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REFERENCE: U-5806

PROJECT: 44378

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CABARRUS
PROJECT DESCRIPTION INTERSECTION OF SR 2894
(CONCORD MILLS BLVD.) AND ENTRANCE NO.1
KINGS GRANT PAVILION
SITE DESCRIPTION BRIDGE ON -YI- OVER -DR02-

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2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-5	CROSS SECTIONS
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14	ROCK TEST RESULTS SUMMARY
15	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5806	1	16

CAUTION NOTICE

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1. 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

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S. DAVIS

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INVESTIGATED BY F&R, Inc.

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CHECKED BY P. ALTON

SUBMITTED BY P. ALTON

DATE AUGUST 2017

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A270EF78A6DF442 8/3/2017

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. It contains detailed technical specifications, classification charts, and symbols for soil and rock analysis.

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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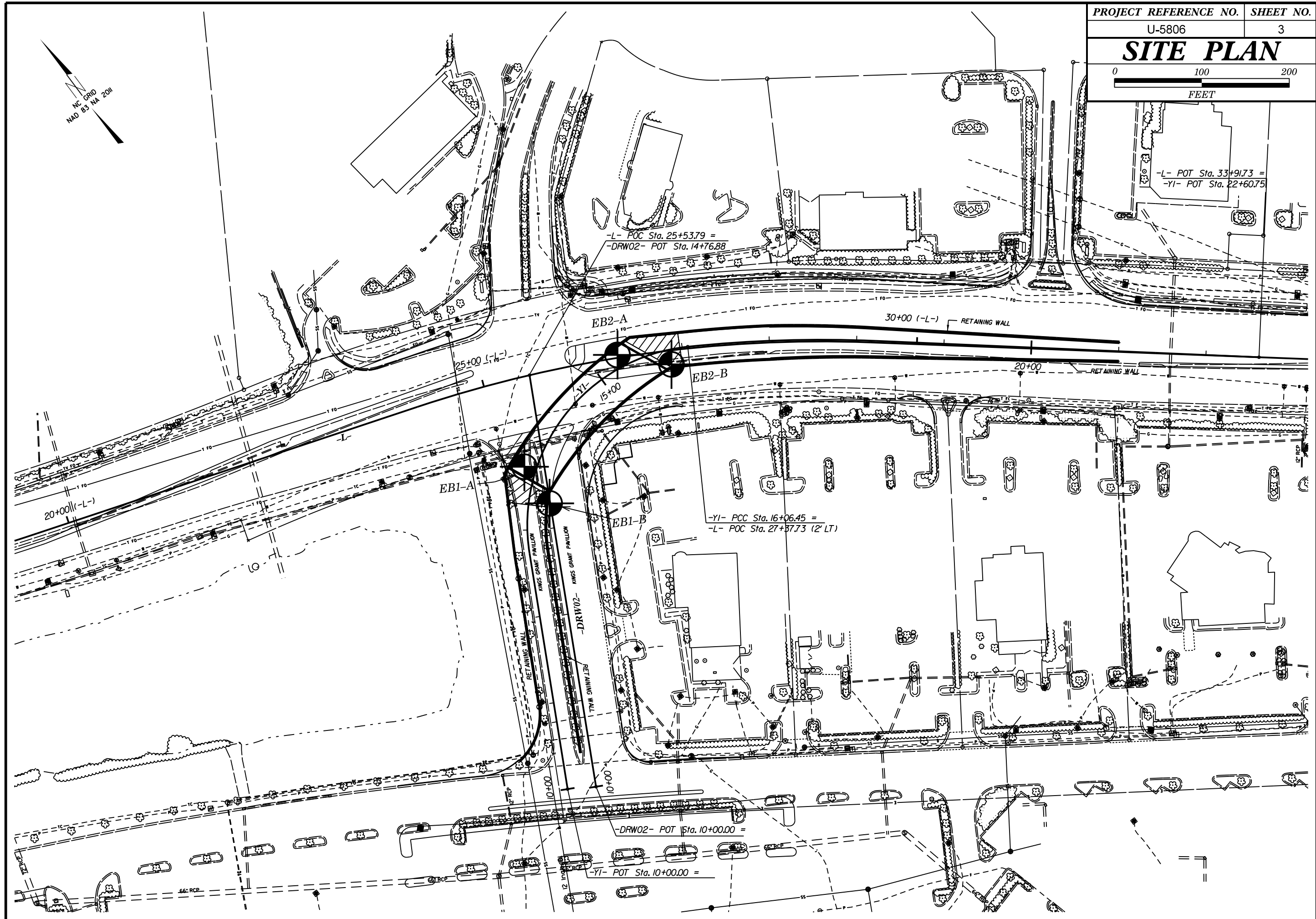
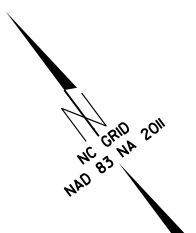
SUBSURFACE INVESTIGATION

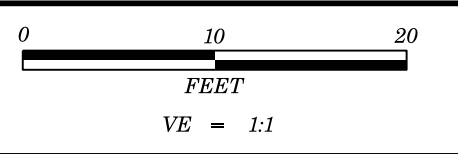
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

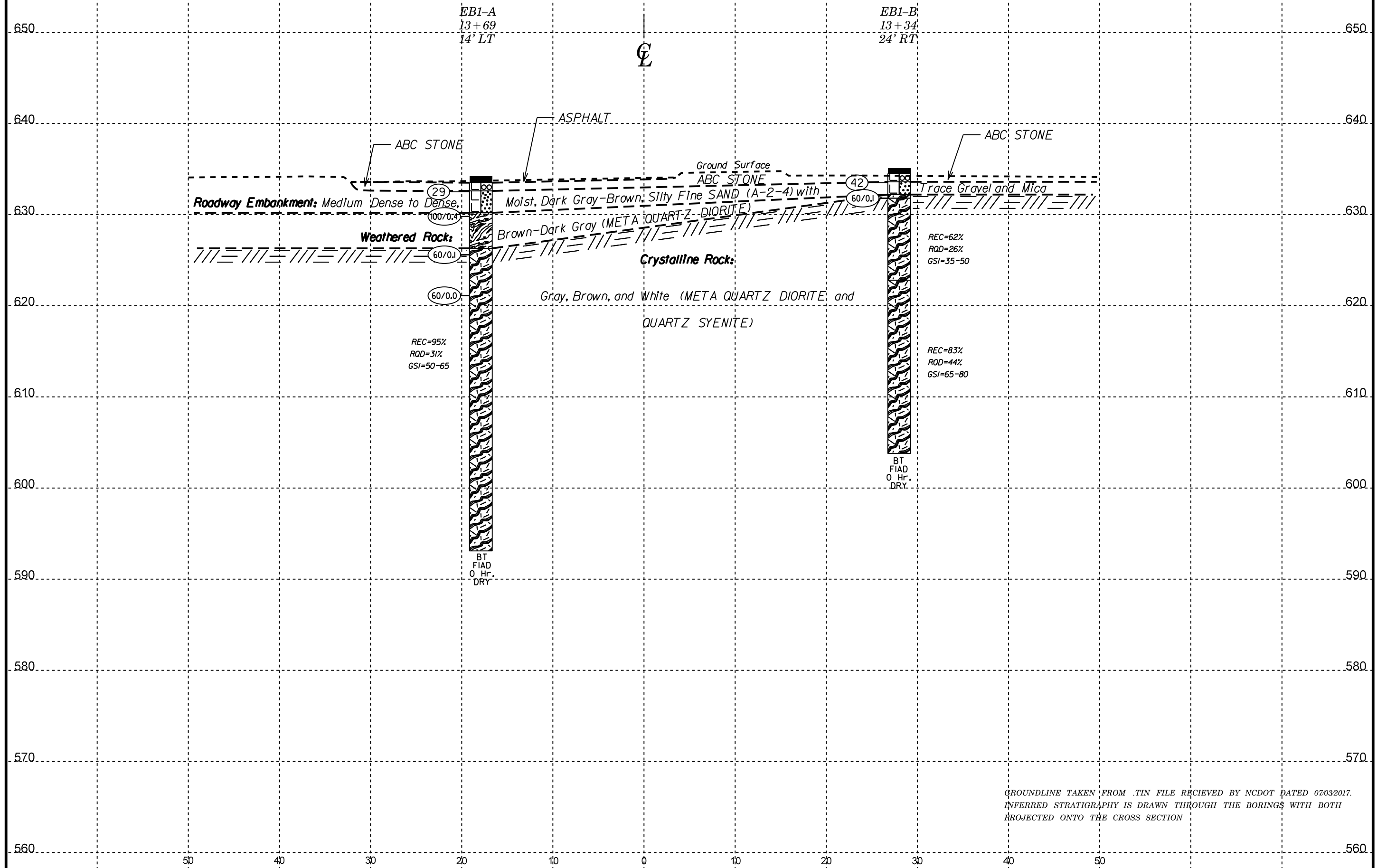
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

<p>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</p> <p>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.</p> <p>STRUCTURE</p>	SURFACE CONDITIONS	VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings
<p>INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p>BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p>VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p>BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p>DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p>LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	SURFACE CONDITIONS					
<p>DECREASING SURFACE QUALITY →</p>						
<p>COMPOSITION AND STRUCTURE</p> <p>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.</p> <p>B. Sandstone with thin inter-layers of siltstone</p> <p>C. Sandstone and siltstone in similar amounts</p> <p>D. Siltstone or silty shale with sandstone layers</p> <p>E. Weak siltstone or clayey shale with sandstone layers</p> <p>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p> <p>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p> <p>H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.</p> <p>→ Means deformation after tectonic disturbance</p>	SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
<p>DECREASING INTERLOCKING OF ROCK PIECES</p>						
<p>→</p>						
<p>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</p> <p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value 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 fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p>						
<p>DECREASING INTERLOCKING OF ROCK PIECES</p>						
<p>→</p>						

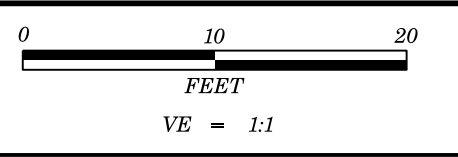




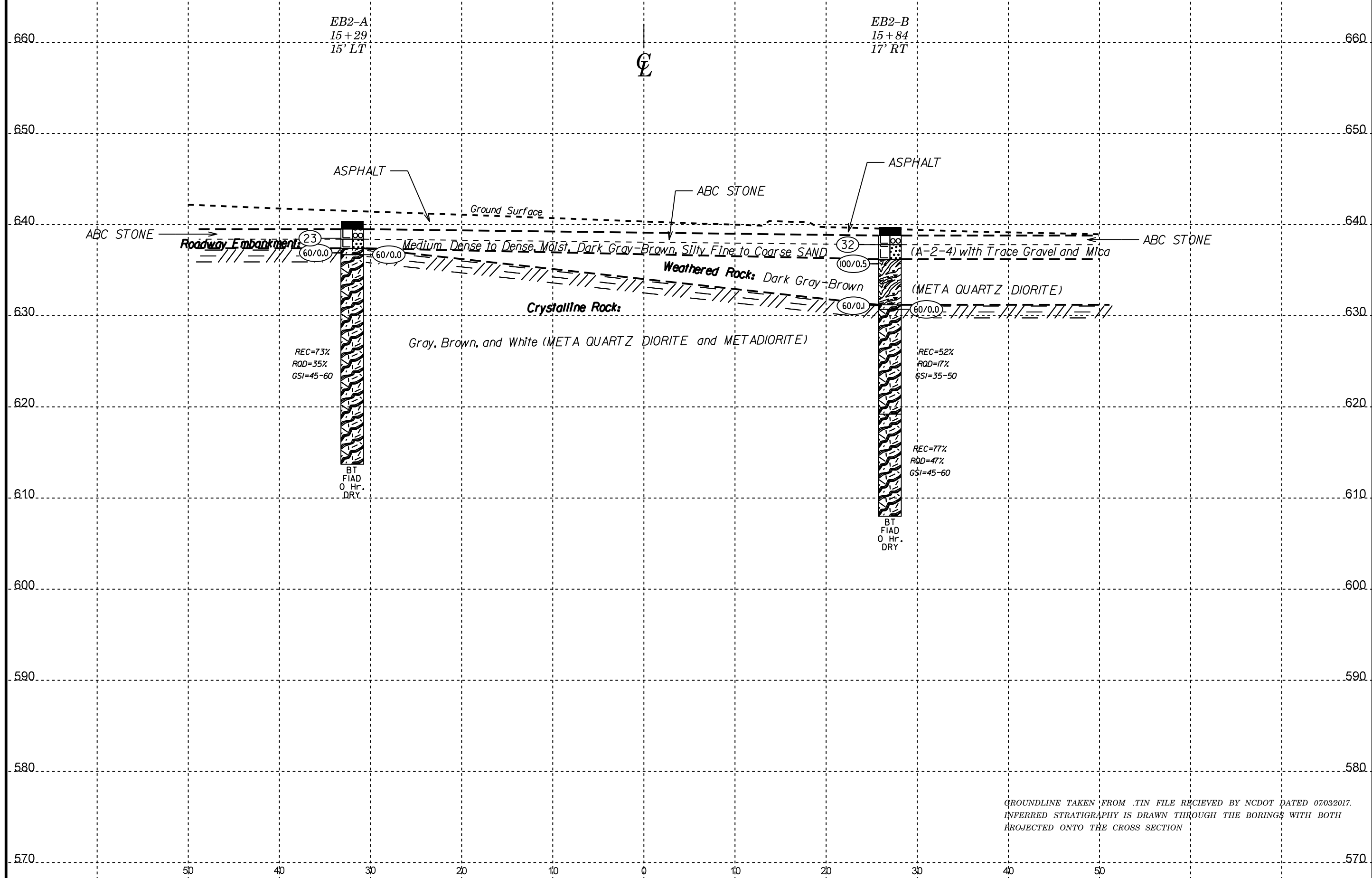
PROJECT REFERENCE NO.	SHEET NO.
U-5806	4
CROSS SECTION THROUGH END BENT 1	
AT -L- STATION 13+51.16	
SKEW=107°	



GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 07/03/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION



PROJECT REFERENCE NO.	SHEET NO.
U-5806	5
CROSS SECTION THROUGH END BENT 2	
AT -L- STATION 15+61.79	
SKEW=48°	



EB2-A
15+29
15' LT

EB2-B
15+84
17' RT

CL

ASPHALT

ABC STONE

ASPHALT

ABC STONE

Roadway Embankment

Ground Surface

Medium Dense to Dense Moist Dark Gray-Brown Silty Fine to Coarse SAND

ABC STONE

Weathered Rock: Dark Gray-Brown

(META QUARTZ DIORITE)

Crystalline Rock:

Gray, Brown, and White (META QUARTZ DIORITE and METADIORITE)

REC=73%
ROD=35%
GSI=45-60

REC=52%
ROD=17%
GSI=35-50

REC=77%
ROD=47%
GSI=45-60

BT
FIAD
0 Hr.
DRY

BT
FIAD
0 Hr.
DRY

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 07/03/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 13+69		OFFSET 14 ft LT		ALIGNMENT -Y1-									
COLLAR ELEV. 634.2 ft		TOTAL DEPTH 41.1 ft		NORTHING 594,462		EASTING 1,487,711									
DRILL RIG/HAMMER EFF/DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/22/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
635														634.2 GROUND SURFACE 0.0	
	633.5	0.7	19	14	15									633.5 ASPHALT 0.7	
	632.6													632.6 ABC STONE 1.6	
630	630.7	3.5	43	100/0.4										630.2 ROADWAY EMBANKMENT 4.0	
														Brown-Dark Gray, Silty Fine SAND (A-2-4) with Trace Gravel and Mica	
														WEATHERED ROCK	
625	625.7	8.5	60/0.1											626.3 Brown-Dark Gray (META QUARTZ DIORITE) 7.9	
														CRYSTALLINE ROCK	
620	621.1	13.1	60/0.0											621.1 Brown-Dark Gray (META QUARTZ DIORITE) 13.1	
														CRYSTALLINE ROCK	
615														Brown-Dark Gray (META QUARTZ DIORITE)	
610															
605															
600															
595															
														593.1 Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 41.1	
NOTES: 1) Auger Refusal at 13.1' 2) FIAD due to boring location in roadway															

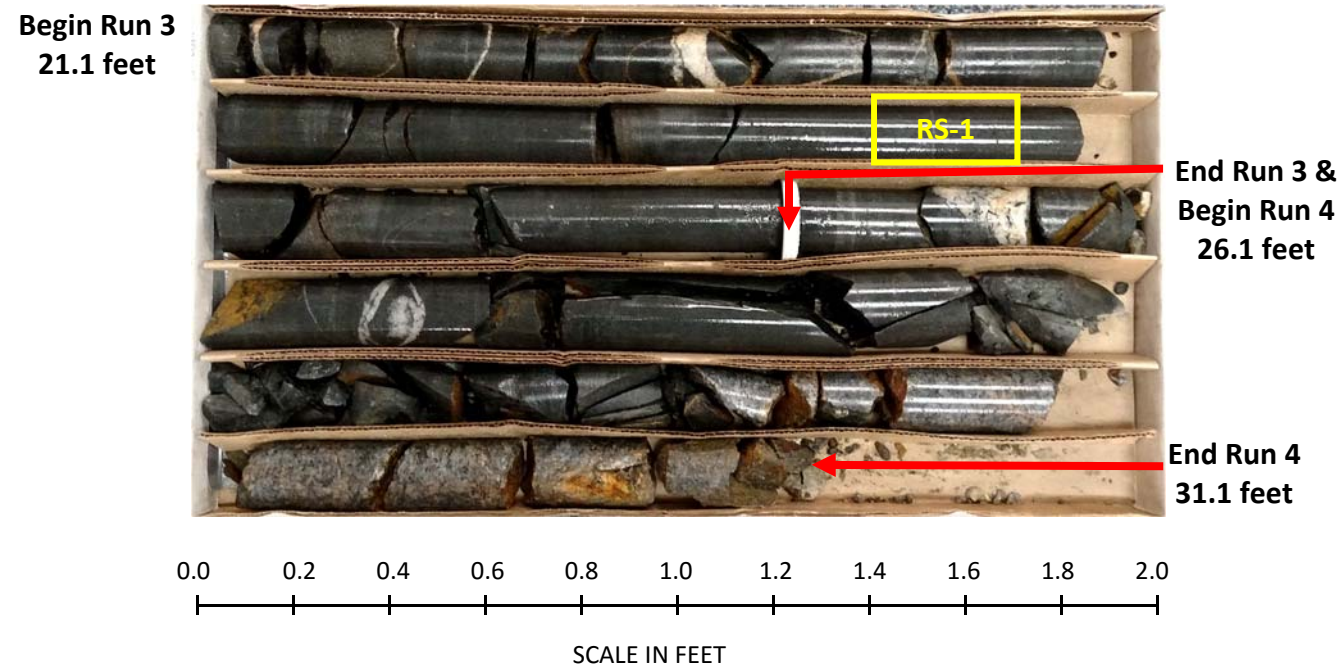
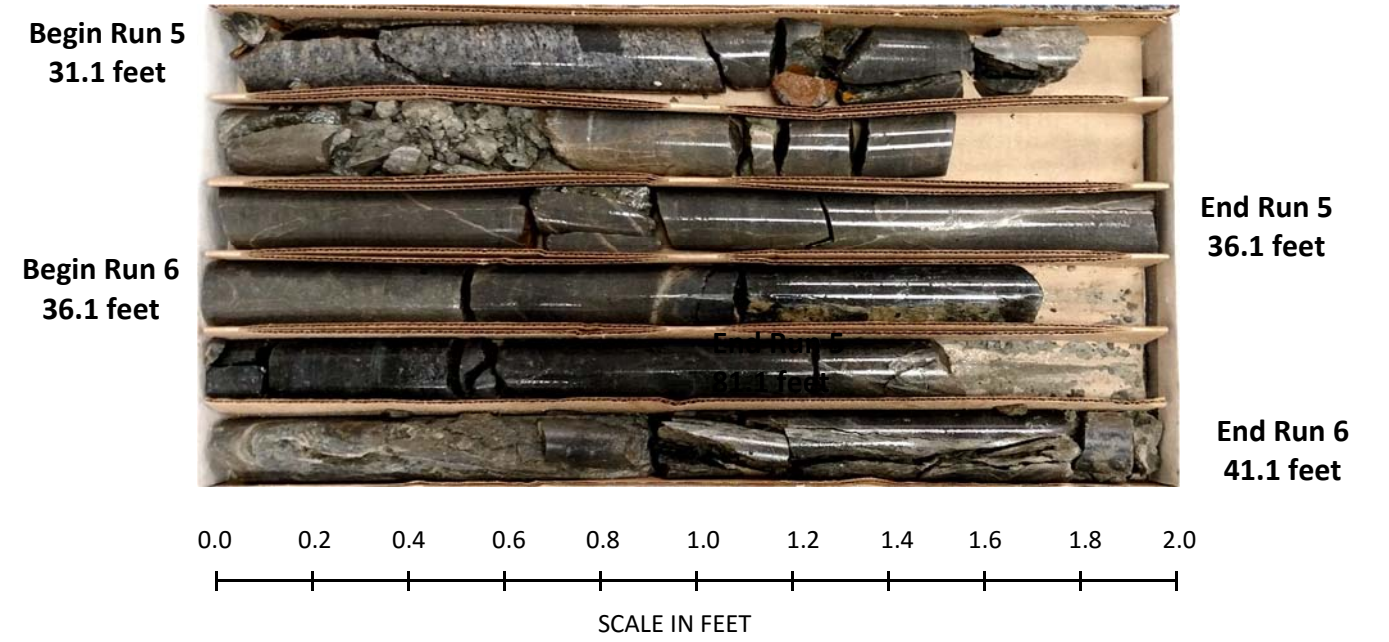
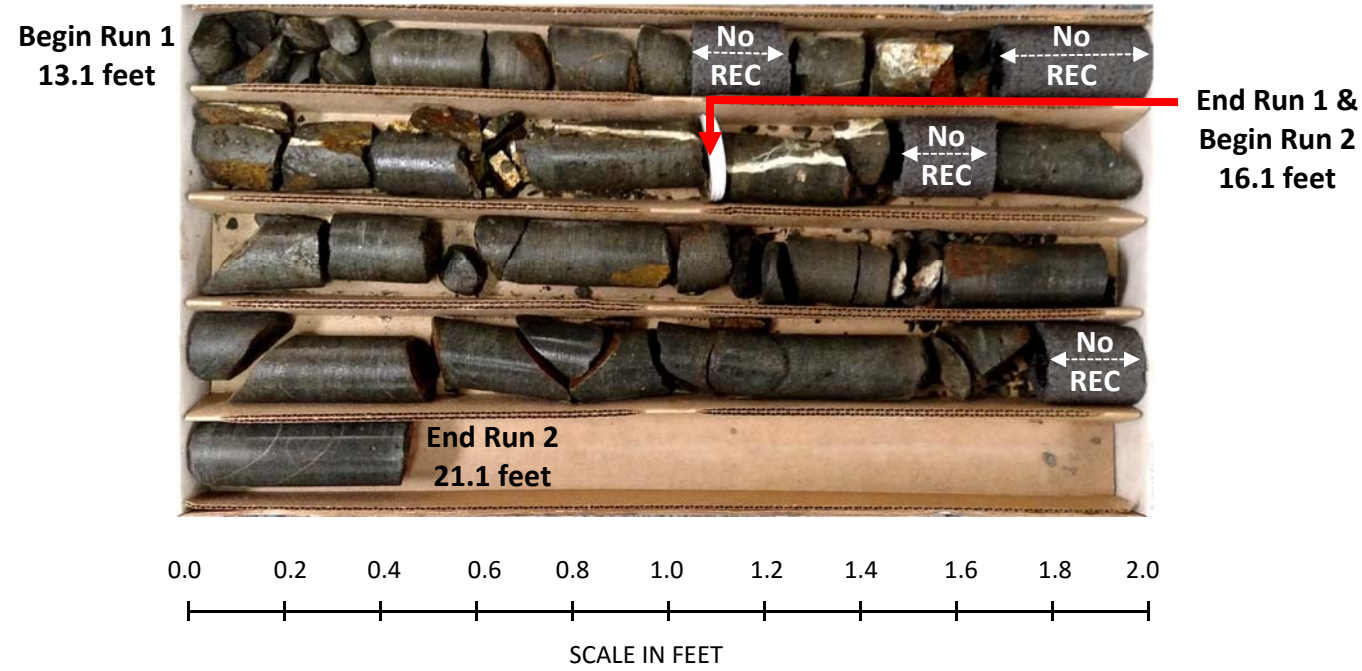
WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold	
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)
BORING NO. EB1-A		STATION 13+69		OFFSET 14 ft LT		ALIGNMENT -Y1-	
COLLAR ELEV. 634.2 ft		TOTAL DEPTH 41.1 ft		NORTHING 594,462		EASTING 1,487,711	
DRILL RIG/HAMMER EFF/DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic	
DRILLER S. Davis		START DATE 08/22/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A	
CORE SIZE		TOTAL RUN		SAMP. NO.		STRATA	
NQ3		28.0 ft					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		LOG
					REC. (ft)	RQD (ft)	
621.1	621.1	13.1	3.0	3:10/1.0	(2.3)	(0.4)	621.1
620				1:29/1.0	77%	13%	
	618.1	16.1		1:49/1.0			621.1
			5.0	1:29/1.0	(4.3)	(0.7)	
615				1:15/1.0	86%	14%	621.1
	613.1	21.1		1:18/1.0			
			5.0	1:27/1.0			621.1
610				1:45/1.0			
			5.0	2:26/1.0	(4.9)	(1.9)	621.1
	608.1	26.1		1:27/1.0	98%	38%	
			5.0	1:33/1.0			621.1
605				1:37/1.0			
			5.0	2:06/1.0	(5.0)	(0.8)	621.1
	603.1	31.1		1:55/1.0	100%	16%	
			5.0	3:51/1.0			621.1
600				2:06/1.0			
			5.0	2:28/1.0	(5.0)	(2.0)	621.1
	598.1	36.1		1:56/1.0	100%	40%	
			5.0	3:37/1.0			621.1
595				1:57/1.0			
			5.0	2:04/1.0	(5.0)	(3.0)	621.1
	593.1	41.1		2:13/1.0	100%	60%	
				2:24/1.0			621.1
				1:49/1.0			
				2:17/1.0			621.1
				2:32/1.0			
Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)							
NOTES: 1) Auger Refusal at 13.1' 2) FIAD due to boring location in roadway							

