#### STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS CONTENTS** GEOTECHNICAL ENGINEERING UNIT SHEET NO. **DESCRIPTION** TITLE SHEET **STRUCTURE** LEGEND (SOIL & ROCK) SUPPLEMENTAL LEGEND (GSI) SITE PLAN

SUBSURFACE INVESTIGATION

COUNTY <u>**ROCKINGHAM**</u>

US 158/NC 14 OVER US 29

2

2A

3

4-5

6-8

9-18

19-20

21

PROFILE(S)

CROSS SECTION(S)

SOIL & ROCK TEST RESULTS SITE PHOTOGRAPH(S)

BORE LOG(S) & CORE REPORT(S) & CORE PHOTOGRAPH(S)

STATE	STATE PROJECT REPERENCE NO.	SHEET NQ.	TOTAL SHEETS
N.C.	BR-0043	1	21

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PERSONNEL

C. Ranieri, GIT

S. Davis

T. Beard

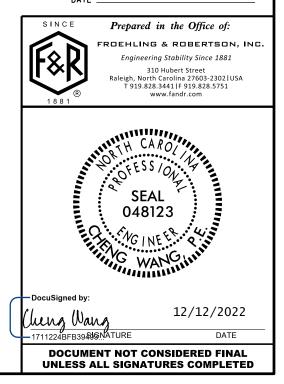
INVESTIGATED BY \_\_\_\_\_\_.

DRAWN BY T.T. Walker

CHECKED BY \_P. Alton P.E.

SUBMITTED BY <u>C. Wang</u>, P.E.

DATE \_October 2022



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			SOIL	DESC	RIPTI	ON				1		GR	ADATION						ROCK DES	
BE PEN ACCOF IS	ETRATED WITH DING TO THE BASED ON TI	H A CONTINU STANDARD I HE AASHTO	DATED, SEMI-CO JOUS FLIGHT P PENETRATION T SYSTEM, BASIC	ONSOLID OWER A EST (A DESCR	ATED, OR UGER AND ASHTO T IPTIONS (	WEATHERED D YIELD LE 206, ASTM GENERALLY	SS THAN 10 D1586), SOI INCLUDE TH	0 BLOWS PE L CLASSIFI E FOLLOWI	ER FOOT CATION NG:	WELL GRADED - INDICA UNIFORMLY GRADED - IN GAP-GRADED - INDICATE	NDICATE	GOOD REPRESEN	TATION OF PARTIC	L APPROXIMA	TELY THE SAME SIZE.	ROCK LINE SPT REFUSA BLOWS IN N	INDICATES AL IS PENE NON-COASTA	THE LEVEL AT TRATION BY A AL PLAIN MATE	ATERIAL THAT W WHICH NON-COAS SPLIT SPOON SAN RIAL, THE TRAN	OULD YIELD SPT REFUSAL IF TESTED STAL PLAIN MATERIAL WOULD YIELD MPLER EQUAL TO OR LESS THAN 0.1 VSITION BETWEEN SOIL AND ROCK I
CONSIS	TENCY, COLOR,	, TEXTURE, M	DISTURE, AASH	O CLAS	SSIFICATI	ION, AND OT	HER PERTIN	ENT FACTOR	RS SUCH				TY OF GRAI					NE OF WEATHE	RED ROCK. IDED AS FOLLOWS	3:
			Y.MOIST WITH I						•			ROUNDNESS OF <u>SUBROUNDED</u> , C	SOIL GRAINS IS D	ESIGNATED B	Y THE TERMS:	WEATHERED	E.	ITASITA		N MATERIAL THAT WOULD YIELD SPT
	S		SEND AND				ICATION	1					CAL COMPOS			ROCK (WR)		13/13/ 10	Ø BLOWS PER FO	OT IF TESTED.
GENERAL CLASS. GROUP	( A-1	GRANULAR MA (≤ 35% PASSIN A-3		(	> 35% PAS	MATERIALS SSING #200) A-6 A-7	OF	GANIC MATERI	IALS		MES SU	JCH AS QUARTZ,	FELDSPAR, MICA, T THEY ARE CONSID	ALC, KAOLIN,		CRYSTALLIN ROCK (CR)	IE		ULD YIELD SPT F EISS, GABBRO, SCF	
CLASS.	A-1-a A-1-b		A-2-5 A-2-6 A-	2-7		A-7-5, A-7-6	A-3	A-6, A-7				COMPR	RESSIBILITY			NON-CRYSTA ROCK (NCR)				RAIN METAMORPHIC AND NON-COASTAL THAT WOULD YEILD SPT REFUSAL IF
SYMBOL	000000000000000000000000000000000000000			S								COMPRESSIBLE Y COMPRESSIBLI	E	LL < 31 LL = 31 -	50	COASTAL PL	AIN			ES PHYLLITE, SLATE, SANDSTONE, ETC. DIMENTS CEMENTED INTO ROCK.BUT N
% PASSING	0000000000		1.02.000 <b>194, 19 19</b>		<u></u>			SILT-			ILY COM	1PRESSIBLE		LL > 50		SEDIMENTAR (CP)			T REFUSAL. ROCK	K TYPE INCLUDES LIMESTONE, SANDST
*10 *40	50 MX 30 MX 50 MX	51 MN					GRANULAR SOILS	CLAY	MUCK, PEAT				SE OF MATER	RIAL					WEATH	ERING
<b>=</b> 200			35 MX 35 MX 35	MX 36	MN 36 MN	36 MN 36 MM	ı	SOILS		ORGANIC MATERIAL		GRANULAR SOILS	SILT - CLAY		MATERIAL	FRESH				S MAY SHOW SLIGHT STAINING. ROCK F
MATERIAL PASSING #40										TRACE OF ORGANIC M LITTLE ORGANIC MAT		2 - 3% 3 - 5%	3 - 5% 5 - 12%	TRACE LITTLE	1 - 10% 10 - 20%	VERY SLIGHT		F CRYSTALLINE		SOME JOINTS MAY SHOW THIN CLAY CO
LL	-		41 MN 40 MX 41				1 111	S WITH LE OR		MODERATELY ORGANIC HIGHLY ORGANIC	:	5 - 10% > 10%	12 - 20% > 20%	SOME HIGHLY	20 - 35% 35% AND ABOVE	(V SLI.)	CRYSTALS	ON A BROKEN	SPECIMEN FACE S	HINE BRIGHTLY. ROCK RINGS UNDER HA
PI GROUP INDEX	6 MX Ø	NP 10 MX	10 MX 11 MN 11 3 4 MX			16 MX NO M	_ MUU	erate NTS OF	HIGHLY ORGANIC				IND WATER			SLIGHT		STALLINE NATU		AND DISCOLORATION EXTENDS INTO ROC
USUAL TYPES		cur c					ORI	GANIC	SOILS	$\nabla$	WAT	ER LEVEL IN B	ORE HOLE IMMEDIA	ATELY AFTER	DRILLING	(SLI.)	1 INCH. O	PEN JOINTS MA	Y CONTAIN CLAY. I	IN GRANITOID ROCKS SOME OCCASIONAL
of Major Materials	GRAVEL, AND SAND		ilty or clayey Ravel and sand		SOLLS	CLAYEY SOILS	MA	TTER		<b>T</b>			EL AFTER 24			MODERATE				STALLINE ROCKS RING UNDER HAMMER COLORATION AND WEATHERING EFFECTS.
GEN. RATING							FAIR TO			<u> </u>	PER	CHED WATER, SA	TURATED ZONE, OR	WATER BEAR	RING STRATA	(MOD.)	GRANITOI	D ROCKS, MOST	FELDSPARS ARE DU	ULL AND DISCOLORED, SOME SHOW CLAY
as subgrade		EXCELLENT TO			FAIR TO		POOR	POOR	UNSUITABLE	- O-M-	SPR	ING OR SEEP					WITH FRE		MER BLUWS AND SP	HOWS SIGNIFICANT LOSS OF STRENGTH
			UBGROUP IS S LI							0.00			NEOUS SYMBO			MODERATELY				STAINED. IN GRANITOID ROCKS, ALL FE
			ONSISTEN	1		STANDARD		GE OF UNC				MISCELLAR	NEUUS STMBL	JLS		SEVERE (MOD. SEV.)				AOLINIZATION. ROCK SHOWS SEVERE LO T'S PICK. ROCK GIVES "CLUNK" SOUND W
PRIMARY	SOIL TYPE	CON	CTNESS OR SISTENCY		ETRATION (N-VA	I RESISTENC ALUE)		RESSIVE S (TONS/FT	TRENGTH				OF ROCK STRU OF ROCK STRU			SEVERE (SEV.)	ALL ROCK		Z DISCOLORED OR	STAINED. ROCK FABRIC CLEAR AND EV N GRANITOID ROCKS ALL FELDSPARS AF
GENER GRANL		1	Y LOOSE .OOSE		< 4 T(	0 10				SOIL SYMBOL		Ð	OPTOMT TEST BOP	RING	SLOPE INDICATOR	(321.)	TO SOME	EXTENT. SOME	FRAGMENTS OF ST	RONG ROCK USUALLY REMAIN.
MATER	IAL		JM DENSE DENSE			030 050		N/A		ARTIFICIAL F	ILL (AF		) AUGER BORING	۵	CONE PENETROMETER TEST	VERY			SPT N VALUES >	<u>100 BPF</u> STAINED. ROCK FABRIC ELEMENTS ARE
(NON-C	OHESIVE)		Y DENSE		> !							4		$\bigcirc$		SEVERE	BUT MASS	S IS EFFECTIVE	LY REDUCED TO SO	OIL STATUS, WITH ONLY FRAGMENTS OF
GENER	ALLY		RY SOFT SOFT		к 2 Т			< 0.25 0.25 TO		- INFERRED SO	IL BOUN		)- CORE BORING	•	SOUNDING ROD	(V SEV.)				ROCK WEATHERED TO A DEGREE THAT IN. IF TESTED, WOULD YIELD SPT N VA
SILT-I MATER	CLAY	MEDI	UM STIFF STIFF		4 T 8 T(	08		0.5 TO 1 1 TO 2	.0	INFERRED ROOM	CK LIN	e <sup>Mw</sup> O	MONITORING W	ELL 🕂	TEST BORING WITH CORE	COMPLETE				DISCERNIBLE, OR DISCERNIBLE ONLY I
(COHE		VER	Y STIFF		15 TI	0 30		2 TO 4		ALLUVIAL SO	IL BOU		PIEZOMETER INSTALLATION	Ò	- SPT N-VALUE		ALSO AN		UNS. QUARTZ MAT	BE PRESENT AS DIKES OR STRINGERS.
								> 4				RECOMMENT	DATION SYMB						ROCK HA	RDNESS
	IEVE SIZE		4 10			60 20	0 270					NCLASSIFIED EX			SIFIED EXCAVATION -	VERY HARD			Y KNIFE OR SHAR	P PICK. BREAKING OF HAND SPECIMENS
OPENING (			4.76 2.0			0.25 0.0						NSUITABLE WAS <sup>.</sup> NCLASSIFIED EX			ABLE, BUT NOT TO BE	HARD	CAN BE S	CRATCHED BY #	NIFE OR PICK ONL	Y WITH DIFFICULTY. HARD HAMMER BL
BOULD		BBLE	GRAVEL		ARSE AND	F IN SAN	in l	SILT	CLAY			CCEPTABLE DEG		EMBANK	MENT OR BACKFILL			CH HAND SPECIM		UGES OR GROOVES TO 0.25 INCHES DE
(BLDF	ι.) (C	COB.)	(GR.)		E. SD.)	(F S		(SL.)	(CL.)			ABBR	EVIATIONS			MODERATELY HARD	EXCAVATE	D BY HARD BLO		T'S PICK. HAND SPECIMENS CAN BE DE
GRAIN N SIZE I		75 3	2.0	9	P	0.25	0.05	0.005	i	AR - AUGER REFUSAL BT - BORING TERMINATE	'n	MED 1 MICA	MEDIUM MICACEOUS		VANE SHEAR TEST WEATHERED	MEDIUM		RATE BLOWS.	IGED 0 05 INCHES	DEEP BY FIRM PRESSURE OF KNIFE OF
			ISTURE -	COB			TERMS			CL CLAY		MOD 1	MODERATELY	γ-1	JNIT WEIGHT	HARD	CAN BE E		MALL CHIPS TO PE	EICES 1 INCH MAXIMUM SIZE BY HARD E
SOI	L MOISTURE		FIELD		DC	GUIDE FOR				CPT - CONE PENETRATIO CSE COARSE	N IESI	ORG (	ON PLASTIC ORGANIC	-	DRY UNIT WEIGHT	SOFT				NIFE OR PICK. CAN BE EXCAVATED IN I
(A	TTERBERG LI	MITS)	DESC	RIPTION		COIDE 1 ON	TILLD THE	STORE DES		DMT - DILATOMETER TES DPT - DYNAMIC PENETRA			PRESSUREMETER TE SAPROLITIC	EST <u>SAI</u> S-B	MPLE ABBREVIATIONS				. INCHES IN SIZE BY FINGER PRESSL	BY MODERATE BLOWS OF A PICK POINT
			- SATU (SA			USUALLY L				e – VOID RATIO F – FINE			AND, SANDY	SS -	SPLIT SPOON SHELBY TUBE	VERY				WATED READILY WITH POINT OF PICK.
		LIMIT								FOSS FOSSILIFEROUS		SLI S	SLIGHTLY	RS -	ROCK	SOFT	OR MORE FINGERNA		CAN BE BROKEN B	Y FINGER PRESSURE. CAN BE SCRATCHE
PLASTIC RANGE <			- WET	- (W)		SEMISOLID			1	FRAC FRACTURED, FRAC FRAGS FRAGMENTS	TURES		IRICONE REFUSAL		RECOMPACTED TRIAXIAL CALIFORNIA BEARING			RE SPACIN		BEDDING
(PI) PL	_ 🔶 PLASTI	IC LIMIT						510AL		HI HIGHLY		V - VEF			RATIO	TERM		<u>SP4</u>	CING	TERM
	м 🔟 ОРТІМИ	JM MOISTUR	- MOIS	- (M)		SOLID; AT	OR NEAR O	РТІМИМ МО	ISTURE		T		ON SUBJECT			VERY WI WIDE	DE		AN 10 FEET 10 FEET	VERY THICKLY BEDDED THICKLY BEDDED 1.5
			- 							DRILL UNITS:		ANCING TOOLS:			OMATIC MANUAL	MODERAT CLOSE	ELY CLOSE		3 FEET D 1 FOOT	THINLY BEDDED 0.16 VERY THINLY BEDDED 0.03
			- DRY	- (D)		REQUIRES			כ				FLIGHT AUGER			VERY CL	OSE		N 0.16 FEET	THICKLY LAMINATED 0.008
				ACT1		ATTAIN UP	1001 101	STORE		Х СМЕ-55		8 HOLLOW AUG		CORE SIZ	Е:				INDUR	THINLY LAMINATED < (
					INDEX (F	PI		RY STRENG	.т <b>ы</b>	СМЕ-550		HARD FACED F		X-NQ3		FOR SEDIME	NTARY ROC	KS. INDURATION		ING OF MATERIAL BY CEMENTING, HEA
	IN PLASTIC		FLHS	0-	5	/	<u>U</u>	VERY LOW				TUNGCARBIDE	INSERTS			FRIA	BLE			FINGER FREES NUMEROUS GRAINS; BY HAMMER DISINTEGRATES SAMPLE.
	IGHTLY PLAS DERATELY P			6-1 16-1				SLIGHT MEDIUM		VANE SHEAR TEST		CASING X	W/ ADVANCER	HAND TOO	ILS: T HOLE DIGGER					SY HAMMER DISINIEGRATES SAMPLE.
	GHLY PLASTI			26 OR				HIGH		PORTABLE HOIST	X		5 <mark>∕16_</mark> •STEEL TEETH		T HOLE DIGGER D AUGER	MODE	RATELY IN	DURATED		WHEN HIT WITH HAMMER.
				COLO	)R					4 🗖			• TUNGCARB.		NDING ROD	INDU	RATED			FICULT TO SEPARATE WITH STEEL P
			LOR OR COLO								X	CORE BIT			E SHEAR TEST					BREAK WITH HAMMER. BLOWS REQUIRED TO BREAK SAMPLE;
	10DIFIERS SL	UCH AS LIG	HT, DARK, STRE	AKED, E	TC. ARE	USED TO	DESCRIBE #	PPEARANCE								EXTR	REMELY INDU	JRATED		BLUWS REQUIRED TO BREAK SAMPLE;

