REFERENCE: BR-0069

PROJECT: 67069

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0069	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CASWELL*

PROJECT DESCRIPTION *BRIDGE 160001 ON US 158 OVER COUNTRY LINE CREEK*

SITE DESCRIPTION *BRIDGE STRUCTURE AT -L- STA. 20+18.00*

CONTENTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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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PERSONNEL

P.M. WEAVER

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SubTerra Exploration

INVESTIGATED BY *ESP Associates, Inc.*

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Paul M. Weaver 03/03/2023
01847D3739AD49C...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-50
- [ ] _____

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

HAMMER TYPE:
- [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: NGS Marker Designation CAS 2, PID FY2340

ELEVATION: 440.98 FEET

NOTES:

F.I.A.D = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
BR–0069	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

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

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

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

A. *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*

D. *Siltstone or silty shale with sandstone layers*

E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

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

G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers* → **H.** ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

→ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

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

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	3

SITE PLAN

0 40 80
FEET

NC GRID
NAD 83 NA 2011

+88 -L-
141' LT

+00.00 -L-
103' LT

+81.21 -L-
102.95 LT

+91 -L-
128.43 LT

+80 -L-
EX R/W

+02 -L-
123' LT

EXISTING R/W

EIP

RIPRAP AT EMBANKMENT
(ROADWAY DETAIL & PAY ITEM)

-LDET-

1'-0" MIN. EARTH BERM
ELEV. 433.28
(LEVEL)

1'-0" MIN. EARTH BERM
ELEV. 425.82
(LEVEL)

W.P. #1
STA. 18+93.00 -L-

W.P. #2
STA. 19+68.00 -L-

W.P. #3
STA. 20+68.00 -L-

W.P. #4
STA. 21+43.00 -L-

BEGIN FRONT SLOPE
STA. 18+81.87
ELEV. = 444.95

BEGIN APPROACH SLAB
STA. 18+68.89 -L-

BEGIN FRONT SLOPE
STA. 21+53.04
ELEV. = 436.72

END APPROACH SLAB
STA. 21+67.11 -L-

EXISTING STRUCTURE

BRIDGE I.D. STA.
STA. 20+18.00 -L-

TO NC 62

TO US 158

US HWY 158/NC HWY 86

FILL FACE
@ END BENT No. 1

FILL FACE
@ END BENT No. 2

B-77

EB1-A

BI-A

B2-A

EB2-AB-77

EB1-B

BI-B

B2-B

EB2-B

29'-10"

56'-9"

26'-11"

25'-6" (TYP.)

51'-0" (TYP.)

56'-9"

26'-11"

110°00'00" (TYP.)

2'-0" TH. CLASS II
RIP RAP W/ GEOTEXTILE
(TYP. EA. END)

EXISTING
SUBSTRUCTURE
(TYP.)

1'-7" MIN.
RIP RAP BERM
(TYP.)

50'-0"

75'-0"

100'-0"

75'-0"

250'-0" (TOTAL LENGTH FILL FACE TO FILL FACE)

IN CONDUIT

48"WW ISBW

WOODS

RIP RAP

CONC

MTL

T FO

COUNTRY LINE CREEK

JS

20

0	20	40

FEET

VE = 1.0

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	4

BRIDGE PROFILE BORINGS PROJECTED ALONG -L-

SPAN "A" SPAN "B" SPAN "C"

FILL FACE AT END BENT No. 1
STA. 18+93.00 -L-

BENT 1

BENT 2

FILL FACE AT END BENT No. 2
STA. 21+43.00 -L-

EBI-A
19+00
14' LT

BI-A
19+73
15' LT

B2-A
20+75
16' LT

EB2-A
21+50
16' LT

460 450 440 430 420 410 400 390 380 370 360 350

GROUND SURFACE

WATER SURFACE 09/21

08/22

WEATHERED ROCK:
BIOTITE GNEISS

BT
DRY
8/22

ALLUVIAL: Gray and Brown with Orange and Black, Very Loose to Silty Coarse to Fine SAND (A-2-4), Saturated

CRYSTALLINE ROCK: Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard, BIOTITE GNEISS RS-1 with Close to Wide Fracture Spacing and with Small Masses of GRANITIC ROCK

GSI=70-100
REC=99%, RQD=97%

BT

Loose, Coarse to Fine SAND (A-1-b) and

Note: Abundant Wood Fragments at 18.9' in B2-A and Starting at 42.0' in EB2-A

CRYSTALLINE ROCK: White and Pink, Slightly Weathered to Fresh, Hard to Very Hard, GRANITIC ROCK with Zones of BIOTITE GNEISS RS-3

REC=100% RQD=100%

REC=100%
RQD=100%

GSI=40-60
REC=98%, RQD=53%

BT
8/22

18+80 19+00 19+50 20+00 20+50 21+00 21+50

Ⓐ ROADWAY EMBANKMENT: Brown with Orange, Red, and Gray, Medium Stiff to Stiff, Coarse to Fine, Sandy SILT (A-4) and Clayey SILT (A-5), Trace Mica, Trace Organics, Trace Gravel, Moist

Ⓑ RESIDUAL: Brown and Gray with Pink, Medium Dense to Very Dense, Coarse to Fine SAND (A-1-b) and Silty Coarse to Fine SAND (A-2-4), Moist to Wet

Ⓒ ROADWAY EMBANKMENT: Brown, Loose, Silty Coarse to Fine SAND (A-2-4) with Gravel, Moist

Ⓓ ROADWAY EMBANKMENT: Brown and Gray to Dark Gray, Medium Stiff to Stiff, Silty CLAY (A-7-5), Moist, Abundant Wood Fragments at 18.6'

Ⓔ WEATHERED ROCK: BIOTITE GNEISS

Ⓕ CRYSTALLINE ROCK: Gray with Black and White, Moderately to Severely Weathered, Moderately Hard to Medium Hard, BIOTITE GNEISS with Very Close to Close Fracture Spacing
GSI=40-60
REC=35%, RQD=0%

Ⓖ CRYSTALLINE ROCK: Gray with Black and White, Moderately to Slightly Weathered, Moderately Hard to Hard, BIOTITE GNEISS with Very Close Fracture Spacing
GSI=60-80
REC=100%, RQD=70%

- PROFILE TAKEN FROM "BR0069_PGD01.dgn" FILE PROVIDED BY NCDOT ON 08/30/22
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE PROFILE

