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-0002

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STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY ASHE

PROJECT DESCRIPTION REPLACE BRIDGE #8 ON NC 194 OVER NORTH FORK NEW RIVER

SITE DESCRIPTION _

67002 PROJECT

STATE PROJECT REFERENCE NO. STATE TOTAL SHEETS NO. 18 N.C **BR-0002** 1

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1919/TO7-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAIL

GENERAL SOL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UNI-PLACE)TEST DATA CAN BE RELIED ON ONLY TO THE DEOREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOL MOISTURE CONDITIONS MAY YARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OF CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLATORS. THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS MADE, OR OPHION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HINSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACULAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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PERSONNEL

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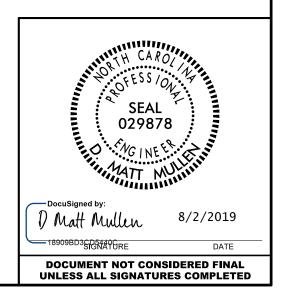
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CHECKED BY J.C. KUHNE

SUBMITTED BY _______

DATE <u>8/1/2019</u>



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			SOIL C	ESCRIP.	TION					GRADATION						ROCK DE	SCRIPTION
BE PENET ACCORDI IS B	TRATED WIT ING TO THE BASED ON T	H A CONTINUO STANDARD PE HE AASHTO SI	US FLIGHT POW NETRATION TE STEM. BASIC [IER AUGER (ST (AASHTO DESCRIPTION	AND YIELD LE T 206, ASTM S GENERALLY) EARTH MATERIA SS THAN 100 BLC D1586). SOIL CLA INCLUDE THE FO HER PERTINENT F	WS PER FOOT SSIFICATION LOWING:	UNIFORMLY GRADED - I	INDICATE	GOOD REPRESENTATION OF PARTI ES THAT SOIL PARTICLES ARE A IXTURE OF UNIFORM PARTICLE S ANGULARITY OF GRAI	LL APPROXIMA	ATELY THE SAME SIZE.	ROCK LINE IN SPT REFUSAL BLOWS IN NO REPRESENTED	NDICATE IS PEN ON-COAS BY A	S THE LEVE NETRATION E STAL PLAIN ZONE OF WE	L AT WHICH NON-CO BY A SPLIT SPOON S MATERIAL, THE TR EATHERED ROCK.	WOULD YIELD SPT REFUSAL IF TEST ASTAL PLAIN MATERIAL WOULD YIELD AMPLER EQUAL TO OR LESS THAN Ø. ANSITION BETWEEN SOIL AND ROCK
A	S MINERALC	OGICAL COMPOS	ITION, ANGULAR	ITY, STRUCT	URE, PLASTIC	TY, ETC. FOR EXERS, HIGHLY PLASTIC.	MPLE.	THE ANGULARI	TY OR F	ROUNDNESS OF SOIL GRAINS IS D		Y THE TERMS:		ALS ARE	E TYPICALL	Y DIVIDED AS FOLLO 역	
			END AND				7.0	ANGULAR, SUBA		, <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .			WEATHERED ROCK (WR)			NON-COASTAL PLA	IN MATERIAL THAT WOULD YIELD SP OOT IF TESTED.
GENERAL		GRANULAR MATE	RIALS	SILT-CL	ay materials		MATERIALS	-		INERALOGICAL COMPOS			CRYSTALLINE		7.7.		GRAIN IGNEOUS AND METAMORPHIC RO
CLASS.		(≤ 35% PASSING		_	PASSING #200)					JCH AS QUARTZ, FELDSPAR, MICA, RIPTIONS WHEN THEY ARE CONSI			ROCK (CR)			GNEISS, GABBRO, S	REFUSAL IF TESTED. ROCK TYPE IN CHIST, ETC.
GROUP CLASS.	A-1 A-1-a A-1-b	A-3 A-2-4 4	A-2 -2-5 A-2-6 A-2-	A-4 A-	5 A-6 A-7		, A-5 , A-7			COMPRESSIBILITY			NON-CRYSTAL	.LINE			GRAIN METAMORPHIC AND NON-COAST K THAT WOULD YEILD SPT REFUSAL
SYMBOL										COMPRESSIBLE Y COMPRESSIBLE	LL < 31 LL = 31 -	50	ROCK (NCR)		===	ROCK TYPE INCLU	DES PHYLLITE, SLATE, SANDSTONE, ET EDIMENTS CEMENTED INTO ROCK, BUT
% PASSING	00000000000			S alation ()				HIGH	HLY COM	IPRESSIBLE	LL > 50	90	SEDIMENTARY			SPT REFUSAL. RO	CK TYPE INCLUDES LIMESTONE, SAND
*10 5	50 MX	51 M				GRANULAR	AY PEAT		F	PERCENTAGE OF MATE	RIAL		(CP)			SHELL BEDS, ETC.	HERING
	30 MX 50 MX 15 MX 25 MX		5 MX 35 MX 35 N	IX 36 MN 36 I	MN 36 MN 36 MI	SOILS S	ILS PERI	ORGANIC MATERIA	<u>IL</u>	GRANULAR SILT - CLAY SOILS SOILS	<u>OTHE</u>	MATERIAL	FRESH	ROCK F	RESH, CRYST	ALS BRIGHT, FEW JOIN	ITS MAY SHOW SLIGHT STAINING. ROCK
MATERIAL PASSING *40 LL PI	_ 6 MX		1 MN 40 MX 41 M 3 MX 11 MN 11 M			SOILS WITH LITTLE OR	HIGHL	TRACE OF ORGANIC N LITTLE ORGANIC MAT MODERATELY ORGANIC HIGHLY ORGANIC	TTER	2 - 3% 3 - 5% 3 - 5% 5 - 12% 5 - 10% 12 - 20% > 10% > 20%	TRACE LITTLE SOME HIGHLY	1 - 10% 10 - 20% 20 - 35% 35% AND ABOVE	VERY SLIGHT (V SLI.)	ROCK G CRYSTA		RESH, JOINTS STAINED OKEN SPECIMEN FACE	,SOME JOINTS MAY SHOW THIN CLAY C SHINE BRIGHTLY. ROCK RINGS UNDER F
GROUP INDEX	0	0 0	4 MX	-	4X 16 MX NO M	MUDERATE	ORGANI	c		GROUND WATER			SLIGHT				AND DISCOLORATION EXTENDS INTO R
USUAL TYPES S OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND	FINE SIL	TY OR CLAYEY VEL AND SAND	SIL TY SOIL S	CLAYEY SOILS	ORGANIC MATTER	SOILS			ER LEVEL IN BORE HOLE IMMEDI TIC WATER LEVEL AFTER _24_		DRILLING	(SLI.) MODERATE	1 INCH. CRYSTA	. OPEN JOINT ALS ARE DUL	S MAY CONTAIN CLAY. L AND DISCOLORED. C	. IN GRANITOID ROCKS SOME OCCASIONA RYSTALLINE ROCKS RING UNDER HAMMEN SCOLORATION AND WEATHERING EFFECT
GEN. RATING	SHIND					FAIR TO				CHED WATER, SATURATED ZONE, O		RING STRATA	(MOD.)	GRANIT	OID ROCKS, M	10ST FELDSPARS ARE	DULL AND DISCOLORED, SOME SHOW CLA
AS SUBGRADE		EXCELLENT TO	500D	FAIR	TO POOR	POOR	IOR UNSUITAI		SPR	ING OR SEEP					SOUND UNDER RESH ROCK.	HAMMER BLOWS AND	SHOWS SIGNIFICANT LOSS OF STRENGTH
			GROUP IS ≤ LL					0.001			<u></u>		MODERATELY				OR STAINED. IN GRANITOID ROCKS, ALL
-			NSISTENC		STANDARD		UNCONFINED			MISCELLANEOUS SYMB	ULS		SEVERE (MOD. SEV.)				KAOLINIZATION. ROCK SHOWS SEVERE L ST'S PICK. ROCK GIVES 'CLUNK' SOUND
PRIMARY S		CONSI	INESS OR STENCY	PENETRATI (N	ON RESISTENC	E COMPRESS	IVE STRENGTH IS/FT ²)		DESCRIPT			SLOPE INDICATOR	SEVERE (SEV.)	ALL RO	DCK EXCEPT		DR STAINED. ROCK FABRIC CLEAR AND E IN GRANITOID ROCKS ALL FELDSPARS (
GENERAL GRANULA		LC	OSE 1 DENSE	4	TO 10			SOIL SYMBOL	•	OPT DMT TEST BC		INSTALLATION				SOME FRAGMENTS OF S <u>YIELD SPT N VALUES</u>	STRONG ROCK USUALLY REMAIN.
MATERIA (NON-CO		DE	NSE DENSE	30	TO 30 TO 50 > 50		N/A		AY EMBA		;	CONE PENETROMETER TEST SOUNDING ROD	VERY SEVERE (V SEV.)	ALL RO BUT MA	DCK EXCEPT ASS IS EFFE	QUARTZ DISCOLORED (CTIVELY REDUCED TO	DR STAINED. ROCK FABRIC ELEMENTS AF SOIL STATUS, WITH ONLY FRAGMENTS OF F ROCK WEATHERED TO A DEGREE THAT
GENERAL SILT-CL MATERIA	AY.	SI	SOFT DFT 1 STIFF IFF	2 4	< 2 TO 4 TO 8 TO 15	Ø.25 Ø.5	0.25 TO 0.5 TO 1.0 TO 2			MW C	/ELL 🔶	TEST BORING WITH CORE	COMPLETE	VESTIG ROCK R	SES OF ORIGI REDUCED TO	NAL ROCK FABRIC REN SOIL. ROCK FABRIC NO	AAIN, <i>IF TESTED, WOULD YIELD SPT N</i> DT DISCERNIBLE, OR DISCERNIBLE ONLY Y BE PRESENT AS DIKES OR STRINGER:
(COHESI)		VERY	STIFF	15	TO 30	2	TO 4	ALLUVIAL SO	JIL BOU⊾	NDARY A PIEZOMETER INSTALLATION	, Ò	- SPT N-VALUE			AN EXAMPLE.	INTERIORS. GORNEZ PR	T DE TRESERT HS DIRES ON STRINGER.
					> 30		> 4		F	RECOMMENDATION SYME						ROCK H	IARDNESS
U.S. STD. SIE	VE SIZE		4 10	40	60 20	0 270				CLASSIFIED EXCAVATION -		SIFIED EXCAVATION -	VERY HARD			HED BY KNIFE OR SHA WS OF THE GEOLOGIST	RP PICK. BREAKING OF HAND SPECIMEN
OPENING (MM BOULDER	4) 	DBBLE (4.76 2.00	Ø.42 COARSE	0.25 0.0	75 0.053	CLAY	SHALLOW UNDERCUT		NSUITABLE WASTE NCLASSIFIED EXCAVATION - CCEPTABLE DEGRADABLE ROCK	USED I	ABLE,BUT NOT TO BE N THE TOP 3 FEET OF MENT OR BACKFILL	HARD	CAN BE TO DET	E SCRATCHED TACH HAND S	BY KNIFE OR PICK O PECIMEN.	NLY WITH DIFFICULTY. HARD HAMMER B
(BLDR.) GRAIN MM	(1	COB.) 75	(GR.)	SAND (CSE. SD.)	0.25	D.) (SL.)	(CL.)	AR - AUGER REFUSAL		ABBREVIATIONS MED MEDIUM		- VANE SHEAR TEST	MODERATELY HARD	EXCAVA		D BLOW OF A GEOLOG	GOUGES OR GROOVES TO 0.25 INCHES D IST'S PICK. HAND SPECIMENS CAN BE D
SIZE IN.		3						BT - BORING TERMINATE CL CLAY	ED	MICA MICACEOUS MOD MODERATELY	WEA.	- WEATHERED UNIT WEIGHT	MEDIUM HARD				S DEEP BY FIRM PRESSURE OF KNIFE (
			STURE - I		TION OF	TERMS		CPT - CONE PENETRATIO	ON TEST	NP - NON PLASTIC		DRY UNIT WEIGHT	HHND		OF A GEOLOG		PEICES 1 INCH MAXIMUM SIZE BY HARD
	MOISTURE		FIELD MO DESCRI	PTION		FIELD MOISTUR		CSE COARSE DMT - DILATOMETER TE DPT - DYNAMIC PENETRA		ORG ORGANIC PMT - PRESSUREMETER T EST SAP SAPROLITIC	rest <u>sa</u> s - e	MPLE ABBREVIATIONS BULK	SOFT	FROM C	CHIPS TO SE		KNIFE OR PICK. CAN BE EXCAVATED IN E BY MODERATE BLOWS OF A PICK POIN SURE.
ᄕᇆᆮ		LIMIT	- SATURA (SAT.)			IQUID; VERY WET)W THE GROUND		e - VOID RATIO F - FINE FOSS FOSSILIFEROUS		SD SAND, SANDY SL SILT, SILTY SLI SLIGHTLY		SPLIT SPOON SHELBY TUBE ROCK	VERY SOFT		RE IN THICKN		CAVATED READILY WITH POINT OF PICK. BY FINGER PRESSURE. CAN BE SCRATCH
PLASTIC RANGE <			- WET -	(W)		REQUIRES DRYI	G TO	FRAC FRACTURED, FRA FRAGS FRAGMENTS	CTURES	TCR - TRICONE REFUSAL W - MOISTURE CONTENT	RT -	RECOMPACTED TRIAXIAL - CALIFORNIA BEARING			TURE SPI		BEDDING
(PI) PL		IC LIMIT			ATTAIN UP	TIMUM MOISTURE		HI HIGHLY		V - VERY	CON	RATIO	TERM			SPACING	
ОМ		JM MOISTURE (AGE LIMIT	- MOIST	- (M)	SOLID; AT	OR NEAR OPTIMU	M MOISTURE	DRILL UNITS:		ENT USED ON SUBJEC ANCING TOOLS:	HAMMER	TYPE:	VERY WIDE WIDE MODERATE		ISE SE	E THAN 10 FEET 8 TO 10 FEET 1 TO 3 FEET	VERY THICKLY BEDDED THICKLY BEDDED 1 THINLY BEDDED 0.
			- DRY -	(D)		ADDITIONAL WAT TIMUM MOISTURE		X CME-45C		CLAY BITS 6"CONTINUOUS FLIGHT AUGER	CORE SIZ		CLOSE VERY CLO	SE		.16 TO 1 FOOT THAN 0.16 FEET	VERY THINLY BEDDED 0.0 THICKLY LAMINATED 0.0 THINLY LAMINATED 4
			PLA	STICITY	/						□-в_	н					RATION
			PLAST	CITY INDEX	(PI)		RENGTH	CME-550		HARD FACED FINGER BITS	X-N X	WL	FOR SEDIMEN	TARY R	OCKS, INDUR		NING OF MATERIAL BY CEMENTING, HE
SLIC	PLASTIC GHTLY PLA ERATELY P			0-5 6-15 16-25		SL	LOW GHT NUM	VANE SHEAR TEST		TUNGCARBIDE INSERTS CASING X W/ ADVANCER	HAND TO		- FRIABL			GENTLE BLOW	FINGER FREES NUMEROUS GRAINS; BY HAMMER DISINTEGRATES SAMPLE. E SEPARATED FROM SAMPLE WITH ST
	HLY PLAST			S OR MORE			GH	PORTABLE HOIST		TRICONE STEEL TEETH		ID AUGER	MODER	ATELY !	INDURATED		Y WHEN HIT WITH HAMMER.
DESCRIPT	IONS MAY				INS (TAN. RFI	, YELLOW-BROWN	BLUE-GRAY)			TRICONE TUNGCARB.	SOL	INDING ROD	INDURA	4TED		DIFFICULT TO	IFFICULT TO SEPARATE WITH STEEL BREAK WITH HAMMER.
						DESCRIBE APPEA					. 🗖 _		EXTRE	MELY IN	NDURATED		R BLOWS REQUIRED TO BREAK SAMPLI (S ACROSS GRAINS.

