

REFERENCE: HB-0030

PROJECT: 50647

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

STRUCTURE  
SUBSURFACE INVESTIGATION

COUNTY MACON  
PROJECT DESCRIPTION REPLACE BRIDGE NO. 550055  
ON SR 1679 (PEEKS CREEK RD) OVER  
CULLASAJA RIVER

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
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13	ROCK TEST RESULTS
14	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HB-0030	1	

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) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE 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.

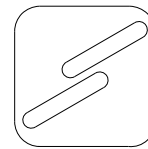
- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
  - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

E. KURTZ

UES EXPLORATION, LLC

INVESTIGATED BY J. HOLLAND  
 DRAWN BY J. HOLLAND  
 CHECKED BY J. CRENSHAW  
 SUBMITTED BY SCHNABEL ENG.  
 DATE MARCH 2025



**Schnabel**  
ENGINEERING



Signed by: Jason A. Holland 04/25/2025  
 DF15142D00C8348A SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

**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																																																																																																																																																															
<p>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></p>										<p>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.</p>										<p>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:</p>										<p>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 (ROD) - 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 (SROD) - 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.</p>																																																																																																																																																															
<p style="text-align: center;"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th></th> <th></th> <th></th> <th></th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING #10 #40 #200</td> <td>50 MX 30 MX 15 MX</td> <td>50 MX 25 MX</td> <td>51 MN 35 MX</td> <td>35 MX</td> <td>35 MX</td> <td>35 MX</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>MATERIAL PASSING #40 LL PI</td> <td>-</td> <td>-</td> <td>40 MX 10 MX</td> <td>41 MN 10 MX</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>40 MX 10 MX</td> <td>41 MN 11 MN</td> <td>40 MX 10 MX</td> <td>41 MN 11 MN</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> <td>0</td> <td>0</td> <td>4 MX</td> <td>8 MX</td> <td>12 MX</td> <td>16 MX</td> <td>NO MX</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. 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ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p style="text-align: center;"><b>WEATHERING</b></p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (IV 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.</p> <p>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.</p> <p>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.</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>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. <i>IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</i></p> <p>VERY SEVERE (IV SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</i></p> <p>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.</p>									
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<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>NOTES:</b></p> <p>BORING AND COLLAR ELEVATIONS OBTAINED WITH LASER LEVEL SURVEY EQUIPMENT - SURVEY DATED 2/11/25</p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> <p> ASPHALT</p>																																																																																																																																																																																			
<p style="text-align: center;"><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p style="text-align: center;"><b>RECOMMENDATION SYMBOLS</b></p> <p> UNDERCUT</p> <p> SHALLOW UNDERCUT</p> <p> UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p>																																																																																																																																																																																			
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<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>NOTES:</b></p> <p>BORING AND COLLAR ELEVATIONS OBTAINED WITH LASER LEVEL SURVEY EQUIPMENT - SURVEY DATED 2/11/25</p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> <p> ASPHALT</p>																																																																																																																																																																																			
<p style="text-align: center;"><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p style="text-align: center;"><b>RECOMMENDATION SYMBOLS</b></p> <p> UNDERCUT</p> <p> SHALLOW UNDERCUT</p> <p> UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p>																																																																																																																																																																																			

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)

