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REFERENCE: I-5506

PROJECT: 43608

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5506	1	16

STRUCTURE
SUBSURFACE INVESTIGATION

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
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4	PROFILE
5-7	CROSS SECTIONS
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14	ROCK CORE SUMMARY
15	CORE PHOTOGRAPHS
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COUNTY WAKE

PROJECT DESCRIPTION I-40 AND SR 1002
(AVIATION PARKWAY) INTERCHANGE

SITE DESCRIPTION REPLACEMENT OF BRIDGE
NO. 073 ON AVIATION PARKWAY (SR 1002)
OVER I-40 AT -L- STA. 50+61

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.

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.

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

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

PERSONNEL

- C. JONES
- B. THOMPSON
- B. KEANEY
- B. HOWEY
- D. TIGNOR

INVESTIGATED BY F&R, Inc.

DRAWN BY CBJ

CHECKED BY ECH

SUBMITTED BY HDR ENGINEERING

DATE 10/2016



DocuSigned by:
Christopher B. Jones 12/15/2016

F0E798212CE SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

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

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																																						
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																						
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<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																																																																																																																																																																																						
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<p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>																				<p>BENCH MARK: L30+00.00 45 LEFT, BM4, NAIL W/TAG IN 18" PINE.</p>										<p>NOTES: BORING EBI-C AND GROUND SURFACE ELEVATIONS OBTAINED FROM 'I5506_Is.tin' file dated 9/7/2016. FIAD - FILLED IMMEDIATELY AFTER DRILLING</p>																																																																																																																																																																																						

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**

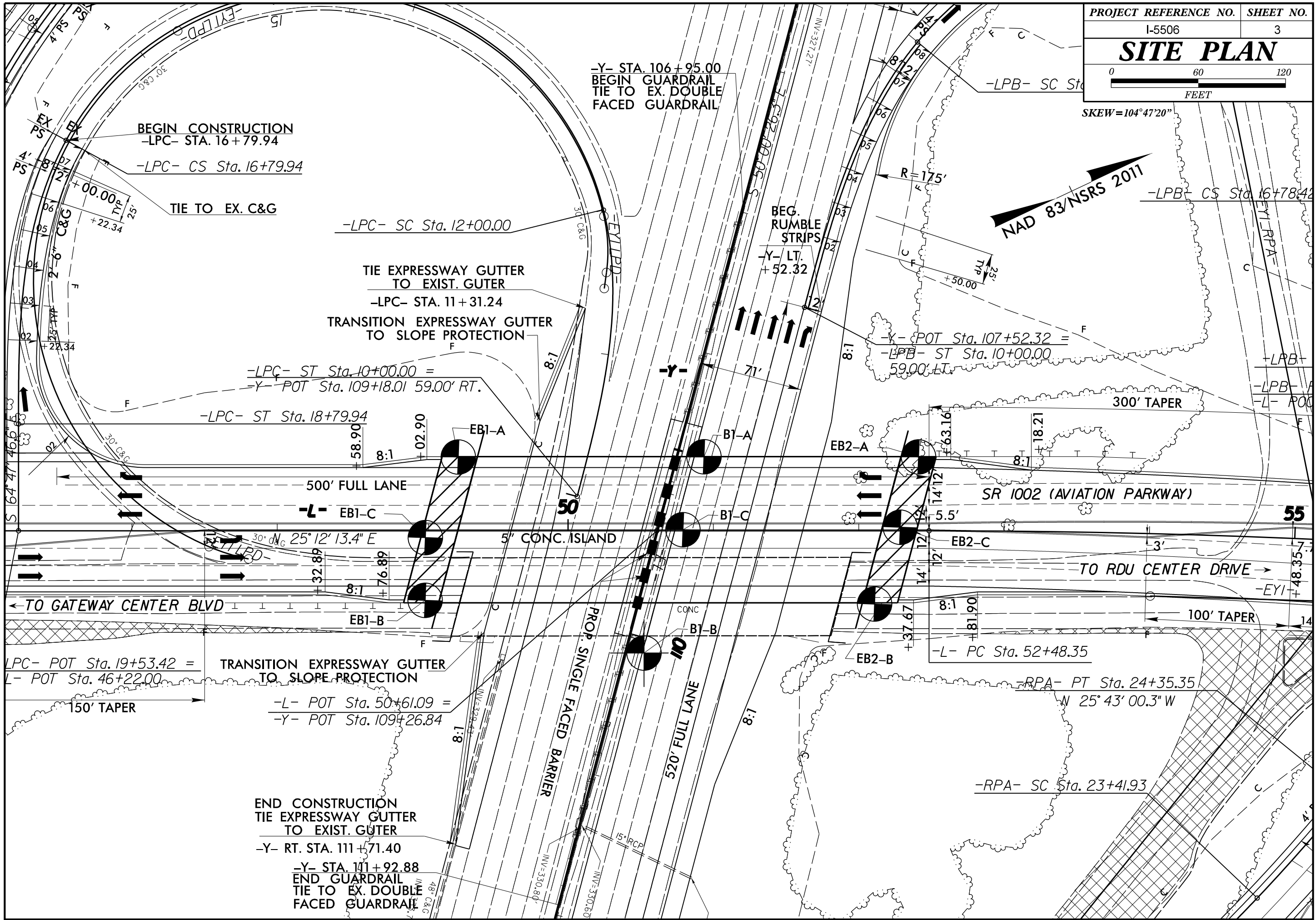
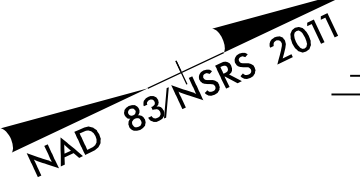
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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	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.		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					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				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				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			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			F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure					20	
				30			G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers						10
				20			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

