

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

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PROJ. REFERENCE NO. 33456.1.1 (B-4100) F.A. PROJ. BRSTP-1741(2)  
COUNTY DAVIDSON  
PROJECT DESCRIPTION BRIDGE 142 OVER ABBOTT'S CREEK ON SR 1741

SITE DESCRIPTION \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CAUTION NOTICE**

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**PROJECT: 33456.1.1 ID: B-4100**

PERSONNEL

LITTLE

MURRAY

ESTEP

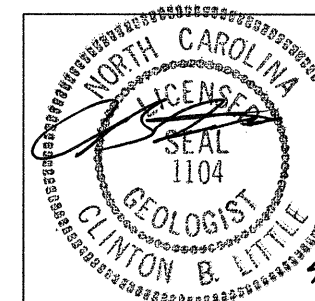
HARPER

INVESTIGATED BY MURRAY

CHECKED BY LITTLE

SUBMITTED BY LITTLE

DATE APRIL 2006



DRAWN BY: LITTLE

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NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

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

**SUBSURFACE INVESTIGATION**

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS	
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</i>		WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.		HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:		ALUVIUM (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 INTRODUCED 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 (SCRC) - 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.	
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>		<b>MINERALOGICAL COMPOSITION</b>		<b>WEATHERING</b>			
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS		MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.			
GROUP CLASS. A-1, A-1-b, A-3, A-2, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7		<b>COMPRESSIBILITY</b>		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.			
SYMBOL		SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50		NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.			
% PASSING # 10 50 MX 30 MX 50 MX 51 MN # 40 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN # 200		<b>PERCENTAGE OF MATERIAL</b>		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.			
LIQUID LIMIT PLASTIC INDEX		ORGANIC MATERIAL GRANULAR SILT-CLAY OTHER MATERIAL SOILS SOILS SOILS TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER			
GROUP INDEX		<b>GROUND WATER</b>		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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>			
USUAL TYPES OF MAJOR MATERIALS		WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP		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. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i>			
GEN. RATING AS A SUBGRADE		MISCELLANEOUS SYMBOLS		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. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i>			
EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD		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.			
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL		ROCK HARDNESS			
<b>CONSISTENCY OR DENSENESS</b>		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		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.			
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F <sup>2</sup> )		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		HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.			
GENERALY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE		w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED w - UNIT WEIGHT w <sub>d</sub> - DRY UNIT WEIGHT		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.			
GENERALY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT MEDIUM STIFF STIFF VERY STIFF HARD		<b>ABBREVIATIONS</b>		MEDIUM HARD CAN BE GROUDED 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.			
TEXTURE OR GRAIN SIZE		EQUIPMENT USED ON SUBJECT PROJECT		SOFT CAN BE GROUDED 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.			
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053		DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST OTHER OTHER		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 FINGER NAIL.			
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)		ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE 2-7/8" TUNG-CARB. CORE BIT OTHER		BEDDING			
GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3		HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST OTHER		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		BENCH MARK: GPS-2 I4+08.36 BL ELEVATION: 783.95 FT.	
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>				INDURATION		NOTES:	
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.			
LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE				FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.			
PLASTIC RANGE (PI) PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE				MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.			
OH OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE				INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.			
SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE				EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.			
<b>PLASTICITY</b>							
NONPLASTIC 0-5 VERY LOW DRY STRENGTH							
LOW PLASTICITY 6-15 VERY LOW SLIGHT							
MED. PLASTICITY 16-25 MEDIUM MEDIUM							
HIGH PLASTICITY 26 OR MORE HIGH							
<b>COLOR</b>							
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.							



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

April 5, 2006

STATE PROJECT: 33456.1.1 (B-4100)  
FEDERAL PROJECT: BRSTP-1741(2)  
COUNTY: Davidson  
DESCRIPTION: Bridge 142 over Abbott's Creek on SR 1741  
SUBJECT: Geotechnical Report – Bridge Foundation Investigation

The project is located in northeastern Davidson County, west of High Point. This is a bridge replacement project utilizing an on-site detour with a temporary detour structure. The existing roadway (SR 1741 Wallburg-High Point Road) is a well traveled two-lane roadway that runs from High Point to NC 109 at Wallburg. The existing bridge is five spans with an overall length of 105.5'. The proposed replacement structure is a single span (1@140') bridge, 43.3' wide, on a skew of 105°.

The Geotechnical investigation was conducted in December 2005 and February 2006 utilizing a CME-550 drill with NW casing and 2-7/8" roller cone bit on a casing advancer with water, or 8" hollow stem augers. We conducted four borings for the primary structure, two borings for the detour structure, and two borings along the detour roadway. The EB2 boring for the detour was offset considerably due to access problems.

The bridges cross Abbott's Creek. The stream channel is about 50' wide at this point, with a floodplain approximately 800' wide. Depth of water at normal flow (Elevation 770.5') is two feet. The 100 yr flood elevation is 779'. The roadway elevation is about 786'. Groundwater readings in the open boreholes were near elevation 770'.

The project area is in the piedmont region on the boundary between the Carolina Slate Belt and the Charlotte Belt. The geology is mapped as metamorphosed granitic rocks. Samples of saprolite obtained indicate a mafic volcanic body intruded by granitic rock with subsequent metamorphism. The rock body is deeply weathered. All borings terminated in saprolite or weathered rock. No rock cores were obtained.

