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7/2/99

REFERENCE: R-1015

PROJECT: 34360

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	8

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (HAVELOCK BYPASS) FROM NORTH OF CARTERET/CRAVEN COUNTY LINE TO NORTH OF PINE GROVE ROAD*

SITE DESCRIPTION *SITE 1 RETAINING WALLS 1 & 2*

CONTENTS

CAUTION NOTICE

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

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

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NOTES:
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PERSONNEL

P. GRAINGER

GET SOLUTIONS

INVESTIGATED BY *J.K. CRENSHAW*

DRAWN BY *W. SHUECRAFT*

CHECKED BY *E.C. HOWEY*

SUBMITTED BY *B.D. KEANEY*

DATE *JULY 2018*

NORTH CAROLINA LICENSED SEAL 2504 GEOLOGIST JARED K. CRENSHAW

DocuSigned by:
Jared K. Crenshaw 8/28/2018
3AB1C06A825F4F1... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / OPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [X] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN 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 WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	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 HARD	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.
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 SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

FIAD: FILLED IMMEDIATELY AFTER DRILLING

BORING LOCATIONS AND ELEVATIONS OBTAINED FROM MCKIM & CREED INC. - SURVEY ON 7-3-2018

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 60 120

FEET

UNDIVIDED COASTAL PLAIN

CS 5+10.98+38.97

END MSE WALL
STA. 14+54.32 –WALL 1–
STA. 11+43.80 –RP1AB–
OFFSET 145.62' LT.

ALLUVIAL

WI-10

WI-9

WI-8

EBI-A LL

WI-7

WI-6

WI-5

EBI-B RL

WI-4a

WI-4

WI-3

WI-3a

WI-2

WI-1

BEGIN MSE WALL
STA. 10+00.00 –WALL 1–
STA. 8+53.96 –RP1AB–
OFFSET 168.49' RT.

W2-1

BEGIN MSE WALL
STA. 10+00.00 –WALL 2–
STA. 14+07.32 –RP1AB–
OFFSET 136.93' LT.

W2-2

EB2-A LL

W2-3

W2-4

W2-5

EB2-B RL

W2-6

W2-7

END MSE WALL
STA. 13+35.38 –WALL 2–
STA. 12+11.67 –RP1AB–
OFFSET 114.65' RT.

TO MOREHEAD CITY

-RPIAB-

N 31° 50' 47.4" W

NB -RPIAB-

TO US 70 BUS.

7+75

16+15

10

15

55

N 51° 08' 32.8" W

7/2/99

GROUNDLINE PROFILE CREATED FROM r1015_ls_tin.tin FILE

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE FRONT FACE OF THE WALL ENVELOPE – LOOKING DOWNSTATION

0 50 100
FEET
VE = 2.5

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

MSE WALL AT END BENT 1

BEGIN MSE WALL
STA. 10+00.00 –WALL 1–
STA. 8+53.96 –RP1AB–
OFFSET 168.49′ RT.

END MSE WALL
STA. 14+54.32 –WALL 1–
STA. 11+43.80 –RP1AB–
OFFSET 145.62′ LT.

POINT "B" BOTTOM OF WALL EL. 30.09′
POINT "B" GRADE ELEVATION EL. 51.63′
POINT "C" GRADE ELEVATION EL. 52.31′
POINT "C" BOTTOM OF WALL EL. 30.09′
POINT "D" GRADE ELEVATION EL. 52.31′
POINT "D" BOTTOM OF WALL EL. 30.27′
POINT "E" GRADE ELEVATION EL. 51.27′
POINT "E" BOTTOM OF WALL EL. 30.44′
BOTTOM OF WALL EL. 30.62′
BOTTOM OF WALL EL. 31.01′
APPROXIMATE LINE OF EXISTING GRADE

WI-1 9+80 80′ LT
WI-2 10+49 31′ LT
WI-3a 10+86 58′ LT
WI-4 11+21 58′ LT
EBI-B RL -RP1AB- 10+14 46′ RT SS-246
WI-5 12+49 19′ RT
WI-6 12+82 8′ RT
WI-7 13+16 6′ RT SS-291
EBI-A_LL -RP1AB- 10+97 61′ LT SS-232 SS-244
WI-8 13+66 6′ LT
WI-9 14+25 4′ RT
WI-10 14+51 18′ RT

BT FIAD 06/18 BT BT BT

WOH 17 3 3 5 6 10 3 4 WOH 13 20 45 34 21 33 100/0.9 77 BT

7 4 4 5 28 WOH 3 4 36 BT

WOH 1 3 3 14 16 BT

1 10 8 4 4 2 28 1 3 3 BT

1 6 3 2 3 19 31 1 4 5 28 BT

1 2 8 4 3 3 19 48 WOH 4 3 9 32 100/0.9 100/0.4 59 100/0.9 27 19 BT

1 9 9 4 7 4 18 27 WOH 4 4 15 BT

2 9 4 10 4 32 30 WOH 5 4 7 BT

2 8 4 14 7 BT

(A) **ALLUVIAL:** Very soft, dark brown, MUCK, moist to wet

(B) **UNDIVIDED COASTAL PLAIN:** Very loose to loose, brown and tan, SAND and silty/clayey SAND (A-2-4, A-2-6, A-3), contains trace organics, moist to saturated

(C) **COASTAL PLAIN:** Very loose to dense, gray, green, and white, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3), saturated (DUPLIN FORMATION)

(D) **COASTAL PLAIN:** Very soft to medium stiff, gray, silty, fine sandy CLAY (A-6), contains shell fragments, wet (DUPLIN FORMATION)

(E) **COASTAL PLAIN:** Loose to very dense, gray, green and white, SAND and silty/clayey SAND (A-3, A-2-4, A-2-6), phosphatic, contains shell fragments (RIVER BEND FORMATION)

-RP1AB- CL

80 60 40 20 0 -20 -40 -60 -80

10+00 10+50 11+00 11+50 12+00 12+50 13+00 13+50 14+00 14+50 15+00 15+50

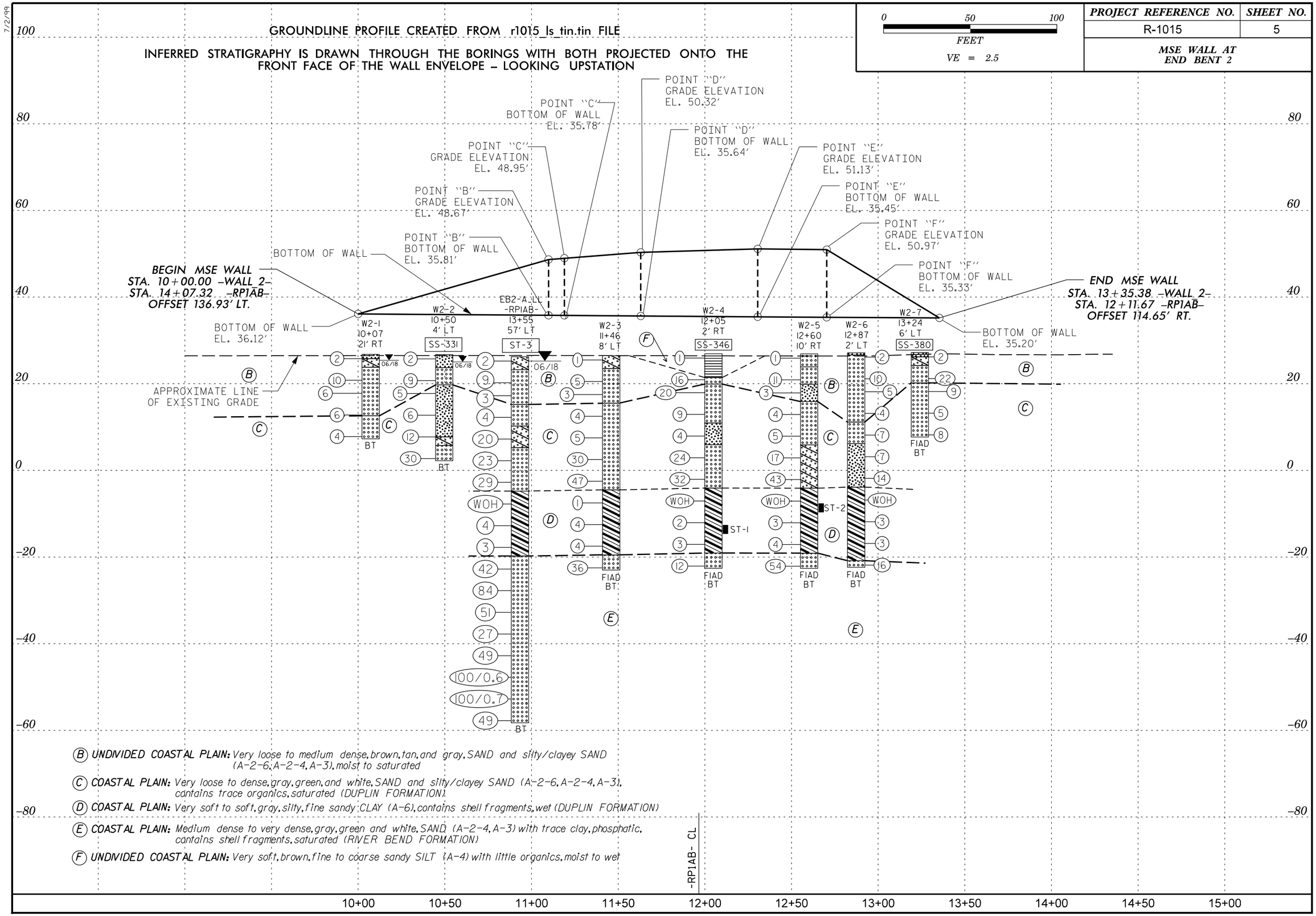
7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5
MSE WALL AT END BENT 2	

0 50 100
FEET
VE = 2.5

GROUNDLINE PROFILE CREATED FROM r1015_ls_tin.tin FILE

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE FRONT FACE OF THE WALL ENVELOPE – LOOKING UPSTATION



(B) **UNDIVIDED COASTAL PLAIN:** *Very loose to medium dense, brown, tan, and gray, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3), moist to saturated*

(C) **COASTAL PLAIN:** *Very loose to dense, gray, green, and white, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3), contains trace organics, saturated (DUPLIN FORMATION)*

(D) **COASTAL PLAIN:** *Very soft to soft, gray, silty, fine sandy CLAY (A-6), contains shell fragments, wet (DUPLIN FORMATION)*

(E) **COASTAL PLAIN:** *Medium dense to very dense, gray, green and white, SAND (A-2-4, A-3) with trace clay, phosphatic, contains shell fragments, saturated (RIVER BEND FORMATION)*

(F) **UNDIVIDED COASTAL PLAIN:** *Very soft, brown, fine to coarse sandy SILT (A-4) with little organics, moist to wet*

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 1: Retaining Wall 1				**GROUND WTR (ft)**
BORING NO. W1-3	**STATION** 10+92	**OFFSET** 77 ft LT	**ALIGNMENT** -WALL 1-	**0 HR.** 0.2
COLLAR ELEV. 25.7 ft	**TOTAL DEPTH** 6.0 ft	**NORTHING** 407,418	**EASTING** 2,632,782	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** Automatic
DRILLER Crenshaw, J.	**START DATE** 06/29/18	**COMP. DATE** 06/29/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
30												
25										GROUND SURFACE **ALLUVIAL** Dark brown, MUCK, moist to wet	25.7	0.0
20										**UNDIVIDED COASTAL PLAIN** Brown, clayey SAND (A-2-6), saturated Boring Terminated at Elevation 19.7 ft in SAND (UNDIVIDED COASTAL PLAIN)	20.7 19.7	5.0 6.0

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 1: Retaining Wall 1				**GROUND WTR (ft)**
BORING NO. W1-4a	**STATION** 11+27	**OFFSET** 74 ft LT	**ALIGNMENT** -WALL 1-	**0 HR.** 0.2
COLLAR ELEV. 25.6 ft	**TOTAL DEPTH** 6.5 ft	**NORTHING** 407,433	**EASTING** 2,632,751	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** Automatic
DRILLER Crenshaw, J.	**START DATE** 06/29/18	**COMP. DATE** 06/29/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
30										
25										25.6 GROUND SURFACE 0.0 **ALLUVIAL** Dark brown, MUCK, moist to wet
20										19.6 6.0 19.1 6.5 **UNDIVIDED COASTAL PLAIN** Brown, SAND (A-3), saturated Boring Terminated at Elevation 19.1 ft in SAND (UNDIVIDED COASTAL PLAIN)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 12+67	**OFFSET** 40 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.9 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 407,738	**EASTING** 2,632,568	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/24/18	**COMP. DATE** 05/24/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
30										
	26.9	0.0								26.9 / 0.0 GROUND SURFACE
25			1	WOH	1	1		M		**UNDIVIDED COASTAL PLAIN**
	21.9	5.0								23.9 / 3.0 Brown, tan and gray, silty SAND and SAND (A-2-4, A-3)
20			6	4	4	8		Sat.		
	18.9	8.0	2	3	3	6		Sat.		
15										
	13.9	13.0	2	3	4	7		Sat.		
10										10.9 / 16.0 **COASTAL PLAIN**
	8.9	18.0	1	2	3	5		Sat.		Gray, SAND (A-3) (DUPLIN FORMATION)
5										
	3.9	23.0	6	10	12	22		Sat.		
0										
	-1.1	28.0	10	16	23	39		Sat.		
-5										-4.1 / 31.0 Gray, silty, fine sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
	-6.1	33.0	WOH	WOH	WOH	0		W		
-10								W		
	-11.1	38.0	1	1	3	4		W		
-15										
	-16.1	43.0	1	1	3	4		W		
-20										-19.1 / 46.0 **COASTAL PLAIN**
	-21.1	48.0	7	15	23	38		Sat.		Gray and green, silty SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION)
-25										
	-26.1	53.0	6	6	10	16		Sat.		
-30										
	-31.1	58.0	22	22	78/0.2	100/0.7		Sat.		-32.1 / 59.0
-35										
	-36.1	63.0	14	10	14	24		Sat.		-39.1 / 66.0
-40										
	-41.1	68.0	17	11	22	33		Sat.		
-45										
	-46.1	73.0	19	26	74/0.2	100/0.7		Sat.		
-50										

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 12+67	**OFFSET** 40 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.9 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 407,738	**EASTING** 2,632,568	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/24/18	**COMP. DATE** 05/24/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.1	78.0	20	20	17	37		Sat.		Gray and green, silty SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION) *(continued)*
-55										
	-56.1	83.0	52	48/0.3		100/0.8		Sat.		
-60										
	-61.1	88.0	23	70	30/0.4	100/0.9		Sat.		
-65										
	-66.1	93.0	69	20	14	34		Sat.		-67.6 / 94.5 Boring Terminated at Elevation -67.6 ft in SAND (RIVER BEND FORMATION)
										Drill chatter between 59.6 and 60.6 feet in depth

