192	0.0192
17	40.000	216	0.0216	0.0216
18	80.000	237	0.0237	0.0237
19	100.000	240	0.0240	0.0240
20	200.000	247	0.0247	0.0247
21	324.600	252	0.0252	0.0252

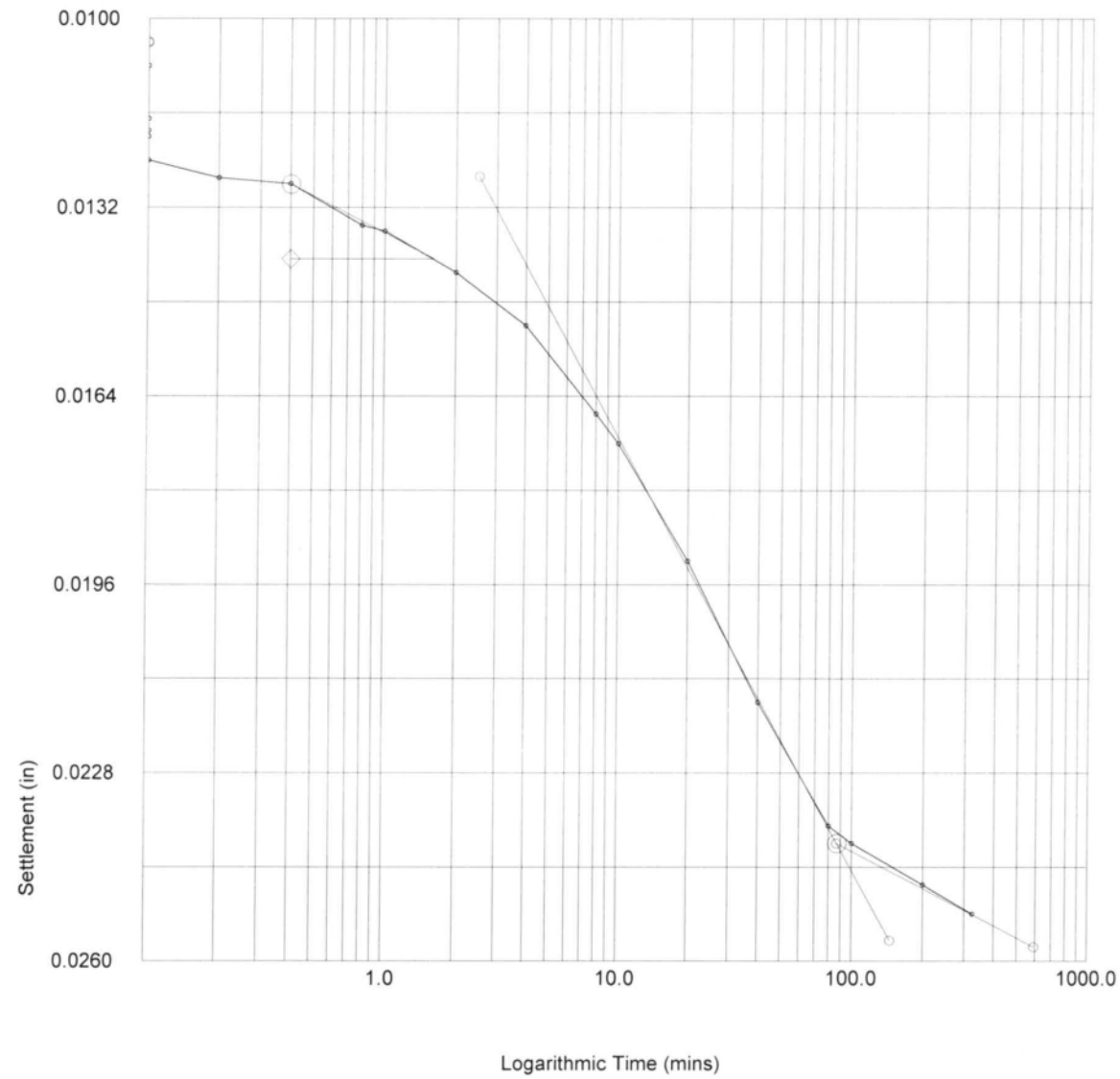
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	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>mlk</i>	Borehole:	EB1-B RT LN
	Checked: <i>mlk</i>	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 0.250 (TSF)
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>mlk</i>	Borehole:	EB1-B RT LN
	Checked: <i>mlk</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0148
Voids Ratio e	0.6061
Final Temp oC	0.0
t ₅₀ (mins)	12.07
c _v (ft ² /day)	0.04
m _v (ft ² /ton)	0.076
Sec Compression C _{sec}	0.0074



Oedometer Settlement Tests

No.	Time (mins)	Disolacement (divs)	Displacement (in)	Settlement (in)
1	0.000	252	0.0252	0.0252
2	0.017	255	0.0255	0.0255
3	0.033	262	0.0262	0.0262
4	0.050	264	0.0264	0.0264
5	0.067	266	0.0266	0.0266
6	0.083	269	0.0269	0.0269
7	0.100	270	0.0270	0.0270
8	0.200	272	0.0272	0.0272
9	0.400	279	0.0279	0.0279
10	0.800	281	0.0281	0.0281
11	1.000	285	0.0285	0.0285
12	2.000	293	0.0293	0.0293
13	4.000	303	0.0303	0.0303
14	8.000	317	0.0317	0.0317
15	10.000	321	0.0321	0.0321
16	20.000	344	0.0344	0.0344
17	40.000	367	0.0367	0.0367
18	80.000	384	0.0384	0.0384
19	100.000	389	0.0389	0.0389
20	193.133	396	0.0396	0.0396

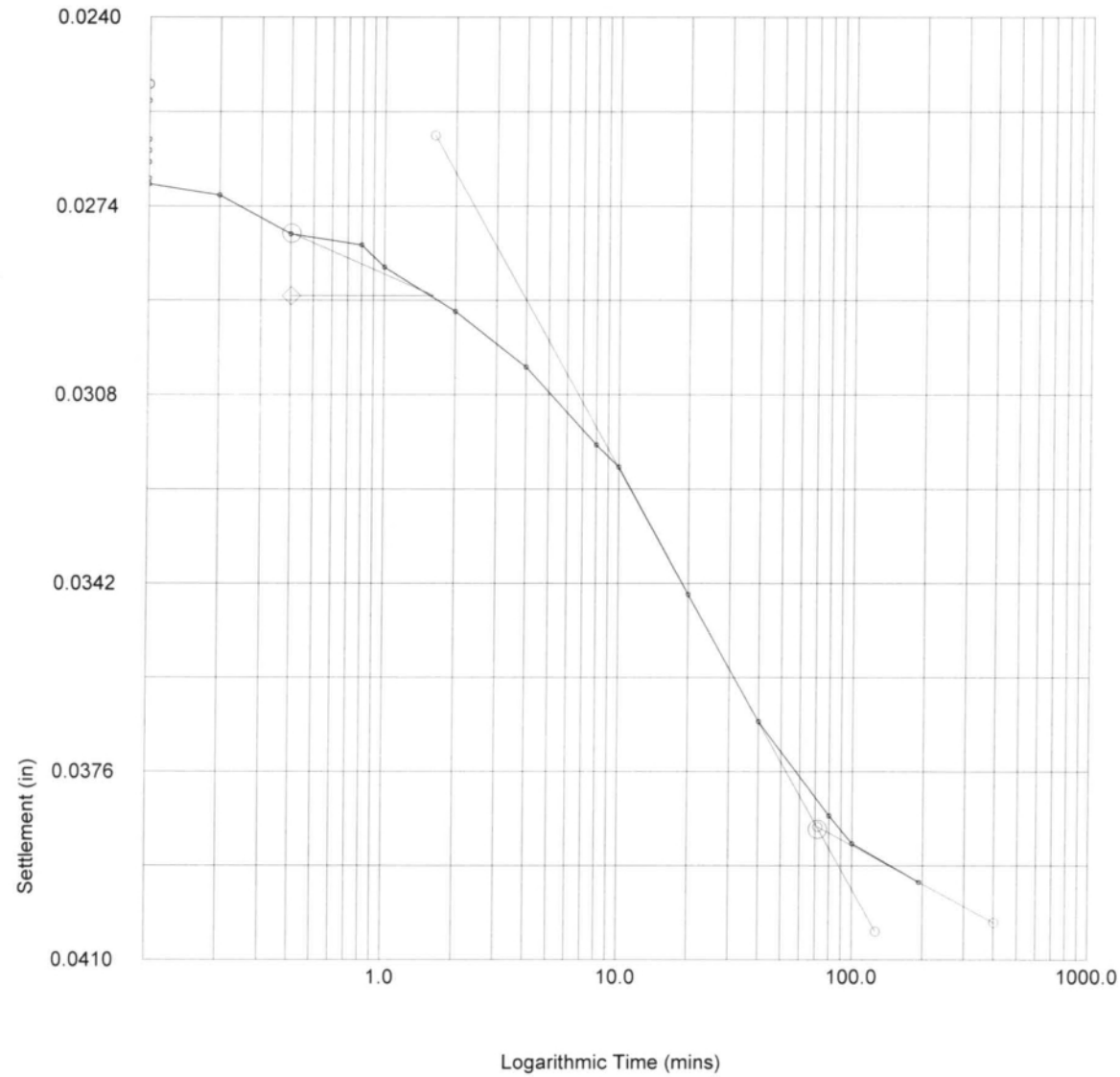
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	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>ml</i>	Borehole:	EB1-B RT LN
	Checked: <i>ml</i>	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 0.500 (TSF)
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>ml</i>	Borehole:	EB1-B RT LN
	Checked: <i>ml</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0144
Voids Ratio e	0.5823
Final Temp oC	0.0
t ₅₀ (mins)	12.20
c _v (ft ² /day)	0.038
m _v (ft ² /ton)	0.06
Sec Compression C _{sec}	0.0023



