CONTRACT: 34445.1.1 ID: R-2518B

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34445.1.1	1	4

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
R-2518B		P.E.
		CONST.

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34445.1.1 I.D. NO. R-2518B

F.A. PROJECT

COUNTY YANCEY

PROJECT DESCRIPTION US 19E FROM EAST OF THE YANCEY CO. LINE TO SR 1336

SITE DESCRIPTION RETAINING WALL STA. 126+50 TO 127+30

CONTENTS:

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

INVESTIGATED BY JC KUHNE PERSONNEL DO CHEEK

CHECKED BY C COFFEY

SUBMITTED BY JC KUHNE GK ROSE

DATE 8-23-05

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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.

DRAWN BY: JC KUHNE

NORTH CAROLINA LICENSED SEAL 1878 GEOLOGIST JODY KUHNE

7/15/05

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2518B	34445.1.1	2	4

METRIC

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
HIGHLY	35% AND ABOVE

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP/DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT DPT VST 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 - CBR SAMPLE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
w - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER_____
- [ ] OTHER_____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER _____

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

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION:

NOTES:

PROJECT REFERENCE NO.	SHEET NO.
34445JJ R-2518B	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST.REV.

R/W REV.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

REVISIONS

8/11/99

NAD 83

-L-

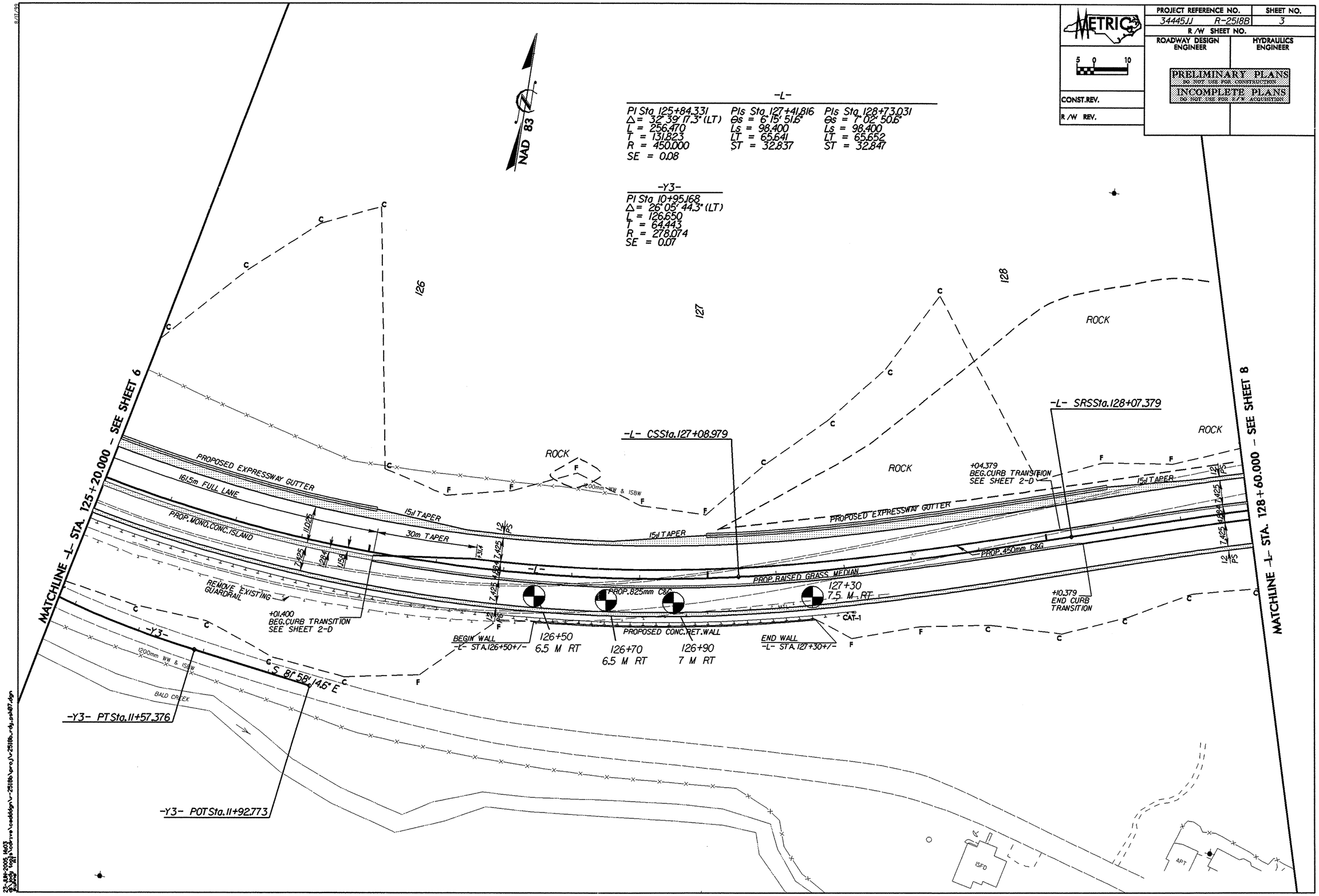
PI Sta 125+84.331
Δ = 32° 39' 17.3" (LT)
L = 256.470
T = 131.823
R = 450.000
SE = 0.08

PIs Sta 127+41.816
θs = 6° 15' 51.6"
Ls = 98.400
LT = 65.641
ST = 32.837

PIs Sta 128+73.031
θs = 7° 02' 50.6"
Ls = 98.400
LT = 65.652
ST = 32.847

-Y3-

PI Sta 10+95.168
Δ = 26° 05' 44.3" (LT)
L = 126.650
T = 64.443
R = 278.074
SE = 0.07



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Kurtz

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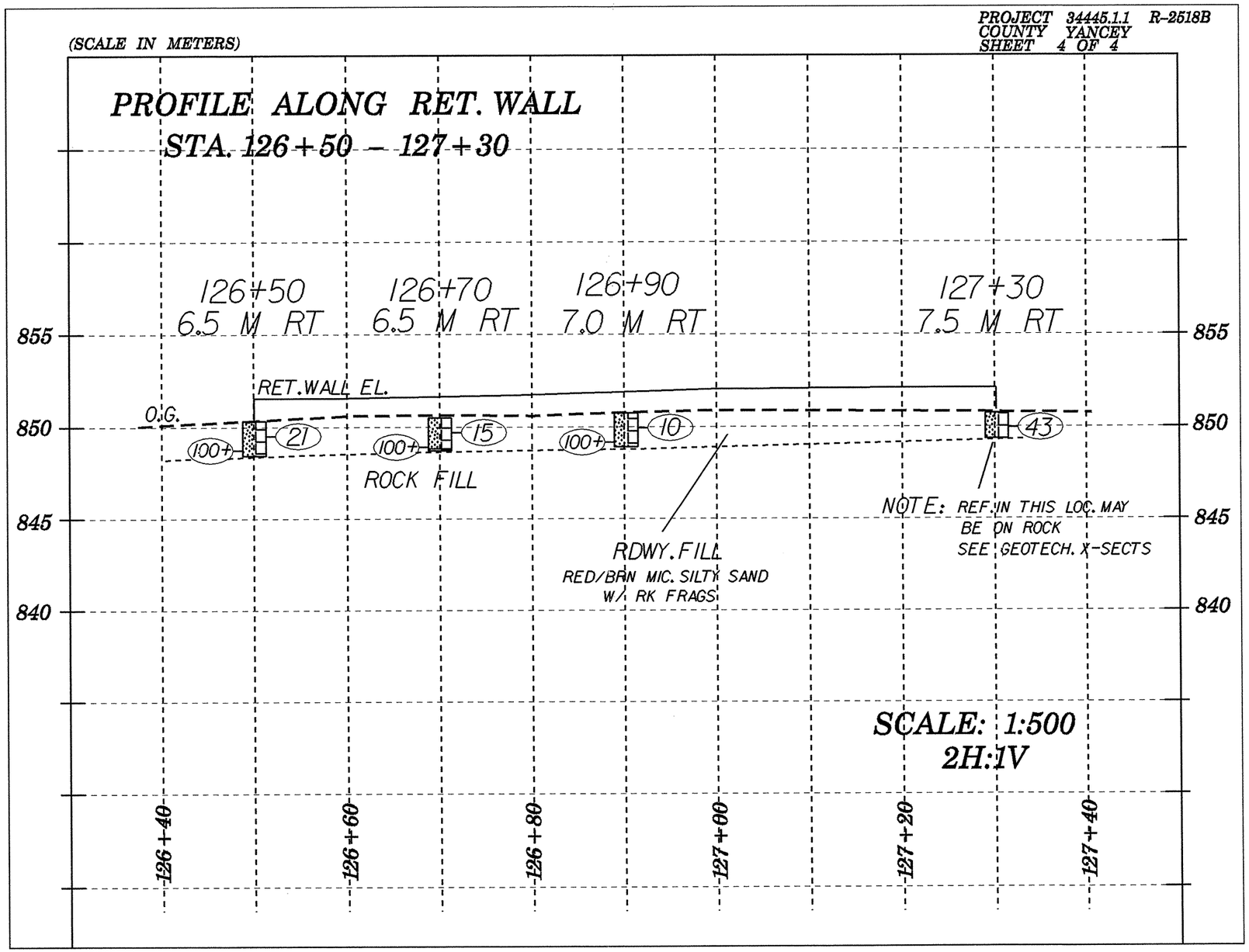

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34445.1.1 (R-2518B)	1	16

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34445.1.1 (R-2518B) F.A. PROJ. _____

COUNTY YANCEY

PROJECT DESCRIPTION US 19 FROM EAST OF THE YANCEY COUNTY LINE TO SR 1336

SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK

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CAUTION NOTICE

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PERSONNEL
M.M. HAGER
D.O. CHEEK
G.K. ROSE

INVESTIGATED BY J.W. MANN
CHECKED BY W.D. FRYE
SUBMITTED BY W.D. FRYE
DATE 6/27/07

NORTH CAROLINA LICENSED SEAL 1941 GEOLOGIST JOHN W. MANN

PROJECT: 34445.1.1

ID: R-2518B

DRAWN BY: J.W. MANN

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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

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 30 CM 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	51 MN											
# 200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
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 MN	11 MX	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 (kN/m^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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE 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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- 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
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____mm STEEL TEETH
- [ ] TRICONE ____mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

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

CORE SIZE:
- [ ] -B_____
- [X] -N XWL
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	100 TO 3 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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.) - IREGULARLY 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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BY16A-129: DISC IN GROUND
STA. 192+05.866 72.922m LT -L-
ELEVATION: 758.846 M

NOTES:

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 22, 2007

STATE PROJECT: 34445.1.1 (R-2518B)
COUNTY: Yancey
DESCRIPTION: Bridge No. 309 on US-19E over Price Creek

SUBJECT: Geotechnical Report – Foundation Investigation

Project Description

The Geotechnical Engineering Unit has completed an investigation for foundation design and presents the following findings.

Bridge No. 309 is located in west-central Yancey County approximately 8 kilometers east of the Madison/Yancey County line and ± 7.2 kilometers west of the town of Burnsville.

The proposed replacement structure is to consist of a three-span replacement bridge with all bents constructed on a 90-degree skew angle. Two spans will be 20 meters, one at 15 meters, for an overall length of 55 meters and a width of ± 10.5 meters.

A CME-550X ORV drill machine equipped with an automatic drive hammer was utilized to conduct the investigation. NW casing was used to advance borings at all bent locales. NXWL rock coring apparatus was employed at Boring B1-A to retrieve hard rock specimens. Standard Penetration Tests (SPT) were performed in all borings and representative soil samples were collected for correlation and tested for AASHTO classification.

Physiography and Geology

The project area is located in mountainous terrain of the Blue Ridge Physiographic Province. The bridge site is located in the floodplains of Price Creek and the Cane River, which serves as the major drainage feature of the project corridor. The confluence of these bodies of water is located ± 0.4 kilometers northwest of the existing crossing. The area is underlain by a heterogeneous gneiss unit, Middle Proterozoic in age, that lies unconformably and has been intruded by metagabbro dikes and sills.

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

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

End Bent One and Two

Borings at these locales penetrated embankment, alluvium, saprolite, and weathered rock. Embankment soils consist of ± 1 to ± 7 meters of medium stiff to stiff sandy silt and silty sand. Alluvium is less than 3 meters thick and is composed of loose to medium dense silty sand and soft silt with a basal gravel layer. Ten to 16.5 meters of saprolitic interlayered loose to very dense silty sand and stiff to hard sandy silt lies beneath the alluvium. Rock fragments are interspersed in this horizon. Weathered rock (gneiss) was encountered at Elevations ± 739 meters in Boring EB2-B and Elevation ± 742 in Boring EB2-A. A weathered rock ledge lies between Elevations 743 and 745 meters at Boring EB1-A.

Bents One and Two

Bents one and Two have developed a similar soil profile as aforementioned with the exception of the absence of embankment materials. Weathered rock (gneiss) was penetrated in three borings between Elevations ± 742 and ± 747 meters. Crystalline rock (gneiss) was retrieved only from Boring B1-A. The top of the contact is at Elevation ± 747 meters.

Rock Properties

The recovered rock consisted of predominantly moderately severely weathered, medium to moderately hard, very closely fractured gneiss. Joints ranged from 0-80 degrees with no discernible sets due to the poor recovery. Strata recovery was 34 percent with RQD equaling zero percent.

Groundwater

A 24-hour tape measurement was obtained in the borings yielding a uniform groundwater surface at Elevation 756.5 meters.

Notice

This geotechnical foundation investigation is based on a Bridge Survey and Hydraulic Design Report dated April 22, 2005. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be reviewed and modified as necessary.

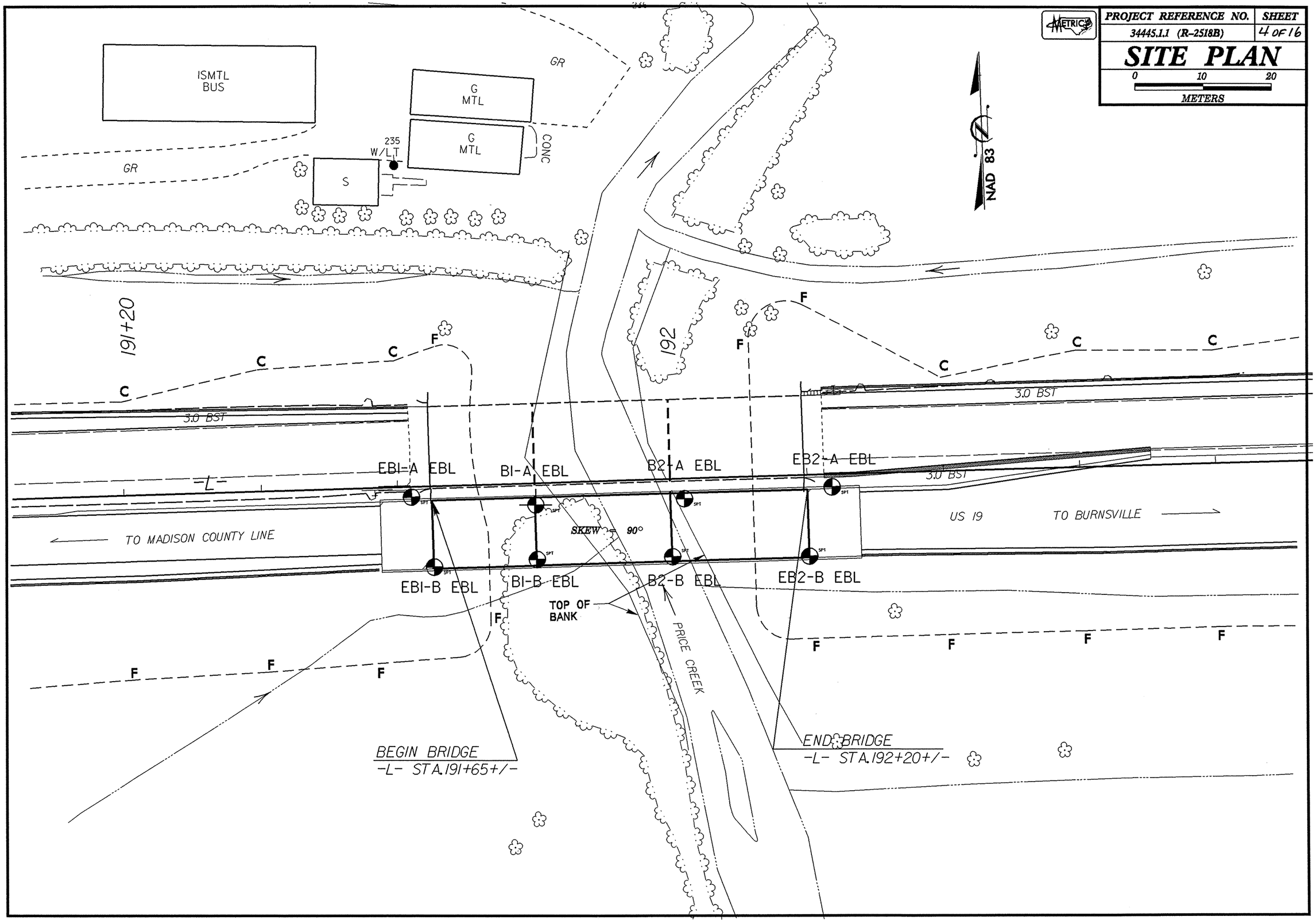
Respectfully Submitted,

John W. Mann, L.G.
Project Geological Engineer

PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	4 OF 16

SITE PLAN

0 10 20
METERS

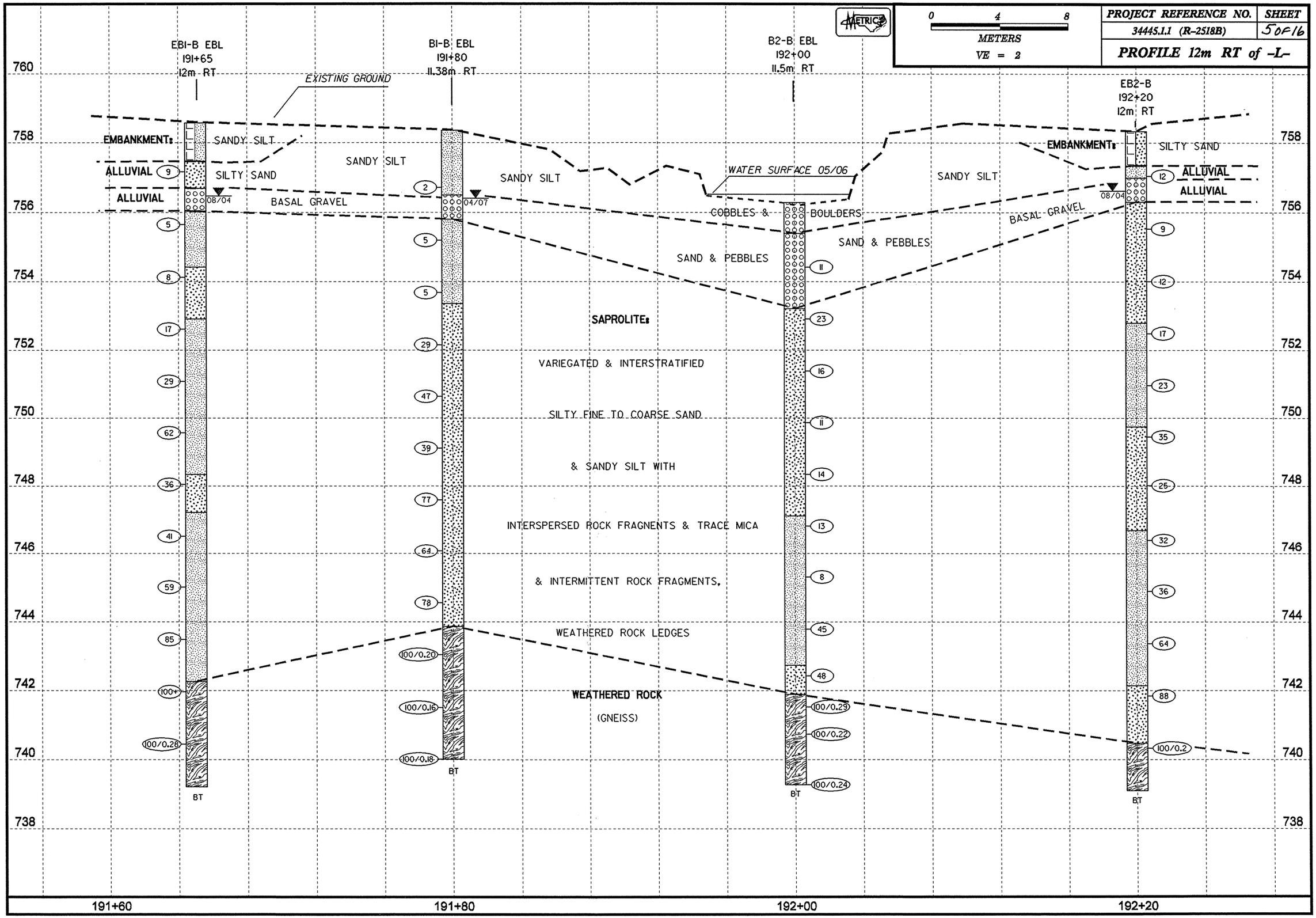


PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	5 OF 16

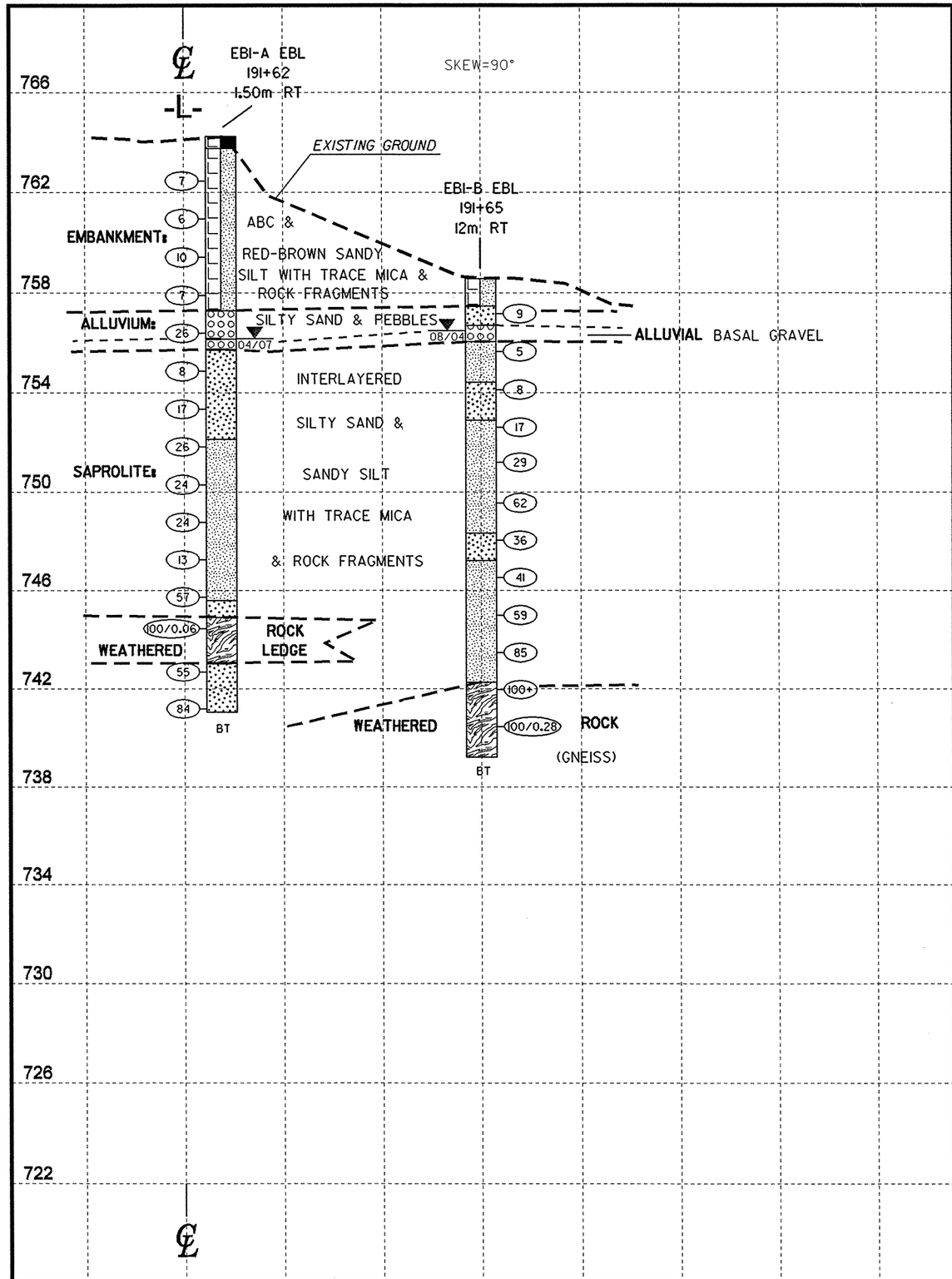
PROFILE 12m RT of -L-

METRIC

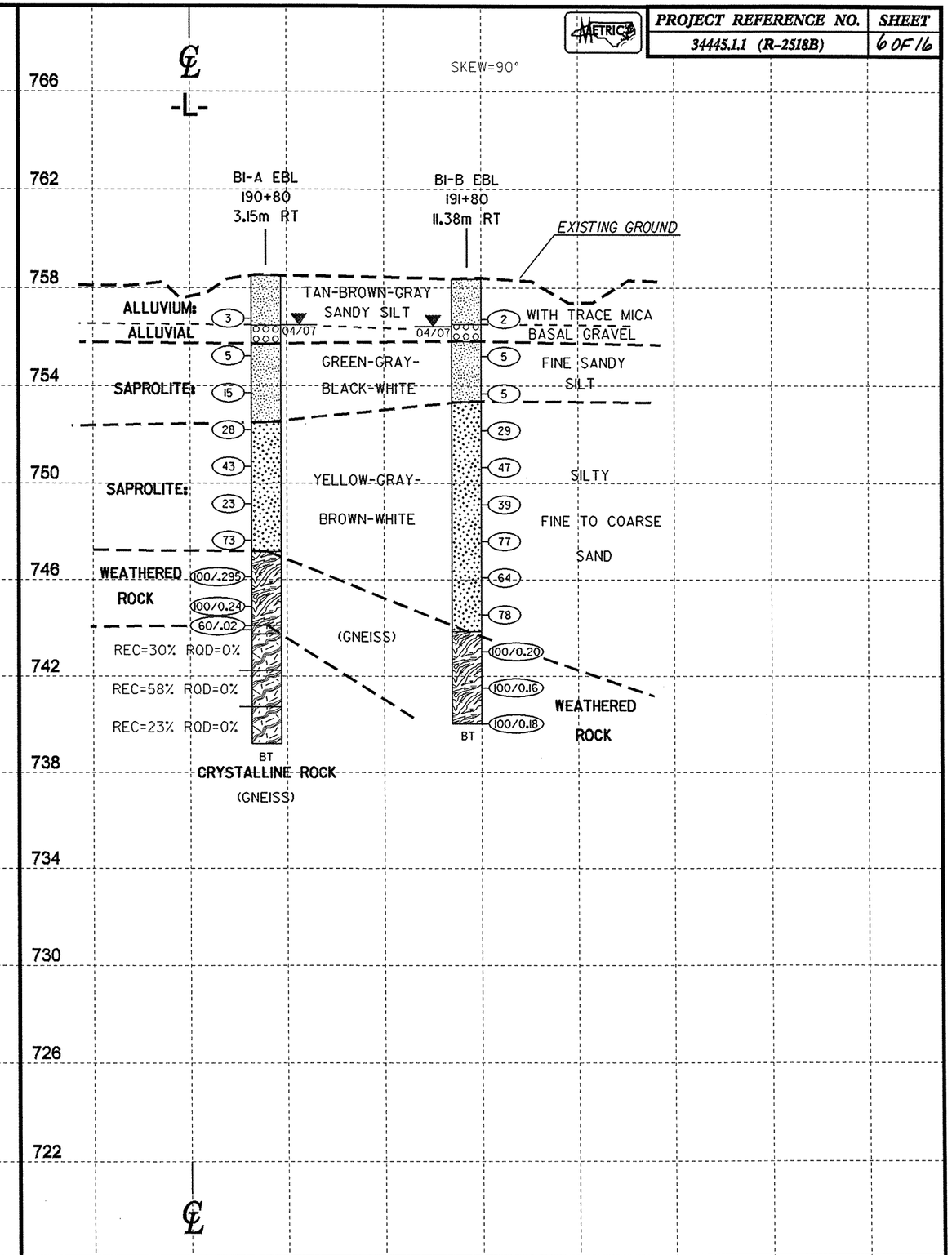
0 4 8
METERS
VE = 2



PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	6 OF 16

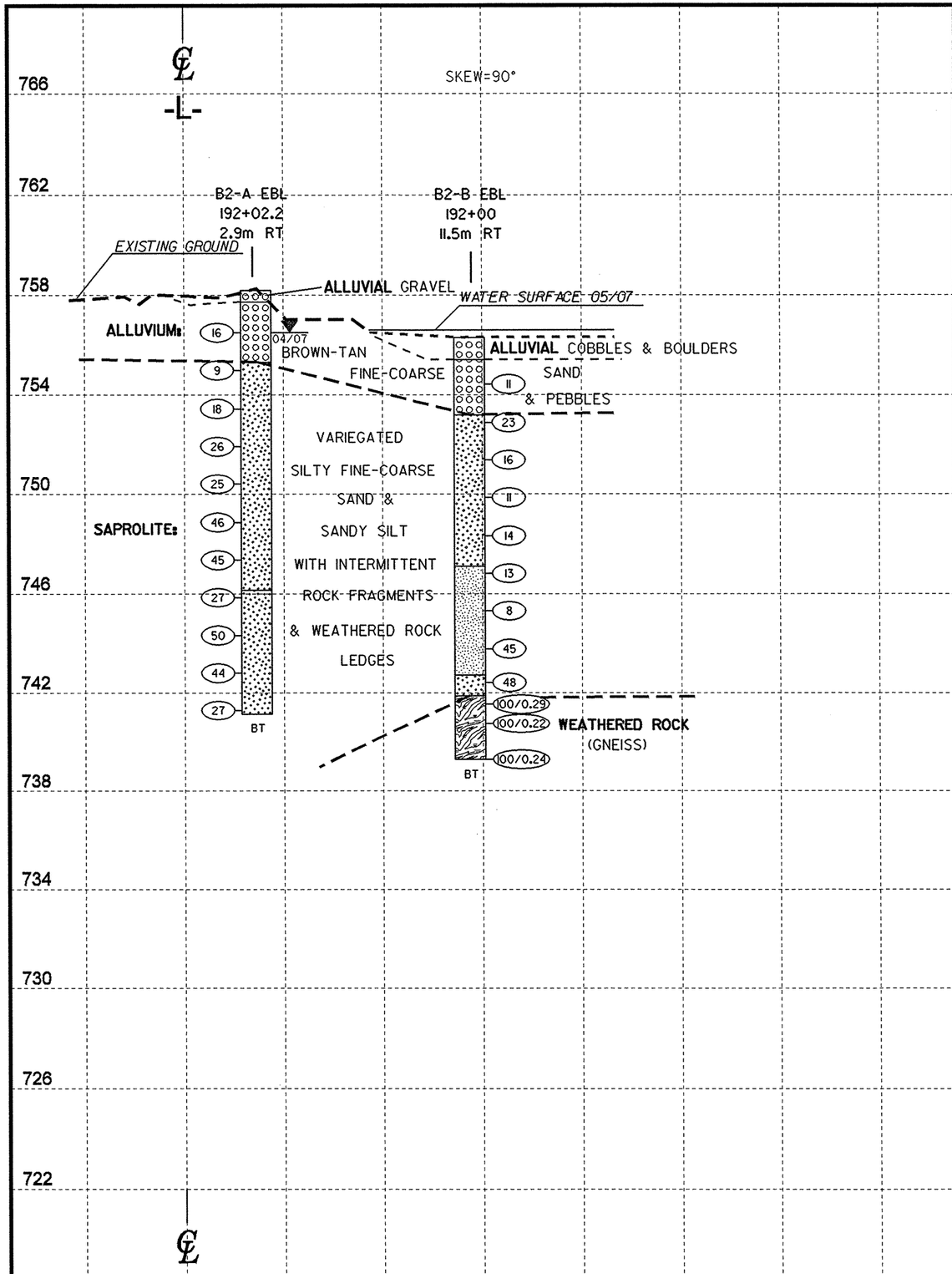


HORIZ. SCALE (METERS) 0 4 8 | VE = 1 | END BENT ONE CROSS SECTION



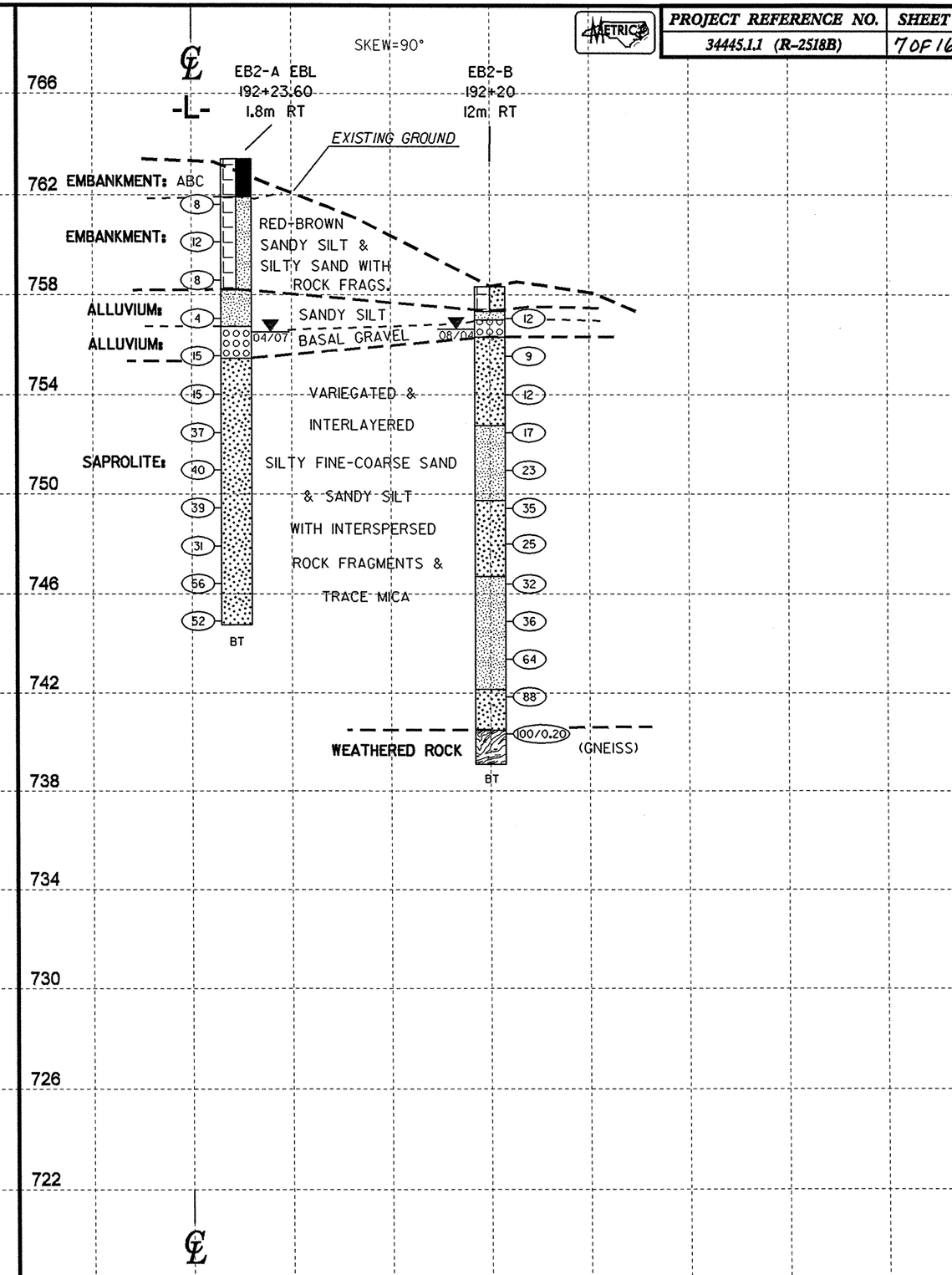
HORIZ. SCALE (METERS) 0 4 8 | VE = 1 | BENT ONE CROSS SECTION

PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	7 OF 16



HORIZ. SCALE (METERS) 0 4 8 | VE = 1

BENT TWO CROSS SECTION



HORIZ. SCALE (METERS) 0 4 8 | VE = 1

END BENT TWO CROSS SECTION

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	**ID.** R-2518B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			**GROUND WTR (m)**
BORING NO. EB1-A EBL	**STATION** 191+62.0	**OFFSET** 1.5m RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 764.26 m	**TOTAL DEPTH** 23.23 m	**NORTHING** 244,894.3	**EASTING** 304,230.9 — **24 HR.** 8.10
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic
START DATE 04/25/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
765									764.26 GROUND SURFACE	0.00
									763.76 **ROADWAY EMBANKMENT** AGGREGATE BASE COURSE	0.50
762.76	1.50								**ROADWAY EMBANKMENT** Red-brown sandy SILT with mica & rock fragments	
		3	3	4	7	SS-9	M			
761.24	3.02									
		3	3	3	6					
759.72	4.54									
		3	4	6	10					
758.20	6.06									
		2	3	4	7		W			
756.68	7.58								757.29 **ALLUVIAL** Gray fine-coarse SAND & PEBBLES	6.97
		3	12	14	26	SS-10			756.14 **ALLUVIAL** Basal GRAVEL	8.12
755.16	9.10								755.72 **SAPROLITE** Dark gray silty SAND with trace mica	8.54
		2	3	5	8	SS-11				
753.64	10.62									
		3	7	10	17					
752.12	12.14								752.12 **SAPROLITE** Light gray-white sandy SILT	12.14
		7	12	14	26	SS-12				
750.60	13.66									
		3	10	14	24					
749.08	15.18									
		4	11	13	24					
747.56	16.70									
		6	6	7	13					
746.04	18.22									
		18	22	37	59				745.60 **SAPROLITE** Red-brown to black silty SAND with trace mica	18.66
									744.92	19.34

NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	**ID.** R-2518B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			**GROUND WTR (m)**
BORING NO. EB1-A EBL	**STATION** 191+62.0	**OFFSET** 1.5m RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 764.26 m	**TOTAL DEPTH** 23.23 m	**NORTHING** 244,894.3	**EASTING** 304,230.9 — **24 HR.** 8.10
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic
START DATE 04/25/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
745					Match Line					
744.52	19.74								**WEATHERED ROCK** (Gneiss ledge) *(continued)*	
		100/0.06			100/0.06					
743.00	21.26								743.06 **SAPROLITE** Gray-red brown-white silty fine-coarse SAND	21.20
		22	21	34	55					
741.48	22.78									
		20	39	45	84				741.03 Boring Terminated at Elevation 741.03 m IN SAPROLITE (SAND)	23.23

NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	**ID.** R-2518B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			**GROUND WTR (m)**
BORING NO. EB1-B EBL	**STATION** 191+65.0	**OFFSET** 12.0m RT	**ALIGNMENT** -L-	**0 HR.** 2.10
COLLAR ELEV. 758.58 m	**TOTAL DEPTH** 19.35 m	**NORTHING** 244,883.8	**EASTING** 304,233.8	**24 HR.** 2.50
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic	
START DATE 08/10/04	**COMP. DATE** 08/16/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
759									GROUND SURFACE	758.58	0.00
757.47	1.11								**ROADWAY EMBANKMENT** Red-brown sandy SILT with mica & rock fragments	757.47	1.11
755.95	2.63	2	4	5	9				**ALLUVIAL** Brown-black-gray silty SAND	756.70	1.88
754.43	4.15	2	2	3	5				**ALLUVIAL** Basal GRAVEL	756.04	2.54
752.91	5.67	2	4	4	8				**SAPROLITE** Blue-white fine sandy SILT with mica	754.43	4.15
751.39	7.19	4	7	10	17				**SAPROLITE** Orange-tan-white fine silty SAND with trace mica & rock fragments	752.91	5.67
749.87	8.71	5	14	15	29				**SAPROLITE** Tan-white-brown fine sandy SILT with trace mica	748.35	10.23
748.35	10.23	8	19	43	62						
746.83	11.75	8	19	17	36				**SAPROLITE** Black-tan-white silty SAND with rock fragments	747.23	11.35
745.31	13.27	15	20	21	41				**SAPROLITE** White-tan-gray fine sandy SILT with mica	742.27	16.31
743.79	14.79	12	21	38	59						
742.27	16.31	16	30	55	85						
740.75	17.83	25	42	65	100+				**WEATHERED ROCK** (Gneiss)	739.23	19.35
		18	32	68/0.13	100/0.28				Boring Terminated at Elevation 739.23 m IN WEATHERED ROCK (GNEISS)		

NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/27/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			GROUND WTR (m)
BORING NO. B1-A EBL	STATION 191+80.0	OFFSET 3.2m RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 758.52 m	TOTAL DEPTH 19.32 m	NORTHING 244,892.5	EASTING 304,248.9	24 HR. 2.05
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 04/11/07	COMP. DATE 04/11/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 14.4 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
759									758.52 GROUND SURFACE 0.00
757.05	1.47	2	1	2	3	SS-1	▼		**ALLUVIAL** Tan-brown-gray sandy SILT with trace mica — 756.46 2.06
755.53	2.99	1	2	3	5	SS-2			**ALLUVIAL** Basal GRAVEL — 755.69 2.83; **SAPROLITE** Dark green-gray fine sandy SILT
754.01	4.51	6	7	8	15				
752.49	6.03	7	14	14	28	SS-3			752.49 6.03; **SAPROLITE** Gray-brown-white silty fine to coarse SAND
750.98	7.54	10	19	24	43				
749.49	9.03	10	13	10	23				
747.94	10.58	11	43	30	73	SS-4			747.18 11.34; **WEATHERED ROCK** (Gneiss)
746.42	12.10	30	43	57/0.145	100/0.295				
744.90	13.62	23	53	47/0.09	100/0.24				
744.12	14.40	60/0.02			60/0.02				744.12 14.40; 743.76 14.76 **CRYSTALLINE ROCK** GNEISS Run: 14.42-14.76 REC=0% RQD=0%; **CRYSTALLINE ROCK** GNEISS Run: 14.76-16.28 REC=30% RQD=0%; 742.24 16.28 **CRYSTALLINE ROCK** GNEISS Run: 16.28-17.80 REC=58% RQD=0%; 740.72 17.80 **CRYSTALLINE ROCK** GNEISS Run: 17.80-19.32 REC=23% RQD=0%; 739.20 19.32 Boring Terminated at Elevation 739.20 m IN CRYSTALLINE ROCK (GNEISS)

NCDOT BORE SINGLE_R2518B_GEO_BH.GPJ NC_DOT.GDT 06/13/07

DATE 4/11/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-A EBL GEOLOGIST: J.W. MANN

DESCRIPTION: BRIDGE NO. 309 ON US 19E OVER PRICE CREEK

COUNTY: YANCEY COLLAR ELEVATION: 758.52 m TOTAL DEPTH: 19.32 m

ELEV. (m)	DEPTH (m)	DRILL RATE MIN./.3 m	RUN (m)	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
744.10	14.42		0.34	0.00 / 0	0.00 / 0		
743.76	14.76		1.52	0.45 / 30	0.00 / 0		ROCK IS PREDOMINANTLY MODERATELY SEVERELY WEATHERED, MEDIUM TO MODERATELY HARD, VERY CLOSELY FRACTURED GNEISS. RECOVERED ROCK IS PREDOMINANTLY PINK-WHITE FELDSPAR. JOINTS VARIABLE FROM 0-80°. SREC=34% SRQD=0%
742.24	16.28		1.52	0.88 / 58	0.00 / 0		
740.72	17.80		1.52	0.35 / 23	0.00 / 0		
739.20	19.32						

CORING TERMINATED AT ELEVATION 739.20 m

DRILLER: G.K. ROSE CORE SIZE: NXWL EQUIPMENT: CME-550X

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	**ID.** R-2518B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			**GROUND WTR (m)**
BORING NO. B1-B EBL	**STATION** 191+80.0	**OFFSET** 11.4m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 758.36 m	**TOTAL DEPTH** 18.34 m	**NORTHING** 244,884.3	**EASTING** 304,248.9	**24 HR.** 1.95
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
START DATE 04/12/07	**COMP. DATE** 04/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
759									758.36 GROUND SURFACE	0.00
757.02	1.34								**ALLUVIAL** Tan-brown sandy SILT	
		WOH	WOH	2	2				756.50	1.86
755.50	2.86								**ALLUVIAL** Basal GRAVEL 755.80	2.56
		WOH	3	2	5				**SAPROLITE** Green-gray-black-white fine sandy SILT	
753.98	4.38									
		1	2	3	5				753.36	5.00
752.46	5.90								**SAPROLITE** Yellow-brown-white silty fine to coarse SAND with intermittent weathered rock ledges from 10.10-11.80	
		5	8	21	29	SS-5				
750.94	7.42									
		11	19	28	47					
749.42	8.94									
		12	16	23	39					
747.90	10.46									
		22	38	39	77					
746.38	11.98									
		19	32	32	64					
744.86	13.50									
		31	34	44	78					
743.34	15.02								743.87	14.49
		37	65	35/0.05	100/0.20				**WEATHERED ROCK** (Gneiss)	
741.82	16.54									
		28	60	40/0.01	100/0.13					
740.20	18.16									
		84	16/0.03		100/0.18				740.02	18.34
									Boring Terminated at Elevation 740.02 m IN WEATHERED ROCK (GNEISS)	

NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			GROUND WTR (m)
BORING NO. B2-A EBL	STATION 192+02.2	OFFSET 2.9m RT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 758.19 m	TOTAL DEPTH 17.05 m	NORTHING 244,892.6	EASTING 304,270.9 / 24 HR. 1.70
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 04/17/07	COMP. DATE 04/17/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
759									758.19 GROUND SURFACE	0.00
									757.74 ALLUVIAL GRAVEL	0.45
756.79	1.40	5	7	9	16				ALLUVIAL Brown-tan silty fine to coarse SAND with pebbles	
755.27	2.92	3	4	5	9				755.29 SAPROLITE White-gray silty fine to coarse SAND with rock fragments	2.90
753.75	4.44	5	10	8	18	SS-6				
752.23	5.96	10	12	14	26					
750.71	7.48	8	12	13	25					
749.19	9.00	11	23	23	46					
747.67	10.52	17	26	19	45	SS-7				
746.15	12.04	5	12	15	27	SS-8			746.15 SAPROLITE Tan-brown-green silty coarse SAND with intermittent weathered rock ledges	12.04
744.63	13.56	8	16	34	50					
743.11	15.08	51	19	25	44					
741.59	16.60	9	12	15	27				741.14 Boring Terminated at Elevation 741.14 m IN SAPROLITE (SAND)	17.05

NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			GROUND WTR (m)
BORING NO. B2-B EBL	STATION 192+00.0	OFFSET 11.5m RT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 756.29 m	TOTAL DEPTH 17.00 m	NORTHING 244,884.0	EASTING 304,268.8 / 24 HR. N/A
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 05/01/07	COMP. DATE 05/01/07	SURFACE WATER DEPTH 0.30m	DEPTH TO ROCK N/A

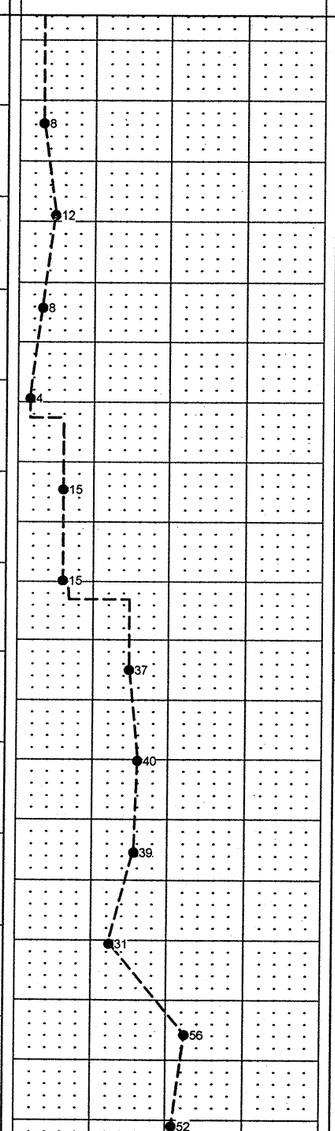
ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
757									WATER SURFACE (05/01/07)	
									756.29 CHANNEL BOTTOM	0.00
									ALLUVIAL COBBLES & BOULDERS	
754.73	1.56	4	3	8	11				755.39 ALLUVIAL SAND & PEBBLES	0.90
753.21	3.08	2	8	15	23				753.21 SAPROLITE Yellow-brown-white-gray silty fine to coarse SAND	3.08
751.69	4.60	3	6	10	16					
750.17	6.12	3	4	7	11					
748.65	7.64	3	5	9	14					
747.13	9.16	3	5	8	13				747.13 SAPROLITE Red-brown fine sandy SILT	9.16
745.61	10.68	2	4	4	8					
744.09	12.20	9	14	31	45					
742.73	13.56	49	21	27	48				742.73 SAPROLITE Red-brown-black-white silty fine to coarse SAND	13.56
741.84	14.45	35	54	46/0.14	100/0.29				741.89 WEATHERED ROCK (Gneiss)	14.40
741.05	15.24	27	61	39/0.07	100/0.22					
739.53	16.76	44	56/0.09		100/0.24				739.29 Boring Terminated at Elevation 739.29 m IN WEATHERED ROCK (GNEISS)	17.00

NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/14/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			GROUND WTR (m)
BORING NO. EB2-A EBL	STATION 192+23.6	OFFSET 1.8m RT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 763.42 m	TOTAL DEPTH 18.67 m	NORTHING 244,893.5	EASTING 304,292.5 / 24 HR. 6.90
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 04/26/07	COMP. DATE 04/26/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
764									
								763.42 GROUND SURFACE	0.00
								ROADWAY EMBANKMENT AGGREGATE BASE COURSE	
761.92	1.50							761.92	1.50
		1	4	4				**ROADWAY EMBANKMENT** Red-brown sandy SILT	
760.40	3.02								
		4	6	6					
758.88	4.54								
		3	3	5					
757.36	6.06							758.20	5.22
								ALLUVIAL Dark gray fine sandy SILT	
		0	1	3	SS-13			756.74	6.68
755.84	7.58							**ALLUVIAL** BASAL GRAVEL & SAND	
		12	11	4				755.44	7.98
754.32	9.10							**SAPROLITE** Red-brown-gray-green silty fine to coarse SAND	
		4	6	9					
752.80	10.62								
		12	15	22	SS-14				
751.28	12.14								
		11	17	23					
749.76	13.66								
		11	16	23					
748.24	15.18								
		7	15	16					
746.72	16.70								
		15	22	34					
745.20	18.22								
		14	20	32				744.75	18.67
								Boring Terminated at Elevation 744.75 m IN SAPROLITE (SAND)	

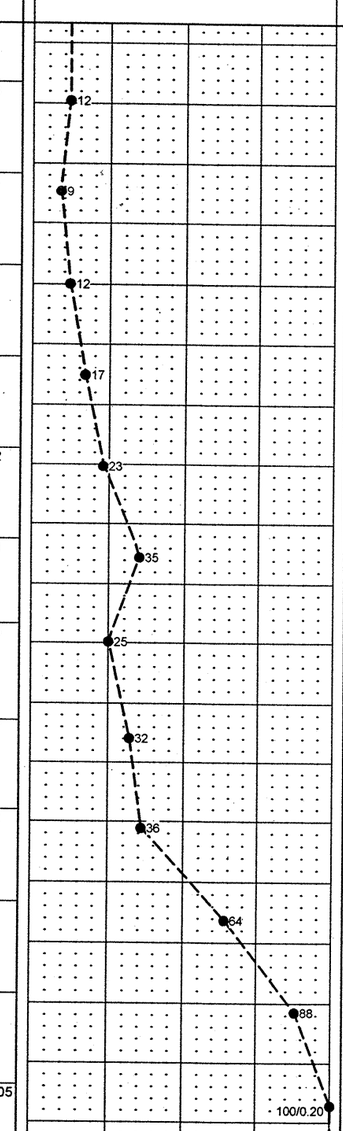


NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/14/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 309 ON US 19E OVER PRICE CREEK			GROUND WTR (m)
BORING NO. EB2-B EBL	STATION 192+20.0	OFFSET 12.0m RT	ALIGNMENT -L- / 0 HR. 1.70 1.70
COLLAR ELEV. 758.33 m	TOTAL DEPTH 19.22 m	NORTHING 244,883.4	EASTING 304,288.8 / 24 HR. N/A
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 08/17/04	COMP. DATE 08/17/04	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
759									
								758.33 GROUND SURFACE	0.00
								ROADWAY EMBANKMENT Red-brown silty SAND with rock fragments	
757.35	0.98							757.35	0.98
		2	4	8				757.00 **ALLUVIAL** Gray-blue-black sandy SILT	1.33
755.83	2.50							756.31 **ALLUVIAL** BASAL GRAVEL & SAND	2.02
		3	5	4				**SAPROLITE** Tan-gray-white-orange silty fine SAND with minor rock fragments	
754.31	4.02								
		3	5	7					
752.79	5.54							752.79	5.54
		3	8	9				**SAPROLITE** Variegated fine sandy SILT with mica	
751.27	7.06								
		6	11	12					
749.75	8.58							749.75	8.58
		8	14	21				**SAPROLITE** White-gray-tan silty SAND with rock fragments	
748.32	10.01								
		7	10	15					
746.71	11.62							746.71	11.62
		7	15	17				**SAPROLITE** Tan-white-gray fine sandy SILT with mica	
745.19	13.14								
		9	14	22					
743.67	14.66								
		9	26	38					
742.15	16.18							742.15	16.18
		25	37	51				**SAPROLITE** Tan-pink-gray-black silty SAND with rock fragments	
740.63	17.70							740.48	17.85
		24	55	45/0.05				**WEATHERED ROCK** (Gneiss)	
								739.11	19.22
								Boring Terminated at Elevation 739.11 m IN WEATHERED ROCK (GNEISS)	



NCDOT BORE SINGLE R2518B_GEO_BH.GPJ NC_DOT.GDT 06/14/07

M&T 503E

JCS

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

T.I.P. ID #:	R-2518 B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	34445.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	4.11.07	DATE RECEIVED:	5.7.07	DATE REPORTED:	5.11.07
SAMPLED FROM:	Bridge	SAMPLED BY:	J. W. Mann		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8
Lab Sample No. A	155063	155064	155065	155066	155067	155068	155069	155070
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	92	99	83	76	80	99	50	87
Passing #40 Sieve %	89	93	69	51	56	82	33	74
Passing #200 Sieve %	41	43	29	28	23	33	11	29

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	8	14	29	44	51	30	50	32
Fine Sand - Ret. #270	56	54	45	24	25	47	33	40
Silt 0.05-0.005 mm %	22	24	20	22	16	21	13	20
Clay < 0.005 mm %	14	8	6	10	8	2	4	8
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--
Liquid Limit	31	38	33	23	26	22	20	40
Plastic Index	NP	NP	NP	NP	NP	NP	NP	NP
AASHTO Classification	A-4 (1)	A-4 (2)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-1-b (0)	A-2-4 (0)
Quantity								
Texture								
Station	191+80	191+80	191+80	191+80	191+80	192+02.2	192+02.2	192+02.2
Hole No.								
Depth (ft) From:	1.62	3.14	6.18	10.73	6.05	4.59	10.67	12.19
To:	1.92	3.44	6.48	11.03	6.35	4.89	10.97	12.49

Remarks:

A-155063 - 155070

CC:

J. W. Mann	
File	

SOILS ENGINEER:	

M&T 503E

JCS

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

T.I.P. ID #:	R-2518 B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	34445.1.1 (cont.)	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	4.25.07	DATE RECEIVED:	5.7.07	DATE REPORTED:	5.11.07
SAMPLED FROM:	Bridge	SAMPLED BY:	J. W. Mann		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14		
Lab Sample No. A	155071	155072	155073	155074	155075	155076		
HiCAMS Sample #	--	--	--	--	--	--		
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0	0.0		
Passing #10 Sieve %	90	56	97	90	92	99		
Passing #40 Sieve %	77	43	95	74	91	93		
Passing #200 Sieve %	39	10	34	40	72	34		

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	25	44	12	30	3	26		
Fine Sand - Ret. #270	39	41	64	32	30	49		
Silt 0.05-0.005 mm %	20	7	20	28	42	19		
Clay < 0.005 mm %	16	8	4	10	25	6		
Passing # 40 Sieve %	--	--	--	--	--	--		
Passing # 200 Sieve %	--	--	--	--	--	--		
Liquid Limit	37	20	34	32	37	33		
Plastic Index	NP	NP	NP	NP	NP	NP		
AASHTO Classification	A-4 (1)	A-1-b (0)	A-2-4 (0)	A-4 (1)	A-4 (7)	A-2-4 (0)		
Quantity								
Texture								
Station	191+62	191+62	191+62	191+62	192+23.6	192+23.6		
Hole No.								
Depth (ft) From:	1.65	7.73	9.25	12.29	6.21	10.72		
To:	1.95	8.03	9.55	12.59	6.51	11.07		

Remarks:

A-155071 - 155076

CC:

J. W. Mann	
File	

SOILS ENGINEER:	

G:/Everyone. . . /M&T Forms/Regional Lab Statesville/Soils Test Report M&T 503E 8-19-2000

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34445.1.1 TIP: R-2518B COUNTY: YANCEY

DESCRIPTION(1): BRIDGE NO. 309 ON US 19E OVER PRICE CREEK

EXISTING BRIDGE

Information from: Field Inspection X Microfilm (reel pos:)
Other (explain) Bridge Survey Report

Bridge No.: 309 Length: 54.97m Total Bents: 4 Bents in Channel: 0 Bents in Floodplain: 4
Foundation Type: Interior: Concrete Piles End Bents: Spill-through Abutment

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Both slopes have evidence of scour at the toe.

Interior Bents: Upstream piles have scour pockets at both bents.

Channel Bed: Possible scour pocket downstream but not clearly evident other than granular deposits. Stream accelerates under bridge at Interior Bent One.

Channel Bank: Past scour evident on both banks under bridge.

EXISTING SCOUR PROTECTION

Type(3): Riprap/Boulders

Extent(4): Placed on toe of both end bent slopes.

Effectiveness(5): Fair

Obstructions(6): None noted

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): Sand, gravel, cobbles, boulders...predominantly cobbles

Channel Bank Material(8): Silt, sand, gravel

Channel Bank Cover(9): Grass, bramble, trees

Floodplain Width(10): ~457 meters

Floodplain Cover(11): Grass, crops, sparse trees

Stream is(12): Aggrading Degrading X Static

Channel Migration Tendency(13): Toward Interior Bent One

Observations and Other Comments: Point bar located upstream. Slight meander at bridge site.

DESIGN SCOUR ELEVATIONS(14) Feet Meters X

BENTS B1	B2	B3	B4							
755.3	753									

Comparison of DSE to Hydraulics Unit theoretical scour:
The DSE is in accordance with the theoretical scour shown on the Bridge Survey & Hydraulics Report dated 4/22/05.

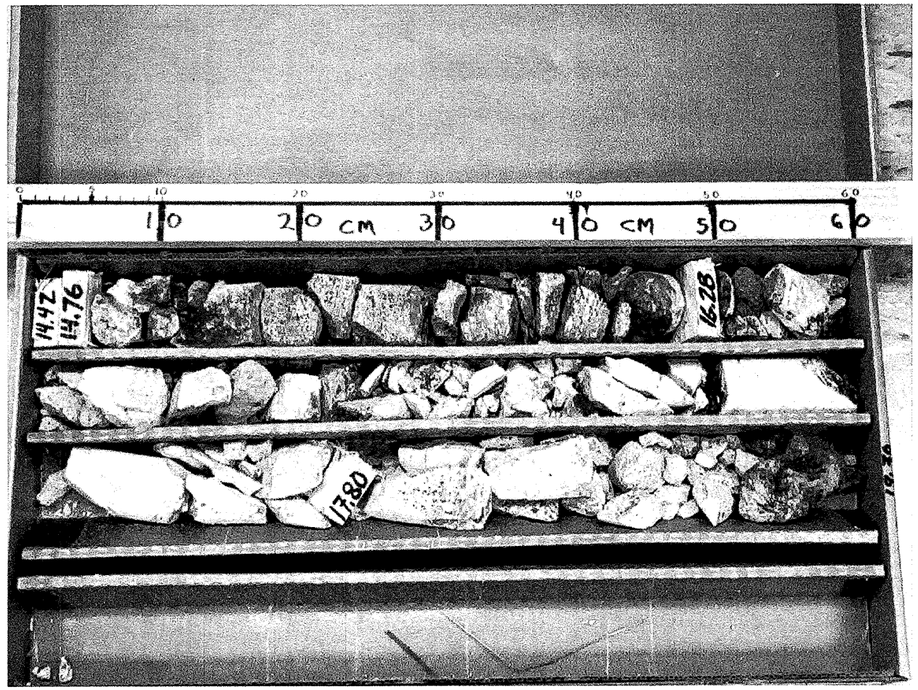
SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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: J.W. Mann **Date:** 6/28/2007

WBS 34445.1.1 I.D. R-2518B
BRIDGE NO. 309 ON US 19 OVER PRICE'S CREEK
YANCEY COUNTY



B1-A (EBL)
STA. 191+80 3.15 M RT
CORE RUN DEPTH - 14.40 M – 19.32 M

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2518B	1	48

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R-2518B F.A. PROJ.

COUNTY YANCEY

PROJECT DESCRIPTION US 19 FROM EAST OF THE MADISON COUNTY LINE TO SR 1336

SITE DESCRIPTION DUAL BRIDGES ON US 19 OVER BALD CREEK

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3-3A	GEOTECHNICAL REPORT
4	PLAN VIEW
5-6	PROFILE (WBL)
7-10	CROSS SECTIONS (WBL)
11-14	BORE LOGS (WBL)
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20-21	PROFILE (EBL)
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26-29	BORE LOGS (EBL)
30-32	CORE REPORTS (EBL)
33	SCOUR REPORT
34-47	CORE PHOTOGRAPHS (WBL & EBL)
48	SITE PHOTOGRAPHS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

M.M. HAGER

D.O. CHEEK

C.J. COFFEY

G.K. ROSE

INVESTIGATED BY P. Q. LOCKAMY

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6.15.07

NORTH CAROLINA LICENSED SEAL 1907 GEOLOGIST Patrick Q. Lockamy

P. Q. Lockamy

6-15-07

PROJECT: 34445.1.1

ID: R-2518B

DRAWN BY: J.T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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.

PROJECT REFERENCE NO.	SHEET NO.
R-2518B	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 30 CM 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	51 MN											
# 200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
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 (kN/m²)
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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE 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 (PD) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- 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
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [X] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ___ mm STEEL TEETH
- [ ] TRICONE ___ mm TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

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

CORE SIZE:
- [ ] -B ___
- [X] -N XWL
- [ ] -H ___

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	1 TO 3 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: -BY13-I24 - NORTHING : 245198.47 EASTING : 302672.242

ELEVATION: 766.995 M

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 15, 2007

STATE PROJECT: 34445.1.1 (R-2518B)
COUNTY: Yancey
DESCRIPTION: Bridge No. 30 on US-19 over Bald Creek

SUBJECT: Geotechnical report - Inventory

Introduction

This project is located in Yancey County, approximately 5.5 miles west of Burnsville on US-19. The existing 4-barrel RCBC will be replaced with tandem, triple-span, 2-lane bridges centered at -L- Station 175+52.267. The proposed structures are identical in dimension with spans of 12, 20 and 12 meters on a 135° skew and an out to out distance of 11.19 meters. The west bound lane bridge, referred to as WBL or left lane, is centered left of -L- Station 175+58.5354. The east bound lane bridge (right lane or EBL) is centered right of -L- Station 175+46.00. A detour is not needed.

The subsurface investigation was conducted using a CME-550 drill machine with -N- casing and advancer. Standard Penetration Tests were performed where applicable, using an automatic drop hammer. Rock core was retrieved with NXWL equipment.

The existing culvert is founded on predominantly very dense sandy saprolite and patches of weathered rock. At B1-B WBL the culvert rests directly on crystalline rock. Aggregate used in the concrete appears to be Pensacola gravel, mostly subrounded gneissic alluvium which was mined along Pensacola Creek in Yancey County.

A boring was not made at the B1-A EBL location due to the steep slope. The near by boring at B1-B WBL is used on the EBL B1 cross section. Two borings on B2 WBL went through the culvert cap and floor. Datum elevations from the bottom of the culvert's concrete floor are used there.

MAILING ADDRESS:
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1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

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

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

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

Physiography and Geology

This site is located on a long east-west trending valley (one of the more prominent physiographic features in the Southern Appalachians). The valley is oblique to regional strike and does not follow faults, rock type, or any geologic structure that typically controls such a long, straight valley. The lineation may be a dextral shear produced by a rotational event during compression.

Generally, shallow medium dense to very dense saprolitic silty sand and/or weathered rock or crystalline rock is present below thin alluvium across this site. Some embankment overlies alluvium. Crystalline rock is layered with weathered rock and possesses poor RQD.

Embankment encountered consists of 2.3 to 4.4 meters of loose silty sand with some stiff to very stiff sandy silt. At this site, the existing 2-lane highway utilizes the WBL alignment and most of the embankment encountered is along the WBL.

Alluvium consists predominantly of silty sand with basal sand and gravel with cobbles; some sandy silt is also present. The lithic portion of the alluvia is composed of subrounded amphibolitic and gneissic rocks with a lesser amount of vein quartz. Flood events here can be intense with large patches of alluvial soil being swept away leaving just the cobbles and gravel behind. The alluvium tends to be rather thin – two meters or less with a coarse base.

Saprolite up to 4.74 meters thick consists of medium to very dense silty sand. Some borings had weathered rock in contact with basal alluvium with no saprolite. Saprolite layers are also present in the weathered rock.

Weathered rock from just a thin rind to more than 6 meters thick is present across the site. Weathered rock may alternate to dense to very dense sand. Some thin layers of crystalline rock may also be present within weathered rock strata.

Rock Properties

Rock type is Grenville age basement gneiss composed on dark colored (mafic) hornblende gneiss grading to amphibolite intricately mixed with light colored (felsic) gneiss. The rock has so many joints and fractures that it breaks up in small pieces – very much like tempered glass – and has produced rubble covered slopes on near by road cuts. Coring proved exceedingly difficult in this very close to close fractured rock. A typical 1.52 meter core run would have to be pulled 3 or 4 times per run as the rock would wedge and block the inner barrel.

