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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY _ DAVIDSON

PROJECT DESCRIPTION BRIDGE NO. 246 ON SR 2351 (FLAT SWAMP ROAD) OVER LICK CREEK

SITE DESCRIPTION BRIDGE STRUCTURE AT -L-*STA*. *15* + *80.00*

P9.R006. PROIEC

STA	TE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.	C.	SF-280246	1	

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Summit Design &

Engineering

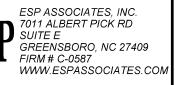
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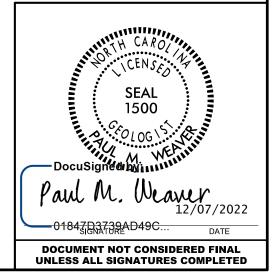
DRAWN BY P.B. GONZALEZ

CHECKED BY _____. WEAVER

SUBMITTED BY <u>ESP</u> Associates, Inc.

DATE ______ December 2022





NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED 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	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	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	<u>AQUIFER</u> - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > NOK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
	MINERALOGICAL COMPOSITION	The sine to coarse crain igneries and metamorphic pock that	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (≤ 35% PASSING •200) (> 35% PASSING •200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	DOCK (P) VOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.		CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7		POCK (NCP) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL SCOORDOOD	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7 PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
10 50 MX GRANULAR SILT- MUCK,	PERCENTAGE OF MATERIAL		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*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 50 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
PASSING #40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL — — — 40 MX 41 MN LITTLE OR HIGHLY	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF	GROUND WATER	OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
OBGANIC SUILS		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR UNSUITABLE	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) 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	PARENT MATERIAL.
AS SUBUKAUE YUUK	· · · · · · · · · · · · · · · · · · ·	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS \leq LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	<u>FORMATION (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION - OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4	SOIL SYMBOL	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR LUUSE 4 IU 10 GRANULAR MEDIUM DENSE 10 TO 30 N/O		IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	- INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	TTEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4		SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	ALLUVIAL SOIL BOUNDARY A PIEZUMEIER OF SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	LXX STELLER UNSUITABLE WASTE LXX ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
DOW DED CODDUE COARSE FINE OUT	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY (BLDR.) (COB.) (GR.) (SL.) (CL.)		MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(CSE, SD.) (F SD.) (CEL)		HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
	CLCLAY MODMODERATELY γ -UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{\rm d}$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u>	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	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	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.
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL		
	FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	FRACTURE SPACING BEDDING	BENCH MARK: BM #I:-L- STA. 15+37.16, 51.6' LT (RR SPIKE IN 32'' OAK)
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: 610.11 FEET
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	
SL SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	F.I.A.D = FILLED IMMEDIATELY AFTER DRILLING
	CME-55	THINLY LAMINATED < 0.008 FEET	
PLASTICITY			
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
NON PLASTIC Ø-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	TUNGCARBIDE INSERTS	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	AND TOULS:	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE:	
HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CME 550X CORE BIT SOUNDING ROD	DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14

PROJECT REFERENCE NO.

SF-280246

2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed F	Rock Mass (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the	Gook Mass (Mari GOOD rough, fresh unweathered surfaces	ghtly weathered, ıron staıned	moderately weathered and surfaces	ided, highly weathered surfaces pact coatings or fillings ar fragments	JR ided, highly weathered surfaces t clay coatings or fillings	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average valu of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for
fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis. STRUCTURE	VERY Very	CREASING SI	FAIR Smooth, altered	POOR Slickenside with compact	VERY POOR Slickensided, F with soft clay	by a slight shift to the right in the columns for fai poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
				ΑLITY		COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
BLOCKY - well interlocked un- disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with thin inter-
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			layers of siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H .
discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Manual into small rock pr