SKEW = 104° 47' 20"



BEGIN CONSTRUCTION
-LPC- STA. 16+79.94
-LPC- CS Sta. 16+79.94

TIE TO EX. C&G

-LPC- SC Sta. 12+00.00

TIE EXPRESSWAY GUTTER TO EXIST. GUTTER
-LPC- STA. 11+31.24
TRANSITION EXPRESSWAY GUTTER TO SLOPE PROTECTION

-LPC- ST Sta. 10+00.00 =
-Y- POT Sta. 109+18.01 59.00' RT.

-LPC- ST Sta. 18+79.94

500' FULL LANE

-L- EB1-C

5' CONC. ISLAND

SR 1002 (AVIATION PARKWAY)

TO RDU CENTER DRIVE

TO GATEWAY CENTER BLVD

TRANSITION EXPRESSWAY GUTTER TO SLOPE PROTECTION

-L- POT Sta. 50+61.09 =
-Y- POT Sta. 109+26.84

150' TAPER

END CONSTRUCTION
TIE EXPRESSWAY GUTTER TO EXIST. GUTTER

-Y- RT. STA. 111+71.40

-Y- STA. 111+92.88
END GUARDRAIL
TIE TO EX. DOUBLE FACED GUARDRAIL

-Y- STA. 106+95.00
BEGIN GUARDRAIL
TIE TO EX. DOUBLE FACED GUARDRAIL

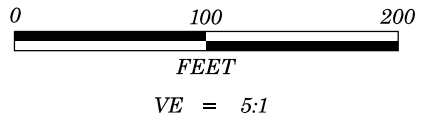
BEG. RUMBLE STRIPS
-Y- LT. +52.32

-Y- POT Sta. 107+52.32 =
-LPC- ST Sta. 10+00.00 59.00' LT.

