STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4103	1	19

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *B-4103* F.A. PROJ. _____

COUNTY *DAVIDSON*

PROJECT DESCRIPTION *BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)*

SITE DESCRIPTION *STA. 17+82.50 -L-*

PROJECT: 33459.1.1

ID: B-4103

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PERSONNEL

C.C. MURRAY

J.E. ESTEP

L.N. HARPER

INVESTIGATED BY *C.B. LITTLE*

CHECKED BY *C.B. LITTLE*

SUBMITTED BY *C.B. LITTLE*

DATE *JUNE 2006*

NORTH CAROLINA LICENSED SEAL 1104 GEOLOGIST CLINTON B. LITTLE

6-14-06

DRAWN BY: *T.A. MECHUM*

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PROJECT REFERENCE NO.	SHEET NO.
B-4103	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 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 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 ($TONS/FT^2$)
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	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >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		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — 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
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_X_____
- [ ] -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: B4103-1 GPS STA. BL-PINC 12+99.12 = TI-PINC 12+99.12

ELEVATION: 514.93 FT.

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 14, 2006

STATE PROJECT: 33459.1.1 (B-4103)
FEDERAL PROJECT: BRZ-2550(1)
COUNTY: Davidson
DESCRIPTION: Bridge 416 on SR 2550 over Beaverdam Creek (Badin Lake)
SUBJECT: Geotechnical Report – Bridge foundation Investigation

PROJECT DESCRIPTION

The project is located in the southeastern corner of Davidson County, just south and east of NC 49. It is near the edge of the Uwharrie National Forest. The proposed replacement bridge is near the existing alignment with an on-site detour located downstream (south). The proposed structure is a bridge centered at Station 17+82.50 –L- with three spans (1@69'4", 1@68'6", 1@69'4") and overall width of 39'3". The bridge crosses Beaverdam Creek near the point where it enters Badin Lake.

The Geotechnical investigation was conducted in January and February, 2006. Test borings were conducted with a CME-550 drill rig with automatic drop hammer. The end bent borings were advanced with 8""hollow stem augers to refusal. The interior bent borings were advanced with NW casing (with advancer) and NXWL rock coring tools. A total of six borings were performed, with rock core samples obtained from three.

PHYSIOGRAPHY AND GEOLOGY

The project is in the Carolina Slate Belt geologic formation, on the boundary of the Floyd Church formation and the Flat Swamp Member of the Cid Formation. The recovered rock samples are gray to black, extremely fine-grained, moderately hard, meta-volcanics. They do not show much stratification, but there is a great deal of fracturing with considerable mineralization along the fracture surfaces. Some of the fracture surfaces are also iron stained, particularly in the upper portions of the rock mass.

The rock is very shallow. Residual soils are no more than three feet thick. There is a small deposit of recent sediments on the End Bent Two side. The alluvium is three to four feet thick and consists of red-brown silty clay with gravel. The existing roadway fill soils are eight to ten feet thick and contain silty clay soils with gravel and cobbles.

FOUNDATION MATERIALS

End Bent One:

Seven feet of roadway fill overlies two to three feet of residual soil, over crystalline rock. The fill is red-brown soft silty clay with gravel and cobbles. The residual soil is hard clayey silt. Top of rock is about elevation 504.

Bent One:

A single boring was conducted through the existing bridge deck. The boring began on crystalline rock; there was no soil. There was considerable core loss in the first 9.8 feet (Recovery = 72%, 42%, 77%), but the recovered core was only slightly weathered. This indicates layers of competent rock with seams of soil or poor quality rock. Below a depth of 9.8', recovery was at or near 100% with RQD greater than 80% indicating sound and competent rock. The depth of 9.8' equates to elevation 491.2'.

Bent Two:

Two borings were conducted on the shoulders of the existing roadway. Roadway fill soils are present to a depth of about nine feet. The fill rests on one to two feet of hard residual clayey silt soil over weathered rock and crystalline rock. The weathered rock zone is one to two feet thick. The top of weathered rock is at elevation 503-504; top of crystalline rock is at elevation 502. Again, the upper portion of the rock mass is of poorer quality; to a depth of 16.5 to 17.5' (elevation 496-498). In this case, the recovery was fair to good (73% to 100%), but the RQD was very low (0% to 37%). The rock is only slightly weathered, but it is very fractured. Below the given elevation, the rock mass appears sound and relatively fresh.

End Bent Two:

Only one boring was conducted for this bent due to an overhead power line. The boring penetrated about eleven feet of roadway fill and less than one half foot of residual soil/weathered rock to refusal on crystalline rock. No alluvium was noted in the boring, but alluvial soils are observable on the ground surface to either side of the roadway. A previous boring performed for the detour roadway found about three feet of soft alluvial clay with gravel. We interpret that there was a previous gully or stream channel that cut through the sediments and was covered by the roadway fill. An alternate interpretation is that the sediments were removed before placement of the fill. In either case, the sediments are thin and should not present any difficulties. The top of rock elevation is in the range of 503-505'.

GROUNDWATER

Groundwater elevations across the site were in the range of 508-510'. The stream/lake water surface was at elevation 507'.

Respectfully submitted,

Clint Little
Regional Geological Engineer

PROJECT REFERENCE NO.	SHEET NO.
B-4103	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS
5/14/99

NC GRID NAD 83

BLAINEWOOD INC.
D.B. 1436 PG. 517

BL-4 PINC 9+42.09
(-L- 13+31.39 17.30' RT)

-L- PT Sta. 15+68.47

GPS B4103-1
-BL- PINC 12+99.12=
(-L- 16+86.45 25.40' LT)

-L- PC Sta. 18+77.21

-L- PT Sta. 20+89.75

BL-3 POT 17+17.68=
BY-1POT 5+00.00
(-L- 21+02.47 13.42' LT)

