STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

May 13, 2011

MEMORANDUM TO: C. E. (Neil) Lassiter, Jr., P.E.
Division 2 Engineer

ATTENTION: Lang Jones
Division Design Engineer

FROM: CAK Kyung (K. J.) Kim, Ph.D., P.E.
Eastern Regional Geotechnical Manager

STATE PROJECT: 45348.1.1 (BD-5102A)
FEDERAL PROJECT: N/A
COUNTY: Pitt

DESCRIPTION: Bridge No. 104 on SR 1409 (between SR 1411 and SR 1400) over Conetoe Creek

SUBJECT: Bridge Foundation Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and has prepared the foundation design recommendations for the above structure and presents the following project data:

__X__ Bridge Inventory (10) pages

__X__ Foundation Design Recommendations (3) pages

_____ Design Calculations ( ) pages

_____ Special Provisions ( ) pages

Please call Majid Khazaei, P.E. or Chris Kreider, P.E. at (919) 662-4710 if there are any questions concerning this memorandum.

KJK/CAK/MK
Attachment

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FOUNDATION RECOMMENDATIONS

WBS: 45348.1.1

T.I.P. NO.: BD-5102A

COUNTY: Pitt

STATION: 10+40.00 -L-

DESCRIPTION : Bridge No. 104 on SR 1409 (between SR 1411 and SR 1400) over Conetoe Creek

	INITIALS	DATE
DESIGN	MK	4/11/11
CHECK	NAA	5/13/11
APPROVAL	CRK	5/13/11

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036278 ENGINEER MAND KHAZAEI

SIGNATURE 5-13-11

BENT	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT 1	9+93.75 -L-	Cap on HP 12x53 Steel Piles	55 tons/pile	Bottom of Cap El. = 36.0 ft ± Estimated Length of Pile = 40.0 ft ± Number of Piles = 5
BENT 1	10+14.94 -L-	Cap on HP 14x73 Steel Piles	105 tons/pile	Bottom of Cap El. = 36.0 ft ± Point of Fixity = 9 ft ± Tip Elevation No Higher than = 2.5 ft Estimated Length of Pile = 55 ft ± Number of Piles = 7
BENT 2	10+65.06 -L-	Cap on HP 14x73 Steel Piles	105 tons/pile	Bottom of Cap El. = 36.0 ft ± Point of Fixity = 11 ft ± Tip Elevation No Higher than = 4.0 ft Estimated Length of Pile = 55 ft ± Number of Piles = 7
END BENT 2	10+86.25 -L-	Cap on HP 12x53 Steel Piles	55 tons/pile	Bottom of Cap El. = 36.0 ft ± Estimated Length of Pile = 50.0 ft ± Number of Piles = 5

NOTES ON PLANS & COMMENTS

See Following Pages

PREPARED BY: MK
DATE: 4/11/2011
CHECKED BY: NAA
DATE: 9/13/11

FOUNDATION RECOMMENDATION NOTES ON PLANS

1) FOR PILES, SEE SPECIAL PROVISIONS.

2) PILES AT END BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 55 TONS PER PILE. DRIVE PILES TO A REQUIRED DRIVING RESISTANCE OF 100 TONS PER PILE.

3) PILES AT BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 105 TONS PER PILE. DRIVE PILES TO A REQUIRED DRIVING RESISTANCE OF 200 TONS PER PILE. THIS REQUIRED DRIVING RESISTANCE INCLUDES ADDITIONAL RESISTANCE FOR DOWNDRAG OR SCOUR.

4) PILES AT BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 105 TONS PER PILE. DRIVE PILES TO A REQUIRED DRIVING RESISTANCE OF 200 TONS PER PILE. THIS REQUIRED DRIVING RESISTANCE INCLUDES ADDITIONAL RESISTANCE FOR DOWNDRAG OR SCOUR.

5) PILES AT END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 55 TONS PER PILE. DRIVE PILES TO A REQUIRED DRIVING RESISTANCE OF 120 TONS PER PILE.

6) INSTALL PILES AT BENT NO. 1 TO A TIP ELEVATION NO HIGHER THAN 2.5 FT.

7) INSTALL PILES AT BENT NO. 2 TO A TIP ELEVATION NO HIGHER THAN 4.0 FT.

8) SCOUR CRITICAL ELEVATION FOR BOTH BENT NO. 1 AND BENT NO. 2 IS ELEVATION 15.0 FT. SCOUR CRITICAL ELEVATION IS USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

9) IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 35 to 45 FT-KIPS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT END BENT NO. 1 AND END BENT NO. 2. THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH THE PILES PROVISION.

10) IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 40 to 75 FT-KIPS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT BENT NO. 1 AND BENT NO. 2. THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH THE PILES PROVISION.

FOUNDATION RECOMMENDATION COMMENTS

1) 1½:1 (H:V) SLOPE AT THE END BENTS ARE OK WITH SLOPE PROTECTION.

