STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5963A	1	

REFERENCE: R-5963A

PROJECT: 48599

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CHATHAM*

PROJECT DESCRIPTION *CHATHAM PARK WAY FROM US 15-501 TO US 64 BUSINESS*

SITE DESCRIPTION *BRIDGE NO. 180B01 ON SR 2700 (CHATHAM PARK WAY) OVER UNNAMED TRIBUTARY TO ROBESON CREEK -L- STA. 76+49*

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.

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.

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DATE *DECEMBER 2024*

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SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	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
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-50
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] 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 07/18/2024.

BRIDGE BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 (SURVEY GRADE GPS).

CT = CORING TERMINATED

REF = REFUSAL

NM = NOT MEASURED

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	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 - 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
70	A			
60				
50	B	C	D	E
40				
30			F	
20				
10		G	H	

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	3

SITE PLAN

0 50 100

FEET

BRIDGE NO. 180B01 ON SR 2700
(CHATHAM PARK WAY) OVER
UNNAMED TRIBUTARY TO
ROBESON CREEK -L- STA. 76+49
SKEW = 110 DEGREES

NC GRID
NAD 83 NA 2011

T Sta. 10+00.00

BEGIN BRIDGE
-L- Sta.75+78.00

END BRIDGE
-L- Sta.77+20.00

TO US 15-501

-L-

CHATHAM PARK WAY
SR 2700

75+00

80+00

L_7675_EBI-A
L_7675_BI-A
L_7675_EB2-A
L_7675_EBI-C
L_7675_BI-C
L_7675_EB2-C
L_7675_EBI-B
L_7675_BI-B
L_7675_EB2-B

TO BUS US-64

30°01'26.0"LT

15+00

PDE
PUE
RW
CA
CR
JS
RAIL

5/14/99

-L-

EXISTING GROUND LINE ALONG -L- TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE PROFILE.

Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP

0 50 100
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	4

PROFILE ALONG CENTERLINE OF -L-

410
400
390
380
370
360
350
340
330

EXISTING GROUND

BEGIN BRIDGE
-L- STA.75+78.00
ELEV = 388.28'

END BRIDGE
-L- STA.77+20.00
ELEV = 389.70'

L_7675_EBI-C
75+85
10' RT

L_7675_BI-C
76+37
7' RT
RS-2

L_7675_EB2-C
77+32
2' RT

Ⓑ -RESIDUAL-

Ⓐ -ALLUVIAL-

Ⓒ -WEATHERED ROCK-

-CRYSTALLINE ROCK-
(METAVOLCANIC ROCK)

100/0.8
100/0.2
100/0.2
60/0.0
100/0.9
60/0.0
47
100/0.9
100/0.3
60/0.0
08/24

REC=100%
RQD=30%
GSI=30-35

REC=100%
RQD=0%
GSI=15-20

REC=100%
RQD=60%
GSI=45-50

CT

REC=98%
RQD=83%
GSI=65-70

CT

REC=99%
RQD=52%
GSI=40-45

CT

-CRYSTALLINE ROCK-
MODERATELY SEVERE WEATHERED TO FRESH, SOFT TO HARD, GRAY-GREEN-WHITE (METAVOLCANIC ROCK), WITH VERY CLOSE TO WIDE FRACTURE SPACING

Ⓐ **-ALLUVIAL-** STIFF, MOIST, BROWN, SILTY CLAY (A-7)

Ⓑ **-RESIDUAL-** MEDIUM DENSE TO DENSE, MOIST, GRAY-ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

Ⓒ **-WEATHERED ROCK-** (METAVOLCANIC ROCK)

73+00 74+00 75+00 76+00 77+00 78+00 79+00 80+00

13-DEC-2024 14:04
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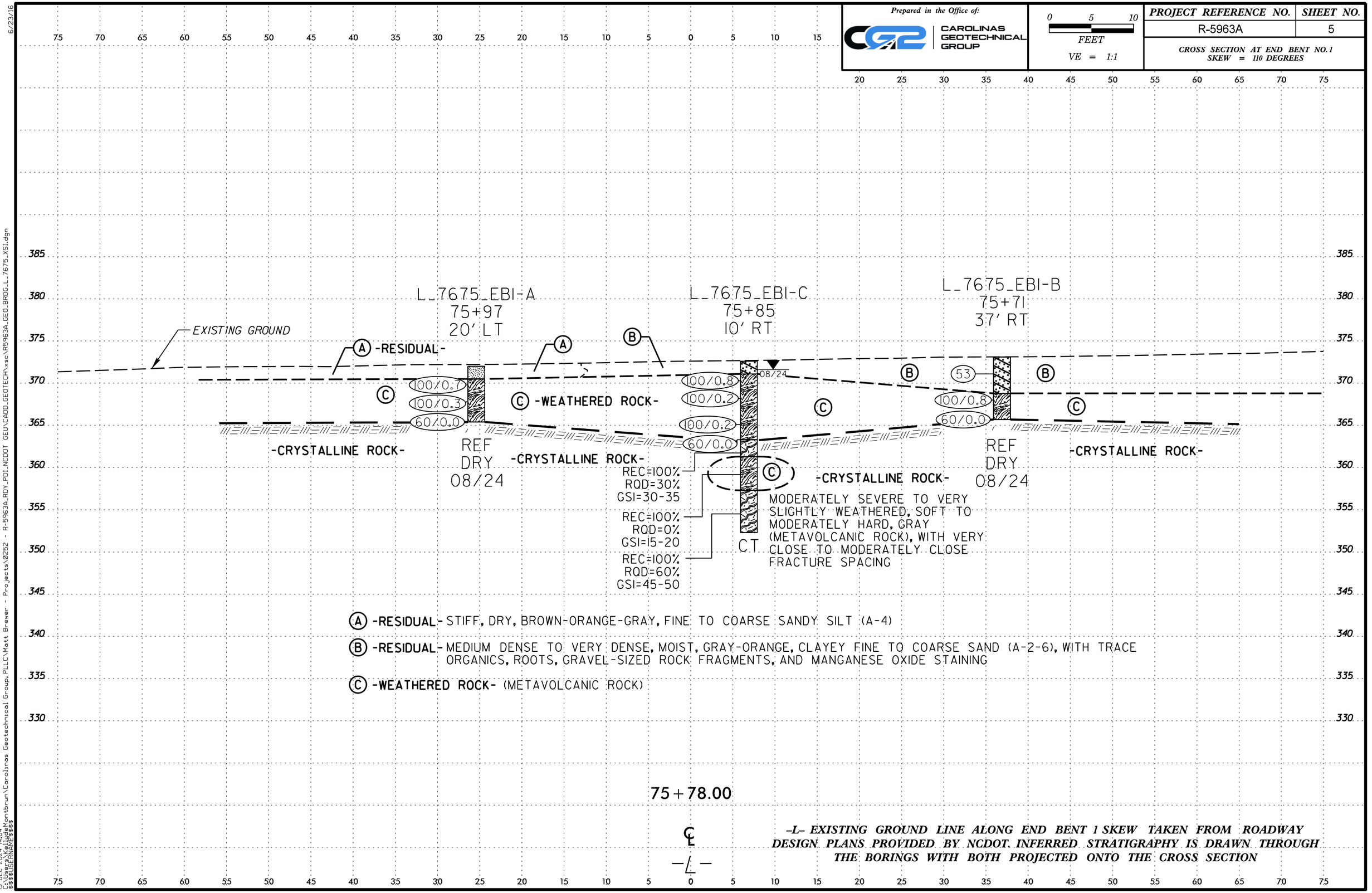
Prepared in the Office of: CAROLINAS GEOTECHNICAL GROUP

0 5 10
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	5

CROSS SECTION AT END BENT NO. 1
SKEW = 110 DEGREES



A -RESIDUAL- STIFF, DRY, BROWN-ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4)

B -RESIDUAL- MEDIUM DENSE TO VERY DENSE, MOIST, GRAY-ORANGE, CLAYEY FINE TO COARSE SAND (A-2-6), WITH TRACE ORGANICS, ROOTS, GRAVEL-SIZED ROCK FRAGMENTS, AND MANGANESE OXIDE STAINING

C -WEATHERED ROCK- (METAVOLCANIC ROCK)