-L- POT Sta. 21+60.00
-Y1- POT Sta. 10+00.00

END GRADE
BEGIN OVERLAY
-L- POT Sta. 22+25.00

-L- POT Sta. 24+53.52

END PROJECT B-4103
-L- POT Sta. 24+34.21=

BADEN LAKE ROAD
TO NC HWY 49
SR 2550
22.0' PAVED

S 67° 42' 03.0" E

S 67° 01' 11.9" E

SR 2550 BADEN LAKE ROAD
22' PAVED

-Y1- S 26° 29' 11.8" E
TO BADEN LAKE SR 2552
LAKESHORE DRIVE
18' PAVED

S 27° 58' 48.1" W

-L- PT Sta. 11+07.92

-L- PC Sta. 10+00.00

BEGIN PROJECT B-4103
-L- PC Sta. 13+50.00 =

-Y1- PC Sta. 10+12.54

-Y1- PT Sta. 10+64.53

END CONSTRUCTION
-Y1- POT Sta. 11+75.00

-Y1- POT Sta. 13+25.53

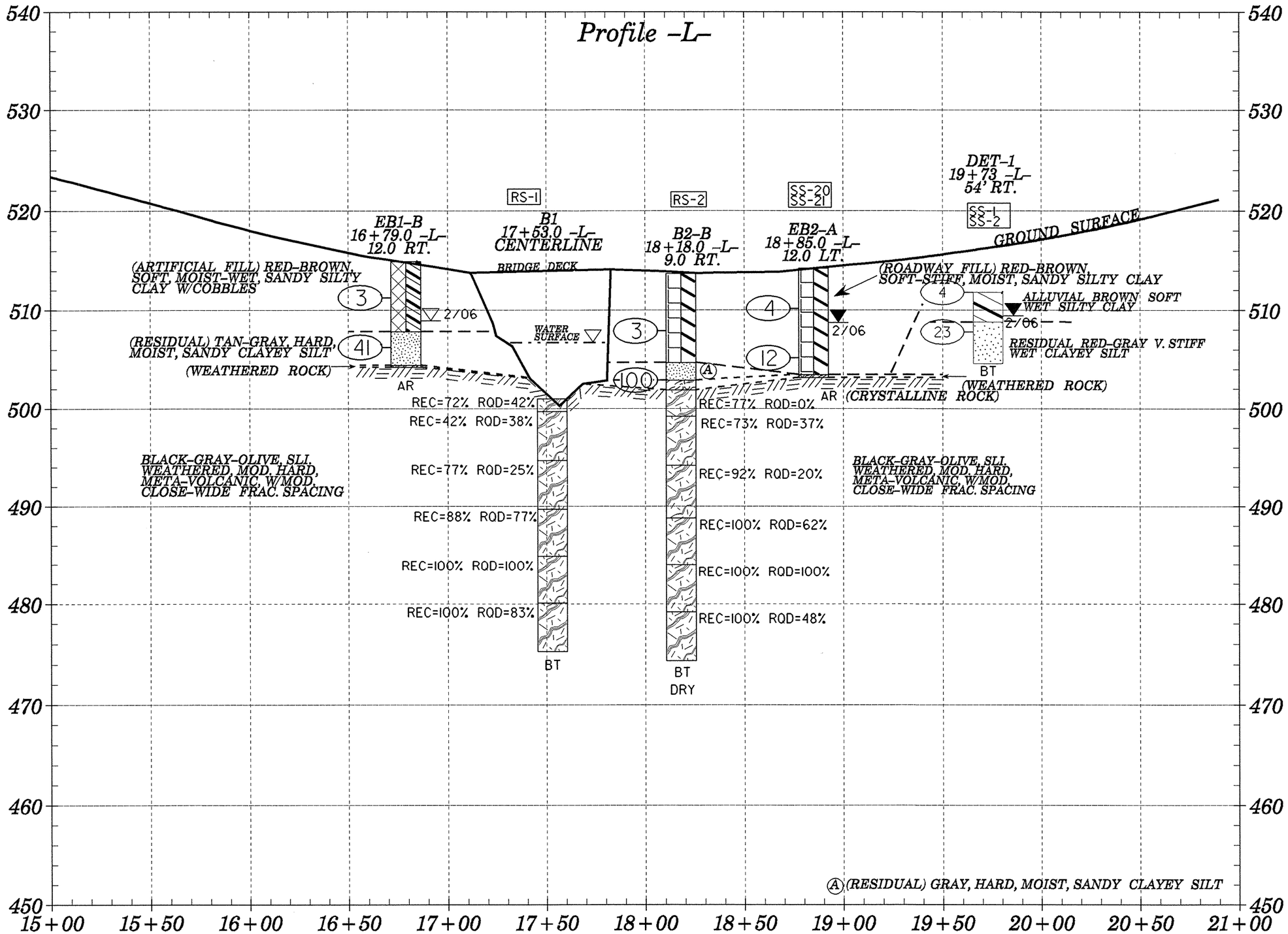
BY-6 POT 8+93.74

RESIDUAL
ALLUVIAL
ROADWAY FILL
WOODS
GRAVEL
STEPS
ISF BUS.
WOOD RETAINING WALL
BEAVER DAM CREEK
BRICK SIGN
EXISTING R/W APPROX. LOC
APPROX. LOC EXISTING R/W
B1
B2-A
B2-B
EB1-A
EB1-B
EB2-A
EB2-B
DET-1
15+00
20+00

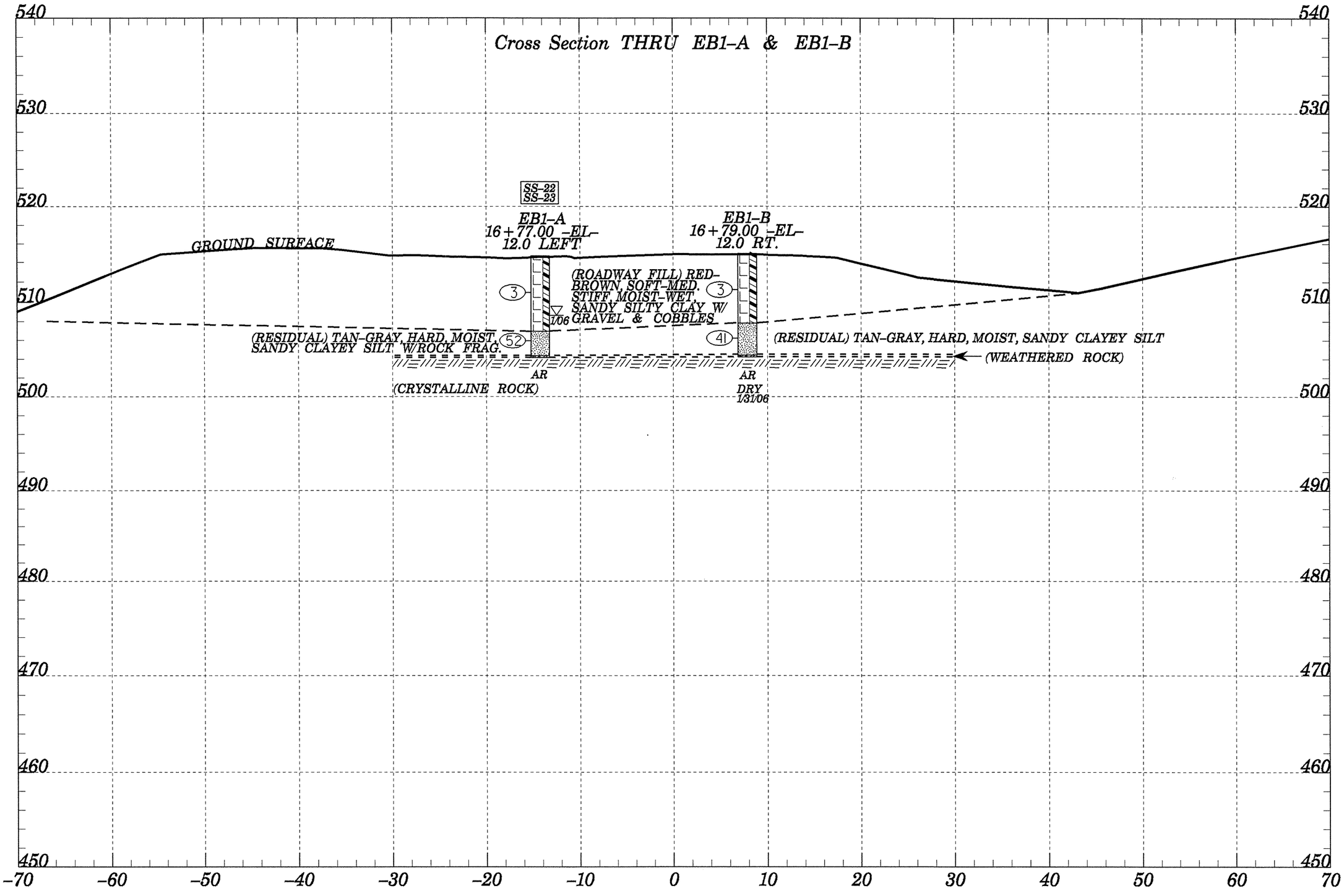
06-SEP-2006 10:27
o:\projects\b4103_rdy_psh\b4103dd.dgn

