STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33558.1.1 (B-4212)	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33558.1.1 (B-4212) F.A. PROJ. BRSTP-35(1)

COUNTY NORTHAMPTON

PROJECT DESCRIPTION BRIDGE NO. 77 ON NC 35 OVER KIRBY'S CREEK AT -L- STATION 26+25

ID: B-4212

PROJECT: 33558.1.1

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CAUTION NOTICE

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INVESTIGATED BY D.N. ARGENBRIGHT

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DATE DECEMBER, 2006

NORTH CAROLINA LICENSED SEAL 1050 GEOLOGIST D.N. ARGENBRIGHT 12-6-06

DRAWN BY: J.R. MATULA, C.M. KENT

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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.
B-4212	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 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	
	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											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#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			
LIQUID LIMIT	6 MX		NP	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
PLASTIC INDEX				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 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	<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 0.50
	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	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
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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

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
- MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-__
- [ ] BK-51
- [X] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] __ CME-45B
- [ ] __

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 15/16 " 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 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, 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 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 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 (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: BM-11RR SPIKE IN BASE OF 30" GUM 27.1' LT STA. 23+69 -BL-

ELEVATION: 43.93 FT.

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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LYNDO TIPPETT
SECRETARY

December 6, 2006

STATE PROJECT: 33558.1.1 B-4212
F.A. PROJECT: BRSTP-35(1)
COUNTY: Northampton
DESCRIPTION: Bridge No. 77 on NC 35 over Kirby's Creek at -L- Sta. 26+25

SUBJECT: Geotechnical Report – Structure Inventory

Site Description

The proposed bridge site is located approximately 2 miles north of Conway at the existing NC 35 bridge over Kirby's Creek. The replacement structure will be constructed along the existing alignment. Based on the proposed design, the new bridge will have four spans having a total length of 230 feet. The bents will have a variable skew from 130° 01' 00" at End Bent 1 to 139° 59' 00" at End Bent 2.

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. The borings were made with an ATV mounted CME 45 drill machine. All borings were advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by recent alluvial deposits, Pliocene age sediments of the Yorktown Formation and Cretaceous marine sediments of the Cape Fear Formation. Kirby's Creek is a slow flowing stream typically 40 to 60 feet wide and 3 to 9 feet deep. Topography along the project is nearly flat to gently sloping. Elevations at the site range from 31± feet along the streambed to 51± feet along the existing NC 35 embankment. The existing approach embankments are bordered by a 1300± feet wide flood plain lying at elevations ranging from 40± to 45± feet.

Groundwater in the borings and the water surface of Kirby's Creek were measured at an elevation of 42± feet at the time of this investigation.

Soil Description

Alluvial soils consist of 6 to 11 feet of very loose to medium dense sand (A-2-4) underlain by 2 to 5 feet of very soft to soft sandy clay (A-6). The sandy clay layer was not encountered at End Bent 1 or End Bent 2. The Yorktown Formation underlies the alluvial soils from an elevation of 28 to 35 feet. Soils in the Yorktown Formation consist of 44 to 51 feet of soft to medium stiff clayey and sandy silt (A-4, A-5) and very loose to loose sand (A-2-4, A-1-b) with shell fragments. A Shelby Tube (ST-1) was collected in the soft silt soils and submitted for Triaxial CU testing. Soils belonging to the Cretaceous age Cape Fear Formation underlie the Yorktown Formation at elevations ranging from -14 to -17 feet. Soils in the Cape Fear Formation consist of slightly micaceous medium dense to very dense sand (A-2-4, A-3, A-1-b). In boring EB1-A and B1-A, a 5 to 15 feet thick discontinuous layer of hard sandy silt (A-4, A-5) was encountered at an elevation of -26± feet.