NCDOT BORE DOUBLE U5806 GEO_BH_BRDG.GPJ NC_DOT.GDT 8/1/17

NCDOT CORE DOUBLE U5806 GEO_BH_BRDG.GPJ NC_DOT.GDT 8/1/17



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



**GEOTECHNICAL BORING REPORT
BORE LOG**

**GEOTECHNICAL BORING REPORT
CORE LOG**

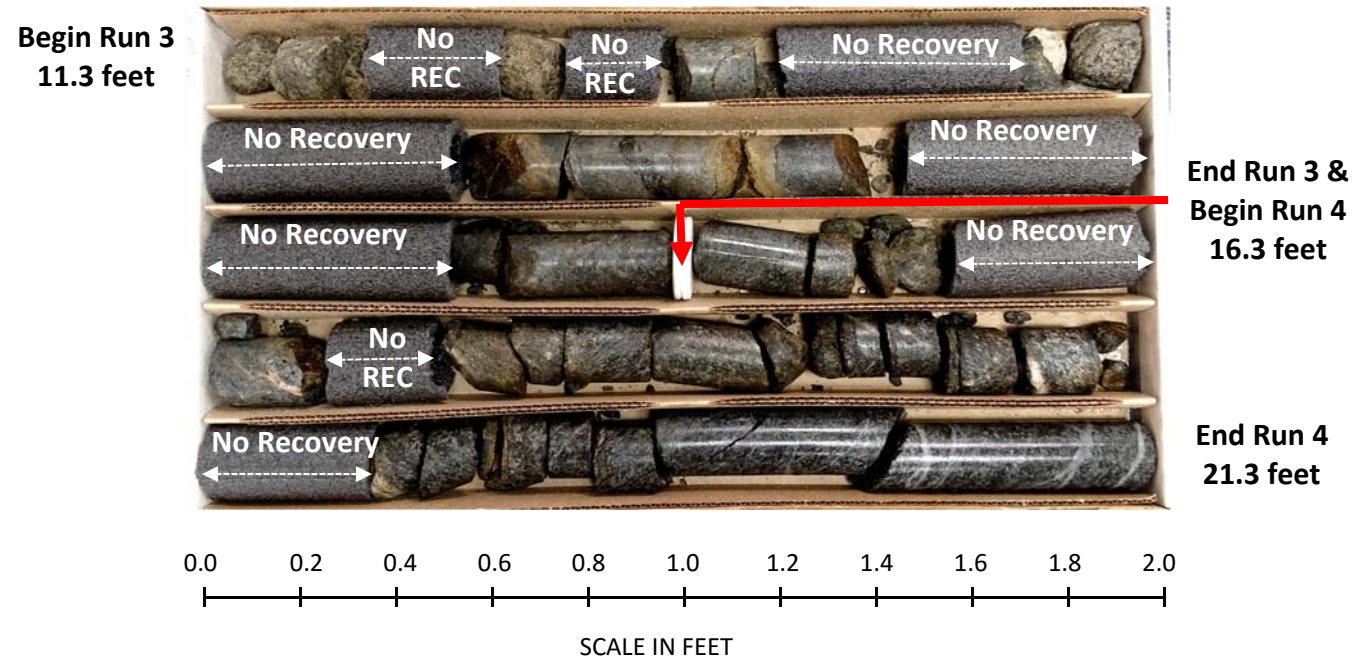
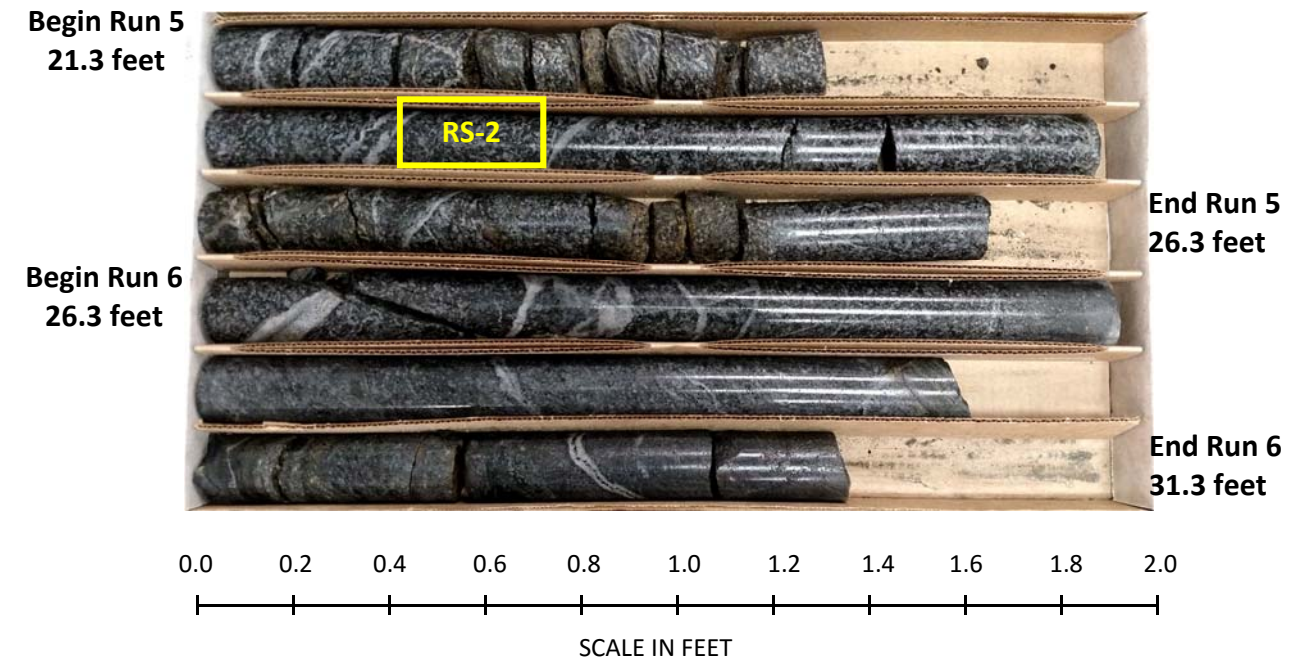
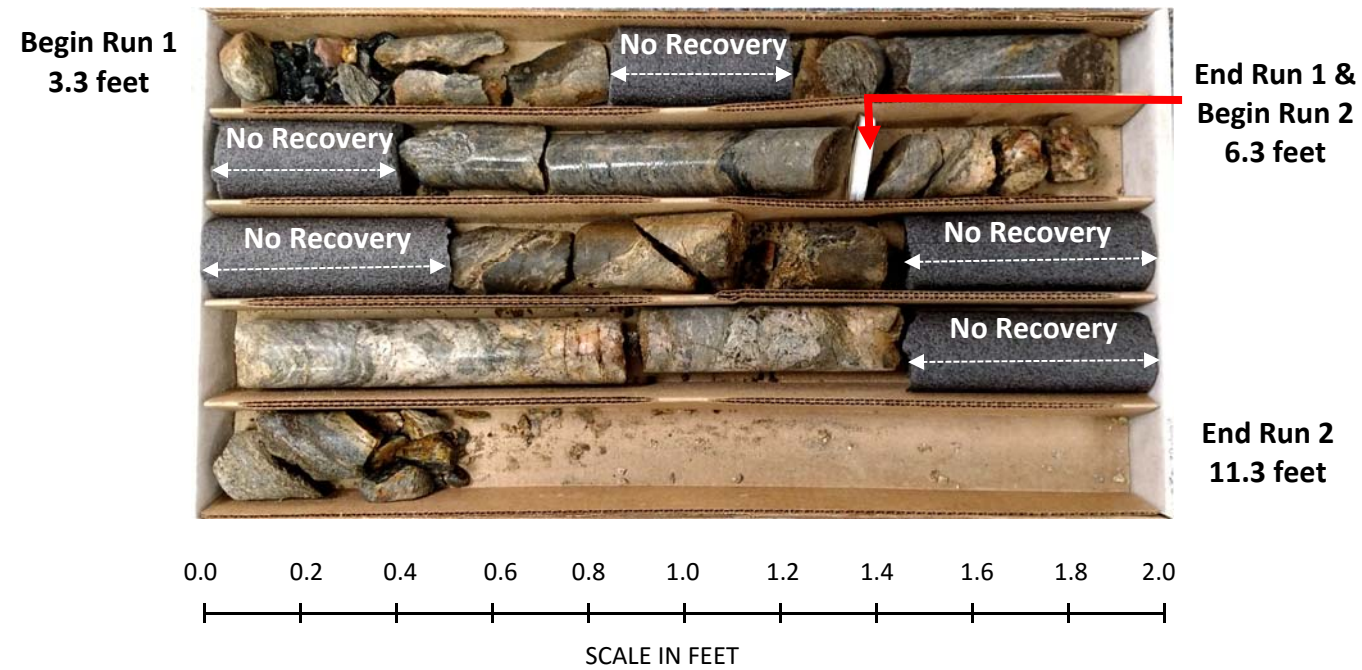
WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 13+34		OFFSET 24 ft RT		ALIGNMENT -Y1-		0 HR. Dry							
COLLAR ELEV. 635.1 ft		TOTAL DEPTH 31.3 ft		NORTHING 594,414		EASTING 1,487,708		24 HR. FIAD							
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/24/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640															
635	634.5	0.6	21	20	22							M	635.1 GROUND SURFACE 0.0 634.5 ASPHALT 0.6 633.6 ABC STONE 1.5 632.2 ROADWAY EMBANKMENT 2.9 631.8 Dark Gray-Brown, Silty Fine SAND (A-2-4) with Trace Gravel and Mica 3.3		
630	631.9	3.2	60/0.1												
625													CRYSTALLINE ROCK Tan-Gray-Brown (QUARTZ SYENITE)		
620													White-Gray (META QUARTZ DIORITE)	12.3	
615															
610												RS-2			
605															
														603.8	
Boring Terminated at Elevation 603.8 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)															
NOTES: 1) Auger Refusal at 3.2' 2) FIAD due to boring location in roadway															

NCDOT BORE DOUBLE U5806_GEO_BH_BRDG.GPJ NC_DOT.GDT 8/1/17

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold						
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)					
BORING NO. EB1-B		STATION 13+34		OFFSET 24 ft RT		ALIGNMENT -Y1-		0 HR. Dry				
COLLAR ELEV. 635.1 ft		TOTAL DEPTH 31.3 ft		NORTHING 594,414		EASTING 1,487,708		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/24/16		SURFACE WATER DEPTH N/A						
CORE SIZE NQ3		TOTAL RUN 28.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)		REC. (%)	ROD (%)			
631.8	631.8	3.3	3.0	1:23/1.0	(2.2)	(1.0)		(5.6)	(2.3)			3.3
630	628.8	6.3		1:31/1.0 3:26/1.0	73%	33%		62%	26%		Begin Coring @ 3.3 ft CRYSTALLINE ROCK Tan-Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard (QUARTZ SYENITE) with Moderately Close to Close Fracture Spacing GSI=35-50	
625	623.8	11.3	5.0	1:52/1.0 1:25/1.0 1:37/1.0 1:27/1.0 1:33/1.0	(3.0)	(1.3)						
620	618.8	16.3	5.0	1:47/1.0 1:31/1.0 1:37/1.0 1:23/1.0 1:37/1.0	(2.3)	(0.7)		(15.7)	(8.4)		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	12.3
615	613.8	21.3	5.0	1:47/1.0 1:22/1.0 1:29/1.0 1:33/1.0 1:39/1.0	(3.8)	(1.0)						
610	608.8	26.3	5.0	1:40/1.0 1:32/1.0 1:30/1.0 1:26/1.0 1:33/1.0	(5.0)	(2.7)	RS-2					
605	603.8	31.3	5.0	1:43/1.0 1:34/1.0 1:34/1.0 1:42/1.0 1:42/1.0	(5.0)	(4.0)						
												31.3
Boring Terminated at Elevation 603.8 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)												
NOTES: 1) Auger Refusal at 3.2' 2) FIAD due to boring location in roadway												

NCDOT BORE DOUBLE U5806_GEO_BH_BRDG.GPJ NC_DOT.GDT 8/1/17

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



GEOTECHNICAL BORING REPORT BORE LOG

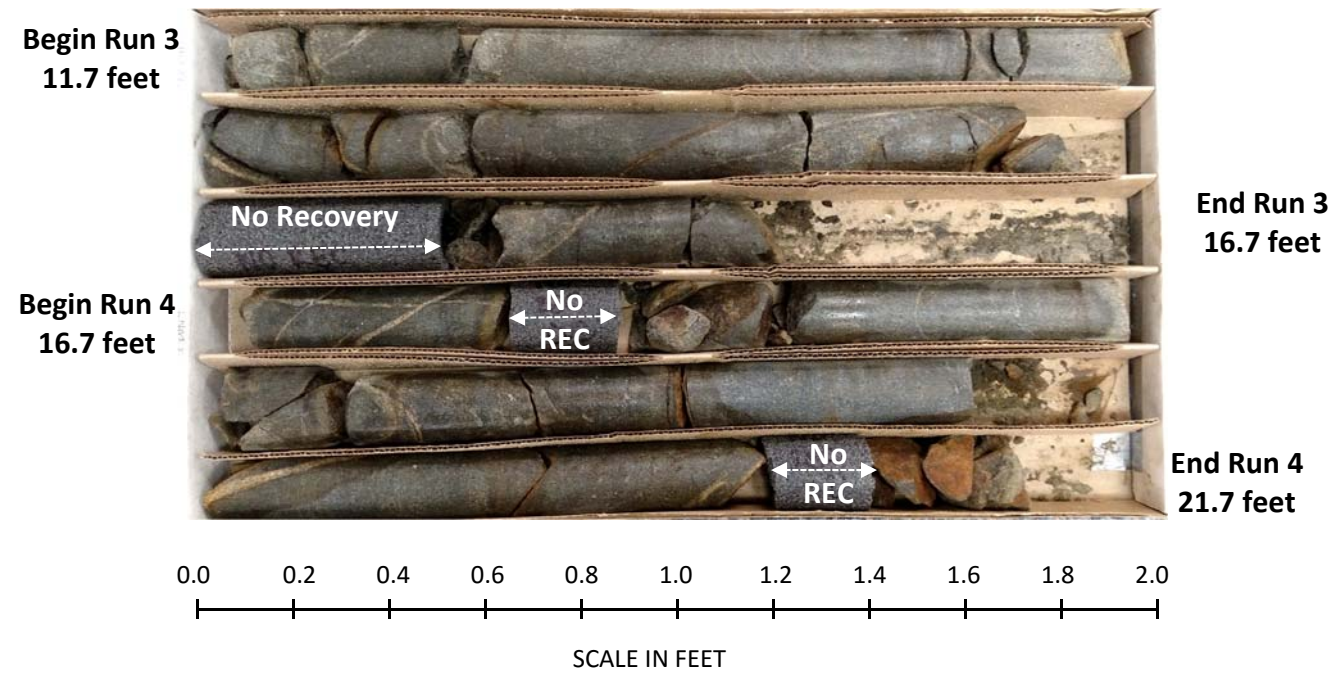
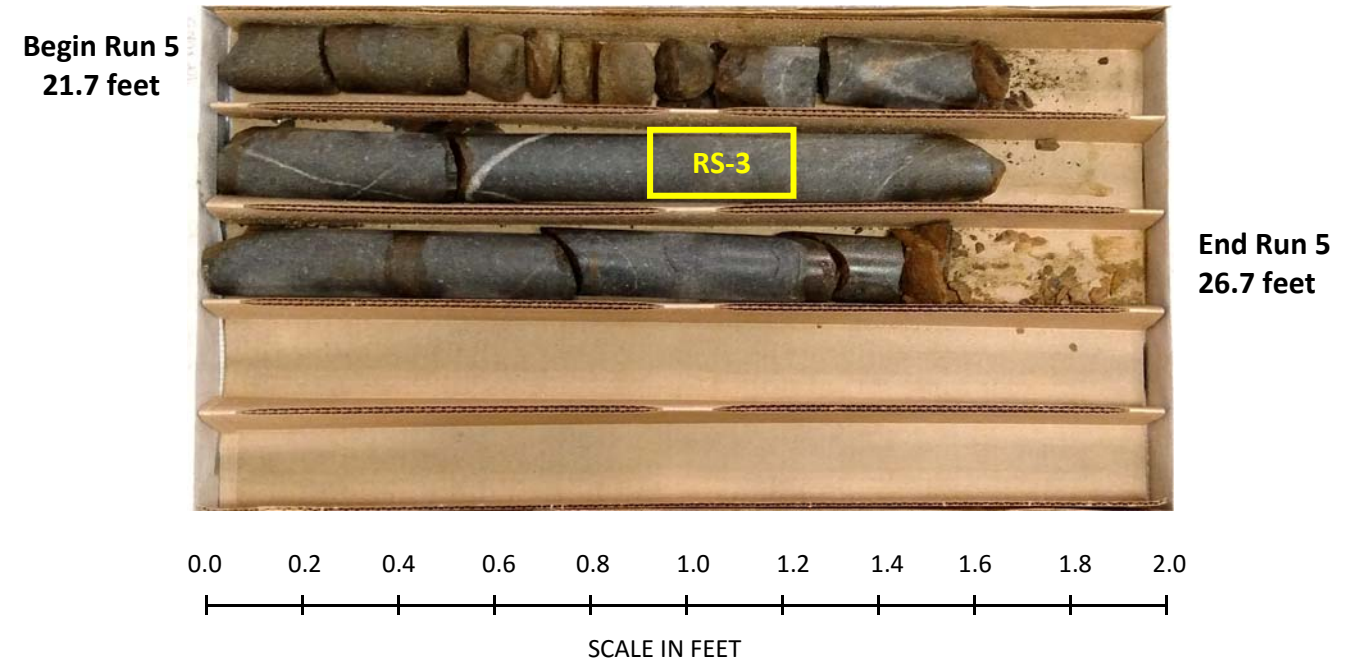
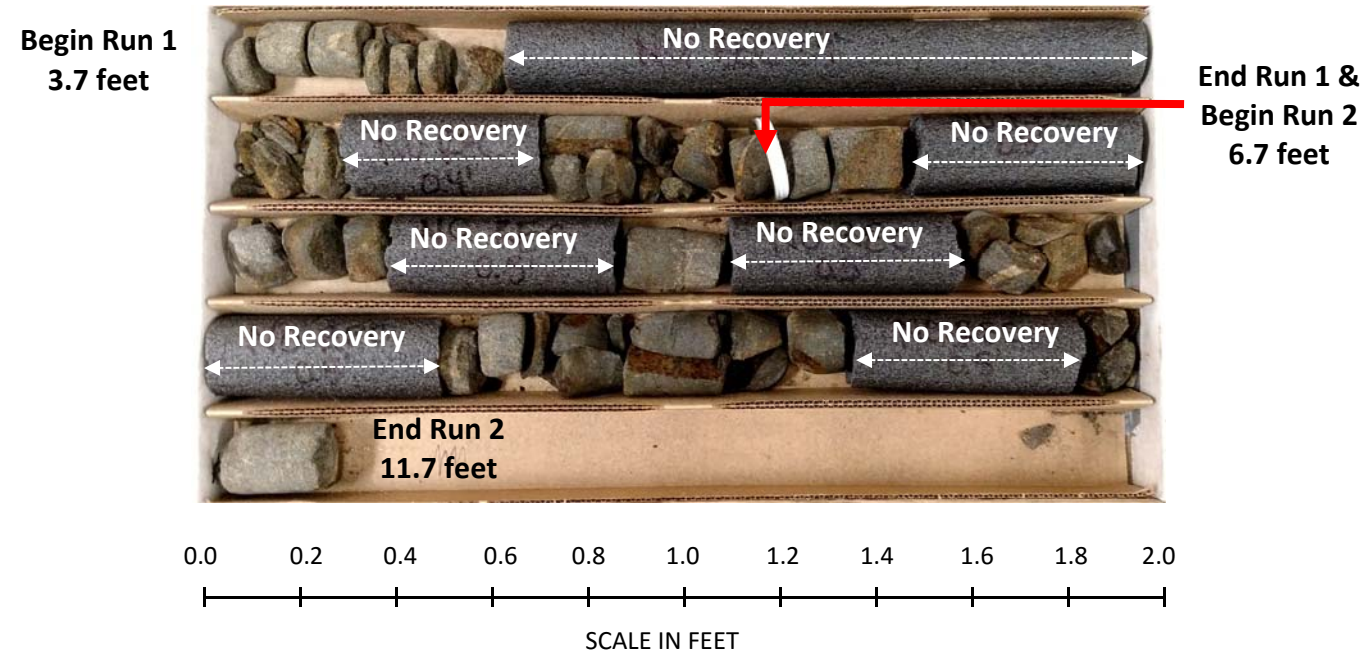
GEOTECHNICAL BORING REPORT CORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold								
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)							
BORING NO. EB2-A		STATION 15+29		OFFSET 15 ft LT		ALIGNMENT -Y1-								
COLLAR ELEV. 640.4 ft		TOTAL DEPTH 26.7 ft		NORTHING 594,501		EASTING 1,487,873								
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016			DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic								
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
645														
640	639.5	0.9	19	17	6									640.4 GROUND SURFACE 0.0 639.5 ASPHALT 0.9 638.4 ABC STONE 2.0 637.4 ROADWAY EMBANKMENT 3.9 636.7 Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel and Mica 3.7 CRYSTALLINE ROCK Dark Gray-Brown (META QUARTZ DIORITE)
635	636.9 636.7	3.5 3.7	60/0.0 60/0.0											
630														
625														
620														
615												RS-3		613.7 Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 26.7 NOTES: 1) Auger Refusal at 3.7' 2) FIAD due to boring location in roadway

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold					
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)				
BORING NO. EB2-A		STATION 15+29		OFFSET 15 ft LT		ALIGNMENT -Y1-					
COLLAR ELEV. 640.4 ft		TOTAL DEPTH 26.7 ft		NORTHING 594,501		EASTING 1,487,873					
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016			DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic					
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A					
CORE SIZE		TOTAL RUN									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS ELEV. (ft) DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
636.7	636.7	3.7	3.0	1:44/1.0 1:05/1.0 1:11/1.0	(1.2) 40%	(0.0) 0%		(16.8) 73%	(8.0) 35%		Begin Coring @ 3.7 ft CRYSTALLINE ROCK 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
635	633.7	6.7	5.0	2:21/1.0 1:39/1.0 1:27/1.0 1:49/1.0 1:26/1.0	(2.2) 44%	(0.0) 0%					
630	628.7	11.7	5.0	1:49/1.0 1:13/1.0 1:27/1.0 1:26/1.0 2:37/1.0	(4.5) 90%	(2.1) 42%					
625	623.7	16.7	5.0	1:41/1.0 1:44/1.0 1:40/1.0 1:36/1.0 1:54/1.0	(4.3) 86%	(3.3) 66%					
620	618.7	21.7	5.0	2:35/1.0 1:44/1.0 1:41/1.0 1:37/1.0 1:29/1.0	(4.6) 92%	(2.6) 52%					
615	613.7	26.7					RS-3				613.7 Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 26.7 NOTES: 1) Auger Refusal at 3.7' 2) FIAD due to boring location in roadway

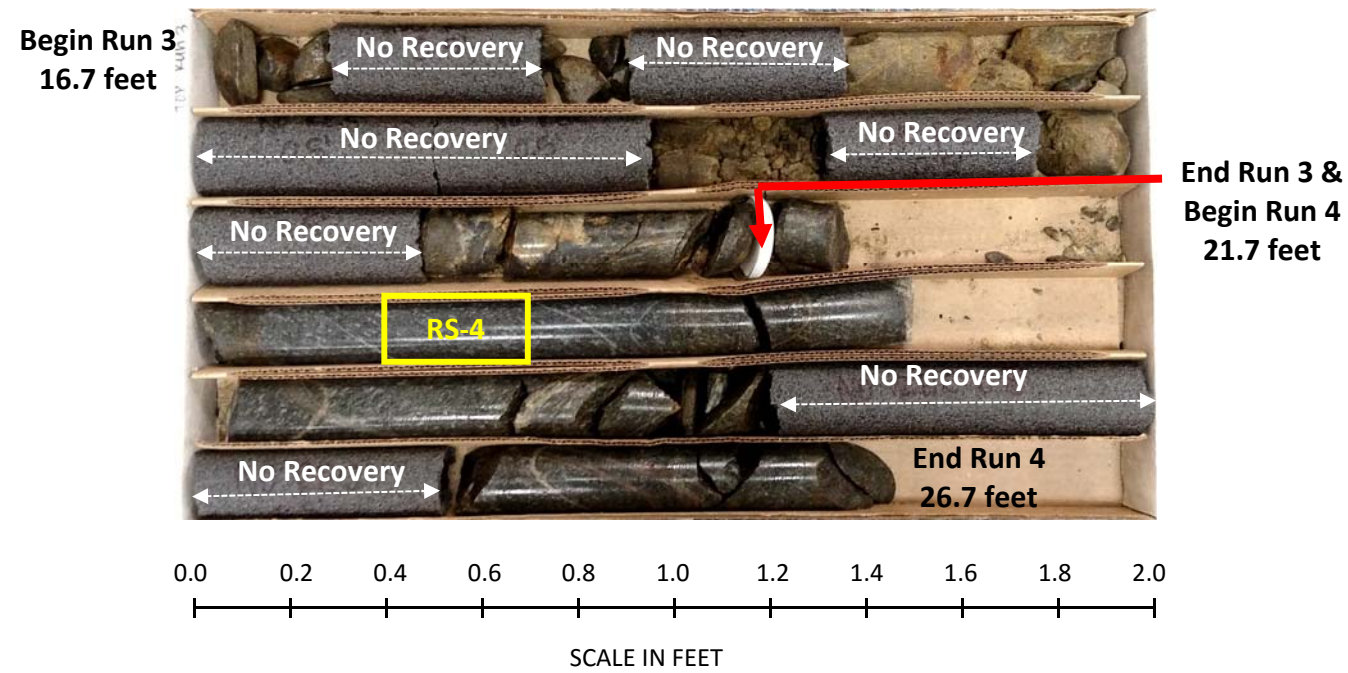
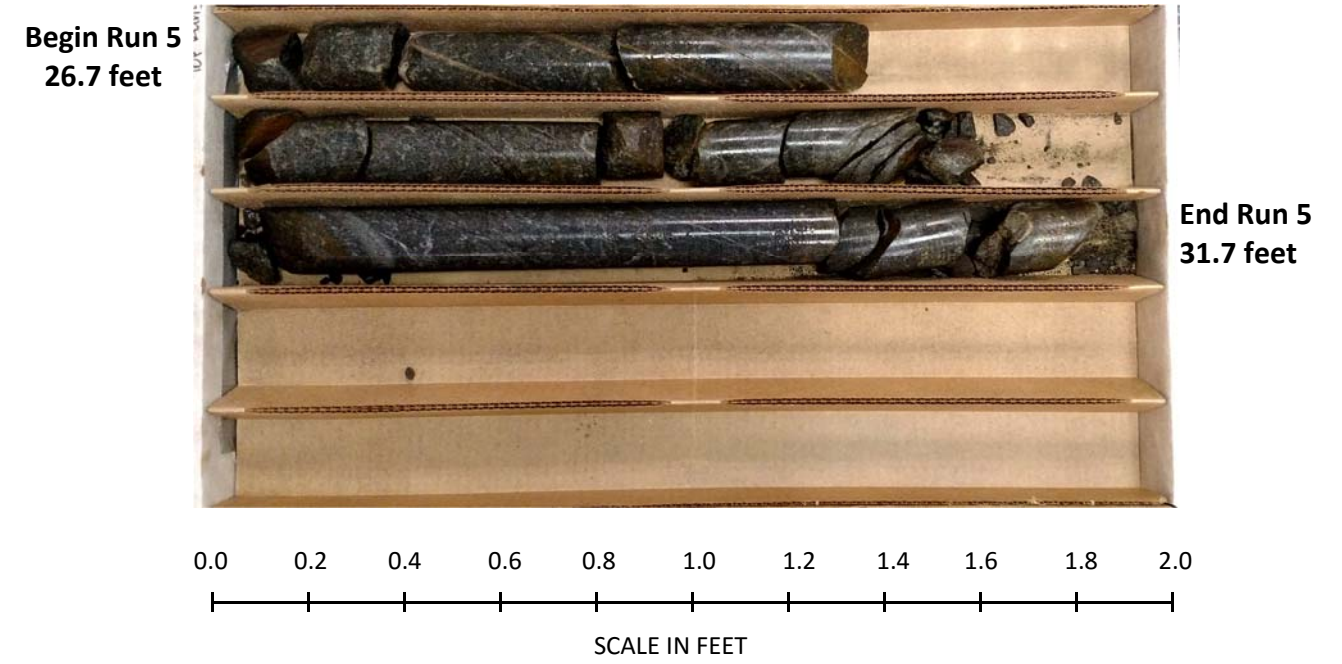
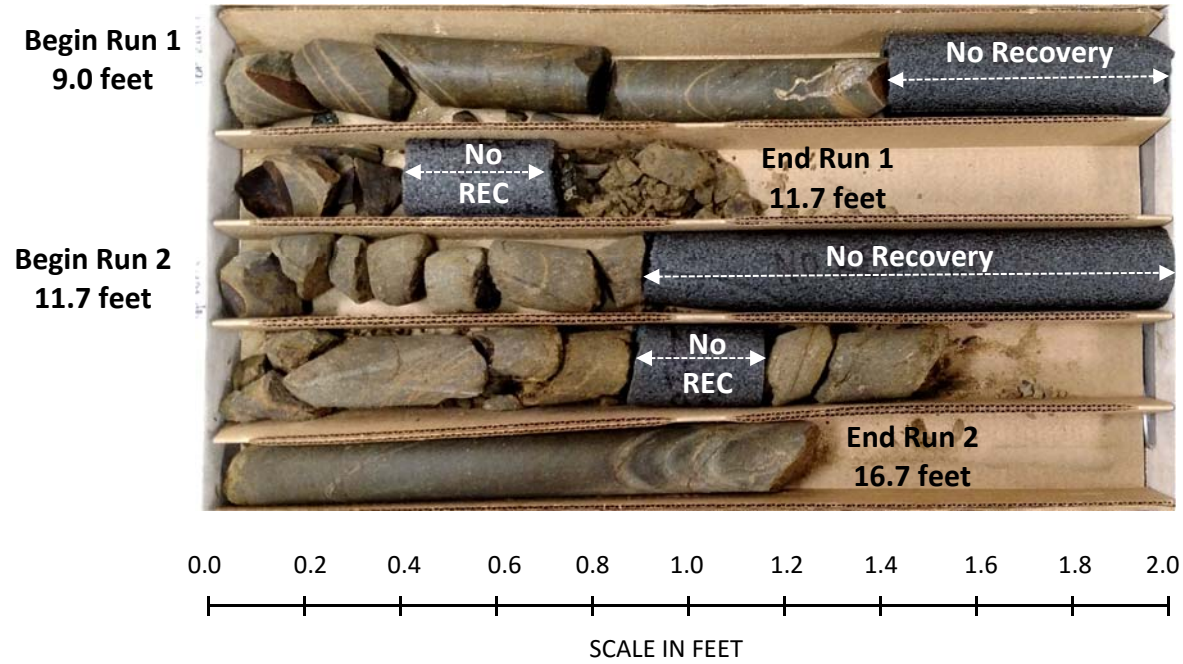


CORE PHOTOGRAPHS: NCDOT U-5806 Bridge, Cabarrus Co., EB2-A: -Y1- 15+29, 15' Lt.





