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SHEET NO.

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3421

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REFERENCE

**DESCRIPTION** TITLE SHEET LEGEND SITE PLAN PROFILE BORING LOGS SOIL TEST RESULTS SITE PHOTOGRAPHS

# STATE OF NORTH CAROLINA

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

# **STRUCTURE** SUBSURFACE INVESTIGATION

### COUNTY **<u>RICHMOND</u>**

PROJECT DESCRIPTION US 220 BYPASS FROM 0.3 MILES OF SR 1104 (OLD CHARLOTTE HWY) TO 0.2 MILES SW OF SR 1304 (HARRINGTON RD) SITE DESCRIPTION BRIDGE NO. 243 OVER US 220 BYPASS (-L-) ON SR 1140 (-Y3-)BETWEEN US 74 BUS AND SR 1141 *STA*. *140* + 97.00

# 542 4 Õ PROIEC

STATE N.C





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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, GEOTECHNICL 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 OPNION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTION STO 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 CONDENSATION OF 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

B. KEANEY

B. HOWEY

C. JONES

D. TIGNOR

C. MYERS

HDR ENGINEERING, INC. INVESTIGATED BY **F & R, INC.** 

DRAWN BY \_\_\_\_\_CGM

CHECKED BY \_**BDK** 

SUBMITTED BY HDR ENGINEERING, INC.



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

	SOIL D	ESCRIPTION			GRADATION		ROCK DESCRIPTION						
SOIL IS CONSIDERED	UNCONSOLIDATED, SEMI-CONS	SOLIDATED, OR WEATHERED E	ARTH MATERIALS THAT CAN	WELL GRADED - INDICA	TES A GOOD REPRESENTATION OF PARTIC	LE SIZES FROM FINE TO COARSE.	HARD ROCK IS N	NON-COASTAL PLAIN MATERIAL THAT	WOULD YIELD SPT REFUSAL IF TESTE				
ACCORDING TO THE	STANDARD PENETRATION TES	ST (AASHTO T 206,ASTM DI	586), SOIL CLASSIFICATION	UNIFORMLY GRADED - I GAP-GRADED - INDICAT	INDICATES THAT SOIL PARTICLES ARE AL ES A MIXTURE OF UNIFORM PARTICLE SU	L APPROXIMATELY THE SAME SIZE.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS TH						
IS BASED ON TH CONSISTENCY, COLOR,	HE AASHTO SYSTEM. BASIC D TEXTURE. MOISTURE. AASHTO	ESCRIPTIONS GENERALLY IN CLASSIFICATION, AND OTHER	CLUDE THE FOLLOWING: R PERTINENT FACTORS SUCH				REPRESENTED B	JY A ZONE OF WEATHERED ROCK.	ANSITION BETWEEN SUIL AND RUCK				
AS MINERALOO	SICAL COMPOSITION, ANGULAR	RITY, STRUCTURE, PLASTICITY	, ETC. FOR EXAMPLE,	THE ANGULARI	TY OR ROUNDNESS OF SOIL GRAINS IS DE	SIGNATED BY THE TERMS:	- ROCK MATERIAL	S ARE TYPICALLY DIVIDED AS FOLLO	wS:				
VERT STIFF,G	OTI LEGEND AND /	AASHTO CLASSIEI	NGHLT PLASTIC, A-7-6	ANGULAR, SUBA	NGULAR, SUBROUNDED, OR ROUNDED.		WEATHERED	NON-COASTAL PLA	IN MATERIAL THAT WOULD YIELD SPT				
GENERAL		SILT-CLAY MATERIALS		_	MINERALOGICAL COMPOSI	TION		FINE TO COARSE	GRAIN IGNEOUS AND METAMORPHIC RO				
CLASS. (	≤ 35% PASSING #200)	( > 35% PASSING #200)	ORGANIC MATERIALS	MINERAL NA	MES SUCH AS QUARTZ, FELDSPAR, MICA, T	ALC, KAOLIN, ETC.	ROCK (CR)	WOULD YIELD SPT	REFUSAL IF TESTED. ROCK TYPE IN				
GROUP A-1	A-3 A-2	A-4 A-5 A-6 A-7	A-1, A-2 A-4, A-5	ARE USED I	COMPDESCIPTIONS WHEN THEY ARE CONSID	ERED OF SIGNIFICANCE.		NE FINE TO COARSE	GRAIN METAMORPHIC AND NON-COASTA				
ULASS. A-1-a A-1-b	A-2-4 A-2-5 A-2-6 A-2-	7 A-7-6	A-3 A-6, A-7	su tr		11 < 31	ROCK (NCR)	ROCK TYPE INCLU	K THAT WOULD YEILD SPT REFUSAL : DES PHYLLITE, SLATE, SANDSTONE, ETC				
SYMBOL 000000000				MOD	ERATELY COMPRESSIBLE	LL = 31 - 50	COASTAL PLAIN	COASTAL PLAIN S	EDIMENTS CEMENTED INTO ROCK, BUT				
% PASSING			SILT- MUCK	HIGH	PEDCENTACE OF MATER		- (CP)	SPT REFUSAL. ROL	CK ITPE INCLUDES LIMESTONE, SANDS				
#40 30 MX 50 MX	51 MN		SOILS SOILS PEAT				1	WEAT	HERING				
#200 15 MX 25 MX	10 MX 35 MX 35 MX 35 MX 35 M	1X 36 MN 36 MN 36 MN 36 MN	30123	ORGANIC MATERIA		OTHER MATERIAL	FRESH RC	DCK FRESH, CRYSTALS BRIGHT, FEW JOIN	ITS MAY SHOW SLIGHT STAINING. ROCK				
MATERIAL PASSING #40				LITTLE ORGANIC MAT	TTER 3 - 5% 5 - 12%	LITTLE 10 - 20%		AMMER IF URISTALLINE.	COME TOTATE MAY SHOW THIN CLAY OF				
LL –	- 40 MX 41 MN 40 MX 41 MM	N 40 MX 41 MN 40 MX 41 MN	SOILS WITH LITTLE OR	MODERATELY ORGANIC	C 5 - 10% 12 - 20%	SOME 20 - 35%	(V SLI.) CF	RYSTALS ON A BROKEN SPECIMEN FACE	SHINE BRIGHTLY, ROCK RINGS UNDER HA				
PI 6 MX	NP 10 MX 10 MX 11 MN 11 MM	N 10 MX 10 MX 11 MN 11 MN	MODERATE ORGANI		GROUND WATER		OF	F A CRYSTALLINE NATURE.					
URUUP INDEX 0	0 0 4 MX	8 MX 12 MX 16 MX NU MX	ORGANIC SOILS	$\nabla$		TELY AFTER ORIGINA	(SLI.) 1	JCK GENERALLY FRESH, JUINIS STAINED INCH. OPEN JOINTS MAY CONTAIN CLAY.	AND DISCULURATION EXTENDS INTO RO IN GRANITOID ROCKS SOME OCCASIONAL				
OF MAJOR GRAVEL, AND	FINE SILTY OR CLAYEY	SILTY CLAYEY	MATTER		WHITER LEVEL IN BORE HOLE IMMEDIA		CF	RYSTALS ARE DULL AND DISCOLORED. C	RYSTALLINE ROCKS RING UNDER HAMMER				
MATERIALS SAND		30123 30123			STATIC WATER LEVEL AFTER 27 F		MODERATE SI (MOD.) G'	IGNIFICANT PORTIONS OF ROCK SHOW DI RANITOID ROCKS MOST FELDSPARS ARE	SCOLORATION AND WEATHERING EFFECTS				
GEN, RATING AS, SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR UNSUITAE		PERCHED WATER, SATURATED ZUNE, UR	WATER BEARING STRATA	DI	ULL SOUND UNDER HAMMER BLOWS AND	SHOWS SIGNIFICANT LOSS OF STRENGTH				
F	PLOF A-7-5 SUBGROUP IS ≤ LL -	- 30 : PI OF A-7-6 SUBGROUP IS >	> LL - 30		SPRING OR SEEP		WI	ITH FRESH ROCK.					
	CONSISTENC	Y OR DENSENESS			MISCELLANEOUS SYMBO	ILS	SEVERE AT	ND DISCOLORED AND A MAJORITY SHOW	KAOLINIZATION. ROCK SHOWS SEVERE LO				
	COMPACTNESS OR	RANGE OF STANDARD	RANGE OF UNCONFINED		25/025 010 010 010		(MOD. SEV.) AN	ND CAN BE EXCAVATED WITH A GEOLOGI	ST'S PICK. ROCK GIVES "CLUNK" SOUND W				
PRIMARY SUIL TYPE	CONSISTENCY	(N-VALUE)	(TONS/FT <sup>2</sup> )	L NUADWAY EM	ESCRIPTION	CTURES	SEVERE A	LL ROCK EXCEPT QUARTZ DISCOLORED (	R STAINED, ROCK FABRIC CLEAR AND E				
GENERALLY	VERY LOOSE	< 4				ING SLOPE INDICATOR	(SEV.) RE	EDUCED IN STRENGTH TO STRONG SOIL.	IN GRANITOID ROCKS ALL FELDSPARS A				
GRANULAR	LOOSE MEDIUM DENSE	4 TO 10 10 TO 30	N/A	M	VST PMT	INSTALLATION	<u>I</u> F	TESTED, WOULD YIELD SPT N VALUES	> 100 BPF				
MATERIAL (NON-COHESIVE)	DENSE	30 TO 50		THAN ROADW	AV EMBANKMENT	TEST	VERY AL	LL ROCK EXCEPT QUARTZ DISCOLORED (	OR STAINED. ROCK FABRIC ELEMENTS AR				
	VERY DENSE	> 50	( 0.05				SEVERE BU (V.SEV.) B'	JT MASS IS EFFECTIVELY REDUCED TO EMAINING, SAPROLITE IS AN EXAMPLE C	SOIL STATUS, WITH ONLY FRAGMENTS OF F ROCK WEATHERED TO A DEGREE THAT				
GENERALLY	SOFT	2 TO 4	0.25 TO 0.5				VF	ESTIGES OF ORIGINAL ROCK FABRIC REM	AIN. <u>IF TESTED, WOULD YIELD SPT N V</u>				
SILT-CLAY MATERIAL	MEDIUM STIFF	4 TO 8 8 TO 15	0.5 TO 1.0	INFERRED RC	OCK LINE OMONITORING WE	WITH CORE	COMPLETE RO	JCK REDUCED TO SOIL, ROCK FABRIC NO	DT DISCERNIBLE, OR DISCERNIBLE ONLY				
(COHESIVE)	VERY STIFF	15 TO 30	2 TO 4	★★★★★★ ALLUVIAL SO	NIL BOUNDARY A PIEZOMETER	- SPT N-VALUE	Al	LSO AN EXAMPLE.	T BE TRESENT MS BIKES ON STRINGENS.				
			> 4					ROCK H	IARDNESS				
							VERY HARD CA	ANNOT BE SCRATCHED BY KNIFE OR SHA	ARP PICK. BREAKING OF HAND SPECIMENS				
U.S. STD. SIEVE SIZE OPENING (MM)	4 10 4.76 2.00	40 60 200 0.42 0.25 0.075	270 0.053	EXCAVATION	UNSUITABLE WASTE	ACCEPTABLE, BUT NOT TO BE	UARD C.	AN RE SCRATCHED BY KNIES OF DICK O	NY WITH DIFFICULTY HARD HAMMER RE				
		COARSE FINE		SHALLOW		EMBANKMENT OR BACKFILL	Tr	O DETACH HAND SPECIMEN.					
(BLDR.) (C	(GR.)	SAND SAND (CSE, SD.) (E, SD.)	(SL.) (CL.)				- MODERATELY CA	AN BE SCRATCHED BY KNIFE OR PICK. C	GOUGES OR GROOVES TO 0.25 INCHES DE				
GRAIN MM 305	75 2.0	0.25	0.05 0.005	AR - AUGER REFUSAL	MED MEDIUM	VST - VANE SHEAR TEST	B'	Y MODERATE BLOWS.	IST'S FICK. HHND SPECIMENS CHN BE DI				
SIZE IN. 12	3			BT - BORING TERMINATE	D MICA MICACEOUS	WEA WEATHERED	MEDIUM Cr	AN BE GROOVED OR GOUGED 0.05 INCHE	S DEEP BY FIRM PRESSURE OF KNIFE O				
S	OIL MOISTURE - C	CORRELATION OF	TERMS	CPT - CONE PENETRATIO	MUD MUDERATELY ON TEST NP - NON PLASTIC	$\gamma$ - UNIT WEIGHT $\gamma$ - DRY UNIT WEIGHT	HARD CA	AN BE EXCAVATED IN SMALL CHIPS TO OINT OF A GEOLOGIST'S PICK.	PEICES 1 INCH MAXIMUM SIZE BY HARD				
SOIL MOISTURE S	SCALE FIELD MO	GUIDE FOR F	IELD MOISTURE DESCRIPTION	CSE COARSE	ORG ORGANIC		SOFT Cr	AN BE GROVED OR GOUGED READILY BY	KNIFE OR PICK. CAN BE EXCAVATED IN				
CATTERBERG LIN	MITS) DESCRIP	PTION		DPT - DYNAMIC PENETRA	ATION TEST SAP SAPROLITIC	S - BULK	FF	ROM CHIPS TO SEVERAL INCHES IN SIZE	E BY MODERATE BLOWS OF A PICK POINT SURF				
	- SATURA	TED - USUALLY LIQ	UID; VERY WET, USUALLY	e - VOID RATIO	SD SAND, SANDY	SS - SPLIT SPOON	VERY C	AN BE CARVED WITH KNIFE. CAN BE EX	CAVATED READILY WITH POINT OF PICK.				
	LIMIT	HOLD DEED		FOSS FOSSILIFEROUS	SLI SLIGHTLY	RS - ROCK	SOFT OF	R MORE IN THICKNESS CAN BE BROKEN	BY FINGER PRESSURE. CAN BE SCRATCH				
PLASTIC RANGE <	- WET - (	(W) SEMISOLID: R	EQUIRES DRYING TO	FRAC FRACTURED, FRA	CTURES TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL	FR		BEDDING				
(PI) PL PLASTIC	C LIMIT	ATTAIN UPTI	NUM MUISTURE	HI HIGHLY	V - VERY	RATIO	TERM	SPACING	TERM				
	- MOIST		NEAR OPTIMUM MOISTURE	EC	UIPMENT USED ON SUBJECT	PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED						
	M MOISTURE	30210, HT 01	NEHR OF THOM MOISTONE	DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THICKLY BEDDED						
		REQUIRES AD	DITIONAL WATER TO	CME-45C	CLAY BITS	X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED						
	- DRY - (	(D) ATTAIN OPTI	MUM MOISTURE	X CME-55	6' CONTINUOUS FLIGHT AUGER	CORE SIZE:		LESS THEN BID FEET	THINLY LAMINATED <				
	PLA	STICITY			8" HOLLOW AUGERS	В		INDU	RATION				
	PLASTI	CITY INDEX (PI)	DRY STRENGTH	CME-550	HARD FACED FINGER BITS	-N	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL E						
NON PLASTIC		Ø-5 6-15	VERY LOW	VANE SHEAR TEST	TUNGCARBIDE INSERTS		FRIABLE RUBBING WITH FINGER FREES NUME GENTLE BLOW BY HAMMER DISINTE						
MODERATELY PL	LASTIC	16-25	MEDIUM		CASING W/ ADVANCER	POST HOLE DIGGER	GRAINS CAN BE SEPARATED FROM SF						
HIGHLY PLASTIC	ບ 26	6 UR MORE	HIGH	PORTABLE HOIST	TRICONE STEEL TEETH	HAND AUGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAM BREAKS EASILY WHEN HIT WITH HAMM						
	C	JULOR		$\neg$	TRICONE TUNGCARB.	SOUNDING ROD	INDURATE	ED GRAINS ARE D	IFFICULT TO SEPARATE WITH STEEL				
DESCRIPTIONS MAY I	INCLUDE COLOR OR COLOR	COMBINATIONS (TAN, RED, )	ELLOW-BROWN, BLUE-GRAY).		CORE BIT	VANE SHEAR TEST		DIFFICULT TU	DICEN WITH HENRICH.				
MODIFIERS SU	ICH AS LIGHT, DARK, STREAM	KED, ETC. ARE USED TO DE	SCRIBE APPEARANCE.				EXTREME	LY INDURATED SAMPLE BREAK	S ACROSS GRAINS.				



