STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0155	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *ROCKINGHAM*

PROJECT DESCRIPTION *REPLACE BRIDGE 163 ON US 158 OVER HOGAN'S CREEK*

REFERENCE: BR-0155

PROJECT: 67155

CONTENTS

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.

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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BR-0155	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
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.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] MOBILE B-29
- [ ] _____

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

HAMMER TYPE:
- [ ] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q

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

ROCK DESCRIPTION

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:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V 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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, 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.

BENCH MARK:

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY NCDOT DATED DECEMBER 2, 2024.

BRIDGE BORING COLLAR ELEVATION OBTAINED USING CARLSON BRx7 GPS.

FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
BR-0155	2A

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)

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.

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 ⇩

SURFACE CONDITIONS

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

DECREASING SURFACE QUALITY ⇨

90			N/A	N/A
80				
70				
60				
50				
40				
30				
20				
10				
N/A	N/A			

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

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.

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 interlayers 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

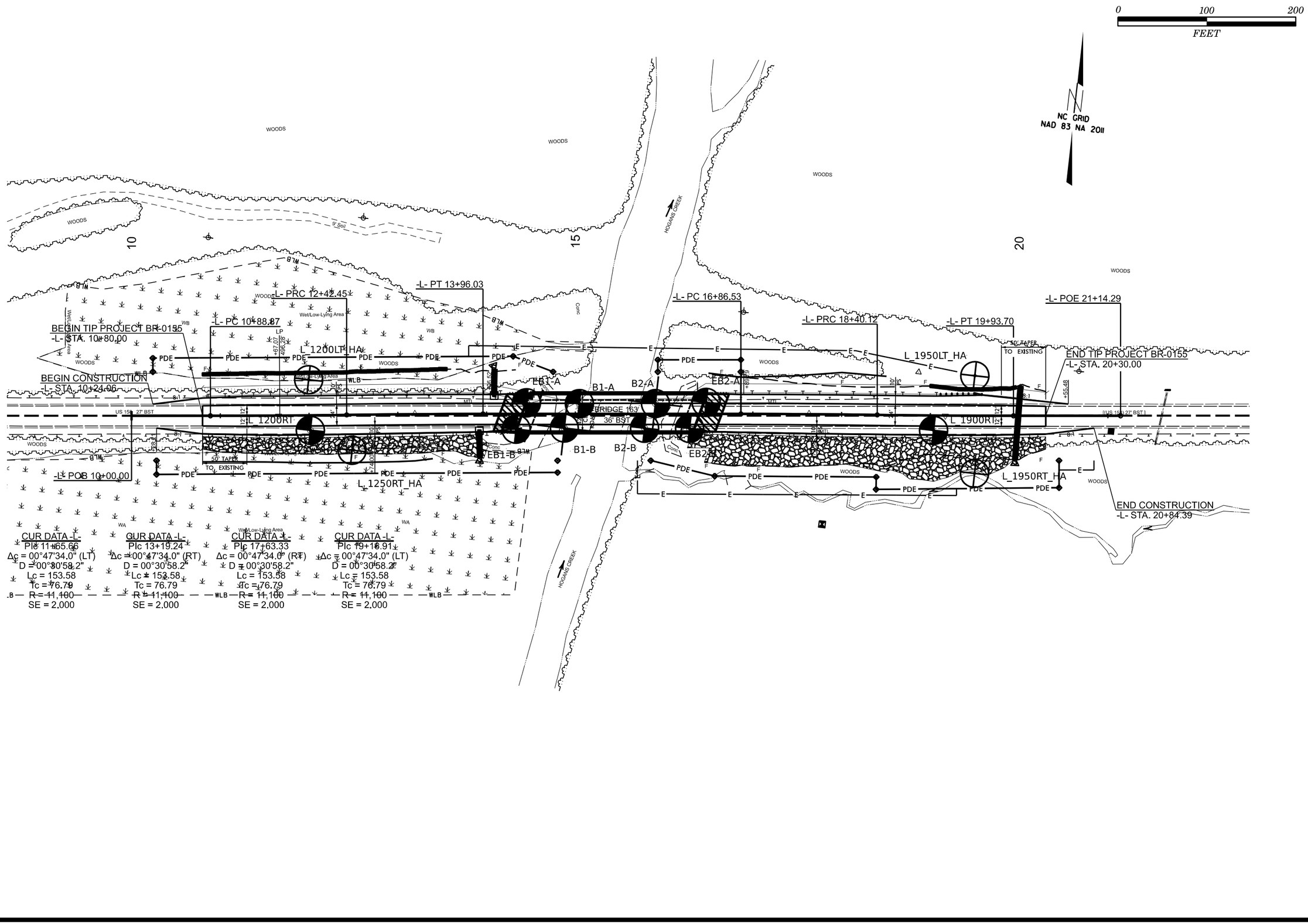
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
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

70	A			
60				
50		B	C	D E
40				
30				F
20				
10			G	H

DATE: 8-19-16

5/26/20



BR-0155
GEO | 003

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Prepared For:

