STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2146	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *32620.1.1 (B-2146)* F.A. PROJ. *BRZ-1333(5)*

COUNTY *IREDELL*

PROJECT DESCRIPTION *BRIDGE NO. 86 AND APPROACHES OVER BUFFALO SHOALS CREEK ON SR 1333 (EUFOLA RD.) BETWEEN US 70 AND SR 1369.*

SITE DESCRIPTION *BRIDGE NO. 86 OVER BUFFALO SHOALS CREEK ON SR 1333 (EUFOLA RD.)*

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PERSONNEL

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C.L. SMITH

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INVESTIGATED BY *C.B. LITTLE*

CHECKED BY *C.B. LITTLE*

SUBMITTED BY *C.B. LITTLE*

DATE

NORTH CAROLINA LICENSED SEAL 11048 GEOLOGIST CLINTON B. LITTLE

8-11-05

PROJECT: 32620.1.1

ID: B-2146

DRAWN BY: *C.E. BURRIS*

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PROJECT REFERENCE NO.	SHEET NO.
32620.1.1 (B-2146)	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	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX												
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

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

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
- [X] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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: R.R. SPIKE IN 24" PINE 63' RT. OF -BL- STA. 10+75
53.13' RT. OF -L- STA 17+64.76, ELEV. 783.82', NAVD 88.
ELEVATION: 783.82 FT.

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

August 17, 2006

STATE PROJECT: 32620.1.1 (B-2146)
FEDERAL PROJECT: BRZ-1333(5)
COUNTY: Iredell
DESCRIPTION: Bridge 86 on SR 1333 (Eufola Rd.) over Buffalo Shoals Creek
SUBJECT: Geotechnical Report – Bridge foundation Investigation

PROJECT DESCRIPTION

The project is located in southwestern Iredell County, south and west of Statesville. Buffalo Shoals Creek flows into the Catawba River/Lake Norman just downstream. The bridge replacement was previously investigated as a Bridge Maintenance project in 1993. At that time, the design was a three span structure. The current design is a one span structure (1@125'). All of the borings are presented herein for detail and completeness, but cross-sections for the former interior bents have been eliminated. One additional boring (EB2-B) was conducted in July 2006.

The original borings were conducted in December 1993 with a CME 550 drill rig utilizing 8" hollow stem augers or NX casing with water. Rock core was obtained with NXWL (wireline) coring tools. The core was obtained from the former interior bents. The additional boring at EB2-B was conducted with NW casing and water. It was advanced deeper than EB2-A in order to find the weathered rock or crystalline rock line. It penetrated approximately 15 feet of weathered rock and terminated without encountering crystalline rock.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

Rock

Rock outcrops are visible in the existing roadway cut slope on the left side, Station 15 to 17+50. Rock is exposed under the existing bridge as a steep bluff, on the southern side only. Borings for the structure found rock near the surface on the southern (EB1) side, but no rock on the northern (EB2) side.

PHYSIOGRAPHY AND GEOLOGY

The project is located in the piedmont region of North Carolina. It appears to be situated on or very near the Eufola Fault, which defines the northern terminus of the Kings Mountain Geologic Belt at its contact with the Inner Piedmont Geologic Belt. There is a sharp boundary at the creek itself, with crystalline rock (brecciated biotite gneiss) to the south and a deep soil profile (saprolite: deeply weathered hornblende gneiss) on the north. The floodplain of Buffalo Shoals Creek is predominantly on the northern side.

FOUNDATION MATERIALS

End Bent One:

A very thin (less than one foot) layer of roadway fill was found in the left and centerline borings resting on weathered rock. The right side boring found 7.5 feet of residual sandy soil, loose on the surface but dense at 4.5 feet. All three borings refused on crystalline rock at depths of: 1.7', 3.2', and 7.6', from left to right. As previously discussed, rock is visible under the existing bridge in the vicinity of End Bent One.

End Bent Two:

The borings found 12 to 16 feet of roadway fill, loose to medium dense sand or clayey sand. Below the fill was a six to seven foot layer of alluvial, loose, silty sand. Residual soil was encountered at depths of 19 to 22', sloping down from right to left. The soil consists of medium dense to dense, moist to wet, silty sand. The left side boring was advanced through this material and terminated at a depth of 55.3' in medium dense silty sand. The right side boring encountered weathered rock at about 66', elevation 720.

GROUNDWATER

The End Bent One borings did not reach groundwater. The former interior borings were conducted near or in the stream; water levels were coincident with the stream elevation at 765'. A zero hour water reading in boring EB2-A was at 13', elevation 772.

