NOTE: SEE SHEET 1A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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-L-	10+00 TO 15+25	4		5,6
-Y1-	11+47 TO 23+50	4		7-11

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

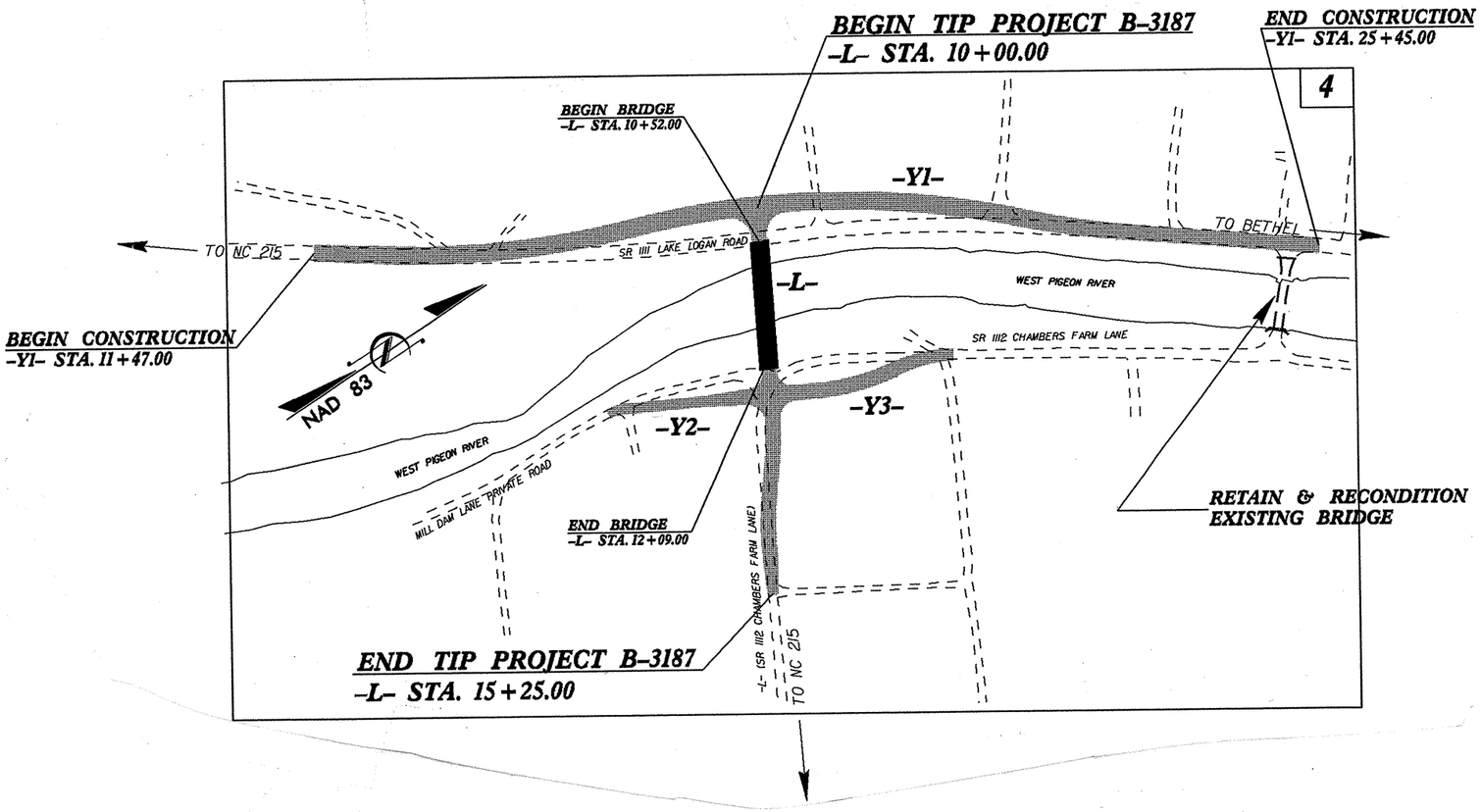
ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 32919.1.1 F.A. PROJ. BRZ-1112(2)

COUNTY HAYWOOD

PROJECT DESCRIPTION BRIDGE NO. 79 ON SR-1112 OVER WEST FORK PIGEON RIVER

INVENTORY



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3187	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
32919.1.1	BRZ-1112(2)	PE
32919.2.1	BRZ-1112(2)	R/W AND UTILITIES
32919.3.1	BRZ-1112(2)	CONST.

