STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HB–0057	1	16

PROJECT: HB–0057 REFERENCE:

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CALDWELL*

SITE DESCRIPTION *REPLACEMENT OF BRIDGE 130185 ON SR 1356 (OLD JOHNS RIVER ROAD) OVER JOHNS RIVER*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-15	BORE LOGS, CORE LOGS, CORE PHOTOS
16	SITE PHOTO

PERSONNEL

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INVESTIGATED BY *GFT INC.*

DRAWN BY *B. WORLEY, PG*

CHECKED BY *B. HARLACHER, EIT*

SUBMITTED BY *B. WORLEY, PG*

DATE *MAY, 2026*

CAUTION NOTICE

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NORTH CAROLINA LICENSED SEAL 1926 GEOLOGIST BRADLEY D. WORLEY

Bradley D. Worley 5/7/2026

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
HB–0057	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

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	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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
- [X] CME-750X
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 6" 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
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

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: *See Note

ELEVATION: FEET

NOTES:

Stations/Offsets, Northings/Eastings, and Elevations for boring collars provided by GFT, Inc. Roadway/Survey (Raleigh, NC) using GPS coordinates gathered in the field.

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
HB–0057	2B

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 (PAGE 1 OF 2)

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

SURFACE CONDITIONS

VERY GOOD Very rough, fresh unweathered surfaces

GOOD Rough, slightly weathered, iron stained surfaces

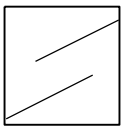
FAIR Smooth, moderately weathered and altered surfaces

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

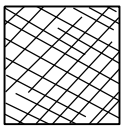
VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

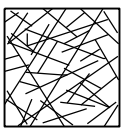
DECREASING INTERLOCKING OF ROCK PIECES ⇩



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



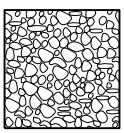
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



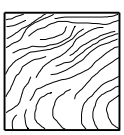
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets



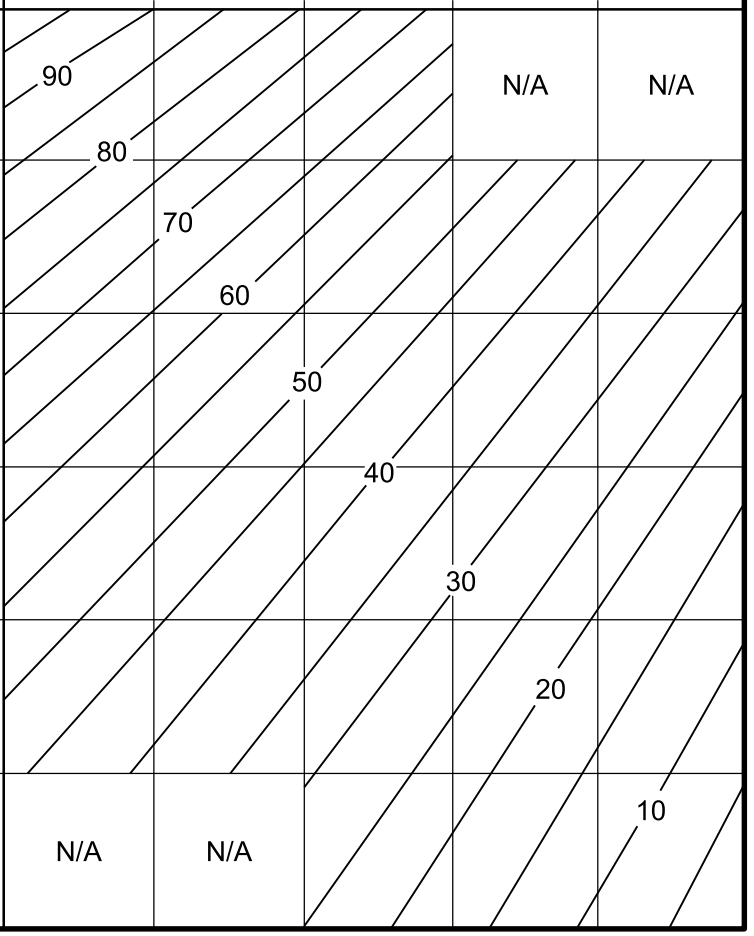
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity



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



PROJECT REFERENCE NO.	SHEET NO.
HB–0057	2C

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 (PAGE 2 OF 2)

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

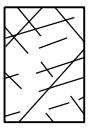
GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

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

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



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.*



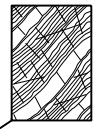
B. *Sandstone with thin interlayers of siltstone*



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.**



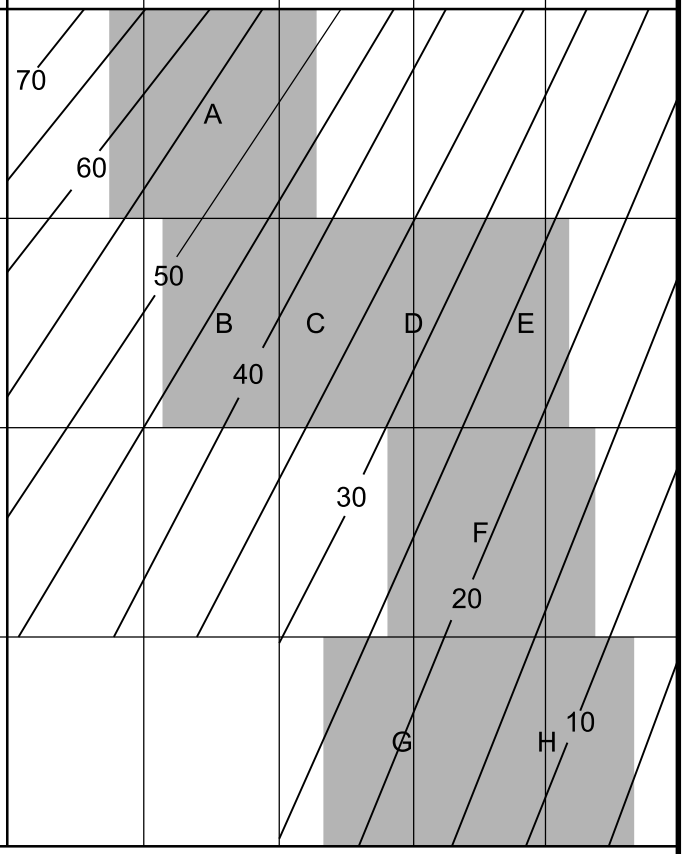
F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*



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

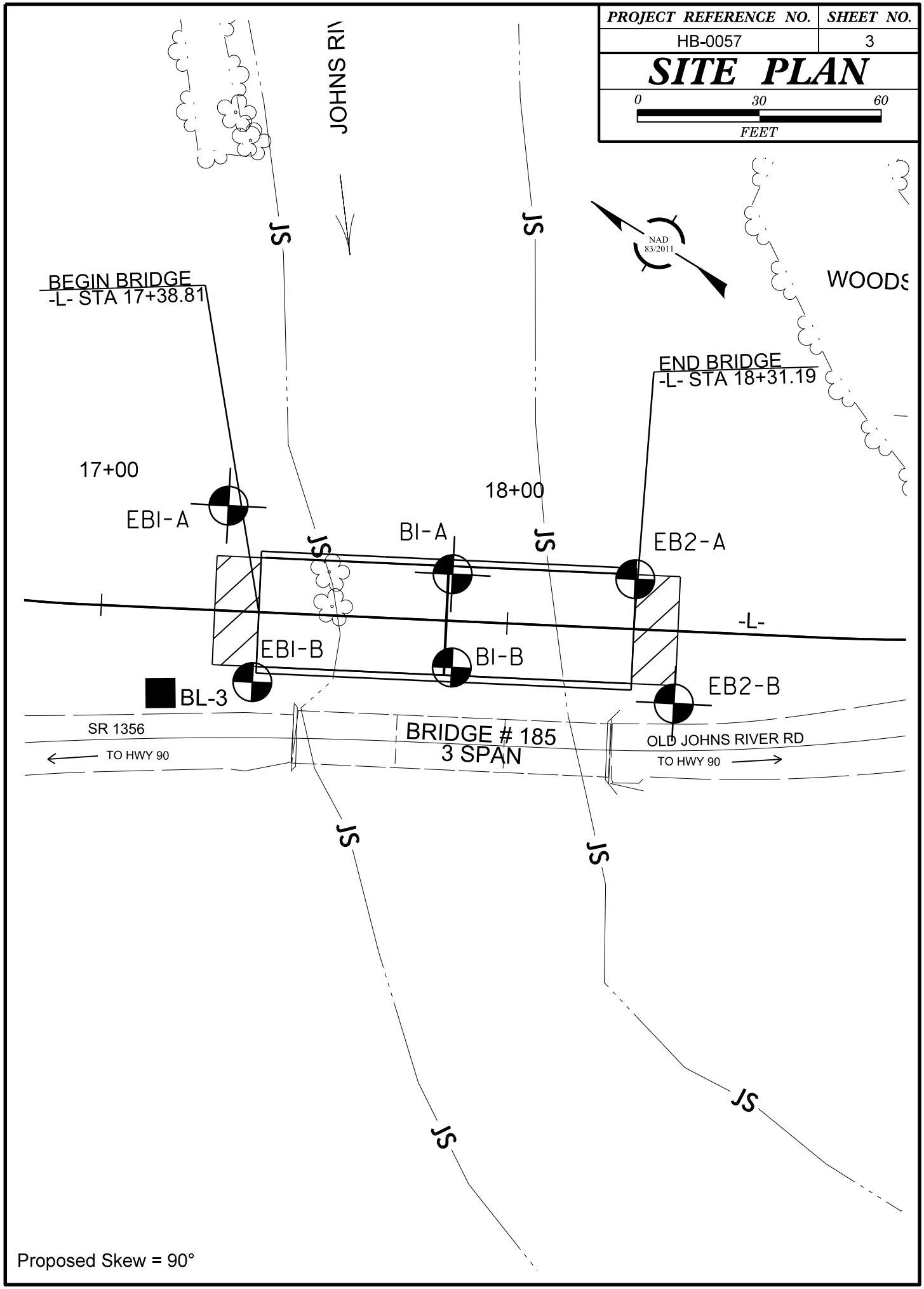


H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***



Means deformation after tectonic disturbance

DATE: 8-19-16


PROJECT REFERENCE NO.
HB-0057
SHEET NO.
3
SITE PLAN
0
30
60
FEET
JOHNS RIV
JS
NAD
83/2011
WOODS
BEGIN BRIDGE
-L- STA 17+38.81
END BRIDGE
-L- STA 18+31.19
17+00
18+00
EBI-A
BI-A
EB2-A
-L-
EBI-B
BI-B
EB2-B
BL-3
SR 1356
TO HWY 90
BRIDGE # 185
3 SPAN
OLD JOHNS RIVER RD
TO HWY 90
Proposed Skew = 90°

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 17+29	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.1
COLLAR ELEV. 1,117.0 ft	**TOTAL DEPTH** 25.3 ft	**NORTHING** 810,773	**EASTING** 1,199,417	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/02/26	**COMP. DATE** 04/02/26	**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)
1120										
	1,117.0	0.0	WOH	1	2	3		M		1,117.0 GROUND SURFACE 0.0
1115										**ALLUVIAL** Brown, v. loose to loose, Silty f. SAND (A-2-4) w/ trace rootlets and trace gravel-sized rock fragments
	1,113.5	3.5	3	3	3	6		M		
1110										1,109.0 8.0
	1,108.5	8.5	7	24	69	93		W		1,107.5 9.5 **RESIDUAL** Brown and white, med. to v. dense, saprolitic, Silty f. to cse. SAND (A-2-4) w/ little gravel and trace mica
1105										**WEATHERED ROCK** (Blowing Rock Gneiss)
	1,103.5	13.5	100/0.3			100/0.3				
	1,101.7	15.3	60/0.0			60/0.0				1,101.7 15.3 **CRYSTALLINE ROCK** (Blowing Rock Gneiss)
1100										REC = 83% RQD = 67% GSI = 65-95
1095										1,091.7 25.3 Boring Terminated with Standard Penetration Test Refusal at Elevation 1,091.7 ft on CR (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 17+29	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.1
COLLAR ELEV. 1,117.0 ft	**TOTAL DEPTH** 25.3 ft	**NORTHING** 810,773	**EASTING** 1,199,417	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/02/26	**COMP. DATE** 04/02/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ3	**TOTAL RUN** 10.0 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
1101.7											Begin Coring @ 15.3 ft
1100	1,101.7	15.3	5.0	*N=60/0.0* 0:42/1.0 1:06/1.0 1:12/1.0 0:58/1.0 1:32/1.0	(3.9) 78%	(2.3) 46%		(8.3) 83%	(6.7) 67%		1,101.7 **CRYSTALLINE ROCK** 15.3 Brown to gray, mod. severely to v. slightly weathered, mod. hard to hard, v. close to close-fractured, biotite gneiss (Blowing Rock Gneiss) GSI = 65-95
	1,096.7	20.3									
1095			5.0	0:58/1.0 1:06/1.0 1:12/1.0 1:11/1.0 1:26/1.0	(4.4) 88%	(4.4) 88%					
	1,091.7	25.3									1,091.7 25.3 Boring Terminated with Standard Penetration Test Refusal at Elevation 1,091.7 ft on CR (Blowing Rock Gneiss)

