

REFERENCE: I-2513AC

PROJECT: 34165

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION I-26I-40I-240 INTERCHANGE
TO SR 3548 (HAYWOOD ROAD)

SITE DESCRIPTION BRIDGE NO. 242 ON NC 191
(BREVARD ROAD) OVER I-26I-240
-Y2- STA. 22 + 70.15

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-2513AC	1	20

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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS 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

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T. COOK

T. HIBDON

GEOLOGIC EXPLORATION

TERRACON CONSULTANTS

INVESTIGATED BY ECS SOUTHEAST, LLC

DRAWN BY A. SUTTLE, P.G.

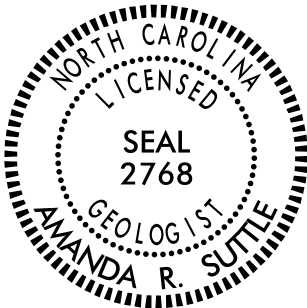
CHECKED BY M. MULLA, P.E.

SUBMITTED BY ECS SOUTHEAST, LLC

DATE JULY 2025

Prepared in the Office of:

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ENGINEERING
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Signed by:

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DATE

7/25/2025

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

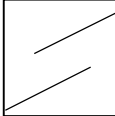
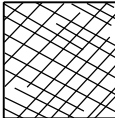
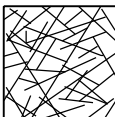
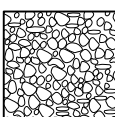
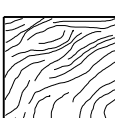
SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE 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, VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6										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.										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:										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 (SRQD) - 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.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERED ROCK (WR)										CRISTALLINE ROCK (CR)									
GENERAL CLASS.										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.										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.									
GROUP CLASS.										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										NON-CRYSTALLINE ROCK (NCR)										COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.									
SYMBOL										SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE										COASTAL PLAIN SEDIMENTARY ROCK (CP)										PERCENTAGE OF MATERIAL									
%										ORGANIC MATERIAL TRACE OF ORGANIC MATTER LITTLE ORGANIC MATTER MODERATELY ORGANIC HIGHLY ORGANIC										GRANDULAR SOILS SILT - CLAY SOILS										GROUND WATER									
MATERIAL PASSING #40 #200										PERCENTAGE OF MATERIAL										FRESH										VERY SLIGHT (V SL.)									
GROUP INDEX										SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE										SLIGHT (SL.)										MODERATE (MOD.)									
USUAL TYPES OF MAJOR MATERIALS										GROUND WATER										MODERATELY SEVERE (MOD. SEV.)										SEVERE (SEV.)									
GEN. RATING AS SUBGRADE										GROUND WATER										SEVERE (IV SEV.)										COMPLETE									
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION										VERY HARD										HARD									
CONSISTENCY OR DENSENESS										MISCELLANEOUS SYMBOLS										MODERATELY HARD										MEDIUM HARD									
PRIMARY SOIL TYPE										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION										VERY SOFT										SOFT									
COMPACTNESS OR CONSISTENCY										SOIL SYMBOL										MEDIUM STIFF										VERY SOFT									
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)										ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT										VERY STIFF										HARD									
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)										INFERRED SOIL BOUNDARY										INFERRED ROCK LINE										ALLUVIAL SOIL BOUNDARY									
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS										ROCK HARDNESS										FRACTURE SPACING									
U.S. STD. SIEVE SIZE OPENING (MM)										UNDERCUT										HARD										BEDDING									
BOULDER (BLDR.)										UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE										MODERATELY HARD										TERM									
COBBLE (COB.)										UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK										HARD										SPACING									
GRAVEL (GR.)										ABBREVIATIONS										SOFT										TERM									
COARSE SAND (CSE. SD.)										AR - AUGER REFUSAL										VERY SOFT										THICKNESS									
FINE SAND (F SD.)										BT - BORING TERMINATED										HARD										THICKLY BEDDED									
SILT (SL.)										CL - CLAY										MODERATELY HARD										THINLY BEDDED									
CLAY (CL.)										CPT - CONE PENETRATION TEST										VERY SOFT										VERY THINLY BEDDED									
GRAIN SIZE										CSE. - COARSE										HARD										THICKLY LAMINATED									
SOIL MOISTURE - CORRELATION OF TERMS																																							

