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EFERENCE

15403.1065018/15403.1071014

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

#### **CONTENTS**

SHEET NO.

**DESCRIPTION** 

TITLE SHEET LEGEND (SOIL & ROCK) PROJECT TITLE SHEET PLAN SHEETS CROSS SECTIONS **BORE LOGS** 

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

**DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

## **ROADWAY** SUBSURFACE INVESTIGATION

COUNTY NEW HANOVER /PENDER PROJECT DESCRIPTION I-40 FROM NORTH OF SR 2003 (KINGS GRANT ROAD) TO MILE MARKER 390 **INVENTORY** 

STATE PROJECT REFERENCE NO. 15403.1065018 / 13 15403.1071014

#### **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 1919) 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 NDICATED 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 WARRANTE OR GLARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

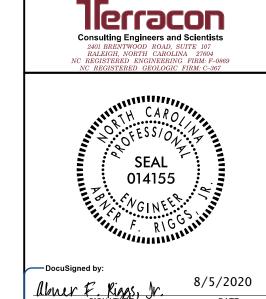
  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

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

BUNCH, C. M. TURNAGE, J. R. COLON-MIRANDA, J. INVESTIGATED BY  $\_BUNCH$ , C.M.FIELDS, W. D. *NASH*, *A*. *A*. CHECKED BY SUBMITTED BY \_\_RIGGS, Jr., A. F. MARCH 2020

Prepared in the Office of:

**PERSONNEL** 



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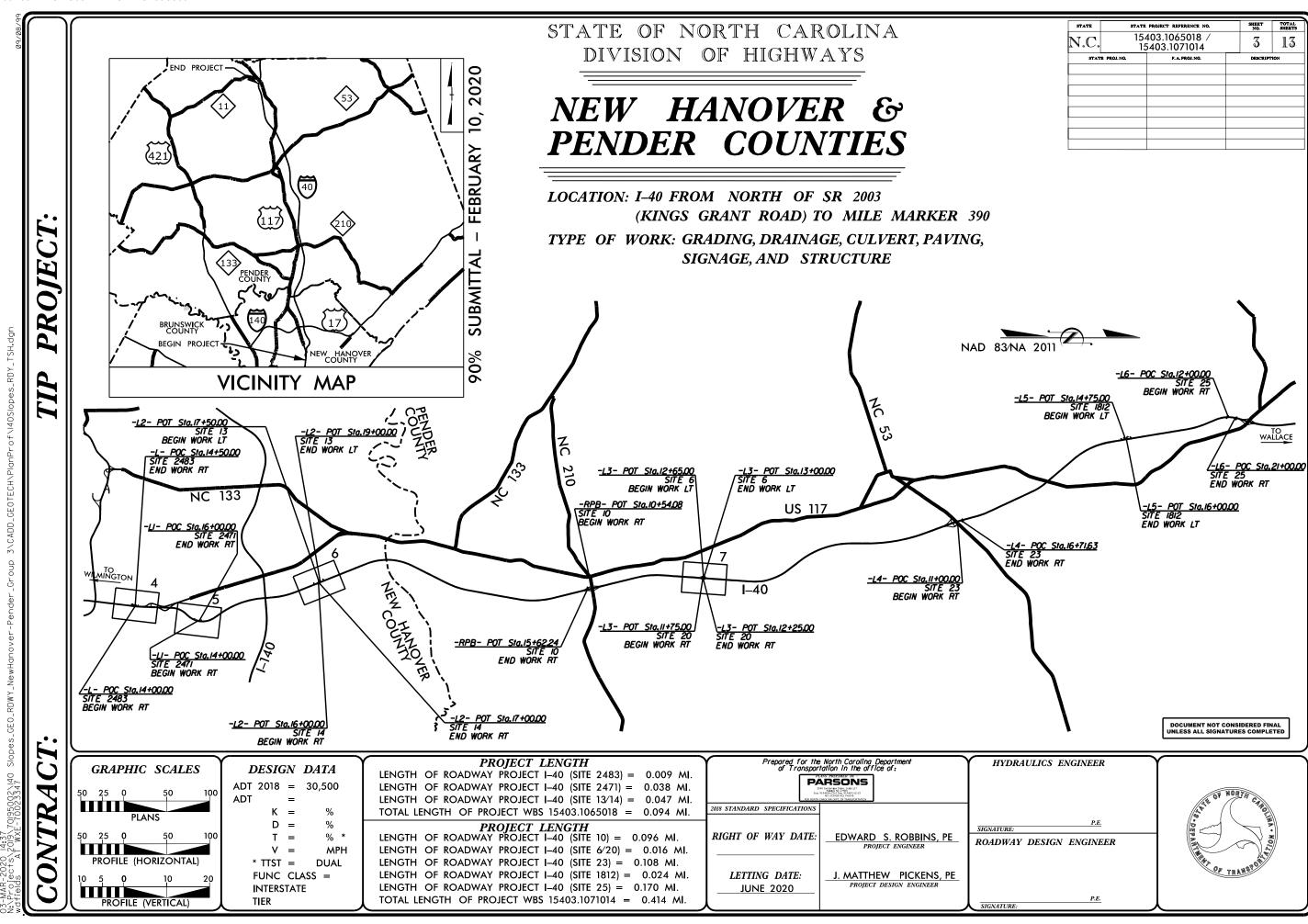
PROJECT REPERENCE NO. SHEET NO. 15403.1065018 / 15403.1071014

