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REFERENCE: HF-0005

PROJECT: 49864

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SHEET NO.	DESCRIPTION
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CLAY
PROJECT DESCRIPTION BRIDGE NO. 63 OVER BLAIR CREEK ON SR 1140 (MYERS CHAPEL ROAD)

SITE DESCRIPTION -LI- STATION 14+65

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HF-0005	1	7

CAUTION NOTICE

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PERSONNEL

A. BLACKMORE

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INVESTIGATED BY ECS SOUTHEAST, LLP

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HF-0005

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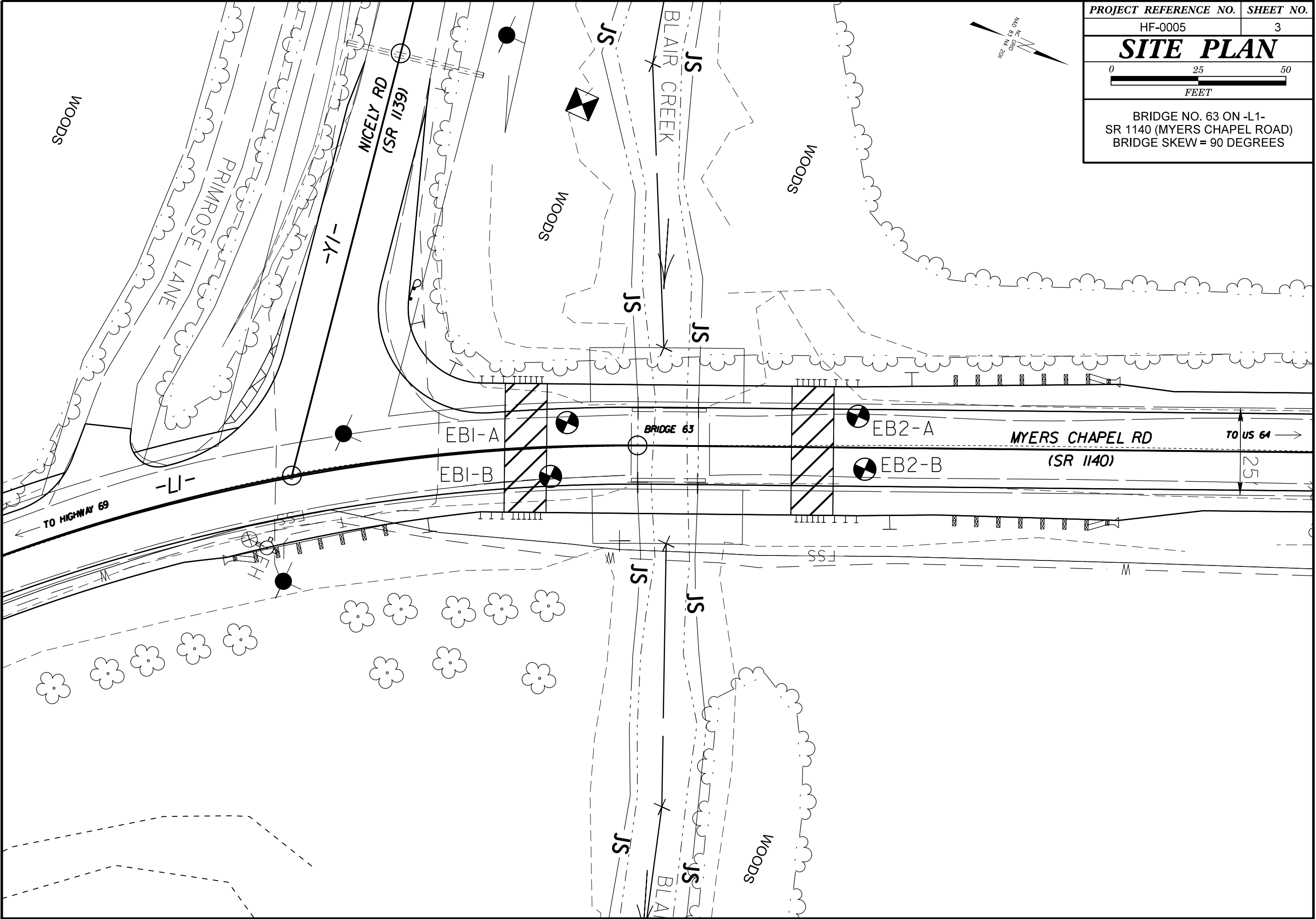
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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 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: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										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. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.										HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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:										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, SUCH 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.									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING																			
GENERAL CLASS.										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH																			
GROUP CLASS.										COMPRESSIBILITY										VERY SLIGHT (V SL.)																			
SYMBOL										PERCENTAGE OF MATERIAL										SLIGHT (SL.)																			
Z PASSING #10 #40 #200										GROUND WATER										MODERATE (MOD.)																			
MATERIAL PASSING #40 LL PI										MISCELLANEOUS SYMBOLS										SEVERE (MOD. SEV.)																			
GROUP INDEX										RECOMMENDATION SYMBOLS										SEVERE (SEV.)																			
USUAL TYPES OF MAJOR MATERIALS										ABBREVIATIONS										VERY SEVERE (V SEV.)																			
GEN. RATING AS SUBGRADE										EQUIPMENT USED ON SUBJECT PROJECT										COMPLETE																			
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																				ROCK HARDNESS																			
CONSISTENCY OR DENSENESS																				VERY HARD																			
PRIMARY SOIL TYPE																				HARD																			
COMPACTNESS OR CONSISTENCY																				MODERATELY HARD																			
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)																				MEDIUM HARD																			
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																				SOFT																			
GENERAL																				VERY SOFT																			
GRANULAR MATERIAL (NON-COHESSIVE)																				MEDIUM STIFF																			
GENERAL																				VERY STIFF																			
SILT-CLAY MATERIAL (COHESSIVE)																				HARD																			
TEXTURE OR GRAIN SIZE																				FRACTURE SPACING										BEDDING									
U.S. STD. SIEVE SIZE OPENING (MM)																				TERM										TERM									
BOULDER (BLDR.)																				VERY WIDE										THICKLY BEDDED									
COBBLE (COB.)																				WIDE										THINLY BEDDED									
GRAVEL (GR.)																				MODERATELY CLOSE										VERY THINLY BEDDED									
COARSE SAND (CSE. SD.)																				CLOSE										THICKLY LAMINATED									
FINE SAND (F. SD.)																				VERY CLOSE										THINLY LAMINATED									
SILT (SL.)																																							
CLAY (CL.)																																							
GRAIN SIZE																																							
SOIL MOISTURE - CORRELATION OF TERMS																																							
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																																							
FIELD MOISTURE DESCRIPTION																																							
GUIDE FOR FIELD MOISTURE DESCRIPTION																																							
LL - LIQUID LIMIT																																							
PL - PLASTIC LIMIT																																							
OM - OPTIMUM MOISTURE SHRINKAGE LIMIT																																							
PLASTICITY																																							
NON PLASTIC																																							
SLIGHTLY PLASTIC																																							
MODERATELY PLASTIC																																							
HIGHLY PLASTIC																																							
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.																																							