-L- PC Sta. 52+48.35

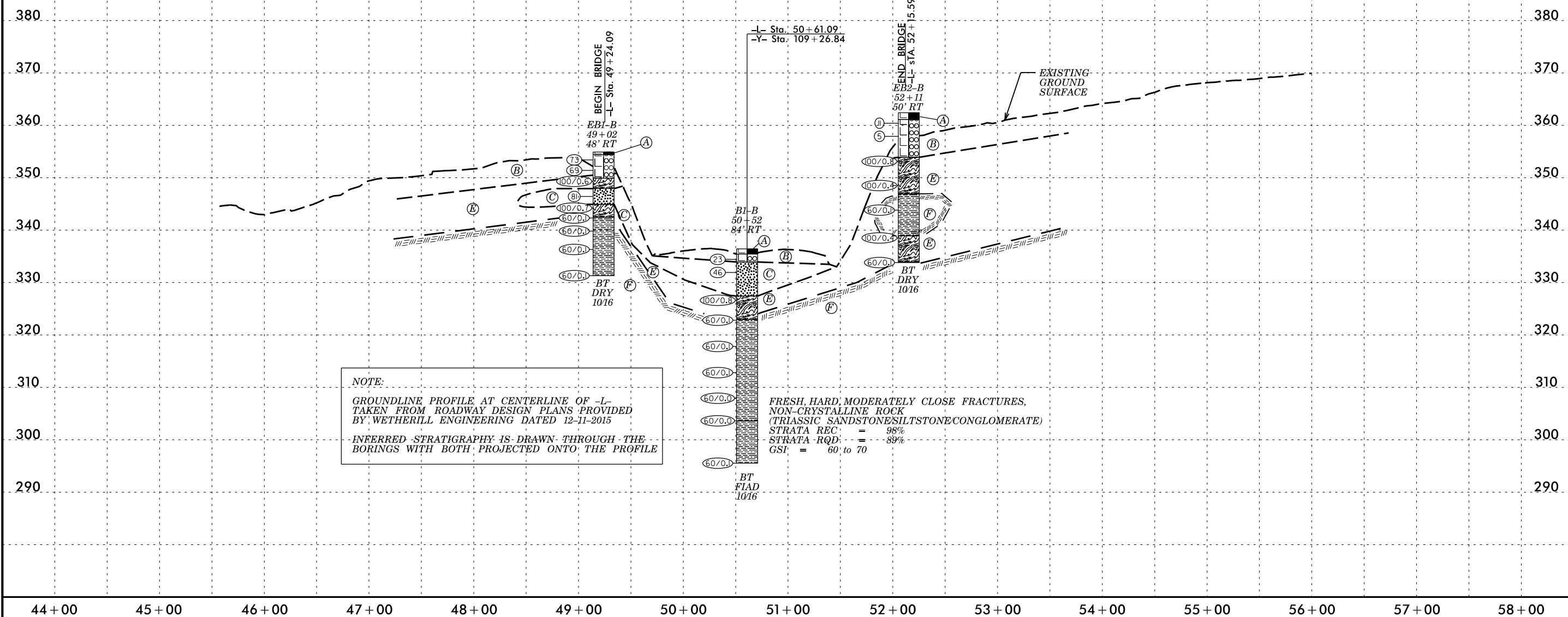
-RPA- PT Sta. 24+35.35
N 25° 43' 00.3" W

-RPA- SC Sta. 23+41.93



PROJECT REFERENCE NO.	SHEET NO.
I-5506	4
PROFILE ALONG -L- CENTERLINE	

- (A) ASPHALT PAVEMENT AND CONCRETE PAVEMENT
- (B) ROADWAY EMBANKMENT
BROWN, GRAY AND RED-BROWN, FINE SAND (A-3) AND FINE TO COARSE SAND (A-1-b), TRACE TO SOME SILT, GRAVEL AND CLAY, LOOSE TO VERY DENSE, DRY.
- (C) TRIASSIC RESIDUAL
RED-BROWN, FINE TO COARSE SAND (A-2-4), LITTLE SILT AND ROCK FRAGMENTS, DENSE TO VERY DENSE, DRY
- (E) WEATHERED ROCK
(TRIASSIC SANDSTONE AND SILTSTONE)
- (F) NON-CRYSTALLINE ROCK
(TRIASSIC SILTSTONE, SANDSTONE AND CONGLOMERATE)



44+00 45+00 46+00 47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00 58+00

6/23/16



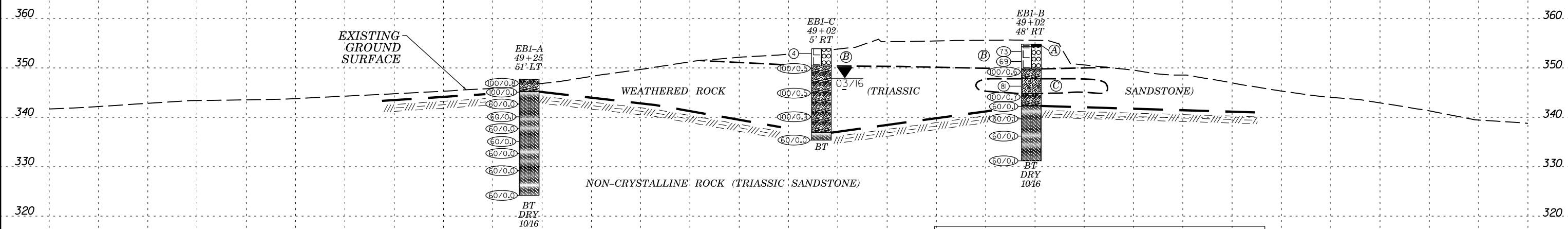
PROJ. REFERENCE NO.	SHEET NO.
1-5506	5

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

SKEW ANGLE = 104.47'20"

