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## STATE OF NORTH CAROLINA

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

## **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY CABARRUS

PROJECT DESCRIPTION <u>INTERSECTION OF</u> SR 2894 (CONCORD MILLS BLVD.) AND ENTRANCE NO.1

KINGS GRANT PAVILION

SITE DESCRIPTION BRIDGE ON -YI- OVER -DR02-

# 5806 REFERENCE

## 8 43 4 PROJEC

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U–5806	1	16

## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLT TEST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSFORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 1707-6800. THE SUBSURFACE 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 SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNOCS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN STIU UNI-FLACE) TEST DATA CAN BE RELED ON ONLY TO THE DECREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLL MOISTIGE CONDITIONS MAY YARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE BUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION WADE, 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 SATISY 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 RESULTION FOR MATERIAL COMPENSATION, OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTION FOR MATERIAL COMPENSATION, THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION,

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

PERSONNEL

M. ARNOLD

S. DAVIS

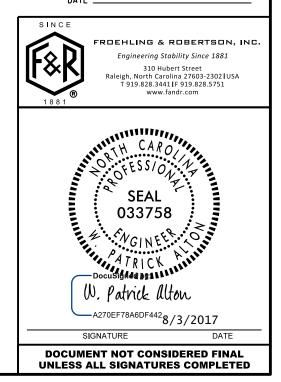
T. SHARPE

INVESTIGATED BY \_\_\_\_\_\_ F&R, Inc.

DRAWN BY \_\_\_\_\_. WALKER

SUBMITTED BY P. ALTON

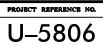
DATE AUGUST 2017



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

				SOIL	DES	CRIP	TION								GF	RADATION						F	ROCK DES	CRIPTION
BE PENE ACCORE IS																								
	AS MINE	RALOGICA	l compos	TION, ANG	ILARITY	, STRUCI	TURE, F	LASTICIT	Y.ETC. FI	OR EXAMPLE.		THE ANG	JLARITY	OR R				D BY THE TERMS:				r DIVIDED	D AS FOLLOW	
	VERI SI											ANGULAR	SUBANGL									NON-CO 100 BI	OASTAL PLAII	I MATERIAL THAT WOULD YIELD S DT IF TESTED.
Best Declement Accelerations and count and			NE	77	🖞 WOULD	) YIELD SPT	REFUSAL IF TESTED. ROCK TYPE																	
				-		A-4 A-	-5 A-							0200								FINE 1	TO COARSE G	RAIN METAMORPHIC AND NON-COAS
SYMBOL															OMPRESSIBLE						====	ROCK	TYPE INCLUD	ES PHYLLITE, SLATE, SANDSTONE, E
% PASSING	000000	<u></u>								Ch T.			HIGHLY	COMP	PRESSIBLE		LL >		SEDIMENTA			SPT R	EFUSAL. ROCI	
	50 MX 30 MX 5	60 MX 51 M								CLAY				P			IAL					1 311000		ERING
	15 MX 2	25 MX 10 M	X 35 MX 35	MX 35 MX	35 MX 3	6 MN 36	MN 36	MN 36 MN		SUILS					SOILS				FRESH				HT.FEW JOINT	5 MAY SHOW SLIGHT STAINING. ROC
									co.,	C 14170		LITTLE ORGANI	MATTER		3 - 5%	5 - 12%	LITT	LE 10 - 20%	VERY SLIGH				NTS STAINED.	Some Joints May Show Thin Clay
LL PI	- 6 M	x   -							LIT	TLE OR	HIGHLY									CRYSTAL	.s on a bro	OKEN SPEC		
GROUP INDEX	-		0								ORGANIC				GRO	UND WATER			SLIGHT				NTS STAINED	AND DISCOLORATION EXTENDS INTO
			SILT	r or claye	,	SILTY					50125	▽		WATE	R LEVEL IN	BORE HOLE IMMEDIA	TELY AF	TER DRILLING	(SLI.)					
			) GRAV	el and san	)	SOILS		SOILS				<b>▼</b>		STAT	IC WATER LE	VEL AFTER 24	HOURS			SIGNIFIC	ANT PORTION	INS OF RO	OCK SHOW DIS	COLORATION AND WEATHERING EFFEC
		EXCE	LLENT TO G	000		FAIF	R TO PO	IOR	FAIR TO	POOR	UNSUITABLE			PERC	HED WATER, S	SATURATED ZONE, OF	WATER	BEARING STRATA	(MOD.)					
AS SUBURAUE		P1 OF	A-7-5 SUB(	Roup is <	11 - 30	+ P1 OF A	-7-6 5	IBGROUP IS	> 11 - 30			- O-W	-	SPRI	NG OR SEEP									
														1	MISCELLA	NEOUS SYMB	DLS		SEVERE	and dis	COLORED AND	ND A MAJO	ORITY SHOW K	AOLINIZATION. ROCK SHOWS SEVERE
PRIMARY	5011 T	YPF			Р							ЕП воерие	Y EMBAN	KMFN	IT (RF) 25/6		ECTION		(MOD. SEV.)					"S PICK. ROCK GIVES "CLUNK" SOUND
							I-VALUE																	
						4		2				SOIL S	MBOL			OPTONT TEST BO	RING (		(SEV.)	to some	E EXTENT. SO	SOME FRAC	GMENTS OF ST	RONG ROCK USUALLY REMAIN.
MATER	AL									N/A							G		VERV					
(NON-C	DHESIVE		VERY	DENSE	_		> 50		_			<u>a</u>			لر	ς			SEVERE	BUT MAS	SS IS EFFEC	TIVELY R	REDUCED TO S	DIL STATUS, WITH ONLY FRAGMENTS
GENERA	LLY											INFERR	D SOIL	BOUN		r -		1	(* 524.)					
													D ROCK	LINE	"(	) MONITORING W	au -		COMPLETE					
			VERY	STIFF		15	i TO 3			2 TO 4		≠=≈ <sub>=</sub> ∢ ALLUVI	L SOIL	BOUN	DARY Z		C	- SPT N-VALUE					. GOHICIZ INHI	DE TRESERT AS DIRES ON STRINGE
					EOR			IZE						R	ECOMMEN	DATION SYME	OLS							
U.S. STD. S	EVE SI	ZE		4	0	40	60	200	270				77						VERY HARD					
OPENING (N	IM)			4.76 2			0.25		5 0.053	 							USE	D IN THE TOP 3 FEET OF	HARD				E OR PICK ON	Y WITH DIFFICULTY. HARD HAMMER
						SAND		SAND						J ACI			EME	ANKMENT UR BACKFILL	MODERATEL				E OR PICK. GO	UGES OR GROOVES TO 0.25 INCHES
						SE. SD.)												T - VANE CHEAD TEST	HARD				OF A GEOLOGIS	T'S PICK. HAND SPECIMENS CAN BE
				4			0.23	)	0.00	0.005		BT - BORING TERM			MICA.	- MICACEOUS	W	EA WEATHERED		CAN BE	GROOVED OR	r gouged		
		SOI	_ MOIS	TURE	- CO	RREL	ATIO	N OF	TERMS	5		CPT - CONE PENET	RATION	TEST					HARD					ICES I INCH MAXIMUM SIZE BY HAR
							GUI	de for i	FIELD MO	DISTURE DES	CRIPTION	DMT - DILATOMETE		0N TE	PMT -	PRESSUREMETER T			SOFT	FROM CH	HIPS TO SEV	VERAL INC	CHES IN SIZE	BY MODERATE BLOWS OF A PICK PO
						) -						e - VOID RATIO		0.1 .2	SD 1	SAND, SANDY	S	5 - SPLIT SPOON	VERY					
	. <b>-</b> - u	OUID LIM	IT	13	нт./		r RL			NUMD WHILE	RINDLE	FOSS FOSSILIFE							SOFT			ESS CAN	BE BROKEN B	FINGER PRESSURE. CAN BE SCRAT
RANGE <				- WEI	- (W)									JRES			R					ACING		BEDDING
<sup>(P])</sup> PL	. 🗕 РL	ASTIC L	MIT							1310.12		HI HIGHLY							TERM	1		SPACING	<u>6</u>	TERM
01			OISTURE	- MOI	ST - (M	1)	SOL	.ID; AT O	R NEAR (	ОРТІМИМ МО	ISTURE						1		WIDE		3	TO 10 F	EET	THICKLY BEDDED
														_						TELY CLOS				
				- DR1	- (D)						)					IS FLIGHT AUGER				LOSE	LESS	THAN Ø.	16 FEET	THICKLY LAMINATED 0.
				F		ידיסו						X CME-55		X	8" HOLLOW A	UGERS							INDUR	
									ſ	DRY STRENG	ТН	СМЕ-550		$\Box$	HARD FACED	FINGER BITS			FOR SEDIM	ENTARY RO	CKS, INDURA			
					(	ð-5			-	VERY LOW			FST		TUNGCARBIC	E INSERTS			FRIA	BLE				
мо	DERATE	LY PLAS	r IC		16	6-25				MEDIUM									MOO					
	HLY PL	.45110								HIGH			ST						MUU	LIGHTELT IN	DONHIED	BRI	REAKS EASILY	WHEN HIT WITH HAMMER.
												1 🗆	_	Ц		* TUNGCARB.		SOUNDING ROD	INDU	JRATED				FICULT TO SEPARATE WITH STEE BREAK WITH HAMMER.
										BROWN, BLUE APPEARANCE				H	CORE BIT			VANE SHEAR TEST	EXTR	REMELY INC	JURATED			BLOWS REQUIRED TO BREAK SAMP ACROSS GRAINS.
														1 1			1 1 1					SA	warit BREAKS	HUBUSS USAINS.



TED. AN INFERRED	TERMS AND DEFINITIONS
D SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
0.1 FOOT PER 60 < IS OFTEN	<u>ADUIFER</u> - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
PT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE SLATE, ETC. A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ROCK THAT INCLUDES GRANITE.	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
TAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
. IF TESTED. TC.	<u>Colluvium</u> - Rock Fragments mixed with soil deposited by gravity on slope or at bottom of slope.
T MAY NOT YIELD DSTONE, 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.
k Rings under	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
COATINGS IF OPEN.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
HAMMER 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.
ROCK UP TO NAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
ER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
TS. IN Lay. Rock has Th as compared	<u>FLOAT</u> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIG <sub>I</sub> NAL POSITION AND DISLODGED FROM PARENT MATERIAL.
IN HO COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM,
FELDSPARS DULL LOSS OF STRENGTH	F <u>ormation (FM.)</u> - A mappable geologic unit that can be recognized and traced in the Field.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
ARE DISCERNIBLE OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
AT ONLY MINOR VALUES < 100 BPF	OF AN INTERVENING IMPERVIOUS STRATUM.
Y IN SMALL AND RS. SAPROLITE IS	<u>RESIDUAL (RES.)SOIL</u> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <u>Rock quality designation (ROD)</u> - A measure of rock quality described by total length of Rock secments equal to or greater than 4 inches divided by the total length of core
	RUN AND EXPRESSED AS A PERCENTAGE. <u>SAPROLITE (SAP.)</u> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
INS REQUIRES	ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
BLOWS REQUIRED	SILE - AN INTROSIVE BOUT OF TOMEOUS MOLK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH TIS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
DEEP CAN BE DETACHED	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D BLOWS OF THE	STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR BPF)OF A 140 LB, HAMMER FALLING 30 INCHES REDUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
IN FRAGMENTS INT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
K. PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
CHED READILY BY	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	BENCH MARK: TBM: BY5-404 METAL SURVEY DISK N: 594,551, E: 1,487,930
THICKNESS 4 FEET	ELEVATION: 644.32 FEET
1.5 - 4 FEET 0.16 - 1.5 FEET	
.03 - 0.16 FEET	
008 - 0.03 FEET < 0.008 FEET	F.I.A.D.= FILLED IMMEDIATELY AFTER DRILLING
HEAT, PRESSURE, ETC.	
Ε.	
L. STEEL PROBE:	
PROBE:	
LE;	
	DATE: 8-15-14

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

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

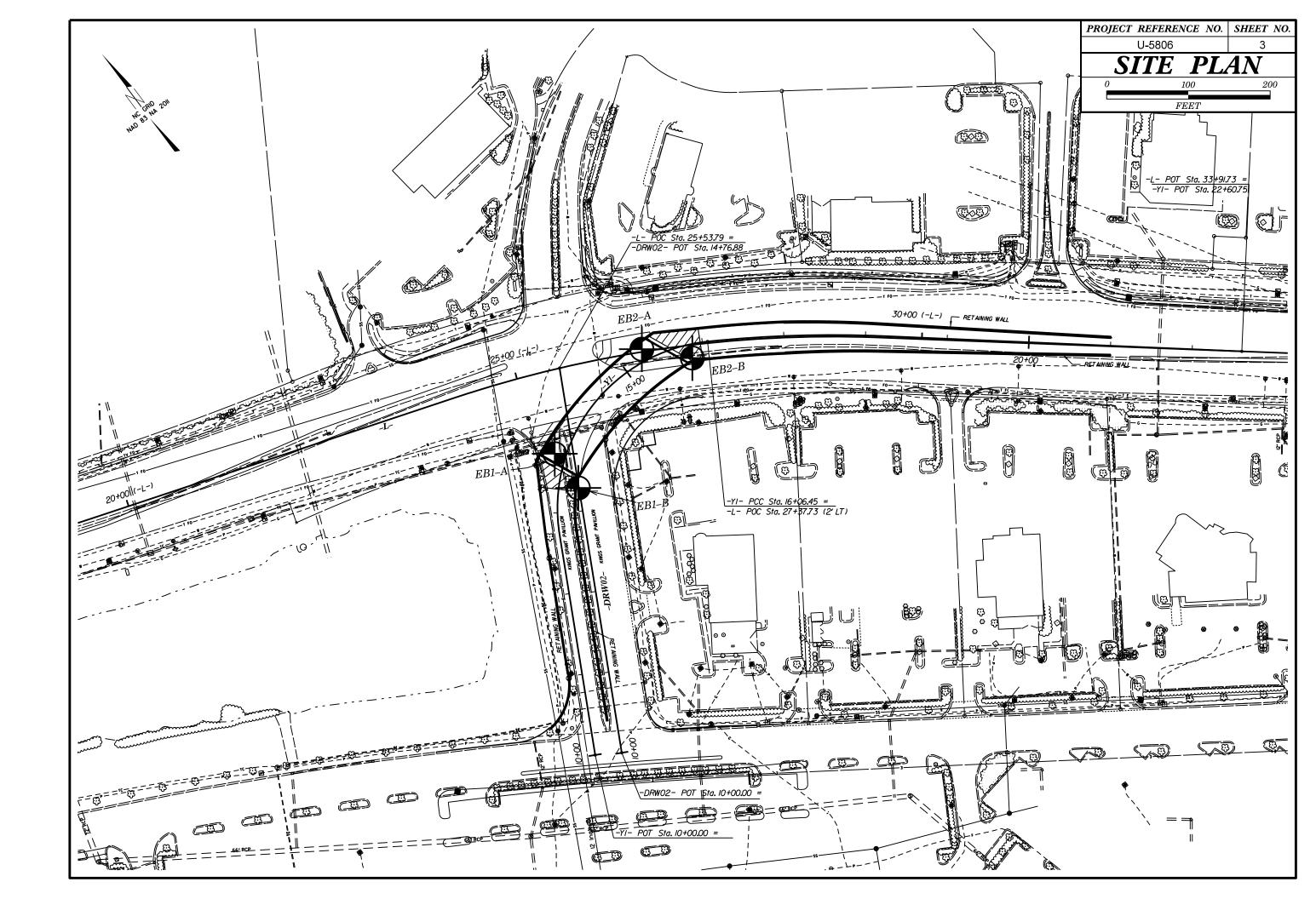
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for "
GEOLOGICAL STRENGTH INDEX (GSI)FOR JOINTED ROCKS (Hoek and Marinos, 2000)	aces	p		s G C	s O O	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	0D igh, fresh unweathered surf	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfac with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfac with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the conditi of the discontinuities and estimate the average val of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fa poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING S	URFACE QUI	ALITY 💳	⇒	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked up:	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rack mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting x of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with c. Sand- stone or silty shale
VERY BLOCKY - interlocked, cc partially disturbed mass with Z multi-faceted angular blocks y formed by 4 or more joint sets		Ę	50			thin inter- layers of siltstone siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Mana Store are tr into small rock p ————————————————————————————————————

		U–5	806			2A
Tectonically Defo	prmed Heterog	geneous Rock	Masses (Marır	nos and	Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	600D - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth,occasionally slickensided surfaces with compact	coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
	70 60	A		/		
E. Weak siltstone or clayey shale with sandstone layers		50 B 40	С	s/	E	
leformed, d/faulted, hale or siltstone deformed s forming an tructure			30	F 20		
leformed silty forming a e with pockets yers of ransformed pieces.			\$		-	10 1

PROJECT REPERENCE NO.

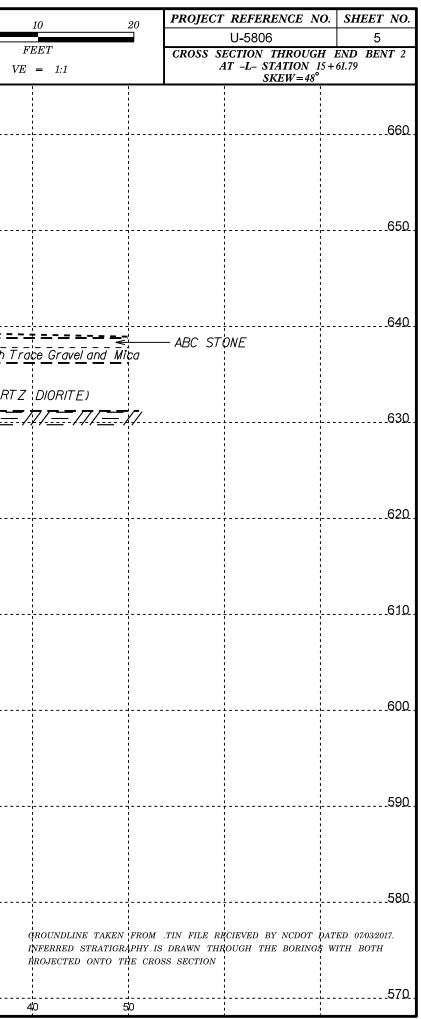
SHEET NO.

DATE: 8-19-16



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									FEET $E = 1:1$	CROSS S	ECTION THROUGH AT -L- STATION 13 SKEW=107°	I END BENT 1 3+51.16
			EB1–A				EB1-	-B				
550			$\frac{13+69}{14'LT}$			; 	$\frac{13+}{24' H}$					650
					Ľ							
640			<i>[</i>	ASPHALT								640
		- ABC STON			Ground	Surface			BC STONE			
630	Roadway Emban	kment: Medium Dense to Dense	Moist, L	Dark Gray-Brow	n, Silty Fine SAN	() (A-2-4) with		<u>Trace</u> Gravel	and Mica 			630
	7 <i>17_</i> 7 <i>1</i> 7_	Meathered Rock:	Brown-L	Dark Gray (MET TYT=T/T=	Crystalline Rock	///=///=		REC=62% RQD=26% GSI=35-50				
620		(60/0,		Gray, Brown, and	QUARTZ SYEN		and					620
		REC=95% R0D=31% GSI=50-65			GUARTZ STEN			REC=83% RQD=44% GSI=65-80				
610												611
600							BT FIAI O HI					600
800						 - - - -	ב DR)	<u> </u>				
590			BT FIAD O Hr. DRY									
580												580
570											· · · · · · · · · · · · · · · · · · ·	
									GROUNDLINE TAKEN INFERRED STRATIGRA RROJECTED ONTO TH	PHY IS DRAWN THI		
560												560

Weathered Rock: Dark Ca						1 1 1	   			0
680.     161/20     167/10       680.     167/10     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17       680.     167/17     177/17										
ASPHALT         ASPHALT         ASPHALT           ABC: STONE         Freedom: Freedom: Freedom: Freedom: Store	- 660		15-	-29		9	E .		15 + 84	4
640     ABC STONE     ABC STONE     Image: Constraint of the second se	_650					1 1 1 1 1 1 1	         		       	
ABC       STONE       Fraction T. place methods       fractio			AS	PHALT	Ground Surface		ABC S	TONE	AS	PHALT
Proceeding Product Process Fill Construct State Ling to Carter State Stat	_640A	BC STONE			·					
		Road <u>wii</u>	<b>ay E m<u>ban</u>kment (2) - 1</b> /////(60/0.0) - 7 /////	Međium D	ense to Dense Mo	51.51_Dark_Grav_	Brown, Silty Fine Weathered R	to <u>Coarse</u> SAND <b>ock:</b> Dark Gray-	32 (00/0.5)	(META QUART
	_630				Crys	talline Rock:		=///_7/	(60/0.1)	7,60/0.0 777
	620		ROD=35%	Gray, Bro	wn, and White (N	IETA QUARTZ	DIORITE and M	ET ADIORITE)		REC=52% ROD=17% GS1=35-50
			F	at land						REC=77% RQD=47% G\$1=45-60
	<u>_ 610</u>			RY					BT FIAD O Hr. DRY	
.580	_ 600									
.570	_ 590					1 1 1 1 1 1	1 1 1 7 		     	
.570										
-570. 50 40 30 20 10 0 10 20 30	_ 580					· · · · ·	1 1 1 1		     	
570										
	. 570	50	40	30	2'0 1	IO	; D 1	0 2	% %	30



## **GEOTECHNICAL BORING REPORT** BORE LOG

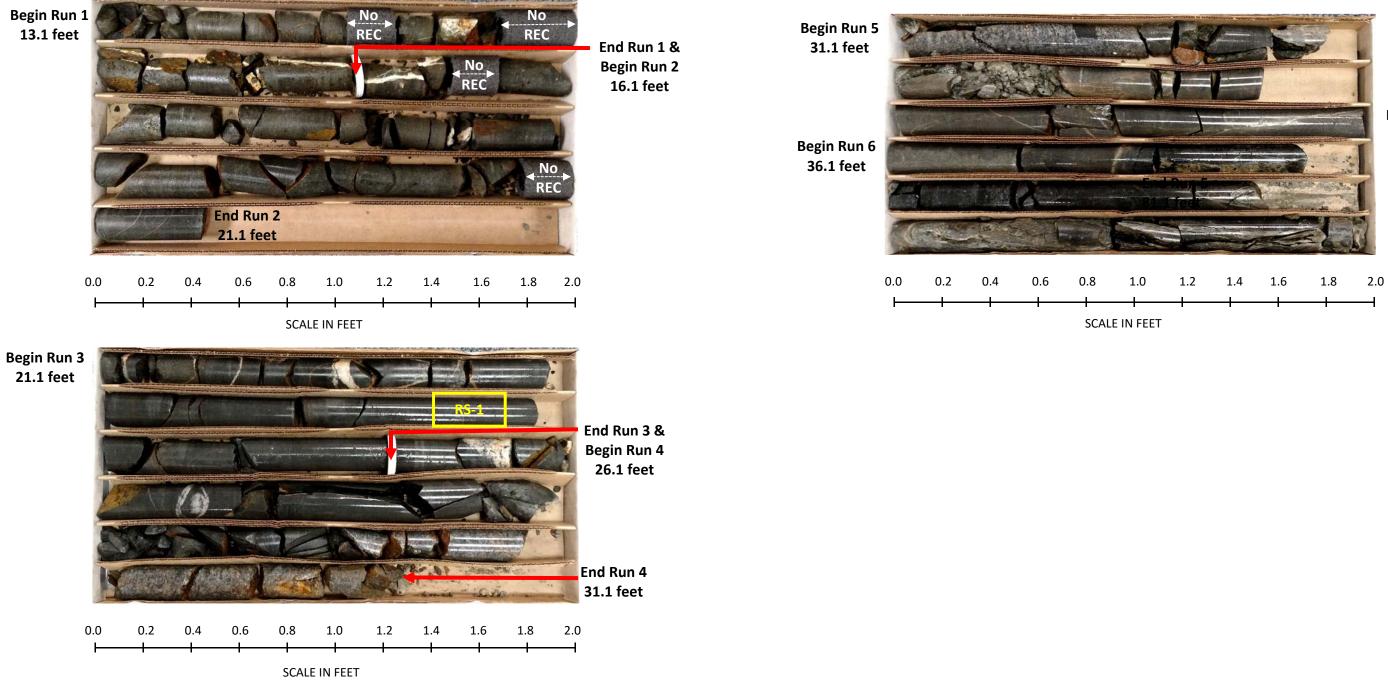
								В	<u>ORE L</u>	UG							_						1			
	44378.1.D					<b>D</b> -5806			Y CABARF				GEOLOGI	ST M. Ar	nold				44378					U-580		<b>C</b>
SITE	DESCRIPTIC	ON I	nterse	ectior	n of SF	R 2894 (C	oncord Mil	ls Blvd.) a	and Entrance	e No. 1 I	Kings	Gran	Pavilion			GROUND WTR (	it)					rsection		,		l Mills
BORI	NG NO. EB	31-A			ST	ATION 1	3+69		OFFSET	14 ft LT			ALIGNME	NT -Y1-		0 HR. D	у		ING NO						13+69	
	AR ELEV.						<b>TH</b> 41.1 f		NORTHING	<b>3</b> 594,4	62		EASTING	1,487,71	1	<b>24 HR</b> . FIA	D		LAR EL						PTH 4	
DRILL	RIG/HAMMER	R EFF./	/DATE	F&F	2175	CME-55 86	% 02/16/201	6		DRILLI	METH	od s	PT Core Boring		HAMM	RTYPE Automatic	:					TE F&R2				
DRILI	LER S. Dav	/is			ST	ART DAT	E 08/22/1	6	COMP. DA	<b>TE</b> 08/	23/16	3	SURFACE	WATER D	DEPTH N/	4			LER S						<b>TE</b> 08/	
	DRIVE ELEV DEPT	···-	BLOW					PER FOOT		SAMP.	$\mathbf{V}$			SOIL AND	ROCK DESC	RIPTION		COR		1	1			AL RUI	<b>N</b> 28.0	ft न इन
(ft)	(ft) (ft)	0.	5ft 0	.5ft	0.5ft	0	25 :	50	75 100	NO.	Имс	DI G	ELEV. (ft)			DEPTH	(ft)	ELEV (ft)	RUN ELEV	DEPTH (ft)	RUN (ft)	DRILL RATE	REC. (ft) %		SAMP. NO.	STI REC. (ft) %
																			(ft)	( )	. ,	(Min/ft)	%	%		%_
635													-634.2	GRC	UND SURFA		0.0	621.1 620	621.1	13.1	3.0	3:10/1.0	(2.3)	(0.4)		(26.5
-	<u>633.5</u> - 0.7	1	9	14	15		 				м		633.5		ASPHALT ABC STONE		0.7 1.6		618.1	16.1		1:29/1.0 1:49/1.0	77%			95%
630	630.7 - 3.5		3 10	0/0.4			I						630.2	ROADW			4.0			ŧ	5.0	1:15/1.0	(4.3) 86%	(0.7) 14%		
	Ŧ		.5 10	0/0.4					100/0.4					with Tra	ce Gravel an			615	-	+		1:18/1.0 1:27/1.0				
	625.7 + 8.5												626.3		THERED RO		7.9		613.1	21.1	5.0	1:45/1.0 2:26/1.0	(4.9)	(1.9)		
625	<u>625.7 + 8.5</u>	60/	0.1				· · · · ·		60/0.1				_ \	CRYS	DIORÌTE)			610	_	Ŧ		1:27/1.0 1:33/1.0	98%	38%		
	Ŧ													Brown-Dark	Gray (META DIORITE)	QUARTZ			608.1	26.1		1:37/1.0 1:33/1.0	(= =)		RS-1	_
620	<u>621.1 </u> 13.1	1 60/	0.0						60/0.0				621.1		TALLINE RO	CK	3.1			ŧ	5.0	2:06/1.0 1:55/1.0	(5.0)	(0.8) 16%		
	Ŧ												-	Brown-Dark	Gray (META DIORITE)	QUARTZ		605	-	+		3:51/1.0 2:06/1.0				
	Ŧ														,				603.1	31.1	5.0	2:16/1.0 2:28/1.0	(5.0)	(2.0)		
615	Ŧ												-					600	_	ŧ		1:56/1.0 3:37/1.0	100%	40%		
	Ŧ																		598.1	36.1		1:57/1.0 2:04/1.0	(5.0)			
610	Ŧ												_							ŧ	5.0	2:13/1.0 2:24/1.0	(5.0)	(3.0) 60%		
	Ŧ									RS-1	1		-					595	- 593.1	+		1:49/1.0 2:17/1.0				
	Ī																		595.1	+ 41.1 +		2:32/1.0				
605	$\pm$					<u> </u>	<u> </u>	+	<u> </u>				-						-	‡						
	ŧ																			‡						
600	1												_							‡						
	ŧ																		-	‡						
505	‡							· · · ·												+						
595	+						<u> </u>						-						-	+						
ł	<u>+</u>															on 593.1 ft in	1.1			+						
	1												- Ci	RYSTALLIN	E ROCK (ME DIORITE)	IAQUARIZ				+						
	‡												NOT						-	ŧ						
	‡													uger Refusal AD due to b	at 13.1' oring location	in roadway				ŧ						
	+												-				1/17		-	ŧ						
	‡																T 8/1/1			ŧ						
	‡												-				T.GD.			ŧ						
	‡																C_DOT		-	Ŧ						
	‡																GPJ NC			Ŧ						
	+												-				DG.GI		-	Ŧ						
	‡																L BRDG.			Ŧ						
	+												-				EO_BH			Ŧ						
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## **GEOTECHNICAL BORING REPORT** CORE LOG

	_				<u> </u>	•							
	TIP	U-580	6	C	OUNT	YC	ABARR	US		GEOLOGIST	M. Arnold		
ection c	of SR 2	2894 (	Concord	Mills E	Blvd.) a	and I	Entrance	No. 1 Kings	Grant I	Pavilion		GROUN	ID WTR (ft)
	STA	ΓΙΟΝ	13+69			OF	FSET 1	4 ft LT		ALIGNMENT	-Y1-	0 HR.	Dry
	тоти	AL DEI	<b>PTH</b> 41.	1 ft		NO	RTHING	594,462		EASTING 1,4	87,711	24 HR.	FIAD
F&R2	175 CN	/IE-55 8	6% 02/16/	2016				DRILL METH	OD SPT	Core Boring	HAMN	IER TYPE	Automatic
	STAF	rt da'	TE 08/2	2/16		со	MP. DA1	E 08/23/16	6	SURFACE WA	TER DEPTH N	/A	
			N 28.0 ft	t									
DRILL RATE	REC.	RQD	SAMP.	REC.	ATA RQD	LO			D	ESCRIPTION AND	REMARKS		
Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	ELEV. (f	:)	2				DEPTH (ft)
		(5.1)		(0.0	(2.2)		-			Begin Coring @	0 13.1 ft		
:10/1.0 :29/1.0	(2.3) 77%	(0.4) 13%		(26.5) 95%	(8.8) 31%		621.1	Brown-Dar	k Gray, V	CRYSTALLIN ery Slight to Moder	ate Weathering, Ha	ard to Medi	13.1 um
:49/1.0 :29/1.0	(4.3)	(0.7)					-	Hard (META	QUARTZ RS-1::	DIORITE) with Clo 24.3'-24.6', qu=16,8	ose to Very Close F 830 psi, GSI=50-65	racture Spa	acing
:15/1.0 :18/1.0	86%	14%					-				•		
:27/1.0 :45/1.0							-						
:26/1.0 :27/1.0	(4.9) 98%	(1.9) 38%					-						
$\cdot 33/10$	/ 0		RS-1 /			P	-						
:37/1.0 :33/1.0 ::06/1.0	(5.0)	(0.8)				R	-						
:55/1.0	100%	16%					-						
::06/1.0 ::16/1.0							-						
:28/1.0	(5.0)	(2.0)					-						
:56/1.0	100%	40%					-						
:57/1.0 ::04/1.0	(= =)	(5.5)					_						
::13/1.0 ::24/1.0	(5.0) 100%	(3.0) 60%					-						
:49/1.0 ::17/1.0 ::32/1.0													
:32/1.0							593.1	Boring Terr	ninated a	t Elevation 593.1 ft	in CRYSTALLINE	ROCK (ME	41.1 TA
							-			QUARTZ DIC	ORITE)		
							-	NOTES: 1) Auger Refu	ısal at 13	1'			
							-			ocation in roadway			
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## CORE PHOTOGRAPHS: NCDOT U-5806 Bridge, Cabarrus Co., EB1-A: -Y1- 13+69, 14' Lt.



## SHEET 7

End Run 5 36.1 feet

End Run 6 41.1 feet

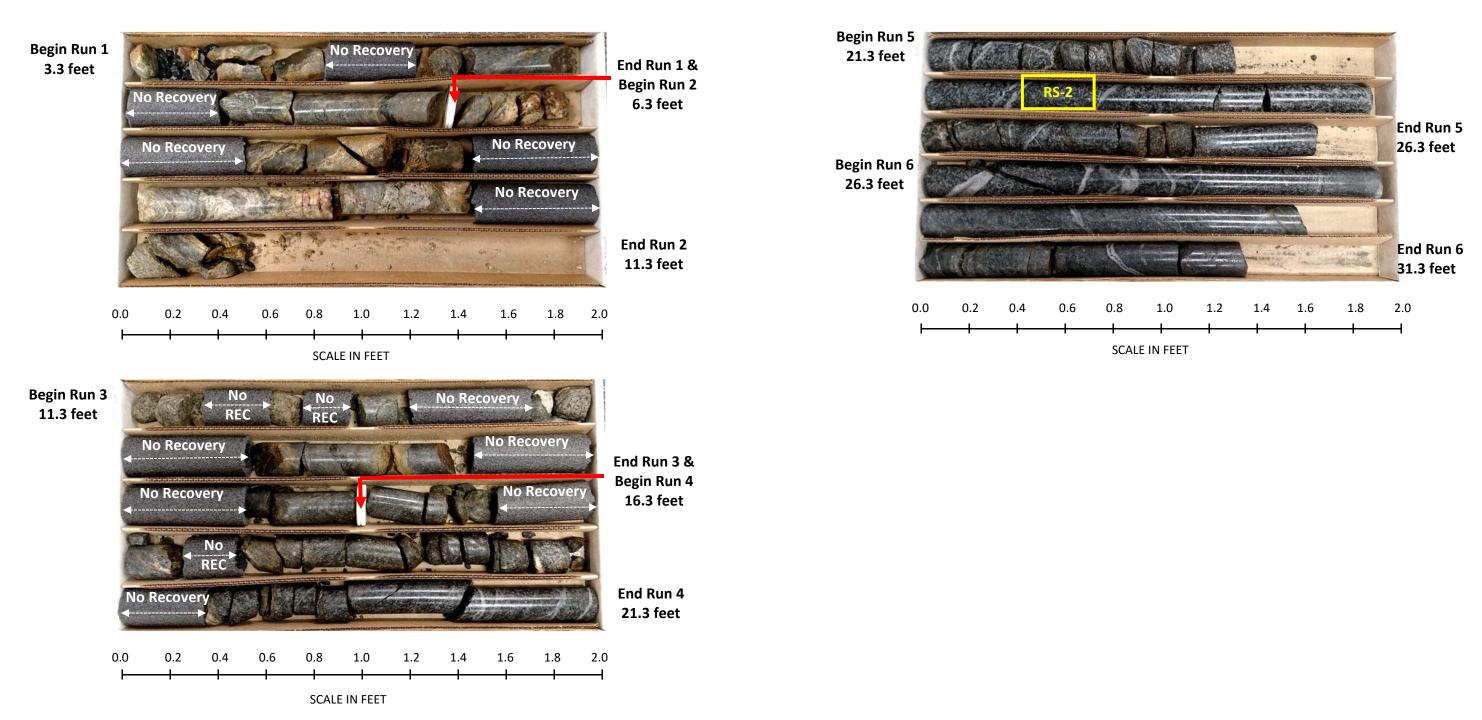
## GEOTECHNICAL BORING REPORT BORF I OG

	B	ORE LOG				ORE LUG	1	
<b>WBS</b> 44378.1.D1	TIP U-5806 COUNT	Y CABARRUS	GEOLOGIST M. Arnold	WBS 44378.1.D1		TY CABARRUS	GEOLOGIST M. Arnold	
SITE DESCRIPTION Intersection of	SR 2894 (Concord Mills Blvd.)	and Entrance No. 1 Kings Grant	Pavilion GROUND WTR (ft)		ection of SR 2894 (Concord Mills Blvd.)			
BORING NO. EB1-B	STATION 13+34	OFFSET 24 ft RT	ALIGNMENT -Y1- 0 HR. Dry	BORING NO. EB1-B	<b>STATION</b> 13+34	OFFSET 24 ft RT		0 HR. Dry
	TOTAL DEPTH 31.3 ft	NORTHING 594,414	<b>EASTING</b> 1,487,708 <b>24 HR.</b> FIAD	COLLAR ELEV. 635.1 ft	TOTAL DEPTH         31.3 ft           F&R2175         CME-55         86% 02/16/2016	NORTHING 594,414		4 HR. FIAD RTYPE Automatic
DRILL RIG/HAMMER EFF./DATE F&R21	75 CME-55 86% 02/16/2016	DRILL METHOD SF	T Core Boring HAMMER TYPE Automatic			· · · · · · · · · · · · · · · · · · ·		
	<b>START DATE</b> 08/23/16	COMP. DATE 08/24/16	SURFACE WATER DEPTH N/A			<b>COMP. DATE</b> 08/24/16	SURFACE WATER DEPTH N/A	
	START DATE         08/23/16           BLOWS PER FOOT         BLOWS PER FOOT           ft         0         25         50	COMP. DATE 08/24/16	SURFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION ELEV. (f) DEPTH (f) - - - - - - - - - - - - -	DRILLER         S. Davis           CORE         SIZE         NQ3           ELEV         RUN ELEV         DEPTH (ft)         RUN (ft)         I           631.8	START DATE         08/23/16           TOTAL RUN         28.0 ft           DRILL RATE (ft)         RUN (ft)         SAMP. (ft)         STRATA REC. (ft)           Min/ft)         %         %	COMP. DATE 08/24/16	SURFACE WATER DEPTH N/A         SURFACE WATER DEPTH N/A         DESCRIPTION AND REMARKS         Begin Coring @ 3.3 ft         CRYSTALLINE ROCK         ght to Moderately Severe Weathering, Ha         NITE) with Moderately Close to Close Frac         GSI=35-50         ight to Moderate Weathering, Very Hard to         TZ DIORITE) with Moderately Close to Close Spacing         2: 23.5'-23.8', qu=7,397 psi, GSI=65-80         at Elevation 603.8 ft in CRYSTALLINE RO         QUARTZ DIORITE)	DEPTH (ft) 3.3 rd to Medium sture Spacing 12.3 D Moderately Dise Fracture

## GEOTECHNICAL BORING REPORT CORE LOG



CORE PHOTOGRAPHS: NCDOT U-5806 Bridge, Cabarrus Co., EB1-B: -Y1- 13+34, 24' Rt.