SITE PLAN



BRIDGE NO. 63 ON -L1-
SR 1140 (MYERS CHAPEL ROAD)
BRIDGE SKEW = 90 DEGREES



NCDOT BORE DOUBLE BRIDGE 063 ON SR 1140 OVER BLAIR CREEK.GPJ NC DOT.GDT 5/9/23

WBS 49864.1.1				TIP HF-0005				COUNTY CLAY				GEOLOGIST A. Blackmore					
SITE DESCRIPTION Replace Bridge No. 63 over Blair Creek on SR 1140 (Myers Chapel Road)												GROUND WTR (ft)					
BORING NO. EB1-B				STATION 14+30				OFFSET 8 ft RT				ALIGNMENT -L1-				0 HR. 17.3	
COLLAR ELEV. 1,805.5 ft				TOTAL DEPTH 33.5 ft				NORTHING 501,335				EASTING 561,069				24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE ECS0888 CME 750X 93% 12/02/2022								DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER C. Osborne				START DATE 04/18/23				COMP. DATE 04/18/23				SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1810																	
1805	1,804.5	1.0	3	3	2	5						M		1,805.5	0.0	GROUND SURFACE	
														1,804.9	0.0	ROADWAY EMBANKMENT	
	1,802.0	3.5	2	2	3	5						M				Asphalt (0.4'), Stone Base (0.2')	
1800	1,799.5	6.0	2	2	1	3						M		1,800.0	5.5	Medium Stiff, Brown-Red, Fine to Coarse Sandy CLAY (A-6), with trace gravel	
	1,797.0	8.5	1	2	1	3						M				Soft, Brown-Gray-Red, Fine to Coarse Sandy SILT (A-4), with trace mica	
1795																	
	1,792.0	13.5	WOH	2	1	3						M		1,792.5	13.0	Soft, Brown, Fine to Coarse Sandy CLAY (A-6), with trace mica	
1790																	
	1,787.0	18.5	5	6	1	7						W		1,787.5	18.0	RESIDUAL	
1785																Medium Stiff, Brown, Fine to Coarse Sandy CLAY (A-6)	
	1,782.0	23.5	WOH	3	4	7						W		1,782.5	23.0	Soft to Medium Stiff, Gray-Orange-Brown, Fine to Coarse Sandy SILT (A-4), with trace to little mica	
1780																	
	1,777.0	28.5	WOH	WOH	2	2						W					
1775																	
	1,772.0	33.5												1,772.0	33.5	Boring Terminated with Standard Penetration Test Refusal at Elevation 1,772.0 ft On Crystalline Rock (BIOTITE GNEISS)	

SOIL TEST RESULTS																
BORING NO.	SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.I.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
								C. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1-A	SS-17	7' LT	14+36 -L1-	8.5-10.0	A-7-6(8)	47	22	16.7	32.3	24.5	26.4	86.4	78.4	50.2	27.7	-
EB2-A	SS-27	9' LT	15+19 -L1-	13.5-15.0	A-4(7)	38	9	11.0	31.1	33.5	24.4	98.4	95.4	72.6	46.9	-

LAB TECHNICIAN: DANIEL REEVE

NCDOT CERTIFICATION NO. 135-03-0816



PHOTO 1: VIEW FACING BRIDGE 63 FROM -L1- ALIGNMENT, FACING DOWNSTATION.