GEOTECHNICAL

BR-0155

Replace Bridge 163 on US 158 over Hogan's Creek

GOTECHNICAL UNIT

PREPARED BY

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** M. Malisher	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. L_1200LT_HA	**STATION** 12+00	**OFFSET** 40 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.0
COLLAR ELEV. 484.2 ft	**TOTAL DEPTH** 3.2 ft	**NORTHING** 964,431	**EASTING** 1,843,716	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
485										
										484.2 / 0.0 GROUND SURFACE
								M		**ALLUVIAL**
										483.2 / 1.0 Soft, Brown-Gray, Fine Sandy CLAY (A-6), with trace mica and organics
								▽		482.2 / 2.0 Very Loose to Medium Dense, Brown-Gray, Clayey Fine SAND (A-2-6), with trace mica and gravel
								W		481.0 / 3.2 Very Loose, Gray, Silty Fine to Coarse SAND (A-2-4), with trace mica and gravel
										Boring Terminated at Elevation 481.0 ft In Alluvial Silty SAND (A-2-4)

Note:
Hand auger terminated upon manual auger refusal. Multiple offsets attempted with similar refusal depths.

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. L_1200RT	**STATION** 12+01	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 16.0
COLLAR ELEV. 495.4 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 964,375	**EASTING** 1,843,724	**24 HR.** 12.2
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/08/25	**COMP. DATE** 01/08/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
500										
495	494.4	1.0	6	6	5	11	SS-1	12%		495.4 / 0.0 GROUND SURFACE
	491.9	3.5								**ROADWAY EMBANKMENT**
490			9	10	10	20		M		Medium Dense, Brown-Orange, Silty Fine SAND (A-2-4), with trace organics and gravel
	489.4	6.0	100/0.3			100/0.3				Boulders Encountered 6.0'-8.0'
	486.9	8.5	2	3	5	8		M		487.4 / 8.0 **ALLUVIAL**
485										Medium Stiff, Gray-Brown, Fine Sandy SILT (A-4), with trace organics, gravel, and mica
	481.9	13.5	WOH	1	1	2		▽		483.4 / 12.0 Soft to Medium Stiff, Gray-Brown-Orange, Silty CLAY (A-7), with trace to little organics, wood fragments, and fine sand
480								M		
	476.9	18.5	1	2	3	5				
475								W		
	471.9	23.5	2	2	2	4				471.2 / 24.2 Very Loose to Loose, Gray-White, Clayey Fine to Coarse SAND (A-2-6)
470								W		
	466.9	28.5	2	1	2	3		W		465.4 / 30.0 Boring Terminated at Elevation 465.4 ft In Alluvial Clayey SAND (A-2-6)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** M. Malisher	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. L_1250RT_HA	**STATION** 12+50	**OFFSET** 40 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.5
COLLAR ELEV. 484.0 ft	**TOTAL DEPTH** 3.5 ft	**NORTHING** 964,358	**EASTING** 1,843,773	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
DRILLER N/A	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
485										
										484.0 GROUND SURFACE 0.0
								W		**ALLUVIAL** Very Soft, Brown-Gray, Fine Sandy CLAY (A-6), with trace organics and mica
										480.5 3.5
										Boring Terminated at Elevation 480.5 ft In Alluvial Sandy CLAY (A-6)
										Note: Hand auger terminated due hole cave-in. Multiple offsets attempted.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 14+45	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 498.3 ft	**TOTAL DEPTH** 48.4 ft	**NORTHING** 964,432	**EASTING** 1,843,963	**24 HR.** 15.6
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/09/25	**COMP. DATE** 01/09/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
500											
	498.3	0.0								498.3 GROUND SURFACE	0.0
			3	4	8	12		M		**ROADWAY EMBANKMENT** Medium Stiff to Stiff, Orange, Fine Sandy SILT (A-4), with trace to little asphalt fragments, gravel, and organics, and trace mica	
495	493.6	4.7	4	3	3	6		M			
490	488.6	9.7	2	2	4	6		M		485.8 **ALLUVIAL** Medium Stiff, Gray-Brown, Fine Sandy SILT (A-4), with trace organics, mica, and clay	12.5
485	483.6	14.7	3	2	4	6				480.3 Soft, Gray, Silty CLAY (A-7), with trace organics	18.0
480	478.6	19.7	1	1	1	2		W		477.6 Soft, Gray-Brown, Fine Sandy SILT (A-4), with trace mica	20.7
475	473.6	24.7	2	2	2	4		W			
470	468.6	29.7	2	3	4	7		Sat.		470.8 Very Loose to Loose, Gray-White, Silty Fine to Coarse SAND (A-2-4)	27.5
465	463.6	34.7	1	1	2	3		Sat.		462.3 Soft to Medium Stiff, Gray, Fine Sandy CLAY (A-6), with trace wood fragments and mica	36.0
460	458.6	39.7	1	4	3	7		M		456.4 **WEATHERED ROCK** Gray (Biotite Gneiss)	41.9
455	454.4	43.9	90	10/0.1		100/0.6				452.3 **CRYSTALLINE ROCK** (Biotite Gneiss)	46.0
450	450.0	48.3	60/0.1			60/0.1				449.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 449.9 ft In Crystalline Rock (Biotite Gneiss)	48.4

Surficial Organic Soil 0.0-0.2'

Note:
Hard drilling encountered at 41.9 ft.

Crystalline Rock encountered at 46.0 ft with PDC bit.