#### project reference no. BR-0043

DATE: 8-15-14

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TERMS AND DEFINITIONS ED AN INFERRED ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. LD SPT REFUSAL. 0.1 FOOT PER 60 ( IS OFTEN 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. T N VALUES > 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 ОСК ТНАТ SURFACE. NCLUDES GRANITE. 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. AL PLAIN IF TESTED. MAY NOT YIELD 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. STONE, CEMENTED DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT BOCKS OR CUTS MASSIVE BOCK. RINGS UNDER  $\underline{\text{DIP}}$  - The angle at which a stratum or any planar feature is inclined from the horizontal. COATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. HAMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE OCK UP TO SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. AL FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  $\underline{\mathsf{FLOAT}}$  - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. TS. IN AY. ROCK HAS H AS COMPARED 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. FELDSPARS DULL LOSS OF STRENGTH WHEN STRUCK. 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 EVIDENT BUT ITS LATERAL EXTENT. ARE KAOLINIZED 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. ARE DISCERNIBLE OF STRONG ROCK PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE ONLY MINOR OF AN INTERVENING IMPERVIOUS STRATUM. VALUES < 100 BPF RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. IN SMALL AND 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 RS. SAPROLITE IS RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT POCK NS REQUIRES <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO BLOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT DEEP CAN BE DETACHED 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 OR PICK POINT. WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL BLOWS OF THE 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. FRAGMENTS NT. SMALL, THIN 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 THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. PIECES 1 INCH CHED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: USGS BENCH MARK STAMPED "USGS 28 MAX 1971" THICKNESS ON BRIDGE WINGWALL AT THE NORTHWEST CORNER OF BRIDGE 4 FEET 1.5 - 4 FEET Easting: 1,815,132.935, Northing: 950,691.222 ELEVATION: 763.0 FEET 0.16 - 1.5 FEET .03 - 0.16 FEET NOTES 008 - 0.03 FEET BRIDGE BORING ELEVATIONS OBTAINED USING USGS BENCHMARK 0.008 FEET FIAD= FILLED IMMEDIATELY AFTER DRILLING NM= NOT MEASURED EAT. PRESSURE. ETC. TEEL PROBE: PROBE;

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

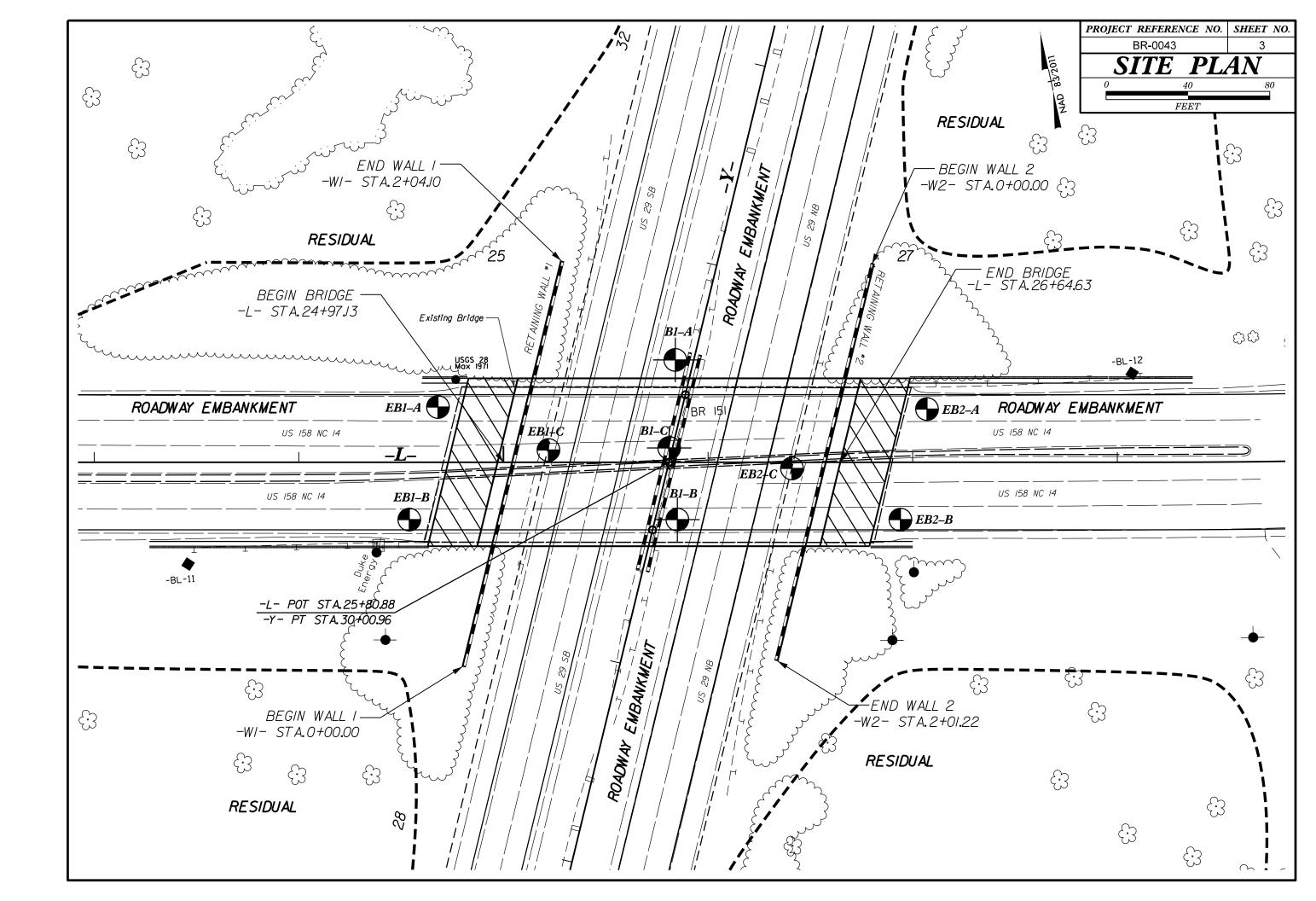
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

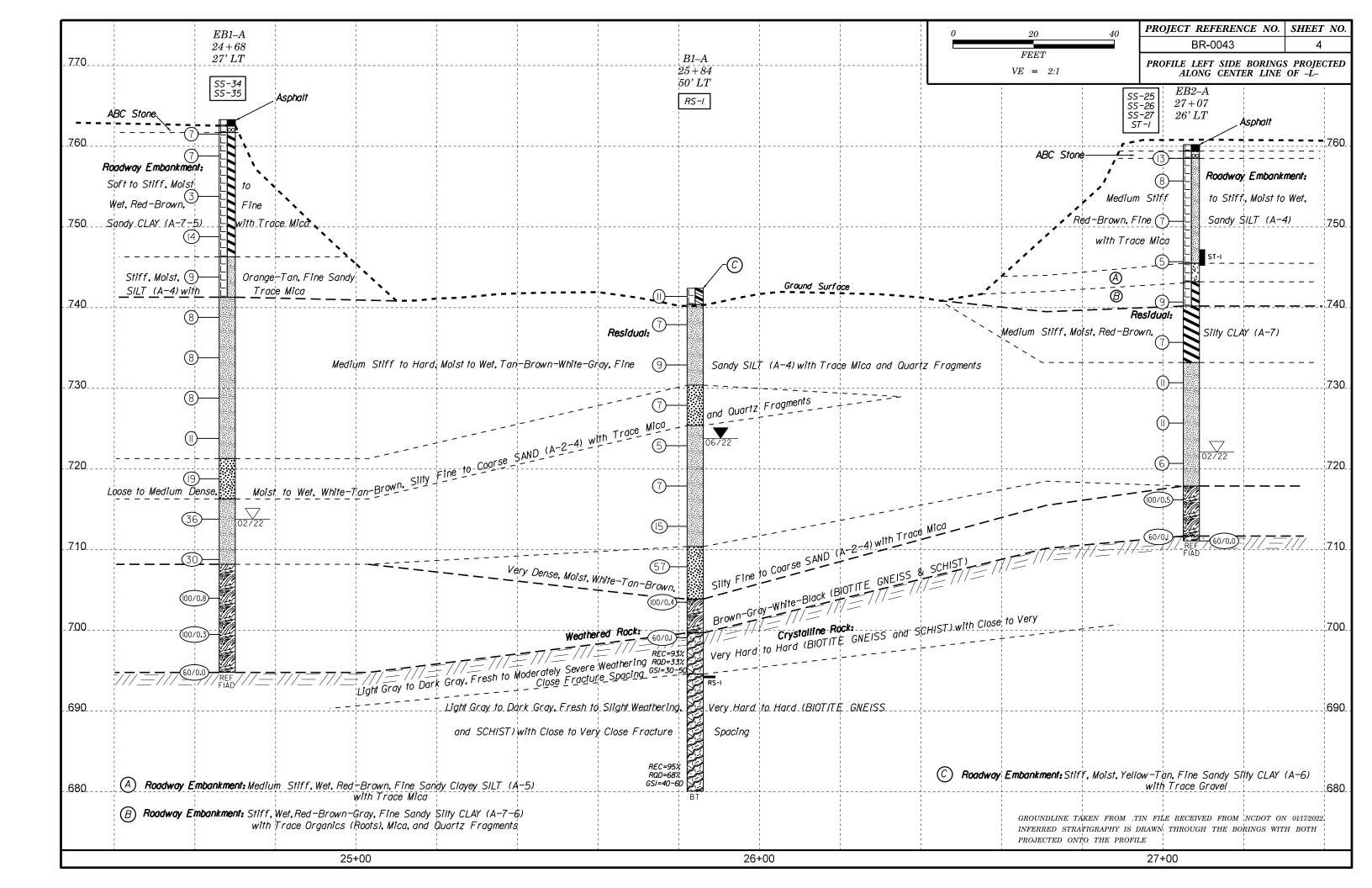
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed F	Rock Mass (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, 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.	VERY GOOD Very rough, fresh unweathered surfaces	<b>GOOD</b> 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	<b>VERY POOR</b> Slickensided, highly weathered surfaces with soft clay coatings or fillings	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 fo by a slight shift to the right in the columns for fail poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE		CREASING SI	JRFACE QUA	ALITY 💳	⇒	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A	A. Thick bedded, very blocky sondstone 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.
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 <sup>°</sup>				B. Sand- stone with thun inter-
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		5	50			layers of siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly inter- locked, heavily broken rock mass			40	30		<b>C, D, E,</b> and <b>G</b> - 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 <b>F</b> and <b>H</b> .
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Means deformation after tectonic disturbance