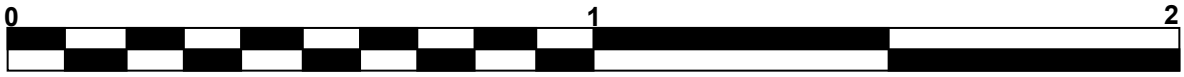
NCDOT CORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

CORE PHOTOGRAPHS

EB1-A

BOX 1: 15.3' to 25.3'





GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 17+38	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,116.0 ft	**TOTAL DEPTH** 14.7 ft	**NORTHING** 810,750	**EASTING** 1,199,393	**24 HR.** 6.8
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/02/26	**COMP. DATE** 04/02/26	**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)
1120										
	1,116.0	0.0								1,116.0 GROUND SURFACE 0.0
1115			1	2	2	4		M		**ALLUVIAL** Brown, loose, Silty f. to cse. SAND (A-2-4) w/ trace rootlets
	1,112.5	3.5	3	9	13	22		M		1,113.0 3.0 **RESIDUAL** *Gravel in drive shoe, very little recovery: interpreted as Silty SAND (A-2)
1110										
	1,107.5	8.5	90	10/0.1		100/0.6				1,107.5 8.5 **WEATHERED ROCK** (Blowing Rock Gneiss)
1105										
	1,102.5	13.5								
	1,101.3	14.7	100/0.3 60/0.0			100/0.3 60/0.0				1,101.3 14.7 **CRYSTALLINE ROCK** (Blowing Rock Gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,101.3 ft on CR (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 17+86	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,109.0 ft	**TOTAL DEPTH** 35.8 ft	**NORTHING** 810,722	**EASTING** 1,199,442	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/14/26	**COMP. DATE** 04/14/26	**SURFACE WATER DEPTH** 0.2ft

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)
1110										
	1,109.0	0.0	7	9	12	21		Sat.		1,109.0 GROUND SURFACE 0.0 **ALLUVIAL** Brown, med. v. dense, f. to cse. SAND (A-1-b) w/ high amounts of gravel-sized rock fragments and trace to "pocket" of mica *alluvial cobbles and boulders encountered below 1st drive)
1105	1,104.3	4.7	13	27	29	56		Sat.		
1100	1,099.3	9.7								1,098.8 10.2
	1,098.3	10.7	24 60/0.1	76/0.2		100/0.7 60/0.1				1,098.3 10.7 **WEATHERED ROCK** (Blowing Rock Gneiss) 1,098.2 10.8 **CRYSTALLINE ROCK** (Blowing Rock Gneiss) (Blowing Rock Gneiss) REC = 91% RQD = 50% GSI = 55-75
1095										
1090										
1085										
1080										
1075										1,073.2 35.8 Boring Terminated at Elevation 1,073.2 ft in CR (Blowing Rock Gneiss)

GEOTECHNICAL BORING REPORT
CORE LOG

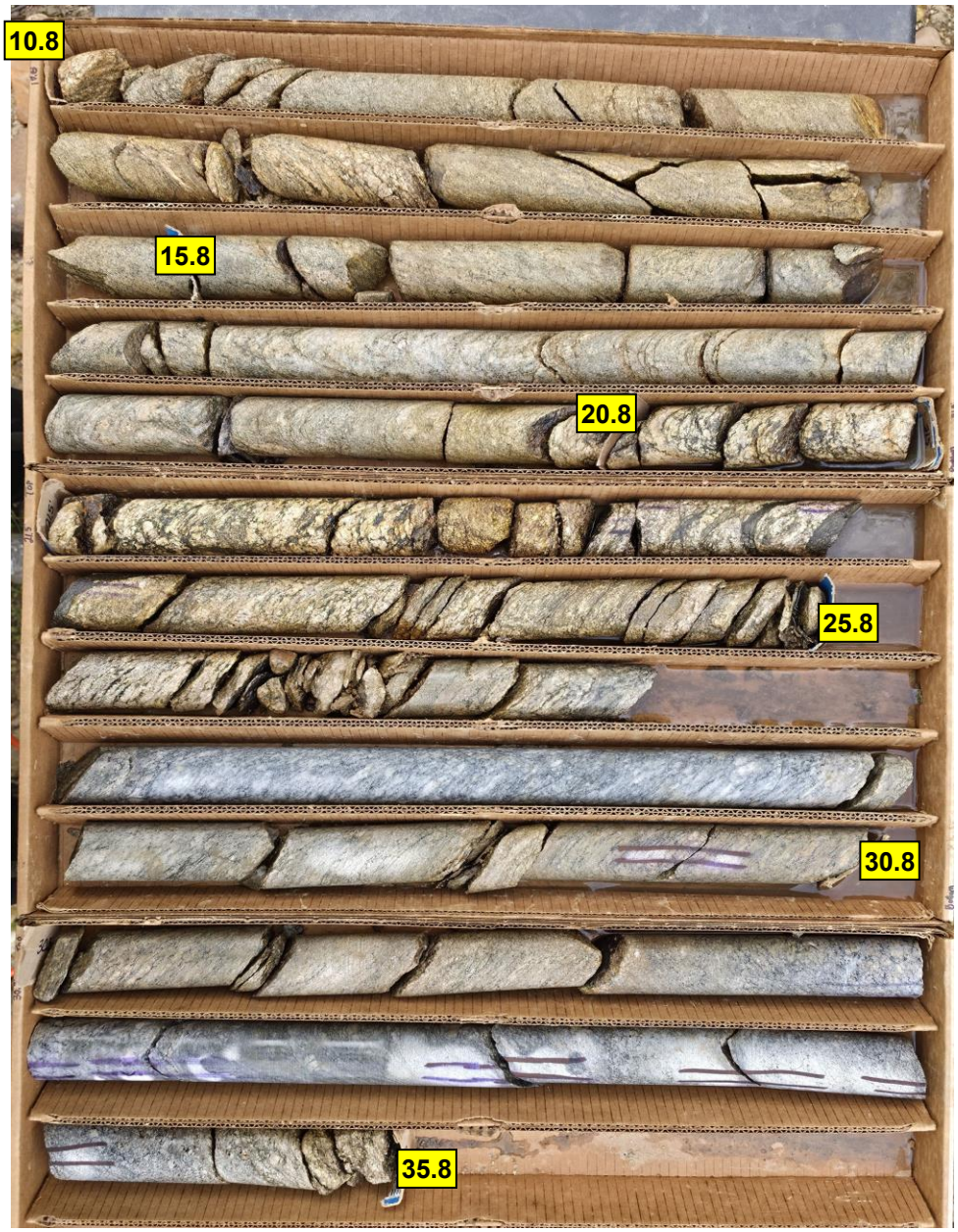
WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 17+86	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,109.0 ft	**TOTAL DEPTH** 35.8 ft	**NORTHING** 810,722	**EASTING** 1,199,442	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/14/26	**COMP. DATE** 04/14/26	**SURFACE WATER DEPTH** 0.2ft
CORE SIZE NQ3	**TOTAL RUN** 25.0 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
1098.2											Begin Coring @ 10.8 ft
	1,098.2	10.8	5.0	1:16/1.0 1:21/1.0 1:47/1.0 1:22/1.0 1:22/1.0	(4.0) 80%	(1.6) 32%		(22.7) 91%	(12.6) 50%		1,098.2 Gray and brown, moderately severe to very slightly weathered, moderately hard to hard, v. close to close fractured, biotite gneiss (Blowing Rock Gneiss) 10.8 GSI = 55-75
1095	1,093.2	15.8	5.0	1:17/1.0 1:26/1.0 1:07/1.0 1:41/1.0 1:32/1.0	(4.8) 96%	(2.1) 42%					
1090	1,088.2	20.8	5.0	1:13/1.0 1:08/1.0 1:15/1.0 1:36/1.0 1:20/1.0	(4.2) 84%	(1.8) 36%					
1085	1,083.2	25.8	5.0	1:46/1.0 1:47/1.0 2:21/1.0 2:46/1.0 2:13/1.0	(5.0) 100%	(3.3) 66%					
1080	1,078.2	30.8	5.0	2:01/1.0 2:18/1.0 2:00/1.0 2:36/1.0 2:17/1.0	(4.7) 94%	(3.8) 76%					
1075	1,073.2	35.8									1,073.2 35.8 Boring Terminated at Elevation 1,073.2 ft in CR (Blowing Rock Gneiss)

CORE PHOTOGRAPHS

B1-A

BOXES 1, 2, and 3: 10.8' to 35.8'



GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 17+87	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,108.0 ft	**TOTAL DEPTH** 9.8 ft	**NORTHING** 810,710	**EASTING** 1,199,421	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/15/26	**COMP. DATE** 04/15/26	**SURFACE WATER DEPTH** 0.8ft

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
1110										ELEV. (ft) / DEPTH (ft)
	1,108.0	0.0								1,108.0 GROUND SURFACE 0.0
			1	1	3	4		Sat.		**ALLUVIAL** Brown, loose, f. to cse. SAND (A-1-b) w/ high amount of gravel
1105										1,105.0 3.0
	1,103.5	4.5								**RESIDUAL** Orange-brown and white, med. dense, saprolitic, Silty f. to cse. SAND (A-2-4) w/ trace gravel
			9	13	17	30		Sat.		
1100										1,100.0 8.0
	1,098.5	9.5								
	1,098.2	9.8	100/0.3			100/0.3				1,098.2 9.8 **WEATHERED ROCK** (Blowing Rock Gneiss)
			60/0.0			60/0.0				**CRYSTALLINE ROCK** (Blowing Rock Gneiss)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 1,098.2 ft on CR (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 18+31	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,116.0 ft	**TOTAL DEPTH** 14.0 ft	**NORTHING** 810,682	**EASTING** 1,199,464	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/13/26	**COMP. DATE** 04/13/26	**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)
1120										
	1,116.0	0.0								1,116.0 GROUND SURFACE 0.0
1115			1	1	4	5		M		**ALLUVIAL** Brown, loose to med. dense, Silty cse. SAND (A-2-4) w/ little to some gravel-size rock fragments and trace rootlets
	1,112.5	3.5	7	8	6	14		M		
1110										
	1,107.5	8.5	14	6	7	13		M		1,108.0 8.0 **RESIDUAL** Dark brown to light brown, med. dense, saprolitic, Silty f. SAND (A-2-4) w/ trace gravel and trace mica
1105										1,105.0 11.0
	1,102.5	13.5								**WEATHERED ROCK** (Blowing Rock Gneiss)
	1,102.0	14.0	100/0.2			100/0.2				1,102.0 14.0
			60/0.0			60/0.0				**CRYSTALLINE ROCK** (Blowing Rock Gneiss)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 1,102.0 ft on CR (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 18+42	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,116.0 ft	**TOTAL DEPTH** 20.3 ft	**NORTHING** 810,659	**EASTING** 1,199,443	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/13/26	**COMP. DATE** 04/14/26	**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)
1120										
	1,116.0	0.0								1,116.0 GROUND SURFACE 0.0
1115			1	1	4	5		M		**ARTIFICIAL FILL** Brown, loose to med. dense, Silty f. to cse. SAND (A-2-4) w/ little to high gravel-sized rock fragments, trace rootlets, and trace mica
	1,112.5	3.5	7	4	7	11		M		
1110										1,109.5 6.5
	1,107.5	8.5	100/0.5			100/0.5				**WEATHERED ROCK** (Blowing Rock Gneiss)
1105	1,104.7	11.3	60/0.0			60/0.0				1,104.7 11.3
										CRYSTALLINE ROCK (Blowing Rock Gneiss)
1100										REC = 92% RQD = 57% GSI = 60-80
										1,095.7 20.3
										Boring Terminated at Elevation 1,095.7 ft in CR (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0057	**TIP** HB-0057	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman, PE
SITE DESCRIPTION Bridge No, 130185 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 18+42	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,116.0 ft	**TOTAL DEPTH** 20.3 ft	**NORTHING** 810,659	**EASTING** 1,199,443	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/13/26	**COMP. DATE** 04/14/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ3	**TOTAL RUN** 9.0 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
1104.7											Begin Coring @ 11.3 ft
	1,104.7	11.3	4.0	*N=60/0.0* 1:31/1.0 1:46/1.0 1:29/1.0 1:36/1.0	(3.5) 88%	(2.5) 63%		(8.3) 92%	(5.1) 57%		1,104.7 **CRYSTALLINE ROCK** 11.3 Light brown to brown and white, mod. severe to slightly weathered, mod. hard to hard, v. close to close fractured, biotite gneiss (Blowing Rock Gneiss) GSI = 60-80
	1,100.7	15.3									
1100			5.0	2:11/1.0 3:06/1.0 2:06/1.0 1:47/1.0 2:13/1.0	(4.8) 96%	(2.6) 52%					
	1,095.7	20.3									1,095.7 20.3 Boring Terminated at Elevation 1,095.7 ft in CR (Blowing Rock Gneiss)