Respectfully submitted,

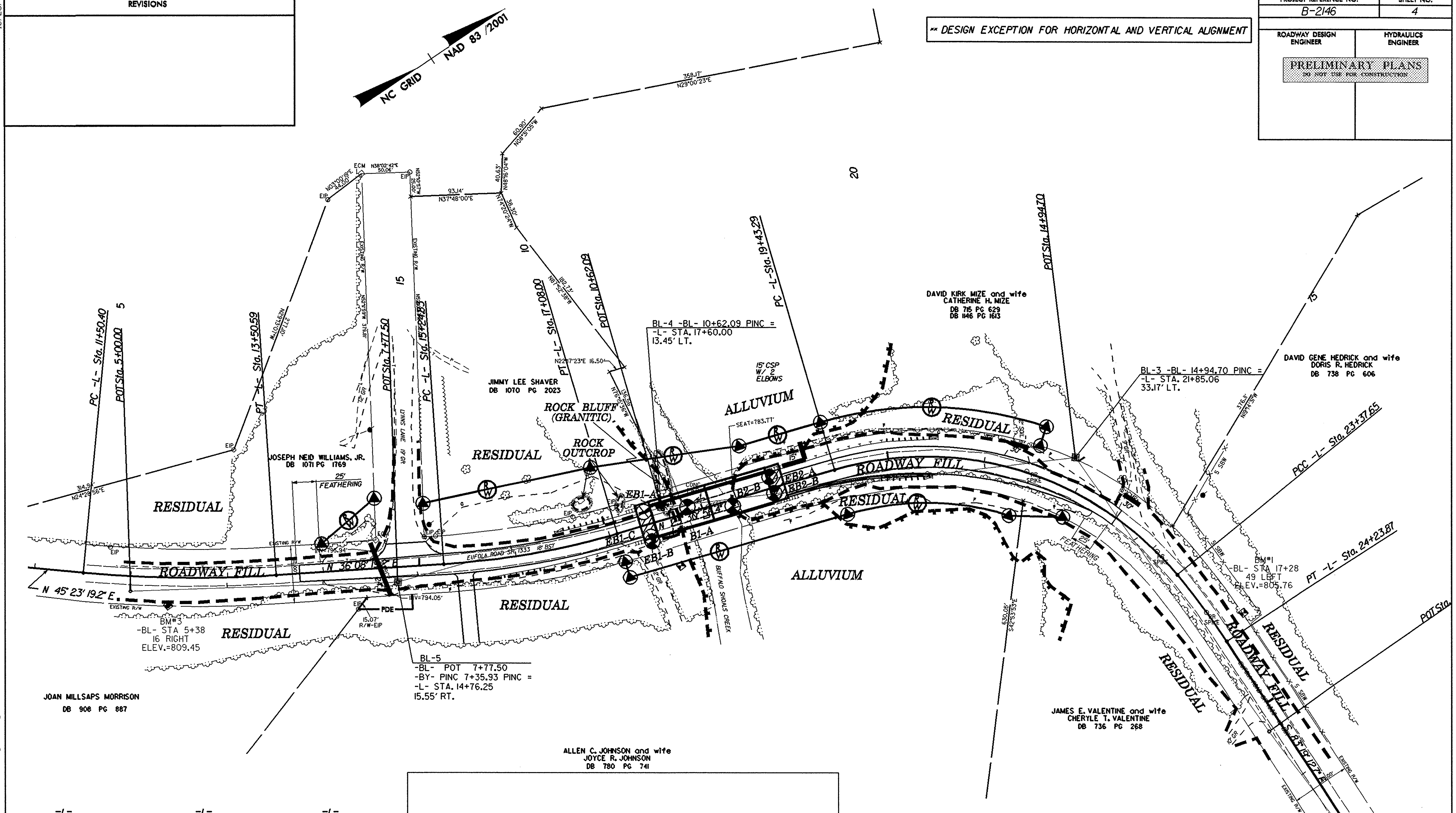
Clint Little
Regional Geological Engineer