Differential weathering is striking in this location with the mafic gneiss typically rotting away while the felsic gneiss remains relatively fresh. Consequently, crystalline rock is layered with weathered rock and weathered rock is layered with saprolitic sand.

Recovery and RQD of cored rock is quite variable with recovery rates ranging from 7 to 100 percent and RQD generally being very low.

Groundwater

Groundwater was measured using a weighted tape measure lowered into the borings after a 24-hour period. Across the site static groundwater averages 762.3 to 763.1 meters in elevation.

Closing Statement

This subsurface investigation is based on a Bridge Survey and Hydraulic Report dated April 22, 2005. If any significant changes are made to the design or location of the proposed structures, the subsurface information will have to be reviewed or modified as necessary.

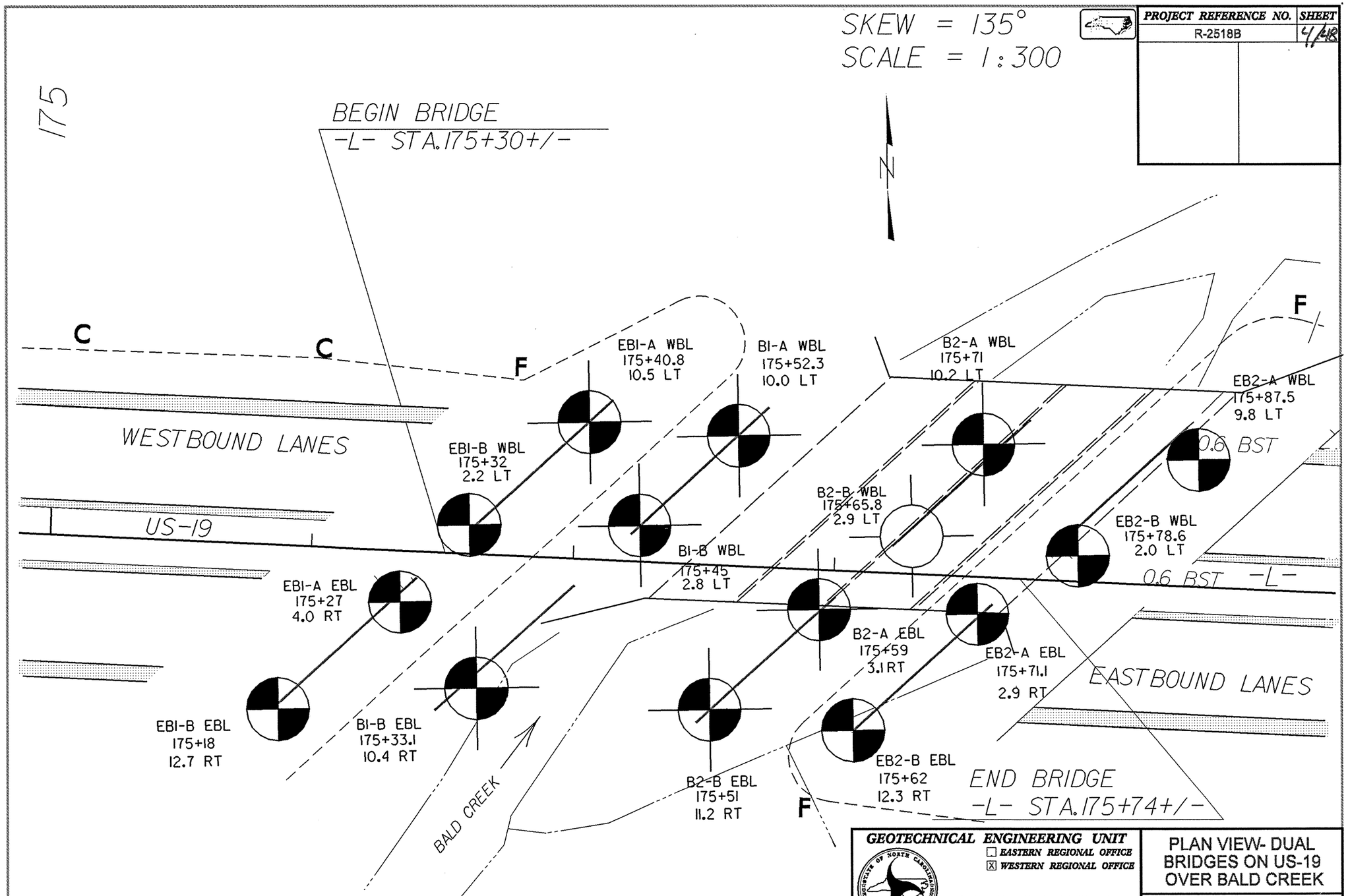
Respectfully Submitted,

P.Q. Lockamy

PQ Lockamy, LG
Project Geologist

PROJECT REFERENCE NO.	SHEET
R-2518B	4/4B

SKEW = 135°
SCALE = 1:300



PREPARED BY: J.T. WILLIAMS	DATE: 6.1.07
REVIEWED BY: P.Q. LOCKAMY	DATE: 6.1.07

NOTE : PLAN VIEW FROM ROADWAY DESIGN PLANS

GEOTECHNICAL ENGINEERING UNIT
☐ EASTERN REGIONAL OFFICE
☒ WESTERN REGIONAL OFFICE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PLAN VIEW- DUAL BRIDGES ON US-19 OVER BALD CREEK

REVISIONS

NO.	BY	DATE	NO.	BY	DATE
1	-	-	3	-	-
2	-	-	4	-	-

PROJECT REFERENCE NO.	SHEET
R-2518B	5/48

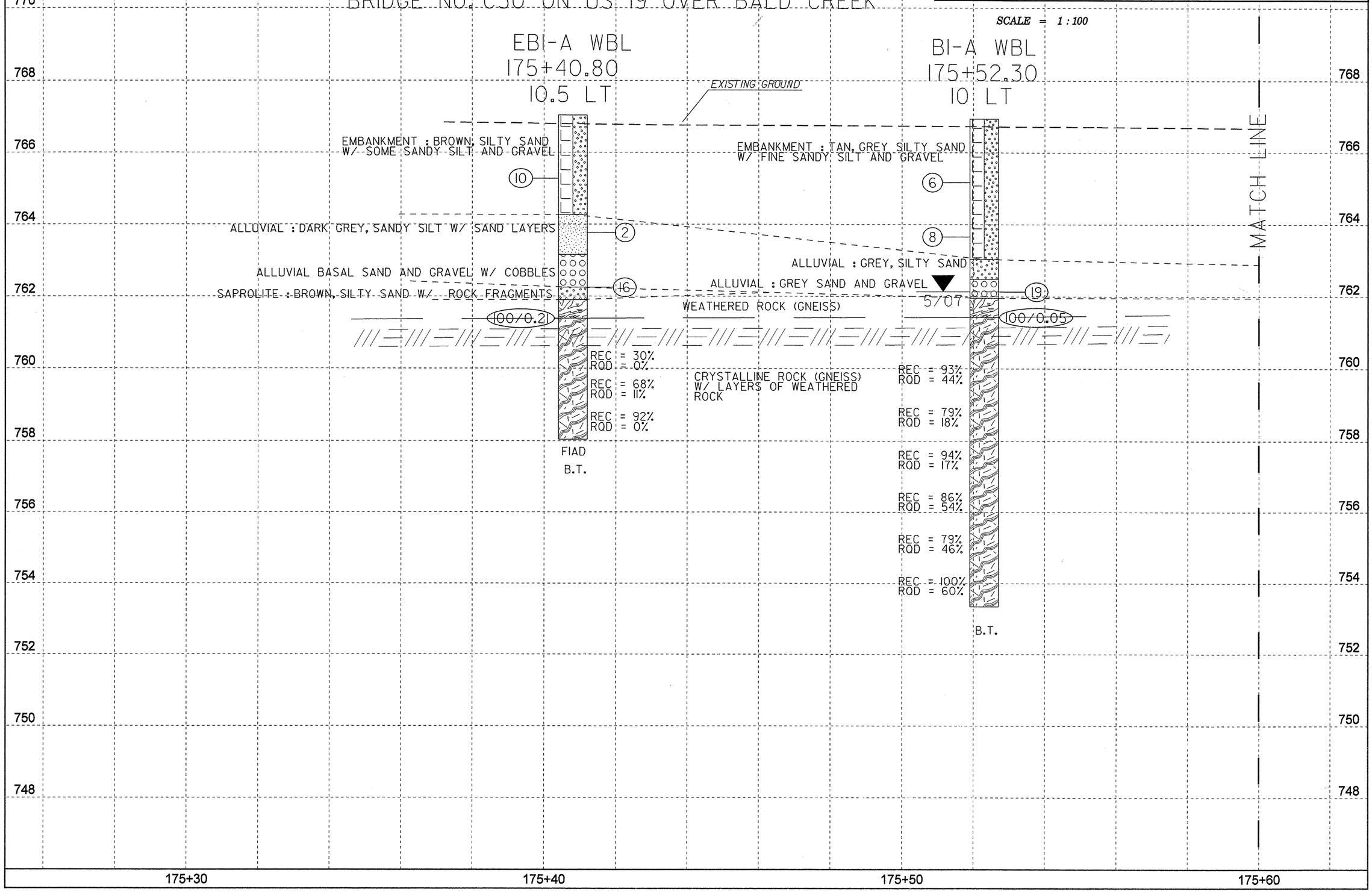
PROFILE ALONG A-SIDE WESTBOUND LANE

0 2 4
METERS
VE = 1

SCALE = 1 : 100

PROFILE 12.27 M LT OF -L-

BRIDGE NO. C30 ON US 19 OVER BALD CREEK

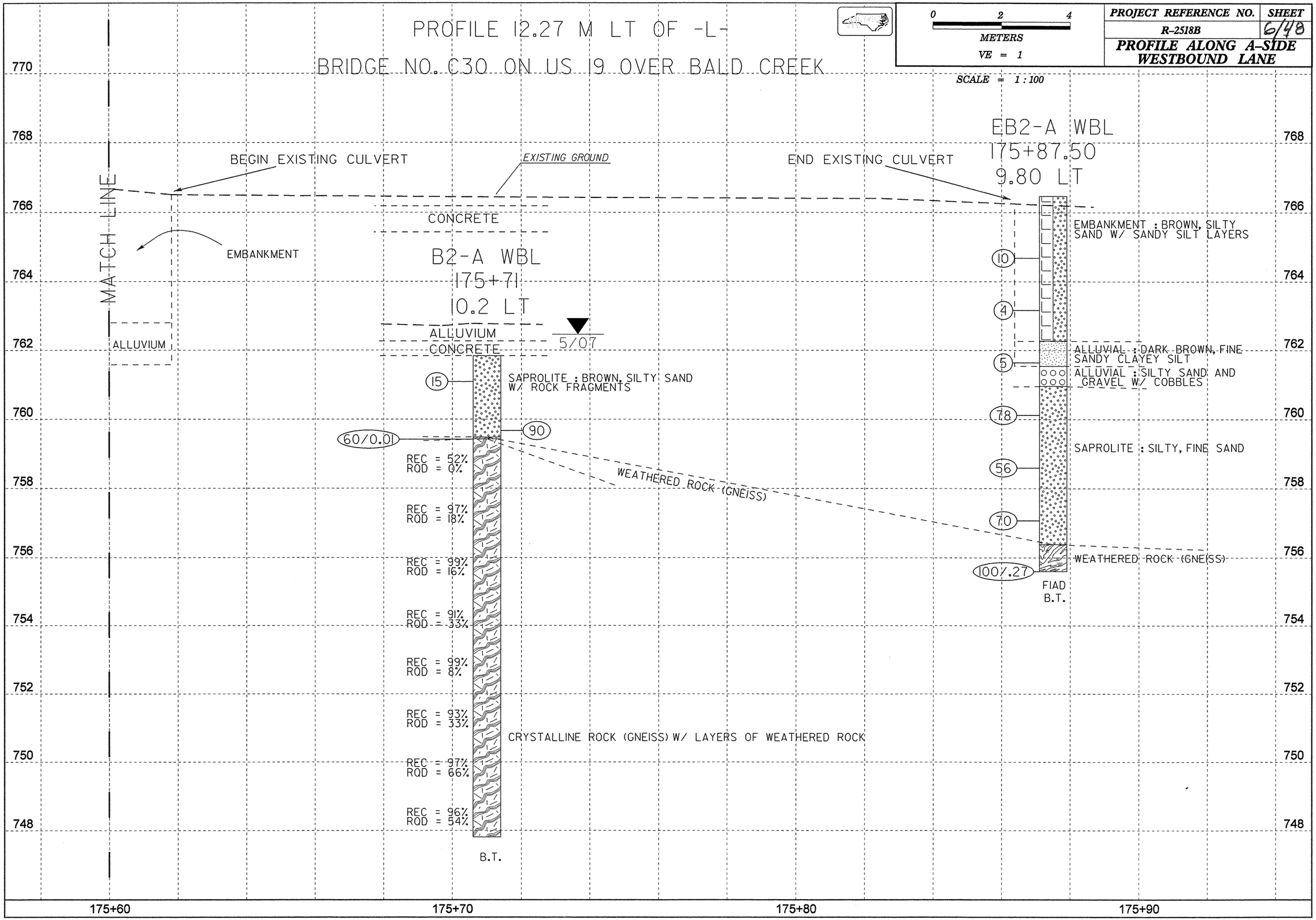


PROJECT REFERENCE NO.	SHEET
R-2518B	6/48

PROFILE ALONG A-SIDE WESTBOUND LANE

0 2 4
METERS
VE = 1

SCALE = 1 : 100



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. B1-B EBL	STATION 175+33.1	OFFSET 10.4m RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 763.31 m	TOTAL DEPTH 15.08 m	NORTHING 245,239.6	EASTING 302,668.5	24 HR. 0.50
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/08/07	COMP. DATE 05/09/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 7.8 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
764									763.31 GROUND SURFACE	0.00
									ALLUVIAL SILTY SAND W/GRAVEL AND COBBLES	
761.93	1.38								762.15	1.16
		13	18	17	35				**SAPROLITE** BROWN, SILTY SAND W/ ROCK FRAGMENTS	
760.41	2.90									
		24	16	35	51					
758.89	4.42									
		12	23	32	55					
757.37	5.94								757.41	5.90
		100/0.12			100/0.12				**WEATHERED ROCK** (GNEISS)	
755.85	7.46									
		100/0.14			100/0.14				755.55	7.76
									CRYSTALLINE ROCK W/ LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 65% TOTAL RQD = 8%	
									748.23	15.08
									Boring Terminated at Elevation 748.23 m IN CRYSTALLINE ROCK (GNEISS)	

NCDOT BORE DOUBLE R2518B_GEO.GPJ NC_DOT.GDT 08/11/07

PROJECT REFERENCE NO.	SHEET
R-2518B	7/48

SECTION THRU EBI WESTBOUND LANE

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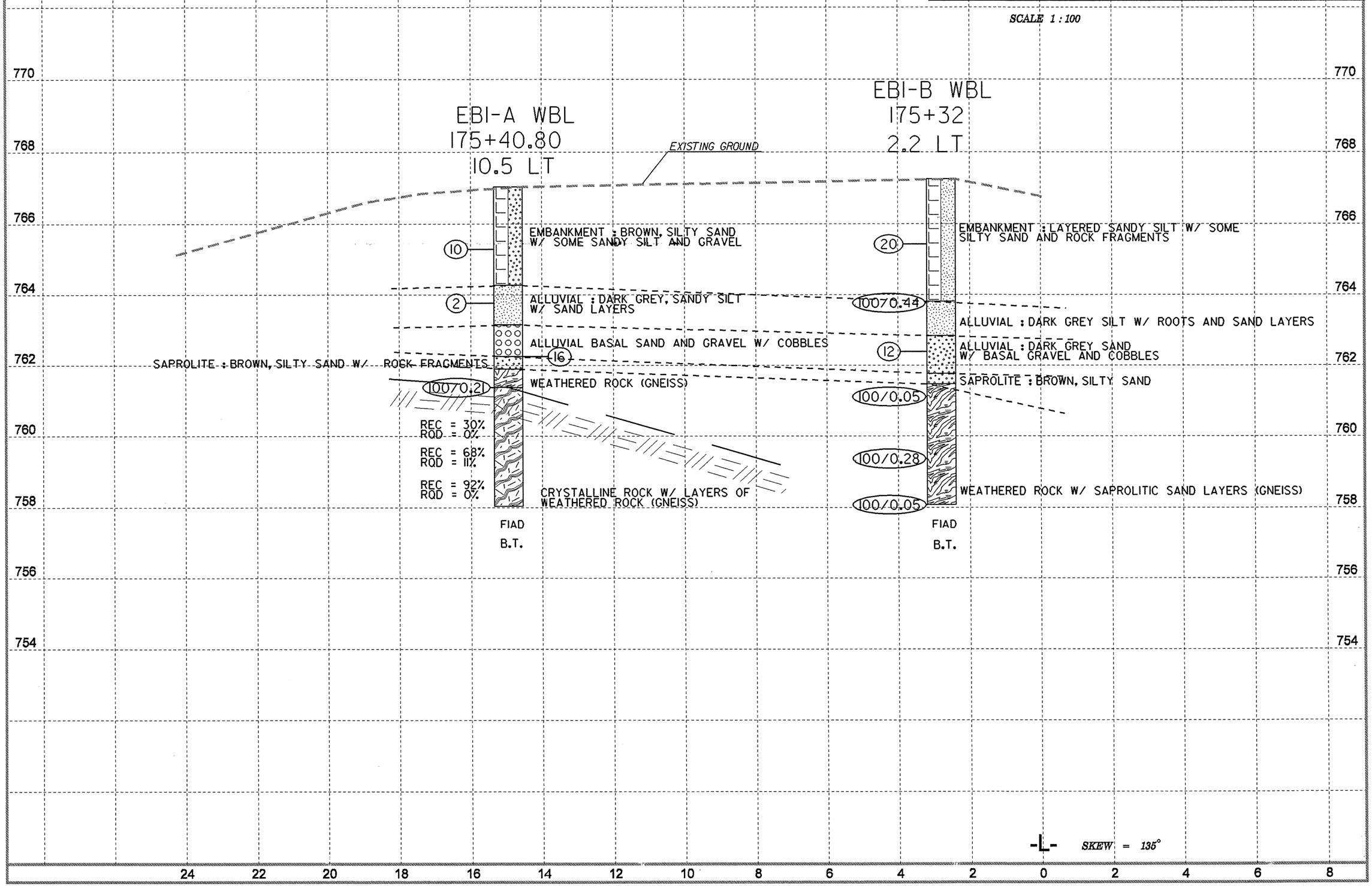
METERS
VE = 1

SCALE 1 : 100



PROJECT REFERENCE NO.	SHEET
R-2518B	8/48
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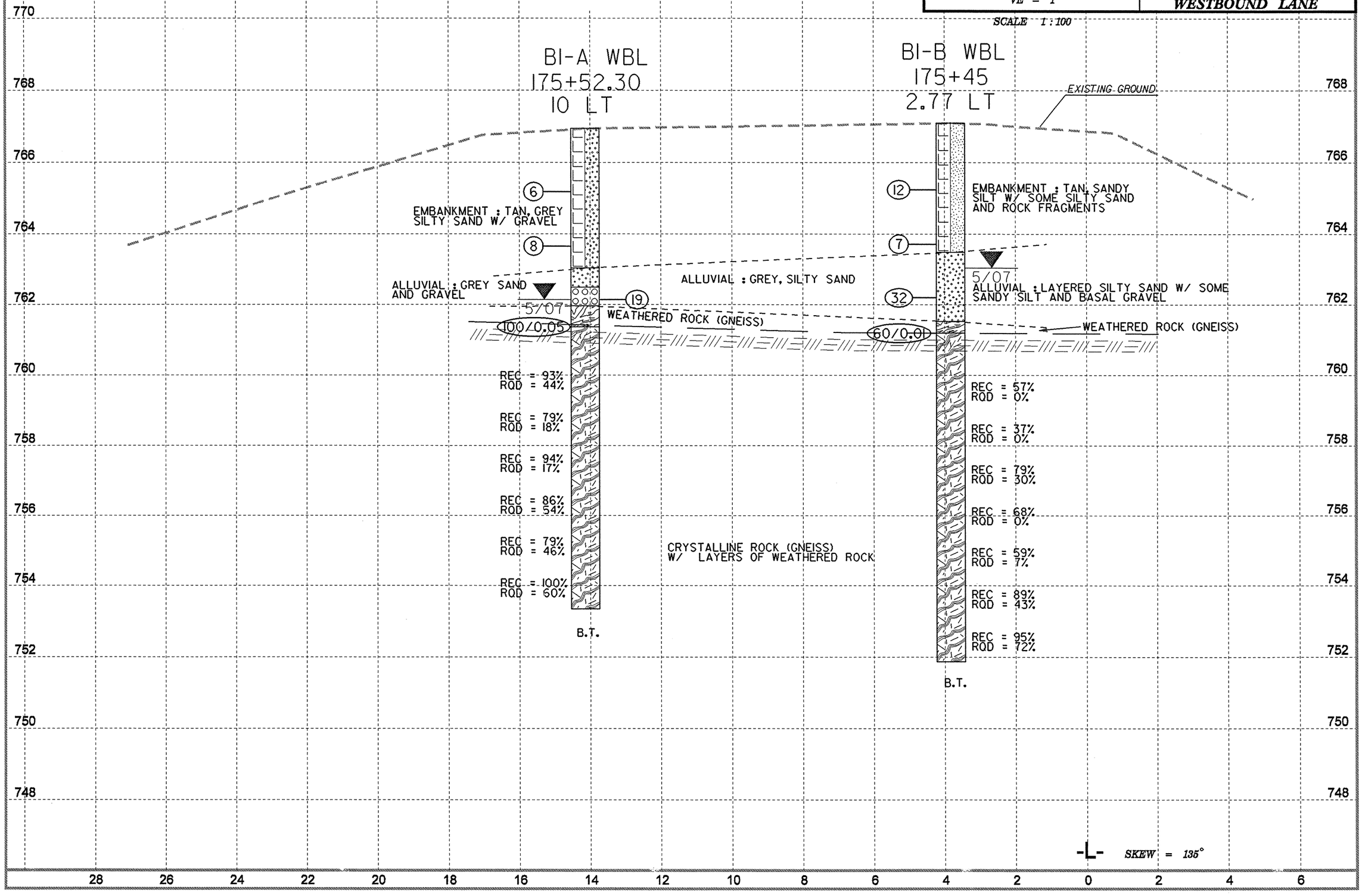
METERS
VE = 1
SCALE 1:100



PROJECT REFERENCE NO.	SHEET
R-2518B	9/48

SECTION THRU B2 WESTBOUND LANE

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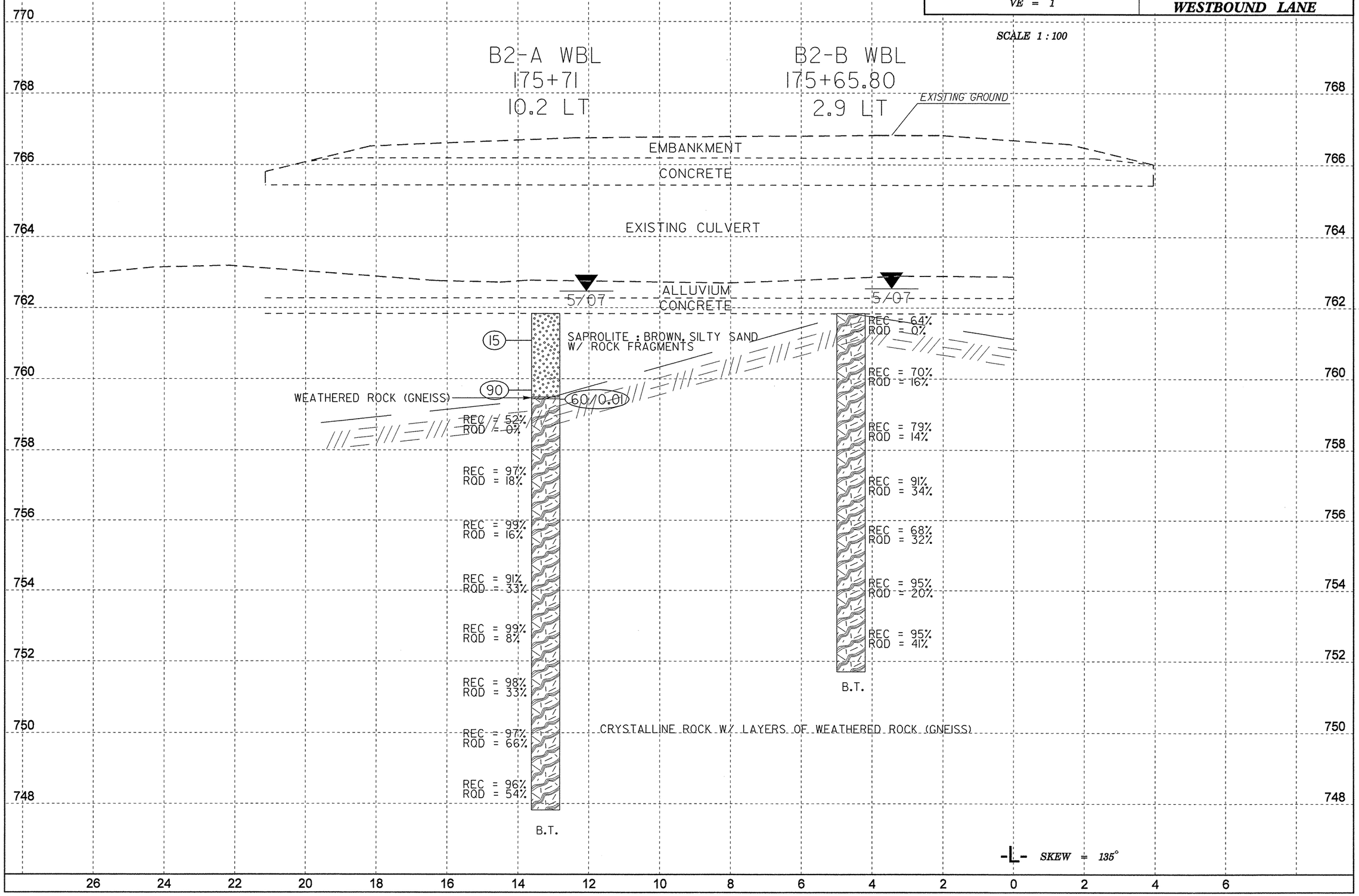
SCALE 1 : 100



PROJECT REFERENCE NO.	SHEET
R-2518B	10/48

SECTION THRU EB2 WESTBOUND LANE

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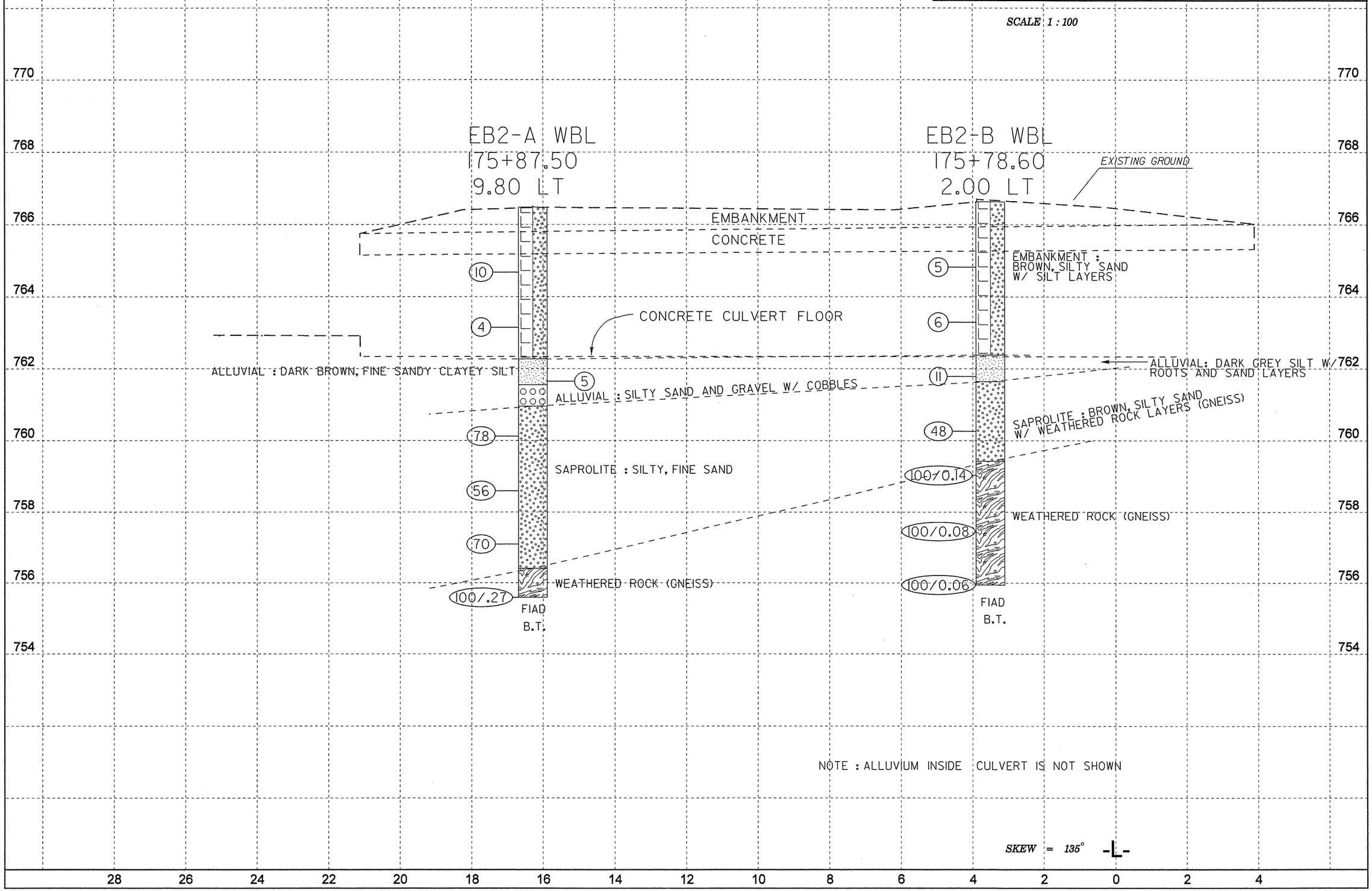
METERS
VE = 1

SCALE 1 : 100



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. EB1-A WBL	STATION 175+40.8	OFFSET 10.5m LT	ALIGNMENT -L-
COLLAR ELEV. 767.04 m	TOTAL DEPTH 9.00 m	NORTHING 245,260.0	EASTING 302,677.5
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/18/07	COMP. DATE 05/22/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 5.7 m

GROUND WTR (m): 0 HR. N/A; 24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
768									
									767.04 GROUND SURFACE 0.00
									ROADWAY EMBANKMENT BROWN, SILTY SAND W/ SOME SANDY SILT AND GRAVEL
765.59	1.45								
		3	5	5	10				
									764.27 2.77
764.07	2.97								**ALLUVIAL** DARK GREY, SANDY SILT W/ SAND LAYERS
		2	1	1	2				
									763.16 3.88
									ALLUVIAL BASAL SAND AND GRAVEL W/ COBBLES
762.55	4.49								
		6	6	10	16				
									762.25 4.79
									761.90 5.14 **SAPROLITE** BROWN, SILTY SAND W/ ROCK FRAGMENTS
761.59	5.45								
		48	52/.06		100/0.21				761.38 5.66 **WEATHERED ROCK** (GNEISS)
									CRYSTALLINE ROCK (GNEISS) W/ LAYERS OF WEATHERED ROCK TOTAL REC = 76% TOTAL RQD = 5%
									758.04 9.00
									Boring Terminated at Elevation 758.04 m IN CRYSTALLINE ROCK (GNEISS)

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. EB1-B WBL	STATION 175+32.0	OFFSET 2.2m LT	ALIGNMENT -L-
COLLAR ELEV. 767.25 m	TOTAL DEPTH 9.17 m	NORTHING 245,252.3	EASTING 302,668.2
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 05/22/07	COMP. DATE 05/22/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
768									
									767.25 GROUND SURFACE 0.00
									ROADWAY EMBANKMENT LAYERED SANDY SILT W/ SOME SILTY SAND AND ROCK FRAGMENTS
765.73	1.52								
		3	9	11	20				
764.21	3.04								
		2	7	93/.14	100/0.44				763.81 3.44
									ALLUVIAL DARK GREY SILT W/ ROOTS AND SAND LAYERS
762.69	4.56								762.85 4.40
		1	1	11	12				**ALLUVIAL** DARK GREY SAND W/ BASAL GRAVEL AND COBBLES
761.17	6.08								761.77 5.48
		100/0.05			100/0.05				761.47 5.78 **SAPROLITE** BROWN, SILTY SAND
									WEATHERED ROCK W/ SAPROLITIC SANDY LAYERS (GNEISS)
759.65	7.60								
		24	76/0.13		100/0.28				
758.13	9.12								
		100/0.05			100/0.05				758.08 9.17
									Boring Terminated at Elevation 758.08 m IN WEATHERED ROCK (GNEISS)

