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TITLE SHEET LEGEND (SOIL & ROCK)

SITE PLAN PROFILE(S)

CROSS SECTION(S)

SITE PHOTOGRAPH(S) ROCK COMPRESSION TEST

SUPPLEMENTAL LEGEND (GSI)

4610

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

CONTENTS SHEET NO. **DESCRIPTION**

STRUCTURE SUBSURFACE INVESTIGATION BORE LOG(S), CORE REPORT(S), & CORE PHOTOGRAPH(S)

COUNTY <u>CLEVELAND</u>

SITE DESCRIPTION BRIDGE NO. 201 ON SR 1641 (BRACKETT RD.) OVER KNOB CREEK

STATE PROJECT REPERENCE NO. B-5392

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DATE _NOVEMBER 2016



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-5392	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

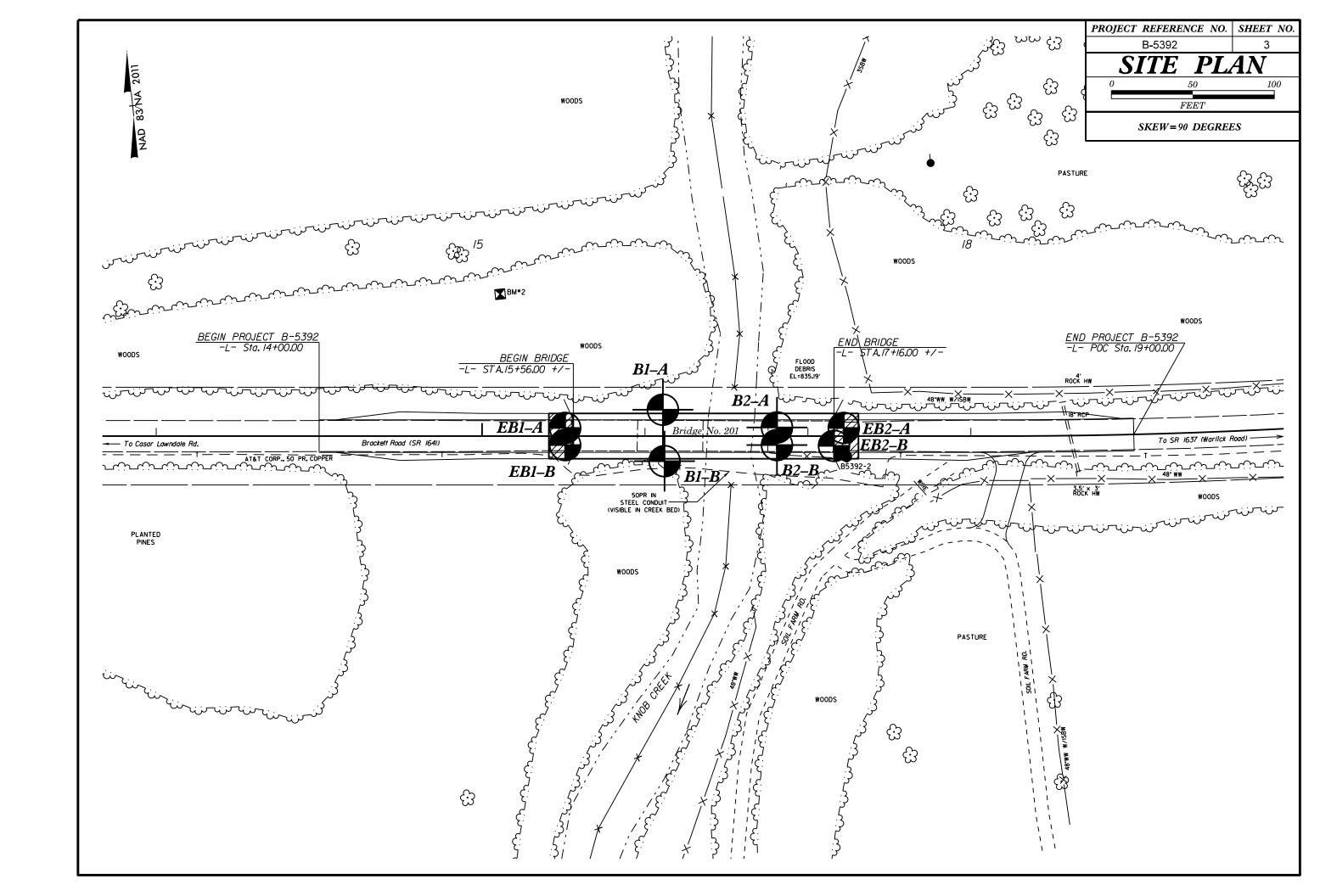
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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.	ALLUYIUM (ALLUY.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	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	AQUIFER - A WATER BEARING FORMATION OR STRATA,
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK, ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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
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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. (≤ 35% PASSING "200) (> 35% PASSING "200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-7-6 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLO SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL DOGGOOGGOOGGOOGGOOGGOOGGOOGGOOGGOOGGOOG	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7. PASSING Str. T.	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
"18 50 MX GRANULAR CLAY MUCK, "40 30 MX 50 MX 51 MN SOILS CRAY PEAT	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
"200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	HORIZONTAL.
LL - 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 5UILS WITH	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 18 MX 18 MX 11 MN 11 MN 18 MX 11 MN 11 MN MODERATE MIGHT	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE GROUND WATER	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH, FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX 8 8 8 8 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF ORGANIC SOILS		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL, AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATEMIALS SANU	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	── OMING OR SEEP	WITH FRESH ROCK. MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
CONSISTENCY CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL SOIL SYMBOL ST ONT TEST BORING INSTALLATION SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MATERIAL MEDIUM DENSE 10 TO 30 N/A	I Ø↑	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	── INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	(V SEV.) REMAINING SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	A DIEZOMETED	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TREADING TEN	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SHALLOW INCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OF BACKFILL	TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
	☐ CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE CAUSE FOR THE OLD AND THE	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 _d - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID: YERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIEF. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS, - FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES I INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLIDA DEGLIDES DEVING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: BM-2: R/R SPIKE SET IN BASE OF 16" TULIP POPLAR TREE,
	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	-L- STATION 15+II,II, 87,I6 LT ELEVATION: 830,30 FEET
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE	
SL _ SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE Ø.16 TO 1 FOOT VERY THINLY BEDDED Ø.03 - Ø.16 FEET	NOTES:
- DRY - (D) RECOURES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6° CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	
PLASTICITY	CME-55	INDURATION	
PLASTICITY INDEX (PI) ORY STRENGTH	CME-550 HARD FACED FINGER BITS X-N X	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST X CASING X W/ ADVANCER HAND TOOLS:	COAING CAN DE CEDADATED EDOM CAMBIE MITH CIEFL DOORE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST X TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	X CME-550X TRICONE TUNG, CARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	X CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER,	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14

