STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33715.1.1 (B-4466)	1	20

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33715.1.1 (B-4466) F.A. PROJ. BRZ-1104(11)

COUNTY CLAY

PROJECT DESCRIPTION BRIDGE NO. 4 ON SR-1104 OVER BRASSTOWN CREEK

SITE DESCRIPTION

ID: B-4466

PROJECT:33715.1.1

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T B DANIEL
C J COFFEY
R D CHILDERS

INVESTIGATED BY C A DUNNAGAN
CHECKED BY W D FRYE, Jr
SUBMITTED BY W D FRYE, Jr
DATE MAY 2007

NORTH CAROLINA LICENSED GEOLOGIST CHARLES ANDREWS DUNNAGAN

DRAWN BY: C A DUNNAGAN

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PROJECT REFERENCE NO.	SHEET NO.
33715.1.1 (B-4466)	2/20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
FIAD- FILLED IMMEDIATELY AFTER DRILLING

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45C
- ☒ CME-550
- ☐ PORTABLE HOIST
- ☐ _____
- ☐ _____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☒ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☒ CASING ☒ W/ ADVANCER
- ☐ TRICONE _____" STEEL TEETH
- ☐ TRICONE _____" TUNG.-CARB.
- ☐ CORE BIT
- ☐ _____

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B____
- ☒ -N XWL
- ☐ -H____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BM#2: 8-INCH SPIKE IN 12" PINE
40' RT OF -BL- STA 15+14
ELEVATION: 1688.89 FT.

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

May 1, 2007

STATE PROJECT: 33715.1.1 (B-4466)
F. A. PROJECT: BRZ-1104 (11)
COUNTY: Clay

DESCRIPTION: Bridge No. 4 on SR-1104 over Brasstown Creek

SUBJECT: Geotechnical Report – Foundation Investigation

This project is located in southwest Clay County, approximately 1.5 miles from the border with Georgia. The proposed structure is a double-span, each of 81.0 feet. The skew is 90 degrees. The subsurface investigation was conducted using a CME-550 drill machine with an automatic drive hammer. The borings were advanced using both eight-inch hollow stem augers, and NW casing with advancer. Standard Penetration Tests were performed at intervals of 5.0 feet. Soil samples were collected and submitted for testing of quality. Rock core was retrieved using NXWL equipment. One (1) rock core sample was submitted for testing for Unit Weight, Compressive Strength (Qu), Young's Modulus (E) and Split Tensile Strength.

Physiography and Geology

The project site is located in moderately rolling countryside. Except for EB1-B, the bridge lies within a broad, flat floodplain. Adjacent to EB1-B is moderate to steep hillside. Brasstown Creek is incised approximately 10 feet into the floodplain. The geology of the area is the Brevard Fault Zone.

Roadway embankment was not encountered in the borings for Interior Bent One. In the borings for the End Bents, embankment ranged from 1.0 to 5.0 feet thick and consisted of sandy gravels, silty sands, sandy silts and silty clays. Alluvium was encountered in each of the borings. It consists generally of loose silty sand with some soft sandy silts. A basal gravel layer is common.

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
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1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-250-4088
FAX: 919-250-4237

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

Saprolite was not found above weathered rock (of schist) in the borings for End Bent One. Elsewhere, it was encountered between the elevations of 1647.8 and 1653.0. Weathered rock (of schist) was encountered in each of the borings. The elevations to the top of weathered rock (of schist) are 1651.8 to 1653.4. At the EB1-B site, a saprolite layer is present within the weathered rock (of schist) between the elevations 1649.9 and 1650.7.

Crystalline rock (schist) was encountered in each of the borings at this site. The elevation of the top of crystalline rock (schist) ranges across the site from 1643.0 (B1-A) to 1652.3 (EB1-A).

Rock Properties

The rock underlying this project is a member of the Dean Formation, labeled "Zd" on the Geologic Map of North Carolina (1985). The Dean Formation is mostly a light gray, sericite schist with abundant cross biotite porphyroblasts. The recovered core was predominately slightly weathered to fresh, and hard. Trace amounts of pyrite and chlorite were noted. The few naturally occurring discontinuities occurred as partings along schistocity at 50° and joints at 45°. The rock also tends to part readily along the schistocity during the drilling operation. The Recoveries across the site ranged from 81 to 100 percent (95 percent average). The RQD's ranged from 0 to 100 percent (89 percent average).

Groundwater

Static groundwater was measured in 4 of the 6 borings, using non-extraordinary means. The groundwater elevations ranged from 1654.3 to 1655.7.