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CHECKED BY W.D. FRYE, JR.

SUBMITTED BY W.D. FRYE, JR.

DATE 10/19/2007

NORTH CAROLINA LICENSED SEAL 2049 GEOLOGIST MICHAEL McCLAIN HAGER

DRAWN BY: M.M. HAGER

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ID: B-3187

CONTRACT: C202323

PROJECT REFERENCE NO.	SHEET NO.
32919.1.1 (B-3187)	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, BRN, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [X] 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:
ELEVATIONS DERIVED FROM PROVIDED CROSS SECTIONS.

REVISED 02/23/06

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

October 19, 2007

STATE PROJECT: 32919.1.1
FA PROJECT: BRZ-1112 (2)
COUNTY: HAYYWOOD

DESCRIPTION: Approaches to Bridge No. 79 on SR-1112 over WEST FORK PIGEON RIVER

SUBJECT: Geotechnical Report- Inventory

PROJECT DESCRIPTION

This project is located in southern Haywood Co., approximately 5 miles south of Canton, NC. An appended field investigation was performed between late August and early September of 2007 utilizing a CME-550 powered drill rig equipped with 8" Hollow Stem Augers, steel sounding rods (bridge rods), and field mapping techniques. To facilitate the replacement of Bridge No. 79, realignment of SR roads 1111 (Lake Logan Rd.) and 1112 (Chambers Farm Ln.) were investigated. The project length along -L- is approximately 0.1 miles. The majority of the field investigation focused on the realignment of Line -Y1- which is approximately 0.3 miles in length.

The following survey lines were investigated:

Line -L-	Station 10+00 to Station 15+25
Line -Y1-	Station 11+47 to Station 23+50

AREAS OF SPECIAL GEOTECHNICAL INTEREST

1. The following area was found to contain rock above or within 6 feet below proposed grade.

Line	Station	Offset
-Y1-	13+00 to 13+50	24ft to 50ft LT
-Y1-	13+50 to 13+70	10ft to 70ft LT

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

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

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

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC

PHYSIOGROPHY AND GEOLOGY

Geologically, the project area is located within basement gneiss, containing rocks consisting of highly migmatized and deformed biotite-gneiss and amphibolite-gneiss.

The project corridor is flat to moderately precipitous as it borders the western edge and crosses the expansive flood plain of the West Fork of the Pigeon River. Agricultural fields in the flood plain dominate land use in the vicinity of the project. An abandoned logging railroad borders the project along Lake Logan Rd from the beginning of the project along Line -Y1-

Bordering the floodplain on the western margin of the West Fork of the Pigeon River is a discontinuous, massive exposure of biotite-gneiss. Intermittent exposure of bedrock and several feet of bouldery colluvial soil define slopes in this region.

Overall surface drainage within the project corridor appears to be acceptable although the area is subject to flooding by the Pigeon River as reported by a local property owner.

SOIL PROPERTIES

Soils encountered within the project area consist of fill, alluvium associated with the West Fork of the Pigeon River, and saprolitic soils weathered from local basement rock.

Located along Line -Y1-, bordering the existing alignment of Lake Logan Rd. to the west, an abandoned railroad bed composed of medium dense boulders, cobbles, and gravels and infilled with silty fine to coarse sand dominates the landscape (A1). This unit is generally shallow, usually not persisting to depths greater than 5'. The origin of the fill material is evidently alluvial in nature and was probably mined locally.

Typical alluvial soils encountered on this project are dominated by sands with intermittent cobbles and boulders (A2) grading downward into a basal unit consisting primarily of well rounded boulders, cobbles, and gravels infilled with fine to coarse sand (A1). Density values range throughout this unit from medium dense to very dense.

Saprolitic soils found within the project are composed mainly of silty fine to coarse sand (A2) and are derivative of gneissic bedrock. These soils tend to range in density from loose to very dense, usually increasing density with depth. Intermittent lenses of weathered rock were found to occur within the unit as ledges.

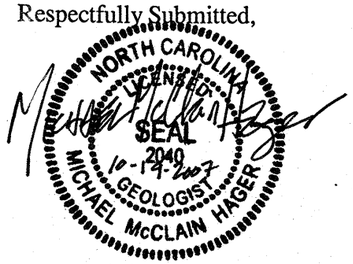
ROCK PROPERTIES

No rock core was retrieved during the field investigation process for this project. A site walk around performed by staff geologists during the investigation period revealed the presence of several rock outcrops of biotite-gneiss that appears intensely folded and discontinuous with no preferred foliation orientation.