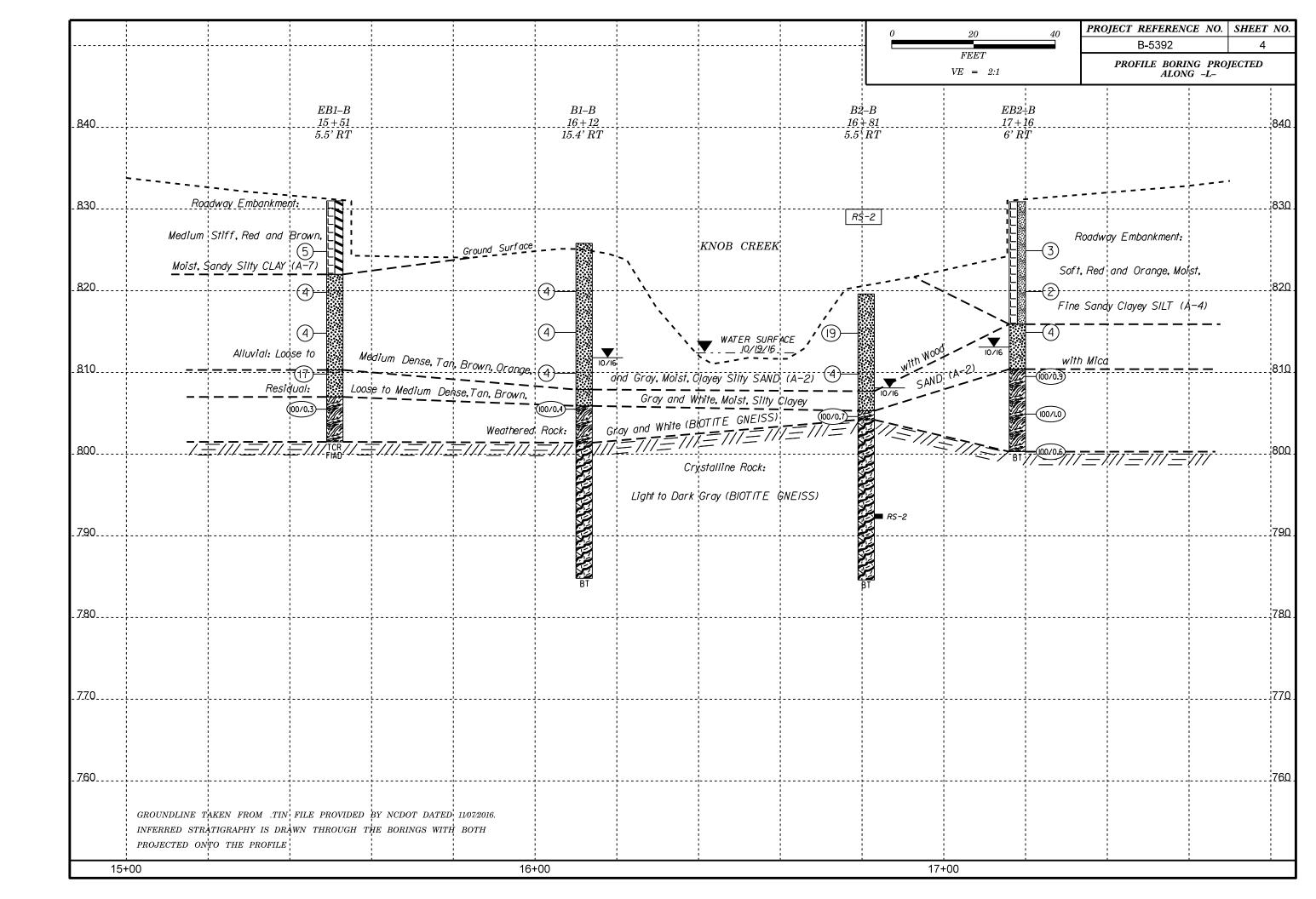
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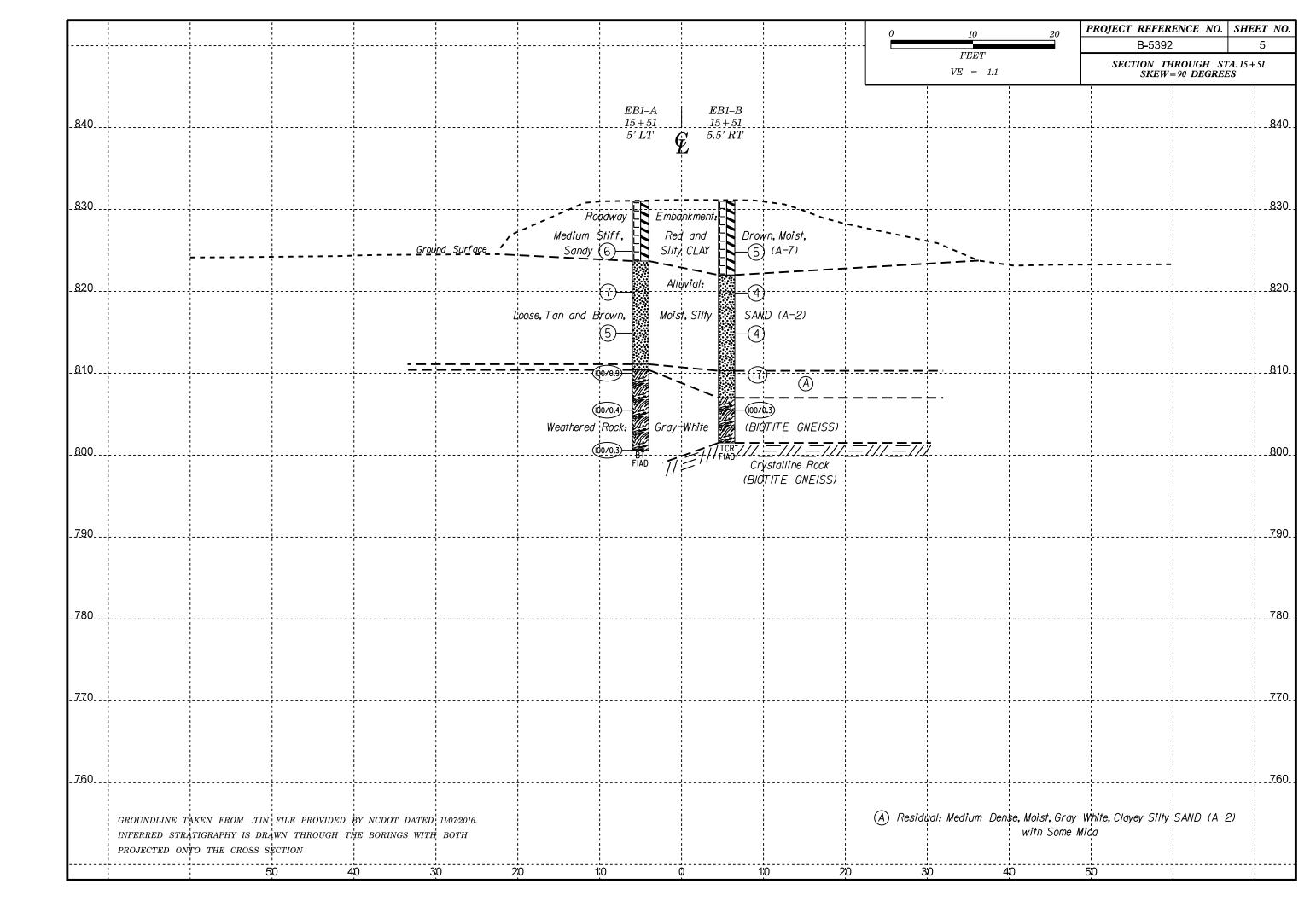
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

