CONTRACT: C202339

ID: R-2710

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	9

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34499.1.1	STP - 194(4)	P.E.
34499.2.2	STP - 194(4)	RW
34499.3.STI	STM - 194(13)	CONST.

CONTENTS

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

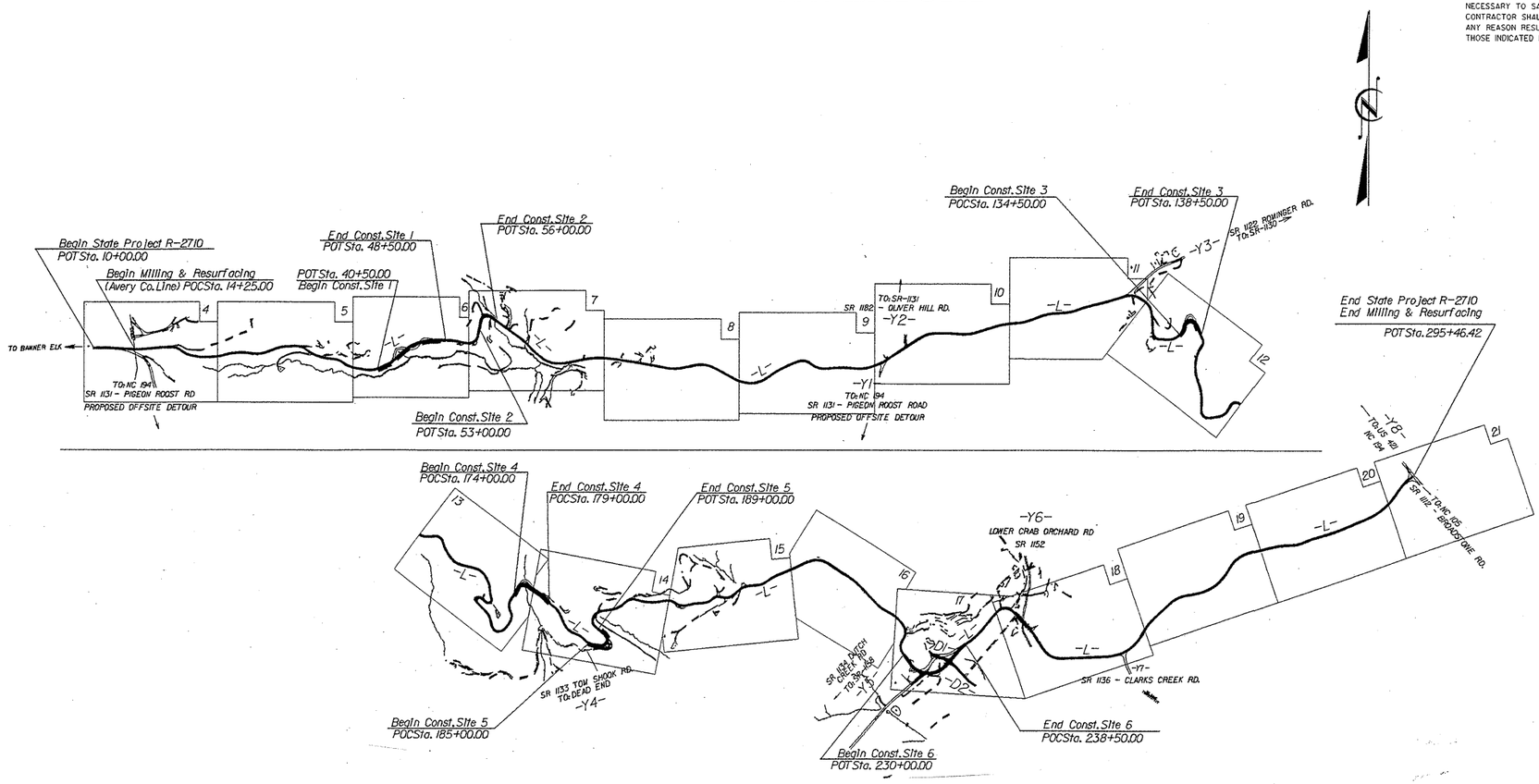
ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34499.1.1 R-2710 F.A. PROJ. STP-194(4)

COUNTY WATAUGA

PROJECT DESCRIPTION NC 194 FROM BANNER ELK IN AVERY COUNTY TO VALLE CRUCIS IN WATAUGA COUNTY

INVENTORY



INVESTIGATED BY J.C. KUHNE

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE OCTOBER 24, 2007

NORTH CAROLINA PROFESSIONAL SEAL 25521 ENGINEER JOHN L. PILIPCHUK

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.

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.

EARTHWORK BALANCE SHEET

Volumes in Cubic Yards

PROJECT: R-2710 COUNTY: Watauga DATE: 7/14/2010 COMPILED BY: PJS SHEET 1 OF 1 SHEETS

STATION	STATION	EXCAVATION					EMBANKMENT				BORROW	WASTE			
		TOTAL UNCLASS.	ROCK	UNDERCUT	UNSUIT. UNCLASS.	SUITABLE UNCLASS.	TOTAL	ROCK	EARTH	EMBANK. +15%		ROCK	SUITABLE	UNSUIT.	TOTAL
-L- 40+00	-L- 49+00	12,347				12,347	4,535		4,535	5,215			7,132		7,132
-L- 53+00	-L- 56+00	1,181				1,181	195		195	224			957		957
	SUBTOTAL	13,528				13,528	4,730		4,730	5,440			8,089		8,089
-L- 134+00	-L- 138+50	5,138				5,138	2,101		2,101	2,416			2,722		2,722
	SUBTOTAL	5,138				5,138	2,101		2,101	2,416			2,722		2,722
-L- 174+00	-L- 179+00	9,759				9,759	2,201		2,201	2,531			7,228		7,228
-L- 185+00	-L- 189+00	8,250				8,250	299		299	344			7,906		7,906
	SUBTOTAL	18,009				18,009	2,500		2,500	2,875			15,134		15,134
-L- 231+50	-L- 238+50	292				292	10,064		10,064	11,574	11,282				
-D1- 11+00	-D1- 12+00	67				67	284		284	327	260				
-D2- 10+50	-D2- 13+00						4,250		4,250	4,888	4,888				
-Y5- 10+50	-Y5- 10+75	5				5	49		49	56	51				
	SUBTOTAL	364				364	14,647		14,647	16,844	16,480				
TOTAL		37,039				37,039	23,978		23,978	27,575	16,480		25,944		25,944
MATERIAL FOR SHOULDER CONSTRUCTION															
LOSS DUE TO CLEARING & GRUBBING		-200				-200							-200		-200
ROCK WASTE TO REPLACE BORROW															
ADJUST FOR ROCK WASTE															
WASTE IN LIEU OF BORROW											-16,480		-16,480		-16,480
PROJECT TOTAL		36,839				36,839	23,978		23,978	27,575			9,264		9,264
EST. 5% TO REPLACE TOP SOIL ON BORROW PIT															
GRAND TOTAL		36,839				36,839	23,978		23,978	27,575			9,264		9,264
SAY		36,900								27,600			9,300		
SHALLOW UNDERCUT CONTINGENCY		200 CY													

NOTE: EARTHWORK QUANTITIES ARE CALCULATED BY THE DIVISION DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.

PROJECT REFERENCE NO.	SHEET NO.
R-2710	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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
- [ ] 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:

ELEVATION: FT.

NOTES:

REVISED 02/23/06

09/08/99

TIP PROJECT: R-2710

CONTRACT: C202339

21-JUL-2010 08:06
c:\documents_and_settings\jpilipchuk\desktop\r2710\r2710_ddc_tsh_091104.dgn
jpilipchuk AT GEC248321

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34499.1.1	STP - 194(4)	P.E.
34499.2.2	STP - 194(4)	R/W
34499.3.ST1	STM - 194(13)	CONST.

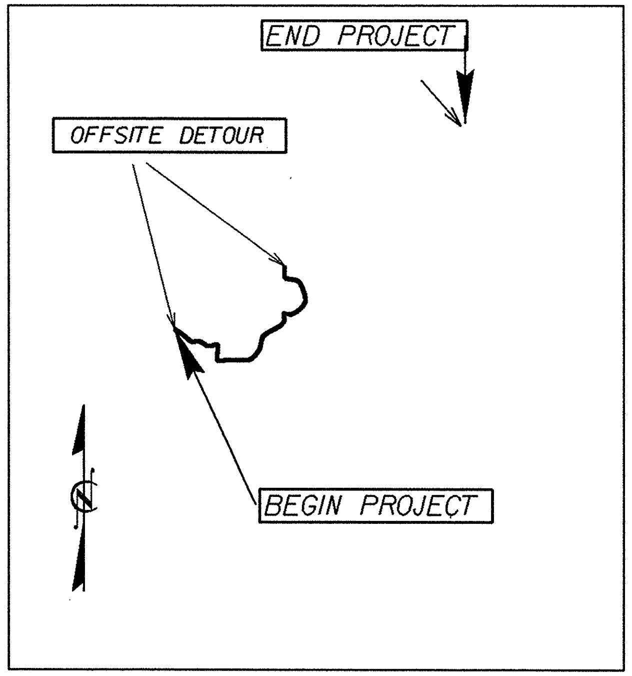
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WATAUGA

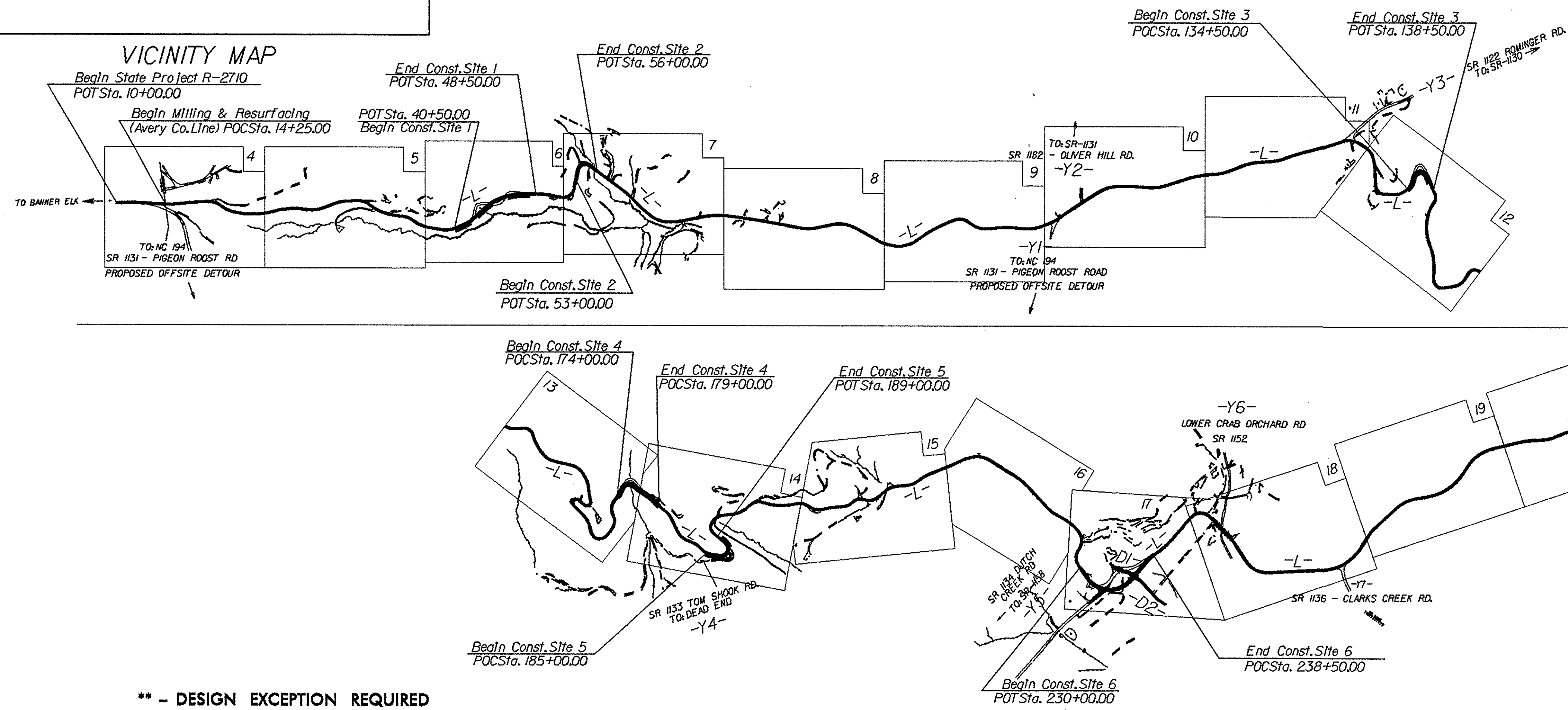
LOCATION: NC 194 FROM THE AVERY COUNTY LINE TO SR 1112 (BROADSTONE ROAD) IN VALLE CRUCIS

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND RETAINING WALLS

See Sheet 1-A For Index of Sheets



VICINITY MAP



** - DESIGN EXCEPTION REQUIRED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA
REGIONAL TIER DESIGN

ADT 2001 = 2200
ADT 2030 = 5200
DHV = 14 %
D ≐ 55 %
T = 5 % *
$V_{SITES 1-5}$ = 35 MPH**
$V_{SITE 6}$ = 15 MPH**

* TTST 2 DUAL 3

PROJECT LENGTH

LENGTH ROADWAY STATE PROJECT R-2710 = 5.41 MILES

Prepared In the Office of:
DIVISION OF HIGHWAYS
801 Statesville Road, North Wilkesboro, NC, 28659

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
MARCH 16, 2010

LETTING DATE:
SEPTEMBER 21, 2010

DIVISION ENGINEER
M.A. PETTYJOHN, PE

SIGNATURE: P.E.

DATE

HYDRAULICS ENGINEER
J. W. TWISDALE JR., PE

SIGNATURE: P.E.

DATE

DIVISION DESIGN ENGINEER
PHILIP J. SHEPHERD, PE

NORTH CAROLINA PROFESSIONAL SEAL 035668 ENGINEER PHILIP J. SHEPHERD

SIGNATURE: P.E.

DATE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

September 16, 2007

MEMORANDUM TO: Kevin Whittington, District Maintenance Engineer, Div. 11

FROM: John Pilipchuk, PG, PE
Western Region Geotechnical Engineer

STATE PROJECT: 34499.1.1, R-2710
FEDERAL PROJECT: STP – 194(4)
COUNTY: Watauga

DESCRIPTION: NC 194 from Avery/Watauga County line East 5.41 miles to Broadstone Road (SR 1112)

SUBJECT: Geotechnical Report – Additional Inventory information

The majority of subsurface investigation conducted at the six Sites on this project concerns information applicable to retaining wall design and construction.
In addition, five borings were taken at areas that were perceived to have Geotechnical interest.
Attached to this cover letter are the five boring logs. They pertain to the following two sites:

SITE TWO

Three borings were taken at Site 2; S2-B1, S2-B2 and S2-B3. These are showing stable material for the small fill section with B2 and B3 showing subsurface material related to extending the existing culvert at that location.

SITE SIX

Borings S6-B1 and S6-B2 were done to show that decent intact soil was present to construct the requested 1.5:1.0 fill slope proposed for this location.

