STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33421.1.1 (B-4057)	1	19

ID: B-4057

CONTRACT:

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33421.1.1 I.D. NO. B-4057

F.A. PROJECT BRZ-1503(5)

COUNTY CASWELL

PROJECT DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK AT STATION 23+80

CONTENTS:

CAUTION NOTICE

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INVESTIGATED BY J. L. PEDRO

CHECKED BY N. T. ROBERSON

SUBMITTED BY N. T. ROBERSON

DATE JANUARY 2007

PERSONNEL J.L. PEDRO, O.B. OTI, C. D. CZAJKA, W. N. CHERRY, R. E. SMITH, CONSULTANT: TRIGON, W.T. DUGGINS, E. HARRIS, T. JEFFERS

DRAWN BY: J. L. PEDRO, T. T. WALKER

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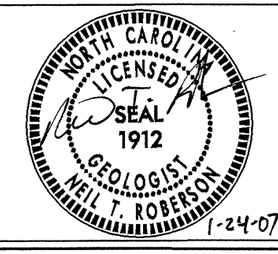


1-24-07

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-4057	33421.1.1	2	19

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL 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 FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T286, 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-7-5, A-7-6)	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							
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	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 (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	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	2.0	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)	- 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
- 25/026 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT CPT / DPT DMT / VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- 50/06 — 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

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B- 57
- [ ] BK-51
- [X] CME-45B
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] OTHER CME-850
- [ ] OTHER

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

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

CORE SIZE:
- [ ] -B____
- [X] -NXWL____
- [ ] -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 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 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 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 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 0.25 INCHES 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 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 GEOLOGISTS 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 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 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 4 INCHES 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 OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.

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: BL-5 at -L- Station 25+16.55, Offset 15.75' RT

ELEVATION: 391.10 Ft

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

January 8, 2007

STATE PROJECT: 33421.1.1 (B-4057)
F.A. PROJECT: BRZ-1503 (5)
COUNTY: Caswell

DESCRIPTION: Bridge No. 39 on -L- (SR 1503) over Hogan's Creek at Station 23+80

SUBJECT: Geotechnical Report – Structure Inventory

Project Description

A three-span bridge, 210-feet in length with a 90° skew, is proposed to replace the existing bridge. The new bridge will be 9 feet longer than the existing structure. The project is located in northern Caswell County about 8 miles north of the town of Yanceyville and less than half a mile from the Virginia stateline.

The subsurface investigation for the bridge was conducted during October 2005 using an ATV-mounted B-57 drill machine and track-mounted CME-850. Two Standard Penetration Test borings were performed along -L- at each of the four bent locations. Borings B1-A, B2-A, and B2-B were cored using NXWL core equipment. The detour bridge was investigated in December 2006 using an ATV-mounted CME-45B drill machine. One Standard Penetration Test boring was performed along -DET- at each End Bent location. All borings in both investigations were advanced until crystalline rock was encountered. Representative soil samples were obtained for visual classification in the field and selected samples were sent to the Materials and Tests Unit for laboratory analysis. Three rock core samples were submitted to the Materials and Tests Unit to determine Unit Weight and Compressive Strength.

Physiography and Geology

The project is located in relatively hilly terrain of the Piedmont Physiographic province. The area is rural, with scattered single-family homes, farmland, and pastures. The area along Hogan's Creek is wooded. Geologically, the project is located within the Milton Belt, and is underlain by biotite gneiss and schist.

Soil Properties

Soils encountered at the project site include roadway embankment, alluvial, and residual soils.

Roadway embankment soils were encountered at EB1-B. The existing roadway was constructed on 13.0 to 15.0 feet of embankment consisting of tan-brown, medium stiff, moist, sandy silt (A-4). Other embankment soils present include sandy clay (A-6) and silty clay (A-7-6).

Alluvial soils were encountered at all bent locations. The alluvial soils range from 12.0 to 18.0 feet in thickness. These soils predominantly consist of tan-brown and gray, soft to stiff, dry to moist, sandy silt (A-4) and gray and tan-brown, loose to dense, moist to wet, silty sand (A-2-4). The alluvial soils were deposited on residual soil.

Residual soils were encountered at all bent locations and range from 7.0 to 15.5 feet in thickness. The residual soils primarily consist of tan-brown-gray and orange, loose to very dense, moist, micaceous, saprolitic, silty sand (A-2-4). Other soils present are green to orange and white, stiff to very stiff, moist, saprolitic, sandy silt (A-4). The residual soils are underlain by weathered and/or crystalline rock.

Rock Properties

Weathered rock was derived from the underlying biotite gneiss and schist, and ranges in thickness from 0.8 feet at EB1-B to as much as 11.2 feet at B1-A. Weathered rock was encountered in all of the borings except for B2-B. The top of weathered rock ranges in elevation from 347.0 feet at B1-B to 355.9 feet at EB2-B.

Crystalline rock was encountered at all bent locations, and was cored at B1-A, B2-A, and B2-B. Rock present at the site predominantly consists of light gray and gray, slightly weathered to fresh, hard, moderately closely fractured to widely fractured, thickly bedded, granite gneiss. Core Recovery (REC) values range from 86% to 98%, and Rock Quality Designation (RQD) values range from 69% to 98%. Laboratory tests show compressive strengths of 2.47 ksi, 7.98 ksi, and 8.72 ksi for each of the three samples and unit weights ranging from 168.0 lb/ft^3 to 170.9 lb/ft^3. More detailed rock descriptions can be found in the Core Boring Reports. The top of crystalline rock ranges in elevation from 340.9 feet at B1-B to 354.8 feet at EB2-B.

Groundwater

Groundwater was present in all of the borings. The groundwater elevations range from 367.1 feet at EB1-A to 373.9 feet at EB1-B. Surface water in Hogan's Creek was at elevation 371.2 feet on October 18, 2005.

Temporary Detour Structure

A temporary detour structure will be constructed approximately 40 feet upstream of the existing bridge at -DET- Station 14+12. The structure has a total length of 195 feet. Borings EB1-A and EB2-B were drilled along the -DET- alignment to provide additional information for the detour structure. Geologic conditions along the detour alignment correlate directly to those encountered along the main line structure.

Notice

This Geotechnical foundation report is based on the bridge survey report for Hogan's Creek dated July 16, 2006 and the Preliminary General Drawing dated September 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared by,

