STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.1(U-2519DA)	1	20

METRIC

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.1(U-2519DA) F.A. PROJ. DPR-0100(001)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)

SITE DESCRIPTION BRIDGE NO. 366 AND NO. 367 ON -L- (FAYETTEVILLE OUTER LOOP) OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)

INVENTORY

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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PERSONNEL

MACTEC

TRIGON

J.I. MILKOVITS, JR.

INVESTIGATED BY K.B. MILLER

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE OCTOBER 2007

NORTH CAROLINA LICENSED SEAL 2029 GEOLOGIST KEVIN BENNETT MILLER

Kevin Bennett Miller 11/01/2007

DRAWN BY: T.T. WALKER

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PROJECT: 34817.1.1

ID: U-2519DA

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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 30 CM 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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (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
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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
w - 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
- [ ] CME-45C
- [x] CME-550
- [ ] PORTABLE HOIST
- [x] CME-45B
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [x] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____mm STEEL TEETH
- [ ] TRICONE ____mm TUNG.-CARB.
- [ ] CORE BIT
- [x] 7.46 cm DRAG 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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

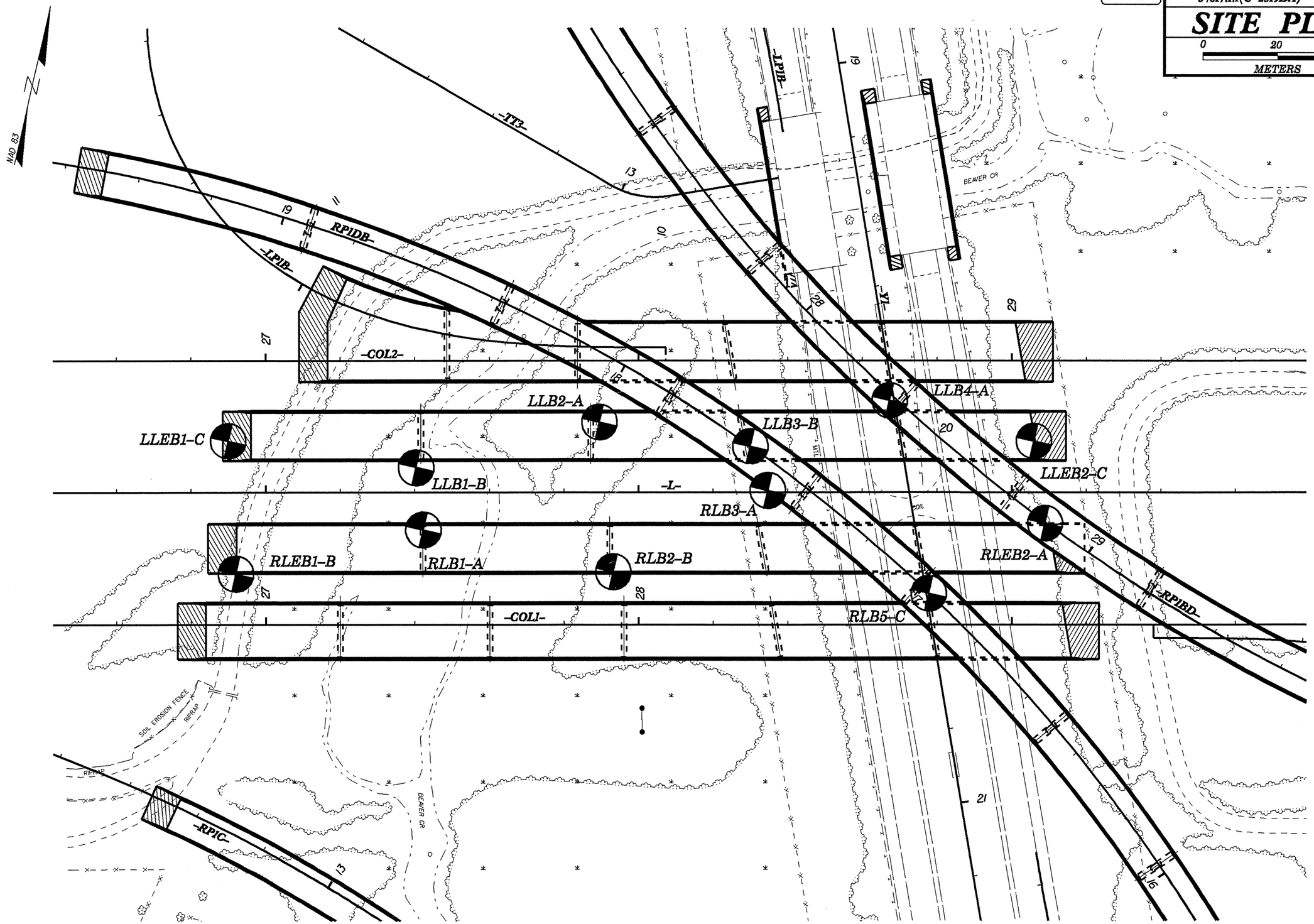
BENCH MARK: BL-14 @ STATION 23+60 (EB2-A)	ELEVATION: 64.782	M
BENCH MARK: BL-12 @ STATION 21+93 (EB1-B)	ELEVATION: 59.506	M

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
34817.1.1(U-2519DA)	3

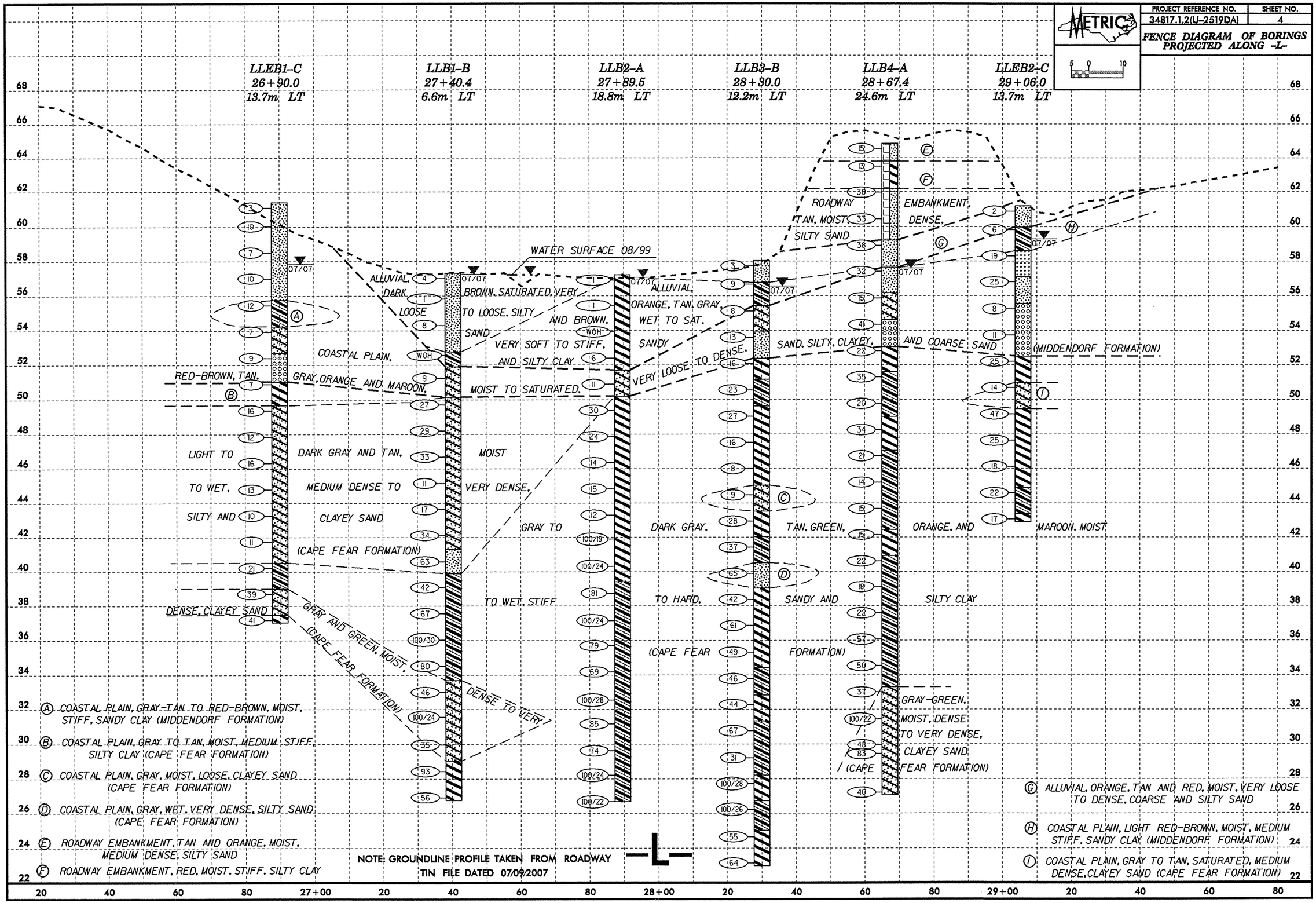
SITE PLAN

0 20 40
METERS



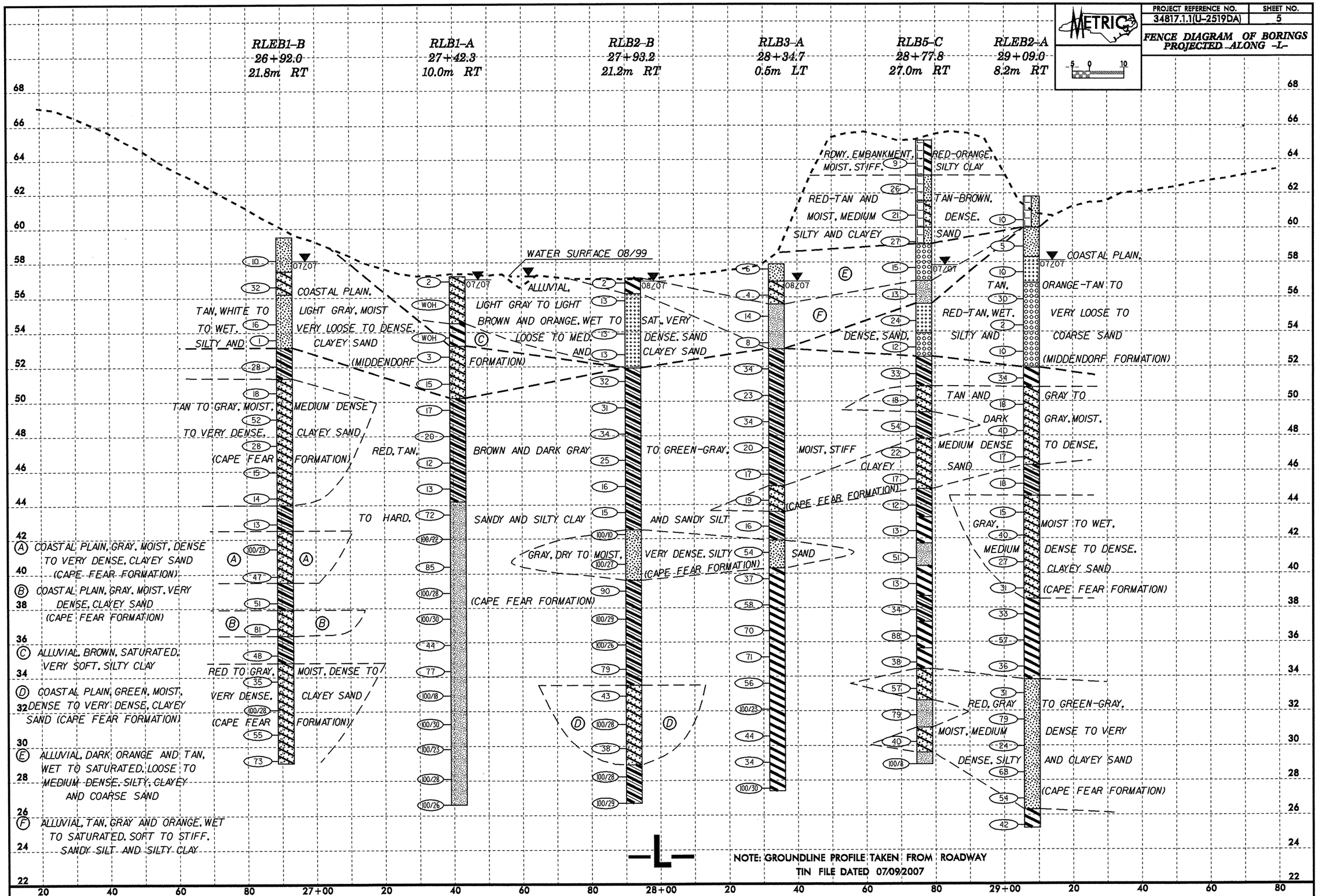
PROJECT REFERENCE NO.	SHEET NO.
34817.1.2(U-2519DA)	4

FENCE DIAGRAM OF BORINGS PROJECTED ALONG -L-



PROJECT REFERENCE NO.	SHEET NO.
34817.1.1(U-2519DA)	5

FENCE DIAGRAM OF BORINGS PROJECTED ALONG -L-



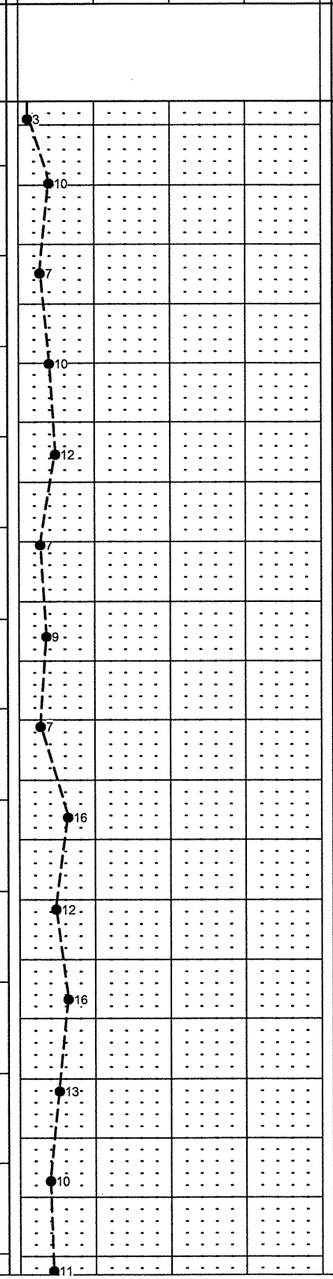
NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLEB1-C	**STATION** 26+90.0	**OFFSET** 13.7m LT	**ALIGNMENT** -L-
COLLAR ELEV. 61.40 m	**TOTAL DEPTH** 24.38 m	**NORTHING** 150,986.9	**EASTING** 611,714.5
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 06/10/98	**COMP. DATE** 06/10/98	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	3.57

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	62									
	61.40	0.00						GROUND SURFACE	61.40	0.00
61			1	1	2		M	COASTAL PLAIN RED-BROWN, TAN, AND GRAY, SILTY SAND (MIDDENDORF FORMATION)		
	60.33	1.07								
60			3	5	5	SS-2	8% M			
59	58.81	2.59								
			3	3	4	SS-3	7% M			
58										
57	57.29	4.11	4	4	6	SS-4	17% M			
56	55.76	5.64							55.76	5.64
			2	3	9		13% M	GRAY-TAN TO RED-BROWN, SANDY CLAY		
55										
54	54.24	7.16	2	4	3	SS-5	21% M		54.24	7.16
								GRAY-TAN TO RED-BROWN, CLAYEY SAND		
53	52.71	8.69							52.71	8.69
52			3	4	5	SS-7	M	TAN, RED-BROWN TO GRAY, COARSE SAND		
51	51.19	10.21							51.04	10.36
			2	2	5	SS-8	13% M	GRAY TO TAN, SILTY CLAY (CAPE FEAR FORMATION)		
50										
49	49.67	11.73	5	6	10	SS-9	14% M	GRAY TO TAN, CLAYEY SAND	49.67	11.73
48	48.14	13.26								
			5	6	6	SS-10	16% M			
47	46.62	14.78								
46			4	7	9	SS-11	13% M			
45	45.09	16.31								
			4	5	8	SS-12	15% M			
44	43.57	17.83								
43			4	5	5	SS-13	14% M			
42	42.05	19.35								
			6	6	5	SS-14	17% M			

BLOWS PER 30 CM (0, 25, 50, 75, 100)

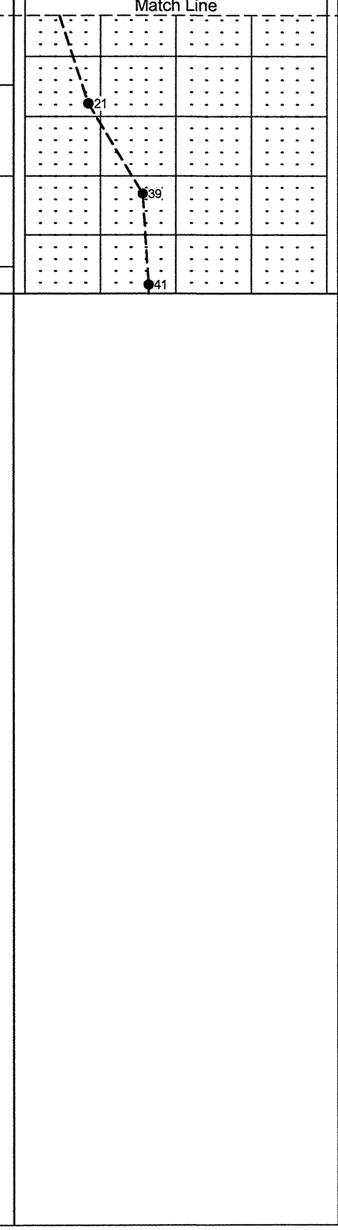


PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLEB1-C	**STATION** 26+90.0	**OFFSET** 13.7m LT	**ALIGNMENT** -L-
COLLAR ELEV. 61.40 m	**TOTAL DEPTH** 24.38 m	**NORTHING** 150,986.9	**EASTING** 611,714.5
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 06/10/98	**COMP. DATE** 06/10/98	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	3.57

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	42							Match Line		
41								GRAY TO TAN, CLAYEY SAND *(continued)*	40.52	20.88
	40.52	20.88								
40			7	10	11	SS-15	14% M	GRAY TO TAN, SANDY CLAY	39.00	22.40
39	39.00	22.40								
			13	18	21	SS-16	17% M	GRAY, CLAYEY SAND	37.47	23.93
38										
	37.47	23.93								
37			12	16	25	SS-17	15% M	GRAY TO RED-BROWN, SILTY CLAY	37.02	24.38
36								Boring Terminated at Elevation 37.02 m in COASTAL PLAIN SILTY CLAY		
35										
34										
33										
32										
31										
30										
29										
28										
27										
26										
25										
24										
23										
22										

BLOWS PER 30 CM (0, 25, 50, 75, 100)



NCDOT BORE DOUBLE U2519DA_GEO_BRDG_366_367.GPJ NC_DOT.GDT 10/26/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. GERNER
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLEB1-B	**STATION** 26+92.0	**OFFSET** 21.8m RT	**ALIGNMENT** -L-
COLLAR ELEV. 59.47 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 150,952.8	**EASTING** 611,724.6
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/25/07	**COMP. DATE** 07/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	1.52
24 HR.	1.37

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG
59	58.40	1.07	3	5	5	10	SS-120	M	
57	56.88	2.59	6	15	17	32	SS-121	M	
55	55.36	4.11	6	9	7	16	SS-122	M	
53	53.83	5.64	1	1	0	1		W	
52	52.31	7.16	7	12	16	28	SS-124	M	
51	50.78	8.69	4	8	10	18	SS-125	M	
49	49.26	10.21	14	24	28	52		M	
48	47.74	11.73	7	11	17	28	SS-127	M	
46	46.21	13.26	6	8	7	15		M	
44	44.69	14.78	4	6	8	14	SS-129	M	
43	43.16	16.31	4	6	7	13	SS-130	M	
41	41.64	17.83	52	48/8		100/23		M	
40	40.12	19.35	26	25	22	47	SS-132	M	

ELEV. (m)	SOIL AND ROCK DESCRIPTION	DEPTH (m)
59.47	GROUND SURFACE	0.00
	COASTAL PLAIN TAN, SILTY SAND (MIDDENDORF FORMATION)	
57.47	TAN, CLAYEY SAND	2.00
56.17	WHITE, RED, AND TAN, SILTY SAND	3.30
53.07	GRAY, SANDY CLAY (CAPE FEAR FORMATION)	6.40
51.32	TAN TO GRAY, CLAYEY SAND	8.15
43.97	RED TO GRAY, SANDY CLAY	15.50
42.47	GRAY, CLAYEY SAND	17.00

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. GERNER
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLEB1-B	**STATION** 26+92.0	**OFFSET** 21.8m RT	**ALIGNMENT** -L-
COLLAR ELEV. 59.47 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 150,952.8	**EASTING** 611,724.6
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/25/07	**COMP. DATE** 07/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	1.52
24 HR.	1.37

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG
39	38.59	20.88	13	22	29	51		M	
37	37.07	22.40	20	35	46	81		M	
35	35.54	23.93	15	21	27	48		M	
33	34.02	25.45	11	15	20	35		M	
32	32.50	26.97	14	37	63/13	100/28		M	
30	30.97	28.50	17	26	29	55		M	
29	29.45	30.02	22	33	40	73		M	

Match Line

ELEV. (m)	SOIL AND ROCK DESCRIPTION	DEPTH (m)
39.47	GRAY, SANDY CLAY	20.00
37.87	GRAY, CLAYEY SAND	21.60
36.37	RED TO GRAY, SANDY CLAY	23.10
34.77	RED TO GRAY, CLAYEY SAND	24.70
29.00	Boring Terminated at Elevation 29.00 m in COASTAL PLAIN CLAYEY SAND	30.47

NCDOT BORE DOUBLE U2519DA_GEO_BRDG_366_367.GPJ NC_DOT.GDT 11/01/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB1-B	**STATION** 27+40.4	**OFFSET** 6.6m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.30 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 150,991.3	**EASTING** 611,765.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/17/07	**COMP. DATE** 07/17/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.22
24 HR.	0.07

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	58										
	57.30	0.00							GROUND SURFACE	57.30	0.00
57			1	2	2		Sat.		**ALLUVIAL** DARK BROWN, SILTY SAND		
	56.13	1.17									
56			1	1	0		Sat.				
	54.61	2.69									
55			WOH	1	7	SS-20	Sat.				
	52.88	4.42								52.78	4.52
54			WOH	WOH	WOH		W		TAN, SANDY CLAY		
	51.54	5.76								51.90	5.40
53			4	4	5		W		**COASTAL PLAIN** LIGHT GRAY, CLAYEY SAND (MIDDENDORF FORMATION)		
	50.02	7.28								50.15	7.15
52			6	8	19		M		LIGHT TO DARK GRAY, CLAYEY SAND (CAPE FEAR FORMATION)		
	48.50	8.80									
51			10	13	16		M				
	46.98	10.32									
50			10	14	19	SS-23	W				
	45.46	11.84									
49			5	5	6		W				
	43.94	13.36									
48			6	8	9		M				
	42.42	14.88									
47			8	14	20		M				
	40.90	16.40								41.30	16.00
46			21	26	37	SS-24	Sat.		LIGHT GRAY, SILTY SAND		
	39.38	17.92								39.90	17.40
45			12	19	23	SS-25	M		DARK GRAY, SANDY CLAY		
	37.86	19.44									

BLOWS PER 30 CM: 0 25 50 75 100

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB1-B	**STATION** 27+40.4	**OFFSET** 6.6m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.30 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 150,991.3	**EASTING** 611,765.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/17/07	**COMP. DATE** 07/17/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.22
24 HR.	0.07

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	38										
37			17	26	41		M		DARK GRAY, SANDY CLAY *(continued)*		
	36.34	20.96									
36			43	57/15			M				
	34.82	22.48									
35			27	39	41		M				
	33.30	24.00								33.70	23.60
34			13	23	23	SS-26	M		GREEN AND GRAY, CLAYEY SAND		
	31.78	25.52									
33			60	40/9			M				
	30.26	27.04									
32			15	18	17		M				
	28.74	28.56								29.05	28.25
31			46	36	57	SS-27	M		DARK GRAY TO GREEN, SILTY CLAY		
	27.22	30.08									
30			22	26	30		M			26.77	30.53
									Boring Terminated at Elevation 26.77 m in COASTAL PLAIN SILTY CLAY		

BLOWS PER 30 CM: 0 25 50 75 100 — Match Line

NCDOT BORE DOUBLE U2519DA_GEO_BRDG_366_367.GPJ NC_DOT.GDT 10/26/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB1-A	**STATION** 27+42.3	**OFFSET** 10.0m RT	**ALIGNMENT** -L-
COLLAR ELEV. 57.15 m	**TOTAL DEPTH** 30.60 m	**NORTHING** 150,975.6	**EASTING** 611,770.8
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/19/07	**COMP. DATE** 07/23/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 0.06; 24 HR. 0.17

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
	58										
57	57.15	0.00	WOH	1	1	2	SS-32	W		57.15 GROUND SURFACE	0.00
										ALLUVIAL LIGHT BROWN, CLAYEY SAND	
56	55.84	1.31	WOH	WOH	WOH	0		W			
55											
54	53.93	3.22	WOH	WOH	WOH	0	SS-33	Sat.		54.45 BROWN, SILTY CLAY	2.70
53	52.80	4.35	1	1	2	3	SS-34	W		53.15 **COASTAL PLAIN** WHITE AND LIGHT GRAY, CLAYEY SAND (MIDDENDORF FORMATION)	4.00
52											
51	51.28	5.87	8	6	9	15	SS-35	W			
50	49.76	7.39	9	8	9	17	SS-36	M		50.15 GRAY TO DARK GRAY, SANDY CLAY (CAPE FEAR FORMATION)	7.00
49											
48	48.24	8.91	9	9	11	20		M			
47	46.72	10.43	4	5	7	12		M			
46											
45	45.20	11.95	6	6	7	13		M			
44	43.68	13.47	18	34	38	72	SS-37	W		44.15 GREEN, GRAY TO DARK GRAY, SANDY SILT	13.00
43											
42	42.16	14.99	51	49/7		100/22		Sat.			
41											
40	40.64	16.51	26	39	46	85	SS-38	M			
39	39.12	18.03	30	48	52/13	100/28		M			
38											

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB1-A	**STATION** 27+42.3	**OFFSET** 10.0m RT	**ALIGNMENT** -L-
COLLAR ELEV. 57.15 m	**TOTAL DEPTH** 30.60 m	**NORTHING** 150,975.6	**EASTING** 611,770.8
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/19/07	**COMP. DATE** 07/23/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 0.06; 24 HR. 0.17

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	38					Match Line				
37	37.60	19.55	33	67/15		100/30		M		GREEN, GRAY TO DARK GRAY, SANDY SILT *(continued)*
36	36.08	21.07	14	17	27	44		M		
35	34.56	22.59	32	37	40	77		M		
34	33.04	24.11	80	20/3		100/18		M		
33	31.52	25.63	13	33	67/15	100/30		M		
32	30.00	27.15	55	45/8		100/23		M		
31	28.48	28.67	37	43	57/13	100/28		M		
30	26.96	30.19	42	47	53/11	100/26		M		26.55 Boring Terminated at Elevation 26.55 m in COASTAL PLAIN SANDY SILT 30.60
29										
28										
27										
26										
25										
24										
23										
22										
21										
20										
19										
18										

NCDOT BORE DOUBLE U2519DA_GEO_BRDG_366_367.GPJ NC_DOT.GDT 10/26/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB2-A	**STATION** 27+89.5	**OFFSET** 18.8m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.15 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 151,014.2	**EASTING** 611,810.3
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/26/07	**COMP. DATE** 07/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.00
24 HR.	0.15

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	58											
57	57.15	0.00	WOH	1	0	1		Sat.		GROUND SURFACE	57.15	0.00
										ALLUVIAL GRAY AND BROWN, SILTY CLAY		
56	55.70	1.45	WOH	1	0	1	SS-28	Sat.				
55												
54	54.18	2.97	1	0	0	0		Sat.				
53												
52	52.66	4.49	2	3	3	6		Sat.				
51	51.14	6.01	6	5	6	11	SS-29	M			51.65	5.50
										COASTAL PLAIN GRAY, CLAYEY SAND (MIDDENDORF FORMATION)		
50	49.64	7.51	9	13	17	30	SS-30	M			50.15	7.00
										GRAY TO DARK GRAY, SILTY CLAY (CAPE FEAR FORMATION)		
49												
48	48.12	9.03	8	10	14	24		M				
47												
46	46.60	10.55	5	7	7	14		M				
45	45.08	12.07	7	7	8	15		M				
44												
43	43.56	13.59	4	5	7	12		M				
42	42.04	15.11	62	38/4		100/19		M				
41												
40	40.52	16.63	55	45/9		100/24		M				
39	39.00	18.15	27	39	42	81	SS-31	M			39.35	17.80
										DARK GRAY AND GREEN, SANDY CLAY		
38												

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB2-A	**STATION** 27+89.5	**OFFSET** 18.8m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.15 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 151,014.2	**EASTING** 611,810.3
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/26/07	**COMP. DATE** 07/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.00
24 HR.	0.15

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	38					Match Line				
37	37.48	19.67	33	53	47/9	100/24		M		DARK GRAY AND GREEN, SANDY CLAY *(continued)*
36	35.96	21.19	28	32	47	79		M		
35	34.44	22.71	22	33	36	69		M		
34	32.92	24.23	19	42	58/13	100/28		M		
33	31.40	25.75	20	41	44	85		M		
32	29.88	27.27	18	26	48	74		M		
31	28.41	28.74	54	46/9		100/24		M		
30	26.84	30.31	67	33/7		100/22		M		26.62 — 30.53 Boring Terminated at Elevation 26.62 m in COASTAL PLAIN SANDY CLAY
29										
28										
27										
26										
25										
24										
23										
22										
21										
20										
19										
18										

NCDOT BORE DOUBLE U2519DA_GEO_BRDG_366_367.GPJ NC_DOT.GDT 10/26/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB2-B	**STATION** 27+93.2	**OFFSET** 21.2m RT	**ALIGNMENT** -L-
COLLAR ELEV. 57.11 m	**TOTAL DEPTH** 30.42 m	**NORTHING** 150,976.2	**EASTING** 611,823.4
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/31/07	**COMP. DATE** 08/01/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.00
24 HR.	0.21

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	58										
57	57.11	0.00	1	1	1	2	SS-39	W		57.11 GROUND SURFACE	0.00
										ALLUVIAL TAN, SILTY CLAY	
56	56.09	1.02	3	6	7	13	SS-40	Sat.		56.21 LIGHT GRAY TO ORANGE, SAND	0.90
55											
54	54.19	2.92	7	6	7	13		Sat.			
53	52.97	4.14	3	6	7	13		Sat.			
52										51.91 **COASTAL PLAIN** GRAY AND DARK GRAY, SANDY CLAY (CAPE FEAR FORMATION)	5.20
51	51.45	5.66	8	14	18	32	SS-41	M			
50	49.93	7.18	10	15	16	31		M			
49											
48	48.41	8.70	8	16	18	34		M			
47	46.89	10.22	7	12	13	25		M			
46											
45	45.37	11.74	5	8	8	16		M			
44	43.85	13.26	6	7	8	15		M			
43											
42	42.33	14.78	100/10			100/10		D		42.51 GRAY, SILTY SAND	14.60
41	40.81	16.30	31	69/12		100/27	SS-42	M			
40										39.61 DARK GRAY AND GREEN, SANDY CLAY	17.50
39	39.29	17.82	15	46	44	90	SS-43	M			
38	37.77	19.34									

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB2-B	**STATION** 27+93.2	**OFFSET** 21.2m RT	**ALIGNMENT** -L-
COLLAR ELEV. 57.11 m	**TOTAL DEPTH** 30.42 m	**NORTHING** 150,976.2	**EASTING** 611,823.4
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/31/07	**COMP. DATE** 08/01/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.00
24 HR.	0.21

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	38					Match Line				
37			20	57	43/14	100/29		M		DARK GRAY AND GREEN, SANDY CLAY *(continued)*
36	36.25	20.86	26	58	42/11	100/26		M		
35	34.73	22.38	31	41	38	79		M		
34										33.51 GREEN, CLAYEY SAND 23.60
33	33.19	23.92	13	23	20	43	SS-44	M		
32	31.69	25.42	32	42	58/13	100/28		M		
31	30.17	26.94	15	17	21	38		M		
30	28.65	28.46	13	22	78/13	100/28	SS-45	M		28.91 GREEN, SANDY CLAY 28.20
29	27.13	29.98	36	40	60/14	100/29		M		26.69 Boring Terminated at Elevation 26.69 m in COASTAL PLAIN SANDY CLAY 30.42
28										
27										
26										
25										
24										
23										
22										
21										
20										
19										
18										

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NCDOT GEOTECHNICAL ENGINEERING UNIT
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PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D. CARR
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB3-B	**STATION** 28+30.0	**OFFSET** 12.2m LT	**ALIGNMENT** -L-
COLLAR ELEV. 58.01 m	**TOTAL DEPTH** 35.04 m	**NORTHING** 151,016.9	**EASTING** 611,851.3
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/18/00	**COMP. DATE** 10/20/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	1.63
24 HR.	1.49

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	59										
58	58.01	0.00								58.01 GROUND SURFACE	0.00
			1	1	2	3		M		**ALLUVIAL** ORANGE, SILTY SAND	
57	56.94	1.07								56.74	1.27
			2	3	6	9		M		LIGHT GRAY, TAN AND ORANGE, SANDY CLAY	
56	55.42	2.59								55.42	2.59
			4	4	4	8	SS-3	20%		**COASTAL PLAIN** ORANGE AND LIGHT GRAY, CLAYEY SAND (MIDDENDORF FORMATION)	
55	53.90	4.11								53.90	4.11
			16	6	7	13		W		TAN AND MAROON, SILTY SAND	
54	52.37	5.64								52.37	5.64
			4	5	11	16		M		TAN, SILTY CLAY (CAPE FEAR FORMATION)	
53	50.85	7.16								51.16	6.85
			5	11	12	23		M		LIGHT AND TAN-ORANGE, SANDY CLAY	
52	49.32	8.69								49.61	8.40
			5	11	16	27		M		GRAY, SILTY CLAY	
51	47.80	10.21									
			3	7	9	16		M			
50	46.28	11.73									
			2	3	5	8		M			
49	44.75	13.26								45.01	13.00
			2	3	6	9	SS-10	18%		GRAY, CLAYEY SAND	
48	43.23	14.78								43.51	14.50
			3	5	23	28		M		GRAY AND MAROON, SILTY CLAY	
47	41.70	16.31								42.01	16.00
			15	18	19	37		M		GRAY, SANDY CLAY	
46	40.18	17.83								40.51	17.50
			28	31	34	65		W		GRAY, SILTY SAND	
45	38.66	19.35								39.01	19.00
										GRAY AND TAN, SILTY CLAY	

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D. CARR
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB3-B	**STATION** 28+30.0	**OFFSET** 12.2m LT	**ALIGNMENT** -L-
COLLAR ELEV. 58.01 m	**TOTAL DEPTH** 35.04 m	**NORTHING** 151,016.9	**EASTING** 611,851.3
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/18/00	**COMP. DATE** 10/20/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	1.63
24 HR.	1.49

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	39					Match Line				
38	37.13	20.88	11	17	25	42	SS-14	19%		GRAY AND TAN, SILTY CLAY *(continued)*
37	35.61	22.40	15	21	40	61		M		
36	34.08	23.93	22	21	28	49		M		
35	32.56	25.45	25	16	30	46		M		LIGHT GRAY TO GRAY-GREEN, SAND CLAY (34.41 – 23.60)
34	31.04	26.97	13	17	27	44		M		GRAY-GREEN AND GRAY, SILTY CLAY (32.81 – 25.20)
33	29.51	28.50	25	31	36	67		M		GRAY-GREEN AND GRAY, SANDY CLAY (31.31 – 26.70)
32	27.99	30.02	8	11	20	31		M		GRAY TO GRAY-GREEN, SILTY CLAY (28.21 – 29.80)
31	26.47	31.54	29	35	65/13	100/28		M		GRAY-GREEN, SANDY CLAY (26.71 – 31.30)
30	24.94	33.07	54	46/11		100/26		M		GRAY-GREEN AND MAROON, SILTY CLAY (25.01 – 33.00)
29	23.42	34.59	20	22	33	55	SS-23	21%		
28			20	25	39	64		M		Boring Terminated at Elevation 22.97 m in COASTAL PLAIN SILTY CLAY (22.97 – 35.04)

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PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB3-A	**STATION** 28+34.7	**OFFSET** 0.5m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.94 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 151,006.5	**EASTING** 611,858.5
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/14/07	**COMP. DATE** 08/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.04
24 HR.	0.98

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
	57.94	0.00								57.94 GROUND SURFACE	0.00
			WOH	3	3	6	SS-46	Sat.		**ALLUVIAL** DARK ORANGE, SILTY SAND	
57										56.94	1.00
	56.45	1.49								TAN, CLAYEY SAND	
			2	2	2	4	SS-47	Sat.			
56										55.64	2.30
	55.22	2.72								GRAY TO ORANGE, SANDY SILT	
			2	5	9	14	SS-48	Sat.			
55											
54	53.70	4.24									
			3	5	3	8		Sat.			
53										53.04	4.90
	52.18	5.76								**COASTAL PLAIN** GRAY TO DARK GRAY, SANDY CLAY (CAPE FEAR FORMATION)	
			8	16	18	34	SS-49	M			
52											
51	50.66	7.28									
			7	9	14	23		M			
50											
49	49.14	8.80									
			13	17	17	34		M			
48											
	47.62	10.32									
			7	8	12	20		M			
47											
46	46.10	11.84									
			5	7	10	17		M			
45										45.14	12.80
	44.58	13.36								DARK GRAY, CLAYEY SAND	
			6	8	11	19	SS-50	M			
44										43.64	14.30
43	43.06	14.88								GRAY, SANDY CLAY	
			4	7	9	16		M			
42										41.94	16.00
	41.54	16.40								GRAY, SILTY SAND	
			15	23	31	54	SS-51	M			
41										40.34	17.60
40	40.02	17.92								GREEN TO GRAY, SILTY CLAY	
			23	16	21	37	SS-52	M			
39											
	38.50	19.44									
38			16	34	24	58		M			

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB3-A	**STATION** 28+34.7	**OFFSET** 0.5m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.94 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 151,006.5	**EASTING** 611,858.5
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/14/07	**COMP. DATE** 08/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.04
24 HR.	0.98

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	38					Match Line				GREEN TO GRAY, SILTY CLAY *(continued)*
37	36.98	20.96								
			22	32	38	70		M		
36										
	35.46	22.48								
			23	26	45	71		M		
35										
34	33.94	24.00								
			20	28	28	56		M		
33										
	32.42	25.52								
			21	56	44/8	100/23		M		
32										
31	30.90	27.04								
			22	24	20	44		M		
30										
	29.38	28.56								
			15	15	19	34		M		
29										
28	27.86	30.08								
			30	37	63/15	100/30		M		27.41 — 30.53
27										Boring Terminated at Elevation 27.41 m in COASTAL PLAIN SILTY CLAY
26										
25										
24										
23										
22										
21										
20										
19										
18										

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PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D. CARR
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB4-A	**STATION** 28+67.4	**OFFSET** 24.6m LT	**ALIGNMENT** -L-
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 37.79 m	**NORTHING** 151,037.3	**EASTING** 611,884.9
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/30/00	**COMP. DATE** 09/01/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	7.04
24 HR.	7.04

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	65										
	64.86	0.00								64.86 GROUND SURFACE	0.00
64			5	8	7	15		M		**ROADWAY EMBANKMENT** TAN AND ORANGE, SILTY SAND	
	63.79	1.07								63.79	1.07
63			4	7	6	13		M		RED, SILTY CLAY	
	62.27	2.59								62.18	2.68
62			6	12	18	30		M		TAN, SILTY SAND	
61	60.75	4.11	8	16	17	33		M			
60											
	59.22	5.64								59.22	5.64
59			8	17	21	38	SS-5	9% M		**ALLUVIAL** TAN AND RED, SILTY SAND	
58	57.70	7.16						▼		57.70	7.16
										57.62 TAN, COARSE SAND	7.24
57			12	16	16	32		M		**COASTAL PLAIN** TAN, SILTY SAND (MIDDENDORF FORMATION)	
56	56.17	8.69	4	8	7	15		M		56.17 LIGHT GRAY, CLAYEY SAND	8.69
55	54.65	10.21								54.65	10.21
54			12	19	22	41		W		ORANGE, MAROON, AND TAN, COARSE SAND	
53	53.13	11.73	5	8	14	22	SS-9	20% M		53.06 GRAY AND TAN, SILTY CLAY (CAPE FEAR FORMATION)	11.80
52	51.60	13.26								51.60	13.26
51			9	14	21	35		M		TAN AND ORANGE, SANDY CLAY	
50	50.08	14.78	8	9	11	20		M			
49										49.02	15.84
	48.55	16.31								GRAY, SILTY CLAY	
48			9	12	22	34		M			
47	47.03	17.83								47.03	17.83
			6	8	13	21		M		GRAY, SANDY CLAY	
46	45.51	19.35									
45			4	6	8	14		M			

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D. CARR
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLB4-A	**STATION** 28+67.4	**OFFSET** 24.6m LT	**ALIGNMENT** -L-
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 37.79 m	**NORTHING** 151,037.3	**EASTING** 611,884.9
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/30/00	**COMP. DATE** 09/01/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	7.04
24 HR.	7.04

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	45					Match Line				
44	43.98	20.88								GRAY, SANDY CLAY *(continued)*
43			13	7	8	15		M		
	42.46	22.40								42.46
42			4	6	9	15	SS-16	26% M		MAROON, GRAY, AND ORANGE, SILTY CLAY
41	40.93	23.93								40.93
40			7	10	12	22		M		GRAY, SANDY CLAY
39	39.41	25.45	6	7	11	18		M		
38	37.89	26.97	5	10	12	22		M		
37	36.36	28.50	13	23	34	57		M		
36	34.84	30.02	12	20	30	50	SS-21	24% M		
35	33.31	31.55	12	15	22	37		M		33.31 GRAY-GREEN, CLAYEY SAND
34	31.79	33.07	17	56	44/7	100/22		M		
33	30.26	34.60	16	21	27	48				
32	28.75	36.11	30	33	50	83	SS-25	12% M		
31	27.52	37.34	15	17	23	40		M		27.07 Boring Terminated at Elevation 27.07 m in COASTAL PLAIN CLAYEY SAND
30										
29										
28										
27										
26										
25										

NCDOT GEOTECHNICAL ENGINEERING UNIT
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PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D.G./J.G.
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB5-C	**STATION** 28+77.8	**OFFSET** 27.0m RT	**ALIGNMENT** -L-
COLLAR ELEV. 65.10 m	**TOTAL DEPTH** 36.19 m	**NORTHING** 150,989.4	**EASTING** 611,906.7
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/18/07	**COMP. DATE** 07/19/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	7.92
24 HR.	7.32

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
	66									65.10 GROUND SURFACE	0.00
										ROADWAY EMBANKMENT RED-ORANGE, SILTY CLAY	
	64.03	1.07	3	4	5	9	SS-45	M		63.04	2.06
										RED-TAN, SILTY SAND	
	62.51	2.59	2	10	16	26	SS-46	M		61.52	3.58
										TAN, CLAYEY SAND	
	60.99	4.11	5	10	11	21	SS-47	M		60.00	5.10
										TAN, SILTY SAND	
	59.46	5.64	9	13	14	27	SS-48	M		59.03	6.07
										ALLUVIAL TAN, COARSE SAND WITH TRACE GRAVEL	
	57.94	7.16	13	10	5	15	SS-49	W		56.90	8.20
										LIGHT GRAY, SANDY SILT WITH LAYERS OF SILTY CLAY, AND TRACE ORGANICS	
	56.41	8.69	1	2	11	13	SS-50	W		55.60	9.50
										COASTAL PLAIN TAN, SAND (MIDDENDORF FORMATION)	
	54.89	10.21	9	12	12	24	SS-51	W		53.90	11.20
										TAN, COARSE SAND	
	53.37	11.73	3	4	8	12	SS-52	M		52.50	12.60
										LIGHT GRAY, SANDY CLAY (CAPE FEAR FORMATION)	
	51.84	13.26	6	12	21	33	SS-53	M		50.85	14.25
										TAN-GRAY, CLAYEY SAND	
	50.32	14.78	4	8	10	18	SS-54	M		49.33	15.77
										TAN AND GRAY, SANDY CLAY	
	48.79	16.31	14	25	29	54	SS-55	M		47.80	17.30
										TAN AND GRAY, CLAYEY SAND	
	47.27	17.83	7	9	13	22	SS-56	M			
	45.75	19.35									

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D.G./J.G.
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLB5-C	**STATION** 28+77.8	**OFFSET** 27.0m RT	**ALIGNMENT** -L-
COLLAR ELEV. 65.10 m	**TOTAL DEPTH** 36.19 m	**NORTHING** 150,989.4	**EASTING** 611,906.7
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/18/07	**COMP. DATE** 07/19/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	7.92
24 HR.	7.32

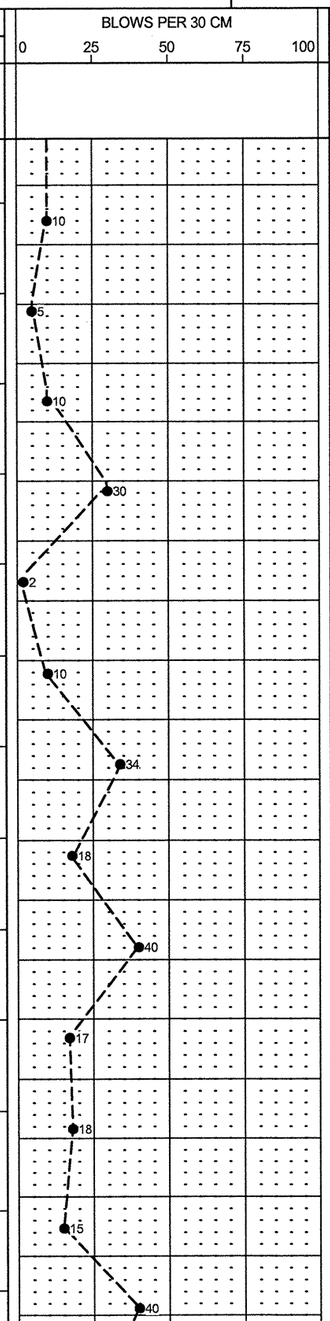
ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	46					Match Line				
	44.22	20.88	5	8	9	17	SS-57	M		TAN AND GRAY, CLAYEY SAND *(continued)* — 44.90 / 20.20
										GRAY, SANDY CLAY WITH TRACE MICA
	42.70	22.40	4	5	7	12	SS-58	M		43.23 / 21.87
										RED AND GRAY, SILTY CLAY
	41.17	23.93	4	5	8	13	SS-59	M		41.70 / 23.40
										GRAY, SANDY SILT
	39.65	25.45	37	29	22	51	SS-60	M		40.40 / 24.70
										GRAY, SILTY CLAY, HIGHLY PLASTIC
	38.13	26.97	11	6	7	13	SS-61	M		38.66 / 26.44
										BROWN, SANDY CLAY
	36.60	28.50	6	14	20	34	SS-62	M		37.14 / 27.96
										BROWN TO GRAY, SILTY CLAY
	35.08	30.02	21	36	52	88	SS-63	M		35.61 / 29.49
										GRAY TO BROWN, SILTY CLAY, HIGHLY PLASTIC
	33.55	31.55	13	16	22	38	SS-64	M		34.40 / 30.70
										GRAY, CLAYEY SAND
	32.03	33.07	21	26	31	57	SS-65	M		32.60 / 32.50
										GRAY, SANDY SILT
	30.50	34.60	21	32	47	79	SS-66	M		31.04 / 34.06
										GREEN-GRAY, CLAYEY SAND
	28.99	36.11	12	19	21	40	SS-67	M		29.60 / 35.50
										GRAY, SANDY SILT
			100/8			100/8	SS-68	M		28.91 / 36.19
										Boring Terminated at Elevation 28.91 m in COASTAL PLAIN SANDY SILT

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLEB2-A	**STATION** 29+09.0	**OFFSET** 8.2m RT	**ALIGNMENT** -L-
COLLAR ELEV. 61.77 m	**TOTAL DEPTH** 36.56 m	**NORTHING** 151,014.9	**EASTING** 611,933.8
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/11/07	**COMP. DATE** 07/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	3.78
24 HR.	3.66

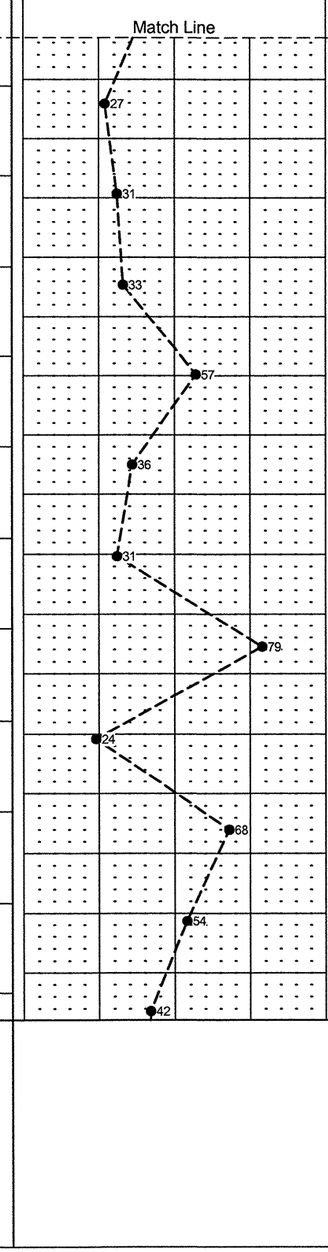
ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	62								61.77 GROUND SURFACE	0.00
									ROADWAY EMBANKMENT TAN AND BROWN, SILTY SAND	
61	60.70	1.07	7	6	4	SS-1	M			
60									59.97	1.80
									COASTAL PLAIN ORANGE-TAN, SILTY SAND (MIDDENDORF FORMATION)	
59	59.18	2.59	2	2	3	SS-2	M			
58									58.27	3.50
	57.66	4.11							TAN, SAND	
57			3	5	5	SS-3	W			
56	56.13	5.64							56.77	5.00
									RED-TAN, COARSE SAND	
55	54.61	7.16	10	14	16	SS-4	W			
54			WOH	WOH	2		W			
53	53.08	8.69								
52			2	4	6		W			
51	51.56	10.21							51.87	9.90
			8	14	20	SS-7	M		TAN, SILTY CLAY (CAPE FEAR FORMATION)	
50	50.04	11.73							50.77	11.00
									TAN AND GRAY, CLAYEY SAND	
49			5	8	10	SS-8	M			
48	48.51	13.26								
47	46.99	14.78	11	18	22		M			
46			6	8	9		M		46.27	15.50
									GRAY, SANDY CLAY	
45	45.46	16.31	4	8	10	SS-11	M			
44									44.47	17.30
									GRAY, CLAYEY SAND	
43	43.77	18.00	6	6	9	SS-12	M			
42	42.42	19.35	4	18	22		M			



PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 367 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. RLEB2-A	**STATION** 29+09.0	**OFFSET** 8.2m RT	**ALIGNMENT** -L-
COLLAR ELEV. 61.77 m	**TOTAL DEPTH** 36.56 m	**NORTHING** 151,014.9	**EASTING** 611,933.8
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/11/07	**COMP. DATE** 07/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	3.78
24 HR.	3.66

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	42								Match Line
41	40.89	20.88							GRAY, CLAYEY SAND *(continued)*
			19	13	14		W		
40									
39	39.37	22.40	5	15	16		M		
38									38.47 23.30
									TAN AND GRAY, SILTY CLAY
37	37.84	23.93	9	13	20	SS-16	M		
36	36.32	25.45	13	22	35		M		
35	34.80	26.97							
34			11	15	21		M		33.77 28.00
									GREEN-GRAY, GRAY AND RED, SILTY SAND
33	33.27	28.50	13	16	15	SS-19	M		
32	31.75	30.02							
31			18	33	46		M		
30	30.22	31.55	10	12	12		M		
29	28.70	33.07							
28			19	29	39		M		
27	27.17	34.60	16	27	27		M		26.27 35.50
									GRAY, SILTY CLAY
26	25.66	36.11							
25			13	19	23		M		25.21 36.56
									Boring Terminated at Elevation 25.21 m in COASTAL PLAIN SILTY CLAY
24									
23									
22									



NCDOT BORE DOUBLE U2519DA_GEO_BRDG_366_367.GPJ NC_DOT.GDT 10/26/07

PROJECT NO. 34817.1.1	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** J. HOWARD
SITE DESCRIPTION BRIDGE NO. 366 ON -L- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)			**GROUND WTR (m)**
BORING NO. LLEB2-C	**STATION** 29+06.0	**OFFSET** 13.7m LT	**ALIGNMENT** -L-	**0 HR.** 1.00
COLLAR ELEV. 61.20 m	**TOTAL DEPTH** 18.28 m	**NORTHING** 151,035.4	**EASTING** 611,925.0	**24 HR.** 1.92
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 05/12/98	**COMP. DATE** 05/01/98	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
	62										
	61.20	0.00								GROUND SURFACE	0.00
61			1	1	1	2		M		**ALLUVIAL** TAN, SILTY SAND	
60	60.13	1.07									1.22
			3	3	3	6	SS-2	M		**COASTAL PLAIN** LIGHT RED-BROWN, SANDY CLAY (MIDDENDORF FORMATION)	
59											
	58.61	2.59									2.59
			5	9	10	19	SS-3	Sat.		LIGHT RED-BROWN TO TAN, SAND	
58											
57	57.09	4.11									4.11
			8	11	14	25	SS-4	Sat.		GRAY, TAN AND DARK RED, SILTY SAND	
56											
	55.56	5.64									5.64
			4	4	4	8	SS-5	Sat.		RED-BROWN TO TAN, COARSE SAND	
55											
54	54.04	7.16									
			4	4	7	11	SS-6	Sat.			
53											
	52.51	8.69									8.69
			7	10	15	25	SS-7	W		GRAY TO TAN, SILTY CLAY (CAPE FEAR FORMATION)	
52											
51	50.99	10.21									10.21
			4	6	8	14	SS-8	Sat.		GRAY TO TAN, CLAYEY SAND	
50											
	49.47	11.73									11.73
			9	19	28	47	SS-9	W		GRAY, BROWN, AND RED, SILTY CLAY	
49											
48	47.94	13.26									
			6	10	15	25	SS-10	M			
47											
	46.42	14.78									
46			5	7	11	18	SS-11	M			
45	44.89	16.31									16.31
			7	10	12	22	SS-12	W		GRAY, SANDY CLAY	
44											
	43.37	17.83									17.83
43			3	6	11	17	SS-13	M		GRAY, BROWN, AND RED, SILTY CLAY	18.28
										42.92 Boring Terminated at Elevation 42.92 m in COASTAL PLAIN SILTY CLAY	
42											

LLEB1-C

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-2	13.7m LT	26+90.0	1.07-1.52	A-2-4(0)	31	8	67.6	16.3	3.7	12.4	97.8	47.2	17.0	7.9	-
SS-3	13.7m LT	26+90.0	2.59-3.04	A-2-4(0)	29	10	72.7	8.7	5.9	12.7	97.0	41.3	18.8	7.0	-
SS-4	13.7m LT	26+90.0	4.11-4.56	A-2-4(0)	23	NP	30.0	58.6	0.5	10.9	93.2	70.0	13.5	17.4	-
SS-5	13.7m LT	26+90.0	5.64-6.09	A-6(7)	36	19	27.2	19.2	17.4	36.2	97.2	77.4	55.4	13.2	-
SS-7	13.7m LT	26+90.0	8.69-9.14	A-1-b(0)	22	2	88.0	5.8	1.9	4.3	94.7	21.2	6.3	-	-
SS-8	13.7m LT	26+90.0	10.36-10.66	A-7-6(13)	41	23	11.6	26.1	43.5	11.6	100.0	93.8	66.7	13.4	-
SS-9	13.7m LT	26+90.0	11.73-12.18	A-2-7(1)	42	25	54.3	17.2	4.6	23.9	98.9	66.2	29.1	14.3	-
SS-10	13.7m LT	26+90.0	13.26-13.71	A-2-6(0)	39	22	64.0	10.0	4.1	21.9	96.8	48.6	26.0	15.9	-
SS-11	13.7m LT	26+90.0	14.78-15.23	A-2-6(3)	38	23	40.1	25.3	4.1	30.5	99.1	74.7	35.4	13.3	-
SS-12	13.7m LT	26+90.0	16.31-16.76	A-2-6(0)	34	20	64.4	12.7	3.2	19.7	97.7	51.9	23.1	15.0	-
SS-13	13.7m LT	26+90.0	17.38-18.28	A-2-6(1)	33	19	49.4	19.1	4.4	27.1	99.5	69.1	32.7	14.3	-
SS-14	13.7m LT	26+90.0	19.35-19.80	A-2-7(0)	53	38	71.8	7.9	4.2	16.1	96.6	38.3	20.4	17.4	-
SS-15	13.7m LT	26+90.0	20.88-21.33	A-6(6)	29	15	15.3	30.7	43.1	10.9	100.0	91.1	61.9	14.2	-
SS-16	13.7m LT	26+90.0	22.40-22.85	A-2-6(0)	36	15	70.7	16.9	1.1	11.3	99.3	51.9	14.0	17.2	-
SS-17	13.7m LT	26+90.0	23.93-24.38	A-7-6(24)	51	33	7.3	17.4	28.7	46.6	93.5	90.0	74.8	15.0	-

RLEB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-120	21.8m RT	26+92.0	1.07-1.52	A-2-4(0)	20	3	70.3	4.2	13.3	12.1	97	63	26	-	-
SS-121	21.8m RT	26+92.0	2.59-3.04	A-2-6(0)	29	14	62.1	16.3	2.4	19.2	100	50	23	-	-
SS-122	21.8m RT	26+92.0	4.11-4.56	A-2-4(0)	18	NP	72.6	17.4	2.9	7.1	98	53	11	-	-
SS-124	21.8m RT	26+92.0	7.16-7.61	A-6(12)	38	22	12.7	26.1	14.7	46.5	100	93	66	-	-
SS-125	21.8m RT	26+92.0	8.69-9.14	A-2-6(1)	37	21	54.3	17.6	4.9	23.3	90	55	26	-	-
SS-127	21.8m RT	26+92.0	10.21-10.66	A-2-6(2)	35	22	52.1	15.9	1.7	30.3	98	69	32	-	-
SS-129	21.8m RT	26+92.0	14.78-15.23	A-2-6(1)	34	18	64.5	13.5	3.7	18.2	99	58	23	-	-
SS-130	21.8m RT	26+92.0	16.31-16.76	A-6(17)	40	23	8.3	17.8	23.4	50.6	100	96	78	-	-
SS-132	21.8m RT	26+92.0	19.35-19.80	A-2-6(1)	36	19	51.9	22.3	9.6	16.2	93	64	26	-	-

LLB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-20	6.6m LT	27+40.4	2.69-3.14	A-2-4(0)	27	NP	64.6	21.9	7.4	6.0	97	54	15	-	-
SS-21	6.6m LT	27+40.4	4.42-4.87	A-6(1)	30	12	38.6	21.9	12.3	27.2	93	65	40	-	-
SS-22	6.6m LT	27+40.4	5.76-6.21	A-2-7(2)	43	25	54.0	16.2	2.6	27.2	97	60	30	-	-
SS-23	6.6m LT	27+40.4	10.32-10.77	A-2-6(0)	34	18	72.6	6.5	1.7	19.1	94	40	20	-	-
SS-24	6.6m LT	27+40.4	16.40-16.85	A-2-4(0)	18	NP	64.1	22.0	5.8	8.0	99	61	16	-	-
SS-25	6.6m LT	27+40.4	17.92-18.37	A-6(12)	36	21	13.5	24.5	29.8	32.2	100	92	70	-	-
SS-26	6.6m LT	27+40.4	24.00-24.45	A-2-6(0)	37	16	68.3	13.5	12.2	6.0	95	47	20	-	-
SS-27	6.6m LT	27+40.4	28.56-29.01	A-7-6(10)	44	19	23.5	20.7	39.6	16.1	99	84	61	-	-

RLB1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-32	10.0m RT	27+42.3	0.00-0.45	A-2-6(1)	35	13	45.3	22.5	20.1	12.1	98	75	34	-	-
SS-33	10.0m RT	27+42.3	3.22-3.67	A-7-5(13)	67	23	32.4	7.0	28.4	32.2	94	70	58	-	-
SS-34	10.0m RT	27+42.3	4.35-4.80	A-2-6(0)	30	12	59.2	17.9	2.8	20.1	97	60	23	-	-
SS-35	10.0m RT	27+42.3	5.87-6.32	A-2-6(0)	27	11	67.9	12.6	2.4	17.1	84	41	17	-	-
SS-36	10.0m RT	27+42.3	7.39-7.84	A-6(9)	39	22	34.0	12.1	9.7	44.3	100	78	56	-	-
SS-37	10.0m RT	27+42.3	13.47-13.92	A-4(0)	19	3	16.7	52.1	21.1	10.1	100	90	42	-	-
SS-38	10.0m RT	27+42.3	16.51-16.96	A-4(0)	24	7	28.8	40.6	12.5	18.1	100	85	37	-	-

LLB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-28	18.8m LT	27+89.5	1.45-1.90	A-7-6(12)	54	26	38.2	7.4	26.2	28.2	98	65	55	-	-
SS-29	18.8m LT	27+89.5	6.01-6.46	A-2-6(1)	37	20	57.0	17.0	2.8	23.1	97	61	26	-	-
SS-30	18.8m LT	27+89.5	7.51-7.96	A-7-6(24)	52	28	10.3	11.7	13.7	64.4	100	94	81	-	-
SS-31	18.8m LT	27+89.5	18.15-18.60	A-6(9)	40	18	18.1	24.9	32.8	24.1	100	89	63	-	-

RLB2-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-39	21.2m RT	27+93.2	0.00-0.45	A-7-6(20)	49	27	12.9	17.1	21.7	48.3	100	92	74	-	-
SS-40	21.2m RT	27+93.2	1.02-1.47	A-3(0)	19	NP	69.0	24.3	0.6	6.0	100	60	8	-	-
SS-41	21.2m RT	27+93.2	5.66-6.11	A-6(5)	35	15	24.9	26.4	10.5	38.2	100	83	52	-	-
SS-42	21.2m RT	27+93.2	16.30-16.57	A-2-4(0)	24	9	46.7	29.2	12.1	12.1	99	72	29	-	-
SS-43	21.2m RT	27+93.2	17.82-18.27	A-6(14)	38	25	14.1	25.6	36.2	24.1	100	92	67	-	-
SS-44	21.2m RT	27+93.2	23.90-24.35	A-2-6(0)	37	11	56.9	23.3	13.7	6.0	95	57	22	-	-
SS-45	21.2m RT	27+93.2	28.46-28.91	A-6(3)	31	17	46.6	11.8	28.6	13.1	96	67	41	-	-

LLB3-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-3	12.2m LT	28+30.0	2.59-3.04	A-2-6(0)	37	16	69.1	8.3	5.2	17.4	99.8	46.6	22.7	19.9	-
SS-10	12.2m LT	28+30.0	13.26-13.71	A-2-6(0)	39	14	68.9	6.8	6.7	17.6	99.4	46.2	24.3	17.5	-
SS-14	12.2m LT	28+30.0	19.35-19.80	A-7-6(23)	48	16	9.4	15.9	36.1	38.6	100.0	94.6	76.2	18.9	-
SS-23	12.2m LT	28+30.0	33.07-33.52	A-7-6(3)	42	20	24.4	41.6	24.4	9.6	100.0	87.4	36.7	20.7	-

RLB3-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-46	0.5m LT	28+34.7	0.00-0.45	A-2-4(0)	19	2	54.2	30.0	3.7	12.1	96	65	19	-	-
SS-47	0.5m LT	28+34.7	1.49-1.94	A-2-6(0)	28	11	71.3	13.6	2.0	13.1	94	42	15	-	-
SS-48	0.5m LT	28+34.7	2.72-3.17	A-4(0)	21	4	15.7	49.1	21.1	14.1	100	94	47	-	-
SS-49	0.5m LT	28+34.7	5.76-6.21	A-6(10)	35	17	8.9	25.8	19.1	46.3	100	95	72	-	-
SS-50	0.5m LT	28+34.7	13.36-13.81	A-2-7(2)	41	27	62.3	11.3	8.4	18.1	94	51	26	-	-
SS-51	0.5m LT	28+34.7	16.40-16.85	A-2-4(0)	20	6	32.2	37.4	16.3	14.1	96	76	31	-	-
SS-52	0.5m LT	28+34.7	17.92-18.37	A-7-6(11)	41	24	4.0	42.3	17.5	36.2	100	99	59	-	-

LLB4-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-5	24.6m LT	28+67.4	5.64-6.09	A-2-4(0)	28	20	70.6	9.6	5.5	14.3	96.8	44.2	19.4	9.1	-
SS-9	24.6m LT	28+67.4	11.80-12.18	A-7-6(31)	57	22	4.2	12.4	20.4	63.0	100.0	97.9	83.8	20.2	-
SS-16	24.6m LT	28+67.4	22.40-22.85	A-7-6(20)	65	25	9.0	7.9	13.4	69.7	100.0	94.3	83.6	25.9	-
SS-21	24.6m LT	28+67.4	30.02-30.47	A-7-6(15)	57	27	20.1	25.9	32.6	21.4	100.0	88.4	56.7	24.2	-
SS-25	24.6m LT	28+67.4	36.11-36.56	A-2-6(0)	30	15	45.0	30.0	21.2	3.8	99.6	72.4	26.6	11.6	-

RLB5-C

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-45	27.0m RT	28+77.8	1.07-1.52	A-7-6(3)	43	21	35.1	31.0	5.6	28.4	98	78	38	-	-
SS-46	27.0m RT	28+77.8	2.59-3.04	A-2-4(0)	25	9	52.1	24.7	2.9	20.3	97	66	25	-	-
SS-47	27.0m RT	28+77.8	4.11-4.56	A-2-6(0)	32	14	56.7	21.7	1.3	20.3	94	63	22	-	-
SS-48	27.0m RT	28+77.8	5.64-6.09	A-2-4(0)	21	3	63.6	21.9	1.3	13.2	97	60	16	-	-
SS-49	27.0m RT	28+77.8	7.16-7.61	A-1-b(0)	17	NP	63.8	24.5	3.5	8.1	91	49	13	-	-
SS-50	27.0m RT	28+77.8	8.69-9.14	A-4(0)	21	4	8.3	53.1	14.3	24.3	100	98	51	-	-
SS-51	27.0m RT	28+77.8	10.21-10.66	A-3(0)	22	NP	70.1	21.7	1.1	7.1	97	55	9	-	-
SS-52	27.0m RT	28+77.8	11.73-12.18	A-1-b(0)	23	NP	90.6	3.3	0.0	6.1	100	23	6	-	-
SS-53	27.0m RT	28+77.8	13.26-13.71	A-6(6)	31	16	10.1	40.9	14.5	34.4	100	95	55	-	-
SS-54	27.0m RT	28+77.8	14.78-15.23	A-2-691)	30	15	45.4	23.5	1.7	29.4	99	86	32	-	-
SS-55	27.0m RT	28+77.8	16.31-16.76	A-6(4)	30	17	37.1	19.0	11.4	32.4	100	77	48	-	-
SS-56	27.0m RT	28+77.8	17.83-18.28	A-2-6(2)	35	22	50.4	18.8	0.4	30.4	97	68	31	-	-
SS-57	27.0m RT	28+77.8	19.35-19.80	A-2-6(1)	31	15	61.4	11.6	4.8	22.3	99	60	28	-	-
SS-58	27.0m RT	28+77.8	20.88-21.33	A-6(1)	28	14	24.0	42.2	8.4	25.3	99	91	36	-	-
SS-59	27.0m RT	28+77.8	22.40-22.85	A-7-6(26)	53	36	12.8	15.8	20.8	50.7	100	93	74	-	-
SS-60	27.0m RT	28+77.8	23.93-24.38	A-4(0)	20	7	22.9	48.6	48.3	10.1	100	90	36	-	-
SS-61	27.0m RT	28+77.8	25.45-25.90	A-7-6(26)	54	36	4.3	30.6	30.7	34.4	100	97	74	-	-
SS-62	27.0m RT	28+77.8	26.97-27.42	A-6(11)	35	21	16.8	22.5	26.2	34.4	100	91	67	-	-
SS-63	27.0m RT	28+77.8	28.50-28.95	-7-6(4)	42	19	43.0	16.4	18.3	22.3	98	70	42	-	-
SS-64	27.0m RT	28+77.8	30.02-30.43	A-7-6(16)	46	26	13.8	25.7	34.1	26.3	100	92	68	-	-
SS-65	27.0m RT	28+77.8	31.55-32.00	A-2-7(1)	48	22	62.2	10.7	13.9	13.2	95	49	27	-	-
SS-66	27.0m RT	28+77.8	33.07-33.52	A-4(0)	32	10	45.6	20.6	19.7	14.2	98	68	37	-	-
SS-67	27.0m RT	28+77.8	34.60-35.05	A-2-6(0)	39	17	62.1	27.1	6.7	4.1	96	59	14	-	-
SS-68	27.0m RT	28+77.8	36.11-36.19	A-4(0)	23	8	39.9	27.4	22.4	10.2	100	76	37	-	-

RLEB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	21.8m LT	29+09.0	1.07-1.52	A-2-4(0)	27	NP	40.6	38.8	16.5	4.0	100	76	26	-	-
SS-2	21.8m LT	29+09.0	2.59-3.04	A-2-4(0)	21	6	53.8	26.5	7.6	12.1	90	53	21	-	-
SS-3	21.8m LT	29+09.0	4.11-4.56	A-3(0)	17	NP	69.4	23.7	0.9	6.1	100	61	8	-	-
SS-4	21.8m LT	29+09.0	5.64-6.09	A-1-b(0)	16	NP	84.1	8.7	3.1	4.0	98	29	8	-	-
SS-7	21.8m LT	29+09.0	10.21-10.66	A-7-6(15)	43	26	17.4	17.4	34.9	30.3	100	94	66	-	-
SS-8	21.8m LT	29+09.0	12.00-12.45	A-2-6(1)	34	17	64.1	11.5	2.1	22.2	94	47	24	-	-
SS-11	21.8m LT	29+09.0	16.31-16.76	A-6(2)	27	12	11.1	45.3	11.2	32.4	100	97	47	-	-
SS-12	21.8m LT	29+09.0	17.83-18.28	A-2-6(1)	36	19	59.3	16.4	4.1	20.2	100	62	26	-	-
SS-16	21.8m LT	29+09.0	23.93-24.38	A-7-6(36)	60	35	2.0	8.9	46.6	42.5	100	99	92	-	-
SS-19	21.8m LT	29+09.0	28.50-28.95	A-2-4(0)	35	NP	44.1	41.5	10.4	4.0	100	81	19	-	-

LLEB2-C

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-2	13.7m LT	29+06.0	1.07-1.52	A-6(3)	39	19	41.5	23.3	6.6	28.6	100	75.7	38.1	-	-
SS-3	13.7m LT	29+06.0	2.59-3.04	A-3(0)	26	NP	58.9	35.2	4.3	1.6	100	79.3	6.4	-	-
SS-4	13.7m LT	29+06.0	4.11-4.56	A-2-4(0)	27	8	46.6	30.3	6.2	16.9	99.4	72.2	24.4	-	-
SS-5	13.7m LT	29+06.0	5.64-6.09	A-1-b(0)	25	NP	76.7	16.6	1.2	5.5	97.1	49.9	6.7	-	-
SS-6	13.7m LT	29+06.0	7.16-7.61	A-1-b(0)	25	NP	79.7	13.3	3.6	3.4	100.0	40.5	7.4	-	-
SS-7	13.7m LT	29+06.0	8.69-9.14	A-7-6(13)	46	25	8.3	34.2	10.9	46.6	100.0	97.4	62.6	-	-
SS-8	13.7m LT	29+06.0	10.21-10.66	A-2-7(1)	44	23	56.7	14.0	1.6	27.7	99.4	61.7	30.1	-	-
SS-9	13.7m LT	29+06.0	11.73-12.18	A-7-6(11)	41	25	26.7	18.3	8.7	46.3	100.0	83.5	58.0	-	-
SS-10	13.7m LT	29+06.0	13.26-13.71	A-7-6(4)	47	29	52.0	11.6	1.6	34.8	98.2	65.8	36.5	-	-
SS-11	13.7m LT	29+06.0	14.78-15.23	A-7-6(24)	49	29	6.6	16.3	14.9	62.2	100.0	96.1	80.5	-	-
SS-12	13.7m LT	29+06.0	16.31-16.76	A-6(2)	32	18	40.9	24.8	11.7	22.6	99.4	76.6	36.8	-	-
SS-13	13.7m LT	29+06.0	17.83-18.28	A-7-6(30)	56	41	10.4	18.7	10.7	60.2	99.8	94.6	74.7	-	-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34817.1.1 TIP: U-2519DA COUNTY: Cumberland

DESCRIPTION(1): Bridges # 366 and 367 on -L-(FOL) over Beaver Creek and -Y1- (All American Freeway)

EXISTING BRIDGE

Information from: Field Inspection N/A Microfilm ____ (reel ____ pos: ____
Other (explain) From Bridge Survey & Hydraulic Design Report 1-11-07

Bridge No.: 366;367 Length: N/A Total Bents: N/A Bents in Channel: N/A Bents in Floodplain: N/A
Foundation Type: N/A

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: N/A

Interior Bents: N/A

Channel Bed: N/A

Channel Bank: N/A

EXISTING SCOUR PROTECTION

Type(3): N/A

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): N/A

DESIGN INFORMATION

Channel Bed Material(7): Alluvial, wet to saturated, very loose to loose, silty and clayey sand, SS-20 and SS-32

Channel Bank Material(8): Alluvial, wet to saturated, very loose to loose, silty and clayey sand, SS-20 and SS-32

Channel Bank Cover(9): Brush, grass and small trees

Floodplain Width(10): 130 meters

Floodplain Cover(11): Brush, grass and small trees

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

Channel Migration Tendency(13): Slight tendency for migration to the southwest toward Bent 1

Observations and Other Comments:

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

Bridge Number 366 (Structure Number 1)

B1	B2	B3
56.60	56.20	57.00

Bridge Number 367 (Structure Number 2)

B1	B2	B3
56.58	56.19	57.20

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees with the theoretical scour elevations for the 100 year event as shown in the Bridge Survey and Hydraulic Design Report dated 01/11/07

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

"See Soil Test Results" for samples: SS-20 SS-32

Form GEU-017e Revised 7/26/2007

Reported by: Kevin B. Miller Date: 10/19/2007

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.

PROJECT: 34817.1.2 ID: U-2519DA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2	1	24

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
U-2519DA	NHF-DPR-0100 (1)	P.E.
		CONST.

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34817.1.2 I.D. NO. U-2519DA

F.A. PROJECT NHF-DPR-0100 (1)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO EAST OF NC 24

SITE DESCRIPTION STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)

FOR LETTING

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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: R. RAHIE

INVESTIGATED BY	MACTEC ENGINEERING AND CONSULTING, INC.	PERSONNEL	J. HOWARD
CHECKED BY	J. VEITH		M. LEAR
SUBMITTED BY	M. LEAR		B. DEOBALD
DATE	07/27/07		E. BURKETT
REVISED	08/14/07		

NORTH CAROLINA LICENSED SEAL 1927 GEOLOGIST MICHAEL B. LEAR 8/15/07

SEAL

MACTEC

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SIGNATURE

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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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		N.P.	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

P.I. OF A-7-5 ≤L.L. - 30 : P.I. OF A-7-6 >L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- 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
- BM BENCH MARK
- 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 - CBR SAMPLE
- MARSH
- TREE LINE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
C.I. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FIAD - FILLED IMMEDIATELY AFTER DRILLING
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
LS. - LIMESTONE
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
V. - VERY
VST - VANE SHEAR TEST
W - MOISTURE CONTENT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] DIEDRICH D-50
- [X] CME-550
- [X] CME-45B ON MARSH BUGGY
- [ ] CME-55 ON BARGE
- [ ] PORTABLE HOIST
- [X] OTHER CME-45C TRAILER
- [X] OTHER CME-850

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 7.5cm STEEL TEETH
- [ ] TRICONE ____ TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER SIDE-DISCHARGE WING BIT

HAMMER TYPE:
- [X] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B _____
- [ ] -N _____
- [ ] -H _____

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

ROCK DESCRIPTION

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 2.5 cm PER 50 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 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. *IF TESTED, YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 GEOLOGISTS 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 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 (S.R.Q.D.) - 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.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: NCDOT BASELINE POINTS BL-12 (59.506m), BL-13 (65.008m), AND BL-14 (64.782m)

NOTES:
Geotechnical Exploration Performed By:

MACTEC
MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604
(919) 876-0416

Subject: **Revised Geotechnical Report**

Description: **Structure 3: Bridge on -COL2- over Beaver Creek and -Y1- (All American Freeway)**
Fayetteville Outer Loop

Project Number:	**34817.1.2**
Tip Number:	**U-2519DA**
F.A. Number:	**NHF-DPR-0100 (1)**
MACTEC Project Number:	**6468-07-1787**

Project Information

The purpose of this investigation was to obtain geotechnical information for design and construction of the proposed bridge over Beaver Creek and All American Freeway located on and adjacent to the Fort Bragg Military Reservation, south of the controlled access point on All American Freeway, Cumberland County, North Carolina (Drawings 1 and 2). The ramp is part of a proposed segment of the Fayetteville Outer Loop from East of SR 1415 to East of NC 24. Our understanding of this project comes from conversations and site visits with NCDOT Geotechnical Engineering Unit personnel, and from documents and drawings provided by the Geotechnical Engineering Unit, including a Request for Proposal dated June 1, 2007, and electronic drawings obtained via the NCDOT file transfer system.

The proposed bridge is approximately 186 meters long and 17 to 28 meters wide. The bridge is to be constructed on six bents with five unequal spans of length 32, 35, 41, 42, and 36 meters. The bridge is wider at End Bent 1 and Bent 1 to accommodate an exit loop (-LP1B-). End Bent 1 to Bent 2 are skewed 90° to the alignment (-COL2-) and Bent 3 to End Bent 2 are skewed approximately 81° to -COL2-. The proposed grade is approximately 11 to 15 meters above the natural ground surface in the vicinity of End Bent 1 to Bent 3, and 8 to 13 meters above the natural ground surface in the vicinity of Bent 4 and End Bent 2.

We were requested to drill one SPT-boring at End Bent 1, Bent 1, Bent 2 and End Bent 2, for a total of four borings for the project. We were instructed by the NCDOT to drill all borings to the depth of 30 meters. The NCDOT provided boring logs from previous geotechnical investigations completed in the vicinity of Bents 3 and 4 that are incorporated into this report.

Field Testing

During June and July, 2007, MACTEC drilled 1 boring at End Bent 1, Bent 1 and Bent 2, and at the request of MACTEC, Trigon Engineering and Consulting drilled 1 boring at End Bent 2. The 4 borings were advanced at locations shown on the Boring Location Plan (Drawing 3). The locations of the 2 borings completed by the NCDOT are also shown on the Boring Location Plan. Boring EB1 was drilled with a CME-45C trailer-mounted drill rig equipped with a 63.5 kilogram automatic hammer, borings B1 and B2 were drilled with a CME-45B marsh buggy-mounted drill rig equipped with a 63.5 kilogram manual hammer, and Boring EB2 was drilled with a CME-850 ATV drill rig equipped with a 63.5 kilogram automatic hammer. The borings were advanced using mud rotary drilling techniques. Borings RP1DB and RPIBD, performed by the NCDOT, were advanced with a CME-550 drill rig equipped with a 63.5 kilogram automatic hammer using hollow-stem auger and mud rotary drilling techniques.

All borings were advanced to an approximate depth of 30 meters. Standard penetration tests (SPT) were conducted and soil samples collected at approximately 1.5 meter intervals from within the soil profile using split-barrel samplers and 63.5 kilogram manual or automatic hammers.

MACTEC boring locations were established at the project site utilizing GPS equipment. As-drilled boring location coordinates were captured with GPS equipment and were corrected as necessary using post-processing differential correction. Conventional survey techniques were used to establish the collar elevations at boring locations and selected ground surface points depicted on the subsurface profile drawings included with this report. U-2519DA Baseline Survey Points BL-12, BL-13, and BL-14, established at the project site by the NCDOT, were used as benchmarks.

