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250008

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

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STATE PROJECT REFERENCE NO. 16 250008

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 1991 707-680. 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 INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAP AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS MEDITARIES DESCRIPTIONS AND ASSOCIATIONS AND ASSOCIATION AND ASSOCIATION AND ASSOCIATION AND ASSOCIATION AND ASSOCIATION ASSOCIATION ASSOCIATION AND ASSOCIATION ASSOCIATION AND ASSOCIATION ASSOCIA 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.

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 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.

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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ROADWAY SUBSURFACE INVESTIGATION COUNTY <u>CUMBERLAND</u>

INVENTORY

PROJECT REPERENCE NO. SHEET N

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 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	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 PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED WON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	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.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	ROCK (WR) NON-CUASTAL PLAIN MATERIAL THAT WOULD FIELD SPT N VALUES >	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (≤ 25% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE CRYSTALLINE WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE,	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CROUP 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.	GNEISS, GABBRO, SCHIST, ETC.	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-7-5 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELD SPIT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7. PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	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.
*10 50 MX GRANULAR CLAY PEAT	PERCENTAGE OF MATERIAL	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 36 MN 36 MN 36 MN 36 MN	GRANUL AR SILT - CLAY ORGANIC MATERIAL SOILS SOILS TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%	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. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN LITTLE OR HIGHLY	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	VERT SCIONT MOUN GENERALLY FRESH, JUIN'S STAINED, SOME JUIN'S MAY SHOW THIN CLAY CURTINGS IF DEEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	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
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.	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL AND 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 EVEL I FAIT TO COOD FAIR TO DOOD FAIR TO DOOD INSCILLABLE	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POUR POUR UNSUTTABLE	O→MV► 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 CONSISTENCY OR DENSENESS	0 11	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 FIELD.
DANCE OF STANDARD DANCE OF UNICONEINED	MISCELLANEOUS SYMBOLS	SEVERE 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,	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE (TONS/FTZ)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION FROCK 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. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR LOOSE 4 TO 10	SOIL SYMBOL OPT ONT TEST BORING SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. 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	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERT DENSE / DW		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.
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	— INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 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 TEST BORING 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	TTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER SPT N-VALUE	SCATTERED CONCENTRATIONS, GUARTZ MAT 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 RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4 TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
U.S. STD. SIEVE SIZE 4 10 40 60 200 270		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK,	ROCK.
O.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT // UNSUITABLE WASTE // ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	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
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL		THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SILT CLAY	UNDERCOT LOCAL HOCEF THBLE DEGRHDHBLE NOCK	TO DETACH HAND SPECIMEN.	CLICVENCIDE - DOLICHED AND CIDIATED CHIPAGE THAT DECLI TO FROM EDICTION ALONG A CAULT
BUULDER CUBBLE GRAVEL SAND SAND (SL.) (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.)	ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	$rac{SLICKENSIDE}{OR}$ - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
(BLDR.) (COB.) (GR.) (SE.S).) (F SD.) (SL.) (CL.) GRAIN MM 305 75 2.0 0.25 0.005	ABBRE VIATIONS AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
(BLDR.) (COB.) (GR.) SHNU (CSE. SD.) SHNU (F SD.) (SL.) (CL.) GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 3 1 </td <td>ABBREVIATIONS AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT</td> <td>MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED</td> <td>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 I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL</td>	ABBREVIATIONS AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	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 I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
(BLDR.) (COB.) (GR.) (SE.SD.) (F.SD.) (SL.) (CL.) GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 SOIL MOISTURE - CORRELATION OF TERMS	ABBRE VIATIONS AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 ₆ - DRY UNIT WEIGHT	MODERATELY HARD MODERATELY HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	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 I 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.
(BLDR.) (COB.) (GR.) SHNU (CSE. SD.) SHNU (F SD.) (SL.) (CL.) GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 3 1 </td <td>ABBREVIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED CL CLAY CPT - CONE PENETRATION TEST DMT - DILATOMETER TEST DMT - DILATOMETER TEST ABBREVIATIONS MED MEDIUM VST - VANE SHEAR TEST MICA MICACEOUS WEA WEATHERED Y - UNIT WEIGHT VG - PRESSUREMETER TEST SAMPLE ABBREVIATIONS</td> <td>MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE</td> <td>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 I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL</td>	ABBREVIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED CL CLAY CPT - CONE PENETRATION TEST DMT - DILATOMETER TEST DMT - DILATOMETER TEST ABBREVIATIONS MED MEDIUM VST - VANE SHEAR TEST MICA MICACEOUS WEA WEATHERED Y - UNIT WEIGHT VG - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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 I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
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Corain Mm 305 75 2.0 0.25 0.05 0.005	ABBRE VIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY CPT - CONE PENETRATION TEST OMG ORGANIC DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S SULK SULT, SILTY S SHULK FOSS FOSSILIFEROUS SIL SLIGHTLY FRAGS FRACTURED, FRACTURES TER - TRICOME REFUSAL HI HIGHLY V - VERY RATIO EQUIPMENT USED ON SUBJECT PROJECT	MODERATELY HARD **EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED DR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. 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 PIECES CAN BE BROKEN BY FINGER PRESSURE. 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 FINGERNAIL. **FRACTURE SPACING** TERM** VERY WIDE MORE THAN 10 FEET WIDE MODERATELY CLOSE 1 TO 3 FEET THICKLY BEDDED 0.15 - 4 FEET MODERATELY CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	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 (SPEC) - 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 QUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BY-2; N=431283.72, E=2018587.55 ELEVATION: 173.80 FEET NOTES:
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900

BR NO. 129 & 130

BR NO. 008

Payetteville Minicipal Airport

95

Payetteville Minicipal Airport

NOT TO SCALE

STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

CUMBERLAND COUNTY

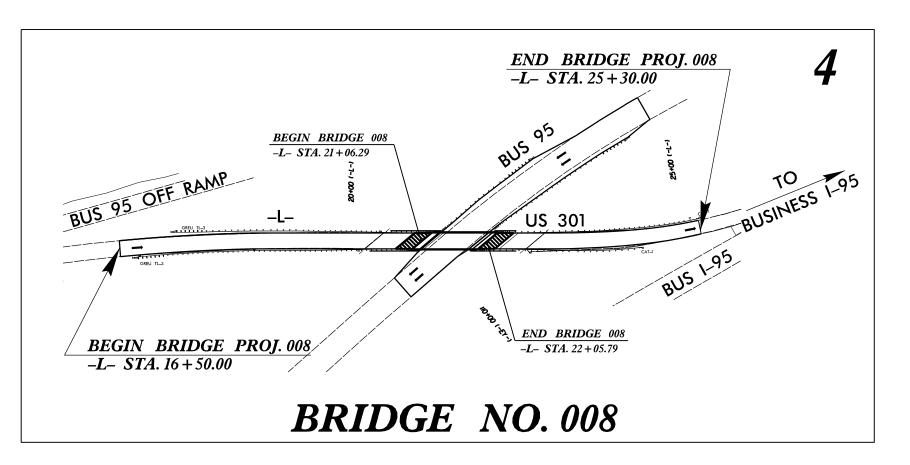
LOCATION: BRIDGE NOS. 129 & 130 ON 1-95 BUSINESS LOOP
OVER US 301 AND BRIDGE NO. 008 ON US 301
OVER I-95 BUSINESS LOOP SBL
TYPE OF WORK: GRADING, PAVING, DRAINAGE, STRUCTURE,
SIGNING & TRAFFIC CONTROL

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N.C.	4	250008	3	16				
STAT	E PROJ. NO.	P. A. PROJ. NO.		DESCRIPTION				
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			+					

HYDRAULICS ENGINEER

ROADWAY DESIGN

ENGINEER



Vhb

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

N/A

LETTING DATE:

DECEMBER 12, 2017

= 0.148 MI.

= 0.019 MI

= 0.167 MI.

= 0.135 MI.

= 0.035 MI.

= 0.170 MI.

SUNGATE DESIGN GROUP, P.A.

TIM GOINS, PE

LIZ LAWES, PE

紘

WBS: 41665.74

GRAPHIC SCALES

PROFILE (HORIZONTAL)

DESIGN DATA

BRIDGES 129 & 130

V = 40 MPH

V = 60 MPH

* TTST = DUAL FUNC CLASS =

INTERSTATE TIER

BRIDGE 008:

PROJECT LENGTH

TIP PROJECT BRIDGE 008:

TOTAL LENGTH OF PROJECT

LENGTH ROADWAY (EACH)

LENGTH STRUCTURE (EACH)

TIP PROJECT BRIDGES 129 & 130:

TOTAL LENGTH OF PROJECT (EACH)

LENGTH ROADWAY

LENGTH STRUCTURE



PROJ

PROJECT REFERENCE NO. SHEET NO. 250008 3A

Date: October 2017
WBS Number: 41665.7A
TIP Number: 250008
County: Cumberland

Description: Bridge No.008 on US 301 over I-95 Business Loop SBL

Subject: Roadway Geotechnical Report - Inventory

Project Description

The project is located at the intersection of US 301 and I-95 Business Loop SBL, south of Fayetteville, near Hope Mills in Cumberland County, North Carolina. The project will consist of replacing the existing bridge on US 301 (-L-) over I-95 Business (-L2-) with a new single span bridge with MSE walls constructed at each abutment. The total length of the project is 0.167 miles. The alignments will stay near existing grades and pavements will be widened along the shoulders. Maximum fill heights for construction of the MSE walls at the approaches will be about 23 feet. The project corridor is in a rural setting with some limited development and a cemetery located to the west of the project.

The geotechnical subsurface investigation was performed in September of 2017. Standard penetration test (SPT) borings were advanced using a Diedrich D-50 rotary drill rig equipped with a recently calibrated automatic hammer. Borings were advanced utilizing wash boring and hollow stem auger drilling techniques to the necessary depths. In addition to soil test borings performed along the corridor, three hand auger borings were performed along the roadway shoulders of the -L- and -L2- alignments. Representative soil samples were collected in the field for visual classification and selected samples were submitted for laboratory analysis by Terracon's soil testing laboratory. Laboratory testing was performed in accordance with the AASHTO Soil Classification System.

