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# Ö REFERENCE

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**DESCRIPTION** 

BORE LOG REPORTS, CORE BORING REPORT

SOIL LABORATORY TESTS RESULTS

TITLE SHEET LEGEND SITE PLAN

CROSS SECTIONS

& CORE PHOTOGRAPH

PROFILE

SHEET NO.

5-7

8-15

# 42840

### STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

## **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY <u>New Hanover</u> PROJECT DESCRIPTION <u>Bridge No. 19 over Lords Creek or</u> SR 1100 at -L- Station 15+60.59	<u>ı</u>
SITE DESCRIPTION	

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAI SHEET
N.C.	B-5236	1	16

### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

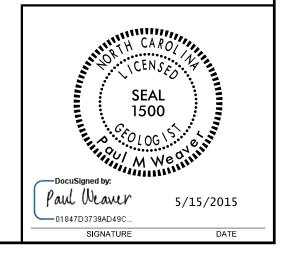
- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

B. Fowler M. Small P. Weaver INVESTIGATED BY P. Weaver DRAWN BY \_\_P. Petrucci CHECKED BY P. Weaver SUBMITTED BY \_ESP Associates, PA DATE <u>April</u>, 2015

**PERSONNEL** 



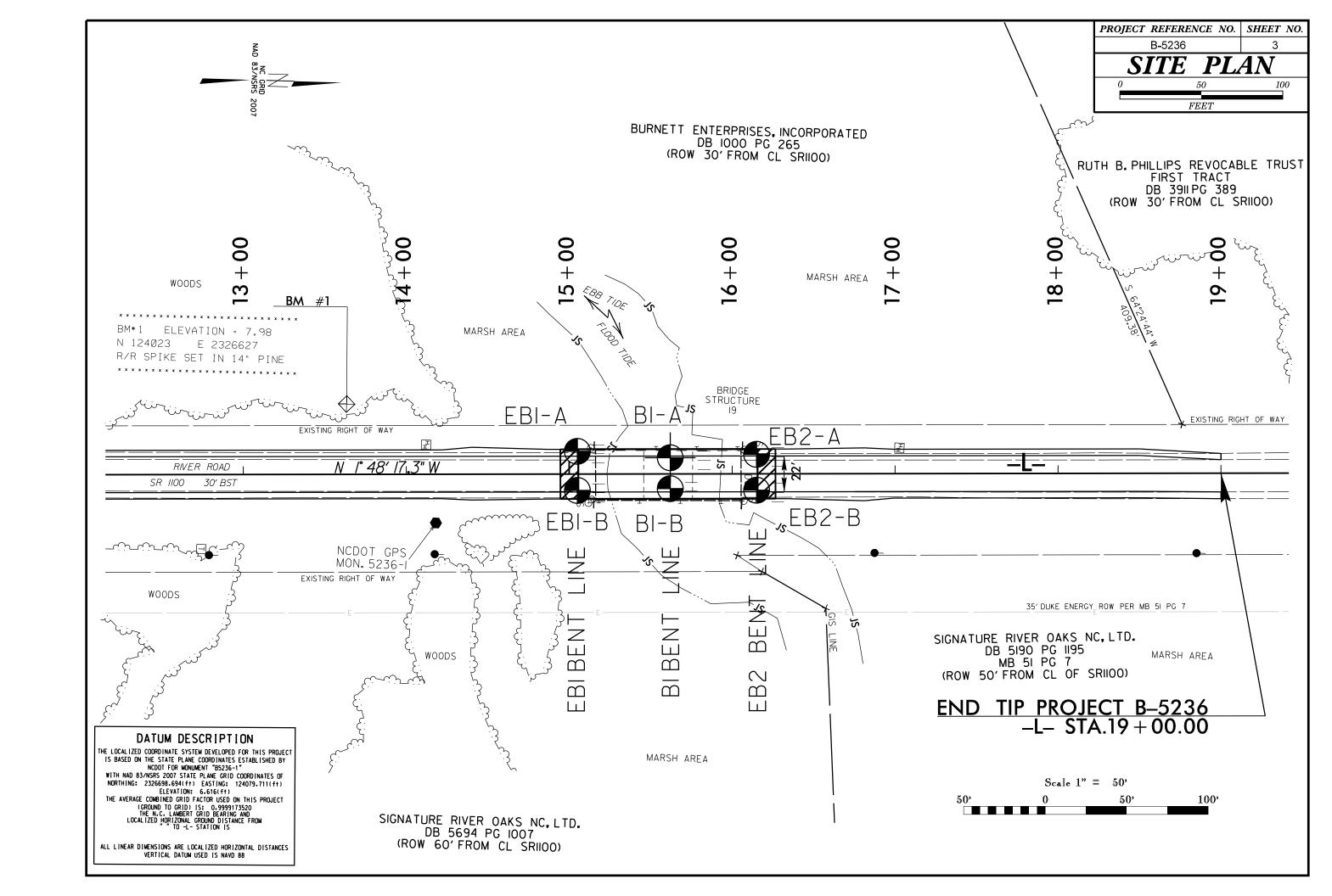
PROJECT REFERENCE NO. SHEET NO. 2

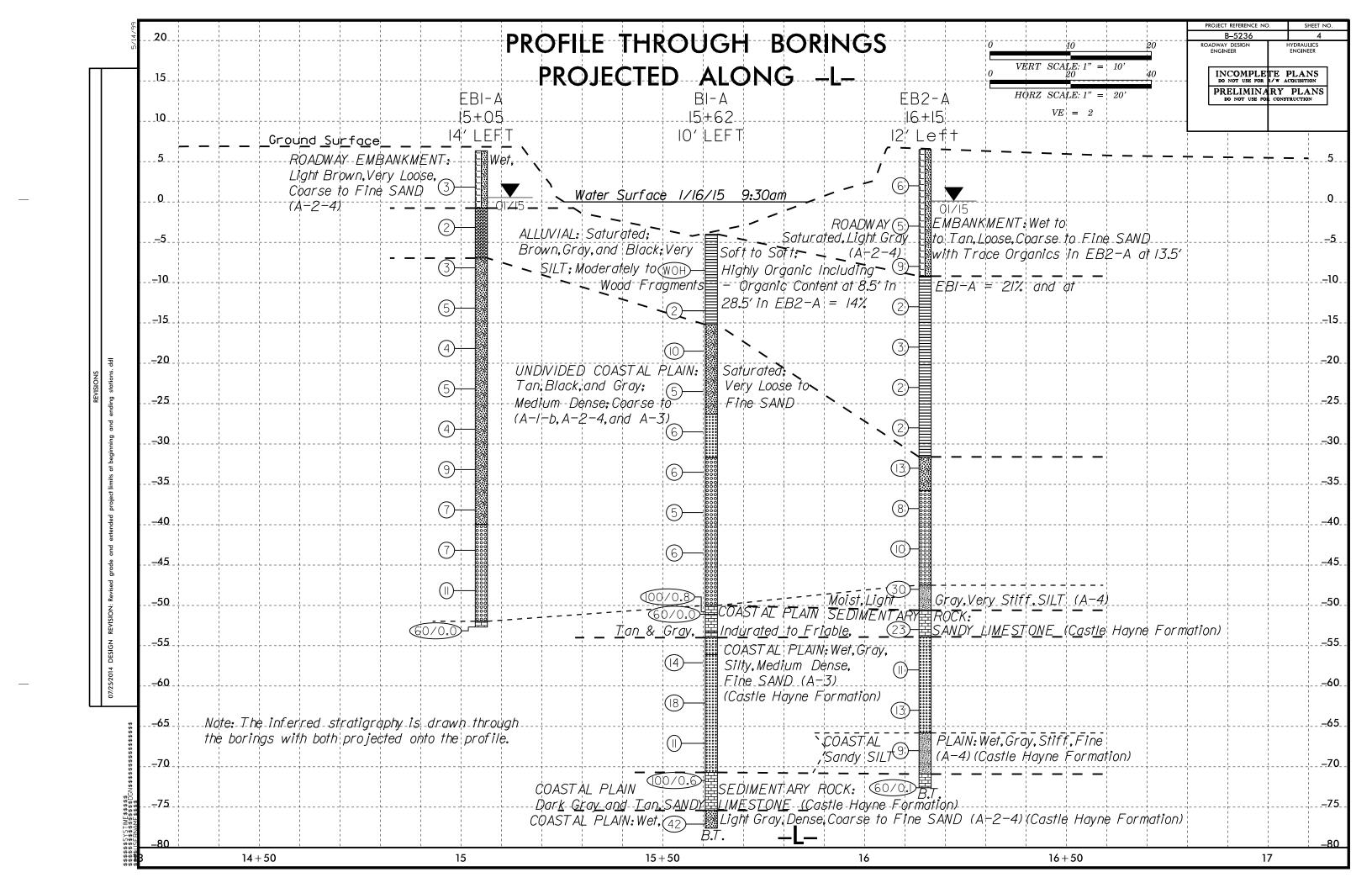
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

