REFERENCE: B-4605

PROJECT: 17BP.2.R.91

CONTENTS

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY **PITT**

PROJECT DESCRIPTION **BRIDGE NO. 5 ON –L–**
(SR 1777) OVER CHICOD CREEK AT STA. 14+14.00

CAUTION NOTICE

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

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

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

NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

C.J. CORNETTE
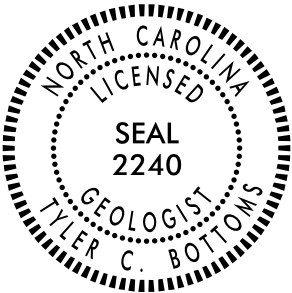
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CHECKED BY **D.N. ARGENBRIGHT**

SUBMITTED BY **D.N. ARGENBRIGHT**

DATE **JULY 2018**

NORTH CAROLINA LICENSED
SEAL 2240
GEOLOGIST
Tyler C. Bottoms

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Tyler Bottoms
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SIGNATURE

10/17/2018
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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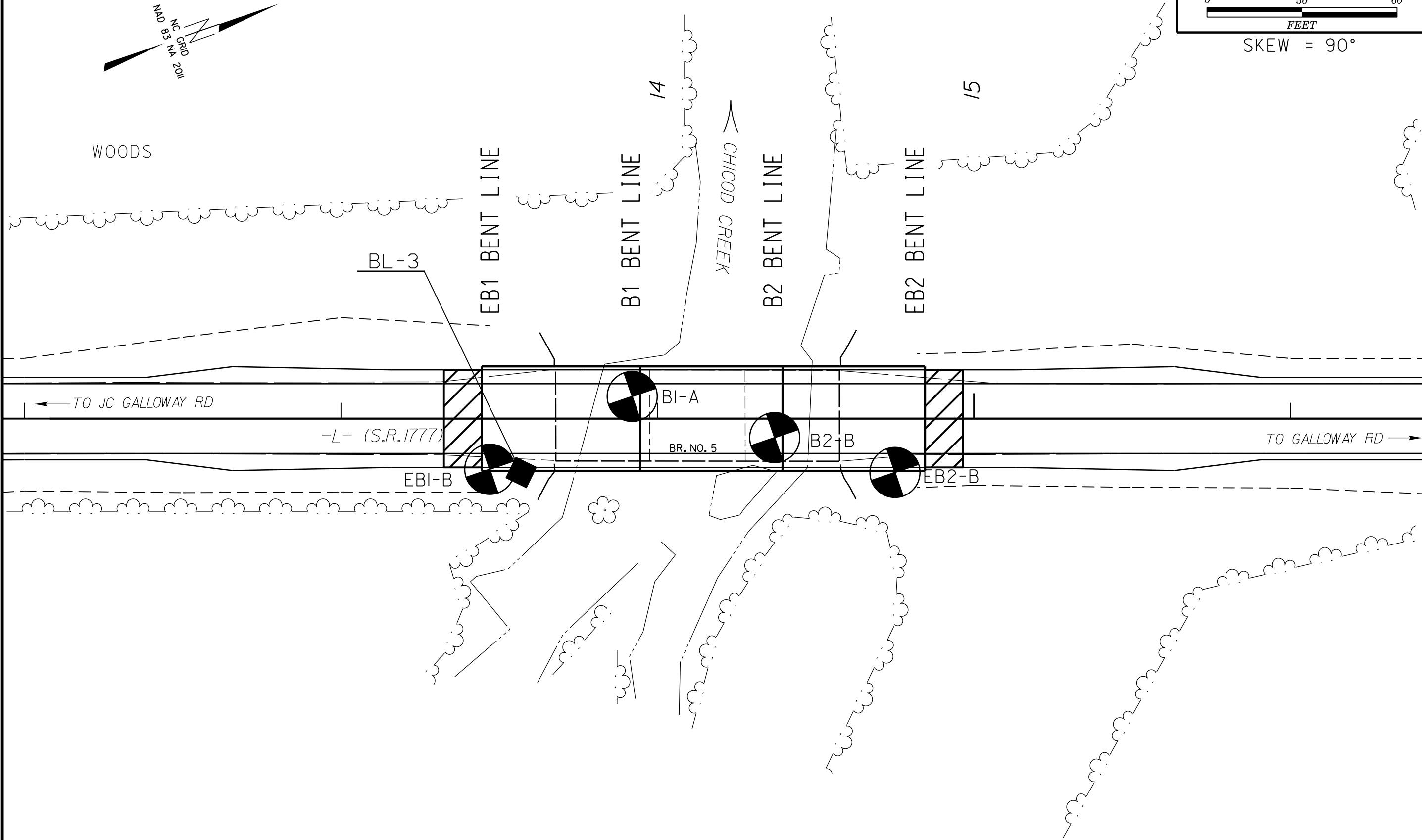## DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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-1, A-2	A-4, A-5
	A-1-a	A-1-b		A-2-4 A-2-5 A-2-6 A-2-7	A-4	A-5	A-6	A-7 A-7-5 A-7-6	A-3	A-6, A-7
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	36 MN	GRANULAR SOILS	SILT-CLAY SOILS / MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX	— NP	40 MX 10 MX	40 MN 41 MN 40 MX 41 MN 10 MX 10 MX 11 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	20 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				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 RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	> 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 4