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION

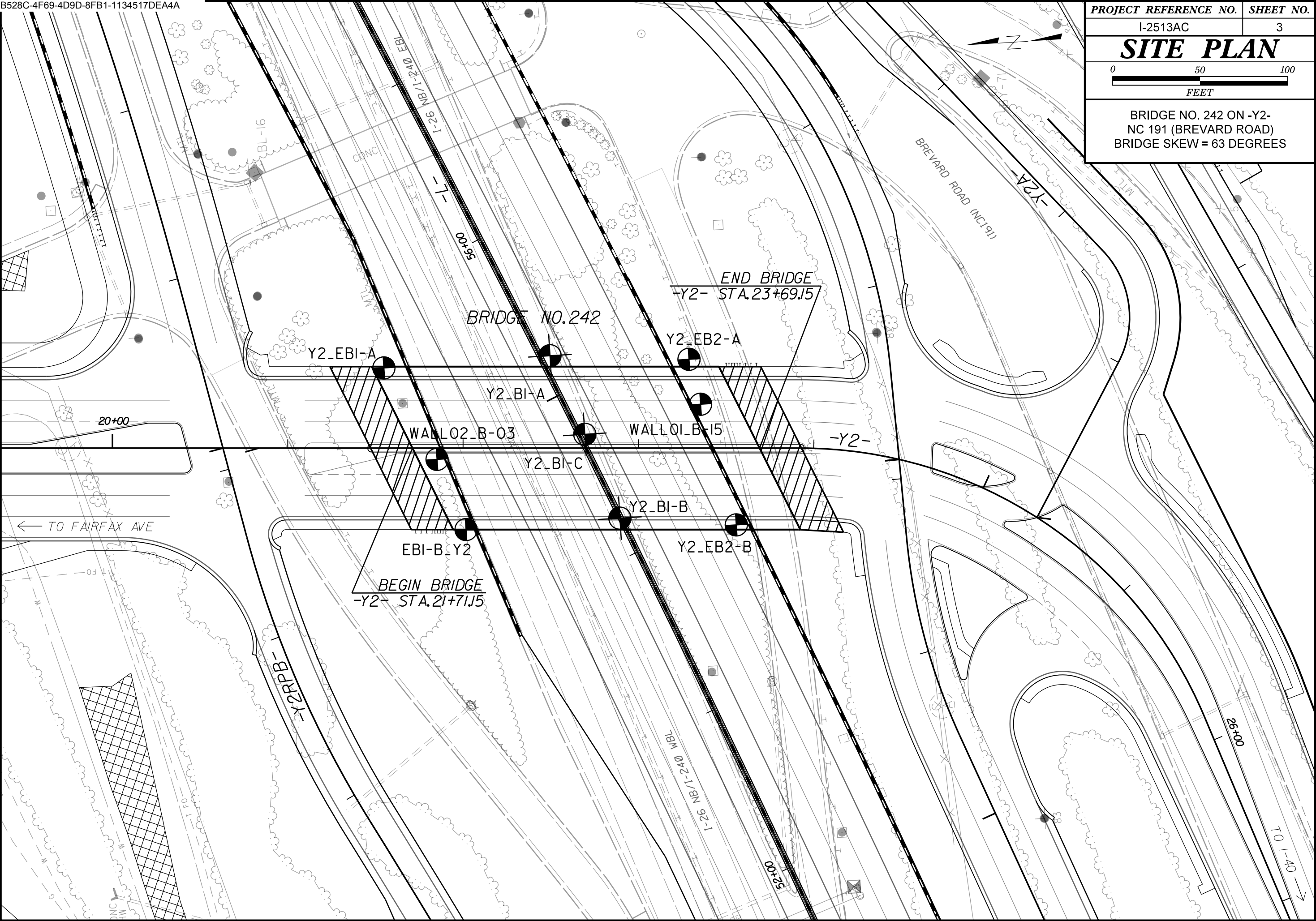
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

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) 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.		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					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000) 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.		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes) 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 80 70 60 50 40 30 20 10 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 60 50 40 30 20 10				
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets						 B. Sandstone with thin inter-layers of siltstone						
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets						 C. Sandstone and siltstone in similar amounts						
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity						 D. Siltstone or silty shale with sandstone layers						
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces						 E. Weak siltstone or clayey shale with sandstone layers						
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes						C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.						
							 F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure						
							 G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers						
							 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						

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	3
SITE PLAN	
0 50 100 FEET	
BRIDGE NO. 242 ON -Y2- NC 191 (BREVARD ROAD) BRIDGE SKEW = 63 DEGREES	