PROJECT REFERENCE NO. **BR-0002**



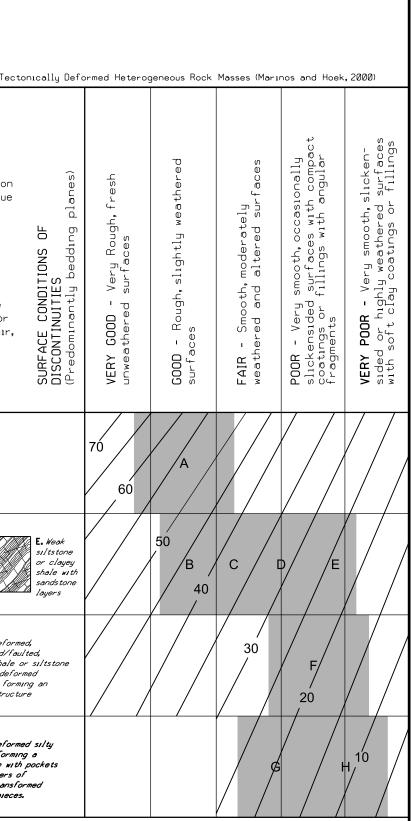
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TERMS AND DEFINITIONS ED. AN INFERRED) SPT REFUSAL. 1 FOOT PER 60 IS OFTEN ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND CK THAT SURFACE. CLUDES GRANITE, CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. AL PLAIN IF TESTED. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. MAY NOT YIELD STONE, CEMENTED 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. $\underline{\text{DIKE}}$ - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. NATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. AMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE СК ИР ТО SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. BLOWS. $\underline{\mathsf{FLOAT}}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. . IN Y. ROCK HAS 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. ELDSPARS DULL OSS 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 VIDENT 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. RE DISCERNIBLE PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE STRONG ROCK ONLY MINOR OF AN INTERVENING IMPERVIOUS STRATUM. ALUES < 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 SAPROLITE IS ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. S REQUIRES SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO LOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. EEP CAN BE ETACHED 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. $\underline{STRATA CORE RECOVERY (SREC.)}$ - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. FRAGMENTS IT. 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 ED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BL-7 THICKNESS 4 FEET 1.5 - 4 FEET ELEVATION: 2686.06 FEET 16 - 1.5 FEET NOTES: 3 - 0.16 FEET 08 - 0.03 FEET 0.008 FEET AT, 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	unweathered surfaces	ıron staıned	weathered and	eathered surfaces s or fillings	weathered surfaces ings 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 valu 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
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	600D Rough, slightly weathered, surfaces	FAIR Smooth, moderately altered surfaces	POOR Slickensided, highly wea with compact coatings or angular fragments	VERY POOR Slickensided, highly with soft clay coat	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 fai 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		REASING SU		ALIIY	↓	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 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.
BLOCKY - well interlocked un- disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with thin inter-
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			layers of siltstone amounts stone layers
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		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 .
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	

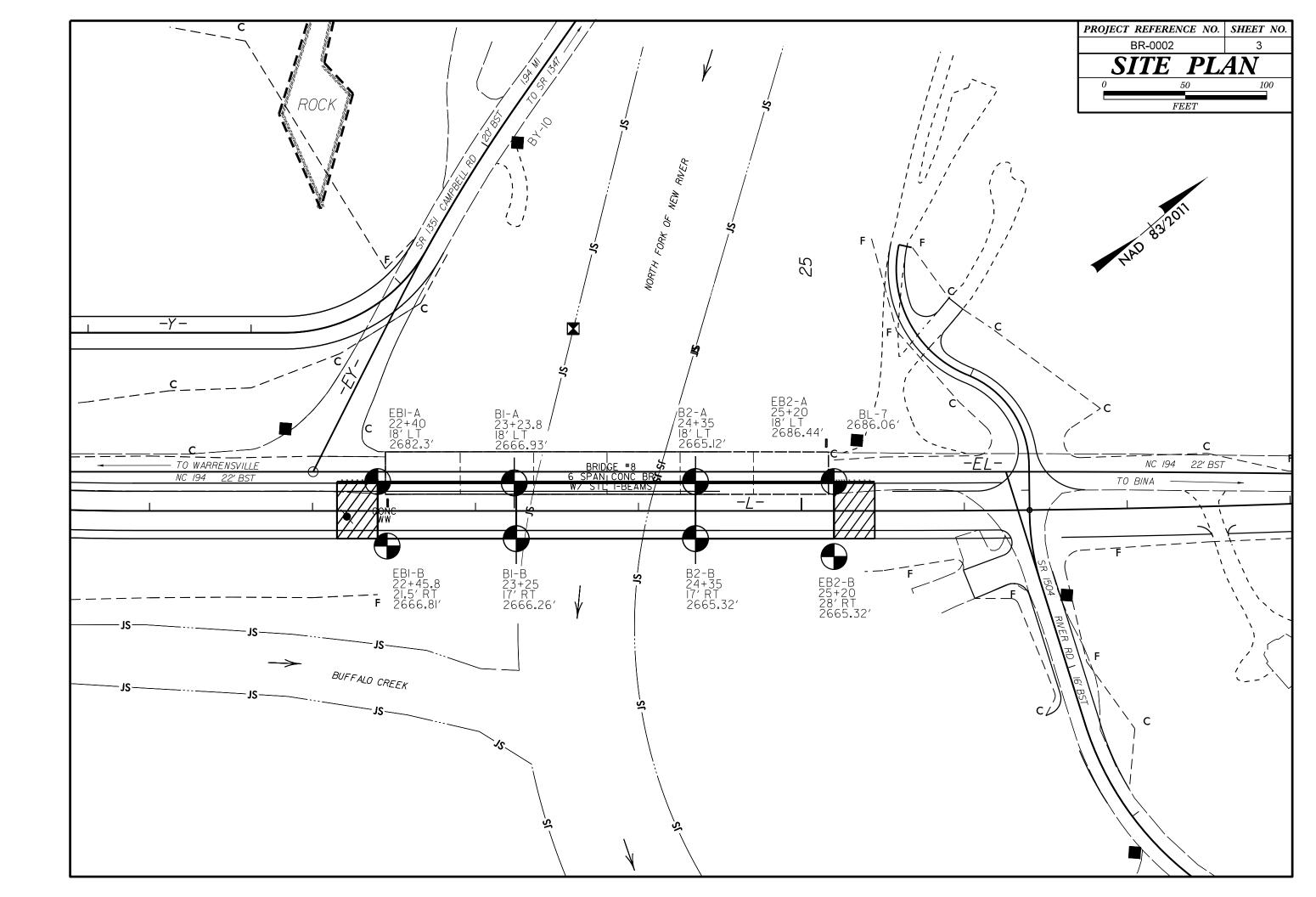


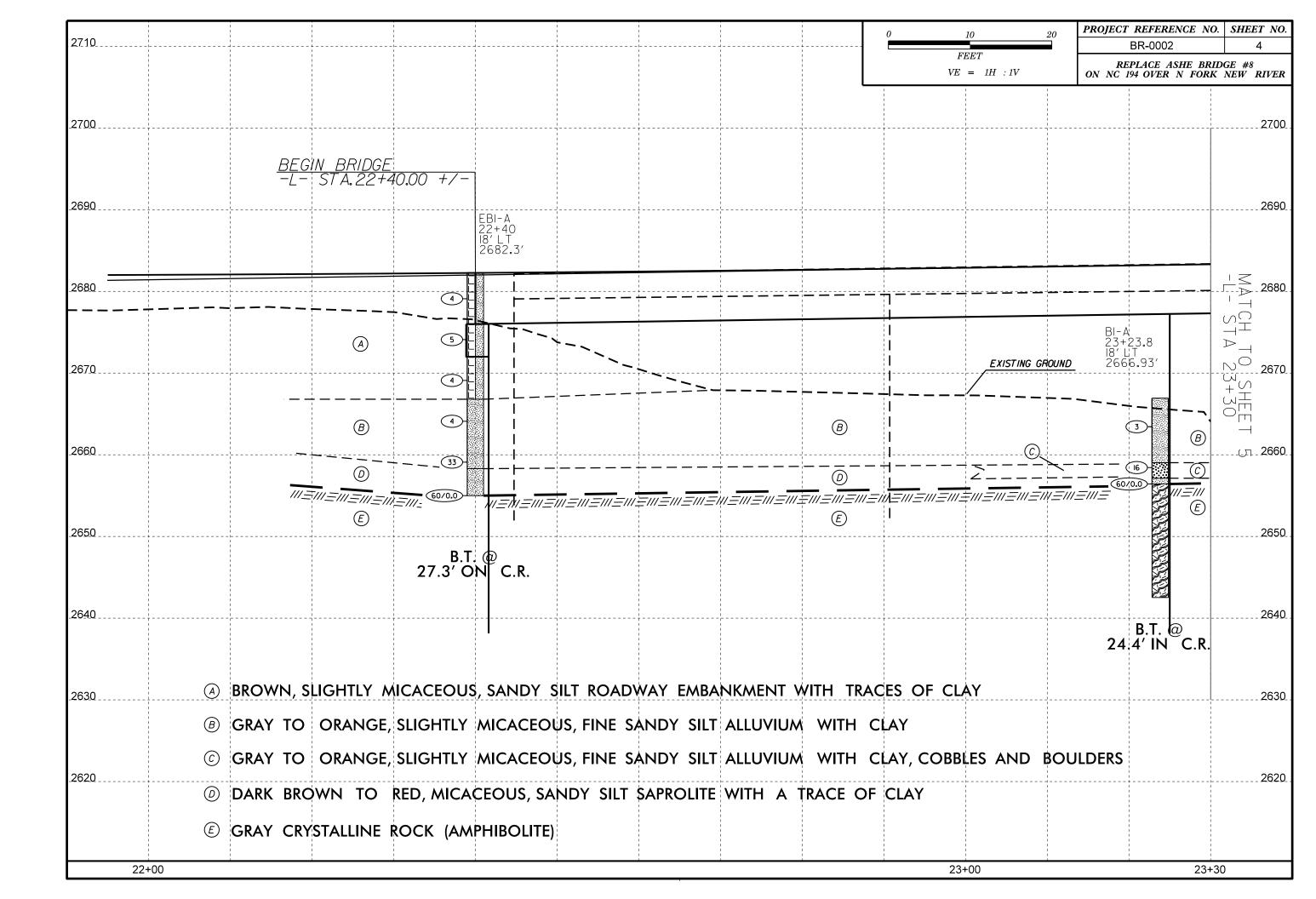
PROJECT REFERENCE NO.

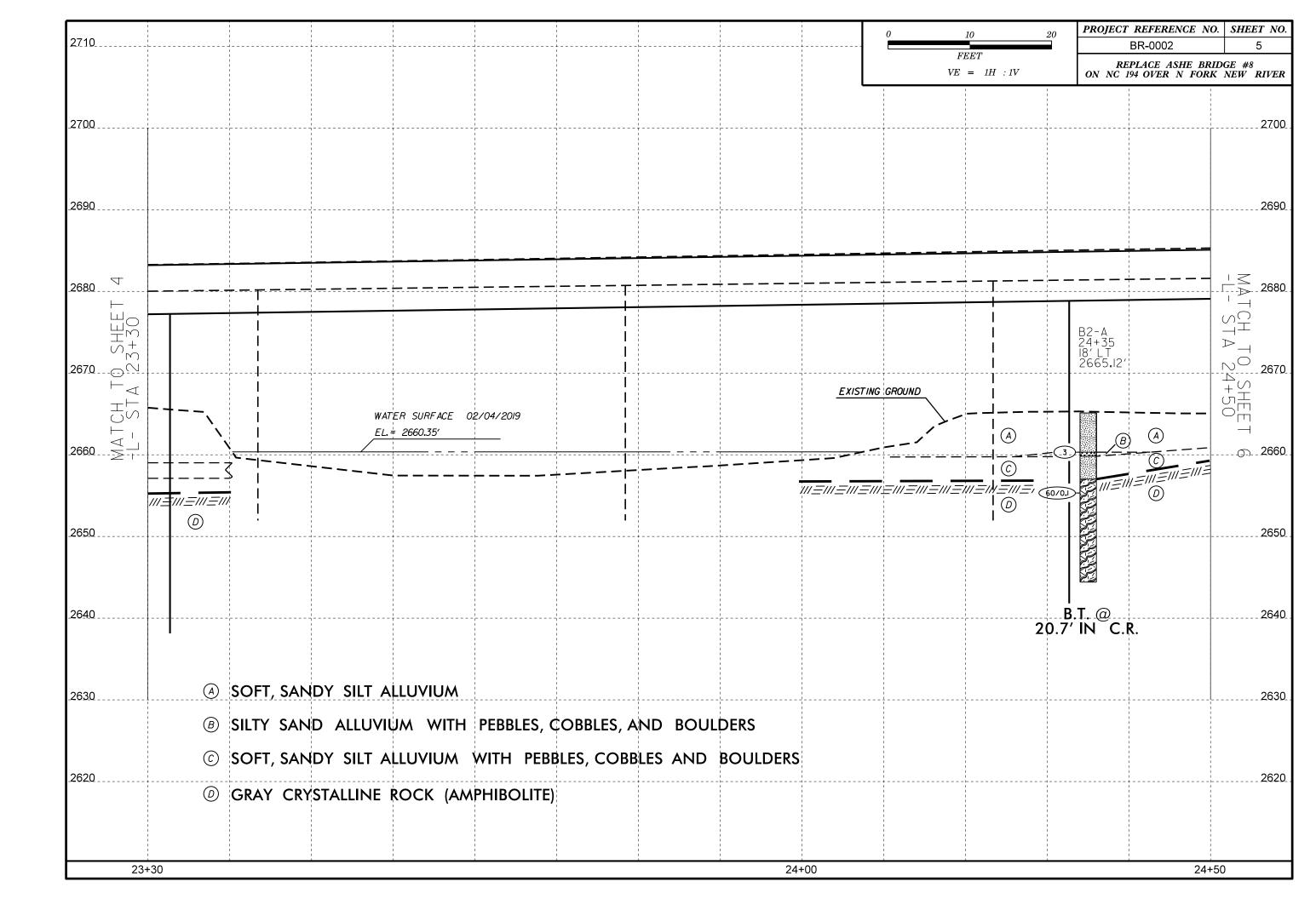
BR-0002

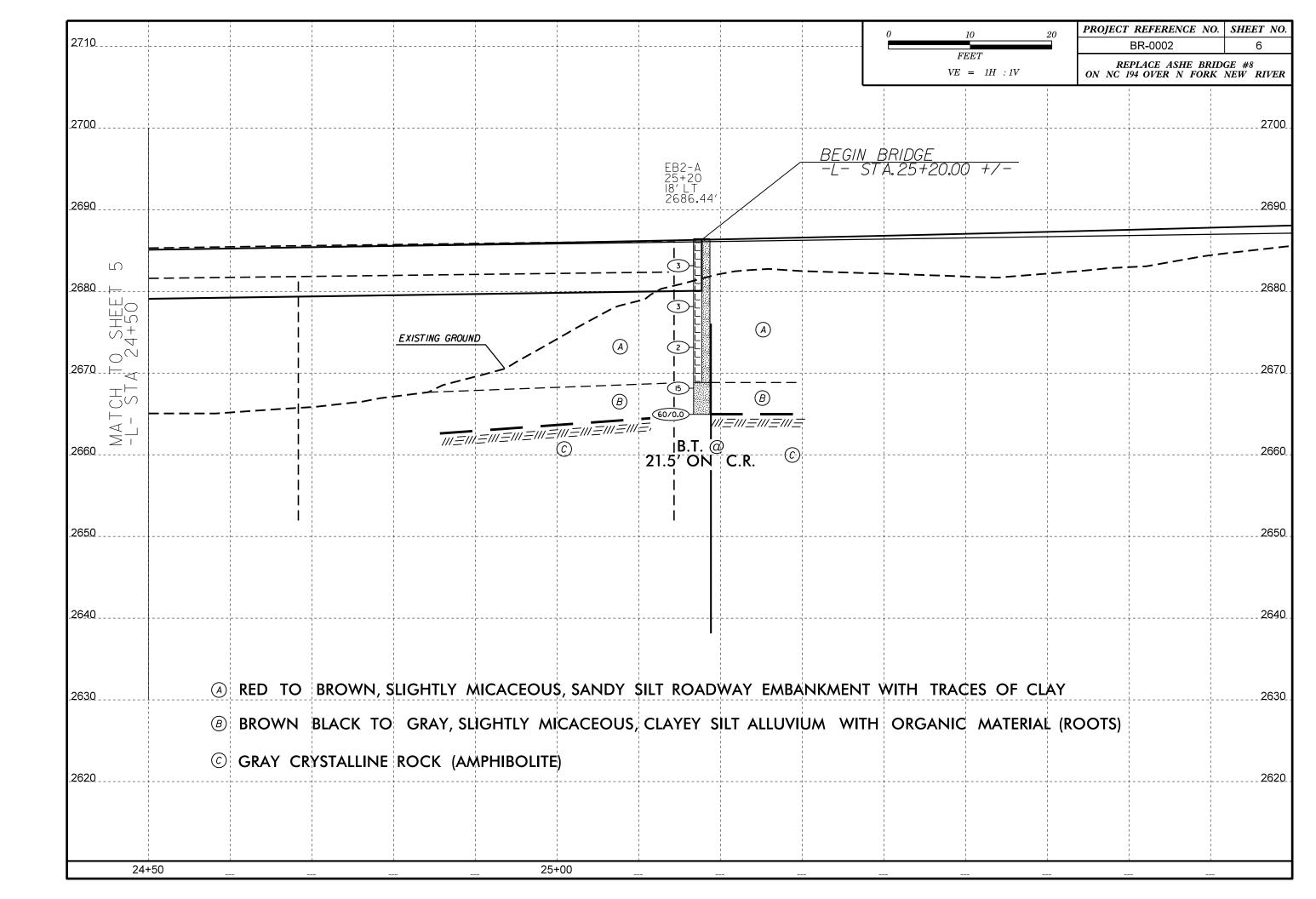
SHEET NO.

