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### STATE OF NORTH CAROLINA

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

SHEET NO.	<u>DESCRIPTION</u>									
1	TITLE SHEET									
2	LEGEND									
3	SITE PLAN									
4	CROSS SECTION(S)									
5-7	BORE LOG(S) & CORE REPORT(									
8-9	CORE PHOTOGRAPH(S)									
10	SITE PHOTOGRAPH(S)									

**CONTENTS** 

## **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY GUILFORD

PROJECT DESCRIPTION BRIDGE NO. 161 ON SR 2821 (HARVEST ROAD) OVER SOUTH BUFFALO CREEK

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5344	1	10

### **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 LOOS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEGICH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL 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 BORNGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON DOLLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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 INTERPRETATIONS 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 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 ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- IES:
  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.
  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.

**PERSONNEL** 

D. RACEY

S. DAVIS M. RENZA

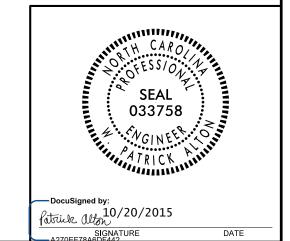
C. WANG

T. WALKER

DRAWN BY D. RACEY

CHECKED BY \_P. ALTON

SUBMITTED BY P.ALTON



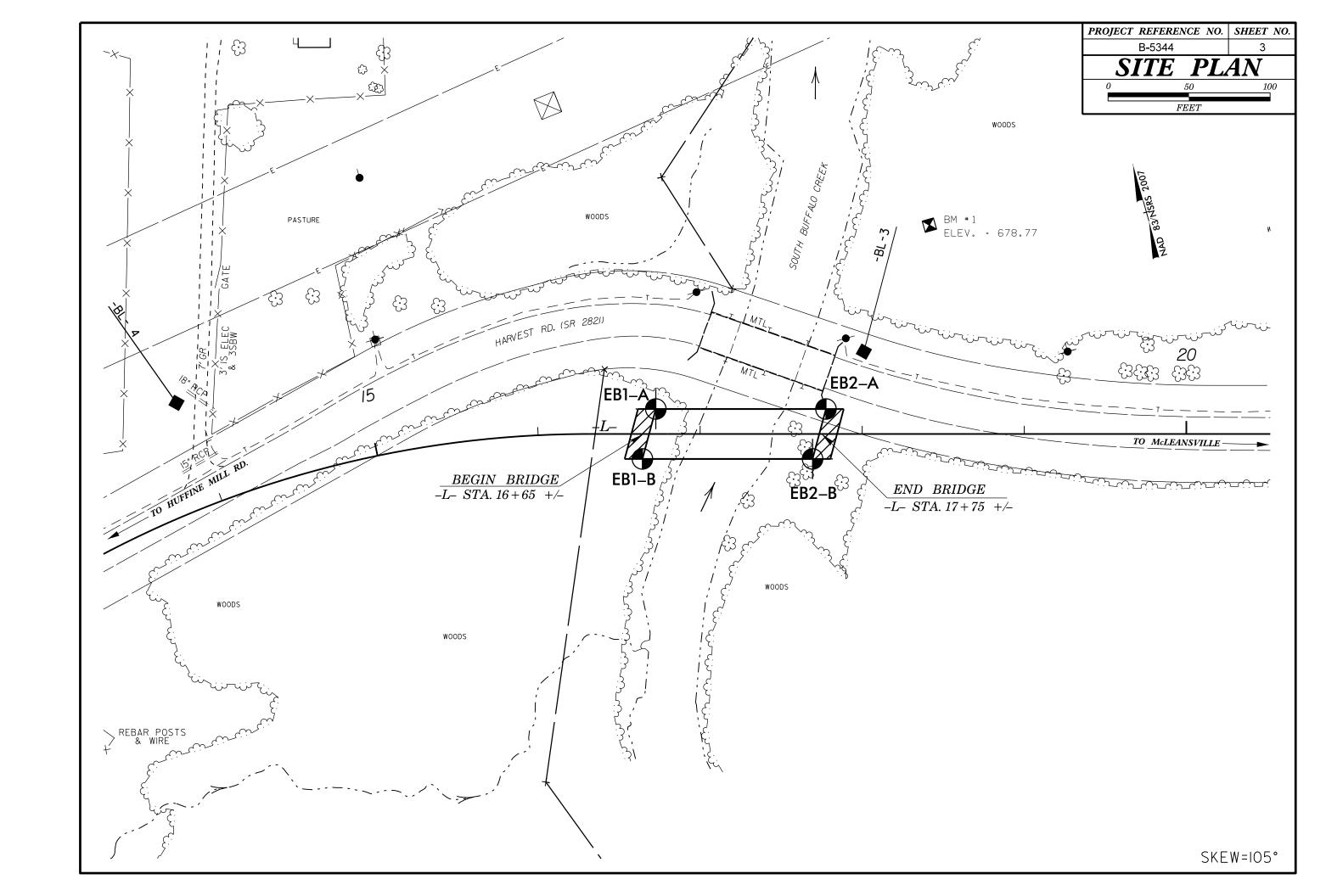
PROJECT REFERENCE NO.	SHEET NO.
B-5344	2