Based on the proposed design, the existing grade will be raised approximately 2± feet at the bridge site. The existing roadway embankment at the end bents and Bent 3 consists of very loose to dense sand (A-2-4). Some additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

Notice

This Geotechnical Foundation Report is based on the Bridge Survey and Hydraulic Design Report for Kirby's Creek dated July 17, 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

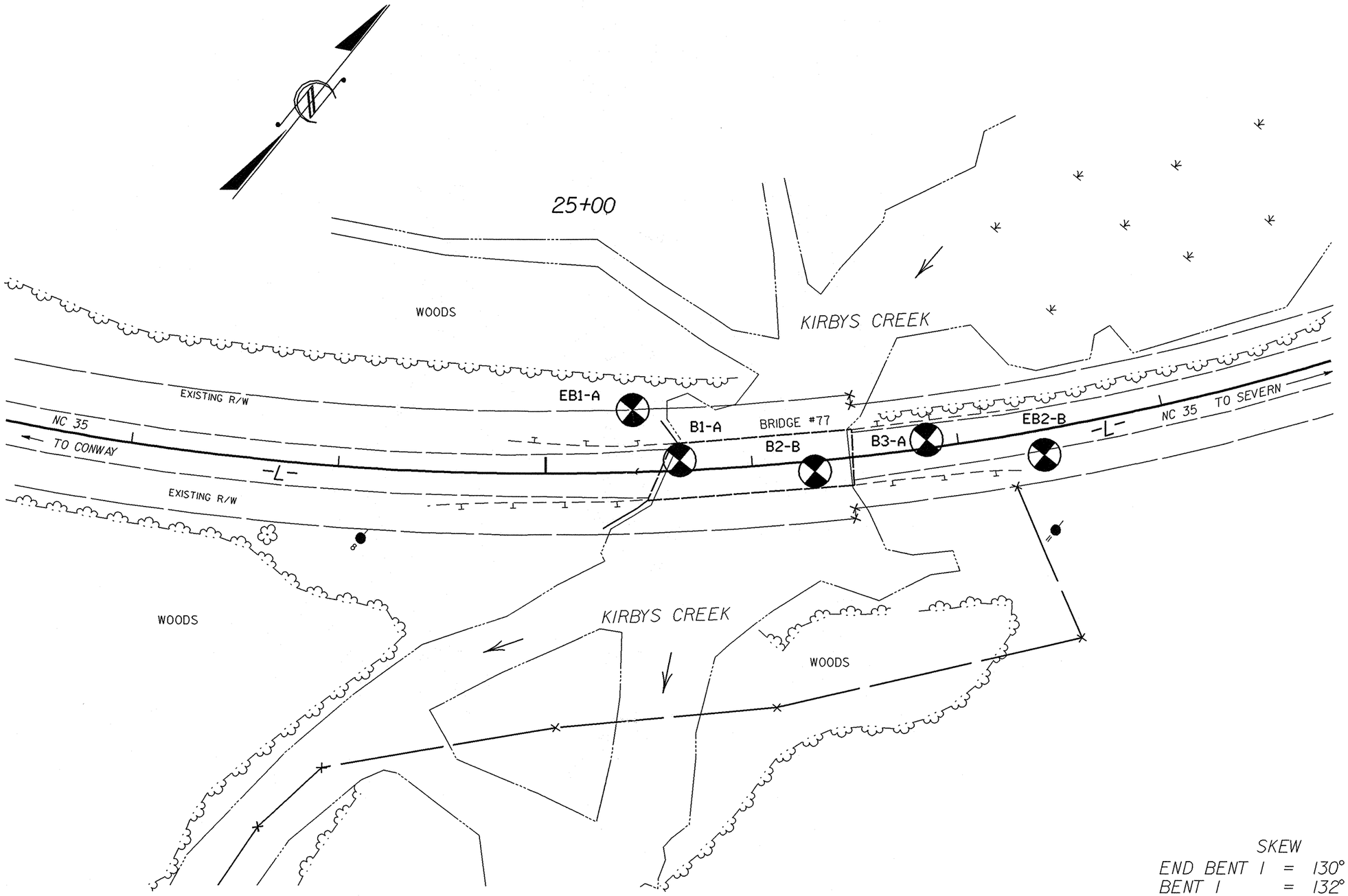
Prepared By:

Dean N. Argenbright, L.G.
Regional Geological Engineer

0	50	100
FEET		

PROJECT REFERENCE NO.	SHEET
33558.1.1 (B-4212)	4

SITE PLAN



SKEW

END BENT 1 = 130° 01' 00"
BENT 1 = 132° 24' 00"
BENT 2 = 135° 13' 00"
BENT 3 = 137° 36' 00"
END BENT 2 = 139° 59' 00"

PROJECT REFERENCE NO.	SHEET
33558.1.1 (B-4212)	5

0 20 40 FEET

BORINGS PROJECTED ON -L- PROFILE

EB1-A 25+43 30 LT

B1-A 25+65 5 LT

B2-B 26+30 5 RT

B3-A 26+85 4 LT

EB2-B 27+40 12 RT

WATER SURFACE

Ⓑ

Ⓐ

Ⓒ

02/04

09/06

ST-1

VERY SOFT TO SOFT

SOFT TO MEDIUM STIFF GRAY CLAYEY FRAGMENTS.WET TO SATURATED

GRAY SANDY CLAY,WET (ALLUVIUM)

SANDY SILT AND VERY LOOSE TO (YORKTOWN FORMATION)

VERY LOOSE TO MEDIUM DENSE TAN BROWN SAND, SATURATED (ROADWAY EMBANKMENT)

TAN BROWN SAND,MOIST TO SATURATED (ALLUVIUM)

LOOSE GRAY SAND WITH SHELL

MEDIUM DENSE TO VERY DENSE GRAY GREEN SLIGHTLY MICACEOUS SAND. SATURATED (CAPE FEAR FORMATION)

HARD GRAY GREEN SANDY SLIGHTLY MICACEOUS SILT.WET

80 60 40 20 0 -20 -40 -60 -80 -100

+20 +40 +60 +80 26+00 +20 +40 +60 +80 27+00 +20 +40 +60 +80

Ⓐ VERY LOOSE TO MEDIUM DENSE TAN BROWN SAND,MOIST TO SATURATED (ROADWAY EMBANKMENT)

Ⓑ VERY LOOSE TO LOOSE TAN BROWN SAND.MOIST TO SATURATED (ALLUVIUM)

Ⓒ MEDIUM DENSE TAN BROWN SAND,MOIST TO SATURATED (ALLUVIUM)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton		**GEOLOGIST** Quick, K. B.	
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek				**GROUND WTR (ft)**	
BORING NO. EB1-A	**STATION** 25+43	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 45.4 ft	**TOTAL DEPTH** 89.6 ft	**NORTHING** 989,311	**EASTING** 2,527,389	**24 HR.**	3.4
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic		
START DATE 02/11/04	**COMP. DATE** 02/11/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A		

ELEV. (ft)	ELEV. 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)
45.4									GROUND SURFACE	0.0
41.4	0.0	1	2	1	3				TAN SAND, MOIST TO WET (ALLUVIUM)	
	4.0	2	2	2	4	SS-1				
37.3	8.1	2	2	4	6					
32.3	13.1	2	2	3	5	SS-2				
27.3	18.1	2	1	2	3					
22.3	23.1	2	2	2	4					
17.3	28.1	2	3	3	6					
12.3	33.1	3	3	4	7	SS-3				
7.3	38.1	1	2	3	5	SS-4				
2.3	43.1	2	2	2	4					
-2.7	48.1	2	2	2	4					
-7.7	53.1	2	4	3	7	SS-5				
-12.7	58.1	3	4	6	10					
-17.7	63.1	10	10	11	21	SS-6				
-22.7	68.1	12	13	16	29					
-27.7	73.1	14	18	18	36	SS-7				
34.4	11.0								TAN SAND, MOIST TO WET (ALLUVIUM)	
14.4	31.0								GRAY SAND WITH SHELL FRAGMENTS, SATURATED	
-16.7	62.1								GRAY GREEN SLIGHTLY MICACEOUS SAND, SATURATED (CAPE FEAR FORMATION)	
-25.6	71.0								GRAY GREEN SLIGHTLY MICACEOUS SANDY SILT, WET	