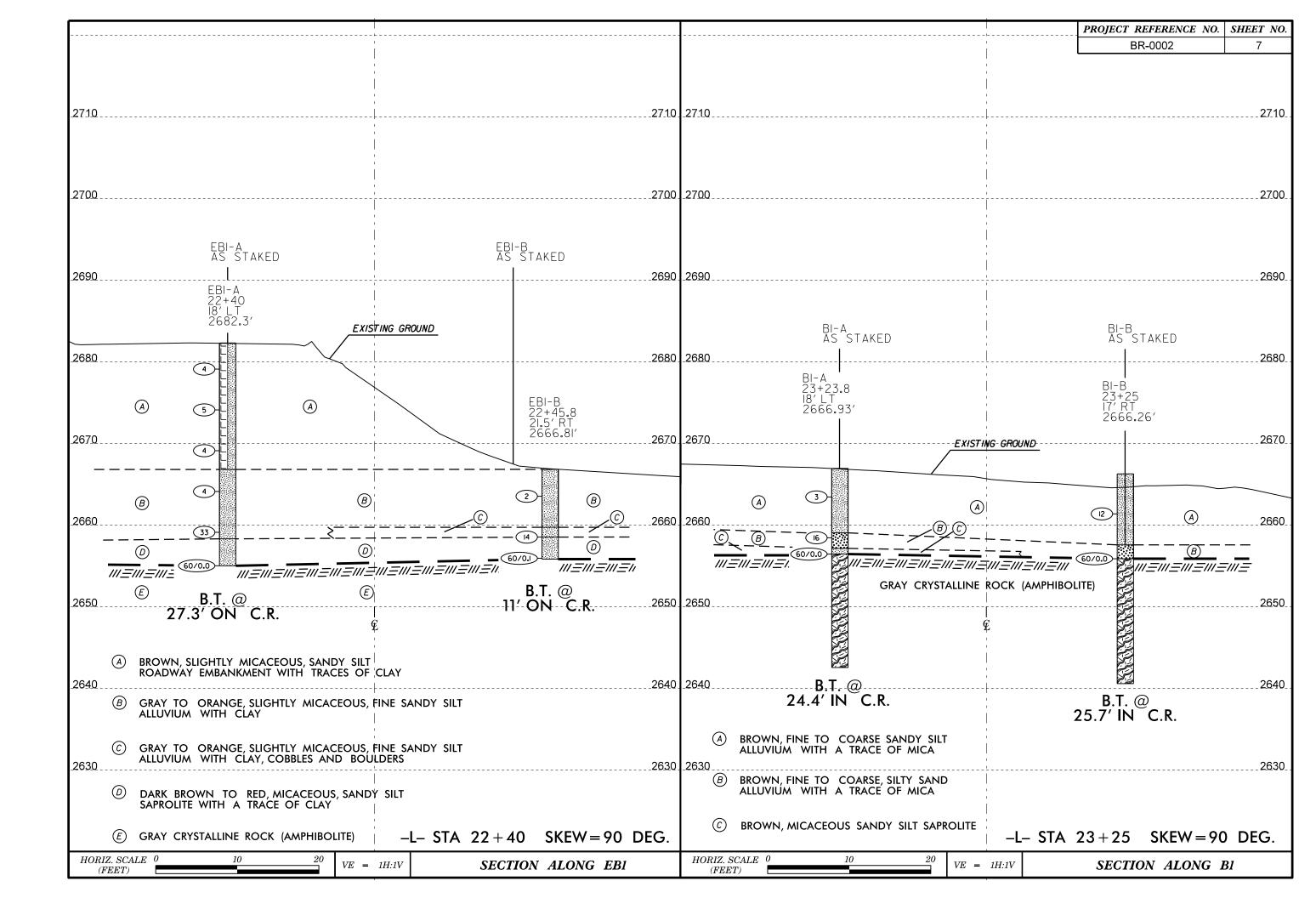
2A

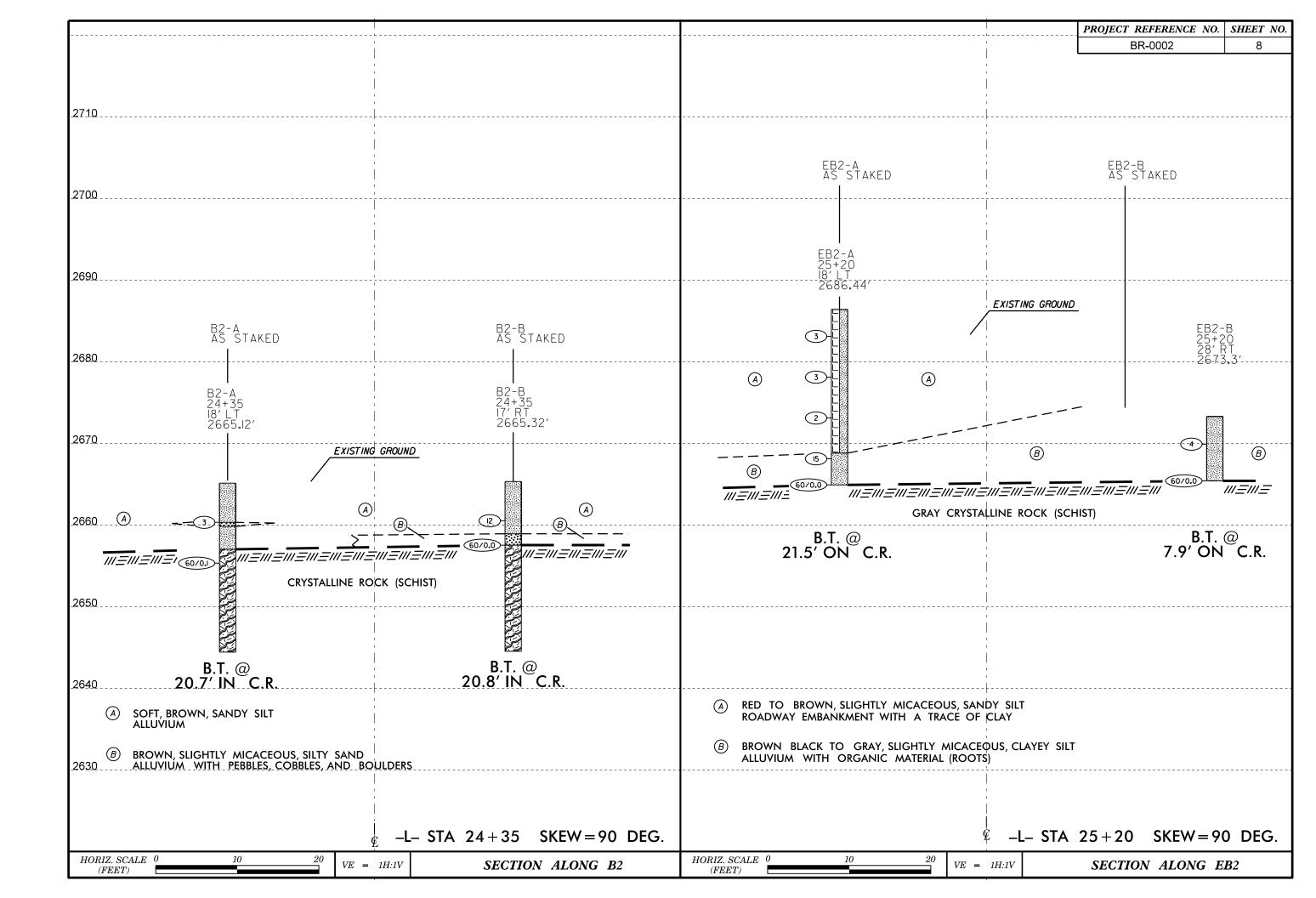




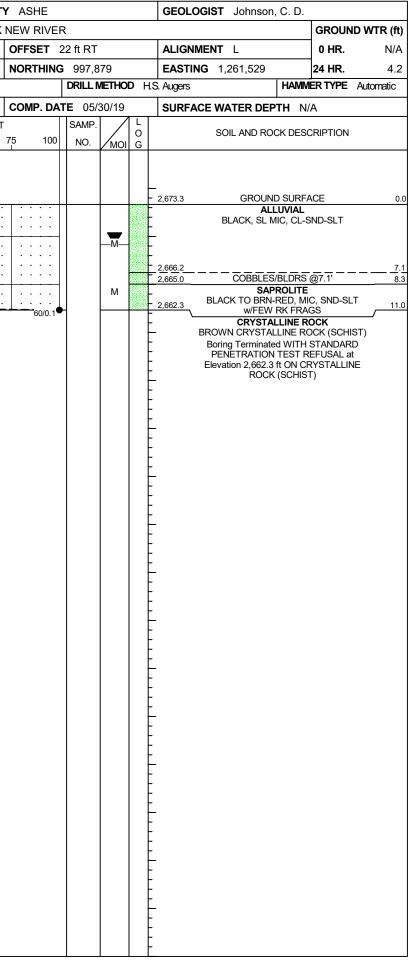








	67002					P BR-000			Y ASHE				GEOLO	GIST Johnson, C. D.	1			67002					• BR-00		COUNTY
				DGE #				H FORK	NEW RIVE						GROUND	WTR (ft)					DGE #				TH FORK N
BOR	ING NO.	. EB1-	A		-	TATION 2	-		OFFSET	18 ft LT			ALIGN	IENT L	0 HR.	15.0	BOR	ING NO.	EB1-	В		ST	ATION	22+46	
	LAR ELI	,				OTAL DEPT			NORTHING					G 1,261,495	24 HR.	FIAD		LAR ELI						PTH 11.0	
DRIL	L RIG/HA	MMER E	FF./DA	TE AF	06744	CME - 45C 9	2%07/31/20	17		DRILL	METHOD	р Н.	S. Augers	HAM	MER TYPE A	utomatic	DRIL	l Rig/Ha	MMER E	FF./DA1	TE AF	06744 (CME - 45C	;92%07/31/2	2017
DRIL	LER C	heek, D	D. O.		S	TART DATE	E 05/29/1	9	COMP. DA	TE 05/	/29/19		SURFA	CE WATER DEPTH	I/A		DRIL	LER C	heek, D	0. 0.		ST	ART DAT	TE 05/30/	/19
ELEV	DRIVE ELEV	DEPTH	<u> </u>	W COL			BLOWS F	PER FOOT		SAMP.		LO		SOIL AND ROCK DES	CRIPTION		ELEV	DRIVE ELEV	DEPTH	<u> </u>	W COL			BLOWS	PER FOOT
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50 I	75 100	NO.			ELEV. (ft)			DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50 7
2685		Ļ										Ļ	_				2675		Ļ						
	-	ŧ										E	2,682.3	GROUND SURF	ACE	0.0		-	-				 · · ·	· · · · · ·	
	-	1										-101	2,002.0	ROADWAY EMBAN	NKMENT	0.0		-	Ļ					· · · · ·	.
2680	2,679.1	3.2						<u> </u>	· · · · ·			-01	-	BROWN, SL MIC, SND-S PIECES OF ASPHAL			2670	2,670.0	3.3	1	1	1			
	-	ŧ	2	2	2	↓ ↓4 · · · ·	· · · ·				M	-01						-	L				$\overline{\lambda}$		
2675		Ł				<u>.</u>						- E	_				2665	2,665.0	8.3				· .		
	2,674.1	8.2	1	2	3	5					M	-10E						-	ŀ	12	7	7	· · • • 14	4	
		ł				I						= }-						2.662.4	10.9	60/0.1					
2670	2.669.1	T 13.2										= F	_					-	F						
	-	Ŧ	1	2	2						M	= F	2,666.8			15.5		-	F						
2665	-	Ŧ										F		ALLUVIAL GREY TO ORANGE, SL MI				-	F						
	2,664.1	18.2	2	2	2					SS-SS-	1 M	F		w/CL	C, TN SND-SI	-1		-	F						
	-	ŧ					· · · · ·			00-00-	-	F						-	ŧ						
2660	2,659.1	+ - 23.2						· · · ·				F	_					-	F						
			4	13	20		• <u>3</u> 3.				м	-	2,658.3	SAPROLITE	E	24.0		-	ŧ						
2655	2,655.0	27.3							1			ļ	2.655.0	K BROWN-RED, MIC, SN SAPROLITIC TEX		L, 27.3		-	ŧ.						
		+ + + +												GREY CRYSTALLIN (AMPHIBOLIT) Boring Terminated WITH PENETRATION TEST I Elevation 2,655.0 ft ON C ROCK (AMPHIBC	E) STANDARD REFUSAL at RYSTALLINE				+ - - -						
		+ + + +										-							-						
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GEOTECHNICAL BORING REPORT

						02	0.20	В	ORE	LO	G		`_											-	•	••••	C	OR	:E
WB	S 67002	2.1.1			ТІ	P BR-00	02	COUNT	Y ASHE					GEOLOGIST Johnso	n, C. D.			WB	S 6700	2.1.1			TIP	BR-00	002	C	OUNT	/ AS	SHE
SITE	E DESCR	IPTION	BRI	DGE #8	8 ON	NC194 O	VER NOR	TH FORK	NEW RIV	ER				1		GROUN	D WTR (ft)	SIT	E DESCR	RIPTION	BRI	IDGE #8	ON NO	C194 C	OVER NC	ORTH F	ORK	NEW	RI
BOF	RING NO.	B1-A			ST	TATION	23+24	-	OFFSET	18 ft	LT			ALIGNMENT L		0 HR.	N/A	BO	ring no	. B1-A	4		STA	TION	23+24			OFF	SET
	LAR ELI	,					TH 24.4		NORTHI	NG 99	97,96	3		EASTING 1,261,551		24 HR.	6.0 Caved	COI	LAR EL	EV. 2,	666.9	ft	тоти	AL DEI	PTH 24	.4 ft		NOR	۲H
DRIL	l rig/ha	MMER E	FF./DA1	TE AFO	06744	CME - 45C	92%07/31/20)17		DRI	ll Me	ethod) N	W Casing W/SPT & Core	HAMM	ER TYPE	Automatic	DRIL	L RIG/HA	MMER E	eff./da	TE AFO	6744 CIV	/IE - 45C	C 92% 07/3	1/2017			
DRI	LLER C	heek, [0. 0.		ST		E 05/30/ ⁻	19	COMP. D	ATE	05/30	0/19		SURFACE WATER DE	PTH N/	/A			LLER		D. O.		STA	rt da	TE 05/3	0/19		CON	/IP.
ELEV	, DRIVE ELEV	DEPTH	<u> </u>	W COU				PER FOOT			MP.			SOIL AND R	OCK DESC	CRIPTION		CO	RE SIZE	nxwl	1	1			N 13.9 f		AT A	<u> </u>	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 10	0 N	0.	MOI	G	ELEV. (ft)			DEPTH (ft)	ELE\ (ft)	RUN ELEV (ft)	DEPTH (ft)	I RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	REC. (ft) %	ATA RQD (ft) %	L O G	ELE
2670																		2656.4											
	-	ł												- - 2,666.9 GROU	ND SURFA	ACE	0.0	2655		+ 10.5 + +	3.9	N=60/0.0	(3.6) 92%	(3.0) 77%					2,65
2665	-													A Brown, fine to coa	LLUVIAL	silt with a tr	race		2,652.5	<u>+ 14.4</u> +	5.0		(5.0)	(4.7)					
	2,663.4	3.5	2	2	1										of mica			2650		ŧ			100%	94%				ĻÈ	-
0000	-	Ļ		2	·	9 ³ · · ·						▼		-					2,647.5	19.4	5.0		(5.0)	(47)	-			Ē	
2660	2,658.4	- 85				<u> </u>		· · · · ·						2,659.0			7.9	2645		Ŧ	5.0		(5.0) 100%	(4.7) 94%				, E	_
	2,656.4	t	8	9	7		6	· · · ·						2,657.1 Brown, fine to coa	L LUVIAL rse silty sa of mica	and with a tr	race 9.8		2.642.5	- 24.4									
2655		+	60/0.0											- SA	PROLITE		[]			+									
	-	F											F	Brown, mic CRYST	ALLINE R				-	ŧ								,	•
2650	-	Ē											E	-						+								ļ	
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2645	-	+											þ	-						Ŧ								Ē	_
		+								-4	┢		ł	- Boring Terminated	at Elevatio	on 2,642.5	ft IN			ŧ									
	-	÷											ļ	- CRYSTALLII	NE ROCK	(SCHIST)				ŧ									
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CDOT BORE DOUBLE BR0002_BRDG0008_ASHE_BOREHOLES.GPJ NC_DOT.GDT 7/19/19

