## **CONTENTS** N 42007 SHEET NO. 2 -3 5,6 L 5

REFERENCE

**DESCRIPTION** TITLE SHEET LEGEND SITE PLAN PROFILE BORE LOGS SITE PHOTOGRAPH

# STATE OF NORTH CAROLINA

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

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY HARNETT

PROJECT DESCRIPTION BRIDGE NO. 72 ON SR 2045 (ELLIOTT BRIDGE ROAD) OVER ANDERSON CREEK

# 96 R 0 BP. N PROIEC

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-420072	1	7

### **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 RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6860. THE SUBSIFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CALITORIED 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 WARANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF 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 CONDENSION OR FOR AN THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

- TES: 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 REDUESTED 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

K. PLUMMER

CAROLINA DRILLING

M. RADFORD

T. POGGIE

INVESTIGATED BY <u>K. PLUMMER</u>

DRAWN BY \_\_\_\_\_C.T. TANG, EI

CHECKED BY \_\_\_\_\_\_ D. BROWN, PE

SUBMITTED BY \_\_\_\_\_\_. D. BROWN, PE

DATE \_\_\_\_\_\_ 2018



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

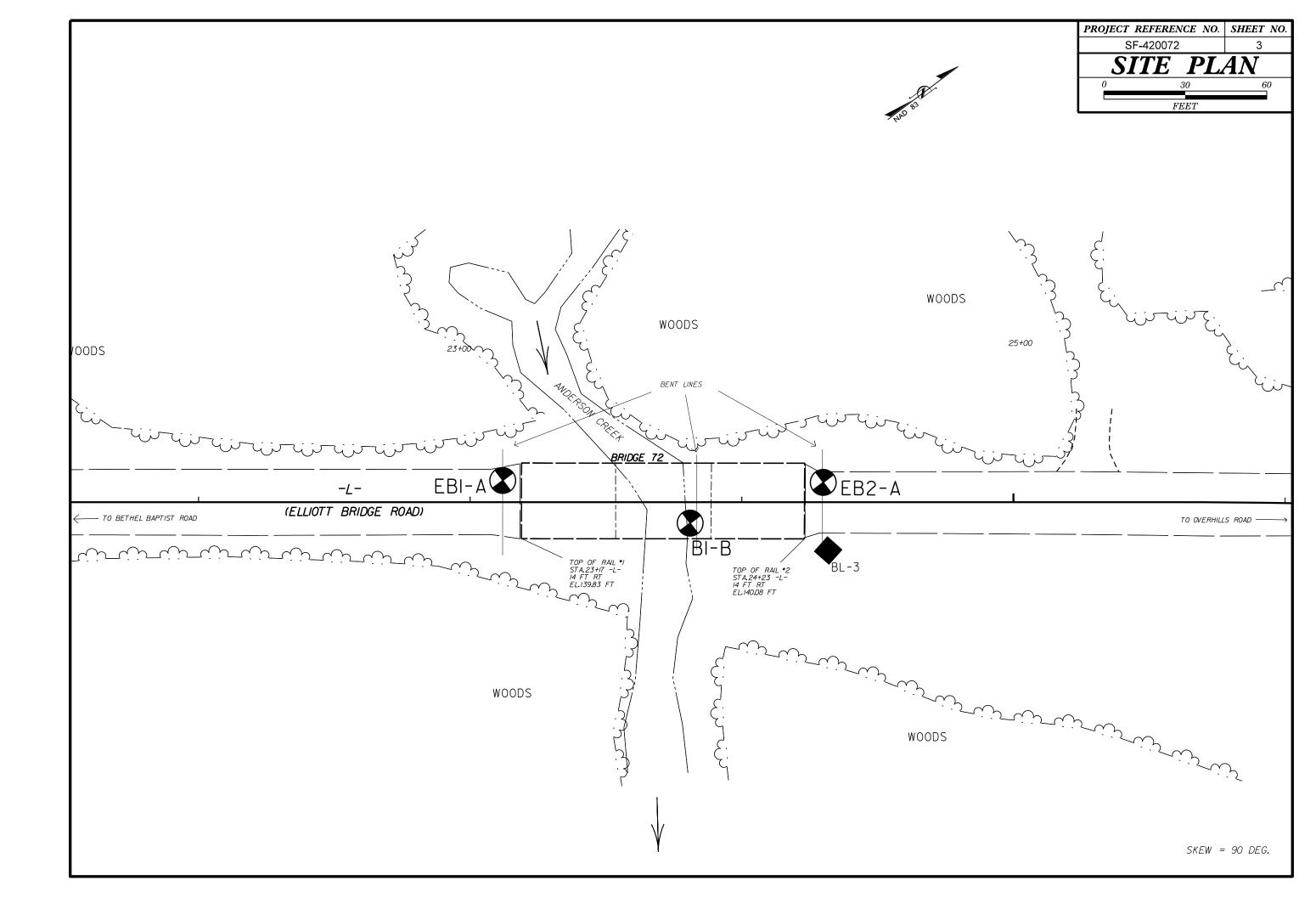
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