Respectfully submitted,

Jody C. Kuhne

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY WATAUGA	GEOLOGIST Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			GROU
BORING NO. SITE2-B1	STATION 54+50	OFFSET 5ft RT	ALIGNMENT -L-	0 H
COLLAR ELEV. N/A	TOTAL DEPTH 18.9 ft	NORTHING N/A	EASTING N/A	24 H
DRILL MACHINE N/A	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Manua
START DATE 08/01/07	COMP. DATE 08/01/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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)
									GROUND SURFACE
	1.0								ROADWAY EMBANKMENT
	3.5	5	5	6	11				BRN SILTY SAND W/ RK FRAGMEN
	6.0	19	22	21	43				RESIDUAL
	8.5	20	25	35	60				TAN/BRN DENSE SILTY SAND
		55	45		100				WEATHERED ROCK
	13.5	60/0.3			60/0.3				WHITE/TAN/BRN SAND
	18.5	100/0.4			100/0.4				Boring Terminated at Depth 18.9 f
									WEATHERED ROCK

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** WATAUGA	**GEOLOGIST** Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			**GROU**
BORING NO. SITE2-B2	**STATION** 55+40	**OFFSET** 10ft LT	**ALIGNMENT** -L-	**0 H**
COLLAR ELEV. N/A	**TOTAL DEPTH** 28.6 ft	**NORTHING** N/A	**EASTING** N/A	**24 H**
DRILL MACHINE N/A	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Manua
START DATE 08/02/07	**COMP. DATE** 08/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

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)
									GROUND SURFACE
	1.0								**ROADWAY EMBANKMENT**
	3.5	5	3	3	6 11 9				GRAY/BRN SANDY SILT W/ GRAVI
	6.0	16	7	4					
	8.5	5	5	4	25				**SAPROLITE**
	13.5	4	7	18					WHITE/TAN/BRN SILTY SAND
	18.5	50	50/.2		50/.2				**WEATHERED ROCK** GRAY/TAN SILTY SAND W/ SAPROL SEAMS
	23.5	25	9	17	26				
	28.5	60/.1			60/.1				**WEATHERED ROCK** VERY HARD WEATHERED ROCK
		60/.1			60/.1				Boring Terminated with Standard Penet Test Refusal at Depth 28.6 ft CRYST. R GRANTITC GNEISS

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** WATAUGA	**GEOLOGIST** Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			**GROU**
BORING NO. SITE2-B3	**STATION** 55+85	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 H**
COLLAR ELEV. N/A	**TOTAL DEPTH** 34.3 ft	**NORTHING** N/A	**EASTING** N/A	**24 H**
DRILL MACHINE N/A	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Manua
START DATE 08/02/07	**COMP. DATE** 08/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

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)
									GROUND SURFACE
	1.0								**ROADWAY EMBANKMENT**
	3.5	5	7	11	18 45				WHITE/TAN/BRN SANDY CLAYEY SIL GRAVEL
	6.0	7	20	25					
	8.5	10	11	11	22				**SAPROLITE**
	13.5	15	9	7	16				TAN/BRN SILTY SAND W/ RK FRAGM
	18.5	6	12	12	24				
	23.5	9	22	61	83				**WEATHERED ROCK** GRAY/TAN GRANITIC GNEISS
	28.5	45	55/.3		100				
	33.5	30	45	35	80				**SAPROLITE** WHITE/GRAY/BRN DENSE SILTY SA
		44	56/.3		100				**WEATHERED ROCK** TAN/BRN/WHITE GRANITIC GNEIS
									Boring Terminated at Depth 34.3 f WEATHERED ROCK

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** WATAUGA	**GEOLOGIST** Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			**GROU**
BORING NO. SITE6-B1	**STATION** 234+45	**OFFSET** 16ft LT	**ALIGNMENT** -L-	**0 H**
COLLAR ELEV. N/A	**TOTAL DEPTH** 15.0 ft	**NORTHING** N/A	**EASTING** N/A	**24 H**
DRILL MACHINE N/A	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Manua
START DATE 08/03/07	**COMP. DATE** 08/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

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)
							▼		GROUND SURFACE
	1.0								**RESIDUAL**
	3.5	3	3	5	8				TAN/BRN MED. STIFF SANDY SIL
	6.0	2	2	3	5				
	8.5	2	2	3	5				**SAPROLITE**
	13.5	5	7	9	16				TAN/BRN, TRACE MICA, SANDY SI
		4	5	7	12				Boring Terminated at Depth 15.0 f
									SAPROLITE

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** WATAUGA	**GEOLOGIST** Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			**GROU**
BORING NO. SITE6-B2	**STATION** 235+90	**OFFSET** 11ft LT	**ALIGNMENT** -L-	**0 H**
COLLAR ELEV. N/A	**TOTAL DEPTH** 15.0 ft	**NORTHING** N/A	**EASTING** N/A	**24 H**
DRILL MACHINE N/A	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Manua
START DATE 08/03/07	**COMP. DATE** 08/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

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)
							▼		GROUND SURFACE
	1.0								**RESIDUAL**
	3.5	3	5	5	10				ORANGE/BRN STIFF SANDY, SILTY (
	6.0	9	9	12	21				**SAPROLITE**
	8.5	6	9	16	25				BRN/TAN CLAYEY SANDY SILT
	13.5	9	10	13	23				
		12	14	10	24				Boring Terminated at Depth 15.0 f
									SAPROLITE

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley, GOVERNOR — P.O. BOX 25201, RALEIGH, N.C. 27611-5201 — Lyndo Tippett, SECRETARY

3 April, 2007

MEMO TO: John Twisdale, Jr., PE, Project Engineer, Hydraulics

FROM: Jody Kuhne, PG, PE , Project Geological Engineer

STATE PROJECT: 34499.1.1, R-2710
COUNTY: Watauga
DESCRIPTION: NC 194 from Banner Elk to Valle Crucis
SUBJECT: Culvert investigation, Sta. 17+50

Two boring logs are attached for Stations 70+17 and 70+88 on the subject project. The proposed culvert does not have bedrock with 5' of the ground surface in the footprint.

Please contact me if I may be of further assistance.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	ID. R2710	COUNTY WATAUGA	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION NC 194 FROM BANNER ELK TO VALLE CRUCIS			GROUND WTR (ft)
BORING NO. R2710-1	STATION 70+88	OFFSET 40 ft LT	ALIGNMENT -L- — 0 HR. 3.8
COLLAR ELEV. N/A	TOTAL DEPTH 25.2 ft	NORTHING N/A	EASTING N/A — 24 HR. 4.2
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 03/29/07	COMP. DATE 03/29/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV. (ft)	ELEV. 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)
									GROUND SURFACE	0.0
	3.8	15	7	10	17		Sat.		**ALLUVIAL** BRN SILTY COARSE SAND AND GRAVEL W/ COBBLES AND BOULDERS	
	6.3	8	6	25	31		W			
	8.8	1	7	5	12		W			11.0
	11.3	3	5	4	9		Sat.		**SAPROLITE** TAN/BROWN SILTY SAND	
	13.8	5	10	13	23		W			
	15.3	4	7	16	23		M			
	18.8	11	14	13	27		M			
	23.8	6	8	8	16		M			25.2
									Boring Terminated at Depth 25.2 ft SAPROLITE	

NCDOT BORE SINGLE B4675_GEO_BH.GPJ NC_DOT.GDT 04/03/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R2710	**COUNTY** WATAUGA		**GEOLOGIST** Daniel, T. B.
SITE DESCRIPTION NC 194 FROM BANNER ELK TO VALLE CRUCIS				**GROUND WTR (ft)**
BORING NO. R2710-2	**STATION** 70+17	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 7.7
COLLAR ELEV. N/A	**TOTAL DEPTH** 25.1 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** N/A
DRILL MACHINE CME-550	**DRILL METHOD** NW Casing w/ SPT			**HAMMER TYPE** Automatic
START DATE 03/30/07	**COMP. DATE** 03/30/07	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** N/A

ELEV. (ft)	ELEV. 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)
									GROUND SURFACE	0.0
	3.6	1	1	1	2		W		**ALLUVIAL** GRAY/BRN SILTY COARSE SAND W/ GRAVEL	
	6.1	1	1	2	3		Sat.			
	8.6	8	10	4	14		Sat.			
	11.1	13	16	15	31		Sat.			
	13.6	12	2	2	4		M			14.0
	16.1	3	6	11	17		M		**SAPROLITE** YELL/BRN SILTY SAND/SANDY SILT	
	18.6	8	16	21	37		M			
	23.6	12	18	23	41		M			25.1
									Boring Terminated at Depth 25.1 ft SAPROLITE	

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	11

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34499.1.1	STP - 194(4)	P.E.
34499.2.2	STP - 194(4)	R/W
34499.3.ST1	STM - 194(13)	CONST.

ID: R-2710

PROJECT: C202339

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34499.1.1 I.D. NO. R-2710

F.A. PROJECT STP-194(4)

COUNTY WATAUGA

PROJECT DESCRIPTION NC 194 FROM BANNER ELK IN AVERY COUNTY TO VALLE CRUCIS IN WATAUGA COUNTY

SITE DESCRIPTION SITE 5: TWO RETAINING WALLS FROM -L- STATIONS 185+00 TO 189+00

CONTENTS:

DRAWN BY: DRK

CAUTION NOTICE

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

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

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

INVESTIGATED BY T WELLS

CHECKED BY J VINSON

SUBMITTED BY P WEAVER

DATE 9/12/07

PERSONNEL D KITCHEN
A HAYES
T WELLS
R TOOTHMAN
B DUNCAN

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

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

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER SEAL

10/19/07

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2710	34499.1.1	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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
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 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	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	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS	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 SEEPAGE

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CI. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
C.T. - CORING TERMINATED
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
N/A - NOT APPLICABLE
NM - NOT MEASURED
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
w - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B- 57
- [ ] BK-51
- [ ] CME-45
- [ ] CME-55
- [ ] PORTABLE HOIST
- [ ] OTHER CME 850
- [X] OTHER ACKER MARK II

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [X] TRICONE 3⅞" TUNG.-CARB.
- [X] CORE BIT
- [ ] OTHER ____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B____
- [X] -N 0
- [ ] -H 0

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 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 GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 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 GEOLOGISTS 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 WHICH HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.

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

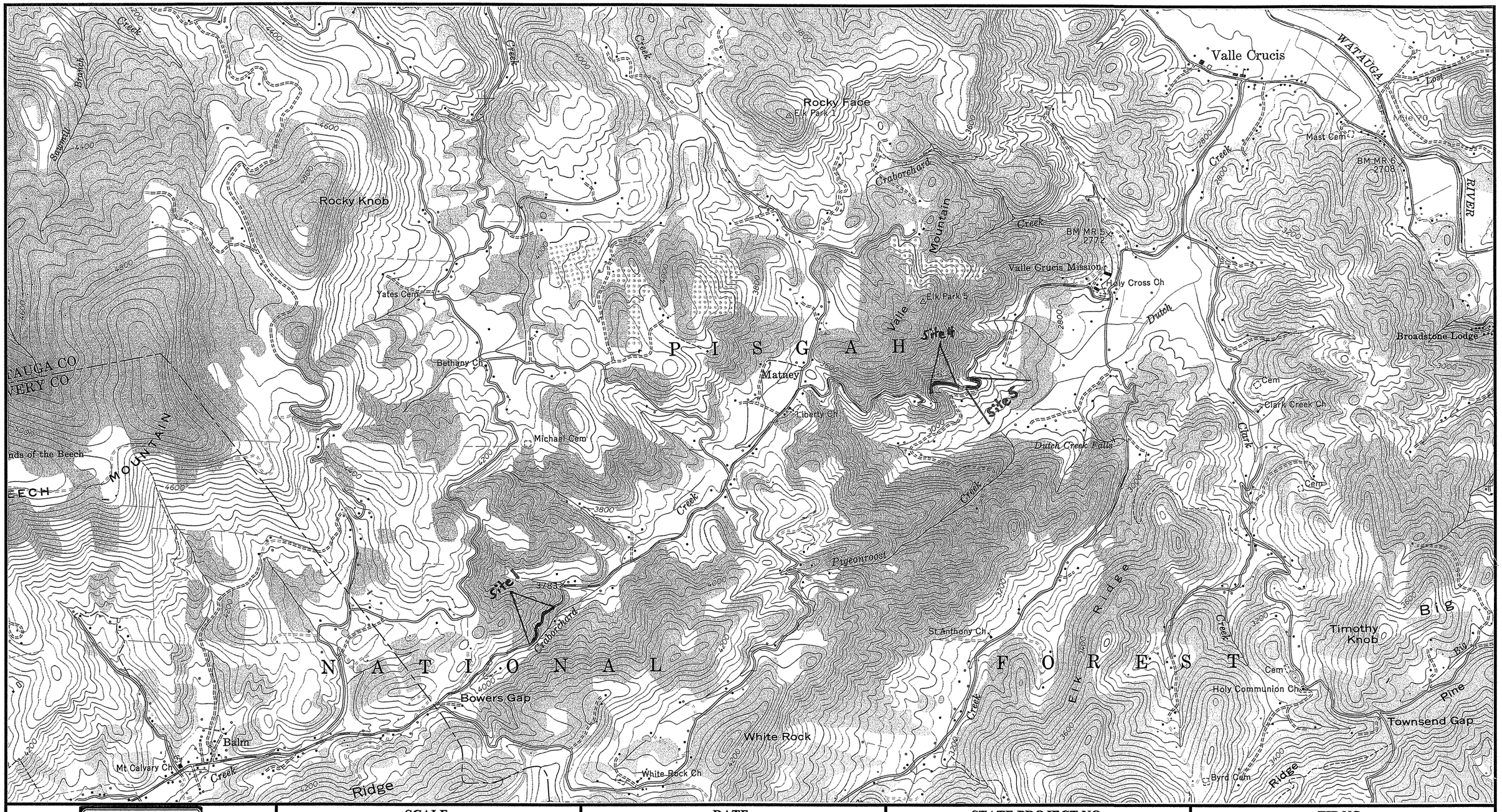
STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BM #1: 8" SPIKE IN BASE OF 10" BIRCH TREE -BL- STA. 34+33, 147' RT

ELEVATION: 3905.36'

NOTES:



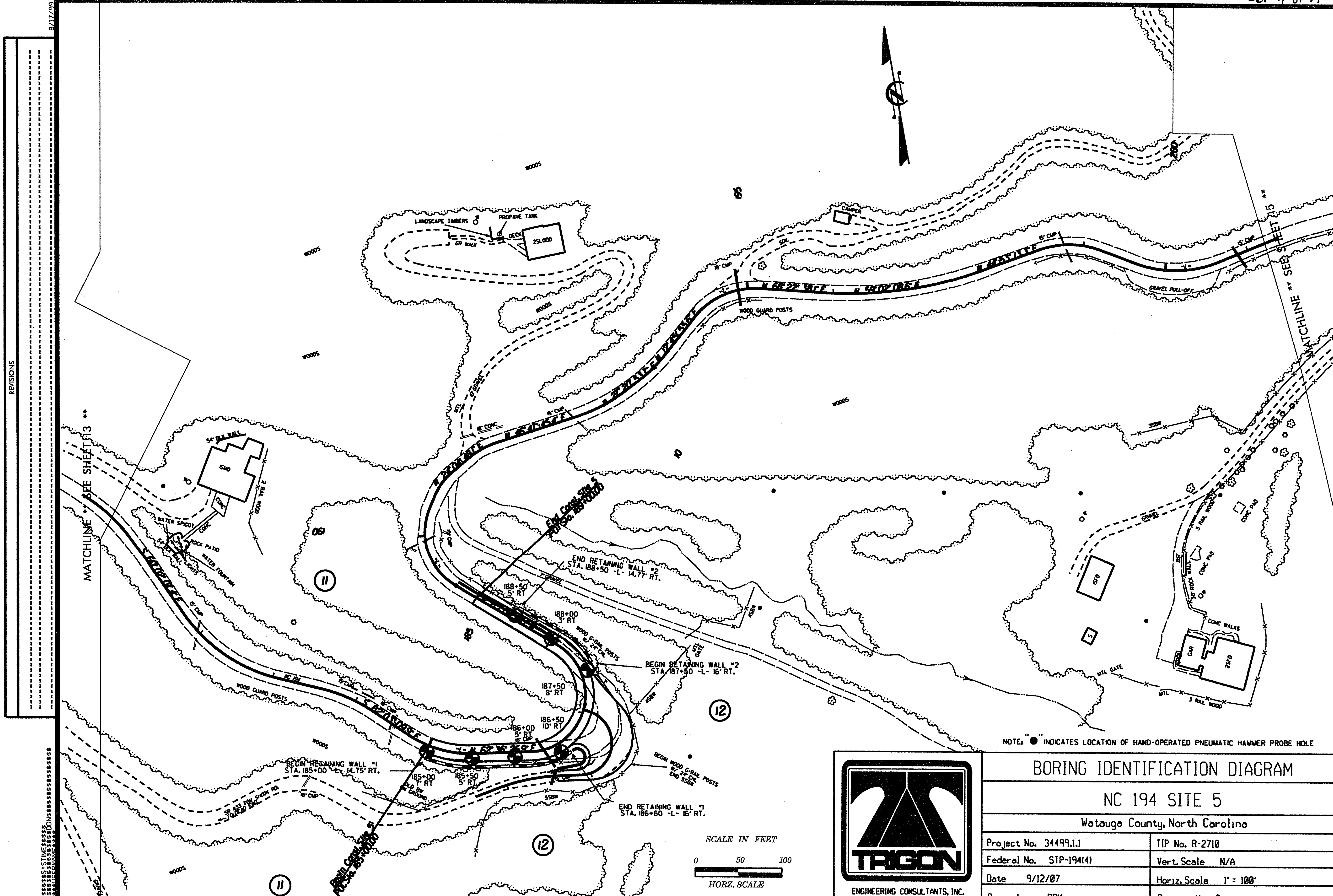
SCALE:	DATE:	STATE PROJECT NO.	TIP NO.:
1′ = 24,000′	09/04/07	34499.1.1	R-2710

SITE VICINITY MAP
NC 194 Retaining Walls at Sites 1, 4, and 5, Watauga County, North Carolina

TRIGON
Trigon Engineering Consultants, Inc.
Greensboro North Carolina

USGS Valle Crucis Quadrangle

DRAWING NUMBER:
1



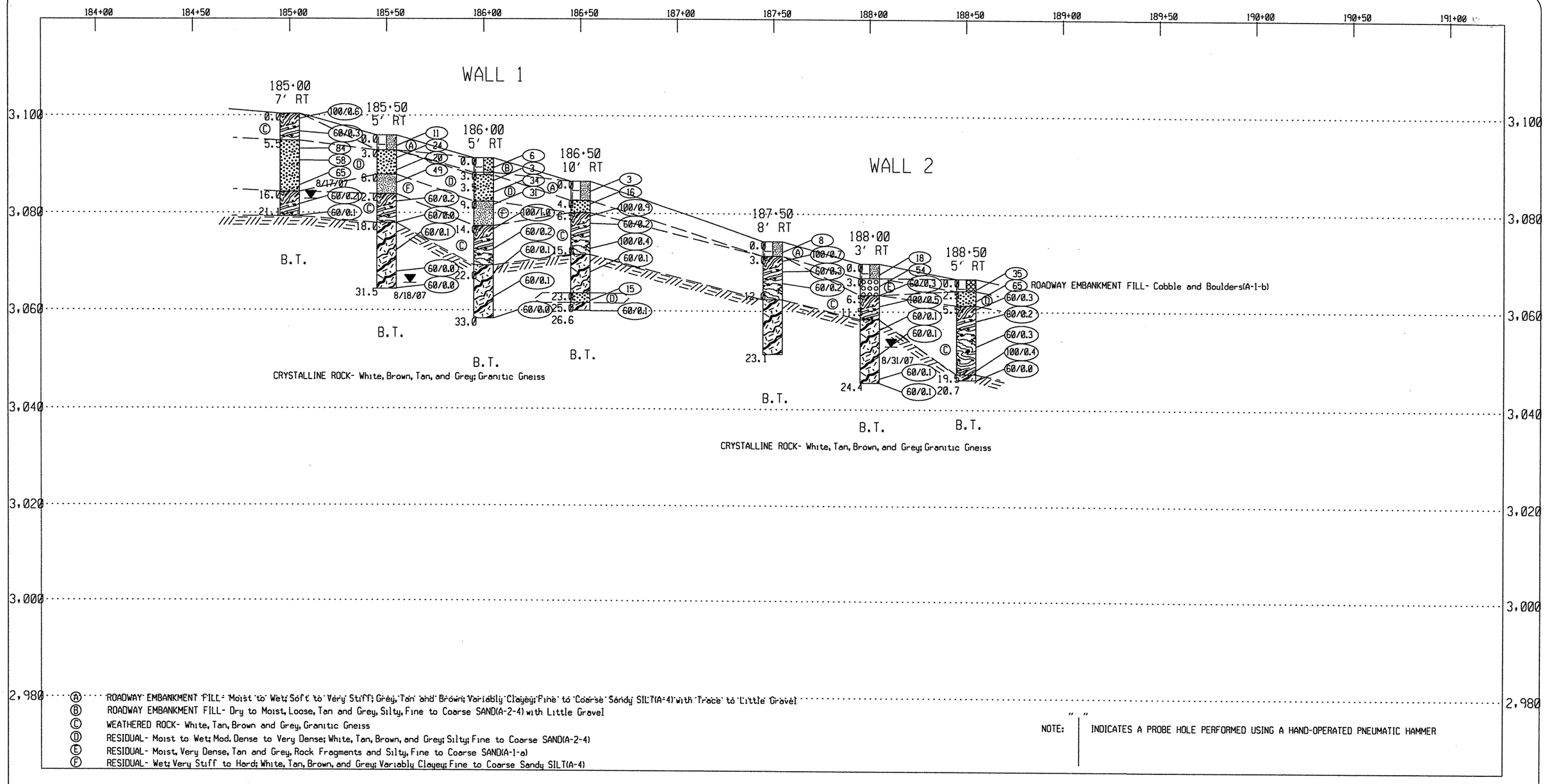
BORING IDENTIFICATION DIAGRAM

NC 194 SITE 5

Watauga County, North Carolina

TRIGON ENGINEERING CONSULTANTS, INC.

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale N/A
Date 9/12/07	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2



Ⓐ ROADWAY EMBANKMENT FILL- Moist to Wet; Soft to Very Stiff; Grey, Tan and Brown; Variably Clayey; Fine to Coarse Sandy SILT(A-4) with Trace to Little Gravel
Ⓑ ROADWAY EMBANKMENT FILL- Dry to Moist, Loose, Tan and Grey, Silty, Fine to Coarse SAND(A-2-4) with Little Gravel
Ⓒ WEATHERED ROCK- White, Tan, Brown and Grey, Granitic Gneiss
Ⓓ RESIDUAL- Moist to Wet; Mod. Dense to Very Dense; White, Tan, Brown, and Grey; Silty; Fine to Coarse SAND(A-2-4)
Ⓔ RESIDUAL- Moist, Very Dense, Tan and Grey, Rock Fragments and Silty, Fine to Coarse SAND(A-1-a)
Ⓕ RESIDUAL- Wet; Very Stiff to Hard; White, Tan, Brown, and Grey; Variably Clayey; Fine to Coarse Sandy SILT(A-4)

NOTE: " " INDICATES A PROBE HOLE PERFORMED USING A HAND-OPERATED PNEUMATIC HAMMER

SCALE IN FEET

0 10 20
VERT. SCALE

0 25 50
HORZ. SCALE

TRIGON
ENGINEERING CONSULTANTS, INC.

PROFILE RIGHT OF -L-

NC 194 SITE 5

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 3

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5				**GROUND WTR (ft)**
BORING NO. 185+00	**STATION** 185+00	**OFFSET** 7ft RT	**ALIGNMENT** -L-	**0 HR.** 10.1
COLLAR ELEV. 3,100.4 ft	**TOTAL DEPTH** 21.1 ft	**NORTHING** 900,154	**EASTING** 1,174,397	**24 HR.** 17.5
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/16/07	**COMP. DATE** 08/16/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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
3105									ELEV. (ft) 3,100.4 DEPTH (ft) 0.0
3,099.4	1.0								WEATHERED ROCK: Tan and Grey, Granitic Gneiss
3,096.9	3.5	69	31/0.1		100/0.6				
3,094.4	6.0	60/0.3			60/0.3				ELEV. (ft) 3,094.9 DEPTH (ft) 5.5
3,091.9	8.5	24	38	46	84		M		RESIDUAL: Very Dense; White, Grey and Brown; Silty, Fine to Coarse SAND
3,086.9	13.5	5	14	44	58		W		
3,081.9	18.5	22	30	35	65		W		ELEV. (ft) 3,084.4 DEPTH (ft) 16.0
3,079.4	21.0	60/0.2			60/0.2				WEATHERED ROCK: Brown and Grey, Granitic Gneiss
		60/0.1			60/0.1				ELEV. (ft) 3,079.3 DEPTH (ft) 21.1
									Boring Terminated at Elevation 3,079.3 ft

SHEET 6 OF 11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5				**GROUND WTR (ft)**
BORING NO. 185+50	**STATION** 185+50	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 3,095.9 ft	**TOTAL DEPTH** 31.5 ft	**NORTHING** 900,170	**EASTING** 1,174,448	**24 HR.** 30.3
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/16/07	**COMP. DATE** 08/17/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.0 ft	

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
3100									ELEV. (ft) 3,095.9 DEPTH (ft) 0.0
3,094.9	1.0								ROADWAY EMBANKMENT FILL: Stiff, Tannish Brown, Clayey, Fine to Coarse Sandy SILT with Trace Gravel
3,092.4	3.5	47	5	6	11 24	SS-11	16.5%		ELEV. (ft) 3,092.9 DEPTH (ft) 3.0
3,089.9	6.0	6	10	14	20		W		RESIDUAL: Medium Dense, Grey and Tan, Silty, Fine to Coarse SAND with Trace Rock Fragments
3,087.4	8.5	7	6	14	49		W		ELEV. (ft) 3,087.9 DEPTH (ft) 8.0
3,082.4	13.5	21	25	24	60/0.2		W		Hard; White, Tan and Grey; Fine to Coarse Sandy SILT
3,077.4	18.5	60/0.2			60/0.0				ELEV. (ft) 3,083.9 DEPTH (ft) 12.0
3,072.4	23.5	60/0.0			60/0.1				WEATHERED ROCK: Granitic Gneiss
3,067.4	28.5	60/0.1			60/0.0				ELEV. (ft) 3,077.9 DEPTH (ft) 18.0
3,064.4	31.5	60/0.0			60/0.0 60/0.0				CRYSTALLINE ROCK: Granitic Gneiss
									ELEV. (ft) 3,064.4 DEPTH (ft) 31.5
									Boring Terminated at Elevation 3,064.4 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5			**GROUND WTR (ft)**
BORING NO. 186+00	**STATION** 186+00	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,091.4 ft	**TOTAL DEPTH** 33.0 ft	**NORTHING** 900,193	**EASTING** 1,174,493	**24 HR.** Dry
DRILL MACHINE B-57	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual
START DATE 08/23/07	**COMP. DATE** 08/24/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 22.0 ft

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)
3095										
									3,091.4	0.0
3,090.4	1.0						M		ROADWAY EMBANKMENT FILL: Loose, Tan and Grey, Silty, Fine to Coarse SAND with Little Gravel	
3,087.9	3.5	4	3	3	6 3		W		3,088.4	3.0
3,085.4	6.0	1	1	2			M		3,087.9 ROADWAY EMBANKMENT FILL: Soft, Tannish Brown, Fine to Coarse Sandy SILT with Trace Gravel	3.5
3,082.9	8.5	2	19	15	34 31		W		RESIDUAL: Dense, Tan and Grey, Silty, Fine to Coarse SAND	
		22	20	11		SS-4			3,082.4	9.0
3,077.9	13.5								Very Stiff, Grey, Tan and Brown, Clayey, Fine to Coarse Sandy SILT	
		8	20	80	100/1.0		W		3,077.4	14.0
3,072.9	18.5								WEATHERED ROCK: White, Tan and Grey, Granitic Gneiss	
		60/0.2			60/0.2					
3,067.9	23.5								3,069.4	22.0
		60/0.1			60/0.1				CRYSTALLINE ROCK: Tan and Grey, Granitic Gneiss	
3,062.9	28.5									
		60/0.1			60/0.1					
3,058.4	33.0								3,058.4	33.0
		60/0.0			60/0.0 60/0.0				Boring Terminated at Elevation 3,058.4 ft	

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

SHEET 7 OF 11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5			**GROUND WTR (ft)**
BORING NO. 186+50	**STATION** 186+50	**OFFSET** 10ft RT	**ALIGNMENT** -L-	**0 HR.** 23.4
COLLAR ELEV. 3,086.6 ft	**TOTAL DEPTH** 26.6 ft	**NORTHING** 900,221	**EASTING** 1,174,540	**24 HR.** Dry
DRILL MACHINE B-57	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual
START DATE 08/27/07	**COMP. DATE** 08/28/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 15.0 ft

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)
3090										
									3,086.6	0.0
3,085.6	1.0						M		ROADWAY EMBANKMENT FILL: Soft, Tan and Brown, Fine to Coarse Sandy SILT with Trace Gravel	
3,083.1	3.5	4	1	2	3		M		3,082.6	4.0
3,080.6	6.0	1	6	10	16		M		RESIDUAL: Medium Dense, Tan and Brown, Silty, Fine to Coarse SAND	
3,078.1	8.5	10	20	80/0.4	100/0.9 60/0.2				3,080.1	6.5
		60/0.2							WEATHERED ROCK: Tan and Grey, Granitic Gneiss	
3,073.1	13.5									
		100/0.4			100/0.4					
3,068.1	18.5								3,071.6	15.0
		60/0.1			60/0.1				CRYSTALLINE ROCK: Grey, Granitic Gneiss	
3,063.1	23.5									
		20	8	7	15				3,063.6	23.0
3,060.1	26.5								RESIDUAL: Medium Dense, Tan and Grey, Silty, Fine to Coarse SAND	
		60/0.1			60/0.1				3,061.6	25.0
									CRYSTALLINE ROCK: Grey and Brown , Granitic Gneiss	
									3,060.0	26.6
									Boring Terminated at Elevation 3,060.0 ft	

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5				**GROUND WTR (ft)**
BORING NO. 187+50	**STATION** 187+50	**OFFSET** 8ft RT	**ALIGNMENT** -L-	**0 HR.**C.I.@ 6.0'
COLLAR ELEV. 3,074.4 ft	**TOTAL DEPTH** 23.1 ft	**NORTHING** 900,319	**EASTING** 1,174,528	**24 HR.** C.I.@ 6.0
DRILL MACHINE B-57	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/28/07	**COMP. DATE** 08/29/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 12.0 ft	

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)
3075										
3073.4	1.0								3,074.4 ROADWAY EMBANKMENT FILL: Medium Stiff, Tannish Brown, Clayey, Fine to Coarse Sandy SILT with Little Gravel	0.0
3070.9	3.5	18	6	2	8	SS-12	22.5%		3,071.4 WEATHERED ROCK: White,Tan and Grey, Granitic Gneiss	3.0
3068.4	6.0	60	40/0.2		100/0.7					
3065.9	8.5	60/0.3			60/0.3					
3060.9	13.5	60/0.2			60/0.2				3,062.4 CRYSTALLINE ROCK: White, Brown and Grey, Granitic Gneiss	12.0
3055.9	18.5	60/0.1			60/0.1					
3051.4	23.0	60/0.1			60/0.1				3,051.3 Boring Terminated at Elevation 3,051.3 ft	23.1