-L-

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	5

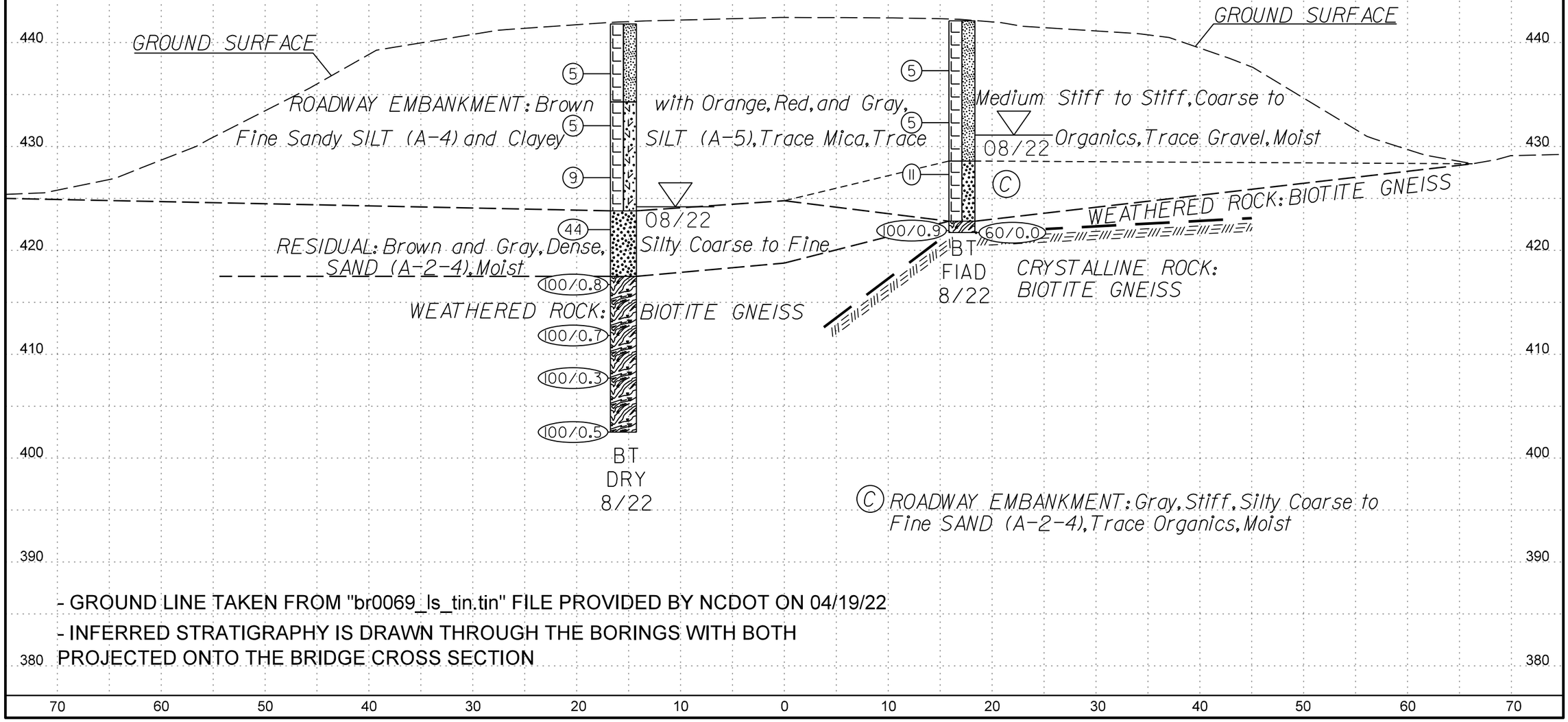
CROSS SECTION AT END BENT 1
-L- STATION 18+93.00
SKEW = 110°00'00"

0 10 20
FEET
VE = 1.0

-L- STA. 18+93.00

EBI-A
19+00
14' LT

EBI-B
18+87
16' RT



- GROUND LINE TAKEN FROM "br0069_ls_tin.tin" FILE PROVIDED BY NCDOT ON 04/19/22
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

0	10	20

FEET

VE = 1.0

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	6

CROSS SECTION AT BENT 1
-L- STATION 19+68.00
SKEW = 110°00'00"

-L- STA. 19+68.00

℄

BI-A
19+73
15' LT

BI-B
19+62
17' RT

Note: At Bent 1, BI-A and BI-B Were Drilled Within the Creek Bed and Below the Creek Water Surface

WATER SURFACE 08/22

GROUND SURFACE

GROUND SURFACE

ALLUVIAL: Gray and Brown, Very Loose, Coarse to Fine SAND (A-1-b), Saturated

WOH

100/0.3

60/0.0

WEATHERED ROCK: BIOTITE GNEISS

100/0.7

60/0.0

CRYSTALLINE ROCK: Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard, BIOTITE GNEISS with Moderately Close to Very Wide Fracture Spacing and with Small Masses of GRANITIC ROCK

RS-1

GSI=80-100
REC=99%
RQD=97%

RS-2

CRYSTALLINE ROCK: Gray with Black, White and Pink, Slightly to Very Slightly Weathered, Hard to Very Hard, BIOTITE GNEISS with Close to Moderately Close Fracture Spacing

GSI=50-70
REC=96%, RQD=83%

REC=99%
RQD=99%

BT
8/22

BT
8/22

420 410 400 390 380 370 360 350

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

- GROUND LINE TAKEN FROM "br0069_ls_tin.tin" FILE PROVIDED BY NCDOT ON 04/19/22
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	7

CROSS SECTION AT BENT 2
-L- STATION 20+68.00
SKEW = 110°00'00"

0 10 20
FEET
VE = 1.0

-L- STA. 20+68.00

℄

Ⓔ WEATHERED ROCK: BIOTITE GNEISS

Ⓕ CRYSTALLINE ROCK: Gray with Black and White, Moderately to Severely Weathered, Moderately Hard to Medium Hard, BIOTITE GNEISS with Very Close to Close Fracture Spacing GSI=40-60, REC=35%, RQD=0%

B2-A
20+75
16' LT

B2-B
20+62
17' RT

GROUND SURFACE

420
410
400
390
380
370
360
350
340

08/22

ALLUVIAL: Gray with Brown, White and Black, Very Loose to SAND (A-1-b) and Silty Coarse to Fine SAND

Note: Abundant Wood Fragments at 18.9' in B2-A

WOH

28

60/0.0

CRYSTALLINE ROCK: White, Pink, and Gray with Black, Slightly Weathered to Fresh, Hard to Very Hard, GRANITIC ROCK with Very Close to Moderately Close Fracture Spacing and with Zones of BIOTITE GNEISS GSI=40-70, REC=98%, RQD=53%