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 14+33	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 15.5
COLLAR ELEV. 498.1 ft	**TOTAL DEPTH** 46.3 ft	**NORTHING** 964,402	**EASTING** 1,843,954	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/08/25	**COMP. DATE** 01/08/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
500										
	497.1	1.0								498.1 GROUND SURFACE 0.0
495	494.7	3.4	11	8	5	13		M		**ROADWAY EMBANKMENT** Medium Stiff to Stiff, Orange, Fine Sandy SILT (A-4), with trace gravel, asphalt fragments, organics, and mica
490	492.1	6.0	2	4	4	8		M		
	489.7	8.4	3	4	4	8		M		
485	484.7	13.4	3	4	5	9		M		
480	479.7	18.4	2	4	96/0.3	100/0.8				Boulders encountered 14.5' - 16.0' 481.6 16.5
475	474.7	23.4	2	2	2	4		W		**ALLUVIAL** Soft, Brown-Gray, Silty CLAY (A-7), with trace organics and trace to little fine sand 474.2 23.9
470	469.7	28.4	WOH	WOH	2	2		W		Soft, Gray-Brown, Fine Sandy CLAY (A-6), with trace gravel 471.6 26.5
465	464.7	33.4	2	1	1	2		Sat.		Very Loose, Gray-White, Silty Fine to Coarse SAND (A-2-4), with trace wood fragments 464.2 33.9
460	459.7	38.4	4	1	0	1		Sat.		Very Soft, Gray, Fine Sandy CLAY (A-6), with trace organics and mica 461.1 37.0
455	454.7	43.4	1	4	3	7		W		Loose, Gray-White, Clayey Fine to Coarse SAND (A-2-6) 456.1 42.0
	451.8	46.3	100/0.5			100/0.5				**RESIDUAL** Medium Stiff, Brown-Gray, Fine Sandy SILT (A-4), with trace gravel and mica 454.7 43.4
			60/0.0			60/0.0				**WEATHERED ROCK** Gray-Brown-Orange (Biotite Gneiss) 451.8 46.3
										Boring Terminated with Standard Penetration Test Refusal at Elevation 451.8 ft On Crystalline Rock (Biotite Gneiss)

Surficial Organic Soil 0.0-0.3'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 15+05	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 483.6 ft	**TOTAL DEPTH** 31.4 ft	**NORTHING** 964,438	**EASTING** 1,844,022	**24 HR.** 0.9
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/09/25	**COMP. DATE** 01/09/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
485											
	483.6	0.0	1	0	1	1				483.6 GROUND SURFACE	0.0
480										**ALLUVIAL** Very Soft, Gray-Brown, Silty CLAY (A-7), with trace fine to coarse sand, gravel, and organics	
	478.7	4.9	2	1	0	1		W		480.6	3.0
475										Very Soft, Orange-Brown, Fine to Coarse Sandy SILT (A-4)	
	473.7	9.9	2	8	4	12		W		475.6 Medium Dense, White-Gray, Silty Fine to Coarse SAND (A-2-4)	8.0
470										470.1	13.5
	468.7	14.9	4	1	3	4		Sat.		Loose, Gray-White-Orange, Clayey Fine to Coarse SAND (A-2-6), with trace gravel	
465										466.1	17.5
	463.7	19.9	7	11	29	40		M		**RESIDUAL** Hard, Orange, Fine Sandy SILT (A-4), with trace to little mica	
460											
	458.7	24.9	27	60	40/0.2	100/0.7				458.2	25.4
	456.0	27.6	60	40/0.3		100/0.8				**WEATHERED ROCK** Brown-Gray-Orange, (Biotite Gneiss)	
455	454.7	28.9	55	45/0.2		100/0.7					
	452.2	31.4	60/0.0			60/0.0				452.2	31.4
										Boring Terminated with Standard Penetration Test Refusal at Elevation 452.2 ft On Crystalline Rock (Biotite Gneiss)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** T. Wenner	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 14+88	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 484.5 ft	**TOTAL DEPTH** 44.5 ft	**NORTHING** 964,409	**EASTING** 1,844,008	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/13/25	**COMP. DATE** 01/13/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
485											
	484.5	0.0	2	2	1	3				484.5 GROUND SURFACE	0.0
480	479.5	5.0	1	1	1	2		W		**ALLUVIAL** Soft, Brown-Gray. Fine Sandy SILT (A-4), with trace mica and organics	
475	474.5	10.0	1	1	2	3		W		476.5 Very Loose to Loose, Gray, Silty Fine to Coarse SAND (A-2-4), with trace gravel	8.0
470	469.5	15.0	2	2	3	5		W			
465	464.5	20.0	30	48	52/0.4	100/0.8		W		467.0 **RESIDUAL** Very Stiff, Tan, Fine to Coarse Sandy SILT (A-4), with trace mica	17.5
460	460.0	24.5	60/0.0			60/0.0				464.0 **WEATHERED ROCK** Tan, (Biotite Gneiss)	20.5
455										460.0 **CRYSTALLINE ROCK** Brown-Gray, (Biotite Gneiss)	24.5
450							RS-01			456.8 / 455.8 REC = 100% RQD = 0% GSI = 15-20 **WEATHERED ROCK** Brown-Gray, (Biotite Gneiss) **CRYSTALLINE ROCK** Gray-White, (Biotite Gneiss) REC = 98% RQD =75% GSI = 55-60	27.7 / 28.7
445							RS-02				
440										440.0 Boring Terminated at Elevation 440.0 ft In Crystalline Rock (Biotite Gneiss)	44.5

