STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	18

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 (R-2519B) F.A. PROJ. _____

COUNTY YANCEY

PROJECT DESCRIPTION US-19E FROM SR-1186 IN YANCEY COUNTY TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE IN MITCHELL COUNTY

SITE DESCRIPTION BRIDGES ON US-19E WBL AND EBL OVER SR-1308

ID: R-2519B

PROJECT: 35609.1.1

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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.

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PERSONNEL

M M HAGER

D O CHEEK

G K ROSE

R D CHILDERS

INVESTIGATED BY C A DUNNAGAN

CHECKED BY W D FRYE, Jr

SUBMITTED BY W D FRYE, Jr

DATE APRIL 2011

NORTH CAROLINA LICENSED SEAL 1004 GEOLOGIST CHARLES ANDREWS DUNNAGAN

DRAWN BY: C A DUNNAGAN

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

PROJECT REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/18

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
WOH-WEIGHT OF HAMMER
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
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

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

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SL.)	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 (SL.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BM#2: SPIKE SET IN 20" WHITE PINE
85.5' RIGHT OF -L- STATION 25+82.75
ELEVATION: 2512.01 FT.

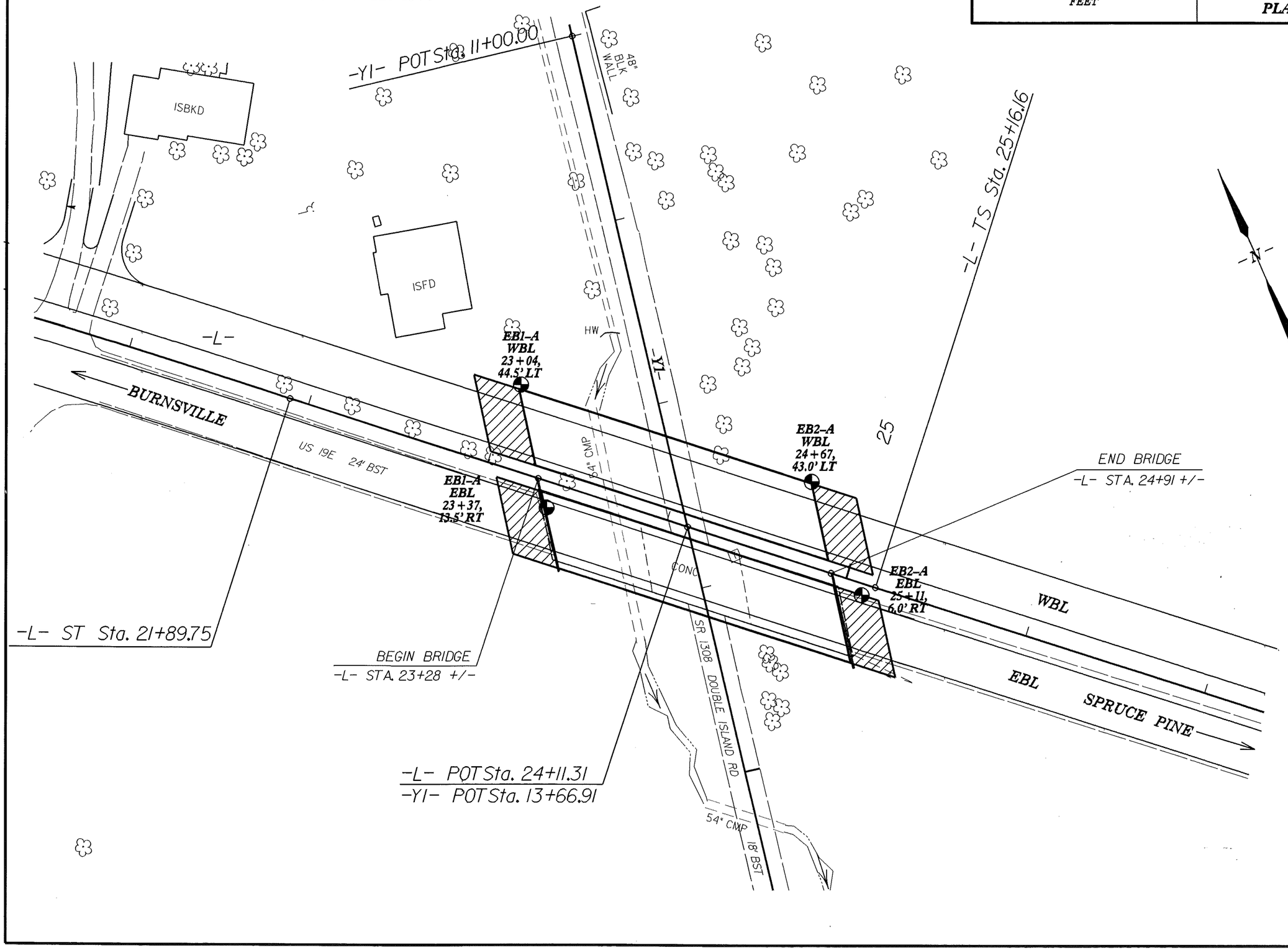
NOTES:

REVISED 02/23/06

BRIDGE ON WBL US-19E OVER SR-1308

0	50	100
FEET		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	3/18
PLAN VIEW	



PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4/18

℄ -L-

℄ WBL

EB1-A
EBL
23+37,
13.5' RT

EB1-A
WBL
23+04,
45.0' LT

EXISTING GROUND

EMBANKMENT: BROWN SANDY SILT WITH TRACE OF CLAY AND ORGANIC MATERIAL

ALLUVIUM: BROWN SANDY SILT WITH CLAY AND TRACE OF ORGANIC MATERIAL

RESIDUAL: YELLOW-BROWN SANDY CLAY

SAPROLITE: TAN TO BROWN SILTY SAND AND SANDY SILT WITH CLAY; MANGANESE OXIDE AND QUARTZ VEINS

WEATHERED ROCK OF GNEISS

BT
FIAD

BT
CRYSTALLINE ROCK: AMPHIBOLITE GNEISS

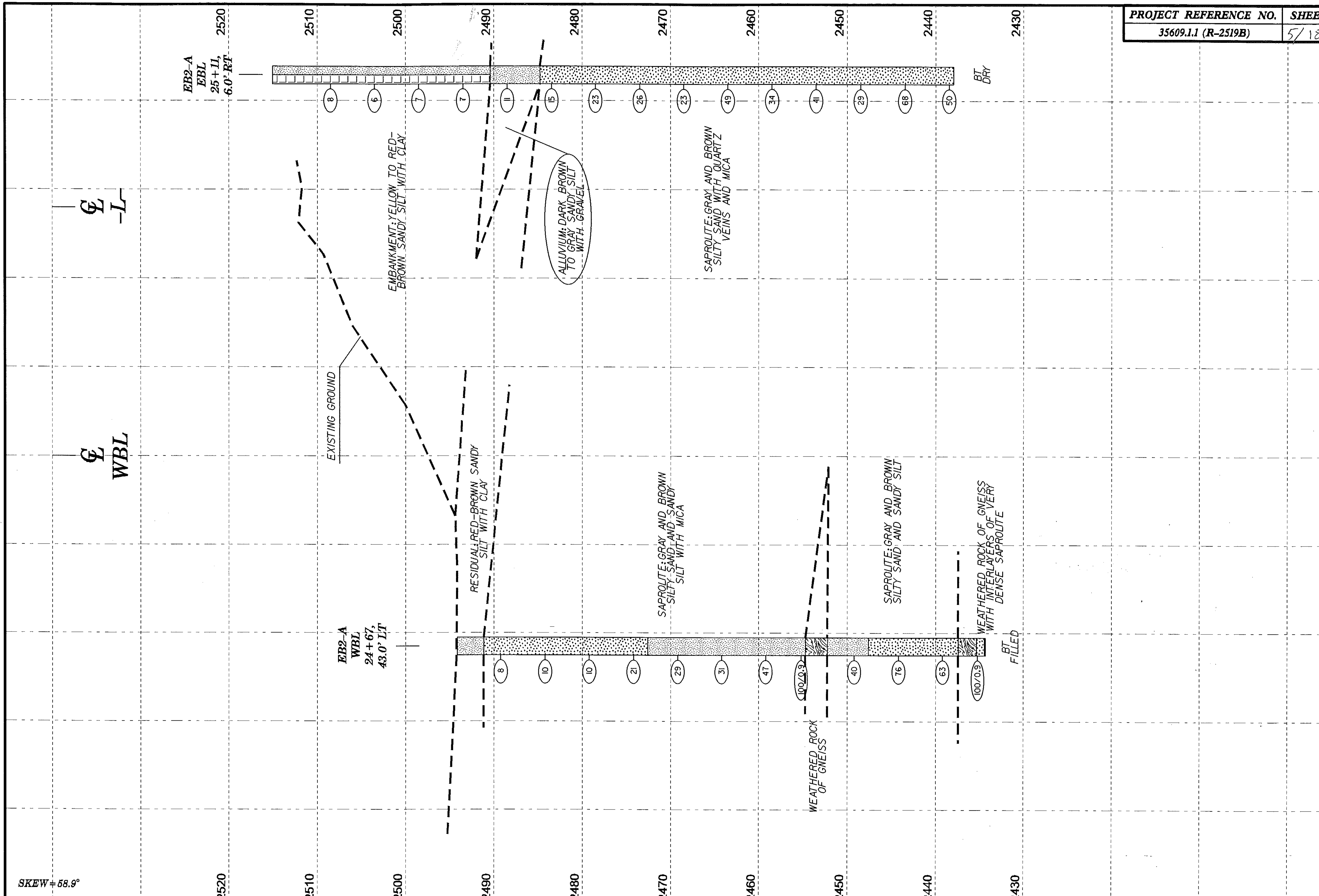
SKEW = 58.9°

HORIZ. SCALE (FEET) 0 10 20

VE = 1

WBL END BENT ONE

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	5/18



HORIZ. SCALE (FEET) 0 10 20	VE = 1	WBL END BENT TWO

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION Bridge on Proposed US-19E WBL over SR-1308.			**GROUND WTR (ft)**
BORING NO. EB1-A WBL	**STATION** 23+04	**OFFSET** 45 ft LT	**ALIGNMENT** L — **0 HR.** 3.0
COLLAR ELEV. 2,494.3 ft	**TOTAL DEPTH** 43.9 ft	**NORTHING** 801,501	**EASTING** 1,046,708 — **24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE AFO0070 CME-550X 81% 09/03/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Rose, G. K.	**START DATE** 02/28/11	**COMP. DATE** 02/28/11	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
2495										2,494.3 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Yellow-brown sandy silt with clay. 2,491.8	2.5
2490	2,490.5	3.8	1	1	1	2		Sat.		**RESIDUAL** Yellow-brown sandy clay.	
2485	2,485.5	8.8	4	3	8	11		W		2,486.8	7.5
2480	2,480.5	13.8	1	3	8	11		M		**SAPROLITE** Tan silty sand with trace of clay and manganese oxide.	
2475	2,475.5	18.8	4	4	16	20		M		2,471.8	22.5
2470	2,470.5	23.8	12	14	21	35		M		**SAPROLITE** Tan silty sand with trace of clay, manganese oxide and quartz veins.	
2465	2,465.5	28.8	16	32	42	74		M			
2460	2,460.5	33.8	33	46	27	73		D			
2455	2,455.5	38.8	30	70/0.4		100/0.9				2,455.0 WEATHERED ROCK Weathered rock of gneiss.	39.3
	2,450.5	43.8	60/0.1			60/0.1				2,450.5 CRYSTALLINE ROCK Amphibolite gniess. 2,450.4	43.8 43.9
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,450.4 ft in amphibolite gneiss.	

NCDOT BORE SINGLE WBL_BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 6/18

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION Bridge on Proposed US-19E WBL over SR-1308.			**GROUND WTR (ft)**
BORING NO. EB1-A EBL	**STATION** 23+37	**OFFSET** 14 ft RT	**ALIGNMENT** L — **0 HR.** 20.7
COLLAR ELEV. 2,522.5 ft	**TOTAL DEPTH** 66.2 ft	**NORTHING** 801,435	**EASTING** 1,046,694 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 03/16/11	**COMP. DATE** 03/16/11	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
2525										2,522.5 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Brown-gray sandy silt with trace of organic material.	
2520	2,517.8	4.7	1	3	3	6	SS-10	M			
2515	2,512.8	9.7	2	2	3	5					
2510	2,507.8	14.7	1	1	2	3	SS-11	W			
2505	2,502.8	19.7	4	4	4	8		▽			
2500	2,497.8	24.7	3	3	7	10				2,495.5	27.0
2495	2,492.8	29.7	WOH	WOH	WOH	0		W		**ALLUVIAL** Brown-gray sandy silt with clay and trace of organic material.	
2490	2,487.8	34.7	5	6	4	10	SS-12	M		2,485.7	36.8
2485	2,482.8	39.7	7	11	21	32	SS-13			**SAPROLITE** Brown silty sand.	
2480	2,477.8	44.7	10	21	30	51					
2475	2,472.8	49.7	13	16	33	49					
2470	2,467.8	54.7	9	26	30	56					
2465	2,462.8	59.7	42	58/0.4		100/0.9				2,462.8	59.7
2460	2,457.8	64.7	20	38	52	90				2,461.9 **WEATHERED ROCK** Weathered rock of gneiss. **SAPROLITE** Brown silty sand.	60.6
										2,456.3 Boring Terminated at Elevation 2,456.3 ft in very dense saprolite.	66.2

NCDOT BORE SINGLE WBL_BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

7/18

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION Bridge on Proposed US-19E WBL over SR-1308.			**GROUND WTR (ft)**
BORING NO. EB2-A WBL	**STATION** 24+67	**OFFSET** 43 ft LT	**ALIGNMENT** L — **0 HR.** N/A
COLLAR ELEV. 2,494.1 ft	**TOTAL DEPTH** 59.8 ft	**NORTHING** 801,392	**EASTING** 1,046,829 — **24 HR.** FILLED
DRILL RIG/HAMMER EFF./DATE AFO0070 CME-550X 81% 09/03/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 03/01/11	**COMP. DATE** 03/01/11	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2495										ELEV. (ft) 2,494.1 GROUND SURFACE — DEPTH (ft) 0.0
2490	2,490.2	3.9	2	3	5	8		M		**RESIDUAL** Red-brown sandy silt with clay. 2,491.1 — 3.0
2485	2,485.2	8.9	4	5	5	10		M		**SAPROLITE** Dark gray silty sand.
2480	2,480.2	13.9	2	5	5	10		W		
2475	2,475.2	18.9	5	10	11	21		W		2,472.6 — 21.5
2470	2,470.2	23.9	6	11	18	29		M		**SAPROLITE** Gray to tan sandy silt with mica.
2465	2,465.2	28.9	6	17	14	31		M		
2460	2,460.2	33.9	12	23	24	47		M		
2455	2,455.2	38.9	25	75/0.4		100/0.9				2,454.7 — 39.4
2450	2,450.2	43.9	6	13	17	30				**WEATHERED ROCK** Weathered rock of gneiss. 2,452.2 — 41.9
2445	2,445.2	48.9	6	13	17	30		M		**SAPROLITE** Gray to brown silty sand.
2440	2,440.2	53.9	18	25	40	65		D		2,437.4 — 56.7
2435	2,435.2	58.9	21	79/0.4		100/0.9				**WEATHERED ROCK** Weathered rock of gneiss. 2,435.3 — 58.8
										2,434.4 — 59.7 **SAPROLITE** Gray to brown silty sand. 2,434.3 — 59.8
										WEATHERED ROCK Weathered rock of gneiss.
										Boring Terminated at Elevation 2,434.3 ft weathered rock of gneiss.

NCDOT BORE SINGLE WBL BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.	
SITE DESCRIPTION Bridge on Proposed US-19E WBL over SR-1308.				**GROUND WTR (ft)**
BORING NO. EB2-A EBL	**STATION** 25+11	**OFFSET** 6 ft RT	**ALIGNMENT** L	**0 HR.** N/A
COLLAR ELEV. 2,515.0 ft	**TOTAL DEPTH** 77.0 ft	**NORTHING** 801,327	**EASTING** 1,046,829	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Rose, G. K.	**START DATE** 03/07/11	**COMP. DATE** 03/08/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2520										ELEV. (ft) DEPTH (ft)
2515										2,515.0 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT
2510	2,509.5	5.5	2	3	5	8		M		Yellow to red-brown sandy silt with clay.
2505	2,504.5	10.5	3	2	4	6				
2500	2,499.5	15.5	2	3	4	7		W		
2495	2,494.5	20.5	WOH	3	4	7		Sat.		2,490.4 24.6
2490	2,489.5	25.5	4	6	5	11		Sat.		**ALLUVIAL**
2485	2,484.5	30.5	13	11	4	15		W		Dark brown to gray sandy silt with gravel.
2480	2,479.5	35.5	5	10	13	23		W		2,484.8 30.2
2475	2,474.5	40.5	4	10	16	26				**SAPROLITE**
2470	2,469.5	45.5	9	11	12	23				Dark gray and brown silty sand with quartz veins and mica.
2465	2,464.5	50.5	15	26	23	49				
2460	2,459.5	55.5	12	17	17	34				
2455	2,454.5	60.5	6	17	24	41				
2450	2,449.5	65.5	7	10	19	29				
2445	2,444.5	70.5	17	33	35	68				
2440										

NCDOT BORE SINGLE WBL_BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET

8/18

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.	
SITE DESCRIPTION Bridge on Proposed US-19E WBL over SR-1308.				**GROUND WTR (ft)**
BORING NO. EB2-A EBL	**STATION** 25+11	**OFFSET** 6 ft RT	**ALIGNMENT** L	**0 HR.** N/A
COLLAR ELEV. 2,515.0 ft	**TOTAL DEPTH** 77.0 ft	**NORTHING** 801,327	**EASTING** 1,046,829	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Rose, G. K.	**START DATE** 03/07/11	**COMP. DATE** 03/08/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2440						Match Line				ELEV. (ft) DEPTH (ft)
	2,439.5	75.5	24	27	23	50				2,438.0 77.0
										Boring Terminated at Elevation 2,438.0 ft in very dense saprolite.

NCDOT BORE SINGLE WBL_BORELOGS.GPJ NC_DOT.GDT 04/15/11

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-2519B

REPORT ON SAMPLES OF:	Soil for Quality

PROJECT:	35609.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	3.2. & 3.3.11	DATE RECEIVED:	3.4.11	DATE REPORTED:	3.8.11
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2006	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4				
Lab Sample No. A	166099	166100	166101	166102				
HiCAMS Sample #	--	--	--	--				
Retained #4 Sieve %	0.6	0.0	0.0	0.0				
Passing #10 Sieve %	97	90	100	99				
Passing #40 Sieve %	89	82	97	84				
Passing #200 Sieve %	51	57	22	26				

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	20	16	17	33				
Fine Sand - Ret. #270	35	26	70	50				
Silt 0.05-0.005 mm %	21	24	9	13				
Clay < 0.005 mm %	24	34	4	4				
Passing # 40 Sieve %	--	--	--	--				
Passing # 200 Sieve %	--	--	--	--				

Liquid Limit	36	42	33	26				
Plastic Index	NP	NP	NP	NP				
AASHTO Classification	A-4 (3)	A-5 (4)	A-2-4 (0)	A-2-4 (0)				
Quantity								
Texture								
Station	25+32	25+32	25+32	25+32				
Hole No.								
Depth (ft) From:	5.8	25.8	35.8	60.8				
To:	6.8	26.8	36.8	61.8				
	OK	OK	OK	OK				

Remarks:

A-166099 - 166102

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

M&T 503E

9/18

JCS

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

T.I.P. ID #:	R-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	3.14-3.16.11	DATE RECEIVED:	3.17.11	DATE REPORTED:	3.24.11
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2006	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Lab Sample No. A	166198	166199	166200	166201	166202	166203	166204	166205
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	98	93	97	97	94	97	97	94
Passing #40 Sieve %	88	85	88	86	89	89	89	85
Passing #200 Sieve %	46	48	53	29	33	48	58	54

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	23	18	17	26	17	17	17	18
Fine Sand - Ret. #270	38	39	34	56	60	43	31	31
Silt 0.05-0.005 mm %	23	23	23	14	21	22	23	27
Clay < 0.005 mm %	16	20	26	4	2	18	29	24
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	39	42	35	32	27	37	38	35
Plastic Index	NP	NP	NP	NP	NP	NP	NP	NP
AASHTO Classification	A-4 (2)	A-5 (3)	A-4 (4)	A-2-4 (0)	A-2-4 (0)	A-4 (3)	A-4 (5)	A-4 (4)
Quantity								
Texture								
Station	23+40	23+40	23+40	23+40	23+40	23+37	23+37	23+37
Hole No.								
Depth (ft) From:	30.4	5.4	35.4	40.4	50.4	5.2	15.3	35.2
To:	31.4	6.4	36.4	41.4	51.4	6.2	16.3	36.2
	OK	OK	OK	OK	OK	OK	OK	OK

Remarks:

A-166198 - 166205

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

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

JCS

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

10/18

T.I.P. ID #:	R-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1 (cont.)	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	3.16.11	DATE RECEIVED:	3.17.11	DATE REPORTED:	3.24.11
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye	2006	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-13							
Lab Sample No. A	166206							
HiCAMS Sample #	--							
Retained #4 Sieve %	0.0							
Passing #10 Sieve %	99							
Passing #40 Sieve %	75							
Passing #200 Sieve %	24							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	43							
Fine Sand - Ret. #270	40							
Silt 0.05-0.005 mm %	13							
Clay < 0.005 mm %	4							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	25							
Plastic Index	NP							
AASHTO Classification	A-2-4 (0)							
Quantity								
Texture								
Station	23+37							
Hole No.								
Depth (ft) From:	40.2							
To:	41.2							
	OK							

Remarks:

A-166206

CC:

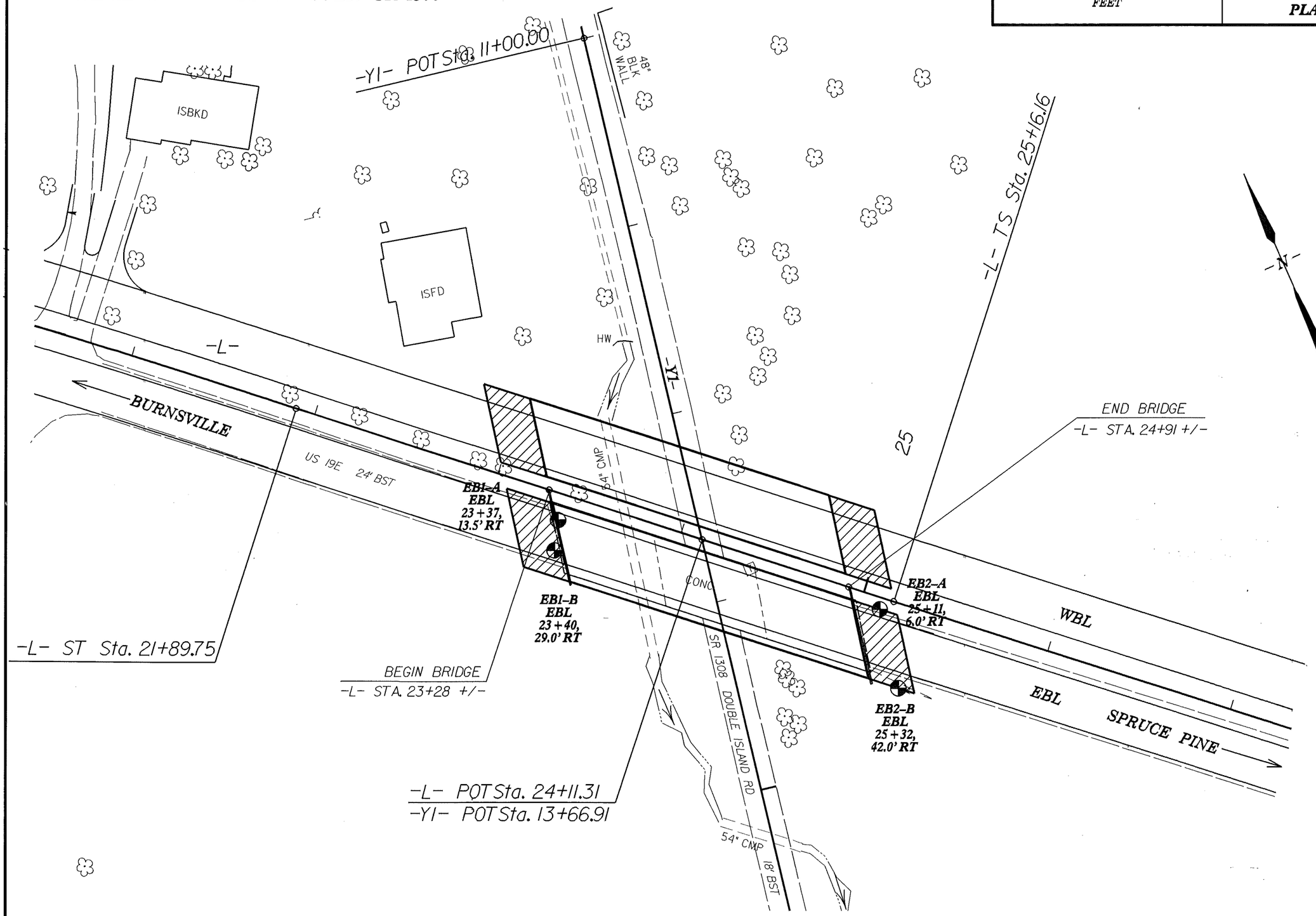
C. A. Dunnagan	
File	

SOILS ENGINEER:	

BRIDGE ON EBL US-19E OVER SR-1308

0	50	100
	FEET	

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	11/18
PLAN VIEW	



PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	12/18

HORIZ. SCALE (FEET) 0 10 20 | VE = 1 | **EBL END BENT ONE**

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	13/18

℄ EBL

EXISTING GROUND

EB2-B
EBL
25+32,
42.0' RT

8 5 5 5 7 16 27 48 60 23 100/0.7 47 43 100/0.4

BT
DRY

EMBANKMENT: YELLOW TO RED-BROWN SANDY SILT WITH CLAY

ALLUVIUM: BROWN TO GRAY SILTY SAND AND SANDY SILT WITH TRACE OF ORGANIC MATERIAL AND GRAVEL.

SAPROLITE; BROWN AND GRAY SILTY SAND WITH QUARTZ VEINS AND MICA

WEATHERED ROCK OF GNEISS

SAPROLITE; BROWN AND GRAY SILTY SAND WITH QUARTZ VEINS AND MICA

WEATHERED ROCK OF GNEISS

EB2-A
EBL
25+11,
6.0' RT

8 6 7 7 11 15 23 26 23 49 34 41 29 68 50

BT
DRY

℄ L

SKEW = 58.9°

2520 2510 2500 2490 2480 2470 2460 2450 2440 2430

HORIZ. SCALE (FEET) 0 10 20

VE = 1

EBL END BENT TWO

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.	
SITE DESCRIPTION Bridge on Proposed US-19E EBL over SR-1308				**GROUND WTR (ft)**
BORING NO. EB1-A EBL	**STATION** 23+37	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** 20.7
COLLAR ELEV. 2,522.5 ft	**TOTAL DEPTH** 66.2 ft	**NORTHING** 801,435	**EASTING** 1,046,694	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 03/16/11	**COMP. DATE** 03/16/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2525										ELEV. (ft) DEPTH (ft)
										2,522.5 GROUND SURFACE 0.0
2520										**ROADWAY EMBANKMENT** Brown-gray sandy silt with trace of organic material.
	2,517.8	4.7	1	3	3	6	SS-10	M		
2515	2,512.8	9.7	2	2	3	5				
2510	2,507.8	14.7	1	1	2	3	SS-11	W		
2505	2,502.8	19.7	4	4	4	8		W		
2500	2,497.8	24.7	3	3	7	10				
2495	2,492.8	29.7	WOH	WOH	WOH	0		W		
2490	2,487.8	34.7	5	6	4	10	SS-12	M		
2485	2,482.8	39.7	7	11	21	32	SS-13			
2480	2,477.8	44.7	10	21	30	51				
2475	2,472.8	49.7	13	16	33	49				
2470	2,467.8	54.7	9	26	30	56				
2465	2,462.8	59.7	42	58/0.4		100/0.9				2,462.8 59.7
2460	2,457.8	64.7	20	38	52	90				2,461.9 60.6 **WEATHERED ROCK** Weathered rock of gneiss. **SAPROLITE** Brown silty sand.
										2,456.3 66.2 Boring Terminated at Elevation 2,456.3 ft in very dense saprolite.

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.	
SITE DESCRIPTION Bridge on Proposed US-19E EBL over SR-1308				**GROUND WTR (ft)**
BORING NO. EB1-B EBL	**STATION** 23+40	**OFFSET** 29 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,522.2 ft	**TOTAL DEPTH** 60.3 ft	**NORTHING** 801,422	**EASTING** 1,046,686	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Childers, R.	**START DATE** 03/14/11	**COMP. DATE** 03/14/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2525										ELEV. (ft) DEPTH (ft)
										2,522.2 GROUND SURFACE 0.0
2520										**ROADWAY EMBANKMENT** Gray-brown sandy silt with trace of gravel.
	2,517.3	4.9	2	3	4	7	SS-5	M		
2515	2,512.3	9.9	2	3	5	8		M		
2510	2,507.3	14.9	1	1	2	3				
2505	2,502.3	19.9	2	5	5	10				
2500	2,497.3	24.9	2	3	3	6				
2495	2,492.3	29.9	1	2	1	3	SS-6	W		
2490	2,487.3	34.9	3	4	7	11	SS-7	M		
2485	2,482.3	39.9	5	7	19	26	SS-8	M		
2480	2,477.3	44.9	18	27	48	75				
2475	2,472.3	49.9	28	37	42	79	SS-9			
2470	2,467.3	54.9	28	41	59/0.3	100/0.8				
2465	2,462.3	59.9	100/0.4			100/0.4 (NOTE: 60.2'-60.3'@ 60/0.1)				2,494.8 27.4 **ROADWAY EMBANKMENT** Gray-brown sandy silt with trace of gravel. 2,488.7 33.5 **ALLUVIAL** Dark gray to brown sandy silt with clay and a trace of organic material and rounded gravel. 2,483.5 38.7 **SAPROLITE** Gray silty sand. 2,466.8 55.4 **WEATHERED ROCK** Weathered rock of gneiss. 2,462.0 60.2 2,461.9 60.3 **CRYSTALLINE ROCK** Amphibolite gneiss. Boring Terminated at Elevation 2,461.9 ft in amphibolite gniess.

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.	
SITE DESCRIPTION Bridge on Proposed US-19E EBL over SR-1308				**GROUND WTR (ft)**
BORING NO. EB2-A EBL	**STATION** 25+11	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,513.6 ft	**TOTAL DEPTH** 77.0 ft	**NORTHING** 801,327	**EASTING** 1,046,829	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Rose, G. K.	**START DATE** 03/07/11	**COMP. DATE** 03/08/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2515										ELEV. (ft) DEPTH (ft)
										2,513.6 GROUND SURFACE 0.0
2510										**ROADWAY EMBANKMENT** Yellow to red-brown sandy silt with clay.
	2,508.1	5.5	2	3	5	8		M		
2505	2,503.1	10.5	3	2	4	6				
2500	2,498.1	15.5	2	3	4	7		W		
2495	2,493.1	20.5	WOH	3	4	7		Sat.		
2490	2,488.1	25.5	4	6	5	11				2,489.0 24.6
2485	2,483.1	30.5	13	11	4	15		W		**ALLUVIAL** Dark brown to gray sandy silt with gravel.
2480	2,478.1	35.5	5	10	13	23		W		2,483.4 30.2
2475	2,473.1	40.5	4	10	16	26				**SAPROLITE** Dark gray and brown silty sand with quartz veins and mica.
2470	2,468.1	45.5	9	11	12	23				
2465	2,463.1	50.5	15	26	23	49				
2460	2,458.1	55.5	12	17	17	34				
2455	2,453.1	60.5	6	17	24	41				
2450	2,448.1	65.5	7	10	19	29				
2445	2,443.1	70.5	17	33	35	68				
2440	2,438.1	75.5	24	27	23	50				2,436.6 77.0
										Boring Terminated at Elevation 2,436.6 ft in

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.	
SITE DESCRIPTION Bridge on Proposed US-19E EBL over SR-1308				**GROUND WTR (ft)**
BORING NO. EB2-A EBL	**STATION** 25+11	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,513.6 ft	**TOTAL DEPTH** 77.0 ft	**NORTHING** 801,327	**EASTING** 1,046,829	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Rose, G. K.	**START DATE** 03/07/11	**COMP. DATE** 03/08/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2435						Match Line				ELEV. (ft) DEPTH (ft)
										very dense saprolite.

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 04/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Hager, M. M.
SITE DESCRIPTION Bridge on Proposed US-19E EBL over SR-1308			**GROUND WTR (ft)**
BORING NO. EB2-B EBL	**STATION** 25+32	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,515.0 ft	**TOTAL DEPTH** 70.7 ft	**NORTHING** 801,285	**EASTING** 1,046,822	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Rose, G. K.	**START DATE** 03/02/11	**COMP. DATE** 03/03/11	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2520										
2515										2,515.0 GROUND SURFACE 0.0
2510	2,509.7	5.3	2	4	4	8	SS-1	M		**ROADWAY EMBANKMENT** Red-brown sandy silt.
2505	2,504.7	10.3	2	2	3	5				
2500	2,499.7	15.3	2	3	2	5				
2495	2,494.7	20.3	1	2	3	5				
2490	2,489.7	25.3	2	3	4	7	SS-2	W		2,490.0 **ALLUVIAL** Red to Brown sandy silt with trace of organic material. 25.0
2485	2,484.7	30.3	5	8	8	16		Sat.		2,487.0 **ALLUVIAL** Interlayers of sandy silt and silty sand with gravel. 28.0
2480	2,479.7	35.3	9	12	15	27	SS-3	W		2,483.5 **SAPROLITE** Brown and gray silty sand with mica. 31.5
2475	2,474.7	40.3	27	25	23	48				
2470	2,469.7	45.3	21	30	30	60		M		
2465	2,464.7	50.3	6	10	13	23		W		
2460	2,459.7	55.3	25	36	64/0.2	100/0.7				2,459.7 2,458.2 **WEATHERED ROCK** Weathered rock of gneiss. 55.3 56.8
2455	2,454.7	60.3	10	20	27	47	SS-4			**SAPROLITE** Yellow-brown silty snd with mica.
2450	2,449.7	65.3	15	22	21	43				
2445	2,444.7	70.3	100/0.4			100/0.4				2,444.7 2,444.3 **WEATHERED ROCK** Weathered rock of gneiss. 70.3 70.7 Boring Terminated at Elevation 2,444.3 ft in weathered rock of gneiss.