#### Foundation Materials

There is a significant difference in the depth to the top of the weathered rock strata from End Bent One to End Bent Two. This is readily apparent on the attached profile sheets. The following discussion of subsurface conditions applies to the permanent replacement structure as well as the detour structure.

#### **End Bent One:**

The existing roadway embankment fill is twelve feet thick and consists of loose silty sand and medium stiff sandy silt. The fill rests on an alluvial layer of saturated sand and gravel, five to 8 feet thick. Residual soils below the alluvium are variable. The samples ranged from A-7 sandy clay to A-1 coarse sand. Standard Penetration Test "N" values ranged from 16 to 65. The thickness of residual soils ranged from eight to 13 feet. Weathered rock was encountered across the bent at elevation 752 to 754. The borings were advanced six to ten feet into the weathered rock and terminated. Groundwater was measured in the Detour boring at three feet depth, elevation 771. It should be similar or slightly higher at the permanent structure location.

#### **End Bent Two**

The existing embankment fill is about ten feet thick and consists of loose silty sand. It rests on an alluvial layer of silty sand to coarse sand with gravel, ten feet thick. The top of residual soil occurs near elevation 765. The residual soil is much thicker than at End Bent One. SPT "N" counts ranged from three blows per foot at the top of the layer to 83 blows per foot at the bottom of Boring EB2-C, (at a depth of 75 feet). Neither boring encountered weathered rock or hard rock. The residual soil (saprolite) was described as green-olive and white sandy silt with vertical foliation with lenses of almost pure white silt. All of the samples returned A-4 classifications. Groundwater was measured in the boreholes near elevation 770, within the alluvial sand strata. The Detour boring was offset 80' from the Detour alignment due to access problems, but yielded enough data to infer that the subsurface conditions are similar across the Detour Structure End Bent.

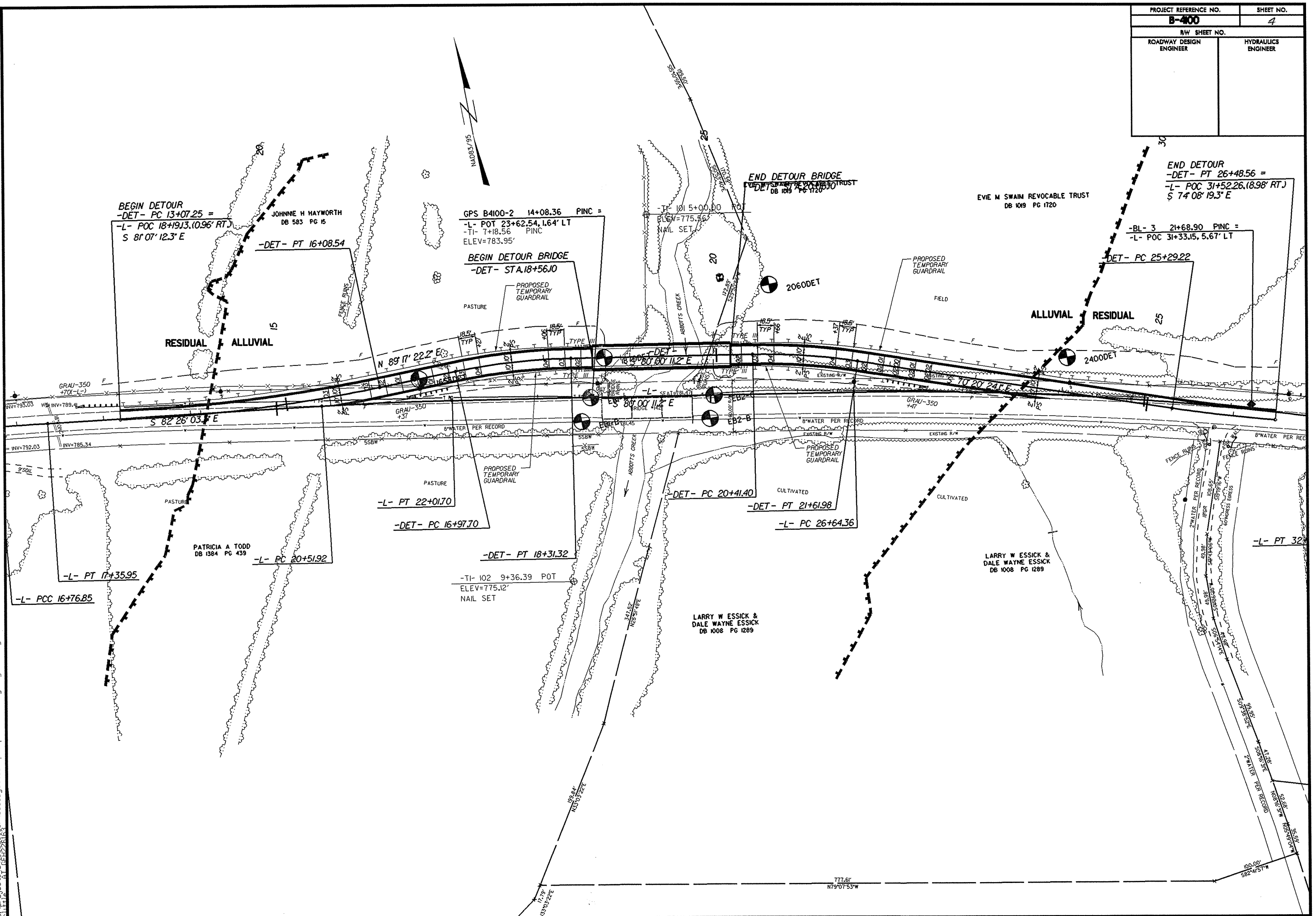
Respectfully submitted,

Clint Little  
Project Engineering Geologist

8/17/99

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PROJECT REFERENCE NO. <b>B-400</b>	SHEET NO. <b>4</b>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