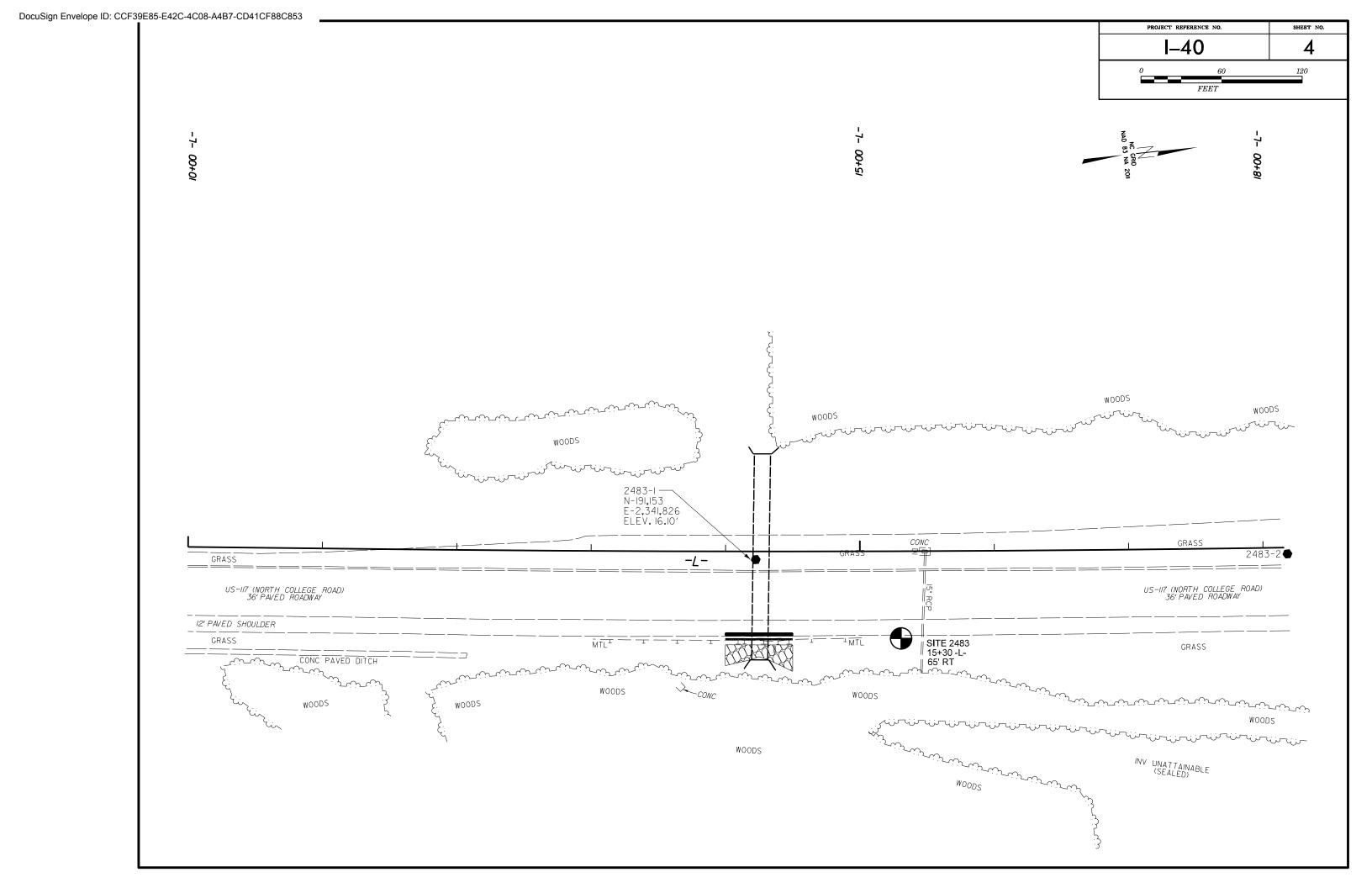
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