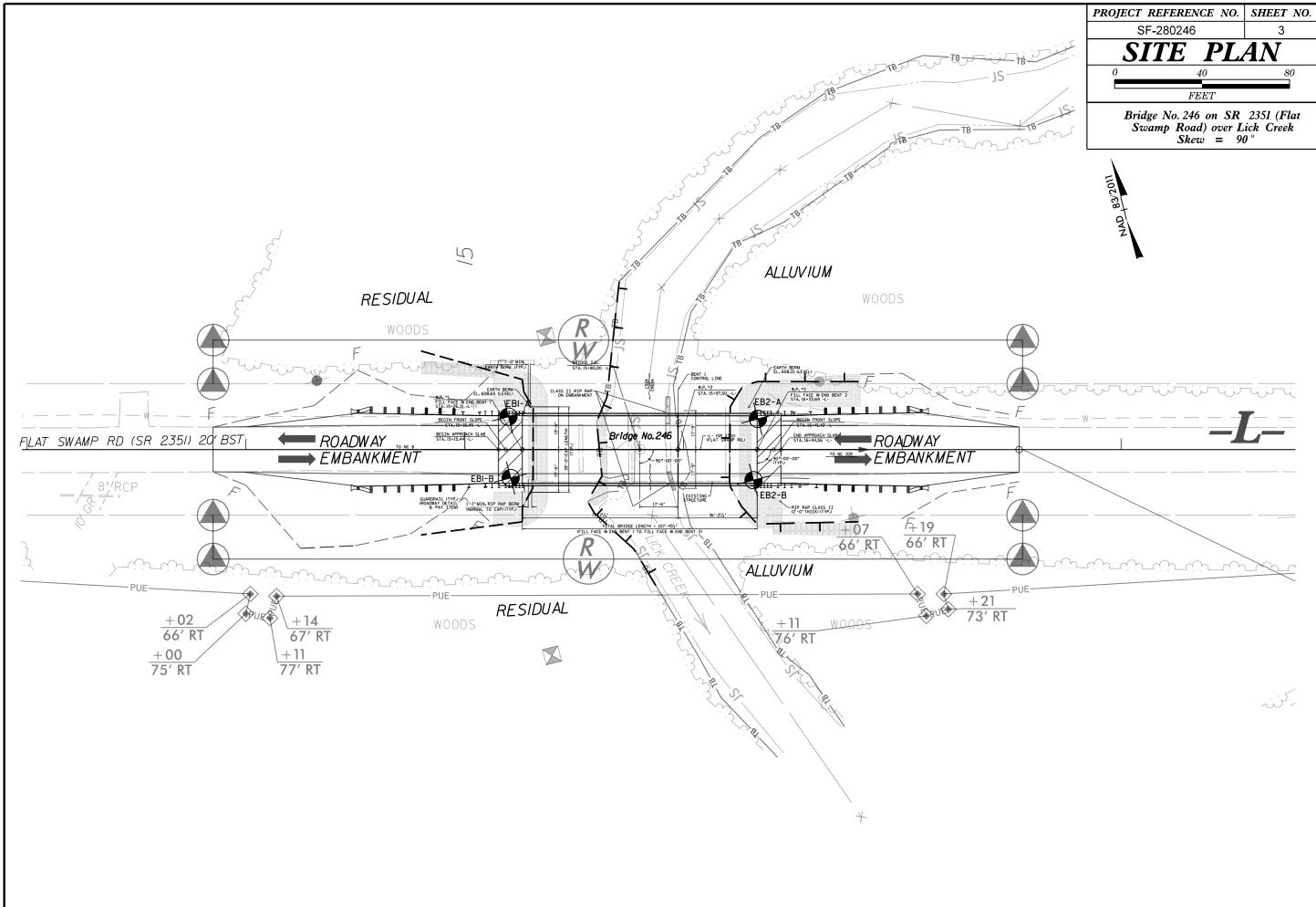
Tectonically Defo	ormed Heterog	geneous Rock	Masses (Marır	nos and Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken ⁻ sided or highly weathered surfaces with soft clay coatings or fillings
E. Weak siltstone or clayey shale with sandstone layers aformed, drfaulted, hale or siltstone deformed forming an tructure	70 60	A 50 B 40	C [р Е F 20	
aformed silty forming a with pockets ers of ansformed neces.			¢	ŀ	+10 +/

PROJECT REFERENCE NO.

SF-280246

SHEET NO.

2A



:				: : :		:	0	10	PROJECT	REFERENCE NO.	SHEET NO.
								10 .	.0	F-280246	4
	(A) ROADWAY EMBANKMENT: Tan and Brown with Black Medium Dense, Coarse to Fine SAND (A-I-b), Silty Co SAND (A-2-4), and Clayey Coarse to Fine SAND (A-	parse to Fine		-L- STA. 15	o+26.31			FEET $VE = 1.0$	CROSS	S SECTION AT ENI -L- STATION 15+2 SKEW = 90°00'0	6.31
	SAND (A-2-4), and Clayey Coarse to Fine SAND (A- Abundant Asphalt Fragments and Trace Gravel, Dry to Note: Blow Count from 0.5' to 1.0' in EBI-B Influence Fragments	Wet ed by Asphalt		E		· · · · · · · · · · · · · · · · · · ·	*NOTF:Heavy rai	in the previous day (1ffected		
	B ROADWAY EMBANKMENT: Tan and Brown, Soft to Med Clayey SILT (A-5), Moist	dium Stiff,					24-hour water	reading in EBI-Á			
	© RESIDUAL: Brown and Tan with Gray,Very Stiff,Coal Sandy CLAY (A-6),Trace Rock Fragments,Moist	rse to Fine									
	D RESIDUAL: Gray, Brown, and Tan, Medium Stiff to Ver to Fine Sandy SILT (A-4) and Clayey SILT (A-5), Tr Fragements, Wet to Moist	ry Stiff,Coarse ace Rock	EBI-A 15+20			I-B +2I					
620			15' L T		13						620
	GROUND SURF	ACE -			· [88 					
610				A (A)	2	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
		(N N N 11/22	<u>_</u>	≥⊷			;
600		(42-4		<u> </u>)	<u> </u>			600
	<u>"="="=""=""=""</u> =""=""	<u>=60</u>	070.0	WEATHERED R METAMUDSTONE							
		NON-CRYSTA Grav Mode	rately FEE Sev	erely to							
590		60	/0.0 Slig	htly Weathered,	60/0.0		<u>=</u>				590
		REC=29% RQD=0% 60	ME With	lerately Hard, TAMUDSTONE h Very Close hcture Spacing =20-40	00/0.2	<u> </u>	4%	<i></i>			
580		Ć	GSI GSI	=20-40			ERED ROCK:MET				580
		60	/0.0				=///_//_//_//_//_//_//_ //_ 55% RQD=0%	<u>'''='''</u> ''.			
570					Ē	==== }T					570
		· · · · · · · · · · · · · · · · · · ·	ВТ								
560			-								560
	- GROUND LINE TAKEN FROM "280246_Ls_tnl.tin" FILE PR		DOT ON 10/11	/22							
	- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE I PROJECTED ONTO THE BRIDGE CROSS SECTION			1							
550										· · · · · · · · · · · · · · · · · · ·	550
			20	<u> </u>			20 30	40			:

	70	60	50	40	30	20	10	0 10	20	30	
	- INFERR	ED STRATIGI	RAPHY IS INTI	ERPOLATED F	ROM BORINGS	BY NCDOT ON EB1-A, EB1-B, E SE CROSS SEC	B2-A,				
560						· · · · · · · · · · · · · · · · · · ·					
.570											
									.1		
580											
					Hard to M	ALLINE ROCK: oderately Hard, pable Zones of	METAMUDS	tely Severely to Slightly TONE with Very Close Rock Potentially Up to 9	Weathered, Medi Fracture Spaci Feet Thick	um 'ng	
590							"='''='''='''='''	ROCK: MET AMUDSTONE	<u>nususususususus</u>	<u>, = </u>	<u></u>
			<u> = </u> =	<u>U_III_III_III_III</u> _III		<u></u>	WEATHERED	ROCK:METAMUDSTONE			
600				<u> </u>	ay <u>ish Brown, S</u> c	ft to Medium	Stiff, Silty CL	<u>AY (A-7-5), Moist</u>	1		
			<u>GROUND</u>	SURFACE	÷	······	_				
610						Interpo Point	Nation No.I		No. 2		
620											
								-			
								\vec{e}			VE = 1.0
							-L-	STA.15+97,50			10 FEET

	10	2	eo P	ROJECT	REFER	ENCE NO.	SHEET NO.
					SF-28024		5
	EET = 1.0			CR	-L-STA	$\begin{array}{rcr} TION & AT \\ TION & 15+9 \\ = & 90^{\circ}00^{\prime}0 \end{array}$	7.50
							620
							600
	<u> = = </u>						
/	~~~~~ <u>~</u> ~~~						
							500
							580
							570
							560
							550
0	4	0	5	0	6	0	70

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	Fi)ADWAY ne SANL EB2-A) (A-/-	-b) and	Silty Co	parse to	Fine S	SAND ()	4-2-4)	, Abunda				q	Ē			· · · · · ·	*NOTE:	ve Heavy rain th reading in El
	Sc)ADWAY indy SIL)ADWAY	Ţ (A−4),Trace	Gravel,	Wet				e									WUIEI	
.620					· · · · · · · · · · · · · · · · · · ·						I	B2-A 6+34 4' L T					EB2 16+ 14 F	32		
			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		<u>GRO</u>	UND SI	<u>URF ACI</u>		<u>()</u>		 - *	 (E)		())		· x 、	
.6.1.0			· ·					4		E 			22	· — —		(6) 			<u>*</u>	
.600			· · ·			· · · · · · · · · · · · · · · · · · ·				0	0/0.9		METAN	HERED MUDST	ROCK ONE	00/0	.9	Silty	CLAY (A 	-7-5),Wet
.590			· · · · · · · · · · · · · · · · · · ·			· · · · ·		<u>'''='''</u>	<i>RE</i>	5C=35% QD=0%	<u>,</u>		' <i>=''II=III</i> =I NON−C Wee	RYSTA	LLINE	ROCK:G	ray,	Moder	ately Se	<u>memememe</u> ROD=0% everely to Slig rately Hard,M
.580			· · · · · · · · · · · · · · · · · · ·							@ @	0/0.D- 0/0.D-	BT	: :	Nith Ve GSI=2		e Fract 60/0		Spaci	ng	
.57.0			· · · · · · · ·								· · · · · ·									
560			· · · · · · · · · · · · · · · · · · ·																	
	- INFE	UND LIN RRED S ECTED C	TRATIG	RAPHY	IS DRA		ROUGH	THE B				10/11/2	22							
	70	: F	<u> </u>	<u>:</u> {	50	4	.0	3	30		20	: - 1	0	(0	1	0		20	30

	10		20	PROJECT	SHEET NO.		
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the EB	previou 2-A an	us day nd EB2	at t ecte –B	ed 24-h	our	· · · · · · · · · · · · · · · · · · ·	
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							550
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GEOTECHNICAL BORING REPORT POPEIOC