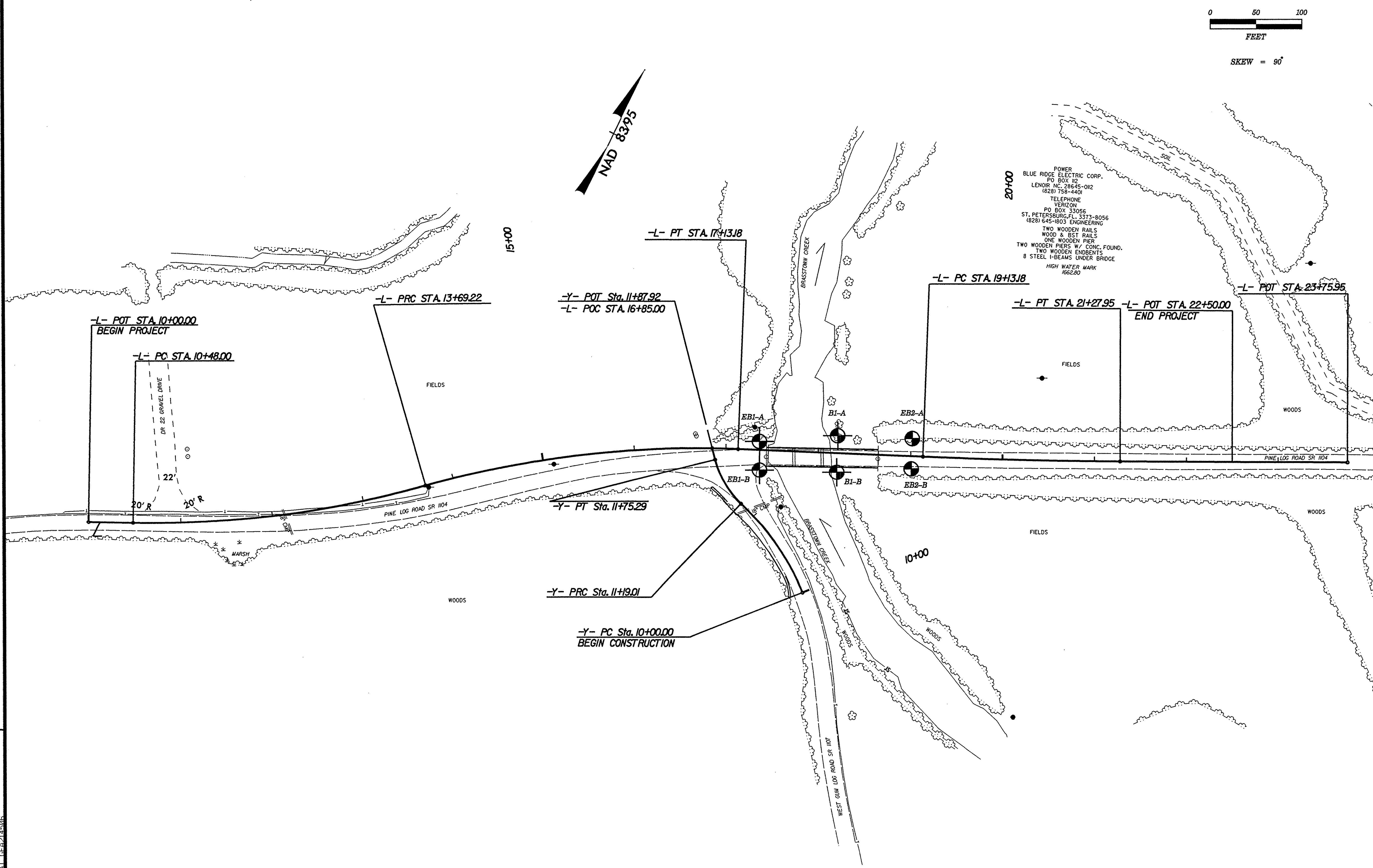
Comments

This geotechnical foundation investigation was based on the Preliminary General Drawing received January 19, 2007. Additional information was gleaned from the Hydraulic Design Report dated January 10, 2007. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be reviewed and modified as necessary.

Respectfully Submitted,

Charles A. Dunnagan, L.G.
Project Geological Engineer

PROJECT REFERENCE NO.	SHEET NO.
B-4466	4/20



0 50 100
FEET
SKEW = 90°
NAD 83/95
POWER
BLUE RIDGE ELECTRIC CORP.
PO BOX 112
LENOIR NC. 28645-0112
(828) 758-4401
TELEPHONE
VERIZON
PO BOX 33056
ST. PETERSBURG,FL. 3373-8056
(828) 645-1803 ENGINEERING
TWO WOODEN RAILS
WOOD & BST RAILS
ONE WOODEN PIER
TWO WOODEN PIERS W/ CONC. FOUND.
TWO WOODEN ENDBENTS
8 STEEL I-BEAMS UNDER BRIDGE
HIGH WATER MARK
1662.80
-L- POT STA. 10+00.00
BEGIN PROJECT
-L- PC STA. 10+48.00
-L- PRC STA. 13+69.22
-Y- POT Sta. 11+87.92
-L- POC STA. 16+85.00
-L- PT STA. 17+13.18
-L- PC STA. 19+13.18
-L- PT STA. 21+27.95
-L- POT STA. 22+50.00
END PROJECT
-L- POT STA. 23+75.95
-Y- PT Sta. 11+75.29
-Y- PRC Sta. 11+19.01
-Y- PC Sta. 10+00.00
BEGIN CONSTRUCTION
DR 22 GRAVEL DRIVE
22'
20' R
20' R
PINE LOG ROAD SR 1104
BRASSTOWN CREEK
WEST GUM LOG ROAD SR 1107
FIELDS
WOODS
MARSH
SOIL
EB1-A
EB1-B
B1-A
B1-B
EB2-A
EB2-B
15+00
20+00
10+00
16+00
17+00
18+00
19+00