PROJECT REFERENCE NO.	SHEET NO.
B-2146	4

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

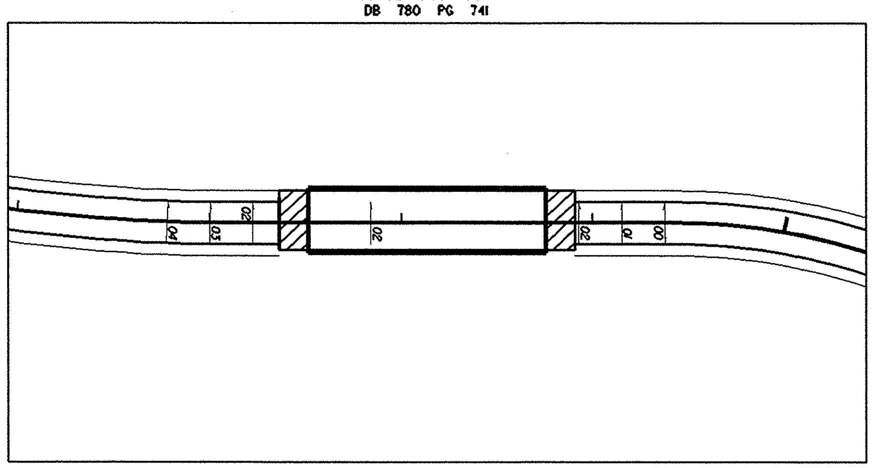
REVISIONS

** DESIGN EXCEPTION FOR HORIZONTAL AND VERTICAL ALIGNMENT



NC GRID
NAD 83 /2001
358.17' N29°00'23"E
RESIDUAL
ROADWAY FILL
ALLUVIUM
ROCK BLUFF (GRANITIC)
ROCK OUTCROP
PC -L- Sta. 11+50.40
POT Sta. 5+00.00
PT -L- Sta. 13+50.59
POT Sta. 7+77.50
PC -L- Sta. 15+24.85
PT -L- Sta. 17+08.00
POT Sta. 10+62.09
PC -L- Sta. 19+43.29
POT Sta. 14+94.70
PCC -L- Sta. 23+37.65
PT -L- Sta. 24+23.87
BL-4 -BL- 10+62.09 PINC = -L- STA. 17+60.00 13.45' LT.
BL-3 -BL- 14+94.70 PINC = -L- STA. 21+85.06 33.17' LT.
BL-5 -BL- POT 7+77.50 -BY- PINC 7+35.93 PINC = -L- STA. 14+76.25 15.55' RT.
BM#3 -BL- STA 5+38 16 RIGHT ELEV.=809.45
BM#1 -BL- STA 17+28 49 LEFT ELEV.=805.76
N 45°23'19.2" E
N 36°08'
25' FEATHERING
15" CSP W/ 2 ELBOWS
SEAT=783.77'
EB1-A
EB1-B
EB1-C
B1-A
B1-B
B2-A
B2-B
EB2-A
EB2-B
BUFFALO SHOALS CREEK
EUFOLA ROAD SR 1333
PDE
JOSEPH NEID WILLIAMS, JR. DB 1071 PG 1769
JIMMY LEE SHAVER DB 1070 PG 2023
DAVID KIRK MIZE and wife CATHERINE H. MIZE DB 715 PG 629 DB 1146 PG 1613
DAVID GENE HEDRICK and wife DORIS R. HEDRICK DB 738 PG 606
JOAN MILLSAPS MORRISON DB 908 PG 887
JAMES E. VALENTINE and wife CHERYLE T. VALENTINE DB 736 PG 268
ALLEN C. JOHNSON and wife JOYCE R. JOHNSON DB 780 PG 741

-L-	-L-	-L-	-L-
PI Sta 12+50.72	PI Sta 16+16.79	PI Sta 21+66.54	PI Sta 23+80.80
Δ = 9°15'00.0" (LT)	Δ = 12°37'22.8" (LT)	Δ = 67°02'30.5" (RT)	Δ = 6°07'20.5" (RT)
D = 4°37'14.3"	D = 6°53'29.6"	D = 17°00'00.0"	D = 7°06'02.7"
L = 200.19'	L = 183.17'	L = 394.36'	L = 86.22'
T = 100.31'	T = 91.96'	T = 223.25'	T = 43.15'
R = 1,240.00'	R = 831.39'	R = 337.03'	R = 806.90'
E = 0.06	E = 0.06	E = 0.06	E = 0.06
RUN OFF = SEE PLANS	RUN OFF = SEE PLANS	RUN OFF = SEE PLANS	RUN OFF = SEE PLANS



DENOTES APPROACH SLAB

FOR -L- PROFILE SEE SHEET NO.5

SEE SHEETS S-1 THRU S- FOR STRUCTURE PLANS

SUNGATE DESIGN GROUP, P.A.

RAMEY KEMP & ASSOCIATES, INC.

10/26/98

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-2146	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

890 880 870 860 850 840 830 820 810 800 790 780 770 760 750 740 730 720 710 700 690

BEGIN FEATHERING
-L- STA.13+75.00
TIE TO EXIST.

802.01

BEGIN GRADE
-L- STA.14+00.00
ELEV.= 802.01
(INCLUDES 1.25" RESURFACING)

BEGIN VERTICAL CURVE
STA.15+75.00

RESIDUAL

RED-BRN LOOSE TO DENSE MOIST CLAYEY SILTY SAND (A-2-4, A-1-B) OVER WEATHERED ROCK (SEV. WEATH. BIOTITE GNEISS)

ROADWAY FILL
RED LOOSE MOIST CLAYEY SILTY SAND (A-2-4)

(+)4.3095%

(-)10.5365%

CRYSTALLINE ROCK

WEATHERED ROCK (SEV. WEATH. BIOTITE GNEISS)

PI = 17+15.00
EL = 786.54'
K = 64
VC = 280'

B1-A
17+86 -L-
6.00 LT.

SS-8
SS-9
SS-10

EB1-C
17+41 -L-
13.00 RT.

AR
NM
(12/2/98)

END VERTICAL CURVE
STA. 18+55.00

B2-B
18+31 -L-
6.00 RT.

EB2-B
18+76 -L-
5.50 RT.

BEGIN VERTICAL CURVE
STA. 19+20.00

PI = 20+70.00
EL = 784.64'
K = 64
VC = 300'

(-)0.5365%

(+)4.1866%

ROADWAY FILL

GRAY-TAN-BROWN-ORANGE LOOSE MOIST TO DRY SILTY CLAYEY SAND W/GRVL AT 12.4 (A-2-6, A-2-4)

CRYSTALLINE ROCK

GRAY HARD BIOTITE GNEISS
BT REC=95% RQD=40%

GRAY HARD BIOTITE GNEISS V.FRAC.
REC=98% RQD=79%

GRAY HARD BIOTITE GNEISS V.FRAC.
REC=95% RQD=42%

GRAY HARD BIOTITE GNEISS
REC=82% RQD=68%

BT

CRYSTALLINE ROCK

BT
NM
(12/1/98)

WEATHERED ROCK
(SEV. WEATH. BIOTITE GNEISS)

RESIDUAL

TAN-BROWN-BLACK-WHITE LOOSE TO DENSE MOIST MICA CLAYEY SILTY SAND (A-2-4)

WEATHERED ROCK

BT
NM
07/06

END GRADE
-L- STA.22+25.00
ELEV.= 791.13
(INCLUDES 1.25" RESURFACING)

END VERTICAL CURVE
STA. 22+20.00

791.13

END FEATHERING
-L- STA.22+50.00
TIE TO EXIST.