NCDOT BORE DOUBLE BR0155_GEO_BRDG_GTM.GPJ NC_DOT.GDT 2/13/25

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** T. Wenner	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 14+88	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 484.5 ft	**TOTAL DEPTH** 44.5 ft	**NORTHING** 964,409	**EASTING** 1,844,008	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/13/25	**COMP. DATE** 01/13/25	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 20.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
460											Begin Coring @ 24.5 ft	
	460.0	24.5	5.0	*N=60/0.0* 4:50/1.0 1:37/1.0 1:17/1.0 1:50/1.0 3:02/1.0	(4.5) 90%	(0.4) 8%		(3.2) 100%	(0.0) 0%		460.0 **CRYSTALLINE ROCK** Moderately Severe Weathering to Moderate Weathering, Soft to Moderately Hard, Brown-Gray, (Biotite Gneiss), with Very Close to Close Fracture Spacing	24.5
455	455.0	29.5	5.0	2:43/1.0 3:27/1.0 4:18/1.0 4:55/1.0 4:55/1.0	(4.7) 94%	(1.7) 34%		(0.5) 50% / (15.5) 98%	(0.0) 0% / (11.9) 75%		456.8 / 455.8 GSI = 15-20 **WEATHERED ROCK** Brown-Gray, (Biotite Gneiss) **CRYSTALLINE ROCK** Moderate Weathering to Fresh, Moderately Hard to Hard, Gray-White (Biotite Gneiss), with Close to Wide Fracture Spacing GSI = 55-60 RS-01: 33.9'-34.5' Unit Weight: 173.0 pcf Unconfined Compressive Strength: 9,180 psi (1,320 ksf) RS-02: 39.5'-40.5' Unit Weight: 171.8 pcf Unconfined Compressive Strength: 10,560 psi (1,520 ksf)	27.7 / 28.7
450	450.0	34.5	5.0	4:33/1.0 3:13/1.0 4:43/1.0 5:15/1.0 3:03/1.0	(5.0) 100%	(4.9) 98%	RS-01					
445	445.0	39.5	5.0	2:50/1.0 3:33/1.0 1:53/1.0 3:06/1.0 4:30/1.0	(5.0) 100%	(4.9) 98%	RS-02				440.0 Boring Terminated at Elevation 440.0 ft In Crystalline Rock (Biotite Gneiss)	44.5
440	440.0	44.5										

NCDOT CORE DOUBLE BR0155_GEO_BRDG_GTM.GPJ NC_DOT.GDT 2/13/25

CAROLINAS GEOTECHNICAL GROUP

BR-0155 - Replace Bridge 163 on US 158 over Hogans Creek
Rockingham County, North Carolina
Rock Core Photographs
Boring: B1-B
24.5 to 44.5 Feet

*Note: Sample was removed before the rock core box could be photographed.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 15+90	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 486.3 ft	**TOTAL DEPTH** 50.4 ft	**NORTHING** 964,447	**EASTING** 1,844,107	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/10/25	**COMP. DATE** 01/10/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
490											
	486.3	0.0								486.3 GROUND SURFACE	0.0
485			3	1	2	3		M		**ALLUVIAL** Soft, Brown-Gray, Fine Sandy CLAY (A-6), with trace organics and gravel	
	481.3	5.0								483.8	2.5
480			WOH	WOH	WOH	0		Sat.		Very Soft, Gray-Green, Fine Sandy SILT (A-4), with trace organics and mica	
	476.3	10.0								478.3	8.0
475			WOH	WOH	1	1		W		Very Soft, Gray, Fine Sandy CLAY (A-6), with trace mica and organics	
	471.3	15.0								473.3	13.0
470			6	6	12	18		M		**RESIDUAL** Very Stiff, Orange-Brown-White, Fine Sandy SILT (A-4), with trace to little mica	
	466.3	20.0								466.3	20.0
465			13	87/0.4		100/0.9				**WEATHERED ROCK** Brown-Orange-White (Biotite Gneiss)	
	462.9	23.4	60/0.0			60/0.0				462.9	23.4
460										**CRYSTALLINE ROCK** Gray-Brown-White (Biotite Gneiss)	
										459.6	26.7
455										458.6 REC = 75% RQD = 0% GSI = 15-20	27.7
										WEATHERED ROCK Orange-Brown (Biotite Gneiss)	
							RS-03			**CRYSTALLINE ROCK**	
450							RS-04			452.5 Gray-Brown-Orange (Biotite Gneiss)	33.8
										452.0	34.3
										450.9	35.4
										450.4 REC = 98% RQD = 48% GSI = 35-40	35.9
445							RS-05			**WEATHERED ROCK** Brown-Orange (Biotite Gneiss)	
							RS-06			444.2 **CRYSTALLINE ROCK** Brown-Orange-White (Biotite Gneiss)	42.1
440										REC = 100% RQD = 0% GSI = 15-20	
										RESIDUAL Soil Seam from 35.4' - 35.9'	
										435.9 **CRYSTALLINE ROCK** Orange-Brown-White (Biotite Gneiss)	50.4
										REC = 100% RQD = 13% GSI = 20-25	
										Gray (Biotite Gneiss)	
										REC = 99% RQD = 94% GSI = 75-80	
										Boring Terminated at Elevation 435.9 ft In Crystalline Rock (Biotite Gneiss)	