Laboratory Testing

Laboratory testing consisting of AASHTO classification, grain-size distribution, and/or organic content tests were performed on split-barrel samples SS-1 through SS-22. Cohesive soils were also tested for moisture content.

Laboratory testing was performed in general accordance with applicable ASTM/AASHTO/ NCDOT specifications. Test results for AASHTO classification, grain-size distribution, organic content, and moisture content are included with this report.

Physiography

The ground surface along the approaches to the proposed structure slopes gradually down toward the end bents. There is approximately 14 meters of relief between the approaches to the end bents and the flood plain of Beaver Creek. The ground surface is at elevation 59± meters mean sea level (msl) along End Bent 1, and 60± meters msl along End Bent 2. The ground surface ranges from 56 to 57± meters msl at interior bent locations, except at Bent 4, which is in the median of All American Freeway with a ground surface elevation of 64± meters msl.

The site is currently undeveloped. The upland areas located at the end bents are moderately wooded with young to mature pine and hardwood trees. A soil road crosses the alignment near End Bent 1. The flood plain of Beaver Creek is moderately to thinly wooded with mature hardwood and pine trees, and areas of thick brush and grass. Beaver Creek enters the site from the north and the main channel of the creek crosses the alignment between bents 1 and 2. At the time of our investigation, Beaver Creek was confined to a main channel. It appears that Beaver Creek occasionally overtops its banks and spreads laterally across the site submerging much of the flood plain. The water surface elevation of Beaver Creek was measured at 56.51 meters msl, on July 16, 2007. All American Freeway crosses the site between Bent 3 and End Bent 2, with Bent 4 located in the median. All American Freeway consists of a four-lane, divided highway constructed on an embankment approximately 8 meters above the flood plain of Beaver Creek. End Bent 2 is located along the toe of the embankment slope of All American Freeway. Site photographs included in this report show site conditions during our field investigation.

Geology

The project site is located in the western portion of the Carolina Coastal Plain Physiographic Province. The Carolina Coastal Plain is a wedge of mostly marine sediments and sedimentary rocks that gradually thickens to the east (towards the present day coast-line) that were deposited during depositional cycles caused by fluctuating sea-levels. The Coastal Plain sediments encountered at the project site were deposited at a time when sea-level was much higher than its present condition. The depositional processes that resulted in the sediments encountered at the project site are similar to those in existence today along the current coast-line. Younger sediments lie at the surface near the coast. Older sediments, which underlie these younger sediments, lie at or near the surface further inland. The 1985 Geologic Map of North Carolina, compiled by the N.C. Geologic Survey, indicates that the project site is underlain by sediments of the Middendorf and Cape Fear Formations. We encountered the following stratigraphic units at the project site:

- Roadway Embankment Fill
- Alluvium
- Middendorf Formation
- Cape Fear Formation

Boring logs describing subsurface conditions at each of the boring locations are included in this report. A Profile, Drawings 4 to 6, depicts generalized subsurface conditions along the length of the structure.

Soil

Roadway Embankment Fill was only encountered in boring RP1BD completed by the NCDOT in the vicinity of Bent 4. The fill consists of medium dense to dense, silty, fine to coarse sand (A-2-4) with trace gravel; and stiff, sandy, silty clay (A-7-5). The fill overlies alluvial soils at approximate elevation 59± meters msl.

Alluvium was encountered at the surface in borings EB1, B1, B2, RP1DB, and EB2, and below roadway embankment fill in boring RP1BD. Alluvial soils consist of very loose to dense, silty, fine to coarse sand and gravel (A-2-4/A-1-b) with organics and wood fragments; and very soft, fine sandy, silty clay (A-7-5) with little organics. Alluvial soils are thickest in the vicinity of Bents 1 and 2, which coincide with the current location of Beaver Creek. Alluvial soils overlie the Middendorf Formation at approximate elevations ranging from 49 to 58± meters msl.

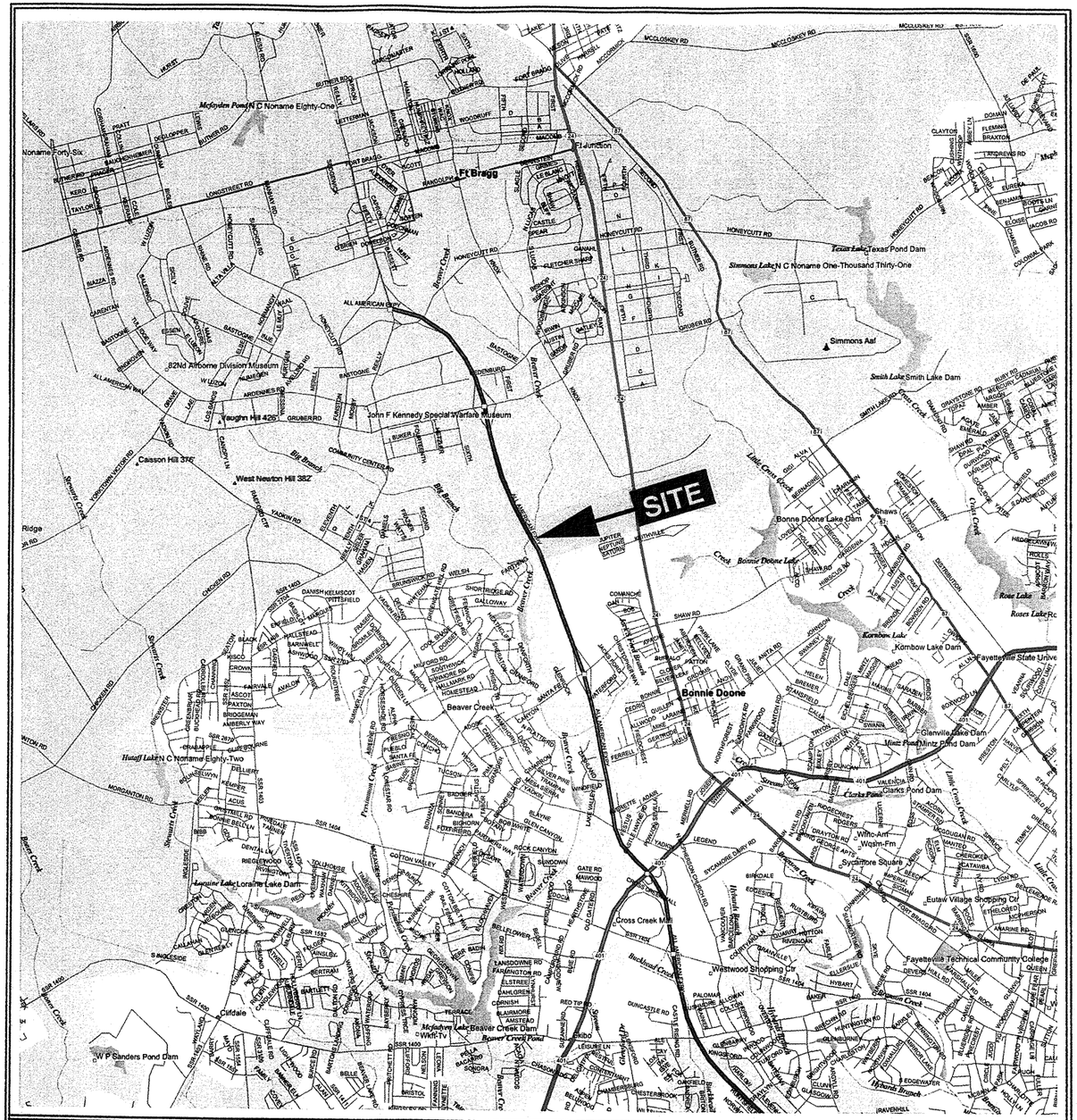
Middendorf Formation soils were encountered below alluvium and typically consist of interbedded, loose to very dense, silty, clayey, fine to coarse sand and gravel (A-1-b/A-3/A-2-4/A-2-6) with trace mica; and medium stiff to hard, fine to coarse sandy, silt and clay (A-4/A-6/A-7-6/A-7-5) with trace mica and gravel. Middendorf Formation soils are generally lightly colored gray, tan, brown, orange, and maroon, and commonly mottled with red or orange. Individual beds are laterally discontinuous. The base of the Middendorf Formation / top of the Cape Fear Formation ranges from elevation 37 to 40± meters msl.

The Cape Fear Formation was encountered underlying the Middendorf Formation and generally consists of interbedded clays and sands; including very stiff to hard, fine to coarse sandy, silty, clay (A-6/A-7-6) with trace mica and gravel; and dense to very dense, clayey, fine to coarse sand

(A-2-6) with trace mica and gravel. Cape Fear Formation soils are typically darkly colored gray to green, mottled with tan, orange, red, maroon, and brown. All borings were terminated in the Cape Fear Formation.

Groundwater

Groundwater level measurements were obtained 24-hours after drilling was completed in all borings except EB1, which was backfilled immediately after drilling was completed. Groundwater elevations ranged from 56.5 to 57.8± meters msl at these locations. The groundwater elevations coincide with or are slightly higher than the surface water elevations observed for Beaver Creek and appear to be a subdued reflection of the site overall topography.



REFERENCE: Delorme Street Atlas

N

GRAPHIC SCALE MILES

1.0 0.5 0 1.0 2.0

NOTE: SITE LOCATION IS APPROXIMATE

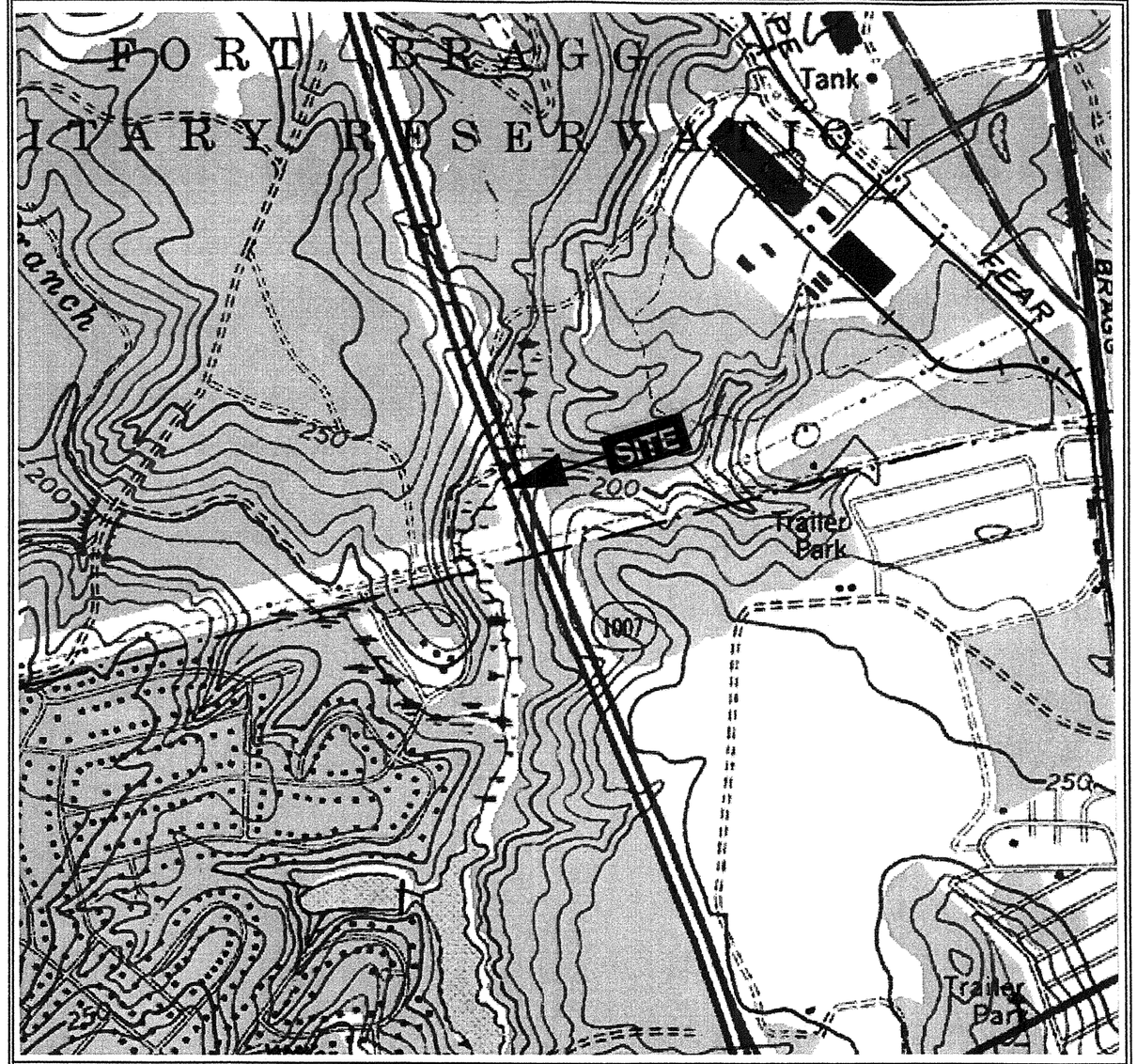
MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

SITE LOCATION MAP
STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)
NCDOT PROJ. NO. 34817.1.2 (U-2519DA)
CUMBERLAND COUNTY, NORTH CAROLINA

DRAWN: MBL	DATE: JULY 2007	DRAWING	
ENG CHECK:	SCALE: 1 : 62500	1	
APPROVAL:	JOB: 6468-07-1787		

SHEET 5



FAYETTEVILLE, N.C.
SW/4 FAYETTEVILLE 15'
QUADRANGLE
35078-A8-TF-024
1957
PHOTOREVISED 1987
DMA 5254 III SW – SERIES V842

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

GRAPHIC SCALE FEET

1000 500 0 1000 2000

NOTE: SITE LOCATION IS APPROXIMATE

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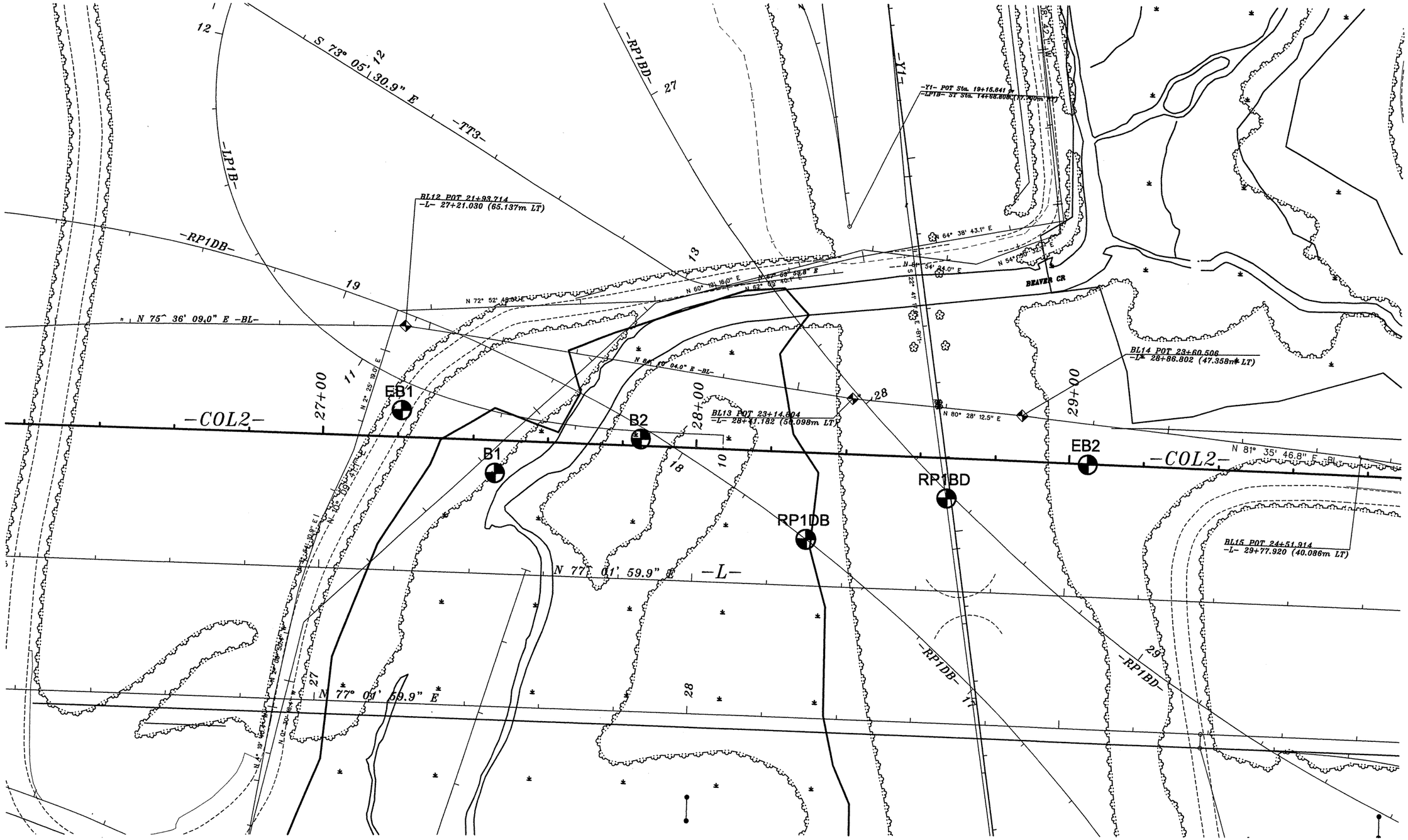
MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

TOPOGRAPHIC SITE MAP
STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)
NCDOT PROJ. NO. 34817.1.2 (U-2519DA)
CUMBERLAND COUNTY, NORTH CAROLINA

DRAWN: MBL	DATE: JULY 2007	DRAWING	
ENG CHECK:	SCALE: 1 : 12000	2	
APPROVAL:	JOB: 6468-07-1787		

SHEET: 6



0 10 20 40

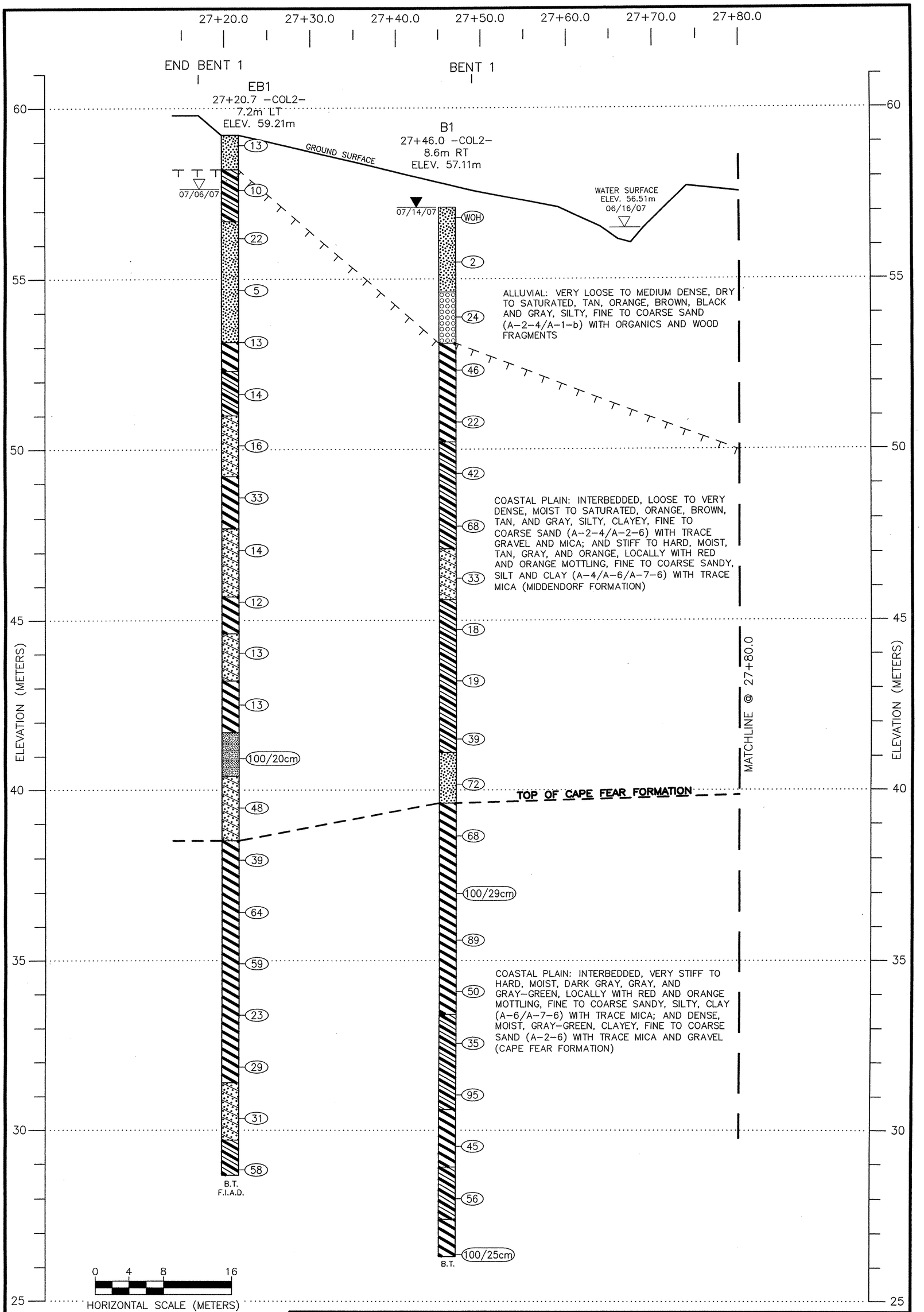
HORIZONTAL SCALE (METER)
1:100

NAD 83

BORING LOCATION PLAN
STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK
AND -Y1- (ALL AMERICAN FREEWAY)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
F.A. No. NHF-DPR-0100(1)
CUMBERLAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 06/27/07
	DFT CHECK: M.B.L.	JOB : 6468-07-1787
	ENG CHECK: J.E.V.	DWG: 3

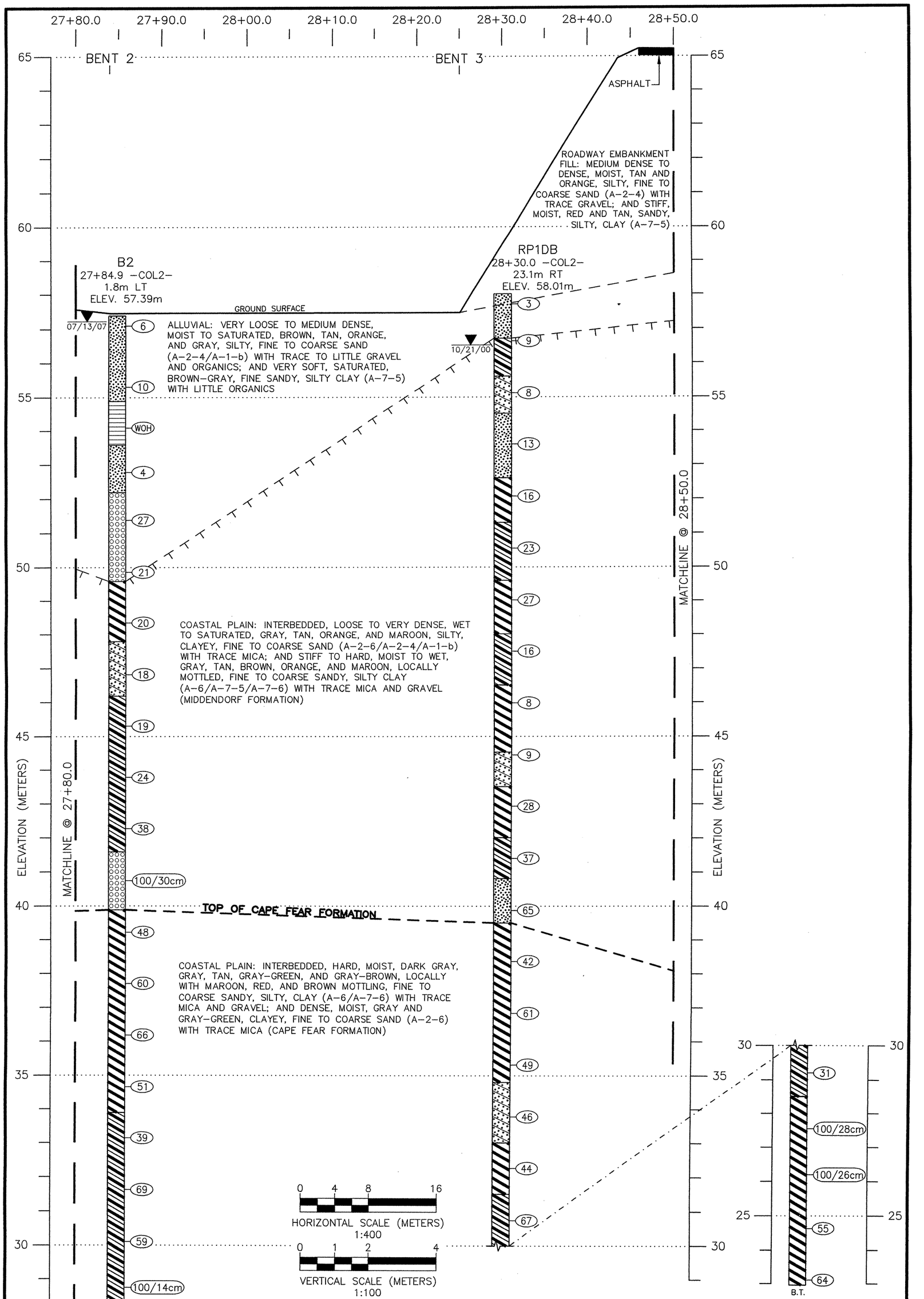


PROFILE ALONG -COL2-
STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
F.A. No. NHF-DPR-0100(1)
CUMBERLAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 07/27/07
08/14/07	DFT CHECK: M.B.L.	JOB: 6468-07-1787
	ENG CHECK: J.E.V.	DWG: 4

SHEET: 7

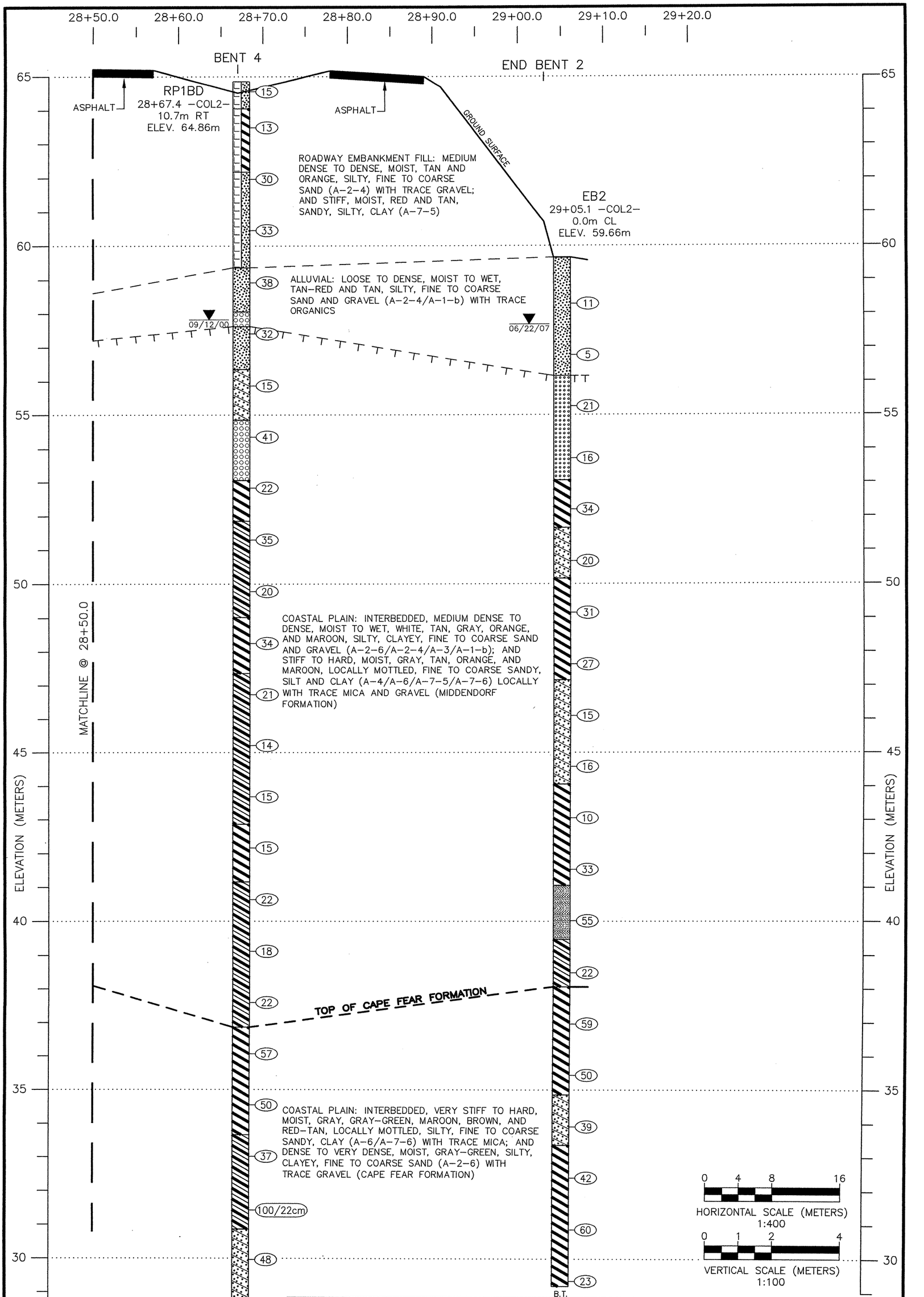


PROFILE ALONG -COL2-
STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
F.A. No. NHF-DPR-0100(1)
CUMBERLAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 07/27/07
08/14/07	DFT CHECK: M.B.L.	JOB: 6468-07-1787
	ENG CHECK: J.E.V.	DWG: 5

SHEET: 8



PROFILE ALONG -COL2-
STRUCTURE 3: BRIDGE ON -COL2- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
F.A. No. NHF-DPR-0100(1)
CUMBERLAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 07/27/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1787
	ENG CHECK: J.E.V.	DWG: 6

SHEET: 9

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. EB1	**STATION** 27+20.7	**OFFSET** 7.2m LT	**ALIGNMENT** -COL2-
COLLAR ELEV. 59.21 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 151,021.9	**EASTING** 611,738.0
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/06/07	**COMP. DATE** 07/06/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.56
24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
59.21	0.00								**GROUND SURFACE** 0.00
		5	6	7	13		D		**ALLUVIAL** Tan-orange, silty, fine SAND (A-2-4)
58.21	1.00								**COASTAL PLAIN** Tan with orange and brown mottling, sandy CLAY (A-6) (Middendorf Formation)
57.92	1.29	1	3	7	10		M		
56.71	2.50								**COASTAL PLAIN** Orange, brown, and tan, silty, fine to coarse SAND (A-2-4) (Middendorf Formation)
56.51	2.70	11	12	10	22		Sat.		
54.97	4.24	3	3	2	5		Sat.		
53.45	5.76	5	4	9	13		Sat.		
53.15	6.06								**COASTAL PLAIN** Tan, silty CLAY (A-7-6) (Middendorf Formation)
52.31	6.90								**COASTAL PLAIN** Gray and tan, sandy, silty CLAY (A-6) with trace mica (Middendorf Formation)
51.93	7.28	4	5	9	14		M		
51.01	8.20								**COASTAL PLAIN** Tan and gray, clayey, fine to coarse SAND (A-2-6) with trace gravel and mica (Middendorf Formation)
50.41	8.80	7	8	8	16		M		
49.21	10.00								**COASTAL PLAIN** Dark gray with orange and red mottling, silty CLAY (A-7-6) (Middendorf Formation)
48.89	10.32	11	15	18	33		M		
47.71	11.50								**COASTAL PLAIN** Gray with orange, clayey, fine to coarse SAND (A-2-6) with trace mica (Middendorf Formation)
47.37	11.84	4	6	8	14		M		
45.71	13.50								**COASTAL PLAIN** Dark gray, sandy CLAY (A-7-6) (Middendorf Formation)
45.85	13.36	6	6	6	12		M		
44.61	14.60								**COASTAL PLAIN** Light gray, clayey, fine to coarse SAND (A-2-6) with trace mica (Middendorf Formation)
44.33	14.88	8	6	7	13		W		
43.21	16.00								**COASTAL PLAIN** Red and gray mottled, sandy, silty, CLAY (A-7-6) (Middendorf Formation)
42.81	16.40	4	6	7	13		M		
41.71	17.50								**COASTAL PLAIN** Gray, fine sandy, clayey SILT (A-4) with trace mica (Middendorf Formation)
41.29	17.92	15	57	43/5	100/20		M		
40.41	18.80								
39.77	19.44								

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. EB1	**STATION** 27+20.7	**OFFSET** 7.2m LT	**ALIGNMENT** -COL2-
COLLAR ELEV. 59.21 m	**TOTAL DEPTH** 30.53 m	**NORTHING** 151,021.9	**EASTING** 611,738.0
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/06/07	**COMP. DATE** 07/06/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.56
24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
40					Match Line				
		14	23	25	48		M		**COASTAL PLAIN** Gray, clayey, fine to coarse SAND (A-2-6) with trace mica (Middendorf Formation)*(continued)*
38.51	20.70								**COASTAL PLAIN** Dark gray with red and orange mottling, and gray-green, fine sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation)
38.25	20.96	12	16	23	39		M		
36.73	22.48	16	27	37	64		M		
35.21	24.00	14	30	29	59		M		
33.69	25.52	8	10	13	23		M		
32.17	27.04	10	13	16	29		M		
31.41	27.80								**COASTAL PLAIN** Gray-green, clayey, fine to coarse SAND (A-2-6) with trace mica and gravel (Cape Fear Formation)
30.65	28.56	16	16	15	31		M		
29.71	29.50								**COASTAL PLAIN** Gray-green, sandy CLAY (A-6) with trace mica (Cape Fear Formation)
29.13	30.08	11	14	44	58		M		
28.68	30.53								Boring Terminated at Elevation 28.68 m in Coastal Plain: Hard, sandy, CLAY (A-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.09 g/cm
Casing Depth: 0.62m (10cm)

Note: Boring offset approximately 3.0m down-station from proposed location due to site conditions.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. B1	**STATION** 27+46.0	**OFFSET** 8.6m RT	**ALIGNMENT** -COL2-	**0 HR.** 0.40
COLLAR ELEV. 57.11 m	**TOTAL DEPTH** 30.78 m	**NORTHING** 151,012.2	**EASTING** 611,766.2	**24 HR.** 0.00
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 07/12/07	**COMP. DATE** 07/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58									
57.11	0.00								**GROUND SURFACE** 0.00
		WOH	WOH	WOH	0		Sat.		**ALLUVIAL** Brown and black, silty, fine to coarse SAND (A-2-4) with organics and wood fragments
55.79	1.32	WOH	1	1	2		Sat.		
54.61	2.50								**ALLUVIAL** Gray, tan, and orange, fine to coarse SAND (A-1-b) with trace organics
54.17	2.94	8	14	10	24	SS-15	Sat.		
53.11	4.00								**COASTAL PLAIN** Gray with orange, fine sandy, silty CLAY (A-7-6) (Middendorf Formation)
52.62	4.49	15	18	28	46	SS-16	16%		
51.10	6.01	5	8	14	22		M		
50.21	6.90								**COASTAL PLAIN** Dark gray and orange, silty CLAY (A-6) (Middendorf Formation)
49.58	7.53	6	16	26	42	SS-17	26%		
48.06	9.05	21	31	37	68		M		
47.11	10.00								**COASTAL PLAIN** Gray, clayey, fine SAND (A-2-6) with trace mica (Middendorf Formation)
46.54	10.57	13	14	19	33		W		
45.61	11.50								**COASTAL PLAIN** Gray, fine to coarse sandy, silty CLAY (A-6) with trace mica (Middendorf Formation)
45.02	12.09	12	7	11	18	SS-18	17%		
43.50	13.61	8	9	10	19		M		
41.80	15.31	15	16	23	39		M		
41.11	16.00								**COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-2-4) with trace mica (Middendorf Formation)
40.46	16.65	17	25	47	72		Sat.		
39.61	17.50								**COASTAL PLAIN** Dark gray and gray-green with orange mottling, sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation)
38.94	18.17	20	35	33	68		M		

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. B1	**STATION** 27+46.0	**OFFSET** 8.6m RT	**ALIGNMENT** -COL2-	**0 HR.** 0.40
COLLAR ELEV. 57.11 m	**TOTAL DEPTH** 30.78 m	**NORTHING** 151,012.2	**EASTING** 611,766.2	**24 HR.** 0.00
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 07/12/07	**COMP. DATE** 07/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
38					Match Line				
37.42	19.69	34	43	57/14	100/29		M		**COASTAL PLAIN** Dark gray and gray-green with orange mottling, sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation) *(continued)*
35.90	21.21	25	45	44	89		M		
34.38	22.73	18	20	30	50		M		
33.41	23.70								**COASTAL PLAIN** Gray-green, silty, fine to coarse sandy, CLAY (A-6) (Cape Fear Formation)
32.86	24.25	14	16	19	35		M		
31.34	25.77	29	43	52	95		M		
30.61	26.50								**COASTAL PLAIN** Dark gray, fine sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation)
29.82	27.29	22	24	21	45		M		
28.91	28.20								**COASTAL PLAIN** Gray-green, sandy CLAY (A-6) with trace mica (Cape Fear Formation)
28.30	28.81	20	23	33	56		M		
27.41	29.70								**COASTAL PLAIN** Gray, sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation)
26.78	30.33	27	31	69/10	100/25		M		
26.33	30.78								Boring Terminated at Elevation 26.33 m in Coastal Plain: Hard, sandy, silty, CLAY (A-7-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.08 g/cm
Casing Depth: 3.15m (10cm)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. B2	**STATION** 27+84.9	**OFFSET** 1.8m LT	**ALIGNMENT** -COL2-
COLLAR ELEV. 57.39 m	**TOTAL DEPTH** 30.26 m	**NORTHING** 151,031.0	**EASTING** 611,801.7
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/11/07	**COMP. DATE** 07/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 0.34; 24 HR. 0.17

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58							
57.39	0.00						GROUND SURFACE
		1	3	3		M	**ALLUVIAL** Brown and tan, silty SAND (A-2-4) with roots and organic debris
55.61	1.78						
		4	6	4	SS-19	Sat.	
54.39	3.00						**ALLUVIAL** Brown-gray, fine sandy, silty CLAY (A-7-5) with little organics Organic Content (SS-20)=8.6%
		WOH	WOH	WOH	SS-20	177%	
53.08	4.31						**ALLUVIAL** Brown-gray, silty SAND (A-2-4) with trace organics
		1	1	3		Sat.	
51.68	5.71						**ALLUVIAL** Tan, fine to coarse SAND (A-1-b) with trace to little gravel and trace organics
		4	10	17		Sat.	
50.16	7.23						
		7	8	13	SS-21	Sat.	
48.64	8.75						**COASTAL PLAIN** Dark gray, fine sandy, silty CLAY (A-7-6) (Middendorf Formation)
		6	10	10		M	
47.12	10.27						**COASTAL PLAIN** Gray-tan, clayey, SAND (A-2-6) with trace mica (Middendorf Formation)
		8	9	9		Sat.	
45.60	11.79						**COASTAL PLAIN** Gray with brown mottling, sandy CLAY (A-6) with trace mica (Middendorf Formation)
		7	8	11		W	
44.08	13.31						
		10	11	13		M	
42.56	14.83						
		27	18	20		M	
41.04	16.35						**COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-1-b) (Middendorf Formation)
		34	66/15		SS-22	Sat.	
39.52	17.87						**COASTAL PLAIN** Dark gray with orange, red, and brown mottling, sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation)
		15	20	28		M	
38.00	19.39						
		19	30	30		M	

Elevations: 2.50, 3.80, 5.20, 7.80, 9.60, 11.20, 15.80, 17.50

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. B2	**STATION** 27+84.9	**OFFSET** 1.8m LT	**ALIGNMENT** -COL2-
COLLAR ELEV. 57.39 m	**TOTAL DEPTH** 30.26 m	**NORTHING** 151,031.0	**EASTING** 611,801.7
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/11/07	**COMP. DATE** 07/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 0.34; 24 HR. 0.17

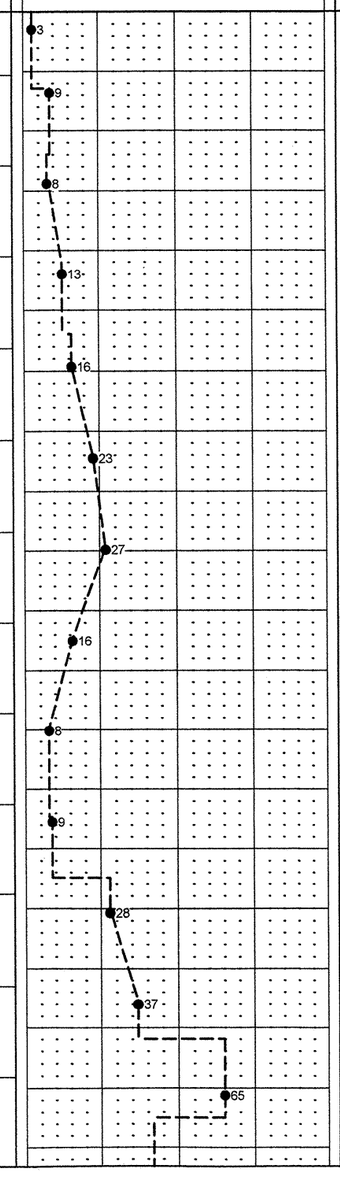
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION
38							Match Line
36.48	20.91						**COASTAL PLAIN** Dark gray with orange, red, and brown mottling, sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation) *(continued)*
		34	29	37		M	
34.96	22.43						
		19	23	28		M	
33.44	23.95						33.89 / 23.50 **COASTAL PLAIN** Gray-green, gray-brown, and gray, silty, fine to coarse sandy, CLAY (A-6) with trace mica and pyrite (Cape Fear Formation)
		13	17	22		M	
31.92	25.47						
		22	27	42		M	
30.40	26.99						
		22	26	33		M	
28.88	28.51						
		100/14				M	
27.36	30.03						
		38	62/8			M	27.13 / 30.26 Boring Terminated at Elevation 27.13 m in Coastal Plain: Hard, sandy, CLAY (A-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.10 g/cm
Casing Depth: 1.78m (10cm)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

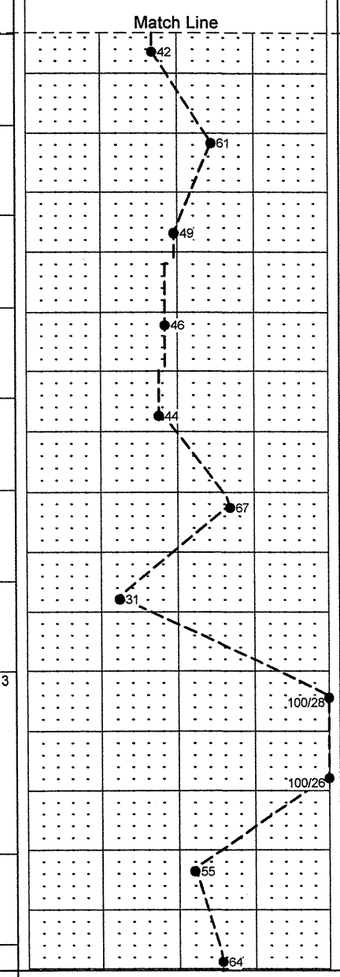
PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. RP1DB	**STATION** 28+30.0	**OFFSET** 23.1m RT	**ALIGNMENT** -COL2-	**0 HR.** 1.63
COLLAR ELEV. 58.01 m	**TOTAL DEPTH** 35.04 m	**NORTHING** 151,016.9	**EASTING** 611,851.3	**24 HR.** 1.49
DRILL MACHINE CME-550	**DRILL METHOD** H.S. Augers w/ Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 10/18/00	**COMP. DATE** 10/20/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58.01	0.00							**GROUND SURFACE** 0.00
56.94	1.07	1	1	2		D/M		**ALLUVIAL** Brown and orange, silty, fine to coarse SAND (A-2-4) with trace roots, organic debris, and gravel 1.29
55.42	2.59	2	3	6				**COASTAL PLAIN** Light gray, tan, and orange mottled, silty, fine sandy, CLAY (A-6) (Middendorf Formation) 2.40
53.90	4.11	4	4	4		20%		**COASTAL PLAIN** Orange and light gray, clayey, fine to coarse SAND (A-2-6) (Middendorf Formation) 3.50
52.37	5.64	16	6	7		W		**COASTAL PLAIN** Tan and maroon, clayey, silty, fine to coarse SAND (A-2-4) (Middendorf Formation) 5.40
50.85	7.16	4	5	11		W/M		**COASTAL PLAIN** Tan, silty CLAY (A-7-5) with trace gravel (Middendorf Formation) 6.70
49.32	8.69	5	11	12		M		**COASTAL PLAIN** Gray, tan, and orange mottled, fine to coarse sandy, CLAY (A-6) with trace mica and gravel (Middendorf Formation) 8.40
47.80	10.21	5	11	16		M		**COASTAL PLAIN** Gray, silty CLAY (A-7-6) (Middendorf Formation) 10.00
46.28	11.73	3	7	9		M		**COASTAL PLAIN** Gray, fine to coarse sandy, CLAY (A-6) (Middendorf Formation) 11.50
44.75	13.26	2	3	5		M		**COASTAL PLAIN** Gray with tan and brown, silty CLAY (A-7-6) (Middendorf Formation) 13.47
43.23	14.78	2	3	6		18%		**COASTAL PLAIN** Gray, clayey, fine to coarse SAND (A-2-6) (Middendorf Formation) 14.50
41.70	16.31	3	5	23		M		**COASTAL PLAIN** Gray and maroon mottled, silty CLAY (A-7-6) (Middendorf Formation) 16.00
40.18	17.83	15	18	19		M		**COASTAL PLAIN** Gray, fine sandy, CLAY (A-6) (Middendorf Formation) 17.20
38.66	19.35	28	31	34		W		**COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-2-4) (Middendorf Formation) 18.50
								COASTAL PLAIN Gray with tan and maroon, fine sandy, silty CLAY (A-7-6) (Cape Fear Formation)



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. RP1DB	**STATION** 28+30.0	**OFFSET** 23.1m RT	**ALIGNMENT** -COL2-	**0 HR.** 1.63
COLLAR ELEV. 58.01 m	**TOTAL DEPTH** 35.04 m	**NORTHING** 151,016.9	**EASTING** 611,851.3	**24 HR.** 1.49
DRILL MACHINE CME-550	**DRILL METHOD** H.S. Augers w/ Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 10/18/00	**COMP. DATE** 10/20/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
37.13	20.88	11	17	25		19%		**COASTAL PLAIN** Gray with tan and maroon, fine sandy, silty CLAY (A-7-6) (Cape Fear Formation) *(continued)*
35.61	22.40	15	21	40		M		
34.08	23.93	22	21	28		M		34.81 23.20 **COASTAL PLAIN** Gray and gray-green, clayey, fine to coarse SAND (A-2-6) with trace mica (Cape Fear Formation)
32.56	25.45	25	16	30		M		33.01 25.00 **COASTAL PLAIN** Gray-green with dark gray and maroon, silty CLAY (A-7-6) (Cape Fear Formation)
31.04	26.97	13	17	27		M		31.51 26.50 **COASTAL PLAIN** Gray-green, fine to coarse sandy, CLAY (A-6) with trace mica and gravel (Cape Fear Formation)
29.51	28.50	25	31	36		M		
27.99	30.02	8	11	20		M		28.51 29.50 **COASTAL PLAIN** Gray, gray-green, tan, and maroon mottled, fine to coarse sandy, silty, CLAY (A-7-6) with trace mica (Cape Fear Formation)
26.47	31.54	29	35	65/13		M		
24.94	33.07	54	46/11			M		
23.42	34.59	20	22	33		21%		
		20	25	39		M		22.97 35.04 Boring Terminated at Elevation 22.97 m in Coastal Plain: Hard, fine sandy, silty CLAY (A-7-6) with trace mica (Cape Fear Formation)



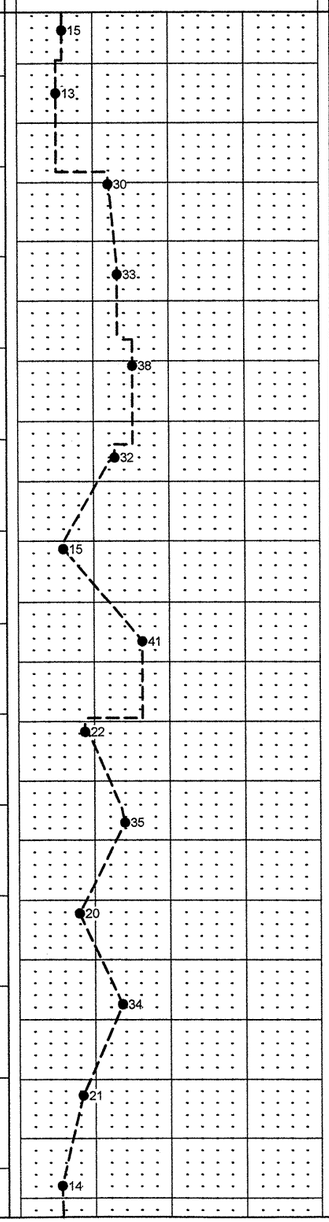
Bits Used: HSA to 3.04m, then 7.5cm Drag Bit
Drilling Fluid Properties: ND
Casing Depth: 4.56m (Augers)

Note: Boring drilled and logged by NCDOT personnel.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

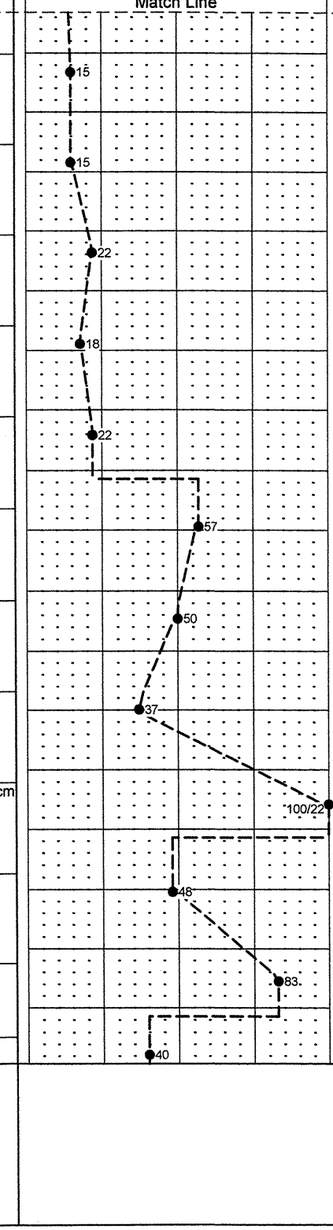
PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. RP1BD	**STATION** 28+67.4	**OFFSET** 10.7m RT	**ALIGNMENT** -COL2- / **0 HR.** 7.04
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 37.79 m	**NORTHING** 151,037.3	**EASTING** 611,884.9 / **24 HR.** 7.04
DRILL MACHINE CME-550	**DRILL METHOD** H.S. Augers w/ Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/30/00	**COMP. DATE** 09/11/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
65								
64.86	0.00	5	8	7		D/M		**GROUND SURFACE** 0.00
								ROADWAY EMBANKMENT Tan and orange, silty, fine SAND (A-2-4)
64.06	0.80							
63.79	1.07	4	7	6		M		**ROADWAY EMBANKMENT** Red and tan, sandy, silty, CLAY (A-7-5)
62.18	2.68							
62.27	2.59	6	12	18		M		**ROADWAY EMBANKMENT** Tan, silty, fine to coarse SAND (A-2-4) with trace gravel
60.75	4.11	8	16	17		M		
59.36	5.50							**ALLUVIAL** Tan-red, silty, fine to coarse SAND (A-2-4)
59.22	5.64	8	17	21		M		
58.06	6.80							
57.70	7.16	12	16	16		M/W		**ALLUVIAL** Tan, silty, fine to coarse SAND and GRAVEL (A-1-b)
57.62	7.24							**COASTAL PLAIN** Tan, silty, fine SAND (A-2-4) (Middendorf Formation)
56.36	8.50							**COASTAL PLAIN** Light gray, clayey, fine to coarse SAND (A-2-6) (Middendorf Formation)
56.17	8.69	4	8	7		M		
54.86	10.00							**COASTAL PLAIN** Orange, maroon, and tan, silty, fine to coarse SAND and GRAVEL (A-1-b) (Middendorf Formation)
54.65	10.21	12	19	22		W		
53.06	11.80							**COASTAL PLAIN** Gray-tan, fine sandy, silty CLAY (A-7-6) (Middendorf Formation)
53.13	11.73	5	8	14		20%		
51.86	13.00							**COASTAL PLAIN** Tan and orange, fine to coarse sandy, CLAY (A-6) (Middendorf Formation)
51.60	13.26	9	14	21		M		
50.08	14.78	8	9	11		M		
49.02	15.84							**COASTAL PLAIN** Gray, fine to coarse sandy, silty CLAY (A-7-5) (Middendorf Formation)
48.55	16.31	9	12	22		M		
47.36	17.50							**COASTAL PLAIN** Gray, fine to coarse sandy, CLAY (A-6) with gravel and trace mica (Middendorf Formation)
47.03	17.83	6	8	13		M		
45.51	19.35	4	6	8		M		



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. RP1BD	**STATION** 28+67.4	**OFFSET** 10.7m RT	**ALIGNMENT** -COL2- / **0 HR.** 7.04
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 37.79 m	**NORTHING** 151,037.3	**EASTING** 611,884.9 / **24 HR.** 7.04
DRILL MACHINE CME-550	**DRILL METHOD** H.S. Augers w/ Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/30/00	**COMP. DATE** 09/11/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
45								Match Line
43.98	20.88	13	7	8		M		**COASTAL PLAIN** Gray, fine to coarse sandy, CLAY (A-6) with gravel and trace mica (Middendorf Formation) *(continued)*
42.86	22.00							**COASTAL PLAIN** Maroon, gray, and orange mottled, silty, CLAY (A-7-6) (Middendorf Formation)
42.46	22.40	4	6	9		26%		
41.16	23.70							**COASTAL PLAIN** Gray, fine to coarse sandy, CLAY (A-6) (Middendorf Formation)
40.93	23.93	7	10	12		M		
39.41	25.45	6	7	11		M		
37.89	26.97	5	10	12		M		
36.86	28.00							**COASTAL PLAIN** Gray, maroon, and brown, fine sandy, silty CLAY (A-7-6) (Cape Fear Formation)
36.36	28.50	13	23	34		M		
34.84	30.02	12	20	30		24%		
33.66	31.20							**COASTAL PLAIN** Gray to gray-green, fine to coarse sandy, CLAY (A-6) with trace mica (Cape Fear Formation)
33.31	31.55	12	15	22		M		
31.79	33.07	17	56	44/7cm		M		
30.86	34.00							**COASTAL PLAIN** Gray-green, clayey, fine to coarse SAND (A-2-6) with trace feldpsar gravel (Cape Fear Formation)
30.26	34.60	16	21	27				
28.75	36.11	30	33	50		12%		
27.86	37.00							**COASTAL PLAIN** Gray-green and maroon mottled, fine sandy, CLAY (A-6) (Cape Fear Formation)
27.52	37.34	15	17	23		M		
27.07	37.79							Boring Terminated at Elevation 27.07 m in Coastal Plain: Hard, fine sandy, CLAY (A-6) (Cape Fear Formation)

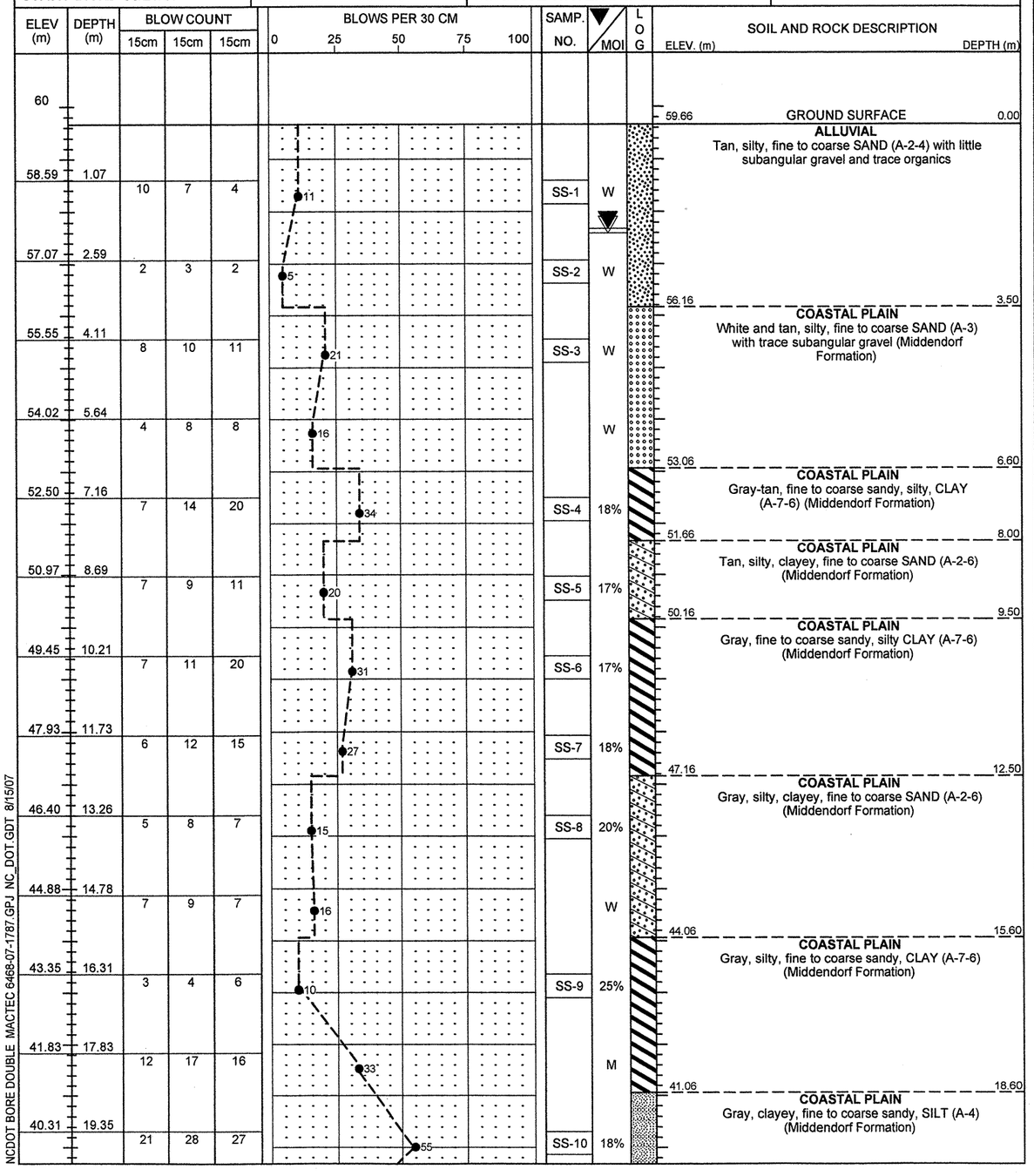


Bits Used: HSA to 6.09m, then 7.6cm Drag Bit
Drilling Fluid Properties: ND
Casing Depth: 6.09m (Augers)

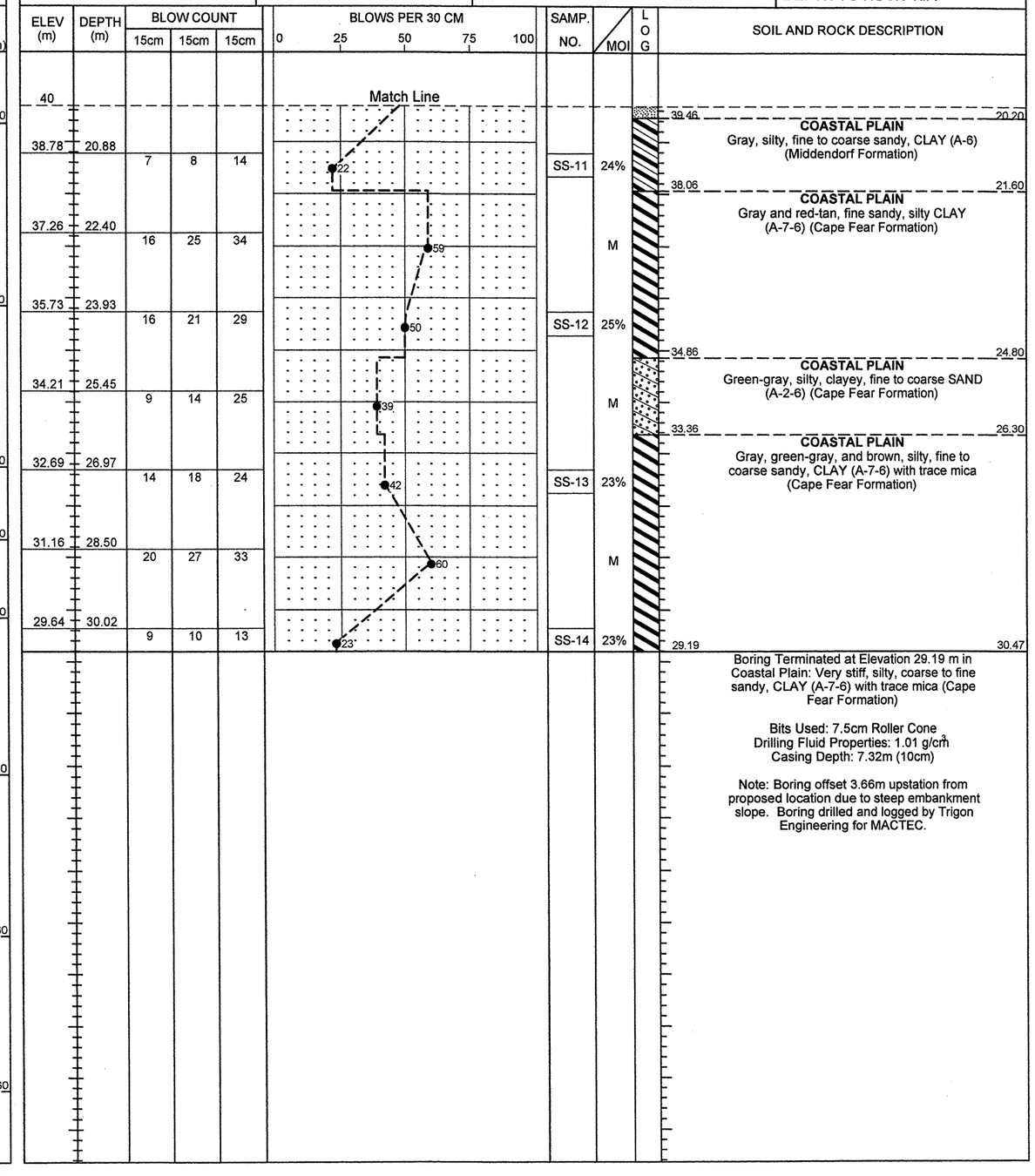
Note: Boring drilled and logged by NCDOT personnel.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. EB2	**STATION** 29+05.1	**OFFSET** 0.0m CL	**ALIGNMENT** -COL2- / **0 HR.** 2.07
COLLAR ELEV. 59.66 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,056.1	**EASTING** 611,919.3 / **24 HR.** 1.98
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 06/21/07	**COMP. DATE** 06/21/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Structure 3: Bridge on -COL2- over Beaver Creek and -Y1-(All American Freeway)(MACTEC 6468071787)			**GROUND WTR (m)**
BORING NO. EB2	**STATION** 29+05.1	**OFFSET** 0.0m CL	**ALIGNMENT** -COL2- / **0 HR.** 2.07
COLLAR ELEV. 59.66 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,056.1	**EASTING** 611,919.3 / **24 HR.** 1.98
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 06/21/07	**COMP. DATE** 06/21/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A



NCDOT BORE DOUBLE MACTEC 6468-07-1787.GPJ NC_DOT.GDT 8/15/07

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 3: Bridge on -COL2- Over Beaver Creek and -Y1- (All American Freeway)/(6468-07-1787)

PROJECT: 34817.1.2 (U-2519DA) COUNTY: CUMBERLAND OWNER: N.C.D.O.T.

DATE SAMPLED: June-July 2007 RECEIVED: 6/28/2007 REPORTED BY: MACTEC

SAMPLED FROM: EB2

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained 4.75 mm Sieve	(%)	0.1	9.9	0.1	0.0	1.4	0.0
Passing 2.00 mm Sieve	(%)	97.5	85.1	99.1	99.9	90.3	99.9
Passing 425 µm Sieve	(%)	69.5	17.7	55.3	94.1	52.2	89.9
Passing 75 µm Sieve	(%)	21.3	8.0	8.5	78.2	23.9	68.6

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	46.5	86.5	78.4	10.2	56.8	19.3
Fine Sand Ret - 53 µm	(%)	36.7	4.7	14.2	15.0	19.4	16.8
Silt 0.05 - 0.005 mm	(%)	6.2	2.4	4.0	20.4	2.7	17.2
Clay < 0.005 mm	(%)	10.7	6.5	3.3	54.4	21.2	46.6

Moisture Content	(%)	ND	ND	ND	17.5	17.3	16.6
Liquid Limit, L.L.		15	22	19	50	34	42
Plasticity Index, P.I.		1	7	NP	31	17	23
AASHTO Classification		A-2-4(0)	A-2-4(0)	A-3	A-7-6(24)	A-2-6(1)	A-7-6(14)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB2	EB2	EB2	EB2	EB2	EB2
Station		29+05.1	29+05.1	29+05.1	29+05.1	29+05.1	29+05.1
Offset		0.0 CL	0.0 CL	0.0 CL	0.0 CL	0.0 CL	0.0 CL
Alignment		-COL2-	-COL2-	-COL2-	-COL2-	-COL2-	-COL2-
Depth (M)	From	1.07	2.59	4.11	7.16	8.69	10.21
	to	1.52	3.04	4.56	7.61	9.14	10.66

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: NBL
Project Geologist

MACTEC

SHEET 16

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 3: Bridge on -COL2- Over Beaver Creek and -Y1- (All American Freeway)/(6468-07-1787)

PROJECT: 34817.1.2 (U-2519DA) COUNTY: CUMBERLAND OWNER: N.C.D.O.T.

DATE SAMPLED: June-July 2007 RECEIVED: 6/28/2007 REPORTED BY: MACTEC

SAMPLED FROM: EB2

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	0.0	3.9	0.0
Passing 2.00 mm Sieve	(%)	98.8	97.3	95.1	98.2	95.3	99.6
Passing 425 µm Sieve	(%)	79.6	63.0	70.6	69.3	93.8	95.7
Passing 75 µm Sieve	(%)	54.5	26.2	42.7	39.4	35.7	81.1

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	34.8	58.6	36.6	48.2	9.5	7.1
Fine Sand Ret - 53 µm	(%)	11.8	16.1	22.1	13.3	59.3	14.5
Silt 0.05 - 0.005 mm	(%)	10.1	3.9	14.9	17.0	14.4	33.7
Clay < 0.005 mm	(%)	43.2	21.4	26.4	21.5	16.8	44.7

Moisture Content	(%)	17.6	19.9	25.1	18.1	24.2	25.4
Liquid Limit, L.L.		52	37	43	26	38	57
Plasticity Index, P.I.		32	23	28	9	17	28
AASHTO Classification		A-7-6(14)	A-2-6(1)	A-7-6(7)	A-4(0)	A-6(2)	A-7-6(25)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB2	EB2	EB2	EB2	EB2	EB2
Station		29+05.1	29+05.1	29+05.1	29+05.1	29+05.1	29+05.1
Offset		0.0 CL	0.0 CL	0.0 CL	0.0 CL	0.0 CL	0.0 CL
Alignment		-COL2-	-COL2-	-COL2-	-COL2-	-COL2-	-COL2-
Depth (M)	From	11.73	13.26	16.31	19.35	20.88	23.93
	to	12.18	13.71	16.76	19.80	21.33	24.38

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: NBL
Project Geologist

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 3: Bridge on -COL2- Over Beaver Creek and -Y1- (All American Freeway)/(6468-07-1787)

PROJECT: 34817.1.2 (U-2519DA) COUNTY: CUMBERLAND OWNER: N.C.D.O.T.

DATE SAMPLED: June-July 2007 RECEIVED: 7/18/2007 REPORTED BY: MACTEC

SAMPLED FROM: EB2, B1

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-13	SS-14	SS-15	SS-16	SS-17	SS-18
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.3	0.2	0.0	0.1
Passing 2.00 mm Sieve	(%)	98.3	100.0	99.5	99.6	99.9	99.5
Passing 425 µm Sieve	(%)	92.1	79.6	41.8	87.3	91.4	85.0
Passing 75 µm Sieve	(%)	63.5	52.0	5.5	60.0	74.8	45.5

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	14.5	29.3	81.4	21.6	13.0	32.1
Fine Sand Ret - 53 µm	(%)	27.3	24.3	13.9	22.3	15.2	25.6
Silt 0.05 - 0.005 mm	(%)	30.2	26.3	2.7	20.3	22.9	9.1
Clay < 0.005 mm	(%)	28.0	20.1	2.0	35.8	48.8	33.2

Moisture Content	(%)	23.1	22.9	ND	16.3	25.7	17.2
Liquid Limit, L.L.		55	47	16	41	39	34
Plasticity Index, P.I.		28	26	NP	26	21	21
AASHTO Classification		A-7-6(17)	A-7-6(10)	A-1-b	A-7-6(12)	A-6(14)	A-6(5)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB2	EB2	B1	B1	B1	B1
Station		29+05.1	29+05.1	27+46.0	27+46.0	27+46.0	27+46.0
Offset		0.0 CL	0.0 CL	8.6m RT	8.6m RT	8.6m RT	8.6m RT
Alignment		-COL2-	-COL2-	-COL2-	-COL2-	-COL2-	-COL2-
Depth (M)	From	26.97	30.02	2.94	4.49	7.53	12.09
	to	27.42	30.47	3.39	4.94	7.98	12.54

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: MBC
Project Geologist

MACTEC

SHEET 17

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 3: Bridge on -COL2- Over Beaver Creek and -Y1- (All American Freeway)/(6468-07-1787)

PROJECT: 34817.1.2 (U-2519DA) COUNTY: CUMBERLAND OWNER: N.C.D.O.T.

DATE SAMPLED: July 2007 RECEIVED: 7/18/2007 REPORTED BY: MACTEC

SAMPLED FROM: B2

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-19	SS-20	SS-21	SS-22		
Retained 4.75 mm Sieve	(%)	0.9	0.2	0.3	0.1		
Passing 2.00 mm Sieve	(%)	98.8	99.2	98.7	97.7		
Passing 425 µm Sieve	(%)	64.3	85.9	50.2	42.5		
Passing 75 µm Sieve	(%)	21.4	72.7	10.4	4.5		

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	53.0	17.8	67.7	83.8		
Fine Sand Ret - 53 µm	(%)	30.4	13.3	23.4	12.2		
Silt 0.05 - 0.005 mm	(%)	4.3	21.9	5.2	2.4		
Clay < 0.005 mm	(%)	12.3	47.0	3.7	1.6		

Moisture Content	(%)	ND	176.5	ND	ND		
Liquid Limit, L.L.		19	68	21	19		
Plasticity Index, P.I.		1	28	NP	NP		
AASHTO Classification		A-2-4(0)	A-7-5(23)	A-1-b	A-1-b		
Organic Content	(%)	ND	8.6	ND	ND		

Boring No.		B2	B2	B2	B2		
Station		27+84.9	27+84.9	27+84.9	27+84.9		
Offset		1.8m LT	1.8m LT	1.8m LT	1.8m LT		
Alignment		-COL2-	-COL2-	-COL2-	-COL2-		
Depth (M)	From	1.78	3.00	7.23	16.35		
	to	2.23	3.45	7.68	16.80		

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: MBC
Project Geologist

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34817.1.2 TIP: U-2519DA COUNTY: Cumberland

DESCRIPTION(1): Structure 3: Bridge on -COL2- over Beaver Creek and -Y1- (All American Freeway)

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) Not Applicable: No Existing Bridge

Bridge No.: ____ Length: ____ Total Bents: ____ Bents in Channel: ____ Bents in Floodplain: ____
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: ____

Interior Bents: ____

Channel Bed: ____

Channel Bank: ____

EXISTING SCOUR PROTECTION

Type(3): ____

Extent(4): ____

Effectiveness(5): ____

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 theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Sand (A-1-b)

Channel Bank Material(8): Sand (A-2-4) and Clay (A-7-5)

Channel Bank Cover(9): Brush and small to large hardwoods and pines.

Floodplain Width(10): 90 meters

Floodplain Cover(11): Grasses, brush, small to large hardwoods and pines.

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

Channel Migration Tendency(13): Migration tendency to the east.

Observations and Other Comments: Evidence of creek overtopping banks and submerging flood plain.

Reported by: Michael B. [signature] **Date:** 7/26/2007
MACTEC Engineering and Consulting, Inc.

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

	BENTS B1	B2	B3								
100-year DSE	57	56.7	56.7								
500-year DSE	56.8	56.6	56.6								

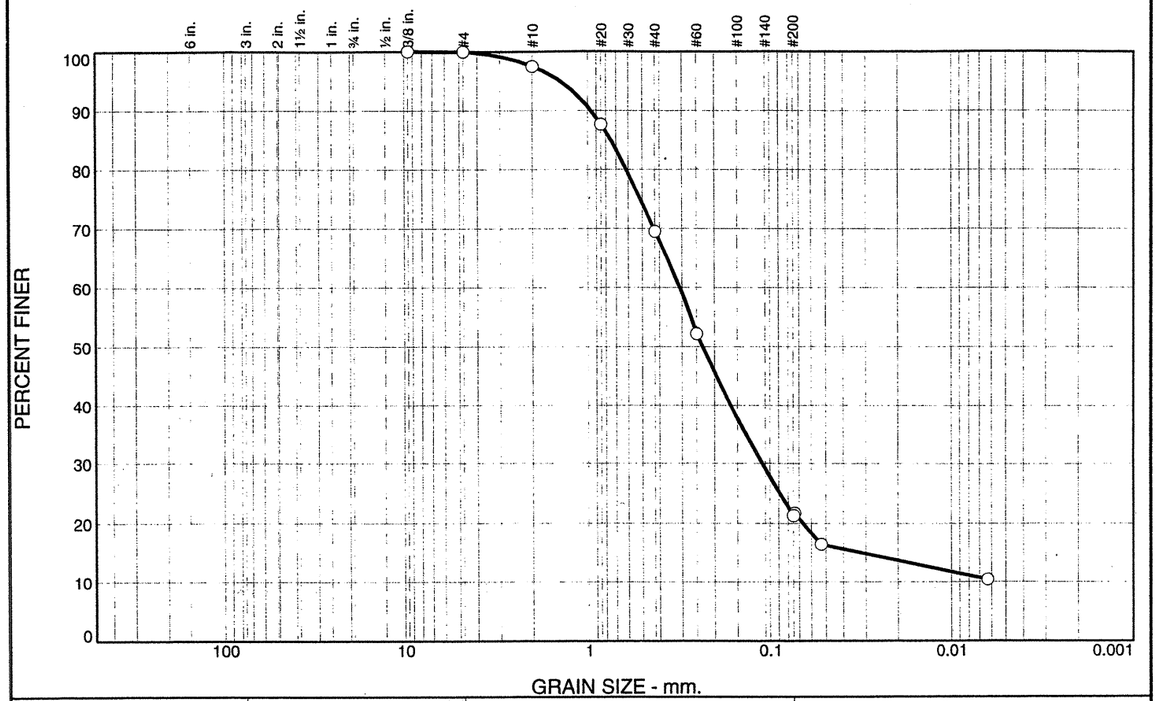
Comparison of DSE to Hydraulics Unit theoretical scour:
We agree with the scour calculations given on the Bridge Survey and Hydraulic Report dated 12/20/06.

DSE determined by: [signature] **Date:** 8/10/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bed	Bank	Bank	Bed			
Sample No.	SS-15	SS-19	SS-20	SS-21			
Retained #4	0.3	0.9	0.2	0.3			
Passed #10	99.5	98.8	99.2	98.7			
Passed #40	41.8	64.3	85.9	50.2			
Passed #200	5.5	21.4	72.7	10.4			
Coarse Sand	81.4	53	17.8	67.7			
Fine Sand	13.9	30.4	13.3	23.4			
Silt	2.7	4.3	21.9	5.2			
Clay	2	12.3	47	3.7			
LL	16	19	68	21			
PI	NP	1	28	NP			
AASHTO	A-1-b	A-2-4(0)	A-7-5(23)	A-1-b			
Station	27+46.0	27+84.9	27+84.9	27+84.9			
Offset	8.6m RT	1.8m LT	1.8m LT	1.8m LT			
Depth	2.94-3.39	1.78-2.23	3.00-3.45	7.23-7.68			

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	2.4	28.0	48.2	21.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.9		
#10	97.5		
#20	87.6		
#40	69.5		
#60	52.2		
#200	21.3		
0.0741 mm.	21.7		
#270	16.4		
0.0063 mm.	10.4		

* (no specification provided)

Soil Description

Gray Silty SAND

Atterberg Limits

PL= 14 LL= 15 PI= 1

Coefficients

D_{85}= 0.7533 D_{60}= 0.3098 D_{50}= 0.2325
D_{30}= 0.1106 D_{15}= 0.0321 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Entire sample was tested.

Sample No.: SS-1 **Source of Sample:** Boring EB2 **Date:** 6-21-07
Location: **Elev./Depth:** 1.07-1.52m

MACTEC, Inc.

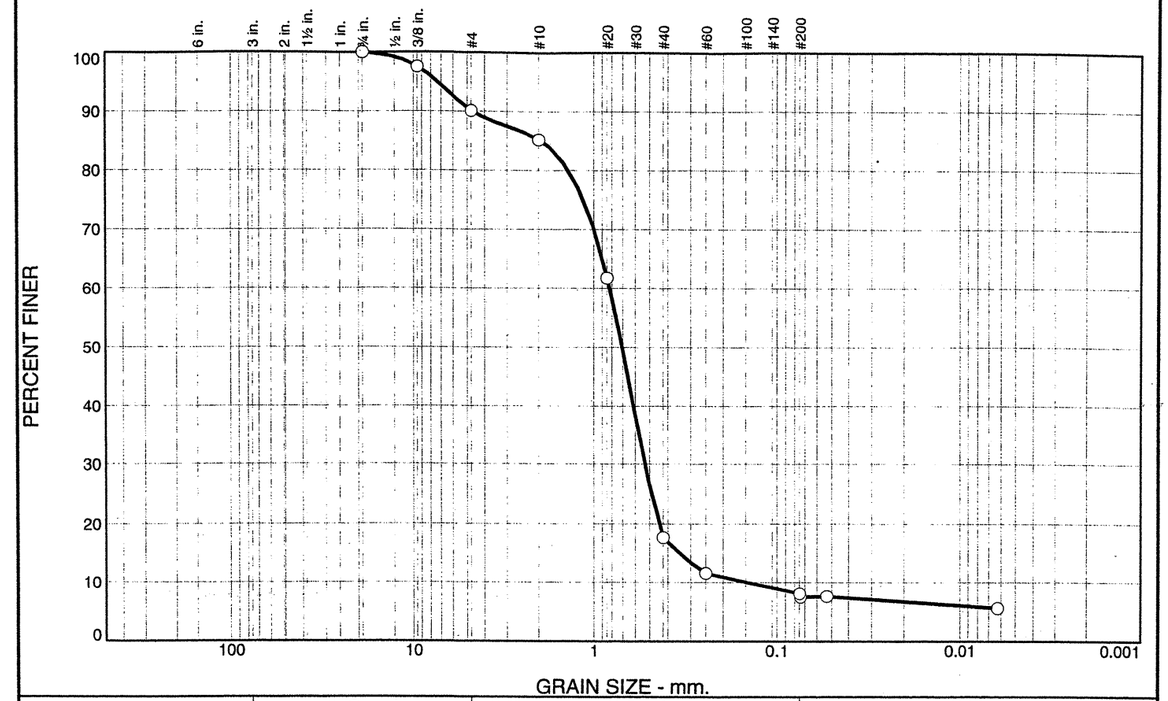
Raleigh, North Carolina

Client: NCDOT
Project: Structure 3: Bridge on - COL2 - Over Beaver Creek and - Y1 - (All American Freeway)
Project No: 6468071787 **Figure**

Tested By: CS **Checked By:** LBJ

SHEET 19

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.9	5.0	67.4	9.7	8.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	97.5		
#4	90.1		
#10	85.1		
#20	61.7		
#40	17.7		
#60	11.5		
#200	8.0		
0.0740 mm.	7.4		
#270	7.5		
0.0063 mm.	5.5		

* (no specification provided)

Soil Description

Yellow Silty Clayey SAND

Atterberg Limits

PL= 15 LL= 22 PI= 7

Coefficients

D_{85}= 1.9723 D_{60}= 0.8254 D_{50}= 0.7093
D_{30}= 0.5329 D_{15}= 0.3470 D_{10}= 0.1473
C_u= 5.60 C_c= 2.34

Classification

USCS= SP-SC AASHTO= A-2-4(0)

Remarks

Entire sample was tested.