GENTECHNICAL BORING REDORT

WBS	BP9.F	R006.1			Т	ĪΡ	SF-2802	46	1						GEOLOGIST Barrera	Gonzale	ez, P.	
			Bric	lge No			SR 2351										-	ID WTR (ft
	NG NO.			<u> </u>			TION 15			i –		15 ft LT			ALIGNMENT -L-		0 HR.	4.2
	AR ELI				Т	ΟΤΑ	AL DEPTI	H 47.5 f	ť	NORT	HING	688,8	01		EASTING 1,657,986		24 HR.	5.8
				TE S			/E-550X 86			1					W Casing w/ Advancer	НАММ		Automatic
	LER M				1					COMP		TE 11/						Automatic
		<u> </u>	-	ow co					PER FOO			SAMP.		1.1	SURFACE WATER DEP		/A	
ELEV (ft)	ELEV	DEPTH (ft)	0.5ft	-	0.5ft	$ _{0}$) 25		50	75	100	NO.		0	SOIL AND RC	CK DES	CRIPTION	
	(ft)		0.01	0.01	0.010				1	1			/моі	G	ELEV. (ft)			DEPTH (
620		+													-			
	-	T 0.0												F	. 616.7 GROUN	ID SURF.	ACE	O
615	616.7 -	<u>+ 0.0</u> +	4	5	6		· •11 ·						м		- ROADWAY	EMBAN	KMENT	
		+ - - 3.5					· / · · ·							L	 Tan and Brown with Fine SAND, Trace 			
		1	3	3	4	11	₩7	· · · · ·		· · · · · ·			-	LI				
510	-	t								· · ·	• •			Ŀ	_			
	608.2	8.5					<u>:i::: </u>			.	· ·				<u> 608.7 </u>	SIDUAL		8
	-	Ŧ	2	4	4								м	N V		Clayey SI	LT	
605	-	Ŧ					· · · · ·	· · · ·		· · ·				<u> </u> , ,	_			
	603.2	13.5	9	13	29	$\left \right $				· · · · · ·					603.4 Tan, Gray, and Brow	vn. Coars	se to Fine S	andv <u>13</u>
	-	‡			20			• • • • • • • •	<u>+++</u>	:+÷÷			м	177	SILT, Trace	Rock Fra	agments	
500	-	<u>+</u>													METAN	ERED RO		10
	598.2	<u> </u>	60/0.1	1						• • • • • • • • •	D/0.1♥				598.2 598.1_/\NON-CRYS			18
595	-	Ŧ																
	-	ŧ													Gray, Moderate	v Severe	ly to Sliight	ly
	-	‡						· · · · ·		· · · · · ·					- Weathered, Medi Hard, METAMUDS	STONE w	vith Very Cl	eiy ose
590		±													- Fractu	ire Spaci	ng	
	589.2	27.5	60/0.0							60	0.0/0	'		1				
	-	Ŧ																
585	584.2	T 32.5						· · · ·			<u> </u>				_			
		-	60/0.1	1				· · · · ·		60	0/0.1 9	1						
	-	ŧ									::							
580	579.2	37.5	CO/0 4	-					<u> </u>		 D/0.1	,			-			
	-	ł	60/0.1								•••							
575	-	Ŧ													•			
	574.2	42.5	60/0.0	-						60	 	,			-			
	-	‡						· · · · ·							•			
570	-	‡							· · ·	· · ·	· ·				- 			47
	-	ŧ							1		1	1			Boring Terminated			ft in
	-	t										1			Non-Crystalline Ro			
	-	ł										1			Note: Heavy rain t the 24-hou	he previo ir water r	us day affe eading	ected
	-	Ŧ										1			•		5	
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WBS	BP9.F	R006.1			TIP	SF-28	30246	С	OUNT	Υ	DAVIDSC	N	GEOLOGIST Barrera	Gonzalez, P.			
SITE	DESCF		l Brid	ge No. 24	46 on :	SR 23	51 (Flat S	Swamp	Roa	d) O	ver Lick (Creek		GROU	ND WTR (ft		
		. EB1-		-			15+20			r –	FSET 1		ALIGNMENT -L-	0 HR.			
COLL	AR EL	EV. 61	6.7 ft		тот	AL DE	PTH 47	.5 ft		NC	RTHING	688,801	EASTING 1,657,986	24 HR.	5.8		
DRILL	RIG/HA	MMER E	FF./DA	TE SUM3	123 CN	1E-550×	(86% 11/2	/2021				DRILL METHOD	IW Casing w/ Advancer		Automatic		
DRILI	LER M	loseley	, M.		STA		TE 11/0)8/22		cc	COMP. DATE 11/08/22 SURFACE WATER DEPTH N/A						
CORE	E SIZE	NQ			TOTA	AL RUI	N 28.71	ft					·				
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD ®(€)%	SAMP NO	STR REC. (ft) %	ATA RQD (ft) %	L O G	ELEV. (ft)	DESCRIPTION AND REMARK	S	DEPTH (
598.1 595	598.1	18.6	3.9	0:53/0.9 0:33/1.0 1:45/1.0	(0.0) 0%	(0.0) 0%		(8.4) 29%	(0.0) 0%		598.1	Moderately Hard,	Begin Coring @ 18.6 ft NON-CRYSTALLINE ROCK By Severely to Sliightly Weatherd METAMUDSTONE with Very C	ed, Medium Hard lose Fracture Spa	18 to cing		
590		- - -	5.0	5:47/1.0 3:51/1.0 5:18/1.0 5:54/1.0 6:12/1.0	(1.8) 36%	(0.0) 0%					-	F	ractures at 10 degrees to 30 de GSI=20-40	grees			
585		<u>27.5</u>	5.0	4:40/1.0 2:11/1.0 6:11/1.0 6:55/1.0 6:23/1.0	(1.8) 36%	(0.0) 0%					-						
580	584.2 ⁻ 584.1	- <u>32.5</u> - <u>32.6</u> -	4.9	7:07/1.0 <u>W=60/0.1</u> / 1:32/0.9 8:44/1.0 2:32/1.0 3:49/1.0 5:49/1.0	(1.5) 31%	(0.0) 0%					-						
575	579.2 ⁻ 579.1	<u>37.5</u>	4.9	2:34/0.9/ 2:39/1.0 1:44/1.0	(1.6) 33%	(0.0) 0%					- - -						
570	574.2	42.5	5.0	2:29/1.0 3:04/1.0 2:12/1.0 4:56/1.0 2:44/1.0 4:52/1.0	(1.7) 34%	(0.0) 0%											
570	569.2	47.5		5:25/1.0							569.2	Borina Termir	nated at Elevation 569.2 ft in Nor	n-Crystalline Rock	47.		
		ŧ									F	Doning rennin	METAMUDSTONE	r orystamine receit	•		
												NOLE. Heavy fai	n the previous day affected the 2		ш		

