

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33442.1.1 (B-4080) F.A. PROJ. BRSTP-1437(2)
COUNTY COLUMBUS
PROJECT DESCRIPTION BRIDGE NO. 148 ON SR 1437
OVER PINE LOG SWAMP AT -L- STATION 15+27.5

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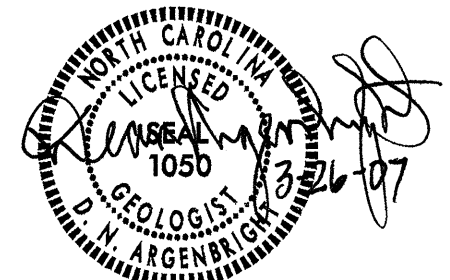
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DATE MARCH, 2007



PROJECT: 33442.1.1
ID: B-4080

DRAWN BY: C.P. TURNER

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. 33442.1I(B-4080)	SHEET NO. 2 OF 11
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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 THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (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, MOST WITH INTERBEDDED FINE SAND LAYERS, HARDY PLASTIC, A-7-6		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.		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:		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 DISLOADED 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 (ROD) - 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 (SROD) - 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.	
SOIL LEGEND AND AASHTO CLASSIFICATION		MINERALOGICAL COMPOSITION		WEATHERING		ROCK HARDNESS	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS		MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	
GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1-A, A-2-A, A-3, A-4, A-5, A-6, A-7		COMPRESSIBILITY		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.		HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	
SYMBOL		SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50		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.		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.	
% PASSING #10, #40, #200		PERCENTAGE OF MATERIAL		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.		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.	
LIQUID LIMIT PLASTIC INDEX		ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		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.	
GROUP INDEX		TRACE OF ORGANIC MATTER 2-3% LITTLE ORGANIC MATTER 3-5% MODERATELY ORGANIC 5-10% HIGHLY ORGANIC >10%		HIGHLY ORGANIC SOILS		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 FINGERMAIL.	
USUAL TYPES OF MAJOR MATERIALS		GROUND WATER		HIGHLY ORGANIC SOILS		FRACURE SPACING	
GENERATING AS A SUBGRADE		WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP		EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE		BEDDING	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		MISCELLANEOUS SYMBOLS		PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		INDURATION	
CONSISTENCY OR DENSENESS		ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD		PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
GENERALY GRANULAR MATERIAL (NON-COHESIVE)		ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD		VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE		FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
GENERALY SILT-CLAY MATERIAL (COHESIVE)		ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD		VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
U.S. STD. SIEVE SIZE OPENING (MM)		ABBREVIATIONS		MEDIUM STIFF STIFF VERY STIFF HARD		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F. SD.) SILT (SL.) CLAY (CL.)		AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST o - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS		2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	
GRAIN SIZE		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		0.075 0.075 0.075 0.075 0.075			
SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		0.05 0.005			
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION		DRILL UNITS: MOBILE B- BK-51 CME-45B CME-550 PORTABLE HOIST		ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT		HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	
LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE		MOBILE B- BK-51 CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT		TERM SPACING VERY WIDE MORE THAN 18 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	
PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT		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	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT		INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT		BENCH MARK: BL-3 -L- STATION 14+85.24, 14.83' RT ELEVATION: 59.3 FT.	
PLASTICITY		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT		NOTES:	
PLASTICITY INDEX (PI) DRY STRENGTH		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			
NONPLASTIC 0-5 VERY LOW		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			
LOW PLASTICITY 6-15 SLIGHT		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			
MED. PLASTICITY 16-25 MEDIUM		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			
HIGH PLASTICITY 26 OR MORE HIGH		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			
COLOR		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			
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.		CME-45B CME-550 PORTABLE HOIST		CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE 2 1/8" STEEL TEETH TRICONE " TUNG.-CARB. CORE BIT			



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

March 26, 2007

STATE PROJECT: 33442.1.1 B-4080
F. A. PROJECT: BRSTP-1437(2)
COUNTY: Columbus
DESCRIPTION: Bridge No. 148 on SR 1437 over Pine Log Swamp
SUBJECT: Geotechnical Report - Bridge Foundation Investigation for
SR 1437 over Pine Log Swamp at -L- Station 15+27.5

Site Description

The proposed bridge site is located at the existing SR 1437 bridge over Pine Log Swamp in Whiteville. The replacement structure will be constructed along the existing alignment. Based on the proposed design, the new structure will have three spans with a total length of 125 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 ATV mounted CME-45B 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 alluvial deposits, Pliocene age soils of the Duplin Formation and Cretaceous age soils of the Peedee Formation. Topography at the site is nearly flat to gentle sloping. Elevations at the site range from 51± feet along the channel bed to 60± feet along the existing SR 1437 roadway. During this investigation, water levels within the boreholes and the surface of Pine Log Swamp were measured at an elevation of 54± feet.

Soil Description

Subsurface conditions at the site are relatively uniform. Surficial alluvial soils generally consist of 11± feet of loose to medium dense sand (A-2-4, A-3). Soils belonging to the Pliocene age Duplin Formation underlie the alluvial deposits at elevations ranging from 42± to 44± feet. Soils of the Duplin Formation consist of 19 to 25 feet of loose to dense sand (A-2-4) underlain by 10 to 14 feet of stiff to very stiff sandy and silty clay (A-6, A-7-6). Shell fragments were noted throughout the Duplin deposits. The Peedee Formation underlies the Duplin deposits at elevations ranging from 8± to 9± feet. Soils of the Peedee Formation consist of medium dense to very dense sand (A-1-b, A-2-4, A-3) and clayey sand (A-2-6). A hard clay (A-7-6) layer was encountered below the sands in End Bent 2.