2) REINFORCED BRIDGE APPROACH FILLS ARE REQUIRED AT EACH END BENT.

3) USE BRACE PILES AT BOTH END BENT NO. 1 AND END BENT NO. 2.

4) THE DESIGN SCOUR ELEVATION FOR BENT NO. 1 IS 18.9 FT.

5) THE DESIGN SCOUR ELEVATION FOR BENT NO. 2 IS 18.9 FT.

6) NO WAITING PERIOD IS REQUIRED BEFORE BEGINNING ANY WORK FOR END BENT CONSTRUCTION AFTER COMPLETION OF THE EMBANKMENT AT EACH END BENT.

PILE PAY ITEM QUANTITIES

(Revised 3/4/10)

WBS ELEMENT 45348.1.1 DATE 4/11/2011

TIP NO. BD-5102A DESIGNED BY MK

COUNTY Pitt CHECKED BY NAA 5/13/11

STATION 10+40.00 -L-

DESCRIPTION Bridge No. 104 on SR 1409 (between SR 1411 and SR 1400) over Conetoe Creek

NUMBER OF BENTS WITH PILES _____
NUMBER OF PILES PER BENT _____
NUMBER OF END BENTS WITH PILES _____
NUMBER OF PILES PER END BENT _____

Only required for "Predrilling for Piles" & "Pile Excavation" Pay Items

Bent # or End Bent #	PILE PAY ITEM QUANTITIES							
	Steel Pile Points (yes/no)	Pipe Pile Plates (yes/no/maybe)	Predrilling for Piles (per linear ft)	Pile Redrives (per each)	Pile Excavation (per linear ft)		PDA Testing (per each)	PDA Assistance (per each)
					In Soil	Not In Soil		
End Bent #1	no			3				
Bent #1	no			4				
Bent #2	no			4				
End Bent #2	no			3				
TOTALS			0	14	0	0	0	0

Notes:

Blanks or "no" represent quantity of zero.

If steel pile points are required, Structure Design should calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

If pipe pile plates may be or are required, Structure Design should calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

If PDA testing may be required, show quantities of "PDA Assistance", if applicable, and "PDA Testing" as totals only. If PDA testing is required, show quantities of "PDA Assistance", if applicable, and "PDA Testing" for each specific bent or end bent from the Notes on Plans.

PROJECT: 45348.1.1 ID: BD-5102A

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45348.1.1 (BD-5102A) F.A. PROJ. N/A

COUNTY PITT

PROJECT DESCRIPTION BRIDGE NO. 104 ON SR 1409 OVER CONETOE CREEK AT -L- STA. 10+40

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45348.1.1 (BD-5102A)	1	10

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
45348.1.1		P.E.
		R/W & UTIL.

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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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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 THIS 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.

PERSONNEL

RES

JME

JPD

JRS

INVESTIGATED BY J.L. STONE

CHECKED BY D.N. ARGENBRIGHT

SUBMITTED BY D.N. ARGENBRIGHT

DATE APRIL 2011

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE 4/4/11

DRAWN BY: C.R. SUMNER

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NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
BD-5102A	2 OF 10

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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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	
SYMBOL	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
% PASSING # 10	50 MAX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
# 40	30 MAX	50 MAX	51 MIN											
# 200	15 MAX	25 MAX	10 MAX	35 MAX	35 MAX	35 MAX	35 MAX	36 MIN	36 MIN	36 MIN	36 MIN			
LIQUID LIMIT (PLASTIC INDEX)	6 MAX		NP	40 MAX 10 MAX	41 MIN 10 MAX	40 MAX 11 MIN	41 MIN 11 MIN	40 MAX 10 MAX	41 MIN 10 MAX	40 MAX 11 MIN	41 MIN 11 MIN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	5		4 MAX		8 MAX	12 MAX	16 MAX	20 MAX			
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 A 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/FT²)
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 0.50 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 (COBJ	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F. SD.)	SILT (SL.)	CLAY (CL.)
GRAIN MM 305	75	2.0	0.25	0.05	0.005	
SIZE 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 (PR) PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. ALSO POORLY GRADED
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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
- 25/42 DIP & DIP DIRECTION OF ROCK STRUCTURES
- DPT WH WOH TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF SPT REFUSAL

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
γd - DRY UNIT WEIGHT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:

- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-550
- [X] CME-45B
- [ ] CME-75B
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:

- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 4/5" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:

- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:

- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

HAND TOOLS:

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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 YIELD 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 "CLINK" 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, YIELDS SPT N VALUES > 100 BPF
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS 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 PIECES 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 FEET
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 THE 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, 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 (RESI.) 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.