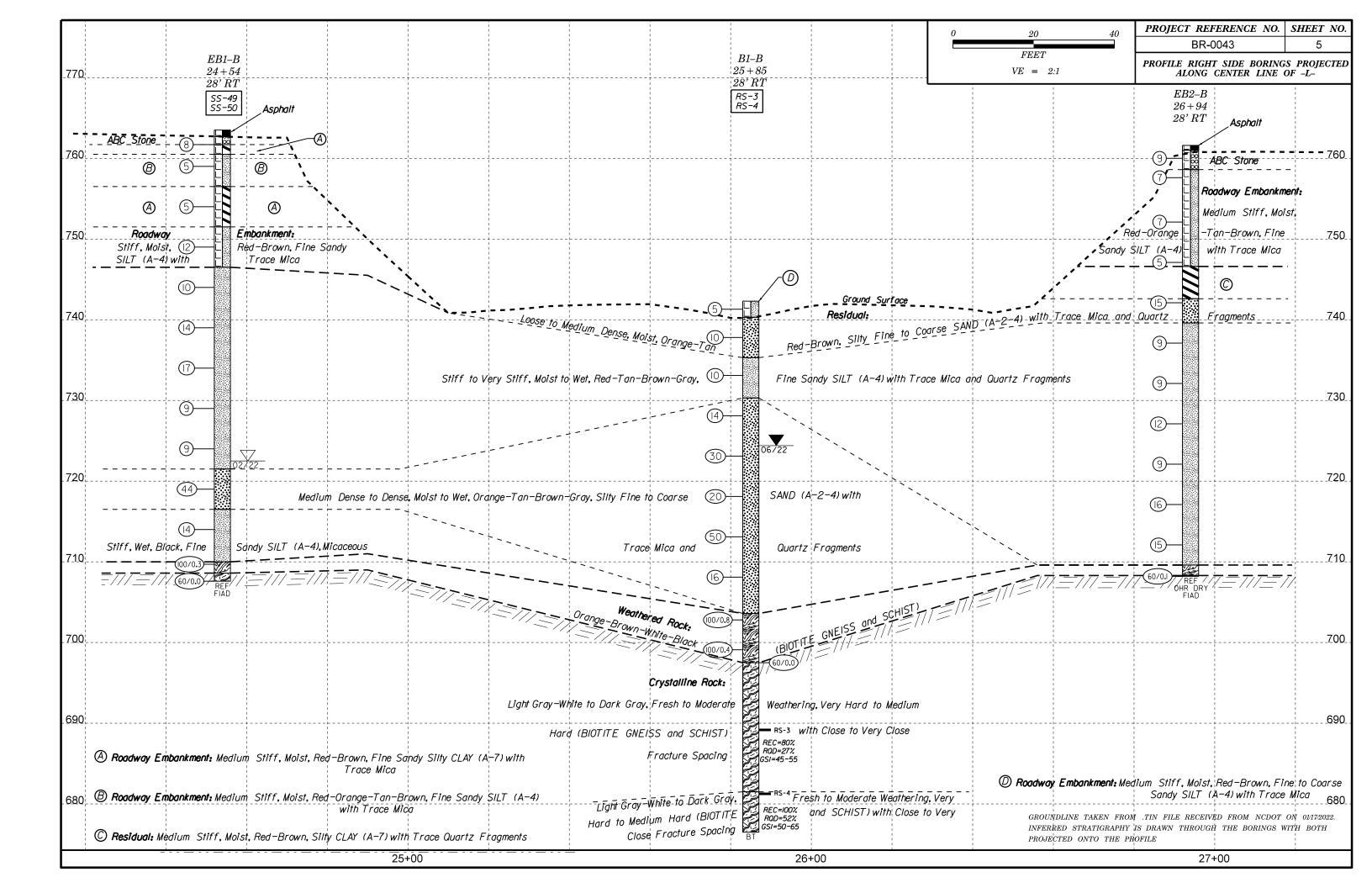
					• •
		BR-C	043		2A
Tectonically Defo	ormed Heterog	geneous Rock	Masses (Marını	os and H	oek, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	<b>GOOD -</b> Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth,occasionally slickensided surfaces with compact coatings or fillings with angular	tragments VERY POOR - Very smooth, slicken <sup>-</sup> sided or highly weathered surfaces with soft clay coatings or fillings
	70 60	A			
E. Weak siltstone or clayey shale with sandstone layers		50 B 40	СВ		E
leformed, Id/faulted, hale or siltstone deformed forming an tructure			30	F/ 20	
leformed silty forming a e with pockets iers of ransformed oieces.			¢		H, <sup>10</sup>

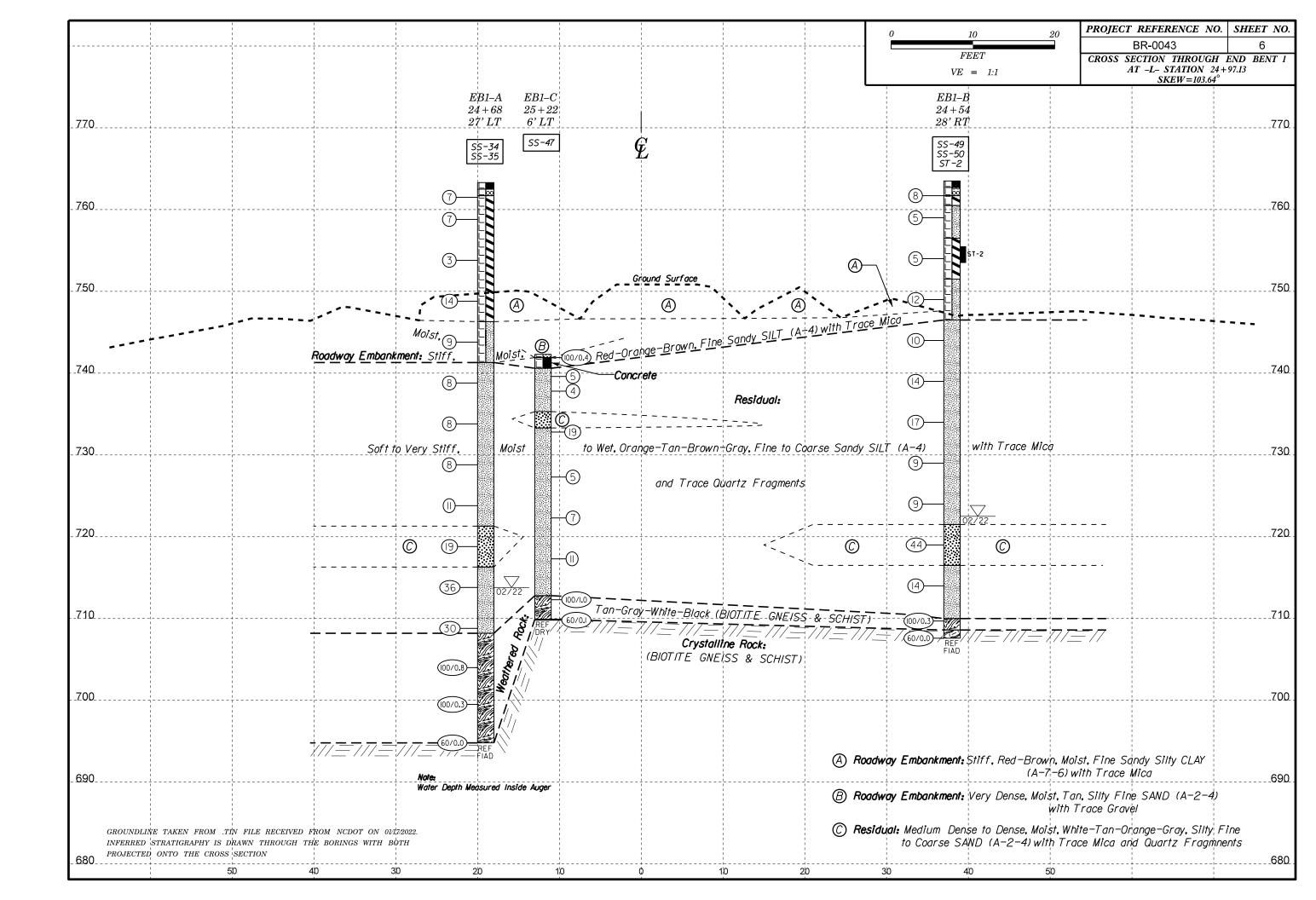
PROJECT REFERENCE NO.

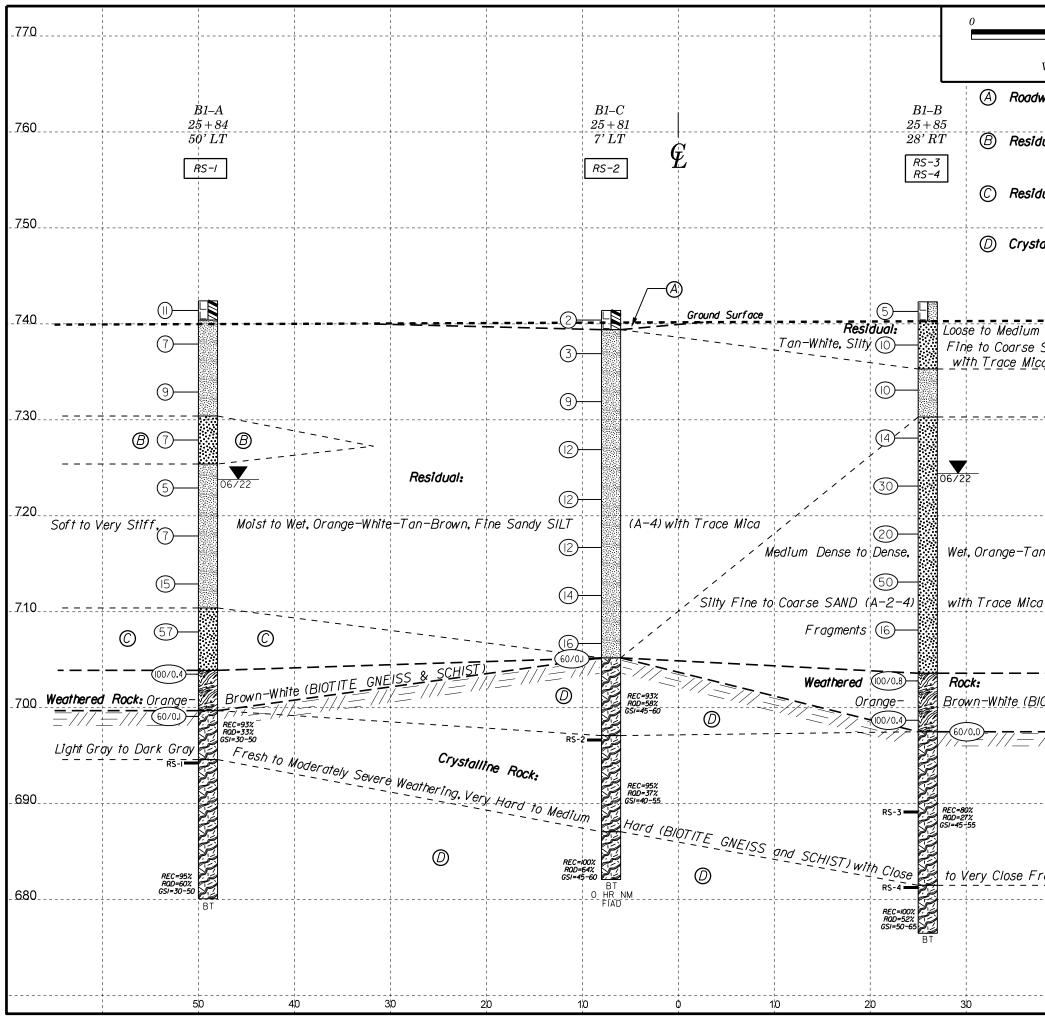
SHEET NO.