SHEET 8 OF 11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5				**GROUND WTR (ft)**
BORING NO. 188+00	**STATION** 188+00	**OFFSET** 3ft RT	**ALIGNMENT** -L-	**0 HR.** 15.1
COLLAR ELEV. 3,069.9 ft	**TOTAL DEPTH** 24.4 ft	**NORTHING** 900,319	**EASTING** 1,174,528	**24 HR.** 16.9
DRILL MACHINE B-57	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/29/07	**COMP. DATE** 08/30/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 11.5 ft	

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)
3070										
3068.9	1.0						M		3,069.9 ROADWAY EMBANKMENT FILL: Very Stiff, Grey and Tan, Fine to Coarse Sandy SILT with Little Gravel	0.0
3066.4	3.5	13	7	11	18	SS-13	M		3,066.9 RESIDUAL: Very Dense, Tan and Grey, Rock Fragments and Silty, Fine to Coarse SAND	3.0
3063.9	6.0	7	15	39	54				3,063.4 WEATHERED ROCK: White, Tan and Grey, Granitic Gneiss	6.5
3061.4	8.5	17	60/0.3		60/0.3					
3056.4	13.5	100/0.5			100/0.5				3,058.4 CRYSTALLINE ROCK: White and Grey, Granitic Gneiss	11.5
3051.4	18.5	60/0.1			60/0.1					
3046.4	23.5	60/0.1			60/0.1					
3045.6	24.3	60/0.1			60/0.1				3,045.5 Boring Terminated at Elevation 3,045.5 ft	24.4

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 5			**GROUND WTR (ft)**
BORING NO. 188+50	**STATION** 188+50	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** 18.3
COLLAR ELEV. 3,066.8 ft	**TOTAL DEPTH** 20.7 ft	**NORTHING** 900,340	**EASTING** 1,174,424	**24 HR.** NM
DRILL MACHINE B-57	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual
START DATE 08/30/07	**COMP. DATE** 08/31/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.5 ft

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)
3070										
3,066.8									3,066.8	0.0
3,065.8	1.0						D		ROADWAY EMBANKMENT FILL: Cobbles and Boulders 1.0'-2.5'	
3,063.3	3.5	36	21	14	35		D		3,064.3	2.5
3,060.8	6.0	26	28	37	65				RESIDUAL: Very Dense, Tan and Grey, Silty, Fine to Coarse SAND	
3,058.3	8.5	60/0.3			60/0.3				3,061.3	5.5
3,053.3	13.5	60/0.2			60/0.2				WEATHERED ROCK: Tan to Brown and Grey, Granitic Gneiss	
3,048.3	18.5	60/0.3			60/0.3		▽			
3,046.1	20.7	100/0.4			100/0.4				3,047.3	19.5
		60/0.0			60/0.0				3,046.1 CRYSTALLINE ROCK: Granitic Gneiss	20.7
									Boring Terminated at Elevation 3,046.1 ft	

State Project No. 34499.1.1
TIP No. R-2710 F.A. No. STP-194(4)
NC 194 from Banner Elk in Avery County to Valle Crucis in Watauga County
Site 5: Two Retaining Walls from -L- Stations 185+00 to 189+00
Watauga County, North Carolina
SUMMARY OF LABORATORY TEST DATA

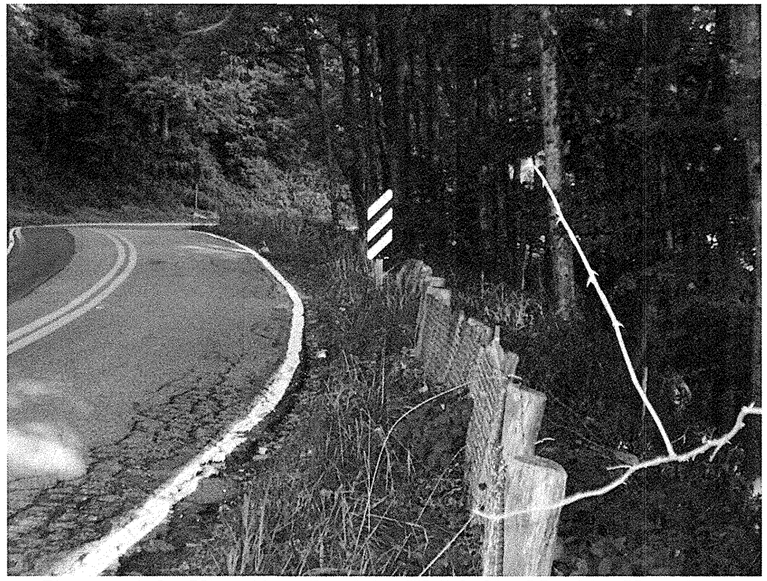
						Atterberg Limits			Gradation Results							
Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
185+50	1.0-2.5	SS-11	16.5	A-4 (0)	11	25	21	4	90	69	51	53	30	18	28	24
187+50	1.0-2.5	SS-12	22.5	A-4 (2)	8	33	23	10	89	70	51	53	29	18	42	11
188+00	3.5-5.0	SS-13	-	A-1-a (0)	54	25	NP	NP	49	18	9	92	71	12	13	4

* SS = Split-Barrel Sample (ASTM-D-1586)
** G = Grab Sample
***ST=Shelby Tube (Undisturbed) Sample
NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-07-036
Page: 1 of 1

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Site 5: Two Retaining Walls from -L- Sta. 185+00 to 189+00
Watauga County, North Carolina
Page 1 of 1

Photograph 1 – View Along Retaining Wall 1, Site 5 Looking Upstation



Photograph 2 – View Along Retaining Wall 2, Site 5 Looking Upstation

ID: R-2710

PROJECT: C202339

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	12

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34499.1.1	STP - 194(4)	P.E.
34499.2.2	STP - 194(4)	R/W
34499.3.STI	STM - 194(13)	CONST.

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34499.1.1 I.D. NO. R-2710

F.A. PROJECT STP-194(4)

COUNTY WATAUGA

PROJECT DESCRIPTION NC 194 FROM BANNER ELK IN AVERY COUNTY TO VALLE CRUCIS IN WATAUGA COUNTY

SITE DESCRIPTION SITE 4: ONE RETAINING WALL FROM -L- STATIONS 174+00 TO 179+00

CAUTION NOTICE

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

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

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

CONTENTS:

INVESTIGATED BY T WELLS

CHECKED BY J VINSON

SUBMITTED BY P WEAVER

DATE 9/12/07

PERSONNEL D KITCHEN
A HAYES
T WELLS
R TOOTHMAN
B DUNCAN

DRAWN BY: DRK

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

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

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

SEAL 10/19/07

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2710	34499.1.1	2	12

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤35% PASSING #200)							SILT-CLAY MATERIALS (>35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2, A-3	A-4, A-5, A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
LIQUID LIMIT				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	6 MX		N.P.	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	16+ MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (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 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	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	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS	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 SEEPAGE

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CI. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
C.T. - CORING TERMINATED
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
N/A - NOT APPLICABLE
NM - NOT MEASURED
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B- 57
- [ ] BK-51
- [ ] CME-45
- [ ] CME-55
- [ ] PORTABLE HOIST
- [ ] OTHER CME 850
- [X] OTHER ACKER MARK II

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [X] TRICONE 3⅞" TUNG.-CARB.
- [X] CORE BIT
- [ ] OTHER ____

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

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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 YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 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 GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 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 GEOLOGISTS 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 WHICH HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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.

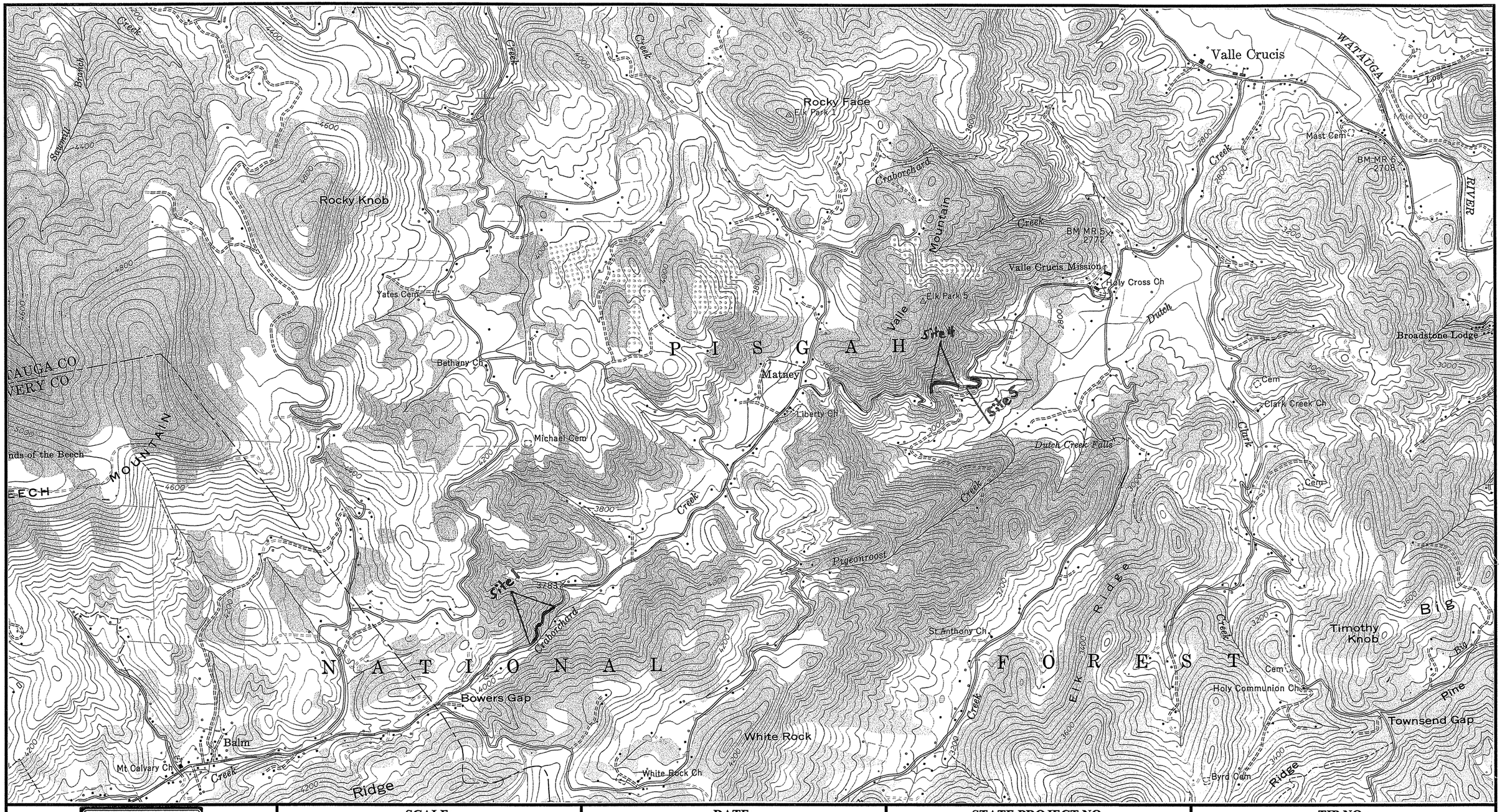
TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #1; 8" SPIKE IN BASE OF 10" BIRCH TREE -BL- STA. 34+33, 147' RT

ELEVATION: 3905.36'

NOTES:

REVISED 09/15/00



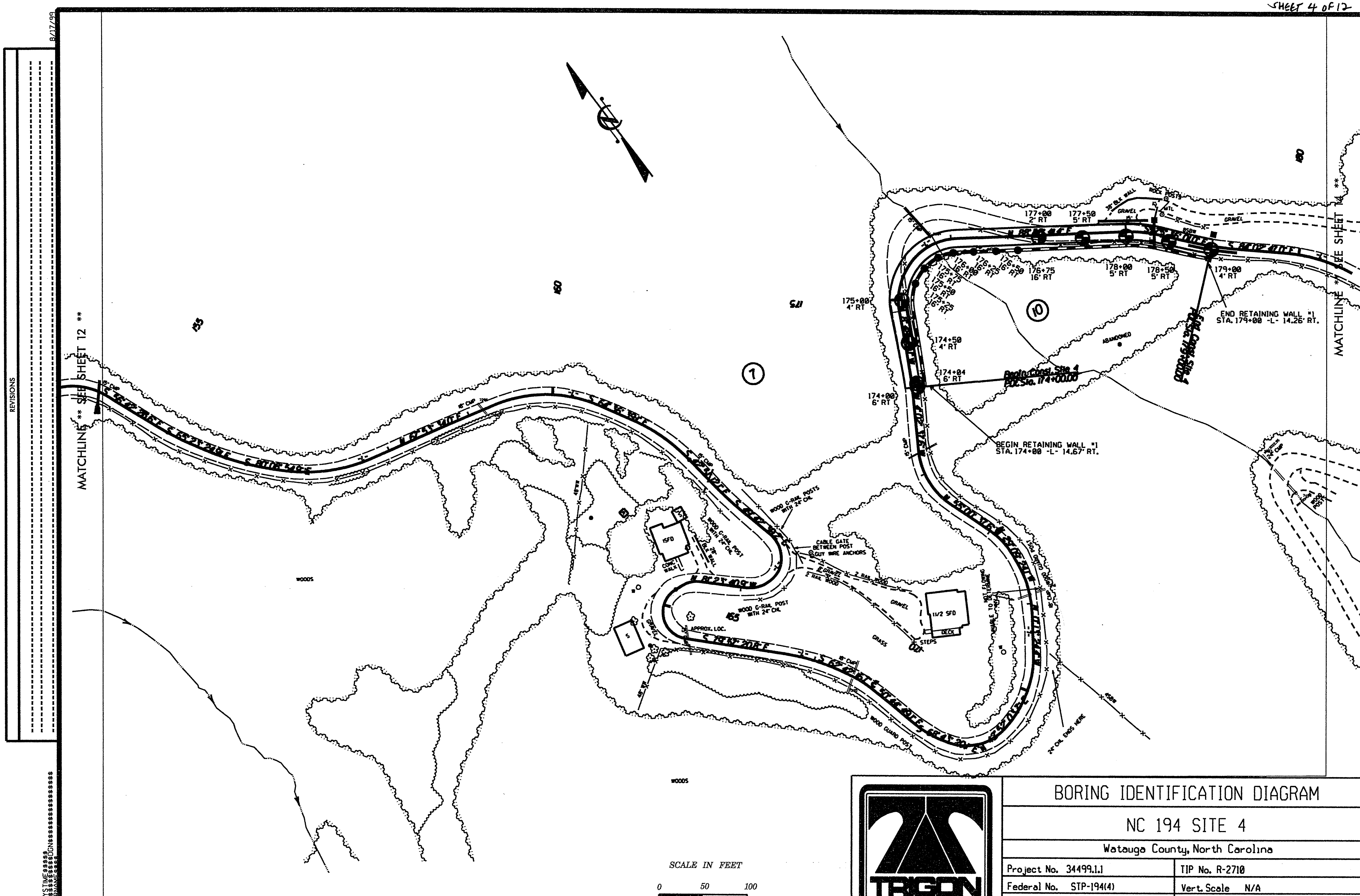
SCALE: **1′ = 24,000′**	**DATE:** **09/04/07**	**STATE PROJECT NO.** **34499.1.1**	**TIP NO.:** **R-2710**

SITE VICINITY MAP
NC 194 Retaining Walls at Sites 1, 4, and 5, Watauga County, North Carolina