Based on the proposed design, the existing grade will be raised 1± foot at the bridge site. The existing roadway embankment at the end bents consists of 5± to 7± feet of very loose to loose sand (A-2-4) and medium stiff to very stiff clayey sandy silt (A-4). The proposed end bent slopes will be mainly constructed within the existing embankment. 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.

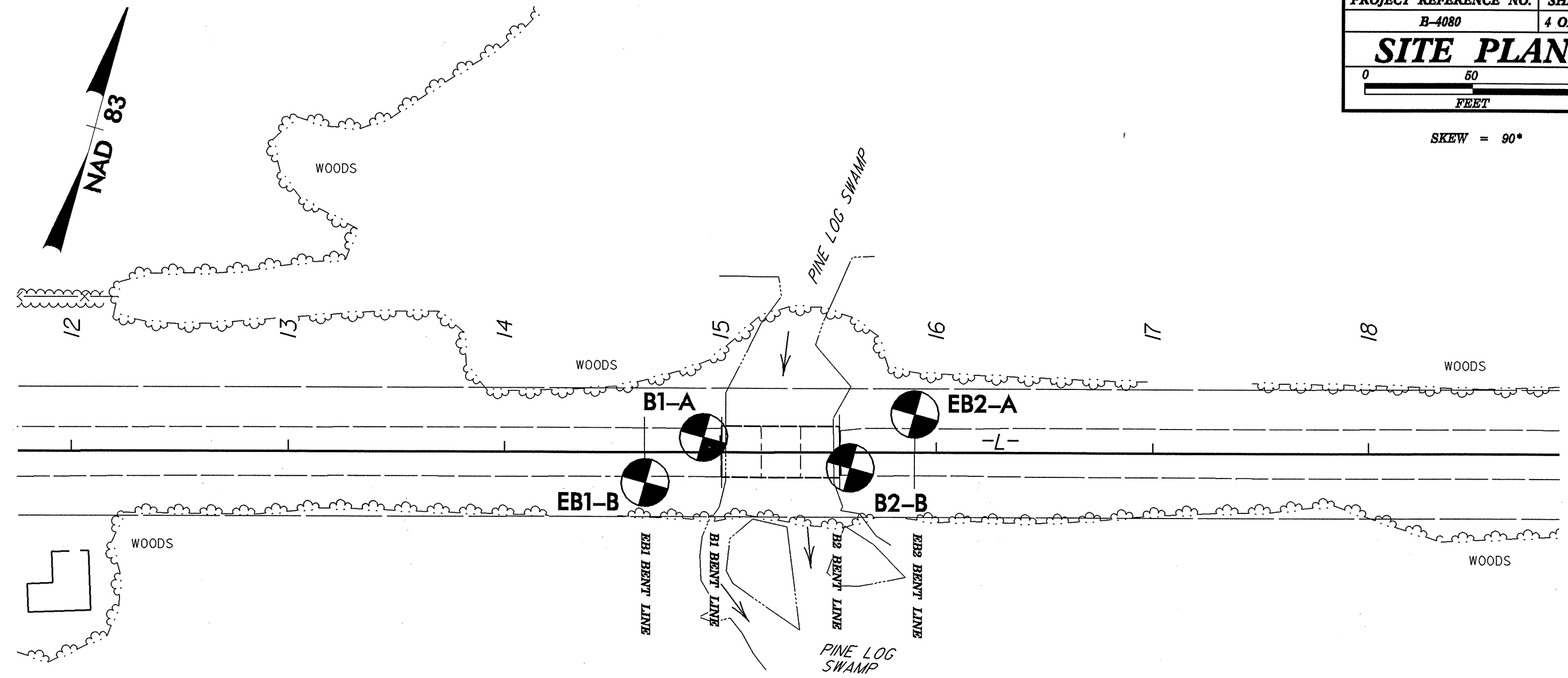
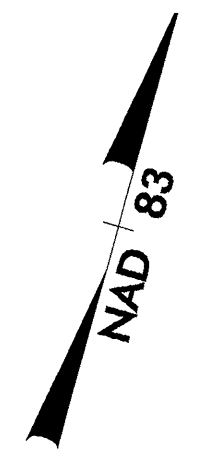
Note

The Geotechnical foundation report is based on the Bridge Survey and Hydraulic Design Report dated March 2, 2007. 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:

Fred M. Wescott III
Project Geological Engineer

SKEW = 90*



5/14/99

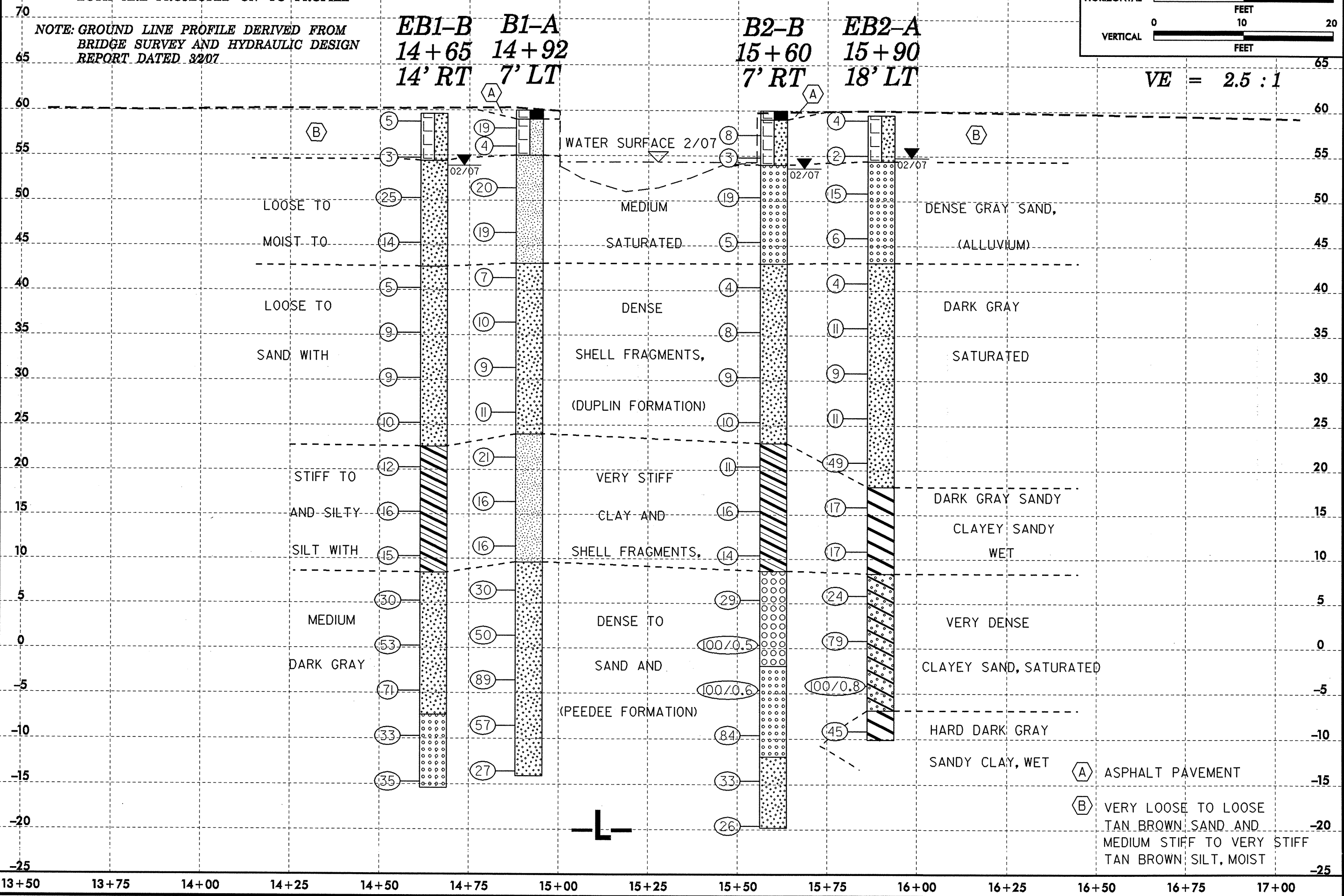
NOTE: INFERRED STRATIGRAPHY
DRAWN THROUGH BORINGS AND
BOTH ARE PROJECTED ON TO PROFILE