SHEET 7

EB1-A 22.5 FEET - 47.5 FEET





SHEET 8 BP9.R006.1 (SF-280246)/BRIDGE NO. 246

GEOTECHNICAL BORING REPORT BODEIOG

							B	ORE L	OG						
WBS	BP9.F	R006.1			TI	P SF-280246	COUNT	Y DAVIDS	NC			GEOLOGIST Barrera	Gonzale	ez, P.	
SITE	DESCR	IPTION	N Bric	dge No	o. 246 d	on SR 2351 (Fla	it Swamp Road	d) Over Lick	Creek					GROUN	ID WTR (ft)
BOR	ING NO	EB1	-В		S	TATION 15+21		OFFSET [~]	13 ft RT			ALIGNMENT -L-		0 HR.	N/A
COL	LAR ELI	EV. 6 ⁻	17.2 ft		т	OTAL DEPTH	44.8 ft	NORTHING	688,7	774		EASTING 1,657,980		24 HR.	10.7
DRILI	RIG/HA	MMER E	EFF./DA	TE S	UM3123	CME-550X 86% 1	1/2/2021			METHO	D N\	N Casing w/ Advancer	HAMM	ER TYPE	Automatic
DRIL	LER M	loseley	ν, M.		S	TART DATE 1	1/09/22	COMP. DA	TE 11/	09/22		SURFACE WATER DEP	TH N/	A	
ELEV	DRIVE		' <u> </u>		1		OWS PER FOOT		SAMP.			SOIL AND ROO	CK DESC	RIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50 I	75 100	NO.	/моі	G	ELEV. (ft)			DEPTH (ft)
620		ł										-			
	617.2	0.0									Ē	617.2 GROUNE			0.0
615	-	Ŧ	4	46	12					D		ROADWAY I –614.6 Black with Brown, 0	Coarse to	o Fine SAN	
	613.4	3.8				F						Abundant Asphalt Fr Note: Blow count			
		Ŧ	1	1	1					W			ments		i
610		Ŧ											ravel		8.3
	608.4	<u>† 8.8</u>	2	1	3							Tan and Brov	wn, Claye	ey SILT	
605		Ŧ									Ē	604.7			12.5
	603.4	13.8	6		44	· · × × · ·									
	-	Ŧ	6	10	11	21	· · · · · · · · · ·			м		<u>601.6</u> Sandy CLAY, Tra	ace Rock	Fragment	s 15.6
600		Ŧ										METAM			
	598.4	<u>† 18.8</u> †	100/0.2	2				· 100/0.2	,						
595		Ŧ													
	593.4	23.8										_			
		Ŧ	100/0.2	2			· · · · · · ·	· 100/0.2	'						
590	-	ŧ					· · · · · · ·					_			
	587.4 ·	+ - 29.8					· · · · · · · ·					587.4			29.8
585	-	ŧ	60/0.0				 	60/0.0				NON-CRYST Gray, Moderately			lv
000	-	ŧ										Weathered, Mediu Hard, METAMUDS	m Hard t	o Moderat	ely
	582.4	<u>+ 34.8</u>	100/0.2	a			 	· · · · ·	,		977		e Spacir	ng	
580		ŧ						· · · ·				METAM			
	577.4 ⁻	+ - <u>39.8</u>					 					577.4			39.8
575		Ŧ	60/0.1]			 	· · 60/0.1	1			- 577.3_/ NON-CRYST	IDOTO		39.9/
575	-	ŧ						· · · ·				NON-CRYST	ALLINE	ROCK	/
		<u>†</u>							-		鬥	Weathered, Mediu	m Hard t	o Moderat	ely <u>44.8</u>
	-	‡											e Spacir	ng	
		ŧ										Boring Terminated			
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	BP9.F		I D			SF-28							GEOLOGIST Barrera	Gonzal	
				lge No. 2	1			Swam	о коа	· ·					
	NG NO						15+21	0.0		+	FSET		ALIGNMENT -L-		0 HR. N/
	AR ELI						PTH 44					688,774	EASTING 1,657,980	1	24 HR. 10
				TE SUM3								DRILL METHOD NW	-		IER TYPE Automatic
			, M.				TE 11/0	19/22			DMP. DA	TE 11/09/22	SURFACE WATER DEI	PTH N	I/A
	RUN	I		DRILL		AL RU	N 9.9 ft	I STR	RATA	$\frac{1}{1}$					
ELEV (ft)	ELEV (ft)	DEPTH (ft)	RUN (ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	ESCRIPTION AND REMARK	Ś	DEPTH			
587.4	587.4 -	- 29.8	5.0	0.00/1.0	(0.0)				(0.0)				Begin Coring @ 29.8 ft		
585	582.4	34.8	5.0	8:09/1.0 9:46/1.0 9:38/1.0 12:26/1.0 8:16/1.0	(0.2) 4%	(0.0) 0%		(0.2) 4%	(0.0) 0%		587.4 582.4	Moderately Hard, M	NON-CRYSTALLINE ROC Severely to Slightly Weathe ETAMUDSTONE with Very (ctures at 10 degrees to 30 de GSI=20-40	red, Medi Close Fra	2 ium Hard to cture Spacing 3
580	-	+ +		N=100/0.2								\	WEATHERED ROCK METAMUDSTONE		/
	577.3	<u>39.9</u>	4.9	<u>N=60/0.1</u> 6:15/0.9	(2.7)	(0.0)		(2.7)	(0.0)	Ĩ	577.4 577.3	1	NON-CRYSTALLINE ROC	к	
575	-	ŧ		<u>N=60/0.1</u> / 6:15/0.9 6:21/1.0 4:23/1.0 3:50/1.0 4:55/1.0	55%	0%		55%	NON-CRYSTALL	NON-CRYSTALLINE ROC	к]			
-	572.4	<u>44.8</u>		3:50/1.0 4:55/1.0							572.4	 Moderately Hard, M 	Severely to Sliightly Weathe ETAMUDSTONE with Very 0 ctures at 10 degrees to 30 de GSI=20-40	Close Fra	ium Hard to cture Spacing
	-	Ŧ									F	Boring Terminat	ed at Elevation 572.4 ft in No METAMUDSTONE	on-Crysta	lline Rock:
	-	Ŧ									F		METAMODSTONE		
	-	ŧ									F				
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GEOTECHNICAL BORING REPORT

