GEOTECHNICAL SUBSURFACE DATA REPORT

EMERGENCY BRIDGE PACKAGE 5
US-301 REPLACEMENT BRIDGES OVER
BLACK RIVER

CLARENDON COUNTY, SOUTH CAROLINA

PREPARED FOR



Mr. Trapp Harris, P.E.
South Carolina Department of Transportation
955 Park Street
Columbia, South Carolina 29201

PREPARED BY

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JANUARY 22, 2016

F&ME Project No. G5500.08 (REVISION 1)



January 22, 2016

Mr. Trapp Harris, P.E. South Carolina Department of Transportation 955 Park Street Columbia, South Carolina 29201

Re: Geotechnical Subsurface Data Report Emergency Bridge Package 5 US-301 Replacement Bridges over Black River

Clarendon County, South Carolina

F&ME Project No.: G5500.08 (Revision 1)

Dear Mr. Harris:

Submitted herein is F&ME Consultants, Inc.'s (F&ME) Geotechnical Subsurface Data Report (GSDR) for the Emergency Bridge Package 5. This report contains findings from our subsurface field investigation and soil laboratory testing program.

It has been a pleasure working with you on this project and we appreciate the opportunity to be of service. Please notify us if there are any questions or if we may be of further assistance.

Sincerely,

F&ME

Alex M. Abernethy

Geotechnical Staff Professional

Jason P. Stewart, P.E. Project Engineer





Enclosures

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I. INTRODUCTION

A. General

The Emergency Bridge Package 5 project is located in Clarendon County, South Carolina. We understand that the primary objective for the project is to replace the existing bridges on alignment. Four (4) existing bridges will be replaced along US-301 south of Black River Road and north of State Road S-14-50. The length of the new bridge structures will vary. Currently the existing bridge structures range from 130 feet to 400 feet. A Site Location Plan is presented as Figure 1 in Appendix A of this report.

B. Scope

F&ME performed a geotechnical subsurface investigation and laboratory testing for the bridge portion of the Emergency Bridge Package 5 project. The South Carolina Department of Transportation (SCDOT) request and scope for the geotechnical subsurface investigation was issued on December 14, 2015. A copy of the Scope of Services can be found in Appendix F of this report.

The field investigation included soil test borings (STB), electro-piezocone soundings (CPT), and multi-channel analysis of surface waves (MASW). Laboratory testing was performed on soil samples collected from the test borings. All exploration methods and laboratory procedures were conducted in accordance with the most recent American Association of State Highway and Transportation Officials (AASHTO), American Society of Testing and Materials (ASTM) Standards, and the SCDOT Geotechnical Design Manual (GDM). This report was prepared in general accordance with the 2010 SCDOT Geotechnical Design Manual (GDM), Version 2.0.

II. FIELD INVESTIGATION SUMMARY

From December 21, 2015 through January 8, 2016, F&ME performed eight (8) soil test borings (STB), eight (8) electro-piezocone soundings (CPT), and four (4) multi-channel analyses of surface waves (MASW) for the four (4) bridge locations along US-301. A Scope of Services with the field investigation details were provided by the SCDOT.

The soil test borings were advanced using a CME 550 ATV mounted drill rig with an automatic standard penetration test (SPT) hammer system. Soil test borings were advanced to the individual target depths provided by the SCDOT or to refusal. Rotary wash drilling techniques were used to maintain a stable borehole. Borings were advanced with standard split-spoon sampling to the boring termination depths. Details of each boring are included on the individual Soil Test Boring Logs in Appendix B.

A. Soil Test Borings (STB)

The following table is a summary of the soil test boring designations, depths, locations, and surface elevations. Soil Test Boring locations are shown on Figures 2A through 2D in Appendix A.

SOIL TEST BORINGS (STB)								
Test Hole No.	Soil Depth (ft.)	Surface Condition	Latitude	Longitude	TOB Elev. (ftMSL)			
B-1 (Bridge 4)	100	Asphalt Roadway	33.8169859	80.1074057	88.3			
B-2 (Bridge 4)	100	Asphalt Roadway	33.8172855	80.107153	88.2			
B-3 (Bridge 3)	100	Asphalt Roadway	33.8129291	80.1108129	88.2			
B-4 (Bridge 3)	100	Asphalt Roadway	33.8126310	80.1110636	88.2			
B-5 (Bridge 2)	100	Asphalt Roadway	33.8096518	80.1135956	89.6			
B-6 (Bridge 2)	100	Asphalt Roadway	33.8086801	80.1143269	89.7			
B-7 (Bridge 1)	100	Asphalt Roadway	33.8035154	80.1187237	88.0			
B-8 (Bridge 1)	88.5	Asphalt Roadway	33.8030499	80.1190712	88.3			
Totals	788.5							

B. Electro-Piezocone Soundings (CPT)

The following table is a summary of the electro-piezocone sounding designations, depths, locations, and surface elevations. CPT testing was performed at the approach embankments at each end of the four (4) emergency bridges. CPT's were advanced using a CME 45B drill rig and were pushed until refusal. CPT locations are shown on Figures 2A through 2D in Appendix A. Detailed descriptions of each CPT are also shown in Appendix B of this report. A CD with an electronic copy of the spreadsheet meeting SCDOT requirements for CPT will be delivered with the report.

	ELECTRO-PIEZOCONE SOUNDINGS (CPT)							
Test Hole No.	Soil Depth (ft.)	Surface Condition	Latitude	Longitude	TOB Elev. (ftMSL)			
CPT-1 (Bridge 4)	32.2	Asphalt Roadway	33.8172793	80.1071279	88.0			
CPT-2 (Bridge 4)	26.7	Asphalt Roadway	33.8169738	80.1073829	88.1			
CPT-3 (Bridge 3)	32.8	Asphalt Roadway	33.8129255	80.1107829	88.1			
CPT-4 (Bridge 3)	35.9	Asphalt Roadway	33.8126172	80.1110418	88.0			
CPT-5 (Bridge 2)	26.4	Asphalt Roadway	33.8096302	80.1135477	89.6			
CPT-6 (Bridge 2)	30.8	Asphalt Roadway	33.8087053	80.1143738	89.4			
CPT-7 (Bridge 1)	28.2	Asphalt Roadway	33.8034961	80.1186991	87.7			
CPT-8 (Bridge 1)	40.7	Asphalt Roadway	33.8030652	80.1191101	87.8			
Totals	253.7				•			

C. Multi-Channel Analysis of Surface Waves (MASW)

On December 23 through 28, 2015, F&ME performed a Multi-channel Analysis of Surface Waves (MASW) at each of the four (4) emergency bridges to determine the average shear wave velocities to a depth of 100 feet at the array locations shown in Figures 3A through 3D in Appendix D of this report. A more detailed description of the MASW array locations and results can be found in Appendix D of this report. The following table provides a summary of the locations of each MASW array performed.

MULTI-CHANNEL ANALYSIS OF SURFACE WAVES (MASW)						
Task Hala Na	Be	gin	End			
Test Hole No.	Latitude	Longitude	Latitude	Longitude		
MASW (Bridge 1)	33.802071	80.119857	33.802579	80.119434		
MASW (Bridge 2)	33.807352	80.115539	33.807857	80.115112		
MASW (Bridge 3)	33.811409	80.112019	33.811915	80.111594		
MASW (Bridge 4)	33.816315	80.108017	33.816788	80.107621		

D. Groundwater

Groundwater depth measurements were made at the time of boring for all soil test borings, and are noted on the individual Soil Test Boring Logs in Appendix B. Groundwater measurements were also made twenty-four (24) hours following boring completion for all soil test borings. Time of boring groundwater measurements for electro-piezocone soundings were interpreted from the cone penetration testing logs.

The following table is a summary of the groundwater measurements for the soil test borings and cone penetration tests at time of boring (TOB) and twenty-four (24) hours following boring completion.

GROUNDWATER DEPTH							
Boring No.	Date of TOB Groundwater Measurement	TOB Groundwater Depth (ft.)	24-hr. Groundwater Depth (ft.)				
B-1 (Bridge 4)	12-28-2015	10.0	8.3				
B-2 (Bridge 4)	12-21-2015	10.0	9.5				
B-3 (Bridge 3)	12-29-2015	8.0	8.9				
B-4 (Bridge 3)	12-30-2015	8.0	8.5				
B-5 (Bridge 2)	01-04-2016	10.0	11.5				
B-6 (Bridge 2)	01-05-2016	10.0	10.2				
B-7 (Bridge 1)	01-06-2016	8.0	5.5				
B-8 (Bridge 1)	01-07-2016	8.0	4.8				
CPT-1 (Bridge 4)	01-08-2016	9.5	Backfilled at Completion of Drilling				
CPT-2 (Bridge 4)	01-08-2016	8.3	Backfilled at Completion of Drilling				
CPT-3 (Bridge 3)	01-09-2016	8.9	Backfilled at Completion of Drilling				
CPT-4 (Bridge 3)	01-09-2016	8.5	Backfilled at Completion of Drilling				
CPT-5 (Bridge 2)	01-09-2016	11.5	Backfilled at Completion of Drilling				
CPT-6 (Bridge 2)	01-09-2016	10.2	Backfilled at Completion of Drilling				
CPT-7 (Bridge 1)	01-09-2016	5.5	Backfilled at Completion of Drilling				
CPT-8 (Bridge 1)	01-09-2016	4.7	Backfilled at Completion of Drilling				

III. SOIL LABORATORY TESTING

Following completion of F&ME's field investigation, preliminary soil test boring logs were prepared based on visual soil classification in the field. Based on the data represented in these logs, soil samples were selected by F&ME for laboratory testing. The selected split-spoon samples were tested in F&ME's laboratory to determine applicable physical and engineering properties. All laboratory testing was performed in accordance with procedures set forth in the most recently published AASHTO and ASTM standards.

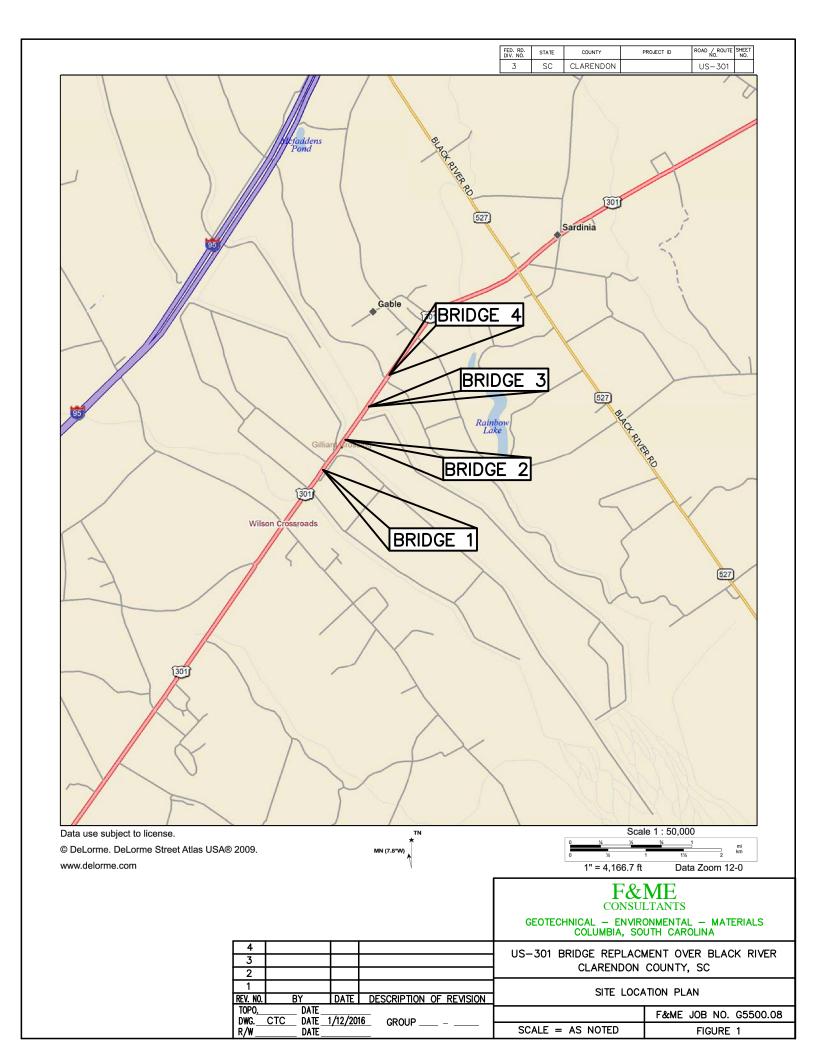
The laboratory testing performed for the split-spoon samples are detailed in the table below. Data sheets containing the results of the laboratory testing are provided in Appendix C of this report.

LABORATORY SOIL TESTING (SPLIT-SPOON SAMPLES)						
Type of Test	Quantity	Procedure				
Wash #200	31	AASHTO T11				
Atterberg Limits	15	AASHTO T89/T90				
Moisture Content	31	ASTM D2216				

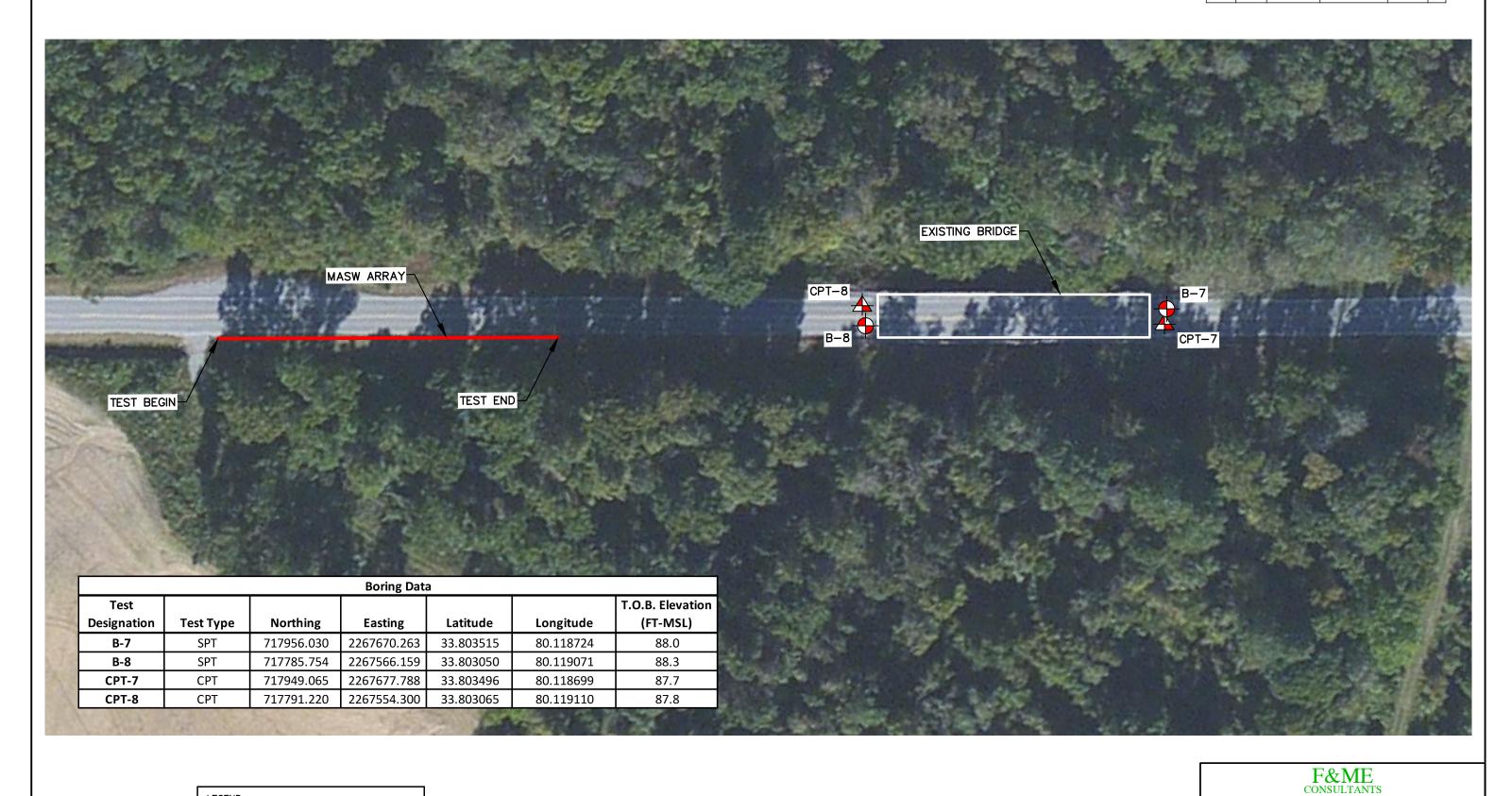
APPENDIX A

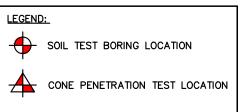
Location Plans





FED. RD. DIV. NO.		PROJECT ID	ROAD / ROUTE NO.	SHEET NO.
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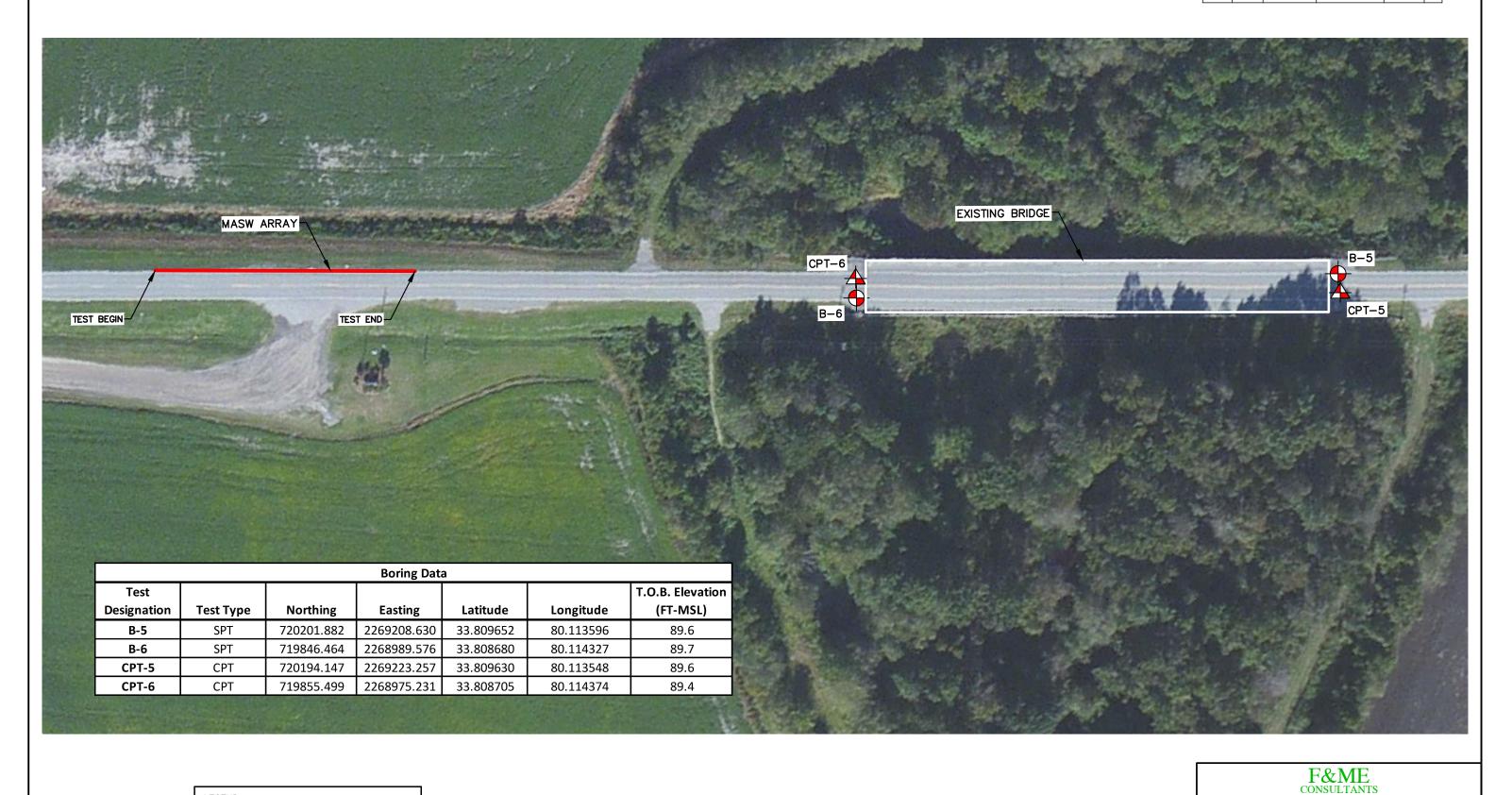


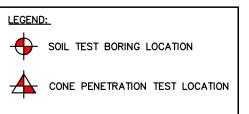




					CONSO	LIMITO	
						ONMENTAL — MATERIALS UTH CAROLINA	
3					US-301 BRIDGE (#1) REPLACEMENT OVER BLACK RIVER		
2					CLARENDON COUNTY, SC		
1					SOIL TEST BORIN	G LOCATION PLAN	
REV. NO.	BY	DATE	DESCRIPTION OF REV	<u>ISION</u>			
TOPO. DATE DWG. CTC DATE 1/12/2016 GROUP -			F&ME JOB NO. G5500.08				
R/W_			SCALE = NTS	FIGURE 2A			

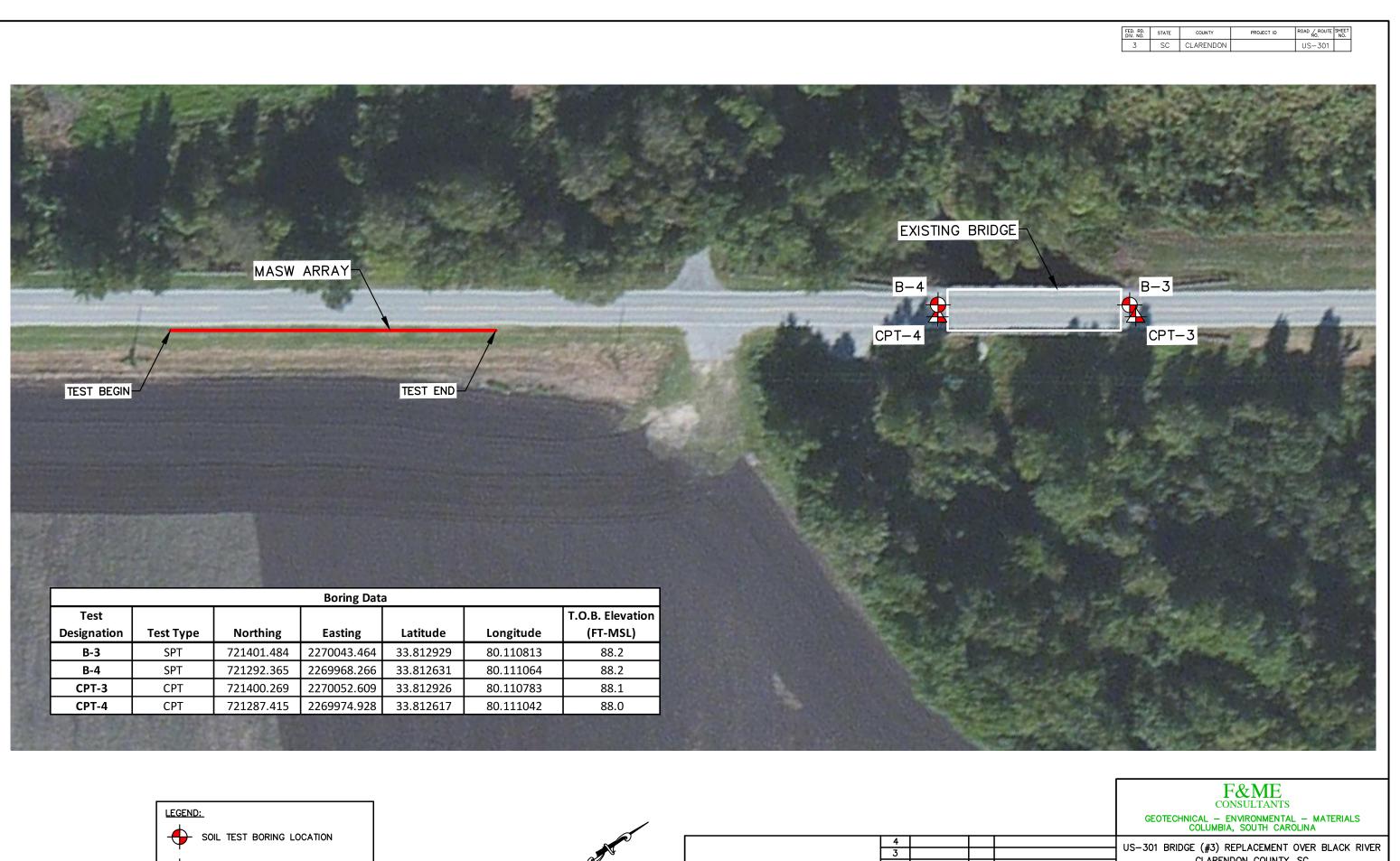
FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE	SHEET NO.
3	SC	CLARENDON		US-301	



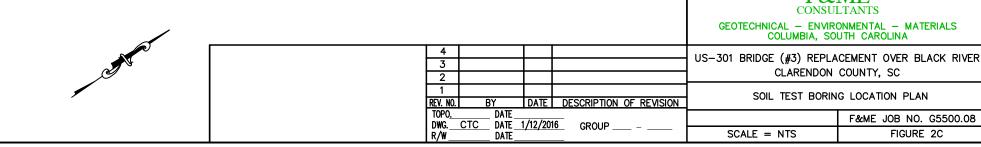




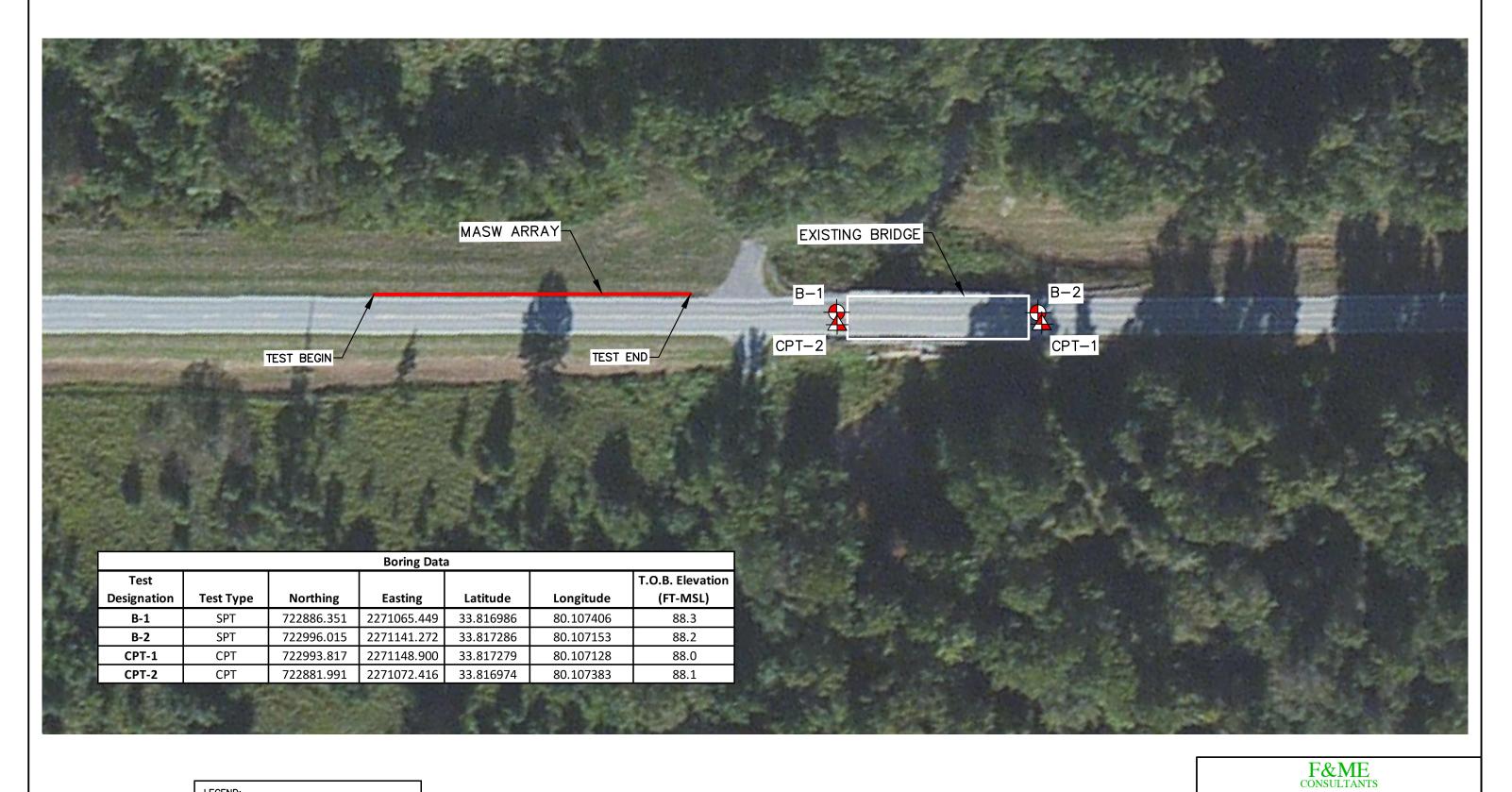
					CONSO	LIMINIO	
					GEOTECHNICAL — ENVIRO COLUMBIA, SO	ONMENTAL — MATERIALS UTH CAROLINA	
3					US-301 BRIDGE (#2) REPLACEMENT OVER BLACK RIVE		
2					CLARENDON COUNTY, SC		
1	DV	DATE	DECODIDATION OF D	NEVACIONI	SOIL TEST BORIN	G LOCATION PLAN	
REV. NO.	•	DATE	DESCRIPTION OF R	EVISION			
TOPO DATE DWG. CTC DATE 1/12/2016 GROUP -			F&ME JOB NO. G5500.08				
R/W_			SCALE = NTS	FIGURE 2B			
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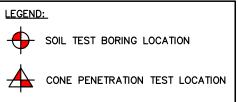


CONE PENETRATION TEST LOCATION



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE	SHEET NO.
3	SC	CLARENDON		US-301	







		ONMENTAL — MATERIALS UTH CAROLINA	
3	US-301 BRIDGE (#4) REPLACEMENT OVER BLACK RIVER CLARENDON COUNTY, SC		
2			
1	SOIL TEST BORING LOCATION PLAN		
TOPO.		F&ME JOB NO. G5500.08	
R/W DATE	SCALE = NTS	FIGURE 2D	