Oedometer Settlement Tests

No.	Time (mins)	Disolacement (divs)	Displacement (in)	Settlement (in)
1	0.000	397	0.0397	0.0397
2	0.017	398	0.0398	0.0398
3	0.033	398	0.0398	0.0398
4	0.050	400	0.0400	0.0400
5	0.067	416	0.0416	0.0416
6	0.083	424	0.0424	0.0424
7	0.100	429	0.0429	0.0429
8	0.200	432	0.0432	0.0432
9	0.400	440	0.0440	0.0440
10	0.800	448	0.0448	0.0448
11	1.000	449	0.0449	0.0449
12	2.000	462	0.0462	0.0462
13	4.000	478	0.0478	0.0478
14	8.000	497	0.0497	0.0497
15	10.000	508	0.0508	0.0508
16	20.000	540	0.0540	0.0540
17	40.000	572	0.0572	0.0572
18	80.000	591	0.0591	0.0591
19	100.000	593	0.0593	0.0593
20	200.000	600	0.0600	0.0600
21	400.000	605	0.0605	0.0605
22	800.000	607	0.0607	0.0607
23	917.267	608	0.0608	0.0608

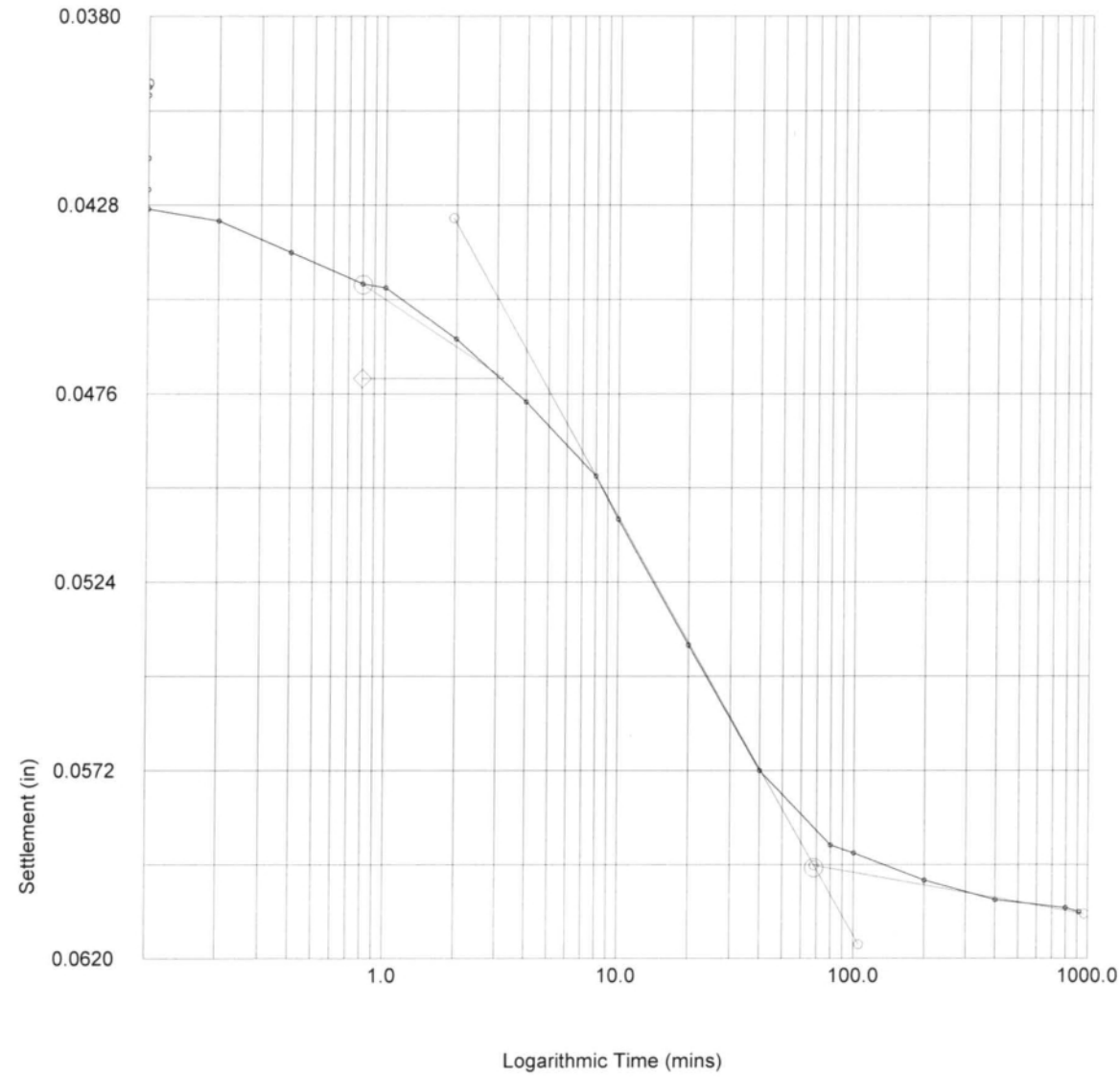
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	Operator: <i>ML</i>	Borehole:	EB1-B RT LN
	Checked: <i>ML</i>	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 1.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>ML</i>	Borehole:	EB1-B RT LN
	Checked: <i>ML</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0211
Voids Ratio e	0.5472
Final Temp oC	0.0
t ₅₀ (mins)	10.55
c _v (ft ² /day)	0.042
m _v (ft ² /ton)	0.045
Sec Compression C _{sec}	0.0107



Oedometer Settlement Tests

No.	Time (mins)	Disolacement (divs)	Displacement (in)	Settlement (in)
1	0.000	608	0.0608	0.0608
2	0.017	616	0.0616	0.0616
3	0.033	616	0.0616	0.0616
4	0.050	624	0.0624	0.0624
5	0.067	632	0.0632	0.0632
6	0.083	635	0.0635	0.0635
7	0.100	637	0.0637	0.0637
8	0.200	641	0.0641	0.0641
9	0.400	648	0.0648	0.0648
10	0.800	656	0.0656	0.0656
11	1.000	663	0.0663	0.0663
12	2.000	673	0.0673	0.0673
13	4.000	693	0.0693	0.0693
14	8.000	718	0.0718	0.0718
15	10.000	728	0.0728	0.0728
16	20.000	760	0.0760	0.0760
17	40.283	800	0.0800	0.0800
18	80.283	824	0.0824	0.0824
19	100.283	829	0.0829	0.0829
20	200.283	837	0.0837	0.0837
21	278.583	839	0.0839	0.0839

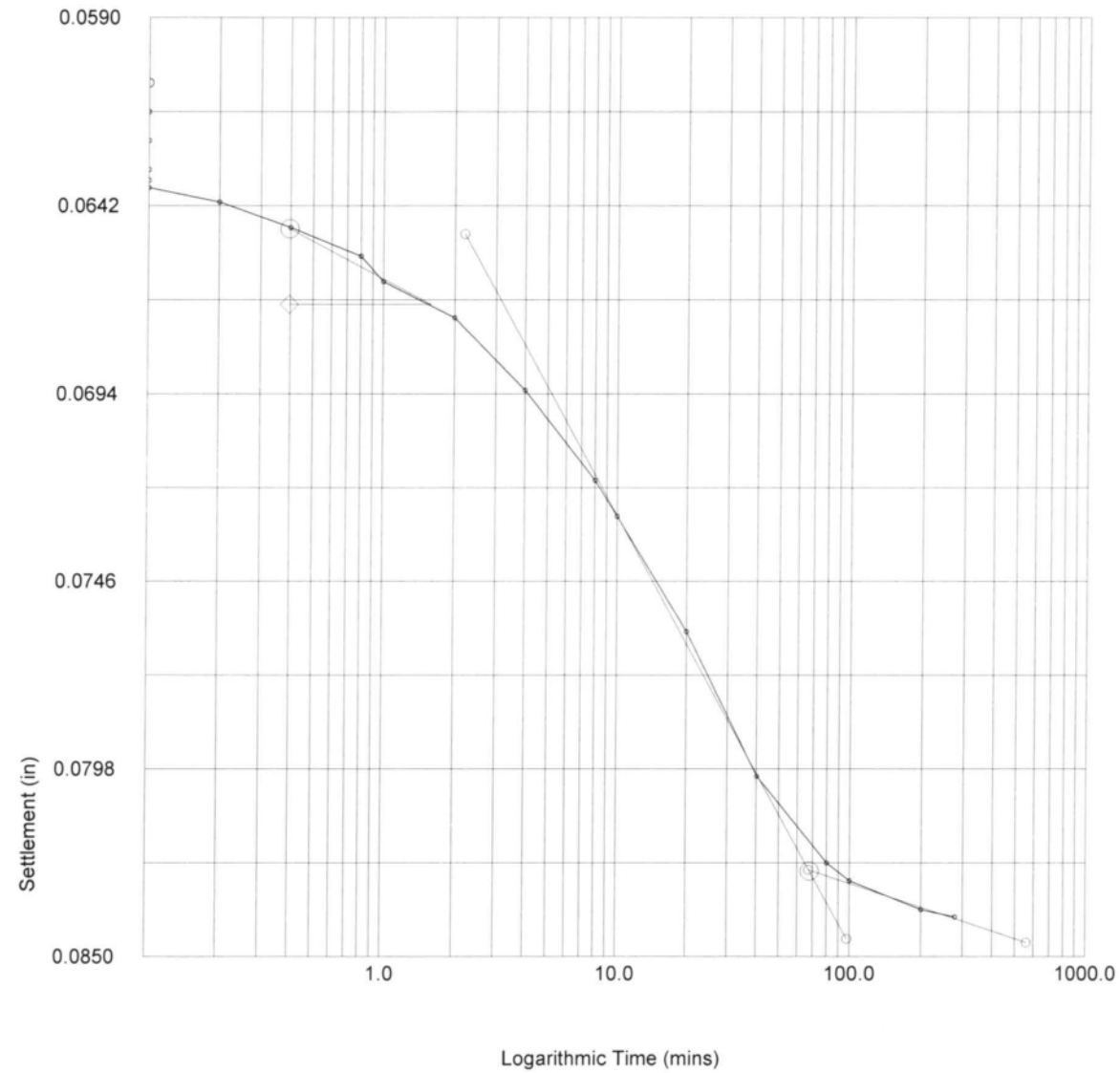
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	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mlk</i>	Borehole: EB1-B RT LN
Checked: <i>mlk</i>	Approved:	