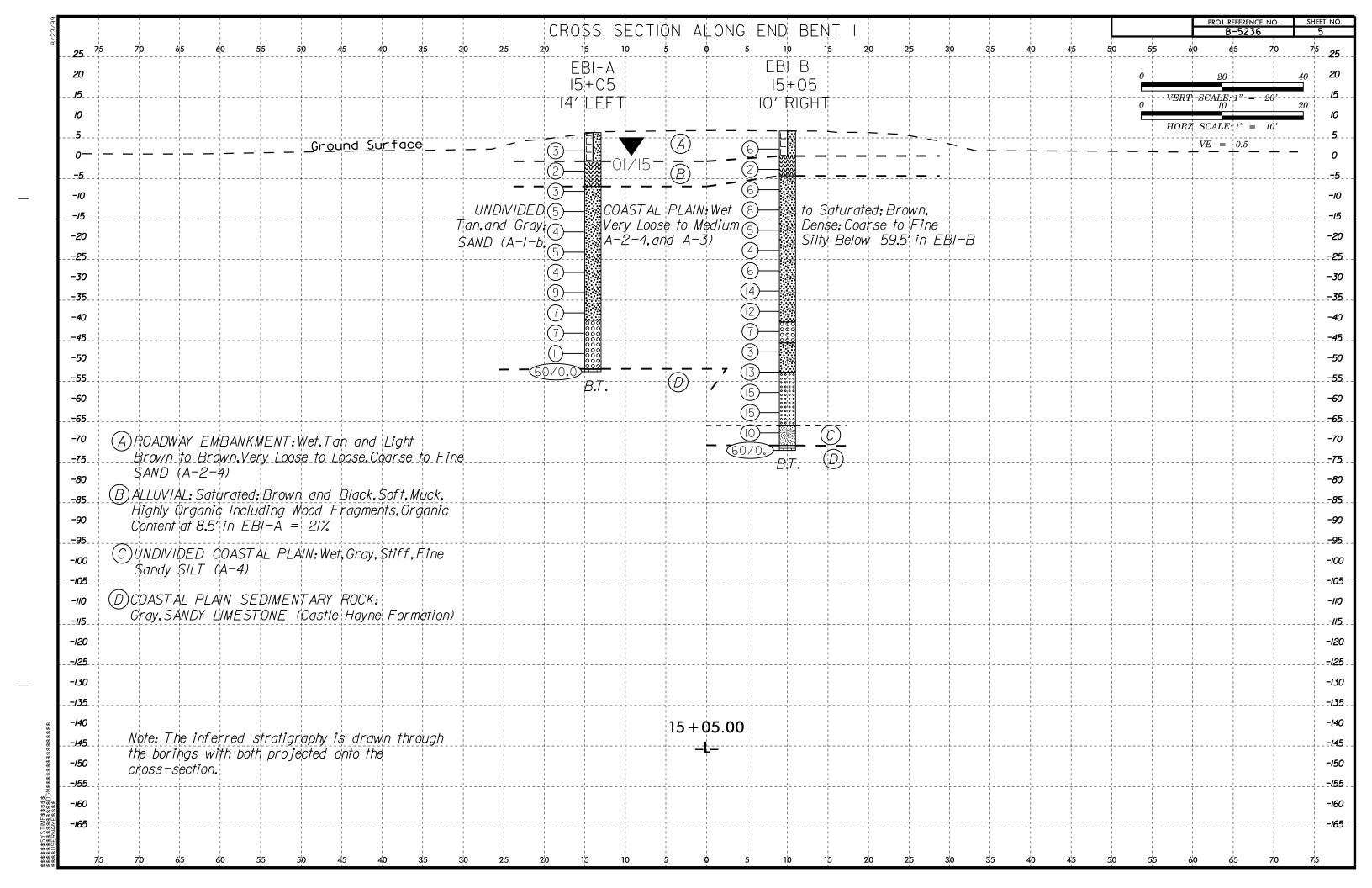
## SUBSURFACE INVESTIGATION

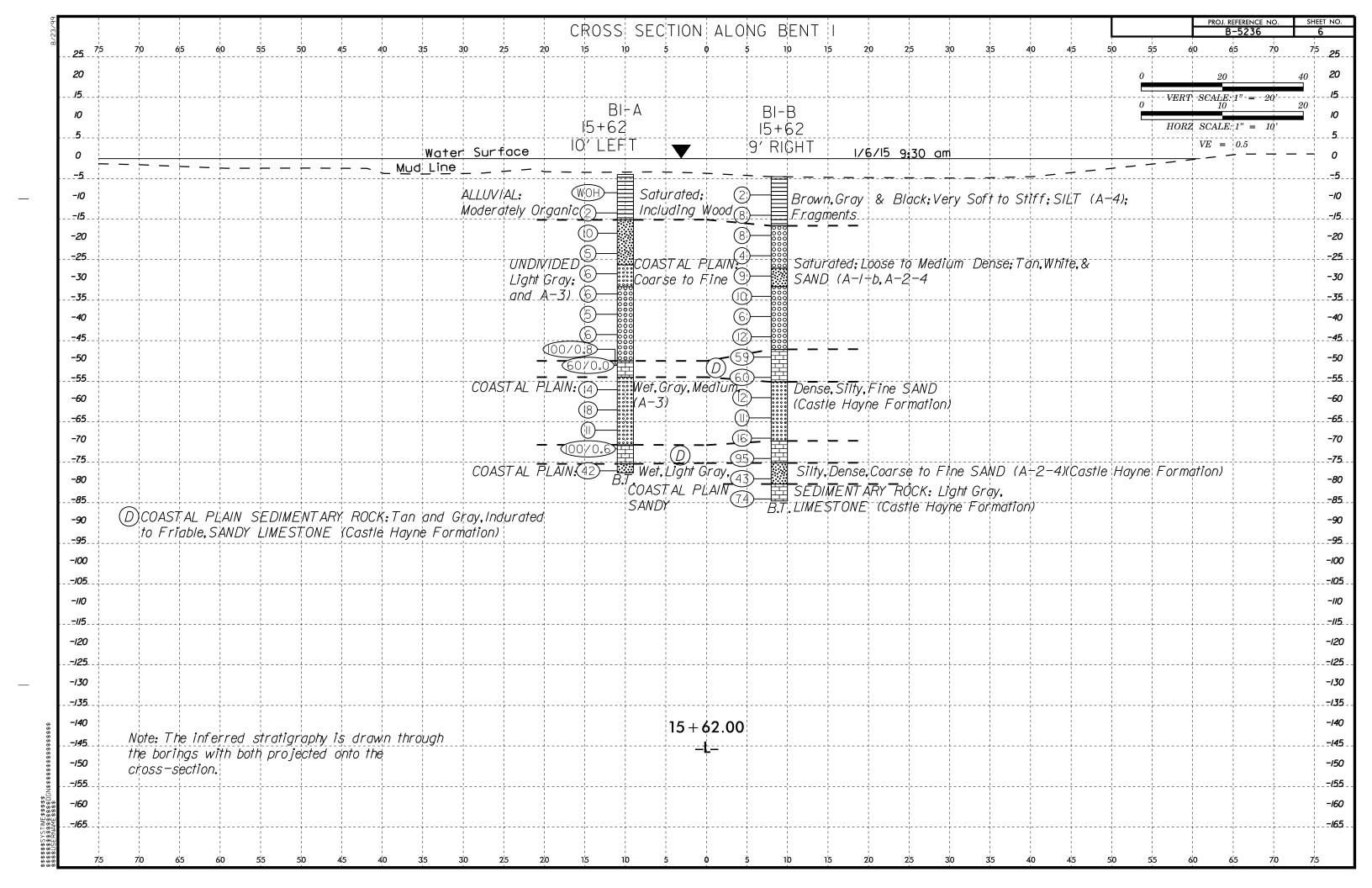
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