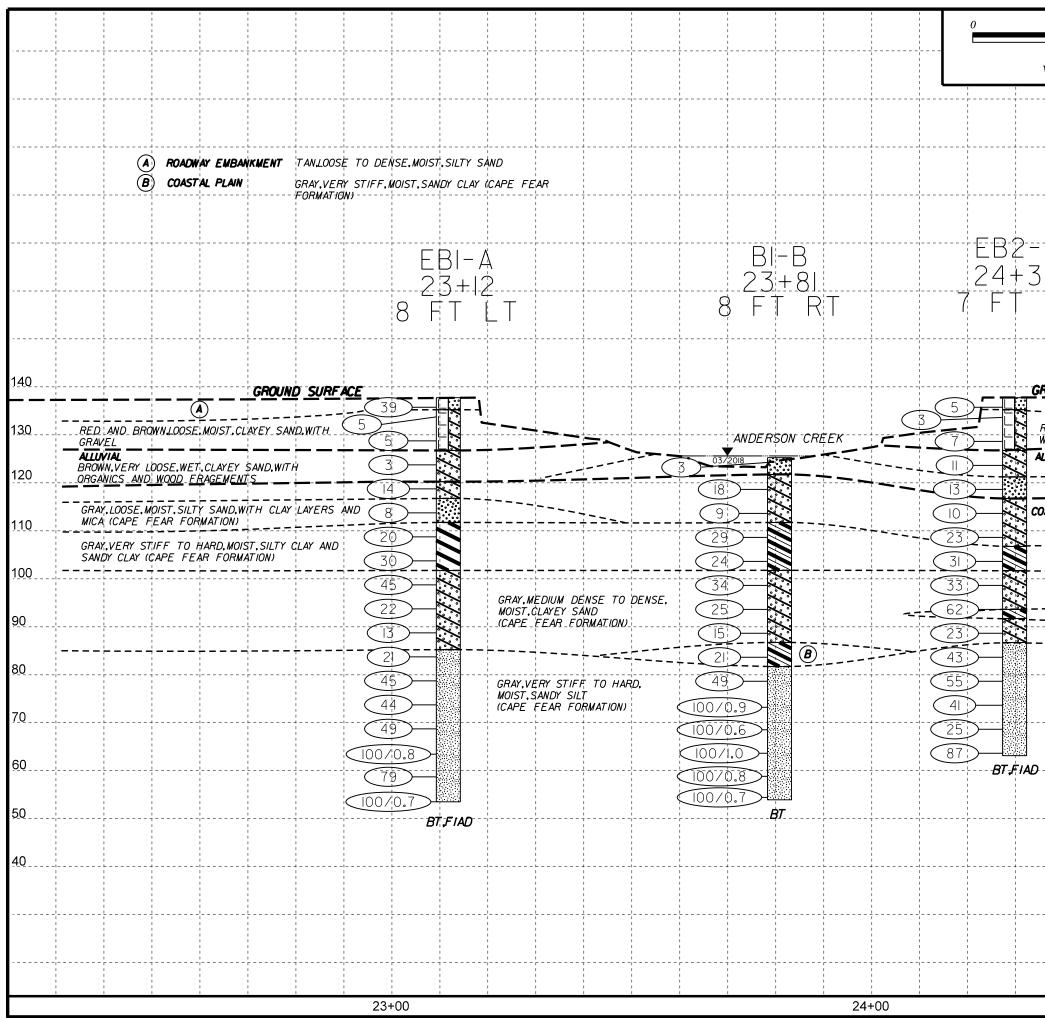
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS				
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD 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.				
BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.				
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:					
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY. SILTY CLAY. MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	SI//ASI//A	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	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR)	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT				
	MINERALOGICAL COMPOSITION		HICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE LEVEL AT				
GENERAL         GRANULAR MATERIALS         SILT-CLAY MATERIALS         ORGANIC MATERIALS           CLASS.         ( ≤ 35% PASSING *200)         ( > 35% PASSING *200)         ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE	SURFACE.				
	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.				
	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	<u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM				
		ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED.	CULLUVIUM - ROCK FRAGMENTS MIXED WITH SUIL DEPOSITED BY GRAVITY ON SLOPE OR AT BUTTOM OF SLOPE.				
SYMBOL BOOOGGOOOOG	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				
7 PASSING	MIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.				
10 50 MX GRANULAR SIL1- MUCK,	PERCENTAGE OF MATERIAL		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT				
40 30 MX 50 MX 51 MN PEAT	GRANULAR SILT - CLAY	WEATHERING	ROCKS OR CUTS MASSIVE ROCK.				
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE				
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.	HORIZONTAL.				
	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 – – 40 MX 41 MN LITTLE OR PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITTLE OR	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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.				
CROUP INDEY A A A A MY R MY 12 MY 16 MY NO MY AMOUNTS OF ORGANIC	GROUND WATER		FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE				
SUILS SUILS		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 FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.				
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				
		(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	PARENT MATERIAL.				
GEN. RATING 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 $\leq$ 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				
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.				
COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED	25/825	(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.				
PRIMART SUIL TYPE I CONSTRUCT PENETRATION RESISTENCE I CUMPRESSIVE STRENGTH		IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO				
		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 LUUSE 4 IU IU GRANULAR MEDIUM DENSE 10 10 30 N/A	R1	IT SUME EXTENT. SUME FRAGMENTS OF STRUNG RUCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS				
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.				
(NON-COHESIVE) VERY DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE				