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton		**GEOLOGIST** Quick, K. B.	
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek				**GROUND WTR (ft)**	
BORING NO. EB1-A	**STATION** 25+43	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 45.4 ft	**TOTAL DEPTH** 89.6 ft	**NORTHING** 989,311	**EASTING** 2,527,389	**24 HR.**	3.4
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic		
START DATE 02/11/04	**COMP. DATE** 02/11/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A		

ELEV. (ft)	ELEV. 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					Match Line				
	-32.7								
	78.1	8	12	15	27	SS-8			
-35	-37.7								
	83.1	15	18	15	33	SS-9			
-40	-42.7								
	88.1	21	18	18	36				
-45									
-50									
-55									
-60									
-65									
-70									
-75									
-80									
-85									
-90									
-95									
-100									
-105									
-30.6	76.0								GRAY GREEN SLIGHTLY MICACEOUS SAND, SATURATED
-35.6	81.0								
-44.2	89.6								Boring Terminated at Elevation -44.2 ft in dense sand

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton	**GEOLOGIST** Swartley, J. R
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 25+65	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 33.6 ft	**TOTAL DEPTH** 82.7 ft	**NORTHING** 989,307	**EASTING** 2,527,422	**24 HR.** N/A
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/11/06	**COMP. DATE** 09/12/06	**SURFACE WATER DEPTH** 5.8 ft	**DEPTH TO ROCK** N/A

ELEV. (ft)	ELEV. 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)
									WATER SURFACE (09/11/06)	
	33.6								33.6 GROUND SURFACE	0.0
	0.0	WOH	2	0	2					
	30.6								31.1 GRAY SANDY CLAY, WET (ALLUVIUM)	2.5
	3.0	1	1	2	3	SS-10	24%			
	27.4								28.1	5.5
	6.2	1	2	2	4				GRAY CLAYEY AND SANDY SILT WITH SHELL FRAGMENTS, WET (YORKTOWN FORMATION)	
	22.4									
	11.2	1	2	2	4					
	17.4									
	16.2	1	2	4	6					
	12.4									
	21.2	1	2	4	6					
	7.4									
	26.2	1	3	3	6					
	2.4									
	31.2	1	1	1	2	SS-11				
	-2.6									
	36.2	1	1	1	2					
	-7.6									
	41.2	1	1	1	2	SS-12				
	-12.6									
	46.2	WOH	1	2	3					
	-17.6								-15.4	49.0
	51.2	9	14	17	31	SS-13			GRAY GREEN SLIGHTLY MICACEOUS SAND, SATURATED (CAPE FEAR FORMATION)	
	-22.6									
	56.2	15	21	23	44					
	-27.6								-26.4	60.0
	61.2	11	16	18	34	SS-14			GRAY GREEN SLIGHTLY MICACEOUS SANDY SILT, WET	
	-32.6									
	66.2	8	14	19	33					
	-37.6								-35.4	69.0
	71.2	10	13	23	36	SS-15			GRAY GREEN SLIGHTLY MICACEOUS SAND, SAT	

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton	**GEOLOGIST** Swartley, J. R
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 25+65	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 33.6 ft	**TOTAL DEPTH** 82.7 ft	**NORTHING** 989,307	**EASTING** 2,527,422	**24 HR.** N/A
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/11/06	**COMP. DATE** 09/12/06	**SURFACE WATER DEPTH** 5.8 ft	**DEPTH TO ROCK** N/A

ELEV. (ft)	ELEV. 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				
	-42.6								
	76.2	11	15	15	30				GRAY GREEN SLIGHTLY MICACEOUS SAND, SAT *(continued)*
	-47.6								
	81.2	9	16	17	33	SS-16			
-49.1	82.7								Boring Terminated at Elevation -49.1 ft in dense sand