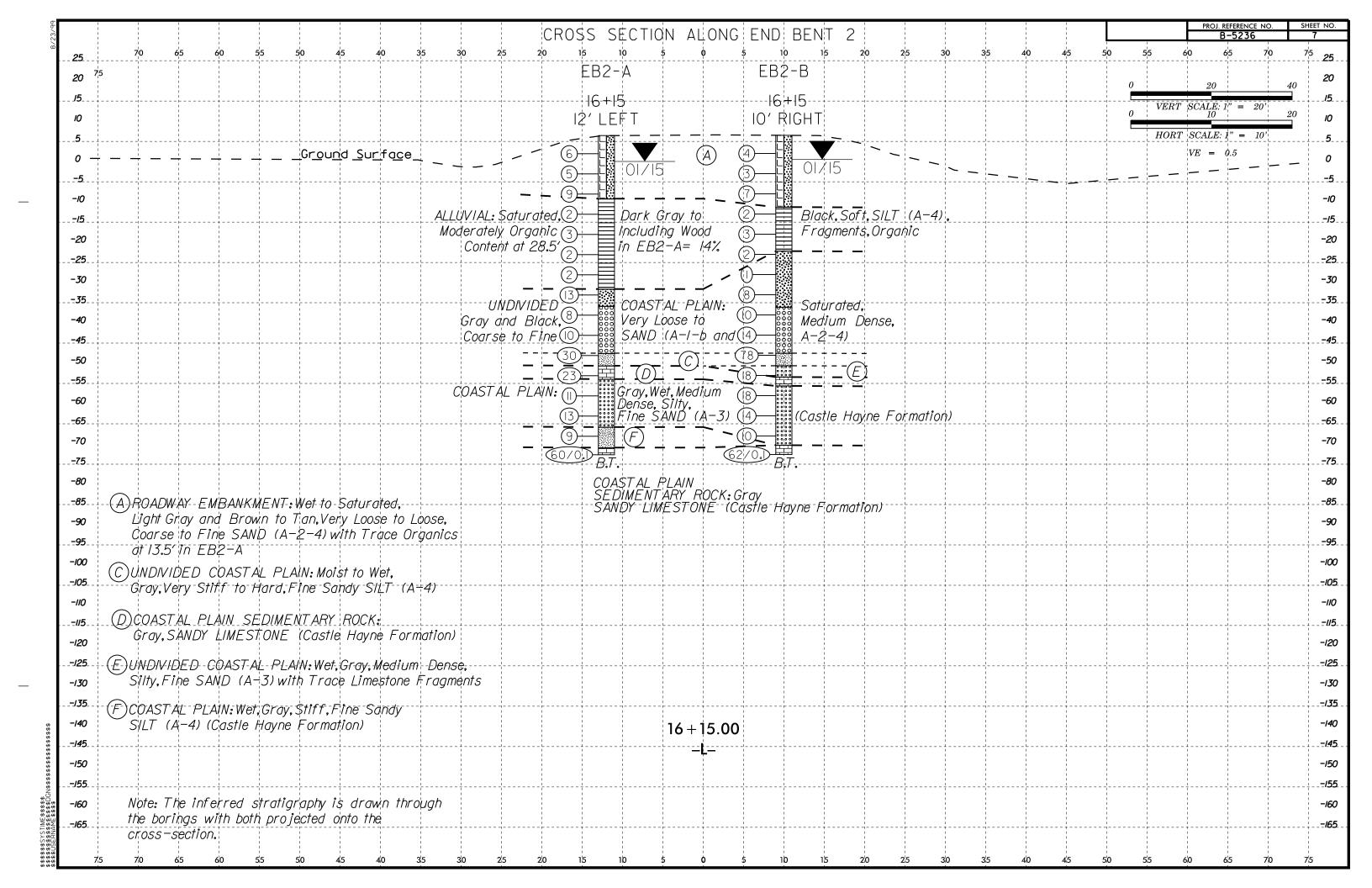
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTIMENT FACTORS SUCH	ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED // NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
CENEDAL COMMINAD MATEDIALS CILTURY MATEDIALS	MINERALOGICAL COMPOSITION	FINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC POCK THAT	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRTSTALLINE   WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE,	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	EINE TO COADES CRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-6 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SET REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 0000 000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
% PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY MUCK, CLAY SOILS CLAY PEAT	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%  LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 50ILS WITH	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN 11 MN MODERATE HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOUS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND MATERIALS SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
CEN BATING FAIR TO		(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABL	E → SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	FIELD.  JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
CONSISTENCY CONSISTENCY (N-VALUE) (TONS/FT <sup>2</sup> )	₩ITH SOIL DESCRIPTION → OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE 4 4	SOIL SYMBOL  SOIL SYMBOL  SOIL SYMBOL  SPT DMT TEST BORING  INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED  TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A	RT	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50 (NON-COHESIVE) VERY STUDENTS	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT  AUGER BORING  CONE PENETROMETER TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AFRATION AND LACK OF GOOD DRAINAGE.
VERY DENSE         > 50           VERY SOFT         < 2	☐ INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK  (V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	MW - TEST DODING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY   MEDIUM STIFF   4 TO 8   0.5 TO 1.0   MATERIAL   STIFF   8 TO 15   1 TO 2	INFERRED ROCK LINE MONITORING WELL WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4	→▼→→→→ ALLUVIAL SOIL BOUNDARY △ PIEZOMETER INSTALLATION ← SPT N-VALUE	ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4		ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	ROCK,
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
COARSE FINE	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY	UNDERCOT LZZI ACCEPTABLE DEGRADABLE ROCK	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(LSE, SU.) (F SU.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS.  MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
	L CL CLAY MOD MODERATELY $\gamma$ - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS  SOIL MOISTURE SCALE   FIELD MOISTURE   CHURC FOR THE ACCOUNT OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 <sub>d</sub> - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
(ATTERBERG LIMITS)    Could for field moisture description   Could for field moisture description	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u>	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
(SAT,) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	TENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNALL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
■ RANGE ✓   SEMISOLID; REQUIRES DRING TO	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: BM #1: RR Spike set in 14° Pine.
(PI) PL PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	N 124023, E 2326627
- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 7.98 FEET
OM OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
PENLIPES ANDITIONAL WATER TO	X CME-45C X CLAY BITS X AUTOMATIC MANUAL	CLOSE	FIAD = Filled Immediately After Driling
- DRY - (D) ATTAIN OPTIMUM MOISTURE	CME-55 6° CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	THE - THE HIMEGIGIETS ATTEL DI HIMG
PLASTICITY	8" HOLLOW AUGERS	INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS X -N Q	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST X CASING W/ ADVANCER HAND TOOLS:  POST HOLE DIGGER	CRANG CAN DE CERARATER FROM CAMPLE MITH CTEEL PROPE	
HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER  POST HOLE DIGGER  AND AUGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
11.6.12 12.16.16 12.16.12 11.6.12		1	
COLOR		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
COLOR	TRICONE TUNG,-CARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
			DATE: 8-15-1