VERY SOFT < 2 < 0.25	- INFERRED SOIL BOUNDARY - CORE BORING • SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.				
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	Ý	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.				
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	TIET 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		SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF				
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	ALLUVIAL SOIL BOUNDARY A PIEZUMEIER - SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.				
		ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT				
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	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		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	LEAST LESS INSUITABLE WASTE LESS ACCEPTABLE, BUT NOT TO BE	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				
	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.				
(PDP.) (CDP.) (CDP.) (CD.) (CD.)		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.) (CUB.) (GR.) (CSE. SD.) (F SD.) (SL.)	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				
	CL CLAY MOD MODERATELY 2 UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL				
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	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	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 TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.				
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.					
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON		<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 SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.				
	- FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.				
RANGE - WET - (W) SEMISOLIDE REGULARS DRYING TO	FRAC FRACTURED, FRACTURES     TCR - TRICONE REFUSAL     RT - RECOMPACTED TRIAXIAL       FRAGS FRAGMENTS     W - MOISTURE CONTENT     CBR - CALIFORNIA BEARING						
(PI) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS     W - MOISTURE CONTENT     CBR - CALIFORNIA BEARING       HI HIGHLY     V - VERY     RATIO		BENCH MARK: BL-3 AT STA.16+00 -BL-,18 FT RT				
		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	WIDE 3 TO 10 FEET THICKLY BEDDED 4 FEET	ELEVATION: 136.67 FEET				
OM OPTIMUM MUISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES				
	X CME-45C X CLAY BITS X 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 THINLY LAMINATED < 0.008 FEET					
PLASTICITY	8" HOLLOW AUGERSВН	INDURATION					
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS     -N	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.					
NON PLASTIC 0-5 VERY LOW		FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS;					
SLIGHTLY PLASTIC 6-15 SLIGHT		GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.					
MODERATELY PLASTIC 16-25 MEDIUM	HAND TOOLS:	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE:					
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST     TRICONE'STEEL TEETH     HAND AUGER	MUDERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.					
COLOR		GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;					
		INDURATED DIFFICULT TO BREAK WITH HAMMER.					
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).		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.