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	8

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	ALIGNMENT	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
								C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-246	46′ RT	10+14	-RP1AB-	5.0-6.5	A-3(0)	NP	NP	19.4	73.6	1.9	5.1	100	100	8	27.8	-
SS-232	61′ LT	10+97	-RP1AB-	23.0-24.5	A-3(0)	NP	NP	6.4	85.1	3.6	4.9	100	100	10	26.7	-
SS-244	61′ LT	10+97	-RP1AB-	83.0-84.5	A-3(0)	NP	NP	9.5	82.9	2.9	4.7	100	98	8	31.5	-
SS-291	6′ RT	13+16	-WALL 1-	23.0-24.5	A-3(0)	NP	NP	4.6	90.3	2.5	2.6	100	99	6	24.0	-
SS-331	4′ LT	10+50	-WALL 2-	8.0-9.5	A-2-4(0)	NP	NP	36.4	51.2	3.4	8.9	96	87	12	37.6	-
SS-346	2′ RT	12+05	-WALL 2-	0.0-1.5	A-4(0)	37	9	32.7	31.7	16.6	19.0	100	88	37	32.9	6.1
SS-380	6′ LT	13+24	-WALL 2-	5.0-6.5	A-3(0)	NP	NP	18.3	77.7	1.3	2.6	100	93	5	23.0	-
ST-1	2′ RT	12+05	-WALL 2-	39.5-41.5	A-6(1)	31	11	19.8	42.0	20.7	17.5	87	73	40	35.2	-
ST-2	10′ RT	12+60	-WALL 2-	34.5-36.5	A-6(2)	29	12	3.7	56.6	22.7	17.1	100	99	47	29.3	-
ST-3	52′ LT	13+54	-RP1AB-	33.0-35.0	A-6(2)	30	11	3.2	59.2	19.1	18.4	100	99	46	31.0	-

7/2/99

REFERENCE: R-1015

PROJECT: 34360

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (HAVELOCK BYPASS) FROM NORTH OF CARTERET/CRAVEN COUNTY LINE TO NORTH OF PINE GROVE ROAD*

SITE DESCRIPTION *SITE 1 – DUAL BRIDGES NO. 272 AND NO. 273 ON –RP1AB– (US 70 BUS.) OVER US 70 BYPASS BETWEEN US 70 & SR 1824 –L– STATION 96+97.07*

CONTENTS

CAUTION NOTICE

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

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NOTES:
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PERSONNEL

P. GRAINGER

GET SOLUTIONS

INVESTIGATED BY *J. K. CRENSHAW*

DRAWN BY *W. SHUECRAFT*

CHECKED BY *B. HOWEY*

SUBMITTED BY *B. D. KEANEY*

DATE *JULY, 2018*

HDR

NORTH CAROLINA LICENSED SEAL 2504 GEOLOGIST JARED K. CRENSHAW

DocuSigned by:
Jared K. Crenshaw 8/15/2018
3AB1C06A82EE4F1... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL	—		—	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PI	6 MX		NP	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, SPT DMT, VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN 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 WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	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 HARD	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.
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 SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

BORING LOCATIONS AND ELEVATIONS OBTAINED FROM MCKIM & CREED INC. SURVEY DATED - 7/3/2018

UCP - UNDIVIDED COASTAL PLAIN

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 50 100
FEET

-L- POC STA. 96+97.07 =
-RPIAB- POT STA. 11+76.30

10

86

14

EB1-A LL

B1-A LL

EB2-A LL

BRIDGE NO. 272

TO MOREHEAD CITY

N 31° 50' 47.4" W

-RPIAB-

BRIDGE NO. 273

EB1-B RL

B1-B RL

EB2-B RL

TO NEW BERN

95

-L-

138°16' 56"
TANGENT TO CURVE

F

7/2/99

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –RP1AB–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018

0 50 100
FEET
VE = 2.5

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

PROFILE – BRIDGE NO. 272
BORINGS PROJECTED ONTO –RP1AB–

PROPOSED GRADE

BEGIN GRADE –RP1AB– STA. 4+89.37
EL. 49.54'

EXISTING GROUNDLINE

EB1-A LL
10+97
61' LT
SS-232
SS-244

B1-A LL
12+36
54' LT

EB2-A LL
13+55
57' LT
ST-2

	EB1-A	B1-A	EB2-A
A	2, 8, 4, 3	2, 7, 3, 4	2, 9, 3, 4
B	3, 19, 48, WOH	6, 22, 29, 2	20, 23, 29, WOH
C	4, 3, 9, 32	4, 5, 22, 35	4, 3, 42, 84
D	100/0.9, 100/0.4, 59, 100/0.9, 27, 19	87, 100/1.0, 36, 100/1.0, 100/0.7, 55, 25, 37	51, 27, 49, 100/0.6, 100/0.7, 49
	06/18	05/18	06/18
	BT	BT	BT

(A) UNDIVIDED COASTAL PLAIN: Very loose to loose, brown, tan, and orange, SAND and silty/clayey SAND (A-2-4, A-2-6, A-3), moist to saturated

(B) COASTAL PLAIN: Very loose to dense, gray and green, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3), saturated (DUPLIN FORMATION)

(C) COASTAL PLAIN: Very soft to medium stiff, gray, silty, fine sandy CLAY and sandy SILT (A-6, A-4), contains shell fragments, wet (DUPLIN FORMATION)

(D) COASTAL PLAIN: Loose to very dense, gray, green and white, SAND and silty/clayey SAND (A-3, A-2-4, A-2-6), phosphatic, contains shell fragments (RIVER BEND FORMATION)

70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70 –80 –90 –100

5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

PROFILE – BRIDGE NO. 273
BORINGS PROJECTED ONTO –RPIAB–

0 50 100
FEET
VE = 2.5

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –RPIAB–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018

PROPOSED GRADE

BEGIN GRADE –RPIAB– STA. 4+89.37
EL. 49.54'

EXISTING GROUNDLINE

EB1-B RL
10+14
46' RT
SS-246

B1-B RL
11+36
40' RT
SS-215

EB2-B RL
13+67
40' RT

EB1-B	B1-B	EB2-B
WOH	2	1
17	8	8
3	5	6
3	4	7
5	3	5
6	4	22
10	32	39
3	1	WOH
4	3	4
WOH	5	4
13	16	38
20	16	16
45	100/0.6	100/0.7
34	100/0.6	24
21	32	33
33	41	100/0.7
100/0.9	46	37
77	100/0.7	100/0.8
	100/0.4	100/0.9
		34
BT	BT	FIAD BT

06/18 (EB1-B)
06/18 (B1-B)

(A) **UNDIVIDED COASTAL PLAIN:** *Very loose to medium dense, brown, tan and gray, SAND and silty SAND (A-2-4, A-3), contains trace organics, moist to saturated*

(B) **COASTAL PLAIN:** *Very loose to dense, gray, green, and brown, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3), saturated (DUPLIN FORMATION)*

(C) **COASTAL PLAIN:** *Very soft to medium stiff, gray, silty, fine sandy CLAY and sandy SILT (A-6, A-4), contains shell fragments, wet (DUPLIN FORMATION)*

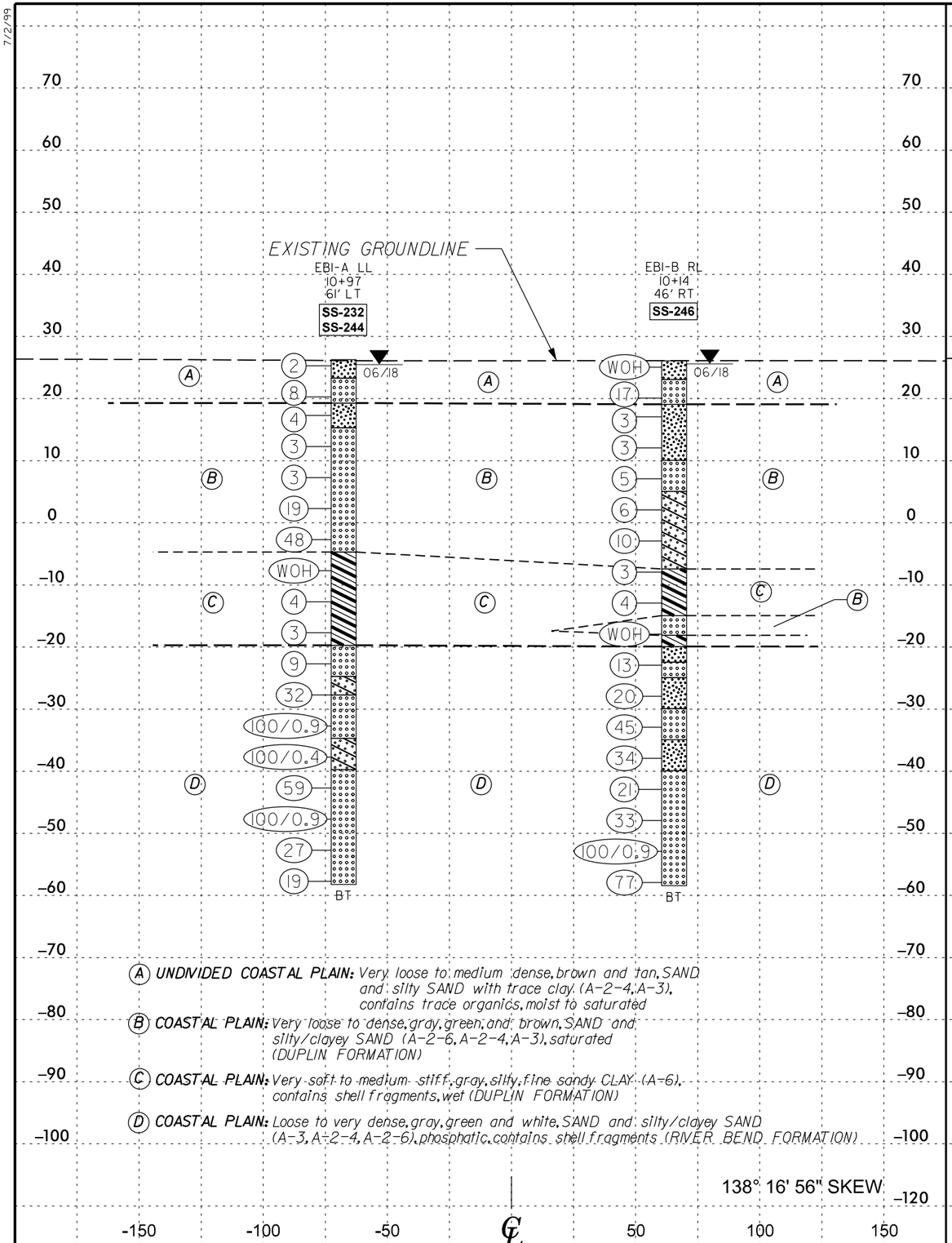
(D) **COASTAL PLAIN:** *Medium dense to very dense, gray, green and white, SAND and silty/clayey SAND (A-3, A-2-4, A-2-6), contains shell fragments (RIVER BEND FORMATION)*

70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70 –80 –90 –100

5+00 6+00 7+00 8+00 8+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00

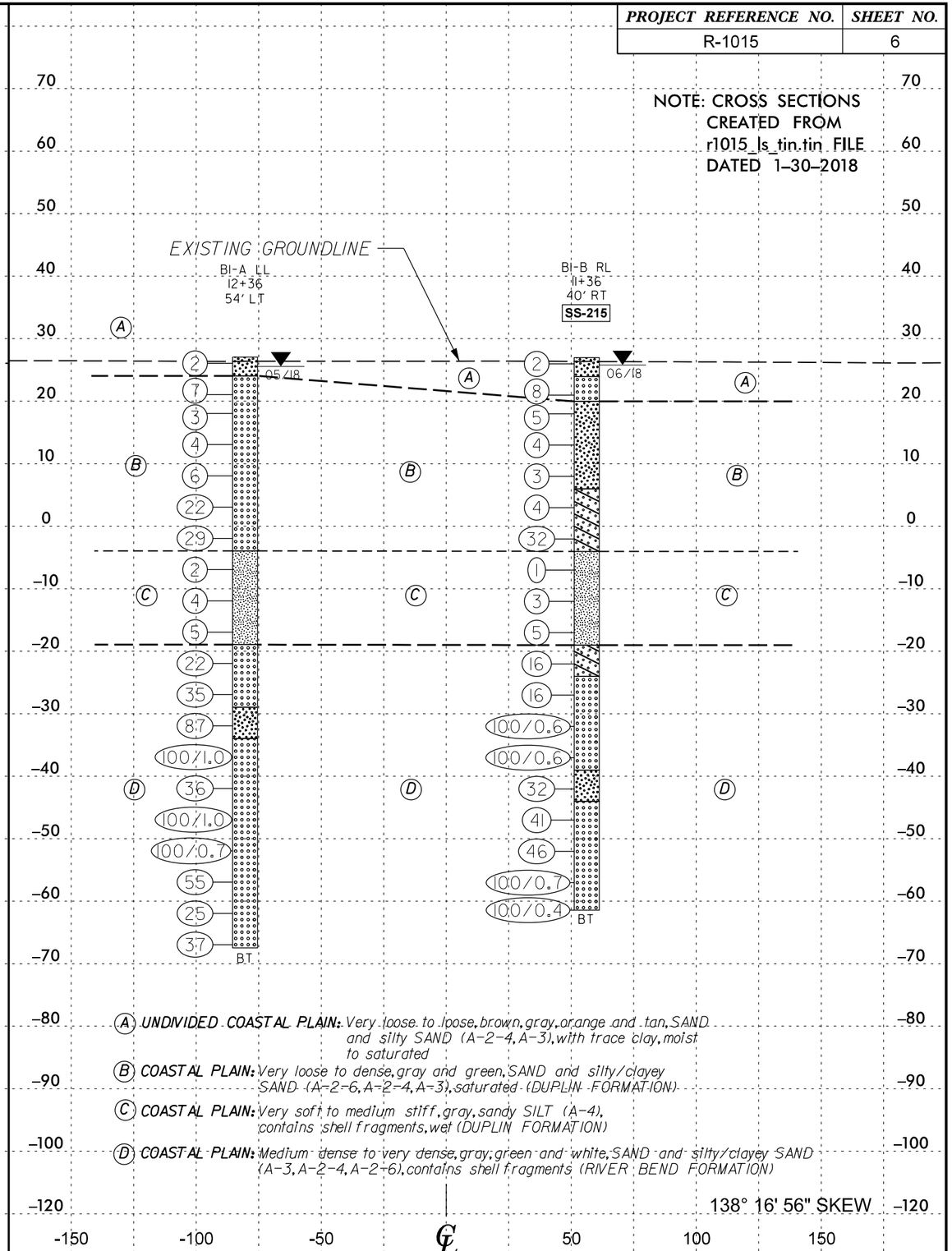
7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	6



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – END BENT 1
–RP1AB– STA 10+60.56