		0.1.1	. –			TIP B-5236	<del></del>				-		
SITE	DESCR	RIPTION	Rep	lace E	Bridge	No. 19 over Lords Ci	eek on SF			)			GROUND WTR (ft
BORI	NG NO	. EB1-	-A		S	STATION 15+05		OFFSET	14 ft LT		ALI	GNMENT -L-	<b>0 HR.</b> N/A
COLL	AR ELI	<b>EV.</b> 6.0	6 ft		Т Т	OTAL DEPTH 59.0	t	NORTHING	124,2	222	EAS	STING 2,326,654	24 HR. 5.8 Caved
RILL	RIG/HA	MMER E	FF./DA	TE MI	ID5464	CME-45C 86% 08/07/201	4		DRILL N	METHOD	Mud Rota	ry HAMN	MER TYPE Automatic
DRILL	LER F	owler, E	3.		s	START DATE 01/08/	5	COMP. DA	TE 01/	08/15	SUF	RFACE WATER DEPTH N	/A
LEV	DRIVE	DEPTH	T	ow col			PER FOOT		SAMP.		Τ'		
(ft)	ELEV (ft)	(ft)	0.5ft			<b>- </b>		75 100	NO.	MOI		SOIL AND ROCK DES	CRIPTION DEPTH
	(11)						.1			I WIOT C	LLLV.	(II)	DEI III
40													
10		t									-		
		+									6.6	GROUND SURF	ACE
5		F				<u> </u>						ROADWAY EMBAN	IKMENT
	3.1	3.5										Light Brown, Coarse to Fine	e SAND (A-2-4)
	 	1 3.3	2	2	1					l ₩ 🗏			
0	_	‡									-0.5_		
	-1.9	8.5				J  i:::: ::::				] 🔣		ALLUVIAL	
		Ŧ	1	1	1	2			SS-1	Sat.   \	₹ -	Brown, MUCK, Highly Org Wood Fragme	nts
-5	-	Ŧ					<u> </u>	ļ · · · ·			<u></u>	Organic Content in Sample	SS-1 = 21.1%
	-6.9	13.5	2	1	2	-    <del> </del>					-6.7_	UNDIVIDED COASTA	ΔΙ-ΡΙΔΙΝ — — — 1
40		‡	-	'	-					Sat.		Brown to Tan to Light Gray,	Coarse to Fine
-10	-	t					+	+				SAND (A-2-4	·)
	-11.9	18.5	3	3	2	-   ]				Sat.			
-15		Ŧ											
	-16.9	23.5				1	1	1					
	-10.9	23.5	2	2	2	- - - - - - - - - - - - - - - - - - -				Sat.			
-20	_	1				<u>                                   </u>					<u>.</u>		
	-21.9	28.5				] }::::							
		Ŧ	2	2	3	<b>♦</b> 5				Sat.	#		
-25	_	Ŧ					<del> </del>	<u> </u>					
	-26.9	33.5	1	2	2	4  ;:::: :::::							
		‡	'		-	4				Sat.			
-30	-	t					+	+					
	-31.9	38.5	5	4	5					Sat.			
-35	•	Ŧ				: 7   :	: : : :				::[		
	-36.9	43.5				1							
	-50.9	1 43.3	4	3	4	<sup>-</sup>				Sat.			
-40	_	‡									-39.7	Tan, Fine to Coarse SA	MD (A 1 b) — 4
	-41.9	48.5				_				000	ŠŁ	ran, Fine to Coarse SA	MND (A- 1-0)
		+	3	4	3					Sat.	<u>~</u>		
-45	-	Ŧ				1 . 1	<del>                                     </del>	+		000	<u>-</u>		
	-46.9	53.5	6	6	5					000	<u>-</u>		
F0		‡				· • 11 ·   · · · ·				Sat.			
-50		<u> </u>					<del> </del>	<del>   </del>		000	ŏ <u> </u>		E
F	-51.9	58.5	100/0.5	60/0.0		.	<u>+</u>	60/0.0	<b>-</b>	Lost Circulation	5 -51.7 52.4	COASTAL PLAIN SEDIME	
	•	Ŧ			1						F	Gray, SANDY LIMESTONE Formation)	(Castle Hayne
	-	Ŧ									F	Boring Terminated with	
		‡									ļ.	Penetration Test Refusal at I in Coastal Plain Sedime	entary Rock:
	_	‡									L	LIMESTONE	
		ŧ									F		
		+									F		
	_	Ŧ									F		
		‡									ļ.		

	42840.					<b>P</b> B-5236		<u> </u>		HANOVER		G	EOLOGIST Weaver, P.M.				42840.1.					TY NEW HA			GEOLOGIST Weaver		
ITE DI	ESCRIF	PTION	Repl	lace B	<u> </u>			reek on S	<del></del>	iver Road)				GROUND V	WTR (ft)	SITE	DESCRIPT	ION Rep	place B	<u> </u>	lo. 19 over Lords Creek on S	SR 1100 (Rive	er Road	)	1	GROUN	ND WTR
ORING	G NO.	EB1-	В		ST	TATION 15	5+05		OFFSET	10 ft RT		Al	LIGNMENT -L-	0 HR.	N/A	BOR	ING NO. E	B1-B		ST	<b>ATION</b> 15+05	OFFSET	10 ft RT	-	ALIGNMENT -L-	0 HR.	N
OLLA	R ELE\	<b>V.</b> 6.7	7 ft		TC	TAL DEPT	<b>TH</b> 78.8	ft	NORTHI	<b>NG</b> 124,22	3	E	<b>ASTING</b> 2,326,673	24 HR.	FIAD	COL	LAR ELEV.	6.7 ft		ТО	TAL DEPTH 78.8 ft	NORTHING	124,2	223	<b>EASTING</b> 2,326,673	24 HR.	FIA
RILL R	IG/HAMI	MER EI	FF./DAT	TE MII	D5464 (	CME-45C 86%	% 08/07/201	14	•	DRILL ME	THOD	Mud Ro	tary HAMI	MER TYPE Au	tomatic	DRILI	L RIG/HAMME	R EFF./DA	TE MI	D5464 C	ME-45C 86% 08/07/2014	•	DRILL	METHO	D Mud Rotary	HAMMER TYPE	Automati
RILLE	R Fo	wler, E	3.		ST	ART DATE	01/09/	15	COMP. [	<b>DATE</b> 01/10	0/15	SI	JRFACE WATER DEPTH	N/A		DRIL	LER Fowl	er, B.		ST	<b>ART DATE</b> 01/09/15	COMP. DA	TE 01	/10/15	SURFACE WATER DE	PTH N/A	
.EV D		DEPTH		w cor				PER FOO	T	SAMP.	<b>V</b> / (	L	SOIL AND ROCK DES	SCRIPTION		ELEV	DRIVE DE		ow cor		BLOWS PER FOC		SAMP.	. /	L SOIL AND RO	CK DESCRIPTION	ı
	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 	50	75 10	00 NO.		G ELE			DEPTH (ft)	(ft)	(ft)	ft) 0.5ft	0.5ft	0.5ft	0 25 50	75 100	NO.	MOI			
0												L				-70	ļ <del> </del>		$\perp$		Match Line		<b> </b>	L			
	‡											<b> </b>					-72.0 78	3.7 60/0.1			.!	60/0.1			-70.9 -72.1 COASTAL PLAIN		
,	‡					1				.	L	6.7	GROUND SURF ROADWAY EMBAN	NKMENT	0.0		‡	00/0.1	1			00/0.1				ated with Standard	
	3.2	3.5				1	1	<u> </u>		7	L	-	Tan and Brown, Coarse (A-2-4)	to Fine SAND			‡								<ul><li>Penetration Test Re</li><li>in Coastal Plair</li></ul>	efusal at Elevation -7 n Sedimentary Rock ESTONE	72.1 ft c:
	J.2	5.5	3	3	3	6		: : :			w	-					‡								LIM	ESTONE	
	‡					<u> </u>		ļ · · ·				- <del>[::]-</del> 0.5 .	ALLUVIAL		6.2		‡										
<u> </u>	-1.8	8.5	WOH	1	1	<u> </u>  :::::		: : :		:	Sat. \$5	<del>}}</del>	Black, Silt, Highly Organic Fragments - Ml	Including Wood UCK			‡										
	‡					•2 · · · · · · · · · · · · · · · · · · ·					3ai. 8884	**************************************			11.1		‡										
	-6.8	13.5				1	: : : :	1		-			UNDIVIDED COAST	e, Coarse to Fin	ie		‡								-		
	<u> </u>	10.0	3	3	3	6	: : : :			:	Sat.		SAND (A-2-4	4)			‡										
	‡					<u> </u>		ļ · · ·									‡										
-	11.8	18.5	3	3	5	1.1			I	:	Sat.						‡										
	‡									:	Sal.						‡										
	16.8	23.5				<u> </u>		1		7							‡								-		
	10.0	20.0	2	3	2	<b>∮</b> 5		: : :		·	Sat.						‡										
	‡					1		<u> </u>									‡										
<u>_</u>	21.8	28.5	2	2	2					:	Sat.						‡										
	‡		_	-	-	<b>●</b> 4 · · · · <b> </b>				:	Sal.						‡										
	26.8	33.5				1		1		-							‡										
	70.0	00.0	2	3	3	6	: : : :			:	Sat.						‡										
-	‡					-/		ļ · · · ·									‡								-		
F	31.8	38.5	6	7	7	: ./. :	::::			:	Sat.						‡								-		
;	‡					₹14				:	Jai.						‡										
	36.8	43.5				į		1		7							‡								-		
	1		6	6	6	12 .				.	W						‡										
	‡					1 1		<u> </u>				40.	4		47.1		‡								-		
F	41.8 †	48.5	4	4	3	: j: : :					Sat.	000	Light Gray, Fine to Coarse	e SAND (A-1-b)			ļ ‡										
	Ŧ					7					000	000					ļ ‡								F		
	46.8	53.5				7		1		-	Lost ::	45.	Tan, Coarse to Fine SA	AND (A-2-4)	52.3		Ŧ								F		
	+		3	2	1	<b>∮</b> 3		: : :		·   Circ	Lost   : : culation,						‡										
+	‡					H		+			Hole lave-In						‡								<del> </del>		
-	51.8 ‡	58.5	1	1	12	12					Sat. W	-52.8	8		59.5		‡								[		
	Ŧ										Lost 3		Tan to Gray, Silty, Fine	SAND (A-3)			‡								I E		
	56.8	63.5								Circ	culation						Ŧ								l E		
	Ŧ		7	6	9	•15					W														E		
	Ŧ						<u> </u>	+			0 0						‡								<del>[</del> -		
-	·61.8 T	68.5	7	7	8					:	W														E		
5	Ŧ					<u> </u>	<u> </u>			·_	0 0						Ŧ								E		
	66.8	73.5								: ]		-65. <u>9</u>	9 Gray, Fine Sandy S	ILT (A-4)	72.6		Ŧ								E		
- 1	Ť		5	4	6	10				. 11 1	W	333E	, , , , , , , , , , , , , , , , , , ,				1 I	- 1					1	1	І Г		