Sample No.: SS-2 **Source of Sample:** Boring EB2 **Date:** 6-21-07
Location: **Elev./Depth:** 2.59-3.04m

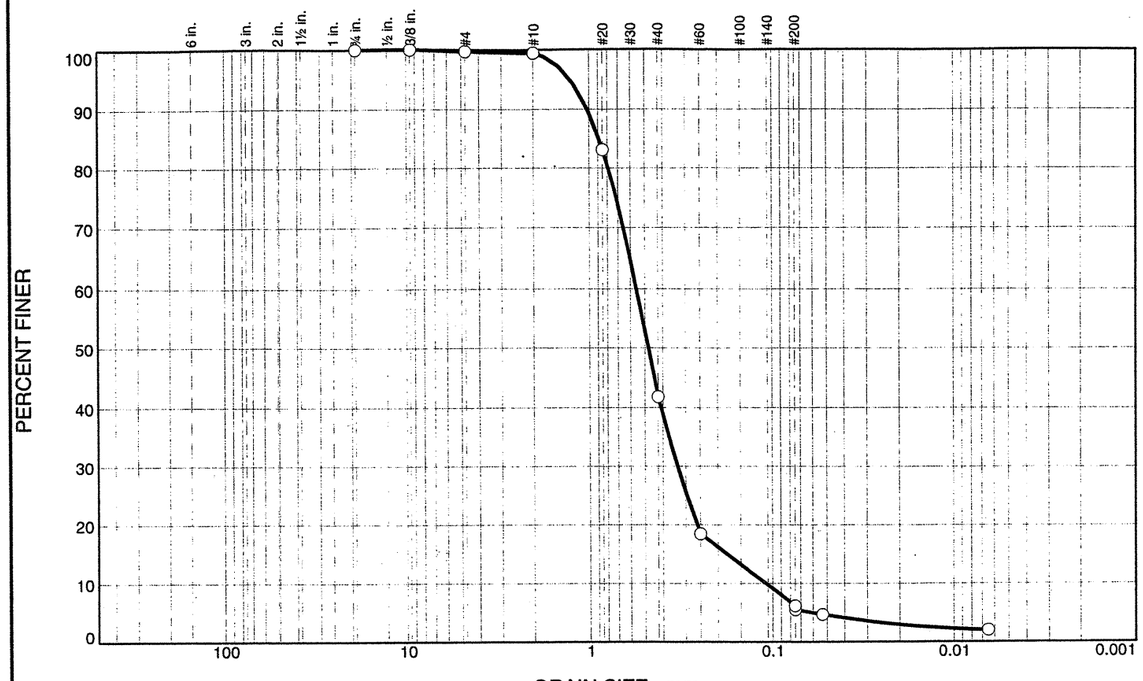
MACTEC, Inc.

Raleigh, North Carolina

Client: NCDOT
Project: Structure 3: Bridge on - COL2 - Over Beaver Creek and - Y1 - (All American Freeway)
Project No: 6468071787 **Figure**

Tested By: CS **Checked By:** LBJ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.2	57.7	36.3	5.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	100.0		
#4	99.7		
#10	99.5		
#20	83.1		
#40	41.8		
#60	18.5		
0.0753 mm.	6.2		
#200	5.5		
#270	4.7		
0.0065 mm.	2.0		

* (no specification provided)

Soil Description

Tan Gray Silty SAND

Atterberg Limits

PL= NP LL= 16 PI= NP

Coefficients

D_{85}= 0.8898 D_{60}= 0.5592 D_{50}= 0.4803
D_{30}= 0.3353 D_{15}= 0.1783 D_{10}= 0.1094
C_u= 5.11 C_c= 1.84

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Entire Sample was tested.

Sample No.: SS-15 **Source of Sample:** Boring B1 **Date:** 7-13-07
Location: **Elev./Depth:** 2.94-3.39m

MACTEC, Inc.

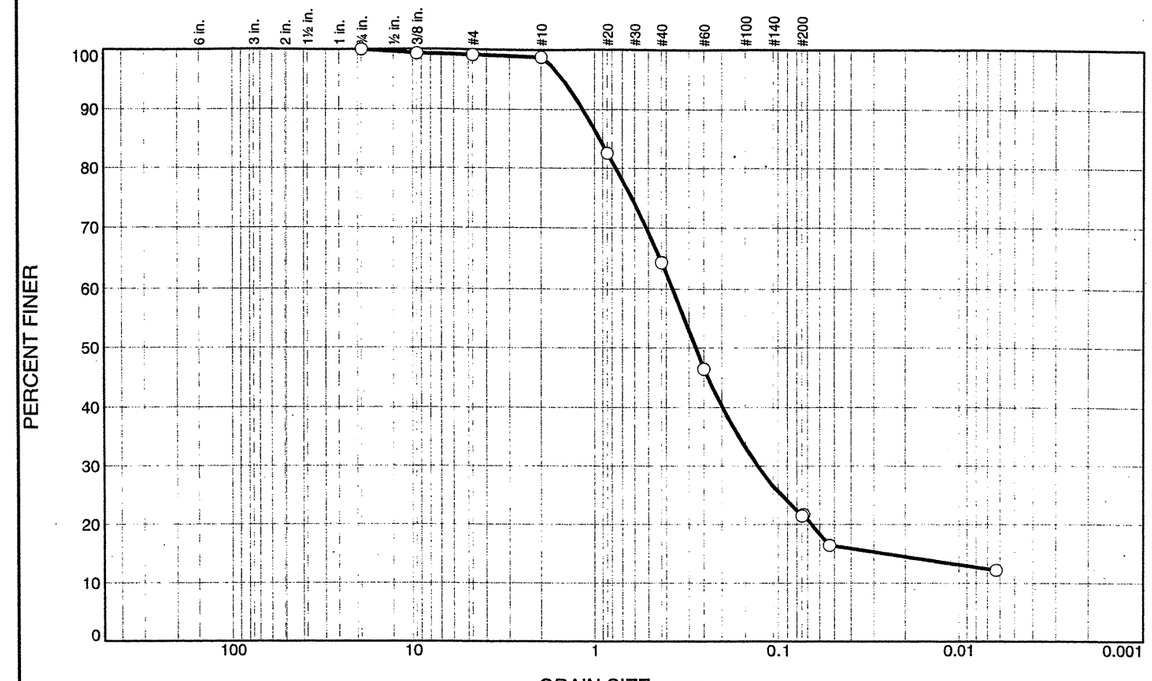
Raleigh, North Carolina

Client: NCDOT
Project: Structure 3: Bridge on - COL2 - Over Beaver Creek and - Y1 - (All American Freeway)
Project No: 6468071787 **Figure**

Tested By: CS **Checked By:** LBJ

SHEET 20

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	0.3	34.5	42.9	21.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	99.3		
#4	99.1		
#10	98.8		
#20	82.5		
#40	64.3		
#60	46.4		
#200	21.4		
0.0736 mm.	21.6		
#270	16.4		
0.0063 mm.	12.2		

* (no specification provided)

Soil Description

Yellowish Brown Silty SAND with organic

Atterberg Limits

PL= 18 LL= 19 PI= 1

Coefficients

D_{85}= 0.9417 D_{60}= 0.3712 D_{50}= 0.2769
D_{30}= 0.1291 D_{15}= 0.0258 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Entire sample was tested.

Sample No.: SS-19 **Source of Sample:** Boring B2 **Date:** 7-12-07
Location: **Elev./Depth:** 1.78-2.23m

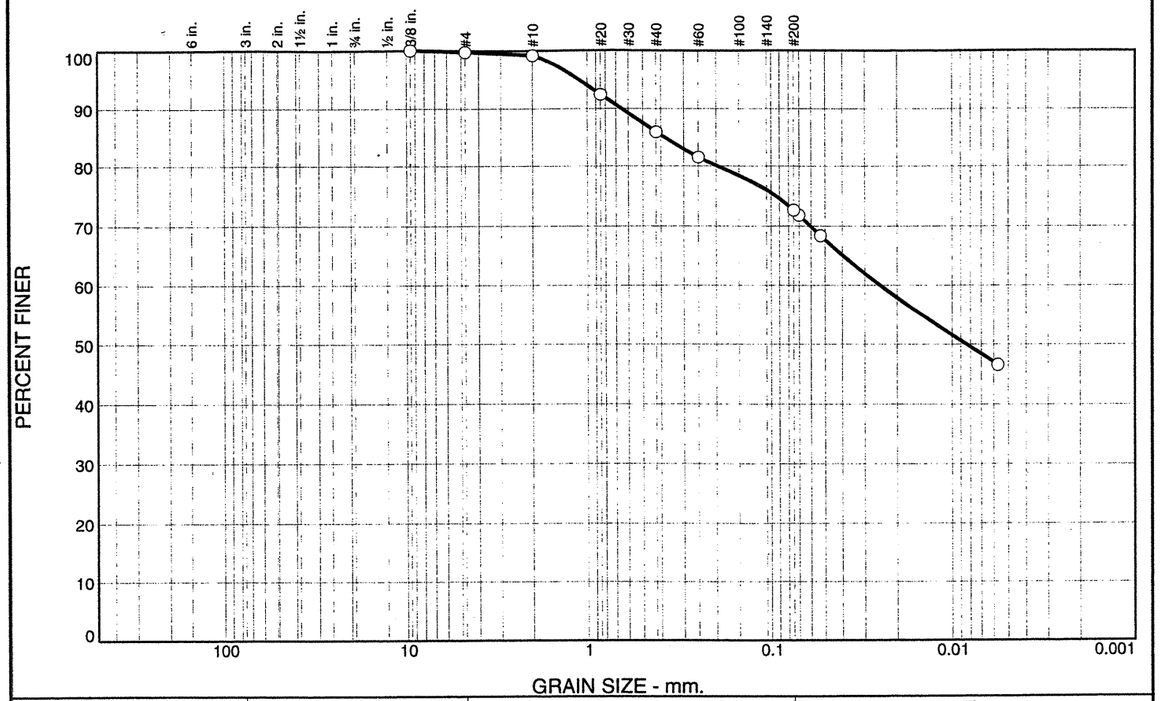
MACTEC, Inc.

Raleigh, North Carolina

Client: NCDOT
Project: Structure 3: Bridge on - COL2 - Over Beaver Creek and - Y1 - (All American Freeway)
Project No: 6468071787 **Figure**

Tested By: CS **Checked By:** LBJ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.6	13.3	13.2	72.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.2		
#20	92.5		
#40	85.9		
#60	81.5		
#200	72.7		
0.0701 mm.	71.8		
#270	68.3		
0.0057 mm.	46.6		

* (no specification provided)

Soil Description

Dark Silty Clay with organic

Atterberg Limits

PL= 40 LL= 68 PI= 28

Coefficients

D_{85}= 0.3835 D_{60}= 0.0250 D_{50}= 0.0084
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(23)

Remarks

Entire sample was tested.

Sample No.: SS-20 **Source of Sample:** Boring B2 **Date:** 7-12-07
Location: **Elev./Depth:** 3.00-3.45m

MACTEC, Inc.

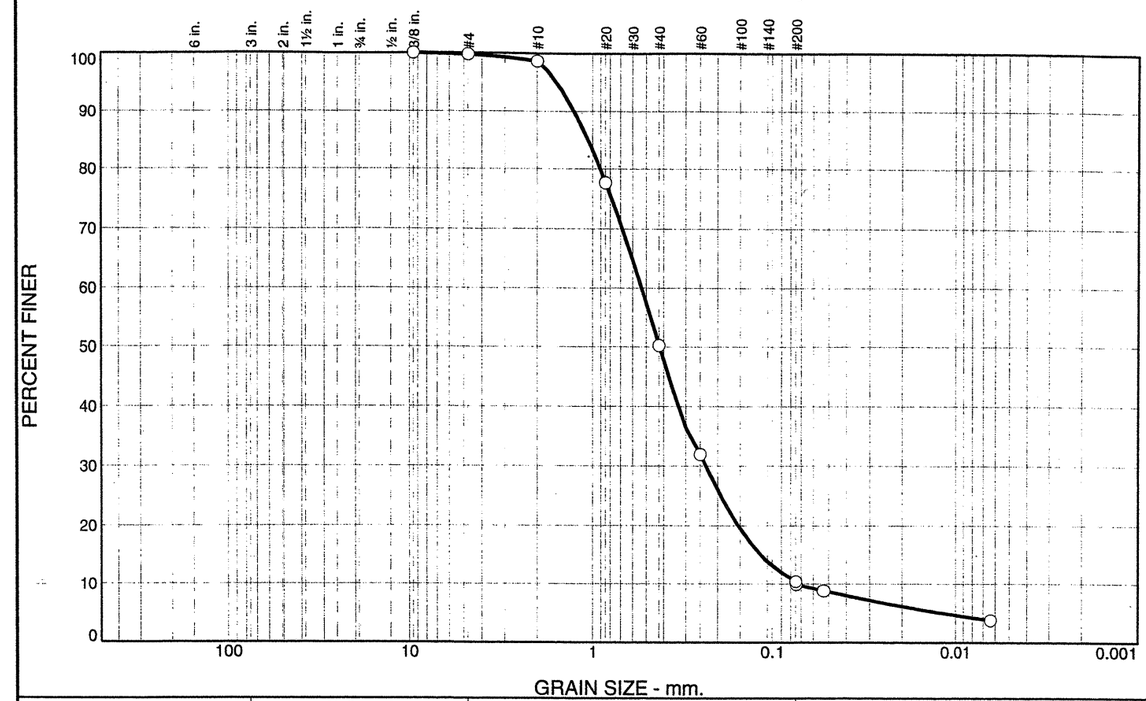
Raleigh, North Carolina

Client: NCDOT
Project: Structure 3: Bridge on - COL2 - Over Beaver Creek and - Y1 - (All American Freeway)
Project No: 6468071787 **Figure**

Tested By: CS **Checked By:** LBJ

SHEET 21

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	1.0	48.5	39.8	10.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.7		
#10	98.7		
#20	77.7		
#40	50.2		
#60	31.9		
#200	10.4		
0.0746 mm.	9.9		
#270	8.8		
0.0064 mm.	3.7		

* (no specification provided)

Soil Description

Tan Silty SAND

Atterberg Limits

PL= NP LL= 21 PI= NP

Coefficients

D_{85}= 1.0622 D_{60}= 0.5352 D_{50}= 0.4228
D_{30}= 0.2336 D_{15}= 0.1159 D_{10}= 0.0747
C_u= 7.17 C_c= 1.37

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Entire sample was tested.

Sample No.: SS-21 **Source of Sample:** Boring B2 **Date:** 7-12-07
Location: **Elev./Depth:** 7.23-7.68m

MACTEC, Inc.

Raleigh, North Carolina

Client: NCDOT
Project: Structure 3: Bridge on - COL2 - Over Beaver Creek and - Y1 - (All American Freeway)
Project No: 6468071787 **Figure**

Tested By: CS **Checked By:** LBJ

View looking upstation along -COL2- towards End Bent 1.

View looking upstation towards Bent 1.

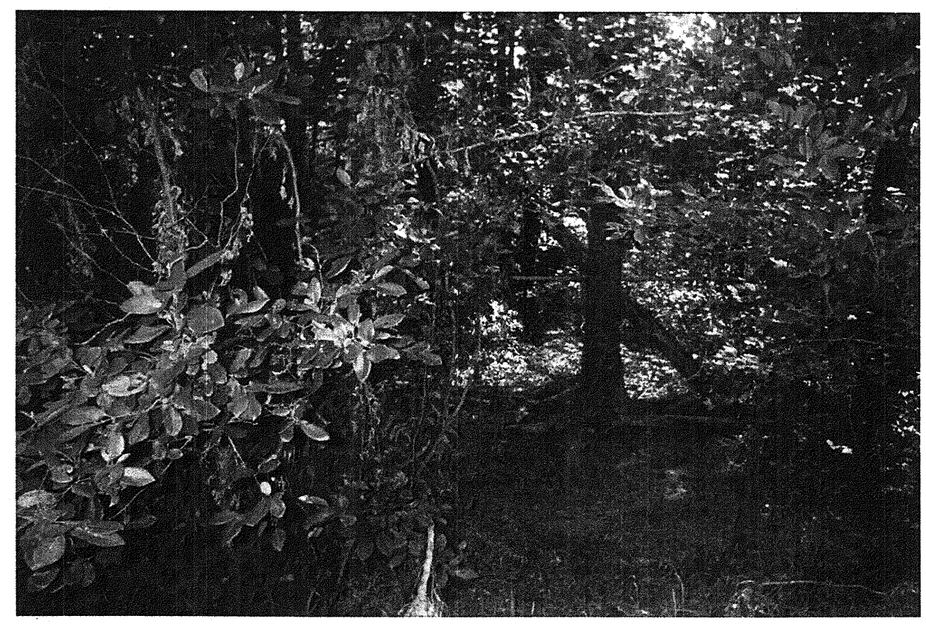
View looking left to right along End Bent 1.

View looking left to right along Bent 1.

View looking downstation towards Bent 1 from near Bent 2 along -COL2-.

View looking left to right along Bent 2.

View looking downstation towards Bent 2 along -COL2-.



View looking upstation along -COL2- towards Bent 3

View looking right to left along Bent 4 from the median of All American Freeway.

View looking downstation along -COL2- towards End Bent 2.

View looking right to left along End Bent 2.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519DA)	1	14

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 (U-2519DA) F.A. PROJ. DPR-0100(001)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)

SITE DESCRIPTION BRIDGE NO. 368 ON -COL1- OVER BEAVER CREEK AND -Y1- (ALL AMERICAN FREEWAY) AT STATION 28+78.486

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-11	BORE LOGS
12-13	SOIL TEST RESULTS
14	SCOUR REPORT

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

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

TRIGON PERSONNEL
D. GOODNIGHT
S. WHICHARD
R. BOYKIN
J. GERNER

MACTEC PERSONNEL
J. HOWARD
D. RHODES
E. BURKETT

INVESTIGATED BY C.D. CZAJKA
CHECKED BY N.T. ROBERSON
SUBMITTED BY N.T. ROBERSON
DATE SEPTEMBER 2007

NORTH CAROLINA LICENSED SEAL 1912 GEOLOGIST NEIL T. ROBERSON 10/31/07

PROJECT: 34817.1.2

ID: U-2519DA

DRAWN BY: C.D. CZAJKA & J.R. MATULA

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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.
34817.1.2 (U-2519DA)	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 30 CM 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 / PLASTIC INDEX	6 MX		NP	40 MX / 10 MX	41 MN / 10 MX	40 MX / 11 MN	41 MN / 11 MN	40 MX / 10 MX	41 MN / 10 MX	40 MX / 11 MN	41 MN / 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (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
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 DPT VST / CPT DMT 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
w - 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-45B
- [X] CME-850
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____mm STEEL TEETH
- [ ] TRICONE ____mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [X] 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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-14, -L- STATION 23+60.506

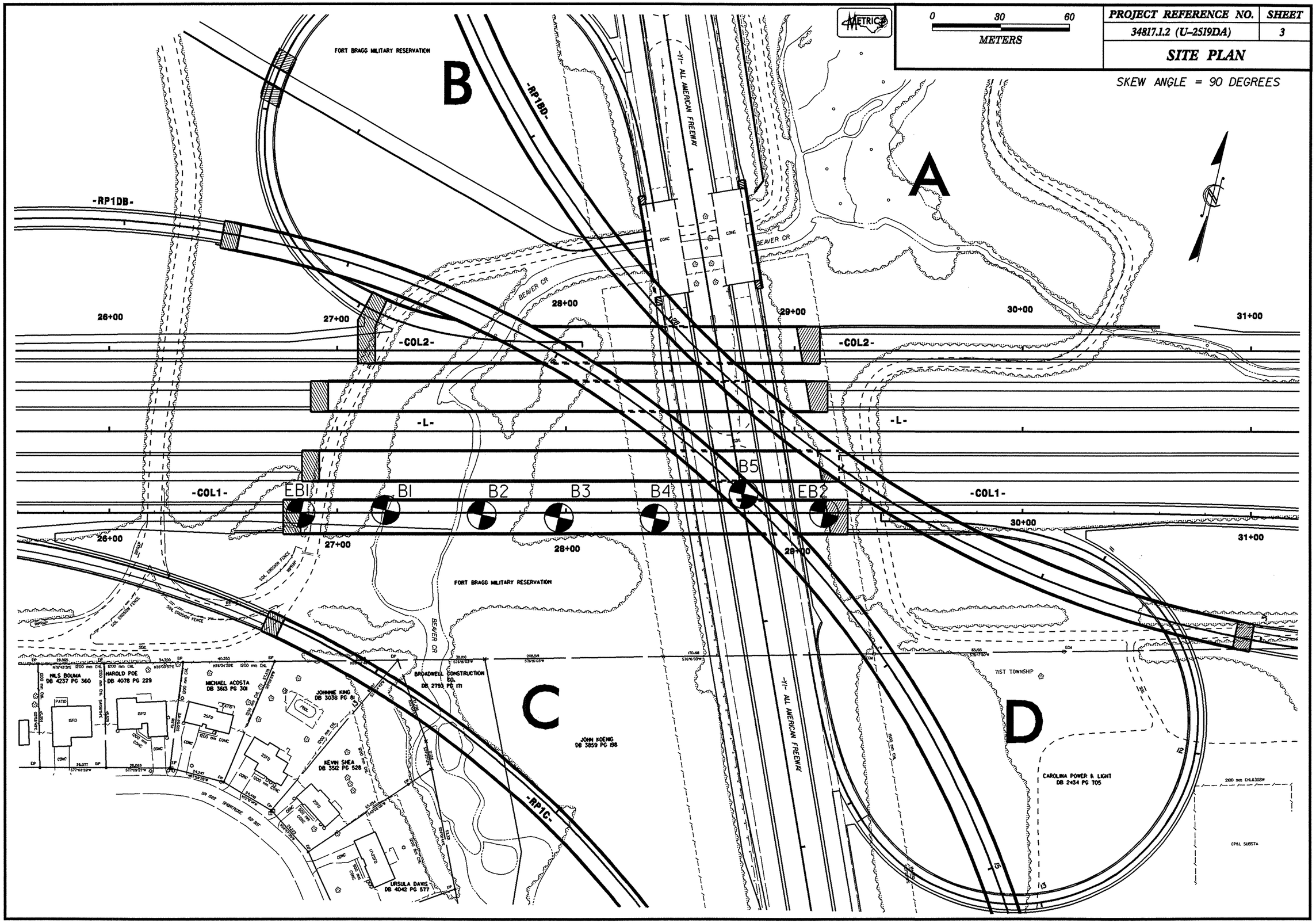
ELEVATION: 64.782 M

NOTES:

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	3

SITE PLAN

SKEW ANGLE = 90 DEGREES



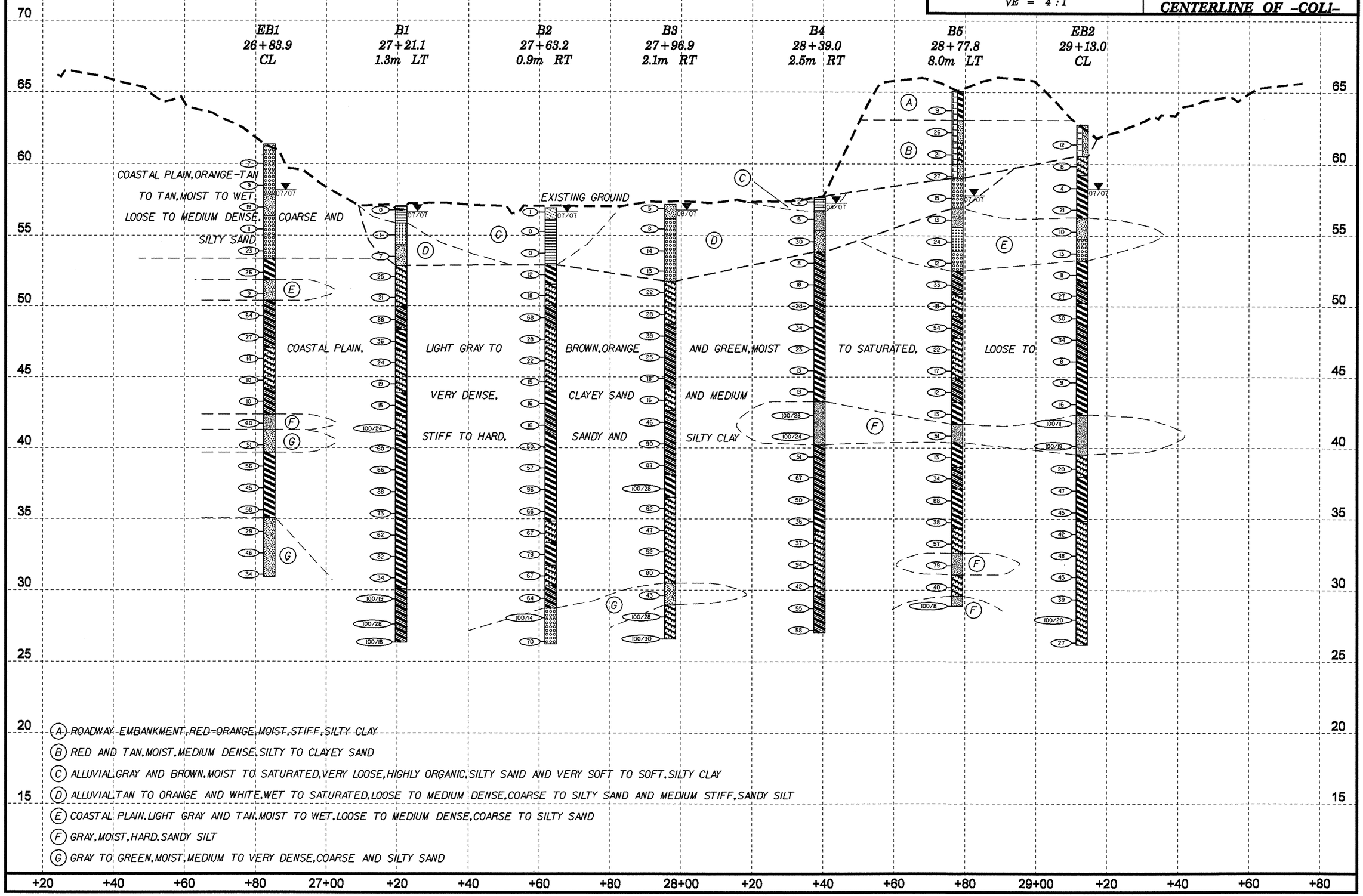
GROUNDLINE PROFILE AT CENTERLINE OF -COL 1- TAKEN FROM ROADWAY DESIGN PLANS AS OF 08/16/2007

METRIC

0 20 40
METERS
VE = 4 : 1

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	4

PROFILE ALONG CENTERLINE OF -COL1-



(A) ROADWAY EMBANKMENT, RED-ORANGE, MOIST, STIFF, SILTY CLAY

(B) RED AND TAN, MOIST, MEDIUM DENSE, SILTY TO CLAYEY SAND

(C) ALLUVIAL GRAY AND BROWN, MOIST TO SATURATED, VERY LOOSE, HIGHLY ORGANIC, SILTY SAND AND VERY SOFT TO SOFT, SILTY CLAY

(D) ALLUVIAL TAN TO ORANGE AND WHITE, WET TO SATURATED, LOOSE TO MEDIUM DENSE, COARSE TO SILTY SAND AND MEDIUM STIFF, SANDY SILT

(E) COASTAL PLAIN, LIGHT GRAY AND TAN, MOIST TO WET, LOOSE TO MEDIUM DENSE, COARSE TO SILTY SAND

(F) GRAY, MOIST, HARD, SANDY SILT

(G) GRAY TO GREEN, MOIST, MEDIUM TO VERY DENSE, COARSE AND SILTY SAND

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. EB1	**STATION** 26+83.9	**OFFSET** CL	**ALIGNMENT** -COL1-
COLLAR ELEV. 61.37 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 150,937.8	**EASTING** 611,719.6
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/09/07	**COMP. DATE** 07/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	3.20

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
62											
									GROUND SURFACE	61.37	0.00
									COASTAL PLAIN Orange-Tan, Coarse Sand		
60.30	1.07	5	4	3	7	SS-1	M				
58.78	2.59	3	4	5	9		M				
									Tan, Silty Sand	57.87	3.50
57.26	4.11	8	11	8	19	SS-3	W				
									Tan, Coarse Sand	56.37	5.00
55.73	5.64	5	5	6	11	SS-4	W				
54.21	7.16	7	10	13	23		W				
									Tan, Silty Clay	53.37	8.00
52.68	8.69	5	11	15	26	SS-6	M				
									Tan, Silty Sand	51.87	9.50
51.16	10.21	4	4	5	9	SS-7	M				
									Tan-Gray, Sandy Clay	50.37	11.00
49.64	11.73	11	23	41	64	SS-8	M				
48.11	13.26	7	9	18	27		M				
									Gray, Clayey Sand	47.07	14.30
46.59	14.78	5	7	7	14	SS-10	W				
45.06	16.31	3	4	6	10	SS-11	M				
									Gray, Sandy Clay	44.17	17.20
43.54	17.83	3	4	6	10	SS-12	M				
									Gray, Sandy Silt	42.37	19.00
42.02	19.35	10	20	40	60	SS-13	M				

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.
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DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/09/07	**COMP. DATE** 07/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	3.20

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
42					Match Line						
									Gray, Sandy Silt *(continued)*	41.27	20.10
									Gray, Silty Sand		
40.49	20.88	17	22	29	51	SS-14	W				
										39.67	21.70
									Gray and Red-Tan, Silty Clay		
38.97	22.40	13	24	32	56	SS-15	M				
37.44	23.93	16	20	25	45		M				
35.92	25.45	14	23	35	58		M				
										35.07	26.30
									Green-Gray, Silty Sand		
34.40	26.97	8	11	18	29	SS-18	M				
32.87	28.50	18	20	26	46		M				
31.35	30.02	11	13	21	34		M			30.90	30.47
									Boring Terminated at Elevation 30.90 m in Silty Sand		

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 09/20/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B1	**STATION** 27+21.1	**OFFSET** 1.3m LT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 57.06 m	**TOTAL DEPTH** 30.69 m	**NORTHING** 150,947.4	**EASTING** 611,755.5	**24 HR.** 0.41
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/24/07	**COMP. DATE** 07/24/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58									
57.06	0.00								GROUND SURFACE (57.06 / 0.00)
		WOH	WOH	WOH		SS-70	Sat.		**ALLUVIAL** Gray, Highly Organic, Silty Clay
55.33	1.73								(55.86 / 1.20) Brown, Organic, Fine Sand
		1	1	WOH		SS-71	Sat.		
53.83	3.23								(54.36 / 2.70) Tan, Silty Sand
		4	4	3		SS-72	Sat.		
52.39	4.67								(52.86 / 4.20) **COASTAL PLAIN** Light Gray, Clayey Sand
		6	11	14		SS-73	M		
50.87	6.19								
		6	10	11			M		
49.35	7.71								(49.96 / 7.10) Gray, Sandy Clay
		21	31	57		SS-75	M		
47.83	9.23								(48.35 / 8.71) Gray, Silty Clay
		10	15	21		SS-76	M		
46.31	10.75								(46.86 / 10.20) Light to Dark Gray, Clayey Sand
		11	13	11		SS-77	Sat.		
44.79	12.27								
		6	8	11		SS-78	Sat.		
43.27	13.79								(43.86 / 13.20) Gray, Silty Clay
		4	7	8		SS-79	M		
41.75	15.31								(42.27 / 14.79) Gray, Clayey Sand
		25	50	50/9		SS-80	M		
40.23	16.83								(40.86 / 16.20) Gray to Dark Gray and Green, Silty Clay
		15	25	35		SS-81	M		
38.71	18.35								
		18	27	39		SS-82	M		

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B1	**STATION** 27+21.1	**OFFSET** 1.3m LT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 57.06 m	**TOTAL DEPTH** 30.69 m	**NORTHING** 150,947.4	**EASTING** 611,755.5	**24 HR.** 0.41
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/24/07	**COMP. DATE** 07/24/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
38					Match Line				
37.19	19.87								Gray to Dark Gray and Green, Silty Clay *(continued)*
		24	43	45		SS-83	M		
35.67	21.39								
		28	30	43			M		
34.15	22.91								
		22	28	34			M		
32.63	24.43								
		20	30	52			M		
31.11	25.95								
		16	14	20			M		
29.59	27.47								(30.11 / 26.95) Gray to Green-Gray, Sandy Clay
		75	25/4			SS-88	M		
28.07	28.99								
		31	41	59/13			M		
26.55	30.51								
		69	31/3				M		(26.37 / 30.69) Boring Terminated at Elevation 26.37 m in Sandy Clay

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B2	**STATION** 27+63.2	**OFFSET** 0.9m RT	**ALIGNMENT** -COL1-
COLLAR ELEV. 56.92 m	**TOTAL DEPTH** 30.67 m	**NORTHING** 150,954.7	**EASTING** 611,797.0
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/25/07	**COMP. DATE** 07/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. 0.32

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
56.92	0.00								**GROUND SURFACE**	56.92	0.00
		1	WOH	1	1		W		**ALLUVIAL** Brown, Highly Organic, Silty Sand	56.12	0.80
55.58	1.34								Brown, Highly Organic, Silty Clay		
		WOH	WOH	WOH	0	SS-92	Sat.				
54.06	2.86										
		WOH	WOH	WOH	0		Sat.				
52.54	4.38									52.92	4.00
		2	5	7	12	SS-94	M		**COASTAL PLAIN** Gray, Silty Clay		
51.02	5.90									51.56	5.36
		7	8	10	18	SS-95			Gray, Clayey Sand		
49.50	7.42									50.04	6.88
		8	29	39	68	SS-96	M		Brown, Sandy Clay		
47.98	8.94									48.52	8.40
		8	12	16	28		M		Dark Gray to Gray, Clayey Sand		
46.46	10.46										
		12	12	10	22	SS-98	W				
44.94	11.98										
		5	6	9	15	SS-99	M				
43.42	13.50								Gray, Silty Clay	43.92	13.00
		5	6	10	16	SS-100	M				
41.90	15.02								Dark Gray, Sandy Clay	42.52	14.40
		6	7	9	16	SS-101	M				
40.38	16.54								Gray to Dark Gray, Silty Clay	40.92	16.00
		16	20	30	50		M				
38.86	18.06										
		19	22	35	57	SS-103	M				
37.34	19.58										
		22	31	65	96						

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B2	**STATION** 27+63.2	**OFFSET** 0.9m RT	**ALIGNMENT** -COL1-
COLLAR ELEV. 56.92 m	**TOTAL DEPTH** 30.67 m	**NORTHING** 150,954.7	**EASTING** 611,797.0
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/25/07	**COMP. DATE** 07/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. 0.32

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
37					Match Line						
35.82	21.10								Gray to Dark Gray, Silty Clay *(continued)*		
		23	29	37	66		M				
34.30	22.62									34.84	22.08
		24	34	33	67	SS-106	M		Green, Clayey Sand		
32.78	24.14									33.32	23.60
		20	47	32	79	SS-107	M		Green, Silty Clay		
31.26	25.66									31.72	25.20
		37	37	30	67	SS-108	M		Green, Clayey Sand		
29.74	27.18									30.28	26.64
		23	30	34	64	SS-109	M		Green, Sandy Clay		
28.22	28.70									28.76	28.16
		100/14			100/14	SS-110	M		Gray and Green, Coarse Sand		
26.70	30.22									26.25	30.67
		34	33	37	70		M		Boring Terminated at Elevation 26.25 m in Coarse Sand		

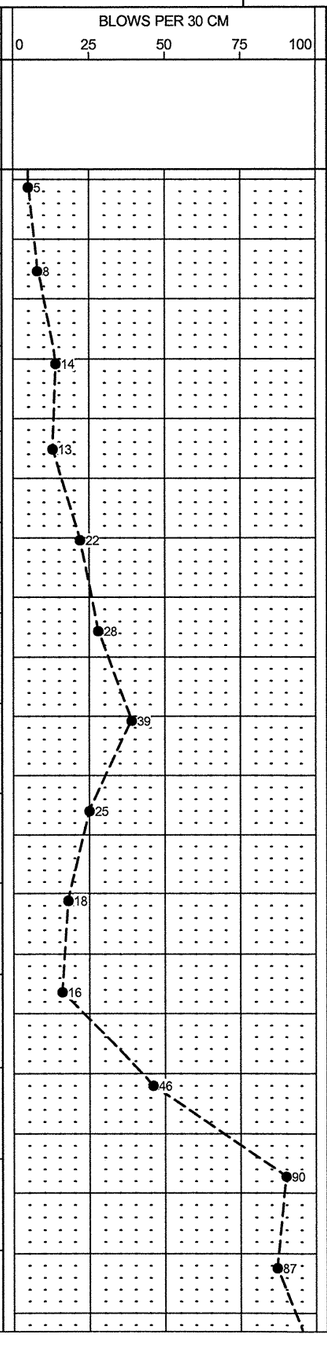
NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 09/20/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B3	**STATION** 27+96.9	**OFFSET** 2.1m RT	**ALIGNMENT** -COL1-
COLLAR ELEV. 57.17 m	**TOTAL DEPTH** 30.57 m	**NORTHING** 150,961.1	**EASTING** 611,830.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 08/08/07	**COMP. DATE** 08/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	0.37

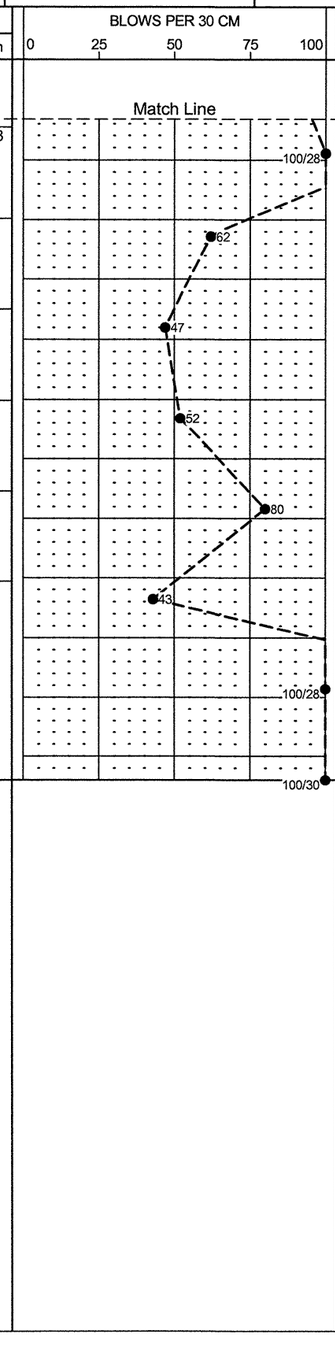
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
58										
57.17	0.00							GROUND SURFACE	57.17	0.00
		3	1	4	SS-112	W		**ALLUVIAL** Tan, Silty Sand	56.17	1.00
55.76	1.41							Tan to Orange, Coarse Sand		
		2	3	5	SS-113	Sat.				
54.22	2.95									
		6	8	6		Sat.				
52.78	4.39									
		6	6	7		Sat.			51.77	5.40
51.26	5.91							**COASTAL PLAIN** Orange, Clayey Sand		
		4	8	14	SS-116	M				
49.74	7.43									
		6	11	17		M				
48.22	8.95								48.76	8.41
								Dark Gray, Sandy Clay		
		13	17	22	SS-118	M				
46.70	10.47									
		11	12	13		M				
45.18	11.99									
		7	9	9	SS-120	M			44.20	12.97
43.66	13.51							Gray, Clayey Sand		
		6	9	7	SS-121	M				
42.10	15.07								42.64	14.53
								Gray, Sandy Clay		
		22	18	28	SS-122	M				
40.58	16.59									
		29	45	45		M				
39.06	18.11									
		17	32	55		M			38.08	19.09
								Dark Gray, Silty Clay		



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B3	**STATION** 27+96.9	**OFFSET** 2.1m RT	**ALIGNMENT** -COL1-
COLLAR ELEV. 57.17 m	**TOTAL DEPTH** 30.57 m	**NORTHING** 150,961.1	**EASTING** 611,830.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 08/08/07	**COMP. DATE** 08/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	0.37

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
38								Match Line
37.54	19.63							Dark Gray, Silty Clay *(continued)*
		21	43	57/13	SS-125	M		
36.02	21.15							36.53 / 20.64 Gray and Green, Clayey Sand
		17	22	40	SS-126	M		
34.50	22.67							
		19	23	24		M		
32.98	24.19							
		15	24	28	SS-128	M		
31.46	25.71							
		39	36	44		M		
29.94	27.23							30.48 / 26.69 Green, Silty Sand
		20	22	21	SS-130	M		
28.42	28.75							28.97 / 28.20 Gray and Green, Clayey Sand
		42	58/13		SS-131	M		
26.90	30.27							
		50	50/15			M		26.60 / 30.57 Boring Terminated at Elevation 26.60 m in Clayey Sand



NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 09/20/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B4	**STATION** 28+39.0	**OFFSET** 2.5m RT	**ALIGNMENT** -COL1-
COLLAR ELEV. 57.65 m	**TOTAL DEPTH** 30.58 m	**NORTHING** 150,970.2	**EASTING** 611,871.3
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 08/08/07	**COMP. DATE** 08/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	0.38

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58									
57.65	0.00								GROUND SURFACE 0.00
		1	1	1	2		M		**ALLUVIAL** Brown, Highly Organic, Sandy Silt
56.43	1.22								56.65 / 1.00
		1	2	3	5	SS-134	M		White, Sandy Silt
54.88	2.77								55.35 / 2.30
		4	12	18	30	SS-135			Orange, Silty Sand
53.36	4.29								53.85 / 3.80
		1	2	6	8	SS-136			**COASTAL PLAIN** Orange to Brown and Gray, Sandy Clay
51.84	5.81								
		5	7	11	18				
50.32	7.33								
		6	9	14	23		M		
48.80	8.85								49.34 / 8.31
		8	14	20	34	SS-139	M		Dark to Light Gray, Silty Clay
47.28	10.37								
		9	13	10	23		M		
45.76	11.89								
		5	6	7	13		M		
44.24	13.41								
		5	7	6	13		M		
42.72	14.93								43.26 / 14.39
		27	34	66/13	100/28	SS-143	M		Gray, Sandy Silt
41.20	16.45								
		25	64	36/9	100/24		M		
39.68	17.97								40.22 / 17.43
		13	22	29	51	SS-145	M		Dark Gray to Gray, Sandy Clay
38.16	19.49								
		13	21	46	67		M		

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B4	**STATION** 28+39.0	**OFFSET** 2.5m RT	**ALIGNMENT** -COL1-
COLLAR ELEV. 57.65 m	**TOTAL DEPTH** 30.58 m	**NORTHING** 150,970.2	**EASTING** 611,871.3
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 08/08/07	**COMP. DATE** 08/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	0.38

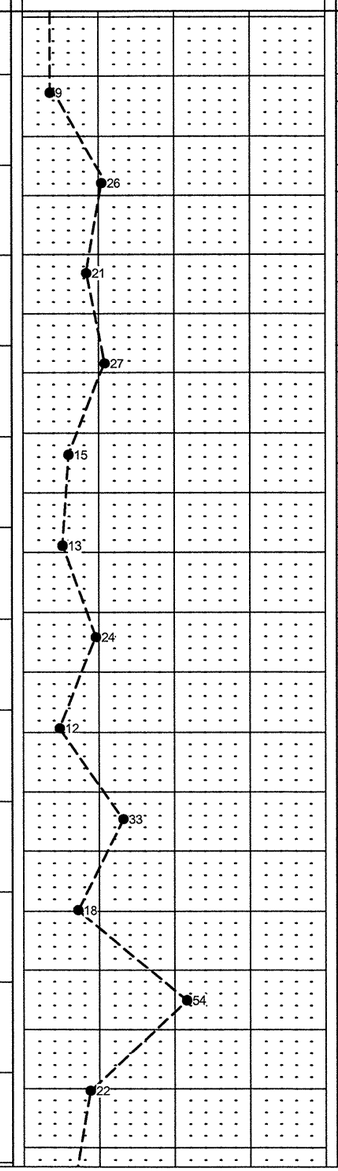
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
38					Match Line				
36.64	21.01								Dark Gray to Gray, Sandy Clay *(continued)*
		18	21	29	50		M		
35.12	22.53								35.66 / 21.99
		12	17	19	36	SS-148	M		Gray, Silty Clay
33.60	24.05								34.14 / 23.51
		15	17	20	37	SS-149	M		Green and Gray, Clayey Sand
32.08	25.57								
		20	41	53	94		M		
30.56	27.09								
		20	23	19	42		M		
29.04	28.61								29.58 / 28.07
		13	20	35	55	SS-152	M		Green, Sandy Clay
27.52	30.13								
		22	27	31	58		M		27.07 / 30.58
									Boring Terminated at Elevation 27.07 m in Sandy Clay

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B5	**STATION** 28+77.8	**OFFSET** 8.0m LT	**ALIGNMENT** -COL 1-
COLLAR ELEV. 65.10 m	**TOTAL DEPTH** 36.19 m	**NORTHING** 150,989.4	**EASTING** 611,906.6
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/18/07	**COMP. DATE** 07/19/07	**SURFACE WATER DEPTH** 7.92m	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	7.32

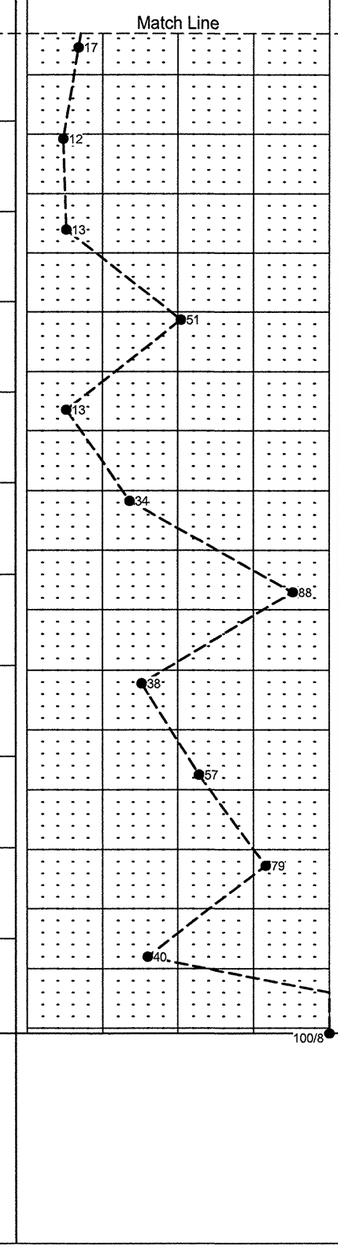
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
66							
65.10	0.00						**GROUND SURFACE**
							ROADWAY EMBANKMENT Red-Orange, Silty Clay
64.03	1.07	3	4	5	SS-45	M	
63.04	2.06						Red-Tan, Silty Sand
62.51	2.59	2	10	16	SS-46	M	
61.52	3.58						Tan, Clayey Sand
60.99	4.11	5	10	11	SS-47	M	
60.00	5.10						Tan, Silty Sand
59.46	5.64	9	13	14	SS-48	M	
59.03	6.07						**ALLUVIAL** Tan, Coarse Sand with Trace Gravel
57.94	7.16	13	10	5	SS-49	W	
56.90	8.20						**COASTAL PLAIN** Light Gray, Sandy Silt
56.41	8.69	1	2	11	SS-50	W	
55.60	9.50						Tan, Fine Sand
54.89	10.21	9	12	12	SS-51	W	
53.90	11.20						Tan, Coarse Sand
53.37	11.73	3	4	8	SS-52	W	
52.50	12.60						Light Gray, Sandy Silt
51.84	13.26	6	12	21	SS-53	M	
50.85	14.25						Tand-Gray, Clayey Sand
50.32	14.78	4	8	10	SS-54	M	
49.33	15.77						Tan and Gray, Sandy Clay
48.79	16.31	14	25	29	SS-55	M	
47.80	17.30						Tand and Gray, Clayey Sand
47.27	17.83	7	9	13	SS-56	M	
45.75	19.35						



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. B5	**STATION** 28+77.8	**OFFSET** 8.0m LT	**ALIGNMENT** -COL 1-
COLLAR ELEV. 65.10 m	**TOTAL DEPTH** 36.19 m	**NORTHING** 150,989.4	**EASTING** 611,906.6
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/18/07	**COMP. DATE** 07/19/07	**SURFACE WATER DEPTH** 7.92m	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	7.32

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
46							
		5	8	9	SS-57	M	
44.22	20.88						
		4	5	7	SS-58	M	
42.70	22.40						
		4	5	8	SS-59	M	
41.17	23.93						
		37	29	22	SS-60	M	
39.65	25.45						
		11	6	7	SS-61	M	
38.13	26.97						
		6	14	20	SS-62	M	
36.60	28.50						
		21	36	52	SS-63	M	
35.08	30.02						
		13	16	22	SS-64	M	
33.55	31.55						
		21	26	31	SS-65	M	
32.03	33.07						
		21	32	47	SS-66	M	
30.50	34.60						
		12	19	21	SS-67	M	
28.99	36.11						
		100/8			SS-68	M	



ELEV (m)	DEPTH (m)
44.90	20.20
43.23	21.87
41.70	23.40
40.40	24.70
38.66	26.44
37.14	27.96
34.40	30.70
32.60	32.50
31.04	34.06
29.60	35.50
28.91	36.19

Tand and Gray, Clayey Sand *(continued)*
Gray, Sandy Clay
Red and Gray, Silty Clay
Gray, Sandy Silt
Gray, Silty Clay
Brown, Sandy Clay
Brown to Gray, Silty Clay
Gray, Clayey Sand
Gray, Sandy Silt
Green-Gray, Sandy Silt
Gray, Sandy Silt
Boring Terminated at Elevation 28.91 m in Sandy Silt

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 09/20/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. EB2	**STATION** 29+13.0	**OFFSET** CL	**ALIGNMENT** -COL1-
COLLAR ELEV. 62.75 m	**TOTAL DEPTH** 36.56 m	**NORTHING** 150,989.2	**EASTING** 611,942.8
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/12/07	**COMP. DATE** 07/16/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	4.48

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
63									62.75 GROUND SURFACE	0.00
									ROADWAY EMBANKMENT Tan and Red, Silty Sand	
61.68	1.07	4	4	8	12	SS-21	M			
									60.55 **COASTAL PLAIN** Tan and Red, Clayey Sand	2.20
60.16	2.59	3	3	5	8	SS-22	M			
									59.25 Gray, Silty Clay	3.50
58.64	4.11	2	2	2	4	SS-23	W			
57.11	5.64	3	7	14	21		M			
									56.25 Orange-Tan, Silty Sand	6.50
55.59	7.16	5	5	5	10	SS-25	W			
									54.75 Tan, Coarse Sand	8.00
54.06	8.69	3	6	7	13	SS-26	W			
									53.25 Gray and Tan, Silty Clay	9.50
52.54	10.21	2	3	8	11		M			
									51.75 Tan and Gray, Sandy Clay	11.00
51.02	11.73	7	13	14	27	SS-28	M			
									50.25 Tan and Gray, Silty Clay	12.50
49.49	13.26	9	19	31	50		M			
									48.75 Tan and Gray, Sandy Clay	14.00
47.97	14.78	9	14	20	34	SS-30	M			
46.44	16.31	4	3	5	8		M		46.34 Gray, Tan and Red, Silty Clay	16.41
44.92	17.83	3	4	5	9	SS-32	M			
43.40	19.35	3	6	10	16	SS-33	M			

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.
SITE DESCRIPTION Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)			**GROUND WTR (m)**
BORING NO. EB2	**STATION** 29+13.0	**OFFSET** CL	**ALIGNMENT** -COL1-
COLLAR ELEV. 62.75 m	**TOTAL DEPTH** 36.56 m	**NORTHING** 150,989.2	**EASTING** 611,942.8
DRILL MACHINE CME-850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/12/07	**COMP. DATE** 07/16/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	N/A
24 HR.	4.48

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
43					Match Line				
41.87	20.88	100/11			100/11	SS-34	M		
40.35	22.40	65	35/4		100/19		M		
38.82	23.93	10	9	11	20	SS-36	M		
37.30	25.45	12	19	28	47	SS-37	M		
35.78	26.97	11	19	26	45		M		
34.25	28.50	13	18	24	42	SS-39	M		
32.73	30.02	14	22	26	48		M		
31.20	31.55	13	20	23	43		M		
29.68	33.07	8	11	28	39		M		
28.15	34.60	60	40/5		100/20		M		
26.64	36.11	11	13	14	27		M		

ELEV (m)	DEPTH (m)	SOIL AND ROCK DESCRIPTION
42.35	20.40	Gray, Tan and Red, Silty Clay *(continued)*
		Gray, Sandy Silt
39.55	23.20	Green-Gray, Clayey Sand
37.95	24.80	Gray, Tan and Red, Silty Clay
34.85	27.90	Green-Gray, Clayey Sand
26.19	36.56	Boring Terminated at Elevation 26.19 m in Clayey Sand

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 09/20/07

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - Cumberland

EB1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	CL	26+83.9	1.07-1.52	A-1-b(0)	21	6	68.1	13.7	4.0	14.1	94	42	19	-	-
SS-3	CL	26+83.9	4.11-4.56	A-2-4(0)	20	5	58.2	26.9	2.8	12.1	98	58	17	-	-
SS-4	CL	26+83.9	5.64-6.09	A-1-b(0)	22	NP	88.2	6.1	0.7	5.1	97	29	16	-	-
SS-6	CL	26+83.9	8.69-9.14	A-7-6(32)	57	33	1.0	17.6	22.8	58.6	100	100	88	-	-
SS-7	CL	26+83.9	10.21-10.66	A-2-4(0)	26	9	50.3	23.6	1.8	24.2	99	78	27	-	-
SS-8	CL	26+83.9	11.73-12.18	A-6(5)	31	19	33.3	21.0	11.3	34.3	100	80	49	-	-
SS-10	CL	26+83.9	14.78-15.23	A-2-6(0)	31	15	67.5	10.3	2.0	20.2	90	40	21	-	-
SS-11	CL	26+83.9	16.31-16.76	A-2-6(2)	34	20	56.0	13.3	2.4	28.3	99	69	32	-	-
SS-12	CL	26+83.9	17.83-18.28	A-7-6(30)	58	42	4.6	24.0	14.7	56.6	100	98	74	-	-
SS-13	CL	26+83.9	19.35-19.80	A-4(0)	19	5	20.8	36.2	24.8	18.2	100	86	55	-	-
SS-14	CL	26+83.9	20.88-21.33	A-2-4(0)	28	NP	71.1	18.4	2.4	8.1	98	56	11	-	-
SS-15	CL	26+83.9	22.10-22.85	A-7-6(21)	47	32	14.7	19.4	21.4	44.4	100	92	71	-	-
SS-18	CL	26+83.9	26.97-27.42	A-2-4(0)	38	NP	53.5	26.3	12.1	8.1	96	66	22	-	-

B1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-70	1.3m LT	27+21.1	0.00-0.45	A-7-5(35)	63	3	1.8	6.2	43.6	48.3	100	99	95	-	-
SS-71	1.3m LT	27+21.1	1.73-2.18	A-3(0)	21	NP	81.6	12.1	4.3	2.0	100	57	7	-	-
SS-72	1.3m LT	27+21.1	3.23-3.68	A-2-4(0)	22	8	60.4	19.9	5.5	14.1	93	62	21	-	-
SS-73	1.3m LT	27+21.1	4.67-5.12	A-2-6(1)	36	22	58.2	16.2	3.4	22.2	99	63	27	-	-
SS-75	1.3m LT	27+21.1	7.71-8.16	A-6(7)	30	18	27.8	18.3	21.7	32.2	100	82	58	-	-
SS-76	1.3m LT	27+21.1	9.23-9.68	A-7-6(6)	44	29	50.4	7.8	6.6	35.2	96	60	41	-	-
SS-77	1.3m LT	27+21.1	10.75-11.20	A-2-6(0)	34	19	76.7	6.4	4.7	12.1	91	29	16	-	-
SS-78	1.3m LT	27+21.1	12.27-12.72	A-2-7(3)	44	28	62.1	7.9	7.9	22.2	95	43	29	-	-
SS-79	1.3m LT	27+21.1	13.79-14.24	A-7-6(32)	55	37	3.8	15.9	21.9	58.4	100	98	83	-	-
SS-80	1.3m LT	27+21.1	15.31-15.76	A-2-7(2)	48	20	57.4	10.2	4.2	28.2	95	56	32	-	-
SS-81	1.3m LT	27+21.1	16.83-17.28	A-7-6(48)	71	43	2.6	3.2	37.8	56.4	100	98	96	-	-
SS-82	1.3m LT	27+21.1	18.35-18.80	A-7-6(10)	41	15	13.7	20.9	37.2	28.2	100	92	72	-	-
SS-83	1.3m LT	27+21.1	19.87-20.32	A-7-6(7)	43	22	20.9	35.0	31.9	12.1	100	90	49	-	-
SS-88	1.3m LT	27+21.1	27.47-27.92	A-6(1)	24	11	34.2	25.0	32.7	8.1	100	82	42	-	-

B2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-92	0.9m RT	27+63.2	1.34-1.79	A-7-5(38)	72	34	5.5	2.4	29.4	62.7	98	93	91	-	-
SS-94	0.9m RT	27+63.2	4.38-4.83	A-7-6(11)	44	25	24.9	19.8	12.8	42.5	95	78	56	-	-
SS-95	0.9m RT	27+63.2	5.90-6.35	A-2-6(3)	34	27	41.1	27.7	2.9	28.3	97	71	31	-	-
SS-96	0.9m RT	27+63.2	7.42-7.87	A-6(10)	37	21	26.3	17.8	17.5	38.4	100	83	60	-	-
SS-98	0.9m RT	27+63.2	10.46-10.91	A-2-7(1)	45	30	72.1	6.8	2.9	18.2	97	38	21	-	-
SS-99	0.9m RT	27+63.2	11.98-12.43	A-2-6(3)	39	24	56.0	12.4	5.3	26.3	100	60	33	-	-
SS-100	0.9m RT	27+63.2	13.50-13.95	A-7-6(34)	60	39	5.5	13.5	22.3	58.6	100	98	83	-	-
SS-101	0.9m RT	27+63.2	15.02-15.42	A-6(2)	24	12	37.1	24.7	17.0	21.2	100	77	44	-	-
SS-103	0.9m RT	27+63.2	18.06-18.51	A-7-6(20)	50	28	13.5	19.2	32.9	34.4	100	92	72	-	-
SS-106	0.9m RT	27+63.2	22.62-23.07	A-2-6(1)	35	18	43.2	31.0	16.7	9.1	99	79	30	-	-
SS-107	0.9m RT	27+63.2	24.14-24.59	A-7-6(10)	41	18	14.2	33.2	40.5	12.1	100	94	63	-	-
SS-108	0.9m RT	27+63.2	25.66-26.11	A-2-6(1)	35	17	45.7	24.7	17.5	12.1	95	66	32	-	-
SS-109	0.9m RT	27+63.2	27.18-27.63	A-6(11)	40	19	3.8	43.7	40.3	12.1	100	98	65	-	-
SS-110	0.9m RT	27+63.2	28.70-29.15	A-1-b(0)	41	2	75.4	15.9	5.7	3.0	96	37	10	-	-

B3

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-112	2.1m RT	27+96.9	0.00-0.45	A-2-4(0)	23	NP	54.4	26.3	11.2	8.1	96	62	21	-	-
SS-113	2.1m RT	27+96.9	1.41-1.86	A-1-b(0)	20	NP	90.0	5.5	0.5	4.0	98	24	15	-	-
SS-116	2.1m RT	27+96.9	5.91-6.36	A-2-6(2)	36	19	42.2	25.2	4.3	28.3	99	72	34	-	-
SS-118	2.1m RT	27+96.9	8.95-9.40	A-6(6)	38	24	44.5	12.3	6.8	36.4	99	69	44	-	-
SS-120	2.1m RT	27+96.9	11.99-12.44	A-6(4)	30	17	34.6	21.6	15.5	28.3	100	80	47	-	-
SS-121	2.1m RT	27+96.9	13.51-13.96	A-2-7(1)	41	27	67.7	11.7	8.4	12.1	97	48	21	-	-
SS-122	2.1m RT	27+96.9	15.07-15.52	A-6(8)	32	19	20.2	26.1	27.4	26.3	100	88	60	-	-
SS-125	2.1m RT	27+96.9	19.63-20.08	A-7-6(6)	42	19	28.1	26.3	23.4	22.2	100	81	50	-	-
SS-126	2.1m RT	27+96.9	21.15-21.60	A-2-7(2)	44	22	46.1	22.6	21.1	10.1	97	67	35	-	-
SS-128	2.1m RT	27+96.9	24.19-24.64	A-2-6(0)	36	14	52.8	28.7	14.5	4.0	98	60	22	-	-
SS-130	2.1m RT	27+96.9	27.23-27.68	A-2-5(0)	68	NP	54.8	32.8	4.3	8.1	97	70	15	-	-
SS-131	2.1m RT	27+96.9	30.27-30.72	A-2-6(1)	37	15	56.8	19.7	16.4	7.1	100	68	27	-	-

B4

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-134	2.5m RT	28+39.0	1.22-1.67	A-4(2)	26	8	24.5	27.5	23.7	24.3	100	84	55	-	-
SS-135	2.5m RT	28+39.0	2.77-3.22	A-2-4(0)	16	NP	33.6	47.8	12.6	6.1	74	56	20	-	-
SS-136	2.5m RT	28+39.0	4.29-4.73	A-6(7)	31	14	9.5	27.9	26.1	36.4	100	97	68	-	-
SS-139	2.5m RT	28+39.0	8.85-9.30	A-7-6(13)	53	35	40.9	9.1	5.5	44.5	99	72	50	-	-
SS-143	2.5m RT	28+39.0	14.93-15.38	A-4(0)	24	2	32.0	30.8	21.1	16.2	100	82	44	-	-
SS-145	2.5m RT	28+39.0	17.97-18.42	A-6(7)	31	13	13.6	26.1	40.1	20.2	100	92	69	-	-
SS-148	2.5m RT	28+39.0	22.53-22.98	A-7-6(7)	45	20	19.8	38.3	29.8	12.1	100	88	50	-	-
SS-149	2.5m RT	28+39.0	24.05-24.50	A-2-6(0)	33	13	57.5	22.5	11.9	8.1	97	62	23	-	-
SS-152	2.5m RT	28+39.0	28.61-29.06	A-6(1)	37	16	43.7	24.5	21.7	10.1	99	71	36	-	-

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - Cumberland

B5

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-45	8.0m LT	28+77.8	1.07-1.52	A-7-6(3)	43	21	35.1	31.0	5.6	28.4	98	78	38	-	-
SS-46	8.0m LT	28+77.8	2.59-3.04	A-2-4(0)	25	9	52.1	24.7	2.9	20.3	97	66	25	-	-
SS-47	8.0m LT	28+77.8	4.11-4.56	A-2-6(0)	32	14	56.7	21.7	1.3	20.3	94	63	22	-	-
SS-48	8.0m LT	28+77.8	5.64-6.09	A-2-4(0)	21	3	63.6	21.9	1.3	13.2	97	60	16	-	-
SS-49	8.0m LT	28+77.8	7.16-7.61	A-1-b(0)	17	NP	63.8	24.5	3.5	8.1	91	49	13	-	-
SS-50	8.0m LT	28+77.8	8.69-9.14	A-4(0)	21	4	8.3	53.1	14.3	24.3	100	98	51	-	-
SS-51	8.0m LT	28+77.8	10.21-10.66	A-3(0)	22	NP	70.1	21.7	1.1	7.1	97	55	9	-	-
SS-52	8.0m LT	28+77.8	11.73-12.18	A-1-b(0)	23	NP	90.6	3.3	0.0	6.1	100	23	6	-	-
SS-53	8.0m LT	28+77.8	13.26-13.71	A-6(6)	31	16	10.1	40.9	14.5	34.4	100	95	55	-	-
SS-54	8.0m LT	28+77.8	14.78-15.23	A-2-6(1)	30	15	45.4	23.5	1.7	29.4	99	86	32	-	-
SS-55	8.0m LT	28+77.8	16.31-16.76	A-6(4)	30	17	37.1	19.0	11.4	32.4	100	77	48	-	-
SS-56	8.0m LT	28+77.8	17.83-18.28	A-2-6(2)	35	22	50.4	18.8	0.4	30.4	97	68	31	-	-
SS-57	8.0m LT	28+77.8	19.35-19.80	A-2-6(1)	31	15	61.4	11.6	4.8	22.3	99	60	28	-	-
SS-58	8.0m LT	28+77.8	20.88-21.33	A-6(1)	28	14	24.0	42.2	8.4	25.3	99	91	36	-	-
SS-59	8.0m LT	28+77.8	22.40-22.85	A-7-6(26)	53	36	12.8	15.8	20.8	50.7	100	93	74	-	-
SS-60	8.0m LT	28+77.8	23.93-24.38	A-4(0)	20	7	22.9	48.6	18.3	10.1	100	90	36	-	-
SS-61	8.0m LT	28+77.8	25.45-25.90	A-7-6(26)	54	36	4.3	30.6	30.7	34.4	100	97	74	-	-
SS-62	8.0m LT	28+77.8	26.97-27.42	A-6(11)	35	21	16.8	22.5	26.2	34.4	100	91	67	-	-
SS-63	8.0m LT	28+77.8	28.50-28.95	A-7-6(4)	42	19	43.0	16.4	18.3	22.3	98	70	42	-	-
SS-64	8.0m LT	28+77.8	30.02-30.43	A-7-6(16)	46	26	13.8	25.7	34.1	26.3	100	92	68	-	-
SS-65	8.0m LT	28+77.8	31.55-32.00	A-2-7(1)	48	22	62.2	10.7	13.9	13.2	95	49	27	-	-
SS-66	8.0m LT	28+77.8	33.07-33.52	A-4(0)	32	10	45.6	20.6	19.7	14.2	98	68	37	-	-
SS-67	8.0m LT	28+77.8	34.60-35.05	A-2-6(0)	39	17	62.1	27.1	6.7	4.1	96	59	14	-	-
SS-68	8.0m LT	28+77.8	36.11-36.19	A-4(0)	17	8	39.9	27.4	22.4	10.2	100	76	37	-	-

EB2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-21	CL	29+13.0	1.07-1.52	A-2-4(0)	21	4	49.3	29.1	6.5	15.2	98	68	26	-	-
SS-22	CL	29+13.0	2.59-3.04	A-2-6(1)	35	15	47.1	25.5	3.2	24.2	93	63	28	-	-
SS-23	CL	29+13.0	4.11-4.56	A-7-6(27)	53	29	11.7	2.2	33.5	52.5	98	88	85	-	-
SS-25	CL	29+13.0	7.16-7.61	A-2-4(0)	20	NP	59.5	23.4	1.9	15.2	100	75	18	-	-
SS-26	CL	29+13.0	8.69-9.14	A-1-b(0)	20	NP	91.5	3.0	1.4	4.0	99	16	5	-	-
SS-28	CL	29+13.0	11.73-12.18	A-6(3)	35	18	47.3	12.5	1.8	38.4	99	72	41	-	-
SS-30	CL	29+13.0	14.78-15.23	A-6(2)	31	15	49.1	13.5	7.1	30.3	96	63	38	-	-
SS-32	CL	29+13.0	17.83-18.28	A-7-6(25)	56	35	17.0	14.5	18.0	50.5	100	90	73	-	-
SS-33	CL	29+13.0	19.35-19.80	A-7-6(48)	72	51	4.8	10.7	19.8	64.6	100	98	87	-	-
SS-34	CL	29+13.0	20.88-21.33	A-4(1)	31	9	33.7	30.5	19.6	16.2	100	79	42	-	-
SS-36	CL	29+13.0	23.93-24.38	A-2-6(0)	34	13	46.3	25.6	18.1	10.1	99	66	29	-	-
SS-37	CL	29+13.0	25.45-25.90	A-7-6(25)	54	31	9.3	17.0	41.4	32.3	100	95	78	-	-
SS-39	CL	29+13.0	28.50-28.95	A-2-6(1)	37	17	50.2	20.4	14.2	15.2	96	64	30	-	-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34817.1.1 TIP: U-2519DA COUNTY: Cumberland

DESCRIPTION(1): Bridge No. 368 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)

EXISTING BRIDGE

Information from: Field Inspection N/A Microfilm ____ (reel ____ pos: ____
Other (explain) From Bridge Survey & Hydraulic Design Report 1-11-07

Bridge No.: 368 Length: N/A Total Bents: N/A Bents in Channel: N/A Bents in Floodplain: N/A
Foundation Type: N/A

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: N/A

Interior Bents: N/A

Channel Bed: N/A

Channel Bank: N/A

EXISTING SCOUR PROTECTION

Type(3): N/A

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): N/A

DESIGN INFORMATION

Channel Bed Material(7): Alluvial, wet to saturated, very loose to loose, silty and clayey sand

Channel Bank Material(8): Alluvial, saturated, very loose to loose, fine and silty sand, and very soft, silty clay

Channel Bank Cover(9): Brush, grass and small trees

Floodplain Width(10): 130 meters

Floodplain Cover(11): Brush, grass and small trees

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

Channel Migration Tendency(13): Slight tendency for migration to the east toward Bent 2

Observations and Other Comments:

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

Bridge Number 368

B1	B2	B3	B4
56.10	56.30	56.50	56.40

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees with the theoretical scour elevations for the 100 year event as shown in the Bridge Survey and Hydraulic Design Report dated 01/11/07

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

	Bank	Bank	Bank	Bank			
Sample No.	SS-70	SS-71	SS-72	SS-92			
Retained #4	-	-	2	-			
Passed #10	100	100	93	98			
Passed #40	99	57	62	93			
Passed #200	95	7	21	91			
Coarse Sand	1.8	81.6	60.4	5.5			
Fine Sand	6.2	12.1	19.9	2.4			
Silt	43.6	4.3	5.5	29.4			
Clay	48.3	2.0	14.1	62.7			
LL	63	21	22	72			
PI	3	NP	8	34			
AASHTO	A-7-5(35)	A-3(0)	A-2-4(0)	A-7-5(38)			
Station	27+21.1	27+21.1	27+21.1	27+63.2			
Offset	1.3m LT	1.3m LT	1.3m LT	0.9m RT			
Depth	0.00-0.45	1.73-2.18	3.23-3.68	1.34-1.79			

Form GEU-017e Revised 7/26/2007

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.

Reported by: C. Doug Czajka **Date:** 9/21/2007

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2519DA	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 (U-2519DA) F.A. PROJ. NHF-DPR-0100(1)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)

SITE DESCRIPTION BRIDGE NO. 235 AND 004 ON -Y1- (ALL-AMERICAN FREEWAY) OVER BEAVER CREEK

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILES
5	PROFILES
6-9	BORE LOG REPORTS
10	SOIL TEST RESULTS
11	FIELD SCOUR FORM

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

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

PERSONNEL
Y. KUNTUKOVA

INVESTIGATED BY N. T. ROBERSON
CHECKED BY N. T. ROBERSON
SUBMITTED BY N. T. ROBERSON
DATE 08/2007

NORTH CAROLINA LICENSED GEOLOGIST 1912 NEIL T. ROBERSON
8/14/07

PROJECT: 34817.1.2

ID: U-2519DA

DRAWN BY: YEKATERINA KUNTUKOVA

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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.
U-2519DA	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 30 CM 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		50 MX	51 MN								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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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
w - 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
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____ mm STEEL TEETH
- [ ] TRICONE ____ mm 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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BY-5 ALUMINUM DISK 1.718M RT.-Y1- STA. 19+11.827

ELEVATION: 64.338 M

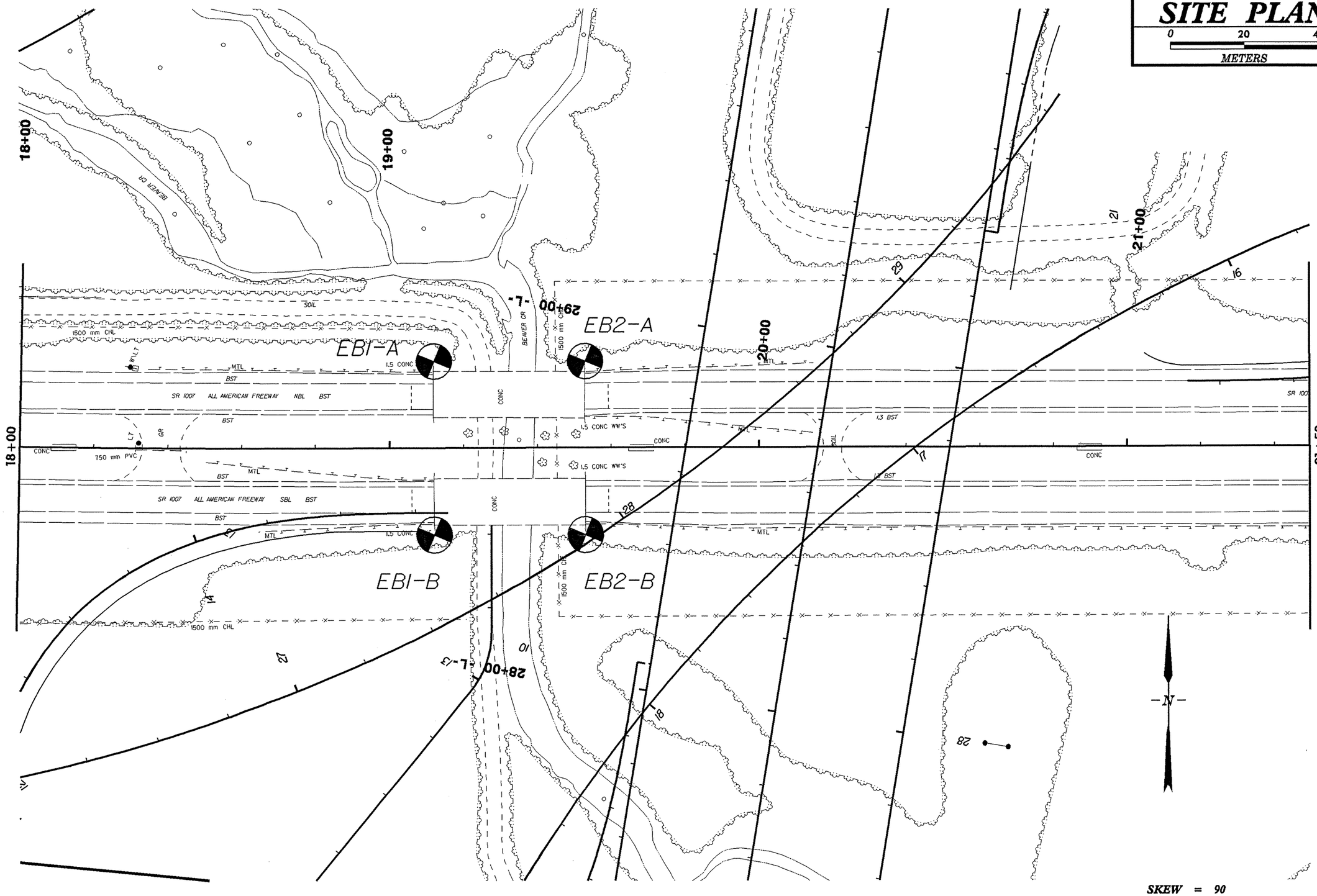
NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
U-2519DA	3

SITE PLAN

0 20 40
METERS



SKEW = 90

PROJECT REFERENCE NO.	SHEET NO.
U-2519DA	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

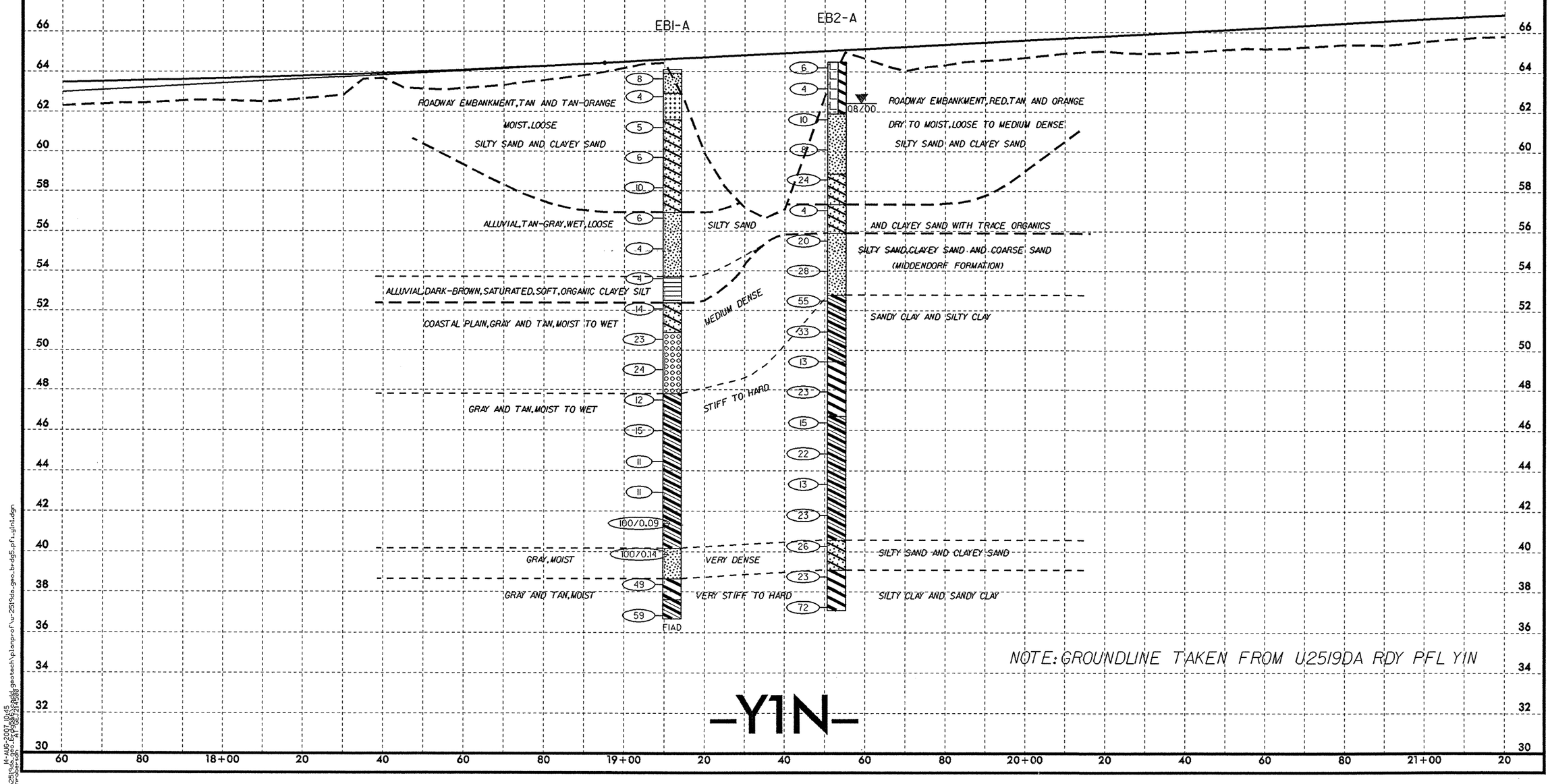
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

CONST.REV.

R/W REV.