DATE: 8-15-14



	TERMS AND DEFINITIONS
D. AN INFERRED SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS OF IEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
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.
ск тнат	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
LUDES GRANITE,	SURFAUE.
PLAIN	CALLAREOUS (CALC.) - SUES THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIOM CARBONATE.
H IESTED. May not yifi d	OF SLOPE.
TONE, 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.
RINGS LINDER	UIKE - A LABULAR BUDY OF IGREDUS RUCK THAT CUTS ACRUSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
ATINCS IE OPEN	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
MMER BLOWS IF	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
K UP TO FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
. IN 7. ROCK HAS	$\underline{FLOAT}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
ELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
ISS OF STRENGTH	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
IDENT BUT	ITS LATERAL EXTENT.
TE KHULINIZED	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.
STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
N SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SAPROLITE IS	HOCK QUALITY DESIGNATION (HOD) - A MEASURE OF HOCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
	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
EP CAN BE	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
TACHED	OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR BPF)OF
R PICK POINT. BLOWS OF THE	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
EDACMENTS	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
PIECES 1 INCH	LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
ED READILY BY	TOPSOTE LENGTH OF STATET HAD EXPRESSED AS A FERGENTHOE.
THICKNESS	BENCH MARK:
4 FEET	ELEVATION: FEET
5 - 4 FEET	NOTES.
8 - 0.16 FEET	NUTES:
0.008 FEET	BORING AND GROUND SURFACE ELEVATIONS OBTAINED FROM
AT, PRESSURE, ETC.	
EL PROBE:	
ROBE:	



450						0	50	100	PROJECT	REFERENCE NO	D. SHEET NO.
							FEET			R-3421B	4
440	NOTE:								PROFIL	LE ALONG -Y3- (	CENTERLINE
	GROUNDLINE PROFILE AT CENTERLINE OF -Y3- TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY MULKEY DATED 04–15–	15									
430	INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH										430
	PROJECTED ONTO THE PROFILE.										
420											420
410											410
			_1_	· · · · · · · · · · · · · · · · · · ·							· · · · · · · · · · · · · · · · · · ·
400			Ē								400
390			B1–B		EB2-A						390
	EXISTING GROUND SURFACE	$EB1 extrm{-}A\ 23 extrm{+}19\ 49^{\circ}LT$	$24 + 17 \\ 14'  RT$		25 + 47 15' LT						
380		(A)			 5 24-		·				380
370			(55)-000		04/1.0						370
		26	(42)-0000 ▼		25						
360		00/0.0	22		33						360
		60/0	32-		55						
350		( <u>3</u> <b>▼</b> 03/14	42		(44) ▼ 03/15		·				350
2.40				(B)							240
340		32		, U	0 (1)						540
330		) ()	©		6						330
		@-			@-						
320		8-	· · · · · · · · · · · · · · · · · · ·		(3–						320
			®				_				
310											310
200				(C)							300
300											500
290	A BROWN AND RED, LOOSE, FINE TO COARSE SAND (A–2–4), LITTLE CLAY AND GRAVEL, MOIST, ROADWAY EMBANKMENT		00/0.5	$\widehat{D}$	60/0.						290
	WHITE, TAN, ORANGE AND GRAY, LOOSE TO V. DENSE,		60/0 BT	$\bigcirc$	00/0.5 BT						
280	FINE TO COARSE SAND (A-2-4), CLAYEY SAND (A-2-6) B AND FINE TO COARSE SAND AND GRAVEL (A-1-B), LITTLE QUARTZ GRAVEL DRY TO WET COASTAL PLAIN										280
070	WITH LAYERS OF WHITE, RED AND TAN, FINE SANDY AND SILTY CLAY (A-7-56),										
270	DRY TO MOIST, COASTAL PLAIN GRAY, ORANGE, BLACK AND TAN STIFF TO HARD.										270
260	C HIGHLY SILTY CLAY (A-7-5) TO FINE TO COARSE SANDY CLAY (A-7-6), DRY TO MOIST, RESIDUAL		$-\gamma 3-$								260
	D GREENISH GRAY, BLACK, GABBRO, WEATHERED ROCK						·				
17 + 0	0 18+00 19+00 20+00 21+00 22+00	23+00	24+00	25	5+00 26-	+00 27+	-00 2	28+00	29+00	30+00	31+00

WBS         34542.1.FR4         TIP         R-3421B         COUNTY         RICHMOND	GEOLOGIST C. Jones		WBS 34542.1.FR4					<b>TIP</b> R-34	21B (	COUNTY RICHMO	DNC	GEOLOGIST C. Jones	
SITE DESCRIPTION Bridge No. 243 on SR 1140 over US 220		GROUND WTR (ft)	SITE	DESCR		Bridge	e No. 24	3 on SR 11	40 over US 22	20		-1	GROUND WTR (ft)
BORING NO.         EB1-A         STATION         23+19         OFFSET         49 ft	ALIGNMENT         -Y3-	0 HR. 31.5	5 BORING NO. B1-B STATION 24+17					STATION	24+17	OFFSET	14 ft RT	ALIGNMENT -Y3-	<b>0 HR.</b> 24.0
COLLAR ELEV.375.8 ftTOTAL DEPTH70.0 ftNORTHING44	,607 <b>EASTING</b> 1,745,655	<b>24 HR.</b> 30.0	COL	LAR ELI	<b>EV.</b> 380	).3 ft		TOTAL DE	<b>PTH</b> 92.9 ft	NORTHIN	<b>G</b> 441,631	EASTING 1,745,757	<b>24 HR.</b> 16.0
DRILL RIG/HAMMER EFF./DATE         F&R3495         CME-55         73% 02/05/2015         DRI	METHOD H.S. Augers HAM	IMER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE			F&R34	95 CME-55	73% 02/05/2015		DRILL METHOD	I.S. Augers	IAMMER TYPE Automatic	
DRILLER         D. Tignor         START DATE         03/09/14         COMP. DATE	SURFACE WATER DEPTH	N/A	DRIL	LER D	. Tignor			START DA	<b>TE</b> 03/05/15	COMP. DA	ATE 03/06/15	SURFACE WATER DEPTH	H N/A
ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOOT	D. L O SOIL AND ROCK DES	SCRIPTION	ELEV	DRIVE	DEPTH	BLOW	/ COUNT		BLOWS PE	R FOOT	SAMP.	SOIL AND ROCK	DESCRIPTION
(ft) (ft) 0.5ft 0.5ft 0.5ft 0.25 50 75 100 N	MOI G ELEV. (ft)	DEPTH (ft)	(11)	(ft)	(11)	0.5ft (	0.5ft 0.5	oft 0	25 50	/5 100	NO. MOI G		
380			385										
			000		ŧI								
	375.8 GROUND SUR	RFACE 0.0	200	380.3								- - 380.3 GROUND S	SURFACE 0.0
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	M A 373.8 Brown and red, fine to coar	NKMENT rse SAND (A-2-4) <u>2.0</u>	300			4	5 4				M	COASTAL	Fine to coarse SAND
372.3 3.5 24 40 60/0.4	COASTAL PL	d gravelj		376.8 -	3.5					· · · ·   · · · · · · · · · · · · · · ·		(A-2-4) with little	clay and gravel
370	White and red, fine to coars	rse gravelly SAND	375		‡	10	15 20	)	· · · • 35 ·	· · · · · · · · · · · ·		Orange and tan, fine sa	andy silty CLAY (A-6)
	Tan and orange, clayey fir	ne SAND (A-2-7)		-	‡					· · · ·   · · · · · · · · · · · · · · ·		373.3 Red_orange and white	fine to coarse SAND
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M		270	371.8 -	8.5	21	26 29	ə   · · · ·		• • • • • • • • • • • • • • • • • • •		(A-1-b) an	id gravel
	363.8	12.0	570	-	‡				/			<u> </u>	
	White and red, fine sand	ly CLAY (A-7-6)		366.8	13.5	-10			: :::/	· · · · ·   · · · · · ·		₩_ 	
360		17.0	365		‡	16	20 22	2	· · · • • • • • • • • • • • • • • • • •	· · · ·   · · · ·		-	
	White, partially cemented	d fine to coarse			‡ _					· · · · · · · · · · · ·		363.3	fine to coarse clavey 17.0
	D SAND (A-2-4	-4),	360	361.8 -	<u>+ 18.5  </u>	8	8 14	4	$\bullet_{22}$ $\cdot$ $\cdot$ $\cdot$ $\cdot$	· · · · · · · · · · ·	M	SAND (/	A-2-7)
		22.0	000	-	‡							- 358.3	22.0
	M	A-2-7)		356.8	23.5		14 10		I XIII	· · · · ·   · · · · ·		White and tan, fine s	andy CLAY (A-7-5)
			355	-	‡	0	14 10	°	· • • 32 · ·	· · · · ·   · · · · ·		• •-	
					‡				$\begin{vmatrix} \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \end{vmatrix}$	· · · · ·   · · · · ·		L .	
345 4 5 7			350	351.8 -	- 28.5	9	14 28	3	· · · · · · · · · · · · · · · · · · ·	· · · · ·   · · · · ·			
				-	ŧ				. /				32.0
				346.8	33.5	3	5 5	· · · ·		· · · ·   · · · · · ·		White, tan and orange, SAND (/	clayey fine to coarse A-2-6)
			345		ŧ			• • 10	· · · · · ·		-   V ****		,
				241.0	<b>↓</b>							F F	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M Providence		340		- 30.3	5	7 7	$    \cdot \cdot  $	4		W		
	333.8 Tan and orange, fine to coa	arse SAND (A-2-4) 42.0			Εl								
	W with little clay, some c	clay nodules		336.8	43.5	3	5 5				W 20		
			335		ŧl					· · · · · · · · · · · · · · · · · · ·			
			1	331.8	48.5			:					
	Sat.		330	-	1	4	5 5	• • 10			W		
			1	-	‡			:: <b>`</b> `	·   · · · ·				
$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $	Sat. little quartz gravel	l at 53.5'	00-	326.8	53.5	6	7 10	<u>, ; ;    -</u>			W 200		
			325		±							- 222.2	57.0
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				321.8 -	58.5				· · · · · ·	· · · ·   · · · · ·		Orange, fine to coa	rse SAND (A-2-4)
	Sat.		320		±	10	7 8		15	· · · · · · · · · · ·	Sat.	-	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		L62.0	1		‡			::!	· · · · · · ·	· · · ·   · · · · · · · · · · · · · · ·		318.3 Tan and orange_CLAV	(A-7-5/6) with gravel 62.0
$\begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{y}_{2} \\ \mathbf{x}_{3} \end{bmatrix}_{3 1 0} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{y}_{2} \\ \mathbf{x}_{3} \end{bmatrix} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \end{bmatrix} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \end{bmatrix} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \end{bmatrix} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \end{bmatrix} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \\ \mathbf{x}_{3} \end{bmatrix} \begin{bmatrix} \mathbf{x}_{1} \\ \mathbf{x}_{3} $	1         27%         Gray ,orange and white, find CLAY (A-7-6)(23) with som	ne to coarse sandy me silt and quartz	315	316.8 -	+ 63.5 -	5	6 6			· · · ·   · · · · · · ·			
	rock fragments, si	saprolitic	515	1 -	‡					· · · · · · · · · · ·		- 313.3	67.0
		70.0	1	311.8	68.5		10 4	· · · · · ·	<u>,    </u>	· · · ·   · · · · · ·		RESID	areenish aray, fine to
	Boring Terminated at Elev	vation 305.8 ft IN (UAL)	310		ŧI	ບ		· · · ·	•21 · · · ·	· · · · ·   · · · · · ·	^ ₽	coarse sandy CLAY (A- and rock fragme	-7-5)(3) with some silt ents, saprolitic
	Notes	, 		306.8 -	73.5	14	20 0	7	$\left  \begin{array}{c} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 $	· · · ·   · · · · · · · · · · · · · · ·		₽- }-	
	1) 0.2" Tops	SOII	305		t l	14	20 21		• • • • • • • • 47		SS-36 19%		

	WBS	34542	2.1.FR4			ТІ	<b>P</b> R-342	1B	COUNT	Y RICHMO	OND			GEOLOGIST C. Jones	WBS 34542.1.FR4						<b>TIP</b> R-3421B						
	SITE	DESCR	IPTION	l Brid	ge No	. 243 (	on SR 114	10 over US	\$ 220					ł	GROUND WTR (ft)	SITE DESCRIPTION Bridge No.						243 on SR 1140 over US 220					
	BOR	ING NO.	B1-B			S	TATION	24+17		OFFSET	14 ft RT	-		ALIGNMENT -Y3-		<b>0 HR.</b> 24.0	BOR	ING NO.	EB2-	A		STATION 25+47					
	COL		<b>EV.</b> 38	80.3 ft		т	OTAL DEF	<b>TH</b> 92.9	ft	NORTHIN	THING 441,631         EASTING 1,745,757         24 HR.         16.0						COL	LAR ELE	<b>EV.</b> 38	31.5 ft		TOTAL DEPTH 94.4 ft					
	DRILL	RIG/HAI	MMER E	FF./DA	TE F8	R3495	CME-55 73	3% 02/05/20	15	1	DRILL	METHO	DD H	H.S. Augers	HAMM	ER TYPE Automatic	DRIL	L RIG/HAI	MMER E	FF./DA	TE F&F	R3495 CME-55 73% 02/05/2015					
	DRIL	LER D	. Tigno	r		S	TART DAT	E 03/05/	/15	COMP. DA	TE 03/	/06/15		SURFACE WATER DEP	TH N	/A	DRILLER D. Tignor START DATE 03/04/15										
	ELEV	DRIVE	DEPTH	BLC	W COL	JNT		BLOWS	PER FOOT	-	SAMP.						ELEV	DRIVE	DEPTH	BLC	ow cou	INT		BLOWS	PER FOOT		
	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 100	NO.	мо	I G	ELEV. (ft)		DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25	50		
	305		L					Mat	ch Line			L					385		Ļ								
		-	Ļ						1 : : : :					Crange, black, tan ar	SIDUAL nd greer	nish gray, fine to		-	ŧ								
	000	301.8 -	- 78.5	14	19	26		,     .	<b> </b>					coarse sandy CLAY and rock fragments	(A-7-5)(3 s, saproli	3) with some silt tic <i>(continued)</i>		381.5	0.0	2	3	2	1	· · · · ·	· · · ·		
	300		F														380	-	+				•••				
		- 296.8 -	83.5											296.3		84.0		378.0	3.5	9	11	13		 24			
	295	-	+	28	51	49/0.3		· · · · ·				W		WEATHE			375	-	+					· · · · · · · · ·	<u> </u>		
		-	-						·   · · · · ·					Greenish g	ji dy, GA	BBRU		373.0	8.5			70					
	200	291.8 -	<u>88.5</u>	100/0.5				·   · · · ·	 	 ·		м					270	-	ł	24	34	10	· · · ·	· · · · ·			
	290		F F											g 			370	-	+								
		287.4	92.9	60/0				· · · · ·	· · · · ·	<u> </u>			977	287.4 Boring Termina	ated with	92.9 Standard		368.0	13.5	11	12	13		•25 · · · ·			
			Ļ											Penetration Test Re	fusal at	Elevation 287.4	365		ŧ					$\lambda$			
		-	ł															363.0	18.5	7	14	10	· · · · ·				
		-	÷											Ę			360	-	ŧ			15		·•33· ·			
		-	F											F			300		+ 					· · · · · · · ·			
		-	+											Ę				358.0	23.5	13	23	32	· · · · ·	· · · · ·	• · · · · ·		
		-	+											-			355	-	+					· · · ·	<u>/····</u>		
		-	ł											-				353.0	28.5	13	19	25		:::;	: : : : :		
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		_	E											E			335	-	F								
/15		-	L															333.0	48.5	6	7	9		· · · ·			
8/19		-	Ł											-			330	-	Ł								
.GDT		-	L															328.0	53.5					· · · ·			
DOT		-	L											L				-	Ł	4	6	6	· • 12 ·	· · · ·			
NC		-	L											E			325	-	F					<u> </u>			
S.GP.		-	L															323.0	58.5	3	5	8	· · • • 13•	· · · ·			
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<b>JUBLI</b>		-	ŧ											L L				313.0	68.5	5	9	10		 9			
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T BOF		-	ł											<u>t</u>				308.0	73.5			14	:::i	· · · · ·	· · · · ·		
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WBS	34542	.1.FR4			ТІ	P F	8-342	1B		С	OUNT	<b>Y</b> R	ICHMO	ND			GEOLOGIST C. Jones		
SITE	DESCR	IPTION	l Brid	lge No	. 243 (	on Sl	R 114	40 c	over US	5 2 2	)							GROUN	ID WTR (ft)
BOR	ing no.	EB2-	A		S	ΓΑΤΙ	ON	25+	-47			OFF	SET	15 ft LT			ALIGNMENT -Y3-	0 HR.	35.0
COL	LAR ELE	<b>IV</b> . 38	81.5 ft		т	DTAL	DEF	ртн	94.4	ft		NO	RTHING	<b>6</b> 441,7	'21		EASTING 1,745,856	24 HR.	32.0
DRILL	RIG/HAN	MMER E	FF./DA	TE F8	&R3495	CME	-55 7	3% (	02/05/20	15				DRILL N	NETHO	D H.	S. Augers HAMMI	ER TYPE	Automatic
DRIL	LER D	. Tigno	r		S	TAR		ΓЕ	03/04/	15		CO	MP. DA	TE 03/	05/15		SURFACE WATER DEPTH N/	Ą	
ELEV	DRIVE ELEV	DEPTH	BLC		UNT			05	BLOWS	S PEF	R FOOT		100	SAMP.			SOIL AND ROCK DESC	RIPTION	
(11)	(ft)	(11)	0.5ft	0.5ft	0.5ft	0		25		50		/5	100	NO.	Иог	G	ELEV. (ft)		DEPTH (ft)
305				+					Mat	ich L	ine	Τ-		+	<u> </u>				
	303.0	78.5	15	22	25							:					Gray to greenish gray and b coarse sandy highly silty Cl	orown, fine	e to (12)
300	-	-					•••		•••	• 4/							with rock fragments, saprolit	ic (continu	ied)
	298.0	835										1.					-		
		-	20	35	65/0.5		•••		•••			:	· · · 100				WEATHERED RC	ск	<u> </u>
295	_	-				·		•				+-					Greenish black, GA	BRO	
	293.0	88.5	36	60/0 1			• • •					:							
290	-	-		00,0.1			•••	•	•••		· · · ·		· 96/0.6	<b>'</b>					
200		-										1.					-		
		93.5	23	100/0.5		·	• •	•	• • •	•		•	100/0.5	,			287.1 Boring Terminated with	Standard	94.4
	-	-															Penetration Test Refusal at E	Elevation 2	87.1
	-	-																GABBRU	)
	-	-															. Notes . 1) 0.2' Topsoil		
	-	-															<ul> <li>2) Strata break in split spo</li> </ul>	oon at 64.2	2'
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CEN	-	-																	
BKIL		-															-		
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### North Carolina Department of Transportation **Division of Highways** Materials and Test Unit Soils Laboratory

T.I.P. ID NO.: R-3421B

DESCRIPTION: US 220 Bypass from 0.3 miles south of SR 1140 to 0.2 miles SW of SR 1304

REPORT ON SAMPLES OF: SOIL FOR QUALITY

PROJECT:	34542.1.FR4	
DATE SAMPLED:	3/4/15 - 3/9/15	
SAMPLED FROM:	Y3	
SUBMITTED BY:	B. Howey, P.E.	

COUNTY:	Richmond
RECEIVED:	3/4/15 - 3/9/15
REPORTED:	3/4/15 - 3/9/15
BY:	D. Jenks
	Cert No. 101-02-0603

TEST RESULTS

		r				I			-	
PROJ. SAMPLE NO.	SS-51	SS-36	SS-16							
BORING NO.	EB1-A	B1-B	EB2-A							
Retained #4 Sieve %	5.0	9.4	7.1							
Passing #10 Sieve %	90.3	84.9	86.8							
Passing #40 Sieve %	67.3	65.9	75.3							
Passing #200 Sieve %	52.6	39.5	60.6							

SOIL MORTAR - 100%									
Coarse Sand Ret - #60 %	32.1	33.8	16.6						
Fine Sand Ret - #270 %	11.6	23.8	18.5						
Silt 0.053 - 0.010 mm %	21.1	26.4	41.4						
Clay < 0.010 mm %	35.2	16.0	23.5						
L.L.	81	64	62						
P.L.	30	45	43						
P.I.	51	19	19						1
AASHTO Classification	A-7-6 (23)	A-7-5 (3)	A-7-5 (12)						
Station	-Y3- 23+19	-Y3- 24+17	-Y3- 25+47						1
Offset	49' LT	14' RT	15' LT						1
Depth (ft)	63.5	73.5	73.5						
to	65.0	75.0	75.0						1
Moisture Content (%)	26.6	19.4	34.3						
Organic Content (%)	NT	NT	NT						

NP=Not plastic NT=Not tested ND = Not Determined CL = Centerline

W.P. Alton, PE

Soils Engineer



1. View looking East along –Y3- from EB1 to EB2.



2. View looking North across End Bent 1





July 2015 Richmond County, NC

# 542 34. PROJEC

3421B Ż REFERENCE

CONTENTS	
SHEET NO.	<b>DESCRIPTION</b>
	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-6	CROSS SECTION(S)
7-9	BORINGS LOGS
10-11	SOIL TEST RESULTS
12	SITE PHOTOGRAPHS

# STATE OF NORTH CAROLINA

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

# **STRUCTURE** SUBSURFACE INVESTIGATION

### COUNTY **<u><b>RICHMOND**</u>

PROJECT DESCRIPTION <u>US 220 BYPASS FROM</u> 0.3 MILES OF
SR 1104 (OLD CHARLOTTE HWY) TO 0.2 MILES SW OF
SR 1304 (HARRINGTON RD)
SITE DESCRIPTION BRIDGE NOS. 244 (LEFT LANE) &
245 (RIGHT LANE) OVER SR 1005 (-Y5-) ON US 220 BYPASS (-L-
BETWEEN SR 1141 AND SR 1303 AT -L- STA. 301+83.52

STATE N.C





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#### **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 OPNION 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 OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FOM THE ACTUAL CONDENSATIONS FOR ANY EXTENSION OF TIME FOR ANY REASON RESULTING FOR THE ACTUAL CONDITIONS ENCOUNTERED AT 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 REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAVES ANY CLAIMS FOR INCRESSED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.
- 2.