WBS	42840	0.1.1			TIF	<b>B</b> -5236		COUNT	Y NEW HA	NOVE	R		GEOLOGIST Weaver, P.M.		<b>WBS</b> 42840.1.1		<b>TIP</b> B-5236	COUNTY NEW HA	ANOVE	R		GEOLOGIST Weaver, P.		
SITE	DESCR	RIPTION	<b>I</b> Rep	olace E	ridge N	No. 19 ove	r Lords Cı	reek on S	R 1100 (Rive	er Road	d)			GROUND WTR (ft)	SITE DESCRIPTION	Replace Brid	dge No. 19 over Lords (	Creek on SR 1100 (Rive	er Road	d)			GROUND WTR	(ft
BOR	ING NO	. B1-A	4		ST	ATION 1	5+62		OFFSET	10 ft LT	Γ		ALIGNMENT -L-	<b>0 HR.</b> N/A	BORING NO. B1-A		STATION 15+62	OFFSET	10 ft LT	Γ		ALIGNMENT -L-	0 HR. N	N/A
COL	LAR EL	<b>EV</b> 4	.0 ft		тс	TAL DEP	<b>TH</b> 73.61	ft	NORTHING	<b>3</b> 124,	165			<b>24 HR.</b> N/A	COLLAR ELEV4.	0 ft	TOTAL DEPTH 73.6	ft NORTHING	<b>3</b> 124,	165		<b>EASTING</b> 2,326,652	24 HR. N	N/A
DRIL	L RIG/HA	MMER E	FF./DA	TE MI	D5464 C	CME-45C 869	% 08/07/201	14		DRILL	METH	OD N	W Casing W/SPT & Core HAMM	IER TYPE Automatic	DRILL RIG/HAMMER E	FF./DATE MID54	464 CME-45C 86% 08/07/20	014	DRILL	METHO	OD	NW Casing W/SPT & Core F	HAMMER TYPE Automati	ic
DRIL	LER F					ART DATE			COMP. DA			5	SURFACE WATER DEPTH 3.	9ft	DRILLER Fowler, E		START DATE 01/06	<u>!</u>			5	SURFACE WATER DEPTH	<b>H</b> 3.9ft	
ELEV (ft)	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	DEPTH (ft)	`——	0.5ft				PER FOOT		SAMP	17		SOIL AND ROCK DESC		ELEV DRIVE DEPTH (ft)	0.5ft 0.5ft 0.		S PER FOOT 50 75 100	SAMP				DESCRIPTION	
(11)	(ft)	(1.7)	υ.5π	0.5π	0.511		25	50	75 100	NO.	/MC	OI G	ELEV. (ft)	DEPTH (ft)	(it) (ft) (it)	0.511 0.511 0.	.5π 0 25	50 75 100	NO.	/MO	OI G			—
40																	Ma	atch Line						
10		‡											<del>_</del> -		-70 -71.1 <b>-</b> 67.1	67 33/0.1	_ + <del></del>			-		COASTAL PLAIN SE	DIMENTARY ROCK	<u>6</u> 6.
		‡											- -			67  33/0.1					Ħ	Dark Gray, SANDY L Hayne Fo	IMESTONE (Castle	
5	_	‡											- <del>-</del>		-75 -76.1 - 72.1						***	-75.4	•	<u>71</u> .
		Ŧ											- -		-70.1 - 72.1	11 16 2	26	42	Ц	W	2000	Light Gray, Coarse to	Fine SAND (A-2-4)	73.
0		Ŧ										,	- WATER SURFACE (0	01/06/15)								Castle Hayne Boring Terminated at	Elevation -77.6 ft in	
		Ŧ										7 -[	<del>-</del>		$  \cdot  $							Coastal Plain M	laterial: SAND	
l _		<u> </u>											-4.0 GROUND SURFA	ACE 0.0								E		
-5	-	‡				1		+					ALLUVIAL Dark Brown to Gray and	Black, Silt,								-		
	-7.5	3.5	WOH	WOH	WOH						Sat.		Moderately Organic Inclusion Fragments	uding Wood								-		
-10	-	‡				T		<u> </u>					- -									-		
	-12.5	8.5		<u> </u>		į:::::							- -									-		
-15		Ŧ	2	1	1	2					Sat.	·	- - 15.2	11.2								F		
	17.5	Ī.,, -				-1							UNDIVIDED COASTA  Light Tan, Coarse to Fine 9	AL PLAIN								E		
	-17.5	† 13.5 	4	5	5	10					Sat.			0,410 (,42 1)								E		
-20	-	<u> </u>				1		+					-  -									-		
	-22.5	18.5	2	2	3	1:::					Sat.		<del>-</del> -											
-25	_	‡				<b>\P</b> 5					Jai		- <del>-</del>									-		
	-27.5	23.5										0000	<u>26.3</u> - Light Gray, Fine SAND (A-3)	) with Little SILT								-		
-30		‡	3	3	3	<b>•</b> 6					Sat.	. 0000	<del>-</del> -									-		
		Ť				1						0000	31.7	27.7								F		
	-32.5	<u>† 28.5</u>	3	3	3	<b>1</b>					Sat.		Light Gray to Light Tan, Fi SAND (A-1-b)	)								-		
-35	-	Ŧ				1		+ : : :				0000	Note: Very Soft Area or Voi 45.5'; Rods Dropped 2' Be	elow Planned	1 1 ±							F		
	-37.5	33.5	2	3	2	<u>  i                                 </u>					Sat.	000	Sample Depth of	43.5'										
-40	_	‡				5					Jai	000	- <del>-</del>									-		
3	-42.5	38.5				1						000	- -									-		
-45		‡	3	3	3	6					Sat.	. 0000	<del>-</del> -		‡							-		
5	-	ŧ				1:::		1				000	<del>-</del> -									F		
<u> </u>	40.5	Ī									Lost		<del>-</del> -									-		
-50	_	45.5 47.1	45	23	77/0.3	1	<del>                                     </del>	+	100/0.8				-50.0 COASTAL PLAIN SEDIMEI	NTARY ROCK	1 1 = 1							-		
ŝ		<u> </u>	60/0.0						60/0.0				Gray and Tan, Indurated to F LIMESTONE (Castle Hayn	ne Formation)								_		
-55		‡				· · · L =	<u> </u>	+				0000	COASTAL PLA	NN 50.0								_		
	56.1	52.1	6	7	7	l					w	0000	Dark Gray, Silty, Fine SANE Hayne Formatic	D (A-3) (Castle on)								‡		
-60		‡							:			0000	- -									ļ.		
-00	-61.1	57.1	7	9	a	<u> </u>	: : : :	1:::			,,,	0000	<del>-</del> -		‡							F		
		Ŧ	'	9	9	· · · • 18			.		W	0000	<del>-</del> -									F		
-65	_ 66.1	62.1				· · / ·	<del>                                     </del>	+				0000	-  -		‡							E		
			4	5	6	. 11					w	0000	- -		1 1 1							E		
-70		Ţ	1				: : : :	: : :	.			0000	- -		‡							-		