SEE SHEET 5 FOR -L- & -Y- PROFILES

SEE SHEET S-1 THUR S- FOR STRUCTURE PLANS

REVISIONS

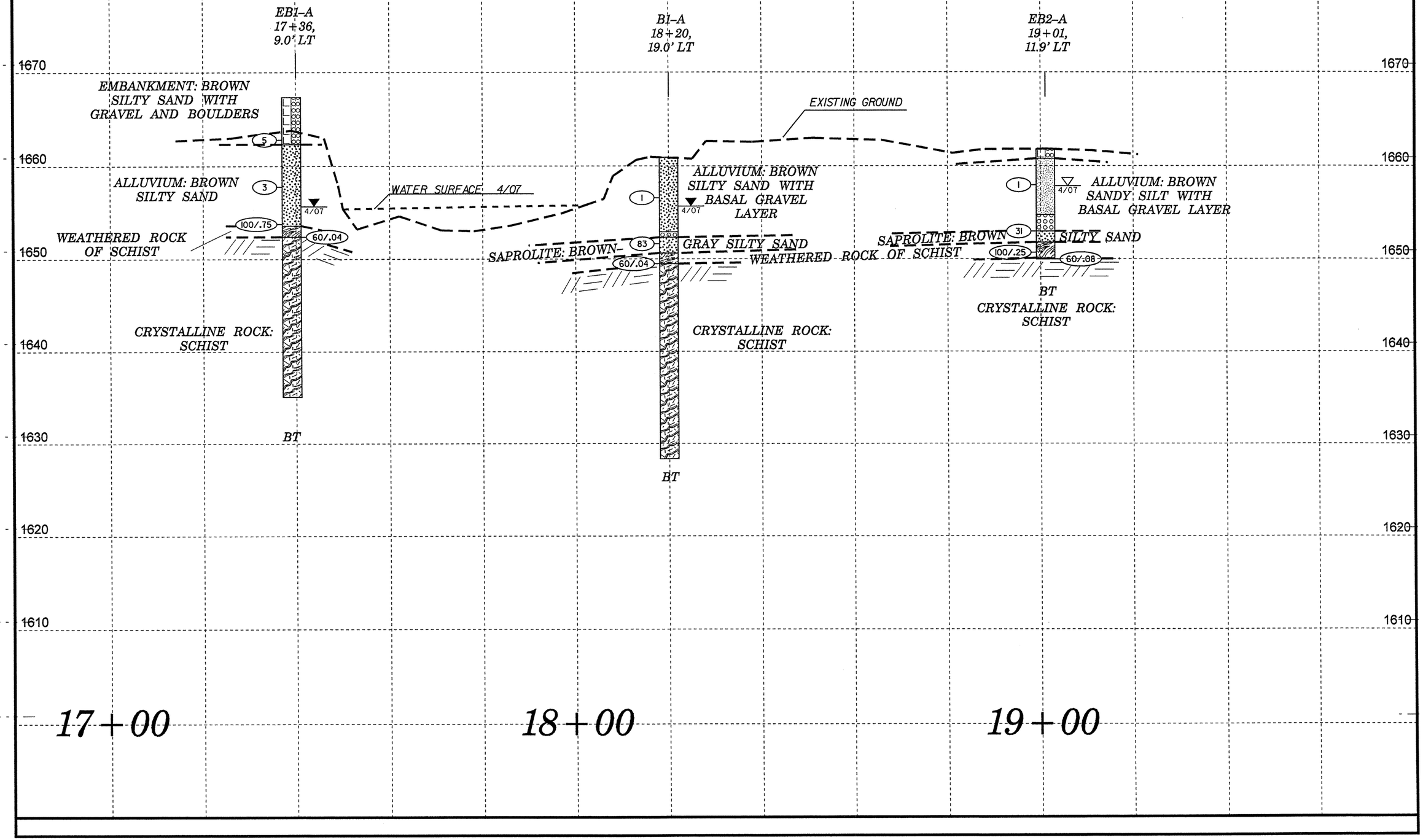
8/17/99

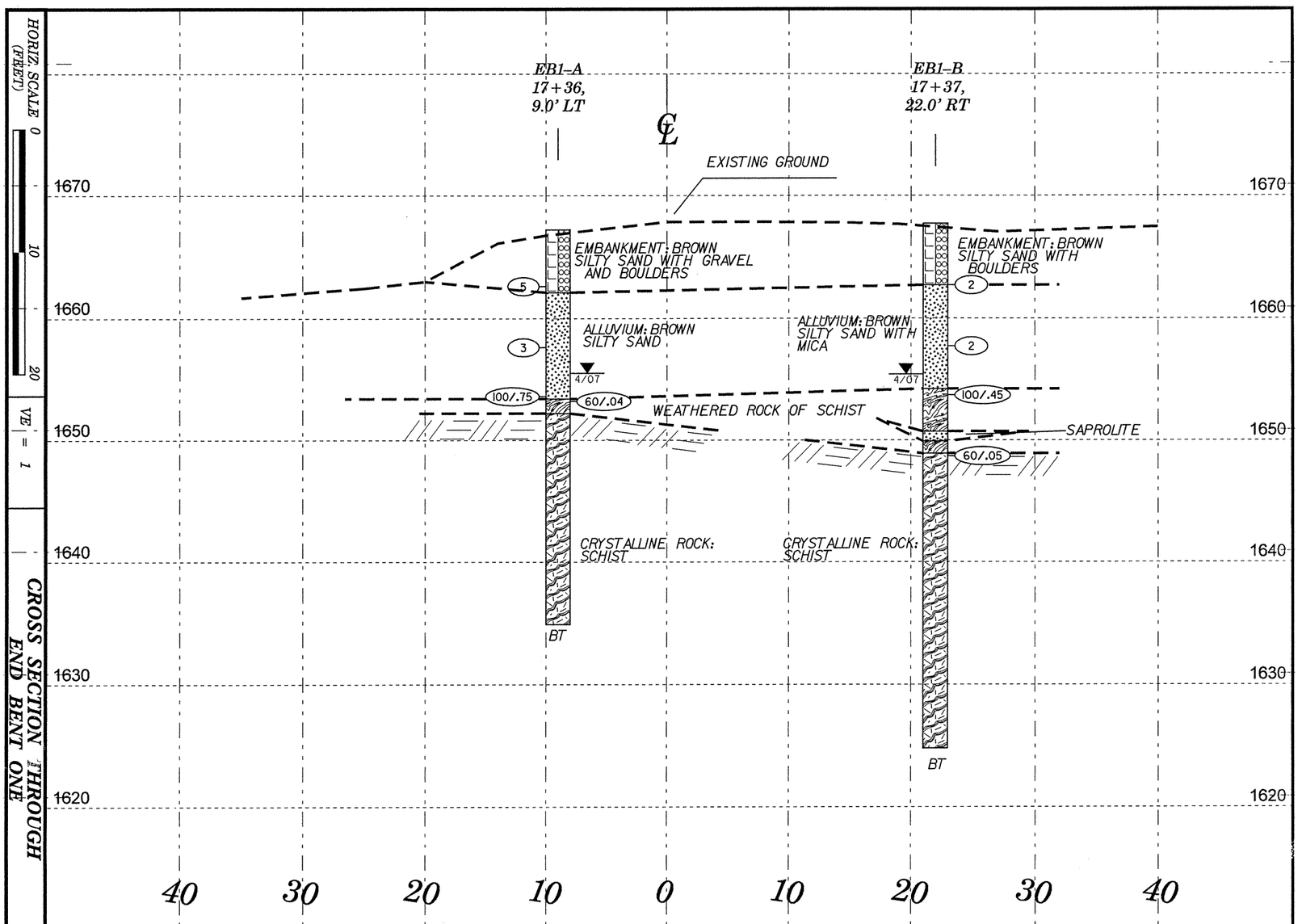
18-APR-2007 07:45
d:\projects\b4466_geo_brdg0004_structure\CADD_GEOTECH\Site&Sub\PlanView.dgn