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.D1
TIP NO.: U-5806
COUNTY: Cabarrus
DESCRIPTION: Intersection of SR 2894 (Concord Mills Blvd) and Entrance No. 1 Kings Grant Pavilion

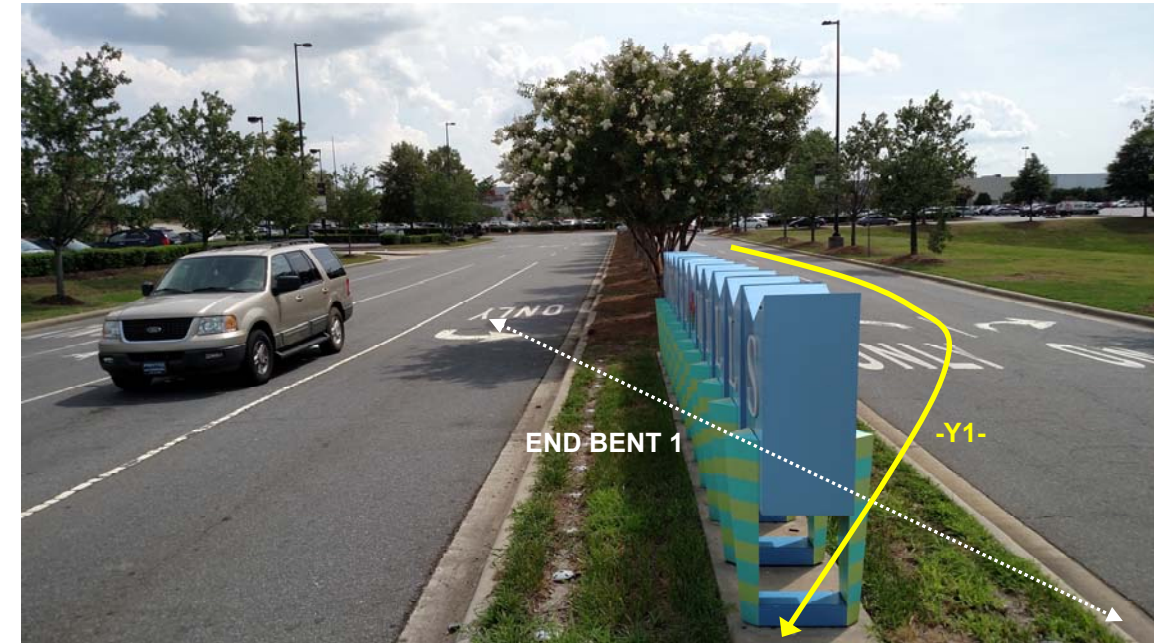
Sample #	Boring #	Alignment	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus, E (ksi)	GSI
RS-1	EB1-A	-Y1-	13+69	14' Lt.	24.3-24.6	Meta Quartz Diorite	PzZq	38%	3.82	1.77	182.3	16,830	2,999	50-65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



SITE PHOTOGRAPHS



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



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



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



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806

PROJECT: 44378

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CABARRUS
PROJECT DESCRIPTION INTERSECTION OF SR 2894
(CONCORD MILLS BLVD.) AND ENTRANCE NO.1
KINGS GRANT PAVILION
SITE DESCRIPTION MSE RETAINING WALL NO.1 AT
END BENT 1

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
6-10	BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS
11	ROCK TEST RESULTS SUMMARY
12	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE 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, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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1. 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 T.T. WALKER

CHECKED BY P. ALTON

SUBMITTED BY P. ALTON

DATE AUGUST 2017

SINCE



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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

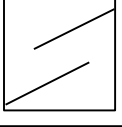
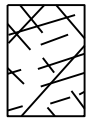
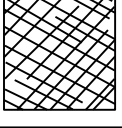

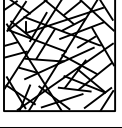



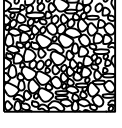

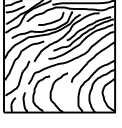



Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. Includes sub-sections like SOIL LEGEND AND AASHTO CLASSIFICATION, CONSISTENCY OR DENSENESS, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, and various symbols and abbreviations.

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

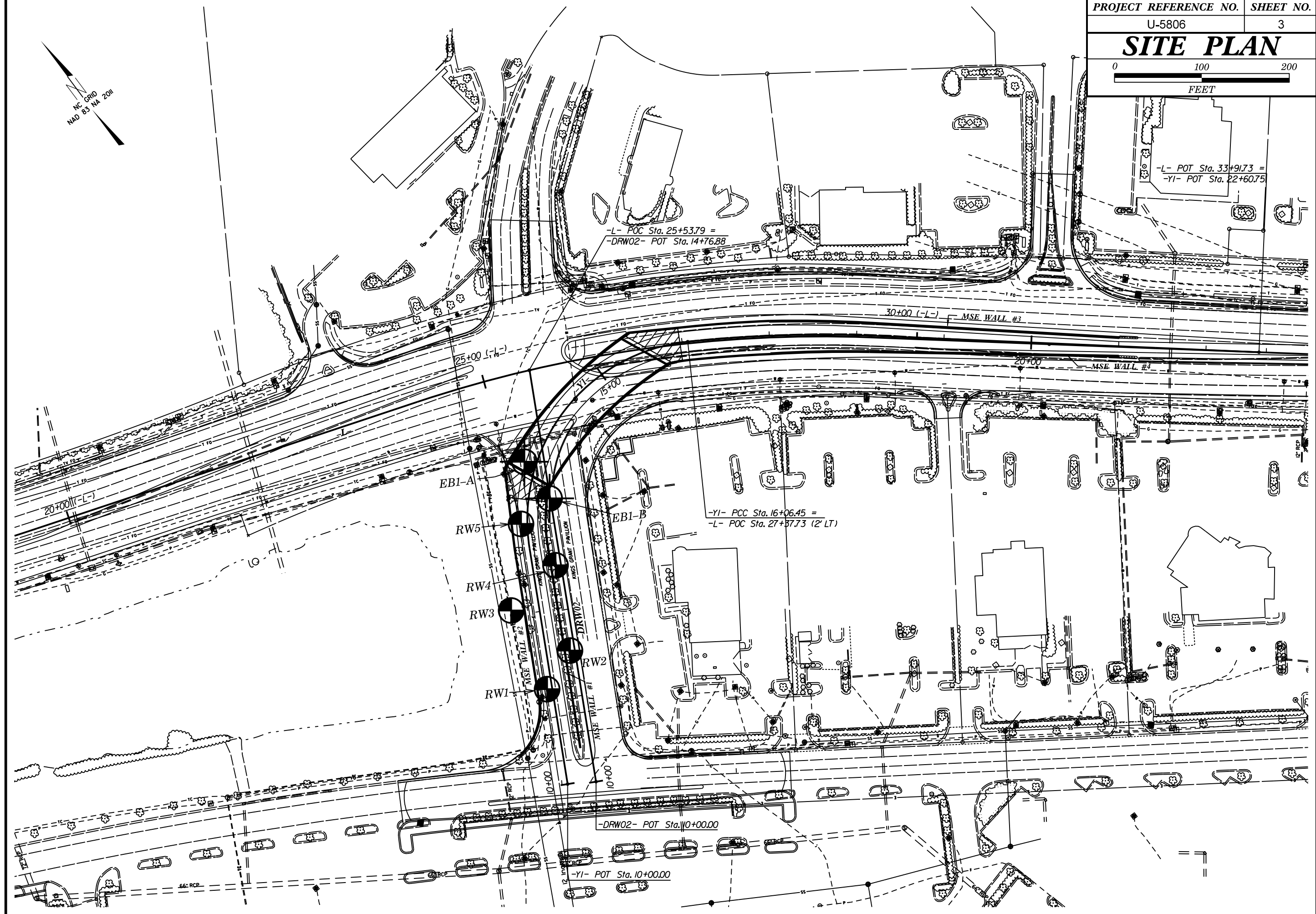
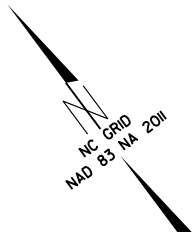
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)						
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.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - 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, slickensided or highly weathered surfaces 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 condition of the discontinuities and estimate the average value 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 fair, 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		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE								
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70						
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70					B. Sandstone with thin inter-layers of siltstone	60						
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60					C. Sandstone and siltstone in similar amounts	50						
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			50				D. Siltstone or silty shale with sandstone layers	40						
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				40			E. Weak siltstone or clayey shale with sandstone layers	30						
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes					30		F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure	20						
								G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers	10						
								H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.							

→ Means deformation after tectonic disturbance



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold	
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)
BORING NO. RW2		STATION 11+50		OFFSET 27 ft RT		ALIGNMENT -Y1-	
COLLAR ELEV. 638.1 ft		TOTAL DEPTH 14.1 ft		NORTHING 594,258		EASTING 1,487,623	
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER S. Davis		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640															
	637.7	0.4		19	19	10									638.1
															637.7
	634.6	3.5		12	27	43									636.6
															636.1
	629.6	8.5		27	38	62/0.4									629.1
															629.6
	624.6	13.5		70	30/0.1										624.0
															624.0

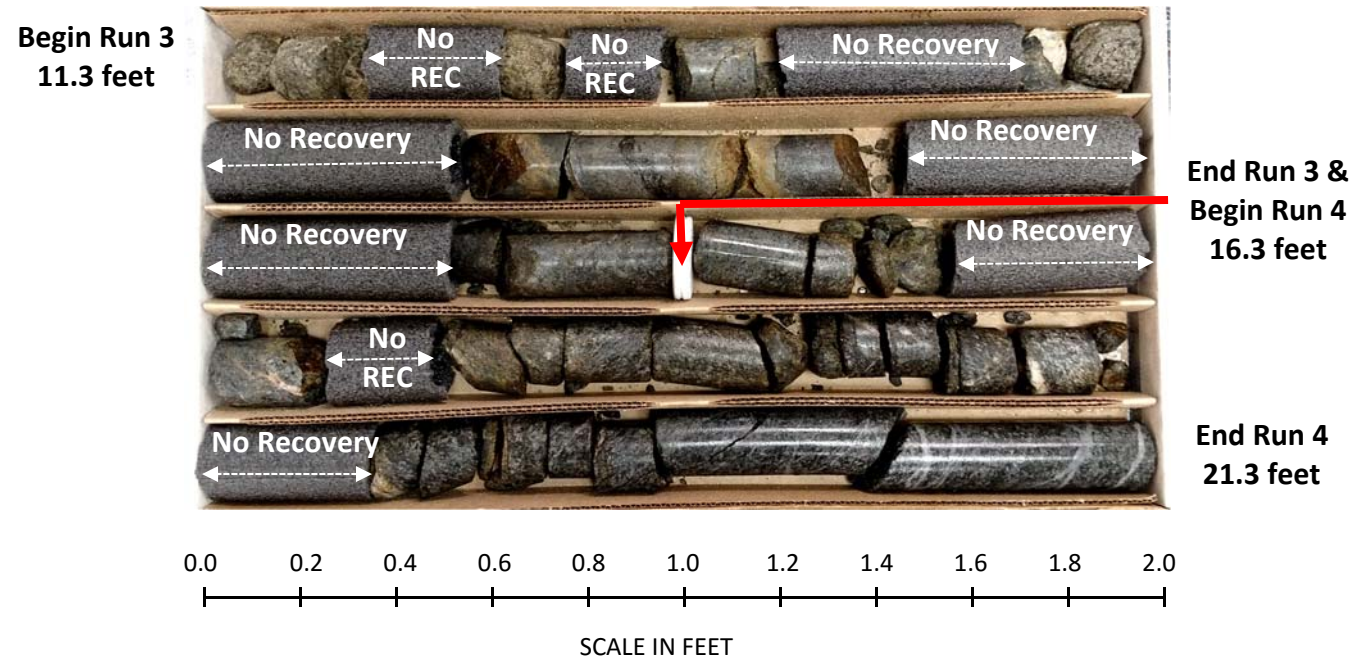
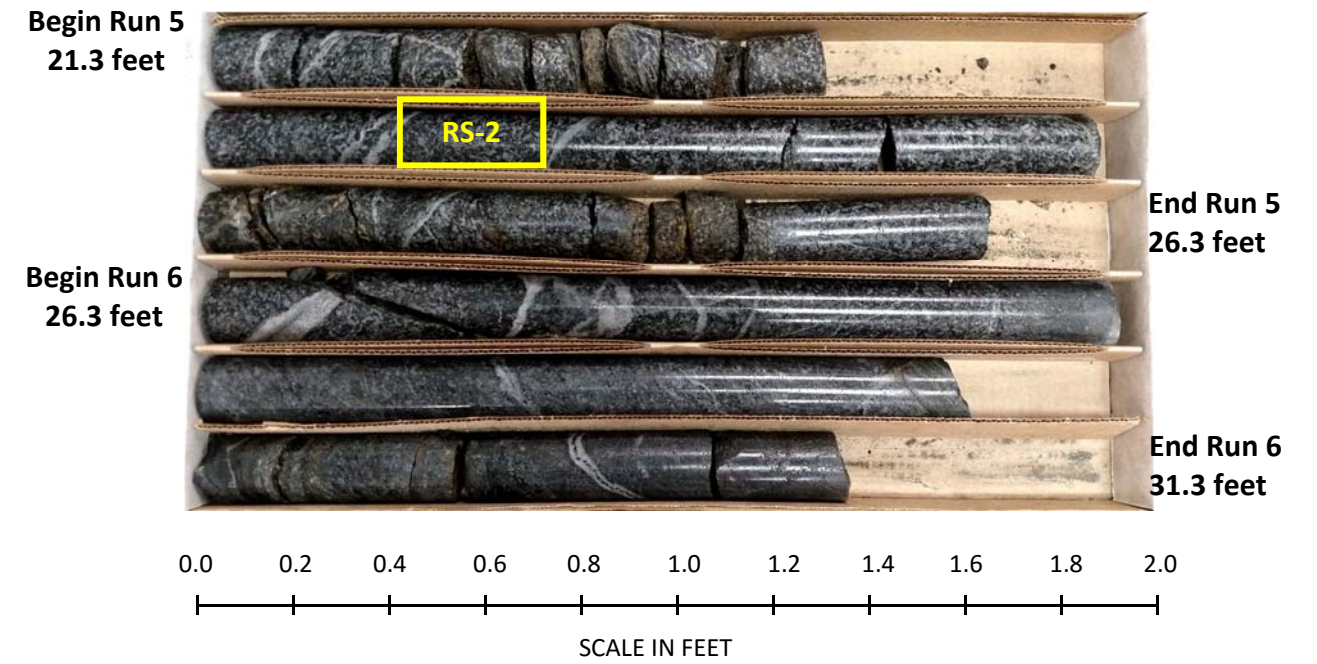
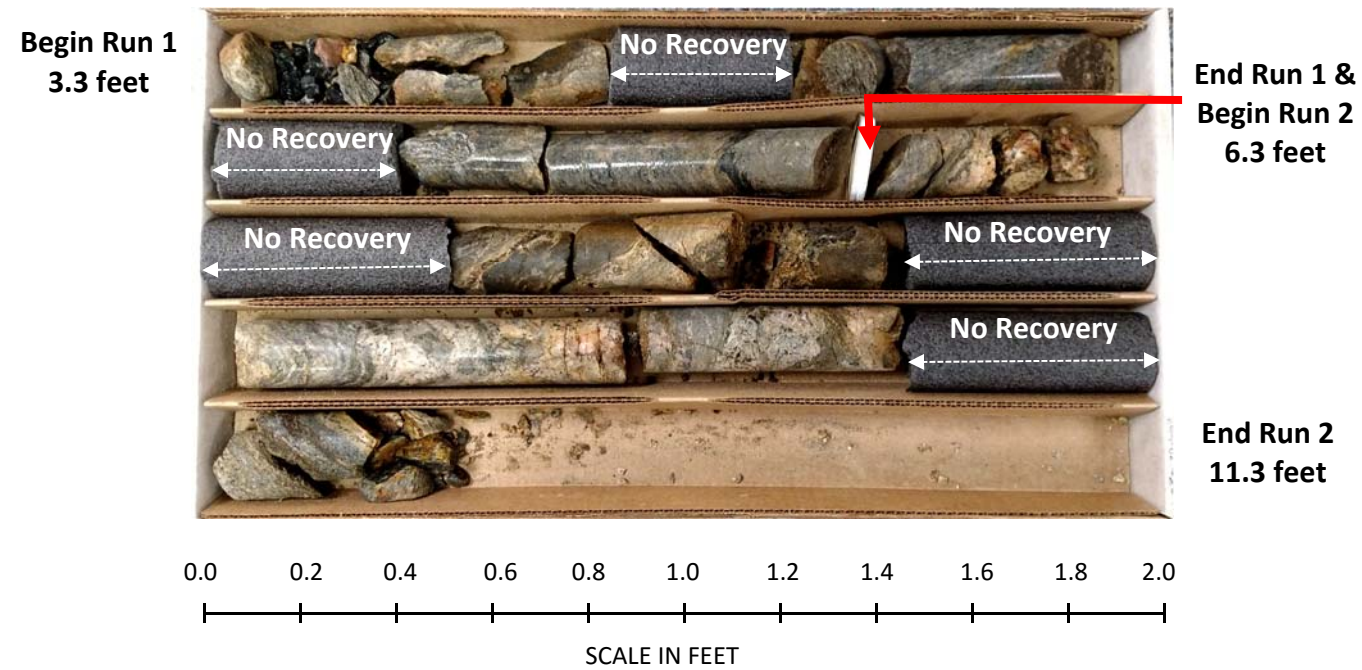
WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold	
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)
BORING NO. RW4		STATION 12+49		OFFSET 26 ft RT		ALIGNMENT -Y1-	
COLLAR ELEV. 636.3 ft		TOTAL DEPTH 9.5 ft		NORTHING 594,346		EASTING 1,487,668	
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER S. Davis		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640															
	636.3	0.0													636.3
															635.8
	635.8	0.5		20	17	17									635.8
															635.3
	632.8	3.5		24	18	15									632.8
															632.3
	629.6	6.7													629.6
															629.1
	627.8	8.5													627.8
	626.8	9.5		100/0.3											626.8
															626.3

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17



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



GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW1	STATION 11+11	OFFSET 6 ft LT	ALIGNMENT -Y1-
COLLAR ELEV. 638.2 ft	TOTAL DEPTH 28.9 ft	NORTHING 594,238	EASTING 1,487,576
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/18/16	COMP. DATE 08/18/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640														638.2 GROUND SURFACE 0.0	
	637.5	0.7	14	16	12									637.5 ASPHALT 0.7	
	636.3													636.3 ABC STONE 1.9	
635	634.7	3.5	11	10	9									ROADWAY EMBANKMENT	
														Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica	
630	629.7	8.5	2	3	3									629.4 Dark Gray-Dark Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots) and Mica 8.8	
625	624.7	13.5	8	14	22									626.2 RESIDUAL 12.0	
														Orange-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica	
620	619.7	18.5	16	14	16									618.9 Black-Orange-Brown, Fine Sandy SILT (A-4) with Trace Mica 19.3	
615	614.7	23.5	41	78	22/0.1									614.2 WEATHERED ROCK 24.0	
														Tan-Orange-Brown (META QUARTZ DIORITE)	
610	609.7	28.5	100/0.4											609.3 WEATHERED ROCK (META QUARTZ DIORITE) 28.9	
														Boring Terminated at Elevation 609.3 ft in WEATHERED ROCK (META QUARTZ DIORITE)	

NOTE:
1) FIAD due to boring location in roadway

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW3	STATION 12+06	OFFSET 32 ft LT	ALIGNMENT -Y1-
COLLAR ELEV. 635.6 ft	TOTAL DEPTH 8.6 ft	NORTHING 594,335	EASTING 1,487,597
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/23/16	COMP. DATE 08/23/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640														635.6 GROUND SURFACE 0.0	
	635.6	0.0	5	25	100/0.4									634.6 RESIDUAL 1.0	
635	632.1	3.5												Tan-Brown, Silty Fine SAND (A-2-4) with Trace Organics (Roots) and Trace Mica	
														WEATHERED ROCK	
630	627.1	8.5	60/0.1											627.0 Tan-Brown (META QUARTZ DIORITE) 8.5	
														CRISTALLINE ROCK	
														Tan-Dark Brown (META QUARTZ DIORITE)	

Boring Terminated with Standard Penetration Test Refusal at Elevation 627.0 ft in CRISTALLINE ROCK (META QUARTZ DIORITE)

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold	
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)
BORING NO. RW5		STATION 13+01		OFFSET 7 ft LT		ALIGNMENT -Y1-	
COLLAR ELEV. 634.6 ft		TOTAL DEPTH 4.0 ft		NORTHING 594,407		EASTING 1,487,665	
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER S. Davis		START DATE 08/19/16		COMP. DATE 08/19/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
635																	
	634.0	0.6													634.6	GROUND SURFACE	0.0
			16	18	21										634.0	ASPHALT	0.6
															633.1	ABC STONE	1.5
	631.1	3.5													631.1	RESIDUAL	3.5
	630.6	4.0	100/0.3												630.6	Black-Gray-Brown, Silty Fine SAND (A-2-4) with Trace Mica	4.0
			60/0.0													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:
 1) Auger refusal at 4.0'
 2) FIAD due to boring location in roadway

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 44378.1.D1			TIP U-5806			COUNTY CABARRUS			GEOLOGIST M. Arnold						
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. EB1-A			STATION 13+69		OFFSET 14 ft LT		ALIGNMENT -Y1-		0 HR. Dry						
COLLAR ELEV. 634.2 ft			TOTAL DEPTH 41.1 ft		NORTHING 594,462		EASTING 1,487,711		24 HR. FIAD						
DRILL RIG/HAMMER EFF/DATE F&R2175 CME-55 86% 02/16/2016					DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic							
DRILLER S. Davis			START DATE 08/22/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
635														634.2 GROUND SURFACE	0.0
	633.5	0.7												633.5 ASPHALT	0.7
	632.6													632.6 ABC STONE	1.6
	630.7	3.5	19	14	15									630.2 ROADWAY EMBANKMENT	4.0
630	630.7	3.5	43	100/0.4										Brown-Dark Gray, Silty Fine SAND (A-2-4) with Trace Gravel and Mica	4.0
	625.7	8.5												626.3 WEATHERED ROCK	7.9
625	625.7	8.5		60/0.1										Brown-Dark Gray (META QUARTZ DIORITE)	7.9
	621.1	13.1												621.1 CRYSTALLINE ROCK	13.1
620	621.1	13.1		60/0.0										Brown-Dark Gray (META QUARTZ DIORITE)	13.1
615															
610															
605															
600															
595															
														593.1 Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)	41.1

WBS 44378.1.D1			TIP U-5806			COUNTY CABARRUS			GEOLOGIST M. Arnold			
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)					
BORING NO. EB1-A			STATION 13+69		OFFSET 14 ft LT		ALIGNMENT -Y1-		0 HR. Dry			
COLLAR ELEV. 634.2 ft			TOTAL DEPTH 41.1 ft		NORTHING 594,462		EASTING 1,487,711		24 HR. FIAD			
DRILL RIG/HAMMER EFF/DATE F&R2175 CME-55 86% 02/16/2016					DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic				
DRILLER S. Davis			START DATE 08/22/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)		REC. (%)	ROD (%)			
621.1												621.1 Begin Coring @ 13.1 ft
620	621.1	13.1	3.0	3:10/1.0	(2.3)	(0.4)		(26.5)	(8.8)			621.1 CRYSTALLINE ROCK
	618.1	16.1		1:29/1.0	77%	13%						Brown-Dark Gray, Very Slight to Moderate Weathering, Hard to Medium Hard (META QUARTZ DIORITE) with Close to Very Close Fracture Spacing
	615		5.0	1:49/1.0	86%	14%						RS-1: 24.3'-24.6', qu=16,830 psi, GSI=50-65
	613.1	21.1		1:29/1.0	(4.3)	(0.7)						
	610		5.0	1:15/1.0								
	608.1	26.1		1:18/1.0	(4.9)	(1.9)						
	605		5.0	1:27/1.0	98%	38%						
	603.1	31.1		1:33/1.0	100%	16%						
	600		5.0	1:37/1.0	100%	40%						
	598.1	36.1		2:06/1.0	(5.0)	(2.0)						
	595		5.0	1:56/1.0	100%	60%						
	593.1	41.1		3:37/1.0	(5.0)	(3.0)						
				2:04/1.0								
				2:13/1.0								
				2:24/1.0								
				1:49/1.0								
				2:17/1.0								
				2:32/1.0								

