ID: B-3635

CONTRACT: C202038

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3635	1	8

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
33183.1.1	BRSTP-1505(1)	P.E.
33183.2.1	BRSTP-1505(1)	R/W & UTILITIES
33183.3.1	BRSTP-1505(1)	CONST.

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33183.1.1 F.A. PROJ. BRSTP-1505(1)

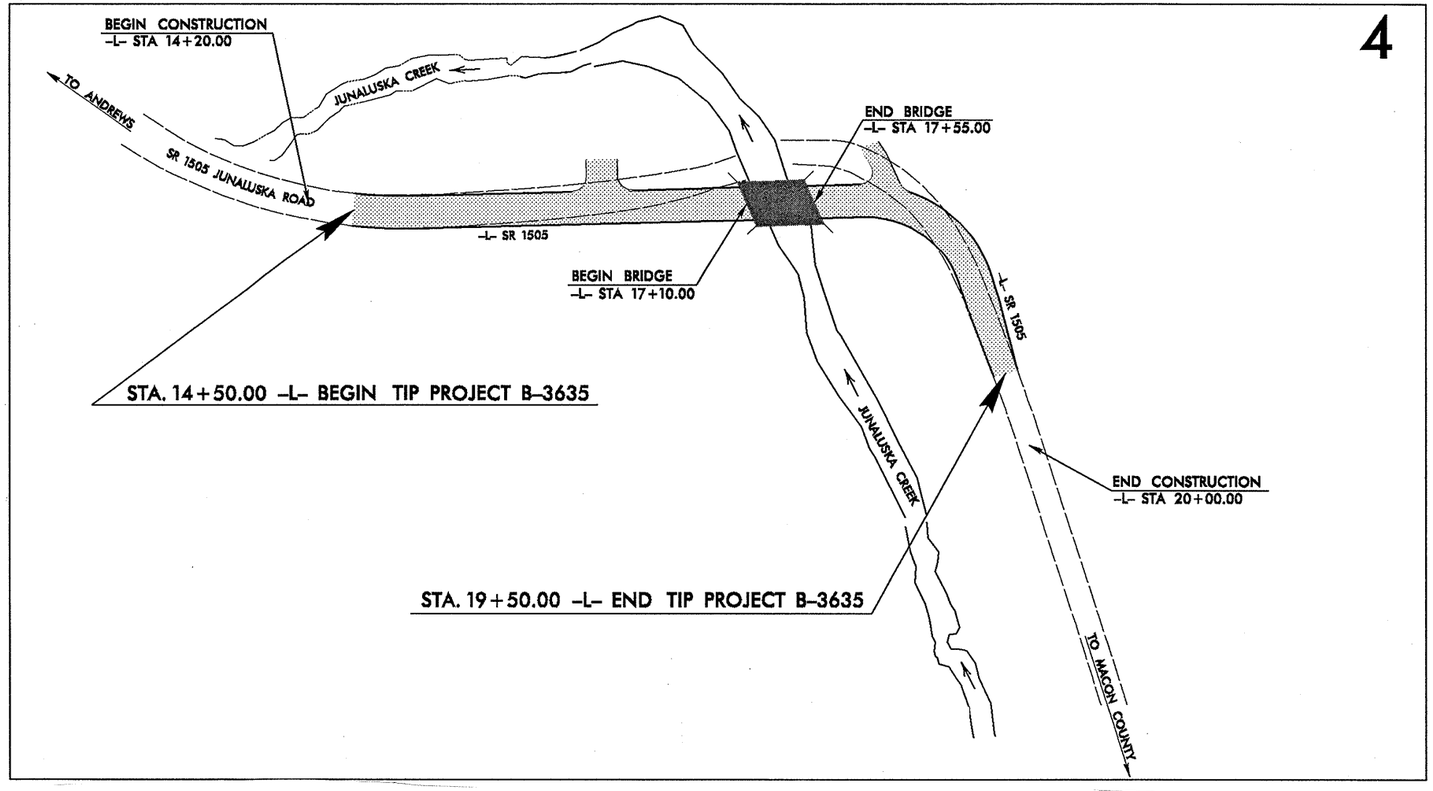
COUNTY CHEROKEE

PROJECT DESCRIPTION APPROACHES TO BRIDGE NO. 26 OVER JUNALUSKA CREEK ON SR 1505 (JUNALUSKA ROAD)

INVENTORY

CONTENTS

LINE	STATION	SHEET NUMBERS EARTHWORK SHEET	PLAN	XSECT
-L-	14+20.00 to 20+00.00	3	4	5-7



4

NAD 83

CAUTION NOTICE

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

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

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

PERSONNEL

D.P. MURPHY

D.O. CHEEK

G.K. ROSE

C.J. COFFEY

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 3/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

DRAWN BY: J.T. WILLIAMS

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

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

PROJECT REFERENCE NO.	SHEET NO.
B-3635	2 of 8

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL 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
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
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
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
- [ ] OTHER _____
- [ ] OTHER _____

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

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

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT 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 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: XXX
XXX
XXX ELEVATION: XXX FT.