APPENDIX B

Geotechnical Subsurface Exploration





Soil Test Boring Log Descriptors

Correlation of Penetration Resistance with Relative Density and Consistency

Coarse Grained (Sa	ands/Gravels)	Fine Grained (Clay	r/Silt)
SPT Blow Count	Relative Density	SPT Blow Count	Relative Density
<4	Very Loose	<2	Very Soft
5 – 10	Loose	3 – 4	Soft
11 – 30	Medium Dense	5 – 8	Firm
31 – 50	Dense	9 – 15	Stiff
>51	Very Dense	16 – 30	Very Stiff
		>31	Hard

Particle Size Indentification

Gravel	Sieve Size
Fine	#4 to 3/4 inch
Coarse	³ / ₄ inch to 3 inch

Sand	Sieve Size
Fine	#200 to #40
Medium	#40 to #10
Coarse	#10 to #4

Clay/Silt	Sieve Size
Fines Content	<#200

	SCCT	CONCRETE
	SCAT	ASPHALT
70 70 40 40 6 40 40 40 40 70 70 40 40 40	SCTS	TOPSOIL/PEAT
	SCSAND	SAND
	SCSTSAND	SILTY SAND/SANDY SILT
	SCCLSAND	CLAYEY SAND/SANDY CLAY
	SCCLAY	CLAY
	SCSILT	SILT
	SCSTCLAY	SILTY CLAY/CLAYEY SILT
110 1 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SCSAP	SAPROLITE
	SCLS	LIMESTONE
	SCBR	GRANITE (BEDROCK)
	SCMARL	MARL

SOIL CLASSIFICATION CHART

M	AJOR DIVISI	ONS	SYME		TYPICAL
	AJOK DIVISI	ONG	GRAPH	LETTER	DESCRIPTIONS
	GRAVEL	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED SOLS	MORE THAN 50% OF COARSE FRACTION	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
0000	RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND	CLEAN SANDS		sw	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	AND SANDY SOILS	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
	SIEVE	(APPRECIABLE AMOUNT OF FINES)		sc	CLAYEY SANDS, SAND - CLAY MIXTURES
				ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
FINE GRAINED	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
SOLS				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS				МН	INORGANIC SILTS, MICACEOUS OR DIATOMICEOUS FINE SAND OR SILTY SOILS
SMALLER THAN NO. 200 SIEVE SIZE		LIQUID LIMIT GREATER THAN 50		СН	INORGANIC CLAYS OF HIGH PLASTICITY
				ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
н	GHLY ORGANIC S	SOLS	0000	PT	PEAT, HUMUS, SWIAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



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68.3-	_	P.H./R.W. Boring Locatic 33.8169858 100 ft Soil Depth: 100 Diameter (in): 4 Sampler C BE CME 550 Drill Method: F N/A Driller: D. H MATERIAL DESCRIPTION Asphalt Roadway ASPHALT (7.0") FILL Medium Dense to Loose, Moist, Dark Yellowish Brown, Low Plasticity, Clayey F to Coarse SAND (SC), Munsell=10YR 5/8		4/0			55-7	W	/OH/1	ιδ.	WOH	7	0	: :	- :	: :		
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	88.3 ft									itude				1057		Date					_		2015	
otal D	-			_				0 ft		ore D)ер		0 f			Date							2015	
			. ,						gura	tion	1	Line				_	<u>N</u>				Use		Υ	N
	achine:		E 550		Drill I			RW			_	amme		-				E	Ener		Ratio	_		
Core S	ıze:	N/A			Drille	r:	D. I	Harris			G	round	lwa	ter:	10	В	10 ft			24	HR	{	3.3 ft	
									Τ		Т								•	DT N	N VAL	LIE		
																						.0_ \		
Elevation (ft)	₽ _								je,	울토		Sample No./Type				<u>ne</u>			PL X—		MC ⊖		$\overset{LL}{ imes}$	
eva (ft)	Depth (ft)	N	MATER	RIAL I	DESC	RIPT	TION		Graphic	Sample Depth	Œ	am) o./T	9	2nd 6"		N Value		4	▲ FIN	IFS (CONT	FNT	(%)	
Ш										0) –		o ž	1st 6"	Zuc	3rd 6"	2	0 10				50 6			90
33.3 -]	Very St	iff, Moist ty, <u>SILT</u>	t, Ver	y Dark	Gray,	Low				1	SS-14	6	7	10	17	:	•	:	:	<u>:</u>	:		:
-		Lamina	tions, Lig	gnite 8	& Plan	Foss	ils,				-							:	:	:		:		
_	58.5	Micace	ous, Mui	nsell=	5Y 3/1					58.	5							:	:	:		:		:
_	30.5		Moist, V						十九	J 36.		SS-15	6	19	25	44	:	:	:	•	. !	:		:
28.3-	1 1		astic, Fin		ND (S	P-SM)	, with	Silt,			\pm	-					1	- :	:	:-	-	:		:
_]	iviurisėl	I=5GY 3.	12							-						:	:	:		:	:		:
_	63.5								1	63.									::	:	:	:		:
23.3-]		Moist, Volume Low Plant								7	SS-16	5	4	4	8	•		\ O		<u>:</u>	:		- 1
-	1 1	<u>(SM),</u> N	/lunsell=	5GY	3/2						-							:	:	:	:	:	:	:
_	68.5	NMC=2	29.3%, %	6#200	=21.5					68.	.5								:			:		
-	1	Hard, M	———— ∕loist, Lig	ht Gr	ay, Lo	- – – w Plas	ticity,		TT			SS-17	48	23	46	69	1 :	:	:	:	i	•		:
18.3 <i>-</i>	1]	Sandy S	<u>SILT (MĬ</u> ted Lens	L), wit	h Grav	/el & T	hin [*]				1							:	:	:		:		- 1
-	1 1	Cemen	tea Lens	es, iv	iunseii	=2.5 Y	7/1				-							:	:	:	:	:		:
_	73.5	Very De	 ense, Mo	niet V	ery Da	ark Gr		ne to		73.		CC 10	19	25	40	65	1	:	:	:			:	:
13.3-	-	Low Pla	asticity, S	Silty F	ine SA	ND (S	зу, 1 1 0 <u>SM</u>),	iic to			+	SS-18	19	25	40	00	1	<u>:</u>	- :	:		: U		- :
_	1]	Munsel	I=2.5Y 3	/1							1								:			:		
-	-									78.	.5-] :	:	:	:	:	:		:
8.3	1]	=> Med	lium Der	nse							1	SS-19	7	11	15	26		:	•	- :		:		
-											-							:	:	:	:	:		:
_	83.5	=> Cen	nented L	ayer (@ 82.0)'				83.	5-								:	:	:	:		:
_	33.3	LIMES	TONE						H			SS-20	17	22	40	62	1 :	:	:	:		•		:
3.3-]]		ense, Mo						H		#							:	:	:	:	:		:
-			<u>EL (GP-C</u> HCl Rea						H		+							:	:	:		:		:
_	88.5								H	88.	.5	SS-21		50/4.5		100+		:		:	:	:		i
-1.7-		Very De	ense, Mo ty, Silty F	oist, D Fine to	ark G o Medi	ray, No um S/	one to	Low SM)	H	\exists	-						:	:	:	:	:	:	: :	:
_]]		l=2.5Y 4			. <u> </u>		,		$\overline{}$	1							:	:			:		:
-		_							H	93.								:	:	:		:		:
-6.7]]	=> Med Fragme	lium Der ents	nse, w	ith Tra	ice of	Shell		H	7	1	SS-22	5	6	8	14		•	:		-	:		:
J., –	-	ragine	ILO						H	7	+						:	:	:	:		:		:
_]]									98.	5						:	:	:	:		:		
_	100.0								H	= 30.		SS-23	6	8	9	17	1 :	•	:	:		:		
-11.7 -	100.0	Boring	Terminat	ted at	100.0	feet			T'-	1	#							:	:	:		:		:
-		-									+							:	:	:		:		:
_]										1							:		:	:	:		:
-16.7											-						:	:	:	-:-	-:-	:		:
	<u> </u>										_ +				_	L		_ :	_ :	_:	<u>:</u>	<u>:</u>		_ :
	_			_					L	EGEN	ID				_			-		_		_		_

SS - Split Spoon UD - Undisturbed Sample AWG - Rock Core, 1-1/8" NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube

HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing



Project	ID: N	I/A					Co	unty:	Cla	aren	don			Bor	ing N	o.: B-	2 (Bric	lge
ite De	script	ion: US-301	Replaceme	nt Brid	ge ove	er Bla	ck Ri	ver					'		Rout		S-301	
		R.W./P.H.	Boring I						Offse	et:				Alic	nmer		On	
	88.2 f			17285		ongit	ude:		1071		I	Date	Star		,		21/201	5
otal D			oil Depth:	100			re De		0 f				Com		ed:		28/201	
	•	ameter (in):	<u> </u>	pler C				Line				Y	(Ñ)	•		Used		
rill Ma			Drill Meth		RW	uruti		Hamme					$\overline{}$				74%	
ore Si		N/A	Driller:	D. H				Ground		-	TOI		10 ft			HR	9.51	
0.00	20.	14// (Dimer.	10.11	arrio			Oround	, , , , , , , , , , , , , , , , , , ,				1011				0.0	÷
															• SPT	N VAL	UE •	
														Р		MC		
Elevation (ft)	ŧ.					Graphic Log	e t	Sample No./Type				N Value		>	<u> </u>		——X	
evati (ft)	Depth (ft)	MATERIA	L DESCRIP	TION		irap Lo	Sample Depth (ft)	am 5.7	9	2nd 6"	3rd 6"	\rightarrow{a}			FINES	CONTE	ENT (%)	
▥	0.0	Asphalt Roadway				0	<i>o</i> , –	o ž	1st 6"	2nc	3rd	Z	0 10				0 70 8	0 9
	0.9	<u>ASPHALT</u> (10.5")					0.9							:	: :	: :		
	_	FILL					2.0	SS-1	6	10			:	:	: :	: :		
٦		Loose to Medium [Dense, Moist, I	Reddish				00.0		_				:				
	_	Yellow, None to Lo	w Plasticity, S	ilty Fine	to		4.0	SS-2	6	5	4	9			4tn 6	6" = 5 B	IOWS	
00.0	_	Medium SAND (SI	•		·						_	40] [. :				
83.2	_	=> Strong Brown,	Munsell=7.5YF	₹ 5/6			6.0	SS-3	4	6	7	13		'	4th (6" = 8 B	iows	
=	-				-		5.0			_		_		:				
=	7.5	ALLUVIUM					8.0	SS-4	4	5	4	9	•	:	4th 6	6" = 5 B	IOWS	
7	_		no Moint to M	of Olive	E		5.0	66 -	_	_		_		, :_~				
	_	Loose to Very Loos Brown, Low Plastic						SS-5	5	2	1	3		(⊗ :	4th	" = 1 B	low	
78.2	_	SAND (SC), Muns											1	:	:			_
-	_	LL=22, PL=14, PI=	8, NMC=21.7	%,			•	┦ │						:				
7	_	%#200=42.6			ķ			1										
7	13.5	¬ => Grayish Brown,	with Wood Fr	ragments	, ,		13.5						1 :	:	<u> </u>			
+	-	and Peat, Munsell	=2.5Y 5/2		/			SS-6	W	OH/1	8"	WOH	•	\times	' × :	0	A	
73.2-	-	Very Soft, Wet, Da			_								 	- :	1 1			
+	-	Plasticity, Sandy L	ean CLAY (CL										:	:	: :		:	
+	_	Organics, Munsell		C0/	į.		-											
+	18.5	LL=33, PL=23, PI= %#200=65.3	10, NIVIC=52.0	0%,	, .		18.5						1	:				
+	_	`			'			SS-7	7	8	12	20		•				
68.2	_	Medium Dense, W Non-Plastic, Fine t			ŀ								1	- :	: :	: :		
+	-	Munsell=2.5Y 5/2	o oodise <u>sain</u>	<u>ın (or)</u> ,									:	:				
+	_				-													
-	23.5	 -=-===					23.5						1	:				
+	_	BLACK MINGO G			ŀ	기기기		SS-8	W	OH/1	8"	WOH	•	4	, d			
63.2-	-	Very Loose, Wet, Plasticity, Silty Find	Gray, None to	Low	1)								1	- :				
+	_	Munsell=10YR 5/1		מוס) מניי	<u>.,</u>								:	:				
-	_	NMC=37.9%, %#2	200=24.9			리리하								:				
+	28.5						28.5						1	:				
+	_	Stiff to Very Stiff, V			v		-	SS-9	4	6	3	9	•	:		()		
58.2	_	Plasticity, Sandy L Munsell=10YR 5/1		<u>-</u> J,	k		-							- :	<u> </u>			
+	_	NMC=53.7%, %#2					-						:	:			:	
-	_				į.		-							:				
+	-	_					33.5] :	:				
+	-	=> Dark Gray, wit Micaceous, Munse		aminatio	ns,			SS-10	5	6	11	17	:	•				
53.2	-	iviicaceous, iviurise	ai=3 i 4/ i										1	- :	: :			
+	_													:				
-	-							┥					:	:				
	38.5						38.5						<u> </u>	:				
						LEC	GEND)							Со	ntinue	ed Nex	t F
20 -		SAMPLE		, =:-					<u> </u>			RILLII	NG ME		D			_
	Split Spo Indisturt	on oed Sample	NQ - Rock Co CU - Cuttings					A - Hollov A - Contii				ers			Rotary Rock C			
		e, 1-1/8"	CT - Continue					- Drivin				J. J		-		J. J		



roject	ID: N									unty:		Clare	ndor			Bor	ring N	lo.: B-2	2 (Brid	dge
ite De	script	on: US-	301 R	Replac	emer	nt Brid	lge ov	er Bla	ack Ri	iver							Rou		3-301	
ng./Ge	eo.: R	2.W./P.H.		Bor	ring L	.ocati	on:				Of	fset:				Alig	gnme	nt: C)n	
lev.:	88.2 f	Latit	ude:		33.81	17285	55 L	.ongit	tude:	8	0.10	07153	3	Date	Star	ted:		12/2	1/201	5
otal D	epth:	100 ft	Soil	Dept	th:	100	0 ft	Co	ore De	epth:		0 ft		Date	Con	nple	ted:	12/2	8/201	5
ore Ho	ole Dia	meter (in):	4		Sam	pler C	Config	gurati	on	Li	ner	Requ	ired			-		r Used	: Y	(N
rill Ma	chine	: CME 550		Drill			RW			Hamı			_		tic	E	nerg	y Ratio	74%	, 0
ore Si	ze:	N/A		Drille	er:	D. F	Harris			Grou			_		10 ft	_		4HR	9.5	
									I										1	
																	● SP	T N VALU	E●	
Elevation (ft)	Depth (ft)	MATE	DIAI	DESC	דמומי	TION		Graphic Log	Sample Depth	Sample No /Type	2016		_	N Value		P >	PL ·	MC	LL —×	
Elev (1	De De							Gra	Sar	Sar		1st 6" 2nd 6"	3rd 6"	z	0 10			S CONTE 0 50 60		
48.2-	_	Very Stiff, We Plasticity, ELA 4/1	t to Mo	oist, Da SILT (<u>I</u>	ark Gra <u>MH),</u> M	ay, High 1unsell:	n =5Y			SS-1	1	5 7	7	14		•	X	× 0		A
-	_	LL=53, PL=29 %#200=85.5	, PI=2	4, NM(C=60.3	5%,				-						:			*	
=	43.5	Medium Dens							43.5	SS-1	2 .	10 1 ²	1 14	25	- :					
43.2	_	Greenish Gray Clayey Fine to Lignite Lenses	Mediu	ım <u>SAI</u>	ND (SC	<u>2),</u> with	1			33-1	_	10 1	. 14	23	:					
-	-	Lightle Lettses	o, iviui l	3 5 11 - 30	4/∠ ار	ασισ	<i>)</i> / I			-									•	
-	-	=> Dark Gray Clay Lenses,	with L	_amina	ted Fin	e Sand	d and		48.5	SS-1	3	8 16	31	47	1			•	*	
38.2	- -	Clay Lenses,	JIdUC0	лиис, К	nurisell	i-51 4/	' 1			+										
-	-								E2 F	-										
22.0	_								53.5	SS-1	4	12 1 ⁻	1 17	28	1		•		<u>:</u>	
33.2	_									-										
-	58.5								58.5										•	
28.2	- -	Very Dense, M SAND (SP-SO Micaceous, M	<u>2)</u> , with	n Clay I	Lamina		ine			SS-1	5	11 20) 41	61				•	•	
-	- -	WIICACCOUS, IVI	u 13611-	J1 J/	•					-									•	
-	63.5	 Medium Dens	 e. Mois	st. Gra	v. I ow	 Plastic			63.5		_	-			-					
23.2-	_	Clayey Fine to Munsell=5Y 5	Mediu	ım <u>SAİ</u>	ND (SC	<u>),</u>	- ·-y ,			SS-1	0	7 8	11	19		-			:	
-	_									-						:			•	
=	68.5	Medium Dens Gray, Non-Pla							68.5	SS-1	7	6 8	11	19	:	•			•	
18.2	-	Clay & Shell F	ragme	ents, M	unsell=	: <u>-30),</u> :5GY 3	8/2			+						:				
-	-								73.5	_										
13.2-	-								. 5.5	SS-1	8	9 1	1 19	30		:	•			:
-	_									-									•	:
								LE	GENE)								ontinue	d Nex	t Pa
JD - U			(TYPE NQ - Ro CU - Co CT - Co	uttings				CF	SA - Ho FA - Co C - Dri	ntinu	ious Fli	uger ght Au			RW -		y Wash Core		



88.2 ft epth:	.W./P.H		301 F		cemei	nt Bric	lae o	ver RI:	ack D	:							_	4	1110		
88.2 ft epth:		l.		l —				VCI DI	auk K	iver							Ro	ute:	US	-301	
epth:				Bo	ring L	_ocati	on:				Offs	et:				Ali	ignm	ent	: C)n	
•	.	Latitu	ıde:		33.8	17285	55	Longi	tude:	80	.107	153		Date	Star	rted	l:		12/2	1/2015	5
•	100 1	ft	Soi	l Dep	th:	100	0 ft	Co	re D	epth:	0	ft		Date	Con	nple	eted:	:	12/2	8/2015	5
ole Dia	meter ((in):	4		Sam	pler (Confi	igurati	ion	Lin	er R	equi	red:	: Y	(N	<u>)</u>	Lir	ner (Jsed	: Y	N
chine:	СМ	E 550		Drill	Meth	od:	RW			Hamn				_	С	E	Ener	gy R	atio:	74%	Ť
ze:	N/A			Drille	er:	D. F	Harris	3		Groun	idwa	iter:	TO	B ′	10 ft			24F	IR	9.5 ft	
																	● S	PT N	VALU	E●	
(ft)	N	//ATEF	RIAL	DES	CRIPT	ΓΙΟΝ		raphic Log	ample Septh	ample ./Type		.9	9	Value			X-	(>		
_								g	ις, _Π	N S	1st	2nd	3rd	Z	0 10						90
70.5									70.5							:		:			
78.5	Clay & S	Shell Fr	ragme	ents, M	lunsell=	<u>F-3C),</u> =5GY 3	8/2	/	/8.5		6	50/4'		100+	:	:	:	:	: :	: :	>
_	LIMEST	TONE													1						
4	Very De	ense, M	loist. \	Verv D	ark Gr	eenish				4						:	:	:			:
_	Gray, N	Ion-Plas	stic, F	ine SA	AND (S	P-SC),	with	H								:		:			:
_	Clay & S	Shell Fr	ragme	ents (S =50× 1	trong F	HCI			Q2 F									:			:
_	i (Gactivi	, iviu	., 13CII-	551	JI <u>C</u>				03.5	′_ SS-2 0	+-	50/1'		100+	1	:	:	:			;
_										4						- :	:				- :
_]						:	:		:		: :	:
_									l							:					:
									00.5								:				
	=> Med	ium De	nse to	o Dens	se				88.5 		+			+	1		:	:			:
			.55	5110	-					SS-21	7	8	9	17	1	•	:	:		1 1	:
									1	_					[:					- [
																:	:	:	: :		:
								H		.]						:	*	:			:
]									93.5		+			+_	1	:	: _	:			:
]										SS-22	7	19	15	34			•	:	<u> </u>		
									1							-					:
]																:	:	:			:
									l						:	:	:	:		: :	:
]	=> Verv	/ Dense	9						98.5		5 5	50/3'		100+	:	:	:				:
100.0				+ 100 () foot						Ť	22.0				:	- ;	:			- :
4	Boring	ı ermina	aled a	ıı 100.(J ieet					-							•				
4										-							:	:			:
+										-					:			:			:
+										1						:		:			:
+										1					1	:	:	:		: :	:
+										1						:	:				:
+										7						:	:	:			
+										-					;	:		:			:
+										-						:		:			:
+										1						:	- :	:			:
+										1						:	:	:			
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4										+						:	:	:			
-										-							-:	:			- :
								LE	GENI)											
nlit Space		SAMI	PLER	TYPE	ock Co	ro 1.7/	8"		ЦС	- Hου.	OW, C+,	em A		DRILLIN				arv M	ach		
ndisturb	ed Sample	е				, 1-1/	0		CF	A - Con	tinuou	ıs Fligh		gers							
	- - - - - - - - - - - - - - - - - - -	78.5 - Medium Gray, N Clay & S - LIMEST - Very De Gray, N Clay & S - Reactiv	78.5 Medium Dense Gray, Non-Plat Clay & Shell Fi Very Dense, M Gray, Non-Plat Clay & Shell Fi Reactivity), Mu	78.5 Medium Dense, Moi Gray, Non-Plastic, F Clay & Shell Fragme Very Dense, Moist, Gray, Non-Plastic, F Clay & Shell Fragme Reactivity), Munsell => Medium Dense to SAMPLER	Medium Dense, Moist, Ver Gray, Non-Plastic, Fine SAClay & Shell Fragments, Medium Dense, Moist, Very Dense, Moist, Moist, Very Dense, Moist, Very Dense, Moist,	Medium Dense, Moist, Very Dark Gray, Non-Plastic, Fine SAND (S Clay & Shell Fragments, Munsell= LIMESTONE Very Dense, Moist, Very Dark Gr Gray, Non-Plastic, Fine SAND (S Clay & Shell Fragments (Strong F Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense Boring Terminated at 100.0 feet SAMPLER TYPE Olit Spoon Indisturbed Sample SAMPLER TYPE OUT OF THE SAND (S Clay & Shell Fragments (Strong F Reactivity), Munsell=5GY 3/2	Medium Dense, Moist, Very Dark Green Gray, Non-Plastic, Fine SAND (SP-SC). Clay & Shell Fragments, Munsell=5GY 3 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC). Clay & Shell Fragments (Strong HCI Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense Boring Terminated at 100.0 feet SAMPLER TYPE NQ - Rock Core, 1-7/ CU - Cuttings	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCl Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense The second of the	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCI Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense Boring Terminated at 100.0 feet SAMPLER TYPE Dit Spoon Indisturbed Sample SAMPLER TYPE CU - Cuttings LE SAMPLER TYPE CU - Cuttings	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HC) Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense 88.5 => Very Dense Boring Terminated at 100.0 feet Boring Terminated at 100.0 feet HS (SAMPLER TYPE)	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 / LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCl Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense 88.5 SS-21 39.5 SS-22 SS-23 LEGEND SAMPLER TYPE OU - Rock Core, 1-7/8" CU - Cuttings LEGEND SAMPLER TYPE CU - Cuttings HSA - Holl CFA - Conditions and the sample of the sample	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCl Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense 88.5 => Medium Dense to Dense SS-21 7 93.5 SS-22 7 SS-23 5 SS-22 7 Dilt Spoon SAMPLER TYPE NO - Rock Core, 1-7/8* CU - Cuttings HSA - Hollow St. CFA - Continuo.	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 SS-19 6 50/4* LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCl Reactivity), Munsell=5GY 3/2 83.5 SS-20 56/4* => Medium Dense to Dense 98.5 SS-21 7 8 SS-21 7 8 SS-22 7 19 SS-23 5 50/3* => Very Dense 98.5 SS-22 7 19 Boring Terminated at 100.0 feet 98.5 SS-23 5 50/3* SS-21 7 8 SS-22 7 19 SS-23 5 50/3* SS-22 7 19 SS-23 5 50/3* SS-24 SS-25 SS-26 SS-26 SS-27 S	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCl Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense SS-21 7 8 9 98.5 SS-22 7 19 15 SS-22 7 19 15 SS-23 5 50/3** SS-23 5 50/3** SS-24	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2	Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 LIMESTONE Very Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments (Strong HCl Reactivity), Munsell=5GY 3/2 => Medium Dense to Dense ### Section 100.0 Section 100.0 feet Page	MATERIAL DESCRIPTION	MATERIAL DESCRIPTION	MATERIAL DESCRIPTION	MATERIAL DESCRIPTION Medium Dense, Moist, Very Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SC), with Clay & Shell Fragments, Munsell=5GY 3/2 SS-21 7 8 9 17 100+ 100+ 100	MATERIAL DESCRIPTION



ita Dagar		<u> </u>							unity:		ai ei i	uon			DOLILI	g No.	- B-3	(Rud	ge
ite Descr	riptio	on: US-3	301 R	Replac	emen	t Bridge	over Bl	ack R	iver	•				•	F	oute:	US	-301	
										Offs	et:				Align	ment	: C)n	
lev.: 88	3.2 ft	Latitu	ıde:		33.81	29291	Longi	tude:	80	.110	8129		Date	Start	ed:		12/2	9/201	5
otal Dept	th:	100 ft	Soil	l Dept	h:	100 ft	C	ore D	epth:	0 f	ft		Date	Com	plete	d:	12/3	0/201	5
ore Hole	Dia	meter (in):	4		Samp	ler Con	figurat	ion	Lin	er R	equi	red:	Y	N	L	iner l	Jsed:	: Y	1
rill Machi	ine:	CME 550		Drill N	Metho	d: RV	/		Hamm	er T	ype:	Auto	mati	С	Ene	rgy F	Ratio:	74%	
ore Size:	:	N/A		Drille	r:	D. Harr	is		Groun	dwa	ter:	TOE	3 8	3 ft		24F	łR	8.9 f	t
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				DESC	RIPT	ION	Graphic Log	Sample Depth	Sample No./Type	st 6"	9 pu	rd 6"	N Value	0.40		NES C	⊖ ONTEI		
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-	Hole Diameter (in):																		
92 2																			
05.2	7	Fine to Mediun						6.0)——	 _	<u> </u>	4	<i>'</i>		: :	:	: :	: :	
- ₈	8.0	7						8.0	SS-4	3	3	3	6	•		4th	6" = 6	Blows	
]]	1	=> Strong Brow	-	unsell=	7.5YR	5/8	1			5	9	25	34			• 4th	6" = 34	4 Blows	;
78.2-	+	·	ics				J		+	+				 	: :			: :	_
1	1				1-4-5											:			
+	Simple S																		
73.2	1	with Wood Fra	Asphalt Roadway ASPHALT (8.0") FILL Medium Dense to Loose, Moist to We Reddish Yellow, None to Low Plasticitine to Medium SAND (SM), Munsell=/6 Strong Brown, Munsell=7.5YR 5/8 With Organics LLUVIUM Dense to Medium Dense, Wet, Brown Ron-Plastic, Fine to Medium SAND (Swith Wood Fragments, Munsell=10YR 6/3 IMC=20.9%, %#200=2.6 Loose IMC=21.9%, %#200=1.0 Doose, Wet, Brown, None to Low Plasticy Fine to Coarse SAND (SM), with Gragments, Munsell=7.5YR 5/2 IMC=25.4%, %#200=22.5 BLACK MINGO GROUP Stiff, Moist, Greenish Black, Medium Plasticity, SILT (ML), Munsell=GLEY1.5/5GY L=49, PL=33, Pl=16, NMC=41.9%,		OYR 4/3			SS-6	3	5	7	12	A •	0	- :				
	-	=> Pale Brown			YR 6/3	}			-							•			
	_							10 5	;]							•			
4	-						10.5		6	4	5	9		.0					
68.2	_						:	1					<u> </u>						
4	-							:	-							•			
<u> </u>	3.5	Non-Plastic, Fine to Medium Swith Wood Fragments, Munsel=10YRNMC=20.9%, %#200=2.6 => Loose NMC=21.9%, %#200=1.0 Loose, Wet, Brown, None to Loily Fine to Coarse SAND (SN			Plantinity		23.5		-						:				
63.2	FILL Medium Dense to Loose, Moist to Wet, Reddish Yellow, None to Low Plasticity, Fine to Medium SAND (SM), Munsell=5\(6/6\) 8.0 Strong Brown, Munsell=7.5YR 5/8 > with Organics ALLUVIUM Dense to Medium Dense, Wet, Brown, Non-Plastic, Fine to Medium SAND (SP) with Wood Fragments, Munsell=10YR 4. > Pale Brown, Munsell=10YR 6/3 NMC=20.9%, %#200=2.6 > Loose NMC=21.9%, %#200=1.0 3.5 Loose, Wet, Brown, None to Low Plastic Silty Fine to Coarse SAND (SM), with W Fragments, Munsell=7.5YR 5/2 NMC=25.4%, %#200=22.5 BLACK MINGO GROUP Stiff, Moist, Greenish Black, Medium Plasticity, SILT (ML), Munsell=GLEY1 2.5/5GY				:	SS-8	3	3	4	7		(A)	:	: :	: :				
_	MATERIAL DESCRIPTION Asphalt Roadway 0.7 ASPHALT (8.0") FILL Medium Dense to Loose, Moist to Wet, Reddish Yellow, None to Low Plasticity, Silty Fine to Medium SAND (SM), Munsell=5YR 66 8.0																		
7 28				28.5	;														
59.2	_	BLACK MING	O GRO	OUP					SS-9	4	4	7	11	•		$\times \stackrel{:}{\longrightarrow} \rangle$	<u> </u>		_
56.2	MATERIAL DESCRIPTION Asphalt Roadway 0.7 ASPHALT (8.0") FILL Medium Dense to Loose, Moist to Wet, Reddish Yellow, None to Low Plasticity, Sitty Fine to Medium SAND (SM), Munsell=5YR 6/6 8.0 S-2 Strong Brown, Munsell=7.5YR 5/8 > Strong Brown, Munsell=7.5YR 5/8 > Strong Brown, Munsell=7.5YR 5/8 > Pale Brown, Munsell=10YR 6/3 NMC=20.9%, %#200=2.6 SC-3 SS-4 SC-3 SC-7 12 A Ath 6" = 34 Ath 6																		
+	ړٍ ⊦		ILUS-301 Replacement Bridge over Black River Groundwater Groundwat																
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48.2																			
+																			
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	+		, PI=1	7, NMC	=49.39	%,		70.0		7	9	12	21	1	*	→ <u>:</u> (÷ :	A	
43.2	1	%#200=66.9														:		:	
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38.2	4	very Dark	ا ay, ا	iviui iS C II	i-GLE	1 1 3/11			55-13	9	18	19	3/		: :		: :	: :	
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SS - Split :	Snoo				ok Cara	. 1 7/0"		110	SA LISUS	24 Ct-	m A		RILLIN			oton (\A	lach		
JD - Undis	isturbe	ed Sample				o, 1-110							ers						
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Project ID	_		<u> </u>							ounty:	C	Clarer	idor	1		ьс					(Brid	ge
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ratio	(#)	MATER	ו ואוכ	DESC	רסוסי	LION		Graphic Log	Sample Depth	Sample No./Type		=		Value			\times		-		\rightarrow	
Elevation (ft)	7	IVIATE	NAL I	DESC	JKIF I	IION		Gra L	Sar De	Sar Yo./	1st 6"	2nd 6"	3rd 6"	> z							T (%)	
		Hard Maist \/a	ory Do	rk Cro	w Ma	dium		17777			_				0 10	20	30	40	50	60	70 80) 9
33.2-	4	Hard, Moist, Ve Plasticity, Sand	ary Da dv Leai	n CLA	ay, Med Y (CL)	alum).				SS-14	14	1 25	49	74		- :		- :			•	
+	-	Munsell=GLEY	1 3/N		•					1					:	:	:	:	:	:	: :	:
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13.2		=> Medium De	nse, w	ith Sh	ell Fra	gments	S			SS-18	8	7	12	19	:	•	:	:	:	:	<u> </u>	
13.2	4									4						:	:	:	:	:		
┥.																:						
] '	78.5	LIMESTONE							78.5	SS-19		50/5.	5"	100+		:	:	:	:	:		
8.2-		Very Dense, M	oist. G	Greenis	sh Blad	ck.				4						- :	- :	- :	- :	-	: :	
	٦	Non-Plastic, Fir	ne SA	ND (S	P-SC)	, with (Clay			_					:	:	:	:	:	:		
4		& Gravel (Stror Munsell=GLEY			tivity),				83.5	5-						:		:		:		
	1			301						SS-20) 5	8	9	17	:	lacktriangle	:	:	:	:	: :	
3.2]	=> Medium De	nse												:	:	:	:	:	:		
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	+	=> Very Dense	<u>:</u>							- SS-22	2 6	34	50/1	.5" 84+] ;	:	:		:		1	•
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SS - Split Spoon
UD - Undisturbed Sample
AWG - Rock Core, 1-1/8"

NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube

HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing



- rojeci	:ID: N	/A						Co	unty:	Cla	arendo	on		E	Boring	No.:	B-4	(Bridg	je 🤅
Site De	scripti	on: US-3	01 Repla	aceme	nt Brid	ge ov	er Bla	ack Ri	iver							oute:		-301	
Eng./G	eo.: L	.G./P.H.		oring l						Offse	et:			1	Nignn	nent:	O	n	
Elev.:	88.2 f	Latitu	de:	33.8	12631	L	ongit	ude:	80.	1110	636	Da	ite S	Starte)/2015	,
Γotal D	epth:	100 ft	Soil De	pth:	100) ft	Co	re De	epth:	0 ft		Da	ite C	Comp	leted	:	12/30)/2015	,
3ore H	ole Dia	meter (in):	4	Sam	pler C	onfi	gurati	on	Line	r Re	quire	d:	Υ	N	Li	ner Ü	sed:	Y	N
Orill Ma	chine	CME 550	Dril	I Meth	od:	RW			Hamme	er Ty	pe: A	uton	natio	;	Ener	gy R	atio:	74%	
Core S	ize:	N/A	Dril	ler:	D. F	larris			Ground	lwat	er: T	ОВ	8	ft		24H	R	8.5 ft	
															• 8	SPT N	VALUE	•	
Elevation (ft)	Depth (ft)		RIAL DES	SCRIP	TION		Graphic Log	Sample Depth	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	2.40		IES CC	ONTEN		00
	0.0	Asphalt Roadw ASPHALT (9.0)						0.5				<u>ო</u>) 10	20 30	40 5	:	70 80	90
	0.0_	FILL	,			/		2.0		6	8	8	16	•			:		:
-	-	Medium Dense	to Loose	Moiet \	Vallowie	h		4.0	- SS-2	3	5	7	12	•		4th 6	6" = 8	Blows	:
83.2-		Red, Low Plast	icity, Clay	ey Fine t					- 55.3	8	8	9	17			4th 6	6" = 9	Blowe	:
-	-	SAND (SC), M						6.0	+							: :	:	: :	:
		=> Yellowish Bı						8.0	- SS-4	4	5	4	9	•		4th 6	5" = 3	Blows	:
4	-	=> Grayish Bro	wn, Muns	ell=10YI	R <u>5/2</u> _	/			SS-5	6	7	5	12		A	4th 6	6" = 4	Blows	:
78.2	-	ALLUVIUM							_					:		: :	:		
=		Medium Dense							4										:
-	13.5	Brown, Low Pla SAND (SC), wi	th Trace o	ayey Fin of Organ	ie io ivie ics,	aiuiTi I		13.5						. :					:
73.2-		Munsell=10YR	5/6		•	į			SS-6	W	OH/18"	M	/OH	: :	: :	: :	A	: :	- :
-	-	NMC=13.0%, %	%#200=24	.4					+					:			:		:
_	- 18.5	\ \ Very Soft, Wet,		– – – – /e Brown		- – –'		18.5]					:			:		:
	-10.0	Plasticity, Sand	ly ELASTI	C SILT		/ith		10.0	SS-7	19	9	9	18	A (D		:		:
68.2		Organics, Muns	sell=2.5Y	5/2		1			1				\dashv	:			:		-
-	-	\LL=65, PL=62, \\\%#200=55.2	PI=3, NM	C=>100)%,	į			-					:					:
	23.5	¬					7/7/7	23.5		•	_	10	40						:
63.2		Medium Dense Non-Plastic, Fir	, Moist, G	rayish B	Brown,	, į			SS-8	2	3	10	13	•	: :	: :	:	: :	-:
-	-	Munsell=10YR		um <u>SAN</u>	<u>vレ (SP)</u>	ı, 			_					:			:		:
=	28.5	NMC=18.7%, %	%#200=4.2	2		į		28.5						:					:
- 58.2	-	┐¹—————— │Stiff, Moist, Dar	rk Grav I	ow Plac	ticity Fi	——'∣ ine			SS-9	3	5	10	15	•		<u>:</u>			:
50.Z		Sandy CLAY (C							4					:					:
-	20.5	BLACK MINGO	GROUP					22.5	_					:			:		:
=	33.5	Stiff, Moist, Dar	rk Gray, L	ow Plas	ticity, C	layey /		33.5	SS-10	3	4	5	9	•		×0—			_ <u>;</u> ×
53.2	-	Fine SAND (SC	<u>;),</u> Munse 	II=10YR 	4/1 	′				-	•	-			: :		:	: :	
7		Stiff, Moist, Bla	ck, High F	Plasticity	, ELAS	<u>TIC</u>]					:					
-	38.5	SILT (MH), Mu				/		38.5				_	_				:		:
48.2		LL=89, PL=39, %#200=96.7	rı-ou, ini	vi ∪=4 U.\$	⊅ 70,	1			SS-11	6	11	11	22	- :	•	: :	- :		
_	-	Very Stiff to Ha	rd Moiet	Greenio	h Block	'			_					:			:		:
=		Low Plasticity,	CLAY (CL	<u>),</u> with F	ine to	٠,		43.5						:			:		:
- 43.2-	-	Medium Sand,							SS-12	8	13	17	30	<u>:</u>	•				_ :
43.2									4					:			:		:
-	-							40.5	_					:			:		:
7								48.5	SS-13	23	34 4	49	83	:				_	
38.2-	-								133.10		· ·		-	:	: :	. :	•		-:
=]					:			:		:
=	_							53.5	_					:	: :	-	:	<u> </u>	
							LE	GENE)					- · ·		Conti	nuea	Next	<u>Pa</u>
SS - S	Split Spoo		PLER TYPE NQ -	E Rock Co	ore, 1-7/8	3"		HS	SA - Hollov	w Sten	n Augei		LLIN(G MET RV	HOD / - Rot	ary Wa	ash		
	In diaturb	ed Sample	CU -	Cuttings				l CF	A - Conti	กมดมร	Flight A	Auger	S	RC	- Ro	ck Core	<u>ڊ</u>		



Project	t ID: N	/A								Co	ounty	:	Cla	rend	on			Bor	ing	No	.: B	-4 (Brid	ge 3)
Site De	scripti	on:	US-3	801 F	Repla	aceme	ent Brid	ge o	ver Bla	ack R	liver									ute		S-3		,
Eng./G	eo.: L	G/P.H.					Locati					Of	ffse	t:				Alic	nn	nent	: 1	On		
Elev.:			Latitu	ıde:	_		312631		Longi	tude:	8			636	T	Date		_			_		2015	5
Total D		100			il De			0 ft			epth:		0 ft		_	Date							2015	
Bore H				4		• ,	npler (quire		Y	(N)	_			Use		Y	(N)
Drill Ma			E 550			II Meth		RW	gurat	011				pe: A			$\overline{}$						<u>'</u> 74%	
			⊏ 550		_									•					ner			_		
Core Si	ize:	N/A			Drii	ller:	D. F	Harris	j		Grou	ınav	wat	er: i	OE	5	3 ft			24ŀ	ıĸ	0	3.5 ft	•
																			• 0	DT N	1 \ / ^ 1			
																			• 5	PIN	I VAL	UE		
5	_								ပ္	υ ₋	υ	g				υ		P	Ļ		MC —		$\stackrel{LL}{ imes}$	
Elevation (ft)	epth (ft)	N	MATER	RIAI	DES	SCRIP	MOIT		Graphic Log	Sample Depth	Sample	<u>-</u>		<u>.</u>	=_	Value		/	`		0		^	
Ele	ا م	-							\20 0	Sa	Sa	<u> </u>	1st 6"	2nd 6"	3rd 6"	ź					ONT			
		Hard, M	Agist C	rooni	ich Dl	ack Lo	w Dlacti	oitv	/////			-				40	0 10	20	30	40	50 6	0 7	0 80	90
33.2		CLAY (City,			SS-	14	6	10	30	40		:	-	•	-			-
-	-	Munsel					,				-						:	:	:	:	:	:	: :	:
]										E0 E	_]						:	:	:	:	:	:	: :	
]]									58.5	SS-	15	8	13	24	37	:	:		•		:	: :	
28.2	-										133-	10	-	10	4	31	:	-:-		-	-	:	: :	:
] -										1						:	:	:	:	:	:		
]	63.5									63.5	5							:		:	:	:		
4	55.5	Very De	ense, M	loist,	Gree	nish Bla	- — — — ack,			30.0	SS-	16	34	41	31	72		:	:	:	:	:	•	
23.2		Non-Pla	astic, Fi	ne to) Medi	ium <u>SA</u>	ND (SP) ,			+	+				_	:	:	-:	:	:	:		-:-
]]	Munsel	I=10Y 2	2.5/1]						:	:	:	:	:	:	: :	
4	68.5									68.5	5-						:	:	:	:	:	:	: :	:
	-	Medium									SS-	17	9	12	16	28		:	•	:	:	:	: :	:
18.2]	Non-Pla						<u>-SM)</u> ,			<u> </u>						:	:	-:	:	:	:		-:
]]	with Silf	t, iviuns	eli=G	DLE Y I	15612	2.5/1										:	:		:	:	:		
4	-									73.5	5-							:		:	:	:		
	-	=> Very	/ Dense)							- SS-	18	7	50/5"		100+		:	:	:	:	:	: :	>>
13.2											1						:	:	:	:	:	:		- :
4										1	4						:	:	:	:	:	:		
+	78.5									78.5	5 SS-	10		50/4"		100+			:			:		>>
0 2		LIMES								!		19	,	50/4		100+		:	:	:	:	:		
8.2]	Very De]							:	:	:	:	:	:		: .
4	-	Non-Pla with Silt					ND (SP	<u>-SIVI),</u>		İ	-						:	:	:	:	:	:	: :	: .
- 1	1 -	Munsel	I=GLEY	′1 5G	SY 2.5	5/1			H^{\perp}	83.5								:	:	:		:		
3.2]									l	SS-	20	5	7 5	0/5"	57+		- :			•	:		
-	-										4								:			:		
-	-										-						1	:	:	:	:	:	: :	
]]								H	88.5		24	40	40	4.4	20	:	:		:	:	:		
-1.8	-									1	SS-	21	12	18	14	32	:	:		:	:	:	: :	- :
+	-									İ	+						:	:		:	:	:	: :	
										93.5							:	:	:	:	:	:		
4										93.0)_ -ss-	22	 5	0/2.5"		100+			:			:		>>
-6.8	-										-						- :	:		-	1	:		
+] -								+	l	_							:		:	:	:		
]]									98.5	5							:	:	:	:	:		
4	100.0	=> Med	lium De	nse,	with S	Shell Fr	agments	S	T,	33.0	SS-	23	14	8	11	19		•	:	:	:	:		
-11.8	100.0	Boring ¹							+			+		•			:	:	:	-	-	:		:
]]		2								7						:	:	:			:		
4	-										4									:	:	:		
40.5	-										1							:	:	:		:		
-16.8]										1							:	-	:	:	:		
																		- :	- :	-	:	:		
									LE	GENI	D													
99	Split Span		SAMI		R TYPE		oro 1 7/	Ω"		1.16	٠. ۸	ماام	Ston	n Aure		RILLIN	IG ME	THO	D	ory M	laah			
	Split Spoc Undisturb	on ed Sampl	е			Cuttings	ore, 1-7/ 3	U			SA - Ho FA - Co					ers				ary W k Co				
		e, 1-1/8"					ous Tub	е			C - Di													



Project	ID: N	I/A				Со	unty:	Cla	aren	don			Boring	No.:	B-5	(Brid	ge :
			Replaceme	nt Bridge o	over Bla	_						-				301	
								Offse	et:				Alignn		O		
					Longit	tude:					ate	Start			/4/2		
	89.6 ft Latitude: 33.8096518 Longitude: 80.1 epth: 100 ft Soil Depth: 100 ft Core Depth: Die Diameter (in): 4 Sampler Configuration Lines Chine: CME 550 Drill Method: RW Hammer Care: N/A Driller: D. Harris Grounds MATERIAL DESCRIPTION D. Harris Grounds D. Hammer Care: N/A Driller: D. Harris D. Harris D. Harris D. Harris D. Hammer Care: N/A Driller: D. Harris D. Harris D. Harris D. Hammer Care: N/A Driller: D. Harris D. Harris D. Hammer Care: N/A Driller: D. Harris D. Hammer Care: N/A D.	O ft		-			pleted		/4/2								
		D: N/A					Υ	(N)	•	ner Us		Y	(Ñ				
								mati	$\overline{}$		gy Ra		74%				
ore Si									-	TOE		0 ft		24HF		11.5	
													• 9	SPT N V	ALUE	•	
Elevation (ft)	pth t)	MATERIAL	DECODID	TION	phic	pth	y nple rype				N Value		PL ×	MC	;	LL ×	
Elev.			L DESCRIP	TION	Gra	San	San No.7	1st 6"	2nd 6"	3rd 6"	> Z	0 10	▲ FIN 20 30	IES CON 40 50) 90
4	0.6_	<u> ASPHALT</u> (7.0")			/ <u>ABB</u>		7 00 4	4	4	3	7		: :		:	: :	:
4	-	FILL				2.0	+						A+1- O"	- 0 DI-			:
]	_					4.0	35-2	2	2	3	5		4(1) 0 =	= 2 Blow	S :		:
84.6	_	SAND (SM). Muns	ity, Siity Fine i ell=10YR 5/4	to ivieaium		6.0	SS-3	2	2	2	4	•	4th 6" =	1 Blow	;	: :	-:
=	-	=> Yellowish Brow	Yellowish Red	d,			- 99-4	2	2	2	4	•	4th 6" =	= 1 Blow			
	-						SS-5	2	1	3	4	•	4th 6" =	= 3 Blow	s		:
79.6	_														:		:
4	-	<u>¥</u> .					4					1			:		
	13.5					13.5		40	40	40	· ·						:
74.6	=		oosa Wat Li	aht			SS-6	10	12	12	24	:	•	: :	:		-:
4	-	Yellowish Brown, N	Ion-Plastic, Fi	ne to			+						: :		:		
1	_	Medium SAND (SF	P), Munsell=2.	5Y 6/3		18.5]								:		:
-	-	=> Very Pale Brow	n, Munsell=10	YR 7/3		10.0		5	6	4	10		0		:		:
69.6	_	•													:		-:
4	-						4					:					
	_					23.5			4.	4.0	0-						:
64.6	_						SS-8	17	14	13	27	:	•	: :	:	: :	:
-	-						1								:		:
]	28.5					28.5]					:			:		:
-	_0.0	BLACK MINGO GI	ROUP		17	_5.5		7	10	8	18		•				
59.6	_	Medium Dense, W	et, Dark Olive	Gray,			1					:	: :		:		-:
4	_	Non-Plastic, Fine to	o Coarse <u>SAN</u> Munsell=5Y 3/	<u>D (SP-SC),</u> 2			-					:	: :		:		:
_	_	•				33.5				4.5	0.4				:		
54.6	-		isii Gieen, Mil	ıı ıs c ıı−3G f			55-10	3	9	15	24	:			:		:
_	_						_								:		
-	_					38.5									;		:
49.6	39.5	Ctiff \\/\at\/\at\/\at\			-1/1/1			9	9	6	15				<u>:</u>		
49.0	=	Plasticity, Fine San	dy CLAY (CL									:	: :		:		-
4	40 -	Micaceous, Munse	II=5GY 3/2				+								:		:
1	43.5	Hard to Very Stiff	Wet. Verv Dai	k Greenish	-4////	43.5		7	15	23	38	:			:		
44.6	-	Gray, High Plastici	ty, Lean <u>CLAY</u>	<u>' (CL)</u> , with			33-12	<u>'</u>	10	23	50		: :	- :	- :	: :	
	_	Sand & Lignite Sea	ms, Munsell=	5GY 3/2			1					:			:		:
4	_					48.5									:		:
39.6	_						SS-13	6	12	16	28	:	•		:		
39.0	_						-						: :				:
+	-					-	+					1					:
	_				<u> </u>	<u>53.5</u> GENE		<u> </u>					- :	Contin	ued	Nevi	P,
		SAMPLE	R TYPF			GEINL	,			DF	RILLIN	IG MF	THOD	COHUI	ueu	INCX	
	Split Spor	on	NQ - Rock Co				A - Hollo			jer		R'	W - Rot		sh		
		ed Sample e, 1-1/8"	CU - Cuttings CT - Continue				A - Conti C - Drivir			ι Auge	:15	R	C - Ro	JK COre			



	t ID: N						unty:	Cla	arenc	lon			Bo	ring					€ 2
	scripti		1 Replacemer	nt Bridge c	ver Bl	ack R	iver							Rou			-301		
ng./G	eo.: R	. Wessinger	Boring L	ocation:				Offs	et:				Ali	gnm	ent:	С	n		
lev.:	89.6 ft	Latitud	e: 33.80	096518	Longi	tude:	80.	113	5956		ate	Start	ted:			1/4/2	016		
otal D	epth:	100 ft S	Soil Depth:	100 ft	C	ore De	epth:	0 f	t		ate	Com	ple	ted:	1	1/4/2	016		
ore H	ole Dia	meter (in):	4 Sam	pler Conf	igurat	ion	Line	r Re	equir	ed:	Υ	N		Line	er U	sed:	Y		(
rill Ma	achine:	CME 550	Drill Metho	od: RW			Hamme	er Ty	уре:	Auto	mati	ic	E	nerg	y R	atio:	749	%	
ore S	ize:	N/A	Driller:	D. Harris	3		Ground	dwa	ter:	TOE	3 ′	10 ft		1	24H	R	11.	5 ft	
						1								• 05	OT NI	/			
													-		PT N Y				
Elevation (ft)	₽ _				jë E	e t	Sample No./Type				N Value		5	'L ←—			$\overset{LL}{ o}$		
eva (ff)	Depth (ft)	MATERIA	AL DESCRIPT	ΓΙΟΝ	Graphic Log	Sample Depth	am j		9		\ \			FINE	S CC	NITEN	JT (%	١	
ѿ						0) –	σž	1st 6"	2nd 6"	3rd 6"	z	0 10		30 4					9
24.0	=	Very Stiff to Hard	d, Wet, Very Dark	k Greenish			SS-14	8	9	9	18		•	X	: X	> =	À	:	
34.6]]	Gray, High Plasti Sand & Lignite Se	icity, Lean <u>CLAY</u> eams. Munsell=5	(CL), with GY 3/2								:	:	:		:	:	:	:
_		LL=40, PL=17, P					-						:			:	:	:	
_]	%#200=71.0	. 20, 1400-40.7	. • ,		58.5				-		1	:	:		:	:	:	
29.6-]	=> Micaceous					SS-15	12	18	28	46	1	:	- :	•	- ;	- :	:	_
_	+	5300040				1	-						:	:		:		:	
_]]					63.5	.]					:	:	:		:	:	:	
-	-					33.3	SS-16	7	15	19	34	1	:	•		:	:	:	
24.6							<u> </u>	<u> </u>		-			- :	-:-	: :	:	:	:	-
_]]]						:	:	: :	:	:	:	
-	68.5				_\///	68.5	;-					1	:	:		:	:	:	
- 19.6]	Very Dense, Wet Non-Plastic, Fine	t, Very Dark Gree	enish Gray,			SS-17	19	25	36	61		:	:	: :	•	:	:	
- 0.61]	Micaceous, Muns	sell=10Y 3/1	, with Clay,		1	-										: -		-
_		, , , , , , , , , , , , , , , , , , , ,					_						:	:		:		:	
_]	=> with Lignite				73.5		45	00	20	00	- :	:	:			:	:	
14.6-		with Lighte					SS-18	15	26	36	62	1	- :	- :	: :	•	:	:	_
-							_						:	:		:		:	
_	78.5					78.5	<u>-</u>					:	:	:		:	:	:	
	- 3.5	Very Dense to De	ense, Moist, Darl	COlive		1	SS-19	12	32 5	50/4"	82+] :	:	:		:		•	
9.6-]	Gray, Non-Plastic (Sandstone Lens]						:	:	:		:	:	:	-
_		(Sanusione Lens	be), iviui iseli=5 Y 3) /		}	-						:	:		:	:	:	
-						83.5						1	:			:		:	
4.6]]					1	SS-20	6	17	19	36		- :	•	<u>: :</u>	:	- :	<u>:</u>	_:
-							-						:	:		:		:	
-	88.5	=> Hard Drilling a	at 87.0'			00.5						:	:	:	: :	:	:	:	
_	00.5	LIMESTONE				88.5	'] SS-21	H	50/2.5"	-	100+	1	:			:	:	:	:
-0.4		Very Dense, Mois	st to Dry, Dark O	live Grav.		1	_						:	:	: :	•	:	:	-
_]]	Non-Plastic, GRA	AVEL (GP), with	Sand		1]							:		:	:	:	
-	93.5	(Strong HCl Read	ctivity), Munsell= 	5Y 3/2 		93.5	;-						:			:	:	:	
-5.4]	Medium Dense, M			Н	1	SS-22	8	10	11	21		•	- :	: :	:	:	:	-
J. T		Plasticity, Clayey Fragments, Muns), with Shell	H-	1	-					:	:	:		:	:	:	
-		r raginicilis, iviulis	3011-01 J/Z		F		. 🕇						:				:	:	
_]]					98.5	SS-23	6	7	10	17	1				:	:	:	
-10.4	100.0	Boring Terminate	ad at 100 0 feet		+		33-23	0	- 1	10	17	- :		- :	: :	- ;	- :	:	-
_]	Doming Terminate	a at 100.0 leet				_						:	:		:	:	:	
_]												:	:		:	:	:	
_ 	-						-						:		: :	:	:	:	:
-15.4 -]						1							:		:	:	:	-
						GENI							:	:	<u>: :</u>	:	:	:	

SAMPLER TY
SS - Split Spoon NG
UD - Undisturbed Sample
AWG - Rock Core, 1-1/8" CT

NQ - Rock Core, 1-7/8" CU - Cuttings CT - Continuous Tube HSA - Hollow Stem Auger CFA - Continuous Flight Augers DC - Driving Casing



	t ID: N										ounty:		arenc	ion						(Brid	ige
	escripti			801 I					over B	ack R								oute		301	
		. Wessi			_	oring						Offs					Align	men)n	
lev.:	89.7 ft		Latitu	ıde:		33.	80868	301	Long	itude:	80	.114		1	Date	Start	ed:		1/5/2	2016	
otal D	epth:	100	ft	So	il De	pth:	1	00 ft	С	ore D	epth:	0 1	t	[Date	Com	plete	d:	1/6/2	2016	
ore H	ole Dia	meter ((in):	4		Sar	npler	Con	figurat	ion	Lin	er R	equir	ed:	Υ	(N)	L	iner	Used	: Y	1)
rill Ma	achine:	СМ	E 550		Dri	II Meti	hod:	RW	1		Hamm	er T	vpe:	Auto	omat	ic	Ene	erav l	Ratio:	74%	<u> </u>
ore S		N/A				ller:		Harr			Groun		•	TOE		10 ft		24		10.2	
											0.00										
																	•	SPT N	N VALU	E●	
Elevation (ft)	Depth O (ft)	N Asphalt	MATEF : Roadw		. DE	SCRIF	OIT	1	Graphic	Sample Depth	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	0 10	PL ★ FI 20 30	NES C	MC ONTE		
	0.8	ASPHA								3.0	3		-			:	: :	:	; ;	:	
_	1.2	STONE			"\				1	2.0	- 00 4	2	3] :	: :	:		:	
-	1	`	<u> D/ IOL</u>	<u>(0.0</u>	<u>/</u>				-114	2.0	+					1 :		:		:	
-	3.0	FILL	N/a!=(\	/ . II		Decl. M.				<u> </u>	SS-2	2	2	3	5	•	4th 6"	= 4 BI	ows	:	
-	4.0	Loose, Plasticit							1	4.0	J+	+				1		:		:	
84.7-		Munsel			10 141	calaiti <u>s</u>	J 11 11 D	(<u>U.VIJ</u> ,			SS-3	2	2	2	4	•	4th 6"	= 3 BI	ows	-	
-	1 -	1			— — .	n Diast			-" [44]	6.0)+	-			-	-		:	: :	:	
-	-	Loose, Medium									SS-4	3	3	5	8	•	4th 6"	= 6 BI	ows	:	
_	8.0			·	· — —				-	8.0	——					:		:		:	
_	4 4	Very Lo								il .	SS-5	3	1	1	2		4th 6"	= 2 BI	ows		
79.7-	_	₩Medium	SAND	(SN	1), Mu	insell=1	10YR 4	/6	出財		+	ļ_	-		<u> </u>				: - :	-	
		ਜ ∖=> Dark	Yellow	vish E	Browr	n/Gray,												:			
_]]	Munsell									1							:	: :	:	
_] ,_]	ALLUV	IUM							<u> </u>							: :	:	: :	:	
	13.5	⊺ Very Lo	ose, W	et, Y	'ellow	ish Bro	wn, No	ne to	/ <u>x\</u> 1/x.	13.5		+				1		:		:	
74 -]	Low Pla	asticity,	Silty	Fine	to Med				3	SS-6	6	2	2	4	•		:			
74.7-	1 1	\(<u>(SM)</u> , N	/Iunsell=	=10Y	R 5/4]								:		:	
_	1 1	ORGAN	VICS (V	v00	 D)					.1	1							:			
-	1 1		•						1 1 1 1	*	1							:		:	
-	18.5								<u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	18.5	5	1				1 !	: :	:		:	
-		Loose to Non-Pla									SS-7	5	4	4	8	A •	0	:			
69.7-	1 1	Munsell			, ivi c u	iui 11 <u>34</u>	מיאה (ס	<u></u> ,			+						: :	:	: :	:	
-		NMC=2			00=1.	7				3	-					:		:		:	
-			,								+							:		:	
-	1 1									23.5	5-							:			
-											SS-8	6	7	6	13	•	, ! !	:			
64.7-											+	+-	•		+-	+-	: :	:	: :	:	:
_	1 -										4							:		:	
-	-										-							:			
-	28.5									28.5	5-						: :	:		:	
-	1 -	BLACK	MING	O GF	ROUP						SS-9	3	3	3	6	•		×	· · · · ×		
59.7-		Firm, M								1	+ 333	+		_	Ť	+	: :		: :	- : -	
-		Plasticit Munsell					with S	and,		1	4							:	: :	:	
_		LL=62,					70/-			1	4							:		:	
_	33.5	%#200=		F I=	ı Ə, IN	IVIO-44	.1 /0,			33.5	<u>5</u> -							:			
_	55.5	7							_/	[]	SS-10	12	9	10	19	1		:			
54.7-		Medium									33-10	12	<u>9</u>	10	19	1	<u> </u>	:	: :	:	
		Non-Pla with Silt	astic, Fi	ne to anite	Coal Mur	rse <u>SAl</u>	<u>ND (SI</u>	<u>~-SM),</u> 10GV		}	4							:		:	
_]]	2.5/1	anu Ll	griile	, iviul	iscii-Gi	LL	1001			1							:			
_																		:			
	38.5								<u> </u>	38.5						1 :	- : :	<u> </u>	tin	d N/	# D
			SAMI	ם כר	TVD				LE	GEN	ע				יי יוס	VIC NAT	TUOD	Cor	tinue	ı ivex	ιra
S - S	Split Spoo	n	SAIVII			E Rock C	ore, 1-	7/8"		H	SA - Hollo	ow Ste	m Auge		rxiLLIİ	NG ME R	тнов W - R	otary V	Vash		
J		ed Sample				Cutting					FA - Cont							ock Co			