NCDOT BORE DOUBLE BR0155_GEO_BRDG_GTM.GPJ NC_DOT.GDT 2/11/25

GEOTECHNICAL BORING REPORT
CORE LOG

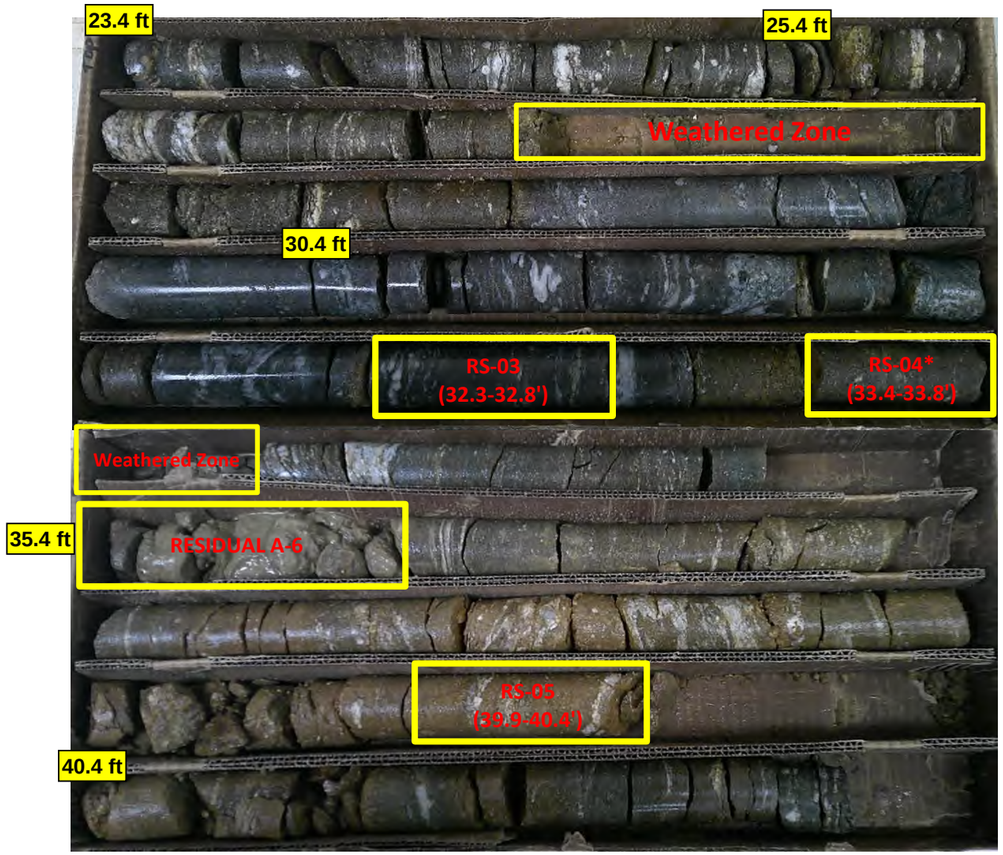
WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 15+90	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 486.3 ft	**TOTAL DEPTH** 50.4 ft	**NORTHING** 964,447	**EASTING** 1,844,107	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/10/25	**COMP. DATE** 01/10/25	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 27.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
462.9											Begin Coring @ 23.4 ft	
	462.9	23.4	2.0	*N=60/0.0*	(1.5) 75%	(0.0) 0%		(2.9) 88%	(0.0) 0%		462.9 **CRYSTALLINE ROCK** Moderately Severely Weathered to Moderately Weathered, Very Soft to Soft, Gray-Brown-White (Biotite Gneiss), with Very Close to Close Fracture Spacing	23.4
460	460.9	25.4	5.0	2:21/1.0 3:29/1.0 1:53/1.0	(4.0) 80%	(1.1) 22%		(0.2) 20%	(0.0) 0%		459.6	26.7
				1:08/1.0 1:13/1.0 2:10/1.0							458.6 GSI = 15-20	27.7
455	455.9	30.4	5.0	3:18/1.0	(4.5) 90%	(1.8) 36%		(6.0) 98%	(2.9) 48%		**WEATHERED ROCK** Orange-Brown (Biotite Gneiss)	
				1:46/1.0 1:51/1.0 3:12/1.0 2:33/1.0			RS-03 RS-04				**CRYSTALLINE ROCK**	
450	450.9	35.4	5.0	2:22/1.0	(5.0) 100%	(0.8) 16%		(0.2) 40%	(0.0) 0%		452.5 Moderately to Slightly Weathered, Very Soft to Moderately Hard, Gray-Brown-Orange (Biotite Gneiss), with Very Close to Close Fracture Spacing	33.8
				2:29/1.0 2:16/1.0 2:04/1.0 2:35/1.0				(1.1) 100%	(0.0) 0%		452.0	34.3
								(0.0) 0%	(0.0) 0%		450.9	35.4
445	445.9	40.4	5.0	4:37/1.0	(4.8) 96%	(3.0) 60%	RS-05 RS-06	(6.2) 100%	(0.8) 13%		450.4 GSI = 35-40 RS-03: 32.3'-32.8' Unit Weight: 170.7 pcf Unconfined Compressive Strength: 7,020 psi (1,010 ksf)	35.9
				2:44/1.0 2:51/1.0 2:23/1.0 1:54/1.0				(8.2) 99%	(7.8) 94%		444.2 **WEATHERED ROCK** Brown-Orange (Biotite Gneiss)	42.1
440	440.9	45.4	5.0	2:47/1.0	(5.0) 100%	(4.8) 96%					**CRYSTALLINE ROCK** Moderately Severe Weathered, Moderately Hard, Brown-Orange-White (Biotite Gneiss), with Very Close to Close Fracture Spacing	
				2:32/1.0 2:50/1.0 2:55/1.0 1:29/1.0							435.9 GSI = 15-20 RS-04: 33.4-33.8' (RS-04 did not produce a qualified sample for testing)	50.4
	435.9	50.4		1:29/1.0							**RESIDUAL** Soil Seam from 35.4' - 35.9' **CRYSTALLINE ROCK** Moderately Severe to Moderately Weathered, Very Soft to Moderately Hard, Orange-Brown-White (Biotite Gneiss), with Very Close to Close Fracture Spacing GSI = 20-25 RS-05: 39.9'-40.4' Unit Weight: 154.5 pcf Unconfined Compressive Strength: 970 psi (140 ksf) Slightly Weathered to Fresh, Moderately Hard to Hard, Gray (Biotite Gneiss), with Close to Moderately Close Fracture Spacing GSI = 75-80 RS-06: 42.2'-43.0' Unit Weight: 167.0 pcf Unconfined Compressive Strength: 11,540 psi (1,660 ksf) Boring Terminated at Elevation 435.9 ft In Crystalline Rock (Biotite Gneiss)	