PHOTO 2: VIEW FACING BRIDGE 63 FROM -L1- ALIGNMENT, FACING UPSTATION.



PHOTO 3: VIEW FACING UPSTREAM FROM BRIDGE.



PHOTO 4: VIEW FACING DOWNSTREAM FROM BRIDGE.

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CONTENTS

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2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-9	BORE LOGS, CORELOGS, AND CORE PHOTOGRAPHS
10	SOIL TEST RESULTS
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12	SITE PHOTOGRAPHS

STATE OF NORTH CAROLINA
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GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CLAY
PROJECT DESCRIPTION BRIDGE NO. 88 OVER HYATT CREEK ON SR 1140 (MYERS CHAPEL ROAD)

SITE DESCRIPTION -L2- STATION 14+39

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HF-0005	1	12

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DATE MAY 2023

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SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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 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: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										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. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.										HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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:										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, SUCH 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.									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING																			
GENERAL CLASS.										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH																			
GROUP CLASS.										COMPRESSIBILITY										VERY SLIGHT (V SL.)																			
SYMBOL										PERCENTAGE OF MATERIAL										SLIGHT (SL.)																			
Z PASSING #10 #40 #200										GROUND WATER										MODERATE (MOD.)																			
MATERIAL PASSING #40 LL PI										MISCELLANEOUS SYMBOLS										SEVERE (MOD. SEV.)																			
GROUP INDEX										RECOMMENDATION SYMBOLS										SEVERE (SEV.)																			
USUAL TYPES OF MAJOR MATERIALS										ABBREVIATIONS										VERY SEVERE (V SEV.)																			
GEN. RATING AS SUBGRADE										EQUIPMENT USED ON SUBJECT PROJECT										COMPLETE																			
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																				ROCK HARDNESS																			
CONSISTENCY OR DENSENESS																				VERY HARD																			
PRIMARY SOIL TYPE																				HARD																			
COMPACTNESS OR CONSISTENCY																				MODERATELY HARD																			
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)																				MEDIUM HARD																			
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																				SOFT																			
GENERAL																				VERY SOFT																			
GRANULAR MATERIAL (NON-COHESIVE)																				MEDIUM																			
SILT-CLAY MATERIAL (COHESIVE)																				VERY HARD																			
TEXTURE OR GRAIN SIZE																				BEDDING																			
U.S. STD. SIEVE SIZE OPENING (MM)																				FRACTURE SPACING																			
BOULDER (BLDR.)																				TERM																			
COBBLE (COB.)																				SPACING																			
GRAVEL (GR.)																				THICKNESS																			
COARSE SAND (CSE, SD.)																				VERY WIDE																			
FINE SAND (F SD.)																				WIDE																			
SILT (SL.)																				MODERATELY CLOSE																			
CLAY (CL.)																				CLOSE																			
GRAIN SIZE																				VERY CLOSE																			
SOIL MOISTURE - CORRELATION OF TERMS																				INDURATION																			
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																				FRIABLE																			
FIELD MOISTURE DESCRIPTION																				MODERATELY INDURATED																			
GUIDE FOR FIELD MOISTURE DESCRIPTION																				INDURATED																			
LL - LIQUID LIMIT																				EXTREMELY INDURATED																			
PL - PLASTIC LIMIT																																							
OM - OPTIMUM MOISTURE SHRINKAGE LIMIT																																							
PLASTICITY																																							
NON PLASTIC																																							
SLIGHTLY PLASTIC																																							
MODERATELY PLASTIC																																							
HIGHLY PLASTIC																																							
COLOR																																							
DESCRIPTORS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																																							

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 Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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 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.

SURFACE CONDITIONS

VERY GOOD
Very rough, fresh unweathered surfaces

GOOD
Rough, slightly weathered, iron stained surfaces

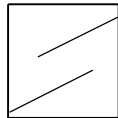
FAIR
Smooth, moderately weathered and altered surfaces

POOR
Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

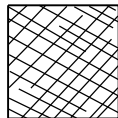
VERY POOR
Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ➡

STRUCTURE



INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



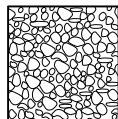
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



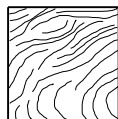
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets



BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity



DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces



LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES
⇩

90

80

70

60

50

40

30

20

10

N/A

N/A

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 value 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 by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

SURFACE CONDITIONS OF
DISCONTINUITIES
(Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces

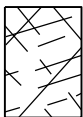
GOOD - Rough, slightly weathered surfaces

FAIR - Smooth, moderately weathered and altered surfaces

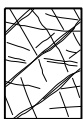
POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments

VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

COMPOSITION AND STRUCTURE



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.



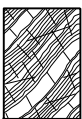
B. Sandstone with thin inter-layers of siltstone



C. Sandstone and siltstone in similar amounts



D. Siltstone or silty shale with sandstone layers



E. Weak siltstone or clayey shale with sandstone layers

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**.