The following alignments were investigated by soil testing and visual reconnaissance:

Alignment Stations
-L- 16+50 to 25+30
-L2- 106+20 to 110+75

Physiography and Geology

The site is located within the Inner Coastal Plain Physiographic and Geologic Province of North Carolina in Cumberland County. The Coastal Plain Province is characterized by subdued topographic features. The existing natural grade elevations along the investigated corridor range from approximately 170 feet to 180 feet. In general, the topography at this site is slightly rolling with gentle slopes.

The project is located in the Inner Coastal Plain Physiographic Province with geology consisting of a wedge of unconsolidated sands, silt, marl, and other clays interbedded with occasional limestone strata, which rests atop crystalline basement rocks. Based on previous mapping (N.C. Geologic Map 1985) and our knowledge of the local geology, the site falls within the Cretaceous age Black Creek Formation. However, based on our site

visit and subsurface conditions encountered, the near surface soils appear to be recent Coastal Plain deposits of alluvial origin and are consistent with interbedded sands, clayey sands and clays typical of Undivided Coastal Plain soils. These near surface soils overlie the denser, darker soils belonging to the Black Creek Formation. The Black Creek Formation soils are described as gray to black lignitic clay with thin beds and laminae of fine-grained micaceous sand and thick lenses of cross-bedded sand. Glauconitic, fossiliferous clayey sand lenses are common in the upper part.

Soil Properties

Soils encountered during this investigation are separated into three categories based on their origin. The soils encountered consist of roadway embankment fill, Undivided Coastal Plain deposited soils and Formational soils.

Roadway Embankment soils were encountered at the following approximate locations:

AlignmentStations-L-16+50 to 25+30-L2-106+20 to 110+75

Roadway embankment soils were encountered along the -L- and -L2- alignments at the beginning through the end of the roadway work limits. Approximately 12 to 20 feet of roadway embankment fill soils were encountered along the -L- alignment and at the approaches to the existing bridge. These soils consist of medium dense to dense, dry to moist, relatively clean to silty and clayey fine to coarse sands (A-3, A-2-4 and A-2-6). The roadway embankment soils on the -L2- alignment appear to be reworked in-place Undivided Coastal Plain soils measuring about 1.5 to 3 feet thick beneath the ground surface and existing asphalt pavement sections. The roadway embankment soils along -L2- consist of loose to medium dense, dry to moist, silty fine to coarse sand (A-2-4).

Undivided Coastal Plain deposits are present at the surface and beneath the roadway embankment soils and asphalt pavement sections. The Undivided Coastal Plain soils can be generalized as alternating layers of silty clay and clayey to silty sand extending to the maximum depths of exploration or to the surface of the underlying Black Creek Formation. The near surface natural soils along the -L- and -L2- alignments consist of thickly bedded very loose to dense, moist to saturated, relatively clean to silty and clayey fine to coarse sands (A-3, A-2-4 and A-2-6) and 3 to 10 foot thick layers of very soft to stiff, moist to wet, fine to coarse sandy clays (A-6), moderately to high plasticity silty clays (A-7-6) and fine sandy silts (A-4). These soils were underlain by alternating layers of very loose to dense, saturated, silty to clayey sands (A-2-4 and A-2-6) and very soft to stiff, wet, sandy clays (A-6) and silty clays (A-7-6). The silt and clay soils exhibited plastic indices of 7 to 26 percent and are considered to be slightly to highly plastic soils. These soils also had between 37 and 48 percent fines passing the No. 200 sieve.

Formational soils of the Black Creek Formation were encountered in the deep borings as high as elevation 134.5 feet. These soils are characterized by their black to gray color and consist of layers of very loose to

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250008	3B

dense, saturated, silty to clayey sands (A-2-4 and A-2-6) and medium stiff to stiff, moist to wet, silty clays (A-7-6) with traces of mica and lignite.

Groundwater

In general, the corridor drains to unnamed jurisdictional streams that run south and east out of the corridor. Groundwater was not encountered within the 13 to 15 feet boring termination depths beneath the ground surface on the -L- alignment. Groundwater was encountered during drilling and sampling along the -L2-alignment at depths of about 8.5 and 9.5 feet below the existing ground surface. The depth of groundwater, beneath the ground surface, will fluctuate with seasonal precipitation and may occur a higher levels at other times of the year and above less permeable near surface clayey soils.

Areas of Special Geotechnical Interest

1) <u>Plastic Soils</u> - Moderate to high plasticity soils with plastic indices (PI) of 16 and greater were encountered near the existing ground surface at the following locations:

<u>Alignment</u>	<u>Stations</u>
-L-	106+20 to 108+75
-L-	110+60 to 110+75

A discussion of these plastic soils is located above in the section titled "Soil Properties".

BULK SAMPLES

No bulks samples were collected

UNDISTRUBED SAMPLES

No "Shelby" tube samples were taken.

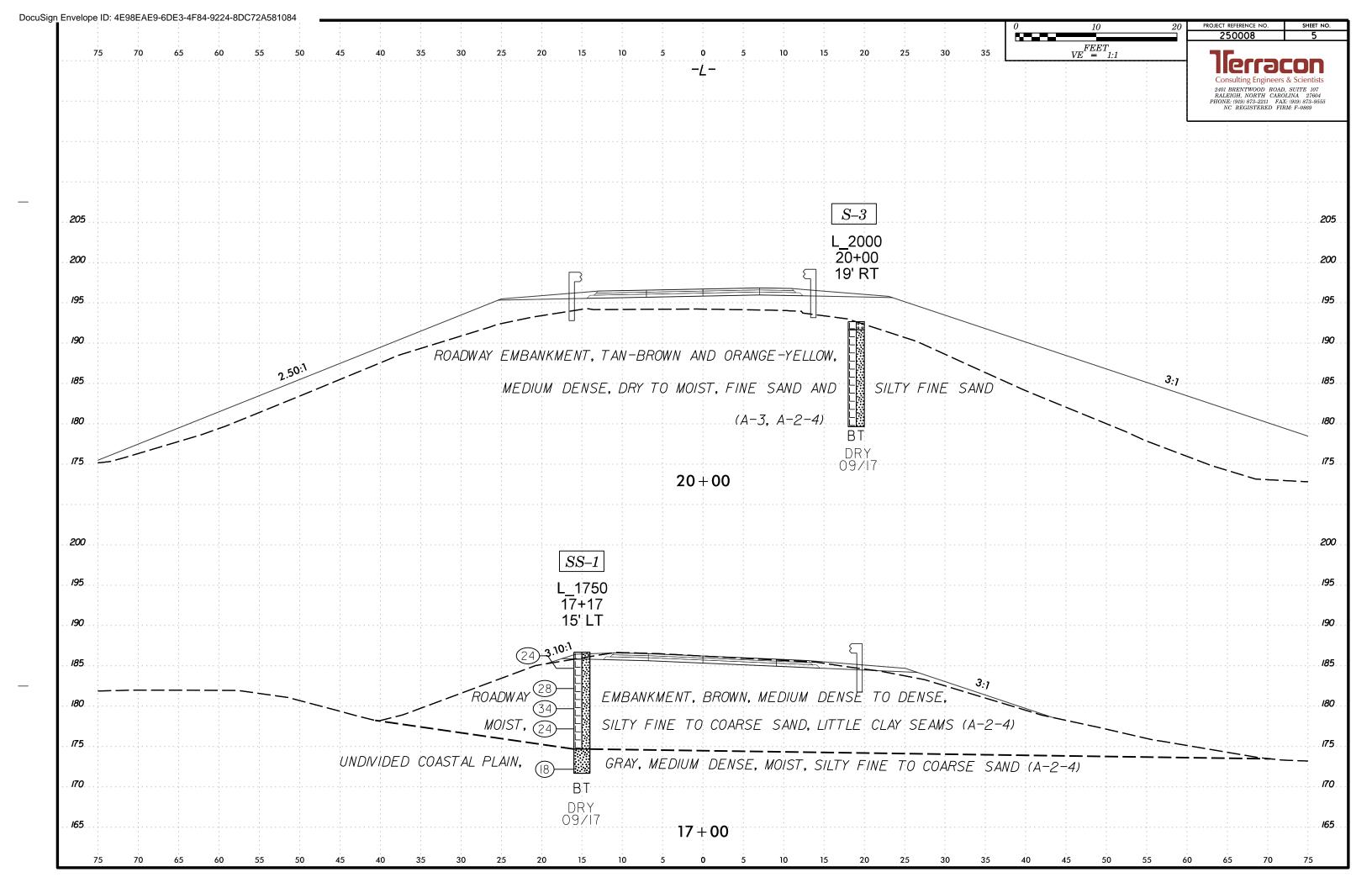
Sincerely,
Terracon Consultants, Inc.