										Cla	aren	don							lge
						<u> </u>	er Bl	ack Ri							F	Route:	US	-301	
ng./G	eo.: R									Offse	et:				Align	ment:	C)n	
lev.:	89.7 ft	Latitu	de:	33.8	08680	1 L	ongi	tude:	80.	1143	3269) [Date	Start	ed:		1/5/2	2016	
otal D	epth:	100 ft	Soil Dep	th:	100) ft	Co	ore De	epth:	0 f	t	1	Date	Com	plete	d:	1/6/2	2016	
ore H	ole Dia	meter (in):	4	Sam	pler C	Second S	: Y	(
rill Ma	chine:	CME 550	Drill	Meth	od:	RW			Hamm	er Ty	/pe:	Auto	omati	ic	Ene	ergy R	atio:	74%)
ore Si	ze:	N/A	Drill	er:	D. H	larris			Ground	dwat	ter:	TOE	3 /	10 ft		24H	R	10.2	: ft
									Reference Route										
															•	SPT N	VALU	E●	
<u> </u>							l _o	0	η φ				d)		ΡĻ	N	<u>I</u> C	ĻĻ	
Elevation (ft)	Depth (ft)	MATER	NAL DES	CRIP	TION		in go	nper ∌gth	ag E		ŧ.,		alu,		X	()	 X	
Elev	ا ``ق	IVIATEIN	IAL DES	CIVII	IIOIN		Gra	Sar	Sar No./	st 6'	9 pc	d 6	> Z						
		Stiff Moiet Gre	onich Plac	k High	Dlactic	it.,				1 6	7			0 10	20 3	0 40 5	0 60	70 8	0 9
40.7					riasiic	ıty,			SS-11	4	4	7	11	•	: :	: ∞		\times	A
49.7		Munsell=GLEY	1 10GY 2.5	5/1										:			: :		
]			PI=21, NM	IC=44.2	2%,									:		:			:
]		⁷ 0#∠UU=8∠.3												:		:			:
]]	=> with Micace	ous Fine S	and Se	ams			43.5						1					:
44.7		· with Micacet	545 I IIIG 00	aa 00	G1110				SS-12	4	6	7	13	•	' : :	:			:
¬¬./]		Boring Location: Boring		:														
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]								 								:			:
]	48.5	Dense Wet Ve	ery Dark G	 reenish	Grav		╙┸	∎ 48.5		_			-	1		_ :			
39.7-		Non-Plastic, Fir	ne to Mediu	ım <u>SAN</u>	ID (ŠP)				SS-13	6	17	19	36			•			
33.1			, Micaceou	s, Mun	sell=5G	Y		:	_							:			
		JIZ	Boring Location:		:														
	E2 F	District US-301 Replacement Bridge over Black River Series US-307 Replacement US-307 Rev. US-307																	
_	53.5	Dense, Wet. Ve	ery Dark G	 reenish	Rent Bridge Over Black River Solute: Sol	:													
34.7	_	Plasticity, Claye	y Fine to N	/ledium	SAND			1	Route: US-301	·									
	_	(SC), with Glau	conite, Mui	nsell=5	GY 3/2				4					:		:			:
4	_								4					:		:			:
4	4							58.5	-					:		:			:
4	4							30.5		14	1/1	20	3/1	1 :		•			:
29.7-	4							1	33-13	14	14	20	J 4	<u>:</u>	: ;	- :			
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4	4							63.5	4					:					:
4	4		ack, Micac	eous, M	/lunsell=	:10Y		33.5		7	14	20	34	1		•			:
24.7-	4	2.5/1						1	130 10	Ļ.			-	- :	: :	-			
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19.7-	+				אָט (SP)	,			+					 	: :	:		-:	-
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+	73.5							73.5	-]		:			:
+	-	Dense, Moist, D	Dark Gray,	Non-Pi	astic, F	ine			SS-18	6	17	20	37	:		•			:
14.7-	+	Micaceous. Mui	<u>וט (SP-SC)</u> nsell=5Y 4/), with (/1	∪iay,				+					1		:			
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							<u> </u>	GENI)					- :	•	Cont	inue	d Nev	
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Project	· ID· N									Co	untv		aren	don			Bori	na N	<u>o .</u> ⊤	B-6	(Bride	16 2\
			US-3	301 F	Renlar	eme	nt Brid	de ov	er RI:	_		0	ai Ci I	uUII						US-:		<u> </u>
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				ıdo.					onai	hildo.	80				Data			IIIICI				
		R. Wessinger ft Latitude: 33.808 100 ft Soil Depth: iameter (in): 4 Sample Sample Drill Method N/A Driller: I Wery Dense, Moist, Dark Gray, Non-Fine to Medium SAND (SP-SC), with Micaceous, Munsell=5Y 4/1 Dense, Moist, Dark Gray, Non-Plast SAND (SP), Munsell=5Y 4/1 Dense, Moist, Dark Gray, Non-Plast SAND (SP), Munsell=5Y 4/1 Sample													od.	_						
		R. Wessinger Boring Location: ft Latitude: 33.8086801 Lone															Y	(N)				
				jurat													——					
															10.2	ft						
Core 3	IZE.	tion: US-301 Replacement Bridge over R. Wessinger Boring Location: fft Latitude: 33.8086801 Location: 100 ft Soil Depth: 100 ft iameter (in): 4 Sampler Configue: CME 550 Drill Method: RW N/A Driller: D. Harris MATERIAL DESCRIPTION Very Dense, Moist, Dark Gray, Non-Plastic, Fine to Medium SAND (SP-SC), with Clay, Micaceous, Munsell=5Y 4/1 Dense, Moist, Dark Gray, Non-Plastic, Fine SAND (SP), Munsell=5Y 4/1				Groui	iuwa	lei.	101	5	1011		Z'	+1111		10.2	-					
		### SAMPLER TYPE In the service of									(● SPT	NV	ALUE	•							
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9.7-	_				33-18	, 0	19	43	02	:	-:-	: :	:		: :	-:						
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_	_	=> Very	y Dense)						90.0		3 6	13	50/3'	63+		:					: -
-10.3	100.0		-								- 00-20	, 0	10	30/3	00.	- :	:	: :	:		: :	- : -
il _	_	Boring	I ermina	ated a	it 100.C) feet					_						:		:	:		: -
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-10.3			SAMI					-							RILLIN	IG ME	THOE)				
SS - S UD - I			NQ - Rock Con le CU - Cuttings				3"							ıere					h			
-								:						Aug	,013	- 151	J - 1	. NOON C	<i>7</i> 01 C			
-																						



Project	ID: N							unty:	Clar	endo	n				B-7 (Br	
ite Des	scripti	on: US-3	01 Re	placeme	nt Bridge	over Bla	ack R						F	loute:	US-301	
ng./Ge	:0.: R	. Wessinger		Boring L	ocation_	:			Offset	:			Align	ment:	On	
lev.:	88.0 ft		ıde:	33.8	035154	Longi	tude:	80.	11872	237		Start			/6/2016	
otal De	epth:	100 ft	Soil I	Depth:	100 ft	C	ore De		0 ft			Com	plete	d: 1	/7/2016	
ore Ho	ole Dia	ameter (in):	4	Sam	pler Cor	nfigurat	ion	Line	er Rec	quire	d: \	′ <u>N</u>		iner Us		
rill Ma				Orill Meth	od: RV	V		Hamme		_	utoma		Ene	rgy Ra	tio: 74°	%
ore Si	ze:	N/A		Oriller:	D. Har	ris		Ground	dwate	r: T	ОВ	8 ft		24HR	5.5	ft
													•	SPT N V	ALUE	
Elevation (ft)	Depth (ft)			DESCRIPT	ΓΙΟΝ	Graphic Log	Sample Depth	Sample No./Type	1st 6"	2nd 6"	3rd 6" N Value				NTENT (%) 5)
	0.0	Asphalt Roadw ASPHALT (6.0					0.5	_	,	<u> </u>	<u>n</u>	0 10	20 30) 40 50	60 70	80 9
	0.5	FILL	,				0.5			_	_				: :	:
		Loose, Moist, Y	حالصيناه	h Brown N	lone to Los	,	2.0	SS-1	4	5	5 10					
-	3.0_	Plasticity, Silty Munsell=10YR	Fine to	Medium SA	AND (SM),			- SS-2	3	4	6 10	•	4th 6	= 8 Blows	s	
+	4.0	Loose, Moist, E	Brown, I	Non-Plastic	Fine to	17/7	4.0	+			+	\dashv				:
83.0	_	Medium SAND				-'		- SS-3	5	5	4 9		4th 6"	= 4 Blows	s :	:
-	6.0_	▼Loose, Moist, C Clayey Fine to Munsell=2.5Y 4	Mediun	rown, Low F n <u>SAND (SC</u> 	'lasticity, <u>C),</u> 	./// 	6.0									
7		Loose, Moist to	Wet, 0	Grayish Bro	wn,			- SS-4	6	6	4 10	•	4th 6"	= 3 Blows	S	:
4	8.0	∑Non-Plastic, Fi √Munsell=10YR		iedium <u>SAN</u>	<u>ID (SP),</u>	da	8.0	+			+	\exists				:
4	-	ALLUVIUM	<u></u> _					- SS-5	3	2	1 3	•	0	▲4th 6" =	2 Blows	:
78.0		Very Loose, W	et. Ven	v Dark Grav	ish Brown						\perp		: :			
70.0		None to Low Pl SAND (SM), w 3/2	lasticity	, Silty Fine	to Medium			-								
	13.5	NMC=22.2%, 9	%#200=	=33.3			13.5	-								:
70.0	14.0	Stiff, Wet, Pale Organic SILT (<u>OH),</u> M	lunsell=10Y	R 6/3		13.3	SS-6	3	7	8 15		• •	0		
73.0	-	Medium Dense Non-Plastic, Si (SM), Munsell= NMC=39.3%, S	Ity Fine =10YR (to Medium 6/3				-								
4	18.5						18.5	:-								
	.0.5	=> No Recover	у			- I salesali s	1 .5.5		_		_	1 : .				:
60.0								SS-7	9	7	7 14		7			:
68.0	-															
	23.5	Medium Dense	\/\/a+	Brownish		7,7576	23.5					- :				:
-	-	Yellow/Grayish	Green	, Low Plasti			:	SS-8	3	4	7 11	•		(•
63.0	+	Fine to Medium 6/8 & 5GY 5/2	1 <u>SAND</u>	<u>) (SM),</u> Mur	nsell=10YF	' [취임회		+			+		: :			:
4	4	NMC=34.8%, 9	%#200=	=36.7			;	-								
																:
							:									
_	28.5						28.5						- : :		: :	
						LE	GENE)						Contin	ued Ne	xt P
JD - U			Cl	YPE Q - Rock Co J - Cuttings Γ - Continuo			CF	SA - Hollov FA - Contil C - Drivin	nuous F	Flight A		ING ME R' R	W - R	otary Was ock Core	sh	



								Cla	aren	don		1					dge
					over Bl	ack Ri											
														nent			
	•						•										
		Injustion: US-301 Replacement Bridge over Black River		(
									-				Ene				
ore Si	ze:	N/A	Driller:	D. Harri	<u>s</u>		Ground	awa	ter:	101	3 8	π		241	HK	5.51	π
													•	SPT N	Ι \/ΔΙ	LIF •	
Elevation (ft)	ŧ.				p pic	g g g	ple				lne		×—			$\overset{LL}{\longrightarrow}$	
leva (ft	Dep (ff	MATER	RIAL DESCR	RIPTION	3rap Lo	Sam Dep	sam o./T		10"		<u>></u>		▲ FII	NFS C	CONTI	=NT (%)	
Ш						0)	0) Z	1st		370		0 10					
-	_						SS-9	15	17	18	35	:		•			:
58.0	_	Dense, Wet, Ve	ery Dark Greer	nish Gray, Low		;	1 30-3	.5	.,,	10	33			-	:		:
33.0		Micaceous, Mu	nsell=5GY 3/1	<u>O/ (14D (OIVI)</u> ,		:]						:		:			
7	_						7					:		:			:
4	_						-					:					:
4	22.5					22.5	4					:					:
	აა.5 _	Stiff to Very Stif	ff, Moist to We	et, Dark Olive		აა.5					\vdash	:		:			
		Gray, Medium F	Plasticity, ELA	STIC SILT			SS-10	3	4	5	9	•		×		\times	4
53.0	_			51 O0/			+					:		:			:
4	_		PI=17, INIVIC=	51.9%,			4					:		:			:
	_						_					:					
												:					:
7	_	Cription: US-301 Replacement Bridge over Black River Offset: Magment: Color: R. Wessinger Boring Location: Offset: Jalignment: 16/13 16/		:													
4	39.0_	Corpition: US-301 Replacement Bridge over Black River	: :														
48.0-	_		County: Clarendon Boring No.: Baring No.: Baring Location: Suring Location: Suring Location: Offset: Alignment: County: Offset: Alignment: County: Offset: Alignment: County: Offset: Alignment: County: Offset: Offset: County: Offset: Offse		<u>:</u>												
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1												:					:
7	_						1					:		:		: :	:
4	_					43.5	-					:					:
_	_	=> with Lignite	Seams			10.0						:		:			:
40.0							SS-12	6	Route: US-30 Stet: Alignment: On 87237 Date Started: 1/6/2016 Oft Date Completed: 1/7/2016 Required: Y N Liner Used: Type: Automatic Energy Ratio: 74 Vater: TOB 8 ft 24HR 5.9 ST N VALUE PL MC MC MC MC MC MC MC MC		:						
43.0	_						1					:					:
+	-						-					:		:			
4	_						4					i	1	:			:
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						48.5					\vdash	:					
7	_						SS-13	6	8	17	25	:	•	:			
38.0-	-						+						: :	:			:
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												:		:			:
7	_											:	<u> </u>				:
4	_					53.5						:		:			:
4	-	=> Very Dense,	Greenish Gra	ay, with Lignite,				6	16	35	51	:		:			:
33.0-	_	wiicaceous, wiu	115611-101 5/1				30-14	L	10		51	:					:
55.0												:		:		: :	:
7	_						1					:		:			:
						CEVIC	<u> </u>					:	: :	Car	tin	od Nov	<i>+</i> ¬
		Medium Dense, Wet, Dark Olive Gray, Non-Plastic, Fine to Medium SAND (SP), Micaceous, Munsell=5Y 3/2 => with Lignite Seams => Very Dense, Greenish Gray, with Lignite, Micaceous, Munsell=10Y 5/1 SAMPLER TYPE it Spoon NQ - Rock Core, 1-7/8" disturbed Sample CU - Cuttings	LE	JEINL	,			D	RILLIN	G MF	THOD	CON	unut	u NEX			
				1 110	امال ۸	Cta	مم ۸					tory M	\/aah				



		Soil les	Log																			
Project	t ID: N								unty	/ :	Cla	aren	don			В						ge 1)
Site De			01 Repla	cemen	t Bridg	ge ov	er Bl	ack R	iver								_	oute		S-3	01	
Eng./G	ieo.: R	. Wessinger	Во	ring L	ocatio	on:				0	ffse	et:				A	lignr	nen	t:	On		
Elev.:	88.0 ft	Latitue	de:	33.80	35154	4 L	.ongi	tude:		80.1	1187	237		Date	Sta	rtec	d:		1/6	/20	16	
Total D	epth:	100 ft	Soil Dep	th:	100	ft	Co	ore D	epth	:	0 ft			Date	Con	npl	etec	1:	1/7	/20	16	
Bore H	lole Dia	meter (in):	4	Samp	oler C	onfiç	gurati	ion	I	Line	r Re	qui	red	: Y	<u>(N</u>	1)	Li	ner	Used	d:	Υ	(N)
Drill Ma	achine	CME 550	Drill	Metho	od: F	RW			Han	nme	r Ty	pe:	Au	tomat	ic		Ene	rgy l	Ratio	o: 7	4%	
Core S	ize:	N/A	Drille	er:	D. H	arris				und		-	ТО		8 ft	I			HR	_	5.5 ft	
																	•	SPT N	N VAL	UE	•	
_										υ							PL		MC		LL	
Elevation (ft)	Depth (ft)	MATED	RIAL DES	CDIDT	ION		Graphic Log	Sample Depth		No./Type				N Value			×-				\rightarrow	
	20	WATER	IAL DES	CKIFI	ION		Gra L	Sar	Sar	9	st 6"	2nd 6"	3rd 6"	> z					CONT			
	_	Mam. Danas ta F	Damas 14/a	1 0	ish Oss		12.30.00		-	_	<u>~</u>	7	က်		0 10	20	0 30	40	50 6	0 7	0 80	90
		Very Dense to Dense t	Jense, vve ne to Mediu	t, Green m SANI	iish Gra D (SP)	ay,									:	:	:	:		:		:
_	1 7	with Lignite, Mic						58.5	;						4	:		:				1
_	1 1								SS	-15	14	16	21	37	:	:	:	•	: :	:		-
28.0-									1						- :	:	:	- :		:		- :
																:		:		:		
_	1 1								7						:	:	:	:		:		
-	1 1								+							:		:		:		-
_								1														
	63.5	Dense to Very [Dense We	t Green	ich Gra		$+v_{z}$	63.5	·						- :	:	;	:		:		:
_	1 1	Non-Plastic, Fin							SS	-16	11	20	28	48		:			•			
23.0-		with Clay, Muns				,			+						:		- :	:		-	-	
															:	:	:	:		:		:
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_	1 1								+						:	:	:	:		:		-
_																:		:		:		
		-> Vory Dork C	rov with C	hall Era	amonto			68.5	·	_					- :	:	:					
-	1 1	=> Very Dark G Munsell=5Y 3/1		neli Fra	gments	,			ss	-17	14	21	30	51	:	:	:	:	•	:		: -
18.0-	1 1								+						- :	:		- :		:		
																:		:		:		
_	1 1								1						:	:	:	:		:		: 7
_	1 1	=> Hard Drilling	at 72 0'					1	+						:	:	:	:		:		-
_		- Filara Drilling	at 72.0													:		:		:		
	73.5	LIMESTONE					1/2	73.5	5	5-18		50/6"		100+		:	:	:		:		>>
_	1 1	Very Dense, W	at Vary Da	ark Grove	,			1	133			JJ/ U		1001	1 :	:	:	:		:		
13.0-		Non-Plastic, Fin	eເ, very Da ne to Mediu	m SANI	, D (SP).				4						:	:	1	:	: :	: : :		
		with Shell Fragr	nents (Stro	ong HCI	Reactiv	∕ity),		}								:		:		:		
_		Munsell=5Y 3/1						ļ								:	:	:		:		: 1
-	1 1						H.	1	+						:	:		:		:		
_																:	:	:		:		
	79.0							78.5		10	10.5	0/4 5	"	400	-	:	:	:		:		
_	1	Very Dense, W						1	55	5-19	13 5	0/4.5		100+	-			:				>>
8.0-	1 1	Non-Plastic, GF with Sand, Mun	RAVEL (GF	2) (Sand	Istone),		H_		+							:	- :	- :		<u>: </u>		
_		willi Sand, Mun	SEII-31 31						1						:	:	:	:		:		
																:		:		:		
-	1 1								1							:	:			:		
_	ا وي و							83.5							:	:	:	:		:		
	83.5	Very Dense, Mo	oist, Verv D	ark Gra	— — — - av.		+	03.5		5-20	5 5	0/3.5	"	100+	1	:	:	:				>>
_]	Non-Plastic, Fin	ne <u>SANĎ (S</u>	<u>SP)</u> , with	n Grave	& le						2.0.0		1.50	1			:		:		
3.0-	┧	Shell Fragments	s, Munsell=	5Y 3/1					1	_	_	_				:	_ :	_:				
							LE	GENI)									Cor	ntinue	ed i	Vext	Page
00	0-111 0		LER TYPE	NI C	- 4 = 151					1-"	. 6:			DRILLI								<u> </u>
	Split Spoo Undisturb	on ed Sample	NQ - R CU - C	Rock Core Cuttinas	e, 1-7/8				SA - F FA - C					aers				otary V ock Co				
	Rock Cor			Continuo	us Tube				<u> </u>													



											ount		Cla	ren	don			Boi				7 (Brid	
				01 R					ver Bla	ack R	liver									ute		S-301	
					Bor)ffse						_	nent)n	
							_						1187			Date						2016	
				_	Dept					ore D			0 ft			Date		-	_			2016	
			<u> </u>						gurat	ion		Line					N				Jsed		N
			E 550				_	l						•		omati		ΙE	ner			74%	
ore S	ıze:	N/A			Drille	r:	D. I	Harris			Gro	ound	wat	er:	TOI	B 8	3 ft			24H	iK_	5.5	tt
	scription: US-301 Replacement Bridge over B eo.: R. Wessinger Boring Location: 88.0 ft Latitude: 33.8035154 Long epth: 100 ft Soil Depth: 100 ft Cole Diameter (in): 4 Sampler Configura echine: CME 550 Drill Method: RW ize: N/A Driller: D. Harris												• 8	PT N	VALL	IE •							
ion			.je	9 c	<u>a</u>	be				e		P	L —	N	/C	LL ×							
Elevation (ft)	Very Dense to Dense, Moist, Very Dark Gray, Non-Plastic, Fine <u>SAND (SP)</u> , with Gravel & Shell Fragments, Munsell=5Y 3/1	Graph	Sample Depth	Samr	No./Type	1st 6"	2nd 6"	3rd 6"	N Value	0 10					NT (%) 70 8								
		Very Dense to Dense, Moist, Very Dark Gray, Non-Plastic, Fine <u>SAND (SP)</u> , with Gravel & Shell Fragments, Munsell=5Y 3/1					· ·	(1)		0 10	-20	30	+0	50 00	10 0	50 30							
			tic, Fi	ine <u>SA</u>	ND (SF	2), wit	:h 2/1		l								:	:	:		:		
1	- Vo	Graver	a Shell i	-rayıı	ienis,	iviurise	10-01	3/ I			1						:	:	:	:	: :		
-										88.5	5						:						
-											SS	S-21	19 5	0/2.5	"	100+				:			
-2.0									H									:	:	:			
-											1							:	:	:		:	
4	Geo.: F								H		4							:	:	:			
	Description: US- //Geo.: R. Wessinger : 88.0 ft Latit I Depth: 100 ft Hole Diameter (in): Machine: CME 550 Size: N/A Very Dense to Gray, Non-Pla Gray, Non-Pla Gravel & She																:	:	:		:		
	Description: US-301 Replacement Bridge over IGeo.: R. Wessinger Boring Location:	ell=5Y	4/1				93.5	⁵						1	:	:	:		:				
1				SS	S-22	22	18	17	35			•)		:								
-7.0	88.0 ft										+						1	:	- :	:		- :	
4											4							:	:	:			
																	:	:	:	:	: :	:	: :
										l								:	:	:			
1	98.5								H	98.5	5							:	:				
-	-	Dense, Plastici	Moist, E ity Clave	Dark (Olive G	Gray, Lo)W				SS	S-23	13	20	23	43		:	:	•		:	
-12.0	100.0				0 0/ 114	D (00)	.,	/	H	!	+						- :	- :	- :	:	: :		
		Boring	Termina	ted at	100.0	feet												:		:		:	
																		:	:				
1	_										1							:	:	:			
+	+										\dashv						:	:	:	:	: :	:	: :
_	_										4							:	:	:			
17.0																			:	:		:	
-17.0	7																	:	:				
+	+										+							:	:	:		:	
4	4										+							:	:	:		:	
																		:	:	:			:
																		:	:	:		:	
1	1										1							:	:	:		:	
-22.0	+										+						1	- :	- :	:		- :	
4	-										-							:	:	:		:	
																		:	:				
																		:	:	:			
4	7										1							:		:			
																		:	- :	•	: :	:	<u>: :</u>

SS - Split Spoon NQ - Rock Core, 1-7/8"
UD - Undisturbed Sample CU - Cuttings
AWG - Rock Core, 1-1/8" CT - Continuous Tube

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing



Project								unty:	Cla	rend	lon		В	oring				ge
Site Description: US-301 Replacement Bridge over Bl							ack R	iver							ute:		-301	
ng./G	eo.: R	. Wessinger	Во		ocation				Offse	t:			Δ	lignm	ent:	0	n	
lev.:	88.3 f	Latitu	de:	33.80	030499	Longit	ude:	80.	1190	712	Da	ate St	arte	d:	1	1/7/2	016	
otal D			Soil Dep		88.5 f			epth:	0 ft			ate C	omp	leted:		1/8/2	_	
ore H	ole Dia	meter (in):	4	Sam	pler Cor	nfigurati	on	Line	er Re	quir	ed:	Υ	N		er U			(
	chine	CME 550	Drill	Metho	od: R	V		Hamm		•	Autor	natic		Ener	gy Ra	atio:	74%	
ore Si	ize:	N/A	Drille	er:	D. Har	ris		Ground	dwat	er:	ТОВ	8 f	t		24HF	₹	4.8 ft	i
														• S	PT N \	/ALUE	•	
uc	_					ပ္ပ	ө с	e e				<u>o</u>		PL	MO		LL —×	
Elevation (ft)	Depth (ft)	MATER	RIAL DES	CRIPT	TION	Graphic Log	Sample Depth	Sample No./Type	- -		<u>.</u>	N Value		^			, ,	
Ele	□ 0.0	Asphalt Roadwa				6	Sa	S _S S	1st 6"	2nd 6"	3rd 6"	ź	10 3	▲ FIN 20 30				۱ (
_	0.5_	<u>∖ASPHALT</u> (6.0"				/ 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	0.5	<u> </u>					10 2	0 30	+0 50	:	70 00	
_	_	FILL	•				2.0		4	7	6	13	•			:		
	_	Medium Dense	to Loose, N	∕loist, S	strong		4.0	SS-2	3	3	4	7	•	4	th 6" =	5 Blov	NS	
83.3	5.0	▼Brown, None to Medium SAND	Low Plasti	city, Sil	ty Fine to			SS-3	5	7	8	15	•	4	th 6" =	8 Blov	ws :	
-	_	\	<u>(3141)</u> , 1VIUN	0. 1–136 – – – –			6.0	SS-4	5	3	4	7		1	th 6" =	3 🗀 🖰	NC.	
7	=	ZALLUVIUM					8.0	-	5	J	7		•	: :	: :	:	: :	
78.3	_	Medium Dense Brown, None to						SS-5	2	1	1	2	- 0	▲ 4	th 6" =	1 Blov	N	
10.3	=	Medium SAND	(<u>SM</u>), Mun	sell=2.5	5Y 5/4			-										
+	-	=> Very Loose,	Wet, with	Organic	cs		46-						:			:		
1	13.5	¬ NMC=15.0%, %		-			13.5	SS-6	1	2	4	6		. ××	,			
73.3	-	Firm Wet Ligh	t Olivo Pro			,		100-0	'				- :	. / . /		- :		_
]	_	Firm, Wet, Ligh SILT (ML), with				',		1								:		
+	18.5	LL=34, PL=24,					18.5	-					:					
68.3	_	%#200=74.1				_/ //		SS-7	8	7	8	15	•			:		
-	_	Medium Dense						4					:			•		
	_	Medium Plastici	ity, Fine to	Coarse			22.5									:		
4	24.5	(<u>SP-SC)</u> , with 0 Munsell=2.5Y 7	Jay a Oiga 73	ai IICS,			23.5	SS-8	9	3	3	6	: Då (: X		:		
63.3	_	\LL=35, PL=24,		C=20.1	%,				_	-	-+		:	: :	: :	:	: :	
]	_	\%#200=10.3				_'		4					;			;		
-	_	BLACK MINGO					28.5		_									
58.3	=	Firm to Stiff, Wo						SS-9	2	5	4	9	•	<u> </u>	₩ :	A :	<u> </u>	
-	-	Munsell=5GY 4		-can <u>Cl</u>	<u>-AI (UL)</u> ,			_										
7	24.0	=> Dark Greeni	sh Grav. M	lunsell=	5GY 4/1		33.5	;-					:			;		
<u> </u>	34.0_	LL=34, PL=19,				14///		SS-10	3	5	6	11	•			:		
53.3	_	\%#200=54.4	•		-			1								:		
-	-	Stiff to Very Stif					00 -	<u></u>					:					
]	39.5 [–]	Low Plasticity, (38.5	SS-11	3	6	16	22		•		:		
48.3	-	Medium Dense							<u> </u>		+		:			:	: :	
]	_	Greenish Gray, SAND (SP), Mic						7					:			:		
-	-	•					43.5						:			:		
43.3	_	=> with Glaucor Laminations	nite, Lignite	, and C	ıay			SS-12	5	9	16	25	:	•	: :	:	: :	
	_							+					:		1 1	:		
]	_						48.5	.]					:		: :	;		
-	_							SS-13	6	16	20	36	:			:		
38.3	_							1										
4	-							+					:					
=	_						53.5						:	: :	Confi	: nua a	1 1 1 - 1 - 4	
		SAMD	LER TYPE			LE	GENI	,			DBI	LLING	METI		JUNTII	iuea	Next	_
	Split Spo	on	NQ - R		e, 1-7/8"			SA - Hollo			er		RW	- Rota				
		ed Sample e, 1-1/8"	CU - C		us Tube			A - Conti C - Drivir			Auger	5	RC	- Roc	r core			



Project		/A)II 1 C 3							Co	unty:		larer	ndon			Boı	rina	Nο	.: R	-8 (F	Brido	je 1)
Site De			US-3	01 F	Renlac	reme	nt Bri	dae o	ver Bla				nai ci	14011					ute		S-30		<u>,c 1)</u>
Eng./G				011			Loca		VCI DI	201(1)		Off	ent:				Δli	gnm			On	-	
Elev.:			Latitu	do.			30304		Longi	tudo:	80		9071	2	Date	Star		_	CIII	_	/201	6	
					il Don					ore D													
Total Depth: 88.5 ft Soil Depth: 88.5 ft Bore Hole Diameter (in): 4 Sampler Config									: 0 ft Liner Required			Date Comp			•			1/8/2016					
				4					gurat	ion				_	_	<u>N</u>				Use	-	Υ	<u>N</u>
Drill Ma			1E 550		Drill			RW			Hamn			_			E				o: 7		
Core Si	ze:	N/A			Drille	er:	D.	Harris	3		Grou	ndw	ater:	ТО	B	8 ft			24ŀ	HR	4	.8 ft	
																		• s	PT N	N VALUE		•	
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION					Graphic Log	Sample Depth	Sample No./Type	:		o	N Value		>	PL X				LL ×			
Ë										Ō			3rd	z	0 10		▲ FIN 20 30					90	
33.3	-	Very Dense to Dense, Wet to Moist, Dark Greenish Gray, Non-Plastic, Fine <u>SAND</u> (<u>SP</u>), Munsell=5Y 5/1									SS-14	4 8	23	40	63					:	•		
- -	-	 ,								58.5	- ;-						:		:			:	-
28.3											SS-15	5 17	27	28	55		:		:	•		:	
	-									63.5	- <u> </u> -												: -
23.3	=										SS-16	3 16	3 29	48	77		:	:				•	
- -	=									68.5	- - -												-
18.3	=	=> Ver 3/1	ry Dark C	Greer	nish Gra	ay, Mu	ınsell=	10Y			SS-17	7 9	13	21	34			•				:	
- -	-									73.5													: -
13.3											SS-18	3 7	45	50/3	95+		- :						•
- 	78.5									78.5													: -
8.3		Very D	STONE Dense, W	et to	Moist,	Very	Dark) (CD)]	SS-19	9 5	6	50/2	56+		:	:	:	•		:	
	83.5	(Stron	ish Gray, g HCl Re	eactiv	vity), Mu	unsell=				83.5	- - SS-2(50/0 .	5"	100+								>>
3.3]	·	mented L													<u> </u>				-			
-1.7- -6.7- -11.7- -16.7-	88.5	Non-P	Dense, M lastic, <u>Gl</u> ell=5Y 7/1	RAVI				,		88.5	- - -												: - : -
-1.7 <i>-</i>	-	Boring	Termina	ted a	at 88.5'	Due t	o Refu	sal		00.0	'_ - SS-2 ' -		50/0.2	25"	 100+			:	:				:>> <u>•</u>
	-										_						:	:				:	-
-6.7 -	-																:	:	:			:	
	-										-												: -
-11.7 -	1																:	:	:	:			
	-										_								:				: -
-16.7 - -	-																:		:			:	: -
									LF	GENI)				1	<u> </u>	•	-	•	-	-	•	-
SS - S UD - L	Split Spoo	ed Samp			TYPE NQ - R CU - C	uttings	3			HS CF	SA - Holl FA - Cor	ntinuo	us Flig	iger	ORILLIN gers	R	:W -	D Rota Roc					
AWG - F	Rock Core	e, 1-1/8"			CT - C	ontinu	ous Tu	be		DC	C - Driv	ring C	asing										



Cone Penetrometer Log Cover Page

Test Methods:

F&ME performs in-situ testing in general accordance with the currently published ASTM preedures along with generally acceptable industry practices. Applicable procedures include:

• Piezo Cone Penetration Tests (CPTu): D5778

Instrumentation

- All of F&ME's probes are manufactured and are calibrated at least annually by Vertek.
- The equipment used for the exploration includes electronic VTK 10 cm² digital cones.