BEGIN DETOUR  
-DET- PC 13+07.25 =  
-L- POC 18+19.13 (10.96' RT.)  
S 81° 07' 12.3" E

GPS B4100-2 14+08.36 PINC =  
-L- POT 23+62.54 (1.64' LT)  
-TI- 7+18.56 PINC  
ELEV=783.95'

BEGIN DETOUR BRIDGE  
-DET- STA. 18+56.10

END DETOUR BRIDGE  
-DET- STA. 26+48.56 =

EVIE M SWAIM REVOCABLE TRUST  
DB 1019 PG 1720

END DETOUR  
-DET- PT 26+48.56 =  
-L- POC 31+52.26 (18.98' RT.)  
S 74° 08' 19.3" E

-BL- 3 21+68.90 PINC =  
-L- POC 31+33.15 (5.67' LT)

-DET- PC 25+29.22

-L- PT 22+01.70  
-DET- PC 16+97.70

-DET- PC 20+41.40  
-DET- PT 21+61.98  
-L- PC 26+64.36

-L- PT 17+35.95

-L- PC 20+51.92

-DET- PT 18+31.32

-TI- 102 9+36.39 POT  
ELEV=775.12'  
NAIL SET

LARRY W ESSICK &  
DALE WAYNE ESSICK  
DB 1008 PG 1289

LARRY W ESSICK &  
DALE WAYNE ESSICK  
DB 1008 PG 1289

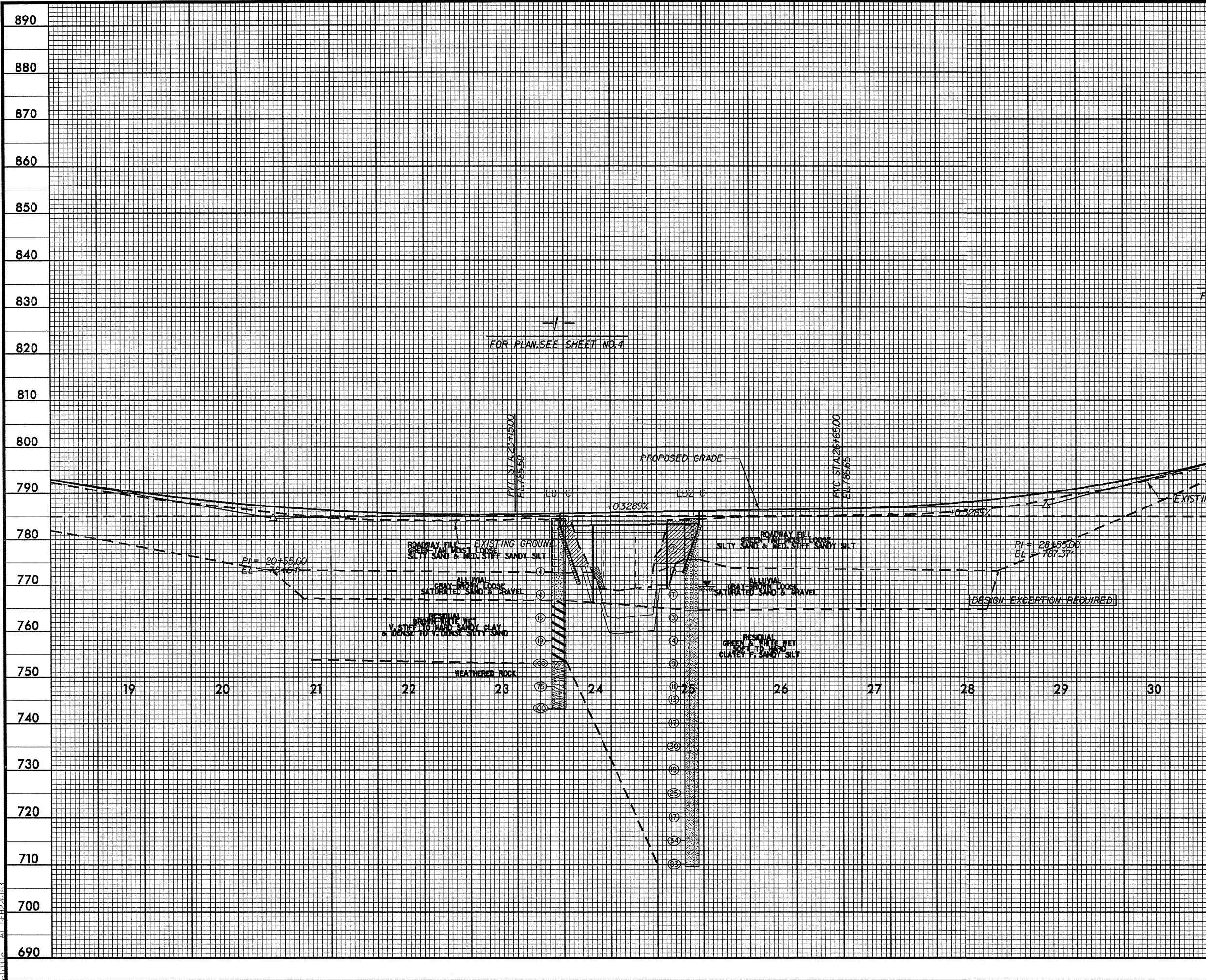
-L- PT 32



771.61  
N79°07'53"W

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	880
	870



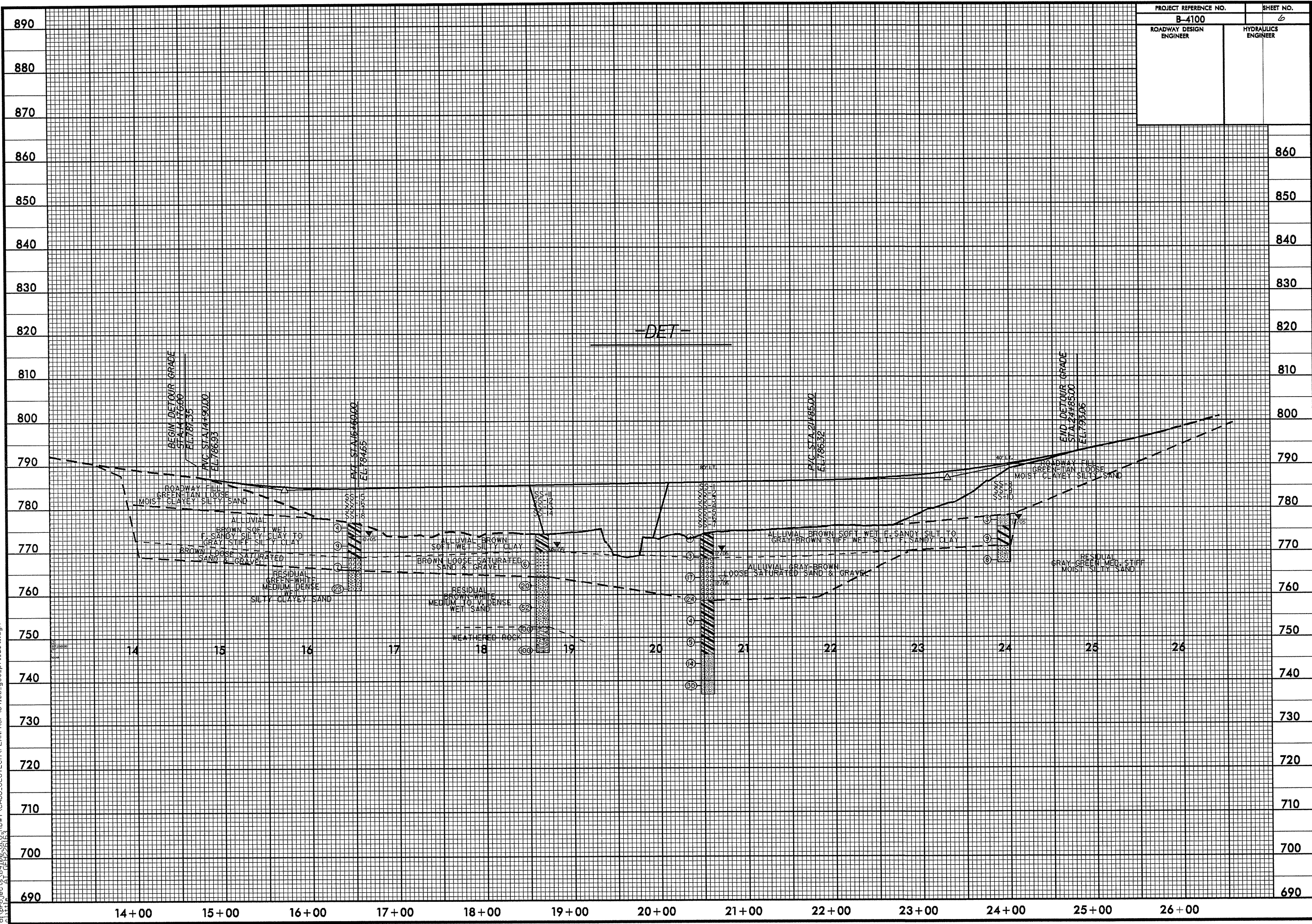
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690