NOTES:
1) Auger Refusal at 13.1'
2) FIAD due to boring location in roadway

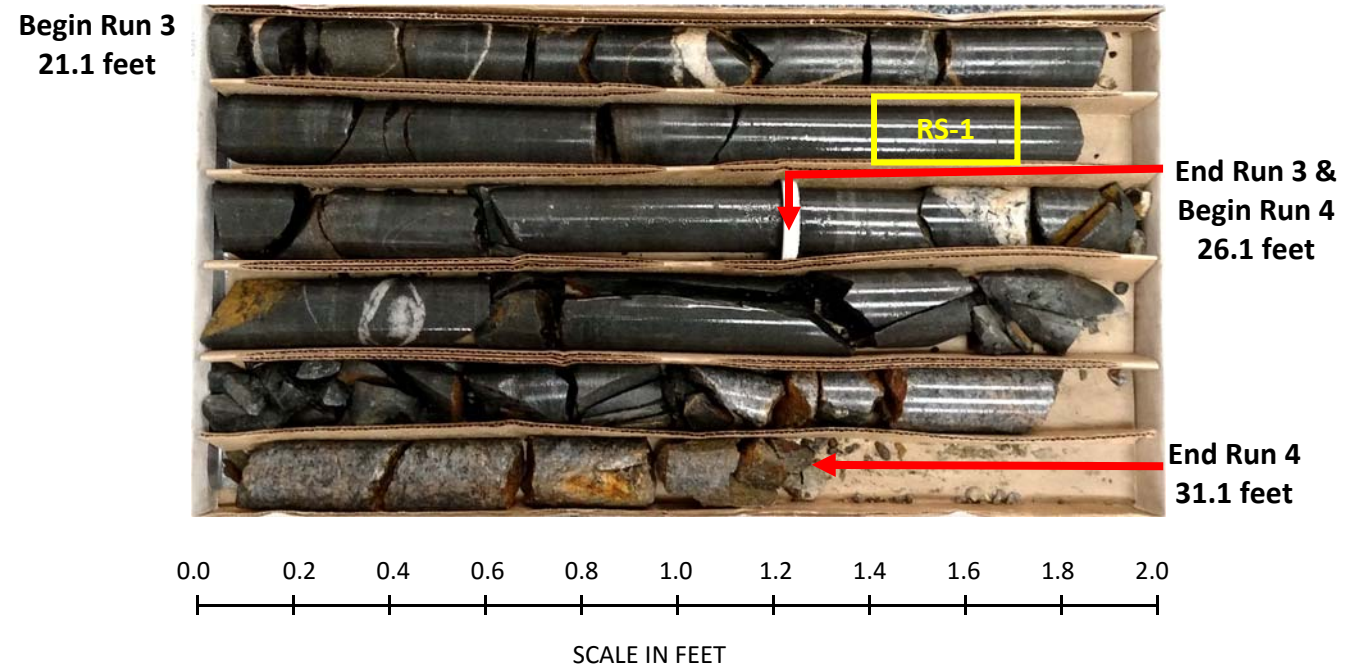
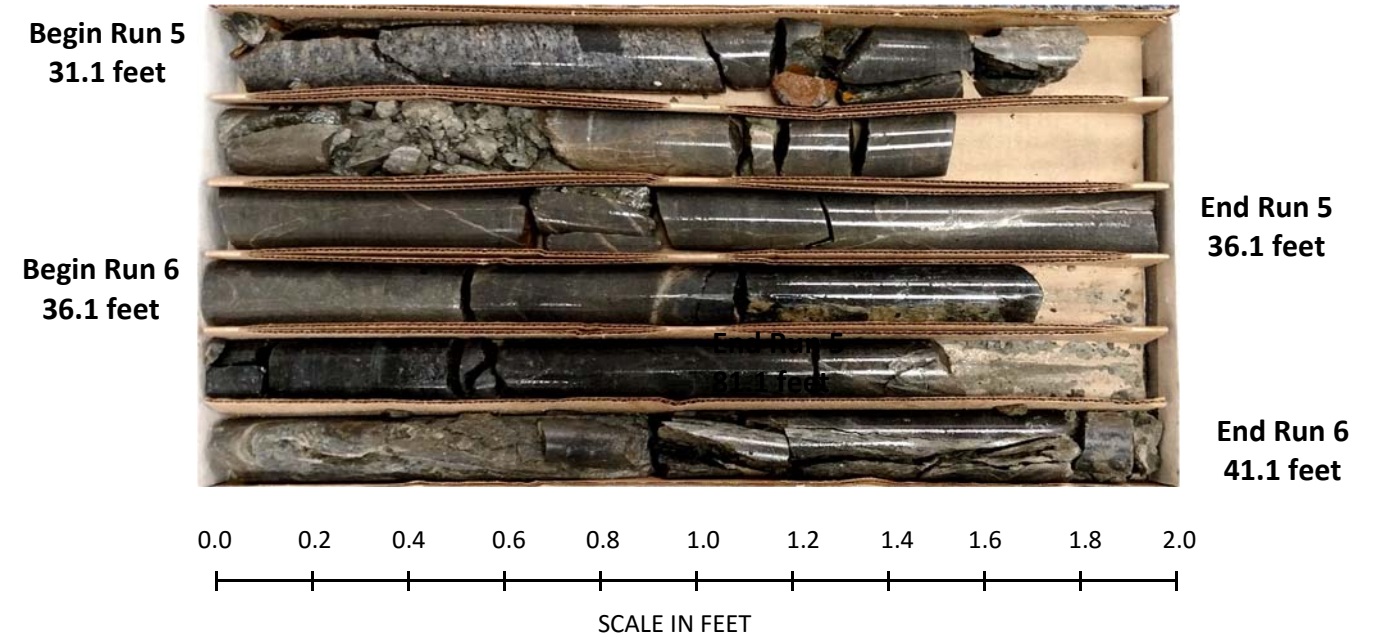
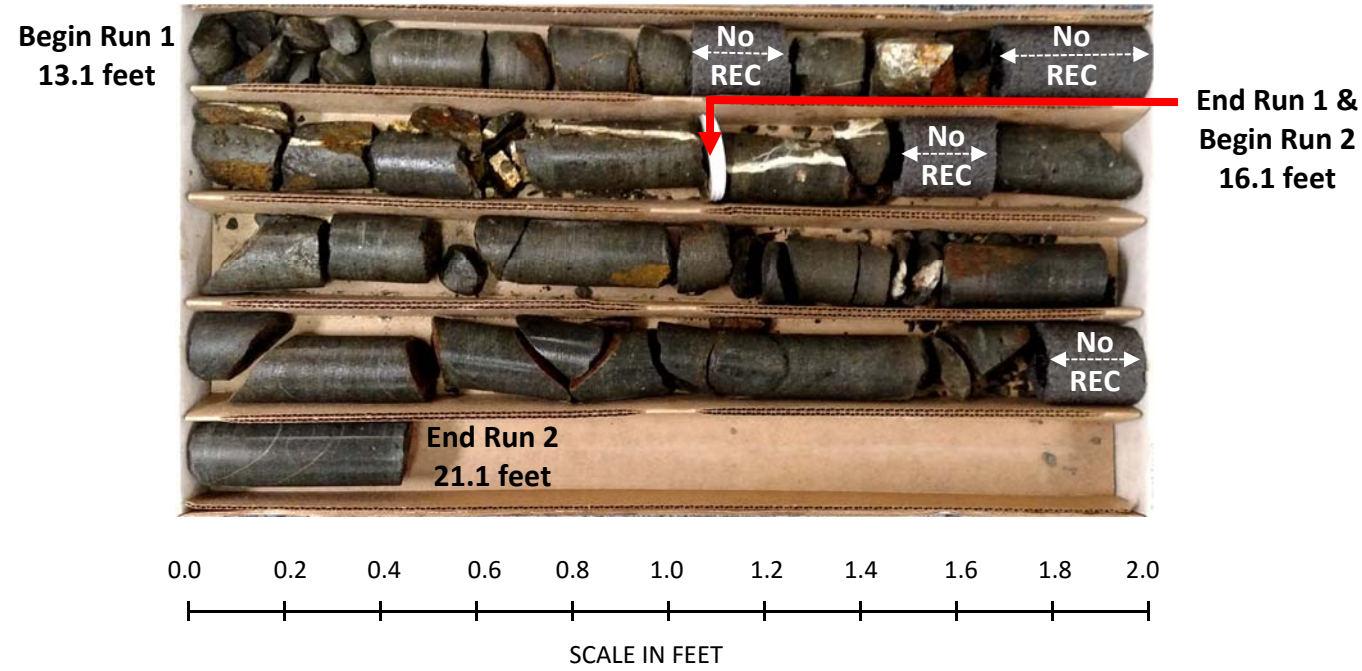
NOTES:
1) Auger Refusal at 13.1'
2) FIAD due to boring location in roadway

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17



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



LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 44378.1.D1
TIP NO.: U-5806
COUNTY: Cabarrus
DESCRIPTION: 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



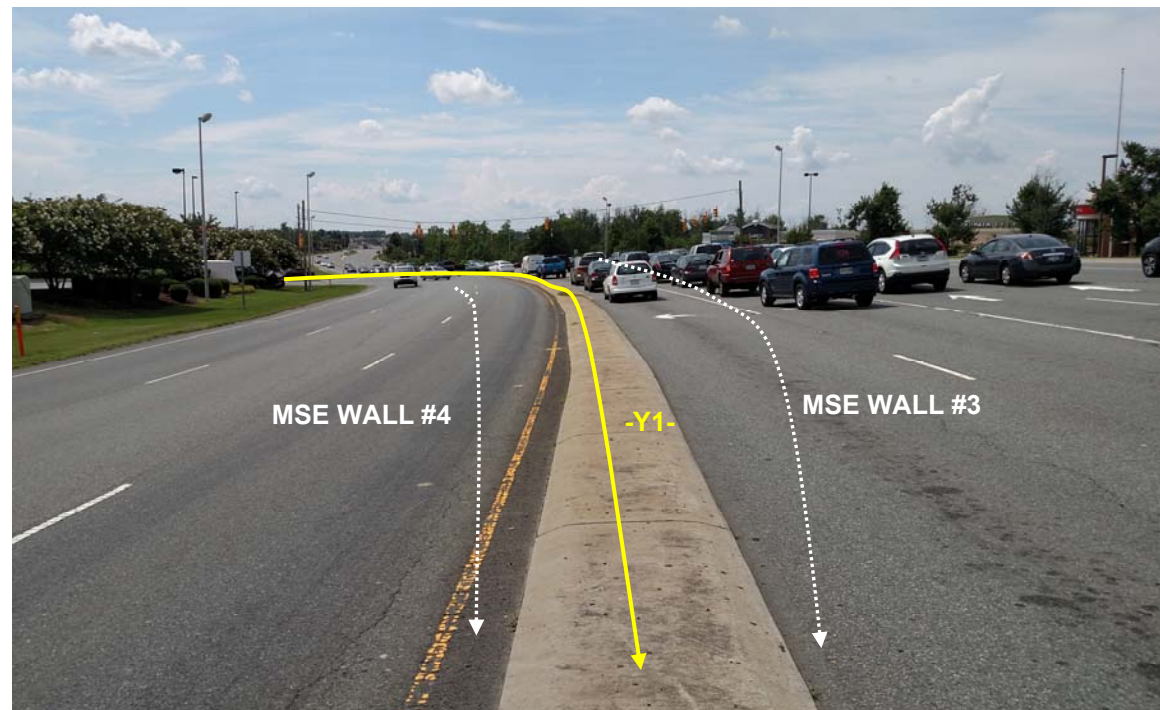
SITE PHOTOGRAPHS



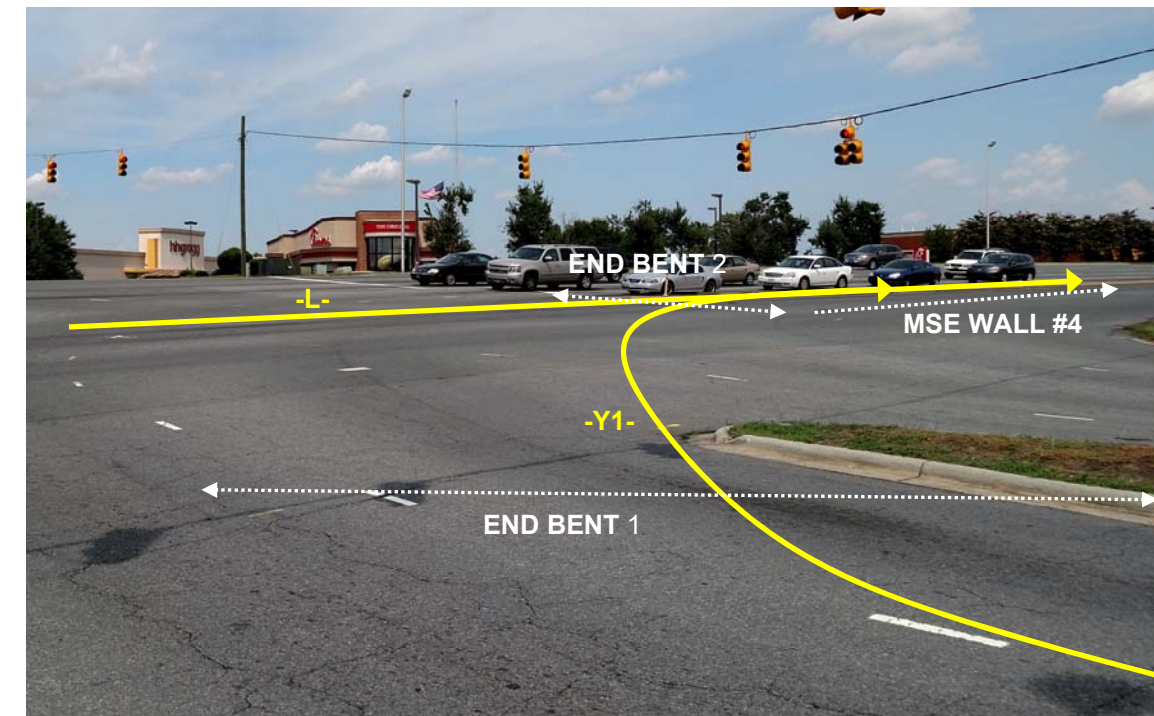
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



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



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



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806

PROJECT: 44378

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CABARRUS
PROJECT DESCRIPTION INTERSECTION OF SR 2894
(CONCORD MILLS BLVD.) AND ENTRANCE NO.1
KINGS GRANT PAVILION
SITE DESCRIPTION MSE RETAINING WALL NO.2 AT
END BENT 1

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
6-10	BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS
11	ROCK TEST RESULTS SUMMARY
12	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE 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, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 T07-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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- NOTES:
1. 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 T.T. WALKER

CHECKED BY P. ALTON

SUBMITTED BY P. ALTON

DATE AUGUST 2017

SINCE



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Engineering Stability Since 1881
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W. Patrick Alton

8/8/2017

SIGNATURE

DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

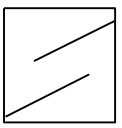
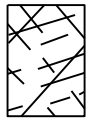
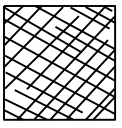




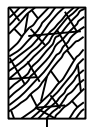
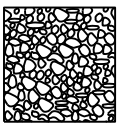

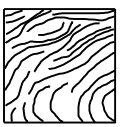



Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. It contains detailed technical specifications, classification charts, and symbols for soil and rock analysis.

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

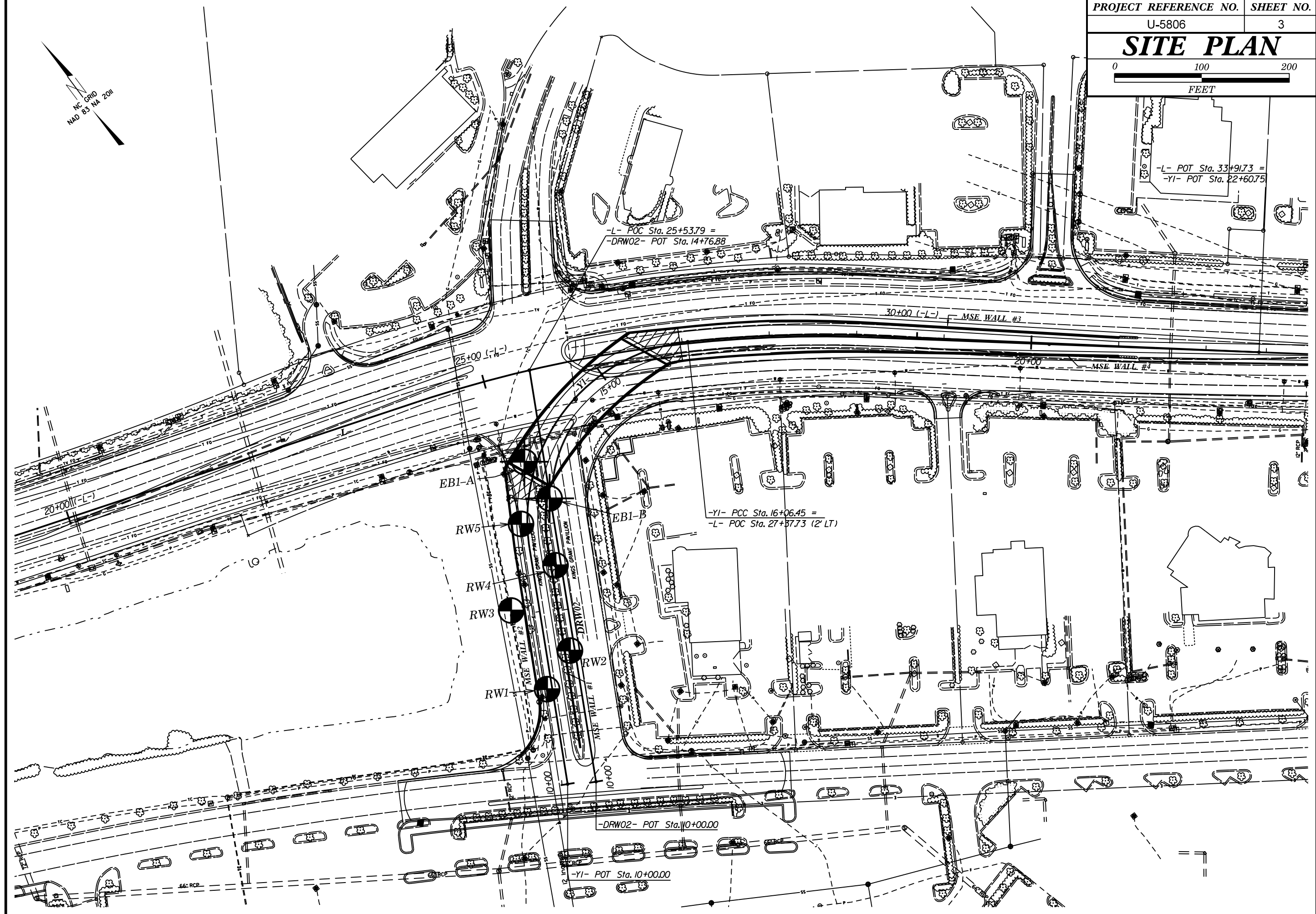
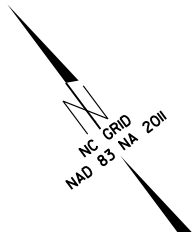
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)						
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.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - 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, slickensided or highly weathered surfaces with soft clay coatings or fillings				
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE								
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70						
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70					B. Sandstone with thin inter-layers of siltstone	60						
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60					C. Sandstone and siltstone in similar amounts	50						
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			50				D. Siltstone or silty shale with sandstone layers	40						
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			40				E. Weak siltstone or clayey shale with sandstone layers	30						
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes			30				F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure	20						
				20				G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers	10						
		N/A	N/A					H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.							

→ Means deformation after tectonic disturbance



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. RW1		STATION 11+11		OFFSET 6 ft LT		ALIGNMENT -Y1-										
COLLAR ELEV. 638.2 ft		TOTAL DEPTH 28.9 ft		NORTHING 594,238		EASTING 1,487,576										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
640																
	637.5	0.7	14	16	12									638.2	0.0	GROUND SURFACE
														637.5	0.7	ASPHALT
	634.7	3.5	11	10	9									636.3	1.9	ABC STONE
																ROADWAY EMBANKMENT
																Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica
	629.7	8.5	2	3	3									629.4	8.8	Dark Gray-Dark Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots) and Mica
														626.2	12.0	RESIDUAL
																Orange-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica
	619.7	18.5	16	14	16									618.9	19.3	Black-Orange-Brown, Fine Sandy SILT (A-4) with Trace Mica
	614.7	23.5	41	78	22/0.1									614.2	24.0	WEATHERED ROCK
																Tan-Orange-Brown (META QUARTZ DIORITE)
	609.7	28.5	100/0.4											609.3	28.9	Boring Terminated at Elevation 609.3 ft in WEATHERED ROCK (META QUARTZ DIORITE)
																NOTE: 1) FIAD due to boring location in roadway

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. RW3		STATION 12+06		OFFSET 32 ft LT		ALIGNMENT -Y1-										
COLLAR ELEV. 635.6 ft		TOTAL DEPTH 8.6 ft		NORTHING 594,335		EASTING 1,487,597										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
640																
	635.6	0.0	5	25	100/0.4									635.6	0.0	GROUND SURFACE
														634.6	1.0	RESIDUAL
																Tan-Brown, Silty Fine SAND (A-2-4) with Trace Organics (Roots) and Trace Mica
																WEATHERED ROCK
																Tan-Brown (META QUARTZ DIORITE)
	627.1	8.5	60/0.1											627.1	8.5	CRYSTALLINE ROCK
														627.0	8.6	Tan-Dark Brown (META QUARTZ DIORITE)
																Boring Terminated with Standard Penetration Test Refusal at Elevation 627.0 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold	
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)
BORING NO. RW5		STATION 13+01		OFFSET 7 ft LT		ALIGNMENT -Y1-	
COLLAR ELEV. 634.6 ft		TOTAL DEPTH 4.0 ft		NORTHING 594,407		EASTING 1,487,665	
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic			
DRILLER S. Davis		START DATE 08/19/16		COMP. DATE 08/19/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)	
635																
	634.0	0.6		16	18	21								634.6	GROUND SURFACE	0.0
														634.0	ASPHALT	0.6
														633.1	ABC STONE	1.5
	631.1	3.5												631.1	RESIDUAL	3.5
	630.6	4.0		100/0.3										630.6	Black-Gray-Brown, Silty Fine SAND (A-2-4) with Trace Mica	4.0
				60/0.0											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:
 1) Auger refusal at 4.0'
 2) FIAD due to boring location in roadway

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 13+69		OFFSET 14 ft LT		ALIGNMENT -Y1-									
COLLAR ELEV. 634.2 ft		TOTAL DEPTH 41.1 ft		NORTHING 594,462		EASTING 1,487,711									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/22/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
635														634.2 GROUND SURFACE 0.0	
	633.5	0.7	19	14	15									633.5 ASPHALT 0.7	
														632.6 ABC STONE 1.6	
630	630.7	3.5	43	100/0.4										630.2 ROADWAY EMBANKMENT 4.0	
														Brown-Dark Gray, Silty Fine SAND (A-2-4) with Trace Gravel and Mica	
														WEATHERED ROCK	
625	625.7	8.5	60/0.1											626.3 Brown-Dark Gray (META QUARTZ DIORITE) 7.9	
														CRYSTALLINE ROCK	
620	621.1	13.1	60/0.0											621.1 Brown-Dark Gray (META QUARTZ DIORITE) 13.1	
														CRYSTALLINE ROCK	
														Brown-Dark Gray (META QUARTZ DIORITE)	
615															
610															
605															
600															
595															
														593.1 Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 41.1	
NOTES: 1) Auger Refusal at 13.1' 2) FIAD due to boring location in roadway															