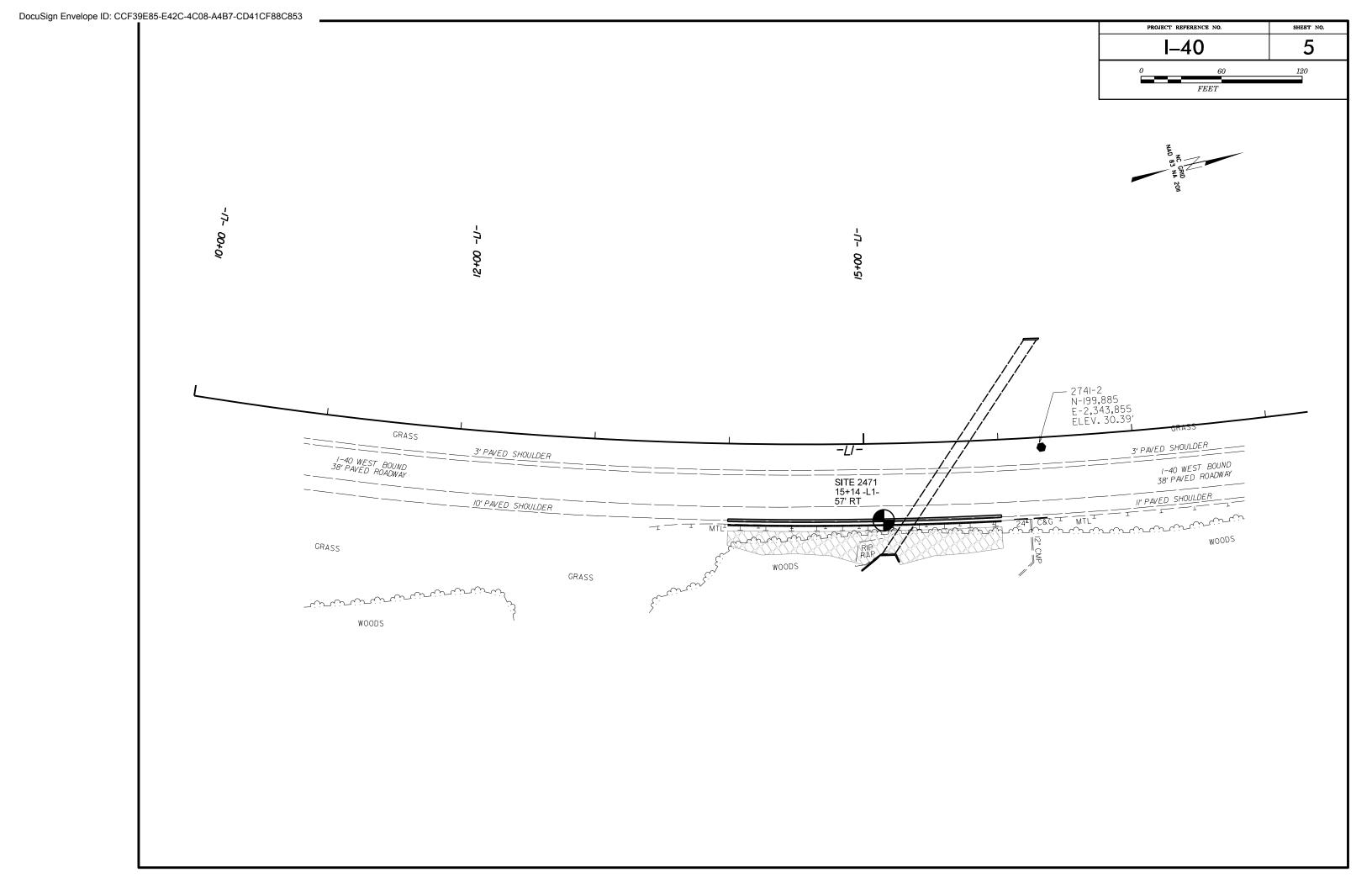
## SUBSURFACE INVESTIGATION

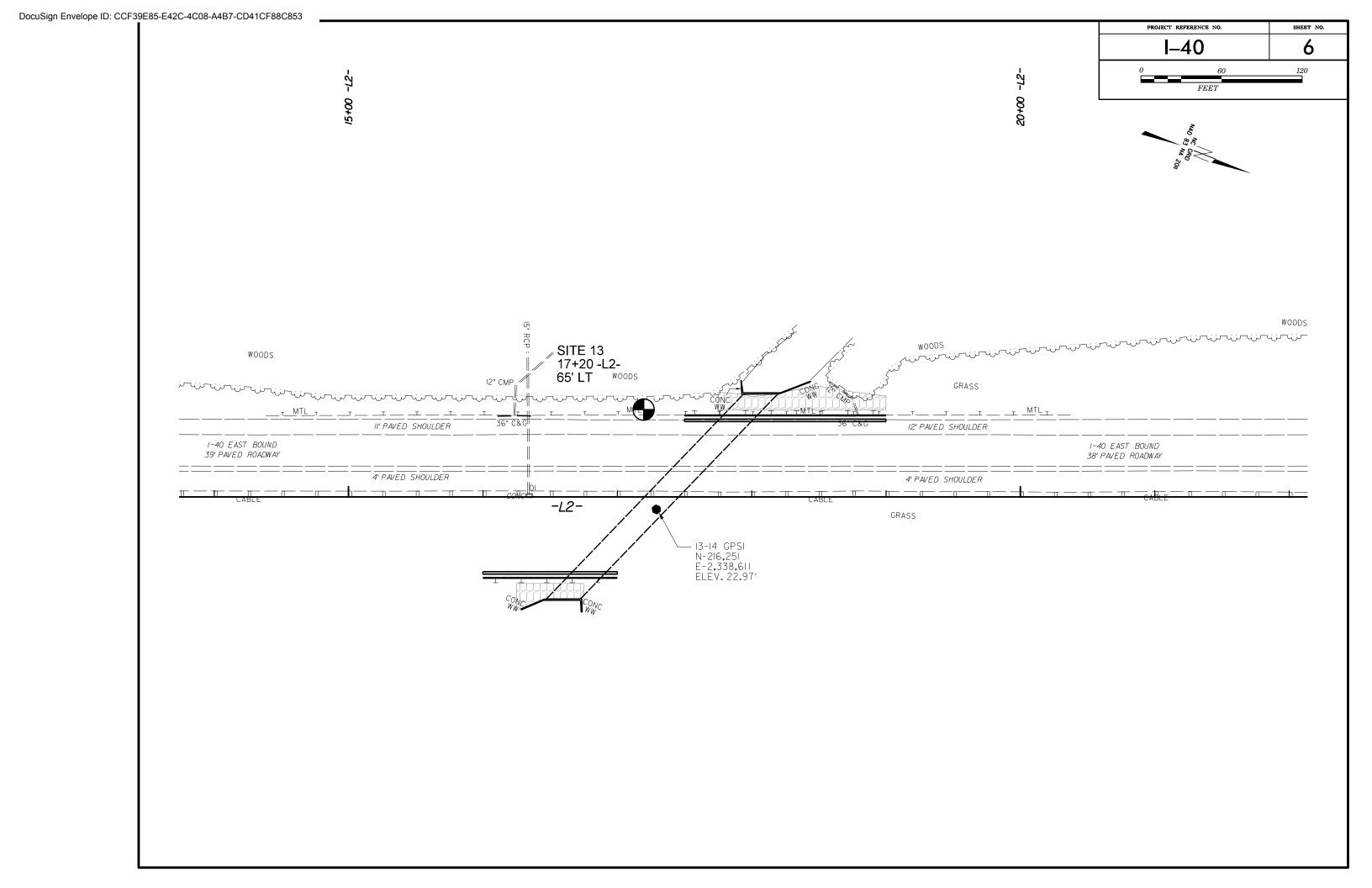
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