BORING DESCRIPTIONS

(A) TAN-BROWN-GRAY LOOSE MOIST TO WET MICA CLAYEY SILTY SAND W/QUARTZ GRAVEL (A-2-4) (ALLUVIUM)

11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00

PROJECT REFERENCE NO.	SHEET NO.
B-2146	6

ROADWAY DESIGN ENGINEER

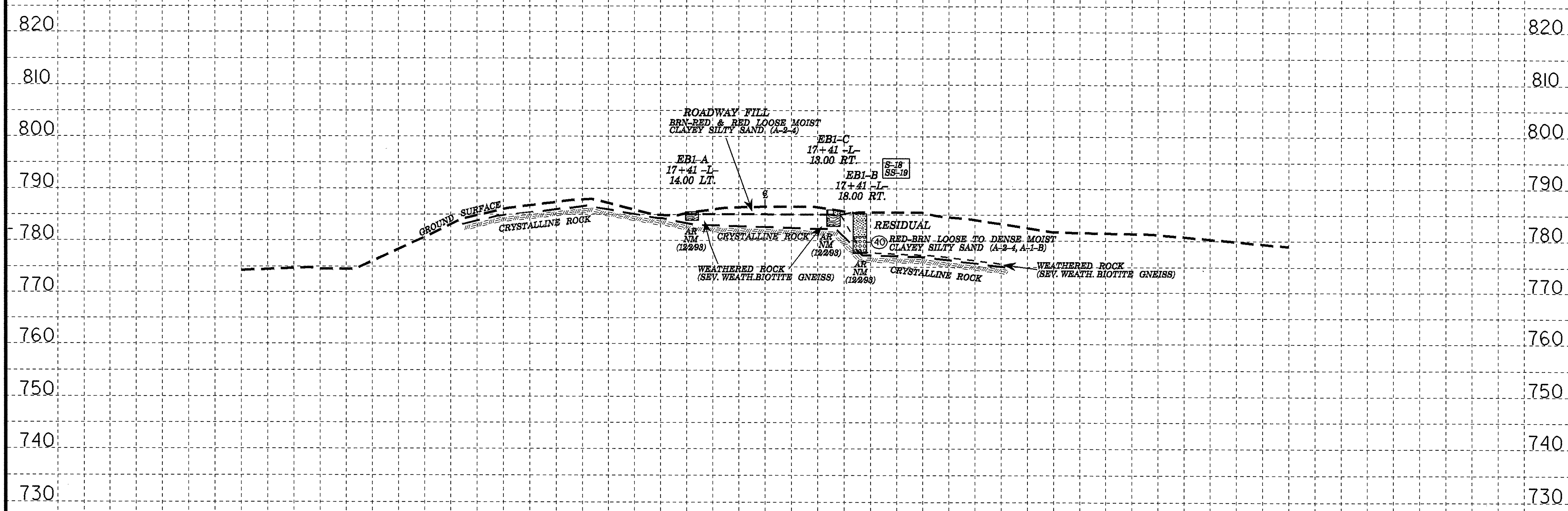
HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

5/28/99

SECTION THRU EB1
STA. 17+51 -L-



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PROJECT REFERENCE NO.	SHEET NO.
B-2146	7

ROADWAY DESIGN ENGINEER

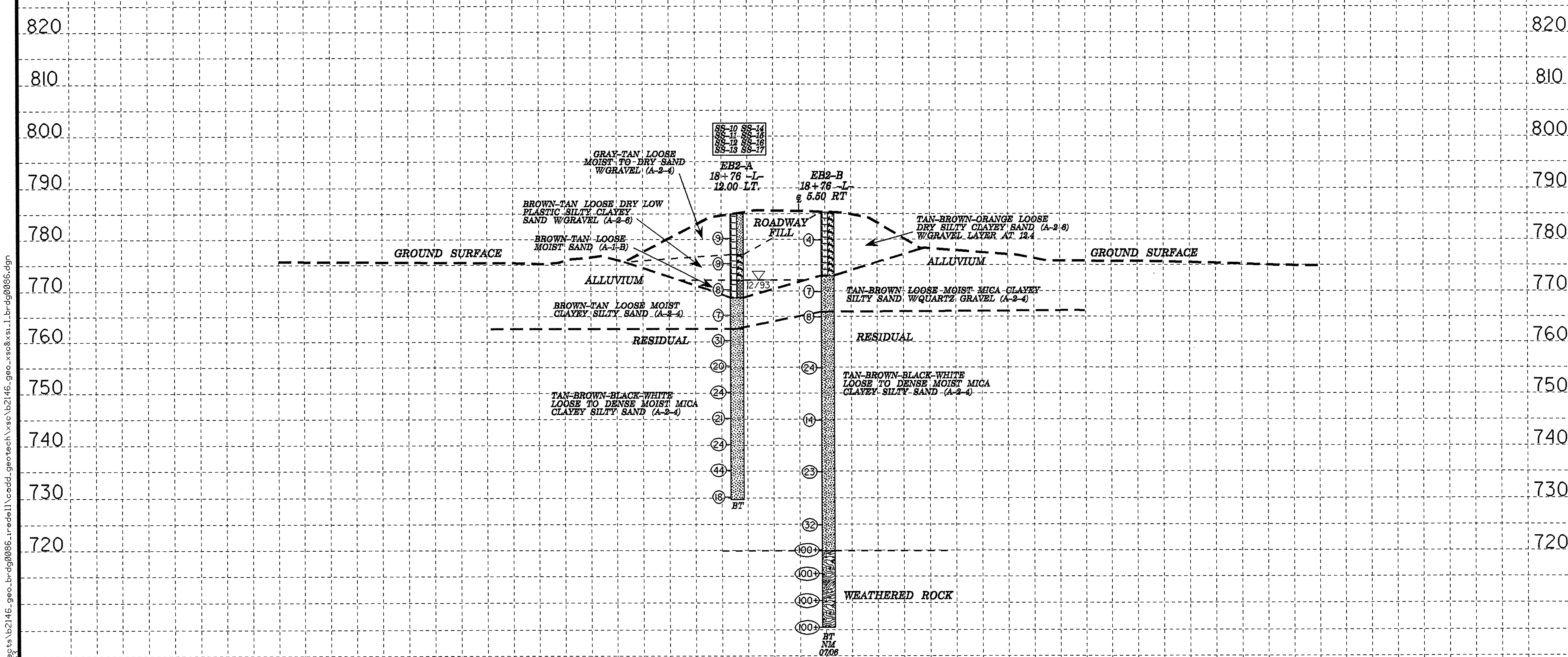
HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