NCDOT BORE DOUBLE R2518B_GEO.GPJ NC_DOT.GDT 08/13/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. B1-A WBL	STATION 175+52.3	OFFSET 10.0m LT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 766.94 m	TOTAL DEPTH 13.60 m	NORTHING 245,258.8	EASTING 302,688.9	24 HR. 4.80
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/15/07	COMP. DATE 05/15/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 5.6 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
767									766.94 GROUND SURFACE 0.00
									ROADWAY EMBANKMENT TAN, GREY SILTY SAND W/ FINE SANDY SILT AND GRAVEL
765.48	1.46	3	3	3	6				
763.96	2.98	1	3	5	8				
									763.04 3.90
762.44	4.50	8	10	9	19				762.49 4.45 **ALLUVIAL** GREY, SILTY SAND
									761.96 4.98 **ALLUVIAL** GREY, SAND AND GRAVEL
761.42	5.52	100/0.05			100/0.05				761.37 5.57 **WEATHERED ROCK** (GNEISS)
									CRYSTALLINE ROCK W/ LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 88% TOTAL RQD = 39%
									753.34 13.60
									Boring Terminated at Elevation 753.34 m IN CRYSTALLINE ROCK (GNEISS)

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. B1-B WBL	STATION 175+45.0	OFFSET 2.8m LT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 767.10 m	TOTAL DEPTH 15.22 m	NORTHING 245,252.1	EASTING 302,681.2	24 HR. 4.04
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/14/07	COMP. DATE 05/14/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 5.9 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
768									767.10 GROUND SURFACE 0.00
									ROADWAY EMBANKMENT TAN, SANDY SILT W/ SOME SILTY SAND AND ROCK FRAGMENTS
765.55	1.55	3	5	7	12				
764.03	3.07	2	3	4	7				763.50 3.60
									ALLUVIAL LAYERED SILTY SAND W/ SOME SANDY SILT, AND BASAL GRAVEL AND COBBLES
762.51	4.59	11	20	12	32				
									761.54 5.56
761.21	5.89	60/0.01			60/0.01				761.21 5.89 **WEATHERED ROCK** (GNEISS)
									CRYSTALLINE ROCK W/LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 71% TOTAL RQD = 25%
									751.88 15.22
									Boring Terminated at Elevation 751.88 m IN CRYSTALLINE ROCK (GNEISS)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	**ID.** R-2518B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			**GROUND WTR (m)**
BORING NO. B2-A WBL	**STATION** 175+71.0	**OFFSET** 10.2m LT	**ALIGNMENT** -L-
COLLAR ELEV. 761.84 m	**TOTAL DEPTH** 14.02 m	**NORTHING** 245,257.9	**EASTING** 302,707.6
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT Core		**HAMMER TYPE** Automatic
START DATE 05/16/07	**COMP. DATE** 05/17/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 2.4 m

GROUND WTR (m)	
0 HR.	N/A
24 HR.	-0.63

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
762									761.84 DATUM SURFACE	0.00
761.39	0.45	11	8	7	15				**SAPROLITE** BROWN SILTY SAND W/ ROCK FRAGMENTS	
759.98	1.86	12	22	68	90				759.49	2.35
759.44	2.40	60/0.01			60/0.01				759.44 **WEATHERED ROCK** (GNEISS)	2.40
									CRYSTALLINE ROCK W/ LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 93% TOTAL RQD = 30%	
									747.82	14.02
									Boring Terminated at Elevation 747.82 m IN CRYSTALLINE ROCK (GNEISS)	

PROJECT NO. 34445.1.1	**ID.** R-2518B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			**GROUND WTR (m)**
BORING NO. B2-B WBL	**STATION** 175+65.8	**OFFSET** 2.9m LT	**ALIGNMENT** -L-
COLLAR ELEV. 761.84 m	**TOTAL DEPTH** 10.13 m	**NORTHING** 245,250.9	**EASTING** 302,701.9
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Core		**HAMMER TYPE** Automatic
START DATE 05/21/07	**COMP. DATE** 05/21/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 0.0 m

GROUND WTR (m)	
0 HR.	N/A
24 HR.	-0.70

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
762									761.84 GROUND SURFACE	0.00
									CRYSTALLINE ROCK W/ LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 81% TOTAL RQD = 24%	
									751.71	10.13
									Boring Terminated at Elevation 751.71 m IN CRYSTALLINE ROCK (GNEISS)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. EB2-A WBL	STATION 175+87.5	OFFSET 9.8m LT	ALIGNMENT -L-
COLLAR ELEV. 766.47 m	TOTAL DEPTH 10.88 m	NORTHING 245,256.5	EASTING 302,724.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 05/17/07	COMP. DATE 05/17/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
767									
766.47									GROUND SURFACE 0.00
									ROADWAY EMBANKMENT BROWN, SILTY SAND W/ SANDY SILT LAYERS
764.98	1.49								
		1	2	8	10				
763.46	3.01								
		2	1	3	4				
762.27									4.20
761.94	4.53								
		0	0	5	5				**ALLUVIAL** DARK BROWN, FINE SANDY CLAYEY SILT
761.54									4.93
									ALLUVIAL SILTY SAND AND GRAVEL W/ COBBLES
760.95									5.52
760.42	6.05								
		14	35	43	78				**SAPROLITE** SILTY, FINE SAND
758.90	7.57								
		10	15	41	56				
757.38	9.09								
		22	30	40	70				
756.39									10.08
755.86	10.61								
		46	54/0.12		100/0.27				**WEATHERED ROCK** (GNEISS)
755.59									10.88
									Boring Terminated at Elevation 755.59 m IN WEATHERED ROCK (GNEISS)

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. EB2-B WBL	STATION 175+78.6	OFFSET 2.0m LT	ALIGNMENT -L-
COLLAR ELEV. 766.63 m	TOTAL DEPTH 10.68 m	NORTHING 245,249.3	EASTING 302,714.7
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 05/22/07	COMP. DATE 05/22/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

GROUND WTR (m): 0 HR. N/A; 24 HR. FIAD

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
767									
766.63									GROUND SURFACE 0.00
									ROADWAY EMBANKMENT BROWN, SILTY SAND W /SILT LAYERS
765.13	1.50								
		1	3	2	5				
763.61	3.02								
		1	3	3	6				
762.39									4.24
762.09	4.54								
		3	5	6	11				**ALLUVIAL** DARK GREY, FINE, SANDY, CLAYEY SILT W/ BASAL GRAVEL AND COBBLES
761.64									4.99
760.57	6.06								**SAPROLITE** BROWN, SILTY SAND W/ WEATHERED ROCK LAYERS (GNEISS)
		9	23	25	48				
759.43									7.20
759.05	7.58								
		100/0.14			100/0.14				**WEATHERED ROCK** (GNEISS)
757.53	9.10								
		100/0.08			100/0.08				
756.01	10.62								
		100/0.06			100/0.06				
755.95									10.68
									Boring Terminated at Elevation 755.95 m IN WEATHERED ROCK (GNEISS)

SHEET ____ OF ____

DATE 5/22/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: EB1-A WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+40.8 10.5m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 767.04 m. TOTAL DEPTH: 9.00 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
761.38	5.66		0.30	0.09 30	0.00 0		CLOSE FRACTURED MAFIC GNEISS (SLIGHT, MOD. HARD). WITH LAYERS OF WEATHERED ROCK.
761.08	5.96						
761.08	5.96		1.52	1.04 68	0.16 11		VERY CLOSE TO CLOSE FRACTURED MAFIC GNEISS, MOD. WEATHERED, MED. HARD WITH LAYERS OF WEATHERED ROCK.
759.56	7.48						
759.56	7.48		1.52	1.40 92	0.00 0		VERY CLOSE TO CLOSE FRACTURED MAFIC GNEISS, MOD. WEATHERED, MED. TO MOD. HARD WITH LAYERS OF WEATHERED ROCK.
758.04	9.00						

CORING TERMINATED AT ELEVATION 758.04 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

SHEET ____ OF ____

DATE 5/15/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-A WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+52.3 12.34m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 766.94 m. TOTAL DEPTH: 13.60 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
761.37	5.57		0.43	0.40 93	0.19 44		CLOSE FRACTURED MAFIC GNEISS. HARD TO MOD. HARD, VERY SLIGHT WEATHERED.
760.94	6.00						
760.94	6.00		1.42	1.12 79	0.26 18		CLOSE FRACTURED MAFIC GNEISS. HARD TO MOD. HARD, VERY SLIGHT WEATHERED.
759.52	7.42						
759.52	7.42		1.62	1.52 94	0.27 17		CLOSE FRACTURED MAFIC GNEISS. SLIGHT TO MOD. WEATHERING, HARD TO MOD. HARD.
757.90	9.04						
757.90	9.04		1.52	1.30 86	0.82 54		CLOSE FRACTURED MAFIC GNEISS. SLIGHT WEATHERING, HARD.
756.38	10.56						
756.38	10.56		1.52	1.20 79	0.70 46		MOSTLY CLOSE FRACTURED MAFIC GNEISS. VERY SLIGHT TO FRESH, HARD.
754.86	12.08						
754.86	12.08		1.52	1.52 100	0.91 60		CLOSE FRACTURED MAFIC GNEISS. HARD AND FRESH.
753.34	13.60						

CORING TERMINATED AT
ELEVATION 753.34 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 5/14/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-B WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+45 2.77m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 767.10 m. TOTAL DEPTH: 15.22 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
761.21	5.89		0.21	0.12 57	0.00 0		VERY CLOSE FRACTURED FELSIC GNEISS. HARD, MOD. WEATHERED.
761.00	6.10		1.52	0.56 37	0.00 0		VERY CLOSE FRACTURED FELSIC GNEISS WITH LAYERS OF WEATHERED ROCK. HARD, MOD. WEATHERED.
759.48	7.62		1.52	1.20 79	0.45 30		CLOSE FRACTURED FELSIC GNEISS HARD, MOD. WEATHERED.
757.96	9.14		1.52	1.03 68	0.00 0		VERY CLOSE FRACTURED MAFIC GNEISS. MOD. SEVERE WEATHERED, MEDIUM HARD TO SOFT.
756.44	10.66		1.52	0.90 59	0.10 7		VERY CLOSE FRACTURED GNEISS. MOD. WEATHERED, MODERATE HARD.
754.92	12.18		1.52	1.35 89	0.66 43		CLOSE FRACTURED GNEISS MOD. TO SLIGHT WEATHERED, HARD TO MOD HARD.
753.40	13.70						

CORING TERMINATED AT
ELEVATION 751.88 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 5/14/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-B WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+45 2.77m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 767.10 m. TOTAL DEPTH: 15.22 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
753.40	13.70		1.52	1.45 95	1.10 72		MODERATELY CLOSE GRACTURED GNEISS. FELSIC PORTIONS ARE FRESH AND VERY HARD. MAFIC PORTIONS ARE MOSTLY SLIGHT WITH SOME MOD. SEVERE WEATHERING AND ARE MOSTLY HARD WITH A SOME SOFT MATERIAL.
751.88	15.22						

CORING TERMINATED AT
ELEVATION 748.44 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 5/17/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-A WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+71 10.2m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 761.84 m. TOTAL DEPTH: 14.02 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
759.43	2.41		0.97	0.50 52	0.00 0		VERY CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERING. MED. HARD.
758.46	3.38						
758.46	3.38		1.52	1.47 97	0.28 18		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERING. MED. HARD.
756.94	4.90						
756.94	4.90		1.52	1.50 99	0.25 16		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERING. MED. TO MOD. HARD.
755.42	6.42						
-6.42	6.42		1.52	1.38 91	0.50 33		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERING. MED. HARD TO HARD.
753.90	7.94						
753.90	7.94		1.52	1.50 99	0.12 8		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERING. MED. HARD TO HARD.
752.38	9.46						
752.38	9.46		1.52	1.42 93	0.50 33		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERING. MED. HARD TO HARD.
750.86	10.98						

CORING TERMINATED AT
ELEVATION 747.82 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 5/17/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-A WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+71 10.2m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 761.84 m. TOTAL DEPTH: 14.02 m.

750.86	10.98		1.52	1.48 97	1.01 66		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO SLIGHT WEATHERING. MOD. HARD TO HARD.
749.34	12.50						
749.34	12.50		1.52	1.46 96	0.82 54		VERY CLOSE TO CLOSE FRACTURED GNEISS. SLIGHT WEATHERING. MOD. HARD TO HARD.
747.82	14.02						

CORING TERMINATED AT
ELEVATION 747.82 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 5/21/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-B WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+65.8 2.9m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 761.84 m. TOTAL DEPTH: 10.13 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
761.84	0.00		1.01	0.65 64	0.00 0		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. WEATHERED. MOD. HARD.
760.83	1.01		1.52	1.06 70	0.24 16		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. WEATHERED. MOD. HARD.
759.31	2.53		1.52	1.20 79	0.22 14		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO MOD. SEVER WEATHERED. MOD. TO MED. HARD.
757.79	4.05		1.52	1.38 91	0.52 34		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. WEATHERED. MOD. HARD.
756.27	5.57		1.52	1.03 68	0.49 32		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. WEATHERED. MOD. HARD.
754.75	7.09		1.52	1.44 95	0.30 20		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. WEATHERED. MOD. HARD.
753.23	8.61						

CORING TERMINATED AT
ELEVATION 751.71 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 5/21/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-B WBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+65.8 2.9m Lt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 761.84 m. TOTAL DEPTH: 10.13 m.

METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
753.23	8.61		1.52	1.45 95	0.62 41		VERY CLOSE TO CLOSE FRACTURED GNEISS. MOD. TO SLIGHT WEATHERING. MOD. HARD TO HARD.
751.71	10.13						

CORING TERMINATED AT
ELEVATION 751.71 m.

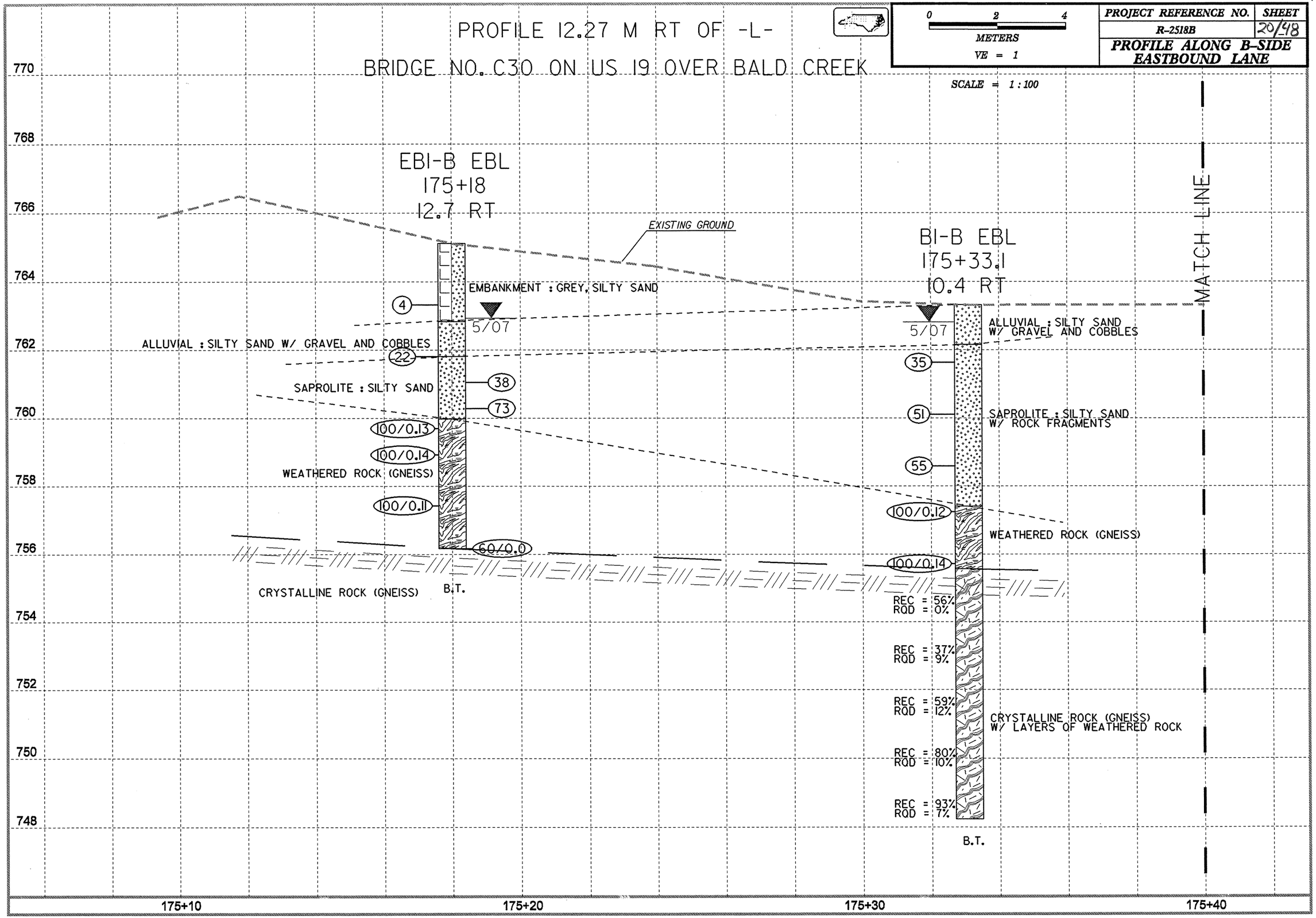
DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

PROJECT REFERENCE NO.	SHEET
R-2518B	20/48

PROFILE ALONG B-SIDE EASTBOUND LANE

0 2 4
METERS
VE = 1

SCALE = 1 : 100

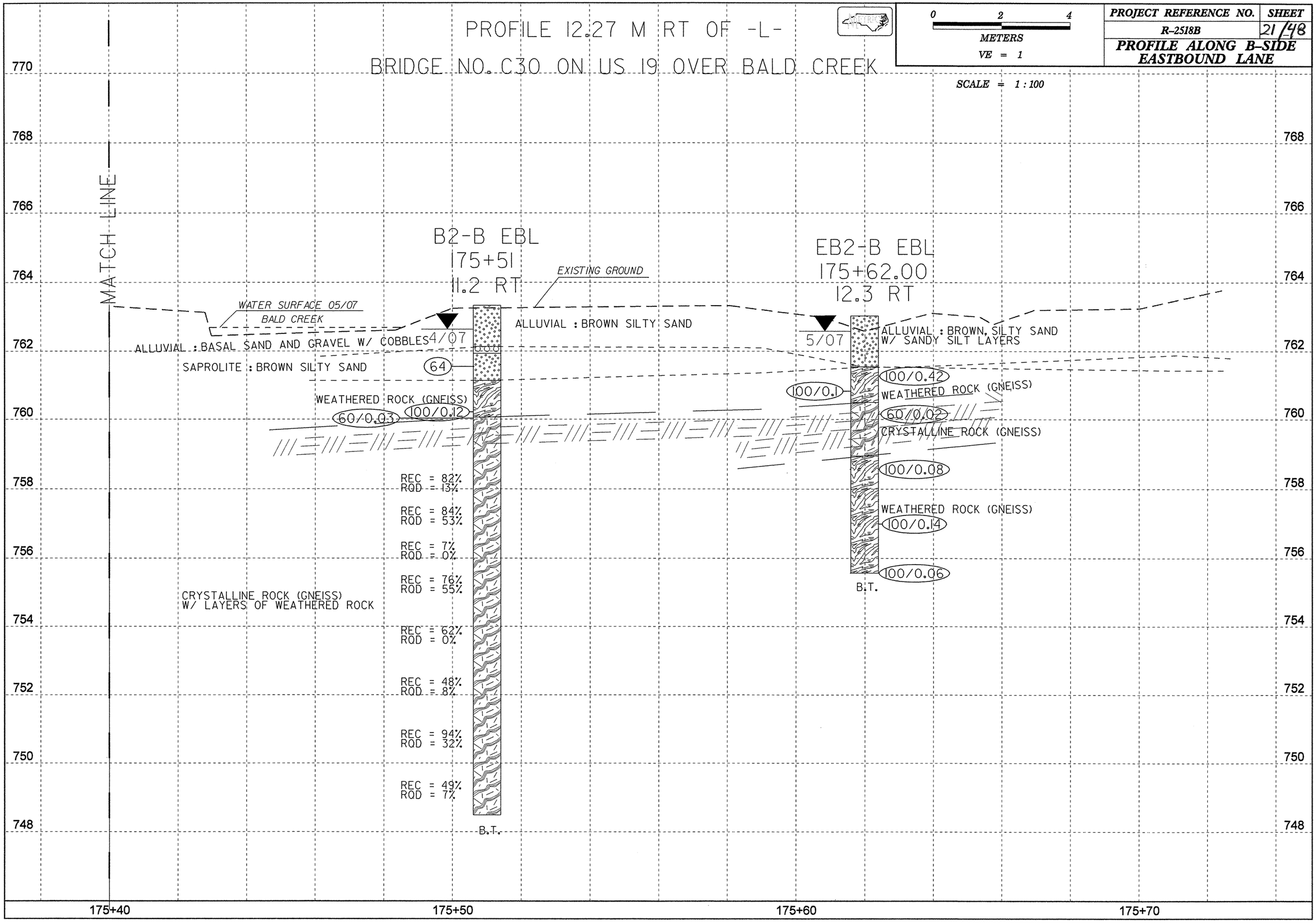


PROJECT REFERENCE NO.	SHEET
R-2518B	21/48

PROFILE ALONG B-SIDE EASTBOUND LANE

0 2 4
METERS
VE = 1

SCALE = 1 : 100

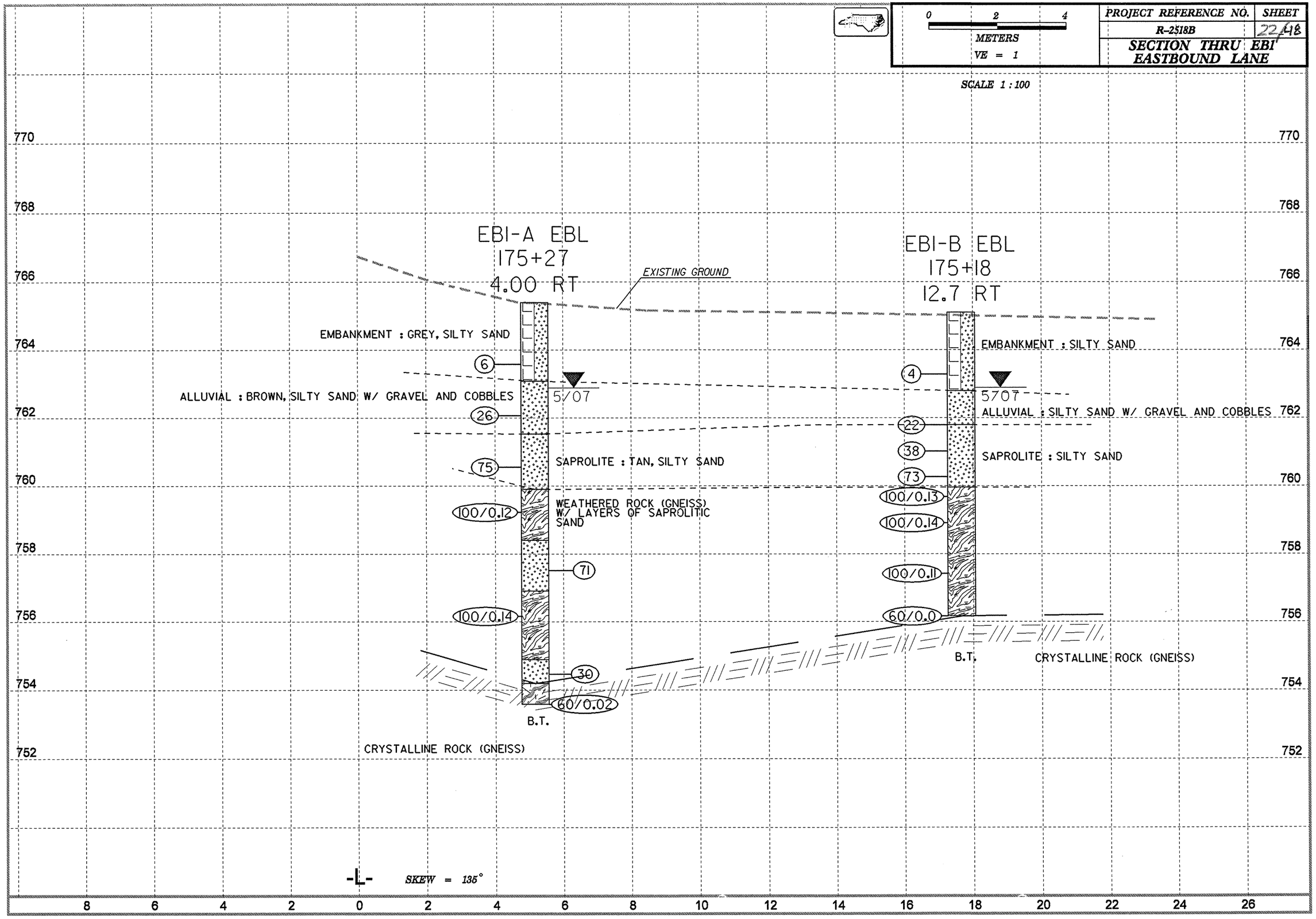


PROJECT REFERENCE NO.	SHEET
R-2518B	22/48

SECTION THRU EBI EASTBOUND LANE

0 2 4
METERS
VE = 1

SCALE 1 : 100

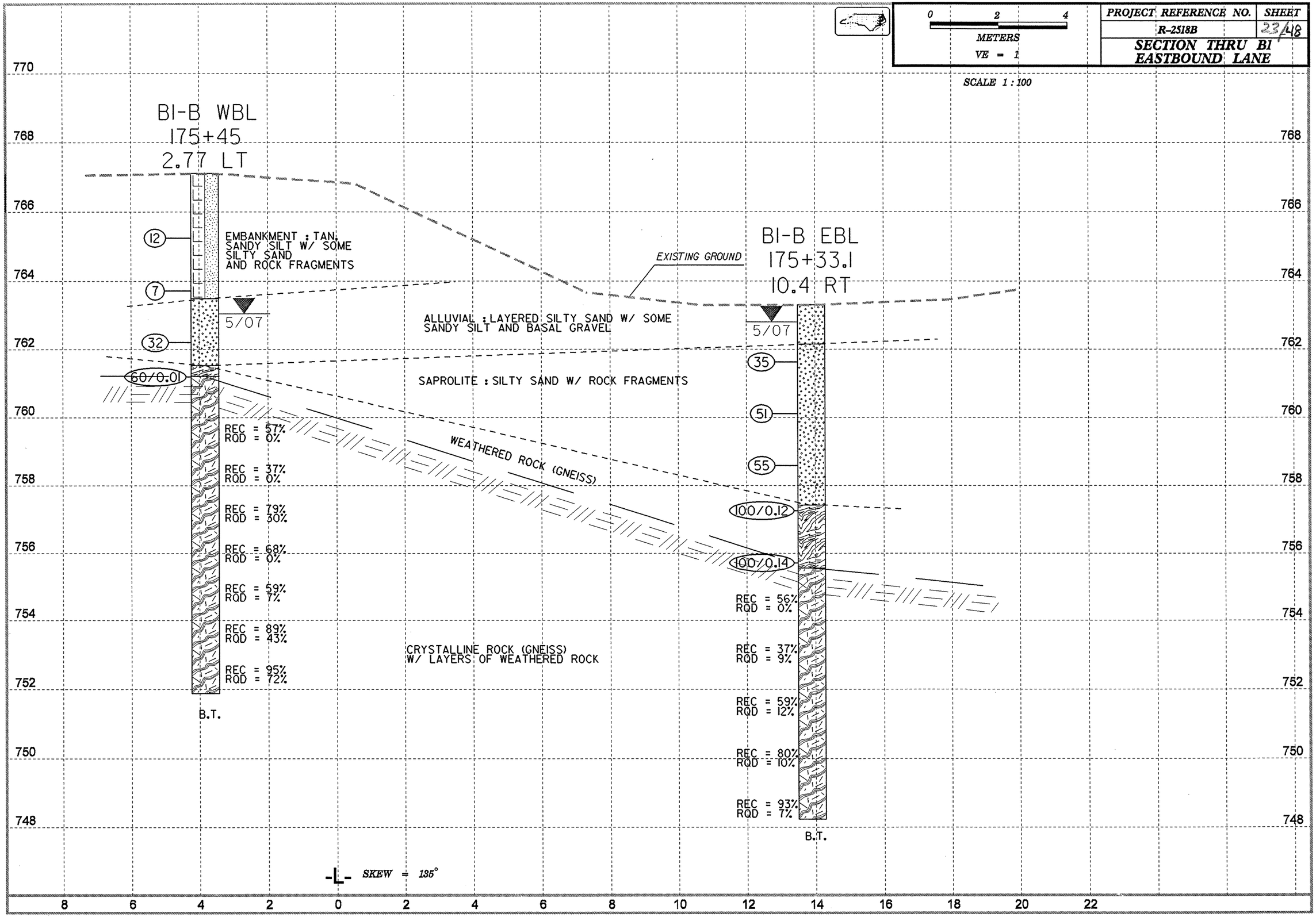


PROJECT REFERENCE NO.	SHEET
R-2518B	23/48

SECTION THRU B1 EASTBOUND LANE

0 2 4
METERS
VE = 1

SCALE 1 : 100

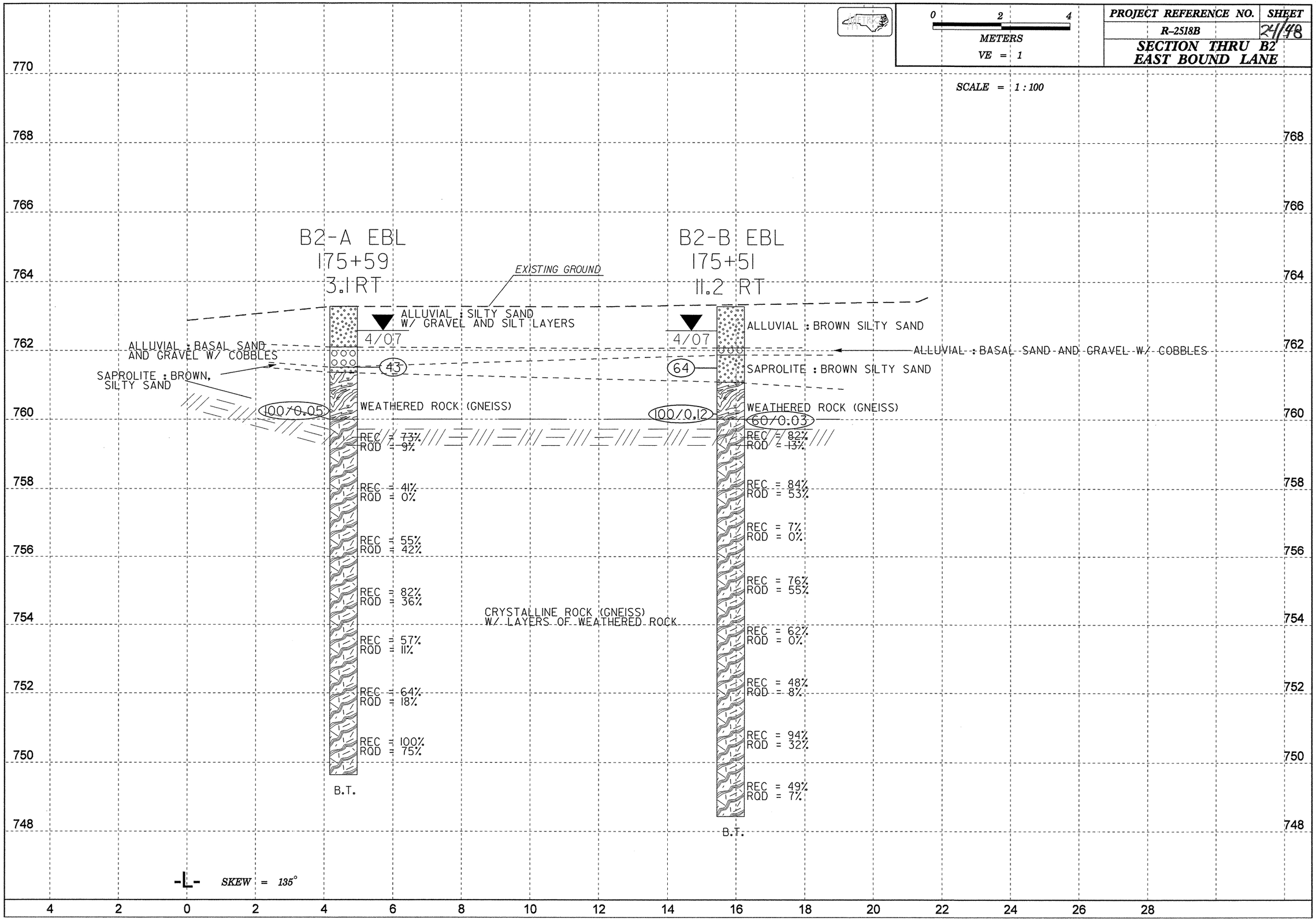


PROJECT REFERENCE NO.	SHEET
R-2518B	24/48

SECTION THRU B2 EAST BOUND LANE

0 2 4
METERS
VE = 1

SCALE = 1 : 100

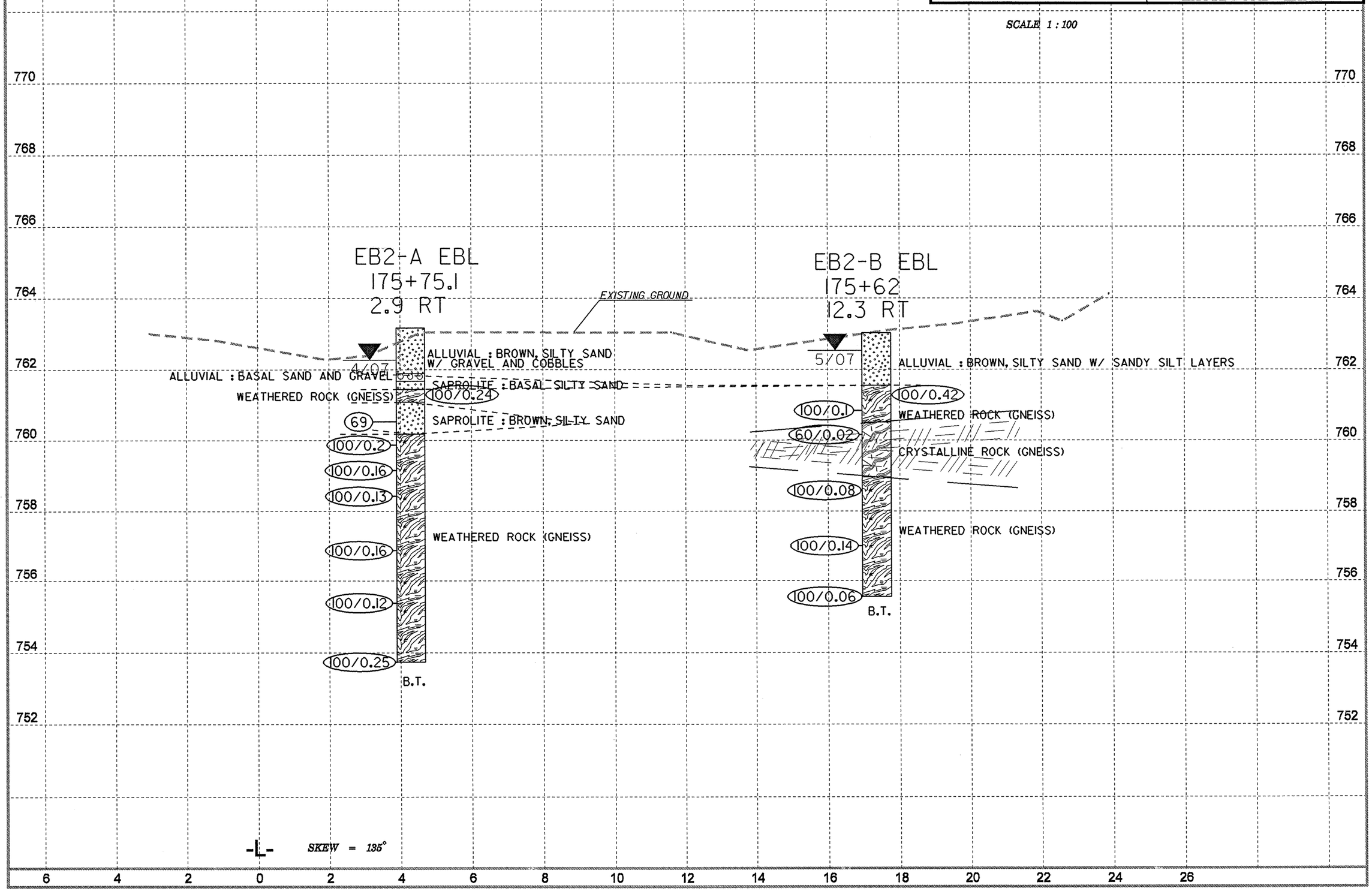


PROJECT REFERENCE NO.	SHEET
R-2518B	25/48

SECTION THRU EB2 EASTBOUND LANE

0 2 4
METERS
VE = 1

SCALE 1 : 100



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. EB1-A EBL	STATION 175+27.0	OFFSET 4.0m RT	ALIGNMENT -L-
COLLAR ELEV. 765.40 m	TOTAL DEPTH 11.81 m	NORTHING 245,246.4	EASTING 302,662.8
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 05/09/07	COMP. DATE 05/09/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 11.2 m