SECTION THROUGH END BENT 1

- (A) ASPHALT PAVEMENT
- (B) ROADWAY EMBANKMENT
BROWN, GRAY AND RED-BROWN, FINE TO COARSE SAND (A-1-b),
SOME GRAVEL, TRACE SILT, LOOSE TO VERY DENSE, DRY
- (C) TRIASSIC RESIDUAL
RED-BROWN, FINE SAND (A-2-4), LITTLE SILT, VERY DENSE, DRY



NOTE:
 GROUNDLINE FOR CROSS SECTION AT STATION
 49+24 GENERATED FROM: 1-5506_LS_TIN.TIN
 DATED 9-7-2016
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE
 BORINGS WITH BOTH PROJECTED ONTO THE SECTION

49+24

SYSTEMS ENGINEERING

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

6/23/16



PROJ. REFERENCE NO.
1-5506

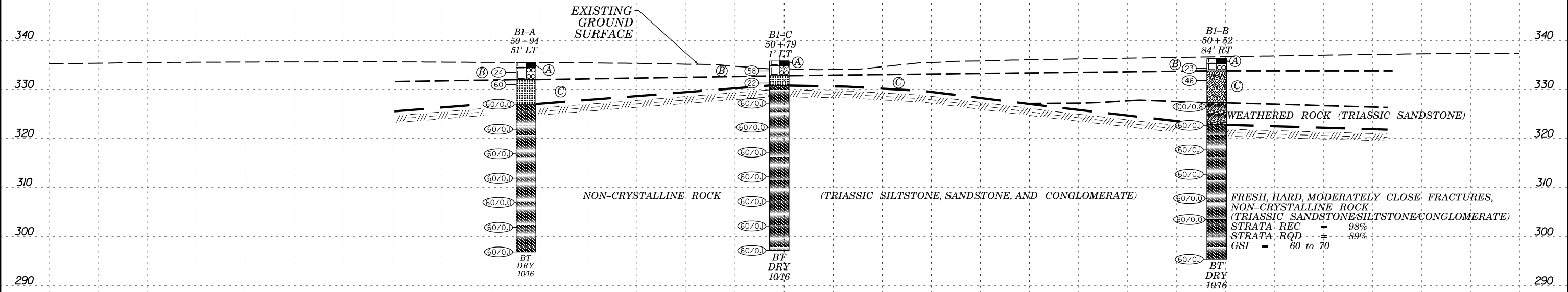
SHEET NO.
6

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

SKREW ANGLE = 104.47'20"

SECTION THROUGH BENT 1

- (A) ASPHALT PAVEMENT
- (B) ROADWAY EMBANKMENT
BROWN, BLACK AND GREEN, FINE TO COARSE SAND (A-1-b),
LITTLE TO SOME SILT, GRAVEL AND CLAY, MEDIUM TO
VERY DENSE, DRY
- (C) TRIASSIC RESIDUAL
RED-BROWN, GRAY AND WHITE, FINE TO COARSE SAND (A-3) AND
SILTY, FINE TO COARSE SAND (A-2-4), LITTLE ROCK FRAGMENTS,
TRACE SILT, MEDIUM DENSE TO VERY DENSE, DRY



NOTE:
 GROUNDLINE FOR CROSS SECTION AT STATION
 50+61 GENERATED FROM '1-5506 LS TIN TIN'
 DATED 9-7-2016
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE
 BORINGS WITH BOTH PROJECTED ONTO THE SECTION

50+61

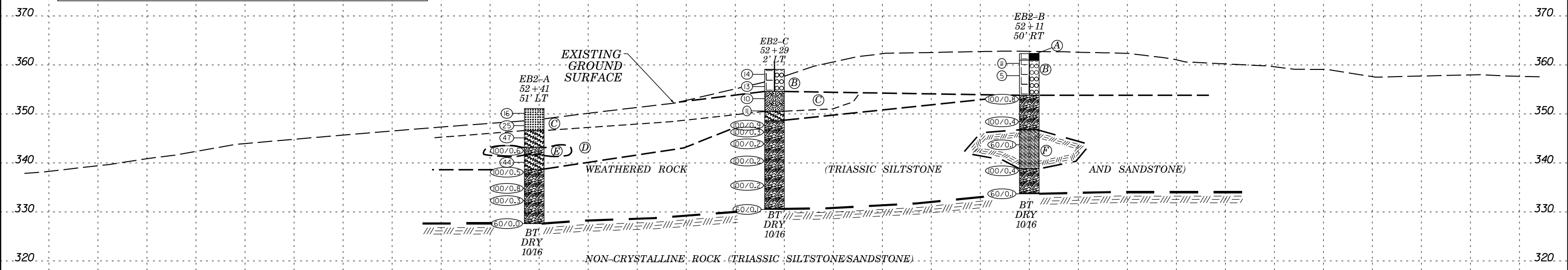
SYSTEMS ENGINEERING & CONSTRUCTION

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

SKEW ANGLE = 104.47'20"