75+78.00

℄
–L–

–L– EXISTING GROUND LINE ALONG END BENT 1 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16
13-DEC-2024 14:04
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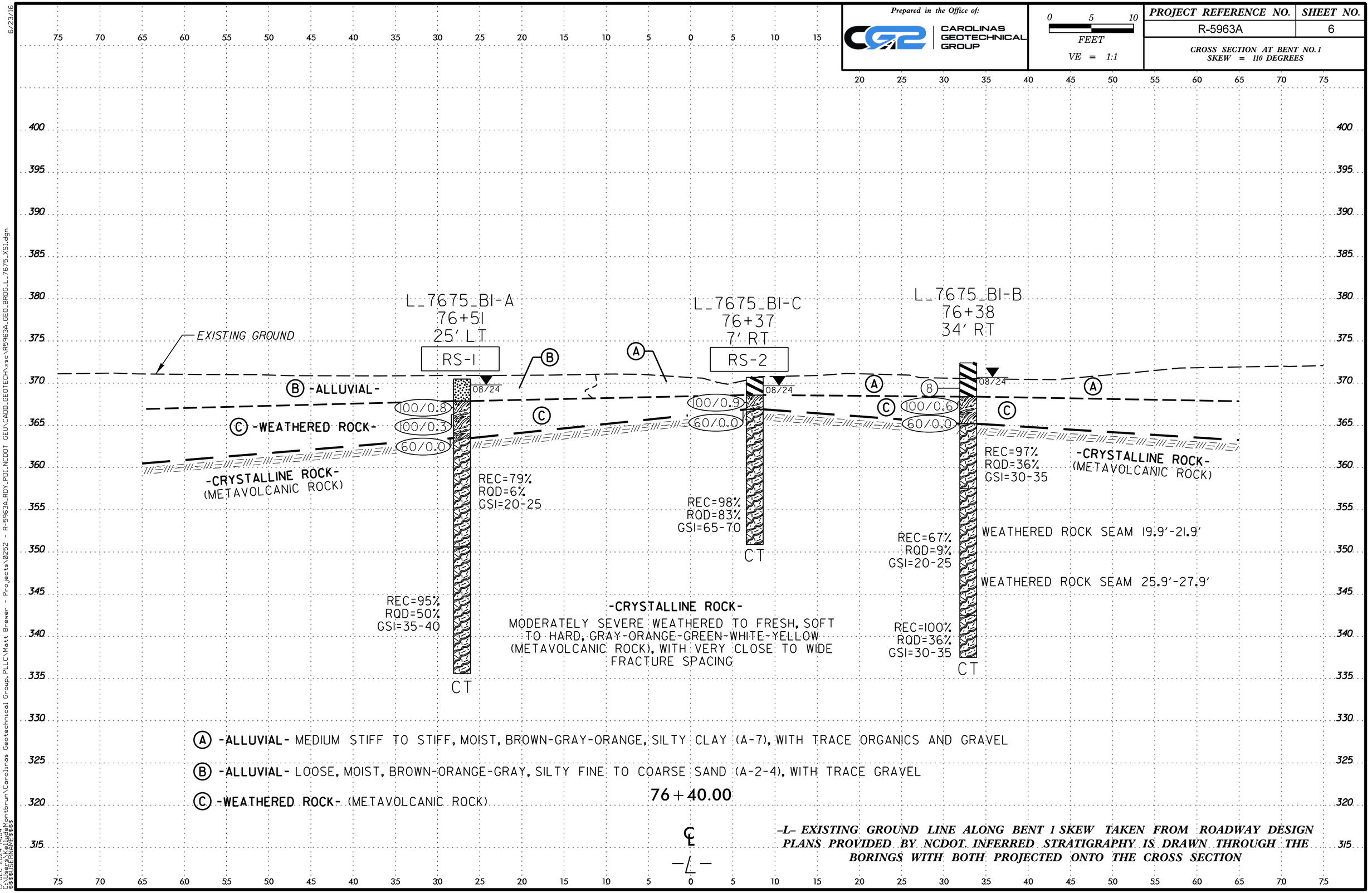
Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP

0 5 10
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	6

CROSS SECTION AT BENT NO. 1
SKEW = 110 DEGREES



(A) -ALLUVIAL- MEDIUM STIFF TO STIFF, MOIST, BROWN-GRAY-ORANGE, SILTY CLAY (A-7), WITH TRACE ORGANICS AND GRAVEL

(B) -ALLUVIAL- LOOSE, MOIST, BROWN-ORANGE-GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL

(C) -WEATHERED ROCK- (METAVOLCANIC ROCK)

76+40.00

℄
—L—

–L– EXISTING GROUND LINE ALONG BENT 1 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16

13-DEC-2024 14:04
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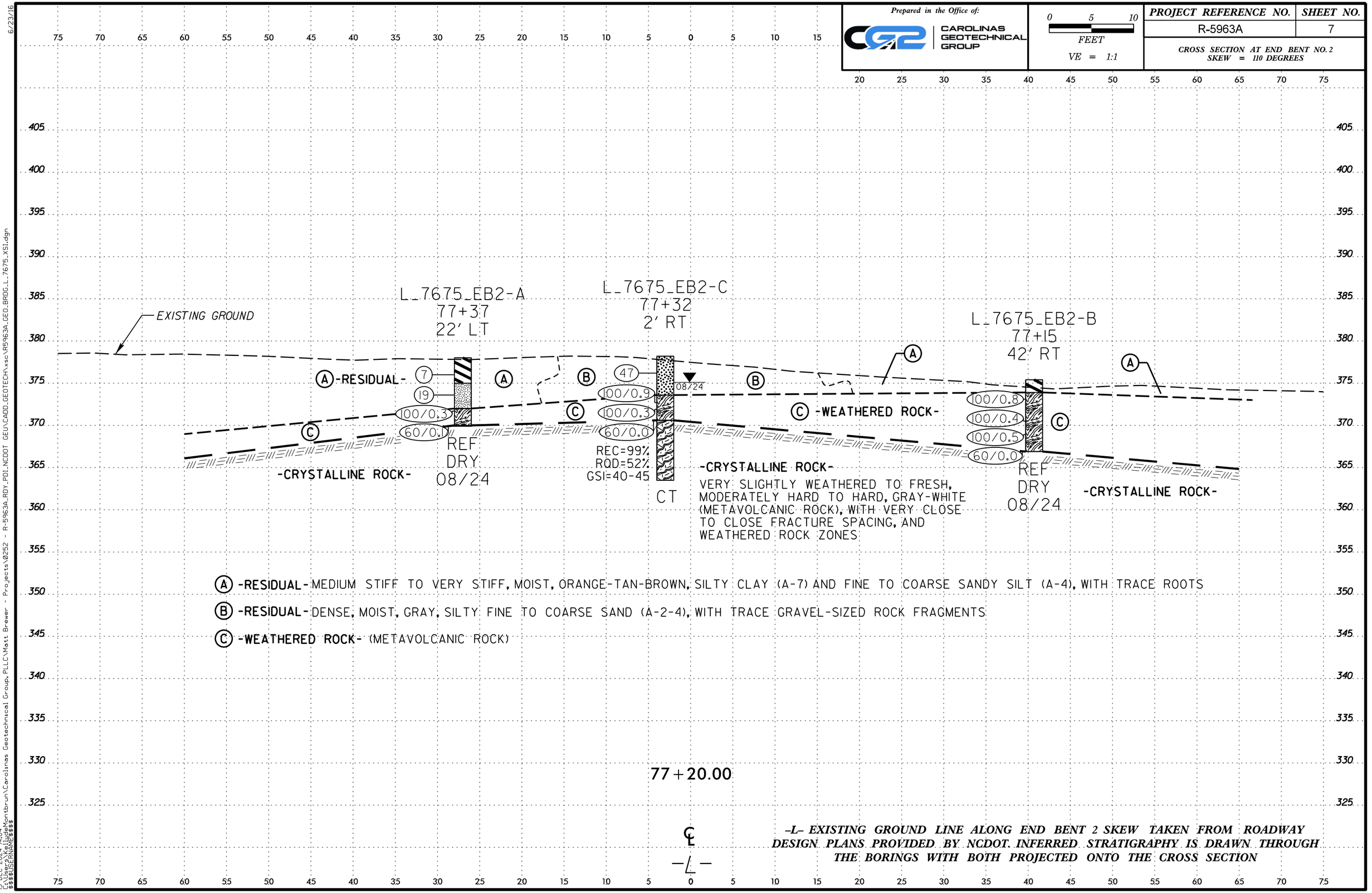
Prepared in the Office of: CAROLINAS GEOTECHNICAL GROUP

0 5 10
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	7

CROSS SECTION AT END BENT NO. 2
SKEW = 110 DEGREES



(A) **-RESIDUAL-** MEDIUM STIFF TO VERY STIFF, MOIST, ORANGE-TAN-BROWN, SILTY CLAY (A-7) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE ROOTS

(B) **-RESIDUAL-** DENSE, MOIST, GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

(C) **-WEATHERED ROCK-** (METAVOLCANIC ROCK)

77+20.00

℄

-L- EXISTING GROUND LINE ALONG END BENT 2 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16
13-DEC-2024 14:04
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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB1-A	**STATION** 75+97	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 372.0 ft	**TOTAL DEPTH** 6.6 ft	**NORTHING** 707,284	**EASTING** 1,953,162	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 08/12/24	**COMP. DATE** 08/12/24	**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
375										ELEV. (ft) DEPTH (ft)
										372.0 GROUND SURFACE 0.0
	371.0	1.0						D		370.5 **RESIDUAL** 1.5
370			14	42	58/0.2	100/0.7				Stiff, Brown-Orange-Gray, Fine to Coarse Sandy SILT (A-4)
	368.1	3.9	100/0.3			100/0.3				**WEATHERED ROCK**
	365.4	6.6								Brown-Gray (Metavolcanic Rock)
			60/0.0			60/0.0				365.4 6.6
										Boring Terminated with Standard Penetration Test Refusal at Elevation 365.4 ft On Crystalline Rock (Metavolcanic Rock)
										Surficial Organic Soil 0.0 - 0.2'

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 10/22/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB1-C	**STATION** 75+85	**OFFSET** 10 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 372.6 ft	**TOTAL DEPTH** 20.3 ft	**NORTHING** 707,253	**EASTING** 1,953,170	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 08/12/24	**COMP. DATE** 08/14/24	**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)
375											
										372.6 GROUND SURFACE	0.0
	371.6	1.0								371.1 **RESIDUAL** Medium Dense, Gray-Orange, Clayey Fine to Coarse SAND (A-2-6)	1.5
370			20	59	41/0.3	100/0.8				**WEATHERED ROCK** Gray-Orange (Metavolcanic Rock)	
	368.4	4.2	100/0.2			100/0.2					
365	365.2	7.4	100/0.2			100/0.2					
	363.3	9.3	60/0.0			60/0.0				363.3 **CRYSTALLINE ROCK** Gray (Metavolcanic Rock)	9.3
360										361.3 REC=100% RQD=30% GSI=30-35	11.3
										357.3 **WEATHERED ROCK** Gray (Metavolcanic Rock)	15.3
355										REC = 100% RQD = 0% GSI = 15-20	
										352.3 **CRYSTALLINE ROCK** Gray (Metavolcanic Rock)	20.3
										REC = 100% RQD = 60% GSI = 45-50	
										Boring Terminated at Elevation 352.3 ft In Crystalline Rock (Metavolcanic Rock)	
										Surficial Organic Soil 0.0 - 0.2'	