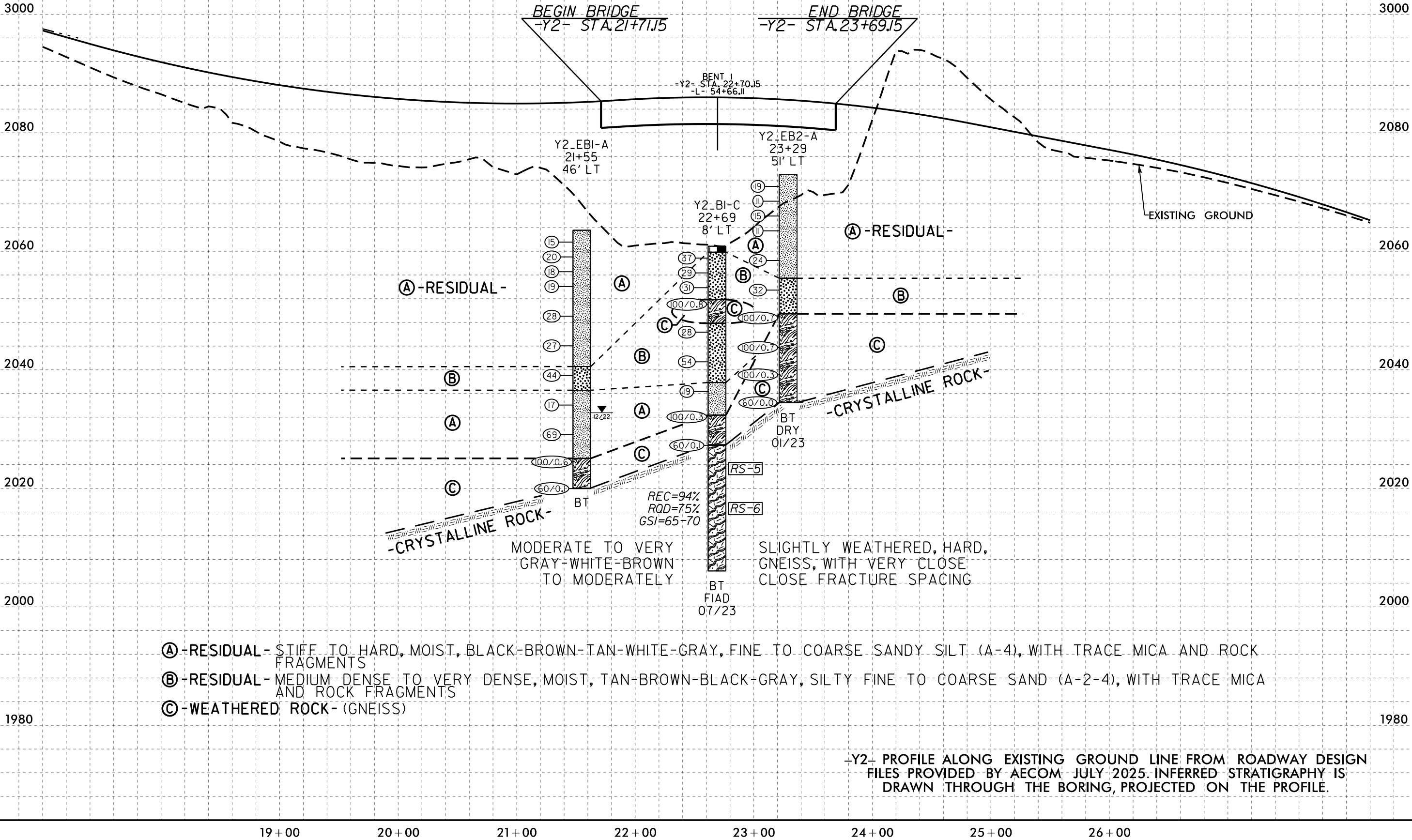


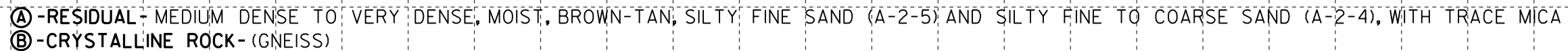
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NC REGISTERED
ENGINEERING
FIRM # F-1519