GROUNDWATER

Groundwater elevations across the site are varying dependent upon depth to rock and land use. Along Line -Y1- groundwater is found to occur at an average elevation of 2665'. Along Line -L- groundwater was found to occur at an elevation of 2678'. No seeps or springs were located along the project corridor. Residential dwellings located along the project are on well water.

Respectfully Submitted,



Michael McClain Hager, LG

EARTHWORK BALANCE SHEET

Volumes in Cubic Yards

PROJECT **TIP #** B-3187 COUNTY Haywood DATE 11/15/10 Rock Swell 25% SHEET__ OF __ SHEETS

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT EXCAV.	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 15%	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
-L-	10+11.25	10+52	0				0	48			48	55	55			
-Y1-	11+47	23+50	2178	422			1756	864	422		336	808	0	1370		1370
		Subtotal	2178	422			1756	912	422		384	863	55	1370		1370
-L-	12+09.00	15+25	221				221	426			426	490	269			
-Y2-	10+00	12+12.93	188				188	132			132	152	0	36		36
-Y3-	10+09.45	12+53.00	196				196	167			167	192	0	4		4
		Subtotal	605				605	725			725	834	269	40		40
													0			
PROJECT SUBTOTAL			2783	422			2361	1637	422		1109	1697	324	1410		1410
													0			
													0			
LOSS DUE TO CLEARING & GRUBBING			-75				-75							-75		-75
WASTE IN LIEU OF BORROW													-324	-324		-324
PROJECT TOTAL			2708	422	0	0	2286	1637	422	0	1109	1697	0	1011		1011
GRAND TOTAL			2708	422			2286	1637	422		1109	1697		1011		1011
SAY			2750													
SHALLOW **DDE= 6 CY**																
~~Contingency~~ Undercut					100											

*** EARTHWORK QUANTITIES ARE CALCULATED BY THE ROADWAY DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.**

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-3187	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

NAD 83

15

20

B-1 12+47 26' LT
B-2 13+00 25' LT
B-3 17+50 18' RT
B-4 16+00 25' LT
B-5 12+15 ℄
RS-1 13+00 9' LT
RS-2 13+00 47' LT
RS-3 13+00 54' LT
RS-4 13+50 12' LT
RS-5 13+50 56' LT
RS-6 13+50 59' LT
RS-7 13+50 69' LT

OUTCROP

BM #6
-BYI- STA 7+56.99
18.43' RIGHT
ELEV. 2685.90'
-YI- STA. 11+40.39
30.72' RT.

BM #2
-BL- STA 13+37.81
6.75' LEFT
ELEV. 2689.51'
-L- STA. 13+06.99
7.04' LT.

-L- STA 10+00=
-YI- STA 11+51.35

-L- STA 12+55.26=
-Y2- STA 12+21.44=
-Y3- STA 10+00

-Y3- STA 12+53

BM #3
-BL- STA 20+38.23
46.23' RIGHT
ELEV. 2683.14'

BM #1
-BL- STA 7+84.90
28.38' LEFT
ELEV. 2687.66'
-YI- STA 15+31.08
770.01' RT

USGS MON
"CASING-STATION"
ELEV. 2672.91' (DOT)

WEST PIGEON RIVER

MILL DAM LANE PRIVATE ROAD 11' GR

SR 119 CHAMBERS FARM LANE 11' GR

PRIVATE ROAD FIELD VIEW WAY 15' GR

STOCTON LANE

ISBKD

ISFBUS

ISFD

SEPTIC

DRAIN FIELD

VINEYARD

HTR

WD DECK

VENTCAP

WOODS

CULTIVATED FIELD

8' SOIL

10' SOIL

7' SOIL

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8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-3187	5

2:1 4:1

4:1 2:1

2688.89
10+47.65

2:1 4:1

4:1 2:1

2689.22
10+25.00

B-3
10-18
℄

ALLUVIUM: 38 — DENSE TO VERY DENSE, YELLOW SILTY FINE SAND WITH INTERMITTENT ROUNDED PEBBLES AND COBBLES

66

3

SAPROLITE: 12 — VERY LOOSE TO MEDIUM DENSE, SILTY FINE TO COARSE SAND WITH TRACE MICA.