RS-3

REC=100%
RQD=100%

BT
8/22

08/22

Medium Dense, Coarse to (A-2-4), Saturated

RESIDUAL: Gray, Very Loose to Dense, Silty Coarse to Fine SAND (A-2-4), Wet to Saturated

37

100/0.4

60/0.0

RS-4

REC=100%, RQD=89%

CRYSTALLINE ROCK: Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard, BIOTITE GNEISS with Close to Wide Fracture Spacing GSI=70-100

REC=99%
RQD=98%

BT

Ⓖ CRYSTALLINE ROCK: Gray with Black and White, Moderately to Slightly Weathered, Moderately Hard to Hard, BIOTITE GNEISS with Very Close Fracture Spacing
GSI=60-80
REC=100%, RQD=70%

- GROUND LINE TAKEN FROM "br0069_ls_tin.tin" FILE PROVIDED BY NCDOT ON 04/19/22
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	8

CROSS SECTION AT END BENT 2
-L- STATION 21+43.00
SKEW = 110°00'00"

0 10 20
FEET
VE = 1.0

-L- STA. 21+43.00

EB2-A
21+50
16' LT

EB2-B
21+37
16' RT

(A) ROADWAY EMBANKMENT: Brown and Gray, Medium Stiff, Coarse to Fine Sandy SILT (A-4), Moist

(E) WEATHERED ROCK: BIOTITE GNEISS

GROUND SURFACE

ROADWAY EMBANKMENT: Brown and Orange, Loose, Silty Coarse to Fine SAND (8) (A-2-4) with Gravel, Moist (5)

GROUND SURFACE

(11) (9)

ROADWAY EMBANKMENT: Brown and Gray to Dark Gray, Medium Stiff to Stiff, Coarse to Fine Sandy SILT (A-4), Trace Mica, Moist (7) (7)

(11) (6)

ROADWAY EMBANKMENT: Brown Mica and Trace Organics

Medium Stiff to Stiff, Silty CLAY (A-7-5), Trace Fragments at 18.6' in EB2-A

(8) (7)

08/22 Note: Abundant Wood

(A)

(7) (6)

ALLUVIAL: Tan, Brown, Orange and Dark Gray, Very Loose to Loose, Coarse to Silty Coarse to Fine SAND (A-2-4), Saturated (1) (2)

08/22 Fine SAND (A-1-b) and

(9) (10)

Note: Abundant Wood Fragments at 42' in EB2-A

(4) (7)

RESIDUAL: Gray and Dark Gray with Pink, Loose to Very Dense, Coarse to Fine SAND (A-1-b), Moist to Wet

(8) (50/0.9)

(E) (50/0.0) (50/0.7) (50/0.0) (E)

BT BT

FIAD

CRYSTALLINE ROCK: BIOTITE GNEISS 8/22

- GROUND LINE TAKEN FROM "br0069_ls_tin.tin" FILE PROVIDED BY NCDOT ON 04/19/22
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

440 430 420 410 400 390 380 370

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 19+00	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** 17.6
COLLAR ELEV. 441.8 ft	**TOTAL DEPTH** 39.3 ft	**NORTHING** 966,309	**EASTING** 1,912,283	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/03/22	**COMP. DATE** 08/03/22	**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)
445										
										441.8 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT Brown with Orange and Gray, Coarse to Fine Sandy SILT, Trace Mica
440	438.0	3.8	2	2	3	5		M		
435	433.0	8.8	2	2	3	5		M		434.3 7.5 Brown with Orange and Red to Dark Gray, Clayey SILT, Trace Mica, Trace Organics, Trace Gravel
430	428.0	13.8	2	4	5	9		M		
425	423.0	18.8	12	21	23	44		M		423.8 18.0 **RESIDUAL** Brown and Gray, Silty Coarse to Fine SAND
420	418.0	23.8	21	65	35/0.3	100/0.8				417.5 24.3 **WEATHERED ROCK** BIOTITE GNEISS
415	413.0	28.8	30	52	48/0.2	100/0.7				
410	408.0	33.8	100/0.3			100/0.3				
405	403.0	38.8	100/0.5			100/0.5				402.5 39.3 Boring Terminated at Elevation 402.5 ft in Weathered Rock: BIOTITE GNEISS

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 18+87	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** 11.0
COLLAR ELEV. 442.1 ft	**TOTAL DEPTH** 20.4 ft	**NORTHING** 966,295	**EASTING** 1,912,253	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/08/22	**COMP. DATE** 08/08/22	**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
445										
										442.1 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT Brown and Orange, Coarse to Fine Sandy SILT, Trace Mica
440	438.3	3.8	2	2	3	5		M		
435	433.3	8.8	2	2	3	5		M		
430	428.3	13.8	3	5	6	11		M		428.6 13.5 Gray, Silty Coarse to Fine SAND, Trace Organics
425	423.3	18.8	21	44	56/0.4	100/0.9				422.8 19.3
	421.7	20.4	60/0.0			60/0.0				421.7 20.4 **WEATHERED ROCK** BIOTITE GNEISS Boring Terminated with Standard Penetration Test Refusal at Elevation 421.7 ft on Crystalline Rock: BIOTITE GNEISS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 19+73	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 406.2 ft	**TOTAL DEPTH** 31.9 ft	**NORTHING** 966,262	**EASTING** 1,912,338	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/02/22	**COMP. DATE** 08/02/22	**SURFACE WATER DEPTH** 2.3ft	

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)
410										
										406.2 GROUND SURFACE 0.0
405										**ALLUVIAL** Brown, Coarse to Fine SAND
	401.4	4.8	WOH	WOH	0	0		Sat.		
400										
	396.4	9.8	100/0.3			100/0.3				396.4 9.8
395	395.0	11.2	60/0.0			60/0.0				395.0 **WEATHERED ROCK** 11.2
										BIOTITE GNEISS
390										**CRYSTALLINE ROCK** Gray with Black and White, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Moderately Close to Wide Fracture Spacing and with Small Masses of Granitic Rock
385							RS-1			
380										
375										374.3 31.9
										Boring Terminated at Elevation 374.3 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT BORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