## **GEOTECHNICAL BORING REPORT** BODEIOC

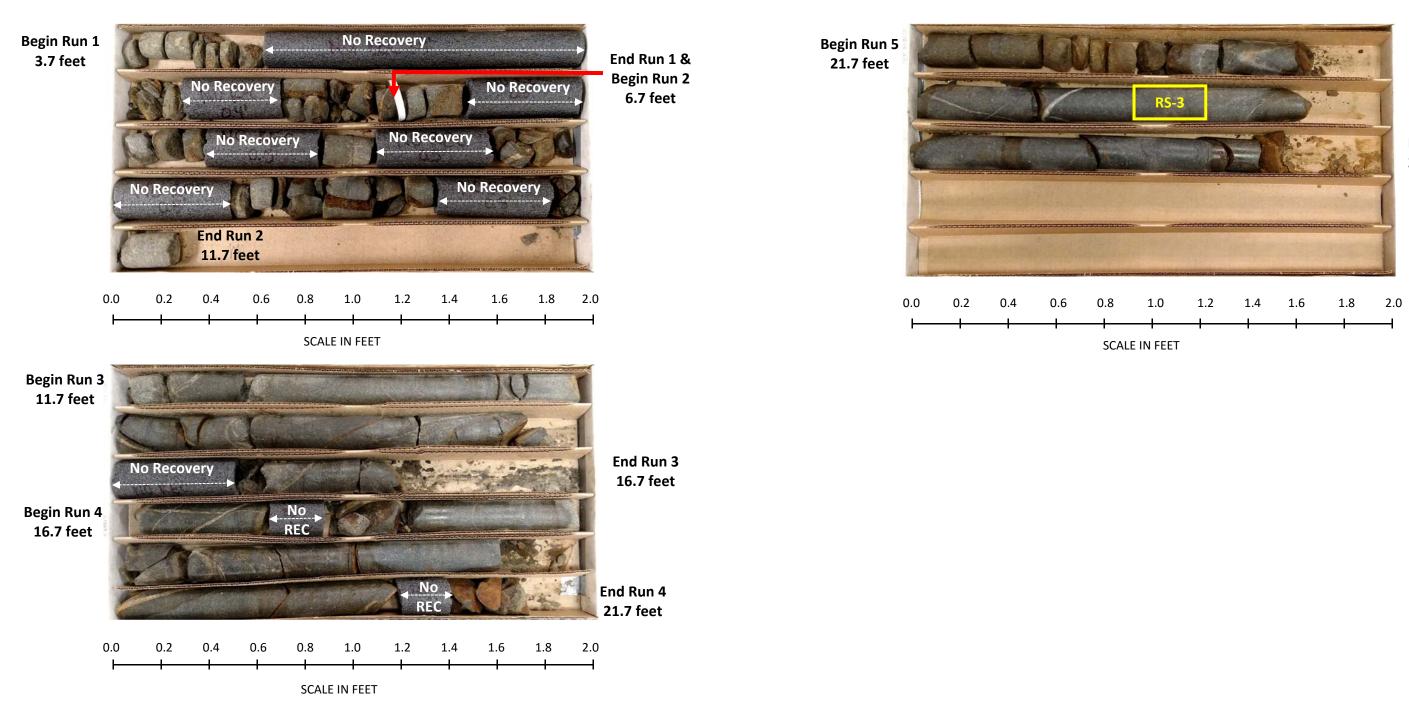
								E	SORE L	OG								_										С
WBS	44378	3.1.D1			т	<b>IP</b> U-580	3	COUN	<b>FY</b> CABARF	RUS			GEOLO	GIST M. Arnol	d					44378					U-580			OUNT
SITE	DESCR		I Inte	rsectio	on of S	SR 2894 (C	Concord N	lills Blvd.)	and Entrance	e No. 1	Kings	Grar	nt Pavilion			GROUN	ID WTR (ft)						rsection	1			Mills	3lvd.)
BOR	NG NO.	. EB2-	-A		S	TATION	15+29		OFFSET	15 ft LT			ALIGN	ENT -Y1-		0 HR.	Dry			NG NO.						15+29		
COL	AR ELI	<b>EV.</b> 64	40.4 ft		Т	OTAL DEP	<b>'TH</b> 26.7	ft	NORTHING	<b>5</b> 594,8	501		EASTIN	<b>G</b> 1,487,873		24 HR.	FIAD			AR ELE						<b>PTH</b> 26		
DRILL	RIG/HA	MMER E	FF./DA	TE F	&R2175	5 CME-55 86	3% 02/16/2	016	- <b>i</b>	DRILL	METHO	DD S	SPT Core Bori	ng	HAMM	ER TYPE	Automatic						TE F&R2	-				
DRIL	LER S					TART DAT			COMP. DA				SURFA	E WATER DEF	PTH N/	A				LER S		5				TE 08/1		
ELEV (ft)	ELEV	DEPTH (ft)			-		BLOWS	S PER FOO		SAMP.	17			SOIL AND RO	CK DESC	RIPTION		-		RUN		1	DRILL	R	UN	N 23.01	ST	RATA
(11)	(ft)	(19	0.5π	0.5ft	0.5π	0		50 I	75 100	NO.	/мо	I G	ELEV. (ft)				DEPTH (ft)	E	LEV (ft)	ELEV (ft)	DEPTH (ft)	I RUN (ft)	RATE (Min/ft)	REC.	RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %
0.15																		6	36.7	(19				70	70		70	- 70
645		ŧ											-						635	636.7	3.7	3.0	1:44/1.0 1:05/1.0	(1.2)	(0.0) 0%		(16.8)	
Ĩ	-	ŧ											-							633.7	6.7	5.0	1:11/1.0			-	10%	0070
640	639.5 -	- 0.9											- 640.4 - 639.5		D SURFA	CE	0.0			-	Ī	0.0	1:39/1.0	44%	0%			
Ĩ	-	t	19	17	6	]  · · · ·   · · · .			· · · · · ·		м		- 638.4 - 637.4	ABC	STONE		2.0	(	630	628.7	11.7		1:49/1.0					
635	636.9 636.7	<u>3.5</u>											- 630.7	ROADWAY Gray-Brown, Silty	Fine to C	oarse SAN				-	l I	5.0	1:49/1.0 1:13/1.0	(4.5)	(2.1)			
000	-	ŧ	60/0.0												LLINE RO	ОСК		(	625	-	ŧ		1:27/1.0					
i	-	ŧ						.	· · · · · ·				# 1-	Dark Gray-Brov Dl	wn (META ORITE)	QUARTZ			-	623.7 -	<u> </u>	5.0	2:37/1.0 1:41/1.0	(4.3)	(3.3)	-		
630	-	ŧ						· · · · ·					613.7						620	-	ŧ		1:44/1.0 1:40/1.0		66%			
i	-	Ŧ						.											020	618.7	21.7		1:36/1.0 1:54/1.0					
625	-	Ŧ						· · · · ·	· · · · ·											-	ŧ	5.0	1:44/1.0	92%	(2.6) 52%			
		Ŧ											E					(	615	- - 613.7 -	+		1:41/1.0			RS-3	7	
	-	l					.	.											-		<u>+ 20.7</u> +		1:29/1.0		<u> </u>	-		-
620	-	F											- -							-	Ŧ							
i	-	ŧ											4							-	Ŧ							
615	-	ŧ								RS-3			4_ 4_							-	Ŧ							
í	-	+				<u>  </u>	<u> </u>						<u> </u>	Boring Terminated	at Elevat	ion 613.7	26.7 ft in			-	ŧ							
i	-	ŧ											F	CRYSTALLINE R	OCK (ME ORITE)	TA QUAR	TZ			-	ŧ							
i	-	ŧ												DTES:						-	ŧ							
i	-	ŧ												Auger Refusal at FIAD due to borin		in roadwa	iy			-	ŧ							
i	-	ŧ											F							-	ŧ							
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d '	-	Ŧ											F					NCD		-	‡							

# GEOTECHNICAL BORING REPORT

1 -				)G							
			ABARRU			GEOLOGIST	M. Arnol				
ls E	Blvd.)	1		lo. 1 Kings Gra	-				ROUN	D WT	R (ft)
		<u> </u>		ft LT		ALIGNMENT			HR.		Dry
t		NO	RTHING			EASTING	,487,873		HR.		FIAD
6			D	RILL METHOD	SPTO	Core Boring		HAMMER	TYPE	Autor	natic
6		со	MP. DATE	08/18/16	5	SURFACE W	ATER DEF	TH N/A			
51R EC. ft) %	ATA RQD	L O			DES	SCRIPTION A	ND REMARK	S			
%	(ft) %	G	ELEV. (ft)							DE	PTH (ft
6.8)	(8.0)		- 636.7			Begin Coring CRYSTALL					3.7
	35%		- - - - - - - - - - - - - - - - - - -	Boring Terminat NOTES: ) Auger Refusal a ) FIAD due to bor	ed at E at 3.7'	DIORITE) with Spar 4.5'-24.8', qu= Elevation 613. QUARTZ	n Moderately cing 4,600 psi, GS 7 ft in CRYST DIORITE)	Close to Clos	e Fract	ure	26.



## CORE PHOTOGRAPHS: NCDOT U-5806 Bridge, Cabarrus Co., EB2-A: -Y1- 15+29, 15' Lt.



End Run 5 26.7 feet

## **GEOTECHNICAL BORING REPORT** BORE LOG

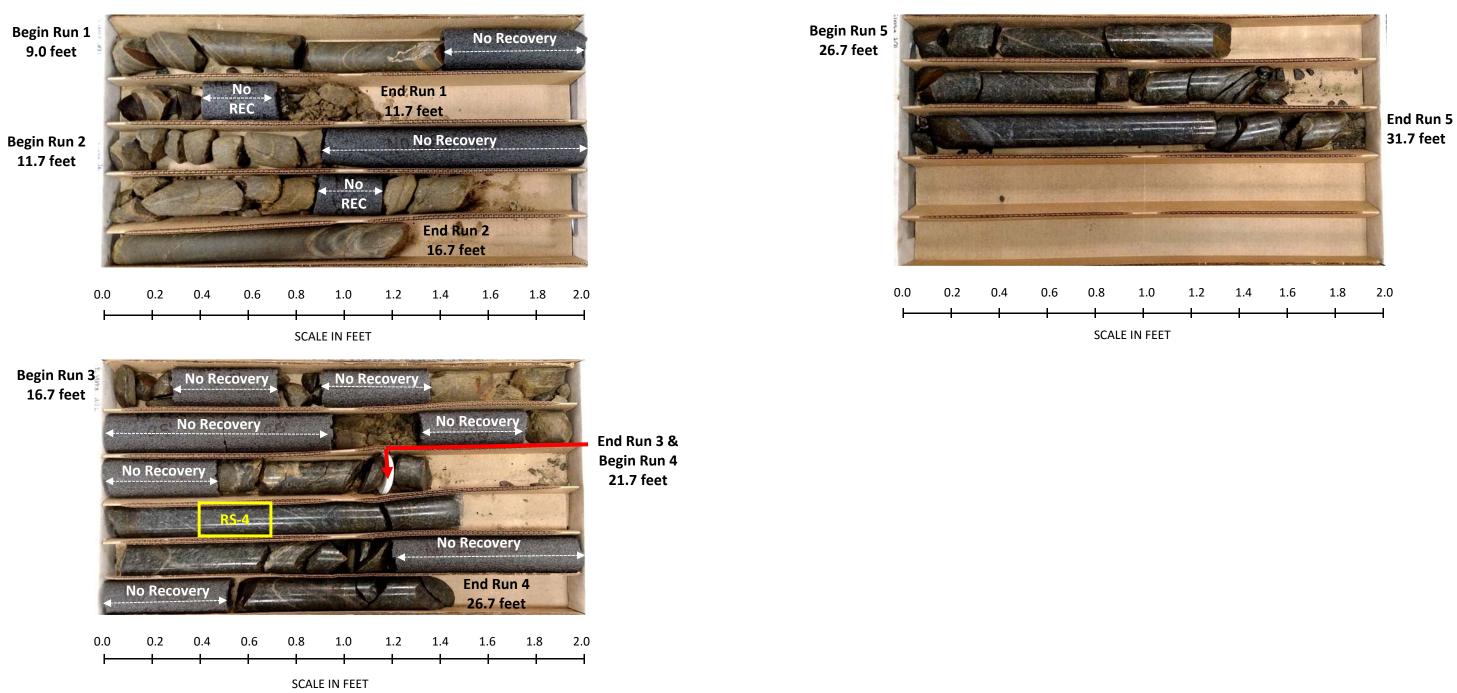
											ORE		<u>J</u>																				
WBS	4437	8.1.D1				TIP	U-580	6		COUNT	Y CABA	RRU	S				GEOLO	OGIST	M. Arn	old			WB	<b>S</b> 44	378.1.[	D1			TIP	U-580	6		cc
SITE	DESC	RIPTION	<b>I</b> Inte	ersect	tion o	f SR	2894 (0	Conc	ord Mil	ls Blvd.)	and Entra	nce N	lo. 1 l	Kings	Gra	nt P	Pavilion				GROUN	D WTR (ft)					Inters	section o				l Mills	В
BOR	ING NC	). EB2	-В			STA	TION	15+8	34		OFFSE	<b>T</b> 17	ft RT				ALIGN	MENT	-Y1-		0 HR.	Dry	во	RING I	<b>NO.</b> E	B2-B					15+84		
OL	LAR EL	<b>EV.</b> 63	39.7 ft			тот	AL DE	РТН	31.7 f	t	NORTH	ING	594,4	155			EASTIN	<b>NG</b> 1,4	487,916		24 HR.	FIAD				639.7					<b>PTH</b> 3 <sup>-</sup>		
JRILI	_ RIG/H/	MMER E	EFF./D/	ATE I	F&R21	175 C	ME-55 8	6% 0	2/16/201	6	•	D	RILLI	METHO	DD :	SPT	Core Bor	ring		HAM	MER TYPE	Automatic	DRI	LL RIG/	HAMME	ER EFF.	/DATI	E F&R21	175 CN	/IE-55 8	6% 02/10	6/2016	
RIL	LER S	6. Davis	3			STA	RT DA	TE (	08/16/1	6	COMP.	DATE	08/	17/16	6		SURFA	CE WA		EPTH N	I/A		DR	LLER	S. Da	avis			STAF	rt da	<b>FE</b> 08/	16/16	
.EV	DRIVE ELEV	DEPTH	BL	ow co	OUNT			В	BLOWS	PER FOO	Г	5	Samp.					SO			CRIPTION		со	RE SIZ	E NG	23					<b>1</b> 22.7	ft	
t)	(ft)	(ft)	0.5ft	0.5f	t 0.5	5ft (	0	25		50	75 ´	100	NO.	Имо	) G		ELEV. (ft)					DEPTH (ft)	ELE				UN	DRILL RATE	REC.	JN RQD	SAMP.	ST REC (ft) %	<u>R</u> /
																							(ft)	(ft		ft) (1	ft)	(Min/ft)	(ft) %	(ft) %	NO.	(II) %	_
		Ļ															639.7		GROL	IND SURF	ACE	0.0	630 630	7 630	.7_9	0 2	2.7	1.36/0 7	(1.7)	(0.8)		(6.0	1)
	638.8	- 0.9 -	12	13	19	9	· · · · · ·		 32 <u>∸</u> :					М			638.8 637.8			ASPHALT BC STONE	F	0.9		628		1.7	.,	1:36/0.7 1:38/1.0 1:05/1.0	63%	30%		52%	6
ļ	636.2	3.5	100/0.	_			· · ·	·   ·		·	÷+÷÷;	·					<u>636.2</u>		ROADWA	Y EMBAN	NKMENT	3.5			Ŧ	5	5.0	1:41/1.0 1:13/1.0	(3.1) 62%	(1.1)			
		ŧ	100/0.	3				<u> </u>	 	<u> </u>	100/	0.5								n, Silty Fin e Gravel a	e SAND (A-2 and Mica	-4)	625	_	Ŧ			1:09/1.0 1:27/1.0	0270	2270			
		ł										·					_	Dark		HERED R	OCK TA QUARTZ			623	<u>.0 † 16</u>	6.7	-	1:30/1.0	(1.0)	(0.3)			
63 63	1.2	<u>7 8.5</u>					• • •	•   •	• • •		· · · 60/	0.1					631.2 630.7 -		· [	DIORÌTE)		/	620		‡		· · ·	1:46/1.0 1:53/1.0	36%	6%			
	-	Ŧ	60/0.0	D								·				F		G		<b>ALLINE F</b> n (METAD			020		.0 + 2'	4 7	·	1:39/1.0 1:27/1.0				(8.6	3
		Ŧ					· · · · · ·	.   .	· · · · · ·		.													010	.0 <u>  2</u>		5.0	<u>1:29/1.0</u> 1:51/1.0	(3.7)	(2.5)	RS-4	(8.6	6
		Ŧ						·   ·								Ŧ							615		1		· ·	1:30/1.0 1:32/1.0	74%	50%	110-4	-1	
		ŧ					· · · ·	.   .	· · · · · ·			:												613	.0 20			1:25/1.0 1:37/1.0					
		‡					· · · · · ·	·   ·	· · · · · ·		·   · · · ·   · · ·	:													Ŧ	5	· · ·	1:56/1.0 1:15/1.0	(4.3) 86%	(2.5) 50%			
		ŧ						.   .							S.	<u>+</u> 6	619.2	W/hite	Grav (M			20.5	610		$\pm$		·	1:25/1.0 1:16/1.0					
		‡					· · · · · ·	·   ·	· · · · · ·	· · · ·	·   · · · ·   · · ·		RS-4					winte-				_/		608	<u>.0 3'</u>	1.7		1:24/1.0				-	_
		‡						•   •				- I ľ		Ί		ł									Ŧ								
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		Ŧ								<u> </u>						ł									‡								
		<u> </u>			_	+									- 52		608.0	Boring	Terminate	ed at Eleva	ation 608.0 ft	31.7 t in			‡								
		Ŧ														-		CRYS	TALLINE	ROCK (M DIORITE)	IETA QUART	Z			‡								
		Ŧ														F	Ν	NOTES:	-						‡								
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## **GEOTECHNICAL BORING REPORT** CORE LOG

			U-580					CABARRU			GEOLOGIST M. Arnolo	b		
	rsection of	r			Mills E	Blvd.) a			No. 1 Kings Gra	ant I				ID WTR (ft)
·B				15+84	7 #		<u> </u>	FSET 17			ALIGNMENT -Y1- EASTING 1,487,916		0 HR. 24 HR.	Dry FIAD
39.7 ft FF/DA	TE F&R2			<b>PTH</b> 31. 36% 02/16/					594,455 DRILL METHOD	SPT				Automatic
				<b>TE</b> 08/1			0		E 08/17/16		SURFACE WATER DEP			
				N 22.7 f								111 IN/		
RUN	DRILL	REC.		SAMP.	STR		L							
(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	REC. (ft) %	RQD (ft) %	0 G	ELEV. (ft)		D	ESCRIPTION AND REMARK	5		DEPTH (ft)
											Begin Coring @ 9.0 ft			
2.7	1:36/0.7 1:38/1.0 1:05/1.0	(1.7) 63%	(0.8) 30%		(6.0) 52%	(1.9) 17%		- 630.7 -			CRYSTALLINE ROCK e to Moderately Severe Weat			
5.0	1:41/1.0 1:13/1.0	(3.1) 62%	(1.1) 22%					-	Hard (METAD	IOR	ITE) with Moderately Close to Spacing	Very Clo	se Fractur	e
	1:09/1.0	02 /0	2270					-			GSI=35-50			
5.0	1:30/1.0 1:46/1.0	(1.8)	(0.3)					-						
	1:53/1.0 1:39/1.0	36%	6%					-						
	1:27/1.0 1:29/1.0				(8.6)	(5.3) 47%	Ø	619.2	White-Gray, Very	Slig	ht to Moderate Weathering, V	ery Hard	to Modera	20.5 ately
5.0	1:51/1.0 1:30/1.0	(3.7) 74%	(2.5) 50%	RS-4	77%	47%		-			Z DIORITE) with Moderately ( Spacing		Jose Frac	ture
	1:32/1.0 1:25/1.0							  -	R	S-4:	22.3'-22.6', qu=9,590 psi, GS	I=45-60		
5.0	1:37/1.0	(4.3)	(2.5) 50%	-				-						
	1:15/1.0 1:25/1.0 1:16/1.0	86%	50%					-						
	1:24/1.0							608.0	Boring Torminat	od a	t Elevation 608.0 ft in CRYST			31.7
								-	Doning Terminat	sua	QUARTZ DIORITE)			
									NOTES: 1) Auger Refusal a	+ 0 0	יר			
											ocation in roadway			
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## CORE PHOTOGRAPHS: NCDOT U-5806 Bridge, Cabarrus Co., EB2-B: -Y1- 15+84, 17' Rt.



## LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.:44378.1.D1TIP NO.:U-5806COUNTY:CabarrusDESCRIPTION:Intersection of SR 2894 (Concord Mills Blvd) and Entrance No. 1 Kings Grant Pavilion

Sample #	Boring #	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus, E (ksi)	GSI
RS-1	EB1-A	-Y1-	13+69	14' Lt.	24.3-24.6	Meta Quartz Diorite	PzZq	38%	3.82	1.77	182.3	16,830	2,999	50-65
RS-2	EB1-B	-Y1-	13+34	24' Rt.	23.5-23.8	Meta Quartz Diorite	PzZq	54%	3.88	1.77	180.7	7,397	876	65-80
RS-3	EB2-A	-Y1-	15+29	15' Lt.	24.5-24.8	Meta Quartz Diorite	PzZq	52%	3.81	1.77	171.0	4,600	352	45-60
RS-4	EB2-B	-Y1-	15+84	17' Rt.	22.3-22.6	Meta Quartz Diorite	PzZq	50%	3.83	1.77	178.2	9,590	1,373	45-60

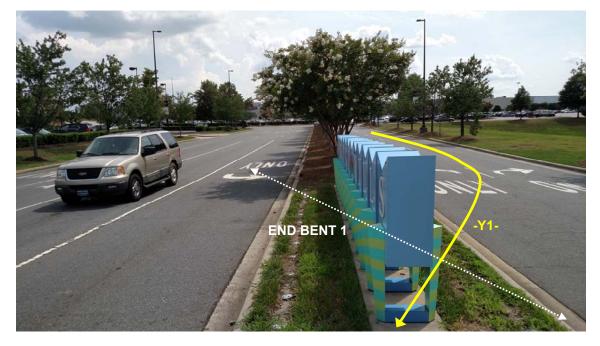




Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) towards End Bent 2



Photograph No. 2: On –L- (Concord Mills Blvd.) looking northwest towards End Bent 2



Photograph No. 3: On –Y1- (Kings Grant Pavilion) looking southwest



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806	CONTENTS <u>SHEET NO.</u> 1 2 2A 3 6-10 11 12	DESCRIPTION TITLE SHEET LEGEND (SOL & ROCK) SUPPLEMENTAL LEGEND (GSI) BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS ROCK TEST RESULTS SUMMARY SITE PHOTOGRAPH(S)	<section-header><section-header><section-header><text><text></text></text></section-header></section-header></section-header>
PROJECT: 44378			

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U–5806	1	13

## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES, THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLT EST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 TOT-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARLY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLED DATA AND THE IN STUY UN-PLACETTEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESSE MATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

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

PERSONNEL

M. ARNOLD

S. DAVIS

T. SHARPE

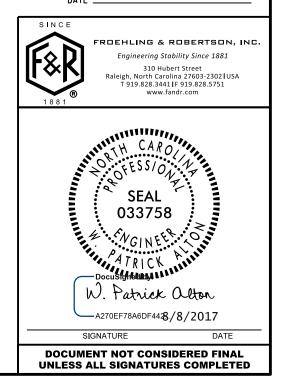
INVESTIGATED BY \_\_\_\_\_\_.

DRAWN BY <u>T.T. WALKER</u>

CHECKED BY <u>P. ALTON</u>

SUBMITTED BY P. ALTON

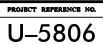
DATE AUGUST 2017



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

				SOIL	DESC	RIPT	ON							GF	ADATION						ROCK E	ESCRIPTION	
BE PENE ACCORD IS	TRATED ING TO BASED O	With a Ci The Stani N The Aa	ontinuous Dard Peni Shto Sys	FLIGHT P TRATION T TEM. BASIC	OWER A EST (A DESCR	UGER AN ASHTO T IPTIONS	D YIELI 206, A GENERA	d less 1 Stm D158 NLLY INCI	RTH MATERIALS TI THAN 100 BLOWS P 36J. SOIL CLASSIF LUDE THE FOLLOW PERTINENT FACTO	ER FOOT ICATION ING:	UNIFORML	Y GRADED - INC	DICATE	S THAT SOIL		L APPROXI ZES OF TW	FROM FINE TO COARSE. MATELY THE SAME SIZE. O OR MORE SIZES.	ROCK LINE SPT REFUS/ BLOWS IN I REPRESENT	INDICATES THE I AL IS PENETRATI NON-COASTAL PL ED BY A ZONE O	LEVEL A ION BY A AIN MA	AT WHICH NON-( A SPLIT SPOON TERIAL, THE HERED ROCK.	I WOULD YIELD SPT RE OASTAL PLAIN MATERIA SAMPLER EQUAL TO OR RANSITION BETWEEN S	al Would Yiel R Less Than (
A	S MINER	ALOGICAL	COMPOSIT	ION, ANGUL	ARITY, S	STRUCTU	RE, PLAS	STICITY, I	ETC. FOR EXAMPLE					OUNDNESS OF	SOIL GRAINS IS DE		BY THE TERMS:		RIALS ARE TYPIC	1////			
				ND AND							<u></u>	ANGULAR, <u>SUBAN</u>			OR <u>ROUNDED.</u> CAL COMPOSI	TION		ROCK (WR)			NON-COASTAL P 100 BLOWS PER	AIN MATERIAL THAT W FOOT IF TESTED.	OULD YIELD SI
GENERAL CLASS.			ar Materia Passing "2	00)		SILT-CLAY > 35% PA	SSING 2	00)	ORGANIC MATER	IALS			IES SUC	CH AS QUARTZ	FELDSPAR, MICA, T	ALC, KAOLI		CRYSTALLIN ROCK (CR)	E	ا المغر		GRAIN IGNEOUS AND N PT REFUSAL IF TESTED SCHIST, ETC.	
GROUP CLASS.	A-1 A-1-a A-		A-2-4 A-2	A-2 -5 A-2-6 A-	2-7	4 A-5		A-7-5 A-7-5	A-1, A-2 A-4, A-5 A-3 A-6, A-7						RESSIBILITY			NON-CRYSTA ROCK (NCR)				E GRAIN METAMORPHIC / DCK THAT WOULD YEILD	
SYMBOL						1.7.4						MODER	RATELY	OMPRESSIBLE COMPRESSIBL	E	LL < 3 LL = 3		COASTAL PL		_	COASTAL PLAIN	UDES PHYLLITE, SLATE, SEDIMENTS CEMENTED	INTO ROCK, BU
% Passing "10									RANULAR SILT-	MUCK,		HIGHL			GE OF MATER		0	SEDIMENTAR (CP)			SPT REFUSAL. SHELL BEDS,ET	ROCK TYPE INCLUDES LI C.	IMESTONE, SAN
40	30 MX 50	MX 51 MN							SOILS SOILS	PEAT				GRANULAR	SILT - CLAY			<b> </b>				THERING	
Material Passing "40	10 MA 20			MX 35 MX 35					SOILS WITH		TRACE	ANIC MATERIAL OF ORGANIC MA ORGANIC MATTI ATELY ORGANIC		<u>SOILS</u> 2 - 3% 3 - 5% 5 - 10%	<u>SUILS</u> 3 - 5% 5 - 12% 12 - 20%	TRACE LITTL SOME		FRESH	HAMMER IF CR	LY FRES	NE. H, JOINTS STAIN	ints may show slight Ed, some joints may sh	HOW THIN CLAY
LL PI GROUP INDEX	6 MX	- NP Ø		4N 40 MX 41 4X 11 MN 11 4 MX	MN 10		11 MN	11 MN	LITTLE OR MODERATE AMOUNTS OF	HIGHLY ORGANIC		ORGANIC		> 10%	> 20% JND WATER	HIGHL		(V SLI.) SLIGHT	OF A CRYSTAL	LINE NA	TURE.	E SHINE BRIGHTLY. ROCK	
usual types of major	STONE FR	AGS. FINE		or clayey L and sand	-	silty S01ls	CLAN	rEY .	ORGANIC	SOILS		▽		ER LEVEL IN I	BORE HOLE IMMEDIA		R DRILLING	(SLI.)	1 INCH. OPEN J CRYSTALS ARE	joints M Dull A	ND DISCOLORED.	Y. IN GRANITOID ROCKS CRYSTALLINE ROCKS RIN	Some occasion NG UNDER HAMM
MATERIALS GEN. RATING AS SUBGRADE	Sand		ENT TO GO		+	FAIR T			AIR TO POOR	UNSUITABLE					ATURATED ZONE, OR		ARING STRATA	MODERATE (MOD.)	granitoid Roc Dull Sound U	CKS, MOST INDER HA	FELDSPARS AR	DISCOLORATION AND WEA E DULL AND DISCOLORED, D SHOWS SIGNIFICANT LO	, SOME SHOW CL
		P1 OF 4	-7-5 SUBGF	oup is ≤ li	L - 30 ;	PIOF A-7	6 SUBGR	ioup is > i	LL - 30	1		0-111-	SPRI	NG OR SEEP				MODERATELY	WITH FRESH RO ALL ROCK EXC		RTZ DISCOLORED	OR STAINED. IN GRANIT	OID ROCKS. ALL
			CON	SISTEN	1	R DEM			RANGE OF UN	0.50.50	<b></b>		!	MISCELLA	NEOUS SYMBO	DLS		SEVERE (MOD. SEV.)	AND DISCOLORE	ed and #	A MAJORITY SHO	W KAOLINIZATION. ROCK GIST'S PICK. ROCK GIVES	SHOWS SEVERE
PRIMARY	SOIL TY	PE	COMPACTN CONSIST	ENCY		ETRATION (N-V			COMPRESSIVE (TONS/F	STRENGTH	[ []	ROADWAY EMBA WITH SOIL DES					SLOPE INDICATOR	SEVERE (SEV.)	ALL ROCK EXC	EPT QUA		OR STAINED. ROCK FABF IN GRANITOID ROCKS A	
GENERA GRANUL			LOO	ε		4 T	010		N/A			SOIL SYMBOL		-	UPT DAT TEST BOF		INSTALLATION		TO SOME EXTE	NT. SOM		STRONG ROCK USUALLY	
MATERIA (NON-CO			DENS VERY D	ε			0 50		N/H		X	ARTIFICIAL FIL THAN ROADWAY			AUGER BORING	Ø	CONE PENETROMETER	VERY SEVERE	ALL ROCK EXC	EPT QUA	RTZ DISCOLORED	OR STAINED. ROCK FABR D SOIL STATUS, WITH ONL	
GENERA			VERY SOF				2 10 4		< 0.25 0.25 TO			INFERRED SOIL	. BOUN	IDARY -(	)- CORE BORING	•	SOUNDING ROD	(V SEV.)				OF ROCK WEATHERED TO EMAIN. <u>IF TESTED, WOULL</u>	
SILT-CL MATERIA (COHESI	.AY AL		MEDIUM STIF	STIFF		4 1 8 T	10 8 0 15 10 30		0.5 TO 1 TO 2 2 TO	1.0 2		INFERRED ROCK				au - 🖣	WITH CORE	COMPLETE		NCENTRA		NOT DISCERNIBLE, OR DIS MAY BE PRESENT AS DIKE	
			HAR					'F	> 4						DATION SYMB						ROCK	HARDNESS	
U.S. STD. SI	EVE SIZ	'F		4 10		40	60	200	270					CLASSIFIED E			SSIFIED EXCAVATION -	VERY HARD			BY KNIFE OR S	HARP PICK. BREAKING OF ST'S PICK.	HAND SPECIME
OPENING (M				.76 2.0	0 e	.42		0.075	0.053					SUITABLE WAS		USED	TABLE.BUT NOT TO BE IN THE TOP 3 FEET OF	HARD	CAN BE SCRAT	CHED BY	KNIFE OR PICK	ONLY WITH DIFFICULTY.	, HARD HAMMER
BOULDE (BLDR.)		COBBLE (COB.)		AVEL GR.)	S	ARSE AND E. SD.)		FINE SAND (FSD.)	SILT (SL.)	CLAY (CL.)					KCAVATION - RADABLE ROCK	EMBA	KMENT OR BACKFILL	MODERATELY HARD	EXCAVATED BY	CHED BY HARD B	KNIFE OR PICK	GOUGES OR GROOVES TO GIST'S PICK, HAND SPEC	
GRAIN MN SIZE IN			75 3	2.0	9		0.25		0.05 0.00	5	AR - AUGEI BT - BORIN CL CLAY	NG TERMINATED		MICA	MEDIUM MICACEOUS MODERATELY	WE4	- VANE SHEAR TEST WEATHERED · UNIT WEIGHT	MEDIUM HARD		ED OR G		es deep by firm press d peices 1 inch maximum	
601	MOISTU	SOIL		FURE -			ION	OF T	ERMS			E PENETRATION	TEST	NP - N	ON PLASTIC ORGANIC		DRY UNIT WEIGHT		POINT OF A GE	EOLOGIST	'S PICK.		
		LIMITS)		FIELD P DESCF - SATU	RIPTION				ID: VERY WET. USL		DMT - DILA DPT - DYN	ATOMETER TEST		PMT - EST SAP	PRESSUREMETER TE SAPROLITIC AND, SANDY	s -	BULK	SOFT	FROM CHIPS TO	O SEVER		Y KNIFE OR PICK. CAN B ZE BY MODERATE BLOWS SSURE.	
	+ .10	UID LIMI	· _	(SA)			FROM	BELOW	THE GROUND WATE	R TABLE		NATIO		SL 9 SLI	ILT, SILTY SLIGHTLY	ST RS	- SPLIT SPOON - SHELBY TUBE - ROCK	VERY SOF T				XCAVATED READILY WITH N BY FINGER PRESSURE.	
RANGE <				- WET	- (W)				DUIRES DRYING TI JM MOISTURE	נ	FRAGS FI	RAGMENTS	URES	w - M	TRICONE REFUSAL	CBF	- RECOMPACTED TRIAXIAL - CALIFORNIA BEARING		FRACTURE				BEDDING
(P]) PL _				- MOIST	r . (M)		501 104		NEAR OPTIMUM M		HI HIGHL		JIPM	V - VE ENT USED	ON SUBJECT	PROJ	RATIO CT	VERY WI WIDE		MORE T	<u>Pacing</u> Han 10 feet ) 10 feet	TERM VERY THICKLY THICKLY BEDDE	
		rimum mo Rinkage l					30210			513 TONE				NCING TOOLS:				MODERAT	ELY CLOSE	1 10	3 FEET	THINLY BEDDEC	D 6
				- DRY ·	- (D)				ITIONAL WATER T JM MOISTURE	0	СМЕ-4 Х СМЕ-5				FLIGHT AUGER	CORE S	UTOMATIC MANUAL	CLOSE VERY CL	OSE L		TO 1 FOOT AN 0.16 FEET	THICKLY LAMIN THINLY LAMINA	NATED Ø.
				PL	ASTI	CITY										-в	🛛 "						
SLI		PLASTIC		PLAS	<u>TICITY</u> 0- 6-1		(P1)		DRY STREN VERY LOI SLIGHT	v		550 SHEAR TEST		HARD FACED	E INSERTS	X-N HAND 1		FOR SEDIME		NDURATIO	RUBBING WI	DENING OF MATERIAL BY TH FINGER FREES NUME W BY HAMMER DISINTED	ROUS GRAINS:
	ERATEL	Y PLASTI ASTIC	C		16- 26 OR	MORE			MEDIUM HIGH			ABLE HOIST	×	CASING	W/ ADVANCER STEEL TEETH	۹ 🔲 ۱	DST HOLE DIGGER AND AUGER	MODE	RATELY INDURAT	TED		BE SEPARATED FROM S ILY WHEN HIT WITH HAI	
L					COLI										TUNGCARB.		DUNDING ROD	INDU	RATED			DIFFICULT TO SEPARAT	
									LLOW-BROWN, BLU CRIBE APPEARANC					CORE BIT			ANE SHEAR TEST	EXTR	EMELY INDURATE	ED		ER BLOWS REQUIRED TO AKS ACROSS GRAINS.	O BREAK SAMP



TED. AN INFERRED	TERMS AND DEFINITIONS
D SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
0.1 FOOT PER 60 K IS OFTEN	ADUIFER - A WATER BEARING FORMATION OR STRATA.
	<u>ARENACEOUS</u> - 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
PT N VALUES >	ANGLEAREDUS - APPCIED TO ALL ROLKS OF SUBSTANCES COMPOSED OF CLAT MINERALS, OF MAYING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
ROCK THAT INCLUDES GRANITE,	ANTESTAN " UNDURU WHICH THAT IS UNDER SUFFICIENT FRESSURE TO RISE HOUVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
TAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
. IF TESTED. TC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
T MAY NOT YIELD DSTONE, 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.
k rings under	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
COATINGS IF OPEN.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
Rock up to Val Feldspar	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
ER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
:TS. IN LAY. ROCK HAS TH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
HU CUMPHRED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FELDSPARS DULL LOSS OF STRENGTH	<u>Formation (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
ARE DISCERNIBLE OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
at only minor	OF AN INTERVENING IMPERVIOUS STRATUM.
<u>VALUES &lt; 100 BPF</u> Y IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
RS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
NS REQUIRES	SAPPOLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BLOWS 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 INTRUDED ROCKS.
DEEP CAN BE DETACHED	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D BLOWS OF THE	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 WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
IN FRAGMENTS INT. SMALL, THIN	<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
K. PIECES 1 INCH CHED READILY BY	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	BENCH MARK: TBM: BY5-404 METAL SURVEY DISK N: 594,551, E: 1,487,930
THICKNESS 4 FEET	
1.5 - 4 FEET	ELEVATION: 644.32 FEET
0.16 - 1.5 FEET .03 - 0.16 FEET	NOTES:
008 - 0.03 FEET < 0.008 FEET	F.I.A.D.= FILLED IMMEDIATELY AFTER DRILLING
EAT, PRESSURE, ETC.	
Ε.	
STEEL PROBE:	
PROBE:	
LE;	DATE: 8-15-14

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

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

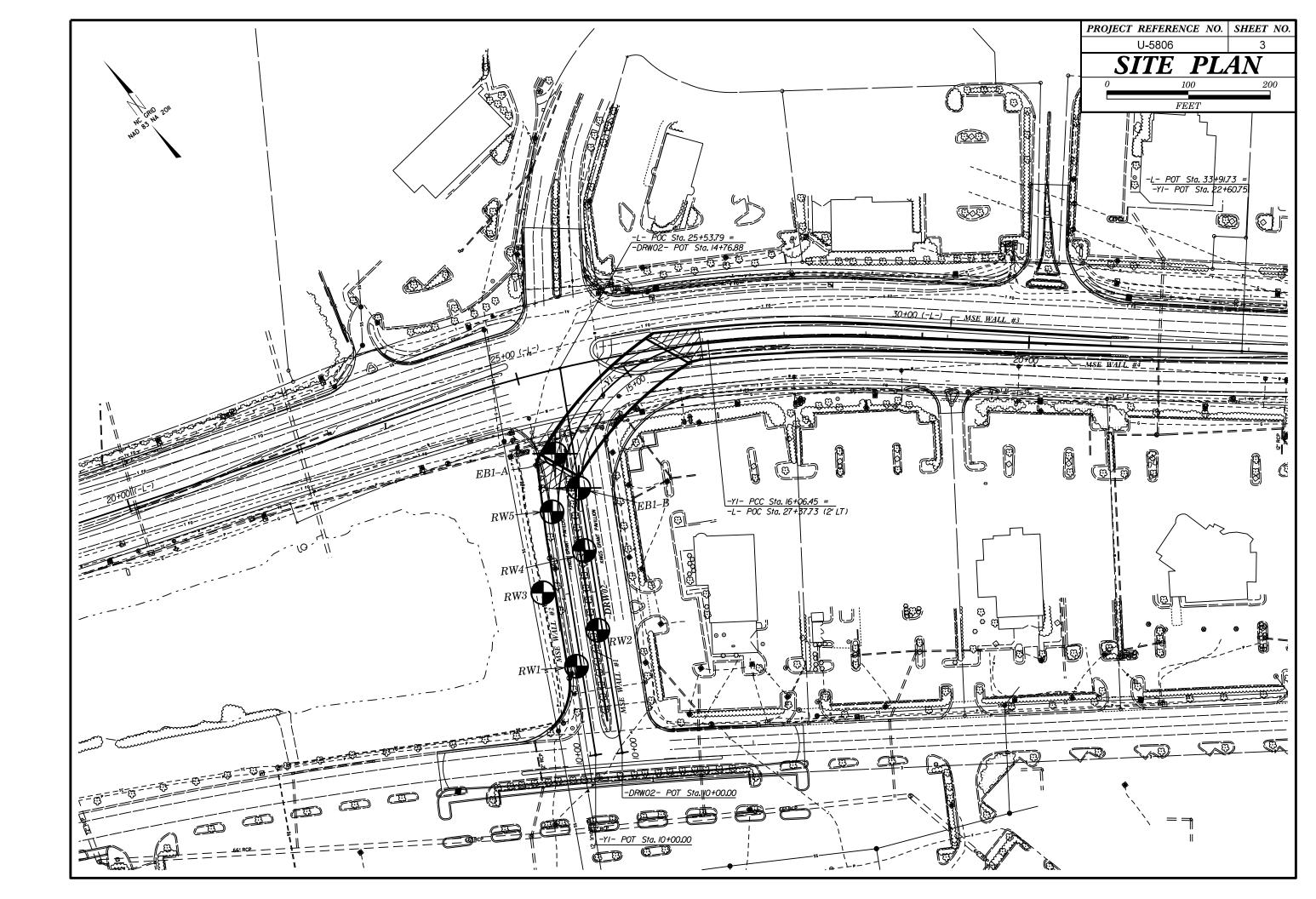
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI)FOR JOINTED ROCKS (Hoek and Marinos, 2000)	aces	p		s G	s O O	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	0D igh, fresh unweathered surf	600D Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfac with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfac with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the conditi of the discontinuities and estimate the average val of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fa poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING S	URFACE QUI	ALITY 💳	╤ <b>&gt;</b>	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked up:	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting x of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with Stone and Stone or silty shale
VERY BLOCKY - interlocked, cc partially disturbed mass with Z multi-faceted angular blocks y formed by 4 or more joint sets		5	50			thin inter- layers of siltstone siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Means deformation after tectonic disturbance