NOTES:

REVISED 03/07/05

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

March 6, 2006

STATE PROJECT: 33183.1.1
TIP NO: B-3635
COUNTY: Cherokee
DESCRIPTION: Approaches to Bridge No. 26 on SR 1505 over Junaluska Creek

SUBJECT: Geotechnical Report – Inventory

Site Description

This project is located in eastern Cherokee County, approximately 2 miles east of the city of Andrews. Junaluska Creek is a major tributary in the headwaters of Valley River. It is a bold, mountain stream in a channel 20 to 30 feet wide, with a shallow bed of gravel and boulders and intermittent exposures of bedrock. SR 1505 closely follows the creek on a sinuous track below steep, forested slopes. Small house sites lie close beside the road or on excavated benches low on the slopes.

Plans call for construction of a replacement bridge and its approaches on new alignment -L- upstream of the existing bridge. Construction is to begin at Station 14+20 and end at Station 20+00. Construction activities and their approximate locations on -L- are as follows:

Station 14+20 to 17+00, Left Side – fill of 3 feet or less
Station 15+50 to 17+00, Right Side – cut 10 feet or less, cut slope 20 feet high
Station 17+10 to 17+55 – bridge
Station 1755 to 20+00 – cuts of 5 feet or less, fills 2 feet or less

The Geotechnical Engineering Unit conducted a subsurface investigation in February, 2004, on an alignment now abandoned in favor of the present -L-. Four borings were made using a CME 45 power drilling machine. The borings were advanced through surficial materials with an NX casing advancer, and Standard Penetration Tests were performed at regular intervals. Soil samples were submitted to a DOT laboratory for quality testing. Rock was cored at two borings with NXWL coring equipment. Subsurface information was supplemented with observations of rock outcrops and soil cuts at the site.

Items of Special Geotechnical Interest

Hard Rock in Cut

Hard rock will be encountered in a proposed cut on the Right Side between Stations 15+50 and 17+00.

Acid Rock

The bedrock at this site is part of the Nantahala Formation, a rock unit known to be acidic. The lithology at the site is dark gray, mica phyllite containing graphite and abundant visible iron pyrite. Tests of Net Neutralization Potential (NNP) have confirmed the acidic nature of the lithology at this site.

Soil and Rock Materials

Alluvial floodplain gravel, alluvial terrace sediments, colluvium, and hard rock are the principal materials encountered on this project. Small amounts of saprolite and weathered rock are present also.

Alluvial sediment on the floodplain consists of loose, coarse, sandy gravel, cobbles, and boulders in a bed approximately 4 to 8 feet thick overlying weathered or fresh rock.

Alluvial terrace sediments are found on a natural bench 10 feet to more than 20 feet above the floodplain, on the Right Side, back station from the stream crossing. The terrace sediments comprise deeply weathered soils in two layers – an upper, soft, red, sandy clay (A-7-6) with a liquid limit of 44 and a plastic index of 19; and a basal, loose, yellow, silty, sandy gravel (A-1-b).

A very thin layer of hard, silty saprolite (A-4) was found below the terrace gravel.

Colluvial soil lies along the base of the slope on the Left Side of the existing road up station from the stream crossing, where it will be encountered in cuts from there to near the end of the project. The colluvium is a very loose, very micaceous mixture of platy rock fragments in all sizes from silt and sand to cobbles and small boulders.

The bedrock lithology is dark gray, mica phyllite containing graphite and pyrite. The fresh rock is only moderately hard due to its very high mica content. A very well developed platy cleavage, which dips moderately to the east, allows the rock to break

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL 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
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

easily into platy or tabular pieces. Visual inspection of the rock indicates a high concentration of iron sulfide, an indicator of acid rock. A composite sample from one of the core borings has been submitted for tests of Net Neutralization Potential, and the acidic nature of the rock has been confirmed.