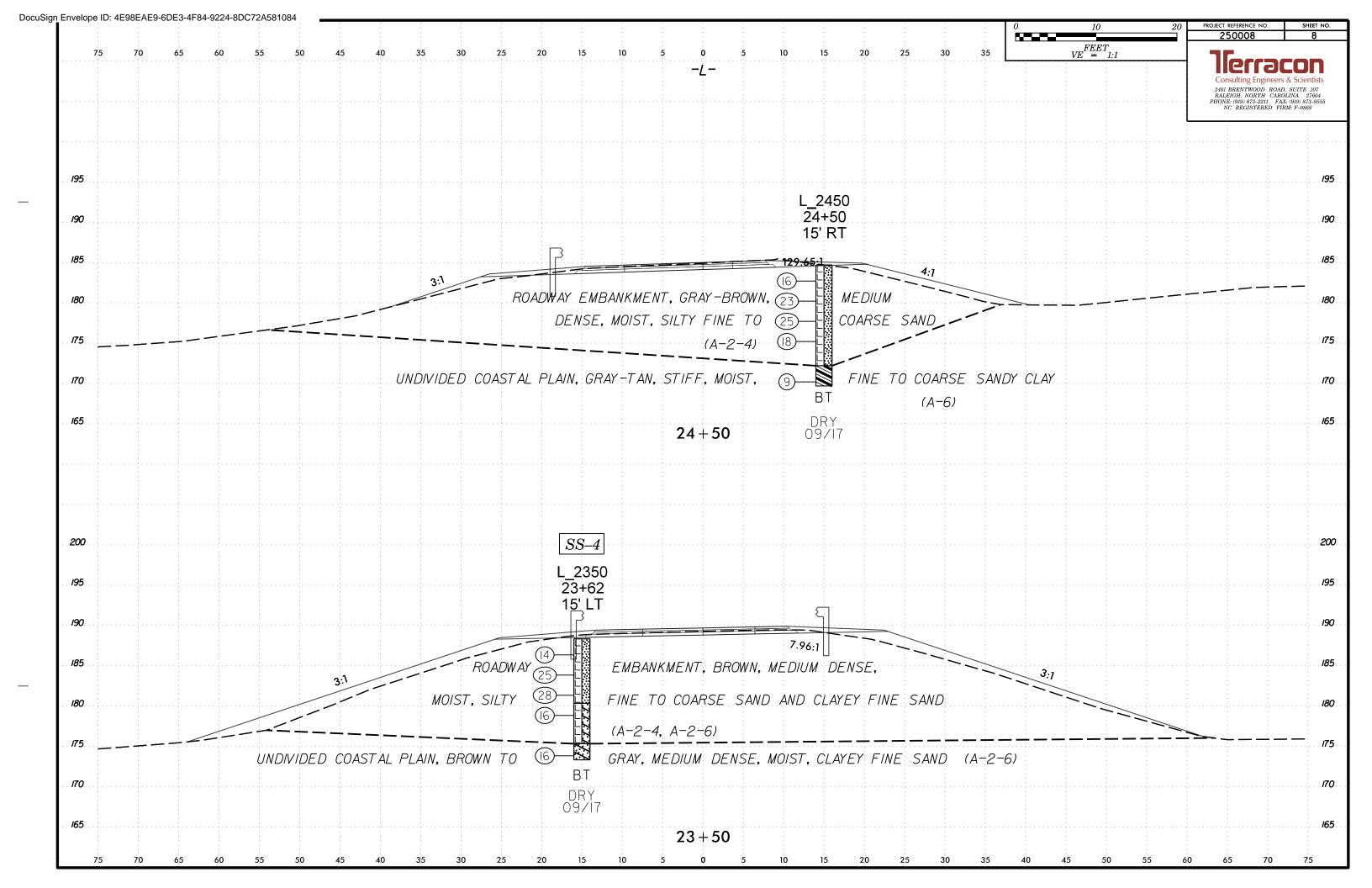


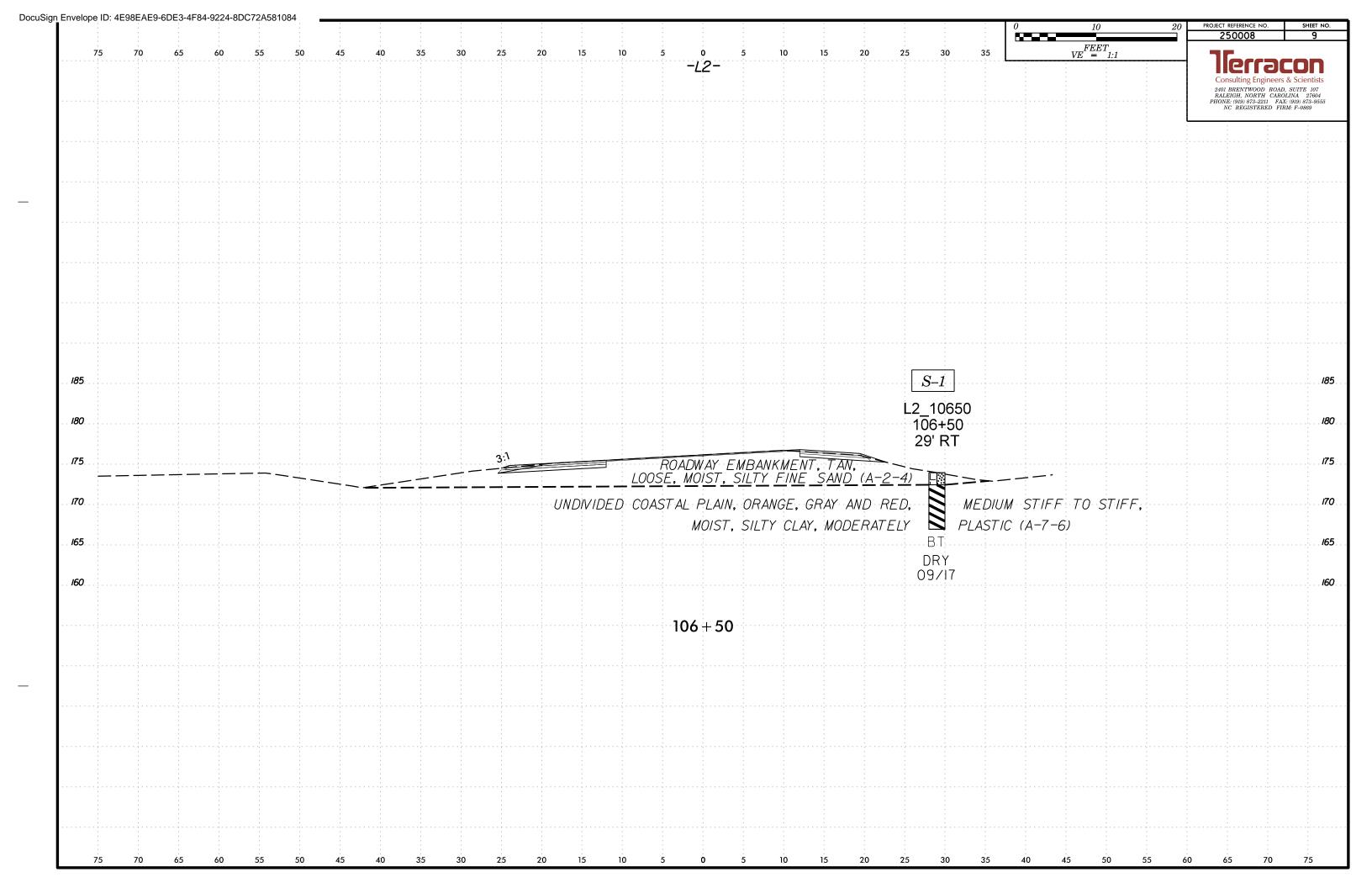
Abner F. Riggs, Jr., PE Senior Geotechnical Engineer

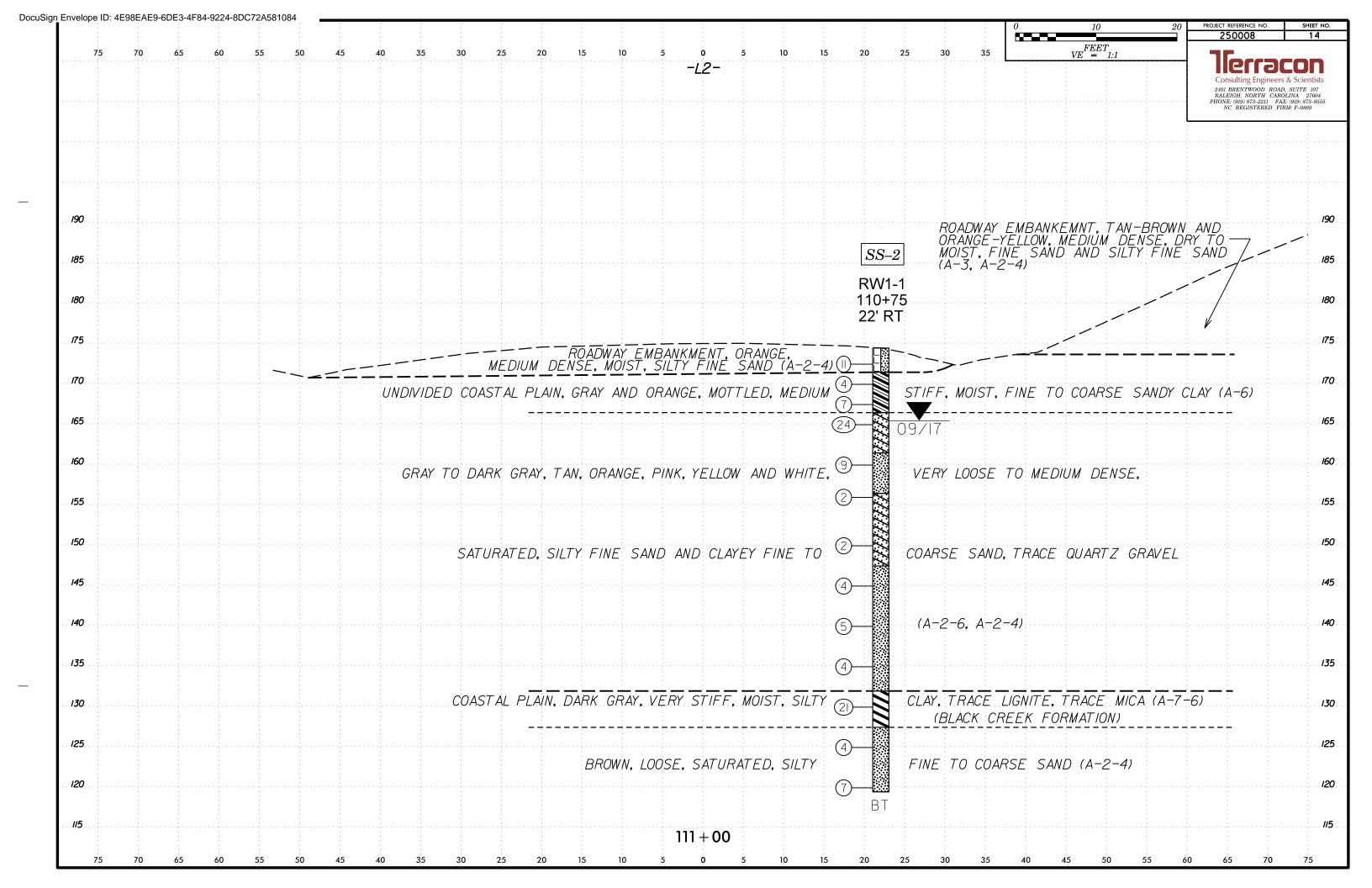
Andrew Nash

Andrew A. Nash, PE Geotechnical Department Manager









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			N.C.	250008		16
REFERENCE: 250008		PPENDIX A				
PROIECT: 41665.74						