23

09/07

100/0.9

WEATHERED ROCK: 100/0.3 — (GNEISS)

43

SAPROLITE: — DENSE, SILTY FINE TO COARSE SAND WITH TRACE MICA.

B.T.
10+13.00

—1—

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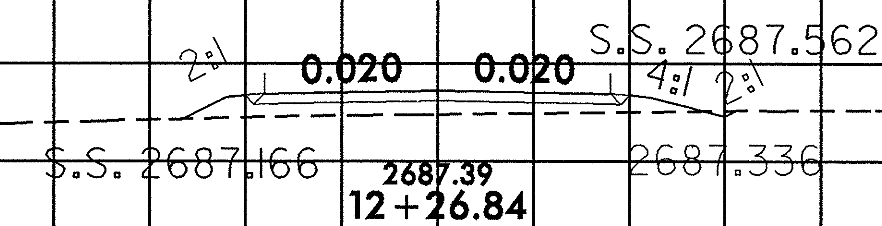


Ⓐ **EMBANKMENT:** *LOOSE TO DENSE, ANGULAR GRAVELS WITH SILTY FINE TO COARSE SAND*

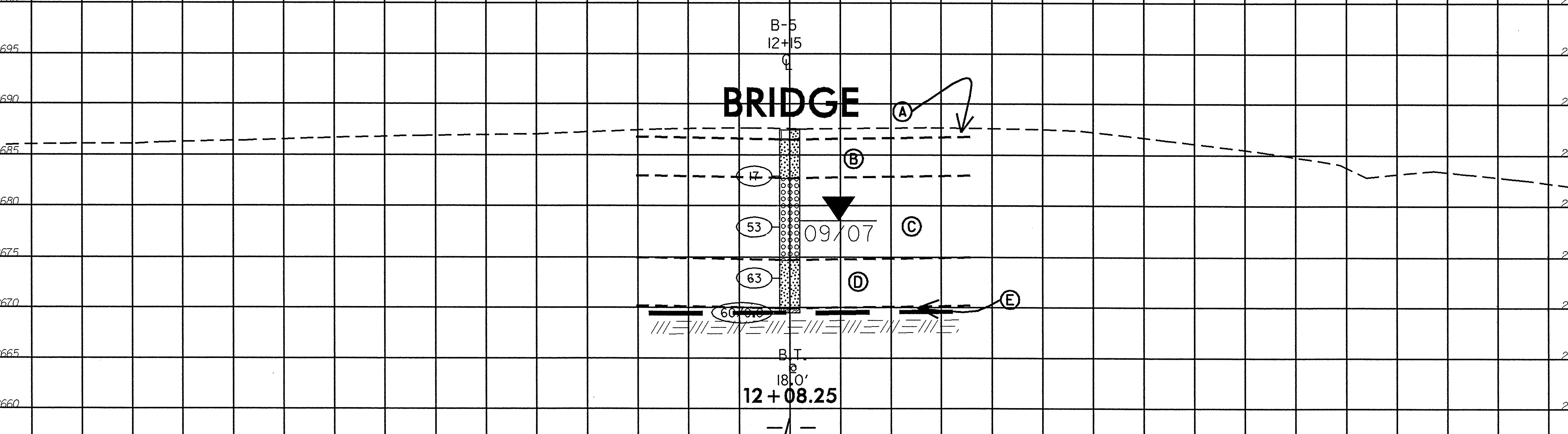
Ⓑ **ALLUVIUM:** *MEDIUM DENSE, TAN TO YELLOW, FINE SANDY SILT*