PERSONNEL

B. KEANEY

B. HOWEY

C. JONES

D. TIGNOR

C. MYERS

HDR ENGINEERING, INC. INVESTIGATED BY **F & R, INC.** 

DRAWN BY \_\_\_\_\_CGM

CHECKED BY \_\_\_\_\_\_BDK

SUBMITTED BY HDR ENGINEERING, INC.

DATE \_\_\_\_\_7/2015



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

	SOIL D	ESCRIPTION			GRADATION			ROCK DE	SCRIPTION			
SOIL IS CONSIDERED	UNCONSOLIDATED, SEMI-CON	SOLIDATED, OR WEATHERED E	ARTH MATERIALS THAT CAN	WELL GRADED - INDICA	TES A GOOD REPRESENTATION OF PARTIC	LE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TEST ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIEL					
ACCORDING TO THE	STANDARD PENETRATION TES	ST (AASHTO T 206,ASTM DI	586). SOIL CLASSIFICATION	UNIFORMLY GRADED - 1 GAP-GRADED - INDICAT	INDICATES THAT SOIL PARTICLES ARE AL ES A MIXTURE OF UNIFORM PARTICLE SU	L APPROXIMATELY THE SAME SIZE.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THA					
IS BASED ON TH CONSISTENCY, COLOR,	HE AASHTO SYSTEM. BASIC D TEXTURE.MOISTURE.AASHTO	ESCRIPTIONS GENERALLY IN CLASSIFICATION, AND OTHER	CLUDE THE FOLLOWING: R PERTINENT FACTORS SUCH				REPRESENTED B	Y A ZONE OF WEATHERED ROCK.	ANSILION BETWEEN SUIL AND RUCK			
AS MINERALOO	GICAL COMPOSITION, ANGULAR	RITY, STRUCTURE, PLASTICITY	, ETC. FOR EXAMPLE,	THE ANGULARI	TY OR ROUNDNESS OF SOIL GRAINS IS DE	SIGNATED BY THE TERMS:	- ROCK MATERIALS	3 ARE TYPICALLY DIVIDED AS FOLLO	wS:			
	OTI LEGEND AND	AASHTA CLASSIFI		ANGULAR, SUBA	NGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED BOCK (WB)	NON-COASTAL PLA	IN MATERIAL THAT WOULD YIELD SPT				
GENERAL	GRANULAR MATERIALS	SILT-CLAY MATERIALS			MINERALOGICAL COMPOSI	TION		FINE TO COARSE	GRAIN IGNEOUS AND METAMORPHIC RO			
CLASS. (	≤ 35% PASSING *200)	( > 35% PASSING #200)	ORGANIC MATERIALS	MINERAL NA	MES SUCH AS QUARTZ, FELDSPAR, MICA, T	ALC, KAOLIN, ETC.	ROCK (CR)	WOULD YIELD SPT	REFUSAL IF TESTED. ROCK TYPE IN			
GROUP A-1	A-3 A-2	A-4 A-5 A-6 A-7	A-1, A-2 A-4, A-5	ARE USED .	COMPDESCIPTIONS WHEN THEY ARE CONSID	ERED OF SIGNIFICANCE.		FINE TO COARSE	GRAIN METAMORPHIC AND NON-COASTA			
ULASS: A-1-a A-1-b	A-2-4 A-2-5 A-2-6 A-2-	7 A-7-6	A-3 A-6, A-7			11 < 31	ROCK (NCR)	SEDIMENTARY ROC	K THAT WOULD YEILD SPT REFUSAL DES PHYLLITE, SLATE, SANDSTONE, ET(			
SYMBOL 000000000				MOD	ERATELY COMPRESSIBLE	LL = 31 - 50	COASTAL PLAIN	COASTAL PLAIN S	EDIMENTS CEMENTED INTO ROCK, BUT			
% PASSING			CDANULAD SILT-	HIGH	PEDCENTACE OF MATER		- (CP)	SPT REFUSAL. ROL	CK TIPE INCLUDES LIMESTONE, SANDS			
*40 30 MX 50 MX	51 MN		SOILS CLAY PEAT			IHL		WEAT	HERING			
*200 15 MX 25 MX	10 MX 35 MX 35 MX 35 MX 35 M	1X 36 MN 36 MN 36 MN 36 MN	30123	ORGANIC MATERIA		OTHER MATERIAL	FRESH RC	JCK FRESH, CRYSTALS BRIGHT, FEW JOIN	ITS MAY SHOW SLIGHT STAINING. ROCK			
MATERIAL PASSING #40				LITTLE ORGANIC MAT	TTER 3 - 5% 5 - 12%	LITTLE 10 - 20%		THERE IF CRISTALLINE.	COME TOTATE MAY CHOW THIN CLAY C			
LL –	- 40 MX 41 MN 40 MX 41 M	N 40 MX 41 MN 40 MX 41 MN	SOILS WITH LITTLE OR	MODERATELY ORGANIC	C 5 - 10% 12 - 20%	SOME 20 - 35%	(V SLI.) CF	TYSTALS ON A BROKEN SPECIMEN FACE	SHINE BRIGHTLY, ROCK RINGS UNDER H			
PI 6 MX	NP 10 MX 10 MX 11 MN 11 M	N 10 MX 10 MX 11 MN 11 MN	MODERATE ORGAN	c			0F	A CRYSTALLINE NATURE.				
GRUUP INDEX Ø	0 0 4 MX	8 MX 12 MX 16 MX NU MX	ORGANIC SOILS				_ SLIGHT RC (SLI.) 1	JCK GENERALLY FRESH, JOINTS STAINED INCH. OPEN JOINTS MAY CONTAIN CLAY	AND DISCOLORATION EXTENDS INTO RO IN GRANITOID ROCKS SOME OCCASIONA			
OF MAJOR GRAVEL, AND	FINE SILTY OR CLAYEY	SILTY CLAYEY	MATTER		WATER LEVEL IN BURE HOLE IMMEDIA	TELY AFTER DRILLING	CF	YSTALS ARE DULL AND DISCOLORED. C	RYSTALLINE ROCKS RING UNDER HAMMEP			
MATERIALS SAND	SHIND GRAVEL AND SHIND	SUILS SUILS			STATIC WATER LEVEL AFTER 24 F	IUURS	MODERATE SI	GNIFICANT PORTIONS OF ROCK SHOW DI	SCOLORATION AND WEATHERING EFFECTS			
GEN, RATING	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR UNSULTA	BLE VPW	PERCHED WATER, SATURATED ZONE, OR	WATER BEARING STRATA	DL	JLL SOUND UNDER HAMMER BLOWS AND	SHOWS SIGNIFICANT LOSS OF STRENGTH			
HS SUBURHUE	PLOF A-7-5 SURGROUP IS < 11	- 30 • PLOE A-7-6 SUBCROUP IS >			SPRING OR SEEP		WI	TH FRESH ROCK.				
		Y OR DENSENESS			MISCELLANEOUS SYMBO	ILS	SEVERE AN	.L ROCK EXCEPT QUARTZ DISCOLORED O ND DISCOLORED AND A MAJORITY SHOW	OR STAINED. IN GRANITOID ROCKS,ALL F KAOLINIZATION. ROCK SHOWS SEVERE L			
	COMPACTNESS OR	RANGE OF STANDARD	RANGE OF UNCONFINED	m	25/025		(MOD. SEV.) AN	D CAN BE EXCAVATED WITH A GEOLOGI	ST'S PICK, ROCK GIVES "CLUNK" SOUND			
PRIMARY SOIL TYPE	CONSISTENCY	PENETRATION RESISTENCE (N-VALUE)	COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	H L ROADWAY EM	BANKMENT (RE) 25,025 DIP & DIP DIR ESCRIPTION DF ROCK STRU	ECTION CTURES		I POCK EXCEPT OUAPTZ DISCOLOPED (				
CENEDALLY	VERY LOOSE	< 4			SPT STATE TECT DOG	SLOPE INDICATOR	(SEV.) RE	EDUCED IN STRENGTH TO STRONG SOIL.	IN GRANITOID ROCKS ALL FELDSPARS 4			
GRANULAR	LOOSE	4 TO 10		SULL STMBUL		ING V INSTALLATION	TC	J SOME EXTENT. SOME FRAGMENTS OF S TESTED, WOULD YTELD SPT N VALUES	STRONG ROCK USUALLY REMAIN.			
	DENSE	30 TO 50	NZ H	ARTIFICIAL F	FILL (AF) OTHER AUGER BORING	CONE PENETROMETER	VERY AL	LL ROCK EXCEPT QUARTZ DISCOLORED (	DR STAINED. ROCK FABRIC ELEMENTS AR			
(NUN-COHESIVE)	VERY DENSE	> 50			<u> </u>		SEVERE BL	JT MASS IS EFFECTIVELY REDUCED TO	SOIL STATUS, WITH ONLY FRAGMENTS OF			
	VERY SOFT	< 2 2 TO 4	< 0.25 0.25 TO 0.5	- INFERRED SC	IIL BOUNDARY - CORE BORING		V SEV./ NE	STIGES OF ORIGINAL ROCK FABRIC REN	AIN. <u>IF TESTED, WOULD YIELD SPT N V</u>			
SILT-CLAY	MEDIUM STIFF	4 TO 8	0.5 TO 1.0	INFERRED RO	CK LINE <sup>MW</sup> O MONITORING WE	LL - TEST BORING	COMPLETE RC	JCK REDUCED TO SOIL. ROCK FABRIC NO	OT DISCERNIBLE, OR DISCERNIBLE ONLY			
(COHESIVE)	VERY STIFF	8 TU 15 15 TO 30	2 TO 4	TTT ALLUVIAL SC	IL BOUNDARY A PIEZOMETER	SPT N-VALUE	SC	CATTERED CONCENTRATIONS. QUARTZ MA	Y BE PRESENT AS DIKES OR STRINGERS			
	HARD	> 30	> 4		INSTALLATION		_	ROCK +	IARDNESS			
	TEXTURE	UR GRAIN SIZE			RECUMMENDATION SYMB	ULS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SI					
U.S. STD. SIEVE SIZE	4 10	40 60 200	270	EXCAVATION	UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	ACCEPTABLE, BUT NOT TO BE	SE	IVERAL HARD BLOWS OF THE GEOLOGIST	T'S PICK.			
	4.78 2.00		0.000	SHALLOW	UNCLASSIFIED EXCAVATION -	USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKETLI	HARD CA	IN BE SCRATCHED BY KNIFE OR PICK OF D DETACH HAND SPECIMEN.	NLY WITH DIFFICULTY. HARD HAMMER B			
BOULDER COE (BLDR.) (C	BBLE GRAVEL	SAND SAND	SILT CLAY (SL.) (CL.)	UNDERCUT	ACCEPTABLE DEGRADABLE ROCK		MODERATELY CF	N BE SCRATCHED BY KNIFE OR PICK. (	GOUGES OR GROOVES TO 0.25 INCHES DE			
		(CSE.SD.) (F SD.)			ABBREVIATIONS		HARD EX	CAVATED BY HARD BLOW OF A GEOLOG	IST'S PICK. HAND SPECIMENS CAN BE D			
GRAIN MM 305 SIZE IN. 12	75 2.0 3	0.25	0.05 0.005	BT - BORING TERMINATE	ED MICA MICACEOUS	WEA WEATHERED	MEDIUM Cr	AN BE GROOVED OR GOUGED 0.05 INCHE	S DEEP BY FIRM PRESSURE OF KNIFE C			
c	OTI MOISTURE - (	CORRELATION OF	TERMS	CL CLAY	MOD MODERATELY	2 - UNIT WEIGHT	HARD CA	IN BE EXCAVATED IN SMALL CHIPS TO	PEICES 1 INCH MAXIMUM SIZE BY HARD			
SOIL MOISTURE	SCALE FIELD MC			CSE COARSE	UN TEST NP - NUN PLASTIC ORG ORGANIC	Zd- DRY UNIT WEIGHT	PU SOFT C/	JINT OF A GEULUGIST'S PICK.	UNICE OF DICK CAN BE EXCAVATED IN			
(ATTERBERG LIN	MITS) DESCRIP	PTION GUIDE FOR F	IELD MOISTURE DESCRIPTIO	N DMT - DILATOMETER TE	ST PMT - PRESSUREMETER TE	ST SAMPLE ABBREVIATIONS	FF	ROM CHIPS TO SEVERAL INCHES IN SIZE	E BY MODERATE BLOWS OF A PICK POIN			
	- SATURA	TED - USUALLY LIQ	UID; VERY WET, USUALLY	e - VOID RATIO	ATION TEST SAP SAPROLITIC SD SAND, SANDY	S - BULK SS - SPLIT SPOON	PI	ECES CAN BE BROKEN BY FINGER PRES	SURE.			
	(SAT.)	FROM BELOW	THE GROUND WATER TABLE	F - FINE	SL SILT, SILTY	ST - SHELBY TUBE	SOFT OF	AN BE CARVED WITH KNIFE. CAN BE EXU ₹ MORE IN THICKNESS CAN BE BROKEN	BY FINGER PRESSURE. CAN BE SCRATCH			
PLASTIC		SEMISOLID: B	EQUIRES DRYING TO	FRAC FRACTURED, FRA	CTURES TCR - TRICONE REFUSAL	RS - RUCK RT - RECOMPACTED TRIAXIAL	FI	NGERNAIL.				
RANGE <	- WET -	(W) ATTAIN OPTI	MUM MOISTURE	FRAGS FRAGMENTS	W - MOISTURE CONTENT	CBR - CALIFORNIA BEARING	FR	ACTURE SPACING	BEDDING			
PLL_PLASTIC	C LIMII			FC	UITEMENT LISED ON SUBJECT			MORE THAN 10 FEET	VERY THICKLY BEDDED			
ОМ ОРТІМИ	M MOISTURE - MOIST	- (M) SOLID; AT OR	NEAR OPTIMUM MOISTURE	DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:	- WIDE	3 TO 10 FEET	THICKLY BEDDED 1			
SL SHRINK	AGE LIMIT			CME-45C	CLAY BITS		CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED 0.0			
	- DRY -	(D) REQUIRES AD	DITIONAL WATER TO		6' CONTINUOUS FLIGHT AUGER		VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED 0.00			
	~ IO			X CME-55	X 8" HOLLOW AUGERS		<u> </u>	ΙΝΠΙ	RATION			
				CME-550	HARD FACED FINGER BITS		FOR SEDIMENTA	RY ROCKS, INDURATION IS THE HARDE	NING OF MATERIAL BY CEMENTING, HE			
NON PLASTIC	PLASTI	0-5	VERY LOW			└_┘ <sup>-</sup> <b>-</b>	FRIARI E	RUBBING WITH	FINGER FREES NUMEROUS GRAINS;			
SLIGHTLY PLAS	STIC	6-15	SLIGHT	VANE SHEAR TEST		HAND TOOLS:	FRIMOLE	GENTLE BLOW	BY HAMMER DISINTEGRATES SAMPLE.			
HIGHLY PLASTI	C 26	6 OR MORE	HIGH			POST HOLE DIGGER	MODERATE	ELY INDURATED GRAINS CAN B	E SEPARATED FROM SAMPLE WITH ST			
	(	COLOR				HAND AUGER		CRAINS ADE F	IFFICIET TO SEPARATE WITH STEEL			
				┨□			INDURATE	D DIFFICULT TO	BREAK WITH HAMMER.			
MODIFIERS SU	INCLUDE CULOR OR COLOR JCH AS LIGHT, DARK, STREA	CUMBINATIONS (TAN, RED, ) KED, ETC. ARE USED TO DE	CRIBE APPEARANCE.			VANE SHEAR IEST	FXTREME	LY INDURATED SHARP HAMMER	R BLOWS REQUIRED TO BREAK SAMPLE			
1							1	SAMPLE BREAK	(S ACROSS GRAINS.			



