

REFERENCE: U-2519BA

PROJECT: 34817

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP
FROM SOUTH OF SR 1003 (CAMDEN RD) TO
SOUTH OF SR 1104 (STRICKLAND BRIDGE RD)

SITE DESCRIPTION DUAL STRUCTURE BRIDGE ON -L-
(STA. 398+06.2 NBL) & (STA. 397+69.8 SBL) OVER
UNNAMED TRIBUTARY TO STEWARTS CREEK

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2519BA	1	10

CAUTION NOTICE

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

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

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

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

PERSONNEL

B. SMITH, PG

MIKE MOSELEY

MICHAEL MOSELEY

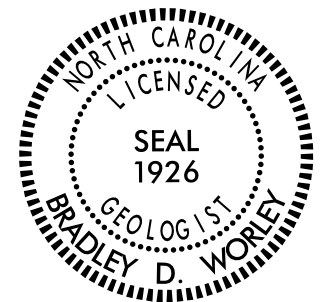
INVESTIGATED BY B. WORLEY, PG

DRAWN BY B. WORLEY, PG

CHECKED BY D. DEWEY, PE

SUBMITTED BY Summit Design and Engineering Services, PLLC

DATE NOVEMBER, 2016



DocuSigned by:

Brad Worley

3/1/2017

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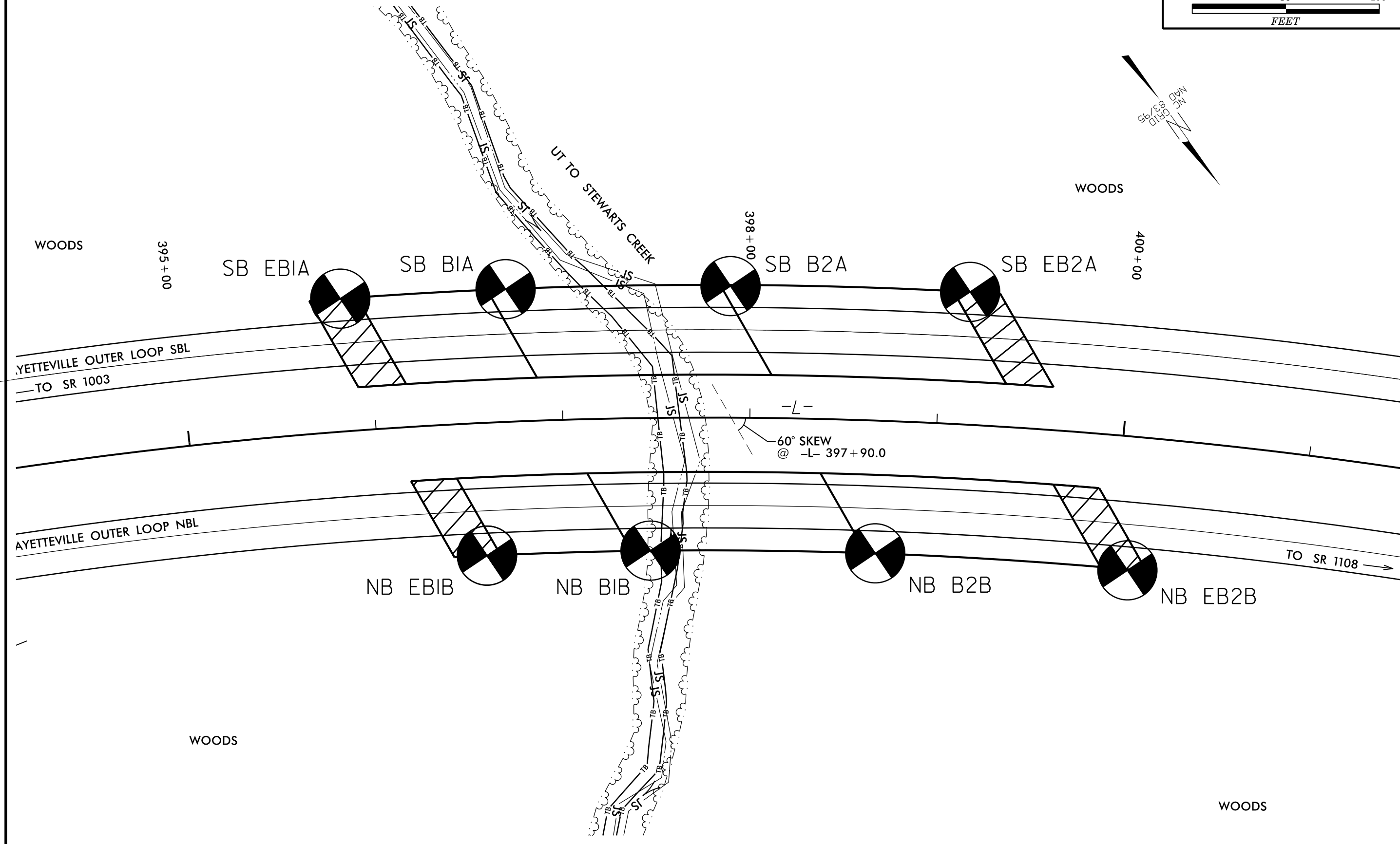
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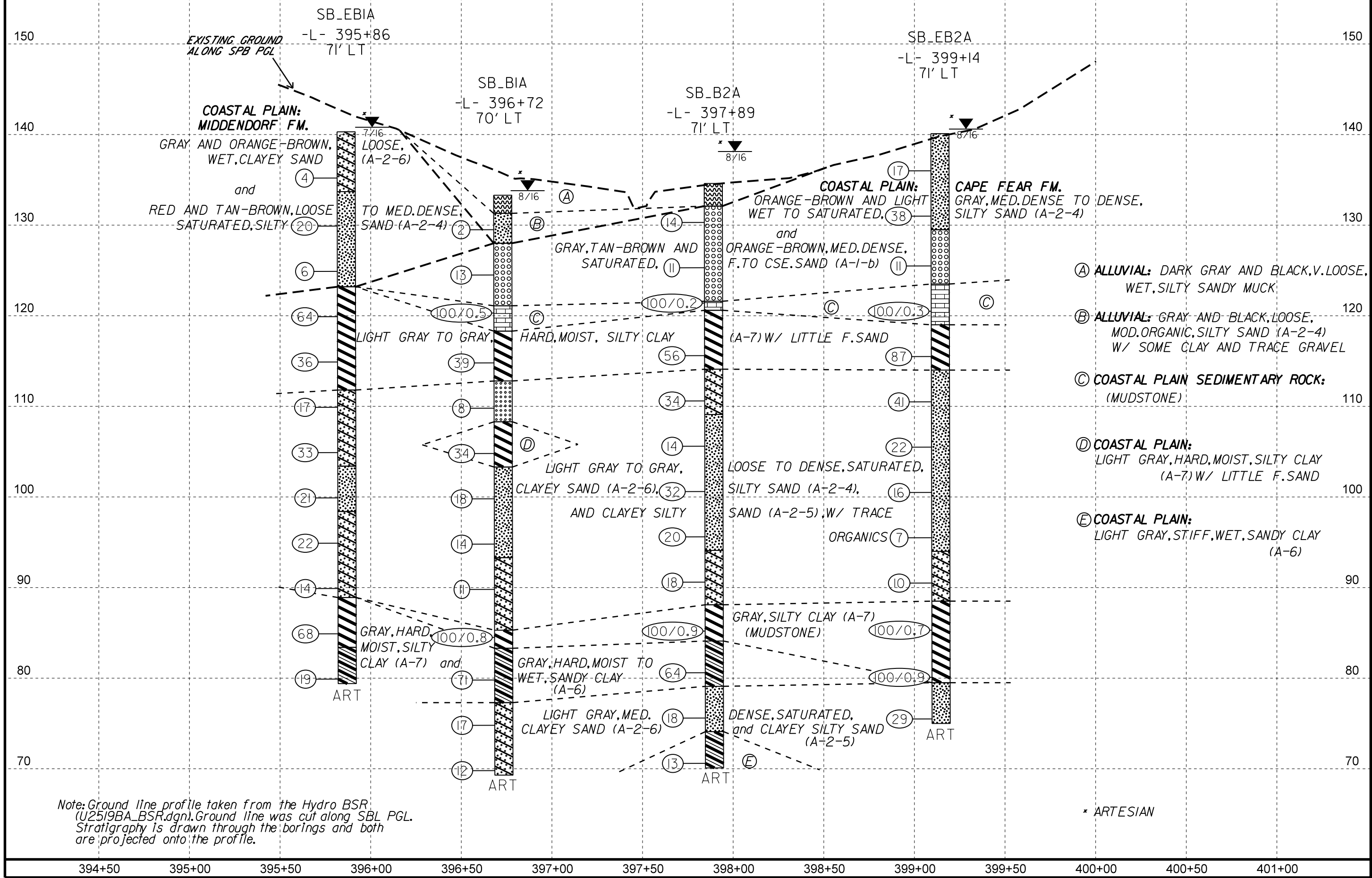
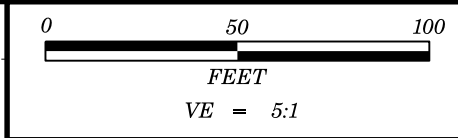
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**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