NBS	42840	).1.1			TIP	B-523	86	C	TNUC	ΥN	EW HANOVER	GEOLOGIST Weaver, P.M.	
SITE	DESCR	IPTION	l Rep	olace Brid	ge No	. 19 o\	er Lords	Creek	on S	R 11	00 (River Road)	1	GROUND WTR (1
3OR	ING NO.	. B1-A			STA	ΓΙΟΝ	15+62			OF	FSET 10 ft LT	ALIGNMENT -L-	0 HR. N/
COLI	LAR ELI	<b>EV</b> 4	.0 ft		тот	AL DE	<b>PTH</b> 73.	.6 ft		NO	<b>RTHING</b> 124,165	<b>EASTING</b> 2,326,652	24 HR. N/
RILL	RIG/HA	MMER E	FF./DA	TE MID54	164 CMI	E-45C 8	86% 08/07/2	2014			DRILL METHOD N	W Casing W/SPT & Core HA	MMER TYPE Automatic
DRIL	<b>LER</b> F	owler, I	 3.		STAF	RT DA	<b>TE</b> 01/0	6/15		СО	MP. DATE 01/07/15	SURFACE WATER DEPTH	3.9ft
	E SIZE				1		<b>N</b> 5.0 ft						
LEV	RUN	DEPTH	RUN	DRILL	l .	JN	SAMP.	STR REC.	ATA RQD	L			
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft)	O G	ELEV. (ft)	DESCRIPTION AND REMARKS	DEPTH
51.1												Begin Coring @ 47.1 ft	
	-51.1	47.1	5.0	5:23 N=60/0.0 5:23 9:12 :59 :13 :08	(3.3) 66%	N/A				H	_ COASTA	L PLAIN SEDIMENTARY ROCK (co	ntinued)
55		-		5:23 9:12 -50						0000	54.0	COASTAL PLAIN	<u>5</u>
	-56.1	52.1								0000	Gray, Silt	y, Fine SAND (A-3) (Castle Hayne Fo	rmation)
	-	Ŧ		N=14						0000	-		
60	_	Ŧ								0000	- -		
	-	Ŧ		N=18						0000	- -		
65		Ŧ								0000	-		
	-	Ŧ		N=11						0000	<del>-</del> -		
		‡		//-//						0000	<del>-</del> -		
70	_	‡								0000	- <sub>-70.7</sub>		6
	-	‡		N=100/0.6						H		ASTAL PLAIN SEDIMENTARY ROO SANDY LIMESTONE (Castle Hayne	
75		‡								Ħ	•	0, 11, 12	
5	-	‡		N-40							<u></u>	COASTAL PLAIN	
		<u> </u>	-	N=42							77.6 Light Gray, Coa	rse to Fine SAND (A-2-4) (Castle Had at Elevation -77.6 ft in Coastal Plain	/ne Formation) 7:
	- - - - - -	† † † † † †									- - - - - - - -		

SHEET 12

### **CORE PHOTOGRAPH**

WBS No. 42840.1.1

TIP No. B-5236

Project Description: Replace Bridge No. 19 over Lords Creek on SR 1100 (River Road)

New Hanover County, North Carolina

B1- A

47.1 Feet to 52.1 Feet



WBS 4284					B-5236	PORT		ITY NE	- ΜΑΝ	NOVE	<del></del>		GEOLOGIST Weaver, P.M.			WRS 4	2840.1.1			Т	IP B-5236		COLINI	ry new h	NOVE	 R		GEOLOGIST Weaver, P	P M	
SITE DESCI		Repla	ice Bri	_								ı	Veaver, 1 .ivi.	GROUND	WTR (ft)				eplace l					R 1100 (Riv				GEOLOGIOT Weaver, 1	GROUND	WTR (f
BORING NO		rtopia		Ť	ATION 1				<b>SET</b> 9		,		ALIGNMENT -L-	0 HR.	N/A	BORING			iopiaco i	<del></del>	TATION 1			OFFSET				ALIGNMENT -L-	0 HR.	N//
COLLAR EL		6 ft		+	TAL DEP		ft		THING		166	_	<b>EASTING</b> 2,326,676	24 HR.	N/A	COLLA					OTAL DEP		ft	NORTHIN				<b>EASTING</b> 2,326,676	24 HR.	N//
DRILL RIG/HA			MID					Non			METHOD			MMER TYPE							CME-45C 86			1			OD M		HAMMER TYPE A	
DRILLER					ART DAT			СОМІ	IP. DAT				SURFACE WATER DEPTH				R Fowle				TART DAT			COMP. DA				SURFACE WATER DEPT		
	DEPTH		/ COUN				PER FO			SAMP.		L				ELEV DF			BLOW CO				PER FOO		SAMP		71			
(ft) ELEV	(ft)	0.5ft (	0.5ft (	).5ft	0	25	50	<b>7</b> 5	100	NO.		O G E	SOIL AND ROCK DE ELEV. (ft)	ESCRIPTION	DEPTH (ft)	(ft)	(ft) (ft	0.5	5ft 0.5ft	0.5ft	0	25	50	75 100	NO.	MC	O OI G	SOIL AND ROCK	K DESCRIPTION	
10	↓											L				-70					<u> </u>	Mat	ch Line		<del> </del>	- L	1-1			
	‡																	_										COASTAL PLAIN SE Gray, SANDY LIMES	STONE (Castle Hayr	ne ne
5	‡															-75	73.1 <u>68.</u>	.5	2 39	56					 5			Formation)	(continued)	7.
	‡											-				-73	‡					· · · ī	+	-+				- CUASIA	AL PLAIN	
	‡															7	<u>78.1 <sup>‡</sup> 73.</u>	.5	B 21	22		: : :  :				,,,		Light Gray, Coarse t (Castle Hayn		+)
0	‡											_ <del> -</del> -	WATER SURFACE	(01/05/15)		-80	‡	"	] [			· · · · •	43	- 1		W		- 		75
	‡											F					33.1 78.	5						• •				COASTAL PLAIN SE Light Gray, SANDY Hayne Fo	LIMESTONE (Castle	e e
-5	1					1						<u> </u>	4.6 GROUND SUF		0.0		5.1 = 70.	10	0 42	32				74				- Hayne Fo	ormation)	80
	Ξl												ALLUVIA Brown and Black, Silt, Mo	oderately Organ	nic		Ŧ											Boring Terminated a Coastal Plain Se	edimentary Rock:	n
-8.1	3.5	WOH	1	1			.				Sat.		Including Wood F	ragments			<u> </u>											LIMES	STONE	
-10	‡				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	1											+											<u>-</u>		
-13.1	8.5				j : : :		.										‡											-		
-15	‡	2	4	4	- 98						Sat.						‡											- -		
	‡ , , ,				.		.					-	16.7 UNDIVIDED COAS	TAL PLAIN	12.1		‡											<del>-</del> -		
-20	13.5	3	4	4	. l		.				Sat.	000 000 000	Tan and White, Fine to (A-1-b)	Coarse SAND			‡											-		
20	‡				<u> </u>	1						0000	(*****)				‡											<del>-</del> -		
-23.1	18.5	2	2	2			.				Cat	000 <b>-</b>					‡											-		
-25	‡	-	_	_	4 · · ·	ļ · · ·					Sat.	000					+											<del>-</del>		
-28.1	I 23.5				1							000 000 000-	27.2 White, Coarse to Fine	SAND (A-2-4)	22.6		Ŧ													
-30	I I	4	4	5	9						Sat.		TTIMES, COURSE TO THIS	0, 11.12 (1.12 1.)			$\frac{1}{2}$											<u>-</u>		
	‡				:   : :		.   .						31.7 Tan and White, Fine to	Coores CAND	27.1		‡											-		
-33.1	28.5	4	5	5	. 10 .		.				Sat.	000 000 000	(A-1-b)	Coarse SAIND			‡											-		
-35	‡				· <del>  · · ·</del>	1						000					‡											<del>_</del> -		
-38.1	33.5	3	3	3	:j: : :		.					000 <b>-</b>					‡											<del>-</del> -		
ලි <u>-40</u>	‡			١	6	ļ · · ·					Sat.	0000					‡											<u>-</u>		
2 -43.1	38.5				./							000 000 000					‡											-		
- <del></del>	1 30.3	5	6	6	• • 12 •						Sat.	000 <b>-</b>					Ŧ											-		
-38.1 -40 -43.1 -43.1 -45 -50 -53.1 -55 -60 -63.1 -63.1 -68.1	Ŧ				]						Lost		47.2		42.6		Ŧ											-		
-48.1	I 43.5	19	29	30							Circulation	on T	COASTAL PLAIN SEDIN Gray, SANDY LIMESTON				1										[			
-50 5	‡												Formation				+											<u> </u>		
-53.1	48.5		27				.   . l . .   . l .				[						‡											-		
-55 -55	‡	11	31	23	· · · ·		. •60	) ·   · ·				-	55.2	. – . – –	50.6		‡											<u>-</u>		
GEO 4	‡ _ [						.					0000	Gray, Silty, Fine SAND (A	LAIN (Castle Hay	ne		‡											<del>-</del> -		
-58.1 -60	53.5	5	6	6	• • 12 •		.				w	0000	Formation	n)			‡											-		
#	†					1		-									‡											<del>-</del> -		
-63.1	58.5	4	5	6							w	0000					‡													
-65	Ŧ				11	1					"						$\frac{1}{1}$											- -		
-68.1	1 63.5				: :   :												Ŧ										[	_		
3 -70	+	4	4	12	16		.	.			w	:::: <u> </u>	69.8		65.2		+											-		