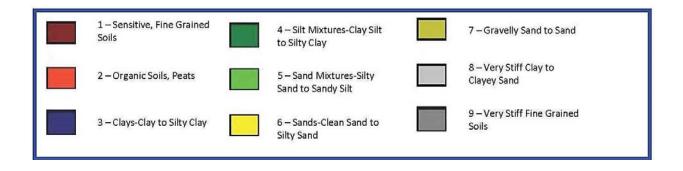
Rig

• F&ME uses a CME 45B drill rig to advance the cones.

Software

• F&ME uses Bentley's, gINT and Dataforensic's, RapidCPT to process and output the raw data collected.

SBT Material Correlations Legend (Robertson and Campanella: 1990)



Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-1

Project No. : G5500.08

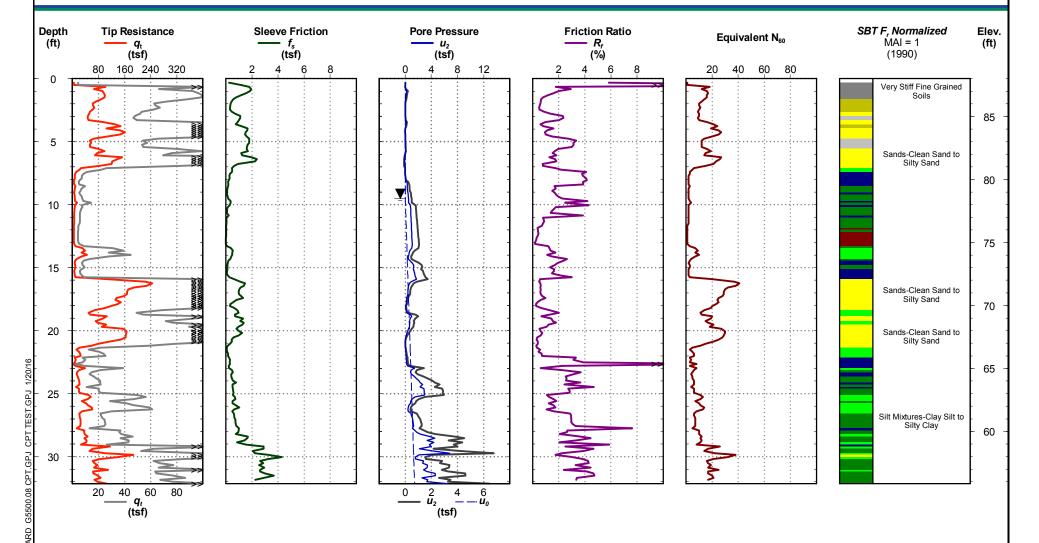
Date: Jan. 8, 2016 Estimated Water Depth: 9.5 ft

Rig/Operator: P. Hainer

Latitude: 33.8172793 Longitude: 80.1071279 Elevation: 88.0MSL

Total Depth: 32.2 ft **Termination Criteria:** Maximum Reaction Force

Cone Size:



Electronic File Name: G5500.08 - US-301 RBO Black River.

Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-2

Project No. : G5500.08

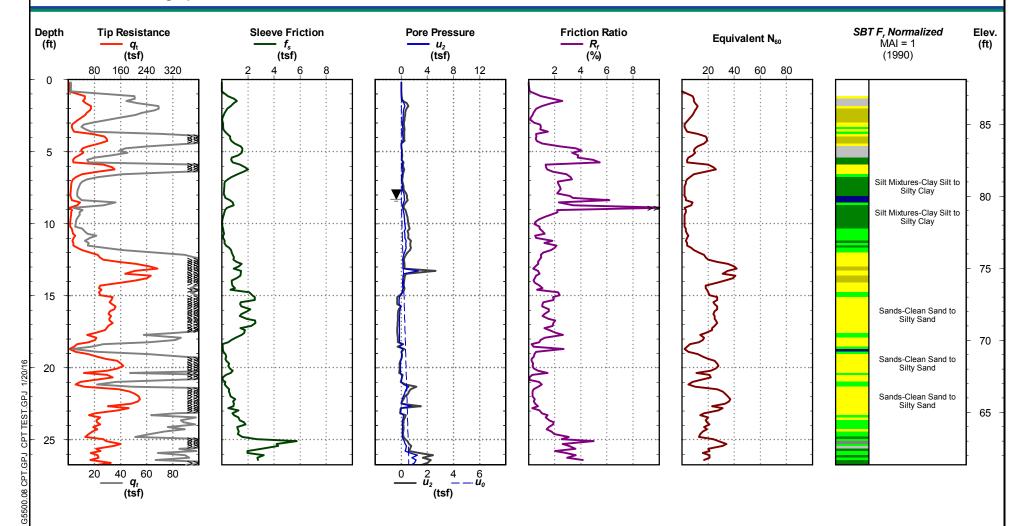
Date: Jan. 8, 2016 Estimated Water Depth: 8.3 ft

Rig/Operator: P. Hainer

Latitude: 33.8169738 Longitude: 80.1073829 Elevation: 88.1MSL

Total Depth: 26.7 ft **Termination Criteria:** Maximum Reaction Force

Cone Size:



Page 1 of 1

Electronic File Name: G5500.08 - US-301 RBO Black River

Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-3

Project No. : G5500.08

Date: Jan. 9, 2016 Estimated Water Depth: 8.9 ft

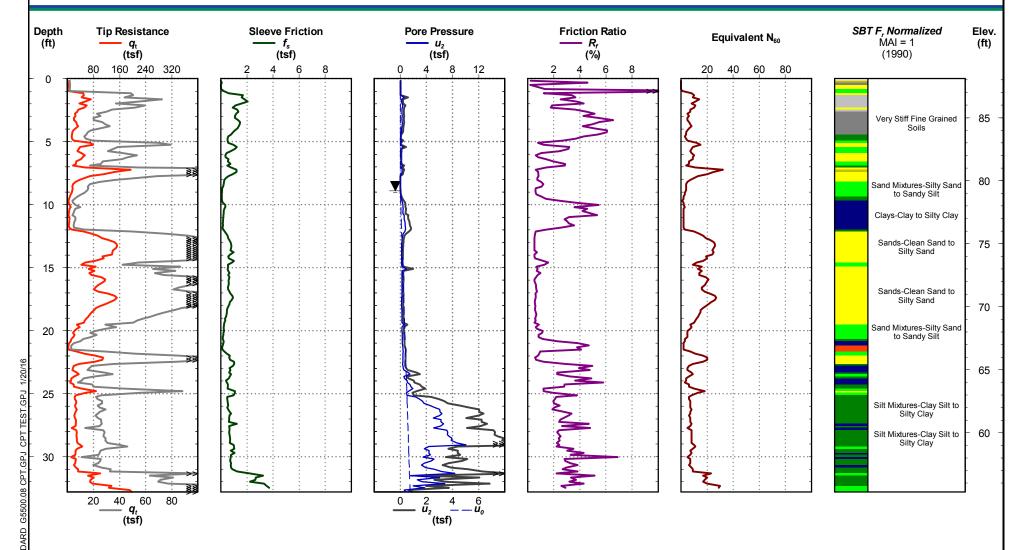
Rig/Operator: P. Hainer

Latitude: 33.8129255 Longitude: 80.1107829 Elevation: 88.1MSL

Total Depth: 32.8 ft

Termination Criteria: Maximum Reaction Force

Cone Size:



Page 1 of 1

Electronic File Name: G5500.08 - US-301 RBO Black River CPT-3.

Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-4

Project No. : G5500.08

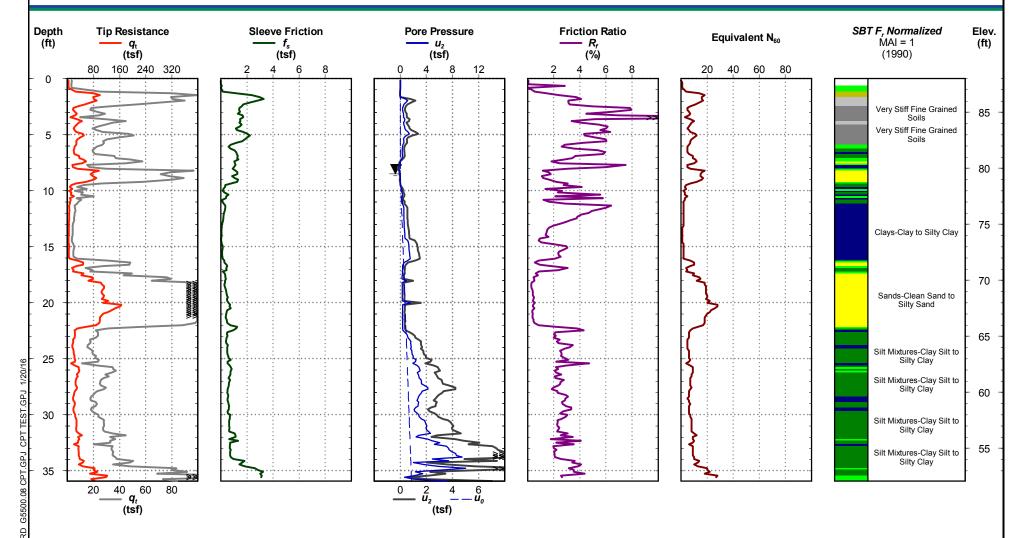
Date: Jan. 9, 2016 Estimated Water Depth: 8.5 ft

Rig/Operator: P. Hainer

Latitude: 33.8126172 Longitude: 80.1110418 Elevation: 88.0MSL

Total Depth: 35.9 ft **Termination Criteria:** Maximum Reaction Force

Cone Size:



Page 1 of 1

Electronic File Name: G5500.08 - US-301 RBO Black River

Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-5

Project No. : G5500.08

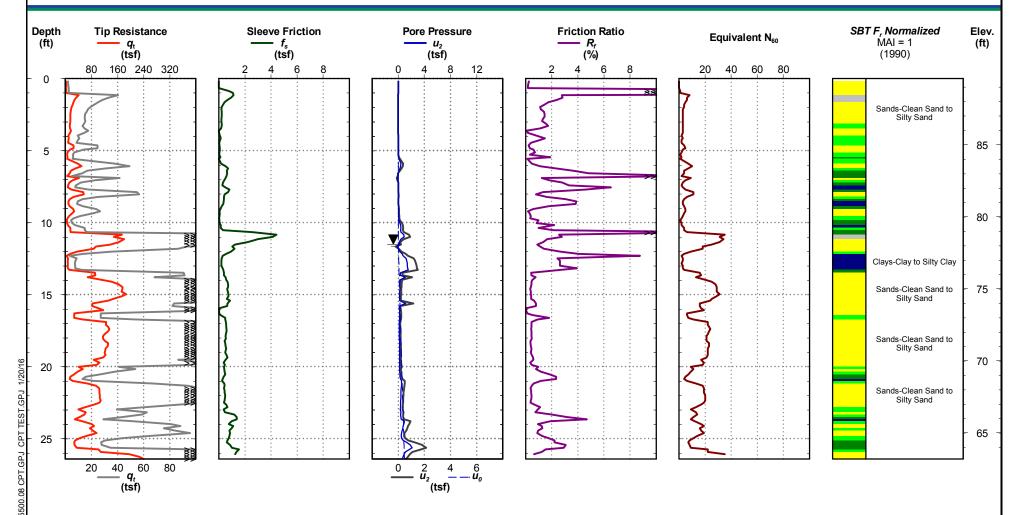
Date: Jan. 9, 2016 Estimated Water Depth: 11.5 ft

Rig/Operator: P. Hainer

Latitude: 33.8096302 Longitude: 80.1135477 Elevation: 89.6MSL

Total Depth: 26.4 ft
Termination Criteria: Maximum Reaction Force

Cone Size:



Page 1 of 1

Electronic File Name: G5500.08 - US-301 RBO Black River

Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-6

Project No. : G5500.08

Date: Jan. 9, 2016 Estimated Water Depth: 10.2 ft

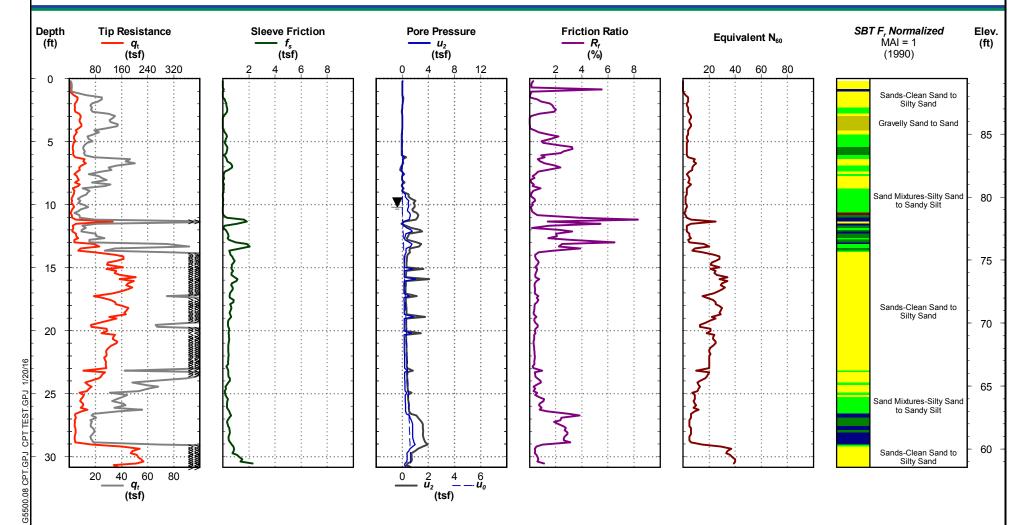
Rig/Operator: P. Hainer

Latitude: 33.8087053 Longitude: 80.1143738 Elevation: 89.4MSL

Total Depth: 30.8 ft

Termination Criteria: Maximum Reaction Force

Cone Size:



Page 1 of 1

Electronic File Name: G5500.08 - US-301 RBO Black River CPT-6.



Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-7

Project No. : G5500.08

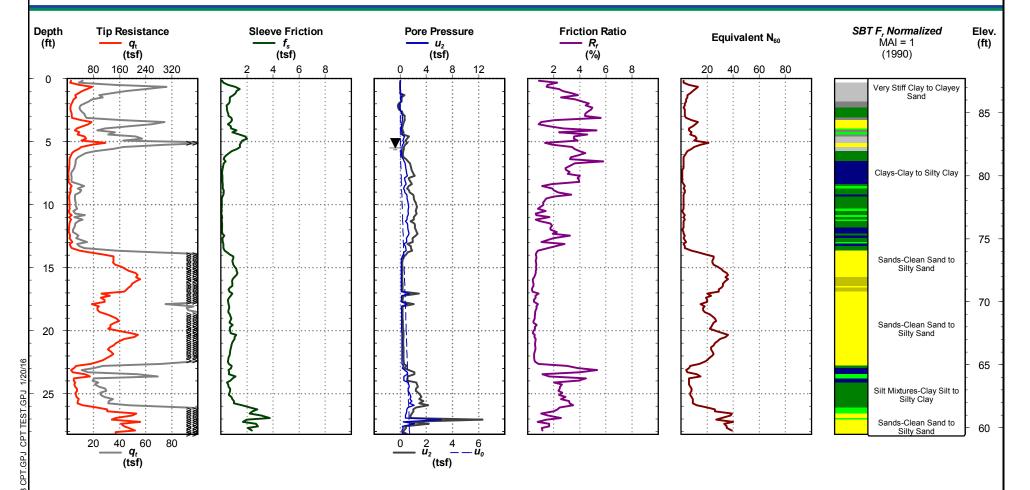
Date: Jan. 9, 2016 Estimated Water Depth: 5.5 ft

Rig/Operator: P. Hainer

Latitude: 33.8034961 Longitude: 80.1186991 Elevation: 87.7MSL

Total Depth: 28.2 ft **Termination Criteria:** Maximum Reaction Force

Cone Size:



Page 1 of 1

Electronic File Name: G5500.08 RBO Black River CPT-7.2

F&ME CONSULTANTS

Emergency Bridge Package 5 Clarendon County (South Carolina)

Cone Penetration Test

CPT-8

Project No. : G5500.08

Date: Jan. 9, 2016 Estimated Water Depth: 4.7 ft

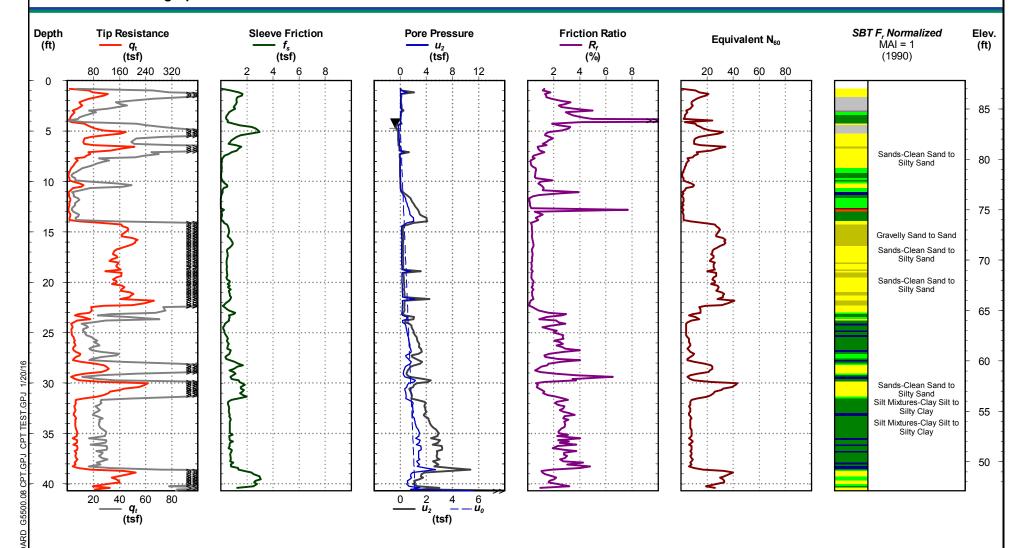
Rig/Operator: P. Hainer

Latitude: 33.8030652 **Longitude:** 80.1191101 **Elevation:** 87.8MSL

Total Depth: 40.7 ft

Termination Criteria: Maximum Reaction Force

Cone Size:



APPENDIX C

Laboratory Test Results





PAGE 1 OF 1



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

					PRO	JECT COUN	TY Clarendo	on			
Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class- ification	Water Content (%)	Dry Density (pcf)	Satur- ation (%)	Void Ratio
B-1 (Bridge 4)	10.0	31	27	4	0.075	51	ML	65.3			
B-1 (Bridge 4)	20.0				0.075	10	SP-SM	26.8			
B-1 (Bridge 4)	30.0				0.075	1ĺ	SM	27.3			
B-1 (Bridge 4)	65.0				0.075	22	SM	29.3			
B-2 (Bridge 4)	10.0	22	14	8	0.075	43	SC	21.7			
B-2 (Bridge 4)	15.0	33	23	10	0.075	65	CL	52.6			
B-2 (Bridge 4)	25.0				0.075	25	SM	37.9			
B-2 (Bridge 4)	30.0				0.075	57	CL	ÍHĒ			
B-2 (Bridge 4)	40.0	53	29	24	0.075	86	MH	60.3			
B-3 (Bridge 3)	15.0				0.075	3	SP	20.9			
B-3 (Bridge 3)	20.0				0.075	1	SP	21.9			
B-3 (Bridge 3)	25.0				0.075	23	SM	25.I			
B-3 (Bridge 3)	30.0	49	33	16	0.075	86	ML	41.9			
B-3 (Bridge 3)	45.0	39	22	17	0.075	67	CL	49.3			
B-4 (Bridge 3)	10.0				0.075	24	SC	12.9			
B-4 (Bridge 3)	15.0	65	62	3	0.075	55	MH	132.4			
B-4 (Bridge 3)	20.0				0.075	4	SP	18.7			
B-4 (Bridge 3)	35.0	89	39	50	0.075	97	MH	40.9			
B-5 (Bridge 2)	20.0				0.075	1	SP	20.9			
B-5 (Bridge 2)	55.0	40	17	23	0.075	71	CL	49.7			
B-6 (Bridge 2)	20.0				0.075	2	SP	25.0			
B-6 (Bridge 2)	30.0	62	43	19	0.075	75	MH	44.7			
B-6 (Bridge 2)	40.0	67	46	21	0.075	82	MH	44.2			
B-7 (Bridge 1)	10.0				0.075	33	SM	22.2			
B-7 (Bridge 1)	15.0				0.075	25	SM	39.3			
B-7 (Bridge 1)	25.0				0.075	37	SM	34.8			
B-7 (Bridge 1)	35.0	62	45	17	0.075	88	MH	51.9			
B-8 (Bridge 1)	10.0				0.075	24	SM	14.9			
B-8 (Bridge 1)	15.0	34	24	10	0.075	74	ML	41.8			
B-8 (Bridge 1)	25.0	35	24	11	0.075	10	SP-SC	20.1			
B-8 (Bridge 1)	30.0	34	19	15	0.075	54	CL	38.8			

LAB SUMMARY G5500.08 - US301 RBO BLACK RIVER GPJ GINT STD US LAB.GDT 1/21/16

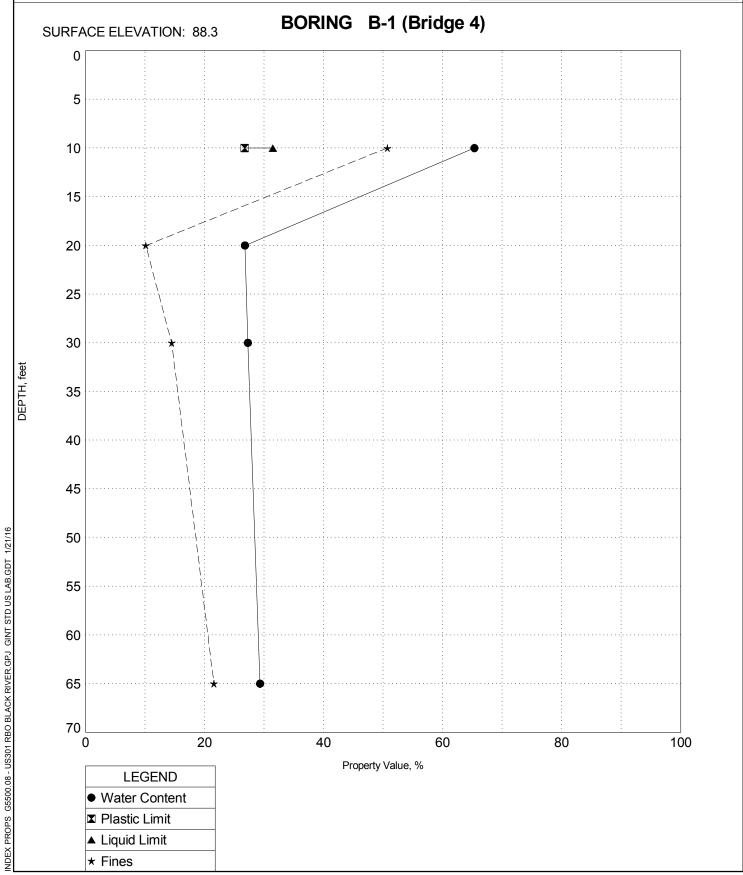


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

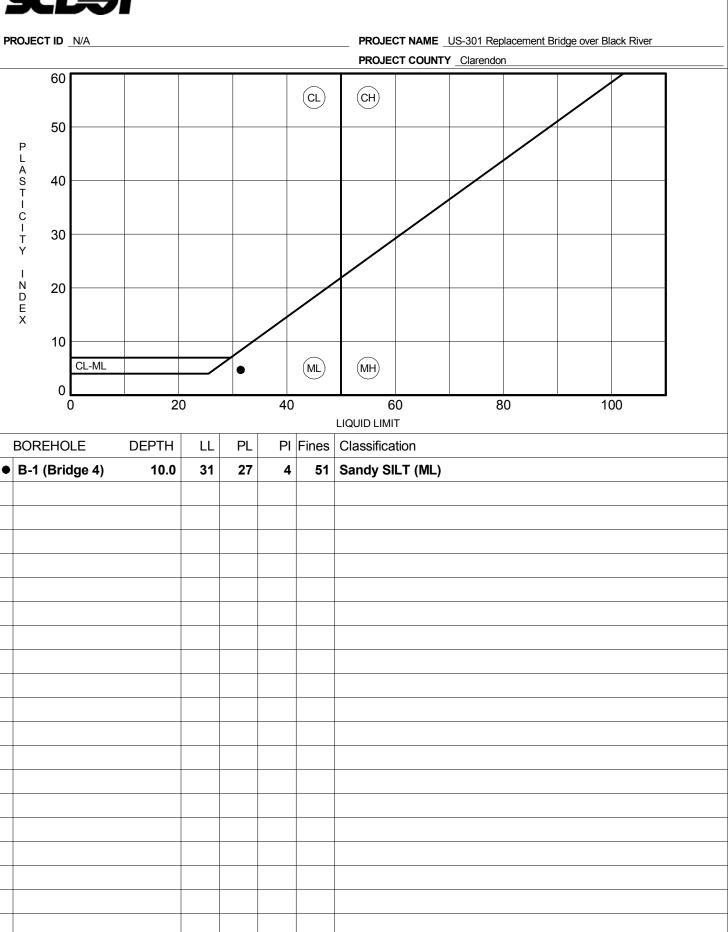
PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS



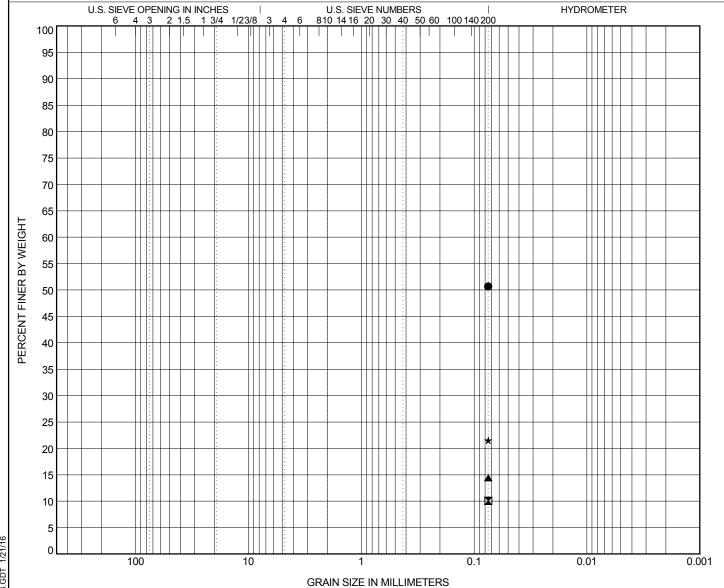
GRAIN SIZE DISTRIBUTION



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



CORRIES	GRA	VEL		SAND		
COBBLES	coarse	fine	coarse	medium	fine	SILT OR CLAY

-										
BOREHOLE DEPTH			LL	PL	PI	Сс	Cu			
● B-1 (Bridge 4) 10.0		S	andy SILT (ML)		31	27	4		
I B-1 (Bridge 4) 20.0		SANI	D (SP-SM), v	with Silt						
B-1 (Bridge 4) 30.0		S	Silty SAND (SM)						
■ B-1 (Bridge 4) 20.0 ■ B-1 (Bridge 4) 30.0 ★ B-1 (Bridge 4) 65.0 BOREHOLE DEPTH		S								
BOREHOLE DEPTH	D100	D95	D50	D10	%Gravel	%Sand	ı	%Silt	%	Clay
A D 1 (Dridge 1) 10 0	0.075								50.7	
I B-1 (Bridge 4) 20.0	0.075							•	10.1	
B-1 (Bridge 4) 10.0 B-1 (Bridge 4) 20.0 B-1 (Bridge 4) 30.0 B-1 (Bridge 4) 65.0	0.075	0.075						•	14.5	
* B-1 (Bridge 4) 65.0	0.075							2	21.5	

GINT STD US LAB.GDT 1/21/16

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US	3-301 Replacement Bridge	over Black River		PROJECT NO.:	G5500.08
SAMPLE NUMBER:	16-0	0001	DATE SAI	MPLE RECEIVED:	1/13/2016
DESCRIPTION OF SOIL:			VARIOUS	_	
TESTED BY:	MB		D .	ATE OF TESTING:	1/13/2016
			DAT	TE OF WEIGHING:	1/14/2016
				_	
BORING NO.	B-1	B-1	B-1	B-1	
SAMPLE NO.	16-0001C	16-0001E	16-0001G	16-0001I	
SAMPLE DEPTH	8.0-10.0'	18.5-20.0'	28.5-30.0'	63.5-65'	
WATER CONTENT,	W% 65.3	26.8	27.3	29.3	
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT,	W%				
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT,	W%				
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATED CONTENT	VX /0/				