Other Samples:
ST-1 (7.7 - 9.7)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton		**GEOLOGIST** Swartley, J. R	
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek				**GROUND WTR (ft)**	
BORING NO. B2-B	**STATION** 26+30	**OFFSET** 5 ft RT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 31.3 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 989,345	**EASTING** 2,527,476	**24 HR.**	N/A
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic		
START DATE 09/12/06	**COMP. DATE** 09/12/06	**SURFACE WATER DEPTH** 7.9 ft		**DEPTH TO ROCK** N/A	

ELEV. (ft)	ELEV. 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)
									WATER SURFACE (09/12/06)	
	31.3								GROUND SURFACE	0.0
	0.0	1	0	1	1	SS-17			GRAY SANDY CLAY, WET (ALLUVIUM)	
	26.4									3.0
	4.9	1	2	2	4				GRAY CLAYEY SILT WITH SHELL FRAGMENTS, WET (YORKTOWN FORMATION)	
	23.2									7.0
	8.1	1	1	3	4	SS-18				
	18.2									11.0
	13.1	1	3	3	6				GRAY SAND WITH SHELL FRAGMENTS, SATURATED	
	13.2									
	18.1	2	2	2	4	SS-19				
	8.2									
	23.1	1	2	3	5					
	3.2									
	28.1	1	1	1	2	SS-20				
	-1.8									
	33.1	WOH	1	1	2					
	-6.8									
	38.1	WOH	1	1	2	SS-21				
	-11.8									
	43.1	1	1	1	2					
	-16.8									
	48.1	9	11	16	27	SS-22				
	-21.8									
	53.1	8	16	22	38					
	-26.8									
	58.1	16	18	19	37	SS-23				
	-31.8									
	63.1	7	12	17	29					
	-36.8									
	68.1	10	13	17	30	SS-24				
	-15.7									47.0
									GRAY GREEN SLIGHTLY MICACEOUS SAND, SATURATED (CAPE FEAR FORMATION)	

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton		**GEOLOGIST** Swartley, J. R	
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek				**GROUND WTR (ft)**	
BORING NO. B2-B	**STATION** 26+30	**OFFSET** 5 ft RT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 31.3 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 989,345	**EASTING** 2,527,476	**24 HR.**	N/A
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic		
START DATE 09/12/06	**COMP. DATE** 09/12/06	**SURFACE WATER DEPTH** 7.9 ft		**DEPTH TO ROCK** N/A	

ELEV. (ft)	ELEV. 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				
	-41.8								
	73.1	10	11	15	26				
-45	-46.8								
	78.1	13	13	13	26				
	-48.3								79.6
-50									Boring Terminated at Elevation -48.3 ft in medium dense sand
-55									
-60									
-65									
-70									
-75									
-80									
-85									
-90									
-95									
-100									
-105									
-110									
-115									

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton		**GEOLOGIST** Swartley, J. R	
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek				**GROUND WTR (ft)**	
BORING NO. B3-A	**STATION** 26+85	**OFFSET** 4 ft LT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 49.7 ft	**TOTAL DEPTH** 98.4 ft	**NORTHING** 989,391	**EASTING** 2,527,508	**24 HR.**	7.7
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic		
START DATE 09/20/06	**COMP. DATE** 09/20/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A		