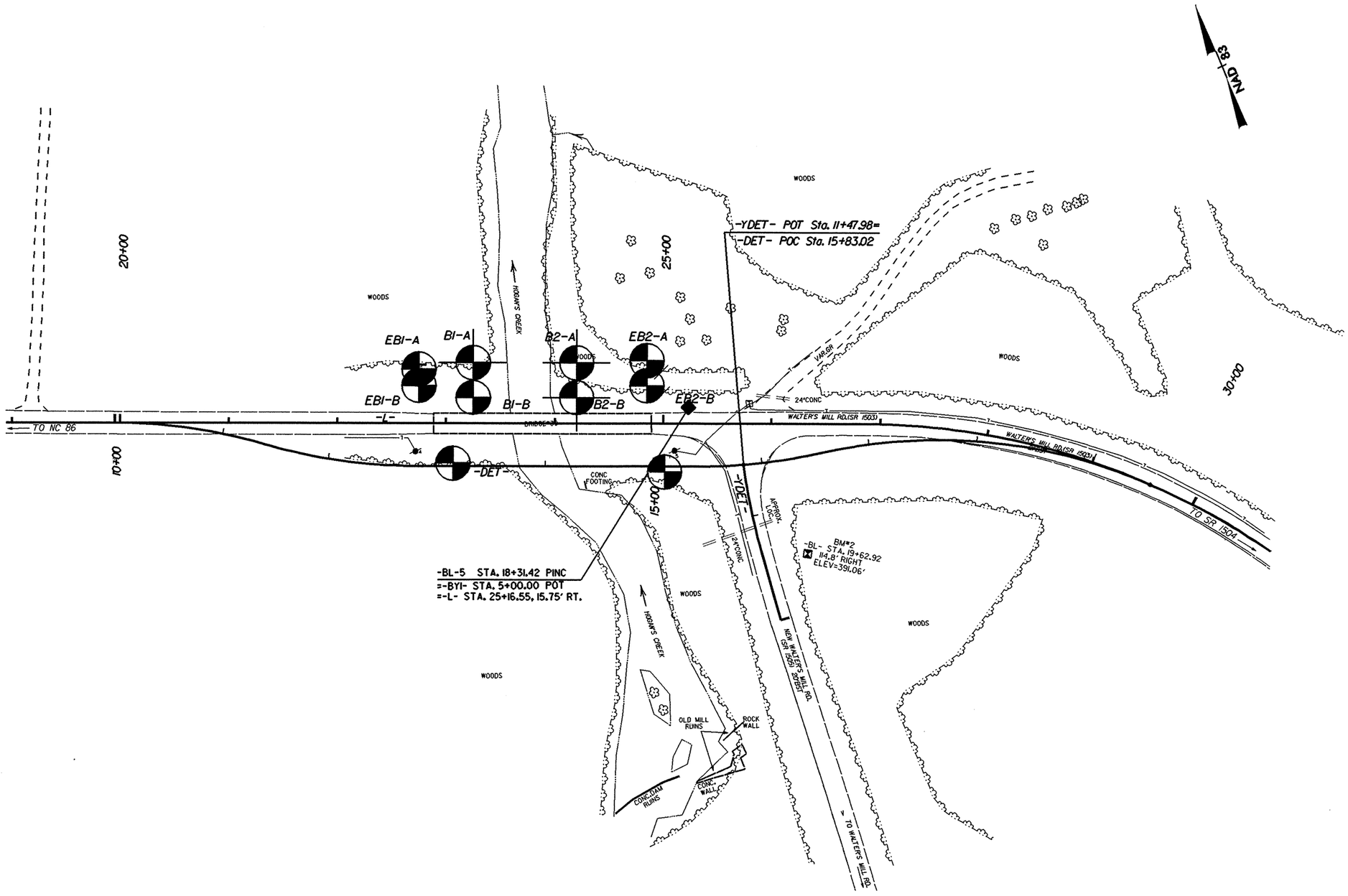
for: Jaime Love Pedro
Engineering Geologist

PROJECT REFERENCE NO.	SHEET
33421.1.1(B-4057)	4 OF 19

0 50 100
FEET

SKEW ANGLE = 90

TEST SITE PLAN



FENCE DIAGRAM THROUGH BORINGS PROJECTED 40' LT OF -L-

EB1-A	B1-A	B2-A	EB2-A
22+75	23+25	24+20	24+85
50' LT	56' LT	56' LT	58' LT

390
380
370
360
350
340
330
320

ALLUVIAL, SOFT TO STIFF, WITH SOME MICA — 5, 4, 15, 10

RESIDUAL, 10, 43, 50, 60/0.0

TAN-BROWN AND BRN., MOIST, SANDY SILT — 8, 13, 7, 5, 8, 34, 10

TAN-BROWN-GRAY AND 16, 100+, 100+

WEATHERED ROCK (GRANITE GNEISS)

CRYSTALLINE ROCK, LIGHT GRAY AND GRAY,

10/05

ALLUVIAL, GRAY, LT. GRAY, AND TAN-BROWN, LOOSE TO

Ⓐ

WHITE, LOOSE TO VERY DENSE, MOIST,

VERY SLIGHTLY WEATHERED TO FRESH, HARD, WIDELY

REC=97-98% RQD=97-98%

ALLUVIAL, TO MOIST, 8, WOH, 13, 34, 17, 100+

GROUND SURFACE

TAN-BROWN, V. SOFT MEDIUM STIFF, SANDY SILT

DENSE, MOIST, SILTY SAND WITH

MICACEOUS, SAPROLITIC, SILTY SAND

WEATHERED ROCK (MICA AND

FRACTURED, THICKLY BEDDED, GRANITE GNEISS

5, 6, 5, 16, 100+

SOME GRAVEL

GRANITE GNEISS)