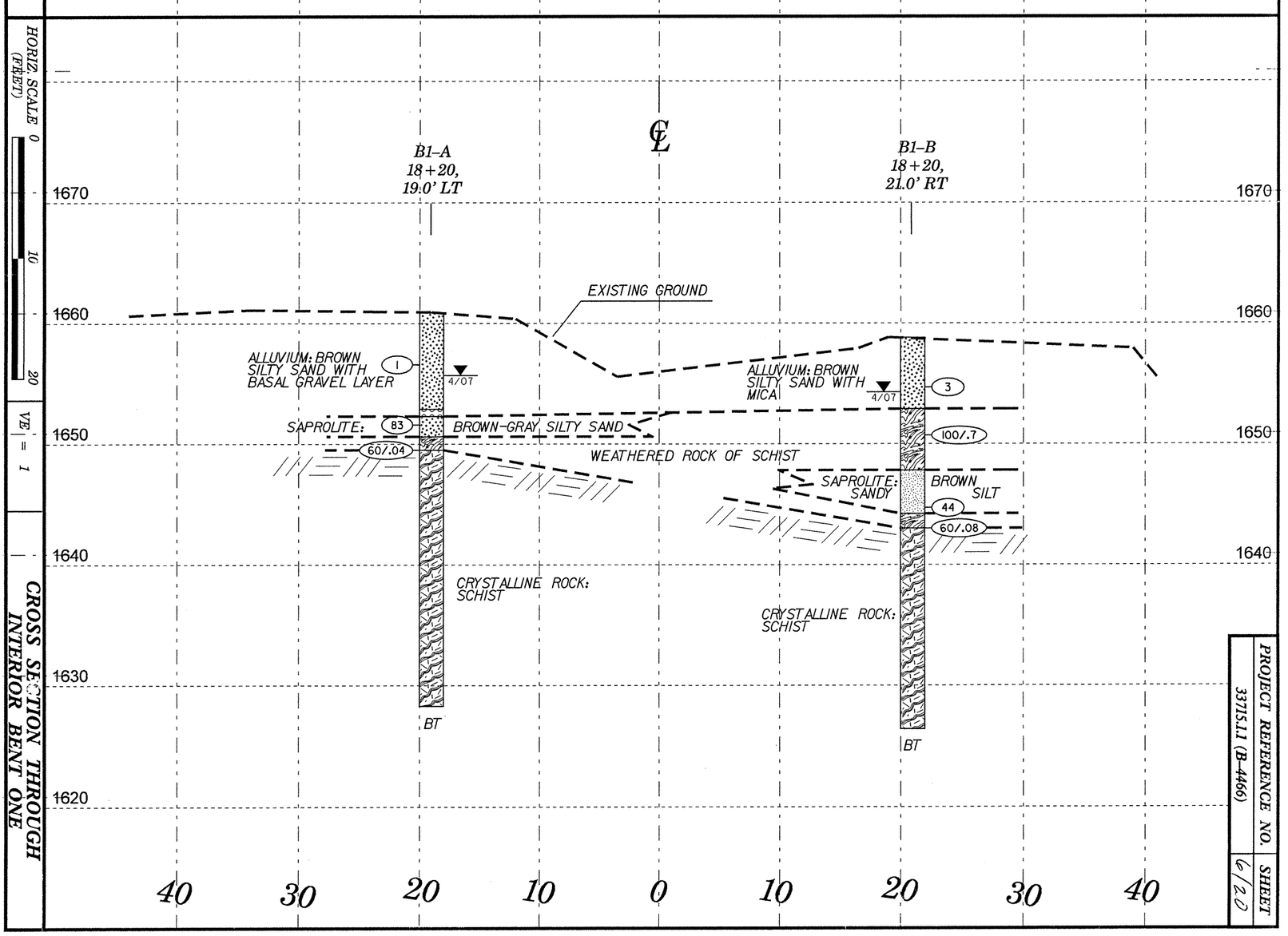
0	20	40
FEET		
VE = 2		

PROJECT REFERENCE NO.	SHEET
33715.1.1 (B-4466)	5/20

PROFILE 19.0' LEFT OF CENTERLINE -L-







PROJECT REFERENCE NO.	SHEET
33715.1.1 (B-4466)	6/22

PROJECT REFERENCE NO.	SHEET
33715.1.1 (B-4466)	7/20

CROSS SECTION THROUGH END BENT TWO

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 33715.1.1	**ID.** B-4466	**COUNTY** Clay	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 4 on SR-1104 over Brasstown Creek			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 17+36	**OFFSET** 9ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,667.2 ft	**TOTAL DEPTH** 32.3 ft	**NORTHING** 491,369	**EASTING** 525,030	**24 HR.** 11.7
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic
START DATE 04/10/07	**COMP. DATE** 04/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 14.9 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
1670											
									GROUND SURFACE	1,667.2	0.0
1,663.6	3.6								**ROADWAY EMBANKMENT** Brown silty sand with gravel and boulders.		
		2	2	3	5		M			1,662.1	5.1
1,658.6	8.6								**ALLUVIAL** Brown silty sand.		
		0	1	2	3		W				
1,653.6	13.6									1,653.4	13.8
1,652.3	14.9	49	51/.25		100/.75		Sat.		**WEATHERED ROCK** Weathered rock of schist.	1,652.3	14.9
		60/.04			60/.04				**CRYSTALLINE ROCK** Gray sericite schist.		
										1,634.9	32.3
									Boring Terminated at Elevation 1,634.9 ft in Crystalline Rock (schist)		

NCDOT BORE SINGLE GINTFILES.GPJ NC_DOT.GDT 08/08/07

6/20

SHEET 1 OF 1

DATE 13-Apr-07

CORE BORING REPORT

PROJECT: 33715.1.1 I. D. NO: B-4466 BORING NO: EB1-A GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 4 on SR-1104 over Brasstown Creek

COUNTY: Clay COLLAR ELEVATION: 1667.2 FT. TOTAL DEPTH: 32.3 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET	REC. %	RQD. FEET	RQD. %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
1652.2	15.0		2.3	2.2	96	0.0	0		Gray and brown sericite schist. Moderately severe to moderately weathered. Soft to hard. a) Parts along schistocity @ 50°. b) Joints @ 45°.
1649.9	17.3								
1649.9	17.3		5.0	4.9	98	4.3	86		~~17.6ft~~
1644.9	22.3								
1644.9	22.3		5.0	4.9	98	4.9	98		Gray sericite schist. Fresh, hard with moderately weathered zone from 18.2ft to 18.5ft. Trace of pyrite; trace of chlorite.
1639.9	27.3								
1639.9	27.3		5.0	4.6	92	4.6	92		
1634.9	32.3								

CORING TERMINATED AT ELEVATION 1634.9 FT.