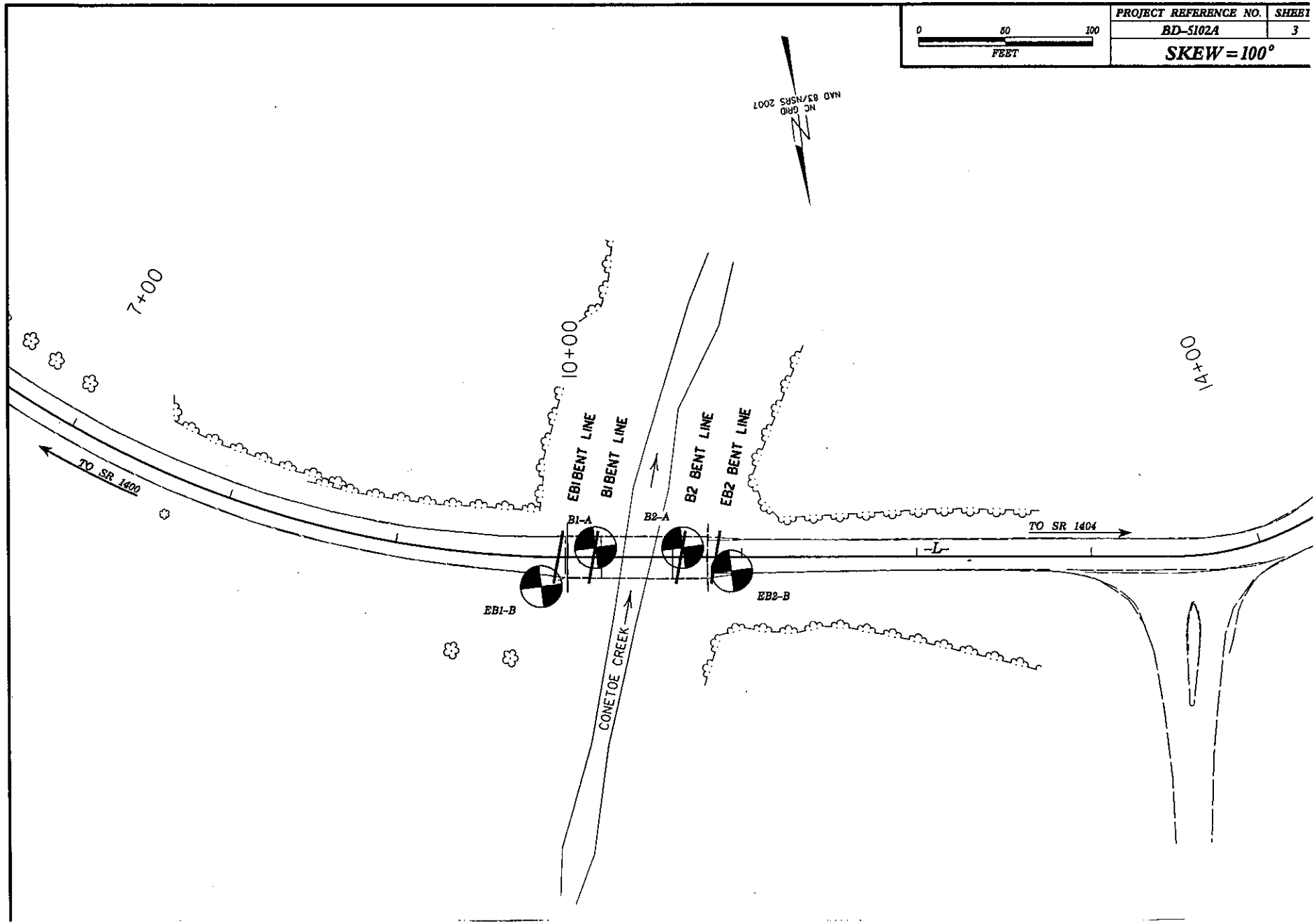
TOPSOIL (TOPS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BRIDGE NAIL AT BASE OF 30" HARDWOOD TREE, APPROXIMATELY AT STA. 8+26, 102' LEFT.

ELEVATION: 37.49 FT.

NOTES:

REVISED 02/23/06

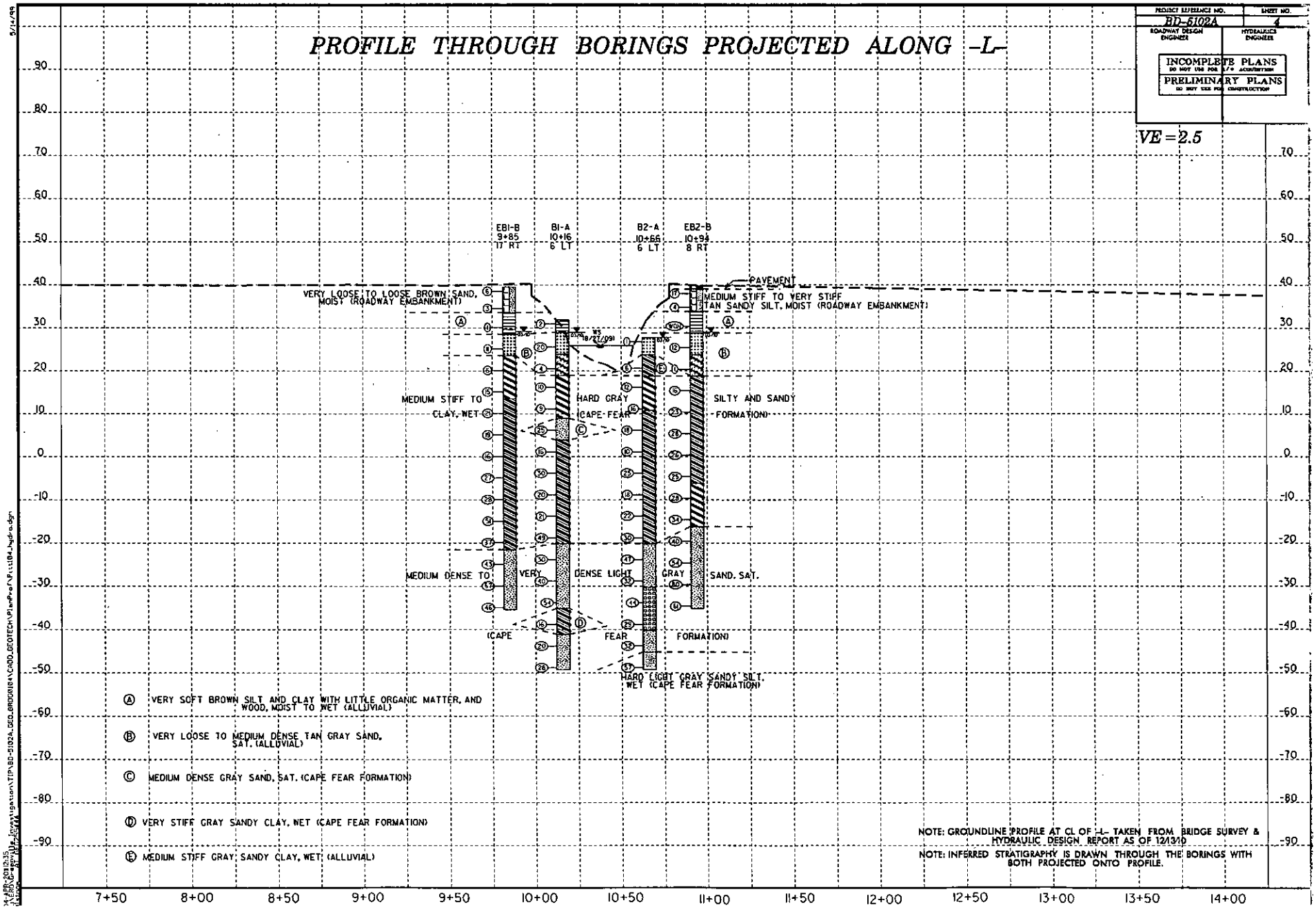

0
50
100
FEET
PROJECT REFERENCE NO.
BD-5102A
SHEET
3
SKEW = 100°
NC GRID
NAD 83/NSRS 2007
7+00
10+00
14+00
EB1 BENT LINE
B1 BENT LINE
B2 BENT LINE
EB2 BENT LINE
B1-A
B2-A
EB1-B
EB2-B
TO SR 1400
TO SR 1404
-L-
CONETOE CREEK

PROFILE THROUGH BORINGS PROJECTED ALONG -L-

PROJECT REFERENCE NO.	SHEET NO.
BD-5102A	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

VE = 2.5



Ⓐ VERY SOFT BROWN SILT AND CLAY WITH LITTLE ORGANIC MATTER, AND WOOD, MOIST TO WET (ALLUVIAL)

Ⓑ VERY LOOSE TO MEDIUM DENSE TAN GRAY SAND, SAT. (ALLUVIAL)

Ⓒ MEDIUM DENSE GRAY SAND, SAT. (CAPE FEAR FORMATION)

Ⓓ VERY STIFF GRAY SANDY CLAY, WET (CAPE FEAR FORMATION)

Ⓔ MEDIUM STIFF GRAY SANDY CLAY, WET (ALLUVIAL)