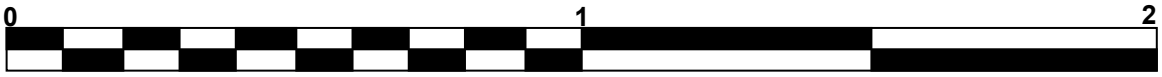
NCDOT CORE SINGLE HB-0057_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/6/26

CORE PHOTOGRAPHS

EB2-B

BOX 1: 11.3' to 20.3'





SITE PHOTO – HB-0057 – Bridge 130185 on SR 1356 over Johns River



Existing Bridge 185 (View Facing South)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HB–0058	1	18

PROJECT: HB–0058 REFERENCE:

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CALDWELL*

SITE DESCRIPTION *REPLACEMENT OF BRIDGE 130186 ON SR 1356 (OLD JOHNS RIVER ROAD) OVER JOHNS RIVER*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-17	BORE LOGS, CORE LOGS, CORE PHOTOS
18	SITE PHOTO

PERSONNEL

B. WORLEY, PG

M. SHIPMAN, PE

S. DAVIS (F&R)

J. MARTINEZ (F&R)

INVESTIGATED BY *GFT INC.*

DRAWN BY *B. WORLEY, PG*

CHECKED BY *B. HARLACHER, EIT*

SUBMITTED BY *B. WORLEY, PG*

DATE *MAY, 2026*

GFT

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919-420-7660
NC Lic. No. F-0270

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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.

NORTH CAROLINA LICENSED SEAL 1926 GEOLOGIST BRADLEY D. WORLEY

SIGNATURE 5/12/2026 DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
HB–0058	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

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		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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
- [X] CME-750X
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 6" 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
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
HB–0058	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

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: *See Note

ELEVATION: FEET

NOTES:

Stations/Offsets, Northings/Eastings, and Elevations for boring collars provided by GFT, Inc. Roadway/Survey (Raleigh, NC) using GPS coordinates gathered in the field.

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
HB–0058	2B

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 (PAGE 1 OF 2)

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

SURFACE CONDITIONS

VERY GOOD Very rough, fresh unweathered surfaces

GOOD Rough, slightly weathered, iron stained surfaces

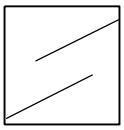
FAIR Smooth, moderately weathered and altered surfaces

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

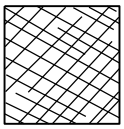
VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

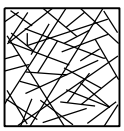
DECREASING INTERLOCKING OF ROCK PIECES ⇩



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



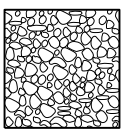
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



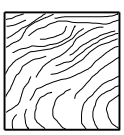
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets



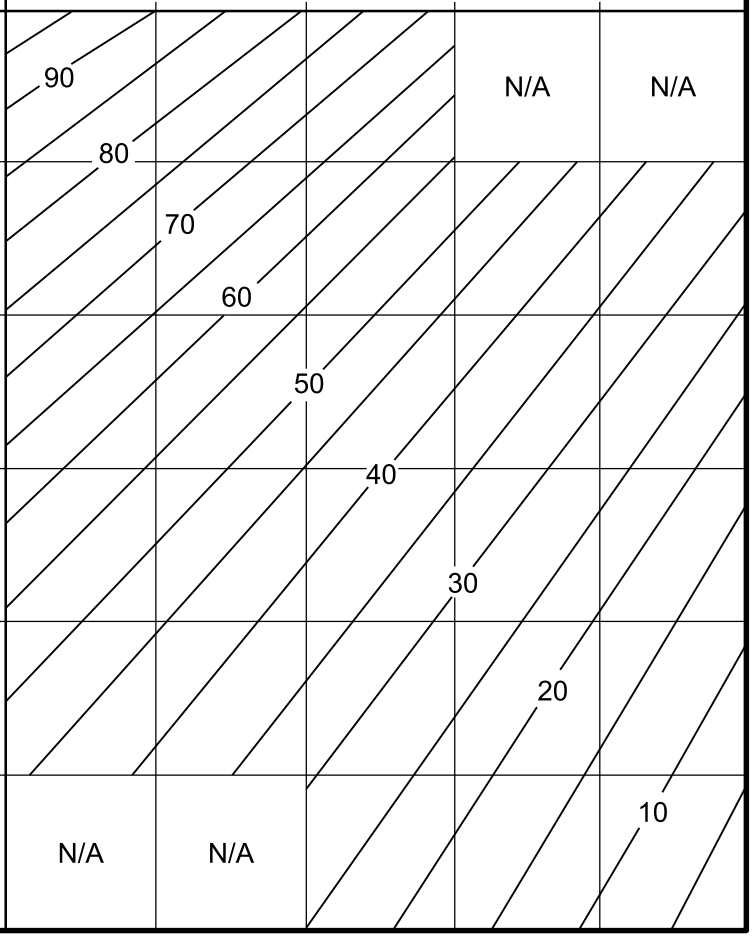
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity



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



PROJECT REFERENCE NO.	SHEET NO.
HB–0058	2C

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 (PAGE 2 OF 2)

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

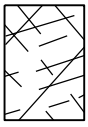
GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

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

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



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.*



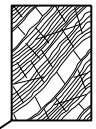
B. *Sandstone with thin interlayers of siltstone*



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.**



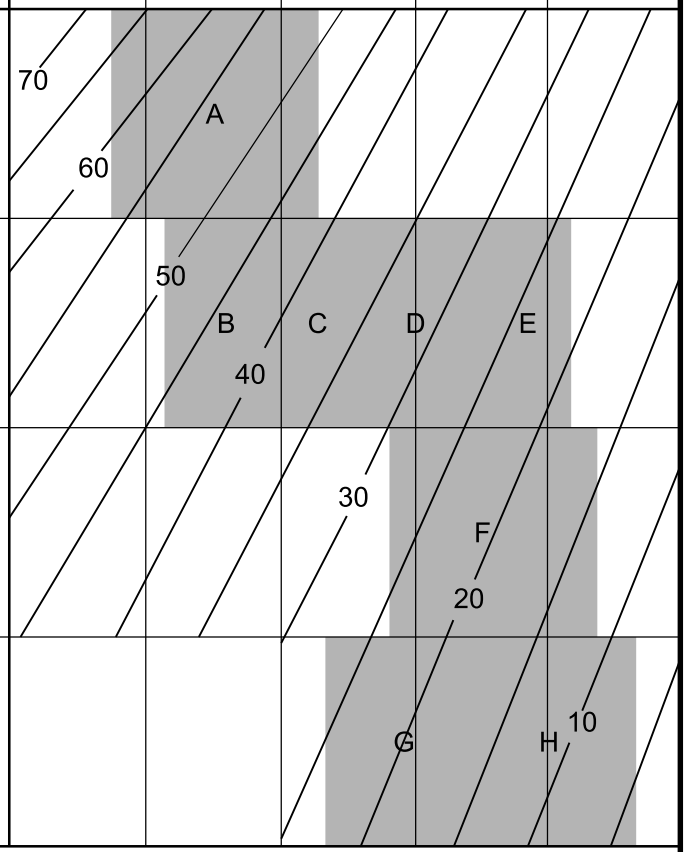
F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*



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

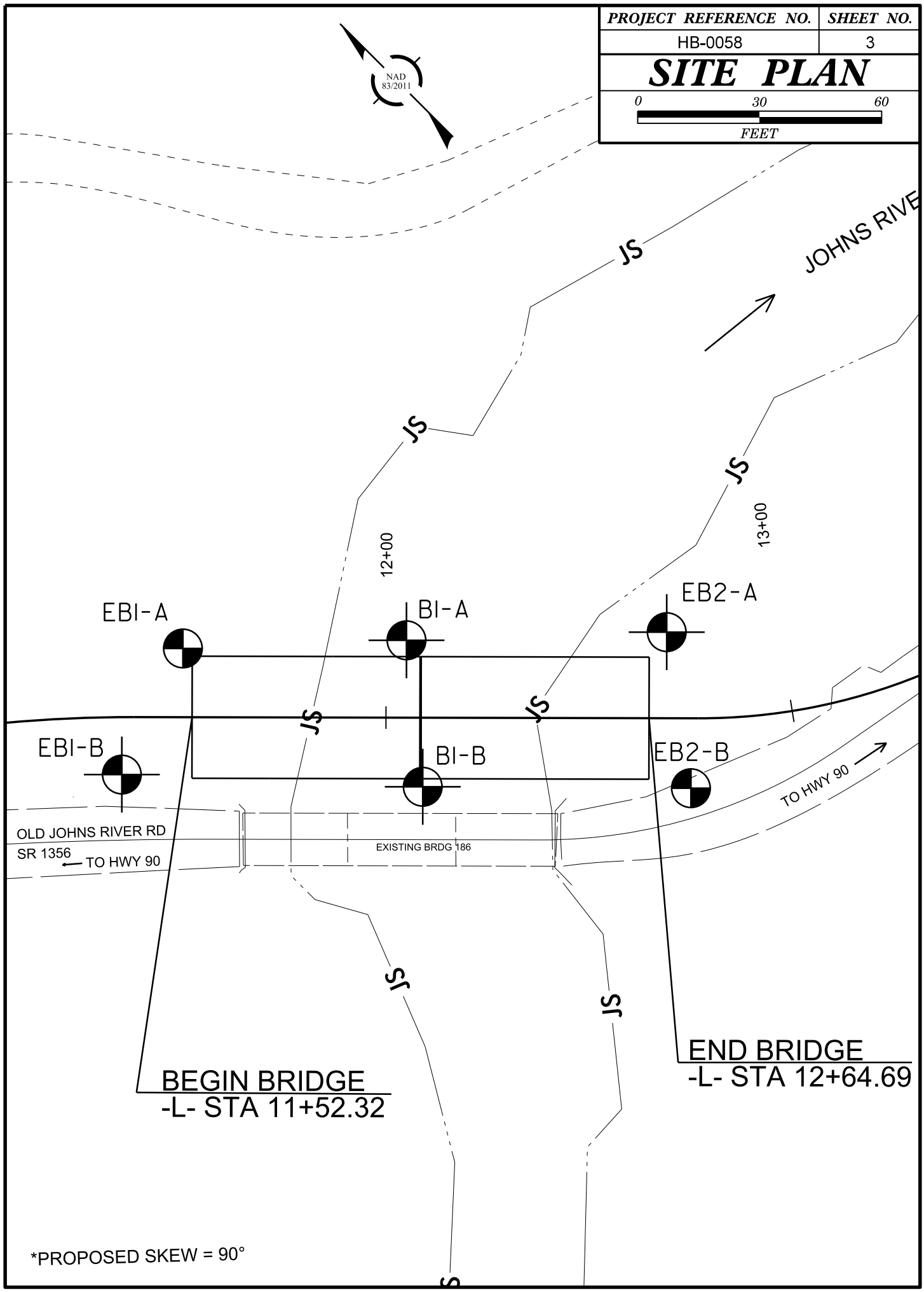


H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***



Means deformation after tectonic disturbance

DATE: 8-19-16


PROJECT REFERENCE NO.
HB-0058
SHEET NO.
3
SITE PLAN
0
30
60
FEET
NAD 83/2011
JOHNS RIVE
JS
12+00
13+00
EBI-A
BI-A
EB2-A
EBI-B
BI-B
EB2-B
OLD JOHNS RIVER RD
SR 1356
TO HWY 90
EXISTING BRDG 186
TO HWY 90
BEGIN BRIDGE
-L- STA 11+52.32
END BRIDGE
-L- STA 12+64.69
*PROPOSED SKEW = 90°