F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure



G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers



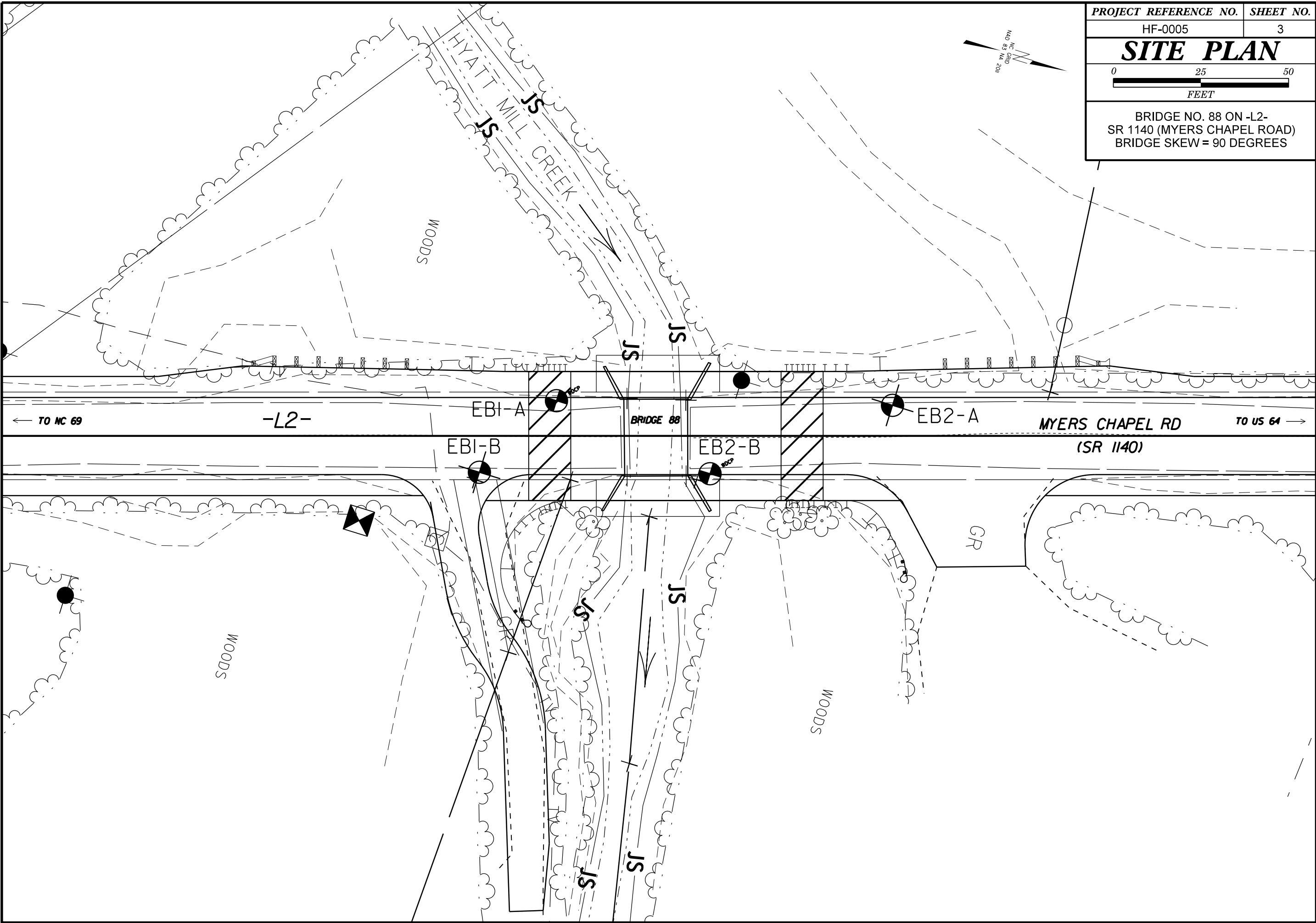
H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.