Ⓐ RESIDUAL, GREEN, STIFF, MOIST, SAPROLITIC, SANDY SILT

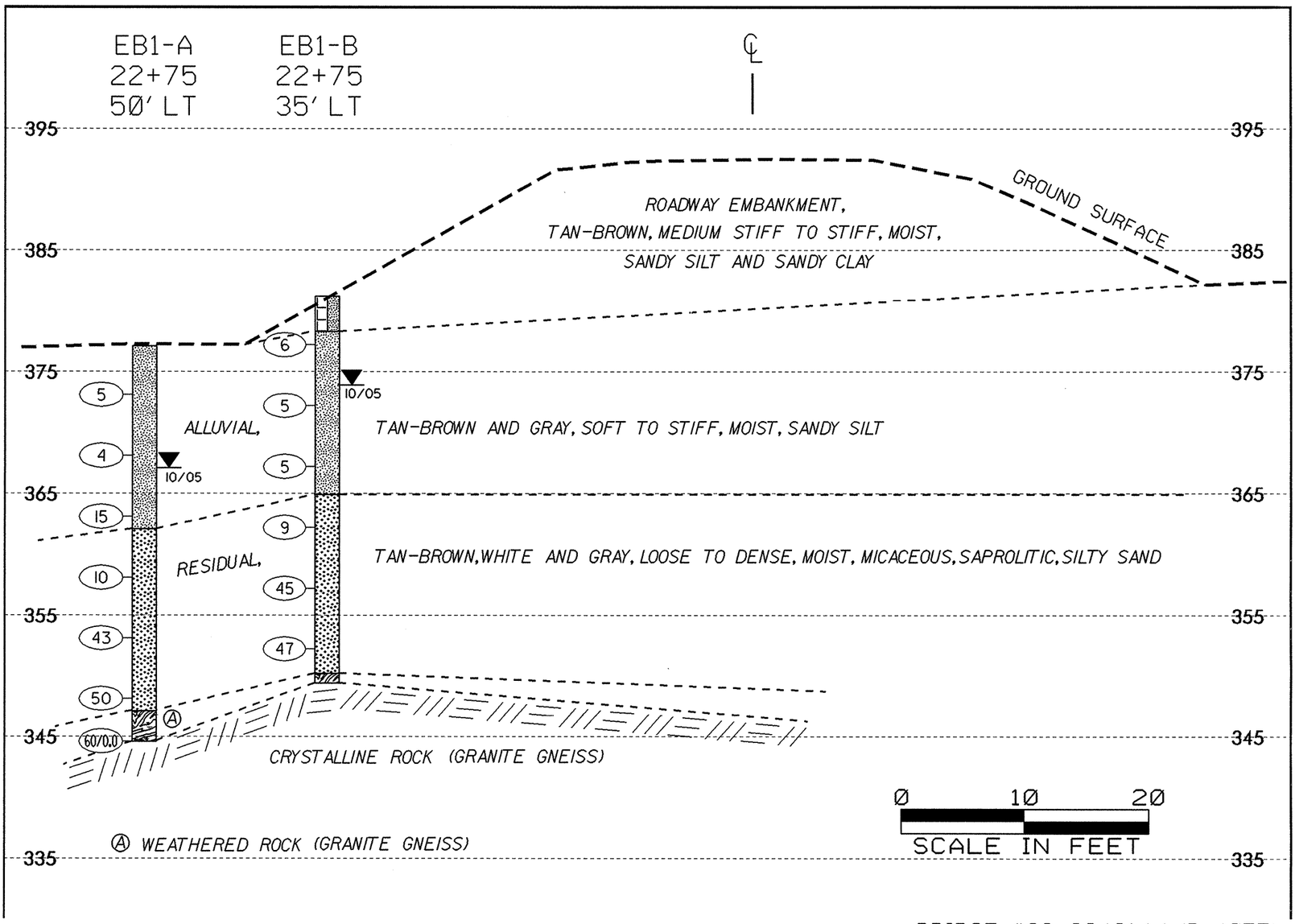
VE=2:1

0 20 40

SCALE IN FEET

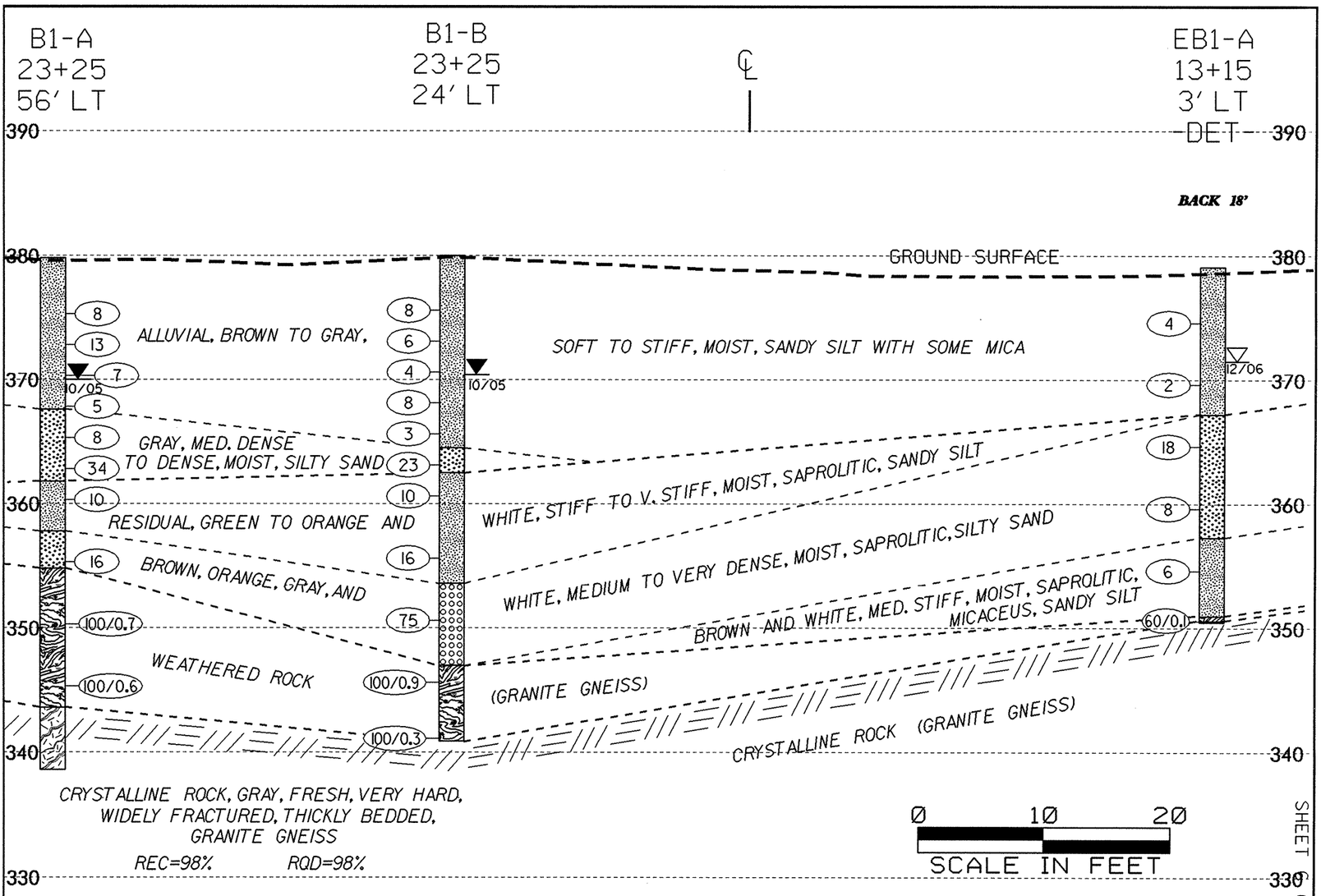
23+00 24+00 25+00

CROSS SECTION THROUGH END BENT 1



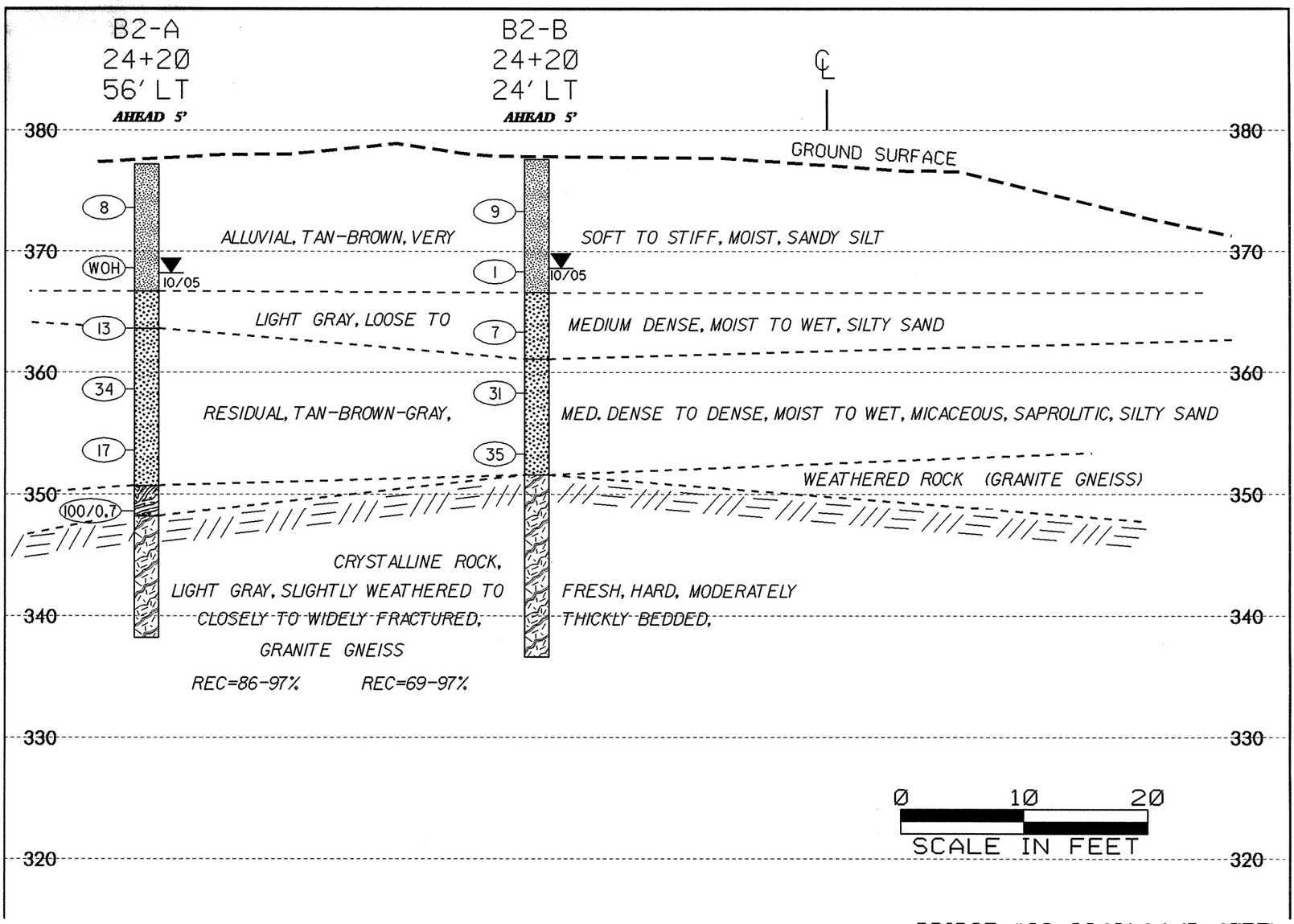
BRIDGE #39, 33421.1.1 (B-4057)