	SUPPL	EMENTAL LE FROM AASI	EGEND, GI HTO LRF	EOLOGIC FD BRID	CAL STRENGTH INDEX (GSI) TABLES GE DESIGN SPECIFICATIONS					
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Join	ted Rock Mass (Marinos and	Hoek, 2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Def	ormed Hetero	geneous Rock N	Masses (Marı	nos and Hoek	. 2000)
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)	faces		aces	seo	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos.P and Hoek E., 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.	SURFACE CONDITIONS VERY GOOD Very rough, fresh unweathered surface GOOD GOOD Rouch, slightly weathered, from stained	urfaces J J All All All All All All All All Anderately weathered and ltered surfaces	POOR Slickensided, highly weathered surfa with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	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.	VERY GOOD - Very Rough, fresh unweathered surfaces	G00D - 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, slicken- sided or highly weathered surfaces
STRUCTURE	DECREASIN	NG SURFACE QUA		⇒	COMPOSITION AND STRUCTURE					
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	PIECES 08 08		N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70 60	A			
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	70 60				B. Sand- stone with stone and slitstone or silty shale or siltstone or clayey		50			
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	OCKING O	50			B. Sand- stone with stone and sultstone layers of sultstone sultst		/B 40	C / [) /E	
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	ASING INTERL	40	30		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.			30	F 20	
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces	□ DECRE		20		G. Undisturbed silty or clayey shale with or clayey shale with or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone layers and stone are transformed into small rock pieces.			<u></u>	-	10
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	V N/A N/			10 /	Into small rock pieces. → Means deformation after tectonic disturbance					DATE: 8-