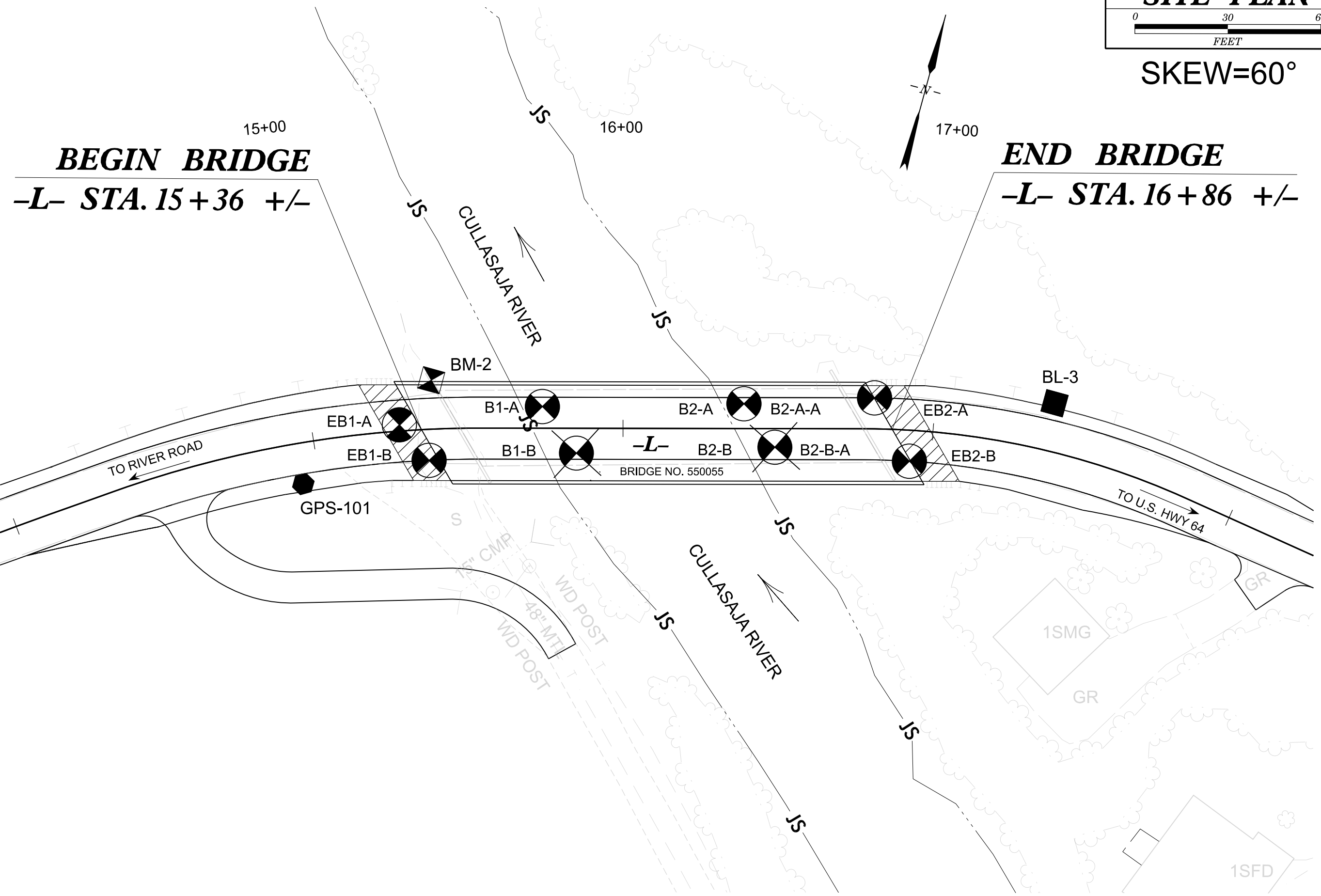
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
<p>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.</p>		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	<p>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.</p>		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
		Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings			Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings	
STRUCTURE		DECREASING SURFACE QUALITY →					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.	70					
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80						B. Sandstone with thin inter-layers of siltstone	60					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70					C. Sandstone and siltstone in similar amounts		50				
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60					D. Siltstone or silty shale with sandstone layers			40			
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			50				E. Weak siltstone or clayey shale with sandstone layers				30		
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes			40				F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure					20	
				30				G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers						10
				20				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.						
				10										
		N/A	N/A											

→ Means deformation after tectonic disturbance

PROJECT REFERENCE NO.	SHEET NO.
HB-0030	3
<b>SITE PLAN</b>	
 0                      30                      60 FEET	

**SKEW=60°**



15+00  
**BEGIN BRIDGE**  
 -L- STA. 15+36 +/-

17+00  
**END BRIDGE**  
 -L- STA. 16+86 +/-

-L- BRIDGE NO. 550055

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz									
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 15+28		OFFSET 2 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,151.9 ft		TOTAL DEPTH 18.7 ft		NORTHING 528,133		EASTING 719,114									
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER W. Greenwell		START DATE 02/06/25		COMP. DATE 02/06/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2155															
	2,151.7	0.2												2,151.9	GROUND SURFACE
			35	23	6										ROADWAY EMBANKMENT ASPHALT 2-INCHES
2150															Brown, SAND and GRAVEL (A-1-b)
	2,148.4	3.5	1	1	2									2,147.9	Brown and red, clayey SAND (A-2-6)
2145															
	2,143.4	8.5	2	1	2									2,141.4	RESIDUAL
2140															Brown and dark gray, SAND and GRAVEL (A-1-b)
	2,138.4	13.5	2	2	2									2,135.4	WEATHERED ROCK
2135														2,133.4	Dark brown, BIOTITE GNEISS
	2,133.4	18.5	60/0.1											2,133.2	CRYSTALLINE ROCK
	2,133.3	18.6	60/0.1												Dark gray and brown, BIOTITE GNEISS
															Boring Terminated with Standard Penetration Test Refusal at Elevation 2,133.2 ft in Crystalline rock (Biotite Gneiss)