SF-420072

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## GEOTECHNICAL BORING REPORT BORE LOG

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		3P.6.R.9				P SF-420				HARN				GEOL	OGIST K. Plummer	1			17.BP.					• SF-42		COUN	
				dge No		n SR 2045		Bridge				reek					R (ft)					ge No			5 (Elliott B	Bridge Roa	id) o
BOR	ING NO	<b>O.</b> EB1	-A		S	TATION 2	3+12			OFFSET	8 ft LT			ALIGN	MENT -L-	0 HR.	N/A	BOR	ING NO.	EB1	-A		ST	ATION	23+12		0
COL	LAR EI	<b>LEV.</b> 1	37.7 ft		т	OTAL DEP	<b>TH</b> 84.	2 ft		NORTHING 548,975			EASTI	EASTING 2,038,558 24 HR. FIA										2 ft	N		
DRIL	L RIG/H	AMMER E	EFF./DA	TE B	RI2974 (	CME-45C 939	% 02/26/2	018			DRILL	METHO	DD N	lud Rotary	HAN	IMER TYPE Autom	atic	DRILL	RIG/HAN	IMER E	FF./DA	re BF	RI2974 C	ME-45C 9	3% 02/26/20	018	
DRIL		M. Radf			ST	FART DAT	E 03/1	3/18		COMP. D	DATE 03	3/13/18		SURF	CE WATER DEPTH	N/A		DRIL	LER M	. Radfe	ord		ST	ART DA	<b>TE</b> 03/13	8/18	C
ELEV	DRIVE		H BLO	ow co	-			/S PER			SAMF				SOIL AND ROCK DE	SCRIPTION		ELEV	DRIVE ELEV	DEPTH	· — — —	w cou				S PER FOC	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50		75 10	00 NO.	Имо	I G	ELEV. (ft)			PTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75
l																											
140		+												L				60	59.7	78.0	26				Ma	atch Line	
		‡								1				137.7	GROUND SUF		0.0		+	-	26	32	47		· · · · ·		. (
135	136.7	+	15	24	15				· · · · · ·			м		- 135.2	ROADWAY EMBA Tan, Silty Sa		2.5	55	+	-					· · · · · · · · ·	· · · · ·	
	134.7	<u>' + 3.0</u> +	4	2	3	•5	1					м			Red Brown to Dark Brown, Gravel	Clayey Sand with	2.0			- 83.0 -	25	64	36/0.2				
		‡							· · · · · ·				]	-	Glaver				+	-							
130	129.7	<u>, +</u> 8.0					· · ·	• •					」	-					+	-							
		‡	3	3	2	<b>●</b> 5		· ·	· · · · · ·			M		-					+	-							
405		‡					· · ·	· · ·	· · ·	· · · ·				– 126.7 –	ALLUVIA		11.0		+	-							
125	124.7	<u>' + 13.0</u>	1	1	2	$\mathbf{I}_{\alpha}$ · · ·	1					w		<u>-</u>	Gray, Clayey Sand	with Roots			+	-							
		ţ				$  \mathbf{v}^{2} \cdot \cdot$	· · ·	: :	· · ·										+	-							
120	119.7	, <del> </del> 				• \ • •		• •						120.2			17.5			-							
		1	6	6	8	●14	· · ·	· ·	· · ·			м		L	COASTAL P Gray, Clayey Sand [Cape				ł	-							
1		ł				:;/::		·   ·						_ 116.7	Gray, Silty Sand with Clay	Lavers and Mica	21.0		ł								
115	114.7	<u>/ _ 23.0</u>	3	4	4		+	<u> </u>				м		<u> </u>	[Cape Fear For				+	-							
		Ŧ		·										- 111.7			26.0		-	-							
110	109.7	, <u> </u>													Gray, Silty Clay [Cape F	ear Formation]	20.0		Ŧ	-							
	109.7	+ 28.0	5	8	12		20					м		-					Ŧ	-							
ł		Ŧ												F					ļ	-							
105	104.7	<u>,                                    </u>			10	· · · ·	$\lambda$	• •			·			-					-	-							
ł		ŧ	11	14	16		30		· · · · · ·			M							ļ	-							
100		<b>†</b>							· · · · · ·					<u> </u>	Gray, Clayey Sand [Cape	Fear Formation]	36.0		+	-							
	99.7	+ 38.0	12	20	25			45				м		-					+	-							
		ŧ							· · · · · ·					-					+	-							
95	94.7	43.0		10				• •						-					+	-							
ł		ŧ	6	10	12	,	22	:   :	· · · · · ·			M		-					ļ	-							
90		<b>†</b>		1					· · · · · ·					F						-							
	89.7	+ 48.0	5	6	7	· · •	<u> </u>	.   .				м		-						-							
		‡				· · · · ·		:   :	· · · · · ·				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	F						-							
85	84.7	+ 53.0				$  \cdot \cdot$	· · ·	·   ·						85.2	Gray to Red, Sandy Si	It [Cape Fear	52.5		+ +	-							
80 75 70		‡	6	9	12		21	:   :	· · · · · ·			м		F	Formation	] ]				-							
80		‡							· · · · · ·	· · · ·				-  -						-							
00	79.7	+ 58.0	13	21	24		<u> </u>	A5				м		  -						-							
		‡				· · · ·		ŢĨĬ :	· · · · · ·	· · · ·				-  -						-							
75	74.7	+ 63.0					· · ·	<u>;   :</u>						- -						-							
		‡	11	18	26			<b>4</b> 44	· · · · · ·			м		-  -						-							
		‡							· · ·					-						-							
	69.7	+ 68.0	14	24	25	· · · · ·	+					м		  -						-							
		ŧ					· · ·	. 49	S					-						-							
65	64.7	73.0								<u> </u>				-					-	-							
65	04.7	1 10.0	16	55	45/0.3							м		F						-							
60		Ŧ																		-							
60		I						.   .											1								