NOTE: GROUNDLINE PROFILE AT CL OF -L- TAKEN FROM BRIDGE SURVEY & HYDRAULIC DESIGN REPORT AS OF 12/13/10

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

5/14/99

04-APR-2011 12:35
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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45348.1.1	TIP BD-5102A	COUNTY PITT	GEOLOGIST Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 104 ON -L- (SR 1409) OVER CONETOE CREEK			GROUND WTR (ft)
BORING NO. EB1-B	STATION 9+85	OFFSET 17 ft RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 39.5 ft	TOTAL DEPTH 74.9 ft	NORTHING 740,335	EASTING 2,455,584	24 HR. 10.4
DRILL RIG/HAMMER EFF./DATE GFO0062 CME-45B 83% 12/12/2005		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Smith, R. E.	START DATE 03/10/10	COMP. DATE 03/10/10	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										39.5 GROUND SURFACE	0.0
	39.5	0.0	2	3	3	6	SS-95			ROADWAY EMBANKMENT BROWN SAND, MOIST (ROADWAY EMBANKMENT)	
35	35.5	4.0	2	1	2	3				33.5	6.0
	31.1	8.4								ALLUVIAL BROWN SILT WITH LITTLE ORGANIC MATTER, MOIST TO WET	
30			1	1	0	1	SS-96	▼		28.5	11.0
	26.1	13.4								ALLUVIAL TAN SAND, SAT. (ALLUVIAL)	
25			6	6	5	11	SS-97			23.5	16.0
	21.1	18.4								COASTAL PLAIN GRAY SANDY AND SILTY CLAY, WET (CAPE FEAR FORMATION)	
20			2	2	3	5	SS-98				
	16.1	23.4									
15			5	7	8	15				13.5	26.0
	11.1	28.4									
10			5	8	13	21	SS-99				
	6.1	33.4									
5			6	8	11	19	SS-100				
	1.1	38.4									
0			5	8	8	16					
	-3.9	43.4									
-5			10	11	16	27					
	-8.9	48.4									
-10			9	12	16	28	SS-101				
	-13.9	53.4									
-15			14	20	31	51					
	-18.9	58.4									
-20			12	16	21	37				-21.5 COASTAL PLAIN LIGHT GRAY SAND, SAT. (CAPE FEAR FORMATION)	61.0
	-23.9	63.4									
-25			11	16	27	43	SS-102				
	-28.9	68.4									
-30			12	22	35	57					
	-33.9	73.4									
-35			27	20	26	46				-35.4 Boring Terminated at Elevation -35.4 ft IN DENSE SAND	74.9

NCDOT BORE DOUBLE PITT104_BORINGS.GPJ NC_DOT.GDT 4/4/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45348.1.1	TIP BD-5102A	COUNTY PITT	GEOLOGIST DeLoatch, J. P.
SITE DESCRIPTION BRIDGE NO. 104 ON -L- (SR 1409) OVER CONETOE CREEK			GROUND WTR (ft)
BORING NO. B1-A	STATION 10+16	OFFSET 6 ft LT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 31.9 ft	TOTAL DEPTH 81.2 ft	NORTHING 740,335	EASTING 2,455,661 / 24 HR. 2.0
DRILL RIG/HAMMER EFF./DATE GFO0062 CME-45B 83% 12/12/2005		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Smith, R. E.	START DATE 03/14/11	COMP. DATE 03/15/11	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)
35											
	31.9	0.0	WOH	WOH	2	2	SS-11			31.9 GROUND SURFACE	0.0
30										ALLUVIAL BROWN SANDY CLAY WITH LITTLE ORGANIC MATTER AND WOOD, WET	
	28.9	3.0								ALLUVIAL GRAY SAND WITH WOOD FRAGMENTS, SAT.	
25	26.6	5.4	6	11	9	20					
	23.9	8.0									
20	22.2	9.7	2	2	2	4	SS-12				
	18.9	13.0								COASTAL PLAIN GRAY SANDY CLAY, WET (CAPE FEAR FORMATION)	
15	17.2	14.7	3	4	6	10	SS-13				
10	12.2	19.7	3	4	5	9					
	8.9	23.0								COASTAL PLAIN GRAY SAND, SAT. (CAPE FORMATION)	
5	7.2	24.7	8	12	13	25	SS-14				
	3.9	28.0								COASTAL PLAIN GRAY SANDY AND SILTY CLAY, WET (CAPE FEAR FORMATION)	
0	2.2	29.7	6	6	10	16					
-5	-2.8	34.7	8	14	16	30	SS-15	28%			
-10	-7.8	39.7	8	9	11	20					
-15	-12.8	44.7	7	9	12	21	SS-16				
-20	-17.8	49.7	9	12	37	49				-20.1 COASTAL PLAIN LIGHT GRAY SAND, SAT. (CAPE FEAR FORMATION)	52.0
-25	-22.8	54.7	15	16	14	30	SS-17				
-30	-27.8	59.7	10	23	17	40					
-35	-32.8	64.7	10	19	35	54	SS-18			-35.1 COASTAL PLAIN GRAY SANDY CLAY, WET (CAPE FEAR FORMATION)	67.0
-40	-37.8	69.7	3	7	9	16	SS-19	23%			
										-41.1 COASTAL PLAIN LIGHT GRAY SAND, SAT. (CAPE FEAR FORMATION)	73.0
-45	-42.8	74.7	6	11	9	20	SS-20				