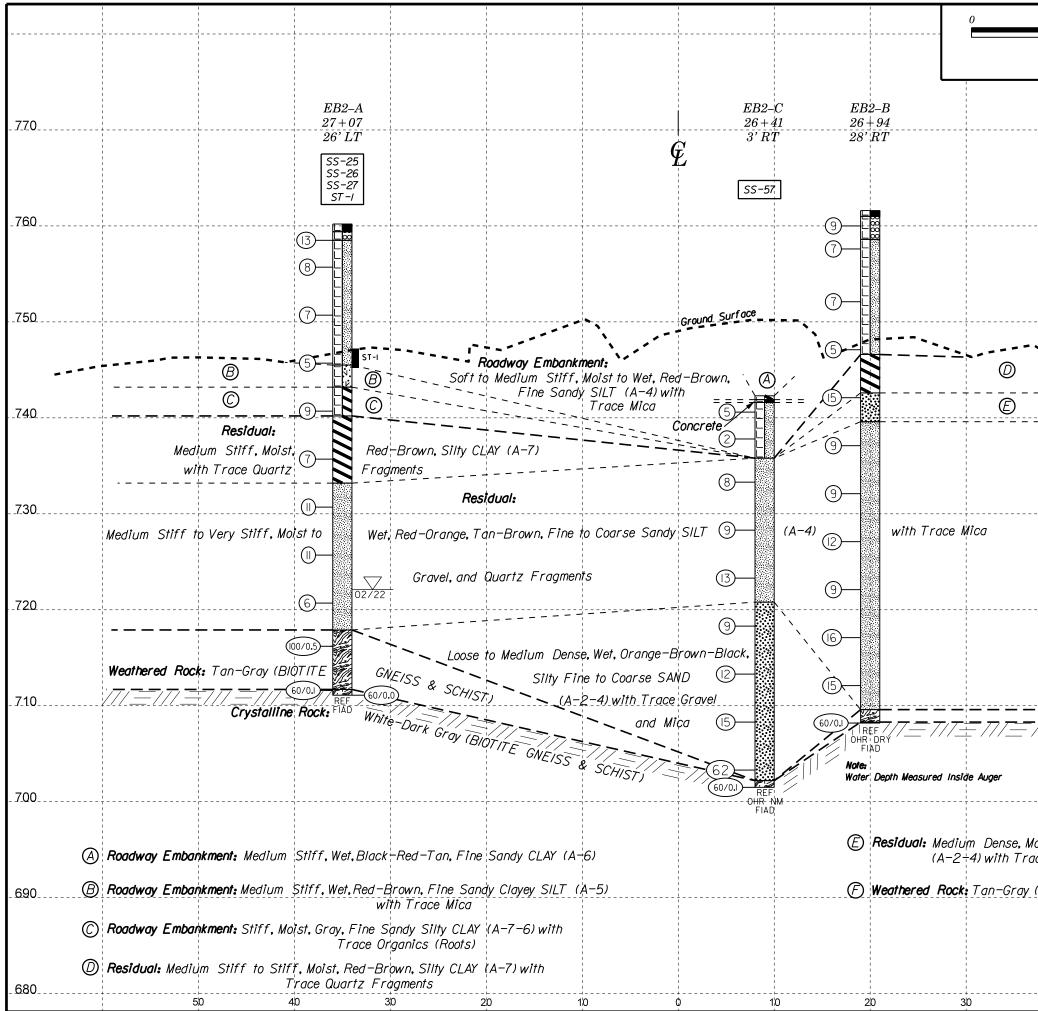






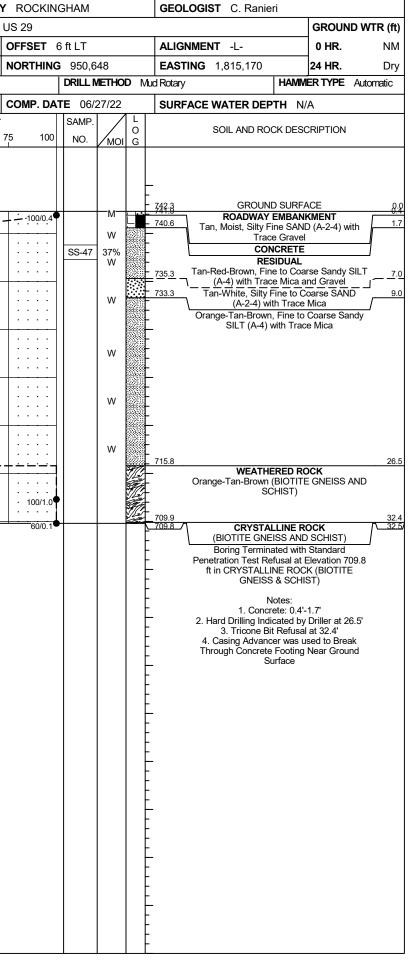


		PROJECT	REFERENCE N	O. SHEET NO.
10	20	Thojzor	BR-0043	7
<i>FEET</i> <i>VE</i> = 1:1			SECTION THRO T -L- STATION 2 SKEW=103.6	UGH BENT 1 25 + 80.88
<b>dway Embankment:</b> S				
<b>'dual:</b> Loose, Wet, Whi			ilty Fine to Coai race Mica	
<b>dual:</b> Very Dense, Ma Coarse S			rown, Silty Fine h Trace Mica	to 750 .
	Hard to	o Medium	Fresh to Moder Hard, (BIOTITE Very Close Frac	GNEISS and
n Dense, Moist, SAND (A-2-4) ica				740
				730
an-Brown-White,				720 .
ca and Quartz				710.
BIOTITE_GNEISS_& 7/7=7/7=7/		<u>T)</u>		700.
racture Spacing	· · · · · · · · · · · · · · · · · · ·			680
INFERRED STRAT PROJECTED ONT	TGRAPHY	IS DRAWN	RECEIVED FROM N THROUGH THE BORI	
40	50		1	!



10	20	PROJECT	REFERENCE	<i>NO</i> .	SHEET NO.
	Ĩ		BR-0043		8
FEET		CROSS S.	ECTION THROU	GH .	END BENT 2
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loist,Red–Orange, ace Mica and Quai			SAND	-	
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(BIOTITE GNEISS	s & SCH	HIST)	 		
			1 1 1		
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			RECEIVED FROM 1 ROUGH THE BOR		
PROJECTED ON	1		1		
 40	 50		, +	!	

												REL																		
	6704					I <b>P</b> BF					ΤY	ROCKIN	IGHAM			G	EOLOC	<b>GIST</b> C. Ranieri				67043					IP BR-00		COUN	
		RIPTION		ge No					JS 29	)										` '					lace			n US 158/N	NC14 ove	_
		<b>).</b> EB1-			_	ΤΑΤΙΟ					_	FFSET						ENT -L-	0 HR.	49.5		ING NO.					TATION			
		<b>.EV.</b> 76				OTAL					N	ORTHIN						<b>1</b> ,815,122		FIAD								<b>PTH</b> 32.5		N
		AMMER E	FF./DA	TE Få	&R2175	CME-5	5 97%	04/30/	2021				DRILL			H.S. Au	ugers	HAM	MER TYPE Auto	matic					TEF			%04/30/202		
DRIL		S. Davis				TART	DATE					omp. Da			2	SI	URFAC	E WATER DEPTH	N/A		DRIL	LER S	Davis				TART DA	<b>FE</b> 06/27/		0
ELEV (ft)	DRIVE ELEV	IDEPIR		W CO			,			ER FOC		400	SAMP.	17				SOIL AND ROCK DES	SCRIPTION		ELEV	ELEV		· – – – – – – – – – – – – – – – – – – –	W CC				PER FOO	
(ii)	(ft)	(ft)	0.5ft	0.5ft	0.5ft		4	25	5	0	75	100	NO.	/м	OI G	ELE	EV. (ft)		DE	EPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft		25	50	75
765		+														-					745		-							
	762.5	- 0.8				<u> </u>	•••	· ·	• •		•	• • • •		-		- 763 - 762 0- 761	1.3 1.5	GROUND SURF ASPHALT		0.0 0.8 1.6		742.3	- 0.0							
760	759.8	‡	14	4	3	<b>∶</b> ∳?	•••	· · ·	••• •••	· · · · · ·	:	· · · · · · · ·		D	Ľ	<u>0- 761</u>	<u>.                                    </u>	ROADWAY EMBAI ABC Stone		1.6	740	740.6 -	-	100/0.4				· · · · · ·		
	/59.8	<u> </u>	2	3	4	<b>↓</b> 7							SS-34	25%	% L			Red-Brown, Fine to Coar	se Sandy Silty			738.8 -	- 3.5	2	3	2	<b>9</b> 5			
		‡				;  :	•••		••• •••	· · · · · ·		· · · · · · · ·			Ľ			CLAY (A-7-5) with T				-	-		2		<b>4</b> <sup>4</sup> · · ·	.		
755	754.8	<u> </u>		4				· ·	•••	· · ·	·	••••		4		\$					735	-	-				- <u>``</u>	.	· · ·	÷
i		‡	1		2	<b>   </b> ♥³ :	•••	· ·   · ·	· · · ·	· · · · · ·		· · · · · · · ·	SS-35	M								733.8 -	- 8.5 -	9	9	10	1 ∶∶`\	·   · · · · 19 · · · ·		:
750		‡				$\left  \right  $	•••		· · · ·	· · ·	:	· · · · · · · ·									730	-	-				::/	·   · · · · ·		:
, 50	749.8	<u>+ 13.5</u> +	4	6	8	1 - '	<b>•</b> 14				.			м		\$					100	728.3	- 14.0				· / ·		· · ·	.
		‡							· · · ·	· · ·	:	· · · · · · · ·				746	5.3			17.0			-	2	2	3	•5	·   · · · · ·		
745	744.8	+ 18.5		4	_	<u>  -'</u> !	i : :	• •	•••		·					F		Drange-Tan, Fine Sandy Trace Mica	SILT (A-4) with		725		-					·   · · · ·	· · ·	·
		‡	3	4	5	<b> </b>   ∶ <b>∳</b> .	9	· ·	· · · ·	· · · · · ·	:	· · · · · · · ·		M		8 <b>-</b>			•			723.3	19.0	2	3	4	<u>i</u> : : :	·   · · · · ·		
740		‡					•••		· · · ·	· · ·	:	· · · · · · · ·				<u>- 741</u>	.3			<u>22.0</u>	720	-	-		-			.   .		:
740	739.8	<u> </u>	3	3	5		 							М		<u> </u>	C	Prange-Tan-Gray, Fine Sa with Trace M	andy SILT (A-4)		120	718.3	-						<u> </u>	
		‡				.T.    . .	· · ·	· · 	· ·	· · ·	:	· · · ·				<u>ال</u>		with Hace w	lua			- / 10.3	- 24.0	3	4	7		.   .		:
735	734.8	28.5					•••		•••		·					٥ <u>ل</u>					715	-	-							<u>-</u> +
		ŧ	3	4	4		B : :	· ·	· ·	· · ·	:	· · · · ·		M		۱.						713.3	29.0	19	27	73/0.5				
		ŧ				. .    . .	•••		· ·	· · ·	:	· · · ·									= 10	-	-		21	10/0.0				
730	729.8	33.5	3	3	5								-	М		÷					710	709.9	_ 32.4	60/0.1						-
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725	724.8	38.5							•••		•					Ľ						-	-							
		ŧ	3	5	6	:	11	· · ·	· ·	· · ·	:	· · · ·		М		÷						-	-							
		ŧ					Ĭ.	· · ·	· ·	· · ·	:					721	.3	Vhite, Silty Fine to Coars		<u>42.0</u>		-	-							
720	719.8	43.5	2	7	12	$\left\  \right\ _{\ldots}$		<u> </u>					-	м			v	with Trace Mica and Qua	e SAND (A-2-4) artz Fragments			_	-							
		ŧ					•	Í::	· ·	 	:	· · · ·				- 740	2			47.0		-	-							
715	714.8	48.5					•••	<u>\.</u>	•••		•				-	<u>716</u>	<u> </u>	ay, Fine to Coarse Sand	y SILT (A-4) with	<u>47</u> .0		-	-							
		±	8	17	19	1 ::	•••	: <b>`</b> •	36 ·	 	:	· · · · ·		Гм		<u>_</u>		Trace Mica and Quartz	riagments			-	-							
		ŧ					•••		· ·		:					<u>_</u>						-	-							
710	709.8	53.5	14	13	17	↓ ├					.+		-	м		L				·		_	_							
		ŧ					•••	<u>¶30</u>			- + ·	<del></del>	1		5/1	<u>708</u>		WEATHERED F		55.1		-	-							
705	704.8	58.5				11	•••	• •	•••				!			ł	(	Fray-White-Black (BIOTIT SCHIST)	E GNEISS and			-	-							
		+	60	40/0.3	]	11			•••			100/0.8	•			ł						]	-							
700		ŧ					•••									ł						-	_							
	699.8	<u> </u>	100/0.3									. 100/0.3	•			1						-	_							
695		Ŧ					•••		•••	· · · ·						1						-	_							
695	694.8	<u> </u>							• •							£694	.8			68.5		-	-							
		- - - - -	60/0.0									60/0.0				-		Boring Terminated wit enetration Test Refusal at ft on CRYSTALLINE RC GNEISS and SC	t Elevation 694.8 CK (BIOTITE			-	-							
																- - -	1.	Notes: Harder drilling indicated 2. Water observed in a immediately after	uger at 49.5'				-							