FENCE DIAGRAM THROUGH BORINGS PROJECT ON -YIN-

VE=5



PROJECT REFERENCE NO.	SHEET NO.
U-2519DA	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

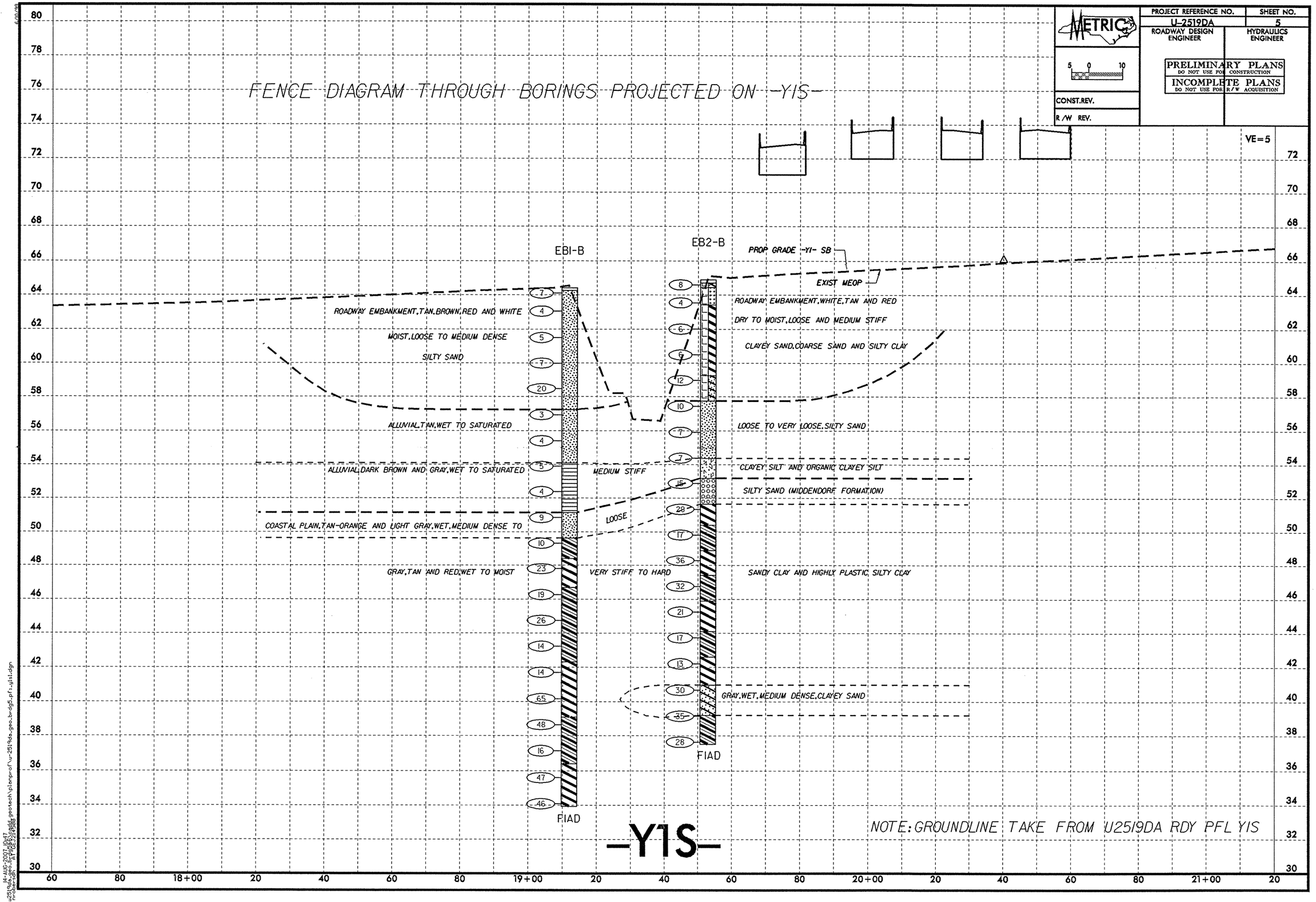
5 0 10

CONST.REV.

R/W REV.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 19+12.0	**OFFSET** 23.6m LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 64.05 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,119.7	**EASTING** 611,877.7	**24 HR.** FIAD
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/13/00	**COMP. DATE** 10/13/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
65							
63.87	0.18						64.05 / 0.00 GROUND SURFACE
		5	4	4		M	63.87 / 0.18 **ROADWAY EMBANKMENT** Asphalt; Tan-Orange, Silty Sand
62.98	1.07						
		2	2	2		M	62.85 / 1.20 Light Tan, Fine Sand
61.46	2.59						
		2	2	3		M	61.55 / 2.50 Tan-Orange, Clayey Sand
59.94	4.11						
		3	3	3		M	
58.41	5.64						
		2	3	7	SS-5	16%	
56.89	7.16						56.89 / 7.16 **ALLUVIAL** Tan-Gray, Silty Sand
		2	3	3		W	
55.36	8.69						
		2	2	2		W	
53.84	10.21						
		2	2	2		W 122%	53.64 / 10.41 Dark Brown, Organic Clayey Silt
52.32	11.73						52.32 / 11.73 **COASTAL PLAIN** Gray, Clayey Sand with trace Mica (Middendorf Formation)
		3	2	12			
50.79	13.26						50.84 / 13.21 Tan, Coarse Sand with some Gravel
		8	11	12		W	
49.27	14.78						
		14	14	10		W	
47.74	16.31						47.74 / 16.31 Gray, Sandy Clay
		3	5	7		M	
46.22	17.83						
		5	6	9		M	
44.70	19.35						

PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 19+12.0	**OFFSET** 23.6m LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 64.05 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,119.7	**EASTING** 611,877.7	**24 HR.** FIAD
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/13/00	**COMP. DATE** 10/13/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION
45							Match Line
		4	3	8		M	Gray, Sandy Clay *(continued)*
43.17	20.88						
		3	4	7	SS-15	M	
41.65	22.40						
		100/9				M	
40.12	23.93						40.12 / 23.93 Gray, Silty Sand
		100/14				M	
38.60	25.45						38.60 / 25.45 Gray, Silty Clay
		14	20	29		M	
37.08	26.97						37.55 / 26.50 Gray, Sandy Clay
		13	20	39		M	36.63 / 27.42 Boring Terminated at Elevation 36.63 m Sandy Clay (Middendorf Formation)

Other Samples:
M-8 (10.4 - 10.6)

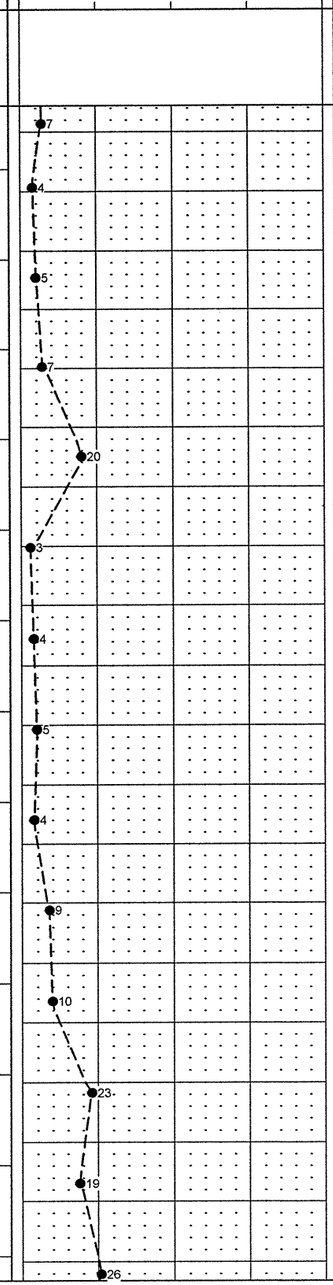
NCDOT BORE DOUBLE U2519DA_GEO_BRDG586.GPJ NC_DOT.GDT 08/10/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 19+12.0	**OFFSET** 23.6m RT	**ALIGNMENT** -Y1-
COLLAR ELEV. 64.44 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,101.7	**EASTING** 611,834.1
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/11/00	**COMP. DATE** 10/12/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
64.44	0.00						GROUND SURFACE (0.00)
64.30	0.14						**ROADWAY EMBANKMENT** Asphalt
						M	Tan, Brown, Red and White, Silty Sand with some Gravel (0.14-1.52)
63.37	1.07	3	3	4		M
61.85	2.59	3	2	2		12%
60.33	4.11	2	2	3	SS-4	M
58.80	5.64	3	4	3		M
57.28	7.16	8	9	11		Sat.	**ALLUVIAL** Tan, Silty Sand
55.75	8.69	2	1	2		Sat.
54.23	10.21	2	2	2		156%
52.71	11.73	2	2	3	SS-9	71%	Dark Gray and Brown, Organic Clayey Silt
51.18	13.26	3	2	2		Sat.	**COASTAL PLAIN SEDIMENTARY ROCK** Light Gray, Silty Sand (Midddendorf Formation)
49.66	14.78	2	4	5		W	Light Gray, Sandy Clay
48.13	16.31	3	4	6		M	Gray, Moderate Plasticity, Silty Clay
46.61	17.83	5	9	14		M	Gray, Sandy Clay
45.09	19.35	5	8	11		M
		4	7	19		M

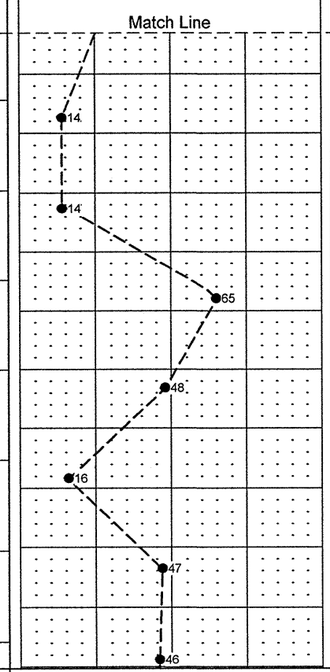


PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 19+12.0	**OFFSET** 23.6m RT	**ALIGNMENT** -Y1-
COLLAR ELEV. 64.44 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,101.7	**EASTING** 611,834.1
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/11/00	**COMP. DATE** 10/12/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
45							Match Line
							Gray, Sandy Clay *(continued)*
43.56	20.88	5	6	8		M
42.04	22.40	4	6	8	SS-16	M
42.34	22.10						Gray and Tan-Brown, Silty Clay
40.51	23.93	14	21	44		M
39.14	25.30						Gray, Sandy Clay
38.99	25.45	19	22	26		M
37.47	26.97	6	7	9		M
36.44	28.00						Gray, Highly Plastic, Silty Clay
35.94	28.50	13	22	25		M
34.42	30.02	14	20	26		M
33.97	30.47						Boring Terminated at Elevation 33.97 m Silty Clay (Middendorf Formation)

Other Samples:
M-8 (10.3 - 10.6)



NCDOT BORE DOUBLE U2519DA_GEO_BRDG5&6.GPJ NC_DOT.GDT 08/10/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 19+53.0	**OFFSET** 23.6m LT	**ALIGNMENT** -Y1-
COLLAR ELEV. 64.54 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,081.8	**EASTING** 611,893.3
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/29/00	**COMP. DATE** 08/29/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	2.60
24 HR.	2.07

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
65									
64.54	0.00								GROUND SURFACE
		4	2	4	6		D		**ROADWAY EMBANKMENT** Red, Loose, Clayey Sand
63.47	1.07								
		4	2	2	4		D		
61.95	2.59								
		3	4	6	10		M		Tan-Orange, Silty Sand
60.43	4.11								
		5	5	3	8		M		
58.90	5.64								
		5	9	15	24		M		Tan, Clayey Sand
57.38	7.16								
		1	2	2	4		W		**ALLUVIAL** Tan and Gray, Clayey Sand with trace organics
55.85	8.69								
		9	10	10	20		W		**COASTAL PLAIN SEDIMENTARY ROCK** Light Gray, Silty Sand (Middendorf Formation)
54.33	10.21								
		10	13	15	28		W		
52.81	11.73								
		10	18	37	55	SS-9	14%		Gray and Tan, Sandy Clay
51.28	13.26								
		9	16	17	33		W		
49.76	14.78								
		4	4	9	13		M		Tan and Gray, Moderate Plasticity, Silty Clay
48.23	16.31								
		6	9	14	23		M		
46.71	17.83								
		5	6	9	15		M		Gray, Sandy Clay with trace Mica
45.19	19.35								
		10	12	10	22		M		

52.81	11.73		
61.94	2.60		
58.90	5.64		
57.38	7.16		
55.94	8.60		
52.81	11.73		
49.47	15.07		
46.74	17.80		

PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 19+53.0	**OFFSET** 23.6m LT	**ALIGNMENT** -Y1-
COLLAR ELEV. 64.54 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,081.8	**EASTING** 611,893.3
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 08/29/00	**COMP. DATE** 08/29/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	2.60
24 HR.	2.07

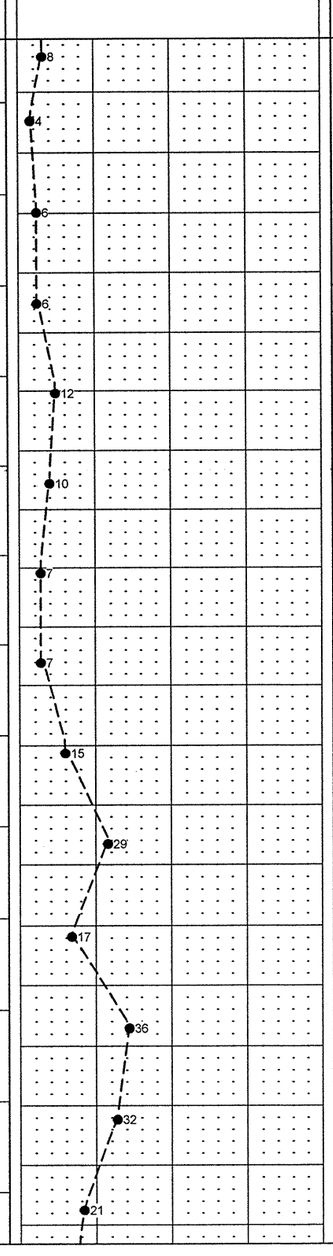
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
45					Match Line				
									Gray, Sandy Clay with trace Mica *(continued)*
43.66	20.88								
		5	6	7	13		M		
42.14	22.40								
		7	9	14	23		M		
40.61	23.93								
		9	12	14	26		M		Gray, Clayey Sand
39.09	25.45								
		7	9	14	23		M		Gray and Tan, Silty Clay
37.57	26.97								
		15	27	45	72	SS-19	26%		
									Boring Terminated at Elevation 37.12 m Silty Clay (Middendorf Formation)

40.61	23.93
39.13	25.41
37.12	27.42

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

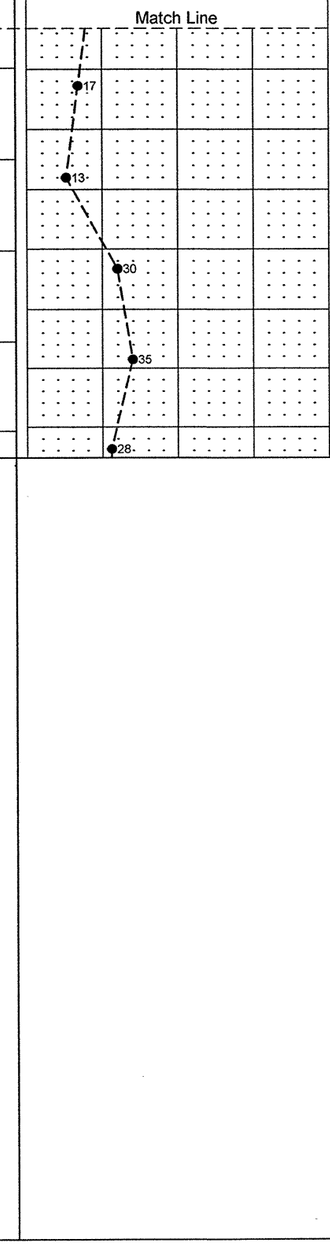
PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 19+53.0	**OFFSET** 23.6m RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 64.90 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,063.8	**EASTING** 611,849.7	**24 HR.** FIAD
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/12/00	**COMP. DATE** 10/12/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
64.90	0.00							GROUND SURFACE
		5	4	4		D		**ROADWAY EMBANKMENT** (64.72 / 0.18); Asphalt (64.44 / 0.46); Tan, Clayey Sand; White and Tan, Fine to Coarse Sand with trace 5mm Gravel
63.83	1.07							
		2	2	2		M		Red, Silty Clay (63.40 / 1.50)
62.31	2.59							
		2	3	3		M		
60.79	4.11							
		2	3	3	SS-4	M		
59.26	5.64							
		7	6	6		M		Tan-Orange, Clayey Sand (59.25 / 5.65)
57.74	7.16							
		5	5	5		M		**ALLUVIAL** Tan, Silty Sand with trace 15mm Gravel (57.74 / 7.16)
56.21	8.69							
		3	3	4		M		
54.69	10.21							
		4	4	3		W		Dark Brown and Gray, Clayey Silt (54.38 / 10.52)
53.17	11.73							
		4	6	9		W		**COASTAL PLAIN SEDIMENTARY ROCK** Tan-Orange and Red, Silty Sand with some Gravel (Middendorf Formation) (53.17 / 11.73)
51.64	13.26							
		9	13	16	SS-10	W		Gray, Tan and Red, Highly Plastic, Silty Clay (51.64 / 13.26)
50.12	14.78							
		6	7	10		W		Tan, Sandy Clay (50.40 / 14.50)
48.59	16.31							
		10	15	21		M		Gray, Silty Clay (48.90 / 16.00)
47.07	17.83							
		9	13	19		M		Dark Gray, Sandy Clay (47.40 / 17.50)
45.55	19.35							
		5	8	13	SS-14	M		Gray and Tan, Silty Clay (45.90 / 19.00)



PROJECT NO. 34817.1.2	**ID.** U-2519-DA	**COUNTY** Cumberland	**GEOLOGIST** Dan Carr
SITE DESCRIPTION Fayetteville Outer Loop/ Bridge on All American over Beaver Creek			**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 19+53.0	**OFFSET** 23.6m RT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 64.90 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,063.8	**EASTING** 611,849.7	**24 HR.** FIAD
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/12/00	**COMP. DATE** 10/12/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
45								Match Line
44.02	20.88							Gray and Tan, Silty Clay *(continued)* (44.10 / 20.80)
		5	8	9		M		Gray, Sandy Clay
42.50	22.40							Gray, Silty Clay (42.60 / 22.30)
		5	5	8		M		
40.97	23.93							Gray, Clayey Sand (40.97 / 23.93)
		9	12	18		M		
39.45	25.45							Gray and Tan, Sandy Clay with trace Mica (39.20 / 25.70)
		24	23	12		W		
37.93	26.97							Boring Terminated at Elevation 37.48 m Sandy Clay (Middendorf Formation) (37.50 / 27.40)
		10	12	16		W		



NCDOT BORE DOUBLE U2519DA_GEO_BRDG586.GPJ NC_DOT.GDT 08/10/07

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	23.6m LT.	19+53.0	11.73-12.18	A-6(13)	38	17	10.8	20.1	24.5	44.6	100.0	94.1	69.7	14.1	-
SS-19	23.6m LT.	19+53.0	26.97-27.42	A-7-6(20)	53	27	8.6	19.9	40.8	30.7	100.0	95.4	74.1	26.1	-

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	23.6m RT.	19+53.0	4.11-4.56	A-7-6(8)	43	18	27.1	24.7	9.4	38.8	97.7	83.1	48.6	17.8	-
SS-10	23.6m RT.	19+53.0	13.26-13.71	A-7-6(12)	46	18	24.3	21.3	6.3	48.1	100.0	89.6	54.8	18.3	-
SS-14	23.6m RT.	19+53.0	19.35-19.8	A-7-6(31)	51	21	2.8	3.7	36.9	56.6	100.0	98.6	93.7	26.7	-

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	23.6m RT.	19+12.0	4.11-4.56	A-2-4	22	15	60.5	19.4	2.1	18.0	99.5	61.0	20.1	12.3	-
M-8	23.6m RT.	19+12.0	10.31-10.66											155.9	-
SS-9	23.6m RT.	19+12.0	11.73-12.18	A-5(1)	41	31	32.5	27.5	28.7	11.3	99.3	80.7	40.0	70.7	-

SOIL TEST RESULTS

SAMPLE NO.			DEPTH INTERVAL	AASHTO CLASS.			% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-5	23.6m LT.	19+12.0	5.64-6.09	A-2-6(0)	32	18	58.0	16.6	5.6	19.8	99.1	64.3	25.4	15.7	-
M-8	23.6m LT.	19+12.0	10.41-10.66											121.8	-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34817.1.2 TIP: U-2519DA COUNTY: Cumberland

DESCRIPTION(1):

EXISTING BRIDGE

Information from: Field Inspection 1 Microfilm ____ (reel ____ pos: ____)
Other (explain)

Bridge No.: 004; 235 Length: 41.2 M Total Bents: 4 Bents in Channel: 0 Bents in Floodplain: 4
Foundation Type:

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Some shallow scour/erosion on end slopes

Interior Bents: Small amount of contraction scour evident

Channel Bed: None noted

Channel Bank: Slight contraction scour

EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): None

DESIGN INFORMATION

Channel Bed Material(7): Alluvial, wet, loose, silty and clayey sand

Channel Bank Material(8): Alluvial, wet, loose, silty and clayey sand

Channel Bank Cover(9): Brush, grass and small trees

Floodplain Width(10): 180 meters

Floodplain Cover(11): Brush, grass and small trees

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

Channel Migration Tendency(13):

Observations and Other Comments:

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

Bridge Number 004 (Structure Number 6)

B1	B2
57.84	55.89

Bridge Number 235 (Structure Number 5)

B1	B2
58.28	56.70

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees with the theoretical scour elevations for the 500 year event as shown in the Bridge Survey and Hydraulic Design Report dated 3/21/07

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

Form GEU-017e Revised 7/26/2007

Reported by: [signature] **Date:** 8/14/07

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.

PROJECT: 34817.1.2 ID: U-2519DA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2	1	24

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
U-2519DA	NHF-DPR-0100 (1)	P.E.
		CONST.

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

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34817.1.2 I.D. NO. U-2519DA
F.A. PROJECT NHF-DPR-0100 (1)
COUNTY CUMBERLAND
PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO EAST OF NC 24

SITE DESCRIPTION STRUCTURE 7: BRIDGE ON -RP1A- OVER BEAVER CREEK AND -TT1- (TANK TRAIL 1)

FOR LETTING

CONTENTS:

	SHEET
STRUCTURE TITLE SHEET	1
NC DEPARTMENT OF TRANSPORTATION, DIVISION OF HIGHWAYS, GEOTECHNICAL ENGINEERING UNIT, SOIL AND ROCK LEGEND, TERMS, SYMBOLS AND ABBREVIATIONS	2
GEOTECHNICAL REPORT	3-4
SITE LOCATION MAP AND TOPOGRAPHIC SITE MAP (DRAWING NOS. 1-2)	5
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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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

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

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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: R. RAHIE

INVESTIGATED BY	MACTEC ENGINEERING AND CONSULTING, INC.	PERSONNEL	J. HOWARD
CHECKED BY	J. VEITH		M. LEAR
SUBMITTED BY	M. LEAR		B. DEOBALD
DATE	07/20/07		D. RHODES
REVISED	08/14/07		E. BURKETT

NORTH CAROLINA LICENSED SEAL 1927 GEOLOGIST MICHAEL B. LEAR

8/13/07
SEAL

MACTEC
MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604
(919) 876-0416

SIGNATURE

ID	PROJECT NO.	SHEET NO.	TOTAL SHEETS
U-2519DA	34817.1.2	2	24

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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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		N.P.	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

P.I. OF A-7-5 ≤L.L. - 30 : P.I. OF A-7-6 >L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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
GRAIN SIZE IN.	12"	3"				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- 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
- BM BENCH MARK
- 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 - CBR SAMPLE
- MARSH
- TREE LINE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
C.I. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FIAD - FILLED IMMEDIATELY AFTER DRILLING
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
LS. - LIMESTONE
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
V. - VERY
VST - VANE SHEAR TEST
W - MOISTURE CONTENT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] DIEDRICH D-50
- [ ] CME-550
- [X] CME-45B ON MARSH BUGGY
- [ ] CME-55 ON BARGE
- [ ] PORTABLE HOIST
- [X] OTHER CME-45C TRAILER
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____ STEEL TEETH
- [ ] TRICONE ____ TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER SIDE-DISCHARGE WING BIT

HAMMER TYPE:
- [X] AUTOMATIC
- [X] MANUAL

CORE SIZE:
- [ ] -B _____
- [ ] -N _____
- [ ] -H _____

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

ROCK DESCRIPTION

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 2.5 cm PER 50 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 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. *IF TESTED, YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 GEOLOGISTS 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 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 (S.R.Q.D.) - 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.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BASELINE POINTS BL-12 (59.506m) AND BL-16 (57.625m) SET BY NCDOT PERS.

NOTES:
Geotechnical Exploration
Performed By:

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604
(919) 876-0416

Subject: **Revised Geotechnical Report**

Description: **Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1)**
Fayetteville Outer Loop

Project Number:	**34817.1.2**
Tip Number:	**U-2519DA**
F.A. Number:	**NHF-DPR-0100 (1)**
MACTEC Project Number:	**6468-07-1786**

Project Information

The purpose of this investigation was to obtain geotechnical information for design and construction of the proposed ramp over Beaver Creek and Tank Trail 1 located on and adjacent to the Fort Bragg Military Reservation, southeast of the controlled access point on All American Freeway, Cumberland County, North Carolina (Drawings 1 and 2). The ramp is part of a proposed segment of the Fayetteville Outer Loop from East of SR 1415 to East of NC 24. Our understanding of this project comes from conversations and site visits with NCDOT Geotechnical Engineering Unit personnel and from documents and drawings provided by the Geotechnical Engineering Unit, including a Request for Proposal dated June 1, 2007, a Bridge Survey and Hydraulic Design Report dated April 11, 2007, and electronic drawings obtained via the NCDOT file transfer system.

The proposed bridge is approximately 196 meters long and 10 meters wide. The bridge is to be constructed on six bents with one span 35 meters long, three spans 42 meters long, and one span 35 meters long. The bridge is designed on curve and the bents are skewed 90° to the tangent of the alignment (-RP1A-). The proposed grade is approximately 11 meters above the natural ground surface at End Bent 1, and gradually slopes downward toward End Bent 2.

We were requested to drill one SPT-boring at each bent location, for a total of six borings for the project. We were instructed by the NCDOT to drill all borings to the depth of 25 meters.

Field Testing

During June and July, 2007, MACTEC advanced 6 borings at locations shown on the Boring Location Plan (Drawings 3). The borings were drilled with a CME-45B marsh buggy-mounted drill rig equipped with a 63.5 kilogram manual hammer and a CME-45C trailer-mounted drill rig equipped with a 63.5 kilogram automatic hammer. The borings were advanced using mud rotary drilling techniques.

All borings were advanced to an approximate depth of 25 meters. Standard penetration tests (SPT) were conducted and soil samples collected at approximately 1.5 meter intervals. Samples were collected from within the soil profile using split-barrel samplers and 63.5 kilogram manual or automatic hammers. We attempted to collect undisturbed samples of shallow cohesive soil with Shelby tubes for consolidation testing and for Erosion Function Apparatus (EFA) analyses with no success.

Proposed boring locations were established at the project site utilizing GPS equipment. As-drilled boring location coordinates were captured with GPS equipment. The collected coordinates were corrected as necessary using post-processing differential correction. Conventional survey techniques were used to establish the collar elevations at all boring locations and selected ground surface points depicted on the subsurface profile drawings included with this report. U-2519DA Baseline Survey Points BL-12 and BL-16, established at the project site by the NCDOT, were used as benchmarks.

Laboratory Testing

Laboratory testing consisting of AASHTO classification, grain-size distribution, and/or organic content tests were performed on split-barrel samples SS-1 through SS-19. Cohesive soils were also tested for moisture content.

Laboratory testing was performed in general accordance with applicable ASTM/AASHTO/ NCDOT specifications. Test results for AASHTO classification, grain-size distribution, organic content, and moisture content are included with this report.

Physiography

The ground surface along the approaches to the proposed structure slopes gradually down toward the End Bents. There is approximately 10 meters of relief between the approaches to End Bent 1 and 2 and the flood plain of Beaver Creek. The ground surface is at elevation 59± meters mean sea level (msl) along End Bent 1, and 60± meters msl along End Bent 2. The ground surface ranges from 57 to 58± meters msl at interior bent locations.

The site is currently undeveloped. The upland areas, located at the end bents, are moderately wooded with young to mature pine and hardwood trees. The flood plain of Beaver Creek is moderately to thinly wooded with mature hardwood and pine trees, and areas of thick brush. Beaver Creek enters the site from the north and the main channel of the creek crosses the alignment between bents 2 and 3. There are beaver dams restricting water flow through the project area, causing Beaver Creek to spread laterally across the site submerging much of the flood plain. The water surface elevation of Beaver Creek, in the vicinity of bents 1 and 2 (downstream of a beaver dam) was measured at 57.38 meters msl, and in the vicinity of bents 3 and 4 (upstream of a beaver dam) was measured at 57.86 meters msl, on June 27, 2007. Site photographs included in this report show site conditions during our field investigation.

Geology

The project site is located in the western portion of the Carolina Coastal Plain Physiographic Province. The Carolina Coastal Plain is a wedge of mostly marine sediments and sedimentary rocks that gradually thickens to the east (towards the present day coast-line) that were deposited during depositional cycles caused by fluctuating sea-levels. The Coastal Plain sediments encountered at the project site were deposited at a time when sea-level was much higher than its present condition. The depositional processes that resulted in the sediments encountered at the project site are similar to those in existence today along the current coast-line. Younger sediments lie at the surface near the coast. Older sediments, which underlie these younger sediments, lie at or near the surface further inland. The 1985 Geologic Map of North Carolina, compiled by the N.C.

Geologic Survey, indicates that the project site is underlain by sediments of the Middendorf and Cape Fear Formations. We encountered the following stratigraphic units at the project site:

- Alluvium
- Middendorf Formation
- Cape Fear Formation

Boring logs describing subsurface conditions at each of the boring locations are included in this report. A Profile, Drawings 4 to 6, depicts generalized subsurface conditions along the length of the structure.

Soil

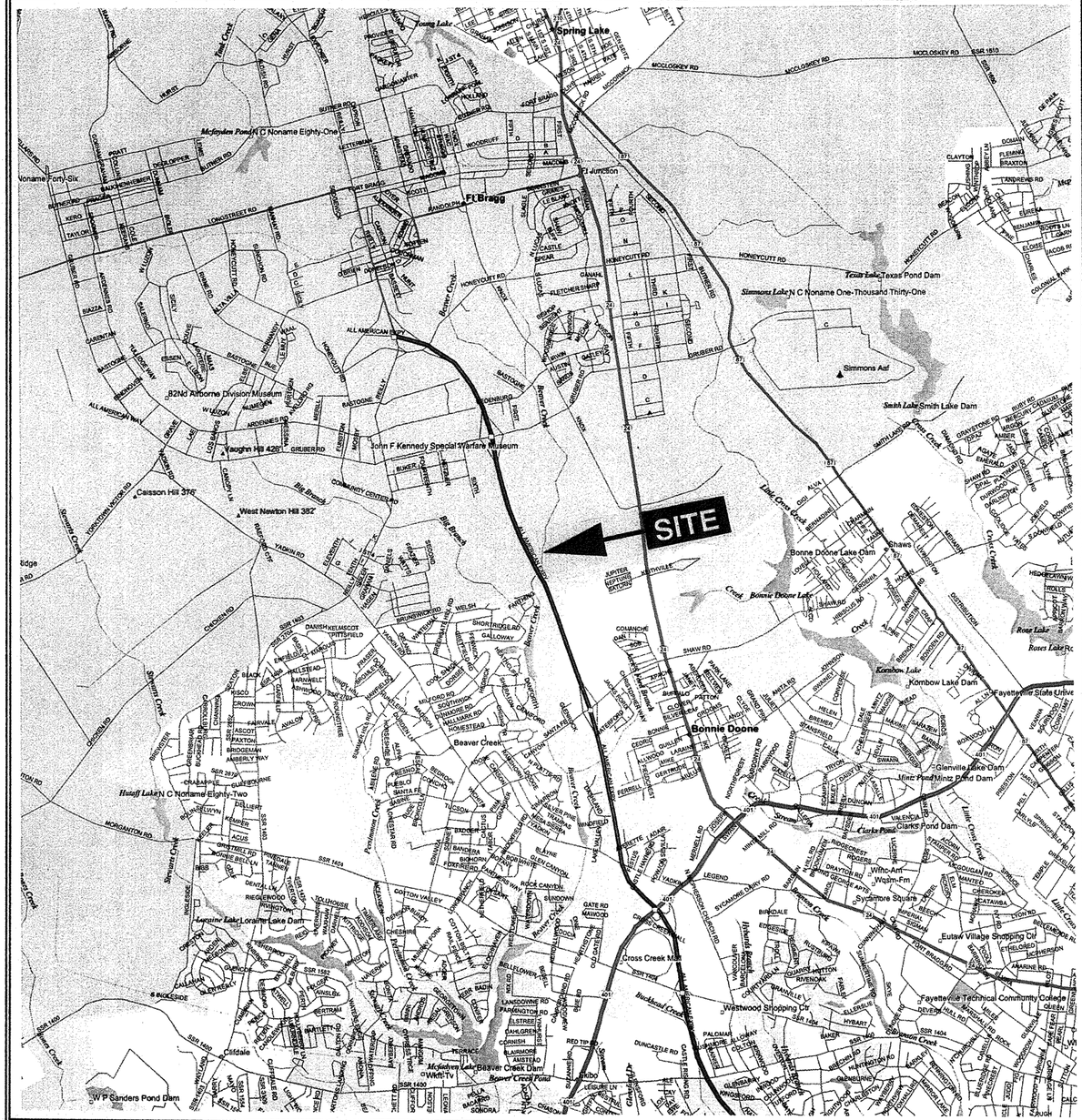
Alluvium was encountered at the surface in all borings performed at the project site. Alluvial soils encountered at interior bent borings B1 to B3 consist of a surficial layer of very soft to soft, sandy, silty, clay (A-6) with little organics. Alluvial soils encountered at the surface in borings EB1, B4, and EB2, and in the subsurface in borings B1 to B3, consist of very loose to medium dense, clayey, silty, fine to coarse sand (A-2-6/A-2-4/A-1-b) with organics. Alluvial soils overlie the Middendorf Formation at approximate elevations ranging from 52 to 57± meters msl.

Middendorf Formation soils were encountered below alluvium and typically consist of interbedded, loose to very dense, silty, clayey, fine to coarse sand (A-1-b/A-3/A-2-4/A-2-6/A-2-7) with trace mica; and medium stiff to hard, fine to coarse sandy, silty, clay (A-6/A-7-6/A-7-5) with trace mica. Middendorf Formation soils are generally lightly colored gray, brown, orange, red, and green, and commonly mottled with red or orange. Individual beds are laterally discontinuous. The base of the Middendorf Formation / top of the Cape Fear Formation ranges from elevation 37 to 39± meters msl.

The Cape Fear Formation was encountered underlying the Middendorf Formation and generally consists of interbedded clays and sands; including very stiff to hard, silty, sandy, clay (A-6/A-7-6/A-7-5) with trace mica, and dense to very dense, clayey, fine to coarse sand (A-2-6) with trace mica. The soils are typically darkly colored gray to green, mottled with tan, orange, red, and brown. All borings were terminated in the Cape Fear Formation.

Groundwater

Groundwater level measurements were obtained 24-hours after drilling was completed in borings EB1, B4, and EB2. Groundwater elevations ranged from 57.4 to 58.7± meters msl at these locations. The groundwater elevations coincide with or are slightly higher than the surface water elevations observed for Beaver Creek and appear to be a subdued reflection of the site topography.



REFERENCE: Delorme Street Atlas

GRAPHIC SCALE MILES

1.0 0.5 0 1.0 2.0

NOTE: SITE LOCATION IS APPROXIMATE

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SITE LOCATION MAP
STRUCTURE 7: BRIDGE ON -RP1A- OVER BEAVER CREEK AND -TT1- (TANK TRAIL 1)
NCDOT PROJ. NO. 34817.1.2 (U-2519DA)
CUMBERLAND COUNTY, NORTH CAROLINA

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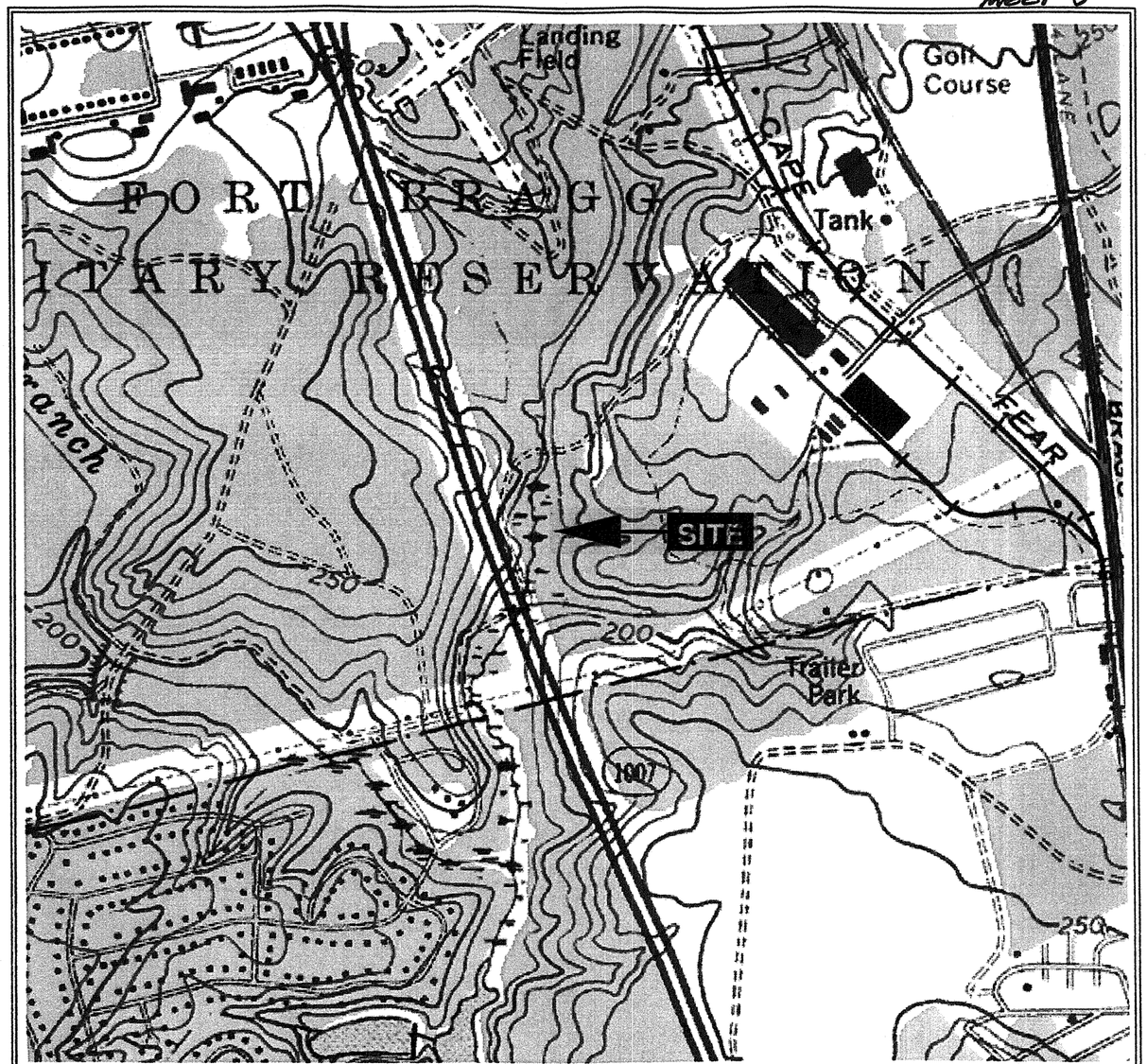
APPROVAL:	JOB: 6468-07-1786	

SHEET 5



FAYETTEVILLE, N.C.
SW/4 FAYETTEVILLE 15'
QUADRANGLE
35078-A8-TF-024
1957
PHOTOREVISED 1987
DMA 5254 III SW – SERIES V842

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GRAPHIC SCALE FEET

1000 500 0 1000 2000

NOTE: SITE LOCATION IS APPROXIMATE

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TOPOGRAPHIC SITE MAP
STRUCTURE 7: BRIDGE ON -RP1A- OVER BEAVER CREEK AND -TT1- (TANK TRAIL 1)
NCDOT PROJ. NO. 34817.1.2 (U-2519DA)
CUMBERLAND COUNTY, NORTH CAROLINA

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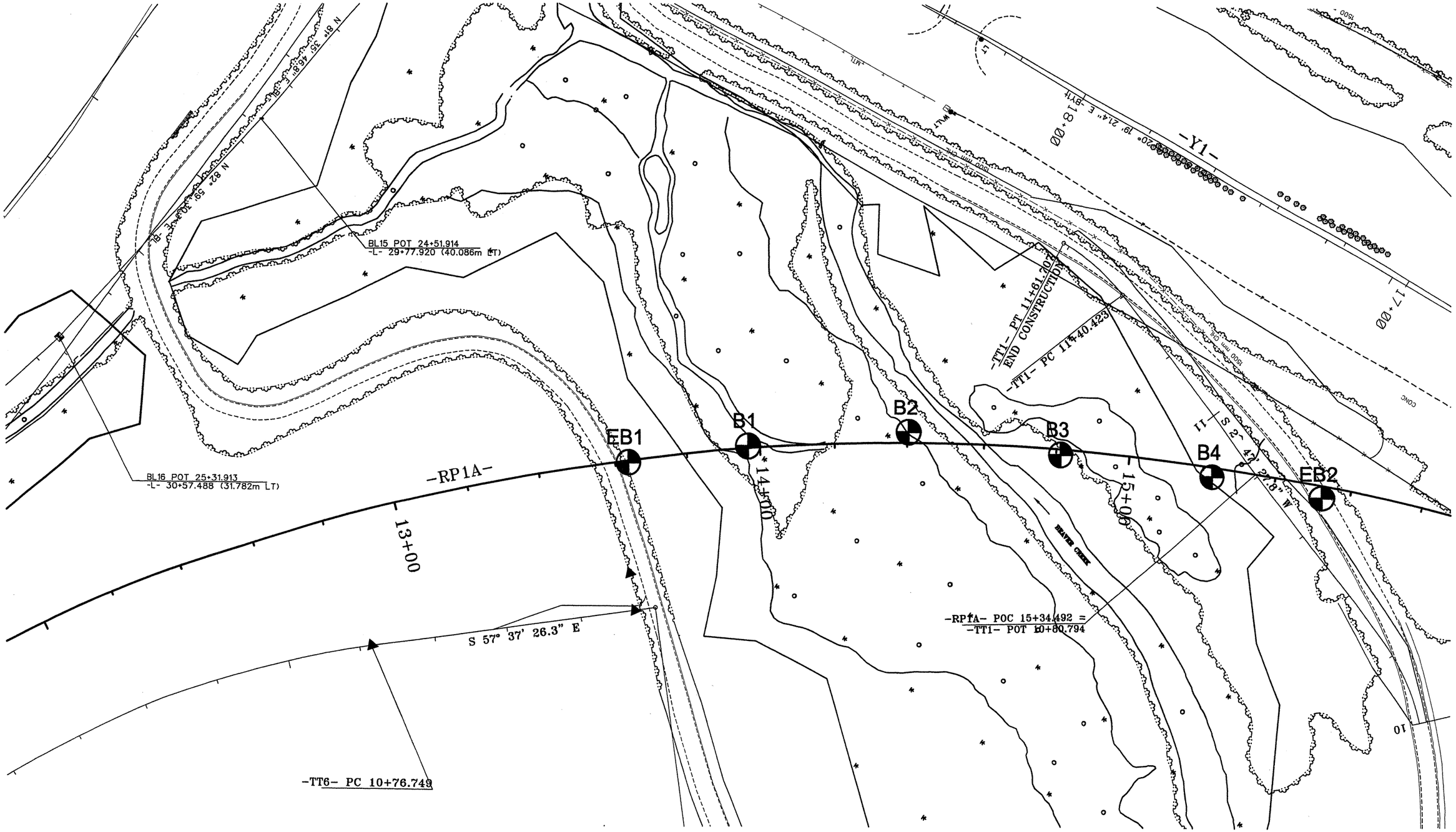

0 10 20 40

HORIZONTAL SCALE (METER)
1:100

NAD 83

BORING LOCATION PLAN
STRUCTURE 7: BRDIGE ON -RP1A- OVER BEAVER CREEK
AND -TT1- (TANK TRAIL 1)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
F.A. No. NHF-DPR-0100 (1)
CUMBERLAND COUNTY, NORTH CAROLINA

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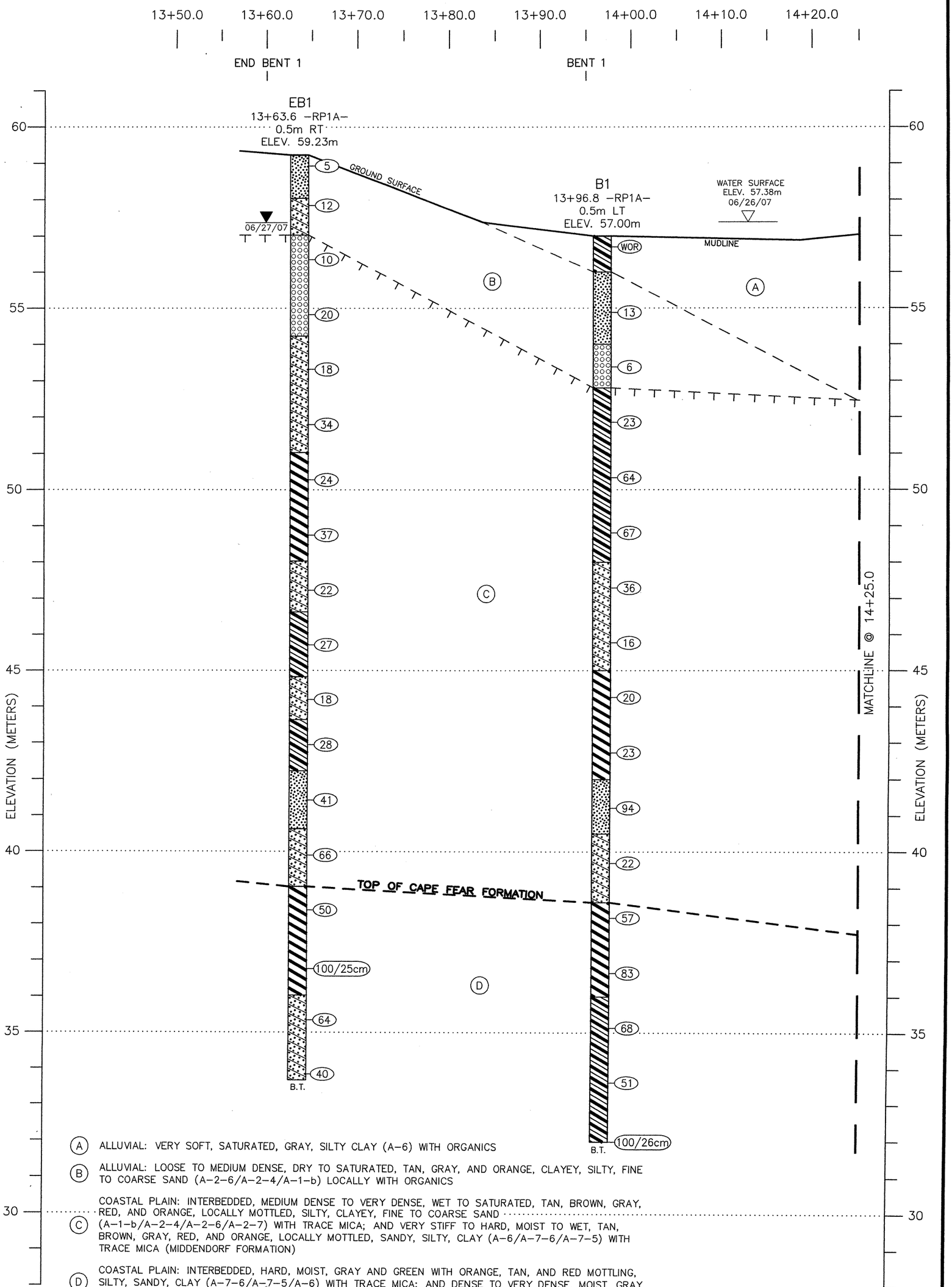
	DFT CHECK: M.B.L.	JOB : 6468-07-1786
	ENG CHECK: J.E.V.	DWG: 3



(A) ALLUVIAL: VERY SOFT, SATURATED, GRAY, SILTY CLAY (A-6) WITH ORGANICS

(B) ALLUVIAL: LOOSE TO MEDIUM DENSE, DRY TO SATURATED, TAN, GRAY, AND ORANGE, CLAYEY, SILTY, FINE TO COARSE SAND (A-2-6/A-2-4/A-1-b) LOCALLY WITH ORGANICS

(C) COASTAL PLAIN: INTERBEDDED, MEDIUM DENSE TO VERY DENSE, WET TO SATURATED, TAN, BROWN, GRAY, RED, AND ORANGE, LOCALLY MOTTLED, SILTY, CLAYEY, FINE TO COARSE SAND (A-1-b/A-2-4/A-2-6/A-2-7) WITH TRACE MICA; AND VERY STIFF TO HARD, MOIST TO WET, TAN, BROWN, GRAY, RED, AND ORANGE, LOCALLY MOTTLED, SANDY, SILTY, CLAY (A-6/A-7-6/A-7-5) WITH TRACE MICA (MIDDENDORF FORMATION)

(D) COASTAL PLAIN: INTERBEDDED, HARD, MOIST, GRAY AND GREEN WITH ORANGE, TAN, AND RED MOTTLING, SILTY, SANDY, CLAY (A-7-6/A-7-5/A-6) WITH TRACE MICA; AND DENSE TO VERY DENSE, MOIST, GRAY, CLAYEY SAND (A-2-6) WITH TRACE MICA (CAPE FEAR FORMATION)

0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

0 1 2 4
VERTICAL SCALE (METERS)
1:100

PROFILE ALONG -RP1A-
STRUCTURE 7: BRIDGE ON -RP1A- OVER BEAVER CREEK AND -TT1- (TANK TRAIL 1)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
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	ENG CHECK: J.E.V.	DWG: 4

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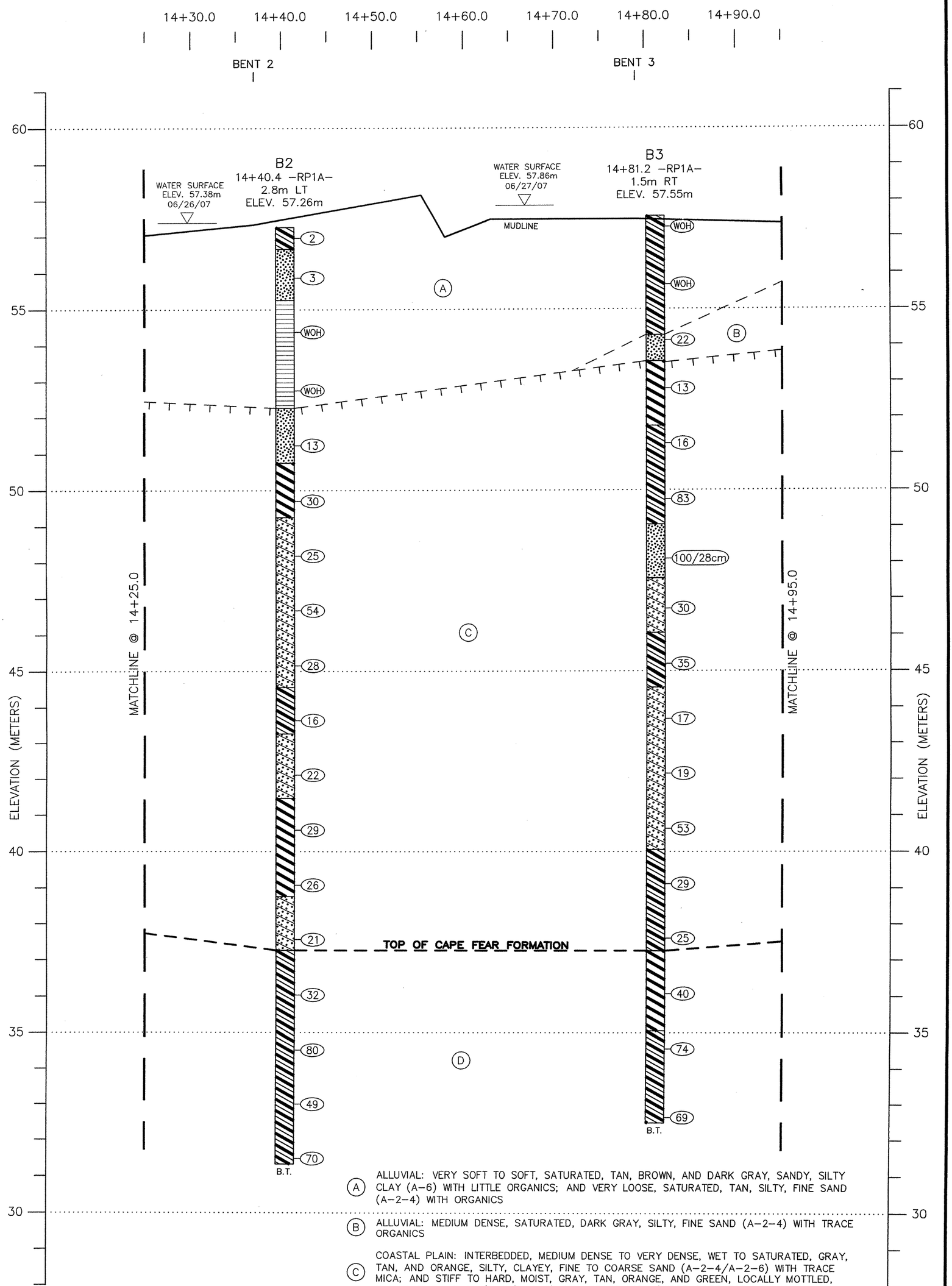

(A) ALLUVIAL: VERY SOFT TO SOFT, SATURATED, TAN, BROWN, AND DARK GRAY, SANDY, SILTY CLAY (A-6) WITH LITTLE ORGANICS; AND VERY LOOSE, SATURATED, TAN, SILTY, FINE SAND (A-2-4) WITH ORGANICS

(B) ALLUVIAL: MEDIUM DENSE, SATURATED, DARK GRAY, SILTY, FINE SAND (A-2-4) WITH TRACE ORGANICS

(C) COASTAL PLAIN: INTERBEDDED, MEDIUM DENSE TO VERY DENSE, WET TO SATURATED, GRAY, TAN, AND ORANGE, SILTY, CLAYEY, FINE TO COARSE SAND (A-2-4/A-2-6) WITH TRACE MICA; AND STIFF TO HARD, MOIST, GRAY, TAN, ORANGE, AND GREEN, LOCALLY MOTTLED, SANDY, SILTY, CLAY (A-6/A-7-6) WITH TRACE MICA (MIDDENDORF FORMATION)

(D) COASTAL PLAIN: HARD, MOIST, GRAY AND GREEN WITH ORANGE, RED, AND BROWN MOTTLING, SILTY, SANDY, CLAY (A-7-6/A-6) WITH TRACE MICA (CAPE FEAR FORMATION)

0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

0 1 2 4
VERTICAL SCALE (METERS)
1:100

PROFILE ALONG -RP1A-
STRUCTURE 7: BRIDGE ON -RP1A- OVER BEAVER CREEK AND -TT1- (TANK TRAIL 1)
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F.A. No. NHF-DPR-0100 (1)
CUMBERLAND COUNTY, NORTH CAROLINA

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REVISIONS	DRAWN: R.R.	DATE: 07/20/07
08/14/07	DFT CHECK: M.B.L.	JOB: 6468-07-1786
	ENG CHECK: J.E.V.	DWG: 5

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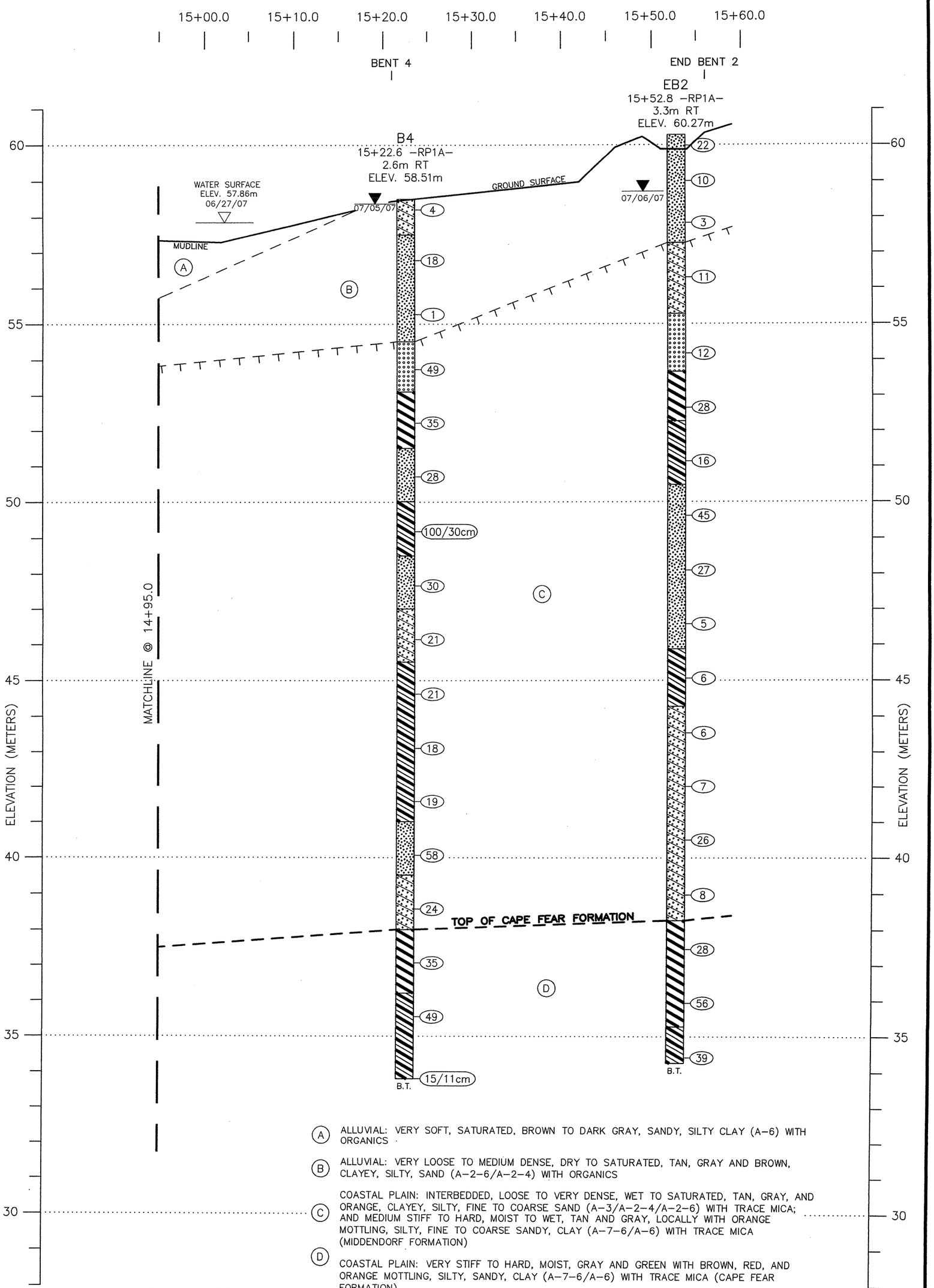

(A) ALLUVIAL: VERY SOFT, SATURATED, BROWN TO DARK GRAY, SANDY, SILTY CLAY (A-6) WITH ORGANICS

(B) ALLUVIAL: VERY LOOSE TO MEDIUM DENSE, DRY TO SATURATED, TAN, GRAY AND BROWN, CLAYEY, SILTY, SAND (A-2-6/A-2-4) WITH ORGANICS

(C) COASTAL PLAIN: INTERBEDDED, LOOSE TO VERY DENSE, WET TO SATURATED, TAN, GRAY, AND ORANGE, CLAYEY, SILTY, FINE TO COARSE SAND (A-3/A-2-4/A-2-6) WITH TRACE MICA; AND MEDIUM STIFF TO HARD, MOIST TO WET, TAN AND GRAY, LOCALLY WITH ORANGE MOTTLING, SILTY, FINE TO COARSE SANDY, CLAY (A-7-6/A-6) WITH TRACE MICA (MIDDENDORF FORMATION)

(D) COASTAL PLAIN: VERY STIFF TO HARD, MOIST, GRAY AND GREEN WITH BROWN, RED, AND ORANGE MOTTLING, SILTY, SANDY, CLAY (A-7-6/A-6) WITH TRACE MICA (CAPE FEAR FORMATION)

0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

0 1 2 4
VERTICAL SCALE (METERS)
1:100

PROFILE ALONG -RP1A-
STRUCTURE 7: BRIDGE ON -RP1A- OVER BEAVER CREEK AND -TT1- (TANK TRAIL 1)
NCDOT PROJECT NO. 34817.1.2 (U-2519DA)
F.A. No. NHF-DPR-0100 (1)
CUMBERLAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 07/20/07
08/14/07	DFT CHECK: M.B.L.	JOB: 6468-07-1786
	ENG CHECK: J.E.V.	DWG: 6

SHEET: 9

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. EB1	**STATION** 13+63.6	**OFFSET** 0.5m RT	**ALIGNMENT** -RP1A-
COLLAR ELEV. 59.23 m	**TOTAL DEPTH** 25.56 m	**NORTHING** 151,210.8	**EASTING** 611,973.0
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/26/07	**COMP. DATE** 06/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.10
24 HR.	1.86

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
60									
59.23	0.00								GROUND SURFACE (59.23 / 0.00)
		1	2	3	5	SS-1	D		**ALLUVIAL** Tan, silty, fine SAND (A-2-4)
58.14	1.09								(58.04 / 1.19)
		4	6	6	12		W		**ALLUVIAL** Light gray, clayey, fine SAND (A-2-6)
56.65	2.58								(57.03 / 2.20)
		2	4	6	10		Sat.		**COASTAL PLAIN** Tan, brown, and red, fine to coarse SAND (A-1-b) (Middendorf Formation)
55.13	4.10								
		9	8	12	20	SS-2	Sat.		
53.61	5.62								(54.23 / 5.00)
		10	9	9	18		M		**COASTAL PLAIN** Gray and tan, with red mottling, clayey SAND (A-2-6) with trace mica (Middendorf Formation)
52.09	7.14								
		11	15	19	34	SS-3	17%		
50.57	8.66								(51.03 / 8.20)
		12	10	14	24	SS-4	26%		**COASTAL PLAIN** Brown and gray, with red mottling, sandy CLAY (A-7-5/A-7-6) with trace mica (Middendorf Formation)
49.05	10.18								
		14	17	20	37	SS-5	20%		
47.53	11.70								(48.03 / 11.20)
		11	10	12	22	SS-6	18%		**COASTAL PLAIN** Dark gray, clayey, fine SAND (A-2-6) (Middendorf Formation)
46.01	13.22								(46.63 / 12.60)
		9	12	15	27	SS-7	19%		**COASTAL PLAIN** Dark gray with orange mottling, sandy CLAY (A-6) with trace mica (Middendorf Formation)
44.49	14.74								(44.83 / 14.40)
		7	9	9	18	SS-8	21%		**COASTAL PLAIN** Dark gray, clayey, fine SAND (A-2-7) (Middendorf Formation)
43.24	15.99								(43.63 / 15.60)
		20	12	16	28	SS-9	14%		**COASTAL PLAIN** Dark gray, sandy CLAY (A-6)
41.72	17.51								(42.23 / 17.00)
		16	20	21	41	SS-10	Sat.		**COASTAL PLAIN** Dark gray, clayey, silty, fine SAND (A-2-4) (Middendorf Formation)
40.20	19.03								(40.63 / 18.60)
		24	35	31	66	SS-11	Sat.		**COASTAL PLAIN** Dark gray, clayey, fine to coarse SAND (A-2-7) with trace mica (Middendorf Formation)

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. EB1	**STATION** 13+63.6	**OFFSET** 0.5m RT	**ALIGNMENT** -RP1A-
COLLAR ELEV. 59.23 m	**TOTAL DEPTH** 25.56 m	**NORTHING** 151,210.8	**EASTING** 611,973.0
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/26/07	**COMP. DATE** 06/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	0.10
24 HR.	1.86

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
40					Match Line				
38.68	20.55								
		14	23	27	50	SS-12	24%		
37.16	22.07								
		29	44	56/10	100/25		M		
35.64	23.59								
		20	29	35	64	SS-13	22%		
34.12	25.11								
		15	18	22	40		M		
									(39.03 / 20.20) **COASTAL PLAIN** Dark gray with orange mottling, sandy CLAY (A-7-6) with trace mica (Cape Fear Formation)
									(36.03 / 23.20) **COASTAL PLAIN** Gray, clayey SAND (A-2-6) with trace mica (Cape Fear Formation)
									(33.67 / 25.56) Boring Terminated at Elevation 33.67 m in Coastal Plain: Dense, clayey SAND (A-2-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.08 g/cm
Casing Depth: 1.39m (10cm)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B1	**STATION** 13+96.8	**OFFSET** 0.5m LT	**ALIGNMENT** -RP1A-	**0 HR.** Water
COLLAR ELEV. 57.00 m	**TOTAL DEPTH** 25.02 m	**NORTHING** 151,228.7	**EASTING** 611,945.0	**24 HR.** Boring
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/26/07	**COMP. DATE** 06/27/07	**SURFACE WATER DEPTH** 0.38m	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
57									57.00 / 0.00 **MUDLINE**
57.00	0.00	WOR	WOR	WOR	WOR		Sat.		**ALLUVIAL** Gray, silty CLAY (A-6) with organics Shelby Tube ST-1 pushed at offset location (0.3m upstation) from 0.00-0.60m with no recovery — 56.00 / 1.00
55.18	1.82	4	6	7	13	SS-14	Sat.		**ALLUVIAL** Gray, silty, fine SAND (A-2-4) with organics — 54.00 / 3.00
53.67	3.33	1	3	3	6	SS-15	Sat.		**ALLUVIAL** Orange, silty, fine to coarse SAND (A-1-b) — 52.80 / 4.20
52.15	4.85	6	10	13	23		W		**COASTAL PLAIN** Tan, gray, brown, with orange, sandy CLAY (A-6) with trace mica (Middendorf Formation)
50.63	6.37	15	27	37	64		M		
49.11	7.89	23	33	34	67		M		
47.59	9.41	9	18	18	36		W		48.00 / 9.00 **COASTAL PLAIN** Gray with orange and brown, clayey, fine SAND (A-2-6) with trace mica (Middendorf Formation)
46.07	10.93	7	6	10	16		W		
44.55	12.45	8	10	10	20		M		45.00 / 12.00 **COASTAL PLAIN** Gray, sandy, silty CLAY (A-7-6) with trace mica (Middendorf Formation)
43.03	13.97	9	12	11	23	SS-16	34%		
41.51	15.49	19	35	59	94	SS-17	Sat.		42.00 / 15.00 **COASTAL PLAIN** Gray, silty, fine SAND (A-2-4) with trace mica (Middendorf Formation)
39.99	17.01	8	12	10	22		Sat.		40.50 / 16.50 **COASTAL PLAIN** Gray, clayey, fine SAND (A-2-6) with trace mica (Middendorf Formation)
38.47	18.53	20	26	31	57		M		38.60 / 18.40 **COASTAL PLAIN** Dark gray, with tan and red mottling, silty CLAY (A-7-5) (Cape Fear Formation)
36.95	20.05	27	33	50					

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B1	**STATION** 13+96.8	**OFFSET** 0.5m LT	**ALIGNMENT** -RP1A-	**0 HR.** Water
COLLAR ELEV. 57.00 m	**TOTAL DEPTH** 25.02 m	**NORTHING** 151,228.7	**EASTING** 611,945.0	**24 HR.** Boring
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/26/07	**COMP. DATE** 06/27/07	**SURFACE WATER DEPTH** 0.38m	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
37					Match Line				
					83	SS-18	25%		36.00 / 21.00 **COASTAL PLAIN** Green and gray, with tan and red mottling, sandy CLAY (A-6) (Cape Fear Formation)
35.43	21.57	20	31	37	68		M		
33.91	23.09	16	26	25	51		M		
32.39	24.61	34	54	46/11	100/26		M		31.98 / 25.02 Boring Terminated at Elevation 31.98 m in Coastal Plain: Hard, sandy CLAY (A-6) (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.08 g/cm
Casing Depth: 2.10m (10cm)

Other Samples:
ST-1 (0.0 - 0.6)

NCDOT GEOTECHNICAL ENGINEERING UNIT
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PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B2	**STATION** 14+40.4	**OFFSET** 2.8m LT	**ALIGNMENT** -RP1A-
COLLAR ELEV. 57.26 m	**TOTAL DEPTH** 25.94 m	**NORTHING** 151,253.8	**EASTING** 611,909.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/28/07	**COMP. DATE** 06/28/07	**SURFACE WATER DEPTH** 0.01m	**DEPTH TO ROCK** N/A

GROUND WTR (m)		
0 HR.	Water	
24 HR.	Boring	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
58										
57.26	0.00								MUDLINE	0.00
		1	WOH	2	2		Sat.		**ALLUVIAL** Tan, silty CLAY (A-6) with organics	0.60
56.17	1.09								**ALLUVIAL** Tan, silty, fine SAND (A-2-4) with organics	
		1	1	2	3		Sat.			2.00
54.68	2.58								**ALLUVIAL** Dark gray, fine sandy, silty CLAY (A-6) with little organics Organic Content (SS-19)=10.8%	
		WOH	WOH	WOH WOH	0	SS-19	77%			
53.05	4.21									
		WOH	WOH	WOH WOH	0		Sat.			5.00
51.53	5.73								**COASTAL PLAIN** Light gray, silty, fine SAND (A-2-4) (Middendorf Formation)	
		4	7	6	13		Sat.			6.50
50.01	7.25								**COASTAL PLAIN** Dark gray, silty CLAY (A-7-6) (Middendorf Formation)	
		8	14	16	30		M			8.00
48.49	8.77								**COASTAL PLAIN** Gray with orange, silty, clayey, fine SAND (A-2-6) (Middendorf Formation)	
		5	8	17	25		Sat.			
46.97	10.29									
		17	25	29	54		W			
45.45	11.81									
		11	12	16	28		W			12.70
43.93	13.33								**COASTAL PLAIN** Dark gray, sandy CLAY (A-6) with trace mica (Middendorf Formation)	
		9	7	9	16		M			14.00
42.41	14.85								**COASTAL PLAIN** Gray, clayey, fine SAND (A-2-6) with trace mica (Middendorf Formation)	
		6	10	12	22		Sat.			15.80
40.89	16.37								**COASTAL PLAIN** Gray with orange mottling, sandy, silty CLAY (A-7-6) (Middendorf Formation)	
		8	12	17	29		M			
39.37	17.89									
		9	11	15	26		M			18.50
37.85	19.41								**COASTAL PLAIN** Gray, clayey SAND (A-2-6) with trace mica (Middendorf Formation)	

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B2	**STATION** 14+40.4	**OFFSET** 2.8m LT	**ALIGNMENT** -RP1A-
COLLAR ELEV. 57.26 m	**TOTAL DEPTH** 25.94 m	**NORTHING** 151,253.8	**EASTING** 611,909.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/28/07	**COMP. DATE** 06/28/07	**SURFACE WATER DEPTH** 0.01m	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	Water
24 HR.	Boring

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
38					Match Line				
		9	9	12	21		W		
36.33	20.93								37.26 / 20.00 **COASTAL PLAIN** Gray and green, with orange, red, and brown mottling, sandy CLAY (A-6) with trace mica (Cape Fear Formation)
		10	14	18	32		M		
34.81	22.45								
		27	32	48	80		M		
33.29	23.97								
		20	21	28	49		M		
31.77	25.49								
		17	16	54	70		M		31.32 / 25.94

Boring Terminated at Elevation 31.32 m in Coastal Plain: Hard, sandy CLAY (A-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.10 g/cm
Casing Depth: 4.04m (10cm)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B3	**STATION** 14+81.2	**OFFSET** 1.5m RT	**ALIGNMENT** -RP1A-
COLLAR ELEV. 57.55 m	**TOTAL DEPTH** 25.07 m	**NORTHING** 151,284.3	**EASTING** 611,881.7
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/29/07	**COMP. DATE** 07/02/07	**SURFACE WATER DEPTH** 0.00m	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	Water
24 HR.	Boring

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58									
57.55	0.00								57.55 / 0.00 **MUDLINE**
		WOH	WOH	WOH	WOH		Sat.		**ALLUVIAL** Brown to dark gray, sandy, silty CLAY (A-6) with organics
55.97	1.58	WOH	WOH	WOH	WOH		Sat.		
54.43	3.12	1	10	12	22		Sat.		54.28 / 3.27 **ALLUVIAL** Dark gray, silty, fine SAND (A-2-4) with trace organics
53.09	4.46	2	4	9	13		M		53.55 / 4.00 **COASTAL PLAIN** Tan orange, silty CLAY (A-7-6) (Middendorf Formation)
51.57	5.98	4	7	9	16		M		51.75 / 5.80 **COASTAL PLAIN** Tan, orange, and gray, fine sandy, silty CLAY (A-6) with trace mica (Middendorf Formation)
50.05	7.50	19	33	50	83		M		
48.53	9.02	38	54	46/13	100/28		W		49.05 / 8.50 **COASTAL PLAIN** Gray, tan, and orange, silty, fine SAND (A-2-4) (Middendorf Formation)
47.01	10.54	11	13	17	30		W		47.55 / 10.00 **COASTAL PLAIN** Gray with orange, clayey, fine to coarse SAND (A-2-6) (Middendorf Formation)
45.49	12.06	5	15	20	35		M		46.05 / 11.50 **COASTAL PLAIN** Dark gray, sandy CLAY (A-6) with trace mica (Middendorf Formation)
43.97	13.58	8	7	10	17		W		44.55 / 13.00 **COASTAL PLAIN** Light gray, clayey, fine SAND (A-2-6) with trace mica (Middendorf Formation)
42.45	15.10	7	8	11	19		W		
40.93	16.62	14	23	30	53		W		40.05 / 17.50 **COASTAL PLAIN** Gray and green, sandy CLAY (A-6) with trace mica (Middendorf Formation)
39.41	18.14	9	13	16	29		M		
37.89	19.66								

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B3	**STATION** 14+81.2	**OFFSET** 1.5m RT	**ALIGNMENT** -RP1A-
COLLAR ELEV. 57.55 m	**TOTAL DEPTH** 25.07 m	**NORTHING** 151,284.3	**EASTING** 611,881.7
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/29/07	**COMP. DATE** 07/02/07	**SURFACE WATER DEPTH** 0.00m	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	Water
24 HR.	Boring

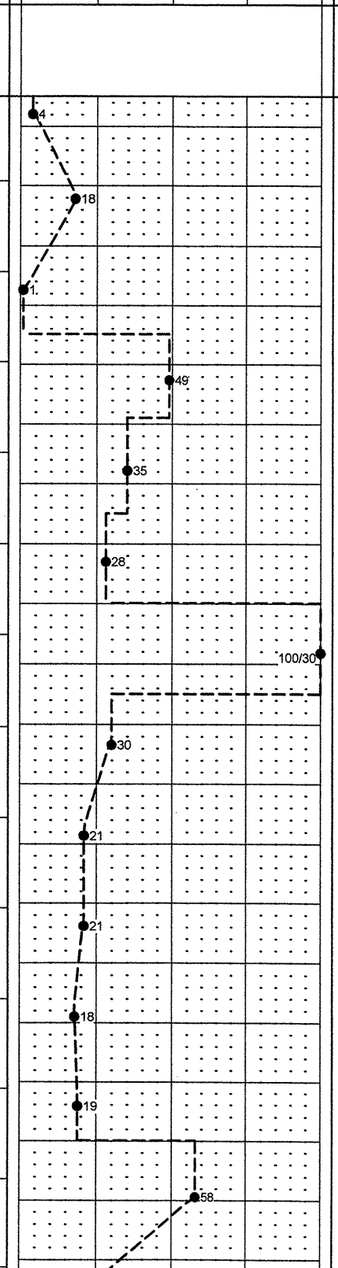
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
38					Match Line				
		9	11	14	25		M		37.25 / 20.30 **COASTAL PLAIN** Dark gray with orange and red mottling, silty CLAY (A-7-6) (Cape Fear Formation)
36.37	21.18	13	18	22	40		M		
34.85	22.70	21	27	47	74		M		35.05 / 22.50 **COASTAL PLAIN** Light to dark gray with green, sandy CLAY (A-6) with trace mica (Cape Fear Formation)
32.93	24.62	21	26	43	69		M		32.48 / 25.07 Boring Terminated at Elevation 32.48 m in Coastal Plain: Hard, sandy CLAY (A-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.10 g/cm
Casing Depth: 4.62m (10cm)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

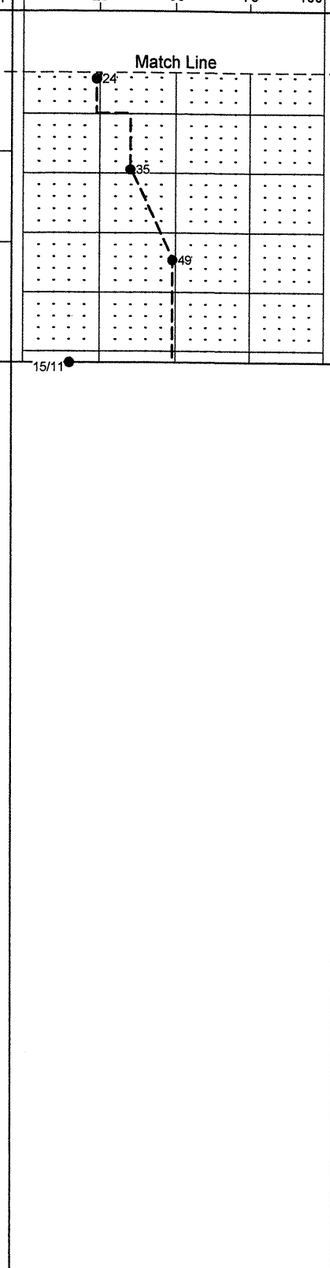
PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B4	**STATION** 15+22.6	**OFFSET** 2.6m RT	**ALIGNMENT** -RP1A- / **0 HR.** 0.00
COLLAR ELEV. 58.51 m	**TOTAL DEPTH** 24.70 m	**NORTHING** 151,314.8	**EASTING** 611,853.8 / **24 HR.** 0.13
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/03/07	**COMP. DATE** 07/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58.51	0.00					W	**GROUND SURFACE**
		3	2	2			**ALLUVIAL** Tan, clayey SAND (A-2-6) with organics
57.51	1.00						**ALLUVIAL** Dark gray, silty, fine SAND (A-2-4) with organics
57.08	1.43	10	11	7		Sat.	
55.56	2.95	3	1	WOH		W	
54.51	4.00						**COASTAL PLAIN** Tan, silty, fine to coarse SAND (A-3) with trace gravel (Middendorf Formation)
54.04	4.47	24	23	26		Sat.	
53.11	5.40						**COASTAL PLAIN** Tan, fine sandy, silty, CLAY (A-7-6) (Middendorf Formation)
52.52	5.99	11	16	19		M	
51.51	7.00						**COASTAL PLAIN** Gray with orange, silty, fine SAND (A-2-4) (Middendorf Formation)
51.00	7.51	10	11	17		Sat.	
50.01	8.50						**COASTAL PLAIN** Tan and gray, sandy CLAY (A-6) with trace mica (Middendorf Formation)
49.48	9.03	21	34	66/15		M	
48.51	10.00						**COASTAL PLAIN** Gray, silty, fine SAND (A-2-4) (Middendorf Formation)
47.96	10.55	17	12	18		Sat.	
47.01	11.50						**COASTAL PLAIN** Gray, silty, clayey, fine SAND (A-2-6) (Middendorf Formation)
46.44	12.07	9	10	11		Sat.	
45.51	13.00						**COASTAL PLAIN** Dark gray and gray, fine to coarse sandy, CLAY (A-6) with trace mica (Middendorf Formation)
44.92	13.59	7	9	12		M	
43.40	15.11	8	8	10		M	
41.88	16.63	8	9	10		M	
41.01	17.50						**COASTAL PLAIN** Gray, clayey, silty, fine SAND (A-2-4) with trace mica (Middendorf Formation)
40.36	18.15	16	26	32		Sat.	
39.51	19.00						**COASTAL PLAIN** Gray, silty, clayey, fine to coarse SAND (A-2-6) with trace mica (Middendorf Formation)
38.88	19.63						



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. B4	**STATION** 15+22.6	**OFFSET** 2.6m RT	**ALIGNMENT** -RP1A- / **0 HR.** 0.00
COLLAR ELEV. 58.51 m	**TOTAL DEPTH** 24.70 m	**NORTHING** 151,314.8	**EASTING** 611,853.8 / **24 HR.** 0.13
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/03/07	**COMP. DATE** 07/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
39							Match Line
		8	11	13		Sat.	
37.36	21.15	10	15	20		M	
35.84	22.67	17	20	29		M	
33.92	24.59	15/11				M	
38.01	20.50						**COASTAL PLAIN** Dark gray, with orange mottling, silty CLAY (A-7-6) (Cape Fear Formation)
36.21	22.30						**COASTAL PLAIN** Dark gray and green, sandy, CLAY (A-6) with trace mica (Cape Fear Formation)
33.81	24.70						Boring Terminated at Elevation 33.81 m in Coastal Plain: Hard, sandy CLAY (A-6) (Cape Fear Formation)



Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.09 g/cm
Casing Depth: 4.97m (10cm)

Note: Boring terminated early during SPT drive at 24.59m due to mechanical failure. PTO drive from engine to manual hammer broke-unable to continue SPT.