		U–5	806			2A
Tectonically Defo	prmed Heterog	geneous Rock	Masses (Marır	nos and	Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	600D - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth,occasionally slickensided surfaces with compact	coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
	70 60	A		/		
E. Weak siltstone or clayey shale with sandstone layers		50 B 40	С	s/	E	
leformed, d/faulted, hale or siltstone deformed s forming an tructure			30	F 20		
leformed silty forming a e with pockets yers of ransformed pieces.			\$		-	10 1

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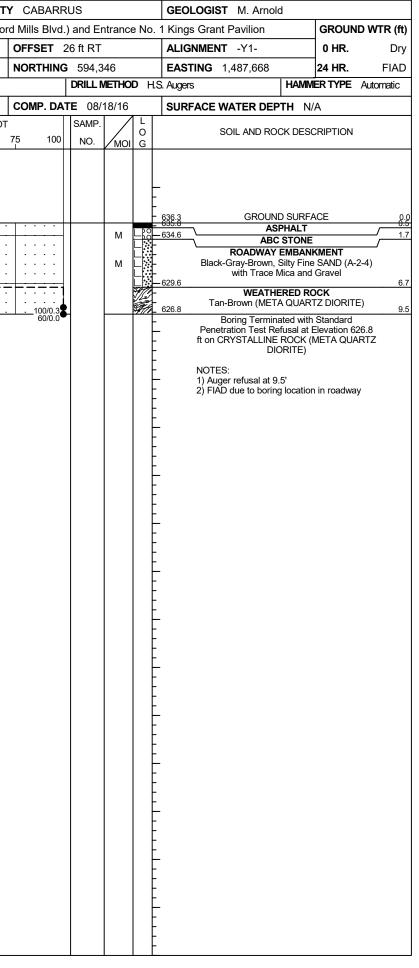
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DATE: 8-19-16



## GEOTECHNICAL BORING REPORT BORE LOG

									URE L															
	44378					<b>P</b> U-5806			Y CABARI					OGIST M. Arnold	1	_	<b>S</b> 44378					<b>U</b> -5806		COUNTY
SITE	DESCR	IPTION	I MSE	E Wall	s at In	tersection (	of SR 2894	(Concor	rd Mills Blvd	.) and Ei	ntranc	e No	. 1 Kings	Grant Pavilion	GROUND WTR (f	) SIT	E DESCR	RIPTION	MSE	E Walls	s at Inte	ersection of	SR 2894	(Concord
BOR	NG NO.	RW2	2		S	TATION 1	1+50		OFFSET	27 ft RT			ALIG	IMENT -Y1-	0 HR. Dr	вО	ring no	. RW4	1		ST	ATION 12+	-49	
COLI	AR ELE	<b>IV.</b> 63	38.1 ft		т	OTAL DEP	<b>TH</b> 14.1 ft		NORTHIN	<b>G</b> 594,2	258		EAST	NG 1,487,623	24 HR. FIAI	co	LLAR EL	<b>EV.</b> 63	36.3 ft		то	TAL DEPTH	9.5 ft	
DRILL	RIG/HAN	MMER E	FF./DA	TE F8	R2175	CME-55 869	% 02/16/2010	6		DRILL	METHC	DD ⊦	I.S. Augers	HAMM	ER TYPE Automatic	DRI	LL RIG/HA	MMER E	FF./DAT	TE F&	R2175 (	CME-55 86%	02/16/2016	6
DRIL	LER S.	. Davis			S		E 08/18/1	6	COMP. DA	TE 08/	/18/16		SURF	ACE WATER DEPTH N	/A	DR	LLER S	5. Davis	;		ST	ART DATE	08/18/16	6
ELEV	DRIVE ELEV	DEPTH	BLC	w col	JNT		BLOWS F	PER FOOT		SAMP.		L				ELE	/ DRIVE ELEV	DEPTH	BLO	W COU	JNT		BLOWS P	ER FOOT
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50	75 100	NO.	мо	O I G	ELEV. (ft)	SOIL AND ROCK DESC	DEPTH	(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	0 7
									-															-
640																640								
0.10	-	-												GROUND SURF	ACE			ŧ						
	637.7 -	- 0.4 -	19	19	10		20				м		636.6	ASPHALT		<u>A</u> 5		‡						
635	- 634.6	25					<b>6</b> 29						636.1	ABC STONE ROADWAY EMBAN		635	635.8	- 0.5	20	17	17		• • • •	
	- 034.0	- 3.5	12	27	43						м		$\vdash$	Black-Gray-Brown, Silty Fine	e SAND (A-2-4)		632.8	3.5						
	-	F									1		F	with Trace Mic RESIDUAL			002.0	<del></del>	24	18	15			
630	629.6 -	8.5			00/0		+ • • • •				1		629.1	Black-Dark Brown, Silty Fi SAND (A-2-4) with Tra	ine to Coarse ace Mica	630		Ŧ						
	-	F	27	38	62/0.4			<b>.</b> 	· 100/0.9	•	1	T.		WEATHERED RO	ОСК	1	627.8	8.5	100/0					
005	-	È.									1		F F	Orange-Dark Brown (ME DIORITE)	TA QUARTZ		626.8	<u>+ 9.5</u> +	100/0.3 60/0.0					
625	624.6 -	- 13.5	70	30/0.1					+ • • • •				624.0		14	1	-	‡						
	-								100/0.6				L	Boring Terminated at Eleva WEATHERED ROCK (ME	ation 624.0 ft in ETA QUARTZ			t						
	-	-											-	DIORITÈ)				Ŧ						
	-	F												NOTE: 1) FIAD due to boring locatior	n in roodwov		-	Ŧ						
	-	-											-	T) FIAD due to boiling location	ITITTOadway			ŧ						
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## **GEOTECHNICAL BORING REPORT** BORFIOG

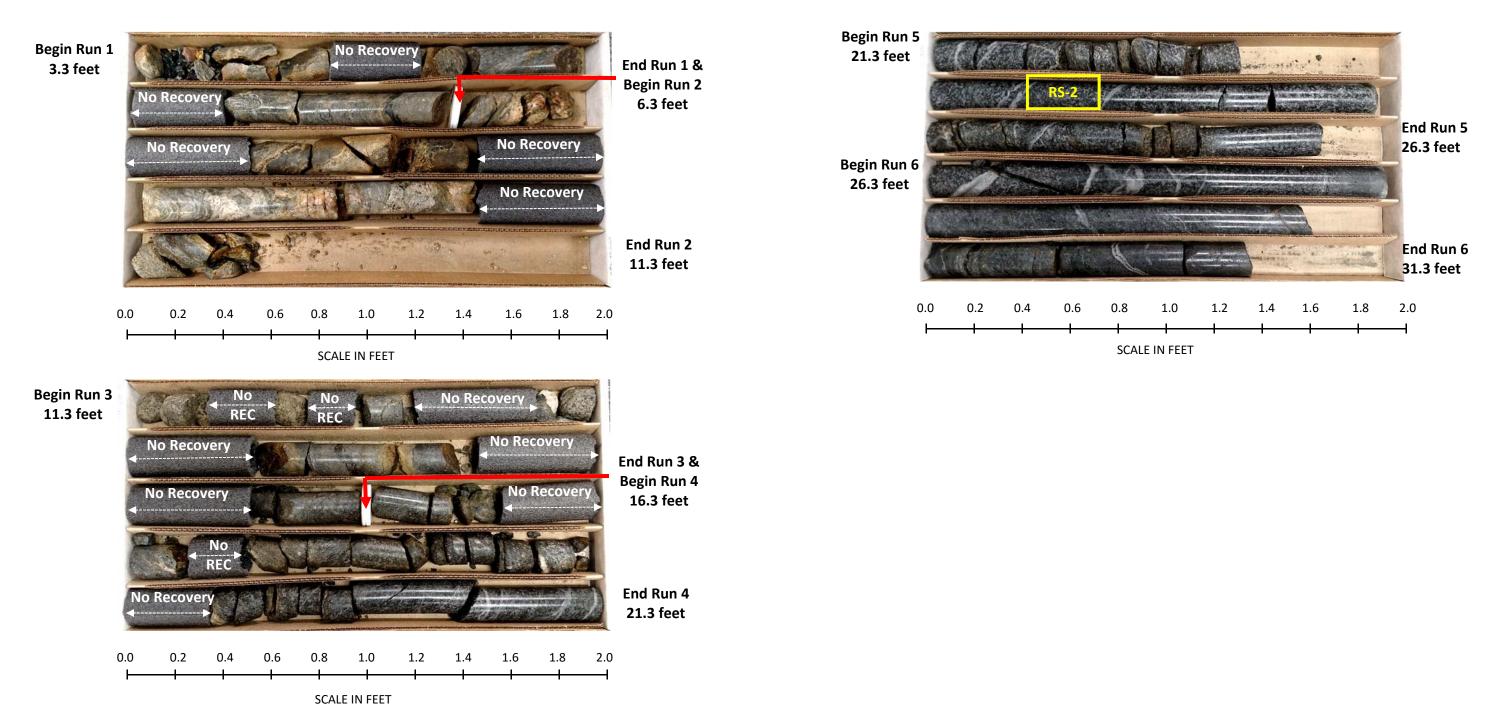
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WBS	4437	78.1.D1			ר	TIP U-5	5806		COUNT	Y CABAR	RUS			GE	OLOGIST M. Arno	ld	-		IF		44378					U-580			OUNT
SITE	DESC	RIPTIO	N Inte	ersecti	on of	SR 289	4 (Co	ncord M	ills Blvd.)	and Entrand		-	Gran				GROUN	ID WTR (ft)	I F					ersection	1			Mills I	3lvd.)
BORI	NG NC	<b>).</b> EB1	-В		5	STATIO	<b>N</b> 13	+34		OFFSET	24 ft RT	-		ALI	GNMENT -Y1-		0 HR.	Dry			NG NO				-		13+34		
		L <b>EV.</b> 6						<b>H</b> 31.3		NORTHIN					<b>STING</b> 1,487,708		24 HR.	FIAD			AR EL						<b>PTH</b> 31		
DRILL	RIG/H/	AMMER E	EFF./DA	TE F	&R217	5 CME-5	5 86%	5 02/16/20	16		DRILL	METHO	DD S	SPT Core	Boring	HAM	MER TYPE	Automatic	]  -					TE F&R2					
DRIL	_ER \$	S. Davis	6		5	START [	DATE	08/23/	16	COMP. DA	<b>TE</b> 08	/24/16		SU	RFACE WATER DE	PTH N	I/A		IF		LER S		5		<u> </u>		<b>TE</b> 08/2		
ELEV	DRIVE ELEV		· <b> </b>	ow co	-	_			PER FOO		SAMP	. <b>V</b>			SOIL AND RO	OCK DES	CRIPTION			COR		NQ3	,		1	AL RUI Un	N 28.0		RATA
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	5	50	75 100	NO.	Имо	I G	ELEV	(ft)			DEPTH (ft)		ELEV (ft)	RUN ELEV	DEPTH (ft)	RUN (ft)	IVAIL	REC.	RQD (ft) %	SAMP. NO.	REC.	RQD
																					(ft)	(,	(,	(Min/ft)	%	%		%	(ft) %
640		+												_						631.8	631.8	3.3	3.0	1:23/1.0 1:31/1.0	(2.2)	(1.0)		(5.6)	(2.3) 26%
		Ŧ												F						630	628.8	6.3		3:26/1.0				62%	26%
635		Ŧ												635.1		ID SURF	ACE	0.0				‡	5.0	1:52/1.0 1:25/1.0	(3.0) 60%	(1.3) 26%			
	634.5	<u>+ 0.6</u>	21	20	22		· · ·		2			м		- 634.5 - 633.6		SPHALT	=	<u>0.6</u> 	а г	625		+ 		1:37/1.0 1:27/1.0					
-	631.9	3.2	60/0.1	-				· · · · ·		60/0.1	•			632.2 631.8		' Embai	KMENT	2.9			023.0	<u>+ 11.3</u> +	5.0	1:33/1.0	(2.3)	(0.7)		(45.7)	
630		Ŧ								- <del></del>	4			-	with Trace	Gravel a	nd Mica	2-4)		620		ŧ		1:31/1.0		14%		(15.7) 83%	(8.4) 44%
		Ŧ								.	]			L	<b>CRYST</b> Tan-Gray-Brow			Ξ)		020	618.8	16.3	5.0	1:23/1.0 1:37/1.0		(1.0)			
625		1					• •							-								ŧ	5.0	1:47/1.0 1:22/1.0 1:29/1.0	76%	20%			
		ŧ									!			622.8				12.3		615	613.8	$\frac{1}{213}$		1:33/1.0					
<b>COO</b>		‡					· · ·	· · · · ·			!			L	White-Gray (ME	FA QUAI	RTZ DIORIT	E)			010.0	+	5.0	1:40/1.0 1:32/1.0	(5.0)	(2.7)			
620		+									1			-						610		Ŧ		1:30/1.0 1:26/1.0		54 /0	RS-2	7	
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Ī		+				+		<u></u>	<u> </u>	.	•			- 003.0	Boring Terminate	d at Elev	ation 603.8	ft in			-	ŧ							
		Ŧ												-	CRYSTALLINE F	ORITE)	ETA QUAR	IZ				ŧ							
		Ŧ												-	NOTES:	0.01					-	‡							
		Ŧ												F	<ol> <li>Auger Refusal at 2) FIAD due to bori</li> </ol>	3.2' ng locatio	on in roadwa	y			•	ŧ							
		Ŧ												-								ŧ							
		Ŧ												F							-	ŧ							
		Ŧ												F					8/4/17			‡							
		Ŧ												-					DT 8		-	‡							
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		Ŧ												_					NCDOT			<u>‡</u>							

## GEOTECHNICAL BORING REPORT CORE LOG

JUNT	ΥC	ABARR	US		GEOLOGI	ST	M. Arnolo	ł		
slvd.) a	and E	Entrance	No. 1 Kings Gr	ant I	Pavilion				GROUN	D WTR (ft)
	OF	FSET 2	24 ft RT		ALIGNME	NT	-Y1-		0 HR.	Dry
	NO	RTHING	594,414		EASTING	1,	487,708		24 HR.	FIAD
			DRILL METHOD	SP	T Core Boring			HAMM	ER TYPE	Automatic
	со	MP. DA	<b>FE</b> 08/24/16		SURFACE	WA	ATER DEP	TH N/	A	
ATA RQD	L O			D	ESCRIPTION	AN	D REMARKS	6		
(ft) %	G	ELEV. (f	ť)							DEPTH (ft)
(2.3)	72)	- 631.8			Begin Cor		@ 3.3 ft NE ROCK			3.3
(2.3) 26%		_	Tan-Gray-Brown, Hard (QUARTZ S		ht to Moderate	ely S	Severe Weat			lium
		-					5-50	0.00011	aota o ope	l
		-								
		622.8								12.3
(8.4) 44%		_	White-Gray, Ver Hard (META QU							
		-			Sp 23.5'-23.8', qu	oacii	ng			
		-								
		-								
		-								
		-								
		-								
		-								
		 603.8								31.3
		-	Boring Termina	ted a			ft in CRYST/ IORITE)	ALLINE F	ROCK (ME	
		-	NOTES:							
		-	1) Auger Refusal a 2) FIAD due to bo	at 3.2 ring l	2' location in roa	dwa	v			
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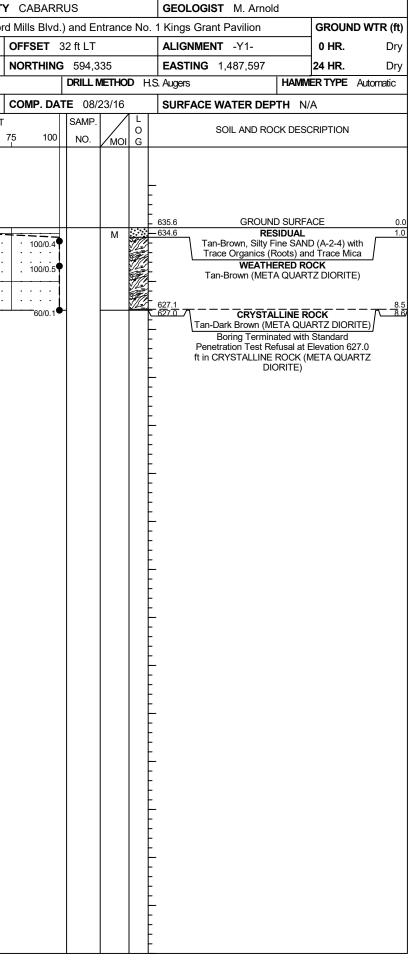


CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB1-B: -Y1- 13+34, 24' Rt.



## GEOTECHNICAL BORING REPORT BORE LOG

									URE L				1			ı ——								
		78.1.D1				<b>P</b> U-5806			CABAR				GEOLOGIST			-	<b>3</b> 44378					<b>P</b> U-5806		COUNTY
SITE	DESC	RIPTIO	N MS	E Wal				· ·		-	ntranc	e No	1 Kings Grant P	avilion	GROUND WTR (ft)	SITE	DESCR		I MSE	Wall				4 (Concord
BOF	RING NO	<b>).</b> RW	1		S	TATION 1	1+11		OFFSET	6 ft LT			ALIGNMENT	-Y1-	0 HR. 16.9	BOR	RING NO	RW3	3		ST	TATION 1	2+06	
COL	LAR EI	L <b>EV.</b> 6	38.2 ft		т	OTAL DEPT	<b>FH</b> 28.9 ft	:	NORTHIN	<b>G</b> 594,2	238		EASTING 1,4	87,576	24 HR. FIAD	COL	LAR ELI	<b>EV.</b> 63	35.6 ft		тс	DTAL DEP	TH 8.6 ft	
DRIL	l Rig/H	AMMER B	EFF./DA	TE F	&R2175	CME-55 865	% 02/16/201	6		DRILL	METHO	DD H	S. Augers	HAMN	NER TYPE Automatic	DRIL	l rig/ha	MMER E	FF./DA	TE F8	R2175	CME-55 86	% 02/16/201	16
DRII	LER	S. Davis	5		S		E 08/18/1	6	COMP. DA	TE 08/	/18/16		SURFACE WA	TER DEPTH N	/A	DRIL	LER S	. Davis			ST		E 08/23/1	6
ELEV	DRIVE	DEPTH	BLC	ow co				PER FOOT		SAMP.		1				ELEV		DEPTH	1	w col				PER FOOT
(ft)	ELEV (ft)	(ft)	· — —	0.5ft		0 2			75 100		мо	0	SOI ELEV. (ft)	L AND ROCK DES	CRIPTION DEPTH (fi	(ft)	ELEV (ft)	(ft)	0.5ft			0		50 7
640		4											_			640		Ļ						
	637.5	+ 0.7					<u>.</u>						638.2 637.5	GROUND SURF	0.7			ŧ						
635		‡	14	16	12		<b>●</b> 28				м		636.3	ABC STONE		635	635.6 ·	0.0					_	
000	634.7	- 3.5	11	10	9	· · · ·	<u> </u>				м	Ľ	– R Gray-B	OADWAY EMBAN rown, Silty Fine to (	Coarse SAND	000	1 -	ŧ	5	25	100/0.4			
1		<u>†</u>				· · ·//·		· · · ·						(A-2-4) with Trace	Mica		632.1	3.5	100/0 5					
630	620 7	+ 8.5										L				630		Ł	100/0.5					
	023.1	+ 0.0	2	3	3	<b>6</b> · · ·					м		- 629.4 Dark Gra	y-Dark Brown, Silty	8.8 Fine to Coarse			ł					· · · ·	
		Ŧ											SAND (#	-2-4) with Trace O and Mica	12.0		627.1	8.5	60/0.1					
625	624.7	+ 13.5		<u> </u>							1			RESIDUAL Brown, Silty Fine to		]	-	ŧ						
		‡	8	14	22		36				м		Orange-	(A-2-4) with Trace				ŧ						
		t									$\square$	_						ŧ						
620	619.7	+ 18.5	16	14	16		<u>i</u>		+		М		618.9		19.3			F						
		Ŧ					<b>•</b> 30						. Black-Ora	ange-Brown, Fine S with Trace Mic	Sandy SILT (A-4)			ł						
615		Ŧ											•		54			Ŧ						
	614.7	+ 23.5	41	78	22/0.1							477	614.2	WEATHERED R	24.0		-	ŧ						
		‡						· · · ·	. 100/0.6				Tan-0	Drange-Brown (MET DIORITE)				ŧ						
610	609.7	28.5											609.3	DIORITE)	28.9			Ł						
	000.7		100/0.4	4					100/0.4	•		<u></u>	Boring	erminated at Eleva HERED ROCK (ME DIORITE)	ation 609.3 ft in		-							
		+											NOTE: 1) FIAD d	, ue to boring location	n in roadway		-							
		+											_					+ +						
																	-							
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		‡ +											—				· · · · · · · · · · · · · · · · · · ·	+ +						
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# GEOTECHNICAL BORING REPORT

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WBS	44378	3.1.D1			Т	IP	<b>U</b> -5806		COUN
SITE	DESCR		MS	E Wall	s at In	te	ersection o	of SR 2894	4 (Conce
	ING NO					_	ATION 1		
	AR ELI						TAL DEPT		
DRILL	RIG/HA	MMER E	FF./DA	TE F8	&R2175	(	CME-55 86%	6 02/16/201	6
DRIL	LER S	. Davis				T/		08/19/1	6
	DRIVE ELEV	DEPTH		W CO				BLOWS	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	$\left  \right $	0 2	25 5	50 I
635	634.0	0.6				L			
		- 0.0	16	18	21	1		· · • • 39_	
	631.1 630.6	3.5	100/0.3			L	· · · · ·	· · · · ·	
		<u> </u>	60/0.0						
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	SAL BC ORE L		GI		FURI				
	Y CABARR				GEOLO	GIST M. Arnol	d		
(Concor	d Mills Blvd.)	) and Er	ntranc	e No.	1 Kings G	rant Pavilion		GROUN	OWTR (ft)
	OFFSET 7							0 HR.	Dry
	NORTHING		07		EASTIN			24 HR.	FIAD
				DDH.	S. Augers		HAMM	ER TYPE	
6	COMP. DAT	<b>FE</b> 08/ <sup>-</sup>	19/16		SURFAC	E WATER DEF	 РТН N/	A	
ER FOOT		SAMP.	<b>V</b> /	1	1				
0	75 100	NO.	мо	O G	ELEV. (ft)	SOIL AND RO	CK DESC	CRIPTION	DEPTH (ft)
					624.6				0.0
			м	LPO	- 634.6 634.0 633.1	AS	D SURFA		0.0 0.6 1.5
			101		·		STONE		
• • • •	100/0.3 60/0.0	1			631.1 630.6 B	lack-Gray-Brown,		SAND (A-2	-4)
					: [-	WEATH	ERED RO	DCK	
					:		ORITE)		
					- <u> </u>	Boring Termin enetration Test Re	ated with		0.6
					ft o	on CRYSTALLINE	ROCK (I ORITE)	META QUA	RTZ
							UNIE)		
					1)	OTES: Auger refusal at 4	.0'		
					. 2)	FIAD due to borin	g locatior	in roadway	
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## **GEOTECHNICAL BORING REPORT** BORE LOG

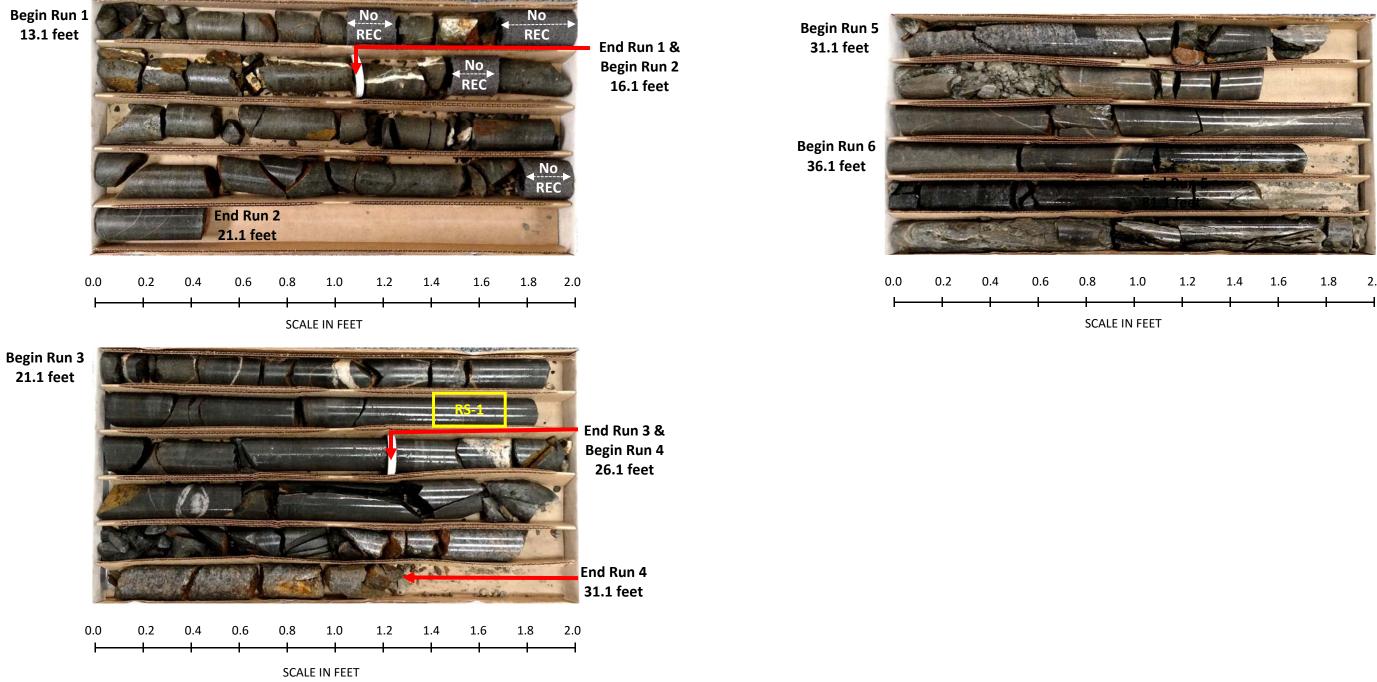
											D	ORE		JG								44070							
	4437						U-58					CABA						GEOLOGIST M. Arnold				44378		بغيرا ا			U-580		
SITE	DESCR	RIPTION	l Int	ersec	tion c					/ills E		nd Entra			-	s Gra			GROUND WTR (ft)						rsection	1			
BOR	NG NO	. EB1-	A			STA	ATION	13-	+69			OFFSET	14	ft LT				ALIGNMENT -Y1-	0 HR. Dry			NG NO.						13+69	
		<b>EV.</b> 63							<b>H</b> 41.1			NORTH						EASTING 1,487,711	24 HR. FIAD						TE F&R2			<b>PTH</b> 41	
		MMER E		ATE	F&R2	175 C	ME-55	86%	02/16/2	016								3	MER TYPE Automatic										
		6. Davis	-				ART DA		08/22			COMP.				3		SURFACE WATER DEPTH	J/A			LER S E SIZE						TE 08/2 N 28.0	
ELEV (ft)	DRIVE ELEV	DEPTH (ft)	<u> </u>	OW C	_		0	25		S PEF 50	RFOOT	75 1		SAMP.	17			SOIL AND ROCK DES							DRILL	RI	UN	20.0	STF
()	(ft)	(,	0.51	0.5	1 0.8		0	25	,	50				NO.	/ мс	DI G	<u> </u>	EV. (ft)	DEPTH (ft)		ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	(ft)	RATE (Min/ft)	REC. (ft)	RQD (ft) %	SAMP. NO.	STF REC. (ft) %
																					521.1	(,			(	70	70		70
635	600 F	+ + 0.7								<u> </u>							- 6	4.2 GROUND SURF	ACE 0.0		620	621.1	13.1	3.0	3:10/1.0 1:29/1.0	(2.3) 77%			(26.5) 95%
	055.5	± 0.7	19	14	1	5	· · ·	:	<b>.</b> 29	· · ·			.		м		<u>0</u> -6	3.5         ASPHALT           2.6         ABC STONE	16		-	618.1	16.1	5.0	1:49/1.0 1:29/1.0				9370
630	630.7	3.5	43	100/0	).4			•	I <u> </u>			· · ·						0.2 ROADWAY EMBAN Brown-Dark Gray, Silty Find	e SAND (A-2-4)		615	-	+	0.0	1:15/1.0	86%	14%		
		ŧ					· · ·	:	· · ·	:   :		100/0	.4					with Trace Gravel a WEATHERED R	and Mica		010		21.1		1:27/1.0				
	625.7	- - 8.5					· · ·	:	· · ·				: ]					6.3 Brown-Dark Gray (MET DIORITE)			Ī	-	-	5.0	2:26/1.0 1:27/1.0	(4.9)	(1.9)		
625	-	ŧ	60/0.	1								60/0	.1					CRYSTALLINE			610	-	+		1:33/1.0 1:37/1.0	0070	0070	RS-1	_
	004.4	±					· · ·	•	· · ·	· · ·		· · · ·	:					Brown-Dark Gray (MET DIORITE)			-	608.1	26.1	5.0	1:33/1.0 2:06/1.0	(5.0)	(0.8)	1.0-1	-1
620	621.1	<u> </u>	60/0.	0				·		• •		• • 60/0	.0•					CRYSTALLINE F			605	-	+	0.0	1:55/1.0 3:51/1.0	100%	16%		
		ŧ					· · · · · ·	:	· · · · · ·		· · · ·	· · · ·	:					Brown-Dark Gray (MET DIORITE)	IA QUARTZ			603.1	31.1		2:06/1.0 2:16/1.0				
615		ŧ					· · ·	:	· · · · · ·		· · · ·	· · · ·	:									-	-	5.0	2:28/1.0 1:56/1.0	(5.0) 100%	(2.0) 40%		
015	-	ŧ						.					-							_	600	-	Ē		3:37/1.0 1:57/1.0				
		ŧ					· · ·	:	· · · · · ·	.   .	· · · ·										+	598.1	<u>    36.1    </u>	5.0	2:04/1.0 2:13/1.0	(5.0)	(3.0)		
610	-	‡											-11-	RS-1							595	_	E		2:24/1.0 1:49/1.0	100%	60%		
		ŧ					· · · · · ·	:	· · · · · ·	.   .	· · · ·		·	R0-1	1							593.1	41.1		2:17/1.0 2:32/1.0				
605		ŧ					· · ·	:	· · · · · ·													-	Ļ						
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600	-	Ŧ					· · · ·		· · · ·													-	÷						
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595	_	Ŧ															E					-	+						
		Ŧ														S.	5	3.1	41.1			-	+						
		Ŧ															E	Boring Terminated at Eleva CRYSTALLINE ROCK (M	IETA QUARTZ			-	+						
	-	ŧ															F	DIORITÉ)				-	+						
		ŧ															F	NOTES: 1) Auger Refusal at 13.1'		2		-	+						
	-	ŧ															F	2) FIAD due to boring location	on in roadway	8/4/1		-	+						
		ŧ															Ę			GDT		-	+						
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## **GEOTECHNICAL BORING REPORT** CORE LOG

1:27/1.0       (4.9)       (1.9)         1:26/1.0       98%       38%         1:33/1.0       RS-1         1:33/1.0       100%         1:35/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:66/1.0       100%         2:66/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:56/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:56/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:55/1.0       100%									
STATION         13+69         OFFSET         14 ft LT         ALIGNMENT         -Y1-         0 HR.         Dry           TOTAL DEPTH         41.1 ft         NORTHING         594,462         EASTING         1,487,711         24 HR.         FIAD           E F&R2175         OME-55         86%         02/16/2016         DRILL METHOD         SPT Core Boring         HAMMER TYPE         Automatic           START DATE         08/22/16         COMP. DATE         08/23/16         SURFACE WATER DEPTH         N/A           DRILL         RUN         28.0 ft         DESCRIPTION AND REMARKS         DEPTH (n)           MMr/T         Viral         RRATA         L         ELEV. (n)         DESCRIPTION AND REMARKS         DEPTH (n)           130/10         (23)         0.4)         (26.5)         (8.8)         31%         EELV. (n)         DESCRIPTION AND REMARKS         DEPTH (n)           130/10         (23)         0.4)         (26.5)         (8.8)         31%         EELV. (n)         DESCRIPTION AND REMARKS         DEPTH (n)           130/10         (43)         (07)         13%         95%         31%         EEV. (n)         DESCRIPTION AND REMARKS         DEPTH (n)           133/10         (28.1)         (43)		TIP	U-580	)6	C	OUNT	ΥC	ABARRUS GEOLOGIST M. Arnold	
TOTAL DEPTH         41.1 ft         NORTHING         594.462         EASTING         1,487,711         24 HR.         FIAD           FRR2175         CME-55         86% 02/16/2016         DRILL METHOD         SPT Core Boing         HAMMER TYPE         Automatic           START DATE         08/22/16         COMP. DATE         08/23/16         SURFACE WATER DEPTH         N/A           DRILL         REVN         28.0 ft         DESCRIPTION AND REMARKS         DESCRIPTION AND REMARKS         DEPTH (ft)           DRIUL         REVN         SAMP.         STRATA         L         DESCRIPTION AND REMARKS         DEPTH (ft)           10/1.0         (2.3)         (0.4)         (26.5)         (8.8)         E12.1         DESCRIPTION AND REMARKS         DEPTH (ft)           120/1.0         77%         13%         (26.5)         (8.8)         E62.1.1         DERVER Care Very Slight to Moderate Weathering, Hard to Medium Hard (META QUARTZ DIORITE) with Close to Very Close Fracture Spacing R3-1: 24.3-24.6', qu=16.830 psi, GSI=50-65         13.1           1371.0         (5.0)         (2.0)         (5.0)         (2.0)         SSIMP         SSIMP         SSIMP         41.1           13371.0         (5.0)         (5.0)         (3.0)         SSIMP         SSIMP         SSIMP         SSIMP	ection c	of SR 2	2894 (	Concord	Mills E	Blvd.) a	-		GROUND WTR (ft)
FBR2175 CME-55 86% 02/16/2016         DRILL METHOD         SPT Core Boring         HAMMER TYPE         Automatic           START DATE         08/22/16         COMP. DATE         08/23/16         SURFACE WATER DEPTH         N/A           TOTAL RUN         28.0 ft         DRILL         RUN         SAMP.         STRATA         DESCRIPTION AND REMARKS           DRILL         RATE         00/0         SAMP.         STRATA         DESCRIPTION AND REMARKS         DEPTH (t)           DRILL         RUN         28.0 ft         Gestanta         DESCRIPTION AND REMARKS         DEPTH (t)           DRILL 80.0         Comp. Dark Grav, Very Stight to Moderate Weathering, Hard to Medium         13.1         13.1           129/10         (4.3)         (0.7)         13%         SSMAP         SSMAP         13.1           129/10         (4.3)         (0.7)         13%         SSMAP         SSMAP         SSMAP         13.1           128/10         138/0         Comp. Dark Grav, Very Stight to Moderate Weathering, Hard to Medium         13.1         13.1           128/10         (6.0)         (1.8)         SSMAP         SSMAP         SSMAP         SSMAP           228/10         (5.0)         (2.0)         SSMAP         SSMAP         SSMAP         <		STA	ΓΙΟΝ	13+69			OF	SET 14 ft LT ALIGNMENT -Y1-	0 HR. Dry
START DATE         08/22/16         COMP. DATE         08/23/16         SURFACE WATER DEPTH         N/A           TOTAL RUN         28.0 ft         Image: Complex Com							NO		
TOTAL RUN         28.0 ft           DRILL RATE (Min/rt)         RUN (ft)         SAMP. (ft)         STRATA (ft)         DESCRIPTION AND REMARKS (ft)         DESCRIPTION AND REMARKS (ft)           10/10         (23)         (0.4)         STRATA (ft)         ELEV. (ft)         DESCRIPTION AND REMARKS (ft)         DEPTH (ft)           129/10         (23)         (0.4)         (ft)         (ft)         Gradient (ft)         CRYSTALLINE ROCK         13.1           129/10         77%         13%         (ft)         (ft)         13.1         Brown-Dark Gray, Very Sight to Moderate Weathering, Hard to Medium Hard (META QUARTZ DIORITE) with Cose to Very Close Fracture Spacing (ft)         13.1           129/10         (ft)         (ft)         (ft)         (ft)         (ft)         (ft)         13.1           129/10         (ft)         (ft) <td>F&amp;R2</td> <td>175 CN</td> <td>/IE-55 8</td> <td>36% 02/16/</td> <td>2016</td> <td></td> <td></td> <td>DRILL METHOD SPT Core Boring HAMM</td> <td>ER TYPE Automatic</td>	F&R2	175 CN	/IE-55 8	36% 02/16/	2016			DRILL METHOD SPT Core Boring HAMM	ER TYPE Automatic
DRILL RATE (Min/ft)         RUN Ref: (Min/ft)         SAMP RO.         STRATA Ref: (Min/ft)         SAMP Ref: (Min/ft)         STRATA (R) (Min/ft)         DESCRIPTION AND REMARKS (Min/ft)         DEPTH (ft)         DEPTH (ft)           10/10         (2.3)         (0.4)         (0.7)         13%         6         ELEV. (ft)         DESCRIPTION AND REMARKS           129/10         77%         13%         (26.5)         (8.8)         621.1         CrystalLine ROCK         13.1           129/10         77%         13%         (26.5)         (8.8)         621.1         Brown-Dark Gray, Very Slight to Moderate Weathering, Hard to Medium Hard (META QUARTZ DIORITE) with Close to Very Close Fracture Spacing RS-1: 24.3'-24.6', qu=16.830 psi, GSI=50-65           139/10         RS-1         RS-1         RS-1         14%         14%           133/10         RS-1         16%         16%         16%         16%           133/10         RS-1         16%         16%         16%         16%         16%		STAF	rt da	<b>TE</b> 08/2	2/16		со	MP. DATE 08/23/16 SURFACE WATER DEPTH N/	A
Ummini         1/2<		TOTA	AL RU	<b>N</b> 28.0 f					
Ummini         1/2<		REC.	JN RQD		REC.	RQD	L O	DESCRIPTION AND REMARKS	
1:101.0       (2.3)       (0.4)       (26.5)       (8.8)       621.1       CRYSTALLINE ROCK       13.1         1:291.0       77%       13%       13%       Brown-Dark Gray, Very Slight to Moderate Weathering, Hard to Medium Hard (META QUARTZ DIORITE) with Close to Very Close Fracture Spacing RS-1: 24.3'-24.6', qu=16,830 psi, GSI=50-65       14%       14/10       10/10 <td>(Min/ft)</td> <td>(II) %</td> <td>(II) %</td> <td>NO.</td> <td>(II) %</td> <td>%</td> <td>G</td> <td>ELEV. (ft)</td> <td>DEPTH (ft)</td>	(Min/ft)	(II) %	(II) %	NO.	(II) %	%	G	ELEV. (ft)	DEPTH (ft)
129/1.0       77%       13%       95%       31%       Brown-Dark Gray, Very Slight to Moderate Weathering, Hard to Medium         139/1.0       (4.3)       (0.7)       14%       14%       14%         128/1.0       (4.3)       (1.9)       14%       14%       14%         128/1.0       (4.3)       (1.9)       13%       RS-1: 24.3:-24.6', qu=16,830 psi, GSI=50-65         127/1.0       98%       38%       RS-1: 24.3:-24.6', qu=16,830 psi, GSI=50-65         1371.0       RS-11       100%       16%         133/1.0       RS-11       100%       16%         126/1.0       (5.0)       (2.0)       16%         126/1.0       100%       40%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%       60%         123/1.0       100%	3.10/1.0	(2.3)	(0.4)		(26.5)	(8.8)			13.1
12911.0       (4.3)       (0.7)         1511.0       86%       14%         12711.0       98%       38%         12711.0       98%       38%         12711.0       98%       38%         12311.0       10         12311.0       100%         1331.0       10         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1231.10       100%         1331.10       100%         1491.10       100%         1231.10       100%         130.10       100%         130.10       100%         131.10       100%         131.10       100%         141.10       100%         131.10       100%         131.10       100%         131.10       100%         131.10       100%         131.10	:29/1.0					31%		Brown-Dark Gray, Very Slight to Moderate Weathering, Ha	rd to Medium
1:18/1.0	:29/1.0							RS-1: 24.3'-24.6', qu=16,830 psi, GSI=50-65	acture opacing
2:2611.0 (4.9) (1.9) 1:2711.0 98% 38% RS-1 1:3311.0 RS-1 1:3711.0 RS-1 1:5511.0 100% 16% 1:5511.0 100% 16% 1:5511.0 100% 40% 1:5611.0 100% 40% 1:5711.0 100% 40% 1:5711.0 100% 60% 1:3711.0 100% 60% 1:3711.0 5.0 (3.0) 1:3711.0 5.0 (3.0) 1:3711.0 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTES: 1) Auger Refusal at 13.1'	1:18/1.0	0070	1470					-	
1:27/1.0       98%       38%         1:33/1.0       RS-1         1:33/1.0       RS-1         1:33/1.0       RS-1         1:33/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:56/1.0       100%         1:56/1.0       100%         2:32/1.0       500         1:57/1.0       500         1:57/1.0       500         1:57/1.0       500         1:57/1.0       500         2:32/1.0       593.1         593.1       41.1         Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)         NOTES:       1) Auger Refusal at 13.1'	:45/1.0	(1.0)	(1.0)						
1:37/1.0       RS-1         1:33/1.0       (5.0)         1:33/1.0       100%         1:55/1.0       100%         1:55/1.0       100%         1:61/1.0       16%         2:28/1.0       (5.0)         1:55/1.0       100%         2:28/1.0       (5.0)         1:55/1.0       100%         2:28/1.0       (5.0)         1:57/1.0       100%         2:37/1.0       100%         1:57/1.0       100%         2:34/1.0       (5.0)         1:49/1.0       593.1         2:32/1.0       593.1         41.1       593.1         41.1       Auger Refusal at 13.1'	1:27/1.0								
2:06/1.0 (5.0) (0.8) 1:55/1.0 100% 16% 2:06/1.0 2:06/1.	:37/1.0			RS-1				-	
11.1       100%         12:06/1.0       100%         12:28/1.0       (5.0)         12:37/1.0       100%         15:771.0       100%         10:0%       60%         12:24/1.0       100%         12:24/1.0       100%         12:32/1.0       593.1         593.1       41.1         12:32/1.0       593.1         VITTIO       593.1         41.1       100%         100%       10%         100%       10%	2:06/1.0	(5.0)	(0.8)						
2:16/1.0	8:51/1.0	100%	10%					_	
:56/1.0       100%       40%         :57/1.0       :       .         :13/1.0       (5.0)       (3.0)         ::24/1.0       .       .         :13/1.0       .       .         :24/1.0       .       .         ::32/1.0       .       .         :32/1.0       .       .         :32/1.0       .       .         .       .       .         .       .       .         .       .       .         .       .       .         .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .       .       .       .         .	2:16/1.0	(E.O)	(2.0)						
1:57/1.0       1:2:04/1.0         2:04/1.0       (5.0)         2:24/1.0       100%         0:24/1.0       100%         2:24/1.0       100%         0:2:32/1.0       593.1         2:32/1.0       593.1         41.1       Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)         NOTES:       1) Auger Refusal at 13.1'	:56/1.0	(5.0) 100%	(2.0) 40%						
2:13/1.0       (5.0)       (3.0)         1:24/1.0       100%       60%         2:49/1.0       593.1       593.1         2:32/1.0       593.1       41.1         Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)       0         NOTES:       1) Auger Refusal at 13.1'	:57/1.0							-	
1:49/1.0 2:17/1.0 3:32/1.0 Constraints of the constraint of the	2:13/1.0								
2:32/1.0 593.1 593.1 41.1 Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTES: 1) Auger Refusal at 13.1'	:49/1.0	100%	60%					-	
QUARTZ DIORITE)	2:32/1.0						X		
1) Auger Refusal at 13.1'									
								_	
								-	
								-	
								-	
								_	
								-	
								-	
								-	
								-	



## CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB1-A: -Y1- 13+69, 14' Lt.



## SHEET 10

End Run 5 36.1 feet

End Run 6 41.1 feet

2.0

## LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

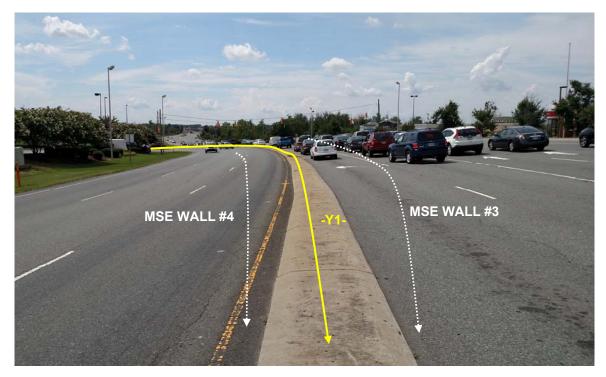
PROJECT NO.:44378.1.D1TIP NO.:U-5806COUNTY:CabarrusDESCRIPTION:Intersection of SR 2894 (Concord Mills Blvd) and Entrance No. 1 Kings Grant Pavilion

Sample #	Boring #	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus, E (ksi)	GSI
RS-1	EB1-A	-Y1-	13+69	14' Lt.	24.3-24.6	Meta Quartz Diorite	PzZq	38%	3.82	1.77	182.3	16,830	2,999	50-65
RS-2	EB1-B	-Y1-	13+34	24' Rt.	23.5-23.8	Meta Quartz Diorite	PzZq	54%	3.88	1.77	180.7	7,397	876	65-80

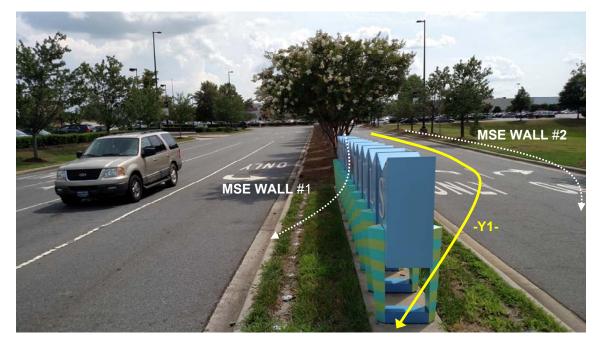




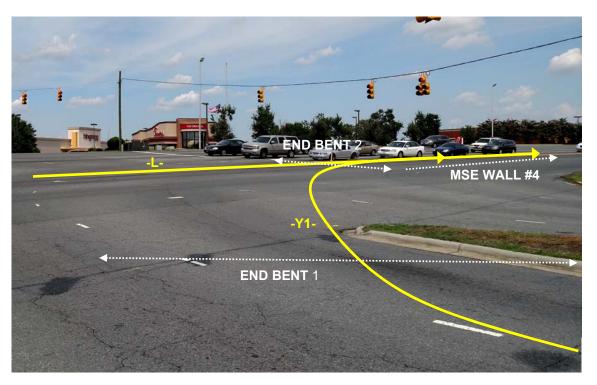
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



Photograph No. 2: On –L- (Concord Mills Blvd.) looking northwest



Photograph No. 3: On -Y1- (Kings Grant Pavilion) looking southwest



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806	CONTENTS <u>SHEET NO.</u> 1 2 2A 3 6-10 11 12	DESCRIPTION TITLE SHEET LEGEND SOLS & ROCKI SUPPLEMENTAL LEGEND (GSI) STE PLAN BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS ROCK TEST RESULTS SUMMARY SITE PHOTOGRAPH(S)	
PROJECT: 44378			

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U–5806	1	13

## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES, THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLT EST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 TOT-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARLY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLED DATA AND THE IN STUY UN-PLACETTEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESSE MATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

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

PERSONNEL

M. ARNOLD

S. DAVIS

T. SHARPE

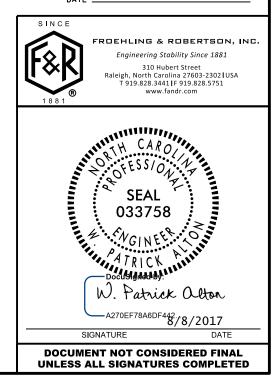
INVESTIGATED BY \_\_\_\_\_\_.

DRAWN BY <u>T.T. WALKER</u>

CHECKED BY <u>P. ALTON</u>

SUBMITTED BY P. ALTON

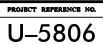
DATE AUGUST 2017



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

				SOIL	DESC	RIPT	ON							GF	ADATION						ROCK E	ESCRIPTION	
BE PENE ACCORD IS	TRATED ING TO BASED O	With a Ci The Stani N The Aa	ontinuous Dard Peni Shto Sys	FLIGHT P TRATION T TEM. BASIC	OWER A EST (A DESCR	UGER AN ASHTO T IPTIONS	D YIELI 206, A GENERA	d less 1 Stm D158 NLLY INCI	RTH MATERIALS TI THAN 100 BLOWS P 36J. SOIL CLASSIF LUDE THE FOLLOW PERTINENT FACTO	ER FOOT ICATION ING:	UNIFORML	Y GRADED - INC	DICATE	S THAT SOIL		L APPROXI ZES OF TW	FROM FINE TO COARSE. MATELY THE SAME SIZE. O OR MORE SIZES.	ROCK LINE SPT REFUS/ BLOWS IN I REPRESENT	INDICATES THE I AL IS PENETRATI NON-COASTAL PL ED BY A ZONE O	LEVEL A ION BY A AIN MA	AT WHICH NON-( A SPLIT SPOON TERIAL, THE HERED ROCK.	I WOULD YIELD SPT RE OASTAL PLAIN MATERIA SAMPLER EQUAL TO OR RANSITION BETWEEN S	al Would Yiel R Less Than (
A	S MINER	ALOGICAL	COMPOSIT	ION, ANGUL	ARITY, S	STRUCTU	RE, PLAS	STICITY, I	ETC. FOR EXAMPLE					OUNDNESS OF	SOIL GRAINS IS DE		BY THE TERMS:		RIALS ARE TYPIC	1////			
				ND AND							<u></u>	ANGULAR, <u>SUBAN</u>			OR <u>ROUNDED.</u> CAL COMPOSI	TION		ROCK (WR)			NON-COASTAL P 100 BLOWS PER	AIN MATERIAL THAT W FOOT IF TESTED.	OULD YIELD SI
GENERAL CLASS.			ar Materia Passing "2	00)		SILT-CLAY > 35% PA	SSING 2	00)	ORGANIC MATER	IALS			IES SUC	CH AS QUARTZ	FELDSPAR, MICA, T	ALC, KAOLI		CRYSTALLIN ROCK (CR)	E	ا المغر		GRAIN IGNEOUS AND N PT REFUSAL IF TESTED SCHIST, ETC.	
GROUP CLASS.	A-1 A-1-a A-		A-2-4 A-2	A-2 -5 A-2-6 A-	2-7	4 A-5		A-7-5 A-7-5	A-1, A-2 A-4, A-5 A-3 A-6, A-7						RESSIBILITY			NON-CRYSTA ROCK (NCR)				E GRAIN METAMORPHIC / DCK THAT WOULD YEILD	
SYMBOL						1.7.4						MODER	RATELY	OMPRESSIBLE COMPRESSIBL	E	LL < 3 LL = 3		COASTAL PL		_	COASTAL PLAIN	UDES PHYLLITE, SLATE, SEDIMENTS CEMENTED	INTO ROCK, BU
% Passing "10									RANULAR SILT-	MUCK,		HIGHL			GE OF MATER		0	SEDIMENTAR (CP)			SPT REFUSAL. SHELL BEDS,ET	ROCK TYPE INCLUDES LI C.	IMESTONE, SAN
40	30 MX 50	MX 51 MN							SOILS SOILS	PEAT				GRANULAR	SILT - CLAY			<b> </b>				THERING	
Material Passing "40	10 MA 20			MX 35 MX 35					SOILS WITH		TRACE	ANIC MATERIAL OF ORGANIC MA ORGANIC MATTI ATELY ORGANIC		<u>SOILS</u> 2 - 3% 3 - 5% 5 - 10%	<u>SUILS</u> 3 - 5% 5 - 12% 12 - 20%	TRACE LITTL SOME		FRESH	HAMMER IF CR	LY FRES	NE. H, JOINTS STAIN	ints may show slight Ed, some joints may sh	HOW THIN CLAY
LL PI GROUP INDEX	6 MX	- NP Ø		4N 40 MX 41 4X 11 MN 11 4 MX	MN 10		11 MN	11 MN	LITTLE OR MODERATE AMOUNTS OF	HIGHLY ORGANIC		ORGANIC		> 10%	> 20% JND WATER	HIGHL		(V SLI.) SLIGHT	OF A CRYSTAL	LINE NA	TURE.	E SHINE BRIGHTLY. ROCK	
usual types of major	STONE FR	AGS. FINE		or clayey L and sand	-	silty S01ls	CLAN	rEY .	ORGANIC	SOILS		▽		ER LEVEL IN I	BORE HOLE IMMEDIA		R DRILLING	(SLI.)	1 INCH. OPEN J CRYSTALS ARE	joints M Dull A	ND DISCOLORED.	Y. IN GRANITOID ROCKS CRYSTALLINE ROCKS RIN	Some occasion NG UNDER HAMM
MATERIALS GEN. RATING AS SUBGRADE	Sand		ENT TO GO		+	FAIR T			AIR TO POOR	UNSUITABLE					ATURATED ZONE, OR		ARING STRATA	MODERATE (MOD.)	granitoid Roc Dull Sound U	CKS, MOST INDER HA	FELDSPARS AR	DISCOLORATION AND WEA E DULL AND DISCOLORED, D SHOWS SIGNIFICANT LO	, SOME SHOW CL
		P1 OF 4	-7-5 SUBGF	oup is ≤ li	L - 30 ;	PIOF A-7	6 SUBGR	ioup is > i	LL - 30	1		0-111-	SPRI	NG OR SEEP				MODERATELY	WITH FRESH RO ALL ROCK EXC		RTZ DISCOLORED	OR STAINED. IN GRANIT	OID ROCKS. ALL
			CON	SISTEN	1	R DEM			RANGE OF UN	0.50.50	<b></b>		!	MISCELLA	NEOUS SYMBO	DLS		SEVERE (MOD. SEV.)	AND DISCOLORE	ed and #	A MAJORITY SHO	W KAOLINIZATION. ROCK GIST'S PICK. ROCK GIVES	SHOWS SEVERE
PRIMARY	SOIL TY	PE	COMPACTN CONSIST	ENCY		ETRATION (N-V			COMPRESSIVE (TONS/F	STRENGTH	[ []	ROADWAY EMBA WITH SOIL DES					SLOPE INDICATOR	SEVERE (SEV.)	ALL ROCK EXC	EPT QUA		OR STAINED. ROCK FABF IN GRANITOID ROCKS A	
GENERA GRANUL			LOO	ε		4 T	010		N/A			SOIL SYMBOL		-	UPT DAT TEST BOF		INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG RU IF TESTED, WOULD YIELD SPT N VALUES > 100 BPD					
MATERIA (NON-CO			DENS VERY D	ε			0 50		N/H		X	ARTIFICIAL FIL THAN ROADWAY			AUGER BORING	Ø	CONE PENETROMETER	VERY SEVERE	ALL ROCK EXC	EPT QUA	RTZ DISCOLORED	OR STAINED. ROCK FABR D SOIL STATUS, WITH ONL	
GENERA			VERY SOF				2 10 4		< 0.25 0.25 TO			INFERRED SOIL	. BOUN	IDARY -(	)- CORE BORING	•	SOUNDING ROD	(V SEV.)				OF ROCK WEATHERED TO EMAIN. <u>IF TESTED, WOULL</u>	
SILT-CL MATERIA (COHESI	.AY AL		MEDIUM STIF	STIFF		4 1 8 T	108 015 1030		0.5 TO 1 TO 2 2 TO	1.0 2		INFERRED ROCK				au - 🖣	WITH CORE	COMPLETE		NCENTRA		NOT DISCERNIBLE, OR DIS MAY BE PRESENT AS DIKE	
			HAR					'F	> 4						DATION SYMB						ROCK	HARDNESS	
U.S. STD. SI	EVE SIZ	'F		4 10		40	60	200	270					CLASSIFIED E			SSIFIED EXCAVATION -	VERY HARD			BY KNIFE OR S	HARP PICK. BREAKING OF ST'S PICK.	HAND SPECIME
OPENING (M				.76 2.0	0 e	.42		0.075	0.053					SUITABLE WAS		USED	TABLE.BUT NOT TO BE IN THE TOP 3 FEET OF	HARD	CAN BE SCRAT	CHED BY	KNIFE OR PICK	ONLY WITH DIFFICULTY.	, HARD HAMMER
BOULDE (BLDR.)		COBBLE (COB.)		AVEL GR.)	S	ARSE AND E. SD.)		FINE SAND (FSD.)	SILT (SL.)	CLAY (CL.)					KCAVATION - RADABLE ROCK	EMBA	KMENT OR BACKFILL	MODERATELY HARD	EXCAVATED BY	CHED BY HARD B	KNIFE OR PICK	GOUGES OR GROOVES TO GIST'S PICK, HAND SPEC	
GRAIN MN SIZE IN			75 3	2.0	9		0.25		0.05 0.00	5	AR - AUGEI BT - BORIN CL CLAY	NG TERMINATED		MICA	MEDIUM MICACEOUS MODERATELY	WE4	- VANE SHEAR TEST WEATHERED · UNIT WEIGHT	MEDIUM HARD		ED OR G		es deep by firm press d peices 1 inch maximum	
601	MOISTU	SOIL		FURE -			ION	OF T	ERMS			E PENETRATION	TEST	NP - N	ON PLASTIC ORGANIC		DRY UNIT WEIGHT		POINT OF A GE	EOLOGIST	'S PICK.		
		LIMITS)		FIELD P DESCF - SATU	RIPTION				ID: VERY WET. USL		DMT - DILA DPT - DYN	ATOMETER TEST		PMT - EST SAP	PRESSUREMETER TE SAPROLITIC AND, SANDY	s -	BULK	SOFT	FROM CHIPS TO	O SEVER		Y KNIFE OR PICK. CAN B ZE BY MODERATE BLOWS SSURE.	
	+ .10	UID LIMI	· _	(SA)			FROM	BELOW	THE GROUND WATE	R TABLE		NATIO		SL 9 SLI	ILT, SILTY SLIGHTLY	ST RS	- SPLIT SPOON - SHELBY TUBE - ROCK	VERY SOF T				XCAVATED READILY WITH N BY FINGER PRESSURE.	
RANGE <				- WET	- (W)				DUIRES DRYING TI JM MOISTURE	נ	FRAGS FI	RAGMENTS	URES	w - M	TRICONE REFUSAL	CBF	- RECOMPACTED TRIAXIAL - CALIFORNIA BEARING		FRACTURE				BEDDING
(P]) PL _				- MOIST	r . (M)		501 104		NEAR OPTIMUM M		HI HIGHL		JIPM	V - VE ENT USED	ON SUBJECT	PROJ	RATIO CT	VERY WI WIDE		MORE T	<u>Pacing</u> Han 10 feet ) 10 feet	TERM VERY THICKLY THICKLY BEDDE	
		rimum mo Rinkage l					30210			513 TONE				NCING TOOLS:				MODERAT	ELY CLOSE	1 10	) 3 FEET	THINLY BEDDEC	D 6
				- DRY ·	- (D)				ITIONAL WATER T JM MOISTURE	0	СМЕ-4				FLIGHT AUGER	CORE S	UTOMATIC MANUAL	CLOSE VERY CL	OSE L		TO 1 FOOT AN 0.16 FEET	THICKLY LAMIN THINLY LAMINA	NATED Ø.
				PL	ASTI	CITY										-в	🛛 "						
SLI		PLASTIC		PLAS	<u>TICITY</u> 0- 6-1		(P1)		DRY STREN VERY LOI SLIGHT	v		550 SHEAR TEST		HARD FACED	E INSERTS	X-N HAND 1		FOR SEDIME		NDURATIO	RUBBING WI	DENING OF MATERIAL BY TH FINGER FREES NUME W BY HAMMER DISINTED	ROUS GRAINS:
	ERATEL	Y PLASTI ASTIC	C		16- 26 OR	MORE			MEDIUM HIGH			ABLE HOIST	×	CASING	W/ ADVANCER STEEL TEETH	۹ 🔲 ۱	DST HOLE DIGGER AND AUGER	MODE	RATELY INDURAT	TED		BE SEPARATED FROM S ILY WHEN HIT WITH HAI	
L					COLI										• TUNGCARB.		DUNDING ROD	INDU	RATED			DIFFICULT TO SEPARAT	
									LLOW-BROWN, BLU CRIBE APPEARANC					CORE BIT			ANE SHEAR TEST	EXTR	EMELY INDURATE	ED		ER BLOWS REQUIRED TO AKS ACROSS GRAINS.	O BREAK SAMP



TED. AN INFERRED	TERMS AND DEFINITIONS
D SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
0.1 FOOT PER 60 K IS OFTEN	ADUIFER - A WATER BEARING FORMATION OR STRATA.
	<u>ARENACEOUS</u> - 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
PT N VALUES >	ANGLEAREDUS - APPCIED TO ALL ROLKS OF SUBSTANCES COMPOSED OF CLAT MINERALS, OF MAYING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
ROCK THAT INCLUDES GRANITE,	ATTESTAN " UNDUNU WHICH THAT IS UNDER SUFFICIENT FRESSURE TO RISE HOUVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
TAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
. IF TESTED. TC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
T MAY NOT YIELD DSTONE, 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.
k Rings under	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
COATINGS IF OPEN.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
Rock up to Val Feldspar	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
ER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
:TS. IN LAY. ROCK HAS TH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
HU CUMPHRED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FELDSPARS DULL LOSS OF STRENGTH	<u>Formation (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
ARE DISCERNIBLE OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
at only minor	OF AN INTERVENING IMPERVIOUS STRATUM.
<u>VALUES &lt; 100 BPF</u> Y IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
RS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
NS REQUIRES	SAPPOLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BLOWS 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 INTRUDED ROCKS.
DEEP CAN BE DETACHED	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D BLOWS OF THE	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 WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
IN FRAGMENTS INT. SMALL, THIN	<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
K. PIECES 1 INCH CHED READILY BY	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	BENCH MARK: TBM: BY5-404 METAL SURVEY DISK N: 594,551, E: 1,487,930
THICKNESS 4 FEET	
1.5 - 4 FEET	ELEVATION: 644.32 FEET
0.16 - 1.5 FEET .03 - 0.16 FEET	NOTES:
008 - 0.03 FEET < 0.008 FEET	F.I.A.D.= FILLED IMMEDIATELY AFTER DRILLING
EAT, PRESSURE, ETC.	
Ε.	
STEEL PROBE:	
PROBE:	
LE;	DATE: 8-15-14

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

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

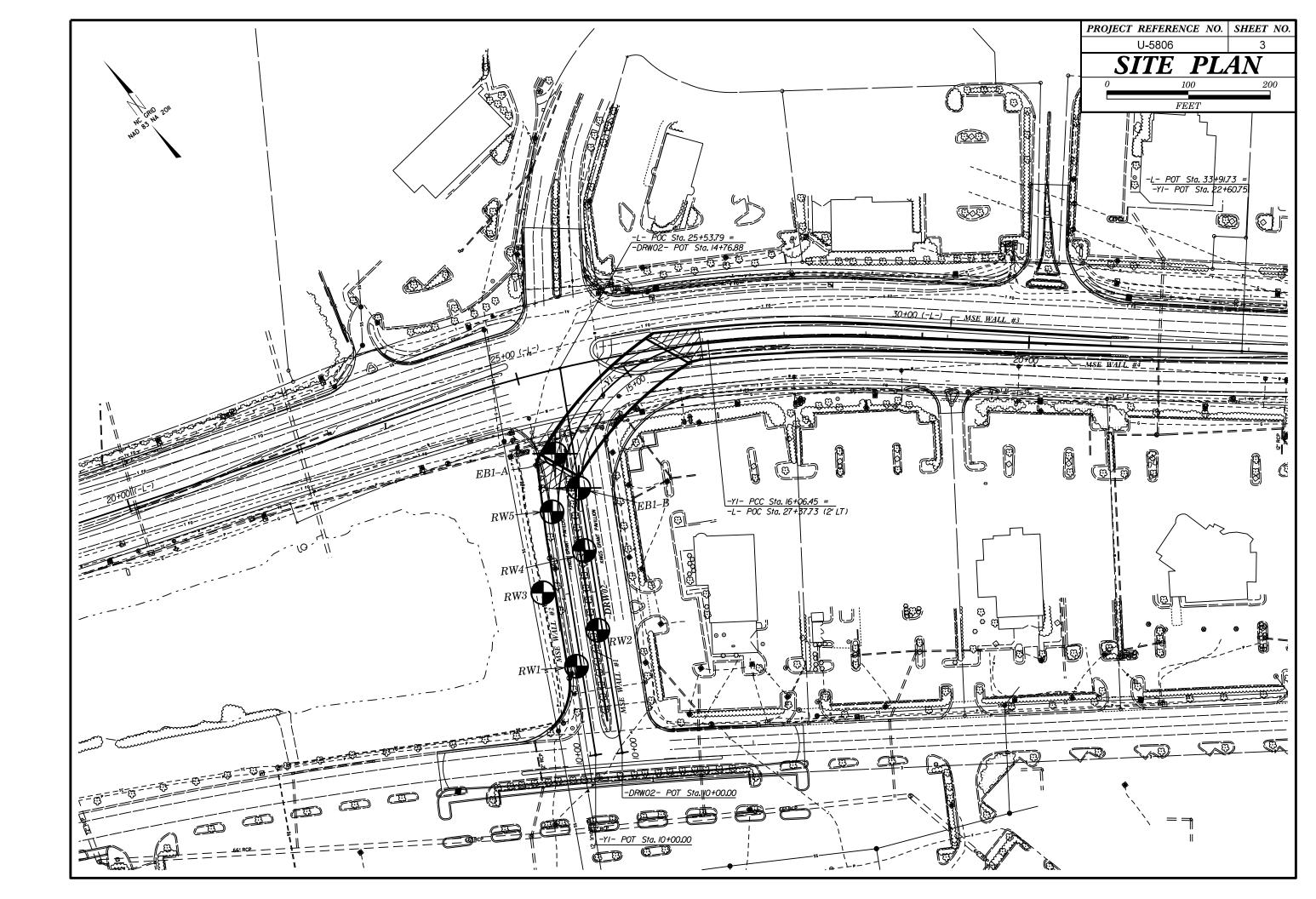
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI)FOR JOINTED ROCKS (Hoek and Marinos, 2000)	aces	p		s G	s O O	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	0D igh, fresh unweathered surf	600D Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfac with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfac with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the conditi of the discontinuities and estimate the average val of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fa poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING S	URFACE QUI	ALITY 💳	╤ <b>&gt;</b>	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked up:	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting x of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with Stone and Stone or silty shale
VERY BLOCKY - interlocked, cc partially disturbed mass with Z multi-faceted angular blocks y formed by 4 or more joint sets		5	50			thin inter- layers of siltstone siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Means deformation after tectonic disturbance

		2A				
Tectonically Defo	prmed Heterog	geneous Rock	Masses (Marır	nos and	Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	600D - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth,occasionally slickensided surfaces with compact	coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
	70 60	A		/		
E. Weak siltstone or clayey shale with sandstone layers		50 B 40	С	s/	E	
leformed, d/faulted, hale or siltstone deformed s forming an tructure			30	F 20	./	
leformed silty forming a e with pockets yers of ransformed pieces.			\$		-	10 1

PROJECT REPERENCE NO.

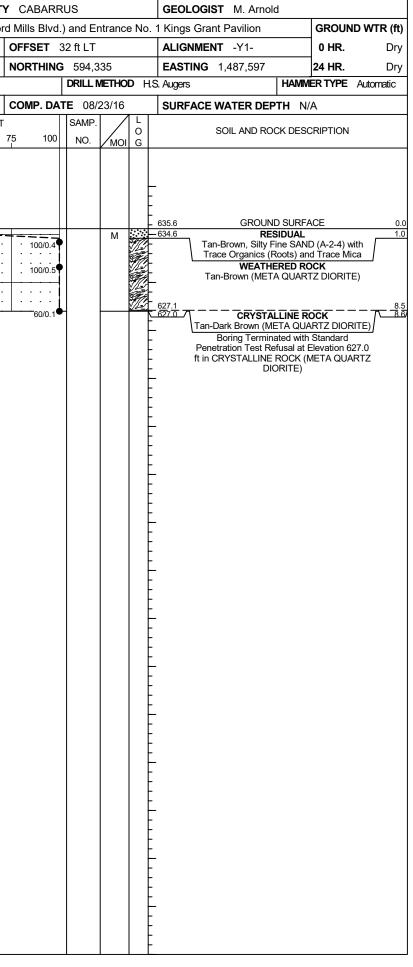
SHEET NO.

DATE: 8-19-16



## GEOTECHNICAL BORING REPORT BORE LOG

									URE L																
		78.1.D1				<b>P</b> U-5806			CABAR					GIST M. Arnold	1		WBS 44378.1.D1						<b>P</b> U-5806		COUNTY
SITE	DESC	RIPTIO	N MS	E Wal	-						ntranc	e No	1 Kings G	rant Pavilion		R (ft)	SITE DESCRIPTION MSE Walls			N MSE Walls at Intersection of					
BOR	RING NO	<b>0</b> . RW	1		S	TATION 1	1+11		OFFSET	6 ft LT			ALIGNN	<b>ENT</b> -Y1-	0 HR.	16.9	BORING NO. RW3			STATION 12+06					
COL	LAR E	<b>LEV.</b> 6	38.2 ft		Т	OTAL DEP	<b>FH</b> 28.9 ft	:	NORTHIN	<b>G</b> 594,2	238		EASTIN	<b>G</b> 1,487,576	24 HR. F	IAD	COL	LAR ELE	<b>EV.</b> 63	35.6 ft		тс	OTAL DEP	<b>TH</b> 8.6 ft	
DRIL	l Rig/H	AMMER	EFF./DA	TE F	&R2175	CME-55 86	% 02/16/201	6		DRILL	METHO	DD H	S. Augers	HAM	NER TYPE Autom	atic	DRIL	RIG/HA	MMER E	FF./DA	TE F8	R2175	CME-55 86	% 02/16/201	16
DRIL	LER	S. Davis	5		S		E 08/18/1	6	COMP. DA	TE 08/	/18/16		SURFAC		I/A		DRIL	LER S	. Davis			ST	ART DAT	E 08/23/1	16
ELEV	DRIVE		BLO	ow co				PER FOOT		SAMP.		1					ELEV	DRIVE ELEV	DEPTH	-	w co				PER FOOT
(ft)	ELEV (ft)	(ft)	·——		0.5ft	0 :			75 100		мо	0	ELEV. (ft)	SOIL AND ROCK DES		TH (ft)	(ft)	ELEV (ft)	(ft)		0.5ft		0		50 7
640		4											_				640		-						
	637.5	5 = 0.7					<u>.</u>						638.2 637.5	GROUND SURF ASPHALT	ACE	0.0		-	ŧ						
635		‡	14	16	12		<b>●</b> 28	· · · · ·			м		- <u>636.3</u>	ABC STON		1.9	635	- 635.6 -	0.0					_	
000	634.7	<u>' + 3.5</u> +	11	10	9		<u> </u>				м	Ľ	-	ROADWAY EMBAN Gray-Brown, Silty Fine to	Coarse SAND		000	-	F	5	25	100/0.4			+
l		ţ				· · · //·'		· · · ·						(A-2-4) with Trace	e Mica			632.1	3.5	100/0 5					
630	620 7	, + 8.5				·						L	-				630	-	Ł	100/0.5					
	023.1	+ 0.0	2	3	3	6					м		-629.4 D	ark Gray-Dark Brown, Silt	/ Fine to Coarse	8.8		-	+						
		Ŧ		1							1		. <u>626.2</u>	AND (A-2-4) with Trace C and Mica		12.0		627.1	8.5	60/0.1					
625	624.7	<u>, +</u> 13.5				``					1			RESIDUAL				-	ļ.						
		‡	8	14	22		36	· · · ·			м		. (	(A-2-4) with Trace				-	ŧ.						
		ţ						· · · ·			$\square$	_						-	ŧ.						
620	619.7	<u>' + 18.5</u>	16	14	16		<u>i</u>		+		М		618.9			19.3		_	Ł						
		Ŧ					<b>•</b> 30						. В	ack-Orange-Brown, Fine S with Trace Mi	Sandy SILT (A-4)			-	ł						
615		Ŧ												with Hade Wi	00			-	F						
	614.7	<u>' + 23.5</u> +	41	78	22/0.1							477	614.2	WEATHERED R	OCK	24.0		-	F						
		‡						· · · ·	. 100/0.6	T I				Tan-Orange-Brown (ME DIORITE)				-	ŧ						
610	609 7	<u>, +</u> 28.5								!			- 	DIORITE)		28.9		-	Ł						
		+	100/0.4	4					100/0.4	•		<u></u>	-	Boring Terminated at Eleva WEATHERED ROCK (MI DIORITE)	ation 609.3 ft in ETA QUARTZ	20.9		-	-						
		Ŧ												) TE: FIAD due to boring locatio	on in roadway			-							
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WBS	44378	.1.D1			т	ΊP	U-5806		COUNTY						
SITE	DESCR	IPTION	MSE	E Wall	s at l	nte	ersection o	f SR 2894	(Concord						
-	ING NO.					at Intersection of SR 2894 (Concord STATION 13+01									
						TOTAL DEPTH 4.0 ft									
	LAR ELE														
DRILL	_ RIG/HAI	MMER E	FF./DA	TE F8	R217	5 (	CME-55 86%	6 02/16/201	6						
DRIL	LER S	. Davis			S	σT/	ART DATE	08/19/1	6						
ELEV	DRIVE	DEPTH	BLC	W CO	JNT	Τ		BLOWS F	PER FOOT						
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	1	0 2	5 5	50 7						
	()					╈									
635	004.0														
	634.0	0.6	16	18	21			<b> </b> <b>●</b> 39							
	631.1	<u>3.5</u>													
	631.1 630.6	4.0	100/0.3 60/0.0			╈	• • • •								
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## **GEOTECHNICAL BORING REPORT** BORE LOG

COUNTY CABARRUS GEOLOGIST M. Arnold **GROUND WTR (ft)** Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion OFFSET 7 ft LT ALIGNMENT -Y1-0 HR. Dry **NORTHING** 594,407 **EASTING** 1,487,665 24 HR. FIAD DRILL METHOD H.S. Augers HAMMER TYPE Automatic **COMP. DATE** 08/19/16 SURFACE WATER DEPTH N/A SAMP. MOI G SOIL AND ROCK DESCRIPTION 75 100 NO. ELEV. (ft) DEPTH (ft) GROUND SURFACE 634.6 0.0 M 633.1 ASPHALT 0.6 . . . . ABC STONE <u>...</u> 100/0.3 60/0.0 631.1 **RESIDUAL** 3.5 630.6 Black-Gray-Brown, Silty Fine SAND (A-2-4) 4.0 with Trace Mica WITH Trace Mica WEATHERED ROCK Gray-Black-Brown (META QUARTZ DIORITE) Boring Terminated with Standard Penetration Test Refusal at Elevation 630.6 ft on CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTES: Auger refusal at 4.0'
 FIAD due to boring location in roadway

## **GEOTECHNICAL BORING REPORT** BORE LOG

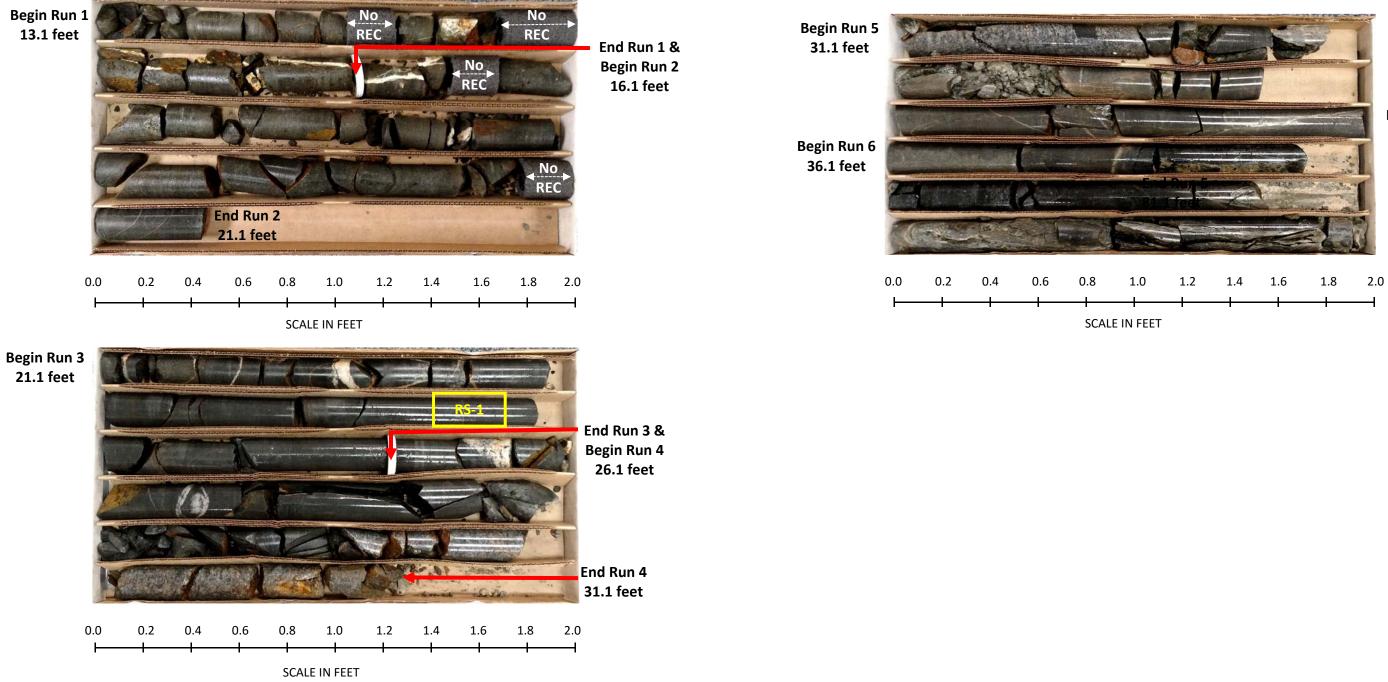
											50	)RE	<u>LC</u>	<u>J</u> <u>G</u>									Г											
WBS	4437	8.1.D1				TIP U-	5806			COUN	ITY	CABA	RRU	s				GEOLOG	ST M. Arno	old			-		44378						U-580			OUNT
SITE	DESC	riptio	N Int	ersec	tion of	SR 289	94 (Co	oncord	d Mill	s Blvd	) an	d Entra	nce N	lo. 1	Kings	s Gra	int F	Pavilion			GROUN	OWTR (ft)	- H					ersecti				Concord	Mills I	Blvd.) a
BOR	ing no	<b>).</b> EB1	1-A			STATIO	<b>N</b> 13	3+69			0	OFFSET	· 14	ft LT				ALIGNME	NT -Y1-		0 HR.	Dry	- H		NG NO							13+69		
COLI	LAR EL	. <b>EV</b> . 6	634.2 f	ť		TOTAL	DEPT	<b>FH</b> 4	1.1 ft		I	NORTH	NG	594,4	462			EASTING	1,487,711		24 HR.	FIAD			AR ELI							<b>PTH</b> 41		
DRILL	RIG/H/	MMER	EFF./D	ATE	F&R21	75 CME-8	55 86%	% 02/1	6/2010	6			D	RILLI	METH	IOD	SPI	Core Boring		HAMM	ER TYPE	Automatic	- H					ATE F	-&R217	75 CM	E-55 8	6% 02/16	/2016	
DRIL	LER S	S. Davi	s			START	DATE	E 08/	/22/1	6	0	COMP. I	DATE	08/	/23/1	6		SURFACE	WATER DE	PTH N	/A		-		LER S		;					<b>FE</b> 08/2		
ELEV	DRIVE ELEV		H BL	OW C	OUNT			BLC	OWS F	PER FO	ОТ		5	SAMP.					SOIL AND RO	OCK DES	CRIPTION			COR		NQ3						<b>1</b> 28.0 f		
(ft)	(ft)	(ft)	0.5f	t 0.5f	ft 0.5	ft 0	2	25	5	i0 I	7	5 1	00	NO.	/м	OI G		ELEV. (ft)				DEPTH (ft)		ELEV (ft)	RUN ELEV	DEPTH (ft)	RUN (ft)	RA	TE   <sup>F</sup>	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft)	RATA RQD (ft) %
																							-		(ft)	()	()	(Min	1/ft)	<u>`%</u>	%		%	%
635		+																634.2	GROUI	ND SURF	ACE	0.0		621.1 620	621.1	13.1	3.0		/1.0 (		(0.4)		(26.5)	(8.8)
	633.5	<u>+ 0.7</u>	19	14	15			<b>●</b> 29							м			633.5		SPHALT C STONE	:	0.7			618.1	16.1		1:49/	/1.0				95%	31%
630	630.7	3.5	13	100/0	14			l r ·	· ·			· · · ·					ŀ	630.2 Pro	ROADWAY	Y EMBAN	KMENT	4.0		045		ŧ	5.0	1:15/	/1.0 ( /1.0 8	(4.3) 86%	(0.7) 14%			
		Ŧ	-3	100/0					• •			100/0	.4				Ŧ	БЮ	wn-Dark Gray, with Trace	Gravel ar	nd Mica	-4)	ŀ	615	-			1:18/	/1.0					
	625.7	- - 8.5							•••			· · · ·	.				1	626.3	Brown-Dark G	HERED RO	<b>DCK</b> A QUARTZ	7.9			613.1	<u> </u>	5.0	1:45/	/1.0 /1.0 ( /1.0 §	(4.9)	(1.9)			
5	023.7	<u>+ 0.5</u>	60/0.	.1				+ • •				60/0	1			÷.	Ŧ			IORÌTE) Alline R	оск			610	-	ŧ		1:33/	/1.0	98%	38%			
		Ŧ							• •			· · · · · · ·	:				Ŧ		Brown-Dark G						608.1	26.1	E 0	1:37	/1.0	(5.0)	(0.0)	RS-1	1	
20	621.1	<u>† 13.1</u>	60/0.	0					•••			• • 60/0	11				£	621.1	CRYST			13.1		605	•	‡	5.0	2:06/ 1:55/ 3:51/	/1.0   1	00%	(0.8) 16%			
		Ŧ							• •								F		Brown-Dark G	iray (MET/ IORITE)	A QUARTZ			605		-		2:06/	/1.0					
		Ŧ							• •											- /					003.1	- 31.1	5.0	2:16/	/1.0 /1.0 ( /1.0 1	(5.0)	(2.0)			
515		Ŧ							<u> </u>								F							600	-	ŧ		3:37/	/1.0	00%	40%			
		Ŧ							•••																598.1	36.1	5.0	1:57/ 2:04/ 2:13/	/1.0	(5.0)	(3.0)			
610		Ŧ							•••								Ł							595	•	ŧ	5.0	2:24/	/1.0   1	00%	60%			
		ŧ						· ·	· ·			· · ·	:    -	RS-1	/									000	- 593.1	+ + + 41 1		2:17	/1.0					
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# GEOTECHNICAL BORING REPORT CORE LOG

				<u>RE L</u>					
						GEOLOGIST M. Arnol	Id	00010	
	iiis B	orva.) a		Entrance	No. 1 Kings Grant				D WTR (ft)
	£4				i 594,462	ALIGNMENT -Y1-		0 HR.	Dry FIAD
1.1 6/20						EASTING 1,487,711		24 HR.	Automatic
						-			Automatic
/22/	10		0.0	IVIP. DA	<b>FE</b> 08/23/16	SURFACE WATER DEF	PIH N//	4	
ft	STR REC.	ATA							
F	REC. (ft) %	RQD (ft) %	0 G			ESCRIPTION AND REMARK	(S		
+	%	%	Ŭ	ELEV. (f	()	Begin Coring @ 13.1 ft			DEPTH (ft)
(2	26.5)	(8.8)	R	621.1	Danie Dank Orace M	CRYSTALLINE ROCK			13.1
	95%	31%		-	Hard (META QUARTZ	ery Slight to Moderate Weath DIORITE) with Close to Ver	y Close Fra	a to Medic acture Spa	um icing
				-	RS-1:	24.3'-24.6 <sup>°</sup> , qu=16,830 psi, G	SI=50-65		
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-			25	593.1	Boring Terminated a	t Elevation 593.1 ft in CRYS	FALLINE F	OCK (ME	41.1 TA
				-	3	QUARTZ DIORITE)		(	
				-	NOTES: 1) Auger Refusal at 13	1'			
				-	2) FIAD due to boring	location in roadway			
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# CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB1-A: -Y1- 13+69, 14' Lt.