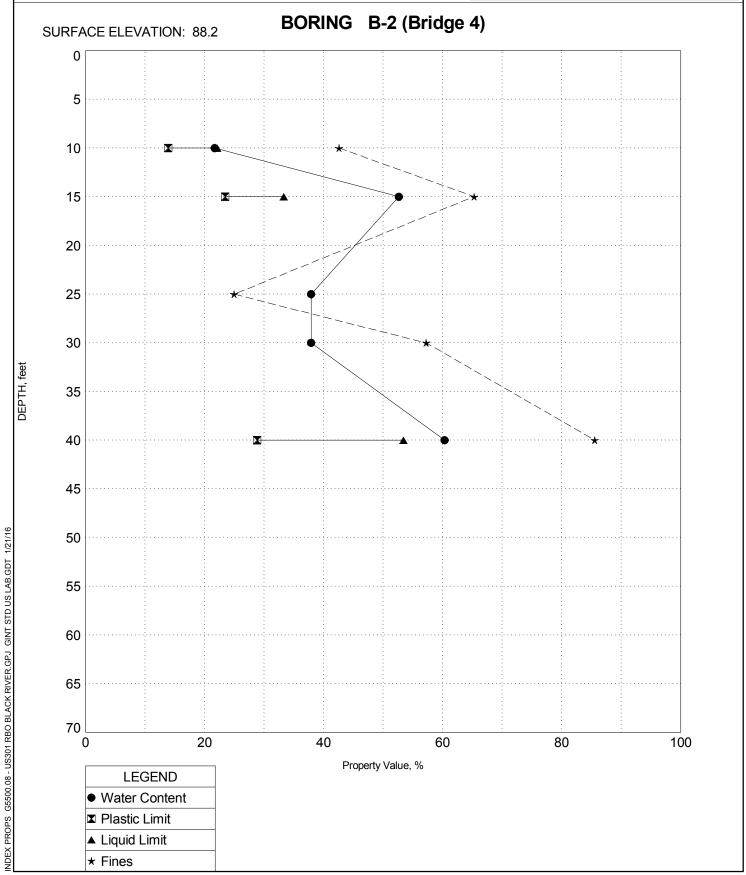


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS

PROJECT ID N/A PROJECT NAME US-301 Replacement Bridge over Black River PROJECT COUNTY Clarendon 60 (CL) (CH) 50 P L A S T I 40 C I T Y 30 N D E X 20 10 CL-ML (ML) (MH) 0 20 40 60 80 100 LIQUID LIMIT PI Fines **BOREHOLE DEPTH** LL PL Classification ● B-2 (Bridge 4) 10.0 22 14 8 43 Clayey SAND (SC) 65 Sandy Lean CLAY (CL) **■** B-2 (Bridge 4) 15.0 33 23 10 ▲ B-2 (Bridge 4) **ELASTIC SILT (MH)** 40.0 53 29 24

GRAIN SIZE DISTRIBUTION

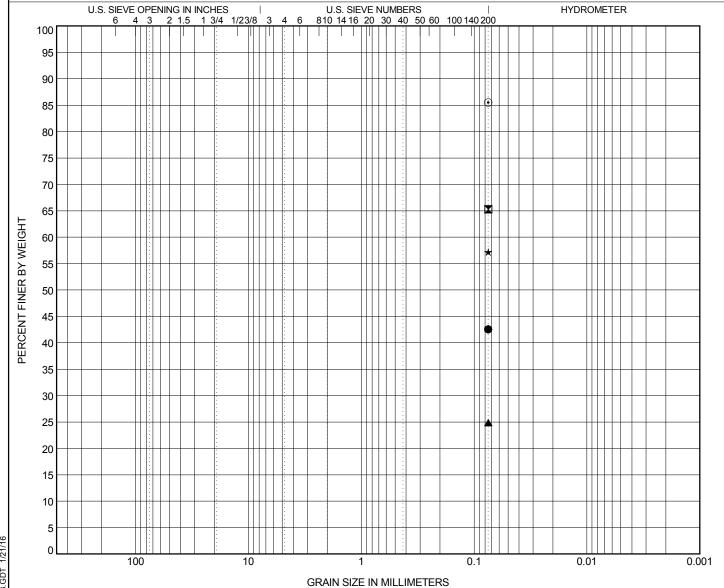
85.5



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



COPPLES	GRA	VEL		SAND)	SILT OR CLAY
COBBLES	coarse	fine	coarse	medium	fine	SILT OR CLAT

N 0	BOREHOLE DEPTH		Classification						PI	Сс	Cu
GP.	B-2 (Bridge 4) 10.0		CI	22	14	8					
RBO BLACK RIVER	B-2 (Bridge 4) 15.0		Sand	dy Lean CLA	AY (CL)		33	23	10		
Ϋ́	B-2 (Bridge 4) 25.0		S	ilty SAND (SM)						
BLA	B-2 (Bridge 4) 30.0		Sand	dy Lean CLA	AY (CL)						
RBC	B-2 (Bridge 4) 40.0		EL	ASTIC SILT	(MH)		53	29	24		
US301	BOREHOLE DEPTH	D100	D95	D50	D10	%Gravel	%Sand	1	%Silt	%(Clay
	B-2 (Bridge 4) 10.0	0.075								42.6	
G5500.08	B-2 (Bridge 4) 15.0	0.075	.075							65.3	
ان ایا	B-2 (Bridge 4) 25.0	0.075	0.075							24.9	
IN SIZE	B-2 (Bridge 4) 30.0	0.075	.075							57.2	

1 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

B-2 (Bridge 4) 40.0

0.075

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US-301 F	Replacement Bridge	over Black River		PROJECT NO.:	G5500.08
SAMPLE NUMBER:	16-0	0002	DATE SA	MPLE RECEIVED:	1/13/2016
DESCRIPTION OF SOIL:			VARIOUS	_	
TESTED BY:	MB		D.	ATE OF TESTING:	1/13/2016
			DAT	TE OF WEIGHING:	1/14/2016
BORING NO.	B-2	B-2	B-2	B-2	B-2
SAMPLE NO.	16-0002C	16-0002F	16-0002H	16-0002J	16-0002M
SAMPLE DEPTH	8.0-10.0'	13.5-15.0'	23.5-25.0'	28.5-30.0'	38.5-40.0'
WATER CONTENT, W%	21.7	52.6	37.9	53.7	60.3
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT W%					

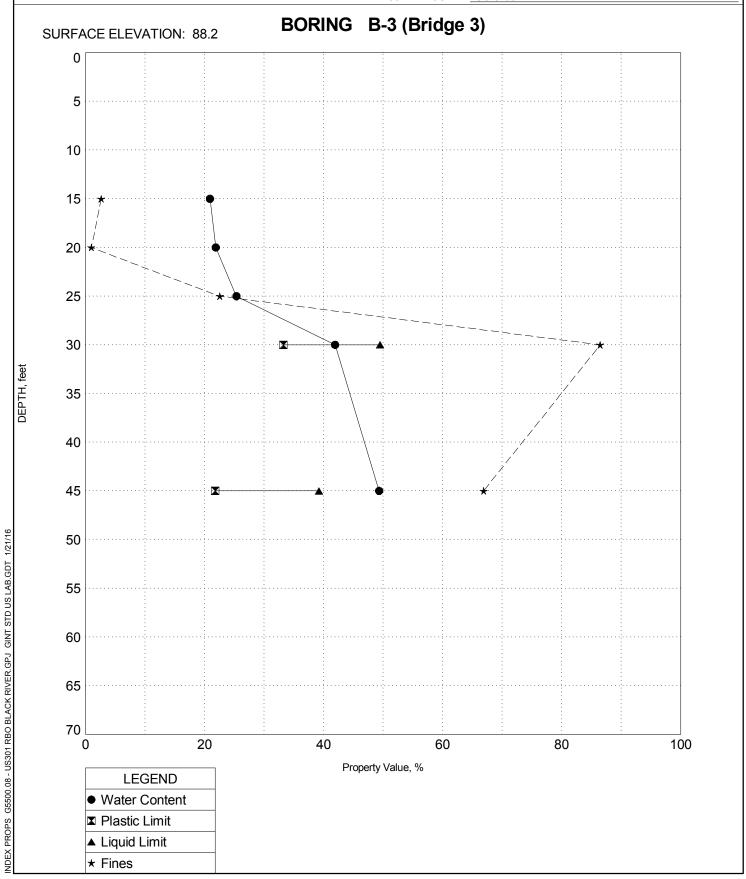


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

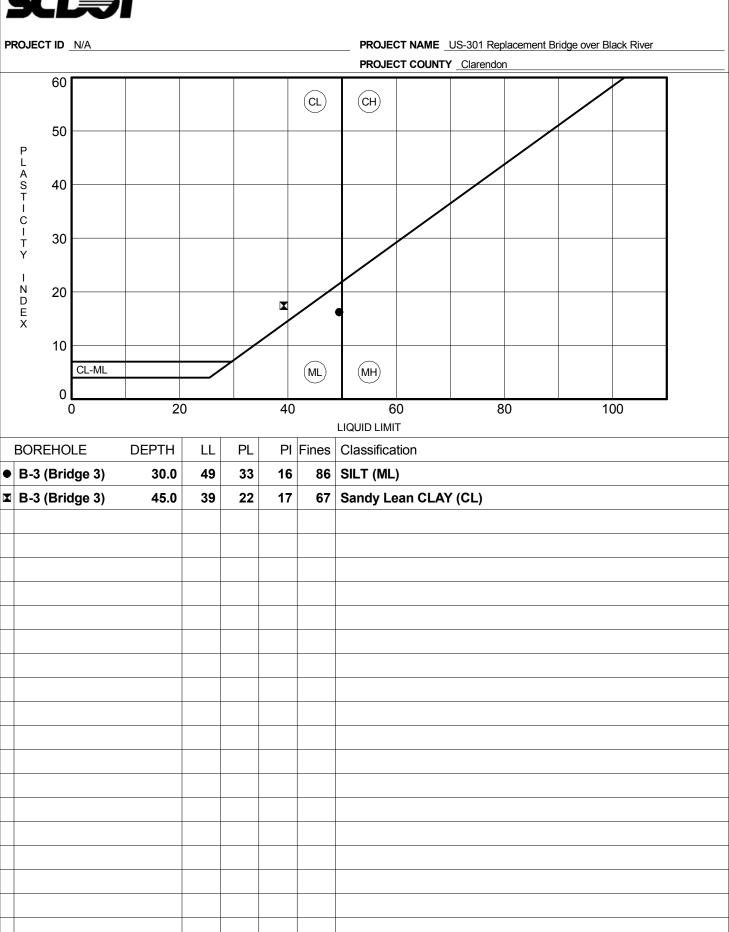
PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS



GRAIN SIZE DISTRIBUTION

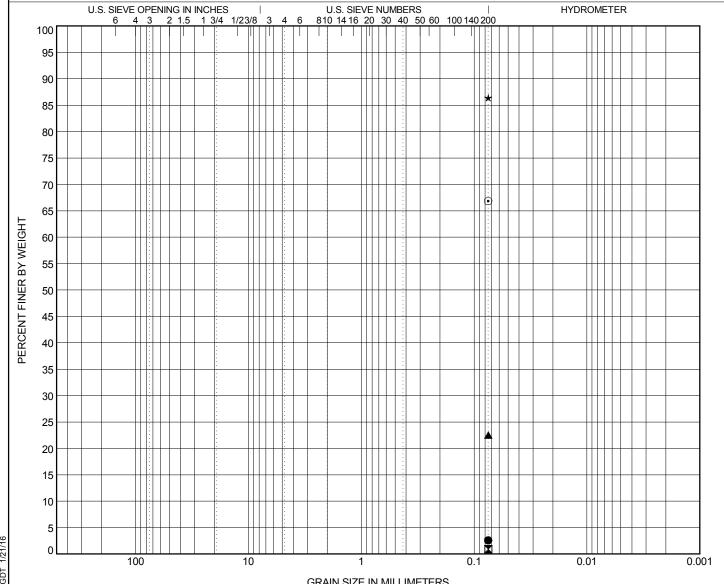
66.9



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



GRAIN SIZE IN MILLIMETERS

CORRIES	GRA	VEL		SAND)	SILT OR CLAY
COBBLES	coarse	fine	coarse	medium	fine	SILT OR CLAT

_												
E	BOREHOLE I	DEPTH			LL	PL	PI	Сс	Cu			
•	B-3 (Bridge 3)	15.0										
	B-3 (Bridge 3)	20.0										
● ★ •	B-3 (Bridge 3)	25.0		5								
*	B-3 (Bridge 3)	30.0			49	33	16					
		45.0		San	dy Lean CLA	AY (CL)		39	22	17		
E	BOREHOLE I	DEPTH	D100	D95	D50	D10	%Gravel	%Sand		%Silt	%	Clay
•	B-3 (Bridge 3)	15.0	0.075								2.6	
	B-3 (Bridge 3)	20.0	0.075	0.075						1.0		
E ● ■ ★	B-3 (Bridge 3)	25.0	0.075				22.5					
*	B-3 (Bridge 3)	30.0	0.075							8	36.4	

RIVER.GPJ GINT STD US LAB.GDT 1/21/16

B-3 (Bridge 3) 45.0

0.075

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT:	US-301 R	eplacement Bridge	over Black River		PROJECT NO.:	G5500.08
SAMPLE NUMBE	R:	15-2	2098	DATE SA	MPLE RECEIVED:	1/13/2016
DESCRIPTION OF SOIL:				VARIOUS	-	
TESTED BY:		MB		D	ATE OF TESTING:	1/13/2016
				DAT	TE OF WEIGHING:	1/14/2016
BORING NO.		B-3	B-3	B-3	B-3	B-3
SAMPLE NO.		15-2098B	15-2098D	15-2098F	15-2098I	15-2098L
SAMPLE DEPTH		13.5-15.0'	18.5-20.0'	23.5-25.0'	28.5-30.0'	43.5-45.0'
WATER CONTEN	T, W%	20.9	21.9	25.4	41.9	49.3
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTEN	T, W%					
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTEN	T, W%					
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATED CONTENT	T 13/0/					

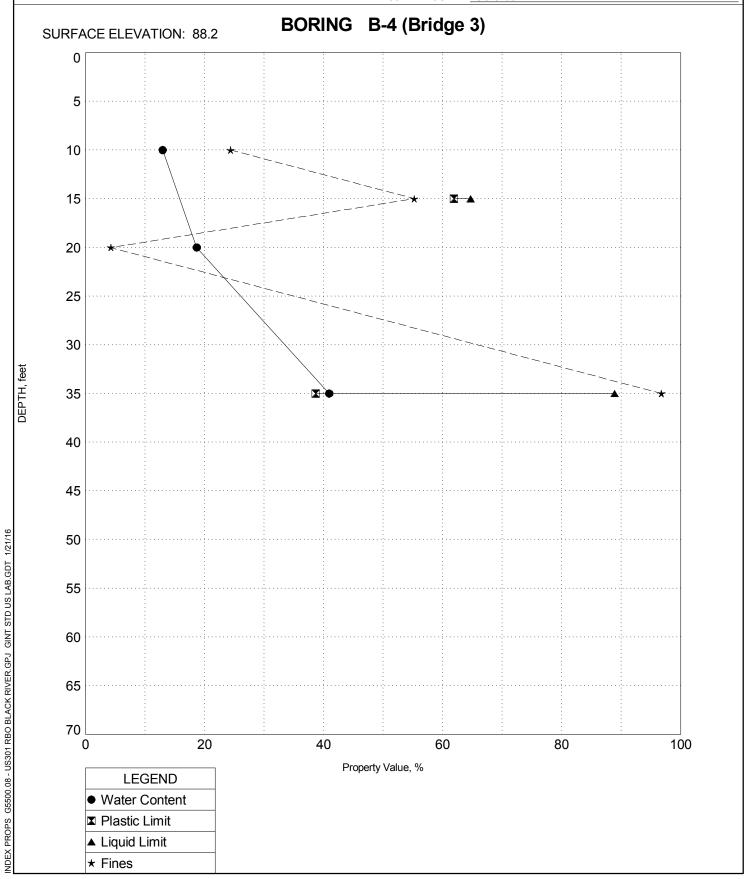


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

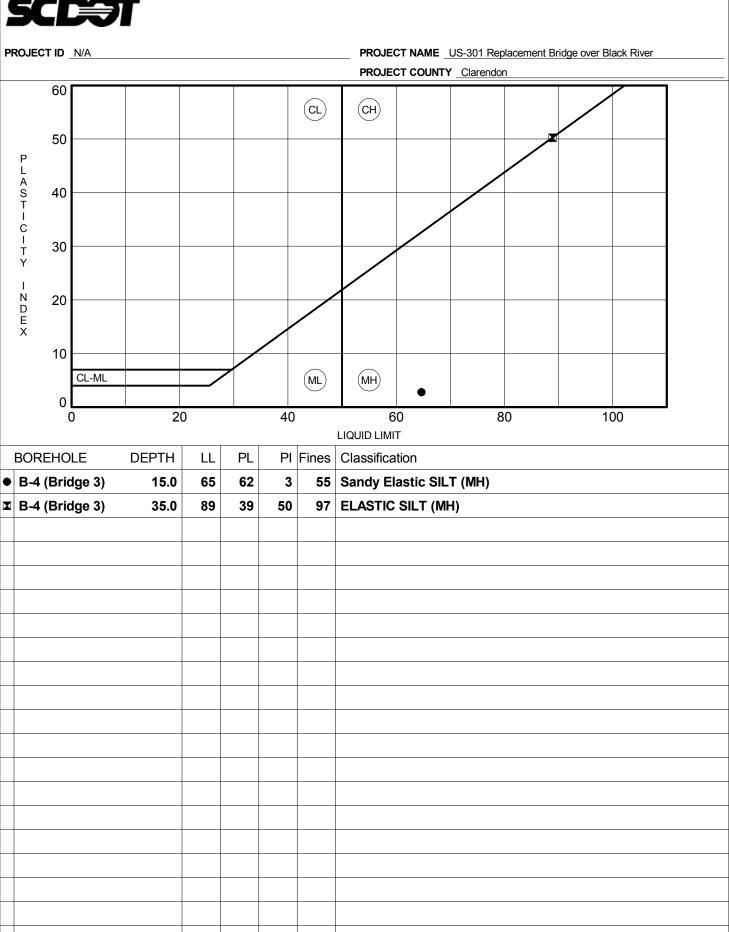
PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS



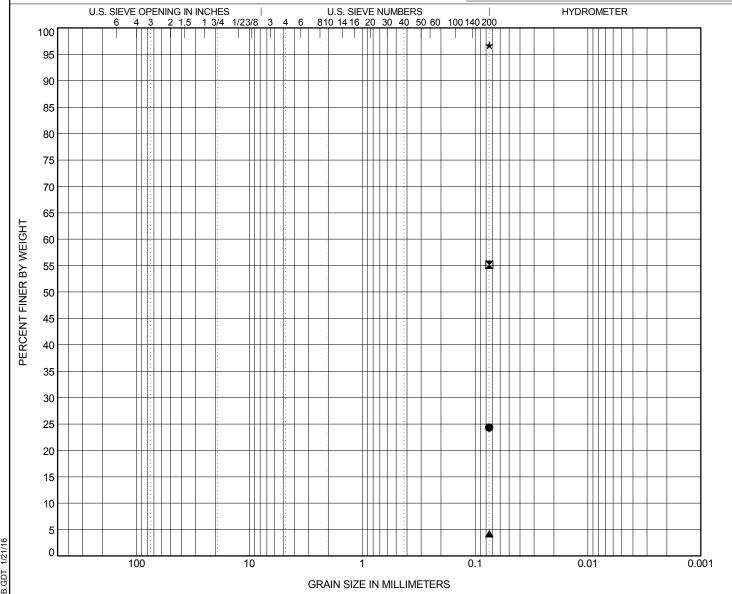
GRAIN SIZE DISTRIBUTION



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



CORRIES	GRA	VEL		SAND)	SILT OR CLAY
COBBLES	coarse	fine	coarse	medium	fine	SILT OR CLAT

BOREHOLE	DEPTH			LL	PL	PI	Сс	Cu			
B-4 (Bridge	3) 10.0		CI								
B-4 (Bridge	3) 15.0		Sandy Elastic SILT (MH)						3		
B-4 (Bridge	3) 20.0			SAND (SP	')						
B-4 (Bridge	3) 35.0		89	39	50						
BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	ł	%Silt	%(Clay
B-4 (Bridge	3) 10.0	0.075							2	24.4	
B-4 (Bridge	3) 15.0	0.075	0.075							55.2	
B-4 (Bridge	3) 20.0	0.075	0.075							4.2	
B-4 (Bridge	3) 35.0	0.075	0.075						Ç	96.7	
	B-4 (Bridge B-4 (Bridge B-4 (Bridge BOREHOLE B-4 (Bridge B-4 (Bridge B-4 (Bridge B-4 (Bridge B-4 (Bridge		B-4 (Bridge 3) 10.0 B-4 (Bridge 3) 15.0 B-4 (Bridge 3) 20.0 B-4 (Bridge 3) 35.0 BOREHOLE DEPTH D100 B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 CI B-4 (Bridge 3) 15.0 Sand B-4 (Bridge 3) 20.0 B-4 (Bridge 3) 35.0 EL BOREHOLE DEPTH D100 D95 B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND B-4 (Bridge 3) 15.0 Sandy Elastic SII B-4 (Bridge 3) 20.0 SAND (SP B-4 (Bridge 3) 35.0 ELASTIC SILT BOREHOLE DEPTH D100 D95 D50 B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND (SC) B-4 (Bridge 3) 15.0 Sandy Elastic SILT (MH) B-4 (Bridge 3) 20.0 SAND (SP) B-4 (Bridge 3) 35.0 ELASTIC SILT (MH) BOREHOLE DEPTH D100 D95 D50 D10 B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND (SC) B-4 (Bridge 3) 15.0 Sandy Elastic SILT (MH) B-4 (Bridge 3) 20.0 SAND (SP) B-4 (Bridge 3) 35.0 ELASTIC SILT (MH) BOREHOLE DEPTH D100 D95 D50 D10 %Gravel B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND (SC) B-4 (Bridge 3) 15.0 Sandy Elastic SILT (MH) 65 B-4 (Bridge 3) 20.0 SAND (SP) B-4 (Bridge 3) 35.0 ELASTIC SILT (MH) 89 BOREHOLE DEPTH D100 D95 D50 D10 %Gravel %Sand B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND (SC) B-4 (Bridge 3) 15.0 Sandy Elastic SILT (MH) 65 62 B-4 (Bridge 3) 20.0 SAND (SP) B-4 (Bridge 3) 35.0 ELASTIC SILT (MH) 89 39 BOREHOLE DEPTH D100 D95 D50 D10 %Gravel %Sand B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND (SC) B-4 (Bridge 3) 15.0 Sandy Elastic SILT (MH) B-4 (Bridge 3) 20.0 SAND (SP) B-4 (Bridge 3) 35.0 ELASTIC SILT (MH) BOREHOLE DEPTH D100 D95 D50 D10 %Gravel %Sand %Silt B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075	B-4 (Bridge 3) 10.0 Clayey SAND (SC) B-4 (Bridge 3) 15.0 Sandy Elastic SILT (MH) B-4 (Bridge 3) 20.0 SAND (SP) B-4 (Bridge 3) 35.0 ELASTIC SILT (MH) BOREHOLE DEPTH D100 D95 D50 D10 %Gravel %Sand %Silt %0 B-4 (Bridge 3) 10.0 0.075 B-4 (Bridge 3) 15.0 0.075 B-4 (Bridge 3) 20.0 0.075 A B-4 (Bridge 3) 20.0 0.075 A B-4 (Bridge 3) 20.0 0.075

N SIZE G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US-3011	Replacement Bridge	over Black River		G5500.08		
SAMPLE NUMBER:	16-0	0016	DATE SA	1/13/2016		
DESCRIPTION OF SOIL:			VARIOUS			
TESTED BY:	MB		D	OATE OF TESTING:	1/13/2016	
			DAT	TE OF WEIGHING:	1/14/2016	
BORING NO.	B-4	B-4	B-4	B-4		
SAMPLE NO.	16-0016B	16-0016E	16-0016G	16-0016J		
SAMPLE DEPTH	8.0-10.0'	13.5-15.0'	18.5-20.0'	33.5-35.0'		
WATER CONTENT, W%	13.0	132.4	18.7	40.9		
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTENT, W%						
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTENT, W%						
BORING NO.					_	
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTENT W%	·					

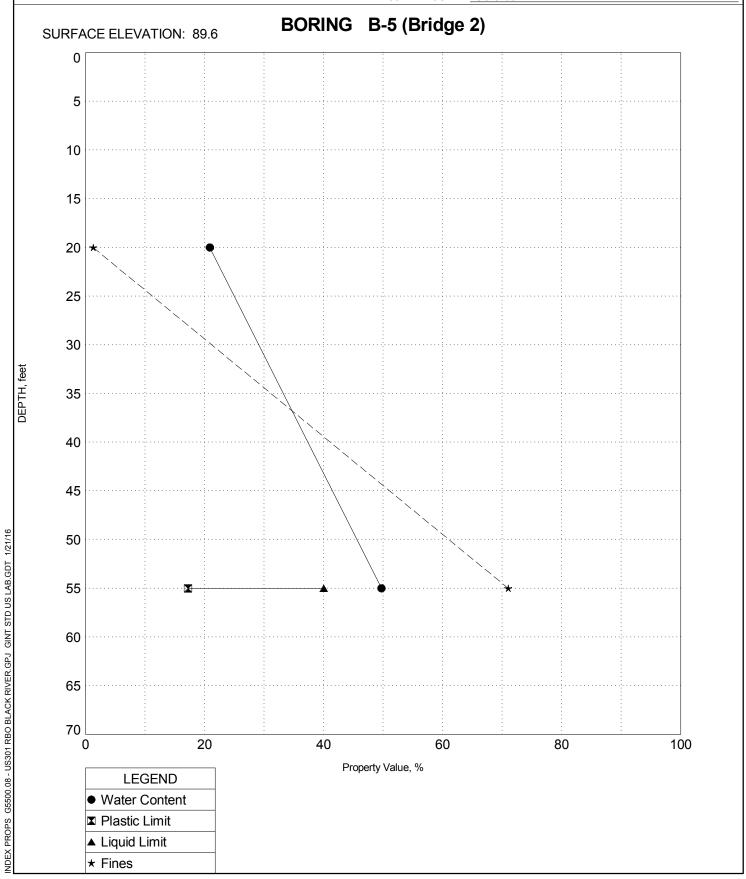


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

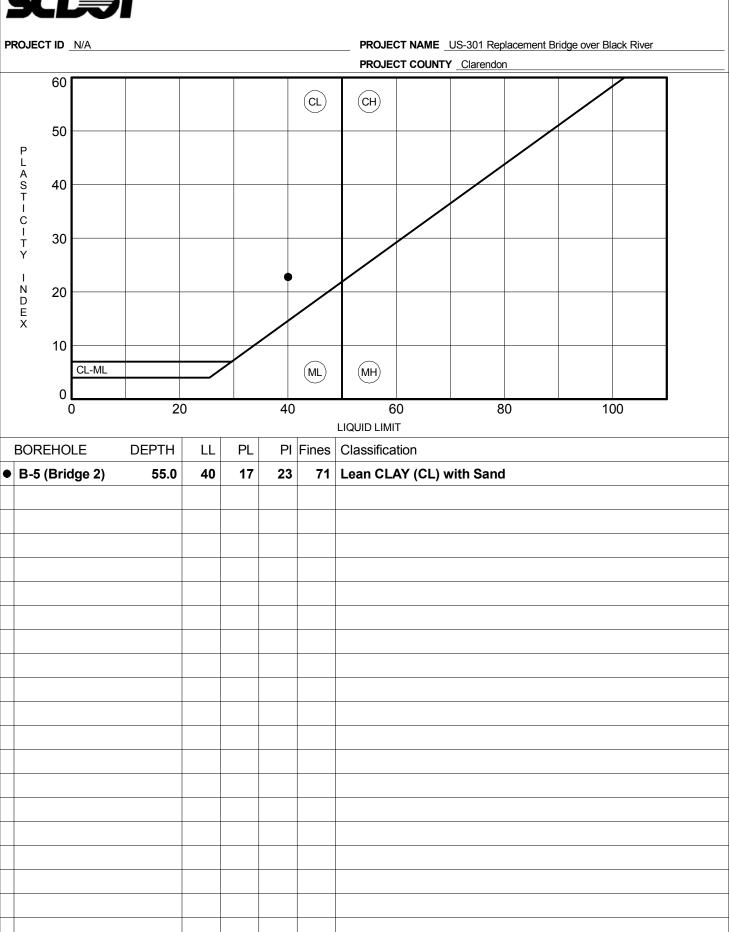
PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS



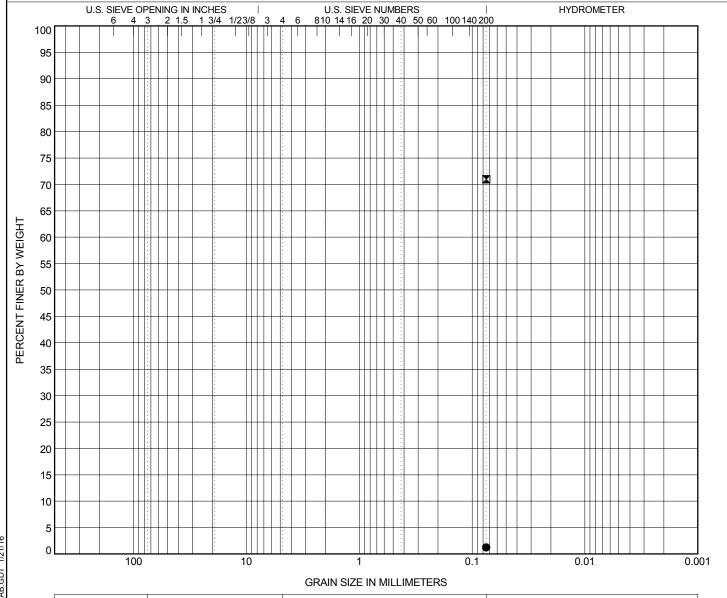
GRAIN SIZE DISTRIBUTION



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



	COBBLES	GRA	VEL		SAND)	SILT OR CLAY
		coarse	fine	coarse	medium	fine	SILT OR CLAY

E	BOREHOLE	DEPTH			LL	PL	PI	Сс	Cu			
5	B-5 (Bridge	2) 20.0		SAND (SP)								
	B-5 (Bridge	2) 55.0		Lean CLAY (CL) with Sand						23		
											<u> </u>	
E	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	t	%Silt	%	Clay
	B-5 (Bridge	2) 20.0	0.075								1.3	
	B-5 (Bridge	2) 55.0	0.075							7	71.0	
ا ا												
202												
III SIZE G												