2665 2,663.4 3.5 2660 2,658.4 8.5 2,656.4 10.5 2655 2650 2645

GEOTECHNICAL BORING REPORT LOG

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Ľ	Y A	ASHE			GEOLOGIST Johnso	on, C. D.		
<	NE\	N RIVE	R				GROUN	D WTR (ft)
	OF	FSET	18 f	ft LT	ALIGNMENT L		0 HR.	N/A
		RTHIN		997,963	EASTING 1,261,551		24 HR.	6.0 Caved
					Casing W/SPT & Core			Automatic
	<u> </u>			05/30/19				
_	00			03/30/19	SURFACE WATER D		A	
_	L							
	0			D	ESCRIPTION AND REMAR	RKS		
_	G	ELEV.	(ft)					DEPTH (ft)
_		2,656.4			Begin Coring @ 10.5 CRYSTALLINE ROCK	ft C		10.5
						•		10.0
		-						
		F						
		F		GSI 80 - 90				
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		L						
		L		Boring Terminate	d at Elevation 2,642.5 ft IN (SCHIST)	CRYSTALL	INE ROCH	K
		-			(0011101)			
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ELEV

(ft)

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2660

2655

2650

2645

WBS 67002.1.1 **TIP** BR-0002 COUNTY ASHE GEOLOGIST Johnson, C. D. **WBS** 67002.1.1 SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER **GROUND WTR (ft)** BORING NO. B1-B **STATION** 23+25 OFFSET 17 ft RT ALIGNMENT L 0 HR. N/A BORING NO. B1-B **COLLAR ELEV.** 2,666.3 ft TOTAL DEPTH 25.7 ft **NORTHING** 997,942 **EASTING** 1,261,577 **COLLAR ELEV.** 2,666.3 ft 24 HR. 6.5 DRILL RIG/HAMMER EFF./DATE AF06744 CME - 45C 92% 07/31/2017 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic DRILLER Cheek, D. O. **DRILLER** Cheek, D. O. **START DATE** 05/30/19 COMP. DATE 05/30/19 SURFACE WATER DEPTH N/A DRIVE DEPTH BLOW COUNT SAMP CORE SIZE nxwl BLOWS PER FOOT SOIL AND ROCK DESCRIPTION ELEV 0 (ft) 0.5ft 0.5ft 0.5ft 25 50 75 100 NO. RUN ELEV (ft) MOI G ELEV (ft) (ft) 2655.86 2655 2,655.9 10.4 GROUND SURFACE 2,666.3 0.0 2,650.6 15.7 ALLUVIAL Brown, slightly micaceous sandy silt with pebbles and rock fragments 2,661.4 4.9 2 2 10 2645 2,645.6 20.7 2,657.6 . . . • • ALLUVIAL 2,655.9 10.4 2,655.9 10.4 Brown, slightly micaceous silty sand with _ _ _ ----60/0.0 2,640.6 25.7 pebbles, cobbles, boulders CRYSTALLINE ROCK . Boring Terminated at Elevation 2,640.6 ft IN CRYSTALLINE ROCK (SCHIST)

COUNTY ASHE **TIP** BR-0002 SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK N **STATION** 23+25 TOTAL DEPTH 25.7 ft DRILL RIG/HAMMER EFF./DATE AF06744 CME - 45C 92% 07/31/2017 **START DATE** 05/30/19 TOTAL RUN 15.3 ft DRILL RATE STRATA REC. RQD (ft) (ft) % % RUN SAMP. REC. (ft) % RQD (ft) % NO. (Min/ft) 5.3 N=60/0.0 (4.8) (4.2) 91% 79% (5.0) (4.7) 100% 94% (5.0) (4.9) 100% 98%

DEPTH RUN

(ft)

5.0

5.0

(ft)

GEOTECHNICAL BORING REPORT CORE LOG

r P	SHE		GEOLOGIST Jonnson	, C. D.		
NEV	W RIVER				GROUN	D WTR (ft)
	FSET 17 f	+ PT	ALIGNMENT L		0 HR.	N/A
					4	
NO	RTHING 9	97,942	EASTING 1,261,577		24 HR.	6.5
		RILL METHOD NM	Casing W/SPT & Core	HAMM	ER TYPE	Automatic
<u> </u>	MP. DATE	05/30/10	SURFACE WATER DEF		٨	
00		00/00/19	SURFACE WATER DEP	IT N/	~	
L				•		
O G		D	ESCRIPTION AND REMARK	S		
	2,655.9		Begin Coring @ 10.4 ft CRYSTALLINE ROCK			10.4
	_ 2,033.9		ONTOTALEINE NOON			10.4
	-					
	-					
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	_	GSI 80 - 90				1
	- 					1
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	-					
	-	Boring Terminator	d at Elevation 2,640.6 ft IN CF	YSTALL		
	-	Donny renninale	(SCHIST)	ALL		
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GEOLOGIST Johnson, C. D.

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	6700					IP BR-00			JNTY				GE	DLOGIST Johnson, C. D.	1			S 67002.1.1				BR-00		COU
				DGE #		NC194 O		RTH FC							GROUND WT	R (ft)		E DESCRIPTION		IDGE #8 (r			ORTH FO
BOR	RING NO). B2-A				TATION				FFSET				GNMENT L	0 HR.	N/A		RING NO. B2-A					24+35	
	LAR EL					OTAL DEF			NC	ORTHING					24 HR. 4.0 C			LAR ELEV. 2,					PTH 20	
DRIL	L RIG/HA	MMER E	FF./DA	TE AF	-06744	1 CME - 45C	92%07/3	1/2017			DRILL	METHOD	NW Casi	g W/SPT & Core HAMM	ER TYPE Autom	natic		l Rig/Hammer e		ATE AFO6				
DRIL	LER (TART DAT				omp. Da		—		RFACE WATER DEPTH N/	Ά			LLER Cheek, [D. O.				TE 05/3	
ELEV	DRIVE ELEV	DEPTH		W COL				VS PER F		100	SAMP.			SOIL AND ROCK DESC	CRIPTION		COF	RE SIZE nxwl					N 11.41	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75	100	NO.	MOI G	ELEV	(ft)	DEI	PTH (ft)	ELEV (ft)		RUN (ft)	DRILL RATE	REC. (ft) %	RQD (ff)	SAMP. NO.	STRATA REC. RC (ft) (f
																		(11)		(Min/ft)	%	%	110.	<u>%</u>
2670		+											+				2655.8 2655	2 2,655.8 2,654.4 10.7	1.4	N-00/0 4	(1.2)	(1.2)		
		Ŧ											F					2,654.4 10.7	5.0	<u>N=60/0.1</u>	(1.2) 86% (5.0)	(1.2) 86% (4.5)		
2665		Ŧ											2,665	GROUND SURFA	ACE	0.0		+			100%	90%		
		-											-	ALLUVIAL Soft sandy silt	t		2650	2,649.4 15.7	5.0		(1.0)	(4.9)		
		Ŧ				i: : : :							F	-					5.0		(4.9) 98%	(4.9) 98%		
2660	2,660.3	<u>† 4.8</u>	50	2	1		===			· · · ·			2,660			4.8 5.3	2645	2,644.4 20.7						
		ŧ											2,657	boulder ALLUVIAL		8.1		2,044.4 20.7						
2655	2,655.3	+ 98							·				-	Brown, slightly micaceous, s pebbles, cobbles, bo	sandy silt with	0.1		+						
2000	1	Ŧ	60/0.1								<u> </u>		F	CRYSTALLINE R										
		‡											F					+						
2650		‡											F					+						
		ŧ											F											
2645		‡											È.					l Ŧ						
2045		<u>+</u>									_	<u> </u>	F	Boring Terminated at Elevation	on 2 644 4 ft IN			1 4						
		‡											È.	CRYSTALLINE ROCK	(SCHIST)									
	-	‡											Ł											
		ŧ											Ł											
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nor		‡									1		ļ.				Ď	‡						
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NCDOT BORE DOUBLE_BR0002_BRDG0008_ASHE_BOREHOLES.GPJ_NC_DOT.GDT_7/19/19		‡									1		Ę					‡						
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GEOTECHNICAL BORING REPORT CORE LOG

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IT)	ΥA	SHE				GEOLOGIST	Johnson,	C. D.		
K	NEV	N RIVE	२						GROUN	ID WTR (ft)
	OF	FSET	18 f	't LT		ALIGNMENT	L		0 HR.	N/A
		RTHING				EASTING 1,2				4.0 Caved
					NW	/ Casing W/SPT & (Automatic
	<u></u>			05/30/19		SURFACE WA				
	50			00/00/10		JUNFAUE WA		IN//	`	
	L									
D	0				D	ESCRIPTION AND	REMARKS	;		
	G	ELEV. (f	t)							DEPTH (ft)
					Co	ntinued from pr	evious pag	je		
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WBS	67002	2.1.1			TIF	BR-0002	2	COUNT	Y ASHE				GEOLOGIST Johnson, C. D.				6 7002					BR-00			OUNT	
SITE	DESCR	RIPTION	BRI	DGE #	8 ON I	NC194 OVE	ER NORT	H FORK	NEW RIVE	२				GROUN	D WTR (ft)	SITE	DESCR	IPTION	BRID	DGE #8 (:194 O	VER NO	RTH F	ORK	Ν
BOR	ING NO	. B2-B			ST	ATION 24	+35		OFFSET	17 ft RT			ALIGNMENT L	0 HR.	N/A	BOF	Ring No.	B2-B			STAT	TION 2	24+35			_
COLI	AR EL	EV. 2,6	665.3	ft	то	TAL DEPT	H 20.8 ft		NORTHING	9 98,0)25		EASTING 1,261,649	24 HR.	5.3		LAR ELI						TH 20.			1
DRILL	. RIG/HA	MMER E	FF./DA	TE AF	06744 (CME - 45C 92	% 07/31/201	7		DRILL	METHO	N D	W Casing W/SPT & Core HAMN	ER TYPE	Automatic	DRIL	l rig/ha	MMER E	FF./DAT	E AFO6	744 CM	E-45C	92% 07/31	/2017		
		cheek, D). O.		ST	ART DATE	05/30/19	9	COMP. DA	TE 05/	30/19		SURFACE WATER DEPTH N	A		DRI	LER C	heek, D). O.		STAF	rt dat	E 05/30)/19		(
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		t											Brown, sandy silt with mica clay	and a trace	e of	2650	2,649.5	- 15.8								
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GEOTECHNICAL BORING REPORT CORE LOG

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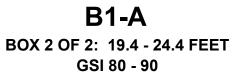
BOX 1 OF 2: 10.5 - 19.4 FEET GSI 80 - 90







SHEET 15 BR-0002 / ASHE BRIDGE NO. 008



B1-B

BOX 1 OF 2: 10.4 - 20.2 FEET GSI 80 - 90

BOX 2 OF 2: 20.2 - 25.7 FEET



20.2

SHEET 16 BR-0002 / ASHE BRIDGE NO. 008

B1-B

GSI 80 - 90



B2-A

BOX 1 OF 2: 9.3 - 17.5 FEET GSI 80 - 90

BOX 2 OF 2: 17.5 - 20.7 FEET





SHEET 17

BR-0002 / ASHE BRIDGE NO. 008

B2-A GSI 80 - 90

B2-B

BOX 1 OF 2: 7.8 - 15.8 FEET GSI 80 - 90 **B2-B** BOX 2 OF 2: 15.8 - 20.8 FEET GSI 80 - 90



15.8





SHEET 18

BR-0002 / ASHE BRIDGE NO. 008

CONTENTS

BR-0002

REFERENCE

<u>SHEET NO.</u>	DESCRIPTION
I	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-7	PROFILES
8-12	CROSS SECTIONS
13-15	BORE LOGS

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY ASHE

PROJECT DESCRIPTION REPLACE ASHE BRIDGE #8 ON NC 194 OVER NORTH FORK OF NEW RIVER

SITE DESCRIPTION **RETAINING WALL** #1 -L- STA 15+00 - 20+00 OFFSET 26.5'RT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	67002.1.1	1	15

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6805. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNICS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UN-FLACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OSESURFACE MATER AND THE SUBSURFACE RONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THES WASTER LEVELS OR SOL MOISTURE CONDITIONS MAY VARY. CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OF CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY THINSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FOM THE ACUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES: I. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE. 2.

PERSONNEL

C.D. JOHNSON

D.O. CHEEK

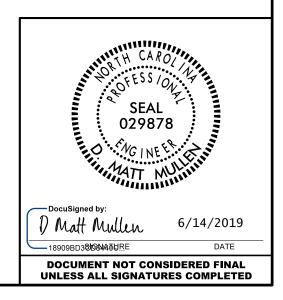
C.J. COFFEY

INVESTIGATED BY _____. MULLEN

DRAWN BY _ **D.M.M**.

CHECKED BY _____. KUHNE

SUBMITTED BY J.C. KUHNE



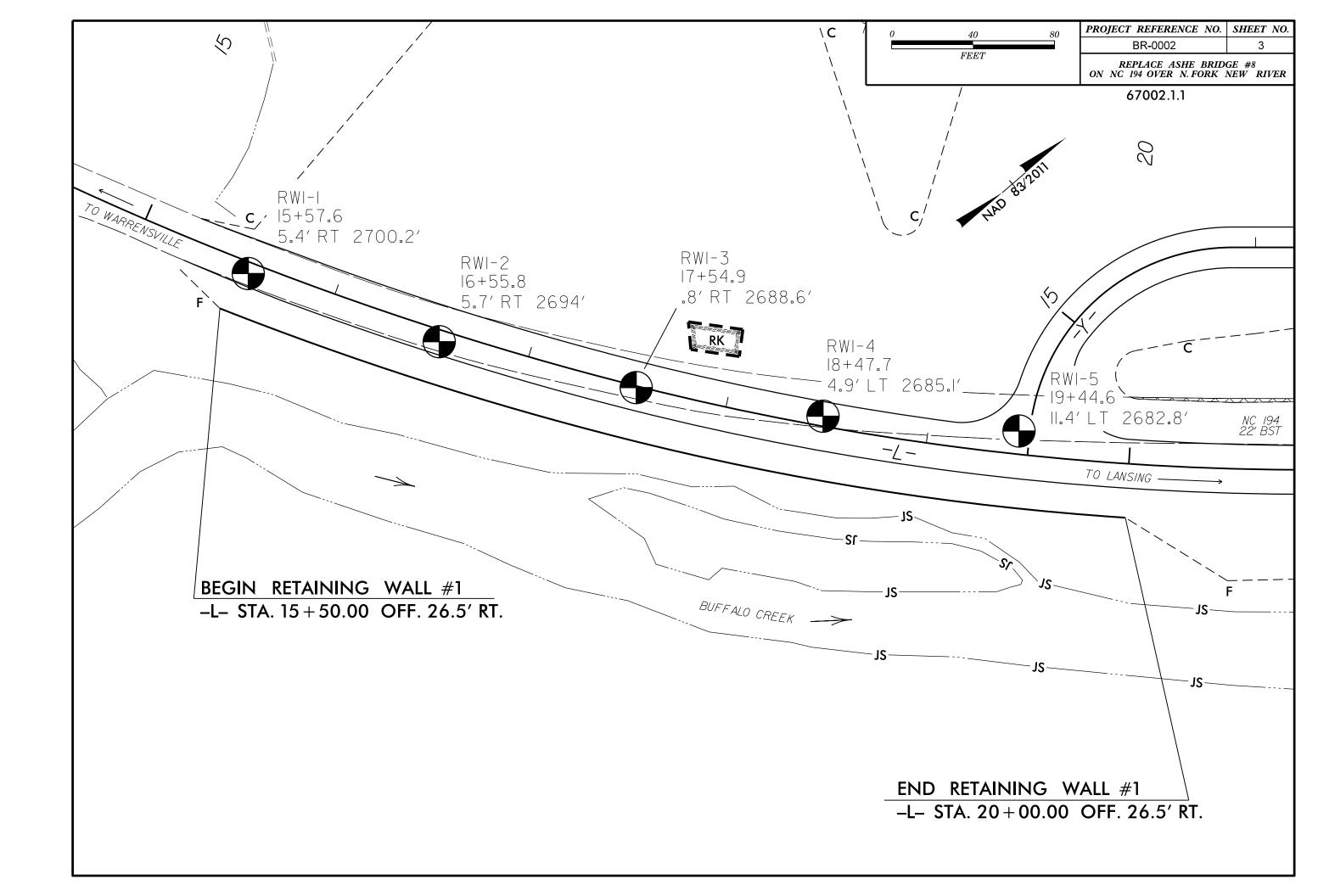
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