➡ Means deformation after tectonic disturbance

SITE PLAN



BRIDGE NO. 88 ON -L2-
SR 1140 (MYERS CHAPEL ROAD)
BRIDGE SKEW = 90 DEGREES



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 49864.1.1			TIP HF-0005			COUNTY CLAY			GEOLOGIST A. Blackmore							
SITE DESCRIPTION Replace Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)										GROUND WTR (ft)						
BORING NO. EB1-A			STATION 14+06			OFFSET 10 ft LT			ALIGNMENT -L2-			0 HR. N/A				
COLLAR ELEV. 1,850.1 ft			TOTAL DEPTH 6.5 ft			NORTHING 496,737			EASTING 563,109			24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE N/A						DRILL METHOD Hand Auger / DCP				HAMMER TYPE N/A						
DRILLER N/A			START DATE 05/03/23			COMP. DATE 05/03/23			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1855																
1850	1,850.1	0.0												1,850.1	GROUND SURFACE	0.0
	1,849.1	1.0	N/A	4	3									ROADWAY EMBANKMENT		
	1,848.1	2.0	N/A	5	2									Medium Stiff, Brown-Gray, Fine to Coarse Sandy SILT (A-4), with trace gravel		
	1,847.1	3.0	N/A	4	5									1,847.6		2.5
	1,847.1	3.0	N/A	7	6									RESIDUAL		
	1,846.1	4.0	N/A	7	6									Stiff to Very Stiff, Brown-Red, Fine to Coarse Sandy CLAY (A-6)		
1845	1,845.1	5.0	N/A	7	9											
	1,844.1	6.0	N/A	8	5									1,844.1		6.0
	1,844.1	6.0	N/A	7	7									1,843.6		6.5
	1,843.1	7.0												Stiff, Brown, Fine to Coarse Sandy SILT (A-4)		
	1,842.1	8.0	N/A	9	8									Boring Terminated at Elevation 1,843.6 ft In Residual Sandy SILT (A-4)		
	1,842.1	8.0	N/A	6	7											
	1,841.1	9.0	N/A	7	9									Notes:		
	1,840.1	10.0	N/A	7	9									Hand Auger Refusal encountered at Elevation 1843.6 feet. To evaluate the subsurface conditions below, DCP testing continued until Elevation 1835.1 feet.		
	1,840.1	10.0	N/A	6	6											
	1,839.1	11.0	N/A	10	12											
	1,838.1	12.0	N/A	25	12											
	1,837.1	13.0	N/A	25	25											
	1,836.1	14.0	N/A	25	25											

NCDOT BORE DOUBLE BRIDGE 088 ON SR 1140 OVER HYATT MILL CREEK.GPJ NC_DOT.GDT 5/22/23

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 49864.1.1		TIP HF-0005		COUNTY CLAY		GEOLOGIST A. Blackmore												
SITE DESCRIPTION Replace Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)								GROUND WTR (ft)										
BORING NO. EB1-B		STATION 13+84		OFFSET 10 ft RT		ALIGNMENT -L2-		0 HR.	N/A									
COLLAR ELEV. 1,850.7 ft		TOTAL DEPTH 23.0 ft		NORTHING 496,722		EASTING 563,135		24 HR.	FIAD									
DRILL RIG/HAMMER EFF./DATE ECS0888 CME 750X 93% 12/02/2022				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic												
DRILLER C. Osborne		START DATE 04/24/23		COMP. DATE 04/24/23		SURFACE WATER DEPTH N/A												
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION				
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)			
1855																		
1850	1,849.7	1.0	1	2	4									1,850.7 1,850.1	0.0 0.6			
1845	1,847.2	3.5	2	3	4									ROADWAY EMBANKMENT Asphalt (0.2'), Stone Base (0.4') Medium Stiff, Brown-Red, Highly Plastic Silty CLAY (A-7-6(13))				
	1,844.7	6.0	4	4	5						SS-45	29%		1,845.2	5.5			
1840	1,842.2	8.5	13	20	17									1,842.7	8.0			
	1,837.7	13.0	60/0.0													1,837.7	13.0	
1835																CRYSTALLINE ROCK Fresh, Hard, White-Gray BIOTITE GNEISS, with Close to Wide Fracture Spacing REC = 97%, RQD = 95%, GSI = 75-80		
1830													RS-1					
																1,827.7	23.0	
															Boring Terminated at Elevation 1,827.7 ft In Crystalline Rock (BIOTITE GNEISS)			

NCDOT BORE DOUBLE BRIDGE 088 ON SR 1140 OVER HYATT MILL CREEK.GPJ NC DOT.GDT 5/22/23

GEOTECHNICAL BORING REPORT

CORE LOG

[illegible]