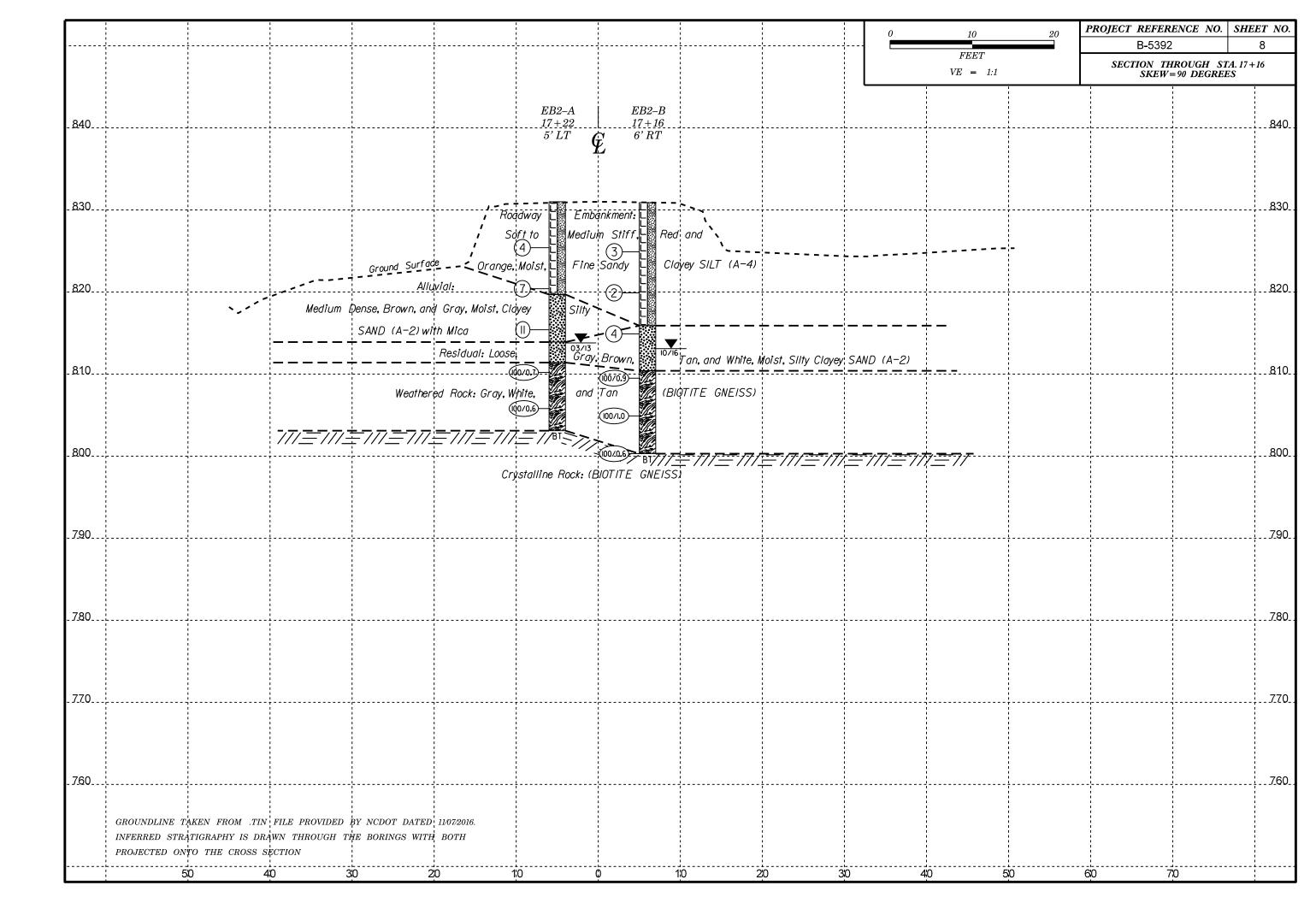


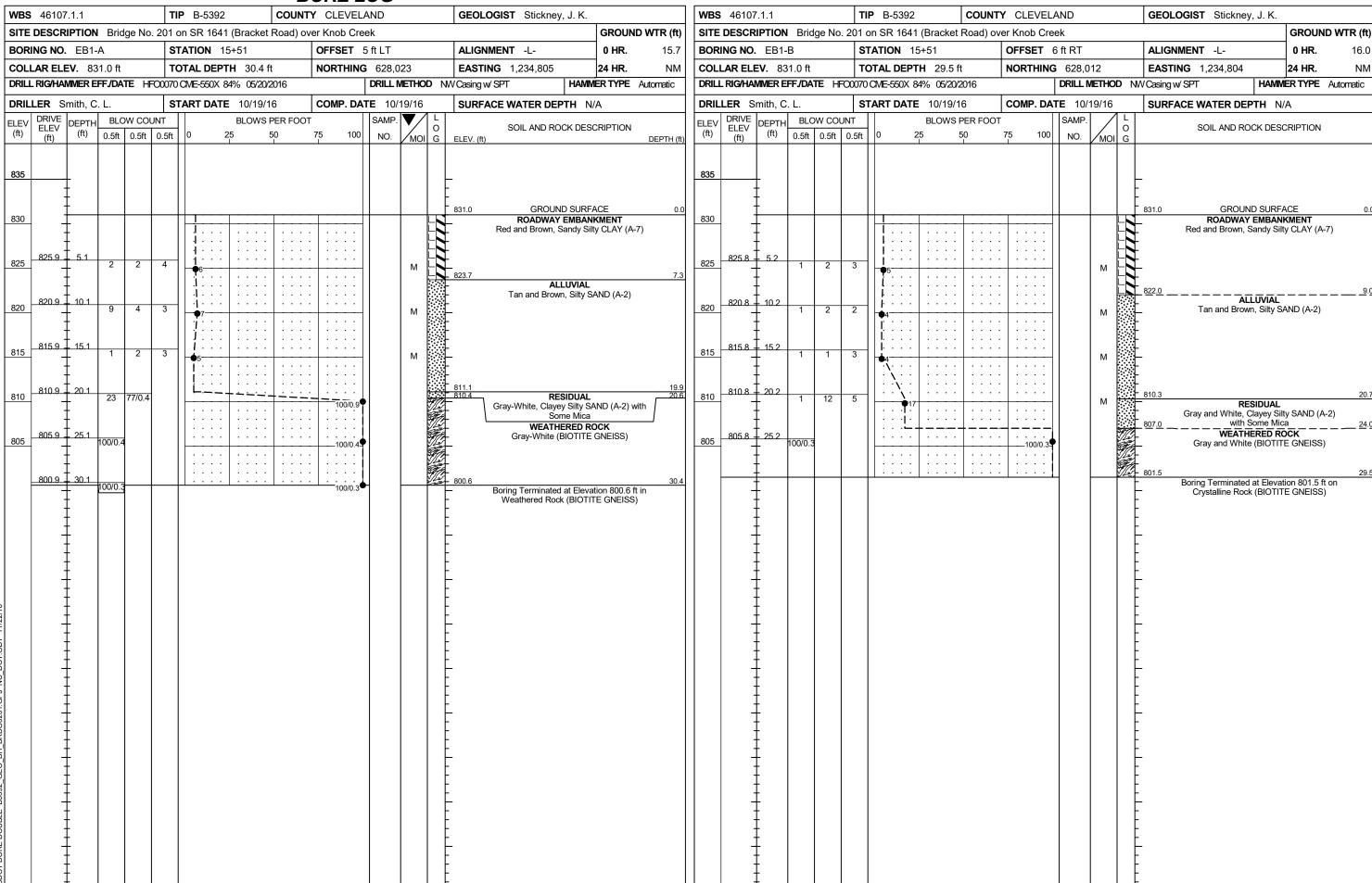




		1	I I	1 1 1	 		! !	0	10 2	PROJECT REFERE	NCE NO. SHEET NO.
			. 	 		¦				B-5392	6
									FEET $VE = 1:1$	SECTION THI SKEW=	ROUGH STA. 16+11 90 DEGREES
		i ! !		<i>B1–A</i>	 		B1–B				
840		: 		16+11 16.2' LT	-]	6+12 (.4' RT				840
				10.2 L1	9	Ė	.4 111				
		i 			 						
830				RS-I							830.
		 		1 1 1 1	 	Ground Surface					
						ground Surrace					
820	ļ					(4)					820
			(3))——	!	vial:					
		Very	Loose to Loose,	an, Oran	; ge, and Light Gray ;	, Moist, Clayey 4	Silty S	SAND (A-2)			
.810		 	2)	 	4	10/16				810
			(35	10/16			with M	 'ica	= =		
		Residu	pal: Dense, Tan ar	Gray.	Moist, Clayey SIII	y SAVD — — (00/0.4)=	(BIOTIT	— — — — — F GNF/SS)			
. <u>8</u> 00		/// <u>=</u> /// <u>=</u>		0.2) - //	7/7 <u>=</u> 7/7 <u>=</u>	7/7 <u>=</u> 7/7 <u>=</u> 7/7	7/7-	_	<i>=7/7=7/</i>		800
					Crystalli	ne Rock					
			R	s-1	ght to Dark Gray	BIOTITE GNEISS)					
. <i>7.</i> 90			i !								790
			1	BT			BT				
				BT :			BT				
. <i>7.</i> 80											7.80
. <i>7</i> .70											770
		·	j	; 	- 						
760		i ! !	i 	1 1 1 1							760
7.60				! !	- }						
	GROUNDLINE TAKEN FROM .TIN FILE PROVID	:	:				 				! ! !
	INFERRED STRATIGRAPHY IS DRAWN THROUG PROJECTED ONTO THE CROSS SECTION	THE BORINGS WIT	H BOTH	1 	1 1 1 1		; ; ; ;				; ; ; ;
	 	40		<u>:</u> :0	1:0	i	20		; ; ;0		

	.	 		; ; ;	; } ;	ļ	; ; ;		. · · · · · · · · · · · · · · · · · · ·	10 20	PROJECT REFER		$\frac{ET\ NO}{7}$
					1 					FEET $VE = 1:1$		ROUGH STA. 16+ 90 DEGREES	-81
840						B2-A 16+81 5.3' LT	E $B2-B$ $16+81$ $5.5' RT$	-					84
830							RS-2						83
820					Ground Surface	- (1)	vial:	********	, e e e e e e e e e e e e e e e e e e e				820
810			Very Loose i	o Medium Dense	Tan, Orange, Bı	(2)	Gray, (19)	Moist, Clayey Silty		with Wood			81
800				Stiff, Tan and Sandy Clayey	 SILT_(A-4)(2 3)————————————————————————————————————		<u> </u>	<u> </u>	 _ _ 7/7 <u>=</u> 7			80
<i>7.</i> 90			Brown, Gi 7/ <u>=</u> /// <u>=</u>	dy, and white (B	Cryst	diline Ro	ck: (BIO)	? TITE GNEISS)					7.9
780						dlline Ro	BT						7.8
7.70													77
7.60													76
	GROUNDLINE TAKEN FRO INFERRED STRATIGRAPHY PROJECTED ONTO THE O	Y IS DRAWN THROUGH	THE BORINGS WITI	в вотн	20	110	0 1%	2:0		idual: Loose, Tan and Gray,	Moist, Clayey Silty SAI	ID (A-2) with Mi	ca