Trigon Engineering Consultants, Inc.
Greensboro North Carolina

USGS Valle Crucis Quadrangle

DRAWING NUMBER:
1



NOTE: "●" INDICATES LOCATION OF HAND-OPERATED PNEUMATIC HAMMER PROBE HOLE

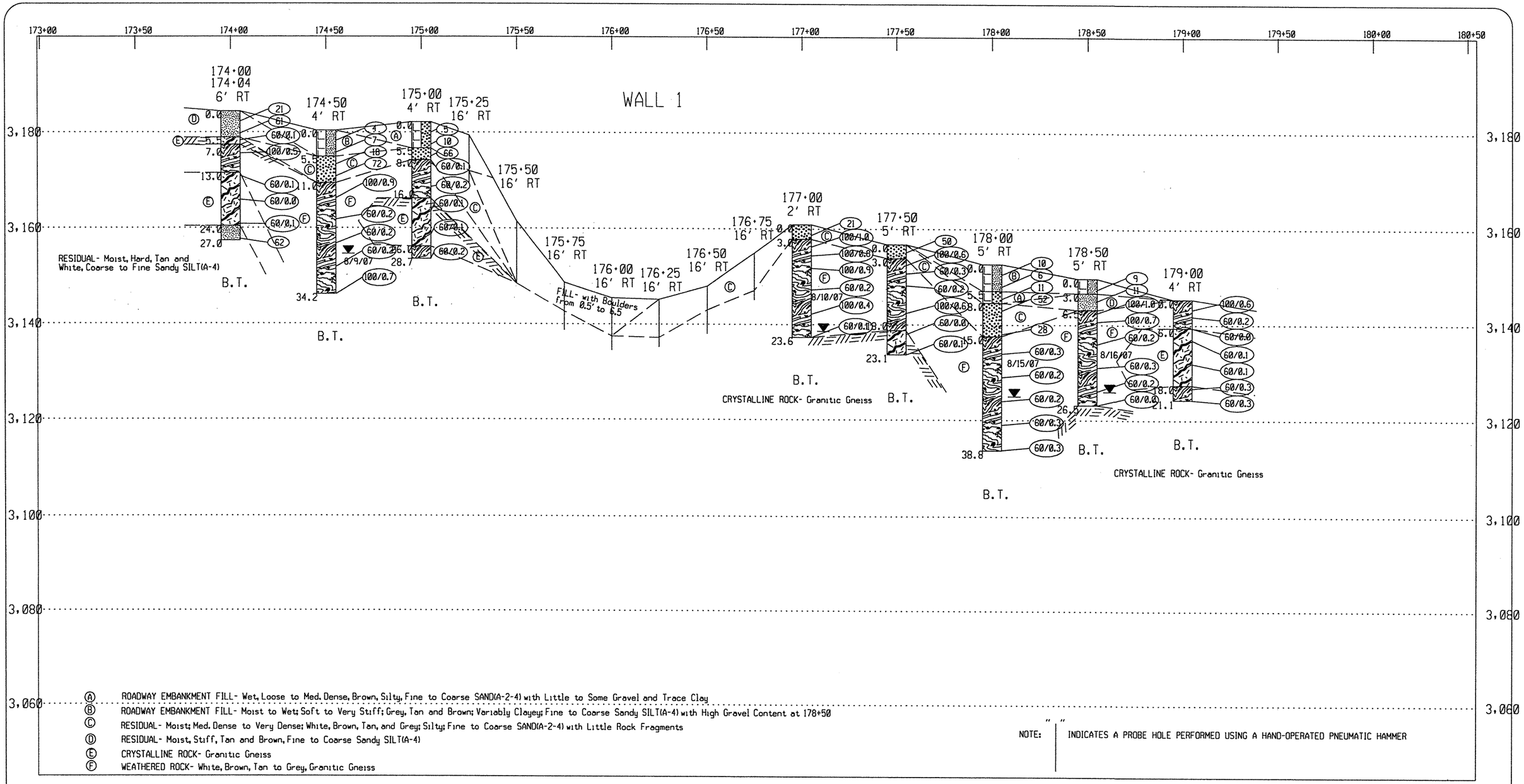
TRIGON ENGINEERING CONSULTANTS, INC.

BORING IDENTIFICATION DIAGRAM

NC 194 SITE 4

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale N/A
Date 9/12/07	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2



Ⓐ ROADWAY EMBANKMENT FILL- Wet, Loose to Med. Dense, Brown, Silty, Fine to Coarse SAND(A-2-4) with Little to Some Gravel and Trace Clay

Ⓑ ROADWAY EMBANKMENT FILL- Moist to Wet; Soft to Very Stiff; Grey, Tan and Brown; Variably Clayey; Fine to Coarse Sandy SILT(A-4) with High Gravel Content at 178+50

Ⓒ RESIDUAL- Moist; Med. Dense to Very Dense; White, Brown, Tan, and Grey; Silty; Fine to Coarse SAND(A-2-4) with Little Rock Fragments

Ⓓ RESIDUAL- Moist, Stiff, Tan and Brown, Fine to Coarse Sandy SILT(A-4)

Ⓔ CRYSTALLINE ROCK- Granitic Gneiss

Ⓕ WEATHERED ROCK- White, Brown, Tan to Grey, Granitic Gneiss

NOTE: " | " INDICATES A PROBE HOLE PERFORMED USING A HAND-OPERATED PNEUMATIC HAMMER

SCALE IN FEET

0 10 20

VERT. SCALE

0 25 50

HORZ. SCALE

TRIGON

ENGINEERING CONSULTANTS, INC.

PROFILE RIGHT OF -L-

NC 194 SITE 4

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 3

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4				**GROUND WTR (ft)**
BORING NO. 174+00	**STATION** 174+00	**OFFSET** 6ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,184.4 ft	**TOTAL DEPTH** 18.5 ft	**NORTHING** 900,113	**EASTING** 1,173,482	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** HSA		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/06/07	**COMP. DATE** 08/06/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.5 ft	

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)
3185										
3,183.4	1.0								3,184.4	0.0
3,180.9	3.5	14	12	9	21 / 61	SS-7	14.0% M		RESIDUAL: Very Stiff to Hard, Brown and Grey, Clayey, Fine to Coarse Sandy SILT with Trace Rock Fragments	
3,178.4	6.0	33	40	21					3,178.9	5.5
3,175.9	8.5	60/0.1			60/0.1				3,177.4 CRYSTALLINE ROCK: Granitic Gneiss	7.0
3,170.9	13.5	100/0.5			100/0.5				WEATHERED ROCK: Granitic Gneiss	
3,165.9	18.5	60/0.1			60/0.1				3,171.4 CRYSTALLINE ROCK: Tan and White, Granitic Gneiss	13.0
		60/0.0			60/0.0				3,165.9 Boring Terminated at Elevation 3,165.9 ft	18.5

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

SHEET 6 OF 12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4				**GROUND WTR (ft)**
BORING NO. 174+04	**STATION** 174+04	**OFFSET** 6ft RT	**ALIGNMENT** -L-	**0 HR.** 23.0
COLLAR ELEV. 3,184.2 ft	**TOTAL DEPTH** 27.0 ft	**NORTHING** 900,117	**EASTING** 1,173,482	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/06/07	**COMP. DATE** 08/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.5 ft	

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)
3185										
3,184.2	0.0								RESIDUAL: Very Stiff to Hard, Brown and Grey, Clayey, Fine to Coarse SILT with Trace Rock Fragments in Upper 3	
3,178.7	5.5								3,178.7 CRYSTALLINE ROCK: Granitic Gneiss	5.5
3,177.2	7.0								3,177.2 WEATHERED ROCK: Granitic Gneiss	7.0
3,171.2	13.0								3,171.2 CRYSTALLINE ROCK: Tan and White, Granitic Gneiss	13.0
3,160.7	23.5	60/0.1			60/0.1				3,160.2 RESIDUAL: Hard, Tan and White, Coarse to Fine Sandy SILT	24.0
3,158.7	25.5	20	15	47	62		M		3,157.2 Boring Terminated at Elevation 3,157.2 ft	27.0

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4				**GROUND WTR (ft)**
BORING NO. 174+50	**STATION** 174+50	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** 16.6
COLLAR ELEV. 3,180.4 ft	**TOTAL DEPTH** 34.2 ft	**NORTHING** 900,162	**EASTING** 1,173,473	**24 HR.** 25.8
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/08/07	**COMP. DATE** 08/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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
3185									ELEV. (ft) / DEPTH (ft)
									3,180.4 / 0.0
3,179.4	1.0								ROADWAY EMBANKMENT FILL: Soft to Medium Stiff, Brown, Clayey, Fine to Coarse Sandy SILT with Little Gravel
3,176.9	3.5	3	2	2	4	SS-8	21.3% W		
3,174.4	6.0	3	3	4	7		M		3,174.9 / 5.5
3,171.9	8.5	3	6	12	18		M		RESIDUAL: Medium Dense to Very Dense, Tan and Grey, Silty, Fine to Coarse SAND with Little Rock Fragments
3,166.9	13.5	13	40	32	72				3,169.4 / 11.0
3,161.9	18.5	32	68/0.4		100/0.9				WEATHERED ROCK: White, Brown and Grey, Granitic Gneiss
3,156.9	23.5	60/0.2			60/0.2				
3,151.9	28.5	60/0.2			60/0.2				
3,146.9	33.5	60/0.2			60/0.2				
		65	35/0.2		100/0.7				3,146.2 / 34.2
									Boring Terminated at Elevation 3,146.2 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

SHEET 7 OF 12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4				**GROUND WTR (ft)**
BORING NO. 175+00	**STATION** 175+00	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** 25.9
COLLAR ELEV. 3,182.2 ft	**TOTAL DEPTH** 28.7 ft	**NORTHING** 900,211	**EASTING** 1,173,467	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/09/07	**COMP. DATE** 08/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 16.0 ft	

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
3185									ELEV. (ft) / DEPTH (ft)
									3,182.2 / 0.0
3,181.2	1.0								ROADWAY EMBANKMENT FILL: Loose to Medium Dense, Brown, Silty, Fine to Coarse SAND with Some Gravel and Trace CLAY
3,178.7	3.5	3	2	3	5	SS-9	W		
3,176.2	6.0	4	5	5	10		W		3,176.7 / 5.5
3,173.7	8.5	14	33	33	66		M		RESIDUAL: Very Dense, Tan and Grey, Silty, Fine to Coarse SAND
3,168.7	13.5	60/0.1			60/0.1				3,174.2 / 8.0
3,163.7	18.5	60/0.2			60/0.2				WEATHERED ROCK: Grey, Granitic Gneiss
3,158.7	23.5	60/0.1			60/0.1				
3,153.7	28.5	60/0.1			60/0.1				3,166.2 / 16.0
		60/0.2			60/0.2				CRYSTALLINE ROCK: Granitic Gneiss
									3,156.2 / 26.0
									WEATHERED ROCK: Granitic Gneiss
									3,153.5 / 28.7
									Boring Terminated at Elevation 3,153.5 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			**GROUND WTR (ft)**
BORING NO. 177+00	**STATION** 177+00	**OFFSET** 2ft RT	**ALIGNMENT** -L-	**0 HR.** 15.4
COLLAR ELEV. 3,160.9 ft	**TOTAL DEPTH** 23.6 ft	**NORTHING** 900,279	**EASTING** 1,173,625	**24 HR.** 22.3
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/09/07	**COMP. DATE** 08/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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
3165									ELEV. (ft) / DEPTH (ft)
									3,160.9 / 0.0
3,159.9	1.0						M		RESIDUAL: Medium Dense, White and Brown, Silty, Fine to Coarse SAND with Little Rock Fragments
		10	12	9	21				3,157.9 / 3.0
3,157.4	3.5								WEATHERED ROCK: Grey and Tan, Granitic Gneiss
		32	46	54	100/1.0				
3,154.9	6.0								
		75	25/0.3		100/0.8				
3,152.4	8.5								
		46	54/0.4		100/0.9				
3,147.4	13.5								
		60/0.2			60/0.2				
3,142.4	18.5								
		100/0.4			100/0.4				
3,137.4	23.5								3,137.3 / 23.6
		60/0.1			60/0.1				Boring Terminated at Elevation 3,137.3 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

SHEET 8 OF 12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			**GROUND WTR (ft)**
BORING NO. 177+50	**STATION** 177+50	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,156.8 ft	**TOTAL DEPTH** 23.1 ft	**NORTHING** 900,276	**EASTING** 1,173,675	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/10/07	**COMP. DATE** 08/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.0 ft	

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
3160									ELEV. (ft) / DEPTH (ft)
									3,156.8 / 0.0
3,155.8	1.0						M		RESIDUAL: Dense, Tan and Grey, Silty, Fine to Coarse SAND with Little Rock Fragments
		13	27	23	50				3,153.8 / 3.0
3,153.3	3.5								WEATHERED ROCK: Grey and Tan, Granitic Gneiss
		22	75	25/0.1	100/0.6				
3,150.8	6.0								
		60/0.3			60/0.3				
3,148.3	8.5								
		60/0.2			60/0.2				
3,143.3	13.5								
		19	56	44/0.1	100/0.6				
3,138.3	18.5								3,138.8 / 18.0
		60/0.0			60/0.0				CRYSTALLINE ROCK: Granitic Gneiss
3,133.8	23.0								3,133.7 / 23.1
		60/0.1			60/0.1				Boring Terminated at Elevation 3,133.7 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4				**GROUND WTR (ft)**
BORING NO. 178+00	**STATION** 178+00	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** 17.5
COLLAR ELEV. 3,152.6 ft	**TOTAL DEPTH** 38.8 ft	**NORTHING** 900,277	**EASTING** 1,173,725	**24 HR.** 27.6
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/14/07	**COMP. DATE** 08/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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)
3155											
3,151.6	1.0									3,152.6	0.0
3,149.1	3.5	12	6	4	10		M		ROADWAY EMBANKMENT FILL: Stiff to Medium Stiff; Grey, Tan and Brown; Fine to Coarse Sandy SILT		
3,146.6	6.0	3	3	3	6		W			3,147.1	5.5
3,144.1	8.5	3	4	7	11		W		ROADWAY EMBANKMENT FILL: Medium Dense, Orangish Brown, Silty, Fine to Coarse SAND with Little Gravel	3,144.6	8.0
3,139.1	13.5	22	26	26	52		M		RESIDUAL: Very Dense to Medium Dense, Brown and Grey, Silty, Fine to Coarse SAND with Little Rock Fragments		
3,134.1	18.5	19	14	14	28					3,137.6	15.0
3,129.1	23.5	60/0.3			60/0.3				WEATHERED ROCK: Tan and Grey, Granitic Gneiss		
3,124.1	28.5	60/0.2			60/0.2						
3,119.1	33.5	60/0.2			60/0.2						
3,114.1	38.5	60/0.3			60/0.3						
		60/0.3			60/0.3					3,113.8	38.8
									Boring Terminated at Elevation 3,113.8 ft		

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

SHEET 9 OF 12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4				**GROUND WTR (ft)**
BORING NO. 178+50	**STATION** 178+50	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** 23.0
COLLAR ELEV. 3,149.6 ft	**TOTAL DEPTH** 26.5 ft	**NORTHING** 900,270	**EASTING** 1,173,774	**24 HR.** 23.7
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 08/14/07	**COMP. DATE** 08/15/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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)
3150											
3,148.6	1.0									3,149.6	0.0
3,146.1	3.5	3	4	5	9	SS-10	18.1%		ROADWAY EMBANKMENT FILL: Stiff, Brown, Clayey, Fine to Coarse Sandy SILT with High Gravel Content	3,146.6	3.0
3,143.6	6.0	3	5	6	11		M		RESIDUAL: Stiff, Tan and Brown, Fine to Coarse Sandy SILT		
3,141.1	8.5	14	26	74	100/1.0		M			3,143.1	6.5
3,136.1	13.5	45	55/0.2		100/0.7				WEATHERED ROCK: White, Tan to Brown and Grey, Granitic Gneiss		
3,131.1	18.5	60/0.2			60/0.2						
3,126.1	23.5	60/0.3			60/0.3						
3,123.1	26.5	60/0.2			60/0.2						
		60/0.0			60/0.0					3,123.1	26.5
									Boring Terminated at Elevation 3,123.1 ft		