5/28/99

SECTION THRU EB2
STA. 18+76 -L-



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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB1-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 17+41.000	**OFFSET** 14.00ft LT	**24 HR** N/A
COLLAR ELEV 785.56ft	**TOTAL DEPTH** 1.70ft	**START DATE** 12/02/93	**COMPLETION DATE** 12/02/93
DRILL MACHINE CME 550	**DRILL METHOD** H.S. AUGERS/NO SPT		**HAMMER TYPE** MANUAL
SURFACE WATER DEPTH	**DEPTH TO ROCK** 1.70ft		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
785.56						Ground Surface				
783.86						AUGER REFUSAL AT ELEV. 783.86 ON ROCK	S-1			0.0-0.5 (ROADWAY FILL) BRN-RED LOOSE MOIST CLAYEY SILTY SAND (A-2-4) 0.5-1.7 WEATHERED ROCK (SEV. WEATH. BIOTITE GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB1-B	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 17+41.000	**OFFSET** 18.00ft RT	**24 HR** N/A
COLLAR ELEV 785.20ft	**TOTAL DEPTH** 7.60ft	**START DATE** 12/02/93	**COMPLETION DATE** 12/12/93
DRILL MACHINE CME 550	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
SURFACE WATER DEPTH	**DEPTH TO ROCK** 7.60ft		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
785.20						Ground Surface				
780.00	4.50	10	16	24	1.0	40	S-18			0.0-4.5 (RESIDUAL) RED-BRN LOOSE MOIST CLAYEY SILTY SAND (A-2-4)
777.60						AUGER REFUSAL AT ELEV. 777.60 ON HARD ROCK	SS-19			4.5-7.5 RED-BRN DENSE MOIST CLAYEY SILTY SAND (A-1-B) 7.5-7.6 WEATHERED ROCK (SEV. WEATH. BIOTITE GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB1-C	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 17+41.000	**OFFSET** 13.00ft RT	**24 HR** N/A
COLLAR ELEV 785.95ft	**TOTAL DEPTH** 3.20ft	**START DATE** 12/02/93	**COMPLETION DATE** 12/02/93
DRILL MACHINE CME 550	**DRILL METHOD** H.S. AUGERS/NO SPT		**HAMMER TYPE** MANUAL
SURFACE WATER DEPTH	**DEPTH TO ROCK** 3.20ft		**Log EB1-C, 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
785.95						Ground Surface				
782.75						AUGER REFUSAL AT ELEV. 782.75 ON HARD ROCK			L	0.0-1.0 (ROADWAY FILL) RED LOOSE MOIST CLAYEY SILTY SAND (A-2-4)
										1.0-3.2 WEATHERED ROCK (SEV. WEATH. BIOTITE GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO B1-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 17+86.000	**OFFSET** 6.00ft LT	**24 HR** 1.00ft
COLLAR ELEV 766.90ft	**TOTAL DEPTH** 25.50ft	**START DATE** 11/30/93	**COMPLETION DATE** 11/30/93
DRILL MACHINE CME 550	**DRILL METHOD** NWCAS/NXWL		**HAMMER TYPE** MANUAL
SURFACE WATER DEPTH	**DEPTH TO ROCK** 2.50ft		Log B1-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
766.90						Ground Surface				
	2.50	100			0.1	100	RUN 1 RS-1			0-2.5 (ALLUVIUM) TAN LOOSE WET SAND & GRAVEL (A-2-4)
760.00										2.5-3.6 CRYSTALLINE ROCK (SPT REFUSAL)
							RUN 2 RS-2			3.6-9.1 (CRYSTALLINE ROCK) GRAY HARD BIOTITE GNEISS REC=95% RQD=40%
							RUN 3 RS-3			9.1-14.1 GRAY HARD BIOTITE GNEISS V. FRAC. REC=98% RQD=79%
750.00							RUN 4			14.1-19.1 GRAY HARD BIOTITE GNEISS V. FRAC. REC=95% RQD=42%
										19.1-25.5 GRAY HARD BIOTITE GNEISS (13 PIEC.) REC=82% RQD=58%
741.40						TERMINATED BORING AT ELEV. 741.40 IN HARD BIOTITE GNEISS	RS-4			