NCDOT BORE DOUBLE MACTEC 6468-07-1786.GPJ NC_DOT.GDT 8/15/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. EB2	**STATION** 15+52.8	**OFFSET** 3.3m RT	**ALIGNMENT** -RP1A- / **0 HR.** 0.27
COLLAR ELEV. 60.27 m	**TOTAL DEPTH** 26.01 m	**NORTHING** 151,338.1	**EASTING** 611,834.8 / **24 HR.** 1.56
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/05/07	**COMP. DATE** 07/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
61									
60.27	0.00								GROUND SURFACE (60.27 / 0.00)
		7	12	10	22		D		**ALLUVIAL** Tan and gray-brown, silty, fine SAND (A-2-4)
59.30	0.97								
		5	5	5	10		M		
58.13	2.14								
		3	2	1	3		Sat.		
57.27	3.00								**COASTAL PLAIN** Tan, gray, and orange, clayey SAND (A-2-6) (Middendorf Formation)
56.59	3.68								
		4	4	7	11		Sat.		
55.27	5.00								**COASTAL PLAIN** Tan, gray, and orange, silty, fine to coarse SAND (A-3) (Middendorf Formation)
54.47	5.80								
		6	5	7	12		Sat.		
53.67	6.60								**COASTAL PLAIN** Gray with orange mottling, fine sandy, silty CLAY (A-7-6) (Middendorf Formation)
52.95	7.32								
		9	13	15	28		M		
52.27	8.00								**COASTAL PLAIN** Tan with orange mottling, fine sandy, CLAY (A-6) with trace mica (Middendorf Formation)
51.43	8.84								
		3	6	10	16		W		
50.47	9.80								**COASTAL PLAIN** Light to dark gray, silty, fine SAND (A-2-4) with trace mica (Middendorf Formation)
49.91	10.36								
		14	20	25	45		Sat.		
48.39	11.88								
		9	15	12	27		Sat.		
46.87	13.40								
		4	3	2	5		Sat.		
45.87	14.40								**COASTAL PLAIN** Dark gray, sandy CLAY (A-6) with trace mica (Middendorf Formation)
45.35	14.92								
		3	3	3	6		M		
44.27	16.00								**COASTAL PLAIN** Gray, clayey SAND (A-2-6) with trace mica (Middendorf Formation)
43.83	16.44								
		3	3	3	6		W		
42.31	17.96								
		3	3	4	7		W		
40.79	19.48								

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** J. Howard
SITE DESCRIPTION Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1) (MACTEC No. 6468-07-1786)			**GROUND WTR (m)**
BORING NO. EB2	**STATION** 15+52.8	**OFFSET** 3.3m RT	**ALIGNMENT** -RP1A- / **0 HR.** 0.27
COLLAR ELEV. 60.27 m	**TOTAL DEPTH** 26.01 m	**NORTHING** 151,338.1	**EASTING** 611,834.8 / **24 HR.** 1.56
DRILL MACHINE CME-45C	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 07/05/07	**COMP. DATE** 07/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
41					Match Line				
		14	14	12	26		Sat.		**COASTAL PLAIN** Gray, clayey SAND (A-2-6) with trace mica (Middendorf Formation)*(continued)*
39.27	21.00								
		3	3	5	8		W		
38.27	22.00								**COASTAL PLAIN** Dark gray with brown, red, and orange mottling, sandy, silty, CLAY (A-7-6) with trace mica (Cape Fear Formation)
37.75	22.52								
		6	12	16	28		M		
36.23	24.04								
		17	26	30	56		M		
35.27	25.00								**COASTAL PLAIN** Gray-green, sandy CLAY (A-6) with trace mica (Cape Fear Formation)
34.71	25.56								
		17	19	20	39		M		
34.26	26.01								Boring Terminated at Elevation 34.26 m in Coastal Plain: Hard, sandy CLAY (A-6) with trace mica (Cape Fear Formation)

Bits Used: 7.3cm Side-Discharge Finger Bit
Drilling Fluid Properties: 1.09 g/cm
Casing Depth: 0.46m (10cm)

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 7: Bridge on -RP1A- Over Beaver Creek and -TT1- (Tank Trail 1)/(6468-07-1786)

PROJECT: 34817.1.2 (U-2519DA) **COUNTY:** CUMBERLAND **OWNER:** N.C.D.O.T.

DATE SAMPLED: June 2007 **RECEIVED:** 7/3/2007 **REPORTED BY:** MACTEC

SAMPLED FROM: EB1

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	0.0	0.0	0.0
Passing 2.00 mm Sieve	(%)	98.1	99.5	99.2	100.0	99.7	97.8
Passing 425 µm Sieve	(%)	70.9	35.4	57.1	94.6	70.3	52.9
Passing 75 µm Sieve	(%)	20.2	8.0	33.1	82.1	37.8	30.9

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	44.1	88.6	61.2	9.4	45.2	60.1
Fine Sand Ret - 53 µm	(%)	38.5	4.3	6.0	12.1	17.8	9.8
Silt 0.05 - 0.005 mm	(%)	6.2	2.2	1.2	23.9	10.2	5.8
Clay < 0.005 mm	(%)	11.1	4.8	31.6	54.6	26.8	24.2

Moisture Content	(%)	ND	ND	17.0	26.0	20.0	18.0
Liquid Limit, L.L.		15	18	30	59	41	40
Plasticity Index, P.I.		NP	NP	11	24	24	25
AASHTO Classification		A-2-4(0)	A-1-b	A-2-6(0)	A-7-5(23)	A-7-6(4)	A-2-6(2)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB1	EB1	EB1	EB1	EB1	EB1
Station		13+63.6	13+63.6	13+63.6	13+63.6	13+63.6	13+63.6
Offset		0.5m RT	0.5m RT	0.5m RT	0.5m RT	0.5m RT	0.5m RT
Alignment		-RP1A-	-RP1A-	-RP1A-	-RP1A-	-RP1A-	-RP1A-
Depth (M)	From	0.00	4.10	7.14	8.66	10.18	11.70
	to	0.45	4.55	7.59	9.11	10.63	12.15

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: _____
Laboratory Manager

SHEET 16

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 7: Bridge on -RP1A- Over Beaver Creek and -TT1- (Tank Trail 1)/(6468-07-1786)

PROJECT: 34817.1.2 (U-2519DA) **COUNTY:** CUMBERLAND **OWNER:** N.C.D.O.T.

DATE SAMPLED: June 2007 **RECEIVED:** 7/3/2007 **REPORTED BY:** MACTEC

SAMPLED FROM: EB1

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	0.0	8.5	0.0
Passing 2.00 mm Sieve	(%)	99.2	97.7	100.0	99.7	80.3	100.0
Passing 425 µm Sieve	(%)	78.6	58.6	79.2	72.5	31.1	95.8
Passing 75 µm Sieve	(%)	42.0	30.8	50.1	19.3	17.3	75.0

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	31.9	55.2	35.0	49.1	71.1	9.4
Fine Sand Ret - 53 µm	(%)	28.1	16.1	19.0	33.0	8.2	19.0
Silt 0.05 - 0.005 mm	(%)	6.5	14.9	16.5	4.9	3.1	18.3
Clay < 0.005 mm	(%)	33.6	13.8	29.5	12.9	17.6	53.3

Moisture Content	(%)	19.0	21.0	14.0	ND	ND	24.0
Liquid Limit, L.L.		39	44	31	21	47	61
Plasticity Index, P.I.		23	20	19	4	24	38
AASHTO Classification		A-6(5)	A-2-7(2)	A-6(5)	A-2-4(0)	A-2-7(0)	A-7-6(29)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB1	EB1	EB1	EB1	EB1	EB1
Station		13+63.6	13+63.6	13+63.6	13+63.6	13+63.6	13+63.6
Offset		0.5m RT	0.5m RT	0.5m RT	0.5m RT	0.5m RT	0.5m RT
Alignment		-RP1A-	-RP1A-	-RP1A-	-RP1A-	-RP1A-	-RP1A-
Depth (M)	From	13.22	14.74	15.99	17.51	19.03	20.55
	to	13.67	15.19	16.44	17.96	19.48	21.00

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: _____
Laboratory Manager

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 7: Bridge on -RP1A- Over Beaver Creek and -TT1- (Tank Trail 1)/(6468-07-1786)

PROJECT: 34817.1.2 (U-2519DA) **COUNTY:** CUMBERLAND **OWNER:** N.C.D.O.T.

DATE SAMPLED: June 2007 **RECEIVED:** 7/3/2007 **REPORTED BY:** MACTEC

SAMPLED FROM: EB1, B1

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-13	SS-14	SS-15	SS-16	SS-17	SS-18
Retained 4.75 mm Sieve	(%)	0.5	0.7	0.0	0.0	0.0	0.0
Passing 2.00 mm Sieve	(%)	92.0	97.8	93.4	100.0	99.8	100.0
Passing 425 µm Sieve	(%)	44.9	78.9	44.2	96.2	75.2	98.5
Passing 75 µm Sieve	(%)	19.6	20.4	5.7	82.5	34.9	88.6

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	69.8	35.3	73.4	6.9	40.3	2.6
Fine Sand Ret - 53 µm	(%)	9.7	49.2	21.1	14.9	30.6	14.4
Silt 0.05 - 0.005 mm	(%)	3.9	5.7	3.9	31.1	25.6	43.7
Clay < 0.005 mm	(%)	16.6	9.8	1.6	47.1	3.6	39.3

Moisture Content	(%)	22.0	ND	ND	34.0	ND	25.0
Liquid Limit, L.L.		38	17	18	64	17	57
Plasticity Index, P.I.		23	2	NP	43	2	27
AASHTO Classification		A-2-6(1)	A-2-4(0)	A-1-b	A-7-6(37)	A-2-4(0)	A-7-5(28)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB1	B1	B1	B1	B1	B1
Station		13+63.6	13+96.8	13+96.8	13+96.8	13+96.8	13+96.8
Offset		0.5m RT	0.5m LT	0.5m LT	0.5m LT	0.5m LT	0.5m LT
Alignment		-RP1A-	-RP1A-	-RP1A-	-RP1A-	-RP1A-	-RP1A-
Depth (M)	From	23.59	1.82	3.33	13.97	15.49	20.05
	to	24.04	2.27	3.78	14.42	15.94	20.50

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: B. Johnson
Laboratory Manager

MACTEC

SHEET 17

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC Proj. Name/No.: Structure 7: Bridge on -RP1A- Over Beaver Creek and -TT1- (Tank Trail 1)/(6468-07-1786)

PROJECT: 34817.1.2 (U-2519DA) **COUNTY:** CUMBERLAND **OWNER:** N.C.D.O.T.

DATE SAMPLED: June 2007 **RECEIVED:** 7/3/2007 **REPORTED BY:** MACTEC

SAMPLED FROM: B2

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-19					
Retained 4.75 mm Sieve	(%)	ND					
Passing 2.00 mm Sieve	(%)	ND					
Passing 425 µm Sieve	(%)	ND					
Passing 75 µm Sieve	(%)	ND					

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	ND					
Fine Sand Ret - 53 µm	(%)	ND					
Silt 0.05 - 0.005 mm	(%)	ND					
Clay < 0.005 mm	(%)	ND					

Moisture Content	(%)	76.7					
Liquid Limit, L.L.		ND					
Plasticity Index, P.I.		ND					
AASHTO Classification		ND					
Organic Content	(%)	10.8					

Boring No.		B2					
Station		14+40.4					
Offset		2.8m LT					
Alignment		-RP1A-					
Depth (M)	From	2.58					
	to	3.03					

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: B. Johnson
Laboratory Manager

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34817.1.2 TIP: U-2519DA COUNTY: Cumberland

DESCRIPTION(1): Structure 7: Bridge on -RP1A- over Beaver Creek and -TT1- (Tank Trail 1)

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) Not Applicable: No Existing Bridge

Bridge No.: ____ Length: ____ Total Bents: ____ Bents in Channel: ____ Bents in Floodplain: ____
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: ____

Interior Bents: ____

Channel Bed: ____

Channel Bank: ____

EXISTING SCOUR PROTECTION

Type(3): ____

Extent(4): ____

Effectiveness(5): ____

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 theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Sand (A-2-4/A-1-b)

Channel Bank Material(8): Sand (A-2-4/A-2-6) and Clay (A-6)

Channel Bank Cover(9): Brush and small to large hardwoods and pines.

Floodplain Width(10): 180 meters

Floodplain Cover(11): Aquatic plants, brush, small to large hardwoods and pines.

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

Channel Migration Tendency(13): Migration tendency to the east.

Observations and Other Comments: Surface water flow restricted by beaver dams.

Reported by: Michael B. [signature] **Date:** 7/19/2007
MACTEC Engineering and Consulting, Inc.

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

	BENTS B1	B2	B3	B4	B5	B6	B7	B8	B9		
100-year DSE	56.2	56.46	56.75	57.71							
500-year DSE	55.8	56.06	56.35	57.31							

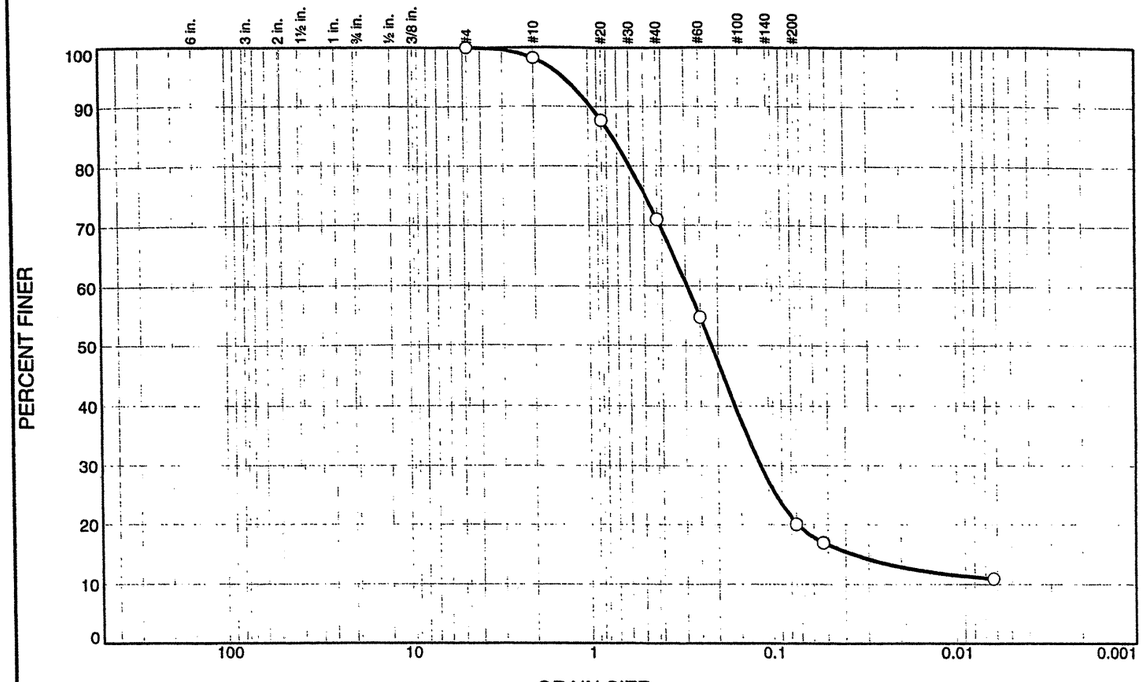
Comparison of DSE to Hydraulics Unit theoretical scour:
We agree with the scour calculations given on the Bridge Survey and Hydraulic Design Report dated 11/08/06.

DSE determined by: Chad [signature] **Date:** 7/26/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bed	Bed				
Sample No.	SS-1	SS-14	SS-15				
Retained #4	0	0.7	0				
Passed #10	98.1	97.8	93.4				
Passed #40	70.9	78.9	44.2				
Passed #200	20.2	20.4	5.7				
Coarse Sand	44.1	35.3	73.4				
Fine Sand	38.5	49.2	21.1				
Silt	6.2	5.7	3.9				
Clay	11.1	9.8	1.6				
LL	15	17	18				
PI	NP	2	NP				
AASHTO	A-2-4(0)	A-2-4(0)	A-1-b				
Station	13+63.6	13+96.8	13+96.8				
Offset	0.5m RT	0.5m LT	0.5m LT				
Depth	0.00-0.45	1.82-2.27	3.33-3.78				

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.9	27.2	50.7	20.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.1		
#20	87.7		
#40	70.9		
#60	54.8		
#200	20.2		
#270	17.0		
0.0063 mm.	10.9		

* (no specification provided)

Soil Description

Brown Silty SAND

Atterberg Limits

PL= NP LL= 15 PI= NP

Coefficients

D_{85}= 0.7454 D_{60}= 0.2939 D_{50}= 0.2167
D_{30}= 0.1173 D_{15}= 0.0364 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Entire sample was tested.

Sample No.: SS-1 **Source of Sample:** Boring EB1 **Date:** 6-26-07
Location: **Elev./Depth:** 0.00-0.45m

MACTEC, Inc.

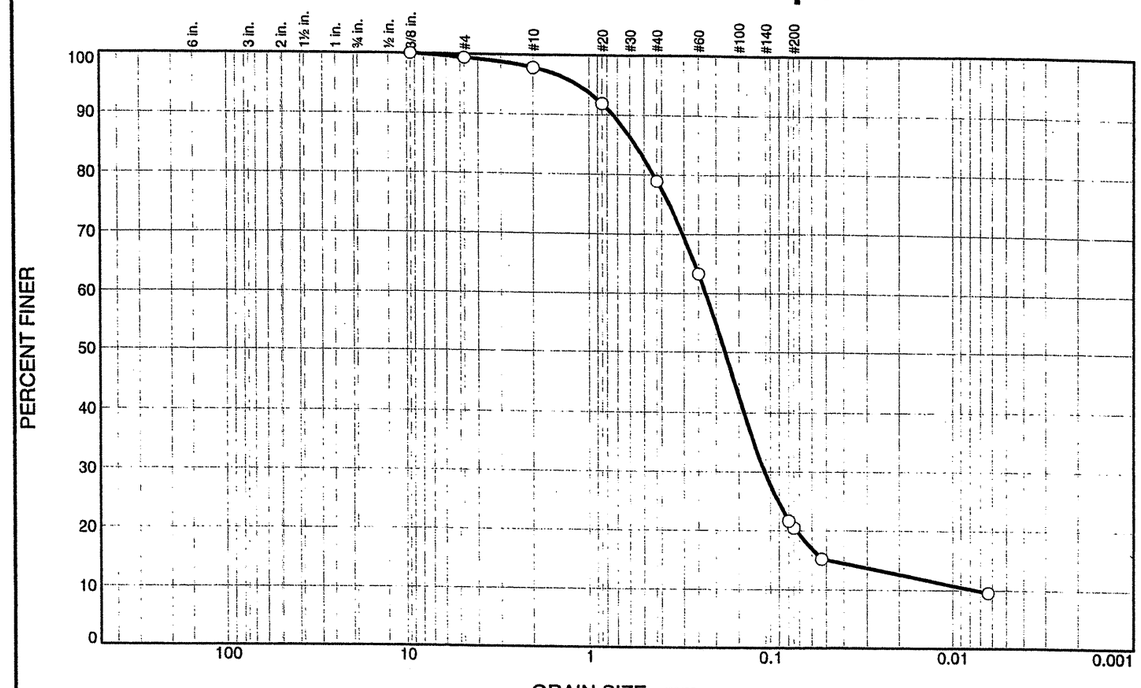
Raleigh, North Carolina

Client: NCDOT
Project: Structure 7: Bridge on - RP1A - over Beaver creek & -TT1 - (Tank Trail 1)
Project No: 6468071786 **Figure**

Tested By: CS **Checked By:** LBJ

SHEET 19

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	1.5	18.9	58.5	20.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.3		
#10	97.8		
#20	91.9		
#40	78.9		
#60	63.3		
0.0798 mm.	21.6		
#200	20.4		
#270	15.2		
0.0063 mm.	9.6		

* (no specification provided)

Soil Description

Gray Silty SAND

Atterberg Limits

PL= 15 LL= 17 PI= 2

Coefficients

D_{85}= 0.5600 D_{60}= 0.2288 D_{50}= 0.1788
D_{30}= 0.1080 D_{15}= 0.0493 D_{10}= 0.0074
C_u= 30.77 C_c= 6.86

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Entire sample was tested.

Sample No.: SS-14 **Source of Sample:** Boring B1 **Date:** 6-27-07
Location: **Elev./Depth:** 1.82-2.27m

MACTEC, Inc.

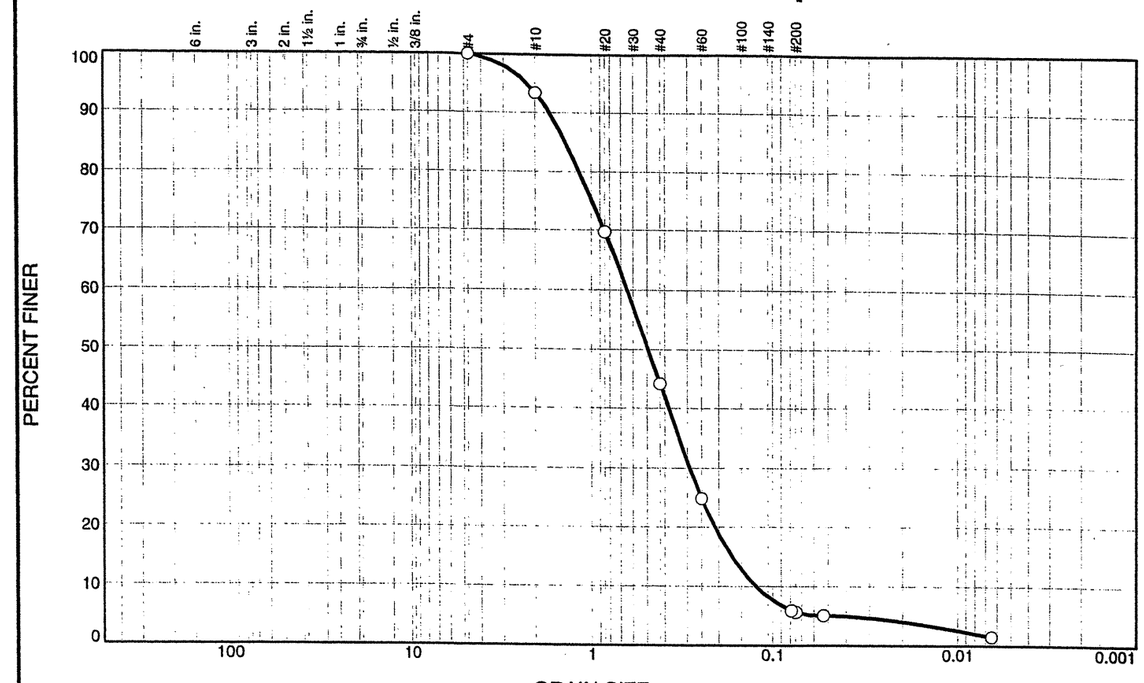
Raleigh, North Carolina

Client: NCDOT
Project: Structure 7: Bridge on - RP1A - over Beaver creek & -TT1 - (Tank Trail 1)
Project No: 6468071786 **Figure**

Tested By: CS **Checked By:** LBJ

SHEET 20

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	6.6	49.2	38.5	5.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	93.4		
#20	69.6		
#40	44.2		
#60	24.8		
0.0792 mm.	5.9		
#200	5.7		
#270	5.1		
0.0065 mm.	1.5		

* (no specification provided)

Soil Description

Yellow Clayey SAND

Atterberg Limits

PL= NP LL= 18 PI= NP

Coefficients

D_{85}= 1.3818 D_{60}= 0.6480 D_{50}= 0.4952
D_{30}= 0.2920 D_{15}= 0.1693 D_{10}= 0.1243
C_u= 5.21 C_c= 1.06

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Entire sample was tested.

Sample No.: SS-15 **Source of Sample:** Boring B1 **Date:** 6-27-07
Location: **Elev./Depth:** 3.33-3.78m

MACTEC, Inc.

Raleigh, North Carolina

Client: NCDOT
Project: Structure 7: Bridge on - RP1A - over Beaver creek & -TT1 - (Tank Trail 1)
Project No: 6468071786 **Figure**

Tested By: CS **Checked By:** LBJ

View looking upstation along -RP1A- from EB1 to B1.

View looking downstation along -RP1A- towards B1.

View looking upstation along -RP1A- at boring B1.

View looking upstation along -RP1A- towards B2.

View looking downstation along -RP1A- from station 14+60 towards boring B2.

View looking upstation along -RP1A- towards B3 from station 14+60.

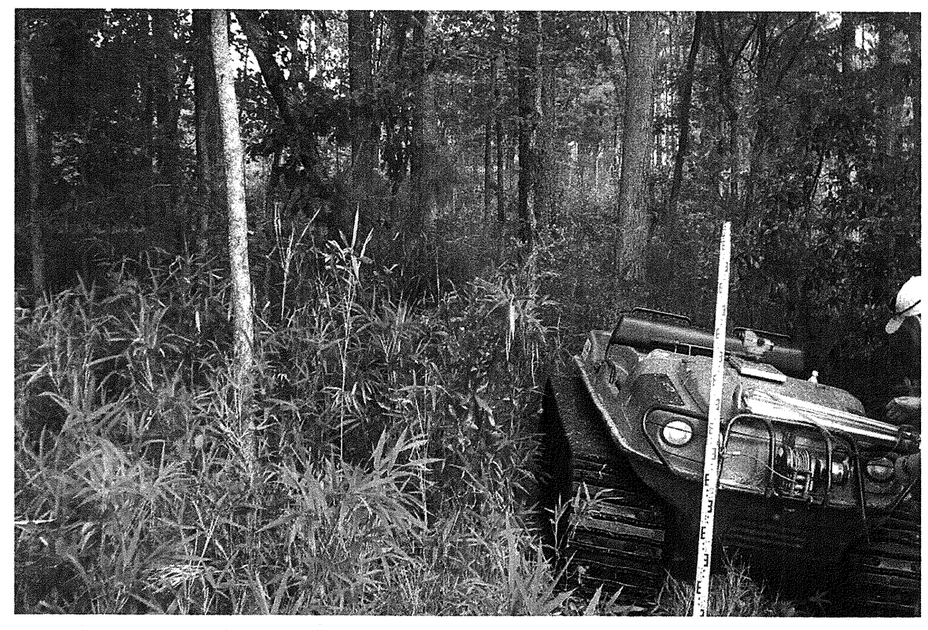
View looking upstream along Beaver Creek from station 14+60.

View looking downstation from B3.

View looking upstation along -RP1A- towards boring B4.

View looking left to right along Bent 4.

View looking downstation towards boring B3 from boring B4 along -RP1A-.



View looking upstation along -RP1A- from B4.

View looking downstation along -RP1A- towards boring B4.

View looking downstation along -RP1A- towards boring EB2.

View looking looking left to right along End Bent 2.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2	1	42

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 F.A. PROJ. NHF-DPR-0100(1)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP BETWEEN SR 1415 AND NC 24

SITE DESCRIPTION SITE 10: BRIDGE ON -RPIBD- OVER BEAVER CREEK, -COL1-, COL2-, -Y1-, -LPIB-, -LPID-, AND -TT3-

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STRUCTURE DESIGN

PERSONNEL

D GOODNIGHT
W WHICHARD
R BOYKIN
R TOOTHMAN
T FOGLE
A HAYES
D KITCHEN
-
-

INVESTIGATED BY D GOODNIGHT
CHECKED BY J VINSON
SUBMITTED BY P WEAVER
DATE 7/25/07

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

8/13/07

PROJECT: 34817.1.2

ID: U-2519DA

DRAWN BY: _

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PROJECT REFERENCE NO.	SHEET NO.
34817.1.2	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 30 CM 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 (kN/m²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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
- PMW 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
w - 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
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [x] CME-850
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [x] CASING [ ] W/ ADVANCER
- [x] TRICONE 7.46 mm STEEL TEETH
- [ ] TRICONE ___ mm 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 3 CM 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 30 CM 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. SL.)	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 (SL.)	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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	1 TO 3 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BM #12: POINT BL12, ALUMINUM DISK 65.137m LT. OF STA. 27+21.030 -L-
ELEVATION: 59.506 M

NOTES:
-

REVISED 02/23/06

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SUBMITTED TO: North Carolina Department of Transportation
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

ATTENTION: Mr. Njoroge W. Wainaina, P.E.
State Geotechnical Engineer

SUBMITTED BY: Trigon Engineering Consultants, Inc.
Post Office Box 18846
Greensboro, North Carolina 27419-8846
Trigon Project No. 071-07-030

DATE: July 26, 2007

STATE PROJECT: 34817.1.2

TIP : U-2519DA

FEDERAL PROJECT: NHF-DPR-0100(1)

COUNTY: Cumberland

DESCRIPTION: Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-

SUBJECT: Geotechnical Report of Structure Subsurface Investigation

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2.0 Project Description 2
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3.5 Groundwater 5
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Appendix (Issued Under Separate Cover)

1. FHWA Geotechnical Report Review Checklist
2. Boring Quantity Summation Sheet
3. Field Boring and Coring Logs
4. Survey Notes

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STATE PROJECT:	34817.1.2
TIP :	U-2519DA
FEDERAL PROJECT:	NHF-DPR-0100(1)
COUNTY:	Cumberland
DESCRIPTION:	Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-
SUBJECT:	Geotechnical Report of Structure Subsurface Investigation

Trigon Engineering Consultants, Inc. has completed the authorized geotechnical investigation for the above referenced project in Cumberland County, North Carolina. The purpose of this exploration was to investigate the subsurface conditions at the proposed bridge bent locations and to provide general construction considerations based on the subsurface conditions.

1.0 SITE DESCRIPTION

The project site is located in the northwest portion of Cumberland County, North Carolina near the southern boundary of the Fort Bragg military reservation. Please see the attached Site Vicinity Map (Drawing No. 1) attached behind this report for the approximate location of the subject structure. The subject structure is part of the project designated as "Fayetteville Outer Loop Between SR 1415 and NC 24", while the site description for the subject structure is "Site 10: Bridge on –RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-". Topographically, the site consists of gently rolling terrain from the proposed End Bent-1 to the creek between the proposed Bents-3 and 4. The site slopes upward from the upstation side of the creek to the top of the existing roadway embankment in vicinity of the proposed Bent-4. The site is relatively level along the top of the existing roadway embankment from the vicinity of the proposed Bent-4 to the vicinity of the proposed Bent-6, then slopes down from the existing roadway

embankment between the proposed Bent-6 and the proposed Bent-7. The site terrain is again gently rolling hills from the vicinity of the proposed Bent-7 to the proposed End Bent-2. The topography of the general site vicinity consists of gently rolling hills.

At the time of this investigation, three-span dual bridges for carrying All American Freeway (-Y1-) over Beaver Creek were present on the north side of the proposed bridge. The bridges were approximately 12.8m wide and approximately 41.2m long. The centerline of the existing bridge closest to the proposed Structure 10 is located approximately 15m north of the proposed Bent-4 center line. The existing bridge consists of a concrete deck on concrete girders with concrete abutments at the end bents. The existing bridge is approximately 190 feet in length and approximately 26 feet in width. The water surface elevation of Beaver Creek surveyed by Trigon on July 13, 2007 was ±56.6 meters. The width of the flood plain in the vicinity of the proposed bridge is approximately 150 meters.

2.0 PROJECT DESCRIPTION

Proposed for construction is a new, ten-span structure to cross over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3- Information for the proposed bridge structure was obtained from the Preliminary General Drawing provided to Trigon by the NCDOT. The proposed bridge will be approximately 303.8 meters in length and approximately 12.39 meters (out to out) in width with a skew angle of 90°00'00" tangent to curve at each bent.

Approximately 4 meters of fill is proposed for the End Bent-1 embankment, approximately 1 meter of cut is proposed in the vicinity of the -LP1B- roadway between End Bent-1 and Bent-1, approximately 1 meter of fill is proposed in the vicinity of the proposed Bent-4 beginning approximately 13 meters downstation of Bent-4 and continuing to approximately 15 meters upstation of Bent-4 to accommodate a work bridge on the south side of -RP1BD-, a maximum of approximately 15 meters of fill is proposed for the -L-, -LP1D-, and -COL1- roadways between Bent-6 and Bent-8, approximately 2 meters of cut is proposed for the -LP1D- roadway between Bent-9 and End Bent-2, and approximately 9 meters of fill is proposed for the End Bent-2 embankment. The centerline of -Y1- (All American Freeway) crosses the -RP1BD- centerline at Bent-5, and the -L- centerline crosses the -RP1BD- centerline approximately half-way between Bent-5 and Bent-6.

The Preliminary General Drawing is in Metric units with meters as the primary unit of length.

3.0 SCOPE OF INVESTIGATION

3.1 FIELD TESTING

The as-drilled locations for the soil test borings were located in the field by personnel from Trigon with a Trimble GEOXT GPS system utilizing boring coordinates obtained from plotting the proposed boring locations on the Preliminary General Drawing supplied by the NCDOT. The boring for Bent-3 was offset from the proposed location due to large trees and swamp at the proposed location, and the borings for Bent-8 and Bent-9 were offset from the proposed locations due to overhead power lines at the proposed locations. Elevations at the as-drilled boring locations, along the centerline profile of the proposed bridge structure, and across the proposed bents were surveyed by personnel from Trigon using Benchmark No. 12 (BL-12) established by an NCDOT survey crew as a reference point.

Trigon's subsurface investigation for the proposed bridge was conducted between June 18 and July 3, 2007. This exploration consisted of drilling seven soil test borings (B1-C, B2-C, B3-C, B6-C, B7-C, B8-A, and B9-C). Borings EB1-C, B4-C, B5-C, and EB2-C were drilled as part of the roadway investigation by the NCDOT prior to Trigon's exploration, and these borings have been incorporated into this report. As-drilled soil test boring locations are shown on the Boring Identification Diagram (Drawing No. 2) following this report, and boring logs are also included following this report.

All of the borings performed by Trigon for this project were drilled using a track-mounted CME 850 drilling machine equipped with a 63.5 kg automatic hammer. The borings were advanced via mud rotary drilling techniques utilizing a 0.0746 meter tricone drill bit. Creek water plus Bentonite was used to create a Bentonite mud slurry which served as the drilling fluid in all borings drilled by Trigon. Mud weights of the slurry ranged from 1.01 to 1.15 grams per cubic centimeter.

The borings performed by the NCDOT for this project were drilled using a CME 550 drilling machine equipped with a 63.5 kg automatic hammer. Boring EB1-C was advanced utilizing hollow-stem augering techniques, Borings B4-C and B5-C were advanced utilizing a combination of hollow-stem augering and mud rotary techniques, and Boring EB2-C was advanced utilizing mud rotary techniques alone. The tricone drill bit employed by the NCDOT measured 0.0826 meters in diameter.

Standard Penetration Tests were performed in the soil test borings in general accordance with NCDOT guidelines. In conjunction with this testing, split-barrel soil samples were recovered for visual classification and potential laboratory testing.

3.2 LABORATORY TESTING

Laboratory soil testing was performed by Trigon on twenty-three representative split-barrel samples and on two grab samples, and by the NCDOT on ten representative split-barrel samples, to aid in the assessment of AASHTO soil classification and to provide data for evaluation of engineering properties. The laboratory testing on the samples consisted of Natural Moisture Content, Atterberg Limit, and grain size analysis with hydrometer. In addition, one total organics content test was performed on a representative split-barrel sample. Laboratory tests were performed in general accordance with AASHTO and NCDOT specifications. The results of the soil laboratory tests are included on Sheet 32 located behind this report.

3.3 SITE GEOLOGY

The site of the proposed project is located in the Coastal Plains province of North Carolina. According to the 1985 Geologic Map of North Carolina, the site is located in an area generally consisting of sand, sandstone, and mudstone belonging to the Middendorf and Cape Fear Formations. The Middendorf Formation overlies the Cape Fear Formation in the project vicinity. The Geologic Map characterizes the Middendorf as being mottled with clay balls and iron-cemented concretions while the Cape Fear Formation is mottled, indurated, and contains blocky clay. It also states that the beds of the Middendorf are laterally discontinuous and that cross-bedding is common, while the Cape Fear bedding in laterally continuous. The Geology of the Carolinas (Horton & Zullo, 1991) states that both the Middendorf and Cape Fear Formations were likely deposited within large deltaic systems during the Upper Cretaceous.

3.4 FOUNDATION MATERIALS

The generalized subsurface conditions indicated by the borings are described below. For soil descriptions and general stratification at a particular boring location, the respective Boring Log should be reviewed. The Boring Identification Diagram and Boring Logs are located behind this report. Representative subsurface cross-sections at each bent location and a subsurface profile along the center line of the proposed structure are also included behind this report. The subsurface properties for the project site are described below.

Foundation materials encountered included roadway embankment fill, alluvium, and coastal plain materials.

Roadway embankment fill was encountered beginning at the existing ground surface at the Bent-4, Bent-5, and Bent-6 borings. The roadway embankment fill extends to depths ranging from ±7.2m (Elevation ±57.7m) at Bent-4, to a depth of ±5.0m (Elevation ±59.7m) at Bent-6. The roadway embankment fill encountered generally consists of soft to stiff, silty clay (A-7-5 and A-7-6), and loose to dense, variably clayey, variably silty, coarse to fine sand (A-2-4, A-2-6, and A-3) with isolated clay masses and gravel. Standard Penetration Tests (SPT) resistance values within the fill material ranged from 4 to 33 blows per 0.30m.

Alluvium was encountered beginning at the existing ground surface at the Bent-3 boring, and underlying the roadway embankment fill at the Bent 4, 5, and 6 borings. The alluvium extends to depths ranging from ±5.5m to ±11.7m and to Elevations ranging from ±57.7m to ±52.4m. The alluvium encountered generally consists of very loose to very dense, variably clayey, variably silty, coarse to fine sand (A-1-b, A-2-4, and A-3). The basal portion of the alluvium at the Bent-4 boring consists of organic, clayey silt (A-5) with roots and wood debris. Trace amounts of organics are common within the remaining alluvium encountered, and enough wood debris is present in the upper portion of the alluvium at Bent-6 to influence the SPT values. Gravel is also common within the alluvium encountered. SPT resistance values within the alluvial material ranged from 1 to 60 blows per 0.30m.

Coastal plains material was encountered beginning at the existing ground surface at the End Bent-1, Bent-1, Bent-2, Bent-7, Bent-8, Bent-9, and End Bent-2 borings, and underlying the alluvium at the Bent-3, Bent-4, Bent-5, and Bent-6 borings. The coastal plains material generally consists of soft to hard, variably silty, coarse to fine sandy clay (A-6, A-7-5, and A-7-6), and very loose to very dense, variably silty, variably clayey, coarse to fine sand (A-1-b, A-2-4, A-2-6, A-2-7, and A-3) with isolated gravel. SPT resistance values within the coastal plains material ranged from 1 to 100+ blows per 0.30m. All of the borings drilled for this project were terminated within coastal plains material.

3.5 GROUNDWATER

Groundwater was encountered at all of the borings drilled for this project, with the exception of Boring B4-C which was backfilled immediately after drilling. The groundwater elevations generally ranged from ±57.1m to ±60.7m. Apparently aberrant groundwater measurements were recorded at Boring EB1-C (groundwater elevation of ±45.4m) and EB2-C (groundwater elevation of ±63.6m). Fluctuation of groundwater surface levels can occur with seasonal and climatic variations.

4.0 CONSTRUCTION CONSIDERATIONS

Gravel is common within the roadway embankment fill and alluvium encountered at the site. Wood debris is also present within some of the fill and alluvium, and in isolated areas within the upper portion of the coastal plains material. Isolated gravel and isolated cementing of the sand fragments are present in the coastal plains material. Some of clay present within the coastal plains material is highly plastic in nature.

5.0 CLOSURE

The geotechnical investigation, analysis, and general construction considerations included in this report are based on the Preliminary General Drawing and the data obtained from our field and laboratory-testing program. If the proposed location and geometry, or finished grades are changed or are different from those outlined above, or if subsurface conditions are encountered during construction which differ from those indicated by our borings, we will require the opportunity to review these changed conditions and make any necessary modifications to the general conditions presented in this report.

Cross-sections and profiles are a generalized interpretation of soil conditions between borings and should not be considered accurate other than at the boring locations. Subsurface conditions between boring locations or elsewhere on the site may vary, and subsurface anomalies may exist which were not detected.

Trigon Engineering Consultants, Inc. appreciates the opportunity to be of service to the NCDOT on this project. Should you have any questions concerning this report, please feel free to contact the undersigned.

Respectfully submitted,

TRIGON ENGINEERING CONSULTANTS, INC.

Paul M. Weaver, P.G.
Registered North Carolina No. 5900

NORTH CAROLINA LICENSED SEAL GEOLOGIST PAUL M. WEAVER

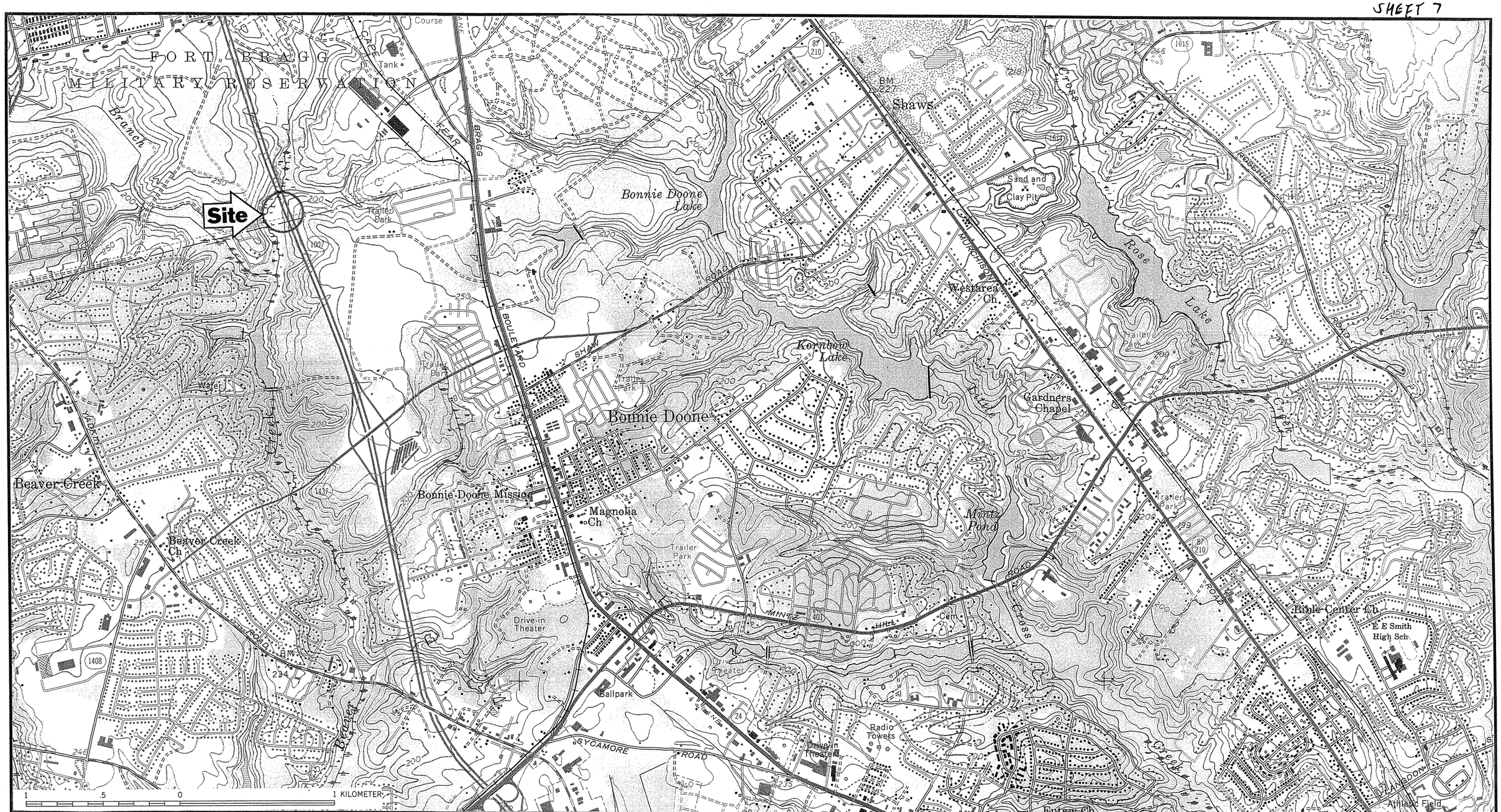
8/13/07

Jeffrey R. Wilson, P.G.
Senior Project Manager

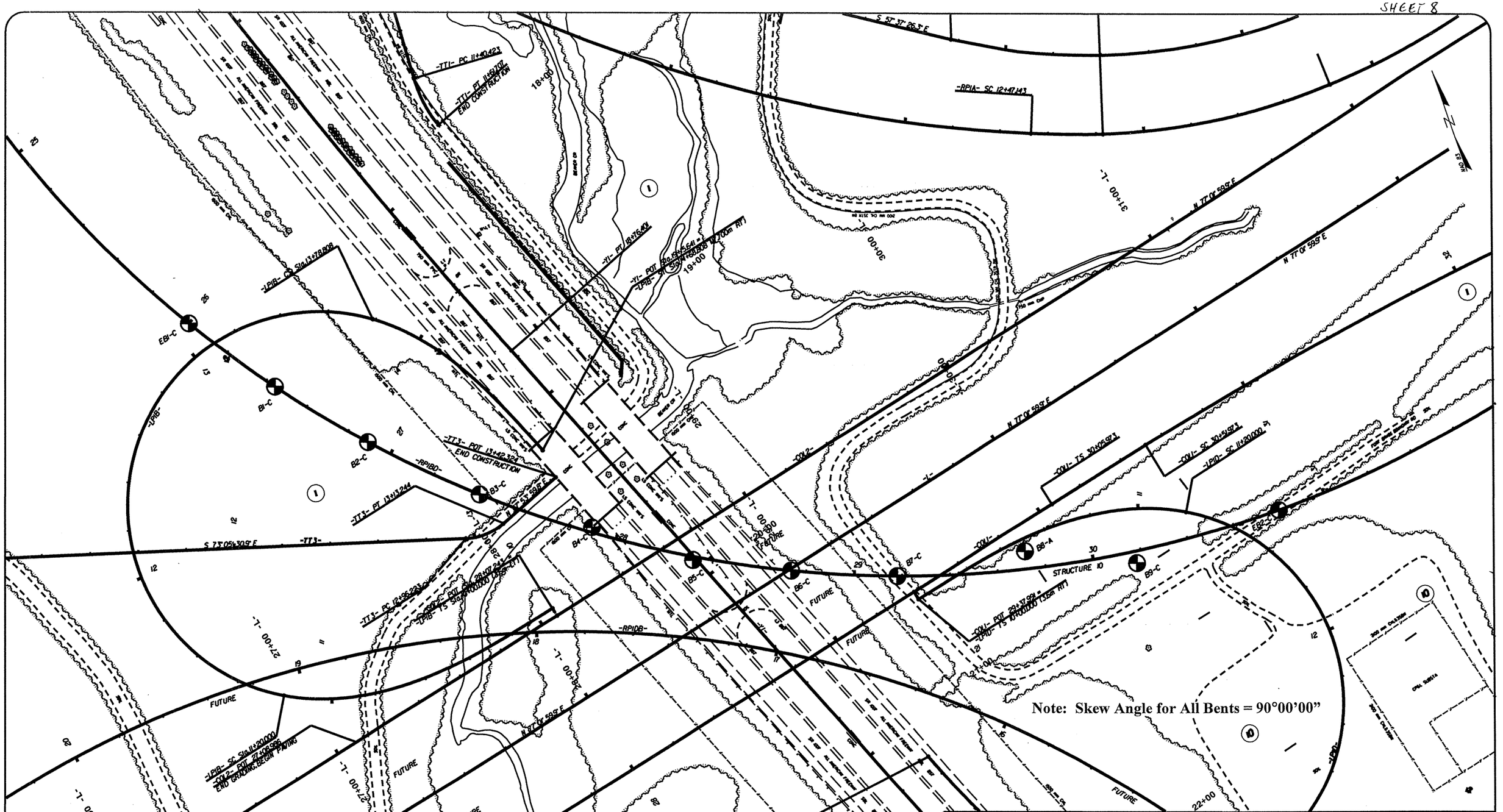
PMW/JRV:pmw
Attachments

s:\0710\projects\2007\U-2519DA Structure 10 in Fayetteville\Structure 10 Report.doc

SHEET 7



TRIGON Trigon Engineering Consultants, Inc. Greensboro North Carolina	SCALE: 1 = 24,000	DATE: 7/20/07	STATE PROJECT NO. 34817.1.2	TIP NO.: U-2519DA
	SITE VICINITY MAP Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-, Cumberland County, North Carolina			
	USGS Fayetteville Quadrangle	DRAWING NUMBER: 1		



Note: Skew Angle for All Bents = 90°00'00"

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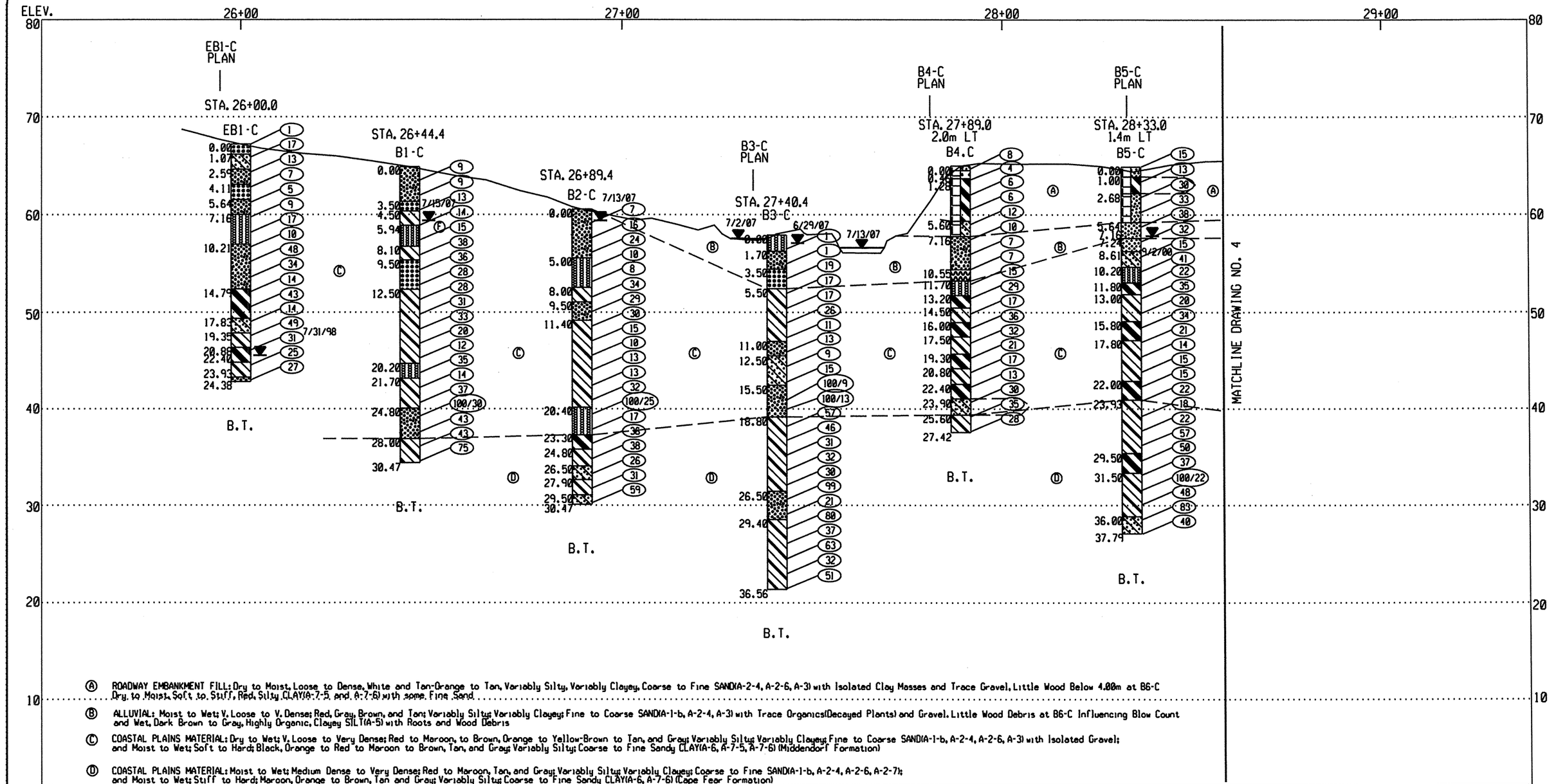
BORING IDENTIFICATION DIAGRAM

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale N/A
Date 7/26/07	Horiz. Scale 1:1500
Drawn by DRK	Drawing No. 2



Ⓐ ROADWAY EMBANKMENT FILL: Dry to Moist, Loose to Dense, White and Tan-Orange to Tan, Variably Silty, Variably Clayey, Coarse to Fine SAND(A-2-4, A-2-6, A-3) with Isolated Clay Masses and Trace Gravel. Little Wood Below 4.00m at B6-C
Dry to Moist, Soft to Stiff, Red, Silty CLAY(A-7-5 and A-7-6) with some Fine Sand

Ⓑ ALLUVIAL: Moist to Wet; V. Loose to V. Dense; Red, Gray, Brown, and Tan; Variably Silty; Variably Clayey; Fine to Coarse SAND(A-1-b, A-2-4, A-3) with Trace Organics(Decayed Plants) and Gravel. Little Wood Debris at B6-C Influencing Blow Count and Wet, Dark Brown to Gray, Highly Organic, Clayey SILT(A-5) with Roots and Wood Debris

Ⓒ COASTAL PLAINS MATERIAL: Dry to Wet; V. Loose to Very Dense; Red to Maroon, to Brown, Orange to Yellow-Brown to Tan, and Gray; Variably Silty; Variably Clayey; Fine to Coarse SAND(A-1-b, A-2-4, A-2-6, A-3) with Isolated Gravel; and Moist to Wet; Soft to Hard; Black, Orange to Red to Maroon to Brown, Tan, and Gray; Variably Silty; Coarse to Fine Sandy CLAY(A-6, A-7-5, A-7-6) (Middendorf Formation)

Ⓓ COASTAL PLAINS MATERIAL: Moist to Wet; Medium Dense to Very Dense; Red to Maroon, Tan, and Gray; Variably Silty; Variably Clayey; Coarse to Fine SAND(A-1-b, A-2-4, A-2-6, A-2-7); and Moist to Wet; Stiff to Hard; Maroon, Orange to Brown, Tan and Gray; Variably Silty; Coarse to Fine Sandy CLAY(A-6, A-7-6) (Cape Fear Formation)

SCALE IN METER

0 8 16

VERT. SCALE

0 20 40

HORZ. SCALE

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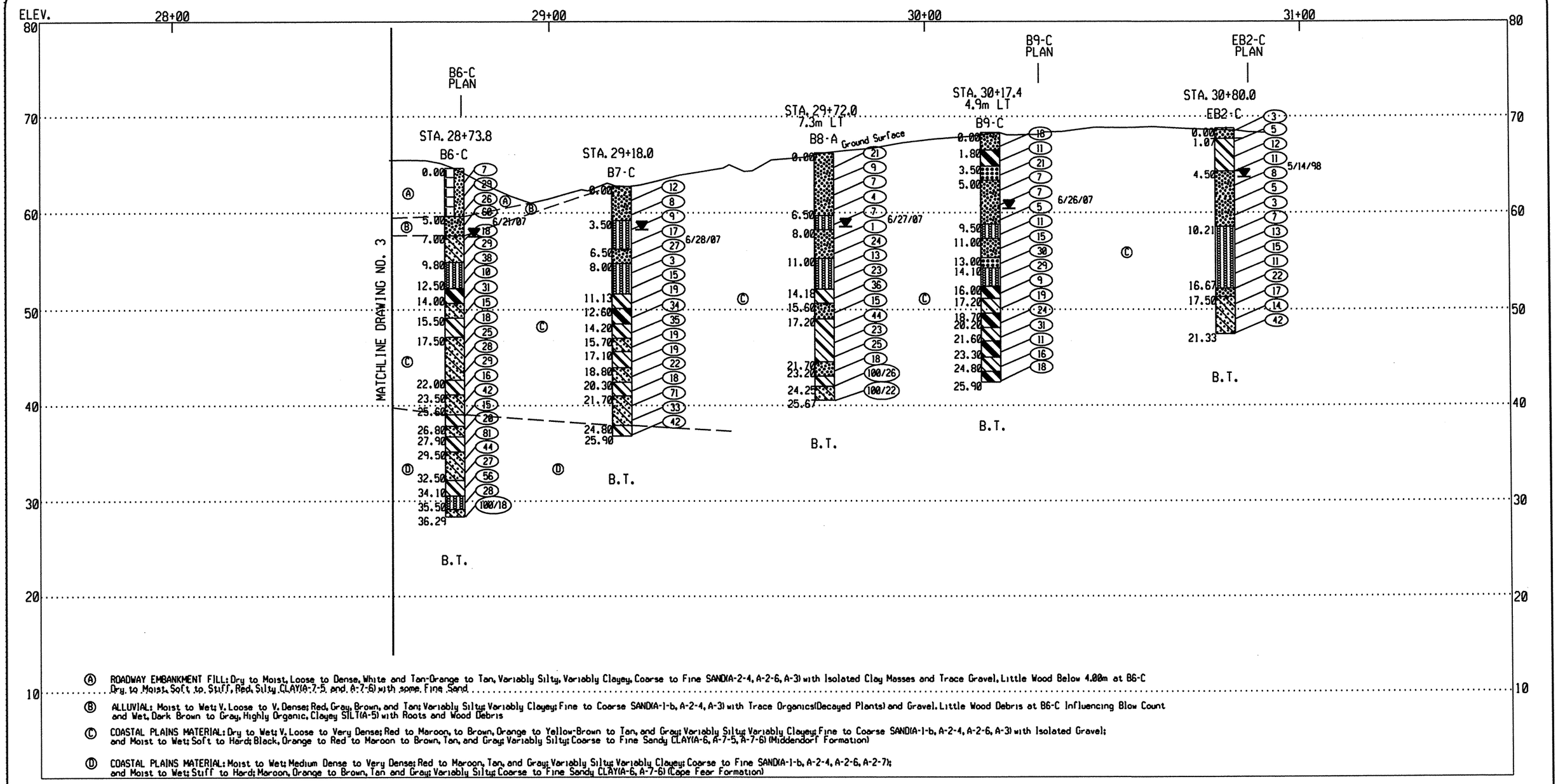
PROFILE ALONG CENTERLINE -RP1BD-

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1_, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:1000
Drawn by DRK	Drawing No. 3



Ⓐ ROADWAY EMBANKMENT FILL: Dry to Moist, Loose to Dense, White and Tan-Orange to Tan, Variably Silty, Variably Clayey, Coarse to Fine SAND(A-2-4, A-2-6, A-3) with Isolated Clay Masses and Trace Gravel. Little Wood Below 4.00m at B6-C
Dry, to Moist, Soft to Stiff, Red, Silty CLAY(A-7-5 and A-7-6) with some Fine Sand

Ⓑ ALLUVIAL: Moist to Wet; V. Loose to V. Dense; Red, Gray, Brown, and Tan; Variably Silty; Variably Clayey; Fine to Coarse SAND(A-1-b, A-2-4, A-3) with Trace Organics(Decayed Plants) and Gravel. Little Wood Debris at B6-C Influencing Blow Count and Wet, Dark Brown to Gray, Highly Organic, Clayey SILT(A-5) with Roots and Wood Debris

Ⓒ COASTAL PLAINS MATERIAL: Dry to Wet; V. Loose to Very Dense; Red to Maroon, to Brown, Orange to Yellow-Brown to Tan, and Gray; Variably Silty; Variably Clayey; Fine to Coarse SAND(A-1-b, A-2-4, A-2-6, A-3) with Isolated Gravel; and Moist to Wet; Soft to Hard; Black, Orange to Red to Maroon to Brown, Tan, and Gray; Variably Silty; Coarse to Fine Sandy CLAY(A-6, A-7-5, A-7-6) (Middendorf Formation)

Ⓓ COASTAL PLAINS MATERIAL: Moist to Wet; Medium Dense to Very Dense; Red to Maroon, Tan, and Gray; Variably Silty; Variably Clayey; Coarse to Fine SAND(A-1-b, A-2-4, A-2-6, A-2-7); and Moist to Wet; Stiff to Hard; Maroon, Orange to Brown, Tan and Gray; Variably Silty; Coarse to Fine Sandy CLAY(A-6, A-7-6) (Cape Fear Formation)

SCALE IN METER

0 8 16

VERT. SCALE

0 20 40

HORZ. SCALE

TRIGON
ENGINEERING CONSULTANTS, INC.

PROFILE ALONG CENTERLINE -RP1BD-

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1_, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:1000
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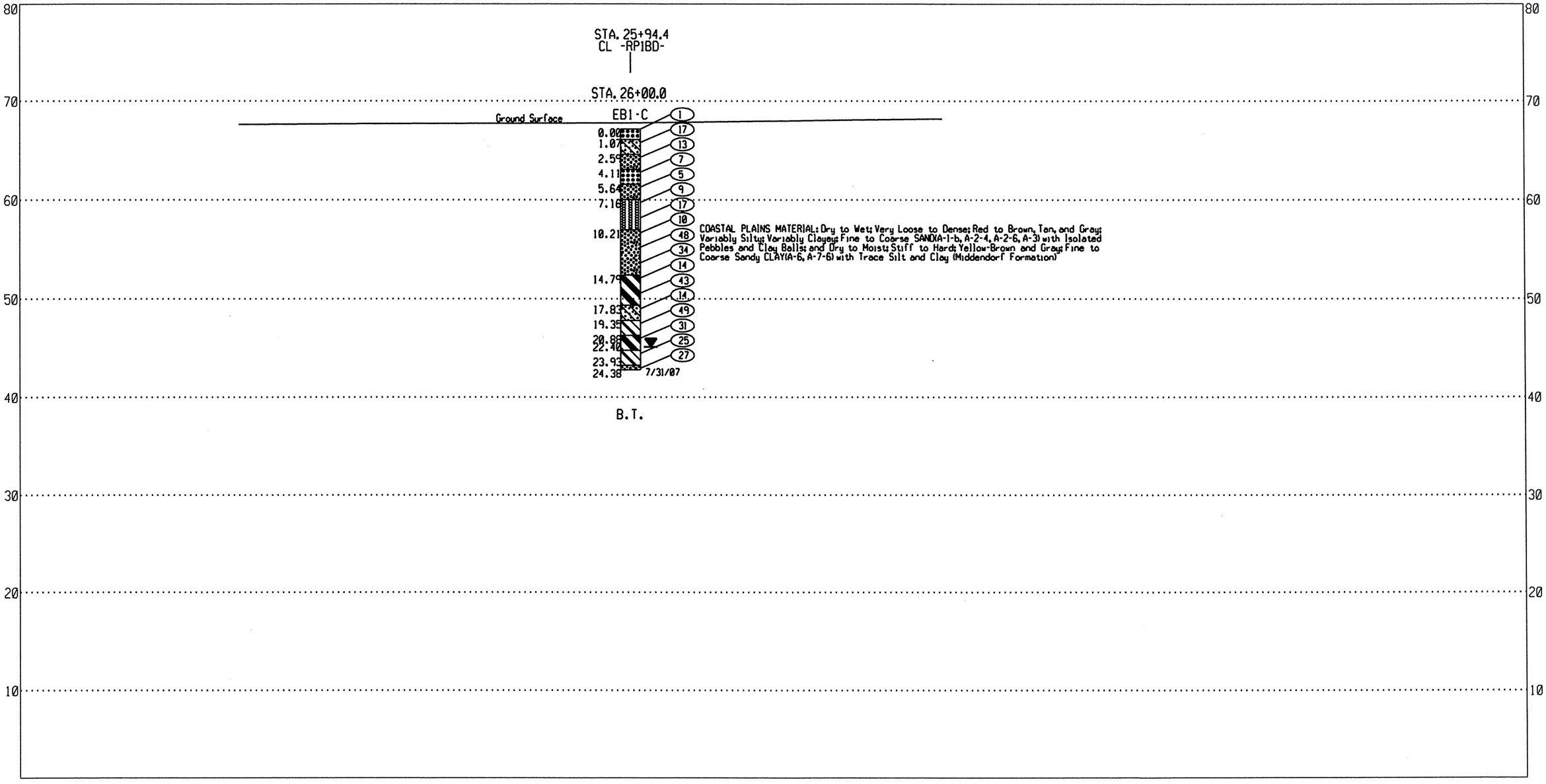

SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

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CROSS SECTION AT END BENT-1

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
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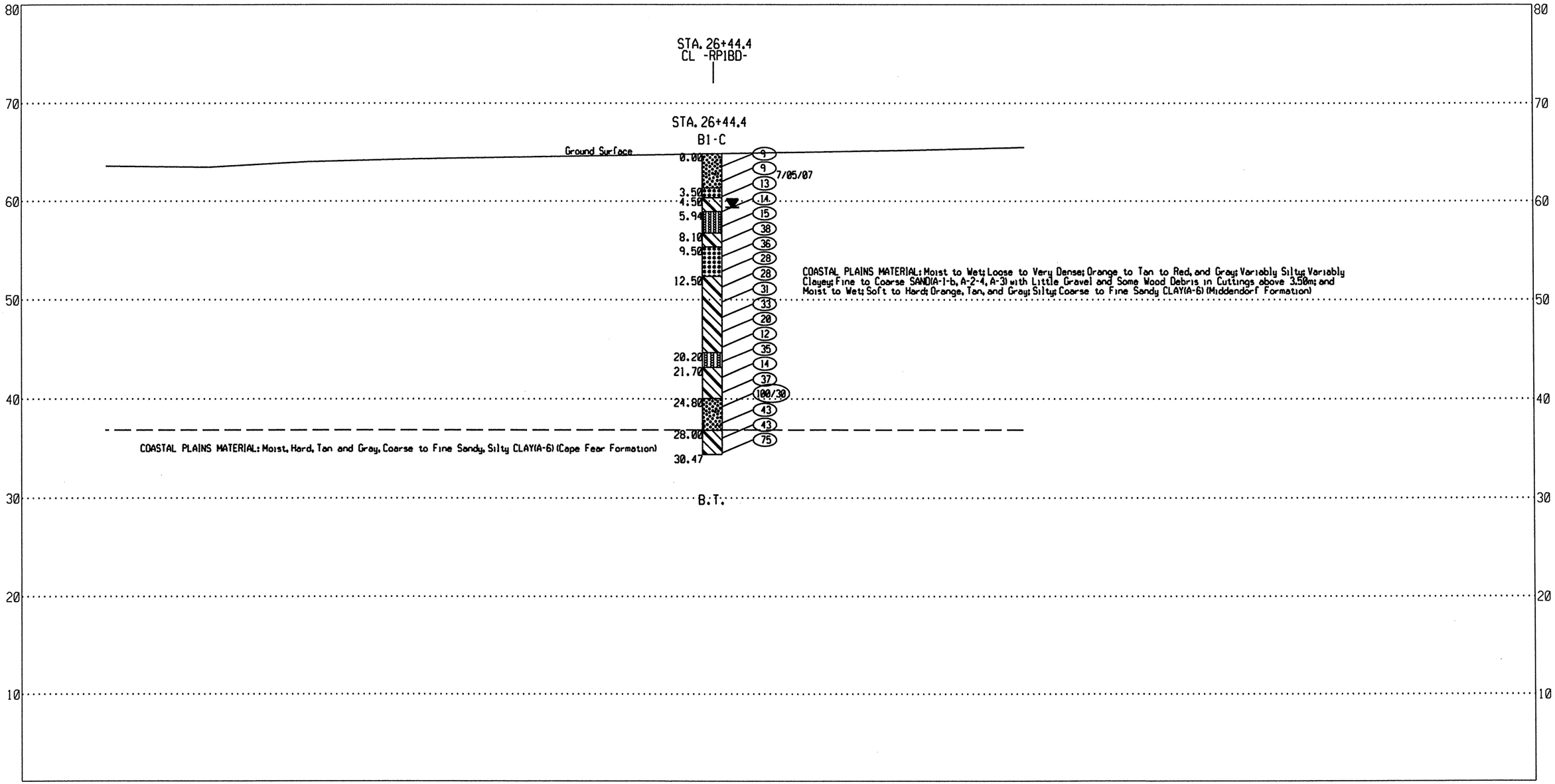

SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

TRIGON

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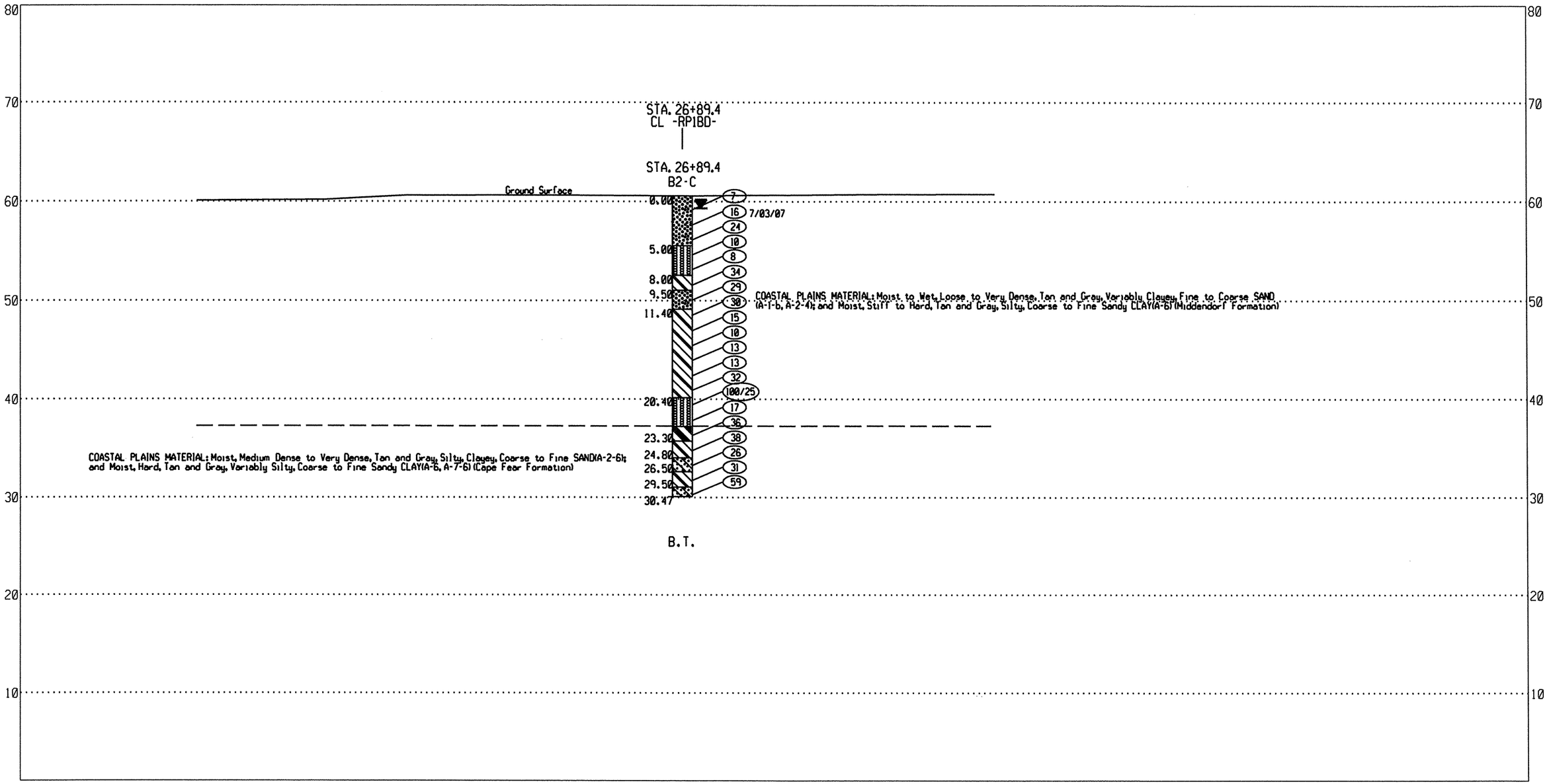
CROSS SECTION AT BENT-1

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 6



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

TRIGON ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-2

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1_, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
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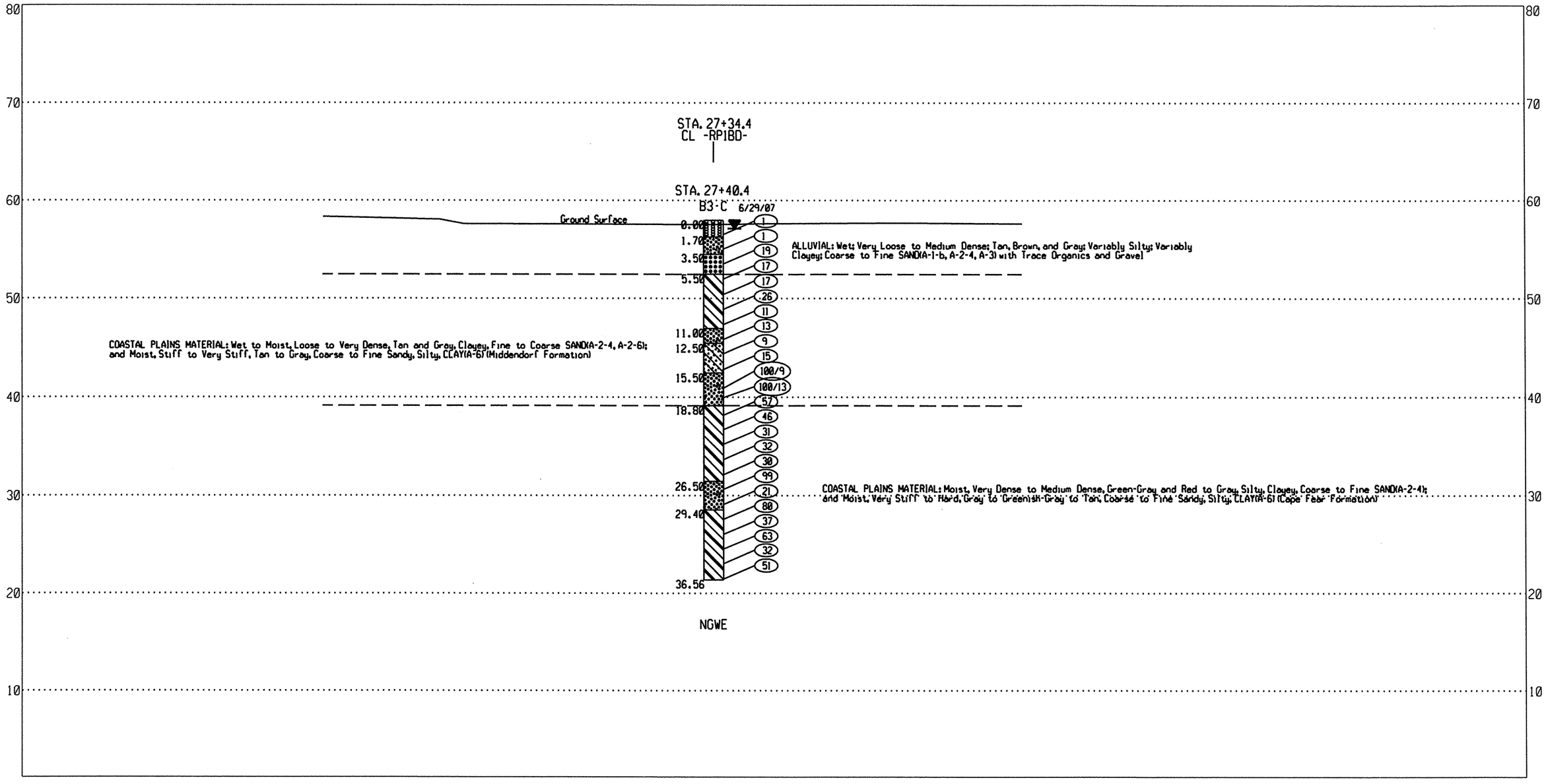


SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

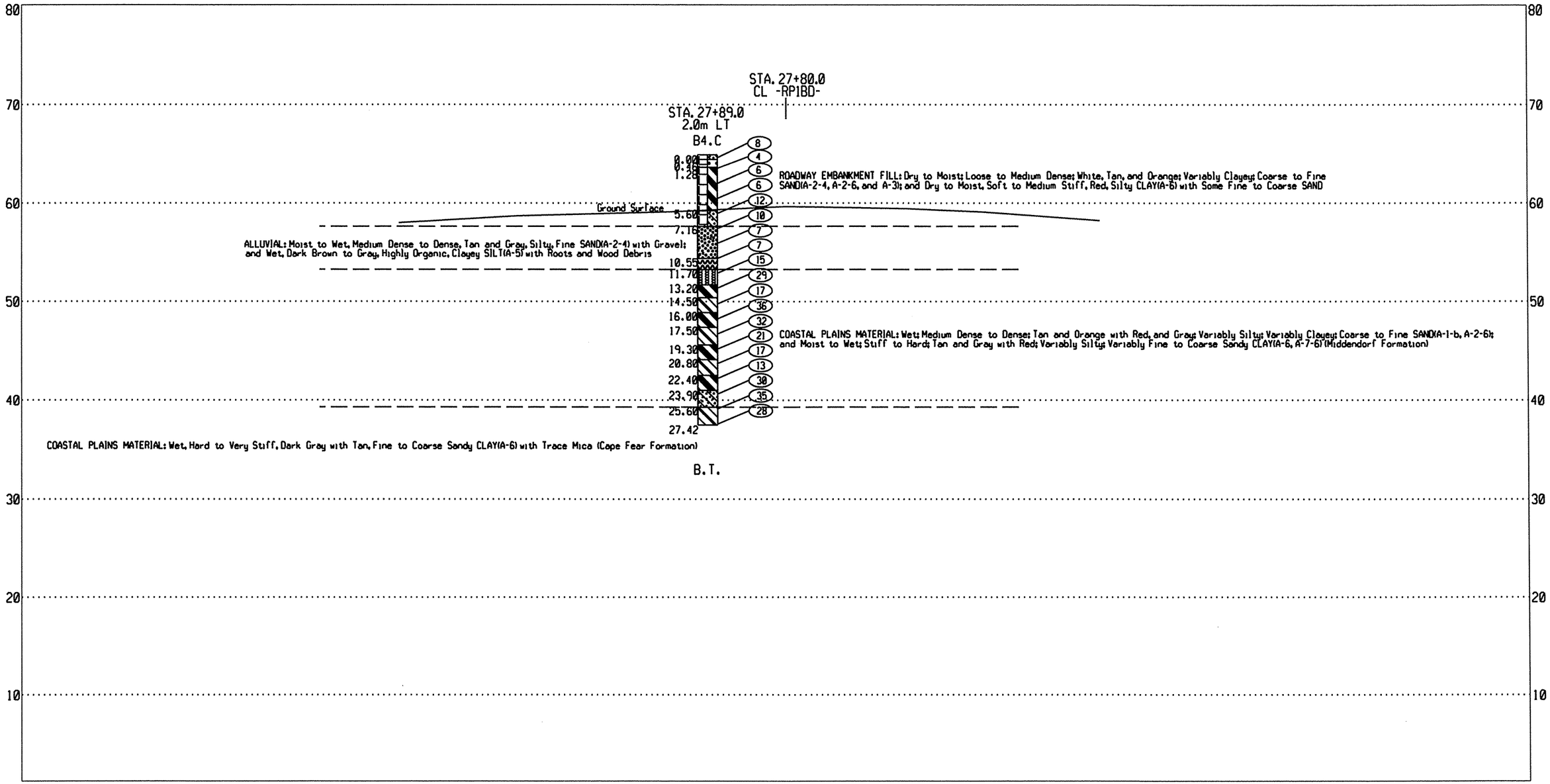
TRIGON ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-3