SHEET 10

GEOTECHNICAL BORING REPORT
CORE LOG

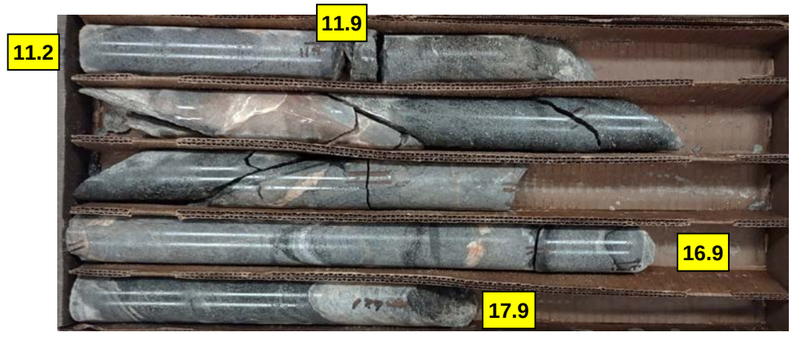
WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 19+73	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 406.2 ft	**TOTAL DEPTH** 31.9 ft	**NORTHING** 966,262	**EASTING** 1,912,338	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/02/22	**COMP. DATE** 08/02/22	**SURFACE WATER DEPTH** 2.3ft	
CORE SIZE NQ	**TOTAL RUN** 20.7 ft			

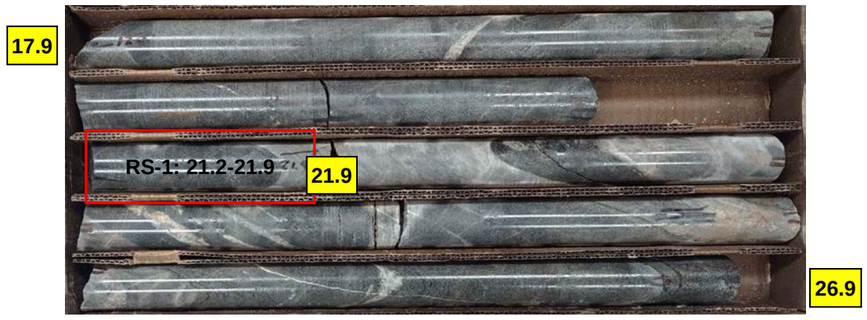
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
395											Begin Coring @ 11.2 ft
	395.0	11.2	0.7	5:16/0.7	(0.7)	(0.7)		(20.5)	(20.1)		395.0 **CRYSTALLINE ROCK** 11.2
	394.3	11.9	5.0	3:21/1.0	100%	100%		99%	97%		Gray with Black and White, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Moderately Close to Wide Fracture Spacing and with Small Masses of Granitic Rock
				3:20/1.0	(4.8)	(4.4)					Variably foliated with foliation angles of 50 degrees to 80 degrees
390				5:58/1.0	96%	88%					4 fractures in upper 3.5' at 50 degrees to 80 degrees parallel to foliation
	389.3	16.9		6:56/1.0							GSI=80 to 100
			5.0	3:10/1.0							
				2:33/1.0	(5.0)	(5.0)					
				2:21/1.0	100%	100%					
385				2:18/1.0							
	384.3	21.9		2:20/1.0							
				2:20/1.0			RS-1				
			5.0	2:06/1.0	(5.0)	(5.0)					
				2:14/1.0	100%	100%					
380				2:14/1.0							
	379.3	26.9		2:39/1.0							
				1:46/1.0							
			5.0	1:58/1.0	(5.0)	(5.0)					
				1:45/1.0	100%	100%					
375				2:25/1.0							
	374.3	31.9		1:57/1.0							374.3 31.9
				2:00/1.0							Boring Terminated at Elevation 374.3 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT CORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

CORE PHOTOGRAPHS

B1-A
BOXES 1 & 2: 11.2 - 26.9 FEET





B1-A
BOX 3: 26.9 - 31.9 FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 19+62	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 407.1 ft	**TOTAL DEPTH** 37.6 ft	**NORTHING** 966,245	**EASTING** 1,912,309	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/04/22	**COMP. DATE** 08/05/22	**SURFACE WATER DEPTH** 1.6ft	

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)
410										
										407.1 GROUND SURFACE 0.0
405										**ALLUVIAL** Gray with Brown, Coarse to Fine SAND
	402.1	5.0	WOH	WOH	1	1		Sat.		
400										
	397.1	10.0	69	31/0.2		100/0.7				397.1 10.0 **WEATHERED ROCK** BIOTITE GNEISS
395										
	392.9	14.2	60/0.0			60/0.0				392.9 14.2 **CRYSTALLINE ROCK** Gray with Black, White, and Pink, Slightly to Very Slightly Weathered, Hard to Very Hard BIOTITE GNEISS with Close to Moderately Close Fracture Spacing
390										
385							RS-2			385.1 22.0 Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Very Wide Fracture Spacing and with Small Masses of Granitic Rock
380										
375										
370										369.5 37.6 Boring Terminated at Elevation 369.5 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT BORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

SHEET 12

GEOTECHNICAL BORING REPORT
CORE LOG

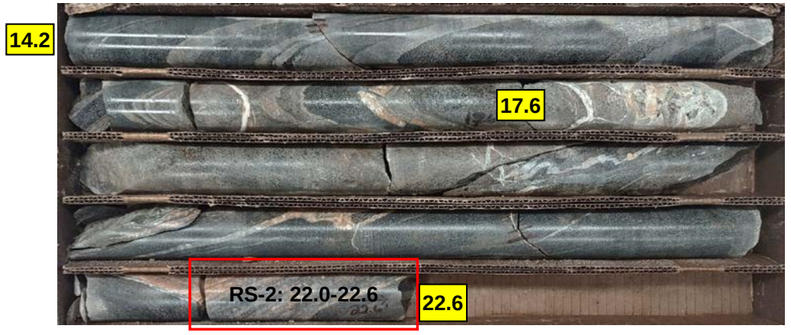
WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 19+62	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 407.1 ft	**TOTAL DEPTH** 37.6 ft	**NORTHING** 966,245	**EASTING** 1,912,309	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic
DRILLER Brown, M.	**START DATE** 08/04/22	**COMP. DATE** 08/05/22	**SURFACE WATER DEPTH** 1.6ft
CORE SIZE NQ	**TOTAL RUN** 23.4 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)
392.9											Begin Coring @ 14.2 ft
	392.9	14.2	3.4	2:38/1.0 2:31/1.0 2:43/1.0 :57/0.4	(3.2) 94%	(2.9) 85%		(7.5) 96%	(6.5) 83%		392.9 **CRYSTALLINE ROCK** 14.2 Gray with Black, White, and Pink, Slightly to Very Slightly Weathered, Hard to Very Hard BIOTITE GNEISS with Close to Moderately Close Fracture Spacing Variably foliated with foliation angles of 70 degrees to 80 degrees 5 fractures at 70 degrees to 80 degrees parallel to foliation 3 fractures at 10 degrees to 20 degrees Vuggy texture 17.6' to 18.3' GSI=50-70
390	389.5	17.6	5.0	1:28/1.0 1:46/1.0 1:56/1.0 1:55/1.0 2:17/1.0	(4.9) 98%	(4.2) 84%					
385	384.5	22.6	5.0	2:22/1.0 2:18/1.0 2:30/1.0 2:19/1.0 2:42/1.0	(5.0) 100%	(5.0) 100%	RS-2	(15.4) 99%	(15.4) 99%		385.1 22.0 Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Very Wide Fracture Spacing and with Small Masses of Granitic Rock Variably foliated with foliation angles of 50 degrees to 70 degrees No natural fractures GSI=80-100
380	379.5	27.6	5.0	2:17/1.0 2:29/1.0 3:23/1.0 2:49/1.0 3:01/1.0	(4.9) 98%	(4.9) 98%					
375	374.5	32.6	5.0	2:42/1.0 3:17/1.0 1:53/1.0 3:01/1.0 2:42/1.0	(4.9) 98%	(4.9) 98%					
370	369.5	37.6									369.5 37.6 Boring Terminated at Elevation 369.5 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT CORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