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY	
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK				**GND WATER**
BORING NO B2-B	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 18+31.000	**OFFSET** 6.00ft RT		**24 HR** N/A
COLLAR ELEV 765.23ft	**TOTAL DEPTH** 34.00ft	**START DATE** 12/01/93	**COMPLETION DATE** 12/01/93	
DRILL MACHINE CME 550	**DRILL METHOD** NWCASING		**HAMMER TYPE** MANUAL	
SURFACE WATER DEPTH 0.60ft	**DEPTH TO ROCK** 33.90ft		**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
765.83						Surface Water Ground Surface				
	1.50	34	18	11	1.0	29				0-1.5 (ALLUVIUM) TAN & GRAY LOOSE WET SILTY SAND (A-2-4)
	3.30	13	30	20	1.0	50	SS-2	W		
760.00	5.80	22	20	14	1.0	34	SS-3	W		1.5-7.9 (RESIDUAL) TAN-GRAY-WHITE CRUSTY MED. DENSE TO DENSE WET SILTY SAND (A-1-B, A-1-A)
	8.30	12	25	24	1.0	49	SS-4	W		
	10.90	13	17	13	1.0	30	SS-5	M		7.9-9.9 BRN DENSE MOIST V. MICA. SILTY SAND (A-2-4)
	13.90	10	17	59	1.0	76	SS-6	M		
750.00	16.00	12	15	21	1.0	36	SS-7	M		9.9-12.9 BRN DENSE MOIST SLI. MICA. SILTY SAND (A-1-B)
	18.50	8	10	19	1.0	29	SS-8	M		12.9-27.4 BRN V. DENSE TO DENSE MOIST SLI. MICA. SILTY SAND (A-2-4)
	23.50	16	13	27	1.0	40				
740.00							SS-9	M		
	28.50	44	27	73	0.9	100				27.4-33.9 WEATHERED ROCK (SEV. WEATH. BIOTITE GNEISS)
731.23	33.90	100			0.1	100				33.9-34.0 CRYSTALLINE ROCK
						TERMINATED BORING AT ELEV. 731.23 ON HARD ROCK				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB2-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** 13.00ft
ALIGNMENT L	**BORING LOCATION** 18+76.000	**OFFSET** 12.00ft LT	**24 HR** N/A
COLLAR ELEV 785.03ft	**TOTAL DEPTH** 55.30ft	**START DATE** 12/02/93	**COMPLETION DATE** 12/02/93
DRILL MACHINE CME 550	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** N/A		**Log EB2-A, Page 1 of 2**

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
785.03						Ground Surface				
	3.80	4	5	4	1.0	9	SS-10	D		0.0-8.0 (ROADWAY FILL) GRAY-TAN LOOSE MOIST TO DRY SAND W/ GRAVEL (A-2-4)
780.00	8.80	2	4	5	1.0	9	SS-11	D		8.0-13.0 BRN-TAN LOOSE DRY LOW PLASTIC (PI=13) SILTY CLAYEY SAND W/ GRAVEL (A-2-6)
	13.80	3	4	4	1.0	8	SS-12	M		13.0-16.3 BRN-TAN LOOSE MOIST SAND (A-1-B)
770.00	18.80	2	3	4	1.0	7	SS-13	M		16.3-22.5 (ALLUVIUM) BRN-TAN LOOSE MOIST CLAYEY SILTY SAND (A-2-4)
	23.80	9	17	14	1.0	31	SS-14	M		22.5-55.3 (RESIDUAL) TAN-BRN-WHITE TO TAN-BRN-BLACK-WHITE DENSE MED. DENSE WET TO MOIST SILTY SAND (A-2-4)
760.00	28.80	4	7	13	1.0	20	SS-15	W		
	33.80	5	11	13	1.0	24	SS-16	M		
750.00	38.80	8	10	11	1.0	21	SS-17	M		
	43.80	5	11	13	1.0	24				
740.00	48.80	5	18	26	1.0	44				
	53.80	6	7	11	1.0	18				
730.00										

Continued on the next page.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** MURRAY
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB2-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** 13.00ft
ALIGNMENT L	**BORING LOCATION** 18+76.000	**OFFSET** 12.00ft LT	**24 HR** N/A
COLLAR ELEV 785.03ft	**TOTAL DEPTH** 55.30ft	**START DATE** 12/02/93	**COMPLETION DATE** 12/02/93
DRILL MACHINE CME 550	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** N/A		**Log EB2-A, Page 2 of 2**

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
730.03 729.73						TERMINATED BORING AT ELEV. 729.73 IN MED. DENSE SILTY SAND (A-2-4)				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** JKS
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB2-B	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 18+76.000	**OFFSET** 5.50ft RT	**24 HR** N/A
COLLAR ELEV 785.26ft	**TOTAL DEPTH** 79.80ft	**START DATE** 7/25/06	**COMPLETION DATE** 07/25/06
DRILL MACHINE CME-55OX	**DRILL METHOD** NWCAS/TRI-CONE		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** N/A		Log EB2-B, Page 1 of 2