GEOTECHNICAL BORING REPORT
CORE LOG

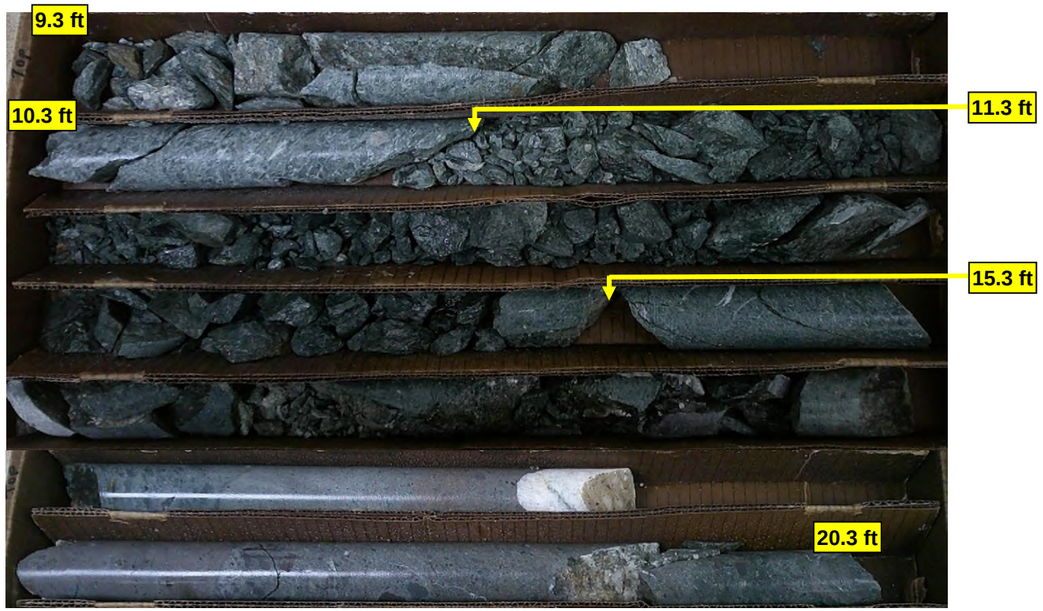
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB1-C	**STATION** 75+85	**OFFSET** 10 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 372.6 ft	**TOTAL DEPTH** 20.3 ft	**NORTHING** 707,253	**EASTING** 1,953,170	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 08/12/24	**COMP. DATE** 08/14/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 11.0 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)
363.3											Begin Coring @ 9.3 ft	
	363.3	9.3	1.0	*N=60/0.0*	(1.0) 100%	(0.0) 0%		(2.0) 100%	(0.6) 30%		363.3 **CRYSTALLINE ROCK** Moderately Severe to Moderately Weathered, Moderately Hard, Gray (Metavolcanic Rock), with Very Close Fracture Spacing	9.3
	362.3	10.3	5.0	3:53/1.0 3:27/1.0 3:43/1.0 5:26/1.0 5:56/1.0 3:07/1.0							361.3 GSI=30-35	11.3
360					(5.0) 100%	(0.6) 12%		(4.0) 100%	(0.0) 0%		**WEATHERED ROCK** Gray (Metavolcanic Rock)	
	357.3	15.3									357.3 GSI = 15-20	15.3
355			5.0	2:31/1.0 2:43/1.0 3:11/1.0 2:20/1.0	(5.0) 100%	(3.0) 60%		(5.0) 100%	(3.0) 60%		**CRYSTALLINE ROCK** Moderately Severe to Very Slightly Weathered, Soft to Moderately Hard, Gray (Metavolcanic Rock), with Very Close to Moderately Close Fracture Spacing	
	352.3	20.3		2:32/1.0							352.3 GSI=45-50	20.3
											Boring Terminated at Elevation 352.3 ft In Crystalline Rock (Metavolcanic Rock)	
											Surficial Organic Soil 0.0 - 0.2'	

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_7675_EB1-C

9.3 to 20.3 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB1-B	**STATION** 75+71	**OFFSET** 37 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 373.1 ft	**TOTAL DEPTH** 7.4 ft	**NORTHING** 707,223	**EASTING** 1,953,174	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 08/12/24	**COMP. DATE** 08/12/24	**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)
375											
										373.1 GROUND SURFACE	0.0
	372.1	1.0	8	23	30	53		M		**RESIDUAL** Very Dense, Gray-Orange, Clayey Fine to Coarse SAND (A-2-6), with trace gravel-sized rock fragments, organics and roots, Manganese Oxide staining	
370	368.8	4.3	68	32/0.3		100/0.8				368.8	4.3
	365.7	7.4	60/0.0			60/0.0				**WEATHERED ROCK** Gray-Orange (Metavolcanic Rock) 365.7	7.4
										Boring Terminated with Standard Penetration Test Refusal at Elevation 365.7 ft On Crystalline Rock (Metavolcanic Rock)	
										Surficial Organic Soil 0.0 - 0.3'	

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 10/22/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_B1-A	**STATION** 76+51	**OFFSET** 25 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 370.5 ft	**TOTAL DEPTH** 34.9 ft	**NORTHING** 707,319	**EASTING** 1,953,204	**24 HR.** 0.7
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 08/13/24	**COMP. DATE** 08/13/24	**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)
375											
370								M		370.5 GROUND SURFACE	0.0
	368.4	2.1	8	38	62/0.3					**ALLUVIAL** Loose, Brown-Orange-Gray, Silty Fine to Coarse SAND (A-2-4), with trace gravel-sized rock fragments	2.6
365	366.6	3.9	100/0.3			100/0.8 100/0.3				367.9 **WEATHERED ROCK** Orange-Gray (Metavolcanic Rock)	7.0
	363.5	7.0	60/0.0			60/0.0				363.5 **CRYSTALLINE ROCK** Gray-Orange (Metavolcanic Rock) REC=79% RQD=6% GSI=20-25	
360											
355											
350										350.6 Gray-Green-White (Metavolcanic Rock) REC=95% RQD=50% GSI=35-40	19.9
345							RS-1				
340										335.6 Boring Terminated at Elevation 335.6 ft In Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 0.3'	34.9

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

GEOTECHNICAL BORING REPORT
CORE LOG

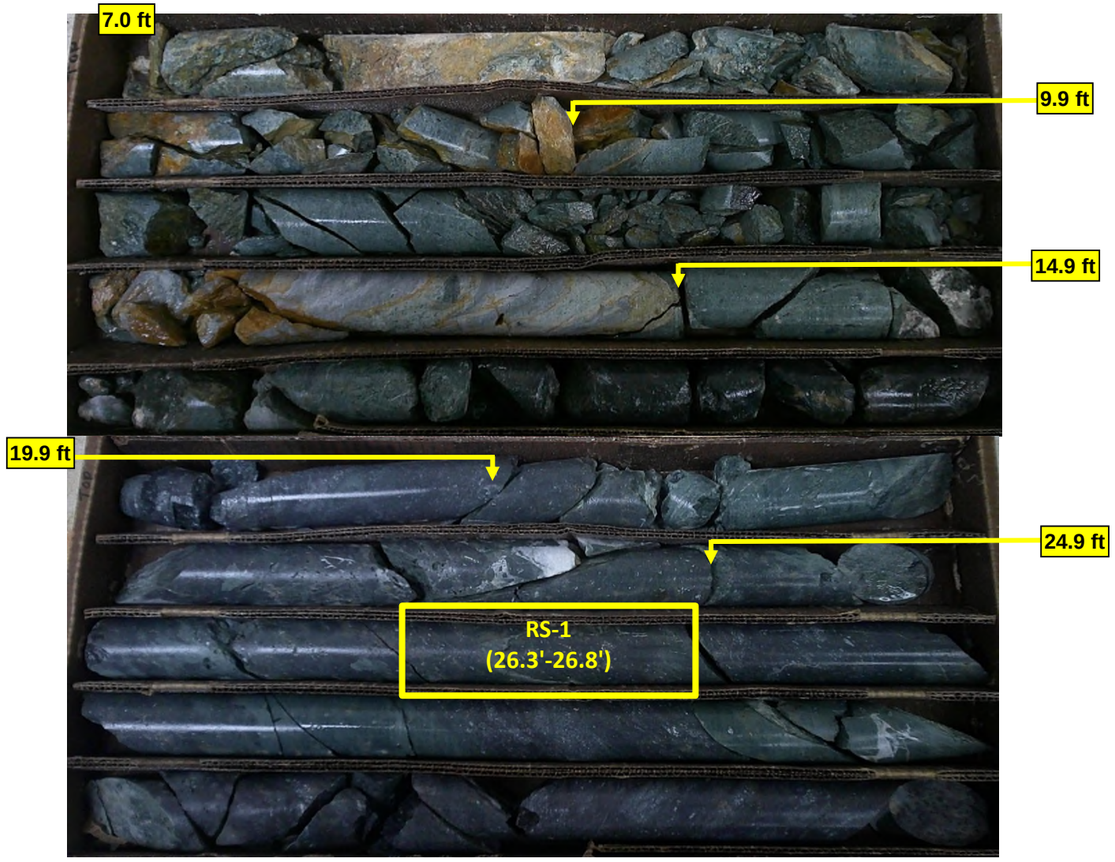
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_B1-A	**STATION** 76+51	**OFFSET** 25 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 370.5 ft	**TOTAL DEPTH** 34.9 ft	**NORTHING** 707,319	**EASTING** 1,953,204	**24 HR.** 0.7
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 08/13/24	**COMP. DATE** 08/13/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 27.9 ft			