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 8



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

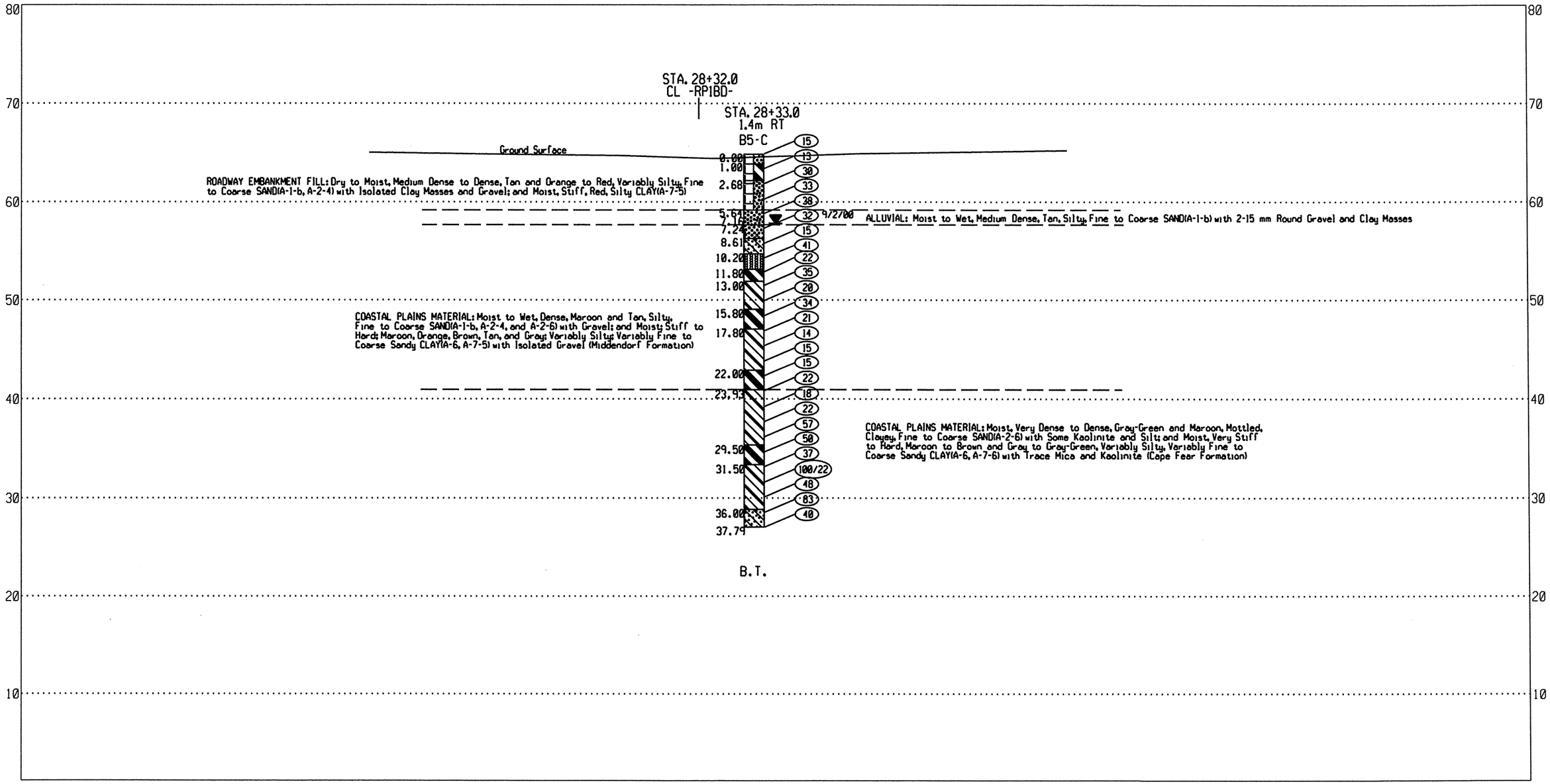
TRIGON
ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-4

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 9



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

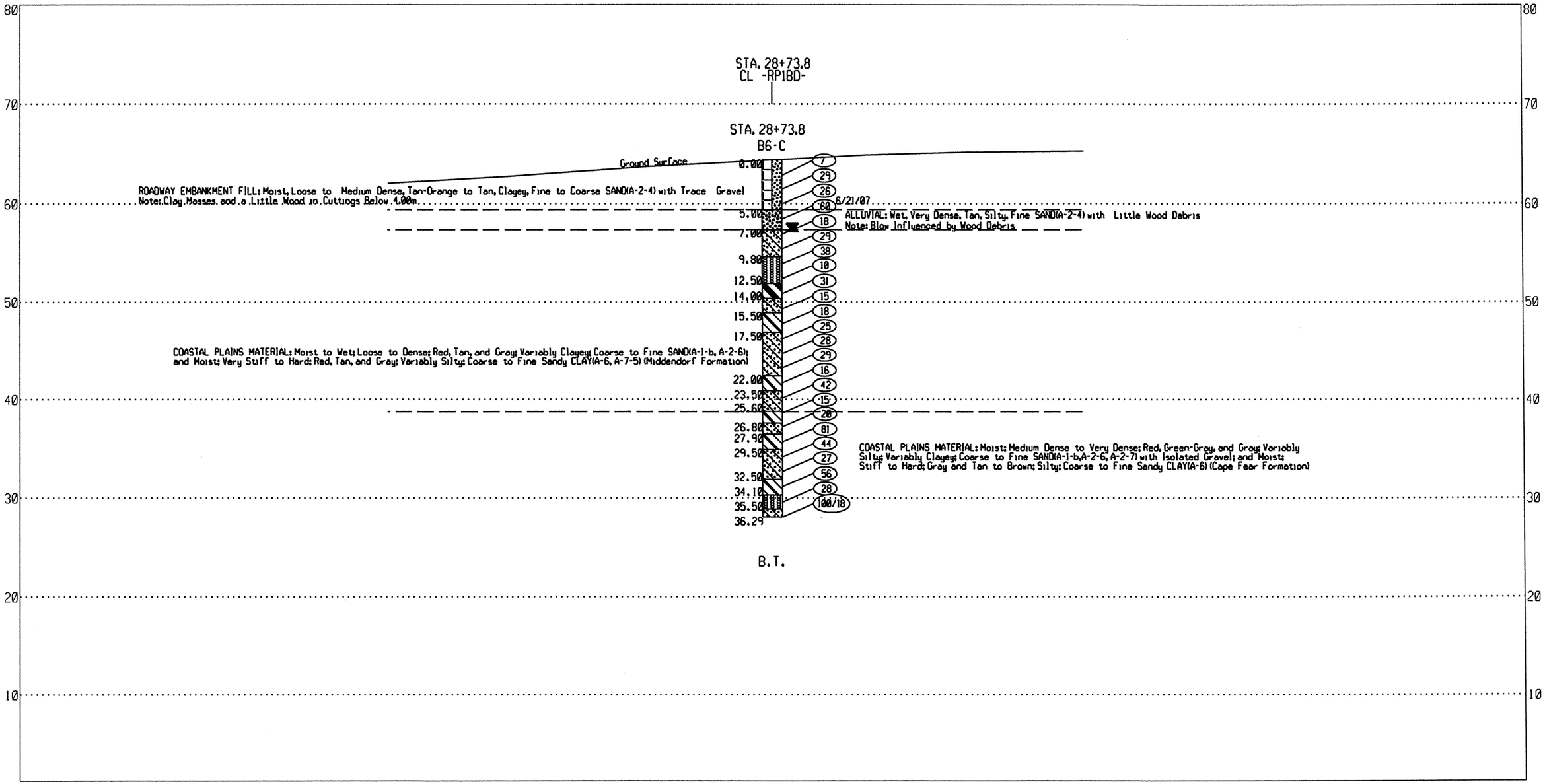
TRIGON
ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-5

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 10



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

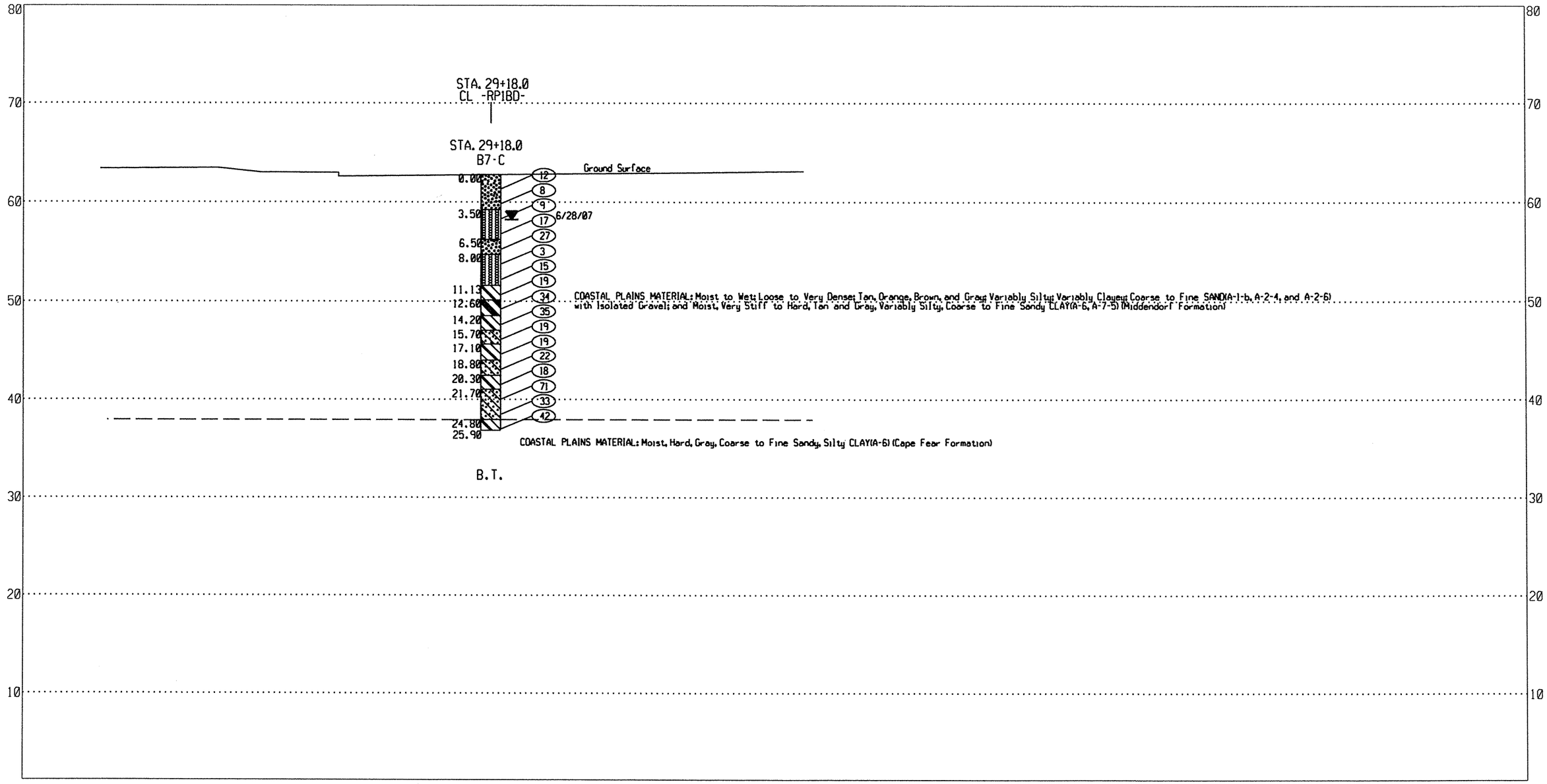
TRIGON
ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-6

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 11



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

TRIGON

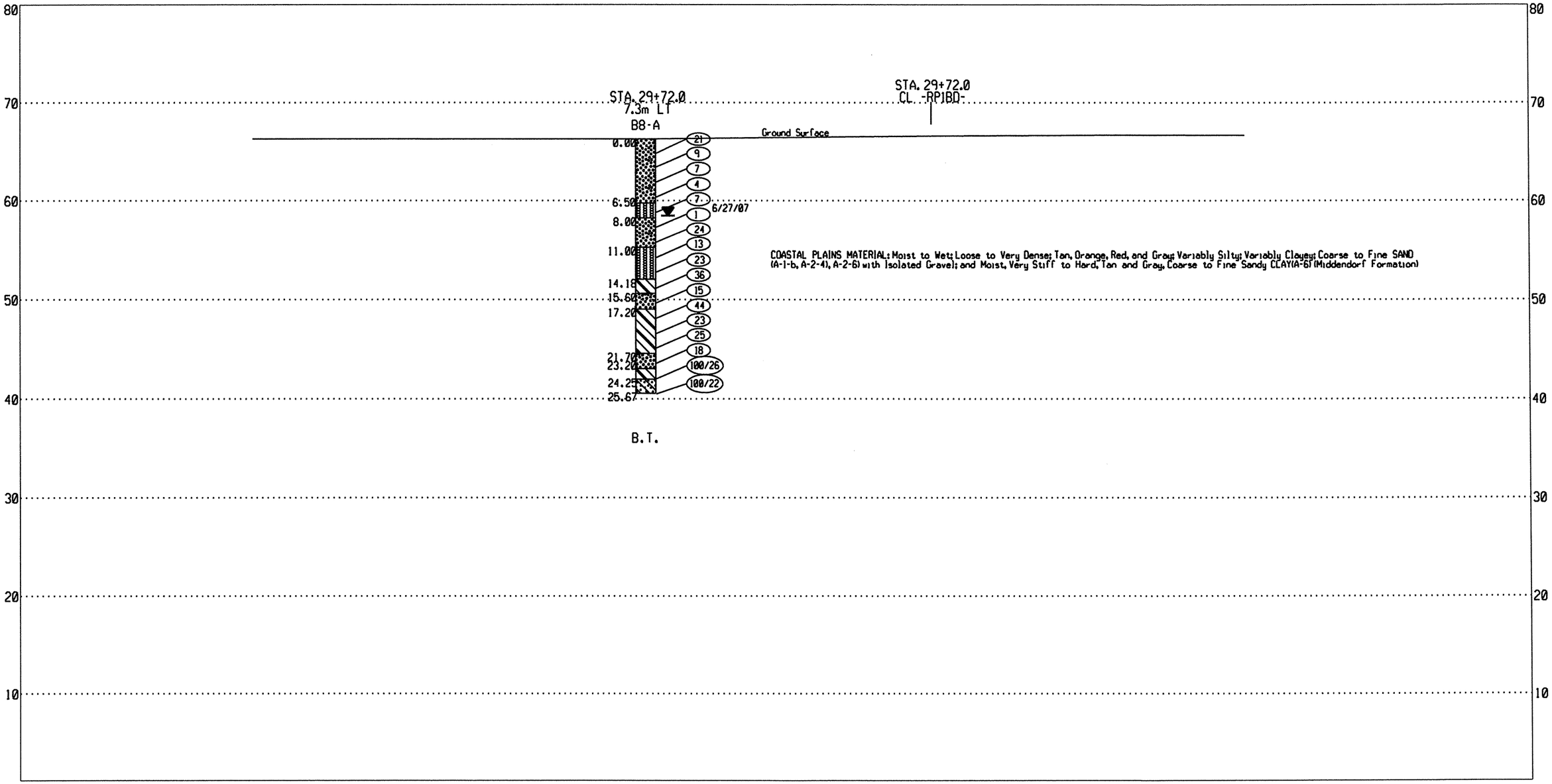
ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-7

Site 10: Bridge on -RP1BD- Over Beaver Creek,
-COL1-, -COL2-, -Y1_, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 12



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

TRIGON

ENGINEERING CONSULTANTS, INC.

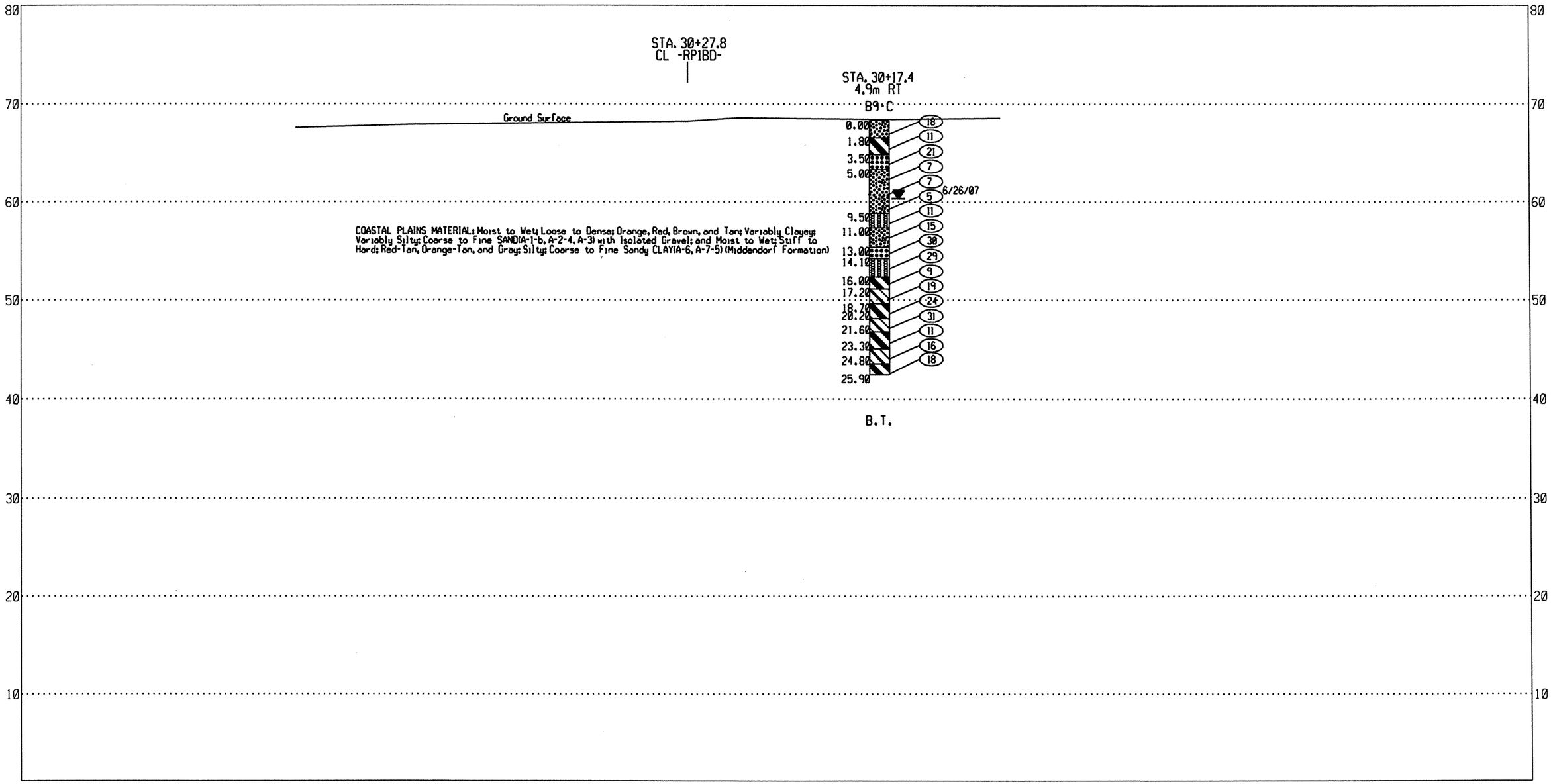
CROSS SECTION AT BENT-8

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 13

SHEET 20



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

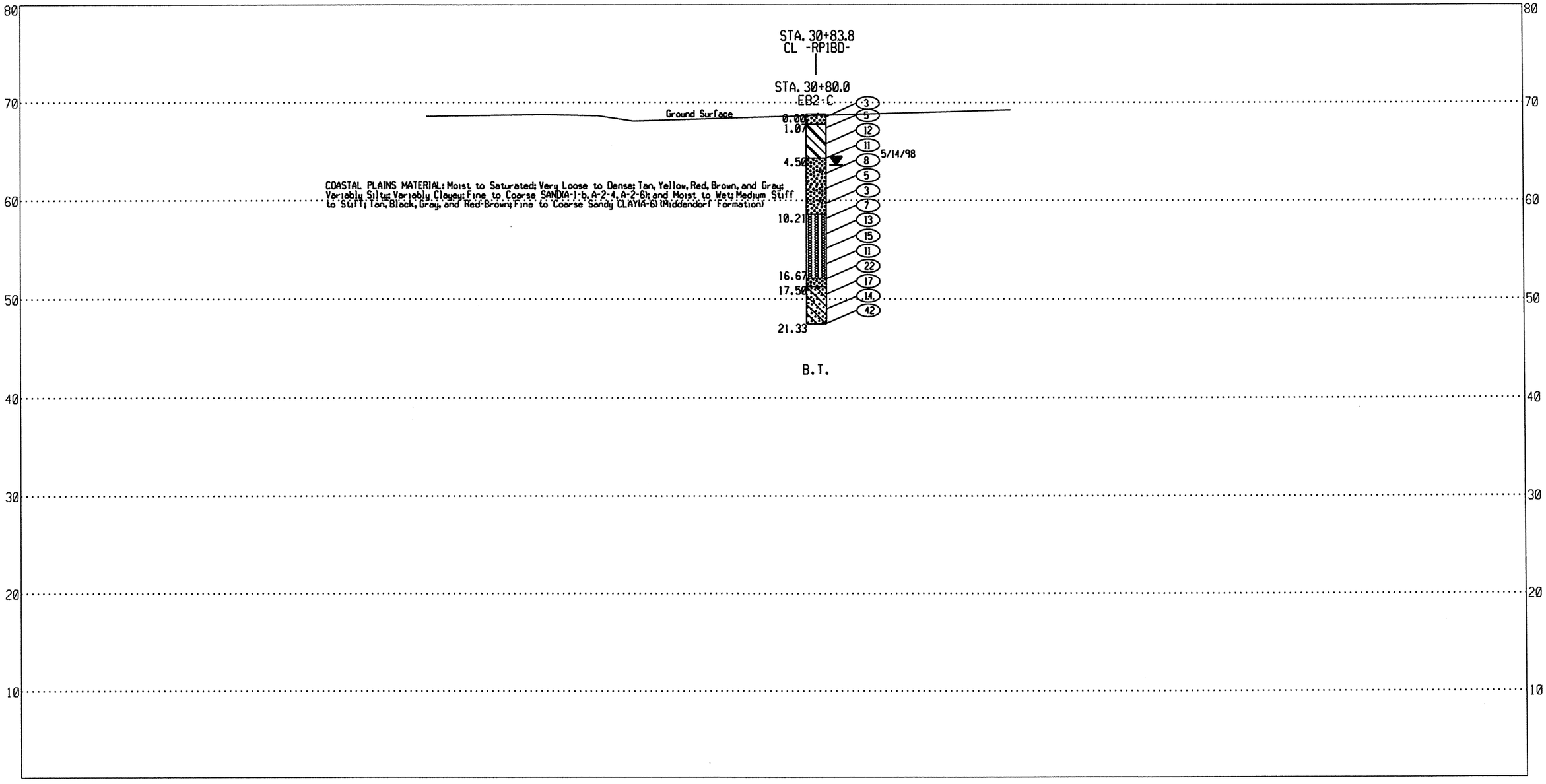
TRIGON ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT BENT-9

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1_, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 14



SCALE IN METER

0 8 16

VERT. SCALE

0 2 4

HORZ. SCALE

TRIGON
ENGINEERING CONSULTANTS, INC.

CROSS SECTION AT END BENT-2

Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, LP1B-, -LP1D-, and -TT3-

Cumberland County, North Carolina

Project No. 34817.1.2	TIP No. U-2519DA
Federal No. NHF-DPR-0100(1)	Vert. Scale 1:400
Date 7/26/07	Horiz. Scale 1:100
Drawn by DRK	Drawing No. 15

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** CAN
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. EB1-C	**STATION** 26+00.0	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 67.20 m	**TOTAL DEPTH** 24.38 m	**NORTHING** 151,198.6	**EASTING** 611,719.5
DRILL MACHINE CME-550	**DRILL METHOD** HSA		**HAMMER TYPE** 63.5kg Automatic
START DATE 07/30/98	**COMP. DATE** 07/30/98	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 11.20; 24 HR. 21.76

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
68									
67.20	0.00								
		WOH	WOH	1	1		D		COASTAL PLAINS MATERIAL: Very Loose, Tan, Silty, Fine to Coarse SAND with Trace Silt and Clay (Middendorf Formation)
66.13	1.07								
		4	7	10	17		D		COASTAL PLAINS MATERIAL: Medium Dense, Red Brown, Clayey, Fine to Coarse SAND with Pebbles and Some Silt and Clay (Middendorf Formation)
64.61	2.59								
		4	5	8	13		D		COASTAL PLAINS MATERIAL: Medium Dense; Red, Gray and Tan; Fine To Coarse SAND with Some Clay and Silt (Middendorf Formation)
63.09	4.11								
		2	3	4	7		DM		COASTAL PLAINS MATERIAL: Loose, Tan and Gray, Fine to Coarse SAND with Pebbles and Clay Balls and with Trace Silt and Clay (Middendorf Formation)
61.56	5.64								
		2	2	3	5		M		COASTAL PLAINS MATERIAL: Loose, Tan, Coarse SAND with Clay Balls and Trace Fine Sand, Silt, and Clay (Middendorf Formation)
60.04	7.16								
		2	3	6	9		M		COASTAL PLAINS MATERIAL: Loose to Medium Dense; Red, Tan, Gray; Coarse SAND with Alternating Layers and Clay (Middendorf Formation)
58.51	8.69								
		9	8	9	17		M/W		
56.99	10.21								
		3	5	5	10		W		COASTAL PLAINS MATERIAL: Loose to Dense; Red, Gray, Tan; Fine to Coarse SAND with Trace to Some Silt and Clay (Middendorf Formation)
55.47	11.73								
		9	17	31	48		M		
53.94	13.26								
		10	16	18	34		M		
52.42	14.78								
		2	4	10	14		19.1%		COASTAL PLAINS MATERIAL: Stiff to Hard, Gray Fine, Sandy CLAY with Trace to Some Silt and Coarse Sand (Middendorf Formation)
50.89	16.31								
		11	19	24	43		20.8%		
49.37	17.83								
		5	6	8	14		M		COASTAL PLAINS MATERIAL: Medium Dense, Tan and Gray, Clayey, Fine SAND (Middendorf Formation)
47.85	19.35						14.4%		

NCDOT BORE SINGLE 07107030.GPJ NC_DOT.GDT 8/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 22

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** CAN
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. EB1-C	**STATION** 26+00.0	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 67.20 m	**TOTAL DEPTH** 24.38 m	**NORTHING** 151,198.6	**EASTING** 611,719.5
DRILL MACHINE CME-550	**DRILL METHOD** HSA		**HAMMER TYPE** 63.5kg Automatic
START DATE 07/30/98	**COMP. DATE** 07/30/98	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 11.20; 24 HR. 21.76

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
48					Match Line				
		12	18	31	49				COASTAL PLAINS MATERIAL: Hard, Gray, Coarse Sandy CLAY with Some Fine Sand and Trace SILT (Middendorf Formation) *(continued)*
46.32	20.88								
		10	12	19	31	SS-24	11.0%		COASTAL PLAINS MATERIAL: Hard, Gray, Coarse Sandy CLAY with Trace Silt and Some Fine Sand (Middendorf Formation)
44.80	22.40								
		9	11	14	25	SS-25	13.3%		COASTAL PLAINS MATERIAL: Very Stiff, Gray to Yellow Brown, Fine to Coarse Sandy CLAY with Some Silt (Middendorf Formation)
43.27	23.93								
		9	12	15	27	SS-26	M		COASTAL PLAINS MATERIAL: Medium Dense, Gray, Fine to Coarse SAND with Trace Silt and Some CLAY (Middendorf Formation)
42.82	24.38								Boring Terminated at Elevation 42.82 m in COASTAL PLAINS MATERIAL (Middendorf Formation)

NCDOT BORE SINGLE 07107030.GPJ NC_DOT.GDT 8/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B1-C	**STATION** 26+44.4	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,162.0	**EASTING** 611,744.7
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 07/03/07	**COMP. DATE** 07/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 5.03; 24 HR. 5.49

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
65									
63.79	1.07	4	5	4	9	SS-1	M		64.66 / 0.00 COASTAL PLAINS MATERIAL: Loose, Orange-Tan, Clayey, Silty, Fine to Coarse SAND with Little Gravel (Middendorf Formation) Note: Some Wood Debris in Cuttings
62.27	2.59	4	4	5	9		M		
60.75	4.11	5	6	7	13		M		61.36 / 3.50 COASTAL PLAINS MATERIAL: Medium Dense, Orange-Tan, Fine to Coarse SAND (Middendorf Formation)
59.22	5.64	2	6	8	14		M		60.36 / 4.50 COASTAL PLAINS MATERIAL: Soft, Tan and Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
57.70	7.16	4	5	10	15		W		58.92 / 5.94 COASTAL PLAINS MATERIAL: Medium Dense, Tan to Red, Fine to Coarse SAND with Intermittent Seams of Silty Clay (Middendorf Formation)
56.17	8.69	8	15	23	38		W		56.76 / 8.10 COASTAL PLAINS MATERIAL: Hard, Light Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
54.65	10.21	12	18	18	36	SS-2	W		55.36 / 9.50 COASTAL PLAINS MATERIAL: Dense to Medium Dense, Red-Tan, Fine to Coarse SAND with Trace Clay (Middendorf Formation)
53.13	11.73	12	12	16	28		W		52.36 / 12.50 COASTAL PLAINS MATERIAL: Stiff to Hard, Tan and Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
51.60	13.26	6	11	17	28	SS-3	18.6%		
50.08	14.78	7	11	20	31		M		
48.55	16.31	9	14	19	33		M		
47.03	17.83	6	8	12	20		M		
45.51	19.35	5	5	7	12		M		44.66 / 20.20

NCDOT BORE SINGLE 07107030.GPJ NC_DOT.GDT 8/13/07

SHEET 23

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B1-C	**STATION** 26+44.4	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,162.0	**EASTING** 611,744.7
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 07/03/07	**COMP. DATE** 07/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. 5.03; 24 HR. 5.49

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
45					Match Line				
43.98	20.88	10	15	20	35		M		COASTAL PLAINS MATERIAL: Dense, Gray, Fine to Coarse SAND (Middendorf Formation)
42.46	22.40	5	6	8	14		M		43.16 / 21.70 COASTAL PLAINS MATERIAL: Stiff to Hard, Orange and Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
40.93	23.93	9	15	22	37		M		
39.41	25.45	33	67		100/30		W		40.06 / 24.80 COASTAL PLAINS MATERIAL: Very Dense to Dense, Light Gray, Silty, Clayey, Coarse to Fine SAND (Middendorf Formation)
37.89	26.97	11	17	26	43		M		
36.36	28.50	11	19	24	43		M		36.86 / 28.00 COASTAL PLAINS MATERIAL: Hard, Tan and Gray, Coarse to Fine Sandy, Silty CLAY (Cape Fear Formation)
34.84	30.02	17	32	43	75		M		34.39 / 30.47 Boring Terminated at Elevation 34.39 m in COASTAL PLAINS MATERIAL (Cape Fear Formation) Note: Bentonite Mud Slurry Used as Drilling Fluid Initial Mud Density = 1.03 g/cm^3 Mud Density at 20.0m = 1.13 g/cm^3

NCDOT BORE SINGLE 07107030.GPJ NC_DOT.GDT 8/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B2-C	**STATION** 26+89.4	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 60.57 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,127.6	**EASTING** 611,773.6
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/29/07	**COMP. DATE** 07/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	1.16
24 HR.	1.22

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
61								60.57 / 0.00
59.50	1.07	1	2	5				COASTAL PLAINS MATERIAL: Loose to Medium Dense, Tan, Clayey, Fine to Coarse SAND (Middendorf Formation)
57.98	2.59	3	8	8		W		
56.46	4.11	6	10	14		W		55.57 / 5.00
54.93	5.64	5	5	5	SS-4	W		COASTAL PLAINS MATERIAL: Loose to Medium Dense, Tan, Fine to Coarse SAND with Trace of Cemented Sand Fragments and Clay (Middendorf Formation)
53.41	7.16	3	2	6		W		52.57 / 8.00
51.88	8.69	9	14	20		M		COASTAL PLAINS MATERIAL: Hard, Tan, Silty, Fine Sandy CLAY (Middendorf Formation)
50.36	10.21	7	11	18		W		51.07 / 9.50
48.84	11.73	8	12	18		M		COASTAL PLAINS MATERIAL: Medium Dense, Tan, Silty, Clayey Coarse to Fine SAND (Middendorf Formation)
47.31	13.26	4	7	8		M		49.17 / 11.40
45.79	14.78	3	4	6	SS-5	21.9%		COASTAL PLAINS MATERIAL: Stiff to Hard, Tan and Gray, Silty, Coarse to Fine Sandy CLAY with Trace of Mica (Middendorf Formation)
44.26	16.31	3	5	8		M		
42.74	17.83	5	7	6		M		
41.22	19.35	9	13	19		M		

BLOWS PER 30 CM: 0 25 50 75 100

SHEET 24

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B2-C	**STATION** 26+89.4	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 60.57 m	**TOTAL DEPTH** 30.47 m	**NORTHING** 151,127.6	**EASTING** 611,773.6
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/29/07	**COMP. DATE** 07/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m)	
0 HR.	1.16
24 HR.	1.22

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
41								40.17 / 20.40
39.69	20.88	20	38	62/10		M		COASTAL PLAINS MATERIAL: Very Dense to Medium Dense, Gray to Green-Gray, Fine to Coarse SAND (Middendorf Formation)
38.17	22.40	7	8	9	SS-6	M		37.27 / 23.30
36.64	23.93	12	15	21		M		COASTAL PLAINS MATERIAL: Hard, Tan and Gray, Fine Sandy, Silty CLAY (Cape Fear Formation)
35.12	25.45	11	17	21		M		35.77 / 24.80
33.60	26.97	9	12	14		M		COASTAL PLAINS MATERIAL: Hard, Gray, Silty, Coarse to Fine Sandy CLAY (Cape Fear Formation)
32.07	28.50	7	12	19		M		34.07 / 26.50
30.55	30.02	22	31	28		M		COASTAL PLAINS MATERIAL: Medium Dense, Green-Gray, Silty, Clayey, Coarse to Fine SAND with Little Mica (Cape Fear Formation)
								32.67 / 27.90
								COASTAL PLAINS MATERIAL: Hard, Gray, Silty, Coarse to Fine Sandy CLAY (Cape Fear Formation)
								31.07 / 29.50
								COASTAL PLAINS MATERIAL: Very Dense, Tan, Silty, Clayey Coarse to Fine SAND (Cape Fear Formation)
								30.10 / 30.47
								Boring Terminated at Elevation 30.10m in COASTAL PLAINS MATERIAL(Cape Fear Formation)

Note: Bentonite Mud Slurry Used as Drilling Fluid
Initial Mud Density= 1.01g/cm^3
Mud Density at 20.88m= 1.14g/cm^3

BLOWS PER 30 CM: 0 25 50 75 100

Match Line

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B3-C	**STATION** 27+40.4	**OFFSET** CL	**ALIGNMENT** -RPIBD- — **0 HR.** 2.16
COLLAR ELEV. 57.95 m	**TOTAL DEPTH** 36.56 m	**NORTHING** 151,092.1	**EASTING** 611,810.2 — **24 HR.** 0.88
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/27/07	**COMP. DATE** 06/28/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
58								
56.88	1.07	1	WOH	1	SS-7	W		57.95 / 0.00 — ALLUVIAL: Very Loose, Tan, Fine to Coarse SAND with Trace Organics (Wood Debris), Trace of Rounded Gravel , and Trace Clay
55.36	2.59	WOH	WOH	1		W		56.25 / 1.70 — ALLUVIAL: Very Loose, Gray, Silty, Clayey, Coarse to Fine SAND with Trace Organics (Decayed Plants)
53.84	4.11	5	8	11		W		54.45 / 3.50 — ALLUVIAL: Medium Dense, Tan and Brown, Coarse to Fine SAND with Trace of Organics (Decayed Plants) Note: Subangular Gravel 2-5mm to 5.0mm in Diameter
52.31	5.64	5	7	10		M		52.45 / 5.50 — COASTAL PLAINS MATERIAL: Stiff to Very Stiff, Tan to Gray, Coarse to Fine Sandy, Silty CLAY (Middendorf Formation)
50.79	7.16	3	7	10		M		
49.26	8.69	6	10	16		M		
47.74	10.21	4	4	7		M		46.95 / 11.00 — COASTAL PLAINS MATERIAL: Medium Dense, Gray, Clayey, Coarse to Fine SAND (Middendorf Formation)
46.22	11.73	6	6	7		W		45.45 / 12.50 — COASTAL PLAINS MATERIAL: Loose to Medium Dense, Gray, Clayey, Fine to Coarse SAND (Middendorf Formation)
44.69	13.26	3	4	5		M		
43.17	14.78	4	7	8	SS-8	M		42.45 / 15.50 — COASTAL PLAINS MATERIAL: Very Dense, Gray, Clayey, Coarse to Fine SAND with Thin Lenses of Cemented Sand and Lenses of Sandy Clay (Middendorf Formation)
41.64	16.31	100/9				M		
40.12	17.83	100/13				M		39.15 / 18.80 — COASTAL PLAINS MATERIAL: Very Stiff to Hard, Gray, Coarse to Fine Sandy, Silty CLAY with Little Muscovite Mica (Cape Fear Formation)
38.60	19.35	10	27	30	SS-9	19.3%		

BLOWS PER 30 CM (0 25 50 75 100): 1; 1; 19; 17; 17; 26; 11; 13; 9; 15; 100/9; 100/13; 57

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B3-C	**STATION** 27+40.4	**OFFSET** CL	**ALIGNMENT** -RPIBD- — **0 HR.** 2.16
COLLAR ELEV. 57.95 m	**TOTAL DEPTH** 36.56 m	**NORTHING** 151,092.1	**EASTING** 611,810.2 — **24 HR.** 0.88
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/27/07	**COMP. DATE** 06/28/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
38								Match Line
37.07	20.88	12	20	26		M		COASTAL PLAINS MATERIAL: Very Stiff to Hard, Gray, Coarse to Fine Sandy, Silty CLAY with Little Muscovite Mica (Cape Fear Formation) *(continued)*
35.55	22.40	8	13	18		M		
34.02	23.93	11	14	18		M		
32.50	25.45	10	14	16		M		31.45 / 26.50 — COASTAL PLAINS MATERIAL: Very Dense to Medium Dense, Green-Gray and Red to Gray, Silty, Clayey Coarse to Fine SAND (Cape Fear Formation)
30.98	26.97	24	40	59		M		
29.45	28.50	6	10	11		M		28.55 / 29.40 — COASTAL PLAINS MATERIAL: Hard, Green-Gray to Tan, Silty, Fine Sandy CLAY (Cape Fear Formation)
27.93	30.02	21	35	45		M		
26.40	31.55	11	16	21		M		
24.88	33.07	17	29	34		M		
23.35	34.60	9	15	17		M		21.39 / 36.56 — Boring Terminated at Elevation 21.39 m in COASTAL PLAINS MATERIAL (Cape Fear Formation)
21.84	36.11	17	25	26		M		

BLOWS PER 30 CM (0 25 50 75 100): 46; 31; 32; 30; 99; 21; 80; 37; 63; 32; 51

Note: Bentonite Mud Slurry Used as Drilling Fluid
Initial Mud Density= 1.02 g/cm^3
Mud Density 9.50m= 1.15g/cm^3
Mud Density 22.0m=1.01g/cm^3

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B4.C	**STATION** 27+89.0	**OFFSET** 2.0m LT	**ALIGNMENT** -RPIBD- — **0 HR.** N/A
COLLAR ELEV. 64.90 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,063.8	**EASTING** 611,849.7 — **24 HR.** N/A
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 10/12/00	**COMP. DATE** 10/12/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
65										
64.90	0.00	5	4	4	8		D/M		64.90 ROADWAY EMBANKMENT FILL: Loose, Tan, Clayey, Fine SAND	0.00
									64.44	0.46
63.83	1.07	2	2	2	4		M		ROADWAY EMBANKMENT FILL: White and Tan, Fine to Coarse SAND with 2-5 mm Rounded and Subrounded Gravel	
									63.62	1.28
62.31	2.59	2	3	3	6		D/M		ROADWAY EMBANKMENT FILL: Soft to Medium Stiff, Red, Silty CLAY with Some Fine to Coarse SAND	
60.79	4.11	2	3	3	6		17.8%			
59.26	5.64	7	6	6	12		M		59.30 ROADWAY EMBANKMENT FILL: Medium Dense, Tan and Orange, Clayey, Fine SAND with Some SILT	5.60
57.74	7.16	5	5	5	10		M		57.74 ALLUVIAL: Medium Dense to Loose, Tan and Gray, Silty, Fine SAND with Rounded to Subrounded 2 to 15 mm Gravel	7.16
56.21	8.69	3	3	4	7		M/W			
54.69	10.21	4	4	3	7		W		54.35 ALLUVIAL: Dark Brown to Gray, Highly Organic, Clayey SILT with Roots and Wood Debris	10.55
53.17	11.73	4	6	9	15		W		53.20 COASTAL PLAINS MATERIAL: Medium Dense, Tan and Orange with Red, Silty, Fine to Coarse SAND with 2-5 mm Rounded Gravel (Middendorf Formation)	11.70
51.64	13.26	9	13	16	29		18.3%		51.70 COASTAL PLAINS MATERIAL: Very Stiff, Gray and Tan with Red, Silty, Clay some Fine to Coarse Sand (Cape Fear Formation)	13.20
50.12	14.78	6	7	10	17		W		50.40 COASTAL PLAINS MATERIAL: Very Stiff, Tan, Fine to Coarse Sandy CLAY (Middendorf Formation)	14.50
48.59	16.31	10	15	21	36		M		48.90 COASTAL PLAINS MATERIAL: Hard, Gray, Silty CLAY with Trace Fine to Coarse SAND (Middendorf Formation)	16.00
47.07	17.83	9	13	19	32		M		47.40 COASTAL PLAINS MATERIAL: Hard, Dark Gray, Fine to Coarse Sandy CLAY with 2-5mm White Subangular Gravel (Middendorf Formation)	17.50
45.55	19.35	5	8	13	21		26.7%		45.60 COASTAL PLAINS MATERIAL: Very Stiff, Gray and Tan, Silty CLAY (Middendorf Formation)	19.30

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B4.C	**STATION** 27+89.0	**OFFSET** 2.0m LT	**ALIGNMENT** -RPIBD- — **0 HR.** N/A
COLLAR ELEV. 64.90 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 151,063.8	**EASTING** 611,849.7 — **24 HR.** N/A
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 10/12/00	**COMP. DATE** 10/12/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
45					Match Line					
44.02	20.88	5	8	9	17		M		44.10 COASTAL PLAINS MATERIAL: Very Stiff, Gray, Fine to Coarse Sandy CLAY with 2-4 mm White Gravel (Middendorf Formation)	20.80
42.50	22.40	5	5	8	13		M		42.50 COASTAL PLAINS MATERIAL: Stiff, Gray, Silty CLAY (Middendorf Formation)	22.40
40.97	23.93	9	12	18	30		W		41.00 COASTAL PLAINS MATERIAL: Medium Dense to Dense, Gray, Clayey, Fine SAND (Middendorf Formation)	23.90
39.45	25.45	24	23	12	35		W		39.30 COASTAL PLAINS MATERIAL: Hard to Very Stiff, Dark Gray with Tan, Fine to Coarse Sandy CLAY with Trace Mica (Cape Fear Formation)	25.60
37.93	26.97	10	12	16	28		W		37.48 Boring Terminated at Elevation 37.48 m in COASTAL PLAINS MATERIAL (Cape Fear Formation)	27.42

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B5-C	**STATION** 28+33.0	**OFFSET** 1.4m RT	**ALIGNMENT** -RPIBD-	**0 HR.** 7.04
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 37.79 m	**NORTHING** 151,037.4	**EASTING** 611,884.9	**24 HR.** 7.04
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic	
START DATE 08/30/00	**COMP. DATE** 09/01/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
65									
64.86	0.00	5	8	7	15				ROADWAY EMBANKMENT FILL: Medium Dense,Tan and Orange, Silty, Fine SAND (0.00)
63.79	1.07	4	7	6	13		D/M		ROADWAY EMBANKMENT FILL: Stiff, Interbedded Red, Silty CLAY and Tan, Silty SAND (1.00)
62.27	2.59	6	12	18	30		M		ROADWAY EMBANKMENT FILL: Medium Dense to Dense, Tan, Silty, Rounded, Fine to Coarse SAND with Clay Masses and Trace Subangular 2-5mm Gravel (2.68)
60.75	4.11	8	16	17	33		M		
59.22	5.64	8	17	21	38		M		ALLUVIAL: Dense, Tan and Red, Coarse, Rounded SAND with Some Fine Sand, Clay Masses and Trace Silt (5.64)
57.70	7.16	12	16	16	32		M/W		ALLUVIAL: Medium Dense, Tan, Silty, Fine to Coarse SAND with 2-15 mm Round Gravel and Clay Masses (7.24)
56.17	8.69	4	8	7	15		M		COASTAL PLAINS MATERIAL: Dense, Tan, Silty, Fine SAND (Middendorf Formation) (8.61)
54.65	10.21	12	19	22	41		W		COASTAL PLAINS MATERIAL: Stiff to Very Stiff, Light Gray, Medium Dense, Fine to Coarse SAND (Middendorf Formation) (10.20)
53.13	11.73	5	8	14	22		20.2%		COASTAL PLAINS MATERIAL: Dense, Orange, Maroon, and Tan; Silty; Fine to Coarse SAND with 2-20 mm Rounded Gravel (Middendorf Formation) (11.80)
51.60	13.26	9	14	21	35		M		COASTAL PLAINS MATERIAL: Very Stiff, Grey and Tan, Silty CLAY with Some Fine Sand (Middendorf Formation) (13.00)
50.08	14.78	8	9	11	20		M		COASTAL PLAINS MATERIAL: Hard to Very Stiff, Tan and Orange, Fine to Coarse Sandy CLAY (Middendorf Formation) (15.80)
48.55	16.31	9	12	22	34		M		COASTAL PLAINS MATERIAL: Hard, Gray, Silty CLAY with Some Fine to Coarse Sand (Middendorf Formation) (17.80)
47.03	17.83	6	8	13	21		M		COASTAL PLAINS MATERIAL: Stiff to Very Stiff; Light Gray to Gray, Maroon, Orange, Brown; Mottled; Fine to Coarse Sandy CLAY with 2-4 mm Subangular to Subrounded White Gravel and Mica (Middendorf Formation)
45.51	19.35	4	6	8	14		M		

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Carr
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B5-C	**STATION** 28+33.0	**OFFSET** 1.4m RT	**ALIGNMENT** -RPIBD-	**0 HR.** 7.04
COLLAR ELEV. 64.86 m	**TOTAL DEPTH** 37.79 m	**NORTHING** 151,037.4	**EASTING** 611,884.9	**24 HR.** 7.04
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic	
START DATE 08/30/00	**COMP. DATE** 09/01/00	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
45					Match Line				
43.98	20.88	13	7	8	15		M		COASTAL PLAINS MATERIAL: Stiff to Very Stiff; Light Gray to Gray, Maroon, Orange, Brown; Mottled; Fine to Coarse Sandy CLAY with 2-4 mm Subangular to Subrounded White Gravel and Mica (Middendorf Formation) *(continued)*
42.46	22.40	4	6	9	15		25.9% M		COASTAL PLAINS MATERIAL: Stiff to Very Stiff; Maroon, Gray and Orange; Mottled; Silty Clay with Trace Mica, Moderately Plastic with Some Fine to Coarse SAND (Middendorf Formation) (22.00)
40.93	23.93	7	10	12	22		M		COASTAL PLAINS MATERIAL: Very Stiff to Hard, Gray and Maroon to Brown, Fine to Coarse Sandy CLAY with Some Silt (Cape Fear Formation) (23.93)
39.41	25.45	6	7	11	18		M		
37.89	26.97	5	10	12	22		M		
36.36	28.50	13	23	34	57		M		COASTAL PLAINS MATERIAL: Hard, Gray and Maroon, Silty CLAY with Some Fine Sand and Some Coarse SAND, Highly Plastic (Cape Fear Formation) (29.50)
34.84	30.02	12	20	30	50		24.2%		COASTAL PLAINS MATERIAL: Hard, Gray to Gray-Green, Fine to Coarse Sandy CLAY with Trace Mica and with 2-5mm White Kaolinite (Cape Fear Formation) (31.50)
33.31	31.55	12	15	22	37		M		
31.79	33.07	17	56	44/7	100/22		M		
30.26	34.60	16	21	27	48		M		COASTAL PLAINS MATERIAL: Very Dense to Dense, Gray-Green and Maroon, Mottled, Clayey, Fine to Coarse SAND with 2-5 mm White Subangular Kaolinite some Silt (Cape Fear Formation) (36.00)
28.75	36.11	30	33	50	83		M		
27.52	37.34	15	17	23	40		M		Boring Terminated at Elevation 37.79 m in COASTAL PLAINS MATERIAL (Cape Fear Formation) (37.79)

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B6-C	**STATION** 28+73.8	**OFFSET** CL	**ALIGNMENT** -RPIBD- — **0 HR.** 7.47
COLLAR ELEV. 64.66 m	**TOTAL DEPTH** 36.29 m	**NORTHING** 151,019.9	**EASTING** 611,921.9 — **24 HR.** 7.13
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/19/07	**COMP. DATE** 06/20/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
65									64.66 / 0.00
63.59	1.07	2	3	4	7	SS-10	M		ROADWAY EMBANKMENT FILL: Loose to Medium Dense, Tan-Orange to Tan, Clayey, Fine to Coarse SAND with Trace Gravel Note: Clay Masses and a Little Wood in Cuttings Below 4.00m
62.07	2.59	7	12	17	29		M		
60.55	4.11	9	13	13	26		M		59.66 / 5.00
59.02	5.64	15	28	32	60		W		ALLUVIAL: Very Dense, Tan, Silty, Fine SAND with Little Wood Debris Note: Blow Influenced by Wood Debris
57.50	7.16	6	8	10	18				57.66 / 7.00
55.97	8.69	10	12	17	29		W		COASTAL PLAINS MATERIAL: Medium Dense, Tan and Red to Gray, Clayey, Fine to Coarse SAND (Middendorf Formation)
54.45	10.21	11	17	21	38		W		54.86 / 9.80
52.93	11.73	3	4	6	10	SS-11	W		COASTAL PLAINS MATERIAL: Dense to Loose, Tan, Coarse SAND (Middendorf Formation)
51.40	13.26	5	13	18	31		M		52.16 / 12.50
49.88	14.78	5	7	8	15		W		COASTAL PLAINS MATERIAL: Hard, Gray and Tan, Coarse to Fine Sandy CLAY (Middendorf Formation)
48.35	16.31	4	8	10	18		M		50.66 / 14.00
46.83	17.83	6	11	14	25		M		COASTAL PLAINS MATERIAL: Medium Dense, Tan, Clayey, Fine to Coarse SAND (Middendorf Formation)
45.31	19.35	6	12	16	28	SS-12	M		49.16 / 15.50 COASTAL PLAINS MATERIAL: Very Stiff, Gray-Tan, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation) 47.16 / 17.50 COASTAL PLAINS MATERIAL: Medium Dense, Gray, Clayey, Fine to Coarse SAND (Middendorf Formation)

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B6-C	**STATION** 28+73.8	**OFFSET** CL	**ALIGNMENT** -RPIBD- — **0 HR.** 7.47
COLLAR ELEV. 64.66 m	**TOTAL DEPTH** 36.29 m	**NORTHING** 151,019.9	**EASTING** 611,921.9 — **24 HR.** 7.13
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/19/07	**COMP. DATE** 06/20/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
45					Match Line				
43.78	20.88	9	18	11	29		M		COASTAL PLAINS MATERIAL: Medium Dense, Gray, Clayey, Fine to Coarse SAND (Middendorf Formation) *(continued)*
42.26	22.40	5	7	9	16	SS-13	23.9%		42.66 / 22.00 COASTAL PLAINS MATERIAL: Very Stiff, Gray and Red, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
40.73	23.93	21	24	18	42		W		41.16 / 23.50 COASTAL PLAINS MATERIAL: Dense, Gray, Clayey, Coarse to Fine SAND (Middendorf Formation)
39.21	25.45	10	8	7	15		M		39.06 / 25.60 COASTAL PLAINS MATERIAL: Stiff to Very Stiff, Tan-Gray, Fine Sandy, Silty CLAY (Cape Fear Formation)
37.69	26.97	5	8	12	20		M		37.86 / 26.80 COASTAL PLAINS MATERIAL: Medium Dense, Gray, Clayey, Coarse to Fine SAND (Cape Fear Formation)
36.16	28.50	24	37	44	81		M		36.76 / 27.90 COASTAL PLAINS MATERIAL: Hard, Gray, Silty, Coarse to Fine Sandy CLAY (Cape Fear Formation)
34.64	30.02	11	20	24	44	SS-14	M		35.16 / 29.50 COASTAL PLAINS MATERIAL: Dense to Medium Dense, Green-Gray and Red, Fine to Coarse SAND (Cape Fear Formation) Note: Losing Mud From 30.00 m to 31.55m, then Mud Returned During Recirculation (Possibly Clay Blocking Off Hole)
33.11	31.55	9	12	15	27		M		
31.59	33.07	18	28	28	56		M		32.16 / 32.50 COASTAL PLAINS MATERIAL: Hard, Gray and Brown, Silty, Coarse to Fine Sandy CLAY (Cape Fear Formation)
30.06	34.60	7	13	15	28		M		30.56 / 34.10 COASTAL PLAINS MATERIAL: Medium Dense, Green-Gray, Coarse To Fine SAND with Little Subangular 2-4 mm Gravel and Trace of Mica (Cape Fear Formation)
28.55	36.11	60	40/3		100/18		M		29.16 / 35.50 COASTAL PLAINS MATERIAL: Very Dense, Gray, Silty, Clayey; Coarse to Fine SAND (Cape Fear Formation) 28.37 / 36.29 Boring Terminated at Elevation 28.37 in COASTAL PLAINS MATERIAL (Cape Fear Formation) Note: Bentonite Mud Slurry Used as Drilling Fluid Initial Mud Density= 1.01 g/cm³ Mud Density at 14.3 m=1.02 g/cm³

NCDOT BORE SINGLE 07107030.GPJ NC_DOT.GDT 8/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B7-C	**STATION** 29+18.0	**OFFSET** CL	**ALIGNMENT** -RPIBD- / **0 HR.** 3.75
COLLAR ELEV. 62.73 m	**TOTAL DEPTH** 25.90 m	**NORTHING** 151,003.3	**EASTING** 611,962.8 / **24 HR.** 4.48
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/27/07	**COMP. DATE** 06/27/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
63									62.73 / 0.00 COASTAL PLAINS MATERIAL: Medium Dense to Loose, Tan and Orange, Silty, Coarse to Fine SAND with Trace of Subrounded Gravel (Middendorf Formation)
61.66	1.07	6	6	6	12		M		
60.14	2.59	3	4	4	8		M		59.23 / 3.50 COASTAL PLAINS MATERIAL: Loose to Medium Dense, Tan and Brown to Red-Tan, Fine to Coarse SAND with Some Rounded Gravel and Fragments of Sandstone (Cemented Sand) (Middendorf Formation)
58.62	4.11	8	5	4	9	SS-15			
57.09	5.64	8	9	8	17	SS-16	W		56.23 / 6.50 COASTAL PLAINS MATERIAL: Medium Dense, Tan, Silty, Clayey, Coarse to Fine SAND (Middendorf Formation)
55.57	7.16	10	12	15	27		W		54.73 / 8.00 COASTAL PLAINS MATERIAL: Very Loose to Medium Dense, Tan, Fine to Coarse SAND (Middendorf Formation)
54.04	8.69	3	1	2	3		W		
52.52	10.21	6	8	7	15		W		51.60 / 11.13 COASTAL PLAINS MATERIAL: Very Stiff, Gray-Tan, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
51.00	11.73	5	8	11	19		W		50.13 / 12.60 COASTAL PLAINS MATERIAL: Hard, Tan and Gray, Coarse to Fine Sandy CLAY (Middendorf Formation)
49.47	13.26	5	13	21	34	SS-17	15.7%		48.53 / 14.20 COASTAL PLAINS MATERIAL: Hard, Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
47.95	14.78	12	16	19	35		M		47.03 / 15.70 COASTAL PLAINS MATERIAL: Medium Dense, Gray, Silty, Clayey, Coarse to Fine SAND (Middendorf Formation)
46.42	16.31	7	9	10	19		M		45.63 / 17.10 COASTAL PLAINS MATERIAL: Very Stiff, Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
44.90	17.83	5	8	11	19		M		43.93 / 18.80 COASTAL PLAINS MATERIAL: Medium Dense, Gray, Silty, Clayey, Fine to Coarse SAND (Middendorf Formation)
43.38	19.35	5	10	12	22	SS-18	M		

NCDOT BORE SINGLE 07107030.GPJ NC_DOT.GDT 8/13/07

SHEET 29

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B7-C	**STATION** 29+18.0	**OFFSET** CL	**ALIGNMENT** -RPIBD- / **0 HR.** 3.75
COLLAR ELEV. 62.73 m	**TOTAL DEPTH** 25.90 m	**NORTHING** 151,003.3	**EASTING** 611,962.8 / **24 HR.** 4.48
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/27/07	**COMP. DATE** 06/27/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
43					Match Line				42.43 / 20.30 COASTAL PLAINS MATERIAL: Very Stiff, Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)
41.85	20.88	5	7	11	18		M		41.03 / 21.70 COASTAL PLAINS MATERIAL: Very Dense to Dense, Light Gray, Silty, Clayey, Coarse to Fine SAND (Middendorf Formation)
40.33	22.40	29	35	36	71		W		
38.80	23.93	11	15	18	33		M		37.93 / 24.80 COASTAL PLAINS MATERIAL: Hard, Gray, Coarse to Fine Sandy, Silty CLAY (Cape Fear Formation)
37.28	25.45	13	18	24	42		M		36.83 / 25.90 Boring Terminated at Elevation 36.83m in COASTAL PLAINS MATERIAL (Cape Fear Formation)

Note: Bentonite Mud Slurry Used as Drilling Fluid
Initial Mud Density=1.03 g/cm^3
Mud Density at 12.00m= 1.13 g/cm^3

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B8-A	**STATION** 29+72.0	**OFFSET** 7.3m LT	**ALIGNMENT** -RPIBD- — **0 HR.** 7.89
COLLAR ELEV. 66.25 m	**TOTAL DEPTH** 25.67 m	**NORTHING** 150,995.4	**EASTING** 612,016.5 — **24 HR.** 7.77
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/26/07	**COMP. DATE** 06/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
67									
65.18	1.07	6	9	12	21		M		COASTAL PLAINS MATERIAL: Medium Dense to Loose, Tan-Orange, Silty, Coarse to Fine SAND with Trace of Quartz Gravel in upper 2.5m (Subrounded to Subangular) (Middendorf Formation)
63.66	2.59	5	4	5	9		M		
62.14	4.11	3	3	4	7		M		
60.61	5.64	1	1	3	4		W		
59.09	7.16	3	4	3	7		W		
57.56	8.69	2	WOH	1	1	SS-19	W		
56.04	10.21	13	13	11	24		W		
54.52	11.73	5	9	4	13	SS-20	W		
52.99	13.26	9	13	10	23		W		
51.47	14.78	9	14	22	36		M		
49.94	16.31	4	6	9	15		M		
48.42	17.83	12	20	24	44		M		
46.90	19.35						M		

Elevation scale: 66.25 (0.00); 59.75 (6.50); 58.25 (8.00); 55.25 (11.00); 52.07 (14.18); 50.65 (15.60); 49.05 (17.20)

COASTAL PLAINS MATERIAL: Loose, Tan and Brown, Fine to Coarse SAND (Middendorf Formation)

COASTAL PLAINS MATERIAL: Very Loose to Medium Dense, Tan, Clayey, Coarse to Fine SAND (Middendorf Formation)

Note: Losing Mud 10.21m to 11.73m

COASTAL PLAINS MATERIAL: Medium Dense, Tan and Red, Fine to Coarse SAND with Trace Clay and Sandstone Fragments (Cemented Sand) (Middendorf Formation)

COASTAL PLAINS MATERIAL: Hard, Gray-Tan, Fine Sandy, Silty CLAY (Middendorf Formation)

COASTAL PLAINS MATERIAL: Medium Dense, Tan, Clayey, Coarse to Fine SAND (Middendorf Formation)

COASTAL PLAINS MATERIAL: Hard to Very Stiff, Tan to Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B8-A	**STATION** 29+72.0	**OFFSET** 7.3m LT	**ALIGNMENT** -RPIBD- — **0 HR.** 7.89
COLLAR ELEV. 66.25 m	**TOTAL DEPTH** 25.67 m	**NORTHING** 150,995.4	**EASTING** 612,016.5 — **24 HR.** 7.77
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/26/07	**COMP. DATE** 06/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
47					Match Line				
45.37	20.88	6	10	13	23		M		COASTAL PLAINS MATERIAL: Hard to Very Stiff, Tan to Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation) *(continued)*
43.85	22.40	5	12	13	25		M		
42.32	23.93	5	9	9	18		M		
40.80	25.45	15	38	62/11	100/26		M		
		58	42/7		100/22				

Elevation scale: 44.55 (21.70); 43.05 (23.20); 42.00 (24.25); 40.58 (25.67)

COASTAL PLAINS MATERIAL: Medium Dense, Gray, Clayey, Coarse to Fine SAND (Middendorf Formation)

COASTAL PLAINS MATERIAL: Hard, Light Gray, Fine Sandy, Silty CLAY (Middendorf Formation)

COASTAL PLAINS MATERIAL: Very Dense, Light Gray, Silty, Clayey, Fine SAND (Middendorf Formation)

Boring Terminated at Elevation 40.58 m in COASTAL PLAINS MATERIAL(Middendorf Formation)

Note: Bentonite Mud Slurry Used as Drilling Fluid
Initial Mud Density= 1.02 g/cm^3
Mud Density at 16.0m=1.04 g/cm^3
Boring Terminated at Elevation 40.58 m

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B9-C	**STATION** 30+17.4	**OFFSET** 4.9m RT	**ALIGNMENT** -RPIBD- / **0 HR.** 7.31
COLLAR ELEV. 68.34 m	**TOTAL DEPTH** 25.90 m	**NORTHING** 150,975.5	**EASTING** 612,058.8 / **24 HR.** 7.62
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/22/07	**COMP. DATE** 06/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
69									68.34 / 0.00
67.27	1.07	5	7	11	18		M		COASTAL PLAINS MATERIAL: Medium Dense, Orange-Tan, Clayey, Silty, Coarse to Fine SAND (Middendorf Formation) — 66.54 / 1.80
65.75	2.59	3	4	7	11	SS-21	29.1%		COASTAL PLAINS MATERIAL: Stiff, Red-Tan, Silty, Fine Sandy CLAY (Middendorf Formation) — 64.84 / 3.50
64.23	4.11	8	10	11	21		M		COASTAL PLAINS MATERIAL: Medium Dense, Orange-Tan, Coarse to Fine SAND (Middendorf Formation) — 63.34 / 5.00
62.70	5.64	3	3	4	7		W		COASTAL PLAINS MATERIAL: Loose, Tan and Red, Silty, Coarse to Fine SAND (Middendorf Formation)
61.18	7.16	3	3	4	7				
59.65	8.69	2	2	3	5		W		58.84 / 9.50
58.13	10.21	2	4	7	11		W		COASTAL PLAINS MATERIAL: Medium Dense, Orange-Tan, Silty, Fine to Coarse SAND with Subangular Gravel 3 to 5mm in Diameter (Middendorf Formation) — 57.34 / 11.00
56.61	11.73	5	5	10	15		W		COASTAL PLAINS MATERIAL: Medium Dense, Orange-Tan, Silty, Coarse to Fine SAND (Middendorf Formation) — 55.34 / 13.00
55.08	13.26	6	13	17	30	SS-22	W		COASTAL PLAINS MATERIAL: Medium Dense to Dense, Orange-Tan, Fine To Coarse SAND with Trace Clay (Middendorf Formation) — 54.24 / 14.10
53.56	14.78	10	15	14	29	SS-23	W		COASTAL PLAINS MATERIAL: Medium Dense, Brown and Tan, Fine to Coarse SAND (Middendorf Formation) — 52.34 / 16.00
52.03	16.31	2	3	6	9		W		COASTAL PLAINS MATERIAL: Stiff, Gray and Tan, Fine Sandy, Silty CLAY (Middendorf Formation) — 51.14 / 17.20
50.51	17.83	7	7	12	19		W		COASTAL PLAINS MATERIAL: Very Stiff, Orange-Tan, Silty, Fine to Coarse Sandy CLAY (Middendorf Formation) — 49.64 / 18.70
48.99	19.35	4	9	15	24		M		COASTAL PLAINS MATERIAL: Very Stiff, Gray, Coarse to Fine Sandy, Silty CLAY (Middendorf Formation)

SHEET 31

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** D. Goodnight
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. B9-C	**STATION** 30+17.4	**OFFSET** 4.9m RT	**ALIGNMENT** -RPIBD- / **0 HR.** 7.31
COLLAR ELEV. 68.34 m	**TOTAL DEPTH** 25.90 m	**NORTHING** 150,975.5	**EASTING** 612,058.8 / **24 HR.** 7.62
DRILL MACHINE CME 850	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 06/22/07	**COMP. DATE** 06/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
49					Match Line				48.14 / 20.20
47.46	20.88	10	13	18	31		M		COASTAL PLAINS MATERIAL: Hard, Gray, Silty, Fine to Coarse Sandy CLAY (Middendorf Formation) — 46.74 / 21.60
45.94	22.40	3	4	7	11		M		COASTAL PLAINS MATERIAL: Stiff, Gray, Coarse to Fine Sandy, Silty CLAY (Middendorf Formation) — 45.04 / 23.30
44.41	23.93	3	6	10	16		M		COASTAL PLAINS MATERIAL: Very Stiff, Gray, Silty, Coarse to Fine Sandy CLAY (Middendorf Formation) — 43.54 / 24.80
42.89	25.45	6	6	12	18		M		COASTAL PLAINS MATERIAL: Very Stiff, Red and Gray, Coarse to Fine Sandy, Silty CLAY (Middendorf Formation) — 42.44 / 25.90
									Boring Terminated at Elevation 42.44 m in COASTAL PLAINS MATERIAL (Middendorf Formation) Note: Bentonite Mud Slurry Used as Drilling Fluid Initial Mud Density= 1.02 g/cm^3 Mud Density at 13.26m=1.06 g/cm^3 Boring Terminated at Elevation 42.44 m

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519 DA	**COUNTY** Cumberland	**GEOLOGIST** CAN
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3-			**GROUND WTR (m)**
BORING NO. EB2-C	**STATION** 30+80.0	**OFFSET** CL	**ALIGNMENT** -RPIBD-
COLLAR ELEV. 68.78 m	**TOTAL DEPTH** 21.33 m	**NORTHING** 150,976.6	**EASTING** 612,121.8
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 63.5kg Automatic
START DATE 05/13/98	**COMP. DATE** 05/13/98	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. 5.15

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
69 / 68.78	0.00							68.78 / 0.00
67.71	1.07	2	2	1		M		COASTAL PLAINS MATERIAL: Very Loose, Tan, Fine to Coarse SAND with Some Silt (Middendorf Formation) — 67.71 / 1.07
66.19	2.59	3	2	3		10.7%		COASTAL PLAINS MATERIAL: Medium Stiff to Stiff, Tan to Black and Gray to Red Brown, Fine to Coarse Sandy CLAY with Some silt (Middendorf Formation)
64.67	4.11	4	5	7		16.1%		
63.14	5.64	3	3	8		31.2%		64.28 / 4.50 — COASTAL PLAINS MATERIAL: Loose to Very Loose,Tan to Red and Brown, Silty, Fine to Coarse SAND with Some Clay (Middendorf Formation)
61.62	7.16	3	3	5		M/W		
60.09	8.69	2	2	3		W		
58.57	10.21	1	1	2		W/S		58.57 / 10.21 — COASTAL PLAINS MATERIAL: Loose to Medium Dense, Tan to Red, Fine to Coarse SAND with Quartz Subrounded Gravel, Some to Trace Clay, and Trace Silt (Middendorf Formation)
57.05	11.73	3	3	4		W/S		
55.52	13.26	4	5	8	SS-27	S		
54.00	14.78	10	9	6	SS-28	S		
52.47	16.31	3	1	10	SS-29	S		
50.95	17.83	4	10	12	SS-30	M		52.11 / 16.67 — COASTAL PLAINS MATERIAL: Medium Dense, Tan, Clayey, Fine to Coarse SAND with Trace Silt (Middendorf Formation) — 51.28 / 17.50
49.43	19.35	6	6	11	SS-31	S		COASTAL PLAINS MATERIAL: Medium Dense to Dense, Gray to Tan and Yellow Brown, Silty, Clayey, Fine to Coarse SAND (Middendorf Formation)
		5	5	9	SS-32	S		

BLOWS PER 30 CM: 0 25 50 75 100

SHEET 32

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2 | ID. U-2519 DA | COUNTY Cumberland | GEOLOGIST CAN
SITE DESCRIPTION Site 10: Bridge on -RPIBD- over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and -TT3- | GROUND WTR (m)
BORING NO. EB2-C | STATION 30+80.0 | OFFSET CL | ALIGNMENT -RPIBD- | 0 HR. N/A
COLLAR ELEV. 68.78 m | TOTAL DEPTH 21.33 m | NORTHING 150,976.6 | EASTING 612,121.8 | 24 HR. 5.15
DRILL MACHINE CME-550 | DRILL METHOD Mud Rotary | HAMMER TYPE 63.5kg Automatic
START DATE 05/13/98 | COMP. DATE 05/13/98 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
49								Match Line
47.90	20.88	12	17	25	SS-33	S		47.45 / 21.33 — COASTAL PLAINS MATERIAL: Medium Dense to Dense, Gray to Tan and Yellow Brown, Silty, Clayey, Fine to Coarse SAND (Middendorf Formation) *(continued)*

Boring Terminated at Elevation 47.45 m in COASTAL PLAINS MATERIAL (Middendorf Formation)

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State Project No. 34817.1.2
TIP No. U-2519DA F.A. No. NHF-DPR-0100(1)
Fayetteville Outer Loop Between Sr 1415 and NC 24
Site 10: Bridge on –RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and –TT3-
Cumberland County, North Carolina
SUMMARY OF LABORATORY TEST DATA

						Atterberg Limits			Gradation Results							
Boring Number	Sample Depth (m)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ 0.30m)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
B1-C	1.07-1.52	SS-1	-	A-2-4 (0)	9	14	NP	NP	87	60	18	84	51	30	3	16
B1-C	10.21-10.66	SS-2	-	A-3 (0)	36	14	NP	NP	100	89	8	93	64	29	0	7
B1-C	13.26-13.71	SS-3	18.6	A-6 (13)	28	36	18	18	100	96	79	24	8	16	14	62
B2-C	5.64-6.09	SS-4	-	A-1-b (0)	10	22	NP	NP	93	39	9	92	79	12	0	9
B2-C	14.78-15.23	SS-5	21.9	A-6 (6)	10	34	12	22	100	94	47	59	10	49	10	31
B2-C	22.40-22.85	SS-6	-	A-1-b (0)	17	18	NP	NP	97	33	2	99	87	12	0	1
B3-C	1.07-1.52	SS-7	-	A-1-b (0)	1	13	NP	NP	99	49	10	91	77	14	1	8
B3-C	2.59-3.04	Total Organic Content = 2.23%														
B3-C	14.78-15.23	SS-8	-	A-2-6 (0)	15	34	16	18	99	60	27	73	61	12	5	22
B3-C	19.36-19.80	SS-9	19.3	A-6 (11)	57	38	22	16	100	94	74	30	11	19	36	34
B6-C	1.07-1.52	SS-10	-	A-2-4 (0)	7	27	20	7	96	67	32	71	44	26	1	29
B6-C	11.73-12.18	SS-11	-	A-1-b (0)	10	13	NP	NP	100	23	5	95	92	3	0	5
B6-C	19.35-19.80	SS-12	-	A-2-6 (0)	28	36	18	18	95	35	27	74	65	8	2	25
B6-C	22.40-22.85	SS-13	23.9	A-6 (11)	16	39	20	19	99	89	66	37	15	21	18	46
B6-C	30.02-30.47	SS-14	-	A-2-7 (0)	44	49	23	26	100	55	13	90	59	31	6	4
B7-C	4.11-4.56	SS-15	-	A-1-b (0)	9	14	NP	NP	79	34	11	91	71	17	5	7
B7-C	5.64-6.09	SS-16	-	A-1-b (0)	17	18	NP	NP	99	31	5	96	89	7	0	4
B7-C	13.26-13.71	SS-17	15.7	A-7-5 (9)	34	54	33	21	100	99	52	50	8	42	3	47
B7-C	19.35-19.80	SS-18	-	A-2-6 (0)	22	36	17	19	98	34	15	85	76	9	7	8

* SS = Split-Barrel Sample (ASTM-D-1586)
** G = Grab Sample
NP -- Non Plastic NA-- Non Applicable
dot – lab testing performed by the NCDOT for borings drilled by the NCDOT

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-07-019 Page: 1 of 2

State Project No. 34817.1.2
TIP No. U-2519DA F.A. No. NHF-DPR-0100(1)
Fayetteville Outer Loop Between Sr 1415 and NC 24
Site 10: Bridge on –RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, and –TT3-
Cumberland County, North Carolina
SUMMARY OF LABORATORY TEST DATA

						Atterberg Limits			Gradation Results							
Boring Number	Sample Depth (m)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ 0.30m)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
B8-A	8.69-9.14	SS-19	-	A-2-4 (0)	1	18	NP	NP	99	85	21	81	25	56	1	18
B8-A	11.73-12.18	SS-20	-	A-1-b (0)	13	14	NP	NP	92	26	6	94	88	6	0	6
B9-C	2.59-3.04	SS-21	29.1	A-7-5	11	55	32	23	100	99	82	23	2	21	9	68
B9-C	13.26-13.71	SS-22	-	A-3 (0)	30	14	NP	NP	99	55	9	93	75	17	0	8
B9-C	14.78-15.23	SS-23	-	A-1-b (0)	29	15	NP	NP	95	43	8	93	73	20	1	6
SBK-1	0.00-0.20	G-1	-	A-2-4 (0)	NA	29	NP	NP	100	82	27	75	40	35	11	14
SBD-1	0.00-0.20	G-2	-	A-1-b (0)	NA	10	NP	NP	80	20	1	100	96	4	0	0
EB1-C	20.88-21.33	SS-24 dot	11.0	A-7-6 (2)	31	57	23	34	92	41	29	69	62	7	1	30
EB1-C	22.40-22.85	SS-25 dot	13.3	A-6 (5)	25	33	14	19	100	88	47	56	31	25	10	34
EB1-C	23.93-24.38	SS-26 dot	-	A-2-4 (0)	27	32	NP	NP	100	79	15	88	50	38	1	11
EB2-C	11.73-12.18	SS-27 dot	-	A-1-b (0)	13	20	NP	NP	99	44	9	91	83	8	2	7
EB2-C	13.26-13.71	SS-28 dot	-	A-1-b (0)	15	21	18	3	86	20	7	92	84	8	1	7
EB2-C	14.78-15.23	SS-29 dot	-	A-1-b (0)	11	20	NP	NP	99	42	10	91	77	14	2	7
EB2-C	16.67-17.12	SS-30 dot	-	A-2-4 (0)	22	22	17	5	97	51	22	80	65	15	6	14
EB2-C	17.83-18.28	SS-31 dot	-	A-2-6 (0)	17	32	20	12	100	79	31	70	45	25	18	12
EB2-C	19.35-19.80	SS-32 dot	-	A-2-6 (0)	14	38	18	20	99	54	25	76	64	12	10	14
EB2-C	20.88-21.33	SS-33 dot	-	A-2-6 (0)	42	31	17	14	99	68	33	68	51	17	16	16

* SS = Split-Barrel Sample (ASTM-D-1586)
** G = Grab Sample
NP -- Non Plastic NA-- Non Applicable
dot – lab testing performed by the NCDOT for borings drilled by the NCDOT

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-07-019 Page: 2 of 2

SHEET 33

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34817.1.2 TIP: U-2519DA COUNTY: Cumberland

DESCRIPTION(1): Site 10: Bridge on -RP1BD- Over Beaver Creek, -COL1-, -COL2-, -Y1-, -LP1B-, -LP1D-, & -TT3-

EXISTING BRIDGE

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

Bridge No.: ? Length: 41.1m Total Bents: 4 Bents in Channel: 0 Bents in Floodplain: 4
Foundation Type: Concrete support columns founded on either piles or drilled shafts

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: none evident

Interior Bents: Scour of embankment slope near base of interior bent on the right side of the NBL and on the left side of the SBL with a 1m gap between the ground and the bottom of the DOT fence

Channel Bed: could not be determined

Channel Bank: Some undermining/undercutting of bank upstream and downstream of both bridges except where protected by boulders; some leaning trees where banks sloughing into channel

EXISTING SCOUR PROTECTION

Type(3): Boulders and/or rip rap on slopes and channel beneath bridges; wood timber bulkheads

Extent(4): Directly under bridges, no other slope protection

Effectiveness(5): Banks in the vicinity of the bridges appear to be protected by measures in place

Obstructions(6): Man-made rock waterfall near left edge of SB bridge; some small trees/limbs extend into creek

DESIGN INFORMATION

Channel Bed Material(7): Coarse Sand (A-1-b) with some gravel

Channel Bank Material(8): Silty, Clayey, Fine to Coarse Sand (A-2-4), and Fine to Coarse Sand with trace of Clay (A-1-b)

Channel Bank Cover(9): Hardwood/pines, weeds and grass, vines, briars, small trees and brush

Floodplain Width(10): Approximately 150 meters

Floodplain Cover(11): Swamp/marsh types vegetations

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

Channel Migration Tendency(13): To the south

Observations and Other Comments: Some erosional ravines or dry channels extend down from the dirt road that parallels the creek and runs under both bridges

Reported by: Paul M. Weaver, Trigon Engineering **Date:** 7/25/2007

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

BENTS

Comparison of DSE to Hydraulics Unit theoretical scour:
No Bridge Survey and Hydraulic Report was available as of August 10, 2007.