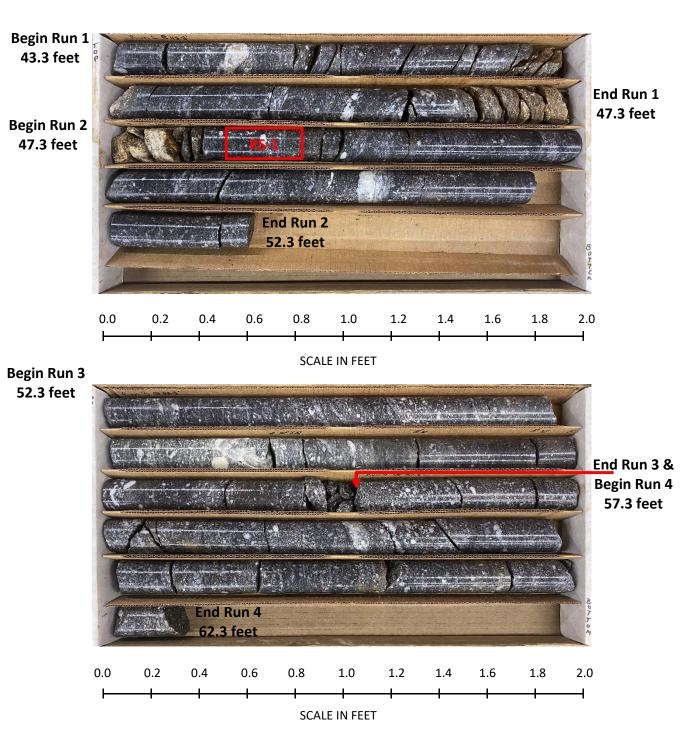
								ORE L							
WBS	67043	3.1.1			TI	IP BR-0043	COUNTY	ROCKING	GHAM		GEO	LOGIST C. Ranie	ri		
SITE	DESCR		Brid	dae No	. 151 (	on US 158 over US 29	9							GROUND	WTR (ft)
	ING NO.					<b>TATION</b> 24+54	-	OFFSET 2				NMENT -L-		0 HR.	41.0
					_						_				
	LAR ELI					OTAL DEPTH 55.9 ft		NORTHING				<b>TING</b> 1,815,096		24 HR.	FIAD
DRILL	_ RIG/HA	MMER E	FF./DA	TE F8	R2175	5 CME-55 97% 04/30/2021			DRILL	/IETHOD	H.S. Auger	S	HAMME	RTYPE A	Automatic
DRIL	LER S	. Davis			S	TART DATE 02/02/2	2	COMP. DAT	<b>FE</b> 02/0	02/22	SUR	FACE WATER DEP	TH N/A	1	
ELEV	DRIVE	DEPTH	BLC	DW COI	JNT	BLOWS F	PER FOOT		SAMP.	V/L					
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25 5	50	75 100	NO.	MOI G	ELEV. (1	SOIL AND ROO	CK DESCF	RIPTION	DEPTH (f
	(11)														
765		ł									<b>-</b>	00010		~-	
	- 762.7 -	- 0.8									- 763.5 - 762.7		D SURFAC	je	0
	-	t	6	5	3					мЦ	- 761.7 - 760.5	ROADWAY	EMBANK	MENT	1.
760	760.0	3.5	2	2	3		<u> </u>	<u> </u>	SS-49	29%	- 100.5	ABC	C Stone		
	-	ŧ	-	-		$\left \begin{array}{c cccccccccccccccccccccccccccccccccc$			55-49	29%	9 <b>-</b>	with T	race Mica		í i
	-	ŧ							ST-2		756.5	Red-Brown, Fine to (	Coarse Sai race Mica	ndy SILT (A	(-4) <u>7</u> .
755	755.0_	8.5	3	2	3				ST-2 SS-50	32% W	-	Red-Brown, Fine	to Coarse		
	-	ļ.			_				33-30		₽ I	CLAY (A-7-5)	) with Trac	e Mica	
750	-	ţ				$\left  \left  \begin{array}{c} \cdot \\ \cdot $					<u>- 751.5</u>	Red-Brown, Fine S	Sandy SII		<u> 12</u> .
750	750.0	13.5	4	5	7	<u> </u>				мЦ	-	Trac	ce Mica	i (A-4) with	1
	.	F									F				
	-	t									<u>- 746.5</u>				17
745	745.0	18.5	2	5	5		+ • • • •	<b>····</b>		м		Tan-Brown-Gray, Fin	e Sandy S	SILT (A-4) w	vith
	-	F									F	Trac	ce Mica		
- 10	-	t									-				
740	740.0	23.5	3	6	8		<u> </u>			м	<u> </u>				
	-	F									F				
705	-	‡									9 <b>-</b>				
735	735.0	28.5	6	8	9		<u> </u>			м	-				
		F									F				
720		‡									ł				
730	730.0	33.5	4	4	5					м	-				
	-	F									F				
705	-	‡									8 <b>-</b>				
725	725.0	_ 38.5	3	4	5					M <sub>5</sub>					
	-	+									_				
720		‡									<u>- 721.5</u>	Tan-Orange-Gray	. Silty Fine	e to Coarse	<u> </u>
120	720.0	43.5	16	19	25		· · · · · · · ·			м		SAND (A-2-4) with	Trace Mic	a and Quar	tz
	-	ł				/						FIA	gments		-
715		‡									<u>- 716.5</u>	Black, Fine Sandy	SILT (A-4)	. Micaceou	<u> </u>
/ 13	715.0	48.5	5	6	8					w		, <b>,</b>	,	,	
	-	ł				]					éL				
710	740.0	F									710.0				53
/ 10	710.0	53.5	100/0.:	3				100/0.3			<u>a – – – -</u>				<u>53</u> 54
	707.6	55.9	60/0.0					60/0.0			- 708.6 - 707.6		NEISS an LLINE RO		55
	-	F	100/0.0	′				00,010			F	(BIOTITE GNE			
		ŧ									F	Boring Termina Penetration Test Re			7.6
	-	Ł									Ł	ft in CRYSTALLI	NE ROCK	(BIOTITE	.0
	-	ł									F	GNEISS a	and SCHIS	51)	
	-	ŧ									F		lotes:	driller of 54	0'
	-	t									Ł	1. Harder drilling ind 2. Auger n	efusal at 5	5.9'	
	-	ł									F	3. Shelby Tube (ST	-2) Obtain 8' RT	ed at 24+52	2,
	-	ŧ									F		0 111		
	-	t									Ł	<u>Other Samples:</u> ST-2 (8.0 - 10.0)			
	-	ŀ									F	012(0.0-10.0)			
	-	ţ									F				
	-	t									Ł				
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		-								· · · · ·	<u> </u>				

								<u>ORE L</u>							
WBS	67043	5.1.1			Т	IP BR-0043	COUNT	Y ROCKIN	GHAM			GEOLOGIST C. Ranieri			<b>3S</b> 67043.1.1
SITE	DESCR	IPTION	l Rep	lace E	Bridge	780151 on US 1	158/NC14 over	US 29						9 <u> </u>	E DESCRIPTIO
BORI	NG NO.	B1-A	١		S	<b>TATION</b> 25+84		OFFSET	50 ft LT			ALIGNMENT -L-	0 HR. NI	//	RING NO. B1
COLL	AR ELE	<b>EV.</b> 74	12.4 ft		Т	OTAL DEPTH	62.3 ft	NORTHING	<b>9</b> 50,6	677		EASTING 1,815,240	<b>24 HR.</b> 18.	5	LLAR ELEV.
DRILL	. RIG/HAI	VIMER E	FF./DA	TE F	&R2175	CME-55 97% 04/30	)/2021		DRILL	METHO	DN	V Casing W/SPT & Core HAMIN	<b>ERTYPE</b> Automatic		ILL RIG/HAMMER
DRIL	L <b>ER</b> S	. Davis			S	TART DATE 06	6/21/22	COMP. DA	<b>TE</b> 06/	21/22		SURFACE WATER DEPTH N	/A		ILLER S. Dav
ELEV	DRIVE ELEV	DEPTH	BLC	w co	UNT	BL	OWS PER FOOT	-	SAMP.	$\mathbf{\nabla}$	L O	SOIL AND ROCK DES	CRIPTION	cc	RE SIZE NQ
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	Имо		ELEV. (ft)	DEPTH	(ft) ELE (ft	ELEV   (ff)
														(1	/ (ft) (ft)
745		_										-		699	.1 699.1 43.3
	- 742.4	- 00										742.4 GROUND SURF	ACE	0.0	1
740	-		4	5	6		· · ·   · · · ·	• • • • •		м		<b>ROADWAY EMBAN</b> 740.4Yellow-Tan, Fine Sandy Silty		.0 69	<u>5 695.1 <del>+</del> 47.3</u>
740	738.9	3.5				- ; +									1
	-	-	3	3	4		 			M	-	Yellow-Tan, Fine Sandy S		69	0 690.1 52.3
735	-	-						• • • • •			-	Trace Roots and	Mica		+
	733.9	8.5	3	4	5	. <b>!</b>     . <b>.</b>	 			w					‡
	-					· <b>T</b> · · ·   · ·						730.4	1:	.0	5 685.1 57.3
730	728.9	_ 13.5										White-Tan-Brown, Silty F SAND (A-2-4) with Tr	ine to Coarse		‡
	-	-	2	3	4	.∳7 · ·   · ·				W		SAND (A-2-4) WIT T			680.1 + 62.3
725	-	_										725.4		. <u>o</u>	
	723.9	18.5	2	2	3					M		with Trace Mic			
	-														
720	718.9	23.5										-			1
	-	-	2	3	4					м					<u>†</u>
715	-	-									F				
	713.9	28.5	4	6	9					w	F	-			
	-	F		-							F	740.4			
710	708.9	33.5					· · · · · · · · · · · · · · · · · · ·				F	710.4 White-Tan-Brown, Silty F	ine to Coarse	<u>0</u>	‡
	-		13	21	36	1	• • • • • • • • • • • • • • • • • • •			м	F	SAND (A-2-4) with Tr	ace Mica		<u>†</u>
705	-	F									F				
	703.9	38.5	100/0.4					100/0.4			977			.5	<u>+</u>
	-	-										Orange-Brown-White (BIOTI SCHIST)	TE GNEISS and		
700	699.2	43.2										<u>- 699.7</u> 699.1 CRYSTALLINE R	42 42		
	-	-	60/0.1					60/0.1			R	Light Gray-White to Dark ( GNEISS and SCI	Gray (BIOTITE		
695	-	F									S-S-	-694.6	,	.8 8	
	-	Ē							RS-1		57	Light Gray-White to Dark C GNEISS and SCI	Gray (BIOTITE	8/4/22	‡
	-										67	GIVEISS and SCH	101)	GDT	
690	-	F									67	-		DOT.0	±
	-	F									67			NC	±
685	-	F									64			GPJ	+
	-	F									64	-		BRDG	±
	-	F					· · ·   · · · ·				BA			EL B	
ł							•••	••••					62 ation 680.1 ft in	<u>3</u> 0 <u>.</u> 9	
	-	F										CRYSTALLINE ROCK (BIO SCHIST)			II
	-	F										_ Notes:		BR0043	±
	-	F										1. Surficial Organic Sc	vil: 0.0-0.2'		<u>I</u>
	-	F										2. Harder Drilling indicated b 3. Auger Refusal a	t 43.2'	Inod	
	-	F										4. Start Coring at - 5. 0 HR Water Level Not M	easured due to	ORE	<del>]</del>
	-	F										Water being introduced	tor coring	NCDOT CORE DOUBLE	7
	-	F												NCD	Ŧ

											E LOG	1	
		43.1.1				BR-00					OCKINGHAM	GEOLOGIST C. Ranieri	1
				place Brid				8/NC1	4 over	1			
BOR	RING N	<b>O.</b> B1-A	۱		STA	TION	25+84			OFF	SET 50 ft LT	ALIGNMENT -L-	0 HR. NN
		LEV. 74			1		<b>PTH</b> 62			NO	THING 950,677	EASTING 1,815,240	<b>24 HR.</b> 18.0
				TE F&R2						-	DRILL METHOD NM	Casing W/SPT & Core HAMIN	IER TYPE Automatic
		S. Davis					TE 06/2			COI	<b>P. DATE</b> 06/21/22	SURFACE WATER DEPTH N	/A
COR		E NQ			TOT	AL RUI	N 19.0						
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)	ESCRIPTION AND REMARKS	DEPTH
<u>699.1</u>	699.	Ŧ	4.0	1:40/1.0 1:30/1.0 1:10/1.0	(3.8) 95%	(1.5) 38%		(4.2) 93%	(1.5) 33%		699.1 Light Gray to Dark Gra to Hard (BIOTITE C	Begin Coring @ 43.3 ft ay, Fresh to Moderately Severe Weath GNEISS) with Close to Very Close Fra GSI=30-50	ering, Very Hard 43 cture Spacing
695	695.	+	5.0	1:32/1.0 1:10/1.0 1:27/1.0 1:39/1.0 1:50/1.0	(4.4) 88%	(3.1) 62%	RS-1	(13.8) 95%	(9.9) 68%		(BIOTITE GNEISS an	Gray, Fresh to Slight Weathering, Very d SCHIST) with Close to Very Close F 48.0'-48.3', qu=5,015 psi, GSI=40-60	47 Y Hard to Hard racture Spacing
690	690.	+	5.0	1:47/1.0 1:37/1.0 1:49/1.0 1:58/1.0 1:58/1.0	(4.8) 96%	(3.5) 70%							
685	685.	+	5.0	1:55/1.0 1:43/1.0 1:42/1.0 1:43/1.0 1:52/1.0	(5.0) 100%	(3.3) 66%							
	680.	1 <u>† 62.3</u>		2:28/1.0							680.1 Boring Terminated at	Elevation 680.1 ft in CRYSTALLINE F GNEISS & SCHIST)	62 ROCK (BIOTITE
											2. Ha	Notes: 1. Surficial Organic Soil: 0.0-0.2' rder Drilling indicated by driller at 42.7' 3. Auger Refusal at 43.2' 4. Start Coring at 43.3' Jot Measured due to Water being intro being intro intro intro the source of the	