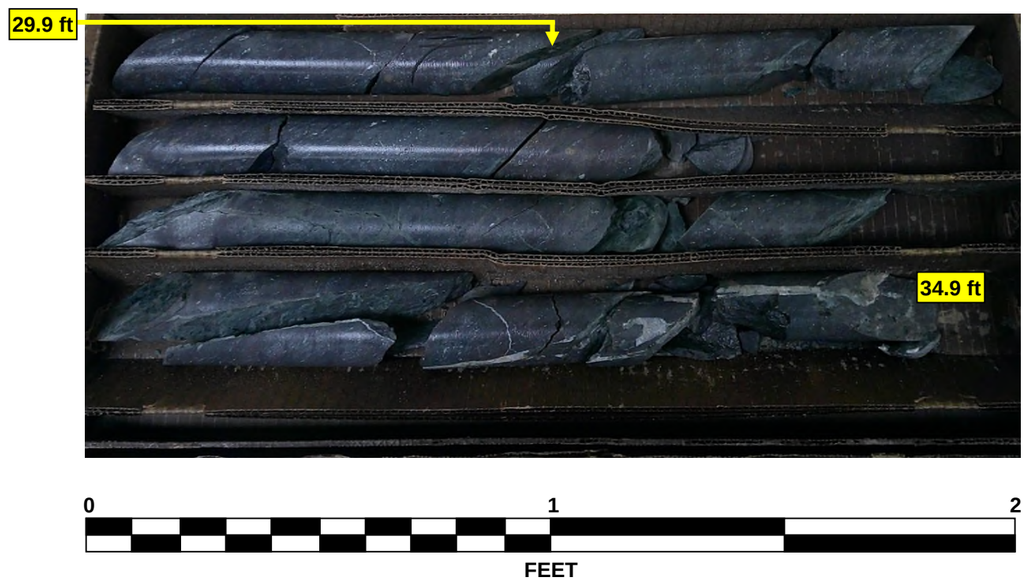
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
363.5											Begin Coring @ 7.0 ft	
	363.5	7.0	2.9	*N=60/0.0* 2:54/1.0 4:05/1.0 5:38/0.9	(2.9) 100%	(0.0) 0%		(10.2) 79%	(0.8) 6%		363.5 **CRYSTALLINE ROCK** Moderately Severe to Moderately Weathered, Soft to Moderately Hard, Gray-Orange (Metavolcanic Rock), with Very Close to Close Fracture Spacing GSI=20-25	7.0
360	360.6	9.9	5.0	5:24/1.0 3:39/1.0 1:53/1.0 2:58/1.0 3:46/1.0	(4.3) 86%	(0.8) 16%						
355	355.6	14.9	5.0	3:33/1.0 1:11/1.0 3:06/1.0 9:08/1.0 4:01/1.0	(3.0) 60%	(0.0) 0%						
350	350.6	19.9	5.0	3:26/1.0 7:57/1.0 3:31/1.0 1:51/1.0 2:24/1.0	(4.5) 90%	(2.2) 44%		(14.3) 95%	(7.5) 50%		350.6 Slightly Weathered, Moderately Hard, Gray-Green-White (Metavolcanic Rock), with Very Close to Close Fracture Spacing RS-1: 26.3-26.8' Unit Weight: 174.0 pcf Unconfined Compressive Strength: 7,680 psi (1,106 ksf) GSI=35-40	19.9
345	345.6	24.9	5.0	1:54/1.0 1:49/1.0 1:57/1.0 6:07/1.0 2:17/1.0	(4.8) 96%	(3.2) 64%	RS-1					
340	340.6	29.9	5.0	3:42/1.0 1:49/1.0 3:00/1.0 1:58/1.0 2:21/1.0	(5.0) 100%	(2.1) 42%					335.6 Boring Terminated at Elevation 335.6 ft In Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 0.3'	34.9
	335.6	34.9										

NCDOT CORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_7675_B1-A
7.0 to 34.9 Feet





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_B1-C	**STATION** 76+37	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 370.7 ft	**TOTAL DEPTH** 19.8 ft	**NORTHING** 707,285	**EASTING** 1,953,211	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 08/14/24	**COMP. DATE** 08/14/24	**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)
375											
370										370.7 GROUND SURFACE	0.0
	368.6	2.1								**ALLUVIAL** Stiff, Brown, Silty CLAY (A-7) 368.6	2.1
	366.9	3.8	20	80/0.4		100/0.9				**WEATHERED ROCK** Brown-Gray (Metavolcanic Rock) 366.9	3.8
365			60/0.0			60/0.0	RS-2			**CRYSTALLINE ROCK** Gray-Green-White (Metavolcanic Rock) REC=98% RQD=83% GSI=65-70	
360											
355										350.9	19.8
										Boring Terminated at Elevation 350.9 ft In Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 0.2'	

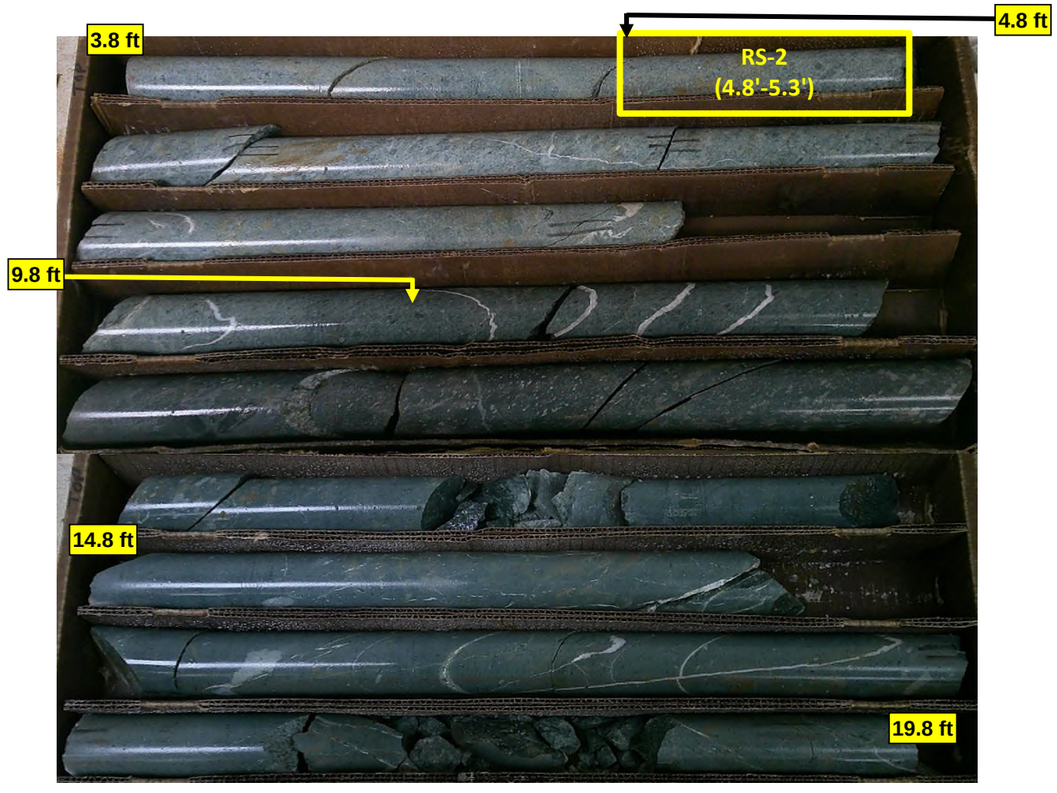
GEOTECHNICAL BORING REPORT
CORE LOG

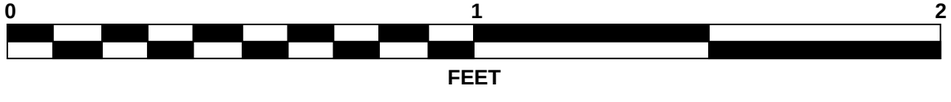
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_B1-C	**STATION** 76+37	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 370.7 ft	**TOTAL DEPTH** 19.8 ft	**NORTHING** 707,285	**EASTING** 1,953,211	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 08/14/24	**COMP. DATE** 08/14/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 16.0 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)
366.9											Begin Coring @ 3.8 ft	
365	366.9 / 365.9	3.8 / 4.8	1.0	*N=60/0.0* 4:42/1.0	(1.0) 100%	(1.0) 100%	RS-2	(15.7) 98%	(13.3) 83%		366.9 **CRYSTALLINE ROCK** Slightly Weathered to Fresh, Moderately Hard to Hard, Gray-Green-White (Metavolcanic Rock), with Very Close to Wide Fracture Spacing RS-2: 4.8-5.3' Unit Weight: 170.2 pcf Unconfined Compressive Strength: 8,280 psi (1,192 ksf) GSI=65-70	3.8
			5.0	3:29/1.0 3:19/1.0 3:47/1.0 3:52/1.0 3:36/1.0	(4.7) 94%	(4.5) 90%						
360	360.9	9.8	5.0	3:28/1.0 3:37/1.0 3:11/1.0 3:28/1.0 5:28/1.0	(5.0) 100%	(3.6) 72%						
355	355.9	14.8	5.0	4:14/1.0 2:45/1.0 3:31/1.0 4:00/1.0 3:35/1.0	(5.0) 100%	(4.2) 84%						
	350.9	19.8									350.9 Boring Terminated at Elevation 350.9 ft In Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 0.2'	19.8

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_7675_B1-C
3.8 to 19.8 Feet





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_B1-B	**STATION** 76+38	**OFFSET** 34 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 372.4 ft	**TOTAL DEPTH** 34.9 ft	**NORTHING** 707,263	**EASTING** 1,953,227	**24 HR.** 1.7
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 08/14/24	**COMP. DATE** 08/14/24	**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)
375											
										372.4 GROUND SURFACE	0.0
370	370.4	2.0	2	4	4	8				**ALLUVIAL** Medium Stiff, Gray-Orange, Silty CLAY (A-7), with trace organics and gravel-sized rock fragments	
	368.4	4.0								368.4	4.0
			90	10/0.1		100/0.6				**WEATHERED ROCK** Brown-Gray (Metavolcanic Rock)	
365	365.2	7.2	60/0.0			60/0.0				365.2	7.2
										CRYSTALLINE ROCK Gray-White-Green (Metavolcanic Rock) REC=97% RQD=36% GSI=30-35	
360											
										357.5	14.9
355										Gray-Green-Yellow-White (Metavolcanic Rock) REC=67% RQD=9% GSI=20-25 Weathered Rock Seam 19.9'-21.9'	
350											
										Weathered Rock Seam 25.9'-27.9'	
345											
										342.5	29.9
340										Gray-Green (Metavolcanic Rock) REC=100% RQD=36% GSI=30-35	
										337.5	34.9
										Boring Terminated at Elevation 337.5 ft In Crystalline Rock (Metavolcanic Rock)	