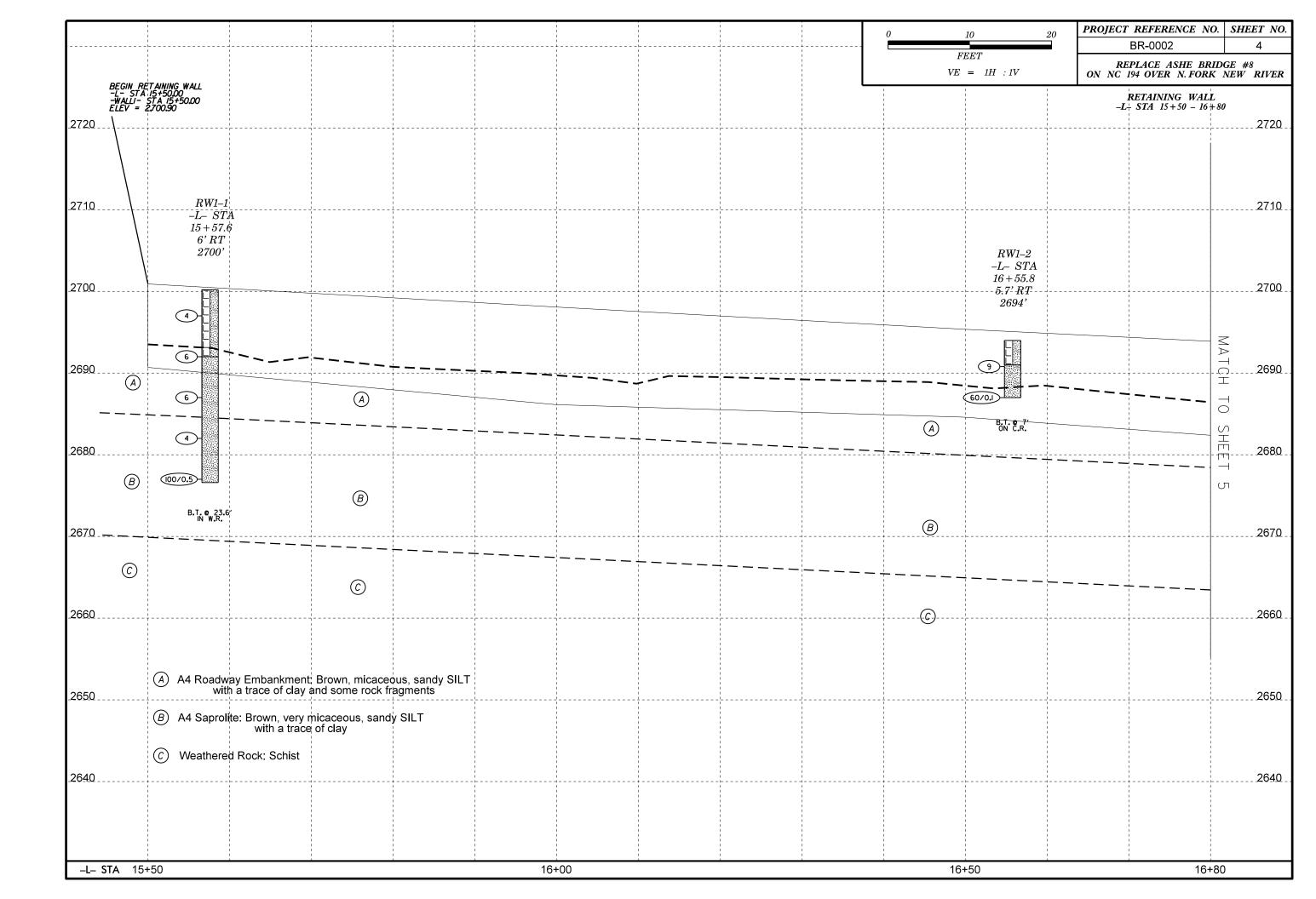
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

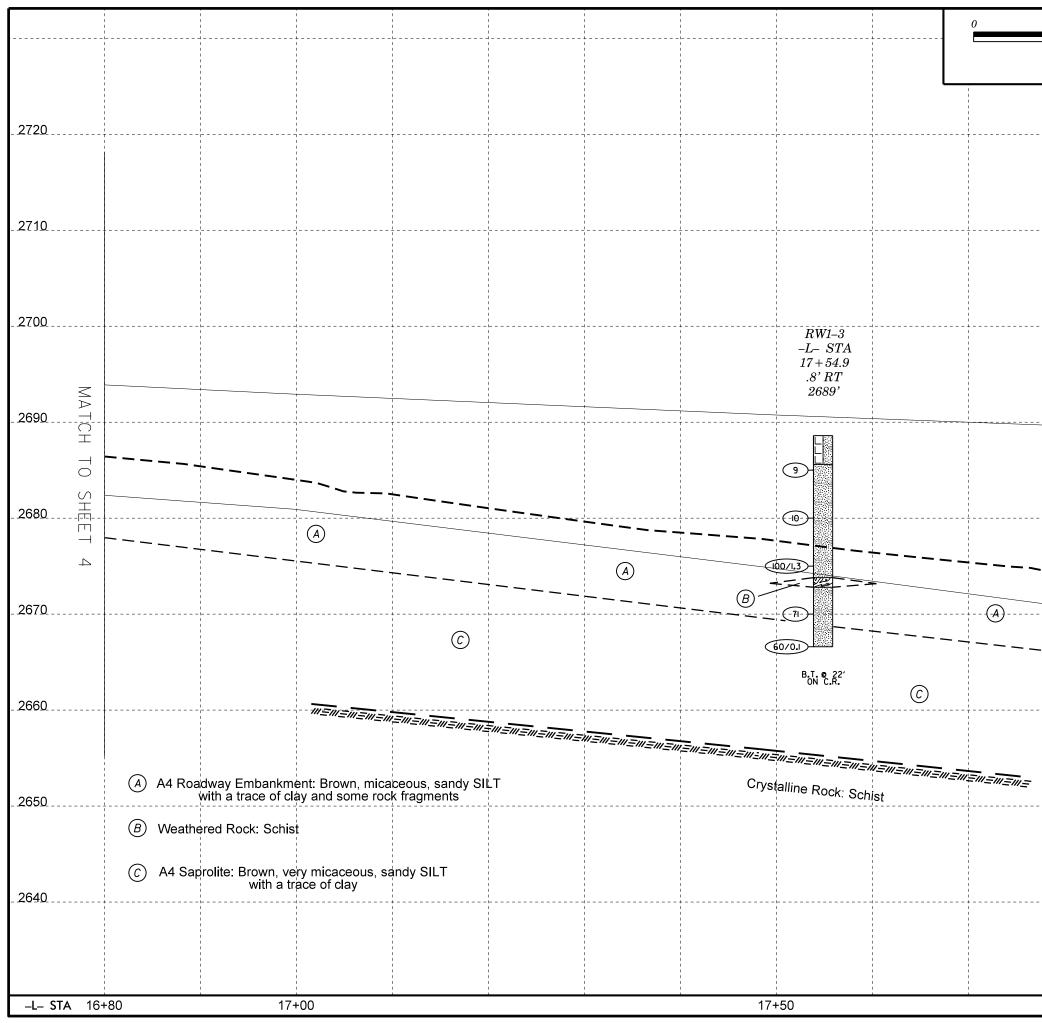
	CRADATION		
		ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD TIELD SPT REFUSAL IF TESTED. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	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	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	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	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	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200)	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-7 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED.	OF SLOPE.
SYMBOL DOODOODOOO	MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
% PASSING SII T-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
■10 50 MX ■40 30 MX 50 MX 51 MN S01LS CLAY 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 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL <u>SOILS</u> OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING #40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	
LL – – 40 MX 41 MN 50 L2 M H	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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 LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
MUDERALE OPCONIC		OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF 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.
USUAL TYPES STONE FRAUS. FINE STITY OF CLAYEY STITY 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.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	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	- OM- Spring or seep		FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
		(MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES CLUNK SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACINESS OF PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
		SEVERE ALL ROCK EXCEPT OUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4 CONVERTING LOOSE 4 TO 10	SOIL SYMBOL	(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.
GRANULAR MEDIUM DENSE 10 TO 30 N/A		IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
(NON-COHESIVE) DENSE 30 10 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT HAUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERT DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	INFERRED SOIL BOUNDARY	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0		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		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	TTTTT ALLUVIAL SOIL BOUNDARY A FIELDMETER OF SPT N-VALUE	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
		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	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	USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	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 OR BACKFILL	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.) (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	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CLCLAY MODMODERATELY γ -UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC χ -DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE CHIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSOREMETER TEST <u>SHOULE HODREVIA TONS</u>	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; VERY 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.	<u>STRATA ROCK QUALITY DESIGNATION (SROD)</u> - 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	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
BANGE - WET - (W) SEMISULID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	
	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: N/A ELEVATION DERIVED FROM DTM
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: FEET
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	
SL SHRINKAGE LIMIT	X CME-45C CLAY BITS AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
	CME-55	THINLY LAMINATED < 0.008 FEET	
PLASTICITY			
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	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: GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM			
HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR		CRAINS ARE DISCIPLET TO SERARATE WITH STEEL PROPE.	
		INDURATED DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE:	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14

PROJECT REFERENCE NO.

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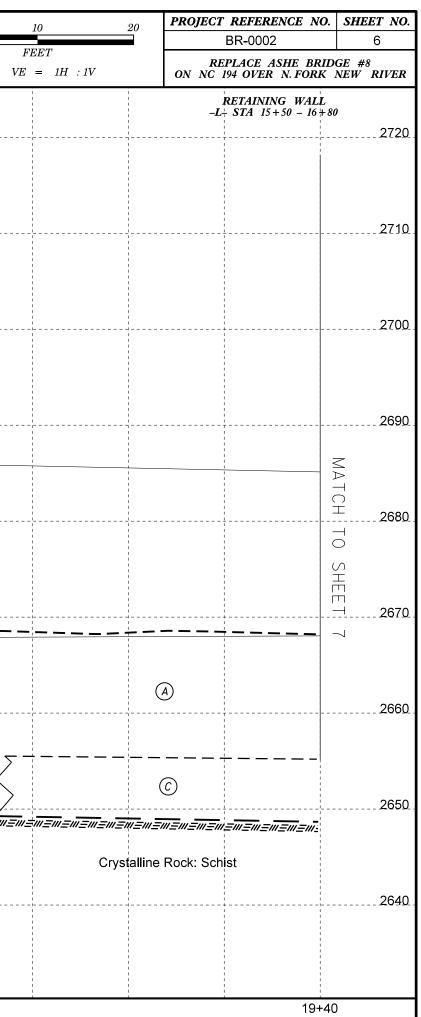