LABORATORY TESTING SUMMARY

PROJECT NUMBER:	41665.7A	TIP:	250008	COUNTY:	CUMBERLAND
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DESCRIPTION: US 301 Over I-95 Business Loop SBL

				Depth					% by V	/eight		%	%	Passing (sie	ves)			Ave. Wet		Shear Strei	ngth Values	
Sample No.	Alignment	Station	Offset (feet)	Depth Interval	AASHTO Class.	L.L.	P.I.	Coarse	Fine Sand	Silt	Clay	Retained #4	#10	#40	#200	% Moisture	% Organic	Unit Wt.	Total Cohesion	Total Friction	Effective Cohesion	Effective Friction
				(feet)				Sand				Sieve						(pcf)	(nsf)	(ф)	(psf)	(ሐ')
SS-1	-L-	17+17	15' LT	1.0-2.5	A-2-4 (0)	16	NP	58.5	28.1	2.8	10.6	0	100	76	15	N/D	N/D	N/D	N/D	N/D	N/D	N/D
SS-2	-L-	20+63	52' RT	3.5-5.0	A-6 (3)	33	19	35.0	25.7	11.7	27.6	8	92	75	39	N/D	N/D	N/D	N/D	N/D	N/D	N/D
SS-3	-L2-	108+57	26' LT	3.5-5.0	A-7-6 (8)	41	26	27.9	28	12.9	31.2	0	100	87	48	18.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-4	-L-	23+62	15' LT	3.5-5.0	A-2-4 (0)	17	NP	66.3	20.9	2.1	10.7	0	100	67	14	N/D	N/D	N/D	N/D	N/D	N/D	N/D
S-1	-L2-	106+50	29' RT	2.5-4.0	A-7-6 (6)	44	24	39.0	20.4	7.4	33.2	0	100	79	43	17.6	N/D	N/D	N/D	N/D	N/D	N/D
S-2	-L2-	110+50	21' LT	3.0-4.5	A-4 (0)	18	7	32.8	34.4	15.7	17.1	0	100	85	37	10.3	N/D	N/D	N/D	N/D	N/D	N/D
S-3	-L-	20+00	19' RT	1.0-2.5	A-2-4 (0)	24	7	58.1	21.7	2.7	17.5	0	100	76	21	N/D	N/D	N/D	N/D	N/D	N/D	N/D
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Stephanie H. Huffman Certified Lab Technician Signature

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25012 REFERENCE

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>
-L1-	102 + 50 TO 111 + 50	4
-L2-	102 + 50 TO 111 + 50	4
Y	10 + 85 TO 17 + 00	4

CROSS SECTIONS

<u>LINE</u>	STATION	SHEETS
L1	103 + 50, 105 + 50	5
-L1-	106 + 00	6
-L1-	107 + 50	7
-L1-	108 + 50, 110 + 00	8
-L2-	103 + 50, 105 + 50	5
-L2-	106 + 00	6
-L2-	107 + 50	7
-L2-	108 + 50, $110 + 00$	8
Y	12 + 00, 13 + 00	9
Y	13 + 50	10
Y	14+00 TO 14+50	11
Y	15 + 00, 16 + 00	12

APPENDICES

<u>PENDIX</u>	<u>TITI</u>	<u>SHEETS</u>	
Α	LABORATORY SU	IMMARY SHEET	14

STATE OF NORTH CAROLINA

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY _CUMBERLAND

PROJECT DESCRIPTION <u>DIVISION</u> 6 - I-95 BUSINESS AND US 301 ROADWAY IMPROVEMENTS

INVENTORY

STATE PROJECT REFERENCE NO. 14 41665

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 1991 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 BORNOS 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 DECREE OF RELIBBILITY 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 WITH THE 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.

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 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.

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NOVEMBER 2017

Prepared in the Office of: Consulting Engineers & Scientists

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11/9/2017

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PROJECT REFERENCE NO.
41665.7A

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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	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.	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 DI586). SOIL CLASSIFICATION	GAP-GRADED - 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 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	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 PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	WEATHERED WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	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.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE CRYSTALLINE WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLASS. (\$\leq 35% PASSING *2000) (>\leq 35% PASSING *2000) (>\leq 35% PASSING *2000) (>\leq 35% PASSING *2000)	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROLK (CH) GNEISS, GABBRO, SCHIST, ETC.	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-7 A-7-6 A	COMPRESSIBILITY	NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 0000d0000d	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7. PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED (CP) SHELL BEDS, ETC.	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.
10 58 MX GRANULAR SIL1 MUCK, **40 38 MX 58 MX 51 MN 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 35 MX 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. 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 10 MX 10 MX 11 MN 11 MN MODERATE OPPONING	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE GROUND WATER	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH, FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
CHOUP INDEX W W A MX 8 MX 12 MX 16 MX NU MX AMUUN 15 UF SOILS		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	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL ITYES STUNE HABUS. 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 SANU	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	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	SPRING OR SEEP	WITH FRESH ROCK. 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	FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK, IF TESTED, WOULD YIELD SPT REFUSAL	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
CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH 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	SOIL SYMBOL SPIT ONT TEST BORING SLOPE INDICATOR 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 MEDIUM DENSE 10 TO 30 N/A	N T	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	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 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	— INFERRED SOIL BOUNDARY — CORE BORING ● SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	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 MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> 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.
MATERIAL STIFF 8 TO 15 1 TO 2	A DIE TOMETED	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 ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY A INSTALLATION SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	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 - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES 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	UNSUITABLE WASTE SHALLOW UNCLASSIFIED EXCAVATION - WED IN THE TOP 3 FEET OF WHEN DAY WHEN TO BE PARKET.	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 SAND SAND COARSE OF THE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN. 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
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	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 0.005 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
	CL CLAY MOD MODERATELY γ - 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 OURS SO STATE AND STATE OF SCALES OF STATE OF S	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 _d - 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) DESCRIPTION GUIDE 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 (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
(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	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLIDA DE OLIDES DEVINCITO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMI-SULIN REGULATES DATING TO ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	_BENCH_MARK: BY-2, N=486,477.58, E=2,062,458.96
	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: 120.92 FEET
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE	
SL _ SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE Ø.16 TO 1 FOOT VERY THINLY BEDDED Ø.03 - 0.16 FEET	NOTES:
- DRY - (D) REGULTES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	CME-55 G' CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD – FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	8* HOLLOW AUGERSBH	INDURATION	PROJECT WAS DRAFTED USING PROVIDED TIN FILE FILE: 250129_ls_tin.tin (DATED: 12/21/2016)
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 X HARD FACED FINGER BITS -N	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	_ · · · · · ·
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	TUNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	X CASING W/ ADVANCER POST HOLE DIGGER	CRANGE CAN DE CEDADATED EDOM CAMBLE MITH CITES DOOR	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	X D-50 (TER373) X TRICONE 25% TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	CHARD HANNED DI DUC DECIMEED TO DEFAY CAMPLE	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	X 3½" HOLLOW STEM AUGER	EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14

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BR NO. 800

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STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

CUMBERLAND COUNTY

LOCATION: BRIDGE NOS. 129 & 130 ON I-95 BUSINESS LOOP OVER US 301 AND BRIDGE NO. 008 ON US 301 OVER I-95 BUSINESS LOOP SBL TYPE OF WORK: GRADING, PAVING, DRAINAGE, STRUCTURE, SIGNING & TRAFFIC CONTROL

STATE	STATE	NO.	SHEETS			
N.C.	BRIDG	3	14			
STAT	F. A. PROJ	DESCRIPTION				
41665.7A				PE		
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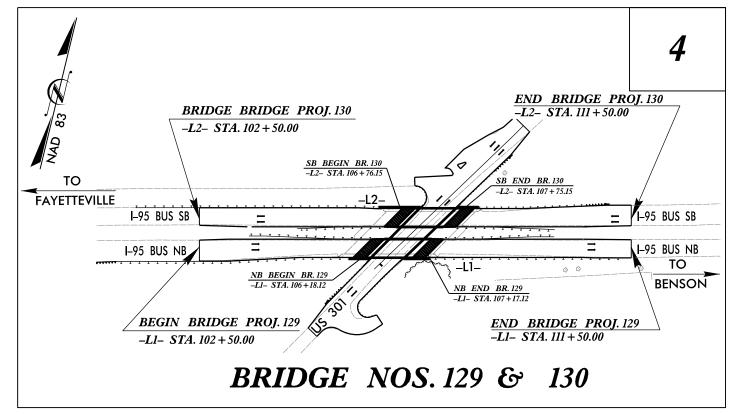
NOT TO SCALE **25% PLANS**

VICINITY MAP

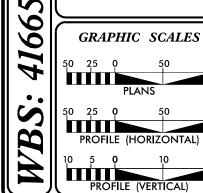
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BR NOS.

129 & 130



PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



DESIGN DATA

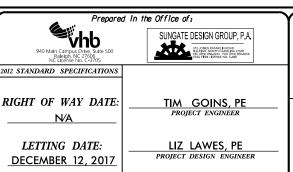
BRIDGE 008: V = 40 MPHBRIDGES 129 & 130 V = 60 MPH

> * TTST = DUAL FUNC CLASS =

INTERSTATE TIER

PROJECT LENGTH

TIP PROJECT BRIDGE 008: LENGTH ROADWAY = 0.148 MI.LENGTH STRUCTURE = 0.019 MI.TOTAL LENGTH OF PROJECT = 0.167 Ml.TIP PROJECT BRIDGES 129 & 130: LENGTH ROADWAY (EACH) = 0.135 MI.LENGTH STRUCTURE (EACH) = 0.035 MI.TOTAL LENGTH OF PROJECT (EACH) = 0.170 MI.