CORE PHOTOGRAPHS

B1-B
BOXES 1 & 2: 14.2 - 31.0 FEET



0 1 2
FEET

B1-B
BOX 3: 31.0 - 37.6 FEET

0 1 2
FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 20+75	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 416.4 ft	**TOTAL DEPTH** 60.3 ft	**NORTHING** 966,196	**EASTING** 1,912,416	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/01/22	**COMP. DATE** 08/01/22	**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)
420										416.4 GROUND SURFACE 0.0
415	412.5	3.9	WOH	WOH	2	2		Sat.		**ALLUVIAL** Gray with Brown and Black, Silty Coarse to Fine SAND, Abundant Wood Fragments in Sample at 18.9 feet
410	407.5	8.9	1	WOH	2	2		Sat.		
405	402.5	13.9	2	2	3	5		Sat.		
400	397.5	18.9	1	2	4	6		Sat.		395.3 21.1 Gray, Coarse to Fine SAND
395	392.5	23.9	WOH	WOH	0	0		Sat.		
390	387.5	28.9	2	6	22	28		W		387.0 29.4 **RESIDUAL** 385.9 30.5 Gray, Silty Coarse to Fine SAND
385	384.3	32.1	60/0.0			60/0.0				384.3 32.1 **WEATHERED ROCK** BIOTITE GNEISS
380										**CRYSTALLINE ROCK** White and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard GRANITIC ROCK with Zones of Black and Gray, Moderately to Slighly Weathered, Moderately Hard to Hard BIOTITE GNEISS; Close to Moderately Close Fracture Spacing with Small Sections of Very Close Fracture Spacing
375										375.6 40.8 Gray with White and Black, Very Slighlty Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Close to Moderately Close Fracture Spacing
370							RS-3			373.8 42.6 372.1 44.3 Gray with Black and White, Moderately to Severely Weathered, Moderately Hard to Medium Hard BIOTITE GNEISS with Very Close to Close Fracture Spacing
365										368.8 47.6 Gray with Black and White, Moderately to Slightly Weathered, Moderately Hard to Hard BIOTITE GNEISS with Very Close to Close Fracture Spacing
360										Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Moderately Close to Wide Fracture Spacing
										356.1 60.3 Boring Terminated at Elevation 356.1 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT BORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

GEOTECHNICAL BORING REPORT
CORE LOG

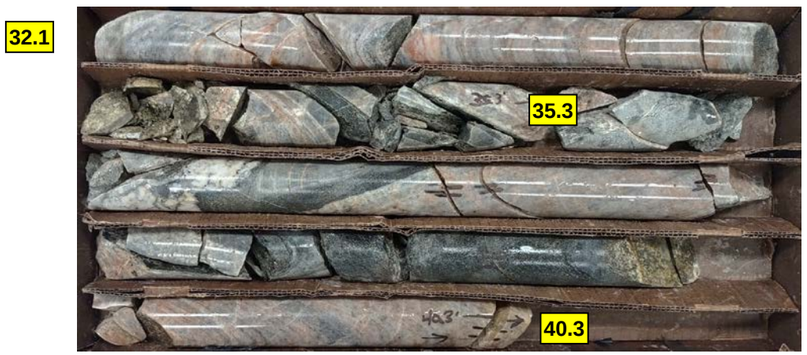
WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 20+75	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 416.4 ft	**TOTAL DEPTH** 60.3 ft	**NORTHING** 966,196	**EASTING** 1,912,416	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/01/22	**COMP. DATE** 08/01/22	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 28.2 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)
384.3											Begin Coring @ 32.1 ft
	384.3	32.1	3.2	2:20/1.0 2:39/1.0 3:19/1.0	(3.0) 94%	(0.6) 19%		(8.5) 98%	(4.6) 53%		384.3 **CRYSTALLINE ROCK** 32.1 White and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard GRANITIC ROCK with Zones of Black and Gray, Moderately to Slighly Weathered, Moderately Hard to Hard BIOTITE GNEISS; Close to Moderately Close Fracture Spacing with Small Sections of Very Close Fracture Spacing Fracture angles at 0 degrees to 70 degrees GSI=40-60
380	381.1	35.3	5.0	1:13/0.2 2:24/1.0 3:59/1.0 4:51/1.0 5:16/1.0 6:08/1.0	(5.0) 100%	(3.5) 70%					
375	376.1	40.3	5.0	5:57/1.0 4:10/1.0 2:28/1.0 2:02/1.0 2:35/1.0	(3.9) 78%	(3.0) 60%		(1.8) 100%	(1.8) 100%		375.6 40.8 Gray with White and Black, Very Slighlty Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Close to Moderately Close Fracture Spacing 2 fractures at 10 degrees GSI=70-90 373.8 42.6
370	371.1	45.3	5.0	1:28/1.0 2:24/1.0 2:15/1.0 3:43/1.0 5:58/1.0	(5.0) 100%	(4.3) 86%	RS-3	(0.6) 35% (3.3) 100%	(0.0) 0% (2.3) 70%		372.1 44.3 Gray with Black and White, Moderately to Severely Weathered, Moderately Hard to Medium Hard BIOTITE GNEISS with Very Close to Close Fracture Spacing Fractures at 70 degrees GSI=40-60 368.8 47.6
365	366.1	50.3	5.0	4:41/1.0 5:12/1.0 5:43/1.0 5:04/1.0 6:05/1.0	(5.0) 100%	(5.0) 100%		(12.7) 100%	(12.7) 100%		Gray with Black and White, Moderately to Slightly Weathered, Moderately Hard to Hard BIOTITE GNEISS with Very Close to Close Fracture Spacing 1 fracture at 20 degrees and 2 fractures at 70 degrees GSI=60-80
360	361.1	55.3	5.0	8:18/1.0 6:05/1.0 8:18/1.0 7:51/1.0 7:06/1.0	(5.0) 100%	(5.0) 100%					Gray with Black, White, and Pink, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Moderately Close to Wide Fracture Spacing 3 fractures at 10 degrees GSI=80-100
	356.1	60.3									356.1 60.3 Boring Terminated at Elevation 356.1 ft in Crystalline Rock: BIOTITE GNEISS

