

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4135	1	10
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33488.1.1	BRZ-1804(2)	P.E.	
		CONST.	

# STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33488.1.1 I.D. NO. B-4135

F.A. PROJECT BRZ-1804(2)

COUNTY HALIFAX

PROJECT DESCRIPTION BRIDGE NO. 72

ON SR 1804 OVER CYPRESS SWAMP

AT -L- STATION 17+10

**CONTENTS:**

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	STRUCTURE INVENTORY REPORT
4	SITE PLAN
5	PROFILE
6-7	BORE LOGS
8	SOIL TEST RESULTS
9	SCOUR REPORT
10	SITE PHOTOGRAPH

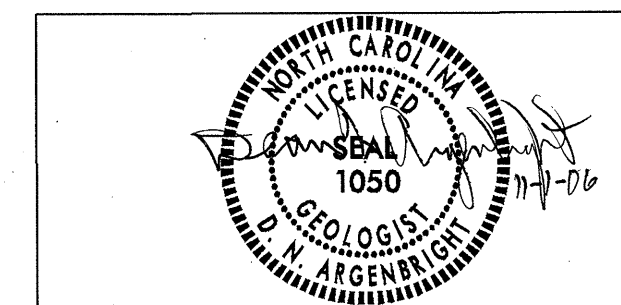
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INVESTIGATED BY ET PERSONNEL ET  
 CHECKED BY DNA LWD  
 SUBMITTED BY DNA KBQ  
 DATE NOVEMBER 2006 MGW



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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.

DRAWN BY: C. M. KENT

PROJECT: 33488.1.1 ID: B-4135

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL UNIT

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B-4135	33488.1.1	2	10

**SUBSURFACE INVESTIGATION**

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS											
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRN SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</i>				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. <b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.				HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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: NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT. FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. 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 SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.				<b>ALLUVIUM (ALLUV.)</b> - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (F.P.)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (R.Q.D.)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (T.S.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.											
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>				<b>MINERALOGICAL COMPOSITION</b>				<b>WEATHERING</b>				<b>WEATHERING</b>											
GENERAL CLASS. GRANULAR MATERIALS (<85% PASSING #200) SILT-CLAY MATERIALS (>85% PASSING #200) ORGANIC MATERIALS				MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.				<b>FRESH</b> ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. <b>VERY SLIGHT (V. SL.)</b> 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. <b>SLIGHT (SL.)</b> 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. <b>MODERATE (MOD.)</b> 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. <b>MODERATELY SEVERE (MOD. SEV.)</b> 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> <b>SEVERE (SEV.)</b> ALL ROCKS 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. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i> <b>VERY SEVERE (V. SEV.)</b> 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. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i> <b>COMPLETE</b> 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.				<b>COMPRESSIBILITY</b> SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 <b>PERCENTAGE OF MATERIAL</b> 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 <b>GROUND WATER</b> ▽ 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 SEEPAGE				<b>MISCELLANEOUS SYMBOLS</b> ROADWAY EMBANKMENT WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS INFERRED SOIL BOUNDARIES INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP/DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL SAMPLE DESIGNATIONS S- BULK SAMPLE SS- SPLIT SPOON SAMPLE ST- SHELBY TUBE SAMPLE RS- ROCK SAMPLE RT- RECOMPACTED TRIAXIAL SAMPLE CBR - CBR SAMPLE				<b>ABBREVIATIONS</b> 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 FRAGS - FRAGMENTS MED. - MEDIUM PMT - PRESSUREMETER TEST SD - SAND, SANDY SL - SILT, SILTY SLI - SLIGHTLY TCR - TRICONE REFUSAL U - UNIT WEIGHT U <sub>d</sub> - DRY UNIT WEIGHT w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST			
<b>CONSISTENCY OR DENSENESS</b> PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )				<b>TEXTURE OR GRAIN SIZE</b> U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 0.075 0.25 0.075 0.075				<b>ROCK HARDNESS</b> 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.															
<b>SOIL MOISTURE - CORRELATION OF TERMS</b> SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				<b>EQUIPMENT USED ON SUBJECT PROJECT</b> DRILL UNITS: <input checked="" type="checkbox"/> MOBILE B-47 <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> OTHER <input type="checkbox"/> OTHER ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG.-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input checked="" type="checkbox"/> TRICONE <input type="checkbox"/> 2 1/16" STEEL TEETH <input type="checkbox"/> TRICONE <input type="checkbox"/> TUNG.-CARB. <input type="checkbox"/> CORE BIT <input type="checkbox"/> OTHER HAMMER TYPE: <input type="checkbox"/> AUTOMATIC <input checked="" type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> B <input type="checkbox"/> N <input type="checkbox"/> H HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> OTHER																			
<b>PLASTICITY</b> NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH				<b>FRACTURE SPACING</b> TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED > 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET																			
<b>COLOR</b> DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.				<b>INDURATION</b> 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.																			