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 11+50	**OFFSET** 17 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,121.6 ft	**TOTAL DEPTH** 15.2 ft	**NORTHING** 811,862	**EASTING** 1,199,463	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/30/26	**COMP. DATE** 03/30/26	**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
1125										ELEV. (ft) / DEPTH (ft)
	1,121.6	0.0								1,121.6 GROUND SURFACE 0.0
1120			1	1	1	2		M		**ALLUVIAL** Brown and red, very loose to loose, Silty fine to coarse SAND (A-2-4), trace rootlets, trace gravel-sized rock fragments
	1,118.1	3.5	2	2	3	5		W		
1115										
	1,113.1	8.5	13	20	19	39		Sat.		1,113.6 8.0
1110										**RESIDUAL** Brown, orange-brown and white, dense, Silty fine to coarse SAND (A-2-4), saprolitic, trace gravel, trace mica
	1,109.6	12.0								**WEATHERED ROCK** (Blowing Rock Gneiss)
	1,108.1	13.5	100/0.2			100/0.2				
	1,106.4	15.2	60/0.0			60/0.0				1,106.4 15.2 **CRYSTALLINE ROCK** (Blowing Rock Gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,106.4 ft on Crystalline Rock (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 11+35	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,121.2 ft	**TOTAL DEPTH** 20.8 ft	**NORTHING** 811,852	**EASTING** 1,199,430	**24 HR.** 6.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/31/26	**COMP. DATE** 03/31/26	**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
1125										ELEV. (ft) DEPTH (ft)
	1,121.2	0.0								1,121.2 GROUND SURFACE 0.0
1120			3	2	1	3		M		1,120.2 **ARTIFICIAL FILL** 1.0 Brown, very loose, Silty fine to coarse SAND (A-2-4), some gravel-sized rock fragments, trace rootlets
	1,117.7	3.5	5	7	9	16		M		**ALLUVIAL** Dark brown to orange-brown, medium dense, Silty fine to coarse SAND (A-2-4), high amounts of gravel-sized quartz fragments 1,113.2 8.0
1115										
	1,112.7	8.5	5	27	40	67		Sat.		**RESIDUAL** Light brown and white, very dense, Silty coarse SAND (A-2-4), saprolitic 1,109.5 11.7
1110	1,109.5	11.7	60/0.0			60/0.0				**CRYSTALLINE ROCK** (Blowing Rock Gneiss) REC = 93% RQD = 92% GSI = 95-100
1105										1,100.4 20.8 Boring Terminated at Elevation 1,100.4 ft in Crystalline Rock (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 11+35	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,121.2 ft	**TOTAL DEPTH** 20.8 ft	**NORTHING** 811,852	**EASTING** 1,199,430	**24 HR.** 6.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/31/26	**COMP. DATE** 03/31/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ3	**TOTAL RUN** 9.1 ft		

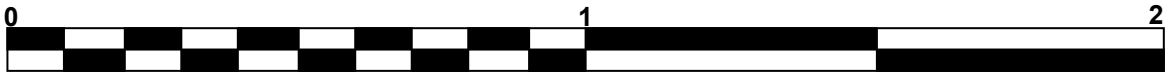
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1109.5											Begin Coring @ 11.7 ft
	1,109.5	11.7	4.1	*N=60/0.0* 1:16/1.0 1:22/1.0 3:58/1.0 5:02/1.0	(3.7) 90%	(3.6) 88%		(8.5) 93%	(8.4) 92%		1,109.5 **CRYSTALLINE ROCK** 11.7 Gray and white, slight to fresh weathering, hard to v. hard, c. close to wide fractured, Blowing Rock Gneiss GSI = 95-100
1105	1,105.4	15.8	5.0	0:51/0.1 4:31/1.0 5:11/1.0 5:18/1.0 6:01/1.0 6:59/1.0	(4.8) 96%	(4.8) 96%					
	1,100.4	20.8									1,100.4 20.8 Boring Terminated at Elevation 1,100.4 ft in Crystalline Rock (Blowing Rock Gneiss)

CORE PHOTOGRAPH

EB1-B

BOX1: 11.7' to 20.8'





FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 12+05	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,113.6 ft	**TOTAL DEPTH** 10.3 ft	**NORTHING** 811,825	**EASTING** 1,199,502	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/01/26	**COMP. DATE** 04/01/26	**SURFACE WATER DEPTH** 1.0

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)
1115										
	1,113.6	0.0								1,113.6 GROUND SURFACE 0.0
	1,113.3	0.3	100/0.3			100/0.3				1,113.3 0.3 **ALLUVIAL**
			60/0.0			60/0.0				Brown and gray, loose, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized rock fragments
1110										**CRYSTALLINE ROCK** (Blowing Rock Gneiss)
1105										REC = 96% RQD = 87% GSI = 85-95
										1,103.3 10.3 Boring Terminated at Elevation 1,103.3 ft in Crystalline Rock (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 12+05	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,113.6 ft	**TOTAL DEPTH** 10.3 ft	**NORTHING** 811,825	**EASTING** 1,199,502	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/01/26	**COMP. DATE** 04/01/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ3	**TOTAL RUN** 10.0 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
1113.3											Begin Coring @ 0.3 ft
	1,113.3	0.3	5.0	*N=60/0.0* 1:41/1.0 1:36/1.0 1:32/1.0 1:40/1.0 1:40/1.0	(4.8) 96%	(4.8) 96%		(9.6) 96%	(8.7) 87%		1,113.3 **CRYSTALLINE ROCK** 0.3 Gray and white, slight to fresh weathered, med. hard to hard, v. close to close-fractured, Blowing Rock Gneiss GSI = 85-95
1110											
	1,108.3	5.3									
			5.0	2:11/1.0 1:41/1.0 2:00/1.0 1:58/1.0 1:40/1.0	(4.8) 96%	(3.9) 78%					
1105											
	1,103.3	10.3									1,103.3 10.3 Boring Terminated at Elevation 1,103.3 ft in Crystalline Rock (Blowing Rock Gneiss)

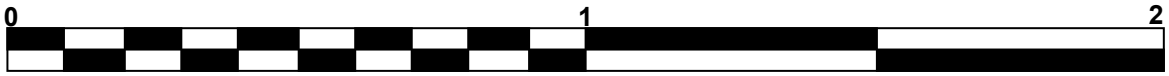
NCDOT CORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

CORE PHOTOGRAPH

B1-A

BOX1: 0.3' to 10.3'





GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 12+08	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,113.1 ft	**TOTAL DEPTH** 10.7 ft	**NORTHING** 811,797	**EASTING** 1,199,479	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/24/26	**COMP. DATE** 04/24/26	**SURFACE WATER DEPTH** 0.8ft

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
1115										ELEV. (ft) DEPTH (ft)
	1,113.1	0.0								1,113.1 GROUND SURFACE 0.0
	1,112.4	0.7	WOH	100/0.2		100/0.2		Sat.		1,112.4 **ALLUVIAL** 0.7
1110			60/0.0			60/0.0				Brown, v. loose, gravel with SAND (A-1-b) *refusal on alluvial gravel
										CRYSTALLINE ROCK (Blowing Rock Gneiss)
1105										REC = 97% RQD = 97% GSI = 90-95
										1,102.4 10.7
										Boring Terminated at Elevation 1,102.4 ft in Crystalline Rock (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

GEOTECHNICAL BORING REPORT
CORE LOG

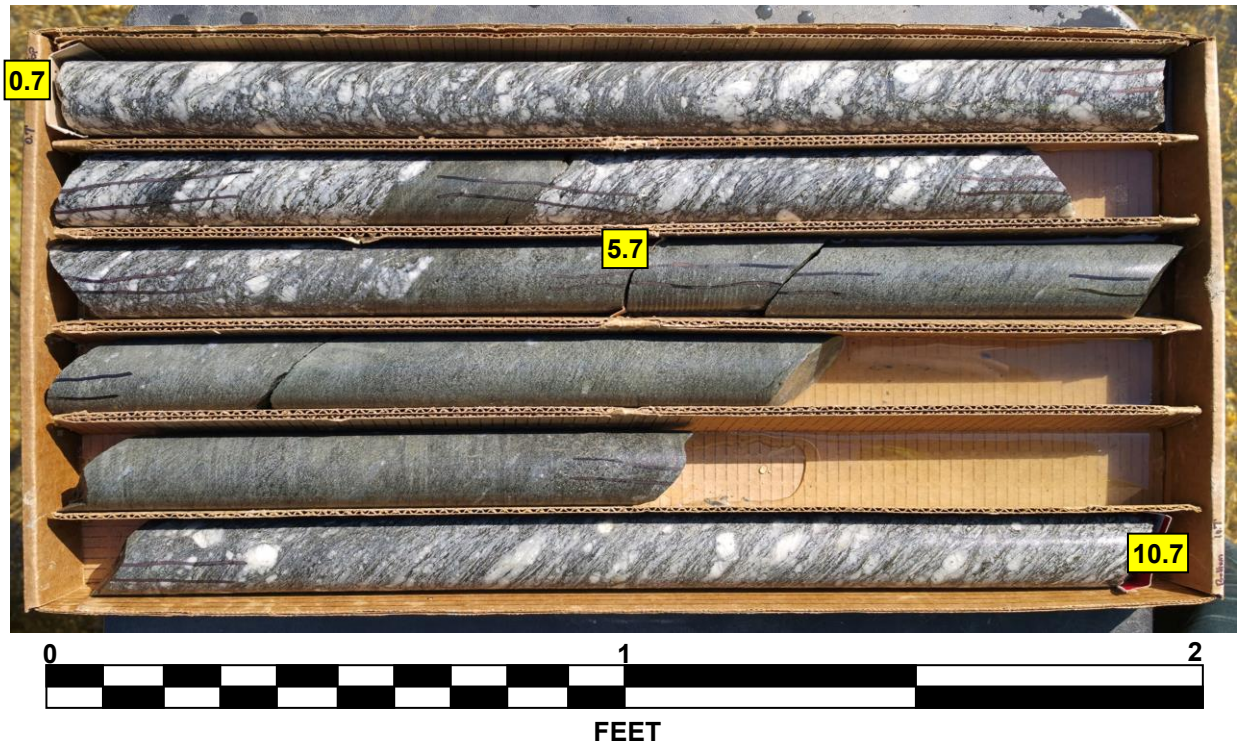
WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 12+08	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,113.1 ft	**TOTAL DEPTH** 10.7 ft	**NORTHING** 811,797	**EASTING** 1,199,479	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/24/26	**COMP. DATE** 04/24/26	**SURFACE WATER DEPTH** 0.8ft
CORE SIZE NQ3	**TOTAL RUN** 10.0 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
1112.4											Begin Coring @ 0.7 ft
1110	1,112.4	0.7	5.0	*N=60/0.0* n/a/1.0 n/a/1.0 n/a/1.0 n/a/1.0 n/a/1.0	(4.7) 94%	(4.7) 94%		(9.7) 97%	(9.7) 97%		1,112.4 **CRYSTALLINE ROCK** 0.7 Gray, fresh, v. hard., mod. close to wide-fractured, Blowing Rock Gneiss GSI = 90-95
1105	1,107.4	5.7	5.0	n/a/1.0 n/a/1.0 n/a/1.0 n/a/1.0 n/a/1.0	(5.0) 100%	(5.0) 100%					
	1,102.4	10.7									1,102.4 10.7 Boring Terminated at Elevation 1,102.4 ft in Crystalline Rock (Blowing Rock Gneiss)

CORE PHOTOGRAPH

B1-B

BOX1: 0.7' to 10.7'



GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 12+69	**OFFSET** 21 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,118.5 ft	**TOTAL DEPTH** 10.3 ft	**NORTHING** 811,781	**EASTING** 1,199,549	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/01/26	**COMP. DATE** 04/02/26	**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
1120										ELEV. (ft) DEPTH (ft)
	1,118.5	0.0								1,118.5 GROUND SURFACE 0.0
			2	3	33	36		M		**ROADWAY EMBANKMENT** Red-brown, medium stiff, Silty CLAY (A-7-5), little gravel-sized rock fragments, trace mica, with cobbles and boulders
1115	1,115.0	3.5								1,115.5 3.0
			10	11	16	27		W		
	1,113.2	5.3	60/0.0			60/0.0				1,113.2 **ROADWAY EMBANKMENT** Brown, med. dense, f. to cse. SAND (A-1-b), with high amount of gravel sized rock fragments and quartz *Interpreted as alluvium used as post-storm fill 5.3
1110										1,108.2 10.3 **CRYSTALLINE ROCK** (Blowing Rock Gneiss) REC = 100% RQD = 100% GSI = 90-95%
										Boring Terminated at Elevation 1,108.2 ft in Crystalline Rock (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 12+69	**OFFSET** 21 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,118.5 ft	**TOTAL DEPTH** 10.3 ft	**NORTHING** 811,781	**EASTING** 1,199,549	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/01/26	**COMP. DATE** 04/02/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ3	**TOTAL RUN** 5.0 ft		