ELEV. (ft)	ELEV. 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)
									49.7 GROUND SURFACE	0.0
	48.7								48.7 ASPHALT	1.0
	1.0 45.7	14	22	21	43				TAN BROWN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT	
	4.0 42.8	8	9	8	17					
	6.9	WOH	WOH	WOH	0	SS-25			40.7	9.0
	37.8								TAN BROWN SAND, SATURATED (ALLUVIUM)	
	11.9 32.8	5	7	11	18				34.7	15.0
	16.9 27.8	1	1	2	3	SS-26			GRAY SANDY CLAY, WET	
	21.9 22.8	1	1	1	2				29.7	20.0
	26.9 17.8	1	1	3	4	SS-27			GRAY SANDY SILT WITH SHELL FRAGMENTS, WET (YORKTOWN FORMATION)	
	31.9 12.8	2	3	3	6					
	36.9 7.8	2	3	4	7					
	41.9 2.8	2	3	3	6	SS-28				
	46.9 -2.2	1	1	2	3					
	51.9 -7.2	1	1	1	2					
	56.9 -12.2	WOH	WOH	1	1					
	61.9 -17.2	WOH	1	2	3				14.7	35.0
	66.9 -22.2	6	6	9	15	SS-29			GRAY SAND WITH SHELL FRAGMENTS, SATURATED	
	71.9 -27.2	10	16	20	36					
	76.9	9	19	23	42				-15.3	65.0
									GRAY GREEN SLIGHTLY MICACEOUS SAND, SATURATED (CAPE FEAR FORMATION)	

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton		**GEOLOGIST** Swartley, J. R	
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek				**GROUND WTR (ft)**	
BORING NO. B3-A	**STATION** 26+85	**OFFSET** 4 ft LT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 49.7 ft	**TOTAL DEPTH** 98.4 ft	**NORTHING** 989,391	**EASTING** 2,527,508	**24 HR.**	7.7
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic		
START DATE 09/20/06	**COMP. DATE** 09/20/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A		

ELEV. (ft)	ELEV. 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					Match Line				-30.3 80.0
	-32.2								
	81.9	11	19	26	45	SS-30			
-35	-37.2								
	86.9	10	17	17	34				
-40	-42.2								
	91.9	12	20	26	46				
-45	-47.2								
	96.9	9	16	20	36				-48.7 98.4
-50									Boring Terminated at Elevation -48.7 ft in dense sand
-55									
-60									
-65									
-70									
-75									
-80									
-85									
-90									
-95									
-100									
-105									

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton	**GEOLOGIST** Swartley, J. R
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 27+40	**OFFSET** 12 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 50.7 ft	**TOTAL DEPTH** 103.6 ft	**NORTHING** 989,421	**EASTING** 2,527,556	**24 HR.** 10.2
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/21/06	**COMP. DATE** 09/21/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV. (ft)	ELEV. 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)
55	50.7								50.7 GROUND SURFACE	0.0
50	0.0	1	2	5	7				TAN BROWN SAND, MOIST (ROADWAY EMBANKMENT)	
	46.7								41.7	9.0
45	4.0	5	8	13	21	SS-31			TAN BROWN SAND, MOIST TO SATURATED (ALLUVIUM)	
	43.6								35.7	15.0
40	7.1	10	12	8	20				GRAY CLAYEY SANDY SILT, WET (YORKTOWN FORMATION)	
	38.6								25.7	25.0
35	12.1	4	7	9	16				GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	
	33.6								20.7	30.0
30	17.1	WOH	1	1	2	SS-32				
	28.6									
25	22.1	1	1	2	3					
	23.6									
20	27.1	1	1	3	4	SS-33				
	18.6									
15	32.1	2	3	4	7					
	13.6									
10	37.1	1	2	2	4					
	8.6									
5	42.1	1	2	3	5					
	3.6									
0	47.1	1	1	2	3					
	-1.4									
-5	52.1	WOH	1	1	2					
	-6.4									
-10	57.1	WOH	WOH	1	1					
	-11.4									
-15	62.1	1	1	2	3					
	-16.4									
-20	67.1	2	6	8	14	SS-34				
	-21.4									
	72.1	8	12	14	26				-14.3	65.0