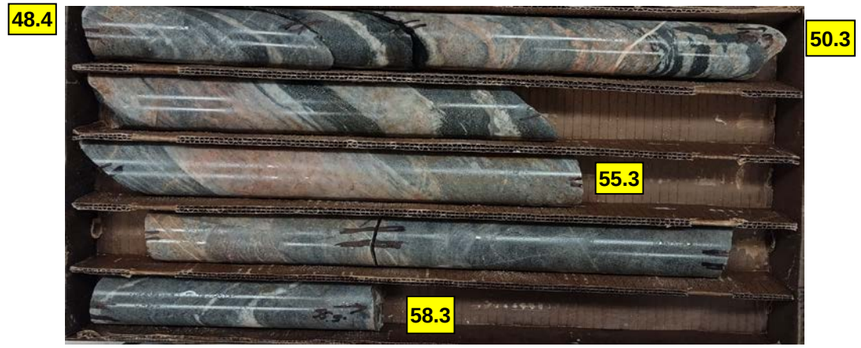
NCDOT CORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

CORE PHOTOGRAPHS

B2-A
BOXES 1 & 2: 32.1 - 48.4 FEET



B2-A
BOXES 3 & 4: 48.4 - 60.3 FEET



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+62	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 414.3 ft	**TOTAL DEPTH** 52.8 ft	**NORTHING** 966,179	**EASTING** 1,912,385	**24 HR.** 5.5
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/03/22	**COMP. DATE** 08/04/22	**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)
415										414.3 GROUND SURFACE 0.0
	412.9	1.4	WOH	1	2	3		W		**ALLUVIAL** Gray and Brown, Silty Coarse to Fine SAND
410	407.9	6.4	1	1	2	3		Sat.		
405	402.9	11.4	1	1	0	1		Sat.		
400	397.9	16.4	5	7	6	13		Sat.		398.8 15.5 Gray with White, Coarse to Fine SAND
395	392.9	21.4	2	WOH	1	1		Sat.		393.3 21.0 **RESIDUAL** Gray, Silty Coarse to Fine SAND, Trace Rock Fragments
390	387.9	26.4	3	5	32	37		W		
385	385.7	28.6	100/0.4			100/0.4	RS-4			385.7 28.6 **WEATHERED ROCK** BIOTITE GNEISS
	384.2	30.1	60/0.0			60/0.0				384.2 30.1 **CRYSTALLINE ROCK** Pink and Gray with White and Black, Slightly to Very Slightly Weathered, Hard to Very Hard GRANITIC ROCK with Very Close to Close Fracture Spacing and with Small Zones of Biotite Gneiss
380										379.6 34.7 Gray with Black and White, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Moderately Close to Wide Fracture Spacing
375										
370										
365										361.5 52.8 Boring Terminated at Elevation 361.5 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT BORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

SHEET 16

GEOTECHNICAL BORING REPORT
CORE LOG

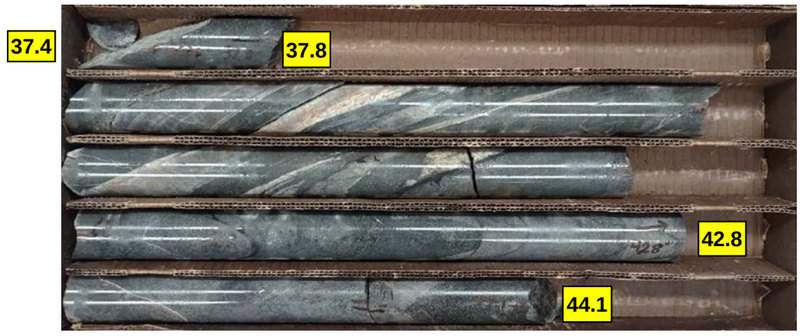
WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+62	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 414.3 ft	**TOTAL DEPTH** 52.8 ft	**NORTHING** 966,179	**EASTING** 1,912,385	**24 HR.** 5.5
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic
DRILLER Brown, M.	**START DATE** 08/03/22	**COMP. DATE** 08/04/22	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ	**TOTAL RUN** 22.7 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)
384.2											Begin Coring @ 30.1 ft
	384.2	30.1	2.7	3:14/1.0 3:21/1.0 2:28/0.7	(2.7) 100%	(2.7) 100%		(4.6) 100%	(4.1) 89%		384.2 **CRYSTALLINE ROCK** 30.1 Pink and Gray with White and Black, Slightly to Very Slightly Weathered, Hard to Very Hard GRANITIC ROCK with Very Close to Close Fracture Spacing and with Small Zones of Biotite Gneiss
380	381.5	32.8	5.0	2:16/1.0 2:25/1.0 2:36/1.0 2:19/1.0 2:06/1.0	(5.0) 100%	(4.5) 90%	RS-4	(18.0) 99%	(17.8) 98%		379.6 34.7 Biotite Gneiss foliation at 60 degrees 4 fractures at 20 degrees to 30 degrees Open and partially healed 1' long vertical fracture GSI=50-70
375	376.5	37.8	5.0	2:21/1.0 2:30/1.0 2:58/1.0 2:30/1.0 2:21/1.0	(5.0) 100%	(5.0) 100%					Gray with Black and White, Very Slightly Weathered to Fresh, Hard to Very Hard BIOTITE GNEISS with Moderately Close to Wide Fracture Spacing Variably foliated with foliation angles of 50 degrees to 80 degrees Fractures generally at 50 degrees to 80 degrees parallel to foliation GSI=80-100
370	371.5	42.8	5.0	2:20/1.0 2:27/1.0 2:51/1.0 2:50/1.0 4:01/1.0	(4.9) 98%	(4.9) 98%					
365	366.5	47.8	5.0	4:18/1.0 2:24/1.0 2:42/1.0 2:44/1.0 3:45/1.0	(5.0) 100%	(4.8) 96%					
	361.5	52.8									361.5 52.8 Boring Terminated at Elevation 361.5 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT CORE SINGLE BR0069_GEO_BRDG_GINT.GPJ NC_DOT.GDT 9/1/22