PROJECT REF. NO.	SHEET NO.	TOTAL SHEETS
B-4103	5	19

Profile –L–



PROJECT REF. NO.	SHEET NO.	TOTAL SHEETS
B-4103	6	19



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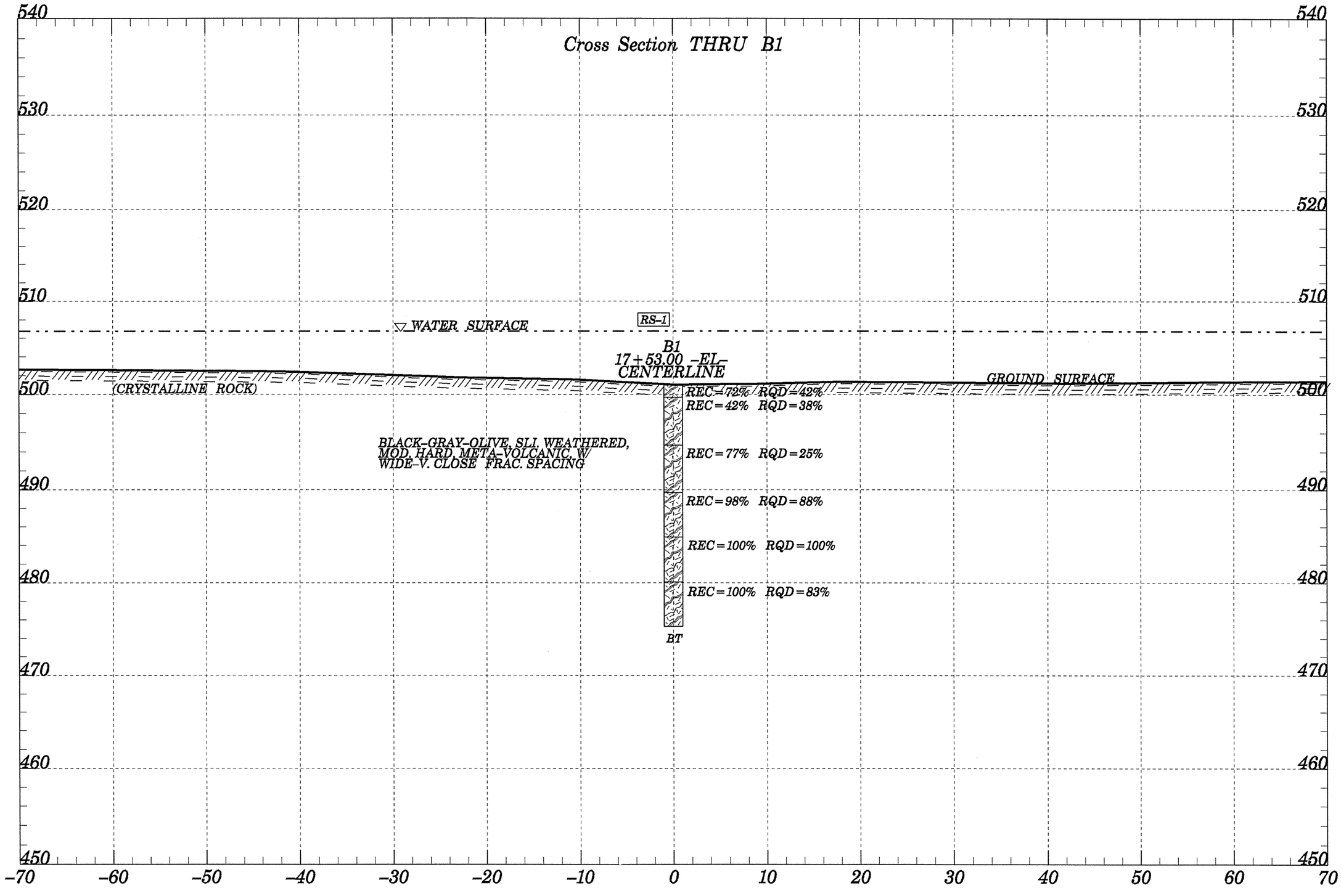

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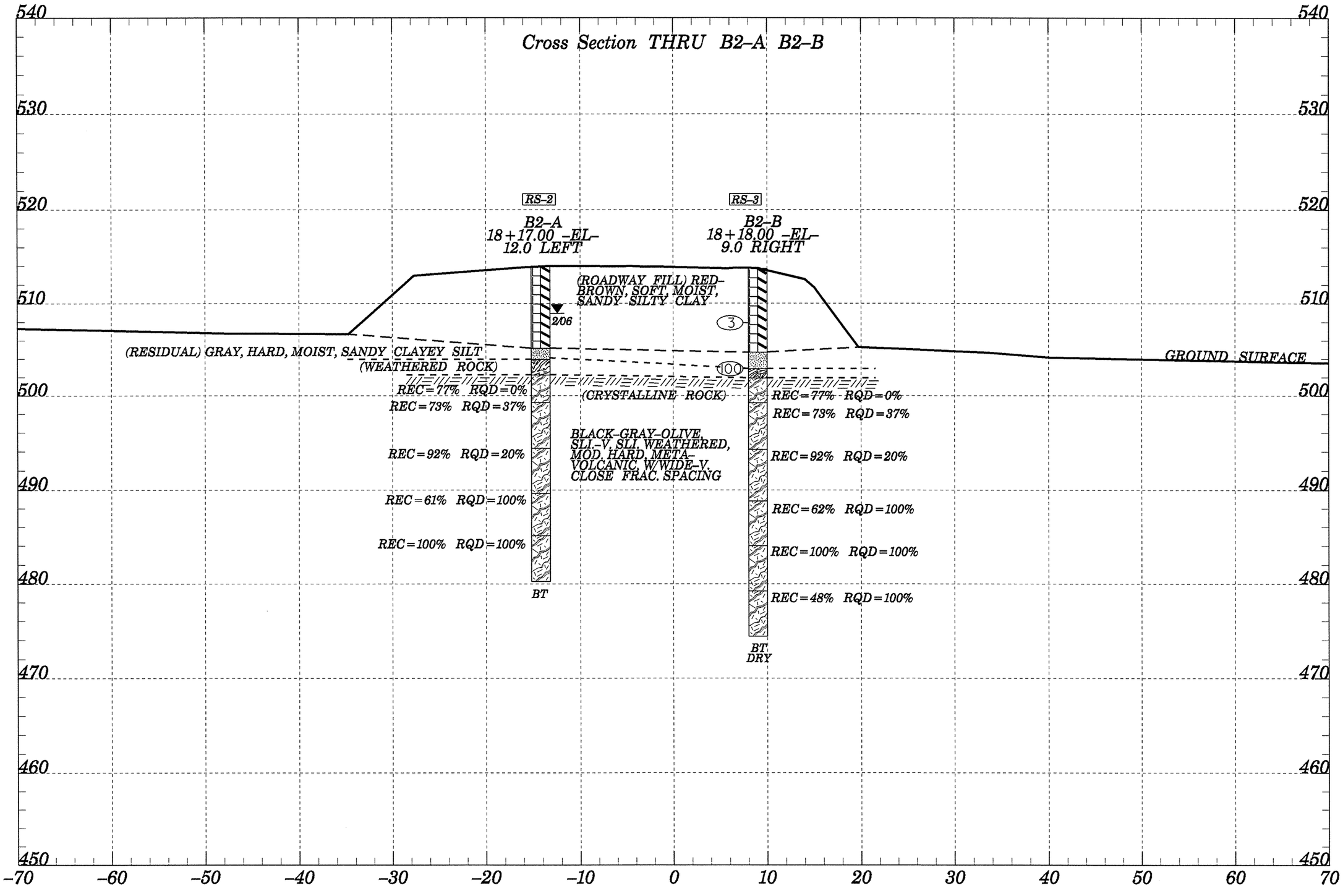