NCDOT BORE SINGLE BORELOGS.GPJ NC_DOT.GDT 04/15/11

JCS

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

T.I.P. ID #:	R-2519B

REPORT ON SAMPLES OF:	Soil for Quality

PROJECT:	35609.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	3.2. & 3.3.11	DATE RECEIVED:	3.4.11	DATE REPORTED:	3.8.11
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye		2006	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4				
Lab Sample No. A	166099	166100	166101	166102				
HiCAMS Sample #	--	--	--	--				
Retained #4 Sieve %	0.6	0.0	0.0	0.0				
Passing #10 Sieve %	97	90	100	99				
Passing #40 Sieve %	89	82	97	84				
Passing #200 Sieve %	51	57	22	26				

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	20	16	17	33				
Fine Sand - Ret. #270	35	26	70	50				
Silt 0.05-0.005 mm %	21	24	9	13				
Clay < 0.005 mm %	24	34	4	4				
Passing # 40 Sieve %	--	--	--	--				
Passing # 200 Sieve %	--	--	--	--				

Liquid Limit	36	42	33	26				
Plastic Index	NP	NP	NP	NP				
AASHTO Classification	A-4 (3)	A-5 (4)	A-2-4 (0)	A-2-4 (0)				
Quantity								
Texture								
Station	25+32	25+32	25+32	25+32				
Hole No.								
Depth (ft) From:	5.8	25.8	35.8	60.8				
To:	6.8	26.8	36.8	61.8				
	OK	OK	OK	OK				

Remarks:

A-166099 - 166102

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

M&T 503E

17/18

JCS

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

T.I.P. ID #:	R-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	3.14-3.16.11	DATE RECEIVED:	3.17.11	DATE REPORTED:	3.24.11
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye		2006	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Lab Sample No. A	166198	166199	166200	166201	166202	166203	166204	166205
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	98	93	97	97	94	97	97	94
Passing #40 Sieve %	88	85	88	86	89	89	89	85
Passing #200 Sieve %	46	48	53	29	33	48	58	54

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	23	18	17	26	17	17	17	18
Fine Sand - Ret. #270	38	39	34	56	60	43	31	31
Silt 0.05-0.005 mm %	23	23	23	14	21	22	23	27
Clay < 0.005 mm %	16	20	26	4	2	18	29	24
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	39	42	35	32	27	37	38	35
Plastic Index	NP	NP	NP	NP	NP	NP	NP	NP
AASHTO Classification	A-4 (2)	A-5 (3)	A-4 (4)	A-2-4 (0)	A-2-4 (0)	A-4 (3)	A-4 (5)	A-4 (4)
Quantity								
Texture								
Station	23+40	23+40	23+40	23+40	23+40	23+37	23+37	23+37
Hole No.								
Depth (ft) From:	30.4	5.4	35.4	40.4	50.4	5.2	15.3	35.2
To:	31.4	6.4	36.4	41.4	51.4	6.2	16.3	36.2
	OK	OK	OK	OK	OK	OK	OK	OK

Remarks:

A-166198 - 166205

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

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

18/18

JCS

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

T.I.P. ID #:	R-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1 (cont.)	COUNTY:	Yancey	Owner:	NCDOT
DATE SAMPLED:	3.16.11	DATE RECEIVED:	3.17.11	DATE REPORTED:	3.24.11
SAMPLED FROM:	Bridge	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye		2006	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-13							
Lab Sample No. A	166206							
HiCAMS Sample #	--							
Retained #4 Sieve %	0.0							
Passing #10 Sieve %	99							
Passing #40 Sieve %	75							
Passing #200 Sieve %	24							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	43							
Fine Sand - Ret. #270	40							
Silt 0.05-0.005 mm %	13							
Clay < 0.005 mm %	4							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	25							
Plastic Index	NP							
AASHTO Classification	A-2-4 (0)							
Quantity								
Texture								
Station	23+37							
Hole No.								
Depth (ft) From:	40.2							
To:	41.2							
	OK							

Remarks:

A-166206

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *35609.1.1 (R-2519B)* F.A. PROJ. _____

COUNTY *Yancey*

PROJECT DESCRIPTION *Bridge No. 43 on South Bound Lanes of US-19E over South Toe River*

SITE DESCRIPTION *Replacement of Existing Structure with Dual Structures*

ID: R-2519B

PROJECT: 35609.1.1

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILES
5	CROSS SECTIONS
8	BORE LOG REPORTS

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

D C Elliot

D O Cheek

C J Coffey

T B Daniel

R D Childers

J C Kuhne

INVESTIGATED BY *C A Dunnagan*

CHECKED BY _____

SUBMITTED BY *C A Dunnagan*

DATE *February 2013*

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 REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/11

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1			A-3	A-2			A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b			A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX		35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP		40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0		0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD								FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT / CPT / OPT / 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
WOH-WEIGHT OF HAMMER

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B-____
- [ ] -N-____
- [ ] -H-____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-143 AT -BL- STA 117+13.07, 43.57' LT

ELEVATION: 2471.55 FT.

NOTES:

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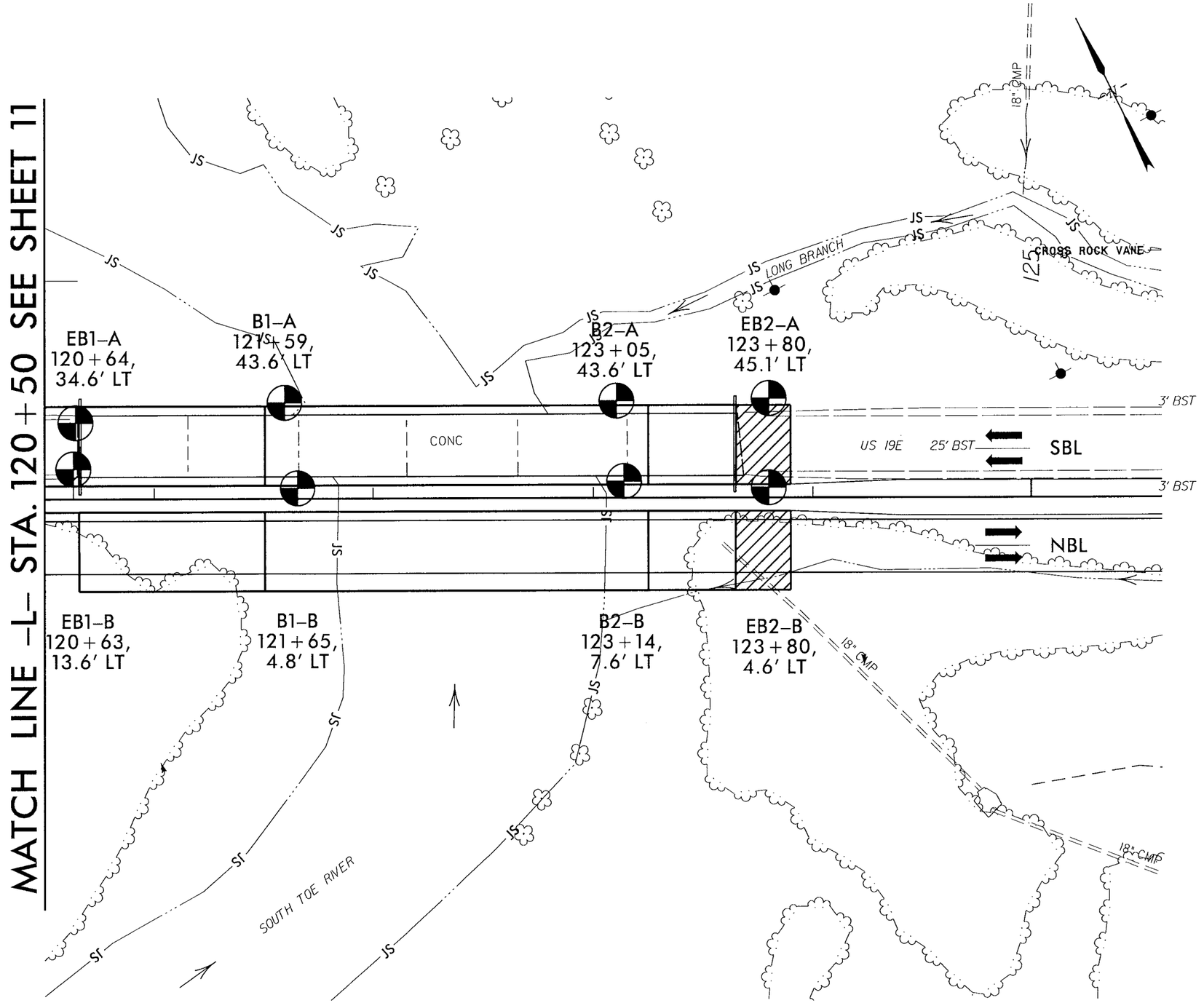
REVISED 02/23/06

BRIDGE No. 43 ON SBL OF US-19E OVER SOUTH TOE RIVER

0 50 100 GR FEET SKEW = 90	PROJECT REFERENCE NO.	SHEET
	35609.1.1 (R-2519B)	3/11
	PLAN VIEW	



BRIDGE No. 43 ON SBL US-19E OVER SOUTH TOE RIVER

0 20 40 FEET VE = 2	PROJECT REFERENCE NO.	SHEET
	35609.1.1 (B-2519B)	4/-11
	Profile: 7.6' Left CL South Bound Lanes (1/2)	

EB1-B
120+63,
13.6' LT

B1-B
121+65,
4.8' LT

B2-B
123+14,
7.6' LT

EXISTING GROUND

EMBANKMENT: RED-BROWN SILTY SAND WITH A TRACE OF GRAVEL

ALLUVIUM: BROWN SILTY SAND WITH GRAVEL AND A TRACE OF COBBLES

SAPROLITE: DARK GRAY AND BROWN SILTY SAND WITH A TRACE OF MICA

WEATHERED ROCK OF GNEISS

CRYSTALLINE ROCK: DARK GRAY BIOTITE GNEISS

BT
DRY

ALLUVIUM: BROWN SILTY SAND, GRAVEL AND COBBLES

SAPROLITE: DARK GRAY AND BROWN SILTY SAND WITH A TRACE OF MICA

WEATHERED ROCK OF GNEISS

BT
DRY

WATER SURFACE 2/13

APPROX. RIVER BOTTOM

1/2013

ALLUVIUM: BROWN SILTY SAND WITH GRAVEL AND A TRACEK OF MICA

SAPROLITE: TAN SILTY SAND WITH A TRACE OF MICA

WEATHERED ROCK OF GNEISS

WEATHERED ROCK OF PEGMATITE

CRYSTALLINE ROCK: LIGHT GRAY GRANITIC PEGMATITE

BT

5	7	26	20	8	100/0.6	100/0.5	60/0.1	22	15	100/0.6	100/0.5	100/0.5	100/0.2	100/0.7	100/0.5	100/0.4
6																

10	42	18	43	100/0.9	100/0.7	100/0.2	100/0.4	60/0.0	60/0.1

2480 2470 2460 2450 2440 2430 2420 2410 2400

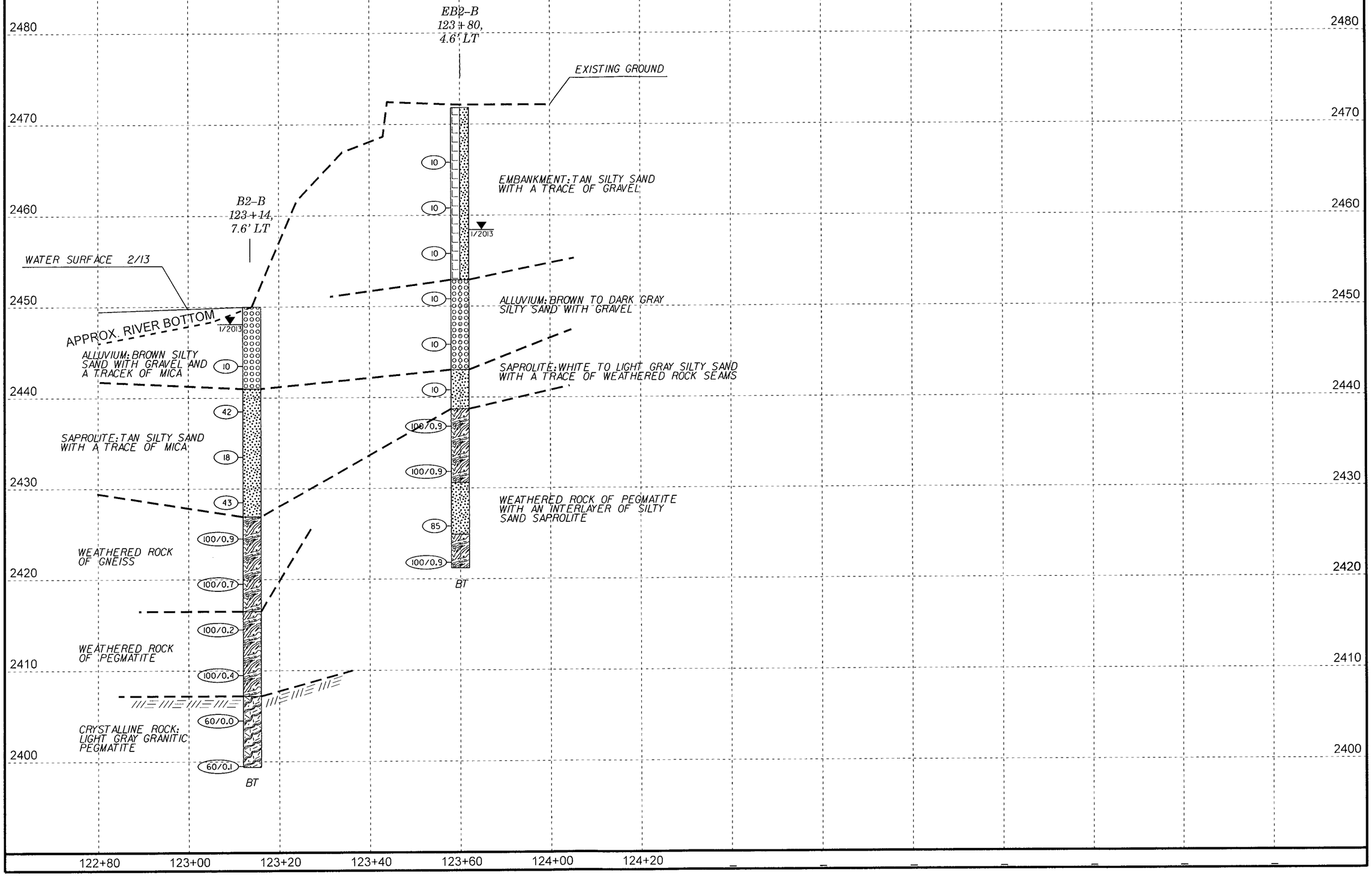
120+40 120+60 120+80 121+00 121+20 121+40 121+60 121+80 122+00 122+20 122+40 122+60 122+80 123+00

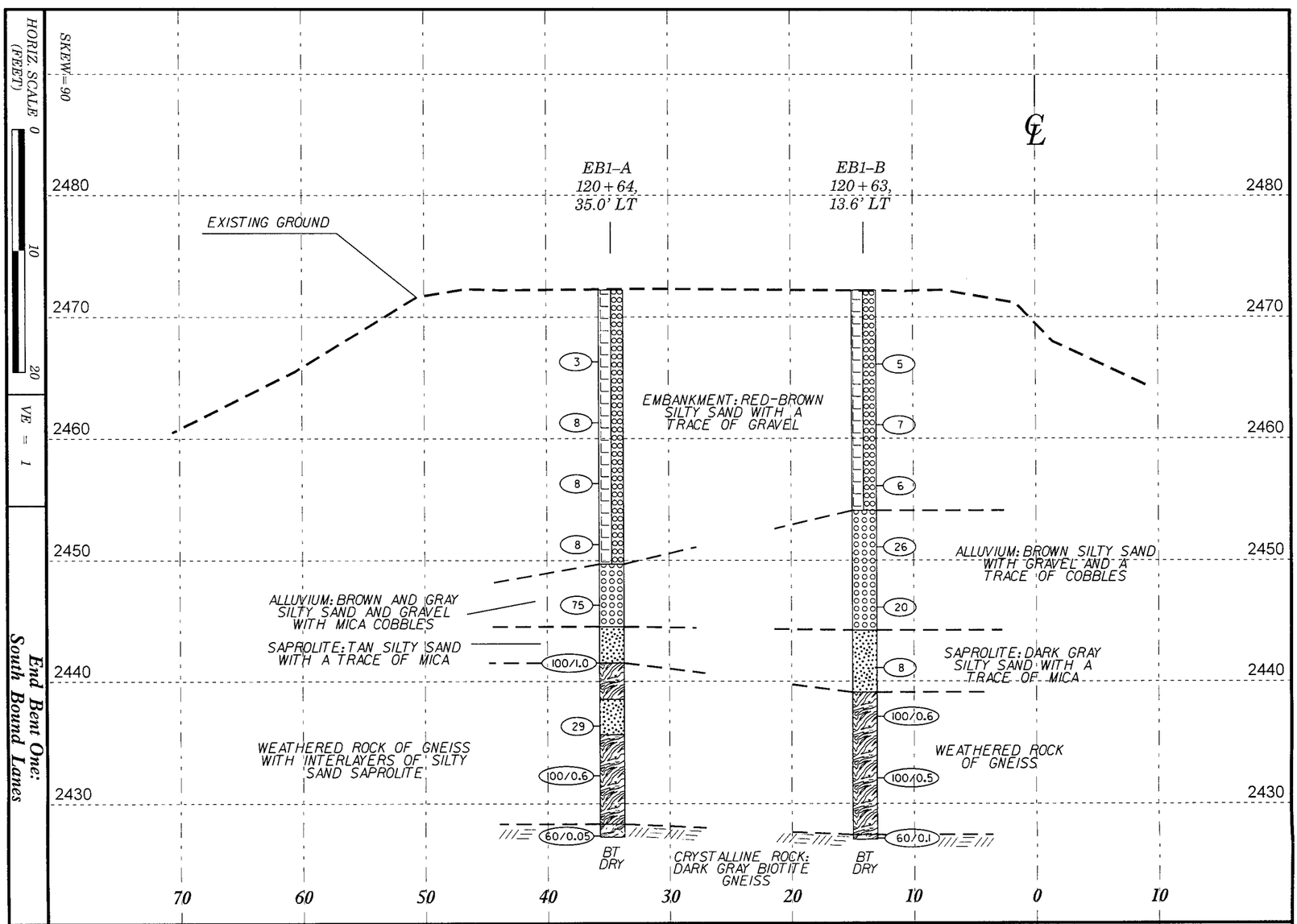
BRIDGE No. 43 ON SBL US-19E OVER SOUTH TOE RIVER

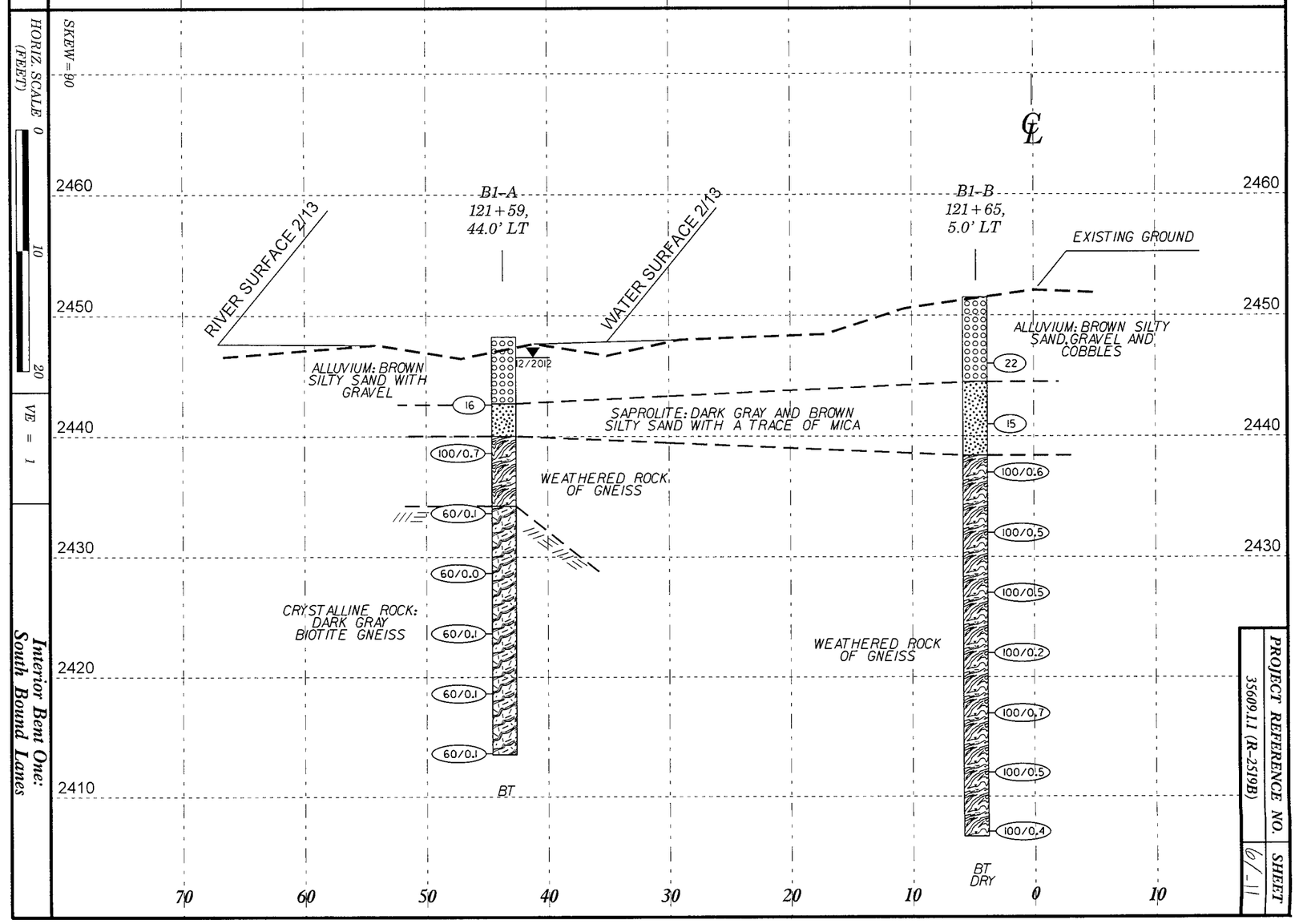
0	20	40
FEET		
VE = 2		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (B-2519B)	5/11

Profile: 7.6' Left CL
South Bound Lanes (2/2)







PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	6/-11

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	7/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 120+64	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,472.2 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 799,966	**EASTING** 1,055,870	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/11/13	**COMP. DATE** 02/11/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2475										2,472.2 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Red-brown silty sand with gravel.	
2470	2,467.3	4.9	2	2	1	3		M			
2465	2,462.3	9.9	WOH	3	5	8		M			
2460	2,457.3	14.9	2	3	5	8		M			
2455	2,452.3	19.9	3	3	5	8		M		2,449.7	22.5
2450	2,447.3	24.9	24	30	45	75		M		**ALLUVIAL** Brown and gray silty sand and gravel with mica and cobbles.	
2445	2,442.3	29.9	40	60/0.5		100/1.0				2,444.5	27.7
2440	2,437.3	34.9	6	12	17	29		M		**SAPROLITE** Brown, tan and white silty sand with trace of mica. 2,441.5	30.7
2435	2,432.3	39.9	73	27/0.1		100/0.6				**WEATHERED ROCK** Weathered rock of gneiss. 2,438.5	33.7
2430	2,427.3	44.9	60/0.05			60/0.05				**SAPROLITE** Brown, tan and white silty sand with trace of mica. 2,435.6	36.6
										WEATHERED ROCK Weathered rock of gneiss. 2,428.3	43.9
										2,427.3 **CRYSTALLINE ROCK** Dark gray biotite gneiss.	45.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,427.3 ft in biotite gneiss.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/21/13

SHEET 8/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 120+63	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,472.2 ft	**TOTAL DEPTH** 45.2 ft	**NORTHING** 799,947	**EASTING** 1,055,860	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/11/13	**COMP. DATE** 02/11/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2475										2,472.2 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Red-brown silty sand with a trace of gravel.	
2470	2,467.1	5.1	2	2	3	5		M			
2465	2,462.1	10.1	2	3	4	7		M			
2460	2,457.1	15.1	2	3	3	6		M			
2455	2,452.1	20.1	9	12	14	26		M		2,454.1	18.1
2450	2,447.1	25.1	8	9	11	20		M		**ALLUVIAL** Brown silty sand with gravel and a trace of cobbles.	
2445	2,442.1	30.1	4	3	5	8		M		2,444.2	28.0
2440	2,437.1	35.1	74	26/0.2		100/0.6				**SAPROLITE** Dark gray silty sand with a trace of mica. 2,439.1	33.1
2435	2,432.1	40.1	100/0.5			100/0.5				**WEATHERED ROCK** Weathered rock of gneiss. 2,427.4	44.8
2430	2,427.1	45.1	60/0.1			60/0.1				2,427.0 **CRYSTALLINE ROCK** Dark gray biotite gneiss.	45.2
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,427.0 ft in biotite gneiss.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

SHEET

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 121+59	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** 1.3
COLLAR ELEV. 2,448.2 ft	**TOTAL DEPTH** 34.7 ft	**NORTHING** 779,930	**EASTING** 1,055,959	**24 HR.** 1.7
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/18/12	**COMP. DATE** 12/18/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2450	2,448.2	0.0								2,448.2 GROUND SURFACE 0.0
										ALLUVIAL Brown silty sand with gravel.
2445	2,443.6	4.6	12	5	11	16		W		2,442.7 5.5
										SAPROLITE Dark gray silty sand with a trace of mica.
2440	2,438.6	9.6	45	55/0.2		100/0.7				2,440.0 8.2
										WEATHERED ROCK Weathered rock of gneiss.
2435	2,433.6	14.6	60/0.1			60/0.1				2,434.2 14.0
										CRYSTALLINE ROCK Dark gray biotite gneiss.
2430	2,428.8	19.4	60/0.0			60/0.0				
2425	2,423.6	24.6	60/0.1			60/0.1				
2420	2,418.6	29.6	60/0.1			60/0.1				
2415	2,413.6	34.6	60/0.1			60/0.1				2,413.5 34.7
										Boring Terminated at Elevation 2,413.5 ft in biotite gneiss.

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

SHEET 9/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 121+65	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,451.5 ft	**TOTAL DEPTH** 44.9 ft	**NORTHING** 799,893	**EASTING** 1,055,946	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO0070 CME-550X 81% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/18/12	**COMP. DATE** 12/19/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2455	2,451.5	0.0								2,451.5 GROUND SURFACE 0.0
										ALLUVIAL Brown silty sand, gravel and cobbles.
2450	2,447.0	4.5	31	12	10	22		W		2,444.5 7.0
										SAPROLITE Dark brown silty sand with a trace of mica.
2445	2,442.0	9.5	3	6	9	15		M		2,438.4 13.1
2440	2,437.0	14.5	50	50/0.1		100/0.6				**WEATHERED ROCK** Weathtered rock of gneiss.
2435	2,432.0	19.5	100/0.5			100/0.5				
2430	2,427.0	24.5	100/0.5			100/0.5				
2425	2,422.0	29.5	100/0.2			100/0.2				
2420	2,417.0	34.5	67	33/0.2		100/0.7				
2415	2,412.0	39.5	100/0.5			100/0.5				
2410	2,407.0	44.5	100/0.4			100/0.4				2,406.6 44.9
										Boring Terminated at Elevation 2,406.6 ft in weathered rock of pegmatite.

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 123+05	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,451.8 ft	**TOTAL DEPTH** 45.8 ft	**NORTHING** 799,861	**EASTING** 1,056,094	**24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 01/24/13	**COMP. DATE** 01/24/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
										ELEV. (ft)	
2455										2,451.8 GROUND SURFACE	0.0
										ALLUVIAL Brown silty sand with a trace of gravel and cobbles.	
2450											
	2,446.1	5.7	1	1	4	5		W			
2445											
	2,441.1	10.7	8	14	10	24		W		2,438.6	13.2
2440										**SAPROLITE** Dark brown silty sand with a trace of mica.	
	2,436.1	15.7	2	7	11	18		M			
2435											
	2,431.1	20.7	23	38	24	62		M		2,427.1	24.7
2430										**WEATHERED ROCK** Weathered rock of pegmatite with interlayers of crystalline rock.	
	2,426.1	25.7	60/0.1			60/0.1				2,423.6	28.2
2425										**WEATHERED ROCK** Weathered rock of pegmatite.	
	2,421.1	30.7	100/0.2			100/0.2					
2420											
	2,416.1	35.7	100/0.3			100/0.3					
2415											
	2,411.1	40.7	60/0.1			60/0.1				2,411.1	40.7
2410										**CRYSTALLINE ROCK** Light gray granitic pegmatite with interlayers of biotite gneiss.	
	2,406.1	45.7	60/0.1			60/0.1				2,406.0	45.8
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,406.0 ft in granitic pegmatite.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/21/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET 10/11

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 123+14	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,450.0 ft	**TOTAL DEPTH** 50.6 ft	**NORTHING** 799,827	**EASTING** 1,056,080	**24 HR.** 1.9
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 01/28/13	**COMP. DATE** 01/28/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
										ELEV. (ft)	
2450										2,450.0 GROUND SURFACE	0.0
										ALLUVIAL Brown silty sand with gravel and a trace of mica.	
2445	2,444.5	5.5	4	5	5	10		W		2,441.0	9.0
2440	2,439.5	10.5	13	20	22	42		M		**SAPROLITE** Tan silty sand with a trace of mica.	
2435	2,434.5	15.5	5	9	9	18		M			
2430	2,429.5	20.5	10	10	33	43		M		2,426.9	23.1
2425	2,424.5	25.5	41	59/0.4		100/0.9				**WEATHERED ROCK** Weathered rock of gneiss.	
2420	2,419.5	30.5	73	27/0.2		100/0.7				2,416.5	33.5
2415	2,414.5	35.5	100/0.2			100/0.2				**WEATHERED ROCK** Weathered rock of pegmatite.	
2410	2,409.5	40.5	100/0.4			100/0.4				2,407.2	42.8
2405	2,404.5	45.5	60/0.0			60/0.0				**CRYSTALLINE ROCK** Light gray granitic pegmatite.	
2400	2,399.5	50.5	60/0.1			60/0.1				2,399.4	50.6
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,399.4 ft in granitic pegmatite.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/21/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 123+80	**OFFSET** 45 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,471.7 ft	**TOTAL DEPTH** 40.5 ft	**NORTHING** 799,830	**EASTING** 1,056,156	**24 HR.** 16.3
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/05/13	**COMP. DATE** 02/05/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2475										2,471.7 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Brown and gray silty sand with gravel.	
2470											
	2,466.3	5.4	2	2	3	5		M			
2465											
	2,461.3	10.4	4	5	5	10		M			
2460											
	2,456.3	15.4	3	6	4	10		M		2,453.9	17.8
2455										**ALLUVIAL** Dark brown and gray silty sand and gravel with cobbles and boulders from 22.7 feet.	
	2,451.3	20.4	2	11	16	27		M			
2450											
	2,446.3	25.4	10	14	18	32		M			
2445										2,443.9	27.8
	2,441.3	30.4	66	34/0.2		100/0.7				**SAPROLITE** Tan silty sand with trace of mica.	
2440										2,441.0	30.7
										WEATHERED ROCK Weathered rock of pegmatite.	
	2,436.3	35.4	67	33/0.2		100/0.7				2,435.9	35.8
2435										**WEATHERED ROCK** Weathered rock of gneiss.	
	2,431.3	40.4	60/0.1			60/0.1				2,431.6	40.1
										2,431.2 **CRYSTALLINE ROCK** Dark gray biotite gneiss.	40.5
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,431.2 ft in biotite gneiss.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/21/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 43 on SBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 123+80	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** 12.1
COLLAR ELEV. 2,471.8 ft	**TOTAL DEPTH** 50.6 ft	**NORTHING** 799,794	**EASTING** 1,056,138	**24 HR.** 13.4
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/07/13	**COMP. DATE** 02/07/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2475										2,471.8 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Tan silty sand with a trace of gravel.	
2470											
	2,466.8	5.0	3	3	3	6		M			
2465											
	2,461.8	10.0	2	3	5	8		M			
2460											
	2,456.8	15.0	3	5	4	9		M		2,452.9	18.9
2455										**ALLUVIAL** Brown to dark gray silty sand with gravel.	
	2,451.8	20.0	17	14	10	24		W			
2450											
	2,446.8	25.0	8	8	9	17		W			
2445										2,443.0	28.8
	2,441.8	30.0	18	37	39	76		M		**SAPROLITE** White to light gray silty sand with a trace of weathered rock seams.	
2440										2,438.7	33.1
	2,436.8	35.0	17	43	57/0.4	100/0.9				**WEATHERED ROCK** Weathered rock of pegmatite.	
2435										2,430.6	41.2
	2,431.8	40.0	37	47	16/0.2	100/1.2				**SAPROLITE** White to light gray silty sand.	
2430										2,424.9	46.9
	2,426.8	45.0	12	24	61	85		M		**WEATHERED ROCK** Weathered rock of pegmatite.	
2425										2,421.2	50.6
	2,421.8	50.0	68	32/0.1		100/0.6				Boring Terminated at Elevation 2,421.2 ft in weathered rock of pegmatite.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/22/13

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	_

PROJECT: 35609.1.1 ID: R-2519B

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

STRUCTURE SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. *35609.1.1 (R-2519B* F.A. PROJ. _

COUNTY *Yancey*

PROJECT DESCRIPTION *Bridge No. 43 on North Bound Lanes of US-19E over South Toe River*

SITE DESCRIPTION *Replacement of Existing Structure with Dual Structures*

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

D C Elliot

D O Cheek

C J Coffey

T B Daniel

R D Childers

J C Kuhne

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_

_

INVESTIGATED BY *C A Dunnagan*

CHECKED BY

SUBMITTED BY *C A Dunnagan*

DATE *February 2013*

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.

[illegible]

NORTH CAROLINA LICENSED SEAL 1992 GEOLOGIST CHARLES ANDREWS DUNNAGAN

PROJECT REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2 / 11

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2, A-3	A-4, A-5, A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
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 N, 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
WOH - WEIGHT OF HAMMER

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-143 AT -BL- STA 117+13.07, 43.57' LT

ELEVATION: 2471.55 FT.