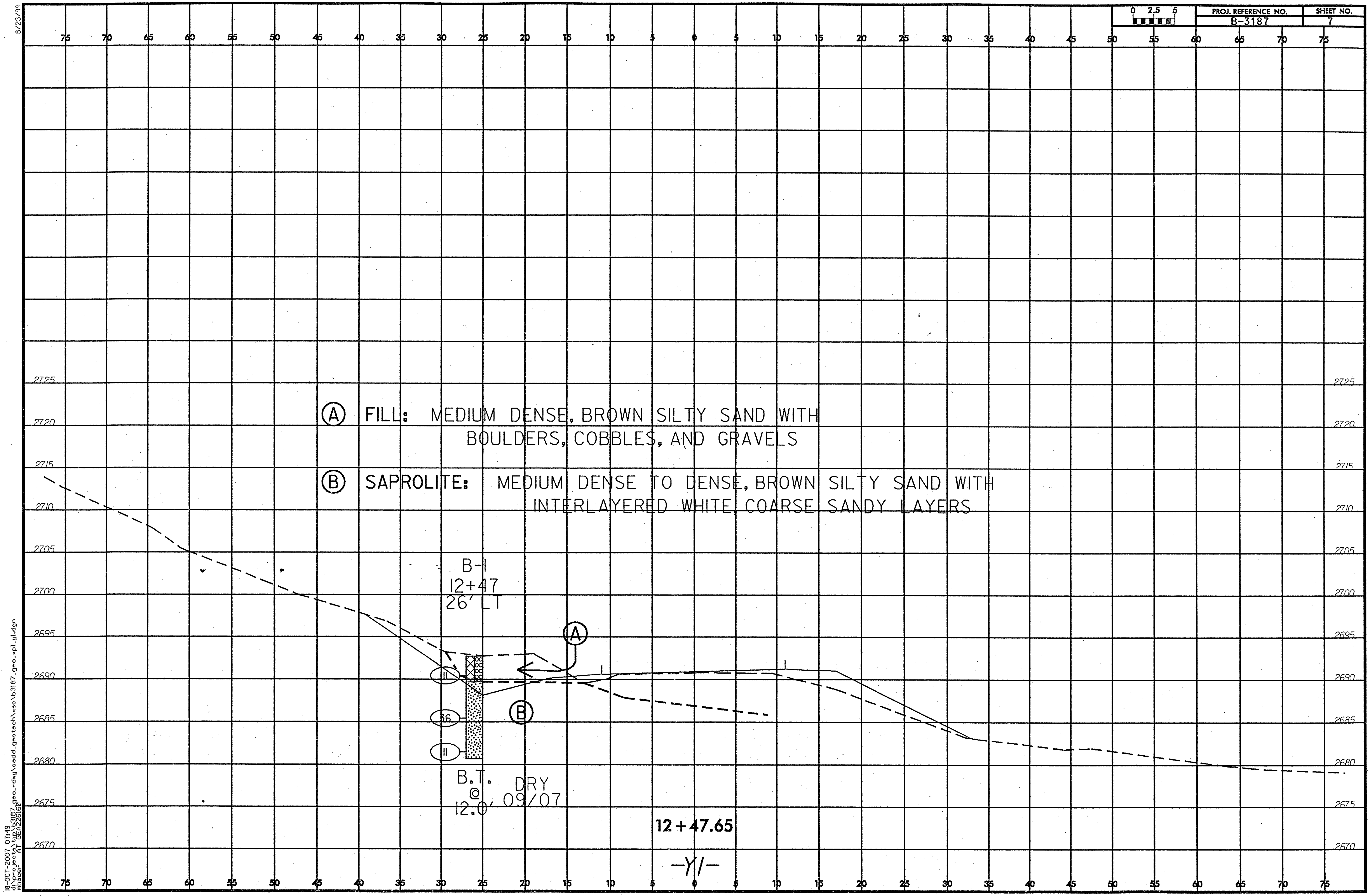
Ⓒ **ALLUVIUM:** *TAN TO YELLOW, MEDIUM DENSE TO VERY DENSE, ROUNDE PEBBLES, COBBLES, AND BOULDERS INFILLED WITH SILTY FINE TO COARSE SAND*