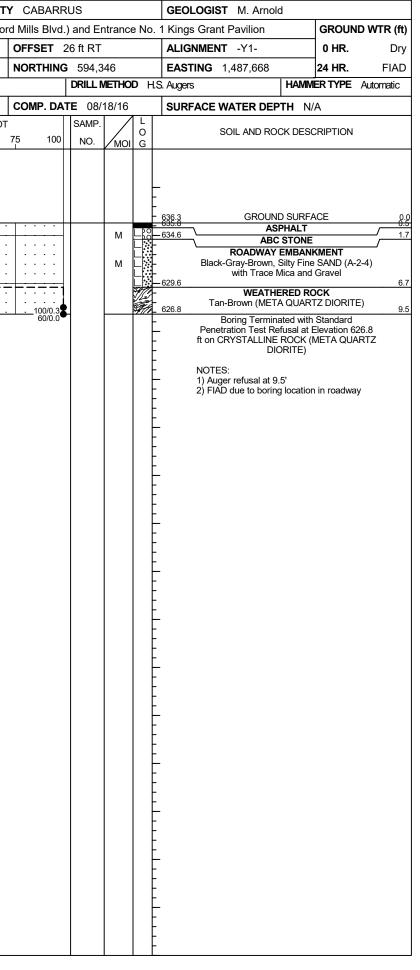


#### SHEET 7

End Run 5 36.1 feet

End Run 6 41.1 feet

									URE L															
	44378					<b>P</b> U-5806			Y CABARI					OGIST M. Arnold	1	_	<b>S</b> 44378					<b>U</b> -5806		COUNTY
SITE	DESCR	IPTION	I MSE	E Wall	s at In	tersection (	of SR 2894	(Concor	rd Mills Blvd	.) and Ei	ntranc	e No	. 1 Kings	Grant Pavilion	GROUND WTR (f	) SIT	E DESCR	RIPTION	MSE	E Walls	s at Inte	ersection of	SR 2894	(Concord
BOR	NG NO.	RW2	2		S	TATION 1	1+50		OFFSET	27 ft RT			ALIG	IMENT -Y1-	0 HR. Dr	BO	ring no	. RW4	1		ST	ATION 12+	-49	
COLI	AR ELE	<b>EV.</b> 63	38.1 ft		т	OTAL DEP	<b>TH</b> 14.1 ft		NORTHIN	<b>G</b> 594,2	258		EAST	NG 1,487,623	24 HR. FIAI	co	LLAR EL	<b>EV.</b> 63	36.3 ft		то	TAL DEPTH	9.5 ft	
DRILL	RIG/HAN	MMER E	FF./DA	TE F8	R2175	CME-55 869	% 02/16/2010	6		DRILL	METHC	DD ⊦	I.S. Augers	HAMM	ER TYPE Automatic	DRI	LL RIG/HA	MMER E	FF./DAT	TE F&	R2175 (	CME-55 86%	02/16/2016	6
DRIL	LER S.	. Davis			S		E 08/18/1	6	COMP. DA	TE 08/	/18/16		SURF	ACE WATER DEPTH N	/A	DR	LLER S	5. Davis	;		ST	ART DATE	08/18/16	6
ELEV	DRIVE ELEV	DEPTH	BLC	w col	JNT		BLOWS F	PER FOOT		SAMP.		L				ELE	/ DRIVE ELEV	DEPTH	BLO	W COU	JNT		BLOWS P	ER FOOT
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 5	50	75 100	NO.	мо	O I G	ELEV. (ft)	SOIL AND ROCK DESC	DEPTH	(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	0 7
									-															-
640																640								
0.10	-	-												GROUND SURF	ACE			ŧ						
	637.7 -	- 0.4 -	19	19	10		20				м		636.6	ASPHALT		<u>A</u> 5		‡						
635	- 634.6	25					<b>6</b> 29						636.1	ABC STONE ROADWAY EMBAN		635	635.8	- 0.5	20	17	17		• • • •	
	- 034.0	- 3.5	12	27	43						м		$\vdash$	Black-Gray-Brown, Silty Fine	e SAND (A-2-4)		632.8	3.5						
	-	F									1		F	with Trace Mic RESIDUAL			002.0	<del></del>	24	18	15			
630	629.6 -	8.5			00/0		+ • • • •				1		629.1	Black-Dark Brown, Silty Fi SAND (A-2-4) with Tra	ine to Coarse ace Mica	630		Ŧ						
	-	F	27	38	62/0.4			<b>.</b> 	· 100/0.9	•	1	T.		WEATHERED RO	ОСК	1	627.8	8.5	100/0					
005	-	È.									1		ŀ	Orange-Dark Brown (ME DIORITE)	TA QUARTZ		626.8	<u>+ 9.5</u> +	100/0.3 60/0.0					
625	624.6 -	- 13.5	70	30/0.1					+ • • • •				624.0		14	1	-	‡						
	-								100/0.6				L	Boring Terminated at Eleva WEATHERED ROCK (ME	ation 624.0 ft in ETA QUARTZ			t						
	-	-											-	DIORITÈ)				Ŧ						
	-	F												NOTE: 1) FIAD due to boring locatior	n in roodwov		-	Ŧ						
	-	-											-	T) FIAD due to boiling location	ITITTOadway			ŧ						
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## **GEOTECHNICAL BORING REPORT** BORF I OG

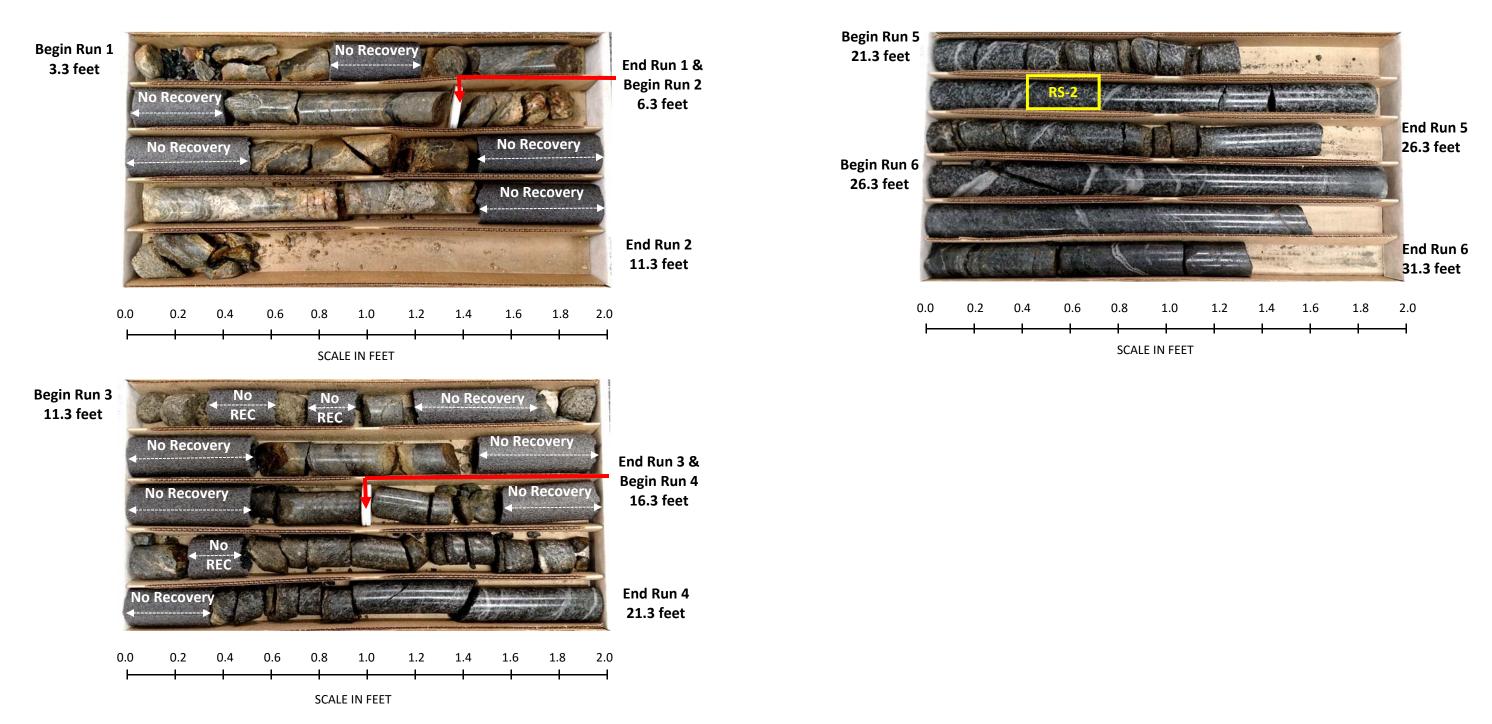
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-		378.1.						U-5806				Y CABAR					GEOLOGI	ST M. Ar	nold			-				N Into	rsection				
					rsectio					d Mill	s Blvd.)	and Entrand			s Gra						UND WTR (ft)	- H		ING NO.			3001011		-	13+34	
		<b>10</b> . E				_		<b>ION</b> 1				OFFSET					ALIGNME				,			LAR ELE						<b>PTH</b> 31	1 3 ft
		ELEV.						L DEP				NORTHIN					EASTING	1,487,70		24 HR							TE F&R2				
				f./DA	TE F8			1E-55 86								SPT	Core Boring		HAM	MERTYP	E Automatic			LER S.						TE 08/2	
DRIL		S. D	avis				STAR					COMP. DA			6	!	SURFACE	WATER I	DEPTH N	N/A				E SIZE		•				N 28.0	
ELEV (ft)			PTH (ft)		W COL						PER FOO		SAMP.	1 7				SOIL AND	ROCK DES	SCRIPTIC	N			<b>D</b>			DRILL	RI	JN		STF
(11)	(ft)	) (	,	0.5π	0.5ft	0.511	0		25	0	i0	75 100	NO.	/мс	DI G	E	LEV. (ft)				DEPTH (ft)		LEV (ft)	ELEV (ft)	DEPTH (ft)	(ft)	RATE (Min/ft)	REC. (ft)	RQD (ft) %	SAMP. NO.	REC. (ft) %
1																						63	31.8	(19			(winning)	70	70		70
640																$\vdash$							51.8 530	631.8	_ 3.3	3.0	1:23/1.0	(2.2)	(1.0)		(5.6)
i.		Ŧ														F							.00	628.8	6.3		1:31/1.0 3:26/1.0		33%		62%
635		Ŧ														F 63	35.1	GRC	UND SURI	FACE	0.0			-	-	5.0	1:52/1.0 1:25/1.0	(3.0) 60%	(1.3) 26%		
	634.	.5 <del>  (</del>	).6	21	20	22				•42				м			34.5		ASPHALT		<u> </u>	6	525		-		1:37/1.0 1:27/1.0 1:33/1.0				
	631.	.9 🕇 3	3.2	60/0.1				· · · · ·				<u> </u>					<u>32.2</u>	ROADW	AY EMBA	NKMENT	<u>2.9</u> 3.3		ł	623.8 -	<u>    11.3  </u>	5.0	1:47/1.0	(2.3)	(0.7)		
630	-	‡	ľ	50/0.1				· · · ·		•••							Dar	k Gray-Brov with Tra	vn, Silty Fir ce Gravel a	ie SAND ( and Mica	(A-2-4)		520	-	-		1:31/1.0 1:37/1.0	46%	14%		(15.7) 83%
		‡						· · · ·		· · · ·		·   · · · ·				1	т		TALLINE	ROCK			020	618.8	16.3		1:23/1.0 1:37/1.0				
625		‡						· · · · · · · ·	· ·	· · · ·	· · · ·	· · · · · ·	i l		1. Second			an-Oray-Di						-	_	5.0	1:47/1.0 1:22/1.0	(3.8) 76%	(1.0) 20%		
025	1	+							1													6	515	- 1	_		1:29/1.0 1:33/1.0				
		‡						· · · · ·	· ·	· · · ·	· · · ·	· · · · · ·	!			<u> </u>	22.8 W	hite-Gray (N	/ETA QUA	RTZ DIOF	12.3 RITE)		ł	613.8 _	_ 21.3	5.0	1:39/1.0 1:40/1.0	(5.0)	(2.7)		
620	_	‡						· · · ·	· ·	•••		· · · · ·	ļ											-	_		1:32/1.0 1:30/1.0	100%	54%	RS-2	-
		‡						 		· · · ·	 											6	510	608.8	26.3		1:26/1.0 1:33/1.0				-1
045		±						· · · ·		· · · ·														-	-	5.0	1:43/1.0 1:34/1.0	(5.0) 100%	(4.0) 80%		
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ĺ		+						<u> </u>					•			F	Boi	ing Termina RYSTALLIN	ated at Elev	ation 603	.8 ft in			-	-						
		Ŧ														F	0		DIORITE)		u (12			-	-						
		Ŧ														F	NOT	ES:						-	-						
		Ŧ														F	1) AL 2) Fl	ger Refusa AD due to b	oring location	on in road	lway			-	-						
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## **GEOTECHNICAL BORING REPORT** CORE LOG

# COUNTY CABARRUS GEOLOGIST M. Arnold R 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion GROUND WTR (ft) OFFSET 24 ft RT ALIGNMENT -Y1-0 HR. Dry **NORTHING** 594,414 EASTING 1,487,708 24 HR. FIAD DRILL METHOD SPT Core Boring HAMMER TYPE Automatic **COMP. DATE** 08/24/16 SURFACE WATER DEPTH N/A STRATA L REC. RQD O (ff) (ff) G DESCRIPTION AND REMARKS ELEV. (ft) DEPTH (ft) Begin Coring @ 3.3 ft CRYSTALLINE ROCK (5.6) (2.3) 62% 26% 631.8 3.3 Tan-Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard (QUARTZ SYENITE) with Moderately Close to Close Fracture Spacing GSI=35-50 622 12.3 (15.7) (8.4) 83% 44% White-Gray, Very Slight to Moderate Weathering, Very Hard to Moderately Hard (META QUARTZ DIORITE) with Moderately Close to Close Fracture Spacing RS-2: 23.5'-23.8', qu=7,397 psi, GSI=65-80 603.8 31.3 Boring Terminated at Elevation 603.8 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTES: Auger Refusal at 3.2' FIAD due to boring location in roadway



CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB1-B: -Y1- 13+34, 24' Rt.



# LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

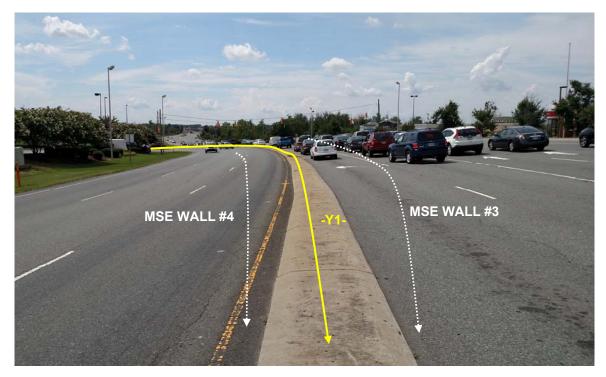
PROJECT NO.:44378.1.D1TIP NO.:U-5806COUNTY:CabarrusDESCRIPTION:Intersection of SR 2894 (Concord Mills Blvd) and Entrance No. 1 Kings Grant Pavilion

Sample #	Boring #	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus, E (ksi)	GSI
RS-1	EB1-A	-Y1-	13+69	14' Lt.	24.3-24.6	Meta Quartz Diorite	PzZq	38%	3.82	1.77	182.3	16,830	2,999	50-65
RS-2	EB1-B	-Y1-	13+34	24' Rt.	23.5-23.8	Meta Quartz Diorite	PzZq	54%	3.88	1.77	180.7	7,397	876	65-80

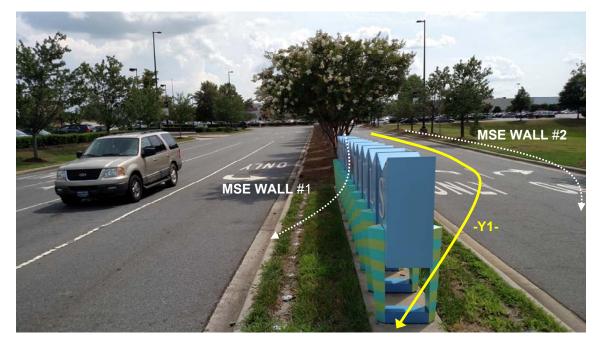




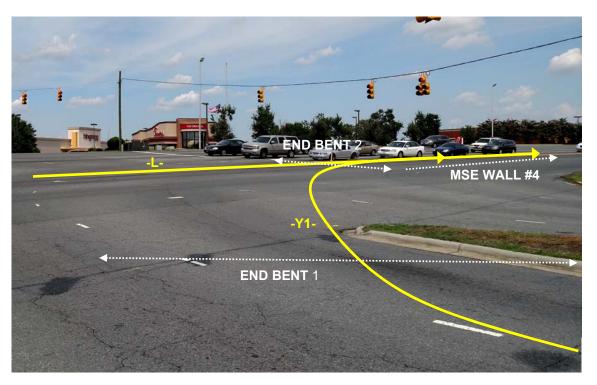
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



Photograph No. 2: On –L- (Concord Mills Blvd.) looking northwest



Photograph No. 3: On -Y1- (Kings Grant Pavilion) looking southwest



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806	CONTENTS <u>SHEET NO.</u>   2 2A 3 4-13 14 15	DESCRIPTION TITLE SHEET LEGEND (SOL & ROCK) SUPPLEMENTAL LEGEND (GSI) SITE PLAN BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS ROCK TEST RESULTS SUMMARY SITE PHOTOGRAPH(S)	<section-header><section-header><section-header><text><text></text></text></section-header></section-header></section-header>
PROJECT: 44378			

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U–5806	1	16

#### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES, THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLT EST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 TOT-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

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

PERSONNEL

M. ARNOLD

S. DAVIS

T. SHARPE

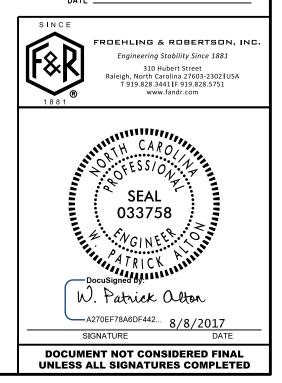
INVESTIGATED BY \_\_\_\_\_\_.

DRAWN BY <u>T.T. WALKER</u>

CHECKED BY <u>P. ALTON</u>

SUBMITTED BY \_\_\_\_\_ P. ALTON

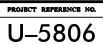
DATE AUGUST 2017



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

				SOIL	DESC	RIPT	ON							GF	ADATION						ROCK E	ESCRIPTION	
BE PENE ACCORD IS	TRATED ING TO BASED O	With a Ci The Stani N The Aa	ontinuous Dard Peni Shto Sys	FLIGHT P TRATION T TEM. BASIC	OWER A EST (A DESCR	UGER AN ASHTO T IPTIONS	D YIELI 206, A GENERA	d less 1 Stm D158 NLLY INCI	RTH MATERIALS TI THAN 100 BLOWS P 36J. SOIL CLASSIF LUDE THE FOLLOW PERTINENT FACTO	ER FOOT ICATION ING:	UNIFORML	Y GRADED - INC	DICATE	S THAT SOIL		L APPROXI ZES OF TW	FROM FINE TO COARSE. MATELY THE SAME SIZE. O OR MORE SIZES.	ROCK LINE SPT REFUS/ BLOWS IN I REPRESENT	INDICATES THE I AL IS PENETRATI NON-COASTAL PL ED BY A ZONE O	LEVEL A ION BY A AIN MA	AT WHICH NON-( A SPLIT SPOON TERIAL, THE HERED ROCK.	I WOULD YIELD SPT RE OASTAL PLAIN MATERIA SAMPLER EQUAL TO OR RANSITION BETWEEN S	al Would Yiel R Less Than (
A	S MINER	ALOGICAL	COMPOSIT	ION, ANGUL	ARITY, S	STRUCTU	RE, PLAS	STICITY, I	ETC. FOR EXAMPLE					OUNDNESS OF	SOIL GRAINS IS DE		BY THE TERMS:		RIALS ARE TYPIC	1////			
				ND AND							<u></u>	ANGULAR, <u>SUBAN</u>			OR <u>ROUNDED.</u> CAL COMPOSI	TION		ROCK (WR)			NON-COASTAL P 100 BLOWS PER	AIN MATERIAL THAT W FOOT IF TESTED.	OULD YIELD SI
GENERAL CLASS.			ar Materia Passing "2	00)		SILT-CLAY	SSING 2	00)	ORGANIC MATER	IALS			IES SUC	CH AS QUARTZ	FELDSPAR, MICA, T	ALC, KAOLI		CRYSTALLIN ROCK (CR)	E	ا المغر		GRAIN IGNEOUS AND N PT REFUSAL IF TESTED SCHIST, ETC.	
GROUP CLASS.	A-1 A-1-a A-		A-2-4 A-2	A-2 -5 A-2-6 A-	2-7	4 A-5		A-7-5 A-7-5	A-1, A-2 A-4, A-5 A-3 A-6, A-7						RESSIBILITY			NON-CRYSTA ROCK (NCR)				E GRAIN METAMORPHIC / DCK THAT WOULD YEILD	
SYMBOL						1.7.4						MODER	RATELY	OMPRESSIBLE COMPRESSIBL	E	LL < 3 LL = 3		COASTAL PL		_	COASTAL PLAIN	UDES PHYLLITE, SLATE, SEDIMENTS CEMENTED	INTO ROCK, BU
% Passing "10									RANULAR SILT-	MUCK,		HIGHL			GE OF MATER		0	SEDIMENTAR (CP)			SPT REFUSAL. SHELL BEDS,ET	ROCK TYPE INCLUDES LI C.	IMESTONE, SAN
40	30 MX 50	MX 51 MN							SOILS SOILS	PEAT				GRANULAR	SILT - CLAY			<b> </b>				THERING	
Material Passing "40	10 MA 20			MX 35 MX 35					SOILS WITH		TRACE	ANIC MATERIAL OF ORGANIC MA ORGANIC MATTI ATELY ORGANIC		<u>SOILS</u> 2 - 3% 3 - 5% 5 - 10%	<u>SUILS</u> 3 - 5% 5 - 12% 12 - 20%	TRACE LITTL SOME		FRESH	HAMMER IF CR	LY FRES	NE. H, JOINTS STAIN	ints may show slight Ed, some joints may sh	HOW THIN CLAY
LL PI GROUP INDEX	6 MX	- NP Ø		4N 40 MX 41 4X 11 MN 11 4 MX	MN 10		11 MN	11 MN	LITTLE OR MODERATE AMOUNTS OF	HIGHLY ORGANIC		ORGANIC		> 10%	> 20% JND WATER	HIGHL		(V SLI.) SLIGHT	OF A CRYSTAL	LINE NA	TURE.	E SHINE BRIGHTLY. ROCK	
usual types of major	STONE FR	AGS. FINE		or clayey L and sand	-	silty S01ls	CLAN	rEY .	ORGANIC	SOILS		▽		ER LEVEL IN I	BORE HOLE IMMEDIA		R DRILLING	(SLI.)	1 INCH. OPEN J CRYSTALS ARE	joints M Dull A	ND DISCOLORED.	Y. IN GRANITOID ROCKS CRYSTALLINE ROCKS RIN	Some occasion NG UNDER HAMM
MATERIALS GEN. RATING AS SUBGRADE	Sand		ENT TO GO		+	FAIR T			AIR TO POOR	UNSUITABLE					ATURATED ZONE, OR		ARING STRATA	MODERATE (MOD.)	granitoid Roc Dull Sound U	CKS, MOST INDER HA	FELDSPARS AR	DISCOLORATION AND WEA E DULL AND DISCOLORED, D SHOWS SIGNIFICANT LO	, SOME SHOW CL
		P1 OF 4	-7-5 SUBGF	oup is ≤ li	L - 30 ;	PIOF A-7	6 SUBGR	ioup is > i	LL - 30	1		0-111-	SPRI	NG OR SEEP				MODERATELY	WITH FRESH RO ALL ROCK EXC		RTZ DISCOLORED	OR STAINED. IN GRANIT	OID ROCKS. ALL
		CONSISTENCY OR DENSENESS COMPACINESS OR RANGE OF STANDARD RANGE OF U OUL TYPE COMPACINESS OR PENETRATION RESISTENCE COMPRESSIVI							D41/25 05 11/	0.50.50	<b></b>		!	MISCELLA	NEOUS SYMBO	DLS		SEVERE (MOD. SEV.)	AND DISCOLORE	ed and #	A MAJORITY SHO	W KAOLINIZATION. ROCK GIST'S PICK. ROCK GIVES	SHOWS SEVERE
PRIMARY	SOIL TY	PE	CONSIST	ENCY		ETRATION (N-V	n Resis Alue)		COMPRESSIVE (TONS/F	STRENGTH	[ []	ROADWAY EMBA WITH SOIL DES					SLOPE INDICATOR	SEVERE (SEV.)	ALL ROCK EXC	EPT QUA		OR STAINED. ROCK FABF IN GRANITOID ROCKS A	
GENERA GRANUL									N/A			SOIL SYMBOL		-	UPT DAT TEST BOF		INSTALLATION		TO SOME EXTE	NT. SOM		STRONG ROCK USUALLY	
MATERIA (NON-CO			DENS VERY D	ε			0 50		N/H		X	ARTIFICIAL FIL THAN ROADWAY			AUGER BORING	Ø	CONE PENETROMETER	VERY SEVERE	ALL ROCK EXC	EPT QUA	RTZ DISCOLORED	OR STAINED. ROCK FABR D SOIL STATUS, WITH ONL	
GENERA			VERY SOF				2 10 4		< 0.25 0.25 TO			INFERRED SOIL	. BOUN	IDARY -(	)- CORE BORING	•	SOUNDING ROD	(V SEV.)				OF ROCK WEATHERED TO EMAIN. <u>IF TESTED, WOULL</u>	
SILT-CL MATERIA (COHESI	.AY AL		MEDIUM STIF	STIFF		4 1 8 T	108 015 1030		0.5 TO 1 TO 2 2 TO	1.0 2		INFERRED ROCK				au - 🖣	WITH CORE	COMPLETE		NCENTRA		NOT DISCERNIBLE, OR DIS MAY BE PRESENT AS DIKE	
			HAR					'F	> 4						DATION SYMB						ROCK	HARDNESS	
U.S. STD. SI	EVE SIZ	'F		4 10		40	60	200	270					CLASSIFIED E			SSIFIED EXCAVATION -	VERY HARD			BY KNIFE OR S	HARP PICK. BREAKING OF ST'S PICK.	HAND SPECIME
OPENING (M				.76 2.0	0 e	.42		0.075	0.053					SUITABLE WAS		USED	TABLE.BUT NOT TO BE IN THE TOP 3 FEET OF	HARD	CAN BE SCRAT	CHED BY	KNIFE OR PICK	ONLY WITH DIFFICULTY.	, HARD HAMMER
BOULDE (BLDR.)		COBBLE (COB.)		AVEL GR.)	S	ARSE AND E. SD.)		FINE SAND (FSD.)	SILT (SL.)	CLAY (CL.)					KCAVATION - RADABLE ROCK	EMBA	KMENT OR BACKFILL	MODERATELY HARD	EXCAVATED BY	CHED BY HARD B	KNIFE OR PICK	GOUGES OR GROOVES TO GIST'S PICK, HAND SPEC	
GRAIN MN SIZE IN			75 3	2.0	9		0.25		0.05 0.00	5	AR - AUGEI BT - BORIN CL CLAY	NG TERMINATED		MICA	MEDIUM MICACEOUS MODERATELY	WE4	- VANE SHEAR TEST WEATHERED · UNIT WEIGHT	MEDIUM HARD		ED OR G		es deep by firm press d peices 1 inch maximum	
601	MOISTU	SOIL		FURE -			ION	OF T	ERMS			E PENETRATION	TEST	NP - N	ON PLASTIC ORGANIC		DRY UNIT WEIGHT		POINT OF A GE	EOLOGIST	'S PICK.		
		LIMITS)		FIELD P DESCF - SATU	RIPTION				ID: VERY WET. USL		DMT - DILA DPT - DYN	ATOMETER TEST		PMT - EST SAP	PRESSUREMETER TE SAPROLITIC AND, SANDY	s -	BULK	SOFT	FROM CHIPS TO	O SEVER		Y KNIFE OR PICK. CAN B ZE BY MODERATE BLOWS SSURE.	
	+ .10	UID LIMI	· _	(SA)			FROM	BELOW	THE GROUND WATE	R TABLE		NATIO		SL 9 SLI	ILT, SILTY SLIGHTLY	ST RS	- SPLIT SPOON - SHELBY TUBE - ROCK	VERY SOF T				XCAVATED READILY WITH N BY FINGER PRESSURE.	
RANGE <				- WET	- (W)				DUIRES DRYING TO JM MOISTURE	נ	FRAGS FI	RAGMENTS	URES	w - M	TRICONE REFUSAL	CBF	- RECOMPACTED TRIAXIAL - CALIFORNIA BEARING		FRACTURE				BEDDING
								HI HIGHL		JIPM	V - VE ENT USED	ON SUBJECT	PROJ	RATIO CT	VERY WI WIDE		MORE T	<u>Pacing</u> Han 10 feet ) 10 feet	TERM VERY THICKLY THICKLY BEDDE				
	UM _ UPTIMUM MUISTURE SL _ SHRINKAGE LIMIT						513 TONE				NCING TOOLS:				MODERAT	ELY CLOSE	1 10	) 3 FEET	THINLY BEDDEC	D 6			
	- DRY - (D) REQUIRES ADDITIONAL WATER T ATTAIN OPTIMUM MOISTURE PLASTICITY						0	СМЕ-4 Х СМЕ-5				FLIGHT AUGER	CORE S	UTOMATIC MANUAL	CLOSE VERY CL	OSE L		TO 1 FOOT AN 0.16 FEET	THICKLY LAMIN THINLY LAMINA	NATED Ø.			
				PL	ASTI	CITY										-в	🛛 "						
SLI		PLASTIC		PLAS	<u>TICITY</u> 0- 6-1		(P1)		DRY STREN VERY LOI SLIGHT	v		550 SHEAR TEST		HARD FACED	E INSERTS	X-N HAND 1		FOR SEDIME		NDURATIO	RUBBING WI	DENING OF MATERIAL BY TH FINGER FREES NUME W BY HAMMER DISINTED	ROUS GRAINS:
	MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH COLOR									ABLE HOIST	×	CASING	W/ ADVANCER STEEL TEETH	۹ 🔲 ۱	DST HOLE DIGGER AND AUGER	MODE	RATELY INDURAT	TED		BE SEPARATED FROM S ILY WHEN HIT WITH HAI			
L															TUNGCARB.		DUNDING ROD	INDU	RATED			DIFFICULT TO SEPARAT	
									LLOW-BROWN, BLU CRIBE APPEARANC					CORE BIT			ANE SHEAR TEST	EXTR	EMELY INDURATE	ED		ER BLOWS REQUIRED TO AKS ACROSS GRAINS.	O BREAK SAMP



TED. AN INFERRED	TERMS AND DEFINITIONS
D SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
0.1 FOOT PER 60 K IS OFTEN	ADUIFER - A WATER BEARING FORMATION OR STRATA.
	<u>ARENACEOUS</u> - 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
PT N VALUES >	ANGLEAREDUS - APPCIED TO ALL ROLKS OF SUBSTANCES COMPOSED OF CLAT MINERALS, OF MAYING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
ROCK THAT INCLUDES GRANITE,	ATTESTAN " UNDUNU WHICH THAT IS UNDER SUFFICIENT FRESSURE TO RISE HOUVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
TAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
. IF TESTED. TC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
T MAY NOT YIELD DSTONE, 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.
k rings under	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
COATINGS IF OPEN.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
Rock up to Val Feldspar	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
ER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
:TS. IN LAY. ROCK HAS TH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
HU CUMPHRED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FELDSPARS DULL LOSS OF STRENGTH	F <u>ormation (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
ARE DISCERNIBLE OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
at only minor	OF AN INTERVENING IMPERVIOUS STRATUM.
<u>VALUES &lt; 100 BPF</u> Y IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
RS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
NS REQUIRES	SAPPOLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BLOWS 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 INTRUDED ROCKS.
DEEP CAN BE DETACHED	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D BLOWS OF THE	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 WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
IN FRAGMENTS INT. SMALL, THIN	<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
K. PIECES 1 INCH CHED READILY BY	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	BENCH MARK: TBM: BY5-404 METAL SURVEY DISK N: 594,551, E: 1,487,930
THICKNESS 4 FEET	
1.5 - 4 FEET	ELEVATION: 644.32 FEET
0.16 - 1.5 FEET .03 - 0.16 FEET	NOTES:
008 - 0.03 FEET < 0.008 FEET	F.I.A.D.= FILLED IMMEDIATELY AFTER DRILLING
EAT, PRESSURE, ETC.	
Ε.	
STEEL PROBE:	
PROBE:	
LE;	DATE: 8-15-14

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

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

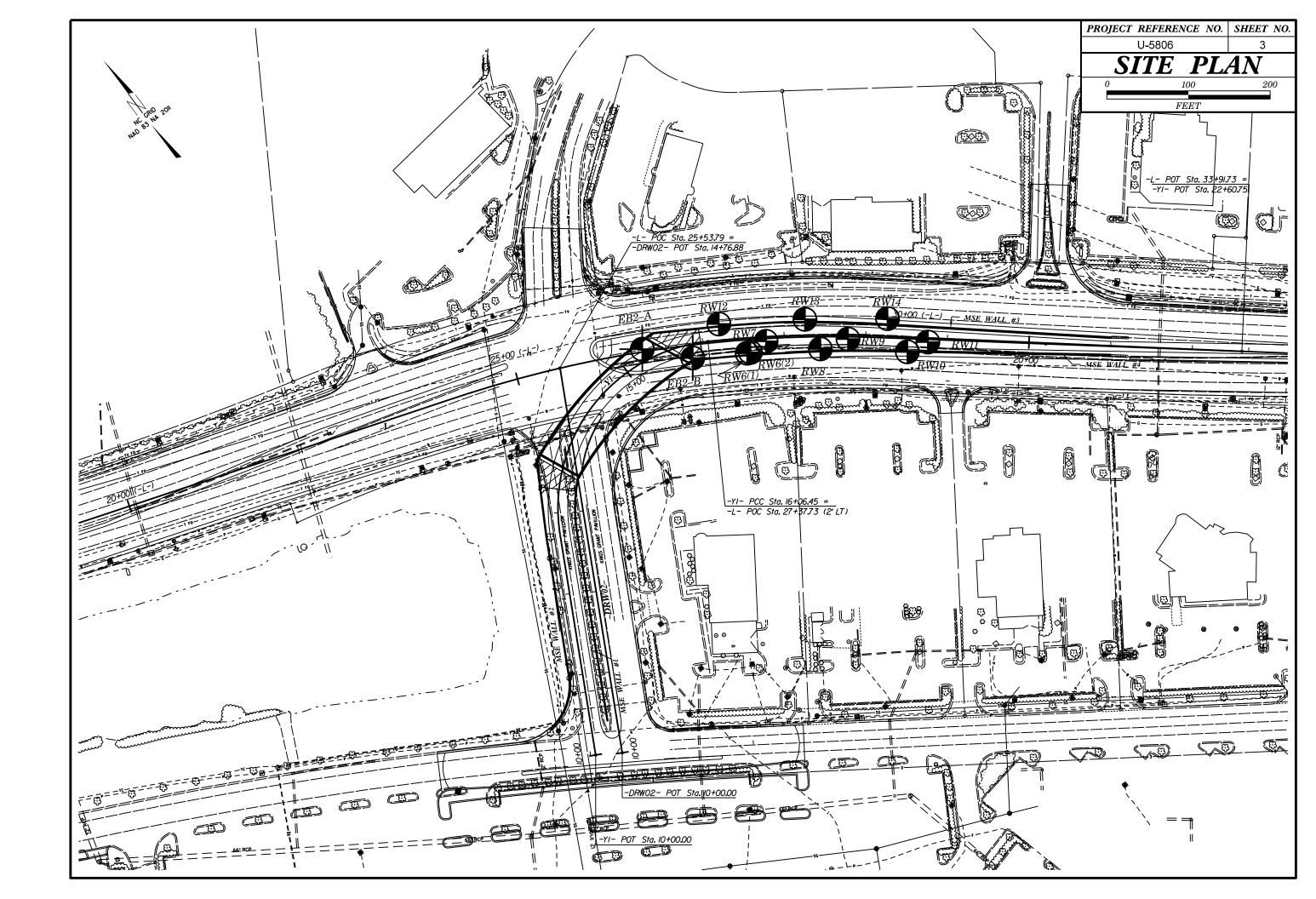
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI)FOR JOINTED ROCKS (Hoek and Marinos, 2000)	aces	p		s G C	s O O	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	0D igh, fresh unweathered surf	600D Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfac with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfac with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the conditi of the discontinuities and estimate the average val of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fa poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING S	URFACE QUI	ALITY 💳	╤ <b>&gt;</b>	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked up:	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting x of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with Stone and Stone or silty shale
VERY BLOCKY - interlocked, cc partially disturbed mass with Z multi-faceted angular blocks y formed by 4 or more joint sets		5	50			thin inter- layers of siltstone siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Means deformation after tectonic disturbance

		U–5	806			2A
Tectonically Defo	prmed Heterog	geneous Rock	Masses (Marır	nos and	Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	600D - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth,occasionally slickensided surfaces with compact	coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
	70 60	A				
E. Weak siltstone or clayey shale with sandstone layers		50 B 40	С	s/	E	
leformed, d/faulted, hale or siltstone deformed s forming an tructure			30	F 20		
leformed silty forming a e with pockets yers of ransformed pieces.			\$		-	10 1

PROJECT REPERENCE NO.