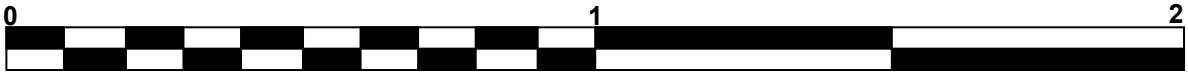
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1113.2											Begin Coring @ 5.3 ft
	1,113.2	5.3	5.0	*N=60/0.0* 2:42/1.0 3:11/1.0 4:43/1.0 4:56/1.0 5:01/1.0	(5.0) 100%	(5.0) 100%		(5.0) 100%	(5.0) 100%		1,113.2 **CRYSTALLINE ROCK** 5.3 Gray and white, slight to fresh weathered, hard to v. hard, v. close to close fractured, Blowing Rock Gneiss
1110											
	1,108.2	10.3									1,108.2 GSI = 90-95 10.3 Boring Terminated at Elevation 1,108.2 ft in Crystalline Rock (Blowing Rock Gneiss)

CORE PHOTOGRAPH

EB2-A

BOX1: 5.3' to 10.3'





GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0058	**TIP** HB-0058	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130186 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 12+75	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,122.8 ft	**TOTAL DEPTH** 10.1 ft	**NORTHING** 811,750	**EASTING** 1,199,526	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/31/26	**COMP. DATE** 03/31/26	**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)
1125										
	1,122.8	0.0								GROUND SURFACE
	1,122.1	0.7	7	7	4	11		M		**ROADWAY EMBANKMENT** Brown, orange-brown and gray, medium dense, Silty fine to coarse SAND (A-2-4), some gravel-sized rock fragments
1120	1,119.8	3.0								
	1,119.3	3.5	8	7	5	12		M		**ROADWAY EMBANKME** Brown to gray, v. soft to stiff, Sandy CLAY (A-6), trace gravel-sized rock fragments, trace rootlets
1115	1,114.3	8.5								
	1,113.0	9.8	3	1	99/0.3	100/0.8				
	1,112.7	10.1	60/0.0			60/0.0				**WEATHERED ROCK** (Blowing Rock Gneiss)
										CRYSTALLINE ROCK (Blowing Rock Gneiss)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 1,112.7 ft on Crystalline Rock (Blowing Rock Gneiss)

NCDOT BORE SINGLE HB-0058_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/12/26

SITE PHOTO – HB-0058 – Bridge 130186 on SR 1356 over Johns River



Existing Bridge 186 (View Facing North)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HB–0059	1	14

PROJECT: HB–0059 REFERENCE:

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CALDWELL*

SITE DESCRIPTION *REPLACEMENT OF BRIDGE 275 ON SR 1356 (OLD ST JOHNS RIVER ROAD) OVER ST JOHNS RIVER*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-13	BORE LOGS, CORE LOGS, CORE PHOTOS
14	SITE PHOTO

PERSONNEL

B. WORLEY, PG

M. SHIPMAN, PE

S. DAVIS (F&R)

J. MARTINEZ (F&R)

INVESTIGATED BY *GFT INC.*

DRAWN BY *B. WORLEY, PG*

CHECKED BY *G. BOLLINGER*

SUBMITTED BY *B. WORLEY, PG*

DATE *APRIL, 2026*

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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.

GFT

GFT Infrastructure, Inc.
One Glenwood Avenue, Suite 900
Raleigh, NC 27603
919-420-7660
NC Lic. No. F-0270

NORTH CAROLINA LICENSED SEAL 1926 GEOLOGIST BRADLEY D. WORLEY

Bradley D. Worley 4/24/2026

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
HB-0059	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
- [X] CME-750
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [ ] 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
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
HB-0059	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

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: *See Note

ELEVATION: FEET

NOTES:

Stations/Offsets, Northings/Eastings, and Elevations for boring collars provided by GFT, Inc. Roadway/Survey (Raleigh, NC) using GPS coordinates gathered in the field.

DATE: 8-15-14

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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 (PAGE 1 OF 2)

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.

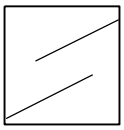
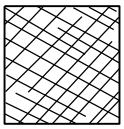
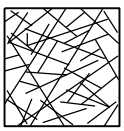
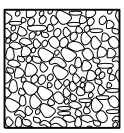
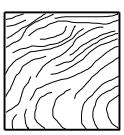
STRUCTURE

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 ⇨

DECREASING INTERLOCKING OF ROCK PIECES ⇩

		VERY GOOD	GOOD	FAIR	POOR	VERY POOR
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90	80	70	N/A	N/A
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70	60	50	40
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	70	60	50	40	30
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	60	50	40	30	20
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces	50	40	30	20	10
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A	30	20	10

PROJECT REFERENCE NO.	SHEET NO.
	2C

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 (PAGE 2 OF 2)

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

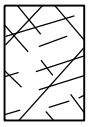
GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

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

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	
		G		H 10



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.*



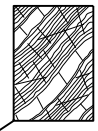
B. *Sandstone with thin interlayers of siltstone*



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

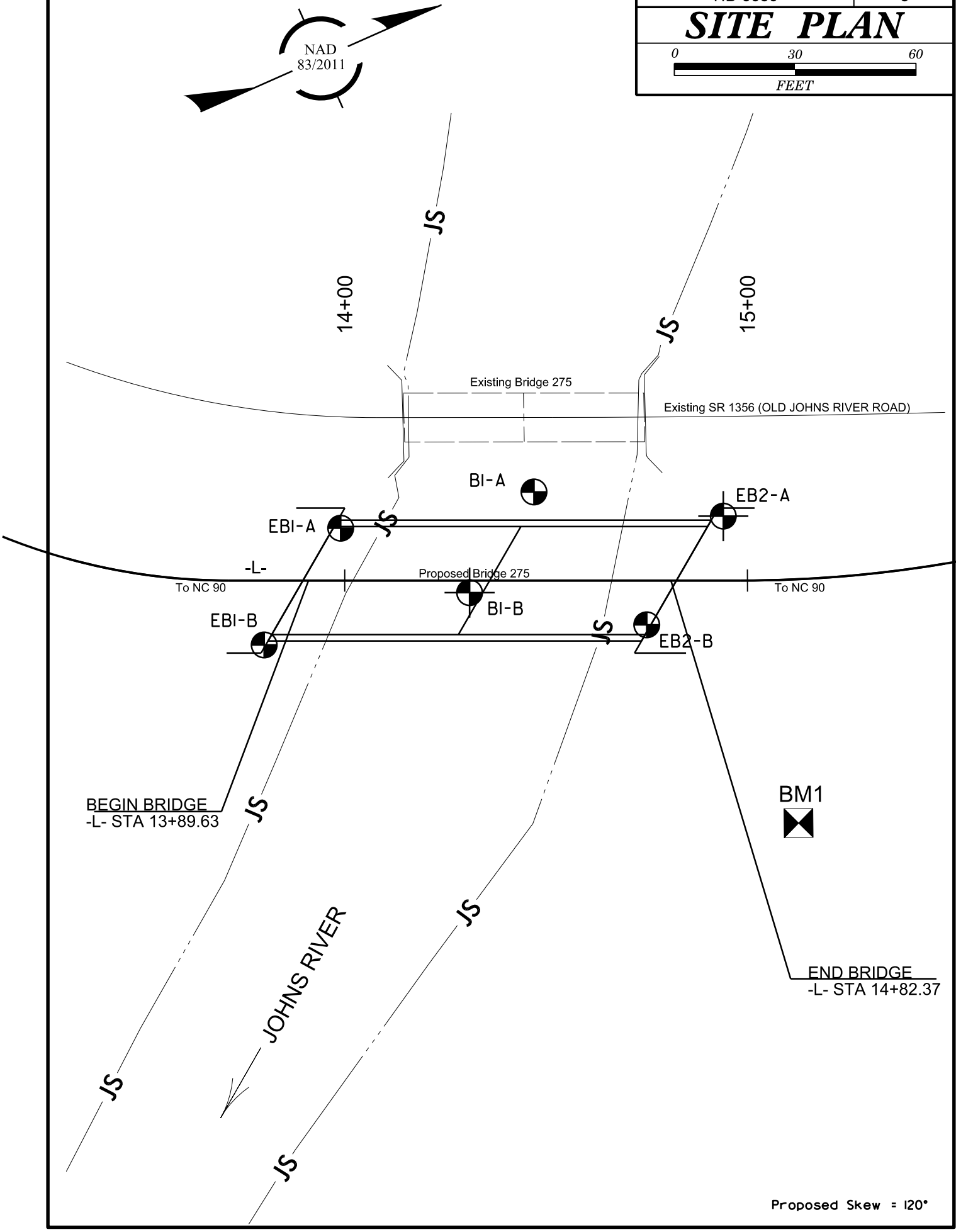
DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
HB-0059	3

SITE PLAN

0 30 60

FEET



GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** B. Worley
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 13+99	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** 1.4
COLLAR ELEV. 1,151.7 ft	**TOTAL DEPTH** 19.5 ft	**NORTHING** 818,144	**EASTING** 1,201,327	**24 HR.** 3.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 03/25/26	**COMP. DATE** 03/25/26	**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)
1155										
										1,151.7 GROUND SURFACE 0.0
1150										**ALLUVIAL** Dark brown to brown, medium dense to dense, Silty coarse SAND (A-2-4), with cobbles and boulders
	1,148.2	3.5	9	6	11	17		M		
1145										
	1,143.2	8.5	17	25	47	72		M		1,142.2 9.5
1140										**RESIDUAL** Tan and gray, dense to very dense, Silty SAND (A-2-4), saprolitic, no to little mica
	1,138.2	13.5	17	21	24	45		M		
1135										
	1,133.2	18.5								1,133.9 17.8
	1,132.2	19.5	100/0.2			100/0.2				1,132.2 **WEATHERED ROCK** (biotite gneiss) 19.5
			60/0.0			60/0.0				**CRYSTALLINE ROCK** (biotite gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,132.2 ft on Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0059_GEO_RDWY_GINT.GPJ NC_DOT.GDT 4/22/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** B. Worley
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 13+80	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,152.1 ft	**TOTAL DEPTH** 33.4 ft	**NORTHING** 818,116	**EASTING** 1,201,326	**24 HR.** 2.2
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/25/26	**COMP. DATE** 03/25/26	**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)
1155										
										1,152.1 GROUND SURFACE 0.0
1150										**ALLUVIAL** Dark brown to tan, loose to dense, Silty coarse SAND (A-2-4), with cobbles
	1,148.6	3.5	12	12	11	23		M		
1145										1,144.6 7.5
	1,143.6	8.5	60	40/0.2		100/0.7				**WEATHERED ROCK** (biotite gneiss)
1140										
	1,138.6	13.5	21	35	65/0.4	100/0.9				
1135										
	1,133.6	18.5	62	38/0.1		100/0.6				
1130										
	1,128.6	23.5	67	33/0.1		100/0.6				
1125										
	1,123.6	28.5	100/0.5			100/0.5				
1120										
	1,118.7	33.4	60/0.0			60/0.0				1,118.7 33.4
										CRYSTALLINE ROCK (biotite gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,118.7 ft on Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0059_GEO_RDWY_GINT.GPJ NC_DOT.GDT 4/22/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 14+47	**OFFSET** 22 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,147.6 ft	**TOTAL DEPTH** 17.6 ft	**NORTHING** 818,192	**EASTING** 1,201,338	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/27/26	**COMP. DATE** 03/27/26	**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)
1150										
	1,147.6	0.0								1,147.6 GROUND SURFACE 0.0
			7	12	15	27		Sat.		**ALLUVIAL** Brown to light brown, medium dense to dense, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized rock and quartz fragments, with cobbles and boulders
1145	1,145.1	2.5								
			5	20	25	45		Sat.		
1140	1,140.1	7.5								1,140.6 7.0
			21	31	40	71		Sat.		**RESIDUAL** Brown, very dense, Silty fine to coarse SAND (A-2-4), saprolitic, little gravel, trace mica
1135	1,135.1	12.5								1,135.6 12.0
			78	22/0.4		100/0.9				**WEATHERED ROCK** (biotite gneiss)
1130	1,130.1	17.5								1,130.1 17.5
			60/0.1			60/0.1				**CRYSTALLINE ROCK** (biotite gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,130.0 ft in Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0059_GEO_RDWY_GINT.GPJ NC_DOT.GDT 4/22/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 14+31	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,148.3 ft	**TOTAL DEPTH** 50.8 ft	**NORTHING** 818,167	**EASTING** 1,201,355	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/26/26	**COMP. DATE** 03/26/26	**SURFACE WATER DEPTH 0.6**