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

SHEET 10 OF 12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			**GROUND WTR (ft)**
BORING NO. 179+00	**STATION** 179+00	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,145.4 ft	**TOTAL DEPTH** 21.1 ft	**NORTHING** 900,259	**EASTING** 1,173,822	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual
START DATE 08/15/07	**COMP. DATE** 08/15/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 6.0 ft

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)
3150									
									3,145.4 / 0.0
3,144.4	1.0								WEATHERED ROCK: Brown and Grey, Granitic Gneiss
		21	60	40/0.1	100/0.6				
3,141.9	3.5	60/0.2			60/0.2				
3,139.4	6.0	60/0.0			60/0.0				3,139.4 / 6.0
3,136.9	8.5	60/0.1			60/0.0 60/0.1				CRYSTALLINE ROCK: Granitic Gneiss
3,131.9	13.5	60/0.1			60/0.1				
3,126.9	18.5	60/0.3			60/0.3				3,127.4 / 18.0
3,124.6	20.8	60/0.3			60/0.3				WEATHERED ROCK: Tan and Brown, Granitic Gneiss 3,124.3 / 21.1 Boring Terminated at Elevation 3,124.3 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 9/12/07

NC 194 Retaining Walls Investigation
NCDOT Project No. 34499.1.1
NCDOT TIP No. R-2710
Trigon Project No. 071-07-036

LOCATIONS FOR HAND DRILLED BORINGS AT SITE 4

Site	Station	Offset	Elev.	Northing	Easting	Depth of Overburden	Depth to Boulder	Boulder Thickness	Depth To Weathered Rock	Termination Depth (ft.)	**Notes
4	175+25	16' RT	3179.39	900229.34	1173482.93	10'	7.5'	6"		10	no rock
4	175+50	15' RT	3161.54	900246.08	1173493.71	10'	4.5'/7'	6"/6"		10	no rock/ bouldery fill
4	175+75	16' RT	3148.66	900257.63	1173509.56	0'	0'	4'	6'	10	6-10' weathered rock
4	176+00	16' RT	3145.53	900262.61	1173527.08	1.5'	1.5'	6.5'	8'	10	large boulder then weathered rock
4	176+25	16' RT	3145.19	900263.24	1173550.57	8'			8'	10	soft weathered at 8'
4	176+50	16' RT	3147.98	900263.69	1173575.71	5'			5'	10	weathered rock 5-10' (no seams)
4	176+75	16' RT	3154.86	900264.14	1173600.85	7.75'			7.75'	10	hard weathered rock after 8'

State Project No. 34499.1.1
TIP No. R-2710 F.A. No. STP-194(4)
NC 194 from Banner Elk in Avery County to Valle Crucis in Watauga County
Site 4: One Retaining Wall from -L- Stations 174+00 to 179+00
Watauga County, North Carolina
SUMMARY OF LABORATORY TEST DATA

						Atterberg Limits			Gradation Results							
Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
174+00	1.0-2.5	SS-7	14.0	A-4 (0)	21	22	21	1	96	73	47	60	31	27	27	15
174+50	1.0-2.5	SS-8	21.3	A-4 (0)	4	25	17	8	82	56	43	59	38	12	30	20
175+00	1.0-2.5	SS-9	-	A-2-4 (0)	5	32	26	6	70	47	35	67	40	14	38	8
178+50	1.0-2.5	SS-10	18.1	A-4 (0)	9	27	18	9	69	53	40	63	29	19	37	15

* SS = Split-Barrel Sample (ASTM-D-1586)
** G = Grab Sample
***ST=Shelby Tube (Undisturbed) Sample
NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-07-036
Page: 1 of 1

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Site 4: One Retaining Wall from -L- Sta. 174+00 to 179+00
Watauga County, North Carolina
Page 1 of 1

Photograph 1 – View Along Retaining Wall at Site 4 Looking Upstation

Photograph 2 – View of Rock Outcrop at Sta. 178+50 Left of Existing Roadway

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	14

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34499.1.1	STP - 194(4)	P.E.
34499.2.2	STP - 194(4)	RW
34499.3.ST1	STM - 194(13)	CONST.

ID: R-2710

PROJECT: 'C202339

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34499.1.1 I.D. NO. R-2710

F.A. PROJECT STP-194(4)

COUNTY WATAUGA

PROJECT DESCRIPTION NC 194 FROM BANNER ELK IN AVERY COUNTY TO VALLE CRUCIS IN WATAUGA COUNTY

SITE DESCRIPTION SITE 1: THREE RETAINING WALLS FROM -L- STATIONS 40+50 TO 48+50

CONTENTS:

DRAWN BY: DRK

CAUTION NOTICE

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

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

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

INVESTIGATED BY T WELLS

CHECKED BY J VINSON

SUBMITTED BY P WEAVER

DATE 9/12/07

PERSONNEL D KITCHEN
A HAYES
T WELLS
R TOOTHMAN
B DUNCAN

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

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

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER SEAL

10/14/07

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2710	34499.1.1	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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (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 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	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	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/825 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT, CPT, DPT, VST, DMT, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CI. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
C.T. - CORING TERMINATED
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
N/A - NOT APPLICABLE
NM - NOT MEASURED
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B- 57
- [ ] BK-51
- [ ] CME-45
- [ ] CME-55
- [ ] PORTABLE HOIST
- [ ] OTHER CME 850
- [X] OTHER ACKER MARK II

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [X] TRICONE 3⅞" TUNG.-CARB.
- [X] CORE BIT
- [ ] OTHER ____

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

CORE SIZE:
- [ ] -B-
- [X] -N- Q
- [ ] -H- Q

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 FELOSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELOSPARS 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 GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 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 GEOLOGISTS 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 WHICH HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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.

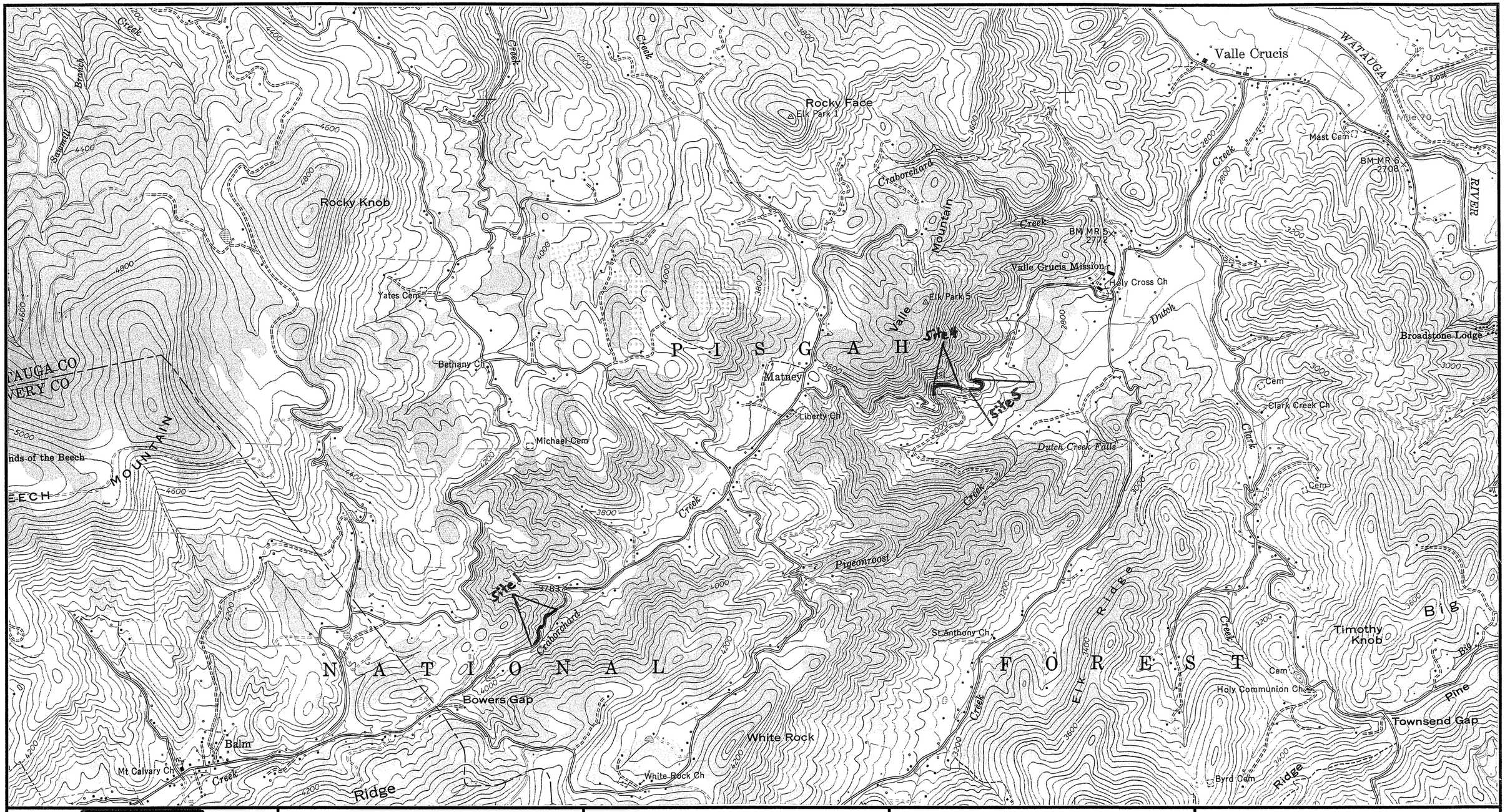
TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #1: 8" SPIKE IN BASE OF 10" BIRCH TREE -BL- STA. 34+33, 147' RT

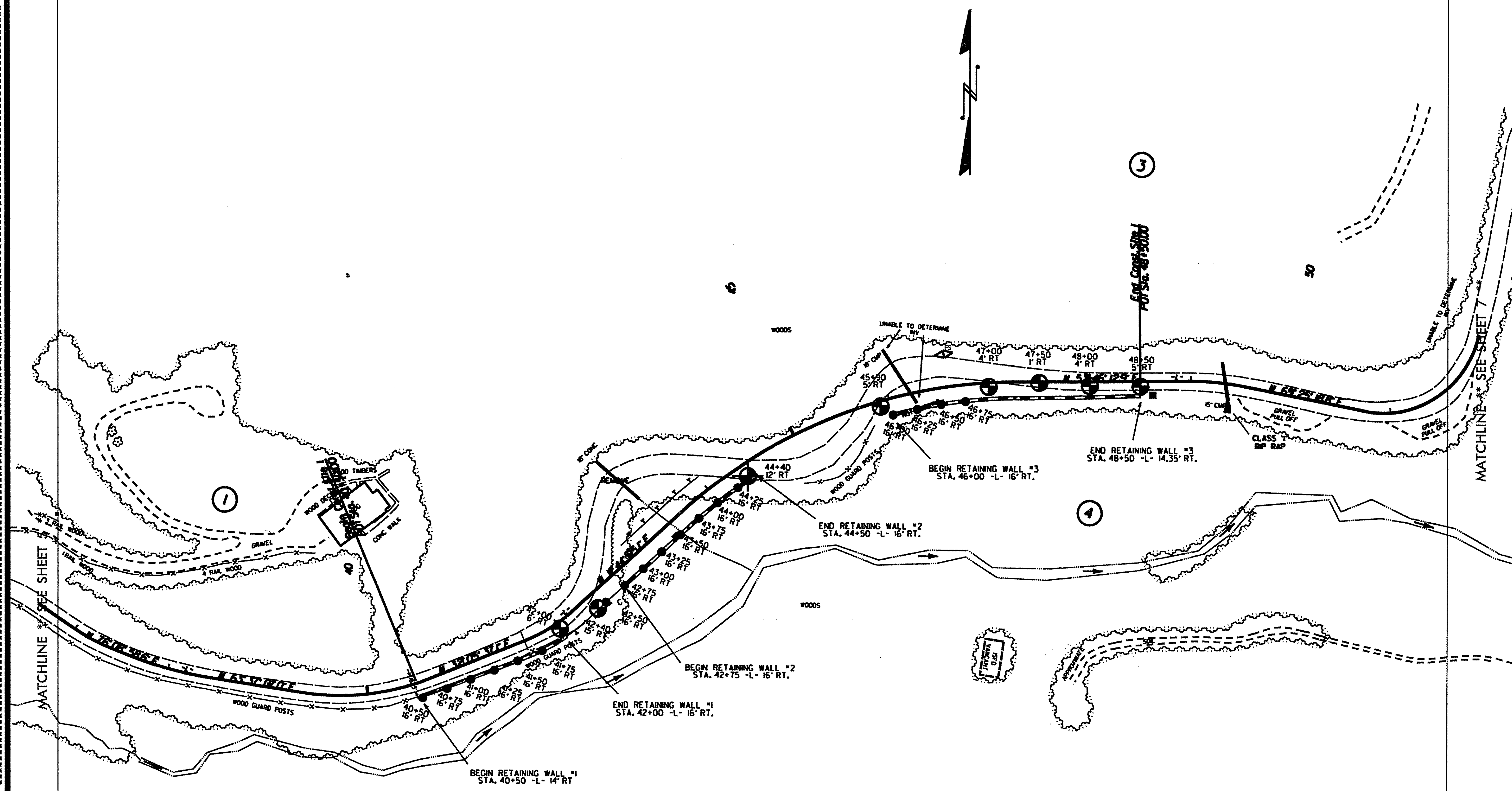
ELEVATION: 3905.36'

NOTES:

REVISED 09/15/00



Trigon Engineering Consultants, Inc. **Greensboro North Carolina**	**SCALE:** **1′ = 24,000′**	**DATE:** **09/04/07**	**STATE PROJECT NO.** **34499.1.1**	**TIP NO.:** **R-2710**
	SITE VICINITY MAP **NC 194 Retaining Walls at Sites 1, 4, and 5, Watauga County, North Carolina**			
	USGS Valle Crucis Quadrangle		**DRAWING NUMBER:** **1**	



NOTE: "●" INDICATES LOCATION OF HAND-OPERATED PNEUMATIC HAMMER PROBE HOLE

SCALE IN FEET

0 50 100

HORZ. SCALE

TRIGON
ENGINEERING CONSULTANTS, INC.