GROUND WTR (m): 0 HR. N/A; 24 HR. 2.50

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
766									
765.40	0.00								GROUND SURFACE
									ROADWAY EMBANKMENT GREY, SILTY SAND
763.90	1.50								
		4	3	3	6				
763.10	2.30								**ALLUVIAL** BROWN, SILTY SAND W/GRAVEL AND COBBLES
762.38	3.02								
		8	11	15	26				
761.53	3.87								**SAPROLITE** TAN, SILTY SAND
760.86	4.54								
		28	42	33	75				
759.90	5.50								**WEATHERED ROCK** (GNEISS)
759.34	6.06								
		100/0.12			100/0.12				
758.40	7.00								**SAPROLITE** BROWN, SILTY SAND
757.82	7.58								
		46	45	26	71				
756.90	8.50								**WEATHERED ROCK** (GNEISS)
756.30	9.10								
		100/0.14			100/0.14				
754.90	10.50								**SAPROLITE** BROWN, SILTY SAND
754.78	10.62								
		20	16	14	30				
754.20	11.20								**CRYSTALLINE ROCK** (GNEISS)
753.60	11.80								
		60/0.02			60/0.02				

Boring Terminated with Standard Penetration Test Refusal at Elevation 753.59 m IN CRYSTALLINE ROCK (GNEISS)

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. EB1-B EBL	STATION 175+18.0	OFFSET 12.7m RT	ALIGNMENT -L-
COLLAR ELEV. 765.11 m	TOTAL DEPTH 8.95 m	NORTHING 245,238.3	EASTING 302,653.3
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 05/04/07	COMP. DATE 05/08/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 8.9 m

GROUND WTR (m): 0 HR. N/A; 24 HR. 2.20

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
766									
765.11	0.00								GROUND SURFACE
									ROADWAY EMBANKMENT GREY, SILTY SAND
763.60	1.51								
		2	2	2	4				
762.81	2.30								**ALLUVIAL** BROWN, SILTY SAND W/GRAVEL AND COBBLES
762.09	3.02								
		17	11	11	22				
761.79	3.32								**SAPROLITE** TAN, SILTY SAND
761.33	3.78								
		16	14	24	38				
760.57	4.54								
		11	30	43	73				
759.96	5.15								**WEATHERED ROCK** (GNEISS)
759.81	5.30								
		100/0.13			100/0.13				
759.05	6.06								
		100/0.14			100/0.14				
757.53	7.58								
		100/0.11			100/0.11				
756.16	8.95								
		60/0.0			60/0.0				
756.16	8.95								**CRYSTALLINE ROCK** (GNEISS)

Boring Terminated with Standard Penetration Test Refusal at Elevation 756.16 m ON CRYSTALLINE ROCK (GNEISS)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. B2-A EBL	STATION 175+59.0	OFFSET 3.1m RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 763.28 m	TOTAL DEPTH 13.64 m	NORTHING 245,245.4	EASTING 302,694.8	24 HR. 0.67
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 04/19/07	COMP. DATE 04/19/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 3.3 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
764									763.28 GROUND SURFACE	0.00
									ALLUVIAL SILTY SAND W/ GRAVEL AND SILT LAYERS	
									762.10	1.18
761.82	1.46	8	8	35	43				ALLUVIAL BASAL SAND AND GRAVEL W/ COBBLES 761.52	1.76
									SAPROLITE BROWN SILTY SAND 761.37	1.91
760.30	2.98	100/0.05			100/0.05				WEATHERED ROCK (GNEISS) 760.00	3.28
									CRYSTALLINE ROCK W/ LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 67% TOTAL RQD = 28%	
									749.64	13.64
									Boring Terminated at Elevation 749.64 m IN CRYSTALLINE ROCK (GNEISS)	

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK			GROUND WTR (m)
BORING NO. B2-B EBL	STATION 175+51.0	OFFSET 11.2m RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 763.28 m	TOTAL DEPTH 14.84 m	NORTHING 245,237.8	EASTING 302,686.3	24 HR. 0.67
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 04/18/07	COMP. DATE 04/18/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 3.3 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (m)
764									763.28 DATUM SURFACE	0.00
									ALLUVIAL BROWN SILTY SAND	
									762.08	1.20
761.80	1.48	13	21	43	64				761.88 ALLUVIAL BASAL SAND AND GRAVEL W/ COBBLES	1.40
									SAPROLITE BROWN SILTY SAND 761.09	2.19
760.28	3.00								WEATHERED ROCK (GNEISS)	
760.01	3.27	100/0.12			100/0.12 60/0.03				760.01	3.27
		60/0.03							CRYSTALLINE ROCK W/ LAYERS OF WEATHERED ROCK (GNEISS) TOTAL REC = 69% TOTAL RQD = 15%	
									748.44	14.84
									Boring Terminated at Elevation 748.44 m IN CRYSTALLINE ROCK (GNEISS)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.	
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK				GROUND WTR (m)
BORING NO. EB2-A EBL	STATION 175+71.1	OFFSET 2.9m RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 763.18 m	TOTAL DEPTH 9.44 m	NORTHING 245,244.8	EASTING 302,207.0	24 HR. 0.91
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic	
START DATE 04/24/07	COMP. DATE 04/24/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
764										
									763.18 GROUND SURFACE	0.00
									ALLUVIAL BROWN SILTY SAND W/ GRAVEL AND COBBLES	
									761.89	1.29
761.59	1.59								761.68 ALLUVIAL BASAL SAND AND GRAVEL	1.50
		10	41	59/0.09	100/0.24				761.44	1.74
760.83	2.35								761.08 SAPROLITE BROWN SILTY SAND	2.10
		25	30	39	69				WEATHERED ROCK (GNEISS)	
760.07	3.11								760.18	3.00
		77	23/0.05		100/0.2				SAPROLITE BROWN SILTY SAND	
759.31	3.87								WEATHERED ROCK (GNEISS)	
		88	12/0.01		100/0.16					
758.55	4.63									
		100/0.13			100/0.13					
757.03	6.15									
		89	11/0.01		100/0.16					
755.51	7.67									
		100/0.12			100/0.12					
753.99	9.19									
		60	40/0.1		100/0.25				753.74	9.44
									Boring Terminated at Elevation 753.74 m IN WEATHERED ROCK (GNEISS)	

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Hager, M. M.	
SITE DESCRIPTION DUAL BRIDGES ON US-19 OVER BALD CREEK				GROUND WTR (m)
BORING NO. EB2-B EBL	STATION 175+62.0	OFFSET 12.3m RT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 763.03 m	TOTAL DEPTH 7.47 m	NORTHING 245,236.0	EASTING 302,697.2	24 HR. 0.49
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic	
START DATE 05/03/07	COMP. DATE 05/03/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 2.5 m	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
764										
									763.03 GROUND SURFACE	0.00
									ALLUVIAL BROWN, SILTY SAND W/ SANDY SILT LAYERS	
761.70	1.33								761.55	1.48
		18	82	18	100/0.42				WEATHERED ROCK (GNEISS)	
760.94	2.09									
		100/0.1			100/0.1					
760.18	2.85								760.51	2.52
		60/0.02			60/0.02				CRYSTALLINE ROCK (GNEISS)	
758.66	4.37								758.96	4.07
		100/0.08			100/0.08				WEATHERED ROCK (GNEISS)	
757.14	5.89									
		100/0.14			100/0.14					
755.62	7.41									
		100/0.06			100/0.06				755.56	7.47
									Boring Terminated at Elevation 755.56 m IN WEATHERED ROCK (GNEISS)	

SHEET ____ OF ____

DATE 5/8/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-B EBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+33.1 10.4m Rt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 763.31 m. TOTAL DEPTH: 15.08 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
755.55	7.76		1.24	0.70 56	0.00 0		GNEISS. MOD. TO V. SEVERE WEATHERED, MOD. HARD.
754.31	9.00						
754.31	9.00		1.52	0.56 37	0.13 9		9.00 - 9.44m GNEISS. MOD. TO V. SEVERE WEATHERED, MOD. HARD. CLOSE TO VERY CLOSE FRACTURED. 9.44 - 10.52m LOW RECOVERY.
752.79	10.52						
752.79	10.52		1.52	0.90 59	0.18 12		10.52 - 11.10 POOR RECOVERY 11.10 - 12.04 GNEISS. MOD. WEATHERED, MOD. HARD.
751.27	12.04						
751.27	12.04		1.52	1.21 80	0.15 10		CLOSE FRACTURED GNEISS. MODERATE WEATHERING, MODERATE HARDNESS.
749.75	13.56						
749.75	13.56		1.52	1.42 93	0.10 7		CLOSE FRACTURED GNEISS. MODERATE TO MOD. SEVERE WEATHERING, MEDIUM HARD TO SOFT.
748.23	15.08						

CORING TERMINATED AT
ELEVATION 748.23 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 4/19/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-A EBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+59 3.1m Rt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 763.28 m. TOTAL DEPTH: 13.64 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
760.00	3.28		1.24	0.91 73	0.11 9		VERY CLOSELY FRACTURED HORNBLENDE GNEISS. MODERATELY SEVERELY TO MODERATE WEATHERED SOFT TO MODERATELY HARD
758.76	4.52		1.52	0.62 41	0.00 0		VERY CLOSELY FRACTURED HORNBLENDE GNEISS. MODERATELY SEVERELY WEATHERED SOFT TO MEDIUM HARD
757.24	6.04		1.52	0.83 55	0.64 42		CLOSELY FRACTURED HORNBLENDE GNEISS. MODERATELY WEATHERED MEDIUM HARD
755.72	7.56		1.52	1.25 82	0.54 36		VERY CLOSELY FRACTURED HORNBLENDE GNEISS. MODERATELY SEVERELY TO MODERATE WEATHERED SOFT TO MODERATELY HARD
754.20	9.08		1.52	0.86 57	0.17 11		CLOSE TO VERY CLOSELY FRACTURED HORNBLENDE GNEISS. MODERATELY SEVERELY WEATHERED SOFT
752.68	10.60		1.52	0.98 64	0.28 18		CLOSELY FRACTURED FELSIC AND HORNBLENDE GNEISS. MODERATELY WEATHERED SOFT TO MEDIUM HARD
751.16	12.12						

CORING TERMINATED AT
ELEVATION 749.64 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 4/19/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-A EBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+59 3.1m Rt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 763.28 m. TOTAL DEPTH: 13.64 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
751.16	12.12		1.52	1.52 100	1.14 75		LAYERED AND SPOTTED (CHLORITE PORPHYROBLASTS) GNEISS SLIGHTLY WEATHERED, HARD WITH RUSTY, SCALE FILLED VERTICAL FRACTURES.
749.64	13.64						

CORING TERMINATED AT
ELEVATION 749.64 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 4/18/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-B EBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+51 11.2m Rt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 763.28 m. TOTAL DEPTH: 14.84 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
759.97	3.31		0.89	0.73 82	0.12 13		CLOSELY FRACTURED HORNBLENDE GNEISS. SLIGHTLY WEATHERED AND MODERATELY HARD.
759.08	4.20		1.52	1.28 84	0.81 53		HORNBLENDE GNEISS. SLIGHTLY TO SEVERELY WEATHERED, MOD. HARD TO SOFT.
757.56	5.72		1.52	0.11 7	0.00 0		HORNBLENDE GNEISS. WITH WEATHERED ROCK.
756.04	7.24		1.52	1.15 76	0.84 55		HORNBLENDE GNEISS. VERY HARD AND FRESH TO SEVERELY WEATHERED AND SOFT.
754.52	8.76		1.52	0.94 62	0.00 0		LAYERED GNEISS AND MASSIVE HORNBLENDE GNEISS, CLOSE FRACTURES IN PLACES. SLIGHT TO SEVERELY WEATHERED AND, HARD TO SOFT.
753.00	10.28		1.43	0.68 48	0.12 8		POOR RECOVERY AT TOP AND BOTTOM OF RUN. CLOSE FRACTURED MYLONITE GNEISS.
751.57	11.71						

CORING TERMINATED AT ELEVATION 748.44 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

DATE 4/18/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-B EBL GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO.30 ON US 19 OVER BALD CREEK 175+51 11.2m Rt. -L-

COUNTY: YANCEY COLLAR ELEVATION: 763.28 m. TOTAL DEPTH: 14.84 m.

ELEV. METERS	DEPTH METERS	DRILL RATE MIN./.305m.	RUN METERS	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
751.57	11.71		1.61	1.52 94	0.52 32		SLIGHTLY TO SEVERELY WEATHERED, HARD TO SOFT HORNBLENDE AND MYLONITE GNEISS WITH CLOSE FRACTURES.
749.96	13.32		1.52	0.74 49	0.11 7		SLIGHT TO V. SEVERELY WEATHERED - MOD. HARD TO VERY SOFT. 13.31 - 13.64 MYLONITE GNEISS WITH VERY CLOSE FRACTURES. 13.64 - 14.44 NO RECOVERY 14.44 - 14.84 RUBBLE & LAYERED GNEISS
748.44	14.84						

CORING TERMINATED AT ELEVATION 748.44 m.

DRILLER: DO CHEEK CORE SIZE: NXWL EQUIPMENT: CME-550

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34445.1.1 TIP: R-2518B COUNTY: YANCEY

DESCRIPTION(1): CULVERT 30 ON US-19 OVER BALD CREEK

EXISTING BRIDGE

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

Bridge No.: 30 Length: 26.8 Total Bents: Bents in Channel: Bents in Floodplain:
Foundation Type: 4 BARREL CONCRETE BOX CULVERT ON SKEW OF 135 DEGREES

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: UPSTREAM WEST BANK HAS BEEN REINFORCED WITH BOULDERS. WING WALL THERE HAS A 1.1 METER DEEP SCOUR HOLE.

Interior Bents: N/A

Channel Bed: SCOUR HOLE AT TOE OF SOUTH WEST WING WALL AND INLET TO FIRST (WESTERN MOST BOX.

Channel Bank: DOWNSTREAM WEST BANK HAS BEEN REINFORCED WITH STACKED COBBLES.

EXISTING SCOUR PROTECTION

Type(3): BOULDERS, COBBLES. CONCRETE WINGS ON ON ALL 4 CORNERS.

Extent(4): BOULDER RIP RAP ON WEST BANK UPSTREAM - COBBLES DOWNSTREAM WEST BANK.

Effectiveness(5): VERY GOOD

Obstructions(6): NONE

INSTRUCTIONS

1 Describe the specific site's location, including route number and body of water crossed.
2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
3 Note existing scour protection (e.g. rip rap).
4 Describe extent of existing scour protection.
5 Describe whether or not the scour protection appears to be working.
6 Note obstructions such as dams, fallen trees, debris at bents, etc.
7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
10 Determine the approximate floodplain width from field observation or a topographic map.
11 Describe the material covering the floodplain (e.g. grass, trees, crops).
12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): ALLUVIAL GRAVEL AND COBBLES WITH SILTY SAND MATRIX.

Channel Bank Material(8): BROWN SILT AND BROWN SAND.

Channel Bank Cover(9): BRUSH AND WEEDS.

Floodplain Width(10): 130 METERS

Floodplain Cover(11): FIELDS

Stream is(12): Aggrading Degrading XXX Static

Channel Migration Tendency(13): TO THE WEST

Observations and Other Comments: EXISTING FLOW FOCUSED ON SW WING WALL AND DEFLECTING INTO FIRST BARREL OF CULVERT.

DESIGN SCOUR ELEVATIONS(14) Feet Meters XXX

ELEV. IN METERS

EBL B1	762.5										
EBL B2	762.4										
WBL B1	762.4										
WBL B2	761.8										

Comparison of DSE to Hydraulics Unit theoretical scour:
DSE IS THE SAME AS THE THEORETICAL SCOUR CALCULATED BY THE HYDRAULICS UNIT ON THE BRIDGE SURVEY AND HYDRAULIC REPORT DATED 4/22/05.

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: P.Q. Lockamy PQ LOCKAMY Date: 5/29/2007

34445.1.1
R-2518B

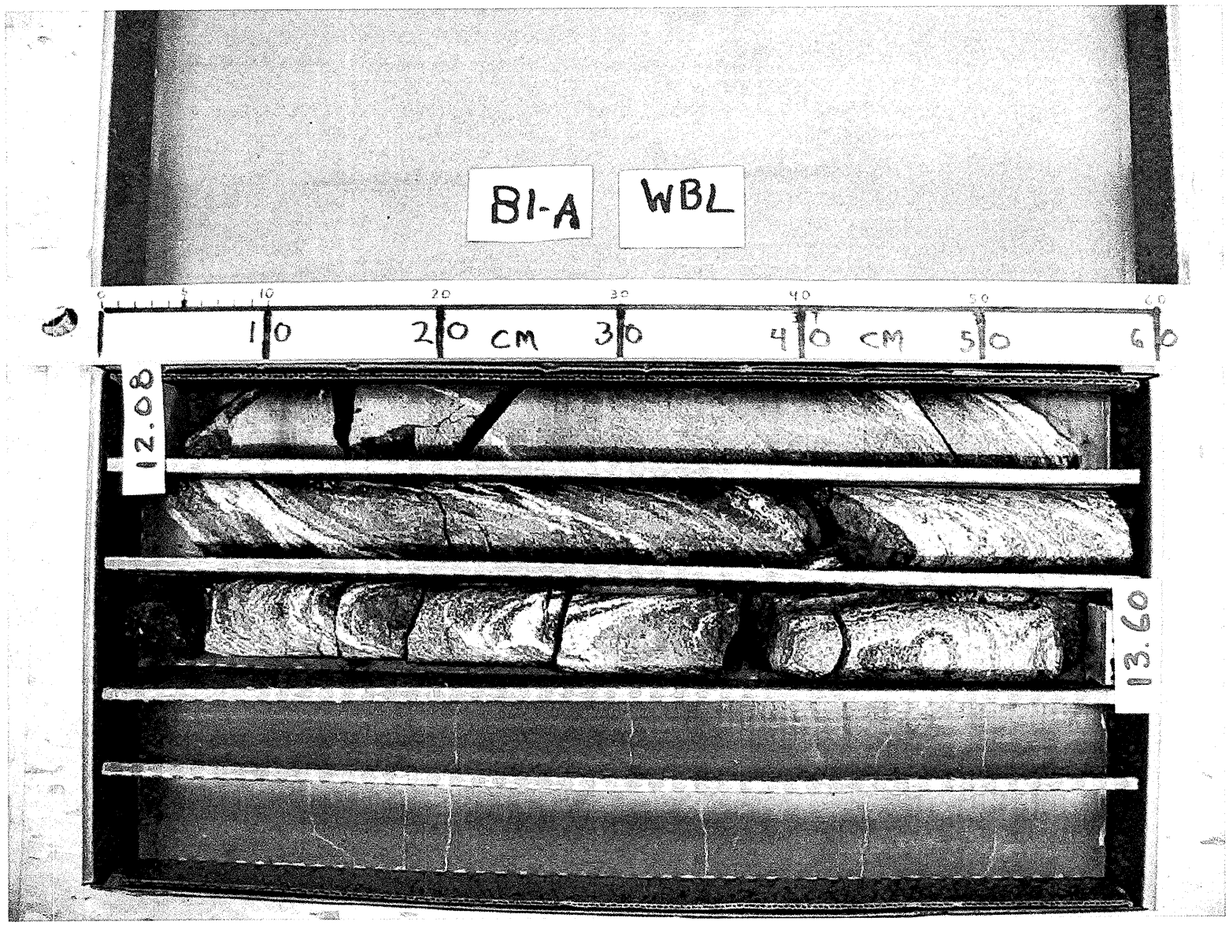
Yancey County Bridge 30 on US-19
Over Bald Creek. B1-A WBL Box 1

34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B1-A WBL Box 2

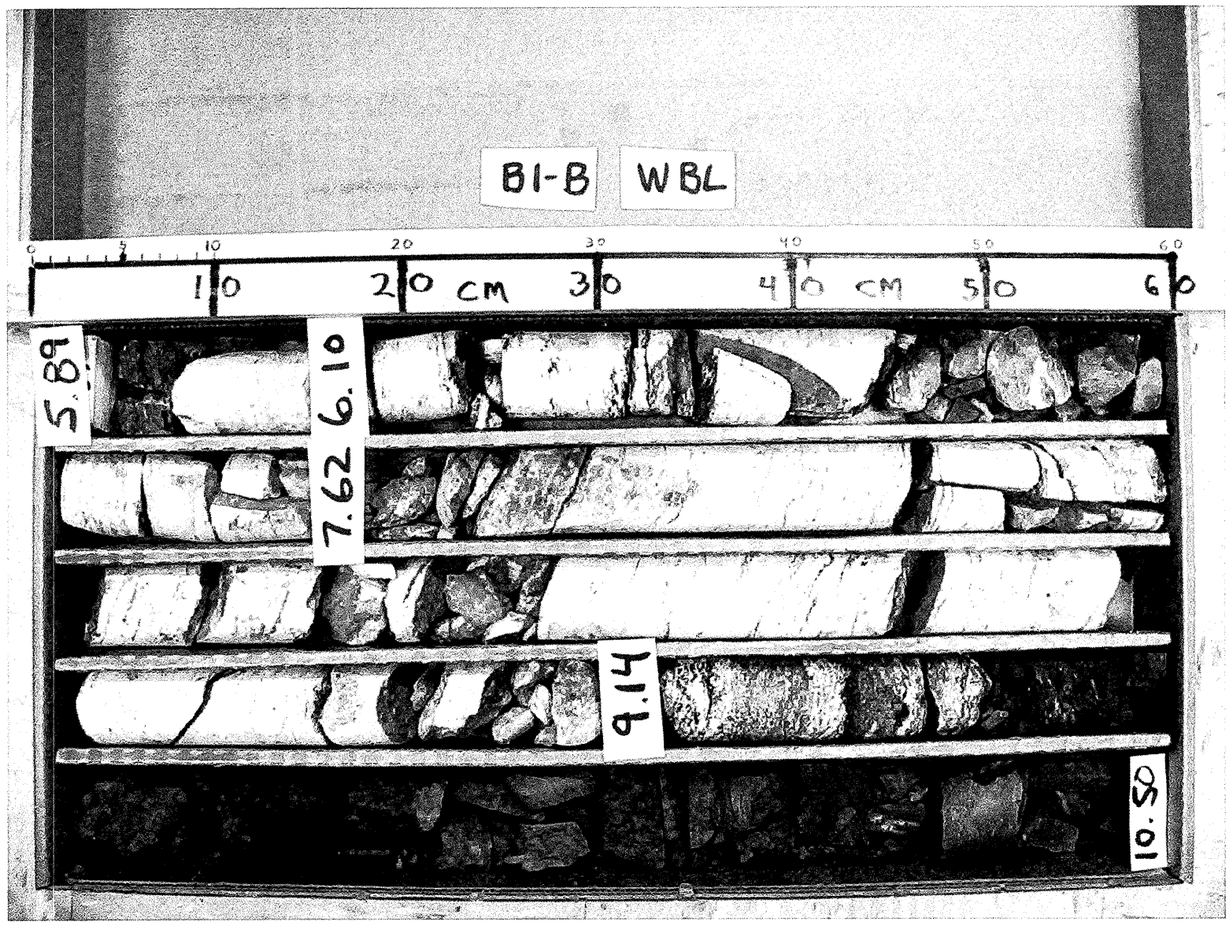
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B1-A WBL Box 3



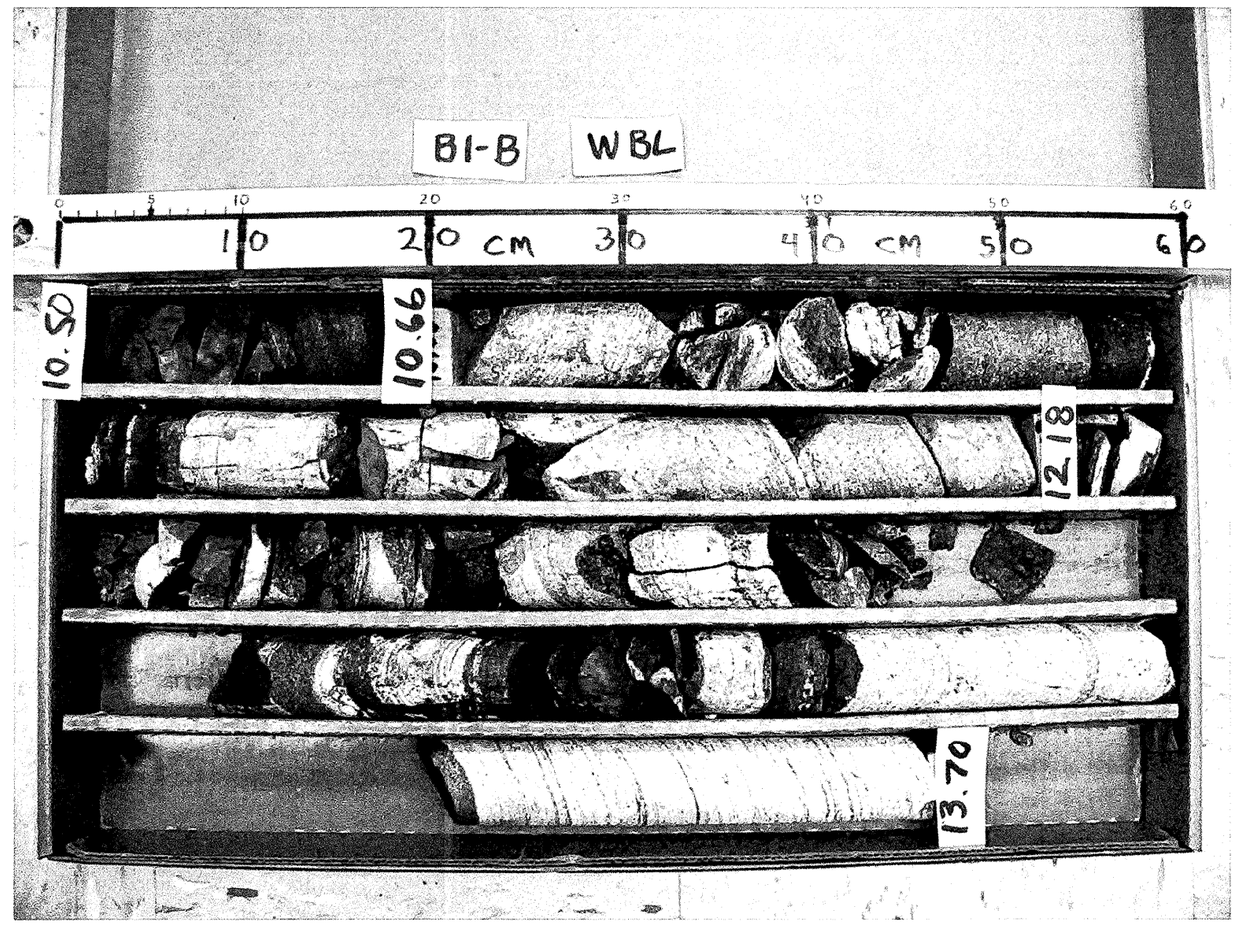
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B1-B WBL Box 1



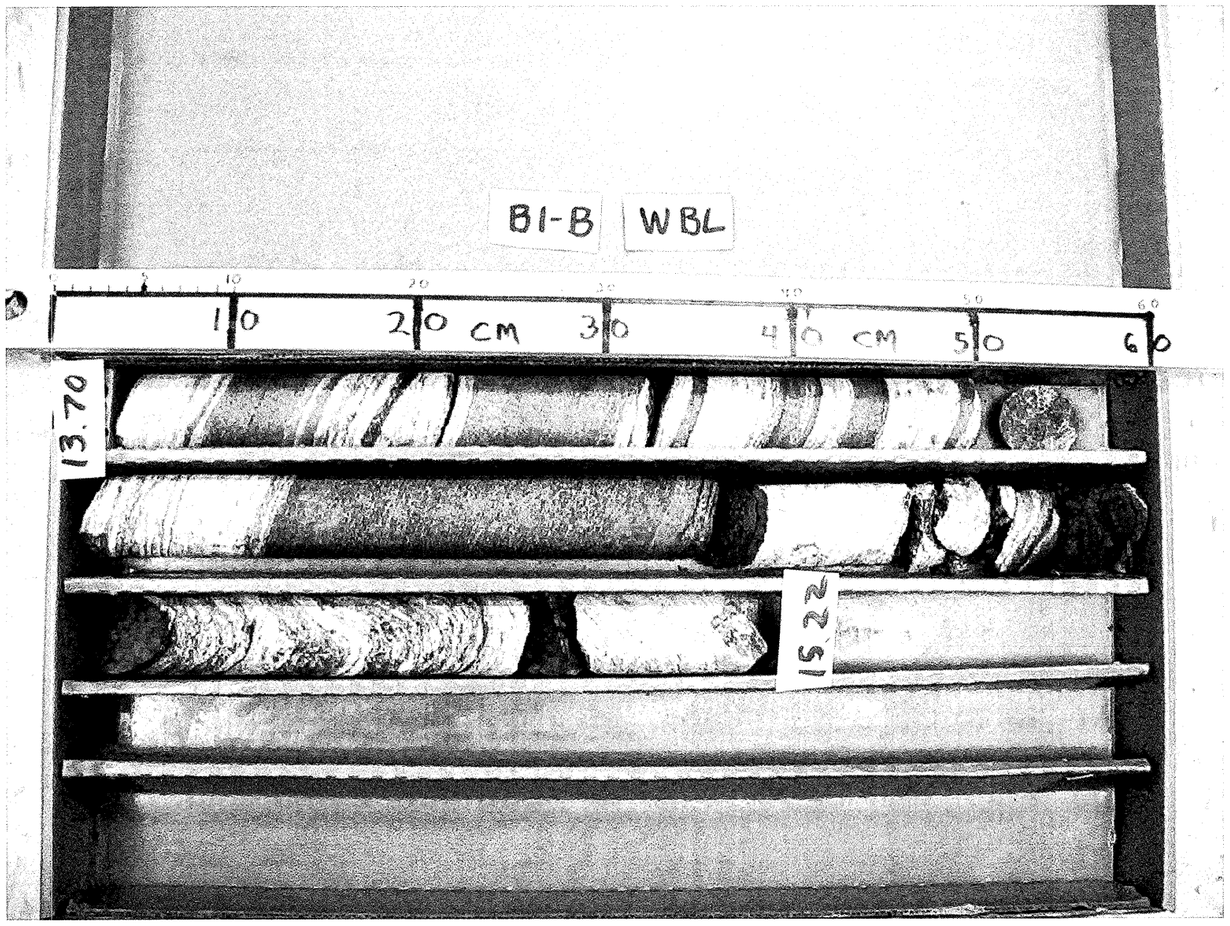
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B1-B WBL Box 2