## SHEET 5

HARNET	Г			GEOLOGIST K. Plum	imer		
over Anders	son Cre	ek				GROUN	D WTR (ft)
OFFSET 8	ft LT			ALIGNMENT -L-		0 HR.	N/A
NORTHING	548,9	75		<b>EASTING</b> 2,038,558		24 HR.	FIAD
	DRILL N		D Mu	d Rotary	HAMM	ER TYPE	Automatic
COMP. DAT				SURFACE WATER DE	PTH N/	A	
	SAMP.	/	L	•			
75 100	NO.	моі	O G	SOIL AND RO	OCK DESC	CRIPTION	
<b>6</b> 79 · ·		M	-	Gray to Red, S	andy Silt	[Cape Fea	
				1 official		ucu)	
100/0.7		М	- 888	53.5 Boring Terminate	ed at Eleva	tion 53.5 fl	84.2 : In
				Š	andy Silt		
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## GEOTECHNICAL BORING REPORT BORE LOG

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		P.6.R.96				P SF-420		COUNT						GEO	LOGIST K. Plun	nmer	1			17.BF					IP SF-420		COUN	
				lge No		n SR 2045		dge Road	í			ek					GROUND						ge No		n SR 2045	-	idge Roa	
		. B1-B			S	TATION 2	3+81		OFFS					_	NMENT -L-		0 HR.	N/A	BOR	ING NO	EB2	-A		S	TATION 2	24+30		OF NC
COLL	AR ELI	<b>EV.</b> 12	25.2 ft		т	DTAL DEP	<b>TH</b> 71.3	ft	<u> </u>					EAS	<b>FING</b> 2,038,612		24 HR.	N/A	-						TOTAL DEPTH 74.6 ft			
DRILL	DRILL RIG/HAMMER EFF./DATE BRI2974 CME-45C 93% 02/26/2018								DRILL METHOD Mud						HAMMER TYPE Automatic						DRILL RIG/HAMMER EFF./DATE BRI2974 CME-45C 93% 02/26/2018							
DRILLER M. Radford START DATE 03/14/18								18	COMP. DATE 03/14/18						SURFACE WATER DEPTH 1.2ft						I. Radf	ord		S	<b>START DATE</b> 03/15/18			
ELEV	DRIVE ELEV	DEPTH		w co				PER FOOT			SAMP.	▼⁄			SOIL AND R	OCK DES	CRIPTION		ELEV	DRIVE ELEV	DEPTH	' <b></b>	W COL				PER FOO	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25	50	75	100	NO.	Имо	I G	ELEV. (1				DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75
130		Ļ												_					140		Ļ							
	-	ŧ												-						-	ŧ							
1 10-		±												- 125.2	WATER SL	IRFACE (C	)3/14/18)	0.0	105	136.7	- 1.0	4	3	2				:
125	125.2	<u> </u>	1	1	2	3						Sat.		-	А	LLUVIAL		0.0	135	134.6 -	3.1	1	1	2	<b>7</b> <sup>5</sup>			<u>+</u>
	-	ŧ				N. T.				•••				- 121.7	Tan	, Silty San	d	3.5		-	Ł			-	$\left  \begin{array}{c} \bullet^{3} \\ \downarrow \end{array} \right  \stackrel{\bullet^{3}}{\downarrow} \stackrel{\cdot}{} \stackrel{\cdot}}{} \stackrel{\cdot}}{} \stackrel{\cdot}{} \stackrel{\cdot}}{} \stackrel{\cdot}{} \stackrel{\cdot}{} \stackrel{\cdot}}{} \stackrel{\cdot}}{} \stackrel{\cdot}{} \stackrel{\cdot}}{} \stackrel{\cdot}}{} \stackrel{\cdot}}{} \stackrel{\cdot}}{} \stackrel{\cdot}}{} \stackrel{\cdot}}} \stackrel{\cdot}}{} \stackrel{\cdot}}{}$			•
120		Ŧ											/./	-	COA Gray, Clayey San	STAL PLA			130		-							•
	119.6 -	+ 5.6 T	5	8	10	18	3					м		-	Glay, Clayey Sal	u [Cape i i				129.6 -	F 8.1	2	4	3				
	-	Ŧ				$ \cdot\cdot,\cdot\rangle$			.					-							Ŧ						.	