	ASTM D2435-96	Test name: Consolidation Load: 2.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mlk</i>	Borehole: EB1-B RT LN
Checked: <i>mlk</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0231
Voids Ratio e	0.5090
Final Temp oC	0.0
t ₅₀ (mins)	9.58
c _v (ft ² /day)	0.045
m _v (ft ² /ton)	0.025
Sec Compression C _{sec}	0.0022



Oedometer Settlement Tests

No.	Time (mins)	Disolacement (divs)	Displacement (in)	Settlement (in)
1	0.000	839	0.0839	0.0839
2	0.017	840	0.0840	0.0840
3	0.033	843	0.0843	0.0843
4	0.050	864	0.0864	0.0864
5	0.067	865	0.0865	0.0865
6	0.083	871	0.0871	0.0871
7	0.100	872	0.0872	0.0872
8	0.200	880	0.0880	0.0880
9	0.400	888	0.0888	0.0888
10	0.800	901	0.0901	0.0901
11	1.000	904	0.0904	0.0904
12	2.000	920	0.0920	0.0920
13	4.000	944	0.0944	0.0944
14	8.000	976	0.0976	0.0976
15	10.000	988	0.0988	0.0988
16	20.000	1032	0.1032	0.1032
17	40.000	1072	0.1072	0.1072
18	80.000	1096	0.1096	0.1096
19	100.000	1100	0.1100	0.1100
20	171.167	1104	0.1104	0.1104

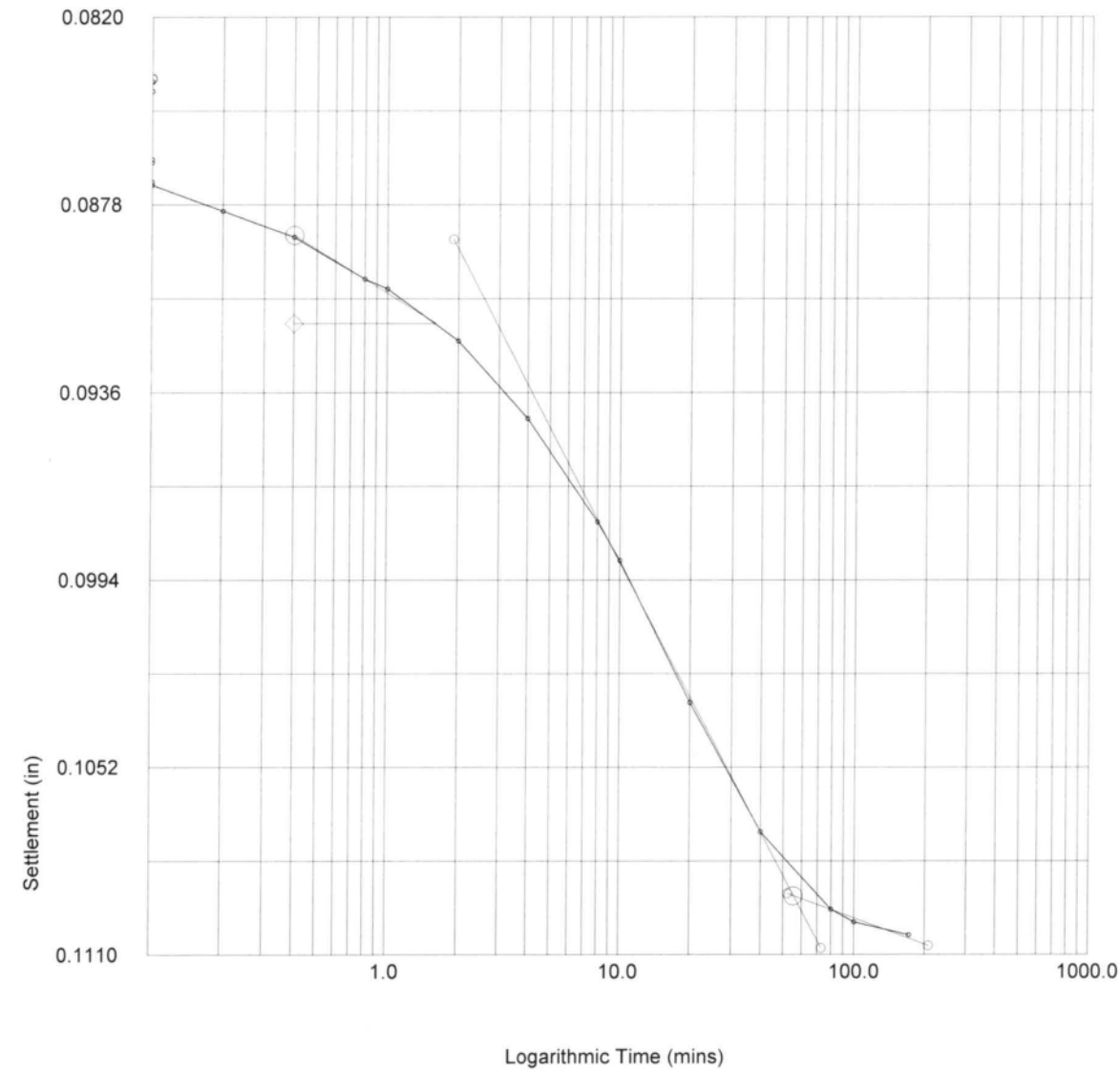
	ASTM D2435-96	Test name	Consolidation
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>MLK</i>	Borehole:	EB1-B RT LN
	Checked: <i>MLK</i>	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 4.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: <i>MLK</i>	Borehole:	EB1-B RT LN
	Checked: <i>MLK</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0265
Voids Ratio e	0.4652
Final Temp oC	0.0
t ₅₀ (mins)	8.23
c _v (ft ² /day)	0.049
m _v (ft ² /ton)	0.015
Sec Compression C _{sec}	0.0027



Oedometer Settlement Tests

No.	Time (mins)	Disolacement (divs)	Displacement (in)	Settlement (in)
1	0.000	1104	0.1104	0.1104
2	0.017	1100	0.1100	0.1100
3	0.033	1100	0.1100	0.1100
4	0.050	1100	0.1100	0.1100
5	0.067	1099	0.1099	0.1099
6	0.083	1099	0.1099	0.1099
7	0.100	1099	0.1099	0.1099
8	0.200	1099	0.1099	0.1099
9	0.400	1098	0.1098	0.1098
10	0.800	1097	0.1097	0.1097
11	1.000	1097	0.1097	0.1097
12	2.000	1092	0.1092	0.1092
13	4.000	1092	0.1092	0.1092
14	8.000	1092	0.1092	0.1092
15	10.000	1092	0.1092	0.1092
16	20.000	1092	0.1092	0.1092
17	40.000	1092	0.1092	0.1092
18	80.000	1091	0.1091	0.1091
19	100.000	1091	0.1091	0.1091
20	200.000	1091	0.1091	0.1091
21	400.000	1091	0.1091	0.1091
22	800.000	1091	0.1091	0.1091
23	1042.500	1091	0.1091	0.1091

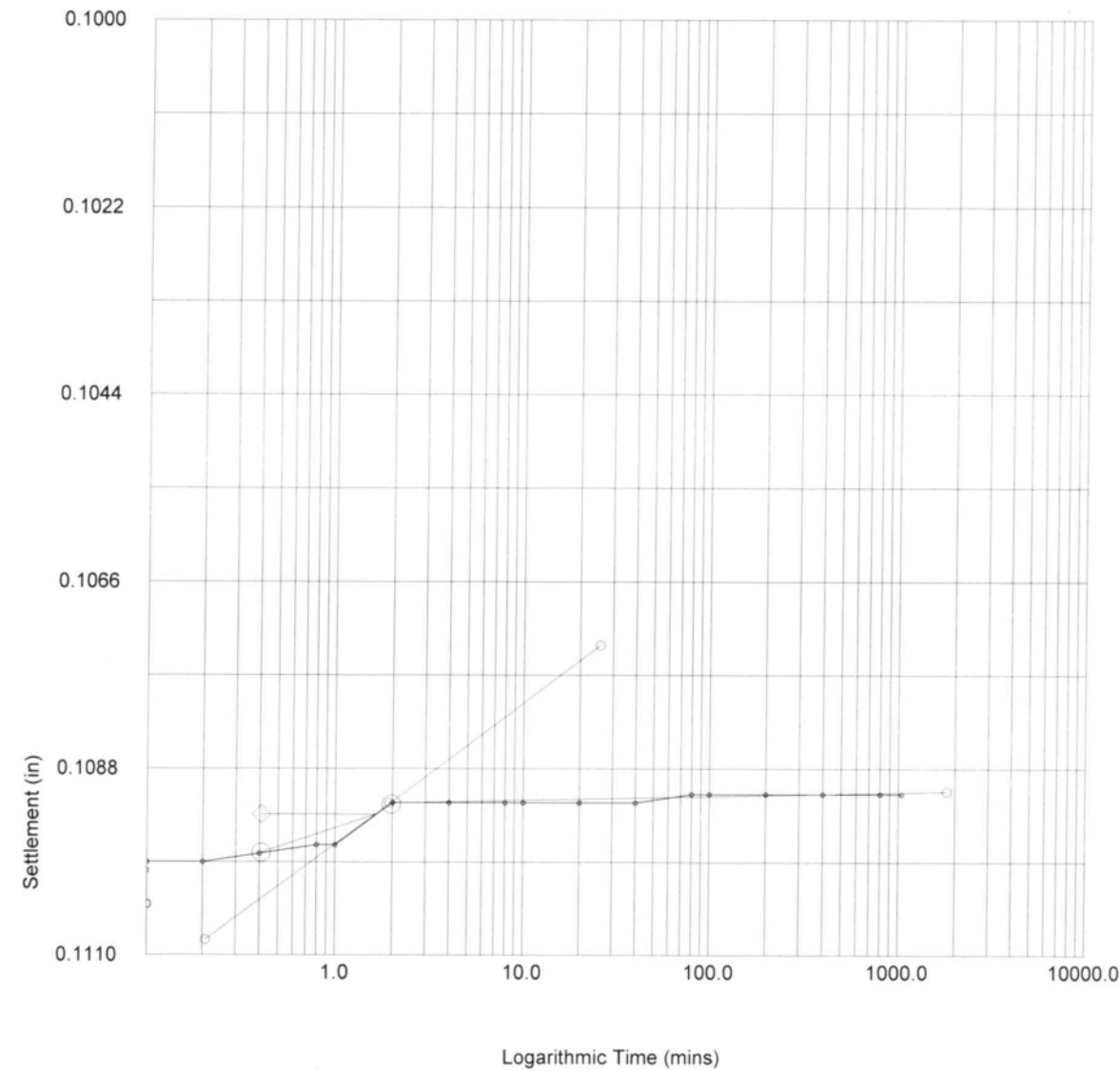
	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 2.000 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 2.000
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0013
 Voids Ratio e 0.4673
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