NCDOT CORE DOUBLE BR0155_GEO_BRDG_GTM.GPJ NC_DOT.GDT 2/11/25

CAROLINAS GEOTECHNICAL GROUP

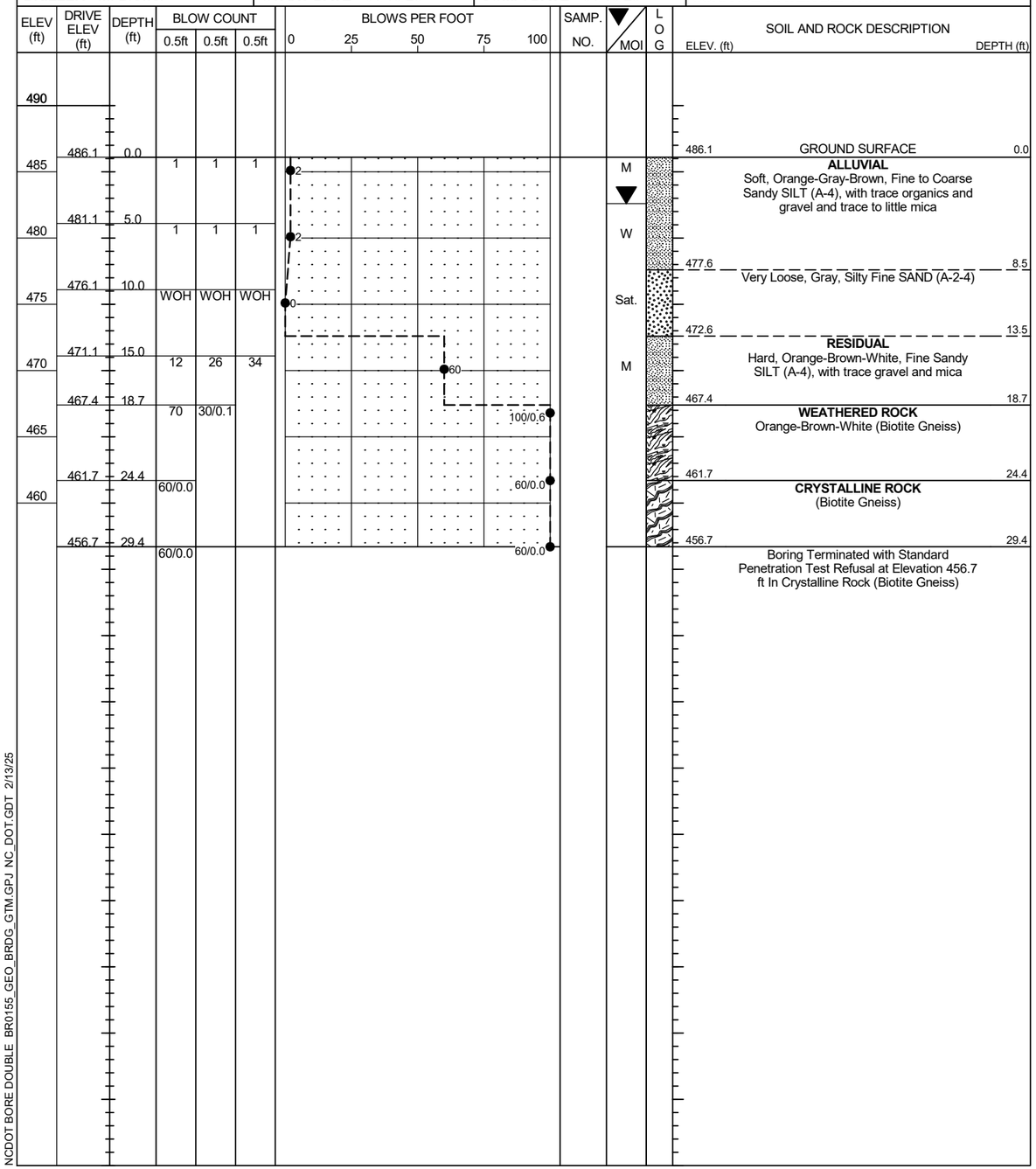
BR-0155 - Replace Bridge 163 on US 158 over Hogans Creek
Rockingham County, North Carolina
Rock Core Photographs
Boring: B2-A
23.4 to 50.4 Feet