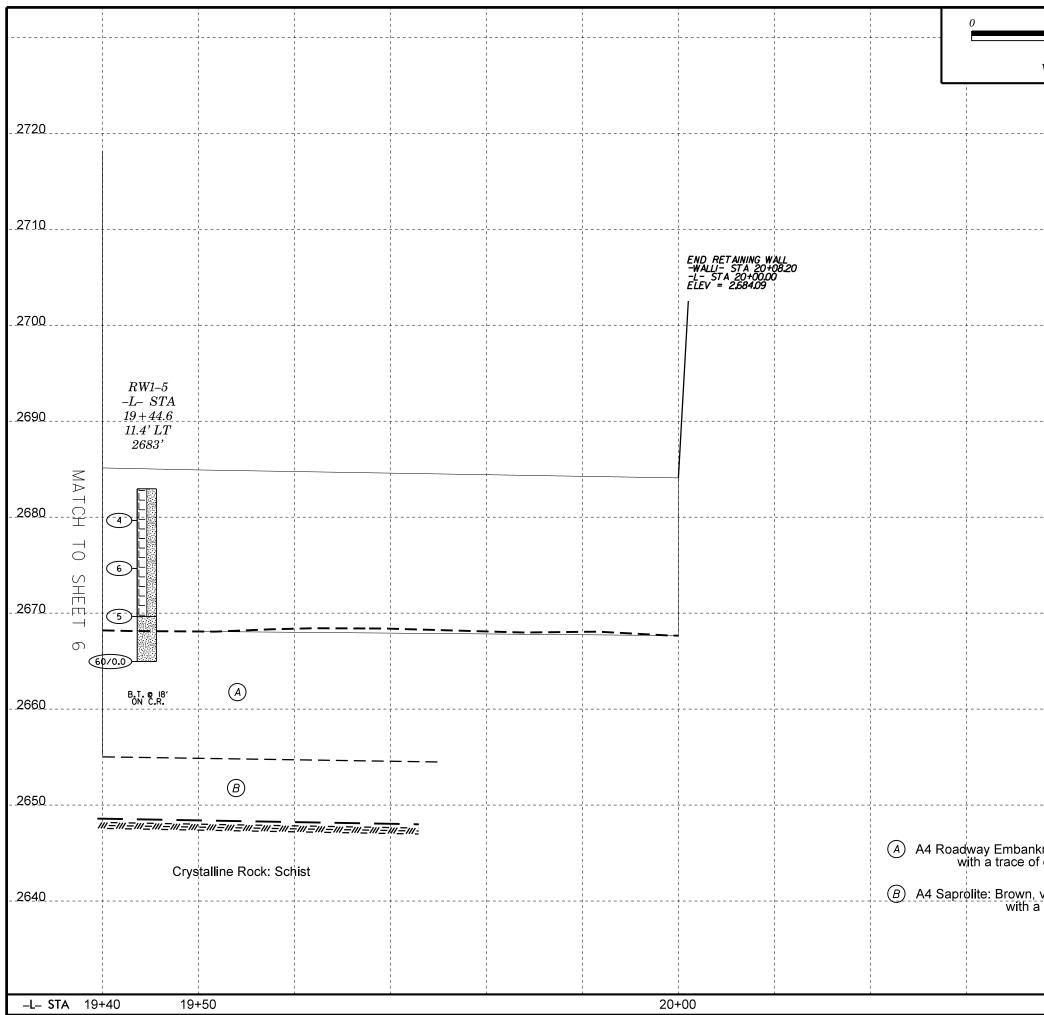




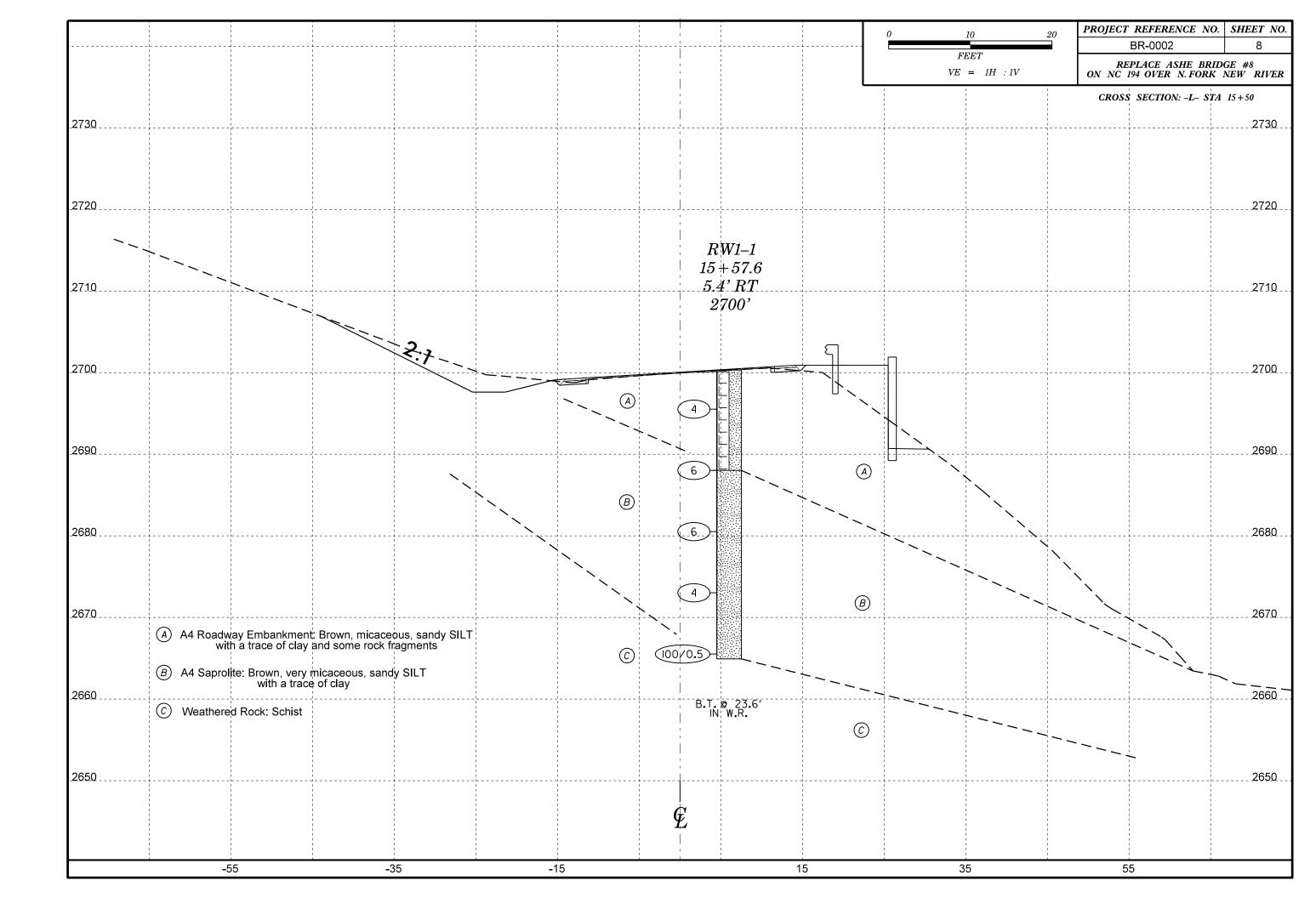
PEET BR-0002 5 $VE = 1H : IV$ REPLACE ASHE BRIDGE ## ON NC 194 OVER N.FOK NEW RIVER RETAINING WALL L; STA 15+50 - 16+80 2720. 2710. 2710. 2710. 2700. 2690. 2690. 2690. 2690. 2710. 2680. 2690. 2690. 2690. \Box 2680. \Box 2680. 2690. \Box \Box 2680. \Box 2680. \Box \Box 2680. \Box 2680. \Box \Box 2680. \Box 2680. \Box \Box \Box \Box \Box 2680. \Box \Box \Box \Box \Box \Box 2680. \Box		10	20	PROJECT	REFERENCE	NO.	SHEET NO.
VE IN REPLACE ASHE BRIDGE #8 ON NC 194 OVER N.FORK NEW RIVER L-STA IS+50 - 16#80 2720 2710 2710 2700 2700 2700 2690 Image: Comparison of the state					BR-0002		5
RETAINING WALL 2720 -L+ SIA 15+50 - 16+80 2720 2710 2710 2700 2700 2690 2690				RE. ON NC I	PLACE ASHE . 194 OVER N. FO	BRID DRK	GE #8 NEW RIVER
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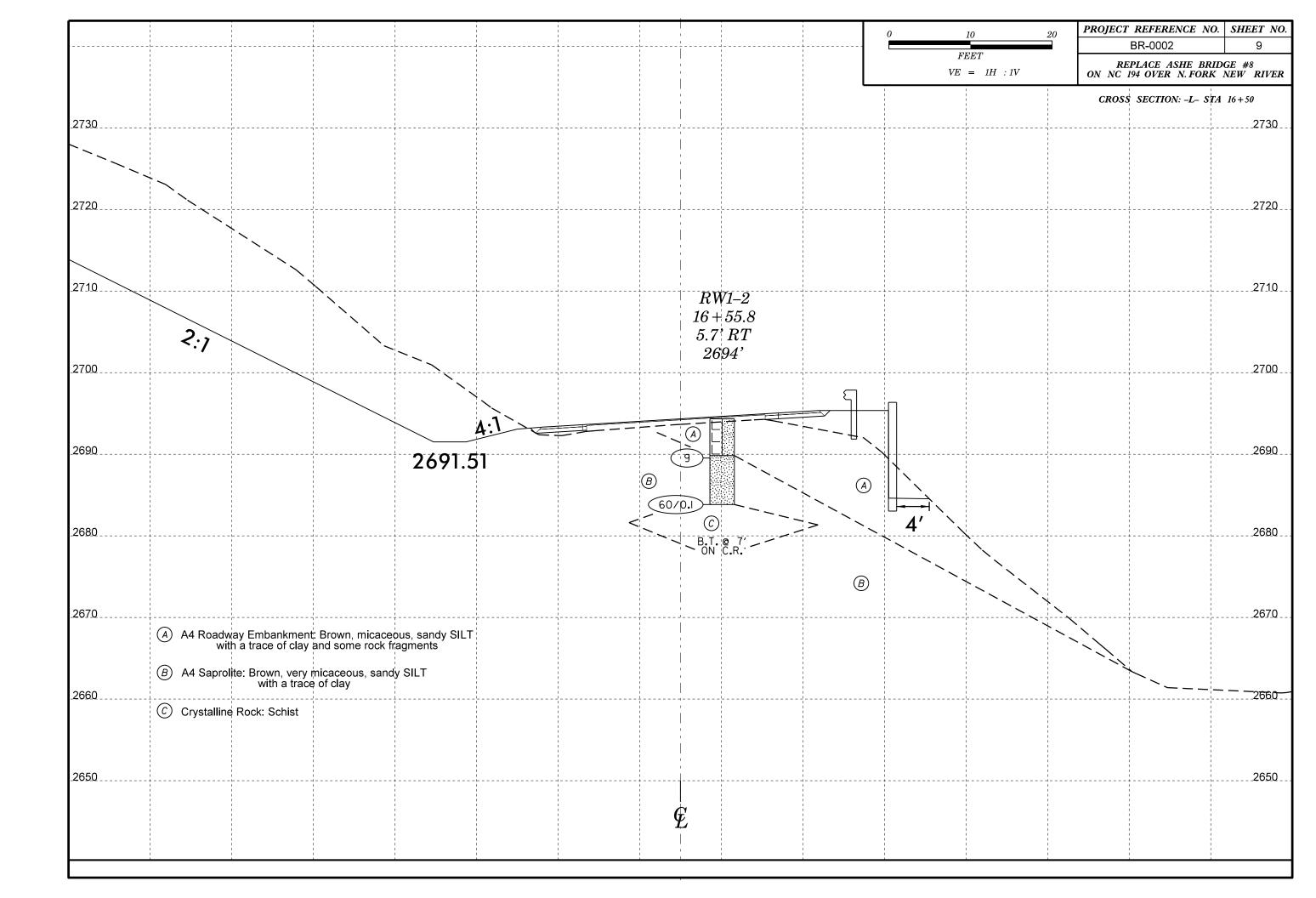
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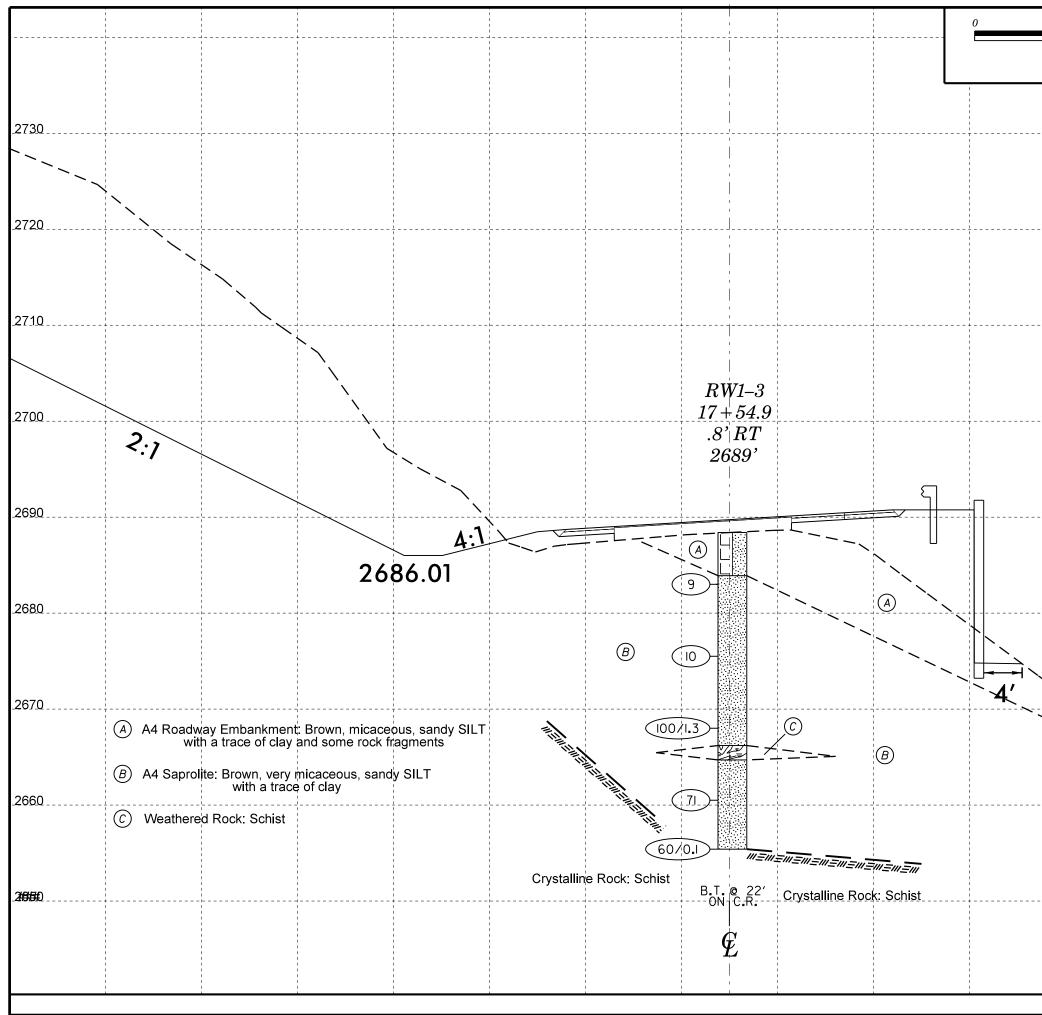




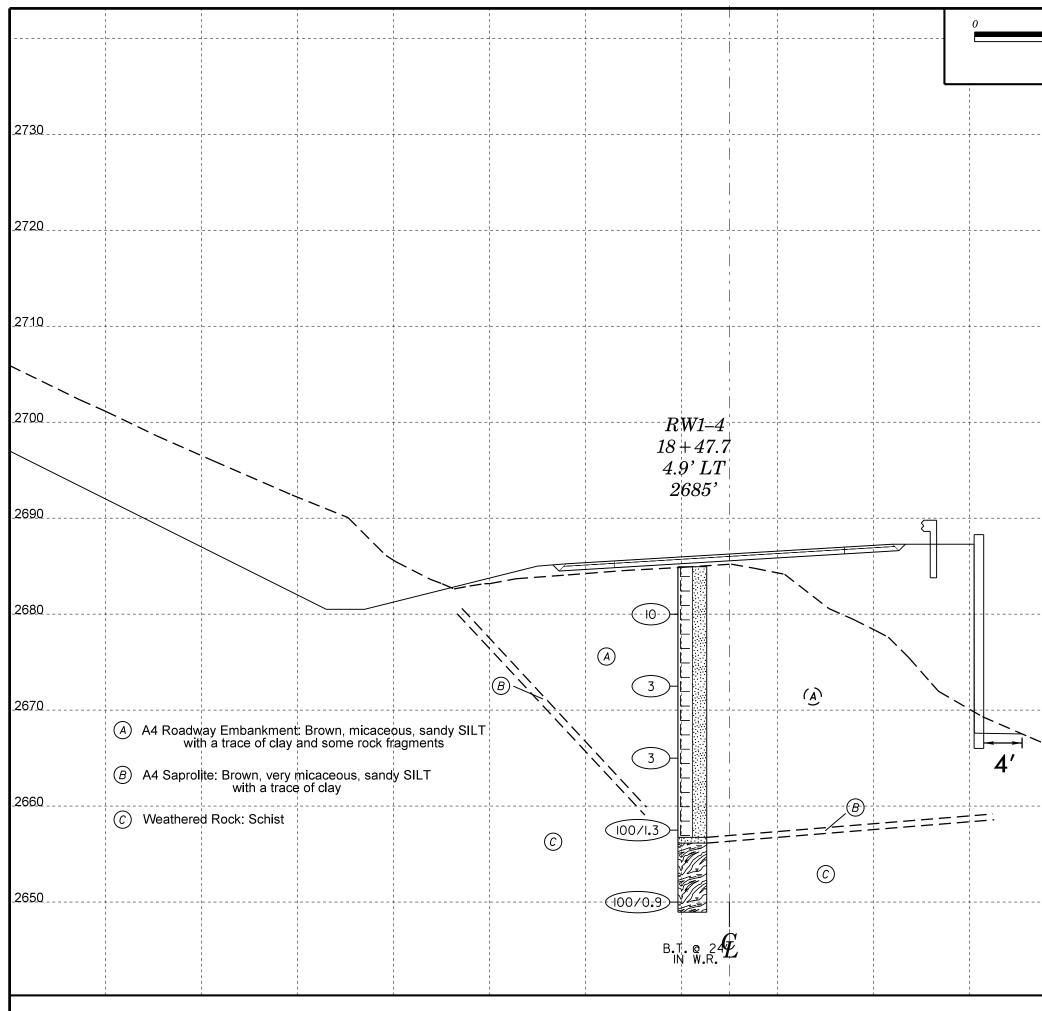
10	20	PROJECT	REFERENCE NO	SHEET NO.
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FEET $VE = 1H$: 1V	RE ON NC	PLACE ASHE BRI 194 OVER N. FORK	DGE #8 NEW RIVER
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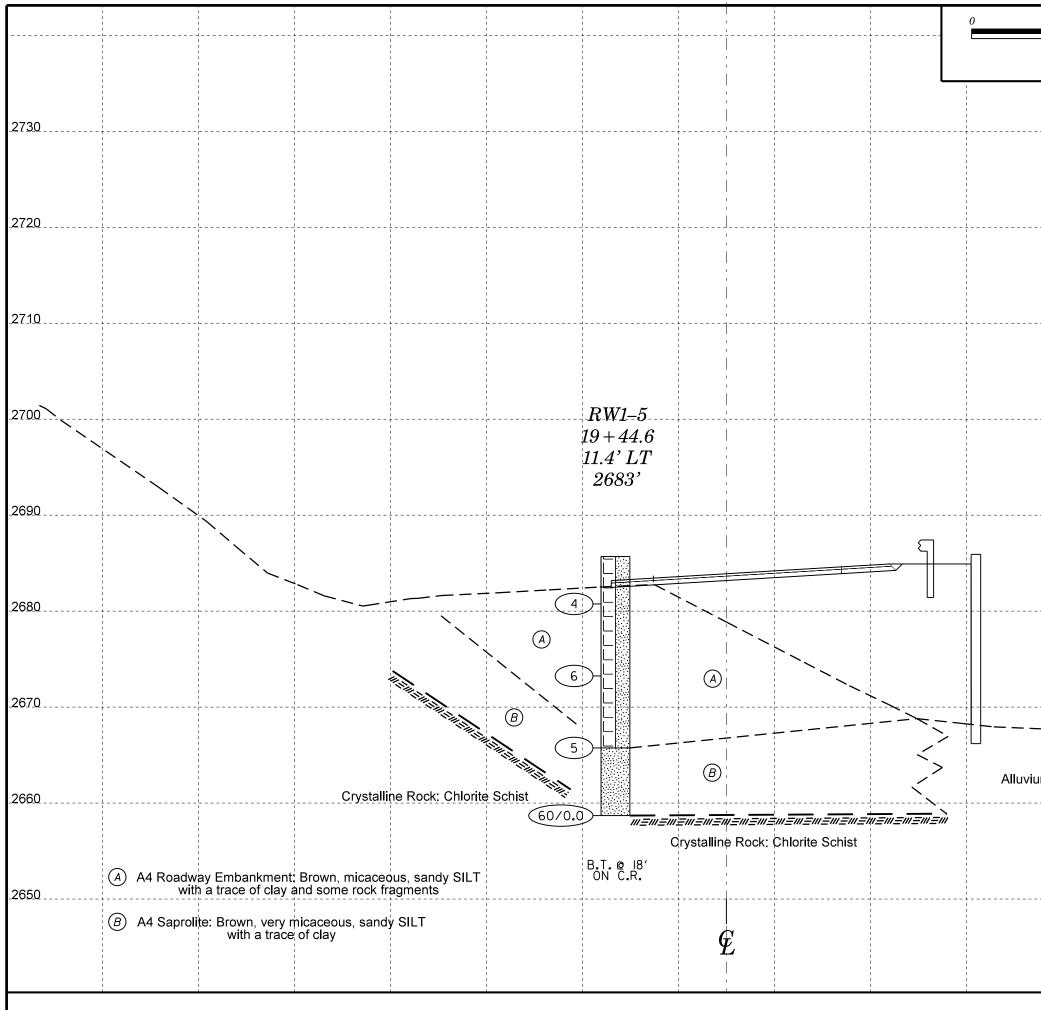




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March 24, 2020



Mr. John Pilipchuk, LG, PE and Ms. Christina Bruinsma, PG Geotechnical Engineering Unit North Carolina Department of Transportation 1020 Birch Ridge Drive Raleigh, NC 27610

RE: REPORT ON GEOPHYSICAL STUDY Proposed Retaining Wall Location by Buffalo Creek, Warrensville, NC ESP Project No. GR22.323

WBS Number:	67002.1.1
TIP Number:	BR-0002
Project ID:	35254
County:	ASHE
Description:	Replace Bridge No. 040008 over North Fork New River on NC194
Site Description:	Retaining Wall, -L- Sta. 15+00 to 20+00

Dear Mr. Pilipchuk and Ms. Bruinsma:

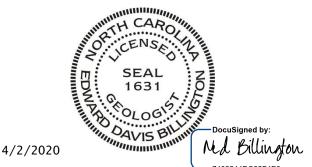
ESP Associates, Inc. (ESP) is pleased to submit this report on our geophysical study of the subject site. This work was performed in accordance with your Request for Proposal dated February 12, 2020 and our cost proposal dated February 21, 2020. The Notice to Proceed (NTP) was received on February 27, 2020.