DRILLER: C J Coffey CORE SIZE: NXWL EQUIPMENT: CME-550x

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 33715.1.1	**ID.** B-4466	**COUNTY** Clay	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 4 on SR-1104 over Brasstown Creek			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 17+37	**OFFSET** 22ft RT	**ALIGNMENT** -L- — **0 HR.** 12.0
COLLAR ELEV. 1,667.7 ft	**TOTAL DEPTH** 42.9 ft	**NORTHING** 491,341	**EASTING** 525,044 — **24 HR.** 12.3
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic
START DATE 04/10/07	**COMP. DATE** 04/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.8 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1670										
									1,667.7 GROUND SURFACE	0.0
1,663.7	4.0								**ROADWAY EMBANKMENT** Brown sandy silt .	
		1	1	1	2	SS-4	M		1,662.7	5.0
1,658.7	9.0								**ALLUVIAL** Dark brown sandy silt with mica.	
		0	1	1	2	SS-5	W			
1,653.7	14.0								1,654.2	13.5
		100/.45			100/.45		M		**WEATHERED ROCK** Weathered rock of schist.	
1,648.7	19.0								1,650.7	17.0
		60/.05			60/.05				1,649.9 **SAPROLITE** Silty sand.	17.8
									1,648.9 **WEATHERED ROCK** Weathered rock of schist.	18.8
									CRYSTALLINE ROCK Gray sericite schist.	
									1,624.8	42.9
									Boring Terminated at Elevation 1,624.8 ft in Crystalline Rock (schist)	

NCDOT BORE SINGLE GINTFILES.GPJ NC_DOT.GDT 08/09/07

1/20

SHEET 1 OF 1

DATE 13-Apr-07

CORE BORING REPORT

PROJECT: 33715.1.1 I. D. NO: B-4466 BORING NO: EB1-B GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No.4 on SR-1104 over Brasstown Creek

COUNTY: Clay COLLAR ELEVATION: 1667.7 FT. TOTAL DEPTH: 42.9 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
1647.5	20.2		2.7	2.2 / 81	2.2 / 81		
1644.8	22.9						
1644.8	22.9		5.0	5.0 / 100	5.0 / 100		
1639.8	27.9						
1639.8	27.9		5.0	5.0 / 100	5.0 / 100		Medium dark gray to gray sericite schist with cross-biotite. Fresh, hard. Trace of biotite; trace of chlorite.
1634.8	32.9						
1634.8	32.9		5.0	5.0 / 100	5.0 / 100		
1629.8	37.9						
1629.8	37.9		5.0	4.8 / 96	4.8 / 96		
1624.8	42.9						

CORING TERMINATED AT ELEVATION 1624.8 FT.

DRILLER: C J Coffey CORE SIZE: NXWL EQUIPMENT: CME-550x

SHEET

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33715.1.1	**ID.** B-4466	**COUNTY** Clay	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 4 on SR-1104 over Brasstown Creek			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 18+20	**OFFSET** 19ft LT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 1,660.9 ft	**TOTAL DEPTH** 32.6 ft	**NORTHING** 491,413	**EASTING** 525,103 — **24 HR.** 5.2
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic
START DATE 04/05/07	**COMP. DATE** 04/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 11.4 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1665										
									1,660.9 GROUND SURFACE	0.0
1,657.6	3.3								**ALLUVIAL** Brown silty sand.	
		0	0	1	1	SS-2	Sat.			
1,652.6	8.3								1,652.9	8.0
		22	40	43	83		M		1,652.3 **ALLUVIAL** Brown sand and gravel	8.6
									1,650.6	10.3
1,649.5	11.4								1,649.5 **SAPROLITE** Brown-gray silty sand.	11.4
		60/.04			60/.04				**WEATHERED ROCK** Weathered rock of schist.	
									CRYSTALLINE ROCK Gray sericite schist.	
									1,628.3	32.6
									Boring Terminated at Elevation 1,628.3 ft in Crystalline Rock (schist)	

NCDOT BORE SINGLE GINTFILES.GPJ NC_DOT.GDT 08/08/07

14/20

SHEET 1 OF 1

DATE 13-Apr-07

CORE BORING REPORT

PROJECT: 33715.1.1 I. D. NO: B-4466 BORING NO: B1-A GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 4 on SR-1104 over Brasstown Creek

COUNTY: Clay COLLAR ELEVATION: 1660.9 FT. TOTAL DEPTH: 32.6 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET	REC. %	RQD. FEET	RQD. %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
1649.4	11.5				0.9		0.9		
			1.1						
1648.3	12.6				82		82		
1648.3	12.6				4.9		4.9		
			5.0						
1643.3	17.6				98		98		
1643.3	17.6				5.0		5.0		Light gray sericite schist with cross-biotite. Slightly weathered to fresh; hard. Trace of pyrite.
			5.0						
1638.3	22.6				100		100		
1638.3	22.6				5.0		5.0		
			5.0						
1633.3	27.6				100		100		
1633.3	27.6				5.0		5.0		
			5.0						
1628.3	32.6				100		100		

CORING TERMINATED AT ELEVATION 1628.3 FT.

DRILLER: C J Coffey CORE SIZE: NXWL EQUIPMENT: CME-550x

SHEET

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33715.1.1	**ID.** B-4466	**COUNTY** Clay	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 4 on SR-1104 over Brasstown Creek			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 18+20	**OFFSET** 21ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 1,658.8 ft	**TOTAL DEPTH** 32.4 ft	**NORTHING** 491,377	**EASTING** 525,119 — **24 HR.** 4.5
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic
START DATE 04/09/07	**COMP. DATE** 04/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 15.8 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
1660										
									1,658.8 GROUND SURFACE	0.0
1,655.7	3.1								**ALLUVIAL** Brown silty sand with mica.	
		1	2	1	3		M			
1,650.7	8.1								1,652.9 **WEATHERED ROCK** Weathered rock of schist.	5.9
		21	71	29/.2	100/.7		M			
1,645.7	13.1								1,647.8 **SAPROLITE** Brown sandy silt.	11.0
		8	9	35	44	SS-3	W		1,644.2	14.6
1,643.0	15.8	60/.08			60/.08	RS-1			1,643.0 **WEATHERED ROCK** Weathered rock of schist. **CRYSTALLINE ROCK** Gray sericite schist.	15.8
									1,626.4 Boring Terminated at Elevation 1,626.4 ft in Crystalline Rock (schist)	32.4

NCDOT BORE SINGLE GINTFILES.GPJ NC_DOT.GDT 08/08/07

11/20

SHEET 1 OF 1

DATE 13-Apr-07

CORE BORING REPORT

PROJECT: 33714.1.1 I. D. NO: B-4466 BORING NO: B1-B GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 4 on SR-1104 over Brasstown Creek

COUNTY: Clay COLLAR ELEVATION: 1658.8 FT. TOTAL DEPTH: 32.4 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
1642.9	15.9		1.5	1.1 73	1.1 73		
1641.4	17.4						
1641.4	17.4		5.0	5.0 100	5.0 100	RS-1	Light gray sericite schist with cross-biotite. Fresh, hard. Trace of pyrite; trace of chlorite.
1636.4	22.4						
1636.4	22.4		5.0	5.0 100	5.0 100		
1631.4	27.4						
1631.4	27.4		5.0	5.0 100	5.0 100		
1626.4	32.4						

CORING TERMINATED AT ELEVATION 1626.4 FT.