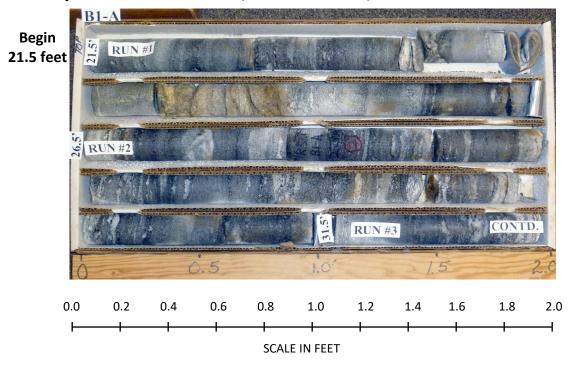


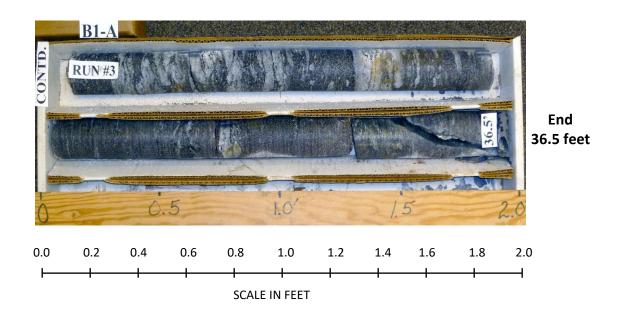


GEOTECHNICAL BORING REPORT CORE LOG

						Е	BORE	LOG														CC	DRE	LO	3					
WBS	46107.1.1		TIF	B-5392		COUN	TY CLEVI	ELAND			GEOLOGIST Stickney, J. K.		WBS	46107.1	1.1			TIP	B-5392	2	C	YTNUC	CLEV	ELAND		GE	EOLOGIST Stickne	y, J. K.		
SITE	DESCRIPTIO	N Bridge N	lo. 201 o	n SR 1641	l (Bracket	Road) o	ver Knob C	reek				GROUND WTR (ft)	SITE D	DESCRIP	MOIT	Brid	ge No. 2	201 on	SR 164	1 (Brack	et Ro	ad) ove	r Knob (Creek					GROUN	ND WTR (ft)
BOR	NG NO. B1-	A	ST	ATION 1	6+11		OFFSET	16 ft LT	_		ALIGNMENT -L-	0 HR. 17.1	BORIN	NG NO.	B1-A			STA	ATION 1	16+11			OFFSET	16 ft	LT	AL	IGNMENT -L-		0 HR.	17.1
COL	AR ELEV. 8	323.5 ft	TC	TAL DEP	TH 36.51	ft	NORTHI	NG 628,	028		EASTING 1,234,866	24 HR. 16.2	COLL	AR ELEV	1. 82	3.5 ft		тот	TAL DEP	TH 36.	5 ft		NORTHI	NG 62	28,028	EA	ASTING 1,234,866		24 HR.	16.2
DRIL	RIG/HAMMER	EFF./DATE								D NW	V Casing W/SPT & Core HAMN	IER TYPE Automatic	DRILL I	RIG/HAMN	IER EF	FF./DA1	TE HFO	0070 CN	ME-550X	84% 05/	20/2016	<u> </u>		DRI	_L METHOD	NW Cas	sing W/SPT & Core	HAMI	IER TYPE	Automatic
DRIL	LER Smith,			ART DATE			COMP.				SURFACE WATER DEPTH N	/A		ER Sm		. L.		+	ART DAT				COMP. I	DATE	10/17/16	SU	JRFACE WATER DE	PTH N	/A	
ELEV (ft)	CLCV /ft/	0.5ft 0.5f				PER FOO 50		SAMF	17	0	SOIL AND ROCK DES			SIZE N					AL RUN			ΔΤΛ								
(10)	(ft)	0.511 0.51	1 0.511	10 2	<u> </u>	30	75	00 NO.	MOI	G	ELEV. (ft)	DEPTH (ft)	ELEV (ft)	LLLV	EPTH (ft)	RUN (ft)	DRILL RATE	REC.	RUN RQD (ft)	SAMP. NO.	STR REC. (ft) %	RQD (ft)	Ö			DESC	RIPTION AND REMAR	KS		
005													802	(ft)	(17)	(1.7)	(Min/ft)	<u>%</u>	%		`%	<u>%</u>	G ELE	V. (ft)						DEPTH (1
825										-	- 823.5 GROUND SURF	ACE 0.0		802.0	21.5	5.0	1:30/1.0	(3.7)	(2.7)		(13.2)	(10.7)	802.	0			gin Coring @ 21.5 ft CRYSTALLINE ROCK		UOTITE OL	21.
	1					1		.		-	ALLUVIAL Tan and Orange, Clayey Si	Ity SAND (A-2)	800	‡			1:30/1.0 1:00/1.0 1:25/1.0 1:29/1.0	74%	54%		88%	71%		Lign	with V	ly, Modera /ery Close	ately Weathered to Fresh to Moderately Close Fra Qu=10.8 ksi, GSI=80-82	n, Hard, E acture Sp	acing	1EISS
820	‡			1						<u> </u>	-			797.0	26.5	5.0	1:29/1.0	(4.8)	(4.0)				787			C	Ju=10.8 KSI, GSI=80-82			
	817.9 5.6	1 1	2	:::::				.	١	+			795	‡		3.0	1:35/1.0 1:32/1.0 1:37/1.0	96%	80%	RS-1										
815	‡	' '	-	1				1 1	М					792.0	31.5		1:33/1.0 1:34/1.0		-											
	812.9 10.6			ļ		1		1 1		-	-		790	+		5.0	1:38/1.0 1:30/1.0	(4.7)	(4.0)											
	612.9 + 10.0	1 1	1	2				.	М					Ŧ			1:35/1.0 1:40/1.0		0070											
810	Ŧ					+					809.1	14.4	_	787.0	36.5		1:41/1.0						787.	0	Boring Termir	nated at E	Elevation 787.0 ft in Crys	stalline Ro	ck (BIOTIT	36. TE
	807.9 I 15.6	8 11	24		• •35			.	M-	\mathbb{E}	RESIDUAL Tan and Gray, Clayey Silty F with Some Mid	Fine SAND (A-2)		Ŧ									F		J		GNEISS)		`	
805	1				.			1 1	""	_		ca		1									L							
	802.9 20.6				: -:-:	+÷÷:		-		7977A	803.6 WEATHERED R	19.9 OCK		‡									L							
800	‡	100/0.2					. 100/0	.2			802.0 Gray-White (BIOTITE CRYSTALLINE R	GNEISS) / Z1.5		‡									-							
800	†						I	1 1			Light to Dark Gray (BIOT			‡									-							
	‡							-						‡									F							
795	‡			<u> </u>		+ · · ·		- $ $ RS-1			-			‡									F							
	‡					1		.	-					‡									F							
790	1							1 1						Ŧ									F							
	Ŧ										-			Ŧ									F							
	$ \frac{1}{1}$					1		4			Boring Terminated at Eleva	36.5 ation 787.0 ft in		Ŧ									E							
	$\frac{1}{1}$									<u> </u>	_ Crystalline Rock (BIOTIT	TE GNEISS)		Ŧ									E							
	1									E				+									-							
	1									Ŀ	_			‡									E							
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NC_DOT.GDT	‡													‡									-							
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1.GP.	1													‡									-							
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BRD	‡									-				‡									F							
핆	‡										-			‡									F							
GEO	‡													‡									F							
5392	‡													‡									F							
E B	†										-			‡									F							
SOUB	‡									F				Ŧ									F							
ORE L	†										_			Ŧ									F							
OT BC	†													‡									F							
NCDC	‡									l F				Ŧ									F							

CORE PHOTOGRAPHS: Bridge No. 201 on SR 1641 (Brackett Rd.) over Knob Creek, B1-A 16+11, 16.2' LT





SHEET 12

GROUND WTR (ft)

N/A

14.0

DEPTH (ft)