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz									
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 15+37		OFFSET 10 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,152.4 ft		TOTAL DEPTH 29.7 ft		NORTHING 528,124		EASTING 719,127									
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER W. Greenwell		START DATE 02/06/25		COMP. DATE 02/06/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2155															
	2,152.2	0.2												2,152.4	GROUND SURFACE
			6	6	5										ROADWAY EMBANKMENT ASPHALT 2-INCHES
2150															Brown, clayey GRAVEL (A-1-b)
	2,148.9	3.5	1	2	8									2,150.4	Brown and red, clayey SAND (A-2-6)
2145															
	2,143.9	8.5	1	2	1									2,145.4	Brown, SAND and GRAVEL (A-1-b)
2140															
	2,138.9	13.5	32	0	8									2,142.4	RESIDUAL
2135															Dark gray, brown, and white, SAND and GRAVEL (A-1-b)
	2,133.9	18.5	11	9	8										
2130															
	2,128.9	23.5	13	12	55										
2125															
	2,123.9	28.5	15	28	72/0.1									2,123.4	WEATHERED ROCK
	2,122.8	29.6	60/0.1											2,122.8	Dark gray and white, BIOTITE GNEISS
														2,122.7	CRYSTALLINE ROCK
															Dark gray and white, BIOTITE GNEISS
															Boring Terminated with Standard Penetration Test Refusal at Elevation 2,122.7 ft in Crystalline rock (Biotite Gneiss)

NCDOT BORE DOUBLE HB0030 GEO\_BRDG\_DRAFT LOGS.GPJ NC\_DOT.GDT 3/10/25

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz									
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)								
BORING NO. B1-A		STATION 15+74		OFFSET 7 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,132.6 ft		TOTAL DEPTH 7.5 ft		NORTHING 528,150		EASTING 719,157									
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic									
DRILLER W. Greenwell		START DATE 02/07/25		COMP. DATE 02/07/25		SURFACE WATER DEPTH 1.0ft									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2135															
	2,132.6	0.0	10	12	34									2,132.6	0.0
2130															
	2,129.1	3.5	16	25	33										
	2,125.2	7.4												2,125.2	7.4
			60/0.1											2,125.1	7.5

NCDOT BORE DOUBLE HB0030 GEO\_BRDG\_DRAFT LOGS.GPJ NC\_DOT.GDT 3/10/25

Sat.

WATER BOTTOM

**ALLUVIAL**  
Brown, SAND and GRAVEL, contains rock fragments (A-1-b)

**CRYSTALLINE ROCK**  
Dary gray, BIOTITE GNEISS  
Boring Terminated with Standard Penetration Test Refusal at Elevation 2,125.1 ft in Crystalline rock (Biotite Gneiss)

# GEOTECHNICAL BORING REPORT

## BORE LOG

# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz									
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)								
BORING NO. B1-B		STATION 15+85		OFFSET 8 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,130.3 ft		TOTAL DEPTH 59.2 ft		NORTHING 528,139		EASTING 719,172									
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023			DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic									
DRILLER W. Greenwell		START DATE 02/04/25		COMP. DATE 02/05/25		SURFACE WATER DEPTH 1.2ft									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2135															
2130	2,130.3	0.0	15	23	22									2,130.3	0.0
2125	2,126.8	3.5	9	8	8									2,121.8	8.5
2120	2,121.8	8.5	100/0.4											2,121.8	8.5
2115	2,116.8	13.5	100/0.4											2,110.3	20.0
2110	2,111.8	18.5	100/0.5											2,110.3	20.0
2105	2,110.3	20.0	60/0.1											2,110.3	20.0
2100														2,101.1	29.2
2095														2,094.6	35.7
2090														2,071.1	59.2
2085															
2080															
2075															