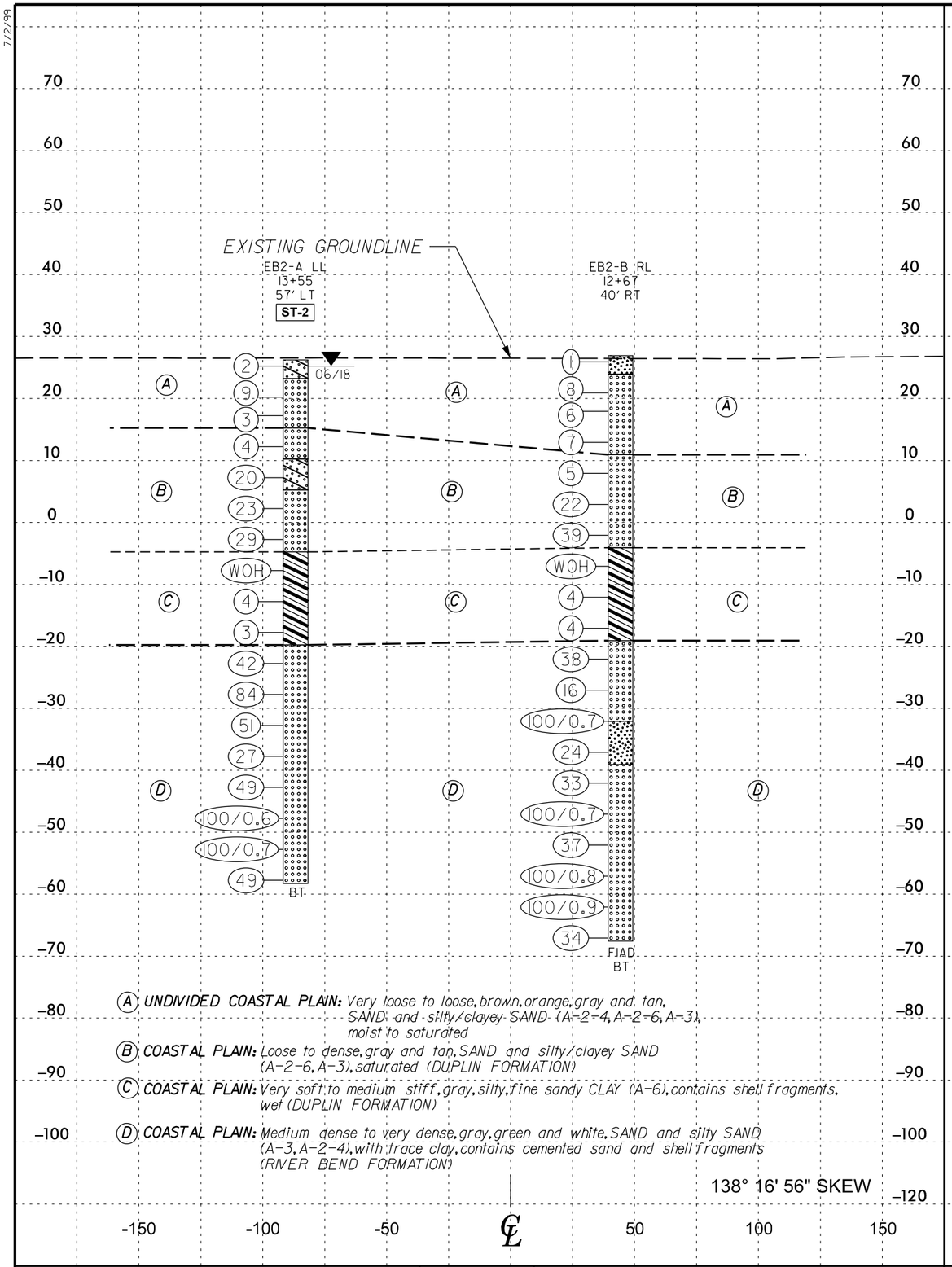


HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 1
–RP1AB– STA 11+76.30

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	7



(A) **UNDIVIDED COASTAL PLAIN:** *Very loose to loose, brown, orange, gray and tan, SAND and silty/clayey SAND (A-2-4, A-2-6, A-3), moist to saturated*

(B) **COASTAL PLAIN:** *Loose to dense, gray and tan, SAND and silty/clayey SAND (A-2-6, A-3), saturated (DUPLIN FORMATION)*

(C) **COASTAL PLAIN:** *Very soft to medium stiff, gray, silty, fine sandy CLAY (A-6), contains shell fragments, wet (DUPLIN FORMATION)*

(D) **COASTAL PLAIN:** *Medium dense to very dense, gray, green and white, SAND and silty SAND (A-3, A-2-4), with trace clay, contains cemented sand and shell fragments (RIVER BEND FORMATION)*

138° 16' 56" SKEW

NOTE: CROSS SECTIONS CREATED FROM r1015_ls_tin.tin FILE DATED 1-30-2018

HORIZ. SCALE (FEET) 0 50 100

VE = 2.5

CROSS SECTION – END BENT 2 –RPIAB– STA 12+89.40

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 272 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 10+97	**OFFSET** 61 ft LT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.3 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 407,540	**EASTING** 2,632,572	**24 HR.** 0.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/04/18	**COMP. DATE** 06/05/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
30										
25	26.3	0.0	1	1	1	2				26.3 / 0.0 GROUND SURFACE
20	21.3	5.0	3	3	5	8		Sat.		**UNDIVIDED COASTAL PLAIN** Brown and tan, silty SAND and SAND (A-2-4, A-3), with trace clay 23.3 / 3.0
15	18.3	8.0	2	2	2	4		Sat.		19.3 / 7.0 **COASTAL PLAIN** Green and gray, SAND (A-3(0), A-2-4), with trace silt and clay (DUPLIN FORMATION) 15.3 / 11.0
10	13.3	13.0	1	2	1	3		Sat.		
5	8.3	18.0	1	1	2	3		Sat.		
0	3.3	23.0	6	8	11	19	SS-232	27%		
-5	-1.7	28.0	13	22	26	48		Sat.		
-10	-6.7	33.0	WOH	WOH	WOH	0		W		
-15	-11.7	38.0	1	2	2	4		W		
-20	-16.7	43.0	2	1	2	3		W		
-25	-21.7	48.0	1	3	6	9		Sat.		-19.7 / 46.0 **COASTAL PLAIN** Gray and green, fine to coarse, SAND and clayey SAND (A-3(0), A-2-6), phosphatic, contains shell fragments (RIVER BEND FORMATION) -24.7 / 51.0
-30	-26.7	53.0	12	15	17	32		Sat.		-27.7 / 54.0
-35	-31.7	58.0	10	20	80/0.4	100/0.9		Sat.		-34.7 / 61.0
-40	-36.7	63.0	100/0.4			100/0.4		Sat.		-39.7 / 66.0
-45	-41.7	68.0	22	31	28	59		Sat.		
-50	-46.7	73.0	37	55	45/0.4	100/0.9		Sat.		

NCDOT BORE DOUBLE R-1015_S1_GEO_BRDG.GPJ NC_DOT.GDT 7/24/18

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 272 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 10+97	**OFFSET** 61 ft LT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.3 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 407,540	**EASTING** 2,632,572	**24 HR.** 0.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/04/18	**COMP. DATE** 06/05/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
-55	-51.7	78.0	11	12	15	27		Sat.		Gray and green, fine to coarse, SAND and clayey SAND (A-3(0), A-2-6), phosphatic, contains shell fragments (RIVER BEND FORMATION) *(continued)*
	-56.7	83.0	8	10	9	19	SS-244	32%		-58.2 / 84.5 Boring Terminated at Elevation -58.2 ft in SAND (RIVER BEND FORMATION)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 10+14	**OFFSET** 46 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.1 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 407,526	**EASTING** 2,632,707	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/05/18	**COMP. DATE** 06/05/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
30											
	26.1	0.0	WOH	WOH	WOH	0				26.1 GROUND SURFACE	0.0
25										**UNDIVIDED COASTAL PLAIN** Brown and tan, silty SAND and SAND (A-2-4, A-3(0)), trace organics at surface.	
	21.1	5.0	6	8	9	17				23.1	3.0
20							SS-246	28%			
	18.1	8.0	2	2	1	3		Sat.		19.1	7.0
15										**COASTAL PLAIN** Gray, green and brown, clayey, silty SAND and SAND (A-2-6, A-2-4, A-3) (DUPLIN FORMATION)	
	13.1	13.0	2	1	2	3		Sat.			
10											
	8.1	18.0	1	2	3	5		Sat.		10.1	16.0
5											
	3.1	23.0	2	3	3	6		Sat.		5.1	21.0
0											
	-1.9	28.0	3	6	4	10		Sat.			
-5											
	-6.9	33.0	4	2	1	3		W		-7.4	33.5
-10										Gray, silty, fine sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)	
	-11.9	38.0	2	2	2	4		W			
-15										-14.9	41.0
	-16.9	43.0								Brown, SAND (A-3) (DUPLIN FORMATION)	
			WOH	WOH	WOH	0		W		-18.1	44.2
-20										Gray, silty, fine sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)	
	-21.9	48.0	3	4	9	13				-19.9	46.0
-25										**COASTAL PLAIN**	
	-26.9	53.0						Sat.		-22.4	48.5
-30			9	10	10	20				Gray, white, and green, silty SAND and SAND (A-2-4, A-3), contains shell fragments (RIVER BEND FORMATION)	
	-31.9	58.0								-24.9	51.0
-35			36	32	13	45		Sat.			
	-36.9	63.0								-29.9	56.0
-40			41	16	18	34		Sat.			
	-41.9	68.0								-34.9	61.0
-45			11	10	11	21		Sat.			
	-46.9	73.0								-39.9	66.0
-50			13	20	13	33		Sat.			

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 10+14	**OFFSET** 46 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.1 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 407,526	**EASTING** 2,632,707	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/05/18	**COMP. DATE** 06/05/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.9	78.0	39	55	45/0.4	100/0.9		Sat.		Gray, white, and green, silty SAND and SAND (A-2-4, A-3), contains shell fragments (RIVER BEND FORMATION) *continued*
-55										
	-56.9	83.0	61	29	48	77		Sat.		-58.4 84.5
										Boring Terminated at Elevation -58.4 ft in SAND (RIVER BEND FORMATION) Strata breaks in Split spoon at a depth of 33.5' and 44.2'.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 272 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 12+36	**OFFSET** 54 ft LT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 27.0 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 407,662	**EASTING** 2,632,504	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/24/18	**COMP. DATE** 05/24/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
30										
	27.0	0.0	WOH	1	1	2				27.0 / 0.0 GROUND SURFACE
25										**UNDIVIDED COASTAL PLAIN** Gray, brown, and orange, silty SAND (A-2-4), with trace clay
	22.0	5.0	3	3	4	7		Sat.		24.0 / 3.0 **COASTAL PLAIN** Gray, SAND (A-3), with trace clay, contains cemented sand fragments (DUPLIN FORMATION)
20	19.0	8.0	1	2	1	3		Sat.		
15	14.0	13.0	2	2	2	4		Sat.		
10	9.0	18.0	2	3	3	6		Sat.		
5	4.0	23.0	11	9	13	22		Sat.		
0	-1.0	28.0	12	13	16	29		Sat.		-4.0 / 31.0 Gray, sandy, SILT (A-4), contains shell fragments (DUPLIN FORMATION)
-5	-6.0	33.0	WOH	1	1	2		W		
-10	-11.0	38.0	1	2	2	4		W		
-15	-16.0	43.0	3	2	3	5		W		-19.0 / 46.0 Gray, silty SAND and SAND (A-2-4, A-3), with trace clay, contains shell fragments (RIVER BEND FORMATION)
-20	-21.0	48.0	12	10	12	22		Sat.		
-25	-26.0	53.0	17	16	19	35		Sat.		-29.0 / 56.0
-30	-31.0	58.0	23	42	45	87		Sat.		-34.0 / 61.0
-35	-36.0	63.0	9	51	49/0.5	100/1.0		Sat.		
-40	-41.0	68.0	11	21	15	36		Sat.		
-45	-46.0	73.0	21	30	70/0.5	100/1.0		Sat.		
-50										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 272 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 12+36	**OFFSET** 54 ft LT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 27.0 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 407,662	**EASTING** 2,632,504	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/24/18	**COMP. DATE** 05/24/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.0	78.0	52	48/0.2		100/0.7		Sat.		Gray, silty SAND and SAND (A-2-4, A-3), with trace clay, contains shell fragments (RIVER BEND FORMATION) *continued*
-55	-56.0	83.0	31	31	24	55		Sat.		
-60	-61.0	88.0	11	12	13	25		Sat.		
-65	-66.0	93.0	13	15	22	37		Sat.		-67.5 / 94.5 Boring Terminated at Elevation -67.5 ft in SAND (RIVER BEND FORMATION)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 11+36	**OFFSET** 40 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 27.0 ft	**TOTAL DEPTH** 88.4 ft	**NORTHING** 407,627	**EASTING** 2,632,637	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/04/18	**COMP. DATE** 06/04/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
30										
	27.0	0.0								27.0 / 0.0 GROUND SURFACE
25			1	0	2	2				**UNDIVIDED COASTAL PLAIN** Brown and tan, silty SAND (A-2-4, A-3), with trace clay
	22.0	5.0								24.0 / 3.0
20			3	5	3	8		Sat.		
	19.0	8.0								**COASTAL PLAIN** Gray and green, silty, clayey SAND (A-2-4, A-2-6) (DUPLIN FORMATION)
			3	2	3	5		Sat.		20.0 / 7.0
15	14.0	13.0								
			2	2	2	4		Sat.		
10	9.0	18.0								
			2	2	1	3		Sat.		6.0 / 21.0
5	4.0	23.0								
			2	1	3	4		Sat.		
0	-1.0	28.0								
			11	15	17	32		Sat.		-4.0 / 31.0 Gray, sandy, SILT (A-4(0)), with little clay, contains shell fragments (DUPLIN FORMATION)
-5	-6.0	33.0								
			WOH	WOH	1	1	SS-215	31%		
-10	-11.0	38.0								
			2	0	3	3		W		
-15	-16.0	43.0								
			2	2	3	5		W		
-20	-21.0	48.0								-19.0 / 46.0 **COASTAL PLAIN** Gray, white, and green, silty, clayey SAND and SAND (A-2-6, A-2-4, A-3), contains limestone and shell fragments (RIVER BEND FORMATION)
			4	6	10	16		Sat.		
-25	-26.0	53.0								-24.0 / 51.0
			12	8	8	16		Sat.		
-30	-31.0	58.0								
			7	29	71/0.1	100/0.6		Sat.		
-35	-36.0	63.0								
			39	61/0.1		100/0.6		Sat.		-39.0 / 66.0
-40	-41.0	68.0								
			9	15	17	32		Sat.		-44.0 / 71.0
-45	-46.0	73.0								
			35	23	18	41		Sat.		
-50										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 11+36	**OFFSET** 40 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 27.0 ft	**TOTAL DEPTH** 88.4 ft	**NORTHING** 407,627	**EASTING** 2,632,637	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/04/18	**COMP. DATE** 06/04/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.0	78.0	15	21	25	46		Sat.		Gray, white, and green, silty, clayey SAND and SAND (A-2-4, A-3), contains limestone and shell fragments (RIVER BEND FORMATION) *continued*
-55										
	-56.0	83.0	41	59/0.2		100/0.7		Sat.		
-60										
	-61.0	88.0	100/0.4			100/0.4		Sat.		-61.4 / 88.4 Boring Terminated at Elevation -61.4 ft in SAND (RIVER BEND FORMATION) Intermittent drill chatter between depths of 58.0 and 63.0 feet in depth.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 272 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 13+55	**OFFSET** 57 ft LT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.2 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 407,761	**EASTING** 2,632,439	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/01/18	**COMP. DATE** 06/01/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	26.2	0.0	1	1	1	2				26.2 GROUND SURFACE	0.0
										UNDIVIDED COASTAL PLAIN Brown, tan and orange, SAND and clayey SAND (A-2-6, A-3)	
	21.2	5.0	4	4	5	9		Sat.			
	18.2	8.0	1	1	2	3		Sat.			
	13.2	13.0	1	2	2	4		Sat.		23.2	3.0
										COASTAL PLAIN Tan and gray, SAND and clayey SAND (A-3, A-2-6) (DUPLIN FORMATION)	
	8.2	18.0	6	6	14	20		Sat.		15.2	11.0
	3.2	23.0	6	9	14	23		Sat.		10.2	16.0
	-1.8	28.0	12	14	15	29		Sat.		5.2	21.0
	-6.8	33.0	WOH	WOH	WOH	0		31%		-4.8	31.0
	-11.8	38.0	1	1	3	4		W		Gray, silty, fine sandy CLAY (A-6(2)), contains shell fragments (DUPLIN FORMATION)	
	-16.8	43.0	3	1	2	3		W		-19.8	46.0
	-21.8	48.0	17	20	22	42		Sat.		**COASTAL PLAIN** Gray, white and green, SAND (A-3) with trace clay, contains cemented sand and shell fragments (RIVER BEND FORMATION)	
	-26.8	53.0	18	31	53	84		Sat.			
	-31.8	58.0	54	17	34	51		Sat.			
	-36.8	63.0	14	12	15	27		Sat.			
	-41.8	68.0	8	20	29	49		Sat.			
	-46.8	73.0	77	23/0.1		100/0.6		Sat.			