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-Y2-

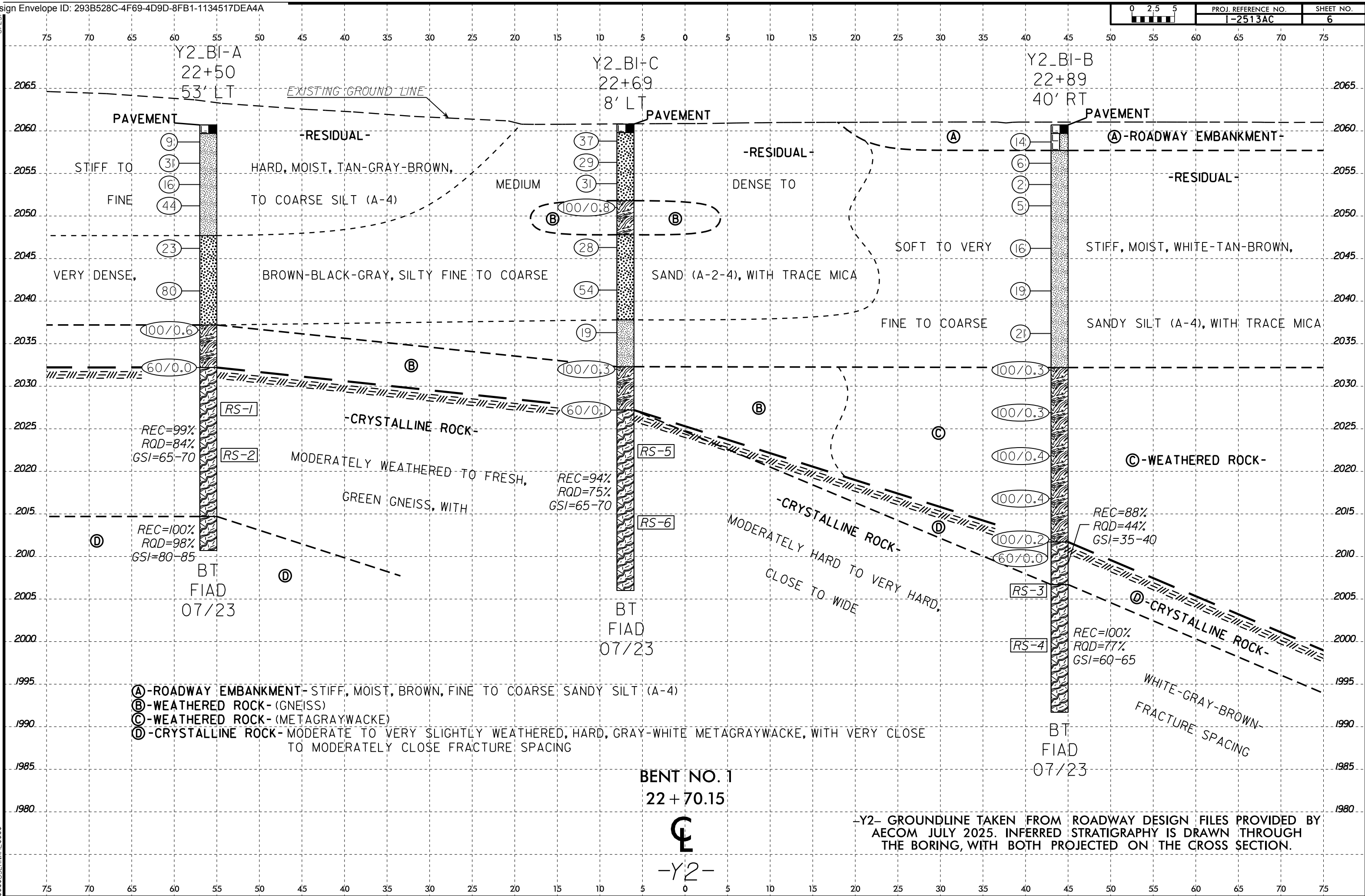




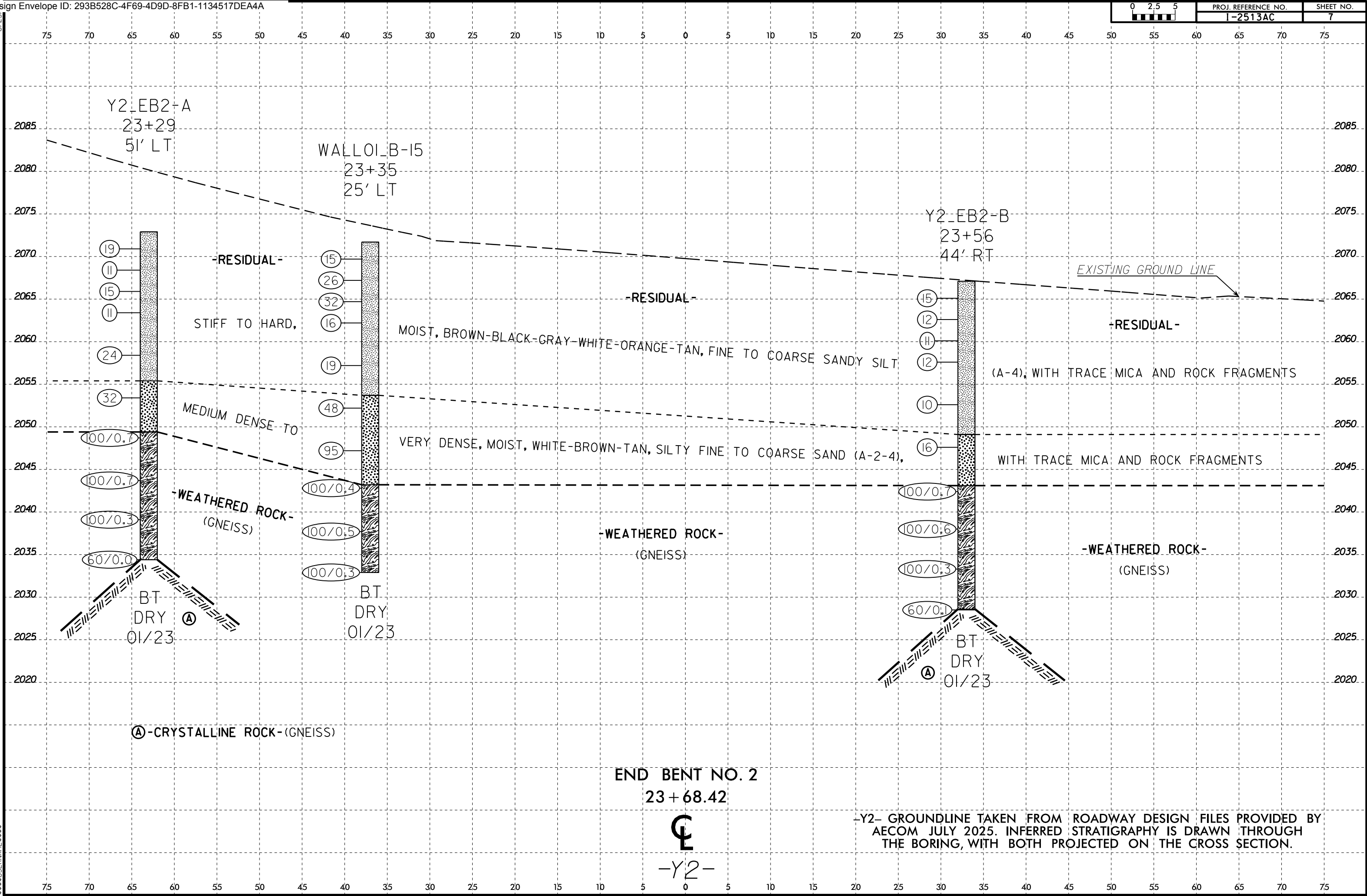
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-Y2-

Y2- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY AECOM JULY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.