CORE PHOTOGRAPHS

B2-B
BOXES 1 & 2: 30.1 - 44.1 FEET



B2-B
BOX 3: 44.1 - 52.8 FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+50	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** 26.4
COLLAR ELEV. 434.1 ft	**TOTAL DEPTH** 52.3 ft	**NORTHING** 966,147	**EASTING** 1,912,473	**24 HR.** 25.7
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/02/22	**COMP. DATE** 08/03/22	**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)
435										434.1 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Brown, Silty Coarse to Fine SAND with Gravel	
430	430.5	3.6	8	4	4	8		M			
425	425.5	8.6	3	4	7	11		M		426.6 Brown with Orange, Coarse to Fine Sandy SILT, Trace Mica	7.5
420	420.5	13.6	4	3	4	7		M			
415	415.5	18.6	5	5	6	11		M		416.1 Brown and Gray to Dark Gray, Silty CLAY, Abundant Wood Fragments in Sample at 18.6 Feet	18.0
410	410.5	23.6	3	3	5	8		M			
405	405.5	28.6	4	3	4	7		M			
400	400.5	33.6	3	1	0	1		Sat.		403.1 **ALLUVIAL** Brown with Orange, Silty Coarse to Fine SAND	31.0
395	395.5	38.6	2	4	5	9		Sat.		398.1 Brown, Coarse to Fine SAND	36.0
390	390.5	43.6	1	1	3	4		Sat.		392.1 Dark Gray with Brown, Silty Coarse to Fine SAND, Abundant Wood Fragments	42.0
385	385.5	48.6	16	23	58	81		M		388.1 **RESIDUAL** Gray and Dark Gray with Pink, Coarse to Fine SAND	46.0
	382.7	51.4								382.7	51.4
	381.8	52.3	6	94/0.2		100/0.7				381.8 **WEATHERED ROCK** BIOTITE GNEISS	52.3
			60/0.0			60/0.0				Boring Terminated with Standard Penetration Test Refusal at Elevation 381.8 ft on Crystalline Rock: BIOTITE GNEISS	

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzalez, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 Over Country Line Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 21+37	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** 33.5
COLLAR ELEV. 434.6 ft	**TOTAL DEPTH** 51.0 ft	**NORTHING** 966,131	**EASTING** 1,912,442	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SEL1975 DIEDRICH D-50 81% 07/26/2022		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Brown, M.	**START DATE** 08/08/22	**COMP. DATE** 08/08/22	**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)
435										434.6 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT Brown and Orange, Silty Coarse to Fine SAND with Gravel	
430	430.8	3.8	4	2	3	5		M		429.1 Brown, Coarse to Fine Sandy SILT, Trace Mica	5.5
425	425.8	8.8	4	4	5	9		M			
420	420.8	13.8	4	3	4	7		M		419.1 Brown and Gray, Silty CLAY, Trace Mica and Trace Organics	15.5
415	415.8	18.8	1	2	4	6		M			
410	410.8	23.8	3	4	3	7		M		408.6 Brown and Gray, Coarse to Fine Sandy SILT	26.0
405	405.8	28.8	2	3	3	6		M			
400	400.8	33.8	1	1	1	2		Sat.		404.6 **ALLUVIAL** Tan and Brown, Silty Coarse to Fine SAND	30.0
395	395.8	38.8	3	4	6	10		W		395.6 **RESIDUAL** Gray, Coarse to Fine SAND	39.0
390	390.8	43.8	WOH	3	4	7		W			
385	385.8	48.8	17	83/0.4		100/0.9				385.8	48.8
	383.6	51.0	60/0.0			60/0.0				383.6 **WEATHERED ROCK** BIOTITE GNEISS	51.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 383.6 ft on Crystalline Rock: BIOTITE GNEISS	

UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C
This method does not report strain rate or deformation

Client: ESP Associates
Client Project: IS14.321
Project No.: R-2022-191-001
Lab ID No.: R-2022-191-001-001

Boring No.: B1-A
Depth (ft): 21.2-21.9
Sample ID: RS-1
Moisture Condition: As received

Specimen Weight (g): 604.11

SPECIMEN LENGTH (in)

Reading 1:	4.40
Reading 2:	4.40
Reading 3:	4.40
Average:	**4.40**

SPECIMEN DIAMETER (in):

Reading 1:	1.99
Reading 2:	1.99
Average:	**1.99**
Area (in^2):	3.11
L/D:	2.21

MOISTURE CONTENT

Tare Number:	441
Wt. of Tare & Wet Sample (g):	184.37
Wt. of Tare & Dry Sample (g):	184.32
Weight of Tare (g):	98.17
Weight of Wet Sample (g):	86.20
Sample Volume (cm^3):	224.28
Moisture Content (%):	0.06
Unit Wet Weight (g/cm^3):	2.694
Unit Wet Weight (pcf):	168.1
Unit Dry Weight (g/cm^3):	2.692
Unit Dry Weight (pcf):	168.0

Total Load (lb): 80,140
Uniaxial Compressive Strength (psi): 25,770

Fracture Type: **Shear**

Rate of Loading (lb/sec): 219
Time to Break (min:sec): 6:05.90
Deviation From Straightness[2]: Pass

AXIAL: *Pass* TOP: *Pass* BOTTOM: *Pass*

Physical Description: Gray Rock Core

Notes:
1) Moisture conditions at time of the test are: As received
2) Sample prep conforms to ASTM D4543-08 "best effort" if applicable
3) Deviation from straightness, Procedure A of ASTM D 4543-08
   Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
4) Temperature is laboratory room temperature.
5) D4543 Prep and D7012 Testing Equipment Used:
   R176 Compression Machine,
   R525 Digital Calipers,
   R148 Feeler Gauge, R419 Scale
   R512 Rock Saw
   R148 Straight Edge
   R582 V-Block, R585 Dial Gauge

Tested By: NS *Date:* 8/29/22 *Checked By:* GEM *Date:* 8/30/22

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UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C
This method does not report strain rate or deformation

Client: ESP Associates
Client Project: IS14.321
Project No.: R-2022-191-001
Lab ID No.: R-2022-191-001-002

Boring No.: B1-B
Depth (ft): 22.0-22.6
Sample ID: RS-2
Moisture Condition: As received

Specimen Weight (g): 582.30

SPECIMEN LENGTH (in)