DRILLER: C J Coffey CORE SIZE: NXWL EQUIPMENT: CME-550x

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET

PROJECT NO. 33715.1.1	**ID.** B-4466	**COUNTY** Clay	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 4 on SR-1104 over Brasstown Creek			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 19+01	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** 3.9
COLLAR ELEV. 1,661.8 ft	**TOTAL DEPTH** 11.8 ft	**NORTHING** 491,446	**EASTING** 525,176	**24 HR.** Caved at 4.4
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic	
START DATE 04/04/07	**COMP. DATE** 04/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 11.7 ft	

ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1665									1,661.8 GROUND SURFACE	0.0
									1,660.8 **ROADWAY EMBANKMENT** Brown sandy silt.	1.0
1660	1,659.0 2.8	0	0	1	1	SS-1	M		**ALLUVIAL** Brown sandy silt with trace of organic matter.	
1655	1,654.0 7.8	6	11	20	31		Sat.		1,654.8	7.0
	1,650.7 1,650.0 11.1 11.8	100/.25	60/.08		100/.25 60/.08				1,653.0 **ALLUVIAL** Brown gravel and boulders. 1,651.8 **SAPROLITE** Brown silty sand. 1,650.1 **WEATHERED ROCK** Weathered rock of schist. 1,650.0 **CRYSTALLINE ROCK** Gray sericite schist.	8.8 10.0 11.7 11.8
1650									Boring Terminated with Standard Penetration Test Refusal at Elevation 1,650.0 ft in Crystalline Rock (schist)	
1645										
1640										
1635										
1630										
1625										
1620										
1615										
1610										
1605										
1600										
1595										
1590										

NCDOT BORE SINGLE GINTFILES.GPJ NC_DOT.GDT 04/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET 12/20

PROJECT NO. 33715.1.1	**ID.** B-4466	**COUNTY** Clay	**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION Bridge No. 4 on SR-1104 over Brasstown Creek			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 19+01	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** 9.0
COLLAR ELEV. 1,667.7 ft	**TOTAL DEPTH** 20.6 ft	**NORTHING** 491,416	**EASTING** 525,190	**24 HR.** FIAD
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic	
START DATE 04/11/07	**COMP. DATE** 04/16/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 20.6 ft	

ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1670									1,667.7 GROUND SURFACE	0.0
									1,665.7 **ROADWAY EMBANKMENT** Red-brown silty clay.	2.0
1665	1,664.1 3.6	1	2	1	3		M		**ROADWAY EMBANKMENT** Brown sandy silt with gravel.	
1660	1,659.1 8.6	2	2	1	3		M		1,661.2 **ALLUVIAL** Brown silty sand with mica.	6.5
1655	1,654.1 13.6	10	12	31	43		Sat.		1,653.0 1,652.2 **SAPROLITE** Gray silty sand.	14.7 15.5
1650	1,649.1 18.6	100/.4			100/.4		M		**WEATHERED ROCK** Weathered rock of schist.	
	1,647.1 20.6	60/.04			60/.04		D		1,647.1 1,647.1 **CRYSTALLINE ROCK** Grey sericite schist.	20.6 20.6
1645									Boring Terminated with Standard Penetration Test Refusal at Elevation 1,647.1 ft in Crystalline Rock (schist)	
1640										
1635										
1630										
1625										
1620										
1615										
1610										
1605										
1600										
1595										

NCDOT BORE SINGLE GINTFILES.GPJ NC_DOT.GDT 04/18/07

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	B-4466

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	33715.1.1	COUNTY:	Clay	Owner:	NCDOT
DATE SAMPLED:	4.4.07	DATE RECEIVED:	4.13.07	DATE REPORTED:	4.19.07
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye		2002	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5			
Lab Sample No. A	154935	154936	154937	154938	154939			
HiCAMS Sample #	--	--	--	--	--			
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0			
Passing #10 Sieve %	92	100	95	78	93			
Passing #40 Sieve %	90	100	81	70	90			
Passing #200 Sieve %	48	33	36	37	61			

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	8	14	26	18	6			
Fine Sand - Ret. #270	49	58	50	41	37			
Silt 0.05-0.005 mm %	31	18	20	19	29			
Clay < 0.005 mm %	12	10	4	22	28			
Passing # 40 Sieve %	--	--	--	--	--			
Passing # 200 Sieve %	--	--	--	--	--			

Liquid Limit	26	20	29	26	36			
Plastic Index	NP	NP	NP	NP	NP			
AASHTO Classification	A-4 (3)	A-2-4 (0)	A-4 (0)	A-4 (0)	A-4 (5)			
Quantity								
Texture								
Station	19+01	18+20	18+20	17+37	17+37			
Hole No.								
Depth (ft) From:	3.3	3.8	13.6	4.5	9.5			
To:	4.3	4.8	14.6	5.5	10.5			

Remarks:

A-154935 - 154939

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33715.1.1 TIP: B-4466 COUNTY: Clay

DESCRIPTION(1): Bridge No.4 on SR-1104 over Brasstown Creek

EXISTING BRIDGE

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

Bridge No.: 4 Length: 120 Total Bents: 5 Bents in Channel: 2 Bents in Floodplain: 3
Foundation Type: Footings (on piles?)

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None noted.

Interior Bents: Minor amounts on the upstream (Right) sides of Interior Bents 1 and 2.

Channel Bed: None noted.

Channel Bank: Minor amount at existing EB1-A.

EXISTING SCOUR PROTECTION

Type(3): Wooden end-bent walls.

Extent(4): Five feet beyond width of bridge, either side.

Effectiveness(5): Good.

Obstructions(6): Rock outcrops in stream bed, approx. 50 feet downstream of existing bridge.

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): Silty sand with cobbles.

Channel Bank Material(8): Silty sand.

Channel Bank Cover(9): Cane and trees.