PROJECT NO. 33558.1.1	**ID.** B-4212	**COUNTY** Northampton	**GEOLOGIST** Swartley, J. R
SITE DESCRIPTION Bridge No.77 on NC 35 over Kirby's Creek			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 27+40	**OFFSET** 12 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 50.7 ft	**TOTAL DEPTH** 103.6 ft	**NORTHING** 989,421	**EASTING** 2,527,556	**24 HR.** 10.2
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/21/06	**COMP. DATE** 09/21/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV. (ft)	ELEV. 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
-25	-26.4				Match Line				
	77.1	12	15	22	37	SS-35			
-30	-31.4								-29.3 80.0
	82.1	11	19	24	43	SS-36			GRAY GREEN SLIGHTLY MICACEOUS SAND, SATURATED (CAPE FEAR FORMATION)
-35	-36.4								
	87.1	16	25	31	56				
-40	-41.4								-39.3 90.0
	92.1	5	12	20	32				
-45	-46.4								
	97.1	15	18	15	33				
-50	-51.4								
	102.1	18	22	27	49	SS-37			-52.9 103.6
-55									Boring Terminated at Elevation -52.9 ft in dense sand
-60									
-65									
-70									
-75									
-80									
-85									
-90									
-95									
-100									

B-4212
BRIDGE NO. 77 ON NC 35 OVER KIRBY'S CREEK

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-A	SS-1	100	98	22	10.8	77.1	7.7	4.4	16	NP	A-2-4(0)	4.0-5.5		
	SS-2	100	98	66	5.4	48.0	34.1	12.4	37	8	A-4(5)	13.1-14.6		
	SS-3	100	95	34	14.8	53.7	17.5	14.0	21	3	A-2-4(0)	33.1-34.6		
	SS-4	100	92	23	26.4	55.9	9.3	8.4	18	NP	A-2-4(0)	38.1-39.6		
	SS-5	92	83	35	19.2	49.8	18.1	12.8	21	NP	A-2-4(0)	53.1-54.6		
	SS-6	100	70	12	66.1	25.8	7.3	0.8	28	NP	A-2-4(0)	63.1-64.6		
	SS-7	100	73	47	33.8	31.6	27.7	6.8	43	8	A-5(2)	73.1-74.6		
	SS-8	100	85	11	50.1	42.6	7.3	0.0	25	NP	A-2-4(0)	78.7-79.6		
	SS-9	95	42	9	75.9	17.0	6.3	0.8	24	NP	A-1-b-(0)	83.1-84.6		
B1-A	SS-10	100	99	77	1.6	43.4	28.5	26.5	43	9	A-5(8)	3.0-4.5	24.1	
	ST-1	99	94	51	18.7	44.9	20.2	16.2	28	7	A-4(1)	7.7-9.7		
	SS-11	100	95	43	23.3	36.1	22.1	18.5	29	8	A-4(1)	31.2-32.7		
	SS-12	100	94	50	15.7	48.0	17.9	18.5	21	NP	A-4(0)	41.2-42.7		
	SS-13	100	80	19	57.2	28.3	8.0	6.4	28	NP	A-2-4(0)	51.2-52.7		
	SS-14	100	89	50	17.9	50.0	23.7	8.4	32	NP	A-4(0)	61.2-62.7		
	SS-15	100	76	13	65.1	23.7	10.8	0.4	23	NP	A-2-4(0)	71.2-72.7		
	SS-16	100	71	13	64.9	23.5	11.2	0.4	24	NP	A-2-4(0)	81.2-82.7		
B2-B	SS-17	100	100	70	1.6	44.4	33.5	20.5	37	14	A-6(9)	0.0-1.5		
	SS-18	54	48	19	32.3	41.0	16.3	10.4	21	NP	A-1-b(0)	8.1-9.6		
	SS-19	80	75	19	15.9	60.6	9.4	14.1	17	NP	A-2-4(0)	18.1-19.6		
	SS-20	100	93	21	27.9	53.6	10.0	8.4	15	NP	A-2-4(0)	28.1-29.6		
	SS-21	100	83	24	49.6	31.1	12.9	6.4	16	NP	A-2-4(0)	38.1-39.6		
	SS-22	100	95	24	25.7	54.4	9.4	10.4	26	NP	A-2-4(0)	48.1-49.6		
	SS-23	100	58	13	62.0	29.1	6.0	2.8	36	NP	A-2-4(0)	58.1-59.6		
	SS-24	100	70	12	70.3	21.1	5.8	2.8	22	NP	A-2-4(0)	68.1-69.6		
B3-A	SS-25	100	95	35	15.3	58.4	15.5	10.8	15	NP	A-2-4(0)	6.9-8.4		
	SS-26	100	99	79	1.4	40.6	29.1	28.9	38	14	A-6(11)	16.9-18.4		
	SS-27	100	93	48	20.9	42.0	18.3	18.9	26	8	A-4(1)	26.9-28.4		
	SS-28	100	92	27	24.9	53.4	10.8	10.8	17	NP	A-2-4(0)	41.9-43.4		
	SS-29	100	92	30	16.5	63.1	11.6	8.8	34	NP	A-2-4(0)	66.9-68.4		
	SS-30	100	59	7	72.5	22.5	4.2	0.8	27	NP	A-3(0)	81.9-83.4		
EB2-B	SS-31	100	89	20	33.3	50.8	7.0	8.8	13	NP	A-2-4(0)	4.0-5.5		
	SS-32	100	99	85	2.0	38.6	36.5	22.9	30	NP	A-4-(1)	17.1-18.6		
	SS-33	51	46	18	30.7	41.2	13.3	14.9	21	NP	A-1-b(0)	27.1-28.6		
	SS-34	100	97	32	8.0	63.9	13.3	14.9	29	NP	A-2-4(0)	67.1-68.6		
	SS-35	100	63	11	62.7	29.5	5.0	2.8	26	NP	A-2-4(0)	77.1-78.6		
	SS-36	100	46	7	76.9	18.3	4.0	0.8	33	NP	A-1-b(0)	82.1-83.6		
	SS-37	100	55	11	76.5	14.1	8.6	0.8	21	NP	A-2-4(0)	102.1-103.6		