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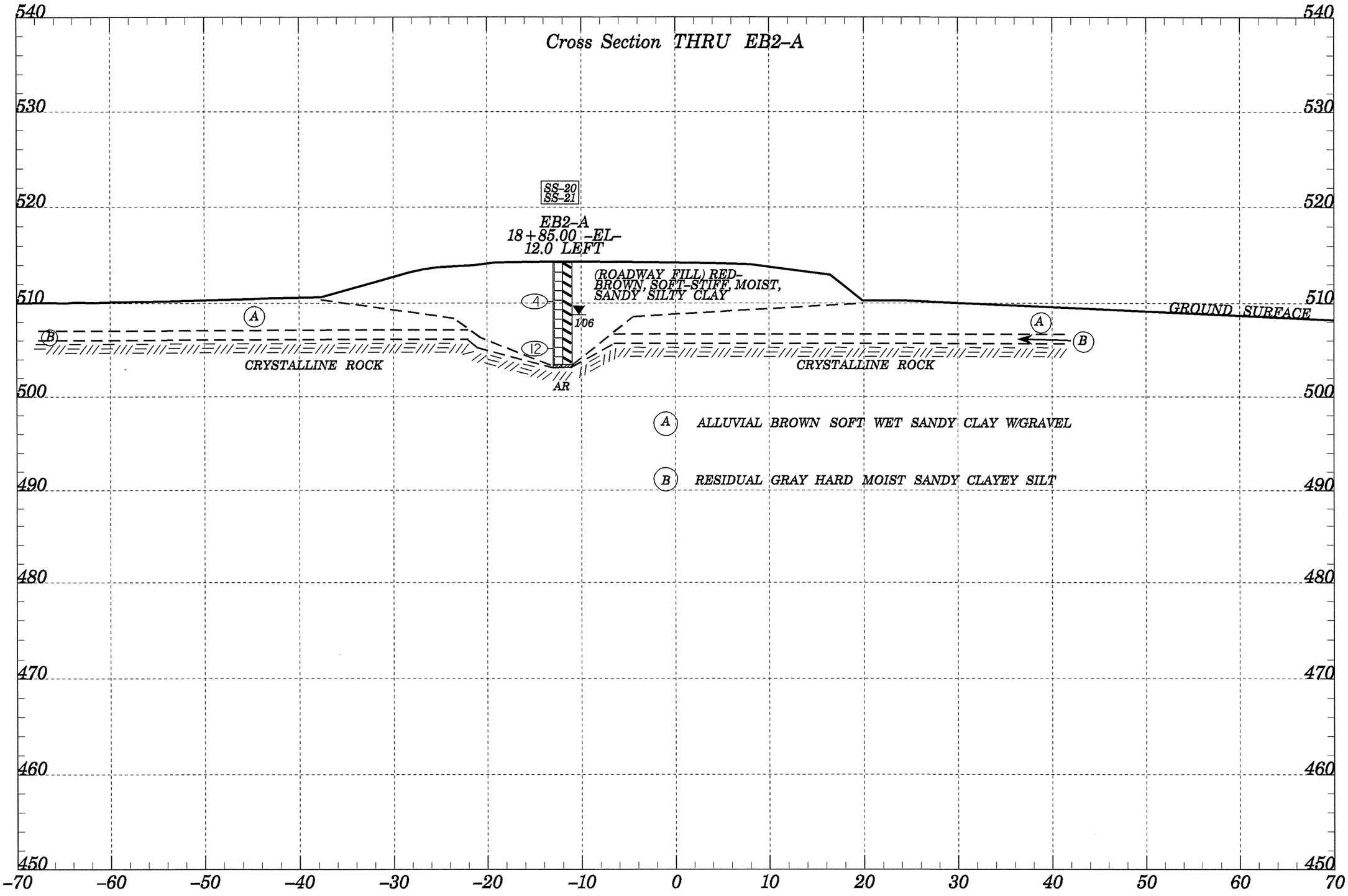
B-4103	9	19



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33459.1.1	**ID** B-4103	**COUNTY** DAVIDSON	**GEOLOGIST** C.C. MURRAY
SITE DESCRIPTION BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)			**GND WATER**
BORING NO EB1-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** 6.00ft
ALIGNMENT L	**BORING LOCATION** 16+77.000	**OFFSET** 12.00ft LT	**24 HR** N/A
COLLAR ELEV 514.68ft	**TOTAL DEPTH** 10.50ft	**START DATE** 1/31/06	**COMPLETION DATE** 01/31/06
DRILL MACHINE CME-55OX	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH	**DEPTH TO ROCK** 10.50ft		**Log EB1-A, Page 1 of 1**

ELEV	DEPTH	BLOW CT 6in	6in	6in	PEN (ft)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
514.68						Ground Surface				
	3.70	2	2	1	1.0	3	SS-22	M M W		(ROADWAY FILL) RED-BROWN, SOFT-MEDIUM STIFF, MOIST-WET, SANDY SILTY CLAY W/ GRAVEL & COBBLES
510.00	8.70	12	20	32	1.0	52	SS-23	M		(RESIDUAL) TAN-GRAY, HARD, MOIST, SANDY CLAYEY SILT W/ ROCK FRAG.
504.18						AUGER REFUSAL AT ELEV. 504.18' ON HARD ROCK				(WEATHERED ROCK)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33459.1.1	**ID** B-4103	**COUNTY** DAVIDSON	**GEOLOGIST** C.C. MURRAY
SITE DESCRIPTION BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)			**GND WATER**
BORING NO EB1-B	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 16+79.000	**OFFSET** 12.00ft RT	**24 HR** N/A
COLLAR ELEV 514.95ft	**TOTAL DEPTH** 10.70ft	**START DATE** 1/31/06	**COMPLETION DATE** 01/31/06
DRILL MACHINE CME-55OX	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** 10.70ft		**Log EB1-B, Page 1 of 1**