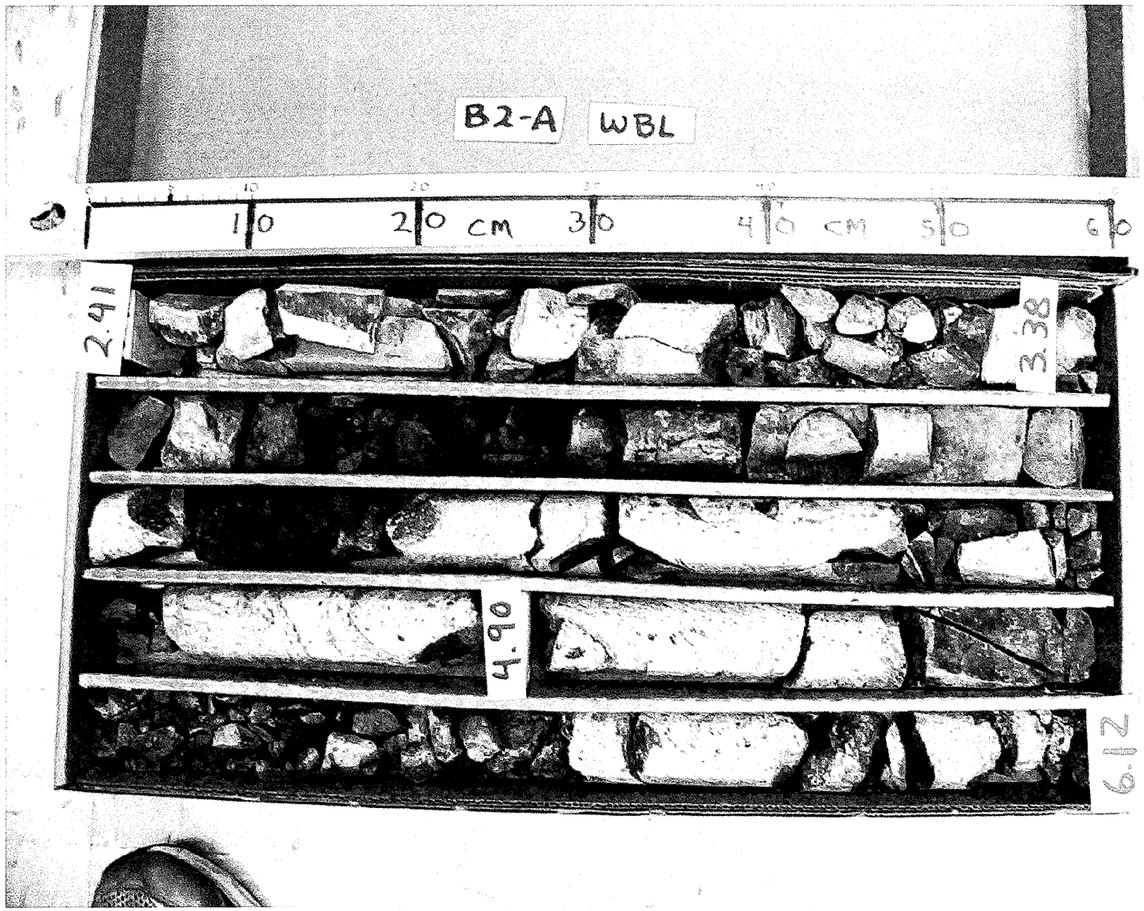
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B1-B WBL Box 3



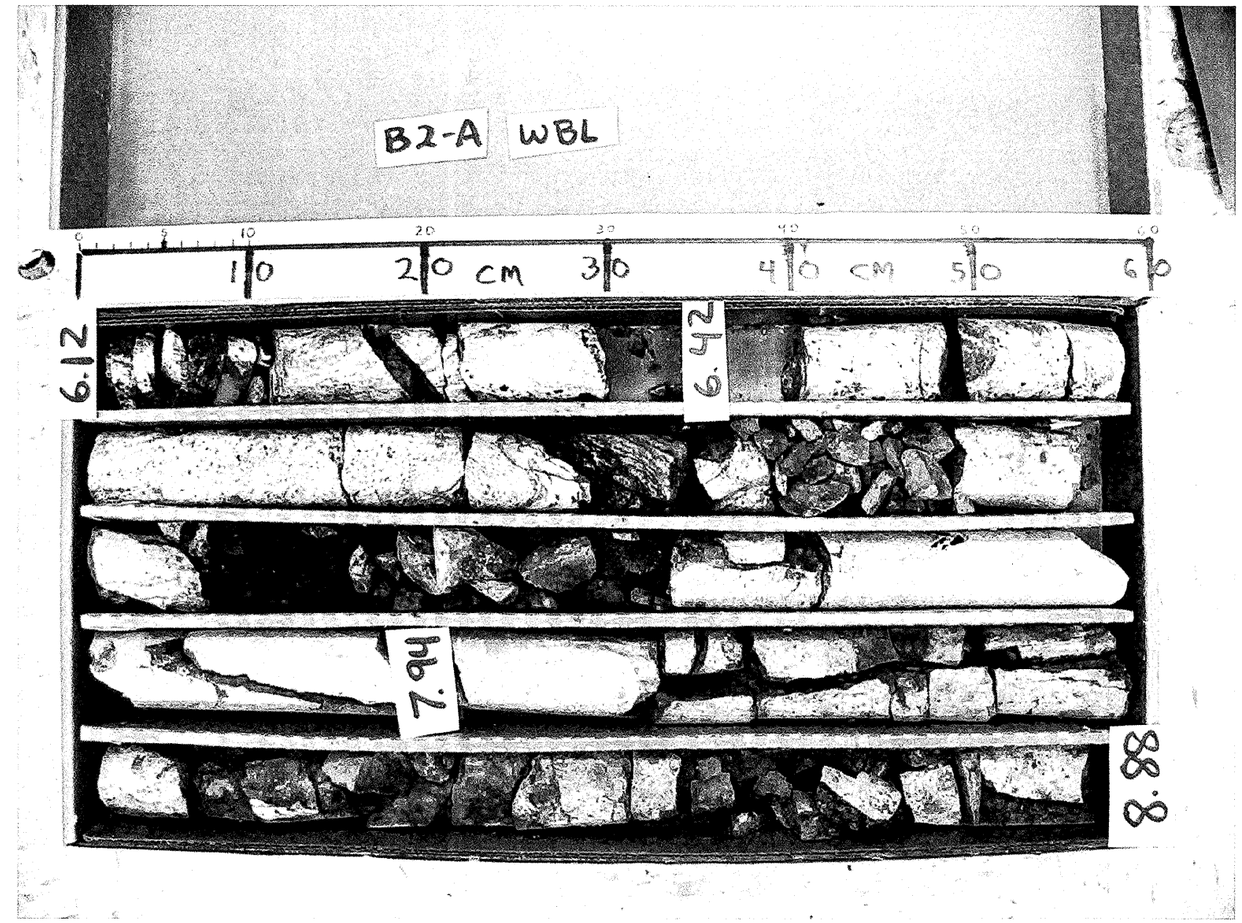
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A WBL Box 1



34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A WBL Box 2

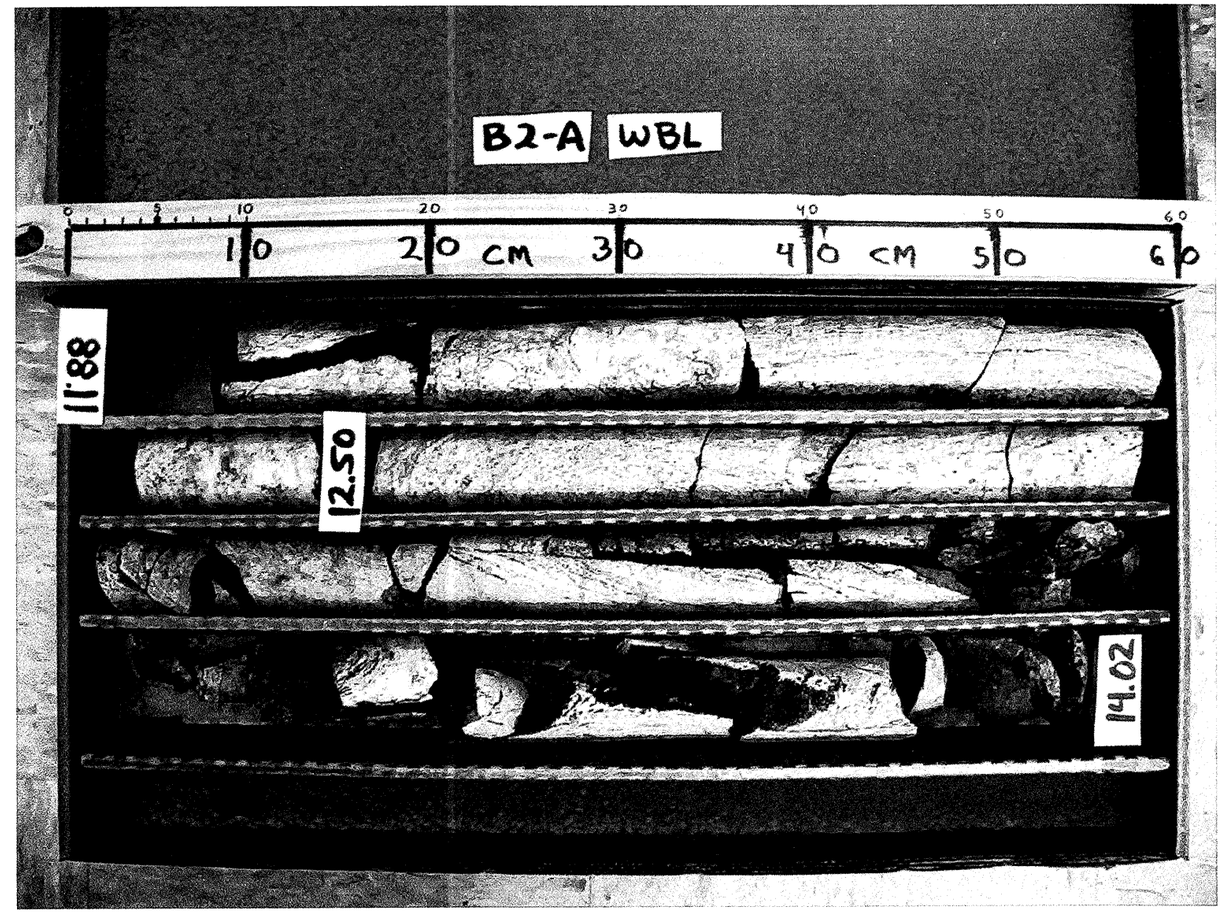


34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A WBL Box 3

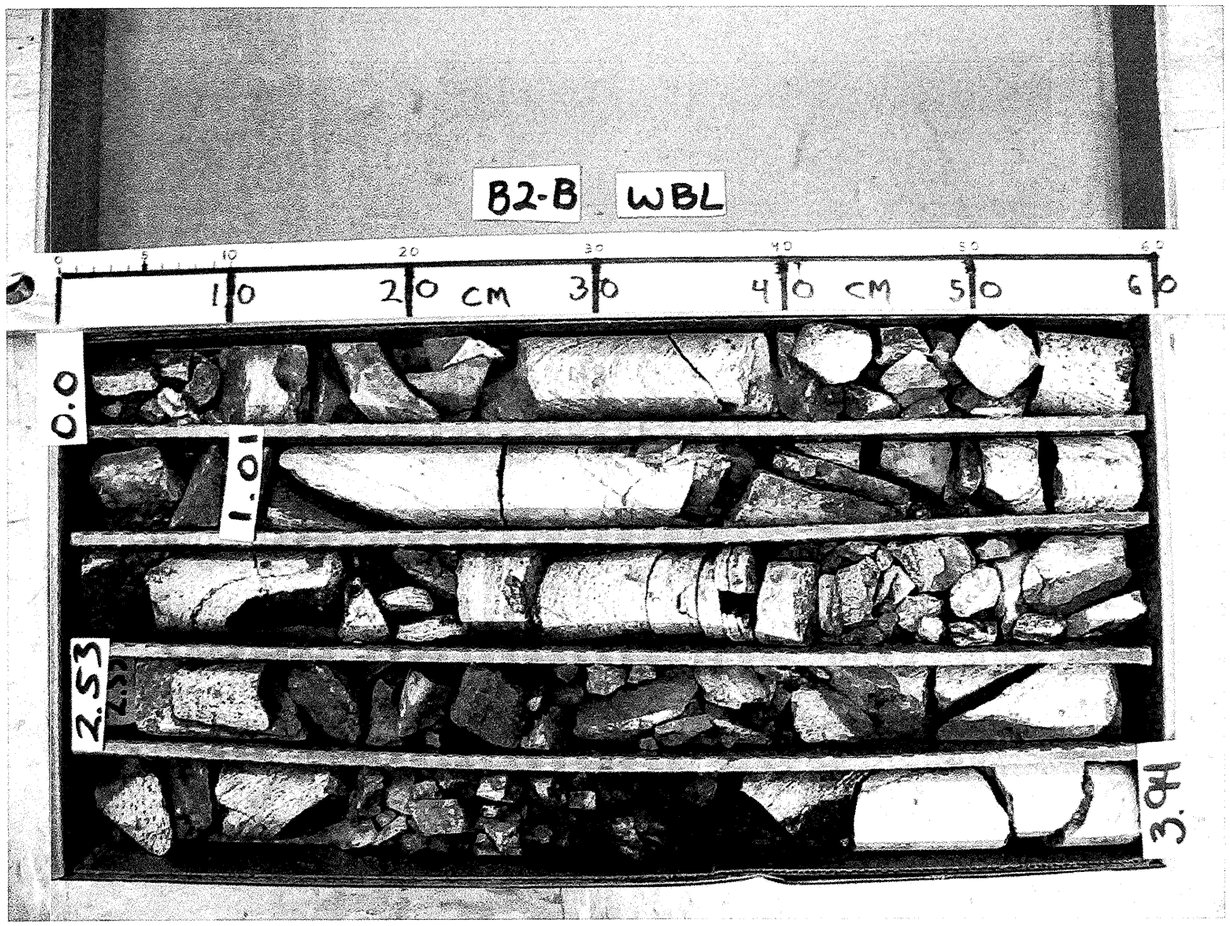
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A WBL Box 4



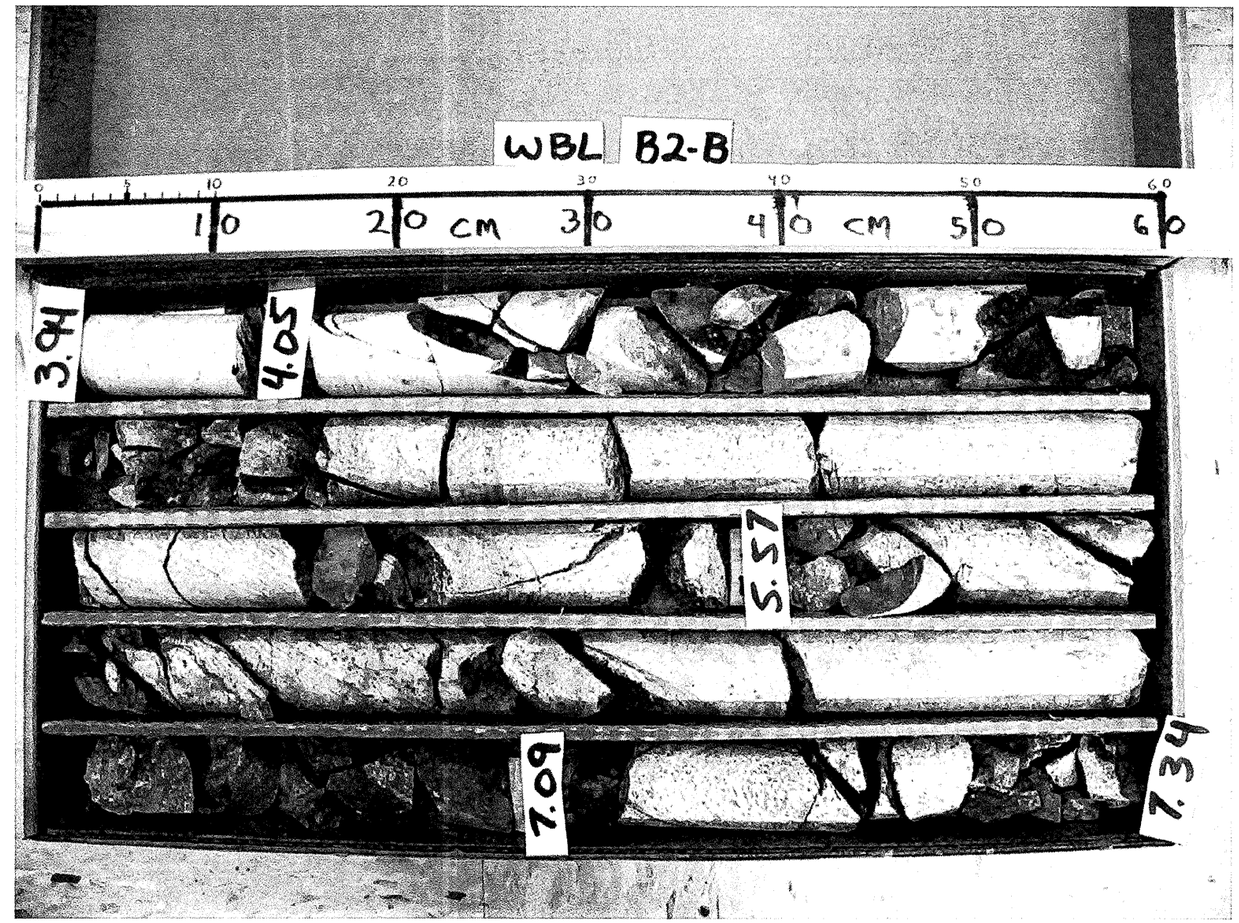
34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-B WBL Box 1



34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-B WBL Box 2



34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-B WBL Box 3

34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. EB1-A WBL Box 1

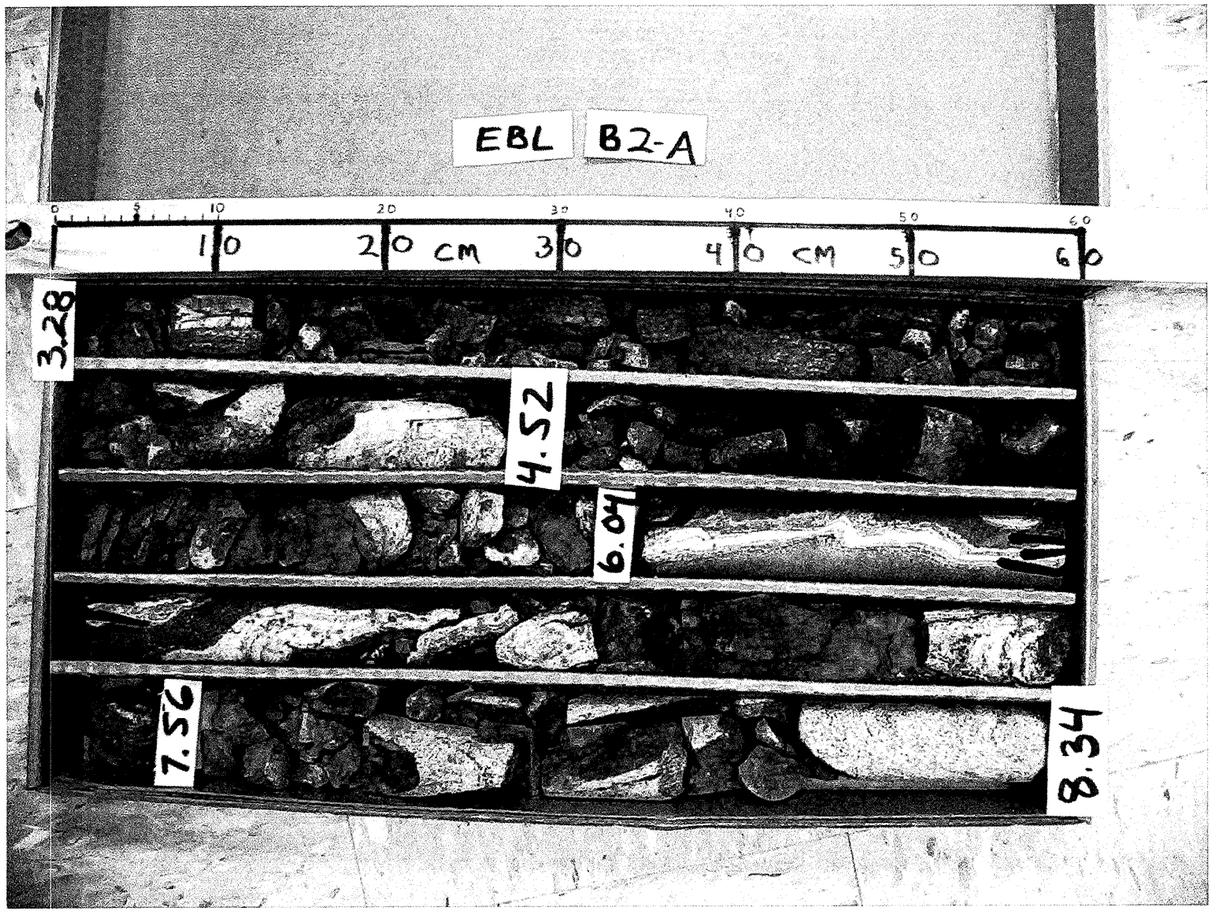
Yancey County Bridge 30 on US-19
Over Bald Creek. B1-B EBL Box 1

34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B1-B EBL Box 2

34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A EBL Box 1



34445.1.1
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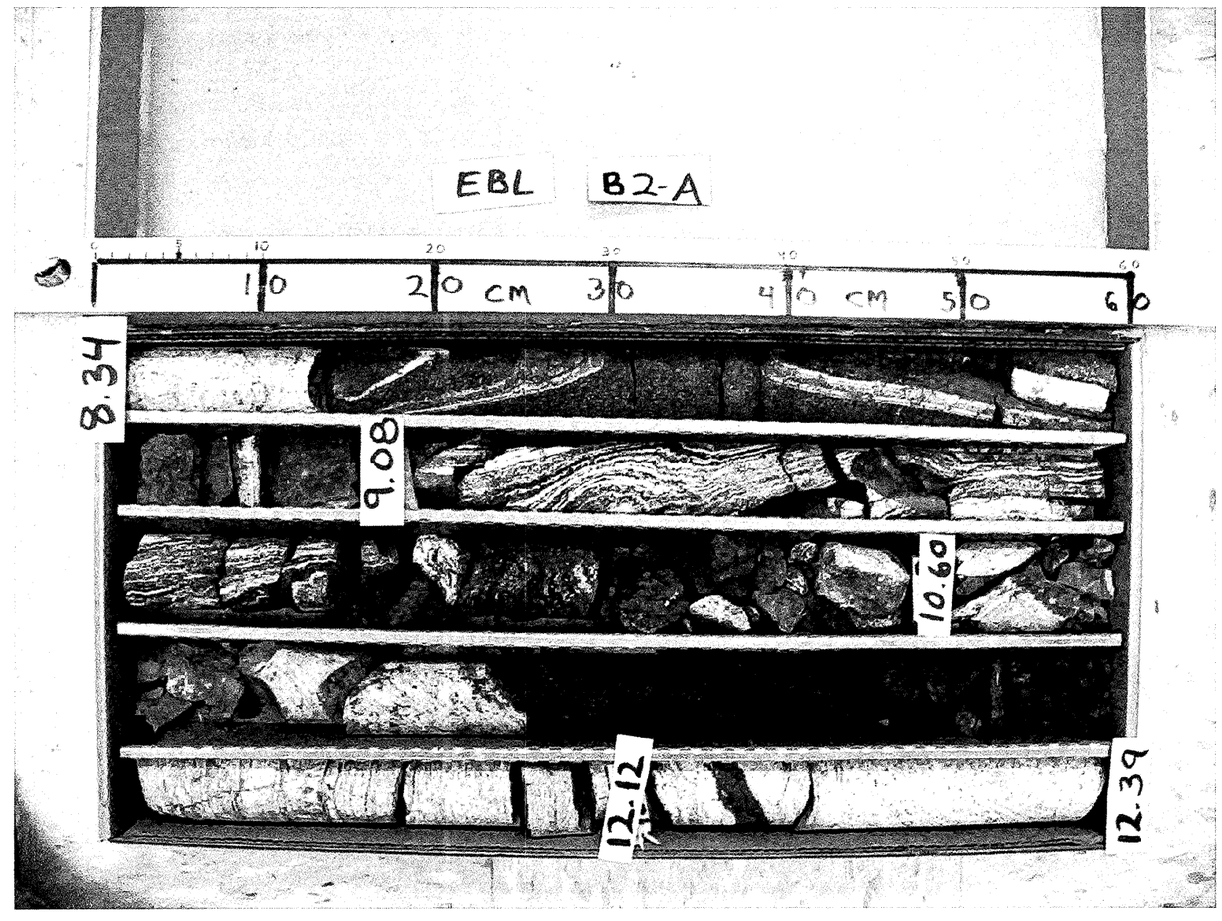
Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A EBL Box 2



34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-A EBL Box 3

34445.1.1
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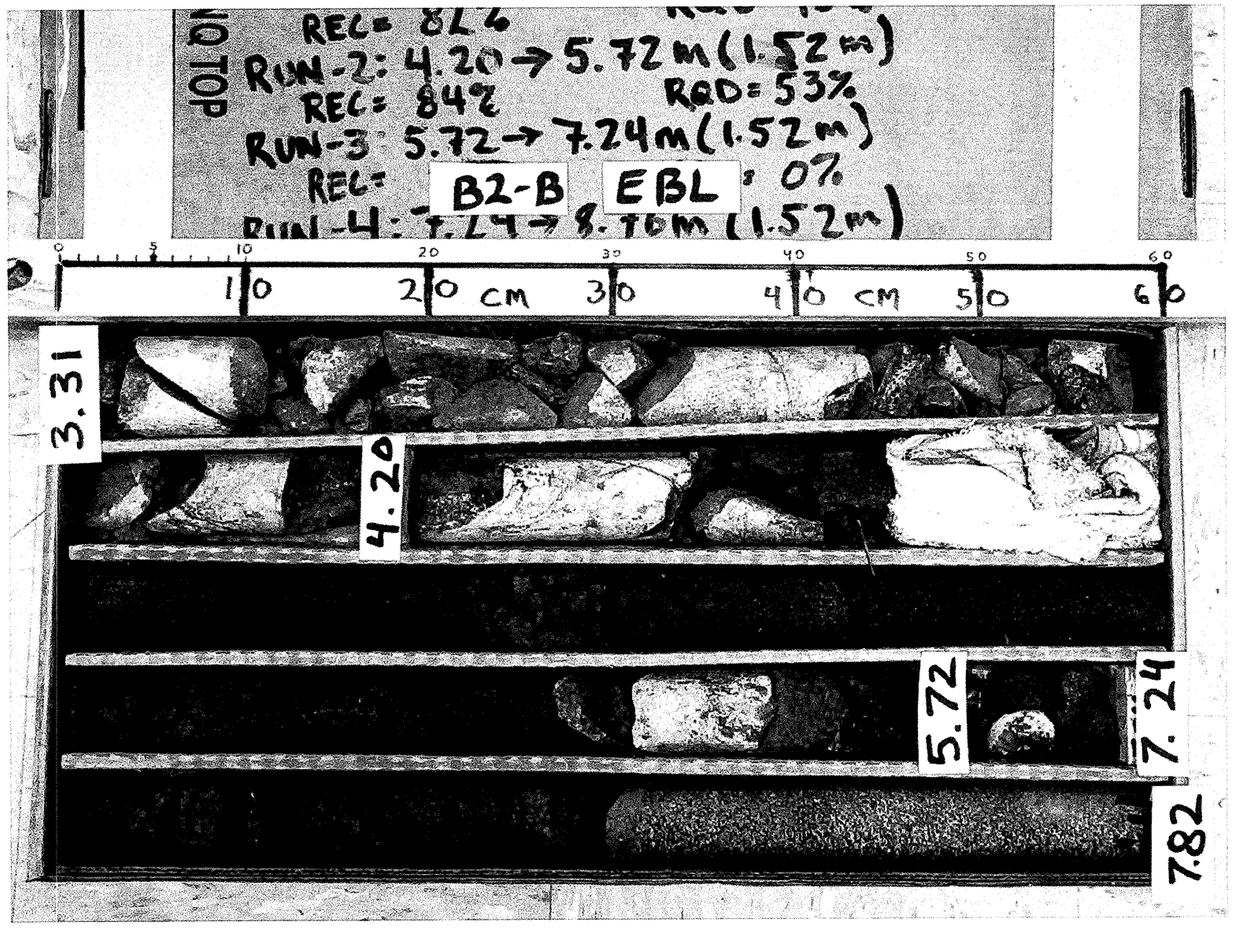
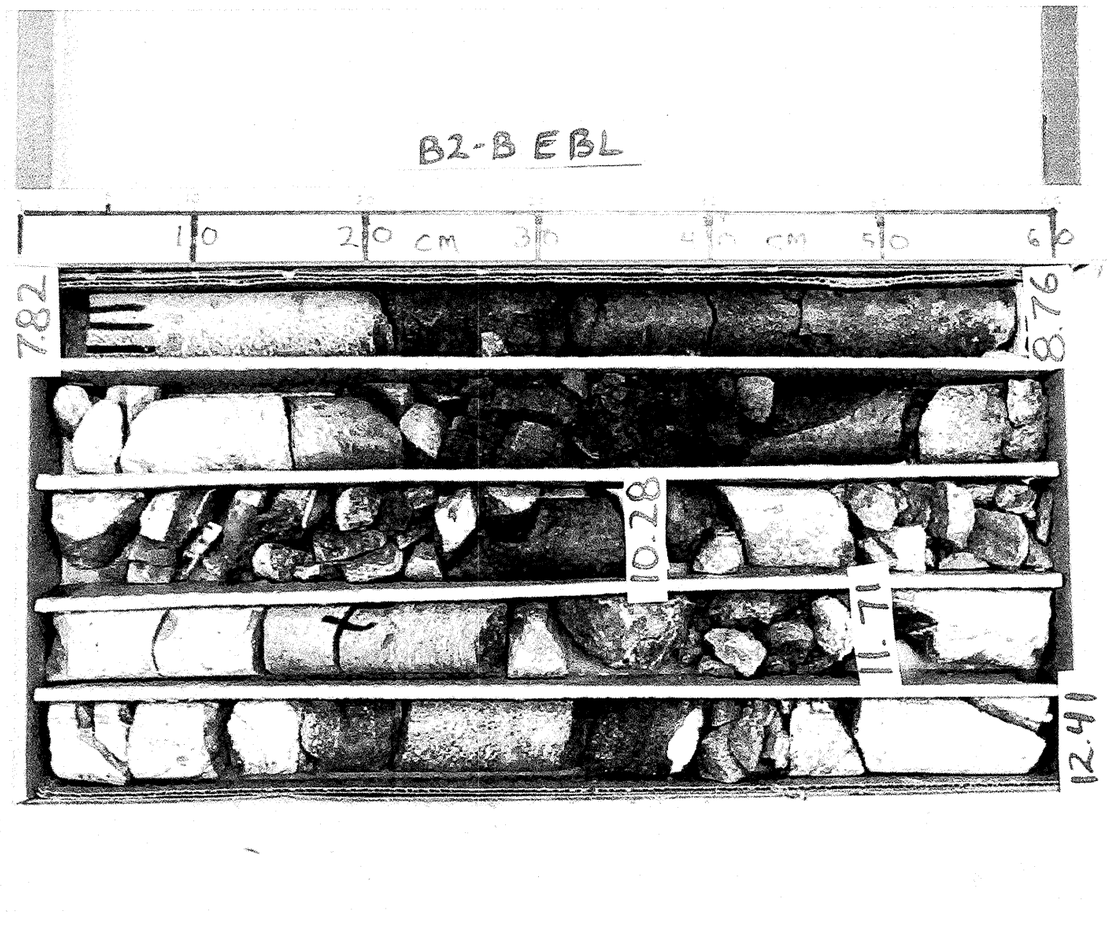
Yancey County Bridge 30 on US-19
Over Bald Creek. B2-B EBL Box 1



Close fractures in places.
Note recovery from 5.72 to 7.24 meters.
Massive hornblende gneiss is fresh near 7.8 meters.