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)
GRAIN MM SIZE IN.	305 12	75 3	2.0	0.25	0.05	0.005

SOIL MOISTURE - CORRELATION OF TERMS

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

	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
ORGANIC 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
- 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	MED. - MEDIUM	VST - VANE SHEAR TEST	
BT - BORING TERMINATED	MICA. - MICACEOUS	WEA. - WEATHERED	
CL. - CLAY	MOD. - MODERATELY	γ - UNIT WEIGHT	
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ_d - DRY UNIT WEIGHT	
CSE. - COARSE	ORG. - ORGANIC		
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	SAMPLE ABBREVIATIONS	
DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	S - BULK	
e - VOID RATIO	SD. - SAND, SANDY	SS - SPLIT SPOON	
F - FINE	SL. - SILT, SILTY	ST - SHELBY TUBE	
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK	
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL	
FRAGS. - FRAGMENTS	ω - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO	
HI. - HIGHLY	V - VERY		

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
[X] CME-45C	[ ] CLAY BITS	[X] AUTOMATIC [ ] MANUAL
[ ] CME-55	[ ] 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
[ ] CME-550	[ ] 8" HOLLOW AUGERS	[ ] -B [ ] -H
	[ ] HARD FACED FINGER BITS	[ ] -N
[ ] VANE SHEAR TEST	[ ] TUNG.-CARBIDE INSERTS	HAND TOOLS:
	[X] CASING [ ] W/ ADVANCER	[ ] POST HOLE DIGGER
[ ] PORTABLE HOIST	[X] TRICONE 2 15/8" STEEL TEETH	[ ] HAND AUGER
	[ ] TRICONE _____" TUNG.-CARB.	[ ] SOUNDING ROD
	[ ] CORE BIT	[ ] 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. 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: BL-3

N: 658492.4540 E: 2532384.3740 ELEVATION: 20.46 FEET

NOTES:

DATE: 8-15-14

SITE PLAN

0   30   60
FEET

SKEW = 90°

NC GRID
NAD 83 NA 2011

WOODS

14

15

CHICOD CREEK

BL-3

EB1 BENT LINE

B1 BENT LINE

B2 BENT LINE

EB2 BENT LINE

← *TO JC GALLOWAY RD*

B1-A

-L- (S.R.1777)