### GEOTECHNICAL BORING REPORT CORE LOG



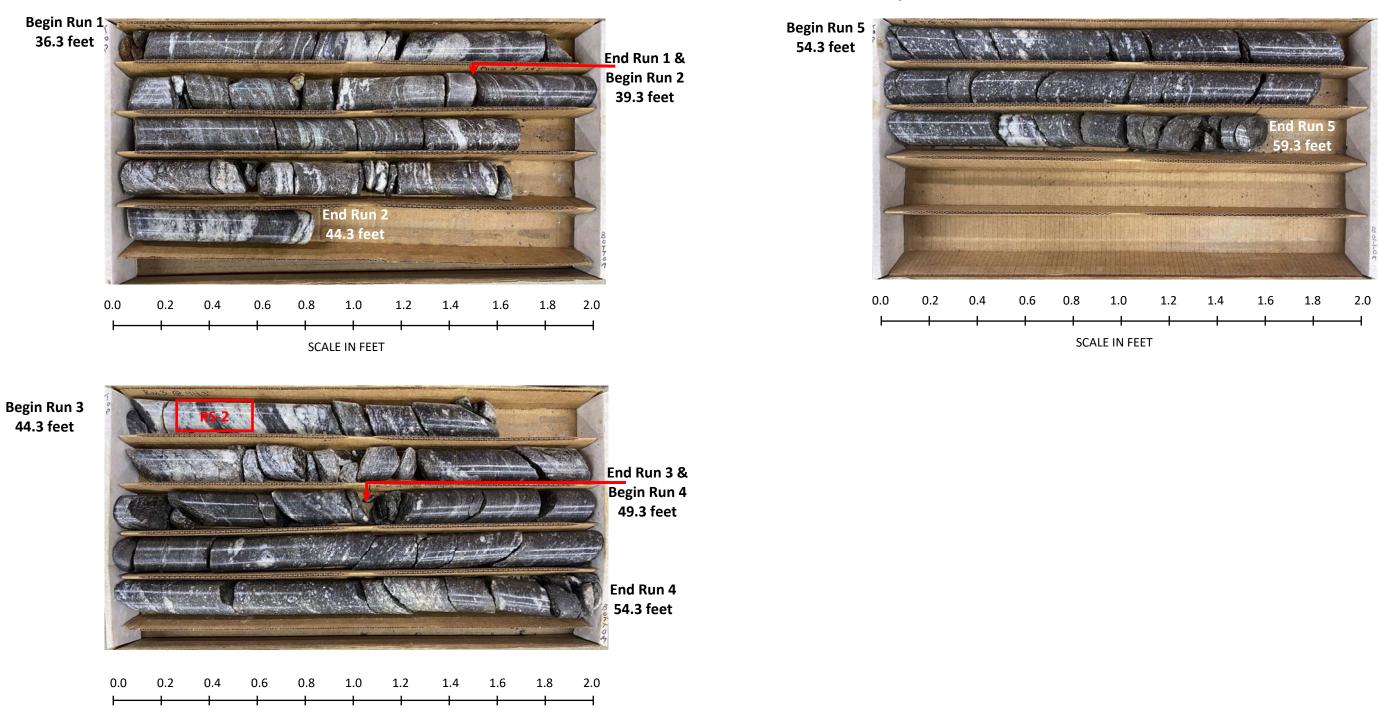


									BORE	LOG																<u> </u>
WBS	6704	3.1.1			Т	IP BR-00	43	COU	NTY ROCKI	NGHAM			GEOLOGIST C. Ranieri				WBS	67043	3.1.1			TIP	BR-0	043	C	COUNT
SITE	DESCR	RIPTION	I Re	blace I	Bridge	780151 oi	n US 158	NC14 o	ver US 29				•		GROUND	NTR (ft)	SITE	DESCR	RIPTION	N Rep	place Brid	lge 78	0151 c	on US 15	58/NC1	14 over
BOR	ING NO	. B1-C	;		s	TATION	25+81		OFFSET	7 ft LT			ALIGNMENT -L-		0 HR.	NM	BOR	ING NO	. B1-0	2		STA	TION	25+81		
COL	LAR EL	<b>EV</b> . 74	1.4 ft		т	OTAL DEF	<b>TH</b> 59.3	ft	NORTHIN	<b>G</b> 950,	636		EASTING 1,815,228	2	24 HR.	FIAD		LAR ELI						<b>PTH</b> 59		
DRIL	l Rig/Ha	MMER E	FF./D/	TE F	&R2175	5 CME-55 97	% 04/30/20	21	•	DRILL	METH	DD N	W Casing W/SPT & Core	HAMME	RTYPE AU	tomatic	DRIL	l Rig/Ha	MMER E	:FF./DA	TE F&R2	2175 CN	/IE-55 97	7% 04/30/	2021	
DRIL	LER S	6. Davis			s	TART DAT	<b>E</b> 06/23	/22	COMP. D	<b>ATE</b> 06	/23/22	2	SURFACE WATER DEPTH	H N/A			DRIL	.LER S	. Davis	;		STA	rt da	<b>TE</b> 06/	23/22	
ELEV	DRIVE ELEV	UEPIN	BL	ow co	UNT		BLOW	S PER FC	OT	SAMP	. 🗸	L	SOIL AND ROCK				COR	E SIZE	NQ					N 23.0		
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 10	NO.	Имс	) G	ELEV. (ft)			DEPTH (ft)	ELEV		DEPTH		DRILL RATE	REC.	UN RQD	SAMP. NO.	REC.	RATA RQD
																	(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %
745		+											_				712551	705.1	36.3	3.0	2:04/1.0	(3.0)	(1.5)	<u> </u>	(7.4)	(4.6)
		ŧ											-		_			702.1	39.3		2:37/1.0 1:39/1.0	100%	50%		93%	) (4.6) 58%
740	741.4	<u>+ 0.0</u> +	WOH	1	1	; · · ·		• • • •	•• •••		D		- 741.4 GROUND S - ROADWAY EN	MBANKI	MENT	0.0	700		Ŧ	5.0	1:44/1.0 1:46/1.0	(4.4) 88%	(3.1) 62%			
	737.9	+ - - <u>3.5</u>											7 <u>39.4</u> Red-Tan, Fine Sandy C Mica and Tra	CLAY (A race Gra	-6) with Trac vel	e <u>2.0</u>		.	Ŧ		2:00/1.0					
		<u>- 3.5</u> -	WOH	1	2						м		RESID Yellow-Tan-Brown, Fil	DUAL		- '		697.1	44.3	5.0	1:43/1.0 2:25/1.0	(4.5)	(1.8)	RS-2	(9.5)	) (3.7) 5 37%
735		Ŧ						· · ·					with Trac		.,		695	-	Ŧ		1:55/1.0	90%	36%		-/ 95%	37%
	732.9	8.5	4	4	5						w		-					692.1	49.3		2:05/1.0 2:44/1.0					
730		Ŧ						· · · ·					-				690		Ī	5.0	1:53/1.0 1:45/1.0					
	727.9	13.5				- 1							-						+		1:47/1.0 1:59/1.0					
		Ī	3	5	7	• • 12					w							687.1	54.3	5.0	1:46/1.0				(5.0)	) (3.2) 6 64%
725		ŧ					<u> </u>	<u> </u>	· · · · · · · ·				_				685	-	ŧ		1:49/1.0	100%	64%		100%	) 64%
	722.7	<u> </u>	3	5	7			·   · ·			w		-					682.1	59.3	<u> </u>	1:56/1.0 1:53/1.0			-		
720		ŧ		-		•12							-					· -	‡							
	717.7	+ 23.7											-						ŧ							
745		+	3	5	7	12	· · ·	.   .			W		-						ŧ							
715		‡											-					-	ŧ							
	712.7	<u>+ 28.7</u> +	4	6	8	_	· · · ·	·   · · ·   · ·	· ·   · · · · ·		w		-						ŧ							
710		‡							· ·   · · · · ·				-					-	ŧ							
	707.7	+ - <u>33.7</u>				] :: <b>i</b> :		·   · · ·					-						ŧ							
705	705.2	+ 36.2	3	6	10		6	·   · · ·   · ·	· ·   · · · · ·		W		- 705.2			36.2			Ŧ							
		+	60/0.1						60/0.1	<b>•</b>		R	705.1 CRYSTALL Light Gray to Dark Gra	INE RO	CK TTE GNEISS	36.3		-	Ŧ							
		Ŧ										R	and SC	CHIST)					Ŧ							
700		Ŧ						· · ·	· · · · · · · ·	$\left\{ \right\}$		R	-					-	Ŧ							
		Ŧ											697.1			44.3			ŧ							
695		Ŧ								RS-2	7		Light Gray to Dark Gra and SC	ay (BIOT CHIST)	TTE GNEISS	;	N		ŧ							
		ŧ											-				8/4/22		‡							
		<u>‡</u>					· · · ·						-				GDT		‡							
690		‡							· · · · · · · ·	11			-				DOT	-	ŧ							
		ŧ					· · · ·						687.1			54.3	NC		ŧ							
685		‡							· ·   · · · · ·				Light Gray to Dark Gra and SC	ay (BIOT CHIST)	TTE GNEISS	,	GPJ.	-	ŧ							
		‡											- 682.1			59.3	BRDG		ŧ							
		+								1			Boring Terminated at CRYSTALLINE ROCK				표		ŧ							
	-	ŧ											SCHI			×	GEO	-	Ŧ							
		ŧ											- - Note - 1. Tricone Bit R		t 36 2'		BR0043		Ŧ							
5	-	Ŧ											_ 2. Start Cori _ 3. 0 HR Water Level N	ing at 36	6.3'		E BR	-	Ŧ							
ODEL		Ŧ											- 3. O FIR Water Level 1 - Water being intro				DOUBLE		ŧ							
		Ŧ											-				ZE DC		t							
2	-	Ŧ											-				r core		ŧ							
		Ŧ											-				NCDOT		t							
		T											-				ž			L	1	1		L	<u> </u>	<u> </u>

## **GEOTECHNICAL BORING REPORT** CORE LOG

				ROCKINGHAM GEOLOGIST C. Ran	iori		
8		4 over				GROUN	D WTR (ft)
_				FSET 7 ft LT ALIGNMENT -L-		0 HR.	NM
).;	3 ft			RTHING 950,636 EASTING 1,815,228		24 HR.	FIAD
20	21			DRILL METHOD NW Casing W/SPT & Core	HAMM	ER TYPE	Automatic
23	3/22		со	MP. DATE 06/23/22 SURFACE WATER DE	EPTH N/	A	
ft				L. L			
T	STR REC.	RQD	L O	DESCRIPTION AND REMAR	KS		
┦	(ft) %	(ft) %	Ğ	ELEV. (ft)			DEPTH (ft)
+	(7.4)	(4.6)		Begin Coring @ 36.3 f 705.1 Light Gray to Dark Gray, Fresh to Moderate W		Verv Hard	to 36.3
	93%́	58%		Medium Hard (BIOTITE GNEISS and SCHIST) Fracture Spacing	with Close	to Very Clo	se
				GSI=45-60			
				-			
╁	(9.5)	(3.7)		697.1 Light Gray to Dark Gray, Fresh to Moderate W	eathering, '	Very Hard	44.3 to
1	95%	37%		Medium Hard (BIOTITÉ GNEISS & SCHIST) w Fracture Spacing		Very Clos	e
				RS-2: 44.6'-44.9', qu=6,566 psi, C	SSI=40-55		
				-			
				- - 687.1			54.3
ł	(5.0) 100%	(3.2) 64%	P	Light Gray to Dark Gray, Fresh to Moderate W Medium Hard (BIOTITE GNEISS and SCHIST)	eathering,	Very Hard	to
	100 /0	04 /0		_ Fracture Spacing			150
			Ż	682.1 GSI=45-60 Boring Terminated at Elevation 682.1 ft in CRYST			59.3
				GNEISS & SCHIST)			
				Notes: 1. Tricone Bit Refusal at 36	3 2'		
				2. Start Coring at 36.3' 3. 0 HR Water Level Not Measured due to Water		luced for c	oring
					boing indice		oning
				-			
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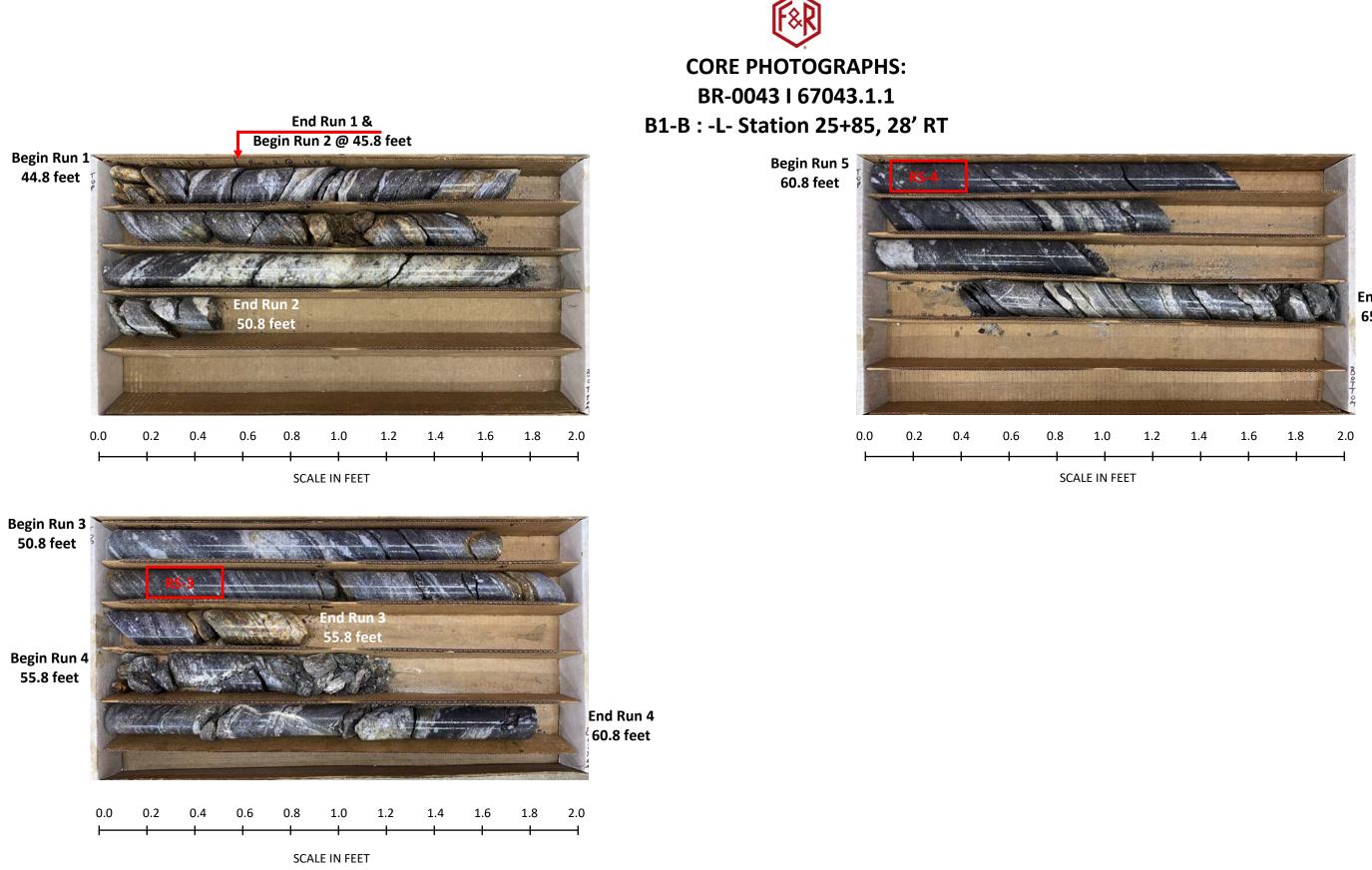
SCALE IN FEET