25-JUL-2025 15:17
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Structures\CA00.GEOTECH\XSC\BROG242\12513AC.GEO.BROG242.XSI.dgn





8

WBS: 34165.1.13	TIP: I-2513AC	COUNTY: BUNCOMBE	GEOLOGIST: A. Blackmore	
SITE DESCRIPTION: BRIDGE NO. 242 ON NC 191 (BREVARD ROAD) OVER I-26/I-240				GROUND WTR (ft)
BORING NO.: WALL02_B-03	STATION: 21+85	OFFSET: 6 ft RT	ALIGNMENT: -Y2-	0 HR. 29.3
COLLAR ELEV.: 2,062.0 ft	TOTAL DEPTH: 34.8 ft	NORTHING: 679,506	EASTING: 931,226	24 HR. Dry

DRILL RIG/HAMMER EFF./DATE: ECS0888 CME-750X 93% 12/02/2022	DRILL METHOD: H.S. Augers	HAMMER TYPE: Automatic
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DRILLER: T. Cook	START DATE: 12/01/22	COMP. DATE: 12/01/22	SURFACE WATER DEPTH: N/A
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ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2065														
	2,061.0	1.0	6	10	12						M		GROUND SURFACE	0.0
2060	2,058.5	3.5	13	23	31						M		RESIDUAL Medium Dense to Very Dense, Brown-Tan, Silty Fine to Coarse SAND (A-2-4), with trace mica	
2055	2,056.0	6.0	11	9	12						M		Stiff to Hard, Brown, Fine to Coarse Sandy SILT (A-4), with trace mica	5.5
	2,053.5	8.5	30	19	48						M			
2050	2,048.5	13.5	22	8	7						M			
2045	2,043.5	18.5	16	30	37						M		Very Dense, Orange-Brown-Tan, Silty Fine to Coarse SAND (A-2-4), with trace rock fragments	18.0
2040	2,038.5	23.5	11	8	10						M		Very Stiff to Hard, Brown-Black, Fine to Coarse Sandy SILT (A-4), with little mica	23.0
2035	2,033.5	28.5	12	21	22									
2030	2,028.5	33.5	25	49	51/0.3									
	2,027.2												WEATHERED ROCK	34.0

NCDOT BORE DOUBLE | 2513AC GEO BRDG242 ECS.GPJ ECS GINT DATA-TEMPLATE.GDT 7/25/25



GEOTECHNICAL BORING REPORT
BORE LOG

WBS: 34165.1.13	TIP: I-2513AC	COUNTY: BUNCOMBE	GEOLOGIST: CHITTICK, N.
SITE DESCRIPTION: I-26 CONNECTOR (I-40 TO US 19 - 23 - 70 NORTH OF ASHEVILLE)			GROUND WTR (ft)
BORING NO.: EB1-B_Y2	STATION: 22+02	OFFSET: 46 ft RT	ALIGNMENT: -Y2-
COLLAR ELEV.: 2,061.9 ft	TOTAL DEPTH: 37.9 ft	NORTHING: 679,492	EASTING: 931,185
DRILL RIG/HAMMER EFF./DATE: TER373 DIEDRICH D-50 95% 02/06/2021		DRILL METHOD: Mud Rotary	HAMMER TYPE: Automatic
DRILLER: TURNAGE, J. R.	START DATE: 06/15/22	COMP. DATE: 06/15/22	SURFACE WATER DEPTH: N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
2065															
	2,060.9	1.0	5	5	5	10						M		2,061.9	GROUND SURFACE 0.0
2060	2,058.4	3.5	6	6	6	12						M	ROADWAY EMBANKMENT MEDIUM DENSE, BROWN, SILTY FINE SAND, TRACE ROOTS, TRACE MICA, MOIST (A-2-4)		
	2,055.9	6.0	5	6	9	15						M		2,055.9	6.0
2055	2,054.0	7.9	5	7	8	15						M	RESIDUAL MEDIUM DENSE, BROWN, SILTY FINE SAND, TRACE MICA, MOIST (A-2-5)		
2050	2,049.0	12.9	4	4	5	19						M	2,049.0	12.9	STIFF, TAN, BLACK, BROWN, FINE SANDY SILT, MOIST (A-4)
2045	2,044.0	17.9	3	5	6	11						M			
2040	2,039.0	22.9	9	11	17	28						M	2,039.0	22.9	MEDIUM DENSE TO VERY DENSE, BROWN, TAN, SITY FINE TO COARSE SAND, SOME MICA, MOIST (A-2-4)
2035	2,034.0	27.9	6	27	42	69						M			
2030	2,029.0	32.9	22	18	38	56						M			
2025	2,024.0	37.9	60	0	0	60				0.0			2,026.4	35.5	CRYSTALLINE ROCK (GNEISS)
													2,024.0	37.9	Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,024.0 ft IN CRYSTALLINE ROCK (GNEISS)
															CAVED DRY @ 34.0' TOPSOIL 3"