ELEV	DEPTH	BLOW CT 6in	6in	6in	PEN (ft)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
514.95						Ground Surface				
	3.70	3	1	2	1.0	3		M M		(ROADWAY FILL) RED-BROWN, SOFT, MOIST-WET, SANDY SILTY CLAY W/ COBBLES
510.00	8.70	11	20	21	1.0	41				(RESIDUAL) TAN-GRAY, HARD, MOIST, SANDY CLAYEY SILT
504.25						BORING TERMINATED AT ELEV. 504.25' ON HARD ROCK				(WEATHERED ROCK)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33459.1.1	**ID** B-4103	**COUNTY** DAVIDSON	**GEOLOGIST** C.C. MURRAY	
SITE DESCRIPTION BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)				**GND WATER**
BORING NO B1	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT EL	**BORING LOCATION** 17+53.000	**OFFSET** 0.00ft		**24 HR** N/A
COLLAR ELEV 501.00ft	**TOTAL DEPTH** 25.70ft	**START DATE** 1/31/06	**COMPLETION DATE** 01/31/06	
DRILL MACHINE CME-55OX	**DRILL METHOD** CORE BORING		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH 5.30ft	**DEPTH TO ROCK** 0.00ft		**Log B1, Page 1 of 1**	

ELEV	DEPTH	BLOW CT 6in	6in	6in	PEN (ft)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
						Surface Water				
506.30						Ground Surface				
500.00							RUN-1 RUN-2			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ CLOSE FRAC. SPACING
490.00							RUN-3			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ MOD. CLOSE-V. CLOSE FRAC. SPACING
							RUN-4			SAME AS ABOVE
							RUN-5			SAME AS ABOVE
480.00							RUN-6 RS-1			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ MOD. CLOSE FRAC. SPACING
475.30						BORING TERMINATED AT ELEV. 475.3' IN BLACK-GRAY-OLIVE, SLIGHTLY WEATHERED, MOD. HARD, META-VOLCANIC				BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ MOD. CLOSE-WIDE FRAC. SPACING

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 33459.1.1 **PROJECT ID:** B-4103 **COUNTY:** Davidson **GEOLOGIST:** C.C. MURRAY
SITE DESCRIPTION: Bridge No. 416 on SR 2550 over Beaver Dam Creek (Badin Lake) **DRILLER:** J.E. ESTEP
BORING NO: B1 **BORING LOCATION (STA):** 17+53 -L- **OFFSET:** Centerline
COLLAR ELEV: 501.0 **PERSONNEL:** LNH **CORE SIZE:** NXWL
TOTAL DEPTH: 25.7 **DRILL MACHINE:** CME-550 **DATE STARTED:** 1/19/06
TOTAL RUN: 25.7 **DRILL EQUIP:** NX Cas/NXWL **DATE COMPLETED:** 1/19/06

ELEV. (FT)	DEPTH (FT)	DRILL RATE (MIN/1.0 FT)	RUN NO.	REC % (FT)	RQD % (FT)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
501.0	0		1	72%	42%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Close fracture spacing
499.7	1.3						
499.7	1.3		2	42%	38%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing
494.7	6.3						
494.7	6.3		3	77%	25%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing
489.7	11.3						
489.7	11.3		4	98%	88%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing
484.9	16.1						
484.9	16.1		5	100%	100%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close fracture spacing
480.1	20.9						
480.1	20.9		6	100%	83%	RS-1 20.9-21.55'	Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Wide fracture spacing
475.3	25.7						

NOTES

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33459.1.1	**ID** B-4103	**COUNTY** DAVIDSON	**GEOLOGIST** C.C. MURRAY	
SITE DESCRIPTION BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)				**GND WATER**
BORING NO B2-A	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT EL	**BORING LOCATION** 18+17.000	**OFFSET** 12.00ft LT		**24 HR** 5.00ft
COLLAR ELEV 513.94ft	**TOTAL DEPTH** 33.70ft	**START DATE** 2/01/06	**COMPLETION DATE** 02/01/06	
DRILL MACHINE CME-55OX	**DRILL METHOD** CORE BORING		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH	**DEPTH TO ROCK** 11.70ft		**Log B2-A, Page 1 of 1**	

ELEV	DEPTH	BLOW CT 6in	6in	6in	PEN (ft)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
513.94						Ground Surface				
510.00								M		(ROADWAY FILL) RED-BROWN, SOFT, MOIST, SANDY SILTY CLAY
										(RESIDUAL) GRAY, HARD, MOIST, SANDY CLAYEY SILT
500.00							RUN-1			(WEATHERED ROCK)
							RUN-2			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ CLOSE-V. CLOSE FRAC. SPACING
							RS-2			
							RUN-3			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ MOD. CLOSE-V. CLOSE FRAC. SPACING
490.00							RUN-4			SAME AS ABOVE
							RUN-5			BLACK-GRAY-OLIVE, V. SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ MOD. CLOSE-CLOSE FRAC. SPACING
480.24						BORING TERMINATED AT ELEV. 480.24' IN BLACK-GRAY-OLIVE, VERY SLIGHTLY WEATHERED, MODERATELY HARD, META-VOLCANIC				BLACK-GRAY-OLIVE, V. SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ WIDE-CLOSE FRAC. SPACING

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 33459.1.1 **PROJECT ID:** B-4103 **COUNTY:** Davidson **GEOLOGIST:** C.C. MURRAY
SITE DESCRIPTION: Bridge No. 416 on SR 2550 over Beaver Dam Creek (Badin Lake) **DRILLER:** J.E. ESTEP
BORING NO: B2-A **BORING LOCATION (STA):** 18+17 -L- **OFFSET:** 12.0 Left
COLLAR ELEV: 513.94 **PERSONNEL:** LNH **CORE SIZE:** NXWL
TOTAL DEPTH: 33.2 **DRILL MACHINE:** CME-550 **DATE STARTED:** 2/1/06
TOTAL RUN: 22.0 **DRILL EQUIP:** NX Cas/NXWL **DATE COMPLETED:** 2/1/06

ELEV. (FT)	DEPTH (FT)	DRILL RATE (MIN/1.0 FT)	RUN NO.	REC % (FT)	RQD % (FT)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
502.24	11.7		1	77%	0%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Close-Very Close fracture spacing Pyrite coats fracture surfaces & pyrite crystals in matrix Rock very fine grained
499.24	14.7						
499.24	14.7		2	73%	37%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing Pyrite coats fracture surfaces & pyrite crystals in matrix Rock very fine grained
494.34	19.6					RS-2 18.0-18.6'	
494.34	19.6		3	92%	20%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing Pyrite coats fracture surfaces & pyrite crystals in matrix Rock very fine grained
489.67	24.3						
489.64	24.3		4	100%	61%		Black-Gray-Olive, Very Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Close fracture spacing Pyrite coats fracture surfaces & pyrite crystals in matrix Rock very fine grained
485.04	28.9						
485.04	28.9		5	100%	100%		Black-Gray-Olive, Very Slightly weathered, Moderately Hard, Meta-Volcanic, with Wide-Close fracture spacing Pyrite coats fracture surfaces & pyrite crystals in matrix Rock very fine grained
480.24	33.7						

NOTES Iron staining along fractures

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33459.1.1	**ID** B-4103	**COUNTY** DAVIDSON	**GEOLOGIST** C.C. MURRAY
SITE DESCRIPTION BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)			**GND WATER**
BORING NO B2-B	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT EL	**BORING LOCATION** 18+18.000	**OFFSET** 9.00ft RT	**24 HR** N/A
COLLAR ELEV 513.70ft	**TOTAL DEPTH** 39.30ft	**START DATE** 2/01/06	**COMPLETION DATE** 02/01/06
DRILL MACHINE CME-55OX	**DRILL METHOD** CORE BORING		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH	**DEPTH TO ROCK** 11.80ft		Log B2-B, Page 1 of 1