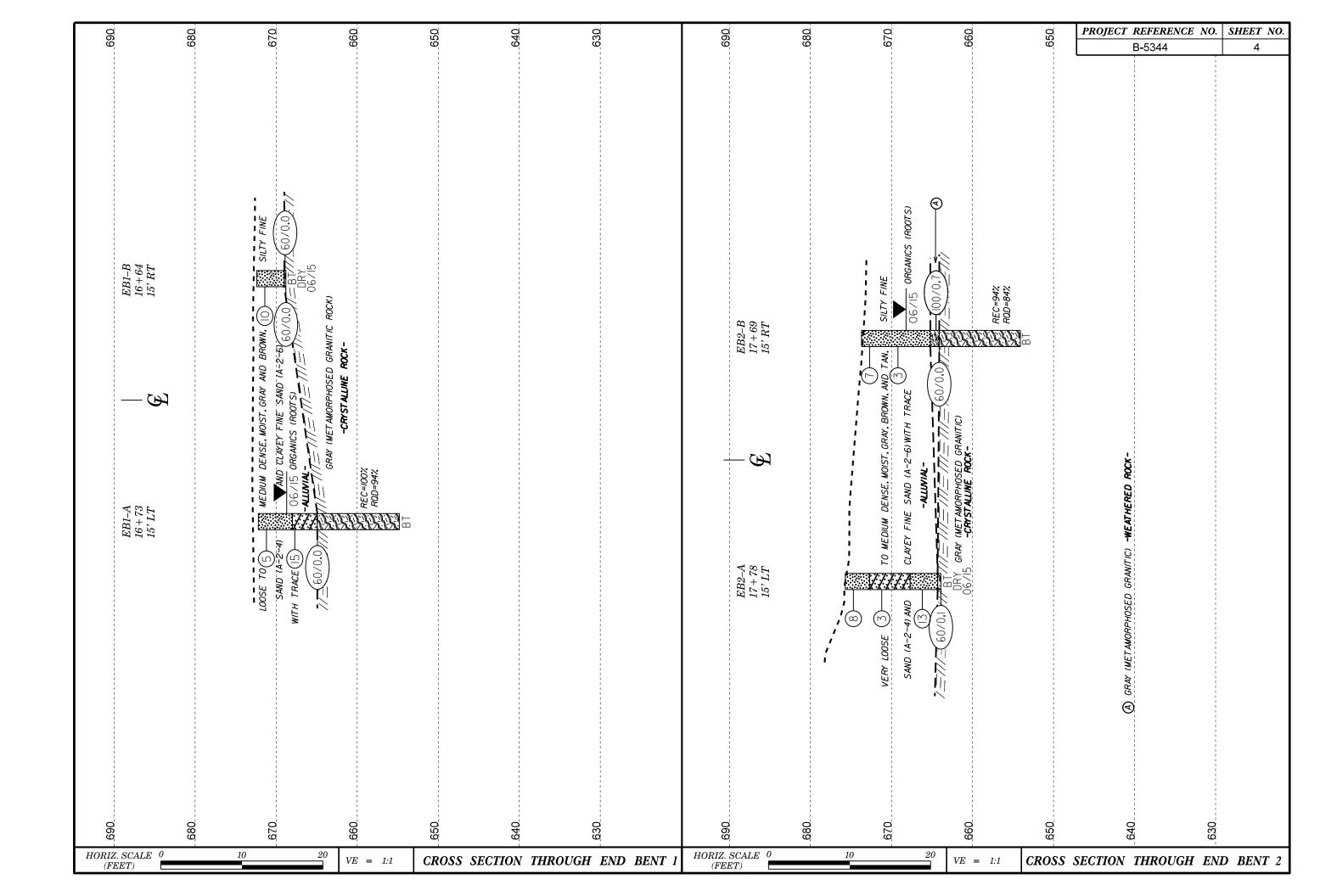
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586), SOIL CLASSIFICATION	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.  GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  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. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SULTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:  ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	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.
SOIL LEGEND AND AASHTO CLASSIFICATION  GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	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
CLASS. (<35% PASSING *280) (>35% PASSING *280) ORGANIC MATERIALS  GROUP A:1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR)  CRYSTALLINE ROCK (CR)  WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CROUP 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-2-6 A-2-7 A-1, A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD STOR REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SEDIMENTARY ROCK SHELL BEDS, ETC.	OF SLOPE.  CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 58 MX	PERCENTAGE OF MATERIAL  GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
*200   10 MX   20 MX   18 MX   30 MX	ORGANIC MATERIAL         GRANUL AR SOILS SOILS         OTHER MATERIAL           TRACE OF ORGANIC MATTER         2 - 3%         3 - 5%         TRACE         1 - 10%           LITTLE ORGANIC MATTER         3 - 5%         5 - 12%         LITTLE         10 - 20%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40  LL 48 MX 41 MN LITTLE OR HIGHLY PI 6 MX NP 18 MX 19 MX 11 MN 11 MN 18 MX 18 MX 11 MN 11 MN MM 11 MN MM 11 MN MM 11 MN MM 11 MM MM 11 MM MM 11 MM MM 11 MM MM	MODERATELY ORGANIC         5 - 10%         12 - 20%         SOME         20 - 35%           HIGHLY ORGANIC         > 10%         > 20%         HIGHLY         35% AND ABOVE	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (Y SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI) I INCH. DPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	<u>FAULT</u> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND MATERIALS SAND 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
GEN.RATING AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(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 WITH FRESH ROCK.	PARENT MATERIAL.  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	SPRING OR SEEP	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  RANGE OF STANDARD  COMPACTNESS OR  RANGE OF STANDARD  RANGE OF UNCONFINED  COMPACTNESS OR  RANGE OF STANDARD  RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE CONSISTENCY PENETRATION RESISTENCE (COMPRESSIVE STRENGTH (N-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE)  ROADWAY EMBANKMENT (RE)  ROADWAY EMBANKMENT (RE)  POR ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL  SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4 COMMITTEE	SOIL SYMBOL  SPI DHT TEST BORING  SLOPE INDICATOR INSTALLATION	(SEY.) 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	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERY SOFT < 2 < 0.25	INFERRED SOIL BOUNDARY	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 VESTICES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5  SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0  MATERIAL STIFF 8 TO 15 1 TO 2	INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (RDD) - 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	****** ALLUVIAL SOIL BOUNDARY \( \triangle \) PIEZOMETER INSTALLATION \( \triangle \) SPT N-VALUE	ALSO AN EXAMPLE.  ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STO. SIEVE SIZE 4 10 40 60 200 270  OPENING (MM) 4.76 2.00 8.42 0.25 0.075 0.053  CORRSE FINE	UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK  UNDERCUT  UNCLASSIFIED EXCAVATION - BET OF EMBANKMENT OR BACKFILL	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.  HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	<u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EPIDAMAPIENT ON BACATILE  ABBRE VIATIONS	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	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT 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	BY MODERATE BLOWS.  MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY $\gamma$ - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I 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 (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	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.	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE LL LIQUID LIMIT	e - VOID RATIO         SD SAND, SANDY         SS - SPLIT SPOON           F - FINE         SL SILT, SILTY         ST - SHELBY TUBE           FOSS FOSSILIFEROUS         SLI SLIGHTLY         RS - ROCK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	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.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS, - FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FINGERNAIL. FRACTURE SPACING BEDDING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.  BENCH MARK: BL-4. N: 860700.6833. E: 1801258.3681
(P]) PL PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM         SPACING         TERM         THICKNESS           VERY WIDE         MORE THAN 10 FEET         VERY THICKLY BEDDED         4 FEET	
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT  DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE	ELEVATION: 692.38 FEET
SL _ SHRÎNKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES:
- URY - (U) ATTAIN OPTIMUM MOISTURE	X CME-55  G* CONTINUOUS FLIGHT AUGER CORE SIZE:  X 8* HOLLOW AUGERS  -B -H	THINLY LAMINATED < 0.008 FEET  INDURATION	
PLASTICITY  PLASTICITY INDEX (PI) DRY STRENGTH	X 8 HOLLOW AUGERS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC	VANE SHEAR TEST UNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	CASING W/ ADVANCER  POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TRICONE SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	CORE BIT VANE SHEAR TEST	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14