DATE: 8-15-14



	TERMS AND DEFINITIONS
D. AN INFERRED SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS OF IEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
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.
ск тнат	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
LUDES GRANITE,	SURFAUE.
PLAIN	CALLAREOUS (CALC.) - SUES THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIOM CARBONATE.
H IESTED. May not yifi d	OF SLOPE.
TONE, 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.
RINGS LINDER	UIKE - A LABULAR BUDY OF IGREDUS RUCK THAT CUTS ACRUSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
ATINCS IE OPEN	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
MMER BLOWS IF	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
K UP TO FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
. IN 7. ROCK HAS	$\underline{FLOAT}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
ELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
ISS OF STRENGTH	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
IDENT BUT	ITS LATERAL EXTENT.
TE KHULINIZED	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.
STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
N SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SAPROLITE IS	HOCK QUALITY DESIGNATION (HOD) - A MEASURE OF HOCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
	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
EP CAN BE	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
TACHED	OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR BPF)OF
R PICK POINT. BLOWS OF THE	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
EDACMENTS	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
PIECES 1 INCH	LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
ED READILY BY	TOPSOTE LENGTH OF STATET HAD EXPRESSED AS A FERGENTHOE.
THICKNESS	BENCH MARK:
4 FEET	ELEVATION: FEET
5 - 4 FEET	NOTES.
8 - 0.16 FEET	NUTES:
0.008 FEET	BORING AND GROUND SURFACE ELEVATIONS OBTAINED FROM
AT, PRESSURE, ETC.	
EL PROBE:	
ROBE:	





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, V. LOO LITTLE	SE TO QUART	M. DENS Z GRAVI	E, FINE EL, MOIS'	ТО СОД Г ТО V	ARSE SA VET. COA	ND (A-2 STAL P	2–4) LAIN	
(A-7-5)	WITH	SOME R	OUNDED	GRAVE	EL, MOISZ	Г		
NISH ( AGMEN	FRAY, ST TS, DRY	TIFF TO TO WE	HARD, H T, SAPRO	IGHLY LITIC, K	SILTY C RESIDUAI	LAY (A- L	7–5⁄6),	
HERED	ROCK							
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OOSE TO M. DENSE, FINE TO COARSE SAND (A–2–4 DME QUARTZ GRAVEL, MOIST, COASTAL PLAIN	()
7. STIFF,	250
CLAY (A-7-5/6), MOIST, COASTAL PLAIN	
TIFF, MOTLED, FINE SANDY CLAY (A–6),	240
ND ORANGE, FINE SANDY SILT (A-5) AND SILT (A-	4),
FATHERED DOCK	230
LATHÈRED RUCK	220
ION CRYSTALLINE ROCK	
	1

WB	<b>3</b> 3454	2.1.FR4			TI	<b>P</b> R-342	1B	COUNTY	RICHMO	ND			GEC	LOGIST C. Jones	;		WBS	<b>3</b> 34542	2.1.FR4	1		TI	<b>P</b> R-3421	В	COUNTY				
SITE	DESC	RIPTION	l Dua	l Bridg	ges (N	o. 244 and	d 245) on l	IS 220 Byp	bass over S	R 1005						GROUND WTR (ft)	SITE	DESCR	RIPTION	<b>N</b> Dua	al Brido	ges (N	o. 244 and	245) on U	IS 220 Byp				
BOF	RING NC	. EB1-	A-LL		S	TATION	301+27		OFFSET	70 ft LT			ALIC	GNMENT -L-		<b>0 HR.</b> 8.0	BOF	RING NO	. EB1-	-C		S	TATION 3	01+21					
COL	LAR EL	<b>EV.</b> 33	87.9 ft		т	OTAL DEF	<b>PTH</b> 58.6	ft	NORTHING	<b>3</b> 449,4	147		EAS	<b>TING</b> 1,758,759		<b>24 HR.</b> 5.0	COL	LAR EL	<b>EV.</b> 33	35.5 ft		т	OTAL DEP	ſ <b>H</b> 43.5 f	t				
DRIL	L RIG/HA	MMER E	FF./DA	TE F8	R3495	CME-55 7	3% 02/05/201	5 DRILL METHOD H.S.						rs	HAMM	IER TYPE Automatic	DRIL	L RIG/HA	MMER E	FF./DA	&R3495	.495 CME-55 73% 02/05/2015							
DRI	LER [	). Tigno	r		S		E 03/02/	15	COMP. DA	<b>TE</b> 03/	02/15		SUR	FACE WATER DEP	TH N	/A	DRII	LER D	). Tigno	or		S	FART DATI	E 03/02/1	15				
ELEV	DRIVE	DEPTH	BLC	W COL	JNT		BLOWS	PER FOOT		SAMP.	▼⁄	L				CRIPTION	ELEV	DRIVE	DEPTH	BLO	ow co	UNT		BLOWS	PER FOOT				
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 100	NO.	мо	I G	ELEV.	(ft)	0.1.020	DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50				
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		Ŧ	1	1	1	•2 · · ·					м			COAST	<b>FAL PLA</b> SAND (A	NN A-2-4) with trace		225 5	±										
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325	324.4	+ 13.5										<b>!</b>		White, tan and orang	ge, fine t	to coarse clayey	325		ŧ				••••		+ • • • •				
		ŧ	8	10	12						w	///	-	SAND (A-2-7) WIT So	nica	inz gravel, trace		222.0	+ 125										
220		‡				:::/						/~/~	-				220	322.0	+ 13.5	5	8	9	 	· · · · ·					
320	319.4	+ 18.5	4	5	7							/./.	-				520	- 1	ŧ				<u> </u>	<u> </u>	<u> </u>				
		‡				<b>q</b> 12	.   .	· · · · ·				///	_					317.0	18.5			_	. <i>. </i>   . <i> </i>	· · · · ·	· · · · ·				
315	314.4	+ 23.5				· · · <u>\</u>						/./.	-				315		ŧ			5	. • • 8 · ·	· · · ·	· · · ·				
	- 514.4	+ 20.0	8	10	14		24				w	///	_						t				: <u>\</u> : :						
		ŧ					/					/./				<u>27.0</u>		312.0	23.5	4	7	8							
310	309.4	28.5		5	8		+ • • • •	<u> </u>	<u> </u>					RES Tan, orange and bl	SIDUAL luish gre	en, highly silty	310		ŧ				· · · · ·	<u> </u>	+				
		Ŧ	-	5	0		.				M			CLÁY (A-7-5)(32) v rock fi	with little	fine sand and		307.0	28.5										
305		Ŧ				• • •							_	10011	ragmon		305		Ŧ	14	29	31			• •60 ·				
	304.4	<u>T 33.5</u> T	7	9	11		20			SS-8	38%		-						Ŧ						<u> </u>				
		Ŧ									1		-					302.0	33.5	28	50	50/0.4							
300	299.4	38.5						<u> </u>					-				300	-	Ŧ										
		Ŧ	14	16	48						D		-					297.0	+ 38.5										
295		ŧ											-				295	201.0	+ 00.0	38	60/0.1								
	294.4	+ 43.5 +	53	47/0.5								977	<u>294.4</u>			<u>оск</u> <u> 43.5</u>		1 -	ŧ						· · · ·				
		ŧ							• 100/1.0				-	Greenish g	ray, PHY	/LLITE		292.0	43.5	60/0				<u> </u>					
290	289.4	+ 48.5											-					-	ŧ										
15		ŧ	29	60	40/0.1				• 100/0.6				-						‡										
285		‡					·   · · · · ·						-						‡										
100	284.4	+ 53.5 +	100/0.2						- 100/0.2	•			-					-	ŧ										
OT.O		‡					·   · · · · ·	· · · · ·					-						‡										
<u>v</u> 280	270 /	+ 58 5											- 279.4			58.5		-	ŧ										
L L L L	213.4	+	100/0.1						100/0.1			1/1-6	279.3						ŧ										
SES.0		ŧ											_	Boring Termina	ated with	Standard			ŧ										
SRIDC		ŧ											_	Penetration Test Re ft IN NON CRY	fusal at (STALLI	Elevation 279.3 NE ROCK		-	ŧ										
18  -		ŧ											_	(PH)	YLLITE)				ŧ										
R-342	.	Ŧ											_	N 1) 0.2	lotes 2' Topsoi	il			Ŧ										
SLE F		ŧ											_	.) 0.2	900				ŧ										
DOUE		Ŧ											_						Ŧ										
ORE [	.	Ŧ											_						Ŧ										
DT B(		Ŧ											F						Ŧ										
NCD		Ŧ											-						Ŧ										



WBS 34542.1.FR4 TIP F	R-3421B COUNTY RICHMO	ND GEO	LOGIST C. Jones	WBS	34542.1.FR4	TIP R-3421B COUNTY
SITE DESCRIPTION Dual Bridges (No. 24	244 and 245) on US 220 Bypass over SF	R 1005	GROUND	VTR (ft) SITE	DESCRIPTION Dual Bridges	(No. 244 and 245) on US 220 By
BORING NO. EB2-A-LL STATI	TION 302+52 OFFSET 7	'0 ft LT ALIG	NMENT -L- 0 HR.	36.0 <b>BORI</b>	NG NO. EB2-C	<b>STATION</b> 302+50
COLLAR ELEV. 336.5 ft TOTA	AL DEPTH 48.5 ft NORTHING	449,515 <b>EAS</b>	<b>TING</b> 1,758,863 <b>24 HR.</b>	8.0 COLL	AR ELEV. 329.9 ft	TOTAL DEPTH 43.5 ft
DRILL RIG/HAMMER EFF./DATE F&R3495 CME	/IE-55 73% 02/05/2015	DRILL METHOD H.S. Augers	B HAMMER TYPE Au	tomatic DRILL	RIG/HAMMER EFF./DATE F&R34	195 CME-55 73% 02/05/2015
DRILLER D. Tignor STAR	RT DATE 03/04/15 COMP. DAT	TE 03/04/15 SURF	FACE WATER DEPTH N/A	DRILL	LER D. Tignor	<b>START DATE</b> 03/03/15
ELEV DRIVE DEPTH BLOW COUNT	BLOWS PER FOOT	SAMP.	SOIL AND ROCK DESCRIPTION	ELEV	DRIVE DEPTH BLOW COUNT	BLOWS PER FOOT
(π) (ft) <sup>(π)</sup> 0.5ft 0.5ft 0.5ft 0	0 25 50 75 100	NO. MOI G ELEV. (f	t)	DEPTH (ft) (π)	(ft) <sup>(π)</sup> 0.5ft 0.5ft 0.	5ft 0 25 50
340				330	3299 0 0 1 1 1	
336.5 + 0.0 WOH 2 2	<b>.</b>	M 336.5	GROUND SURFACE COASTAL PLAIN	0.0	326.4 3.5 2 4 4	$= \left  \begin{array}{c} \mathbf{A} & \cdots & \mathbf{A} \\ \mathbf{A} & \mathbf{A} \\ $
			Brown, tan and orange, fine to coarse SANI (A-2-4) with little clay and gravel	) <u>323</u>	<u>+</u>	
	$\bullet_6$ $\cdot$ $\cdot$ $\bullet$ $\bullet$ $\cdot$ $\bullet$	М	( , , , , , , , , , , , , , , , , , , ,		3214 7 85	
330	· <b>`</b> . · · · · · · · · · · · · · · · · · · ·	329.5		7.0 320		0 <b>.</b>
328.0 8.5 8 12 18			White, orange and maroon, fine to coarse sandy CLAY (A-7-5/6)		‡	$    \cdot \cdot \cdot \cdot   \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot \cdot   \cdot   \cdot \cdot   \cdot   \cdot \cdot   \cdot   \cdot   \cdot \cdot     \cdot   \cdot   \cdot     \cdot   \cdot   \cdot     \cdot   \cdot     \cdot   \cdot     \cdot   \cdot     \cdot     \cdot     \cdot     \cdot       \cdot       \cdot         \cdot  $
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			045	316.4 + 13.5 4 10 1	$\frac{1}{3} \begin{vmatrix} \cdot \cdot \cdot \cdot \cdot \\ \cdot \cdot \cdot \cdot \cdot \end{vmatrix} + \frac{1}{2} \begin{vmatrix} \cdot \cdot \cdot \cdot \cdot \\ \cdot \cdot \cdot \cdot \cdot \end{vmatrix} + \frac{1}{2} \begin{vmatrix} \cdot \cdot \cdot \cdot \cdot \\ \cdot \cdot \cdot \cdot \cdot \end{vmatrix} + \frac{1}{2} \begin{vmatrix} \cdot \cdot \cdot \cdot \cdot \\ \cdot \cdot \cdot \cdot \cdot \end{vmatrix}$
	···· / · · · · · · · · · · · · · · · ·	324.5	White and orange fine to coarse clavey	<u>12.0</u> <u>315</u>	$\pm$	
323.0 13.5 7 9 13	· · · · · · · · · · · · · · · · · · ·	M	SAND (A-2-7)			
320	· · · · <b>/</b> · · · · · · · · · · · · · · · · · · ·	310 5		17.0 310		
318.0 18.5	· · · · <i>!</i>   · · · ·   · · · ·   · · · ·		Light gray and red mottled, fine sandy CLA	, <u></u>	±	
	· · · • • 19 · · · ·   · · · ·   · · · ·		(A-0)		306.4 23.5	
	· · · · · · · · · · · · · · · · · · ·	314.5		<u>22.0</u> <u>305</u>	$\frac{1}{4}$ $\begin{vmatrix} \circ \\ \circ \\ \end{vmatrix}$ $\begin{vmatrix} 14 \\ 2 \end{vmatrix}$	34
313.0 23.5 7 8 11		W W	little quartz gravel		Ŧ	
310	· · · · · · · · · · · · · · · · · · ·			300	<u>301.4 T 28.5</u> T 12 24 3	$\overline{7}$
308 0 28 5			RESIDUAL	<u> </u>	Ŧ	
	· · • 13:	м <b>Г</b>	Greenish tan and greenish gray, SILT (A-4)		296.4 33.5	
305 -				295		
303.0 33.5		- 302.5		34.0	‡	
	· · · · · · · · · · · · · · · · · · ·		WEATHERED ROCK Greenish gray, PHYLLITE	290	291.4 + 38.5   60/0	
298.0 30.3 25 52 60/0.1	· · · · · · · · · · · · · · · · · · ·	M 297.0		39.5	286.4 + 43.5	
295 -	·····		Greenish gray, PHYLLITE			
293.0 43.5	60/0 <del>6</del>				‡	
					‡	
				48.5		
<u>916</u> <u>- 60/0</u> <u>- 60/0</u>	60/0 <b>●</b>	-	Boring Terminated with Standard		‡	
			ft IN NON CRYSTALLINE ROCK		<u>+</u>	
			(PHYLLITE)		‡	
			Notes 1) 0.2' Topsoil		‡	
					$\pm$	
					±	
					±	
4518					$\frac{1}{2}$	
					$\mp$	
					Ŧ	
					‡	
					<b>†</b>	
					‡	
					<u> </u>	

RICHMOND	GEOLOGIST C. Jones	
bass over SR 1005		GROUND WTR (ft)
OFFSET CL	ALIGNMENT -L-	<b>0 HR.</b> 6.0
<b>NORTHING</b> 449,456	EASTING 1,758,900	<b>24 HR.</b> 5.5
DRILL METHOD H	S. Augers HAMM	ER TYPE Automatic
COMP DATE 03/03/15		Δ
	JUNFACE WATER DEFTH IN	~
	SOIL AND ROCK DESC	RIPTION
	_329.9 GROUND SURFA	ACE 0.0
	Brown to orange-tan, fine to	coarse SAND
	(A-2-4) with trace day, s	some roots
	-	
	_ <u>322.9</u>	y fine to coarse7.0
M	SAND (A-2-7), some qua	artz gravel
	-	
_ · · · ·   M	-	
	312.9	17.0
	RESIDUAL Greenish gray tan red and	orange clavev
SS-35 24%	fine sandy SILT (A-	5)(11)
	— ·	
100/0.2	WEATHERED RC	34.0 CK
	Gray, PHYLLIT	E
	291.4	38.5
	- NON-CRYSTALLINE - PHYLLITE	ROCK
	286.4 Boring Terminated with	43.5 Standard
	<ul> <li>Penetration Test Refusal at E</li> <li>fill NON CRYSTALLING</li> </ul>	Elevation 286.4
	(PHYLLITE)	
	Notes	
	1) Auger refusal at	43.5'
	_	
	- -	
	-	
	-	
	_	
	•	

WBS	34542	.1.FR4			Т	P R-3421	3		YR	— <u>–</u> снмо				GEOLOGIST C. Jones		
SITE	DESCR	IPTION	Dua	l Brido	aes (N	o. 244 and	- 245) on U	S 220 By	pass	over SI	R 1005				GROUND WTF	R (ft)
BOR	ING NO.	EB2-	-B-RL		s.	TATION 30	)2+45	,	OFF	SET 7	70 ft RT			ALIGNMENT -L-	0 HR.	4.0
COL	LAR ELE	<b>V</b> . 32	24.3 ft		т	OTAL DEPT	<b>H</b> 39.6 f	ť	NOR	THING	449,3	95		EASTING 1,758,935	24 HR.	3.0
DRILI	RIG/HAN	/MER E	FF./DA	TE F8	R3495	CME-55 73%	6 02/05/201	5	1		DRILL N	IETHO	D H.S	S. Augers HAMM	ER TYPE Automa	atic
DRIL	<b>LER</b> D	Tigno	r		S		03/03/1	5	CON	IP. DA	TE 03/0	03/15			A	
FI FV	DRIVE	DEPTH	BLC	w co	JNT		BLOWS	PER FOOT	<u>і                                    </u>		SAMP.	▼/	L			
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	5	50	75	100	NO.	моі	G	ELEV. (ft)	DEP	PTH (ft)
325															CE.	0.0
	324.3	- 0.0	1	1	2	<b>•</b> 3						м		COASTAL PLA		2.0
	- 320.8 -	- - 3.5				]   <b>i</b> : : : : :							///	$\frac{522.5}{2}$ Brown and red motiled, line in $(A-2-4)$ , trace silt, son	ne roots	
320	_	-	1	1	1							w		Tan, white and orange, fine to SAND (A-2-6), trace	o coarse clayey roots	
	-	-				`\::::										
315	315.8 -	- 8.5	3	4	5							W	~~~	_		
	-	-											~~~	212.2		10.0
	- 310.8 -	- - 13.5					· · · ·							RESIDUAL		_ 12.0
310	_	-	2	3	6	] <b></b> 9						м		(A-4) with rock fragi	nish gray, SILT ments	
	-	-											Ŀ			
305	305.8 -	- 18.5	9	11	12	\						м	Ŀ	_		
	-	-					23						Ŀ			
	300.8 -	- 23 5					<u>.</u>						Ŀ			
300		-	10	12	17	1	•29 <u></u>					м		-		
	-	-											Ŀ			
295	295.8 -	- 28.5	29	100/0.3						~·~:_			-	295.3		29.0
	-	-								100/0.3				<b>WEATHERED RC</b> Greenish gray, PHY	ick Llite	
	290.8	- 33 5												290.8		33.5
290		-	60/0.1	]						_60/0.1				- NON-CRYSTALLINE Greenish grav. PHY	ROCK LLITE	
	-	-					· · · ·									
285	285.8 -	- <u>38.5</u> - 39.6	60/0.1	-						60/0.1				-284.7		39.6
	-	-	60/0							60/0			E	Boring Terminated with Penetration Test Refusal at E	Standard Elevation 284.7	
	-	-												ft IN NON CRYSTALLIN (PHYLLITE)	IE ROCK	
	-	-												- Notes		
	-	-												1) Auger refusal at	39.6'	
	-	-												-		
	-	-														
1.0	-	-														
	-	_												-		
5	-	-											Ŀ			
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2	-	-											Ŀ			
0.01	-	_											E			
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3		-														

T.I.P. ID NO.: R-3421B

DESCRIPTION: Dual Bridges (No. 244 and 245) on US 220 Bypass over SR 1005

REPORT ON SAMPLES OF: SOIL FOR QUALITY

PROJECT:	34542.1.FR4
DATE SAMPLED:	3/2/15 - 3/4/15
SAMPLED FROM:	<u>L</u>
SUBMITTED BY:	B. Howey, P.E.