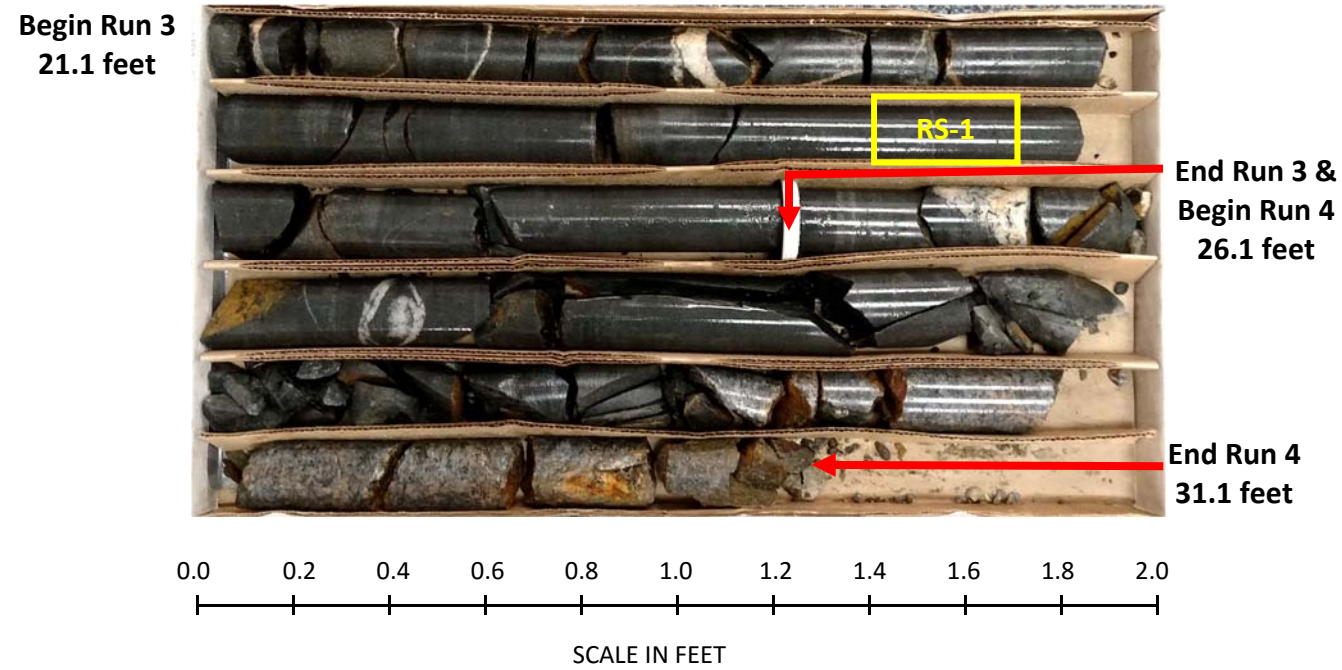
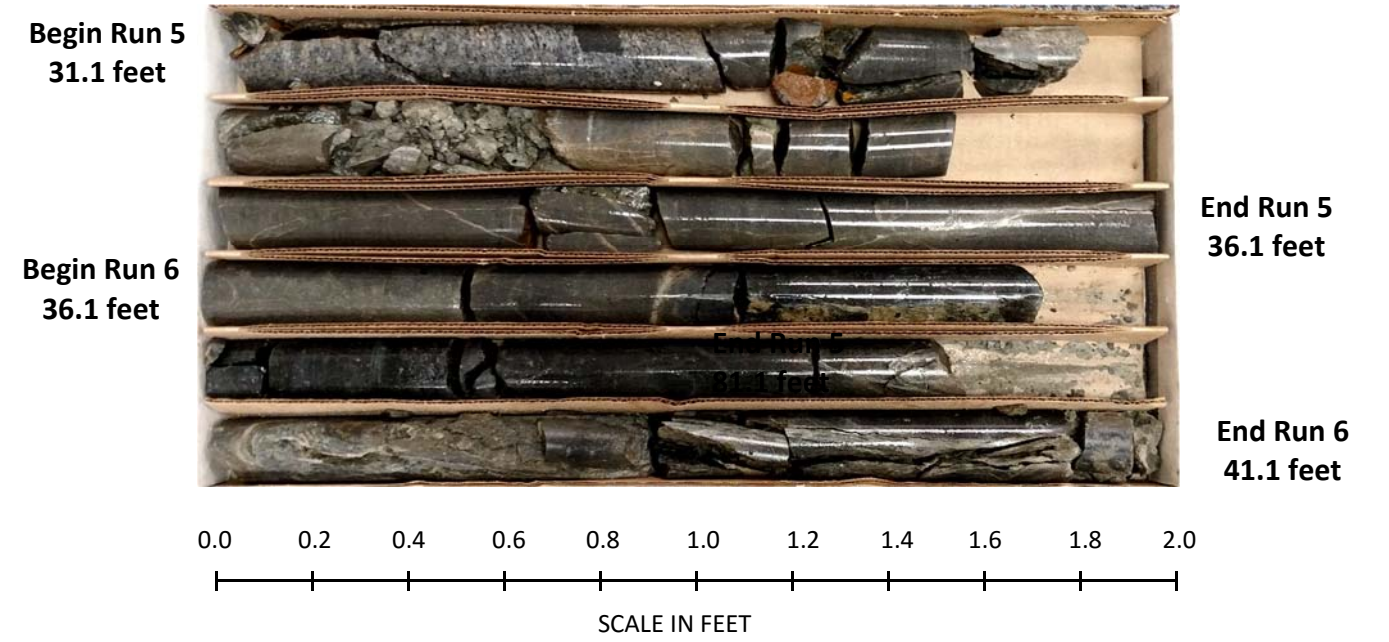
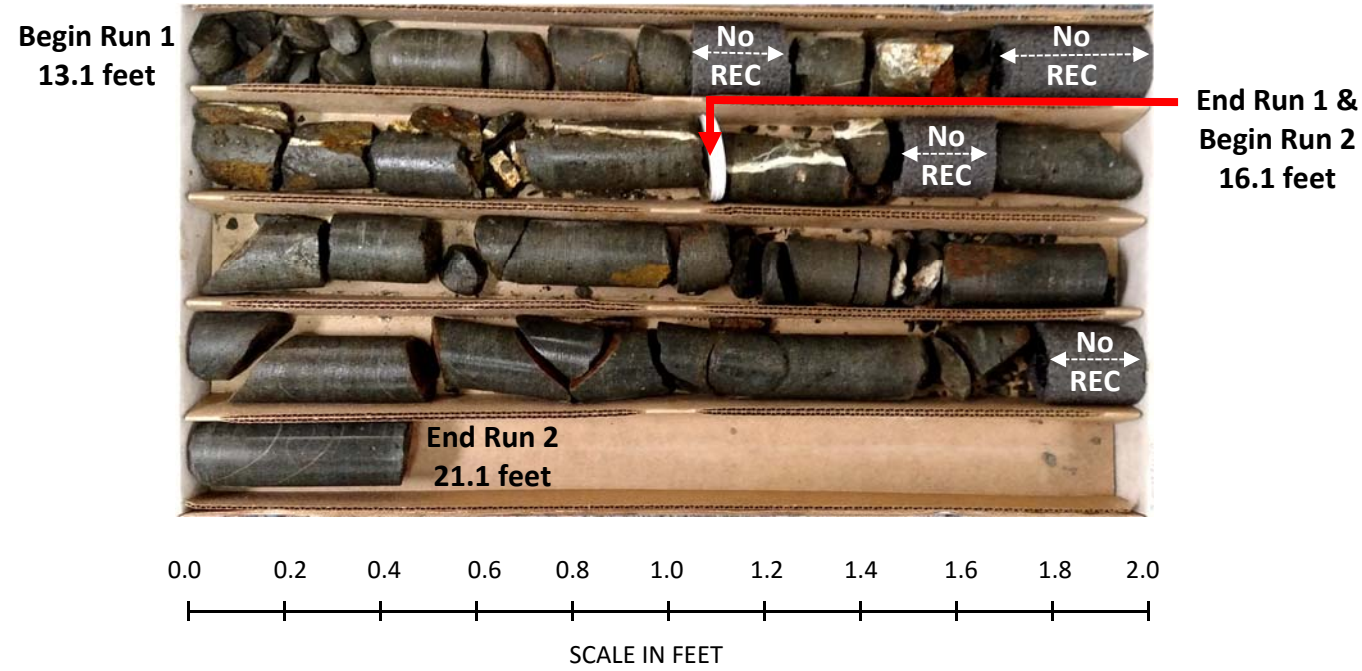
NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold					
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)				
BORING NO. EB1-A		STATION 13+69		OFFSET 14 ft LT		ALIGNMENT -Y1-					
COLLAR ELEV. 634.2 ft		TOTAL DEPTH 41.1 ft		NORTHING 594,462		EASTING 1,487,711					
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic					
DRILLER S. Davis		START DATE 08/22/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)	REC. (%)	ROD (%)			
621.1											Begin Coring @ 13.1 ft
620	621.1	13.1	3.0	3:10/1.0 1:29/1.0 1:49/1.0	(2.3) 77%	(0.4) 13%	(26.5) 95%	(8.8) 31%			621.1 CRYSTALLINE ROCK 13.1
	618.1	16.1	5.0	1:29/1.0 1:15/1.0 1:18/1.0 1:27/1.0 1:45/1.0	(4.3) 86%	(0.7) 14%					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
615	613.1	21.1	5.0	2:26/1.0 1:27/1.0 1:33/1.0 1:37/1.0 1:33/1.0	(4.9) 98%	(1.9) 38%					
610	608.1	26.1	5.0	2:06/1.0 1:55/1.0 3:51/1.0 2:06/1.0 2:16/1.0	(5.0) 100%	(0.8) 16%					
605	603.1	31.1	5.0	2:28/1.0 1:56/1.0 3:37/1.0 1:57/1.0 2:04/1.0	(5.0) 100%	(2.0) 40%					
600	598.1	36.1	5.0	2:13/1.0 2:24/1.0 1:49/1.0 2:17/1.0 2:32/1.0	(5.0) 100%	(3.0) 60%					
595	593.1	41.1									593.1 Boring Terminated at Elevation 593.1 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 41.1
NOTES: 1) Auger Refusal at 13.1' 2) FIAD due to boring location in roadway											

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17



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



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW2		STATION 11+50		OFFSET 27 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 638.1 ft		TOTAL DEPTH 14.1 ft		NORTHING 594,258		EASTING 1,487,623									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640															
	637.7	0.4		19	19	10									638.1
															637.7
	634.6	3.5		12	27	43									636.6
															636.1
	629.6	8.5		27	38	62/0.4									629.1
															629.6
	624.6	13.5		70	30/0.1										624.0
															624.6

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW4		STATION 12+49		OFFSET 26 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 636.3 ft		TOTAL DEPTH 9.5 ft		NORTHING 594,346		EASTING 1,487,668									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
640															
	636.3	0.0													636.3
															635.8
	635.8	0.5		20	17	17									635.8
															634.6
	632.8	3.5		24	18	15									632.8
															629.6
	627.8	8.5		100/0.3											627.8
	626.8	9.5		60/0.0											626.8

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT

BORE LOG

GEOTECHNICAL BORING REPORT

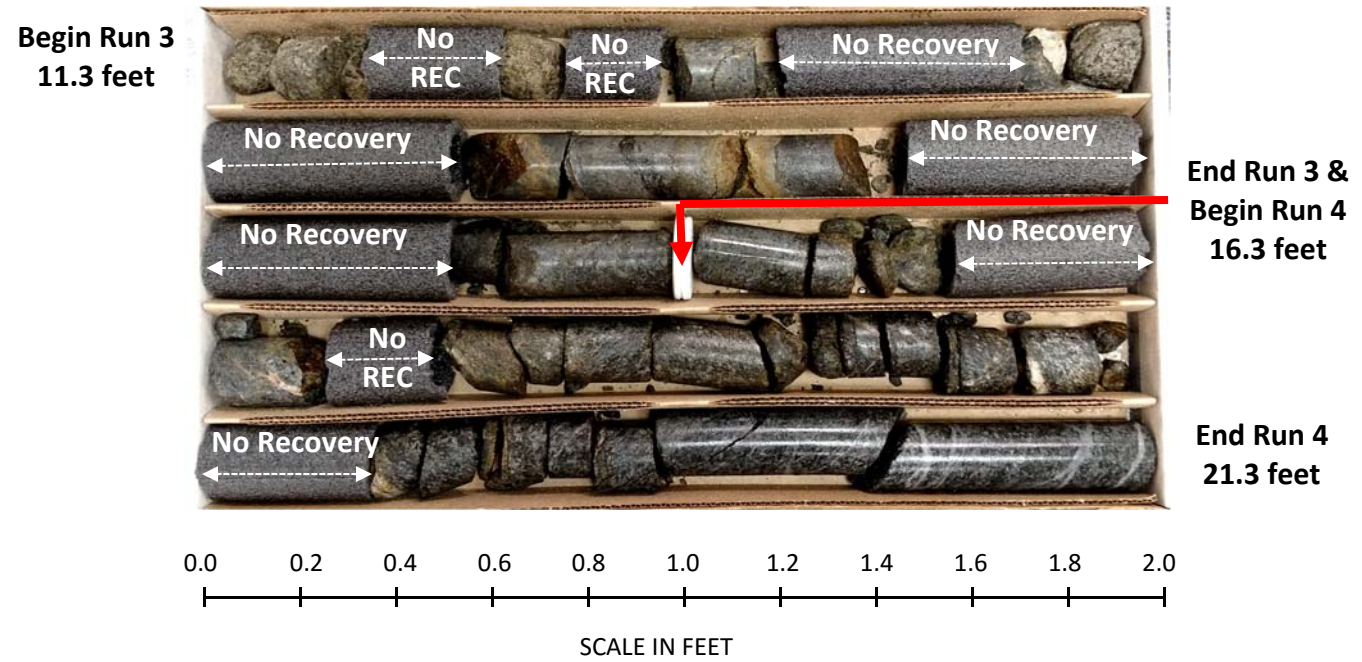
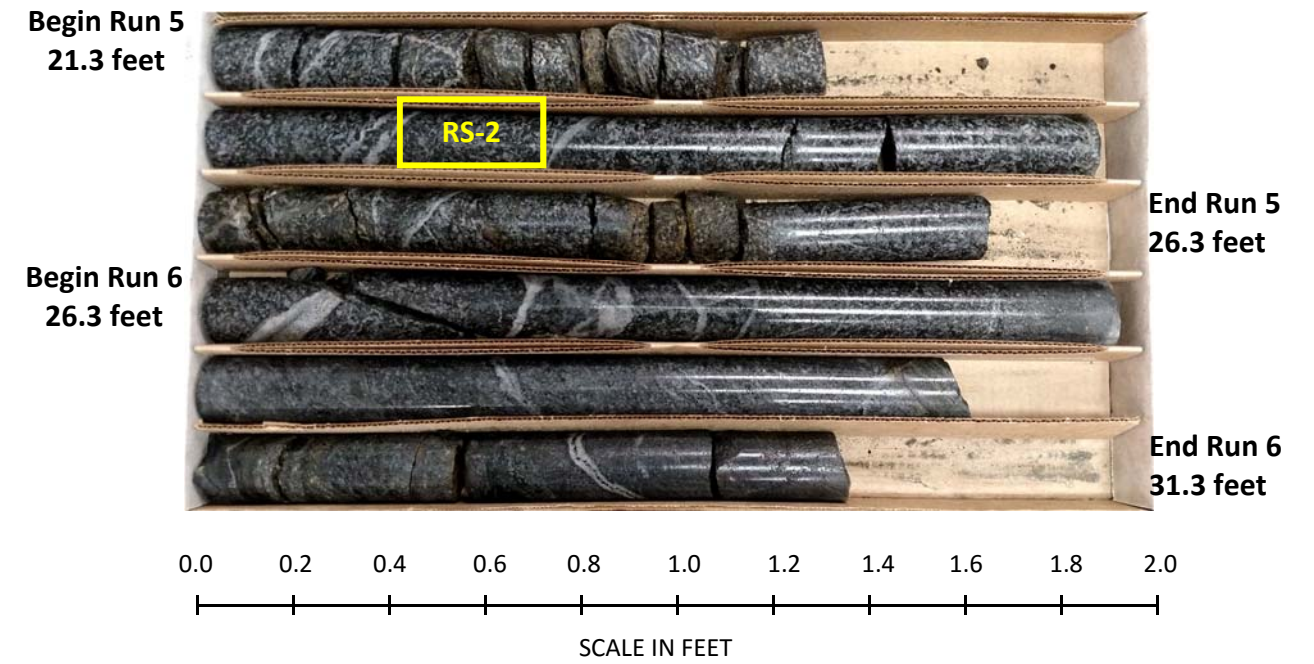
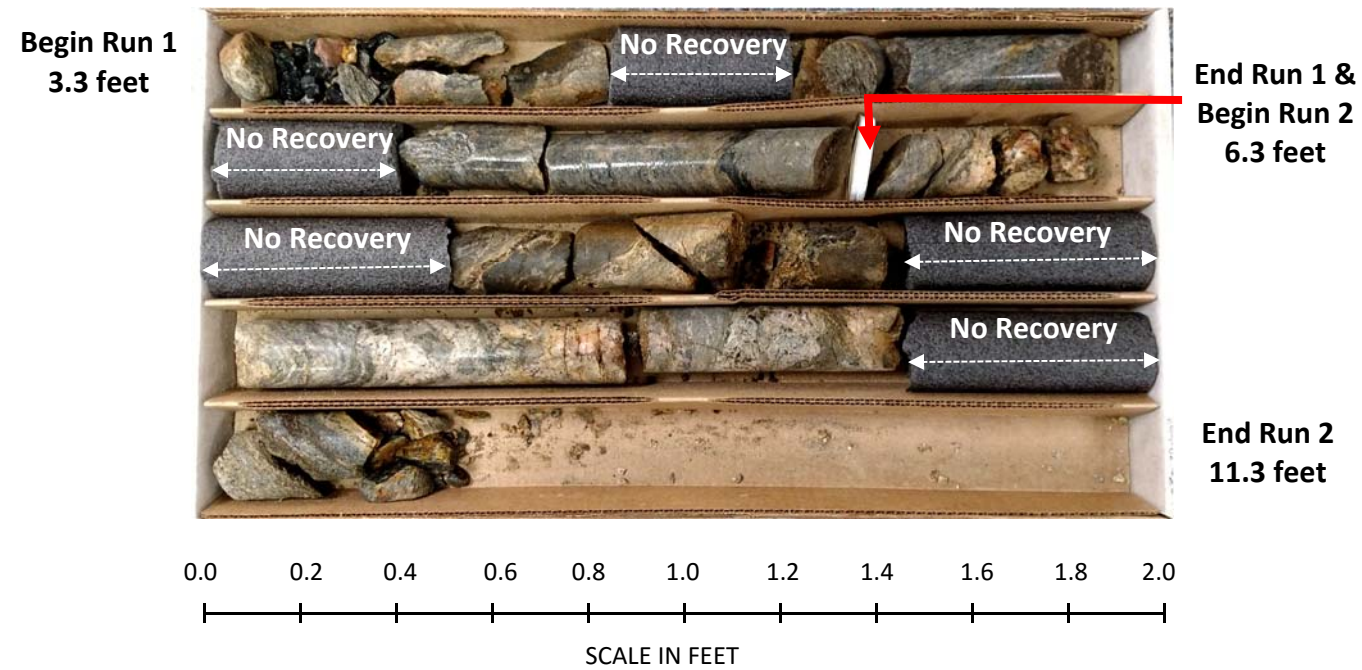
CORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 13+34		OFFSET 24 ft RT		ALIGNMENT -Y1-										
COLLAR ELEV. 635.1 ft		TOTAL DEPTH 31.3 ft		NORTHING 594,414		EASTING 1,487,708										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/24/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
640																
635	634.5	0.6	21	20	22											
630	631.9	3.2	60/0.1													
625																
620																
615																
610																
605																
<p style="text-align: center;">GROUND SURFACE 0.0</p> <p style="text-align: center;">ASPHALT 0.6</p> <p style="text-align: center;">ABC STONE 1.5</p> <p style="text-align: center;">ROADWAY EMBANKMENT 2.9</p> <p style="text-align: center;">Dark Gray-Brown, Silty Fine SAND (A-2-4) with Trace Gravel and Mica 3.3</p> <p style="text-align: center;">CRYSTALLINE ROCK</p> <p style="text-align: center;">Tan-Gray-Brown (QUARTZ SYENITE)</p> <p style="text-align: center;">White-Gray (META QUARTZ DIORITE) 12.3</p> <p style="text-align: center;">603.8</p> <p style="text-align: center;">Boring Terminated at Elevation 603.8 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)</p> <p style="text-align: center;">31.3</p> <p>NOTES: 1) Auger Refusal at 3.2' 2) FIAD due to boring location in roadway</p>																

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold						
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)					
BORING NO. EB1-B		STATION 13+34		OFFSET 24 ft RT		ALIGNMENT -Y1-						
COLLAR ELEV. 635.1 ft		TOTAL DEPTH 31.3 ft		NORTHING 594,414		EASTING 1,487,708						
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/24/16		SURFACE WATER DEPTH N/A						
CORE SIZE NQ3			TOTAL RUN 28.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
631.8	631.8	3.3	3.0	1:23/1.0 1:31/1.0 3:26/1.0	(2.2) 73%	(1.0) 33%		(5.6) 62%	(2.3) 26%		Begin Coring @ 3.3 ft	3.3
630	628.8	6.3									Tan-Gray-Brown, Slight to Moderately Severe Weathering, Hard to Medium Hard (QUARTZ SYENITE) with Moderately Close to Close Fracture Spacing GSI=35-50	
625			5.0	1:52/1.0 1:25/1.0 1:37/1.0 1:27/1.0 1:33/1.0	(3.0) 60%	(1.3) 26%						
620	623.8	11.3										
615			5.0	1:47/1.0 1:31/1.0 1:37/1.0 1:23/1.0 1:37/1.0	(2.3) 46%	(0.7) 14%		(15.7) 83%	(8.4) 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	12.3
610	618.8	16.3										
605			5.0	1:47/1.0 1:22/1.0 1:29/1.0 1:33/1.0 1:39/1.0	(3.8) 76%	(1.0) 20%						
600	613.8	21.3										
605			5.0	1:40/1.0 1:32/1.0 1:30/1.0 1:26/1.0 1:33/1.0	(5.0) 100%	(2.7) 54%				RS-2		
600	608.8	26.3										
605			5.0	1:43/1.0 1:34/1.0 1:34/1.0 1:42/1.0 1:42/1.0	(5.0) 100%	(4.0) 80%						
600	603.8	31.3										
<p style="text-align: center;">603.8</p> <p style="text-align: center;">Boring Terminated at Elevation 603.8 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)</p> <p style="text-align: center;">31.3</p> <p>NOTES: 1) Auger Refusal at 3.2' 2) FIAD due to boring location in roadway</p>												



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.D1
TIP NO.: U-5806
COUNTY: Cabarrus
DESCRIPTION: 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



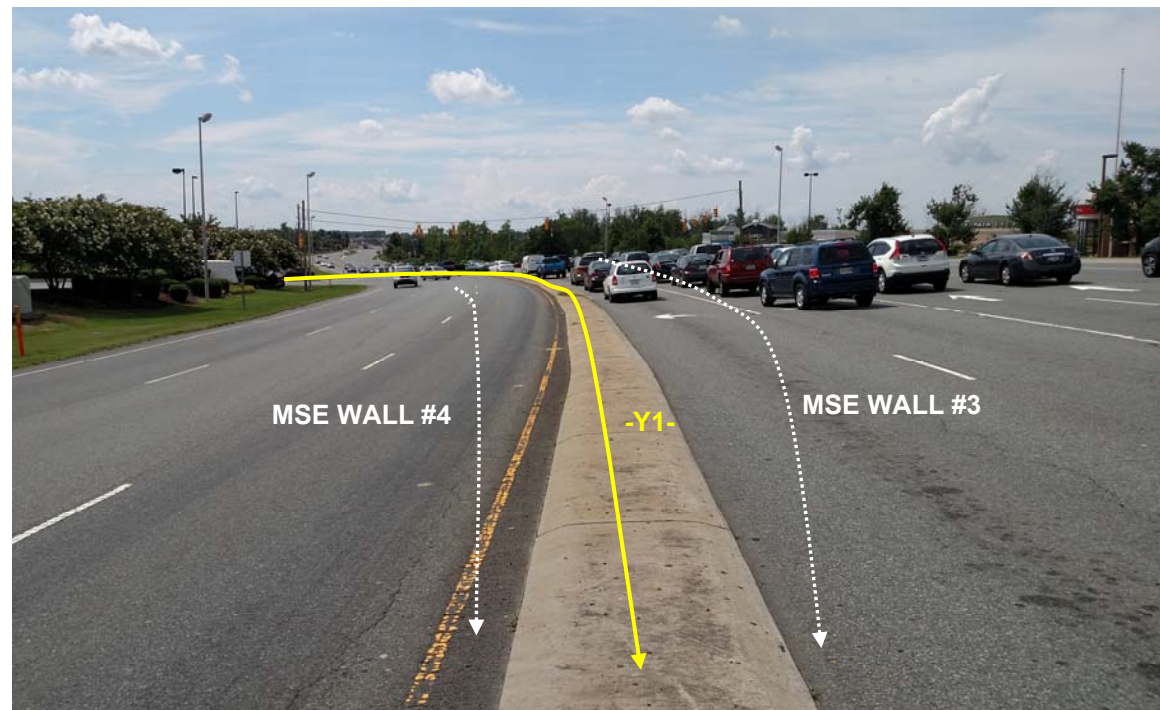
SITE PHOTOGRAPHS



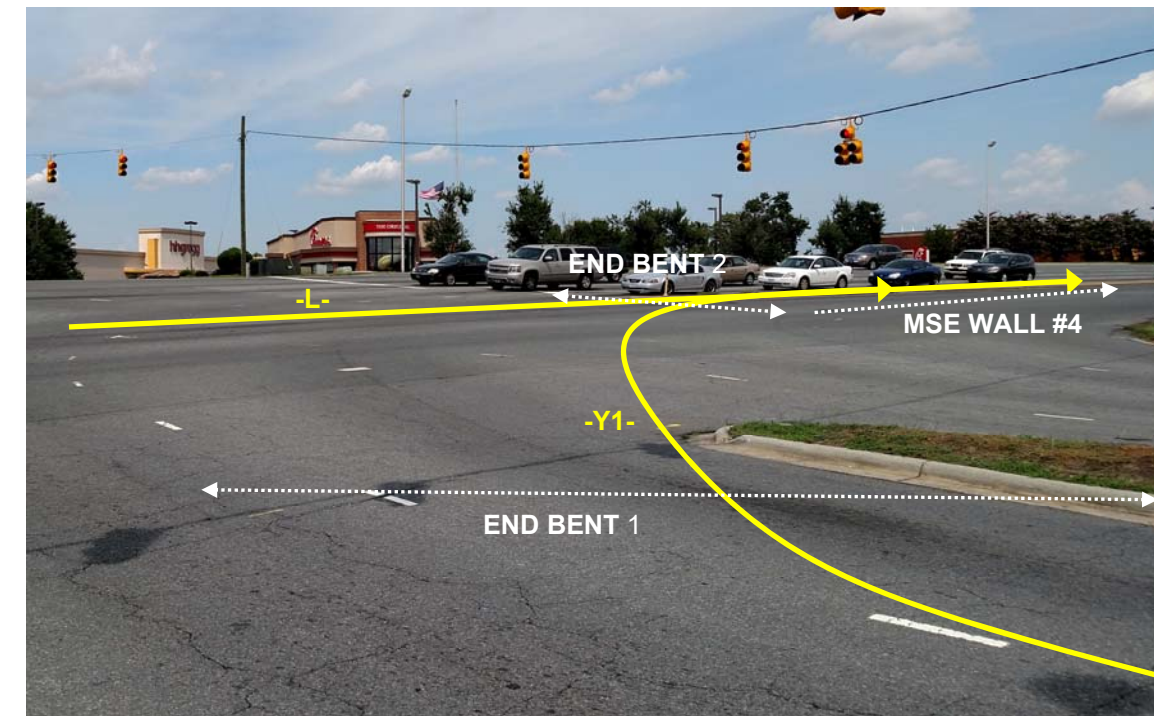
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



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



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



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806

PROJECT: 44378

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CABARRUS
PROJECT DESCRIPTION INTERSECTION OF SR 2894
(CONCORD MILLS BLVD.) AND ENTRANCE NO.1
KINGS GRANT PAVILION
SITE DESCRIPTION MSE RETAINING WALL NO.3 AT
END BENT 2

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-13	BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS
14	ROCK TEST RESULTS SUMMARY
15	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE 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, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 T07-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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 - 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 T.T. WALKER

CHECKED BY P. ALTON

SUBMITTED BY P. ALTON

DATE AUGUST 2017

SINCE



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DocuSigned by:
W. Patrick Alton

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SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

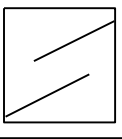
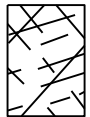
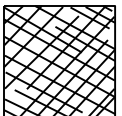




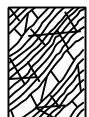
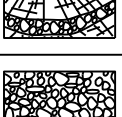
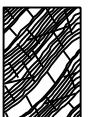
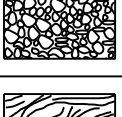



Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. It contains detailed technical specifications, classification charts, and symbols for soil and rock analysis.