ELEV	DEPTH	BLOW CT 6in	6in	6in	PEN (ft)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
513.70						Ground Surface				
510.00	5.80	2	1	2	1.0	3		M		(ROADWAY FILL) RED-BROWN, SOFT, MOIST, SANDY SILTY CLAY
	10.80	17	42	58	0.5	100	RUN-1	M		(RESIDUAL) GRAY, HARD, MOIST, SANDY CLAYEY SILT
500.00							RUN-2			(WEATHERED ROCK)
							RUN-3			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ CLOSE-V. CLOSE FRAC. SPACING
490.00							RUN-4 RS-3			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ MOD. CLOSE-V. CLOSE FRAC. SPACING
										SAME AS ABOVE
480.00							RUN-5			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ CLOSE-V. CLOSE FRAC. SPACING
							RUN-6			BLACK-GRAY-OLIVE, SLI. WEATHERED, MOD. HARD, META-VOLCANIC, W/ V. CLOSE-WIDE FRAC. SPACING
474.40						BORING TERMINATED AT ELEV. 474.4' IN BLACK-GRAY-OLIVE, VERY SLIGHTLY WEATHERED, MODERATELY-HARD, META-VOLCANIC				SAME AS ABOVE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 33459.1.1 **PROJECT ID:** B-4103 **COUNTY:** Davidson **GEOLOGIST:** C.C. MURRAY
SITE DESCRIPTION: Bridge No. 416 on SR 2550 over Beaver Dam Creek (Badin Lake) **DRILLER:** J.E. ESTEP
BORING NO: B2-B **BORING LOCATION (STA):** 18+18 -L- **OFFSET:** 9.0 Right
COLLAR ELEV: 513.7 **PERSONNEL:** LNH **CORE SIZE:** NXWL
TOTAL DEPTH: 39.3 **DRILL MACHINE:** CME-550 **DATE STARTED:** 2/1/06
TOTAL RUN: 27.5 **DRILL EQUIP:** NX Cas/NXWL **DATE COMPLETED:** 2/1/06

ELEV. (FT)	DEPTH (FT)	DRILL RATE (MIN/1.0 FT)	RUN NO.	REC % (FT)	RQD % (FT)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
501.9	11.8		1	77%	0%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Close-Very Close fracture spacing High angle & horizontal fractures Pyrite coats fracture surfaces & pyrite crystals in matrix
499.2	14.5						
499.2	14.5		2	100%	0%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing Very fine grained rock with zeolite veinlets Pyrite coats fracture surfaces & pyrite crystals in matrix
494.2	19.5						
494.2	19.5		3	100%	30%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing Very fine grained rock with zeolite veinlets Pyrite coats fracture surfaces & pyrite crystals in matrix
488.8	24.9						
488.8	24.9		4	94%	67%	RS-3 25.55-26.3'	Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Moderately Close-Very Close fracture spacing Very fine grained rock with zeolite veinlets Pyrite coats fracture surfaces & pyrite crystals in matrix
484.0	29.7						
484.0	29.7		5	100%	71%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Very Close-Wide Close fracture spacing Very fine grained rock with zeolite veinlets Pyrite coats fracture surfaces & pyrite crystals in matrix
479.2	34.5						
479.2	34.5		6	100%	48%		Black-Gray-Olive, Slightly weathered, Moderately Hard, Meta-Volcanic, with Very Close-Wide Close fracture spacing Very fine grained rock with zeolite veinlets Pyrite coats fracture surfaces & pyrite crystals in matrix
474.4	39.3						

NOTES Iron staining along fractures

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33459.1.1	**ID** B-4103	**COUNTY** DAVIDSON	**GEOLOGIST** C.C. MURRAY
SITE DESCRIPTION BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)			**GND WATER**
BORING NO EB2-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT EL	**BORING LOCATION** 18+85.000	**OFFSET** 12.00ft LT	**24 HR** 5.50ft
COLLAR ELEV 514.26ft	**TOTAL DEPTH** 11.10ft	**START DATE** 1/31/06	**COMPLETION DATE** 01/31/06
DRILL MACHINE CME-55OX	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** 11.10ft		**Log EB2-A, Page 1 of 1**

ELEV	DEPTH	BLOW CT 6in	BLOW CT 6in	BLOW CT 6in	PEN (ft)	BLOWS PER FOOT 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
514.26						Ground Surface				
								M		(ROADWAY FILL) RED-BROWN, SOFT-STIFF, MOIST, SANDY SILTY CLAY
510.00	4.10	2	2	2	1.0	4	SS-20			
	9.10	2	4	8	1.0	12	SS-21	M		
503.16						AUGER REFUSAL AT ELEV. 503.16 ON HARD ROCK				(WEATHERED ROCK)

SOIL AND ROCK TEST RESULTS

PROJECT: 33459.1.1 B-4103
COUNTY: DAVIDSON
SITE DESCRIPTION: BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)

SOIL SAMPLE DATA

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	% BY WEIGHT F. SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING SIEVES 10	% PASSING SIEVES 40	% PASSING SIEVES 200	% MOISTURE
SS-22	12.0 LT.	16+77.0 -EL- (EB1-A)	3.7-5.2	A-6(5)	3	38	15	63	57	52	12.5	6.3	30.6	50.6	
SS-23	12.0 LT.	16+77.0 -EL- (EB1-A)	8.7-10.2	A-4(1)	52	30	6	63	54	47	17.4	10.7	33.5	38.4	
SS-20	12.0 LT.	18+85.0 -EL- (EB2-A)	4.1-5.6	A-7-6(12)	4	49	22	75	68	62	12.5	5.5	27.4	54.6	
SS-21	12.0 LT.	18+85.0 -EL- (EB2-A)	9.1-10.6	A-7-6(21)	12	57	32	79	73	68	9.7	6.3	29.4	54.6	
SS-1	54.0 RT.	19+73 -L- (DET-1)	0.0-1.5	A6(6)	4	37	12	16.8	4.3	32.4	46.6	75	64	60	
SS-2	54.0 RT.	19+73 -L- (DET-1)	4.4-5.5	A-4(5)	23	36	10	15.2	6.7	41.7	36.4	80	70	64	

ROCK SAMPLE DATA

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD %	UNIT WT	Q(MPa) (MPsi)	E(Mpa) (MPsi)
RS-1	CL	17+53.0 -EL- (B1)	20.9-21.55'	42%	CURRENTLY BEING TESTED		
RS-2	12.0LT.	18.71.0 -EL- (B2-A)	18.0-18.6'	37%	CURRENTLY BEING TESTED		
RS-3	9.0 RT.	18+18.0 -EL- (EB2-B)	25.55-26.3'	37%	CURRENTLY BEING TESTED		

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33459.1.1 TIP: B-4103 COUNTY: DAVIDSON

DESCRIPTION(1):

EXISTING BRIDGE

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

Bridge No.: 416 Length: 71.83' Total Bents: 2 Bents in Channel: 1 Bents in Floodplain: 0
Foundation Type: EB1 PILE WITH TIMBER CAP, EB2 CONCRETE ABUTMENT