		DESCRIPTION AND REMARKS		
	ELEV. (ft)		DEP.	TH (ft)
T		Degin Coring @ 00.0 #		
_	- 587.4	Begin Coring @ 29.8 ft NON-CRYSTALLINE ROCK		29.8
-	- 507.4	Gray, Moderately Severely to Sliightly Weathered, Medium Hard to		25.0
-		Moderately Hard, METAMUDSTONE with Very Close Fracture Spacing		
	- 582.4	Fractures at 10 degrees to 30 degrees		34.8
7	- \	GSI=20-40		34.0
1	-	WEATHERED ROCK METAMUDSTONE		
1		METAMODSTONE		
	- 577.4			39.8
4	577.3	NON-CRYSTALLINE ROCK	\neg	39.9
	- [METAMUDSTONE		
	_	NON-CRYSTALLINE ROCK		
	- 572.4	Gray, Moderately Severely to Sliightly Weathered, Medium Hard to Moderately Hard, METAMUDSTONE with Very Close Fracture Spacing		44.8
	-	Fractures at 10 degrees to 30 degrees		
1		GSI=20-40		
	- '	Boring Terminated at Elevation 572.4 ft in Non-Crystalline Rock:	_	
ł	-	METAMUDSTONE		
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EB1-B

29.8 FEET - 44.8 FEET





SHEET 10 BP9.R006.1 (SF-280246)/BRIDGE NO. 246

GEOTECHNICAL BORING REPORT

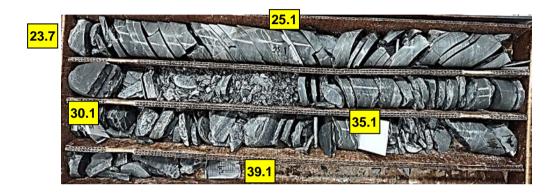
GEOTECHNICAL BORING REPORT CODELOG

WBS	BP9.F	R006.1			Т	IP SF-280	246		ORE L Y DAVIDS				GEOLOGIST Barrera	Gonzale	ez, P.	
SITE	DESCR	IPTIO	N Bric	lge No	o. 246	on SR 2351	(Flat Swa	mp Road) Over Lick	Creek					GROUN	ID WTR (ft)
BOR	ING NO	EB2	-A		S	TATION 1	6+34		OFFSET	14 ft LT			ALIGNMENT -L-		0 HR.	N/A
COL	LAR ELI	EV. 6	16.9 ft		Т	OTAL DEPT	TH 39.2 ft		NORTHING	G 688,7	772		EASTING 1,658,096		24 HR.	6.1
DRILI	RIG/HA	MMER E	FF./DA	TE S	UM312	3 CME-550X 8	6% 11/2/2021			DRILL	METHO	D NV	V Casing w/ Advancer	HAMM	ER TYPE	Automatic
DRIL	LER M	loseley	ν, M.		s	TART DATE	E 11/14/22	2	COMP. DA	TE 11/	/14/22		SURFACE WATER DEP	TH N	/A	
LEV	DRIVE	DEPTH	BLC	ow co	UNT		BLOWS P	ER FOOT		SAMP.	▼/		SOIL AND RO			
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	0	75 100	NO.	мо		ELEV. (ft)	JK DES	SRIFTION	DEPTH (1
620		L											_			
		Ŧ										I F	-			
	616.9	0.0	12	 7	3						D		616.9 GROUNI ROADWAY			0
615		Ŧ							+ • • • •				Black with Brown, <u>614.3</u> Abundant Asp	Coarse t	o Fine SAN	ND,2
	613.2	<u> </u>	WOH	2	1							ĿS		Silty CLA		
510	.	ŧ					· · · · ·	· · · ·				ES				
510	608.2	+ 8.7										LS				8.
		‡	1	2	2			· · · · ·			w	N	ALL Grayish Bro	WIAL	CLAY	
605		‡	1		1	;			· · · ·			N	-			
	603.2	13.7	8	25	75/0.4	l l <u></u> .	L		<u> </u>			D	602.7			14
	-	‡		25	1 3/0.4				100/0.9				WEATHE METAN			
500		±				$\left \right $							-		-	
	598.2	<u> 18.7 </u>	100/0.2	z					100/0.2			Ø				
595		Ŧ										14				
	593.2	23.7											- 593.2			23.