WBS 45348.1.1	TIP BD-5102A	COUNTY PITT	GEOLOGIST DeLoatch, J. P.
SITE DESCRIPTION BRIDGE NO. 104 ON -L- (SR 1409) OVER CONETOE CREEK			GROUND WTR (ft)
BORING NO. B1-A	STATION 10+16	OFFSET 6 ft LT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 31.9 ft	TOTAL DEPTH 81.2 ft	NORTHING 740,335	EASTING 2,455,661 / 24 HR. 2.0
DRILL RIG/HAMMER EFF./DATE GFO0062 CME-45B 83% 12/12/2005		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Smith, R. E.	START DATE 03/14/11	COMP. DATE 03/15/11	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
-45										Match Line
	-47.8	79.7	10	15	13	28				COASTAL PLAIN LIGHT GRAY SAND, SAT. (CAPE FEAR FORMATION) *(continued)*
										-49.3 Boring Terminated at Elevation -49.3 ft IN MEDIUM DENSE SAND 81.2

NCDOT BORE DOUBLE PITT104_BORINGS.GPJ NC_DOT.GDT 4/4/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45348.1.1	TIP BD-5102A	COUNTY PITT	GEOLOGIST Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 104 ON -L- (SR 1409) OVER CONETOE CREEK			GROUND WTR (ft)
BORING NO. B2-A	STATION 10+66	OFFSET 6 ft LT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 27.8 ft	TOTAL DEPTH 77.1 ft	NORTHING 740,341	EASTING 2,455,612 / 24 HR. 0.0
DRILL RIG/HAMMER EFF./DATE GFO0062 CME-45B 83% 12/12/2005		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Smith, R. E.	START DATE 03/14/11	COMP. DATE 03/14/11	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											
	27.8	0.0	WOH	WOH	1	1	SS-1			27.8 GROUND SURFACE TAN SAND, MOIST TO SAT.	0.0
25										23.8 ALLUVIAL GRAY SANDY CLAY, WET	4.0
	21.8	6.2	3	3	3	6	SS-2				
20										18.8 COASTAL PLAIN GRAY SILTY AND SANDY CLAY, WET (CAPE FEAR FORMATION)	9.0
	17.2	10.6	4	5	7	12	SS-3				
15											
	12.2	15.6	4	6	10	16				10.8	17.0
10											
	7.2	20.6	6	7	11	18	SS-4				
5											
	2.2	25.6	4	5	5	10					
0											
	-2.8	30.6	11	11	14	25	SS-5				
-5											
	-7.8	35.6	7	8	10	18					
-10											
	-12.8	40.6	7	10	12	22	SS-6				
-15											
	-17.8	45.6	11	13	17	30				-20.2 COASTAL PLAIN LIGHT GRAY SAND, SAT. (CAPE FEAR FORMATION)	48.0
-20											
	-22.8	50.6	12	22	25	47	SS-7				
-25											
	-27.8	55.6	10	16	16	32				-30.2	58.0
-30											
	-32.8	60.6	14	20	24	44	SS-8				
-35											
	-37.8	65.6	15	14	15	29				-40.2	68.0
-40											
	-42.8	70.6	8	14	18	32	SS-9			-45.2 COASTAL PLAIN LIGHT GRAY SANDY SILT, WET (CAPE FEAR FORMATION)	73.0
-45											
	-47.8	75.6	17	25	32	57	SS-10			-49.3	77.1

WBS 45348.1.1	TIP BD-5102A	COUNTY PITT	GEOLOGIST Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 104 ON -L- (SR 1409) OVER CONETOE CREEK			GROUND WTR (ft)
BORING NO. B2-A	STATION 10+66	OFFSET 6 ft LT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 27.8 ft	TOTAL DEPTH 77.1 ft	NORTHING 740,341	EASTING 2,455,612 / 24 HR. 0.0
DRILL RIG/HAMMER EFF./DATE GFO0062 CME-45B 83% 12/12/2005		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Smith, R. E.	START DATE 03/14/11	COMP. DATE 03/14/11	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
										Boring Terminated at Elevation -49.3 ft IN HARD SANDY SILT