COUNTY:	Richmond
RECEIVED:	3/2/15 - 3/4/15
REPORTED:	3/2/15 - 3/4/15
BY:	D. Jenks Cert No. 101-02-0603

TEST RESULTS

PROJ. SAMPLE NO.	SS-8	SS-18	SS-35							
BORING NO.	EB1-A LL	EB1-C	EB2-C							
Retained #4 Sieve %	0.0	3.3	0.0							
Passing #10 Sieve %	100.0	95.4	100.0							
Passing #40 Sieve %	97.8	94.5	99.4							
Passing #200 Sieve %	87.3	79.9	86.3							

SOIL MORTAR - 100%										
Coarse Sand Ret - #60 %	4.2	2.0	1.6							
Fine Sand Ret - #270 %	11.3	25.5	25.9							
Silt 0.053 - 0.010 mm %	43.8	41.3	50.6							
Clay < 0.010 mm %	40.7	31.2	21.9							
L.L.	70	52	46							
P.L.	41	27	37							
P.I.	29	25	9							
AASHTO Classification	A-7-5 (32)	A-7-6 (21)	A-5 (11)							
Station	-L- 301+27	-L- 301+21	-L- 302+50							
Offset	70 ft LT	CL	CL							
Depth (ft)	33.5	23.5	18.5							
to	35.0	25.0	20.0							
Moisture Content (%)	37.5	32.4	24.2							
Organic Content (%)	NT	NT	NT							

NP=Not plastic NT=Not tested ND = Not Determined CL = Centerline

W.P. Alton, PE

Soils Engineer

### T.I.P. ID NO.: R-3421B DESCRIPTION: Dual Bridges (No. 244 and 245) on US 220 Bypass over SR 1005

EB1-B	RL			SOII	27	TES	ST R	ESUL	TS						
SAMPLE	0.550.55	07171011	DEPTH	AASHTO		DI		% BY W	EIGHT		% PASS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	<i>P.I.</i>	C. SAND	F. SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
~~ ~				1 2 2 ( 1 )										1 1	
<u>SS-674</u>	65 RT	301+23	4.00 - 5.50	A - 2 - 6(1)	31	16	55.9	18.7	5.2	20.3	88	53	24	-	-
SS-675	65RT	301 +23	9.00-10.50	A - 7 - 6(12)	60	39	37.2	18.3	4.0	40.6	99	79	45	-	-
SS-676	65RT	301 +23	14.00-15.50	A - 2 - 7(4)	52	31	54.4	13.6	4.7	27.4	96	58	32	-	_
SS-677	65RT	301 +23	19.00-20.50	A - 2 - 7(2)	60	32	63.8	10.8	3.1	22.3	96	59	25	-	-
SS-678	65RT	301 +23	24.00 - 25.50	A - 7 - 5(69)	104	59	1.8	6.1	23.1	69.0	100	99	94	-	-
SS-679	65RT	301 +23	29.00-30.50	A - 7 - 6(61)	83	61	5.5	8.7	29.0	56.8	100	97	90	-	-
SS-680	65RT	301 +23	34.00-35.50	A - 7 - 6(42)	66	39	1.2	13.6	44.6	40.6	100	99	94	-	_
										· · · · · ·					



1. View looking Northeast along -L- across -Y5- from EB1 to EB2.



2. View looking Northwest along End Bent 1.-Y5- (SR 1005) to the Right.



3. View looking Northeast along End Bent 2. -Y5- (SR 1005) to the left.

July 2015 Richmond County, NC

### **CONTENTS** SHEET NO.

5-6

2

3421

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REFERENCE

**DESCRIPTION** TITLE SHEET LEGEND SITE PLAN PROFILE BORING LOGS

# STATE OF NORTH CAROLINA

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

# **STRUCTURE** SUBSURFACE INVESTIGATION

### COUNTY **<u>RICHMOND</u>**

PROJECT DESCRIPTION US 220 BYPASS FROM 0.3 MILES S OF SR 1140 (OLD CHARLOTTE HWY) TO 0.2 MILES SW OF SR 1304 (HARRINGTON RD) SITE DESCRIPTION CULVERT AT -L- STA. 236+33.6 ON US-73/74 OVER CARTLEDGE CREEK TRIBUTARY 1

# 542 4 Õ PROJEC

STATE N.C

NO.

1



6



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, GEOTECHNICL 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.

CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSUFFACE DATA AND MAY NOT INCESSARILY REFLECT THE ACTUAL SUBSUFFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DECREE OF RELIBULITY INHERENT IN THE SUBSUFFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THES SUBJFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THES WATER LEVELS OR SOL MOSTURE CONDITIONS MAY VARY CONSDERABLY WITH THE ACCOMPINED CANDETIES TO CANDATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CALITORED 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 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 INVESTIGATION AS HE DEEMS NECESSARY TO SATISY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO DEENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO BE INCOUNTERED AT 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

B. KEANEY

B. HOWEY

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#### HDR ENGINEERING, INC. INVESTIGATED BY **ICA, INC.**

DRAWN BY \_\_\_\_\_CGM

CHECKED BY \_**BDK** 

SUBMITTED BY HDR ENGINEERING, INC.

DATE \_\_\_\_\_\_\_\_\_



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL D	DESCRIPTION			GRADATION				ROCK DESCRIPTION		TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CON	NSOLIDATED, OR WEATHERED EAF	ARTH MATERIALS THAT CAN	WELL GRADED - INDICAT	ES A GOOD REPRESENTATION OF PARTICL	E SIZES FROM FINE TO COARSE.	HARD ROCK IS	NON-COASTAL PLAIN MAT	TERIAL THAT WOULD YIELD SPT REFU	SAL IF TESTED. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TE	ST (AASHTO T 206, ASTM D158	86). SOIL CLASSIFICATION	UNIFORMLY GRADED - IN GAP-GRADED - INDICATE	IDICATES THAT SOIL PARTICLES ARE ALL S A MIXTURE OF UNIFORM PARTICLE SIZ	APPROXIMATELY THE SAME SIZE.	SPT REFUSAL	IS PENETRATION BY A SF	PLIT SPOON SAMPLER EQUAL TO OR L	ESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC I CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO	DESCRIPTIONS GENERALLY INCL D CLASSIFICATION, AND OTHER	LUDE THE FOLLOWING: PERTINENT FACTORS SUCH		ANGULARITY OF GRAIN	<u>S</u>	REPRESENTED	BY A ZONE OF WEATHERE	IAL, THE TRANSITION BETWEEN SUI	_ AND RUCK IS UFTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULA	RITY, STRUCTURE, PLASTICITY, E	ETC. FOR EXAMPLE,	THE ANGULARIT	Y OR ROUNDNESS OF SOIL GRAINS IS DE	SIGNATED BY THE TERMS:	ROCK MATERIA	LS ARE TYPICALLY DIVID	ED AS FOLLOWS:		ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
	AASHTO CLASSIFIC	ATION	ANGULAR, SUBAN	GULAR, SUBROUNDED, OR ROUNDED.		WEATHERED	NON-	-COASTAL PLAIN MATERIAL THAT WOU	D YIELD SPT N VALUES >	A NUTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SMALE, SLATE, ETC.
GENERAL GRANILLAR MATERIALS	SILT-CLAY MATERIALS	HIIUN		MINERALOGICAL COMPOSI	TION	HOCK (WID	FINE	TO COARSE GRAIN IGNEOUS AND MET	AMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE LEVEL AT
CLASS. (≤ 35% PASSING #200)	( > 35% PASSING #200)	ORGANIC MATERIALS	MINERAL NAM	IES SUCH AS QUARTZ, FELDSPAR, MICA, TA	LC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR)	VOUL WOUL	LD YIELD SPT REFUSAL IF TESTED. F	OCK TYPE INCLUDES GRANITE,	SURFACE.
GROUP A-1 A-3 A-2	A-4 A-5 A-6 A-7 A	A-1, A-2 A-4, A-5	ARE USED IN	DESCRIPTIONS WHEN THEY ARE CONSIDE	RED OF SIGNIFICANCE.			TO COARSE GRAIN METAMORPHIC AND	NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2	-7 A-7-6	A-3 A-6, A-7			11 2 31	ROCK (NCR)		IMENTARY ROCK THAT WOULD YEILD S	PT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000			MODE	RATELY COMPRESSIBLE	LL = 31 - 50	COASTAL PLAI	N COAS	STAL PLAIN SEDIMENTS CEMENTED IN	O ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7 PASSING		SILT-	HIGHL	PERCENTAGE OF MATER		(CP)	RULK	LEFUSAL. RUCK TYPE INCLUDES LIME LL BEDS, ETC.	SIUNE, SANDSIUNE, LEMENIED	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*40 30 MX 50 MX 51 MN		SOILS CLAY PEAT			IHL			WEATHERING		DIKE - A TABULAR BODY OF ICNEOUS 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	5011.5	ORGANIC MATERIAL		OTHER MATERIAL	FRESH	ROCK FRESH, CRYSTALS BRI	IGHT.FEW JOINTS MAY SHOW SLIGHT ST	AINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING #40			LITTLE ORGANIC MATT	ER 3 - 5% 5 - 12%	LITTLE 10 - 20%		HAMMER IF CRYSTALLINE.	DINTE STAINED COME JOINTE MAY SHOW		HORIZONTAL.
LL 40 MX 41 MN 40 MX 41 M	MN 40 MX 41 MN 40 MX 41 MN	SOILS WITH	MODERATELY ORGANIC	5 - 10% 12 - 20%	SOME 20 - 35%	(V SLI.)	CRYSTALS ON A BROKEN SF	PECIMEN FACE SHINE BRIGHTLY. ROCK R	INGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 M	4N 10 MX 10 MX 11 MN 11 MN	MODERATE ORGANIC	HIGHLY UNGANIC		HIGHLY 35% AND HEOVE		OF A CRYSTALLINE NATURE	ē.		LINE OF DIF, MEASURED CLUCKWISE FROM NURTH.
GROUP INDEX Ø Ø Ø Ø 4 MX	8 MX 12 MX 16 MX NO MX	AMOUNTS OF SOILS		GROUND WHIER		SLIGHT (SLI.)	ROCK GENERALLY FRESH, JO 1 INCH. OPEN JOINTS MAY (	DINTS STAINED AND DISCOLORATION EXT CONTAIN CLAY, IN GRANITOID ROCKS SO	ENDS INTO ROCK UP TO 4E OCCASIONAL EELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY OF MAJOR GRAVEL, AND FINE SILTY OR CLAYEY	SILTY CLAYEY	MATTER	<u> </u>	WATER LEVEL IN BORE HOLE IMMEDIAT	FELY AFTER DRILLING	10LIN	CRYSTALS ARE DULL AND D	DISCOLORED, CRYSTALLINE ROCKS RING	JNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND	SUILS SUILS		<b>▼</b>	STATIC WATER LEVEL AFTER 24 H	UURS	MODERATE	SIGNIFICANT PORTIONS OF	ROCK SHOW DISCOLORATION AND WEATH	RING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR UNSUITABLE	V PW	PERCHED WATER, SATURATED ZONE, OR	WATER BEARING STRATA	(1100.)	DULL SOUND UNDER HAMMER	R BLOWS AND SHOWS SIGNIFICANT LOSS	OF STRENGTH AS COMPARED	FHRENT MHIERIAL.
	- 30 + PLOE A-7-6 SUBCROUP IS > 1	- DUN	O-M-	SPRING OR SEEP			WITH FRESH ROCK.			FORMATION (FM) - A MAPPARIE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
	Y OR DENSENESS	LL 30		MISCELLANEOUS SYMBO	IS	MODERATELY SEVERE	ALL ROCK EXCEPT QUARTZ AND DISCOLORED AND A MA	DISCOLORED OR STAINED, IN GRANITOID AJORITY SHOW KAOLINIZATION, ROCK SHO	ROCKS,ALL FELDSPARS DULL	FIELD.
	RANGE OF STANDARD	RANGE OF UNCONFINED		25/205		(MOD. SEV.)	AND CAN BE EXCAVATED WI	ITH A GEOLOGIST'S PICK. ROCK GIVES "	LUNK'SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE CONSISTENCY	PENETRATION RESISTENCE (N-VALUE)	COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	L ROADWAY EMB	ANKMENT (RE) 25/025 DIP & DIP DIRE SCRIPTION DE ROCK STRUC	CTION TURES	CEVEDE	IF TESTED, WOULD YIELD S	PI REFUSAL	CLEAD AND EVIDENT DUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE	< 4			SPT	SLOPE INDICATOR	(SEV.)	REDUCED IN STRENGTH TO	STRONG SOIL, IN GRANITOID ROCKS ALL	FELDSPARS ARE KAOLINIZED	LENS - A BODY OF SOLL OF ROCK THAT THINS OUT IN ONE OF MORE DIRECTIONS
GENERALLY LOOSE	4 TO 10		SOIL SYMBOL	VST PMT TEST BORI	ING VINSTALLATION		TO SOME EXTENT. SOME FR	RAGMENTS OF STRONG ROCK USUALLY RE	MAIN.	
MATERIAL MEDIUM DENSE	10 TO 30 30 TO 50	N/A	ARTIFICIAL FI	AUGER BORING	CONE PENETROMETER	VEBY	ALL BOCK EXCEPT DUARTZ	DISCOLORED OR STAINED, ROCK FABRIC	ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NUN-CUHESIVE) 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 SOI	L BOUNDARY - CORE BORING	SOUNDING ROD	(V SEV.)	REMAINING. SAPROLITE IS ( VESTIGES OF ORIGINAL ROO	AN EXAMPLE OF ROCK WEATHERED TO A CK FABRIC REMAIN. <i>IF TESTED.WOULD ነ</i>	DEGREE THAT ONLY MINOR IELD SPT N VALUES < 100 BPF	UF AN INTERVENING IMPERVIUUS STRATUM,
SILT-CLAY MEDIUM STIFF	4 TO 8	0.5 TO 1.0	INFERRED ROC	K LINE MW MONITORING WEL		COMPLETE	ROCK REDUCED TO SOIL. RO	OCK FABRIC NOT DISCERNIBLE, OR DISCE	RNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF BOCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL STIFF (COHESIVE) VERY STIFE	8 TO 15 15 TO 30	1 TO 2 2 TO 4					SCATTERED CONCENTRATION	NS. 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 CORE
HARD	> 30	> 4		INSTALLATION	SFT NEVALUE		ALGO AN EXAMILE.			RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE	OR GRAIN SIZE			RECOMMENDATION SYMBO	DLS	VERY HARD	CANNOT BE SCRATCHED BY	KNIEF OR SHARP PICK, BREAKING OF H	AND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10	40 60 200	270		UNCLASSIFIED EXCAVATION -	UNCLASSIFIED EXCAVATION -		SEVERAL HARD BLOWS OF 1	THE GEOLOGIST'S PICK.		SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00	0.42 0.25 0.075	0.053	SHALLOW	UNCLASSIFIED EXCAVATION -	USED IN THE TOP 3 FEET OF	HARD	CAN BE SCRATCHED BY KNI	IFE OR PICK ONLY WITH DIFFICULTY. HA	RD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL	SAND SAND	SILT CLAY		ACCEPTABLE DEGRADABLE ROCK	EMBANKMENT OR BACKFILL	MODERATELY	CAN BE SCRAICHED BY KNI	™ IFE OR PICK, GOUGES OR GROOVES TO Ø	25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
	(CSE.SD.) (F SD.)	(31.) (01.)		ABBREVIATIONS		HARD	EXCAVATED BY HARD BLOW	OF A GEOLOGIST'S PICK. HAND SPECIME	INS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 SIZE IN 12 3	0.25	0.05 0.005	AR - AUGER REFUSAL BT - BORING TERMINATER		VST - VANE SHEAR TEST WEA WEATHERED	MEDTUM	BT MUDERATE BLUWS.	ED 0 05 INCHES DEED BY EIDM DRESSUR	E OF KNIEF 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
		EDMC	CL CLAY	MOD MODERATELY	∑ - UNIT WEIGHT	HARD	CAN BE EXCAVATED IN SMA	ALL CHIPS TO PEICES 1 INCH MAXIMUM S	IZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE SCALE FIELD MI	DISTURE	ERMS	CPT - CONE PENETRATION CSE COARSE	N TEST NP - NON PLASTIC ORG ORGANIC	$\gamma_{\rm d}$ - DRY UNIT WEIGHT	005.7	POINT OF A GEOLOGIST'S P	PICK.	VCAUATED IN EDACHENTE	IU UK LESS IMAN ØJFUUT PEK BØ BLUWS. Strata orre rechverv (speci) i total i ength og strata material rechvered bivingo by
(ATTERBERG LIMITS) DESCRI	IPTION GUIDE FOR FIE	LLU MOISTURE DESCRIPTION	DMT - DILATOMETER TES	T PMT - PRESSUREMETER TES	ST SAMPLE ABBREVIATIONS		FROM CHIPS TO SEVERAL I	INCHES IN SIZE BY MODERATE BLOWS OF	A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATUR	ATED - USUALLY LIQUI	ID; VERY WET, USUALLY	e - VOID RATIO	SD SAND, SANDY	S – BULK SS – SPLIT SPOON		PIECES CAN BE BROKEN BY	FINGER PRESSURE.		STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
(SAT.	.) FROM BELOW T	THE GROUND WATER TABLE	F - FINE	SL SILT, SILTY	ST - SHELBY TUBE	SOFT	OR MORE IN THICKNESS CA	N BE BROKEN BY FINGER PRESSURE. CA	N BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
		OUTRES DRYING TO	FRAC FRACTURED, FRAC	TURES TCR - TRICONE REFUSAL	RS - RUCK RT - RECOMPACTED TRIAXIAL		FINGERNAIL.			TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE < - WET -	(W) ATTAIN OPTIMU	UM MOISTURE	FRAGS - FRAGMENTS	W - MOISTURE CONTENT	CBR - CALIFORNIA BEARING	F	RACTURE SPACINO	G E	BEDDING	BENCH MARK:
PLL PLASTIC LIMIT				ITEMENT LISED ON SUBJECT		VERY WIDE	SPACI MORE THAN	ING TERM IN FEET VERY THICKLY BE	THICKNESS DDFD 4 FFFT	
OM OPTIMUM MOISTURE - MOIST	- (M) SOLID; AT OR N	NEAR OPTIMUM MOISTURE		ADVANCING TOOLS		WIDE	3 TO 10	FEET THICKLY BEDDED	1.5 - 4 FEET	ELEVATION:FEET
SL SHRINKAGE LIMIT			X CME-45C	CLAY BITS		CLOSE	V CLUSE 110 3 0.16 TO 1	1 FOOT VERY THINLY BED	0.16 - 1.5 FEET DED 0.03 - 0.16 FEET	NOTES:
- DRY -	(D) REQUIRES ADDI	ITIONAL WATER TO		6' CONTINUOUS FLIGHT AUGER		VERY CLOS	E LESS THAN I	0.16 FEET THICKLY LAMINAT	ED 0.008 - 0.03 FEET	BORING AND CROLIND SURFACE ELEVATIONS OBTAINED EROM
		51015101L	CME-55						U (0.000 FEE)	NCDOT- PROVIDED DTM FILE
	H511U11Y		CME-550			FOR SEDIMENT	ARY ROCKS. INDURATION I	S THE HARDENING OF MATERIAL BY C	EMENTING, HEAT, PRESSURE, ETC	1
NON PLASTIC	DEX (PI) 0-5	DRY STRENGTH VERY LOW			└── <sup>─</sup> N ────	EDIACI	- F	RUBBING WITH FINGER FREES NUMEROL	IS GRAINS;	
SLIGHTLY PLASTIC	6-15	SLIGHT	VANE SHEAR TEST		HAND TOOLS:	+RIABLE	- c	GENTLE BLOW BY HAMMER DISINTEGRA	TES SAMPLE.	
MODERATELY PLASTIC HIGHLY PLASTIC 2	16-25 26 OR MORE	MEDIUM HIGH			POST HOLE DIGGER	MODERA	TELY INDURATED	GRAINS CAN BE SEPARATED FROM SAM	PLE WITH STEEL PROBE;	
			PURTABLE HUIST		HAND AUGER		E	BREAKS EASILY WHEN HIT WITH HAMM	IN.	
	002011			I INICUNE IUNGCARB.	SOUNDING ROD	INDURA	TED C	DIFFICULT TO BREAK WITH HAMMER.	WITH STEEL PRUBE:	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR MODIFIERS SUCH AS LIGHT DARY STREA	COMBINATIONS (TAN, RED, YE	ELLOW-BROWN, BLUE-GRAY).			VANE SHEAR TEST	EVTDEN		SHARP HAMMER BLOWS REQUIRED TO E	REAK SAMPLE;	
HOULDERS SOOT HE LIGHT, DHINK, STREP		onioe miteminite.		X  3- 1/4" HSA		L EXIREM	CCI INDURHIED	SAMPLE BREAKS ACROSS GRAINS.		DATE: 8-15-14