SHEBT NO.

DATE: 8-19-16



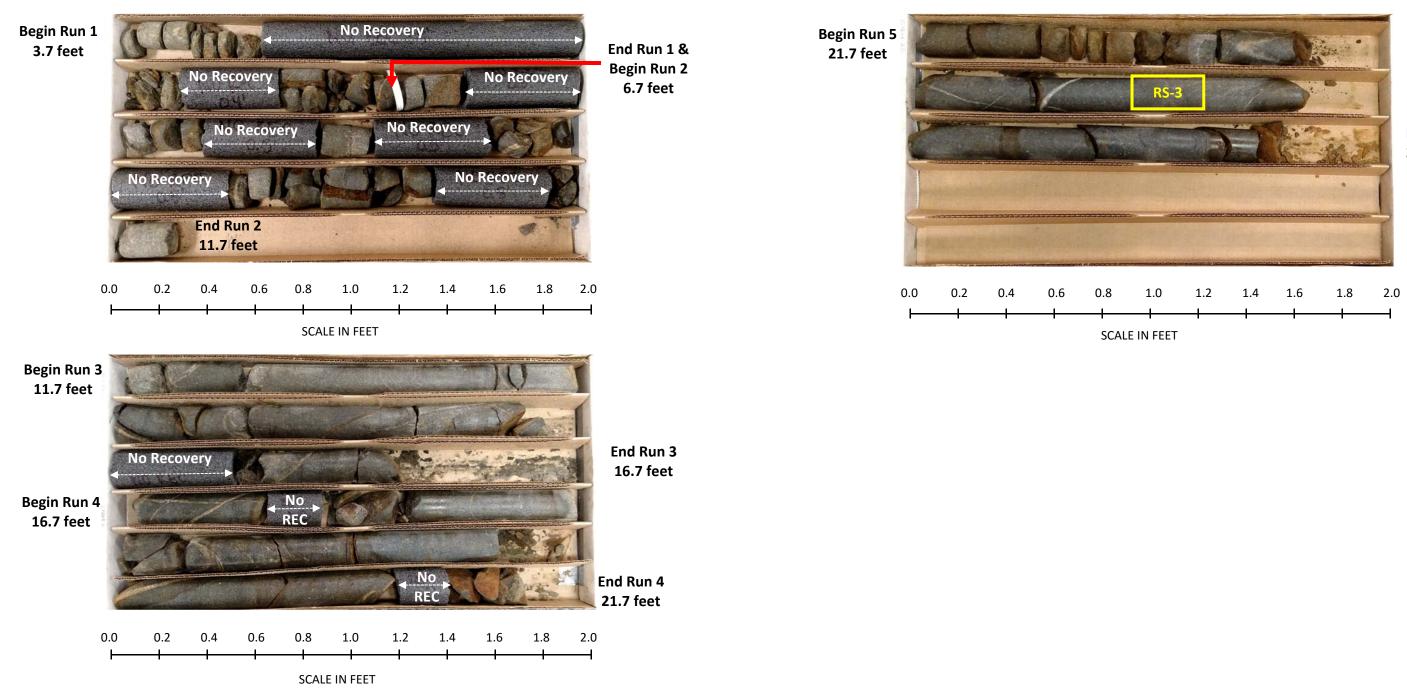
	E	ORE LOG			C
<b>WBS</b> 44378.1.D1	TIP U-5806 COUN	TY CABARRUS	GEOLOGIST M. Arnold	WBS 44378.1.D1 TIP	U-5806 COUN
SITE DESCRIPTION Intersection	on of SR 2894 (Concord Mills Blvd.)	and Entrance No. 1 Kings Grant	ROUND WTR (	ft) SITE DESCRIPTION Intersection of SR 2	2894 (Concord Mills Blvd.)
BORING NO. EB2-A	STATION 15+29	OFFSET 15 ft LT	ALIGNMENT -Y1- 0 HR. D	ry BORING NO. EB2-A STAT	<b>TION</b> 15+29
COLLAR ELEV. 640.4 ft	TOTAL DEPTH 26.7 ft	<b>NORTHING</b> 594,501	<b>EASTING</b> 1,487,873 <b>24 HR.</b> FIA		AL DEPTH 26.7 ft
DRILL RIG/HAMMER EFF/DATE F	R2175 CME-55 86% 02/16/2016	DRILL METHOD SI	PT Core Boring HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE F&R2175 CM	/E-55 86% 02/16/2016
DRILLER S. Davis	START DATE 08/17/16	COMP. DATE 08/18/16	SURFACE WATER DEPTH N/A	DRILLER S. Davis STAR	RT DATE 08/17/16
ELEV DRIVE DEPTH BLOW CO			SOIL AND ROCK DESCRIPTION		AL RUN 23.0 ft
(ft) (ft) (ft) 0.5ft 0.5ft	0.5ft 0 25 50	75 100 NO. MOI G	ELEV. (ft) DEPTH		RQD SAMP. REC. RQD
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(ft) NO. (ft) (ft)
645			_	636.7 636.7 - 3.7 3.0 1:44/1.0 (1.2)	(0.0) (16.8) (8.0)
			-	635 635 633.7 6.7 6.7 6.7 6.7 6.7 6.7 6.7 6.7 6.7 6	(0.0) 0% (16.8) (8.0) 73% 35%
640 000 5 - 00				0.0 5.0 2:21/1.0 (2.2)	(0.0) 0%
639.5 <u>0.9</u> <u>1</u> 19 17	6 <u></u>	<u></u> М <u>Р</u> О	- 639.5 ASPHALT	<u>     2.0     630     1:27/1.0     1:49/1.0     1:49/1.0 </u>	
636.9 <u>3.5</u> 636.7 <u>3.7</u> <u>60/0.0</u>	│		- 638.4 ABC STONE - 637.4 ABC STONE - 637.4 ROADWAY EMBANKMENT - Gray-Brown, Silty Fine to Coarse SAND	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(2.1)
635 60/0.0		· · · · 60/0.0	<ul> <li>(A-2-4) with Trace Gravel and Mica</li> </ul>		42%
			- CRYSTALLINE ROCK Dark Gray-Brown (META QUARTZ	<u>625</u> <u>1:26/1.0</u> <u>623.7 + 16.7 2:37/1.0</u>	
630			DIORITE)		(3.3) 66%
Ŧ				<u>620</u> <u>1:40/1.0</u> 1:36/1.0	
		·   · · · · !     24		618.7 <u>21.7</u> <u>1:54/1.0</u> 5.0 <u>2:35/1.0</u> (4.6)	(2.6)
625	<u></u>		-		
		·   · · · ·		613 613.7 26.7 1:29/1.0	
620			-		
			-		
		RS-3		26.7	
			- Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ		
			- DIORITĖ)		
			- NOTES: - 1) Auger Refusal at 3.7'		
			2) FIAD due to boring location in roadway		
			-		
			-		
			-		
			-		
			-	8/4/17	
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				NCDOT CORE DOUBLE US806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT	
			-		

## **GEOTECHNICAL BORING REPORT** CORE LOG

				ABARRUS		GEOLOGIST	M Arnold				٦
				Entrance No. 1 Kings (	Frant		IVI. AITIOIU		GROUN	ID WTR (ft)	-
_			-	FSET 15 ft LT		ALIGNMENT	-Y1-		0 HR.	Dry	
3	7 ft			<b>RTHING</b> 594,501		EASTING 1,4			24 HR.	FIAD	
	2016				) SP			HAMM		Automatic	+
	7/16		со	MP. DATE 08/18/16				<b>H</b> N/	Δ		-
ft											+
	STR REC.	ATA	L								1
	(ft) %	(ft) %	O G	ELEV. (ft)	D	ESCRIPTION AND	D REMARKS			DEPTH (ft	t)
						Begin Coring	@ 3.7 ft			·	1
	(16.8) 73%	(8.0) 35%		– 636.7 – Dark Gray-Brov	vn, Slic	CRYSTALLIN ght to Moderately S		ering, H	lard to Me	3.7 dium	7
				- Hard, (META 0	QUAR	TZ DIORITE) with I Spacir	Moderately Cl	ose to (	Close Frac	ture	
				-	RS-3:	: 24.5'-24.8', qu=4,	600 psi, GSI=	45-60			
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Ϊ				-							
				- 613.7 - Boring Termir	nated a	at Elevation 613.7 f	t in CRYSTA	LLINE F	ROCK (ME	26.7 TA	4
				-		QUARTZ DI	ORITE)				
				<ul> <li>NOTES:</li> <li>1) Auger Refusa</li> </ul>	al at 3.	7'					
				- 2) FIAD due to I	ooring	location in roadway	Ý				
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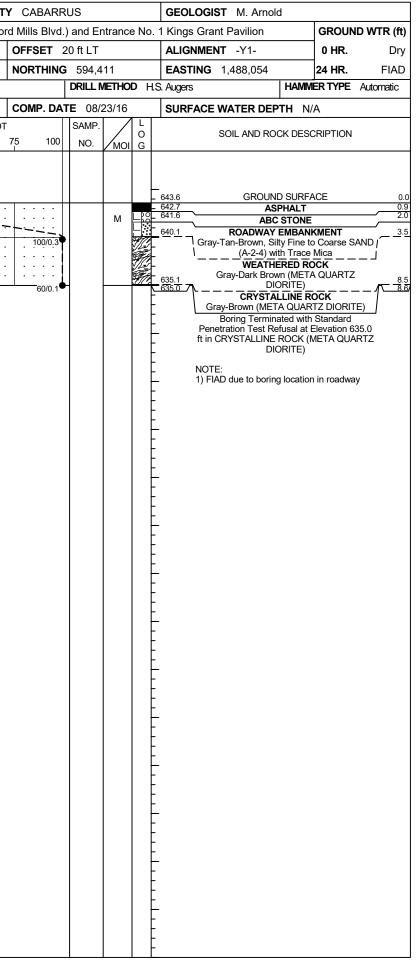


# CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB2-A: -Y1- 15+29, 15' Lt.



End Run 5 26.7 feet

									URE L						-								
		8.1.D1				<b>P</b> U-5806			Y CABARI				GEOLOGIST M. Arnold	- 1		<b>S</b> 44378					<b>P</b> U-5806		COUNTY
SITE	DESC	RIPTION	N MS	E Wall	s at In	tersection	of SR 2894	l (Concoi	rd Mills Blvd	.) and E	ntranc	e No	o. 1 Kings Grant Pavilion	GROUND WTR (ft)	SIT	E DESCR	RIPTION	N MSE	E Wall	s at In	tersection	of SR 289	4 (Concord
BOR	NG NC	<b>).</b> RW	12		SI	TATION 1	6+22		OFFSET	20 ft LT			ALIGNMENT -Y1-	0 HR. Dry	BO	ring no	. RW1	13		ST	TATION 1	7+26	
COLI	AR EL	<b>EV.</b> 64	42.8 ft		т	OTAL DEP	<b>TH</b> 12.7 ft	:	NORTHIN	<b>G</b> 594,4	170		EASTING 1,487,966	24 HR. FIAD	COL	LAR EL	<b>EV</b> . 64	43.6 ft		тс	DTAL DEP	<b>FH</b> 8.6 ft	
DRILL	RIG/H/	MMER E	EFF./DA	TE F8	R2175	CME-55 86	% 02/16/201	6	•	DRILL	METHO	DD ⊢	H.S. Augers HAN	MER TYPE Automatic	DRIL	L RIG/HA	MMER E	FF./DA	TE F8	kR2175	CME-55 86	% 02/16/201	16
DRIL	LER	S. Davis	6		ST		E 08/24/1	6	COMP. DA	TE 08/	24/16		SURFACE WATER DEPTH	N/A	DRI	LLER S	. Davis	;		ST		E 08/23/1	6
ELEV	DRIVE		1	ow cou			BLOWS F			SAMP.		1 L			ELE			1	W COL				PER FOOT
elev (ft)	ELEV (ft)	(ft)	·——	0.5ft		0			75 100		мо	O I G		SCRIPTION DEPTH (f	(ft)	/ DRIVE ELEV (ft)	(ft)	· — —	0.5ft		0		50 7
	(11)		0.011	0.0.0	0.011		1	1	1	110.		I G	ELEV. (π)	DEPTH (f	)	(11)			0.011			1	1
645		+											_		645		+						
1		<u>‡</u>											642.8 GROUND SUF		þ	642.7	- 0.9						
	642.0	0.8	32	23	12		. I • • • 35				м		642.0 ASPHAL		1		t	26	28	23			
640	639.3	3.5						<u> </u>					639.3 RESIDUA	L 3.	<b>1</b> 640	640.1	3.5	100/0.3				+ • • • •	+
		Ŧ	64	36/0.2					. 100/0.7				Black-Tan-Brown, Silty Fi	ne SAND (A-2-4) j			Ŧ						
005		‡											WEATHERED	ROCK	005		‡					· · · · ·	
635	634.3	8.5				<del></del>	· · · · ·					10	Gray-Brown-Black (MB DIORITE	ETA QUARTZ	635	635.1	8.5	60/0.1					
		ł	/8	22/0.1					100/0.6	[	1			,			Ŧ						
	630.0	+ 12.6					· · · · ·	· · · ·					630.2	19 (			‡						
	030.2	+ 12.0	60/0.1				1	1	60/0.1			<i>√/I=</i> /	CRYSTALLINE		7	-	‡						
1		t									1		Black-Dark Gray (META Q Boring Terminated w				t						
		Ŧ											Penetration Test Refusal a ft in CRYSTALLINE ROCK	at Elevation 630.1			+						
	-	Ŧ									1					-	Ŧ						
1		‡											NOTES:				‡						
		ł											<ul> <li>1) Auger refusal at 12.6'</li> <li>2) FIAD due to boring locat</li> </ul>	ion in roadway			ł						
	•	Ŧ											<ul> <li>– 2) FIAD due to boring locat</li> </ul>	ion in roadway		-	Ŧ						
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									ORE L	UG					
WBS	44378	.1.D1			TI	<b>P</b> U-5806	6	COUNT	Y CABARF	RUS			GEOLOGIST M. Arnold	-	
SITE	DESCR	IPTION	MSI	E Wall	s at In	tersection	of SR 2894	4 (Concor	rd Mills Blvd.	) and Er	ntranc	e No.	1 Kings Grant Pavilion	GROUN	D WTR (ft)
BOR	ING NO.	RW1	4		SI	TATION	18+26		OFFSET 2	22 ft LT			ALIGNMENT -Y1-	0 HR.	Dry
COL		<b>V</b> . 64	13.9 ft		тс	DTAL DEP	<b>TH</b> 13.8 f	t	NORTHING	<b>5</b> 94,3	51		<b>EASTING</b> 1,488,135	24 HR.	FIAD
DRILL	RIG/HAI	/IMER E	FF./DA	TE F8	R2175	CME-55 86	5% 02/16/201	6	1	DRILL N	/IETHO	DDH.	S. Augers HAMM	ER TYPE	Automatic
DRIL	LER S	Davis			ST		E 08/23/1	6	COMP. DA	TE 08/2	23/16		SURFACE WATER DEPTH N/	A	
ELEV	DRIVE	DEPTH	1	W CO				PER FOOT	l	SAMP.	<b>V</b> /	1 L			
(ft)	ELEV (ft)	(ft)	0.5ft			0	25	50	75 100	NO.	мо	O G	SOIL AND ROCK DESC	CRIPTION	DEPTH (ft)
645													_		
	643.0	0.9											643.9 GROUND SURFA	ACE	0.0
	-	-	22	16	14		<b>6</b> 30 <b></b>				м		641.9 ABC STONE		2.0
640	640.4	- 3.5	100/0.5						100/0.5			1	640.4 <b>ROADWAY EMBANI</b> Gray-Brown, Silty Fine to C		JD ( <u>3.5</u>
	-	-											(A-2-4) with Trace WEATHERED RO	Mica	
005	- 635.4 <sup>-</sup>	- 8.5											Black-Gray-Brown (MET		
635		-	100/0.2				<u> </u>	<u> </u>	100/0.2				DIORITE)		
	-	-													
	630.4 -	- - 13.5											630.1		13.8
	-	-	100/0.3						100/0.3	7			Boring Terminated at Eleva WEATHERED ROCK (ME	tion 630.1 f TA QUART	t in Z
	-	-										F	DIORITE)		
	-	-											NOTE:	in readure	
	-	-											. 1) FIAD due to boring location	i in roadwa	у
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	-	-										-	_		
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8/4/17 GDT DOT 8 BORE NCDOT E

# **GEOTECHNICAL BORING REPORT** BORE LOG

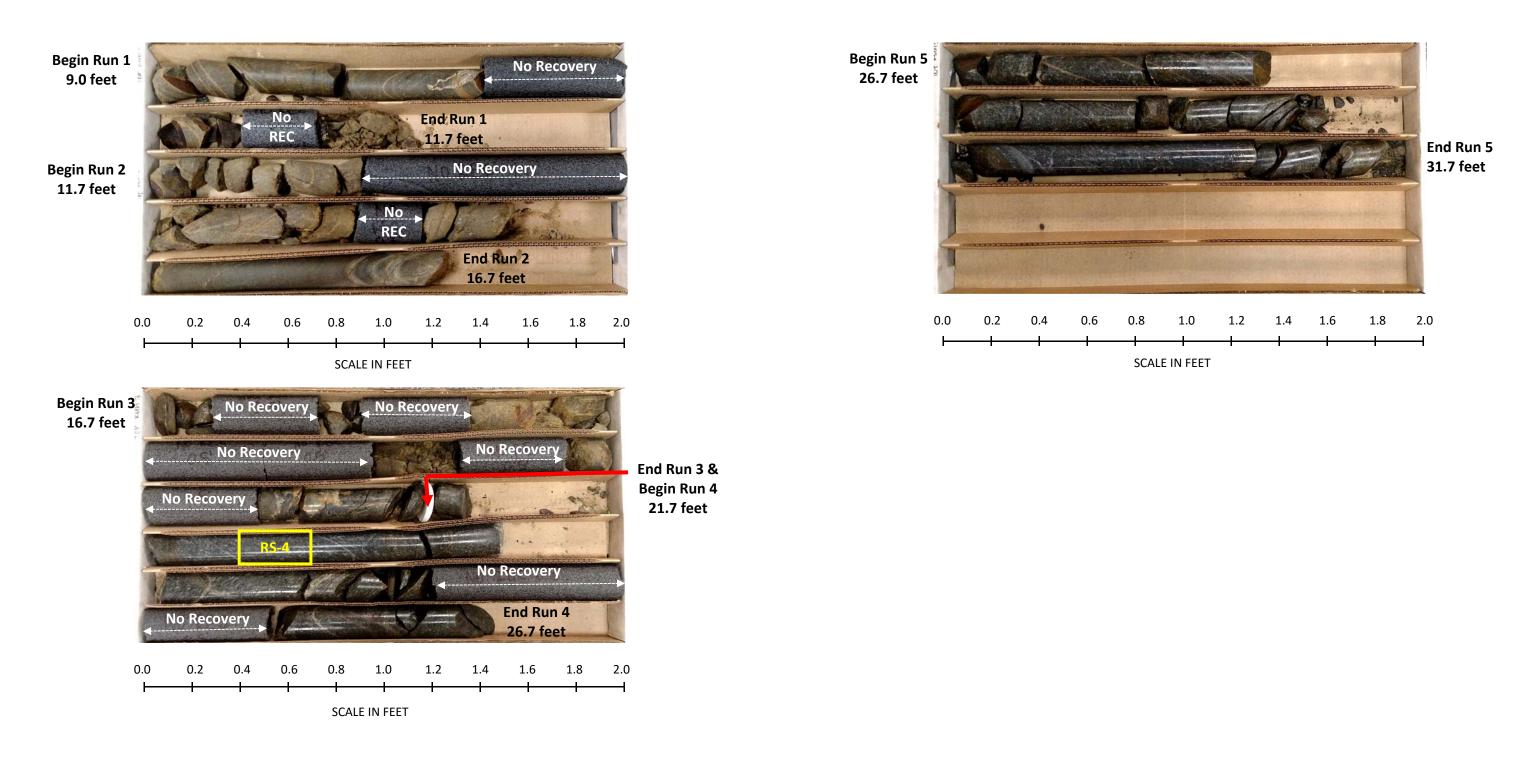
										ORE	LUG							_										
WBS	443	78.1.D1			ТІ	IP U-	-5806		COUNT	Y CABAR	RUS			GE	DLOGIST M. Arnold			v	/BS	44378.1.0	1			TIP	U-580	6	C	OUNT
SITE	DESC	RIPTION	<b>I</b> Inte	ersectio	on of S	SR 289	94 (Co	ncord Mi	lls Blvd.)	and Entrar	ce No. 1	King	s Gra	int Pavil	on	GROUND W	/TR (ft)			DESCRIPTI		nterse	ection c	of SR 2	2894 (0	Concord	Mills E	Blvd.)
BOR	ING N	<b>O</b> . EB2	-В		S	TATIC	<b>DN</b> 15	+84		OFFSET	17 ft R	Т		ALI	GNMENT -Y1-	0 HR.	Dry			<b>IG NO.</b> E						15+84		
		<b>LEV.</b> 63						H 31.7		NORTHI		-			TING 1,487,916	24 HR.	FIAD			AR ELEV.						PTH 31		
DRIL	L RIG/H	IAMMER E	EFF./DA	TE F	&R2175	CME-	55 86%	5 02/16/20	16		DRILL	METH	IOD	SPT Core	Boring HAMM	<b>ERTYPE</b> Auto	omatic			rig/hamme		/DATE	F&R2					
DRIL		S. Davis	-			TART	DATE	08/16/		COMP. D					RFACE WATER DEPTH N/	Ά				ER S. Da						<b>TE</b> 08/1		
ELEV (ft)	DRIV	E DEPTH	' <b> </b>				2		PER FOO			₽.	0		SOIL AND ROCK DESC					SIZE NQ			DRILL	TOTA		N 22.71		ΑΤΑ
(11)	(ft)		0.5π	0.50	0.5ft		2	5	50	75 10	0 NO.		OI G	ELEV.	(ft)	[	DEPTH (ft)		EV ft)	RUN ELEV (ft)		61   F	RATE Min/ft)	REC. (ft)	JN RQD (ft) %	SAMP. NO.	REC. (ft)	ATA RQD (ft) %
																				(II)	/ ·	, (i	iviiri/it)	%	%		%	<u>%</u>
640	638.6	3 - 0.9										_		639.7 638.8	GROUND SURFA	ACE	0.0 0.9	6	30.7 30	630.7 9.	0 2	.7 1:	:36/0.7 :38/1.0	(1.7)	(0.8)		(6.0)	(1.9) 17%
		ł	12	13	19	• •	· · ·	<b>♦</b> 32 <b></b>				м		637.8	ABC STONE		<u> </u>		_	628.0 11		1:	:05/1.0	63% (3.1)	30% (1.1)		52%	17%
635	636.2	2 <u>] 3.5</u>	100/0.	5		1 1				· · · · · · · · · · · · · · · · · · ·	5			636.2	ROADWAY EMBAN	SAND (A-2-4)	3.5	6	25	Ŧ		1:	:41/1.0 :13/1.0 :09/1.0	62%	22%			
		ţ				11	· · ·	· · · · ·							with Trace Gravel an WEATHERED RO	DCK	J			623.0 16	.7	1:	:27/1.0 :30/1.0					
630	631.2	2 <u>8.5</u>	60/0 1				· · ·		· · ·	· · · · · · · · · · · · · · · · · · ·			Ĩ	631.2 630.7	Dark Gray-Brown (META	A QUARTZ	/			Ŧ	5	0 1:	:46/1.0 :53/1.0	(1.8) 36%	(0.3) 6%			
630			60/0.0	ī l					<u> </u>						Gray-Brown (METAD		, 0.0	6	20	Ŧ		1:	:39/1.0 :27/1.0					
		‡					· · ·	· · · · ·		· · · · · ·			Į.			)			-	<u>618.0                                    </u>		1:	:29/1.0	(3.7)	(2.5)	<b>DO</b> 4	(8.6)	(5.3) 47%
625	-	‡								· · · · ·	41		Į.					6	15	Ŧ		1:	:51/1.0 :30/1.0 :32/1.0	(3.7) 74%	50%	RS-4	1	
		ŧ						· · · · ·												613.0 26		11:	:25/1.0 :37/1.0					
620		ŧ					· · ·	· · · · ·		·   · · · · ·			Ś							+	5	5.0 1: 1:	:56/1.0 :15/1.0	(4.3) 86%	(2.5) 50%			
020	1	Ŧ									1		CHK1	619.2	White-Gray (META QUAR	TZ DIORITE)	20.5	6	10	+	_	1:	:25/1.0 :16/1.0					
		ŧ					· · · ·	· · · · ·			RS-4	1				,			F	<u>608.0 31</u>	./	1:	:24/1.0					
615	-	Ŧ							· · · ·				م م							1								
		Ŧ					· · ·	· · · · ·					م م							‡								
610		Ŧ					· · ·	· · · · ·					الجنم معرف							+								
	1	Ŧ											م م	608.0			31.7			+								
		ł												E	Boring Terminated at Eleva CRYSTALLINE ROCK (ME	tion 608.0 ft in TA QUARTZ				+								
		+												F	DIORITÉ)					Ŧ								
		ţ												F	NOTES: 1) Auger Refusal at 9.0'					Ŧ								
		‡												F	2) FIAD due to boring location	n in roadway				+								
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NCDOI BORE DOUBLE US806_GEO_BH_WALL - MSE.GFU NC_DOI.GD1 84/1/		‡												ţ				NCDOT CORE DOUBLE		Ť								
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# **GEOTECHNICAL BORING REPORT** CORE LOG

					EOLOGIST M. Arnold	(51)
	VIIIS E	siva.) a		Entrance No. 1 Kings Grant Pavi		
1	7 ft					Dry AD
	2016				re Boring   HAMMER TYPE Automat	
1	6/16		со		JRFACE WATER DEPTH N/A	
f			_			_
	STR REC.	ATA RQD	L O		CRIPTION AND REMARKS	
	(ft) %	(ft) %	G	ELEV. (ft)	DEPT	<sup>-</sup> H (ft)
	(6.0)	(1.0)			egin Coring @ 9.0 ft CRYSTALLINE ROCK	
	(6.0) 52%	(1.9) 17%		<ul> <li>Gray-Brown, Moderate to I</li> </ul>	Moderately Severe Weathering, Hard to Medium	9.0
					with Moderately Close to Very Close Fracture	
				-	GSI=35-50	
				-		
	(8.6)	(5.3) 47%		619.2 White-Gray, Very Slight to	o Moderate Weathering, Very Hard to Moderately	20.5
]	77%	47%		-	IORITE) with Moderately Close to Close Fracture Spacing	
					3'-22.6', qu=9,590 psi, GSI=45-60	
				-		
				-		
				608.0 Boring Terminated at Elev	evation 608.0 ft in CRYSTALLINE ROCK (META	31.7
				- Doning ronninated at Elo	QUARTZ DIORITE)	
				NOTES: 1) Auger Refusal at 9.0'		
				<ul> <li>2) FIAD due to boring locati</li> </ul>	tion in roadway	
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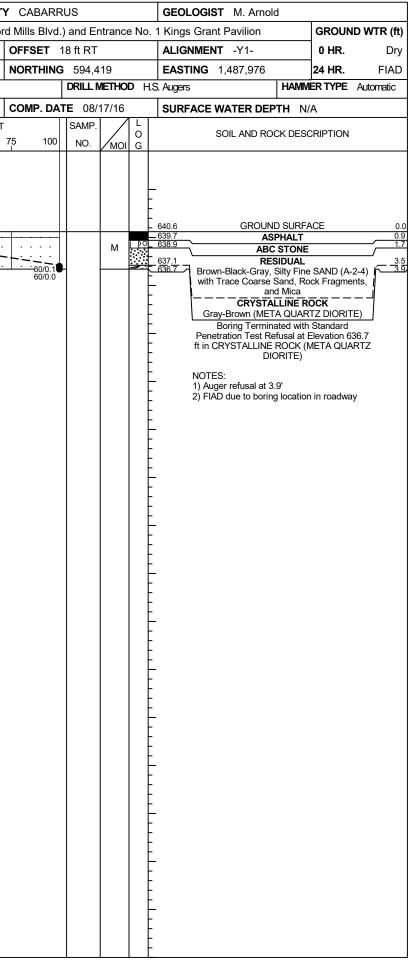


# CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB2-B: -Y1- 15+84, 17' Rt.

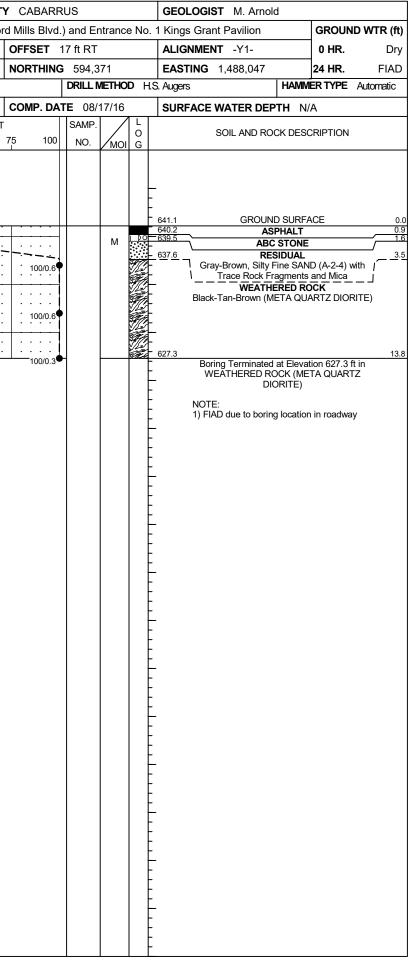




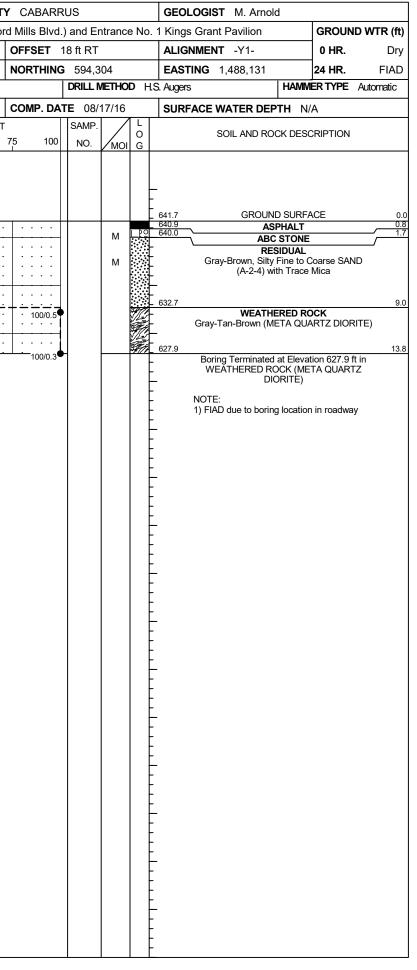
	4437					<b>P</b> U-580				CABAR					LOGIST M. Arnold				<b>S</b> 44378.1					<b>D</b> -580		COUNTY
				E Wal				2894 (Co			-		e No		s Grant Pavilion	GROUND	. ,					E Wall				94 (Concord
BOR	NG NO	. RW	6(1)		S	TATION	16+53			OFFSET	19 ft RT	-		ALIG	NMENT -Y1-	0 HR.	Dry	BOF	RING NO.	RW6	(2)		ST	ATION	16+57	
	AR EL					OTAL DEF			1	NORTHING					<b>FING</b> 1,487,972	24 HR.	FIAD		LAR ELEV						<b>PTH</b> 3.9 ft	
DRILL	RIG/HA	MMERI	EFF./DA	TE F	&R2175	CME-55 8	6% 02/16	6/2016			DRILL	METHO	DD ⊦	H.S. Auger	s HAM	MER TYPE /	Automatic	DRIL	L RIG/HAMIN	MER EF	FF./DA	TE F8	&R2175	CME-55 8	6% 02/16/20	016
DRIL	LER S	. Davis	S		S		<b>TE</b> 08/ <sup>-</sup>	17/16	0	COMP. DA	<b>TE</b> 08/	/17/16		SUR	ACE WATER DEPTH	N/A		DRI	LLER S.C	Davis			ST		<b>FE</b> 08/17/	/16
ELEV	DRIVE ELEV		· — —	ow co			BLO	WS PER I	F00T		SAMP.	· 🔨	L		SOIL AND ROCK DES	SCRIPTION		ELE\		EPTH		w cou				PER FOOT
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25 I	50	7	5 100	NO.	Имо		ELEV. (			DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50 7
645		Ļ												L				645								
		ŧ												F					1							
		ŧ												- 640.5	GROUND SURI	FACE	0.0		<u>†</u>							
640	639.6	0.9	28	23	25								1 00	- 639 6	ASPHALT		0.0	640	639.7	0.9	23	26	19		+ +	+
	637.1	T 3.4			20				<u> </u>	<u> </u>		M		638.8 637.5 637.0	ABC STON		<u></u>		637.1 636.7	3.5						45
		$\overline{+}$	60/0.1							60/0.1	1			<u>- 037.0</u> -	Black-Tan-Brown, Silty Fin with Trace Rock Fragme	e SAND (A-2-4	4)		636.7	3.9	60/0.1 60/0.0			1		
	-	ŧ												F	CRYSTALLINE	ROCK			+							
		‡												F	Gray-Brown (META QUA Boring Terminated with		)		1							
	-	‡												F	Penetration Test Refusal a ft in CRYSTALLINE ROCK	t Elevation 637			1							
		‡												F	DIORITE)		12		1							
		ŧ												F	NOTES:				1							
	-	ŧ												F	<ol> <li>Auger refusal at 3.4'</li> <li>Offset to RW6(2) due to s</li> </ol>	shallow auger										
		ŧ												F	refusal 3) FIAD due to boring location	on in roadway			1 ±							
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	4437					IP U-5806			Y CABAR					LOGIST M. Arnold	T			<b>3</b> 44378					P U-5806		COUNTY
				E Wal				(Concor		-	ntranc	e No		s Grant Pavilion							E Wall				4 (Concord
BOR	ING NO	. RW	7		S	TATION 1	6+77		OFFSET	5 ft RT			_	SNMENT -Y1-	0 HR.	Dry	BOR	ING NO.	RW8			ST	TATION 1	7+44	
	LAR EL					OTAL DEP			NORTHIN							AD		LAR ELE						<b>TH</b> 13.8 f	
DRILL	RIG/HA	MMER	EFF./DA	TE F	&R2175	CME-55 869	% 02/16/201	6		DRILL	METHO	D H	I.S. Auge	rs <b>HAMM</b>	IER TYPE Automa	tic	DRIL	l Rig/Hai	MMER E	FF./DA	TE F8	R2175	CME-55 86	% 02/16/201	16
DRIL	LER S		3		S	TART DATE	E 08/16/1	6	COMP. DA	<b>TE</b> 08/	/16/16		SUR	FACE WATER DEPTH N/	/A		DRI	LER S	. Davis			ST	ART DAT	<b>E</b> 08/17/1	16
ELEV	DRIVE ELEV		' <b></b>	ow co				PER FOOT		SAMP.				SOIL AND ROCK DESC	CRIPTION		ELEV	DRIVE ELEV	DEPTH		W COL				PER FOOT
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 :	25 5	i0 I	75 100	NO.	Имо		ELEV.		DEP	<sup>-</sup> H (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50 7
645		Ļ											L				645		Ļ						
		ŧ											L					-	ŧ						
	640.8	- 0.8											- 641.6 - 640.8	GROUND SURFA	ACE	0.0 0.8		-							
640	-	ŧ	25	25	23			48		-	М		_ 640.8 _ 639.8	ABC STONE		0.8 1.8	640	640.2	0.9	22	20	20		<b>4</b> 0	
	638.1	3.5	19	67	33/0.1	$    \cdot \cdot \cdot \cdot$		_ <u></u>	<u></u>			an	637.6	RESIDUAL Black-Gray-Brown, Silty Fin	ne to Coarse	4.0		637.6 -	3.5		04/04				
635		Ŧ						· · · · ·		•			-	SAND (A-2-4) with Trace Ro and Mica	ock Fragments		635	-	ŧ	00	34/0.1				
	633.1	+ 1 8.5				<del></del>				1			F	WEATHERED RC					ŧ						
	033.1	- 0.5	100/0.:	Ż			· · · · ·			•			-	Red-Brown-Gray (META QUA	ARTZ DIORITE)			632.6 -	8.5	70	30/0.1				
630	-	‡											-				630	-	ŧ						
	628.1	13.5											- 628.6 628.0		оск —	13.0 13.6		- 627.6 -	135						
		Ŧ	60/0.1	4					60/0.1				Ł	Dark Gray-Black (META QUA	ARTZ DIORITE)			- 027.0	10.0	100/0.3					
	-	Ŧ											-	Boring Terminated with Penetration Test Refusal at E	Elevation 628.0			_	F						
		Ŧ											F	ft in CRYSTALLINE ROCK (N DIORITE)	META QUARTZ			-	F						
		Ŧ											F	NOTE:				-	Ŧ						
	-	ŧ											-	1) FIAD due to boring location	n in roadway			-	ŧ						
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WBS	<b>3</b> 4437	8.1.D1			TI	I <b>P</b> U-5806		COUNT	Y CABAR	RUS		0	GEOLOGIST M. Arnold	1	WB	<b>S</b> 44378	3.1.D1			TIF	<b>D</b> -5806		COUNTY
SITE	DESCR	RIPTION	MS	E Wall	s at In	ntersection	of SR 289	4 (Concor	rd Mills Blvo	.) and Er	ntrance l	No. 1 I	Kings Grant Pavilion	GROUND WTR (ft)	SITE	E DESCR		I MSE	E Walls	s at Int	ersection of	SR 2894	(Concord
BOR	ING NO	. RW9	9		S	TATION 1	7+78		OFFSET	5 ft RT		1	ALIGNMENT -Y1-	0 HR. Dry	BOF	ring no	. RW1	0		ST	ATION 18-	+52	
COL	LAR EL	<b>EV.</b> 64	42.1 ft		Т	OTAL DEP	<b>FH</b> 19.0 f	t	NORTHIN	<b>G</b> 594,3	60	E	<b>EASTING</b> 1,488,082	24 HR. FIAD	COL	LAR EL	<b>EV.</b> 64	1.7 ft		то	TAL DEPTH	<b>I</b> 13.8 ft	
DRIL	L RIG/HA	MMER E	FF./DA	TE F8	R2175	CME-55 86	% 02/16/201	6	I	DRILL	<b>IETHOD</b>	H.S. A	Nugers HAMIN	NER TYPE Automatic	DRIL	L RIG/HA	MMER E	FF./DA1	TE F&	R2175	CME-55 86%	02/16/2016	<u> </u>
DRIL	LER S	6. Davis	;		S	TART DATI	E 08/16/1	6	COMP. DA	TE 08/	16/16	5	SURFACE WATER DEPTH N	/A	DRI	LLER S	. Davis			ST	ART DATE	08/17/16	6
ELEV	DRIVE	DEPTH	BLC	w co	JNT		BLOWS	PER FOOT		SAMP.					ELEV	DRIVE	DEPTH	BLO	W COL	JNT		BLOWS P	ER FOOT
(ft)	ELEV (ft)	(ft)		0.5ft	0.5ft	0	25	50	75 100	NO.	моі	О   G   EL	SOIL AND ROCK DES	CRIPTION DEPTH (fi	(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	5 5	0 7
							•							X									
645															645								
<u>0+0</u> _		‡										F					ŧ						
	044.0	<u>†                                    </u>					· · · · · ·					64	2.1 GROUND SURF	ACE 0.			<u>+</u>						
640	641.2	<u> </u>	23	22	24		· · · •	 46 <b></b>			мĻ	PO 64	1.2 ASPHALT 0.2 ABC STONE	- 10	640	640.9	0.8	21	20	16		 	
1	638.6	3.5	25	38	57								RESIDUAL Brown-Black-Gray, Silty Fine			638.2	3.5		-				
l		Ŧ	20		07				· · · · •	5	м	F	with Trace Coarse Sand, Ro	ock Fragments,			Ŧ	4	3	4	Ø7 · ·		
635		ŧ							+ • • • •				and Mica		635		Ŧ					· · · ·	
	633.6	+ 8.5 +	22	37	63/0.4							63	3.1 WEATHERED RO	9.0		633.2	8.5	33	100/0.5		·····	 <u></u>	 _ <u></u> .
<b>C</b> 20		‡							100/0.0				Brown-Grav-Black (MET	A QUARTZ			‡		100,0.0			· · · ·	· · · · ·
630	628.6	- 13.5							+ • • • •				DIORITE)		630	1 -	+						
		1	100/0.4						• 100/0.4							628.2	13.5 	100/0.3					
625		+															+						
	623.6	18.5	100/0.5									<b>F</b> 62	3.1	19.0		-	Ŧ						
		Ŧ	100/0.0	1					100/0.5			F	Boring Terminated at Eleva WEATHERED ROCK (ME		]		Ŧ						
	-	‡										F	DIORITE)			-	‡						
		‡										F	NOTE:				ŧ						
		ŧ										Ę	1) FIAD due to boring location	n in roadway			<u>+</u>						
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WBS	44378	5.1.D1			TI	<b>P</b> U-5806		COUNTY	CABARR	US			GEOLOGIST M. Arnold		
SITE	DESCR	IPTION	I MSI	E Wall	s at In	tersection o	f SR 2894	(Concor	d Mills Blvd.	) and Er	ntranc	e No.	1 Kings Grant Pavilion	GROUND	WTR (ft)
BOR	ing no.	RW1	1		S	TATION 18	8+76		OFFSET 5	5 ft RT			ALIGNMENT -Y1-	0 HR.	Dry
COL	LAR ELE	<b>EV</b> . 64	2.5 ft		т	OTAL DEPT	H 13.5 ft		NORTHING	i 594,2	99		EASTING 1,488,158	24 HR.	FIAD
DRIL	RIG/HAI	MMER E	FF./DA	TE F8	R2175	CME-55 86%	6 02/16/201	6		DRILL	<b>/IETHO</b>	D H.S	Augers HAMM	ER TYPE A	utomatic
DRIL	LER S	Davis			S	TART DATE	08/15/1	6	COMP. DA	<b>FE</b> 08/ <sup>-</sup>	15/16		SURFACE WATER DEPTH N/	A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	-	0W COI		0 2	BLOWS F	PER FOOT	75 100	SAMP. NO.	моі	L O G	SOIL AND ROCK DESC		DEPTH (ft)
645	641.7	- 0.8	18	19	20	· · · · ·	• • • • • • • •		· · · · ·		м		642.5 GROUND SURFA 641.7 ASPHALT 640.7 ABC STONE		0.0 0.8 
640 635	639.0 	3.5 - - - 8.5	20	31	36		· · · · · · · · · · · · · · · · · · ·	• • • • 6 • • • • 6			М		RESIDUAL Brown-Black-Gray, Silty Fine with Trace Mica	sAND (A-2-4 a	/ 4) <u>8.5</u>
630	- - - -	-	100/0.5			· · · · ·	· · · · ·		- 100/0.5  				WEATHERED RC Brown-Black-Gray (MET/ DIORITE)	<b>ock</b> A quartz	13.5
			60/0.0						60/0.0				629.0 Boring Terminated with Penetration Test Refusal at E ft on CRYSTALLINE ROCK ( DIORITE) NOTE: 1) FIAD due to boring location	Elevation 629. META QUAR	13.5