SECTION THROUGH END BENT 2

- (A) ASPHALT PAVEMENT AND CONCRETE PAVEMENT
- (B) ROADWAY EMBANKMENT
RED-BROWN, YELLOW AND WHITE, FINE TO COARSE SAND (A-1-b, A-3), TRACE TO SOME SILT AND GRAVEL, LOOSE TO MEDIUM DENSE, DRY
- (C) TRIASSIC RESIDUAL
RED-BROWN AND WHITE, SILTY FINE SAND (A-2-4) AND FINE SAND (A-3), WITH TRACE SILT, TRACE TO LITTLE ROCK FRAGMENTS, MEDIUM DENSE, DRY
- (D) TRIASSIC RESIDUAL
GRAY, ORANGE AND RED-BROWN, CLAYEY FINE SAND (A-2-7), MEDIUM DENSE TO DENSE, DRY
- (E) WEATHERED ROCK (TRIASSIC SANDSTONE)
- (F) NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE)



NOTE:
 GROUNDLINE FOR CROSS SECTION AT STATION 52+15 GENERATED FROM I-5506_LS_TIN.TIN, DATED 9-7-2016
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE SECTION

52 + 15

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson										
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 49+25		OFFSET 51 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 347.7 ft		TOTAL DEPTH 23.5 ft		NORTHING 764,366		EASTING 2,059,568										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Tignor		START DATE 10/06/16		COMP. DATE 10/06/16		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						
350																
	347.7	0.0													347.7	0.0
			7													
345	345.2	2.5	100/0.1												345.2	2.5
	342.7	5.0	60/0.0													
340	340.2	7.5	60/0.1													
	337.7	10.0	60/0.0													
335	335.2	12.5	60/0.1													
	332.7	15.0	60/0.0													
330	329.2	18.5	60/0.0													
325	324.2	23.5	60/0.0												324.2	23.5
Boring Terminated at Elevation 324.2 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE) 1) Hard drilling from 0.0 to 23.5 feet.																

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson										
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)									
BORING NO. EB1-C		STATION 49+02		OFFSET 5 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 353.9 ft		TOTAL DEPTH 18.5 ft		NORTHING 764,322		EASTING 2,059,609										
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 86% 02/16/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Tignor		START DATE 03/18/16		COMP. DATE 03/18/16		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						
355																
	353.9	0.0													353.9	0.0
			1	2	2											
350	350.4	3.5	100/0.5												350.4	3.5
	345.4	8.5	100/0.5													
345	345.4	8.5	100/0.5													
	340.4	13.5	100/0.3													
340	340.4	13.5	100/0.3													
	335.4	18.5	60/0.0												335.4	18.5
Boring Terminated at Elevation 335.4 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE) 1) Hard drilling from 3.5 to 4.5 feet and 17 to 18.5 feet																

NCDOT BORE DOUBLE I5506_GEO_BRDG_GINT.GPJ NC_DOT.GDT 11/30/16

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson										
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 49+02		OFFSET 48 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 354.8 ft		TOTAL DEPTH 23.6 ft		NORTHING 764,303		EASTING 2,059,648										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER D. Tignor		START DATE 10/13/16		COMP. DATE 10/13/16		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						
355	354.3	0.5														
	352.3	2.5	35	49	24											
	349.8	5.0	18	39	30											
350	347.3	7.5	47	53/0.1												
	344.8	10.0	15	21	60											
345	342.3	12.5	52	48/0.2												
	339.8	15.0	60/0.1													
340	336.3	18.5	60/0.1													
335	331.3	23.5	60/0.1													

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson										
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)									
BORING NO. B1-A		STATION 50+94		OFFSET 51 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 335.5 ft		TOTAL DEPTH 38.6 ft		NORTHING 764,519		EASTING 2,059,640										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER D. Tignor		START DATE 10/11/16		COMP. DATE 10/12/16		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						
340																
335	334.5	1.0	10	15	9											
	332.0	3.5	41	35	25											
330	327.0	8.5	60/0.0													
325	322.0	13.5	60/0.1													
320	317.0	18.5	60/0.1													
315	312.0	23.5	60/0.1													
310	307.0	28.5	60/0.0													
305	302.0	33.5	60/0.1													
300	297.0	38.5	60/0.1													