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

GEOTECHNICAL BORING REPORT
CORE LOG

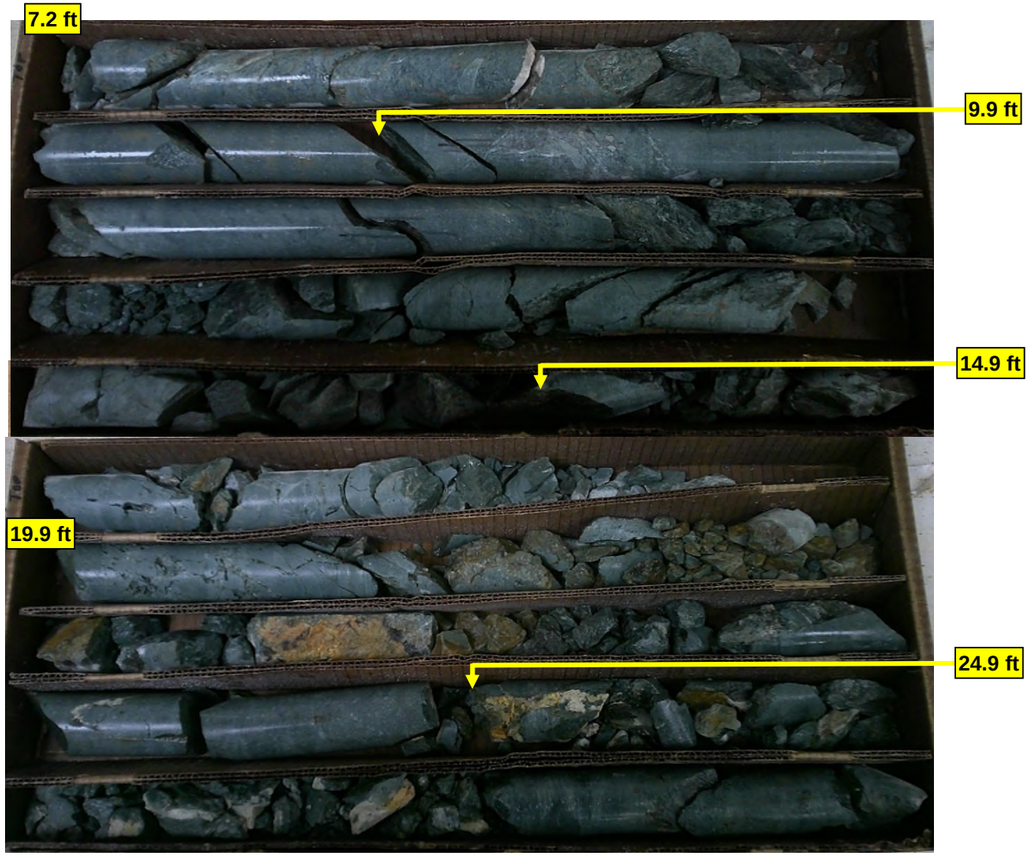
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_B1-B	**STATION** 76+38	**OFFSET** 34 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 372.4 ft	**TOTAL DEPTH** 34.9 ft	**NORTHING** 707,263	**EASTING** 1,953,227	**24 HR.** 1.7
DRILL RIG/HAMMER EFF./DATE GEO366 Diedrich D-50 96% 07/26/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 08/14/24	**COMP. DATE** 08/14/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 27.7 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)
365											Begin Coring @ 7.2 ft	
	365.2	7.2	2.7	*N=60/0.0* 0:59/1.0 3:08/1.0 2:47/0.7	(2.5) 93%	(0.8) 30%		(7.5) 97%	(2.8) 36%		365.2 **CRYSTALLINE ROCK** Moderately Severe to Slightly Weathered, Soft to Moderately Hard, Gray-White-Green (Metavolcanic Rock), with Very Close to Moderately Close Fracture Spacing GSI=30-35	7.2
360	362.5	9.9	5.0	2:56/1.0 2:40/1.0 5:31/1.0 2:41/1.0 3:17/1.0	(5.0) 100%	(2.0) 40%						
	357.5	14.9									357.5	14.9
355			5.0	2:59/1.0 3:54/1.0 2:33/1.0 3:04/1.0 2:46/1.0	(4.1) 82%	(0.6) 12%		(10.1) 67%	(1.4) 9%		Moderately Severe Weathering, Soft to Moderately Hard, Gray-Green-Yellow-White (Metavolcanic Rock), with Very Close to Close Fracture Spacing GSI=20-25 Weathered Rock Seam 19.9'-21.9'	
	352.5	19.9										
350			5.0	1:34/1.0 2:12/1.0 3:39/1.0 6:26/1.0 2:54/1.0	(3.0) 60%	(0.8) 16%						
	347.5	24.9									Weathered Rock Seam 25.9'-27.9'	
345			5.0	2:40/1.0 1:18/1.0 1:00/1.0 7:20/1.0 2:32/1.0	(3.0) 60%	(0.0) 0%						
	342.5	29.9									342.5	29.9
340			5.0	2:13/1.0 2:13/1.0 4:23/1.0 3:25/1.0 3:45/1.0	(5.0) 100%	(1.8) 36%		(5.0) 100%	(1.8) 36%		Moderately Severe to Moderately Weathered, Soft to Moderately Hard, Gray-Green (Metavolcanic Rock), with Very Close to Close Fracture Spacing GSI=30-35	
	337.5	34.9									337.5	34.9
											Boring Terminated at Elevation 337.5 ft In Crystalline Rock (Metavolcanic Rock)	

NCDOT CORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_7675_B1-B
7.2 to 34.9 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** T. Wenner	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB2-A	**STATION** 77+37	**OFFSET** 22 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 378.0 ft	**TOTAL DEPTH** 8.1 ft	**NORTHING** 707,368	**EASTING** 1,953,273	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Ard	**START DATE** 08/05/24	**COMP. DATE** 08/05/24	**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)
380											
										378.0 GROUND SURFACE	0.0
	377.0	1.0	3	3	4	7		M		**RESIDUAL** Medium Stiff, Orange-Tan, Silty CLAY (A-7)	
375	374.6	3.4	7	6	13	19		M		375.0	3.0
	372.0	6.0	100/0.3			100/0.3				Very Stiff, Tan, Fine to Coarse Sandy SILT (A-4) 372.0	6.0
370	370.0	8.0	60/0.1			60/0.1				**WEATHERED ROCK** Gray (Metavolcanic Rock) 370.0	8.0
										369.9 **CRYSTALLINE ROCK** (Metavolcanic Rock)	8.1

Boring Terminated with Standard Penetration Test Refusal at Elevation 369.9 ft In Crystalline Rock (Metavolcanic Rock)

Surficial Organic Soil 0.0 - 0.6'

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 10/22/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** T. Wenner	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB2-C	**STATION** 77+32	**OFFSET** 2 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 378.2 ft	**TOTAL DEPTH** 14.7 ft	**NORTHING** 707,346	**EASTING** 1,953,284	**24 HR.** 3.1
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 08/05/24	**COMP. DATE** 08/22/24	**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)
380												
	377.2	1.0	18	29	18	47		M		GROUND SURFACE	378.2	0.0
375										**RESIDUAL** Dense, Gray, Silty Fine to Coarse SAND (A-2-4), with trace gravel-sized rock fragments		
	374.1	4.1									373.6	4.6
	372.2	6.0	48	52	48/0.4	100/0.9				**WEATHERED ROCK** Gray (Metavolcanic Rock)		
370	370.6	7.6	100/0.3			100/0.3					370.6	7.6
			60/0.0			60/0.0				**CRYSTALLINE ROCK** Gray-White (Metavolcanic Rock) REC=99% RQD=52% GSI=40-45		
365											363.5	14.7
										Boring Terminated at Elevation 363.5 ft In Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 1.0'		

GEOTECHNICAL BORING REPORT
CORE LOG

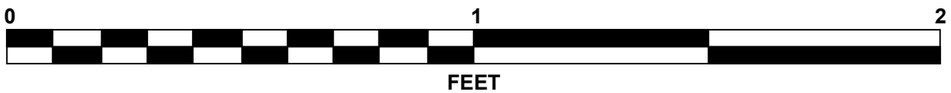
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** T. Wenner	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB2-C	**STATION** 77+32	**OFFSET** 2 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 378.2 ft	**TOTAL DEPTH** 14.7 ft	**NORTHING** 707,346	**EASTING** 1,953,284	**24 HR.** 3.1
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 08/05/24	**COMP. DATE** 08/22/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 7.1 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)
370.6											Begin Coring @ 7.6 ft		
370	370.6	7.6	2.1	*N=60/0.0* 3:13/1.0	(2.0) 95%	(1.1) 52%		(7.0) 99%	(3.7) 52%		**CRYSTALLINE ROCK** Very Slightly Weathered to Fresh, Moderately Hard to Hard, Gray-White (Metavolcanic Rock), with Very Close to Close Fracture Spacing GSI=40-45	370.6	7.6
	368.5	9.7	5.0	2:58/1.0 0:18/0.1	(5.0) 100%	(2.6) 52%							
365				3:08/1.0 3:04/1.0 3:37/1.0 4:55/1.0 2:43/1.0									
	363.5	14.7									Boring Terminated at Elevation 363.5 ft In Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 1.0'	363.5	14.7

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 10/22/24

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_7675_EB2-C
7.6 to 14.7 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** T. Wenner	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_7675_EB2-B	**STATION** 77+15	**OFFSET** 42 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 375.4 ft	**TOTAL DEPTH** 8.5 ft	**NORTHING** 707,304	**EASTING** 1,953,296	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Ard	**START DATE** 08/05/24	**COMP. DATE** 08/05/24	**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
380										ELEV. (ft) DEPTH (ft)
375										375.4 GROUND SURFACE 0.0
	374.4	1.0	16	64	36/0.3	100/0.8		M		373.9 **RESIDUAL** 1.5 Very Stiff, Brown, Silty CLAY (A-7), with trace roots
370	370.9	4.5	100/0.4			100/0.4				**WEATHERED ROCK** Gray, (Metavolcanic Rock)
	369.4	6.0	100/0.5			100/0.5				
	366.9	8.5	60/0.0			60/0.0				366.9 8.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 366.9 ft On Crystalline Rock (Metavolcanic Rock) Surficial Organic Soil 0.0 - 0.2'