	ASTM D2435-96	Test name	Consolidation
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: MK	Borehole:	EB1-B RT LN
	Checked: MK	Approved:	

Oedometer Settlement Tests

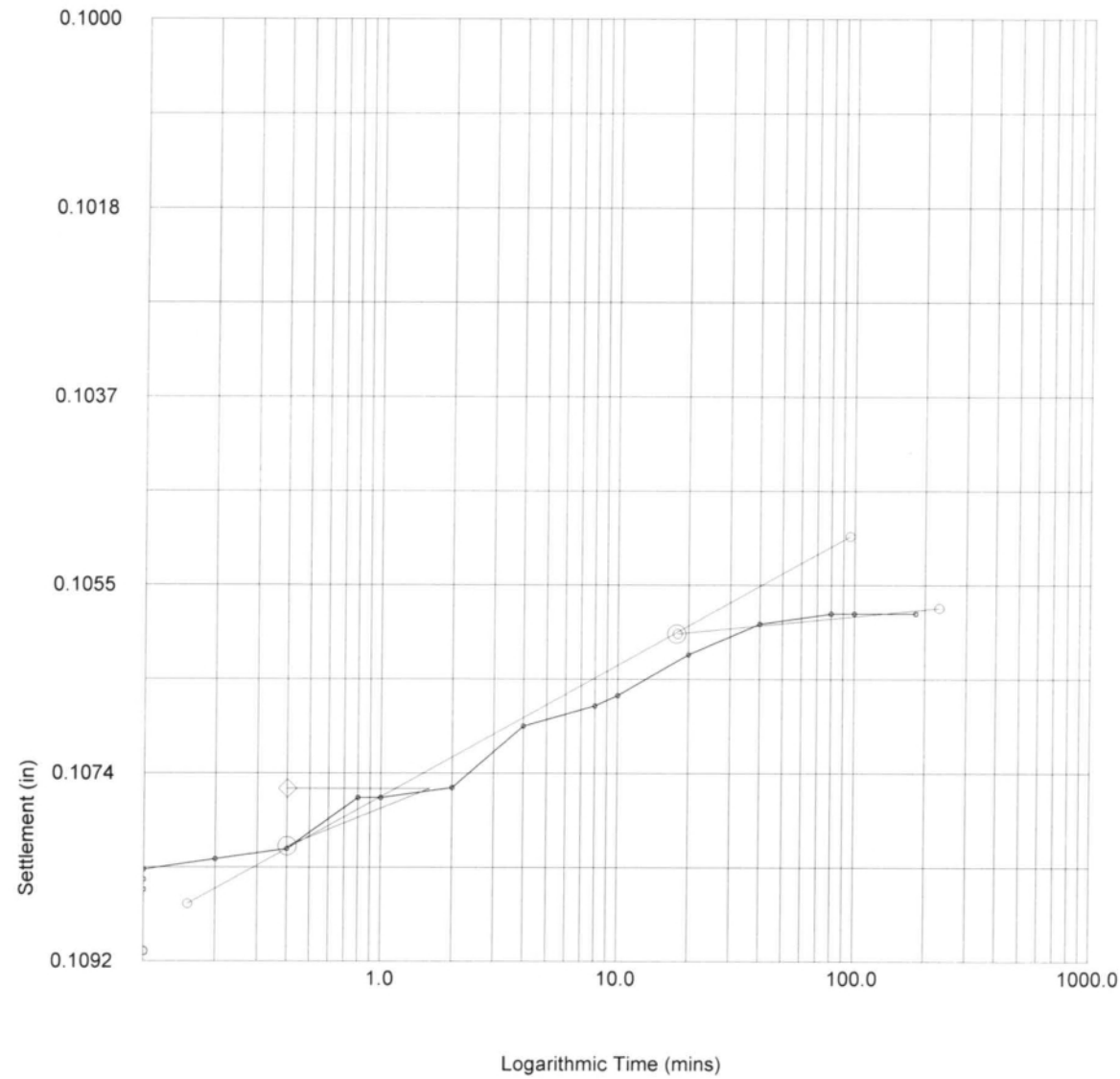
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	1091	0.1091	0.1091
2	0.017	1084	0.1084	0.1084
3	0.033	1085	0.1085	0.1085
4	0.050	1084	0.1084	0.1084
5	0.067	1083	0.1083	0.1083
6	0.083	1083	0.1083	0.1083
7	0.100	1083	0.1083	0.1083
8	0.200	1082	0.1082	0.1082
9	0.400	1081	0.1081	0.1081
10	0.800	1076	0.1076	0.1076
11	1.000	1076	0.1076	0.1076
12	2.000	1075	0.1075	0.1075
13	4.000	1069	0.1069	0.1069
14	8.000	1067	0.1067	0.1067
15	10.000	1066	0.1066	0.1066
16	20.000	1062	0.1062	0.1062
17	40.000	1059	0.1059	0.1059
18	80.000	1058	0.1058	0.1058
19	100.000	1058	0.1058	0.1058
20	182.140	1058	0.1058	0.1058

	ASTM D2435-96	Test name	Consolidation Load: 0.500 (TSF)
	Site Reference: C.F. Harvey	Date of Test:	12-14-16
	Jobfile: E:\16010.JOB	Sample:	ST-3
	Operator: MK	Borehole:	EB1-B RT LN
	Checked: MK	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.500
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0033
 Voids Ratio e 0.4728
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	1058	0.1058	0.1058
2	0.017	1057	0.1057	0.1057
3	0.033	1052	0.1052	0.1052
4	0.050	1052	0.1052	0.1052
5	0.067	1052	0.1052	0.1052
6	0.083	1052	0.1052	0.1052
7	0.100	1052	0.1052	0.1052
8	0.200	1052	0.1052	0.1052
9	0.400	1051	0.1051	0.1051
10	0.800	1049	0.1049	0.1049
11	1.000	1049	0.1049	0.1049
12	2.000	1044	0.1044	0.1044
13	4.000	1042	0.1042	0.1042
14	8.000	1035	0.1035	0.1035
15	10.000	1033	0.1033	0.1033
16	20.000	1025	0.1025	0.1025
17	40.000	1016	0.1016	0.1016
18	80.000	1010	0.1010	0.1010
19	100.000	1008	0.1008	0.1008
20	200.000	1003	0.1003	0.1003
21	391.230	1000	0.1000	0.1000