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 272 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 13+55	**OFFSET** 57 ft LT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.2 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 407,761	**EASTING** 2,632,439	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 06/01/18	**COMP. DATE** 06/01/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.8	78.0	23	32	68/0.2	100/0.7		Sat.		**COASTAL PLAIN** Gray, white and green, SAND (A-3) with trace clay, contains cemented sand and shell fragments (RIVER BEND FORMATION) *(continued)*
-55	-56.8	83.0	20	20	29	49		Sat.		-58.3 84.5 Boring Terminated at Elevation -58.3 ft in SAND (RIVER BEND FORMATION) ST-2 obtained in offset boring at -RP1AB- STA 13+54, 52' LT Other Samples: ST-2 (33.0 - 35.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 12+67	**OFFSET** 40 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.9 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 407,738	**EASTING** 2,632,568	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/24/18	**COMP. DATE** 05/24/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
30										
	26.9	0.0								26.9 GROUND SURFACE 0.0
25			1	0	1	1		M		**UNDIVIDED COASTAL PLAIN** Brown, tan and gray, silty SAND and SAND (A-2-4, A-3)
	21.9	5.0								23.9 3.0
20			6	4	4	8		Sat.		
	18.9	8.0	2	3	3	6		Sat.		
15										
	13.9	13.0	2	3	4	7		Sat.		
10										10.9 16.0
	8.9	18.0	1	2	3	5		Sat.		**COASTAL PLAIN** Gray, SAND (A-3) (DUPLIN FORMATION)
5										
	3.9	23.0	6	10	12	22		Sat.		
0										
	-1.1	28.0	10	16	23	39		Sat.		
-5										-4.1 31.0
	-6.1	33.0	WOH	WOH	WOH	0		W		Gray, silty, fine sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-10										
	-11.1	38.0	1	1	3	4		W		
-15										
	-16.1	43.0	1	1	3	4		W		
-20										-19.1 46.0
	-21.1	48.0	7	15	23	38		Sat.		**COASTAL PLAIN** Gray and green, SAND and silty SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION)
-25										
	-26.1	53.0	6	6	10	16		Sat.		
-30										
	-31.1	58.0	22	22	78/0.2	100/0.7		Sat.		-32.1 59.0
-35										
	-36.1	63.0	14	10	14	24		Sat.		-39.1 66.0
-40										
	-41.1	68.0	17	11	22	33		Sat.		
-45										
	-46.1	73.0	19	26	74/0.2	100/0.7		Sat.		
-50										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Bridge No. 273 on -RP1AB- (US 70 Bus.) Over US 70 Bypass Between US 70 and SR 1824				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 12+67	**OFFSET** 40 ft RT	**ALIGNMENT** -RP1AB-	**0 HR.** N/A
COLLAR ELEV. 26.9 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 407,738	**EASTING** 2,632,568	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/24/18	**COMP. DATE** 05/24/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.1	78.0	20	20	17	37		Sat.		Gray and green, SAND and silty SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION) *continued*
-55										
	-56.1	83.0	52	48/0.3		100/0.8		Sat.		
-60										
	-61.1	88.0	23	70	30/0.4	100/0.9		Sat.		
-65										
	-66.1	93.0	69	20	14	34		Sat.		-67.6 94.5
										Boring Terminated at Elevation -67.6 ft in SAND (RIVER BEND FORMATION) Drill chatter between 59.6 and 60.6 feet in depth

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	14

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-246	46' RT	10+14	5.0-6.5	A-3(0)	NP	NP	19.4	73.6	1.9	5.1	100	100	8	27.8	-
SS-232	61' LT	10+97	23.0-24.5	A-3(0)	NP	NP	6.4	85.1	3.6	4.9	100	100	10	26.7	-
SS-244	61' LT	10+97	83.0-84.5	A-3(0)	NP	NP	9.5	82.9	2.9	4.7	100	98	8	31.5	-
SS-215	40' RT	11+36	33.0-34.5	A-4(0)	26	7	4.3	60.4	18.7	16.7	100	99	42	30.8	-
ST-3	52' LT	13+54	33.0-35.0	A-6(2)	30	11	3.2	59.2	19.1	18.4	100	99	46	31.0	-

Photo 1: Looking towards End Bent 2 and up station of –RP1AB-

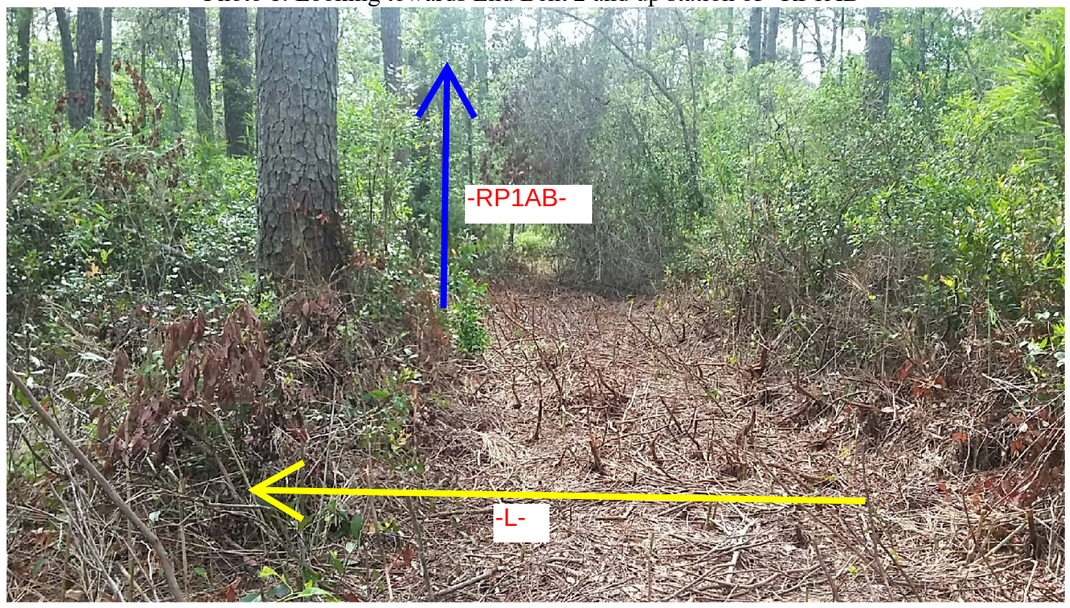
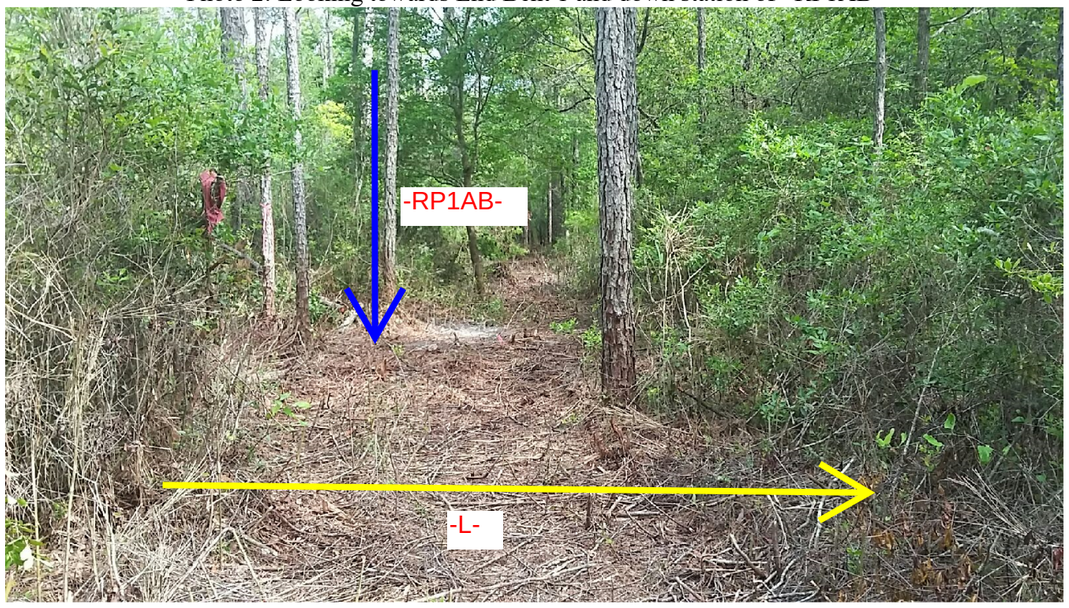


Photo 2: Looking towards End Bent 1 and down station of –RP1AB-



Project 34360.1.1 TIP R-1015
Site 1 Bridge over US 70 Bypass

July 2018
Craven County, NC

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	20

REFERENCE: R-1015

PROJECT: 34360

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY CRAVEN

PROJECT DESCRIPTION US 70 (HAVELOCK BYPASS) FROM NORTH OF CARTERET/CRAVEN COUNTY LINE TO NORTH OF PINE GROVE ROAD

SITE DESCRIPTION SITE 2 – DUAL BRIDGES NO. 274 AND NO. 275 ON –L– (US 70 – HAVELOCK BYPASS) OVER NCRR BETWEEN US 70 AND SR 1756 –L– STATION 138+31.09

CONTENTS

CAUTION NOTICE

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

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PERSONNEL

P. GRAINGER

J.K. CRENSHAW

T. DONAHUE

INVESTIGATED BY J.K. CRENSHAW

DRAWN BY T. LYNN

CHECKED BY B. HOWEY

SUBMITTED BY B. D. KEANEY

DATE JULY, 2018

HDR

NORTH CAROLINA LICENSED SEAL 2504 GEOLOGIST JARED K. CRENSHAW

DocuSigned by:
Jared Crenshaw 7/31/2018
3AB1C06A82EE4F1...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN 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 WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	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 HARD	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.
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 SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

BORING LOCATIONS AND COLLAR ELEVATIONS OBTAINED FROM MCKIM & CREED INC. - SURVEY DATED 7/3/18

UCP - UNDIVIDED COASTAL PLAIN

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 50 100
FEET

SKEW VARIES
37°38'14" to 41°50'48"

N 30°22'18.5" W

-L- STA 138+31.09
-RR EYI- STA 15+66.39

-N-

BEGIN BRIDGE LT.
-L- STA. 136+62.47

BEGIN APPROACH SLAB LT.
-L- STA. 136+39.07

END BRIDGE LT.
-L- STA. 140+25.23

END APPROACH SLAB LT.
-L- STA. 140+48.52

END BRIDGE RT.
-L- STA. 140+84.25

END APPROACH SLAB RT.
-L- STA.141+07.71

135

EBI-A LL

BI-A LL

B2-A LL

B3-A LL

140

15

TO MOREHEAD CITY

BRIDGE NO. 274

-L-

EB2-A LL

40°-09'-50"
TAN.TO CURVE

TO NEW BERN

BRIDGE NO. 275

EBI-B RL

BI-B_RL

B2-B RL

B3-B RL

EB2-B RL

BEGIN APPROACH SLAB RT.
-L- STA. 136+90.73

BEGIN BRIDGE RT.
-L- STA. 137+14.31

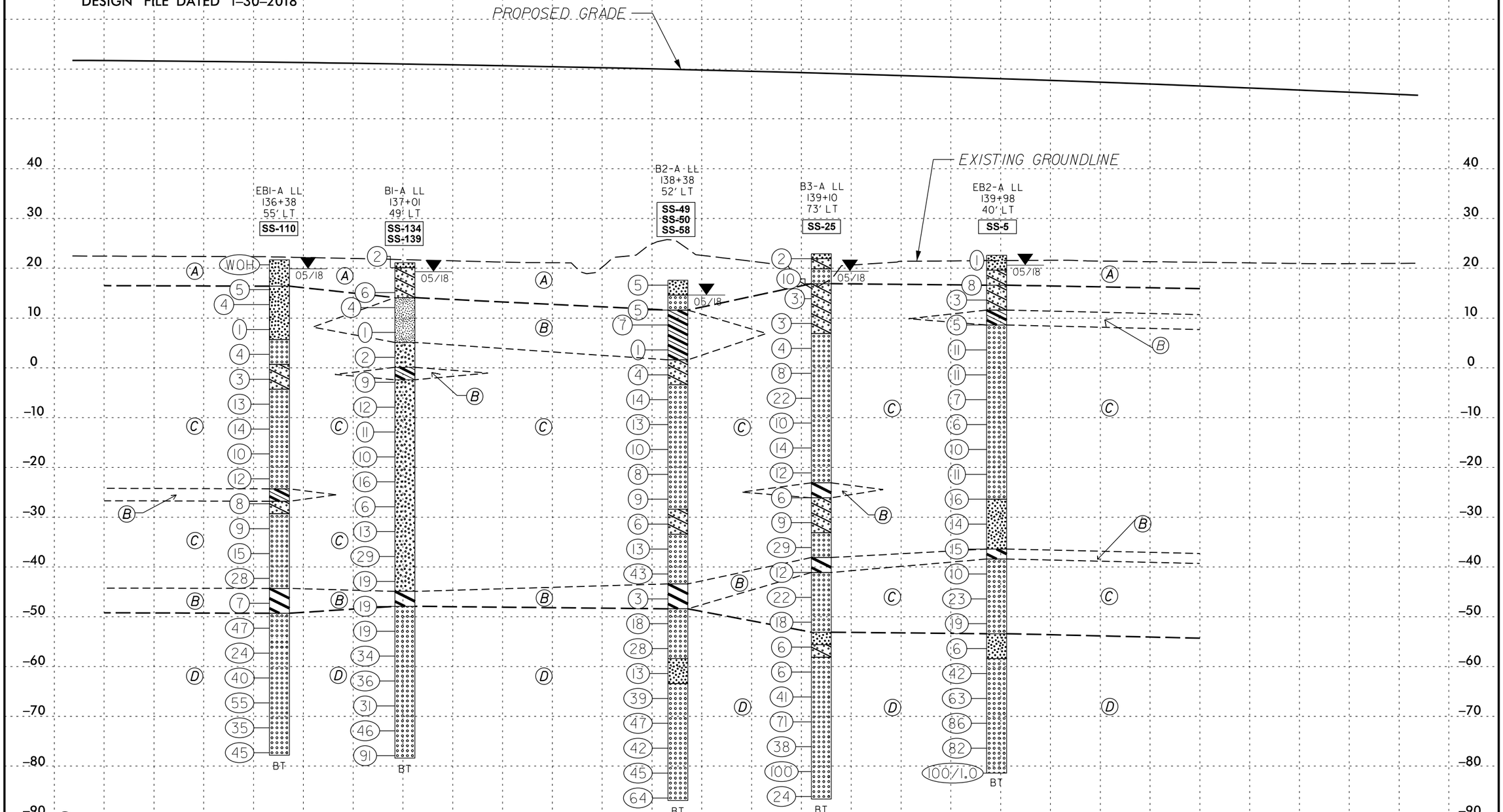
-RR EYI- POT Sta. 16+56.17

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

PROFILE THROUGH BRIDGE NO. 274
BORINGS PROJECTED ONTO –L–

0 50 100
FEET
VE = 2.5

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –L–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018