115	114.6 -	10.6			_				·   · ·					-					125	124.6 -	13.1		_		<del>-                                   </del>		· · · · ·	· 
	-	ŧ	4	4	5	. •9						м		-				10.5		-	ŧ	3	4	'	. <b>•</b> 11 .			
110	-	‡								· · ·				<u>111.7</u>	Gray, Sandy Cla	y [Cape Fe	ar Formation]	13.5	120	-	+						·   · · · ·	:
110	109.6 -	+ 15.6 +	7	14	15	· · · ·	20					М		-					120	119.6 -	- 18.1	4	6	7				
	-	ŧ				· · · · ·	<b>1</b> .29			· ·				-						-	ŧ				· · <b>T</b> . <sup>13</sup> .   · · <b>T</b> · ·			•
105	104.6-	+ + 20.6					1							-					115	114.6-	- 23.1							·
	- 104.0	1	9	11	13		24			· ·		м		-							- 20.1	3	4	6	<b>1</b> 0			:
	-	ŧ					$\left[ \begin{array}{c} & & \\ & & \\ & & \\ & & \\ \end{array} \right]$							_ 101.7	Gray, Clayey Sar	d [Cane Fi	ear Formation	23.5			Ł							•
100	99.6 -	25.6	11	16	18		- <u>_</u>	+ • • • •						_	Gray, Glayey Gar				110	109.6 -	28.1	7	10	13	``,			
	-	Ŧ		10	10		•34					M		-						-	Ŧ	'	10	13		<b>Q</b> 23		
95	-	ŧ					1						/./.	-					105		ŧ							•
	94.6 -	+ 30.6 +	10	12	13		4 <sub>25</sub> · · ·					м		-					100	104.6 -	- 33.1	10	13	18		31		
	-	‡				· · · ·				· · ·				-						-	+							•
90	89.6 -	+ 35.6				· · · /			·   · ·	• •				-					100	99.6 <del>-</del>	- 38.1					· · · · ·	· · · ·	·
	-	ŧ	7	7	8	<b>•</b> 15				· · ·		м		-							+	8	16	17		•33		:
	-	ŧ				$\begin{vmatrix} & \cdot & \cdot & \cdot \\ & \cdot & \cdot & \cdot & \cdot \\ & \cdot & \cdot$								86.7	Gray, Sandy Cla	v [Cape Fe	ar Formation	38.5			ŧ							:
85	84.6 -	40.6	5	9	12		+	+ • • • •	<u> </u>			м		-	,	, [þ			95	94.6 -	43.1	8	12	50		· · · · ·		
	-	ŧ								· ·				- 81.7				43.5		-	Ł							
80	-	45.6													Gray, Sandy Sil	[Cape Fea	ar Formation]		90									•
	/9.0	T 45.6	11	19	30		· · · · ·	49				м		-						89.6 -	F 40.1	14	11	12		<b>Q</b> 23		•
	-	Ŧ												-							F							•
75	74.6 -	50.6	10	25	65/0.4		· · · ·	+ • • • •						-					85	84.6 -	53.1		17	26				·+-
	-	ŧ	18	35	65/0.4				· · · 10	0/0.9		M		-						-	ŧ	9	17	26			43	
70	-	ŧ								I				-					80	-	ŧ							•
10	69.6 -	+ 55.6 +	18	67	33/0.1					1		м		-					00	79.6 -	- 58.1	14	21	34				
65	-	‡				· · · ·				0/0.6				-						-	ŧ							:
65	64 6 -	+ 60.6				· · · ·								-					75	74.6 -	63 1						/	·
		1	35	65/0.5					 10	00/1.0		м		-								14	20	21	1	<b>6</b> 4	1	:
	-	ŧ								1				-					_		ŧ						.	
	59.6 -	65.6	48	52/0.3			+					м		_					70	69.6	68.1	7	11	14		+/-		
	-	£		0.0					10					-							ł	'		'		•25 · · ·		•
55		Ŧ												-					65		F							:
55	54.6 -	+ 70.6 +	50	50/0.2	$\mid$				10	0/0.7		М		53.9	Boring Terminate	ad at Flour	ation 53 0 ft In	71.3		64.6 -	<u>- 73.1</u>	15	32	55				
	-	Ŧ												-	Sound reminate	andy Silt	2001 JJ.9 IL III				F							
	-	<u>†</u>												-						-	t							