NOTES:

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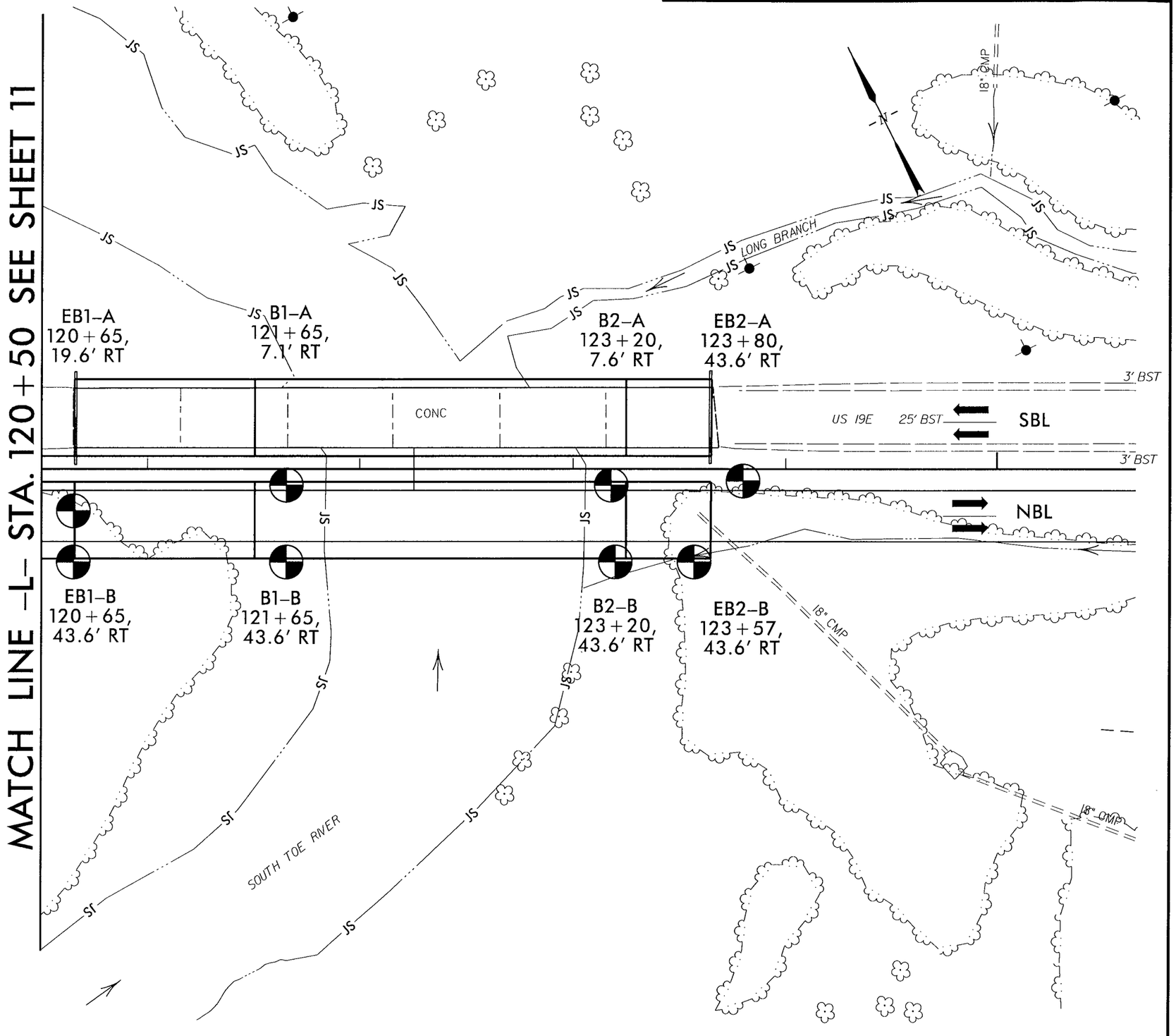
REVISED 02/23/06

BRIDGE No. 43 ON NBL OF US-19E OVER SOUTH TOE RIVER

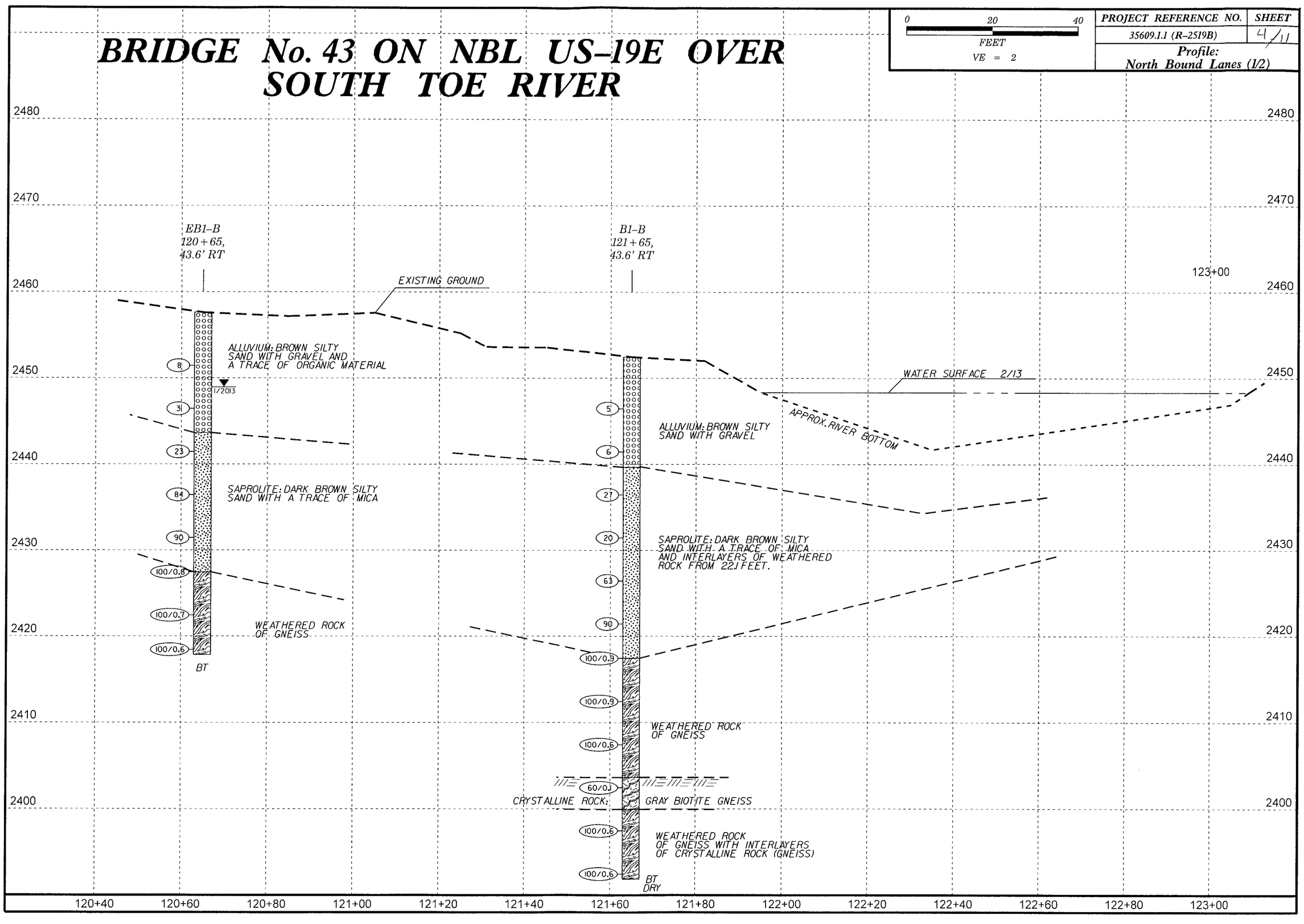
0 50 100 FEET SKEW = 90	PROJECT REFERENCE NO.	SHEET
	35609.1.1 (R-2519B)	3/11
	PLAN VIEW	



BRIDGE No. 43 ON NBL US-19E OVER SOUTH TOE RIVER

0	20	40
FEET		
VE = 2		

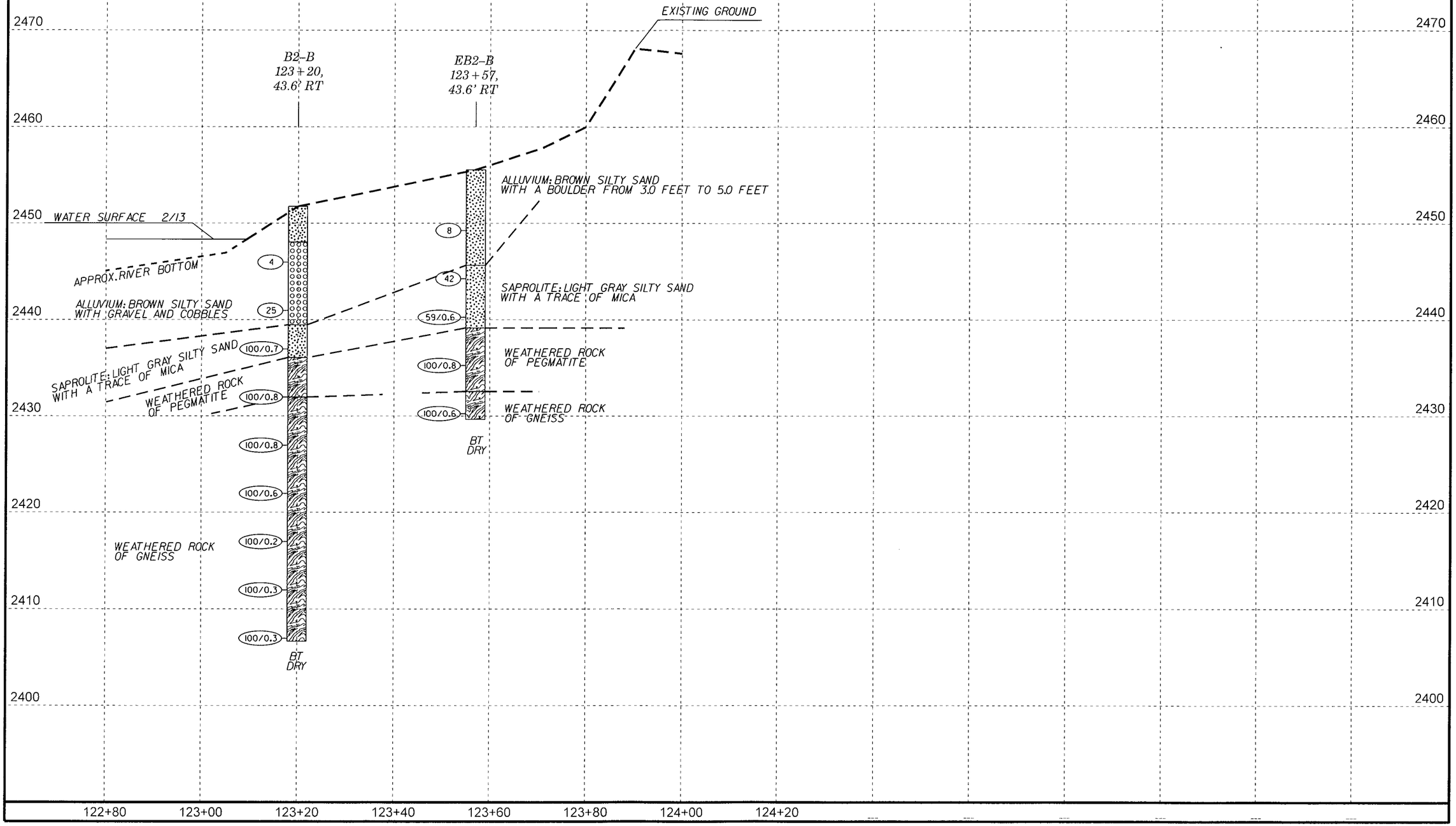
PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4 / 11
Profile: North Bound Lanes (1/2)	

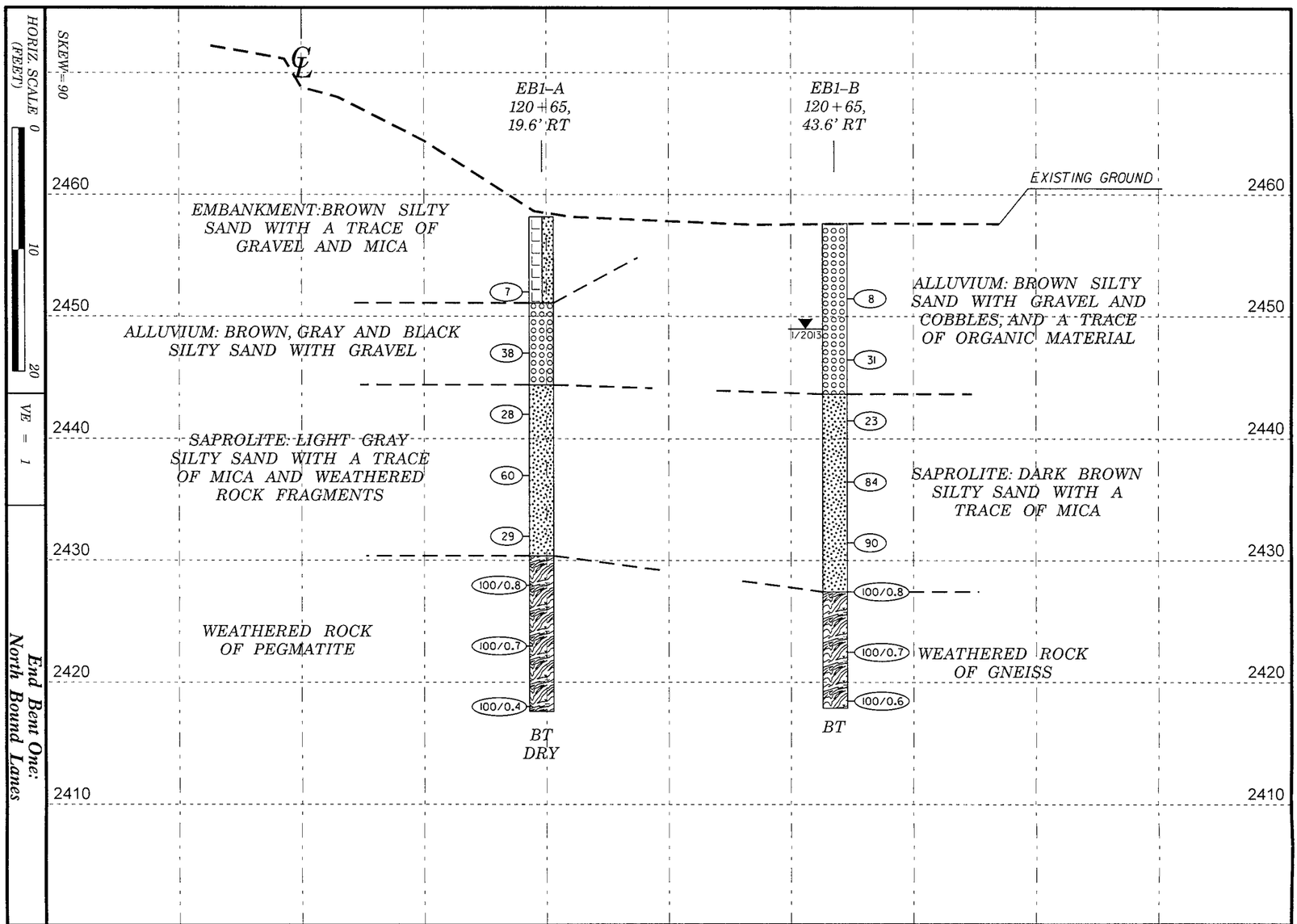


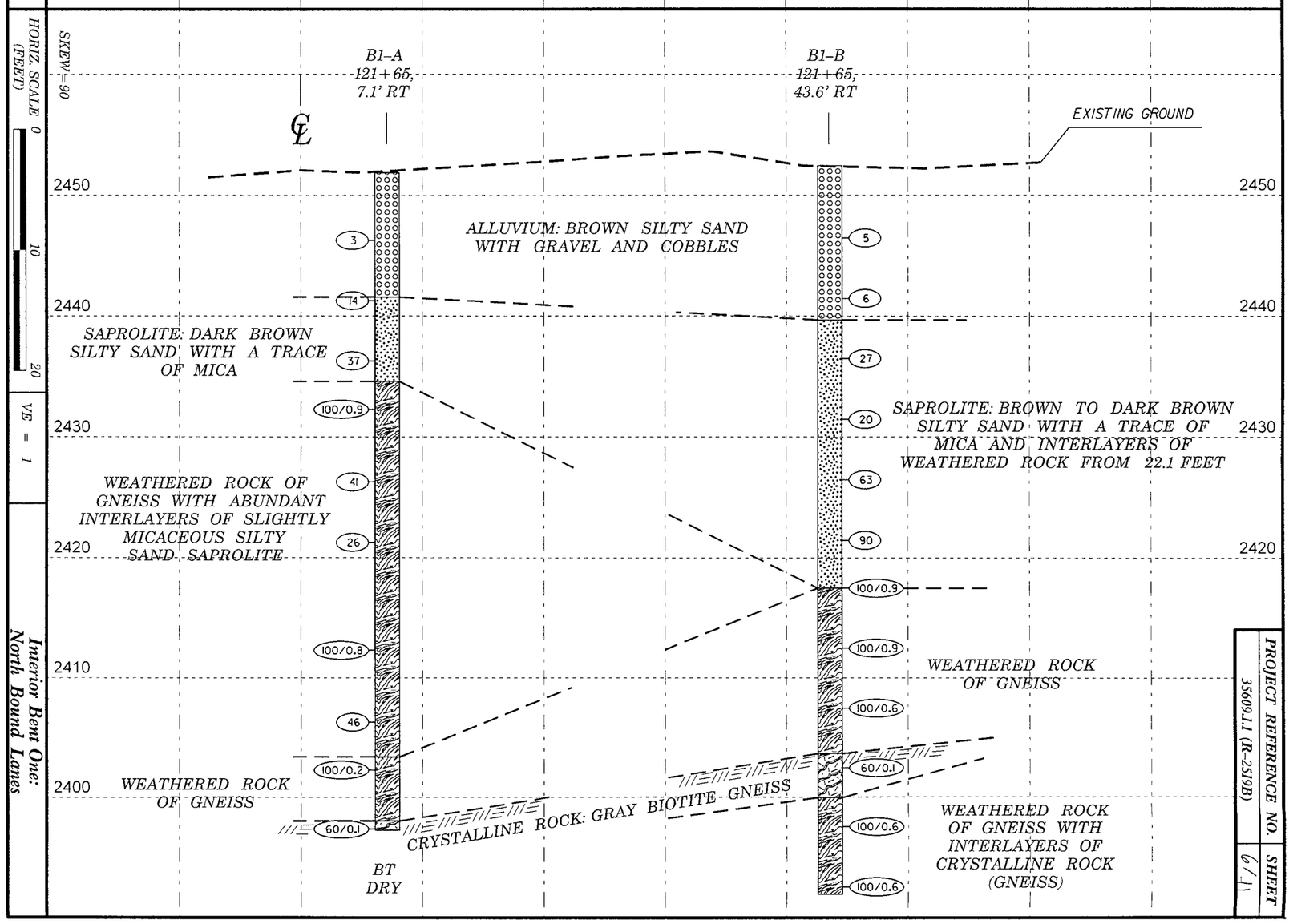
BRIDGE No. 43 ON NBL US-19E OVER SOUTH TOE RIVER

0	20	40
FEET		
VE = 2		

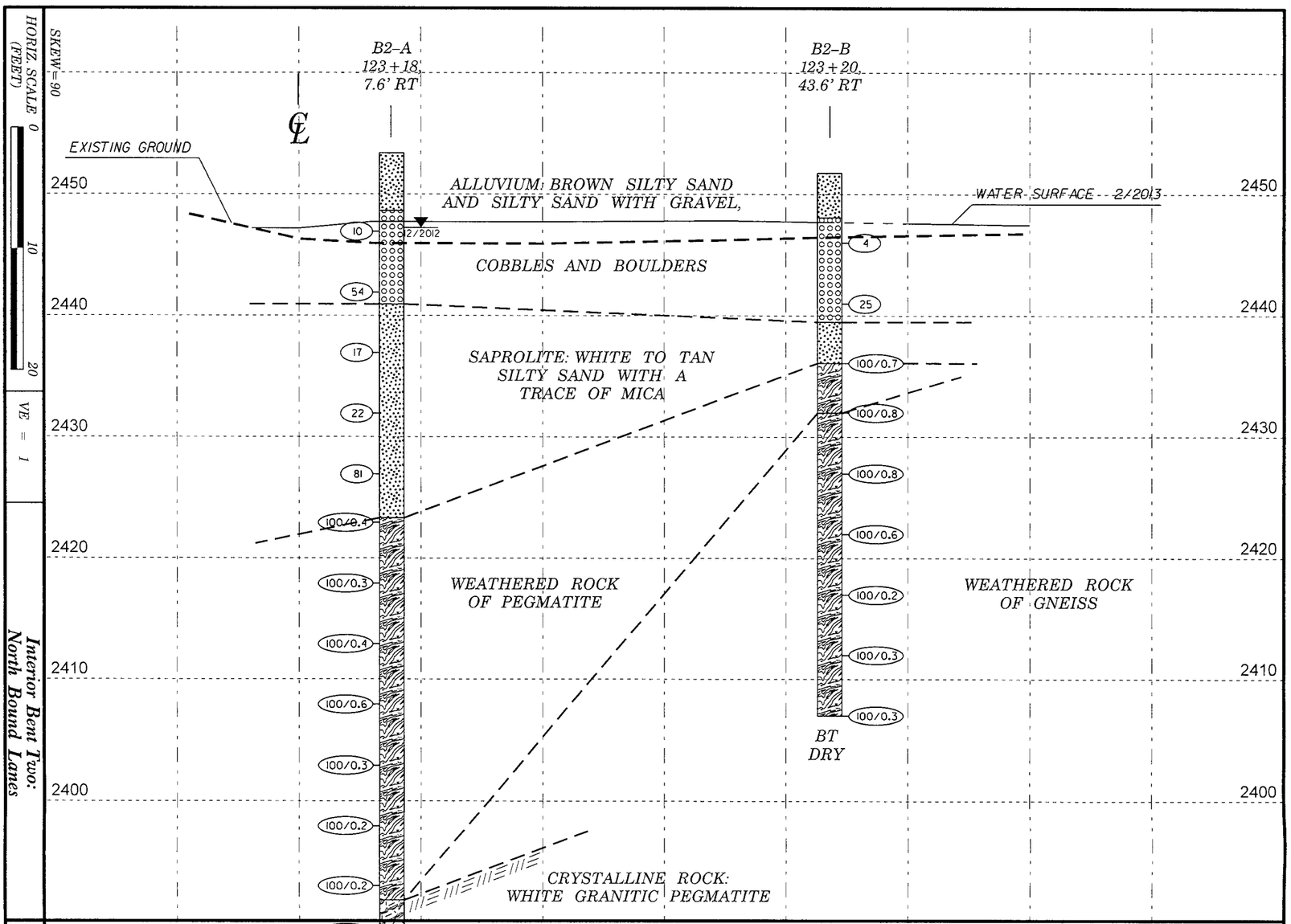
PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	5L 11
Profile: North Bound Lanes (2/2)	

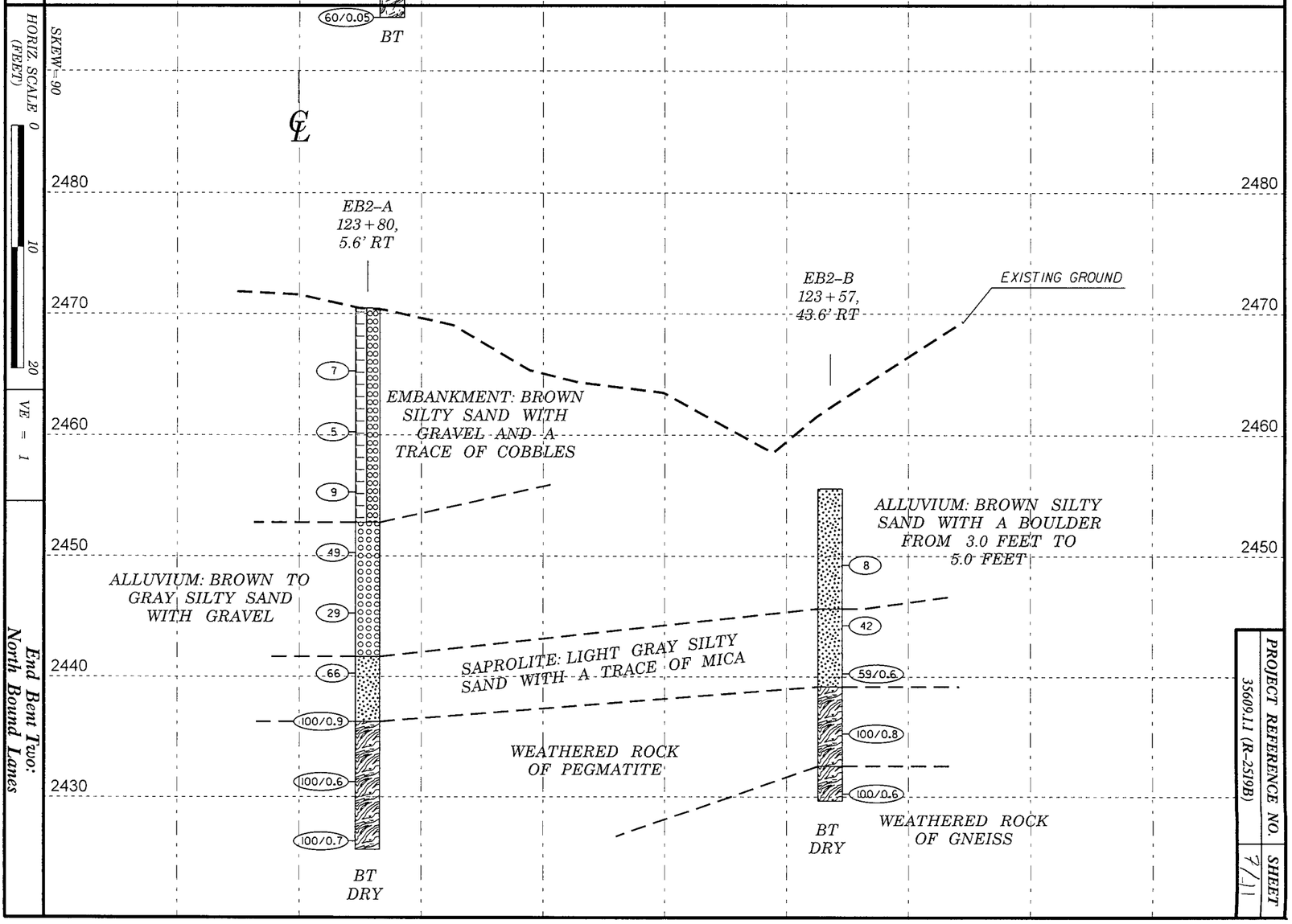






PROJECT REFERENCE NO.	SHEET
35609.11 (R-2519B)	6/11





PROJECT REFERENCE NO.	SHEET
35609.11 (R-2519B)	7/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 120+65	**OFFSET** 20 ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 2,458.2 ft	**TOTAL DEPTH** 40.6 ft	**NORTHING** 799,917	**EASTING** 1,055,846
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Coffey, Jr., C.	**START DATE** 01/09/13	**COMP. DATE** 01/09/13	**SURFACE WATER DEPTH** N/A

GROUND WTR (ft): 0 HR. N/A; 24 HR. Caved

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2460										
										2,458.2 GROUND SURFACE 0.0
2455										**ROADWAY EMBANKMENT** Brown silty sand with a trace of gravel and mica.
	2,453.0	5.2	3	4	3	7		M		2,451.1 7.1
2450										**ALLUVIAL** Brown, gray and black silty sand with gravel.
	2,448.0	10.2	15	28	10	38				2,444.4 13.8
2445										**SAPROLITE** Light gray silty sand with a trace of mica and weathered rock fragments.
	2,443.0	15.2	10	14	14	28		M		
2440										
	2,438.0	20.2	11	23	37	60		M		
2435										
	2,433.0	25.2	10	13	16	29		M		2,430.4 27.8
2430										**WEATHERED ROCK** Weathered rock of granitic pegmatite.
	2,428.0	30.2	46	54/0.3		100/0.8				
2425										
	2,423.0	35.2	32	34	66/0.2	100/0.7				
2420										
	2,418.0	40.2	100/0.4			100/0.4				2,417.6 40.6
										Boring Terminated at Elevation 2,417.6 ft in weathered rock of pegmatite.

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 8/11

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 120+65	**OFFSET** 44 ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 2,457.7 ft	**TOTAL DEPTH** 39.8 ft	**NORTHING** 799,896	**EASTING** 1,055,835
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 01/23/13	**COMP. DATE** 01/23/13	**SURFACE WATER DEPTH** N/A

GROUND WTR (ft): 0 HR. 9.0; 24 HR. 8.7

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2460										
										2,457.7 GROUND SURFACE 0.0
2455										**ALLUVIAL** Brown silty sand with gravel and cobbles, and a trace of organic material.
	2,452.5	5.2	2	3	5	8		M		
2450								W		
	2,447.5	10.2	15	14	17	31				2,443.7 14.0
2445										**SAPROLITE** Dark brown silty sand with a trace of mica.
	2,442.5	15.2	14	9	14	23		M		
2440										
	2,437.5	20.2	25	32	52	84		M		
2435										
	2,432.5	25.2	14	35	55	90				
2430										
	2,427.5	30.2	39	61/0.3		100/0.8				2,427.5 30.2
2425										**WEATHERED ROCK** Weathered rock of gneiss.
	2,422.5	35.2	73	27/0.2		100/0.7				
2420										
	2,418.5	39.2	67	33/0.1		100/0.6				2,417.9 39.8
										Boring Terminated at Elevation 2,417.9 ft in weathered rock of gneiss.

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 121+65	**OFFSET** 8 ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 2,451.9 ft	**TOTAL DEPTH** 54.7 ft	**NORTHING** 799,882	**EASTING** 1,055,941 — **24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 12/19/12	**COMP. DATE** 12/20/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft) — DEPTH (ft)
2455										2,451.9 GROUND SURFACE 0.0
										ALLUVIAL Brown silty sand with gravel and cobbles.
2450	2,447.3	4.6	1	2	1	3		W		
2445	2,442.3	9.6	4	8	6	14		W		2,441.6 10.3 **SAPROLITE** Dark brown silty sand with a trace of mica.
2440	2,437.3	14.6	12	12	25	37		M		2,434.6 17.3 **WEATHERED ROCK** Weathered rock of gneiss with abundant interlayers of slightly micaceous silty sand saprolite.
2435	2,432.3	19.6	27	42	58/0.4	100/0.9				
2430	2,427.3	24.6	22	17	24	41		M		
2425	2,422.3	29.6	9	15	11	26		M		
2420	2,417.3	34.6	48	52						
2415	2,412.3	39.6	37	63/0.3		100/0.8				
2410	2,407.3	44.6	23	19	27	46		M		
2405	2,402.3	49.6	100/0.2			100/0.2				2,403.4 48.5 **WEATHERED ROCK** Weathered rock of gneiss.
2400	2,397.3	54.6	60/0.1			60/0.1				2,398.0 53.9 2,397.2 54.7 **CRYSTALLINE ROCK** Gray biotite gneiss with a trace of mica. Boring Terminated at Elevation 2,397.2 ft in biotite gneiss.

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 121+65	**OFFSET** 44 ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 2,452.5 ft	**TOTAL DEPTH** 60.6 ft	**NORTHING** 799,850	**EASTING** 1,055,924 — **24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 01/03/13	**COMP. DATE** 01/03/13	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft) — DEPTH (ft)
2455										2,452.5 GROUND SURFACE 0.0
										ALLUVIAL Brown silty sand with gravel.
2450	2,447.5	5.0	2	2	3	5		W		
2445	2,442.5	10.0	2	4	2	6		M		2,439.7 12.8 **SAPROLITE** Brown to dark brown silty sand with a trace of mica and interlayers of weathered rock from 22.1 feet.
2440	2,437.5	15.0	17	13	14	27		M		
2435	2,432.5	20.0	8	9	11	20		M		
2430	2,427.5	25.0	24	32	31	63		M		
2425	2,422.5	30.0	19	39	51	90		M		
2420	2,417.5	35.0	17	83/0.4		100/0.9				2,417.5 35.0 **WEATHERED ROCK** Weathered rock of gneiss.
2415	2,412.5	40.0	39	61/0.4		100/0.9				
2410	2,407.5	45.0	71	29/0.1		100/0.6				
2405	2,402.5	50.0	60/0.1			60/0.1				2,403.7 48.8 **CRYSTALLINE ROCK** Gray and white biotite gneiss. 2,400.0 52.5 **WEATHERED ROCK** Weathered rock of gneiss with interlayers of crystalline rock (gneiss).
2400	2,397.5	55.0	80	20/0.1		100/0.6				
2395	2,392.5	60.0	84	16/0.1		100/0.6				2,391.9 60.6 Boring Terminated at Elevation 2,391.9 ft in weathered rock of gneiss.