NBS	46058						<b>9 R</b> P B-5				cou	NTY	GUI	LFOF	RD			GEOLOGIST C. Wang		
SITE	DESCR	IPTION	<b>I</b> BR	IDG	EΝ	IO. 16	1 ON 9	SR 28	821 C	OVER	SOL	JTH I	BUFF	ALO (	CREEK				GROUN	D WTR (1
3OR	ING NO.	EB1	-A			S	TATION	<b>N</b> 16	6+73				OFFSET 15 ft LT					ALIGNMENT -L-	0 HR.	Di
COL	LAR ELE	<b>EV</b> . 67	72.2 ft	:		т	TOTAL DEPTH 17.4 ft						NORT	HING	860,6	17		<b>EASTING</b> 1,801,542	24 HR.	3.
ORILL	RIG/HAI	MMER E	FF./D	ATE	F&I	R2175	CME-5	5 76%	02/2	25/2015	5				DRILL N	IETHO	<b>D</b> SP	T Core Boring HAI	MMER TYPE	Automatic
DRIL	LER S	. Davis				S	TART [	DATE	06/	/09/1	5		COMP	. DA	<b>ΓE</b> 06/0	09/15		SURFACE WATER DEPTH	N/A	
LEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	OW (		JNT 0.5ft	0	2	BLC 5		PER FO		'5 !	100	SAMP. NO.	MOI	L O G	SOIL AND ROCK DI	ESCRIPTION	DEPTH
67 <u>5</u>	672.2	00																- 672.2 GROUND SUI	RFACE	
370	668.7 -	3.5	1	2	2	3	5.									M		ALLUVIA GRAY, SILTY FINE SAI TRACE ROOTS AI	<b>\L</b> ND (A-2-4) WIT	
665	664.9	<u> </u>	4	7	7	8		•15 <u> </u>	· · · · · · · · · · · · · · · · · · ·	· ·	-: · · · : -: ·	· ·	: : - ::-			M		GRAY, CLAYEY FINE		)
60	-		60/0.0	<u>ס</u>										0/0.0 <b>°</b>				CRYSTALLINE GRAY (METAMORPHO ROCK)	SED GRANIT	IC
00_	- - -	<del> </del>  -  -										· ·						-		
55		-																_654.8  Boring Terminated at Ele CRYSTALLINE ROCK (M GRANITIC R	ETAMORPHO	t in SED
																		- NOTES AUGER REFUS/		
																		- -		