Ⓓ **SAPROLITE:** *GRAY, VERY DENSE SILTY FINE TO COARSE SAND WITH RELIC ROCK FABRIC*

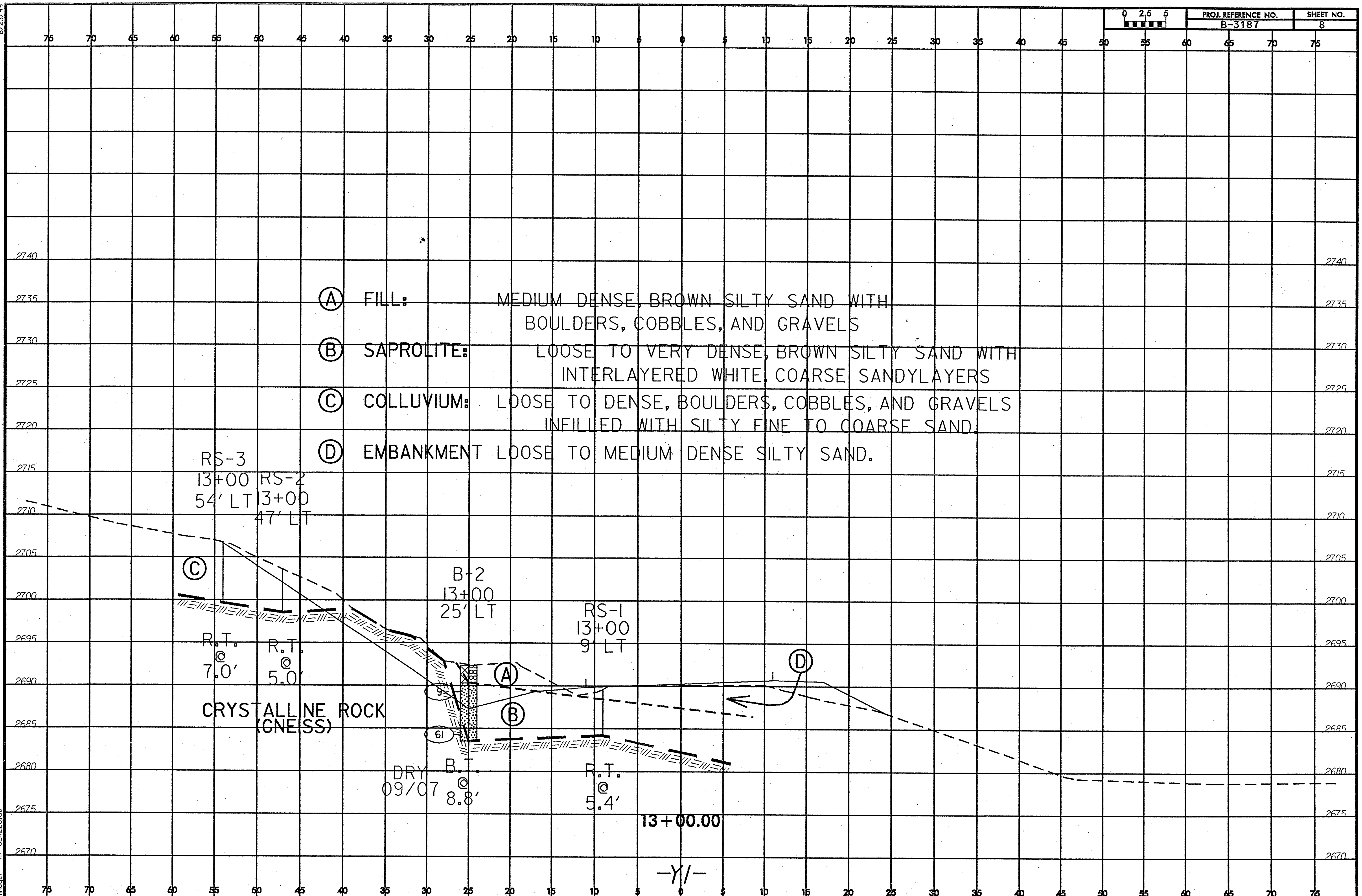
Ⓔ **WEATHERED ROCK:** *(GNEISS)*

Ⓕ **CRYSTALLINE ROCK:** *(GNEISS)*




PROJ. REFERENCE NO.
B-3187
SHEET NO.
7
Ⓐ FILL: MEDIUM DENSE, BROWN SILTY SAND WITH BOULDERS, COBBLES, AND GRAVELS
Ⓑ SAPROLITE: MEDIUM DENSE TO DENSE, BROWN SILTY SAND WITH INTERLAYERED WHITE, COARSE SANDY LAYERS
B-1
12+47
26' LT
B.T.
@
12.0'
DRY
09/07
12+47.65
-Y1-
8/23/99

PROJ. REFERENCE NO.	SHEET NO.
B-3187	8



0 2.5 5
(A) FILL: MEDIUM DENSE, BROWN SILTY SAND WITH BOULDERS, COBBLES, AND GRAVELS
(B) SAPROLITE: LOOSE TO VERY DENSE, BROWN SILTY SAND WITH INTERLAYERED WHITE, COARSE SANDYLAYERS
(C) COLLUVIUM: LOOSE TO DENSE, BOULDERS, COBBLES, AND GRAVELS INFILLED WITH SILTY FINE TO COARSE SAND.
(D) EMBANKMENT LOOSE TO MEDIUM DENSE SILTY SAND.
RS-3 13+00 54' LT
RS-2 13+00 47' LT
B-2 13+00 25' LT
RS-1 13+00 9' LT
R.T. @ 7.0'
R.T. @ 5.0'
CRYSTALLINE ROCK (GNEISS)
DRY 09/07
B.T. @ 8.8'
R.T. @ 5.4'
9
61
13+00.00
-Y1-