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 ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.										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. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:										ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. 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 SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. 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 THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. 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 WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SRC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH 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. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																			
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERED ROCK (WR)										NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.																			
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										CRYSTALLINE ROCK (CR)										FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.																			
GROUP CLASS. A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7										MINERALOGICAL COMPOSITION										NON-CRYSTALLINE ROCK (NCR)										FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.																			
SYMBOL										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										COASTAL PLAIN SEDIMENTARY ROCK (CP)										COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.																			
% PASSING #10, #40, #200										COMPRESSIBILITY										WEATHERING																													
MATERIAL PASSING #40 LL, PI										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.																													
GROUP INDEX										PERCENTAGE OF MATERIAL										VERY SLIGHT (V SLI.)																													
USUAL TYPES OF MAJOR MATERIALS										ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL										SLIGHT (SLI.)																													
GEN. RATING AS SUBGRADE										GROUND WATER										MODERATE (MOD.)																													
EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP										SEVERE (MOD. SEV.)																													
CONSISTENCY OR DENSITY										MISCELLANEOUS SYMBOLS										SEVERE (SEV.)																													
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY										ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF										COMPLETE																			
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS										VERY HARD																													
U.S. STD. SIEVE SIZE OPENING (MM)										UNDERCUT SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK										HARD																													
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										ABBREVIATIONS										MODERATELY HARD																													
GRAIN SIZE MM 305, 75, 2.0, 0.25, 0.05, 0.005										AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY										MEDIUM HARD																													
SOIL MOISTURE - CORRELATION OF TERMS										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										SOFT																													
LL LIQUID LIMIT PL PLASTIC LIMIT OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT										- SATURATED - (SAT.) - WET - (W) - MOIST - (M) - DRY - (D)										VERY SOFT																													
PLASTICITY										EQUIPMENT USED ON SUBJECT PROJECT										FRACTURE SPACING										BEDDING																			
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC										DRILL UNITS: CME-45C, DIEDRICH D-50, CME-450, VANE SHEAR TEST, PORTABLE HOIST										VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE										VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED										BENCH MARK: SEE NOTE									
PLASTICITY INDEX (PI) DRY STRENGTH										ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 6" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING W/ ADVANCER, TRICONE STEEL TEETH, TRICONE 2 5/8" TUNG-CARB., CORE BIT, MUD ROTARY										HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST										ELEVATION: FEET																			
COLOR										INDURATION										INDURATED										NOTES:																			
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.										MODERATELY INDURATED										Note: Elevations derived using the TIN file. (u2519ba.ls.tin.tin)																			
																				EXTREMELY INDURATED										ART = Artesian																			