We appreciate the opportunity to assist you during this phase of the project. If you should have any questions concerning this report, or if we may be of further assistance, please contact us.

Sincerely,

ESP Associates, Inc.

Edward D. Billington, PG Senior Geologist/Geophysicist EDB/PMW/JS



not considered Final unless all signatures are completed

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4.1 4.2	Seismic Refraction Velocity Models	2 2 2

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FIGURES

- Figure 1 Site Vicinity Map
- Figure 2 Data Collection Photographs
- Figure 3 Site Plan with Seismic Line Locations
- Figure 4 Seismic Line 1 Velocity Model
- Figure 5 Seismic Lines 2 through 6 Velocity Models
- Figure 6 NCDOT GEU Soil and Rock Legend

ATTACHMENTS

Attachment A Soil Test Boring Logs Provided by the NCDOT Attachment B Final Survey Report

1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) is planning to replace Bridge No. 040008 over the North Fork New River on NC194 (Figure 1). The project will require realignment of the two-lane highway from NW School Road to the bridge, and the construction of a retaining wall next to Buffalo Creek. The retaining wall is planned to be approximately 500 feet long, extending from -L- Sta. 15+00 to 20+00. Since the planned location of the retaining wall was too steep to allow drilling to explore for bedrock depths, the NCDOT requested that ESP perform a geophysical investigation to assess the approximate depth to bedrock. Based on the 1985 Geologic Map of North Carolina, the bedrock at the site is identified as an amphibolite (Zata), described as equigranular, massive to well foliated, interlayered, rarely discordant, metamorphosed intrusive to extrusive mafic rock; may include metasedimentary rock.

2.0 SITE OBSERVATIONS

ESP performed a site visit with NCDOT personnel on February 5, 2020 to assess the feasibility of performing work on the slope. The slope distance from the guard rail to the creek appeared to range from about 40 to 75 feet. In some places, the slope appeared to be approximately 1H:1V. There was a narrow strip of grass between the edge of pavement and the guard rail and occasionally a narrow soil bench on the slope side of the guard rail. The upper part of the slope was fairly open with tall grass and briars while the lower part of the slope was lightly wooded with briars. Boulders and some apparent rock outcrops were visible on the lower slope and at the creek level.

3.0 FIELD METHODS

ESP performed field work at the planned retaining wall location on March 3 through 6, and on March 9, 2020. The work consisted of seismic refraction data collection on March 3 through 5, driving "bridge rods" on March 6, and surveying the location of stakes for the seismic lines and bridge rod locations on March 9. Photographs of the site and of the seismic data collection are shown on Figure 2.

3.1 Seismic Refraction

ESP collected seismic refraction data along 6 lines: Line 1 was located along the approximate planned retaining wall location, and Lines 2 through 6 were oriented down the slope starting at the edge of pavement (Figure 3). The work was performed by Edward Billington, PG, Ryan Pastrana, GIT, and Chase Hallenbeck of ESP.

The seismic data were collected using a 24-channel system consisting of a Geode seismograph, 8Hz geophones spaced 5 feet apart, and a 16-pound sledgehammer striking a steel plate on the ground as the energy source. Four 115-foot long arrays using 24 geophones were employed for Line 1. Due to the length of the slope, 9 to 10 geophones were used for the slope lines with array lengths of 40 to 45 feet. Some lines or portion of lines required hand clearing. Noise from passing

vehicles affected the data although we tried to not collect data when cars and trucks were passing. Due to the steepness of the slope, the personnel working on the slope used a safety rope to help prevent falls. Wooden stakes were placed at 50-foot intervals along Line 1, and at the top, bottom, and significant slope changes on Lines 2, 3, 4, 5, and 6.

3.2 Bridge Rods

ESP drove bridge rods at the intersections of Line 1 with Lines 2, 3, 5, and 6 on March 6 (Figure 3). The slope at Line 4 was too steep for driving rods. The work consisted of driving 5-foot long half-inch steel rods with a 16-pound slide hammer approximately vertically down into the ground until refusal. Couplers were used when more than one rod was needed. Refusal was defined as 100 blows with less than an inch penetration. Notes were recorded as to the relative softness or hardness of the materials that were driven through with the rods. Wooden stakes were placed to mark the location of the rod drives.

3.3 Location Surveys

On March 9, ESP surveyed the locations and elevations of the wooden stakes placed to mark the seismic line locations and rod drives. The work was performed by a 3-person survey crew utilizing conventional survey equipment. The surveyed points were added to the MicroStation site plan and used to draw the approximate location of the seismic lines and rod drives (Figure 3). More information regarding the survey task is provided in the final survey report (Attachment B).

4.0 DATA ANALYSIS

4.1 Seismic Refraction Velocity Models

The processing steps for the seismic refraction data analysis consisted of assigning geometry, picking the arrival times of refracted energy at each geophone (first breaks), creating an elevation model from the survey point data, then performing a tomographic inversion of the arrival time data to develop a compressional wave velocity model for each line (Figures 4 and 5). The velocities are presented in feet per second (ft/s).

4.2 Bridge Rods and Soil Test Borings Data

The bridge rod and soil test boring data are listed in Table 1 and are superimposed on the velocity models on Figures 4 and 5. The soil test borings were performed by the NCDOT prior to ESP's work on this project (Attachment A).

4.3 Location Survey Data

The results of the location surveys were added to the MicroStation site plan on Figure 3.

5.0 DISCUSSION OF RESULTS

The velocity models were correlated with the rod drives to assess the approximate depth to weathered rock and to crystalline rock. Based on this evaluation, we made the following generalized definitions.

Compressional Wave Velocity (ft/s)	Corresponding Material Type ¹
Less than 3500	Fill and Residual Soil
3500 to 7500	Weathered Rock, WR
7500 or more ²	Crystalline Rock, CR

¹Material type as categorized by the NCDOT GEU; see Figure 6.

²7500 ft/s is the approximate limit of rippability for metamorphic rock (Handbook of Ripping, February 2000, 12th Edition, Caterpillar Inc., Peoria, IL).

The velocity model for Line 1 indicates that the depth to weathered rock is approximately 20 feet from STA 15+00 to 17+00. After STA 17+00, the depth to weathered rock decreases to 10 feet or less. At rod drive BR-01 on the alluvial bench, the material was soft until almost refusal at 4.7 feet below ground surface (bgs). Based on the seismic velocities, it appears that BR-01 refused on crystalline rock, so there appears to be little to no weathered rock in the vicinity of BR-01; this would be expected for an alluvial stream bank where the stream had previously scoured down to bedrock.

Due to the slope distance from the guard rail to the creek, the length of the arrays for Lines 2 through 6 were too short to obtain sufficient refracted arrivals from crystalline rock, resulting in velocity models that probably do not represent the true velocity structure of the subsurface. Although there is not a satisfactory match between the velocity model for Line 1 and the models for Lines 2 through 6 where they intersect, the models for Lines 2 through 6 do indicate that the depth to weathered rock decreases from STA 15+00 to STA 20+00, supporting the interpretation of Line 1, and they show a reasonable correlation with the adjacent RW1 soil test borings.

6.0 LIMITATIONS

These services have been provided to the NCDOT in accordance with generally accepted guidelines for performing geophysical surveys. It is recognized that the results of geophysical surveys are non-unique and subject to interpretation. Further, the seismic refraction method is an averaging technique; it is likely that there are bedrock highs and lows that are not imaged by this method.

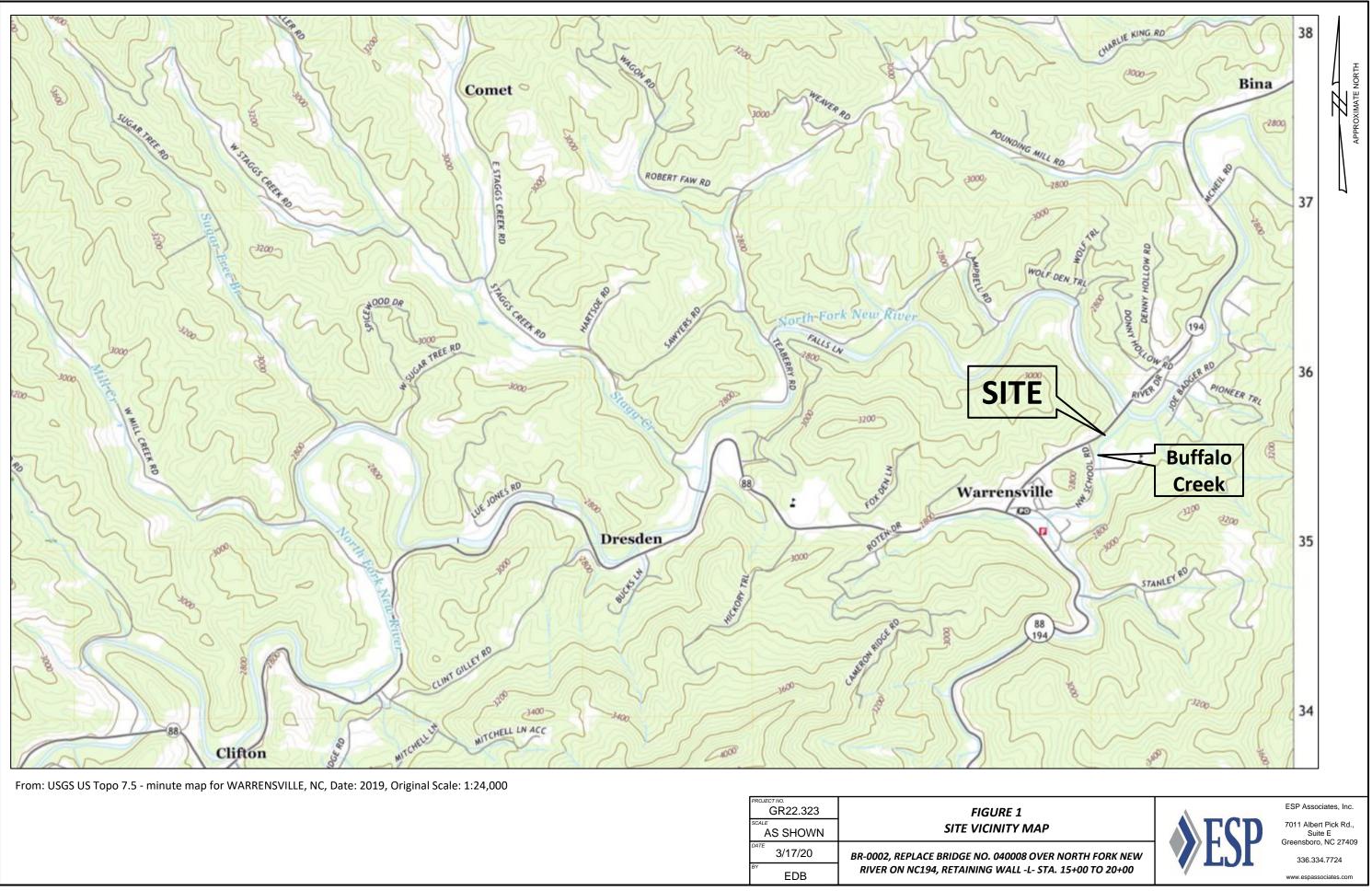
TABLES

Bridge Rod or Boring*	Station & Offset (-WALL1-)	Location on Seismic Line (Line, Station)	Refusal Depth (feet bgs)	Comments
BR-01	19+55 1' LT	Intersection of Line 1 and Line 2; Line 1 458'	4.7	0.0' – 4.5' - Soft 4.5' – 4.7' - Firm
BR-02	18+51 1' RT	Intersection of Line 1 and Line 3; Line 1, 353'	8.3	0.0' – 6.1' - Soft 6.1' – 8.3' - Firm
BR-03	18+50 8' RT	Line 3, 40'	6.7	0.0' – 5.5' - Soft 5.5' – 6.7' - Firm
BR-04	16+59 3' LT	Line 5, 15'	16.7	0.0' – 13.2' - Soft 13.2' – 16.7' - Firm
BR-05	15+51 7' LT	Line 6, 10'	21.8	0.0' – 11.9' - Soft 11.9' – 16.3' - Firm 16.3' – 21.8' - Hard
RW1-1*	15+56 21' LT	Near start of Line 6	-	Weathered Rock from 23.2' - 23.7' Boring Terminated in Weathered Rock
RW1-2*	16+58 21' LT	Near start of Line 5	7.1	Boring Terminated on Crystalline Rock (probable boulder, not bedrock)
RW1-3*	17+58 26' LT	Near start of Line 4	22.0	Weathered Rock and Hard Silt (N=71) from 14.8' - 22.0' Boring Terminated on Crystalline Rock
RW1-4*	18+53 31' LT	Near start of Line 3	-	Weathered Rock from 19.2' - 24.0' Boring Terminated in Weathered Rock
RW1-5*	19+52 38' LT	Near start of Line 2	18.0	Boring Terminated on Crystalline Rock

TABLE 1BRIDGE ROD AND BORING INFORMATION

*Borings completed prior to ESP's work. Boring data provided by NCDOT.

FIGURES



GR22.323 SCALE AS SHOWN	FIGURE 1 SITE VICINITY
DATE 3/17/20	BR-0002, REPLACE BRIDGE NO. 04000
EDB	RIVER ON NC194, RETAINING WALL



A. Photograph of site, looking downstream (northeast).



C. Photograph of seismic line being set up on slope.



B. Photograph of site, looking upstream (southwest).



D. Photograph of seismic refraction data collection with sledgehammer source.

GR22.323	FIGURE 2
scale N/A	DATA COLLECTION PH
^{DATE} 3/17/20	BR-0002, REPLACE BRIDGE NO. 04000
EDB	RIVER ON NC194, RETAINING WALL

2 PHOTOGRAPHS

008 OVER NORTH FORK NEW LL -L- STA. 15+00 TO 20+00

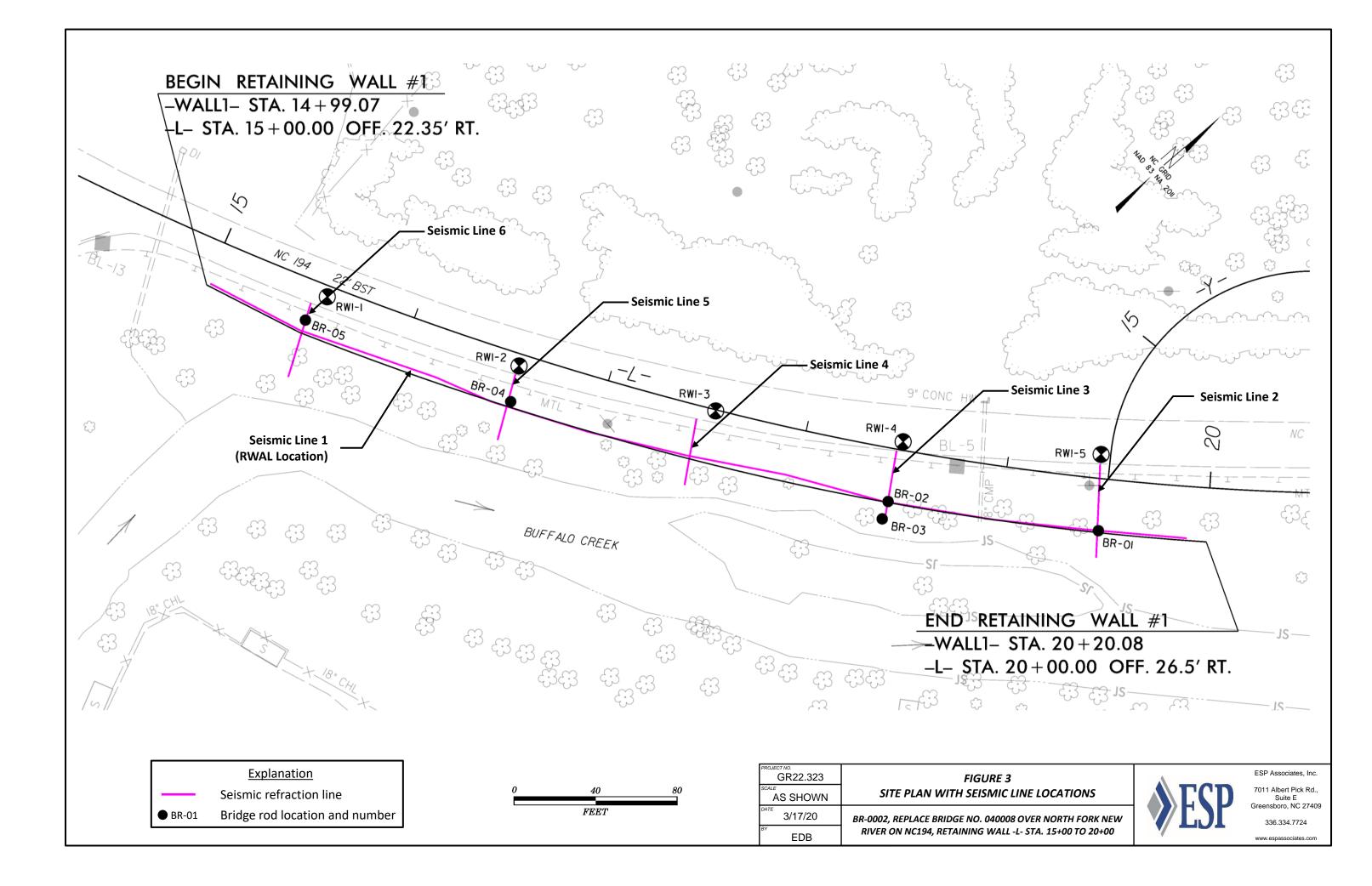


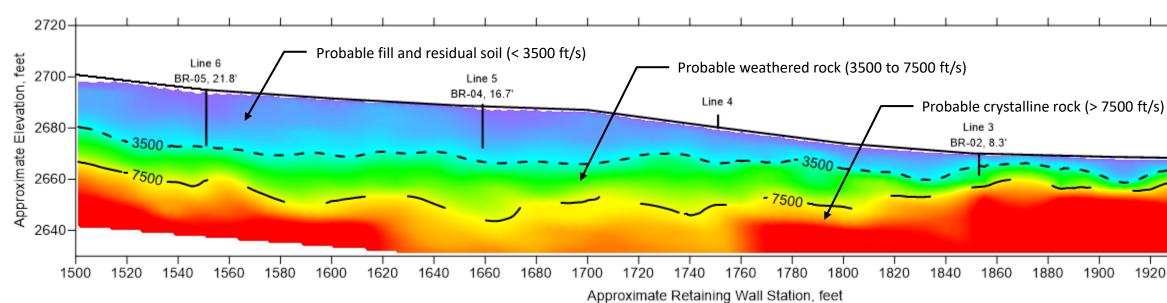
ESP Associates, Inc.