NCDOT CORE DOUBLE BRIDGE 088 ON SR 1140 OVER HYATT MILL CREEK.GPJ NC DOT.GDT 5/22/23

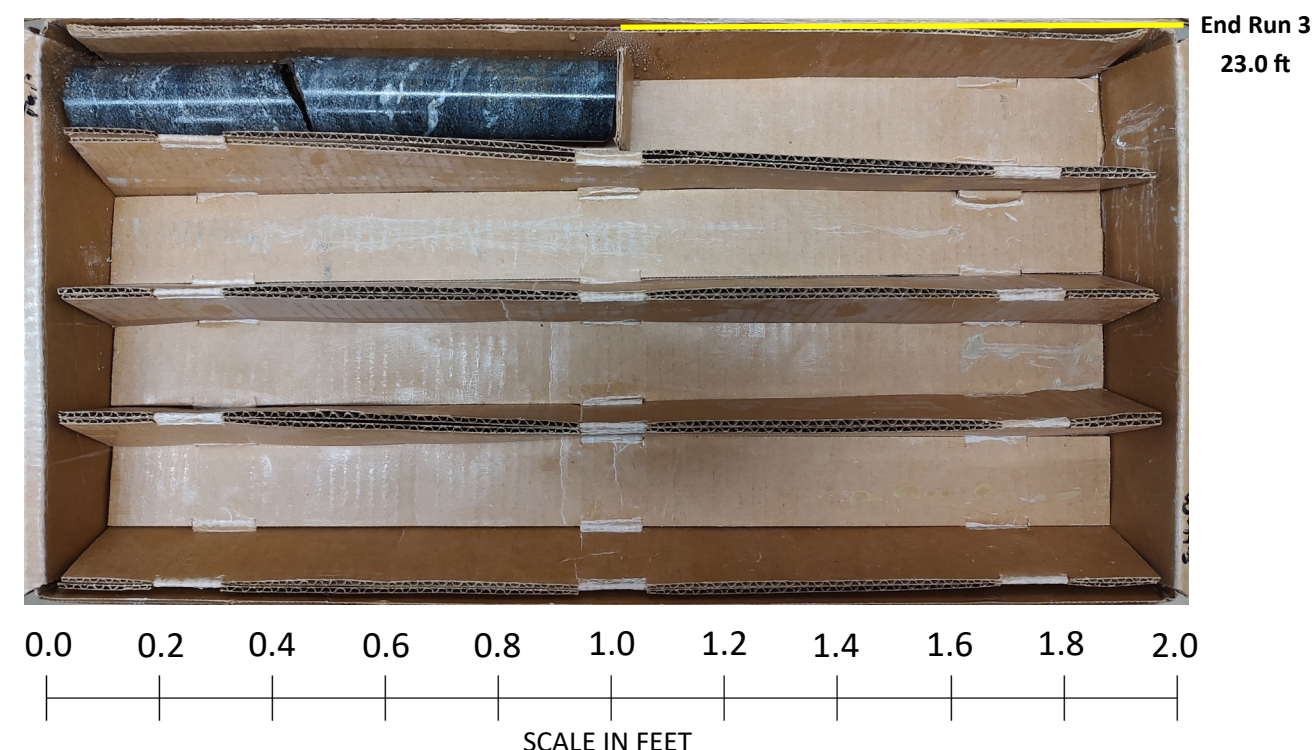
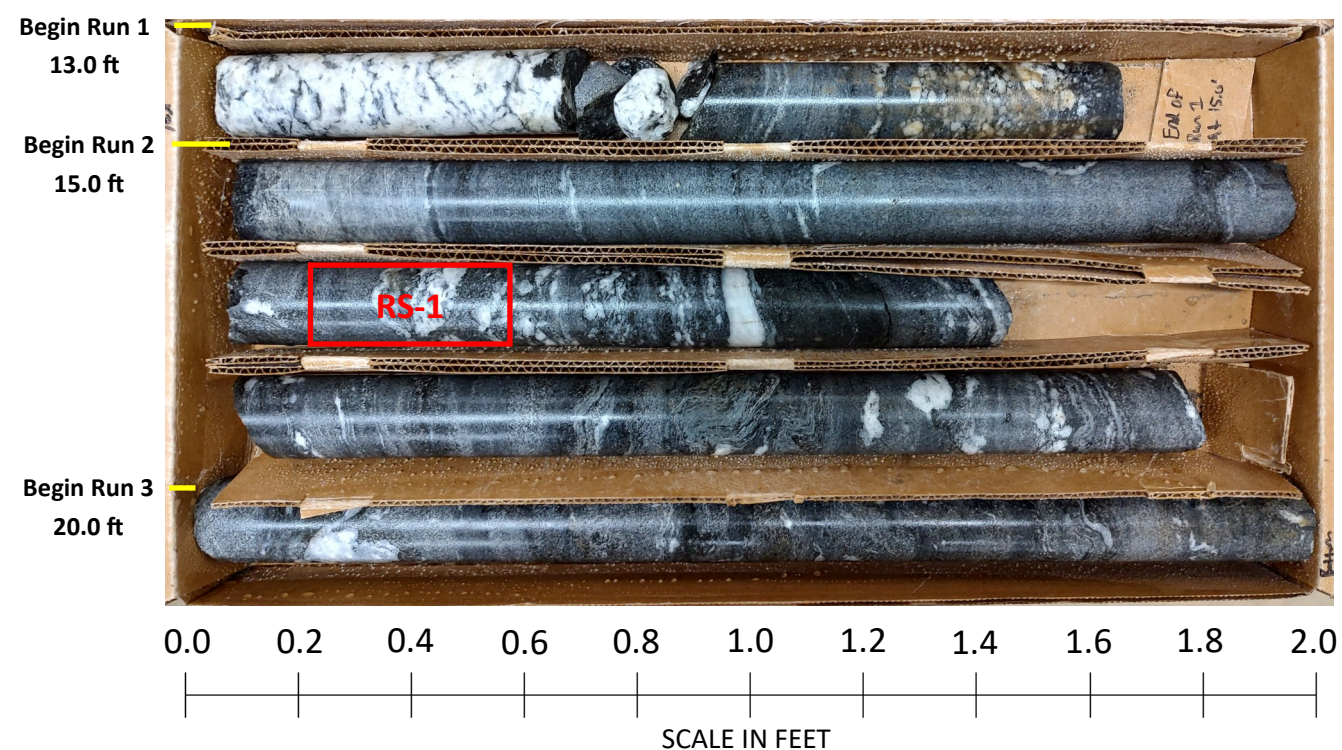


Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)