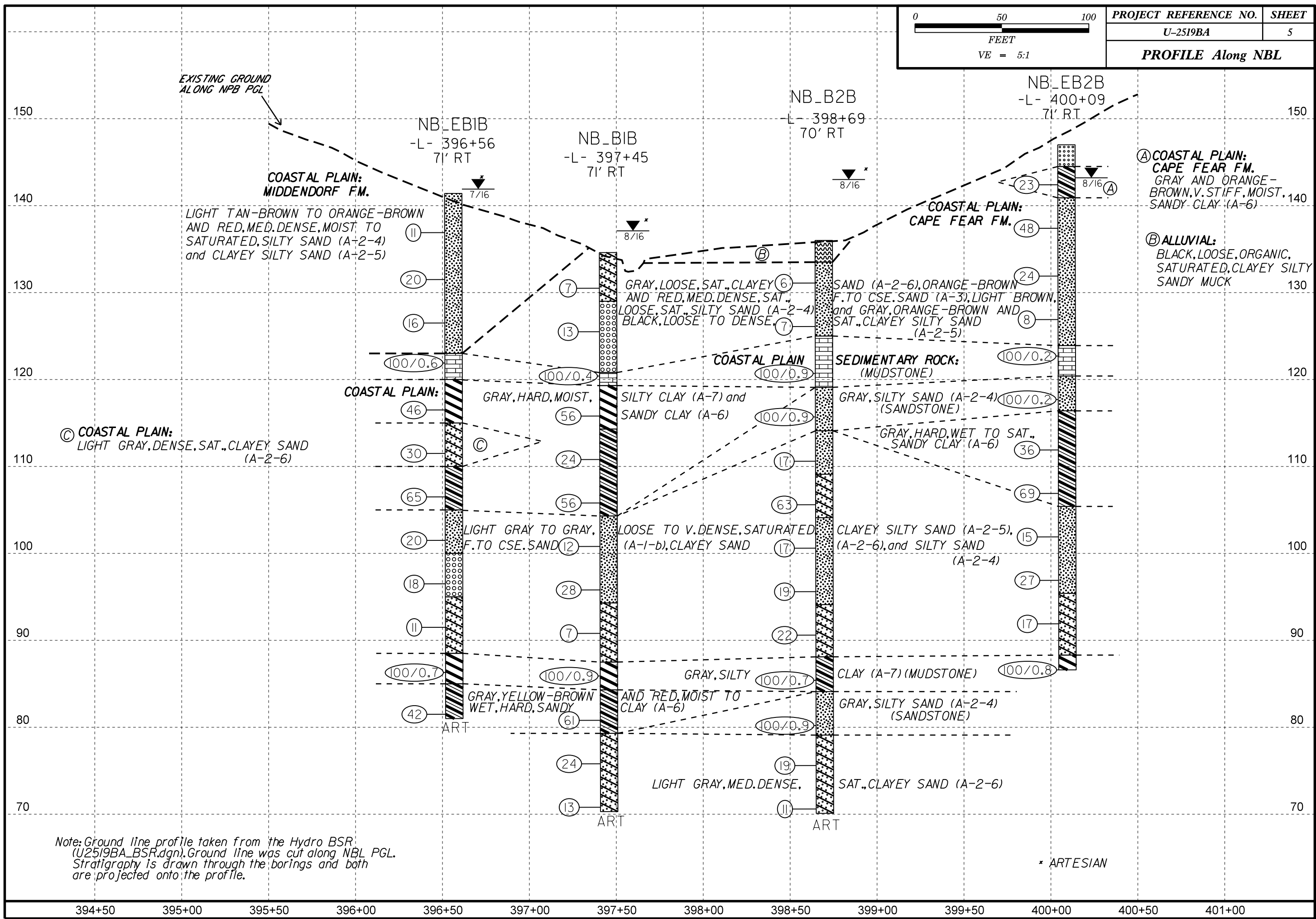
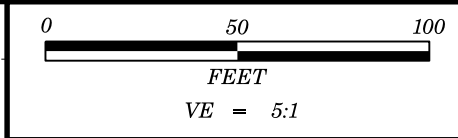
PROJECT REFERENCE NO.	SHEET NO.
U-2519BA	3
SITE PLAN	
 0 50 100 FEET	





Note: Ground line profile taken from the Hydro BSR (U2519BA_BSR.dgn). Ground line was cut along SBL PGL. Stratigraphy is drawn through the borings and both are projected onto the profile.

* ARTESIAN



Note: Ground line profile taken from the Hydro BSR (U2519BA_BSR.dgn). Ground line was cut along NBL PGL. Stratigraphy is drawn through the borings and both are projected onto the profile.

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34817.1.FR7		TIP U-2519BA		COUNTY CUMBERLAND		GEOLOGIST B. Smith, PG										
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek							GROUND WTR (ft)									
BORING NO. SB_EB1A		STATION 395+86		OFFSET 71 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 140.3 ft		TOTAL DEPTH 60.9 ft		NORTHING 443,246		EASTING 1,989,023										
DRILL RIG/HAMMER EFF./DATE SUM3359 CME-450 92% 11/05/2015			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER Mike Moseley		START DATE 07/12/16		COMP. DATE 07/12/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