34445.1.1
R-2518B

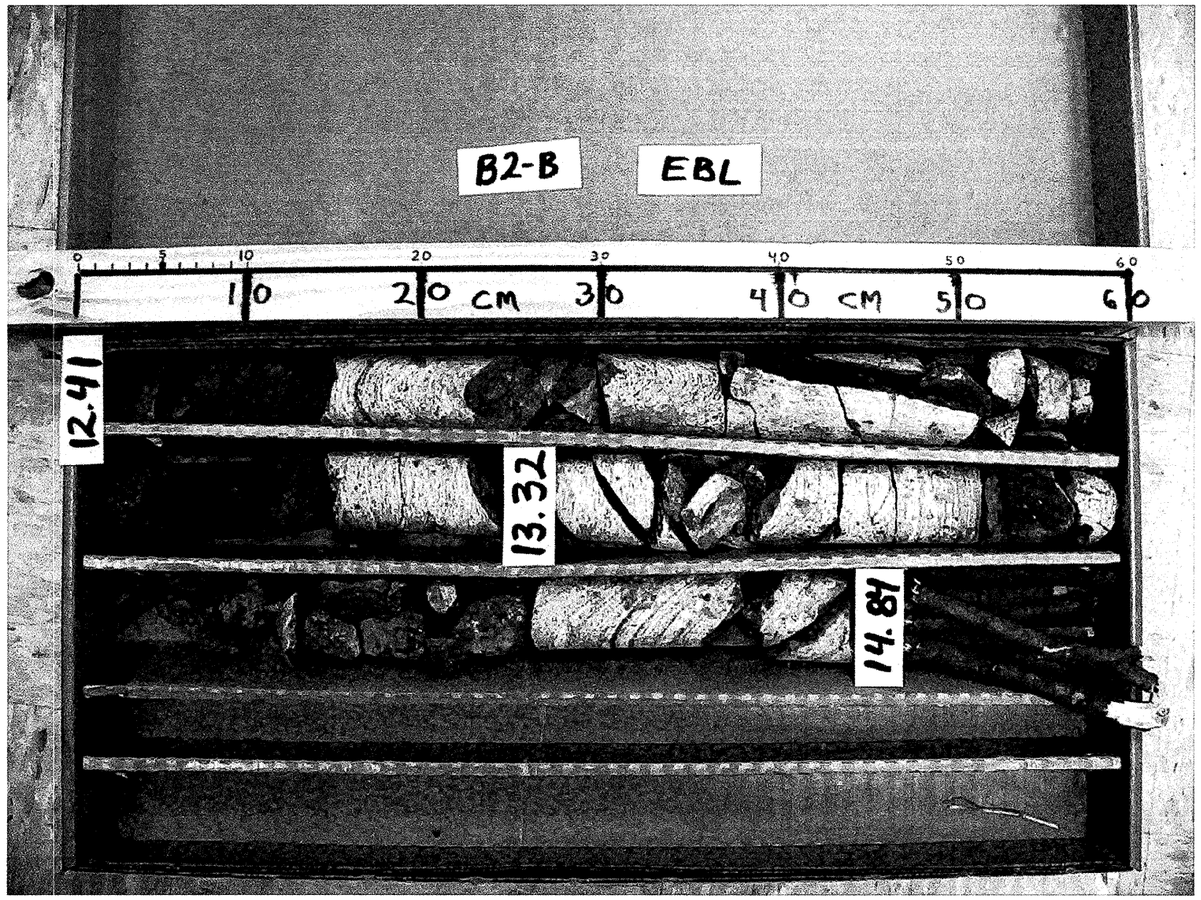
Yancey County Bridge 30 on US-19
Over Bald Creek. B2-B EBL Box 2



Close fractures in places.
Differential weathering abounds.

34445.1.1
R-2518B

Yancey County Bridge 30 on US-19
Over Bald Creek. B2-B EBL Box 3



34445.1.1
R-2518B

Stream flow focused on SW wing wall.

Yancey County Bridge 30 on US-19
Over Bald Creek.

34445.1.1
R-2518B

Normal flow in western most box only.
Basal sand and gravel in next box is exposed.

Yancey County Bridge 30 on US-19
Over Bald Creek.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34445.1.1 (R-2518B)	1	20

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34445.1.1 (R-2518B) F.A. PROJ. _____

COUNTY YANCEY

PROJECT DESCRIPTION US-19 FROM EAST OF MADISON COUNTY LINE TO SR-1336 (JACK'S CREEK ROAD)

SITE DESCRIPTION BRIDGE NO. 9 (STRUCTURE NO.4) ON US-19 OVER CANE RIVER

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5	PROFILE
6	CROSS SECTIONS
8	BORE LOG & CORE REPORTS
14	SOIL TEST RESULTS
16	SCOUR REPORT
17	CORE PHOTOGRAPHS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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PERSONNEL
T B DANIEL
C J COFFEY
R D CHILDERS

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

NORTH CAROLINA LICENSED 31 May 07 GEOLOGIST CHARLES ANDREWS DUNNAGAN

C A Dunnagan

DRAWN BY: C A DUNNAGAN

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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.

PROJECT: 34445.1.1 ID: R-2518B

PROJECT REFERENCE NO.	SHEET NO.
34445.1.1 (R-2518B)	2/20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER 30 CM 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	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
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 (kN/m^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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
GRAIN SIZE 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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [X] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____mm STEEL TEETH
- [ ] TRICONE ____mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

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

CORE SIZE:
- [ ] -B_____
- [X] -N XWL
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: No. 19 - SPIKE IN 500mm WALNUT TREE
20.66m LEFT OF -L- STA 218+60.896
ELEVATION: 779.920 M

NOTES:

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

May 29, 2007

STATE PROJECT:	34445.1.1 (R-2518B)
COUNTY:	Yancey
PROJECT DESCRIPTION:	US-19E From East of Madison County Line to SR-1336 (Jacks Creek Rd.)
SITE DESCRIPTION:	Bridge No. 9 (Structure No. 4) on US-19E over Cane River
SUBJECT:	Geotechnical Report – Foundation Investigation

Project Description

This project is located in west-central Yancey County, approximately 4.8 kilometers west of Burnsville. The proposed structure will be of 3 spans with span lengths of 20.87 meters, 20.73 meters, and 20.79 meters. The skew is 75 degrees. This structure will be appended to the existing structure. The investigation was conducted using CME-550 and CME-45 drill machines. Borings were advanced using 20 centimeter hollow stem augers and -N- casing with casing advancer. Standard Penetration Tests were performed at intervals of 1.52 meters. Soil samples were collected and submitted for testing of quality. Rock core was retrieved using -NXWL- equipment. One rock core sample was submitted for Unit Weight, Compressive Strength (Qu), Young's Modulus (E), and Split Tensile Strength.

Physiography and Geology

The project corridor is a broad valley, trending east-west. The valley may be fault controlled, being in a region with many thrust sheets. The rocks encountered during the subsurface investigation are part of the Ashe Metamorphic Suite. They are a muscovite-biotite gneiss, labeled Zatm on the Geologic Map of North Carolina (1985).

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

The site itself includes several features that may have an impact on design and/or construction.

1) Concrete rubble from an old demolished bridge is present within the project corridor, especially in the Interior Bent One area. These are blocks of 1.5 to 2.0 meters in diameter and contain rebar.

2) Also associated with the old, defunct bridge are two concrete footings. One is visible. The other was encountered in the boring for B2-A.

3) Along the profile, the rock line tends to be somewhat erratic. It can vary as much as 6.0 meters (vertically) within 8.0 meters (horizontally).

At the End Bents, the soil profile generally starts with 3.5 to 5.0 meters of roadway embankment overlying alluvium. The alluvium is 1.5 to 2.0 meters of loose sand, gravel and cobbles. Saprolite was encountered around elevation 766.00. Weathered rock was encountered around elevation 765.00 at End Bent One and elevation 760.00 at End Bent Two. The boring for EB2-A encountered an interval of weathered rock between elevations 762.13 and 762.83. Only the boring for EB2-B was not terminated in crystalline rock (gneiss). Except for the boring for B1-B, the Interior Bents were started in alluvium. At the boring site for B1-B, 5.4 meters of roadway embankment overlays the alluvium. The alluvium consists of 1.5 to 2.5 meters of sandy silt and sand and gravel. The boring for B2-A encountered a relic concrete footing between the elevations 765.20 and 763.42. Saprolite was found between elevations 765.10 and 763.40. Weathered rock elevation varies from 758.01 to 764.45. Saprolite layers are present in most of the weathered rock horizons. Top of crystalline rock (gneiss) varied from 755.00 (B2-A) and 761.27 (B1-B).

Rock Properties

As noted above, the rock retrieved by coring is a muscovite-biotite gneiss belonging to the Ashe Metamorphic Suite. The rock quality is good with Recoveries ranging from 34 to 100 percent (84 percent average). RQD's were from 0 to 100 percent (62 percent average). The lowest values occurred in the boring for B2-B. Here, between the elevations 757.09 and 754.00, the Recoveries were 34 to 66 percent (50 percent average) and the RQD's from 0 to 21 percent (14 percent average). Joints were noted at 10°, 45°, 50°, and 80°. Foliation had two distinct trends, with partings at 10° and 60-75°.

Groundwater

Static groundwater elevations were recorded in the Interior Bent Two borings at 765.3 and 765.7. In the boring for EB1-A, it was noted at 766.9.

Comments

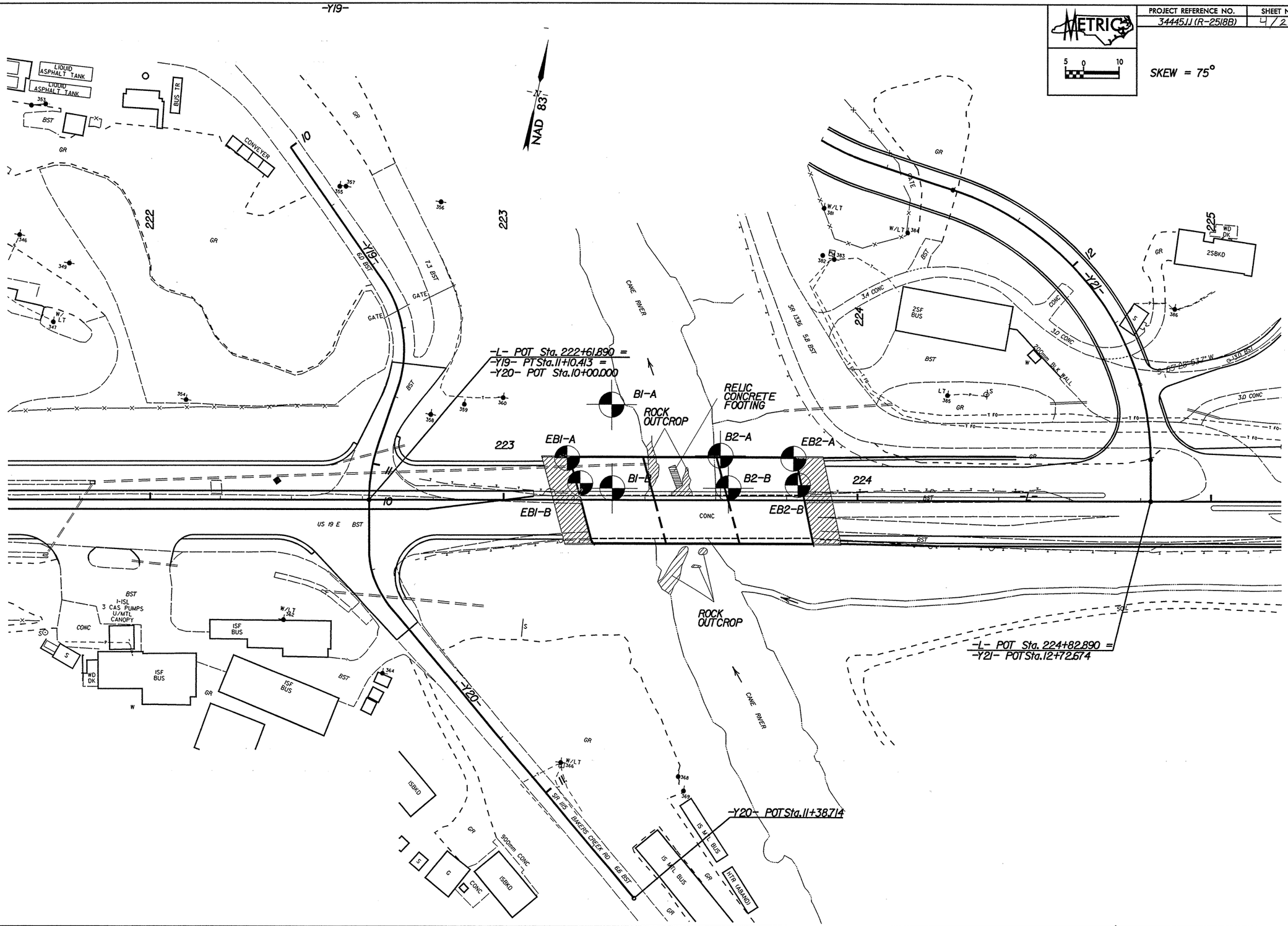
This foundation investigation was based on the Preliminary General Drawing dated March 2006. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be reviewed and modified as necessary.

Respectfully Submitted,

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

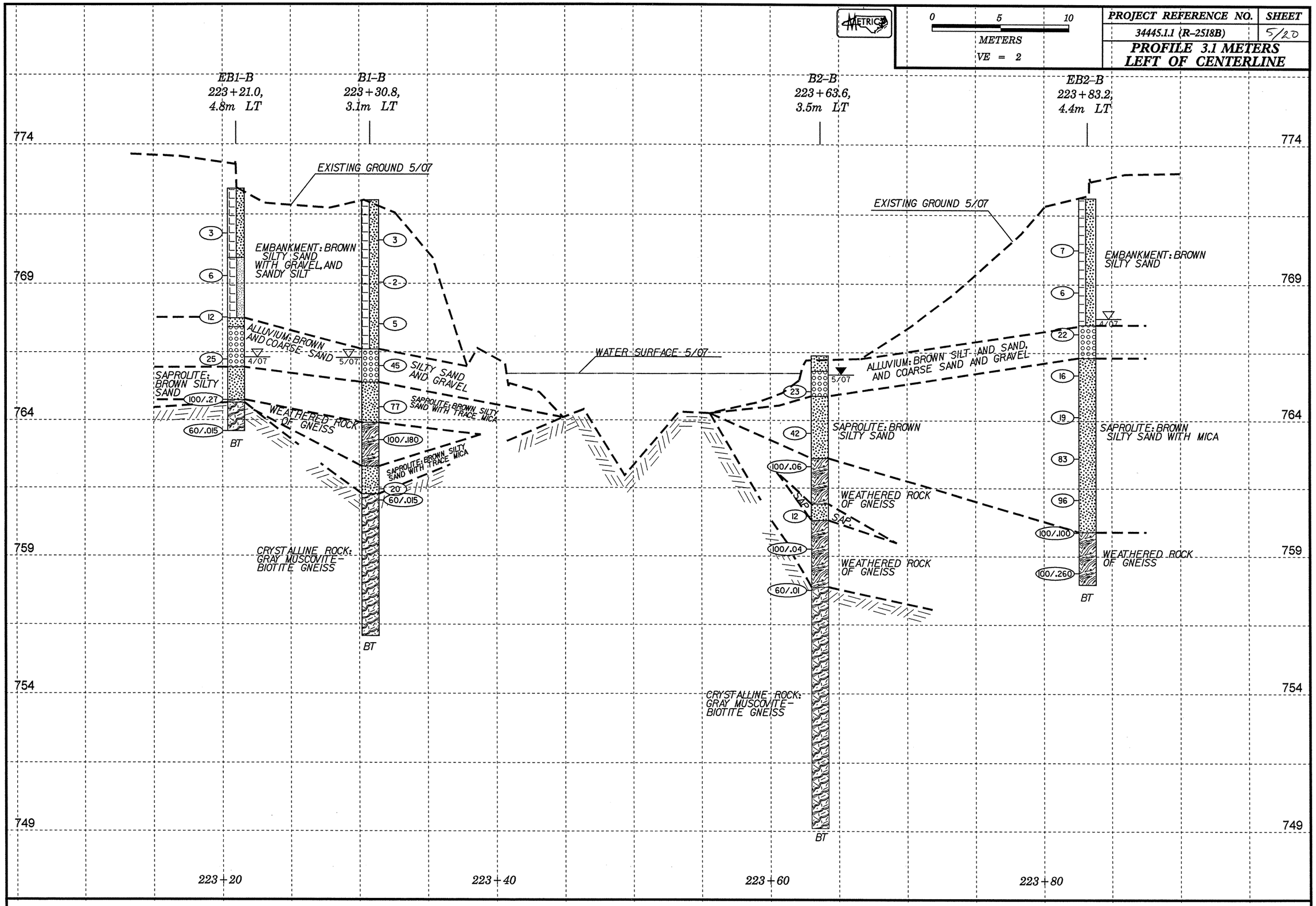
PROJECT REFERENCE NO.	SHEET NO.
34445.1.1 (R-2518B)	4/20

SKEW = 75°



PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	5/20

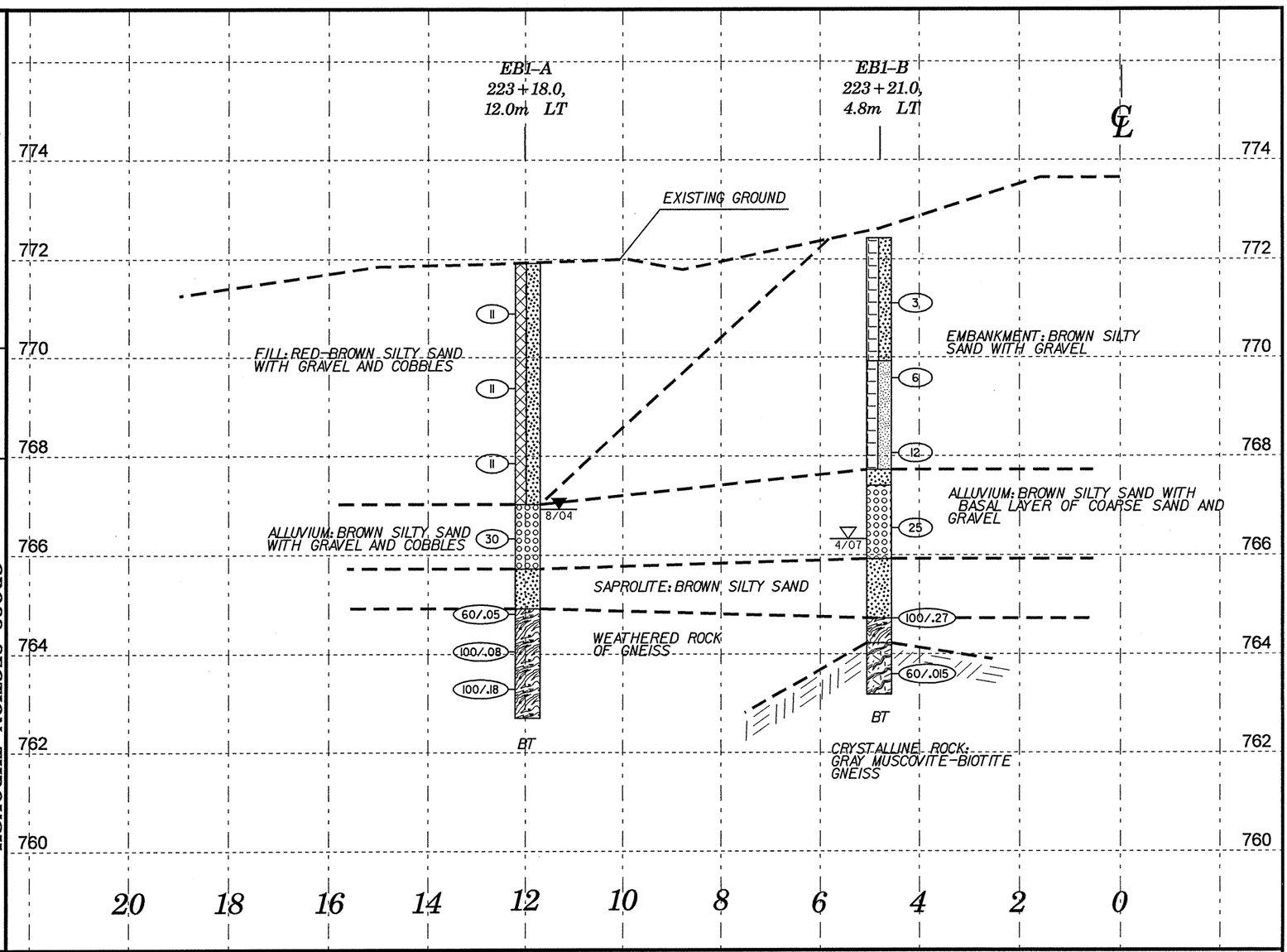
PROFILE 3.1 METERS LEFT OF CENTERLINE



HORIZ. SCALE (METERS) 0 2 4

VE = 1

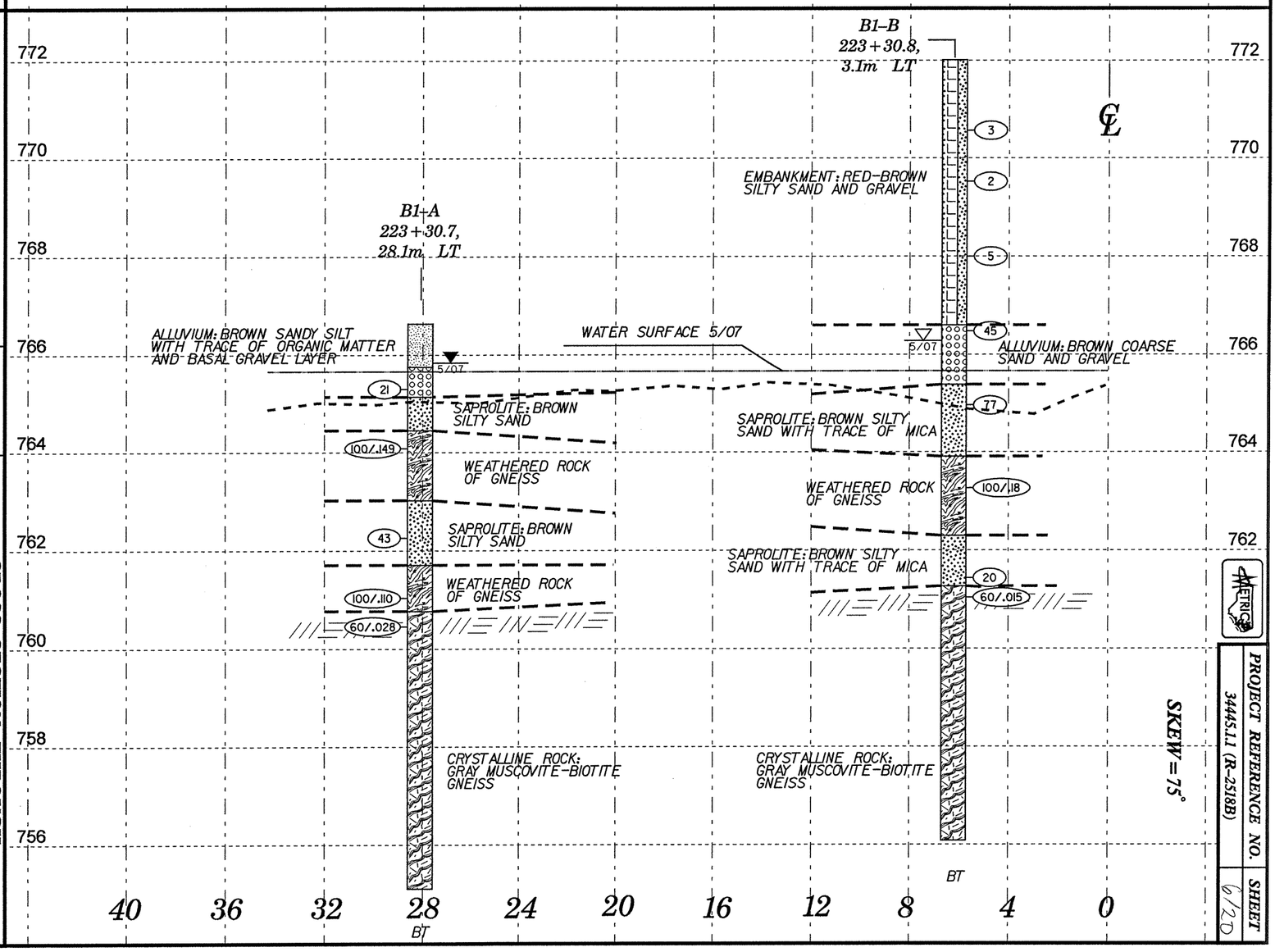
CROSS SECTION THROUGH END BENT ONE



HORIZ. SCALE (METERS) 0 4 8

VE = 2

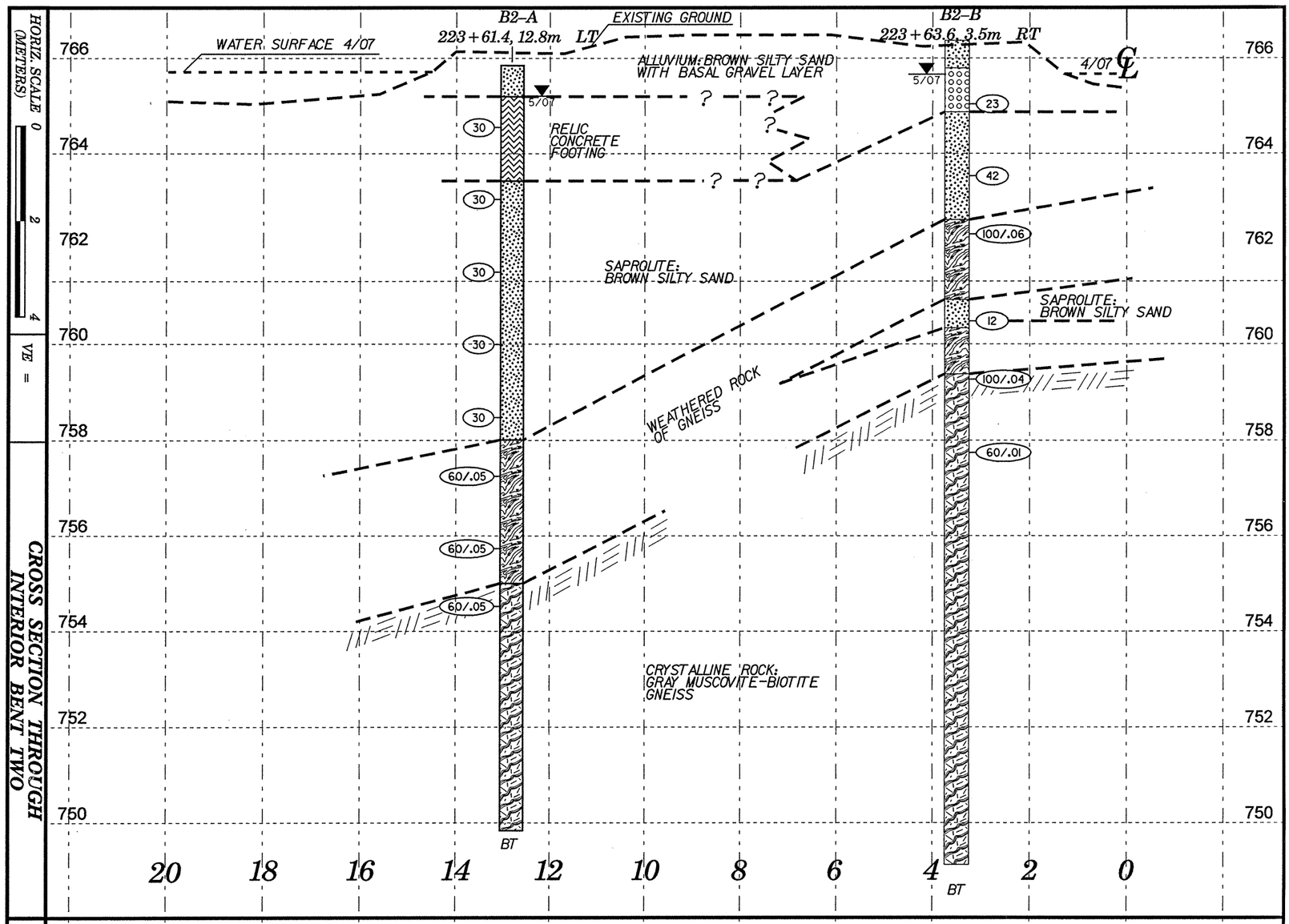
CROSS SECTION THROUGH INTERIOR BENT ONE



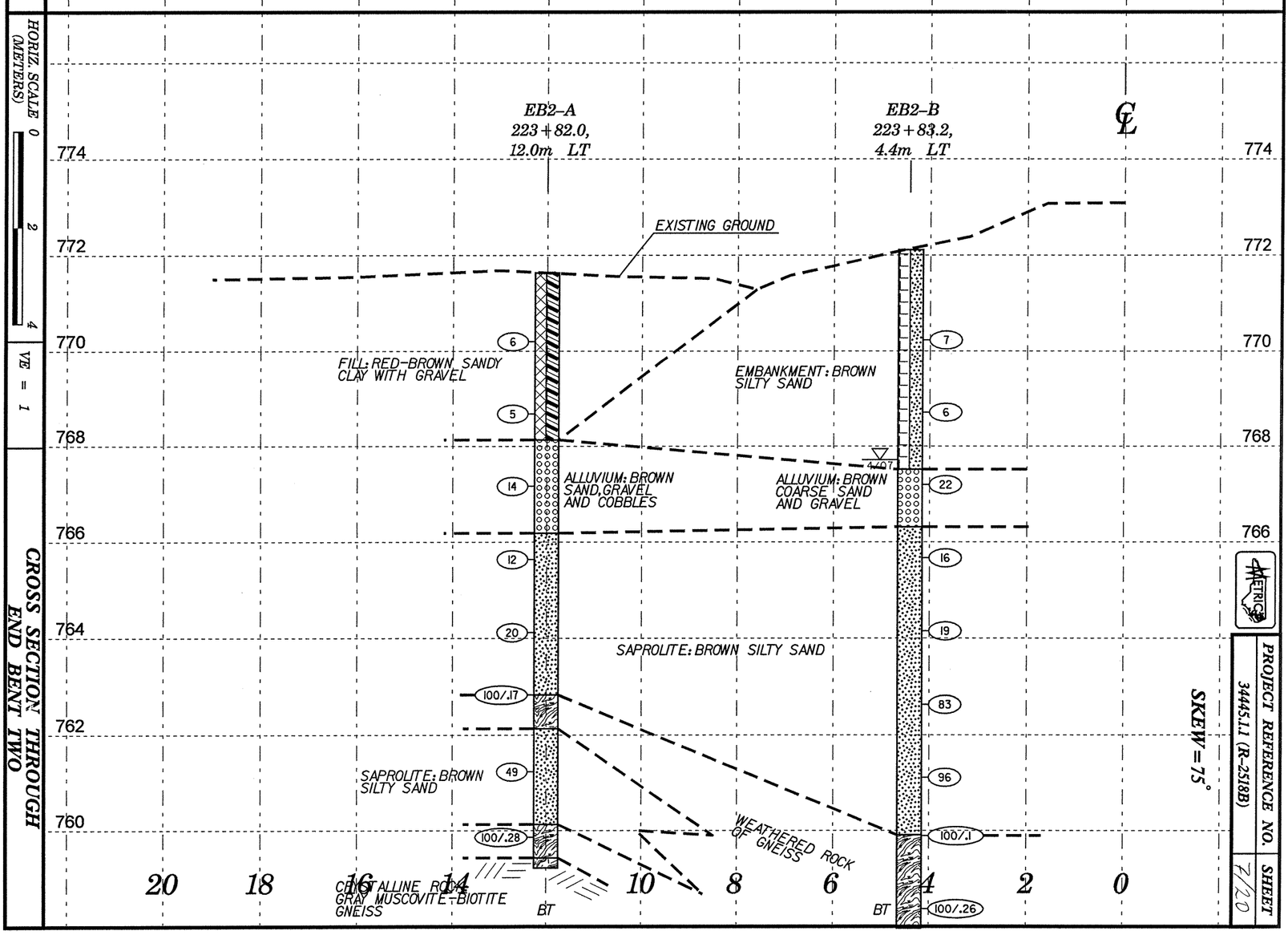
SKEW = 75°

METRIC

PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	6/20



CROSS SECTION THROUGH INTERIOR BENT TWO



CROSS SECTION THROUGH END BENT TWO

SKEW = 75°

METRIC

PROJECT REFERENCE NO.	SHEET
34445.1.1 (R-2518B)	7/20

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Dunnagan, C. A.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. EB1-A	STATION 223+18.0	OFFSET 12.0m LT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 771.93 m	TOTAL DEPTH 9.22 m	NORTHING 244,913.0	EASTING 307,352.0 / 24 HR. 5.00
DRILL MACHINE CME-45C	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 08/18/04	COMP. DATE 08/18/04	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
772									771.93 GROUND SURFACE 0.00
770.90	1.03	2	5	6	11		M		**ARTIFICIAL FILL** Red-brown silty sand with clay, gravel and cobbles.
769.38	2.55	2	6	5	11				
767.86	4.07	2	3	8	11		M		767.03 4.90
766.34	5.59	11	13	17	30		M		**ALLUVIAL** Brown silty sand with gravel and cobbles.
764.82	7.11	60/.05			60/.05				765.73 6.20 **SAPROLITE** Brown silty sand.
764.06	7.87	100/.08			100/.08				764.93 7.00 **WEATHERED ROCK** Weathered rock of gneiss.
763.30	8.63	45	55/.03		100/.18				762.71 9.22

Boring Terminated by Auger Refusal at Elevation 762.71 m Crystalline Rock (gneiss)

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/15/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 8/20