CK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US-301 R	Replacement Bridge	over Black River	PROJECT NO.:	G5500.08		
SAMPLE NUMBER:	16-0	0033	DATE SAMPLE RECEIVED:	1/13/2016		
DESCRIPTION OF SOIL:			VARIOUS			
TESTED BY:	MB		DATE OF TESTING:	1/13/2016		
			DATE OF WEIGHING:	1/14/2016		
BORING NO.	B-5	B-5				
SAMPLE NO.	16-0033B	16-0033E				
SAMPLE DEPTH	18.5-20.0'	53.5-55.0'				
WATER CONTENT, W%	20.9	49.7				
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTENT, W%						
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTENT, W%						
BORING NO.						
SAMPLE NO.						
SAMPLE DEPTH						
WATER CONTENT, W%						

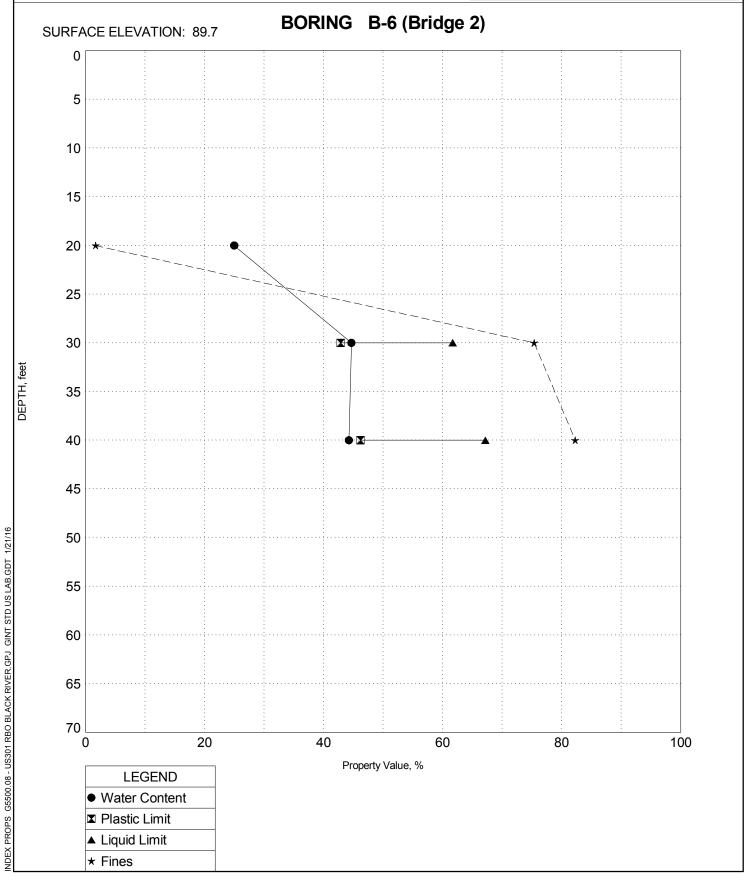


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS

PROJECT ID N/A PROJECT NAME US-301 Replacement Bridge over Black River PROJECT COUNTY Clarendon 60 (CL) (CH) 50 P L A S T I 40 C I T Y 30 I N D E X 20 10 CL-ML (ML) (MH) 0 40 20 60 80 100 LIQUID LIMIT PI Fines | Classification **BOREHOLE DEPTH** LL PL ● B-6 (Bridge 2) 30.0 62 43 19 75 ELASTIC SILT (MH) with Sand **■** B-6 (Bridge 2) 40.0 67 46 21 82 ELASTIC SILT (MH) with Sand

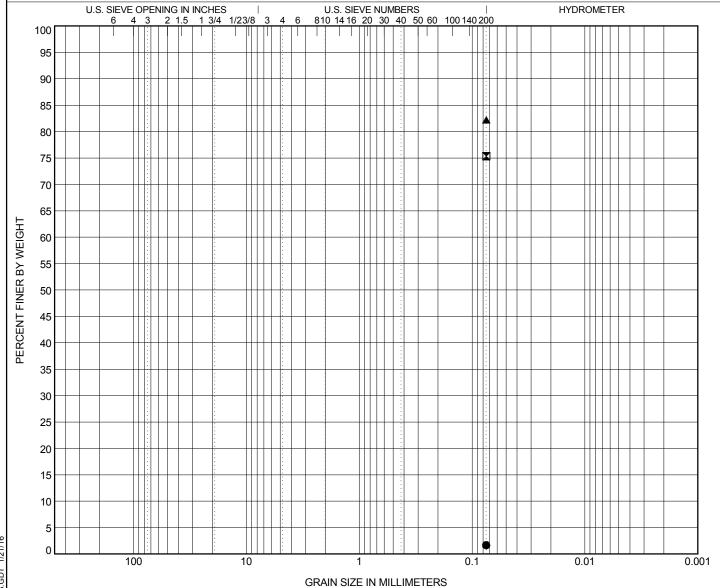
GRAIN SIZE DISTRIBUTION



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



COBBLES	GRA	VEL		SAND		SILT OR CLAY
	coarse	fine	coarse	medium	fine	SILT OR CLAY

5 E	BOREHOLE DEP	PTH		LL	PL	PI	Сс	Cu				
₽. F.	B-6 (Bridge 2) 20.	.0										
Y X	B-6 (Bridge 2) 30.	.0		ELASTIC	SILT (MH)	with Sand		62	43	19		
KBO BLACK RIVEK	B-6 (Bridge 2) 40.	.0		ELASTIC	SILT (MH)	with Sand		67	46	21		
7			·									
E	BOREHOLE DEP	PTH D	100	D95	D50	D10	%Gravel	%Sand		%Silt	%(Clay
	B-6 (Bridge 2) 20.	.0 0.	.075								1.7	
	B-6 (Bridge 2) 30.	.0 0.	.075							7	75.3	
ف ا	B-6 (Bridge 2) 40.	.0 0.	.075							8	32.3	
alze IN SIZE												
= -												

00.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US-301 I	Replacement Bridge	over Black River		PROJECT NO.:	G5500.08				
SAMPLE NUMBER:	16-0	0034	DATE SA	DATE SAMPLE RECEIVED:					
DESCRIPTION OF SOIL:			VARIOUS						
TESTED BY:	MB		D .	ATE OF TESTING:	1/13/2016				
			DAT	TE OF WEIGHING:	1/14/2016				
BORING NO.	B-6	B-6	B-6						
SAMPLE NO.	16-0034E	16-0034H	16-0034K						
SAMPLE DEPTH	18.5-20.0'	28.5-30.0'	38.5-40.0'						
WATER CONTENT, W%	25.0	44.7	44.2						
BORING NO.									
SAMPLE NO.									
SAMPLE DEPTH									
WATER CONTENT, W%									
BORING NO.									
SAMPLE NO.									
SAMPLE DEPTH									
WATER CONTENT, W%									
BORING NO.									
SAMPLE NO.									
SAMPLE DEPTH									
WATER CONTENT W%									

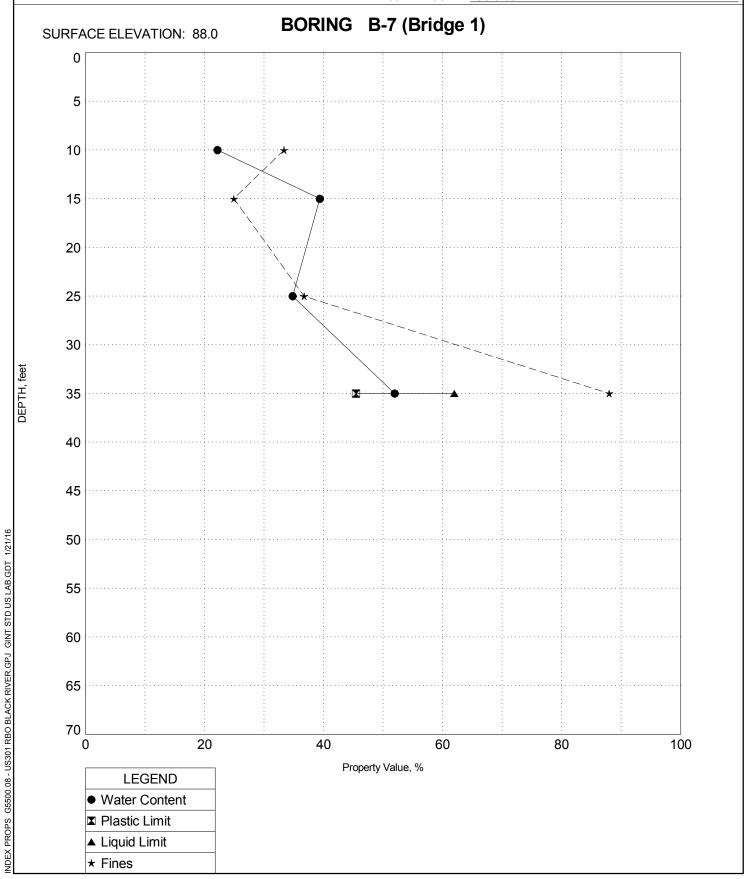


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

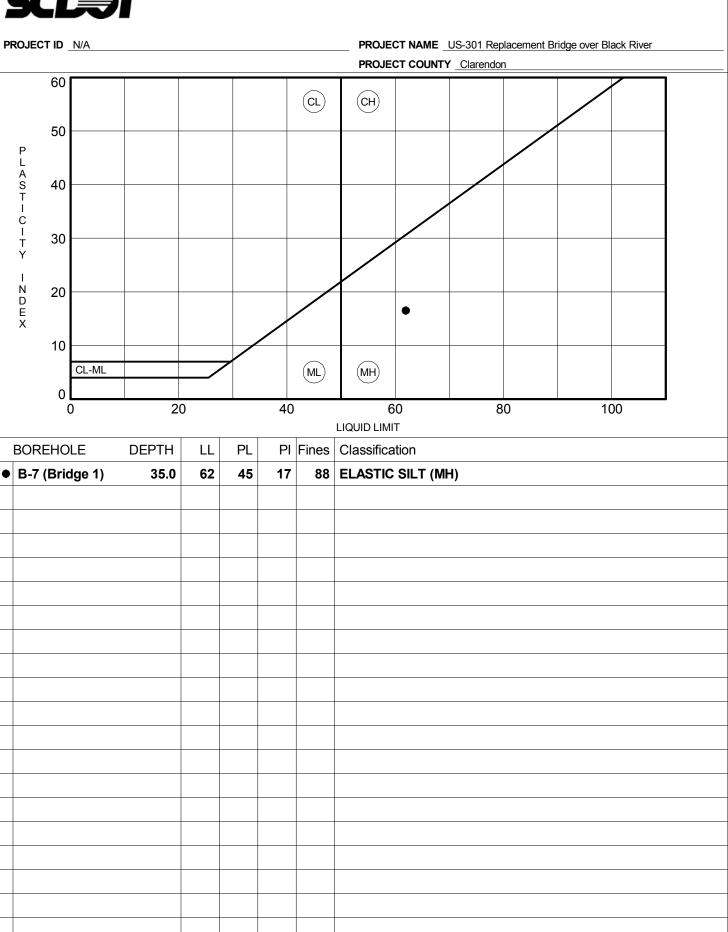
PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS



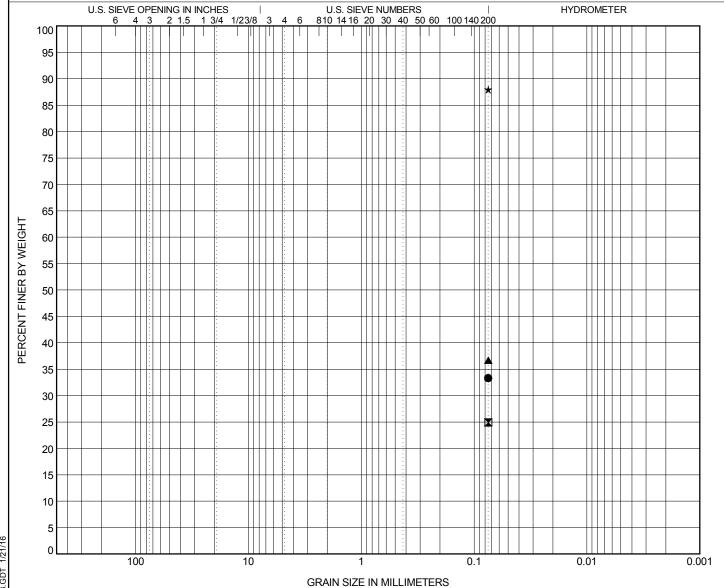
GRAIN SIZE DISTRIBUTION



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



CORDI ES	GRAVEL		SAND			SILT OR CLAY
COBBLES	coarse	fine	coarse	medium	fine	SILT OR CLAY

В	OREHOLE	DEPTH			Classification	on		LL	PL	PI	Сс	Cu
	B-7 (Bridge	1) 10.0		S	ilty SAND (SM)						
	B-7 (Bridge	1) 15.0		S	ilty SAND (SM)						
▲	B-7 (Bridge	1) 25.0		S	ilty SAND (SM)						
● ■ ★	B-7 (Bridge	1) 35.0		EL	ASTIC SILT	(MH)		62	45	17		
В	OREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand		%Silt	%(Clay
	B-7 (Bridge	1) 10.0	0.075							;	33.3	
×	B-7 (Bridge	1) 15.0	0.075							2	24.9	
lack	B-7 (Bridge	1) 25.0	0.075							;	36.7	
▼	B-7 (Bridge	1) 35.0	0.075							8	88.0	

GINT STD US LAB.GDT 1/21/16

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US-301 I	Replacement Bridge	over Black River		PROJECT NO.:	G5500.08
SAMPLE NUMBER:	16-0	0035	DATE SA	MPLE RECEIVED:	1/13/2016
DESCRIPTION OF SOIL:			VARIOUS	_	
TESTED BY:	MB		D	DATE OF TESTING:	1/13/2016
			DA	TE OF WEIGHING:	1/14/2016
BORING NO.	B-7	B-7	B-7	B-7	
SAMPLE NO.	16-0035B	16-0035D	16-0035F	16-0035I	
SAMPLE DEPTH	8.0-10.0'	13.5-15.0'	23.5-25.0'	33.5-35.0'	
WATER CONTENT, W%	22.2	39.3	34.8	51.9	
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT. W%					

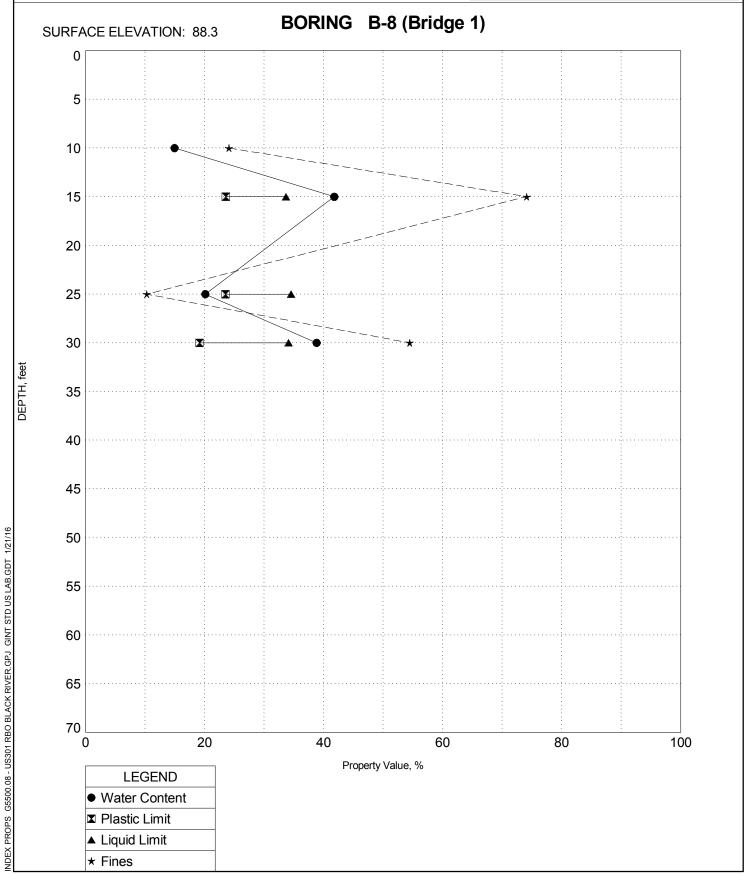


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

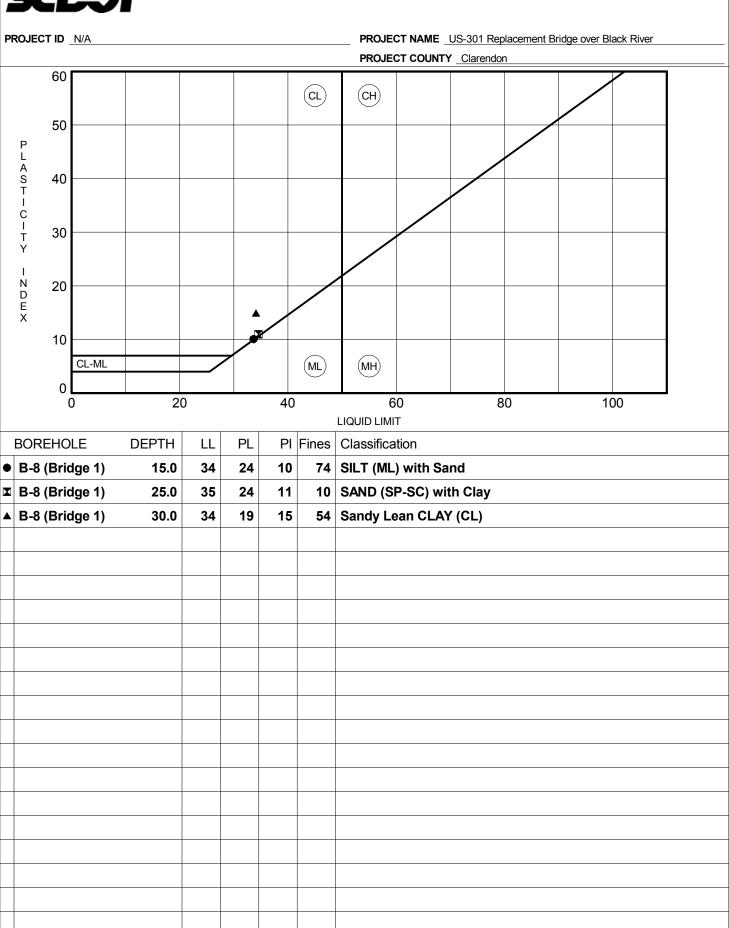
PROJECT COUNTY Clarendon





ATTERBERG LIMITS G5500.08 - US301 RBO BLACK RIVER.GPJ GINT STD US LAB.GDT 1/21/16

ATTERBERG LIMITS' RESULTS



GRAIN SIZE DISTRIBUTION

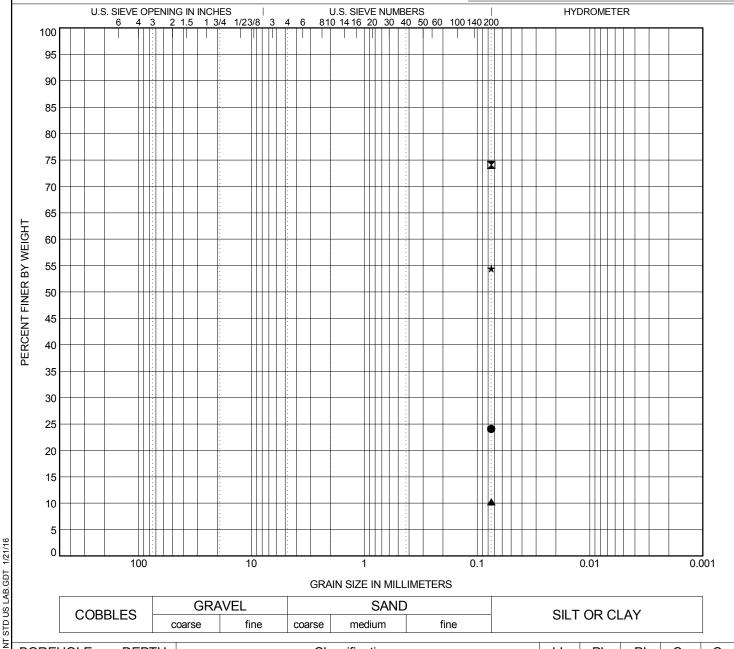
54.4



PROJECT ID N/A

PROJECT NAME US-301 Replacement Bridge over Black River

PROJECT COUNTY Clarendon



CODDIES	GRAVEL		SAND			SILT OR CLAY
COBBLES	coarse	fine	coarse	medium	fine	SILT OR CLAT

5	BOREHOLE	DEPTH			Classification	on		LL	PL	PI	Сс	Cu
GPJ	B-8 (Bridge	1) 10.0		S	ilty SAND (SM)						
RIVER	B-8 (Bridge	1) 15.0		SIL	T (ML) with	Sand		34	24	10		
A R	B-8 (Bridge	1) 25.0		SAND	(SP-SC) w	ith Clay		35	24	11		
BLA	B-8 (Bridge	1) 30.0		Sand	dy Lean CL/	AY (CL)		34	19	15		
RBO												
US301	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	1	%Silt	%(Clay
	B-8 (Bridge	1) 10.0	0.075							2	24.1	
ZE G5500.08	B-8 (Bridge	1) 15.0	0.075							7	74.1	
E G	B-8 (Bridge	1) 25.0	0.075							•	10.3	

B-8 (Bridge 1) 30.0

0.075

F&ME CONSULTANTS 3112 Devine Street Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION (AASHTO T265)

PROJECT: US-301 I	Replacement Bridge	over Black River		PROJECT NO.:	G5500.08
SAMPLE NUMBER:	16-0	0043	DATE SA	MPLE RECEIVED:	1/13/2016
DESCRIPTION OF SOIL:			VARIOUS	_	
TESTED BY:	MB		D	ATE OF TESTING:	1/13/2016
			DA	TE OF WEIGHING:	1/14/2016
BORING NO.	B-8	B-8	B-8	B-8	
SAMPLE NO.	16-0043B	16-0043E	16-0043H	16-0043K	
SAMPLE DEPTH	8.0-10.0'	13.5-15.0'	23.5-25.0'	28.5-30.0'	
WATER CONTENT, W%	15.0	41.8	20.1	38.8	
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT W%					

APPENDIX D

Multi-Channel Analysis of Surface Waves (MASW)



January 20, 2016

Mr. Trapp Harris, P.E. South Carolina Department of Transportation 955 Park Street Columbia, South Carolina 29201

Re: Report of Spectral Analysis of Surface Waves Emergency Bridge Package 5

US-301 Replacement Bridges over Black River

Clarendon County, South Carolina F&ME Project No.: G5500.08

Dear Mr. Harris:

On December 23 through 28, 2015, F&ME Consultants performed four (4) Spectral Analysis of Surface Waves (SASW) tests at each of the four (4) bridges to determine the average shear wave velocity to a depth of 100 feet at the locations shown in Figures 3A through 3D in Appendix D of this Report. A 16-channel Geometrics ES-3000 seismograph with 4.5 Hz geophones was used for data collection. Active survey data was obtained using a 225 foot linear array with 16 geophones spaced at 15 feet. Passive survey data was obtained using a 225 foot linear array with 16 geophones spaced at 15 feet.

A 16 pound sledge hammer striking an aluminum block and a polyethylene block were used as the energy source for the active survey. The block was struck at varying offsets from the arrays and at each end. Resultant vibrations were recorded with a sample rate of 0.5 milliseconds and a recording length of 2 seconds after each hammer blow. The data was stacked five times at each location to minimize the effect of unknown ambient vibrations commonly referred to as noise. The stacking process increases the signal to noise ratio.

The passive survey consisted of the collection of ambient background vibrations. Due to the location, manmade vibrations were minimal. Eighty (80) recordings with a record length of 32 seconds and a sample rate of 2 milliseconds were made during this phase of data acquisition.

Prior to departing the site the data collected from both the passive and active surveys were reviewed and checked for variations from what would be typically expected from the prevailing area geology.

After completion of passive and active survey the data was processed and analyzed using Geometric's SeisImager software suite (Pickwin and WaveEq). This resulted in a one-dimensional subsurface shear wave velocity curve that is developed utilizing both the passive and active survey data. The data from the active survey defines the near surface shear wave velocities, while the passive survey data defines deeper shear wave velocities due to the lower frequencies. The resulting curve represents the average shear wave velocities below the surface arrays to a depth of 100 feet.

Each Shear Wave Velocity Curve, Vs100, for the locations defined herein can be found in Appendix D of this report. The following table summarizes the average shear wave velocity (Vs100) at the four (4) locations.

AVERAG	AVERAGE SHEAR WAVE VELOCITIES							
Boring No.	Average Shear Wave Velocity (Vs100)	Corresponding Seismic Site Class						
MASW (Bridge 1)	1008.1 ft/sec	Site Class D						
MASW (Bridge 2)	891.7 ft/sec	Site Class D						
MASW (Bridge 3)	868.8 ft/sec	Site Class D						
MASW (Bridge 4)	873.4 ft/sec	Site Class D						
Average	910.5 ft/sec	Site Class D						

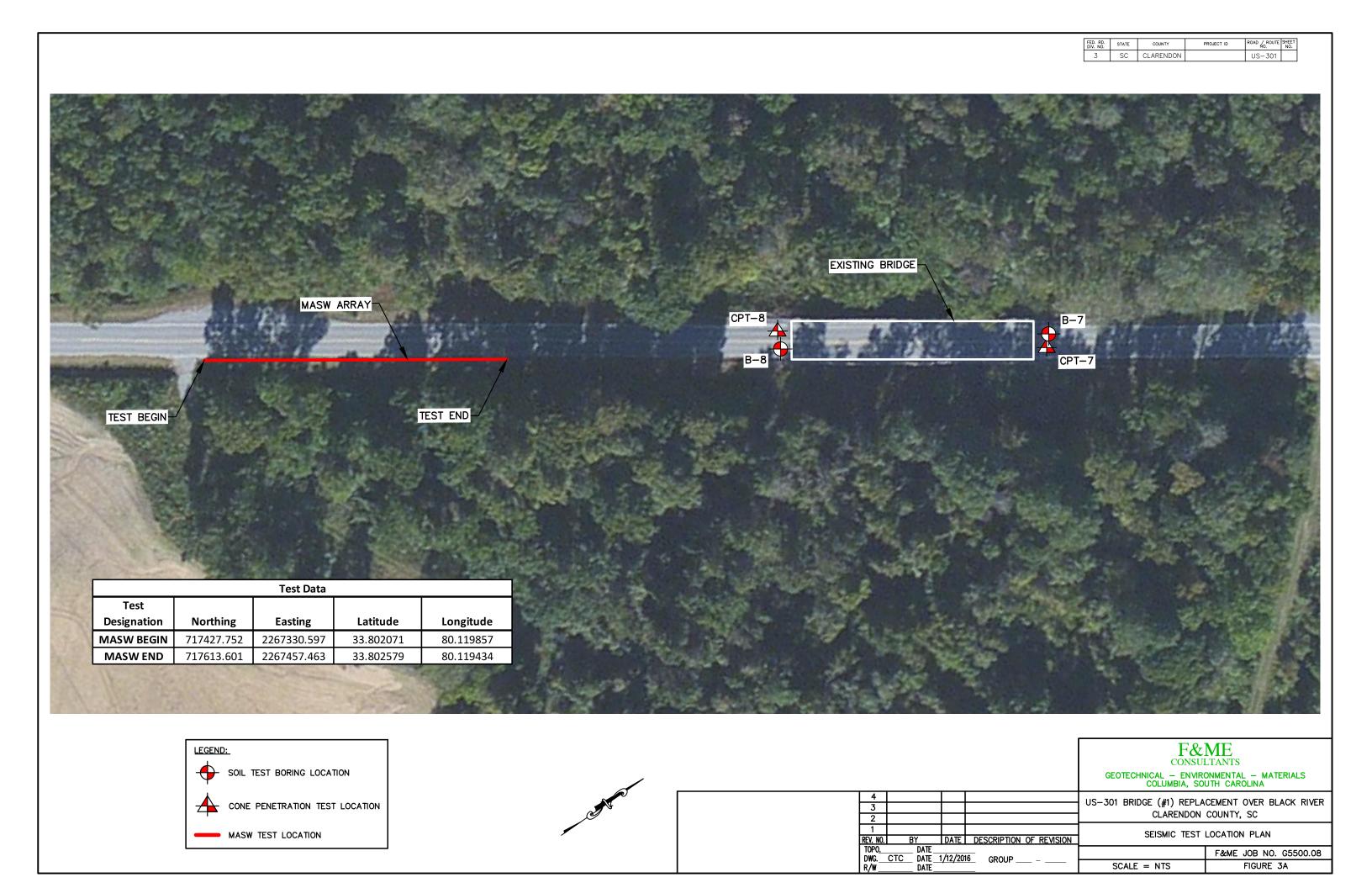
It has been a pleasure working for you on this project and we appreciate the opportunity to be of service. Please contact us if you have any questions or concerns.

Sincerely,

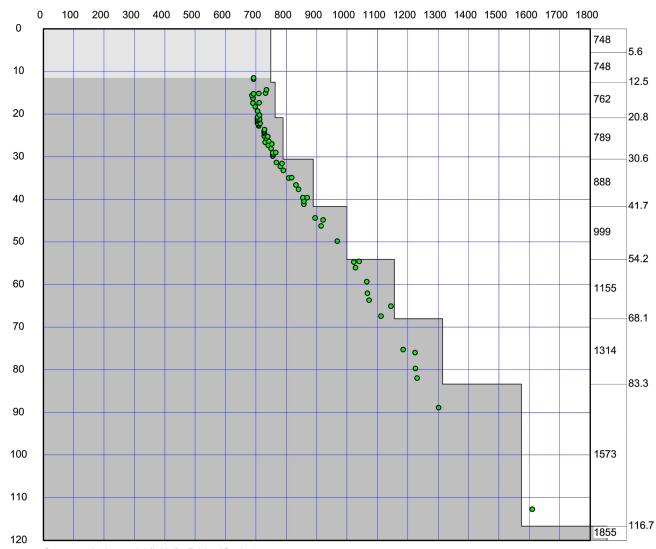
F&ME CONSULTANTS

James R. Wessinger, P.G.