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 123+18	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	0 HR. N/A
COLLAR ELEV. 2,453.4 ft	**TOTAL DEPTH** 64.4 ft	**NORTHING** 799,812	**EASTING** 1,056,077	24 HR. 6.2
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/12/12	**COMP. DATE** 12/13/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2455										2,453.4 GROUND SURFACE	0.0
										ALLUVIAL Brown silty sand.	
2450										2,448.6	4.8
	2,447.9	5.5	7	5	5	10		M		**ALLUVIAL** Brown silty sand with gravel, cobbles and boulders.	
2445											
	2,442.9	10.5	9	21	33	54		W		2,440.9	12.5
2440										**SAPROLITE** White to tan silty sand with a trace of mica.	
	2,437.9	15.5	7	9	8	17		M			
2435											
	2,432.9	20.5	8	8	14	22		M			
2430											
	2,429.1	24.3	17	37	44	81		M			
2425											
	2,422.9	30.5	100/0.4			100/0.4				2,423.3	30.1
2420										**WEATHERED ROCK** Weathered rock of pegmatite.	
	2,417.9	35.5	100/0.3			100/0.3					
2415											
	2,412.9	40.5	100/0.4			100/0.4					
2410											
	2,407.9	45.5	23	77/0.1		100/0.6					
2405											
	2,402.9	50.5	100/0.3			100/0.3					
2400											
	2,397.9	55.5	100/0.2			100/0.2					
2395											
	2,392.9	60.5	100/0.2			100/0.2				2,391.7	61.7
2390										**CRYSTALLINE ROCK** White to light tan granitic pegmatite.	
	2,389.0	64.4	50/0.05			60/0.05				2,389.0	64.4
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,389.0 ft on pegmatite.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

SHEET 10/11

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 123+20	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	0 HR. N/A
COLLAR ELEV. 2,451.8 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 799,779	**EASTING** 1,056,062	24 HR. Caved
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/13/12	**COMP. DATE** 12/13/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2455										2,451.8 GROUND SURFACE	0.0
										ALLUVIAL Brown silty sand.	
2450										2,448.1	3.7
	2,447.0	4.8	2	1	3	4		W		**ALLUVIAL** Brown silty sand with gravel and cobbles.	
2445											
	2,442.0	9.8	8	8	17	25		M		2,439.5	12.3
2440										**SAPROLITE** White silty sand with a trace of mica.	
	2,437.0	14.8	8	28	72/0.2	100/0.7				2,436.1	15.7
2435										**WEATHERED ROCK** Weathered rock of pegmatite.	
	2,432.0	19.8	9	51	49/0.3	100/0.8				2,432.0	19.8
2430										**WEATHERED ROCK** Weathered rock of gneiss.	
	2,427.0	24.8	35	65/0.3		100/0.8					
2425											
	2,422.0	29.8	93	7/0.1		100/0.6					
2420											
	2,417.0	34.8	100/0.2			100/0.2					
2415											
	2,412.0	39.8	100/0.3			100/0.3					
2410											
	2,407.0	44.8	100/0.3			100/0.3				2,406.7	45.1
										Boring Terminated at Elevation 2,406.7 ft in weathered rock of pegmatite.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/26/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 123+80	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,470.5 ft	**TOTAL DEPTH** 44.9 ft	**NORTHING** 799,785	**EASTING** 1,056,133	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/06/13	**COMP. DATE** 02/06/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	ELEV. (ft)	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
2475										2,470.5	GROUND SURFACE	0.0
2470	2,466.3	4.2	2	3	4	7		M			**ROADWAY EMBANKMENT** Brown silty sand with gravel and a trace of cobbles.	
2465	2,461.3	9.2	1	2	3	5		M		2,452.8		17.7
2460	2,456.3	14.2	3	4	5	9		M			**ALLUVIAL** Brown to gray silty sand with gravel.	
2455	2,451.3	19.2	13	17	32	49		M		2,441.7		28.8
2450	2,446.3	24.2	9	13	16	29		M			**SAPROLITE** White to light gray silty sand with a trace of mica.	
2445	2,441.3	29.2	13	25	41	66		M		2,436.3		34.2
2440	2,436.3	34.2	17	34	66/0.4	100/0.9					**WEATHERED ROCK** Weathered rock of pegmatite.	
2435	2,431.3	39.2	81	19/0.1		100/0.6				2,425.6		44.9
2430	2,426.3	44.2	71	29/0.2		100/0.7					Boring Terminated at Elevation 2,425.6 ft in weathered rock of pegmatite.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/25/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 11/11

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Elliot, D C	
SITE DESCRIPTION Bridge No. 43 on NBL of US-19E over South Toe River				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 123+57	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,455.6 ft	**TOTAL DEPTH** 25.9 ft	**NORTHING** 799,762	**EASTING** 1,056,095	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE AFO1045 CME-45 76% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/04/13	**COMP. DATE** 02/04/13	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	ELEV. (ft)	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
2460										2,455.6	GROUND SURFACE	0.0
2455	2,450.3	5.3	2	4	4	8		W			**ALLUVIAL** Brown silty sand with a boulder from 3.0 feet to 5.0 feet.	
2450	2,445.3	10.3	19	21	21	42				2,445.7		9.9
2445	2,440.3	15.3	41	52	7/0.1	59/0.6					**SAPROLITE** Light gray silty sand with a trace of mica.	
2440	2,435.3	20.3	35	65/0.3		100/0.8				2,439.2		16.4
2435	2,430.3	25.3	83	17/0.1		100/0.6					**WEATHERED ROCK** Weathered rock of pegmatite.	
										2,432.6		23.0
											WEATHERED ROCK Weathered rock of gneiss.	
										2,429.7		25.9
											Boring Terminated at Elevation 2,429.7 ft in weathered rock of gneiss.	

NCDOT BORE SINGLE BORE_CORELOGS.GPJ NC_DOT.GDT 2/20/13

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2519B	1	30

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *35609.1.1 (R-2519B)* F.A. PROJ. *N/A*

COUNTY *Yancey/Mitchell*

PROJECT DESCRIPTION *US 19 East from NC 80 in Yancey County to Multi-Lane Section West of Spruce Pine in Mitchell County*

SITE DESCRIPTION *Bridge No. C48 on US 19 East Over Big Crabtree Creek*

Dual Structures on US 19 over Big Crabtree Creek
Bridge No. 48 - Left Lane
Bridge No. 329 - Right Lane

CONTENTS

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26	ROCK TEST RESULTS
27	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.

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PERSONNEL

P. Payne

R. DeLost

M. Gragg

C. Banning

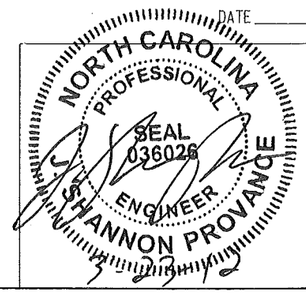
S. Gower

INVESTIGATED BY *F&H*

CHECKED BY *J. Provance*

SUBMITTED BY *F&H*

DATE *3/23/2012*



DRAWN BY: *Tom Rideout*

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

PROJECT: 35609.1.1

ID: R-2519B

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/Ø25 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N Q2
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: USGS Hub #162 left side of bridge between EBI-C and BI-E EBL in existing pavement

ELEVATION: 2564.05 FT.

NOTES:

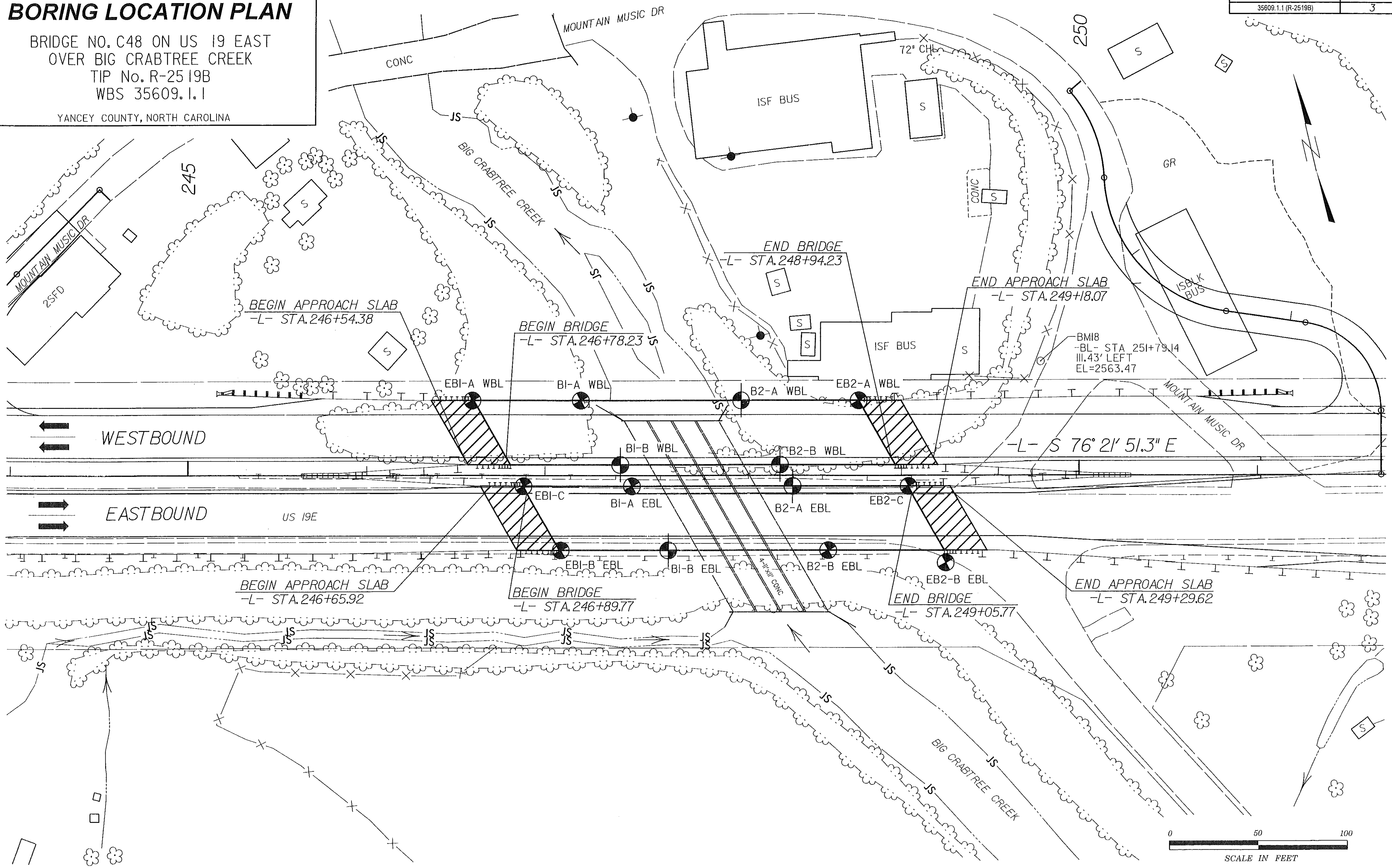
REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	3

BORING LOCATION PLAN

BRIDGE NO. C48 ON US 19 EAST
OVER BIG CRABTREE CREEK
TIP No. R-2519B
WBS 35609.1.1

YANCEY COUNTY, NORTH CAROLINA



GENERALIZED SUBSURFACE PROFILE 42' Lt. of –L–

GROUNDLINE PROFILE OBTAINED FROM DTM PROVIDED BY OTHERS
INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE OFFSET WITH THE BORINGS PROJECTED ONTO THE PROFILE

0 20 40
FEET
VE = NONE

PROJECT REFERENCE NO.	SHEET
R–2519B	4
WBL PROFILE	

EB1–A WBL
246+59
42 LT

B1–A WBL
247+20
42 LT

B2–A WBL
248+10
42 LT

EB2–A WBL
248+76
42 LT

EXISTING GROUND

FLOW

W.S. ELEV (5/14/2007) 2525.86

BIG CRABTREE CREEK

12	4	2	3	a)
4	46	32	85	b)
10	100/0.7	70	5	c)
35	100/0.7	100/0.6	66	d)
21	100/0.2	100/1.0	100/0.8	e)
100/0.8	32	25	36	f)
60/0.0	100/0.2	42	60/0.0	g)
BT	60/0.1	60/0.0	BT	h)
	BT	REC.=94%, RQD=76%, RMR=55		i)
		BT		j)
				k)
				l)
				m)

a) **Alluvial** : Orange & black, soft, micaceous silt.
b) **Alluvial** : Gray, soft, silty clay w/sand grains.
c) **Alluvial** : Brown, soft, silt.
d) **Alluvial** : Brown, v. dense, sand w/gravel & cobbles.
e) **Alluvial** : Tan, loose to dense, f. to cse. grain sand w/mica.
f) **Alluvial** : Tan, dense, f. to cse. grain sand w/gravel & mica.
g) **Residual** : Brown, black, white, brown-red, med. stiff to hard, micaceous silt w/rock frags. in part.
h) **Residual** : White-tan, med. stiff, micaceous silt.
i) **Residual** : White-orange, hard, micaceous silt w/rock frags.
j) **Residual** : Tan, brown, orange, med. dense to v. dense, saprolitic in parts, micaceous sand w/rock frags. & silt.
k) **WR** : Micaceous, cse. grain sand & boulders interpreted as WR.
l) **WR** : Schist
m) **CR** : Gray, white, black-green, brown stain in parts, trcs. rose-pink, fresh w/mod. to sev. weathered interval, hard w/soft interval, close frac. spacing, garnetiferous, Quartz Muscovite Chlorite Schist.

2620 2600 2580 2560 2540 2520 2500 2480 2460 2440

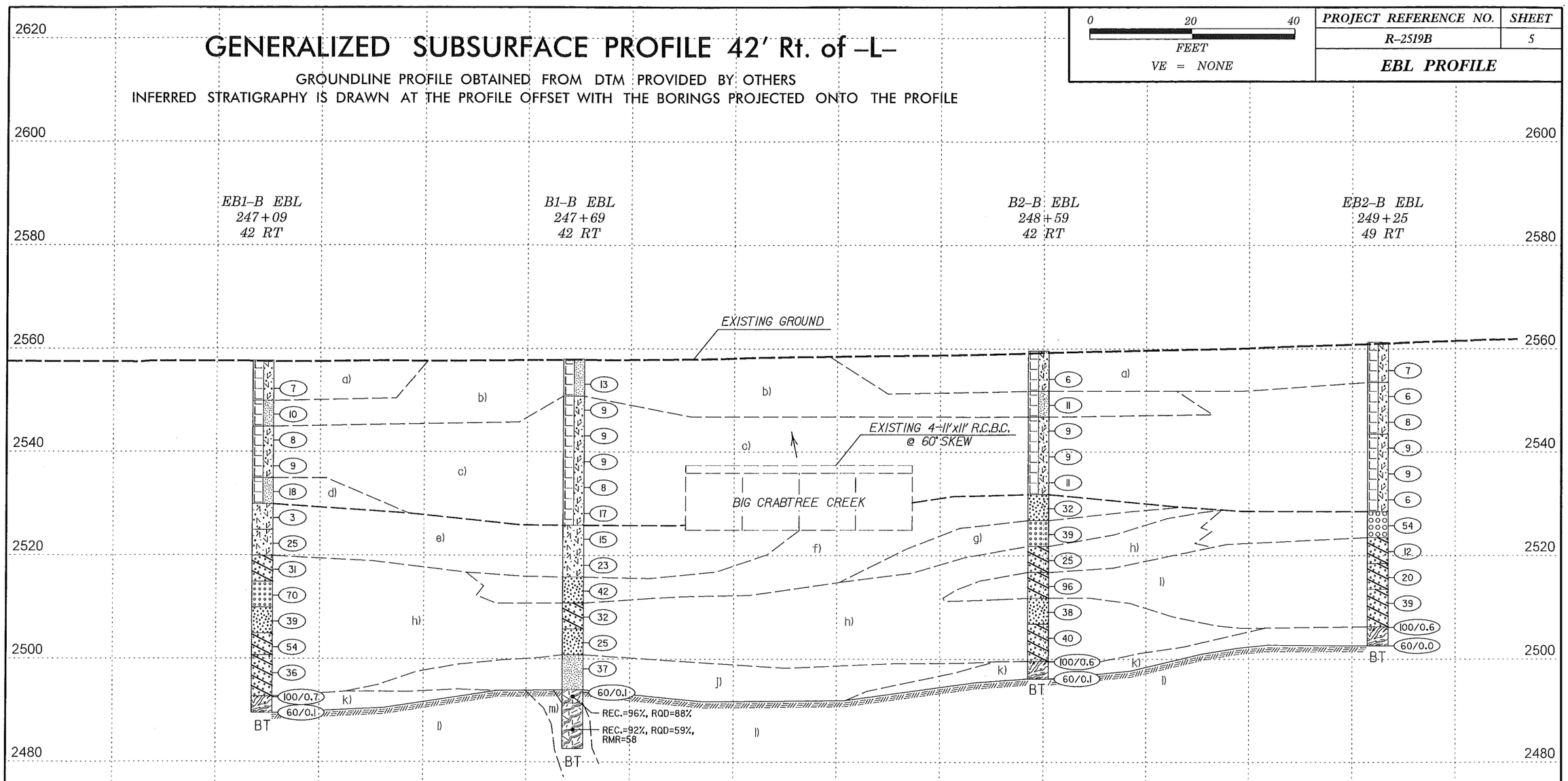
246+40 246+60 246+80 247+00 247+20 247+40 247+60 247+80 248+00 248+20 248+40 248+60 248+80 249+00

GENERALIZED SUBSURFACE PROFILE 42' Rt. of –L–

GROUNDLINE PROFILE OBTAINED FROM DTM PROVIDED BY OTHERS
INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE OFFSET WITH THE BORINGS PROJECTED ONTO THE PROFILE

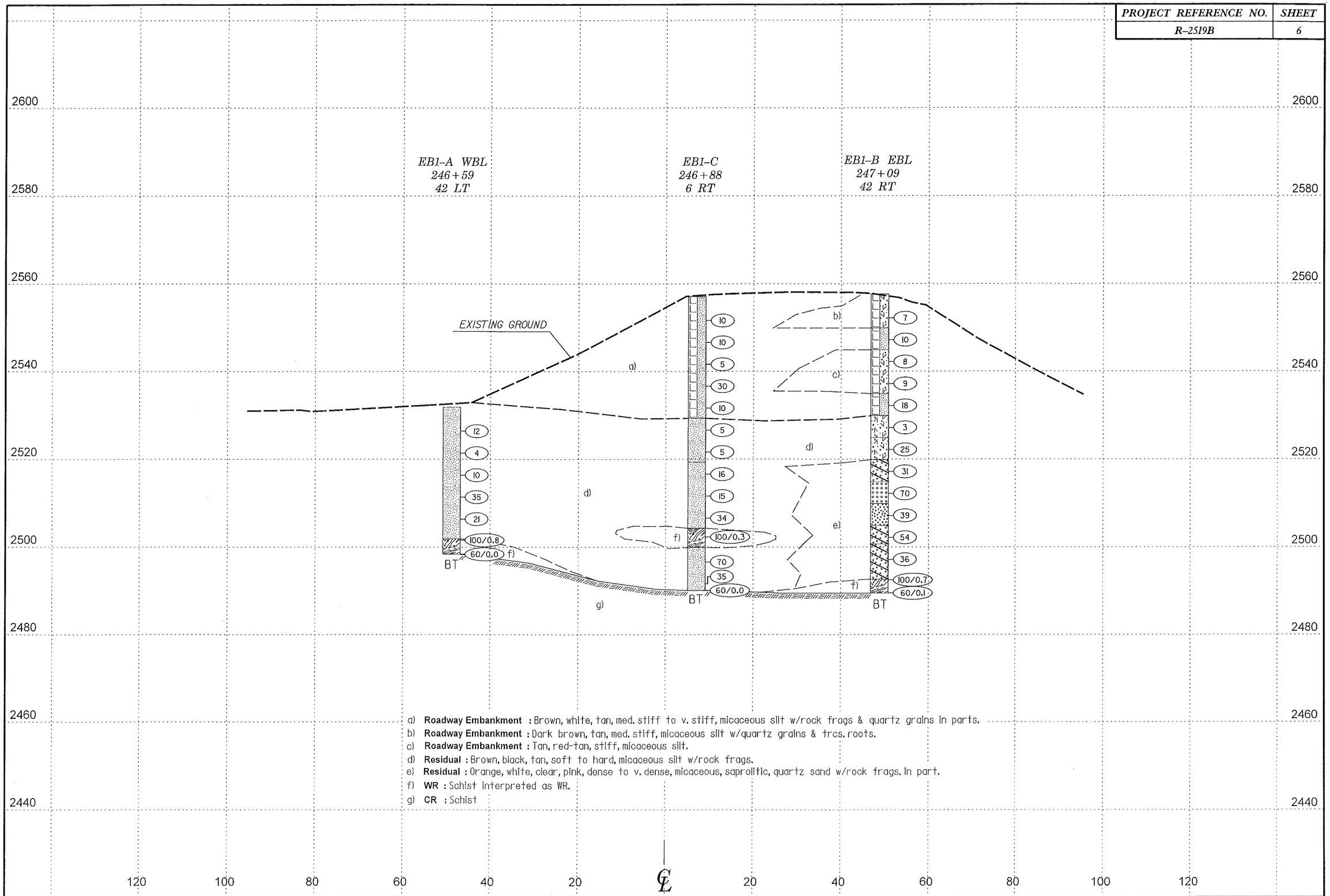
0 20 40
FEET
VE = NONE

PROJECT REFERENCE NO.	SHEET
R-2519B	5
EBL PROFILE	



a) **Roadway Embankment** : Dark brown, brown, tan, med. stiff, micaceous silt w/roots, wood frags. & quartz grains
b) **Roadway Embankment** : White-tan, brown, stiff, micaceous silt w/quartz grains & wood frags.
c) **Roadway Embankment** : Tan-red, tan, brown, med. stiff to stiff, micaceous silt w/quartz grains and rock frags. in parts.
d) **Roadway Embankment** : Tan & white, v. stiff, micaceous silt w/quartz grains and rock frags.
e) **Residual** : Red-tan, tan-brown, brown, soft to v. stiff, micaceous silt w/ rock frags. in parts.
f) **Residual** : White, black, dense, micaceous quartz sand w/ rock frags.
g) **Residual** : Black & white, dense, silty, gravel & cobble size quartz & rock frags.
h) **Residual** : White, orange, clear, pink-orange, red-brown-orange, med. dense to v. dense, micaceous, saprolitic quartz sand.
i) **Residual** : Brown, white, tan, black, med. dense to v. dense, silty, micaceous, f. to cse. grain quartz sand & rock frags.
j) **Residual** : Red-brown, white, hard, micaceous silt w/quartz grains.
k) **WR** : Schist
l) **CR** : Gray, gray-green, white, brown stain, trcs. rose-pink, fresh to mod. weathered w/intervals mod. sev. weathering, mod. hard, close frac. spacing, Quartz Muscovite Chlorite Schist w/trcs. garnets.
m) **CR** : White, gray, blue-gray, clear, trcs. red-orange-pink, fresh to mod. weathered, fracs. & intervals (<0.2') w/sev. to v. sev. weathering, hard to v. hard, close to mod. close frac. spacing, Feldspar Quartz Muscovite Pegmatite w/trcs. schistose wallrock.

PROJECT REFERENCE NO.	SHEET
R-2519B	6

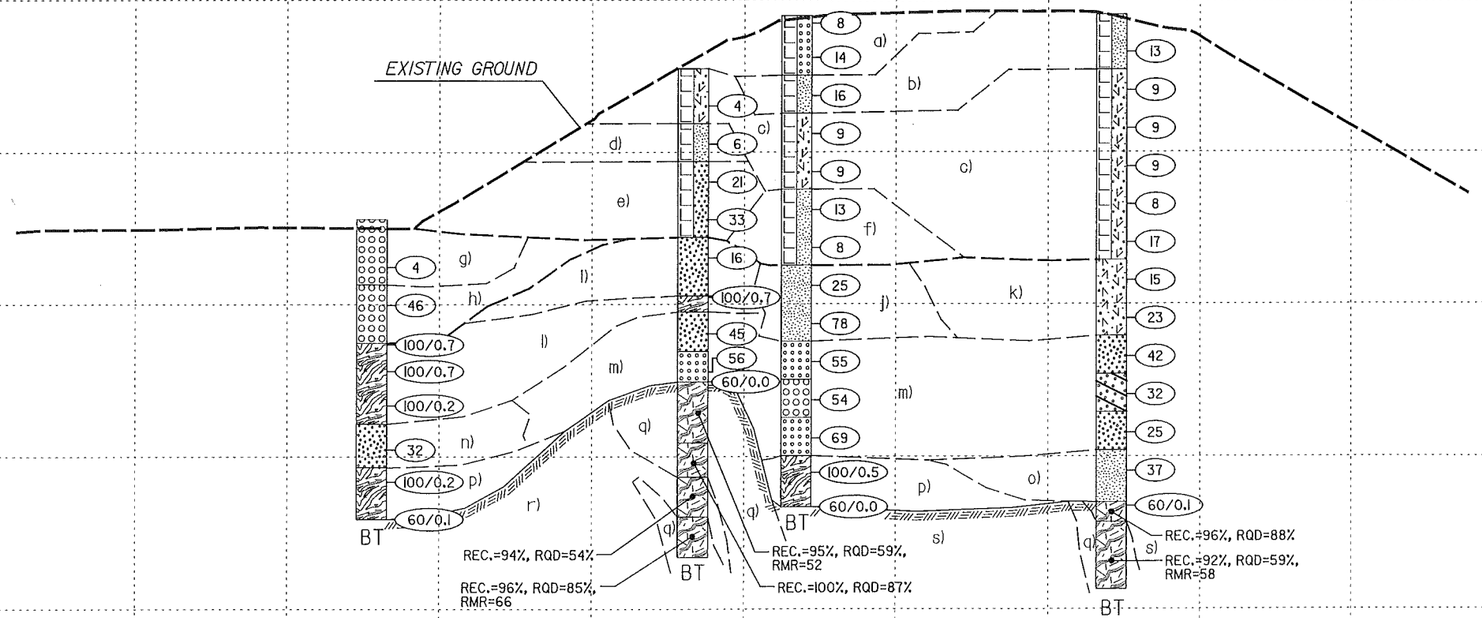


a) **Roadway Embankment** : Brown, white, tan, med. stiff to v. stiff, micaceous silt w/rock frags & quartz grains in parts.
b) **Roadway Embankment** : Dark brown, tan, med. stiff, micaceous silt w/quartz grains & trcs. roots.
c) **Roadway Embankment** : Tan, red-tan, stiff, micaceous silt.
d) **Residual** : Brown, black, tan, soft to hard, micaceous silt w/rock frags.
e) **Residual** : Orange, white, clear, pink, dense to v. dense, micaceous, saprolitic, quartz sand w/rock frags. in part.
f) **WR** : Schist interpreted as WR.
g) **CR** : Schist

WBL END BENT 1 CROSS SECTION	EBL END BENT 1 CROSS SECTION	HORIZ. SCALE (FEET) 0 20 40	VE = NONE

PROJECT REFERENCE NO.	SHEET
R-2519B	7

Note: Boring B1-B WBL was redrilled within 1 foot of the original boring and aquired 15 feet of core from a depth of 49.2 feet to 64.2 feet.



a) **Roadway Embankment** : Tan & brown, loose to med. dense, micaceous, f. grain sand w/rock frags. & trcs. roots.
b) **Roadway Embankment** : Brown, tan, stiff to v. stiff, f. sandy, micaceous silt w/rock frags., quartz grains & wood.
c) **Roadway Embankment** : Tan, brown, red-brown-tan, soft to v. stiff, micaceous silt w/quartz grains, rock frags. & trcs. wood.
d) **Roadway Embankment** : Dark brown, med. stiff, micaceous silt w/rock frags.
e) **Roadway Embankment** : Tan-black, med. dense to dense, micaceous sand, w/ rock frags. & mica.
f) **Roadway Embankment** : Tan & brown, stiff, v.f. to f. sandy, micaceous silt.
g) **Alluvial** : Tan, loose, micaceous f. to cse. grain sand w/mica.
h) **Alluvial** : Tan, dense, f. to cse. grain sand w/gravel & mica.
i) **Residual** : Tan-white, medium dense, micaceous saprolitic, quartz sand.
j) **Residual** : Tan & brown, v. stiff to hard, micaceous silt w/cse. grain quartz & mica vein, rock frags.
k) **Residual** : Red-tan & brown, stiff to v. stiff, micaceous silt w/rock frags.
l) **WR** : Schist
m) **Residual** : Tan-gray, white, brown, red-brown, yellow-tan, med. dense to v. dense, micaceous, saprolitic, f. to cse. grain quartz sand w/rock frags. in part.
n) **Residual** : Brown-red, hard, micaceous silt w/rock frags.
o) **Residual** : Red-brown, white, hard, micaceous silt w/quartz grains.
p) **WR** : Schist
q) **CR** : White, gray, blue-gray-clear, trcs. red-orange-pink, fresh to mod. weathered, fracs. & intervals (<0.2') w/sil. to v. sev. weathering, hard to v. hard, close to mod. close frac. spacing, megacrystalline, Feldspar Quartz Muscovite Pegmatite w/schistose wallrock, muscovite pods & trcs. microcline.
r) **CR** : Blue-gray-clear, gray-green, white, scattered pink-orange, trcs. rose-pink, brown-orange stain, fresh to mod. weathered w/mod. sev. weathering on frac. walls, hard, v. close to close frac. spacing, Muscovite Feldspar Quartz Chlorite Schist w/trcs. garnet & microcline.
s) **CR** : Gray, gray-green, white, brown stain, trcs. rose-pink, fresh to mod. weathered w/intervals mod. sev. weathering, hard to mod. hard, close frac. spacing, Quartz Muscovite Chlorite Schist w/trcs. garnets.

WBL BENT 1 CROSS SECTION

EBL BENT 1 CROSS SECTION

HORIZ. SCALE (FEET) 0 20 40

VE = NONE

PROJECT REFERENCE NO.	SHEET
R-2519B	8

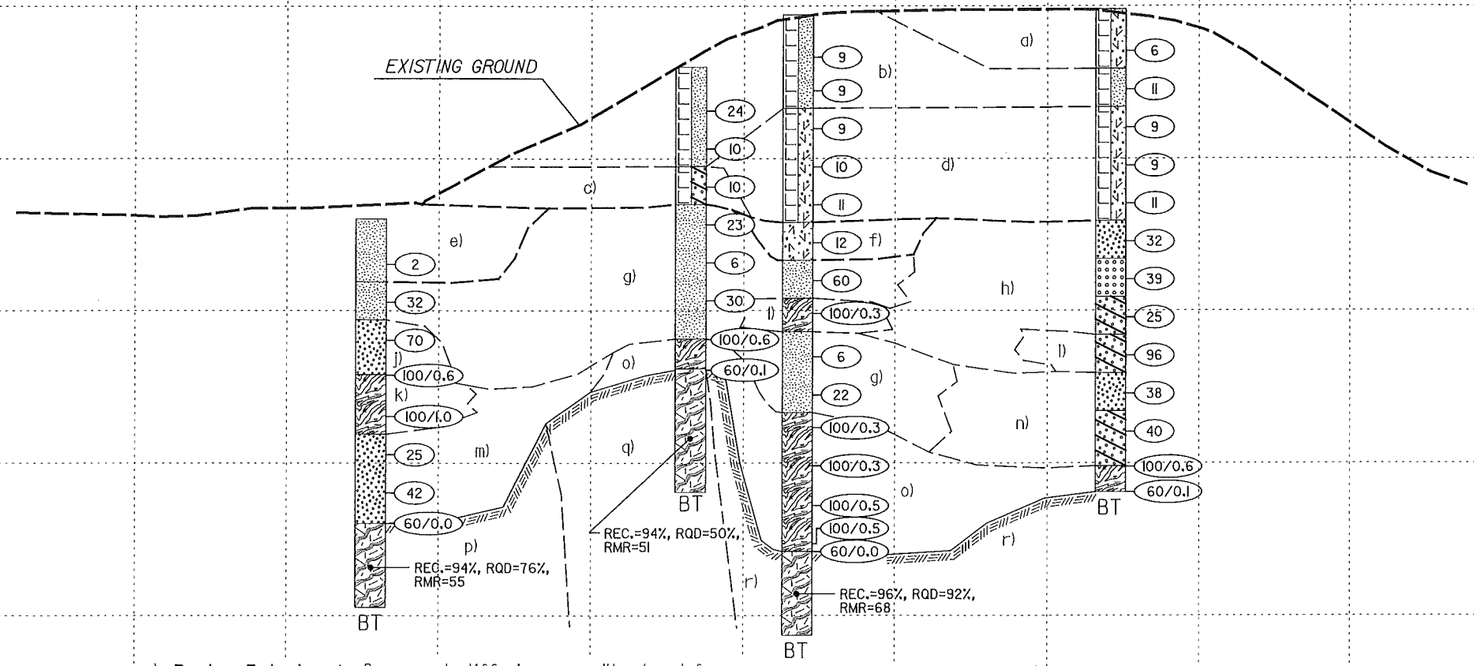
B2-A WBL
248+10
42 LT

B2-B WBL
248+32
6 LT

B2-A EBL
248+39
6 RT

B2-B EBL
248+59
42 RT

Note: Boring B2-B WBL was redrilled within 1 foot of the original boring and aquired 16 feet of core from a depth of 39.7 feet to 55.7 feet.



a) **Roadway Embankment** : Brown, med. stiff, micaceous silt w/wood frags.
b) **Roadway Embankment** : Brown, tan-white, stiff to v. stiff, micaceous silt w/gravel size quartz, rock frags. & wood in parts.
c) **Roadway Embankment** : Brown, loose, micaceous sand w/quartz & rock frags.
d) **Roadway Embankment** : Tan-red, tan, brown, stiff, micaceous silt w/quartz sand size grains in part.
e) **Alluvial** : Brown, soft silt.
f) **Alluvial** : Black & brown, stiff, micaceous silt w/rock frags.
g) **Residual** : White, gray, orange, black, med. stiff to hard, micaceous, silt, saprolitic in parts w/quartz & feldspar grains.
h) **Residual** : Black, white, orange, med. dense to dense, micaceous, silty, quartz sand, saprolitic in parts w/rock frags.
i) **Residual** : Tan, v. dense, micaceous, silty quartz and rock frags.
j) **Residual** : Tan, v. dense, sand w/quartzite rock frags.
k) **WR** : Micaceous cse. grain sand & boulders interpreted as WR.
l) **WR** : Schist.
m) **Residual** : Tan, med. dense to dense, micaceous sand w/rock frags.
n) **Residual** : Red-brown-orange, white, black, dense, micaceous, saprolitic, quartz sand w/rock frags. in part.
o) **WR** : Schist.
p) **CR** : Gray, white, black-green, brown stain in parts, trcs. rose-pink, fresh w/mod. to sev. weathered interval, hard w/soft interval, close frac. spacing, garnetiferous, Quartz Muscovite Chlorite Schist.
q) **CR** : White, clear & gray, brown-orange stain, trcs. orange-pink, fresh to mod. weathered, v. hard, close to mod. close frac. spacing, megacrystalline, Feldspar Quartz Muscovite Pegmatite w/muscovite & chlorite pods & two 0.7'-1.0' intervals of white, blue-clear, brown-orange, mod. sev. weathered, med. hard, v. close to close frac. spacing, Muscovite Feldspar Schist w/trc. microcline.
r) **CR** : Gray, gray-green, white, trcs. rose-pink, fresh w/sli. weathered interval, hard to v. hard, mod. close to close frac. spacing, Quartz Muscovite Chlorite Schist w/garnets & interval (0.5') white, black-green, brown stain, sli. weathered Feldspar Quartz Muscovite Pegmatite.