NCDOT BORE DOUBLE U5806\_GEO\_BH\_WALL - MSE.GPJ NC\_DOT.GDT 8/4/17

# LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

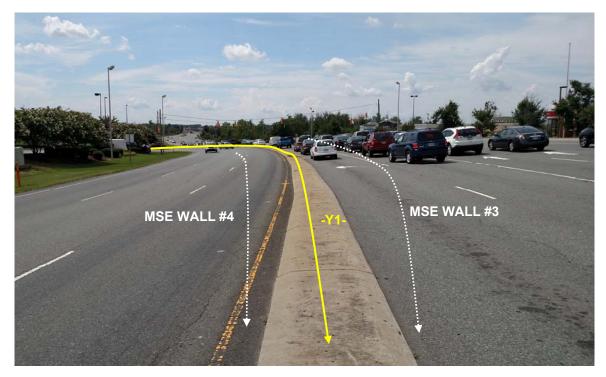
PROJECT NO.:44378.1.D1TIP NO.:U-5806COUNTY:CabarrusDESCRIPTION:Intersection of SR 2894 (Concord Mills Blvd) and Entrance No. 1 Kings Grant Pavilion

Sample #	Boring #	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus, E (ksi)	GSI
RS-3	EB2-A	-Y1-	15+29	15' Lt.	24.5-24.8	Meta Quartz Diorite	PzZq	52%	3.81	1.77	171.0	4,600	352	45-60
RS-4	EB2-B	-Y1-	15+84	17' Rt.	22.3-22.6	Meta Quartz Diorite	PzZq	50%	3.83	1.77	178.2	9,590	1,373	45-60

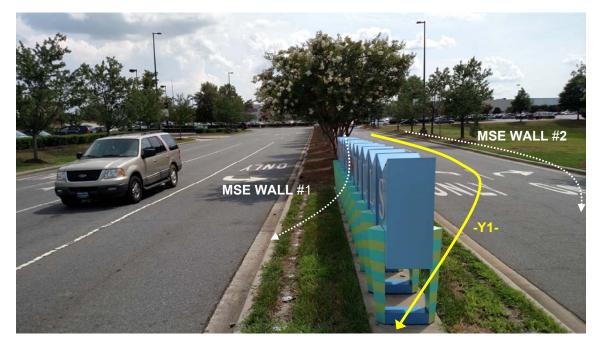




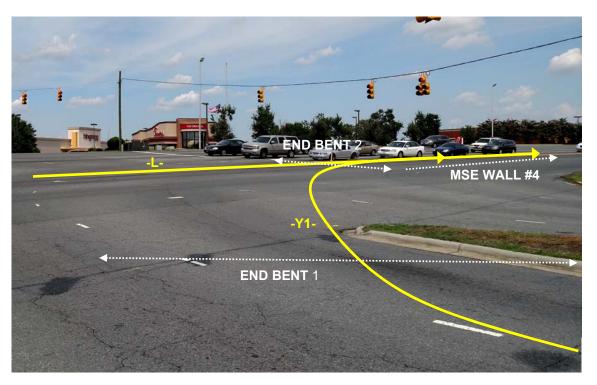
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



Photograph No. 2: On –L- (Concord Mills Blvd.) looking northwest



Photograph No. 3: On -Y1- (Kings Grant Pavilion) looking southwest



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806	CONTENTS <u>SHEET NO.</u>   2 2A 3 4-13 14 15	DESCRIPTION TITLE SHEET LEGEND (SOL & ROCK) SUPPLEMENTAL LEGEND (GSI) SITE PLAN BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS ROCK TEST RESULTS SUMMARY SITE PHOTOGRAPH(S)	
PROJECT: 44378			

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U–5806	1	16

#### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES, THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLT EST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 TOT-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

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PERSONNEL

M. ARNOLD

S. DAVIS

T. SHARPE

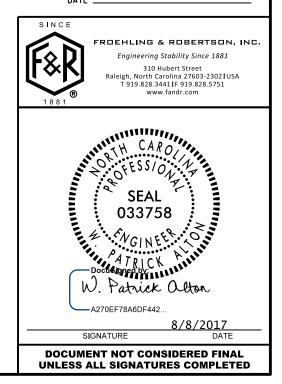
INVESTIGATED BY \_\_\_\_\_\_.

DRAWN BY <u>T.T. WALKER</u>

CHECKED BY P. ALTON

SUBMITTED BY \_\_\_\_\_ P. ALTON

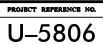
DATE AUGUST 2017



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

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

				SOIL	DESC	RIPT	ON							GF	ADATION						ROCK E	ESCRIPTION	
BE PENE ACCORD IS	TRATED ING TO BASED O	With a Ci The Stani N The Aa	ontinuous Dard Peni Shto Sys	FLIGHT P TRATION T TEM. BASIC	OWER A EST (A DESCR	UGER AN ASHTO T IPTIONS	D YIELI 206, A GENERA	d less 1 Stm D158 NLLY INCI	RTH MATERIALS TI THAN 100 BLOWS P 36J. SOIL CLASSIF LUDE THE FOLLOW PERTINENT FACTO	ER FOOT ICATION ING:	UNIFORML	Y GRADED - INC	DICATE	S THAT SOIL		L APPROXI ZES OF TW	FROM FINE TO COARSE. MATELY THE SAME SIZE. O OR MORE SIZES.	ROCK LINE SPT REFUS/ BLOWS IN I REPRESENT	INDICATES THE I AL IS PENETRATI NON-COASTAL PL ED BY A ZONE O	LEVEL A ION BY A AIN MA	AT WHICH NON-( A SPLIT SPOON TERIAL, THE HERED ROCK.	I WOULD YIELD SPT RE OASTAL PLAIN MATERIA SAMPLER EQUAL TO OR RANSITION BETWEEN S	al Would Yiel R Less Than (
A	S MINER	ALOGICAL	COMPOSIT	ION, ANGUL	ARITY, S	STRUCTU	RE, PLAS	STICITY, I	ETC. FOR EXAMPLE					OUNDNESS OF	SOIL GRAINS IS DE		BY THE TERMS:		RIALS ARE TYPIC	1////			
				ND AND							<u></u>	ANGULAR, <u>SUBAN</u>			OR <u>ROUNDED.</u> CAL COMPOSI	TION		ROCK (WR)			NON-COASTAL P 100 BLOWS PER	AIN MATERIAL THAT W FOOT IF TESTED.	OULD YIELD SI
GENERAL CLASS.			ar Materia Passing "2	00)		SILT-CLAY	SSING 2	00)	ORGANIC MATER	IALS			IES SUC	CH AS QUARTZ	FELDSPAR, MICA, T	ALC, KAOLI		CRYSTALLIN ROCK (CR)	E	ا المغر		GRAIN IGNEOUS AND N PT REFUSAL IF TESTED SCHIST, ETC.	
GROUP CLASS.	A-1 A-1-a A-		A-2-4 A-2	A-2 -5 A-2-6 A-	2-7	4 A-5		A-7-5 A-7-5	A-1, A-2 A-4, A-5 A-3 A-6, A-7						RESSIBILITY			NON-CRYSTA ROCK (NCR)				E GRAIN METAMORPHIC / DCK THAT WOULD YEILD	
SYMBOL						1.7.4						MODER	RATELY	OMPRESSIBLE COMPRESSIBL	E	LL < 3 LL = 3		COASTAL PL		_	COASTAL PLAIN	UDES PHYLLITE, SLATE, SEDIMENTS CEMENTED	INTO ROCK, BU
% Passing "10									RANULAR SILT-	MUCK,		HIGHL			GE OF MATER		0	SEDIMENTAR (CP)			SPT REFUSAL. SHELL BEDS,ET	ROCK TYPE INCLUDES LI C.	IMESTONE, SAN
40	30 MX 50	MX 51 MN							SOILS SOILS	PEAT				GRANULAR	SILT - CLAY			<b> </b>				THERING	
Material Passing "40	10 MA 20			MX 35 MX 35					SOILS WITH		TRACE	ANIC MATERIAL OF ORGANIC MA ORGANIC MATTI ATELY ORGANIC		<u>SOILS</u> 2 - 3% 3 - 5% 5 - 10%	<u>SUILS</u> 3 - 5% 5 - 12% 12 - 20%	TRACE LITTL SOME		FRESH	HAMMER IF CR	LY FRES	NE. H, JOINTS STAIN	ints may show slight Ed, some joints may sh	HOW THIN CLAY
LL PI GROUP INDEX	6 MX	- NP Ø		4N 40 MX 41 4X 11 MN 11 4 MX	MN 10		11 MN	11 MN	LITTLE OR MODERATE AMOUNTS OF	HIGHLY ORGANIC		ORGANIC		> 10%	> 20% JND WATER	HIGHL		(V SLI.) SLIGHT	OF A CRYSTAL	LINE NA	TURE.	E SHINE BRIGHTLY. ROCK	
usual types of major	STONE FR	AGS. FINE		or clayey L and sand	-	silty S01ls	CLAN	rEY .	ORGANIC	SOILS		▽		ER LEVEL IN I	BORE HOLE IMMEDIA		R DRILLING	(SLI.)	1 INCH. OPEN J CRYSTALS ARE	joints M Dull A	ND DISCOLORED.	Y. IN GRANITOID ROCKS CRYSTALLINE ROCKS RIN	Some occasion NG UNDER HAMM
MATERIALS GEN. RATING AS SUBGRADE	Sand		ENT TO GO		+	FAIR T			AIR TO POOR	UNSUITABLE					ATURATED ZONE, OR		ARING STRATA	MODERATE (MOD.)	granitoid Roc Dull Sound U	CKS, MOST INDER HA	FELDSPARS AR	DISCOLORATION AND WEA E DULL AND DISCOLORED, D SHOWS SIGNIFICANT LO	, SOME SHOW CL
		P1 OF 4	-7-5 SUBGF	oup is ≤ li	L - 30 ;	PIOF A-7	6 SUBGR	ioup is > i	LL - 30	1		0-111-	SPRI	NG OR SEEP				MODERATELY	WITH FRESH RO ALL ROCK EXC		RTZ DISCOLORED	OR STAINED. IN GRANIT	OID ROCKS. ALL
			CON	SISTEN	1	R DEM			RANGE OF UN	0.50.50	<b></b>		!	MISCELLA	NEOUS SYMBO	DLS		SEVERE (MOD. SEV.)	AND DISCOLORE	ed and #	A MAJORITY SHO	W KAOLINIZATION. ROCK GIST'S PICK. ROCK GIVES	SHOWS SEVERE
PRIMARY	SOIL TY	PE	COMPACTN CONSIST	ENCY		ETRATION (N-V			COMPRESSIVE (TONS/F	STRENGTH	[ []	ROADWAY EMBA WITH SOIL DES					SLOPE INDICATOR	SEVERE (SEV.)	ALL ROCK EXC	EPT QUA		OR STAINED. ROCK FABF IN GRANITOID ROCKS A	
GENERA GRANUL			LOO	ε		4 T	010		N/A			SOIL SYMBOL		-	UPT DAT TEST BOF		INSTALLATION		TO SOME EXTE	NT. SOM		STRONG ROCK USUALLY	
MATERIA (NON-CO			DENS VERY D	ε			0 50		N/H		X	ARTIFICIAL FIL THAN ROADWAY			AUGER BORING	Ø	CONE PENETROMETER	VERY SEVERE	ALL ROCK EXC	EPT QUA	RTZ DISCOLORED	OR STAINED. ROCK FABR D SOIL STATUS, WITH ONL	
GENERA			VERY SOF				2 10 4		< 0.25 0.25 TO			INFERRED SOIL	. BOUN	IDARY -(	)- CORE BORING	•	SOUNDING ROD	(V SEV.)				OF ROCK WEATHERED TO EMAIN. <u>IF TESTED, WOULL</u>	
SILT-CL MATERIA (COHESI	.AY AL		MEDIUM STIF	STIFF		4 1 8 T	10 8 0 15 10 30		0.5 TO 1 TO 2 2 TO	1.0 2		INFERRED ROCK				au - 🖣	WITH CORE	COMPLETE		NCENTRA		NOT DISCERNIBLE, OR DIS MAY BE PRESENT AS DIKE	
			HAR					'F	> 4						DATION SYMB						ROCK	HARDNESS	
U.S. STD. SI	EVE SIZ	'F		4 10		40	60	200	270					CLASSIFIED E			SSIFIED EXCAVATION -	VERY HARD			BY KNIFE OR S	HARP PICK. BREAKING OF ST'S PICK.	HAND SPECIME
OPENING (M				.76 2.0	0 e	.42		0.075	0.053					SUITABLE WAS		USED	TABLE.BUT NOT TO BE IN THE TOP 3 FEET OF	HARD	CAN BE SCRAT	CHED BY	KNIFE OR PICK	ONLY WITH DIFFICULTY.	, HARD HAMMER
BOULDE (BLDR.)		COBBLE (COB.)		AVEL GR.)	S	ARSE AND E. SD.)		FINE SAND (FSD.)	SILT (SL.)	CLAY (CL.)					KCAVATION - RADABLE ROCK	EMBA	KMENT OR BACKFILL	MODERATELY HARD	EXCAVATED BY	CHED BY HARD B	KNIFE OR PICK	GOUGES OR GROOVES TO GIST'S PICK, HAND SPEC	
GRAIN MN SIZE IN			75 3	2.0	9		0.25		0.05 0.00	5	AR - AUGEI BT - BORIN CL CLAY	NG TERMINATED		MICA	MEDIUM MICACEOUS MODERATELY	WE4	- VANE SHEAR TEST WEATHERED · UNIT WEIGHT	MEDIUM HARD		ED OR G		es deep by firm press d peices 1 inch maximum	
601	MOISTU	SOIL		FURE -			ION	OF T	ERMS			E PENETRATION	TEST	NP - N	ON PLASTIC ORGANIC		DRY UNIT WEIGHT		POINT OF A GE	EOLOGIST	'S PICK.		
		LIMITS)		FIELD P DESCF - SATU	RIPTION				ID: VERY WET. USL		DMT - DILA DPT - DYN	ATOMETER TEST		PMT - EST SAP	PRESSUREMETER TE SAPROLITIC AND, SANDY	s -	BULK	SOFT	FROM CHIPS TO	O SEVER		Y KNIFE OR PICK. CAN B ZE BY MODERATE BLOWS SSURE.	
	+ .10	UID LIMI	· _	(SA)			FROM	BELOW	THE GROUND WATE	R TABLE		NATIO		SL 9 SLI	ILT, SILTY SLIGHTLY	ST RS	- SPLIT SPOON - SHELBY TUBE - ROCK	VERY SOF T				XCAVATED READILY WITH N BY FINGER PRESSURE.	
RANGE <				- WET	- (W)				DUIRES DRYING TI JM MOISTURE	נ	FRAGS FI	RAGMENTS	URES	w - M	TRICONE REFUSAL	CBF	- RECOMPACTED TRIAXIAL - CALIFORNIA BEARING		FRACTURE				BEDDING
(P]) PL _				- MOIST	r . (M)		501 104		NEAR OPTIMUM M		HI HIGHL		JIPM	V - VE ENT USED	ON SUBJECT	PROJ	RATIO CT	VERY WI WIDE		MORE T	<u>Pacing</u> Han 10 feet ) 10 feet	TERM VERY THICKLY THICKLY BEDDE	
		rimum mo Rinkage l					30210			513 TONE				NCING TOOLS:				MODERAT	ELY CLOSE	1 10	3 FEET	THINLY BEDDEC	D 6
				- DRY ·	- (D)				ITIONAL WATER T JM MOISTURE	0	СМЕ-4				FLIGHT AUGER	CORE S	UTOMATIC MANUAL	CLOSE VERY CL	OSE L		TO 1 FOOT AN 0.16 FEET	THICKLY LAMIN THINLY LAMINA	NATED Ø.
				PL	ASTI	CITY										-в	🛛 "						
SLI		PLASTIC		PLAS	<u>TICITY</u> 0- 6-1		(P1)		DRY STREN VERY LOI SLIGHT	v		550 SHEAR TEST		HARD FACED	E INSERTS	X-N HAND 1		FOR SEDIME		NDURATIO	RUBBING WI	DENING OF MATERIAL BY TH FINGER FREES NUME W BY HAMMER DISINTED	ROUS GRAINS:
	ERATEL	Y PLASTI ASTIC	C		16- 26 OR	MORE			MEDIUM HIGH			ABLE HOIST	×	CASING	W/ ADVANCER STEEL TEETH	۹ 🔲 ۱	DST HOLE DIGGER AND AUGER	MODE	RATELY INDURAT	TED		BE SEPARATED FROM S ILY WHEN HIT WITH HAI	
L					COLI										• TUNGCARB.		DUNDING ROD	INDU	RATED			DIFFICULT TO SEPARAT	
									LLOW-BROWN, BLU					CORE BIT			ANE SHEAR TEST	EXTR	EMELY INDURATE	ED		ER BLOWS REQUIRED TO AKS ACROSS GRAINS.	O BREAK SAMP



TED. AN INFERRED	TERMS AND DEFINITIONS
D SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
0.1 FOOT PER 60 K IS OFTEN	ADUIFER - A WATER BEARING FORMATION OR STRATA.
	<u>ARENACEOUS</u> - 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
PT N VALUES >	ANGLEAREDUS - APPCIED TO ALL ROLKS OF SUBSTANCES COMPOSED OF CLAT MINERALS, OF MAYING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
ROCK THAT INCLUDES GRANITE,	ATTESTAN " UNDUNU WHICH THAT IS UNDER SUFFICIENT FRESSURE TO RISE HOUVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
TAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
. IF TESTED. TC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
T MAY NOT YIELD DSTONE, 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.
k Rings under	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
COATINGS IF OPEN.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
Rock up to Val Feldspar	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
ER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
:TS. IN LAY. ROCK HAS TH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
HU CUMPHRED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FELDSPARS DULL LOSS OF STRENGTH	F <u>ormation (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
ARE DISCERNIBLE OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
at only minor	OF AN INTERVENING IMPERVIOUS STRATUM.
<u>VALUES &lt; 100 BPF</u> Y IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
RS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
NS REQUIRES	SAPPOLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BLOWS 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 INTRUDED ROCKS.
DEEP CAN BE DETACHED	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D BLOWS OF THE	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 WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
IN FRAGMENTS INT. SMALL, THIN	<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
K. PIECES 1 INCH CHED READILY BY	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	BENCH MARK: TBM: BY5-404 METAL SURVEY DISK N: 594,551, E: 1,487,930
THICKNESS 4 FEET	
1.5 - 4 FEET	ELEVATION: 644.32 FEET
0.16 - 1.5 FEET .03 - 0.16 FEET	NOTES:
008 - 0.03 FEET < 0.008 FEET	F.I.A.D.= FILLED IMMEDIATELY AFTER DRILLING
EAT, PRESSURE, ETC.	
Ε.	
STEEL PROBE:	
PROBE:	
LE;	DATE: 8-15-14

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

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

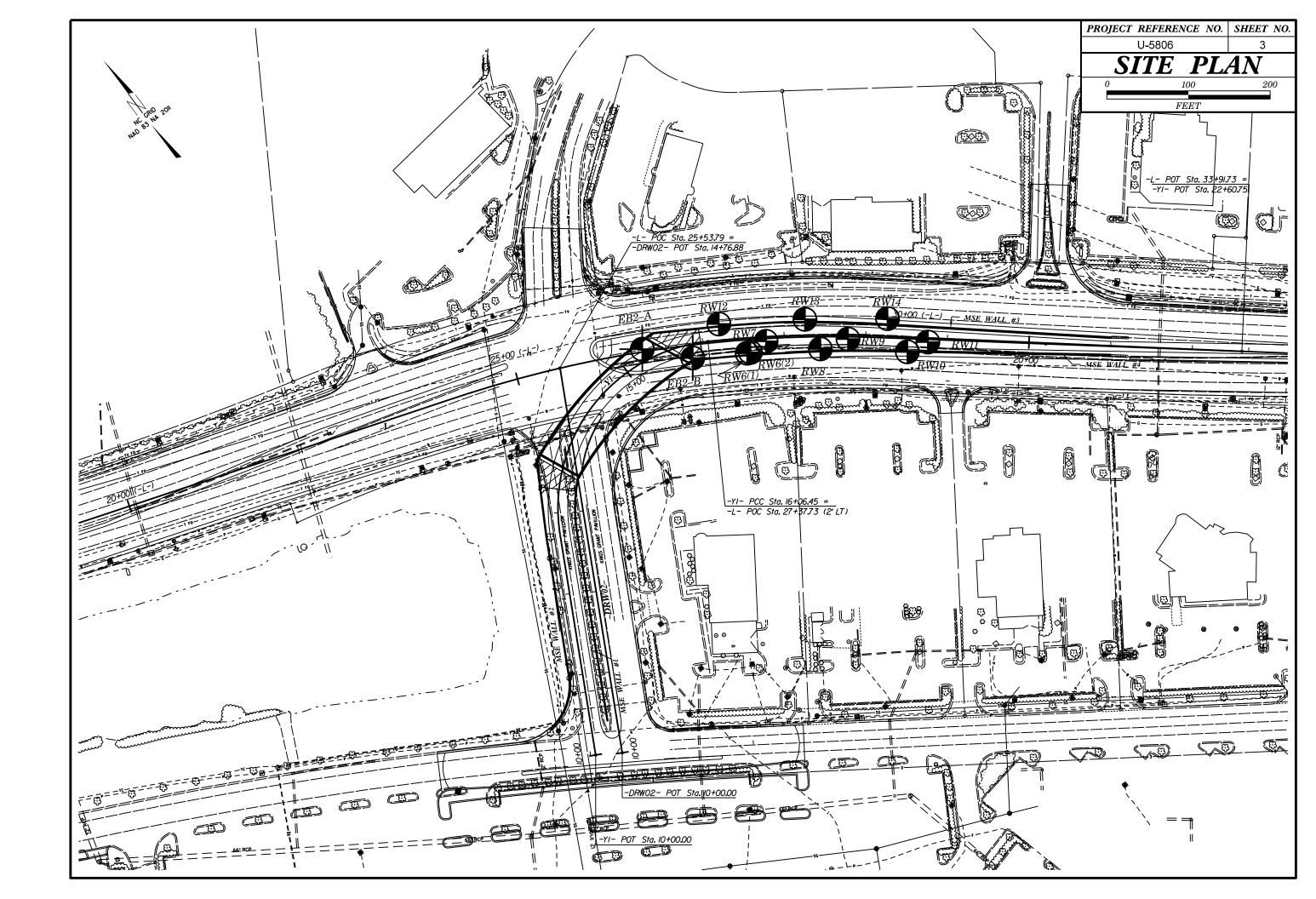
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI)FOR JOINTED ROCKS (Hoek and Marinos, 2000)	aces	p		s G C	s O O	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	0D igh, fresh unweathered surf	600D Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfac with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfac with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the conditi of the discontinuities and estimate the average val of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fa poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING S	URFACE QUI	ALITY 💳	╤ <b>&gt;</b>	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked up:	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting x of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with Stone and Stone or silty shale
VERY BLOCKY - interlocked, cc partially disturbed mass with Z multi-faceted angular blocks y formed by 4 or more joint sets		5	50			thin inter- layers of siltstone siltstone
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Means deformation after tectonic disturbance

		U–5	806			2A
Tectonically Defo	prmed Heterog	geneous Rock	Masses (Marır	nos and	Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	600D - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth,occasionally slickensided surfaces with compact	coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
	70 60	A		/		
E. Weak siltstone or clayey shale with sandstone layers		50 B 40	С	s/	E	
leformed, d/faulted, hale or siltstone deformed s forming an tructure			30	F 20		
leformed silty forming a e with pockets yers of ransformed pieces.			\$		-	10 1

PROJECT REPERENCE NO.

SHEBT NO.

DATE: 8-19-16



									BOF	<u>KE L</u>	<u>UG</u>																		<u> </u>
WB	<b>3</b> 443	378.1.D1			Т	<b>P</b> U-580	6	COL	<b>JNTY</b> C	ABARR	US			GEC	LOGIS	T M. Arn	old			WBS	<b>4</b> 4378	3.1.D1			TIP	U-580	6	C	OUNT
SIT	DESC	CRIPTIO	N Inte	ersectio	on of S	R 2894 (0	Concord N	lills Blv	d.) and E	Entrance	No. 1 I	Kings	Grar	nt Pavilio	on			GROUND	WTR (ft)	SITE	DESCR	RIPTION	I Inte	rsection	of SR 2	2894 (	Concord	Mills E	Blvd.) a
BOF	RING N	<b>IO</b> . EB2	-В		SI	TATION	15+84		OF	FSET <sup>·</sup>	17 ft RT			ALIC	GNMEN	<b>T</b> -Y1-		0 HR.	Dry	BOF	ING NO	. EB2-	·В		STAT	ΓΙΟΝ	15+84		
COL	LAR E	<b>ELEV</b> . 6	39.7 ft		т	OTAL DE	<b>PTH</b> 31.7	ft	NO	RTHING	i 594,4	55		EAS	TING	1,487,916		24 HR.	FIAD	COL	LAR EL	<b>EV.</b> 63	39.7 ft		тот	AL DE	<b>PTH</b> 31	.7 ft	
DRIL	L RIG/I	HAMMER	EFF./DA	TE F	&R2175	CME-55 8	6% 02/16/2	016			DRILL	VIETHO	DD S	SPT Core	Boring		HAMM	ERTYPE A	utomatic	DRIL	l rig/ha	MMER E	FF./DA	TE F&R2	2175 CN	/E-55 8	6% 02/16	/2016	
DRI	LER	S. Davis	6		ST		<b>TE</b> 08/16	/16	CO	MP. DA	<b>FE</b> 08/	17/16		SUR		WATER DE	EPTH N/	A		DRI	LER S	. Davis			STA	rt da	<b>TE</b> 08/1	6/16	
ELE\	DRIV	V DEPT	· <b> </b>	ow co			BLOW	BPER F	ООТ		SAMP.	▼∕	LO		ç	SOIL AND R	OCK DESC	RIPTION		COF	E SIZE	NQ3			тот	AL RUI	<b>N</b> 22.7 f		
(ft)	(ft)		0.5ft	0.5ft	0.5ft	0	25	50	75	100	NO.	мо		ELEV.					DEPTH (ft)	ELEV	RUN ELEV	DEPTH		DRILL RATE	REC.	JN RQD	SAMP.	STR REC.	RQD
																				(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %
640		_												639.7 638.8			JND SURFA	CE	0.0	630.7 630	630.7	90	2.7	1.36/0.7	(1.7)	(0.8)		(6.0)	(1.9)
	638.	<u>8 - 0.9</u> -	12	13	19		· • • 32÷		· ·   ·			м			~		ASPHALT BC STONE		0.9		628.0	11.7	2.1	1:36/0.7 1:38/1.0 1:05/1.0	63%	30%		52%	17%
635	636.	2 7 3.5	100/0.5	5			· · · · ·		╧┽┾┊	100/0.5				636.2	Dark		Y EMBAN	KMENT SAND (A-2-4)	3.5			Ŧ	5.0	1:41/1.0 1:13/1.0	(3.1)	(1.1) 22%			
		Ŧ												-		with Trac	e Gravel an	d Mica	<u></u>	625	-	Ŧ		1:09/1.0 1:27/1.0					
	631.	7 <del>- 8.5</del>							· ·   ·					6 <u>31.2</u> 630.7		ark Gray-Br			8.5		623.0	T 16.7	5.0	1:30/1.0 1:46/1.0	(1.8)	(0.3)			
630	630.	<u>7 7 9.0</u> T	60/0.1						· · · ·	• 60/0.1 60/0.0-			P	630.7	\	CRYST				620		ŧ		1:53/1.0 1:39/1.0		6%			
		Ŧ							.					-		Gray-Brow	/n (METADI	ORITE)			618.0	21.7		1:27/1.0 1:29/1.0				(8.6)	(5.3) 47%
625		Ŧ				•••														045		ŧ	5.0	1:51/1.0 1:30/1.0	74%	(2.5) 50%	RS-4	//%	47%
		Ŧ												E						615	-	+		1:32/1.0 1:25/1.0					
		Ŧ					· · · · · ·		.					E							613.0	26.7	5.0	1:37/1.0 1:56/1.0	(4.3)	(2.5)			
620	-	Ŧ							· · · ·					619.2					20.5	610		ŧ		1:15/1.0		50%			
		Ŧ							.		RS-4				Wh	ite-Gray (Mi	ETA QUAR	TZ DIORITE)			608.0	31.7		1:16/1.0 1:24/1.0					
615		Ŧ									<u></u>	1										ŧ							
		ŧ						.						1							-	ŧ							
		ŧ																				ŧ							
610	-	÷																	04.7		-	ŧ							
		+												608.0	Borir	ng Terminat	ed at Elevat	ion 608.0 ft in	31.7			ŧ							
		‡												È.	CR	YSTALLINE [	DIORITE)	TA QUARTZ				Ŧ							
		ŧ												F	NOTE						-	Ŧ							
		ŧ												F		er Refusal a D due to bor		in roadway				Ŧ							
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		ŧ												F						NCDOT CORE DOUBLE US806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17		‡			1				
		+												_						NCD		‡							

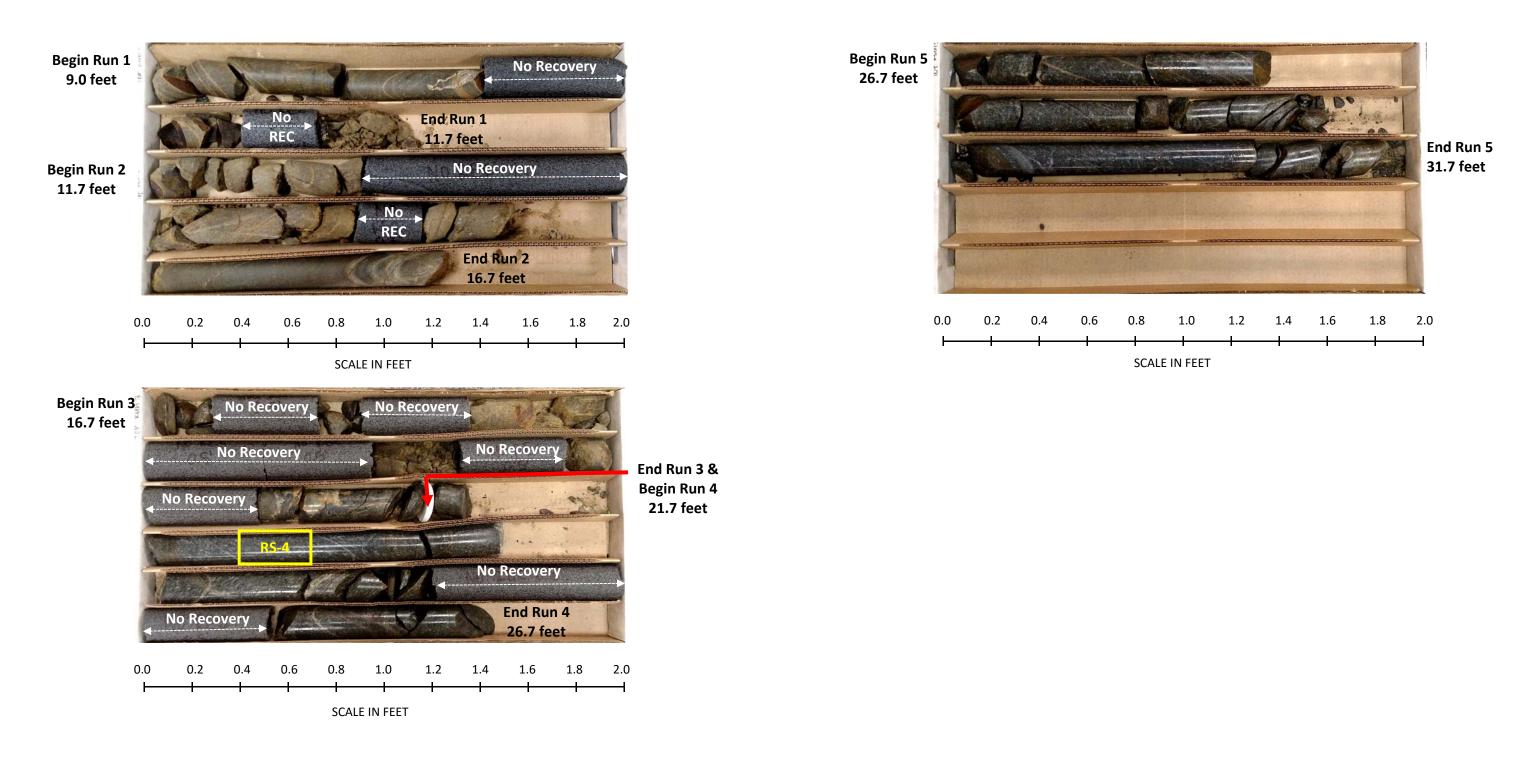
GEO\_BH\_WALL - MSE.GPJ NC\_DOT.GDT 8/4/17 U5806\_ DOUBLE BORE NCDOT