NCDOT GEOTECHNICAL ENGINEERING UNIT

SHEET 5 OF 10

	46058			RE B		B-534					GUILFORD	GEOLOGIST C. Wang		
SITE	DESCR	RIPTION	I BRI	DGE NO	. 161 (	ON SR	2821 O	VER S	OUTH	l BU	FFALO CREEK	<u> </u>	GROU	ND WTR (ft
		. EB1-					16+73			_	FSET 15 ft LT	ALIGNMENT -L-	0 HR.	, ,
COLL	AR EL	<b>EV</b> . 67	2.2 ft		TOT	AL DE	<b>PTH</b> 17	.4 ft		NO	<b>RTHING</b> 860,617	<b>EASTING</b> 1,801,542	24 HR.	3.5
DRILL	RIG/HA	MMER E	FF./DA	TE F&R2	175 CN	ИЕ-55 7	76% 02/25	/2015			DRILL METHOD SPT	Core Boring	HAMMER TYPE	Automatic
DRIL	LER S	S. Davis			STA	RT DA	<b>TE</b> 06/0	9/15		СО	<b>MP. DATE</b> 06/09/15	SURFACE WATER DEPT	H N/A	
CORI	SIZE	NQ3			тот	AL RU	<b>N</b> 10.1 f	ŧ						
ELEV	RUN ELEV	DEPTH	RUN	DRILL	REC.	JN RQD	SAMP.	STR REC.	ATA RQD	L	D.	ECODIDITION AND DEMARKS		
(ft)	(ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	G	ELEV. (ft)	ESCRIPTION AND REMARKS		DEPTH (1
64.93												Begin Coring @ 7.3 ft		
660	664.9	7.3	5.1	1:05/0.8 1:27/1.0 1:30/1.0 2:15/1.0 1:59/1.0	(5.1) 100%	(4.5) 88%		(10.1) 100%	(9.5) 94%			CRYSTALLINE ROCK "LY WEATHERED TO FRESH I ORPHOSED GRANITIC ROCK FRACTURE SPACING		
000	659.8_	12.4	5.0	1:39/1.0 0:35/0.3 1:51/1.0 1:30/1.0 1:34/1.0 1:26/1.0	(5.0) 100%	(5.0) 100%					<del>-</del> - - -			
655	654.8	17.4		1:26/1.0 1:45/1.0							654.8			17
		‡										ed at Elevation 654.8 ft in CRYS AMORPHOSED GRANITIC RO		<
		‡									- -	NOTES:		
	-	‡									_ -	AUGER REFUSAL AT 7.3'		
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Dry