145																
140																
135	136.2	4.1	2	2	2								W	GROUND SURFACE	0.0	
130	130.9	9.4	7	12	8								Sat.	COASTAL PLAIN MIDDENDORF FORMATION Gray and orange-brown, Clayey SAND (A-2-6)		
125	125.9	14.4	1	1	5								Sat.	Red and tan-brown, Silty SAND (A-2-4) (Harder drilling at 17.1')	6.6	
120	120.9	19.4	15	28	36								Sat.	CAPE FEAR FORMATION	17.1	
115	115.9	24.4	10	15	21								M	Gray to dark gray, Silty CLAY (A-7) w/ little f. sand (Softer drilling at 28.5')		
110	110.9	29.4	4	6	11								M	Gray, Clayey SAND (A-2-6)	28.5	
105	105.9	34.4	10	12	21								Sat.	Gray, Clayey SAND (A-2-6)		
100	100.9	39.4	5	6	15								Sat.	Gray, Clayey Silty SAND (A-2-5)	36.9	
95	95.9	44.4	8	11	11								Sat.	Gray, Clayey SAND (A-2-6) (Harder drilling at 51.4')	41.9	
90	90.9	49.4	5	7	7								Sat.	Gray, Silty CLAY (A-7)	51.4	
85	85.9	54.4	18	30	38								W	Gray, Silty CLAY (A-7)	58.9	
80	80.9	59.4	7	8	11								M	Gray, Sandy CLAY (A-6)	60.9	
													W	Boring Terminated at Elevation 79.4 ft In Coastal Plain Sandy CLAY (A-6) Note: ARTESIAN Head Elevation = 140.8'		