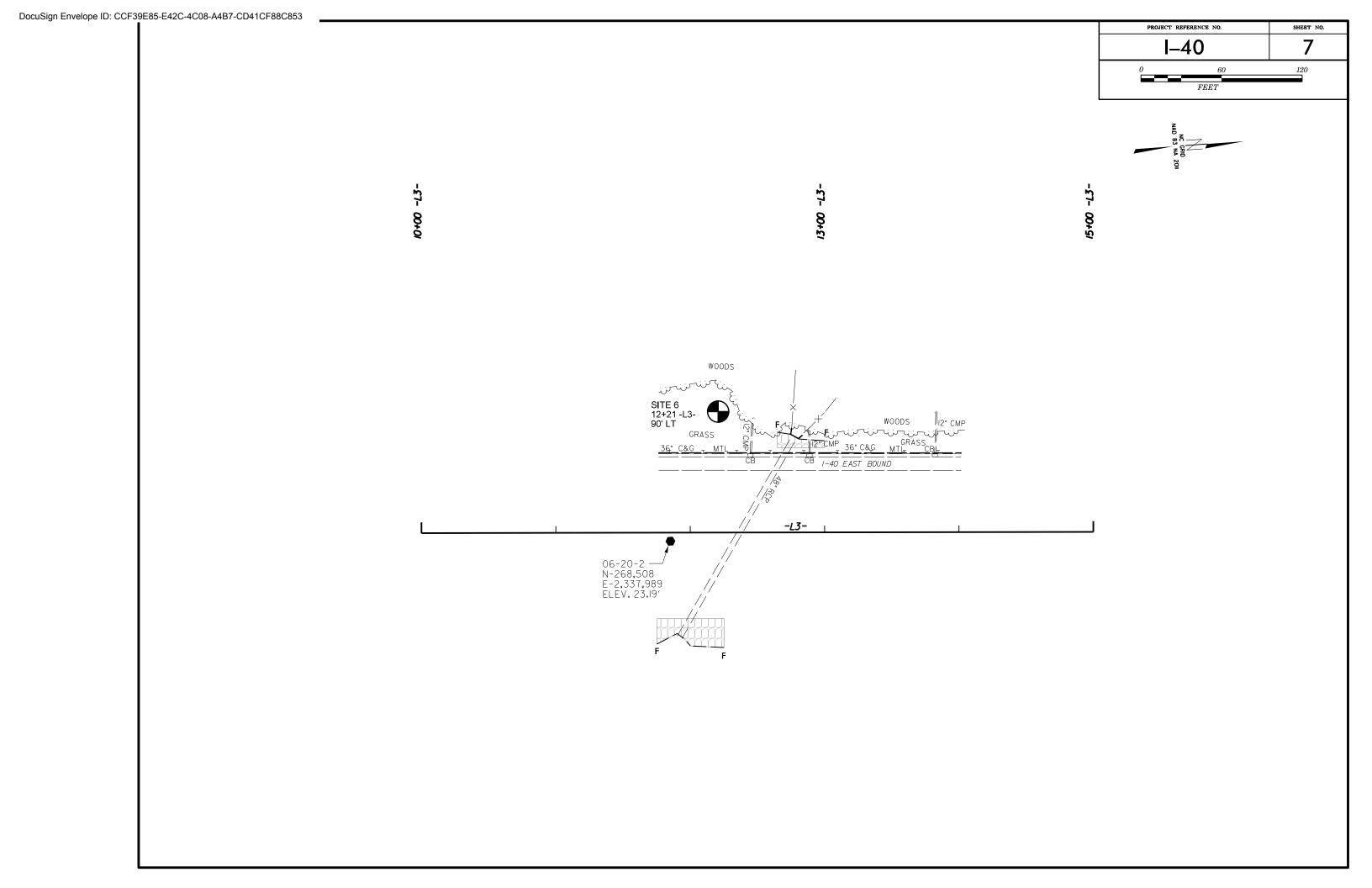
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE 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	<u>AQUIFER</u> - 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 PERTINENT 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 CRANIII AD MATERIAI C CLI T-CLAY MATERIAI C	MINERALOGICAL COMPOSITION	FINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC ROCK 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.	LOCKY (CD) 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.	SINCISS, GHORN, SCHOOL ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SPT 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   OOOO GOOOOO   OOOOOOOOOOOOOOOOOOOOO	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, SOILS CLAY PEAT	PERCENTAGE OF MATERIAL  GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%, LITTLE ORGANIC MATTER 3 - 5%, 5 - 12%, LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	HORIZONTAL.
LL -   - 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 501L5 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 12 MX 10 MX 11 MN 11 MN MODERATE OPCOME	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 4 MX 8 MX 12 MX 16 MX NU MX AMUUN 15 UF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND 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
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
AS SUBURADE PUUR	SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PLOF A-7-5 SUBGROUP IS ≤ LL - 30; PLOF A-7-6 SUBGROUP IS > LL - 30  CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
DANCE OF CTANDARD DANCE OF UNCONFINED	THISCELERINEOUS STILLOUS	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (IN-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE < 4	-	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT  (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GENERALLY LOOSE 4 TO 10	SOIL SYMBOL  SOIL SYMBOL  SLOPE INDICATOR INSTALLATION	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.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 10 10 30 N/A	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THE TOPOWAT EMPHRICAL CO.	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT         < 2         < 0.25           GENERALLY         SOFT         2 TO 4         0.25 TO 0.5	- INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</i>	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY   SOFT   2 TO 4   0.25 TO 0.5     SILT-CLAY   MEDIUM STIFF   4 TO 8   0.5 TO 1.0	INFERRED ROCK LINE MN MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES,) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL   STIFF   8 TO 15   1 TO 2	A PIEZOMETER	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY SPT N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - 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
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SHALLOW INCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE 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	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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 EDUAL
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION  (ATTERBERG LIMITS) DESCRIPTION	CSE COARSE ORG ORGANIC  DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO   SD SAND, SANDY   SS - SPLIT SPOON   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	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
LL LIOUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: 2483-I, N-191,153, E-2,341,826, ELEV. 16.10'
(PI) PL PLASTIC LIMIT	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	274I-2, N-199,885, E-2,343,855, ELEV. 30.39′
- 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	13-14 GPSI: N-216,251; E-2,338,611; ELEV. 22.97'
OM _ OPTIMUM MOISTURE - MOIST - (M) SULID; HT OR NEAR OPTIMUM MOISTURE SL _ SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	06-20-2: N-268,508; E-2,337,989; ELEV. 23.19′
REQUIRES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	ELEVATION: FEET
- DRY - (D) ATTAIN OPTIMUM MOISTURE	CME-55 6° CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	
PLASTICITY	8* HOLLOW AUGERS	INDURATION	NOTES:
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FIAD - FILLED IMMEDIATELY AFTER DRILLING
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND TOOLS:	RUBBING WITH FINGER FREES NUMEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	X CASING W/ ADVANCER POST HOLE DIGGER	CRAING CAN BE CERARATED FROM CAMPLE VITU CTELL PROPE	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED  MODERATELY INDURATED	
COLOR	DIEDRICH D-50 TRICONE TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	X DRAG BIT (25% '')	EXTREMELY INDURATED  SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;  SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14
		1	