BR. NO. 5

B2-B

TO GALLOWAY RD →

EB1-B

EB2-B

PROFILE THROUGH BORINGS PROJECTED ALONG -L-

5/14/99

VE = 2

EBI-B
13+47
16' RT

BI-A
13+92
7' LT

B2-B
14+37
6' RT

EB2-B
14+75
17' RT

LOOSE BROWN AND TAN SAND, MOIST (ROADWAY EMBANKMENT) ⑥

SOFT GRAY, TAN AND ORANGE SANDY CLAY, MOIST (ROADWAY EMBANKMENT) ③

VERY LOOSE BROWN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT) ② ②

▼ SURFACE WATER

07/18

VERY LOOSE TO MEDIUM DENSE GRAY BROWN, AND TAN   SAND WITH WOOD   FRAGMENTS,   MOIST TO SATURATED (ALLUVIAL)

Ⓐ   WOH Ⓑ

LOOSE TO MEDIUM DENSE GRAY   AND GREEN SAND WITH   SHELL FRAGMENTS,   SATURATED   (YORKTOWN FORMATION)

LOOSE TO VERY DENSE   GRAY AND GREEN SAND   AND CLAYEY SAND   WITH HARD LIMESTONE   LAYERS, SATURATED

(PEEDEE   FORMATION)

EBI-B blows: ②, ⑧, ⑰, ⑫, 100/0.3, 100/0.4, ㉛, ㉚, ㊼, 100/0.

BI-A blows: ①, ⑧, ④, ⑤, ⑦, ⑥, ⑧, 56, 100/0.1, 50, 100/0.3, ⑦, ⑥

B2-B blows: ⓪, ⑧, ⑦, ㉑, ⑱, ⑥, ⑲, 56, 100/0.9, 62, 100/0., ⑩

EB2-B blows: ㉕, ⑤, ⑰, ⑫, 100/0.8, 100/0.4, 65, ㉗, ㊺, ㊺

Ⓐ VERY LOOSE BROWN MUCK, SATURATED (ALLUVIAL)
Ⓑ VERY SOFT GRAY SILTY CLAY, WET (ALLUVIAL)

NOTE: GROUNDLINE PROFILE ALONG -L- TAKEN FROM BRIDGE SURVEY AND HYDRAULIC DESIGN REPORT DATED 07/10/18

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

30 20 10 0 -10 -20 -30 -40 -50

13   14   15

GEOTECHNICAL BORING REPORT
BORE LOG

Boring EB1-B

WBS 17BP.2.R.91	TIP B-4605	COUNTY PITT	GEOLOGIST Zimarino, S. N.	
SITE DESCRIPTION BRIDGE NUMBER 5 ON -L- (SR 1777) OVER CHICOD CREEK				GROUND WTR (ft)
BORING NO. EB1-B	STATION 13+47	OFFSET 16 ft RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 21.0 ft	TOTAL DEPTH 59.8 ft	NORTHING 658,572	EASTING 2,532,400	24 HR. 7.7
DRILL RIG/HAMMER EFF./DATE GFO0075 CME-45C 84% 08/21/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Smith, R. E.	START DATE 07/03/18	COMP. DATE 07/03/18	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
25										
20	21.0	0.0	2	3	3	6				ELEV. 21.0 GROUND SURFACE DEPTH 0.0
										ROADWAY EMBANKMENT — BROWN AND TAN SAND, MOIST
										18.0 / 3.0
15	17.0	4.0	1	1	2	3				ROADWAY EMBANKMENT — GRAY, TAN, AND ORANGE SANDY CLAY, MOIST
	12.7	8.3	1	1	1	2				14.0 / 7.0 ALLUVIAL — GRAY AND BROWN SAND WITH WOOD FRAGMENTS, MOIST TO SATURATED
10										
	7.7	13.3	1	1	1	2				
5										5.0 / 16.0
	2.7	18.3	7	5	3	8				
0										0.0 / 21.0 COASTAL PLAIN — GRAY AND GREEN SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
	-2.3	23.3	5	6	11	17				
-5										
	-7.3	28.3	5	6	6	12				-10.0 / 31.0
-10										
	-12.3	33.3	12	100/0.3		100/0.3				-13.3 / 34.3 COASTAL PLAIN — GRAY SAND WITH HARD LIMESTONE LAYERS, SATURATED (PEEDEE FORMATION)
-15										
	-17.3	38.3	8	100/0.4		100/0.4				
-20										
	-22.3	43.3	5	7	24	31				
-25										
	-27.3	48.3	58	15	15	30				
-30										
	-32.3	53.3	18	22	25	47				
-35										
	-37.3	58.3	52	63	37/0.2	100/0.7				-38.8 / 59.8