			60/0.0	7					· · 60/0.0	*			NON-CRYS Gray, Moderately			lv.
590	-	‡						••••					Weathered, Mediu	m Hard	to Moderat	ely
		ŧ										E	Hard, METAMUDS Fractu	e Spaci		ose
	586.9 .	30.0	60/0.1	-					60/0_1			量				
585	-	ł											-			
	581.8	35.1										F				
580		+ <u>33.</u> 1	60/0.1	1					60/0.1			鬪				
		Ŧ ",											-			20
	577.8 .	<u>- 39.1</u> -	60/0.1						60/0.1		<u> </u>		577.7 Boring Terminated	at Eleva	tion 577.7	39. ft in
	-	‡											Non-Črystalline Roo -	k: Met	AMUDSTO	DNE
	-	ŧ											Note: Heavy rain th the 24-hou	e previo water r	us day affe eading	cted
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WBS	BP9.R	006.1			TIP	SF-28	30246	С					GEOLOGIST Barrera	Gonzale	ez, P.			
SITE	DESCRI	PTION	l Brid	lge No. 2	46 on :	SR 23	51 (Flat S	Swam	o Roa	d) O	/er Lick	Creek			GROUN	ND WTR (ff		
BOR	NG NO.	EB2-	A		STA	TION	16+34			OF	FSET	I4 ft LT	ALIGNMENT -L-		0 HR.	N/A		
COLI	AR ELE	V . 61	6.9 ft		тот	AL DE	PTH 39	.2 ft		NC	RTHING	688,772	EASTING 1,658,096		24 HR.	6.1		
DRILL	. RIG/HAM	IMER E	FF./DA	TE SUM	3123 CN	1E-550>	(86% 11/2	/2021		1		DRILL METHOD NW	V Casing w/ Advancer	HAMM	IER TYPE	Automatic		
DRIL	LER Mo	oseley	М.		STA	RT DA	TE 11/1	4/22		cc	MP. DA	FE 11/14/22	SURFACE WATER DE	PTH N	/A			
COR	E SIZE	NQ			TOTAL RUN 15.2 ft								•					
ELEV	RUN ELEV	DEPTH	RUN		REC.	JN I RQD	SAMP.	REC.	RATA RQD	L	DESCRIPTION AND REMARKS							
(ft)	(ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	RQD (ft) %	NO.	(ft) %	(ft) %	G	ELEV. (1		DESCRIPTION AND REMAR	10		DEPTH (
593.2	502.2			-	(2.0)				(0.0)				Begin Coring @ 23.7 ft					
	593.2 + 591.8 -	23.7 25.1	1.4 5.0	7:19/1.0	4 64% 4 0%		(5.5) 35%	(0.0) 0%		593.2	Gray, Moderately	NON-CRYSTALLINE ROC Severely to Sliightly Weather	ered, Medi	um Hard to	23			
590	+	•		6:15/1.0 6:36/1.0 12:37/1.0 3:08/1.0	(2.6) 52%	(0.0) 0%							IETAMUDSTONE with Very actures at 10 degrees to 30 c		cture Spac	ing		
	586.8 586.7	30.1		3:08/1.0							_		GSI=20-40					
585	<u>_586./</u>	_30.2_/	4.9	<u>W=60/0.1</u> 5:11/0.9	(1.1) 22%	(0.0) 0%]			-							
	586.8 30.1 4:10/1, 586.7 30.2 4.9 <u>9-60/0</u> 556.7 30.2 4.9 <u>9-60/0</u> 7:35/1 6 6:30/1, 6:30/1,			6:55/1.0							-							
580	Ŧ	•	0.0	W=60/0.1 6:37/0.9 6:48/1.0 10:07/1.0 14:20/1.0	23%	0%				臺								
	577.8	39.1		14:20/1.0 N=60/0.1							_ 577.7 -	Boring Termina	ted at Elevation 577.7 ft in N	on-Crvsta	ine Rock:	39		
	1										-	20	METAMUDSTONE					
	ŧ										-	Note: Heavy rain t	the previous day affected the	24-hour v	vater readi	ng		
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EB2-A