SHEET 12 OF 13

## Terracon Consulting Engineers and Scientists

### GEOTECHNICAL BORING REPORT BORE LOG

WBS	I-40	ngineers and Scientists  BORE LOG  TIP N/A COUNTY NEW HANOVER GEOLOGIS								GEOLOGIST WELLS, J. W.				
SITE	DESCR	IPTION	I-40	STOR									· · · · · · · · · · · · · · · · · · ·	GROUND WTR
BORII	NG NO.	SITE	2483		- 1	STAT	TION 15+30		OFFSET	65 ft RT			ALIGNMENT -L-	0 HR.
COLL	.LAR ELEV. 17.1 ft TOTAL DEPTH 29.1 ft						l ft	NORTHING		54		<b>EASTING</b> 2,341,896	24 HR.	
RILL	RIG/HAN	IMER EF	F./DATI	E TEF			RICH D-50 84% 02		1	DRILL M		) Mu	<u> </u>	 MER TYPE Automati
RILL	ER TI	JRNAG	E, J.		9	STAF	RT DATE 09/30	T DATE 09/30/19 COMP. DATE 09/30/19 SURFACE WATER DEPTH N/A						
DRILLER TURNAGE, J.  ELEV DRIVE DEPTH BLOW COUN						S PER FOOT		SAMP.		L				
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	t 0	) 25	50	75 100	NO.	моі	O	SOIL AND ROCK DES	DEPT
20													_	
	-	E												
	16.1	1.0				$\pm$	!:::::::	<del></del>					17.1 GROUND SURI	
5	40.0	F	3	3	2	-	<b>4</b> 5		<u> </u>		М		GRAY, DARK BROWN, SII	
	13.6	3.5	3	3	4	1	7				w		GRAY, LIGHT TO DAF CLAYEY FINE S	RK BROWN, SAND
10	11.1	6.0	5	6	6	+	12				l w		•	
	8.6	8.5				4	.,				<u> </u>		9.1 GRAY, LIGHT BROWN,	SILTY CLAY
	-	ļ	2	3	3		<b>6</b> 6						·	OLT TOEXT
5	4.5	12.6				<u></u> ∐⊢	·						5.1 ALLUVIAL	
	-	<u> </u>	2	6	7		13				Sat.		LIGHT TO DARK BROWN	I, GRAY, SILTY
,	-	<u> </u>					\.						COARSE TO FINE SA ORGANICS	
0	-0.5	17.6	7	10	12	Ⅎ┢					Sat.		<del>-</del> ·	
	-	<u> </u>	'				,				Jai.		•	
-5	-5.5 <del>-</del>	22.6					/ .	-					_	
ŀ	-5.5		4	5	6	11	. <b>1</b> 11				Sat.			
	-	F											•	
10	-10.5	27.6				J⊦	- 1						• <del>-</del>	
-		<u> </u>	4	5	7	4	· .				Sat.		-11.9  Boring Terminated at Elev	ration 12.0 ft IN
	-	_											. ALLUVIAL SILTY	SAND
	-	F											•	
	-	F											•	
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## GEOTECHNICAL BORING REPORT BORE LOG