HYDRAULICS ENGINEER ROADWAY DESIGN **ENGINEER**





Date: November 2017

WBS Number: 41665.7A

TIP Number: N/A, (250129 & 250130)

County: Cumberland

Description: Bridge Nos.129 and 130 on I-95 Business Loop over US 301 (Dunn Road)

Subject: Roadway Geotechnical Report - Inventory

Project Description

The project is located at the intersection of I-95 Business Loop over US 301 (Dunn Road), north of Fayetteville, near Eastover in Cumberland County, North Carolina. The project will consist of replacing the existing NBL (-L1-) and SBL (-L2-) bridges on I-95 Business Loop over US 301 (-Y-) with new single span bridges with MSE walls constructed at each abutment. The total length of the project is 0.17 miles. The alignments will stay near existing grades and pavements will be widened along the shoulders. Maximum fill heights for construction of the MSE walls at the approaches will be about 22 feet. The project corridor is in a rural setting with some limited commercial development.

The geotechnical subsurface investigation was performed in September of 2017. Standard penetration test (SPT) borings were advanced using a Diedrich D-50 rotary drill rig equipped with a recently calibrated automatic hammer. Borings were advanced utilizing wash boring and hollow stem auger drilling techniques to the necessary depths. Representative soil samples were collected in the field for visual classification and selected samples were submitted for laboratory analysis by Terracon's soil testing laboratory. Laboratory testing was performed in accordance with the AASHTO Soil Classification System.

The following alignments were investigated by soil testing and visual reconnaissance:

<u>Alignment</u>	<u>Stations</u>
-L1-	102+50 to 111+50
-L2-	102+50 to 111+50
-Y-	10+85 to 17+00

Physiography and Geology

The site is located within the Inner Coastal Plain Physiographic and Geologic Province of North Carolina in Cumberland County. The Coastal Plain Province is characterized by subdued topographic features. The existing natural grade elevations along the investigated corridor range from approximately 120 feet to 125 feet. In general, the topography at this site is slightly rolling with gentle slopes.

The geology of the Inner Coastal Plain Physiographic Province consists of a wedge of unconsolidated sands, silt, marl, and other clays interbedded with occasional limestone strata, which rests atop crystalline basement rocks. Based on previous mapping (N.C. Geologic Map 1985) and our knowledge of the local geology, the site falls within the Cretaceous Age Cape Fear Formation. However, based on our site visit and subsurface conditions encountered, the near surface soils appear to be recent Coastal Plain deposits of alluvial origin

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P [919] 873 2211 F [919] 873 9555 terracon.com NC Registered Firm F-0869

PROJECT REFERENCE NO.	SHEET NO.
250129 & 250130	3A

and are consistent with interbedded sands, clayey sands and clays typical of Undivided Coastal Plain soils. These near surface soils overlie the Cape Fear Formation. The Cape Fear Formation consists of alternating beds of indurated sandstone and mudstone that are generally laterally continuous with some faint cross-bedding. Fine grained to pebble sized quartz are scattered though out the mudstone which grades to a silty clayey soil. Feldspar and mica are also common.

Soil Properties

Soils encountered during this investigation are separated into three categories based on their origin. The soils encountered consist of roadway embankment fill, Undivided Coastal Plain deposited soils and Formational soils.

Roadway Embankment soils were encountered at the following approximate locations:

<u>Alignment</u>	<u>Stations</u>
-L1-	102+50 to 111+50
-L2-	102+50 to 111+50
-Y-	10+85 to 17+00

Roadway embankment soils were encountered along the -L1- , -L2- and -Y- alignments at the beginning through the end of the roadway work limits. Approximately 17 to 18 feet of roadway embankment fill soils were encountered along the -L1- and -L2- alignments and at the approaches to the existing bridges. These soils consist of loose to medium dense, dry to moist, relatively clean to silty fine to coarse sands (A-1-b and A-2-4). The roadway embankment soils on the -Y- alignment appear to be reworked in-place Undivided Coastal Plain soils measuring up to about 6.5 feet thick beneath the ground surface and existing asphalt pavement sections. The roadway embankment soils along -Y- consist of loose to medium dense, dry to moist, relatively clean to silty fine to coarse sand (A-1-b and A-2-4).

Undivided Coastal Plain deposits are present at the surface and beneath the roadway embankment soils and asphalt pavement sections. The Undivided Coastal Plain soils consist of thickly bedded loose to very dense, moist to saturated, relatively clean to silty fine to coarse sands (A-1-b, A-3 and A-2-4) extending to the maximum depths of exploration or to the surface of the underlying Cape Fear Formation. The sandy soils are non-plastic and contain between 6 and 12 percent fines passing the No. 200 sieve.

Formational soils of the Cape Fear Formation were encountered in the deep borings at approximately elevations 103 to 107 feet. The soils in the Cape Fear Formation consist of gray, medium stiff to hard, moist, silty clay (A-7-6) with lenses of mudstone. N-values in the mudstone were as high as 100 blows per 0.4 feet of penetration. The plasticity indices of these soils range from 36 to 41.

Groundwater

In general, the corridor drains to unnamed jurisdictional streams that run south and east out of the corridor. Groundwater was not encountered within the 23 feet beneath the ground surface along the -L1- and -L2- alignments. Groundwater was encountered during drilling and sampling along the -Y- alignment at depths of about 6 to 7 feet below the existing ground surface. The depth of groundwater, beneath the ground surface,

Responsive Resourceful Reliable

 PROJECT REFERENCE NO.
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 250129 & 250130
 3B

will fluctuate with seasonal precipitation and may occur a higher levels at other times of the year and above less permeable near surface clayey soils.

BULK SAMPLES

No bulks samples were collected

UNDISTRUBED SAMPLES

No "Shelby" tube samples were taken.

Sincerely,

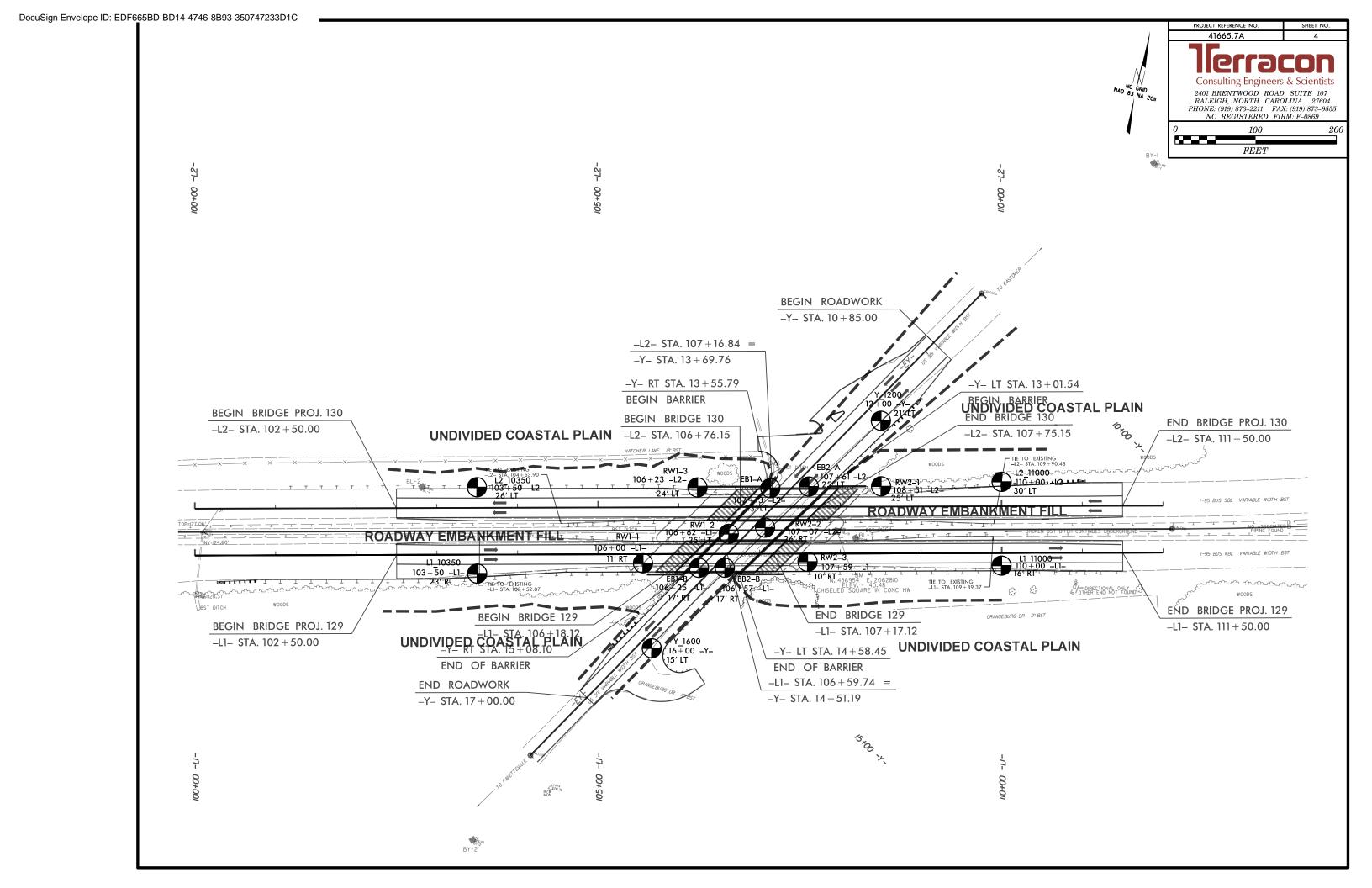
Terracon Consultants, Inc.