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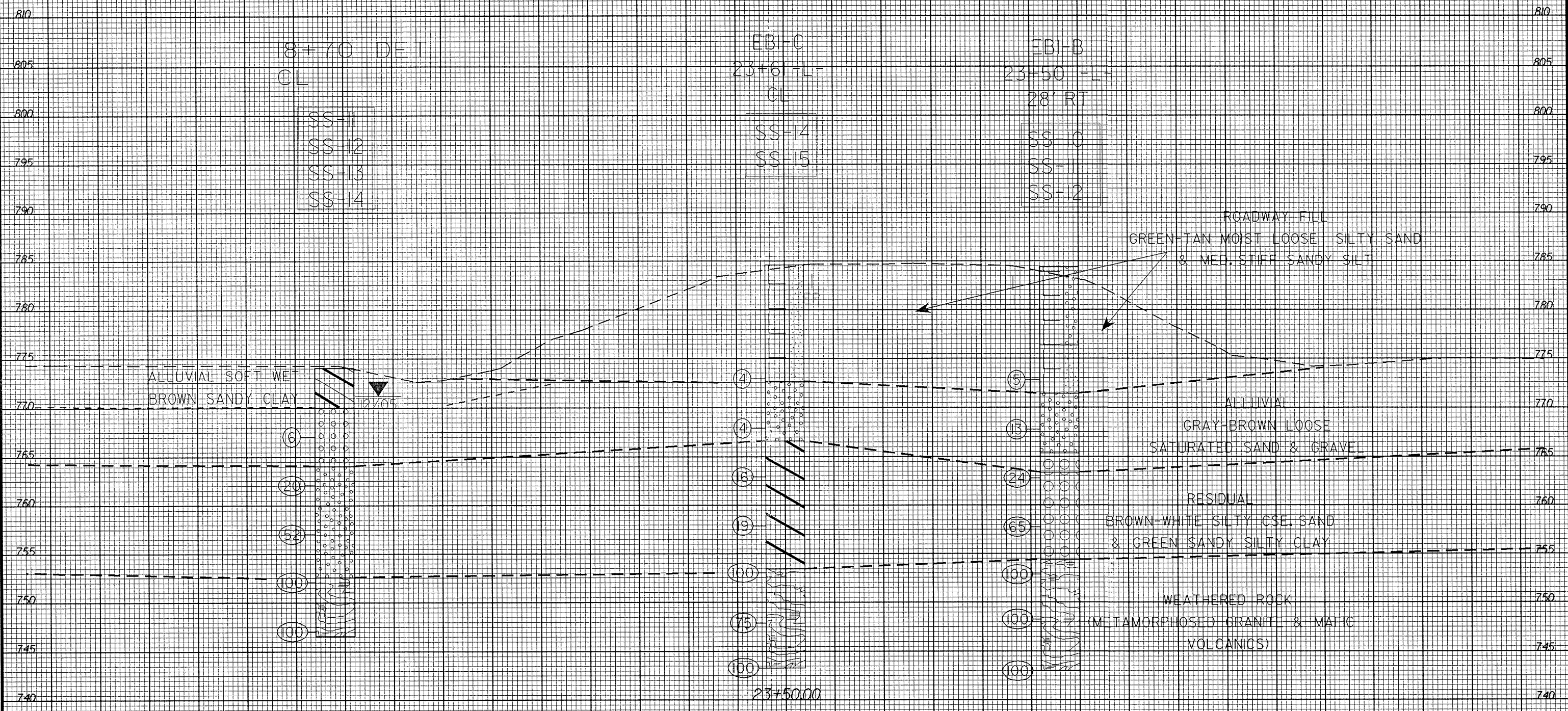
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B-4100		6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	