NCDOT BORE DOUBLE PITT104_BORINGS.GPJ NC_DOT.GDT 4/4/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45348.1.1	TIP BD-5102A	COUNTY PITT	GEOLOGIST Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 104 ON -L- (SR 1409) OVER CONETOE CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 10+94	OFFSET 8 ft RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 39.8 ft	TOTAL DEPTH 74.9 ft	NORTHING 740,335	EASTING 2,455,693	24 HR. 10.8
DRILL RIG/HAMMER EFF./DATE GFO0062 CME-45B 83% 12/12/2005		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Smith, R. E.	START DATE 03/09/10	COMP. DATE 03/09/10	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											
	39.0	0.8	5	10	7	17	SS-87			39.8 GROUND SURFACE	0.0
										39.0 PAVEMENT	0.8
										ROADWAY EMBANKMENT TAN SANDY SILT, MOIST	
35	35.8	4.0	2	2	2	4				33.8	6.0
										ALLUVIAL BROWN SILT WITH LITTLE ORGANIC MATTER, MOIST TO WET	
30	31.4	8.4	WOH	WOH	WOH	0	SS-88			28.8	11.0
										ALLUVIAL GRAY SAND, SAT.	
25	26.4	13.4	2	5	7	12	SS-89			23.8	16.0
20	21.4	18.4	WOH	WOH	1	1	SS-90			18.8	21.0
										COASTAL PLAIN GRAY SILTY AND SANDY CLAY, WET (CAPE FEAR FORMATION)	
15	16.4	23.4	4	7	9	16	SS-91				
10	11.4	28.4	3	8	15	23					
5	6.4	33.4	9	13	15	28	SS-92				
0	1.4	38.4	9	13	13	26					
-5	-3.6	43.4	6	8	17	25				-6.2	46.0
-10	-8.6	48.4	6	14	14	28	SS-93				
-15	-13.6	53.4	9	14	20	34				-16.2	50.0
										COASTAL PLAIN LIGHT GRAY SAND, SAT. (CAPE FEAR FORMATION)	
-20	-18.6	58.4	16	18	22	40					
-25	-23.6	63.4	15	28	28	54	SS-94				
-30	-28.6	68.4	20	35	45	80					
-35	-33.6	73.4	30	31	30	61				-35.1	74.9
										Boring Terminated at Elevation -35.1 ft IN VERY DENSE SAND	

NCDOT BORE DOUBLE PITT104_BORINGS.GPJ NC_DOT.GDT 4/4/11

BD-5102A

45348.1.1

BRIDGE NO. 104 ON SR 1409 OVER CONETOE CREEK

SOIL TEST RESULTS EB1-B

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-95	17 RT	9+85	0.0-1.5	A-2-4(0)	24	NP	41.6	42.4	9.9	6.1	92	71	18	-	-
SS-96	17 RT	9+85	8.4-9.9	NOT	ENOUGH	SAMPLE									6.3
SS-97	17 RT	9+85	13.4-14.9	A-3(0)	26	NP	33.1	63.4	3.5	0.0	98	90	5	-	-
SS-98	17 RT	9+85	18.4-19.9	A-7-6(13)	52	25	21.2	23.4	33.1	22.2	95	85	59	-	-
SS-99	17 RT	9+85	28.4-29.9	A-6(14)	38	19	3.4	29.3	43.0	24.2	100	99	77	-	-
SS-100	17 RT	9+85	33.4-34.9	A-6(15)	36	21	2.4	28.9	30.3	38.4	100	100	78	-	-
SS-101	17 RT	9+85	48.4-49.9	A-6(19)	39	23	2.2	25.1	46.5	26.3	100	99	84	-	-
SS-102	17 RT	9+85	63.4-64.9	A-2-4(0)	22	NP	45.1	43.8	5.1	6.1	100	97	12	-	-

SOIL TEST RESULTS B1-A

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-11	6 LT	10+16	0.0-1.5	A-6(3)	29	12	5.2	50.1	16.6	28.1	100	99	50	-	-
SS-12	6 LT	10+16	9.7-11.2	A-2-6(0)	33	13	59.7	18.0	12.2	10.0	92	60	22	-	-
SS-13	6 LT	10+16	14.7-16.2	A-7-6(29)	54	33	6.4	13.2	48.3	32.1	97	93	84	-	-
SS-14	6 LT	10+16	24.7-26.2	A-2-4(0)	28	7	3.6	68.9	23.4	4.0	100	99	35	-	-
SS-15	6 LT	10+16	34.7-36.2	A-6(11)	33	18	2.6	36.7	44.7	16.0	100	99	75	27.9	-
SS-16	6 LT	10+16	44.7-46.2	A-6(8)	33	17	2.8	45.5	35.7	16.0	99	98	62	-	-
SS-17	6 LT	10+16	54.7-56.2	A-2-4(0)	23	NP	29.5	56.5	6.0	8.0	100	88	16	-	-
SS-18	6 LT	10+16	64.7-66.2	A-2-4(0)	19	NP	29.7	59.3	5.0	6.0	97	94	12	-	-
SS-19	6 LT	10+16	69.7-71.2	A-6(13)	39	23	4.4	36.5	37.1	22.0	96	94	68	23.1	-
SS-20	6 LT	10+16	74.7-76.2	A-2-4(0)	31	NP	62.1	27.3	10.6	0.0	99	73	13	-	-