CROSS SECTION THROUGH BENT 1



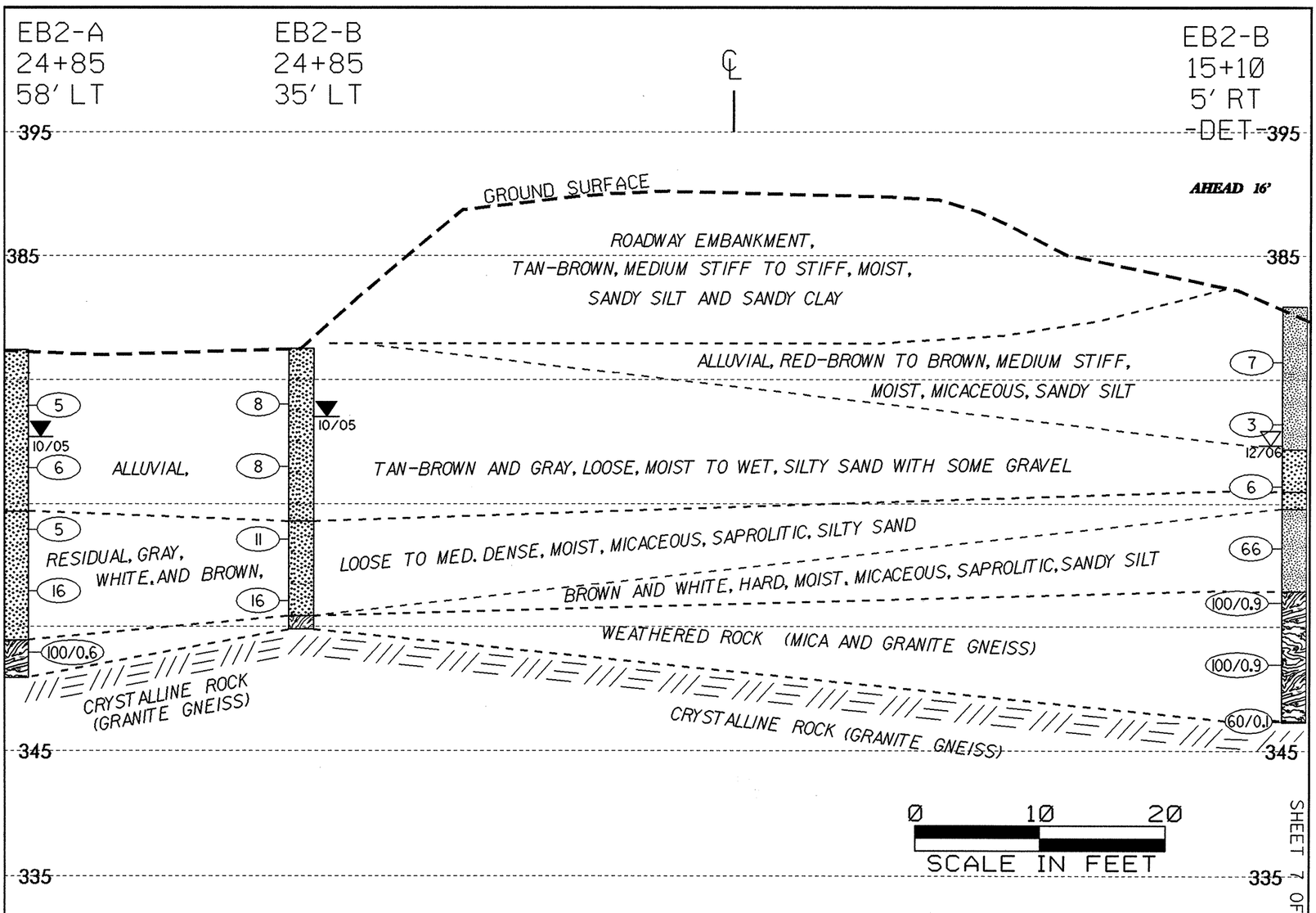
BRIDGE #39, 33421.1.1 (B-4057)

CROSS SECTION THROUGH BENT 2



BRIDGE #39, 33421.1.1 (B-4057)

CROSS SECTION THROUGH END BENT 2



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** O. B. OTI	
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK				**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 22+75	**OFFSET** 50' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 377.1'	**NORTHING** 1014025	**EASTING** 1896358		**24 HR.** 10.0'
TOTAL DEPTH 32.5'	**DRILL MACHINE** CME-850	**DRILL METHOD** ROTARY W/ MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 10/14/05	**COMPLETION DATE** 10/14/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 32.5'	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	▼ MOI.	LOG	SOIL AND ROCK DESCRIPTION
377.1										
375.0	3.0	2	2	3	1.0	X 5	SS-10	M		ALLUVIAL, TAN-BROWN AND GRAY, SANDY SILT
370.0	8.0	2	2	2	1.0	X 4	SS-11	M		
365.0	13.0	1	13	2	1.0	X 15		M		
360.0	18.0	4	6	4	1.0	X 10	SS-12	M		RESIDUAL, TAN-BROWN, MICACEOUS, SAPROLITIC, SILTY SAND
355.0	23.0	31	24	19	1.0	X 43	SS-13	M		
350.0	28.0	2	20	30	1.0	X 50	SS-14	M		
345.0	32.5	60			0.0	60/0.0 X				WEATHERED ROCK (GRANITE GNEISS)
340.0										TRI-CONE REFUSAL AT ELEVATION 344.6 FEET ON CRYSTALLINE ROCK (GRANITE GNEISS)
335.0										
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** O. B. OTI	
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK				**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 22+75	**OFFSET** 35' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 381.2'	**NORTHING** 1014011	**EASTING** 1896352		**24 HR.** 7.3'
TOTAL DEPTH 31.8'	**DRILL MACHINE** CME-850	**DRILL METHOD** ROTARY W/ MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 10/19/05	**COMPLETION DATE** 10/19/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.8'	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	▼ MOI.	LOG	SOIL AND ROCK DESCRIPTION
381.2										
380.0	3.0	3	3	3	1.0	X 6		M		ROADWAY EMBANKMENT, TAN-BROWN, SANDY SILT
375.0	8.0	2	2	3	1.0	X 5		M		ALLUVIAL, TAN-BROWN, SANDY SILT
370.0	13.0	2	2	3	1.0	X 5		M		
365.0	18.0	2	3	6	1.0	X 9		M		RESIDUAL, TAN-BROWN-GRAY, MICACEOUS, SAPROLITIC, SILTY SAND
360.0	23.0	7	14	31	1.0	X 45		M		
355.0	28.0	10	17	30	1.0	X 47		M		
350.0										WEATHERED ROCK (GRANITE GNEISS)
345.0										TRI-CONE REFUSAL AT ELEVATION 349.4 FEET ON CRYSTALLINE ROCK (GRANITE GNEISS)
340.0										
335.0										
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** J. L. PEDRO
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 23+25	**OFFSET** 56' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 379.8'	**NORTHING** 1014010	**EASTING** 1896406	**24 HR.** 9.8'
TOTAL DEPTH 41.2'	**DRILL MACHINE** B-57	**DRILL METHOD** ROTARY W/ MUD	**HAMMER TYPE** MANUAL
START DATE 10/12/05	**COMPLETION DATE** 10/12/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 36.2'