NOTES:  
BENCH MARK: RR SPIKE IN BASE OF 24' CYPRESS  
-BL- STATION 15+05.12 43.00' RT ELEVATION: 27.71'



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

November 1, 2006

STATE PROJECT: 33488.1.1 (B-4135)  
F.A. PROJECT: BRZ-1804 (2)  
COUNTY: Halifax  
DESCRIPTION: Bridge No. 72 on SR 1804 over Cypress Swamp

SUBJECT: Geotechnical report- Bridge Foundation Investigation for  
Bridge No. 72 on SR 1804 over Cypress Swamp at -L-  
Station 17+10

**Site Description**

The proposed bridge site is located at the existing SR 1804 bridge over Cypress Swamp approximately 5 miles northeast of Scotland Neck. The replacement structure will be constructed along the alignment of the existing bridge. Based on the proposed design, the new structure will consist of two spans having a total length of 90 feet. The bents will have a skew of 90 degrees.

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 a truck mounted Mobile B-47 drill machine and 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 to Cretaceous age sediments. The flood plain at this site basically consists of a 400± foot wide flooded swamp. The channel is obscure and varies in width from 10 to 20 feet or more. Based on the benchmark with an elevation of 27.71 feet, the elevations at the site range from 21± feet along the stream bed to 30± feet on the existing SR 1804 roadway embankment. Natural ground elevations of 26± feet are typical within the flood plain areas. Water levels in the boreholes and the surface of Cypress Swamp were measured at an elevation of 26± feet during this investigation.

**Foundation Description**

Subsurface conditions along the proposed structure are relatively uniform. Surficial alluvial soils typically consist of 2 to 4 feet of very soft to medium stiff clay (A-6, A-7-6) and clayey silt (A-4) underlain by 4 to 7 feet of loose to medium dense fine to coarse sand (A-2-4, A-3). Moisture content of a tested clay sample was 33 percent.

The alluvial deposits are underlain by soils of the Yorktown Formation at an elevation of 13± feet. Soils within this formation generally consist of 13 to 16 feet of loose fine to coarse sand (A-2-4, A-3, A-1-b) with shell fragments.

The Cape Fear Formation underlies the Yorktown sediments at an elevation of 0 to -2 feet. Soils typically consist of very stiff to hard sandy and silty clay (A-6, A-7-6) with clayey sand (A-2-6) layers. Moisture content of a tested clay sample was 29 percent.

**End Bent Slopes**

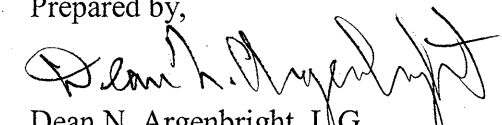
Based on the proposed design, the existing grade will be raised approximately 0.5 feet. The existing embankment is approximately 8 feet high and constructed of very loose to dense fine to coarse sand (A-2-4). The proposed end bent slopes will be constructed within the existing embankment. Some additional fill may be required for the construction of the end bent and side slopes. Borrow meeting Coastal Plain Criteria is available in nearby areas.

Based on borings in the existing embankment and underlying soils 1.5:1 end bent slopes should be stable. Slope protection measures should be used on the end slopes.