120 100 80 60 40 20 ℄ 20 40 60 80 100 120

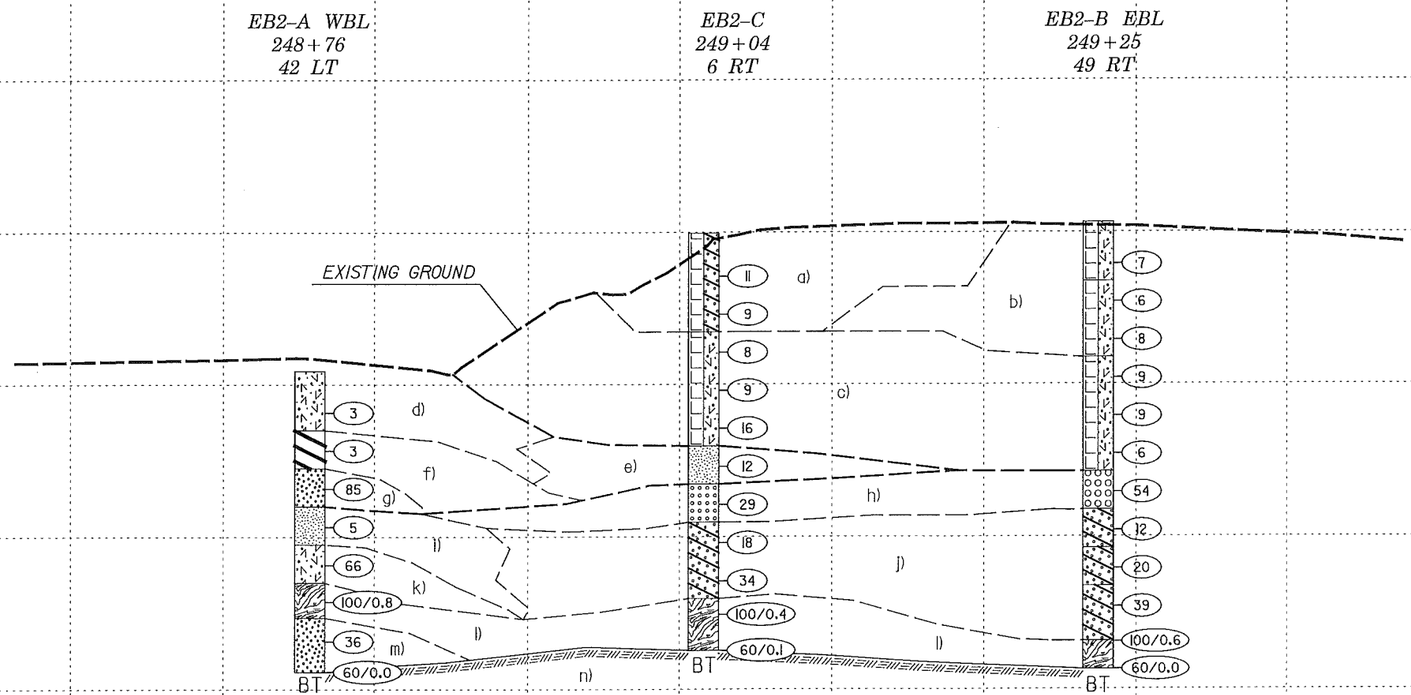
WBL BENT 2 CROSS SECTION

EBL BENT 2 CROSS SECTION

HORIZ. SCALE (FEET) 0 20 40

VE = NONE

PROJECT REFERENCE NO.	SHEET
R-2519B	9



2600
2580
2560
2540
2520
2500
2480
2460
2440

120 100 80 60 40 20 ℄ 20 40 60 80 100 120

a) **Roadway Embankment** : Brown-tan, brown, loose to med. dense, micaceous, f. grain sand w/rock frags.
b) **Roadway Embankment** : Dark brown, med. stiff to stiff, micaceous silt w/quartz grains, roots and wood frags.
c) **Roadway Embankment** : Light brown, tan, med. stiff to v. stiff, micaceous silt.
d) **Alluvial** : Orange & black, soft micaceous silt.
e) **Alluvial** : Tan-brown, stiff, micaceous silt w/cse. rock frags & roots.
f) **Alluvial** : Gray, soft, silty clay w/sand grains.
g) **Alluvial** : Brown, v. dense sand w/gravel to cobble size rock frags.
h) **Residual** : Tan-black, brown, med. dense to v. dense, med. to cse. grain quartz & mica w/silt & rock frags.
i) **Residual** : White-tan, med. stiff, micaceous silt.
j) **Residual** : Orange-white, black, brown, med. dense to dense, silty, micaceous, f. to cse. grain quartz w/rock frags.
k) **Residual** : White-orange, hard, micaceous silt w/rock frags.
l) **WR** : Schist
m) **Residual** : Brown & orange, dense, micaceous saprolitic sand.
n) **CR** : Schist

WBL END BENT 2 CROSS SECTION | ***EBL END BENT 2 CROSS SECTION***

HORIZ. SCALE (FEET) 0 20 40 — *VE = NONE*

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. EB1-A WBL	**STATION** 246+59	**OFFSET** 42 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,531.9 ft	**TOTAL DEPTH** 33.5 ft	**NORTHING** 798,096	**EASTING** 1,068,060	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Gower, S.	**START DATE** 01/18/12	**COMP. DATE** 01/18/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										2,531.9 GROUND SURFACE	0.0
	2,527.4	4.5	2	6	6	12		M		**RESIDUAL** Brown & black, stiff to hard, micaceous silt (A-4).	
	2,522.4	9.5	1	2	2	4		M			
	2,517.4	14.5	2	3	7	10		M			
	2,512.4	19.5	10	17	18	35		Sat.			
	2,507.4	24.5	9	9	12	21		M			
	2,502.4	29.5	36	64/0.3		1 100/0.8				2,501.9 **WEATHERED ROCK** Weathered rock (Schist)	30.0
	2,498.4	33.5	60/0.0			60/0.0				2,498.4 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,498.4 ft on Crystalline Rock (Schist).	33.5

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

798046 1068 082

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 246+88	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,557.1 ft	**TOTAL DEPTH** 67.0 ft	**NORTHING** 798,043	**EASTING** 1,068,077	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/10/12	**COMP. DATE** 01/10/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										2,557.1 GROUND SURFACE	0.0
	2,552.6	4.5	4	6	4	10		M		**ROADWAY EMBANKMENT** Brown, white & red, med. stiff to hard, micaceous silt w/some rock frags (A-4).	
	2,547.6	9.5	4	5	5	10		D			
	2,542.6	14.5	1	2	3	5		D			
	2,537.6	19.5	12	17	13	30		D			
	2,532.6	24.5	2	4	6	10		D			
	2,527.6	29.5	1	2	3	5		M			
	2,522.6	34.5	1	2	3	5		M			
	2,517.6	39.5	6	6	10	16		M		2,529.3 **RESIDUAL** Brown, v. stiff, micaceous silt w/rock frags. (A-4).	27.8
	2,512.6	44.5	6	7	8	15		M		2,519.3 Brown, black & tan, med. stiff to hard, micaceous silt w/rock frags (A-4).	37.8
	2,507.6	49.5	6	17	17	34		W		2,504.3 **WEATHERED ROCK** Weathered rock (Schist)	52.8
	2,502.6	54.5	100/0.3			100/0.3				2,499.9 **RESIDUAL** Tan, hard silt w/rock frags. (A-4).	57.2
	2,497.6	59.5	22	34	36	70		W			
	2,492.6	64.5	8	10	25	35		Sat.			
	2,490.1	67.0	60/0.0			60/0.0				2,490.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,490.1 ft on Crystalline Rock (Schist).	67.0

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. EB1-B EBL	**STATION** 247+09	**OFFSET** 42 ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 2,557.7 ft	**TOTAL DEPTH** 68.2 ft	**NORTHING** 798,003	**EASTING** 1,068,089 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Banning, C.	**START DATE** 01/24/12	**COMP. DATE** 01/25/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2560										
	2,557.7									2,557.7 GROUND SURFACE 0.0
2555										**ROADWAY EMBANKMENT** Dark brown & tan, med. stiff, micaceous silt w/trc. roots & quartz grains (A-5).
	2,553.2	4.5	3	4	3	7		M		
2550										2,549.9 7.8 White & tan, stiff, micaceous silt w/quartz grains (A-4).
	2,548.2	9.5	5	5	5	10		M		
2545										2,544.9 12.8 Tan & red-tan, stiff, micaceous silt (A-5).
	2,543.2	14.5	2	4	4	8		M		
2540										
	2,538.2	19.5	1	3	6	9		M		
2535										2,534.9 22.8 Tan & white, v. stiff, micaceous silt w/quartz and rock frags. (A-4).
	2,533.2	24.5	3	10	8	18		M		
2530										2,529.9 27.8 **RESIDUAL** Tan & brown, soft, micaceous silt (A-5).
	2,528.2	29.5	1	2	1	3		M		
2525										2,524.9 32.8 Tan, brown, hard, micaceous silt w/rock frags. (A-5).
	2,523.2	34.5	12	14	11	25		Sat.		
2520										2,519.9 37.8 Orange-white, dense, micaceous saprolitic quartz sand w/rock frags. (A-2-6).
	2,518.2	39.5	16	13	18	31		M		
2515										2,514.9 42.8 White, clear, v. dense, micaceous saprolitic quartz sand (A-3).
	2,513.2	44.5	26	33	37	70		M		
2510										2,509.9 47.8 White & off-white, dense, micaceous saprolitic quartz sand (A-2-5).
	2,508.2	49.5	7	12	27	39		M		
2505										2,504.9 52.8 Orangish white, v. dense, micaceous saprolitic quartz sand (A-2-6).
	2,503.2	54.5	20	26	28	54		M		
2500										2,500.7 57.0 Pink-orange, dense, micaceous saprolitic quartz sand (A-2-7).
	2,498.2	59.5	4	15	21	36		M		
2495										
	2,493.2	64.5	51	49/0.2		100/0.7	RS-1			2,492.7 65.0 **WEATHERED ROCK** Weathered rock (Schist)
2490	2,489.6	68.1	60/0.1			60/0.1				2,489.5 68.2 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,489.5 ft on Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. B1-A WBL	**STATION** 247+20	**OFFSET** 42 ft LT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 2,531.2 ft	**TOTAL DEPTH** 39.4 ft	**NORTHING** 798,082	**EASTING** 1,068,120 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic
DRILLER Gower, S.	**START DATE** 01/24/12	**COMP. DATE** 01/24/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2535										
	2,531.2									2,531.2 GROUND SURFACE 0.0
2530										**ALLUVIAL** Tan, loose, micaceous f. to cse. grain sand w/mica (A-1-b).
	2,525.9	5.3	1	2	2	4		M		
2525										2,522.6 8.6 Tan, dense, f. to cse. grain sand w/gravel & mica (A-1-b). SPT blow counts at 10.3' to 11.8' influenced by gravel exceeding 2" in diameter.
	2,520.9	10.3	10	20	26	46		M		
2520										
	2,515.9	15.3	20	46	54/0.2	100/0.7				2,514.9 16.3 **WEATHERED ROCK** Weathered rock (Schist)
2515	2,511.9	19.3	20	80/0.2		100/0.7				
2510										
	2,506.9	24.3	100/0.2			100/0.2				
2505										2,504.3 26.9 **RESIDUAL** Brown-red, hard, micaceous silt w/rock frags. (A-2-4).
	2,501.9	29.3	8	16	16	32		M		
2500										2,498.6 32.6 **WEATHERED ROCK** Weathered rock (Schist)
	2,496.9	34.3	100/0.2			100/0.2				
2495										
	2,491.9	39.3	60/0.1			60/0.1				2,491.8 39.4 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,491.8 ft on Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/23/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B1-B WBL	**STATION** 247+42	**OFFSET** 6 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,551.0 ft	**TOTAL DEPTH** 64.2 ft	**NORTHING** 798,041	**EASTING** 1,068,133	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Gower, S.	**START DATE** 02/06/12	**COMP. DATE** 03/01/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2555										
2550										2,551.0 GROUND SURFACE 0.0
	2,547.1	3.9	2	1	3	4		D		**ROADWAY EMBANKMENT** Red-brown, soft, micaceous silt w/rock frags., quartz grains and wood frags. (A-5).
2545										2,543.8 7.2
	2,542.1	8.9	4	3	3	6		D		Dark brown, med. stiff, micaceous silt w/rock frags. (A-4).
2540										2,538.8 12.2
	2,537.1	13.9	4	10	11	21		Sat.		Tan & black, med. dense to dense, micaceous sand w/rock frags. (A-2-4).
2535										
	2,532.1	18.9	10	14	19	33		Sat.		
2530										2,528.8 22.2
	2,527.1	23.9	5	6	10	16		W		**RESIDUAL** Tan & white, med. dense, micaceous saprolite w/alternating quartz & mica bands (A-2-5).
2525										2,521.1 29.9
	2,522.1	28.9	24	52	48/0.2	100/0.7				**WEATHERED ROCK**
2520										2,519.0 Weathered rock (Schist) 32.0
	2,517.1	33.9	19	21	24	45		W		**RESIDUAL** White-tan, dense, micaceous saprolite w/alternating quartz & mica bands (A-2-4).
2515										2,513.8 37.2
	2,512.1	38.9	18	17	39	56		W		White & brown, v. dense, micaceous saprolite w/alternating quartz feldspar & mica bands (A-3).
2510	2,509.8	41.2	60/0.0			60/0.0	RS-4			2,509.8 41.2 **CRYSTALLINE ROCK** Crystalline rock (Pegmatite)
2505										2,501.8 49.2 Crystalline rock (Pegmatite).
2500										2,497.3 53.7 Crystalline rock (Schist).
2495										2,492.1 58.9 Crystalline rock (Pegmatite).
2490										2,486.8 64.2 Boring Terminated at Elevation 2,486.8 ft in Crystalline Rock (Pegmatite).

Note: Boring B1-B WBL was redrilled within 1 foot of the original boring and aquired 15 feet of core from a depth of 49.2 feet to 64.2 feet.

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B1-B WBL	**STATION** 247+42	**OFFSET** 6 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,551.0 ft	**TOTAL DEPTH** 64.2 ft	**NORTHING** 798,041	**EASTING** 1,068,133	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Gower, S.	**START DATE** 02/06/12	**COMP. DATE** 03/01/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 23.0 ft			

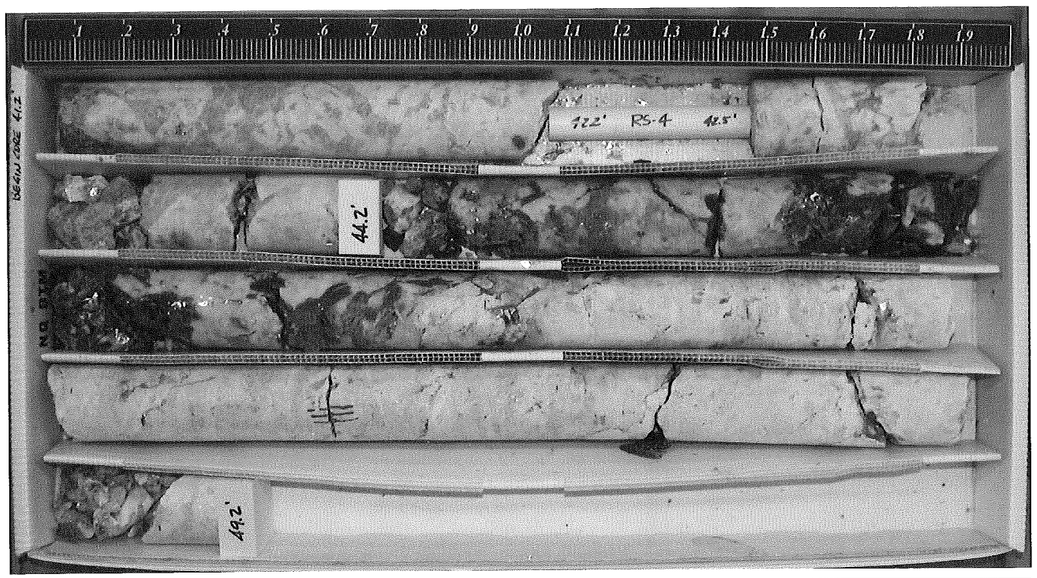
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft) / DEPTH (ft)
2509.8											Begin Coring @ 41.2 ft
	2,509.8	41.2	3.0	N=60/0.0	(2.6)	(1.5)	RS-4	(7.6)	(4.7)		2,509.8 **CRYSTALLINE ROCK** 41.2
	2,506.8	44.2		4:56 4:09 4:49	87%	50%		95%	59%		White, gray, clear-blue-gray, trcs. orange-pink, fresh w/sli. weathering on frac. walls, v. hard, close frac. spacing, megacrystalline, feldspar quartz muscovite pegmatite w/muscovite pods & traces microcline. 15 discontinuities: 2 biotite pods; 11 0°-20° fracs. w/rough, hard walls, 1-2mm between walls; 2 30°-35° fracs. w/hard walls, tight
2505			5.0	3:01 3:49 3:47 4:54 5:57	(5.0) 100%	(3.2) 64%					2,501.8 49.2 Uniaxial compressive strength=281 KSF R1=2, R2=13, R3=10, R4=20, R5=7, RMR=52 Rock Type E
	2,501.8	49.2						(4.5) 100%	(3.9) 87%		
2500			5.0	4:42 7:29 5:51 5:14 5:01	(5.0) 100%	(4.4) 88%					2,497.3 53.7 White, clear-blue & blue-gray, trc. pink-orange, fresh, hard to v. hard, mod. close to v. close frac. spacing, megacrystalline, Feldspar Quartz Muscovite Pegmatite w/muscovite pods & veins, trcs. microcline. 4 0°-20° fracs. w/v. hard walls; 1 35° frac. w/smooth and hard walls; 1 50° frac. w/rough walls
	2,496.8	54.2									
2495			5.0	4:11 3:42 3:32 3:06 3:53	(4.7) 94%	(2.3) 46%		(4.9) 94%	(2.8) 54%		2,492.1 58.9 Blue-gray, clear, gray-green, white, scat. pink-orange, trcs. rose-pink, brown-orange stain, fresh to mod. weathered w/mod. sev. weathering on frac. walls, hard, v. close to close frac. spacing, Muscovite Feldspar Quartz Chlorite Schist w/trcs. garnet & microcline. Schistosity = 60°-90° & crenulated; 6 35°-50° fracs. w/mod. sev. weathering, iron oxide stain; 1 20° frac. w/rough walls; 1 60° frac. along schistocity
	2,491.8	59.2									
2490			5.0	3:59 4:03 4:16 4:53 4:48	(4.8) 96%	(4.5) 90%		(5.1) 96%	(4.5) 85%		2,486.8 64.2 White, clear, blue-gray, olive green-gray, scat. pink-orange, fresh, v. hard, mod. close to wide frac. spacing, Feldspar Quartz Muscovite Pegmatite w/scat. microcline. 3 0° fracs. w/v.hard walls
	2,486.8	64.2									Uniaxial compressive strength=281 KSF R1=2, R2=17, R3=2 Boring Terminated at Elevation 2,486.8 ft in Crystalline Rock (Pegmatite).

Note: Boring B1-B WBL was redrilled within 1 foot of the original boring and aquired 15 feet of core from a depth of 49.2 feet to 64.2 feet.

NCDOT CORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/23/12

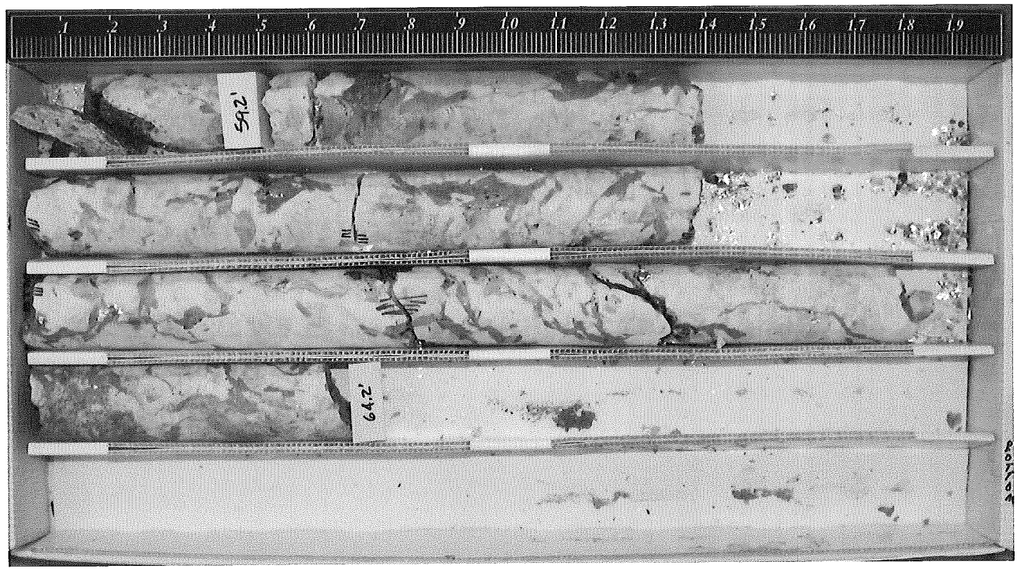
CORE PHOTOGRAPHIC RECORD

Bridge C48 On US 19 East Over Big Crabtree Creek



B1-B WBL – 247+42 @ 6' Lt. Box 1 of 3

B1-B WBL – 247+42 @ 6' Lt. Box 2 of 3



B1-B WBL – 247+42 @ 6' Lt. Box 3 of 3

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B1-A EBL	**STATION** 247+49	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,557.9 ft	**TOTAL DEPTH** 64.5 ft	**NORTHING** 798,028	**EASTING** 1,068,136	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/18/12	**COMP. DATE** 01/18/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2560										
	2,557.9	0.0								2,557.9 GROUND SURFACE 0.0
			6	4	4	8		D		**ROADWAY EMBANKMENT** Tan & brown, loose to med. dense, micaceous f. grain sand w/rock frags. & trcs. roots (A-3).
2555	2,553.4	4.5								
			5	6	8	14		D		
2550	2,548.4	9.5								2,550.1 7.8
			6	6	10	16		M		Brown, v. stiff, f. sandy silt w/micaceous rock frags. & trcs. roots (A-4).
2545	2,543.4	14.5								2,545.1 12.8
			4	4	5	9		M		Tan & brown, stiff, micaceous silt w/trcs. wood (A-5).
2540	2,538.4	19.5								
			2	4	5	9		D		
2535	2,533.4	24.5								2,535.1 22.8
			2	4	9	13		M		Tan & brown, stiff, f. to v. f. sandy, micaceous silt (A-4).
2530	2,528.4	29.5								
			2	3	5	8		M		
2525	2,523.4	34.5								2,525.1 32.8
			45	15	10	25		W		**RESIDUAL** Tan & brown, v. stiff to hard, micaceous silt w/cse. grain quartz vein and mica band, gravel size rock frags. in lower part (A-4).
2520	2,518.4	39.5								
			34	43	35	78		W		
2515	2,513.4	44.5								2,515.1 42.8
			9	21	34	55		Sat.		Tan-gray & white, v. dense, silty, micaceous, f. to cse. grain quartz sand (A-3).
2510	2,508.4	49.5								2,510.1 47.8
			24	30	24	54		Sat.		Yellow-tan, v. dense, micaceous quartz sand w/rock frags. (A-1-b).
2505	2,503.4	54.5								2,505.1 52.8
			10	36	33	69		D		Tan, v. dense, micaceous sand w/rock frags. (A-3).
2500	2,498.4	59.5								2,500.1 57.8
			100/0.5			100/0.5				**WEATHERED ROCK** Weathered rock (Schist)
2495	2,493.4	64.5	60/0.0			60/0.0				2,493.4 64.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,493.4 ft on Crystalline Rock (Schist).

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B1-B EBL	**STATION** 247+69	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,558.0 ft	**TOTAL DEPTH** 75.4 ft	**NORTHING** 797,988	**EASTING** 1,068,148	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/25/12	**COMP. DATE** 01/26/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2560										
										2,558.0 GROUND SURFACE 0.0
2555										**ROADWAY EMBANKMENT** Brown & tan, stiff, micaceous silt w/quartz grains and wood frags. (A-4).
	2,554.1	3.9	2	7	6	13		M		
2550										2,550.8 7.2
	2,549.1	8.9	3	4	5	9		M		Tan, red-tan & red-brown, med. stiff to v. stiff, micaceous silt w/quartz grains & rock frags. (A-5).
2545										
	2,544.1	13.9	2	4	5	9		M		
2540										
	2,539.1	18.9	3	4	5	9		M		
2535										
	2,534.1	23.9	5	4	4	8		M		
2530										
	2,529.1	28.9	3	11	6	17		M		
2525										2,525.8 32.2
	2,524.1	33.9	4	6	9	15		M		**RESIDUAL** Red, tan & brown, stiff to v. stiff, micaceous silt w/rock frags. (A-5).
2520										
	2,519.1	38.9	7	10	13	23		D		
2515										2,515.8 42.2
	2,514.1	43.9	27	24	18	42		M		White, dense, micaceous quartz sand (A-2-4).
2510										2,510.8 47.2
	2,509.1	48.9	12	15	17	32		M		Red-brown & white, dense, micaceous saprolitic quartz sand (A-2-6).
2505										2,505.8 52.2
	2,504.1	53.9	6	10	15	25		M		White, med. dense, micaceous saprolitic quartz sand (A-2-5).
2500										2,500.8 57.2
	2,499.1	58.9	9	13	24	37		M		Red-brown & white, hard, micaceous silt w/quartz grains (A-4).
2495										2,494.0 64.0
	2,494.1	63.9	60/0.1			60/0.1	RS-1			**CRYSTALLINE ROCK** Crystalline rock (Quartz Muscovite Chlorite Schist)
2490										2,491.4 66.6
										Crystalline rock (Feldspar Quartz Muscovite Pegmatite)
2485										2,482.6 75.4
										Boring Terminated at Elevation 2,482.6 ft in Crystalline Rock (Pegmatite).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

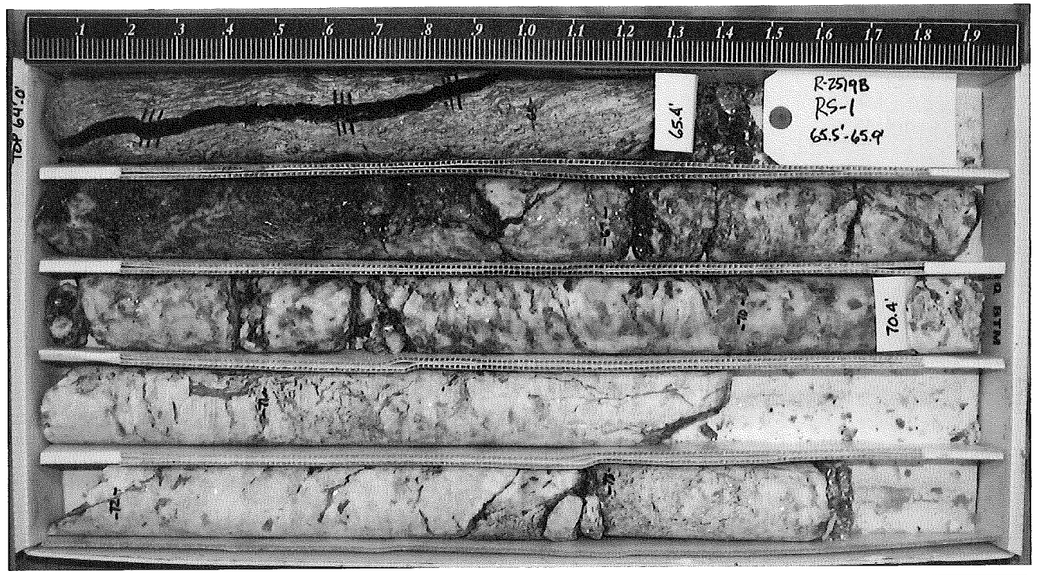
WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B1-B EBL	**STATION** 247+69	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,558.0 ft	**TOTAL DEPTH** 75.4 ft	**NORTHING** 797,988	**EASTING** 1,068,148	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/25/12	**COMP. DATE** 01/26/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 11.4 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
2494											Begin Coring @ 64.0 ft
	2,494.0	64.0	1.4	2:12	(1.4)	(1.3)		(2.5)	(2.3)		2,494.0 **CRYSTALLINE ROCK** 64.0
	2,492.6	65.4		0:48/0.4	100%	93%		96%	88%		Gray, gray-green, white, brown stain, trcs. rose-pink, fresh to mod.
			5.0	1:44	(4.3)	(2.1)	RS-1	(8.1)	(5.2)		2,491.4 66.6 weathered w/intervals mod. sev. weathering, hard to mod. hard, close
2490				2:00	86%	42%		92%	59%		frac. spacing, Quartz Muscovite Chlorite Schist w/trc. garnets.
				2:58							3 20°-30° fracs. w/sev. weathering & heavy iron stain, contact @ 85°
	2,487.6	70.4		2:12							White, gray, blue-gray, clear, trcs. red-orange-pink, fresh to mod.
				2:26							weathered, fracs. & intervals (<0.2') w/sev. to v. sev. weathering, hard to v.
			5.0	3:42	(4.9)	(4.1)					hard, close to mod. close frac. spacing, Feldspar Quartz Muscovite
2485				5:13	98%	82%					Pegmatite w/trcs. schistose wall rock.
				3:59							16 0°-15° fracs. w/iron stain & some loose grains; 5 40°-60° fracs. w/iron
				3:08							stain & some sev. weathering.
	2,482.6	75.4		4:47							2,482.6 75.4
											Uniaxial compressive strength=698 KSF
											R1=4, R2=17, R3=10, R4=20, R5=7, RMR=58
											Rock Type B
											Boring Terminated at Elevation 2,482.6 ft in Crystalline Rock (Pegmatite).

NCDOT CORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

CORE PHOTOGRAPHIC RECORD

Bridge C48 On US 19 East Over Big Crabtree Creek



B1-B EBL – 247+69 @ 42' Rt. Box 1 of 2

B1-B EBL – 247+69 @ 42' Rt. Box 2 of 2

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B2-A WBL	**STATION** 248+10	**OFFSET** 42 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,532.1 ft	**TOTAL DEPTH** 51.0 ft	**NORTHING** 798,060	**EASTING** 1,068,207	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gower, S.	**START DATE** 01/24/12	**COMP. DATE** 01/24/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2535										
										2,532.1 GROUND SURFACE 0.0
2530										**ALLUVIAL** Brown, soft silt (A-4).
	2,527.1	5.0	WOH	1	1	2		Sat.		
2525										2,523.8 8.3
	2,522.1	10.0	10	10	22	32		M		**RESIDUAL** White, hard, micaceous silt (A-4).
2520										2,518.8 13.3
	2,517.1	15.0	40	47	23	70		M		Tan, v. dense, sand w/quartzite rock frags. (A-2-4).
2515										
	2,512.1	20.0	50	50/0.1		100/0.6				2,511.6 20.5
2510										**WEATHERED ROCK** Micaceous cse. grain sand & boulders interpreted as WR.
	2,507.1	25.0	80	20/0.5		100/1.0				
2505										2,503.8 28.3
	2,502.1	30.0	10	12	13	25		M		**RESIDUAL** Tan, med. dense to dense, micaceous sand w/rock frags. (A-2-4).
2500										
	2,497.1	35.0	10	21	21	42		M		
2495										
	2,492.1	40.0	60/0.0			60/0.0	RS-2			2,492.1 40.0
2490										**CRYSTALLINE ROCK** Crystalline rock (Quartz Muscovite Chlorite Schist)
2485										2,481.1 51.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,481.1 ft in Core Loss Interval Interpreted as Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B2-A WBL	**STATION** 248+10	**OFFSET** 42 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,532.1 ft	**TOTAL DEPTH** 51.0 ft	**NORTHING** 798,060	**EASTING** 1,068,207	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gower, S.	**START DATE** 01/24/12	**COMP. DATE** 01/24/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 11.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
2492.1											Begin Coring @ 40.0 ft
	2,492.1	40.0	1.0	*N=60/0.0*	(0.9)	(0.8)	RS-2	(10.3)	(8.4)		2,492.1 **CRYSTALLINE ROCK** 40.0
2490	2,491.1	41.0	5.0	2:02	90%	80%		94%	76%		Gray, white, black-green, brown stain in parts, trcs. rose-pink, fresh w/mod. to sev. weathered interval (44.3'-44.9'), hard w/soft interval (44.5'-44.9'), close frac. spacing, garnetiferous, Quartz Muscovite Chlorite Schist.
				2:19							
				2:30	(4.9)	(3.3)					Schistocity = 1-3mm & crenulated to contorted @ 30°-60°; core loss 50.4'-51.0'; 2 0° fracs. w/iron stain; 6 30° fracs. w/iron stain; 5 45°-50° fracs. w/hard walls, along gneissosity; 3 60°-70° fracs. w/heavy iron stain
	2,486.1	46.0		2:36	98%	66%					
				2:41							
2485			5.0	2:44							
				3:00	(4.4)	(4.3)					
				1:52	88%	86%					
				2:84							
				3:28							
	2,481.1	51.0		4:59							2,481.1 51.0
											Uniaxial compressive strength=210 KSF R1=1, R2=17, R3=10, R4=20, R5=7, RMR=55 Rock Type B
											Boring Terminated with Standard Penetration Test Refusal at Elevation 2,481.1 ft in Core Loss Interval Interpreted as Crystalline Rock (Schist).

NCDOT CORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

CORE PHOTOGRAPHIC RECORD

Bridge C48 On US 19 East Over Big Crabtree Creek

B2-A WBL – 248+10 @ 42' Lt. Box 1 of 2

B2-A WBL – 248+19 @ 42' Lt. Box 2 of 2

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B2-B WBL	**STATION** 248+32	**OFFSET** 6 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,552.1 ft	**TOTAL DEPTH** 55.7 ft	**NORTHING** 798,020	**EASTING** 1,068,220	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER Gower, S.	**START DATE** 01/31/12	**COMP. DATE** 03/02/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2555										
										2,552.1 GROUND SURFACE 0.0
2550										**ROADWAY EMBANKMENT** Brown, stiff to v. stiff, micaceous silt w/gravel size quartz, rock frags. & wood frags. (A-4).
	2,547.3	4.8	2	10	14	24		M		
2545										
	2,542.3	9.8	2	6	4	10		M		
2540										2,539.0 13.1
	2,537.3	14.8	4	4	6	10		Sat.		Brown, loose micaceous sand w/quartz & rock frags. (A-2-6).
2535										2,534.0 18.1
	2,532.3	19.8	8	11	12	23		M		**RESIDUAL** Orange, white & black, med. stiff to v. stiff, micaceous saprolitic silt w/feldspar and quartz grains (A-4).
2530										
	2,527.3	24.8	4	3	3	6		M		
2525										
	2,522.3	29.8	13	14	16	30		M		
2520										
	2,517.3	34.8	17	68	32/0.1	100/0.6				2,516.3 35.8
2515										**WEATHERED ROCK** Weathered rock (Schist)
	2,512.3	39.8	60/0.1			60/0.1				2,512.4 39.7
2510										**CRYSTALLINE ROCK** Crystalline rock (Schist)
2505										SPT from 39.8' to 39.9' was advanced in original boring location. When boring was redrilled within 1 foot of this location, coring operations began at 39.7 feet and included on this log as per NCDOT request.
2500										2,496.4 55.7
										Boring Terminated at Elevation 2,496.4 ft in Core Loss Interval Interpreted as Crystalline Rock (Pegmatite).
										Note: Boring B2-B WBL was redrilled within 1 foot of the original boring and aquired 16 feet of core from a depth of 39.7 feet to 55.7 feet.