<b>WBS</b> 46058.1.1 <b>TIP</b> B-5344	COUNTY GUILFORD	GEOLOGIST C. Wang	9	<b>WBS</b> 46058.1.1	TIP B-5344 COUN	NTY GUILFORD	GEOLOGIST C. Wang	
SITE DESCRIPTION BRIDGE NO. 161 ON SR 2821 O			GROUND WTR (ft)		NO. 161 ON SR 2821 OVER SOUT	1	1	GROUND WTR (fi
BORING NO. EB1-B STATION 16+64	OFFSET 15 ft RT	ALIGNMENT -L-	0 HR. Dry	BORING NO. EB2-A	STATION 17+78	OFFSET 15 ft LT	ALIGNMENT -L-	<b>0 HR.</b> Dr
COLLAR ELEV. 672.4 ft TOTAL DEPTH 3.		<b>EASTING</b> 1,801,526	24 HR. Dry	COLLAR ELEV. 675.7 ft	TOTAL DEPTH 11.8 ft	NORTHING 860,588	<b>EASTING</b> 1,801,643	<b>24 HR.</b> Dr
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 76% 02/25		1	HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE F		DRILL METHOD		HAMMER TYPE Automatic
DRILLER S. Davis START DATE 06/0		SURFACE WATER DEF	PTH N/A	DRILLER S. Davis	<b>START DATE</b> 06/09/15	COMP. DATE 06/09/15	SURFACE WATER DEPT	'H N/A
ELEV   DRIVE   DEPTH   BLOW COUNT   BLOW	0WS PER FOOT SAMP. V L 50 75 100 NO. MOI G		OCK DESCRIPTION  DEPTH (ft)	ELEV Cft) DRIVE ELEV (ft) DEPTH BLOW CC (ft) 0.5ft 0.5ft	<del></del>	OT SAMP. C O NO. MOI G		K DESCRIPTION
675  672.4 0.0 2 6 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	60/0.0 M	GRAY, SILTY FIN ROO' 669.0 CRYSTA GRAY (METAMO F Boring Termin Penetration Test Ro ft on CRYS	ID SURFACE LUVIAL E SAND WITH TRACE TS (A-2-4)  ALLINE ROCK RPHOSED GRANITIC ROCK) atted with Standard efusal at Elevation 668.8 ITALLINE ROCK SED GRANITIC ROCK)	675 675 675 677 0.0 1 3 672 3.5 3 1 665 665 664.0 11.7 60/0.1	2 3	M	GRAY, BROWN, SILT  GRAY, BROWN, SILT  GRAY, BROWN, C  (A-2-6) WITH TRA  GRAY, BROWN, SILT  667.7  GRAY, BROWN, SILT  667.7  GRAY, BROWN, SILT  CRYSTALI  GRAY (METAMORI  Penetration Test Refu  ft on CRYSTALI  (METAMORPHOSE	LINE ROCK PHOSED GRANITIC ICK) ed with Standard usal at Elevation 663.9 ALLINE ROCK