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. EB1-B	STATION 223+21.0	OFFSET 4.8m LT	ALIGNMENT -L- / 0 HR. 6.10
COLLAR ELEV. 772.42 m	TOTAL DEPTH 8.84 m	NORTHING 244,907.0	EASTING 307,357.0 / 24 HR. N/A
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 04/24/07	COMP. DATE 04/24/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 7.8 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
773									772.42 GROUND SURFACE 0.00
771.10	1.32	2	2	1	3	SS-1	M		**ROADWAY EMBANKMENT** Brown silty sand with gravel.
769.58	2.84	2	3	3	6	SS-2	M		769.92 2.50 **ROADWAY EMBANKMENT** Brown sandy silt.
768.06	4.36	5	6	6	12		M		767.72 4.70
766.54	5.88	13	14	11	25	SS-3	M		767.40 5.02 **ALLUVIAL** Brown silty sand. **ALLUVIAL** Brown coarse sand and gravel. 765.92 6.50
765.02	7.40	10	17	83/.12	100/.27	SS-4			**SAPROLITE** Brown silty sand. 764.72 7.70
763.59	8.83	60/.015			60/.015				764.62 7.80 **WEATHERED ROCK** Weathered rock of gneiss. 763.58 **CRYSTALLINE ROCK** Crystalline rock (gneiss). 8.84

Boring Terminated with Standard Penetration Test Refusal at Elevation 763.58 m Crystalline Rock (gneiss)

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/03/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. B1-A	STATION 223+30.7	OFFSET 28.1m LT	ALIGNMENT -L- — 0 HR. 0.82
COLLAR ELEV. 766.64 m	TOTAL DEPTH 11.53 m	NORTHING 244,930.0	EASTING 307,362.0 — 24 HR. 0.80
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/09/07	COMP. DATE 05/10/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 5.9 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
767											
									GROUND SURFACE	766.64	0.00
									ALLUVIAL Brown sandy silt with trace of organic matter.	765.75	0.89
765.60	1.04	23	6	15	21		W		**ALLUVIAL** Brown silty sand with gravel.	765.14	1.50
									SAPROLITE Brown silty sand.	764.45	2.19
764.08	2.56	100/.149			100/.149				**WEATHERED ROCK** Weathered rock of gneiss.	763.02	3.62
762.56	4.08	13	17	26	43				**SAPROLITE** Brown silty sand.	761.71	4.93
761.04	5.60	100/.11			100/.11				**WEATHERED ROCK** Weathered rock of gneiss.	760.77	5.87
760.46	6.18	60/.028			60/.028				**CRYSTALLINE ROCK** Crystalline rock (gneiss).	755.11	11.53
									Boring Terminated with Standard Penetration Test Refusal at Elevation 755.11 m		

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/11/07

9/20

SHEET ____ OF ____

DATE 5/11/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-A GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 9 on US-19 over Cane River

COUNTY: Yancey COLLAR ELEVATION: 766.64 m TOTAL DEPTH: 11.53 m

ELEV. (m)	DEPTH (m)	DRILL RATE MIN./.3 m	RUN (m)	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
760.43	6.21		0.76	0.70 / 92	0.46 / 61		
759.67	6.97		1.52	1.45 / 95	1.32 / 87		Gray-green muscovite-biotite gneiss. Hard, very slightly weathered with moderately weathered zone. Quartz-felspar veins. Trace garnets.
758.15	8.49		1.52	1.04 / 68	1.04 / 68		a) Joints @ 10°. b) Joints @ 50°. c) Parting along foliation @ 60°.
756.63	10.01		1.52	1.52 / 100	1.52 / 100		
755.11	11.53						

CORING TERMINATED AT ELEVATION 755.11 m

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. B1-B	STATION 223+30.8	OFFSET 3.1m LT	ALIGNMENT -L-	0 HR. 5.73
COLLAR ELEV. 772.01 m	TOTAL DEPTH 15.93 m	NORTHING 244,907.0	EASTING 307,366.0	24 HR. Caved@5.74
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/10/07	COMP. DATE 05/11/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 10.7 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
773									772.01 GROUND SURFACE 0.00
770.86	1.15	2	1	2	3		M		**ROADWAY EMBANKMENT** Red-brown silty sand and gravel.
769.34	2.67	2	1	1	2		M		
767.82	4.19	2	2	3	5		M		766.60 5.41
766.30	5.71	14	23	22	45		Sat.		**ALLUVIAL** Brown coarse sand and gravel. 765.38 6.63
764.78	7.23	20	29	48	77		M		**SAPROLITE** Brown silty sand with trace of mica. 763.90 8.11
763.26	8.75	85	15/.03		100/.18				**WEATHERED ROCK** Weathered rock of gneiss. 762.29 9.72
761.74	10.27	5	5	15	20	SS-9			**SAPROLITE** Brown silty sand with trace of mica. 761.27 10.74
761.04	10.97	60/.015			60/.015				**CRYSTALLINE ROCK** Crystalline rock (gneiss). 756.08 15.93
									Boring Terminated with Standard Penetration Test Refusal at Elevation 756.08 m Crystalline Rock (gneiss)

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/17/07

14/20

SHEET ____ OF ____

DATE 5/14/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B1-B GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 9 on US-19 over Cane River

COUNTY: Yancey COLLAR ELEVATION: 772.01 m TOTAL DEPTH: 15.93 m

ELEV. (m)	DEPTH (m)	DRILL RATE MIN./.3 m	RUN (m)	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
772.01	0.00		0.61	0.50 82	0.50 82		
771.40	0.61		1.52	1.50 99	1.50 99		Grey muscovite-biotite gneiss. Fresh, hard with a trace of garnets.
769.88	2.13		1.52	1.52 100	1.52 100		
768.36	3.65		1.52	1.33 88	1.33 88		
766.84	5.17						

CORING TERMINATED AT ELEVATION 756.08 m

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. B2-A	STATION 223+61.4	OFFSET 12.8m LT	ALIGNMENT -L- — 0 HR. N/A
COLLAR ELEV. 765.85 m	TOTAL DEPTH 16.01 m	NORTHING 244,921.0	EASTING 307,395.0 — 24 HR. 0.64
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/03/07	COMP. DATE 05/04/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 10.9 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
766									GROUND SURFACE	765.85	0.00
									ALLUVIAL Brown silty sand with gravel at the base.	765.20	0.65
764.85	1.00	100							Relic concrete footing.		
763.33	2.52	6	13	24	37				**SAPROLITE** Brown silty sand with mica.	763.42	2.43
761.81	4.04	12	25	24	49						
760.29	5.56	15	51	30	81						
758.77	7.08	14	23	21	44					758.01	7.84
757.25	8.60	100/.046			100/.046				**WEATHERED ROCK** Weathered rock of gneiss.		
755.73	10.12	31	58	42/.21	100/.21					755.00	10.85
754.52	11.33	60/.01			60/.01	RS-1			**CRYSTALLINE ROCK** Crystalline rock (gneiss).		
										749.84	16.01

Boring Terminated with Standard Penetration Test Refusal at Elevation 749.84 m Crystalline Rock (gneiss)

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/04/07

11/20

SHEET ____ OF ____

DATE 5/4/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-A GEOLOGIST: C A Dunnagan

DESCRIPTION: Bridge No. 9 on US-19 over Cane River

COUNTY: Yancey COLLAR ELEVATION: 765.85 m TOTAL DEPTH: 16.01 m

ELEV. (m)	DEPTH (m)	DRILL RATE MIN./.3 m	RUN (m)	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
754.52	11.33		1.64	1.55 / 95	1.13 / 69	RS-1	
752.88	12.97		1.52	1.31 / 86	0.85 / 56		Gray muscovite-biotite gneiss. Hard; very slightly weathered with moderately weathered zones. Trace of garnets. a) Joints @ 45°. b) Partings along foliation @ 75°.
751.36	14.49		1.52	1.45 / 95	1.15 / 76		
749.84	16.01						

CORING TERMINATED AT ELEVATION 749.84 m

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. B2-B	STATION 223+63.6	OFFSET 3.5m RT	ALIGNMENT -L- / 0 HR. N/A
COLLAR ELEV. 766.37 m	TOTAL DEPTH 17.26 m	NORTHING 244,912.0	EASTING 307,399.0 / 24 HR. 0.71
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic
START DATE 05/02/07	COMP. DATE 05/02/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 8.5 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
767									GROUND SURFACE	766.37	0.00
765.34	1.03	10	14	9	23		Sat.		ALLUVIAL Brown silt and sand.	765.79	0.58
763.82	2.55	9	21	21	42	SS-8	M		ALLUVIAL Coarse sand and gravel.	764.87	1.50
762.30	4.07	100/.06			100/.06		M		SAPROLITE Brown silty sand.	762.60	3.77
760.78	5.59	6	2	10	12		W		WEATHERED ROCK Weathered rock of gneiss.	760.93	5.44
759.26	7.11	23	61	39/.04	100/.04				SAPROLITE Brown silty sand.	760.33	6.04
757.74	8.63	60/.01			60/.01				WEATHERED ROCK Weathered rock of gneiss.	757.87	8.50
									CRYSTALLINE ROCK Crystalline rock (gneiss).	749.11	17.26
									Boring Terminated with Standard Penetration Test Refusal at Elevation 749.11 m Crystalline Rock (gneiss)		

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/23/07

12/20

SHEET ____ OF ____

DATE 5/3/2007

CORE BORING REPORT

PROJECT: 34445.1.1 I. D. NO: R-2518B BORING NO: B2-B GEOLOGIST: GEOPERSON

DESCRIPTION: Bridge No. 9 on US-19 over Cane River

COUNTY: Yancey COLLAR ELEVATION: 766.37 m TOTAL DEPTH: 17.26 m

ELEV. (m)	DEPTH (m)	DRILL RATE MIN./.3 m	RUN (m)	REC. METERS %	RQD. METERS %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
757.09	9.28		0.68	0.45 / 66	0.14 / 21		Brown muscovite-biotite gneiss. Moderately hard; moderaterly severely to moderately weathered.
756.41	9.96		1.52	0.52 / 34	0.00 / 0		a) Joints @ 45°. b) Parts along foliation @ 10°.
754.89	11.48		1.52	0.76 / 50	0.30 / 20		12.4
753.37	13.00		1.52	1.46 / 96	1.19 / 78		Gray muscovite-biotite gneiss. Hard to very hard; slightly weathered to fresh with moderately weathered zones. Parts readily along foliation.
751.85	14.52		1.52	1.42 / 93	0.94 / 62		a) Joints @ 45°. b) Joint @ 80°. c) Parts along foliation @ 10°.
750.33	16.04		1.22	1.15 / 94	1.00 / 82		
749.11	17.26						

CORING TERMINATED AT ELEVATION 749.11 m

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Dunnagan, C. A.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. EB2-A	STATION 223+82.0	OFFSET 12.0m LT	ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 771.63 m	TOTAL DEPTH 12.41 m	NORTHING 244,923.0	EASTING 307,415.0	24 HR. Caved @5.2
DRILL MACHINE CME-45C	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 08/18/04	COMP. DATE 08/18/04	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 12.2 m

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
772									771.63 GROUND SURFACE	0.00
770.50	1.13								**ARTIFICIAL FILL** Red-brown sandy clay with gravel.	
		10	4	2	6					
768.98	2.65									
		3	2	3	5				768.13	3.50
767.46	4.17								**ALLUVIAL** Brown sand, gravel and cobbles.	
		4	5	9	14					
765.94	5.69								766.18	5.45
		1	3	9	12				**SAPROLITE** Brown sandy silt with mica.	
764.42	7.21									
		6	8	12	20					
762.90	8.73								762.83	8.80
		22	84	16/.02	100/.17				**WEATHERED ROCK** Weathered rock of gneiss.	
									762.13	9.50
761.38	10.25								**SAPROLITE** Brown sandy silt with mica.	
		30	24	25	49					
759.86	11.77								760.13	11.50
		41	59/.13		100/.28				**WEATHERED ROCK** Weathered rock of gneiss.	
									759.43	12.20
									759.22 **CRYSTALLINE ROCK** Crystalline rock (gneiss).	12.41
									Boring Terminated by Auger Refusal at Elevation 759.22 m Crystalline Rock (gneiss)	

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/16/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 13/20

PROJECT NO. 34445.1.1	ID. R-2518B	COUNTY YANCEY	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION Bridge No. 9 on US-19 over Cane River			GROUND WTR (m)
BORING NO. EB2-B	STATION 223+83.2	OFFSET 4.4m LT	ALIGNMENT -L-	0 HR. 4.40
COLLAR ELEV. 772.11 m	TOTAL DEPTH 14.15 m	NORTHING 244,916.0	EASTING 307,418.0	24 HR. N/A
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 04/24/07	COMP. DATE 04/24/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
773									772.11 GROUND SURFACE	0.00
770.53	1.58								**ROADWAY EMBANKMENT** Brown silty sand.	
		7	3	4	7					
769.01	3.10									
		2	3	3	6					
767.49	4.62								767.51	4.60
		4	9	13	22				**ALLUVIAL** Brown coarse sand and gravel.	
765.97	6.14								766.31	5.80
		4	6	10	16	SS-5			**SAPROLITE** Brown silty sand with mica.	
764.45	7.66									
		6	9	10	19	SS-6				
762.93	9.18									
		11	27	56	83	SS-7				
761.41	10.70									
		13	22	74	96					
759.89	12.22								759.91	12.20
		100/.1			100/.1				**WEATHERED ROCK** Weathered rock of gneiss.	
758.37	13.74									
		31	38	62.11	100/.26				757.96	14.15
									Boring Terminated at Elevation 757.96 m in Weathered rock of gneiss.	

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 05/16/07

JCS

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

T.I.P. ID #:	R-2518B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	34445.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	4.24.07	DATE RECEIVED:	4.25.07	DATE REPORTED:	4.30.07
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	
Lab Sample No. A	154994	154995	154996	154997	154998	154999	155000	
HiCAMS Sample #	--	--	--	--	--	--	--	
Retained #4 Sieve %	18.2	7.8	78.0	0.0	0.0	0.0	0.0	
Passing #10 Sieve %	65	76	33	83	99	98	87	
Passing #40 Sieve %	56	68	20	67	91	84	61	
Passing #200 Sieve %	28	40	6	24	32	28	20	

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	26	21	56	36	31	32	47	
Fine Sand - Ret. #270	37	33	30	43	44	48	35	
Silt 0.05-0.005 mm %	19	22	6	13	15	12	8	
Clay < 0.005 mm %	18	24	8	8	10	8	10	
Passing # 40 Sieve %	--	--	--	--	--	--	--	
Passing # 200 Sieve %	--	--	--	--	--	--	--	

Liquid Limit	30	33	21	26	26	27	23	
Plastic Index	NP	NP	NP	NP	NP	NP	NP	
AASHTO Classification	A-2-4 (0)	A-4 (1)	A-1-a (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	
Quantity								
Texture								
Station	223+21.7	223+21.7	223+21.7	223+21.7	223+83.2	223+83.2	223+83.2	
Hole No.								
Depth (ft) From:	1.32	2.84	5.88	7.4	6.14	7.66	9.18	
To:	1.75	3.29	6.33	7.7	6.59	8.11	9.63	

Remarks:

A-154994 – 155000 ; Depths represent meters.

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

14/20

JCS

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

T.I.P. ID #:	R-2518 B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	34445.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	5.2.07	DATE RECEIVED:	5.10.07	DATE REPORTED:	5.14.07
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-8							
Lab Sample No. A	155126							
HiCAMS Sample #	--							
Retained #4 Sieve %	0.0							
Passing #10 Sieve %	95							
Passing #40 Sieve %	79							
Passing #200 Sieve %	30							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	31							
Fine Sand - Ret. #270	45							
Silt 0.05-0.005 mm %	22							
Clay < 0.005 mm %	2							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	28							
Plastic Index	NP							
AASHTO Classification	A-2-4 (0)							
Quantity								
Texture								
Station	223+63.6							
Hole No.								
Depth (ft) From:	2.55							
To:	3.00							

Remarks:

A-155126

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

JCS

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

T.I.P. ID #:	R-2518 B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	34445.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	5.14.07	DATE RECEIVED:	5.15.07	DATE REPORTED:	5.17.07
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye		2002	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-9							
Lab Sample No. A	155139							
HiCAMS Sample #	--							
Retained #4 Sieve %	0.0							
Passing #10 Sieve %	96							
Passing #40 Sieve %	79							
Passing #200 Sieve %	29							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	34							
Fine Sand - Ret. #270	44							
Silt 0.05-0.005 mm %	20							
Clay < 0.005 mm %	2							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	30							
Plastic Index	NP							
AASHTO Classification	A-2-4 (0)							
Quantity								
Texture								
Station	223+30.81							
Hole No.								
Depth (ft) From:	10.27							
To:	10.72							

Remarks:

A-155139

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34445.1.1 TIP: R-2518B COUNTY: Yancey

DESCRIPTION(1): Bridge No. 9 on us-19 over Cane River

EXISTING BRIDGE

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

Bridge No.: 9 Length: 63m Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
Foundation Type: Footings on piles.

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None noted.

Interior Bents: Minor amount around interior pier of B2.

Channel Bed: Indeterminate: murky water.

Channel Bank: Moderate amount at EB1 slope.

EXISTING SCOUR PROTECTION

Type(3): Boulder rip-rap on EB1 slope.

Extent(4): 2 meters upstream of bridge to 23 meters downstream.

Effectiveness(5): Good.

Obstructions(6): Concrete encased pipe upstream; debris around B1; relic concrete footing and debris downstream.

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 with sand, gravel, cobble and boulder alluvium.

Channel Bank Material(8): Silty sand.

Channel Bank Cover(9): Grass and trees.

Floodplain Width(10): Less than 5 meters.

Floodplain Cover(11): Grass and trees.

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

Channel Migration Tendency(13): West

Observations and Other Comments: ____

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

BENTS B1-A	B1-B	B2-A	B2-B							
764.01	763.43	763.77	764.43							

Comparison of DSE to Hydraulics Unit theoretical scour:
DSE is 13m to 8m above Hydraulics Unit's theoretical scour.

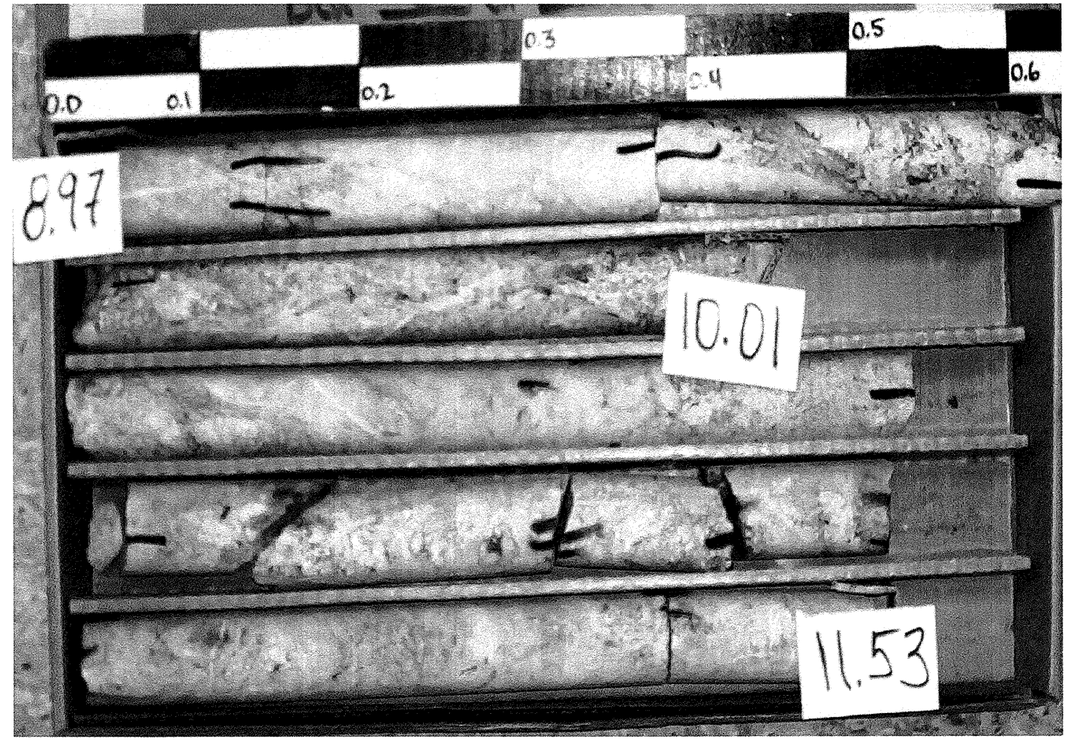
SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

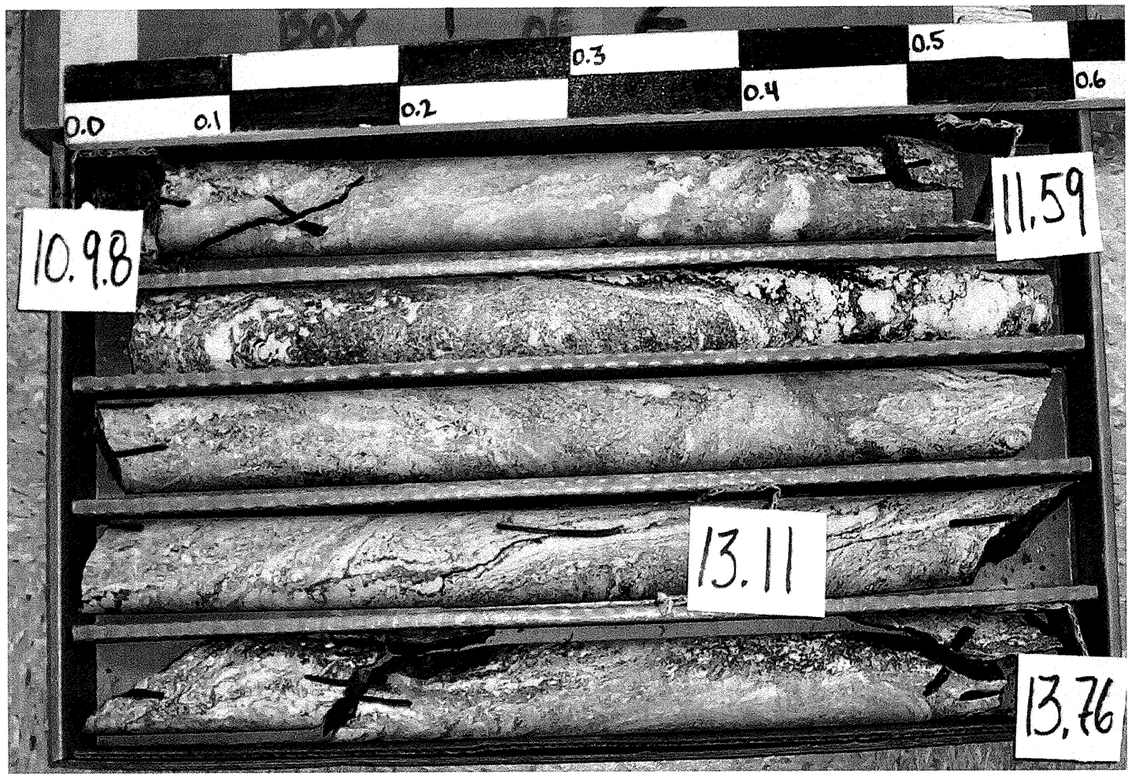
Template Revised 02/07/06

Reported by: C A Dunnagan **Date:** 5/18/2007

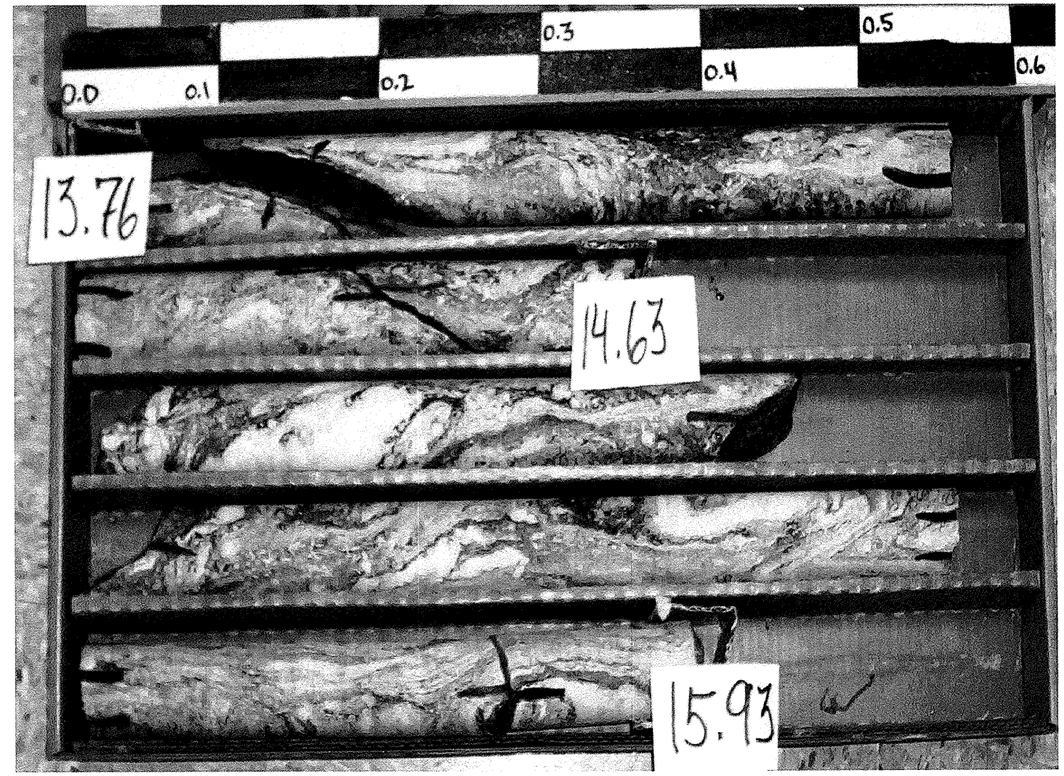
34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B1-A
Box 1 of 2



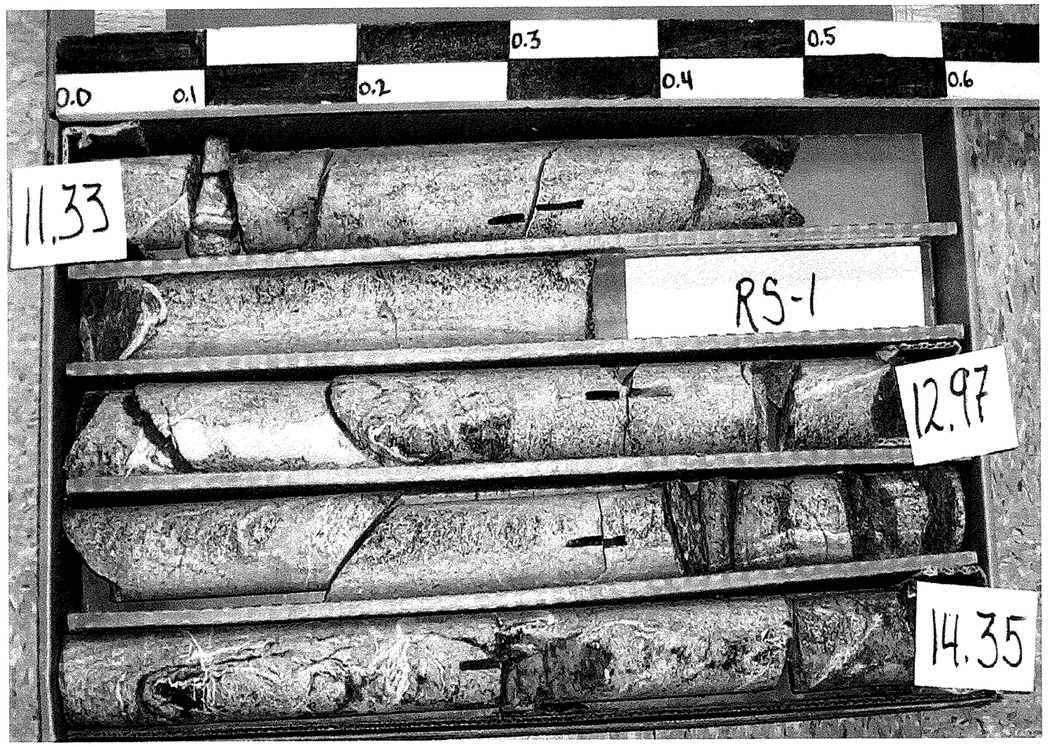
34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B1-A
Box 2 of 2



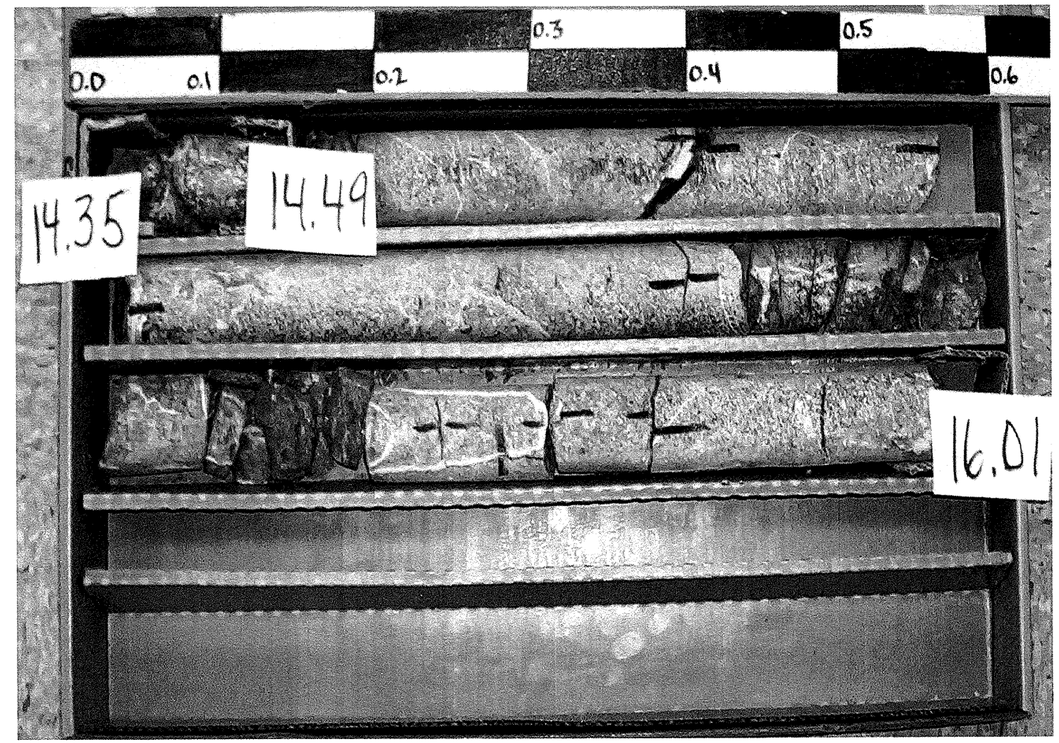
34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B1-B
Box 1 of 2



34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B1-B
Box 2 of 2

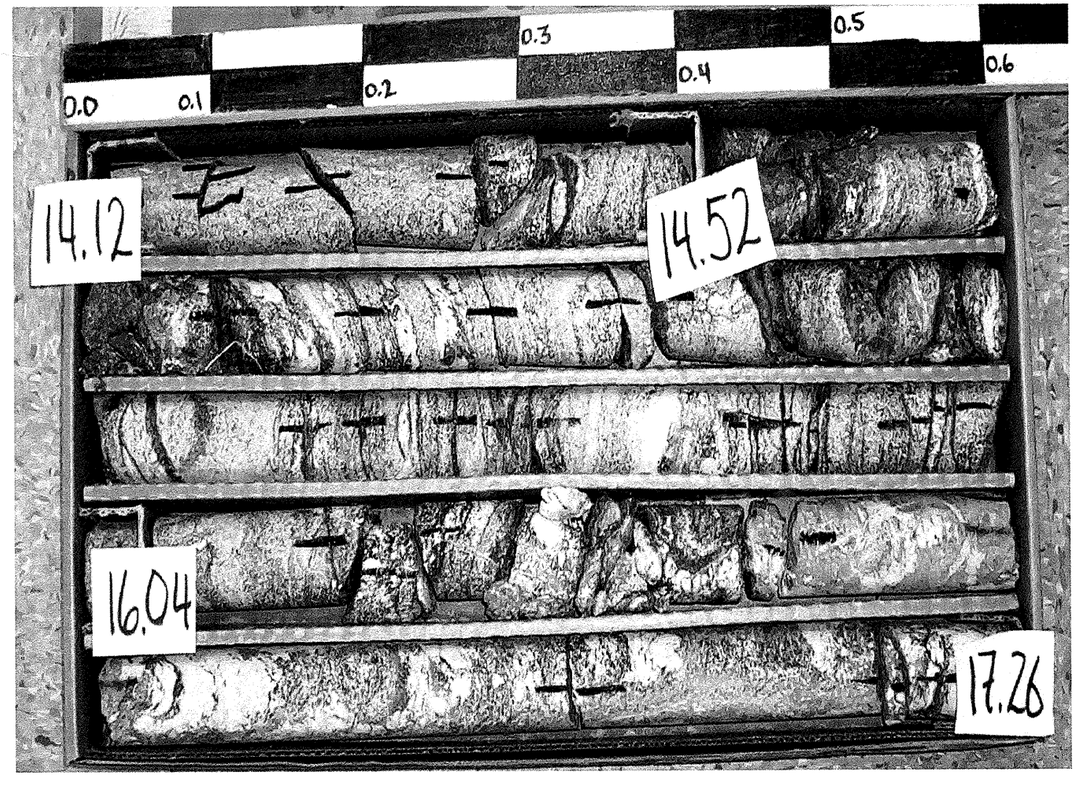


34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B2-A
Box 1 of 2



34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B2-A
Box 2 of 2

34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B2-B
Box 1 of 2



34445.1.1 R-2518B
Bridge No. 9 on US-19
Over Cane River.
B2-B
Box 2 of 2