							BORE L							W	<b>3S</b> 670	)43 1 1	
	67043						TY ROCKIN	IGHAM			GEOLOGIST C. Ranieri						0N
				lace Br		e 780151 on US 158/NC14 ov	-				1	GROUND					-
	NG NO.				_	STATION 25+85	OFFSET				ALIGNMENT -L-	0 HR.	NM				
	AR ELE					FOTAL DEPTH 65.8 ft	NORTHING					24 HR.	17.9		ILL RIG/I		
				TE F&F		75 CME-55 97% 04/30/2021						ER TYPE AL	itomatic		ILLER		
DRILI	LER S	. Davis	1			START DATE 06/28/22	COMP. DA				SURFACE WATER DEPTH N//	4			RE SIZ		
ELEV (ft)	DRIVE ELEV	DEPTH (ft)	·			BLOWS PER FOO t 0 25 50	0T 75 100	SAMP.	17		SOIL AND ROCK DESC	RIPTION			DU		
(14)	(ft)	(14)	0.5ft	0.5ft	0.5π		100	NO.	/мо	I G	ELEV. (ft)		DEPTH (ft)	ELE (ft	*   FIF		
														697			
745		Ł									_				697.	5 44.	8
	742.3	0.0								1 122	742.3 GROUND SURFA		0.0	69	5	$\pm$	
740	-	F	1	2	3	$\left  \left  \begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $			м		ROADWAY EMBANK		4) <u>2.0</u>		601	5 <del>-</del> 50.	。
-	738.8	3.5	3	5	5			1				ı	Ì	69		<u>5 <del>-</del></u> 50. <del>-</del>	°
	-	ŧ			5		· · · · · ·		M		Tan-White, Silty Fine to Co					Ŧ	
735	734.1	8.2					· · · · ·				- <u>735.3</u> (A-2-4) with Trace I Orange-Tan-Brown, Micaceou		<u>7.0</u>		686.	<u>5 <del>-</del> 55</u> .	.8
ľ		- 0.2	3	4	6	-	· · · · · ·		м		SILT (A-4) with Trace	Mica	,	68	5	Ŧ	
730	-	ŧ					· · · · · ·				- 730.3		12.0			‡	
130	729.1	13.2	4	6	8						Orange-Tan-Brown-White, Coarse SAND (A-2-4) with T	Silty Fine to		68		<u>5 + 60.</u> +	8
	-	ŧ	1		0		· · · · · ·		W		Quartz Fragmen	ts		00	5	‡	
725		<u> </u>									-				676.	5 + 65.	.8
	724.1	18.2	5	14	16	$-1$   · · · · · $\sum_{30}$ · · ·   · · ·	· · · · · ·		Ŵ		-					1	
	-	Ł					· · · · · ·				-					t	
720	719.1	23.2									-					ŧ	
	-	ł	6	8	12	• • 20			W		-					$\pm$	
715	-	F									-					ł	
-	714.1	28.2	21	27	23			1	w l		-					Ŧ	
	-	ŧ									-					Ŧ	
710	709.1	33.2					· · · · ·				-					Ŧ	
	-109.1	- 00.2	7	7	9	$  $ $\cdot$	· · · · · ·		w		- -					‡	
705	-	ŧ				<u>.</u> .	· · · · ·				-					‡	
/05	704.1	38.2		50 5	0/0 2						- 703.6		38.7			‡	
	-	ŧ	28	50 5	50/0.3	°	100/0.8				- WEATHERED RO - Orange-Brown-White (BIOTIT		ıd			+	
700	-	Ł									- SCHIST)		_			ŧ	
-	<u>699.1</u> 697.5 -	43.2	100/0.4				100/0.4	•			- - 697.5		44.8			1	
		 	60/0.0					•			- CRYSTALLINE RC					ŧ	
695	-	Ł								P	Light Gray-White to Dark Gr GNEISS and SCH	ST)		8/4/22		ŧ	
	-	Ł												GDT 8		+	
690	-	-									-			DT.GI		ł	
	-	Ł						RS-3			-			NC_DOT.		Ŧ	
	-	F					· · · · · ·				•			GPJ NO		Ŧ	
685	-	F									-			<u> 0.9</u>		Ŧ	
	-	Ŧ									-			BRDG		Ŧ	
680	-	ŧ						RS-4			- 681.5 - Light Gray-White to Dark G	ay (BIOTITE	60.8	B		Ŧ	
	-	ŧ									GNEISS and SCHI	ST)		GEO		Ŧ	
	-	ţ					· · · · · ·	!			- 676.5		65.8	BR0043		Ŧ	
	-	†  - 									<ul> <li>Boring Terminated at Elevati</li> <li>CRYSTALLINE ROCK (BIOT</li> <li>SCHIST)</li> </ul>	on 676.5 ft in TE GNEISS {	ŝ.			ŧ	
	-	Ŧ									- Notes:			CORE DOUBLE		Ŧ	
	-	ŧ									1. Tricone Bit Refusal 2. Start Coring at 4			ORE		Ŧ	
	-	ŧ									3. Ohr water level not measure being introduced for	ed due to wate	er	OT C		‡	
	-	‡									- Demy introduced for	Joinig		NCDOT		1	

**TIP** BR-0043 COUN Replace Bridge 780151 on US 158/NC14 over **STATION** 25+85 2.3 ft TOTAL DEPTH 65.8 ft FF./DATE F&R2175 CME-55 97% 04/30/2021 **START DATE** 06/28/22 TOTAL RUN 21.0 ft 
 RUN (ft)
 DRILL RATE (Min/ft)
 RUN REC.
 SAMP.
 STRATA REC.
 ROD REC.
 ROD (ft)
 SAMP.
 REC.
 ROD (ft)
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## **GEOTECHNICAL BORING REPORT** CORE LOG

T	<b>Y</b> F	ROCKIN	GH	IAM		GEOLOGIS	ST C. Ra	nieri	-				
er	US	29							GROUN	D WTR (ft)			
	OF	FSET 2	28 1	ft RT		ALIGNMEN	IT -L-		0 HR. NM				
	NO	RTHING	; ;	950,601		EASTING	1,815,22	4	24 HR.	17.9			
			D	RILL METHOD	NM	/Casing W/SP	& Core	HAMM	ER TYPE	Automatic			
	со	MP. DA	ΤE	06/28/22		SURFACE	WATER D	EPTH N/	A				
D	L				_								
	O G	ELEV. (1	t)		D	ESCRIPTION	AND REMA	RKS		DEPTH (ft)			
						Begin Corir	ng @ 44.8	ft					
3) %	R	697.5	Li	ght Gray-White	to D:	CRYSTAL	LINE ROC	К	ng Verv Ha	44.8 ard to			
Ū		-		Medium Hard (B	BIOT	ITE GNEISS a	nd SCHIST e Spacing	) with Close	to Very Clo	se			
		-		R	S-3:	53.0'-53.3', qu	e Spacing =8,452 psi,	GSI=45-55					
		-											
		-											
		_											
		-								00.0			
3)		- 681.5 -	Li	ght Gray-White	to Da	ark Gray, Fresl	to Modera	te Weatherin	ig, Very Ha	60.8 ard to			
6		-		Medium Hard (B		Fractur	e Spacing	·	to Very Clo	se			
		- - 676.5				60.9'-61.2', qu				65.8			
		-	B	Boring Terminate	ed at		5 ft in CRYS & SCHIST)		OCK (BIOT	ITE			
		-				N	otes:						
		-				1. Tricone Bit							
		-		3. Ohr water lev	el no	t measured du	e to water b	eing introdu	ced for cori	ng			
		-											
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North Carolina Department of Transportation Bridge No. 151 on NC 158 over US 29