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
379.8										
	3.5	4	4	4	1.0	X 8	SS-7	M		ALLUVIAL, BROWN, SANDY SILT WITH SOME MICA
375.0	6.0	5	7	6	1.0	X 13		M		
	8.5	4	4	5	1.0	X 9		M		
370.0	11.0	3	2	3	1.0	X 5		M		
	13.5	4	5	3	1.0	X 8	SS-8	M		GRAY, SILTY SAND WITH SOME QUARTZ GRAVEL AND WEATHERED ROCK FRAGMENTS
365.0	16.0	12	14	20	1.0	X 34		M		
	18.5	5	4	6	1.0	X 10		M		RESIDUAL, GREEN, SAPROLITIC, SANDY SILT
360.0										
	23.5	3	5	11	1.0	X 16	SS-9	M		BROWN, SAPROLITIC, SILTY SAND
355.0										
	28.5	34	44	56	0.7	100/0.7 X				WEATHERED ROCK (GRANITE GNEISS)
350.0										
	33.5	88	12		0.6	100/0.6 X	RS-1			CRYSTALLINE ROCK, GRAY, FRESH, VERY HARD, WIDELY FRACTURED, THICKLY BEDDED, GRANITE GNEISS
345.0										REC= 98% RQD=98%
340.0										
335.0						CORING TERMINATED AT ELEVATION 338.6 FEET IN CRYSTALLINE ROCK (GRANITE GNEISS)				
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

CORE BORING REPORT

PROJECT: **33421.1.1** ID: **B-4057** COUNTY: **Caswell** BORING NO: **B1-A**

DESCRIPTION: Bridge No. 39 on -L- (SR 1503) over Hogan's Creek

LOCATION OF BORING: -L- Sta. 23+25, Offset - 56' LT COMPLETION DATE: 10/13/05

COLLAR or GROUND ELEVATION: 379.8 ft CORE SIZE: NXWL GEOLOGIST: J. L. Pedro

CORE EQUIPMENT: B-57, N-Casing, NXWL DRILLER: W. T. Duggins

ELEV (ft)	DEPTH (ft)	DRILL RATE (min/ft)	RUN (ft)	REC (ft) (%)	RQD (ft) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
343.6	36.2	3:33				RS-1	Dark gray, fresh, very hard, widely fractured, thickly bedded, granite gneiss
		3:50		4.5	4.5	36.2-36.6	
		3:43	4.5				
		3:14		(100%)	(100%)		
339.1	40.7	2:08/0.5'					
339.1	40.7	2:53/0.5'					Dark gray, fresh, very hard, widely fractured, thickly bedded, granite gneiss
				0.4	0.4		
			0.5				
338.6	41.2			(80%)	(80%)		
							BOREHOLE TERMINATED AT ELEVATION OF 338.6 FEET, IN GRANITE GNEISS.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** J. L. PEDRO
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 23+25	**OFFSET** 24' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 380.0'	**NORTHING** 1013980	**EASTING** 1896393		**24 HR.** 9.6'
TOTAL DEPTH 39.1'	**DRILL MACHINE** B-57	**DRILL METHOD** ROTARY W/ MUD	**HAMMER TYPE** MANUAL	
START DATE 10/11/05	**COMPLETION DATE** 10/11/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 39.1'	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
380.0										
	3.4	3	3	5	1.0	X 8	SS-1	D		ALLUVIAL, BROWN TO GRAY, SANDY SILT WITH SOME MICA
375.0	5.9	3	3	3	1.0	X 6		M		
	8.4	2	2	2	1.0	X 4		M		
370.0	10.9	3	4	4	1.0	X 8		M		
	13.4	3	2	1	1.0	X 3	SS-2	M		
365.0	15.9	3	11	12	1.0	X 23	SS-3	M		GRAY, SILTY SAND
	18.4	6	3	7	1.0	X 10	SS-4	M		RESIDUAL, GREEN TO ORANGE AND WHITE, SAPROLITIC, SANDY SILT
360.0										
	23.4	7	7	9	1.0	X 16	SS-5	M		
355.0										
	28.4	24	43	32	1.0	X 75	SS-6	M		ORANGE-BROWN, SAPROLITIC, SILTY SAND
350.0										
	33.4	25	75		0.9	100/0.9 X				WEATHERED ROCK (GRANITE GNEISS)
345.0										
	38.4	100			0.3	100/0.3 X				
340.0						TRI-CONE REFUSAL AT ELEVATION 340.9 FEET ON CRYSTALLINE ROCK (GRANITE GNEISS)				
335.0										
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	ID. B-4057	COUNTY CASWELL	GEOLOGIST O. B. OTI
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK			GROUND WATER
BORING NO. B2-A	BORING LOCATION 24+20	OFFSET 56' LT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEVATION 377.2'	NORTHING 1013970	EASTING 1896493	24 HR. 9.0'
TOTAL DEPTH 39.0'	DRILL MACHINE CME-850	DRILL METHOD ROTARY W/ MUD	HAMMER TYPE AUTOMATIC
START DATE 10/18/05	COMPLETION DATE 10/18/05	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 29.0'

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
377.2										
375.0	2.6	5	4	4	1.0	X 8		M		ALLUVIAL, TAN-BROWN, SANDY SILT
370.0	7.6	WOH	WOH	WOH	1.0	X 0		M		LIGHT GRAY, SILTY SAND
365.0	12.6	4	7	6	1.0	X 13		M		RESIDUAL, TAN-BROWN-GRAY, MICACEOUS, SAPROLITIC, SILTY SAND
360.0	17.6	12	18	16	1.0	X 34		M		
355.0	22.6	12	7	10	1.0	X 17		M		
350.0	27.6	85	15		0.7	100/0.7 X				WEATHERED ROCK (GRANITE GNEISS)
345.0										CRYSTALLINE ROCK, LIGHT GRAY, VERY SLIGHTLY WEATHERED TO FRESH, HARD, WIDELY FRACTURED, THICKLY BEDDED, GRANITE GNEISS
340.0							RS-3			REC=97% ROD=97%
						CORING TERMINATED AT ELEVATION 338.2 FEET IN CRYSTALLINE ROCK (GRANITE GNEISS)				
335.0										
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

CORE BORING REPORT

PROJECT: 33421.1.1 ID: B-4057 COUNTY: Caswell BORING NO: B2-A

DESCRIPTION: Bridge No. 39 on -L- (SR 1503) over Hogan's Creek

LOCATION OF BORING: -L- Sta. 24+20, Offset -56' LT COMPLETION DATE: 10/18/05

COLLAR or GROUND ELEVATION: 377.2 ft CORE SIZE: NXWL GEOLOGIST: O. B. Oti

CORE EQUIPMENT: CME-850, N-Casing, NXWL DRILLER: W. T. Duggins

ELEV (ft)	DEPTH (ft)	DRILL RATE (min/ft)	RUN (ft)	REC (ft) (%)	RQD (ft) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
348.2	29.0	4:00	5.0	4.7 (94%)	4.7 (94%)		Gray, very slightly weathered to fresh, hard, widely fractured, thickly bedded, granite gneiss
		3:00					
		3:00					
		2:00					
343.2	34.0	2:25					
343.2	34.0	2:12	5.0	5.0 (100%)	5.0 (100%)	RS-3 37.5-38.0	Gray, very slightly weathered to fresh, hard, widely fractured, thickly bedded, granite gneiss
		2:15					
		2:10					
		2:00					
338.2	39.0	2:00					