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WBS	I-40				TII	P N/A	COUNTY	Y NEW HA	NO	VER			GEOLOGIST BUNCH, C. M.	
SITE	DESCRI	PTION	I-40	STORM	REP	PAIRS								GROUND WTR (ft)
BORI	NG NO.	SITE	2471		ST	<b>ΓΑΤΙΟΝ</b> 15+14		OFFSET	57	ft RT			ALIGNMENT -L1-	<b>0 HR.</b> N/A
COLLAR ELEV. 33.2 ft						OTAL DEPTH 48.9 f		NORTHING						<b>24 HR.</b> FIAD
							NORTHIN	_				<u> </u>		
				E TER3	-	EDRICH D-50 84% 02/15						Muc		R TYPE Automatic
DRIL	LER TU	JRNAG	E, J.		ST	TART DATE 09/27/1	9	COMP. DA	TE	09/2	7/19		SURFACE WATER DEPTH N/A	4
ELEV	DRIVE ELEV	DEPTH	BLO	W COU	١T	BLOWS	PER FOOT	-	8	SAMP.	lacktriangledown/	L	SOIL AND ROCK DESC	RIPTION
(ft)	(ft)	(ft)	0.5ft	0.5ft (	).5ft	0 25	50	75 100	Ш	NO.	/MOI		ELEV. (ft)	DEPTH (ft)
35														
-00		-											33.2 GROUND SURFA	ACE 0.0
	32.2	1.0					1::::	1 : : : :	Ħ				33.2 GROUND SURFA PAVEMENT (ASPH	
30	<del>-</del>	-	5	8	9	17					М		ROADWAY EMBANK BROWN, TAN, SILTY F	
	29.7	<del>-</del> 3.5 -	6	7	8	•15			11		W		BROWN, TAN, SILT I	INE SAIND
-	27.2	6.0				· · / 13   · · · ·								
25	<del> </del>		5	5	7	. •12					W			
	24.7	<del>-</del> 8.5 -	4	6	10				11		W		•	
		-					: : : :							
20	20.8	- 12.4	10	11	12	$    \cdot \cdot \cdot \hat{\lambda}   \cdot \cdot \cdot$					14/			
	7	-	10	''	12	23			11		W		•	
		-												
15	15.8	- 17.4	7	13	14						14/			
	7	-	'	10	``				11		W		•	
		-												
10	10.8	- 22.4	9	11	12						14/	<u> </u>		
	7	-		''	' <sup>-</sup>	23			11		W		8.2	25.0
		-											UNDIVIDED COASTA	L PLAIN
5	5.8	- 27.4	9	11	7						0-4	-	TAN, SILTY COARSE TO	FINE SAND
	1	-		''	′	18			11		Sat.	-	•	
	f	-				: / : :   : : : :	: : : :						2.2	31.0
0	0.8	- 32.4	WOH	0	3	/ · · ·   · · · ·						<b>3</b>	GRAY, FINE TO COARSE	SANDY CLAY
		-	WOH	0	١ '	•3····································			11		W		•	
	f	-				j							-2.8	36.0
-5	-4.2	37.4	9	15	17								<b>COASTAL PLA</b> GRAY, SILTY COARSE TO	
	1	-	9	13	''	32			11		Sat.	-	(PEE DEE FORMA	ΓΙΟΝ)
	f	-				::::/::::	: : : :							
-10	-9.2	42.4	9	6	5						۵.	Į		
		-	9	0	١ '	11			11		Sat.		•	
	+	-				$  \cdot\cdot,\cdot \cdot\cdot\cdot\cdot$						-		
-15	-14.2	47.4	12	10	12	::::	: : : :					F		
		-	12	10	12	22	<del> </del>		4		Sat.		-15.7  Boring Terminated at Elevat	48.9
	-	-										ŀ	COASTAL PLAIN SILTY SA	ND (PEE DEE
	- 1	-										F	FORMATION)	
		-											•	
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SHEET 13 OF 13

## Terracon Consulting Engineers and Scientists

#### GEOTECHNICAL BORING REPORT BORE LOG

Consu	ilting En	gineers a	and Sci	entists				ORE L	<u>.UG</u>				