WBS - 49864.1.1 TIP No. HF-0005

Rock Core Photographs: Boring - EB1-B

Station: 13+84 Offset: 10 ft RT




GEOTECHNICAL BORING REPORT
BORE LOG

WBS 49864.1.1		TIP HF-0005		COUNTY CLAY		GEOLOGIST A. Blackmore								
SITE DESCRIPTION Replace Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)							GROUND WTR (ft)							
BORING NO. EB2-A		STATION 15+01		OFFSET 9 ft LT		ALIGNMENT -L2-		0 HR. N/A						
COLLAR ELEV. 1,850.6 ft		TOTAL DEPTH 16.5 ft		NORTHING 496,829		EASTING 563,082		24 HR. FIAD						
DRILL RIG/HAMMER EFF./DATE ECS0888 CME 750X 93% 12/02/2022				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic								
DRILLER C. Osborne		START DATE 04/24/23		COMP. DATE 04/24/23		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				DEPTH (ft)
1855														
1850	1,849.6	1.0	6	2	1									
	1,847.1	3.5	1	2	98/0.2									
1845	1,844.6	6.0								100/0.7				
	1,844.1	6.5	100/0.2							60/0.0				
1840											RS-2			
1835														

GEOTECHNICAL BORING REPORT
CORE LOG

SHEET 7

WBS 49864.1.1				TIP HF-0005				COUNTY CLAY				GEOLOGIST A. Blackmore							
SITE DESCRIPTION Replace Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)												GROUND WTR (ft)							
BORING NO. EB2-A				STATION 15+01				OFFSET 9 ft LT				ALIGNMENT -L2-				0 HR. N/A			
COLLAR ELEV. 1,850.6 ft				TOTAL DEPTH 16.5 ft				NORTHING 496,829				EASTING 563,082				24 HR. FIAD			
DRILL RIG/HAMMER EFF./DATE ECS0888 CME 750X 93% 12/02/2022								DRILL METHOD SPT Core Boring				HAMMER TYPE Automatic							
DRILLER C. Osborne				START DATE 04/24/23				COMP. DATE 04/24/23				SURFACE WATER DEPTH N/A							
CORE SIZE NQ				TOTAL RUN 10.0 ft															
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) % ROD (ft) %		SAMP. NO.	STRATA REC. (ft) % ROD (ft) %		LOG	DESCRIPTION AND REMARKS								
											ELEV. (ft)	DEPTH (ft)							
1844.1											Begin Coring @ 6.5 ft								
	1,844.1	6.5	4.0	N=60/0.0 1:23/1.0 1:57/1.0 1:58/1.0 1:22/1.0	(4.0) 100%	(2.8) 70%	RS-2	(9.7) 97%	(8.3) 83%		1,844.1	6.5							
1840	1,840.1	10.5											CRYSTALLINE ROCK Slightly Weathered to Fresh, Hard, White-Gray BIOTITE GNEISS, with Close to Wide Fracture Spacing						
			5.0	2:10/1.0 2:22/1.0 2:18/1.0 1:50/1.0 2:03/1.0	(4.7) 94%	(4.5) 90%							REC = 97%, RQD = 83%, GSI = 65-70						
												RS-2: 9.2' - 9.6' Unit Weight = 170.3 pcf							
1835	1,835.1	15.5										Unconfined Compressive Strength = 12,550 psi / 1,807 ksf							
	1,834.1	16.5	1.0	1:52/1.0	(1.0) 100%	(1.0) 100%					1,834.1	16.5							
											Boring Terminated at Elevation 1,834.1 ft In Crystalline Rock (BIOTITE GNEISS)								