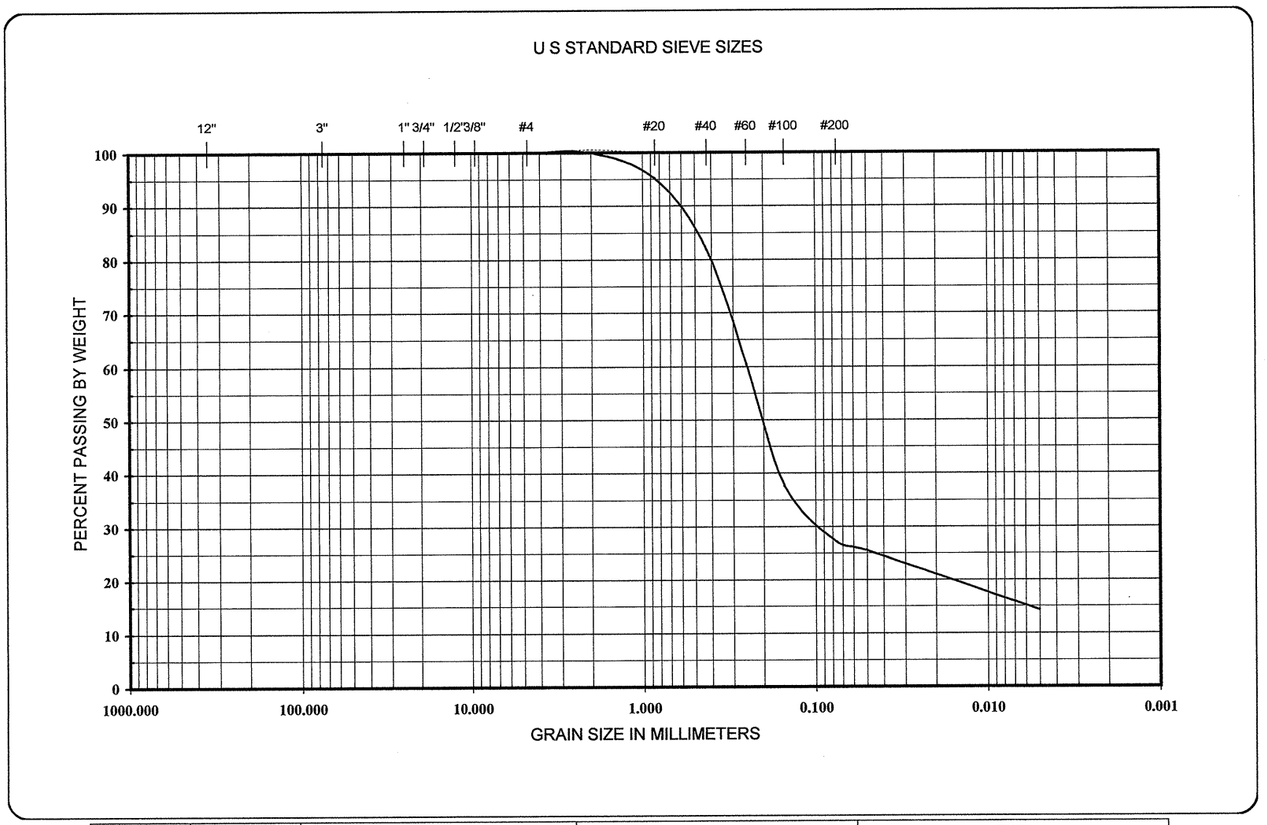
DSE determined by: ____ **Date:** 8/10/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	BANK	BED				
Sample No.	G-1	SS-7	G-2				
Retained #4	0	1	11				
Passed #10	100	99	80				
Passed #40	82	49	20				
Passed #200	27	10	1				
Coarse Sand	40	77	96				
Fine Sand	35	14	4				
Silt	11	1	0				
Clay	14	8	0				
LL	29	13	10				
PI	NP	NP	NP				
AASHTO	A-2-4	A-1-b	A-1-b				
Station	27+70.0	27+40.4	27+70.0				
Offset	CL	CL	15m LT				
Depth	0.00-0.20	1.07-1.52	0.00-0.20				

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.



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
SBK-1	G-1	0.00-0.20	NA	29	NP	NP	ALLUVIAL: Brown, Silty, Clayey, Fine to Coarse SAND (A-2-4)

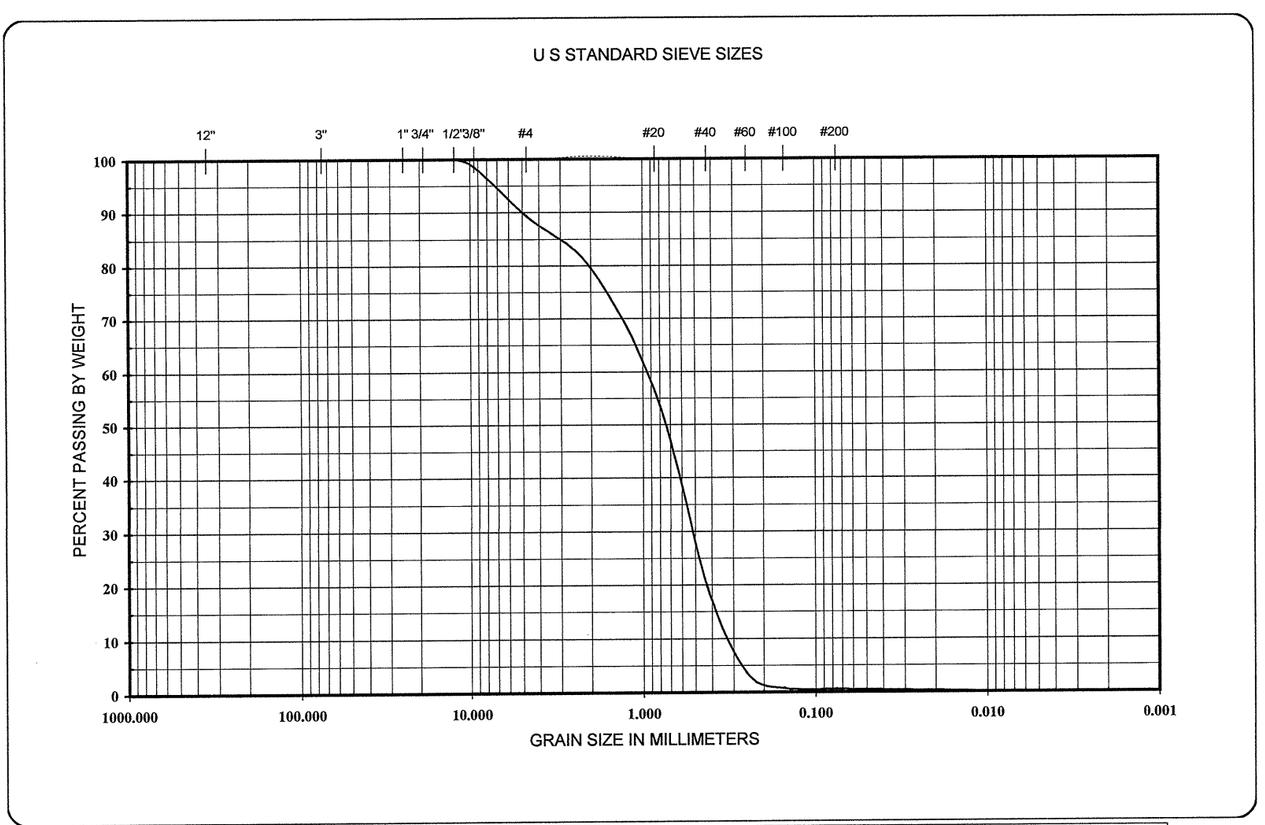
GRAIN SIZE DISTRIBUTION

Structure 10 (U-2519DA)

071-07-030

7/24/2007

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
SBD-1	G-1	0.00-0.20	NA	10	NP	NP	ALLUVIAL: Brown, Coarse SAND (A-1-b)

GRAIN SIZE DISTRIBUTION

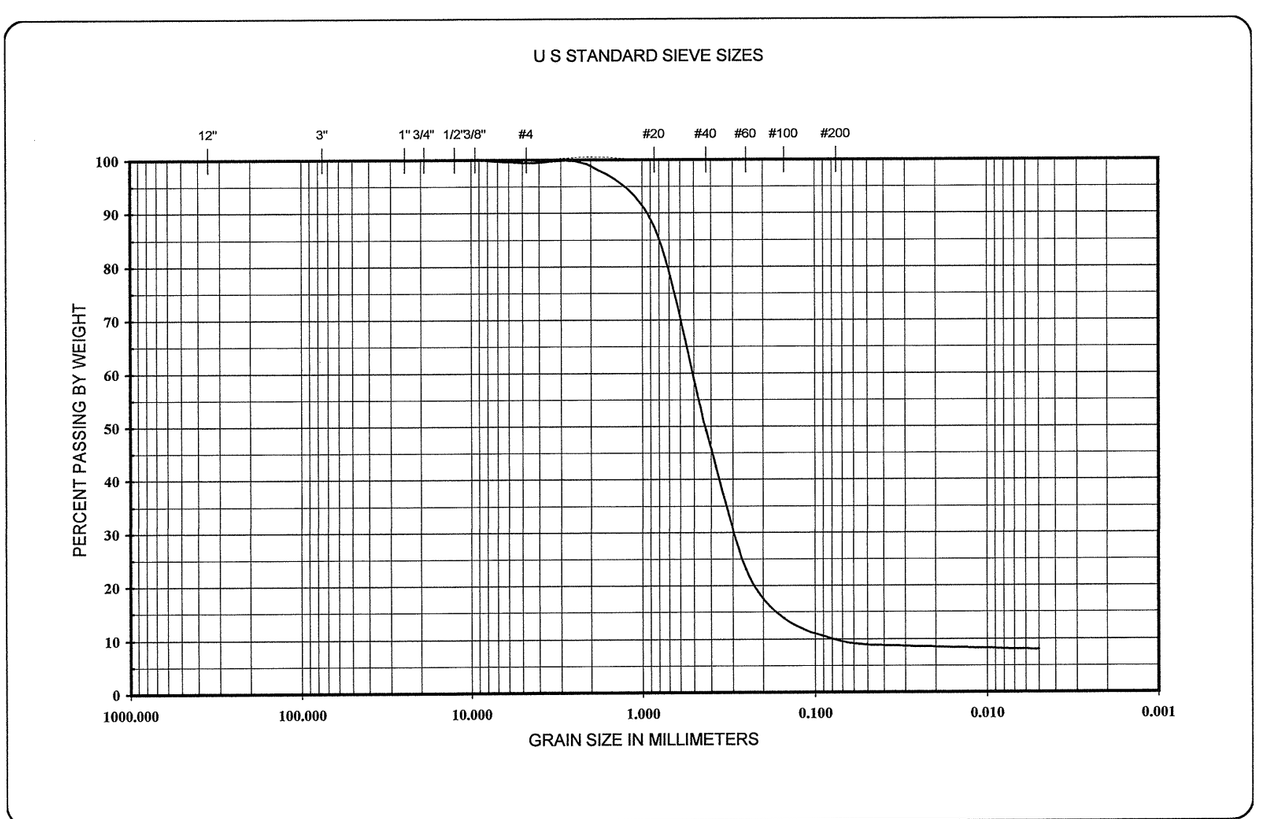
Structure 10 (U-2519DA)

071-07-030

7/24/2007

TRIGON

SHEET 35



BOULDERS	COBBLES	GRAVEL		SAND		FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
B3-C	SS-7	1.07-1.52	NA	13	NP	NP	ALLUVIAL: Tan, Fine to Coarse SAND (A-1-b) with Trace Organics (Wood Debris), Trace Rounded Gravel, and Trace Clay

GRAIN SIZE DISTRIBUTION

Structure 10 (U-2519DA)

071-07-030

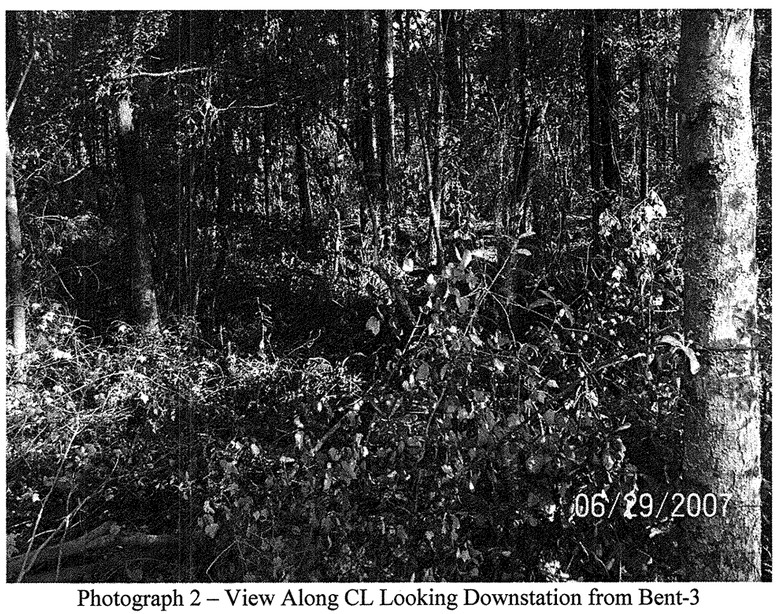
7/24/2007

TRIGON

SHEET 36

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
Page 1 of 12

Photograph 1 – View Along CL Looking Upstation from End Bent-1



Photograph 2 – View Along CL Looking Downstation from Bent-3

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 3 – View Along CL Looking Downstation from Bent-4

Photograph 4 – View Along CL Looking Downstation from Bent-5

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 5 – View Along CL Looking Upstation from Bent-5

Photograph 6 – View Along CL Looking Upstation from Bent-6

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
Page 4 of 12

Photograph 7 – View Along CL Looking Downstation from Bent-9

Photograph 8 – View Along CL Looking Downstation from End Bent-2

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 9 – View Along End Bent-1 Looking Left to Right

Photograph 10 – View Along Bent-1 Looking Right to Left

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 11 – View Along Bent-2 Looking Right to Left

Photograph 12 – View Along Bent-3 Looking Right to Left

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 13 – View Along Bent-4 Looking Left to Right

Photograph 14 – View Along Bent-5 Looking Left to Right

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 15 – View Along Bent-6 Looking Right to Left

Photograph 16 – View Along Bent-7 Looking Left to Right

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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Photograph 17 – View Along Bent-8 Looking Left to Right

Photograph 18 – View Along Bent-9 Looking Right to Left

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
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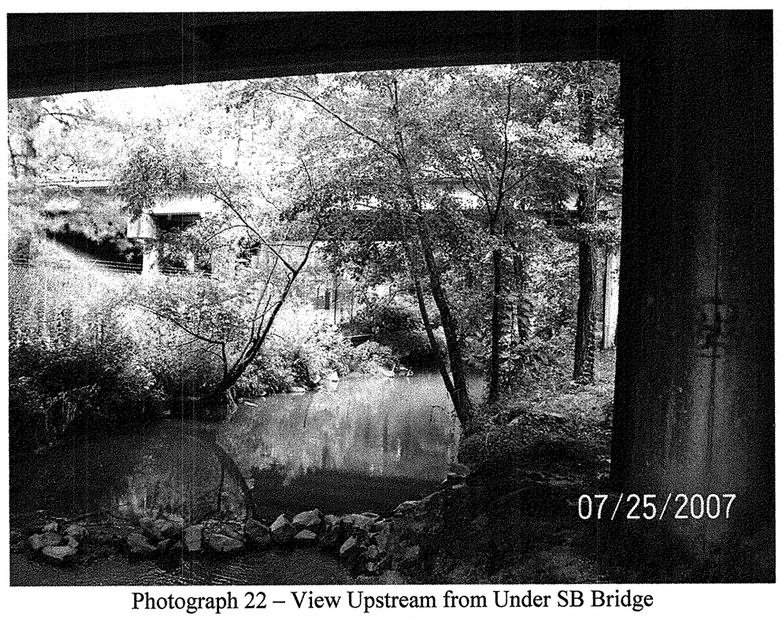
Photograph 19 – View Along End Bent-2 Looking Left to Right

Photograph 20 – View Upstream from Structure 10 CL

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
Page 11 of 12

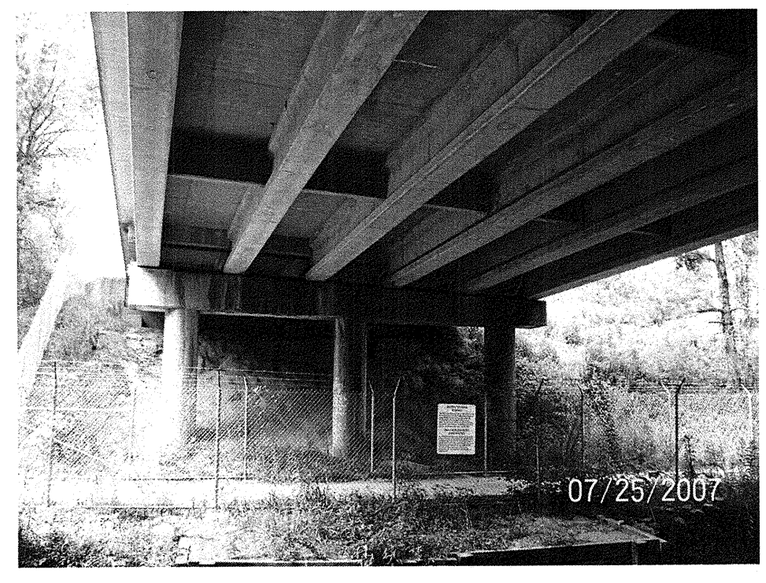
Photograph 21 – View Downstream from Structure 10 CL



Photograph 22 – View Upstream from Under SB Bridge on All American Freeway (-Y1-)

SITE PHOTOGRAPHS
State Project No. 34817.1.2 TIP No. U-2519DA
Site 10: Bridge on -RP1BD-
Cumberland County, North Carolina
Page 12 of 12

Photograph 23 – View of SB Bridge on All American Freeway (-Y1-)



Photograph 24 – View of Underside of SB Bridge on All American Freeway (-Y1-)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519DA)	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 (U-2519DA) F.A. PROJ. DPR-0100(001)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)

SITE DESCRIPTION BRIDGE NO. 376 ON -RP1BD- OVER -COL1- AT STATION 34+21.044

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5	CROSS SECTIONS
6-13	BORE LOG REPORTS
14-15	SOIL TEST RESULTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

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

PERSONNEL

W.N. CHERRY

H.R. CONLEY

C.D. CZAJKA

D.W. DIXON

C.D. HUDSON

K. KUNTUKOVA

R.E. SMITH

INVESTIGATED BY C.D. CZAJKA

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE NOVEMBER 2007

NORTH CAROLINA LICENSED SEAL 1912 GEOLOGIST NEIL T. ROBERSON

10/31/07

DRAWN BY: C.D. CZAJKA & J.R. MATULA

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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: 34817.1.2 ID: U-2519DA

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	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 30 CM 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, SLTY 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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (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
w - 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-45B
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____mm STEEL TEETH
- [ ] TRICONE ____mm 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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM DEEP CAN BE EXCAVATED BY HAND BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

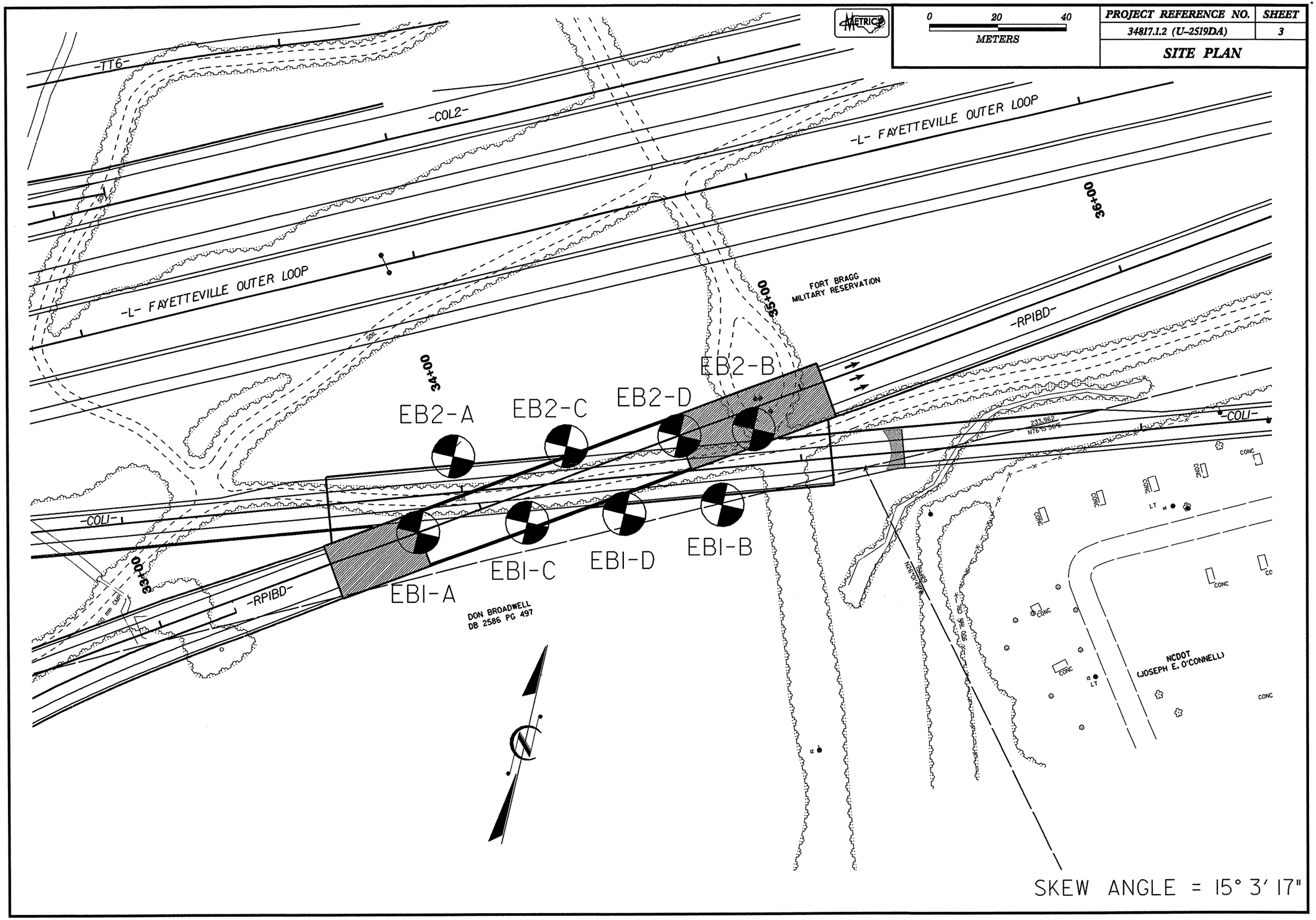
BENCH MARK: BL-18, -L- STATION 34+06.202, 11.696m RT

ELEVATION: 71.317 M

NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	3
SITE PLAN	



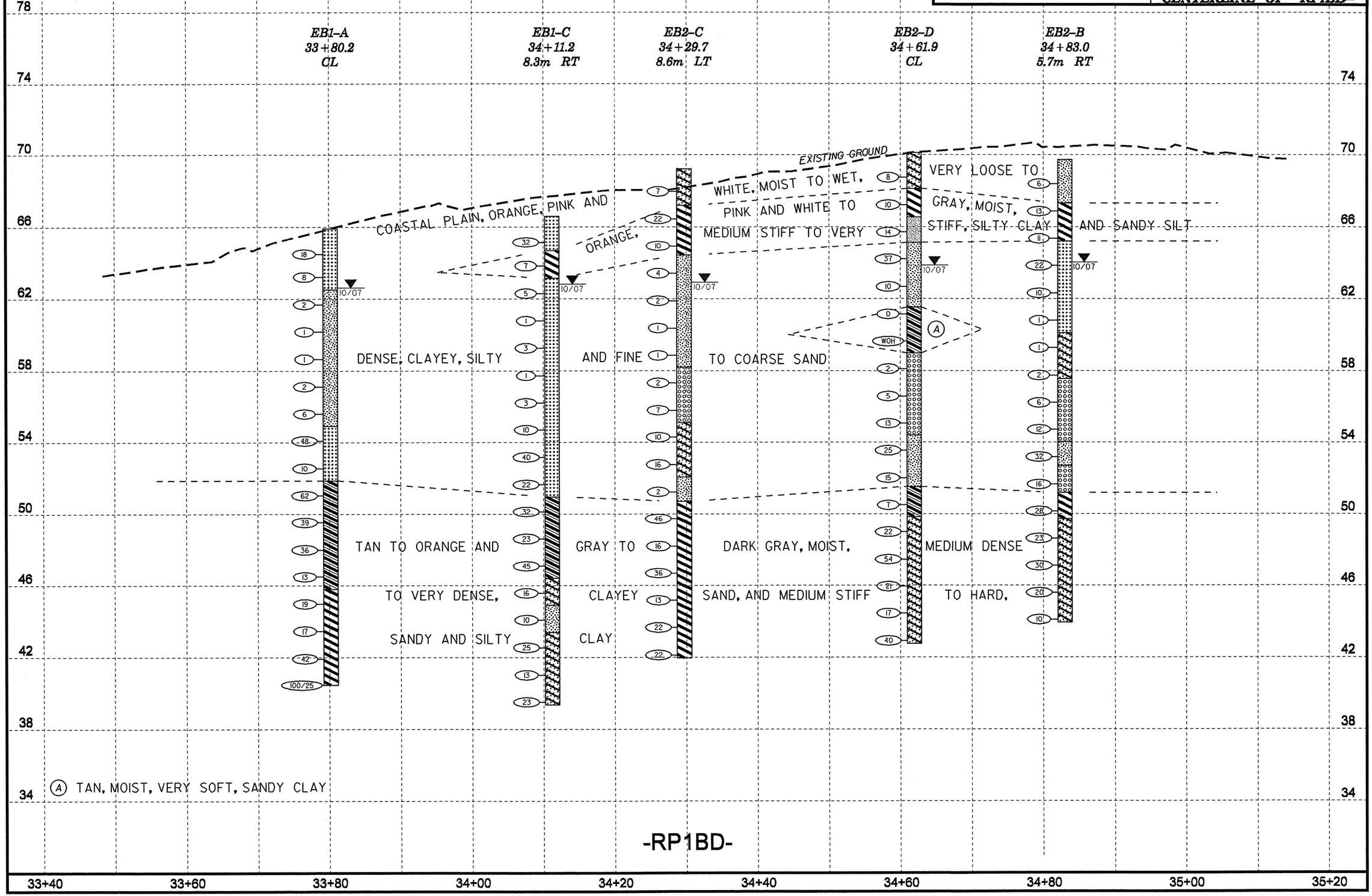
GROUNDLINE PROFILE AT CENTERLINE OF -RP1BD- TAKEN FROM ROADWAY DESIGN PLANS AS OF 09/28/2007

METRIC

0 10 20
METERS
VE = 2.5 : 1

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	4

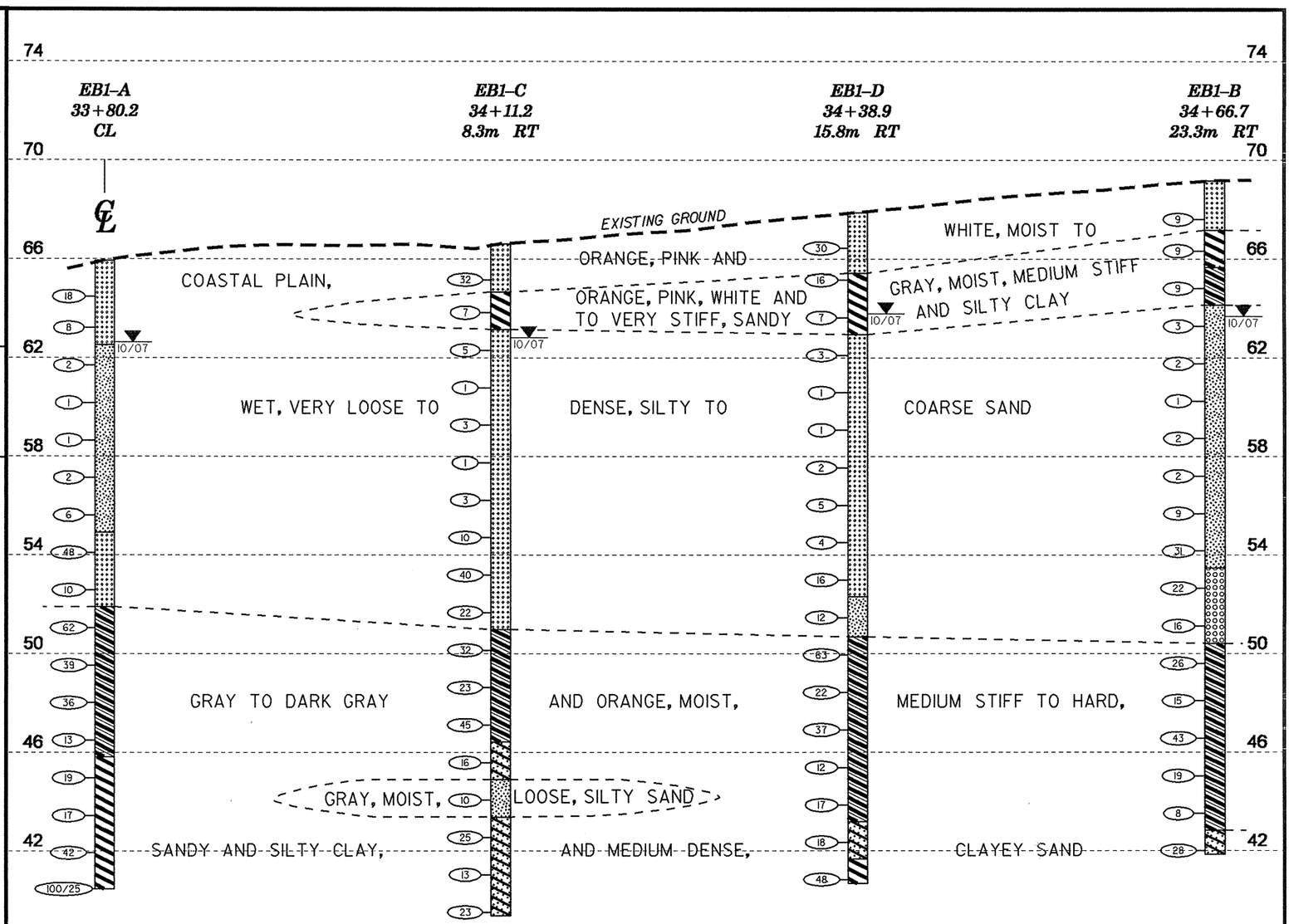
PROFILE ALONG CENTERLINE OF -RP1BD-



HORIZ. SCALE (METERS) 0 8 16

VE = 2:1

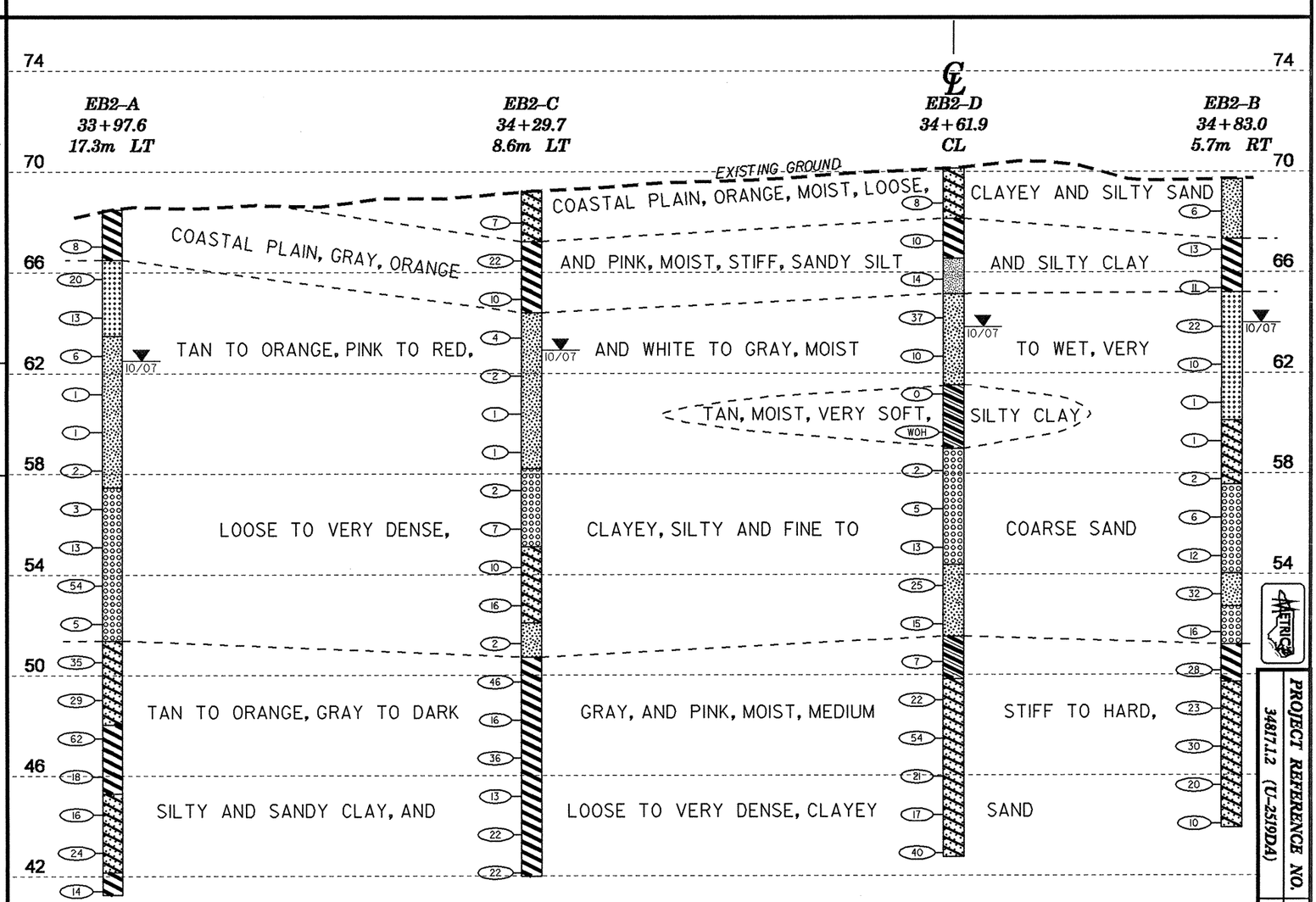
CROSS SECTION THROUGH EB1



HORIZ. SCALE (METERS) 0 8 16

VE = 2:1

CROSS SECTION THROUGH EB2



PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	5

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 33+80.2	**OFFSET** CL	**ALIGNMENT** -RP1BD- — **0 HR.** N/A
COLLAR ELEV. 65.92 m	**TOTAL DEPTH** 25.46 m	**NORTHING** 151,052.7	**EASTING** 612,410.2 — **24 HR.** 3.32
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/11/07	**COMP. DATE** 10/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	66									GROUND SURFACE	65.92	0.00
65	64.77	1.15	4	8	10	18		M		**COASTAL PLAIN** Orange, Pink and White, Fine Sand		
64	63.51	2.41	4	4	4	8		M				
63	61.99	3.93	1	1	1	2	SS-20	W		Orange, Pink and White, Silty Sand	62.52	3.40
62	60.47	5.45	1	0	1	1		W				
61	58.95	6.97	1	1	0	1		W				
60	57.43	8.49	1	1	1	2		W				
59	55.91	10.01	2	3	3	6		W				
58	54.39	11.53	21	25	23	48		W		Orange and Pink, Fine Sand	54.92	11.00
57	52.87	13.05	7	6	4	10		W				
56	51.35	14.57	20	31	31	62	SS-21	M		Gray and Orange, Sandy Clay	51.89	14.03
55	49.83	16.09	10	18	21	39		M				
54	48.31	17.61	10	15	21	36		M				
53	46.79	19.13	5	6	7	13		M			45.81	20.11

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 33+80.2	**OFFSET** CL	**ALIGNMENT** -RP1BD- — **0 HR.** N/A
COLLAR ELEV. 65.92 m	**TOTAL DEPTH** 25.46 m	**NORTHING** 151,052.7	**EASTING** 612,410.2 — **24 HR.** 3.32
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/11/07	**COMP. DATE** 10/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	46					Match Line				
45	45.27	20.65	6	8	11	19	SS-22	M		Dark Gray to Gray, Silty Clay *(continued)*
44	43.75	22.17	5	6	11	17		M		
43	42.23	23.69	15	15	27	42		M		
42	40.71	25.21	10	90/10		100/25	SS-23	M		40.46 — 25.46 Boring Terminated at Elevation 40.46 m in Silty Clay
41										
40										
39										
38										
37										
36										
35										
34										
33										
32										
31										
30										
29										
28										
27										
26										

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 10/30/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 34+66.7	**OFFSET** 23.3m RT	**ALIGNMENT** -RP1BD-	**0 HR.** N/A
COLLAR ELEV. 69.17 m	**TOTAL DEPTH** 27.32 m	**NORTHING** 151,060.6	**EASTING** 612,499.5	**24 HR.** 5.49
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/08/07	**COMP. DATE** 10/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	70										
									GROUND SURFACE	69.17	0.00
									COASTAL PLAIN Orange, Fine Sand		
69											
68	67.90	1.27									
			4	5	4	SS-1	M			67.17	2.00
67									Orange, Silty Clay		
	66.62	2.55									
			2	3	6	SS-2	M			65.65	3.52
66									Gray and Pink, Sandy Clay		
	65.10	4.07									
65			4	4	5	SS-3	M			64.13	5.04
64									Orange, Pink and White, Silty Sand		
	63.58	5.59									
63			1	1	2	SS-4	W				
	62.06	7.11									
62			2	1	1		W				
61											
	60.54	8.63									
60			1	1	0		W				
59	59.02	10.15									
			WOH	1	1		W				
58											
	57.50	11.67									
57			1	1	1		W				
56	55.98	13.19									
			3	5	4		W				
55											
	54.46	14.71									
54			11	15	16	SS-5	M				
53	52.94	16.23								53.48	15.69
									Orange, Pink and White, Coarse Sand		
			10	11	11	SS-6	W				
52											
	51.42	17.75									
51			9	12	4		W				
50	49.90	19.27								50.40	18.77
									Orange and Gray to Dark Gray, Sandy Clay		

BLOWS PER 30 CM: 0 25 50 75 100

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 34+66.7	**OFFSET** 23.3m RT	**ALIGNMENT** -RP1BD-	**0 HR.** N/A
COLLAR ELEV. 69.17 m	**TOTAL DEPTH** 27.32 m	**NORTHING** 151,060.6	**EASTING** 612,499.5	**24 HR.** 5.49
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/08/07	**COMP. DATE** 10/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	50								Match Line		
49			7	12	14	SS-7	M		Orange and Gray to Dark Gray, Sandy Clay *(continued)*		
	48.38	20.79									
48			6	7	8		M				
47	46.86	22.31									
			13	19	24	SS-8	M				
46											
	45.34	23.83									
45			8	9	10		M				
44	43.82	25.35									
			5	4	4		M				
43										42.84	26.33
									Gray, Clayey Sand		
	42.30	26.87									
42			9	13	15	SS-9	M			41.85	27.32
41									Boring Terminated at Elevation 41.85 m in Clayey Sand		
40											
39											
38											
37											
36											
35											
34											
33											
32											
31											
30											

BLOWS PER 30 CM: 0 25 50 75 100

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 10/31/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-C	**STATION** 34+11.2	**OFFSET** 8.3m RT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 66.60 m	**TOTAL DEPTH** 27.25 m	**NORTHING** 151,055.6	**EASTING** 612,442.2 / **24 HR.** 3.81
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/10/07	**COMP. DATE** 10/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
	67									66.60 GROUND SURFACE 0.00
										COASTAL PLAIN Orange, Fine Sand
66	65.45	1.15	14	17	15	32		M		
65	64.12	2.48	3	2	5	7	SS-16A	M		64.66 1.94 White and Red, Silty Clay
64	62.60	4.00	2	2	3	5		W		63.14 3.46 Orange, Pink and White, Fine Sand
63	61.08	5.52	1	0	1	1		W		
62	59.56	7.04	1	1	2	3		W		
61	58.04	8.56	1	0	1	1		W		
60	56.52	10.08	2	1	2	3		W		
59	55.00	11.60	1	2	8	10		W		
58	53.48	13.12	13	22	18	40	SS-17	W		
57	51.96	14.64	6	10	12	22		W		
56	50.44	16.16	8	13	19	32		M		50.98 15.62 Gray and Orange, Sandy Clay
55	48.92	17.68	8	10	13	23		M		
54	47.40	19.20	10	18	27	45		M		

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-C	**STATION** 34+11.2	**OFFSET** 8.3m RT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 66.60 m	**TOTAL DEPTH** 27.25 m	**NORTHING** 151,055.6	**EASTING** 612,442.2 / **24 HR.** 3.81
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/10/07	**COMP. DATE** 10/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
	47					Match Line				46.42 20.18 Gray, Clayey Sand
46	45.88	20.72	6	7	9	16		M		
45	44.36	22.24	5	5	5	10	SS-18	M		44.90 21.70 Gray, Silty Sand
44	42.84	23.76	8	10	15	25		M		43.38 23.22 Gray, Clayey Sand
43	41.32	25.28	7	5	8	13		M		
42	39.80	26.80	6	9	14	23		M		39.35 27.25 Boring Terminated at Elevation 39.35 m in Clayey Sand
41										
40										
39										
38										
37										
36										
35										
34										
33										
32										
31										
30										
29										
28										
27										

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 10/31/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-D	**STATION** 34+38.9	**OFFSET** 15.8m RT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 67.87 m	**TOTAL DEPTH** 27.20 m	**NORTHING** 151,058.1	**EASTING** 612,470.8 / **24 HR.** 4.08
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/09/07	**COMP. DATE** 10/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	68									GROUND SURFACE	67.87	0.00
67	66.73	1.14	5	11	19	30		M		**COASTAL PLAIN** Orange, Fine Sand	65.42	2.45
66	65.44	2.43	3	6	10	16	SS-10	M		Orange, Pink and White, Silty Clay	62.94	4.93
65	63.92	3.95	2	3	4	7	SS-11	M		Orange, Pink and White, Fine Sand		
64	62.40	5.47	2	1	2	3	SS-12	W				
63	60.88	6.99	1	0	1	1		W				
62	59.36	8.51	1	0	1	1		W				
61	57.84	10.03	1	1	1	2		W				
60	56.32	11.55	2	2	3	5		W				
59	54.80	13.07	2	1	3	4		W				
58	53.28	14.59	7	8	8	16		W				
57	51.76	16.11	5	4	8	12	SS-13	W		Orange and Pink, Silty Sand	52.30	15.57
56	50.24	17.63	13	29	34	63	SS-14	M		Gray and Orange, Sandy Clay	50.67	17.20
55	48.72	19.15	8	10	12	22		M				
54												
53												
52												
51												
50												
49												
48												

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB1-D	**STATION** 34+38.9	**OFFSET** 15.8m RT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 67.87 m	**TOTAL DEPTH** 27.20 m	**NORTHING** 151,058.1	**EASTING** 612,470.8 / **24 HR.** 4.08
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/09/07	**COMP. DATE** 10/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	48					Match Line						
47	47.20	20.67	10	16	21	37		M		Gray and Orange, Sandy Clay *(continued)*		
46	45.68	22.19	5	5	7	12		M				
45	44.16	23.71	6	8	9	17		M				
44	42.64	25.23	7	8	10	18	SS-15	M		Gray, Clayey Sand	43.18	24.69
43	41.12	26.75	14	19	29	48	SS-16	M		Gray and Red, Silty Clay	41.66	26.21
42										Boring Terminated at Elevation 40.67 m in Silty Clay	40.67	27.20
41												
40												
39												
38												
37												
36												
35												
34												
33												
32												
31												
30												
29												
28												

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 33+97.6	**OFFSET** 17.3m LT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 68.49 m	**TOTAL DEPTH** 27.22 m	**NORTHING** 151,074.9	**EASTING** 612,420.6 / **24 HR.** 6.04
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/12/07	**COMP. DATE** 10/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
	69									
										68.49 / 0.00 GROUND SURFACE
										COASTAL PLAIN Tan and Orange, Silty Clay
68										
	67.34	1.15								
67			3	4	4	8	SS-24	M		
										66.49 / 2.00
66	66.04	2.45								Tan, Orange and Pink, Fine Sand
			13	12	8	20		M		
65										
	64.52	3.97								
64			3	3	10	13		M		
										63.49 / 5.00
63	63.00	5.49								Orange, Pink and White, Silty Sand
			4	2	4	6	SS-25	W		
62										
	61.48	7.01								
61			1	1	0	1		W		
60	59.96	8.53								
			1	0	1	1		W		
59										
	58.44	10.05								
58			1	1	1	2	SS-26	W		
										57.46 / 11.03
57	56.92	11.57								Orange, White, Pink and Tan, Coarse Sand
			1	1	2	3	SS-27	W		
56										
	55.40	13.09								
55			4	5	8	13		W		
54	53.88	14.61								
			22	26	28	54		W		
53										
	52.36	16.13								
52			8	3	2	5		W		
										51.38 / 17.11
51	50.84	17.65								Gray and Orange, Clayey Sand
			9	15	20	35	SS-28	M		
50										
	49.32	19.17								
49			8	13	16	29		M		

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 33+97.6	**OFFSET** 17.3m LT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 68.49 m	**TOTAL DEPTH** 27.22 m	**NORTHING** 151,074.9	**EASTING** 612,420.6 / **24 HR.** 6.04
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/12/07	**COMP. DATE** 10/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	49					Match Line				
48										Gray and Orange, Clayey Sand *(continued)*
	47.80	20.69								48.04 / 20.45
			18	27	35	62	SS-29	M		Dark Gray to Gray, Silty Clay
47										
	46.28	22.21								
46			5	9	9	18		M		
45										45.30 / 23.19
	44.76	23.73								Gray, Clayey Sand
			4	9	7	16	SS-30	M		
44										
	43.24	25.25								
43			8	10	14	24		M		
42										42.16 / 26.33
	41.72	26.77								Gray and Orange, Silty Clay
			4	6	8	14	SS-31	M		41.27 / 27.22
41										Boring Terminated at Elevation 41.27 m in Silty Clay
40										
39										
38										
37										
36										
35										
34										
33										
32										
31										
30										
29										

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 10/30/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
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PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Kuntukova, Y
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 34+83.0	**OFFSET** 5.7m RT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 69.71 m	**TOTAL DEPTH** 25.78 m	**NORTHING** 151,082.7	**EASTING** 612,507.7 / **24 HR.** 5.70
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/09/07	**COMP. DATE** 10/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	70									69.71 GROUND SURFACE	0.00
69	68.70	1.01	3	3	3	6	SS-100	M		**COASTAL PLAIN** Orange, Silty Sand	
68	67.18	2.53	12	9	4	13	SS-101	M		67.33 Orange, Gray and Pink, Silty Clay	2.38
67	65.66	4.05	8	4	7	11	SS-102	M		65.21 Tan and Pink, Fine Sand	4.50
66	64.14	5.57	5	10	12	22	SS-103	M			
65	62.62	7.09	9	7	3	10		M			
64	61.10	8.61	1	0	1	1	SS-104	M		60.11 Tan and Pink, Clayey Sand	9.60
63	59.58	10.13	1	0	1	1	SS-105	M			
62	58.06	11.65	1	1	1	2		M		57.56 Tan and Pink, Coarse Sand	12.15
61	56.54	13.17	3	3	3	6	SS-106	M			
60	55.02	14.69	8	6	6	12		M		54.04 Gray and Tan, Silty Sand	15.67
59	53.50	16.21	10	18	14	32	SS-107	M		52.71 Gray and Pink, Coarse Sand	17.00
58	51.98	17.73	8	8	8	16	SS-108	M		51.21 Gray, Silty Clay	18.50
57	50.46	19.25	2	12	16	28	SS-109	M		49.71	20.00

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Kuntukova, Y
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 34+83.0	**OFFSET** 5.7m RT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 69.71 m	**TOTAL DEPTH** 25.78 m	**NORTHING** 151,082.7	**EASTING** 612,507.7 / **24 HR.** 5.70
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/09/07	**COMP. DATE** 10/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	50					Match Line				
49	48.94	20.77	8	10	13	23	SS-110	M		Gray and Tan, Clayey Sand *(continued)*
48	47.42	22.29	9	14	16	30		M		
47	45.90	23.81	9	10	10	20		M		
46	44.38	25.33	4	6	4	10	SS-111	M		43.93 Boring Terminated at Elevation 43.93 m in Clayey Sand — 25.78
45										
44										
43										
42										
41										
40										
39										
38										
37										
36										
35										
34										
33										
32										
31										
30										

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NCDOT GEOTECHNICAL ENGINEERING UNIT
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PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Kuntukova, Y
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB2-C	**STATION** 34+29.7	**OFFSET** 8.6m LT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 69.21 m	**TOTAL DEPTH** 27.23 m	**NORTHING** 151,077.8	**EASTING** 612,453.8 / **24 HR.** 6.31
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/11/07	**COMP. DATE** 10/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	70										
										69.21 GROUND SURFACE	0.00
69										**COASTAL PLAIN** Orange, Clayey Sand	
	68.27	0.94									
68			3	3	4	7		M			
67										67.21	2.00
	66.75	2.46								Orange, Pink and Gray, Silty Clay	
66			3	7	15	22	SS-122	M			
65	65.23	3.98									
			2	4	6	10		M			
64										64.41	4.80
	63.71	5.50								Tan and Red, Silty Sand	
63			1	2	2	4		M			
62	62.19	7.02									
			2	1	1	2	SS-123	M			
61	60.67	8.54									
60			1	0	1	1		M			
59	59.15	10.06									
			1	0	1	1		M			
58										58.21	11.00
	57.63	11.58								Tan, Coarse Sand	
57			1	1	1	2		M			
56	56.11	13.10									
			2	3	4	7	SS-124	M			
55										55.11	14.10
	54.59	14.62								Tan and Gray, Clayey Sand	
54			1	4	6	10	SS-125	M			
53	53.07	16.14									
			5	6	10	16		M			
52										52.09	17.12
	51.55	17.66								Tan and Gray, Silty Sand	
51			2	1	1	2	SS-126	M			
										50.71	18.50
50	50.03	19.18								Gray and Tan, Silty Clay	
			15	23	23	46	SS-127	M			

PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland	**GEOLOGIST** Kuntukova, Y
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-			**GROUND WTR (m)**
BORING NO. EB2-C	**STATION** 34+29.7	**OFFSET** 8.6m LT	**ALIGNMENT** -RP1BD- / **0 HR.** N/A
COLLAR ELEV. 69.21 m	**TOTAL DEPTH** 27.23 m	**NORTHING** 151,077.8	**EASTING** 612,453.8 / **24 HR.** 6.31
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/11/07	**COMP. DATE** 10/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	50					Match Line				
49										Gray and Tan, Silty Clay *(continued)*
	48.51	20.70								
48			8	8	8	16		M		
47	46.99	22.22								
			11	16	20	36	SS-128	M		
46										
	45.47	23.74								
45			4	6	7	13		M		
44	43.95	25.26								
			6	10	12	22	SS-129	M		
43										
	42.43	26.78								
42			8	11	11	22		M		41.98 27.23
										Boring Terminated at Elevation 41.98 m in Silty Clay
41										
40										
39										
38										
37										
36										
35										
34										
33										
32										
31										
30										

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NCDOT GEOTECHNICAL ENGINEERING UNIT
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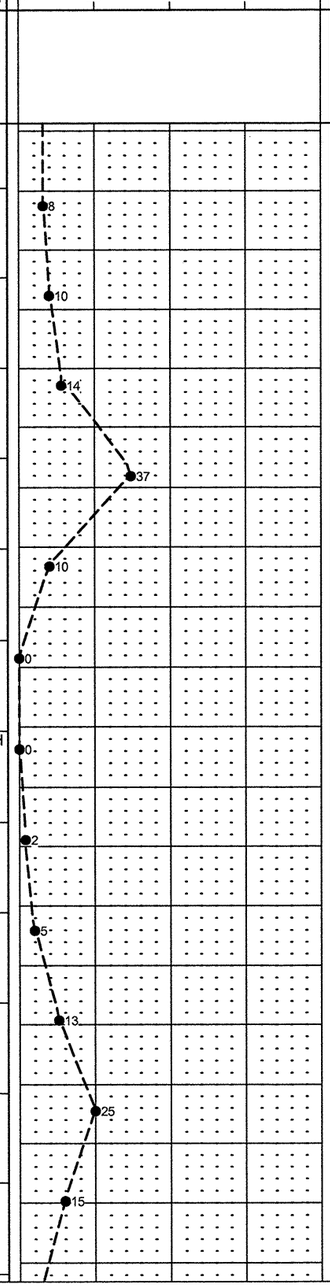
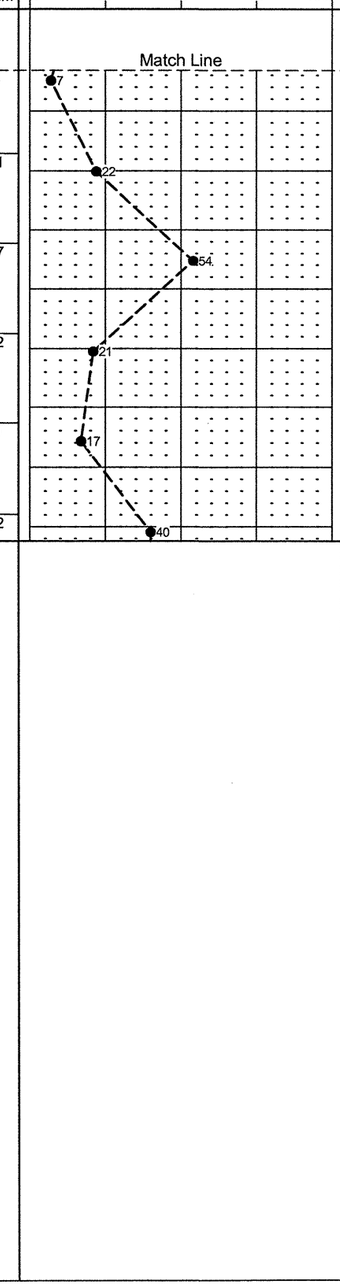
PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland		**GEOLOGIST** Kuntukova, Y
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-				**GROUND WTR (m)**
BORING NO. EB2-D	**STATION** 34+61.9	**OFFSET** CL	**ALIGNMENT** -RP1BD-	**0 HR.** N/A
COLLAR ELEV. 70.13 m	**TOTAL DEPTH** 27.37 m	**NORTHING** 151,080.8	**EASTING** 612,486.9	**24 HR.** 6.30
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 10/10/07	**COMP. DATE** 10/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	71									
70								GROUND SURFACE	70.13	0.00
								COASTAL PLAIN Orange, Clayey Sand		
69	69.05	1.08	3	4	4	SS-112	M			
68	67.53	2.60						Pink, Silty Clay	68.13	2.00
67			7	6	4	SS-113	M			
66	66.01	4.12						Pink and Tan, Sandy Silt	66.55	3.58
65			5	7	7	SS-114	M			
64	64.49	5.64						Light Gray, Silty Sand	65.13	5.00
63			10	17	20	SS-115	M			
62	62.97	7.16					M			
61	61.45	8.68	3	4	6		M	Tan, Sandy Clay	61.53	8.60
60			1	0	0		M			
59	59.93	10.20								
58	58.41	11.72	WOH	WOH	WOH	SS-116	M	Tan, Coarse Sand	58.98	11.15
57	56.89	13.24	1	1	1	SS-117	M			
56	55.37	14.76	2	2	3		M			
55			4	7	6		M			
54	53.85	16.28						Tan and Gray, Silty Sand	54.39	15.74
53	52.33	17.80	13	12	13	SS-118	M			
52			7	7	8		M			
51	50.81	19.32						Gray and Pink, Sandy Clay	51.53	18.60



PROJECT NO. 34817.1.2	**ID.** U-2519DA	**COUNTY** Cumberland		**GEOLOGIST** Kuntukova, Y
SITE DESCRIPTION Bridge No. 376 on -RP1BD- Over -COL1-				**GROUND WTR (m)**
BORING NO. EB2-D	**STATION** 34+61.9	**OFFSET** CL	**ALIGNMENT** -RP1BD-	**0 HR.** N/A
COLLAR ELEV. 70.13 m	**TOTAL DEPTH** 27.37 m	**NORTHING** 151,080.8	**EASTING** 612,486.9	**24 HR.** 6.30
DRILL MACHINE CME-550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 10/10/07	**COMP. DATE** 10/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	SOIL AND ROCK DESCRIPTION
	51							
50			3	3	4	SS-119	M	Gray and Pink, Sandy Clay *(continued)*
49	49.29	20.84	7	11	11	SS-120	M	Gray, Clayey Sand
48	47.77	22.36						
47			12	27	27		M	
46	46.25	23.88						
45			4	9	12		M	
44	44.73	25.40						
43	43.21	26.92	6	8	9	SS-121	M	
42			11	18	22		M	Boring Terminated at Elevation 42.76 m in Clayey Sand
41								
40								
39								
38								
37								
36								
35								
34								
33								
32								
31								



ELEV (m)	DEPTH (m)	LOG
49.83	20.30	
42.76	27.37	

NCDOT BORE DOUBLE U2519DA_GEO_BH.GPJ NC_DOT.GDT 10/30/07

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - Cumberland

EB1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-20	CL	33+80.2	3.93-4.38	A-2-4(0)	20	NP	71.2	17.4	3.3	8.1	96	55	12	-	-
SS-21	CL	33+80.2	14.57-15.02	A-6(6)	32	19	22.8	29.3	15.6	32.3	100	86	52	-	-
SS-22	CL	33+80.2	20.65-21.10	A-7-6(7)	59	39	52.7	11.2	8.9	27.2	99	63	37	-	-
SS-23	CL	33+80.2	25.21-25.46	A-7-6(15)	51	28	18.2	24.8	20.7	36.3	100	88	61	-	-

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	23.3m RT	34+66.7	1.27-1.72	A-3(0)	24	NP	45.2	45.6	1.1	8.1	99	93	10	-	-
SS-2	23.3m RT	34+66.7	2.55-3.00	A-7-6(7)	47	24	40.4	15.7	9.6	34.3	100	76	47	-	-
SS-3	23.3m RT	34+66.7	4.07-4.52	A-6(2)	37	17	43.8	20.2	9.8	26.2	99	72	39	-	-
SS-4	23.3m RT	34+66.7	5.59-6.04	A-2-4(0)	21	NP	36.1	47.0	6.8	10.1	100	83	26	-	-
SS-5	23.3m RT	34+66.7	17.71-15.16	A-2-4(0)	25	9	37.8	33.2	1.7	27.2	100	85	30	-	-
SS-6	23.3m RT	34+66.7	16.23-16.68	A-1-b(0)	19	NP	88.7	5.5	0.7	5.0	100	30	6	-	-
SS-7	23.3m RT	34+66.7	19.27-19.72	A-6(1)	29	13	33.1	30.5	8.2	28.3	96	74	36	-	-
SS-8	23.3m RT	34+66.7	22.31-22.76	A-6(10)	34	18	16.8	18.4	18.5	46.4	100	90	69	-	-
SS-9	23.3m RT	34+66.7	26.87-27.32	A-2-6(1)	39	16	64.7	10.9	14.3	10.1	98	49	26	-	-

EB1-C

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-16A	8.3m RT	34+11.2	2.48-2.93	A-7-5(64)	91	56	3.0	3.2	11.0	82.7	100	98	95	-	-
SS-17	8.3m RT	34+11.2	13.12-13.57	A-3(0)	23	NP	58.3	36.3	3.3	2.0	100	77	7	-	-
SS-18	8.3m RT	34+11.2	22.24-22.69	A-2-4(0)	25	4	68.1	17.8	2.0	12.1	100	62	15	-	-

EB1-D

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-10	15.8m RT	34+38.9	2.43-2.88	A-7-6(20)	57	34	26.4	13.5	13.6	46.4	100	82	63	-	-
SS-11	15.8m RT	34+38.9	3.95-4.40	A-7-6(51)	73	47	3.8	6.3	17.3	72.7	100	97	94	-	-
SS-12	15.8m RT	34+38.9	5.47-5.92	A-3(0)	18	NP	56.1	35.4	1.4	7.1	100	69	10	-	-
SS-13	15.8m RT	34+38.9	16.11-16.56	A-2-4(0)	24	8	85.0	7.9	2.1	5.0	84	22	7	-	-
SS-14	15.8m RT	34+38.9	17.63-18.08	A-6(7)	37	22	36.1	15.7	13.8	34.3	99	73	50	-	-
SS-15	15.8m RT	34+38.9	25.23-25.68	A-2-6(2)	37	21	55.3	11.3	9.2	24.2	98	66	34	-	-
SS-16	15.8m RT	34+38.9	26.75-27.20	A-7-6(23)	51	29	4.6	22.2	20.7	52.5	100	97	79	-	-

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-24	17.3m LT	33+97.6	1.15-1.60	A-7-5(37)	71	37	8.3	9.5	19.7	62.6	100	94	85	-	-
SS-25	17.3m LT	33+97.6	5.49-5.94	A-2-4(0)	25	NP	21.8	67.7	4.4	6.1	100	92	18	-	-
SS-26	17.3m LT	33+97.6	10.05-10.50	A-2-4(0)	21	NP	55.4	29.5	5.0	10.1	99	76	16	-	-
SS-27	17.3m LT	33+97.6	11.57-12.02	A-1-b(0)	19	NP	82.8	8.7	2.4	6.1	94	34	8	-	-
SS-28	17.3m LT	33+97.6	17.65-18.10	A-2-6(1)	28	13	48.0	21.0	7.8	23.2	99	67	33	-	-
SS-29	17.3m LT	33+97.6	20.69-21.14	A-7-6(20)	48	29	12.3	20.0	15.2	52.5	100	94	73	-	-
SS-30	17.3m LT	33+97.6	23.73-24.18	A-2-6(0)	30	15	59.7	18.6	5.5	16.1	96	56	23	-	-
SS-31	17.3m LT	33+97.6	26.77-27.22	A-7-6(31)	52	31	1.6	9.7	24.1	64.6	100	99	92	-	-

EB2-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-100	5.7m RT	34+83.0	1.01-1.46	A-2-4(0)	24	3	57.5	30.2	0.1	12.2	98	64	13	-	-
SS-101	5.7m RT	34+83.0	2.53-2.98	A-7-6(12)	51	29	24.5	24.1	8.8	42.6	96	82	54	-	-
SS-102	5.7m RT	34+83.0	4.05-4.50	A-7-6(14)	44	19	7.5	28.2	17.7	46.6	100	96	75	-	-
SS-103	5.7m RT	34+83.0	5.57-6.02	A-3(0)	16	NP	72.7	23.6	0.6	3.0	100	57	5	-	-
SS-104	5.7m RT	34+83.0	8.61-9.06	A-3(0)	21	NP	51.1	39.3	1.5	8.1	99	79	10	-	-
SS-105	5.7m RT	34+83.0	10.13-10.58	A-2-7(2)	43	28	59.5	17.4	6.9	16.2	100	69	26	-	-
SS-106	5.7m RT	34+83.0	13.17-13.62	A-1-b(0)	22	NP	83.5	9.2	1.2	6.1	92	34	7	-	-
SS-107	5.7m RT	34+83.0	16.21-16.66	A-2-4(0)	20	NP	71.6	16.6	1.6	10.1	98	55	13	-	-
SS-108	5.7m RT	34+83.0	17.73-18.18	A-1-b(0)	21	NP	83.2	9.8	1.9	5.1	90	24	7	-	-
SS-109	5.7m RT	34+83.0	19.25-19.70	A-7-6(35)	64	38	9.1	8.5	11.4	70.9	100	94	84	-	-
SS-110	5.7m RT	34+83.0	20.77-21.22	A-2-7(4)	51	34	58.6	9.6	2.4	29.4	93	52	31	-	-
SS-111	5.7m RT	34+83.0	25.33-25.78	A-2-6(0)	31	11	54.8	21.5	2.4	21.3	99	72	24	-	-

EB2-C

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-122	8.6m LT	34+29.7	2.46-2.91	A-7-6(21)	60	35	24.3	13.6	13.5	48.6	100	87	64	-	-
SS-123	8.6m LT	34+29.7	7.02-7.47	A-2-4(0)	23	NP	36.7	51.7	2.5	9.1	100	84	14	-	-
SS-124	8.6m LT	34+29.7	13.10-13.55	A-1-b(0)	21	NP	87.9	6.2	1.8	4.1	87	23	5	-	-
SS-125	8.6m LT	34+29.7	14.62-15.07	A-2-6(0)	30	15	59.2	18.6	1.9	20.3	100	74	23	-	-
SS-126	8.6m LT	34+29.7	17.66-18.01	A-2-4(0)	24	9	81.5	5.9	4.6	8.1	79	22	11	-	-
SS-127	8.6m LT	34+29.7	19.18-19.63	A-7-6(5)	41	22	39.3	17.3	6.9	36.5	97	71	44	-	-
SS-128	8.6m LT	34+29.7	22.22-22.67	A-7-6(22)	50	32	14.8	15.6	16.9	52.7	100	92	73	-	-
SS-129	8.6m LT	34+29.7	25.26-25.71	A-7-6(12)	60	46	43.6	10.2	6.7	39.5	90	58	43	-	-

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - Cumberland

EB2-D

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-112	CL	34+61.9	1.08-1.53	A-2-6(0)	31	11	42.1	32.8	6.8	18.2	95	67	28	-	-
SS-113	CL	34+61.9	2.60-3.05	A-7-6(43)	77	51	11.6	8.5	13.1	66.9	97	90	79	-	-
SS-114	CL	34+61.9	4.12-4.57	A-4(0)	26	4	3.6	57.5	18.5	20.3	100	99	58	-	-
SS-115	CL	34+61.9	5.64-6.09	A-2-4(0)	22	NP	40.6	52.8	3.5	3.0	100	81	13	-	-
SS-116	CL	34+61.9	10.20-10.65	A-6(3)	32	13	37.1	19.9	18.7	24.3	97	77	47	-	-
SS-117	CL	34+61.9	11.72-12.17	A-1-b(0)	21	3	75.2	12.9	2.8	9.1	100	46	13	-	-
SS-118	CL	34+61.9	16.28-16.73	A-2-4(0)	20	2	66.4	19.1	0.3	14.2	100	68	15	-	-
SS-119	CL	34+61.9	19.32-19.77	A-6(6)	35	21	8.7	43.4	5.4	42.6	100	96	49	-	-
SS-120	CL	34+61.9	20.34-21.29	A-2-7(3)	47	29	58.8	8.7	6.2	26.3	94	53	32	-	-
SS-121	CL	34+61.9	25.40-25.85	A-2-6(0)	37	18	68.8	12.0	2.0	17.2	98	53	20	-	-

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 F.A. PROJ. NHF-DPR-0100(1)

COUNTY CUMBERLAND TIP NO. U-2519DA

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST ON NC 24

SITE DESCRIPTION BRIDGE #375 ON -LPIB- OVER TT3

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	VICINITY MAP
4	SITE PLAN
5	PROFILE
6-9	BORE LOG REPORTS
10	SOIL TEST RESULTS
11-13	SITE PHOTOGRAPHS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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For Letting

INVESTIGATED BY SUMMIT CONSULTING

CHECKED BY DON DEWEY, P.E.

SUBMITTED BY SUMMIT CONSULTING

DATE FEBRUARY 29, 2008

PERSONNEL ANDREW NASH, P.E.
JAY BENALLAL
SCOTT RUSSELL
WILLIAM McCARTHY, P.L.S.
BRAD JENNINGS
TODD PARR
SONNY GROWER
JASON PEGRAM

NORTH CAROLINA PROFESSIONAL SEAL 31022 ENGINEER ANDREW A. NASH 3/24/08

Andrew Nash

DRAWN BY: MIKE BRANDON

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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: 34817.1.2 ID: U-2519DA

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2	2

OF 13

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 30 CM 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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (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
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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
- 25/020 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT 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
w - 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
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] D-50
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 57mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [X] TRICONE 73 mm STEEL TEETH
- [ ] TRICONE ____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] 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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

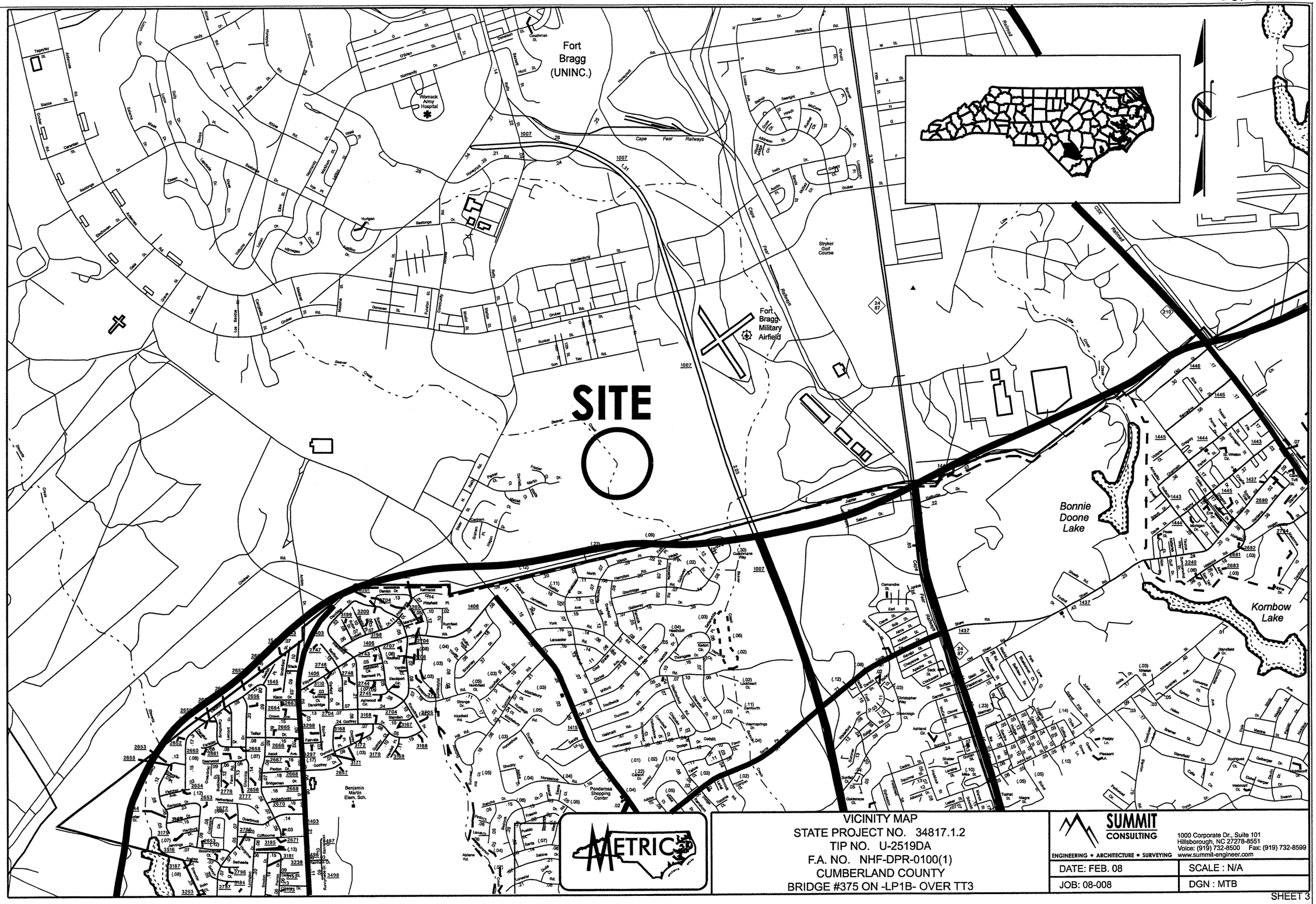
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-11 ....21+16.175

ELEVATION: 63.28 M

NOTES:
-

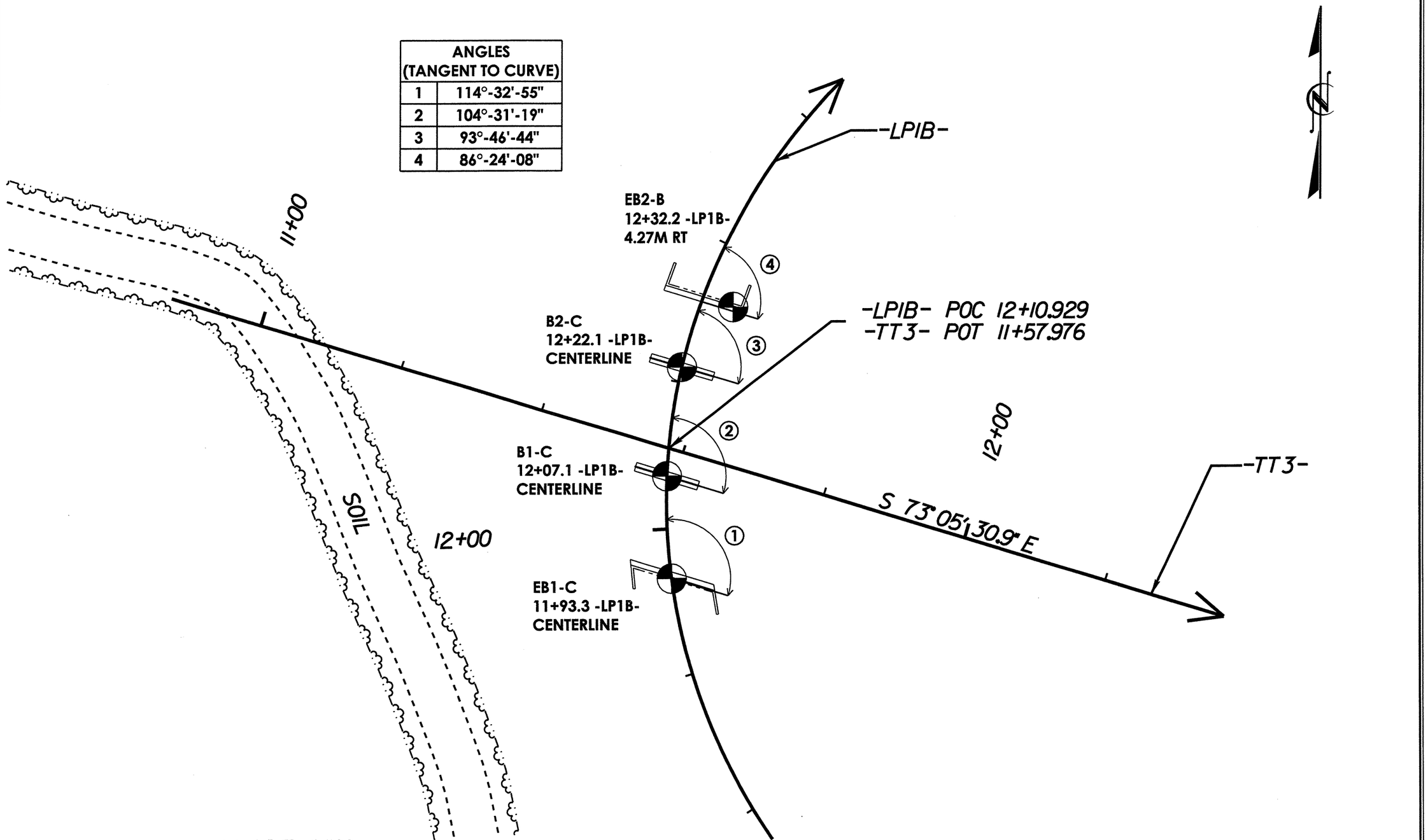


VICINITY MAP
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

SUMMIT CONSULTING
ENGINEERING • ARCHITECTURE • SURVEYING
1000 Corporate Dr., Suite 101
Hillsborough, NC 27278-8551
Voice: (919) 732-8500 Fax: (919) 732-8599
www.summit-engineer.com

DATE: FEB. 08	SCALE : N/A
JOB: 08-008	DGN : MTB

ANGLES (TANGENT TO CURVE)	
1	114°-32'-55"
2	104°-31'-19"
3	93°-46'-44"
4	86°-24'-08"



BORING LOCATION DIAGRAM
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

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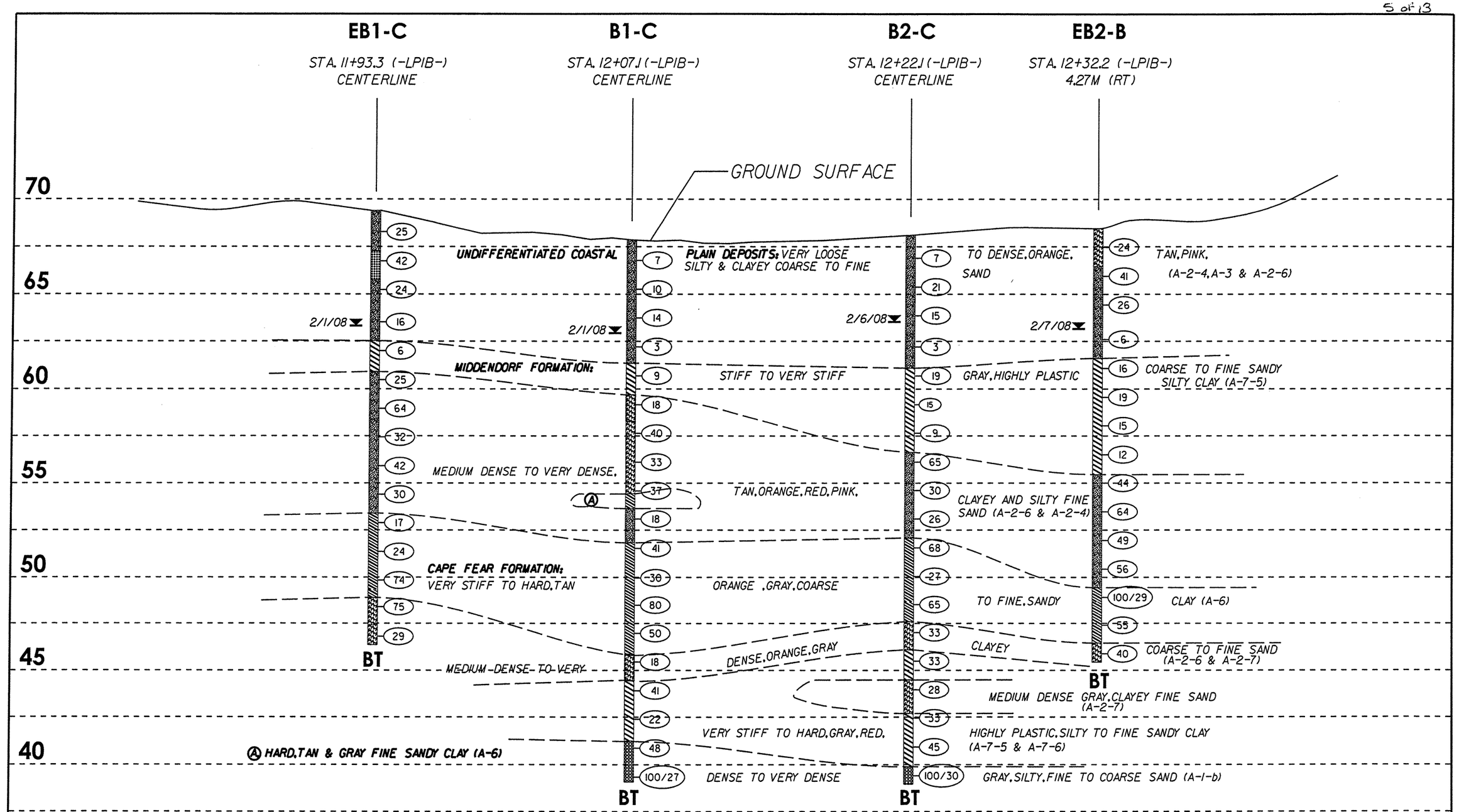
DATE: FEB. 08	SCALE : 1:500
JOB: 08-008	DGN : MTB



NOTE *1: GROUNDLINE PROFILE SURVEYED BY SUMMIT CONSULTINGALONG CENTERLINE OF -LPIB- ON 1/24/2008
NOTE *2: INFERRED STRATIGRAPHY OF BORING EB2-B ONTO CENTERLINE PROFILE.