WBS	I-40				Т	IP N/A	COUNT	Y NEW HAI	NOVER			GEOLOGIST WELLS, J. W.	
SITE	DESCR	RIPTION	I-40	STOR	M REI	PAIRS							GROUND WTR
BORI	NG NO.	SITE	13		s	<b>TATION</b> 17+20		OFFSET	65 ft LT			ALIGNMENT -L2-	0 HR.
COLLAR ELEV. 22.5 ft TOTAL					Т	OTAL DEPTH 48	.9 ft	NORTHING	216,2	13		<b>EASTING</b> 2,338,543	<b>24 HR.</b> Ca
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 84% 02/15						2/15/2019		DRILL N	/IETHOI	D Mu	id Rotary HAW	IMER TYPE Automat	
DRILI	LER T	URNAG	SE, J.		s	TART DATE 09/3	0/19	COMP. DA	TE 09/	30/19		SURFACE WATER DEPTH	V/A
LEV	DRIVE	DEPTH	BLC	w co	UNT	BLOV	VS PER FOOT	·	SAMP.	<b>V</b> /		COIL AND DOOK DE	CODIDTION
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	МО	O I G	SOIL AND ROCK DE ELEV. (ft)	DEP
25		1										_	
		Ī										- - 22.5 GROUND SUF	REACE
	21.5	1.0	3	6	7	1 : ::: : : :				<b>.</b>		- ROADWAY EMBA	NKMENT
20	19.0	$\frac{1}{1}_{3.5}$	ľ	0	_ ′	13				M		GRAY, LIGHT TO DARK FINE SAN	
		+	9	8	8	16				М		-	
15	16.5	<u>† 6.0</u> 1	7	5	6					М		<u>-</u>	
	14.0	8.5	4	5	6	1 2 2 2 2 2 2 2				M		 -	
		Ŧ				:   :: :::				'*'		-	
10	9.9 -	12.6	6	6	5	<del>                                  </del>				١,,,		- 10.5 - UNDIVIDED COAS	
		‡	"			11				W		- LIGHT BROWN, TAN, ( - SANDY CL	
5	4.9 -	† 1 <sub>17.6</sub>				::/: ::						- -	
	4.9 -	+ 1/.6	5	7	11					w		<del>-</del> -	
		‡										• -	
0	-0.1	22.6			10							- 0.5 - COASTAL PI	LAIN
		‡	6	9	10	19				W		LIGHT GRAY, GRAY, CLAY, FOSSILIFEROUS	WHITE, SILTY
_		‡										FRAGMANTS, INTERBE	DDED CLAYEY
-5	-5.1 -	27.6	13	19	23	<del>                                     </del>	42			w		(CASTLE HAYNE FO	
		‡					· · · · · · · · · · · · · · · · · · ·					<u>.</u>	
10	-10.1 -	32.6										- <del>-</del>	
		1	12	27	49			76		W		-	
		ł					,	<u>/</u>  ::::				<u>-</u> -	
15	-15.1 -	37.6	14	24	36	1		1		l w		_	
		Ŧ					60			''		-	
-20	-20.1 -	1 42.6					./					- 19.5	7.E.C. 2.E.E.E.
	-20.1 -	1 72.0	7	12	19	· · · · • •31				w		GRAY, LIGHT GRAY, CL TO FINE SAND, FOSSILI	FEROUS, SOME
		Ŧ										SHELL FRAGN	MENIS
25	-25.1 -	47.6	21	40	60/0.3	3				Sat.		-  26.1	
		<del>†</del>	<u>-</u> -	1.0	00,010	<u> </u>		100/0.8	<b>\</b>	Jai.	Ħ	COASTAL PLAIN SEDIM EXTREMELY INDUR	
		Ŧ										- FOSSILIFEROUS L	IMESTONE
	-	Ŧ										<ul> <li>Boring Terminated BY Al</li> <li>at Elevation -26.4 ft IN S</li> </ul>	SEDIMENTARY
		Ŧ										ROCK (FOSSILIFEROL (CASTLE HAYNE FO	
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## GEOTECHNICAL BORING REPORT BORE LOG