*NOTE: Sample RS-04 was unable produce a qualified sample for testing during trimming.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 15+78	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 486.1 ft	**TOTAL DEPTH** 29.4 ft	**NORTHING** 964,419	**EASTING** 1,844,098	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/10/25	**COMP. DATE** 01/10/25	**SURFACE WATER DEPTH** N/A	



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 16+47	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 502.7 ft	**TOTAL DEPTH** 43.0 ft	**NORTHING** 964,455	**EASTING** 1,844,164	**24 HR.** 19.8
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/08/25	**COMP. DATE** 01/08/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
505											
	502.7	0.0								502.7 GROUND SURFACE	0.0
			2	5	6	11		M		**ROADWAY EMBANKMENT** Stiff, Orange-Brown, Fine Sandy SILT (A-4), with trace gravel, mica, and organics	
500	498.7	4.0	2	5	6	11		M		499.7	3.0
										Stiff, Orange-Brown-Gray, Fine Sandy CLAY (A-6), with trace gravel, mica, organics, and asphalt fragments	
495	493.7	9.0	3	5	5	10		M			
490	488.7	14.0	3	9	7	16		M		491.7 **RESIDUAL** Very Stiff, Orange-Red, Fine Sandy CLAY (A-6), with trace mica	11.0
485	483.7	19.0	3	6	9	15		M		487.7 Medium Dense, Orange-White, Silty Fine to Coarse SAND (A-2-4)	15.0
480	478.7	24.0	6	9	15	24		M		484.7 Stiff, Orange, SILT (A-5), with trace to little mica	18.0
475	473.7	29.0	11	13	23	36		M		480.7 Very Stiff to Hard, Orange-Yellow-Red, Fine to Coarse Sandy SILT (A-4), Manganese Oxide staining	22.0
470	469.7	33.0	20	44	56/0.4	100/0.9				469.2 **WEATHERED ROCK** Orange-Yellow (Biotite Gneiss)	33.5
465	464.7	38.0	28	72/0.4		100/0.9					
460	459.7	43.0	60/0.0			60/0.0				459.7 Boring Terminated with Standard Penetration Test Refusal at Elevation 459.7 ft On Crystalline Rock (Biotite Gneiss)	43.0
										Surficial Organic Soil 0.0-0.2'	

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 16+29	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** 20.6
COLLAR ELEV. 502.3 ft	**TOTAL DEPTH** 44.0 ft	**NORTHING** 964,424	**EASTING** 1,844,148	**24 HR.** 19.3
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/08/25	**COMP. DATE** 01/08/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
505										
	502.3	0.0								502.3 GROUND SURFACE 0.0
	501.3	1.0	5	3	3	6		M		**ROADWAY EMBANKMENT** Soft to Stiff, Orange, Fine Sandy SILT (A-4), with trace gravel, organics, and mica
500	498.7	3.6	3	3	2	5		M		
	496.3	6.0	5	4	5	9		M		
495	493.7	8.6	2	1	3	4		M		
490	488.7	13.6	2	2	5	7		M		490.3 Medium Stiff, Orange-Gray, Fine Sandy CLAY (A-6), with trace mica, gravel, and organics 12.0
485	483.7	18.6	2	2	4	6		W		485.3 **ALLUVIAL** Medium Stiff, Orange-Brown, Silty CLAY (A-7), with trace mica, Manganese Oxide staining 17.0
480	478.7	23.6	5	5	7	12		M		480.3 **RESIDUAL** Stiff to Hard, Orange-Red-Brown-White, Fine Sandy SILT (A-4), with trace to little mica 22.0
475	473.7	28.6	7	16	20	36				
470	468.7	33.6	26	25	59	84				463.2 **WEATHERED ROCK** Brown-Orange (Biotite Gneiss) 39.1
465	463.7	38.6	40	37	63/0.2	100/0.7				
460	458.7	43.6	100/0.3			100/0.3				458.3 Boring Terminated with Standard Penetration Test Refusal at Elevation 458.3 ft On Crystalline Rock (Biotite Gneiss) 44.0
	458.3	44.0	60/0.0			60/0.0				Surficial Organic Soil 0.0-0.2'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. L_1900RT	**STATION** 19+04	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 511.3 ft	**TOTAL DEPTH** 13.0 ft	**NORTHING** 964,452	**EASTING** 1,844,422	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER M. Brewer	**START DATE** 01/08/25	**COMP. DATE** 01/08/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
515										ELEV. (ft) DEPTH (ft)
	511.3	0.0								511.3 GROUND SURFACE 0.0
510	510.3	1.0	3	3	3	6		M		**ROADWAY EMBANKMENT** Loose to Medium Dense, Orange-Gray-Brown, Silty Fine to Coarse SAND (A-2-4), with trace mica, organics, clay, and asphalt fragments
	507.8	3.5	4	5	8	13	SS-34	15%		
505	505.3	6.0	4	3	3	6		M		
	502.8	8.5	3	6	16	22		M		503.3 8.0 **RESIDUAL** Very Stiff, Orange-Brown, Fine Sandy SILT (A-4), with trace gravel-sized rock fragments and mica
500	498.3	13.0	60/0.0			60/0.0				498.3 13.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 498.3 ft On Crystalline Rock (Biotite Gneiss) Surficial Organic Soil 0.0-0.2'