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

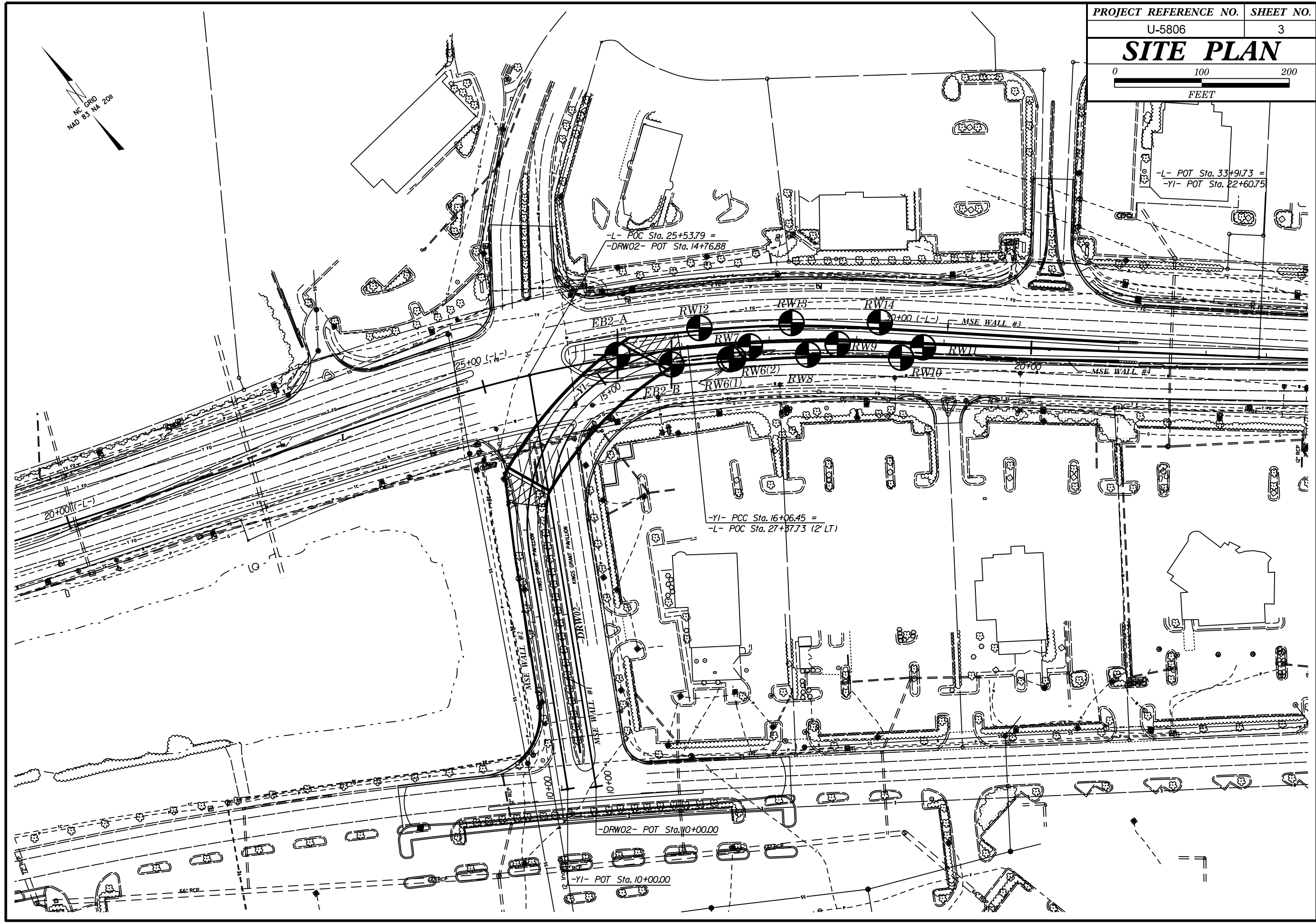
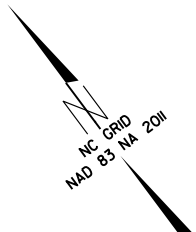
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)							
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.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - 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, slickensided or highly weathered surfaces with soft clay coatings or fillings					
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE									
 INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90				N/A	N/A	 A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70								
 BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80		70				 B. Sandstone with thin inter-layers of siltstone	60								
 VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets			60				 C. Sandstone and siltstone in similar amounts	50								
 BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity				50			 D. Siltstone or silty shale with sandstone layers	40								
 DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces					40		 E. Weak siltstone or clayey shale with sandstone layers	30								
 LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes						30	 F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure	20								
							 G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers	10								
							 H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.									

→ Means deformation after tectonic disturbance



-L- POC Sta. 25+53.79 =
-DRW02- POT Sta. 14+76.88

-L- POT Sta. 33+91.73 =
-YI- POT Sta. 22+60.75

-YI- PCC Sta. 16+06.45 =
-L- POC Sta. 27+37.73 (2' LT)

-DRW02- POT Sta. 10+00.00

-YI- POT Sta. 10+00.00

66" RCP

GEOTECHNICAL BORING REPORT

BORE LOG

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. EB2-A		STATION 15+29		OFFSET 15 ft LT		ALIGNMENT -Y1-									
COLLAR ELEV. 640.4 ft		TOTAL DEPTH 26.7 ft		NORTHING 594,501		EASTING 1,487,873									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	639.5	0.9	19	17	6							M	640.4 GROUND SURFACE 0.0 639.5 ASPHALT 0.9 638.4 ABC STONE 2.0 637.4 ROADWAY EMBANKMENT 3.9 636.7 Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel and Mica 3.7		
635	636.9	3.5	60/0.0										CRISTALLINE ROCK Dark Gray-Brown (META QUARTZ DIORITE)		
630	636.7	3.7	60/0.0												
625															
620															
615												RS-3			
														613.7 Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 26.7	

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold						
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)					
BORING NO. EB2-A		STATION 15+29		OFFSET 15 ft LT		ALIGNMENT -Y1-						
COLLAR ELEV. 640.4 ft		TOTAL DEPTH 26.7 ft		NORTHING 594,501		EASTING 1,487,873						
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A						
CORE SIZE NQ3			TOTAL RUN 23.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
636.7	636.7	3.7	3.0	1:44/1.0	(1.2)	(0.0)		(16.8)	(8.0)		Begin Coring @ 3.7 ft	3.7
635	633.7	6.7	5.0	1:05/1.0 1:11/1.0	40%	0%		73%	35%		CRYSTALLINE ROCK 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	
630			5.0	2:21/1.0 1:39/1.0 1:27/1.0	(2.2)	(0.0)						
625	628.7	11.7	5.0	1:49/1.0 1:26/1.0	44%	0%						
620			5.0	1:49/1.0 1:13/1.0 1:27/1.0	(4.5)	(2.1)						
615	623.7	16.7	5.0	1:41/1.0 1:44/1.0 1:40/1.0	90%	42%						
	618.7	21.7	5.0	1:36/1.0 1:54/1.0	(4.3)	(3.3)						
	615	26.7	5.0	2:35/1.0 1:44/1.0 1:41/1.0 1:37/1.0 1:29/1.0	(4.6)	(2.6)	RS-3					
	613.7	26.7									Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 26.7	

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

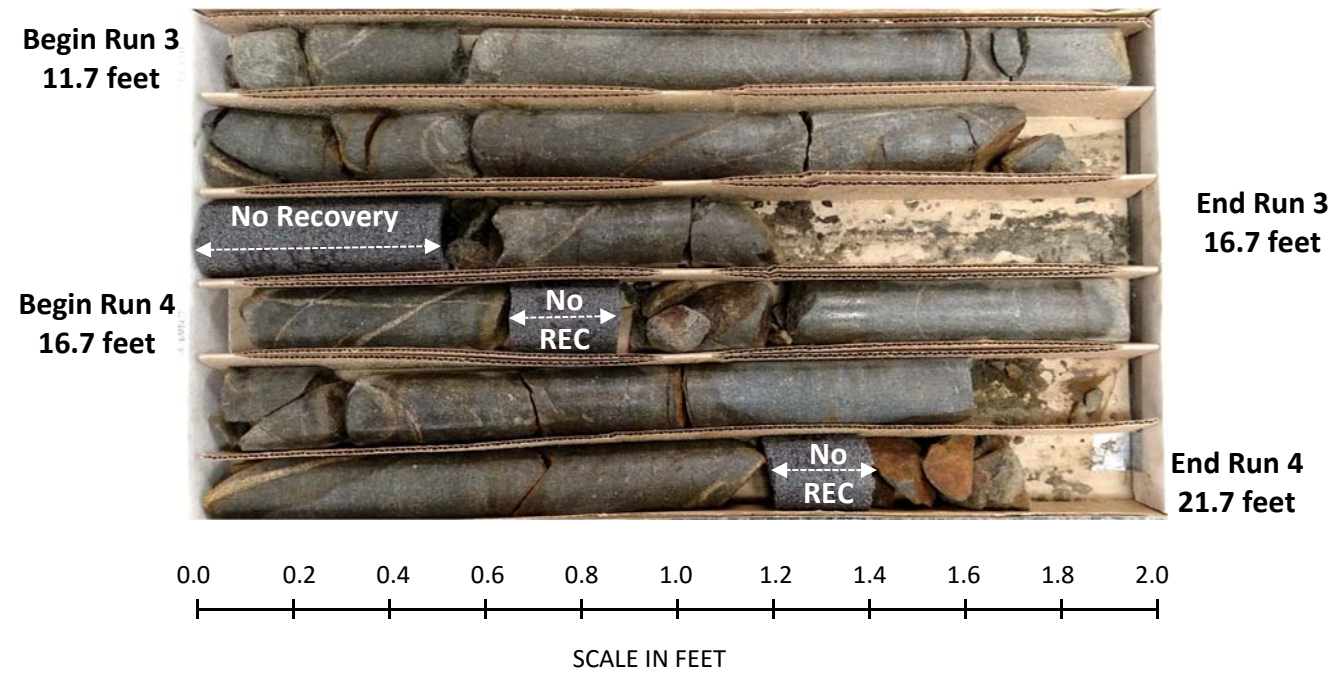
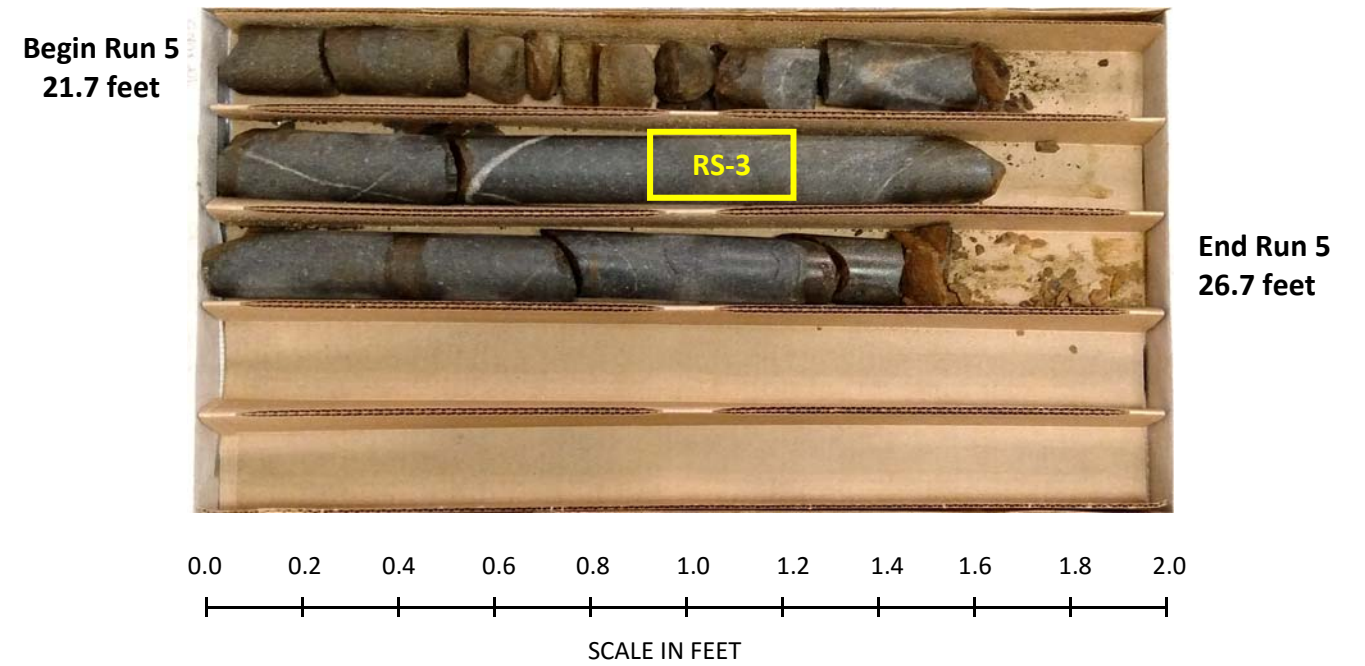
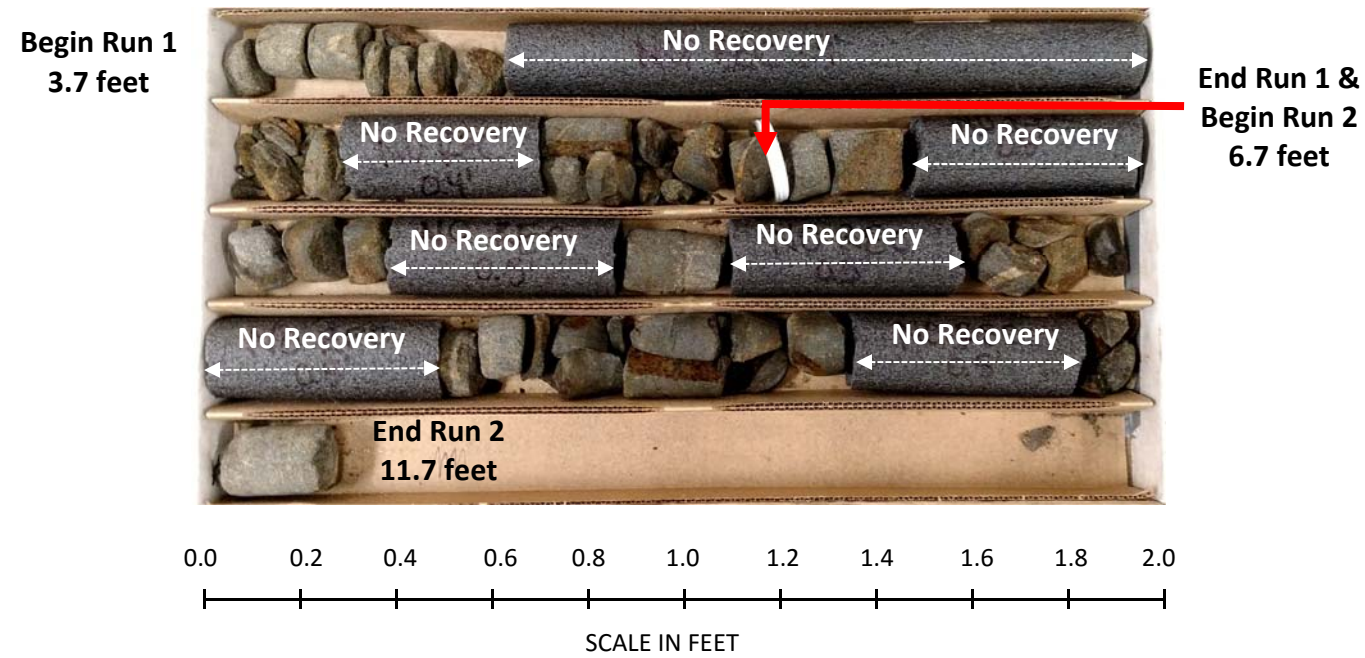
NCDOT CORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

NOTES:
1) Auger Refusal at 3.7'
2) FIAD due to boring location in roadway

NOTES:
1) Auger Refusal at 3.7'
2) FIAD due to boring location in roadway



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



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. RW12		STATION 16+22		OFFSET 20 ft LT		ALIGNMENT -Y1-										
COLLAR ELEV. 642.8 ft		TOTAL DEPTH 12.7 ft		NORTHING 594,470		EASTING 1,487,966										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/24/16		COMP. DATE 08/24/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
645																
	642.0	0.8	32	23	12											
640	639.3	3.5	64	36/0.2												
	634.3	8.5	78	22/0.1												
635	630.2	12.6	60/0.1													

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. RW13		STATION 17+26		OFFSET 20 ft LT		ALIGNMENT -Y1-										
COLLAR ELEV. 643.6 ft		TOTAL DEPTH 8.6 ft		NORTHING 594,411		EASTING 1,488,054										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
645																
	642.7	0.9	26	28	23											
640	640.1	3.5	100/0.3													
	635.1	8.5	60/0.1													
635	630.1	12.7														

NOTES:
 1) Auger refusal at 12.6'
 2) FIAD due to boring location in roadway

NOTE:
 1) FIAD due to boring location in roadway

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW14	STATION 18+26	OFFSET 22 ft LT	ALIGNMENT -Y1-
COLLAR ELEV. 643.9 ft	TOTAL DEPTH 13.8 ft	NORTHING 594,351	EASTING 1,488,135
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/23/16	COMP. DATE 08/23/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
645															
	643.0	0.9	22	16	14									643.9	0.0
														643.0	0.9
														641.9	2.0
640	640.4	3.5												640.4	3.5
			100/0.5												
635	635.4	8.5													
			100/0.2												
	630.4	13.5												630.1	13.8
			100/0.3												

643.9 GROUND SURFACE 0.0

643.0 ASPHALT 0.9

641.9 ABC STONE 2.0

640.4 ROADWAY EMBANKMENT 3.5

Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica

WEATHERED ROCK

Black-Gray-Brown (META QUARTZ DIORITE)

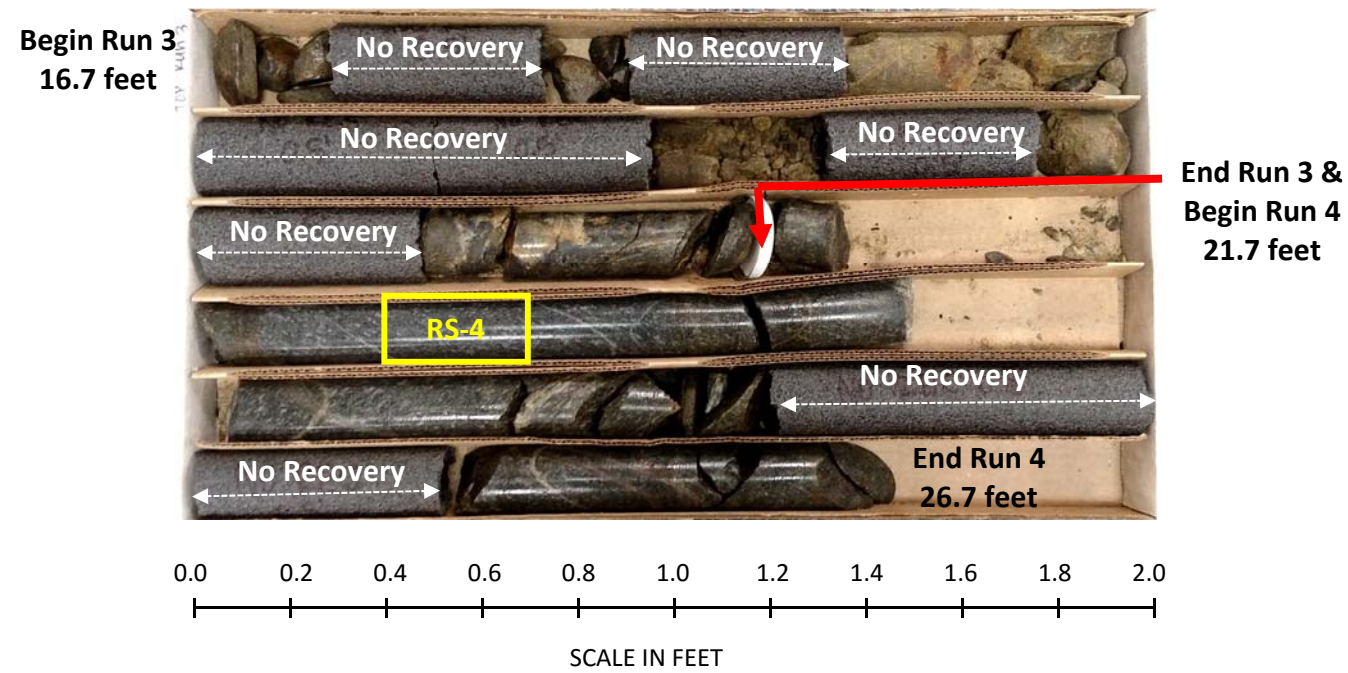
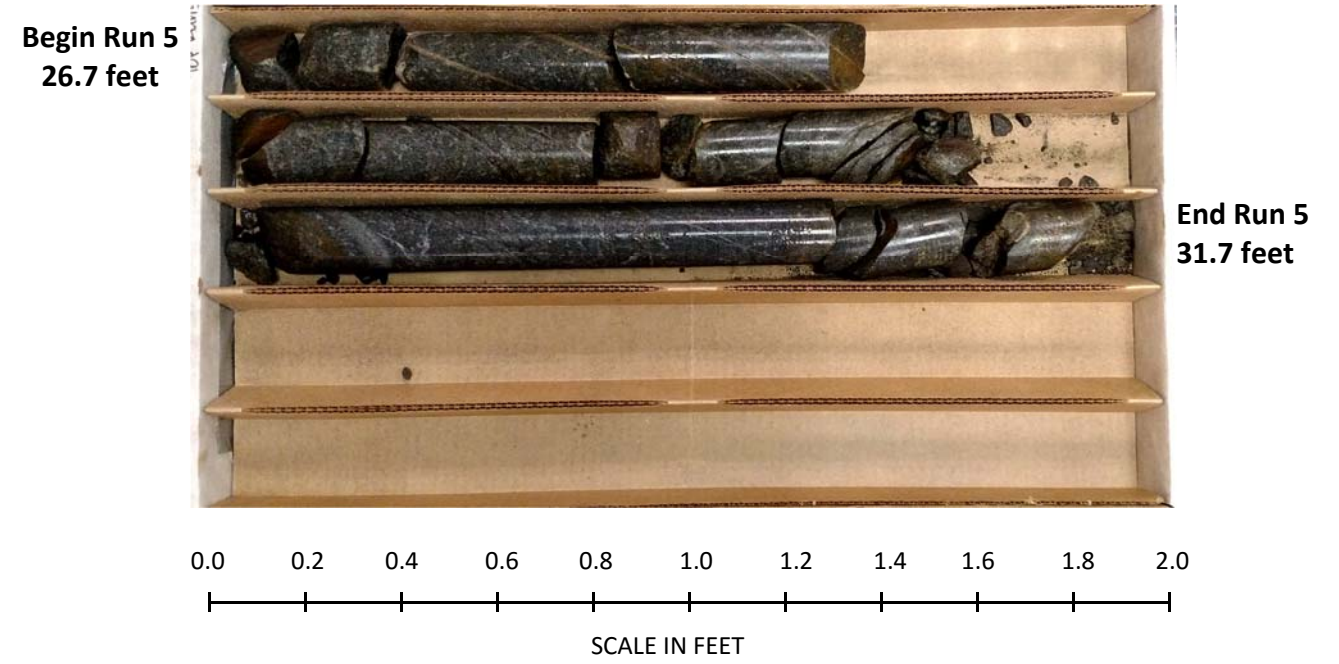
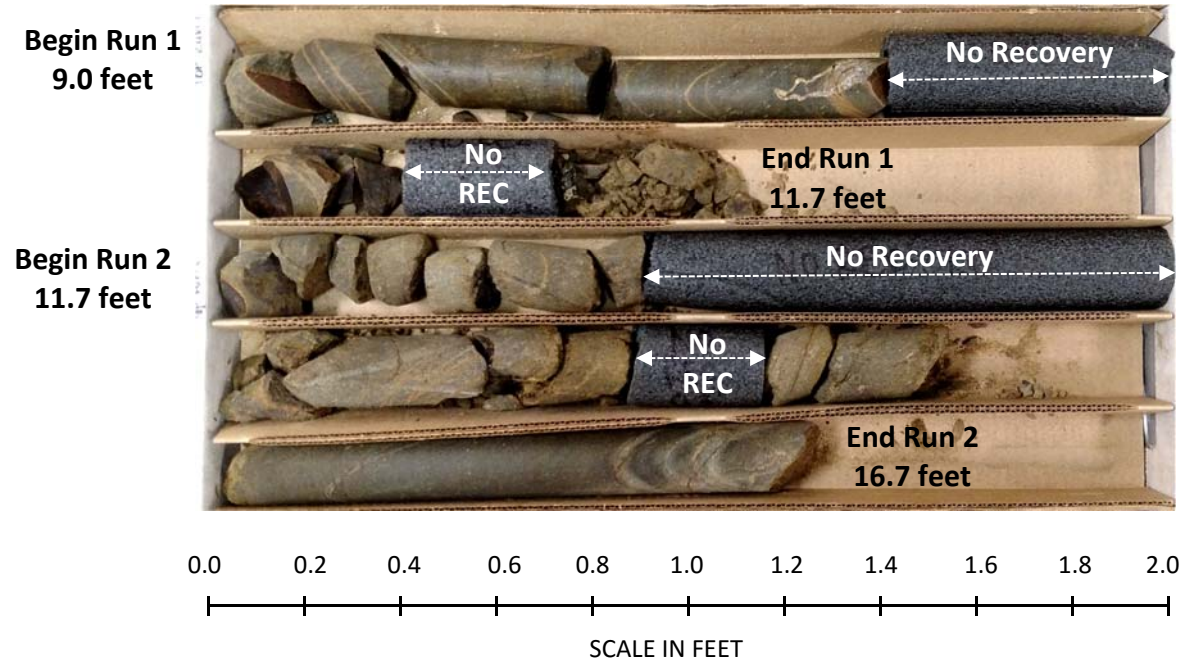
Boring Terminated at Elevation 630.1 ft in WEATHERED ROCK (META QUARTZ DIORITE)