End Run 5 65.8 feet

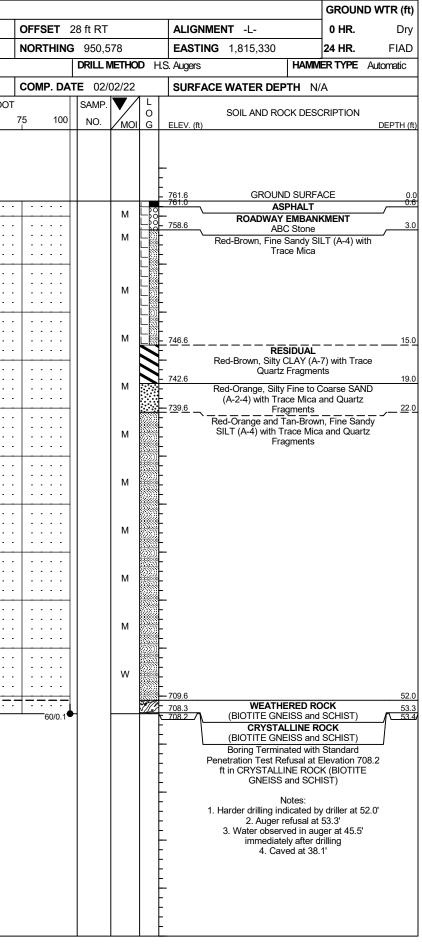
										D	JREL	.00																
WBS	67043	3.1.1			Т	<b>IP</b> BF	R-004	3	CO	UNTY	ROCKIN	IGHAM			GEC	<b>LOGIST</b> C. Ranieri			67043					P BR-			COUN	
	DESCR			dge No					29								GROUND WTR (ft)					blace E			on US 1		214 ove	<u>r U؛</u>
BOR	ING NO	. EB2-	-A		s	TATIC	<b>DN</b> 27	7+07			OFFSET	26 ft LT			ALIO	GNMENT -L-	<b>0 HR.</b> 38.9	BOR	ING NO	. EB2	-C		S	TATION	26+41			C
COLI	LAR ELI	<b>EV.</b> 76	60.2 ft		Т	OTAL	DEPT	<b>H</b> 49.	1 ft		NORTHIN	<b>G</b> 950,6	628		EAS	<b>FING</b> 1,815,355 <b>24 HR.</b> FIAD <b>COLLAR ELEV.</b> 742.									N			
DRILL	RIG/HA	MMER E	FF./DA	TE F	&R2175	5 CME-5	55 97%	04/30/20	21			DRILL	METH	OD	H.S. Auge	rs <b>HAMM</b>	<b>IER TYPE</b> Automatic	DRIL	l rig/ha	MMER E	FF./DA	TE Fa	&R2175	CME-55	97%04/30	)/2021		
DRIL	<b>LER</b> S	. Davis			s	TART	DATE	02/01	/22		COMP. DA	<b>TE</b> 02/	01/22	2	SUF	FACE WATER DEPTH N/	/A	DRIL	.LER S	. Davis			S	TART D	<b>ATE</b> 06	3/29/22	2	C
ELEV	DRIVE ELEV	DEPTH	' <b> </b>	ow co				BLOW	S PER F	TOO		SAMP.				SOIL AND ROCK DES	CRIPTION	ELEV	DRIVE ELEV	DEPTH	' <b> </b>	ow co			BL	OWS PI	PER FOC	л
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	25	50	7	75 100 I	NO.	Имс				DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	<u>)</u>	75
765		Ļ													L			745		Ļ								
	-	ŧ													F					ŧ								
700		t													760.2	GROUND SURF	ACE 0.0	740	741.6	0.7	3	2	3	<b>1</b> • • • • • • • • • • • • • • • • • • •				:
760	759.5 -	0.7	15	9	4								м		- 759.4 0- 758.5		0.8		738.8	3.5				<u> </u>	.			. †
	756.7 ·	- 3.5					.●13 ℓ	 		· · ·						ROADWAY EMBAN				t	WOH	1	1	<b>●</b> 2 ·			· · ·	:
755		t_	2	3	5	] <u>·</u> ∳	8		·   ·			SS-25	25%		۶L	Red-Brown, Fine to Coarse S with Trace Mic	Sandy SILT (A-4)	735							· · · ·		· · ·	·
	-	‡					 	 	:   :	· · ·	· · · ·								734.3	<u>    8.0                                </u>	3	3	5				· · ·	:
764	751.7	8.5	3	3	4	- .   - - <b>⊥</b> -   -	· · · - · ·	· · ·	·   ·	· · ·	· · · ·		м							ŧ				.  .     . I.			· · ·	
750	-	ŧ					<u></u>	<u> </u>	<del>.   .</del>						<u>_</u>			730	729.3	13.0	4	4	5	-+				+
	746.7 ·	- - 13.5				;	 	 	· · ·		· · · ·									ŧ	4	4	5	. <b>♦</b> 9			· · ·	
745			2	2	3	<b>4</b> 5				· · ·		SS-26	33%		- 745.5	Red-Brown, Fine Sandy Cla	14.7	725		+					· ·   · ·			·
	-	ł					· · ·	· · ·	· · ·						743.2	with Trace Mic	a17.0		724.3	18.0	6	5	8		13.		· · ·	:
	741.7	18.5	3	4	5	11 :1			·   ·	 		SS-27	26%			Red-Brown-Gray, Fine to Coa CLAY (A-7-6) with Trace Or	ganics (Roots),			ŧ							· · ·	
740	-	ł					9 		<u>.   .</u>			33-27	20%	ľ	740.2	Mica, and Quartz Fra	agments 20.0	720	719.3	23.0			6	- <u>i</u> -	<u> </u>		<u> </u>	-
	736.7 ·	- 23.5				·i									1	Red-Brown, Silty CLA	AY (A-7)			ł	3	3	6	. •9				
735			2	3	4		7 · ·						м		£			715		E								
	-	Ŧ							•						733.2		27.0		714.3	<u> </u>	4	5	7		2			•
	731.7	28.5	8	5	6				.   .	 					E	Red-Tan-Brown, Fine Sandy Trace Mica and G	r SILT (A-4) with Gravel			Ī				: -]				
730	_	Ŧ					•11 ·						M		F			710	709.3	33.0								
	726.7 ·	- 33.5					<u>]</u>			· · ·					₩F					Ŧ	6	5	10		115			
725		- 33.5	3	4	7		•11						м		F			705		Ŧ						~		
	-	Ŧ										1			F				704.3	<u> </u>	21	28	34					,.
	721.7	38.5	1	2	4	7				· · · · · ·				<u> </u>	F				701.6 ·	40.7	60/0.1					· · · · · ·	· · · • • 62	· <u></u> -
720	_	Ŧ	'				<u> </u>			 			Μ <sup>-</sup>		F				-	Ŧ	00/0.1	1						
	716.7 ·	43.5				)_	 	. <u> </u>		· · · ·				<b>4</b> 17	717.9	WEATHERED RO	42.3 OCK			Ē								
715		+ +3.5 -	100/0.	5		11	· · ·				• 100/0.5	•				Tan-Gray (BIOTITE GNEISS	S and SCHIST)		.	Ŧ								
	-	Ŧ				11									F				-	Ŧ								
	711.7	<u> </u>	160/0 1			11	· · ·	· · · · · · ·		· · ·					711.7		48.5		.	Ŧ								
		ł	60/0.0								60/0.1 60/0.0	-			E	Dark Gray (BIOTITE GNEIS	S and SCHIST) /		-	Í								
		Ŧ													F	Boring Terminated with Penetration Test Refusal at I	Elevation 711.1			Ŧ								
		Ŧ													F	ft in CRYSTALLINE ROC GNEISS and SCH	CK (BIOTITE HIST)			Ŧ								
	-	Ŧ													F	Notes:			-	Ŧ								
		Ŧ													F	1. Harder drilling indicated b 2. Auger refusal at	49.1'			Ŧ								
	-	Ŧ													F	3. Shelby Tube (ST-1) obtain	ed at 27+09, 26'		-	Ŧ								
		Ŧ													F	Other Samples:				Ŧ								
		Ŧ													F	ST-1 (13.0 - 15.0)				Ŧ								
	-	Ŧ													F				-	Ŧ								
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ROCKINGHAM		GEOLOGIST C. Ranieri	
US 29			GROUND WTR (ft)
OFFSET 3 ft RT		ALIGNMENT -L-	0 HR. NM
NORTHING 950,6	13	<b>EASTING</b> 1,815,284	24 HR. FIAD
DRILL	IETHOD N	/ud Rotary	HAMMER TYPE Automatic
COMP. DATE 06/2	29/22	SURFACE WATER DEPT	H N/A
SAMP.	ΛL		
75 100 NO.	MOI G	SOIL AND ROCH	( DESCRIPTION
NO.           NO.           NO.           SS-57           SS-57           SS-57	MOI         G           W         L           36%         L           W         L	720.3 720.3 7241.6 7241.6 7241.6 7241.6 ROADWAY El Black-Red-Tan, Fine CONC Brown-Red, Fine to Co with Tra 735.3 RESII Orange-Brown-Black, SILT (A-4) with Trac 720.3 Orange-Brown-Black SAND (A-2-4) with Trac	MBANKMENT e Sandy CLAY (A-6) RETE varse Sandy SILT (A-4) ice Mica DUAL Fine to Coarse Sandy ce Mica and Gravel 
60/0.1	w w	White (BIOTITE GN Boring Terminate Penetration Test Refu ft in CRYSTALLINI GNEISS 8 Not 1. Hard Drilling Indic 40.1' 2. Tricone Bit F	ed with Standard Isal at Elevation 701.5 E ROCK (BIOTITE & SCHIST) tes: _ated by Driller from _40.7' Refusal at 40.7' was used to Break

WBS	67043	3.1.1			Т	<b>P</b> BR-004	3	
SITE	DESCR		Brid	ge No	. 151 o	on US 158	over US 29	9
BOR	ING NO	. EB2-	·B		S	TATION 2	6+94	
	LAR ELI		61.6 ft			OTAL DEPT		t
DRILL	_ RIG/HA	MMER E	FF./DA	TE F	&R2175	CME-55 97%	04/30/2021	
DRIL	LER S	. Davis			S	TART DATE	02/02/2	2
ELEV	DRIVE ELEV	DEPTH			1		BLOWS F	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50
765								
		ŧ						
760	761.0	0.6	12	5	4	   .		· · ·
700	- 758.6 ·	- 3.0				- <b>•</b> 9 - <b>·</b> · · ·		
		ŧ	2	3	4	7		· · ·   · · ·
755		ŧ				. <b>!</b>   <del>  .<b>!</b></del>		
	753.1	8.5	2	3	4		· · · ·	· · · · · ·
750		ŧ			4	. ↑7 · · ·	 	
730	-	±						
	748.1	13.5	1	2	3	<b>4</b> • • • • • • • • • • • • • • • • • • •	· · · ·	· · ·
745		ŧ				-`\		
	743.1	18.5	3	7	8			· · · ·
740	-	+		'		· · • ●15	· · · · ·	
740	- 738.1	+ 1 23.5						
	. / 30.1	- 23.5	2	4	5			
735	-	ŧ				· I. · ·   <del>  · I</del> . · ·		· · ·
	733.1	28.5	2	4	5		· · · ·	
730		ŧ		4	5	· • • 9 · · ·		
730	- 728.1	33.5						
		- 33.5	5	6	6	· · · · · · · · · · · · · · · · · · ·	· · · · ·	· · · ·
725		ŧ				<u> :i::</u>		
	723.1	38.5	3	3	6			
720		ŧ				· <b>q</b> 9 · ·	· · · · ·	
. 20	718.1	43.5						
			4	7	9	· · • •16		
715	-	ŧ						
	713.1	48.5	4	5	10			
710		ŧ						
	708.3	53.3				· · ! <del>.</del> ·		+
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NTY ROCKINGHAM

GEOLOGIST C. Ranieri





County: Rockingham Description: Bridge No. 151 on US 158 over US 29

						S	OIL TE	ST RESUL	.TS							
SAMPLE	-L- STATION	LOCATION	OFFSET *	DEPTH	AASHTO	L.L.	P.I.		% BY N	/EIGHT	% PASSING (SIEVES)				%	%
NO.	-L-STATION	LOCATION	OFFSEI	INTERVAL	CLASS.	L.L.	P.I.	C. SAND	F. SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-34	24+68	EB1-A	27' LT	3.5-5.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	24.7	NT
SS-35	24+68	EB1-A	27' LT	8.5-10.0	A-7-5 (13)	61	20	17.7	26.0	18.5	37.8	99.9	95.5	61.6	NT	NT
SS-47	25+22	EB1-C	6' LT	3.5-5.0	A-4 (0)	NP	NP	22.4	30.7	18.6	28.3	94.8	81.7	51.0	37.2	NT
SS-49	24+54	EB1-B	28' RT	3.5-5.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	28.6	NT
SS-50	24+54	EB1-B	28' RT	8.5-10.0	A-7-5 (16)	60	25	16.5	25.1	14.7	43.7	99.7	91.0	62.7	NT	NT
ST-2	24+52	EB1-B	28' RT	8.0-10.0	A-7-5 (13)	61	17	9.9	32.8	20.8	36.5	100.0	95.5	64.0	31.6	NT
SS-25	27+07	EB2-A	26' LT	3.5-5.0	A-4 (0)	NP	NP	15.5	40.9	21.9	21.7	99.2	91.6	51.5	24.9	NT
SS-26	27+07	EB2-A	26' LT	14.7-15.0	ND	55	9	NT	NT	NT	NT	NT	NT	NT	32.9	NT
SS-27	27+07	EB2-A	26' LT	18.5-20.0	A-7-6 (8)	44	21	19.8	30.9	13.0	36.3	96.6	86.3	51.9	26.4	NT
ST-1	27+09	EB2-A	26' LT	13.0-15.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
SS-57	26+41	EB2- C	3' RT	3.5-5.0	A-4 (0)	NP	NP	27.7	25.3	19.4	27.6	96.1	77.3	48.9	35.6	NT

NP = Not Plastic NT = Not Tested ND = Not Determined

D. Council Lab Manager, Certification No. 101-02-0603

PROJECT REFERENCE NO.	SHEET NO.
67043.1.1	19

C.Wang, P.E. Soils Engineer



	ROCK TEST RESULTS													
SAMPLE NO.	BORING NO.	ALIGNMENT	STATION	OFFSET	DEPTH INTERVAL	ROCK TYPE	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus E (ksi)	GSI
RS-1	B1-A	-L-	25+84	50' Lt.	48.0 - 48.3	Biotite Gneiss and Schist	CZbg	62%	3.94	1.77	172.5	5,015	700	40-60
RS-2	B1-C	-L-	25+81	7' Lt.	44.6 - 44.9	Biotite Gneiss and Schist	CZbg	36%	4.03	1.76	162.4	6,566	1,000	40-55
RS-3	B1-B	-L-	25+85	28' Rt.	53.0 - 53.3	Biotite Gneiss and Schist	CZbg	36%	4.17	1.77	169.5	8,452	850	45-55
RS-4	B-1B	-L-	25+85	28' Rt.	60.9 - 61.2	Biotite Gneiss and Schist	CZbg	52%	3.96	1.77	171.2	6,608	900	50-65

NP = Not Plastic NT = Not Tested

ND = Not Determined

D. Council

Lab Manager, Certification No. 101-02-0603

ECT REFERENCE NO.	SHEET NO.
67043.1.1	20

C.Wang, P.E.

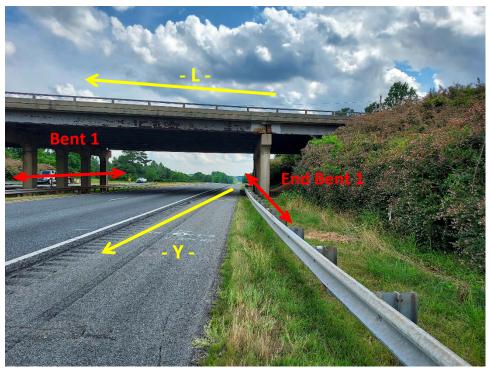
Soils Engineer



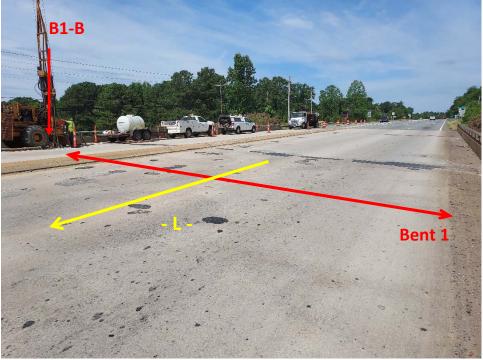
# Replace Bridge 780151 on US 158/NC 14 over US 29 SITE PHOTOGRAPHS



Photograph No. 1: View looking northeast at Bent 1



Photograph No. 2: View looking south along End Bent 1



Photograph No. 3: View looking south-southwest at bent 1 on bridge deck



Photograph No. 4: Below bridge deck, looking at Bent 1