BORING IDENTIFICATION DIAGRAM

NC 194 SITE 1

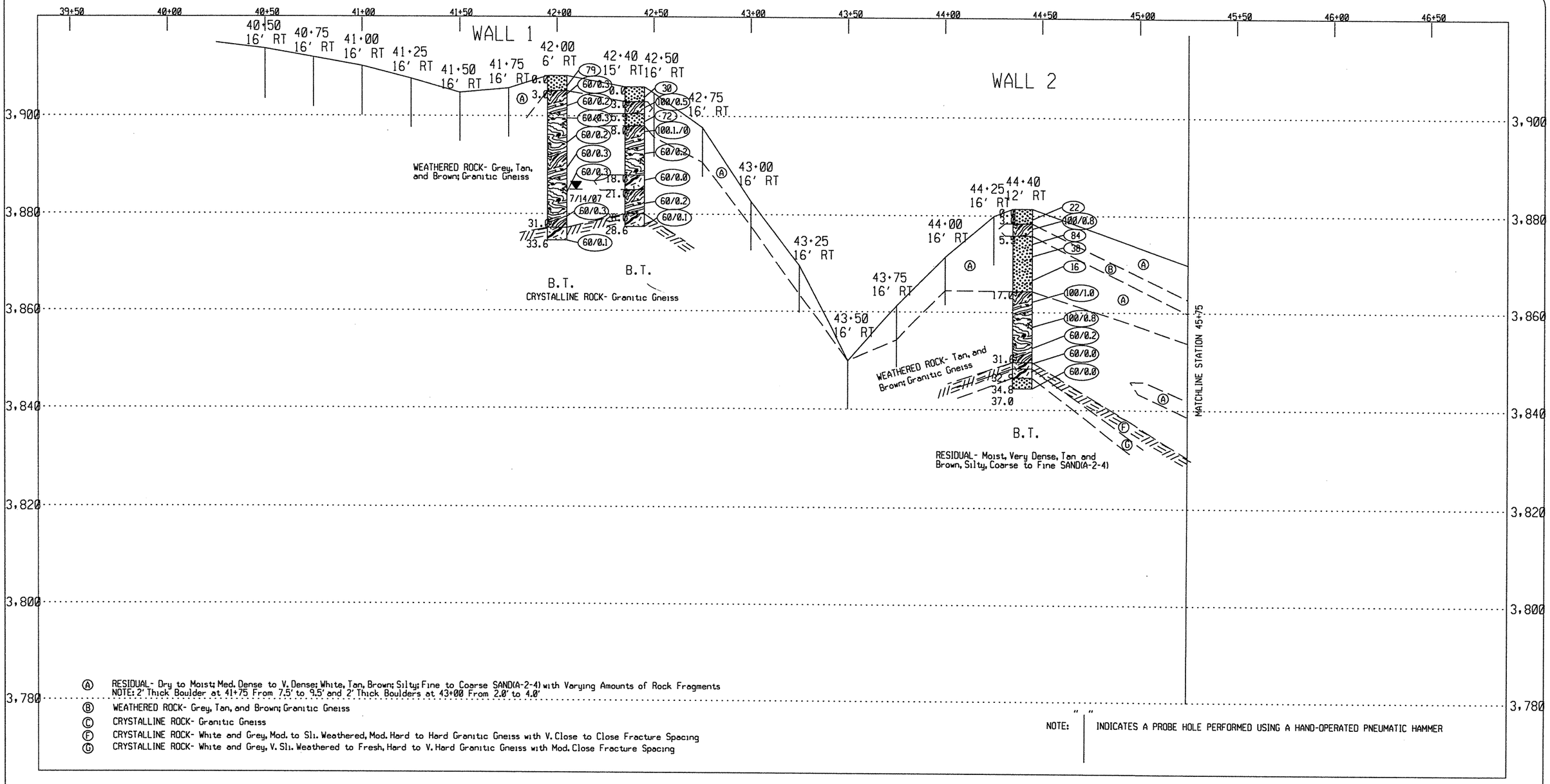
Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale N/A
Date 9/12/07	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2

REVISIONS

8/17/99

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$



Ⓐ RESIDUAL- Dry to Moist; Med. Dense to V. Dense; White, Tan, Brown; Silty; Fine to Coarse SAND(A-2-4) with Varying Amounts of Rock Fragments
NOTE: 2' Thick Boulder at 41+75 From 7.5' to 9.5' and 2' Thick Boulders at 43+00 From 2.0' to 4.0'

Ⓑ WEATHERED ROCK- Grey, Tan, and Brown; Granitic Gneiss

Ⓒ CRYSTALLINE ROCK- Granitic Gneiss

Ⓕ CRYSTALLINE ROCK- White and Grey, Mod. to Sli. Weathered, Mod. Hard to Hard Granitic Gneiss with V. Close to Close Fracture Spacing

Ⓖ CRYSTALLINE ROCK- White and Grey, V. Sli. Weathered to Fresh, Hard to V. Hard Granitic Gneiss with Mod. Close Fracture Spacing

NOTE: " " INDICATES A PROBE HOLE PERFORMED USING A HAND-OPERATED PNEUMATIC HAMMER

SCALE IN FEET

0 10 20
VERT. SCALE

0 25 50
HORZ. SCALE

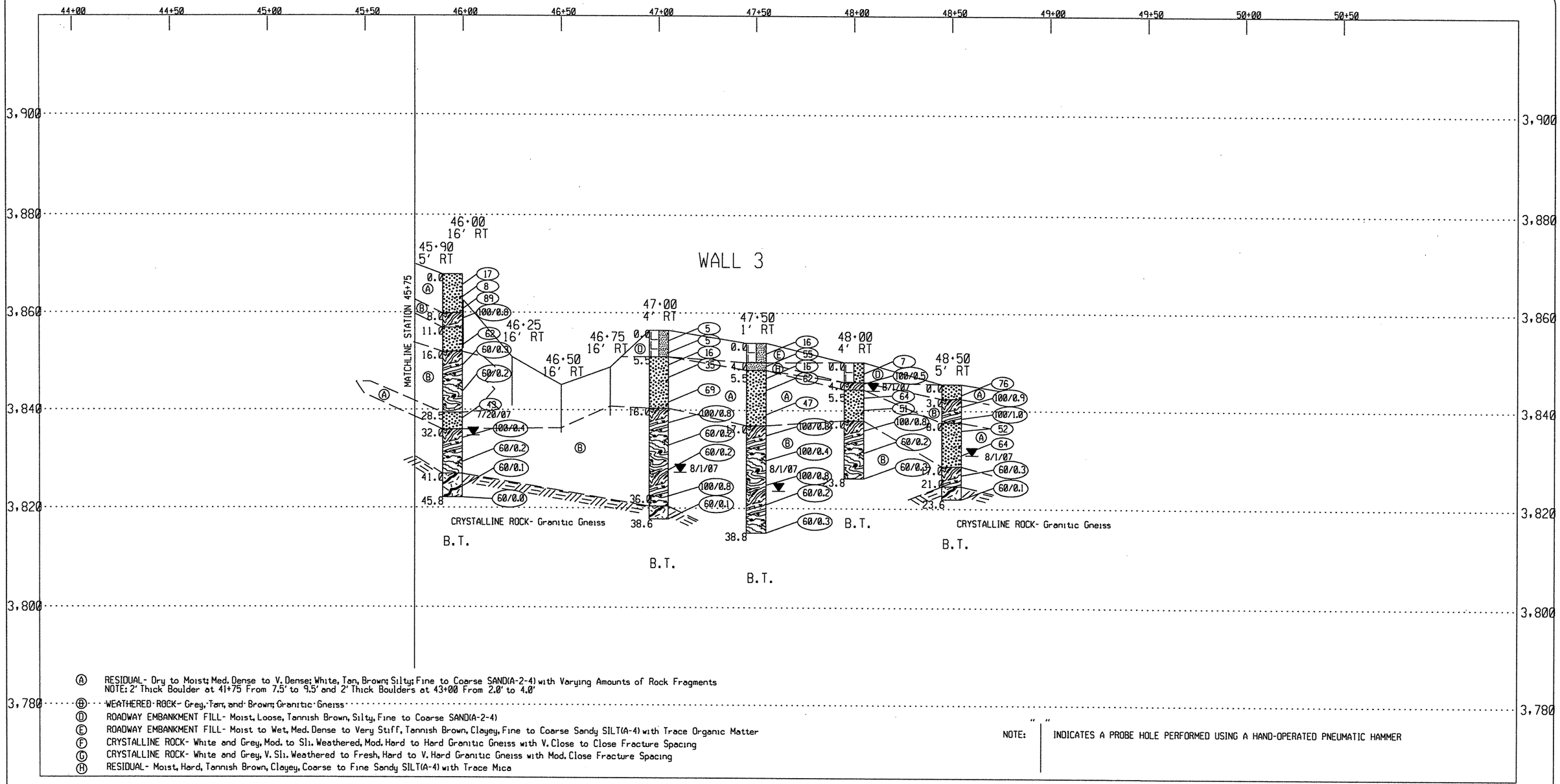
TRIGON
ENGINEERING CONSULTANTS, INC.

PROFILE RIGHT OF -L-

NC 194 SITE 1

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 3



Ⓐ RESIDUAL- Dry to Moist; Med. Dense to V. Dense; White, Tan, Brown; Silty; Fine to Coarse SAND(A-2-4) with Varying Amounts of Rock Fragments
NOTE: 2' Thick Boulder at 41+75 From 7.5' to 9.5' and 2' Thick Boulders at 43+00 From 2.0' to 4.0'

Ⓑ WEATHERED ROCK- Grey, Tan, and Brown; Granitic Gneiss

Ⓓ ROADWAY EMBANKMENT FILL- Moist, Loose, Tannish Brown, Silty, Fine to Coarse SAND(A-2-4)

Ⓔ ROADWAY EMBANKMENT FILL- Moist to Wet, Med. Dense to Very Stiff, Tannish Brown, Clayey, Fine to Coarse Sandy SILT(A-4) with Trace Organic Matter

Ⓕ CRYSTALLINE ROCK- White and Grey, Mod. to Sli. Weathered, Mod. Hard to Hard Granitic Gneiss with V. Close to Close Fracture Spacing

Ⓒ CRYSTALLINE ROCK- White and Grey, V. Sli. Weathered to Fresh, Hard to V. Hard Granitic Gneiss with Mod. Close Fracture Spacing

Ⓗ RESIDUAL- Moist, Hard, Tannish Brown, Clayey, Coarse to Fine Sandy SILT(A-4) with Trace Mica

NOTE: " " INDICATES A PROBE HOLE PERFORMED USING A HAND-OPERATED PNEUMATIC HAMMER

SCALE IN FEET

0 10 20
VERT. SCALE

0 25 50
HORZ. SCALE

TRIGON
ENGINEERING CONSULTANTS, INC.

PROFILE RIGHT OF -L-

NC 194 SITE 1

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 4

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			**GROUND WTR (ft)**
BORING NO. 42+00	**STATION** 42+00	**OFFSET** 6ft RT	**ALIGNMENT** -L-	**0 HR.** 19.5
COLLAR ELEV. 3,908.1 ft	**TOTAL DEPTH** 33.6 ft	**NORTHING** 895,239	**EASTING** 1,164,918	**24 HR.** 23.1
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual
START DATE 07/12/07	**COMP. DATE** 07/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.0 ft

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
3910									ELEV. (ft) / DEPTH (ft)
									3,908.1 / 0.0
3,907.1	1.0								
		15	30	49	79	SS-1	D		RESIDUAL: Very Dense, Brown and Tan, Silty, Fine to Coarse SAND and Rock Fragments
3,904.6	3.5								3,905.1 / 3.0
		60/0.3			60/0.3				WEATHERED ROCK: Tan and Brown, Granitic Gneiss
3,902.1	6.0								
		60/0.2			60/0.2				
3,899.6	8.5								
		60/0.3			60/0.3				
3,894.6	13.5								
		60/0.2			60/0.2				
3,889.6	18.5								
		60/0.3			60/0.3				
3,884.6	23.5								
		60/0.3			60/0.3				
3,879.6	28.5								
		60/0.3			60/0.3				
3,877.1	31.0								CRYSTALLINE ROCK: Granitic Gneiss
3,874.6	33.5	60/0.1			60/0.1				3,874.5 / 33.6
									Boring Terminated at Elevation 3,874.5 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

SHEET 7 OF 14

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			**GROUND WTR (ft)**
BORING NO. 42+40	**STATION** 42+40	**OFFSET** 15ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,906.0 ft	**TOTAL DEPTH** 28.6 ft	**NORTHING** 895,277	**EASTING** 1,164,937	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** HSA		**HAMMER TYPE** 140 lb. Manual
START DATE 07/13/07	**COMP. DATE** 07/16/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.0 ft

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
3910									ELEV. (ft) / DEPTH (ft)
									3,906.0 / 0.0
3,905.0	1.0								
		7	8	22	30		M		RESIDUAL: Medium Dense to Dense, Brown, Silty, Fine to Coarse SAND with Little Rock Fragments
3,902.5	3.5								3,903.0 / 3.0
		13	100/0.5		100/0.5				WEATHERED ROCK: Grey and Tan, Granitic Gneiss
3,900.0	6.0								3,900.5 / 5.5
		33	44	28	72		D		RESIDUAL: Very Dense, Grey and Tan, Silty, Fine to Coarse SAND
3,897.5	8.5								3,898.0 / 8.0
		41	59		100/1.0				WEATHERED ROCK: Grey and Tan, Granitic Gneiss
3,892.5	13.5								
		60/0.2			60/0.2				
3,887.5	18.5								3,888.0 / 18.0
		60/0.0			60/0.0				CRYSTALLINE ROCK: Granitic Gneiss
3,882.5	23.5								3,885.0 / 21.0
		60/0.2			60/0.2				WEATHERED ROCK: Granitic Gneiss
3,877.5	28.5								3,880.0 / 26.0
		60/0.1			60/0.1				CRYSTALLINE ROCK: Granitic Gneiss
									3,877.4 / 28.6
									Boring Terminated at Elevation 3,877.4 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver	
SITE DESCRIPTION NC 194 Site 1				**GROUND WTR (ft)**
BORING NO. 44+40	**STATION** 44+40	**OFFSET** 12ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,881.4 ft	**TOTAL DEPTH** 37.0 ft	**NORTHING** 895,470	**EASTING** 1,164,980	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** HSA/Wash Rotary/NQ Core		**HAMMER TYPE** 140 lb. Manual	
START DATE 07/16/07	**COMP. DATE** 07/18/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.6 ft	

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)
3885										
									3,881.4	0.0
3,880.4	1.0						D		RESIDUAL: Medium Dense; White, Tan and Brown; Silty; Fine to Coarse SAND with Trace Rock Fragments	
3,878.4	3.0	5	9	13	22					
3,877.9	3.5								WEATHERED ROCK: Tan and Brown Granitic Gneiss	
3,875.9	5.5	50	50/0.3		100/0.8					
3,875.4	6.0						M		RESIDUAL: Very Dense to Medium Dense, Tan and Brown, Silty, Fine to Coarse SAND	
3,872.9	8.5	24	49	35	84	SS-2				
		9	16	22	38		M			
3,867.9	13.5									
		9	8	8	16		M			
3,864.4	17.0								WEATHERED ROCK: Tan and Brown, Granitic Gneiss	
3,862.9	18.5	24	76		100/1.0					
3,857.9	23.5	27	47	53/0.3	100/0.8					
3,852.9	28.5	60/0.2			60/0.2					
3,849.8	31.6	60/0.0			60/0.0				CRYSTALLINE ROCK: White and Grey, Moderately to Slightly Weathered, Moderately Hard to Hard, Granitic Gneiss with Very Close to Close Fracture Spacing	
3,848.5	32.9									
3,846.6	34.8								CRYSTALLINE ROCK: White and Grey, Very Slightly Weathered to Fresh, Hard to Very Hard, Granitic Gneiss with Moderately Close Fracture Spacing	
3,844.4	37.0	60/0.0			60/0.0				RESIDUAL: Very Dense, Tan and Brown, Silty, Coarse to Fine SAND	
									Boring Terminated at Elevation 3,844.4 ft	

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

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NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			**GROUND WTR (ft)**
BORING NO. 44+40	**STATION** 44+40	**OFFSET** 12ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,881.4 ft	**TOTAL DEPTH** 37.0 ft	**NORTHING** 895,470	**EASTING** 1,164,980	**24 HR.** Dry
DRILL MACHINE Acker ADII	**DRILL METHOD** HSA/Wash Rotary/NQ Core		**HAMMER TYPE** 140 lb. Manual	
START DATE 07/16/07	**COMP. DATE** 07/18/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.6 ft	
CORE SIZE NQ	**TOTAL RUN** 3.2 ft	**DRILLER** R. Toothman		