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33558.1.1 TIP: B-4212 COUNTY: Northampton

DESCRIPTION(1): Bridge No. 77 on NC 35 over Kirby's Creek

EXISTING BRIDGE

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

Bridge No.: 77 Length: 101.7' Total Bents: 7 Bents in Channel: ____ Bents in Floodplain: ____
Foundation Type: Timber piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Approx. 2 feet of scour underneath and behind End Bent 2 end wall.

Interior Bents: None noted

Channel Bed: 1' to 3' scour pocket noted between Bent 5 and End Bent 2

Channel Bank: 25' to 75 feet of bank erosion southeast of End Bent 2

EXISTING SCOUR PROTECTION

Type(3): 1)Wooden end wall 2)Steel shet piles 3) Boards nailed to wingwalls at both end bents

Extent(4): 1) 10' outside edge of bridge 2)Extent of wingwalls 3) 3 feet from the bottom of the walls

Effectiveness(5): 1) Nor effective 2) Appears satisfactory 3) Somewhat effective

Obstructions(6): Old timber piles in creek channel

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): Sandy clay

Channel Bank Material(8): Sand

Channel Bank Cover(9): Wooded

Floodplain Width(10): Approx. 1300 feet

Floodplain Cover(11): Wooded and crops

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

Channel Migration Tendency(13): Southwest toward End Bent 1

Observations and Other Comments: ____

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS B1	B2	B3	B4							
31.5	29	37								

Comparison of DSE to Hydraulics Unit theoretical scour:
Geotechnical analysis agrees with the Hydraulic Units estimate of scour.

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 Sheet 11, "Soil Test Results", for samples:
Channel Bed: SS-17
Channel Bank: SS-1

Reported by: Dean Argenbright Date: 10/9/2006

33558.1.1 (B-4212)
Bridge No. 77 on NC 35 over Kirby's Creek
Northampton Co.

Looking West Toward End Bent 1