Floodplain Width(10): EB1-B = 0ft. All others greater than 100 feet.

Floodplain Cover(11): Grass.

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

Channel Migration Tendency(13): South-southwest

Observations and Other Comments: Existing End-Bent One marks the edge of the creek.

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS EB1		B1								
1656.8		1652.2								

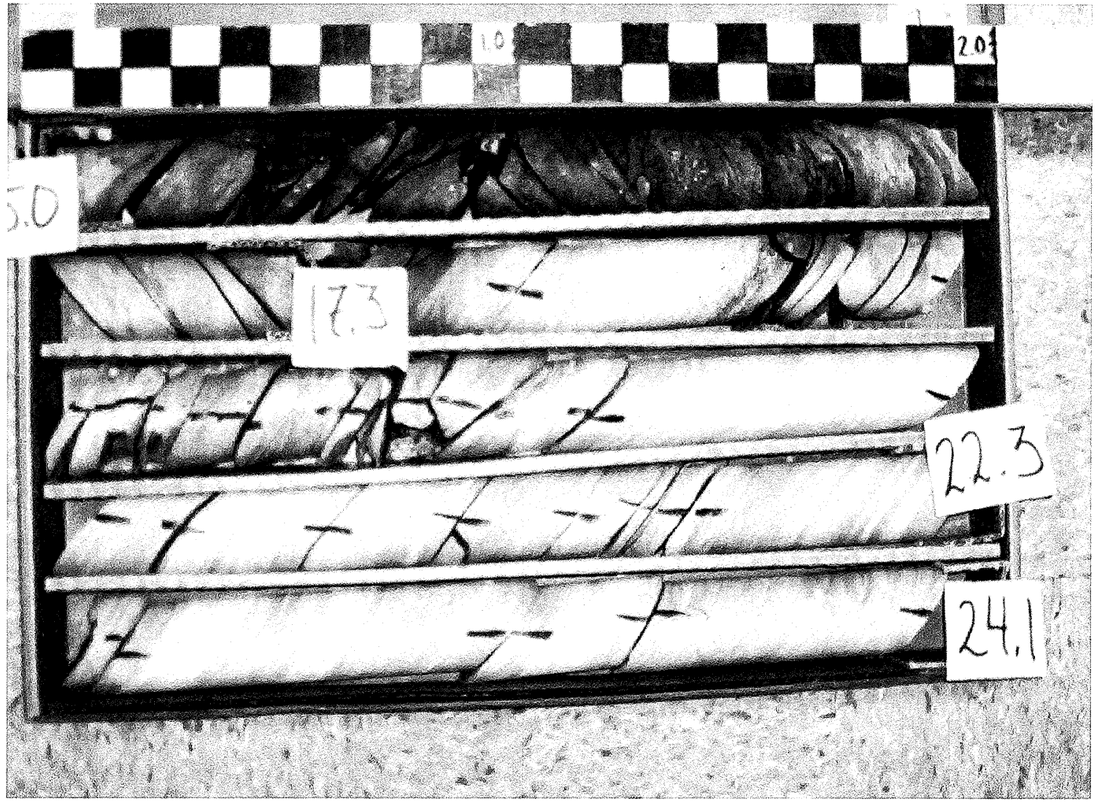
Comparison of DSE to Hydraulics Unit theoretical scour:
EB1 is about the same; B1 is approx 4.5 feet above theoretical scour.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

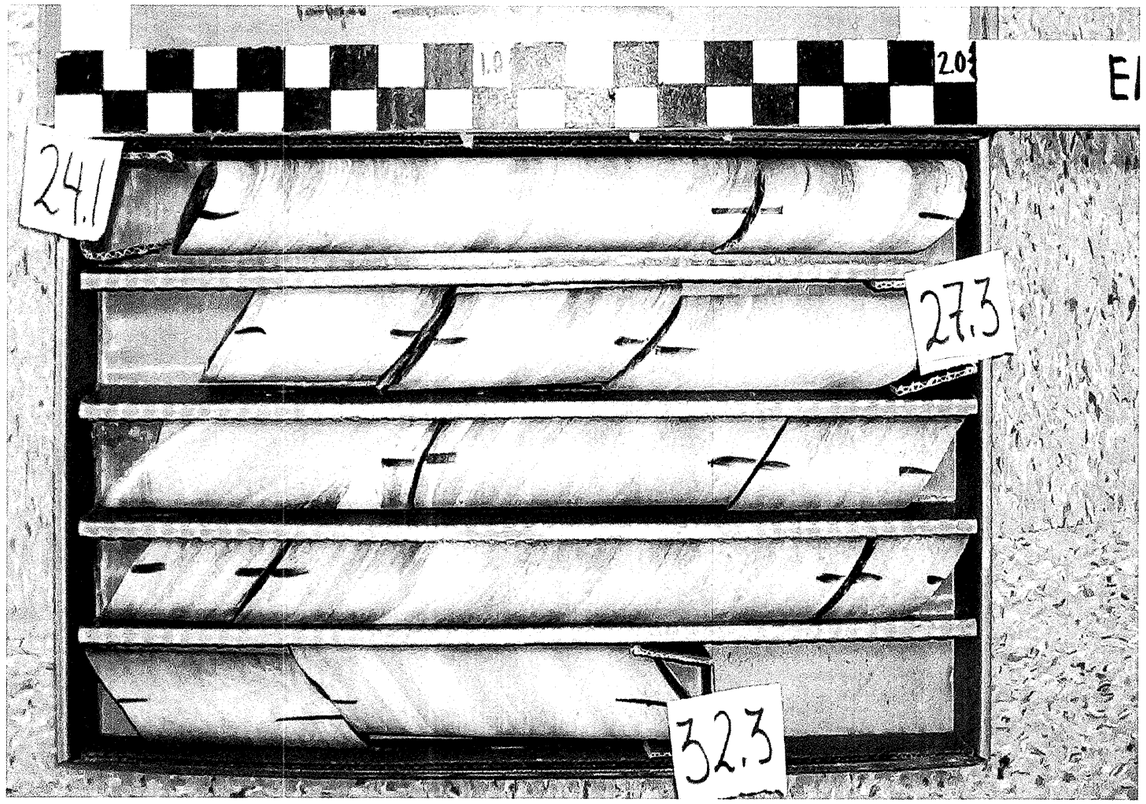
Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