Reading 1:	4.38
Reading 2:	4.38
Reading 3:	4.38
Average:	**4.38**

SPECIMEN DIAMETER (in):

Reading 1:	1.99
Reading 2:	1.99
Average:	**1.99**
Area (in^2):	3.12
L/D:	2.20

MOISTURE CONTENT

Tare Number:	427
Wt. of Tare & Wet Sample (g):	325.80
Wt. of Tare & Dry Sample (g):	325.36
Weight of Tare (g):	99.27
Weight of Wet Sample (g):	226.53
Sample Volume (cm^3):	223.60
Moisture Content (%):	0.19
Unit Wet Weight (g/cm^3):	2.604
Unit Wet Weight (pcf):	162.5
Unit Dry Weight (g/cm^3):	2.599
Unit Dry Weight (pcf):	162.2

Total Load (lb): 38,250
Uniaxial Compressive Strength (psi): 12,270

Fracture Type: **Shear**

Rate of Loading (lb/sec): 240
Time to Break (min:sec): 2:39.64
Deviation From Straightness[2]: Pass

AXIAL: *Pass* TOP: *Pass* BOTTOM: *Pass*

Physical Description: Gray Rock Core

Notes:
1) Moisture conditions at time of the test are: As received
2) Sample prep conforms to ASTM D4543-08 "best effort" if applicable
3) Deviation from straightness, Procedure A of ASTM D 4543-08
   Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
4) Temperature is laboratory room temperature.
5) D4543 Prep and D7012 Testing Equipment Used:
   R176 Compression Machine,
   R525 Digital Calipers,
   R148 Feeler Gauge, R419 Scale
   R512 Rock Saw
   R148 Straight Edge
   R582 V-Block, R585 Dial Gauge

Tested By: NS *Date:* 8/29/22 *Checked By:* GEM *Date:* 8/30/22

page 1 of 1 DCN: CT45A; Revision No.: 1e3 Revision Date: 4/5/17
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UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C
This method does not report strain rate or deformation

Client: ESP Associates
Client Project: IS14.321
Project No.: R-2022-191-001
Lab ID No.: R-2022-191-001-003

Boring No.: B2-A
Depth (ft): 45.8-46.4
Sample ID: RS-3
Moisture Condition: As received

Specimen Weight (g): 637.30

SPECIMEN LENGTH (in)	
Reading 1:	4.35
Reading 2:	4.35
Reading 3:	4.35
Average:	**4.35**

SPECIMEN DIAMETER (in):	
Reading 1:	1.99
Reading 2:	1.99
Average:	**1.99**
Area (in^2):	3.11
L/D:	2.18

MOISTURE CONTENT

Tare Number:	488
Wt. of Tare & Wet Sample (g):	531.79
Wt. of Tare & Dry Sample (g):	531.38
Weight of Tare (g):	99.12
Weight of Wet Sample (g):	432.67
Sample Volume (cm^3):	221.81
Moisture Content (%):	0.09
Unit Wet Weight (g/cm^3):	2.873
Unit Wet Weight (pcf):	179.3
Unit Dry Weight (g/cm^3):	2.870
Unit Dry Weight (pcf):	179.1

Total Load (lb): 2,310
Uniaxial Compressive Strength (psi): 740

Fracture Type: **Shear**

Rate of Loading (lb/sec): 100
Time to Break (min:sec): 0:23
Deviation From Straightness[2]: Pass

AXIAL: *Pass* TOP: *Pass* BOTTOM: *Pass*

Physical Description: Gray Rock Core

Notes:
1) Moisture conditions at time of the test are: As received
2) Sample prep conforms to ASTM D4543-08 "best effort" if applicable
3) Deviation from straightness, Procedure A of ASTM D 4543-08
   Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
4) Temperature is laboratory room temperature.
5) D4543 Prep and D7012 Testing Equipment Used:
   R176 Compression Machine,
   R525 Digital Calipers,
   R148 Feeler Gauge, R419 Scale
   R512 Rock Saw
   R148 Straight Edge
   R582 V-Block, R585 Dial Gauge

Tested By: NS *Date:* 8/29/22 *Checked By:* GEM *Date:* 8/30/22

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UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C
This method does not report strain rate or deformation

Client: ESP Associates
Client Project: IS14.321
Project No.: R-2022-191-001
Lab ID No.: R-2022-191-001-004

Boring No.: B2-B
Depth (ft): 32.2-32.8
Sample ID: RS-4
Moisture Condition: As received

Specimen Weight (g): 580.85

SPECIMEN LENGTH (in)	
Reading 1:	4.40
Reading 2:	4.40
Reading 3:	4.40
Average:	**4.40**

SPECIMEN DIAMETER (in):	
Reading 1:	1.99
Reading 2:	1.99
Average:	**1.99**
Area (in^2):	3.11
L/D:	2.21

MOISTURE CONTENT

Tare Number:	475
Wt. of Tare & Wet Sample (g):	328.09
Wt. of Tare & Dry Sample (g):	324.16
Weight of Tare (g):	98.30
Weight of Wet Sample (g):	229.79
Sample Volume (cm^3):	224.43
Moisture Content (%):	1.74
Unit Wet Weight (g/cm^3):	2.588
Unit Wet Weight (pcf):	161.5
Unit Dry Weight (g/cm^3):	2.544
Unit Dry Weight (pcf):	158.7

Total Load (lb): 6,630
Uniaxial Compressive Strength (psi): 2,130

Fracture Type: **Shear**

Rate of Loading (lb/sec): 80
Time to Break (min:sec): 1:23.20
Deviation From Straightness[2]: Pass

AXIAL: *Pass* TOP: *Pass* BOTTOM: *Pass*

Physical Description: Gray Rock Core

Notes:
1) Moisture conditions at time of the test are: As received
2) Sample prep conforms to ASTM D4543-08 "best effort" if applicable
3) Deviation from straightness, Procedure A of ASTM D 4543-08
   Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
4) Temperature is laboratory room temperature.
5) D4543 Prep and D7012 Testing Equipment Used:
   R176 Compression Machine,
   R525 Digital Calipers,
   R148 Feeler Gauge, R419 Scale
   R512 Rock Saw
   R148 Straight Edge
   R582 V-Block, R585 Dial Gauge

Tested By: NS *Date:* 8/29/22 *Checked By:* GEM *Date:* 8/31/22

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SITE PHOTOGRAPHS

Bridge No.160001 on US 158 over Country Line Creek

View Along Bridge 0001 Looking Upstation

View Looking Upstream from Bridge 0001

View of Along Bridge 0001 Looking Downstation

View Looking Downstream from Bridge 0001