NOTE:
1) FIAD due to boring location in roadway

NCDOT BORE DOUBLE U5806 GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17



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

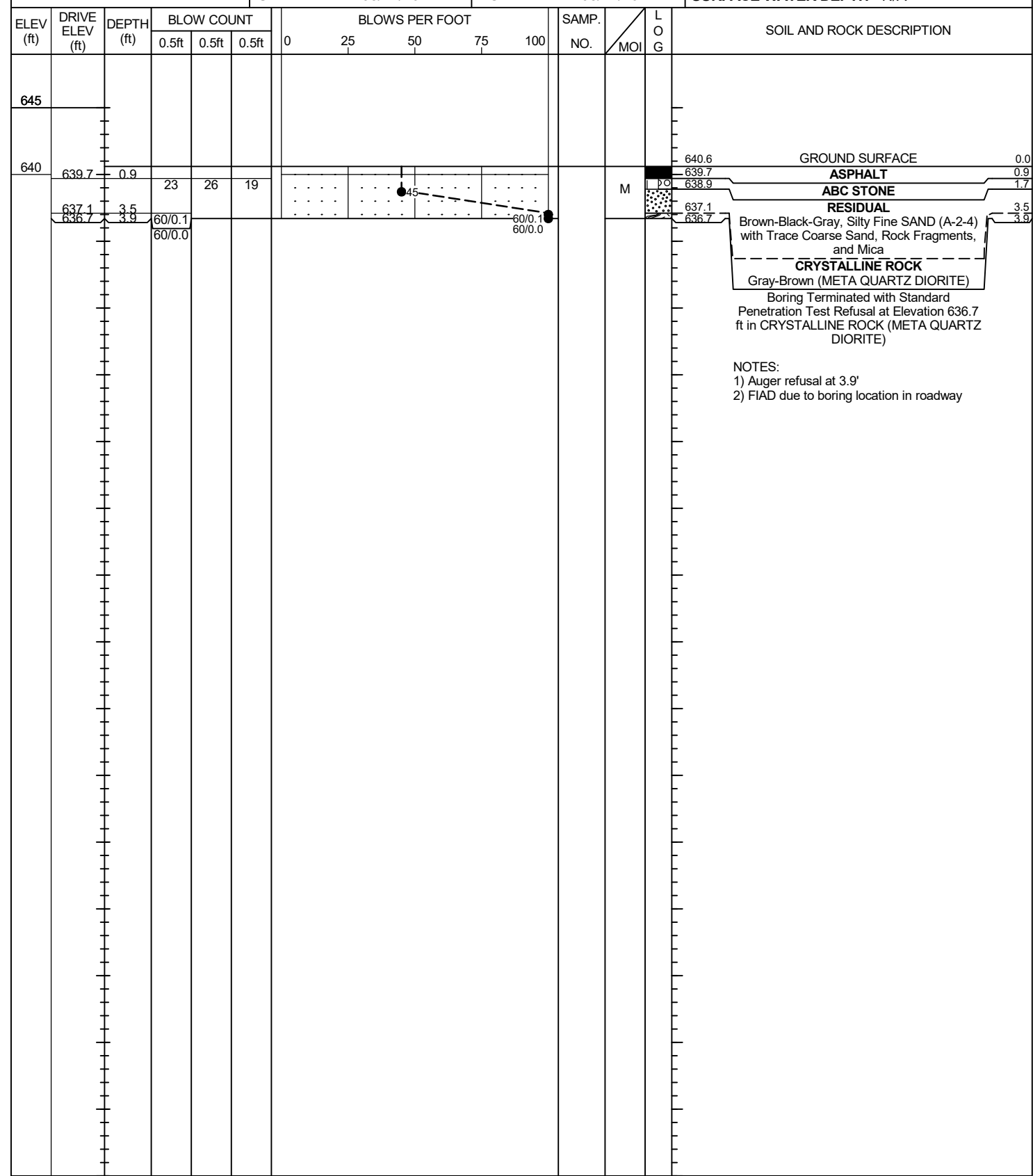
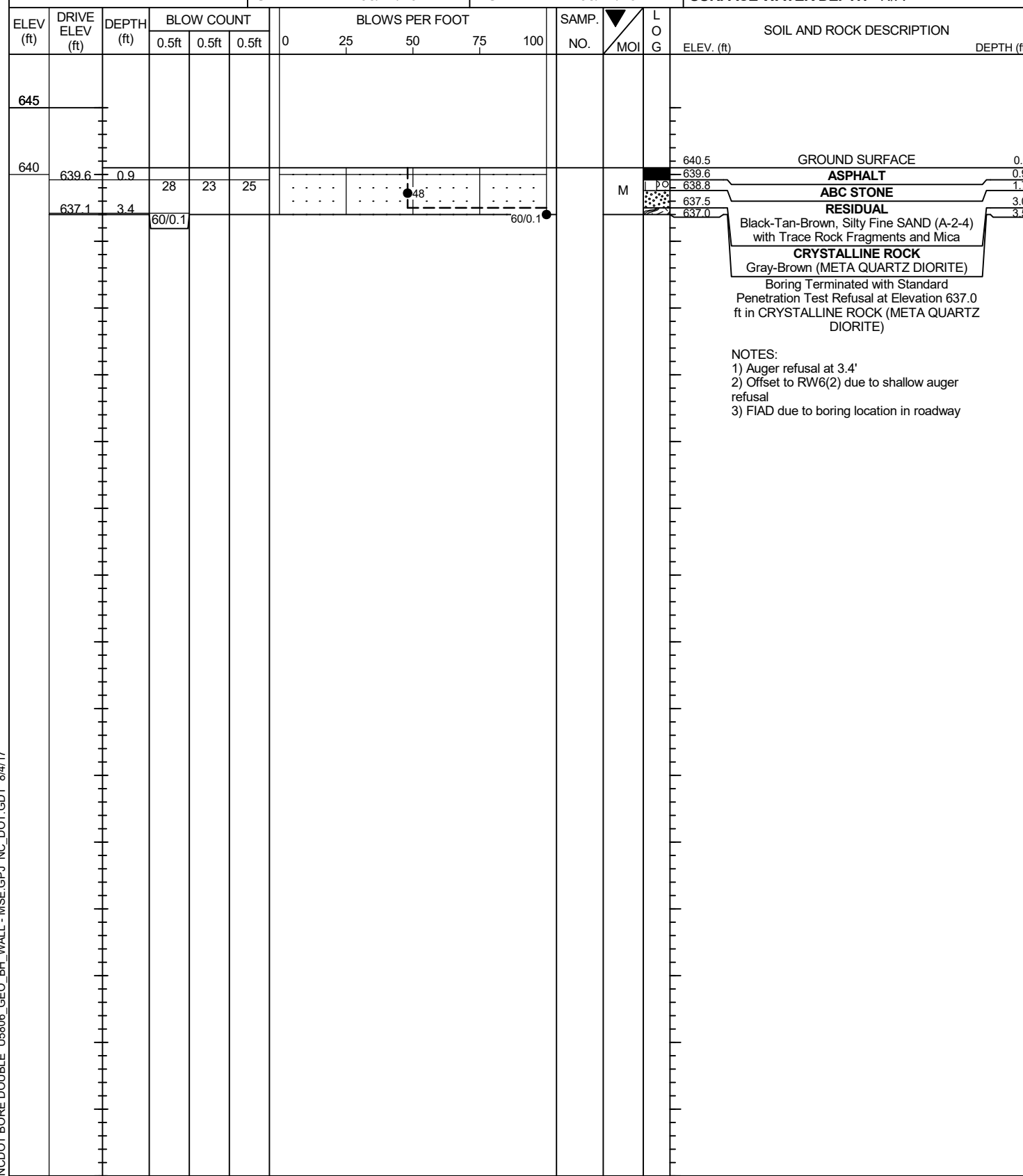


GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW6(1)	STATION 16+53	OFFSET 19 ft RT	ALIGNMENT -Y1-
COLLAR ELEV. 640.5 ft	TOTAL DEPTH 3.5 ft	NORTHING 594,420	EASTING 1,487,972
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/17/16	COMP. DATE 08/17/16	SURFACE WATER DEPTH N/A

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW6(2)	STATION 16+57	OFFSET 18 ft RT	ALIGNMENT -Y1-
COLLAR ELEV. 640.6 ft	TOTAL DEPTH 3.9 ft	NORTHING 594,419	EASTING 1,487,976
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/17/16	COMP. DATE 08/17/16	SURFACE WATER DEPTH N/A



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW7		STATION 16+77		OFFSET 5 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 641.6 ft		TOTAL DEPTH 13.6 ft		NORTHING 594,418		EASTING 1,488,000									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/16/16		COMP. DATE 08/16/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	640.8	0.8	25	25	23								M	641.6 GROUND SURFACE 0.0 640.8 ASPHALT 0.8 639.8 ABC STONE 1.8 637.6 RESIDUAL 4.0 Black-Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Rock Fragments and Mica WEATHERED ROCK Red-Brown-Gray (META QUARTZ DIORITE) 628.6 CRYSTALLINE ROCK 13.0 Dark Gray-Black (META QUARTZ DIORITE) 628.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 628.0 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTE: 1) FIAD due to boring location in roadway	
635	638.1	3.5	19	67	33/0.1										
630	633.1	8.5	100/0.2												
	628.1	13.5	60/0.1												

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW8		STATION 17+44		OFFSET 17 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 641.1 ft		TOTAL DEPTH 13.8 ft		NORTHING 594,371		EASTING 1,488,047									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/17/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	640.2	0.9	22	20	20								M	641.1 GROUND SURFACE 0.0 640.2 ASPHALT 0.9 639.5 ABC STONE 1.6 637.6 RESIDUAL 3.5 Gray-Brown, Silty Fine SAND (A-2-4) with Trace Rock Fragments and Mica WEATHERED ROCK Black-Tan-Brown (META QUARTZ DIORITE) 627.3 Boring Terminated at Elevation 627.3 ft in WEATHERED ROCK (META QUARTZ DIORITE) NOTE: 1) FIAD due to boring location in roadway	
635	637.6	3.5	66	34/0.1											
630	632.6	8.5	70	30/0.1											
	627.6	13.5	100/0.3												

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. RW9		STATION 17+78		OFFSET 5 ft RT		ALIGNMENT -Y1-										
COLLAR ELEV. 642.1 ft		TOTAL DEPTH 19.0 ft		NORTHING 594,360		EASTING 1,488,082										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/16/16		COMP. DATE 08/16/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
645																
	641.2	0.9	23	22	24									GROUND SURFACE	0.0	
640	638.6	3.5	25	38	57									ASPHALT	0.9	
														ABC STONE	1.9	
635	633.6	8.5	22	37	63/0.4									RESIDUAL		
														Brown-Black-Gray, Silty Fine SAND (A-2-4) with Trace Coarse Sand, Rock Fragments, and Mica		
630	628.6	13.5	100/0.4											WEATHERED ROCK	9.0	
														Brown-Gray-Black (META QUARTZ DIORITE)		
625	623.6	18.5	100/0.5												19.0	
														Boring Terminated at Elevation 623.1 ft in WEATHERED ROCK (META QUARTZ DIORITE)		
														NOTE: 1) FIAD due to boring location in roadway		

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold										
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)									
BORING NO. RW10		STATION 18+52		OFFSET 18 ft RT		ALIGNMENT -Y1-										
COLLAR ELEV. 641.7 ft		TOTAL DEPTH 13.8 ft		NORTHING 594,304		EASTING 1,488,131										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/17/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
645																
	641.7													GROUND SURFACE	0.0	
640	640.9	0.8	21	20	16									ASPHALT	0.8	
														ABC STONE	1.7	
635	638.2	3.5	4	3	4									RESIDUAL		
														Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica		
630	633.2	8.5	33	100/0.5										WEATHERED ROCK	9.0	
														Gray-Tan-Brown (META QUARTZ DIORITE)		
625	628.2	13.5	100/0.3												13.8	
														Boring Terminated at Elevation 627.9 ft in WEATHERED ROCK (META QUARTZ DIORITE)		
														NOTE: 1) FIAD due to boring location in roadway		

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW11	STATION 18+76	OFFSET 5 ft RT	ALIGNMENT -Y1-
COLLAR ELEV. 642.5 ft	TOTAL DEPTH 13.5 ft	NORTHING 594,299	EASTING 1,488,158
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/15/16	COMP. DATE 08/15/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
645																
	641.7	0.8	18	19	20	.....	.....	.....	.....	.....				642.5	GROUND SURFACE	0.0
640	639.0	3.5	20	31	36	.....	.....	.....	.....	.....				641.7	ASPHALT	0.8
						.....	.....	.....	.....	.....				640.7	ABC STONE	1.8
635	634.0	8.5	100/0.5			.....	.....	.....	.....	.....					RESIDUAL	
						.....	.....	.....	.....	.....					Brown-Black-Gray, Silty Fine SAND (A-2-4) with Trace Mica	
630	629.0	13.5	60/0.0			.....	.....	.....	.....	.....				634.0	WEATHERED ROCK	8.5
						.....	.....	.....	.....	.....					Brown-Black-Gray (META QUARTZ DIORITE)	
						.....	.....	.....	.....	.....				629.0	Boring Terminated with Standard Penetration Test Refusal at Elevation 629.0 ft on CRYSTALLINE ROCK (META QUARTZ DIORITE)	13.5

NOTE:
1) FIAD due to boring location in roadway

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.D1
TIP NO.: U-5806
COUNTY: Cabarrus
DESCRIPTION: 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



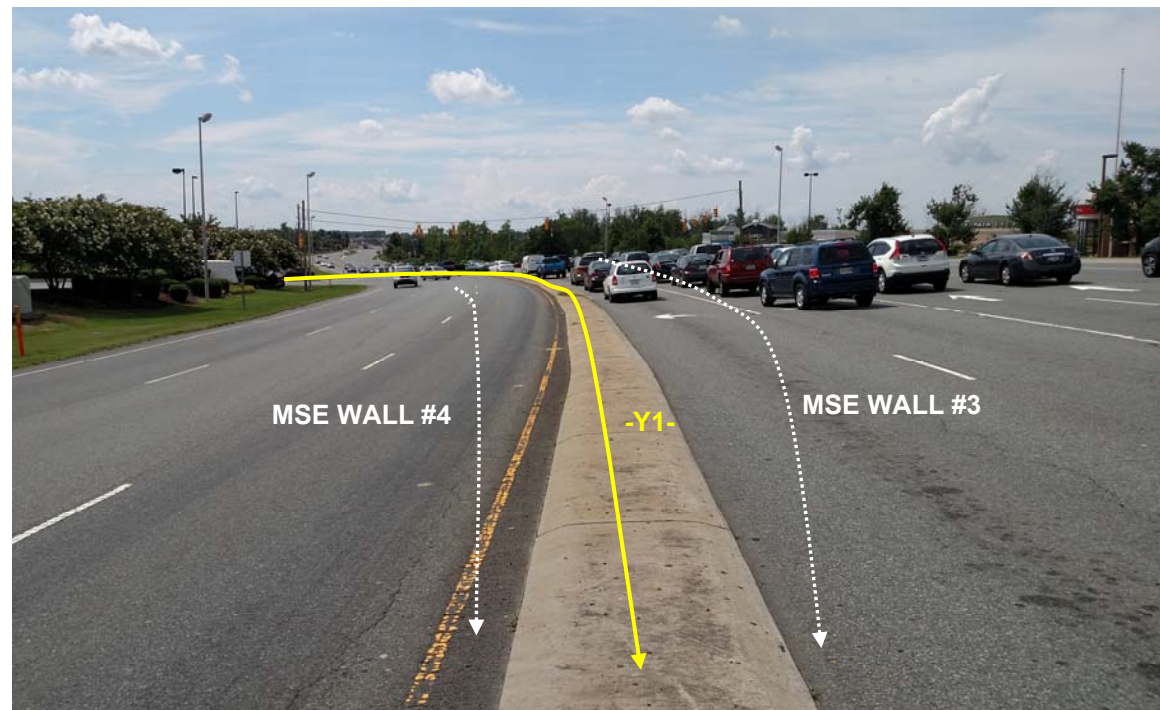
SITE PHOTOGRAPHS



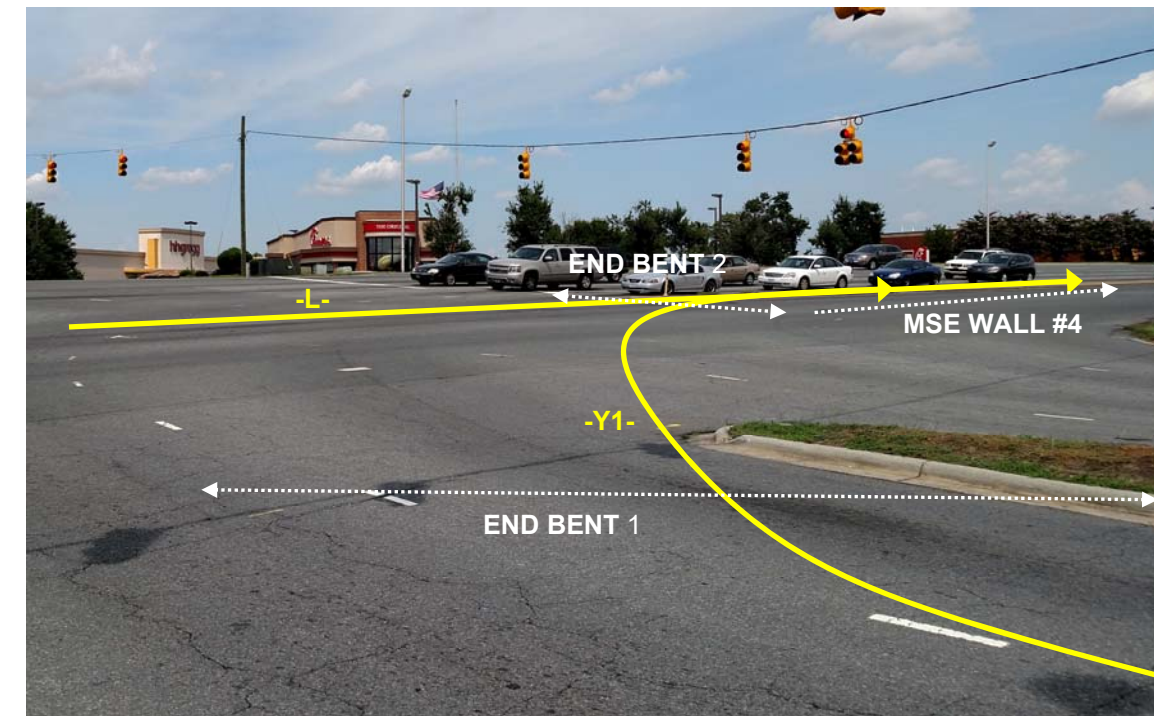
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



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



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



Photograph No. 4: Looking northeast towards End Bent 2

REFERENCE: U-5806

PROJECT: 44378

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CABARRUS
PROJECT DESCRIPTION INTERSECTION OF SR 2894
(CONCORD MILLS BLVD.) AND ENTRANCE NO.1
KINGS GRANT PAVILION
SITE DESCRIPTION MSE RETAINING WALL NO.4 AT
END BENT 2

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-13	BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS
14	ROCK TEST RESULTS SUMMARY
15	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE 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, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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- NOTES:
1. 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 T.T. WALKER

CHECKED BY P. ALTON

SUBMITTED BY P. ALTON

DATE AUGUST 2017

SINCE



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SIGNATURE DATE 8/8/2017

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. It contains detailed technical specifications, classification charts, and symbols for soil and rock analysis.

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

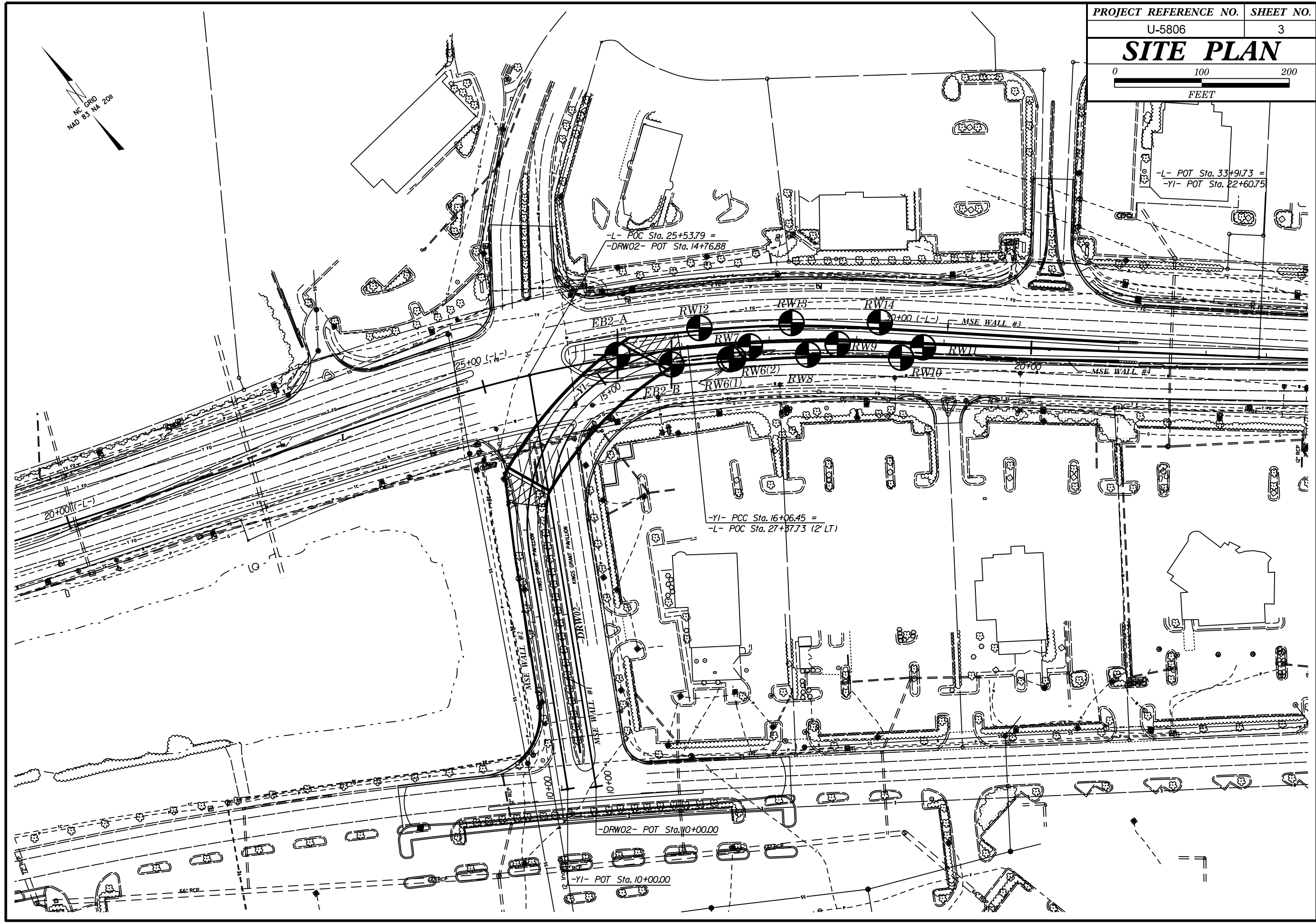
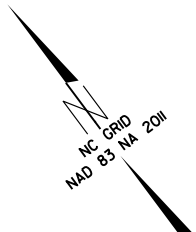
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

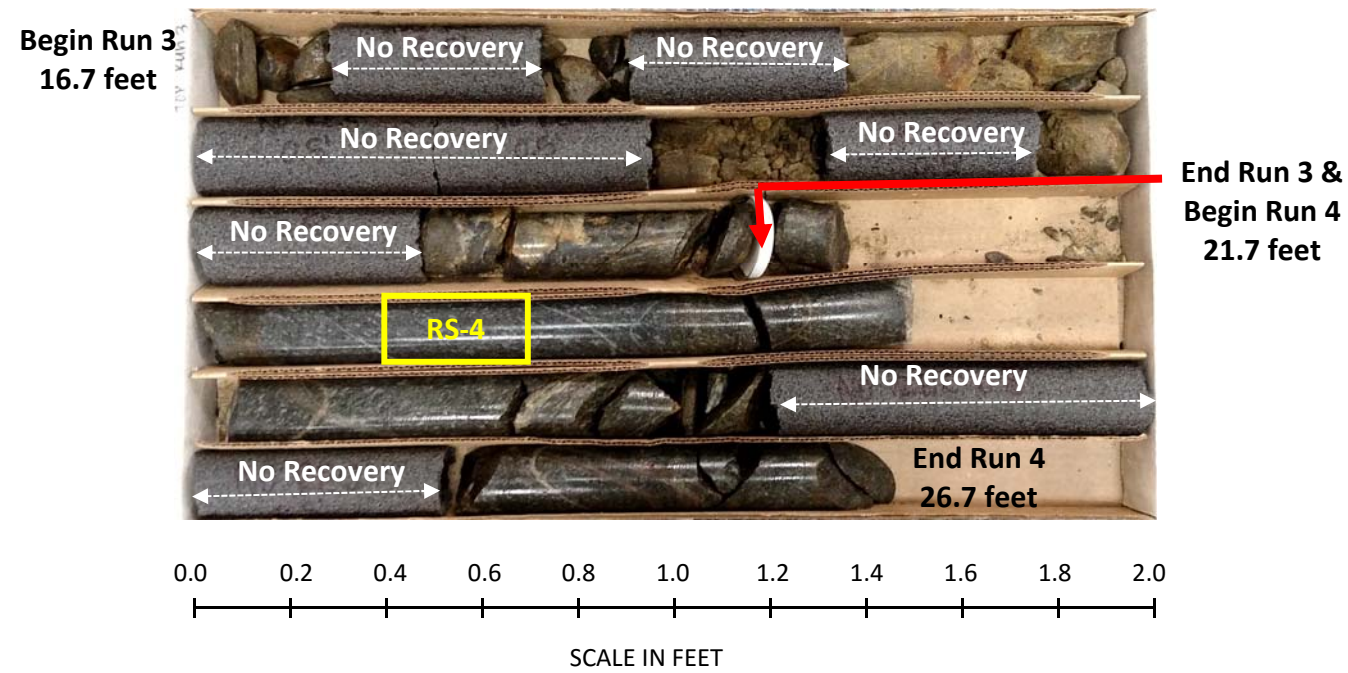
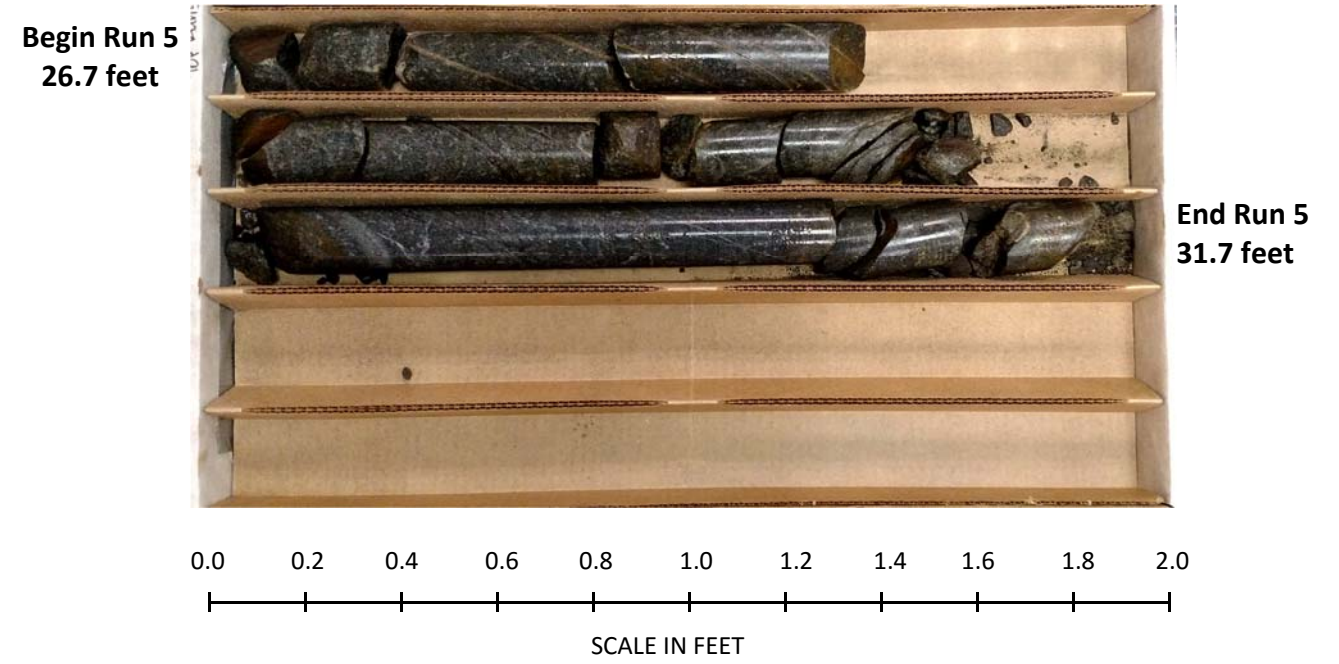
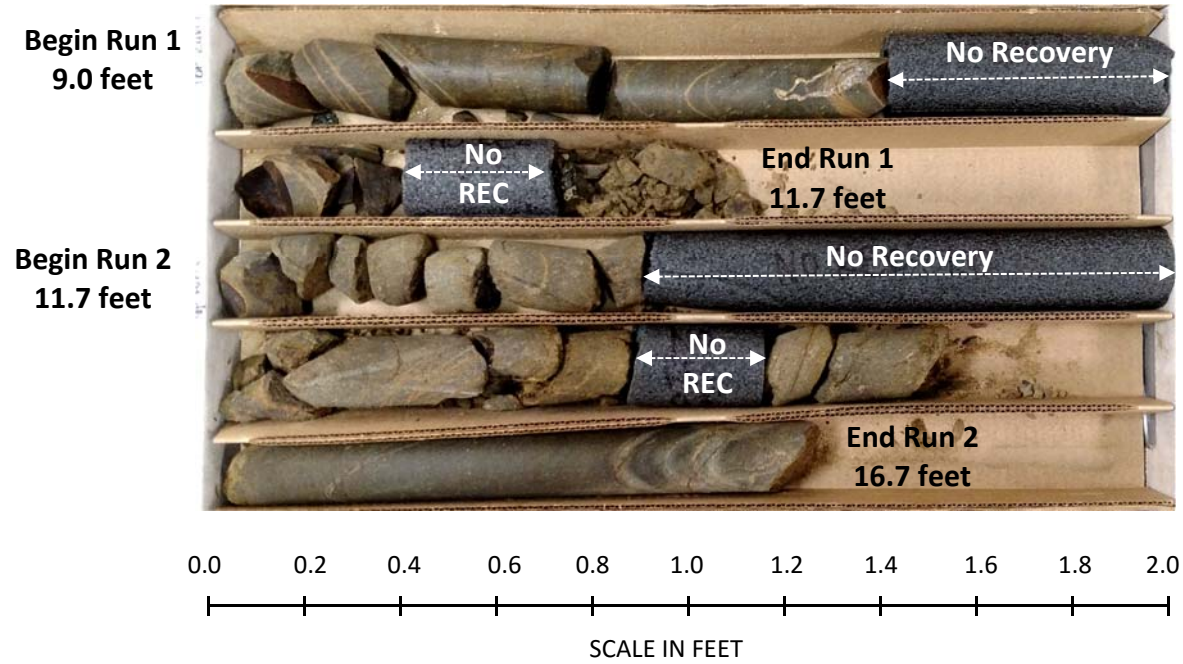
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
From the lithology, structure and surface conditions 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.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - 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, slickensided or highly weathered surfaces 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 condition of the discontinuities and estimate the average value 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 fair, 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	DECREASING INTERLOCKING OF ROCK PIECES	DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90				N/A	N/A	A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70						
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80		70				B. Sandstone with thin inter-layers of siltstone	60						
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	70		60				C. Sandstone and siltstone in similar amounts	50						
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	60		50				D. Siltstone or silty shale with sandstone layers	40						
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces	50		40				E. Weak siltstone or clayey shale with sandstone layers	30						
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	40		30				F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure	20						
	30		20				G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers	10						
	20		10				H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.							
	10													
	N/A		N/A											