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 10/22/24

PROJECT REFERENCE NO.	SHEET NO.
R–5963A	22

ROCK TEST RESULTS

SAMPLE NO.	BORING	STATION	OFFSET	NORTHING	EASTING	DEPTH INTERVAL	ROCK TYPE	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH
RS–1	L_7675_B1–A	76+51 –L–	25' LT	707319	1953204	26.3 – 26.8'	METAVOLCANIC ROCK	174.0	7,680 psi (1,106 ksf)
RS–2	L_7675_B1–C	76+37 –L–	7' RT	707285	1953211	4.8 – 5.3'	METAVOLCANIC ROCK	170.2	8,280 psi (1,192 ksf)

Alex M Abernathy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

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

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	23

SITE PHOTOS

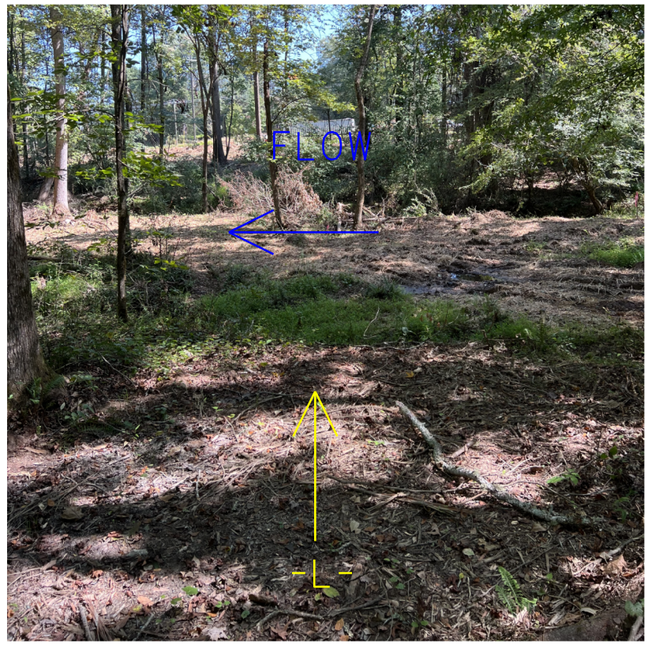


PHOTO #1: VIEW NEAR END BENT NO. 1, FACING UPSTATION

PHOTO #2: VIEW NEAR END BENT NO. 2, FACING DOWNSTATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5963A	1	

REFERENCE: R-5963A

PROJECT: 48599

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CHATHAM*

PROJECT DESCRIPTION *CHATHAM PARK WAY FROM US 15-501 TO US 64 BUSINESS*

SITE DESCRIPTION *BRIDGE NO. 180B02(SB) AND BRIDGE NO. 180B03(NB) ON SR 2700 (CHATHAM PARK WAY) OVER ROBESON CREEK -L- STA. 134+65*

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.

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.

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NOTES:
1. 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.
2. 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

P. PERRY, E.I.T.

CG2 EXPLORATION

INVESTIGATED BY *CG2, PLLC*

DRAWN BY *M.MALISHER, E.I.T.*

CHECKED BY *M. WALKO, P.E.*

SUBMITTED BY *CG2, PLLC*

DATE *DECEMBER 2024*

Prepared in the Office of:

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DocuSigned by:
Matt Brewer 01/13/2025
386129C0A4C1462...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	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
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] 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 07/18/2024.

BRIDGE BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX-7 (SURVEY GRADE GPS).

CT = CORING TERMINATED

NM = NOT MEASURED

REF = REFUSAL

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	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 - 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
70	A			
60				
50	B	C	D	E
40				
30			F	
20				
10		G	H	

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	3

SITE PLAN

0 50 100
FEET

BRIDGE NO. 180B02 AND NO. 180B03 ON SR 2700 (CHATHAM PARK WAY) OVER ROBESON CREEK -L- STA. 134+65
SKEW = 110 DEGREES

00

POT Sta. 129+87.00
POT Sta. 12+00.00

BEGIN BRIDGE
-L- Sta.134+05.00

END BRIDGE
-L- Sta.135+25.00

-L- PC Sta. 137+07.60

L_13465_EB2-A

BL-126

L_13465_EB1-A

BRIDGE NO. 180B02(SB)

TO SR 1012
MONCURE PITTSBORO RD

BL-125

135+00

L_13465_EB2-C

L_13465_EB1-C

CHATHAM PARK WAY
SR 2700

BRIDGE NO. 180B02(NB)

TO BUS US-64

L_13465_EB1-B

L_13465_EB2-B

JS

SR

9+25.00
0+00.00
POT Sta. 12+00.00

-L- POT Sta. 139
-Y11B- POT Sta. 1

NC GRID
NAD 83 NA 2011

5/14/99

—L—

EXISTING GROUND LINE ALONG –L– TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE PROFILE.

Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP

0 50 100
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	4

PROFILE ALONG CENTERLINE OF –L–

BEGIN BRIDGE
–L– STA. 134+05.00
ELEV = 326.08'

END BRIDGE
–L– STA. 135+25.00
ELEV = 327.13'

PROPOSED GRADE

EXISTING GROUND

L_I3465_EB1-C
I34+01
2' RT

L_I3465_EB2-C
I35+23
7' LT

N.W.S.EL. 304.0'
(01/22/2019)

Ⓐ -ALLUVIAL-

Ⓑ -RESIDUAL-

Ⓒ -RESIDUAL-

Ⓓ -WEATHERED ROCK-

WOH
7
14
100/0.7
60/0.0
09/24
11
27
40
96
60/0.0
09/24

-CRYSTALLINE ROCK-
MODERATELY SEVERELY WEATHERED TO FRESH, MODERATELY HARD TO HARD, BLUE-GRAY-GREEN (METAVOLCANIC ROCK), WITH VERY CLOSE TO CLOSE FRACTURE SPACING
*WEATHERED ROCK ZONE I2.3'-I3.5'

REC=100%
RQD=81%
GSI=60-65

REC=100%
RQD=0%
GSI=15-20

REC=100%
RQD=33%
GSI=30-35

CT

REC=93%
RQD=26%
GSI=25-30

CT

-CRYSTALLINE ROCK-
MODERATELY SEVERELY WEATHERED TO FRESH, SOFT TO HARD, BLUE-GRAY-GREEN (METAVOLCANIC ROCK), WITH VERY CLOSE TO CLOSE FRACTURE SPACING
*WEATHERED ROCK ZONE I5.5'-I5.8'

340 330 320 310 300 290 280 270 260 250

131+00 132+00 133+00 134+00 135+00 136+00 137+00

Ⓐ -ALLUVIAL- VERY SOFT, MOIST, BROWN, FINE SANDY SILT (A-4), WITH TRACE ORGANICS

Ⓑ -RESIDUAL- MEDIUM STIFF TO VERY STIFF, MOIST, RED-ORANGE-BROWN-GRAY, SILTY CLAY (A-7), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS AND ORGANICS

Ⓒ -RESIDUAL- VERY STIFF TO HARD, DRY TO MOIST, GREEN-BROWN, FINE SANDY SILT (A-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS AND MANGANESE OXIDE STAINING

Ⓓ -WEATHERED ROCK- (METAVOLCANIC ROCK)

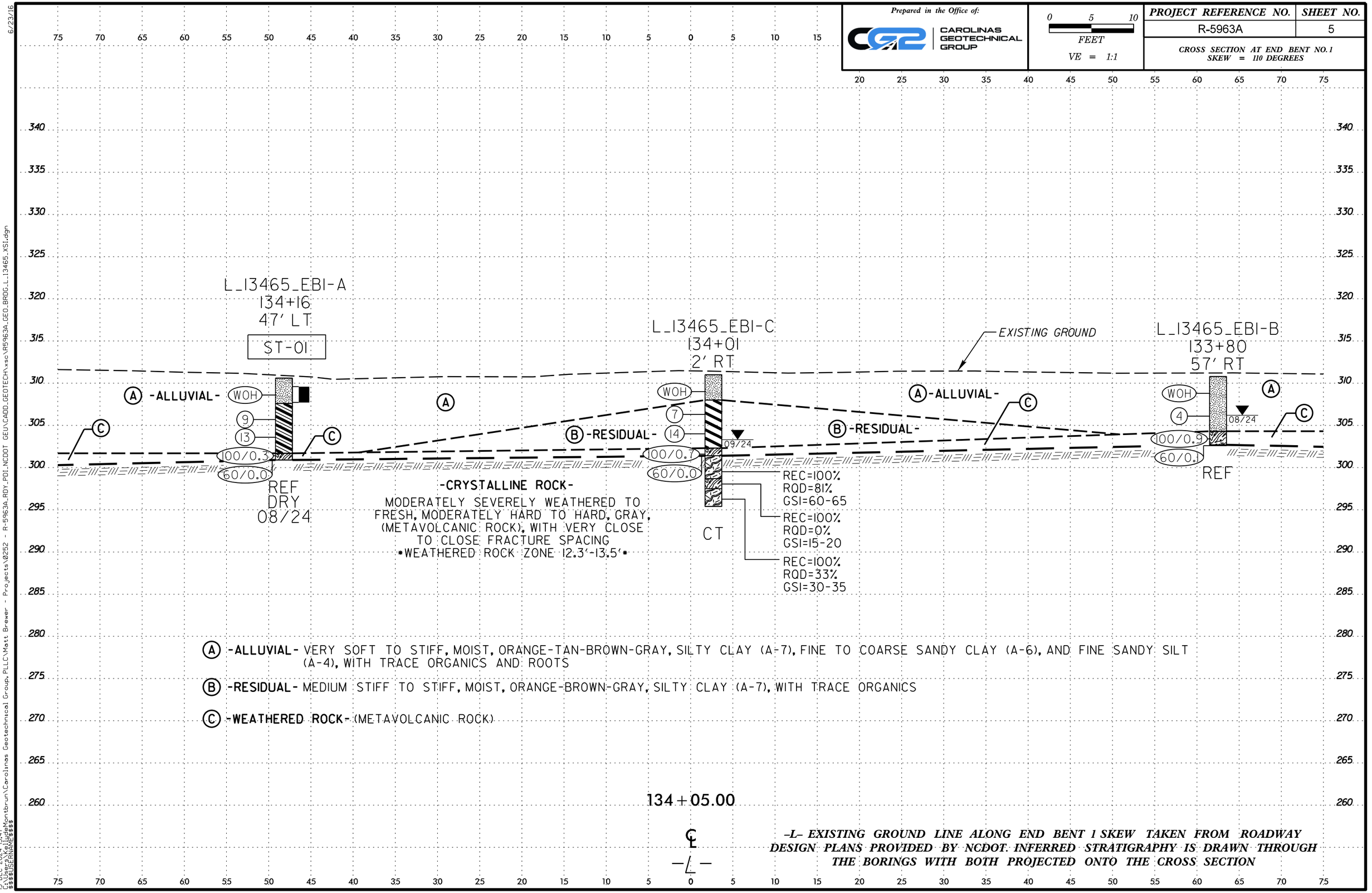
17-DEC-2024 15:28
C:\Users\KelliceMontbrun\Carolinas Geotechnical Group, PLLC\Matt Brewer - Projects\0252 - R-5963A_RDY_PDI.NCDOT GEU\CADD_GEOTECH\Site&Sub\R5963A_GEO_BRDG_L_I3465_PFI.dgn
$$$$USERNAME$$$$

Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP

0 5 10
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	5

CROSS SECTION AT END BENT NO. 1
SKEW = 110 DEGREES



-L- EXISTING GROUND LINE ALONG END BENT 1 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16
13-DEC-2024 13:47
C:\Users\KelludeMontbrun\Carolinas Geotechnical Group, PLLC\Matt Brewer - Projects\0252 - R-5963A_RDY_PDI_NCDOT GEU\CADD_GEOTECH\xsc\R5963A_GEO_BRDG_L_13465_XS1.dgn
$$$$USERNAME$$$$

Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP

0 5 10
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	6

CROSS SECTION AT END BENT NO. 2
SKEW = 110 DEGREES

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

345 340 335 330 325 320 315 310 305 300 295 290 285 280 275 270 265

L_13465_EB2-A
135+40
63' LT

EXISTING GROUND

100/0.9
100/0.4
60/0.0

REF
DRY
09/24

-RESIDUAL-

MEDIUM STIFF TO HARD, DRY TO MOIST, TRACE ORGANICS, GRAVEL-SIZED

L_13465_EB2-C
135+23
7' LT

11
27
40
96
60/0.0

09/24

RED-ORANGE-GREEN-BROWN, SILTY CLAY (A-7) AND FINE SANDY ROCK FRAGMENTS, AND MANGANESE OXIDE STAINING

L_13465_EB2-B
135+06
53' RT

7
95
100/0.7
100/0.6
60/0.0

SILT (A-4), WITH

REF
DRY
09/24

-CRYSTALLINE ROCK-

MODERATELY SEVERE TO VERY SLIGHTLY WEATHERED, SOFT TO HARD, BLUE-GRAY-GREEN, (METAVOLCANIC ROCK), WITH VERY CLOSE TO CLOSE FRACTURE SPACING
WEATHERED ROCK ZONE 15.5'-15.8'

REC=93%
RQD=26%
GSI=25-30

CT

(A) -WEATHERED ROCK- (METAVOLCANIC ROCK)

135+25.00

℄

-L- EXISTING GROUND LINE ALONG END BENT 2 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16

13-DEC-2024 13:47
C:\Users\KellyJudeMontbrun\Carolinas Geotechnical Group, PLLC\Matt Brewer - Projects\0252 - R-5963A_RDY_PDI_NCDOT GEU\CADD_GEOTECH\xsc\R5963A_GEO_BRDG_L_13465_XS1.dgn
$$$$USERNAME$$$$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB1-A	**STATION** 134+16	**OFFSET** 47 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 310.6 ft	**TOTAL DEPTH** 9.7 ft	**NORTHING** 712,311	**EASTING** 1,955,433	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Estep	**START DATE** 08/01/24	**COMP. DATE** 08/01/24	**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)
315											
310										310.6 GROUND SURFACE	0.0
	309.6	1.0	WOH	WOH	WOH	0		M		**ALLUVIAL** Very Soft, Brown, Fine Sandy SILT (A-4(4)),	
	306.7	3.9	3	3	6	9		22% M		with trace organics 307.6	3.0
305	304.6	6.0	4	5	8	13		M		Stiff, Orange-Tan-Gray, Fine to Coarse Sandy CLAY (A-6), with trace organics	
	301.7	8.9								301.7	8.9
	300.9	9.7	100/0.3	60/0.0		100/0.3 60/0.0				**WEATHERED ROCK** 300.9	9.7
										Gray-White (Metavolcanic Rock) Boring Terminated with Standard Penetration Test Refusal at Elevation 300.9 ft On Crystalline Rock (Metavolcanic Rock)	
										Other Samples: ST-01 (1.0 - 3.0)	

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB1-C	**STATION** 134+01	**OFFSET** 2 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 311.0 ft	**TOTAL DEPTH** 15.6 ft	**NORTHING** 712,274	**EASTING** 1,955,468	**24 HR.** 7.7
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Estep	**START DATE** 08/01/24	**COMP. DATE** 09/04/24	**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)
315										
310	310.0	1.0	WOH	WOH	WOH	0		M		311.0 / 0.0 GROUND SURFACE
	307.3	3.7	3	3	4	7		M		308.0 / 3.0 **ALLUVIAL** Very Soft, Brown, Fine Sandy SILT (A-4), with trace organics
305	305.0	6.0	3	4	10	14				**RESIDUAL** Medium Stiff to Stiff, Orange-Brown-Gray, Silty CLAY (A-7), with trace organics
	302.3	8.7								302.3 / 8.7
	301.4	9.6	16	84/0.2						301.4 / 9.6 **WEATHERED ROCK** Orange-Gray (Metavolcanic Rock)
300			60/0.0			100/0.7 60/0.0				298.7 / 12.3 **CRYSTALLINE ROCK** Gray (Metavolcanic Rock)
										297.5 / 13.5 REC=100% RQD=81% GSI=60-65
										295.4 / 15.6 **WEATHERED ROCK** Gray (Metavolcanic Rock)
										REC=100% RQD=0% GSI=15-20
										CRYSTALLINE ROCK Gray (Metavolcanic Rock)
										REC=100% RQD=29% GSI=25-30
										Boring Terminated at Elevation 295.4 ft In Crystalline Rock (Metavolcanic Rock)
										Surficial Organic Soil 0.0 - 0.3'

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/17/24

GEOTECHNICAL BORING REPORT
CORE LOG

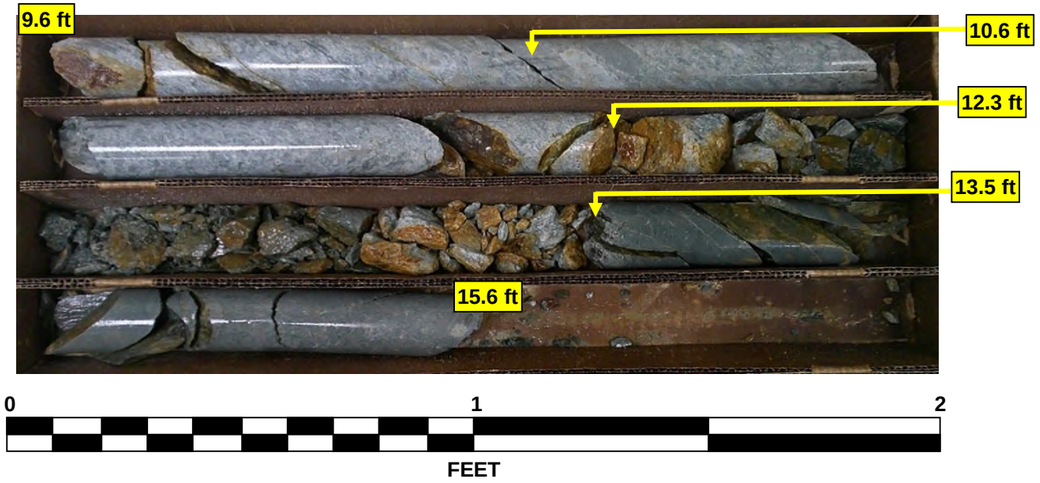
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB1-C	**STATION** 134+01	**OFFSET** 2 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 311.0 ft	**TOTAL DEPTH** 15.6 ft	**NORTHING** 712,274	**EASTING** 1,955,468	**24 HR.** 7.7
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Estep	**START DATE** 08/01/24	**COMP. DATE** 09/04/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 6.0 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)
301.4											Begin Coring @ 9.6 ft
300	301.4	9.6	1.0	*N=60/0.0*	(1.0)	(0.7)		(2.7)	(2.2)		301.4 / 9.6 **CRYSTALLINE ROCK**
	300.4	10.6	5.0	4:54/1.0	100%	70%		100%	81%		Moderately Weathered to Very Slightly Weathered, Moderately Hard, Gray (Metavolcanic Rock), with VClose Fracture Spacing
				3:57/1.0							298.7 / 12.3
				3:00/1.0	(5.0)	(2.1)		(1.2)	(0.0)		297.5 / 13.5
				1:50/1.0	100%	42%		100%	0%		GSI=60-65
	295.4	15.6		3:30/1.0				(2.1)	(0.6)		295.4 / 15.6 **WEATHERED ROCK**
				5:16/1.0				100%	29%		Gray (Metavolcanic Rock)
											GSI=15-20
											CRYSTALLINE ROCK
											Moderately Severely Weathered to Fresh, Moderately Hard to Hard, Gray (Metavolcanic Rock), with Very Close to Close Fracture Spacing
											GSI = 25-30
											Boring Terminated at Elevation 295.4 ft In Crystalline Rock (Metavolcanic Rock)
											Surficial Organic Soil 0.0 - 0.3'