HAMMER TYPE Automatic

GEOTECHNICAL BORING REPORT GEOTECHNICAL BORING REPORT **CORE LOG BORE LOG**

									BO	RE L	<u> LOG</u>															<u></u>	.Ur	RE LOG			
WBS	4610	7.1.1			TIF	B-5392	2	CO	UNTY	CLEVEL	AND			GEOLOGIST Stickney, J. K	•	WB	3 461	07.1.1			1	TIP B	3-5392	2	С	OUNT	r y C	LEVELAND	GEOLOGIST Sti	ckney, J. K.	
SITE	DESCI	RIPTION	Brido	ge No.	201 o	n SR 164	1 (Bracke	et Road	d) over l	Knob Cre	eek				GROUND WTR (ft)	SITE	DESC	CRIPTIO	ON E	Bridge I					ket Ro	oad) ov		nob Creek			GROUND W
BOF	ING NO). B1-B	3		ST	ATION	16+12		О	FFSET	15 ft R	Т		ALIGNMENT -L-	0 HR. N/A	BOF	RING N	Ю. В1	-B			STATI	ON 1	16+12			OFI	FSET 15 ft RT	ALIGNMENT -L-	•	0 HR.
COL	LAR EL	EV . 82	25.8 ft		то	TAL DEP	PTH 41.0) ft	N	ORTHIN	G 627,	,996		EASTING 1,234,864	24 HR. 14.0	COL	LAR E	LEV.	825.8	3 ft	1	TOTAL	L DEP	PTH 41.	.0 ft		NO	RTHING 627,996	EASTING 1,234,	-	24 HR.
DRIL	L RIG/H/	MMER E	FF./DAT	E HR	00070	CME-550X	84% 05/2	20/2016			DRILL	METH	1 QO	NW Casing W/SPT & Core HAN	MER TYPE Automatic	DRIL	L RIG/H	HAMMER	R EFF.	/DATE	HFO007	70 CME	-550X	84% 05/	20/2016	6		DRILL METHOD	W Casing W/SPT & Core	HAM	MER TYPE Auto
DRII	LER S	Smith, C	. L.		ST	ART DAT	E 10/13	3/16	С	OMP. DA	TE 10)/13/1	6	SURFACE WATER DEPTH	N/A	DRII	LLER	Smith,	, C. L.	-	5	START	T DAT	E 10/1	3/16		CO	MP. DATE 10/13/16	SURFACE WATE	R DEPTH	V/A
ELEV	DRIVE ELEV	DEPTH	BLO	N COU	INT		BLOW	S PER F	FOOT		SAMF	P. 🔻	L	SOIL AND ROCK DE	SCRIPTION	COF	RE SIZI	E NX						l 16.6 f							
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75	100	NO.	M		ELEV. (ft)	DEPTH (ft)	ELEV	RUN ELE	DEP	TH RU	SIN I R	RILL F	RUN REC. F (ft)	RQD	SAMP. NO.	STF REC.	RATA RQD (ft) %	- 		DESCRIPTION AND RE	EMARKS	
																(ft)	(ft)	v (ft)) (f	ft) (N	/lin/ft)	(π)	(π) %	NO.	(π) %	(ft) %	Ğ	ELEV. (ft)			DI
830		1														801.4		4 + 24.	4 1	6 1:0	1/1 6 /	(1.6)	(0,0)		(15.4)	(12.6)		- 801 /	Begin Coring @ 2 CRYSTALLINE R	4.4 ft	
		‡												_		800	799.8	4 + 24: 8 + 26:		.0 0:0	01/1.6 (100%	0%		93%	76%		Light to Dark Gra	y, Moderately Weathered GNEISS with Very Close	to Fresh, Mod	derately Hard to
905		<u> </u>												825.8 GROUND SUF				‡				(3.8) (76% ((2.6) 52%					- Пага, БЮТТЕ -	GSI=80-82	e to wide Frac	ture Spacing
825		‡				 	1				1			ALLUVIA Tan, Orange, and Light 0	Gray, Clayey Silty	795	794.8	8 31.	0	1:0	00/1.0 02/1.0							-			
		‡ , .							: : :					SAND (A-	2)			‡	5.	5.0 1:0 1:0	06/1.0 (00/1.0 1	(5.0) (100% 1	(5.0) 00%								
820	820.9	4.9	2	2	2	4		- -			1	М		_		700		‡		1:0)2/1.0 10/1.0										
		‡				T								-		790	789.8	8 36.	0 5.	1:0	01/1.0 06/1.0 (05/1.0 1	(5.0) ((5.0)					- ·			
815	815.9	9.9		2	2	· · · ·								-				‡		I 1:1	10/1.0 I	100%	00%					Light to Dark Gra Hard, BIOTITE Hard, BIOTITE Hard, BIOTITE Hard, BIOTITE			
010	•	‡				• 4					11	M		-		785	784.8	8 41.	0	1:0 1:0	04/1.0 01/1.0							_784.8			
	040.0	‡,,,											7					‡										. Boring Termina -	ted at Elevation 784.8 ft ir GNEISS)	n Crystalline R	ock (BIOTITE
810	810.9	14.9	1	2	2	1 · · · · · · •					-	М		_				‡										•			
		‡				[]]]	1							807.9 RESIDUA	17.9			‡										- -			
805	805.9	19.9	100/0.4			L	ļ			100/0.4			477	Tan and Gray, Clayey Silty				‡										- -			
	1	Ŧ	100/0.1								Ĭ			WEATHERED	ROCK			‡										-			
		Ŧ												Gray and White (BIO)	24.4			‡										• •			
800		Ŧ					ļ · · ·				{			CRYSTALLINE Light to Dark Gray (BIC				‡										•			
		Ŧ																Ŧ										- ·			
795		Ŧ					: : :											Ŧ										•			
		Ŧ					1]			-				‡										-			
		Ī									!			Tan and Gray, Clayey Silt Mica WEATHERED Gray and White (BIO1 CRYSTALLINE Light to Dark Gray (BIO1				Ŧ										•			
790		+									1							Ī										•			
		<u> </u>							I									Ŧ										-			
785		<u> </u>					1		I						41.0			Ī										•			
		<u> </u>												 Boring Terminated at Ele Crystalline Rock (BIO 	vation 784.8 ft in			\pm										- -			
91/6		‡													,	15/16		İ										• •			
11/15/16		‡												-		11/1		<u> </u>										-			
GDT		‡												-		:GDT		‡										• •			
		‡												_		[0]		‡										• •			
ادِ		‡												‡		NC		+										-			
5		‡														1.GP.		‡										<u>.</u>			
10206		‡												-		G020		‡										-			
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티		‡												_		핆		‡													
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282		‡												‡		5392		‡										<u>.</u>			
mi R		‡												F		E B		‡										-			
OUBL		‡												‡		OUB		‡										• •			
W D		‡												_		RE D		‡										• •			
T BO		‡												‡		20 [‡										_			
		‡												‡		CDC		<u>†</u>										.			

CORE PHOTOGRAPHS: Bridge No. 201 on SR 1641 (Brackett Rd.) over Knob Creek, B1-B 16+12, 15.4' RT



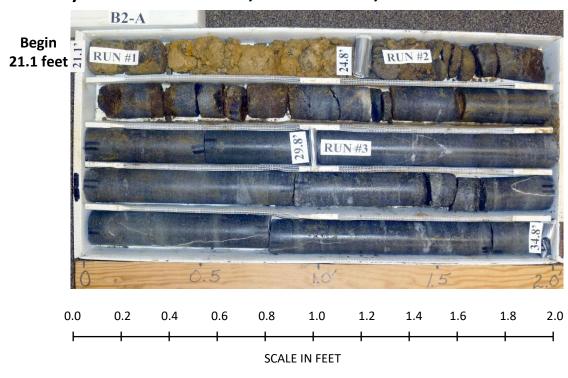


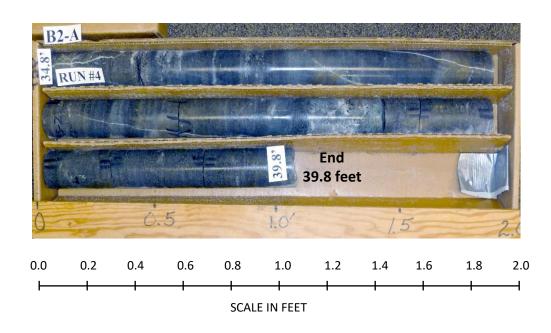
/BS	46107	.1.1			ТІ	P B-53	392		COUNT	Y CL	EVELA	AND			GEOLOGIST Stickney, J. K.		
ITE C	DESCR	IPTION	Bric	dge No	. 201	on SR 1	641	(Bracket	Road) o							GROUNI	O WTR (ft)
ORIN	NG NO.	B2-A			S ⁻	TATION	16	5+81		OFF	SET 5	5 ft LT			ALIGNMENT -L-	0 HR.	15.0
		V . 81						H 39.8 f		NOR	THING	628,0			EASTING 1,234,935	24 HR.	11.2
RILL	RIG/HAI	VIMER E	FF./DA	TE H	FO0070	CME-550	OX 84	4% 05/20/	2016			DRILL N	METHO	D W	W Casing W/SPT & Core HAMM	ER TYPE	Automatic
		mith, C	. L.		S	TART D	ATE	10/18/1	6	CON	IP. DA	TE 10/	18/16		SURFACE WATER DEPTH N/	A	
v	DRIVE ELEV	DEPTH		ow co					PER FOO			SAMP.	lacksquare	L	SOIL AND ROCK DESC	CRIPTION	
ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	5	50	75 	100	NO.	MOI	G	ELEV. (ft)		DEPTH (f
20		-				<u> </u>									_819.6 GROUND SURFA	ACE	0.
	-	-								.					Tan, Orange, Brown, and Gr	ay, Clayey S	Silty
15	816.0	3.6	2	1	1								M		SAND (A-2)		
	-	-													- •		
	811.0	8.6				i									•		
10	_	-	1	2	1	3			 				M		-		44
	-	-				[] : `\;				.			-		RESIDUAL		11.
05	806.0	_ 13.6	6	6	12	\				.			M		Tan and Orange, Fine Sand (A-4)	y Clayey SII	LI
	-	-				:	. T. " . 1			.							
	801.0	- _ 18.6] : : :				.							
00	-	-	12	10	13		_ \	23		<u> </u>			W		_ . 798.8 . 798.5 _∕\		20.
	-	-					[. 798.5 (BIOTITE GNEIS		<u></u>
95	-	-													WEATHERED RO 794.8 (BIOTITE GNES	CK	24.
	-	-								. .					CRYSTALLINE R	OCK	
90	-	-								.					(BIOTITE GNEIS	53)	
90	-	-								.					- ·		
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85	_	-							· · ·						· -		
	-	-								.					•		
80	-	-								.					_779.8		39.
	-	-													Boring Terminated at Eleva Crystalline Rock (BIOTIT	ion 779.8 ft	
	-	-													Crystaillile Rock (BIOTTI	E GINEISS)	
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GEOTECHNICAL BORING REPORT CORE LOG