## **GEOTECHNICAL BORING REPORT** CORE LOG

				CABARRUS GEOLOGIST M. Arnold	00010	
1	VIIIS	Bivd.) a		Entrance No. 1 Kings Grant Pavilion		D WTR (ft)
4	7 4			FSET         17 ft RT         ALIGNMENT         -Y1-           PTUNC         504.455         FASTING         4.02.040	0 HR.	Dry
	7 ft 2016				24 HR. ER TYPE	FIAD Automatic
_			<u></u>			Automatic
ft	6/16			MP. DATE 08/17/16 SURFACE WATER DEPTH N//	4	
1	STI	RATA	L			
	REC. (ft) %	RQD (ft) %	O G	DESCRIPTION AND REMARKS ELEV. (ft)		DEPTH (ft)
	70			Begin Coring @ 9.0 ft		
	(6.0) 52%	(1.9) 17%	R	- 630.7 CRYSTALLINE ROCK - Gray-Brown, Moderate to Moderately Severe Weathering, Ha	ard to Med	9.0 lium
				<ul> <li>Hard (METADIORITE) with Moderately Close to Very Close</li> <li>Spacing</li> </ul>		
				- GSI=35-50		
				-		
				-		
	(8.6)	(5.3)		619.2 White-Gray, Very Slight to Moderate Weathering, Very Hard	to Modera	20.5
	77%	(5.3) 47%		Hard (META QUARTZ DIORITE) with Moderately Close to C	Close Fract	ure
				RS-4: 22.3'-22.6', qu=9,590 psi, GSI=45-60		
				-		
				-		
						31.7
				Boring Terminated at Elevation 608.0 ft in CRYSTALLINE R QUARTZ DIORITE)	ROCK (ME	
				NOTES:		
				<ul> <li>1) Auger Refusal at 9.0'</li> <li>2) FIAD due to boring location in roadway</li> </ul>		
				-		
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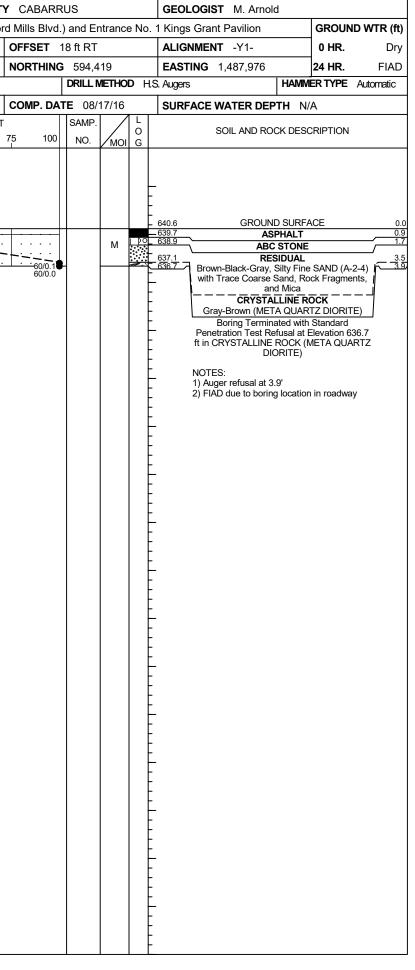


# CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB2-B: -Y1- 15+84, 17' Rt.

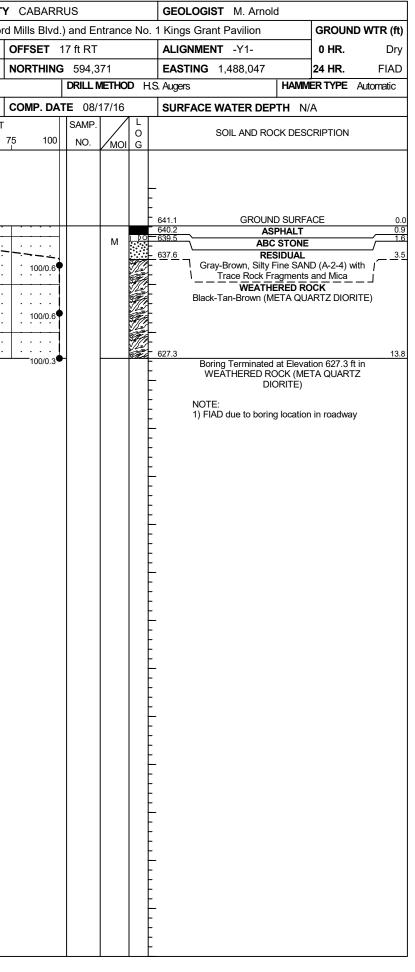




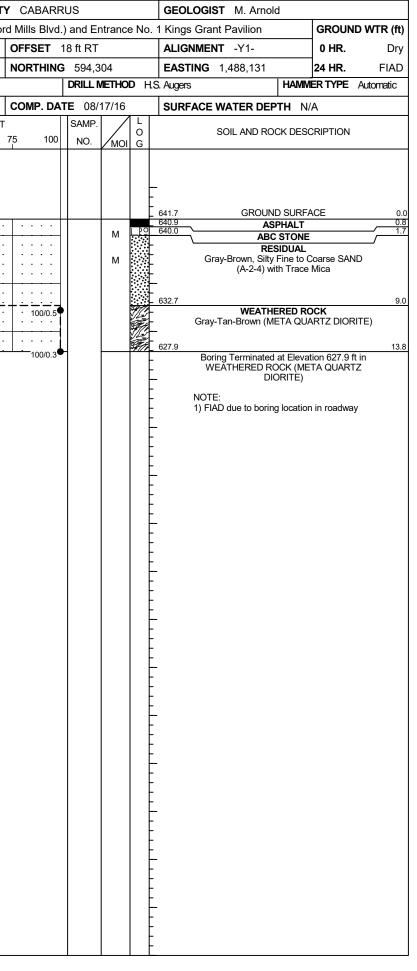
	4437					<b>P</b> U-580				CABAR					LOGIST M. Arnold				<b>S</b> 44378.1					<b>D</b> -580		COUNTY
				E Wal				2894 (Co			-		e No		s Grant Pavilion	GROUND	. ,					E Wall				94 (Concord
BOR	NG NO	. RW	6(1)		S	TATION	16+53			OFFSET	19 ft RT	-		ALIG	NMENT -Y1-	0 HR.	Dry	BOF	RING NO.	RW6	(2)		ST	ATION	16+57	
	AR EL					OTAL DEF			1	NORTHING					<b>FING</b> 1,487,972	24 HR.	FIAD		LAR ELEV						<b>PTH</b> 3.9 ft	
DRILL	RIG/HA	MMERI	EFF./DA	TE F	&R2175	CME-55 8	6% 02/16	6/2016			DRILL	METHO	DD ⊦	H.S. Auger	s HAM	MER TYPE /	Automatic	DRIL	L RIG/HAMIN	VIER EI	FF./DA	TE F8	&R2175	CME-55 8	6% 02/16/20	016
DRIL	LER S	. Davis	S		S		<b>TE</b> 08/ <sup>-</sup>	17/16	0	COMP. DA	<b>TE</b> 08/	/17/16		SUR	ACE WATER DEPTH	N/A		DRI	LLER S.C	Davis			ST		<b>FE</b> 08/17/	/16
ELEV	DRIVE ELEV		· — —	ow co			BLO	WS PER I	F00T		SAMP.	· 🔨	L		SOIL AND ROCK DES	SCRIPTION		ELE\		EPTH		w co				PER FOOT
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25 I	50	7	5 100	NO.	Имо		ELEV. (			DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50 7
645		Ļ												L				645								
		ŧ												F					1							
		ŧ												- 640.5	GROUND SURI	FACE	0.0		<u>†</u>							
640	639.6	0.9	28	23	25								1 00	- 639 6	ASPHALT		0.0	640	639.7	0.9	23	26	19		+ +	+
	637.1	T 3.4			20				<u> </u>	<u> </u>		M		638.8 637.5 637.0	ABC STON		<u></u>		637.1 636.7	3.5						45
		$\overline{+}$	60/0.1							60/0.1	1			<u>- 037.0</u> -	Black-Tan-Brown, Silty Fin with Trace Rock Fragme	e SAND (A-2-4	4)		636.7	3.9	60/0.1 60/0.0			1		
	-	ŧ												F	CRYSTALLINE	ROCK			+							
		‡												F	Gray-Brown (META QUA Boring Terminated with		)		1							
	-	‡												F	Penetration Test Refusal a ft in CRYSTALLINE ROCK	t Elevation 637			1							
		‡												F	DIORITE)		12		1							
		ŧ												F	NOTES:				1							
	-	ŧ												F	<ol> <li>Auger refusal at 3.4'</li> <li>Offset to RW6(2) due to s</li> </ol>	shallow auger										
		ŧ												F	refusal 3) FIAD due to boring location	on in roadway			1 ±							
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	4437					IP U-5806			Y CABAR					LOGIST M. Arnold	T			<b>3</b> 44378					P U-5806		COUNTY
				E Wal				(Concor		-	ntranc	e No		s Grant Pavilion							E Wall				4 (Concord
BOR	ING NO	. RW	7		S	TATION 1	6+77		OFFSET	5 ft RT			_	SNMENT -Y1-	0 HR.	Dry	BOR	ING NO.	RW8			ST	TATION 1	7+44	
	LAR EL					OTAL DEP			NORTHIN							AD		LAR ELE						<b>TH</b> 13.8 f	
DRILL	RIG/HA	MMER	EFF./DA	TE F	&R2175	CME-55 869	% 02/16/201	6		DRILL	METHO	D H	I.S. Auge	rs <b>HAMM</b>	IER TYPE Automa	tic	DRIL	l Rig/Hai	MMER E	FF./DA	TE F8	R2175	CME-55 86	% 02/16/201	16
DRIL	LER S		3		S	TART DATE	E 08/16/1	6	COMP. DA	<b>TE</b> 08/	/16/16		SUR	FACE WATER DEPTH N/	/A		DRI	LER S	. Davis			ST	ART DAT	<b>E</b> 08/17/1	16
ELEV	DRIVE ELEV		' <b></b>	ow co				PER FOOT		SAMP.				SOIL AND ROCK DESC	CRIPTION		ELEV	DRIVE ELEV	DEPTH		W COL				PER FOOT
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 :	25 5	i0 I	75 100	NO.	Имо		ELEV.		DEP	<sup>-</sup> H (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50 7
645		Ļ											L				645		Ļ						
		ŧ											L					-	ŧ						
	640.8	- 0.8											- 641.6 - 640.8	GROUND SURFA	ACE	0.0 0.8		-							
640	-	ŧ	25	25	23			48		-	М		_ 640.8 _ 639.8	ABC STONE		0.8 1.8	640	640.2	0.9	22	20	20		<b>4</b> 0	
	638.1	3.5	19	67	33/0.1	$    \cdot \cdot \cdot \cdot$		_ <u></u>	<u></u>			an	637.6	RESIDUAL Black-Gray-Brown, Silty Fin	ne to Coarse	4.0		637.6 -	3.5		04/04				
635		Ŧ						· · · · ·		•			-	SAND (A-2-4) with Trace Ro and Mica	ock Fragments		635	-	ŧ	00	34/0.1				
	633.1	+ 1 8.5				<del></del>				1			F	WEATHERED RC					ŧ						
	033.1	- 0.5	100/0.:	Ż			· · · · ·			•			-	Red-Brown-Gray (META QUA	ARTZ DIORITE)			632.6 -	8.5	70	30/0.1				
630	-	‡											-				630	-	ŧ						
	628.1	13.5											- 628.6 628.0		оск —	13.0 13.6		- 627.6 -	135						
		Ŧ	60/0.1	4					60/0.1				Ł	Dark Gray-Black (META QUA	ARTZ DIORITE)			- 027.0	10.0	100/0.3					
	-	Ŧ											-	Boring Terminated with Penetration Test Refusal at E	Elevation 628.0			_	F						
		Ŧ											F	ft in CRYSTALLINE ROCK (N DIORITE)	META QUARTZ			-	F						
		Ŧ											F	NOTE:				-	Ŧ						
	-	ŧ											-	1) FIAD due to boring location	n in roadway			-	ŧ						
		‡											È					-	ŧ						
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WBS	<b>3</b> 4437	8.1.D1			TI	I <b>P</b> U-5806		COUNT	Y CABAR	RUS		0	GEOLOGIST M. Arnold	1	WB	<b>S</b> 44378	3.1.D1			TIF	<b>D</b> -5806		COUNTY
SITE	DESCR	RIPTION	MS	E Wall	s at In	ntersection	of SR 289	4 (Concor	rd Mills Blvo	.) and Er	ntrance l	No. 1 I	Kings Grant Pavilion	GROUND WTR (ft)	SITE	E DESCR		I MSE	E Walls	s at Int	ersection of	SR 2894	(Concord
BOR	ING NO	. RW9	9		S	TATION 1	7+78		OFFSET	5 ft RT		1	ALIGNMENT -Y1-	0 HR. Dry	BOF	ring no	. RW1	0		ST	ATION 18-	+52	
COL	LAR EL	<b>EV.</b> 64	42.1 ft		Т	OTAL DEP	<b>FH</b> 19.0 f	t	NORTHIN	<b>G</b> 594,3	60	E	<b>EASTING</b> 1,488,082	24 HR. FIAD	COL	LAR EL	<b>EV.</b> 64	1.7 ft		то	TAL DEPTH	<b>I</b> 13.8 ft	
DRIL	L RIG/HA	MMER E	FF./DA	TE F8	R2175	CME-55 86	% 02/16/201	6	I	DRILL	<b>IETHOD</b>	H.S. A	Nugers HAMIN	NER TYPE Automatic	DRIL	L RIG/HA	MMER E	FF./DA1	TE F&	R2175	CME-55 86%	02/16/2016	<u> </u>
DRIL	LER S	6. Davis	;		S	TART DATI	E 08/16/1	6	COMP. DA	TE 08/	16/16	5	SURFACE WATER DEPTH N	/A	DRI	LLER S	. Davis			ST	ART DATE	08/17/16	6
ELEV	DRIVE	DEPTH	BLC	w co	JNT		BLOWS	PER FOOT		SAMP.					ELEV	DRIVE	DEPTH	BLO	W COL	JNT		BLOWS P	ER FOOT
(ft)	ELEV (ft)	(ft)		0.5ft	0.5ft	0	25	50	75 100	NO.	моі	О   G   EL	SOIL AND ROCK DES	CRIPTION DEPTH (fi	(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	5 5	0 7
							•							X									
645															645								
<u>0+0</u> _		‡										F					ŧ						
	044.0	<u>†                                    </u>					· · · · · ·					64	2.1 GROUND SURF	ACE 0.			<u>+</u>						
640	641.2	<u> </u>	23	22	24		· · · •	 46 <b></b>			мĻ	PO 64	1.2 ASPHALT 0.2 ABC STONE	- 10	640	640.9	0.8	21	20	16		 	
1	638.6	3.5	25	38	57								RESIDUAL Brown-Black-Gray, Silty Fine			638.2	3.5		-				
l		Ŧ	20		07				· · · · •	5	м	F	with Trace Coarse Sand, Ro	ock Fragments,			Ŧ	4	3	4	<b>Ø</b> 7 · ·		
635		ŧ							+ • • • •				and Mica		635		Ŧ					· · · ·	
	633.6	+ 8.5 +	22	37	63/0.4							63	3.1 WEATHERED RO	9.0		633.2	8.5	33	100/0.5		·····	 <u></u>	 _ <u></u> .
<b>C</b> 20		‡							100/0.0				Brown-Grav-Black (MET	A QUARTZ			‡		100,0.0			· · · · ·	· · · · ·
630	628.6	- 13.5							+ • • • •				DIORITE)		630		+						
		1	100/0.4					· · · ·	• 100/0.4							628.2	13.5 	100/0.3					
625		+															+						
	623.6	18.5	100/0.5									<b>F</b> 62	3.1	19.0		-	Ŧ						
		Ŧ	100/0.0	1					100/0.5			F	Boring Terminated at Eleva WEATHERED ROCK (ME		]		Ŧ						
	-	‡										F	DIORITE)			-	‡						
		‡										F	NOTE:				ŧ						
		ŧ										Ę	1) FIAD due to boring location	n in roadway			<u>+</u>						
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WBS	44378	.1.D1			TI	<b>P</b> U-5806	6	COUNT	Y CABARF	RUS			GEOLOGIST M. Arnold	
SITE	DESCR	PTION	MSI	E Wall	ls at In	tersection	of SR 2894	4 (Concor	d Mills Blvd	) and Er	ntranc	e No.	1 Kings Grant Pavilion	GROUND WTR (ft)
BOR	ING NO.	RW1	1		S	TATION 1	18+76		OFFSET	5 ft RT			ALIGNMENT -Y1-	<b>0 HR</b> . Dry
COL	LAR ELE	<b>V</b> . 64	12.5 ft		т	OTAL DEP	<b>TH</b> 13.5 f	t	NORTHING	594,2	99		EASTING 1,488,158	24 HR. FIAD
				TE F8			5% 02/16/201					D H.S		JIER TYPE Automatic
DRII	LER S	Davis			5		E 08/15/1	6	COMP. DA				SURFACE WATER DEPTH N	/Δ
ELEV (ft)		DEPTH (ft)	1	OW CO	UNT		BLOWS	PER FOOT		SAMP. NO.	моі	L O G	SOIL AND ROCK DESC	
645 640 635	641.7 - 639.0 	- 0.8 	18	19 31	20		· · · · · · · · · · · · · · · · · · ·		7		M	-	642.5 GROUND SURF/ 641.7 ASPHALT 640.7 ABC STONE RESIDUAL Brown-Black-Gray, Silty Fine with Trace Mic	0.8 1.8
630	634.0 - - - 629.0	- <u>8.5</u> - - - - 13.5	100/0.5	5					 . 100/0.5 				634.0 WEAT HERED RO Brown-Black-Gray (MET DIORITE) 629.0	<b>DCK</b> <u>8.5</u> A QUARTZ 13.5
			60/0.0						60/0.0				Boring Terminated with Penetration Test Refusal at 1 ft on CRYSTALLINE ROCK ( DIORITE) NOTE: 1) FIAD due to boring location	i Standard Elevation 629.0 META QUARTZ

NCDOT BORE DOUBLE U5806\_GEO\_BH\_WALL - MSE.GPJ NC\_DOT.GDT 8/4/17

		BORE LOG						·		C
WBS 44378.1.D1	TIP U-5806 CO	UNTY CABARRUS	GEOLOGIST M. Arnold		WE	<b>3S</b> 44378.1.D1		<b>TIP</b> U-58	06	COUN
SITE DESCRIPTION Intersection	n of SR 2894 (Concord Mills Bl	vd.) and Entrance No. 1 Kings Gra	nt Pavilion	GROUND WTR (ft)	SIT	TE DESCRIPTION	Intersection	of SR 2894	(Concord	Mills Blvd.)
BORING NO. EB2-A	STATION 15+29	OFFSET 15 ft LT	ALIGNMENT -Y1-	0 HR. Dry	во	DRING NO. EB2-	A	STATION	15+29	
COLLAR ELEV. 640.4 ft	TOTAL DEPTH 26.7 ft	NORTHING 594,501	EASTING 1,487,873	24 HR. FIAD		DLLAR ELEV. 64		TOTAL DE		
DRILL RIG/HAMMER EFF./DATE F&	R2175 CME-55 86% 02/16/2016	DRILL METHOD	SPT Core Boring HAMIV	<b>IER TYPE</b> Automatic	DR	ILL RIG/HAMMER E	FF./DATE F&R	2175 CME-55	86% 02/16	/2016
DRILLER S. Davis	START DATE 08/17/16	COMP. DATE 08/18/16	SURFACE WATER DEPTH N	/A	DR	RILLER S. Davis		START DA	<b>ATE</b> 08/1	7/16
ELEV DRIVE DEPTH BLOW COL			SOIL AND ROCK DES	CRIPTION	со	DRE SIZE NQ3		TOTAL RU	<b>JN</b> 23.0 f	
(ft) (ft) (ft) 0.5ft 0.5ft	0.5ft 0 25 50	75 100 NO. MOI G		DEPTH (ft)	ELE			REC. RQD (ft) (ft) % %	SAMP. NO.	STRATA REC. RQD
645					(ft) 636. 635	636.7 3.7	(ft) (Min/ft) 3.0 1:44/1.0 1:05/1.0	(1.2) (0.0) 40% 0%	NO.	(16.8) (8.0) 73% 35%
640 639.5 0.9 19 17	<u> </u>	· · · · · · · · · · · · · · · · · · ·	- 640.4 GROUND SURF/ - 639.5 ASPHALT - 638.4 ADD COLOUR	0.9	630	633.7 + 6.7	1:11/1.0 5.0 2:21/1.0 1:39/1.0 1:27/1.0	(2.2) (0.0) 44% 0%	-	
636.9 ± 3.5			ABC STONE	3.0	030	<u>628.7 11.7</u>	1:49/1.0 1:26/1.0			
636.7 <u>3.7</u> 60/0.0 60/0.0			Gray-Brown, Silty Fine to 0 (A-2-4) with Trace Grave CRYSTALLINE R	el and Mica	625	5 4	5.0 1:49/1.0 1:13/1.0 1:27/1.0 1:26/1.0	90% 42%		
			Dark Gray-Brown (MET)	A QUARTZ		623.7 _ 16.7	2:37/1.0 5.0 1:41/1.0	(4.3) (3.3)		
					620		1:44/1.0 1:40/1.0 1:36/1.0			
						618.7 _ 21.7	1:54/1.0 5.0 2:35/1.0 1:44/1.0	(4.6) (2.6)		
					615	5 <u>-</u> 613.7 <u>-</u> 26.7	1:41/1.0 1:37/1.0 1:29/1.0		RS-3	
620						-	1.29/1.0			
						+				
615		RS-3								
			613.7     Boring Terminated at Eleva     CRYSTALLINE ROCK (ME	26.7 tion 613.7 ft in ETA QUARTZ						
			– DIORITĖ) – NOTES:							
			1) Auger Refusal at 3.7'     2) FIAD due to boring location	n in roadway						
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			-		8/4/17					
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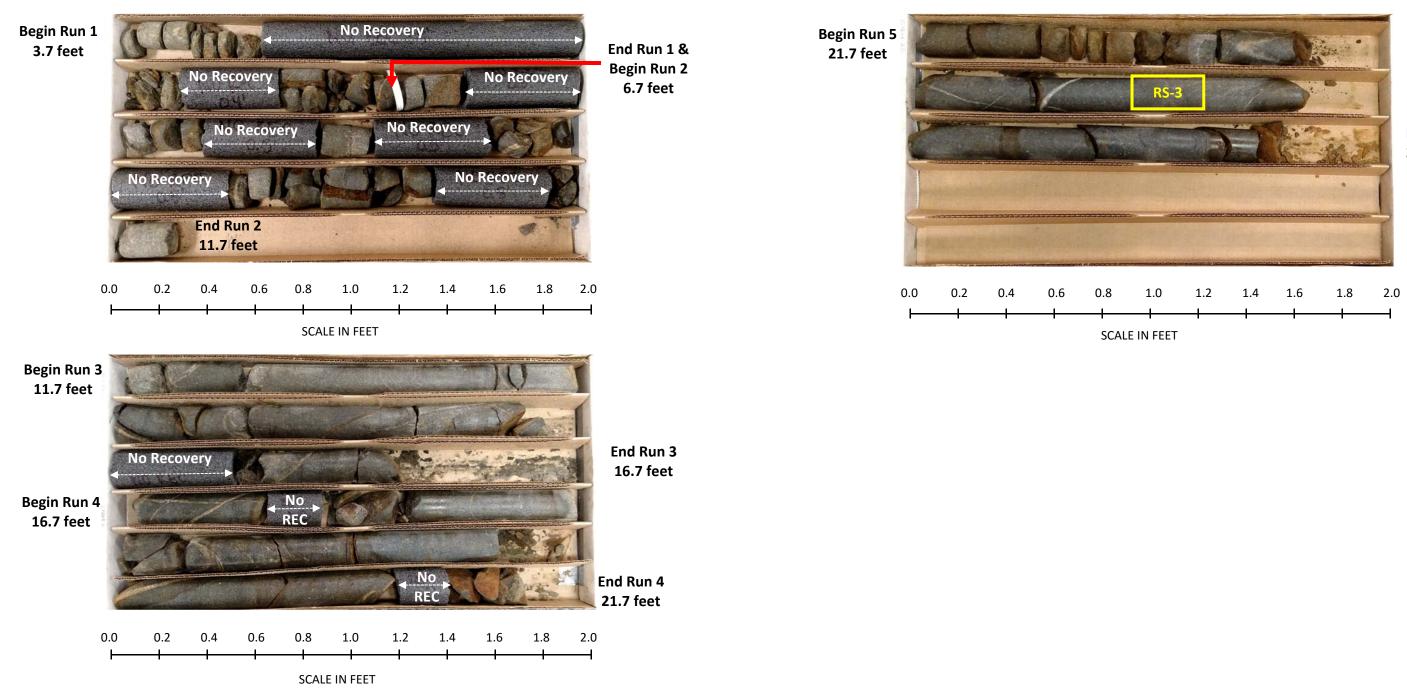
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## **GEOTECHNICAL BORING REPORT** CORE LOG

OUNTY CABARUS       GEOLOGIST M. Amold         IMIIIS BIVd.) and Entrance No. 1 Kings Grant Pavilion       GROUND WTR (ft)         0 FREI 15 ft.1       ALIGNMENT -Y1.       0 HR. Dry         37.ft       NORTHING 594,501       EASTING 1,487,873       24 HR. FIAD         32016       COMP. DATE 08/18/16       SURFACE WATER DEPTH IN/A       FIAD         17.16       COMP. DATE 08/18/16       SURFACE WATER DEPTH IN/A       FIAD         1       T       DESCRIPTION AND REMARKS       DEPTH (ft)         1       DESCRIPTION AND REMARKS       DEPTH (ft)       DEPTH (ft)         1       Comp. Date Caray-Brow, Sight Moderately Cone to Cose Fracture Space (ft)       Space (ft)       Space (ft)         1       Date Caray-Brow, Sight Moderately Cone to Cose Fracture Space (ft)       RN-3: 24.5*24.8*, qu=4, 500 pai, GSI=45-60       3.7         1       Date Caray-Brow, Sight Moderately Cone to Cose Fracture Space (ft)       RN-3: 24.5*24.8*, qu=4, 500 pai, GSI=45-60       3.7         1       Auge Refusal at 3.7       1       Auge Refusal at 3.7       2.1       2.1         1       Auge Refusal at 3.7       1       2.1       PAUD due to boring location in roadway       3.7         1       Auge Refusal at 3.7       1       2.1       PAUD due to boring location in roadway       3.7		1		<u> </u>							
OFFSET 15 ft LT       ALIGNMENT -Y1-       0 HR. Dry         3.7 ft       NORTHING 594,501       EASTING 1,487,873       24 HR. FIAD         S2016       DRILL METHOD SPT Core Boring       HAMMER TYPE       Automatic         17/16       COMP. DATE 08/18/16       SURFACE WATER DEPTH N/A       ft         REC. ROD (%)       C       DESCRIPTION AND REMARKS       DEPTH (ft)         0       G       ELEV. (ft)       DESCRIPTION AND REMARKS       0         (16.8)       (8.0)       636.7       Dark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORITE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60       3.7         613.7       Estimate at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)       26.7         0       Filter       Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)         NOTES:       1) Auger Refusal at 3.7'       26.7	4 1							b	GROUN		(ft)
A.7 ft       NORTHING       594,501       EASTING       1,487,873       24 HR.       FIAD         52016       DRILL METHOD       SPT Core Boring       HAMMER TYPE       Automatic         17/16       COMP. DATE       08/18/16       SURFACE WATER DEPTH       N/A         ft       Image: Composition of the strength o											
Size in the intervention of t	3.	7 ft									-
ft          STRATA       L       DESCRIPTION AND REMARKS         REC.       ROD       G       ELEV. (ft)       DESCRIPTION AND REMARKS         (16.8)       (8.0)       636.7       CRYSTALLINE ROCK       3.7         (16.8)       35%       Bacing       CRYSTALLINE ROCK       3.7         (16.8)       0.0       Association       CRYSTALLINE ROCK       3.7         (16.8)       0.0       CRYSTALLINE ROCK       3.7         Dark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORIE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60       Spacing         613.7       613.7       26.7         Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META 								HAMM			
ft          STRATA       L       DESCRIPTION AND REMARKS         REC.       ROD       G       ELEV. (ft)       DESCRIPTION AND REMARKS         (16.8)       (8.0)       636.7       CRYSTALLINE ROCK       3.7         (16.8)       35%       Bacing       CRYSTALLINE ROCK       3.7         (16.8)       0.0       Association       CRYSTALLINE ROCK       3.7         (16.8)       0.0       CRYSTALLINE ROCK       3.7         Dark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORIE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60       Spacing         613.7       613.7       26.7         Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)       26.7         NOTES: 1) Auger Refusal at 3.7'       NOTES: 1) Auger Refusal at 3.7'	1	7/16		со	MP. DA	<b>TE</b> 08/18/16	SURFACE WATER DEP	I TH N/	A		
RED.       RQD       O       G       DESCRIPTION AND REMARKS         ELEV. (ft)       Begin Coring @ 3.7 ft       DepTH (ft)         (16.8)       (8.0)       636.7       CRYSTALLINE ROCK       3.7         73%       35%       Bark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORITE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60       3.7         613.7       613.7       613.7       26.7         Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)       NOTES:       1) Auger Refusal at 3.7'	_										$\neg$
Image: Weight of the system       G       ELEV. (ft)       DEPTH (ft)         Image: Weight of the system       636.7       CRYSTALLINE ROCK       3.7         73%       35%       636.7       Dark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORITE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60       3.7         613.7       613.7       613.7       26.7         NOTES:       1) Auger Refusal at 3.7'       1) Auger Refusal at 3.7'       1) Auger Refusal at 3.7'		STR REC.	ATA RQD								
(16.8)       (8.0)       636.7       CRYSTALLINE ROCK       3.7         73%       35%       Dark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORITE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60       3.7         613.7       613.7       26.7         Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)       26.7         NOTES:       1) Auger Refusal at 3.7'		(ft) %	(ft) %		ELEV. (f		ESCRIPTION AND REMARKS	5		DEPTH	⊣ (ft)
73% 35% Dark Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard, (META QUARTZ DIORITE) with Moderately Close to Close Fracture Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60		( ) = = )	(2.2)	_			Begin Coring @ 3.7 ft				
Spacing RS-3: 24.5'-24.8', qu=4,600 psi, GSI=45-60		(16.8) 73%	(8.0) 35%		- 636.7	Dark Gray-Brown, Slig	ht to Moderately Severe Weat	thering, H	lard to Me	dium	3.7
613.7 26.7 Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTES: 1) Auger Refusal at 3.7'					-		Spacing		Close Frac	ture	
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					-	RS-3:	: 24.5'-24.8', qu=4,600 psi, GS	1=45-60			
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					-						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					-						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					<u> </u>						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					_						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					_						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					_						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					-						
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META     QUARTZ DIORITE)     NOTES:     1) Auger Refusal at 3.7'					_ 613.7					:	26.7
NOTES: 1) Auger Refusal at 3.7'					-	Boring Terminated a	at Elevation 613.7 ft in CRYST. QUARTZ DIORITE)	ALLINE F	ROCK (ME		
- 1) Auger Refusal at 3.7'					-	NOTES:					
					-	1) Auger Refusal at 3.	7' location in roadway				
					-	2) The due to borning	location in roadway				
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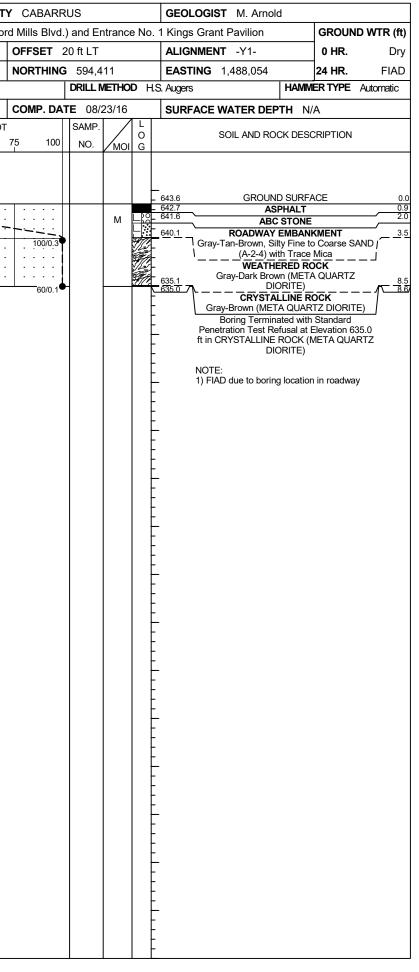


# CORE PHOTOGRAPHS: NCDOT U-5806 Walls, Cabarrus Co., EB2-A: -Y1- 15+29, 15' Lt.



End Run 5 26.7 feet

									URE L						-								
		8.1.D1				<b>P</b> U-5806			Y CABARI				GEOLOGIST M. Arnold	- 1		<b>S</b> 44378					<b>P</b> U-5806		COUNTY
SITE	DESC	RIPTION	N MS	E Wall	s at In	tersection	of SR 2894	l (Concoi	rd Mills Blvd	.) and E	ntranc	e No	o. 1 Kings Grant Pavilion	GROUND WTR (ft)	SIT	E DESCR	RIPTION	N MSE	E Wall	s at In	tersection	of SR 289	4 (Concord
BOR	NG NC	<b>).</b> RW	12		SI	TATION 1	6+22		OFFSET	20 ft LT			ALIGNMENT -Y1-	0 HR. Dry	BO	ring no	. RW1	13		ST	TATION 1	7+26	
COLI	AR EL	<b>EV.</b> 64	42.8 ft		т	OTAL DEP	<b>TH</b> 12.7 ft	:	NORTHIN	<b>G</b> 594,4	170		EASTING 1,487,966	24 HR. FIAD	COL	LAR EL	<b>EV</b> . 64	43.6 ft		тс	DTAL DEP	<b>FH</b> 8.6 ft	
DRILL	RIG/H/	MMER E	EFF./DA	TE F8	R2175	CME-55 86	% 02/16/201	6	•	DRILL	METHO	DD ⊢	H.S. Augers HAN	MER TYPE Automatic	DRIL	L RIG/HA	MMER E	FF./DA	TE F8	kR2175	CME-55 86	% 02/16/201	16
DRIL	LER	S. Davis	6		ST		E 08/24/1	6	COMP. DA	TE 08/	24/16		SURFACE WATER DEPTH	N/A	DRI	LLER S	. Davis	;		ST		E 08/23/1	6
ELEV	DRIVE		1	ow cou			BLOWS F			SAMP.		1 L			ELE			1	W COL				PER FOOT
elev (ft)	ELEV (ft)	(ft)	·——	0.5ft		0			75 100		мо	O I G		SCRIPTION DEPTH (f	(ft)	/ DRIVE ELEV (ft)	(ft)	· — —	0.5ft		0		50 7
	(11)						1	1	1					DEPTH (I	)	(11)						1	1
645		+											_		645		+						
1		<u>‡</u>											642.8 GROUND SUF		þ	642.7	- 0.9						
	642.0	0.8	32	23	12		. I • • • 35				м		642.0 ASPHAL		1		t	26	28	23			
640	639.3	3.5						<u> </u>					639.3 RESIDUA	L 3.	<b>1</b> 640	640.1	3.5	100/0.3				+ • • • •	+
		Ŧ	64	36/0.2					. 100/0.7				Black-Tan-Brown, Silty Fi	ne SAND (A-2-4) j			Ŧ						
005		‡						· · · ·					WEATHERED	ROCK	005		‡					· · · · ·	
635	634.3	8.5				<del></del>	· · · · ·					10	Gray-Brown-Black (MB DIORITE	ETA QUARTZ	635	635.1	8.5	60/0.1					
		ł	/8	22/0.1					100/0.6	[	1			,			Ŧ						
	630.0	+ 12.6					· · · · ·						630.2	19 (			‡						
	030.2	+ 12.0	60/0.1				1	1	60/0.1			<i>√/I=</i> /	CRYSTALLINE		7	-	‡						
1		t									1		Black-Dark Gray (META Q Boring Terminated w				t						
		Ŧ											Penetration Test Refusal a ft in CRYSTALLINE ROCK	at Elevation 630.1			+						
	-	Ŧ									1					-	Ŧ						
1		‡											NOTES:				‡						
		ł											<ul> <li>1) Auger refusal at 12.6'</li> <li>2) FIAD due to boring locat</li> </ul>	ion in roadway			ł						
	•	Ŧ											<ul> <li>– 2) FIAD due to boring locat</li> </ul>	ion in roadway		-	Ŧ						
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WBS 443					<b>P</b> U-5806			Y CABARF				GEOLOGIST M. Arnold		
SITE DES	CRIPTION	I MSE	E Walls	s at In	tersection c	of SR 2894	1 (Concor	d Mills Blvd.	) and En	ntrance	No.	1 Kings Grant Pavilion	GROUN	ID WTR (ft
BORING N	<b>10</b> . RW	4		S	TATION 18	3+26		OFFSET 2	22 ft LT			ALIGNMENT -Y1-	0 HR.	Dry
COLLAR	<b>ELEV</b> . 64	13.9 ft		т	OTAL DEPT	<b>H</b> 13.8 f	t	NORTHING	<b>5</b> 94,3	51		<b>EASTING</b> 1,488,135	24 HR.	FIAD
DRILL RIG/	HAMMER E	FF./DA	TE F8	R2175	CME-55 86%	6 02/16/201	6		DRILL N	<b>IETHOD</b>	H.9	S. Augers HAMIN	NER TYPE	Automatic
DRILLER	S. Davis			S	TART DATE	08/23/1	6	COMP. DA	TE 08/2	23/16		SURFACE WATER DEPTH N	/A	
ELEV DRIV (ft) ELE (ft)			W COL 0.5ft			BLOWS I	PER FOOT		SAMP. NO.		L O G	SOIL AND ROCK DES		DEPTH (
	.0 0.9	22 100/0.5 100/0.2		14		●30		100/0.5	• •			643.9 GROUND SURF 643.0 ASPHALT 641.9 ABC STONE 640.4 ROADWAY EMBAN Gray-Brown, Silty Fine to WEATHERED R Black-Gray-Brown (MET DIORITE)	KMENT Coarse SAI Mica OCK	]
630		100/0.3										E30.1 Boring Terminated at Eleva WEATHERED ROCK (Mi DIORITE) NOTE: 1) FIAD due to boring locatio	eta quar	ΤΖ

# LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

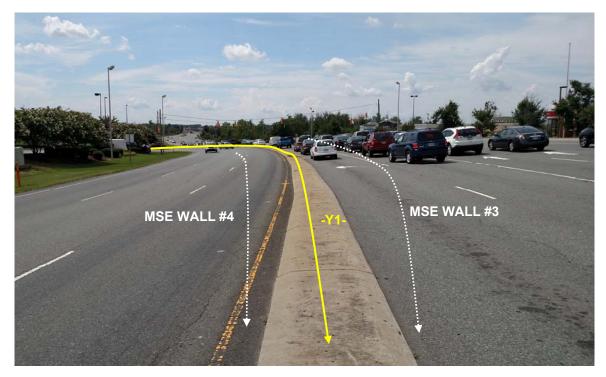
PROJECT NO.:44378.1.D1TIP NO.:U-5806COUNTY:CabarrusDESCRIPTION:Intersection of SR 2894 (Concord Mills Blvd) and Entrance No. 1 Kings Grant Pavilion

Sample #	Boring #	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus, E (ksi)	GSI
RS-3	EB2-A	-Y1-	15+29	15' Lt.	24.5-24.8	Meta Quartz Diorite	PzZq	52%	3.81	1.77	171.0	4,600	352	45-60
RS-4	EB2-B	-Y1-	15+84	17' Rt.	22.3-22.6	Meta Quartz Diorite	PzZq	50%	3.83	1.77	178.2	9,590	1,373	45-60

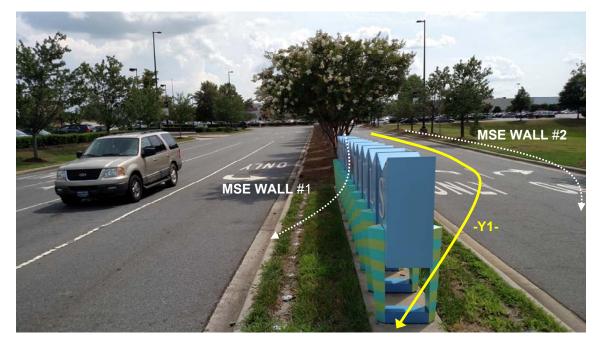




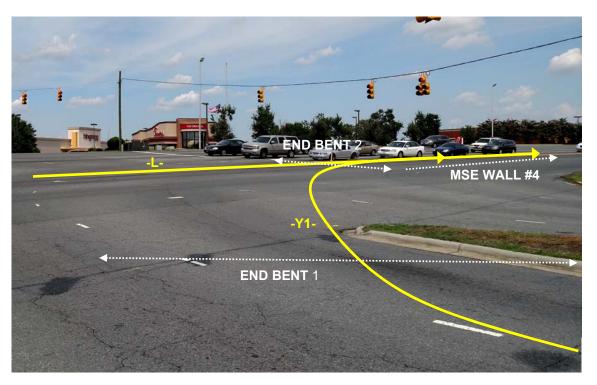
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



Photograph No. 2: On –L- (Concord Mills Blvd.) looking northwest



Photograph No. 3: On -Y1- (Kings Grant Pavilion) looking southwest



Photograph No. 4: Looking northeast towards End Bent 2