**Notice**

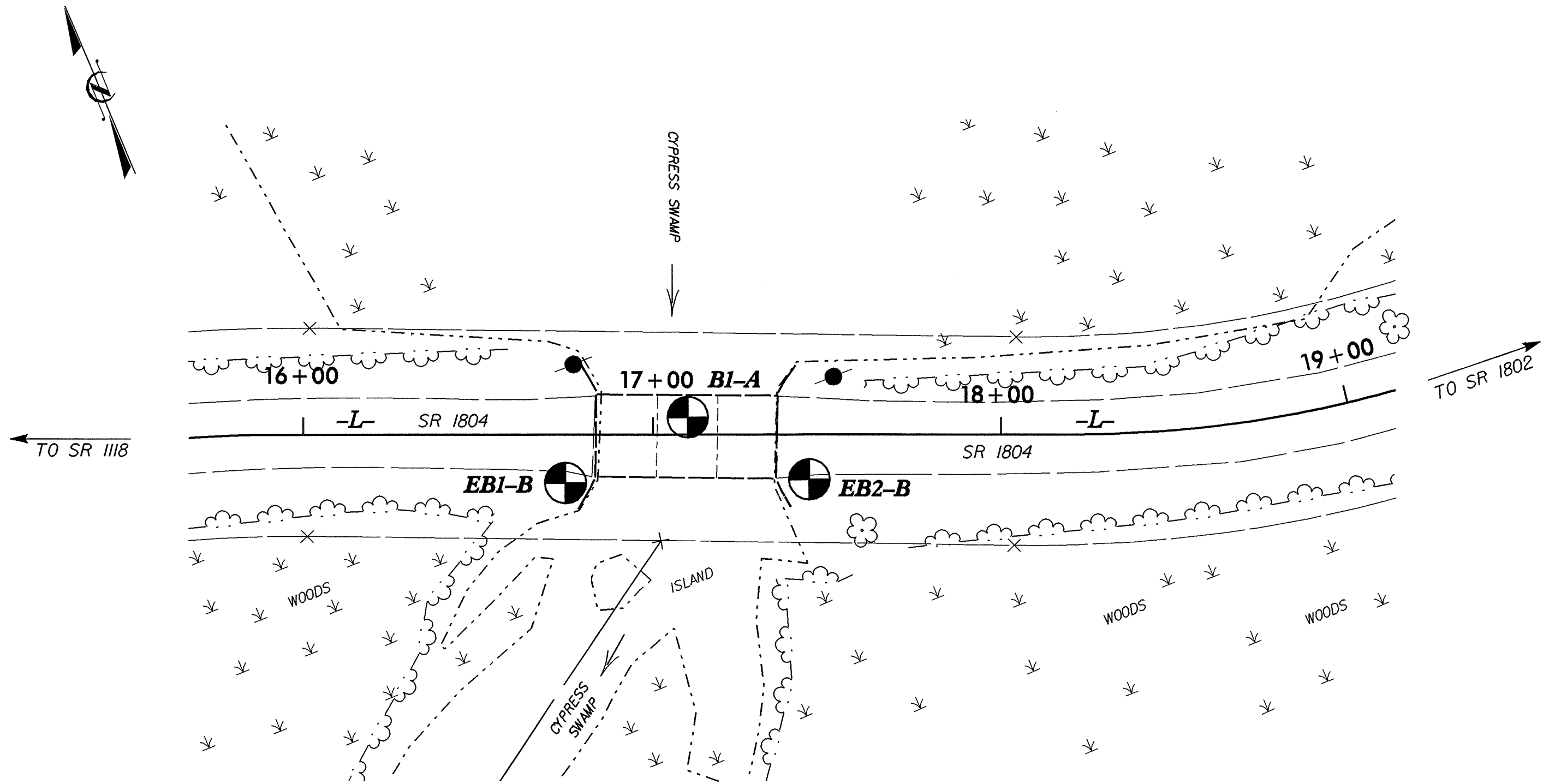
This geotechnical structure inventory report is based on the Bridge Survey & Hydraulic Design Report dated July 24, 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared by,