100		1	200	PROJECI	REFER	ENCE N	0.	SHEE	ET NO.
FEET			-		R-3421E	3			4
					PROF CULVER	TILE ALC T CENTE	NG RLIN	<b>IE</b>	
	_	TB RT							
<u>/</u>									
AND GRA ROOTS	AY/BI AND	ROWN, ST. GRAVEL	IFF, SILTY , MICACE	Z SANDY DUS, MOIS	CLAY (A-6 T TO WE	3) T, ALLUV.	IAL		
GE. TAN	AND	GRAY_G	REEN M	STIFF TO	HARD S	ANDY CL	AY (A	-6)	
TTY CLA	$\widetilde{Y}$ (A	–7–5) WIT ESIDUAL	H RÓCK	FRAGMEN	VTS, MICA	CEOUS, SA	ÎPRÔ.	lĭtic,	
LITE, WEA	ATHE	RED ROO	CK						
LITE, NOI	V- CI	RYSTALLI	NE ROCK	-					
_		_	_	_	_	_	_		

Ī	NBS	3454	2.1.FR4			ТІ	<b>P</b> R-342	21B	C	COUNT	Y RICH	IOMH	ND			GEC	LOGIST R. D	eLost			WBS	34542	.1.FR4			Т	<b>P</b> R-3421	B	COUNT
Ś	SITE I	S     34542.1.FR4     TIP     R-3421B       E     DESCRIPTION     US 220 Bypass from 0.3 miles south       NIC     NIC     NIC     224521								SR 11	40 to 0.2	2 mile	es SW	of SR	1304	4			GROUND WT	R (ft)	SITE	DESCR	IPTION	I US	220 By	ypass	from 0.3 m	iles south	of SR 11
E	BORII	NG NO	. L_23	452L		S	TATION	234+52			OFFSE	<b>T</b> 2	26 ft L	Т		ALIC	SNMENT -L-		0 HR.	4.2	BOR	ING NO.	L_23	700		SI	ATION 2	37+00	
0	COLL	AR EL	<b>EV.</b> 19	93.6 ft		т	OTAL DE	<b>PTH</b> 3′	1.1 ft		NORTH	HING	N/A			EAS	TING N/A		24 HR.	3.9	COLI	LAR ELE	<b>EV.</b> 19	94.2 ft		т	TAL DEP	<b>FH</b> 32.3 f	ft
ſ	RILL	RIG/HA	MMER E	FF./DA	TE IC	A0404 (	CME-45C 9	0% 08/25/	2014				DRILL	METHO	DD H	I.S. Auge	"S	HAMN	IER TYPE Autom	atic	DRILL	RIG/HAI	MMER E	FF./DA	TE IC	A0404 (	CME-45C 90%	6 08/25/201 <sup>,</sup>	4
ſ	DRILL	ER N	1. Morg	an		S		<b>TE</b> 03/2	22/15		COMP	. DAT	<b>E</b> 03/	25/15	5	SUR	FACE WATER	DEPTH N	/A		DRIL	LER M	. Morga	an		ST		E 03/23/*	15
E	LEV	DRIVE	DEPTH	BLC	w co	UNT		BLO	WS PE	R FOOT			SAMP.				SOIL AND	) ROCK DES	CRIPTION		ELEV	DRIVE	DEPTH	BLC	ow col	JNT		BLOWS	PER FOOT
	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50		75	100	NO.	Имс	) G	ELEV.	(ft)		DEF	PTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25	50
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			╞───				· · · ŀ		••		· · ·					- 193.6 -	GR	OUND SURF.	ACE	0.0		-	-						
	100		‡					· · · ·	· ·	· · · · ·						-	Red and tan, (A-6)(7) v	fine to coarse with little silt. r	e sandy CLAY micaceous		100	-						· · · ·	
	190	-	±								+					-	()(.)				190	189.1	5.1		2	4		<u> </u>	<u> </u>
	-	100.2	+ <sup>0.4</sup>	3	9	5	<b>I</b> .   ∳1,	4		· · · · ·				м								-	-		3	4	•7 · ·		
	185	-	‡					· · ·								L					185	-	-				<u> </u>	· · · ·	
		183.2	10.4		5	7	::!:	·   · · ·   · ·								<u> </u>		RESIDUAL		<u>10.0</u>			10.1	5	5	6	. <b>\</b> . <b>\</b> 11 .		
			ŧ	4	5	<i>'</i>	12	·   · · ·		· · · ·				M		ŀ	Orange, tan a	and red, silty	CLAY (A-7-6),		100	-					$\begin{vmatrix} \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot &$		
F	180	-	±								+					$\vdash$	500		2003		180	179.1	15.1	10		10		<u> </u>	+
	-	1/8.2	15.4 1	5	6	15		21						м		Ł						-		12	14	12		•26 · · ·	
	175	_	£					<u>i</u>	<u>-:</u>						N	<u>175.7</u>	Orange tan a	and black silty	V CI AY (A-7-5)	<u> </u>	175	-	_					· · · · · · · · ·	
		173.2	20.4	47	00	04		·   · ·	: [							Ł	with rock frag	ments, micac	eous, saprolitic			174.1	20.1	29	38	36			
			ŧ		20	24		·   · ·	. <b>•</b> 44					M		170.7				22.9		-	_						
F	170	-	+						- <u> </u> - -							E	Orange, tan, b	lack, and olive	e, coarse sandy		170	169.1	25.1					+	
	-	168.2	<u>25.4</u>	8	11	31								м		_	mic	aceous, sapr	olitic			-		14	24	28			<b>6</b> 52 · · ·
	165		Ŧ						.ī.							Ē.					165	-							/
			ŧ		26	74/0.2			·i·							162.9				30.7		164.1	30.1	8	16	28		::: <b>/</b>	 14
			ŧ			60/0.1					<u>+</u> 100	)/0.8 )/0.1			511120	162.6	/ WE	ATHERED RO PHYLLITE	оск 🎵	<u>31.0</u> 31.1		162.0	32.2	60/0.1					
		-	ŧ													F	NON-C		EROCK			-	_						
			Ŧ													E	Boring Te	erminated with	Standard			-							
			Ŧ													E	Penetration Te ft IN NON	st Refusal at I-CRYSTALLI	Elevation 162.5 NE ROCK			-							
		-	Ŧ													F		(PHYLLITE)				-	F						
			Ŧ													F	1) A	Notes Juger refusal a	at 31'			-	F						
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WBS	34542	.1.FR4			Т	<b>P</b> R-	3421E	3	C	OUNT	YR	ІСНМС	ND			GEOLOGIST R. DeLost	
SITE	DESCR	IPTION	US	220 By	/pass	from (	).3 mi	les sou	th of	SR 11	40 to	0.2 mi	les SW o	of SR	1304		GROUND WTR (ft)
BOR	NG NO.	L_23	764R		S	TATIO	<b>N</b> 23	37+64			OFF	SET	219 ft R	Г		ALIGNMENT -L-	<b>0 HR.</b> 4.2
COLL	AR ELE	<b>V.</b> 19	6.9 ft		Т	OTAL	DEPT	<b>H</b> 56.1	1 ft		NO	RTHING	G N/A			EASTING N/A	<b>24 HR.</b> 4.0
DRILL	RIG/HAN	MMER E	FF./DA	TE IC	40404 (	CME-48	5C 90%	08/25/20	)14				DRILL N	<b>NETHC</b>	DDH.	S. Augers HAMME	R TYPE Automatic
DRIL	LER M	. Morga	an		S	TART	DATE	03/25	5/15		CO	MP. DA	TE 03/	25/15	<b>7</b>	SURFACE WATER DEPTH N/A	Ą
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	0W COU 0.5ft	JNT 0.5ft	0	2	BLOW	S PEI 50	R FOOT	75	100	SAMP. NO.	мо	O I G	SOIL AND ROCK DESC ELEV. (ft)	RIPTION DEPTH (ft)
200		-														-	
195	-	- - - -				· ·			•							196.9 GROUND SURFA ALLUVIAL Tan and orange, silty sandy C	CE 0.0
190	- - - 191.6 -	- - <u>5.3</u> -	5	5	6		• • • • • • • • •	· · · · · · · · · · ·		· · · · ·		· · · · · · · · ·		<b>Т</b> м		<u>191.9</u> RESIDUAL	5 5.0
	- - 186.6 -	- 10.3	16	19	20							· · · · · ·				CLAY (A-6) with rock fragmen saprolitic	ts, micaceous,
185	-	-	10	10	20		· · ·	•••3	8 <sup>*</sup>	· · · · ·		· · · · · · ·		м		-	
180	181.6 -  	- 15.3 - - -	14	17	19		· · ·	• • • • • • • • • • • • • • • • • • •		· · · · ·		· · · ·		м		- - -	
175	- 176.6 - -	- 20.3 -	16	21	17		· · ·		В	· · · · ·		· · · · · · · ·		w			
170	- 171.6 - -	- - 25.3 - -	13	18	21		· · ·	· · · · ·	9	· · · · ·		· · · ·		м			27.8
165	- - 166.6 -	- - <u>30.3</u> -	18	24	26			· · · ·		0		· · · · · · · ·		м		Gray, tan, orange and black (A-7-5) with rock fragments	s, silty CLAY s, saprolitic
160	- - - 161.6 -	- - 35.3 -	5	7	9		• • • • • •	· · / / · · ·	• • •	· · · · ·		· · · · · · · · · · · · · · · · · · ·		м			
155	- - 156.6 -	- - - 40.3 -	8	13	17			· · · · ·		· · · · ·		· · · ·		м			
100	- - 151.6 -	- - - 45.3	15	10	<b>E</b> 4				· · ·			· · · ·				Olive, tan and white, silty co CLAY (A-6) with rock fragmen saprolitic	parse sandy ts, micaceous,
150	-	-	13		J <del>4</del>		· · ·		- - -	· · · · ·				M		WEATHERED RO	46.6 CK
145	-	- - -		47	53/0.3			· · · ·	• • •	· · · · ·		100/0.8				_	
11671	-	-			100/0.5		•••	· · ·	:	· · · ·		-100/0.5					56.0 <b>BOCK 1</b> 56.1
					60/0.1							60/0.1				NON-CRYSTALLINE PHYLLITE Boring Terminated with S Penetration Test Refusal at E ft IN NON-CRYSTALLIN (PHYLLITE)	KUCK

# **CONTENTS**

2

-3

SHEET NO. 4-5 6-9

R

3421

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REFERENCE

**DESCRIPTION** TITLE SHEET LEGEND SITE PLAN PROFILE BORING LOGS

# STATE OF NORTH CAROLINA

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

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY \_\_RICHMOND

PROJECT DESCRIPTION US 220 BYPASS FROM 0.3 MILES S OF SR 1140 (OLD CHARLOTTE HWY) TO 0.2 MILES SW OF SR 1304 (HARRINGTON RD) SITE DESCRIPTION BRIDGE NO. 243 OVER US 220 BYPASS (-L-) ON SR 1140 (-Y3 - STA. 140 + 97.00)**RETAINING WALLS #1 AND #2** 

STATE PROJECT REFERENCE NO. STATE NO. SHEETS 9 N.C R-3421B 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 SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICL ENCINEERING UNIT AT (1991 707-6850. THE SUBSIFICATE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSUFFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSUFFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DECREE OF RELIBULITY INHERENT IN THE SUBSUFFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THES USUFFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THES WATER LEVELS OR SOL MOSTUFFE CONDITIONS MAY VARY CONSDERABLY WITH THE ACCOMPING OL CANDITIONS INCLATE SOL MOSTUFFE CONDITIONS MAY WARY CONSDERABLY WITH THE ACCOMPING OL CANDITIONS 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 WARANT 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 SATISY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO DEENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO BE INCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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PERSONNEL

B. KEANEY

B. HOWEY

C. JONES

C. MYERS

M. JOHNSON

M. COOGAN

D. TIGNOR

HDR ENGINEERING, INC. INVESTIGATED BY F & R, INC., MAD

DRAWN BY CGM /D. CHAPMAN

CHECKED BY \_\_BDK

SUBMITTED BY HDR ENGINEERING, INC.