<b>WBS</b> 4284	0.1.1		E DESCRIPTION Replace Bridge No. 19 over Lords Creek o				II INLVVI	HANOVE	Κ.		<b>GEOLOGIST</b> Weaver	, P.M.		MR:	<b>S</b> 42840.	1.1		1	<b>IP</b> B-5236	)	COUNT	Y NEW HA	NOVER	ζ	GEOLOG	IST Weave	r, P.M.	
SITE DESC	RIPTIO	N Repl	ace Bri	idge No	o. 19 over Lords	Creek on S	SR 1100 (R	River Road	l)				GROUND WTR (ft)	SITE	E DESCRI	PTION F	Replac	ce Bridge	No. 19 ove	er Lords Cre	eek on SI	R 1100 (Rive	r Road)				GRO	OUND WTR (
BORING NO	<b>)</b> . EB2	-A		STA	<b>TION</b> 16+15		OFFSET	12 ft LT	-		ALIGNMENT -L-		<b>0 HR.</b> N/A	BOF	RING NO.	EB2-A		s	STATION 1	16+15		OFFSET	12 ft LT		ALIGNMI	ENT -L-	0 Н	R. N
COLLAR EL	<b>EV</b> . 6	.5 ft		тот	<b>FAL DEPTH</b> 79.	l ft	NORTHI	NG 124,	275		<b>EASTING</b> 2,326,651		<b>24 HR.</b> 6.4 Caved	COL	LLAR ELE	<b>V.</b> 6.5 ft	:	Т,	OTAL DEP	<b>TH</b> 79.1 ft		NORTHING	124,2	275	EASTING	2,326,651	24 H	R. 6.4 Cave
DRILL RIG/HA	AMMER E	FF./DAT	E MID	 5464 CN	ME-45C 86% 08/07/2	)14				DD M	ud Rotary	HAMN	 <b>MER TYPE</b> Automatic	DRIL	L RIG/HAM	IMER EFF.	/DATE	MID5464	I CME-45C 86	5% 08/07/201 <sup>4</sup>	ļ.			METHOD M			HAMMER TY	
DRILLER I					ART DATE 01/08		COMP. D	DATE 01.			SURFACE WATER DE				<b>LLER</b> Fo				START DAT			COMP. DA				E WATER DE	PTH N/A	
DRIVE	DEDTH	BLO\	W COUN			S PER FOO		SAMP		11				ELEV	DDI\/E	-	BLOW	COUNT			PER FOOT	L	SAMP.	/ L	00141745			
(ft) ELEV	(ft)	0.5ft	0.5ft		0 25	50		00 NO.	17	0	SOIL AND RO	OCK DES	CRIPTION  DEPTH (ft)	(ft)	ELEV (ft)	(ft) 0.		.5ft 0.5ft	<b> </b>  0			75 100	1	MOI G		SOIL AND R	OCK DESCRIPTI	ON
					1		'													'		'						
10														-70						Matc	h Line							
10	‡										_			-70	<del>_</del>		-†-			+			<b>†</b>		-70.9	OASTAL DI AIN	I SEDIMENTARY	POCK
	‡										6.5 GROUN	ID SURF	ACE 0.0		-72.0	78.5	55 60/	/0.1				60/0.1	+		72.6 -	Dark Gray, LIME	ESTONE (Castle	Hayne
5	‡				1			-			ROADWAY Light Gray to Tan				‡	-									_	Boring Termi	ormation) nated with Stand	
3.0	3.5	3	3	3	i::: :::			:			(A-2-4) with Trace	Organio	s in Sample at		‡										- Pei -	netration Test R in Coastal Pla	efusal at Elevatio in Sedimentary R	n -72.6 ft ock:
	‡	3	3	3	6			11	W			10.0				.									-	LIN	MESTONE	
0	†				1			-	_		_				1 1	-									<del>_</del> =			
-2.0	8.5	2	3	2	5			.	Sat.						1 1	.									_			
-5	Ŧ				Ţ			<u>.</u> ∐			_				1 ±										_			
-7.0	13.5				:\::: :::			1 1							1 1	:									_			
	-	2	4	5	• • 9 • • • • •			.	Sat.		-9.2		15.7		<del> </del>										_			
-10	Ŧ				<u> </u>						AL Dark Gray to Black	LUVIAL Silt Mo			<del> </del>	-									_			
-12.0	18.5	WOH	WOH	2				.	Sat.		Including V	Vood Fra	gments		1 7										- -			
-15	Ŧ			-	• 2 · · · · · · · · · · · · · · · · ·		1	1 1	Sal.		Organic Content ii	n Sample	e SS-2 = 14.1%		1 1										<del>-</del> -			
	23.5				<u> </u>			1 1			-				‡	-									<del></del> -			
-17.0	+ 23.5	1	2	1	<b>♦</b> 3 · · ·   · · ·		I	.	Sat.						‡										- -			
-20	‡				1						_				‡	-									- -			
-22.0	28.5	1			<u> </u> :::: :::			.	4						‡										- -			
05	‡	'	1	'	<b>1</b> · · · · · · · · · · · · · · · · · · ·		I		Sat.							.									- -			
-25	‡				<u> </u>						_					.									_			
-27.0	33.5	1	1	1	2			11	Sat.																-			
-30	<u> </u>				<u> </u>			<u>.                                    </u>			_				1 1										<u>-</u>			
-32.0	38.5				i <sub>250</sub> : :::			:			-31.6 UNDIVIDED	COAST	38. <u>1</u>		1 1	.									_			
	1	1	2	11	• 13.			.	Sat.		Black and Gray,	Coarse t	to Fine SAND		1 1	.									_			
-35	Ŧ										¯-35.8	(A-2-4)	42.3		1 +	.									_			
-37.0	43.5	4	4	4	. [			.	Sat.	0000	Light Gray, Fine to	o Coarse	SAND (A-1-b)		<del> </del>										-			
-40	Ī								Jui	0000	_														_			
-42.0	T 1 48.5							1 1		0000	_				Ŧ										-			
	Ŧ	5	4	6	• • 10 • • • •			.	Sat.	0000															_			
-45	Ŧ									0000	_				‡	.									_			
-47.0	53.5	3	3	27				.	<sub>M</sub>	000	-47.5	- 0" -	54.0		‡										-			
-50	‡		-	-	· · · · ·   <b>/</b> · · · ·			1 1	IVI		Light Gr	ay, SILT			‡										<del>-</del> -			
	58.5				/			-	1.		COASTAL PLAIN	SEDIME	ENTARY ROCK 57.1		‡										<del>-</del> -			
-52.0	+ 30.3	38	18	5	23			:    .	Lost Circulation	ion,⊐	Light Gray, SAND	Y LIMES Formati	STONE (Castle		‡										<del>-</del>			
-55	‡				/-				Hole Cave-I	0000	i Note. Very Hard L		om 57.1' to 57.4' /		‡										_			
-57.0	63.5	5	5		::/:: ::::			:	W		COAS	TAL PL	AIN		‡										-			
60	‡		5	٠	. • • · · · · · · · · · · · · · · · · ·			:	W	0000	Gray, Silty, Fine SA Fo	AND (A-3 rmation)			‡										- -			
-60	‡					<del>-  </del>		-		0000	-				‡	.									<del>-</del> -			
-62.0	68.5	5	6	7	13.			:	w	0000															<u>-</u>			
-65	‡									0000	<sup>-</sup> -65.8		70.0												<u>-</u>			
-67.0	73.5				:::::::::::::::::::::::::::::::::::::::			:			COAS	TAL PL	AIN 72.3												<u>-</u>			
	1	4	4	5	. •9	.		11	W		Gray, Fine Sandy S	SILT (A-4 rmation)	i) (Castle Hayne		1 1										<b>-</b>			