Geotechnical Descriptive Analysis

Stations 14+20 to 17+10

A cut is to be constructed on the Right Side of this segment. The maximum depth of cut at the ditch line will be approximately 10 feet, and the exposed cut face will be about 20 feet high, depending on the angle of the cut. Fresh rock crops out on the natural slope in the cut area. A boring on the Right Side of Station 16+77 found fresh rock at a depth of 11.9 feet, with a thin cap of hard saprolite and weathered rock, overlain by 10 feet of weathered alluvial terrace sediments. The terrace sediments comprise about 5 feet of soft, sandy clay (A-7-6) and 5 feet of very silty, coarse sand and gravel (A-1-b). A cut at this site will encounter the alluvial terrace soils in the upper 5 to 10 feet overlying hard rock and weathered rock. The rock will be acidic.

Stations 17+10 to 17+55

The replacement bridge is to be constructed in this interval.

Station 17+55 to 18+00

Plans call for a few feet of embankment to be placed over the floodplain in this segment. Borings on the floodplain indicate 5 to 8 feet of coarse, bouldery alluvium overlies weathered to fresh rock.

Station 18+00 to 20+00

A cut of 5 feet or less on the Left Side is called for in this segment of the project. Soil material at the site was inspected in a low cut beside the existing ditchline. It consisted of colluvium composed of loose, platy rock fragments in a very micaceous, sandy matrix.

Respectfully submitted,

Louis L. Acker, LG

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
B-3635	3B / 8

EARTHWORK BALANCE SHEET

IN CUBIC YARDS

TIP NO.	B-3635								DATE:		19-Jul-05							
COUNTY:	CHEROKEE																	
CALCULATED BY:	DWG								SHRINKAGE FACTOR:		15%			IN CUBIC YARDS				
CHECKED BY:	PJS 2/21/08																	

LINE	STATION	TO	STATION	TOTAL EXCAV. (UNCL)	ROCK EXCAV.	UNDERCUT EXCAV.	UNSUIT EXCAV.	SUITABLE EXCAV.	TOTAL EMBANK.	ROCK EMBANK.	UNDERCUT EXCAV.	EARTH EMBANK.	EMBANK. +15%	BORROW	ROCK WASTE	SUIT. WASTE	UNSUIT. WASTE	TOTAL WASTE
B-3635																		
SUMMARY NO. 1																		
-L-	14+50.00		17+10.00 (BB)	534	37			497	297			297	342		37	155	37	192
TOTAL SUMMARY NO. 1				534	37			497	297			297	342		37	155	37	192
SUMMARY NO. 2																		
-L-	17+55.00 (EB)		20+00.00	224				224	133			133	153			71		71
TOTAL SUMMARY NO. 2				224				224	133			133	153			71		71
SUMMARY TOTALS				758	37			721	430			430	495		37	226	37	263
LOSS DUE TO C & G				-100				-100								-100		-100
SUB-TOTALS				**658**	**37**			**621**	**430**			**430**	**495**	**-**	**37**	**126**	**37**	**163**
Rock Excavation x1.25															9		9	9
Rock Excavation x1.15															7		7	7
PROJECT B-3635 GRAND TOTAL				**658**	**37**			**621**	**430**			**430**	**495**	**-**	**53**	**126**	**53**	**179**
SAY				**700**														

DDE = 40 CY
UNDERCUT EXCAVATION = 500 CY
SELECT MATERIAL, CLASS IV = 600 TON
SELECT GRANULAR MATERIAL = 500 CY
FABRIC FOR SOIL STABILIZATION = 500 SY

NOTE: 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.