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B2-B WBL	**STATION** 248+32	**OFFSET** 6 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,552.1 ft	**TOTAL DEPTH** 55.7 ft	**NORTHING** 798,020	**EASTING** 1,068,220	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER Gower, S.	**START DATE** 01/31/12	**COMP. DATE** 03/02/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 16.0 ft			

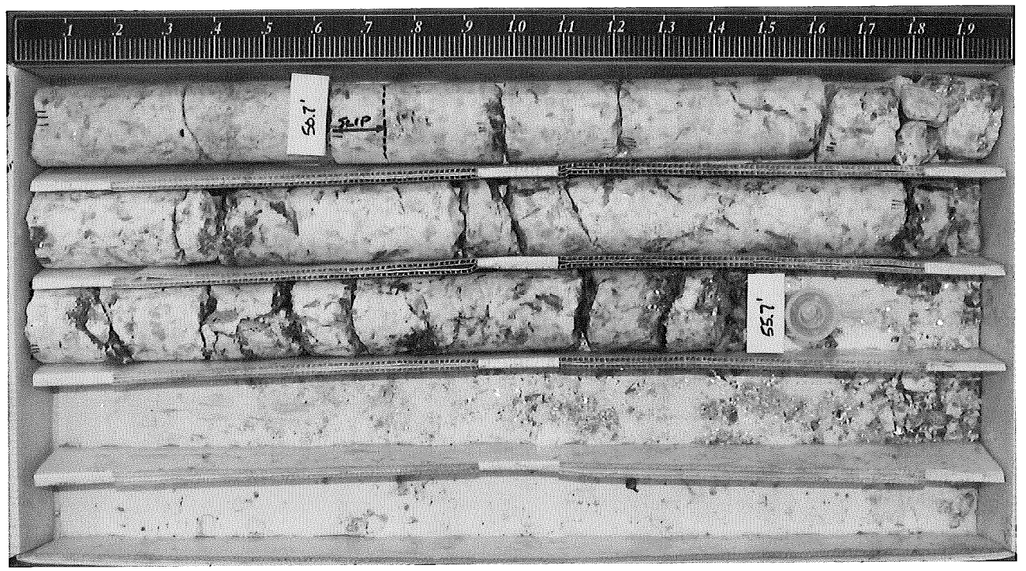
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
2512.4											Begin Coring @ 39.7 ft
	2,512.4	39.7	1.0	3:16	(0.6)	(0.5)		(15.0)	(8.0)		2,512.4 **CRYSTALLINE ROCK** 39.7
2510	2,511.4	40.7	5.0	N=60/0.1	60%	50%		94%	50%		White, clear & gray, brown-orange stain & trcs. pink-orange, fresh to mod. weathered, v. hard, close to mod. close frac. spacing, megacrystalline, Feldspar Quartz Muscovite Pegmatite w/muscovite & chlorite pods and two 0.7'-1.0' intervals of white, blue-clear, brown-orange, mod. sev. weathered, med. hard, v. close to close frac. spacing Muscovite Feldspar Schist w/trc. microcline.
				3:30							
				4:04	(4.8)	(1.1)					
				3:10	96%	22%					
	2,506.4	45.7		2:25							
2505				2:49							
			5.0	2:52	(5.0)	(3.7)					
				2:72	100%	74%					
				2:50							
	2,501.4	50.7		3:16							
2500				3:54							
			5.0	4:04	(4.6)	(2.7)					
				1:52	92%	54%					
				2:15							
				2:18							
	2,496.4	55.7		1:56							2,496.4 55.7
											Boring Terminated at Elevation 2,496.4 ft in Core Loss Interval Interpreted as Crystalline Rock (Pegmatite).
											Note: Boring B2-B WBL was redrilled within 1 foot of the original boring and aquired 16 feet of core from a depth of 39.7 feet to 55.7 feet.

NCDOT CORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

CORE PHOTOGRAPHIC RECORD

Bridge C48 On US 19 East Over Big Crabtree Creek

B2-B WBL – 248+32 @ 6' Lt. Box 1 of 2



B2-B WBL – 248+32 @ 6' Lt. Box 2 of 2

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. B2-A EBL	**STATION** 248+39	**OFFSET** 6 ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 2,558.9 ft	**TOTAL DEPTH** 81.5 ft	**NORTHING** 798,007	**EASTING** 1,068,224 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER Gower, S.	**START DATE** 01/20/12	**COMP. DATE** 01/20/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2560										2,558.9 GROUND SURFACE	0.0
2555	2,554.3	4.6	3	4	5	9		D		**ROADWAY EMBANKMENT** Brown, stiff, micaceous silt w/rock frags. (A-4).	
2550	2,549.9	9.0	2	3	6	9		D			
2545	2,544.9	14.0	3	4	5	9		D		2,546.6 Brown, stiff, micaceous silt (A-5).	12.3
2540	2,539.9	19.0	3	5	5	10		D			
2535	2,534.9	24.0	4	5	6	11		D		2,531.6 **ALLUVIAL** Black & brown, stiff, micaceous silt w/rock frags. (A-5).	27.3
2530	2,529.9	29.0	3	6	6	12		D			
2525	2,524.9	34.0	8	32	28	60		W		2,526.6 **RESIDUAL** Gray, hard, silt w/rock frags. (A-4).	32.3
2520	2,519.9	39.0	100/0.3			100/0.3				2,521.6 **WEATHERED ROCK** Weathered rock (Schist)	37.3
2515	2,514.9	44.0	3	3	3	6		W		2,517.2 **RESIDUAL** Gray & white, med. stiff to v. stiff, micaceous silt w/rock frags. (A-4).	41.7
2510	2,509.9	49.0	7	9	13	22		W			
2505	2,504.9	54.0	100/0.3			100/0.3				2,506.6 **WEATHERED ROCK** Weathered rock (Schist)	52.3
2500	2,499.9	59.0	100/0.3			100/0.3					
2495	2,494.9	64.0	100/0.5			100/0.5					
2490	2,489.9	69.0	100/0.5			100/0.5					
2485	2,488.4	70.5	60/0.0			60/0.0	RS-3			2,488.4 **CRYSTALLINE ROCK** Crystalline rock (Quartz Muscovite Chlorite Schist)	70.5
2480											

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. B2-A EBL	**STATION** 248+39	**OFFSET** 6 ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 2,558.9 ft	**TOTAL DEPTH** 81.5 ft	**NORTHING** 798,007	**EASTING** 1,068,224 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER Gower, S.	**START DATE** 01/20/12	**COMP. DATE** 01/20/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2480						Match Line				2,477.4 Boring Terminated at Elevation 2,477.4 ft in Crystalline Rock (Schist).	81.5

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

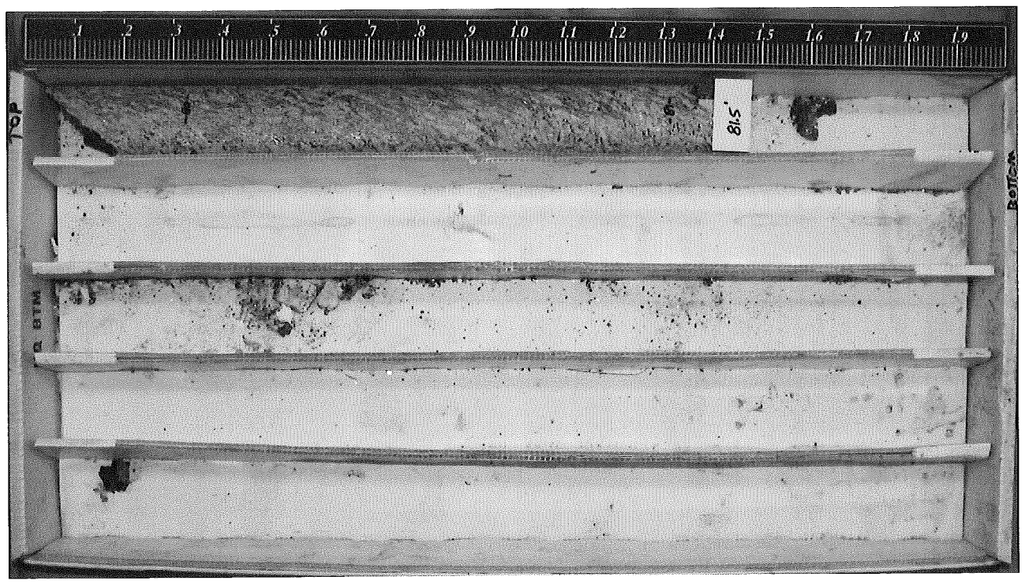
WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** Payne, P.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. B2-A EBL	**STATION** 248+39	**OFFSET** 6 ft RT	**ALIGNMENT** -L- / **0 HR.** N/A
COLLAR ELEV. 2,558.9 ft	**TOTAL DEPTH** 81.5 ft	**NORTHING** 798,007	**EASTING** 1,068,224 / **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER Gower, S.	**START DATE** 01/20/12	**COMP. DATE** 01/20/12	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ2	**TOTAL RUN** 11.0 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
2488.4											Begin Coring @ 70.5 ft
	2,488.4	70.5	1.0	*N=60/0.0*	(1.0)	(1.0)	RS-3	(10.6)	(10.1)		2,488.4 **CRYSTALLINE ROCK** 70.5
	2,487.4	71.5		2:21	100%	100%		96%	92%		Gray, gray-green, white, trcs. rose-pink, fresh w/sli. weathered interval, hard to v. hard, mod. close frac. spacing, Quartz Muscovite Chlorite Schist w/garnets & interval (77.5'-78.0') white, black-green, brown stain, sli. weathered Feldspar Quartz Muscovite Pegmatite. Contact @ 55°; schistocity = 1mm-2mm @ 65°-70°, crenulated to contorted; 2 55° fracs. w/irregular walls & sli. iron stain; 3 5°-20° fracs. w/hard walls& sli. stain; core loss @ 78.0'-78.2' & 81.3'-81.5'
			5.0	2:16							
2485				2:20	(5.0)	(4.8)					
				2:24	100%	96%					
				2:28							
	2,482.4	76.5		3:32							
			5.0	2:44	(5.0)	(4.8)					
2480				2:42	100%	96%					
				2:22							
				2:02							
	2,477.4	81.5		2:48							2,477.4 81.5
											Uniaxial compressive strength=184 KSF R1=1, R2=20, R3=20, R4=20, R5=7, RMR=68 Rock Type B
											Boring Terminated at Elevation 2,477.4 ft in Crystalline Rock (Schist).

CORE PHOTOGRAPHIC RECORD

Bridge C48 On US 19 East Over Big Crabtree Creek

B2-A EBL – 248+39 @ 6' Rt. Box 1 of 2



B2-A EBL – 248+39 @ 6' Rt. Box 2 of 2

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. B2-B EBL	**STATION** 248+59	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,559.6 ft	**TOTAL DEPTH** 63.4 ft	**NORTHING** 797,967	**EASTING** 1,068,235	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/24/12	**COMP. DATE** 01/24/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2560										2,559.6 GROUND SURFACE 0.0
2555	2,555.1	4.5	3	3	3	6		D		**ROADWAY EMBANKMENT** Brown, med. stiff, micaceous silt w/wood frags. (A-5).
2550	2,550.1	9.5	4	4	7	11		M		2,551.8 7.8 Tan-white, stiff, micaceous silt (A-4).
2545	2,545.1	14.5	4	4	5	9		M		2,546.8 12.8 Tan-red & tan, stiff, micaceous silt w/quartz grains (A-5).
2540	2,540.1	19.5	3	4	5	9		M		
2535	2,535.1	24.5	4	5	6	11		M		2,531.8 27.8 **RESIDUAL** Black & white, dense, micaceous quartz sand w/rock frags. (A-2-4).
2530	2,530.1	29.5	4	11	21	32		D		2,526.8 32.8 Black & white, dense, silty gravel & cobble size quartz & rock frags. (A-3).
2525	2,525.1	34.5	7	22	17	39		M		2,521.8 37.8 Orange & white, med. dense, micaceous saprolitic quartz sand w/rock frags. (A-2-6).
2520	2,520.1	39.5	18	14	11	25		M		2,516.8 42.8 Tan, v. dense, micaceous, silty quartz sand and rock frags. (A-2-7).
2515	2,515.1	44.5	21	36	60	96		M		2,511.8 47.8 Red-brown-orange & white, dense, micaceous saprolitic quartz sand w/rock frags (A-2-4).
2510	2,510.1	49.5	14	17	21	38		M		2,506.8 52.8 Orange, white & black, dense, micaceous saprolitic quartz sand (A-2-6).
2505	2,505.1	54.5	22	18	22	40		M		
2500	2,500.1	59.5	91	9/0.1		100/0.6				2,499.6 60.0 **WEATHERED ROCK** Weathered rock (Schist)
	2,496.3	63.3	60/0.1			60/0.1				2,496.2 63.4 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,496.2 ft on Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.	
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek				**GROUND WTR (ft)**
BORING NO. EB2-A WBL	**STATION** 248+76	**OFFSET** 42 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,541.8 ft	**TOTAL DEPTH** 39.5 ft	**NORTHING** 798,045	**EASTING** 1,068,271	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H0404 CME-45C 87.6% 08/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Gower, S.	**START DATE** 01/30/12	**COMP. DATE** 01/30/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2545										2,541.8 GROUND SURFACE 0.0
2540	2,537.3	4.5	1	1	2	3		M		**ALLUVIAL** Orange & black, soft, micaceous silt (A-5).
2535	2,532.3	9.5	3	2	1	3		M		2,534.0 7.8 Gray, soft, silty clay w/sand grains (A-7-5).
2530	2,527.3	14.5	9	32	53	85		Sat.		2,529.0 12.8 **RESIDUAL** Brown, v. dense, sand w/gravel & cobbles (A-2-5). Blow count influenced by presence of gravel and cobbles.
2525	2,522.3	19.5	2	3	2	5		Sat.		2,524.0 17.8 White-tan, med. stiff, micaceous silt (A-4).
2520	2,517.3	24.5	19	32	34	66		M		2,519.0 22.8 **RESIDUAL** White-orange, hard, micaceous silt w/rock frags. (A-5).
2515	2,512.3	29.5	60	40/0.3		100/0.8				2,514.0 27.8 **WEATHERED ROCK** Weathered rock (Schist)
2510	2,507.3	34.5	16	18	18	36		M		2,509.4 32.4 **RESIDUAL** Brown & orange, dense, micaceous, saprolitic sand (A-2-4).
2505	2,502.3	39.5	60/0.0			60/0.0				2,502.3 39.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,502.3 ft on Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 249+04	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,559.9 ft	**TOTAL DEPTH** 54.8 ft	**NORTHING** 797,992	**EASTING** 1,068,287	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/20/12	**COMP. DATE** 01/20/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2560										
										2,559.9 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT Brown-tan & brown, loose to med. dense, micaceous f. grain sand w/rock frags. (A-2-6).
2555	2,555.2	4.7	9	7	4	11		D		
2550	2,550.2	9.7	4	4	5	9		D		
										2,546.9 13.0
2545	2,545.2	14.7	3	4	4	8		M		Light brown & tan, med. stiff to v. stiff, micaceous silt (A-5).
2540	2,540.2	19.7	2	3	6	9		M		
2535	2,535.2	24.7	4	8	8	16		M		
										2,531.9 28.0
										ALLUVIAL Tan-brown, stiff, micaceous silt w/cse. rock frags. & roots (A-4).
2530	2,530.2	29.7	4	6	6	12		M		
										2,526.9 33.0
										RESIDUAL Tan-black, med. dense, silty, cse. grain quartz sand w/mica & rock frags. (A-3).
2525	2,525.2	34.7	9	16	13	29				
										2,521.9 38.0
										Orange-white & brown, med. dense to dense, silty quartz sand w/mica & rock frags. (A-2-6).
2520	2,520.2	39.7	3	5	13	18				
2515	2,515.2	44.7	3	10	24	34				
										2,511.9 48.0
										WEATHERED ROCK Weathered rock (Schist).
2510	2,510.2	49.7	100/0.4			100/0.4				
	2,505.2	54.7	60/0.1			60/0.1				2,505.1 54.8
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,505.1 ft on Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 35609.1.1	**TIP** R-2519B	**COUNTY** YANCEY	**GEOLOGIST** DeLost, R.
SITE DESCRIPTION Bridge No. C48 on US 19 East Over Big Crabtree Creek			**GROUND WTR (ft)**
BORING NO. EB2-B EBL	**STATION** 249+25	**OFFSET** 49 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,561.3 ft	**TOTAL DEPTH** 58.7 ft	**NORTHING** 797,945	**EASTING** 1,068,298	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&H5404 CME-45C 82% 10/21/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Banning, C.	**START DATE** 01/20/12	**COMP. DATE** 01/22/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2565										
										2,561.3 GROUND SURFACE 0.0
2560										**ROADWAY EMBANKMENT** Dark brown, med. stiff, micaceous silt w/roots & wood (A-5).
	2,556.8	4.5	4	3	4	7		M		
2555										2,553.5 7.8
	2,551.8	9.5	1	3	3	6		M		Tan & brown, med. stiff to stiff, micaceous silt w/quartz grains & wood frags. (A-5).
2550										
	2,546.8	14.5	3	4	4	8		M		
2545										2,543.5 17.8
	2,541.8	19.5	3	4	5	9		M		**ROADWAY EMBANKMENT** Tan, med. stiff to stiff, micaceous silt (A-5).
2540										
	2,536.8	24.5	1	4	5	9		M		
2535										
	2,531.8	29.5	2	2	4	6		M		
2530										2,528.5 32.8
	2,526.8	34.5	29	36	18	54				**RESIDUAL** Brown, v. dense, med. to cse. grain micaceous quartz sand w/silt (A-1-b).
2525										2,523.5 37.8
	2,521.8	39.5	13	5	7	12				White & back, med. dense silty micaceous cse. grain quartz sand w/rock frags. (A-2-6).
2520										
	2,516.8	44.5	4	10	10	20				2,518.5 42.8
2515										Orange-white, med. dense, silty micaceous f. to cse. grain quartz sand (A-2-7).
	2,511.8	49.5	17	20	19	39				2,513.5 47.8
2510										Brown & white, silty, dense to v. dense, micaceous f. to cse. grain quartz sand (A-2-6).
	2,506.8	54.5	90	10/0.1		100/0.6				2,506.3 55.0
2505										**WEATHERED ROCK** Weathered rock (Schist)
	2,502.6	58.7	60/0.0			60/0.0				2,502.6 58.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,502.6 ft on Crystalline Rock (Schist).

NCDOT BORE SINGLE R2519B_GEO_BRDG0C48_BORE.GPJ NC_DOT.GDT 3/22/12

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: R2519-B
W.B.S. NO.: 35609.1.1
COUNTY: Yancey
Bridge #C48 on US 19E over Big Crabtree Creek

Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus (PSI)	Splitting Tensile Strength (PSI)	Remarks
RS-1	B1-B EBL	65.5-65.9	Sch/Peg contact	Zabg	86%	4.11	1.99	163	4,851			sli. weathered
RS-2	B2-A WBL	40.4-40.8	Schist	Zabg	80%	4.10	1.99	172	1,449			fresh
RS-3	B2-A EBL	70.7-71.1	Schist	Zabg	100%	4.12	1.98	172	1,279			fresh
RS-4	B1-B WBL	42.2-42.5	Pegmatite	Zabg	50%	4.07	1.99	161	1,949			fresh

SITE PHOTOGRAPHIC RECORD

Bridge C48 on US 19 Over Big Crabtree Creek

B1-A WBL Looking Along Profile Towards EB2-A WBL

EB2-C Looking Towards EB2-A WBL

EB2-C Looking Towards EB1-C

EB2-C Looking Towards B2-B EBL

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	4

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 F.A. PROJ. _____

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL LEFT OF -L- STATION INTERVAL 79+00 TO 87+50

ID:R-2519B

PROJECT: 35609.1.1

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 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.

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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

T B DANIEL

C J COFFEY

R D CHILDERS

G K ROSE

M M HAGER

D O CHEEK

INVESTIGATED BY *C A DUNNAGAN*

CHECKED BY *W D FRYE, Jr*

SUBMITTED BY *W D FRYE, Jr*

DATE *APRIL 2008*

NORTH CAROLINA LICENSED SEAL 008 2004 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.

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PROJECT REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/4

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	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	11 MN	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B-__
- [ ] -N-__
- [ ] -H-__

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

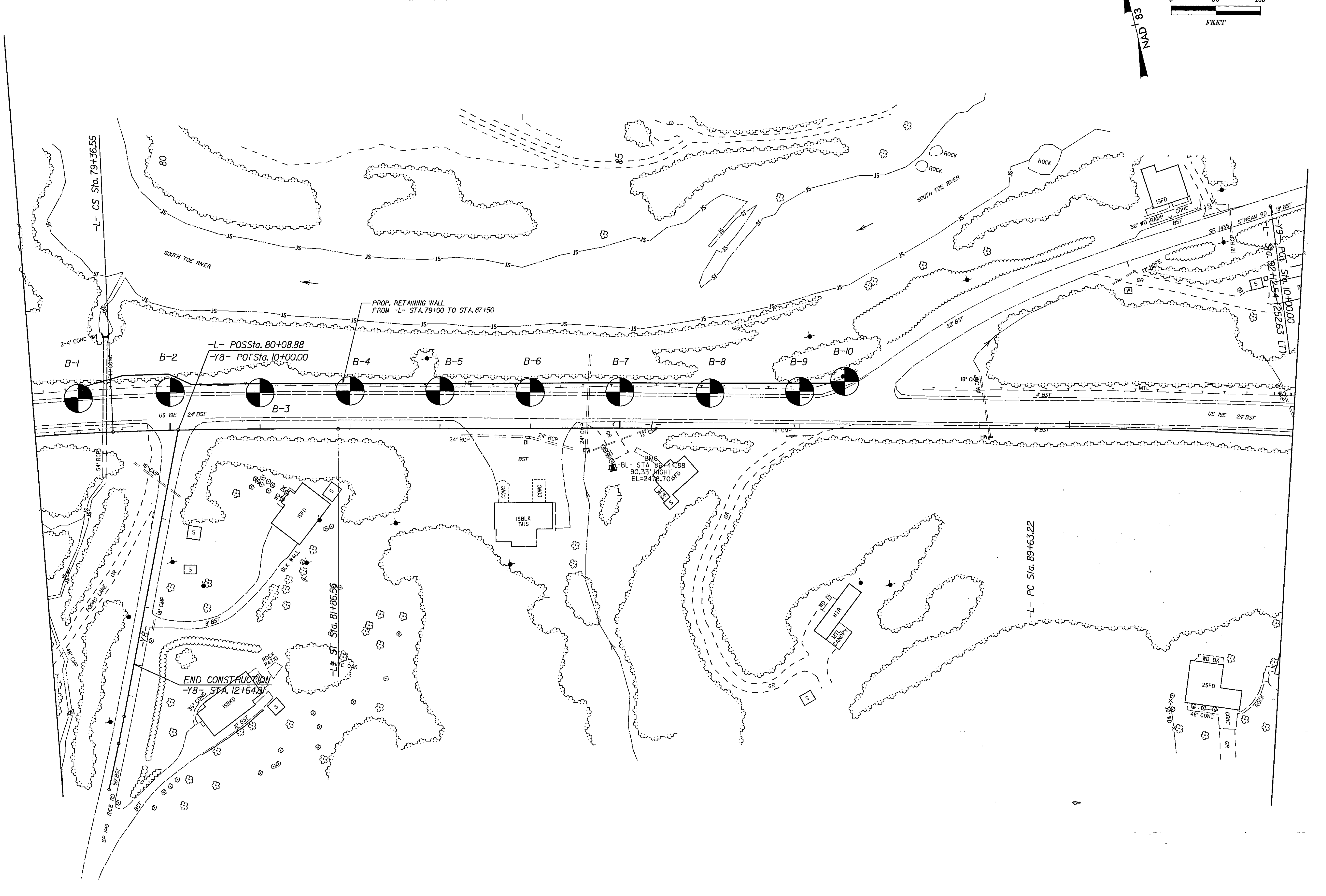
ELEVATION: _____ FT.

NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3/4

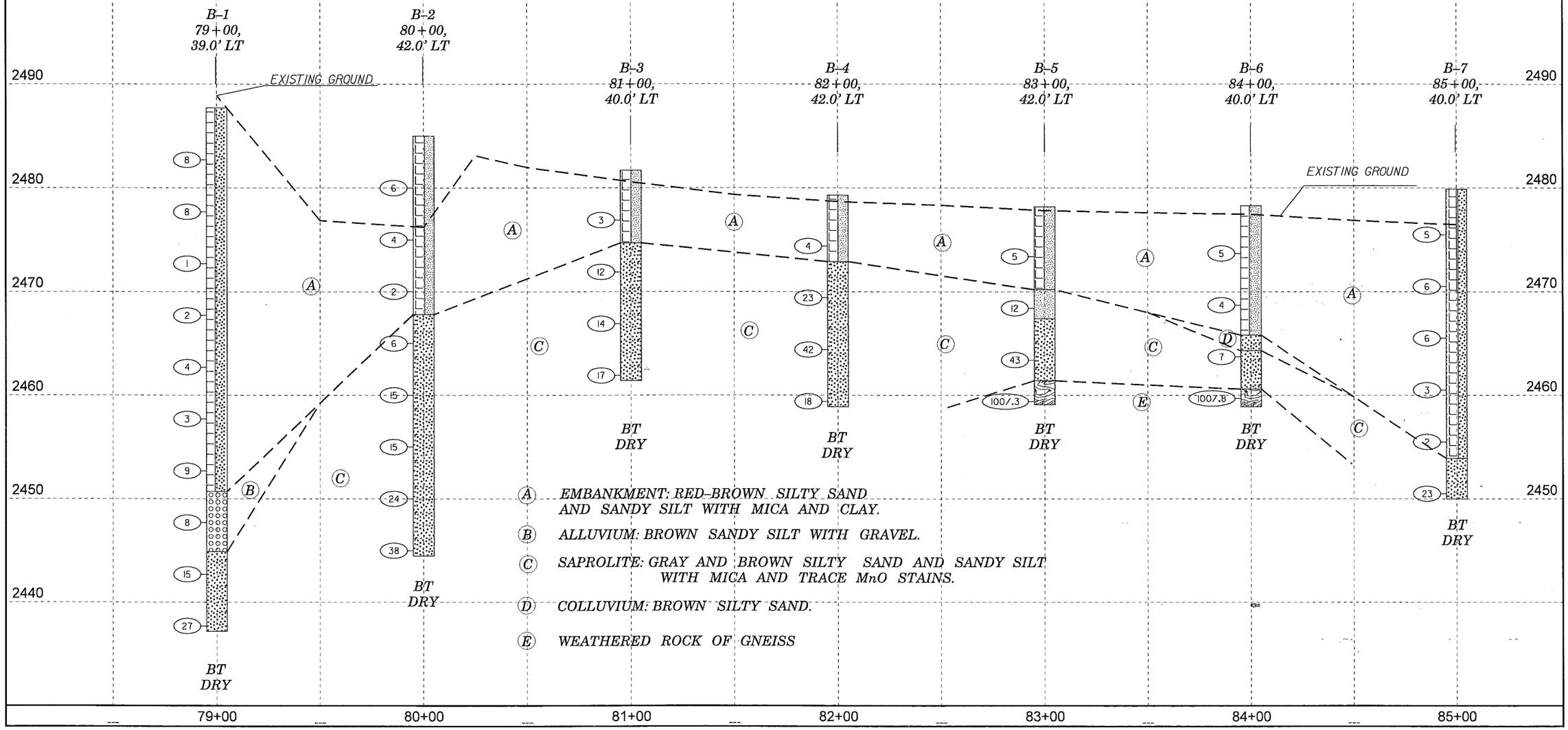
RETAINING WALL LEFT OF -L- STATION 79+00 TO 87+50



0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R–2519B)	4/4
RW–1 (SHEET 1)	

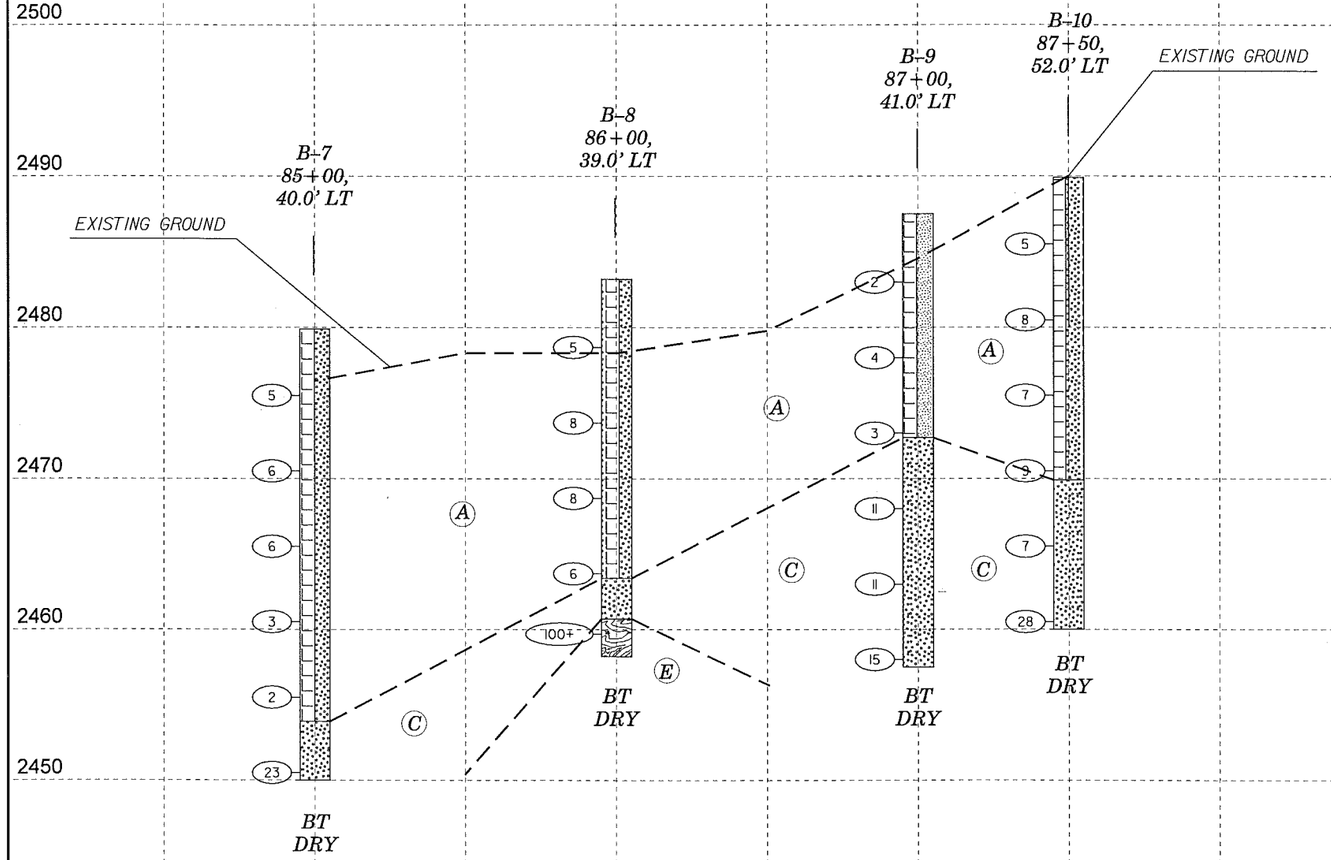
RETAINING WALL LEFT OF –L– STATION INTERVAL 79+00 TO 87+50



0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4B/4
RW-1 (SHEET 2)	

RETAINING WALL LEFT OF -L- STATION INTERVAL 79+00 TO 87+50



(A) EMBANKMENT: RED-BROWN SILTY SAND AND SANDY SILT WITH MICA AND TRACE OF GRAVEL.

(C) SAPROLITE: BROWN TO BLACK SILTY SAND AND SANDY SILT WITH MICA.

(E) WEATHERED ROCK OF GNEISS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	4

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 (R-2519B) F.A. PROJ. _____

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL LEFT OF -L- STATION INTERVAL 125+00 TO 130+00

ID: R-2519B

PROJECT: 35609.1.1

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 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

T B DANIEL

C J COFFEY

R D CHILDERS

G K ROSE

INVESTIGATED BY *C A DUNNAGAN*

CHECKED BY *W D FRYE, Jr*

SUBMITTED BY *W D FRYE, Jr*

DATE *APRIL 2008*

NORTH CAROLINA LICENSED SEAL 15 Apr 08 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 REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2 / 4

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MX	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

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

CORE SIZE:
- [ ] -B__
- [ ] -N__
- [ ] -H__

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS, IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

ELEVATION: _____ FT.

NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3/4

0 50 100
FEET

NAD 83

-Y13- POT Sta. 10+00.00

-Y13- PCC Sta. 13+53.42

-Y13- PCC Sta. 12+24.16

125

130

SR 1424 DENEEN RD 18' BST

12" CMP

18" CMP

GR

HW

18" CMP

SR 1424 DENEEN RD 18' BST

PROP. RETAINING WALL
FROM -L- STA. 125+00 TO STA. 130+00

25FD

WD OK

6.0' ROCK

WLB

WLB

S

LONG BRANCH

LONG BRANCH CREEK

5'CONC WW

2-BARREL 6'x6' CONC

2-6'x6' CONC

5'CONC WW

5'CONC WW

15-6'6CNC WW

16'CONC WW

CONC

US 19E 25' BST

3' BST

MTL

B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10

3' BST

US 19E 25' BST

BM9
-BL- STA 126+19.38
71.96' RIGHT
EL=2472.37

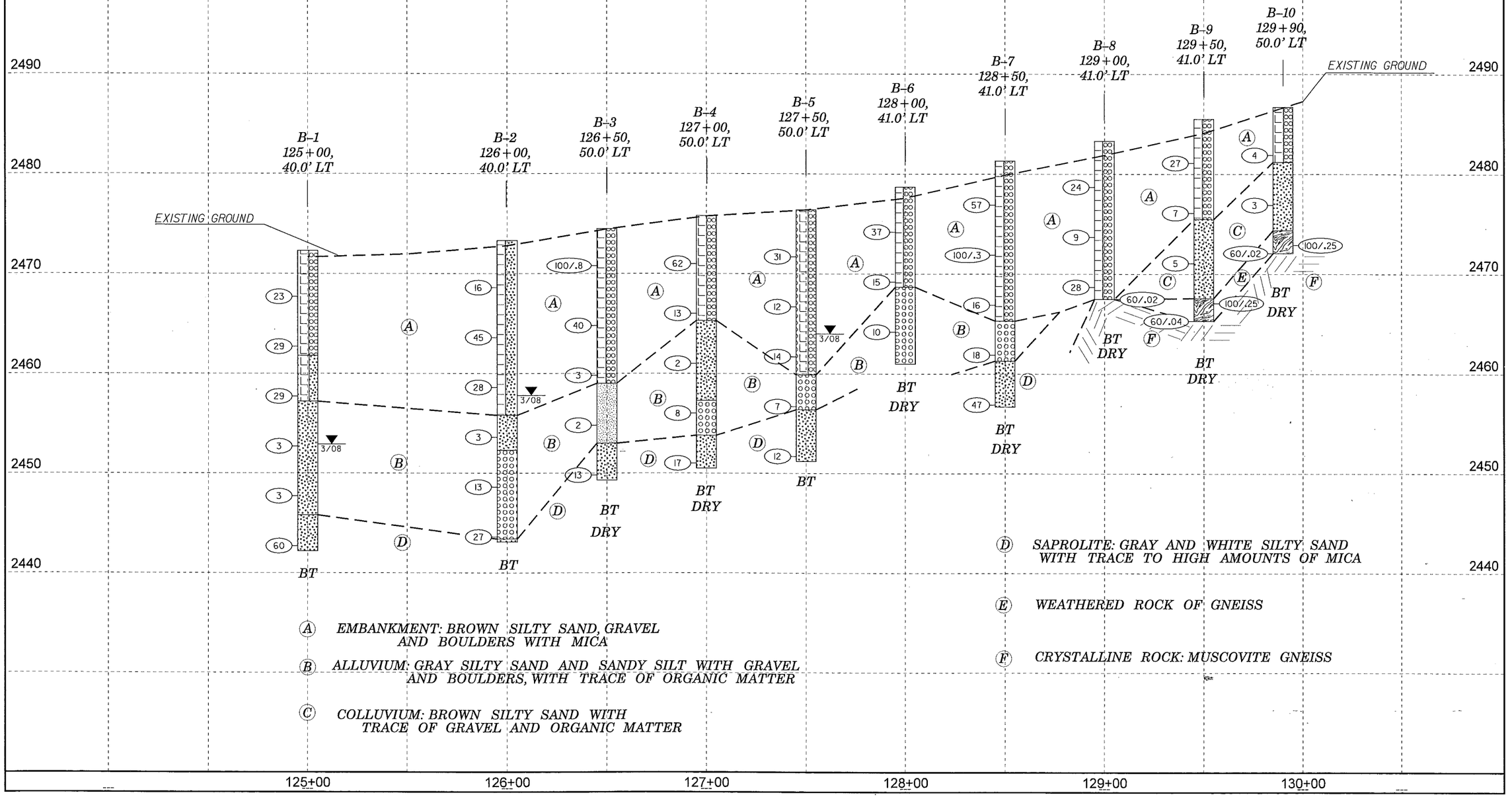
SOUTH TOE RIVER

SOIL

0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4/4
PROFILE	

RETAINING WALL LEFT OF -L- STATION INTERVAL 125+00 TO 130+00



(A) EMBANKMENT: BROWN SILTY SAND, GRAVEL AND BOULDERS WITH MICA

(B) ALLUVIUM: GRAY SILTY SAND AND SANDY SILT WITH GRAVEL AND BOULDERS, WITH TRACE OF ORGANIC MATTER

(C) COLLUVIUM: BROWN SILTY SAND WITH TRACE OF GRAVEL AND ORGANIC MATTER

(D) SAPROLITE: GRAY AND WHITE SILTY SAND WITH TRACE TO HIGH AMOUNTS OF MICA

(E) WEATHERED ROCK OF GNEISS

(F) CRYSTALLINE ROCK: MUSCOVITE GNEISS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	4

PROJECT: 35609.1.1

ID: R-2519B

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 F.A. PROJ. —

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL LEFT OF -L- STATION INTERVAL 198+00 TO 202+25

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 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

T B DANIEL

C J COFFEY

R D CHILDERS

G K ROSE

INVESTIGATED BY C A DUNNAGAN

CHECKED BY W.D FRYE, Jr

SUBMITTED BY W D FRYE, Jr

DATE JANUARY 2008

NORTH CAROLINA LICENSED SEAL 19760 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 REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/14

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX								GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
				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 12 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
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
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE __" STEEL TEETH
- [ ] TRICONE __" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

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

CORE SIZE:
- [ ] -B__
- [ ] -N__
- [ ] -H__

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

ELEVATION: _____ FT.

NOTES:
_

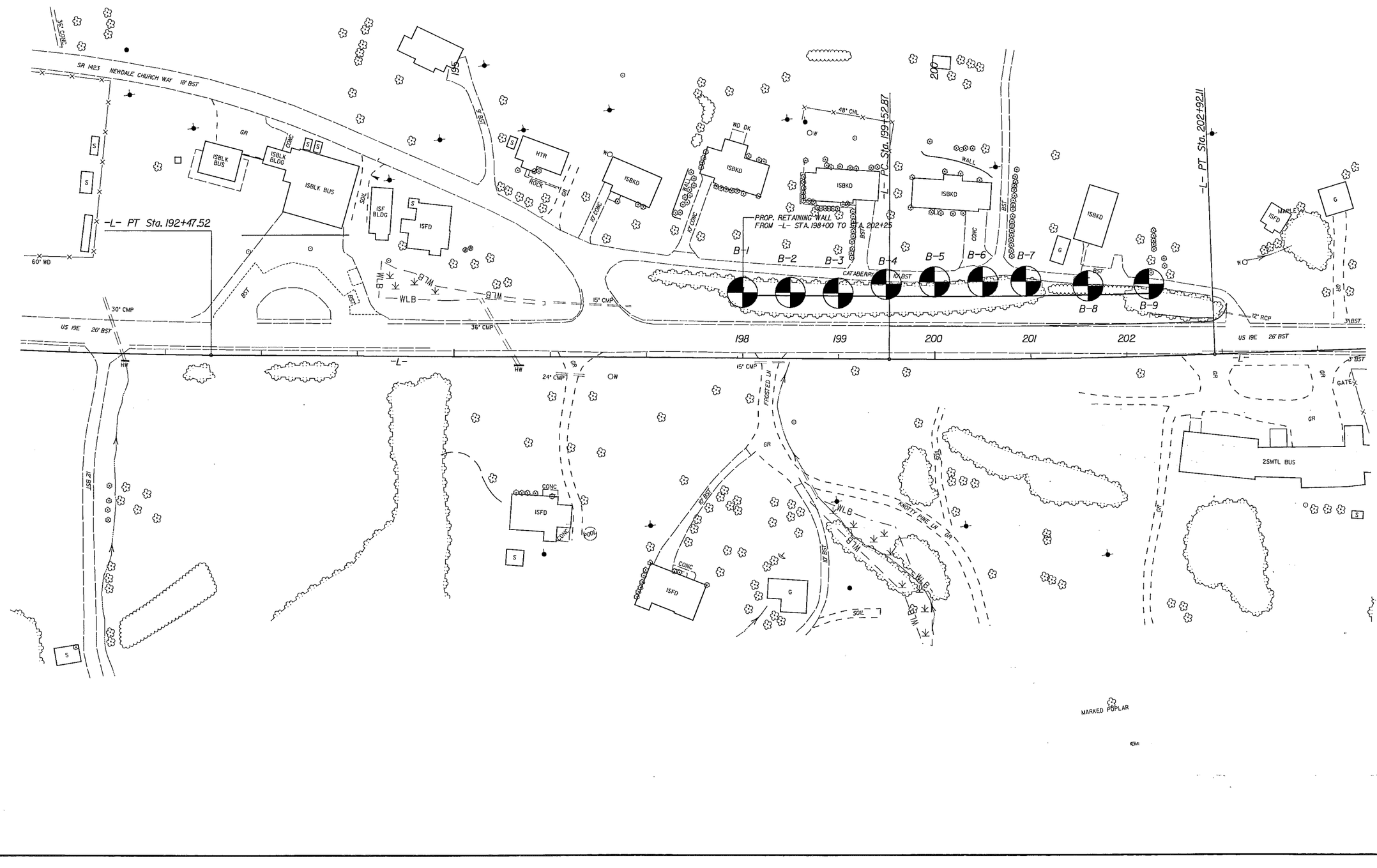
REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3 / 4

RETAINING WALL LEFT OF -L- STATION INTERVAL 198+00 TO 202+25

0 50 100
FEET

NAD 83

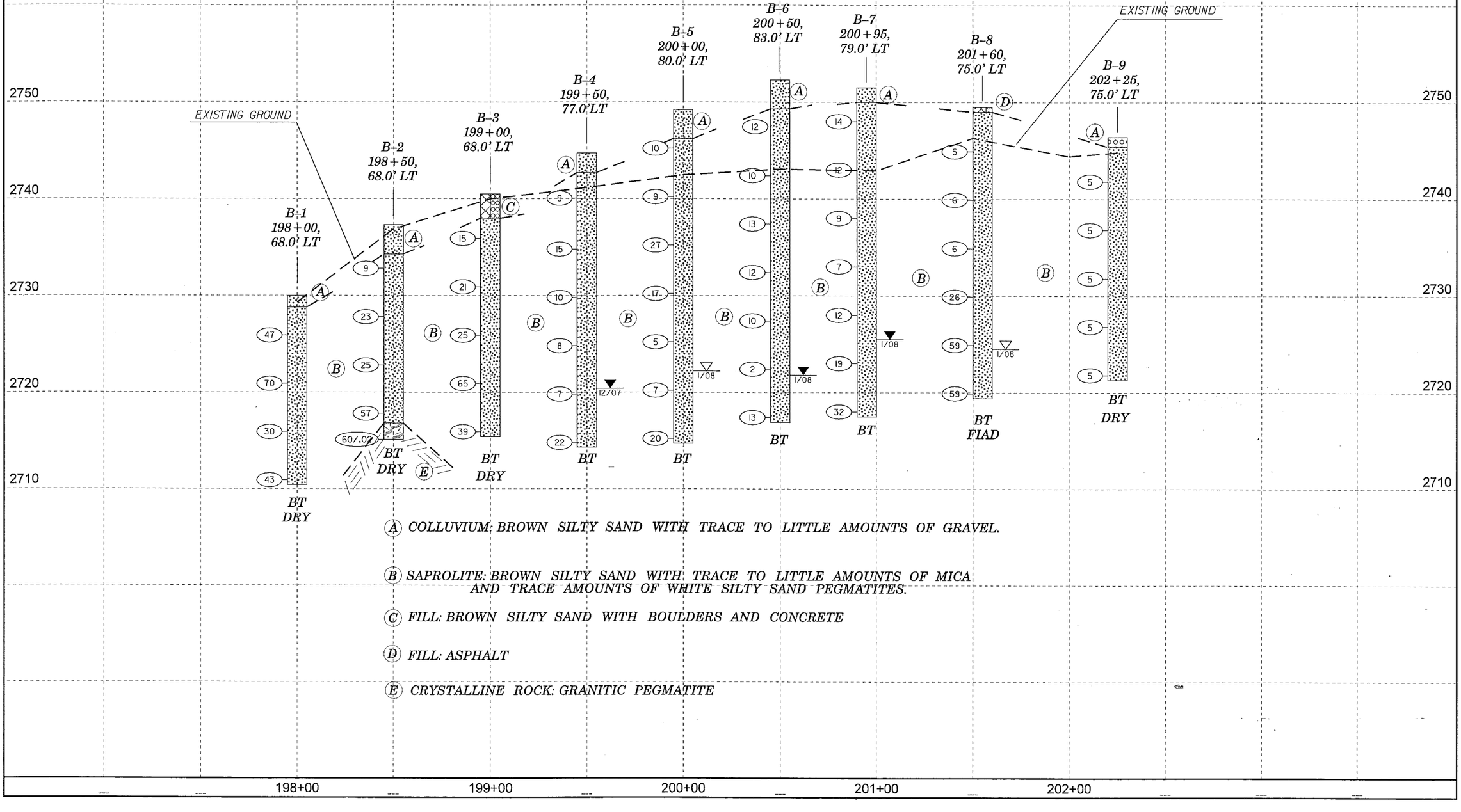


$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$SYSTINGF$$$$

0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4/4
PROFILE	

RETAINING WALL LEFT OF -L- STATIONS 198+00 TO 202+25



(A) COLLUVIUM: BROWN SILTY SAND WITH TRACE TO LITTLE AMOUNTS OF GRAVEL.

(B) SAPROLITE: BROWN SILTY SAND WITH TRACE TO LITTLE AMOUNTS OF MICA AND TRACE AMOUNTS OF WHITE SILTY SAND PEGMATITES.

(C) FILL: BROWN SILTY SAND WITH BOULDERS AND CONCRETE

(D) FILL: ASPHALT

(E) CRYSTALLINE ROCK: GRANITIC PEGMATITE

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

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 (R-2519B) F.A. PROJ. _

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL RIGHT OF -L- STATION INTERVAL 226+50 TO 230+00

ID: R-2519B

PROJECT: 35609.1.1

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 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

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 *APRIL 2008*

NORTH CAROLINA LICENSED SEAL 3804 GEOLOGIST CHARLES ANDREWS 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 REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/4

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MX	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
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
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE __ " STEEL TEETH
- [ ] TRICONE __ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

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

CORE SIZE:
- [ ] -B __
- [ ] -N __
- [ ] -H __

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

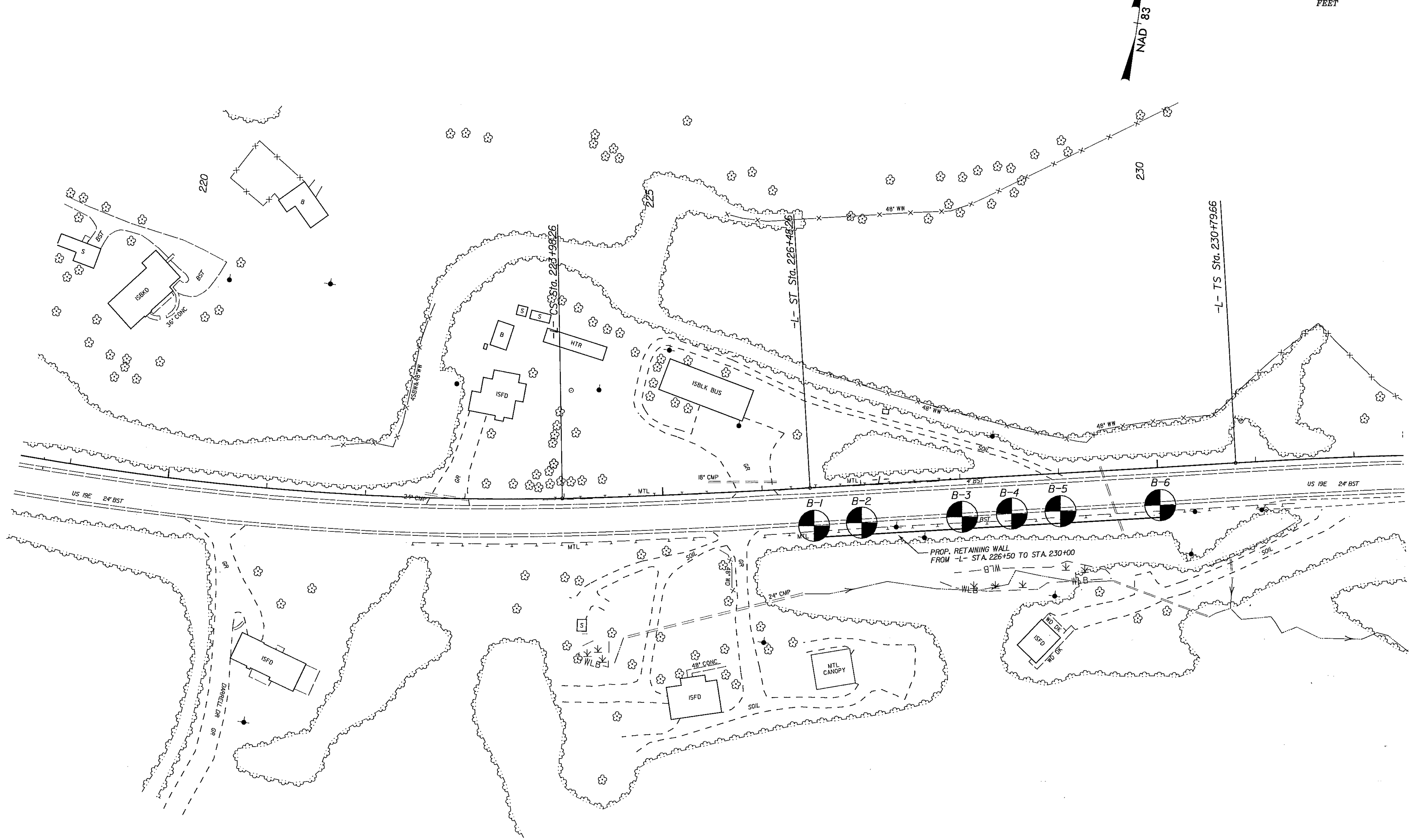
ELEVATION: _____ - FT.

NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3 - 4

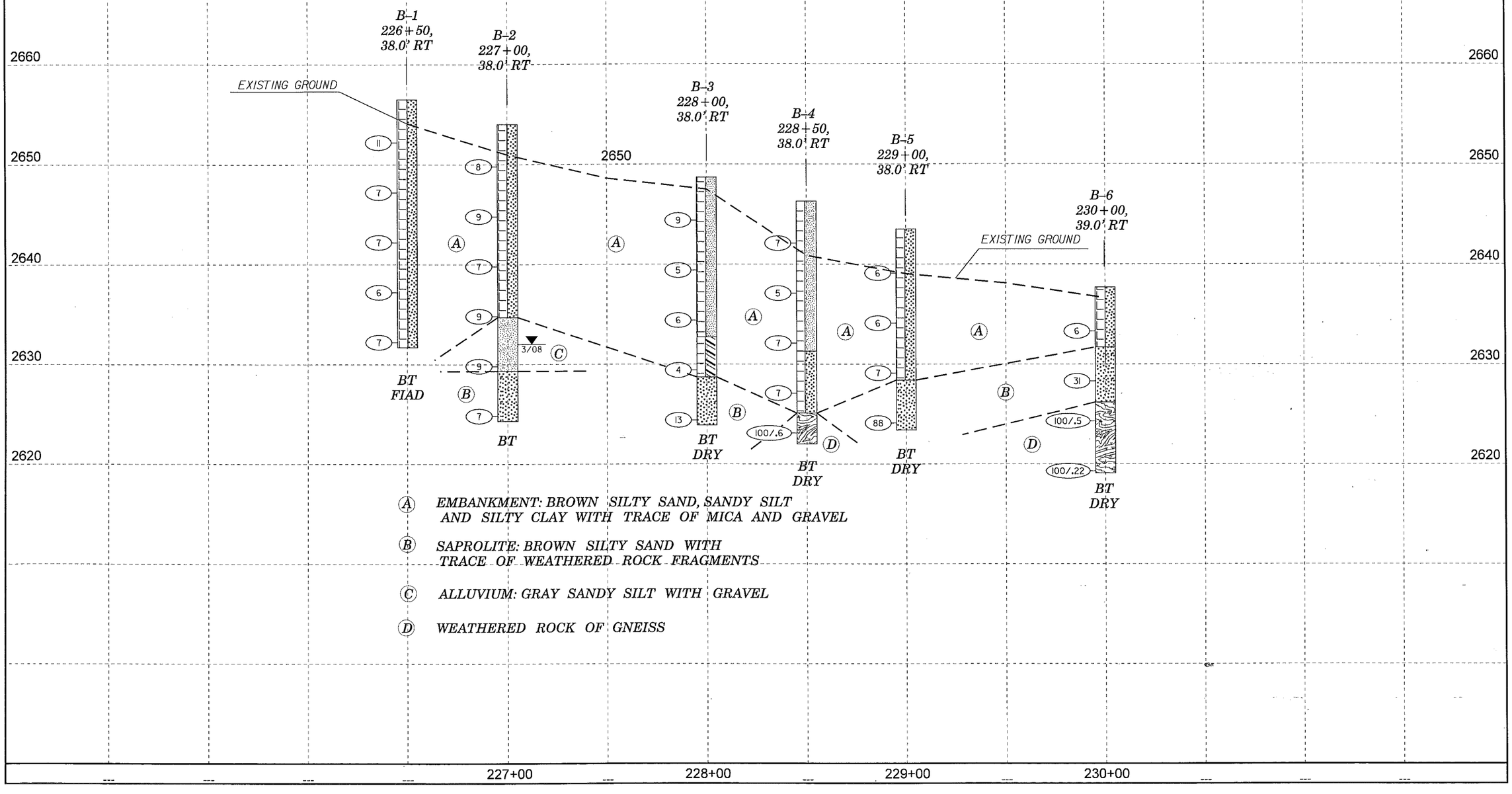
RETAINING WALL RIGHT OF -L- STATION INTERVAL 226+50 TO 230+00



0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4_4
PROFILE	

RETAINING WALL RIGHT OF -L- STATION INTERVAL 226+50 TO 230+00



(A) *EMBANKMENT: BROWN SILTY SAND, SANDY SILT AND SILTY CLAY WITH TRACE OF MICA AND GRAVEL*

(B) *SAPROLITE: BROWN SILTY SAND WITH TRACE OF WEATHERED ROCK FRAGMENTS*

(C) *ALLUVIUM: GRAY SANDY SILT WITH GRAVEL*

(D) *WEATHERED ROCK OF GNEISS*

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	4

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 F.A. PROJ. _____

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL RIGHT OF -L- STATION INTERVAL 273+75 TO 277+00

ID: R-2519B

PROJECT: 35609.1.1

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 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

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 *MARCH 2008*

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.

C A Dunnagan

NORTH CAROLINA LICENSED 19 Mar 18 1904 GEOLOGIST CHARLES ANDREWS DUNNAGAN

PROJECT REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/4

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 - DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT, CPT, DPT, DMT, PMT, 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 - 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
WOH - WEIGHT OF HAMMER

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B-__
- [ ] -N-__
- [ ] -H-__

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

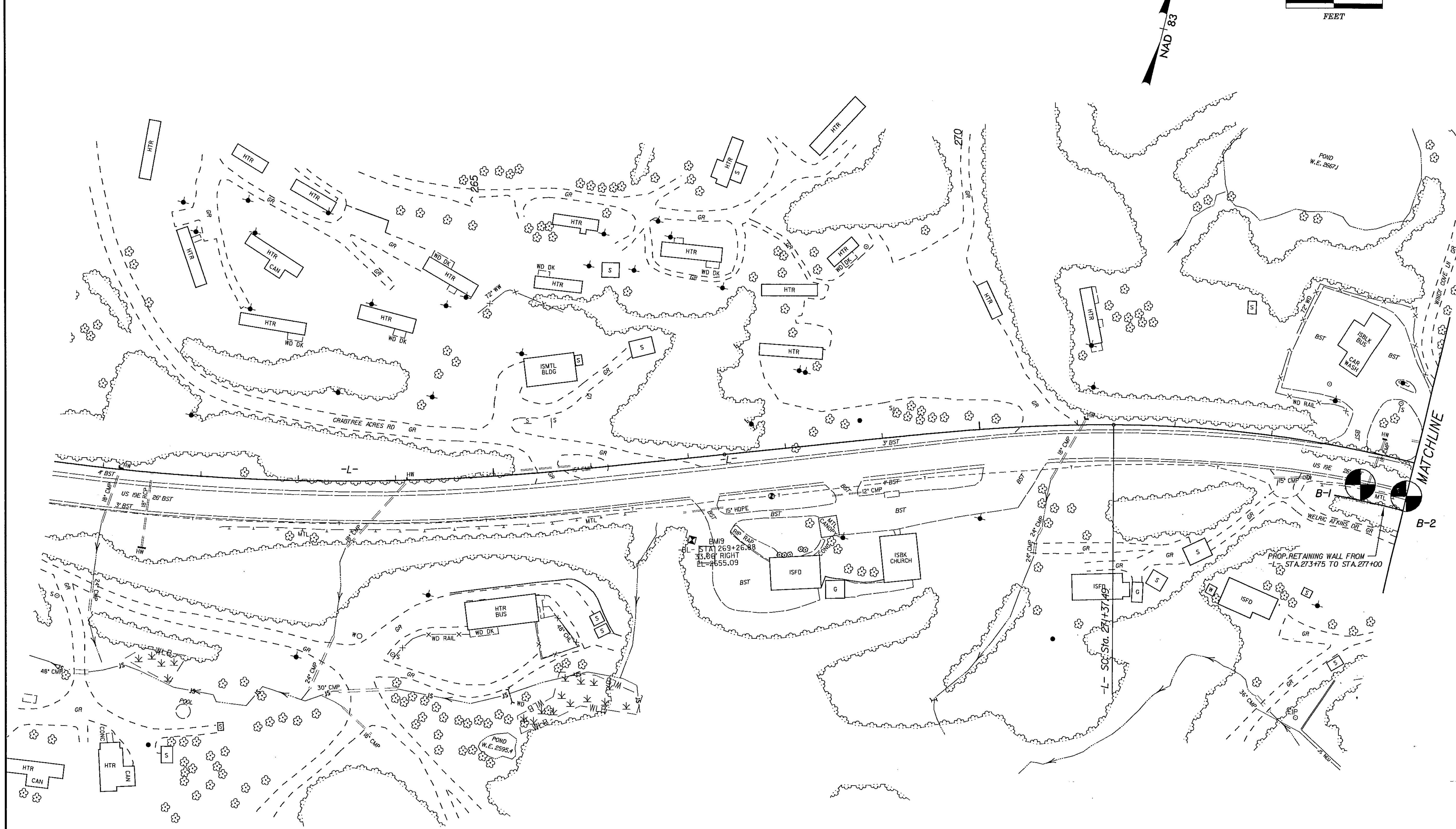
ELEVATION: _____ FT.

NOTES:

REVISED 02/23/06

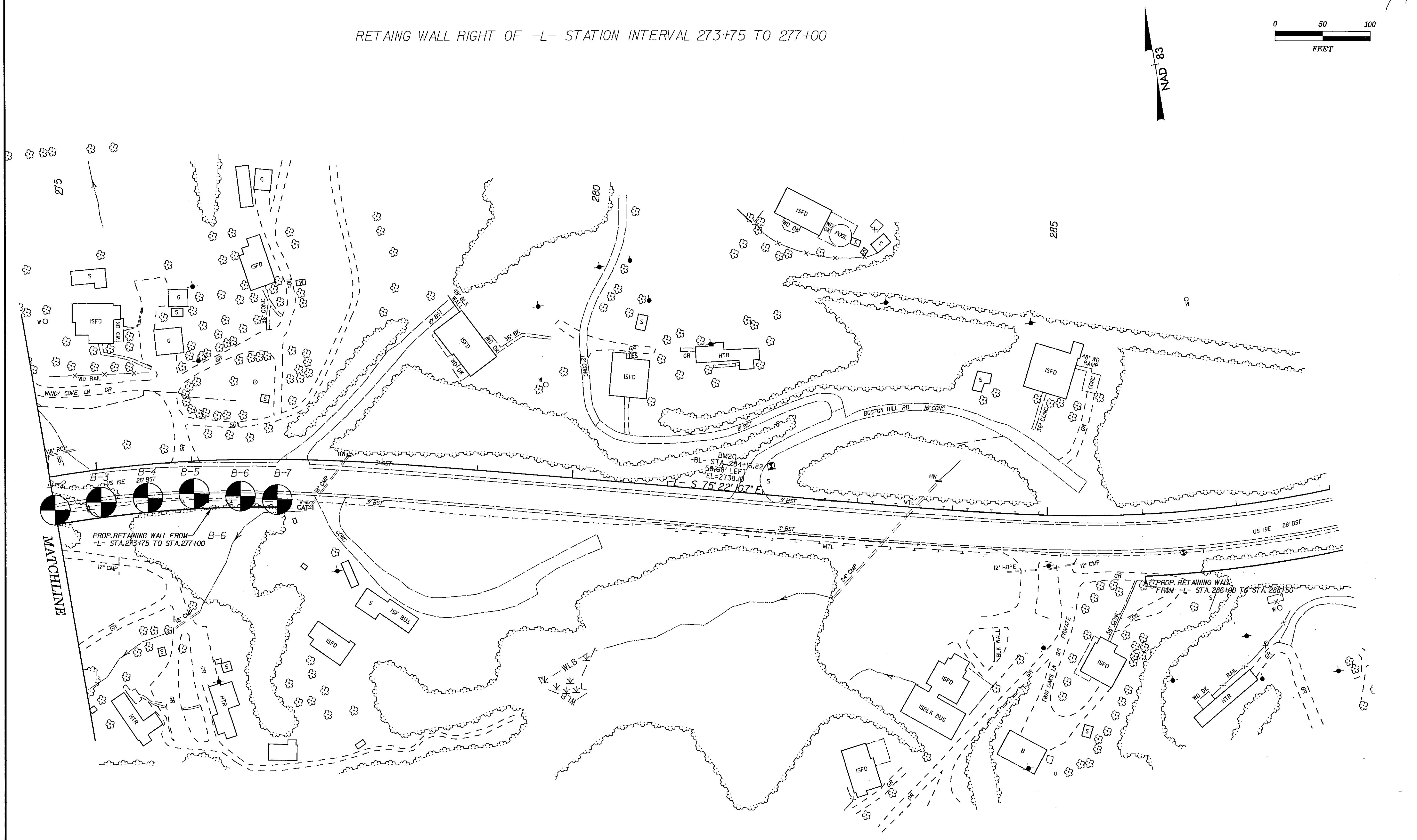
PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3A/4

RETAINING WALL RIGHT OF -L- STATIONS 273+75 TO 277+00



PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3B/4

RETAING WALL RIGHT OF -L- STATION INTERVAL 273+75 TO 277+00

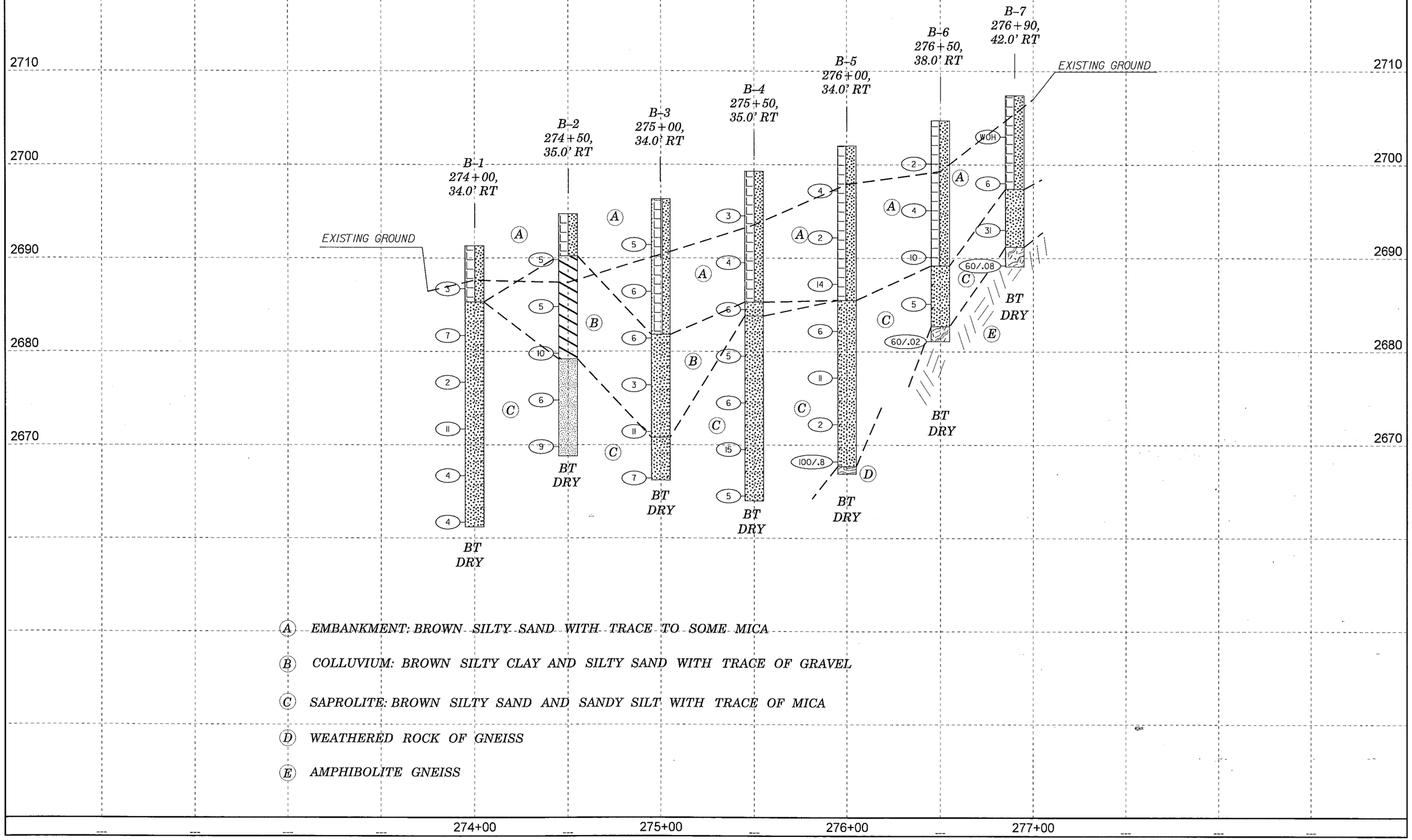


0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	–

PROFILE

RETAINING WALL RIGHT OF –L– STATION INTERVAL 273+75 TO 277+00



(A) EMBANKMENT: BROWN SILTY SAND WITH TRACE TO SOME MICA

(B) COLLUVIUM: BROWN SILTY CLAY AND SILTY SAND WITH TRACE OF GRAVEL

(C) SAPROLITE: BROWN SILTY SAND AND SANDY SILT WITH TRACE OF MICA

(D) WEATHERED ROCK OF GNEISS

(E) AMPHIBOLITE GNEISS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	8

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 25609.1.1 F.A. PROJ. _____

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL RIGHT OF -L- STATION INTERVAL 305+00 TO 308+50

ID: R-2519B

PROJECT: 35609.1.1

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5	CROSS SECTIONS
8	SOIL TEST RESULTS

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

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 *MARCH 2008*

NORTH CAROLINA LICENSED SEAL 28MAR08 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 REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/3

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING # 10 # 40 # 200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX				35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT / DPT DMT PMT / VST PHT — 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
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

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

CORE SIZE:
- [ ] -B____
- [ ] -N____
- [ ] -H____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

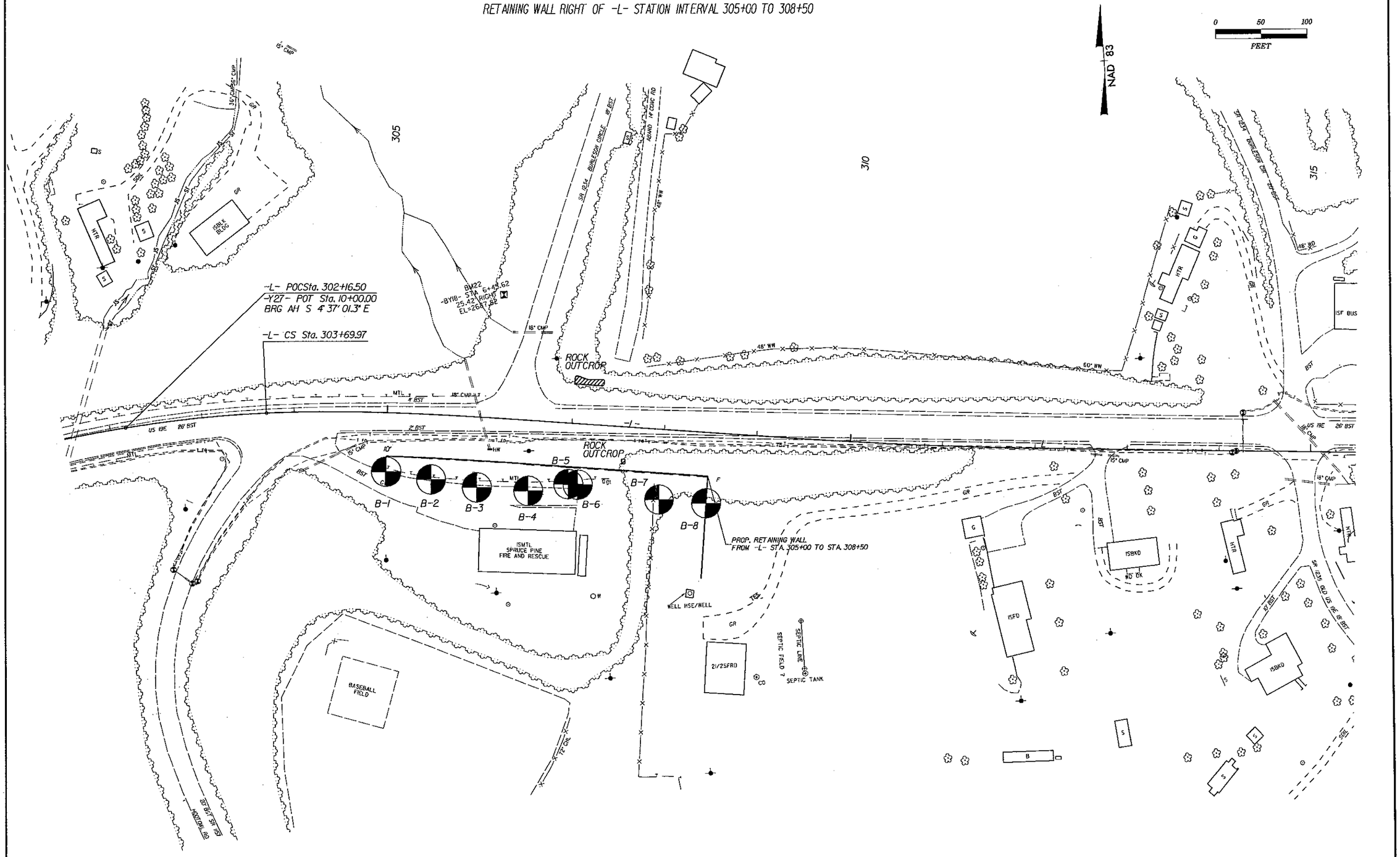
ELEVATION: _____ FT.