					1_						.OG			T	
WBS						P N/A		COUNT	Y PEN	NDER				GEOLOGIST BUNCH, C. M.	
SITE DESCRIPTION 1-40 STORM													T	GROUND WTR (ft)	
BORII	NG NO.	SITE 6	6							ET :	90 ft LT			ALIGNMENT -L3-	<b>0 HR.</b> N/A
COLL	AR ELE	<b>V.</b> 16.	.9 ft		TC	OTAL DEPT	<b>H</b> 29.6 ft		NOR	THING	26,550	0		<b>EASTING</b> 2,337,895	<b>24 HR.</b> 4.6
DRILL	RIG/HAMI	MER EF	F./DATE	TER3	3 DII	EDRICH D-50	84% 02/15	/2019			DRILL N	1ETHOE	) Muc	l Rotary HAMM	ER TYPE Automatic
DRILL	ER TU	IRNAG	E, J.		ST	TART DATE	09/26/1	9	СОМ	P. DA	TE 09/2	26/19		SURFACE WATER DEPTH N/	A
ELEV	DRIVE	DEPTH	BLO	W COU	ıT		BLOWS	PER FOOT	-		SAMP.	<b>V</b> /	L	CON AND DOOK DEC	CDIDTION
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft (	).5ft	0 2	25	50	75	100	NO.	МОІ	O G	SOIL AND ROCK DESC	DEPTH (ft)
20															
	7	.											l F	•	
	‡						1	1						16.9 GROUND SURF.	
15	15.9	. 1.0	5	4	4	9			<u> </u>			М		<b>ROADWAY EMBANI</b> - 14.6 BROWN, TAN, ORANGE,	
	13.4	3.5	2	3	3	.			: :					12.9 SAND	EINE SAND 4.0
	10.9	. 6.0				<b>∮</b> 6,				: :		_		ALLUVIAL	
10	+	.	3	3	5	8		<del>                                     </del>	+:-			Sat.	F	DARK BROWN, BLACK, I CLAY, TRACE ORG	
}	8.4	8.5	3	3	4	1 .1		: : : :	: :			Sat.		UNDIVIDED COASTA GRAY, ORANGE, GREEN	L PLAIN
5	‡	·						: : : :	: :					GRAY, ORANGE, GREEN SAND	I, OILI I ITINE
	3.8	13.1				``			<del> </del>					•	
	1	. ]	6	10	11	: : : • 2	1	: : : :	: :			Sat.			
0	1	.				/.							Ł	_	
-	-1.2	18.1	4	4	5	/						C			
	‡			7	Ĭ	9		: : : :	: :	: :		Sat.			
-5	- ‡	-				•  • • •			<b>↓</b> ∷					-5.1	22.0
}	-6.2	23.1	4	3	3	6			: :			Sat.		COASTAL PLA DARK GRAY, SILTY FINE	SAND, WITH
	1	.				7°			: :					INTERBEDDED SILTY CI (PEE DEE FORMA	
-10	-11.2	. 28 1				<del>  ``                                </del>		<del> </del>	+					•	,
	-11.2	. 20.1	4	3	9	. 12						Sat.	i F	-12.7	29.6
	1	.											l F	Boring Terminated at Eleva COASTAL PLAIN SILTY SA	
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