22-SEP-2008 lw2
F:\Projects\3635\sum
$$$$$ISERNAME$$$$

STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
33183.3.1 B-3635	4	8

PLAN VIEW

BEGIN CONSTRUCTION B-3635
-L- STA. 14+20.00

15

18

EXISTING BRIDGE

F

F

ALLUVIUM

F

C

C

ALLUVIUM

COLLUVIUM

SR 1505 JUNALUSKA RD

B-5

B-1

C

16

C

F

C

19

17

BEGIN STATE PROJECT B-3635
-L- STA 14+50.00

C

C

B-3

ROCK OUTCROPS

B-2

C

ALLUVIUM

18

COLLUVIUM

C

B-3635
END CONSTRUCTION
-L- STA. 20+00.00

B-4

JUNALUSKA CREEK

NAD 83

2004 ALIGNMENT

19

END STATE PROJECT B-3635
-L- STA 19+50.00

B-1

ALLUVIUM : BROWN SILTY SAND, GRAVELS, COBBLES AND BOULDERS

02/11/04

18

WEATHERED ROCK

100+

MOD. HARD, FRESH PHYLLITE

REC = 100%
RQD = 100%

17+00.00

ALLUVIUM AND COLLUVIUM

ALLUVIAL TERRACE

B-3
-L- STA. 16+77.00 63' RT

12

WEATHERED ROCK

100+

16+50.00

-L-

Ⓐ ALLUVIAL TERRACE : RED, SOFT, SANDY CLAY
Ⓑ ALLUVIAL TERRACE : YELLOW SANDY SILTWITH GRAVEL, COBBLES AND BOULDERS
Ⓒ SAPROLITE - DARK GRAY SILT WITH WEATHERED ROCK SEAMS
Ⓓ WEATHERED ROCK
Ⓔ HARD ROCK