23.7 FEET - 39.1 FEET





SHEET 12 BP9.R006.1 (SF-280246)/BRIDGE NO. 246

GEOTECHNICAL BORING REPORT

GEOTECHNICAL BORING REPORT 0005100

WBS	BP9.F	R006.1			Т	P SF-28	30246				DRE L				GEOLOGIST Barrera Gonza	alez, P.	
SITE	DESCR		Brid	lge No	. 246	on SR 23	51 (Fl	lat Swa			Over Lick				•	GROU	ND WTR (f
BOR	NG NO.	EB2	-B		S	TATION	16+3	2		0	OFFSET	14 ft RT			ALIGNMENT -L-	0 HR.	7.
					т	OTAL DEI	РТН	39.2 ft		-† ,	NORTHING	3 688.7	45		EASTING 1,658,087		6.
DRILI	RIG/HAI		FF./DA	TE S	UM3123	CME-550X	(86% ⁻	11/2/202	1					D N	· · ·	 MFR TYPF	Automatic
	LER M					TART DA					COMP. DA	1					71010110110
	DRIVE	1		ow co				LOWS F				SAMP.		1 L T	SURFACE WATER DEFTH	N/A	
ELEV (ft)	ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft	0.5ft	0	25		50	7	5 100	NO.	мо	O G	SOIL AND ROCK DE	SCRIPTION	
620									1						ELEV. (ft)		DEPTH
615	- 615.5 -	0.0							1								(
	-	ŧ	5	4	3	. <u>1</u>							м	L	ROADWAY EMBA Brown with Black, Silty		ne
	612.0	3.5	2	2	4		: :	· · · · · ·		· · · ·	· · · ·			<u>⊢∦</u>	- <u>612.4</u> SAND, Trace Gravel, Fragment		alt <u>, 3</u>
610	-	t	2		4	●6 [,] ·	· ·	· · ·	· ·	•••				LS	Brown, Coarse to Fine Sa		race /
	-	t					: :	· · ·			· · · ·			L.	Gravel		
	607.0	8.5	2	2	2		• •			•••			w		<u>607.2</u> ALLUVIA		
605	-	Ŧ												N	Gray and Brown, S	ilty CLAY	
	- 602.0	13.5					: :							N	-		
500	- 602.0	- 13.5	5	29	71/0.4	!-:-:-	÷+÷	÷ = :	ĺ÷÷∙	<u></u>	100/0.9				- 601.5 - WEATHERED	ROCK	14
000	-	ŧ													- METAMUDST		
	597.0	18.5					· ·	· · ·		· ·					-		
595	-	ł	100/0.2								100/0_2				-		
	-	Ŧ													-		
	592.0	23.5	60/0.1	-			: :	· · · · · ·		· ·	· · · 60/0.1				- 592.0 		23
590	-	t	60/0.1						· ·	•••							
	-	ł					: :	· · ·							- NON-CRYSTALLI - Gray, Moderately Seve		fly
	-	+												1	 Weathered, Medium Har 	d to Modera	itely
585	585.6 -	<u>+ 29.9</u> +	60/0.0						_ · ·	•••	60/0.0				 Hard, METAMUDSTONE Fracture Spa 		lose
	-	‡					: :	· · · · · ·		· ·					-		
	- 580.6 -	- 34.9					: :	· · · ·		::					-		
580	-	t	60/0.1								60/0.1				-		
	-	ł					• •			•••					-		
	576.3	<u>T 39.2</u>	60/0.0				· ·			•••	60/0.0				- 576.3 Boring Terminated at Ele	/ation 576.3	39 ft in
	-	Ŧ													Non-Crystalline Rock: Mi	TAMUDST	ONE
															Note: Heavy rain the prev the 24-hour water		ected
	- - -	Ì.													- 		
	- -	+													-		
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WBS	BP9.F	R006.1			TIP	SF-28	30246	С			RE LOG	GEOLOGIST Barrera	Gonzale	ez, P.				
SITE	DESCR		l Brid	lge No. 2	46 on	SR 23	51 (Flat S	Swamp	o Roa	d) Ov	ver Lick Creek			GROUN	ID WTR (ft			
BOR	NG NO.	. EB2-	·B		STA	TION	16+32			OF	FSET 14 ft RT	ALIGNMENT -L-		0 HR.	7.4			
COLI	AR EL	EV. 61	5.5 ft		тот	AL DE	PTH 39	.2 ft		NO	RTHING 688,745	EASTING 1,658,087		24 HR.	6.9			
DRILL	. RIG/HAI	MMER E	FF./DA	TE SUM	3123 CN	1E-550)	< 86% 11/2	/2021			DRILL METHOD	IW Casing w/ Advancer	HAMM	IER TYPE	Automatic			
DRIL	LER M	loseley	, M.		STA	RT DA	TE 11/1	0/22		co	MP. DATE 11/10/22	SURFACE WATER DEF	· •TH N	/A				
COR	E SIZE	NQ										•						
ELEV	RUN ELEV	DEPTH	RUN	DRILL RATE	TOT/ REC. (ft) %	JN RQD	SAMP.	STF REC. (ft) %	ATA RQD	L O								
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	RQD (ft) %	NO.	(ft) %	RQD (ft) %	Ğ	ELEV. (ft)		.0		DEPTH (
591.9	501 0	23.6	1.0									Begin Coring @ 23.6 ft						
590 585	591.9 590.6 - - - - - - - -	1.3 5.0 5.0	4:57/1.0 1:42/0.3 6:38/1.0 5:44/1.0 9:45/1.0 8:36/1.0 16:21/1.0 4:45/1.0	(2.3)	(0.0) 0% (0.0) 0% (0.0)		(8.9) 57%	(0.0) 0%		 Moderately Hard, 	NON-CRYSTALLINE ROC ely Severely to Sliightly Weather METAMUDSTONE with Very C ractures at 10 degrees to 30 de GSI=20-40	ed, Medi lose Fra						
580	- - - - - - - - - - - - - - - - - - -			4:33/1.0 4:49/1.0 6:31/1.0 7:16/1.0	46%	0%												
	-	-	4.2	W=60/0.1 5:05/0.9 4:54/1.0 8:37/1.0 6:51/1.0 9:33/0.3	(2.0) 48%	(0.0) 0%					-							
	576.3 -	<u>39.2</u>		6:51/1.0 9:33/0.3 N=60/0.0							576.3 Boring Termir	nated at Elevation 576.3 ft in No METAMUDSTONE	n-Crystal	line Rock:	39			
	- -	+ +									Note: Heavy rain the previous day affected the 24-hour water readi							
											 - - -							
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EB2-B

23.7 FEET - 39.1 FEET





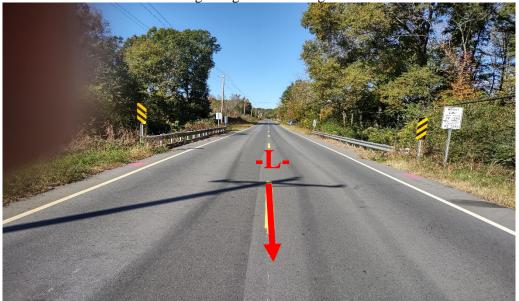
SHEET 14 BP9.R006.1 (SF-280246)/BRIDGE NO. 246

SITE PHOTOGRAPHS Bridge No. 246 on SR 2351 (Flat Swamp Road) over Lick Creek

View Along Bridge 246 Looking Upstation



View of Along Bridge 246 Looking Downstation



View Looking Upstream from Bridge 246



View Looking Downstream from Bridge 246



Project No. BP9.R006.1, TIP No. SF-280246 Davidson County SHEET 15