14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00

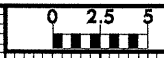
8/23/99

# SECTION THROUGH EBI (DET), EBI-C & EBI-B

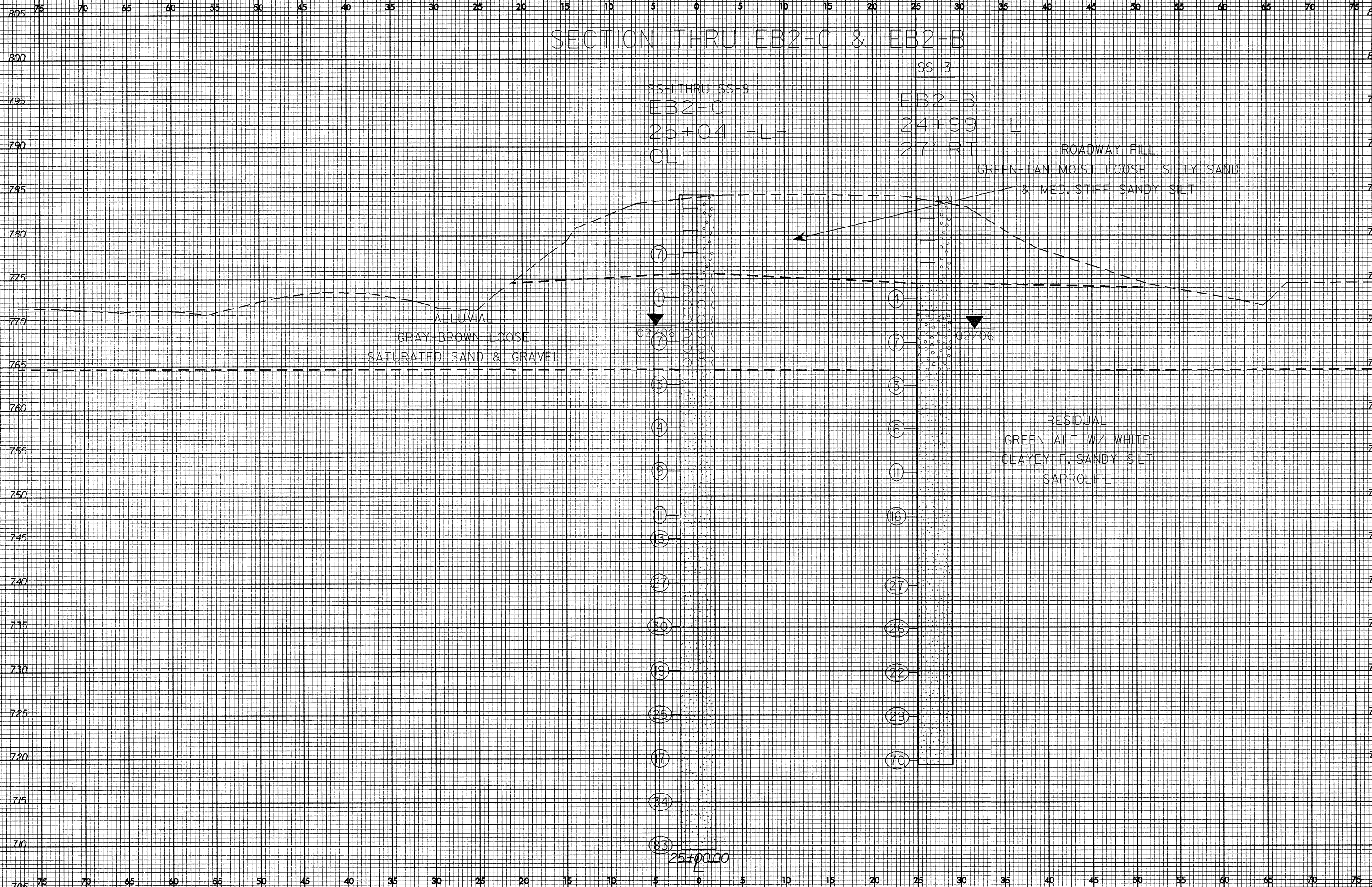


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 c:\little AT GEH226183

8/23/99



PROJ. REFERENCE NO. B-4100 SHEET NO. 8



# SECTION THRU EB2-C & EB2-B

SS-1 THRU SS-9  
EB2-C  
25+04 =L=  
CL

SS-3  
EB2-B  
24+99 L  
27 FT

ROADWAY FILL  
GREEN-TAN MOIST LOOSE SILTY SAND  
& MED. STIFF SANDY SILT

ALLUVIAL  
GRAY-BROWN LOOSE  
SATURATED SAND & GRAVEL

RESIDUAL  
GREEN-TAN W/ WHITE  
CLAYEY F. SANDY SILT  
SAPROLITE

02/56

02/06

25+00.00

3-MAR-2006 09:15  
of 1  
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33456.1.1		ID B-4100		COUNTY DAVIDSON		GEOLOGIST MURRAY								
SITE DESCRIPTION BRIDGE 142 OVER ABBOTT'S CREEK ON SR 1741							GND WATER							
BORING NO EB1-B		NORTHING 0.00		EASTING 0.00		0 HR N/A	24 HR N/A							
ALIGNMENT L		BORING LOCATION 23+50.000		OFFSET 28.00ft RT										
COLLAR ELEV 784.37ft		TOTAL DEPTH 41.40ft		START DATE 2/07/06		COMPLETION DATE 02/07/06								
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK N/A			Log EB1-B, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100				
784.37														Ground Surface
780.00	10.60	3	3	2	1.0	5					SS-10	W		ROADWAY FILL GREEN-TAN SILTY SAND
770.00	15.60	6	9	4	1.0	13					SS-11	SAT		GREEN-TAN SANDY SILT
	20.60	6	10	14	1.0	24								ALLUVIAL GRAY SAND
760.00	25.60	24	31	34	1.0	65					SS-12	W		GRAVEL & COARSE SAND
	30.60	48	52		0.9									RESIDUAL OLIVE & WHITE SILTY COARSE SAND
750.00	35.60	100			0.5									WEATHERED ROCK (METAMORPHOSED GRANITE & MAFIC VOLCANICS)
742.97	40.60	54	46		0.8									WEATHERED ROCK (META-GRANITE)
														TERMINATED IN WEATHERED ROCK AT 41.4'

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33456.1.1		ID B-4100		COUNTY DAVIDSON		GEOLOGIST MURRAY								
SITE DESCRIPTION BRIDGE 142 OVER ABBOTT'S CREEK ON SR 1741							GND WATER							
BORING NO EB1-C		NORTHING 0.00		EASTING 0.00		0 HR N/A	24 HR N/A							
ALIGNMENT L		BORING LOCATION 23+61.000		OFFSET 0.00ft										
COLLAR ELEV 784.60ft		TOTAL DEPTH 41.30ft		START DATE 2/08/06		COMPLETION DATE 02/08/06								
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH N/A			DEPTH TO ROCK N/A			Log EB1-C, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100				
784.60														Ground Surface
780.00	10.70	2	2	2	1.0	4					SS-14	M		ROADWAY FILL GREEN-TAN SILTY SAND ALT W/ RED SILTY CLAY
770.00	15.70	3	2	2	1.0	4								ALLUVIAL TAN TO GRAY COARSE SAND
	20.70	4	7	9	1.0	16								RESIDUAL DARK GREEN V. SANDY CLAY
760.00	25.70	8	9	10	1.0	19					SS-15	M		WEATHERED ROCK (META-GRANITE)
	30.70	31	45	55	0.9									WEATHERED ROCK (META-GRANITE)
750.00	35.70	41	36	39	1.0									WEATHERED ROCK (META-GRANITE)
743.30	40.70	77	23		0.6									WEATHERED ROCK (META-GRANITE)
														TERMINATED IN WEATHERED ROCK AT 41.3'