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)
1150										
	1,148.3	0.0								GROUND SURFACE
1145										**ALLUVIAL** Brown to light brown, medium dense to dense, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized rock and quartz fragments, with cobbles and boulders
	1,144.3	4.0	8	14	18	32		Sat.		
1140										
	1,140.3	8.0								
	1,139.3	9.0	13	31	54	85		Sat.		**RESIDUAL** Brown and white, very dense, Silty fine to coarse SAND (A-2-4), saprolitic, trace mica, trace gravel
1135										
	1,135.3	13.0								
	1,134.3	14.0	100/0.3			100/0.3				**WEATHERED ROCK** (biotite gneiss)
1130										
	1,129.3	19.0	100/0.3			100/0.3				
	1,126.9	21.4	60/0.1			60/0.1				
	1,126.8	21.5								
1125										**CRYSTALLINE ROCK** (biotite gneiss) REC = 26% RQD = 4% GSI = 30-40
1120										
1115										
	1,112.5	35.8								
1110										(biotite gneiss) REC = 75% RQD = 55% GSI = 85-95
1105										
1100										
	1,097.5	50.8								Boring Terminated at Elevation 1,097.5 ft in Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0059_GEO_RDWY_GINT.GPJ NC_DOT.GDT 4/22/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 14+31	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,148.3 ft	**TOTAL DEPTH** 50.8 ft	**NORTHING** 818,167	**EASTING** 1,201,355	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/26/26	**COMP. DATE** 03/26/26	**SURFACE WATER DEPTH 0.6**
CORE SIZE NQ3	**TOTAL RUN** 29.3 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
1126.8											Begin Coring @ 21.5 ft
1125	1,126.8	21.5	4.3	1:29/1.0 1:49/1.0 1:34/1.0 1:47/1.0 0:46/0.3	(1.1) 26%	(0.0) 0%		(3.7) 26%	(0.6) 4%		1,126.8 **CRYSTALLINE ROCK** 21.5 Brown, mod. severely weathered, mod. hard, v. close to close fractured, Blowing Rock Gneiss GSI = 30-40
	1,122.5	25.8									
1120			5.0	1:31/1.0 1:29/1.0 1:44/1.0 1:38/1.0 2:02/1.0	(0.6) 12%	(0.0) 0%					
	1,117.5	30.8									
1115			5.0	1:50/1.0 1:38/1.0 1:27/1.0 1:58/1.0 2:04/1.0	(2.0) 40%	(0.6) 12%					
	1,112.5	35.8									1,112.5 35.8
1110			5.0	1:49/1.0 1:51/1.0 2:02/1.0 2:16/1.0 2:54/1.0	(2.4) 48%	(1.1) 22%		(11.2) 75%	(8.2) 55%		Brown to gray and white, slightly weathered to fresh, hard, mod. close to widely fractured, Blowing Rock Gneiss GSI = 85-95
	1,107.5	40.8									
1105			5.0	2:24/1.0 2:31/1.0 2:24/1.0 2:51/1.0 3:04/1.0	(4.5) 90%	(3.5) 70%					
	1,102.5	45.8									
1100			5.0	2:32/1.0 2:22/1.0 2:27/1.0 2:31/1.0 2:46/1.0	(4.3) 86%	(3.6) 72%					
	1,097.5	50.8									1,097.5 50.8 Boring Terminated at Elevation 1,097.5 ft in Crystalline Rock (biotite gneiss)

Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River

CORE PHOTOGRAPHS

B1-B

BOXES 1 and 2: 21.5' to 50.8'



GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** M. ShipmanSHEET 5	
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+94	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,154.3 ft	**TOTAL DEPTH** 42.3 ft	**NORTHING** 818,232	**EASTING** 1,201,363	**24 HR.** 4.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** HSA w/ SPT & Core	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 03/23/26	**COMP. DATE** 03/24/26	**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)
1155										
	1,154.3	0.0	1	2	7	9		M		1,154.3 GROUND SURFACE 0.0
										ARTIFICIAL FILL
1150	1,150.8	3.5	9	7	9	16		W		Brown, loose, Silty fine to coarse SAND (A-2-4), trace rootlets, trace gravel-sized rock fragments
										1,151.3 3.0
										ALLUVIAL
1145	1,145.8	8.5	20	20	24	44		W		Orange-brown and brown, medium dense, Silty fine to coarse SAND (A-2-4), high amounts of gravel-sized rock and quartz fragments
										1,146.3 8.0
										RESIDUAL
1140	1,140.8	13.5	39	40	51	91		M		Green-gray and white to orange-brown, dense to very dense, Silty fine to coarse SAND (A-2-4), saprolitic, trace to little gravel
										1,139.8 14.5
										WEATHERED ROCK
	1,135.8	18.5								(biotite gneiss)
1135	1,135.5	18.8	100/0.2			100/0.2				1,135.5 18.8
			60/0.0			60/0.0				**CRYSTALLINE ROCK**
										(biotite gneiss)
1130										REC = 58%
										RQD = 35%
1125										GSI = 45-90
1120										
1115										1,112.0 42.3
										Boring Terminated at Elevation 1,112.0 ft in Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0059_GEO_RDWY_GINT.GPJ NC_DOT.GDT 4/22/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+94	**OFFSET** 16 ft LT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 1,154.3 ft	**TOTAL DEPTH** 42.3 ft	**NORTHING** 818,232	**EASTING** 1,201,363 — **24 HR.** 4.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** HSA w/ SPT & Core	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/23/26	**COMP. DATE** 03/24/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ3	**TOTAL RUN** 23.5 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
1135.5											Begin Coring @ 18.8 ft
1135	1,135.5	18.8	3.5	*N=60/0.0* 0:38/0.5 1:07/1.0 1:18/1.0 1:31/1.0	(1.5) 43%	(0.0) 0%		(13.6) 58%	(8.3) 35%		1,135.5 **CRYSTALLINE ROCK** 18.8 Light brown to gray and white, mod. severely weathered to fresh, med. hard to hard, v. close to widely fractured, Blowing Rock Gneiss GSI = 45-90
1130	1,132.0	22.3	5.0	1:58/1.0 1:56/1.0 1:52/1.0 1:35/1.0 1:00/1.0	(4.0) 80%	(2.9) 58%					
1125	1,127.0	27.3	5.0	2:32/1.0 2:49/1.0 1:11/1.0 0:41/1.0 1:04/1.0	(1.6) 32%	(0.0) 0%					
1120	1,122.0	32.3	5.0	1:22/1.0 0:53/1.0 1:20/1.0 1:47/1.0 1:42/1.0	(1.5) 30%	(0.4) 8%					
1115	1,117.0	37.3	5.0	1:35/1.0 1:52/1.0 1:48/1.0 2:02/1.0 2:08/1.0	(5.0) 100%	(5.0) 100%					1,112.0 42.3 Boring Terminated at Elevation 1,112.0 ft in Crystalline Rock (biotite gneiss)
	1,112.0	42.3									

Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River

CORE PHOTOGRAPHS

EB2-A

BOXES 1 and 2: 18.8' to 42.3'



0 1 2

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS HB-0059	**TIP** HB-0059	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130275 on SR1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 14+75	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,152.4 ft	**TOTAL DEPTH** 21.0 ft	**NORTHING** 818,204	**EASTING** 1,201,380	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/24/26	**COMP. DATE** 03/24/26	**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)
1155											
	1,152.4	0.0	1	2	2	4		M		1,152.4 GROUND SURFACE	0.0
1150										**ARTIFICIAL FILL** Brown, loose, Silty fine to coarse SAND (A-2-4), little gravel-sized rock fragments, trace rootlets	
	1,148.9	3.5	8	10	9	19		W		1,149.4	3.0
1145										**ALLUVIAL** Brown, medium dense, Silty fine to coarse SAND (A-2-4), high amounts of gravel-sized rock and quartz fragments	
	1,143.9	8.5	22	25	28	53		W		1,144.4	8.0
1140										**RESIDUAL** Orange-brown, gray, brown and white, very dense, Silty fine to coarse SAND (A-2-4), saprolitic, trace gravel, no to trace mica	
	1,138.9	13.5	42	49	46	95		M			
1135											
	1,133.9	18.5	19	73	27/0.1	100/0.6				1,133.4	19.0
	1,131.4	21.0	60/0.0			60/0.0				**WEATHERED ROCK** (biotite gneiss) 1,131.4	21.0
										CRYSTALLINE ROCK (biotite gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,131.4 ft on Crystalline Rock (biotite gneiss)	

NCDOT BORE SINGLE HB-0059_GEO_RDWY_GINT.GPJ NC_DOT.GDT 4/22/26

SITE PHOTO – HB-0059 – Bridge 275 on SR 1356 over St Johns River



Existing Bridge 275

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HB–0060	1	24

PROJECT: HB–0060 REFERENCE:

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CALDWELL*

SITE DESCRIPTION *REPLACEMENT OF BRIDGE 317 ON SR 1356 (OLD ST JOHNS RIVER ROAD) OVER ST JOHNS RIVER*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-23	BORE LOGS, CORE LOGS, CORE PHOTOS
24	SITE PHOTO

PERSONNEL

B. WORLEY, PG

M. SHIPMAN, PE

S. DAVIS (F&R)

J. MARTINEZ (F&R)

INVESTIGATED BY *GFT INC.*

DRAWN BY *B. WORLEY, PG*

CHECKED BY *G. BOLLINGER*

SUBMITTED BY *B. WORLEY, PG*

DATE *MAY, 2026*

GFT

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919-420-7660
NC Lic. No. F-0270

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NORTH CAROLINA LICENSED SEAL 1926 GEOLOGIST BRADLEY D. WORLEY

Bradley D Worley 5/14/2026

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
HB–0060	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
- [X] CME-750
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 6" HOLLOW STEM 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
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
HB–0060	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

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: *See Note

ELEVATION: FEET

NOTES:

Stations/Offsets, Northings/Eastings, and Elevations for boring collars provided by GFT, Inc. Roadway/Survey (Raleigh, NC) using GPS coordinates gathered in the field.

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
HB–0060	2B

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 (PAGE 1 OF 2)

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

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 ⇨

DECREASING INTERLOCKING OF ROCK PIECES ⇩

INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90	80	N/A	N/A
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70	60	50
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	60	50	40	30
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	50	40	30	20
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces	30	20	10	N/A
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A	N/A	N/A

PROJECT REFERENCE NO.	SHEET NO.
HB–0060	2C

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 (PAGE 2 OF 2)

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

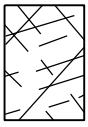
GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

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

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



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.*



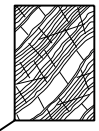
B. *Sandstone with thin interlayers of siltstone*



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.**



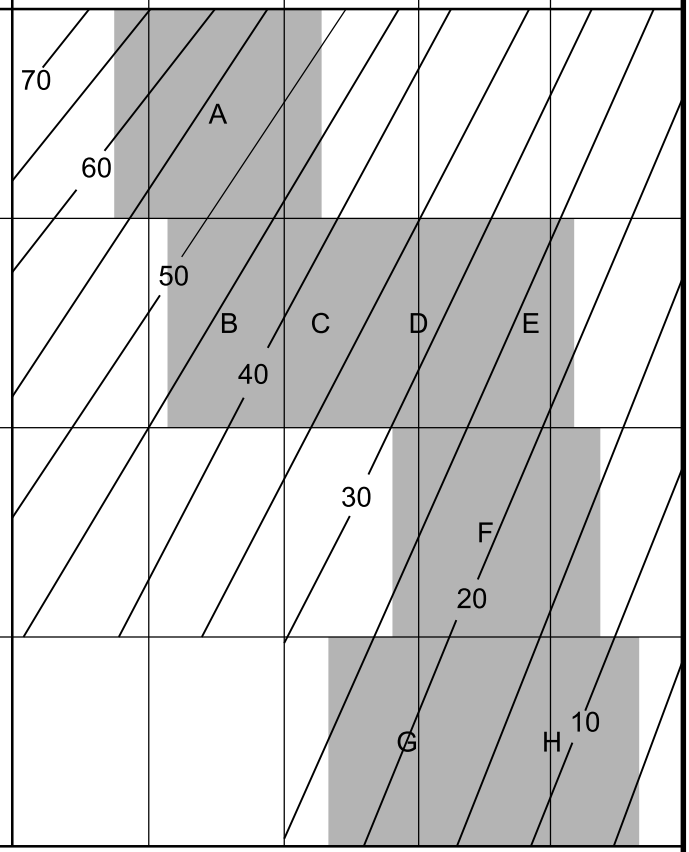
F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*