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NOT OBSERVED

Interior Bents: N/A

Channel Bed: WATER LEVEL TOO HIGH TO DETERMINE. TEST BORING INDICATES CHANNEL IS ROCK, NO SOIL

Channel Bank: NONE OBSERVED

EXISTING SCOUR PROTECTION

Type(3): CONCRETE WINGWALL ON EB2

Extent(4):

Effectiveness(5): GOOD

Obstructions(6): NONE OBSERVED

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): ROCK, METAVOLCANIC

Channel Bank Material(8): ROADWAY FILL A-6(5) SS-22, ROADWAY FILL A-7-6(12) SS-20
RESIDUAL SOIL A-4(1) SS-23

Channel Bank Cover(9): TREES, LAWN

Floodplain Width(10): 80'

Floodplain Cover(11): GRASSY WETLANDS, ROADWAY FILL

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

Channel Migration Tendency(13): MINIMAL

Observations and Other Comments: PART OF BADIN LAKE

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters ____

BENTS										
B1	B2	B3	B4							
497	498									

Comparison of DSE to Hydraulics Unit theoretical scour:
BENT ONE: THEORETICAL SCOUR = 494; ADJUSTED UPWARD DUE TO PRESENCE OF ROCK
BENT TWO: THEORETICAL SCOUR = 498; NO CHANGE

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

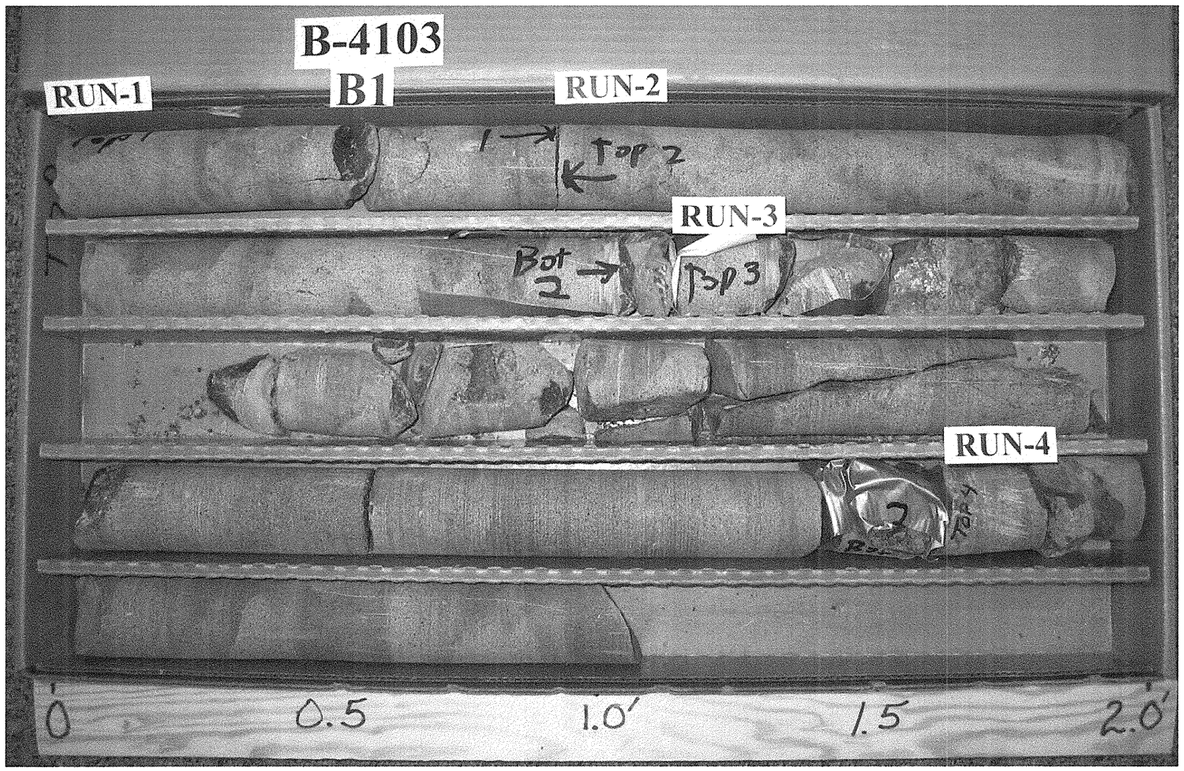
Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