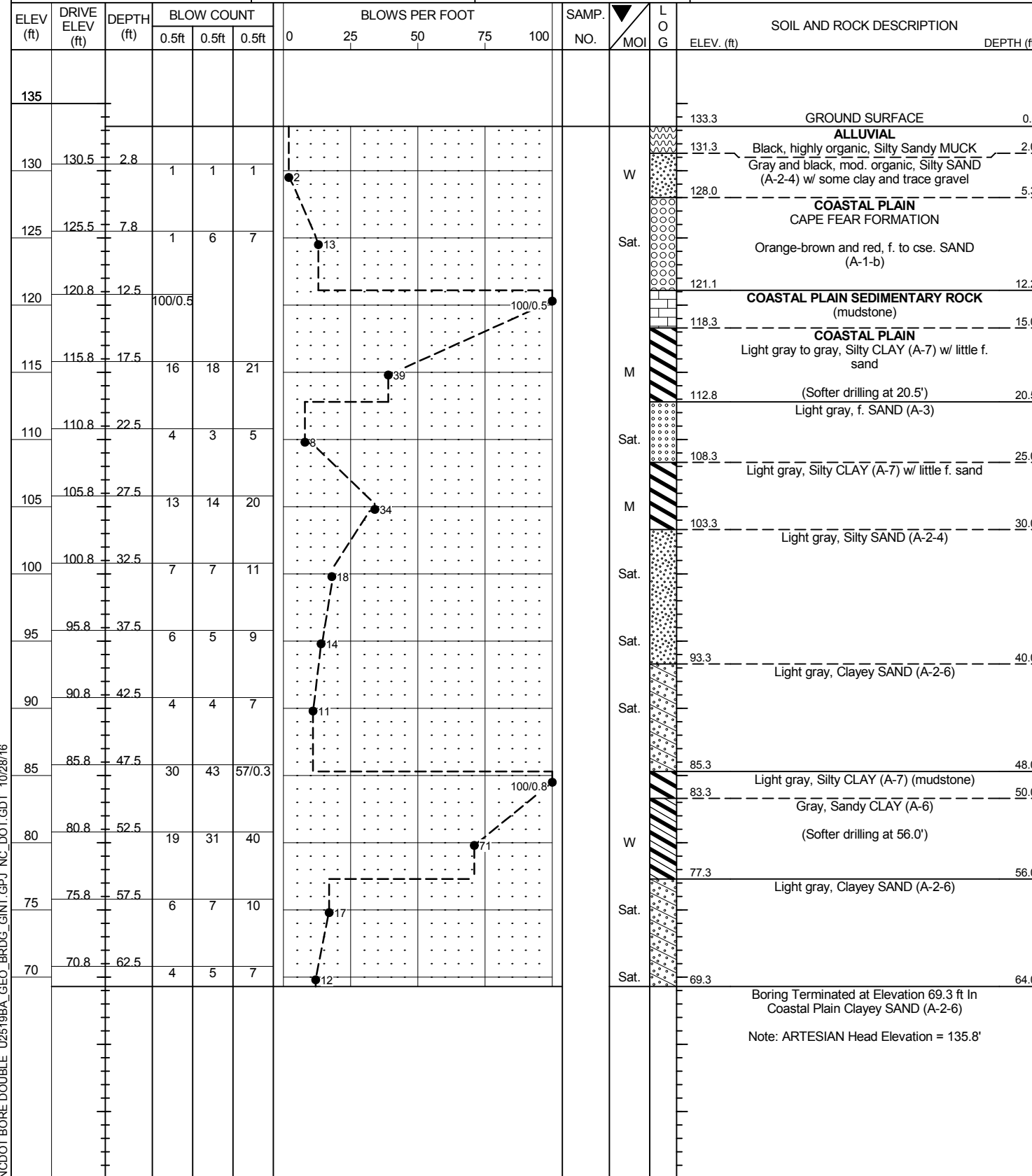
WBS 34817.1.FR7		TIP U-2519BA		COUNTY CUMBERLAND		GEOLOGIST B. Smith, PG										
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek							GROUND WTR (ft)									
BORING NO. NB_EB1B		STATION 396+56		OFFSET 71 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 141.4 ft		TOTAL DEPTH 60.4 ft		NORTHING 443,404		EASTING 1,989,038										
DRILL RIG/HAMMER EFF./DATE SUM3359 CME-450 92% 11/05/2015			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER Mike Moseley		START DATE 07/11/16		COMP. DATE 07/12/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
145																
140																
135	137.9	3.5	3	4	7								M	GROUND SURFACE	0.0	
130	132.5	8.9	7	7	13								Sat.	COASTAL PLAIN MIDDENDORF FORMATION Light tan-brown to orange-brown and red, Silty SAND (A-2-4) and Clayey Silty SAND (A-2-5) (Harder drilling at 18.4')		
125	127.5	13.9	5	8	8								Sat.			
120	122.5	18.9	50	50/01									Sat.	CAPE FEAR FORMATION	18.4	
115	117.5	23.9	12	18	28								M	COASTAL PLAIN SEDIMENTARY ROCK CAPE FEAR FORMATION (mudstone)	21.4	
110	112.5	28.9	7	11	19								M	COASTAL PLAIN Gray, Silty CLAY (A-7) w/ little f. sand	26.4	
105	107.5	33.9	25	28	37								Sat.	Light gray, Clayey SAND (A-2-6)	31.4	
100	102.5	38.9	6	8	12								W	Gray, hard, Sandy CLAY (A-6)	36.4	
95	97.5	43.9	5	7	11								Sat.	Gray, Clayey Silty SAND (A-2-5)	41.4	
90	92.5	48.9	4	5	6								Sat.	Gray, f. to cse. SAND (A-1-b)	46.4	
85	87.5	53.9	23	57	43/0.2								Sat.	Light gray, Clayey SAND (A-2-6) (Harder Drilling at 52.9')	52.9	
80	82.5	58.9	12	19	23								W	Gray, Silty CLAY (A-7) w. little sand (sandy mudstone)	56.4	
													W	Gray, Sandy CLAY (A-6)	60.4	
															Boring Terminated at Elevation 81.0 ft In Coastal Plain Sandy CLAY (A-6) Note: ARTESIAN Head Elevation = 141.9'	