8/23/99

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	B-3187	9

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

2750 2745 2740 2735 2730 2725 2720 2715 2710 2705 2700 2695 2690 2685 2680 2675

Ⓐ COLLUVIUM: LOOSE TO DENSE, BOULDERS, COBBLES, AND GRAVELS INFILLED WITH SILTY FINE TO COARSE SAND.

Ⓑ FILL: MEDIUM DENSE, BROWN SILTY SAND WITH BOULDERS, COBBLES, AND GRAVELS

Ⓒ EMBANKMENT LOOSE TO MEDIUM DENSE SILTY SAND.

Ⓓ SAPROLITE: LOOSE TO VERY DENSE, BROWN SILTY SAND WITH INTERLAYERED WHITE, COARSE SANDY LAYERS

RS-7
13+50
69' LT

RS-6
3+50
59' LT

RS-5
13+50
56' LT

RS-4
13+50
12' LT

Ⓐ

R.T. @ 3.0'

R.T. @ 3.0

R.T. @ 1.5'

CRYSTALLINE ROCK (GNEISS)

Ⓑ

Ⓒ

Ⓓ

R.T. @ 3.2'

13+50.00
-Y/-

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dlange

PROJ. REFERENCE NO.	SHEET NO.
B-3187	10

0 2.5 5

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

2700 2695 2690 2685 2680 2675 2720 2715 2710 2705 2700 2695 2690 2685 2680 2675 2670

2690.35

16+50.00

Ⓐ ALLUVIUM: DENSE, SILTY FINE SAND WITH MINOR INTERMITTENT ROUNDED TO SUB ANGULAR PEBBLES AND COBBLES

Ⓑ ALLUVIUM: DENSE, ROUNDED COBBLES, BOULDERS, AND PEBBLES INFILLED WITH SILTY FINE TO COARSE SAND

B-4
16+00
25' LT

Ⓐ

42

35

B.T. @ 10.1' DRY 09/07

16+00.00

-Y/-

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-3187	11

Ⓐ SAPROLITE: VERY LOOSE TO DENSE, SILTY FINE TO COARSE SAND WITH TRACE MI

Ⓑ WEATHERED ROCK GNEISS

B-3
17+50
18' RT

2690.48

ALLUVIUM: DENSE TO VERY DENSE, YELLOW SILTY FINE SAND WITH ROUNDED PEBBLES AND COBBLES

38
66
3
12 Ⓐ
23
09/07
100/0.9 Ⓑ
100/0.3
43 Ⓐ

17+50.00

-Y1-

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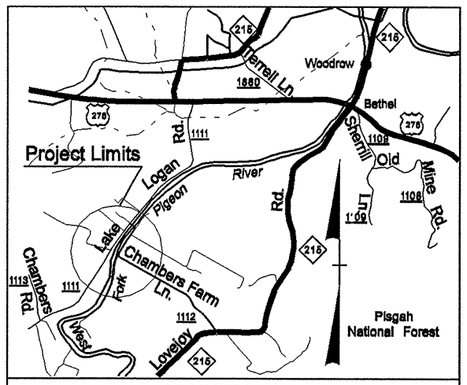
mhager 41 GE4226160

09/08/99

TIP PROJECT: B-3187

CONTRACT:

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional symbols



VICINITY MAP

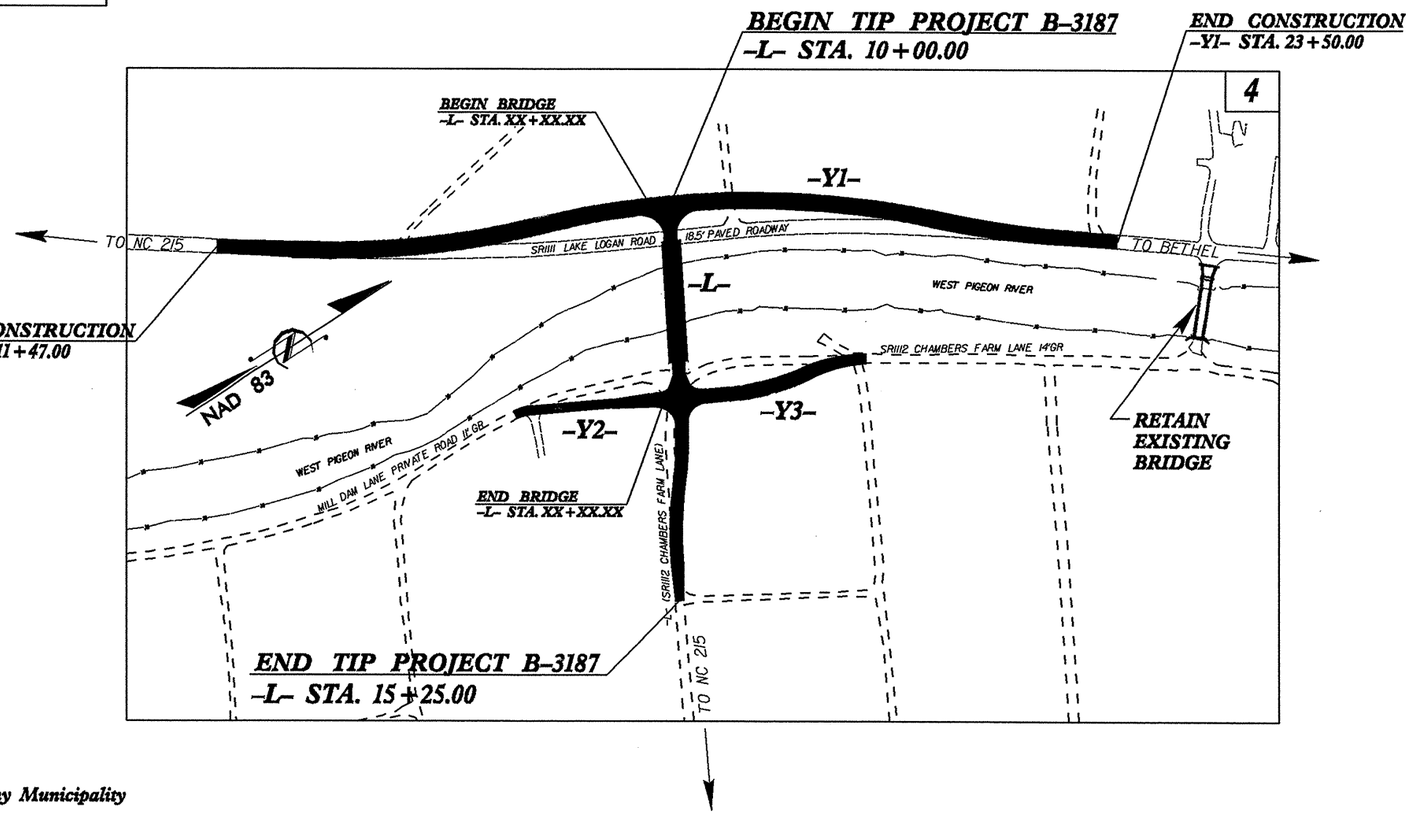
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HAYWOOD COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3187	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
32919.1.1	BRZ-1112(2)	PE	

LOCATION: *Bridge #79 on SR 1112 (Chambers Farm Lane) over West Fork Pigeon River*

TYPE OF WORK: *Grading, Drainage, Paving & Structure*



This Project is Not Within the Limits of any Municipality

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

PLANS 50 25 0 50 100

PROFILE (HORIZONTAL) 50 25 0 50 100

PROFILE (VERTICAL) 10 5 0 10 20

DESIGN DATA

ADT 2007 = 175 VPD
ADT 2030 = 425 VPD
DHV = 10 %
D = 60 %
T = 4 % *
V = 25 MPH

* TTST 1% DUAL 3%

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-3187 =
LENGTH STRUCTURE TIP PROJECT B-3187 =
TOTAL LENGTH TIP PROJECT B-3187 = 0.099 Miles

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: June 20, 2008

LETTING DATE: June 16, 2009

JAMES SPEER, PE
PROJECT ENGINEER

JOHN LANSFORD, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.
STATE HIGHWAY DESIGN ENGINEER

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mhogan AT DEA226160