SOIL TEST RESULTS B2-A

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-1	6 LT	10+66	0.0-1.5	A-3(0)	22	NP	55.9	36.7	5.4	2.0	98	68	9	-	-
SS-2	6 LT	10+66	6.2-7.7	A-6(8)	39	20	22.6	27.5	33.9	16.0	98	87	57	-	-
SS-3	6 LT	10+66	10.6-12.1	A-7-6(24)	49	29	4.2	24.8	46.9	24.0	98	95	81	-	-
SS-4	6 LT	10+66	20.6-22.1	A-6(9)	36	17	5.6	44.5	37.9	12.0	100	98	66	-	-
SS-5	6 LT	10+66	30.6-32.1	A-6(13)	38	19	3.0	32.5	36.5	28.1	100	99	75	-	-
SS-6	6 LT	10+66	40.6-42.1	A-6(7)	29	14	12.2	31.9	35.9	20.0	100	94	70	-	-
SS-7	6 LT	10+66	50.6-52.1	A-2-4(0)	20	NP	53.5	33.9	4.6	8.0	100	89	14	-	-
SS-8	6 LT	10+66	60.6-62.1	A-1-b(0)	18	NP	72.7	18.2	7.0	2.0	94	50	10	-	-
SS-9	6 LT	10+66	70.6-72.1	A-2-4(0)	26	8	56.3	24.6	15.0	4.0	98	70	20	-	-
SS-10	6 LT	10+66	75.6-77.1	A-4(0)	21	3	18.0	49.7	24.2	8.0	100	97	40	-	-

SOIL TEST RESULTS EB2-B

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-87	8 RT	10+94	0.8-2.3	A-4(0)	18	NP	13.9	59.0	19.0	8.1	97	92	36	-	-
SS-88	8 RT	10+94	8.4-9.9	NOT	ENOUGH	SAMPLE									6.6
SS-89	8 RT	10+94	13.4-14.9	A-3(0)	25	NP	33.9	60.0	4.0	2.0	65	62	5	-	-
SS-90	8 RT	10+94	18.4-19.9	A-2-6(0)	33	12	52.7	23.6	13.5	10.1	100	73	26	-	-
SS-91	8 RT	10+94	23.4-24.9	A-6(11)	39	20	3.8	45.1	37.0	14.1	100	98	66	-	-
SS-92	8 RT	10+94	33.4-34.9	A-6(2)	31	15	8.7	53.5	25.7	12.1	100	98	41	-	-
SS-93	8 RT	10+94	48.4-49.9	A-7-6(34)	50	35	0.6	15.4	39.6	44.4	100	100	92	-	-
SS-94	8 RT	10+94	63.4-64.9	A-2-4(0)	22	NP	36.2	50.9	4.8	8.1	100	91	15	-	-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 45348.1.1 TIP: BD-5102A COUNTY: PITT

DESCRIPTION(1): BRIDGE NO. 104 ON SR 1409 OVER CONETOE CREEK

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos ____)
Other (explain) BSR

Bridge No.: 104 Length: 80 Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
Foundation Type: TIMIBER PILES

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: SCOUR NOTED ALONG TOE OF EACH END SLOPE

Interior Bents: SCOUR POCKETS NOTED AROUND BOTH INTERIOR BENTS

Channel Bed: NONE NOTED

Channel Bank: NONE NOTED

EXISTING SCOUR PROTECTION

Type(3): CONCRETE END WALLS

Extent(4): 8' OUTSIDE EDGE OF BRIDGE, BOTH END BENTS

Effectiveness(5): EFFECTIVE

Obstructions(6): NONE NOTED

INSTRUCTIONS

1 Describe the specific site's location, including route number and body of water crossed.
2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
3 Note existing scour protection (e.g. rip rap).
4 Describe extent of existing scour protection.
5 Describe whether or not the scour protection appears to be working.
6 Note obstructions such as dams, fallen trees, debris at bents, etc.
7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
10 Determine the approximate floodplain width from field observation or a topographic map.
11 Describe the material covering the floodplain (e.g. grass, trees, crops).
12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): SAND

Channel Bank Material(8): SILT AND CLAY WITH LITTLE ORGANIC MATTER

Channel Bank Cover(9): TREES AND SHRUBS

Floodplain Width(10): 200' (±)

Floodplain Cover(11): TREES AND SHRUBS

Stream is(12): Aggrading ____ Degrading X Static ____

Channel Migration Tendency(13): UNLIKELY, STREAM IS CHANNELIZED

Observations and Other Comments: STREAM IS CHANNELIZED

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS B1	B2									
18.9±	18.9±									

Comparison of DSE to Hydraulics Unit theoretical scour:
BASED ON THIS GEOTECHNICAL INVESTIGATION THE DSE SHOULD SHOULD BE RAISED 8.9'± FROM THE THEORETICAL SCOUR ELEVATION OUTLINED IN THE BSR REPORT DATED 12/13/10

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

See SheetS 9
"Soil Test Results",
for samples:
(CHANNEL BED) SS-1
(CHANNEL BANK) SS-11,SS-88

Template Revised 02/07/06

Reported by: [signature] Date: 3/31/2011