Template Revised 02/07/06

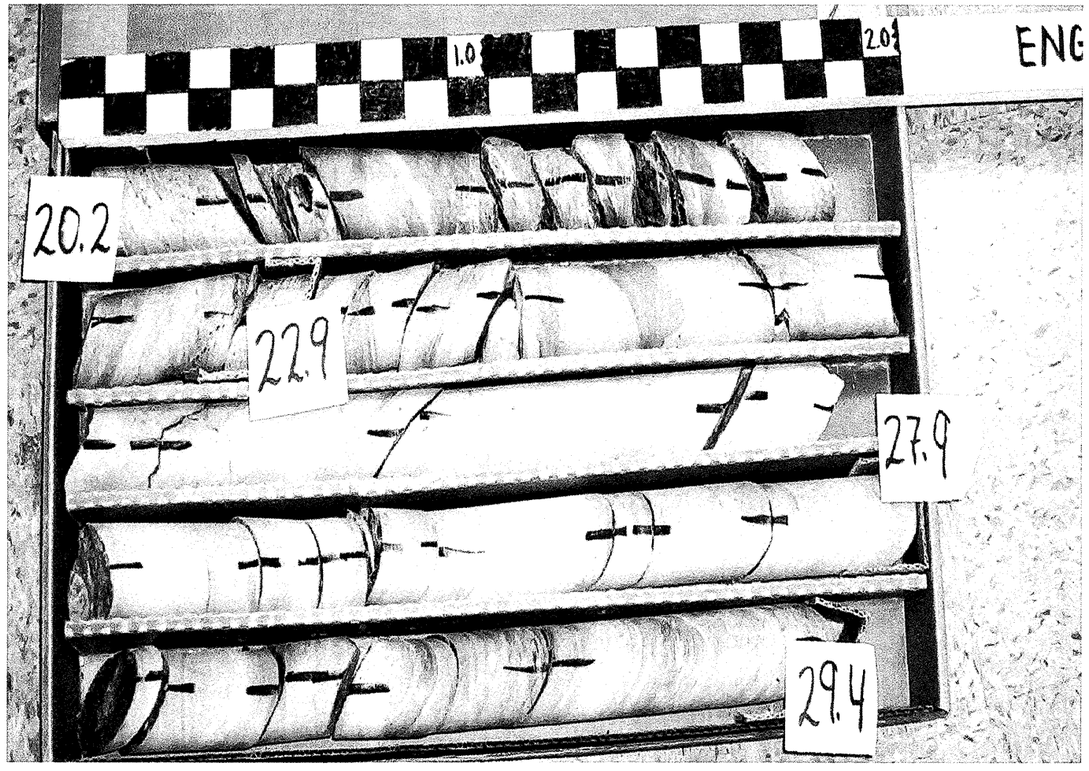
Reported by: C A Dunnagan **Date:** 4/20/2007



33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
EB1-A
Box 1 of 2

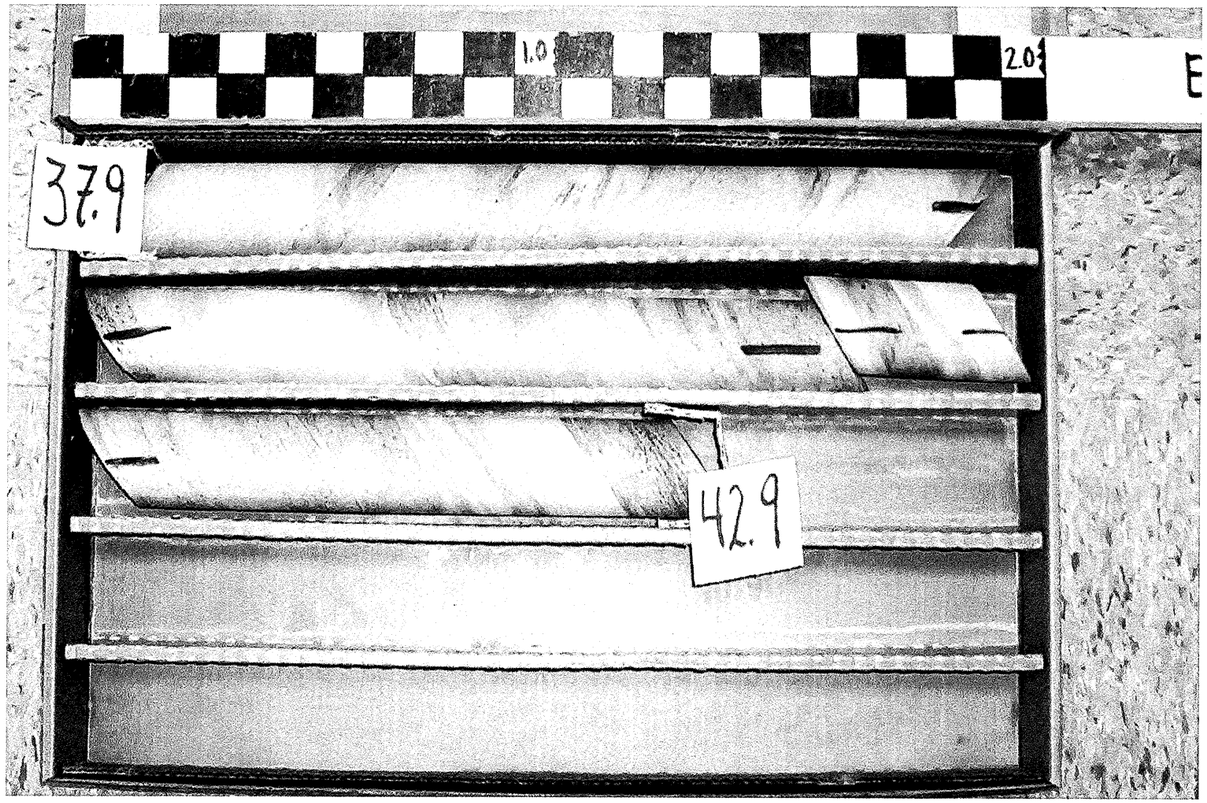


33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
EB1-A
Box 2 of 2



33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
EB1-B
Box 1 of 3

33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
EB1-B
Box 2 of 3



33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
EB1-B
Box 3 of 3

33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
B1-A
Box 1 of 3

33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
B1-A
Box 2 of 3

33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
B1-A
Box 3 of 3

33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
B1-B
Box 1 of 2

33715.1.1 B-4466
Bridge No. 4 on SR-1104
Over Brasstown Creek.
B1-B
Box 2 of 2