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

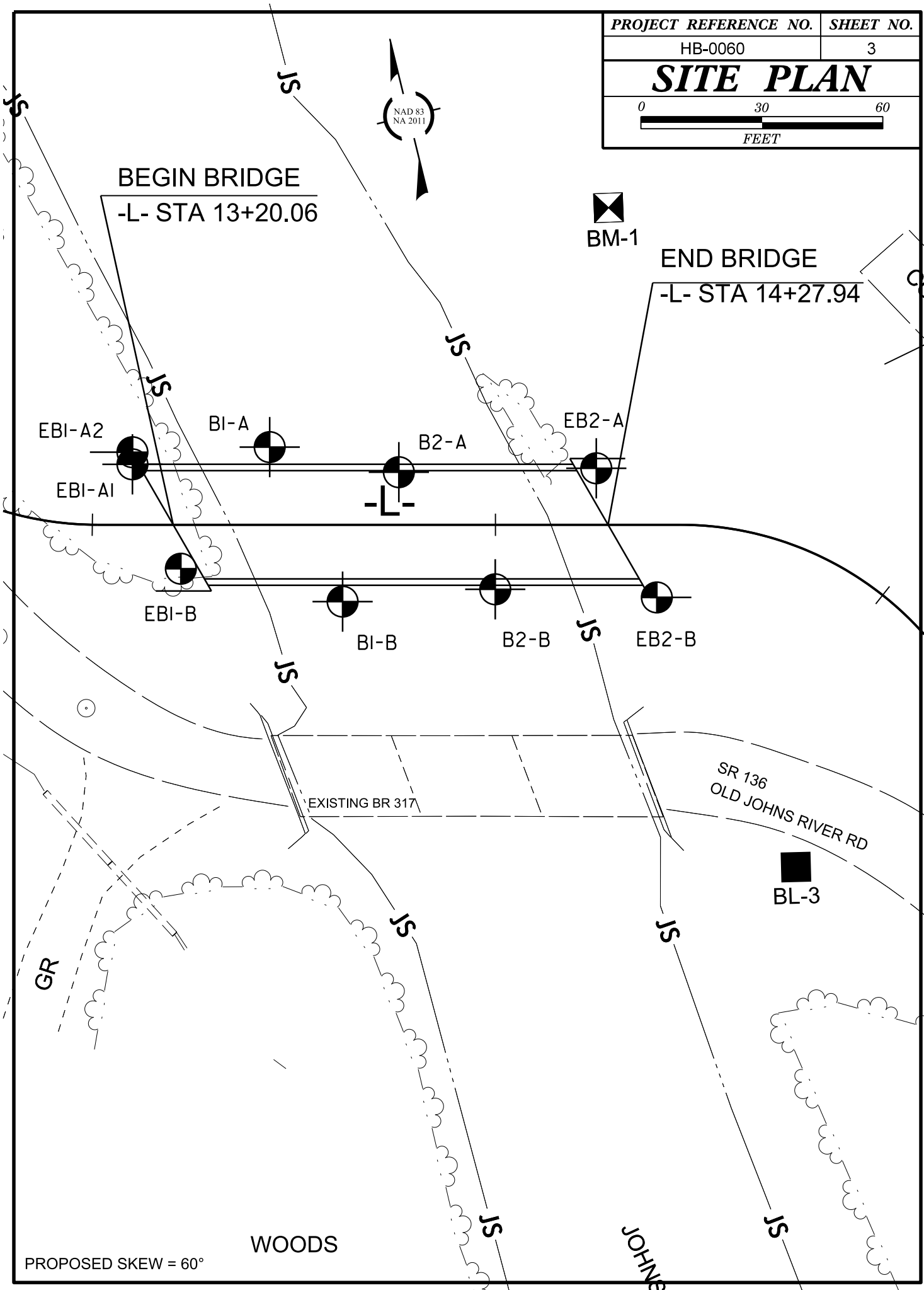


H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***



Means deformation after tectonic disturbance

DATE: 8-19-16


PROJECT REFERENCE NO.
HB-0060
SHEET NO.
3
SITE PLAN
0
30
60
FEET
NAD 83
NA 2011
BEGIN BRIDGE
-L- STA 13+20.06
END BRIDGE
-L- STA 14+27.94
BM-1
EBI-A2
EBI-AI
BI-A
B2-A
EB2-A
EBI-B
BI-B
B2-B
EB2-B
JS
EXISTING BR 317
SR 136
OLD JOHNS RIVER RD
BL-3
GR
WOODS
PROPOSED SKEW = 60°

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-A1	**STATION** 13+10	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,101.7 ft	**TOTAL DEPTH** 11.0 ft	**NORTHING** 805,728	**EASTING** 1,203,484	**24 HR.** 5.6
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/21/26	**COMP. DATE** 04/21/26	**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
1105										
	1,101.7	0.0								1,101.7 GROUND SURFACE 0.0
1100			0	0	0 WOH	0		M		**ALLUVIAL** Brown, very loose, Silty fine SAND (A-2-4), trace rootlets
	1,098.2	3.5	2	2	7	9		M		1,098.7 3.0 Brown, loose, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized quartz fragments
1095										1,094.2 7.5 **WEATHERED ROCK** (biotite gneiss)
	1,093.2 1,092.7	8.5 9.0	100/0.3		60/0.0	100/0.3 60/0.0				1,090.7 11.0 REC = 15% RQD = 0% GSI = 70-90
										Boring Terminated at Elevation 1,090.7 ft in Weathered Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0060_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/13/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. EB1-A1	**STATION** 13+10	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,101.7 ft	**TOTAL DEPTH** 11.0 ft	**NORTHING** 805,728	**EASTING** 1,203,484	**24 HR.** 5.6
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/21/26	**COMP. DATE** 04/21/26	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ3	**TOTAL RUN** 2.0 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
1092.7											Begin Coring @ 9.0 ft
	1,092.7 1,090.7	9.0 11.0	2.0	*N=60/0.0* 1:31/1.0 1:30/1.0	(0.3) 15%	(0.0) 0%					**WEATHERED ROCK** White/gray, severely weathered, soft to mod. hard, biotite gneiss GSI = 70-90 *(continued)* Boring Terminated at Elevation 1,090.7 ft in Weathered Rock (biotite gneiss) *No core photo for EB1-A1

ELEV. (ft) 1,090.7 — DEPTH (ft) 11.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB1-A2	**STATION** 13+10	**OFFSET** 18 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,101.7 ft	**TOTAL DEPTH** 14.4 ft	**NORTHING** 805,730	**EASTING** 1,203,484	**24 HR.** 5.5
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/21/26	**COMP. DATE** 04/21/26	**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)
1105										
										1,101.7 GROUND SURFACE 0.0
1100										**ALLUVIAL** *Interpreted from soils from HSA flights as alluvial SAND w/ gravel (A-1-b)
1095										1,094.2 7.5
										WEATHERED ROCK (biotite gneiss)
1090										
	1,088.2	13.5								
	1,087.3	14.4	100/0.2			100/0.2				1,087.3 14.4
			60/0.0			60/0.0				**CRYSTALLINE ROCK** (biotite gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,087.3 ft on Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0060_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/13/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 13+22	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,103.4 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 805,699	**EASTING** 1,203,489	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/21/26	**COMP. DATE** 04/21/26	**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)
1105										
	1,103.4	0.0								1,103.4 GROUND SURFACE 0.0
			0	0	0 WOH	0		M		**ALLUVIAL** Brown, very loose, Silty fine SAND (A-2-4) trace rootlets and cobbles and boulders
1100	1,099.9	3.5								
			0	1	2	3		M		
										1,096.4 7.0
1095	1,094.9	8.5								**RESIDUAL** Dark brown, medium dense, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized quartz fragments
			20	14	9	23		Sat.		
										1,091.4 12.0
1090	1,089.9	13.5								Brown, dense, Silty fine SAND (A-2-4), saprolitic, trace mica
			13	12	30	42		M		
										1,086.4 17.0
1085	1,084.9	18.5								**WEATHERED ROCK** (biotite gneiss)
	1,084.5	18.9	100/0.2			100/0.2				1,084.5 18.9
			60/0.1			60/0.1				1,084.4 19.0
										CRYSTALLINE ROCK (biotite gneiss)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 1,084.4 ft in Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0060_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/13/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 13+44	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,095.2 ft	**TOTAL DEPTH** 15.5 ft	**NORTHING** 805,723	**EASTING** 1,203,517	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/23/26	**COMP. DATE** 04/23/26	**SURFACE WATER DEPTH** 0.8ft	

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
1100										ELEV. (ft) DEPTH (ft)
1095	1,095.2	0.0								1,095.2 GROUND SURFACE 0.0
			4	6	27	33		Sat.		**ALLUVIAL**
	1,092.4	2.8								Brown, dense, Fine to Coarse SAND
			30	57	43/0.3					(A-1-b), high amounts of gravel-sized rock fragments
1090	1,089.7	5.5				100/0.8				1,091.9 3.3
			60/0.0			60/0.0				1,089.7 **WEATHERED ROCK** 5.5
										(biotite gneiss)
1085										**CRYSTALLINE ROCK**
										(biotite gneiss)
										REC = 83%
										RQD = 59%
1080										GSI = 85-95
										1,079.7 15.5
										Boring Terminated at Elevation 1,079.7 ft in Crystalline Rock (biotite gneiss)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 13+44	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,095.2 ft	**TOTAL DEPTH** 15.5 ft	**NORTHING** 805,723	**EASTING** 1,203,517	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/23/26	**COMP. DATE** 04/23/26	**SURFACE WATER DEPTH** 0.8ft	
CORE SIZE NQ3	**TOTAL RUN** 10.0 ft			

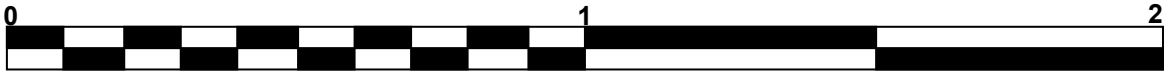
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1089.7											Begin Coring @ 5.5 ft
	1,089.7	5.5	5.0	*N=60/0.0* 2:06/1.0 2:31/1.0 2:14/1.0 2:46/1.0 2:31/1.0	(4.2) 84%	(3.6) 72%		(8.3) 83%	(5.9) 59%		1,089.7 **CRYSTALLINE ROCK** 5.5 Gray, slight to v. slightly weathered, v. hard, v. close to mod. closely fractured, biotite gneiss GSI = 85-95
1085	1,084.7	10.5	5.0	2:20/1.0 2:59/1.0 4:18/1.0 2:09/1.0 0:25/1.0	(4.1) 82%	(2.3) 46%					
1080	1,079.7	15.5									1,079.7 15.5 Boring Terminated at Elevation 1,079.7 ft in Crystalline Rock (biotite gneiss)

CORE PHOTOGRAPH

B1-A

BOX1: 5.5' to 15.5'





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 13+62	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,095.4 ft	**TOTAL DEPTH** 36.0 ft	**NORTHING** 805,682	**EASTING** 1,203,525	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/21/26	**COMP. DATE** 04/22/26	**SURFACE WATER DEPTH** 0.7ft	

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)
1100										
1095	1,095.4	0.0								1,095.4 GROUND SURFACE 0.0
			10	14	39	53		Sat.		**ALLUVIAL**
	1,091.9	3.5								1,092.4 Brown, very dense, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized quartz fragments, with cobbles and boulders 3.0
1090			25	49	42	91		M		**RESIDUAL**
	1,086.9	8.5								Brown, very dense, Silty fine to coarse SAND (A-2-4), saprolitic, trace mica
1085			12	10	90/0.4	100/0.9				1,085.9 9.5 **WEATHERED ROCK** (biotite gneiss)
	1,082.1	13.3	60/0.0			60/0.0				1,082.1 13.3 **CRYSTALLINE ROCK** (biotite gneiss)
1080										REC = 63% RQD = 26% GSI = 50-85
1075										
1070										
1065										
1060										1,059.4 36.0 Boring Terminated at Elevation 1,059.4 ft in Crystalline Rock (biotite gneiss)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 13+62	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,095.4 ft	**TOTAL DEPTH** 36.0 ft	**NORTHING** 805,682	**EASTING** 1,203,525	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/21/26	**COMP. DATE** 04/22/26	**SURFACE WATER DEPTH** 0.7ft
CORE SIZE NQ3	**TOTAL RUN** 22.7 ft		