(A) **UCP:** *Very loose to loose, brown and tan, silty and clayey SAND and SAND (A-2-4, A-2-6, A-3), contains trace organics, moist to saturated*

(B) **COASTAL PLAIN:** *Very soft to medium stiff, gray, sandy silt SILT and sandy/silty CLAY (A-4, A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

(C) **COASTAL PLAIN:** *Very loose to dense, gray, green, and white, SAND and CLAYEY SAND (A-2-6, A-2-4, A-3), with trace silt, phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)*

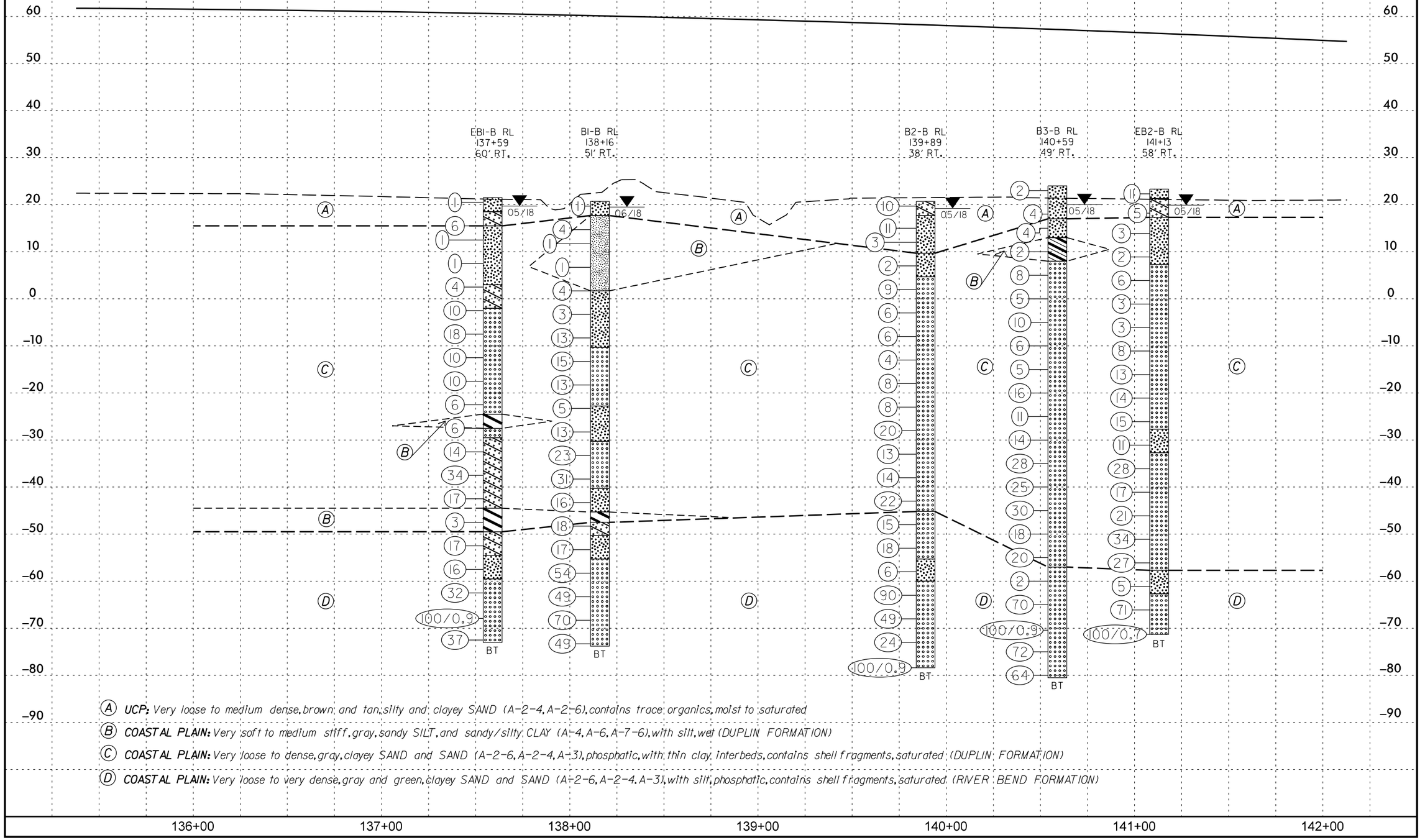
(D) **COASTAL PLAIN:** *Loose to very dense, gray, green, and white, clayey SAND and SAND (A-2-6, A-2-4, A-3), with silt, contains cemented sand and shell fragments, saturated (RIVER BEND FORMATION)*

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –L–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018

0 50 100
FEET
VE = 2.5

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

PROFILE THROUGH BRIDGE NO. 275
BORINGS PROJECTED ONTO –L–



(A) **UCP:** *Very loose to medium dense, brown and tan, silty and clayey SAND (A-2-4, A-2-6), contains trace organics, moist to saturated*

(B) **COASTAL PLAIN:** *Very soft to medium stiff, gray, sandy SILT, and sandy/silty CLAY (A-4, A-6, A-7-6), with silt, wet (DUPLIN FORMATION)*

(C) **COASTAL PLAIN:** *Very loose to dense, gray, clayey SAND and SAND (A-2-6, A-2-4, A-3), phosphatic, with thin clay interbeds, contains shell fragments, saturated (DUPLIN FORMATION)*

(D) **COASTAL PLAIN:** *Very loose to very dense, gray and green, clayey SAND and SAND (A-2-6, A-2-4, A-3), with silt, phosphatic, contains shell fragments, saturated (RIVER BEND FORMATION)*

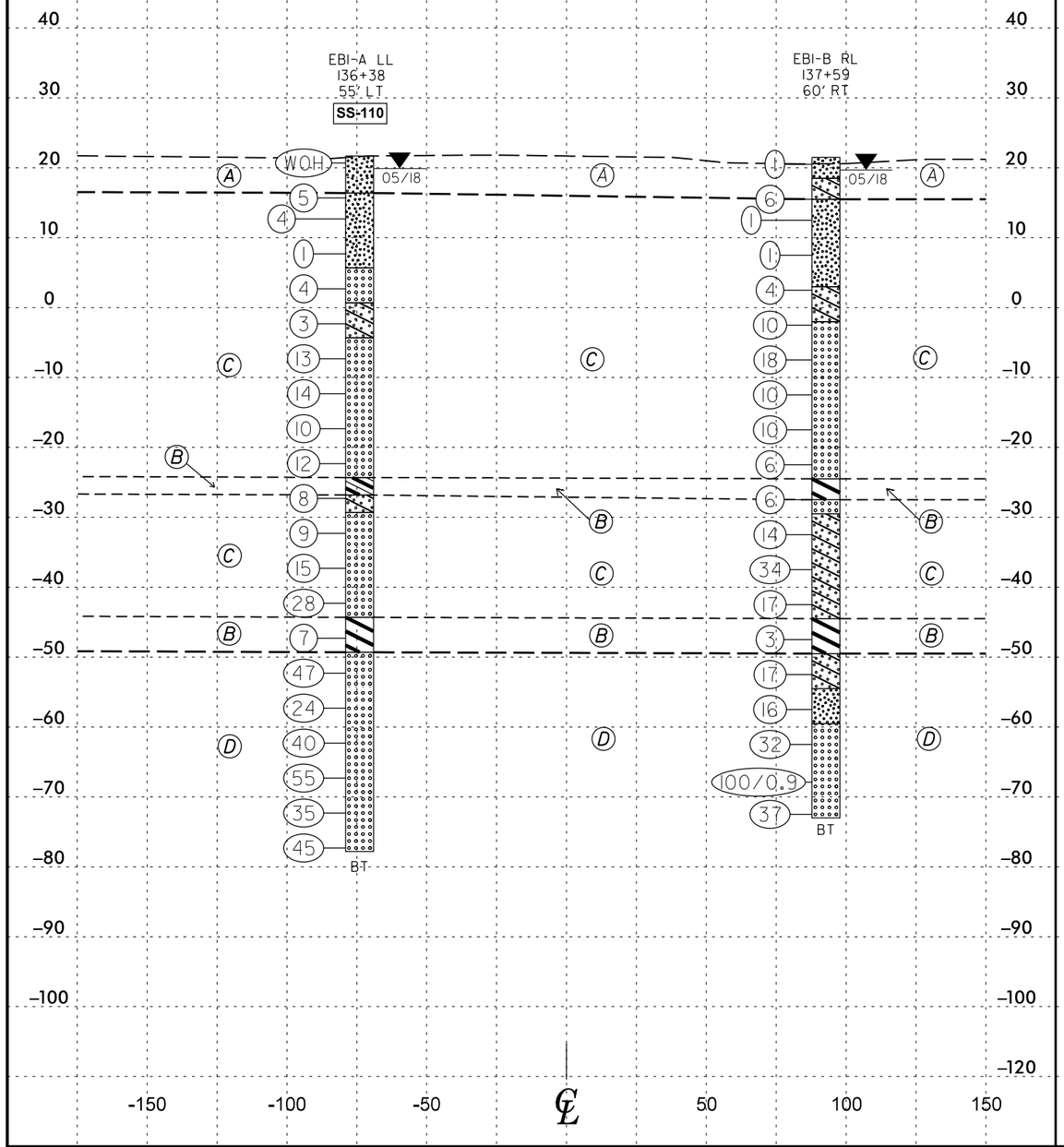
PROJECT REFERENCE NO.	SHEET NO.
R-1015	6

Ⓐ **UCP:** *Very loose to loose, brown, gray and tan, silty and clayey SAND (A-2-4, A-2-6), contains trace organics, moist to saturated*

Ⓑ **COASTAL PLAIN:** *Very soft to medium stiff, gray, sandy/silty CLAY (A-6, A-7-6), wet (DUPLIN FORMATION)*

Ⓒ **COASTAL PLAIN:** *Very loose to dense, gray, SAND and clayey SAND (A-3, A-2-4, A-2-6), contains shell fragments, saturated (DUPLIN FORMATION)*

Ⓓ **COASTAL PLAIN:** *Medium dense to very dense, gray, and green, SAND and clayey SAND (A-2-6, A-2-4, A-3), contains shell fragments, saturated (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

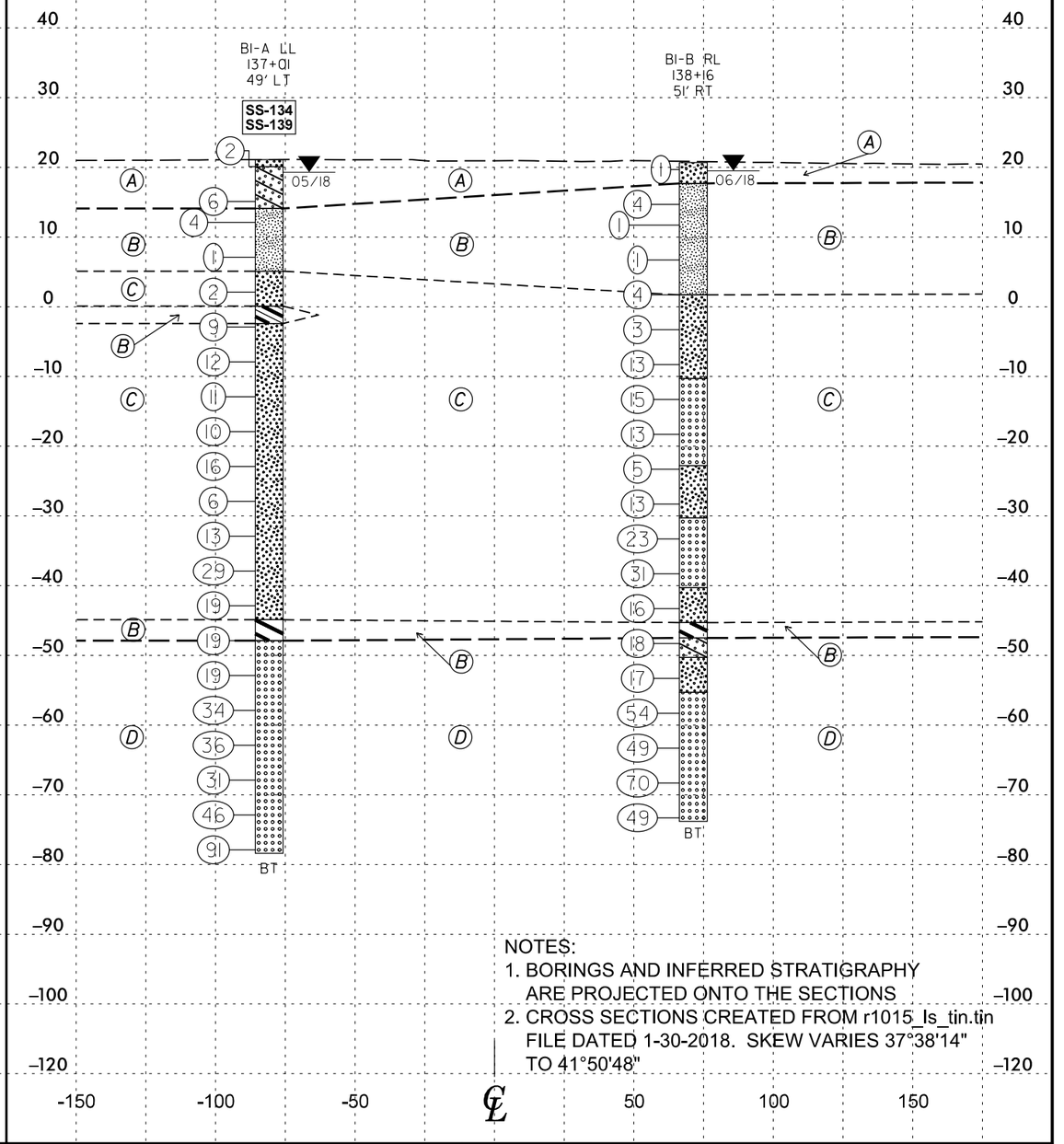
CROSS SECTION – END BENT 1 –L– STA 136+88.22

Ⓐ **UCP:** *Very loose to loose, brown and tan, silty and clayey SAND (A-2-4, A-2-6), contains trace organics, moist to saturated*

Ⓑ **COASTAL PLAIN:** *Very soft to medium stiff, gray, sandy SILT and sandy/silty CLAY (A-4, A-6, A-7-6), wet (DUPLIN FORMATION)*

Ⓒ **COASTAL PLAIN:** *Very loose to dense, gray, SAND (A-2-4, A-3), contains shell fragments, saturated (DUPLIN FORMATION)*

Ⓓ **COASTAL PLAIN:** *Medium dense to very dense, gray, and green, SAND and clayey SAND (A-2-6, A-2-4, A-3), contains cemented sand and shell fragments, saturated (RIVER BEND FORMATION)*



NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO THE SECTIONS
2. CROSS SECTIONS CREATED FROM r1015_ls_tin.tin FILE DATED 1-30-2018. SKEW VARIES 37°38'14" TO 41°50'48"

HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 1 –L– STA 137+65.64

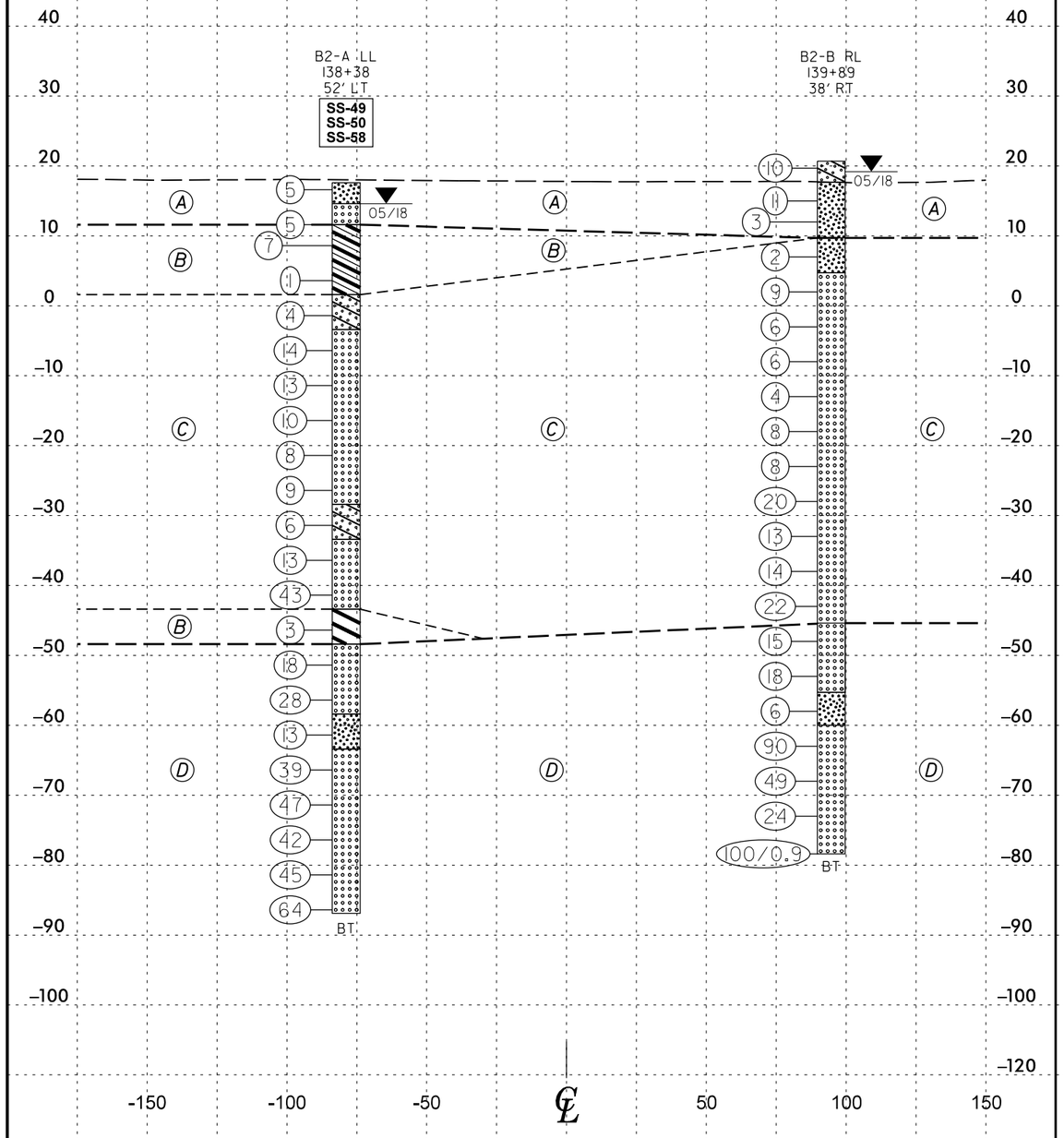
PROJECT REFERENCE NO.	SHEET NO.
R-1015	7

Ⓐ **UCP:** *Very loose to medium dense, brown, tan and gray, silty and clayey SAND and SAND (A-2-6, A-2-4, A-3), with thin clay interbeds, moist to saturated*

Ⓑ **COASTAL PLAIN:** *Very soft to medium stiff, gray, CLAY and sandy CLAY (A-6, A-7-6), wet (DUPLIN FORMATION)*

Ⓒ **COASTAL PLAIN:** *Very loose to dense, gray, SAND and clayey SAND (A-2-6, A-2-4, A-3), contains shell fragments, saturated (DUPLIN FORMATION)*

Ⓓ **COASTAL PLAIN:** *Loose to very dense, gray and green, SAND (A-2-4, A-3), phosphatic, with trace clay, contains shell fragments, saturated (RIVER BEND FORMATION)*



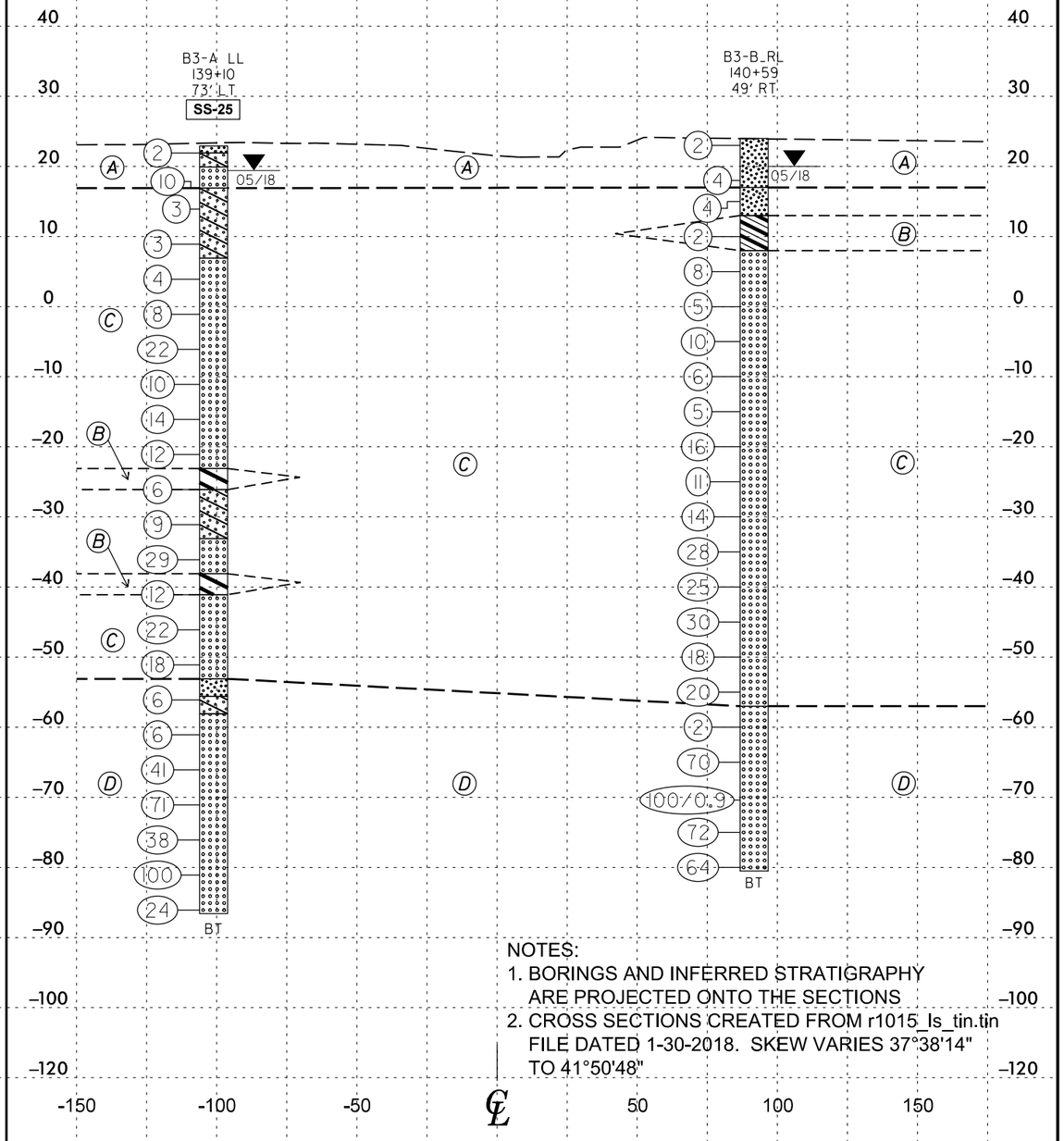
HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5 | **CROSS SECTION – BENT 2 –L– STA 138+97.45**

Ⓐ **UCP:** *Very loose, brown and tan, silty and clayey SAND and SAND (A-2-6, A-2-4, A-3), moist to saturated*

Ⓑ **COASTAL PLAIN:** *Soft, gray, CLAY and sandy CLAY (A-6, A-7-6), wet (DUPLIN FORMATION)*

Ⓒ **COASTAL PLAIN:** *Very loose, to dense, gray, SAND and clayey SAND (A-2-6, A-2-4, A-3), phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)*

Ⓓ **COASTAL PLAIN:** *Very loose to very dense, gray, white, and green, SAND and clayey SAND (A-2-6, A-2-4, A-3), with thin clay interbeds, contains shell fragments, saturated (RIVER BEND FORMATION)*



NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO THE SECTIONS
2. CROSS SECTIONS CREATED FROM r1015_ls_tin.tin FILE DATED 1-30-2018. SKEW VARIES 37°38'14" TO 41°50'48"

HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5 | **CROSS SECTION – BENT 3 –L– STA 139+80.71**

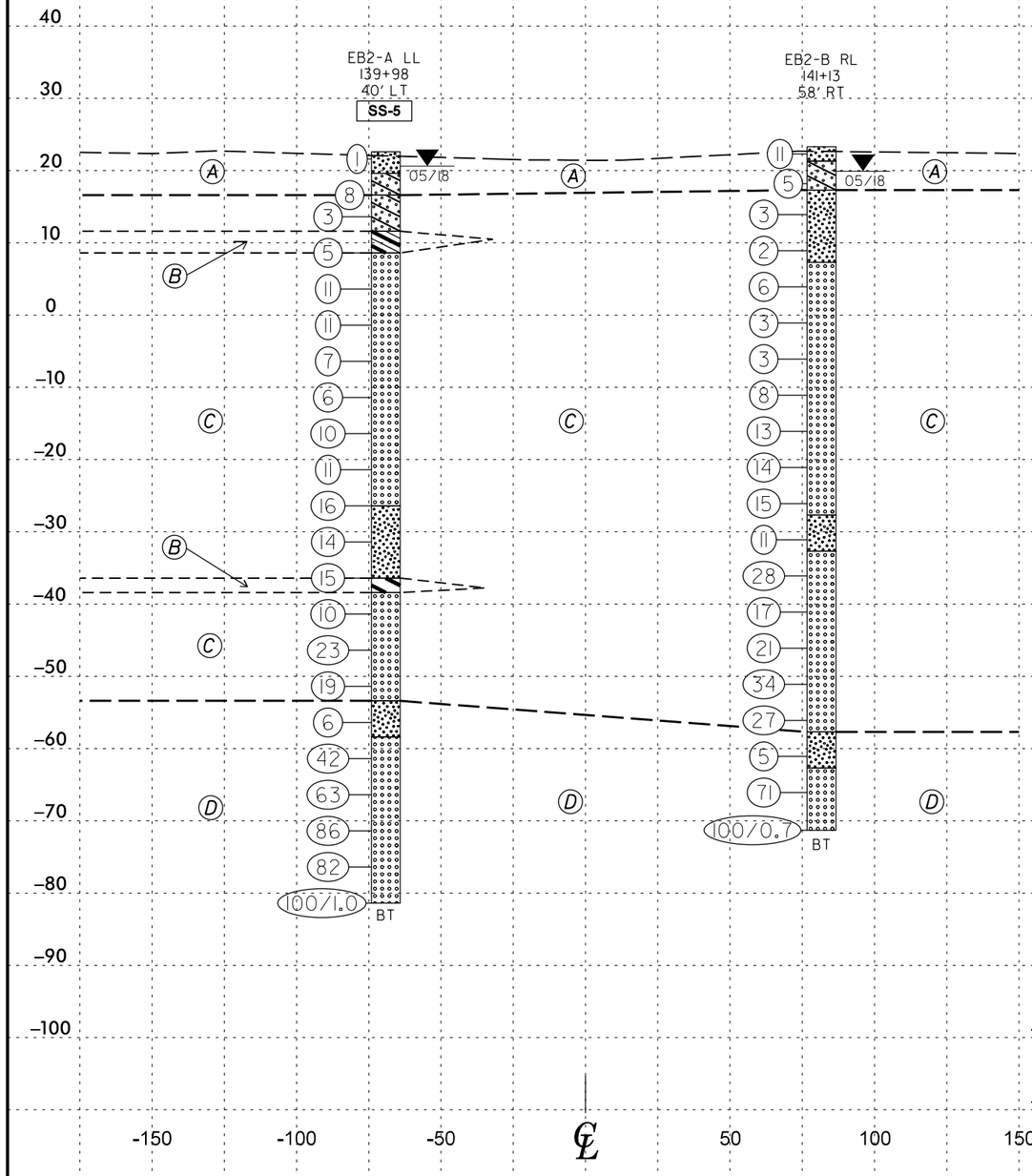
PROJECT REFERENCE NO.	SHEET NO.
R-1015	8

(A) **UCP:** *Very loose to medium dense, brown, silty and clayey SAND (A-2-4, A-2-6), contains trace organics, moist to saturated*

(B) **COASTAL PLAIN:** *Medium stiff to stiff, gray, CLAY and sandy CLAY (A-7-6, A-6), wet (DUPLIN FORMATION)*

(C) **COASTAL PLAIN:** *Very loose to dense, gray, SAND and clayey SAND (A-2-4, A-3, A-2-6), with thin clay interbeds, contains shell fragments, saturated (DUPLIN FORMATION)*

(D) **COASTAL PLAIN:** *Loose to very dense, gray and green, SAND (A-3), saturated (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100

VE = 2.5

CROSS SECTION – END BENT 2 –L– STA 140+54.52

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO THE SECTIONS
2. CROSS SECTIONS CREATED FROM r1015_ls_tin.tin FILE DATED 1-30-2018. SKEW VARIES 37°38'14" TO 41°50'48"

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 136+38	**OFFSET** 55 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.7 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 408,344	**EASTING** 2,628,700	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/30/18	**COMP. DATE** 05/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
40										
35										
30										
25										
20	21.7	0.0	WOH	WOH	WOH	0		Sat.		21.7 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Tan and brown, silty SAND (A-2-4), contains trace organics
15	16.7	5.0	4	2	3	5		Sat.		16.4 5.3 **COASTAL PLAIN** Gray, SAND and clayey SAND (A-3, A-2-4, A-2-6), contains shell fragments (DUPLIN FORMATION)
10	13.7	8.0	3	2	2	4	SS-110	46%		
5	8.7	13.0	2	0	1	1		Sat.		5.7 16.0
0	3.7	18.0	2	2	2	4		Sat.		0.7 21.0
-5	-1.3	23.0	1	1	2	3		Sat.		-4.3 26.0
-10	-6.3	28.0	5	6	7	13		Sat.		
-15	-11.3	33.0	3	7	7	14		Sat.		
-20	-16.3	38.0	3	5	5	10		Sat.		
-25	-21.3	43.0	5	5	7	12		Sat.		-24.3 46.0 Gray, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-30	-26.3	48.0	2	4	4	8		W		-26.8 48.5 Gray, SAND and clayey SAND (A-2-6, A-3), contains shell fragments (DUPLIN FORMATION) 51.0
-35	-31.3	53.0	6	5	4	9		Sat.		
-40	-36.3	58.0	6	6	9	15		Sat.		