PROJ. REFERENCE NO.	SHEET NO.
B-3635	6 of 8

B-2
-L- STA. 17+83.00 77 RT

Ⓐ ALLUVIUM : BROWN SILTY SAND, GRAVELS, COBBLES AND BOULDERS

02/11/04
100+

MOD. HARD, FRESH PHYLLITE
REC = 96%
RQD = 77%

18+00.00
-L-

B-5

ALLUVIUM : BOULDERS, COBBLES AND PEBBLES INFILLED W/BRN FN TO CSE SDY SILT

ALLUVIUM : BROWN TO GRAY, SLI CSE SDY, SILTY CLAY W/PEBBLES AND ROCK FRAGMENTS AND INTERGRATED SILTY SAND

ALLUVIUM : BOULDERS, COBBLES AND PEBBLES INFILLED W/BRN FN TO CSE SDY SILT

SAPROLITE : W/ZONES OF WEATHERED ROCK

HARD ROCK : GRAY GRAPHITIC PHYLLITE
REC = 92.55
RQD = 67.5%

REC = 98.3%
RQD = 88.3%

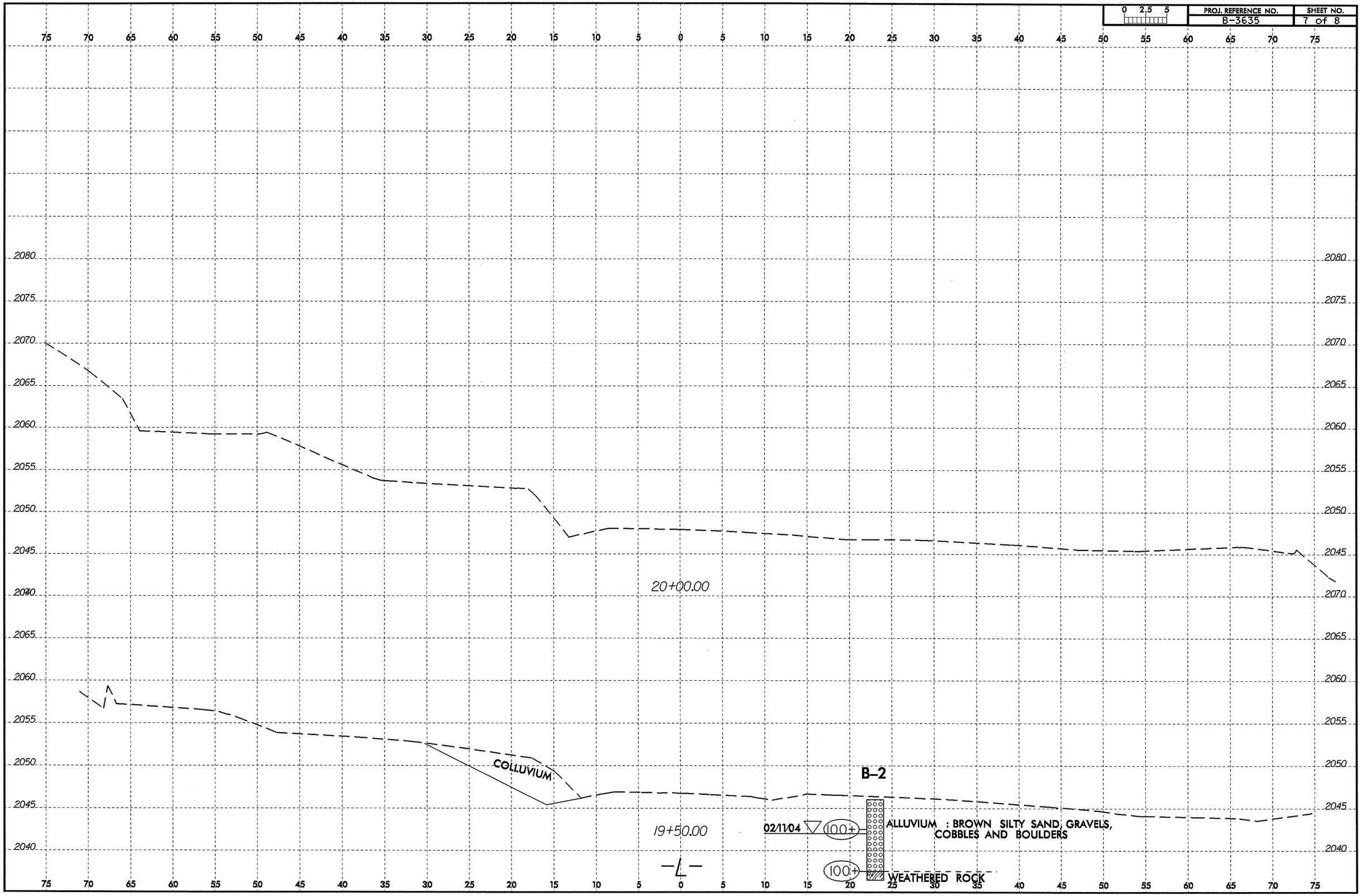
17+50.00
-L-

REC = 100%
RQD = 82%

2055
2050
2045
2040
2035

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

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-3635	7 of 8



M&T 503E

JJL

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

T.I.P. ID #:	

REPORT ON SAMPLES OF:	Soil for Classification

PROJECT:	--	COUNTY:	Cherokee	Owner:	--
DATE SAMPLED:	2-19-04	DATE RECEIVED:	2-20-04	DATE REPORTED:	3-5-04
SAMPLED FROM:	Rdwy –L-	SAMPLED BY:	L L Acker		
SUBMITTED BY:	W D Frye		2002	STANDARD SPECIFICATION	
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	S-2							
Lab Sample No.	A-144490							
HiCAMS Sample #	--							
Retained #4 Sieve %	--							
Passing #10 Sieve %	99							
Passing #40 Sieve %	96							
Passing #200 Sieve %	79							

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	6							
Fine Sand - Ret. #270	20							
Silt 0.05-0.005 mm %	22							
Clay < 0.005 mm %	52							
Passing # 40 Sieve %	--							
Passing # 200 Sieve %	--							

Liquid Limit	44							
Plastic Index	19							
AASHTO Classification	A-7-6 (12)							
Quantity								
Texture								
Station	16+00 Rt							
Hole No.								
Depth (ft) From:	1.0							
To:	2.0							

Remarks:

CC:

W D Frye	
J J Lail	
File	

SOILS ENGINEER:	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
MATERIALS & TESTS UNIT
P.O. BOX 25201 - RALEIGH, NORTH CAROLINA
April 08, 2004

TEST REPORT FOR: **ROCK**

TYPE OF MATERIAL: HARD ROCK
SAMPLE #: 1 – 6
PROJECT #: 33183.3.1
SAMPLED BY: L. ACKER

DATE SAMPLED: 03/30/04
RECEIVED: 04/01/04
COUNTY: CHEROKEE

TEST RESULTS

SAMPLE #	*SULFUR %*	*NEUTRAL. POTENTIAL*	*ACID POTENTIAL*	*NET NEUTRAL POTENTIAL*
1	2.822	42.519	88.188	-45.669
2	2.922	42.269	91.300	-49.031
3	3.403	42.020	106.344	-64.324
4	3.021	42.269	94.413	-52.143
5	3.536	42.519	110.494	-67.975
6	3.303	42.269	103.231	-60.962

NET NEUTRALIZATION POTENTIAL (NNP) REPORTED IN TONS CaCO3 PER 1000 TONS OF MATERIAL. **NNP VALUES LESS THAN NEGATIVE FIVE ARE CONSIDERED HARMFUL (HOT).*

SIGNED: Christopher A. Peoples /wdf

CHRISTOPHER A. PEOPLES
CHEMICAL TESTING ENGINEER

cc: W.D. FRYE
L. ACKER
FILE