NC DOT BORE DOUBLE I-2513AC GEO_BROG242 ECS.GPJ ECS_GINT_DATA_TEMPLATE.GDT 7/25/25



I-2513AC

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WBS: 34165.1.13	TIP: I-2513AC	COUNTY: BUNCOMBE	GEOLOGIST: A. Blackmore	
SITE DESCRIPTION: BRIDGE NO. 242 ON NC 191 (BREVARD ROAD) OVER I-26/I-240				GROUND WTR (ft)
BORING NO.: Y2_B1-A	STATION: 22+50	OFFSET: 53 ft LT	ALIGNMENT: -Y2-	0 HR. N/A
COLLAR ELEV.: 2,060.7 ft	TOTAL DEPTH: 50.0 ft	NORTHING: 679,438	EASTING: 931,281	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE: ECS0888 CME 750X 93% 12/02/2022		DRILL METHOD: NW Casing W/SPT & Core		HAMMER TYPE: Automatic
DRILLER: T. Hibdon	START DATE: 07/10/23	COMP. DATE: 07/10/23	SURFACE WATER DEPTH: N/A	

CORE SIZE: NQ-2				TOTAL RUN: 21.5 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS		
					REC. (ft) %	ROD (ft) %		REC. (ft) %	ROD (ft) %			ELEV. (ft)	DEPTH (ft)
2032.2	2,032.2	28.5	1.5	0:52/1.0	(1.5)	(1.5)		(17.4)	(14.7)		Begin Coring @ 28.5 ft		
2030	2,030.7	30.0	5.0	0:32/0.5	100%	100%		99%	84%		2,032.2	CRYSTALLINE ROCK	28.5
				0:55/1.0	(5.0)	(3.9)						Slightly Weathered to Fresh, Moderately Hard to Very Hard, White-Gray-Green GNEISS, with Very Close to Wide Fracture Spacing	
				0:37/1.0								GSI = 65-70	
2025	2,025.7	35.0		0:54/1.0	100%	78%	RS-1					RS-1: 33.4' - 33.8'	
			5.0	0:49/1.0								Unit Weight = 166.8 pcf	
				1:03/1.0								Unconfined Compressive Strength = 5,750psi / 828	
2020	2,020.7	40.0		1:01/1.0	(5.0)	(4.0)							
			5.0	1:00/1.0	100%	80%	RS-2						
				1:04/1.0									
2015	2,015.7	45.0		0:57/1.0	(5.0)	(5.0)							
			5.0	0:58/1.0	100%	100%							
				1:05/1.0									
				1:02/1.0									
				1:10/1.0									
	2,014.7			0:53/1.0	(4.9)	(4.2)		(4.0)	(3.9)		2,014.7	Very Slightly Weathered, Hard, White METAGRAYWACKE, with Close to Moderately Close Fracture Spacing	46.0
				0:52/1.0	98%	84%		100%	98%				
				0:58/1.0									
	2,010.7	50.0		1:02/1.0							2,010.7	GSI = 80-85	50.0
				1:11/1.0								Boring Terminated at Elevation 2,010.7 ft In Crystalline Rock (METAGRAYWACKE)	