Staff Geologist



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE NO.	SHEET NO.
3	SC	CLARENDON		US-301	



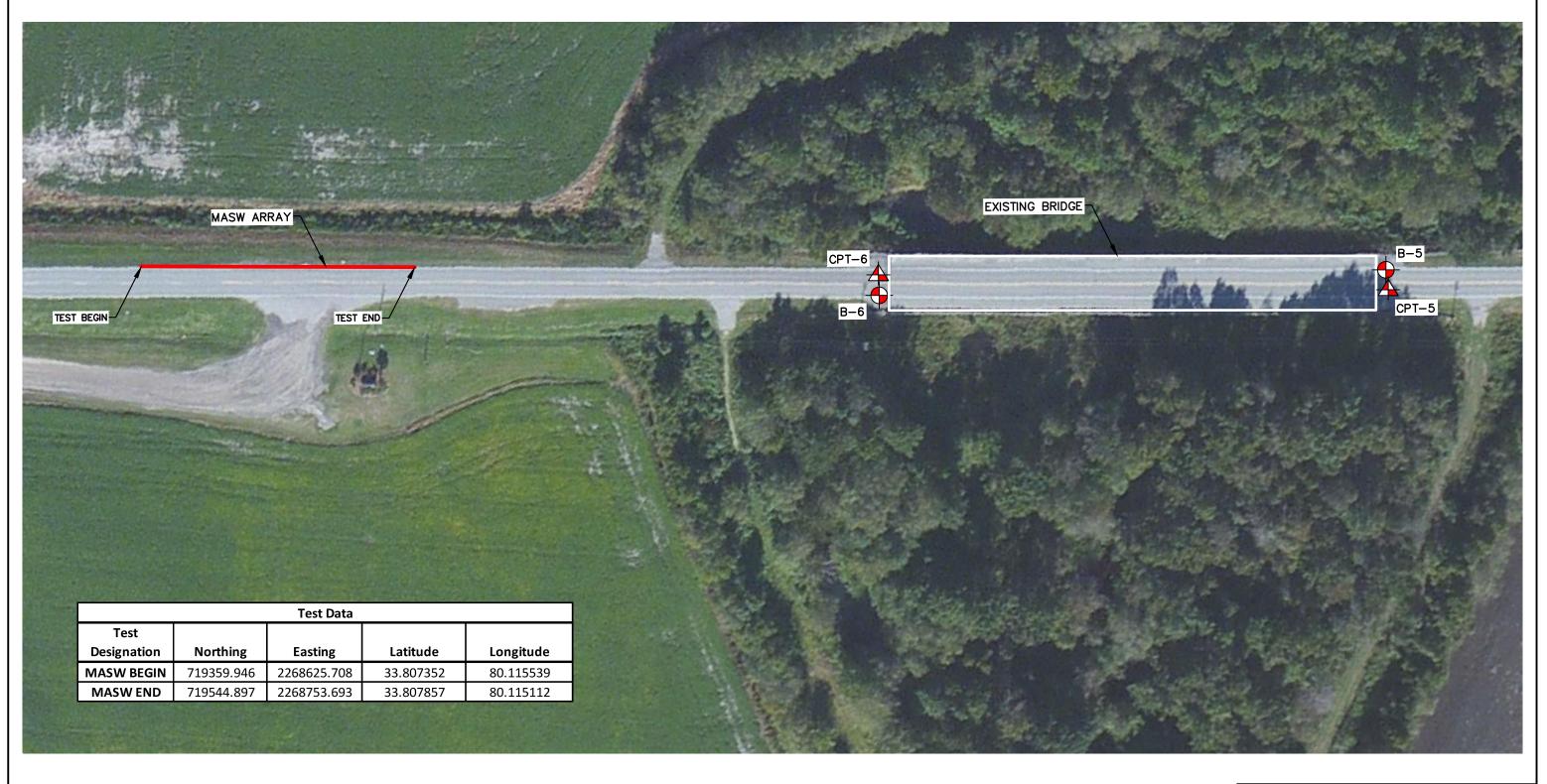
S-wave velocity model (initial): Bridge1final.rst

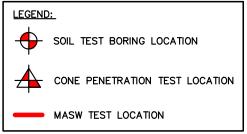
Average Vs 100ft = 1008.1 ft/sec

Depth (ft)

F&ME **CONSULTANTS** GEOTECHNICAL — ENVIRONMENTAL — MATERIALS COLUMBIA, SOUTH CAROLINA US-301 BRIDGE (#1) REPLACEMENT OVER BLACK RIVER 3 CLARENDON COUNTY, SC 2 1 MASW SHEAR WAVE VELOCITY CURVE DATE DESCRIPTION OF REVISION DATE F&ME JOB NO. G5500.08 CTC 1/12/2016 DATE GROUP _

FED. RD. DIV. NO.
3

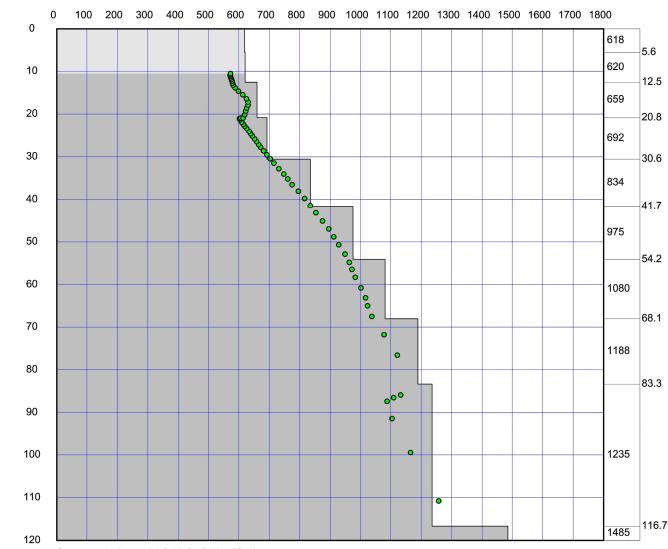






				CONSU. GEOTECHNICAL – ENVIR	ME LTANTS ONMENTAL - MATERIALS UTH CAROLINA
3 2				• • • •	CEMENT OVER BLACK RIVER COUNTY, SC
1 REV. NO	•	DATE	DESCRIPTION OF REVISION	SEISMIC TEST	LOCATION PLAN
TOPO <u>.</u> DWG.	CTC DATE_	1/12/20	 16 GROUP –		F&ME JOB NO. G5500.08
R/W_	DATE_	1/12/20	GROUP =	SCALE = NTS	FIGURE 3B

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE NO.	SHEET NO.
3	SC	CLARENDON		US-301	

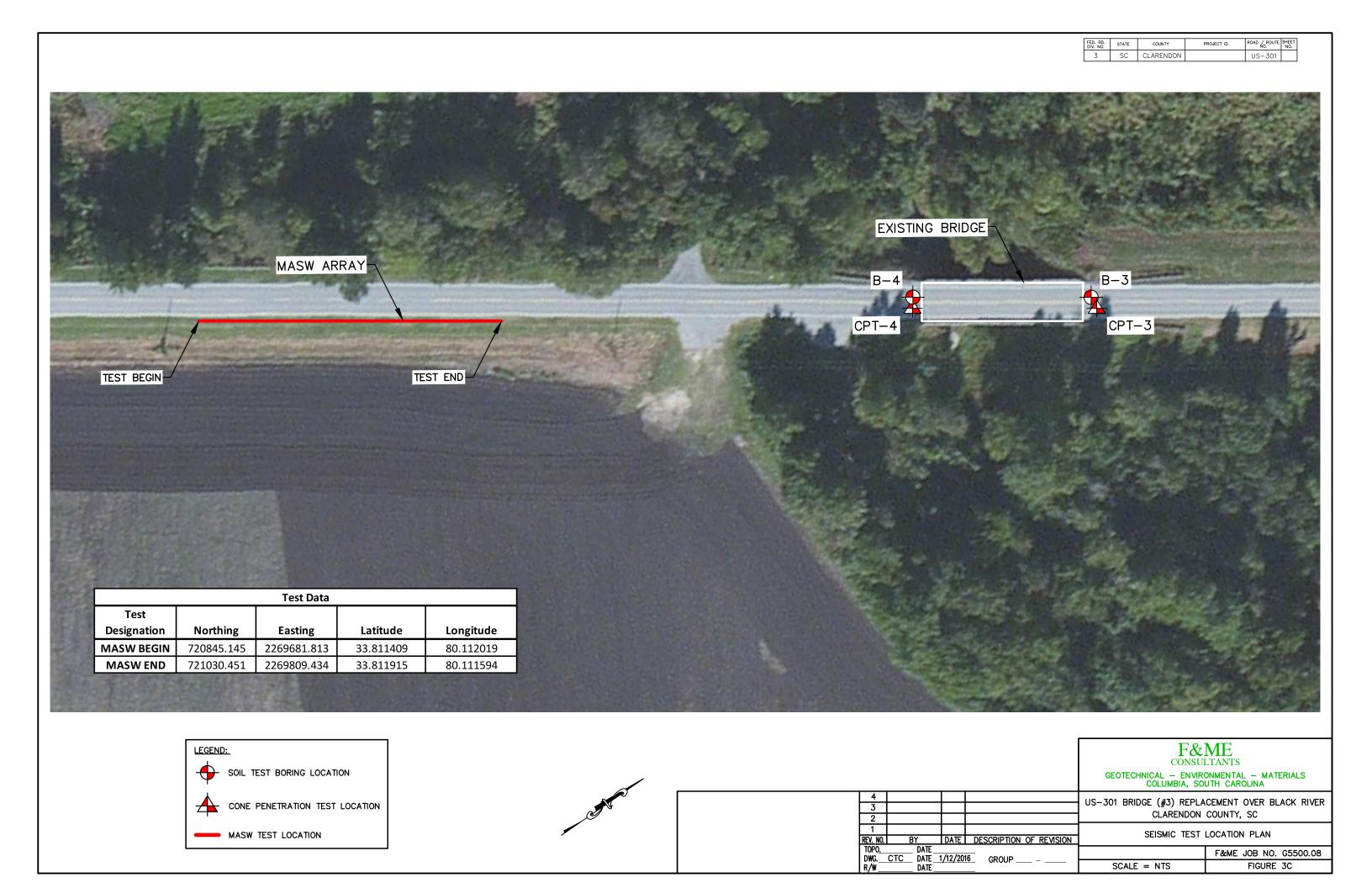


S-wave velocity model (initial) : Bridge2final.rst

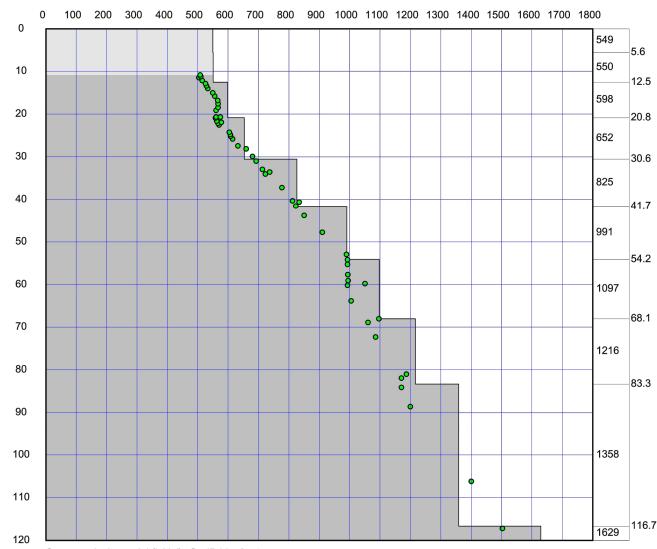
Average Vs 100ft = 891.7 ft/sec

Depth (ft)

F&ME **CONSULTANTS** GEOTECHNICAL — ENVIRONMENTAL — MATERIALS COLUMBIA, SOUTH CAROLINA US-301 BRIDGE (#2) REPLACEMENT OVER BLACK RIVER 3 CLARENDON COUNTY, SC 2 1 MASW SHEAR WAVE VELOCITY CURVE DATE DESCRIPTION OF REVISION DATE F&ME JOB NO. G5500.08 CTC 1/12/2016 DATE GROUP .



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE NO.	SHEET NO.
3	SC	CLARENDON		US-301	



S-wave velocity model (initial): finalBridge3.rst

3

2 1

DATE

CTC

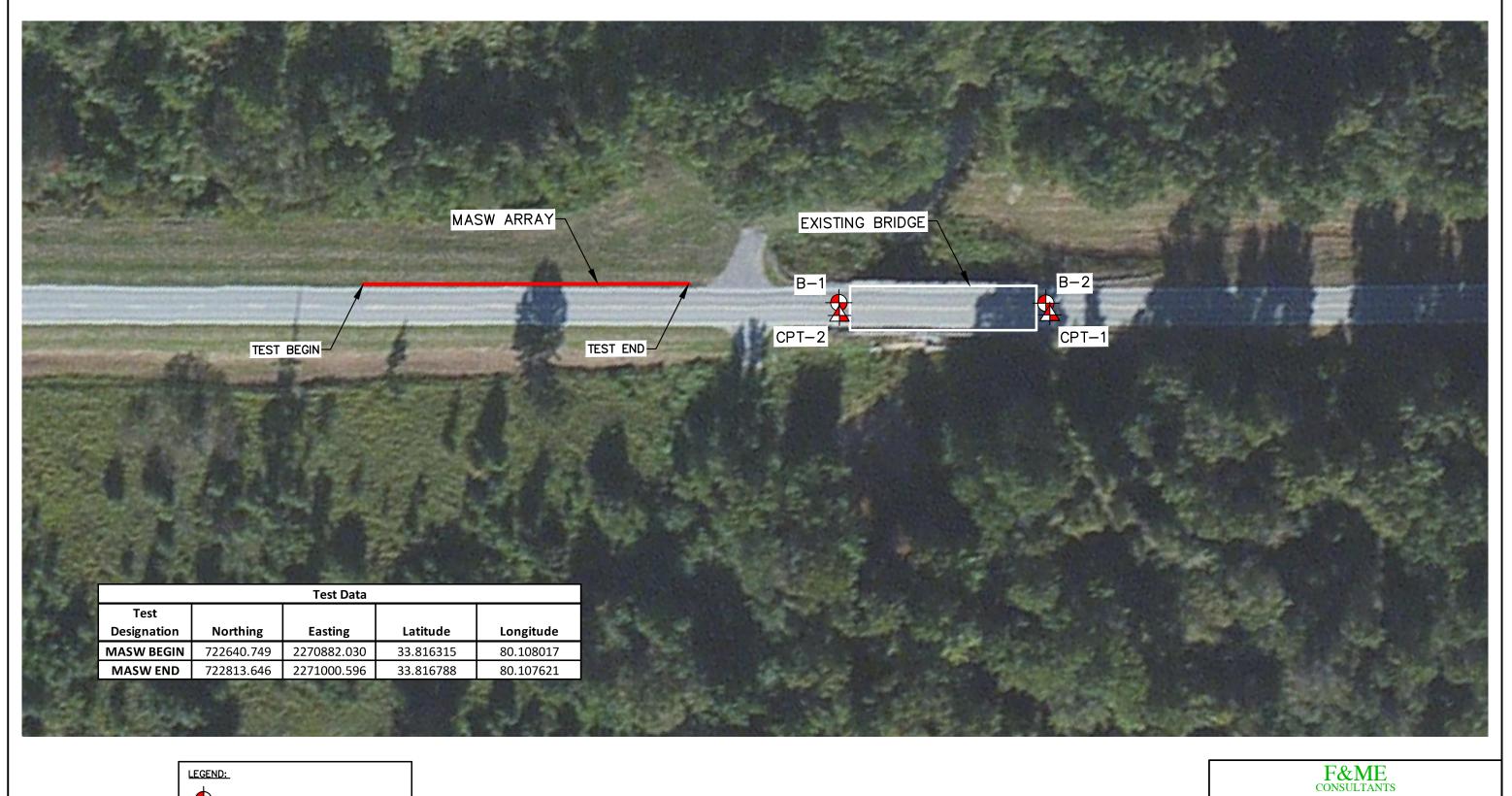
DATE 1/12/2016

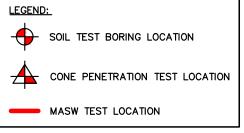
Average Vs 100ft = 868.8 ft/sec

Depth (ft)

F&ME **CONSULTANTS** GEOTECHNICAL — ENVIRONMENTAL — MATERIALS COLUMBIA, SOUTH CAROLINA US-301 BRIDGE (#3) REPLACEMENT OVER BLACK RIVER CLARENDON COUNTY, SC MASW SHEAR WAVE VELOCITY CURVE DATE DESCRIPTION OF REVISION F&ME JOB NO. G5500.08 GROUP _

FED. RD. DIV. NO.
3

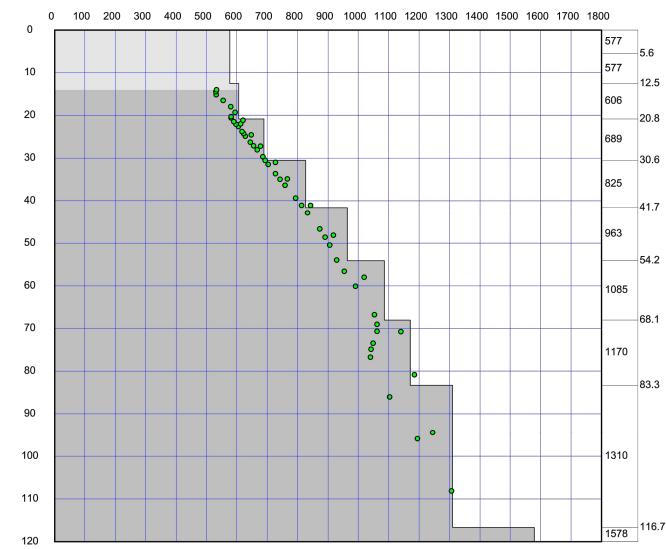






GEOTECHNICAL — ENVIRONMENTAL — MATERIAL COLUMBIA, SOUTH CAROLINA	3
US-301 BRIDGE (#4) REPLACEMENT OVER BLACK	RIVER
CLABENDON COUNTY SC	
2 CLARENDON COUNTY, 3C	
1 SEISMIC TEST LOCATION PLAN	
REV. NO. BY DATE DESCRIPTION OF REVISION	
TOPO. DATE DWG. CTC DATE 1/12/2016 GROUP - F&ME JOB NO. G550	0.08
R/W DATE	

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE NO.	SHEET NO.
3	SC	CLARENDON		US-301	



S-wave velocity model (initial) : finalBridge4.rst

2

Average Vs 100ft = 873.4 ft/sec

APPENDIX E

On-Site Drill Rig Photos





B-1



B-2



B-3



B-4



B-5



B-6



B-7



B-8

APPENDIX F

Request For Work





SCOPE OF SERVICES

A work order request is issued for the following location:

Submittal Date: December 14, 2015 County: Clarendon County

Road: US 301 Project ID: N/A

Project Name: Emergency Bridge Package 5

Local Route Name: US 301

Project Manager: Trapp Harris (803) 737-0776

Priority: <u>Information needed by January 20, 2015</u>

This work order request is for the Emergency Bridge Package 5 project, which includes the US 301 over Black River Swamp bridges (4 bridges). Site soil testing will be required as described below and will consist of soil test borings (STB) and cone penetration test soundings (CPT). All field and lab testing along with reporting of the results shall be performed and provided in accordance with the 2010 Geotechnical Design Manual Version 1.1 (GDM). Any deviations from this request or the requirements set forth in the GDM shall be approved by the D/B GDS prior to execution of the tasks.

All test holes and sampling are to be conducted within the SCDOT Right-of-Way. Consultant shall perform one soil test boring as close as possible to each abutment location (two total) and one CPT sounding as close as possible to each abutment location (two total) of the bridge structure. A total of eight SPT borings and eight CPT soundings are planned for this scope of services. Soil test borings shall be performed using mud-rotary drilling techniques and shall be extended to 100 feet each. CPT soundings shall be extended to 50 feet each. Borings should be placed in one travel lane with the CPT soundings placed in the opposite travel lane.

The test hole depths shall be determined from the existing ground surface. Within the STBs, five split-spoon samples with Standard Penetration Test (SPT) N-value shall be obtained in the upper 10 feet and on 5-foot centers thereafter until the boring termination depth is reached. A field operations engineer or geologist shall be present during all drilling operations so that sampling efforts and soil classifications can be completed in the field. Traffic control is not anticipated to be required because the existing road is closed

Geophysical testing consisting of MASW shear wave velocity testing shall be performed at each bridge site. One MASW test shall be performed at each bridge site for a total of four tests.

Laboratory Testing

Laboratory testing shall consist of performing up to 32 Wash No. 200 Sieve Analyses, 16 Atterberg Limits, and 32 Natural Moisture Contents.

Geotechnical Subsurface Data Report

After completion of the field and laboratory testing, the **CONSULTANT** will prepare a geotechnical subsurface data report. The data report shall be completed in accordance with the 2010 GDM Version 1.1;

specifically Chapter 21 along with Bridge Design Memorandum – DM0510, and shall include, but not be limited to the following:

- 1. Site description with photographic documentation showing the drill rig on the test hole;
- 2. Drilling and testing procedures, along with charts illustrating the soil classification criteria and terminology;
- 3. Boring location plan which will include the locations of all testing and surface soil sampling performed;
- 4. STB and CPT logs which describe the various subsurface strata and graphically illustrate stratigraphy, SPT and CPT data, and **24-hour groundwater levels**;
- 5. Raw gINT and CPT data files;
- 6. Laboratory testing procedures and individual test data sheets.

Deliverables

Deliverables to the Department shall be an electronic copy of the final geotechnical subsurface data report. The electronic copy shall include both a WORD and PDF version of the report along with a DGN file of the test hole location plan. Boring logs file shall also be submitted in gINT data file format. Raw CPT data files shall also be included.

APPENDIX G

SPT Hammer Calibration

















engineers, inc.

Job No. 1159002-1

Report on: Standard Penetration Test Energy Measurements

Iron Station, NC

Prepared for Ameridrill

By Scott Webster, P.E. and Karen Webster

January 16, 2014



January 16, 2015

Ms. Debra Meatyard Ameridrill P.O. Box 2755 Huntersville, NC 28070

Re: Standard Penetration Test Energy Measurements

Iron Station, NC

GRL Job No. 159002-1

Dear Ms. Meatyard,

This report presents results of energy measurements obtained on January 9, 2015 during Standard Penetration Test (SPT) sampling. Three automatic hammers were tested. Two of the hammers were mounted on CME 550X ATV drill rigs and one of the hammers was mounted on a CME 55 truck drill rig. All dynamic tests were performed on AWJ drill rods. GRL Engineers, Inc. obtained the dynamic measurements with an instrumented AWJ subsection and a Model PAX Pile Driving Analyzer®. This report describes the testing procedures and summarizes the test results. Appendix A describes our measurement and analysis methods, Appendix B contains calibration information for the gages and equipment used, and Appendix C is a summary of the field data.

PURPOSE AND SCOPE OF WORK

At the request of Ameridrill, GRL conducted SPT energy measurements at a site in Iron Station, NC. The SPT energy measurements were obtained in accordance with ASTM D4633-10. Specifically, we recorded SPT energy measurements at 5-foot sample intervals between approximately 23.5 and 45.0 to 50.0 feet below the existing ground surface. In general, blank drilling was performed to a depth of approximately 23.5 feet where the first sample was collected. SPT samples were then collected continuously until the boring depth of approximately 45.0 or 50.0 feet was reached.

<u>EQUIPMENT</u>

Drilling and SPT Hammer Equipment

CME 550X (Serial # 269553)

SPT energy measurements were made on an automatic hammer mounted on a CME 550X ATV drill rig operated by Mr. Don Harris. The drilling method used to advance the boring was the hollow stem auger method. Energy measurements for this drill rig were collected at a dummy borehole location to a boring termination depth of 45.0 feet below grade. SPT energy measurement tests were performed at 5-foot sampling penetrations beginning at 23.5 feet. A total of five energy measurement events were monitored for this drill rig.

CME 550X (Serial # 249533)

SPT energy measurements were made on an automatic hammer mounted on a CME 550X ATV drill rig operated by Mr. Brian Boyce. The drilling method used to advance the boring was the hollow stem auger method. Energy measurements for this drill rig were collected at a dummy borehole location to a boring termination depth of 45.0 feet below grade. SPT energy measurement tests were performed at 5-foot sampling penetrations beginning at 23.5 feet. A total of five energy measurement events were monitored for this drill rig.

CME 55 (Serial # 306515)

SPT energy measurements were made on an automatic hammer mounted on a CME 55 truck drill rig operated by Mr. Chris Meatyard. The drilling method used to advance the boring was the hollow stem auger method. Energy measurements for this drill rig were collected at a dummy borehole location to a boring termination depth of 50.0 feet below grade. SPT energy measurement tests were performed at 5-foot sampling penetrations beginning at 23.5 feet. A total of six energy measurement events were monitored for this drill rig.

Instrumentation

A Model PAX Pile Driving Analyzer (PDA) data acquisition system (SN# 3797L) was used to collect and process the dynamic measurements of force and velocity. The data was collected using a two-foot long section of AWJ rod subsection (SN# 168AWJ) with a cross sectional area of 1.18 square inches and instrumented with two full bridge foil resistance strain gages and two piezoresistive accelerometers mounted in the midpoint location of the instrumented rod.

Analog signals from the strain gages and accelerometers were conditioned, digitized, stored and processed with the PDA. The sampling frequency used during the SPT testing was 50 kHz. Selected output from the PDA for each recorded impact included the energy transfer ratio (ETR), maximum rod top velocity (VMX), maximum energy transfer (EFV), maximum rod top force (FMX), and the hammer operating rate (BPM).

MEASUREMENTS AND CALCULATIONS

FV Method (EFV)

Energy transfer to the PDA gage location, EFV, was computed by the PDA using force, F(t), and velocity, v(t), records as follows:

$$EFV = \int_{a}^{b} F(t) \cdot v(t) dt$$

The time "a" corresponds to the start of the record when the energy transfer begins, and "b" is the time at which energy transferred to the rod reaches a maximum value. The FV Method is currently recognized in ASTM D4633-10, and is the theoretically correct result; therefore, no other energy calculation methods are reported.

Corrected SPT number (N₆₀)

While the primary purpose of SPT energy testing is to calculate the maximum transferred energy (ETR) of each hammer blow, the overall average EFV value can be used to calculate the corrected SPT number (N_{60}). To adjust the SPT N-values for hammer performance, the following correction as suggested by Seed for N-value adjustment to 60% transfer efficiency (e.g. 210 ft-pounds) was used:

$$N_{60} = \left(\frac{E_m}{210}\right) N_m$$

Where:

 N_{60} = Corrected N-value

 E_m = overall average measured energy transfer (EFV)

N_m =number of blows for last 12 inches of sampler penetration

A general introduction to dynamic SPT testing methods is included in this report as Appendix A. References for more detailed descriptions of our testing and analysis methods are available upon request.

Any cross-sectional area difference between the GRL rod subsection and the drill rods, any loose connections or changes in area at section joints, or any cross-sectional area differences between the individual drill rod sections will result in stress wave reflections that can potentially influence the energy transfer. The EFV transferred energy calculation method, utilizing both force and velocity records, is theoretically correct and gives energy transfer results that are not adversely affected by cross-sectional area changes or loose connectors. The EFV results are included in Appendix C for all records collected and accepted after checking them for consistency.

RESULTS

Upon return to the office, the records collected by the PDA were checked for consistency and accuracy. For example, records from very weak startup or final impacts were not included in average results. Appendix C contains a representative plot of force and normalized velocity versus time, as well as plots and tables of PDA results for all hammer blows at each dynamically monitored sampling depth. The results include the EFV (transferred energy by the FV method, as recommended by ASTM D4633-10), ETR (energy transfer efficiency for the EFV method), BPM (hammer operating rate), DMX (maximum rod displacement), and VMX (maximum rod top velocity). The plots show

Page 4

each calculated PDA result versus split-spoon penetration, while the tables show statistical summaries for each 6 inch increment. At the end of each table is a statistical evaluation of the results which include the average and standard deviation of the entire measurement sample.

The table below and Table 1 summarize the average transferred energy values calculated by the EFV method. The records consist of averaged hammer blows from the last 12 inches (i.e. N value) at each dynamically monitored sampling depth. The "energy transfer ratio" (ETR) is defined as the ratio of maximum transferred energy EFV divided by the theoretical hammer potential energy of 350 ft-lbs (i.e., computed per the 140 lb SPT hammer and the standard 30 inch drop as specified by ASTM D1586-08). The average hammer operating rate is reported in blows per minute (BPM). A summary of the dynamic measurements of the energy transfer to the drill rods using the EFV equation is provided in the table below.

Drill Rig	Avg. EFV (ft-lbs)	Avg ETR (%)	Range of EFV (ft-lbs)	Range of ETR (%)
CME 550 269553	258	74	245 – 268	70 - 77
CME 550 249533	291	83	289 – 296	83 - 85
CME 55 306515	302	87	296 – 316	85 - 90

CONCLUSIONS

Based upon the dynamic test data obtained, the following conclusions are presented:

- 1. Loose connections in the drill string were sometimes observed in the force and velocity records. However, energy transfer values calculated using the EFV equation are not adversely affected by the connectors and therefore are considered a better indication of transferred energy.
- 2. Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 245 to 268 ft-lbs for the CME 550X 269553 drill rig. This corresponds to a transfer efficiency ranging from 70 to 77% of the SPT hammer energy of 350 ft-lbs.
- Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 289 to 296 ft-lbs for the CME 550X 249533 drill rig. This corresponds to a transfer efficiency ranging from 83 to 85% of the SPT hammer energy of 350 ft-lbs.
- 4. Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 296 to 316 ft-lbs for the CME 55 306515 drill rig. This corresponds to a transfer efficiency ranging from 85 to 90% of the SPT hammer energy of 350 ft-lbs.

SDW:KW:dms

Please review both ASTM D4633-10 and ASTM D1586-08 prior to applying these test results. The energy calibrations reported herein are valid for the same hammer/drill rig, with the same drill operator, same anvil dimensions, and same drilling methods.

We appreciate the opportunity to be of assistance to you on this project. Please contact our office should you have any questions regarding this submittal, require additional information, or if we may be of further service.

Sincerely,

GRL Engineers, Inc.

Karen Webster Karen Webster Luit O. Webster

Scott Webster, P.E.

GRL Engineers, Inc.

TABLE 1: Summary of SPT Energy Measurements
Ameridrill SPT Calibration January 9, 2015
CME 550X ATV Serial # 269553

Soil Sample	Reported Sample Depth	Reported Rod Length	Reported Blow Count	SPT Field N Value	Avg. Energy Transferred FV Method	Energy Transfer Efficiency1	Blow per Minute	N 60
	(feet)	(feet)	(blows/6")		(ft-lbs)	(%)	(bpm)	
SS-1	23.5 - 25.0	29.0	5,6,7	13	245	70	46	15
SS-2	28.5 - 30.0	34.0	3,5,6	11	257	73	48	13
SS-3	33.5 - 35.0	39.0	4,4,5	9	260	74	46	11
SS-4	38.5 - 40.0	44.0	2,5,9	14	268	77	49	18
SS-5	43.5 - 45.0	49.0	2,3,5	8	261	75	49	10
Average(2)					258	74	48	
tandard Dev.(2)					8	3	2	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.

^{2 -} Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.