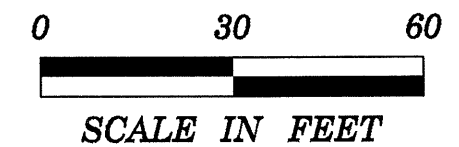
  
Dean N. Argenbright, L.G.  
Regional Geological Engineer

STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
33488.1.1 (B-4135)	4	10

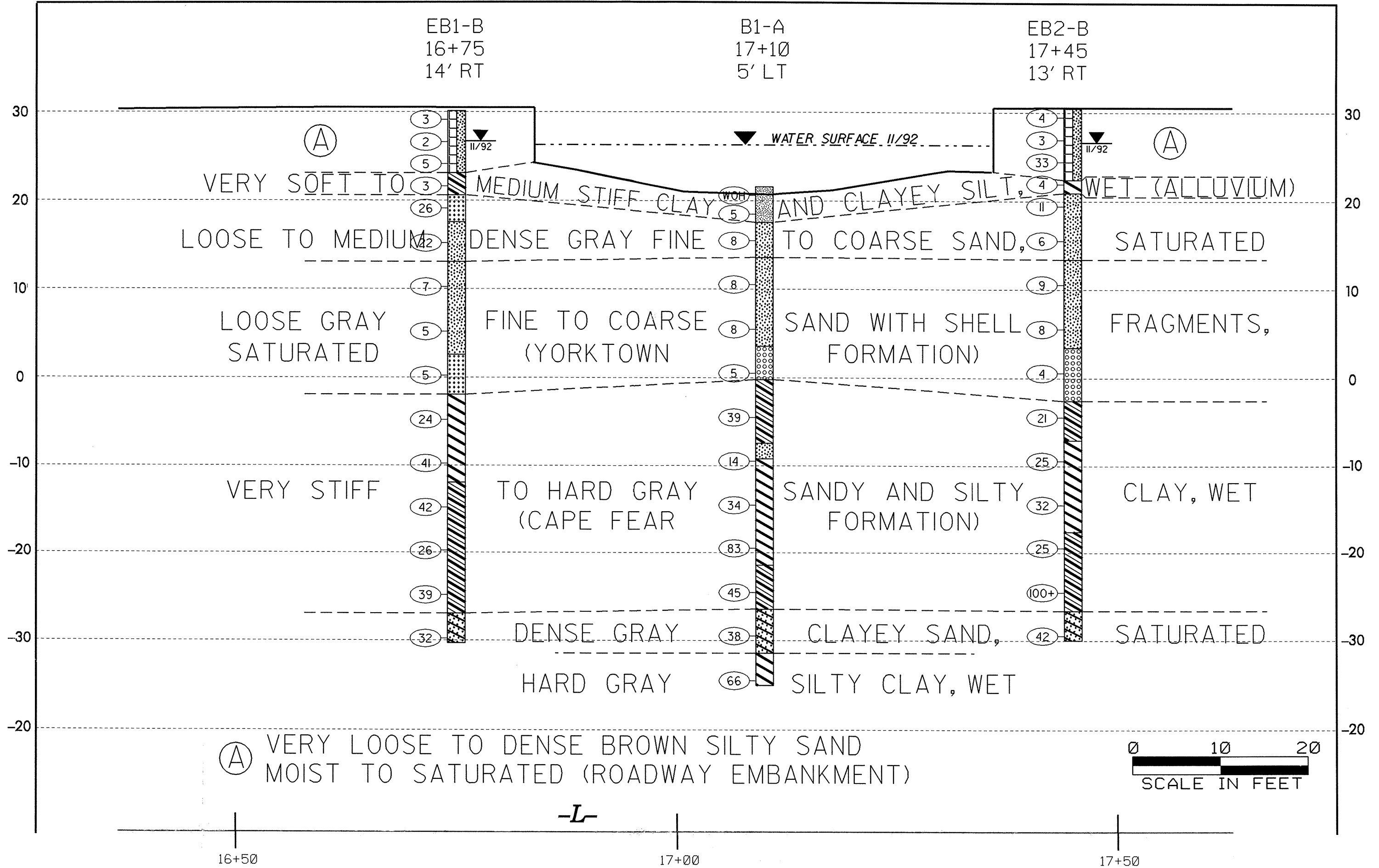
# TEST SITE PLAN



**SKEW = 90°**



PROFILE THROUGH BORINGS PROJECTED ALONG -L-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33488.1.1		ID. B-4135		COUNTY HALIFAX		GEOLOGIST E. TARASCIO							
SITE DESCRIPTION BRIDGE NO. 72 ON SR 1804 OVER CYPRESS SWAMP							GROUND WATER						
BORING NO. EBI-B		BORING LOCATION 16+75		OFFSET 14' RT		ALIGNMENT -L-							
COLLAR ELEVATION 30.1'		NORTHING N/A		EASTING N/A		24 HR. 3.4'							
TOTAL DEPTH 60.4'		DRILL MACHINE MOBILE B-47		DRILL METHOD ROTARY W/MUD		HAMMER TYPE MANUAL							
START DATE 11/23/92		COMPLETION DATE 11/24/92		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A							
ELEV. (FT.)	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT				SAMPLE NUMBER	LOG	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75				100
30.1	0.0	1	1	2	1.0	X 3							
30.0	2.5	1	1	1	1.0	X 2							
25.0	5.0	1	1	4	1.0	X 5							
	7.5	1	1	2	1.0	X 3							
20.0	10.0	8	13	13	1.0	X 26							
15.0	13.9	3	8	14	1.0	X 22							
10.0	18.9	3	3	4	1.0	X 7							
5.0	23.9	4	3	2	1.0	X 5							
0.0	28.9	2	2	3	1.0	X 5							
-5.0	33.9	7	11	13	1.0	X 24							
-10.0	38.9	8	16	25	1.0	X 41							