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
785.26						Ground Surface				
780.00	4.40	0	2	2	1.0	4				(ROADWAY FILL) TAN-BROWN-ORANGE LOOSE DRY SILTY CLAYEY SAND (A-2-6) W/ GRAVEL LAYER AT 12.4
770.00	14.40	5	3	4	1.0	7				(ALLUVIUM) TAN-BROWN LOOSE MOIST MICA CLAYEY SILTY SAND W/ QUARTZ GRAVEL (A-2-4)
	19.40	2	4	4	1.0	8				
760.00										(RESIDUAL) TAN-BROWN-BLACK-WHITE LOOSE TO DENSE MOIST MICA CLAYEY SILTY SAND (A-2-4)
	29.40	5	10	14	1.0	24				
750.00										
	39.40	14	6	8	1.0	14				
740.00										

Continued on the next page

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32620.1.1	**ID** B-2146	**COUNTY** IREDELL	**GEOLOGIST** JKS
SITE DESCRIPTION BRIDGE 86 ON SR 1333 OVER BUFFALO SHOALS CREEK			**GND WATER**
BORING NO EB2-B	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT L	**BORING LOCATION** 18+76.000	**OFFSET** 5.50ft RT	**24 HR** N/A
COLLAR ELEV 785.26ft	**TOTAL DEPTH** 79.80ft	**START DATE** 7/25/06	**COMPLETION DATE** 07/25/06
DRILL MACHINE CME-55OX	**DRILL METHOD** NWCAS/TRI-CONE		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** N/A		Log EB2-B, Page 2 of 2

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
740.00										
	49.40	6	8	15	1.0	23				(RESIDUAL) TAN-BROWN-BLACK-WHITE LOOSE TO DENSE MOIST MICA CLAYEY SILTY SAND (A-2-4)
730.00										
	59.40	8	14	18	1.0	32				
720.00	64.40	10	21	79	0.8	100				
	69.40	100			0.3	100				WEATHERED ROCK (HORNBLENDE GNEISS)
	74.40	100			0.5	100				
705.46	79.40	100			0.4	100				
						BORING TERMINATED AT ELEVATION 705.458 IN WEATHERED ROCK				

TEST RESULTS

PROJECT: 33377.1.1 B-4009
COUNTY: ANSON
SITE DESCRIPTION: BRIDGE NO. 33 OVER BROWNS CREEK ON US 74 WBL

SOIL SAMPLE RESULTS

SAMPLE NO.	*OFFSET*	*STATION*	*DEPTH INTERVAL*	*AASHTO CLASS*	*N*	*L.L.*	*P.I.*	*% BY WEIGHT*				*% PASSING SIEVES*			*% MOISTURE*	*% ORGANIC*	*UNIT WT. (d)*	*VOID RATIO*
								C. SAND	*F. SAND*	*SILT*	*CLAY*	*10*	*40*	*200*				
S-1		CREEK BED		A-3(0)		24	NP	58	39	3	0	98	82	3				
EB1-B																		
S-18	18'RT	17+41	0.0-4.5	A-2-4(0)		26	4	39	29	16	16	76	56	27				
SS-19	18'RT	17+41	4.5-6.0	A-1-B(0)	40	30	NP	51	28	11	10	62	39	15				
B2-B																		
SS-2	6'RT	18+31	3.3-4.8	A-1-B(0)	50	25	NP	60	23	13	4	74	39	15				
SS-3	6'RT	18+31	5.8-7.3	A-1-A(0)	34	23	NP	54	25	15	6	47	28	12				
SS-4	6'RT	18+31	8.3-9.8	A-2-4(0)	49	30	NP	47	32	17	4	88	59	23				
SS-5	6'RT	18+31	10.9-12.4	A-1-B(0)	30	27	NP	55	28	13	4	82	47	18				
SS-6	6'RT	18+31	13.9-15.4	A-2-4(0)	76	26	NP	56	29	11	4	91	56	17				
SS-7	6'RT	18+31	16.0-17.5	A-2-4(0)	36	27	NP	31	44	17	8	97	84	30				
SS-8	6'RT	18+31	18.5-20.0	A-2-4(0)	29	32	NP	38	39	15	8	96	76	26				
SS-9	6'RT	18+31	23.5-25.0	A-2-4(0)	40	27	NP	45	36	13	6	88	62	21				
EB2-A																		
SS-10	12'LT	18+76	3.8-5.3	A-2-4(0)	9	18	NP	57	27	8	8	80	52	14				
SS-11	12'LT	18+76	8.8-10.3	A-2-6(1)	9	37	NP	41	24	13	22	84	61	32				
SS-12	12'LT	18+76	13.8-15.3	A-1-B(0)	8	17	NP	60	24	8	8	79	47	14				
SS-13	12'LT	18+76	18.8-20.3	A-2-4(0)	7	36	S	26	42	18	14	93	82	35				
SS-14	12'LT	18+76	23.8-25.3	A-2-4(0)	31	26	NP	47	30	15	8	89	59	24				
SS-15	12'LT	18+76	28.8-30.3	A-2-4(0)	20	33	NP	42	32	18	8	88	63	27				
SS-16	12'LT	18+76	33.8-35.3	A-2-4(0)	24	33	NP	24	47	21	8	46	86	35				
SS-17	12'LT	18+76	38.8-40.3	A-2-4(0)	21	34	NP	23	47	22	8	89	81	33				