NCDOT BORE DOUBLE I5506_GEO_BRDG_GINT.GPJ NC_DOT.GDT 11/30/16

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 43608.1.1	TIP I-5506	COUNTY WAKE	GEOLOGIST B. Thompson
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40			GROUND WTR (ft)
BORING NO. B1-C	STATION 50+79	OFFSET 1 ft LT	ALIGNMENT -L-
COLLAR ELEV. 335.8 ft	TOTAL DEPTH 38.6 ft	NORTHING 764,485	EASTING 2,059,679
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER D. Tignor	START DATE 10/11/16	COMP. DATE 10/11/16	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)		
340																
335	334.8	1.0	15	35	23									335.8	0.0	GROUND SURFACE
														334.8	1.0	ROADWAY EMBANKMENT
	332.3	3.5	20	12	10									332.8	3.0	Asphalt Pavement
330														330.8	5.0	Brown and black, fine to coarse SAND (A-1-b), little silt and gravel
	327.3	8.5	60/0.1													TRIASSIC RESIDUAL
325																Red-brown and gray, fine SAND (A-3), trace silt, little rock fragments
	322.3	13.5	60/0.0													NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)
320																
	317.3	18.5	60/0.1													
315																
	312.3	23.5	60/0.1													
310																
	307.3	28.5	60/0.1													
305																
	302.3	33.5	60/0.1													
300																
	297.3	38.5	60/0.1											297.2	38.6	Boring Terminated at Elevation 297.2 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)
																1) Hard drilling from 5.0 to 38.5 feet.
																2) SPT N-Values in roadway embankment likely inflated by the presence of gravel.

NCDOT BORE DOUBLE I5506 GEO_BRDG_GINT.GPJ NC_DOT.GDT 11/30/16

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson										
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 52+41		OFFSET 51 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 351.1 ft		TOTAL DEPTH 23.5 ft		NORTHING 764,652		EASTING 2,059,703										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Tignor		START DATE 10/06/16		COMP. DATE 10/06/16		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						
355																
	351.1	0.0	1	6	10									351.1	GROUND SURFACE	0.0
350	348.6	2.5	9	12	13									346.6	TRIASSIC RESIDUAL Red-brown and white, fine SAND (A-3) with trace silt and rock fragments	4.5
	346.1	5.0	13	25	22									346.6	TRIASSIC RESIDUAL Yellow to orange, clayey fine SAND (A-2-7)	4.5
345	343.6	7.5	10	63	37/0.1									343.1	WEATHERED ROCK (TRIASSIC SANDSTONE)	8.0
	341.1	10.0	25	22	22									341.6	TRIASSIC RESIDUAL Gray and red-brown, clayey fine SAND (A-2-7)	9.5
340	338.6	12.5	100/0.5											338.6	WEATHERED ROCK (TRIASSIC SILTSTONE)	12.5
	336.1	15.0	23	47	53/0.3									338.6	WEATHERED ROCK (TRIASSIC SILTSTONE)	12.5
335	332.6	18.5	100/0.3											332.6		18.5
	327.6	23.5	60/0.0											327.6	Boring Terminated at Elevation 327.6 ft ON NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE)	23.5
1) Hard drilling from 13.0 to 14.5 feet and 18.5 to 23.5 feet.																

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson										
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)									
BORING NO. EB2-C		STATION 52+29		OFFSET 2 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 359.1 ft		TOTAL DEPTH 28.6 ft		NORTHING 764,620		EASTING 2,059,741										
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER D. Tignor		START DATE 10/06/16		COMP. DATE 10/06/16		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						
360																
	359.1	0.0	2	6	8									359.1	GROUND SURFACE	0.0
	356.6	2.5	5	7	6									354.6	ROADWAY EMBANKMENT Red-brown and white, fine to coarse SAND (A-1-b), some silt and gravel	4.5
355	354.1	5.0	2	5	5									354.6	TRIASSIC RESIDUAL Red-brown, silty fine SAND (A-2-4), little rock fragments	4.5
	351.6	7.5	4	4	7									350.5	TRIASSIC RESIDUAL Gray, orange, clayey fine SAND (A-2-7), little organics (wood fragments)	8.6
350	349.1	10.0	4	18	82/0.4									348.6	WEATHERED ROCK (TRIASSIC SANDSTONE AND QUARTZ FRAGMENTS AT 12.5 FT AND 18.5 FT)	10.5
	346.6	12.5	100/0.3											348.6	WEATHERED ROCK (TRIASSIC SANDSTONE AND QUARTZ FRAGMENTS AT 12.5 FT AND 18.5 FT)	10.5
345	344.1	15.0	100/0.2											348.6	WEATHERED ROCK (TRIASSIC SANDSTONE AND QUARTZ FRAGMENTS AT 12.5 FT AND 18.5 FT)	10.5
	340.6	18.5	100/0.2											340.6		18.5
340	340.6	18.5	100/0.2											340.6		18.5
	335.6	23.5	100/0.2											335.6		23.5
335	330.6	28.5	60/0.1											330.6	NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	28.5
	330.5	28.5	60/0.1											330.5	NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	28.5
1) Hard drilling from 14.0 to 15.0 feet, 15.5 to 18.5 feet, and 18.5 to 23.5 feet.																