NCDOT BORE DOUBLE BR0155_GEO_BRDG_GTM.GPJ NC_DOT.GDT 2/11/25

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** M. Malisher	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. L_1950LT_HA	**STATION** 19+50	**OFFSET** 45 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 520.4 ft	**TOTAL DEPTH** 6.4 ft	**NORTHING** 964,518	**EASTING** 1,844,461	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
525										
										520.4 GROUND SURFACE 0.0
520								M		**RESIDUAL** Soft to Medium Stiff, Red-Brown, Fine to Coarse Sandy CLAY (A-6), with trace mica and roots
								M		518.4 2.0 Medium Dense, Red-Brown, Silty Fine SAND (A-2-4), with trace mica
515								M		
										514.0 6.4 Boring Terminated at Elevation 514.0 ft In Residual Silty SAND (A-2-4)
										Surficial Organic Soil 0.0-0.1'

WBS 67155.1.1	**TIP** BR-0155	**COUNTY** ROCKINGHAM	**GEOLOGIST** M. Malisher	
SITE DESCRIPTION Replace Bridge 163 on US 158 over Hogan's Creek				**GROUND WTR (ft)**
BORING NO. L_1950RT_HA	**STATION** 19+50	**OFFSET** 65 ft RT	**ALIGNMENT** -L-	**0 HR.** 1.6
COLLAR ELEV. 489.8 ft	**TOTAL DEPTH** 5.5 ft	**NORTHING** 964,409	**EASTING** 1,844,473	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
490										
										489.8 GROUND SURFACE 0.0
										ALLUVIAL Very Loose to Loose, Brown-Gray, Silty Fine to Coarse SAND (A-2-4), with trace mica, roots, and gravel
485								W		
										484.3 5.5 Boring Terminated at Elevation 484.3 ft In Alluvial Silty SAND (A-2-4)
										Surficial Organic Soil 0.0-0.1'

PROJECT REFERENCE NO.	SHEET NO.
BR–0155	16

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
L_1200RT	SS–1	17' RT	12+01 –L–	964375	1843724	1.0 – 2.5'	A–2–4	32	5	24.3	42.3	23.3	10.1	59.2	51.1	23.6	11.8	–
L_1900RT	SS–34	17' RT	19+04 –L–	964452	1844422	3.5 – 5.0'	A–2–4	32	8	29.2	33.0	23.5	14.3	79.8	65.1	33.6	15.1	–

ROCK TEST RESULTS

SAMPLE NO.*	BORING	STATION	OFFSET	NORTHING	EASTING	DEPTH INTERVAL	ROCK TYPE	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH
RS–01	B1–B	14+88 –L–	16' RT	964409	1844008	33.9 – 34.5'	BIOTITE GNEISS	173.0	9,180 psi (1,320 ksf)
RS–02	B1–B	14+88 –L–	16' RT	964409	1844008	39.5 – 40.5'	BIOTITE GNEISS	171.8	10,560 psi (1,520 ksf)
RS–03	B2–A	15+90 –L–	12' LT	964447	1844107	32.3 – 32.8'	BIOTITE GNEISS	170.7	7,020 psi (1,010 ksf)
RS–05	B2–A	15+90 –L–	12' LT	964447	1844107	39.9 – 40.4	BIOTITE GNEISS	154.5	970 psi (140 ksf)
RS–06	B2–A	15+90 –L–	12' RT	964447	1844107	42.2 – 43.0'	BIOTITE GNEISS	167.0	11,540 psi (1,660 ksf)

*NOTE: RS–04 SPECIMEN WAS UNABLE TO PRODUCE A TESTABLE SAMPLE DURING TRIMMING.

Alix M Abernathy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–0212

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SOUTH CAROLINA
NCDOT LAB CERT. NO. 130–0212

PROJECT REFERENCE NO.	SHEET NO.
BR-0155	17

SITE PHOTOS

PHOTO #1: VIEW OF BRIDGE 163 PROFILE FACING NORTH.

PHOTO #2: VIEW ALONG BRIDGE 163, FACING WEST, DOWNSTATION.