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 136+38	**OFFSET** 55 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.7 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 408,344	**EASTING** 2,628,700	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/30/18	**COMP. DATE** 05/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-40						Match Line				
-45	-41.3	63.0	11	15	13	28		Sat.		Gray, SAND and clayey SAND (A-2-6, A-3), contains shell fragments (DUPLIN FORMATION) *(continued)*
-50	-46.3	68.0	4	4	3	7		W		-44.3 66.0 Gray, silty CLAY (A-7-6), contains shell fragments (DUPLIN FORMATION)
-55	-51.3	73.0	10	21	26	47		Sat.		-49.3 71.0 **COASTAL PLAIN** Gray, SAND (A-3), with trace clay, contains shell fragments (RIVER BEND FORMATION)
-60	-56.3	78.0	5	9	15	24		Sat.		
-65	-61.3	83.0	15	18	22	40		Sat.		
-70	-66.3	88.0	22	29	26	55		Sat.		
-75	-71.3	93.0	13	17	18	35		Sat.		
	-76.3	98.0	15	22	23	45		Sat.		-77.8 99.5 Boring Terminated at Elevation -77.8 ft in SAND (River Bend Formation)

Strata change in split spoon at depths of 5.3 feet and 48.5 feet.
ST-4 acquired in offset boring at -L- STA 136+42 58' LT

Other Samples:
ST-4 (8.0 - 10.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 137+59	**OFFSET** 60 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.5 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 408,491	**EASTING** 2,628,621	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/30/18	**COMP. DATE** 05/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
25											
	21.5	0.0	WOH	1	0	1				21.5 GROUND SURFACE	0.0
20										**UNDIVIDED COASTAL PLAIN** Brown, tan, and gray, silty SAND and clayey SAND (A-2-4, A-2-6), contains trace organics	
	16.5	5.0	3	3	3	6				18.5	3.0
15								Sat.		15.5	6.0
	13.5	8.0	1	0	1	1				**COASTAL PLAIN** Gray, SAND and clayey SAND (A-2-6, A-2-4, A-3) (DUPLIN FORMATION)	
10								W			
	8.5	13.0	WOH	WOH	1	1					
5								W			
	3.5	18.0	2	2	2	4					
0								Sat.		3.0	18.5
	-1.5	23.0	3	4	6	10				-2.0	23.5
-5								Sat.			
	-6.5	28.0	7	9	9	18					
-10								Sat.			
	-11.5	33.0	4	4	6	10					
-15								Sat.			
	-16.5	38.0	5	5	5	10					
-20								Sat.			
	-21.5	43.0	5	4	2	6					
-25								Sat.		-24.5	46.0
	-26.5	48.0	1	3	3	6				Gray, silty CLAY (A-7-6) (DUPLIN FORMATION)	
-30								W		-27.5	49.0
	-31.5	53.0	4	6	8	14				Gray, SAND and clayey SAND (A-3, A-2-6) (DUPLIN FORMATION)	
-35								Sat.		-29.5	51.0
	-36.5	58.0	10	15	19	34					
-40								Sat.			
	-41.5	63.0	5	6	11	17					
-45								Sat.		-44.5	66.0
	-46.5	68.0	2	2	1	3				Gray, silty CLAY (A-7-6) (DUPLIN FORMATION)	
-50								W		-49.5	71.0
	-51.5	73.0	6	7	10	17				**COASTAL PLAIN** Gray and green, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3) (RIVER BEND FORMATION)	
-55								Sat.		-54.5	76.0

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 137+59	**OFFSET** 60 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.5 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 408,491	**EASTING** 2,628,621	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/30/18	**COMP. DATE** 05/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-56.5	78.0	6	6	10	16		Sat.		Gray and green, SAND and silty/clayey SAND (A-2-6, A-2-4, A-3) (RIVER BEND FORMATION) *(continued)*
-60										-59.5 81.0
	-61.5	83.0	11	14	18	32		Sat.		
-65										
	-66.5	88.0	38	56	44/0.4	100/0.9		Sat.		
-70										
	-71.5	93.0	16	16	21	37		Sat.		-73.0 94.5
										Boring Terminated at Elevation -73.0 ft in SAND (River Bend Formation) Strata change in split spoon at depths of 6.0 feet and 49.0 feet.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 137+01	**OFFSET** 49 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.1 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 408,405	**EASTING** 2,628,613	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/30/18	**COMP. DATE** 05/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
	21.1	0.0								GROUND SURFACE	21.1	0.0
			1	1	1	2		Sat.		**UNDIVIDED COASTAL PLAIN** Tan and brown, silty and clayey SAND (A-2-4, A-2-6)	20.1	1.0
	16.1	5.0	6	3	3	6						
	13.1	8.0	WOH	2	2	4		W		**COASTAL PLAIN** Gray, sandy SILT (A-4), (DUPLIN FORMATION)	14.1	7.0
	8.1	13.0	1	0	1	1		W				
	3.1	18.0	1	1	1	2		Sat.		Gray, SAND (A-2-4), with trace sand clay (DUPLIN FORMATION)	5.1	16.0
	-1.9	23.0	3	5	4	9	SS-134	36%		Gray, sandy CLAY (A-6) (DUPLIN FORMATION)	0.1	21.0
	-6.9	28.0	5	5	7	12		Sat.		Gray, SAND (A-2-4(0)), with thin clay interbeds, contains cemented sand and shell fragments (DUPLIN FORMATION)	-2.4	23.5
	-11.9	33.0	5	5	6	11		Sat.				
	-16.9	38.0	5	5	5	10		Sat.				
	-21.9	43.0	8	10	6	16		Sat.				
	-26.9	48.0	1	2	4	6	SS-139	53%				
	-31.9	53.0	5	8	5	13		Sat.				
	-36.9	58.0	12	13	16	29		Sat.				
	-41.9	63.0	5	9	10	19		Sat.				
	-46.9	68.0	1	10	9	19		Sat.			-44.9	66.0
	-51.9	73.0	11	9	10	19		Sat.		Gray, silty CLAY (A-7-6) (DUPLIN FORMATION)	-47.9	69.0
										COASTAL PLAIN Gray, SAND (A-3), with trace clay, contains cemented sand and shell fragments (RIVER BEND FORMATION)		

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 137+01	**OFFSET** 49 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.1 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 408,405	**EASTING** 2,628,613	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/30/18	**COMP. DATE** 05/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-56.9	78.0	26	17	17	34		Sat.		**COASTAL PLAIN** Gray, SAND (A-3), with trace clay, contains cemented sand and shell fragments (RIVER BEND FORMATION) *(continued)*
-60										
	-61.9	83.0	13	18	18	36		Sat.		
-65										
	-66.9	88.0	13	14	17	31		Sat.		
-70										
	-71.9	93.0	17	21	25	46		Sat.		
-75										
	-76.9	98.0	21	30	61	91		Sat.		-78.4 99.5
										Boring Terminated at Elevation -78.4 ft in SAND (River Bend Formation)
										Strata change in split spoon at a depths of 23.5 feet and 69.0 feet.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 138+16	**OFFSET** 51 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 20.7 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 408,500	**EASTING** 2,628,564	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/31/18	**COMP. DATE** 05/31/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
25											
20	20.7	0.0	WOH	1	0	1		M		20.7 GROUND SURFACE	0.0
										UNDIVIDED COASTAL PLAIN Dark brown, silty SAND (A-2-4), contains trace organics	
15	15.7	5.0	3	2	2	4		W		17.7	3.0
	12.7	8.0	1	0	1	1		W		**COASTAL PLAIN** Gray, sandy SILT (A-4) (DUPLIN FORMATION)	
10	7.7	13.0	WOH	WOH	1	1		W			
5	2.7	18.0	2	2	2	4		W		1.7	19.0
0	-2.3	23.0	2	2	1	3		Sat.		Gray, clayey SAND (A-2-4, A-3), contains trace shell fragments (DUPLIN FORMATION)	
-5	-7.3	28.0	6	6	7	13		Sat.			
-10	-12.3	33.0	5	7	8	15		Sat.		-10.3	31.0
-15	-17.3	38.0	6	6	7	13		Sat.			
-20	-22.3	43.0	4	2	3	5		Sat.		-22.8	43.5
-25	-27.3	48.0	4	4	9	13		Sat.			
-30	-32.3	53.0	6	8	15	23		Sat.		-30.3	51.0
-35	-37.3	58.0	10	16	15	31		Sat.			
-40	-42.3	63.0	4	6	10	16		Sat.		-40.3	61.0
-45	-47.3	68.0	7	6	12	18		Sat.		-45.3	66.0
-50	-52.3	73.0	9	8	9	17		Sat.		Gray, silty CLAY (A-7-6) (DUPLIN FORMATION)	
-55										-47.5 **COASTAL PLAIN** Gray and green, SAND, silty SAND and clayey SAND (A-2-6, A-2-4, A-3) (RIVER BEND FORMATION)	68.2
										-50.3	71.0

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 138+16	**OFFSET** 51 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 20.7 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 408,500	**EASTING** 2,628,564	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/31/18	**COMP. DATE** 05/31/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-57.3	78.0	13	23	31	54		Sat.		-55.3 Gray and green, SAND, silty SAND and clayey SAND (A-2-6, A-2-4, A-3) (RIVER BEND FORMATION) *(continued)* 76.0
-60	-62.3	83.0	16	23	26	49		Sat.		
-65	-67.3	88.0	19	34	36	70		Sat.		
-70	-72.3	93.0	15	23	26	49		Sat.		-73.8 94.5
										Boring Terminated at Elevation -73.8 ft in SAND (River Bend Formation) Strata change in split spoon at depths of 19.0 feet and 68.2 feet.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 138+38	**OFFSET** 52 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.6 ft	**TOTAL DEPTH** 104.5 ft	**NORTHING** 408,411	**EASTING** 2,628,509	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/15/18	**COMP. DATE** 05/15/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
20												
	17.6	0.0								GROUND SURFACE	17.6	0.0
			1	2	3	5		M		**UNDIVIDED COASTAL PLAIN** Tan, and gray, SAND and silty SAND (A-2-4, A-3), with thin clay interbeds		
15											14.6	3.0
	12.6	5.0	3	3	2	5		Sat.			11.6	6.0
10	9.6	8.0								**COASTAL PLAIN** Gray, sandy CLAY (A-6(5)) (DUPLIN FORMATION)		
			2	2	5	7		W				
5	4.6	13.0										
			1	0	1	1	SS-49	33%				
0	-0.4	18.0									1.6	16.0
			3	1	3	4	SS-50	23%		Gray, SAND and clayey SAND (A-2-6(0), A-3(0)), contains shell fragments, with trace silt (DUPLIN FORMATION)		
-5	-5.4	23.0									-3.4	21.0
			6	7	7	14		Sat.				
-10	-10.4	28.0										
			5	6	7	13		Sat.				
-15	-15.4	33.0										
			2	5	5	10		Sat.				
-20	-20.4	38.0										
			4	4	4	8		Sat.				
-25	-25.4	43.0										
			3	4	5	9		Sat.				
-30	-30.4	48.0									-28.4	46.0
			3	3	3	6		Sat.				
-35	-35.4	53.0									-33.4	51.0
			7	7	6	13		Sat.				
-40	-40.4	58.0										
			10	23	20	43	SS-58	17%			-43.4	61.0
-45	-45.4	63.0								Gray, silty CLAY (A-7-6) (DUPLIN FORMATION)		
			1	2	1	3		W			-48.4	66.0
-50	-50.4	68.0								**COASTAL PLAIN** Gray, green and dark gray, SAND and silty SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION)		
			7	7	11	18		Sat.				
-55	-55.4	73.0										
			13	12	16	28		Sat.				
-60											-58.4	76.0

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 138+38	**OFFSET** 52 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.6 ft	**TOTAL DEPTH** 104.5 ft	**NORTHING** 408,411	**EASTING** 2,628,509	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/15/18	**COMP. DATE** 05/15/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
-60						Match Line						
	-60.4	78.0	4	5	8	13		Sat.		**COASTAL PLAIN** Gray, green and dark gray, SAND and silty SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION) *(continued)*	-63.4	81.0
-65	-65.4	83.0	13	17	22	39		Sat.				
-70	-70.4	88.0	15	20	27	47		Sat.				
-75	-75.4	93.0	10	20	22	42		Sat.				
-80	-80.4	98.0	13	19	26	45		Sat.				
-85	-85.4	103.0	22	29	35	64		Sat.			-86.9	104.5
										Boring Terminated at Elevation -86.9 ft in SAND (River Bend Formation)		

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756			**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 139+89	**OFFSET** 38 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 20.7 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 408,547	**EASTING** 2,628,399	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Donahue, T.	**START DATE** 05/11/18	**COMP. DATE** 05/11/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
	20.7	0.0	2	4	6	10		M		20.7 GROUND SURFACE	0.0
										UNDIVIDED COASTAL PLAIN Tan, SAND and clayey SAND (A-2-4, A-2-6)	
	16.0	4.7	4	6	5	11		Sat.		17.7	3.0
	13.0	7.7	WOH	2	1	3		Sat.		9.7	11.0
	8.0	12.7	1	0	2	2		Sat.		**COASTAL PLAIN** Gray, SAND (A-2-4, A-3), with thin clay interbeds, contains shell fragments (DUPLIN FORMATION)	
	3.0	17.7	1	3	6	9		Sat.		4.7	16.0
	-2.0	22.7	4	3	3	6		Sat.			
	-7.0	27.7	2	3	3	6		Sat.			
	-12.0	32.7	3	2	2	4		Sat.			
	-17.0	37.7	5	4	4	8		Sat.			
	-22.0	42.7	3	3	5	8		Sat.			
	-27.0	47.7	3	8	12	20		Sat.			
	-32.0	52.7	3	5	8	13		Sat.			
	-37.0	57.7	6	5	9	14		Sat.			
	-42.0	62.7	6	8	14	22		Sat.			
	-47.0	67.7	7	4	11	15		Sat.		-44.3 **COASTAL PLAIN** Gray and green, SAND (A-2-4, A-3), phosphatic (RIVER BEND FORMATION)	65.0
	-52.0	72.7	11	10	8	18		Sat.			