Boring Terminated at Elevation -38.8 ft in Very Dense Sand

Boring B1-A

WBS 17BP.2.R.91	TIP B-4605	COUNTY PITT	GEOLOGIST Zimarino, S. N.	
SITE DESCRIPTION BRIDGE NUMBER 5 ON -L- (SR 1777) OVER CHICOD CREEK				GROUND WTR (ft)
BORING NO. B1-A	STATION 13+92	OFFSET 7 ft LT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 11.9 ft	TOTAL DEPTH 60.2 ft	NORTHING 658,483	EASTING 2,532,380	24 HR. N/A
DRILL RIG/HAMMER EFF./DATE GFO0075 CME-45C 84% 08/21/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Smith, R. E.	START DATE 07/02/18	COMP. DATE 07/02/18	SURFACE WATER DEPTH 1.8ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
20										
15										WATER SURFACE (07/02/18)
	11.9	0.0	1	0	1	1				11.9 GROUND SURFACE 0.0 ALLUVIAL — BROWN MUCK, SATURATED
10										8.9 / 3.0
	7.6	4.3	3	4	4	8				ALLUVIAL — GRAY SAND WITH WOOD FRAGMENTS, SATURATED
5	3.2	8.7	2	1	3	4				0.9 / 11.0
0										COASTAL PLAIN — GRAY AND GREEN SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
	-1.8	13.7	2	2	3	5				
-5										
	-6.8	18.7	2	4	3	7				-10.1 / 22.0
-10										-11.6 / 23.5 COASTAL PLAIN — GRAY AND GREEN SAND AND CLAYEY SAND WITH HARD LIMESTONE LAYERS, SATURATED (PEEDEE FORMATION)
	-11.8	23.7	3	3	3	6				
-15										
	-16.8	28.7	1	4	4	8				
-20										
	-21.8	33.7	20	16	40	56				-23.6 / 35.5
-25										-24.6 / 36.5
	-26.8	38.7	11	100/0.1		100/0.1				
-30										
	-31.8	43.7	23	25	25	50				
-35										
	-36.8	48.7	22	100/0.3		100/0.3				-37.6 / 49.5
-40										-38.6 / 50.5
	-41.8	53.7	3	3	4					
-45										
	-46.8	58.7	3	3	3	6				-48.3 / 60.2

Boring Terminated at Elevation -48.3 ft in Very Dense Sand

NCDOT BORE DOUBLE B4605.GPJ NC_DOT.GDT 7/23/18

GEOTECHNICAL BORING REPORT
BORE LOG

Boring B2-B (left)

WBS	17BP.2.R.91	TIP	B-4605	COUNTY	PITT	GEOLOGIST	Zimarino, S. N.	
SITE DESCRIPTION	BRIDGE NUMBER 5 ON -L- (SR 1777) OVER CHICOD CREEK						GROUND WTR (ft)	
BORING NO. B2-B		STATION 14+37		OFFSET 6 ft RT		ALIGNMENT -L-	0 HR.	N/A
COLLAR ELEV. 12.3 ft		TOTAL DEPTH 55.1 ft		NORTHING 658,533		EASTING 2,532,373	24 HR.	N/A
DRILL RIG/HAMMER EFF./DATE	GFO0075 CME-45C 84% 08/21/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER Smith, R. E.		START DATE 06/28/18		COMP. DATE 06/28/18		SURFACE WATER DEPTH 1.8ft		

Blow count / soil description (B2-B):