NCDOT BORE DOUBLE U2519BA_GEO_BRDG_GINT.GPJ_NC_DOT.GDT 10/28/16

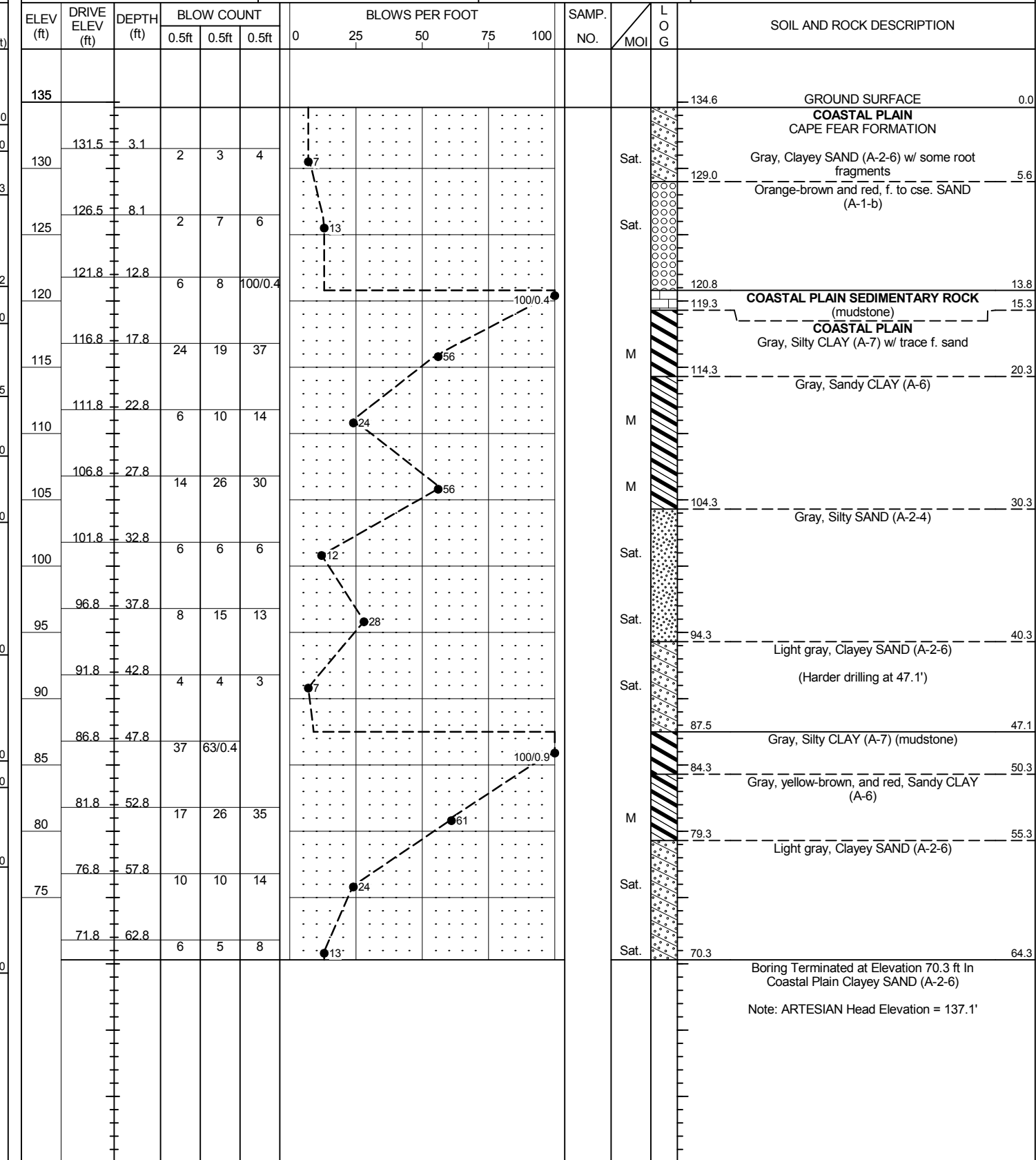
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34817.1.FR7	TIP U-2519BA	COUNTY CUMBERLAND	GEOLOGIST B. Smith, PG
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek			GROUND WTR (ft)
BORING NO. SB_B1A	STATION 396+72	OFFSET 70 ft LT	ALIGNMENT -L-
COLLAR ELEV. 133.3 ft	TOTAL DEPTH 64.0 ft	NORTHING 443,293	EASTING 1,988,948
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Mike Moseley	START DATE 08/23/16	COMP. DATE 08/24/16	SURFACE WATER DEPTH N/A



WBS 34817.1.FR7	TIP U-2519BA	COUNTY CUMBERLAND	GEOLOGIST B. Smith, PG
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek			GROUND WTR (ft)
BORING NO. NB_B1B	STATION 397+45	OFFSET 71 ft RT	ALIGNMENT -L-
COLLAR ELEV. 134.6 ft	TOTAL DEPTH 64.3 ft	NORTHING 443,452	EASTING 1,988,965
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Mike Moseley	START DATE 08/23/16	COMP. DATE 08/23/16	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE U2519BA_GEO_BRDG_GINT.GPJ NC_DOT.GDT 10/28/16

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34817.1.FR7		TIP U-2519BA		COUNTY CUMBERLAND		GEOLOGIST B. Smith, PG	
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek							GROUND WTR (ft)
BORING NO. SB_B2A		STATION 397+89		OFFSET 71 ft LT		ALIGNMENT -L-	
COLLAR ELEV. 134.6 ft		TOTAL DEPTH 64.5 ft		NORTHING 443,361		EASTING 1,988,849	
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER Mike Moseley		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
135														134.6	GROUND SURFACE	0.0
														132.1	ALLUVIAL Dark gray and black, highly organic, Silty Sandy MUCK	2.5
															CAPE FEAR FORMATION	
															Light gray, f. to cse. SAND (A-1-b)	
														121.6	COASTAL PLAIN SEDIMENTARY ROCK (mudstone)	13.0
														120.6	COASTAL PLAIN SEDIMENTARY ROCK (mudstone)	14.0
															COASTAL PLAIN Gray, Silty CLAY (A-7) w/ trace f. sand	
														114.1	Light gray, Clayey SAND (A-2-6)	20.5
														109.1	Gray, Clayey Silty SAND (A-2-5) and light gray, Silty SAND (A-2-4)	25.5
														106.6		
														101.6		
														96.6		
														91.6		
														86.6		
														84.1		
														81.6		
														76.6		
														71.6		