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz						
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)					
BORING NO. B1-B		STATION 15+85		OFFSET 8 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,130.3 ft		TOTAL DEPTH 59.2 ft		NORTHING 528,139		EASTING 719,172						
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023			DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic						
DRILLER W. Greenwell		START DATE 02/04/25		COMP. DATE 02/05/25		SURFACE WATER DEPTH 1.2ft						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2100	2,110.1	20.2	4.0	0:41/1.0 1:23/1.0 2:09/1.0 2:54/1.0	(3.8) 95%	(1.8) 45%		(5.2) 58%	(1.8) 20%		Begin Coring @ 20.2 ft	20.2
2105	2,106.1	24.2	5.0	0:21/1.0 0:47/1.0 1:09/1.0 1:38/1.0 2:16/1.0	(1.4) 28%	(0.0) 0%					CRYSTALLINE ROCK Dark Gray, Biotite Gneiss, slight to complete weathering, moderately hard to very soft, close to very close fracture spacing	20.2
2100	2,101.1	29.2	5.0	0:22/1.0 0:38/1.0 0:49/1.0 0:54/1.0 1:04/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%	(0.0) 0%		RESIDUAL Red and brown, SAND and GRAVEL (A-1-b)	29.2
2095	2,096.1	34.2	5.0	0:54/1.0 1:23/1.0 2:37/1.0 3:12/1.0 4:01/1.0	(1.0) 20%	(0.0) 0%		(16.2) 69%	(14.5) 62%		CRYSTALLINE ROCK Dark gray, white, and brown, BIOTITE GNEISS, fresh to complete weathering, hard to very soft, very close to wide fracture spacing	35.7
2090	2,091.1	39.2	5.0	0:43/1.0 1:23/1.0 2:07/1.0 1:30/1.0 1:15/1.0	(1.5) 30%	(0.8) 16%					GSI=45-50	
2085	2,086.1	44.2	5.0	1:07/1.0 2:11/1.0 3:02/1.0 3:36/1.0 4:42/1.0	(3.9) 78%	(3.9) 78%						
2080	2,081.1	49.2	5.0	1:18/1.0 2:36/1.0 3:42/1.0 4:24/1.0 5:18/1.0	(4.9) 98%	(4.9) 98%						
2075	2,076.1	54.2	5.0	0:27/1.0 1:25/1.0 2:45/1.0 3:52/1.0 6:03/1.0	(4.9) 98%	(49.0) 980%						
	2,071.1	59.2									Boring Terminated at Elevation 2,071.1 ft in Crystalline rock (Biotite Gneiss)	59.2

NCDOT BORE DOUBLE HB0030 GEO\_BRDG\_DRAFT LOGS.GPJ NC\_DOT.GDT 3/10/25

**CORE PHOTOGRAPH**  
**REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER**

**B1-B**  
**BOX 1 OF 4: 20.2 - 44.2 FEET**



APPROXIMATE SCALE IN FEET

**B1-B**  
**BOX 2 OF 4: 44.2 - 50.9 FEET**



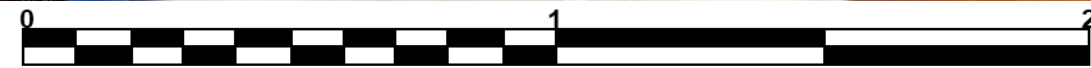
APPROXIMATE SCALE IN FEET

**B1-B**  
**BOX 3 OF 4: 50.9 - 54.2 FEET**



APPROXIMATE SCALE IN FEET

**B1-B**  
**BOX 4 OF 4: 54.2 - 59.2 FEET**



APPROXIMATE SCALE IN FEET







**CORE PHOTOGRAPH**  
**REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEK'S CREEK RD.) OVER CULLASAJA RIVER**

**B2-B-A**  
**BOX 1 OF 1: 6.1 - 8.1 FEET**



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz									
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)								
BORING NO. EB2-A		STATION 16+81		OFFSET 10 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,151.6 ft		TOTAL DEPTH 15.6 ft		NORTHING 528,181		EASTING 719,260									
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER W. Greenwell		START DATE 02/06/25		COMP. DATE 02/06/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2155															
2150	2,151.3	0.3	7	14	11								M	GROUND SURFACE ROADWAY EMBANKMENT ASPHALT 3-INCHES Brown and red, SAND and GRAVEL (A-1-b)	0.0
	2,148.1	3.5	3	1	3								M		
2145	2,143.1	8.5	3	3	2								M		
2140	2,138.6	13.0	7	17	51								M	RESIDUAL Red, white, and brown, SAND and GRAVEL (A-1-b)	10.5
	2,136.1	15.5											M	CRYSTALLINE ROCK Red and brown, BIOTITE GNEISS Boring Terminated with Standard Penetration Test Refusal at Elevation 2,136.0 ft in Crystalline rock (Biotite Gneiss)	15.5
			60/0.1												60/0.1