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

	SOIL D	ESCRIPTION			GRADATION		Т	ROCK DE	SCRIPTION
SOIL IS CONSIDERED	UNCONSOLIDATED, SEMI-CONS	SOLIDATED, OR WEATHERED E	ARTH MATERIALS THAT CAN	WELL GRADED - INDICA	TES A GOOD REPRESENTATION OF PARTIC	LE SIZES FROM FINE TO COARSE.	HARD ROCK IS N	NON-COASTAL PLAIN MATERIAL THAT	WOULD YIELD SPT REFUSAL IF TESTE
ACCORDING TO THE	STANDARD PENETRATION TES	ST (AASHTO T 206, ASTM DI	586), SOIL CLASSIFICATION	UNIFORMLY GRADED - 1 GAP-GRADED - INDICAT	INDICATES THAT SOIL PARTICLES ARE AL ES A MIXTURE OF UNIFORM PARTICLE SU	L APPROXIMATELY THE SAME SIZE. ZES OF TWO OR MORE SIZES.	SPT REFUSAL IS	S PENETRATION BY A SPLIT SPOON S	AMPLER EQUAL TO OR LESS THAN 0.1
IS BASED ON TH CONSISTENCY, COLOR,	HE AASHTO SYSTEM. BASIC D TEXTURE.MOISTURE.AASHTO	ESCRIPTIONS GENERALLY IN CLASSIFICATION. AND OTHER	ICLUDE THE FOLLOWING: R PERTINENT FACTORS SUCH			NS	REPRESENTED B	SY A ZONE OF WEATHERED ROCK.	ANSITION BETWEEN SUIL AND RUCK
AS MINERALOO	GICAL COMPOSITION, ANGULAR	ITY, STRUCTURE, PLASTICITY	, ETC. FOR EXAMPLE,	THE ANGULARI	TY OR ROUNDNESS OF SOIL GRAINS IS DE	ESIGNATED BY THE TERMS:	- ROCK MATERIALS	S ARE TYPICALLY DIVIDED AS FOLLO	wS:
	ΩTI LEGEND ΔΝD (	ABEDUED FINE SAND LAFERS, AASHTO CI ASSIFI	τατιοn	ANGULAR, SUBA	NGULAR, SUBROUNDED, OR ROUNDED.		WEATHERED BOCK (WR)	NON-COASTAL PLA	NN MATERIAL THAT WOULD YIELD SPT
GENERAL	GRANULAR MATERIALS	SILT-CLAY MATERIALS			MINERALOGICAL COMPOSI	ITION		FINE TO COARSE	GRAIN IGNEOUS AND METAMORPHIC RO
CLASS. (	≤ 35% PASSING #200)	( > 35% PASSING #200)	ORGANIC MATERIALS	MINERAL NA	MES SUCH AS QUARTZ, FELDSPAR, MICA, T	ALC, KAOLIN, ETC.	ROCK (CR)	WOULD YIELD SPT	REFUSAL IF TESTED. ROCK TYPE IN
GROUP A-1	A-3 A-2	A-4 A-5 A-6 A-7	A-1, A-2 A-4, A-5	ARE USED .	COMPDECCIPIIUNS WHEN THEY ARE CONSID	ERED OF SIGNIFICANCE.		FINE TO COARSE	GRAIN METAMORPHIC AND NON-COAST4
ULASS: A-1-a A-1-b	A-2-4 A-2-5 A-2-6 A-2-	7 A-7-6	A-3 A-6, A-7	SU 1		11 < 31	- ROCK (NCR)	ROCK TYPE INCLU	CK THAT WOULD YEILD SPT REFUSAL
SYMBOL 000000000				MOD	ERATELY COMPRESSIBLE	LL = 31 - 50	COASTAL PLAIN	COASTAL PLAIN S	EDIMENTS CEMENTED INTO ROCK, BUT
% PASSING			CDANULAD SILT-	HIGH	PEDCENTACE OF MATER		- (CP)	SPT REFUSAL. ROL	CK TIPE INCLUDES LIMESTONE, SANDS
*40 30 MX 50 MX	51 MN		SOILS CLAY PEAT					WEAT	HERING
*200 15 MX 25 MX	10 MX 35 MX 35 MX 35 MX 35 M	X 36 MN 36 MN 36 MN 36 MN	50125	ORGANIC MATERIA		OTHER MATERIAL	FRESH RC	JCK FRESH, CRYSTALS BRIGHT, FEW JOIN	NTS MAY SHOW SLIGHT STAINING. ROCK
MATERIAL PASSING #40				LITTLE ORGANIC MAT	TTER 3 - 5% 5 - 12%	LITTLE 10 - 20%		AMMER IF CRISIALLINE.	COME TOINTS MAY SHOW THIN CLAY C
LL –	- 40 MX 41 MN 40 MX 41 M	N 40 MX 41 MN 40 MX 41 MN	SOILS WITH LITTLE OR	MODERATELY ORGANIC	C 5 - 10% 12 - 20%	SOME 20 - 35%	(V SLI.) CF	RYSTALS ON A BROKEN SPECIMEN FACE	SHINE BRIGHTLY, ROCK RINGS UNDER H
PI 6 MX	NP 10 MX 10 MX 11 MN 11 Mr	N 10 MX 10 MX 11 MN 11 MN	MODERATE ORGAN	c			0F	- A CRYSTALLINE NATURE.	
GRUUP INDEX Ø	0 0 4 MX	8 MX 12 MX 16 MX NU MX	ORGANIC SOILS			TELV AFTER ORIGINA	SLIGHT RC (SLI.) 1	JCK GENERALLY FRESH, JOINTS STAINED INCH. OPEN JOINTS MAY CONTAIN CLAY.	) AND DISCOLORATION EXTENDS INTO RO . IN GRANITOID ROCKS SOME OCCASIONA
OF MAJOR GRAVEL, AND	FINE SILTY OR CLAYEY	SILTY CLAYEY	MATTER		WATER LEVEL IN BURE HULE IMMEDIA	ATELY AFTER DRILLING	CF	RYSTALS ARE DULL AND DISCOLORED, CO	RYSTALLINE ROCKS RING UNDER HAMMEP
MATERIALS SAND	SHIND GRAVEL AND SHIND	50125 50125			STATIC WATER LEVEL AFTER 24 T	HOURS	MODERATE SI	GNIFICANT PORTIONS OF ROCK SHOW DI	ISCOLORATION AND WEATHERING EFFECTS
GEN, RATING	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR UNSUITA	BLE VPW	PERCHED WATER, SATURATED ZONE, OR	WATER BEARING STRATA	DL	JLL SOUND UNDER HAMMER BLOWS AND	SHOWS SIGNIFICANT LOSS OF STRENGTH
HS SUBURHUE	PI OF A-7-5 SURCEOUP IS < 11	30 + PL OF A-7-6 SUBCROUP 15 1			SPRING OR SEEP		WI	ITH FRESH ROCK.	
		Y OR DENSENESS			MISCELLANEOUS SYMBO	)LS	SEVERE AN	L ROCK EXCEPT QUARTZ DISCOLORED O ND DISCOLORED AND A MAJORITY SHOW	DR STAINED. IN GRANITOID ROCKS,ALL F KAOLINIZATION. ROCK SHOWS SEVERE L
	COMPACINESS OR	RANGE OF STANDARD	RANGE OF UNCONFINED	m	25/025		(MOD. SEV.) AN	VD CAN BE EXCAVATED WITH A GEOLOGI	IST'S PICK, ROCK GIVES "CLUNK" SOUND
PRIMARY SOIL TYPE	CONSISTENCY	PENETRATION RESISTENCE (N-VALUE)	COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	H L ROADWAY EM	BANKMENT (RE) 25,825 DIP & DIP DIR ESCRIPTION FROCK STRU	ECTION CTURES	SEVERE AL		DR STAINED ROCK FARRIC CLEAR AND F
CENEDALLY.	VERY LOOSE	< 4			SPT OUT TECT DO	SLOPE INDICATOR	(SEV.) RE	EDUCED IN STRENGTH TO STRONG SOIL.	IN GRANITOID ROCKS ALL FELDSPARS A
GRANULAR	LOOSE	4 TO 10	N/A	SULL STMBUL		INSTALLATION	TC IF	) SOME EXTENT. SOME FRAGMENTS OF S TESTED, WOULD YTELD SPT N VALUES	STRONG ROCK USUALLY REMAIN.
	DENSE	30 TO 50	NZ H	ARTIFICIAL F	FILL (AF) OTHER AUGER BORING	CONE PENETROMETER	VERY AL	LL ROCK EXCEPT QUARTZ DISCOLORED (	DR STAINED. ROCK FABRIC ELEMENTS AR
(NUN-COHESIVE)	VERY DENSE	> 50			<u> </u>		SEVERE BL	JT MASS IS EFFECTIVELY REDUCED TO	SOIL STATUS, WITH ONLY FRAGMENTS OF
	VERY SOFT	< 2 2 TD 4	< 0.25 0.25 TO 0.5	- INFERRED SC	IL BOUNDARY - CORE BORING	SOUNDING ROD	V SEV.) RE	ESTIGES OF ORIGINAL ROCK FABRIC REN	MAIN. <u>IF TESTED, WOULD YIELD SPT N V</u>
SILT-CLAY	MEDIUM STIFF	4 TO 8	0.5 TO 1.0	INFERRED RO	CK LINE <sup>MW</sup> O MONITORING WE	ELL - TEST BORING WITH CORE	COMPLETE RO	JCK REDUCED TO SOIL. ROCK FABRIC NO	DT DISCERNIBLE, OR DISCERNIBLE ONLY
(COHESIVE)	VERY STIFF	8 TU 15 15 TO 30	2 TO 4	TTT ALLUVIAL SC	IL BOUNDARY A PIEZOMETER	SPT N-VALUE	SC Al	CATTERED CONCENTRATIONS. QUARTZ MA	Y BE PRESENT AS DIKES OR STRINGERS
	HARD	> 30	> 4					ROCK F	IARDNESS
	IEXIURE I	JR GRAIN SIZE			RECUMMENDATION SYMB	ULS	VERY HARD CF	ANNOT BE SCRATCHED BY KNIFE OR SHE	ARP PICK. BREAKING OF HAND SPECIMEN
U.S. STD. SIEVE SIZE	4 10	40 60 200	270	EXCAVATION	UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	ACCEPTABLE, BUT NOT TO BE	SE	EVERAL HARD BLOWS OF THE GEOLOGIST	T'S PICK.
	4.78 2.00		0.055	SHALLOW	UNCLASSIFIED EXCAVATION -	USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKETLI	HARD CA	AN BE SCRATCHED BY KNIFE OR PICK OF D DETACH HAND SPECIMEN.	NLY WITH DIFFICULTY. HARD HAMMER B
BOULDER COE (BLDR.) (C	BBLE GRAVEL	SAND SAND	SILT CLAY (SL.) (CL.)	UNDERCUT	ACCEPTABLE DEGRADABLE ROCK		MODERATELY CF	AN BE SCRATCHED BY KNIFE OR PICK. (	GOUGES OR GROOVES TO 0.25 INCHES DE
		(CSE. SD.) (F SD.)	,		ABBREVIATIONS		HARD EX	CAVATED BY HARD BLOW OF A GEOLOG	IST'S PICK. HAND SPECIMENS CAN BE D
GRAIN MM 305 SIZE IN. 12	75 2.0 3	0.25	0.05 0.005	BT - BORING TERMINATE	ED MICA MICACEOUS	WEA WEATHERED	MEDIUM Cr	AN BE GROOVED OR GOUGED 0.05 INCHE	S DEEP BY FIRM PRESSURE OF KNIFE C
c	OTI MOTSTURE - (	OBBELATION OF	TERMS	CL CLAY	MOD MODERATELY	2 - UNIT WEIGHT	HARD CA	AN BE EXCAVATED IN SMALL CHIPS TO	PEICES 1 INCH MAXIMUM SIZE BY HARD
SOIL MOISTURE	SCALE FIELD MO			CSE COARSE	ORG ORGANIC	Zd- DRY UNIT WEIGHT		AN RE GROVED OR COUGED READILY BY	KNIEF OR PICK CAN BE EXCAVATED IN
(ATTERBERG LIN	MITS) DESCRIF	PTION GUIDE FOR F	IELD MUISTURE DESCRIPTIO	DMT - DILATOMETER TE	ST PMT - PRESSUREMETER TE	EST SAMPLE ABBREVIATIONS	FF	ROM CHIPS TO SEVERAL INCHES IN SIZE	E BY MODERATE BLOWS OF A PICK POIN
	- SATURA	TED - USUALLY LIO	UID; VERY WET, USUALLY	e - VOID RATIO	SD SAPRULITIC	S - BULK SS - SPLIT SPOON	PI	ECES CAN BE BROKEN BY FINGER PRES	SURE.
	(SAT.)	FROM BELOW	THE GROUND WATER TABLE	F - FINE	SL SILT, SILTY	ST - SHELBY TUBE	SOFT OF	AN BE CARVED WITH KNIFE. CAN BE EXU R MORE IN THICKNESS CAN BE BROKEN	BY FINGER PRESSURE. CAN BE SCRATCH
PLASTIC		SEMISOL ID: B	FOUTRES DRYING TO	FRAC FRACTURED, FRA	CTURES TCR - TRICONE REFUSAL	RS - RUCK RT - RECOMPACTED TRIAXIAL	FI	INGERNAIL.	
RANGE <	- WET -	(W) ATTAIN OPTI	MUM MOISTURE	FRAGS FRAGMENTS	W - MOISTURE CONTENT	CBR - CALIFORNIA BEARING	FR	ACTURE SPACING	BEDDING
PLL_PLASTIC	C LIMII			FC	UITEMENT LISED ON SUBJECT		VERY WIDE	SPACING MORE THAN 10 FEET	VERY THICKLY BEDDED
ОМ ОРТІМИ	M MOISTURE - MOIST	- (M) SOLID; AT OR	NEAR OPTIMUM MOISTURE	DRILL UNITS:	ADVANCING TOOLS:		- WIDE	3 TO 10 FEET	THICKLY BEDDED 1
SL SHRINK	AGE LIMIT			X CME-45C	CLAY BITS		CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED 0.0
	- DRY - (	D) REQUIRES AD	DITIONAL WATER TO		6 CONTINUOUS FLIGHT AUGER		VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED 0.00
				CME-55	8" HOLLOW AUGERS			ΙΝΠΙ	RATION
				СМЕ-550	HARD FACED FINGER BITS		FOR SEDIMENTA	RY ROCKS, INDURATION IS THE HARDE	NING OF MATERIAL BY CEMENTING, HE
NON PLASTIC	PLASTI	0-5	VERY LOW		TUNGCARBIDE INSERTS		- FRIARI F	RUBBING WITH	FINGER FREES NUMEROUS GRAINS;
SLIGHTLY PLAS	STIC	6-15	SLIGHT	VANE SHEAR TEST		HAND TOOLS:	ININGEL	GENTLE BLOW	BY HAMMER DISINTEGRATES SAMPLE.
HIGHLY PLASTI	C 26	S OR MORE	HIGH			POST HOLE DIGGER	MODERATI	ELY INDURATED GRAINS CAN B	E SEPARATED FROM SAMPLE WITH ST
	(	COLOR				HAND AUGER		GRAINS ARE D	IFFICULT TO SEPARATE WITH STEEL
							INDURATE	D DIFFICULT TO	BREAK WITH HAMMER.
MODIFIERS SU	INCLUDE CULUR UK CULUR JCH AS LIGHT, DARK, STREAK	COMBINATIONS (TAN, RED, )	SCRIBE APPEARANCE.				EXTREME	LY INDURATED SHARP HAMMER	R BLOWS REQUIRED TO BREAK SAMPLE
				I I I				SAMPLE BREAK	KS AURUSS URAINS,



	TERMS AND DEFINITIONS
D. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS OFTEN	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
N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
	ARTESIAN - GRUUND 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
CLUDES GRANITE,	SURFACE.
I PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
F TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
MAY NOT YIELD	OF SLOFE.
TONE, CEMENTED	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
	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.
ATINGS IF OPEN, MMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
CK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
BLUWS.	FISSILE - A PRUPERTY OF SPLITTING ALONG CLUSELY SPACED PARALLEL PLANES.
Y. ROCK HAS	PARENT MATERIAL.
AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
ELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
DSS OF STRENGTH	
HEN STRUCK.	JUINI - FRACTURE IN RUCK ALUNG WHICH NU APPRECIABLE MUVEMENT HAS UCURRED.
VIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OF PROJECTION OF ROLK WHOSE INICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
RE 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
E DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
STRONG ROCK	<u>PERCHED WATER</u> - WATER MAINTAINED ABUVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
ALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
N SMALL AND	ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
SHERULITE IS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
OWS REQUIRED	<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 INTRUGED ROCKS.
EP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
TACHED	OR SLIP PLANE.
R PICK POINT. BLOWS OF THE	STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPI)- 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.
FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
, SHALL, HAIN	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
PIECES 1 INCH	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.
ED READILY BY	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	RENCH MARK
THICKNESS	
4 FEET 5 - 4 FEET	ELEVATION:FEET
6 - 1.5 FEET	NOTES:
8 - 0.03 FEET	
0.008 FEET	BORING AND GROUND SURFACE ELEVATIONS OBTAINED FROM NCDOT- PROVIDED DTM FILE
AT. PRESSURE ETC	
, / NEODONE, ETC.	24 HR GROUNDWATER NUT RECORDED ON MUD RUTARY BURINGS
EEL PROBE;	
YKUBE:	
;	
•	DATE: 8-15-14







WBS         34542.1.FR4         TIP         R-3421B         COUNT	TY RICHMOND	GEOLOGIST M. Johnson	WBS 34542.1.FR4	TIP R-3421B COUNTY
SITE DESCRIPTION US 220 Bypass from 0.3 miles south of SR	140 to 0.2 miles SW of SR 1304	GROUND WTR (ft)	SITE DESCRIPTION US 220 Byp	bass from 0.3 miles south of SR 114
BORING NO. EB1-W1 STATION 22+26	OFFSET 15 ft RT	ALIGNMENT -Y3- 0 HRNot recorded	BORING NO. EB1-W1	STATION 22+26
COLLAR ELEV. 379.2 ft TOTAL DEPTH 89.4 ft	NORTHING 441,534	<b>EASTING</b> 1,745,593 <b>24 HR.</b> FIAD	COLLAR ELEV. 379.2 ft	TOTAL DEPTH 89.4 ft
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 80% 10/14/2014			DRILL RIG/HAMMER EFF./DATE MID	1904 CME-45B 80% 10/14/2014
		SURFACE WATER DEPTH N/A		JT BLOWS PER FOOT
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	75 100 NO. MOL G	SOIL AND ROCK DESCRIPTION	(ft) ELEV ELEV (ft) 0.5ft 0.5ft 0	0.5ft 0 25 50 7
380			300	Match Line
		- 379.2 GROUND SURFACE 0.0		24
3757 - 35		<u>_377.2</u> <u>Brown, silty fine to coarse SAND (A-2-5)</u> <u>2.0</u> Orange and brown, clayey fine to coarse	2957 - 835	
		SAND (A-2-6)(1) with gravel		35
		<u>372.2</u> <u>7.0</u>		· · · · · · · · · · · · · · · · · · ·
370 370.7 8.5	· · · · ·	SAND (A-2-6/7) with gravel	290 290.7 - 88.5 37 100/0.4	
		-		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	· · · · ·	-		
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $				
		- 357.2 22.0		
355 355.7 23.5 15 29 42		Pink, gray, yellow and tan, fine to coarse sandy CLAY (A-6)(3)	]    ‡	
		-		
350 7 28 5				
	SS-7 M	_		
345 345.7 - 33.5	· · · · ·	-		
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	· · · · · ·     w	-		
		- 332.2 47.0		
330 330.7 48.5 9 0 11		Gray and orange, clayey fine to coarse SAND (A-2-7)(4)	]    ‡	
	· · · · ·	-		
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		-		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	· · · · · ·	-		
		- 317.2 62.0		
$[D_{215}]$ $[315.7 + 63.5]$ $[315.7 + 63.5]$ $[315.7 + 63.5]$		Orange, fine to coarse sandy CLAY (A-6)		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	· · · · · · · · · · · · · · · · · · ·	-		
			4	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Gray, tan, orange, and green, silty fine to coarse SAND (A-2-4)(0) trace mica		
$\begin{bmatrix} 3 \\ 0 \end{bmatrix} = 305 + 73.5 + 7 + 12 + 14 + 1 + 14 + 1 + 14 + 14 + 14 +$		-		
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Ľ	Y RICH	HMO	ND			GEOLOGI	ST M. Johns	on		
14	40 to 0.2	2 mil	es SW (	of SR	1304				GROUN	D WTR (ft)
	OFFSE	ET ·	15 ft RT			ALIGNMEN	<b>IT</b> -Y3-		0 HR:No	ot recorded
	NORTH		<b>6</b> 441,5	534		EASTING	1,745,593		24 HR.	FIAD
	l			NETHO	D M	ud Rotarv		НАММ	ER TYPE	Automatic
1	COMP	DA	TE 03/	23/15		SURFACE		TH N/	A	
Т			SAMP.		L					
	75	100	NO.		0		SOIL AND ROO	CK DESC	RIPTION	
					Ū					
-	Τ		<u>SS-17</u>	⊢ м –	-					
						_ Gra	ay, tan, orange,	and gree	n, silty fine	to
•						-	(con	tinued)		
65	<u> </u>			M		-				
•					an				<u> </u>	<u> </u>
•	,	``		М			Gray,	GABBRO	)	89.4
	100	0/0.4		<u> </u>		- Bor	ing Terminated	at Elevati	ion 289.8 f	t IN
						-			(טרוטטרוע)	
						-	N 1) 0.1	iotes ' Topsoil		
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WPC	31510				<b>т</b> і	P R-3/21P	COUNT						
VVD3	04042				- 242	P R-3421B			ND			GEOLOGIST C. Jones	
SILE	DESCR			ige No	0. 243 (		5 220	055057	0 (1 L T				
BOR	ING NO.	EB1-	A		S	<b>FATION</b> 23+19		OFFSET 4	9 ft L I			ALIGNMENT -Y3-	<b>0 HR.</b> 31.5
COLI	LAR ELE	<b>V.</b> 37	′5.8 ft		то	OTAL DEPTH 70.0	ft	NORTHING	441,6	07		<b>EASTING</b> 1,745,655	<b>24 HR.</b> 30.0
DRILL	RIG/HAI	MMER E	FF./DA	TE F8	&R3495	CME-55 73% 02/15/2	)15		DRILL N	IETHO	<b>)</b> H.S	S. Augers HAN	MER TYPE Automatic
DRIL	LER D	. Tigno	r		S	TART DATE 03/09	/14	COMP. DAT	<b>E</b> 03/0	09/14		SURFACE WATER DEPTH	N/A
ELEV	DRIVE ELEV	DEPTH	BLC	W CO	UNT	BLOW	S PER FOOT		SAMP.	▼∕		SOIL AND ROCK DE	SCRIPTION
(π)	(ft)	(π)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	/моі	G	ELEV. (ft)	DEPTH (ft)
380		_										_	
	-	_									E		
	275 0										F	375.8 GROUND SUR	FACE 0.0
375		- 0.0	1	2	4	6				М		- ROADWAY EMBA	
	372.3	35					÷					<u></u>	d gravel /
270	-	-	24	40	60/0.4		·   · · · 7 ·   · · · ·	· 100/0.9		D		White and red, fine to coar	
370	-	_											[A-1-b)7.0
	367.3	8.5		11	15	· · · ·   · · ·					$\sim$	Tan and orange, clayey fi	ne SAND (A-2-7)
365	-	_	9		15	•26				М		_	
	-	-										363.8	$\frac{12.0}{12.0}$
	362.3	13.5	49	100/0.4	1					D	S	white and red, line said	
360	-	-						· 100/0.4		2	N	-	47.0
	3573	-										White, partially cemente	d fine to coarse
055		-	60/0.1	1			·   · · · · ·	· · · 60/0.1		D		SAND (A-2-	4),
355	_	-										- 353.8	22.0
	352.3	23.5			_						$\sim$	Tan, orange, white and gr	ay, fine to coarse
350	-	-	0	0			•   • • • •			М			(27)
	-	-										-	
	347.3	28.5	4	5	7					$\bullet$	$\sim$		
345	-	-										-	
	342.3	33.5					·   · · · · ·						
340	-	-	10	14	25					W	$\mathbb{N}$		
010	-	-				- <i> </i> -						-	
	337.3	38.5	9	12	20		·   · · · · ·			м	$\mathbb{N}$		
335	-	_								IVI		_	
	-	-									$\rightarrow$	_333.8 Tan and orange, fine to coa	arse SAND (A-2-4)
	<u></u>		4	5	6					w		with little clay, some	clay nodules
330	_	_						+			Ŀ	-	
16/15	327.3	48.5					.						
5 - 325	-	-	'	6	6	12.				Sat.	F		
า	-	F									F	=	
	322.3	53.5	4	4	4					Sat.	F	little querta grove	l at 52 5'
z <u>320</u>	-	-										-	Tal 55.5
	317.3	58.5					· · · · · ·						
	-	-	7	8	10		· · · · · · ·			Sat.			
		-				<u>\</u>		<u> </u>					<u>62.0</u>
21B	312.3	63.5	11	11	12	$    \cdot \cdot \cdot \cdot \cdot \cdot     \cdot \cdot \cdot \cdot$	·   · · · · ·		QQ F4	270/	X	RESIDUA Gray ,orange and white, fin	L e to coarse sandy
* 310	-	-				••••••••••••••••••••••••••••••••••••••	·   · · · ·		33-51	∠1%	Y	- CLAY (A-7-6)(23) with sor rock fragments. s	ne silt and quartz
BLE	207.2	- 60 F				::::\\:::	·   · · · ·				Y		
non			10	13	15		.   .   . <u>.</u> .	<u> </u>		м	Y	305.8	70.0
BORE	-	- - -									F	- Boring Terminated at Elev CLAY (RESID	vation 305.8 ft IN UAL)
	-	-									F	Notes 1) 0.2' Tops	oil