WBS	46058					<b>G REP</b> P B-5344		COUNT	Y GUILFO	RD			GEOLOGIST C. Wang		
SITE D	ESCRI	IPTION	<b>I</b> BRI	DGE	NO. 16	1 ON SR 2	821 OVEF	RSOUTH	BUFFALO	CREEK				GROUN	D WTR (ft)
BORIN	G NO.	EB2-	-B		S1	TATION 17	7+69		OFFSET	15 ft RT			ALIGNMENT -L-	0 HR.	Dry
COLLA	R ELE	<b>V</b> . 67	73.7 ft		тс	OTAL DEPT	<b>H</b> 19.6 ft	:	NORTHING	<b>3</b> 860,5	561		<b>EASTING</b> 1,801,627	24 HR.	5.5
DRILL R	RIG/HAN	MER E	FF./DA	TE F	&R2175	CME-55 76%	6 02/25/201	5		DRILL I	METHO	<b>D</b> SF	PT Core Boring HAN	IMER TYPE	Automatic
DRILLE	ER S.	Davis			S1	TART DATE	06/09/1	5	COMP. DA	TE 06/	09/15		SURFACE WATER DEPTH	N/A	
ELEV C	DRIVE	DEPTH	BLC	W CO	UNT		BLOWS F	PER FOOT		SAMP.	<b>V</b> /	1 L	OOIL AND DOOK DE	CODIDTION	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50	75 100	NO.	MOI	O G	SOIL AND ROCK DE ELEV. (ft)	SCRIPTION	DEPTH (f
675															
_6	673.7	- 0.0	2	4	3		I				1		673.7 GROUND SUF		0.
	7	-	-			7					M		GRAY, BROWN, AND T	AN, SILTY FII	
6706	670.2	3.5	2	1	2	42			+		М		SAND (A-2-4) WITH TRA (ROOTS		CS
	1	-						: : : :					•		
665	665.2	- - 8.5						****	:::::				665.2		
	664.1	9.6	44 60/0.0	56/0.2					- 100/0.7 - 60/0.0				665.2 664.1 WEATHERED GRAY (METAMORPHO		
	‡	-	00,010										ROCK) CRYSTALLINE		
660	‡	- -											<ul> <li>GRAY (METAMORPHO</li> </ul>		TIC .
	1	-											ROCK)		
655	‡	-											•		
000		-							+				654.1  Boring Terminated at Ele	ration GEA 1 f	19.
	‡	-											CRYSTALLINE ROCK (ME	TAMORPHO	SED
	1	-											. GRANITIC RO	OCK)	
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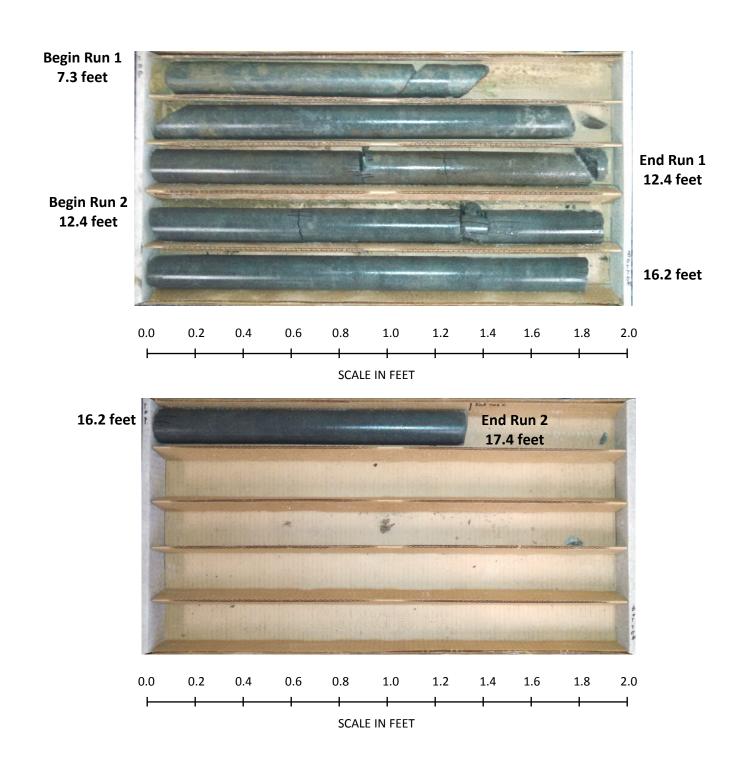
# NCDOT GEOTECHNICAL ENGINEERING UNIT