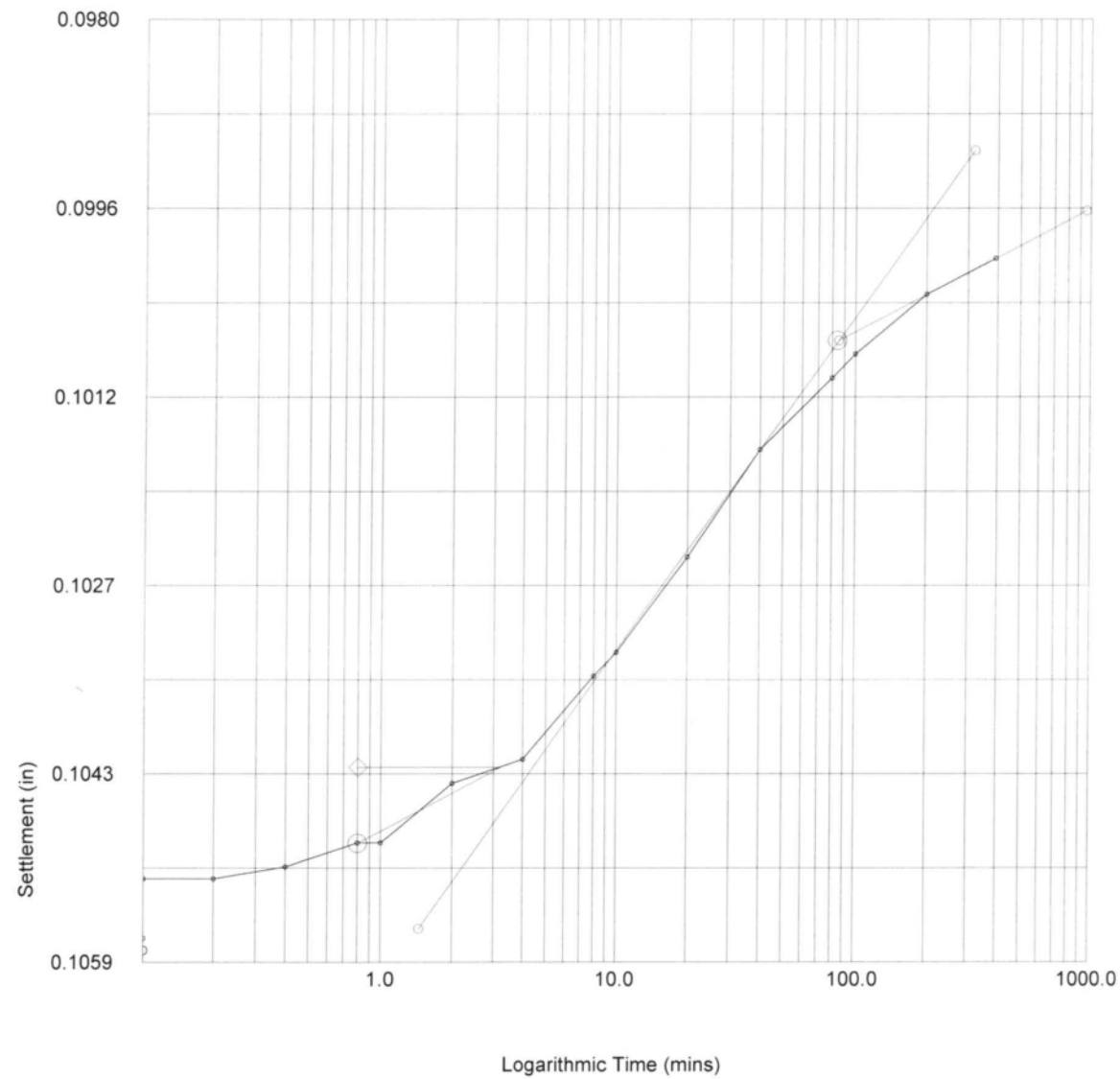
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	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.050 (TSF)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0058
Voids Ratio e	0.4824
Final Temp oC	
t ₅₀ (mins)	
c _v (ft ² /day)	
m _v (ft ² /ton)	
Sec Compression C _{sec}	



Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample



Depth: 18.0 - 20.0 ft.
Description: Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)

	Specimen 1	Specimen 2	Specimen 3
Type	Undisturbed	Undisturbed	Undisturbed
Height H ₀ (in)	5.952	5.801	5.814
Diameter D ₀ (in)	2.861	2.864	2.864
Weight W ₀ (gr)	1275	1236.8	1226.3
Bulk Density ρ (PCF)	126.94	126.08	124.73
Particle Density ρ _s	2.663	2.663	2.663
	(measured)	(measured)	(measured)

Initial Conditions

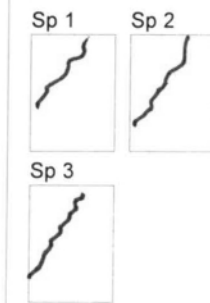
	Specimen 1	Specimen 2	Specimen 3
Cell Pressure σ ₃ (lb/in ²)	8.0	15.0	22.0
Pore Pressure u (lb/in ²)	0.0	0.0	0.0
Machine Speed d _r (in/min)	0.0081	0.0079	0.0104
No. of Membranes	1	1	1
Total Thickness (in)	0.012	0.012	0.012
Strain Channel	1798	1798	1798
Load Channel	1776	1776	1776
Pore P. Channel	1779	1779	1779
Volume Channel	Volume Chang	Volume Chang	Volume Chang
Moisture Content w ₀ %	21.3	23.8	21.9
Dry Density ρ _{d0} (PCF)	104.62	101.88	102.28
Voids Ratio e ₀	0.59	0.63	0.62
Deg of Saturation S ₀ %	96.56	100.00	93.55
Final B Value	0.95	0.95	0.98

Final Conditions

	Specimen 1	Specimen 2	Specimen 3
Moisture Content w _f %	19.7	20.1	18.7
Dry Density ρ _d (PCF)	108.32	107.07	109.24
Voids Ratio e _f	0.53	0.55	0.52
Deg of Saturation S _f %	98.02	96.91	95.79
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε _f %	6.0	10.0	7.0
Corr Dev Stress (σ ₁ - σ ₃) _f (lb/in ²)	7.8	13.4	16.4
Minor Stress σ _{3f} (lb/in ²)	3.7	6.8	8.3
Major Stress σ _{1f} (lb/in ²)	11.5	20.2	24.7
Stress Ratio (σ ₁ /σ ₃) _f	3.1	3.0	3.0

Notes:

Failure Sketch



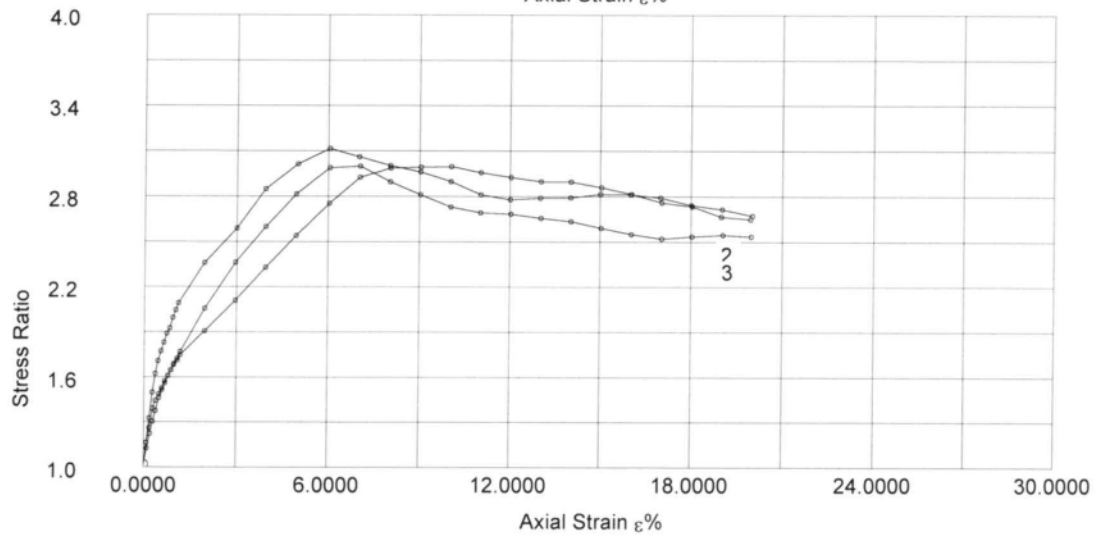
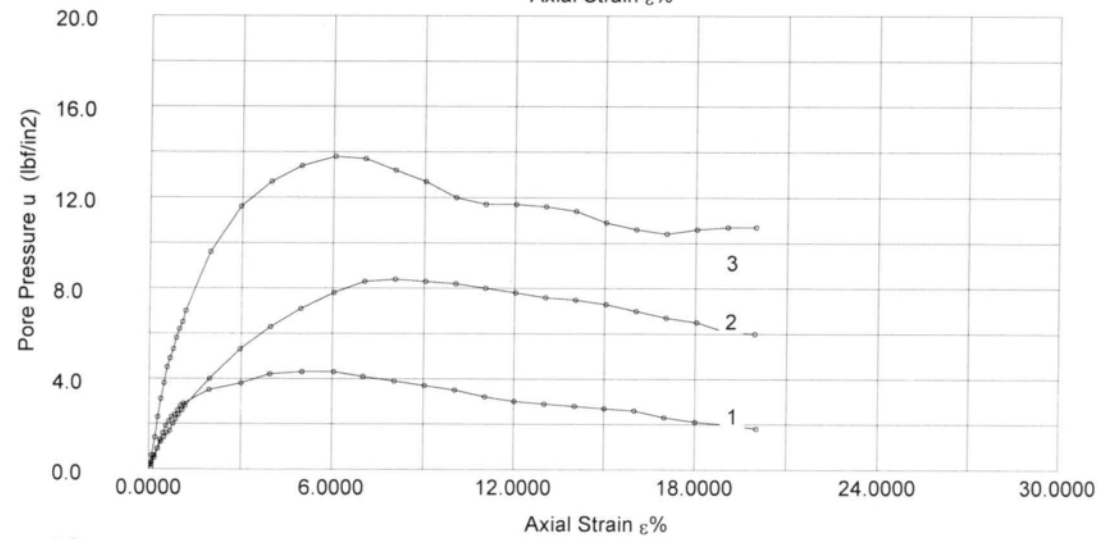
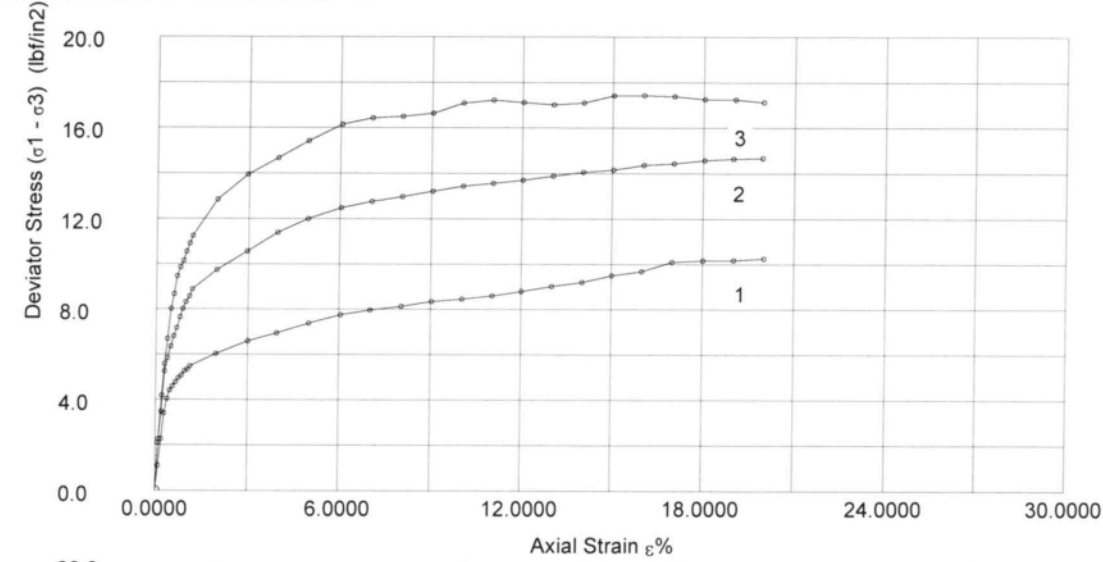
Surface Inclination