PROFILES THROUGH BORINGS PROJECTED ALONG -L-

NOTE: GROUND LINE PROFILE DERIVED FROM
BRIDGE SURVEY AND HYDRAULIC DESIGN
REPORT DATED 3/20/07

	PROJECT REFERENCE NO.	SHEET NO.
	B-4080	5 OF 11
HORIZONTAL	0	25
	0	50
VERTICAL	0	10
	0	20

VE = 2.5 : 1



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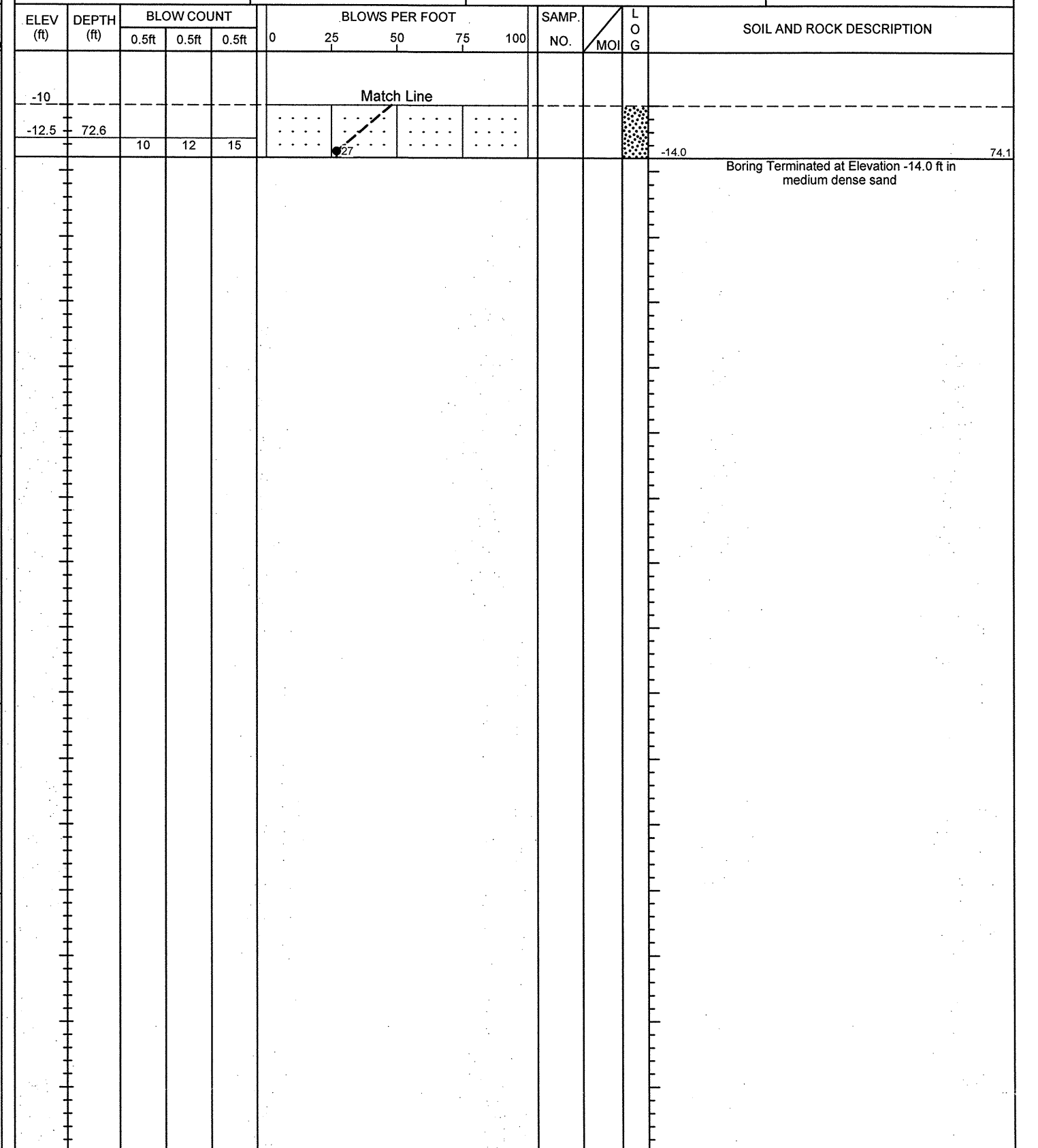
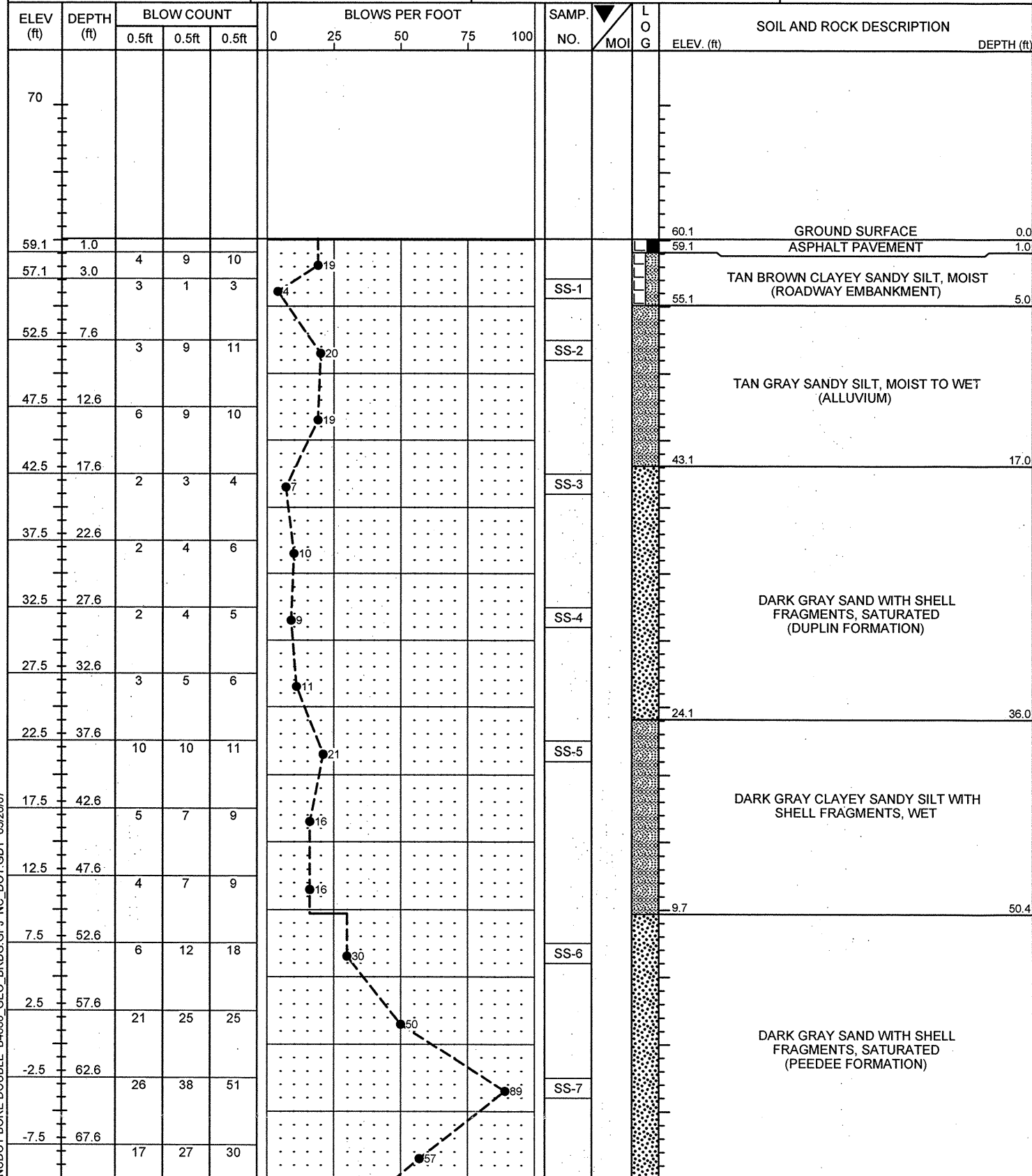
NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33442.1.1		ID. B-4080		COUNTY Columbus		GEOLOGIST Wescott, F. M.									
SITE DESCRIPTION BRIDGE NO. 148 ON SR 1437 OVER PINE LOG SWAMP							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 14+65		OFFSET 14ft RT		ALIGNMENT -L-	0 HR. N/A								
COLLAR ELEV. 59.6 ft		TOTAL DEPTH 75.0 ft		NORTHING 208,673		EASTING 2,082,093	24 HR. 5.9								
DRILL MACHINE CME-45B		DRILL METHOD Mud Rotary			HAMMER TYPE Automatic										
START DATE 02/20/07		COMP. DATE 02/20/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
60															
59.6	0.0	1	2	3										GROUND SURFACE	0.0
55.6	4.0	1	2	1						SS-8				TAN BROWN SILTY SAND, MOIST (ROADWAY EMBANKMENT)	5.2
51.1	8.5	3	10	15						SS-9				GRAY SAND, MOIST TO SATURATED (ALLUVIUM)	
46.1	13.5	2	5	9											
41.1	18.5	2	2	3						SS-10					
36.1	23.5	4	4	5						SS-11				DARK GRAY SAND WITH SHELL FRAGMENTS, SATURATED (DUPLIN FORMATION)	
31.1	28.5	3	4	5											
26.1	33.5	4	5	5											
21.1	38.5	4	5	7						SS-12	16%				
16.1	43.5	5	7	9										DARK GRAY SANDY CLAY WITH SHELL FRAGMENTS, WET	
11.1	48.5	4	6	9						SS-13					
6.1	53.5	9	15	15						SS-14					
1.1	58.5	11	23	30											
-3.9	63.5	21	36	35											
-8.9	68.5	10	15	18						SS-15					
-13.9	73.5	9	15	20											
														Boring Terminated at Elevation -15.4 ft in dense sand	75.0