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** O. B. OTI
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK			**GROUND WATER**
BORING NO. B2-B	**BORING LOCATION** 24+20	**OFFSET** 24' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 377.6'	**NORTHING** 1013947	**EASTING** 1896481	**24 HR.** 9.0'
TOTAL DEPTH 41.0'	**DRILL MACHINE** CME-850	**DRILL METHOD** ROTARY W/ MUD	**HAMMER TYPE** AUTOMATIC
START DATE 10/17/05	**COMPLETION DATE** 10/17/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 26.0'

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	▼ MOI.	LOG	SOIL AND ROCK DESCRIPTION
377.6										
375.0	3.3	4	4	5	1.0	X 9	SS-17	M		ALLUVIAL, TAN-BROWN, SANDY SILT
370.0	8.3	WOH	WOH	1	1.0	X 1	SS-18	M▼		
365.0	13.3	2	3	4	1.0	X 7	SS-19	W		LIGHT GRAY, SILTY SAND
360.0	18.3	6	8	23	1.0	X 31	SS-20	W		RESIDUAL, TAN-BROWN-GRAY, MICACEOUS, SAPROLITIC, SILTY SAND
355.0	23.3	6	10	25	1.0	X 35	SS-21	W		
	26.0	60			0.0	60/0.0 X				
350.0							RS-2			CRYSTALLINE ROCK, LIGHT GRAY, SLIGHTLY WEATHERED TO FRESH, HARD, MODERATELY CLOSELY TO CLOSELY FRACTURED, GRANITE GNEISS REC= 86% ROD=69%
345.0										
340.0										
335.0						CORING TERMINATED AT ELEVATION 336.6 FEET IN CRYSTALLINE ROCK (GRANITE GNEISS)				
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

CORE BORING REPORT

PROJECT: **33421.1.1** ID: **B-4057** COUNTY: **Caswell** BORING NO: **B2-B**

DESCRIPTION: Bridge No. 39 on -L- (SR 1503) over Hogan's Creek

LOCATION OF BORING: -L- Sta. 24+20, Offset - 24' LT COMPLETION DATE: 10/17/05

COLLAR or GROUND ELEVATION: 377.6 ft CORE SIZE: NXWL GEOLOGIST: O. B. Oti

CORE EQUIPMENT: CME-850, N-Casing, NXWL DRILLER: W. T. Duggins

ELEV (ft)	DEPTH (ft)	DRILL RATE (min/ft)	RUN (ft)	REC (ft) (%)	RQD (ft) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
351.6	26.0	10:00					(26.0-26.5) White, slightly weathered, moderately hard, closely fractured, granite
		11:00		3.4	1.4	RS-2	(26.5-31.0) Gray, slightly weathered to fresh, hard, closely fractured, granite gneiss
		8:00	5.0			30.2-30.8	
		7:00		(68%)	(28%)		
346.6	31.0	11:00					
346.6	31.0	5:00					(31.0-31.7) Green, slightly weathered to fresh, hard, closely fractured, meta-volcnaic rock
		5:00		5.0	4.5		(31.7-36.0) Gray, fresh, hard, closely to moderately closely fractured, granite gneiss
		4:00	5.0				
		4:00		(100%)	(90%)		
341.6	36.0	3:00					
341.6	36.0	5:00					Gray, fresh, hard, moderately closely fractured, granite gneiss
		4:00		4.5	4.5		
		3:00	5.0				
		4:00		(90%)	(90%)		
336.6	41.0	5:00					
							BOREHOLE TERMINATED AT ELEVATION OF 336.6 FEET, IN GRANITE GNEISS.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** O. B. OTI	
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK				**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 24+85	**OFFSET** 58' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 377.4'	**NORTHING** 1013948	**EASTING** 1896554		**24 HR.** 7.0'
TOTAL DEPTH 26.5'	**DRILL MACHINE** CME-850	**DRILL METHOD** ROTARY W/ MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 10/14/05	**COMPLETION DATE** 10/14/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 26.5'	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
377.4										
375.0	3.5	2	2	3	1.0	5	SS-15	M		ALLUVIAL, TAN-BROWN, SILTY SAND
370.0	8.5	2	2	4	1.0	6		M		
365.0	13.5	2	2	3	1.0	5	SS-16	M		RESIDUAL, GRAY AND WHITE, MICACEOUS, SAPROLITIC, SILTY SAND
360.0	18.5	5	9	7	1.0	16		M		
355.0	23.5	34	66		0.6	100/0.6				WEATHERED ROCK (GRANITE GNEISS)
350.0						TRI-CONE REFUSAL AT ELEVATION 350.9 FEET ON CRYSTALLINE ROCK (GRANITE GNEISS)				
345.0										
340.0										
335.0										
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** O. B. OTI	
SITE DESCRIPTION BRIDGE NO. 39 ON -L- (SR 1503) OVER HOGAN'S CREEK				**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 24+85	**OFFSET** 35' LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEVATION 377.5'	**NORTHING** 1013927	**EASTING** 1896544		**24 HR.** 5.5'
TOTAL DEPTH 22.7'	**DRILL MACHINE** CME-850	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** AUTOMATIC	
START DATE 10/19/05	**COMPLETION DATE** 10/19/05	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 22.7'	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
377.5										
375.0	3.5	4	4	4	1.0	8		M		ALLUVIAL, TAN-BROWN, SILTY SAND WITH GRAVEL LAYER (12.6'-13.9')
370.0	8.5	2	4	4	1.0	8		M		
365.0	14.4	3	5	6	1.0	11		M		RESIDUAL, GRAY, WHITE, AND BROWN, SAPROLITIC, SILTY SAND
360.0	19.4	5	7	9	1.0	16		M		
355.0										WEATHERED ROCK (GRANITE GNEISS)
350.0						AUGER REFUSAL AT ELEVATION 354.8 FEET ON CRYSTALLINE ROCK (GRANITE GNEISS)				
345.0										
340.0										
335.0										
330.0										
325.0										
320.0										
315.0										
310.0										
305.0										
300.0										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** C. D. CZAJKA	
SITE DESCRIPTION DETOUR BRDIGE ON -DET- OVER HOGAN'S CREEK				**GROUND WATER**
BORING NO. EB1-A	**BORING LOCATION** 13+15	**OFFSET** 3' LT	**ALIGNMENT** -DET-	**0 HR.** 7.6'
COLLAR ELEVATION 379.1'	**NORTHING** 1013936	**EASTING** 1896345		**24 HR.** FIAD
TOTAL DEPTH 28.6'	**DRILL MACHINE** CME-45B	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** AUTOMATIC	
START DATE 12/19/06	**COMPLETION DATE** 12/19/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 28.5'	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	MOI.	LOG	
379.1									
375.0	3.5	1	2	2	1.0	X 4	M		ALLUVIAL, BROWN, SANDY SILT
370.0	8.5	WOH	WOH	2	1.0	2 X	M		
365.0	13.5	5	6	12	1.0	X 18	M		RESIDUAL, BROWN, GRAY, AND WHITE, SAPROLITIC, SILTY SAND
360.0	18.5	3	3	5	1.0	X 8	M		
355.0	23.5	1	2	4	1.0	X 6	M		BROWN AND WHITE, MICACEOUS, SAPROLITIC, SANDY SILT
	28.5	60			0.1	60/0.1 X			WEATHERED ROCK (GRANITE GNEISS) / CRYSTALLINE ROCK (GRANTIE GNEISS)
350.0						SPT REFUSAL AT ELEVATION 350.5 FEET IN CRYSTALLINE ROCK (GRANITE GNEISS)			
345.0									
340.0									
335.0									
330.0									
325.0									
320.0									
315.0									
310.0									
305.0									
300.0									