	ASTM D2435-96	Test name: Consolidation
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

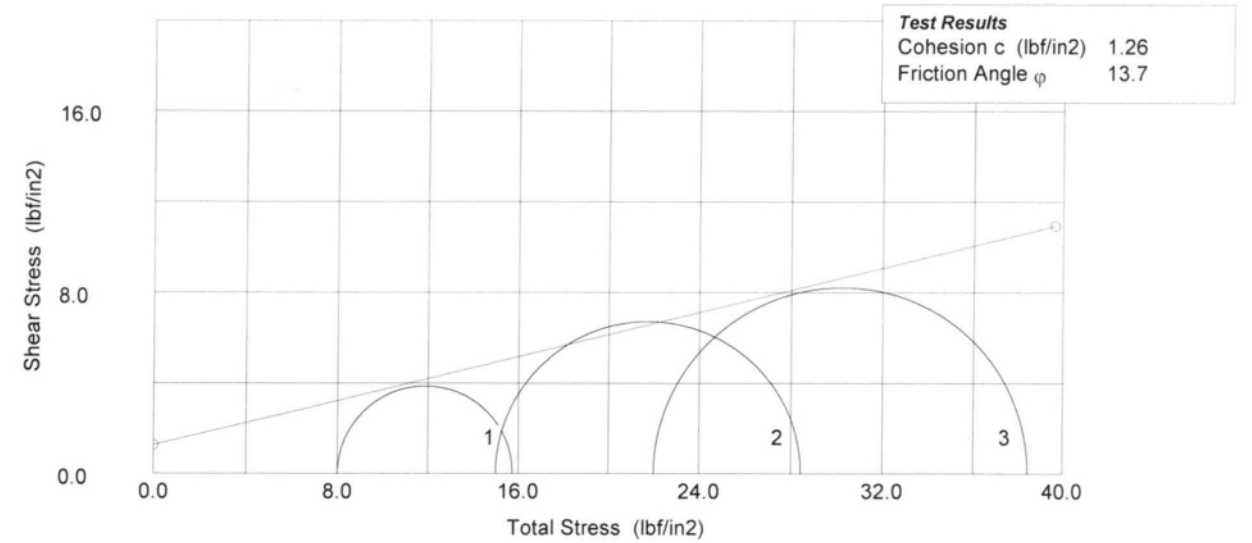
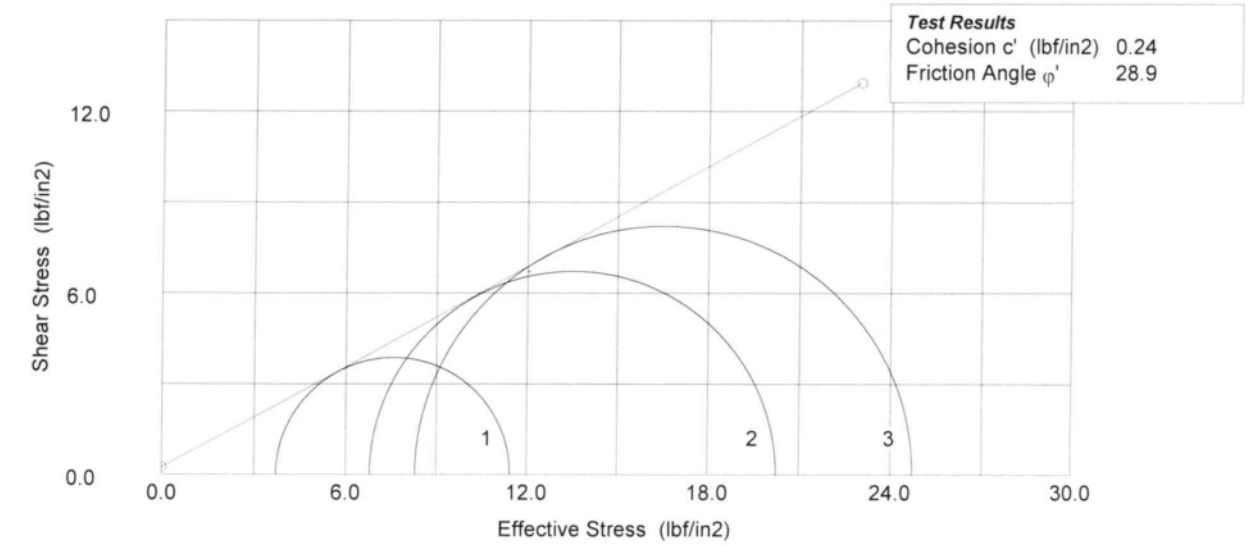
Effective Stress Triaxial Compression

Consolidated Undrained



Effective Stress Triaxial Compression

Consolidated Undrained

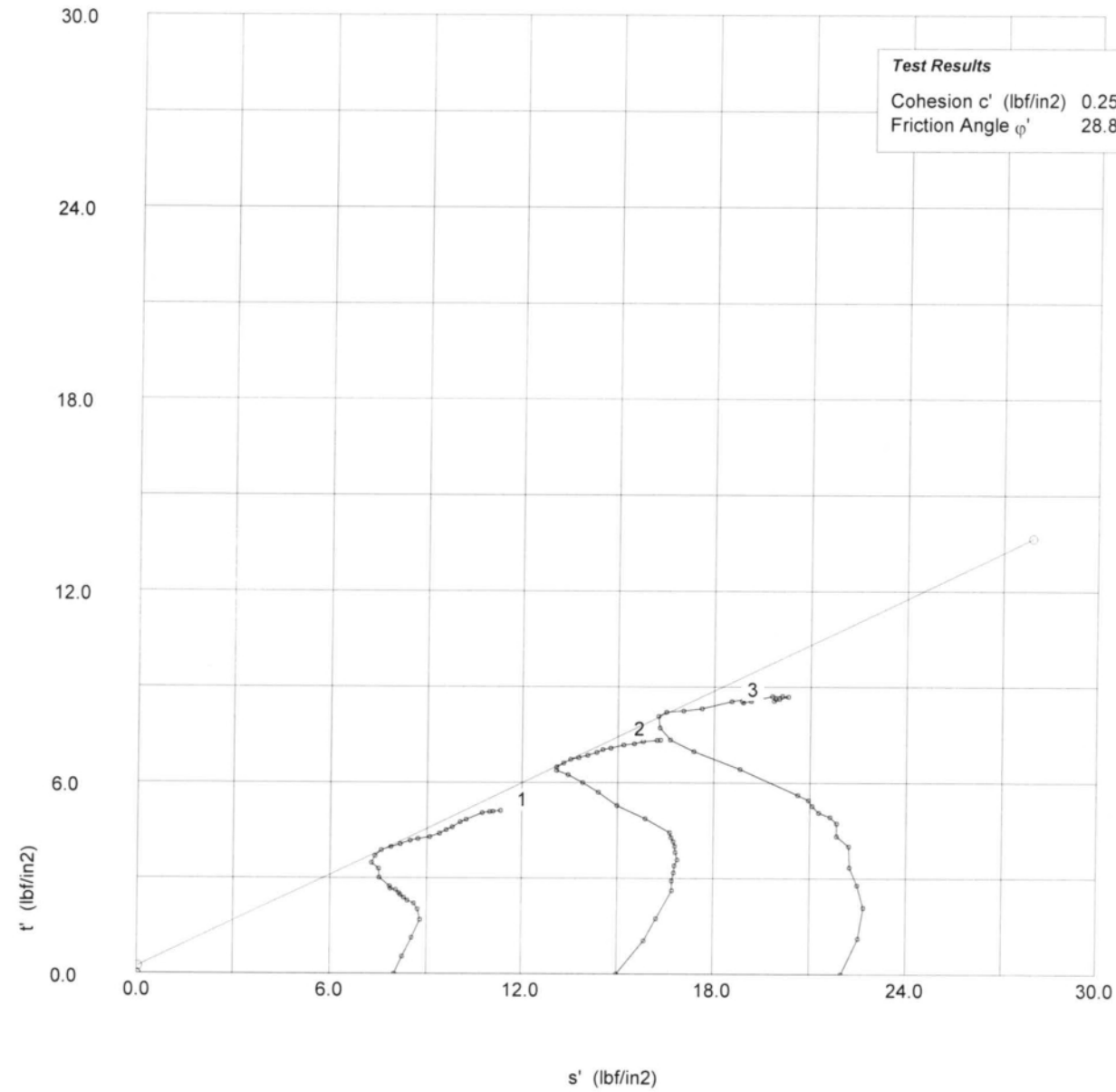


	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>MLC</i>	Borehole: EB1-B RT LN
Checked: <i>MLC</i>	Approved:	