ROCK SAMPLE RESULTS

SAMPLE NO.	*OFFSET*	*STATION*	*DEPTH INTERVAL*	*RQD*	*UNIT WT*	Q(KSI)	E(MPa) (MPsi)
B1-A							
RS-1	6'LT	17+86	3.6-4.0	40%	169.7	13.2	
RS-2	6'LT	17+86	9.1-9.7	79%	169.2	19.5	
RS-3	6'LT	17+86	15.2-15.7	42%	165.9	17.1	
RS-4	6'LT	17+86	23.6-24.2	58%	164.1	16.4	

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: *32620.1.1* TIP NO.: *B-2146* COUNTY: *IREDELL*

DESCRIPTION(1): *BRIDGE NO.86 ON SR 1333 OVER BUFFALO SHOALS CREEK*

♦ ***INFORMATION ON EXISTING BRIDGES*** Information obtained from ☒ Field Inspection
☐ Microfilm (Reel: Position:)
☒ Other *BRIDGE SKETCH*

COUNTY BRIDGE NO. *86* BRIDGE LENGTH *73'* NO. BENTS *3* NO. BENTS IN: CHANNEL *1* FLOODPLAIN *1*

FOUNDATION TYPE: *CONCRETE ABUTMENTS, FOOTINGS, WINGWALLS*

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: *WINGWALL CRACKED AT ABUTMENT WALL ON NE SIDE AT EB2. DUE TO SETTLING (?) OF FOUNDATION AT ABUTMENT.*

INTERIOR BENTS: *BENT 1 HAS BEEN ENLARGED AND REINFORCED WITH CONCRETE, ETC. THE BENT SHOWS SOME SCOURING BOTH ON THE UPSTREAM AND DOWNSTREAM SIDES OF THE BENT. GRAVEL BAR HAS FORMED DOWNSTREAN OF BENT 1.*

CHANNEL BED: *SOME SCOURING UNDER WINGWALL AND END BENT 2 ON NE SIDE (DOWNSTREAM).*

CHANNEL BANKS: *TREES LEANED OVER AND ARE NOW STRAIGHTENING (EVIDENCE OF PAST BANK UNDERCUTTING)*

♦ ***EXISTING SCOUR PROTECTION:***

TYPE(3): *CONCRETE ABUTMENTS AND WINGWALLS. FOOTING AND COLUMN AT BENT 1 HAS BEEN ENLARGED.*

EXTENT(4):

EFFECTIVENESS(5): *POOR*

OBSTRUCTIONS(6) (DAMS, DEBRIS, ETC.): *CONCRETE SLAB NEAR WATER LEVEL ON NW SIDE OF EXISTING END BENT 2 IS REDIRECTING FLOW OF WATER AND CONTRIBUTING TO SCOUR AT END BENT 2.*

(PART OF OLD COTTON GIN DAM). SOME LOGS IN CREEK.

♦ ***DESIGN INFORMATION***

CHANNEL BED MATERIAL(7) (Sample Results Attached): *SAND-SAMPLE S-1 (A-3)*

STREAMBED ARMORED WITH 1" - 2" GRAVEL.

CHANNEL BANK MATERIAL(8) (Sample Results Attached): *SILTY SAND USE SAMPLE SS-13.*

CHANNEL BANK COVER(9): *TREES AND BRUSH*

FLOOD PLAIN WIDTH(10): *300'*

FLOOD PLAIN COVER(11): *WOODS AND FALLOW WEEDS*

STREAM IS: ☒ DEGRADING ☐ AGGRADING (12)

OTHER OBSERVATIONS AND COMMENTS: *CRACKING OF WINGWALL AT EXISTING END BENT 2 ABUTMENT AND REPAIR OF FOUNDATION AT EXISTING BENT 1 SHOWS EVIDENCE OF SOME SEVERE EROSION PROBLEMS ASSOCIATED WITH SCOUR..*

♦
♦
♦
♦ ***DESIGN INFORMATION CONT.***

CHANNEL MIGRATION TENDENCY(13): *TOWARDS NORTH BANK (IF ANY)*

GEOTECHNICAL ADJUSTED SCOUR ELEVATIONS (14):

No interior bents proposed. Contraction scour does not impact End Bents.

REPORTED BY: *C.C. MURRAY/F.C. SECHLER* DATE: *12-3-93*
C.B. LITTLE 6-2-06

INSTRUCTIONS

(1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
(2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS DEGRADATIONS, ETC.)
(3) NOTE ANY EXISTING SCOUR PROTECTION (RIPRAP, ETC.)
(4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
(5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
(6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
(7) DESCRIBE THE CHANNEL BED MATERIAL; A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(8) DESCRIBE THE CHANNEL BANK MATERIAL; A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(9) DESCRIBE THE BANK COVERING (GRASS, TREES, RIPRAP, NONE, ETC.)
(10) GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).
(11) DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.)
(12) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING.
(13) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE LATERALLY DURING THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS).
(14) GIVE THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION EXPECTED OVER THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS THEORETICAL SCOUR AND THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION. IF THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION IS DEPENDENT ON SCOUR COUNTER MEASURES, EXPLAIN. (RIPRAP ARMORING ON SLOPES, ETC.) THE GEOTECHNICAL ADJUSTED SCOUR ELEVATION IS BASED ON THE ERODABILITY OF MATERIALS WITH CONSIDERATION FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY; CORE RECOVERY PERCENTAGE; PERCENT RQD; DIFFERENTIAL WEATHERING; SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.