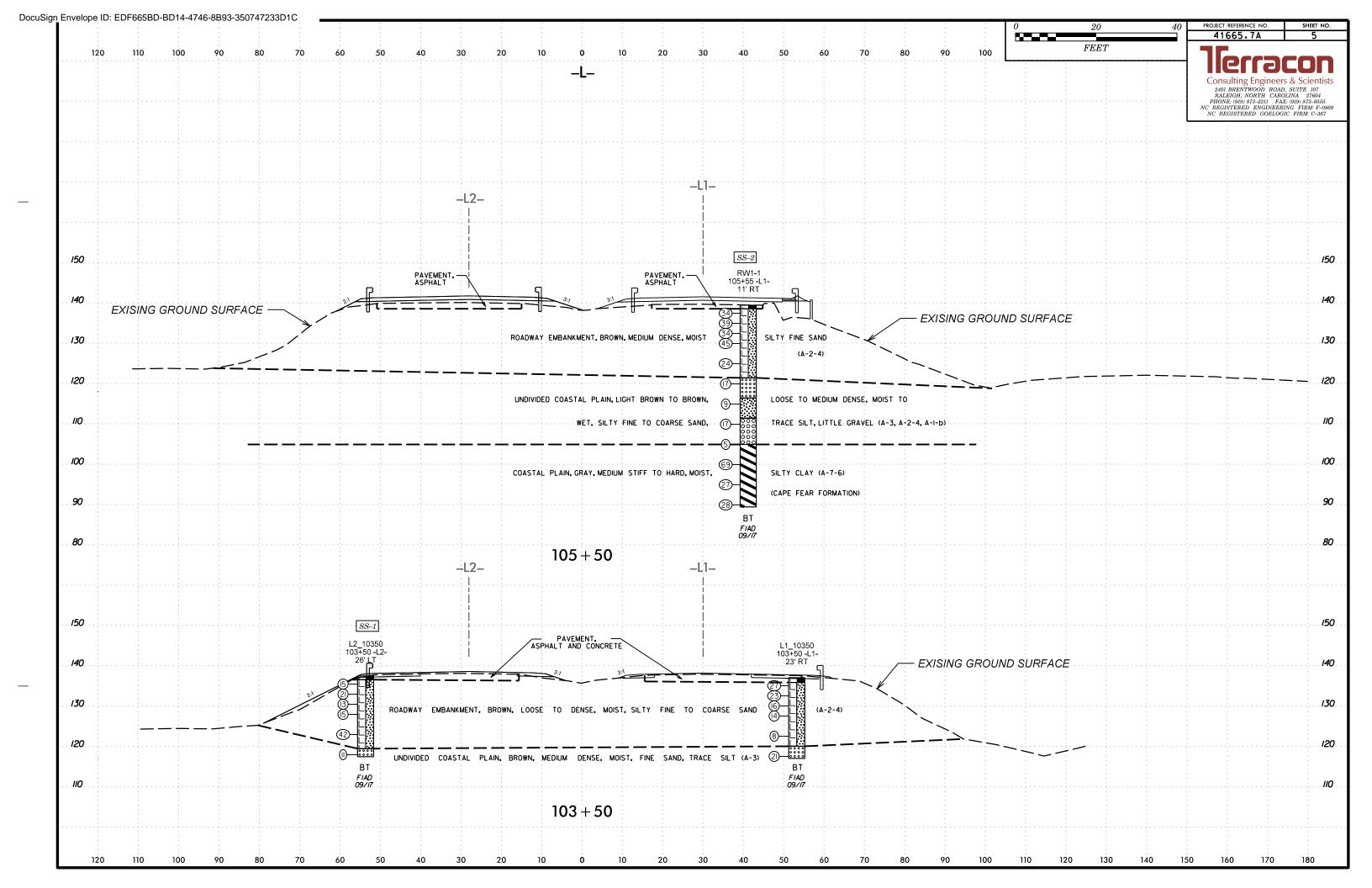


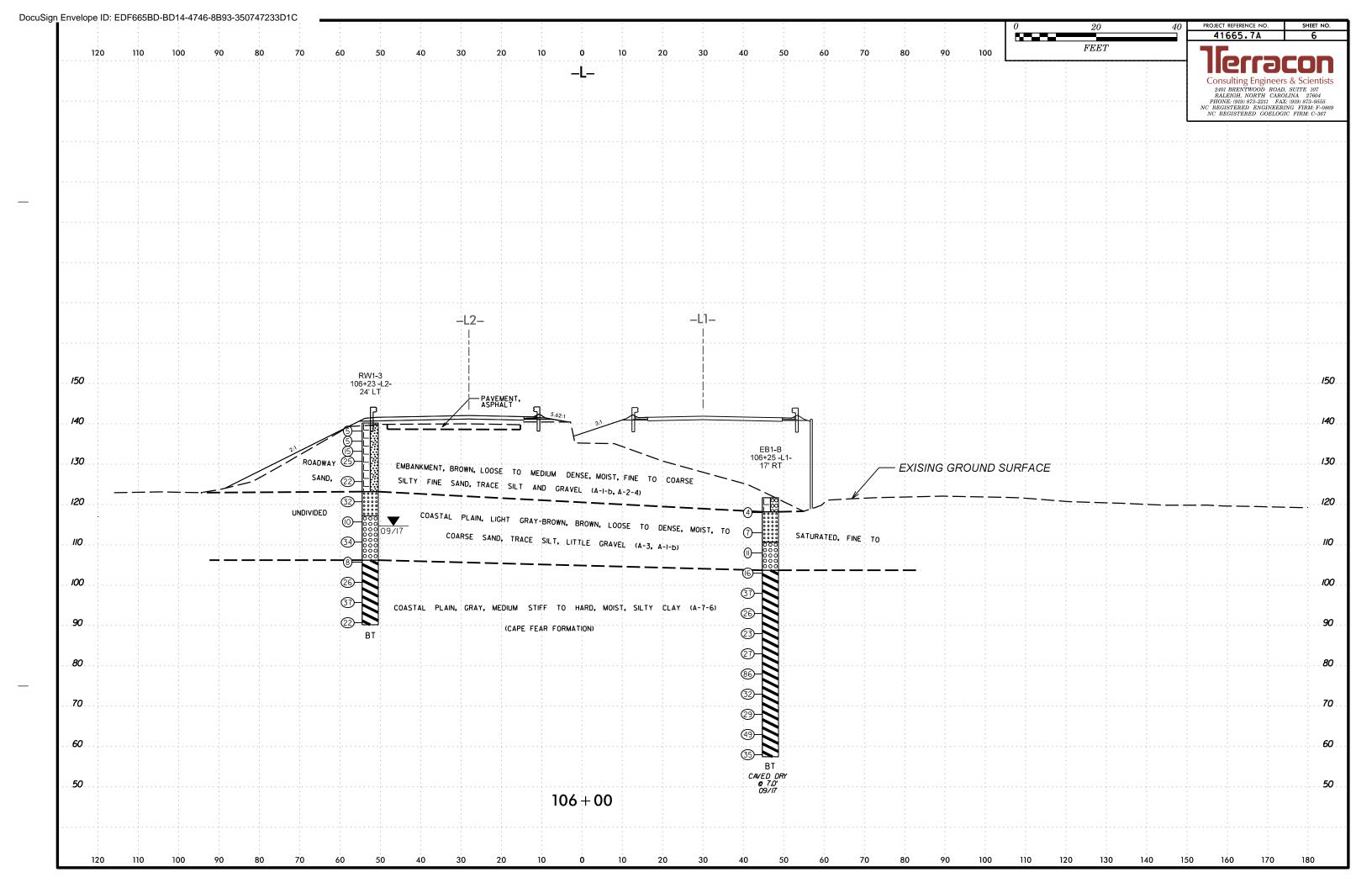
Abner F. Riggs, Jr., PE Senior Geotechnical Engineer