NCDOT CORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/17/24

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_13465_EB1-C
9.6 to 15.6 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB1-B	**STATION** 133+80	**OFFSET** 57 ft RT	**ALIGNMENT** -L-	**0 HR.** 5.3
COLLAR ELEV. 310.8 ft	**TOTAL DEPTH** 8.2 ft	**NORTHING** 712,227	**EASTING** 1,955,505	**24 HR.** 4.6
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER J. Estep	**START DATE** 08/01/24	**COMP. DATE** 08/01/24	**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)
315											
310										310.8 GROUND SURFACE	0.0
	309.8	1.0	WOH	WOH	WOH	0		M		**ALLUVIAL** Very Soft to Soft, Brown-Orange, Fine Sandy SILT (A-4), with trace organics and roots	
	307.1	3.7	3	2	2	4		M			
305	304.8	6.0	3	9	91/0.4					304.3	6.5
	302.7	8.1	60/0.1			100/0.9 60/0.1				302.7 **WEATHERED ROCK** Orange-Gray (Metavolcanic Rock)	8.1
										302.6 **CRYSTALLINE ROCK** Gray (Metavolcanic Rock)	8.2
										Boring Terminated with Standard Penetration Test Refusal at Elevation 302.6 ft In Crystalline Rock (Metavolcanic Rock)	
										Surficial Organic Soil 0.0 - 0.3'	

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perrry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB2-A	**STATION** 135+40	**OFFSET** 63 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 314.9 ft	**TOTAL DEPTH** 6.7 ft	**NORTHING** 712,426	**EASTING** 1,955,482	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 09/03/24	**COMP. DATE** 09/03/24	**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)
315										314.9 GROUND SURFACE	0.0
	313.9	1.0	5	8	92/0.4	100/0.9				313.4 **RESIDUAL** Medium Stiff to Hard, Orange-Brown, Silty CLAY (A-7), with trace organics, gravel-sized rock fragments, and Manganese Oxide staining	1.5
310	311.0	3.9	100/0.4			100/0.4					
	308.2	6.7	60/0.0			60/0.0				308.2 **WEATHERED ROCK** Orange-White (Metavolcanic Rock)	6.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation 308.2 ft On Crystalline Rock (Metavolcanic Rock)	
										Surficial Organic Soil 0.0 - 0.3'	

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB2-C	**STATION** 135+23	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 311.6 ft	**TOTAL DEPTH** 20.4 ft	**NORTHING** 712,383	**EASTING** 1,955,522	**24 HR.** 9.5
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 09/04/24	**COMP. DATE** 09/04/24	**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)
315										
										311.6 GROUND SURFACE 0.0
310	310.6	1.0	4	5	6	11		M		**RESIDUAL** Stiff to Very Stiff, Red-Orange, Silty CLAY (A-7), with trace organics and gravel-sized rock fragments
	307.6	4.0	5	6	21	27		M		306.4 5.2
305	305.6	6.0	8	16	24	40		M		Very Stiff to Hard, Green-Brown, Fine Sandy SILT (A-4), with trace gravel-sized rock fragments and Manganese Oxide staining
	302.6	9.0	29	54	42	96		D		
300	298.4	13.2	60/0.0			60/0.0				298.4 13.2
										CRYSTALLINE ROCK Blue-Gray-Green (Metavolcanic Rock) REC=93% RQD=26% GSI=25-30
295										291.2 Weathered Rock Zone 15.5'-15.8' 20.4
										Boring Terminated at Elevation 291.2 ft In Crystalline Rock (Metavolcanic Rock)

GEOTECHNICAL BORING REPORT
CORE LOG

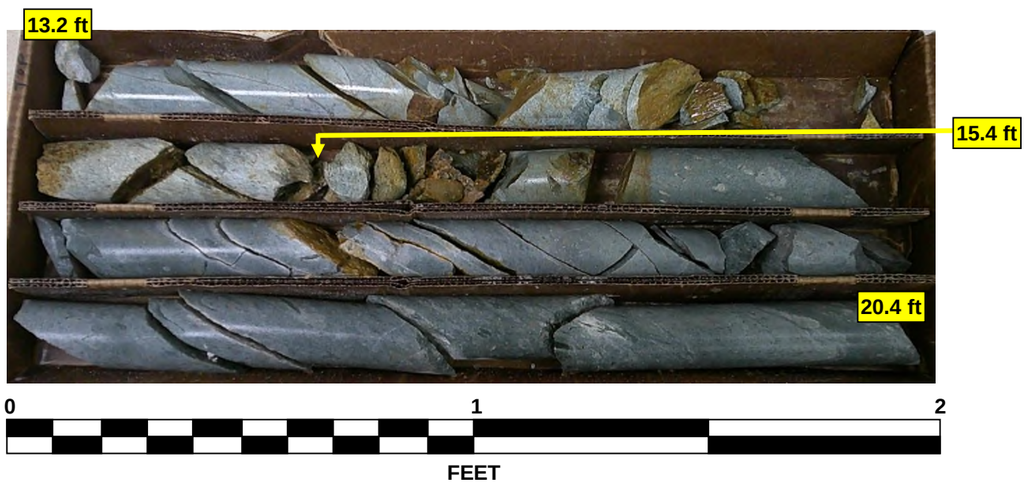
WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB2-C	**STATION** 135+23	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 311.6 ft	**TOTAL DEPTH** 20.4 ft	**NORTHING** 712,383	**EASTING** 1,955,522	**24 HR.** 9.5
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER C. Odom	**START DATE** 09/04/24	**COMP. DATE** 09/04/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 7.2 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)
298.4											Begin Coring @ 13.2 ft
	298.4	13.2	2.2	*N=60/0.0*	(2.2)	(0.0)		(6.7)	(1.9)		298.4 **CRYSTALLINE ROCK** 13.2
	296.2	15.4		2:01/1.0 2:36/1.0	100%	0%		93%	26%		Moderately to Very Slightly Weathered, Soft to Hard, Blue-Gray-Green (Metavolcanic Rock), with Very Close to Close Fracture Spacing
295			5.0	0:23/0.2 2:24/1.0	(4.5)	(1.9)					GSI=25-30
	291.2	20.4		3:43/1.0 6:20/1.0 4:40/1.0 3:36/1.0	90%	38%					291.2 Weathered Rock Zone 15.5'-15.8' 20.4
											Boring Terminated at Elevation 291.2 ft In Crystalline Rock (Metavolcanic Rock)

CAROLINAS GEOTECHNICAL GROUP

Chatham Park Way from US 15-501 to US 64 Business
Chatham County, North Carolina
Rock Core Photographs
L_13465_EB2-C

13.2 to 20.4 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48599.1.1	**TIP** R-5963A	**COUNTY** CHATHAM	**GEOLOGIST** P. Perrry	
SITE DESCRIPTION Chatham Parkway from US 15-501 to US 64 Business				**GROUND WTR (ft)**
BORING NO. L_13465_EB2-B	**STATION** 135+06	**OFFSET** 53 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 312.9 ft	**TOTAL DEPTH** 11.3 ft	**NORTHING** 712,338	**EASTING** 1,955,565	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 09/03/24	**COMP. DATE** 09/03/24	**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
315										ELEV. (ft) / DEPTH (ft)
										312.9 GROUND SURFACE 0.0
	311.9	1.0	3	3	4	7		M		**RESIDUAL** Medium Stiff to Hard, Orange-Brown, Silty CLAY (A-7), with trace organics, gravel-sized rock fragments, and Manganese Oxide staining
310	309.0	3.9	4	24	71	95		M		
	306.9	6.0	79	21/0.2		100/0.7				306.9 6.0
305	304.0	8.9	80	20/0.1		100/0.6				**WEATHERED ROCK** Orange-White (Metavolcanic Rock)
	301.6	11.3	60/0.0			60/0.0				301.6 11.3
										Boring Terminated with Standard Penetration Test Refusal at Elevation 301.6 ft On Crystalline Rock (Metavolcanic Rock)

NCDOT BORE DOUBLE R5963A_RDWY_GEO_GTM.GPJ NC_DOT.GDT 12/13/24

PROJECT REFERENCE NO.	SHEET NO.
R–5963A	15

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_13456_EB1–A	ST–01	47' LT	134+16 –L–	712311	1955433	1.0 – 3.0'	A–4(4)	26	8	7.8	22.9	35.0	34.3	100.0	98.1	73.8	22.0	2.4

Alex M Abernathy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

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

PROJECT REFERENCE NO.	SHEET NO.
R-5963A	16

SITE PHOTOS

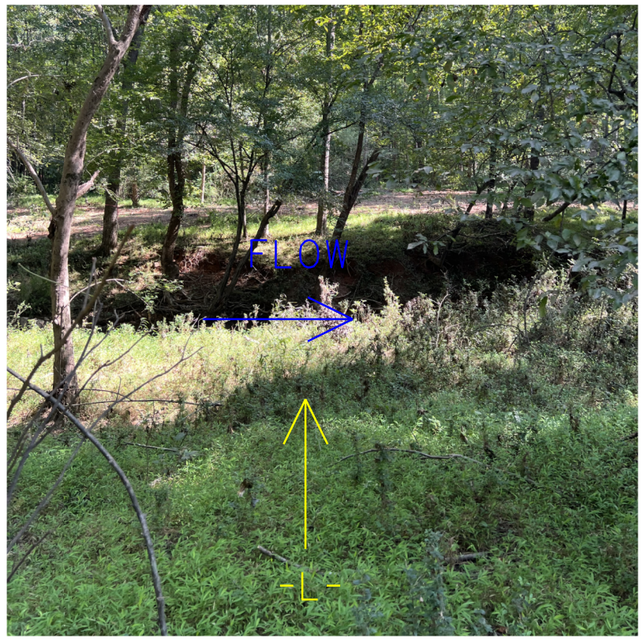


PHOTO #1: VIEW NEAR END BENT NO. 1, FACING UPSTATION

PHOTO #2: VIEW NEAR END BENT NO. 2, FACING DOWNSTATION