WBS 50647.1.1		TIP HB-0030		COUNTY MACON		GEOLOGIST E. Kurtz									
SITE DESCRIPTION REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER							GROUND WTR (ft)								
BORING NO. EB2-B		STATION 16+93		OFFSET 10 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,151.6 ft		TOTAL DEPTH 16.6 ft		NORTHING 528,164		EASTING 719,276									
DRILL RIG/HAMMER EFF./DATE GTE1375 CME-55LC 93% 07/17/2023			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER W. Greenwell		START DATE 02/06/25		COMP. DATE 02/06/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2155															
2150	2,151.4	0.2	9	10	10								M	GROUND SURFACE ROADWAY EMBANKMENT ASPHALT 2-INCHES Red and brown, SAND and GRAVEL (A-1-b)	0.0
	2,148.1	3.5	2	3	2								M		
2145	2,143.1	8.5	1	2	2								M		
2140	2,138.1	13.5	8	25	27								M	RESIDUAL Brown, SAND and GRAVEL (A-1-b)	10.0
	2,135.1	16.5											M	CRYSTALLINE ROCK Brown, BIOTITE GNEISS Boring Terminated with Standard Penetration Test Refusal at Elevation 2,135.0 ft in Crystalline rock (Biotite Gneiss)	16.5
2135			60/0.1												60/0.1

REPORT ON SAMPLES OF: Rock for Quality (ASTM D 7012 Method C)

T.I.P. ID NO.: HB-0030

DESCRIPTION: Replace Bride No. 55055 On SR 1679 Over Cullasaja River

PROJECT: 50647.1.1

COUNTY: Macon

DATE SAMPLED: 2/04/2025

BORING NO	SAMPLE NO	DEPTH (FT)	ROCK TYPE	LENGTH (IN)	DIAMETER (IN)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	YOUNG'S MODULUS (PSI)	SPLITTING TENSILE STRENGTH (PSI)	REMARKS
B1-B	RS-1	21.2 - 22.0	Biotite Gneiss	4.46	1.86	158.9	400	--	--	--
B1-B	RS-2	40.1 - 40.8	Biotite Gneiss	4.40	1.86	173.0	3,890	--	--	--
B1-B	RS-2 (Alt.)	22.3 - 22.8	Biotite Gneiss	4.45	1.86	155.8	1,930	--	--	--

**SITE PHOTOGRAPHS**  
**REPLACE BRIDGE NO. 550055 ON SR 1679 (PEEKS CREEK RD.) OVER CULLASAJA RIVER**



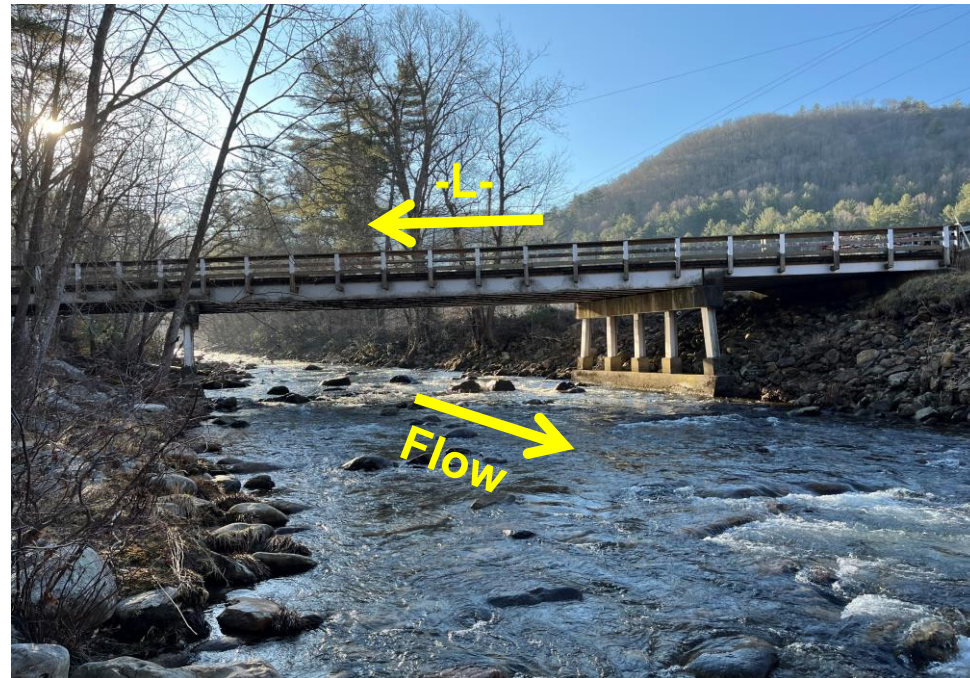
**View of SR 1679 looking east.**



**View of SR 1679 looking west.**



**View of existing Bridge No. 550055 looking northwest.**



**View of existing Bridge No. 550055 looking southeast.**