NCDOT BORE DOUBLE BRIDGE 088 ON SR 1140 OVER HYATT MILL CREEK.GPJ NC_DOT.GDT 5/22/23

NCDOT CORE DOUBLE BRIDGE 088 ON SR 1140 OVER HYATT MILL CREEK.GPJ NC_DOT.GDT 5/22/23

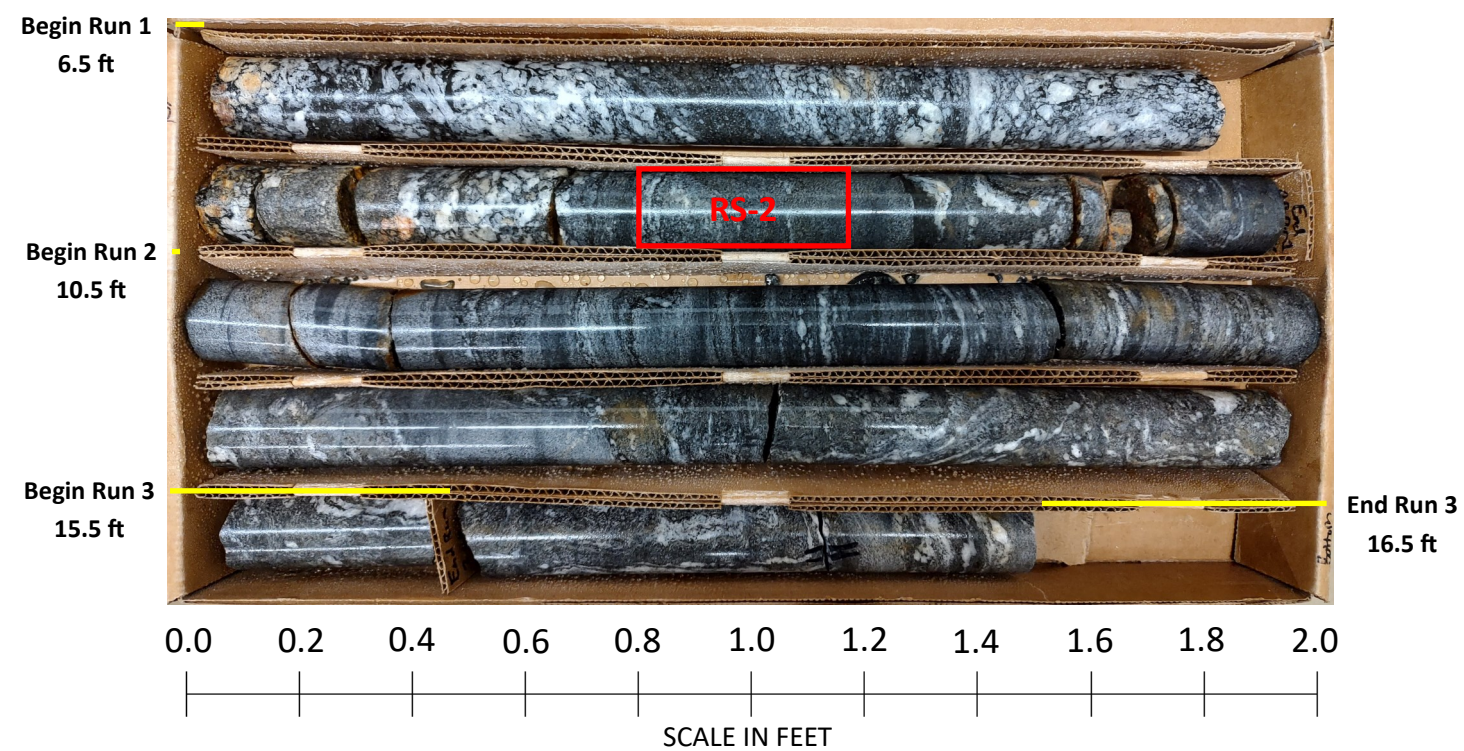


Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)

WBS - 49864.1.1 TIP No. HF-0005

Rock Core Photographs: Boring - EB2-A

Station: 15+01 Offset: 9 ft LT



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 49864.1.1		TIP HF-0005		COUNTY CLAY		GEOLOGIST A. Blackmore								
SITE DESCRIPTION Replace Bridge No. 88 over Hyatt Mill Creek on SR 1140 (Myers Chapel Road)						GROUND WTR (ft)								
BORING NO. EB2-B		STATION 14+49		OFFSET 11 ft RT		ALIGNMENT -L2-								
COLLAR ELEV. 1,849.6 ft		TOTAL DEPTH 3.5 ft		NORTHING 496,785		EASTING 563,116								
DRILL RIG/HAMMER EFF./DATE N/A				DRILL METHOD Hand Auger / DCP		HAMMER TYPE N/A								
DRILLER N/A		START DATE 05/03/23		COMP. DATE 05/03/23		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT		SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100		ELEV. (ft)	DEPTH (ft)	
1850	1,849.6	0.0	N/A	2	2								1,849.6	0.0
	1,848.6	1.0	N/A	4	2						M		ROADWAY EMBANKMENT	
	1,847.6	2.0	N/A	2	2								Soft to Medium Stiff, Brown-Gray, Fine to Coarse Sandy SILT (A-4)	
	1,846.6	3.0	N/A	4	2									
	1,845.6	4.0	N/A	3	3									
	1,844.6	5.0	N/A	7	8								Boring Terminated at Elevation 1,846.1 ft In Residual Sandy SILT (A-4)	
	1,843.6	6.0	N/A	25	11								Notes:	
	1,842.6	7.0	N/A	25	25								Hand Auger Refusal encountered at Elevation 1846.1 feet. To evaluate the subsurface conditions below, DCP testing continued until Elevation 1841.6 feet.	

NCDOT BORE DOUBLE BRIDGE 088 ON SR 1140 OVER HYATT MILL CREEK.GPJ NC_DOT.GDT 5/22/23

SOIL TEST RESULTS																
BORING NO.	SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
								C. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1-B	SS-45	10' RT	13+84 -L2-	3.5-5.0	A-7-6(13)	55	29	21.3	27.0	21.3	30.4	97.7	85.6	54.9	29.3	-

LAB TECHNICIAN: DANIEL REEVE

NCDOT CERTIFICATION NO. 135-03-0816



PHOTO 1: VIEW FACING BRIDGE 88 FROM -L2- ALIGNMENT, FACING DOWNSTATION.



PHOTO 2: VIEW FACING BRIDGE 88 FROM -L2- ALIGNMENT, FACING UPSTATION.



PHOTO 3: VIEW FACING UPSTREAM FROM BRIDGE.



PHOTO 4: VIEW FACING DOWNSTREAM FROM BRIDGE.