-15.0	43.9	11	18	24	1.0	X 42							
-20.0	48.9	8	11	15	1.0	X 26							
-25.0	53.9	12	17	22	1.0	X 39							
-30.0	58.9	11	15	17	1.0	X 32							
BORING TERMINATED AT ELEVATION -30.3 FEET IN DENSE CLAYEY SAND													

PROJECT NO. 33488.1.1		ID. B-4135		COUNTY HALIFAX		GEOLOGIST E. TARASCIO							
SITE DESCRIPTION BRIDGE NO. 72 ON SR 1804 OVER CYPRESS SWAMP							GROUND WATER						
BORING NO. BI-A		BORING LOCATION 17+10		OFFSET 5' LT		ALIGNMENT -L-							
COLLAR ELEVATION 21.6'		NORTHING N/A		EASTING N/A		24 HR. N/A							
TOTAL DEPTH 56.6'		DRILL MACHINE MOBILE B-47		DRILL METHOD ROTARY W/MUD		HAMMER TYPE MANUAL							
START DATE 11/24/92		COMPLETION DATE 11/25/92		SURFACE WATER DEPTH 5.2'		DEPTH TO ROCK N/A							
ELEV. (FT.)	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT				SAMPLE NUMBER	LOG	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75				100
21.6	0.0	WOH	WOH	WOH	1.0	X 5							
20.0	2.1	WOH	2	3	1.0	X 5							
	5.1	9	5	3	1.0	X 8							
15.0	10.1	4	3	5	1.0	X 8							
10.0	15.1	5	4	4	1.0	X 8							
5.0	20.1	3	2	3	1.0	X 5							
-0.0	25.1	14	17	22	1.0	X 39							
-5.0	30.1	5	5	9	1.0	X 14							
-10.0	35.1	15	15	19	1.0	X 34							
-15.0	40.1	23	50	33	1.0	X 83							
-20.0	45.1	18	21	24	1.0	X 45							
-25.0	50.1	17	14	24	1.0	X 38							
-30.0	55.1	15	26	40	1.0	X 66							
BORING TERMINATED AT ELEVATION -35.0 FEET IN HARD SILTY CLAY													