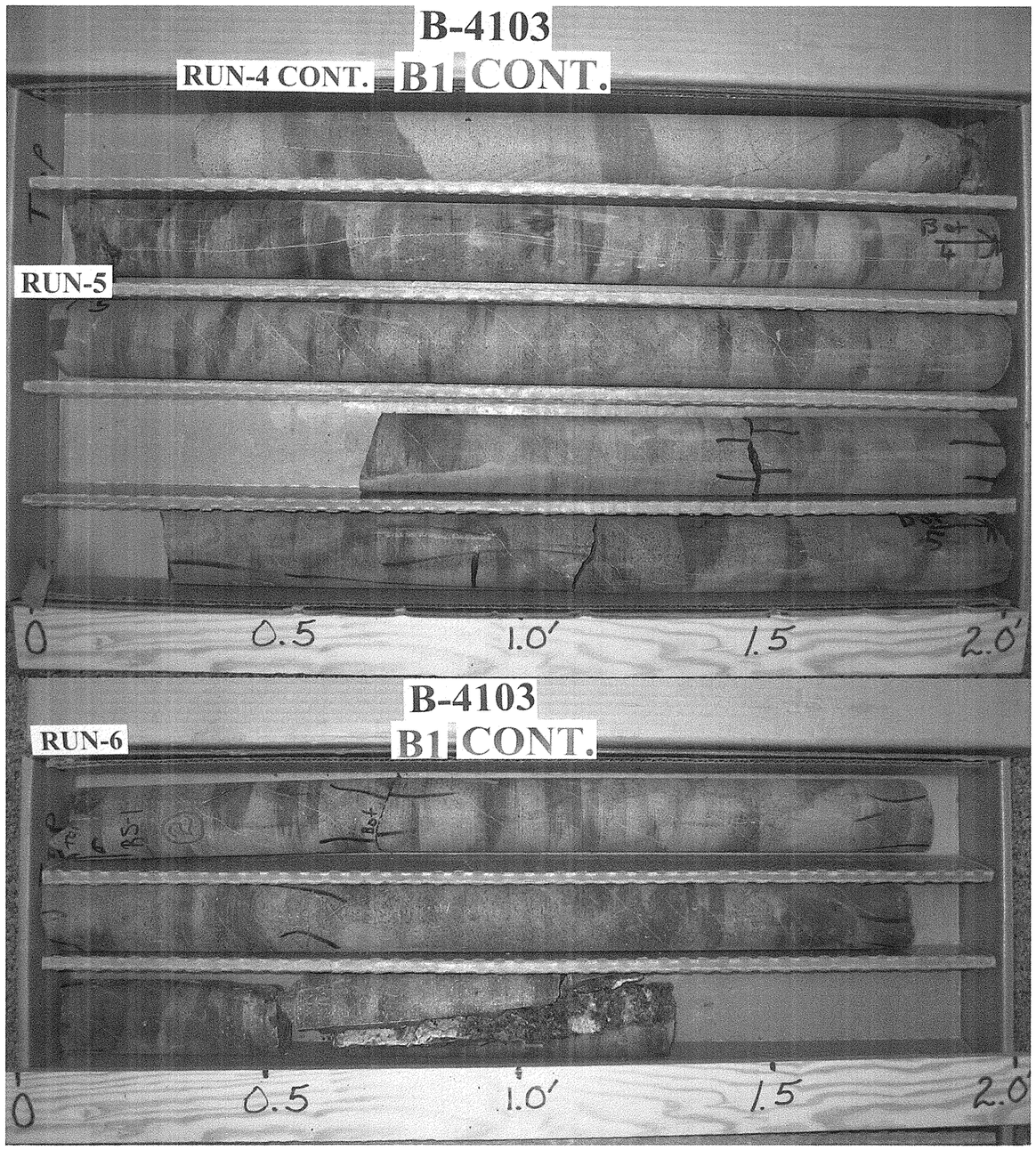
Template Revised 02/07/06

Reported by: LITTLE/MURRAY Date: 2/10/2006

33459.1.1 B-4103
DAVIDSON COUNTY
BRIDGE NO. 416 ON SR 2550 OVER BEAVER DAM CREEK (BADIN LAKE)

CORE PHOTOS





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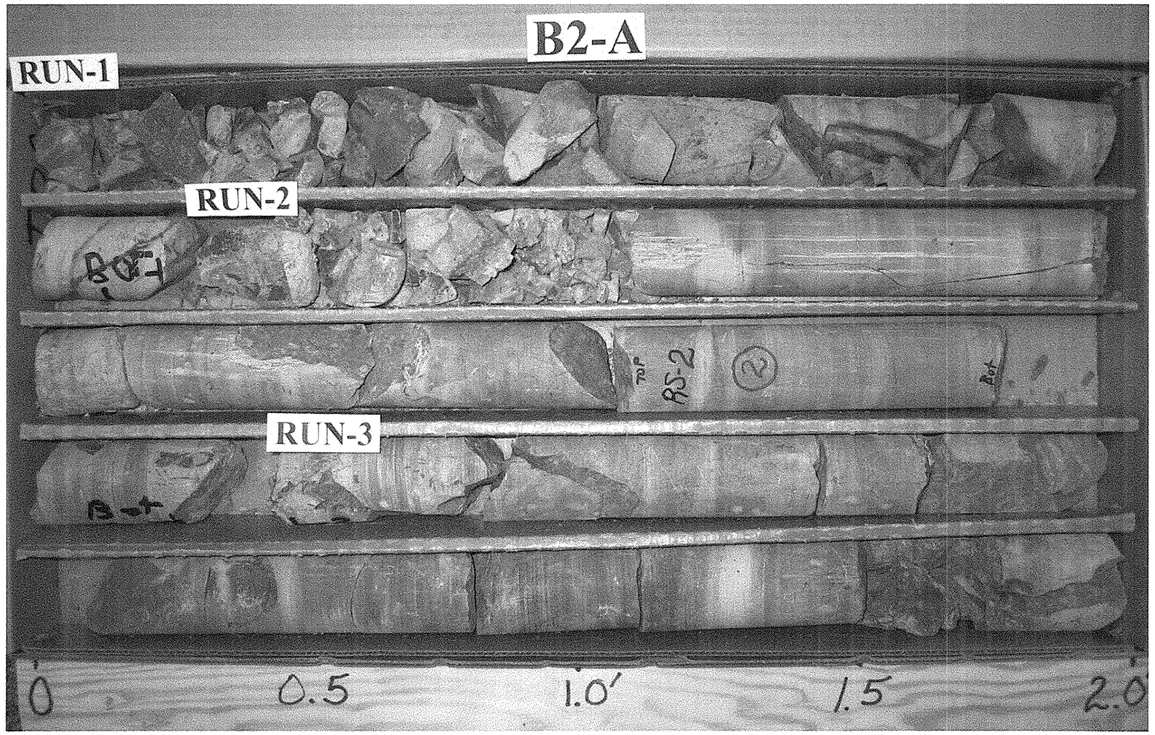

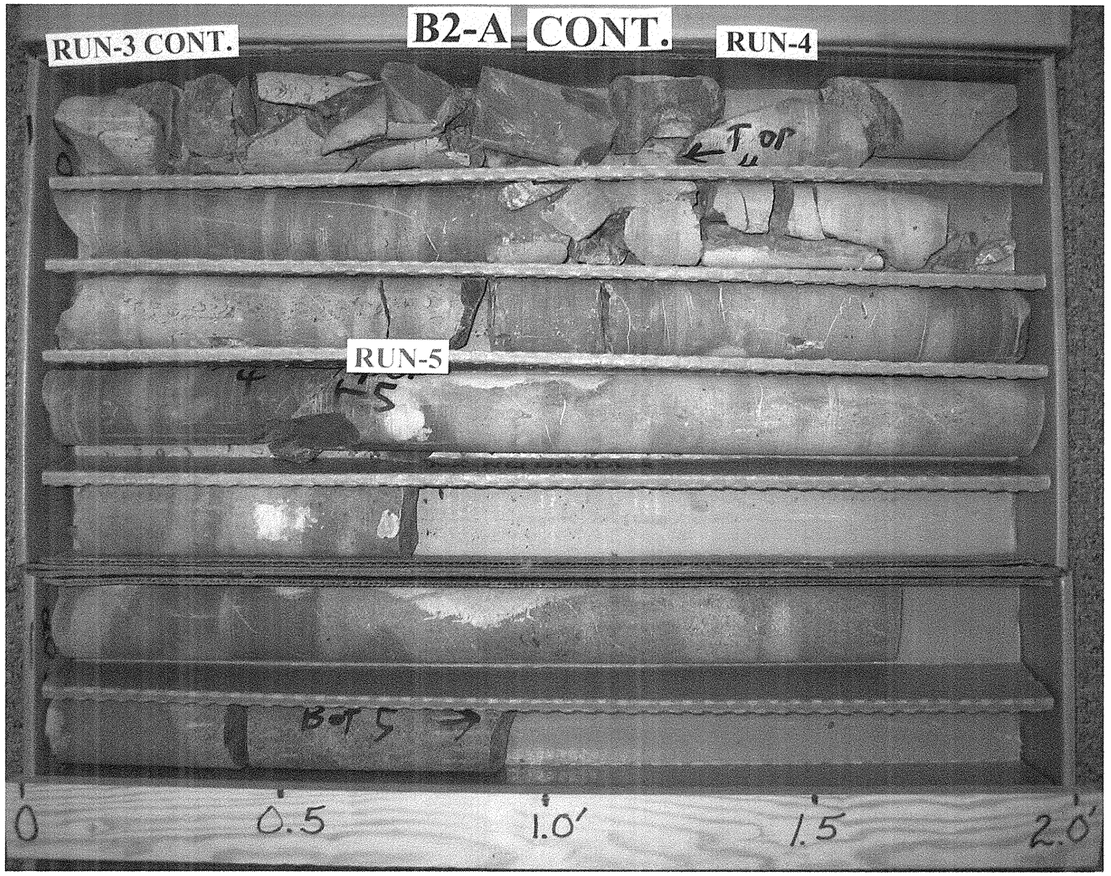

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CORE PHOTOS