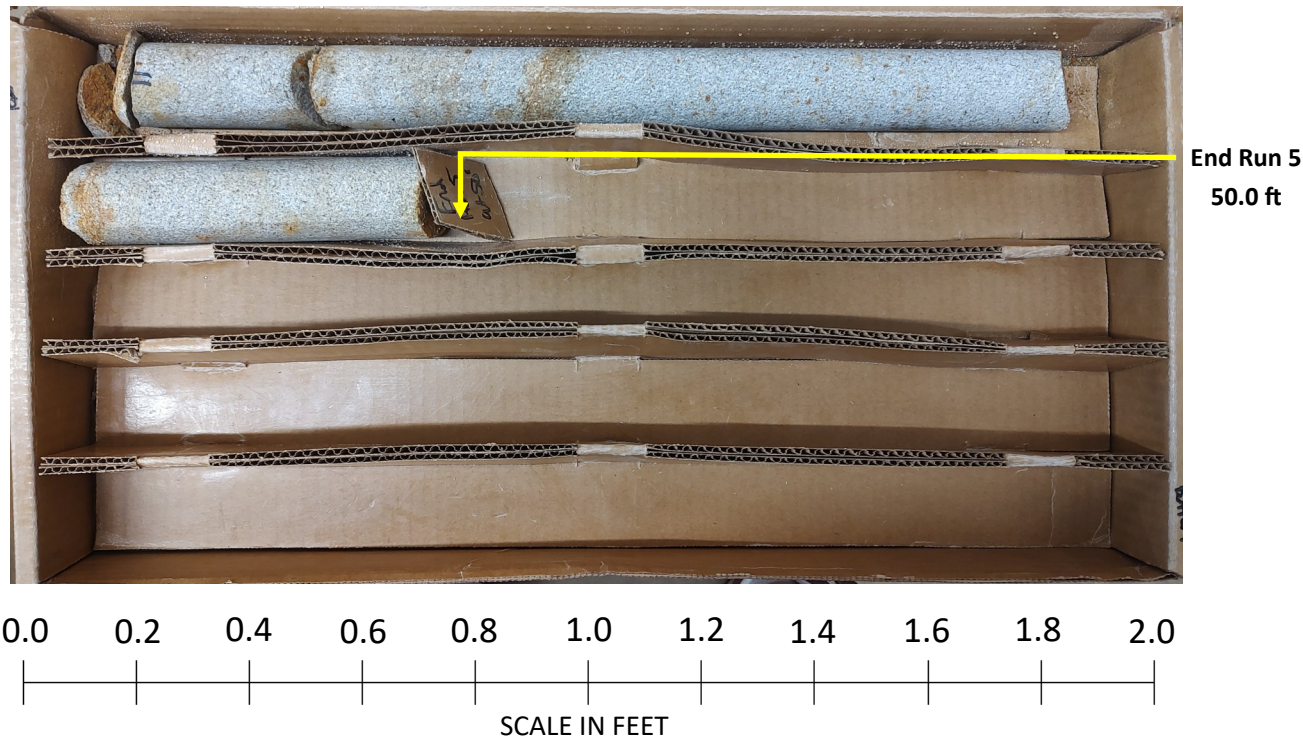
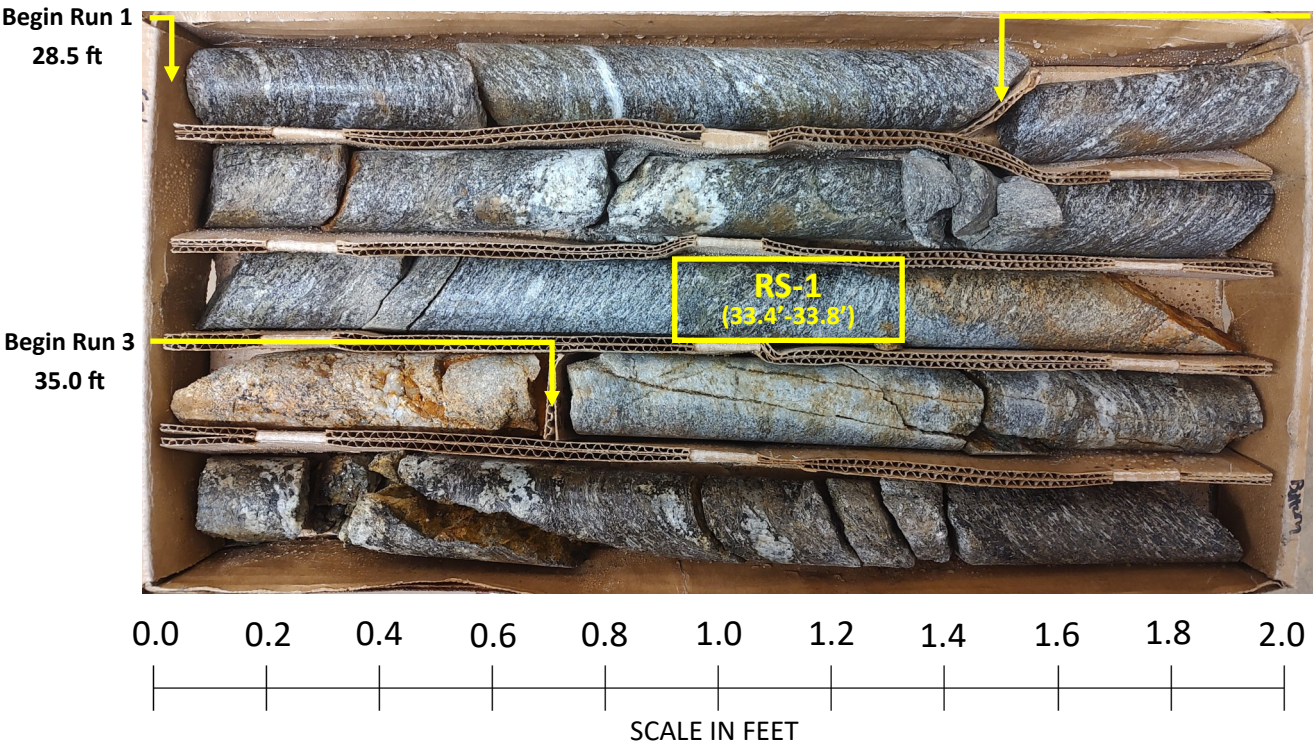