NOTES:
-

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	3/3

RETAINING WALL RIGHT OF -L- STATION INTERVAL 305+00 TO 308+50

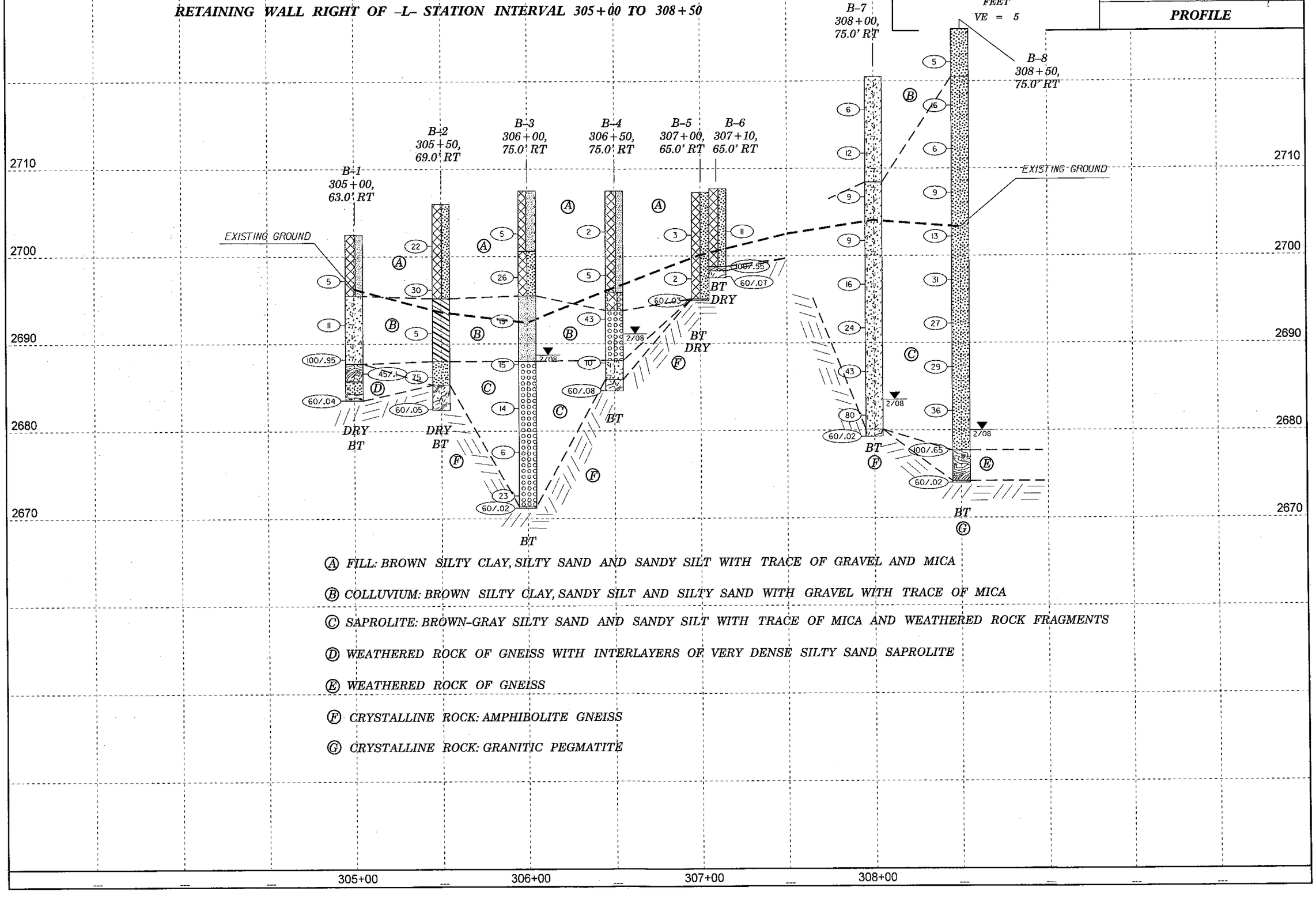


PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4/8

PROFILE

0 50 100
FEET
VE = 5

RETAINING WALL RIGHT OF –L– STATION INTERVAL 305+00 TO 308+50



Ⓐ FILL: BROWN SILTY CLAY, SILTY SAND AND SANDY SILT WITH TRACE OF GRAVEL AND MICA

Ⓑ COLLUVIUM: BROWN SILTY CLAY, SANDY SILT AND SILTY SAND WITH GRAVEL WITH TRACE OF MICA

Ⓒ SAPROLITE: BROWN-GRAY SILTY SAND AND SANDY SILT WITH TRACE OF MICA AND WEATHERED ROCK FRAGMENTS

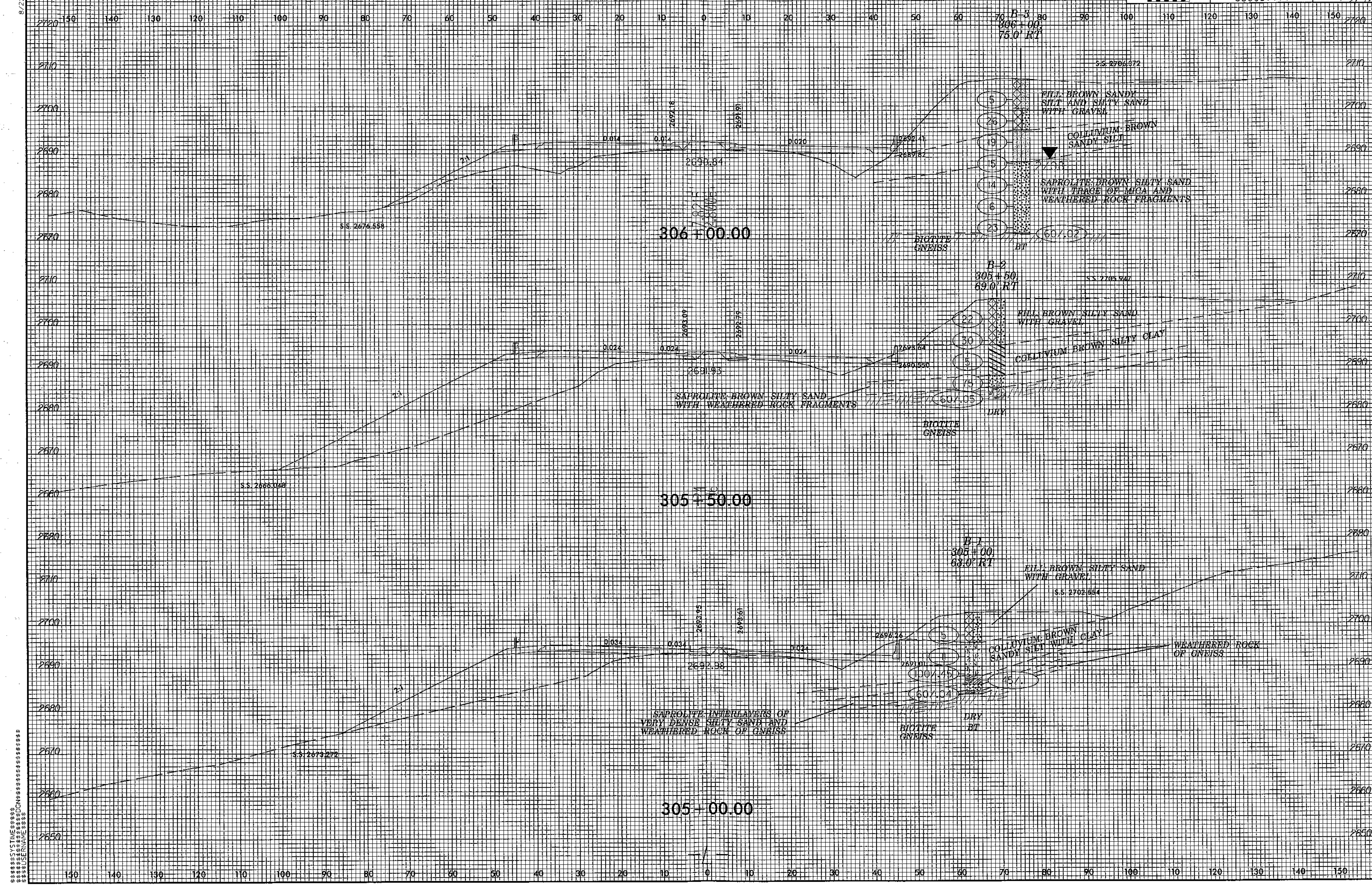
Ⓓ WEATHERED ROCK OF GNEISS WITH INTERLAYERS OF VERY DENSE SILTY SAND SAPROLITE

Ⓔ WEATHERED ROCK OF GNEISS

Ⓕ CRYSTALLINE ROCK: AMPHIBOLITE GNEISS

Ⓖ CRYSTALLINE ROCK: GRANITIC PEGMATITE

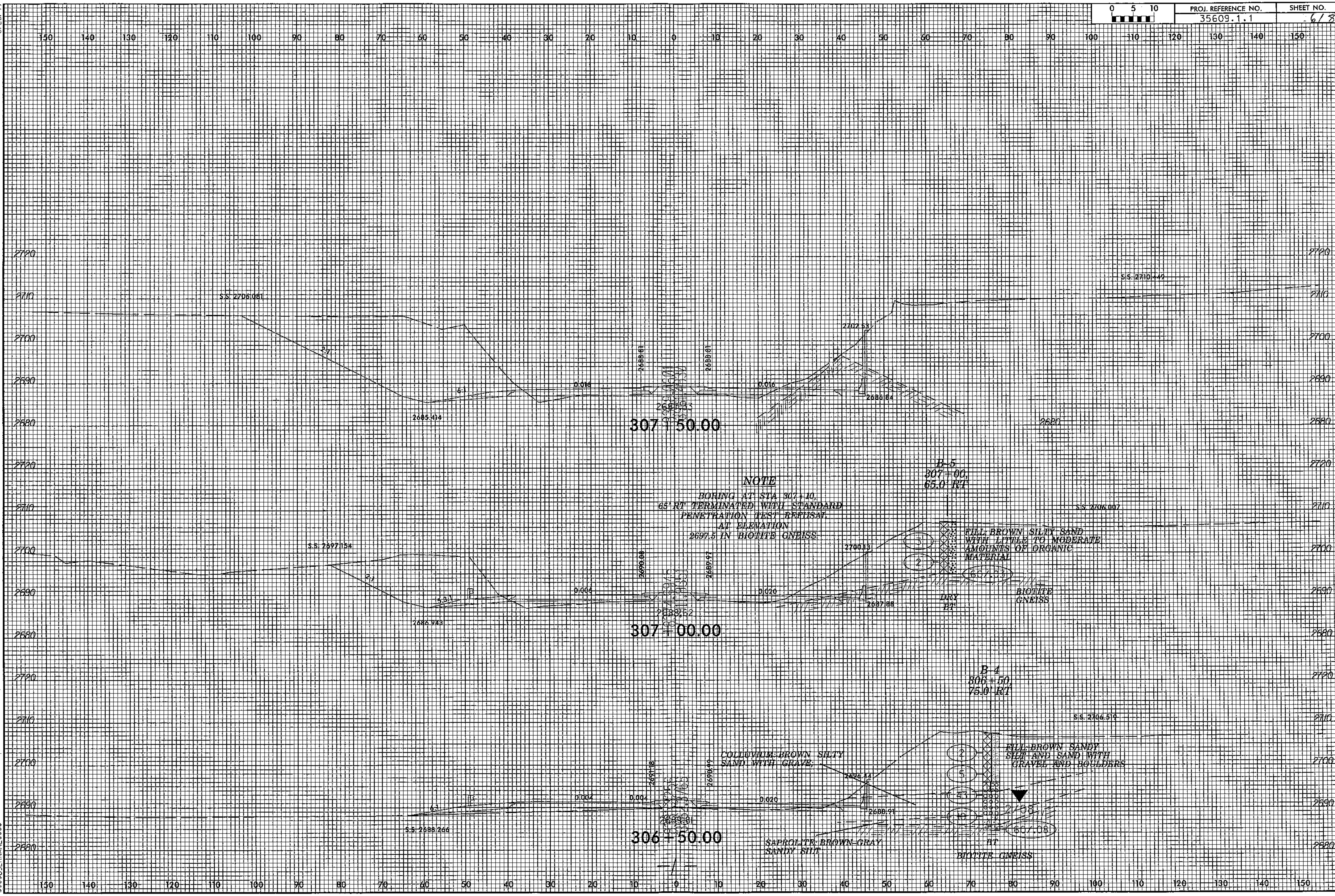
PROJ. REFERENCE NO.	SHEET NO.
35609.1.1	5/8

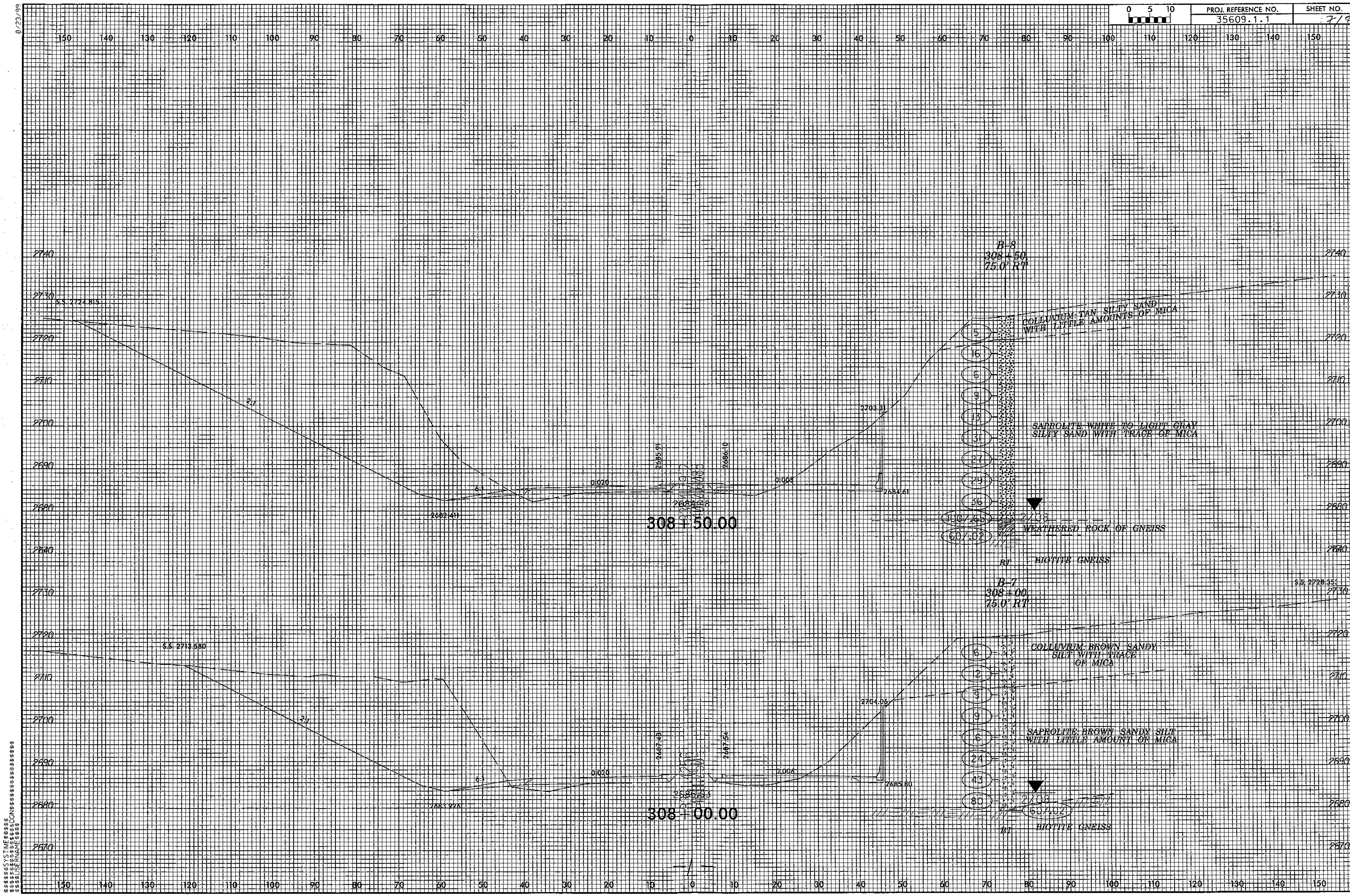


8/23/99

PROJ. REFERENCE NO. 35609.1.1

SHEET NO. 6/8





8/23/99
PROJ. REFERENCE NO.
35609.1.1
SHEET NO.
7/8
0 5 10
B-8
308+50
75.0' RT
S.S. 2724.815
COLLUVIUM: TAN SILTY SAND WITH LITTLE AMOUNTS OF MICA
SAPROLITE: WHITE TO LIGHT GRAY SILTY SAND WITH TRACE OF MICA
WEATHERED ROCK OF GNEISS
BIOTITE GNEISS
5
16
6
9
13
31
27
29
36
100/.65
60/.02
2/08
RT
2703.31
2684.61
2685.91
2686.10
2684.28
2682.411
0.020
0.003
6:1
2:1
308+50.00
B-7
308+00
75.0' RT
S.S. 2713.580
S.S. 2728.353
COLLUVIUM: BROWN SANDY SILT WITH TRACE OF MICA
SAPROLITE: BROWN SANDY SILT WITH LITTLE AMOUNT OF MICA
BIOTITE GNEISS
6
2
9
9
16
24
43
80
60/.02
2/08
RT
2704.06
2685.80
2687.43
2687.54
2683.926
0.020
0.006
6:1
2:1
308+00.00
2740
2730
2720
2710
2700
2690
2680
2670
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
$$$$$$SYSTIME$$$$$
$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

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-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1	COUNTY:	Mitchell	Owner:	NCDOT
DATE SAMPLED:	2.14.08	DATE RECEIVED:	2.19.08	DATE REPORTED:	2.25.08
SAMPLED FROM:	Retaining Wall	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		
Lab Sample No. A	157063	157064	157065	157066	157067	057068		
HiCAMS Sample #	--	--	--	--	--	--		
Retained #4 Sieve %	4.0	0.0	0.0	10.0	16.7	0.0		
Passing #10 Sieve %	79	81	78	77	67	97		
Passing #40 Sieve %	66	67	67	57	48	85		
Passing #200 Sieve %	36	44	42	23	21	44		

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	29	27	25	44	45	26		
Fine Sand - Ret. #270	31	23	25	31	31	34		
Silt 0.05-0.005 mm %	18	19	22	15	18	22		
Clay < 0.005 mm %	22	31	28	10	6	18		
Passing # 40 Sieve %	--	--	--	--	--	--		
Passing # 200 Sieve %	--	--	--	--	--	--		

Liquid Limit	48	35	36	40	34	41		
Plastic Index	NP	11	NP	NP	NP	NP		
AASHTO Classification	A-5 (0)	A-6 (2)	A-4 (1)	A-2-4 (0)	A-1-b (0)	A-5 (2)		
Quantity								
Texture								
Station	305+00	305+50	306+00	306+00	306+00	306+50		
Hole No.								
Depth (ft) From:	9.8	14.3	4.4	24.4	34.4	19.4		
To:	10.8	15.3	5.4	25.4	35.4	20.2		

Remarks:

A-157063 - 157068

CC:

C. A. Dunnagan	
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-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1	COUNTY:	Mitchell	Owner:	NCDOT
DATE SAMPLED:	2.22.08	DATE RECEIVED:	2.25.08	DATE REPORTED:	2.28.08
SAMPLED FROM:	Retaining Wall	SAMPLED BY:	C. A. Dunnagan		
SUBMITTED BY:	W. D. Frye		2002	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-7	SS-8	SS-9					
Lab Sample No. A	157094	157095	157096					
HiCAMS Sample #	--	--	--					
Retained #4 Sieve %	0.0	0.0	0.0					
Passing #10 Sieve %	100	100	100					
Passing #40 Sieve %	92	99	98					
Passing #200 Sieve %	54	51	41					

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	19	9	14					
Fine Sand - Ret. #270	34	52	59					
Silt 0.05-0.005 mm %	11	11	11					
Clay < 0.005 mm %	36	28	16					
Passing # 40 Sieve %	--	--	--					
Passing # 200 Sieve %	--	--	--					

Liquid Limit	53	47	47					
Plastic Index	NP	NP	NP					
AASHTO Classification	A-5 (5)	A-5 (4)	A-5 (1)					
Quantity								
Texture								
Station	308+00	308+00	308+00					
Hole No.								
Depth (ft) From:	3.3	8.3	13.3					
To:	4.3	9.3	14.3					

Remarks:

A-157094 -157096

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	35609.1.1 (R-2519B)	1	5

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35609.1.1 F.A. PROJ. _____

COUNTY YANCEY-MITCHELL

PROJECT DESCRIPTION US-19E FROM SR-1186 TO THE MULTI-LANE SECTION WEST OF SPRUCE PINE

SITE DESCRIPTION RETAINING WALL RIGHT OF -L- STATION INTERVAL 360+50 TO 363+00

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5	SAMPLE RESULTS

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

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 MARCH 2008

NORTH CAROLINA LICENSED SEAL 20078 GEOLOGIST CHARLES ANDREWS DUNNAGAN

C A Dunnagan

PROJECT: 35609.1.1

ID: R-2519B

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 REFERENCE NO.	SHEET NO.
35609.1.1 (R-2519B)	2/5

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
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
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B___
- [ ] -N___
- [ ] -H___

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

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

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: _____

ELEVATION: _____ FT.

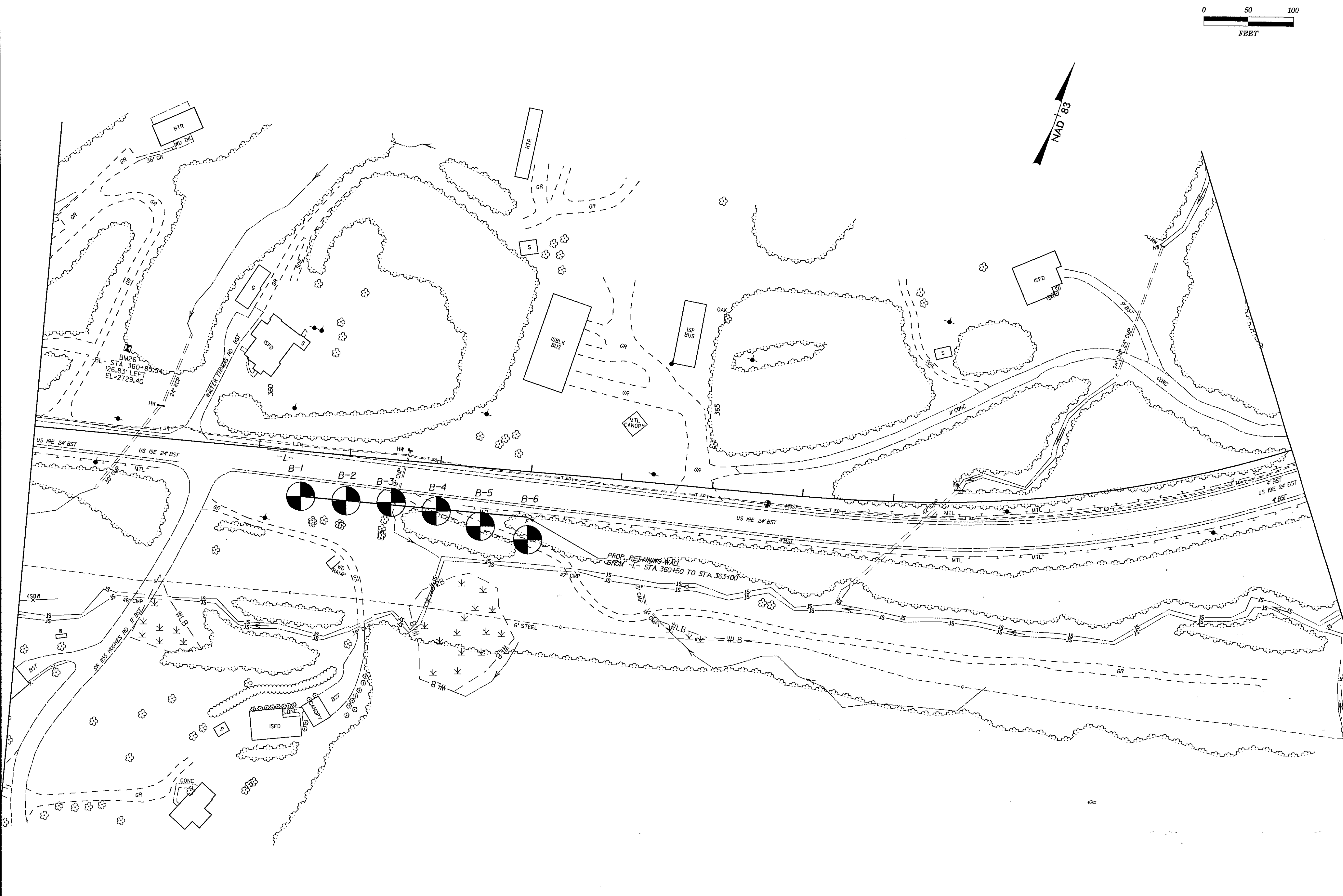
NOTES:

REVISED 02/23/06

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2519B	

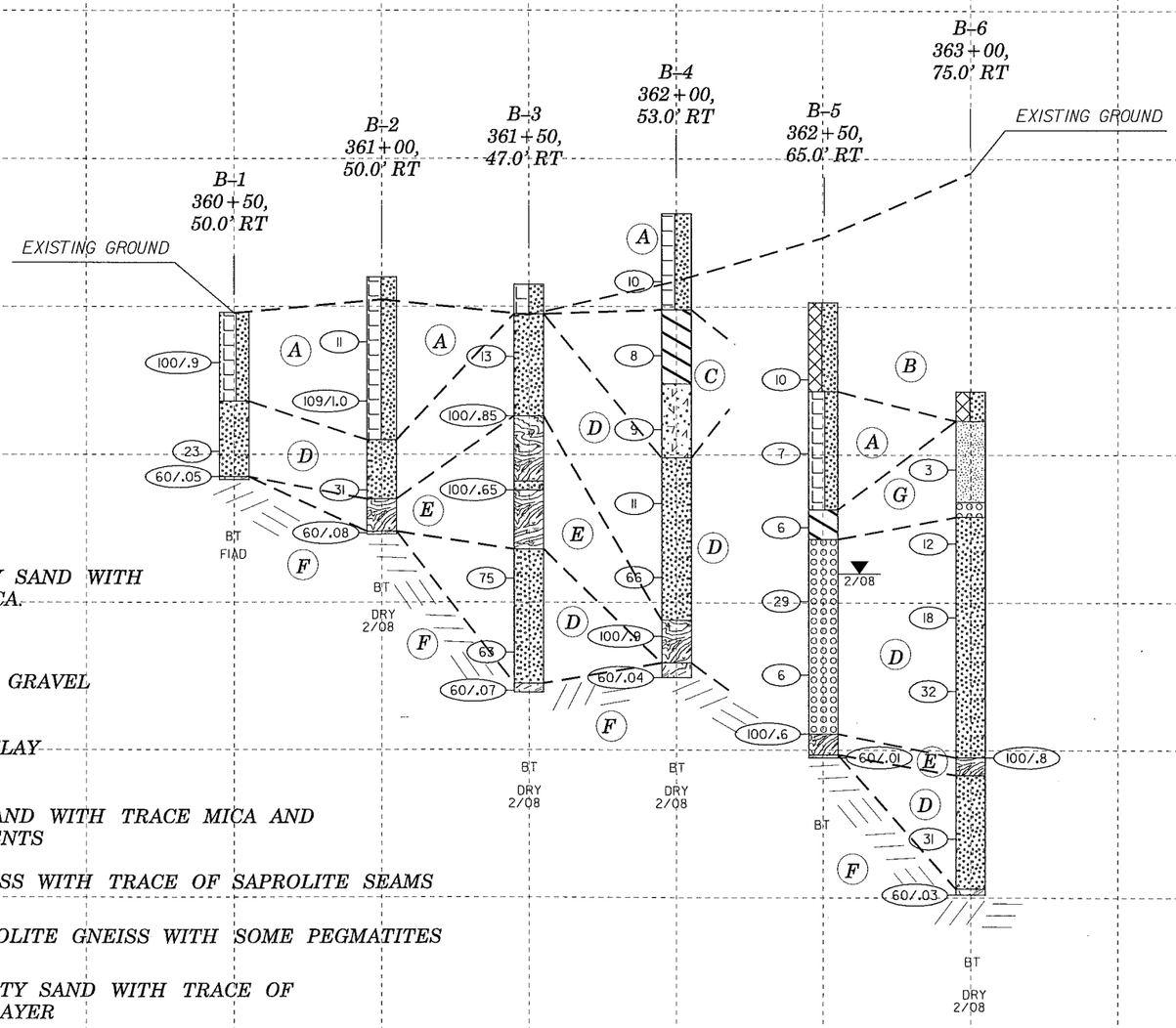
RETAINING WALL REIGHT OF -L- STATIONS 360+50 TO 363+00



RETAINING WALL RIGHT OF -L- STATIONS 360+50 TO 363+00

0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
35609.1.1 (R-2519B)	4/5
PROFILE	



(A) *EMBANKMENT: BROWN SILTY SAND WITH TRACE OF GRAVEL AND MICA.*

(B) *FILL: BROWN SILTY SAND WITH TRACE OF MICA AND GRAVEL*

(C) *COLLUVIUM: BROWN SILTY CLAY AND SANDY SILT*

(D) *SAPROLITE: BROWN SILTY SAND WITH TRACE MICA AND CRYSTALLINE ROCK FRAGMENTS*

(E) *WEATHERED ROCK OF GNEISS WITH TRACE OF SAPROLITE SEAMS*

(F) *CRYSTALLINE ROCK: AMPHIBOLITE GNEISS WITH SOME PEGMATITES*

(G) *ALLUVIUM: GRAY-BROWN SILTY SAND WITH TRACE OF MICA AND BASAL GRAVEL LAYER*

JCS

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

T.I.P. ID #:	R-2519B

REPORT ON SAMPLES OF:	Soils for Quality

PROJECT:	35609.1.1	COUNTY:	Mitchell	Owner:	NCDOT
DATE SAMPLED:	2.29.08	DATE RECEIVED:	3.4.08	DATE REPORTED:	3.11.08
SAMPLED FROM:	Retaining Wall	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				
Lab Sample No. A	157104	157105	157106	157107				
HiCAMS Sample #	--	--	--	--				
Retained #4 Sieve %	0.0	0.0	0.0	0.0				
Passing #10 Sieve %	96	84	91	94				
Passing #40 Sieve %	85	50	76	67				
Passing #200 Sieve %	55	12	53	32				

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	19	61	26	45				
Fine Sand - Ret. #270	29	29	19	23				
Silt 0.05-0.005 mm %	10	2	15	2				
Clay < 0.005 mm %	42	8	40	30				
Passing # 40 Sieve %	--	--	--	--				
Passing # 200 Sieve %	--	--	--	--				

Liquid Limit	49	45	41	43				
Plastic Index	21	NP	17	NP				
AASHTO Classification	A-7-6 (10)	A-1-b (0)	A-7-6 (7)	A-5 (0)				
Quantity								
Texture								
Station	362+50	362+50	362+00	362+00				
Hole No.								
Depth (ft) From:	14.7	24.7	9.1	14.1				
To:	15.7	25.7	10.1	15.1				

Remarks:

A-157104 - 157107

CC:

C. A. Dunnagan	
File	

SOILS ENGINEER:	