									C	O	RE LOG
WBS	4610	7.1.1			TIP	B-539	92	С	OUNT	Υ	CLEVELAND GEOLOGIST Stickney, J. K.
SITE	DESCR	RIPTION	I Brid	lge No. 2	01 on	SR 16	41 (Bracl	ket Ro	ad) ov	er K	Knob Creek GROUND WTR (f
BOR	ING NO	. B2-A	١		STA	TION	16+81			OF	FFSET 5 ft LT ALIGNMENT -L- 0 HR. 15.
	AR EL						PTH 39			NC	ORTHING 628,010 EASTING 1,234,935 24 HR. 11.
				TE HFO					5		DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic
	LER S). L.		-		TE 10/1			CC	OMP. DATE 10/18/16 SURFACE WATER DEPTH N/A
	E SIZE	1	1	DDILL		AL RU Jn	N 18.7 f		RATA	<u> </u>	1
(ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	O G	DESCRIPTION AND REMARKS
798.5	798.5	+ 21.1	3.7		(1.1)	(0.0)		(1.1)	(0.0)	3477	Begin Coring @ 21.1 ft
795		‡	0.7		30%	0%		30%	0%		Brown and Tan, Completely Weathered (As In Soil) to Severely Weathered
700	794.8_	+ 24.0 +	5.0	0:31/1.0	(3.6)	(1.3)		(13.6)	(10.8)		794.8 CRYSTALLINE ROCK
		‡		0:40/1.0 0:49/1.0 0:40/1.0	72%	26%		91%	72%		From 24.8-25.2' is Brown to Light Gray, and Moderately Severely Weathered, Then: Dark Gray, Slightly Weathered to Fresh, Moderately Hard
790	789.8	29.8	5.0	0:44/1.0 1:00/1.0	(5.0)	(4.8)					to Hard, BIOTITE GNEISS with Very Close to Wide Fracture Spacing GSI-80-82 (after 27.2')
		Ī	0.0	1:00/1.0 1:00/1.0 0:55/1.0	100%						
785	784.8	34.8		0:59/1.0 1:04/1.0							
		‡	5.0	1:10/1.0 1:12/1.0	(5.0) 100%	(4.7) 94%					
700		‡		1:15/1.0 1:09/1.0							<u> </u>
780	779.8	39.8		1:15/1.0							779.8 3: Soring Terminated at Elevation 779.8 ft in Crystalline Rock (BIOTITE
		‡									GNEISS)
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CORE PHOTOGRAPHS: Bridge No. 201 on SR 1641 (Brackett Rd.) over Knob Creek, B2-A 16+81, 5.3' LT