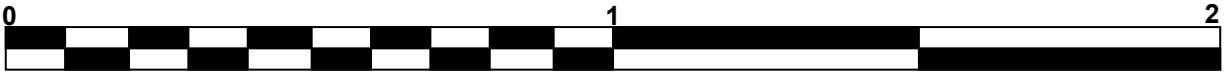
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1082.1											Begin Coring @ 13.3 ft
1080	1,082.1	13.3	2.7	*N=60/0.0* 1:36/1.0 1:26/1.0 1:00/0.7	(0.8) 30%	(0.0) 0%		(14.2) 63%	(5.9) 26%		1,082.1 **CRYSTALLINE ROCK** 13.3 Brown and brown and gray, mod. severe to slightly weathered, v. close to closely fractured, mod. hard to hard, biotite gneiss GSI = 50-85
1075	1,079.4	16.0	5.0	2:16/1.0 2:41/1.0 2:08/1.0 2:21/1.0 2:22/1.0	(0.5) 10%	(0.0) 0%					
1070	1,074.4	21.0	5.0	1:56/1.0 2:31/1.0 2:12/1.0 2:12/1.0 2:46/1.0	(4.4) 88%	(2.1) 42%					
1065	1,069.4	26.0	5.0	1:46/1.0 1:30/1.0 2:08/1.0 2:14/1.0 1:58/1.0	(5.0) 100%	(1.1) 22%					
1060	1,064.4	31.0	5.0	1:36/1.0 1:21/1.0 1:48/1.0 1:52/1.0 1:50/1.0	(3.5) 70%	(2.7) 54%					
	1,059.4	36.0									1,059.4 36.0 Boring Terminated at Elevation 1,059.4 ft in Crystalline Rock (biotite gneiss)

CORE PHOTOGRAPH

B1-B

BOXES 1&2: 13.3' to 36.0'





FEET

GEOTECHNICAL BORING REPORT
BORE LOG

SHEET

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 13+76	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,094.7 ft	**TOTAL DEPTH** 30.3 ft	**NORTHING** 805,709	**EASTING** 1,203,547	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/23/26	**COMP. DATE** 04/23/26	**SURFACE WATER DEPTH** 1.5ft	

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)
1095	1,094.7	0.0								1,094.7 GROUND SURFACE 0.0
	1,092.9	1.8	10	16	80	96/0.0		Sat.		1,092.9 **ALLUVIAL** 1.8
			60/0.0							Brown, medium dense to very dense, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized rock fragments, with cobbles and boulders
1090										**CRYSTALLINE ROCK** (biotite gneiss)
1085										REC = 56% RQD= 36% GSI = 50-90
1080										
1075										
1070										
1065										1,064.4 30.3
										Boring Terminated at Elevation 1,064.4 ft in Crystalline Rock (biotite gneiss)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 13+76	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,094.7 ft	**TOTAL DEPTH** 30.3 ft	**NORTHING** 805,709	**EASTING** 1,203,547	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/23/26	**COMP. DATE** 04/23/26	**SURFACE WATER DEPTH** 1.5ft
CORE SIZE NQ3	**TOTAL RUN** 28.5 ft		

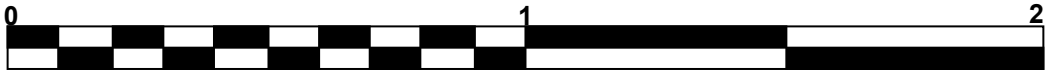
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1092.9											Begin Coring @ 1.8 ft
	1,092.9	1.8	3.5	*N=60/0.0* 1:14/1.0 1:27/1.0 1:16/1.0	(2.2) 63%	(1.0) 29%		(16.0) 56%	(10.2) 36%		1,092.9 **CRYSTALLINE ROCK** 1.8 Gray and brown and gray, mod. severe to fresh weathering, mod. hard to v. hard, v. close to closely fractured, biotite gneiss GSI = 50-90
1090	1,089.4	5.3	5.0	1:01/0.5 1:46/1.0 1:37/1.0 1:41/1.0 2:06/1.0	(1.7) 34%	(0.4) 8%					
1085	1,084.4	10.3	5.0	1:58/1.0 1:21/1.0 1:16/1.0 1:01/1.0 0:15/1.0	(0.6) 12%	(0.0) 0%					
1080	1,079.4	15.3	5.0	1:13/1.0 2:03/1.0 1:49/1.0 2:01/1.0 1:56/1.0	(3.2) 64%	(2.2) 44%					
1075	1,074.4	20.3	5.0	1:48/1.0 2:31/1.0 2:24/1.0 2:46/1.0 2:06/1.0	(3.3) 66%	(2.0) 40%					
1070	1,069.4	25.3	5.0	2:18/1.0 2:04/1.0 2:37/1.0 2:46/1.0 3:02/1.0	(5.0) 100%	(4.6) 92%					
1065	1,064.4	30.3		3:15/1.0							1,064.4 30.3 Boring Terminated at Elevation 1,064.4 ft in Crystalline Rock (biotite gneiss)

CORE PHOTOGRAPH

B2-A

BOXES 1&2: 1.8' to 30.3'





FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 13+98	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,095.2 ft	**TOTAL DEPTH** 16.0 ft	**NORTHING** 805,676	**EASTING** 1,203,561	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/22/26	**COMP. DATE** 04/22/26	**SURFACE WATER DEPTH** 0.8ft	

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
1100										
1095	1,095.2	0.0	2	8	9	17		Sat.		1,095.2 GROUND SURFACE 0.0
1090	1,091.0 / 1,090.7	4.2 / 4.5	100/0.3		60/0.0	100/0.3 60/0.0				**ALLUVIAL** Brown, medium dense, Fine to Coarse SAND (A-1-b), high amounts of gravel-sized rock fragments, with cobbles and boulders 1,091.2 4.0 / 1,090.7 4.5
1085										**WEATHERED ROCK** (biotite gneiss) **CRYSTALLINE ROCK** (biotite gneiss) REC = 74% RQD = 34% GSI = 70-85
1080										1,079.2 16.0 Boring Terminated at Elevation 1,079.2 ft in Crystalline Rock (biotite gneiss)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 13+98	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,095.2 ft	**TOTAL DEPTH** 16.0 ft	**NORTHING** 805,676	**EASTING** 1,203,561	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/22/26	**COMP. DATE** 04/22/26	**SURFACE WATER DEPTH** 0.8ft	
CORE SIZE NQ3	**TOTAL RUN** 11.5 ft			

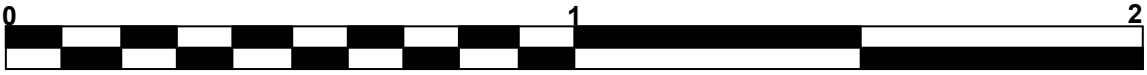
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1090.7											Begin Coring @ 4.5 ft
1090	1,090.7	4.5	1.5	*N=60/0.0*	(0.2) 13%	(0.0) 0%		(8.5) 74%	(4.3) 37%		ELEV. (ft) 1,090.7 — DEPTH (ft) 4.5 **CRYSTALLINE ROCK** Brown to gray and brown, mod. to slightly weathered, hard to v. hard, v. close to closely fractured, biotite gneiss GSI = 70-85
	1,089.2	6.0	5.0	1:21/1.0 0:40/0.5 1:31/1.0 1:28/1.0 1:21/1.0 1:41/1.0 1:31/1.0	(4.0) 80%	(2.2) 44%					
1085	1,084.2	11.0	5.0	1:50/1.0 1:47/1.0 1:39/1.0 1:59/1.0 2:18/1.0	(4.3) 86%	(2.1) 42%					
1080	1,079.2	16.0									ELEV. (ft) 1,079.2 — DEPTH (ft) 16.0 Boring Terminated at Elevation 1,079.2 ft in Crystalline Rock (biotite gneiss)

CORE PHOTOGRAPH

B2-B

BOX1: 4.5' to 16.0'





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+25	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,101.2 ft	**TOTAL DEPTH** 20.2 ft	**NORTHING** 805,698	**EASTING** 1,203,595	**24 HR.** 6.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/15/26	**COMP. DATE** 04/15/26	**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)
1105										
	1,101.2	0.0								1,101.2 GROUND SURFACE 0.0
1100			1	2	4	6		M		**ALLUVIAL** Brown, loose, Silty fine SAND (A-2-4), trace rootlets, trace organics
	1,098.2	3.0								
	1,097.7	3.5	7	7	16	23		M		**RESIDUAL** Light brown & white to red-brown, medium dense, Silty fine to coarse SAND (A-2-4), saprolitic, high amounts of gravel
1095										
	1,092.7	8.5								
	1,091.7	9.5	25	44	56/0.2	100/0.7				
	1,091.0	10.2	60/0.0			60/0.0				**WEATHERED ROCK** (biotite gneiss) 10.2
1090										**CRYSTALLINE ROCK** (biotite gneiss)
1085										REC = 75% RQD = 42% GSI = 50-80
	1,081.0	20.2								Boring Terminated at Elevation 1,081.0 ft in Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0060_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/13/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman	
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+25	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,101.2 ft	**TOTAL DEPTH** 20.2 ft	**NORTHING** 805,698	**EASTING** 1,203,595	**24 HR.** 6.1
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 04/15/26	**COMP. DATE** 04/15/26	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ3	**TOTAL RUN** 10.0 ft			

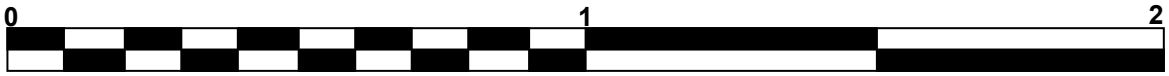
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1091											Begin Coring @ 10.2 ft
1090	1,091.0	10.2	5.0	*N=60/0.0* 1:21/1.0 1:26/1.0 1:30/1.0 1:11/1.0 1:46/1.0	(3.7) 74%	(2.0) 40%		(7.5) 75%	(4.2) 42%		1,091.0 **CRYSTALLINE ROCK** 10.2 Gray and brown, mod. severe to moderately weathered, hard, v. close to closely fractured, biotite gneiss GSI = 50-80
	1,086.0	15.2									
1085			5.0	1:36/1.0 1:31/1.0 1:47/1.0 1:59/1.0 1:30/1.0	(3.8) 76%	(2.2) 44%					
	1,081.0	20.2									1,081.0 20.2 Boring Terminated at Elevation 1,081.0 ft in Crystalline Rock (biotite gneiss)

CORE PHOTOGRAPH

EB2-A

BOX1: 9.0' to 11.0'





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50730.1.1	**TIP** HB-0060	**COUNTY** CALDWELL	**GEOLOGIST** M. Shipman
SITE DESCRIPTION Bridge No. 130317 on SR 1356 (Old Johns River Rd) over Johns River			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 14+40	**OFFSET** 18 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,101.7 ft	**TOTAL DEPTH** 10.7 ft	**NORTHING** 805,664	**EASTING** 1,203,602	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 04/20/26	**COMP. DATE** 04/20/26	**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
1105										ELEV. (ft) DEPTH (ft)
	1,101.7	0.0								1,101.7 GROUND SURFACE 0.0
1100			1	2	5	7		M		**ALLUVIAL** Light brown and brown, loose to medium dense, Silty fine SAND (A-2-4), trace gravel-sized rock fragments, trace rootlets, trace tree roots
	1,098.2	3.5	7	7	7	14		W		
1095										1,093.7 8.0
	1,093.2	8.5	16	16	23	39		Sat.		**RESIDUAL** Orange-brown to brown, dense, Silty fine to coarse SAND (A-2-4), saprolitic, high amounts of quartz
	1,091.0	10.7	60/0.0			60/0.0				1,091.0 10.7 **CRYSTALLINE ROCK** (biotite gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 1,091.0 ft on Crystalline Rock (biotite gneiss)

NCDOT BORE SINGLE HB-0060_GEO_RDWY_GINT.GPJ NC_DOT.GDT 5/13/26

SITE PHOTO – HB-0060 – Bridge 130317 on SR 1356 over Johns River



Existing Bridge 317 (View Facing West)