NCDOT BORE DOUBLE B4080 GEO BRDG.GPJ NC_DOT.GDT 09/26/07

PROJECT NO. 33442.1.1	ID. B-4080	COUNTY Columbus	GEOLOGIST Stone, J. L.
SITE DESCRIPTION BRIDGE NO. 148 ON SR 1437 OVER PINE LOG SWAMP			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+92	OFFSET 7ft LT	ALIGNMENT -L- 0 HR. N/A
COLLAR ELEV. 60.1 ft	TOTAL DEPTH 74.1 ft	NORTHING 208,701	EASTING 2,082,113 24 HR. FIAD
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 02/23/04	COMP. DATE 02/23/04	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33442.1.1	ID. B-4080	COUNTY Columbus	GEOLOGIST Stone, J. L.
SITE DESCRIPTION BRIDGE NO. 148 ON SR 1437 OVER PINE LOG SWAMP			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+92	OFFSET 7ft LT	ALIGNMENT -L- 0 HR. N/A
COLLAR ELEV. 60.1 ft	TOTAL DEPTH 74.1 ft	NORTHING 208,701	EASTING 2,082,113 24 HR. FIAD
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 02/23/04	COMP. DATE 02/23/04	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE B4080_GEO_BRDG.GPJ NC_DOT_GDT 03/26/07