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL UNIT BORING LOG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33456.1.1		ID B-4100		COUNTY DAVIDSON		GEOLOGIST MURRAY							
SITE DESCRIPTION BRIDGE 142 OVER ABBOTT'S CREEK ON SR 1741							GND WATER						
BORING NO EB2-C		NORTHING 0.00		EASTING 0.00		0 HR N/A	24 HR 15.00ft						
ALIGNMENT L		STATION 25+04.000		OFFSET 0.00ft		24 HR 15.00ft	24 HR 15.00ft						
COLLAR ELEV 784.59ft		TOTAL DEPTH 75.00ft		START DATE 2/06/06		COMPLETION DATE 02/06/06							
DRILL MACHINE CME-550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH N/A			DEPTH TO ROCK N/A			Log EB2-C, Page 1 of 2							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
784.59												Ground Surface	
780.00	5.70	4	3	4	1.0					7	SS-1	M	ROADWAY FILL GREEN-TAN □ SILTY SAND
770.00	10.70	1		1	1.0					1			ALLUVIAL GRAY COARSE SAND
760.00	15.70	5	4	3	1.0					7	SS-2	SAT	
	20.70	2	2	1	1.0					3	SS-3	W	RESIDUAL GREEN-TAN & WHITE □ SANDY SILT
	25.70	2	2	2	1.0					4	SS-4	W	
	30.70	3	5	4	1.0					9	SS-5	W	
	35.70	4	4	7	1.0					11	SS-6	W	
	38.50	3	4	9	1.0					13			
	43.50	8	11	6	1.0					7	SS-7	W	
													Continued on the next page.

PROJECT NO 33456.1.1		ID B-4100		COUNTY DAVIDSON		GEOLOGIST MURRAY							
SITE DESCRIPTION BRIDGE 142 OVER ABBOTT'S CREEK ON SR 1741							GND WATER						
BORING NO EB2-C		NORTHING 0.00		EASTING 0.00		0 HR N/A	24 HR 15.00ft						
ALIGNMENT L		STATION 25+04.000		OFFSET 0.00ft		24 HR 15.00ft	24 HR 15.00ft						
COLLAR ELEV 784.59ft		TOTAL DEPTH 75.00ft		START DATE 2/06/06		COMPLETION DATE 02/06/06							
DRILL MACHINE CME-550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH N/A			DEPTH TO ROCK N/A			Log EB2-C, Page 2 of 2							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
740.00													
	48.50	10	12	18	1.0					30			RESIDUAL GREEN-TAN & WHITE □ SANDY SILT
730.00	53.50	6	7	12	1.0					19	SS-8	W	
	58.50	8	13	12	1.0					25			
720.00	63.50	7	7	10	1.0					7			
	68.50	16	19	15	1.0					34	SS-9	W	
709.59	73.50	18	26	57	1.0					83			
													TERMINATED IN HARD SANDY SILT SAPROLITE AT 75.0'