	沙红	D (	COI	RE B	OR	INC	3 RE	PO	RT						
	46058				1	B-534					GUILFORD	GEOLOGIST C. Wang			
SITE	DESCR	IPTION	BRII	DGE NO	. 161 (	)N SR	2821 O\	/ER S	OUTH	I BUI	JFFALO CREEK			GROUN	D WTR (ft)
BORI	NG NO.	EB2-	В		STAT	ION	17+69			OF	FSET 15 ft RT	ALIGNMENT -L-		0 HR.	Dry
COLL	AR ELE	<b>EV</b> . 67	3.7 ft		TOT/	L DEF	<b>PTH</b> 19.	6 ft		NO	<b>DRTHING</b> 860,561	<b>EASTING</b> 1,801,627	24 HR.	5.5	
DRILL	RIG/HAM	/MER E	FF./DA	TE F&R2	175 CN	IE-55 7	6% 02/25/	2015			DRILL METHOD SPT	T Core Boring HAMMER TYPE Automatic			
DRIL	LER S.	Davis			STAF	≀T DA	<b>TE</b> 06/09	9/15		CO	OMP. DATE 06/09/15	SURFACE WATER DEP	TH N/	Α	
COR	E SIZE	NQ3					<b>N</b> 10.0 ft			<u> </u>					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	STR REC. (ft) %	RQD (ft) %	L O G	DE ELEV. (ft)	ESCRIPTION AND REMARKS	3		DEPTH (ft)
664.11				<u> </u>			ļ					Begin Coring @ 9.6 ft			
660	654.1	9.6 10.6 - - 15.6	1.0 5.0 4.0	3:48/1.0 2:04/1.0 2:48/1.0 2:40/1.0 3:23/1.0 5:58/1.0 4:51/1.0 6:40/1.0	(4.0) 100%	(0.6) (60%) (3.8) 76% (4.0) 100%		(9.4) 94%	(8.4) 84%		HARD, METAMORPHO	CRYSTALLINE ROCK EATHERED TO FRESH, MOI DSED GRANITIC ROCK, CLC BLOSE FRACTURED SPACIN	SE TO I		ELY
	654.1			10:00/1.0							Boring Terminate (MET.	d at Elevation 654.1 ft in CRY AMORPHOSED GRANITIC R	STALLIN OCK)	NE ROCK	19.6





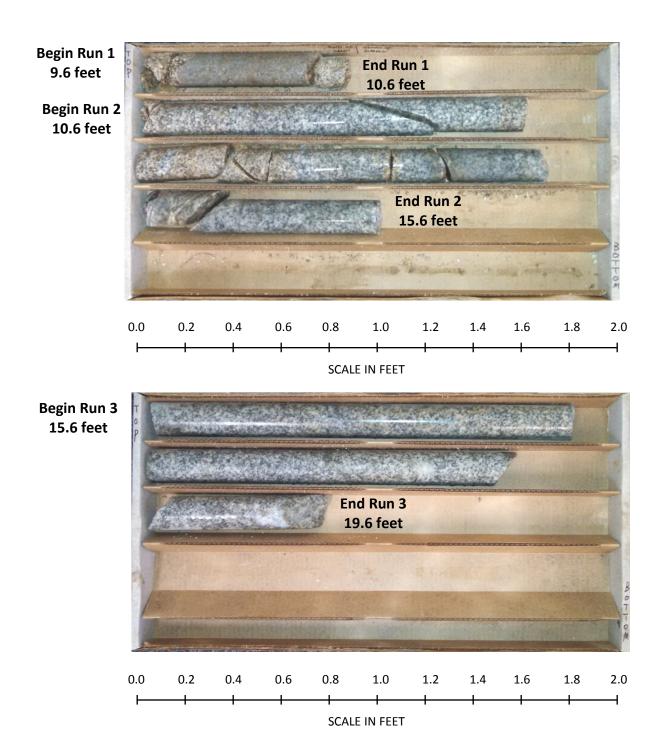
## CORE PHOTOGRAPHS: Bridge No. 161 on SR 2821 over South Buffalo Creek, EB1-A 16+73, 15' LT







## CORE PHOTOGRAPHS: Bridge No. 161 on SR 2821 over South Buffalo Creek, EB2-B 17+69, 15' RT





# Bridge No. 161 on SR 2821 over South Buffalo Creek SITE PHOTOGRAPHS



Photograph No. 1: View of existing bridge looking west



Photograph No. 2: View of existing bridge looking east



**Photograph No. 3:** View of South Buffalo Creek looking upstream



Photograph No. 4: View of South Buffalo Creek looking downstream