NCDOT BORE DOUBLE I5506 GEO_BRDG_GINT.GPJ NC_DOT.GDT 11/30/16

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 43608.1.1		TIP I-5506		COUNTY WAKE		GEOLOGIST B. Thompson	
SITE DESCRIPTION Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) over I-40							GROUND WTR (ft)
BORING NO. EB2-B		STATION 52+11		OFFSET 50 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 362.3 ft		TOTAL DEPTH 28.6 ft		NORTHING 764,582		EASTING 2,059,782	
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER D. Tignor		START DATE 10/13/16		COMP. DATE 10/13/16		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)	
365															
360	361.3	1.0	3	4	7									362.3	0.0
	358.8	3.5	3	2	3									361.0	1.3
355	353.8	8.5	28	72/0.3											
350	348.8	13.5	100/0.4												
345	343.8	18.5	60/0.1												
340	338.8	23.5	100/0.4												
335	333.8	28.5	60/0.1											333.8	28.5
														333.7	28.6

SOIL AND ROCK DESCRIPTION

GROUND SURFACE 0.0

ROADWAY EMBANKMENT 1.3

0.3 foot of Asphalt Pavement and 1.0 foot of Concrete Pavement

Red-brown and yellow, fine SAND (A-3), trace silt and gravel

WEATHERED ROCK (TRIASSIC SANDSTONE) 8.5

NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE) 15.5

WEATHERED ROCK (TRIASSIC SILTSTONE) 23.5

NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE) 28.5

Boring Terminated at Elevation 333.7 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE)

1) Hard drilling from 15.5 to 23.5 feet.

NCDOT BORE DOUBLE 15506 GEO_BRDG_GINT.GPJ NC_DOT.GDT 11/30/16

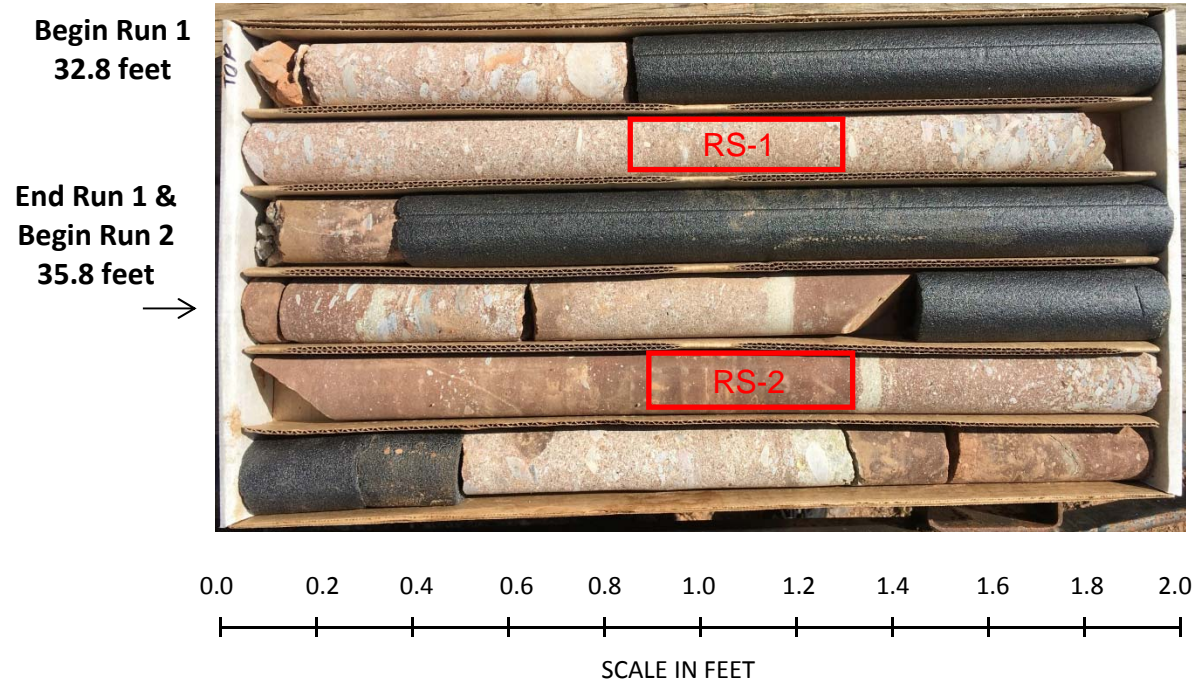
LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 43608.1.1
TIP NO.: I-5506
COUNTY: Wake
DESCRIPTION: Replacement of Bridge No. 073 on Aviation Parkway (SR 1002) Over I-40