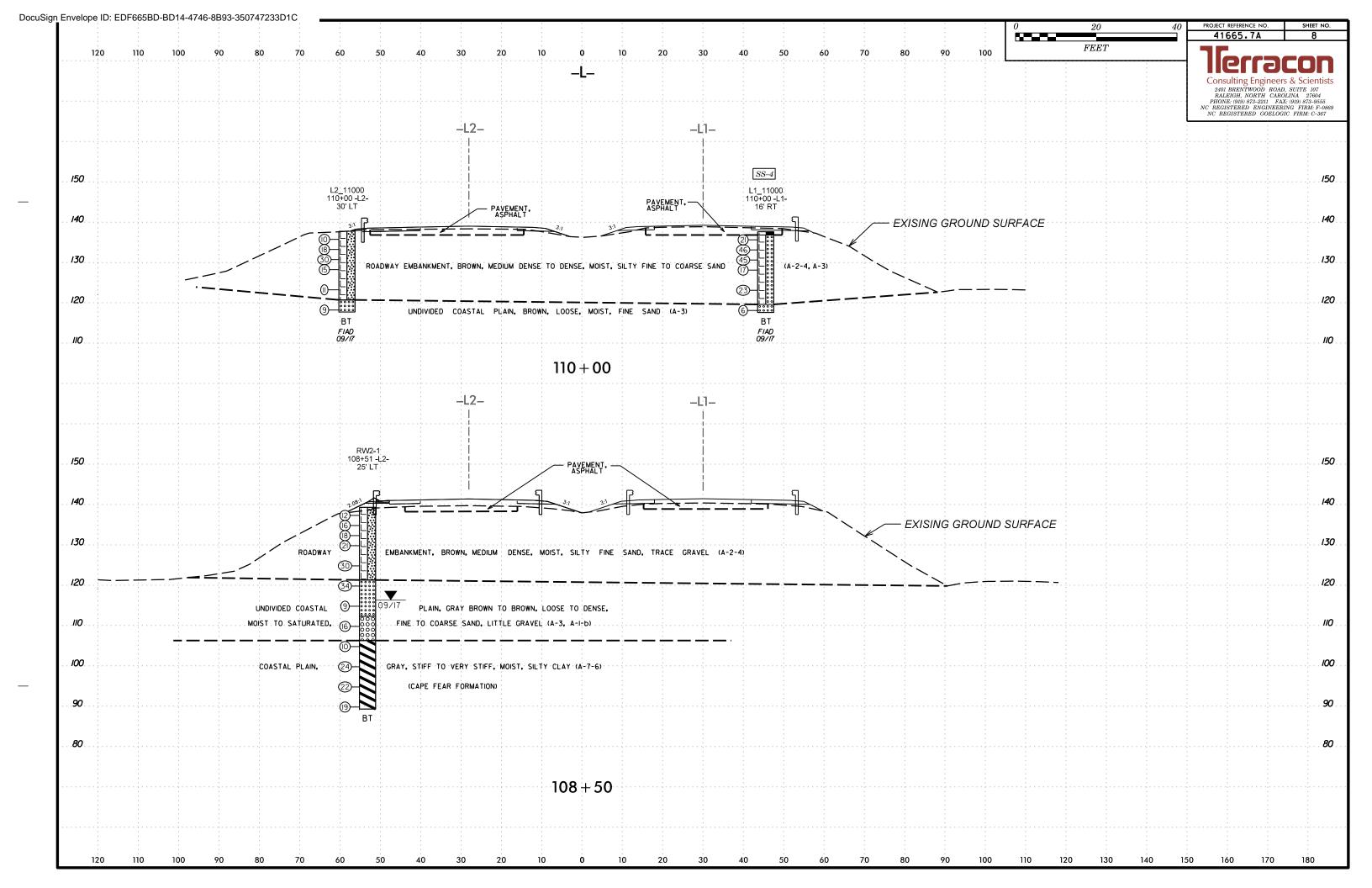
ANDREW MASH

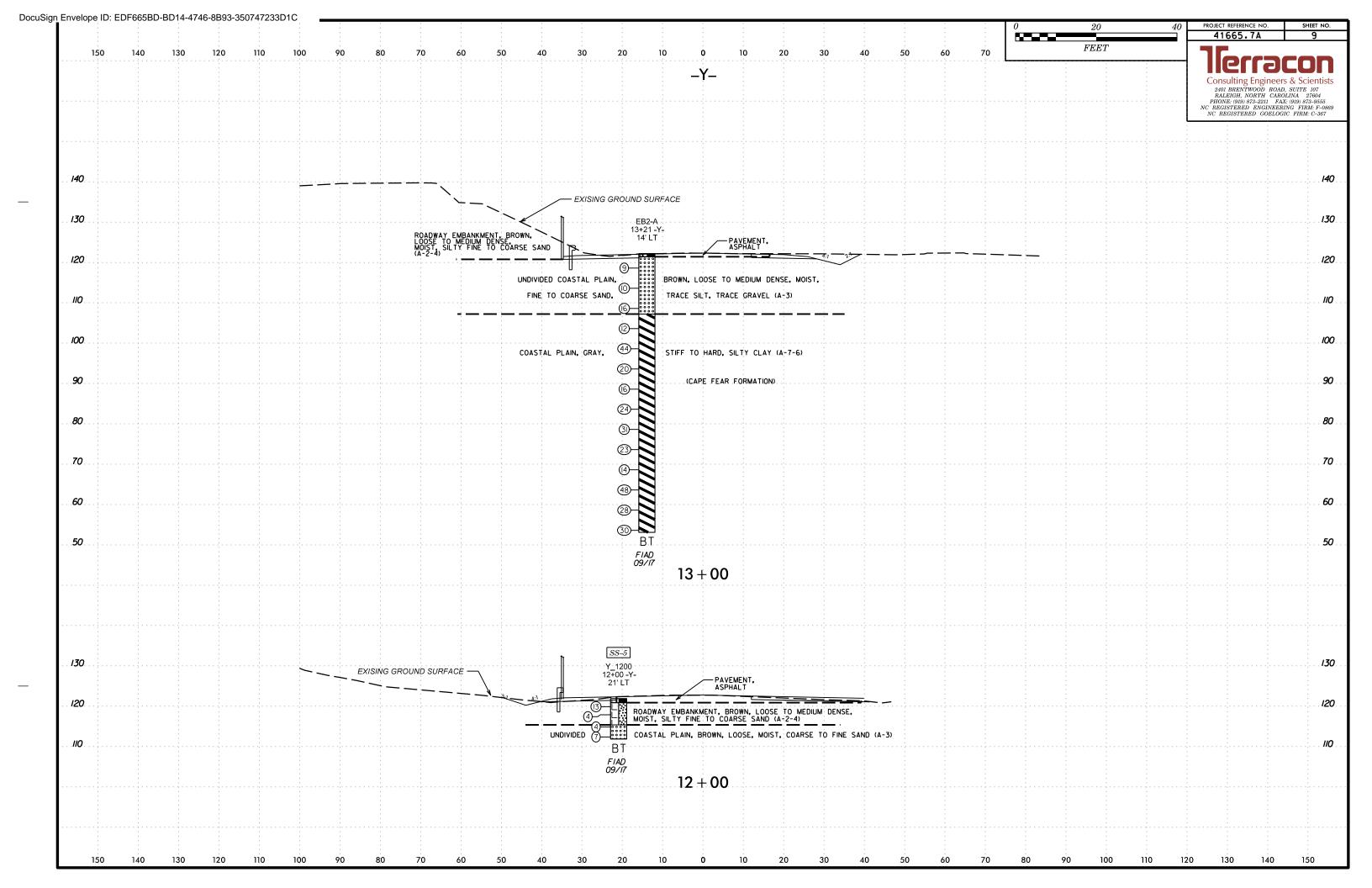
Andrew A. Nash, PE Geotechnical Department Manager