WBS 34817.1.FR7		TIP U-2519BA		COUNTY CUMBERLAND		GEOLOGIST B. Smith, PG	
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek							GROUND WTR (ft)
BORING NO. NB_B2B		STATION 398+69		OFFSET 70 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 136.0 ft		TOTAL DEPTH 65.9 ft		NORTHING 443,522		EASTING 1,988,867	
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER Mike Moseley		START DATE 08/17/16		COMP. DATE 08/17/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
140														136.0	GROUND SURFACE	0.0
														133.5	ALLUVIAL Black, highly organic, Clayey Silty Sandy MUCK	2.5
															CAPE FEAR FORMATION	
															Light tan-brown to orange brown, Silty SAND (A-2-4)	
														125.0	(Harder drilling at 11.0')	11.0
															COASTAL PLAIN SEDIMENTARY ROCK (mudstone)	
														119.1	(sandstone)	16.9
														114.1	COASTAL PLAIN Light gray, Clayey Silty SAND (A-2-5)	21.9
														109.1	Light Gray, Clayey SAND (A-2-6)	26.9
														104.1	Ligh gray, Clayey Silty SAND (A-2-5)	31.9
														94.1	Light Gray, Clayey SAND (A-2-6)	41.9
														88.1	(Harder drilling at 47.9')	47.9
														84.1	Gray, Silty SAND (A-2-4) (sandstone)	51.9
														79.1	Light gray, Clayey SAND (A-2-6)	56.9
														70.1		65.9

NCDOT BORE DOUBLE U2519BA_GEO_BRDG_GINT.GPJ_NC_DOT.GDT 10/28/16

Boring Terminated at Elevation 70.1 ft In Coastal Plain Sandy CLAY (A-6)
Note: ARTESIAN Head Elevation = 138.1'

Boring Terminated at Elevation 70.1 ft In Coastal Plain Clayey SAND (A-2-6)
Note: 0-HR: ARTESIAN Head Elevation = 138.0'
24-HR: ARTESIAN Head Elevation = 143.0'

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 34817.1.FR7		TIP U-2519BA		COUNTY CUMBERLAND		GEOLOGIST B. Smith, PG									
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek							GROUND WTR (ft)								
BORING NO. SB_EB2A		STATION 399+14		OFFSET 71 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 140.1 ft		TOTAL DEPTH 65.1 ft		NORTHING 443,437		EASTING 1,988,745									
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic										
DRILLER Mike Moseley		START DATE 08/16/16		COMP. DATE 08/17/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
145															
140														140.1	0.0
135	137.0	3.1	2	7	10										
130	132.0	8.1	10	22	16										
125	126.5	13.6	WOH	5	6										
120	121.5	18.6	100/0.3												
115	116.5	23.6	16	31	56										
110	111.5	28.6	12	19	22										
105	106.5	33.6	7	10	12										
100	101.5	38.6	6	7	9										
95	96.5	43.6	6	3	4										
90	91.5	48.6	4	5	5										
85	86.5	53.6	26	62	38/0.2										
80	81.5	58.6	27	48	52/0.4										
75	76.5	63.6	12	14	15										

WBS 34817.1.FR7		TIP U-2519BA		COUNTY CUMBERLAND		GEOLOGIST B. Smith, PG									
SITE DESCRIPTION Dual Structure Bridge on -L- Over Unamed Tributary to Stewarts Creek							GROUND WTR (ft)								
BORING NO. NB_EB2B		STATION 400+09		OFFSET 71 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 147.0 ft		TOTAL DEPTH 60.4 ft		NORTHING 443,607		EASTING 1,988,762									
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic										
DRILLER Mike Moseley		START DATE 08/12/16		COMP. DATE 08/16/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
150															
145														147.0	0.0
140	143.4	3.6	5	7	16									144.5	2.5
135	138.4	8.6	11	18	30									140.9	6.1
130	132.9	14.1	7	12	12										
125	127.9	19.1	8	4	4										
120	122.9	24.1	100/0.2											123.9	23.1
115	117.9	29.1	100/0.2											120.4	26.6
110	112.9	34.1	13	17	19									116.4	30.6
105	107.9	39.1	17	32	37										
100	102.9	44.1	7	6	9									105.4	41.6
95	97.9	49.1	9	15	12										
90	92.9	54.1	5	7	10									95.4	51.6
85	87.9	59.1	29	52	48/0.3									88.3	58.7
														86.6	60.4

NCDOT BORE DOUBLE U2519BA_GEO_BRDG_GINT.GPJ_NC_DOT.GDT 10/28/16

SITE PHOTOGRAPH

Proposed Dual Structure Bridge on -L- Over Unnamed Tributary to Stewarts Creek



View Facing South from EB1-B toward EB1-B



View Facing South from B1-B toward B1-A



View Facing North from B2-A toward B2-B



View Facing South from EB2-B toward EB1-A