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT
	12.3	0.0	2	0	0	0
	7.7	4.6	3	4	4	8
	3.7	8.6	5	3	4	7
	-1.3	13.6	11	11	10	21
	-6.3	18.6	6	9	9	18
	-11.3	23.6	3	3	3	6
	-16.3	28.6	58	12	7	19
	-21.3	33.6	25	46	10	56
	-26.3	38.6	12	14	86/0.4	100/0.9
	-31.3	43.6	24	29	33	62
	-36.3	48.6	9	43	57/0.2	100/0.7
	-41.3	53.6	4	5	5	10

Soil and rock description (B2-B):

WATER SURFACE (06/28/18)

ELEV. (ft)	Description	DEPTH (ft)
12.3	GROUND SURFACE	0.0
9.3	ALLUVIAL — BROWN MUCK, SATURATED	3.0
5.3	ALLUVIAL — GRAY SAND WITH WOOD FRAGMENTS, SATURATED	7.0
0.3	COASTAL PLAIN — GRAY AND GREEN SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	12.0
-9.7	COASTAL PLAIN — GRAY AND GREEN SAND WITH HARD LIMESTONE LAYERS, SATURATED (PEEDEE FORMATION)	22.0
-14.2		26.5
-16.6		28.9
-19.7		32.0
-23.8		36.1
-25.2		37.5
-27.7		40.0
-38.7		51.0
-40.2		52.5
-42.8		55.1

Boring Terminated at Elevation -42.8 ft in Medium Dense Sand

Boring EB2-B (right)

WBS	17BP.2.R.91	TIP	B-4605	COUNTY	PITT	GEOLOGIST	Cornette, C. J.	
SITE DESCRIPTION	BRIDGE NUMBER 5 ON -L- (SR 1777) OVER CHICOD CREEK						GROUND WTR (ft)	
BORING NO. EB2-B		STATION 14+75		OFFSET 17 ft RT		ALIGNMENT -L-	0 HR.	N/A
COLLAR ELEV. 20.9 ft		TOTAL DEPTH 59.5 ft		NORTHING 658,604		EASTING 2,532,423	24 HR.	7.4
DRILL RIG/HAMMER EFF./DATE	GFO0075 CME-45C 84% 08/21/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER Smith, R. E.		START DATE 07/05/18		COMP. DATE 07/05/18		SURFACE WATER DEPTH N/A		

Blow count / soil description (EB2-B):

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT
	20.9	0.0	1	1	1	2
	16.7	4.2	2	1	1	2
	12.9	8.0	WOH	WOH	WOH	0
	7.9	13.0	7	13	12	25
	2.9	18.0	WOR	1	4	5
	-2.1	23.0	6	8	9	17
	-7.1	28.0	6	7	5	12
	-12.1	33.0	3	2	98/0.3	100/0.8
	-17.1	38.0	2	100/0.4		100/0.4
	-22.1	43.0	6	47	18	65
	-27.1	48.0	9	15	12	27
	-32.1	53.0	34	24	21	45
	-37.1	58.0	29	21	24	45

Soil and rock description (EB2-B):

ELEV. (ft)	Description	DEPTH (ft)
20.9	GROUND SURFACE	0.0
	ROADWAY EMBANKMENT — BROWN SAND, MOIST TO SATURATED	
11.7	ALLUVIAL — GRAY SILTY CLAY, WET	9.2
9.9	ALLUVIAL — TAN SAND, SATURATED	11.0
4.9	COASTAL PLAIN — GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	16.0
-10.1	COASTAL PLAIN — GRAY SAND WITH HARD LIMESTONE LAYERS, SATURATED (PEEDEE FORMATION)	31.0
-13.4		34.3
-15.1		36.0
-17.9		38.8
-22.1		43.0
-38.6		59.5

Boring Terminated at Elevation -38.6 ft in Dense Sand

NCDOT BORE DOUBLE B4605 GPJ NC_DOT.GDT 7/23/18