B-4135  
Halifax County  
Bridge No. 72 on SR 1804 over Cyprus Swamp

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB2-B	SS-1	83	63	20	44.0	37.0	13.0	6.0	18	NP	A-2-4(0)	0.0 - 1.5		
	SS-2	100	96	13	27.0	64.0	5.0	4.0	21	NP	A-2-4(0)	10.0 - 11.5		
	SS-3	92	83	12	19.0	69.0	7.0	5.0	22	NP	A-2-4(0)	18.9 - 20.4		
	SS-4	89	40	10	63.0	26.0	7.0	4.0	25	5	A-1-b(0)	28.9 - 30.4		
	SS-5	100	98	60	4.0	49.0	33.0	14.0	38	18	A-6(8)	33.9 - 35.4		
	SS-6	100	99	86	2.0	17.0	45.0	30.0	54	33	A-7-6(19)	38.9 - 40.4	28.5	
	SS-7	100	88	47	29.0	30.0	23.0	18.0	30	18	A-6(5)	48.9 - 50.4		
	SS-8	93	60	18	59.0	22.0	9.0	10.0	30	12	A-2-6(0)	58.9 - 60.4		
EB1-B	SS-9	96	82	26	36.0	41.0	15.0	8.0	18	NP	A-2-4(0)	0.0 - 1.5		
	SS-10	100	100	74	4.0	27.0	31.0	38.0	38	23	A-6(13)	7.5 - 9.0	33.1	
	SS-11	93	60	7	64.0	30.0	5.0	1.0	17	NP	A-3(0)	10.0 - 11.5		
	SS-12	90	81	13	19.0	67.0	8.0	6.0	24	NP	A-2-4(0)	18.9 - 20.4		
	SS-13	94	63	8	70.0	22.0	5.0	3.0	18	NP	A-3(0)	28.9 - 30.4		
	SS-14	100	91	62	16.0	29.0	39.0	16.0	52	25	A-7-6(13)	33.9 - 35.4		
	SS-15	100	96	54	10.0	50.0	34.0	6.0	37	14	A-6(5)	43.9 - 45.4		
	SS-16	100	79	39	38.0	31.0	27.0	4.0	28	13	A-6(2)	48.9 - 50.4		
	SS-17	96	70	18	63.0	19.0	5.0	13.0	30	12	A-2-6(0)	58.9 - 60.4		
B1-A	SS-18	100	96	64	12.0	29.0	37.0	22.0	33	10	A-4(6)	0.0 - 1.5		
	SS-19	94	85	15	22.0	64.0	8.0	6.0	21	NP	A-2-4(0)	15.1 - 16.6		
	SS-20	92	50	9	64.0	27.0	5.0	4.0	20	NP	A-1-b(0)	20.1 - 21.6		
	SS-21	99	94	32	13.0	63.0	18.0	6.0	28	3	A-2-4(0)	30.1 - 30.8		
	SS-22	100	98	71	5.0	35.0	42.0	18.0	45	21	A-7-6(11)	35.1 - 36.6		
	SS-23	97	79	36	36.0	30.0	20.0	14.0	33	17	A-6(2)	45.1 - 46.6		
	SS-24	100	99	90	2.0	11.0	34.0	53.0	65	39	A-7-6(20)	55.1 - 56.6		





**FIELD  
 SCOUR REPORT**

WBS: 33488.1.1 TIP: B-4135 COUNTY: Halifax

DESCRIPTION(1): Bridge No. 72 on SR 1804 over Cypress Swamp

**EXISTING BRIDGE**

Information from: Field Inspection  Microfilm \_\_\_\_\_ (reel \_\_\_\_\_ pos: \_\_\_\_\_)  
 Other (explain) \_\_\_\_\_

Bridge No.: 72 Length: 54 ft. Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2  
 Foundation Type: Timber pile

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: Erosion 2 feet behind wooden wing wall on right side of End Bent 1

Interior Bents: None

Channel Bed: None

Channel Bank: None

**EXISTING SCOUR PROTECTION**

Type(3): Wooden end wall

Extent(4): 10 feet outside edge of bridge

Effectiveness(5): Appears satisfactory

Obstructions(6): \_\_\_\_\_

**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 theoretical 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): Clayey silt (SS-18)

Channel Bank Material(8): Sandy clay (SS-10) and silty clay

Channel Bank Cover(9): Wooded

Floodplain Width(10): 400 feet

Floodplain Cover(11): Wooded

Stream is(12): Aggrading \_\_\_\_\_ Degrading \_\_\_\_\_ Static

Channel Migration Tendency(13): Slight tendency to migrate west toward End Bent 1

Observations and Other Comments: \_\_\_\_\_

**DESIGN SCOUR ELEVATIONS(14)**

Feet  Meters \_\_\_\_\_

**BENTS**

	B1	B2	B3	B4									
14													

Comparison of DSE to Hydraulics Unit theoretical scour:  
 Geotechnical analysis agrees with the Hydraulic Unit's 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 8,  
 "Soil Test Results",  
 for samples:  
 Channel Bed: SS-18  
 Channel Bank: SS-10

Reported by: Dean N. Argenbright  
 Dean N. Argenbright

Date: 4/4/2006

**33488.1.1 B-4135**  
**Halifax Co.**  
**Bridge No. 72 on SR 1804 over Cypress Swamp**



Looking West Toward End Bent 1