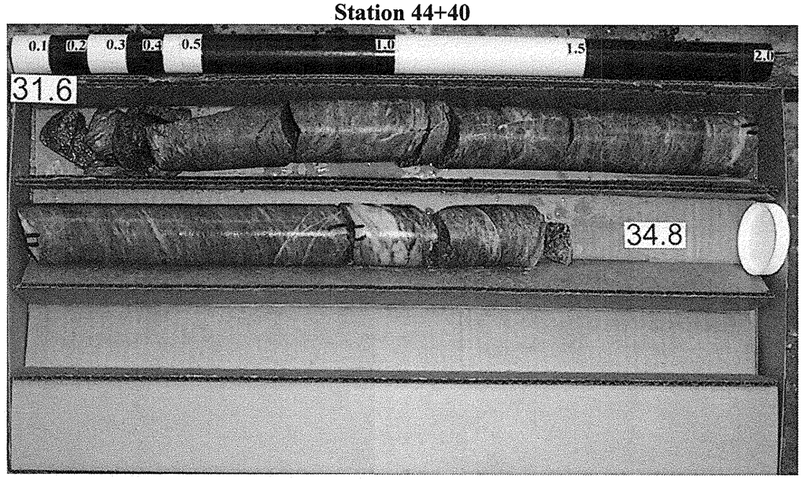
ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
3849.8											
3,849.8	31.6	3.2	3:42 4:10 4:15 1:05/0.2	(3.2) 100%	(1.9) 59%		(1.3) 100%	(0.3) 23%		3,849.8 Begin Coring @ 31.6 ft	
3,846.6	34.8		N=60/0.0				(1.9) 100%	(1.6) 84%		3,848.5 CRYSTALLINE ROCK: White and Grey, Moderately to Slightly Weathered, Moderately Hard to Hard, Granitic Gneiss with Very Close to Close Fracture Spacing	31.6
										Very Broken 31.6 ft. to 31.8 ft.	32.9
										3,846.6 1 Joint at 80°	34.8
										4 Joints at 20° with Light Iron Staining	
										Several Partially Healed Moderately to High Angle Fractures	
										3,844.4 CRYSTALLINE ROCK: White and Grey, Very Slightly Weathered to Fresh, Hard to Very Hard, Granitic Gneiss with Moderately Close Fracture Spacing	37.0
										1 Joint at 34.5 ft.	
										Moderately Weathered at 34.5 ft. to 34.8 ft.	
										RESIDUAL: Very Dense, Tan and Brown, Silty, Coarse to Fine SAND	
										Boring Terminated at Elevation 3,844.4 ft	

NCDOT CORE SINGLE 071-07-036C.GPJ NC_DOT.GDT 9/12/07

CORE PHOTOGRAPH

NCDOT Project No. 34499.1.1 TIP No. R-2710
NC 194 Site 1

Station 44+40



Box 1 of 1

(SCALE = 1:4)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1				**GROUND WTR (ft)**
BORING NO. 45+90	**STATION** 45+90	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 3,867.9 ft	**TOTAL DEPTH** 45.8 ft	**NORTHING** 895,601	**EASTING** 1,165,046	**24 HR.** 33.2
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 07/19/07	**COMP. DATE** 07/20/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 41.0 ft	

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)
3870									
3,866.9	1.0								3,867.9 / 0.0
		10	9	8	17		M		RESIDUAL: Loose to Very Dense, White and Brown, Silty, Fine to Coarse SAND
3,864.4	3.5				8		M		
		3	3	5	89		M		
3,861.9	6.0								3,859.9 / 8.0
		7	24	65					WEATHERED ROCK: Granitic Gneiss
3,859.4	8.5				100/0.8				3,856.9 / 11.0
		37	63/0.3						RESIDUAL: Very Dense, White and Brown, Silty, Fine to Coarse SAND
3,854.4	13.5				62		M		
		17	26	36					3,851.9 / 16.0
3,849.4	18.5								WEATHERED ROCK: White, Tan and Grey Granitic Gneiss
		60/0.3			60/0.3				
3,844.4	23.5								
		60/0.2			60/0.2				
3,839.4	28.5								3,839.4 / 28.5
		55	24	19	43		M		RESIDUAL: Dense, Tan and Brown, Silty, Fine to Coarse SAND
3,834.4	33.5								3,835.9 / 32.0
		100/.4			100/.4				WEATHERED ROCK: Grey, Tan and Brown, Granitic Gneiss
3,829.4	38.5								
		60/0.2			60/0.2				
3,824.4	43.5								3,826.9 / 41.0
		60/0.1			60/0.1				CRYSTALLINE ROCK: Granitic Gneiss
3,822.1	45.8								3,822.1 / 45.8
		60/0.0			60/0.0				Boring Terminated at Elevation 3,822.1 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1				**GROUND WTR (ft)**
BORING NO. 47+00	**STATION** 47+00	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** 32.2
COLLAR ELEV. 3,856.4 ft	**TOTAL DEPTH** 38.6 ft	**NORTHING** 895,679	**EASTING** 1,165,122	**24 HR.** 29.2
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 07/23/07	**COMP. DATE** 07/31/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 36.0 ft	

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)
3860									
3,855.4	1.0								3,856.4 / 0.0
		2	2	3	5	SS-3	22.6%		ROADWAY EMBANKMENT FILL: Medium Stiff, Tannish Brown, Clayey, Fine to Coarse Sandy SILT with Trace of Organic Matter
3,852.9	3.5				5		W		
		1	1	4	16		M		3,850.9 / 5.5
3,850.4	6.0								RESIDUAL: Medium Dense to Very Dense; White, Tan and Brown; Silty; Coarse to Fine SAND
		4	7	9	35		M		
3,847.9	8.5								
		12	16	19	69				
3,842.9	13.5								3,840.4 / 16.0
		17	26	43			M		WEATHERED ROCK: White, Tan and Brown, Granitic Gneiss
3,837.9	18.5				100/0.8				
		45	55/0.3						
3,832.9	23.5				60/0.2				
		60/0.2							
3,827.9	28.5				60/0.2				
		60/0.2							
3,822.9	33.5				100/0.8				
		46	54/0.3						3,820.4 / 36.0
3,817.9	38.5				60/0.1				CRYSTALLINE ROCK: Granitic Gneiss
		60/0.1							3,817.8 / 38.6
									Boring Terminated at Elevation 3,817.8 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1				**GROUND WTR (ft)**
BORING NO. 47+50	**STATION** 47+50	**OFFSET** 1ft RT	**ALIGNMENT** -L-	**0 HR.** 11.8
COLLAR ELEV. 3,853.8 ft	**TOTAL DEPTH** 38.8 ft	**NORTHING** 895,711	**EASTING** 1,165,160	**24 HR.** 30.3
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 07/31/07	**COMP. DATE** 07/31/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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)
3855									3,853.8	0.0
3,852.8	1.0								ROADWAY EMBANKMENT FILL: Very Stiff, Tannish Brown, Clayey, Coarse to Fine Sandy SILT	
3,850.3	3.5	6	7	9	16	SS-4	22.6% M		3,849.8	4.0
3,847.8	6.0	7	24	31	55		M		RESIDUAL: Hard, Tannish Brown, Clayey, Coarse to Fine Sandy, SILTwith Trace of Mica	5.5
3,845.3	8.5	7	7	9	16		W		3,848.3 Medium Dense to Very Dense; White, Brown and Tan; Silty; Coarse to Fine SAND with Trace Mica	
3,840.3	13.5	9	18	44	62		W			
3,835.3	18.5	15	15	32	47				3,836.8 WEATHERED ROCK: Tan, Brown and Grey, Granitic Gneiss	17.0
3,830.3	23.5	35	65/0.3		100/0.8					
3,825.3	28.5	10	100/0.4		100/0.4					
3,821.3	32.5	64	36/0.3		100/0.8					
3,815.3	38.5	23	60/0.2		60/0.2					
		60/0.3			60/0.3				3,815.0 Boring Terminated at Elevation 3,815.0 ft	38.8

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga		**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1				**GROUND WTR (ft)**
BORING NO. 48+00	**STATION** 48+00	**OFFSET** 4ft RT	**ALIGNMENT** -L-	**0 HR.** 2.3
COLLAR ELEV. 3,849.8 ft	**TOTAL DEPTH** 23.8 ft	**NORTHING** 895,738	**EASTING** 1,165,202	**24 HR.** C.I.@ 5.7'
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual	
START DATE 07/31/07	**COMP. DATE** 07/31/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

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)
3850									3,849.8	0.0
3,848.8	1.0								ROADWAY EMBANKMENT FILL: Loose, Tannish Brown, Silty, Fine to Coarse SAND	
3,846.3	3.5	5	3	4	7				3,845.8	4.0
3,843.8	6.0	10	100		100/.5				WEATHERED ROCK: White, Tan and Brown Granitic Gneiss	5.5
3,841.3	8.5	34	28	36	64	SS-5	M		3,844.3 RESIDUAL: Very Dense; White, Tan and Brown; Silty; Fine to Coarse SAND with Trace Clay	
3,836.3	13.5	36	27	24	51		W			
3,831.3	18.5	49	51/0.3		100/0.8				3,837.8 WEATHERED ROCK: Tan, White and Brown, Granitic Gneiss	12.0
3,826.3	23.5	60/0.2			60/0.2					
		60/0.3			60/0.3				3,826.0 Boring Terminated at Elevation 3,826.0 ft	23.8

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34499.1.1	**ID.** R-2710	**COUNTY** Watauga	**GEOLOGIST** T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			**GROUND WTR (ft)**
BORING NO. 48+50	**STATION** 48+50	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** 5.0
COLLAR ELEV. 3,845.5 ft	**TOTAL DEPTH** 23.6 ft	**NORTHING** 895,767	**EASTING** 1,165,243	**24 HR** C.I.@14.8'
DRILL MACHINE Acker ADII	**DRILL METHOD** Wash Rotary		**HAMMER TYPE** 140 lb. Manual
START DATE 08/01/07	**COMP. DATE** 08/01/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 21.0 ft

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)
3850										
									3,845.5	0.0
3,844.5	1.0						M		RESIDUAL: Very Dense, White and Tan, Silty Coarse to Fine SAND	
3,842.0	3.5	19	30	46	76				3,842.5	3.0
3,839.5	6.0	40	55	45/0.4	100/0.9				WEATHERED ROCK: Tannish Brown, Granitic Gneiss	
3,837.0	8.5	40	57	43	100/1.0				3,837.5	8.0
3,832.0	13.5	14	22	30	52	SS-6	W		RESIDUAL: Very Dense; White, Tan and Brown; Variably Clayey, Silty, Fine to Coarse SAND	
3,827.0	18.5	4	28	36	64		W		3,828.5	17.0
		60/0.3			60/0.3				WEATHERED ROCK: Granitic Gneiss	
3,822.0	23.5	60/0.1			60/0.1				3,824.5	21.0
									CRYSTALLINE ROCK: Granitic Gneiss	
									3,821.9	23.6
									Boring Terminated at Elevation 3,821.9 ft	

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NC 194 Retaining Walls Investigation
NCDOT Project No. 34499.1.1
NCDOT TIP No. R-2710
Trigon Project No. 071-07-036

LOCATIONS FOR HAND DRILLED BORINGS AT SITE 1

Site	Station	Offset	Elev.	Northing	Easting	Depth of Overburden	Depth to Boulder	Boulder Thickness	Depth To Weathered Rock	Termination Depth (ft.)	**Notes
1	40+50	15' RT	3913.15	895102.86	1164848.81	10'				10	cobbly overburden/ full depth
1	40+75	16' RT	3911.77	895124.54	1164862.72	10'				10	cobbly overburden/ clay like material after 6'
1	41+00	15' RT	3910.06	895145.73	1164876.01	10'				10	clay like seam at 5.5'/ (1' thick)
1	41+25	15' RT	3907.56	895166.90	1164889.29	10'				10	cobbly overburden full depth
1	41+50	15' RT	3904.82	895188.04	1164902.55	10'				10	cobbly overburden full depth
1	41+75	15' RT	3905.74	895210.40	1164916.09	7.5'	7.5'	2'		10	hit 2' boulder at 7.5'
1	42+50	15' RT	*no stake*	895286.27	1164939.70	9'			9'	10	weathered rock at 9'
1	42+75	15' RT	3897.74	895310.44	1164944.72	7'			7'	10	good weathered rock at 7'
1	43+00	16' RT	3882.71	895335.04	1164949.83	5'	2'	2'	5'	10	good weathered rock at 5'
1	43+25	15' RT	3869.68	895359.46	1164954.90	6'			6'	10	good weathered rock at 6'
1	43+50	16' RT	3849.99	895383.94	1164959.99	6"			6"	10	good weathered rock full depth/ in creek bed
1	43+75	15' RT	3861.27	895407.82	1164965.16	7'			7'	10	hit clay like seam at 4' (2' thick)
1	44+00	15' RT	3871.48	895431.04	1164971.32	7'			7'	10	hit clay like seam at 6' (1.5' thick)
1	44+25	15' RT	3879.85	895454.48	1164978.81	10'				10	no rock/ clay seam at 9'
1	46+00	16' RT	3862.47	895601.36	1165061.18	10'				10	straight dirt full depth
1	46+25	16' RT	3850.81	895619.42	1165077.28	10'				10	straight dirt full depth
1	46+50	15' RT	3845.19	895637.33	1165093.67	9'			9'	10	weathered rock at 9'
1	46+75	16' RT	3848.76	895653.77	1165111.73	8'			8'	10	no boulders/ competent dirt before rock

State Project No. 34499.1.1
TIP No. R-2710 F.A. No. STP-194(4)
NC 194 from Banner Elk in Avery County to Valle Crucis in Watauga County
Site 1: Three Retaining Walls from -L- Stations 40+50 to 48+50
Watauga County, North Carolina
SUMMARY OF LABORATORY TEST DATA

						Atterberg Limits			Gradation Results							
Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
42+00	1.0-2.5	SS-1	-	A-1-b (0)	79	25	NP	NP	55	26	15	88	59	18	19	4
44+40	6.0-7.5	SS-2	-	A-2-4 (0)	84	27	NP	NP	99	63	25	79	47	32	13	8
47+00	1.0-2.5	SS-3	22.6	A-4 (0)	5	26	21	5	97	74	49	55	29	25	25	21
47+50	1.0-2.5	SS-4	22.6	A-4 (2)	16	24	16	8	95	81	59	43	20	21	29	30
48+00	6.0-7.5	SS-5	-	A-2-4 (0)	74	27	NP	NP	90	54	26	77	50	24	16	10
48+50	8.5-10.0	SS-6	-	A-2-4 (0	52	25	NP	NP	98	65	29	75	46	29	13	12

* SS = Split-Barrel Sample (ASTM-D-1586)
** G = Grab Sample
***ST=Shelby Tube (Undisturbed) Sample
NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-07-036
Page: 1 of 1

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Sites 1: Three Retaining Walls from -L- Sta. 40+50 to 48+50
Watauga County, North Carolina
Page 1 of 2

Photograph 1 – View Along Retaining Wall 1, Site 1 Looking Upstation

Photograph 2 – View Along Retaining Wall 2, Site 1 Looking Upstation

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Sites 1: Three Retaining Walls from -L- Sta. 40+50 to 48+50
Watauga County, North Carolina
Page 2 of 2

Photograph 3 – View Along Retaining Wall 3, Site 1 Looking Upstation