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756			**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 139+89	**OFFSET** 38 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 20.7 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 408,547	**EASTING** 2,628,399	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Donahue, T.	**START DATE** 05/11/18	**COMP. DATE** 05/11/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-57.0	77.7	2	2	4	6		Sat.		-55.3 Gray and green, SAND (A-2-4, A-3), phosphatic (RIVER BEND FORMATION) *(continued)* 76.0
-60	-62.0	82.7	24	38	52	90		Sat.		-60.0 80.7
-65	-67.0	87.7	16	24	25	49		Sat.		
-70	-72.0	92.7	7	10	14	24		Sat.		
-75	-77.0	97.7	18	29	71/0.4	100/0.9		Sat.		-78.4 99.1
										Boring Terminated at Elevation -78.4 ft in SAND (River Bend Formation)
										Lost circulation and borehole caved at 99.2'.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B3-A LL	**STATION** 139+10	**OFFSET** 73 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.9 ft	**TOTAL DEPTH** 109.5 ft	**NORTHING** 408,416	**EASTING** 2,628,434	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/15/18	**COMP. DATE** 05/15/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
30											
25											
	22.9	0.0	1	1	1	2		M		22.9 GROUND SURFACE	0.0
20										21.9 **UNDIVIDED COASTAL PLAIN** Brown and tan, SAND and silty/clayey SAND (A-2-4, A-2-6, A-3)	1.0
	17.9	5.0	3	6	4	10				19.9	3.0
15	14.9	8.0	3	2	1	3	SS-25	Sat. 25%		16.9 **COASTAL PLAIN** Gray, SAND (A-2-4(0), A-3), with little clay, contains shell fragments (DUPLIN FORMATION)	6.0
10	9.9	13.0	1	2	1	3		Sat.		6.9	16.0
5	4.9	18.0	1	2	2	4		Sat.			
0	-0.1	23.0	5	5	3	8		Sat.			
-5	-5.1	28.0	10	10	12	22		Sat.			
-10	-10.1	33.0	5	5	5	10		Sat.			
-15	-15.1	38.0	7	7	7	14		Sat.			
-20	-20.1	43.0	4	5	7	12		Sat.			
-25	-25.1	48.0	4	2	4	6		Sat.		-23.1 Gray, CLAY (A-7-6) (DUPLIN FORMATION)	46.0
-30	-30.1	53.0	6	4	5	9		Sat.		-26.1 Gray, SAND and clayey SAND (A-2-6, A-3), contains shell fragments (DUPLIN FORMATION)	49.0
-35	-35.1	58.0	9	12	17	29		Sat.		-33.1	56.0
-40	-40.1	63.0	WOH	6	6	12		W		-38.1 Gray, CLAY (A-7-6) (DUPLIN FORMATION)	61.0
-45	-45.1	68.0	9	10	12	22		Sat.		-41.1 Gray, SAND (A-3), with thin clay interbeds (DUPLIN FORMATION)	64.0
-50											

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B3-A LL	**STATION** 139+10	**OFFSET** 73 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.9 ft	**TOTAL DEPTH** 109.5 ft	**NORTHING** 408,416	**EASTING** 2,628,434	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/15/18	**COMP. DATE** 05/15/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50	-50.1	73.0	6	7	11	Match Line 18		Sat.		Gray, SAND (A-3), with thin clay interbeds (DUPLIN FORMATION) *(continued)*
-55	-55.1	78.0	1	3	3	6		Sat.		-53.1 76.0 **COASTAL PLAIN** -55.6 Gray, dark gray, white and green, fine to coarse SAND, silty SAND and clayey SAND (A-3, A-2-4, A-2-6), with clay interbeds, contains shell fragments (RIVER BEND FORMATION) 78.5
-60	-60.1	83.0	3	2	4	6		Sat.		-58.1 81.0
-65	-65.1	88.0	14	22	19	41		Sat.		
-70	-70.1	93.0	20	31	40	71		Sat.		
-75	-75.1	98.0	13	17	21	38		Sat.		
-80	-80.1	103.0	35	47	53	100		Sat.		
-85	-85.1	108.0	10	11	13	24		Sat.		-86.6 109.5 Boring Terminated at Elevation -86.6 ft in SAND (River Bend Formation) Strata change in split spoon at depths of 49.0 feet and 64.0 feet.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B3-B RL	**STATION** 140+59	**OFFSET** 49 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 24.0 ft	**TOTAL DEPTH** 104.5 ft	**NORTHING** 408,583	**EASTING** 2,628,338	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/11/18	**COMP. DATE** 05/11/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
25										
	24.0	0.0	WOH	1	1	2		M		24.0 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Tan, silty SAND (A-2-4)
20	19.0	5.0	2	2	2	4		Sat.		
	16.0	8.0	2	2	2	4		Sat.		17.0 7.0 **COASTAL PLAIN** Gray, SAND (A-2-4) (DUPLIN FORMATION)
15	11.0	13.0	1	1	1	2		W		13.0 11.0 Gray, sandy CLAY (A-6) (DUPLIN FORMATION)
10	6.0	18.0	2	4	4	8		Sat.		8.0 16.0 Gray, SAND (A-3), phosphatic, contains shell fragments (DUPLIN FORMATION)
5	1.0	23.0	2	3	2	5		Sat.		
0	-4.0	28.0	4	4	6	10		Sat.		
-5	-9.0	33.0	2	3	3	6		Sat.		
-10	-14.0	38.0	2	3	2	5		Sat.		
-15	-19.0	43.0	6	9	7	16		Sat.		
-20	-24.0	48.0	4	5	6	11		Sat.		
-25	-29.0	53.0	5	8	6	14		Sat.		
-30	-34.0	58.0	9	10	18	28		Sat.		
-35	-39.0	63.0	13	10	15	25		Sat.		
-40	-44.0	68.0	13	13	17	30		Sat.		
-45	-49.0	73.0	14	10	8	18		Sat.		
-50	-54.0	78.0	12	11	9	20		Sat.		
-55										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. B3-B RL	**STATION** 140+59	**OFFSET** 49 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 24.0 ft	**TOTAL DEPTH** 104.5 ft	**NORTHING** 408,583	**EASTING** 2,628,338	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/11/18	**COMP. DATE** 05/11/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
-60	-59.0	83.0	2	0	2	2		Sat.		-57.0 81.0 Gray, phosphatic SAND (A-3), with shell fragments (DUPLIN FORMATION) *(continued)* **COASTAL PLAIN** Gray and green, SAND (A-3) (RIVER BEND FORMATION)
-65	-64.0	88.0	33	40	30	70		Sat.		
-70	-69.0	93.0	32	49	51/0.4	100/0.9		Sat.		
-75	-74.0	98.0	14	30	42	72		Sat.		
-80	-79.0	103.0	31	29	35	64		Sat.		-80.5 104.5 Boring Terminated at Elevation -80.5 ft in SAND (River Bend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 139+98	**OFFSET** 40 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.6 ft	**TOTAL DEPTH** 104.0 ft	**NORTHING** 408,478	**EASTING** 2,628,362	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/14/18	**COMP. DATE** 05/14/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
30										
25										
20	22.6	0.0	1	0	1	1				22.6 0.0 GROUND SURFACE **UNDIVIDED COASTAL PLAIN** Dark brown, gray, and tan, SAND and clayey SAND (A-2-6, A-2-4), contains trace organics
15	17.6	5.0	3	5	3	8		Sat.		19.6 3.0
10	14.6	8.0	2	1	2	3		Sat.		16.6 6.0 **COASTAL PLAIN** Gray, clayey SAND (A-2-6) (DUPLIN FORMATION)
5	9.6	13.0	1	3	2	5		W		11.6 11.0 Gray, sandy CLAY (A-6) (DUPLIN FORMATION)
0	4.6	18.0	4	5	6	11	SS-5	19%		8.6 14.0 Gray, SAND (A-3(0), A-2-4), with trace clay, contains shell fragments (DUPLIN FORMATION)
-5	-0.4	23.0	4	5	6	11		Sat.		
-10	-5.4	28.0	3	3	4	7		Sat.		
-15	-10.4	33.0	4	3	3	6		Sat.		
-20	-15.4	38.0	2	6	4	10		Sat.		
-25	-20.4	43.0	4	5	6	11		Sat.		
-30	-25.4	48.0	12	11	5	16		Sat.		-26.4 49.0
-35	-30.4	53.0	4	6	8	14		Sat.		
-40	-35.4	58.0	11	9	6	15		Sat.		-36.4 59.0 Gray, CLAY (A-7-6) (DUPLIN FORMATION) -38.4 61.0 Gray, SAND (A-3, A-2-4), with thin clay interbeds, contains shell fragments (DUPLIN FORMATION)
-45	-40.4	63.0	9	5	5	10		Sat.		
-50	-45.4	68.0	12	11	12	23		Sat.		

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 2 - Bridge No. 274 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 139+98	**OFFSET** 40 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.6 ft	**TOTAL DEPTH** 104.0 ft	**NORTHING** 408,478	**EASTING** 2,628,362	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/14/18	**COMP. DATE** 05/14/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50	-50.4	73.0	8	10	9	Match Line 19		Sat.		Gray, SAND (A-3, A-2-4), with thin clay interbeds, contains shell fragments (DUPLIN FORMATION) *(continued)*
-55	-55.4	78.0	3	2	4	6		Sat.		-53.4 76.0 **COASTAL PLAIN** Gray and green, SAND (A-2-4, A-3), (RIVER BEND FORMATION)
-60	-60.4	83.0	9	20	22	42		Sat.		-58.4 81.0
-65	-65.4	88.0	21	29	34	63		Sat.		
-70	-70.4	93.0	27	37	49	86		Sat.		
-75	-75.4	98.0	15	35	47	82		Sat.		
-80	-80.4	103.0	39	61/0.5		100		Sat.		-81.4 104.0 Boring Terminated at Elevation -81.4 ft in SAND (River Bend Formation) Strata change in split spoon at depths of 14.0 feet and 59.0 feet.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 141+13	**OFFSET** 58 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.3 ft	**TOTAL DEPTH** 94.6 ft	**NORTHING** 408,611	**EASTING** 2,628,292	**24 HR.** 3.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/10/18	**COMP. DATE** 05/10/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
25											
	23.3	0.0	1	6	5	11		M		23.3 GROUND SURFACE	0.0
20										21.3 **UNDIVIDED COASTAL PLAIN** Brown and tan, SAND and clayey SAND (A-2-6, A-2-4), contains trace organics	2.0
	19.2	4.1	2	2	3	5		Sat.			
15										17.3 **COASTAL PLAIN** Gray, SAND (A-3, A-2-4), contains shell fragments, with thin clay interbeds (DUPLIN FORMATION)	6.0
	14.9	8.4	3	1	2	3		Sat.			
10	9.9	13.4	1	1	1	2		Sat.		7.3	16.0
5	4.9	18.4	1	2	4	6		Sat.			
0	-0.1	23.4	1	1	2	3		Sat.			
-5	-5.1	28.4	1	2	1	3		Sat.			
-10	-10.1	33.4	3	4	4	8		Sat.			
-15	-15.1	38.4	5	5	8	13		Sat.			
-20	-20.1	43.4	6	7	7	14		Sat.			
-25	-25.1	48.4	8	10	5	15		Sat.		-27.7	51.0
-30	-30.1	53.4	5	4	7	11		Sat.		-32.7 Gray, dark gray and tan, phosphatic SAND (A-3), with trace clay, contains shell fragments (DUPLIN FORMATION)	56.0
-35	-35.1	58.4	7	14	14	28		Sat.			
-40	-40.1	63.4	6	8	9	17		Sat.			
-45	-45.1	68.4	10	10	11	21		Sat.			
-50	-50.1	73.4	11	17	17	34		Sat.			
-55											

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 2 - Bridge No. 275 On US 70 Bypass Over NCRR Between US 70 and SR 1756				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 141+13	**OFFSET** 58 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.3 ft	**TOTAL DEPTH** 94.6 ft	**NORTHING** 408,611	**EASTING** 2,628,292	**24 HR.** 3.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Donahue, T.	**START DATE** 05/10/18	**COMP. DATE** 05/10/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-55.1	78.4	15	14	13	27		Sat.		-57.7 Gray, dark gray and tan, phosphatic SAND (A-3), with trace clay, contains shell fragments (DUPLIN FORMATION) *(continued)* 81.0
-60	-60.1	83.4	WOH	2	3	5		Sat.		**COASTAL PLAIN** -62.7 Gray, dark gray and tan, phosphatic SAND (A-3, A-2-4), with trace clay, contains shell fragments (RIVER BEND FORMATION) 86.0
-65	-65.1	88.4	23	28	43	71		Sat.		
-70	-70.1	93.4	55	75	25/0.2	100/0.7		Sat.		-71.3 94.6 Boring Terminated at Elevation -71.3 ft in SAND (River Bend Formation)

NCDOT BORE DOUBLE R-1015_S2_GEO_BRDG.GPJ NC_DOT.GDT 7/19/18

7/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-1015	19

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-110	55' LT	136+38	8.0-9.5	A-2-4(0)	NP	NP	0.4	80.9	5.0	13.7	100	100	31	46.2	-
SS-134	49' LT	137+01	23.5-24.5	A-2-4(0)	NP	NP	50.9	32.5	3.3	13.3	100	73	18	35.6	-
SS-139	49' LT	137+01	48.0-49.5	A-2-4(0)	21	1	7.7	63.0	9.7	19.6	100	97	33	53.3	-
SS-49	52' LT	138+38	13.0-14.5	A-6(5)	32	14	12.6	33.4	20.8	33.2	100	98	58	32.6	-
SS-50	52' LT	138+38	18.0-19.5	A-2-6(0)	31	12	35.1	33.9	3.6	27.4	99	81	31	22.8	-
SS-58	52' LT	138+38	58.0-59.5	A-3(0)	NP	NP	77.6	16.0	0.7	5.7	100	78	7	17.0	-
SS-25	73' LT	139+10	8.0-9.5	A-2-4(0)	NP	NP	1.9	85.3	1.7	11.7	100	100	15	25.4	-
SS-5	40' LT	139+98	18.0-19.5	A-3(0)	NP	NP	76.1	19.7	0.6	4.6	96	59	5	19.1	-
ST-4	58' LT	136+42	8.0-10.0	A-2-4(0)	NP	NP	0.1	86.1	1.9	11.9	100	100	15	30.5	-

Photo 1: Looking towards End Bent 2 and up station of -L-

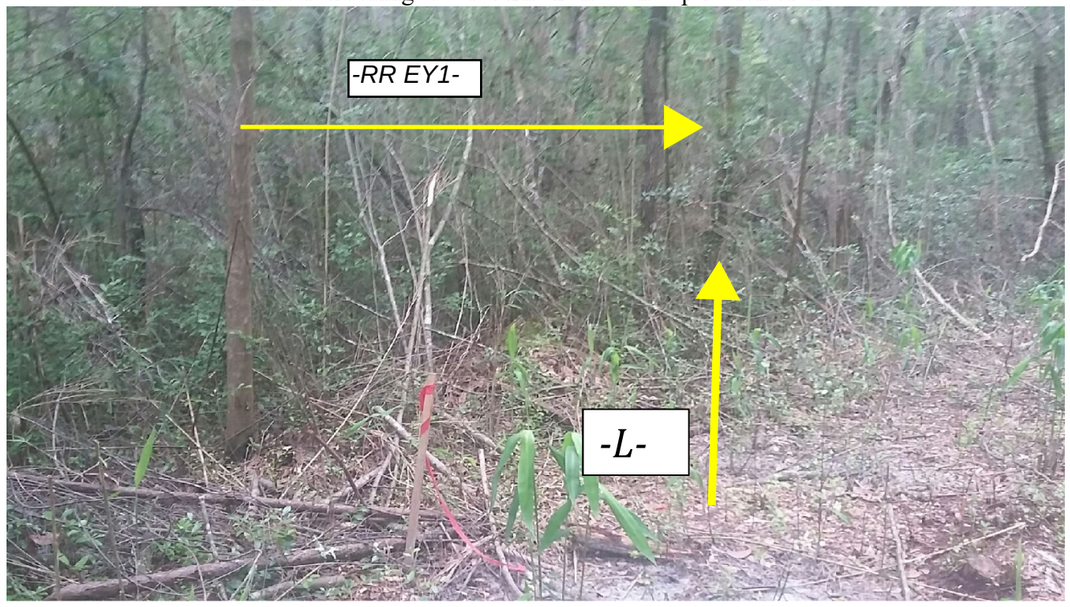


Photo 2: Looking towards End Bent 1 and down station of -L-