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 (ksf)	GSI
RS-1	B1-B	-L-	50+52	84' RT	34.4-34.7	Triassic Sandstone	TRc	87%	3.89	1.77	160.4	6,684	831	60-70
RS-2	B1-B	-L-	50+52	84' RT	38.4-38.7	Triassic Siltstone	TRc	90%	3.76	1.77	163.8	5,990	883	60-70



CORE PHOTOGRAPHS: B1-B



BORING B1-B
Station 50+56

Run 1: 32.8-35.8 feet
100% REC, 87% RQD

Run 2: 35.8-40.8 feet
96% REC, 90% RQD

End Run 2
40.8 feet



Photo 1: Looking Southeast towards End Bent 1 and Bent 1



Photo 2: Looking South along SR1002



Photo 3: Looking East towards Bent 1

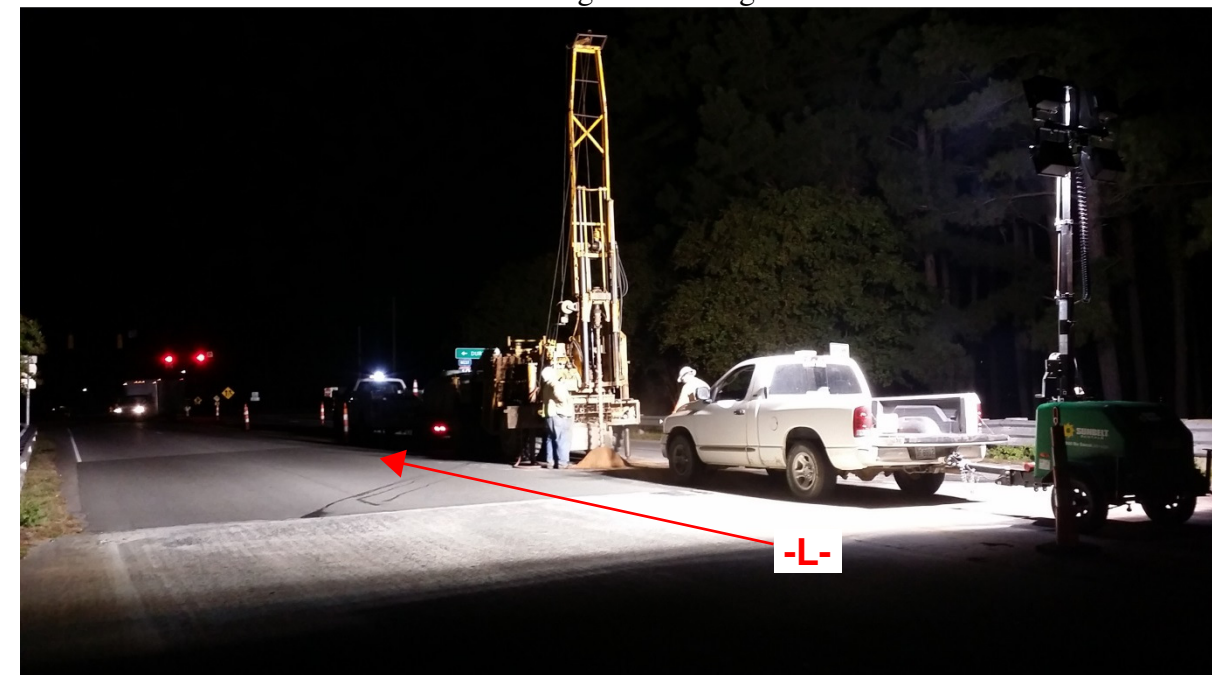


Photo 4: Looking Northeast towards End Bent 2