WBS	42840	0.1.1			TIF	<b>P</b> B-5236	C	COUNTY	NEW HA	NOVER	₹		GEOLOGIST Weaver, P.M.		<b>WBS</b> 42840.1.1		<b>TIP</b> B-5236	COUNTY NEW HA	ANOVE	R		<b>GEOLOGIST</b> Weaver, P	
SITE	DESCR	RIPTION	<b>I</b> Rep	lace B	ridge N	No. 19 over	Lords Cree				<u> </u>			GROUND WTR (ft)	SITE DESCRIPTION	Replace B	Bridge No. 19 over Lords	Creek on SR 1100 (Riv	er Road	d)			GROUND WTR (ft
BOR	ING NO	. EB2-	-B		ST	ATION 16	6+15		OFFSET	10 ft RT	Γ		ALIGNMENT -L-	<b>0 HR.</b> N/A	BORING NO. EB2-	В	STATION 16+15	OFFSET	10 ft R	Т		ALIGNMENT -L-	<b>0 HR.</b> N/A
COL	LAR EL	<b>EV.</b> 6.	5 ft		то	TAL DEPT	<b>H</b> 79.1 ft		NORTHING	124,2	276		<b>EASTING</b> 2,326,673	<b>24 HR.</b> 6.0 Caved	COLLAR ELEV. 6.	5 ft	TOTAL DEPTH 79.	1 ft NORTHING	<b>G</b> 124,	,276		<b>EASTING</b> 2,326,673	<b>24 HR.</b> 6.0 Caved
DRIL	RIG/HA	MMER E	FF./DA	TE MII	D5464 C	ME-45C 86%	6 08/07/2014			DRILL I	METHO	OD Mu	ud Rotary HAMM	IER TYPE Automatic	DRILL RIG/HAMMER E	FF./DATE MI	D5464 CME-45C 86% 08/07/2	2014	DRILL	METHO	D M	lud Rotary	HAMMER TYPE Automatic
DRIL	LER F					ART DATE	01/09/15		COMP. DA			5	SURFACE WATER DEPTH N/	/A	DRILLER Fowler, E		START DATE 01/0	9/15 <b>COMP. DA</b>			4	SURFACE WATER DEPT	Γ <b>H</b> N/A
ELEV (ft)	ELEV	DEPTH (ft)	0.5ft	W COL		0 2	BLOWS PE		75 100	SAMP.	17		SOIL AND ROCK DESC		ELEV DRIVE DEPTH	BLOW COU		/S PER FOOT 50 75 100	SAMF NO.			SOIL AND ROCK	K DESCRIPTION
	(ft)		0.510	0.510	0.510		i i			INO.	I MO	) G	ELEV. (ft)	DEPTH (ft)	(it) (ft) (it)	0.511 0.511	0.51( 0 20	,, ,,	INO.	MOI	I G		
10															-70			atch Line					
<u></u>		‡											<del>-</del> -		-72.0 78.5	+	<del> </del>		<u> </u>	-		COASTAL PLAIN SE	EDIMENTARY ROCK 76
		<u> </u>											- 6.5 GROUND SURFA		-72.0 + 78.5	38 62/0.1		62/0.1	┥		H	- Form	STONE (Castle Hayne 79. nation)
5	-	‡											ROADWAY EMBANI Brown to Tan, Coarse to Fine		‡							<ul> <li>Penetration Test Refus</li> </ul>	ted with Standard Isal at Elevation -72.6 ft
	3.0	3.5	3	2	2						,,,		•		‡							in Coastal Plain S	Sedimentary Rock: STONE
0		Ŧ			_	¶4 · · · ·					W		•		‡							<del>-</del>	
	-2.0	T I 8.5				j							<del>-</del> ·									<del>-</del> -	
			2	1	2	<b>4</b> 3 · · ·					w		•									· •	
-5	_	Ŧ				1							<u> </u>									<u>-</u> -	
	-7.0	13.5	3	4	3	7					Sat.		•		1 1 1							-	
-10	_	£				<u> </u>							_									<u>.</u>	
	-12.0	18.5				l							11.3 <b>ALLUVIA</b> L	17.8	1 1 ±							<u>.</u> -	
4-		‡	WOH	1	1	<b>♦</b> 2 · · ·					Sat.		Black, Silt, Moderately Orga Wood Fragmen	anic Including	‡							<i>,</i> -	
-15	-	<del> </del>				<u> </u>							_ - ·		‡							_ -	
	-17.0	23.5	2	1	2	<b>1 .</b>					Sat.				‡							-	
-20		‡				1							· <del>-</del>		‡							<del>-</del>	
	-22.0	28.5				j:::::							22.2	28.7	‡							-	
-25		‡	2	'	'	<b>∮</b> 2 · · · · · · · · · · · · · · · · · · ·					Sat.		UNDIVIDED COASTA Gray and Black, Silty, Coarse	e to Fine SAND								-	
-23	07.0	‡ ,,, ,				1							<ul> <li>(A-2-4) with Trace Organics I Fragments</li> </ul>	Including Wood	‡							<del>-</del> -	
	-27.0	33.5	WOH	WOH	1	1					Sat.		•									-	
-30	-	‡				1							<del>-</del>		‡							<del>-</del>	
	-32.0	38.5	1	1	7	7::::					Sat.		•		‡							· -	
-35		Ŧ				. 8					J Sal.		•		‡							-	
	-37.0	T I 43.5				.						000										<del>-</del> -	
			3	5	5	· •10 ·					Sat.		. (A-1-b)	000100 07 11 12								· •	
-40	_	Ŧ				1 1 1							<u>-</u>									<u>-</u> -	
	-42.0	48.5	5	6	8	\					Sat.	0000	•									-	
-45		‡				· · · · · ·						0000	<del>-</del>		1 1 ±							<del>-</del>	
	-47.0	53.5				: :   :						000	- 47.5	54.0	1 1 ±							-	
		‡	3	22	56	: :			78		M		Gray, Fine Sandy SIL		‡							-	
-50	-	<u> </u>				-		====	<del> </del>			-	Gray, Silty, Fine SAND (A-	-3) with Trace	‡							<u>-</u> -	
	-52.0	58.5	14	6	12		<u> </u>	 <del></del>	<u> </u>		w		Limestone Fragme	nents 59.9	‡							-	
-55	<u> </u>	‡					_ <del></del>						COASTAL PLAIN SEDIMEN Gray, LIMESTONE (Cas	NTARY ROCK	‡							<del>-</del>	
	-57.0	63.5	Ω	0		: : :[:	T:::::†	<del></del> -					Formation)  COASTAL PLA		‡							-	
-60		‡	8	9	9	18					W	0000	Gray, Silty, Fine SAND (A-3) Formation)									<del>-</del>	
-00	60.0	† 										0000			‡							<del>-</del> -	
	-62.0	68.5	6	6	8	∳14			: : : :		w		•		‡							-	
-65	_	‡				<i>i</i>							<del>-</del>									<del>-</del>	
	-67.0	73.5	3	5	5						\ \	0000	· ·		‡							-	
1	]	İ			١	1 • ●10 •			::::		W	0000									1 1	•	

### **SOILS LABORATORY TESTS RESULTS**

**WBS NO.:** 42840.1.1

**TIP NO.:** B-5236

**COUNTY:** New Hanover

Replace Bridge No. 19 over Lords Creek on SR 1100 (River Road) SITE DESCRIPTION:

SAMPLE	Boring	DEPTH	AASHTO	N	L.L	P.I.	9	% BY WEIGH	HT.	to me and the second second second	% PA	SSING	SIEVES	%	%
NO.		INTERVAL (FT)	CLASS			ł	CSE. SAND	F. SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-1	EB1-A	8.5-10.0	-	_	-	_	-	-	-	-				-	21.1
SS-2	EB2-A	28.5-30.0	-	-	-	-	-	-	-	-	-	, -	-	-	14.1

Tony Summers

Tony Summers

Certification No. 121-01-1108