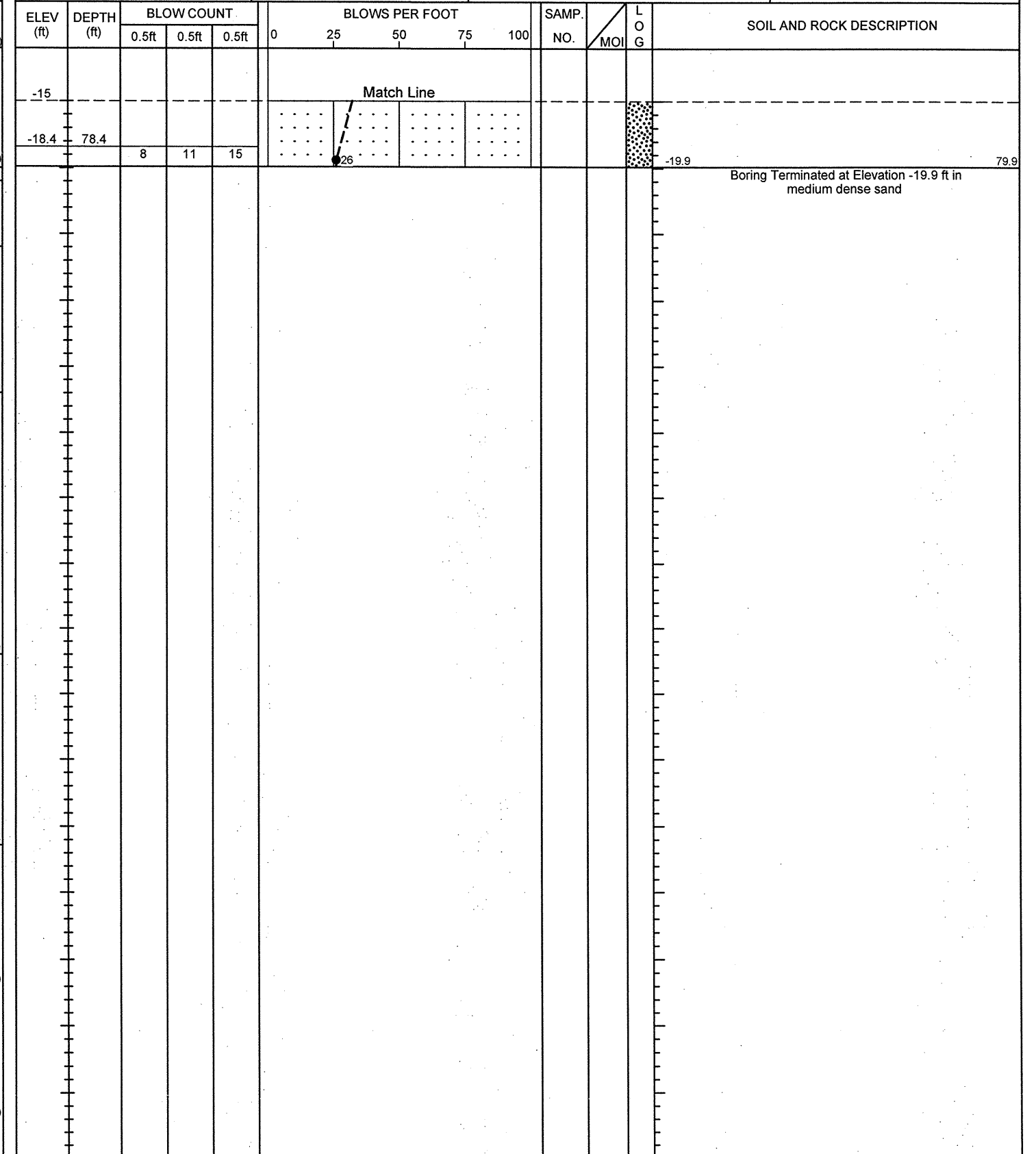
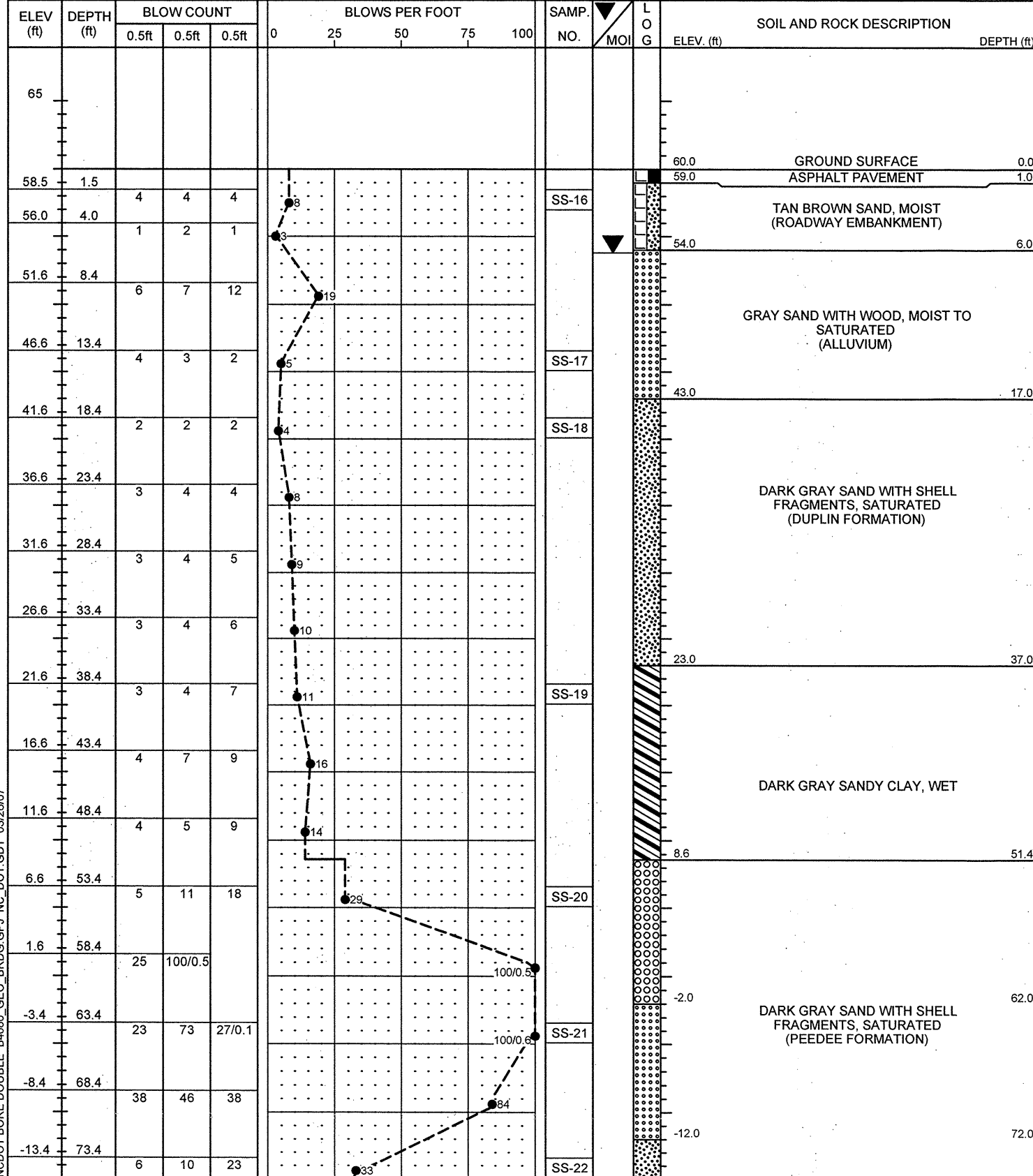


NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33442.1.1	ID. B-4080	COUNTY Columbus	GEOLOGIST Wescott, F. M.
SITE DESCRIPTION BRIDGE NO. 148 ON SR 1437 OVER PINE LOG SWAMP			GROUND WTR (ft)
BORING NO. B2-B	STATION 15+60	OFFSET 7ft RT	ALIGNMENT -L-
COLLAR ELEV. 60.0 ft	TOTAL DEPTH 79.9 ft	NORTHING 208,706	EASTING 2,082,183
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 02/20/07	COMP. DATE 02/20/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33442.1.1	ID. B-4080	COUNTY Columbus	GEOLOGIST Wescott, F. M.
SITE DESCRIPTION BRIDGE NO. 148 ON SR 1437 OVER PINE LOG SWAMP			GROUND WTR (ft)
BORING NO. B2-B	STATION 15+60	OFFSET 7ft RT	ALIGNMENT -L-
COLLAR ELEV. 60.0 ft	TOTAL DEPTH 79.9 ft	NORTHING 208,706	EASTING 2,082,183
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 02/20/07	COMP. DATE 02/20/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

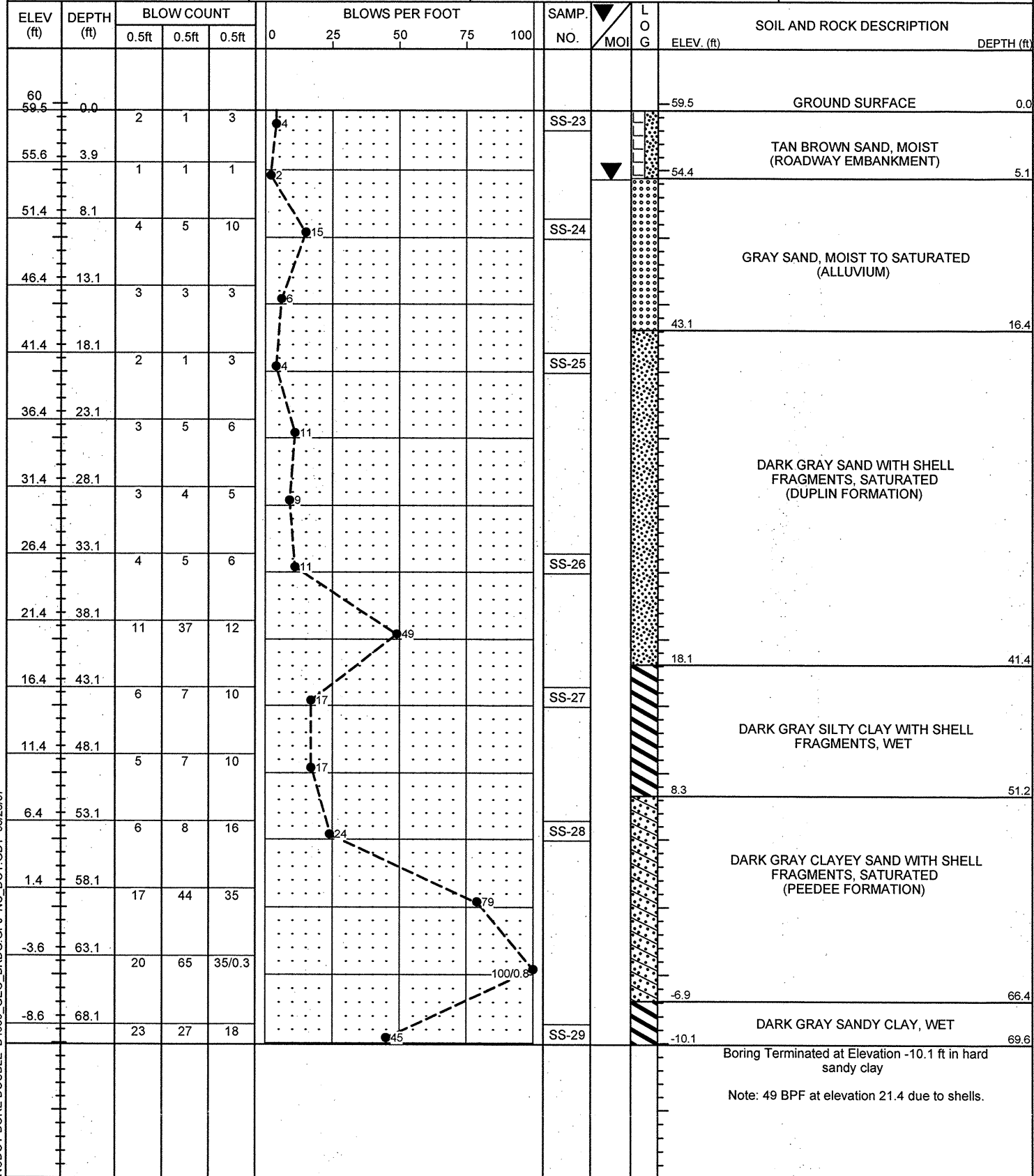


NCDOT BORE DOUBLE B4080_GEO_BRDG.GPJ NC_DOT.GDT 09/26/07



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

PROJECT NO. 33442.1.1	ID. B-4080	COUNTY Columbus	GEOLOGIST Wescott, F. M.
SITE DESCRIPTION BRIDGE NO. 148 ON SR 1437 OVER PINE LOG SWAMP			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+90	OFFSET 18ft LT	ALIGNMENT -L-
COLLAR ELEV. 59.5 ft	TOTAL DEPTH 69.6 ft	NORTHING 208,738	EASTING 2,082,205
DRILL MACHINE CME-45B	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 02/21/07	COMP. DATE 02/21/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE B4080_GEO_BRDG.GPJ NC_DOT.GDT 09/26/07