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>MLC</i>	Borehole: EB1-B RT LN
Checked: <i>MLC</i>	Approved:	

Effective Stress Triaxial Compression

Consolidated Undrained



	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain $\epsilon\%$	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in ²)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in ²)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in ²)	Minor Str σ_3' (lbf/in ²)	Major Str σ_1' (lbf/in ²)	Ratio σ_1'/σ_3'
1	24	0.00	589	0.0	0	0.0	0.0	0.0	8.00	8.00	1.00
2	73	0.08	658	6.9	3	0.3	1.1	1.1	7.70	8.80	1.14
3	128	0.18	732	14.3	6	0.6	2.3	2.3	7.40	9.67	1.31
4	183	0.27	803	21.4	9	0.9	3.4	3.4	7.10	10.50	1.48
5	240	0.37	844	25.5	13	1.3	4.0	4.0	6.70	10.74	1.60
6	294	0.46	867	27.8	16	1.6	4.4	4.4	6.40	10.80	1.69
7	346	0.55	889	30.0	19	1.9	4.7	4.6	6.10	10.69	1.75
8	405	0.65	901	31.2	21	2.1	4.9	4.8	5.90	10.67	1.81
9	458	0.74	913	32.4	23	2.3	5.1	5.0	5.70	10.66	1.87
10	513	0.83	920	33.1	24	2.4	5.2	5.1	5.60	10.66	1.90
11	572	0.93	933	34.4	26	2.6	5.4	5.3	5.40	10.66	1.97
12	625	1.02	938	34.9	28	2.8	5.5	5.3	5.20	10.54	2.03
13	680	1.11	947	35.8	29	2.9	5.6	5.5	5.10	10.57	2.07
14	1177	1.96	993	40.4	35	3.5	6.3	6.0	4.50	10.52	2.34
15	1793	3.01	1039	45.0	38	3.8	6.9	6.6	4.20	10.79	2.57
16	2348	3.95	1075	48.6	42	4.2	7.4	7.0	3.80	10.75	2.83
17	2966	5.00	1114	52.5	43	4.3	7.9	7.4	3.70	11.08	2.99
18	3582	6.05	1150	56.1	43	4.3	8.4	7.8	3.70	11.45	3.09
19	4150	7.01	1175	58.6	41	4.1	8.7	8.0	3.90	11.85	3.04
20	4752	8.03	1199	61.0	39	3.9	8.9	8.1	4.10	12.23	2.98
21	5340	9.03	1226	63.7	37	3.7	9.2	8.3	4.30	12.64	2.94
22	5930	10.04	1246	65.7	35	3.5	9.4	8.4	4.50	12.95	2.88
23	6518	11.03	1269	68.0	32	3.2	9.6	8.6	4.80	13.39	2.79
24	7096	12.02	1297	70.8	30	3.0	9.9	8.8	5.00	13.80	2.76
25	7684	13.02	1326	73.7	29	2.9	10.2	9.0	5.10	14.12	2.77
26	8273	14.02	1354	76.5	28	2.8	10.5	9.2	5.20	14.41	2.77
27	8857	15.01	1389	80.0	27	2.7	10.8	9.5	5.30	14.81	2.79
28	9437	16.00	1416	82.7	26	2.6	11.1	9.7	5.40	15.08	2.79
29	10026	17.00	1463	87.4	23	2.3	11.5	10.1	5.70	15.79	2.77
30	10622	18.01	1484	89.5	21	2.1	11.7	10.2	5.90	16.06	2.72
31	11218	19.02	1499	91.0	20	2.0	11.7	10.2	6.00	16.17	2.70
32	11807	20.02	1519	93.0	18	1.8	11.8	10.2	6.20	16.44	2.65

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Shear (Specimen 1)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
	Operator: <i>mk</i>	Borehole: EB1-B RT LN
	Checked: <i>mk</i>	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 2)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress (σ ₁ - σ ₃) _m (lbf/in2)	D. Stress (σ ₁ - σ ₃) _c (lbf/in2)	Minor Str σ ₃ ' (lbf/in2)	Major Str σ ₁ ' (lbf/in2)	Ratio σ ₁ '/σ ₃ '
1	70	0.00	666	0.0	0	0.0	0.0	0.0	15.00	15.00	1.00
2	118	0.08	797	13.1	2	0.2	2.1	2.1	14.80	16.90	1.14
3	175	0.18	883	21.7	5	0.5	3.5	3.5	14.50	17.98	1.24
4	230	0.28	994	32.8	9	0.9	5.2	5.2	14.10	19.35	1.37
5	286	0.38	1031	36.5	12	1.2	5.8	5.8	13.80	19.64	1.42
6	345	0.48	1064	39.8	14	1.4	6.4	6.4	13.60	19.96	1.47
7	399	0.58	1102	43.6	16	1.6	7.0	6.8	13.40	20.20	1.51
8	454	0.67	1126	46.0	17	1.7	7.3	7.2	13.30	20.47	1.54
9	514	0.78	1156	49.0	20	2.0	7.8	7.6	13.00	20.64	1.59
10	567	0.87	1180	51.4	22	2.2	8.2	8.0	12.80	20.82	1.63
11	622	0.97	1199	53.3	24	2.4	8.5	8.3	12.60	20.91	1.66
12	684	1.08	1216	55.0	26	2.6	8.7	8.6	12.40	20.97	1.69
13	739	1.17	1236	57.0	28	2.8	9.0	8.9	12.20	21.08	1.73
14	1191	1.96	1303	63.7	40	4.0	10.0	9.7	11.00	20.74	1.89
15	1757	2.96	1367	70.1	53	5.3	10.9	10.6	9.70	20.26	2.09
16	2325	3.95	1436	77.0	63	6.3	11.9	11.4	8.70	20.09	2.31
17	2894	4.95	1489	82.3	71	7.1	12.6	12.0	7.90	19.90	2.52
18	3518	6.04	1536	87.0	78	7.8	13.1	12.5	7.20	19.68	2.73
19	4091	7.05	1569	90.3	83	8.3	13.5	12.8	6.70	19.46	2.90
20	4659	8.04	1599	93.3	84	8.4	13.8	13.0	6.60	19.57	2.97
21	5227	9.04	1631	96.5	83	8.3	14.1	13.2	6.70	19.91	2.97
22	5800	10.04	1663	99.7	82	8.2	14.4	13.4	6.80	20.24	2.98
23	6367	11.04	1688	102.2	80	8.0	14.6	13.6	7.00	20.56	2.94
24	6937	12.04	1716	105.0	78	7.8	14.8	13.7	7.20	20.91	2.90
25	7510	13.04	1745	107.9	76	7.6	15.1	13.9	7.40	21.28	2.88
26	8079	14.04	1776	111.0	75	7.5	15.3	14.1	7.50	21.56	2.87
27	8647	15.03	1800	113.4	73	7.3	15.5	14.2	7.70	21.85	2.84
28	9222	16.04	1834	116.8	70	7.0	15.7	14.4	8.00	22.36	2.80
29	9791	17.04	1859	119.3	67	6.7	15.9	14.4	8.30	22.74	2.74
30	10362	18.04	1889	122.3	65	6.5	16.1	14.6	8.50	23.08	2.71
31	10906	18.99	1912	124.6	61	6.1	16.2	14.6	8.90	23.55	2.65
32	11456	19.96	1932	126.6	60	6.0	16.3	14.7	9.00	23.67	2.63

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Shear (Specimen 2)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
Operator: <i>MLC</i>	Checked: <i>MLC</i>	Approved: <i>MLC</i>
	Jobfile: E:\16010.JOB	Borehole: EB1-B RT LN

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 3)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress (σ ₁ - σ ₃) _m (lbf/in2)	D. Stress (σ ₁ - σ ₃) _c (lbf/in2)	Minor Str σ ₃ ' (lbf/in2)	Major Str σ ₁ ' (lbf/in2)	Ratio σ ₁ '/σ ₃ '
1	72	0.00	689	0.0	0	0.0	0.0	0.0	22.00	22.00	1.00
2	126	0.09	828	13.9	6	0.6	2.3	2.3	21.40	23.65	1.11
3	184	0.20	947	25.8	14	1.4	4.2	4.2	20.60	24.78	1.20
4	237	0.29	1034	34.5	23	2.3	5.6	5.6	19.70	25.28	1.28
5	290	0.38	1103	41.4	31	3.1	6.7	6.7	18.90	25.59	1.35
6	350	0.49	1186	49.7	38	3.8	8.0	8.0	18.20	26.22	1.44
7	403	0.58	1236	54.7	45	4.5	8.8	8.7	17.50	26.16	1.50
8	458	0.68	1286	59.7	49	4.9	9.6	9.5	17.10	26.56	1.55
9	518	0.78	1311	62.2	53	5.3	10.0	9.9	16.70	26.55	1.59
10	571	0.88	1329	64.0	58	5.8	10.3	10.1	16.20	26.33	1.63
11	625	0.97	1355	66.6	62	6.2	10.7	10.5	15.80	26.34	1.67
12	685	1.08	1379	69.0	65	6.5	11.1	10.9	15.50	26.41	1.70
13	739	1.17	1400	71.1	70	7.0	11.4	11.2	15.00	26.24	1.75
14	1193	1.97	1514	82.5	96	9.6	13.1	12.8	12.40	25.24	2.04
15	1756	2.96	1598	90.9	116	11.6	14.3	14.0	10.40	24.35	2.34
16	2320	3.95	1662	97.3	127	12.7	15.2	14.7	9.30	23.98	2.58
17	2889	4.95	1726	103.7	134	13.4	16.0	15.4	8.60	24.03	2.79
18	3510	6.04	1790	110.1	138	13.8	16.8	16.1	8.20	24.34	2.97
19	4080	7.05	1826	113.7	137	13.7	17.1	16.4	8.30	24.73	2.98
20	4645	8.04	1848	115.9	132	13.2	17.3	16.5	8.80	25.29	2.87
21	5210	9.03	1876	118.7	127	12.7	17.5	16.6	9.30	25.94	2.79
22	5782	10.04	1926	123.7	120	12.0	18.1	17.1	10.00	27.10	2.71
23	6349	11.03	1954	126.5	117	11.7	18.3	17.2	10.30	27.52	2.67
24	6916	12.03	1967	127.8	117	11.7	18.2	17.1	10.30	27.42	2.66
25	7487	13.03	1979	129.0	116	11.6	18.2	17.0	10.40	27.42	2.64
26	8055	14.03	2006	131.7	114	11.4	18.4	17.1	10.60	27.71	2.61
27	8623	15.03	2048	135.9	109	10.9	18.7	17.4	11.10	28.52	2.57
28	9194	16.04	2070	138.1	106	10.6	18.8	17.4	11.40	28.83	2.53
29	9762	17.03	2089	140.0	104	10.4	18.8	17.4	11.60	28.99	2.50
30	10331	18.03	2101	141.2	106	10.6	18.8	17.3	11.40	28.66	2.51
31	10905	19.04	2120	143.1	107	10.7	18.8	17.2	11.30	28.54	2.53
32	11433	19.97	2131	144.2	107	10.7	18.7	17.1	11.30	28.43	2.52