REVISION: ADJUSTED SCALE
DATE: 04/16/2008

METRIC

PROFILE THROUGH BORINGS ALONG CENTERLINE
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

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DATE: FEB. 08	AS NOTED
JOB: 08-008	DGN : MTB

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. EB1-C (LP1B)	STATION 11+93.3	OFFSET CL	ALIGNMENT -LP1B- / 0 HR. N/M
COLLAR ELEV. 68.74 M	TOTAL DEPTH 23.05 M	NORTHING 151,099.2	EASTING 611,666.8 / 24 HR. 5.90
DRILL MACHINE CME-550	DRILL METHOD 5.7CM HSA & 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (M) / DEPTH (M))
	68.74									68.74 / 0.00 GROUND SURFACE
68										**UNDIFFERENTIATED COASTAL PLAIN DEPOSITS:** MEDIUM DENSE ORANGE SILTY COARSE TO FINE SAND (A-2-4)
	67.61	1.13	10	11	14	25		M		
67										
	66.09	2.65	13	21	21	42		M		66.61 / 2.13 DENSE ORANGE TO TAN SLIGHTLY SILTY FINE SAND (A-3)
66										
	64.57	4.17	13	14	10	24	SS-1	8.6%		65.09 / 3.65 MEDIUM DENSE TAN SILTY COARSE TO FINE SAND (A-2-4) WITH TRACE OF CLAY
65										
64										
	62.86	5.88	8	8	8	16		M		
63										
	61.34	7.40	2	2	4	6		W		61.86 / 6.88 **MIDDENDORF FORMATION:** MEDIUM STIFF GRAY HIGHLY PLASTIC SILTY CLAY (A-7-5)
62										
	59.82	8.92	3	10	15	25		M		60.24 / 8.50 MEDIUM DENSE TAN AND RED SILTY FINE SAND (A-2-4)
61										
	58.30	10.44	21	31	33	64		M		58.74 / 10.00 VERY DENSE TAN AND ORANGE SILTY FINE SAND (A-2-4)
60										
	56.78	11.96	13	15	17	32		M		57.74 / 11.00 MEDIUM DENSE TO DENSE ORANGE, TAN, AND PINK CLAYEY SILTY COARSE TO FINE SAND (A-2-4) WITH CLAY SEAMS
59										
	55.16	13.48	2	17	25	42		M		
58										
	53.74	15.00	12	14	16	30		M		
57										
	52.22	16.52	1	5	12	17		W		52.74 / 16.00 **CAPE FEAR FORMATION:** VERY STIFF TO HARD TAN, ORANGE, AND GRAY FINE SANDY SILTY CLAY (A-6)
56										
	50.70	18.04	9	11	13	24		W		
55										
	49.18	19.56	6	27	47	74	SS-2	16.8%		
54										
53										
52										
51										
50										
49										

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. EB1-C (LP1B)	STATION 11+93.3	OFFSET CL	ALIGNMENT -LP1B- / 0 HR. N/M
COLLAR ELEV. 68.74 M	TOTAL DEPTH 23.05 M	NORTHING 151,099.2	EASTING 611,666.8 / 24 HR. 5.90
DRILL MACHINE CME-550	DRILL METHOD 5.7CM HSA & 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
						MATCH LINE				
48								W		48.24 / 20.50 VERY DENSE ORANGE AND GRAY CLAYEY FINE SAND (A-2-6)
	47.66	21.08	26	36	39	75		W		
47										46.74 / 22.00 MEDIUM DENSE GRAY CLAYEY FINE SAND (A-2-7)
	46.14	22.60	10	13	16	29		W		45.69 / 23.05 BORING TERMINATED AT ELEVATION 45.69 M IN MEDUIM DENSE CLAYEY FINE SAND
46										
45										1) ADVANCED 5.7CM HSA TO 4.17METERS. 2) ADVANCED 7.3 CM TRI-CONE BIT WITH ROTARY WASH BETWEEN 4.17 AND 22.6 METERS. 3) SET 5.63 METERS OF NW CASING. 4) CREEK WATER WITH QUICK GEL ADDED WAS USED AS DRILLING FLUID. 5) DRILLING FLUID DENSITY APPROXIMATELY 10.22 KN/M³ 6) NO LOSS OF DRILLING FLUID OBSERVED.
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NCDOT BORE DOUBLE 08-008G.GPJ NC_DOT.GDT 2/28/08

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. EB2-B (LP1B)	STATION 12+32.2	OFFSET 4.3M RT	ALIGNMENT -LP1B-
COLLAR ELEV. 68.45 M	TOTAL DEPTH 23.02 M	NORTHING 151,136.1	EASTING 611,675.1
DRILL MACHINE CME-550	DRILL METHOD 5.7CM HSA & 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 02/06/08	COMP. DATE 02/06/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

GROUND WTR (M)	
0 HR.	N/M
24 HR.	5.70

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (M)	DEPTH (M)
	68.45									68.45 GROUND SURFACE	0.00
68										**UNDIFFERENTIATED COASTAL PLAIN DEPOSITS:** MEDIUM DENSE ORANGE SILTY CLAYEY FINE SAND (A-2-6)	
	67.47	0.98									
67			7	11	13	24		M			
66	65.95	2.50								66.45 MEDIUM DENSE TO DENSE PINK, LIGHT TAN, AND ORANGE SILTY FINE SAND (A-2-4)	2.00
			14	19	22	41		M			
65											
	64.43	4.02									
64			8	12	14	26		M			
63										63.45 LOOSE TAN AND ORANGE SILTY FINE SAND (A-2-4)	5.00
	62.60	5.85									
62			6	4	2	6		SAT.			
61	61.08	7.37								61.60 **MIDDENDORF FORMATION:** VERY STIFF TO STIFF GRAY HIGHLY PLASTIC FINE SANDY SILTY CLAY (A-7-5) WITH SAND SEAMS	6.85
			3	6	10	16		W			
60											
	59.56	8.89									
59			5	8	11	19		W			
58	58.04	10.41					SS-7				
			4	7	8	15		W			
57											
	56.52	11.93									
56			4	5	7	12		W			
55	55.00	13.45								55.45 DENSE TO VERY DENSE TAN AND ORANGE SILTY FINE SAND (A-2-4) WITH CLAY SEAMS	13.00
			17	24	20	44		M			
54											
	53.48	14.97									
53			21	34	30	64		M			
52	51.96	16.49									
			14	20	29	49		M			
51											
	50.44	18.01									
50			17	21	35	56		M			
49	48.92	19.53								49.45 **CAPE FEAR FORMATION:** HARD TAN AND GRAY SILTY FINE SANDY CLAY (A-6)	19.00
			29	56	44/14						

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. EB2-B (LP1B)	STATION 12+32.2	OFFSET 4.3M RT	ALIGNMENT -LP1B-
COLLAR ELEV. 68.45 M	TOTAL DEPTH 23.02 M	NORTHING 151,136.1	EASTING 611,675.1
DRILL MACHINE CME-550	DRILL METHOD 5.7CM HSA & 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 02/06/08	COMP. DATE 02/06/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

GROUND WTR (M)	
0 HR.	N/M
24 HR.	5.70

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
						MATCH LINE				
48						100/.2		M		HARD TAN AND GRAY SILTY FINE SANDY CLAY (A-6) (CONTINUED)
	47.40	21.05								
47			19	24	31	58		M		
46	45.88	22.57								46.45 DENSE LIGHT GRAY CLAYEY FINE TO COARSE SAND (A-2-7) 22.00
			11	17	23	40	SS-8	M		45.43 BORING TERMINATED AT ELEVATION 45.43 M IN VERY DENSE CLAYEY FINE TO COARSE SAND 23.02
45										1) ADVANCED 5.7CM HSA TO 4.02 METERS. 2) ADVANCED 7.3 CM TRI-CONE BIT WITH ROTARY WASH BETWEEN 4.02 AND 22.57 METERS. 3) SET 5.63 METERS OF NW CASING. 4) CREEK WATER WITH QUICK GEL ADDED WAS USED AS DRILLING FLUID. 5) DRILLING FLUID DENSITY APPROXIMATELY 10.22 KN/M³ 6) NO LOSS OF DRILLING FLUID OBSERVED.
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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. B2-C (LP1B)	STATION 12+22.1	OFFSET CL	ALIGNMENT -LP1B-	0 HR. N/M
COLLAR ELEV. 68.09 M	TOTAL DEPTH 29.13 M	NORTHING 151,127.9	EASTING 611,668.2	24 HR. 5.15
DRILL MACHINE CME-550	DRILL METHOD 5.7CM HSA & 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 02/05/08	COMP. DATE 02/05/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (M)	DEPTH (M)
	68.09									68.09 GROUND SURFACE	0.00
67	66.90	1.19	4	4	3	7		M		**UNDIFFERENTIATED COASTAL PLAIN DEPOSITS:** LOOSE TO MEDIUM DENSE ORANGE AND LIGHT TAN SILTY FINE SAND (A-2-4)	
66	65.38	2.71	7	10	11	21		M			
65	63.86	4.23	5	6	9	15		M			
64	62.21	5.88	2	1	2	3		SAT.		62.84 VERY LOOSE LIGHT TAN, ORANGE, AND RED CLAYEY SILTY FINE SAND (A-2-4)	5.25
63	60.69	7.40	5	8	11	19		W		61.09 **MIDDENDORF FORMATION:** VERY STIFF TO STIFF GRAY HIGHLY PLASTIC FINE SANDY SILTY CLAY (A-7-5)	7.00
62	59.17	8.92	5	7	8	15		W			
61	57.65	10.44	3	3	6	9		W			
60	56.13	11.96	18	34	31	65		M		56.64 VERY DENSE TAN SILTY FINE SAND (A-2-4)	11.45
59	54.61	13.48	8	11	19	30		W		55.09 MEDIUM DENSE TAN AND ORANGE SILTY FINE SAND (A-2-4)	13.00
58	53.09	15.00	16	15	11	26		W		52.09 **CAPE FEAR FORMATION:** VERY STIFF TO HARD LIGHT TAN, GRAY, AND ORANGE COARSE TO FINE SANDY CLAY (A-6)	16.00
57	51.57	16.52	16	29	39	68	SS-5	W			
56	50.05	18.04	8	13	14	27		W			

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. B2-C (LP1B)	STATION 12+22.1	OFFSET CL	ALIGNMENT -LP1B-	0 HR. N/M
COLLAR ELEV. 68.09 M	TOTAL DEPTH 29.13 M	NORTHING 151,127.9	EASTING 611,668.2	24 HR. 5.15
DRILL MACHINE CME-550	DRILL METHOD 5.7CM HSA & 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 02/05/08	COMP. DATE 02/05/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
						MATCH LINE				
48	48.53	19.56	17	27	38	65		W		VERY STIFF TO HARD LIGHT TAN, GRAY, AND ORANGE COARSE TO FINE SANDY CLAY (A-6) (CONTINUED)
47	47.01	21.08	10	16	17	33		M		47.59 DENSE LIGHT GRAY CLAYEY FINE SAND (A-2-6) 20.50
46	45.49	22.60	8	16	17	33		M		46.09 HARD GRAY HIGHLY PLASTIC FINE SANDY CLAY (A-7-5) 22.00
45	43.97	24.12	10	14	14	28		M		44.49 MEDIUM DENSE LIGHT GRAY CLAYEY FINE SAND (A-2-7) 23.60
44	42.45	25.64	12	16	17	33	SS-6	W		42.69 HARD GRAY AND RED HIGHLY PLASTIC SILTY FINE TO COARSE SANDY CLAY (A-7-6) 25.40
43	40.93	27.16	8	18	27	45		W		39.89 VERY DENSE LIGHT GRAY SILTY FINE TO COARSE SAND (A-1-b) 28.20
42	39.41	28.68	27	48	52	100/30		M		38.96 BORING TERMINATED AT ELEVATION 38.96 M IN VERY DENSE SILTY FINE TO COARSE SAND 29.13
41										1) ADVANCED 5.7CM HSA TO 4.23 METERS. 2) ADVANCED 7.3 CM TRI-CONE BIT WITH ROTARY WASH BETWEEN 4.23 AND 28.68 METERS. 3) SET 5.63 METERS OF NW CASING. 4) CREEK WATER WITH QUICK GEL ADDED WAS USED AS DRILLING FLUID. 5) DRILLING FLUID DENSITY APPROXIMATELY 10.22 KN/M³ 6) NO LOSS OF DRILLING FLUID OBSERVED.
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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. B1-C (LP1B)	STATION 12+07.1	OFFSET CL	ALIGNMENT -LP1B-	0 HR. N/M
COLLAR ELEV. 67.85 M	TOTAL DEPTH 28.78 M	NORTHING 151,113.0	EASTING 611,666.2	24 HR. 5.49
DRILL MACHINE CME-550	DRILL METHOD 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 01/29/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (M) / DEPTH (M))
	67.85									67.85 / 0.00 GROUND SURFACE
67	66.78	1.07	4	3	4	7		M		**UNDIFFERENTIATED COASTAL PLAIN DEPOSITS:** MEDIUM DENSE TO LOOSE ORANGE-TAN CLAYEY SILTY FINE SAND (A-2-4) WITH TRACE COARSE SAND
66	65.26	2.59	5	5	5	10		M		
65	63.74	4.11	4	6	8	14		M		
64	62.21	5.64	1	2	1	3		W		62.74 / 5.11 VERY LOOSE LIGHT TAN AND ORANGE CLAYEY SILTY FINE SAND (A-2-4)
63	60.69	7.16	2	4	5	9		W		61.35 / 6.50 **MIDDENDORF FORMATION:** STIFF GRAY HIGHLY PLASTIC COARSE TO FINE SANDY SILTY CLAY (A-7-5)
62	59.16	8.69	5	8	10	18	SS-3	24.1%		59.69 / 8.16 MEDIUM DENSE TO DENSE RED, TAN, AND ORANGE SILTY CLAYEY FINE SAND (A-2-6) WITH SEAMS OF CLAY
61	57.64	10.21	13	20	20	40		M		
60	56.12	11.73	11	13	20	33		M		
59	54.59	13.26	8	12	25	37		W		54.44 / 13.41 HARD LIGHT TAN-GRAY FINE SANDY CLAY (A-6)
58	53.09	14.76	7	10	8	18		M		53.67 / 14.18 MEDIUM DENSE TAN TO ORANGE SILTY FINE SAND (A-2-4)
57	51.54	16.31	13	17	24	41		W		51.85 / 16.00 **CAPE FEAR FORMATION:** VERY STIFF TO HARD LIGHT TAN, GRAY, AND ORANGE COARSE TO FINE SANDY CLAY (A-6)
56	49.97	17.88	11	12	18	30		W		
55	48.50	19.35	20	33	47	80		W		

PROJECT NO. 34817.1.2	ID. U-2519 DA	COUNTY CUMBERLAND	GEOLOGIST A. NASH
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP - BRIDGE #375 ON -LP1B- OVER TANK TRAIL 3 (-TT3-)			GROUND WTR (M)
BORING NO. B1-C (LP1B)	STATION 12+07.1	OFFSET CL	ALIGNMENT -LP1B-	0 HR. N/M
COLLAR ELEV. 67.85 M	TOTAL DEPTH 28.78 M	NORTHING 151,113.0	EASTING 611,666.2	24 HR. 5.49
DRILL MACHINE CME-550	DRILL METHOD 7.3CM TRI-CONE BIT WITH ROTARY WASH		HAMMER TYPE MANUAL
START DATE 01/29/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (M)	DRIVE ELEV (M)	DEPTH (M)	BLOW COUNT 15CM	15CM	15CM	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (M) / DEPTH (M))
						MATCH LINE				
47	46.97	20.88	14	23	27	50		W		VERY STIFF TO HARD LIGHT TAN, GRAY, AND ORANGE COARSE TO FINE SANDY CLAY (A-6) (CONTINUED)
46	45.45	22.40	7	8	10	18		M		45.85 / 22.00 MEDIUM DENSE GRAY SILTY CLAYEY FINE TO COARSE SAND (A-2-7)
45	43.92	23.93	20	20	21	41		W		44.45 / 23.40 VERY STIFF TO HARD LIGHT GRAY HIGHLY PLASTIC FINE SANDY CLAY (A-7-5)
44	42.39	25.46	5	10	12	22		W		41.25 / 26.60 DENSE TO VERY DENSE GRAY SILTY FINE TO COARSE SAND (A-1-b)
43	40.87	26.98	13	19	29	48		M		
42	39.34	28.51	35	65/12		100/27	SS-4	M		39.07 / 28.78 BORING TERMINATED AT ELEVATION 39.07 M IN VERY DENSE SILTY FINE TO COARSE SAND
41										1) ADVANCED 7.3 CM TRI-CONE BIT WITH ROTARY WASH TO 28.51 METERS. 2) SET 5.63 METERS OF NW CASING. 3) CREEK WATER WITH QUICK GEL ADDED WAS USED AS DRILLING FLUID. 4) DRILLING FLUID DENSITY APPROXIMATELY 10.22 KN/M^3 5) NO LOSS OF DRILLING FLUID OBSERVED.
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NCDOT BORE DOUBLE 08-0086.GPJ NC_DOT.GDT 2/28/08

SUMMARY OF LABORATORY RESULTS

BORING NO.	SAMPLE NO.	DEPTH INTERVAL	% PASS #10	% PASS #40	% PASS #200	COARSE	FINE SAND	SILT	CLAY	LL	PI	% MOIST.	AASHTO
EB1–C	SS–1	4.17 – 4.62	99	77	14	41	50	4	5	22	NP	8.6	A–2–4 (0)
EB1–C	SS–2	19.56 – 20.01	100	97	85	5	15	25	55	39	19	16.8	A–6 (16)
B1–C	SS–3	8.69 – 9.14	98	51	32	62	7	7	24	35	15	24.1	A–2–6 (0)
B1–C	SS–4	28.51 – 28.78	91	40	13	71	18	9	2	26	NP	——	A–1–b (0)
B2–C	SS–5	16.52 – 16.97	100	88	48	26	30	13	31	27	11	——	A–6 (2)
B2–C	SS–6	25.64 – 26.09	98	95	78	6	18	10	66	55	34	——	A–7–6 (27)
EB2–B	SS–7	10.41 – 10.86	94	46	29	58	14	0	28	45	27	——	A–7–5 (33)
EB2–B	SS–8	22.57 – 23.02	100	100	98	1	4	21	74	59	27	——	A–2–7 (1)

NP = NON PLASTIC
—— = TEST NOT PERFORMED

LABORATORY RESULTS
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

SUMMIT CONSULTING
ENGINEERING • ARCHITECTURE • SURVEYING
1000 Corporate Dr., Suite 101
Hillsborough, NC 27278-8551
Voice: (919) 732-8500 Fax: (919) 732-8599
www.summit-engineer.com

DATE: FEB. 08 | SCALE : N/A
JOB: 08-008 | DGN : MTB

*1 - LOOKING NORTH @ EBI-C STATION 11+93.3

*2 - LOOKING WEST @ EBI-C STATION 11+93.3

*3 - LOOKING EAST @ EBI-C STATION 11+93.3

*4 - LOOKING WEST @ BI-C STATION 12+07.1

METRIC

BORING LOCATION PHOTOGRAPHS
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

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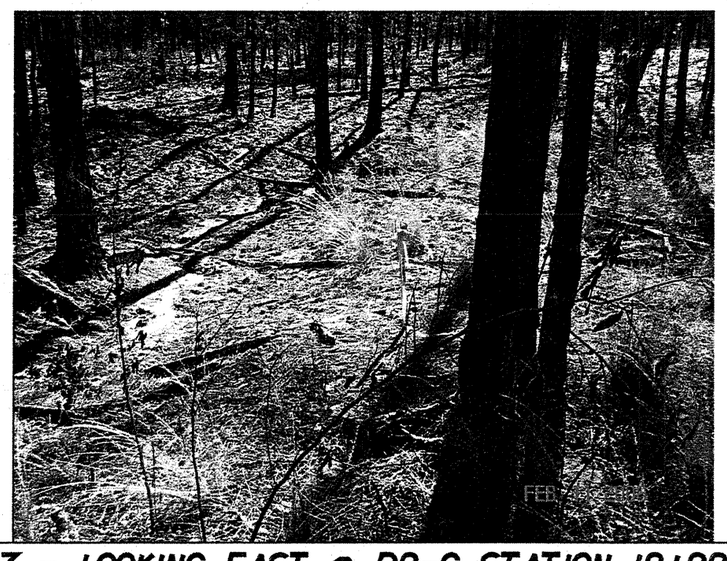
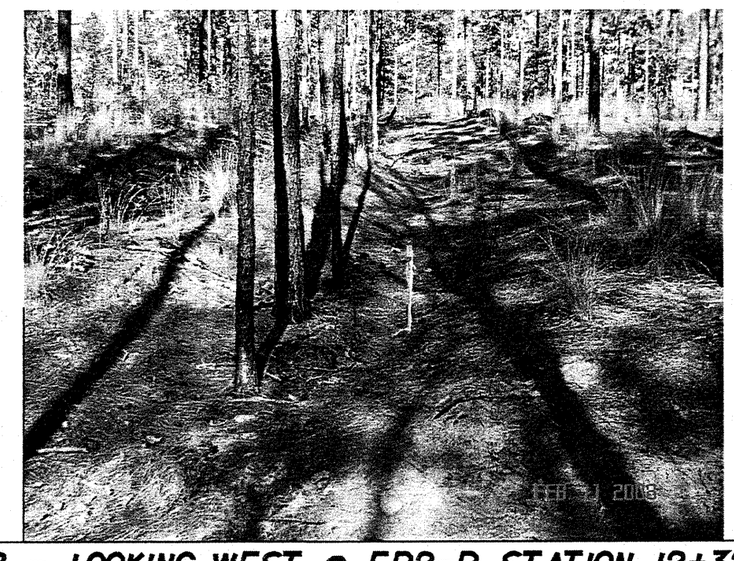
DATE: FEB. 08	SCALE : N/A
JOB: 08-008	DGN : MTB

*5 - LOOKING EAST @ B1-C STATION 12+07J

*6 - LOOKING WEST @ B2-C STATION 12+22J



*7 - LOOKING EAST @ B2-C STATION 12+22J



*8 - LOOKING WEST @ EB2-B STATION 12+32Z

METRIC

BORING LOCATION PHOTOGRAPHS
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

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DATE: FEB. 08	SCALE : N/A
JOB: 08-008	DGN : MTB

#9 - LOOKING EAST @ EB2-B STATION 12+32.2

#10 - LOOKING SOUTH @ EB2-B STATION 12+32.2

METRIC

BORING LOCATION PHOTOGRAPHS
STATE PROJECT NO. 34817.1.2
TIP NO. U-2519DA
F.A. NO. NHF-DPR-0100(1)
CUMBERLAND COUNTY
BRIDGE #375 ON -LP1B- OVER TT3

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DATE: FEB. 08	SCALE : N/A
JOB: 08-008	DGN : MTB

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519DA)	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 (U-2519DA) F.A. PROJ. NHF-DPR-0100(001)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 (CLEARWATER RD.) TO EAST OF NC 24 (BRAGG BLVD.)

SITE DESCRIPTION RETAINING WALL 1 LEFT OF -Y1- STATION 18+00
RETAINING WALL 2 RIGHT OF -COL1- STATION 32+60
RETAINING WALL 3 LEFT OF -COL1- STATION 35+00
NOISE WALL 1 RIGHT OF -L- STATION 10+00
NOISE WALL 2 RIGHT OF -L- STATION 14+40
NOISE WALL 3 RIGHT OF -L- STATION 16+00
NOISE WALL 4 RIGHT OF -L- STATION 21+80

WALL INVENTORY

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

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

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SUBMITTED BY N.T. ROBERSON
DATE MAY, 2007

NORTH CAROLINA LICENSED GEOLOGIST SEAL 1959 CHERYL A. YOUNGBLOOD 5/23/07

PROJECT: 34817.1.2

ID: U-2519DA

DRAWN BY: C.D. CZAJKA, C.A. YOUNGBLOOD, T.T. WALKER

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	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 30 CM 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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 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
w - 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
- [X] CME-550
- [ ] PORTABLE HOIST
- [X] MARSH BUGGY
- [X] CME-45B

ADVANCING TOOLS:
- [X] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [X] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____mm STEEL TEETH
- [ ] TRICONE ____mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [X] 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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK:

ELEVATION: M

NOTES:

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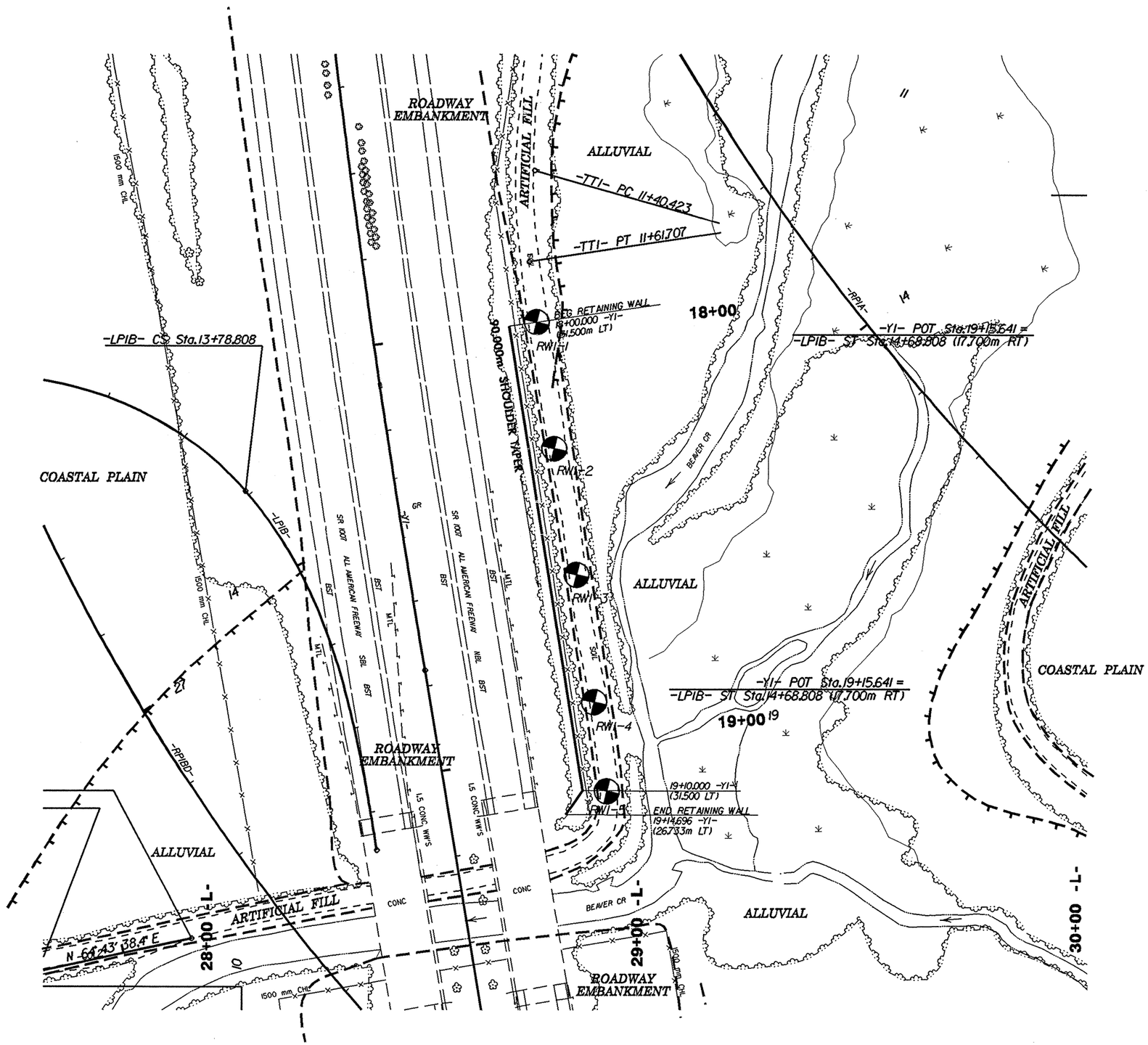
SITE PLAN

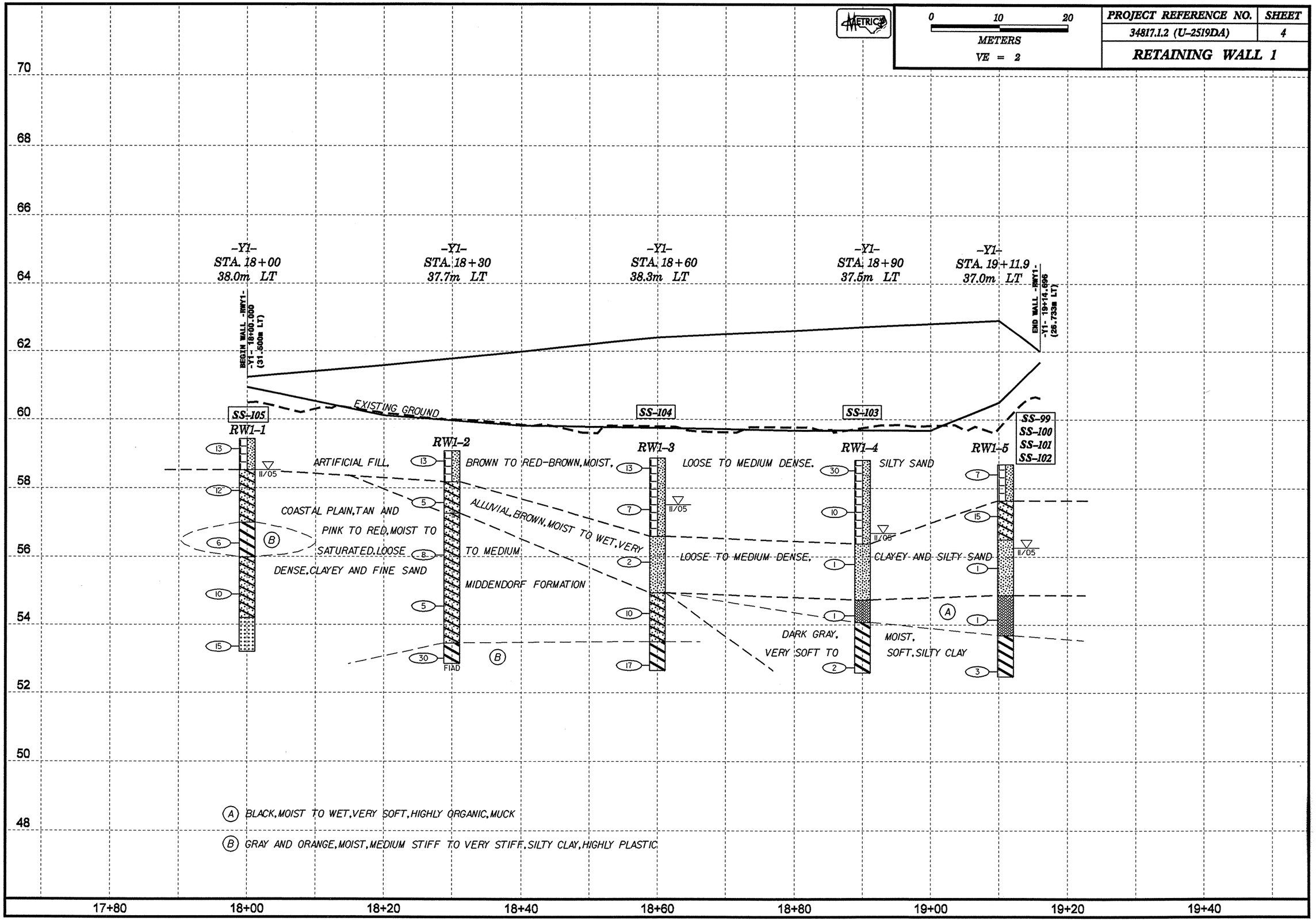
0 20 40

METERS

RETAINING WALL 1



PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	4
RETAINING WALL 1	



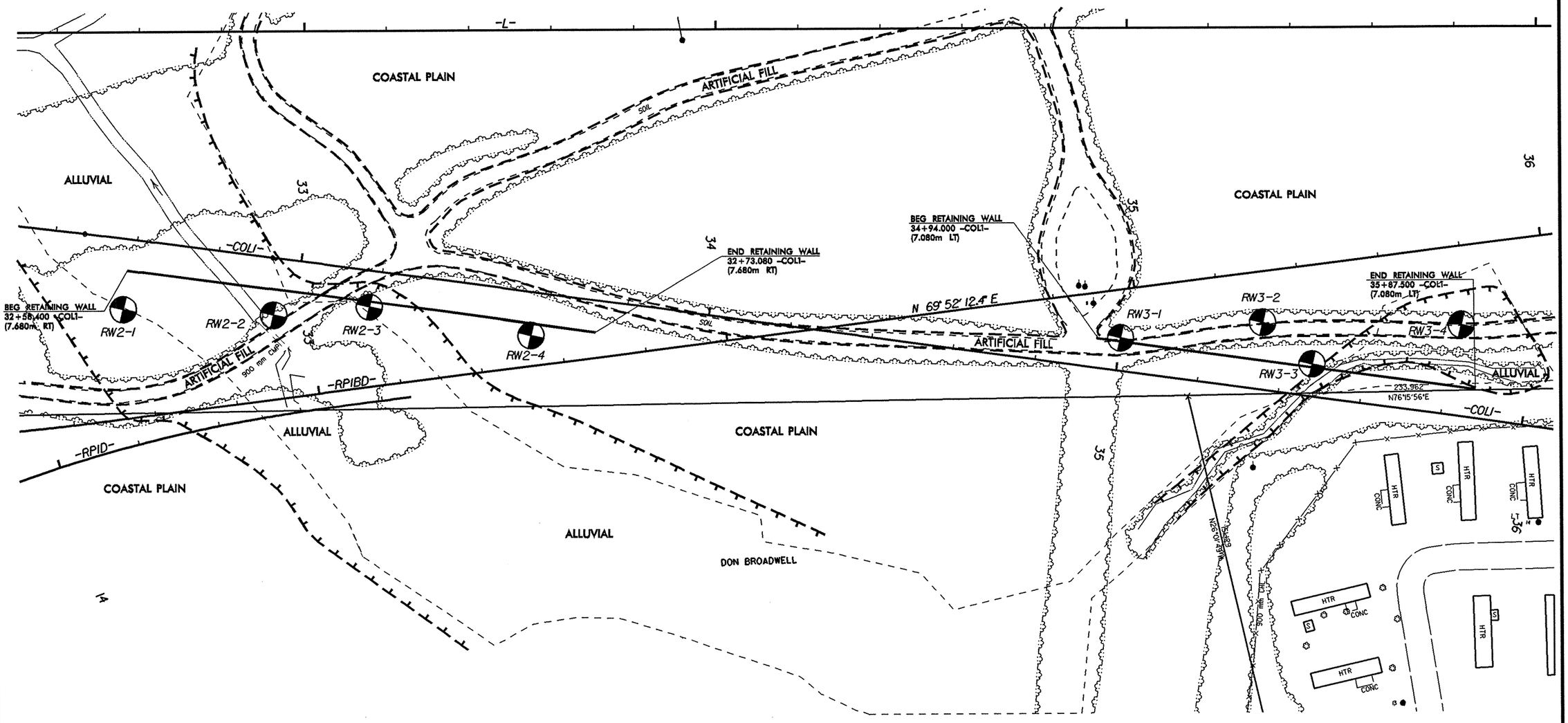
PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	5

SITE PLAN

0 20 40

METERS

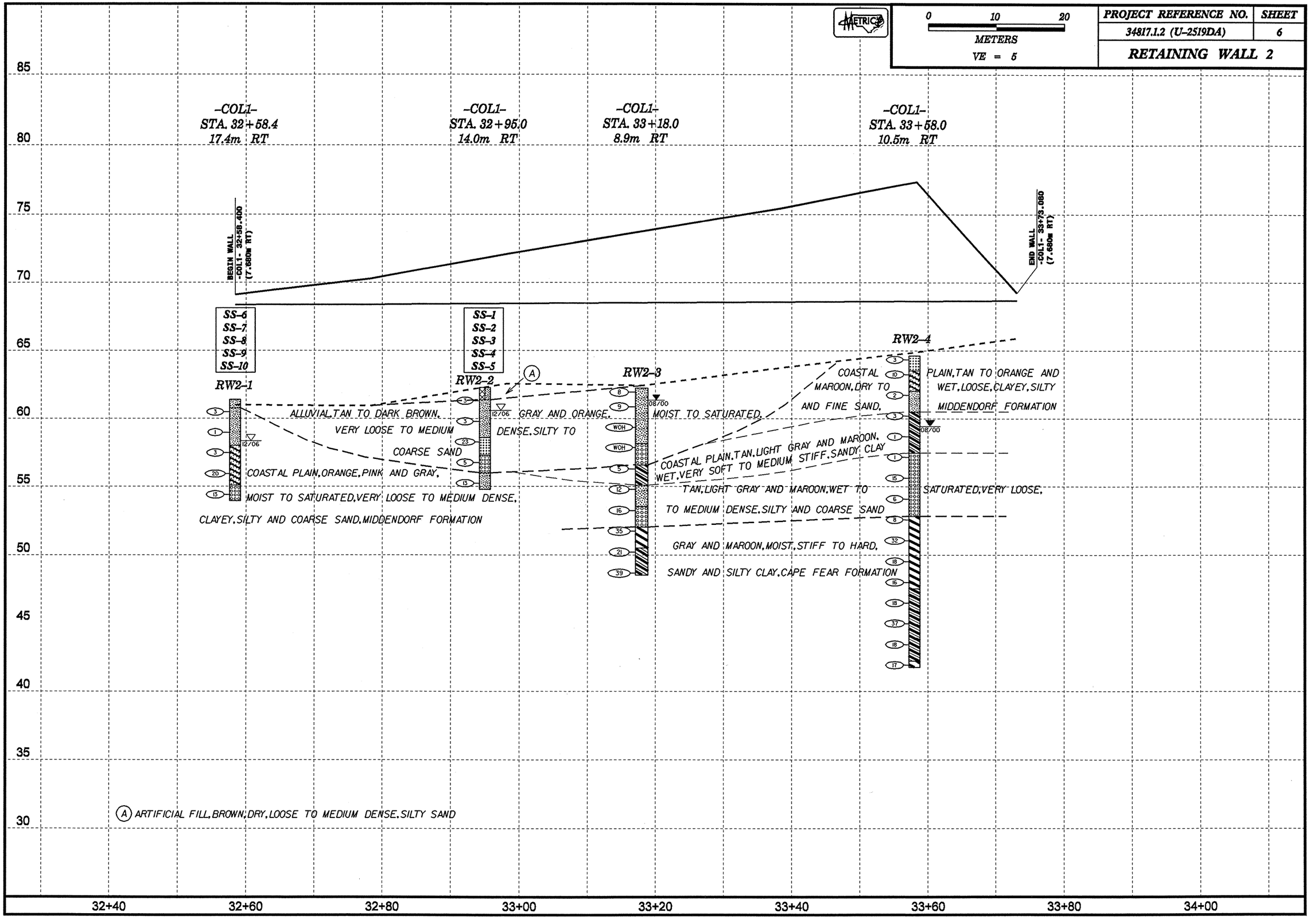
RETAINING WALL 2
RETAINING WALL 3



PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	6
RETAINING WALL 2	

METRIC

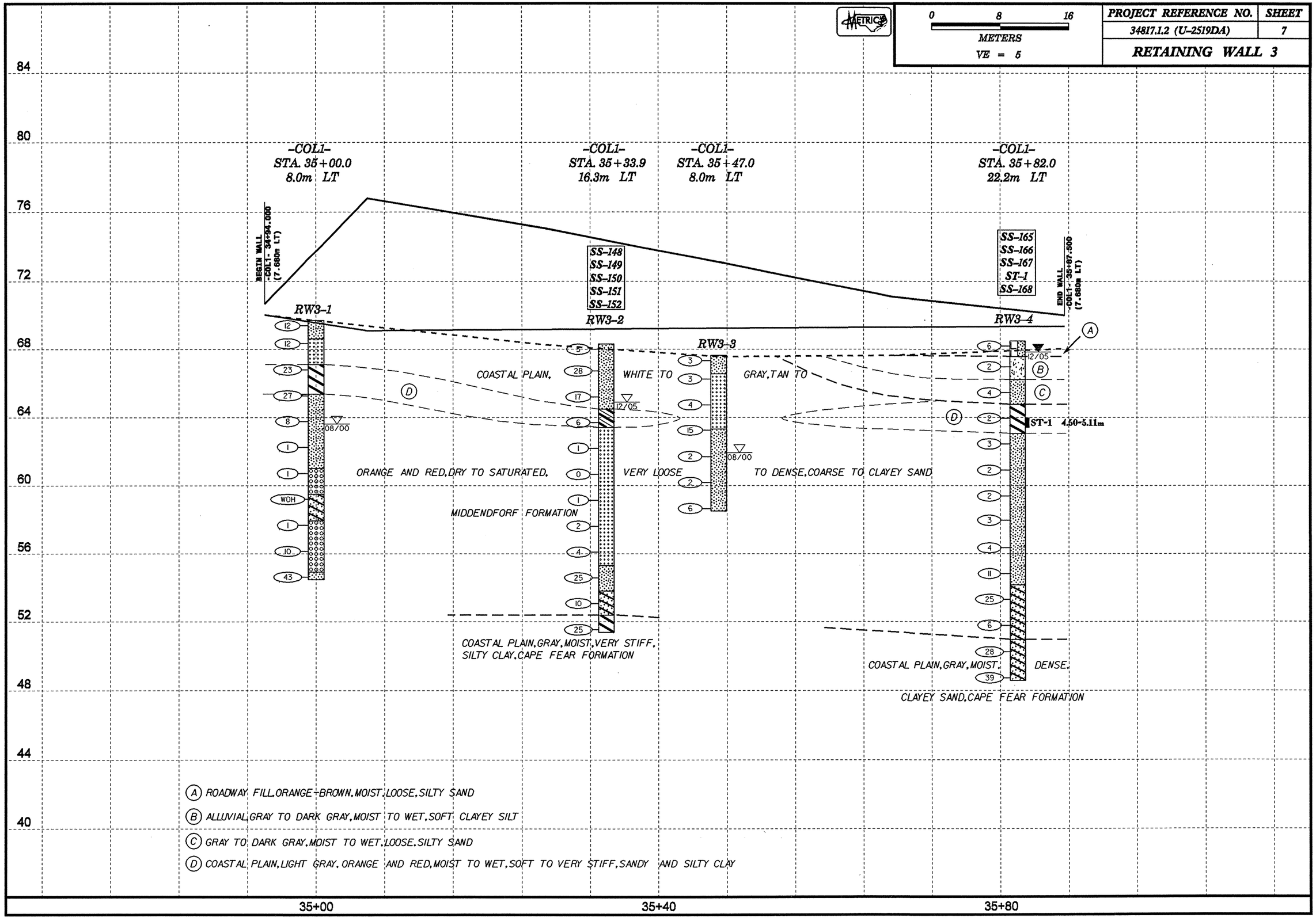
0 10 20
METERS
VE = 5



PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519DA)	7
RETAINING WALL 3	

METRIC

0 8 16
METERS
VE = 5



NOISE WALL PLAN & PROFILE –WALL N1–

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
4020 WESTCHASE BLVD., SUITE 475
RALEIGH, NC 27607

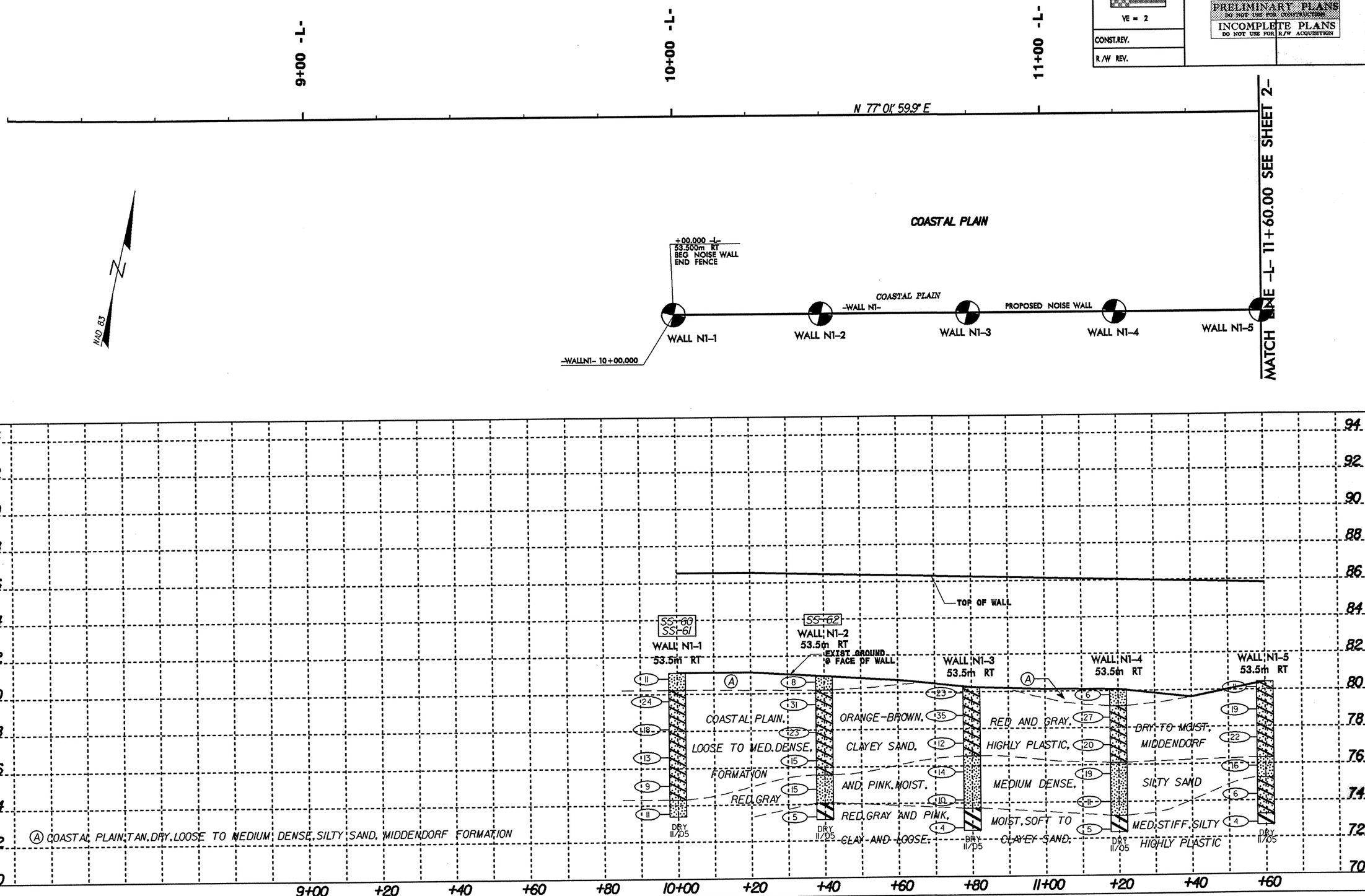
METRIC

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

5m 0 10m
VE = 2

CONST.REV.
R/W REV.

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



FILE: $FILES
DATE: $DATES
STIMES

NOISE WALL PLAN & PROFILE –WALL N1–

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
4280 WESTCHASE BLVD., SUITE 416
RALEIGH, NC 27607

METRIC

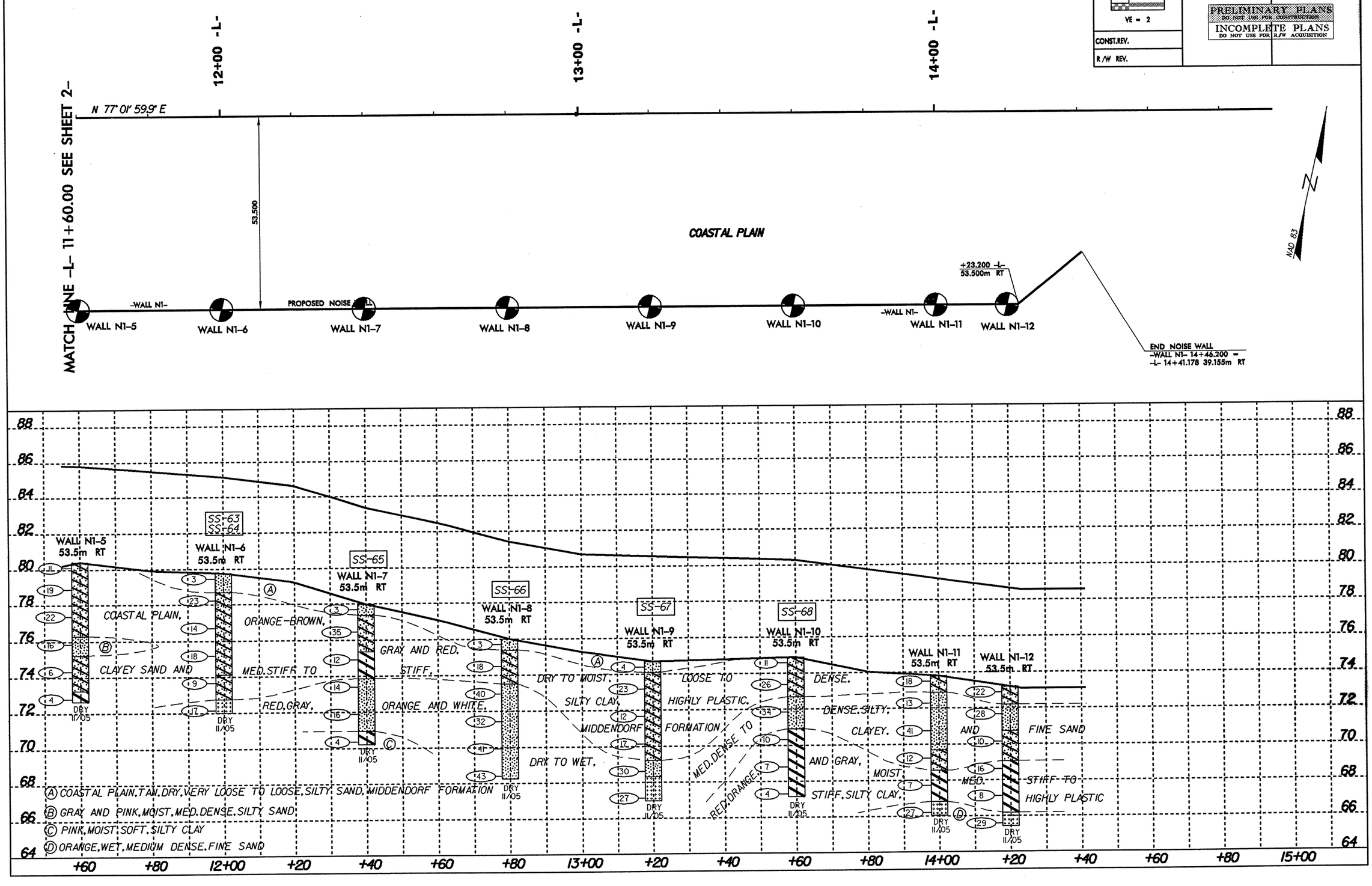
5m 0 10m
VE = 2

CONST.REV.

R/W REV.

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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



NOISE WALL PLAN & PROFILE –WALL N2–

PLANS PREPARED BY:
CONSULTING ENGINEERS
4030 WESTCHASE BLVD., SUITE 476
RALEIGH, NC 27607

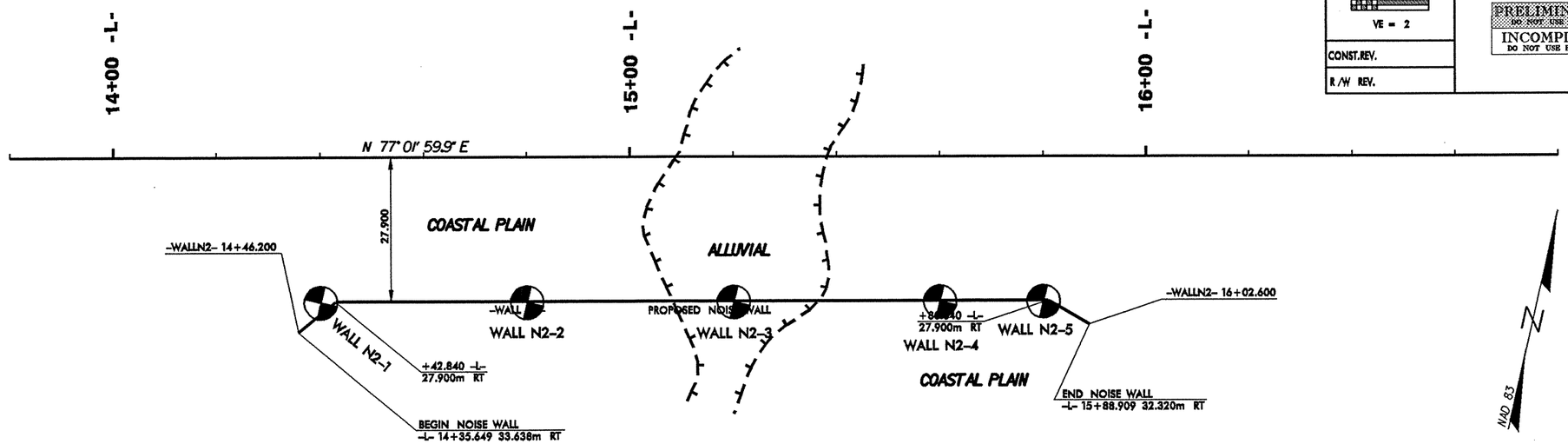
METRIC

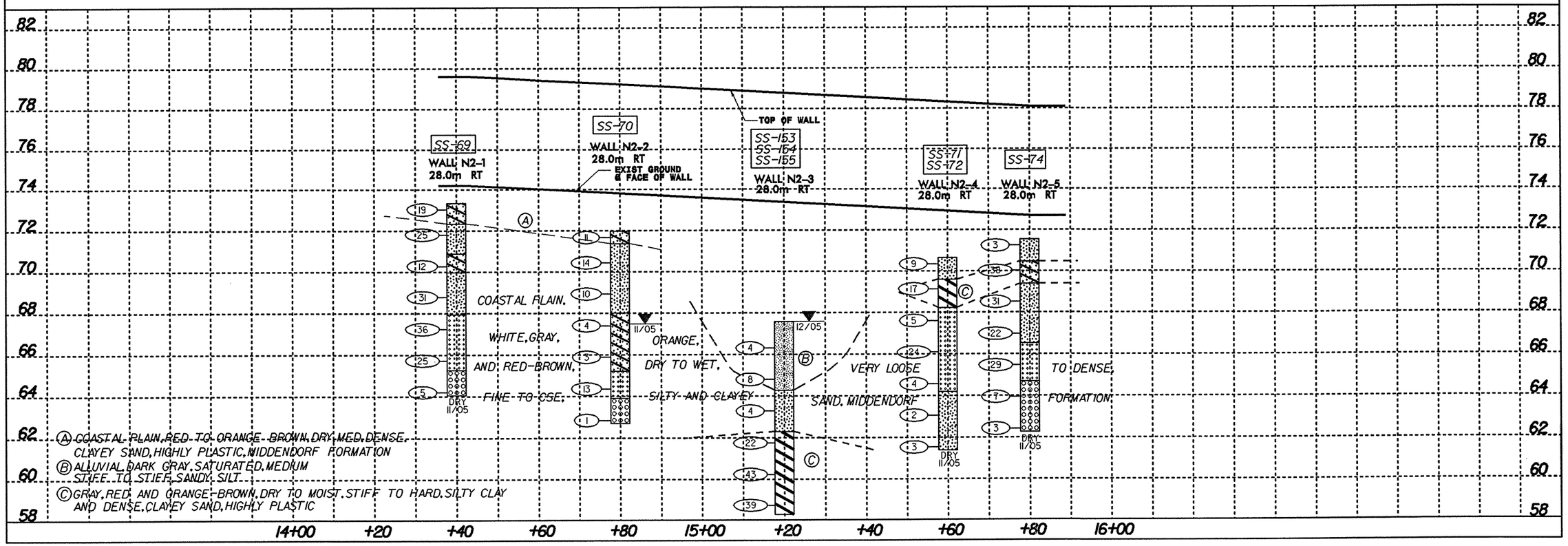
PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

5m 0 10m
VE = 2

CONST.REV.
R/W REV.





(A) COASTAL PLAIN, RED TO ORANGE-BROWN, DRY, MED. DENSE, CLAYEY SAND, HIGHLY PLASTIC, MIDDENDORF FORMATION
(B) ALLUVIAL, DARK GRAY, SATURATED, MEDIUM STIFF TO STIFF, SANDY SILT
(C) GRAY, RED AND ORANGE-BROWN, DRY TO MOIST, STIFF TO HARD, SILTY CLAY AND DENSE, CLAYEY SAND, HIGHLY PLASTIC

NOISE WALL PLAN & PROFILE -WALL N3-

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
4020 WESTCHASE BLVD., SUITE 475
RALEIGH, NC 27607

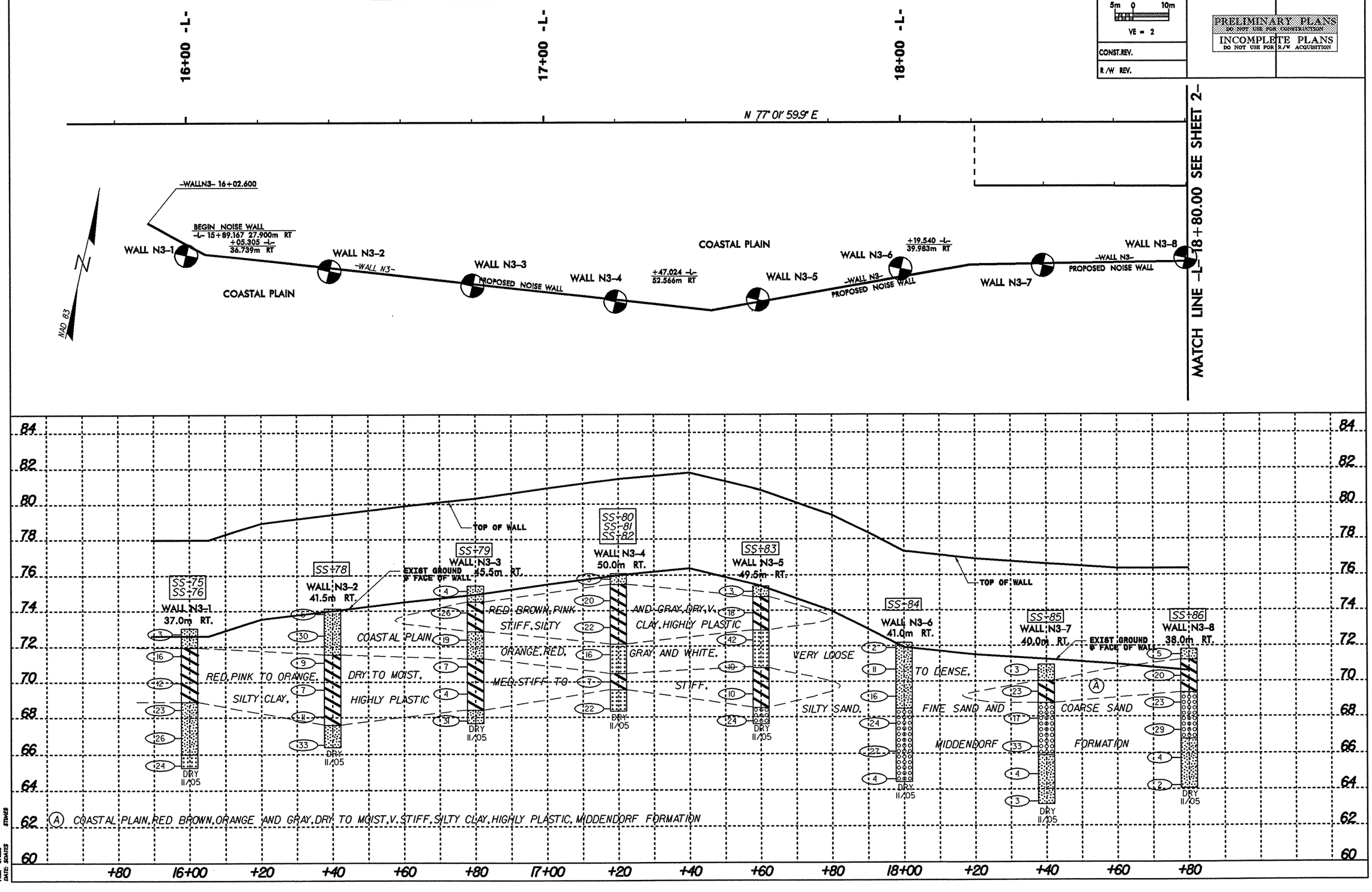
METRIC

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	11
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

5m 0 10m
VE = 2

CONST.REV.
R/W REV.

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



FILE: SFILES
DATE: SDATES
STIMES

NOISE WALL PLAN & PROFILE –WALL N3–

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
4020 WESTCHASE BLVD., SUITE 475
RALEIGH, NC 27607

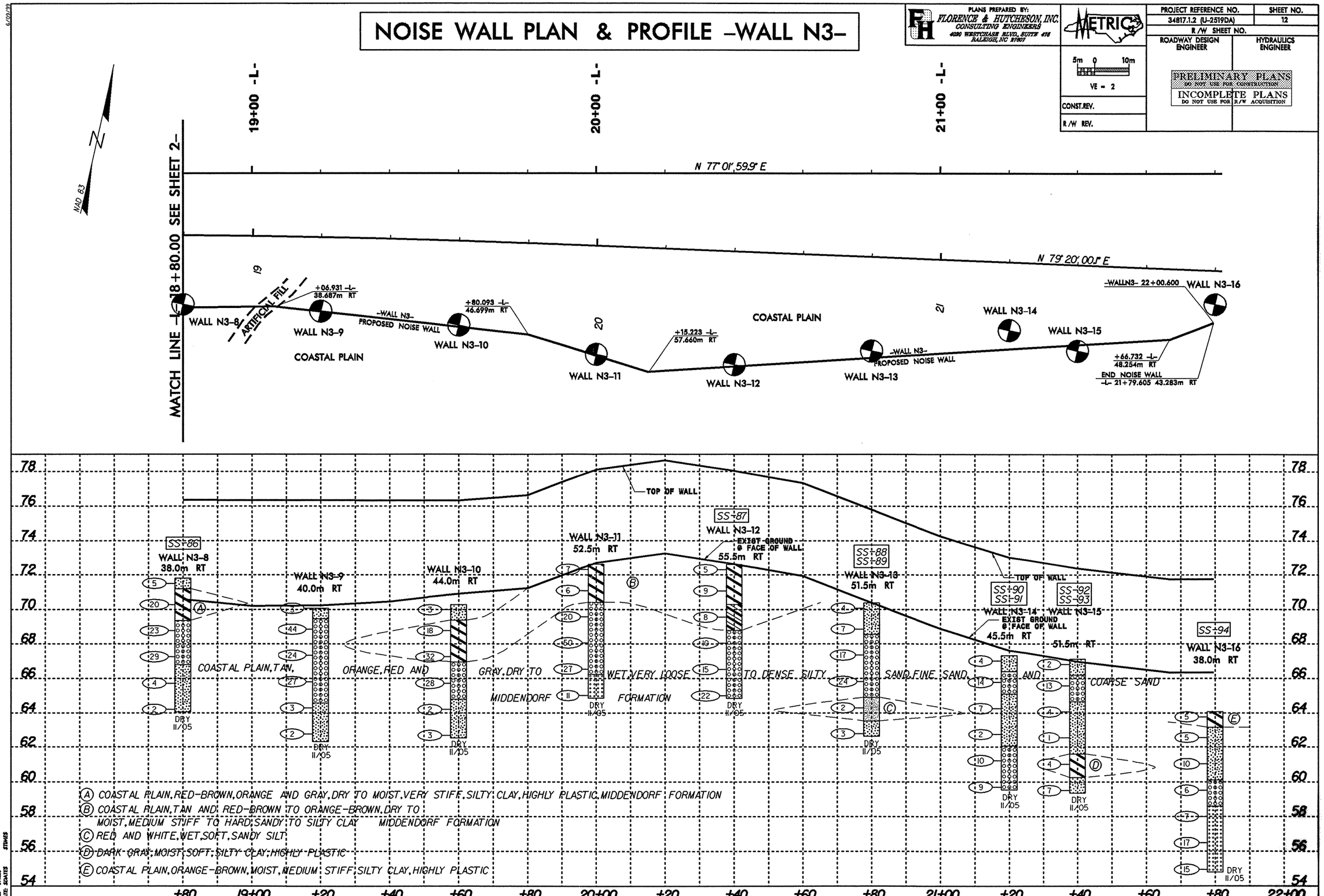
METRIC

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

5m 0 10m
VE = 2

CONST.REV.
R/W REV.

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



(A) COASTAL PLAIN, RED-BROWN, ORANGE AND GRAY, DRY TO MOIST, VERY STIFF, SILTY CLAY, HIGHLY PLASTIC, MIDDENDORF FORMATION
(B) COASTAL PLAIN, TAN AND RED-BROWN TO ORANGE-BROWN, DRY TO MOIST, MEDIUM STIFF TO HARD, SANDY TO SILTY CLAY MIDDENDORF FORMATION
(C) RED AND WHITE, WET, SOFT, SANDY SILT
(D) DARK GRAY, MOIST, SOFT, SILTY CLAY, HIGHLY PLASTIC
(E) COASTAL PLAIN, ORANGE-BROWN, MOIST, MEDIUM STIFF, SILTY CLAY, HIGHLY PLASTIC

FILE: $FILES
DATE: $DATES
STIMES

NOISE WALL PLAN & PROFILE -WALL N4-

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
4020 WESTCHASE BLVD., SUITE 475
RALEIGH, NC 27607

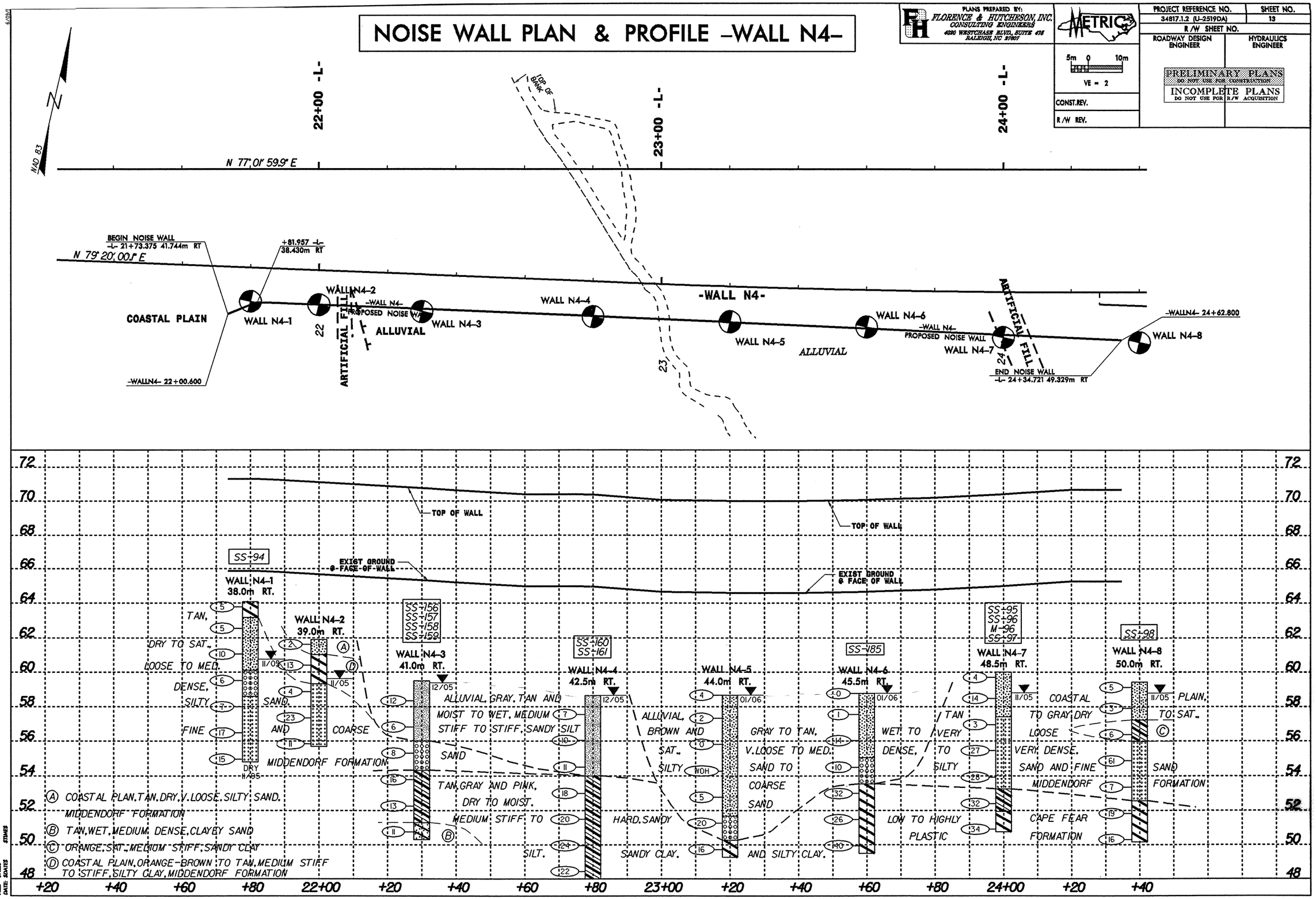
METRIC

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

5m 0 10m
VE = 2

CONST.REV.
R/W REV.

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



PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - CUMBERLAND

RW1-1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-105	38.0M LT	18+00	2.7-3.2	A-7-6(33)	59	31	4.6	2.8	32.2	60.4	100	96	93	-	-

RW1-3

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-104	38.3M RT	18+60	4.3-4.7	A-2-6(0)	28	15	66.7	13.7	4.5	15.1	92	47	20	-	-

RW1-4

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-103	37.5M LT	18+90	0.0-0.5	A-2-4(0)	24	10	43.1	29.9	6.9	20.1	92	68	29	-	-

RW1-5

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-99	37.0M RT	19+11.9	1.2-1.7	A-2-6(0)	28	11	58.5	23.4	3.0	15.1	94	62	19	-	-
SS-100	37.0M LT	19+11.9	2.7-3.2	A-2-4(0)	19	NP	52.5	30.8	4.6	12.1	97	68	20	-	-
SS-101	37.0M LT	19+11.9	4.3-4.7	A-7-5(31)	117	39	7.1	23.6	41.9	27.4	84	81	64	-	-
SS-102	37.0M LT	19+11.9	5.8-6.2	A-7-5(15)	49	18	4.8	27.6	33.4	34.2	100	98	75	-	-

RW2-1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	17.4M RT	32+58.4	0.9-1.4	A-2-4(0)	23	2	47.0	32.6	7.2	13.2	98	81	22	-	-
SS-7	17.4M RT	32+58.4	2.4-2.9	A-2-4(0)	24	6	53.0	24.7	8.0	14.2	99	78	25	-	-
SS-8	17.4M RT	32+58.4	3.9-4.4	A-2-6(1)	34	16	59.7	9.3	9.7	21.3	97	53	31	-	-
SS-9	17.4M RT	32+58.4	5.5-5.9	A-2-6(0)	29	12	53.7	22.8	0.3	23.2	100	80	24	-	-
SS-10	17.4M RT	32+58.4	7.0-7.4	A-1-b(0)	19	NP	85.1	9.5	1.2	4.2	99	43	6	-	-

RW2-2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	14.0M RT	32+95.0	1.0-1.4	A-2-4(0)	22	4	46.6	32.7	3.8	16.9	95	68	25	-	-
SS-2	14.0M RT	32+95.0	2.5-3.0	A-2-4(0)	24	4	45.1	34.1	8.5	12.2	97	72	25	-	-
SS-3	14.0M RT	32+95.0	4.0-4.5	A-3(0)	24	NP	55.4	40.2	2.3	2.0	100	72	6	-	-
SS-4	14.0M RT	32+95.0	5.5-6.0	A-1-b(0)	19	NP	73.6	17.4	2.9	6.1	91	40	10	-	-
SS-5	14.0M RT	32+95.0	7.1-7.5	A-2-4(0)	22	NP	52.4	32.0	1.3	14.2	100	79	16	-	-

RW3-2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-148	16.3M LT	35+33.9	2.8-3.2	A-2-4(0)	21	NP	37.8	47.7	0.4	14.1	100	83	21	-	-
SS-149	16.3M LT	35+33.9	4.3-4.8	A-6(5)	30	13	21.5	34.3	4.0	40.2	100	89	59	-	-
SS-150	16.3M LT	35+33.9	5.8-6.3	A-3(0)	20	NP	40.8	50.5	0.6	8.0	100	84	10	-	-
SS-151	16.3M LT	35+33.9	13.4-13.9	A-2-4(0)	21	6	21.5	49.1	1.2	28.2	100	83	32	-	-
SS-152	16.3M LT	35+33.9	16.5-16.9	A-7-6(27)	59	37	14.5	15.9	1.4	68.3	100	90	73	-	-

RW3-4

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-165	22.2M RT	35+82.0	1.2-1.7	A-5(5)	50	10	23.0	25.4	27.3	24.2	98	83	53	-	-
SS-166	22.2M RT	35+82.0	2.7-3.2	A-2-4(0)	19	NP	44.2	38.3	1.3	16.1	97	73	23	-	-
SS-167	22.2M RT	35+82.0	4.2-4.8	A-7-6(23)	47	24	4.2	20.8	12.4	62.6	100	97	88	-	-
ST-1	22.2M RT	35+82.0	4.50-5.11	A-7-9(13)	52	26	20.5	12.0	15.0	52.4	84	71	59	-	-
SS-168	22.2M RT	35+82.0	17.9-18.4	A-2-6(0)	29	13	48.2	22.6	0.9	28.3	98	67	31	-	-

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - CUMBERLAND

WALLN1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-60	53.5m RT	10+00.0	4.26-4.71	A-2-6(0)	29	11	40.6	35.1	4.2	20.1	100	76	29	-	-
SS-61	53.5m RT	10+00.0	7.30-7.75	A-2-4(0)	22	NP	50.2	34.3	3.4	12.0	100	73	21	-	-
SS-62	53.5m RT	10+40.0	7.30-7.75	A-7-6(7)	41	20	9.4	50.4	12.0	28.1	100	94	50	-	-
SS-63	53.5m LT	12+00.0	4.26-4.71	A-2-7(4)	51	33	43.5	27.6	3.6	25.4	100	74	32	-	-
SS-64	53.5m LT	12+00.0	7.30-7.75	A-3(0)	21	NP	39.6	53.8	1.5	5.1	100	80	9	-	-
SS-65	53.5m LT	12+40.0	2.74-3.19	A-7-6(24)	56	33	15.4	15.6	16.2	52.7	100	91	73	-	-
SS-66	53.5m LT	12+80.0	2.74-3.19	A-2-4(0)	21	NP	73.1	15.5	1.2	10.1	97	56	12	-	-
SS-67	53.5m LT	13+20.0	7.30-7.75	A-3(0)	24	NP	75.9	21.8	0.3	2.0	96	57	4	-	-
SS-68	53.5m LT	13+60.0	4.26-4.71	A-7-6(76)	102	73	7.1	2.8	19.1	71.0	100	95	91	-	-

WALLN2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-69	28.0m RT	14+40.0	8.82-9.27	A-1-b(0)	24	4	61.8	24.7	4.4	9.1	95	49	20	-	-
SS-70	28.0m RT	14+80.0	4.26-4.71	A-2-6(1)	31	15	42.5	31.4	2.7	23.3	100	78	29	-	-
SS-153	28.0m RT	15+20.0	1.27-1.72	A-4(0)	32	3	31.3	37.5	17.1	14.1	98	74	37	-	-
SS-154	28.0m RT	15+20.0	4.31-4.76	A-2-4(0)	21	NP	18.2	69.4	0.3	12.1	92	82	15	-	-
SS-155	28.0m RT	15+20.0	5.83-6.28	A-7-6(36)	61	34	2.8	8.3	16.2	72.7	100	98	92	-	-
SS-71	28.0m RT	15+60.0	1.22-1.67	A-7-5(91)	111	80	2.4	2.2	12.2	83.2	100	98	96	-	-
SS-72	28.0m RT	15+60.0	7.30-7.75	A-2-4(0)	26	NP	16.0	75.3	1.6	7.1	95	84	12	-	-
SS-74	28.0m RT	15+80.0	1.22-1.67	A-2-7(5)	66	37	54.2	13.3	0.1	32.5	100	69	34	-	-

WALLN3

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-75	37.0m T	16+00.0	1.22-1.67	A-7-6(45)	86	58	15.6	12.0	11.6	60.9	100	90	74	-	-
SS-76	37.0m T	16+00.0	2.74-3.19	A-7-5(84)	108	75	3.9	1.8	17.2	77.1	100	98	95	-	-
SS-78	41.5m RT	16+40.0	4.26-4.71	A-7-6(71)	91	64	1.8	3.9	23.3	71.0	100	99	96	-	-
SS-79	45.5m RT	16+80.0	4.26-4.71	A-7-6(71)	98	70	8.1	3.9	19.1	69.0	100	95	89	-	-
SS-80	50.0m RT	17+20.0	1.22-1.67	A-7-6(7)	52	32	28.8	36.7	4.1	30.4	100	83	40	-	-
SS-81	50.0m RT	17+20.0	2.74-3.19	A-7-6(30)	65	43	9.1	28.0	12.2	50.7	100	95	71	-	-
SS-82	50.0m RT	17+20.0	4.26-4.71	A-3(0)	21	NP	73.1	22.3	0.5	4.1	100	62	6	-	-
SS-83	49.5m RT	17+60.0	7.30-7.75	A-1-b(0)	19	NP	91.5	7.3	0.2	1.0	100	32	2	-	-
SS-84	41.0m RT	18+00.0	2.74-3.19	A-2-4(0)	24	5	51.8	31.5	3.6	13.1	100	72	20	-	-
SS-85	40.0m RT	18+40.0	5.78-6.23	A-2-4(0)	29	7	46.5	30.0	7.4	16.1	100	60	35	-	-
SS-86	38.0m RT	18+80.0	1.22-1.67	A-7-6(42)	77	54	13.5	16.7	13.4	56.4	100	94	75	-	-
SS-87	55.5m RT	20+40.0	2.74-3.19	A-6(4)	34	16	13.1	51.7	11.1	24.1	100	94	47	-	-
SS-88	51.5m RT	20+80.0	5.78-6.23	A-4(5)	31	8	11.7	53.3	14.9	20.1	100	93	75	-	-
SS-89	51.5m RT	20+80.0	7.30-7.75	A-2-4(0)	23	NP	24.2	62.2	2.5	11.1	100	91	17	-	-
SS-90	45.5m RT	21+20.0	2.74-3.19	A-2-4(0)	24	NP	38.3	44.1	5.5	12.1	100	73	26	-	-
SS-91	45.5m RT	21+20.0	4.26-4.71	A-2-4(0)	23	NP	20.1	63.3	4.5	12.1	100	91	21	-	-
SS-92	51.5m RT	21+40.0	4.26-4.71	A-2-4(0)	22	NP	20.7	53.5	5.6	20.1	100	90	34	-	-
SS-93	51.5m RT	21+40.0	5.79-6.23	A-7-6(23)	55	29	18.7	6.4	18.5	56.3	100	86	77	-	-
SS-94	38.0m RT	21+80.0	4.26-4.71	A-1-b(0)	20	NP	71.4	15.4	4.1	9.1	95	50	14	-	-

WALLN4

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-94	38.0m RT	21+80.0	4.26-4.71	A-1-b(0)	20	NP	71.4	15.4	4.1	9.1	95	50	14	-	-
SS-156	41.0m RT	22+30.0	1.16-1.61	A-4(0)	19	NP	9.5	62.2	12.2	16.1	100	99	41	-	-
SS-157	41.0m RT	22+30.0	4.20-4.65	A-1-b(0)	20	NP	83.7	8.1	2.2	6.0	99	27	9	-	-
SS-158	41.0m RT	22+30.0	5.72-6.17	A-6(5)	33	19	16.3	38.5	4.7	40.4	100	96	48	-	-
SS-159	41.0m RT	22+30.0	8.76-9.21	A-2-6(0)	33	19	72.2	7.6	2.0	18.1	95	44	20	-	-
SS-160	42.5m RT	22+80.0	1.10-1.55	A-4(0)	20	NP	30.3	17.7	49.0	3.0	96	79	51	-	-
SS-161	42.5m RT	22+80.0	5.66-6.11	A-6(4)	29	14	9.1	47.0	7.6	36.3	100	93	51	-	-
SS-185	45.5m RT	23+60.0	5.78-6.23	A-7-6(41)	63	41	1.8	13.6	31.9	52.7	100	99	91	-	-
SS-95	48.5m RT	24+00.0	1.22-1.67	A-2-4(0)	21	NP	16.6	68.6	5.7	9.1	100	98	22	-	-
SS-96	48.5m LT	24+00.0	7.30-7.75	A-6(10)	34	16	0.8	35.6	25.4	38.2	100	100	75	19.6	-
SS-97	48.5m LT	24+00.0	8.82-9.27	A-7-6(18)	42	21	0.4	23.9	27.4	48.3	100	100	84	-	-
SS-98	50.0m RT	24+40.0	7.30-7.75	A-7-6(18)	44	23	4.2	23.7	21.7	50.3	100	98	78	-	-