Bridge No. 148 on SR 1437 over Pine Log Swamp

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
B1-A	SS-1	100	99	55	2.6	52.5	24.7	20.1	24	3	A-4(0)	3.0-4.5		
	SS-2	100	100	48	2.6	56.3	33.0	8.0	17	NP	A-4(0)	7.6-9.1		
	SS-3	100	95	24	26.0	51.9	10.1	12.1	22	NP	A-2-4(0)	17.6-19.1		
	SS-4	100	89	27	39.8	34.4	7.6	18.1	26	NP	A-2-4(0)	27.6-29.1		
	SS-5	100	91	43	22.7	38.6	12.5	26.2	29	NP	A-4(0)	37.6-39.1		
	SS-6	92	66	13	55.7	31.2	3.0	10.1	26	NP	A-2-4(0)	52.6-54.1		
	SS-7	93	85	12	36.0	52.3	5.6	6.0	19	NP	A-2-4(0)	62.6-64.1		
EB1-B	SS-8	100	97	19	8.2	77.8	12.4	1.6	16	NP	A-2-4(0)	1.0-1.5		
	SS-9	100	100	11	2.8	90.4	5.2	1.6	14	NP	A-2-4(0)	8.5-10.0		
	SS-10	100	95	22	27.5	52.1	10.8	9.6	18	NP	A-2-4(0)	18.5-20.0		
	SS-11	100	87	22	42.5	37.1	14.8	5.6	20	NP	A-2-4(0)	23.5-25.0		
	SS-12	100	91	37	24.0	41.7	14.6	19.6	33	13	A-6(1)	38.5-40.0	15.9	
	SS-13	100	95	40	21.0	42.3	19.0	17.6	37	18	A-6(3)	48.5-50.0		
	SS-14	88	65	13	53.7	33.1	11.6	1.6	20	NP	A-2-4(0)	53.5-55.0		
	SS-15	88	54	7	66.1	27.5	4.8	1.6	13	NP	A-3(0)	68.5-70.0		
B2-B	SS-16	100	99	12	3.0	88.4	8.6	0.0	24	NP	A-2-4(0)	1.5-3.0		
	SS-17	95	76	5	53.5	42.3	4.2	0.0	20	NP	A-3(0)	13.4-14.9		
	SS-18	100	94	22	27.7	52.9	11.8	7.6	25	NP	A-2-4(0)	18.4-19.9		
	SS-19	100	92	40	23.4	39.9	27.1	9.6	37	13	A-6(2)	38.4-39.9		
	SS-20	62	28	8	71.9	16.6	9.8	1.6	25	NP	A-1-b(0)	53.4-54.9		
	SS-21	100	87	6	43.5	52.1	4.4	0.0	20	NP	A-3(0)	63.4-64.5		
	SS-22	100	88	23	43.5	36.7	14.2	5.6	24	NP	A-2-4(0)	73.4-74.9		
EB2-A	SS-23	100	97	29	7.3	70.9	9.6	12.2	19	NP	A-2-4(0)	1.0-1.5		
	SS-24	100	100	10	5.1	87.3	3.6	4.1	24	NP	A-3(0)	8.1-9.6		
	SS-25	100	95	23	26.8	51.2	4.7	17.3	27	7	A-2-4(0)	18.1-19.6		
	SS-26	99	90	21	32.8	47.8	3.2	16.3	26	5	A-2-4(0)	33.1-34.6		
	SS-27	100	99	86	3.4	14.0	59.3	23.4	65	41	A-7-6(39)	43.1-44.6		
	SS-28	92	64	23	46.6	30.4	5.6	17.3	35	12	A-2-6(0)	53.1-54.6		
	SS-29	100	89	56	19.6	28.3	11.4	40.7	51	29	A-7-6(13)	68.1-69.6		



FIELD
 SCOUR REPORT

WBS: 33442.1.1 TIP: B-4080 COUNTY: Columbus

DESCRIPTION(1): Bridge No. 148 on SR 1437 over Pine Log Swamp

EXISTING BRIDGE

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

Bridge No.: 148 Length: 55 Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
 Foundation Type: Wooden piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None noted

Interior Bents: None noted

Channel Bed: None noted

Channel Bank: None noted

EXISTING SCOUR PROTECTION

Type(3): Wooden wing walls

Extent(4): 10'-15' from outside edge of bridge

Effectiveness(5): Appears satisfactory

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 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): Loose to medium dense gray sand and very stiff gray sandy silt

Channel Bank Material(8): Loose to medium desne gray sand

Channel Bank Cover(9): Wooded swamp

Floodplain Width(10): 1000+/- feet

Floodplain Cover(11): Wooded swamp

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): Not likely but may migrate west toward End Bent 1

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

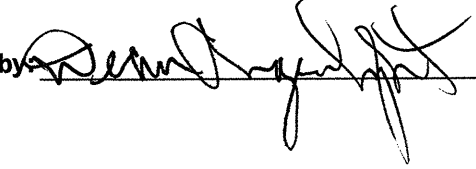
B1	B2	B3								
43	43									

Comparison of DSE to Hydraulics Unit theoretical scour:
 Based on the presence of formation soils, the Design Scour Elevation is 13 and 14 feet higher at bent 1 and 2, respectively, than the 100 yr theoretical scour proposed by the Hydraulics Unit.

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 10,
 "Soil Test Results",
 for samples:
 SS-2, SS-17 Channel bed
 SS-9 Channel bank

Reported by  Date: 3-26-07