12/14

## SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	LINE	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	80 LT	20+60	DET	0.00-1.50	A-6(7)	34	11	4.7	31.2	37.9	26.3	100	98	72	-	-
SS-2	80 LT	20+60	DET	4.20-5.70	A-6(6)	33	12	4.0	39.5	28.1	28.3	100	99	66	-	-
SS-3	80 LT	20+60	DET	9.20-10.70	A-1-b(0)	23	NP	64.4	20.4	7.1	8.1	58	29	11	-	-
SS-4	80 LT	20+60	DET	14.20-15.70	A-1-b(0)	18	NP	58.4	21.8	14.8	5.1	62	34	15	-	-
SS-5	80 LT	20+60	DET	19.20-20.70	A-6(7)	33	11	10.9	24.5	40.3	24.3	98	91	72	-	-
SS-7	80 LT	20+60	DET	29.20-30.70	A-4(2)	32	5	14.8	30.4	36.6	18.2	100	90	64	-	-
SS-8	40 LT	24+00	DET	0.00-1.50	A-4(4)	27	8	15.0	18.0	42.7	24.3	96	86	69	-	-
SS-9	40 LT	24+00	DET	4.40-5.90	A-7-6(20)	51	31	12.3	16.8	22.3	48.6	93	86	69	-	-
SS-10	40 LT	24+00	DET	9.40-10.90	A-2-4(0)	33	NP	36.4	33.8	23.7	6.1	81	60	31	-	-
SS-11	0	18+70	DET	6.00-7.50	A-3(0)	26	NP	65.3	26.5	3.1	5.1	97	55	10	-	-
SS-12	0	18+70	DET	11.00-12.50	A-2-4(0)	28	NP	36.8	39.9	19.2	4.0	80	58	28	-	-
SS-13	0	18+70	DET	16.00-17.50	A-2-4(0)	29	NP	38.9	41.5	15.6	4.0	99	69	32	-	-
SS-14	0	18+70	DET	21.00-22.30	A-1-b(0)	25	NP	53.0	29.7	13.3	4.0	74	43	18	-	-
SS-15	0	16+55	DET	0.00-1.50	A-6(9)	34	16	9.3	27.1	31.2	32.4	97	92	68	-	-
SS-16	0	16+55	DET	4.20-5.70	A-7-6(29)	58	30	6.1	10.7	26.5	56.7	100	96	86	-	-
SS-17	0	16+55	DET	12.50-14.20	A-2-4(0)	25	8	46.4	22.9	12.6	18.2	71	47	25	-	-
SS-18	0	16+55	DET	14.20-15.70	A-2-4(0)	29	NP	38.4	39.6	17.0	5.1	88	62	28	-	-
SS-1	0	25+04	EB2-C	5.70-7.20	A-2-4(0)	31	10	38.7	25.5	25.6	10.1	78	54	33	-	-
SS-2	0	25+04	EB2-C	15.70-17.20	A-1-b(0)	23	NP	73.6	18.6	7.8	0.0	83	37	8	-	-
SS-3	0	25+04	EB2-C	20.70-22.20	A-4(1)	31	5	26.3	24.3	35.2	14.2	100	81	56	-	-
SS-4	0	25+04	EB2-C	25.70-27.20	A-4(3)	33	7	23.7	24.5	35.7	16.2	100	84	59	-	-
SS-5	0	25+04	EB2-C	30.70-32.20	A-4(0)	24	0	29.7	29.3	32.9	8.1	97	77	47	-	-
SS-6	0	25+04	EB2-C	35.70-37.20	A-4(1)	28	3	18.4	25.9	39.5	16.2	100	88	63	-	-
SS-7	0	25+04	EB2-C	43.50-45.00	A-4(0)	25	3	12.1	35.0	42.8	10.1	100	94	63	-	-
SS-8	0	25+04	EB2-C	58.50-60.00	A-4(0)	26	1	21.4	29.9	34.5	14.2	98	85	56	-	-
SS-9	0	25+04	EB2-C	0.00-0.00	A-4(0)	24	NP	23.1	30.7	38.1	8.1	88	75	47	-	-
SS-10	28' RT	23+50	EB1-B	10.60-12.10	A-4(0)	26	8	28.6	31.9	23.2	16.3	95	79	42	-	-
SS-11	28' RT	23+50	EB1-B	15.60-17.10	A-2-4(0)	23	NP	65.8	22.9	5.2	6.1	95	53	13	-	-
SS-12	28' RT	23+50	EB1-B	25.60-27.10	A-1-b(0)	29	NP	58.4	23.9	13.6	4.1	78	41	17	-	-
SS-13	27' RT	24+99	EB2-B	10.70-12.20	A-4(3)	30	9	10.6	35.1	33.8	20.4	99	95	61	-	-
SS-14	CL	23+61	EB1-C	10.70-12.20	A-4(2)	29	10	19.8	34.7	23.0	22.5	98	89	50	-	-
SS-15	CL	23+61	EB1-C	25.70-27.20	A-7-5(3)	47	12	30.2	28.0	33.6	8.2	94	77	44	-	-



**FIELD  
SCOUR REPORT**

WBS: 33456.1.1 TIP: B-4100 COUNTY: DAVIDSON

DESCRIPTION(1): \_\_\_\_\_

**EXISTING BRIDGE**

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

Bridge No.: 142 Length: 105.5' Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2  
Foundation Type: TIMBER PILES

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: NONE OBSERVED

Interior Bents: SOME MINOR SCOUR AROUND PILES

Channel Bed: NONE OBSERVED

Channel Bank: NONE OBSERVED

**EXISTING SCOUR PROTECTION**

Type(3): RIP-RAP AROUND ABUTMENTS

Extent(4): \_\_\_\_\_

Effectiveness(5): GOOD

Obstructions(6): SOME DEBRIS AROUND OLD BRIDGE FOUNDATIONS JUST UPSTREAM

**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 geotechnically adjusted scour elevation (GASE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the GASE. If the GASE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The GASE 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 COARSE SAND & GRAVEL

Channel Bank Material(8): GRAY SILTY FINE SAND

Channel Bank Cover(9): SMALL TRESS AND WEEDS

Floodplain Width(10): 800'

Floodplain Cover(11): CULTIVATED AND PASTURE

Stream is(12): Aggrading \_\_\_\_\_ Degrading X Static \_\_\_\_\_

Channel Migration Tendency(13): MINOR

Observations and Other Comments: \_\_\_\_\_

GEOTECHNICALLY ADJUSTED SCOUR ELEVATIONS(14) Feet X Meters \_\_\_\_\_

**CONTRACTION SCOUR = 759**

**NO INTERIOR BENT; NO END BENT SCOUR ANTICIPATED**


Comparison of GASE to Hydraulics Unit theoretical scour:  
EQUIVALENT

**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																				

Reported by:   
MURRAY/LITTLE

Date: 3/31/2006