## SHEET 6

HARNET	T			GEOLOGIST K. Plumm	ner					
over Ander	son Cre	ek				GROUND WTR (ft)				
OFFSET 7	r ft LT			ALIGNMENT -L-		0 HR.	N/A			
NORTHING		69		EASTING 2,038,630		24 HR.	FIAD			
	DRILL N		D M	lud Rotary			Automatic			
COMP. DA		15/18	- 10							
	SAMP.		L	JUNFACE WATER DEP	IN/F	٦				
75 100	NO.	моі	0 G	SOIL AND ROC	K DESC	RIPTION				
				_						
					SURFA	CE	0.0			
				- ROADWAY E	MBANK	MENT				
		M		- 135.2 Red Brown, Silty S Red Brown to T			y <u>2.5</u>			
		м			. ,	-				
				-						
<u> </u>		м		-						
			,	_ 126.7			11.0			
· · · ·			<u>/</u> /.	– ALL – Brown, Clayey Sar	UVIAL nd with O	roanics an	d			
		Sat.	/./.	- Wood F	ragment	S	-			
			~~~	121.2			16.5			
+ • • • • •				Tan, S	ilty Sand					
		Sat.		-						
					AL PLAI		21.0			
<u> </u>		w	~~~	<ul> <li>Gray, Clayey Sand v</li> <li>Fear Former</li> </ul>	with Som		ipe			
			<u>/</u> ~/~	_						
· · · ·		м	<u>/./</u>	L.						
				- 106.7	2011 - 5	м Гени - "	31.0			
+ • • • •				- Gray, Sandy Clay [0	Jape ⊦ea	II FORMATIO	ויי			
		м		-						
				- 101.7 - Gray, Clayey Sand [	Cape Fe	ar Formati	36.0 on]			
+		м					-			
				_						
· · · · ·			<u>///</u>							
		м		- 93.6	Cono E-	Torm-1	44.1			
				- Gray, Sandy Clay [0			46.0			
· · · ·			/~/~	- Gray, Clayey Sand [	саре не	ar Formati	unj			
		м	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-						
				- 86.7 - Gray, Sandy Silt [C	ape Fea	r Formatio	51.0 n]			
<u> </u>		м					-			
· · · ·				_						
		м		-						
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· · · ·				-						
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<u> </u>										
• • • •		M								
<b>→</b> •87 ·		м		63.1			74.6			
<u>, <u>+</u>or</u>	1			Boring Terminated		ion 63.1 ft	In In			
				San	dy Silt					