7011 Albert Pick Rd., Suite E Greensboro, NC 27409

336.334.7724

www.espassociates.con



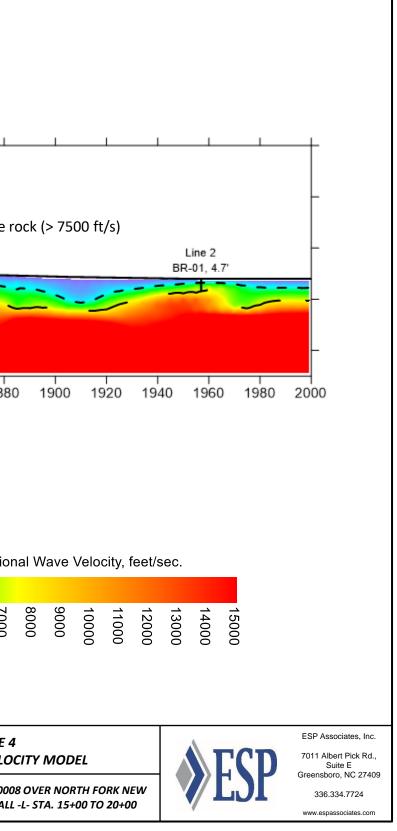


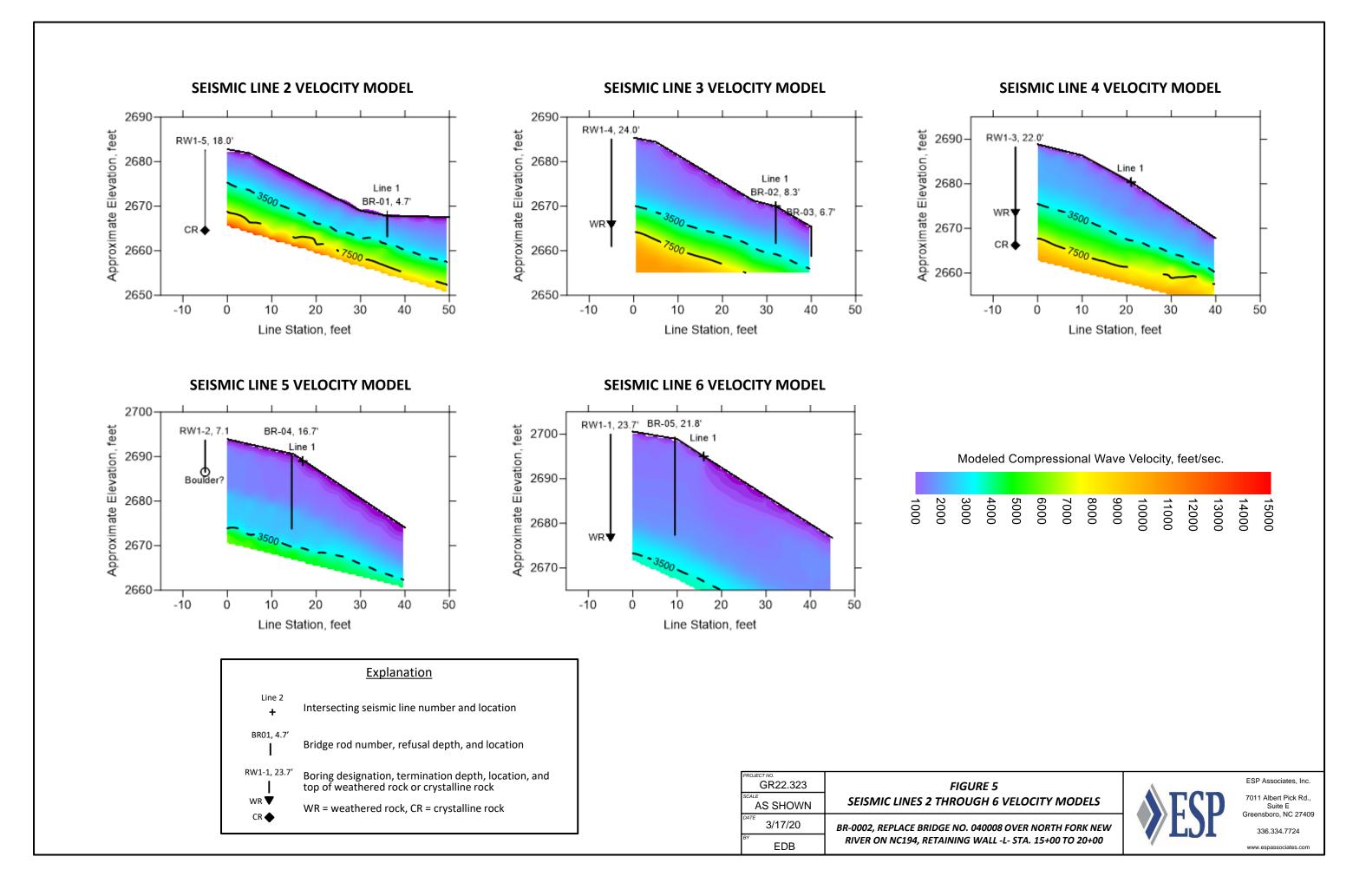
SEISMIC LINE 1 VELOCITY MODEL

	Explanation
Line 2 +	Intersecting seismic line number and location
BR01, 4.7' 	Bridge rod number, refusal depth, and location

		Мос	deled	l Cor	npre	ssio
1000	2000	3000	4000	5000	6000	7000

FIGURE 4	PROJECT NO. GR22.323						
SEISMIC LINE 1 VELO	AS SHOWN						
BR-0002, REPLACE BRIDGE NO. 04000	^{DATE} 3/17/20						
RIVER ON NC194, RETAINING WALL	EDB						





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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION		TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CA BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOC	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586), SOIL CLASSIFICATION	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	ADUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUC		BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	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	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	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLASS. (≤ 35%, PASSING *2009) (> 35%, PASSING *2009) <th< td=""><td>ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</td><td>ROCK (CR) GNEISS, GABBRO, SCHIST, ETC.</td><td>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</td></th<>	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-7 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILITY		<u>Colluvium</u> - Rock fragments mixed with soil deposited by gravity on slope or at bottom
	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED.	OF SLOPE.
SYMBOL DOCODOCOD	MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
% PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
10 50 MX 40 30 MX 50 MX 51 MN		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 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.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3/ 3 - 5/ TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5/ 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING #40 SOILS 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,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL – – 48 MX 41 MN LITTLE OR PI 6 MX NP 18 MX 18 MX 11 MN 11 MN 18 MX 18 MX 11 MN 11 MN LITTLE OR HIG		(V SLI,) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
	S WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(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 SAND CRAVEL AND SAND SOULS SOULS		CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SHIND UNHALL HIND SHIND SUILS SUILS	STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR UNSUL		(MOD,) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
AS SUBURAUE YUUK		WITH FRESH ROCK.	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		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 FIELD.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	J <u>OINT</u> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STREND		IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
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	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4	SOIL SYMBOL	(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.
GRANULAR LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A	81	IE TESTER WOULD YIELD SPT N VALUES > 100 BPE	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER OUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERY DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	INFERRED SOIL BOUNDARY	VEX. VEX. VEX. VEX. VEX. VEX. VEX. VEX.	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	TIST INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4		SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	TTTTT ALLUVIAL SOIL BOUNDARY A INSTALLATION - SPT N-VALUE		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	XX UNDERCUT VICLASSIFIED EXCAVATION - TT UNCLASSIFIED EXCAVATION -	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	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAV	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
BOULDER COBBLE GRAVEL COARSE FINE SILT CLA	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEEL OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (CSE, SD.) (F SD.) (SL.) (CL.			
	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, COUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.005 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE. <u>Standard Penetration test (Penetration Resistance) (SPT)</u> - Number of Blows (N or BPF) of A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
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 CL CLAY MOD MODERATELY γ - UNIT WEIGHT	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	OR SLIP PLANE. <u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT)</u> - NUMBER OF BLOWS (N OR BPF)OF A 140 LB, HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 3 SOIL MOISTURE - CORRELATION OF TERMS	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	OR SLIP PLANE. <u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT)</u> - NUMBER OF BLOWS (N OR BPF)OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	OR SLIP PLANE. <u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT)</u> - NUMBER OF BLOWS (N OR BPF)OF A 140 LB, HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPT	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	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 I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC). TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPT GUIDE FOR FIELD MOISTURE DESCRIPT GUIDE FOR FIELD MOISTURE DESCRIPT - SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TAB	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	OR SLIP PLANE. <u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</u> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION GATTERBERG LIMITS) CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE DESCRIPTION CASTREBERG LIMITS) CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE DESCRIPTION CASTREBERG LIMITS - USUALLY LIQUID: VERY WET, USUALLY FROM BELOW THE GROUND WATER TAB	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROUVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	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 I FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <u>STRATA ROCK QUALITY DESIGNATION (SROD)</u> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SECHENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
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PROJECT	REFERENCE NO.
BR-	-0002

6

ATTACHMENT A SOIL TEST BORING LOGS PROVIDED BY THE NCDOT

GEOTECHNICAL BORING REPORT BORE LOG

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GEOTECHNICAL BORING REPORT BORE LOG

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BORI	NG NO.	RW1	-3		S	TATIC	DN 17	7+47			OFFS	SET C	ft RT			ALIG	NMENT	Ĺ		0 HR.	18.8	BOR	ing no.	RW1	-4		S	TATI	ON 18	+44		OFI
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SHEET 14

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R	PROPC	SED) F	RWAL								GROUN	ID WTR (ft)
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	NORTI	HING	i	997,60)8		EAST	ING	1,261,2	32		24 HR.	FIAD
				ORILL M	ethod	N//	۰. ۹				HAMME	RTYPE	Automatic
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т				SAMP.		L O	•					RIPTION	
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GEOTECHNICAL BORING REPORT BORE LOG

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SITE	DESCR	IPTION	BOR	ING IN	I EXI	STIN	NG PAVE	MENT N	C194 FC	R PR	OPOSE	RWAL				GROUND W	TR (ft
BORI	NG NO.	RW1	5		S	STA	TION 19)+35		0	FFSET	4 ft LT				0 HR.	15.
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	LER C						RT DATE			C	omp. Da		-		SURFACE WATER DEPTH N/A		
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\rightarrow	(11)					++-		1		I					ELEV. (ft)	Di	EPTH
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	-						T							1 155	2,682.8 GROUND SURFA		(
680	-	Ŧ					 								Brown micaceous sandy SIL	T with a trace	
	2,679.5	- <u>3.3</u>	2	2	2	-11	<u> </u>								- of clay, roots, and a fev	w graveis	
	-	ŧ					Ţ : : :							L			
675	- 2.674.5	L .,					1							L	_		
F	2,0/4.5	0.3	1	2	4	11	• •										
	-	Ŧ]:::										
70	- 2,669.5	13.3				」⊢	+				• • • •				-2,669.5		1
	-	+	1	2	3		• 5				· · · ·				SAPROLITE Brown gray, micaceous cla	avev silt with	
	-	ŧ													some rock fragme	ents	
65	2,664.8-	18.0	60/0.0			┼⊢						H			_2,664.8 CRYSTALLINE RO	OCK	1
	-	F													Crystalline chlorite	schist	
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SHEET 15

ATTACHMENT B

FINAL SURVEY REPORT (ESP)



March 17, 2020

ESP Associates, Inc. 7011 Albert Pick Road, Suite E Greensboro, NC 27409

FINAL SURVEY REPORT March 17th, 2020

TIP# BR-0002

PROJECT DESCRIPTION:

Replace Bridge 040008 over North Fork New River on NC 194 Retaining Wall -L- Sta. 15+00 to 20+00- Retaining Wall Geophysical Survey

PROJECT NUMBER: 35254

COUNTY: Ashe

L&S #: 67002.1.1

CONSULTANT: ESP Associates, Inc. 7011 Albert Pick Road Suite E, Greensboro, N.C. 27409 Contact: John P. Scoville III, PLS, CFS

DATE OF SURVEY: 3-9-2020 through 3-10-2020

DATUM DESCRIPTION:

The following Datum Description was supplied by the NCDOT as developed by others.

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE NAD 83 NSRS (2011) NORTH CAROLINA STATE PLANE GRID COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "R5832-BL 43" WITH GRID COORDINATES OF:

NORTHING: 996047.666 (s FT) EASTING: 1259229.395 (s FT)

THE AVERAGE COMBINED FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99997244

ALL LINEAR DISTANCES ARE LOCALIZED HORIZONTAL DISTANCES. THE VERTICAL DATUM FOR THIS PROJECT IS NAVD 88

> ESP Associates, Inc. 7011Albert Pick Road, Suite E Greensboro, NC 27409

PROJECT LIMITS:

• The limits for this project were supplied by NCDOT to ESP geophysical group and defined as the extents of the proposed retaining wall from -L- Sta. 15+00 to Sta. 20+00 26.5' right to include the existing roadway and down existing slope to Buffalo creek.

BASELINE FILE:

• Project Control for Baselines was supplied by NCDOT in filename BR0002 ncdot fs.dgn.

SAFETY:

- ESP survey personnel conducted a PRE JOB Briefing to go over safety concerns at a location outside of traffic concerns adjacent to the project. Signing positions were determined as well as a discussion of proposed procedures and project objectives.
- ESP set signs out at both ends of the work area along highway 194 as well at intersecting New School Road and Cambell Road
- ESP utilized a 3 man crew to accomplish the work along the existing guardrail while one man acted as flagger/lookout for the operation.
- The work plan went well and the work was accomplished accordingly.

DTM DATA:

The project was laid out by the ESP Geophysical group as part of their work in collecting geophysical data in the area of the proposed retaining wall.

ESP's survey group identified several baseline monuments in the vicinity of the project and verified the relationship of the baseline monuments with each other both horizontally and vertically to ensure the data being utilized was correct. Utilizing conventional survey equipment, ESP verified the points being utilized, established additional control points along the existing guardrail and located the following items to aid the geophysical survey for the project.

- Existing borings in the pavement RW1-1 through RW 1-5
- Bridge Rods- BR-01 through BR-05
- EP points at assumed zero station of cross section lines 1 through 5 as established by the geophysical layout.
- Downslope locations of slope breaks and other points as established by the geophysical layout.

Baseline monuments and additional control points were surveyed to a horizontal and vertical accuracy of +/-0.01'. Borings, rod locations, slope breaks and other points were surveyed to a horizontal and vertical accuracy of +/-0.10'

THE FOLLOWING FILES WERE TRANSMITTED TO ESP GEOPHYSICAL GROUP:

GR22.323 TASK 2 ALL.CSV

This csv file contains all of the coordinates established from the survey of the above listed items and including the NCDOT baseline monuments utilized and verified in the survey process.

Completed by: John P. Scoville III, PLS March 17th, 2020

Sincerely, *ESP Associates, Inc.*

John P. Scoville III, PLS, CFS Survey Manager