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 33421.1.1	**ID.** B-4057	**COUNTY** CASWELL	**GEOLOGIST** C. D. CZAJKA	
SITE DESCRIPTION DETOUR BRDIGE ON -DET- OVER HOGAN'S CREEK				**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 15+10	**OFFSET** 5' RT	**ALIGNMENT** -DET-	**0 HR.** 11.2'
COLLAR ELEVATION 380.9	**NORTHING** 1013849	**EASTING** 1896521		**24 HR.** FIAD
TOTAL DEPTH 33.6	**DRILL MACHINE** CME-45B	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** AUTOMATIC	
START DATE 12/19/6	**COMPLETION DATE** 12/19/6	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 33.5	

ELEV.	DEPTH (FT.)	BLOW COUNT 0.5'	0.5'	0.5'	PEN. (FT.)	BLOWS PER FOOT 0 25 50 75 100	MOI.	LOG	
380.9									
380.0									
375.0	3.5	2	2	5	1.0	X 7	M		ALLUVIAL, RED-BROWN TO BROWN, MICACEOUS, SANDY SILT
	8.5	1	1	2	1.0	X 3	M		
370.0							▽		
	13.5	WOR	2	4	1.0	X 6	W		GRAY, SILTY SAND
365.0							M		RESIDUAL, BROWN AND WHITE, SAPROLITIC, SILTY SAND
	18.5	21	35	31	1.0	X 66	M		BROWN AND WHITE, MICACEOUS, SAPROLITIC, SANDY SILT
360.0									
	23.5	24	76		0.9	100/0.9 X			
355.0									WEATHERED ROCK (GRANITE GNEISS)
	28.5	18	82		0.9	100/0.9 X			
350.0									
	33.5	60			0.1	60/0.1 X			CRYSTALLINE ROCK (BRANITE GNEISS)
345.0						SPT REFUSAL AT ELEVATION 347.3 FEET IN CRYSTALLINE ROCK (GRANITE GNIESS)			
340.0									
335.0									
330.0									
325.0									
320.0									
315.0									
310.0									
305.0									

PROJ. NO. - 33421.1.1
ID NO. - B-4057
COUNTY - Caswell

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-10	50 LT	22+75	3.0-4.5	A-4(0)	21	1	7.4	59.9	16.6	16.0	100	98	43	-	-
SS-11	50 LT	22+75	8.0-9.5	A-4(0)	23	NP	5.0	69.9	15.0	10.0	100	100	38	-	-
SS-12	50 LT	22+75	18.0-19.5	A-2-4(0)	33	NP	19.6	56.1	20.2	4.0	98	91	35	-	-
SS-13	50 LT	22+75	23.0-24.5	A-2-4(0)	33	NP	32.7	40.9	18.4	8.0	90	72	31	-	-
SS-14	50 LT	22+75	28.0-29.5	A-2-4(0)	33	NP	29.7	46.9	19.4	4.0	96	80	32	-	-

B1-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-7	56 LT	23+25	3.5-5.0	A-4(0)	26	5	13.2	50.1	16.6	20.0	100	98	43	-	-
SS-8	56 LT	23+25	13.5-15.0	A-2-4(0)	24	NP	12.4	68.5	11.0	8.0	100	97	29	-	-
SS-9	56 LT	23+25	23.5-25.0	A-2-4(0)	39	NP	25.5	50.7	19.8	4.0	99	86	34	-	-

B1-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	24 LT	23+25	3.4-4.9	A-4(0)	27	6	19.8	43.3	18.8	18.0	100	92	45	-	-
SS-2	24 LT	23+25	13.4-14.9	A-4(0)	24	1	2.2	67.1	14.6	16.0	100	100	46	-	-
SS-3	24 LT	23+25	15.9-17.4	A-2-4(0)	23	NP	30.9	57.5	7.6	4.0	75	61	14	-	-
SS-4	24 LT	23+25	18.4-19.9	A-4(0)	37	5	23.2	45.5	23.2	8.0	99	87	41	-	-
SS-5	24 LT	23+25	23.4-24.9	A-4(0)	38	5	25.9	43.5	22.6	8.0	98	84	42	-	-
SS-6	24 LT	23+25	28.4-29.9	A-2-4(0)	33	3	38.3	37.3	18.4	6.0	92	87	30	-	-

B2-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-17	24 LT	24+20	3.3-4.8	A-4(1)	29	6	14.6	44.7	20.6	20.0	100	94	51	-	-
SS-18	24 LT	24+20	8.3-9.8	A-4(0)	23	NP	4.4	70.7	14.8	10.0	100	100	37	-	-
SS-19	24 LT	24+20	13.3-14.8	A-2-4(0)	26	NP	32.3	53.9	9.8	4.0	100	84	21	-	-
SS-20	24 LT	24+20	18.3-19.8	A-2-4(0)	34	NP	30.1	51.3	16.6	2.0	94	78	28	-	-
SS-21	24 LT	24+20	23.3-24.8	A-2-4(0)	34	NP	34.5	45.9	15.6	4.0	92	74	26	-	-

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-15	58 LT	24+85	3.5-5.0	A-2-4(0)	24	NP	14.0	71.9	10.0	4.0	100	98	21	-	-
SS-16	58 LT	24+85	13.5-15.0	A-2-4(0)	40	NP	30.9	49.3	15.8	4.0	93	77	28	-	-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33421.1.1 TIP: B-4057 COUNTY: Caswell

DESCRIPTION(1): Bridge No. 39 on -L- (SR 1503) over Hogan's Creek at Station 23+80

EXISTING BRIDGE

Information from: Field Inspection x Microfilm ____ (reel ____ pos: ____)
Other (explain) Hydro Reoprt

Bridge No.: 39 Length: 201' Total Bents: 6 Bents in Channel: 2 Bents in Floodplain: 4
Foundation Type: Timber Piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None

Interior Bents: Bent 1 - None, Bent 2 - Submerged, Bent 3 - 3' to 5' of sand scoured away from piles, Bent 4 - None

Channel Bed: None

Channel Bank: Some local scour along banks on both sides of creek

EXISTING SCOUR PROTECTION

Type(3): End slopes are covered by chunks of asphalt underneath the bridge

Extent(4): 20' x 50'

Effectiveness(5): Effective

Obstructions(6): None

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): Alluvial, gray, medium dense, silty sand with quartz gravel and weathered rock fragments (SS-3 and SS-19)

Channel Bank Material(8): Alluvial, gray and brown, soft, sandy silt (SS-2) and tan-brown, very soft to stiff, sandy silt (SS-17 and SS-18)

Channel Bank Cover(9): Grass, brush, and trees

Floodplain Width(10): +/- 200 feet

Floodplain Cover(11): Grass, brush, and trees

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

Channel Migration Tend.(13): Northwest towards End Bent 1

Observations and Other Comments: B1, B2, and B3 have had H-pile crutch supports added, Old mill dam and ruins in creek and on bank 350' upstream

DESIGN SCOUR ELEVATIONS(14) Feet x Meters ____

BENTS	
B1	B2
374.0	372.6

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnically Adjusted Scour is unchanged from the Hydraulic Units theoretical 100 year scour.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bed	Bed	Bank	Bank	Bank		
Sample No.	SS-3	SS-19	SS-2	SS-17	SS-18		
Retained #4							
Passed #10	75	100	100	100	100		
Passed #40	61	84	100	94	100		
Passed #200	14	21	46	51	37		
Coarse Sand	30.9	32.3	2.2	14.6	4.4		
Fine Sand	57.5	53.9	67.1	44.7	70.7		
Silt	7.6	9.8	14.6	20.6	14.8		
Clay	4	4	16	20	10		
LL	23	26	24	29	23		
PI	NP	NP	1	6	NP		
AASHTO	A-2-4(0)	A-2-4(0)	A-4(0)	A-4(0)	A-4(0)		
Station	23+25	24+20	23+25	24+20	24+20		
Offset	16' RT	16' RT	16' RT	16' RT	16' RT		
Depth	15.9'-17.4'	13.3'-14.8'	13.4'-14.9'	3.3'-4.8'	8.3'-9.8'		