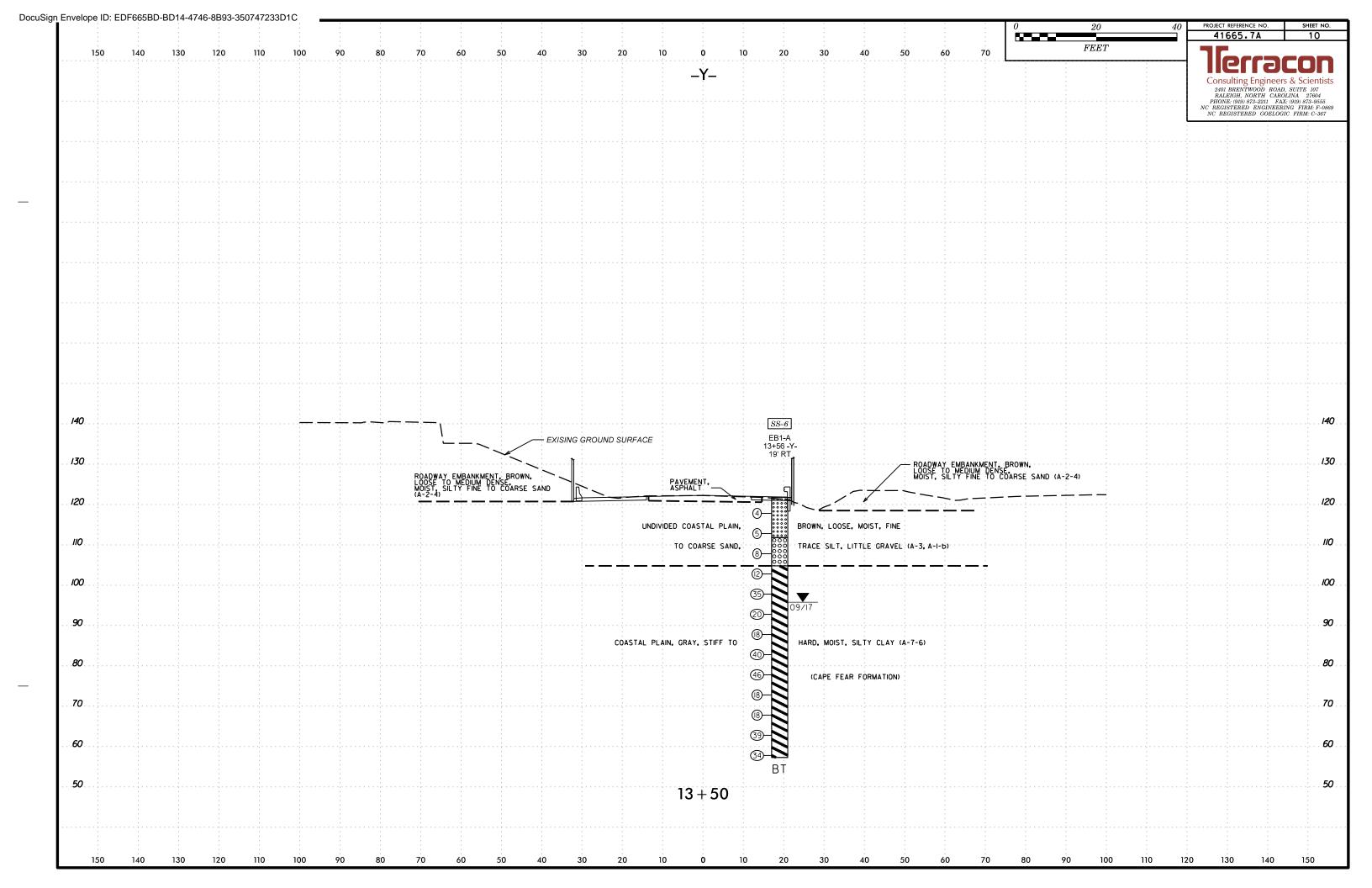


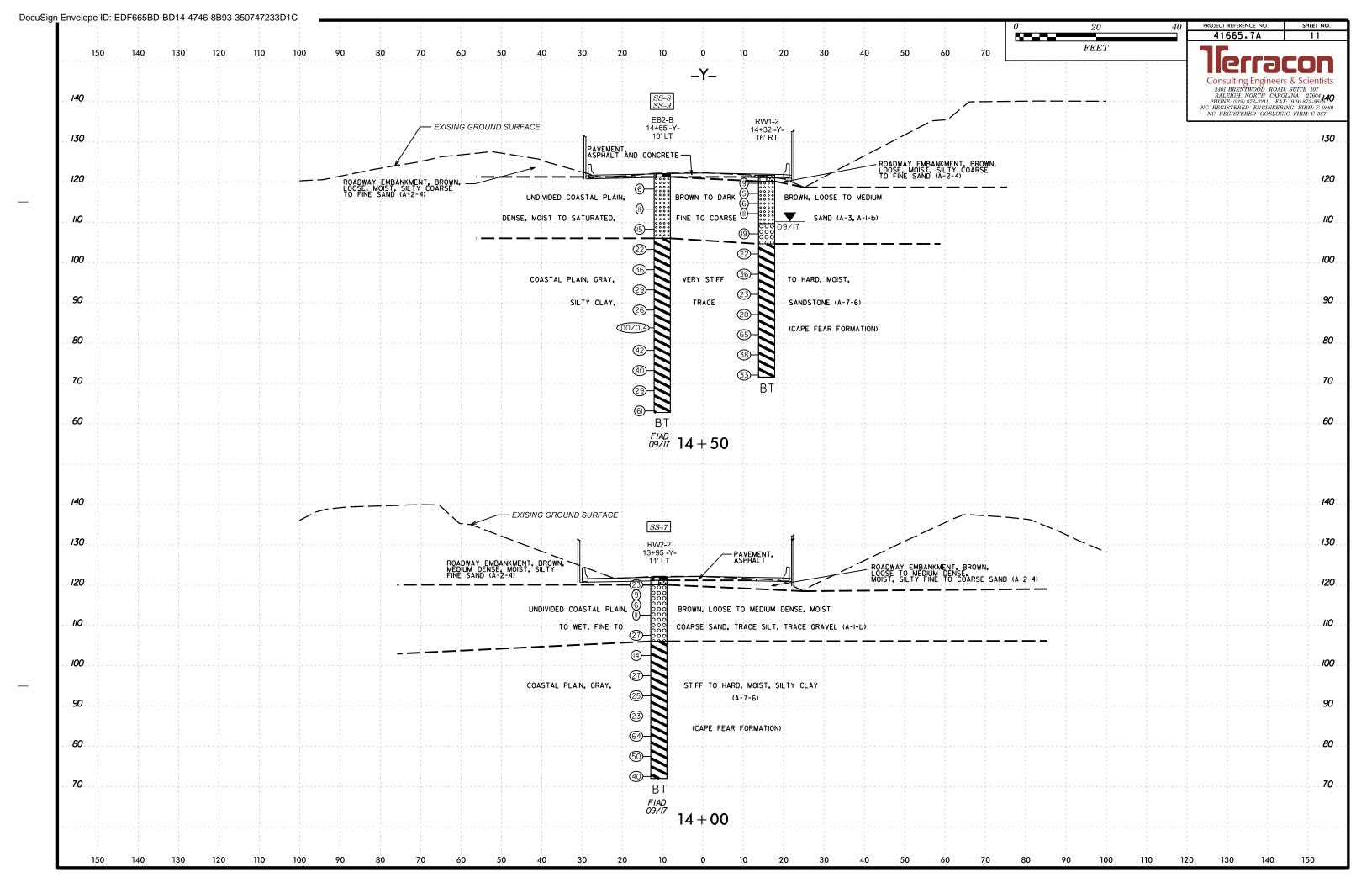


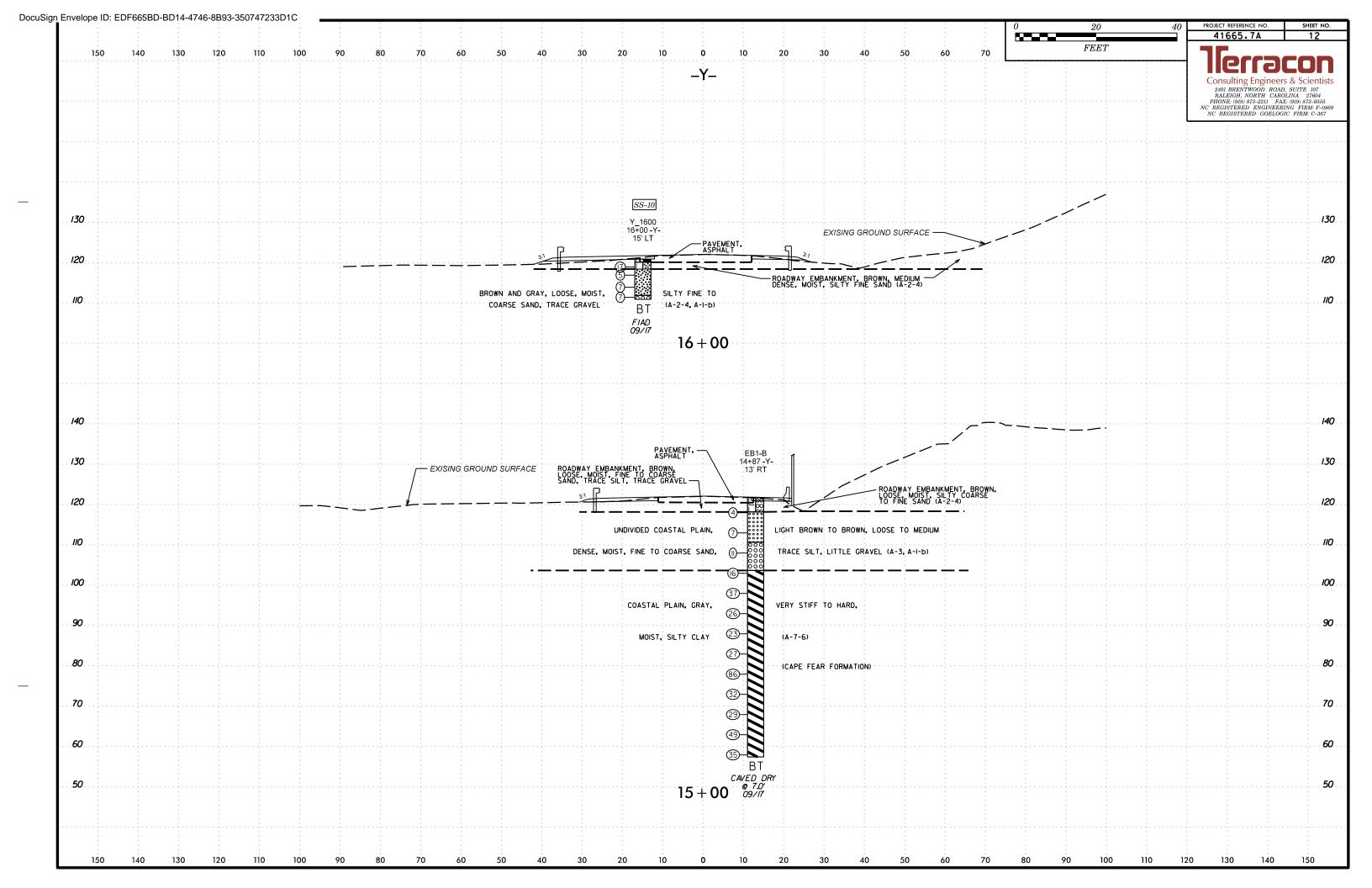












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41665.7A REFERENCE: 250129 **PARTICLE STATES** **	2		Consulting Engineers & S	ocientists
41665.7A REFERENCE: 250129 **PARTICLE STATES** **	ري		RALEIGH, NORTH CAROLINA PHONE: (919) 873-2211 FAX: (919) NC REGISTERED ENGINEERING F	27604 873–9555 IRM: F-0869
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LABORATORY TESTING SUMMARY

PROJECT NUMBER:	41665.7A	TIP:	250129 & 250130	COUNTY:	CUMBERLAND	
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DESCRIPTION: 1-95 Business Loop over US 301

	Offset Depth AASHTO			% by Weight %					% Passing (sieves)					Ave. Wet		Shear Strength Values						
Sample No.	Alignment	Station	Offset (feet)	Interval (feet)	AASHTO Class.	L.L.	P.I.	Coarse Sand	Fine Sand	Silt	Clay	Retained #4 Sieve		#40	#200	% Moisture	% Organic	Unit Wt. (pcf)	Total Cohesion	Total Friction (φ)	Effective Cohesion	Effective Friction
SC 1	10	102.50	26! LT		A 2 4 (0)	15	ND		16.7	2.7	0.2		99	62	10	6.6	N/D		(psf)		(psf) N/D	(Φ')
SS-1 SS-2	- <u>L2-</u> -L1-	103+50 105+61	26' LT 11' RT	3.5-5.0 3.5-5.0	A-2-4 (0) A-2-4 (0)	15 15	NP NP	72.4 73.5	16.7 15.6	2.7 3.1	8.2 7.8	0	100	62 63	12 12	6.6 11.1	N/D N/D	N/D N/D	N/D N/D	N/D N/D	N/D	N/D N/D
SS-3	-L1- -L1-	107+30	10' RT	3.5-5.0	A-2-4 (0) A-2-4 (0)	12	NP NP	71.5	19.5	4.1	4.9	0	99	64	11	4.3	N/D	N/D	N/D	N/D	N/D	N/D
SS-4	-L1-	110+00	16' RT	3.5-5.0	A-3 (0)	13	NP	83.8	11.1	1.1	4.0	1	97	54	6	18.2	N/D	N/D	N/D	N/D	N/D	N/D
SS-5	-Y-	12+00	21' LT	3.5-5.0	A-2-4 (0)	14	NP	76.7	11.3	3.8	8.2	0	100	60	13	6.1	N/D	N/D	N/D	N/D	N/D	N/D
SS-6	-Y-	13+56	19' RT	18.0-19.5	A-7-6 (26)	57	41	9.6	27.2	16.9	46.3	0	100	94	68	27.7	N/D	N/D	N/D	N/D	N/D	N/D
SS-7	-Y-	13+95	11' LT	3.5-5.0	A-1-b (0)	16	NP	82.6	11.2	1.7	4.5	5	89	46	6	16.0	N/D	N/D	N/D	N/D	N/D	N/D
SS-8	-Y-	14+65	10' LT	2.8-4.3	A-3 (0)	15	NP	82.5	11.7	0.9	4.9	2	93	52	6	16.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-9	-Y-	14+65	10' LT	17.8-19.3	A-7-6 (12)	48	36	32.3	22.3	12.5	32.9	0	99	78	49	16.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-10	-Y-	16+00	15' LT	3.5-5.0	A-2-4 (0)	14	NP	76.4	13.7	2.1	7.8	0	100	70	11	5.7	N/D	N/D	N/D	N/D	N/D	N/D
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Stephanie H. Huffman Certified Lab Technician Signature

114-01-1203

Certification Number