→ Means deformation after tectonic disturbance





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



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW6(1)	STATION 16+53	OFFSET 19 ft RT	ALIGNMENT -Y1-
COLLAR ELEV. 640.5 ft	TOTAL DEPTH 3.5 ft	NORTHING 594,420	EASTING 1,487,972
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/17/16	COMP. DATE 08/17/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
645														
640	639.6	0.9											640.5 GROUND SURFACE 0.0	
			28	23	25								639.6 ASPHALT 0.9	
													638.8 ABC STONE 1.7	
	637.1	3.4											637.5 RESIDUAL 3.0	
			60/0.1										637.0 Black-Tan-Brown, Silty Fine SAND (A-2-4) with Trace Rock Fragments and Mica 3.5	
													CRYSTALLINE ROCK Gray-Brown (META QUARTZ DIORITE)	

Boring Terminated with Standard Penetration Test Refusal at Elevation 637.0 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)

NOTES:
 1) Auger refusal at 3.4'
 2) Offset to RW6(2) due to shallow auger refusal
 3) FIAD due to boring location in roadway

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW6(2)	STATION 16+57	OFFSET 18 ft RT	ALIGNMENT -Y1-
COLLAR ELEV. 640.6 ft	TOTAL DEPTH 3.9 ft	NORTHING 594,419	EASTING 1,487,976
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/17/16	COMP. DATE 08/17/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
645														
640	639.7	0.9											640.6 GROUND SURFACE 0.0	
			23	26	19								639.7 ASPHALT 0.9	
													638.9 ABC STONE 1.7	
	637.1	3.5											637.1 RESIDUAL 3.5	
			60/0.1										636.7 Brown-Black-Gray, Silty Fine SAND (A-2-4) with Trace Coarse Sand, Rock Fragments, and Mica 3.9	
													CRYSTALLINE ROCK Gray-Brown (META QUARTZ DIORITE)	

Boring Terminated with Standard Penetration Test Refusal at Elevation 636.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)

NOTES:
 1) Auger refusal at 3.9'
 2) FIAD due to boring location in roadway

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW7		STATION 16+77		OFFSET 5 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 641.6 ft		TOTAL DEPTH 13.6 ft		NORTHING 594,418		EASTING 1,488,000									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/16/16		COMP. DATE 08/16/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	640.8	0.8	25	25	23								M	641.6 GROUND SURFACE 0.0 640.8 ASPHALT 0.8 639.8 ABC STONE 1.8 637.6 RESIDUAL 4.0 Black-Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Rock Fragments and Mica WEATHERED ROCK Red-Brown-Gray (META QUARTZ DIORITE) 628.6 CRYSTALLINE ROCK 13.0 Dark Gray-Black (META QUARTZ DIORITE) 628.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 628.0 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) NOTE: 1) FIAD due to boring location in roadway	
635	638.1	3.5	19	67	33/0.1										
630	633.1	8.5	100/0.2												
	628.1	13.5	60/0.1												

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW8		STATION 17+44		OFFSET 17 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 641.1 ft		TOTAL DEPTH 13.8 ft		NORTHING 594,371		EASTING 1,488,047									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/17/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	640.2	0.9	22	20	20								M	641.1 GROUND SURFACE 0.0 640.2 ASPHALT 0.9 639.5 ABC STONE 1.6 637.6 RESIDUAL 3.5 Gray-Brown, Silty Fine SAND (A-2-4) with Trace Rock Fragments and Mica WEATHERED ROCK Black-Tan-Brown (META QUARTZ DIORITE) 627.3 Boring Terminated at Elevation 627.3 ft in WEATHERED ROCK (META QUARTZ DIORITE) NOTE: 1) FIAD due to boring location in roadway	
635	637.6	3.5	66	34/0.1											
630	632.6	8.5	70	30/0.1											
	627.6	13.5	100/0.3												

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW9		STATION 17+78		OFFSET 5 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 642.1 ft		TOTAL DEPTH 19.0 ft		NORTHING 594,360		EASTING 1,488,082									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/16/16		COMP. DATE 08/16/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	641.2	0.9	23	22	24									GROUND SURFACE 0.0 ASPHALT 0.9 ABC STONE 1.9	
635	638.6	3.5	25	38	57									RESIDUAL Brown-Black-Gray, Silty Fine SAND (A-2-4) with Trace Coarse Sand, Rock Fragments, and Mica	
630	633.6	8.5	22	37	63/0.4									WEATHERED ROCK Brown-Gray-Black (META QUARTZ DIORITE)	9.0
625	628.6	13.5	100/0.4												
	623.6	18.5	100/0.5												623.1 19.0
Boring Terminated at Elevation 623.1 ft in WEATHERED ROCK (META QUARTZ DIORITE)															
NOTE: 1) FIAD due to boring location in roadway															

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW10		STATION 18+52		OFFSET 18 ft RT		ALIGNMENT -Y1-									
COLLAR ELEV. 641.7 ft		TOTAL DEPTH 13.8 ft		NORTHING 594,304		EASTING 1,488,131									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/17/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	640.9	0.8	21	20	16									GROUND SURFACE 0.0 ASPHALT 0.8 ABC STONE 1.7	
635	638.2	3.5	4	3	4									RESIDUAL Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica	
630	633.2	8.5	33	100/0.5										WEATHERED ROCK Gray-Tan-Brown (META QUARTZ DIORITE)	9.0
	628.2	13.5	100/0.3												627.9 13.8
Boring Terminated at Elevation 627.9 ft in WEATHERED ROCK (META QUARTZ DIORITE)															
NOTE: 1) FIAD due to boring location in roadway															

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold	
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)
BORING NO. RW11		STATION 18+76		OFFSET 5 ft RT		ALIGNMENT -Y1-	
COLLAR ELEV. 642.5 ft		TOTAL DEPTH 13.5 ft		NORTHING 594,299		EASTING 1,488,158	
DRILL RIG/HAMMER EFF/DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER S. Davis		START DATE 08/15/16		COMP. DATE 08/15/16		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
645															
640	641.7	0.8	18	19	20	...	...	...	...	...		M	GROUND SURFACE	0.0
640	639.0	3.5	20	31	36	...	...	...	...	...		M	ASPHALT	0.8
635	634.0	8.5				...	...	...	...	...			ABC STONE	1.8
630	629.0	13.5	60/0.0			...	...	...	...	...			RESIDUAL	
													Brown-Black-Gray, Silty Fine SAND (A-2-4) with Trace Mica		
													WEATHERED ROCK	8.5	
													Brown-Black-Gray (META QUARTZ DIORITE)		
													Boring Terminated with Standard Penetration Test Refusal at Elevation 629.0 ft on CRYSTALLINE ROCK (META QUARTZ DIORITE)	13.5	
													NOTE: 1) FIAD due to boring location in roadway		

NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. EB2-A		STATION 15+29		OFFSET 15 ft LT		ALIGNMENT -Y1-									
COLLAR ELEV. 640.4 ft		TOTAL DEPTH 26.7 ft		NORTHING 594,501		EASTING 1,487,873									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
640	639.5	0.9	19	17	6									640.4 GROUND SURFACE 0.0	
														639.5 ASPHALT 0.9	
														638.4 ABC STONE 2.0	
														637.4 ROADWAY EMBANKMENT 3.9	
														636.7 Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel and Mica 3.7	
635	636.9	3.5	60/0.0												
	636.7	3.7	60/0.0												
630															
625															
620															
615															
														613.7 Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE) 26.7	
NOTES: 1) Auger Refusal at 3.7' 2) FIAD due to boring location in roadway															

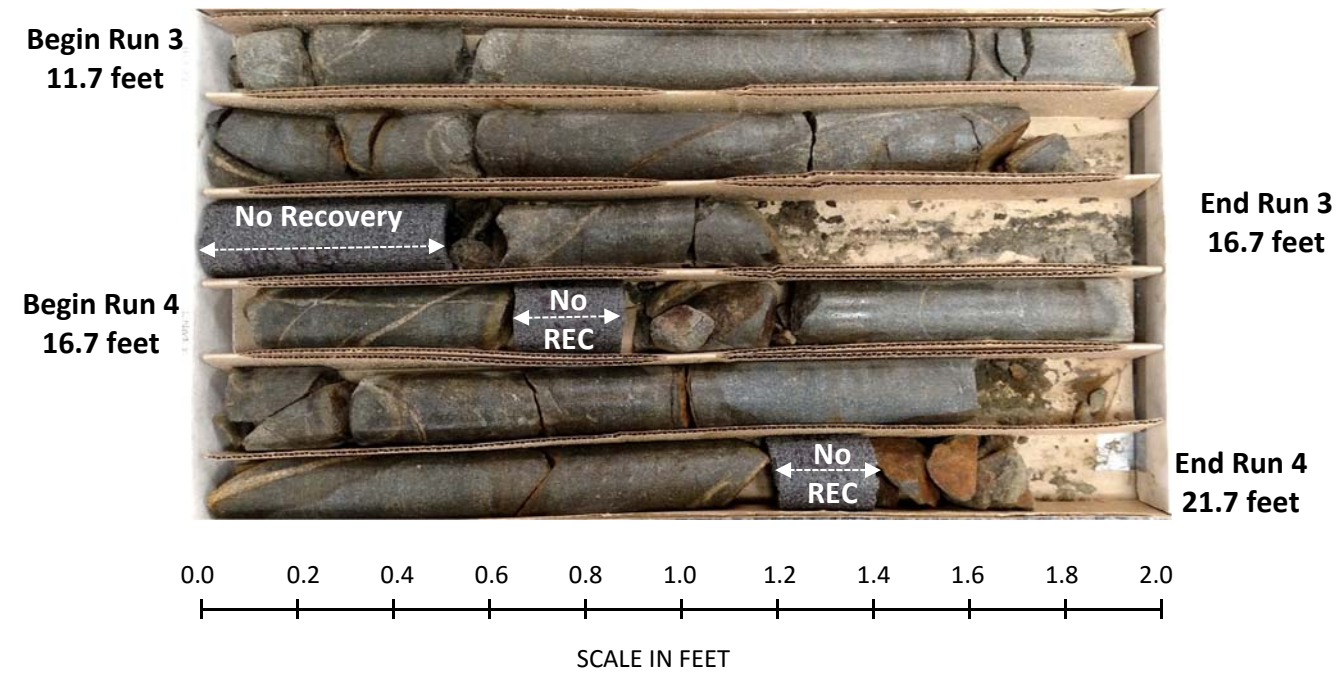
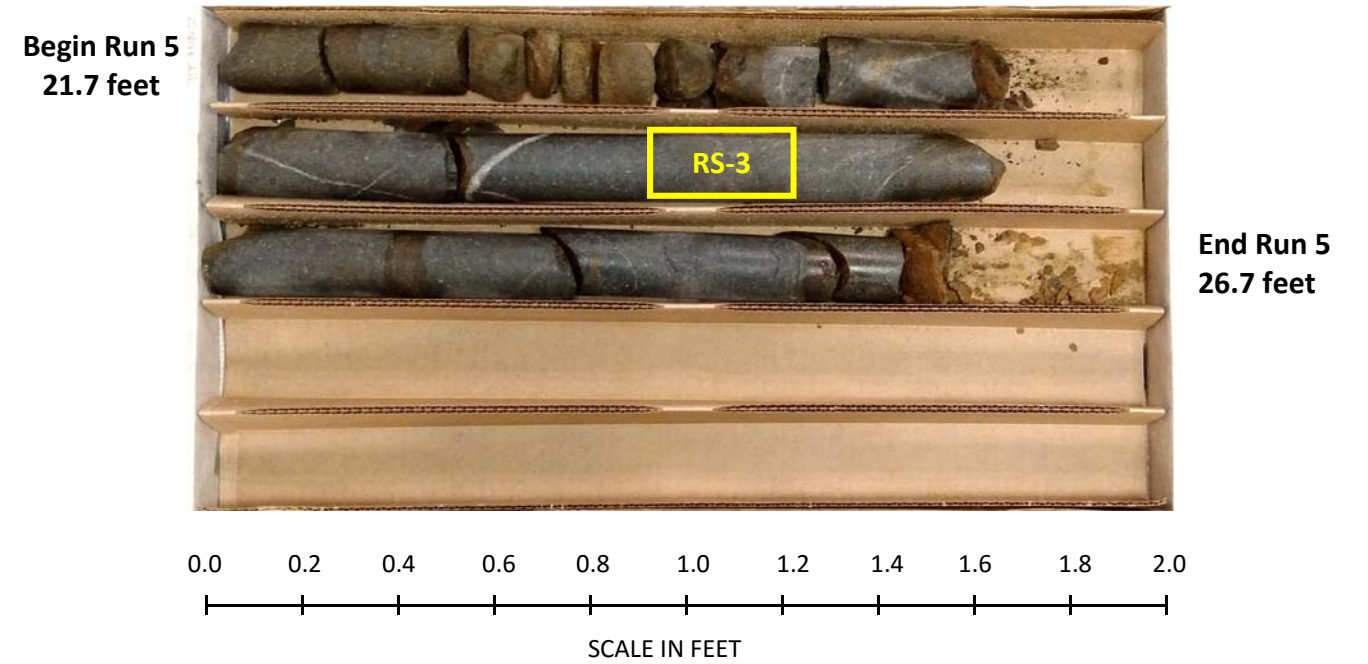
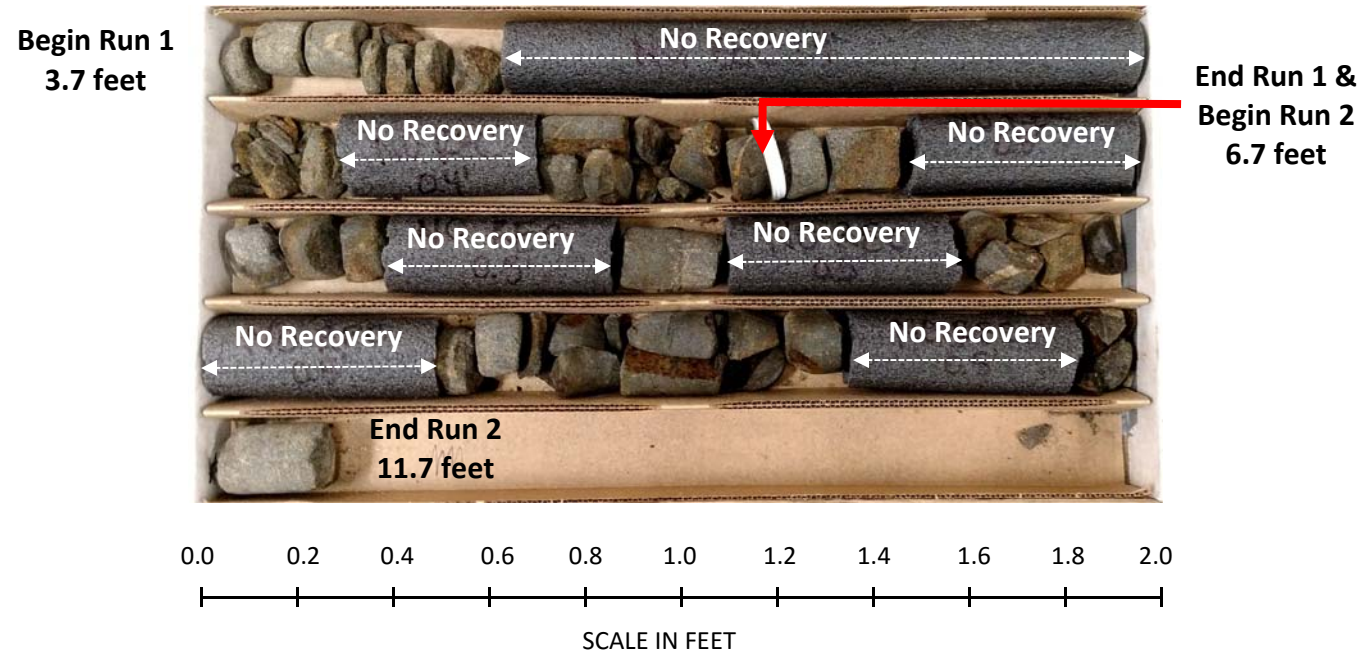
NCDOT BORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold					
SITE DESCRIPTION Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)				
BORING NO. EB2-A		STATION 15+29		OFFSET 15 ft LT		ALIGNMENT -Y1-					
COLLAR ELEV. 640.4 ft		TOTAL DEPTH 26.7 ft		NORTHING 594,501		EASTING 1,487,873					
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic					
DRILLER S. Davis		START DATE 08/17/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft)	RQD (ft)	REC. (ft)	RQD (ft)			
636.7	636.7	3.7	3.0	1:44/1.0	(1.2)	(0.0)					
635	633.7	6.7	5.0	1:05/1.0 1:11/1.0	40%	0%	(16.8)	(8.0)			3.7
630	628.7	11.7	5.0	1:39/1.0 1:27/1.0 1:49/1.0 1:26/1.0	44%	0%					
625	623.7	16.7	5.0	1:49/1.0 1:13/1.0 1:27/1.0 1:26/1.0 2:37/1.0	(4.5)	(2.1)					
620	618.7	21.7	5.0	1:41/1.0 1:44/1.0 1:40/1.0 1:36/1.0 1:54/1.0	90%	42%					
615	613.7	26.7	5.0	2:35/1.0 1:44/1.0 1:41/1.0 1:37/1.0 1:29/1.0	(4.6)	(2.6)					
Boring Terminated at Elevation 613.7 ft in CRYSTALLINE ROCK (META QUARTZ DIORITE)											26.7
NOTES: 1) Auger Refusal at 3.7' 2) FIAD due to boring location in roadway											

NCDOT CORE DOUBLE U5806_GEO_BH_WALL - MSE.GPJ NC_DOT.GDT 8/4/17



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



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW12		STATION 16+22		OFFSET 20 ft LT		ALIGNMENT -Y1-									
COLLAR ELEV. 642.8 ft		TOTAL DEPTH 12.7 ft		NORTHING 594,470		EASTING 1,487,966									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/24/16		COMP. DATE 08/24/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
	642.0	0.8	32	23	12									642.8	0.0
														642.0	0.8
														640.8	2.0
640	639.3	3.5	64	36/0.2										639.3	3.5
635	634.3	8.5	78	22/0.1											
	630.2	12.6	60/0.1											630.2	12.6
														630.1	12.7

NOTES:
 1) Auger refusal at 12.6'
 2) FIAD due to boring location in roadway

WBS 44378.1.D1		TIP U-5806		COUNTY CABARRUS		GEOLOGIST M. Arnold									
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion							GROUND WTR (ft)								
BORING NO. RW13		STATION 17+26		OFFSET 20 ft LT		ALIGNMENT -Y1-									
COLLAR ELEV. 643.6 ft		TOTAL DEPTH 8.6 ft		NORTHING 594,411		EASTING 1,488,054									
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER S. Davis		START DATE 08/23/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
645															
	642.7	0.9	26	28	23									643.6	0.0
														642.7	0.9
														641.6	2.0
640	640.1	3.5	100/0.3											640.1	3.5
635	635.1	8.5	60/0.1											635.1	8.5
														635.0	8.6

NOTE:
 1) FIAD due to boring location in roadway

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44378.1.D1	TIP U-5806	COUNTY CABARRUS	GEOLOGIST M. Arnold
SITE DESCRIPTION MSE Walls at Intersection of SR 2894 (Concord Mills Blvd.) and Entrance No. 1 Kings Grant Pavilion			GROUND WTR (ft)
BORING NO. RW14	STATION 18+26	OFFSET 22 ft LT	ALIGNMENT -Y1-
COLLAR ELEV. 643.9 ft	TOTAL DEPTH 13.8 ft	NORTHING 594,351	EASTING 1,488,135
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 08/23/16	COMP. DATE 08/23/16	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
645														643.9 GROUND SURFACE 0.0	
	643.0	0.9	22	16	14									643.0 ASPHALT 0.9	
	641.9													641.9 ABC STONE 2.0	
640	640.4	3.5	100/0.5											640.4 ROADWAY EMBANKMENT 3.5	
														Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica	
														WEATHERED ROCK	
														Black-Gray-Brown (META QUARTZ DIORITE)	
635	635.4	8.5	100/0.2												
	630.4	13.5	100/0.3											630.1 Boring Terminated at Elevation 630.1 ft in WEATHERED ROCK (META QUARTZ DIORITE) 13.8	

NOTE:
1) FIAD due to boring location in roadway

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.D1
TIP NO.: U-5806
COUNTY: Cabarrus
DESCRIPTION: 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



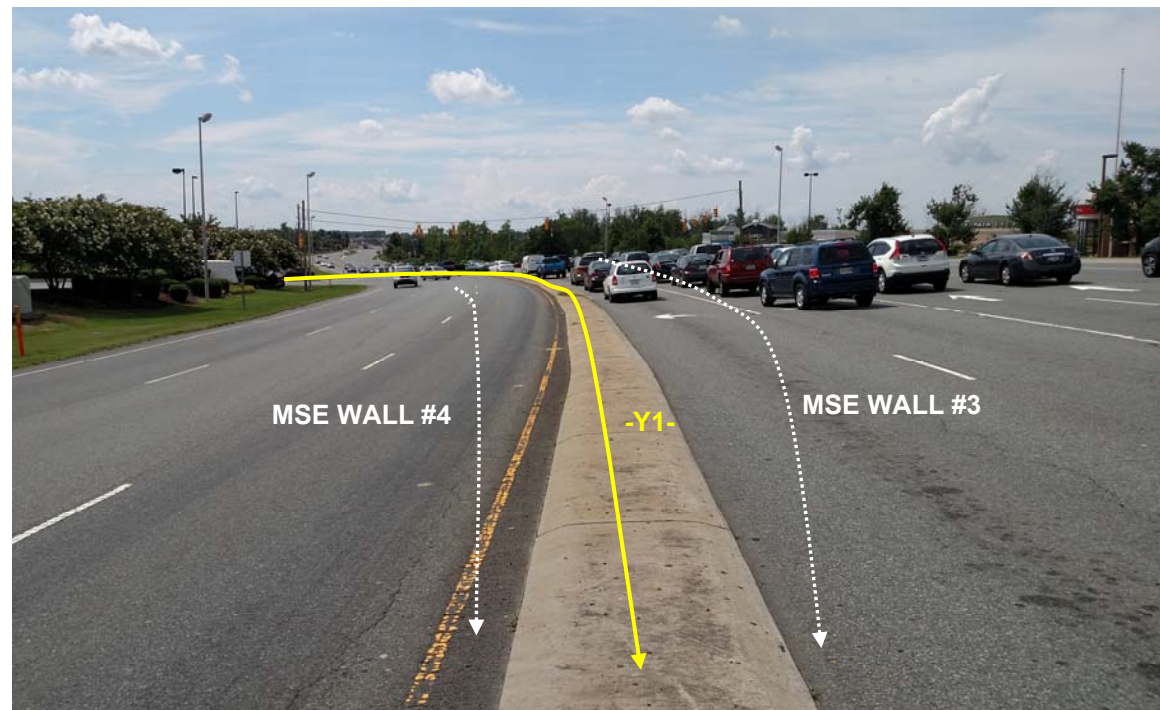
SITE PHOTOGRAPHS



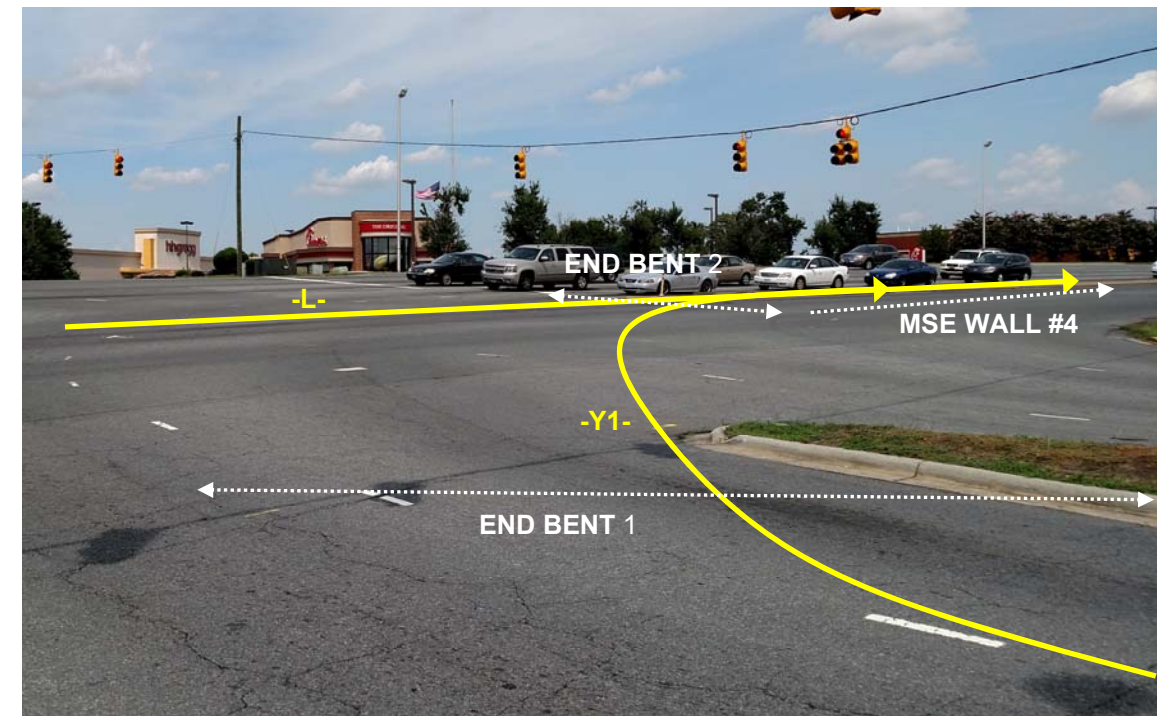
Photograph No. 1: Looking west at -L- (Concord Mills Blvd.) and walls on -Y1-



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



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



Photograph No. 4: Looking northeast towards End Bent 2