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Shear (Specimen 3)
	Site Reference: C.F. Harvey	Date of Test: 12-14-16
	Jobfile: E:\16010.JOB	Sample: ST-3
Operator: <i>MLC</i>	Checked: <i>MLC</i>	Approved: <i>MLC</i>
	Jobfile: E:\16010.JOB	Borehole: EB1-B RT LN

pH of Soil

AASHTO T289



Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616						
Project #:	6235-16-010	Report Date:	11/7/16			
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/5 - 11/7/16			
Client Name:	Michael Baker Engineering					
Client Address:	Raleigh, NC					
Boring #:	EB2-B RT LN	Sample #:	SS-21	Sample Date:	9/6/16	
Location:	167+05	Offset:	36 RT	Depth (ft):	0.5 - 2.0	
Sample Description:	Light Gray Coarse to Fine Sandy Clayey SILT (A-4) (0)					
Equipment:						
Balance	S&ME ID#	1024	Cal. Date:	11/6/16	Due:	11/6/17
Sieve: #10	S&ME ID#	13223	Cal. Date:	6/11/16	Due:	6/11/17
pH Meter:	S&ME ID#	1365	Cal. Date:	11/7/16	Due:	NA

pH Meter Calibration

Buffer Solution	Results
pH buffer 7.0	7.02
pH buffer 4.01	4.01
pH buffer 10.0	10.03
Buffer Temperature °C	22.4

Measuring pH of Soil

Measurements	
Weight of Air Dry Soil (g)	30.02
Distilled Water (g)	30.04
Temperature °C	21.7
pH Readings	5.43

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET
 Technical Responsibility

Signature

Laboratory Manager
 Position

11/14/2016
 Date

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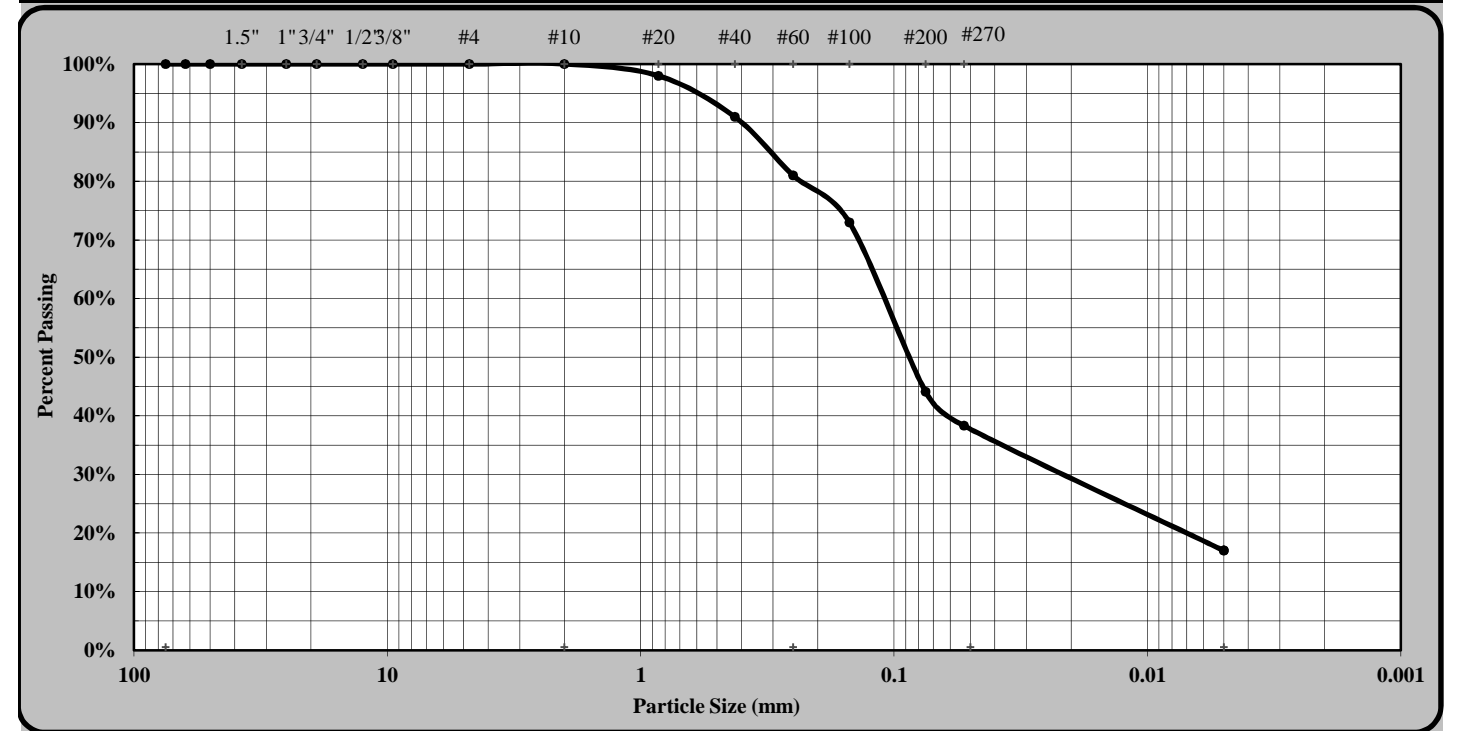
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616			
S&ME Project #:	6235-16-010	Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/7 - 11/14/16
State Project #:	46375.1.1	F.A. Project No:	N/A
Client Name:	Michael Baker Engineering	TIP NO:	R-5703
Address:	Raleigh, NC		
Boring #:	EB2-B RT LN	Sample #:	SS-21
Location:	167+05	Sample Date:	9/6/16
		Offset:	36 RT
		Depth (ft):	0.5 - 2.0
Sample Description:	Light Gray Coarse to Fine Sandy Clayey SILT A-4 (0)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	19%	Silt	21%
Gravel	0%	Fine Sand	43%	Clay	17%
Apparent Relative Density	ND	Moisture Content	18%	% Passing #200	44.1%
Liquid Limit	19	Plastic Limit	12	Plastic Index	7

Soil Mortar (-#10 Sieve)					
Coarse Sand	19%	Fine Sand	43%	Silt	21%
				Clay	17%
Description of Sand & Gravel Particles:	Rounded	<input type="checkbox"/>	Angular	<input type="checkbox"/>	
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input type="checkbox"/>

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET
 Technician Name

104-01-0703
 Certification No.

Laboratory Manager
 Position

11/14/2016
 Date

Mal Krajan, ET
 Technical Responsibility

Signature

Laboratory Manager
 Position

11/14/2016
 Date

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Form No: TR-T267

Revision No. 0

Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	6235-16-010	Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		
Boring #:	EB2-B RT LN	Sample #:	SS-21
		Sample Date:	9/6/16
Location:	167+05	Offset:	36 RT
		Depth (ft):	0.5 - 2.0
Sample Description:	Light Gray Coarse to Fine Sandy Clayey SILT (A-4) (0)		
Equipment:	Balance: 0.01 g. Readability, 500g. Minimum Capacity		
Balance:	S&ME ID #: 1024	Cal. Date:	11/06/16
		Due:	11/06/17

Method A: Moisture Content DeterminationRequired Oven Temperature: $105 \pm 5^\circ \text{C}$

Oven Temperature: 105 °C		Tare #	v
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	47.97
a	Mass of As-Received Specimen + Tare Wt.	grams	99.48
b	Mass of Oven Dry Specimen + Tare Wt.	grams	91.78
w	Water Weight	(a-b)	7.70
A	Mass of As-Received Specimen	(a-t)	51.51
B	Mass of Oven Dry Specimen	(b-t)	43.81
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	14.9%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	17.6%

Oven S&ME ID #: 1454 Cal. Date: 10/7/16 Due: 10/7/17

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

Muffle Furnace: 455 °C		Tare #	30
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	49.02
b	Mass of Oven Dry Specimen + Tare Wt.	grams	87.18
c	Ash Weight + Tare Wt.	grams	86.87
C	Ash Weight	c-t	37.85
B	Mass of Oven Dry Specimen	(b-t)	38.16
D	% Ash Content	(C/B)*100	99.2%
	% Organic Matter	100-D	0.8%

Muffle Furnace: S&ME ID #: 00261

Notes / Deviations / References:

Mal Krajan, ET
Technical Responsibility


Signature

Laboratory Manager
Position

11/14/2016
Date

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