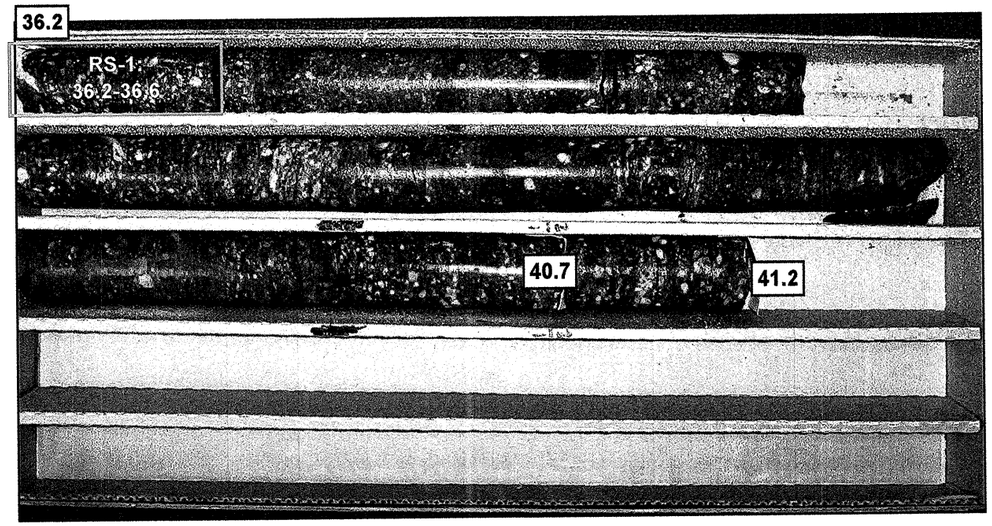
Template Revised 02/07/06

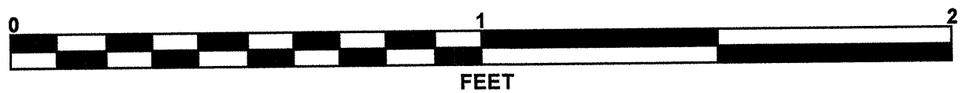
Reported by: Jaime Love Pedro Jaime Love Pedro **Date:** 10/11/2005

CORE PHOTOGRAPHS

B1-A

BOX 1: 36.2 - 41.2 FEET

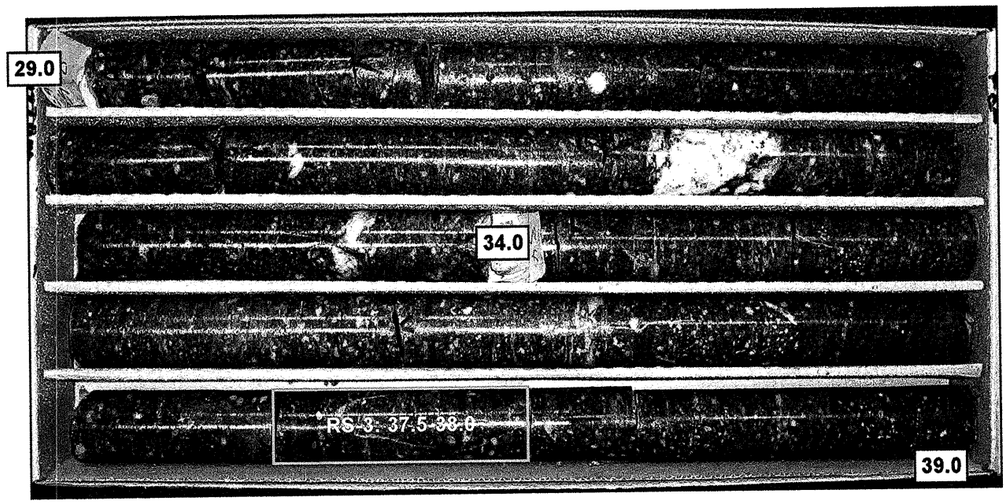


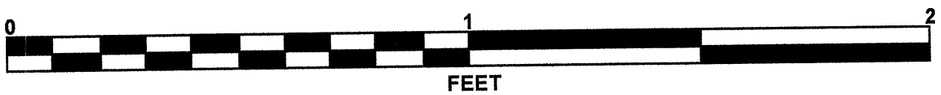


CORE PHOTOGRAPHS

B2-A

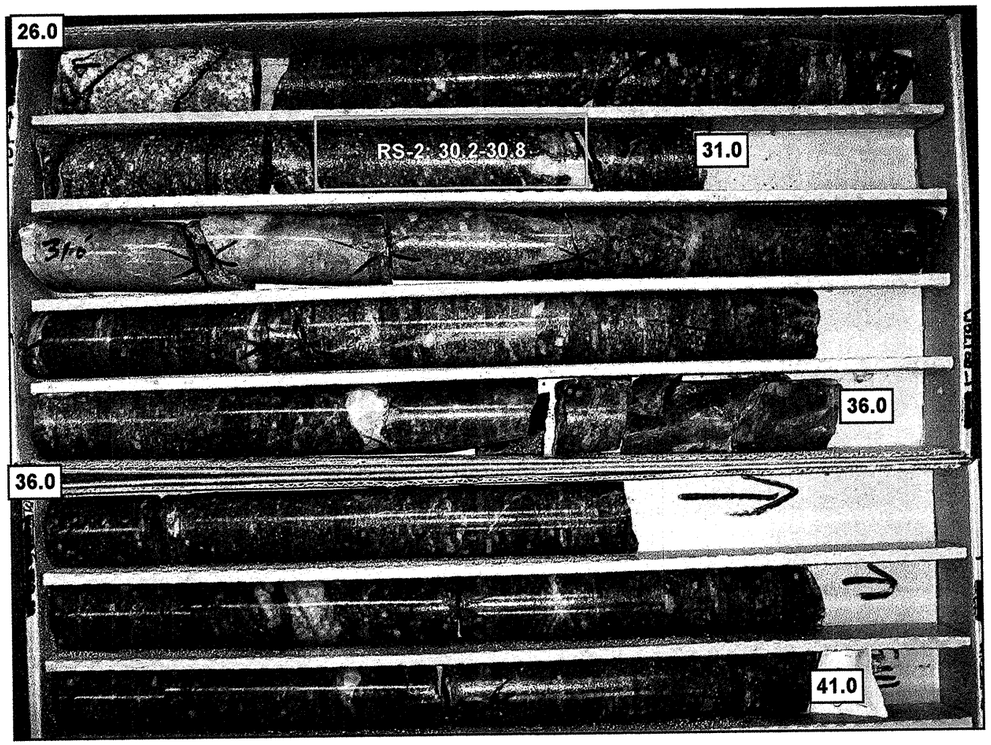
BOX 1: 29.0- 39.0 FEET

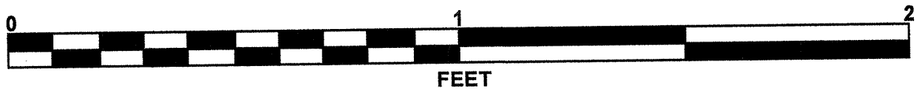




B2-B

BOXES 1 & 2: 26.0 - 41.0 FEET





SITE PHOTOGRAPH

Bridge No. 39 on SR 1503 over Hogan's Creek