WBS	<b>3</b> 4542	2.1.FR4			Т	<b>P</b> R-3421B	COUNT	RICHMC	OND			GEOLOGIST C. Jones		WB	<b>S</b> 34542	2.1.FR4			TIF	• R-3421E	3	COUNTY
SITE	DESCR		l Brid	ge No	. 243	on SR 1140 over U	5 220					-	GROUND WTR (fi	) SITE	E DESCR	IPTION	l Bridg	je No.	243 o	n SR 1140	over US 2	.20
BOR	ING NO	. EB2-	A		S	<b>TATION</b> 25+47		OFFSET	15 ft LT			ALIGNMENT -Y3-	0 HR. 35.0	BOF	ring no.	EB2-	A		ST	ATION 25	j+47	
COL	LAR EL	<b>EV.</b> 38	81.5 ft		<b>T</b>	OTAL DEPTH 94.4	ft	NORTHING	<b>G</b> 441,7	721		EASTING 1,745,856	<b>24 HR.</b> 32.0	COL	LAR ELE	<b>EV.</b> 38	81.5 ft		то	TAL DEPT	H 94.4 ft	
DRIL	L RIG/HA	MMER E	FF./DA	TE F8	R3495	CME-55 73% 02/15/2	)15	- <u>i</u>	DRILL	METHO	р н	I.S. Augers	HAMMER TYPE Automatic	DRIL	L RIG/HAI	MMER E	FF./DATI	E F&F	R3495	CME-55 73%	02/15/2015	
DRIL	LER D	). Tigno	r		S	TART DATE 03/04	/15	COMP. DA	<b>TE</b> 03/	/05/15		SURFACE WATER DEPT	TH N/A	DRI	LLER D	. Tigno	r		ST	ART DATE	03/04/15	;
ELEV	DRIVE	DEPTH	BLC	W COL		BLOW	S PER FOO	T 75 100	SAMP.	·		SOIL AND ROCH	K DESCRIPTION	ELEV	, DRIVE ELEV	DEPTH	BLOV		NT		BLOWS PE	ER FOOT
(11)	(ft)	(11)	0.5π	0.5ft	0.511		50	15 100	NO.	/ MOI	G	ELEV. (ft)	DEPTH (	t) (19	(ft)	(14)	0.5π	0.5π	0.5π			<u> </u>
																					• • • •	
385		ł										-		305	+		+	· — —	+	·		
	391.5											- 381.5 GROUND	SURFACE	.0	303.0	78.5	15	22	25			 17
380			2	3	2	• <u>5</u>				М		- COASTA	AL PLAIN SAND (A-2-6) with little 2	300	-	L					· · · ·	<u>``````</u>
	378.0	3.5													298.0	83.5						· · · · `
075		ŧ	9	11	13	· · · · · 24 · ·		· · · · · ·		М		Red, tan and orange, CLAY	, fine to coarse sandy (A-6)		-	L	20	35 6	55/0.5			
375	-	ŧ										<u>374.5</u> White and orange fine	e to coarse SAND AND	0 295		Ļ				<u></u>	<u> </u>	
	373.0	8.5	24	34	70		 			D		- GRAVEI	L (A-1-b)		293.0	88.5	36 6	50/0.1				
370		t						· · · · · · · · · · · · · · · · · · ·	Ī			- 369.5	12	290		L						· · · ·
	368.0	13.5		10	10	 	·	· · · · · ·			8/./	Tan, orange and red, SAND (A-2-6) with	, fine to coarse clayey	1	288.0	93.5		00/0 5				
005	· ·	t	11	12	13	· · · · • • 25 • ·	 	· · · · · ·		M	//						23 11	00/0.5			L	
305	-	<u>+</u>				\					///	<u> -</u> -				F						
	363.0	18.5 -	7	14	19	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	 	· · · · · ·		м	///	-			-	-						
360		‡				· · · · · · X.					///	- 359.5	22	0	-	+						
	358.0	23.5	12		20			· · · · · ·				Gray and tan, si	ilty CLAY (A-7-6)	71	-	ł						
255		‡	13	23	32		· • • • • •	· · · · · ·		м		-			-	ł						
355	-	+										<u>354.5</u> Red, purple, orange ar	nd white, fine to coarse	<u>0</u>	-	F						
	353.0	<u>  28.5</u> 	13	19	25		44	· · · · · ·		м	///	clayey SAI	ND (A-2-6)		-	÷						
350		‡						· · · · ·			///	-			-	÷						
	348.0	33.5	3	6	7		· · · · ·	· · · · · ·			///	-			-	+						
345		‡		Ŭ	'	$\left \begin{array}{cccccccccccccccccccccccccccccccccccc$	· · · · ·	· · · · · ·		vv		r r				+						
0-10	2420	+									$\langle / /$	 r				+						
		- 30.5	3	5	6	$\left  \begin{array}{c} \cdot \cdot \cdot \\ \cdot \\ \cdot \\ \bullet \\ 11 \cdot \\ \cdot $	· · · · ·	· · · · · ·		w	$\langle / / \rangle$	F F			-	÷						
340		ŧ									///	- -			-	÷						
	338.0	43.5	6	8	9					\A/	//				-	F						
335		Ŧ	-	-		$\left  \begin{array}{ccc} \cdot \cdot \cdot \bullet^{1/} \\ \cdot \cdot \cdot \cdot \bullet^{1/} \\ \cdot \cdot \cdot \bullet \end{array} \right $				vv	///				-	F						
15	333.0	48.5							1		~~~					F						
9/16/		-	6	7	9	$  \cdot \cdot \cdot \bullet 16   \cdot \cdot \cdot$				W	/./.				-	F						
년 <u>330</u>	-	Ŧ									///	329.5 Orango fine to conr	52	0	-	Ľ						
DOT.	328.0	53.5	4	6	6					Sat.		little	clay		-	L						
ຊ່ <u>325</u>		Ł										-			-	L						
GPJ	323.0	58.5										-			-	L						
IDGE		ł	3	5	8	· · • 13· · · ·				Sat.		-			-	L						
ස <u>320</u> හ	-	÷						<u> </u>				-			-	F						
218_Y	318.0	63.5	10	9	9	$\begin{array}{   } & \dots & \dots \\ & &$				м		- 317.3	64 AX (A 7 6)	2	-	ŧ						
215 g	· ·	ŧ										Віаск, СL/ — 314.5	AT (A-7-0) 67	0	-	Ł						
BLE	313.0	68.5	_			:::!!					<b>N</b>	RESI	DUAL	1	-	ŧ						
DOD		‡	5	9	10	$\left \begin{array}{cccccccccccccccccccccccccccccccccccc$	·   · · · ·	·   · · · · ·		М		coarse sandy, highly with rock from	silty CLAY (A-7-5)(12)		-	ŧ						
₩ <u>310</u>	-	<u>+</u>														ŧ						
DOT B	308.0	<u> </u>	9	9	14		·   · · · ·	·   · · · · ·	SS-16	34%		- -			-	ł						
JON 305	· ·	t				····]x.··				1	$\mathbf{N}$	-			-	ł						

TY RICHMOND	GEOLOGIST C. Jones									
		GROUND WTR (ft)								
OFFSET 15 ft LT	ALIGNMENT -Y3-	<b>0 HR.</b> 35.0								
NORTHING 441,721	EASTING 1,745,856	24 HR. 32.0								
DRILL METHOD H.S	Augers HAMM	ER TYPE Automatic								
COMP. DATE 03/05/15										
T SAMP.										
75 100 NO. MOI G	SOIL AND ROCK DESC	CRIPTION								
· · · · · · · · · · · · · · · · · · ·	RESIDUAL									
	Gray to greenish gray and coarse sandy, highly silty CL	brown, fine to AY (A-7-5)(12)								
	with rock fragments, saproli	tic (continued)								
	207 5	84.0								
· · · · 100	WEATHERED RO	оск Ск								
	Greenish black, GA	BBRO								
· · · 96/0.6										
	287.1	94.4								
	Boring Terminated at Eleval WEATHERED ROCK (	GABBRO)								
	Notes									
	1) 0.2' Topsoi 2) Strata break in split sp	 00n at 64 2'								
		0011 dt 04.2								

WBS         34542.1.FR4         TIP         R-3421B         COUNTY         RICHMOND         GEOLOGIST         M. Johnson							WBS	34542	.1.FR4			TI	<b>P</b> R-3421	3	COUNTY	Ŷ											
SITE DESCRIPTION US 220 Bypass from 0.3 miles south of SR 114						40 to 0.2 miles SW of SR 1304					GROUND WTR (ft)			SITE DESCRIPTION US 220 Byp					/pass f	ass from 0.3 miles south of SR 1140							
BORING NO. EB2-W2 STATION 25+41						OFFSET 16 ft RT					ALIGNMENT -Y3- 0 HRNot recorded			BORING NO. EB2-W2					ST	STATION 25+41			<u> </u>				
COLLAR ELEV. 383.1 ft TOTAL DEPTH 89.3 ft						t	NORTHING 441,691				EAS	<b>ING</b> 1,745,866	1	24 HR. FIAD	D COLLAR ELEV. 383.1 ft TOTAL DEPTH 89.3 ft						t						
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 80% 10/14/2014							1		DRILL	METHC	DD N	Iud Rotary		HAMM	ER TYPE Automatic	DRILL	. RIG/HAI	MMER E	FF./DA	re mi	D1904 (	CME-45B 80%	<u>3 10/14/2014</u>	+ 1	Τ		
DRILLER M. Coogan START DATE 03/24/15						5	COMP. DA	<b>TE</b> 03/	24/15	1	SURF	SURFACE WATER DEPTH N/A			DRILLER M. Coogan						START DATE 03/24/15						
EL (f		ELEV	DEPTH	BLC				BLOWS I	PER FOOT	75 100	SAMP.		0		SOIL AND RO	CK DES	CRIPTION	ELEV (ft)	ELEV	DEPTH (ft)	BLO		JNT	0	BLOWS F	PER FOOT	. 7
	,	(ft)	(/	0.51	0.51	0.511		20 .		100	NO.	ИМО	I G	ELEV. (f	t)		DEPTH (ft)	(,	(ft)	(,	0.511	0.511	0.511		<u> </u>	<u> </u>	
	_																								Mata	h line	
- 38	5		+												CROUN			305	304.6	78.5	9	_ <u></u> 10	<u> </u>				.
		383.1	0.0	5	8	8	· · · • • 16					м	~~~	303.1		TAL PLA			-	-				· · · · ·	$\mathbf{N}$		
38	0	379 6 <del>-</del>	- 35				· · · <b>`</b>							<u>381.1</u>	Crange, clayey fine	to coarse	e SAND (A-2-6) ,2.⊍ /	300	- 299.6	- 83 5					· <u> </u>	 	•
		-	+	10	14	16		<b>)</b> 30 : :	· · · · ·			м		-	Orange, clayey (A-	fine to cc -2-7)(4)	arse SAND		-	-	14	20	25	· · · · ·		<sup>1</sup> 5	
37	5	-	ŧ					/ : : : : : ;						-				205	-	-					· · · ·		÷.
	<u> </u>	374.6 -	- 8.5	5	7	11		8			SS-3	м		-				235	294.6	- 88.5	35	100/0.3			<u> </u>	<u> </u>	_
		-	ŧ											371.1			12.0		-	-							
37	0	369.6 <del>-</del>	+ - 13.5_		10	01		· · · · ·							Orange and yellow, with fine to	clayey G	RAVEL (A-2-6)		-	-							
		-	ŧ	17	18	21		39				W		F		0 000100	ound		-	-							
36	5		ŧ											F					-	-							
		364.6 -	<u>= 18.5</u>	16	23	28	1		51		1	w		364.2	Orange and tan, find	e to coar	18.9 se sandy CLAY		-	-							
		-	Ŧ											<u>361.1</u>	(A-7-5/6) 	i) with gra	avel <u>22</u> .0		-	_							
_36		359.6 -	23.5	۹.	14	12								-	Orange, yellow an (A-2-6) with fi	d tan, cla ne to coa	ayey GRAVEL arse sand										
		-	ł										///						-	_							
35	5	-	28.5											<u>356.1</u>	Orange and tan, fin	e sandy	CLAY (A-6)(10) 27.0		-	-							
			20.5	9	22	38	1		<b>1</b> 60		SS-7	м		L					-	-							
0		-	ŧ					· · · ·						<u>351.1</u>			32.0		-	-							
35		349.6 -	- 33.5	12	15	14						W		-	I an, clayey fine to o	coarse S	AND (A-2-6)(1)			-							
		-	ŧ						· · · · ·					-					-	-							
34	5	344.6 <del>-</del>	- 38.5				/							-					-	-							
		-	ŧ	6	5	6	<b> </b>   . <b>•</b> 11				SS-9	-		-					-	-							
34	0		ŧ				:::							<u>341.1</u>	Tan and orange, cla	vev fine l	to coarse SAND 42.0		-	-							
		339.6 -	<u>+ 43.5</u> 	7	5	7					1	w		-	(A-	-2-7)(3)			-	-							
		-	Ŧ											E													
33	5	334.6 -	48.5	5	6	8		+						_					-	_							
23/15		-	ŧ				••••••••••••••••••••••••••••••••••••••		· · · ·					-					-	-							
6 L 33	0	329.6 -	- 53.5											-					-	-							
DT.GI		-	1	4	6	9	15				SS-12	w		-					-	-							
	5	-	ŧ				<i> </i>    <i> </i>	· · · · ·	· · · · ·					326.1			<u>57.0</u>		-	-							
	.5	324.6 -	- 58.5	8	4	5						Sat.		-	SAN	D (A-2-6	)		-	-							
OGE.O		-	ŧ				: <b>`</b> .`;:							-					-	-							
BRI 32	0	319.6 <del>-</del>	- 63.5											-					-	-							
B_≺		-	ŧ	'		15						Sat.		- 318.4 -	Orange, fine to coa	arse san	64.7 dy CLAY (A-6)		-	-							
<sup>2-3421</sup>	5		ŧ											<u>316.1</u>		n gravel	<u> </u>		-	F							
		314.6 -	<del>+</del> 68.5 	6	10	11		1 · · · · · · · · · · · · · · · · · · ·		· · · ·	11	м		F	Orange, gray and sandy silty CLAY	l green, f	ine to coarse (2) with rock		-	F							
DOUB		-	Ŧ				:::/							E	fra	gments	. ,		-								
J 31	0	309.6 <del>-</del>	73.5	7	6	8		+	+ • • • •			l		E						[							
OT B(		-	ŧ	'		0					55-16	-  <sup>M</sup>	/./.	F					-	Ļ							
DN 30	5	-	ł				$   \cdots '$							-					-	_							

NT	<b>Y</b> RICHMO	ND			GEOLOGIS	ST M. Johnson							
114	40 to 0.2 mile	es SW d	of SR	1304				GROUN	D WTR (ft)				
	<b>OFFSET</b> 1	6 ft RT			ALIGNMEN	<b>IT</b> -Y3-		0 HRNot recorded					
	NORTHING	441,6	91		EASTING	1,745,866		24 HR. FIAD					
		DRILL	IETHO	D Mu	d Rotary	HA	MMI	ER TYPE	Automatic				
	COMP. DAT	E 03/2	24/15	-	SURFACE	WATER DEPTH	N/	A					
ют		SAMP.		L									
	75 100	NO.	мо	O G		SOIL AND ROCK D	DESC	RIPTION					
	<u> </u>	†	м			RESIDU	AL						
•••					s	andy silty CLAY (A-2	2-7)(2	2) with rocl	K				
• •						fragments (co	ontint	lea)					
· ·			м	<u>,,,</u> ,									
? :					296.1				87.0				
			м		293.8	Gray, GAB	BBRC	) )	89.3				
	100/0.3			Ē	Bori	ng Terminated at El	levati	ion 293.8 f GABBRO)	t IN				
				I F		Neter		5/188/100)					
				F	•	1) 0.1' To	s psoil						
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