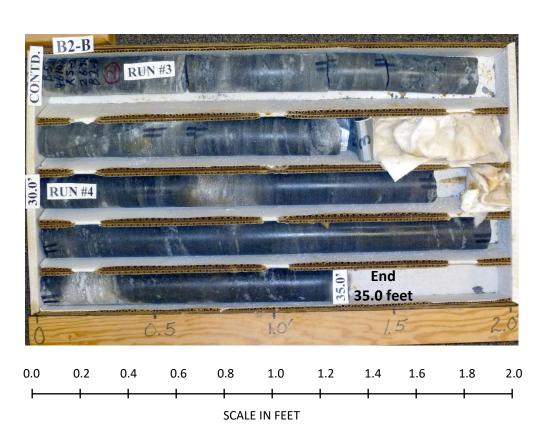
									UKE		<u> </u>				
VBS	46107	'.1.1			TI	P B-539	2	COUNT	Y CLEV	'ELA	AND			GEOLOGIST Stickney, J. K.	
SITE	DESCR	IPTIO	N Bri	dge N	o. 201 (on SR 16	41 (Brack	et Road) o	ver Knob	Cree	ek				GROUND WTR (1
BORI	NG NO.	B2-E	3		S.	TATION	16+81		OFFSE	T 6	ft RT			ALIGNMENT -L-	0 HR. 15.
COLL	AR ELE	EV . 8	19.6 f	t	T	OTAL DE	PTH 35.	O ft	NORTH	ING	627,9	99		EASTING 1,234,934	24 HR. 11.
PRILL	RIG/HAI	VIMER E	EFF./D/	ATE	FO0070	CME-550X	84% 05/2	20/2016	•		DRILL N	VIETHO	D N	V Casing W/SPT & Core HAMIN	MER TYPE Automatic
RILL	ER S	mith, C	D. L.		S.	TART DA	TE 10/18	3/16	COMP.	DAT	ΓΕ 10/	18/16		SURFACE WATER DEPTH N	I/A
LEV	DRIVE ELEV	DEPTH	d BL	ow co	DUNT		BLOW	S PER FOO	T T		SAMP.	lacksquare	LO	SOIL AND ROCK DES	CRIPTION
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25 	50	75 1	100	NO.	МОІ		ELEV. (ft)	DEPTH
320														-819.6 GROUND SURF	ACE
	-												-	ALLUVIAL Brown and Gray Clavey Si	
	- 815.8 -	3.8												Brown and Gray Clayey Si with Wood	(Y 2)
315	_		1	9	10	 	19			\exists		М		-	
	-	ŀ				: :/:				:			<u> </u>		
10	810.8 -	8.8	1	2	2	<u> </u>						M	Ŀ	_	
	-	<u> </u>					: : : :		: : : :	:		Ÿ	Ŀ	807.7	1
	805.8 -	13.8					`							RESIDUAL	0.1.1D (1.0) :::
05		13.0	30	67	33/0.2	1			. 100/	0.7 ●			77	-804.2 \ Mica	
	-	[WEATHERED R Brown, Gray, and White (Bl	OTITE GNEISS)
00	-	F												CRYSTALLINE F (BIOTITE GNE	
	-	F								-]				. (,
	-	F													
95	_	F					+			\dashv				-	
	-	ļ.									RS-2				
90	-	ļ.									K5-2	1			
	-	F												-	
	-	ļ.													
785		<u> </u>	<u> </u>			<u> </u>				\perp				-784.6	3
	-	†												Boring Terminated at Eleva Crystalline Rock (BIOTI	ation 784.6 ft in TE GNEISS)
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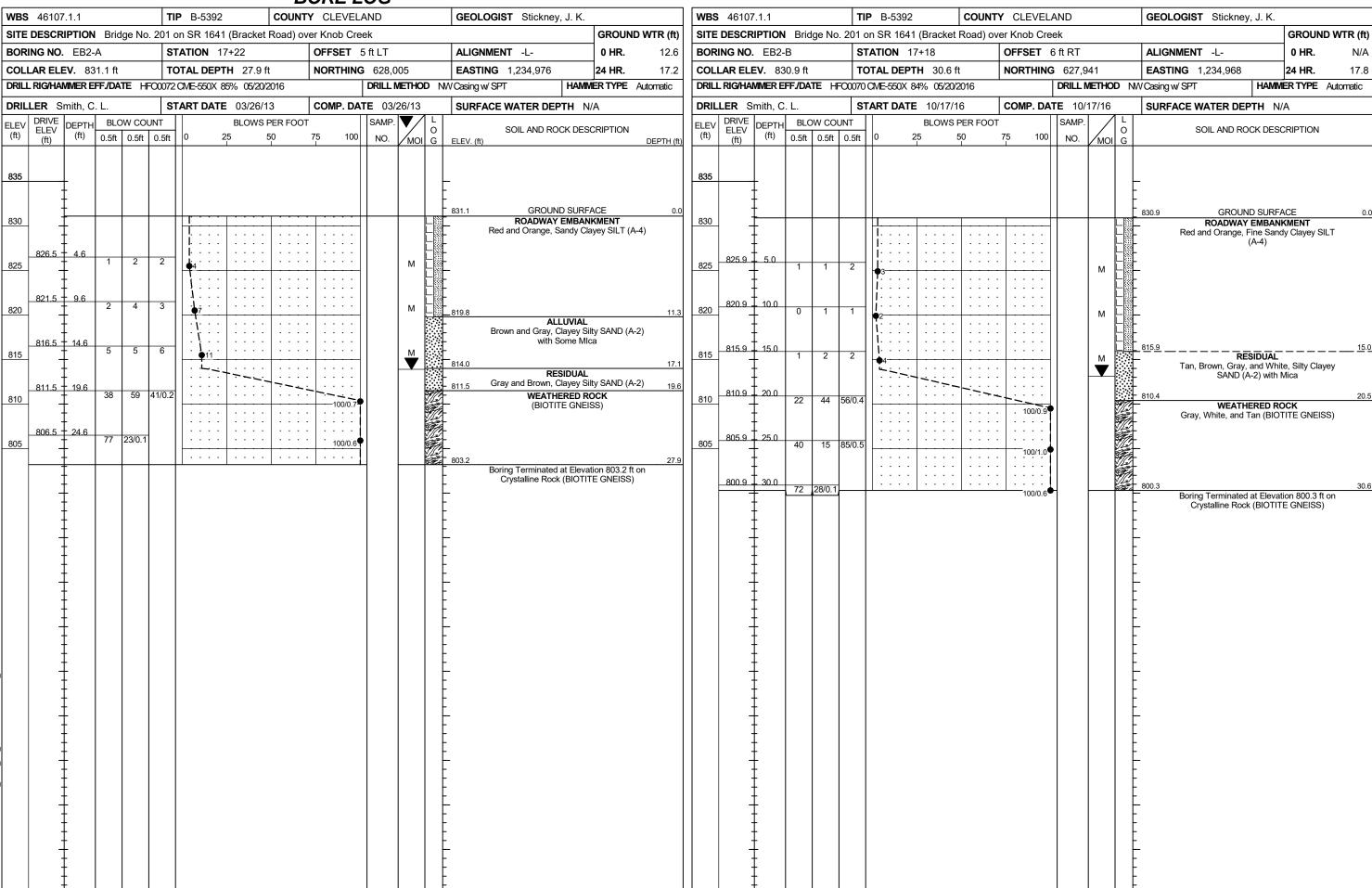
GEOTECHNICAL BORING REPORT CORE LOG

											E LOG					
		07.1.1			1	B-539					EVELAND	GEOLOGIS	ST Stickney	/, J. K.		
				dge No. 2	_			ket Ro	ad) ov	_		_				D WTR (ft)
		O . B2-E			1		16+81			1	SET 6ft RT	ALIGNMEN			0 HR.	15.5
		LEV. 8			1		PTH 35			NO	THING 627,999	EASTING			24 HR.	11.5
				NTE HFO) 		DRILL METHOD N	_				Automatic
		Smith, C	C. L.		 		TE 10/1			co	P. DATE 10/18/16	SURFACE	WATER DEI	PTH N/	A	
COR	E SIZI		_	I pour	1		N 19.6		ΔΤΔ	ļ.,						
ELEV (ft)	RUN ELE\ (ft)		RUN (ft)	DRILL RATE (Min/ft)	REC. (ft)	JN RQD (ft) %	SAMP. NO.	REC. (ft)	RATA RQD (ft) %	L O G	ELEV. (ft)	DESCRIPTION	AND REMARK	(S		DEPTH (ft
804.2 800	804.2	‡	4.6	0:45/1.0 0:44/1.0 1:06/1.0 1:11/1.0 0:00/0.6	57%	(1.1) 24% (3.8)		(17.0) 87%	(14.8) 76%		804.2 Light to Dark Gray, with	CRYSTAL , Slightly Weather or Very Close to V		Hard, BIO⊺	TITE GNEI	15.4 SS
795	794.6	25.0		0:00/0.6 0:51/1.0 0:50/1.0 0:54/1.0 0:55/1.0 0:50/1.0	90%	76%										
	754.0		5.0	1:04/1.0 1:07/1.0 1:00/1.0	(5.0) 100%	(5.0) 100%	RS-2									
790	789.6	30.0	5.0	1:10/1.0 1:05/1.0 1:10/1.0 1:09/1.0	(4.9) 98%	(4.9) 98%										
785	784.6	35.0		1:05/1.0 1:07/1.0 1:08/1.0							784.6 Boring Terminate	ed at Elevation 7	84.6 ft in Cryst	alline Roc	k (BIOTITE	35.0
																

CORE PHOTOGRAPHS: Bridge No. 201 on SR 1641 (Brackett Rd.) over Knob Creek, B2-B 16+81, 5.5' RT







SITE PHOTOGRAPHS



Photograph No. 1: Looking at End Bent 1 toward End Bent 2



Photograph No. 2: Looking Down Stream

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT PHYSICAL TESTING LABORATORY

T. I. P. No.	B-5392							
	REPORT ON SAMI	ROCK COMPRESSION						
Project	46107.1.1	County	Cleveland		Owner	Eric Williams		
Date: Sampled	11/2/2016?	Received	10/25/2016		Reported	11/9/2016		
Sampled from	Br # 201 Over Knob Creek on SR1641			By	Eric Willi	ams		
Submitted by	Eric Williams					Standard Specifications		
Tested By	Michael Dubeau				Date Tested	11/8/2016		

TEST RESULTS

Proj. Sample No.		RS-1	RS-2		
Boring Sample No.		B1-A	B2-B		
Diameter	in	1.870	1.870		
Specimen Height	in	3.65	3.68		
Area	in^2	2.746	2.746		
H/D Ratio		1.95	1.97		
Weight	lbf	1.01	1.02		
Unit Weight	lbf/ft ³	174.1	174.4		
Ultimate	lbf	29700	32500		
Ultimate	ksi	10.800	11.840		
Ultimate Corrected	ksi	10.76	11.82		
Sec Mod @ 40%	Mpsi	2.38	2.77		
Station					
Offset					
Alignment					
Depth (ft)		27.40	26.90		
	to	30.00	27.50		

cc:

Brian Hunter				
Physical Testing Engineer				