Bridge No. 242 on NC 191 (Brevard Road) over I-26/I-240

WBS - 34165 TIP No. I-2513AC

Rock Core Photographs: Boring - Y2_B1-A

Station: 22+50 Offset: 53' LT





I-2513AC

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WBS: 34165.1.13				TIP: I-2513AC				COUNTY: BUNCOMBE				GEOLOGIST: A. Blackmore					
SITE DESCRIPTION: BRIDGE NO. 242 ON NC 191 (BREVARD ROAD) OVER I-26/I-240												GROUND WTR (ft)					
BORING NO.: Y2_B1-C				STATION: 22+69				OFFSET: 8 ft LT				ALIGNMENT: -Y2-				0 HR.	N/A
COLLAR ELEV.: 2,060.8 ft				TOTAL DEPTH: 54.8 ft				NORTHING: 679,421				EASTING: 931,235				24 HR.	FIAD
DRILL RIG/HAMMER EFF./DATE: ECS0888 CME 750X 93% 12/02/2022								DRILL METHOD: NW Casing W/SPT & Core				HAMMER TYPE: Automatic					
DRILLER: T. Hibdon				START DATE: 07/10/23				COMP. DATE: 07/10/23				SURFACE WATER DEPTH: N/A					
CORE SIZE: NQ-2				TOTAL RUN: 21.2 ft													
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %		ROD (ft) %	SAMP. NO.	STRATA REC. (ft) %		ROD (ft) %	L O G	DESCRIPTION AND REMARKS				
													ELEV. (ft)	DEPTH (ft)			
2027.2													Begin Coring @ 33.6 ft				
2025	2,027.2	33.6	4.5	1:11/1.0 1:59/1.0 1:33/1.0 1:29/1.0	(3.7) 82%	(1.8) 40%			(19.9) 94%	(15.8) 75%		2,027.2	Moderate to Very Slightly Weathered, Hard, Gray-White-Brown GNEISS, with Very Close to Moderately Close Fracture Spacing	33.6			
	2,022.7	38.1		0:52/0.5								GSI = 65-70					
	2,021.0	39.8	1.7	1:32/1.0 0:43/0.7	(1.7) 100%	(1.7) 100%	RS-5					RS-5: 38.5' - 38.9' Unit Weight = 188.3 pcf Unconfined Compressive Strength = 6,600 psi / 951 k					
2020			5.0	1:04/1.0 1:06/1.0 2:07/1.0 1:29/1.0 2:25/1.0	(4.5) 90%	(3.5) 70%											
	2,016.0	44.8		2:27/1.0 3:08/1.0 2:53/1.0 2:00/1.0 1:58/1.0	(5.0) 100%	(4.3) 86%	RS-6										
2010	2,011.0	49.8		0:55/1.0 0:42/1.0 0:46/1.0 0:41/1.0 0:45/1.0	(5.0) 100%	(4.5) 90%											
			5.0														
	2,006.0	54.8												2,006.0	Boring Terminated at Elevation 2,006.0 ft In Crystalline Rock (GNEISS)	54.8	

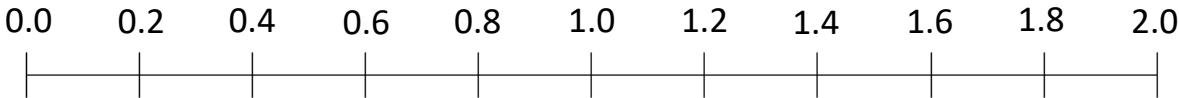


Bridge No. 242 on NC 191 (Brevard Road) over I-26/I-240

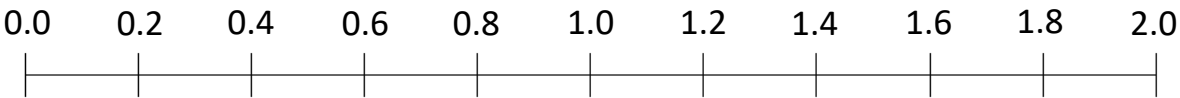
WBS - 34165 TIP No. I-2513AC

Rock Core Photographs: Boring - Y2_B1-C

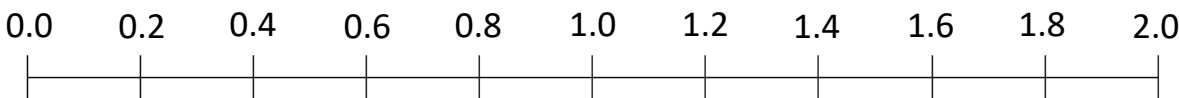
Station: 22+69 Offset: 8' LT



SCALE IN FEET



SCALE IN FEET



SCALE IN FEET



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WBS: 34165.1.13					TIP: I-2513AC			COUNTY: BUNCOMBE			GEOLOGIST: A. West							
SITE DESCRIPTION: BRIDGE NO. 242 ON NC 191 (BREVARD ROAD) OVER I-26/I-240													GROUND WTR (ft)					
BORING NO.: Y2_B1-B				STATION: 22+89				OFFSET: 40 ft RT				ALIGNMENT: -Y2-			0 HR.	N/A		
COLLAR ELEV.: 2,060.7 ft				TOTAL DEPTH: 69.0 ft				NORTHING: 679,404				EASTING: 931,186			24 HR.	FIAD		
DRILL RIG/HAMMER EFF./DATE: ECS3518 CME 750X 96% 07/21/2022								DRILL METHOD: NW Casing W/SPT & Core				HAMMER TYPE: Automatic						
DRILLER: W. King				START DATE: 07/10/23				COMP. DATE: 07/11/23				SURFACE WATER DEPTH: N/A						
CORE SIZE: NQ-2				TOTAL RUN: 20.0 ft														
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) RQD (ft) %		SAMP. NO.	STRATA REC. (ft) RQD (ft) %		L O G	DESCRIPTION AND REMARKS					DEPTH (ft)		
											ELEV. (ft)							
2011.7											Begin Coring @ 49.0 ft							
2010	2,011.7	49.0	5.0	0:55/1.0 0:52/1.0 0:58/1.0 1:02/1.0 1:08/1.0	(4.4) 88%	(2.2) 44%		(4.4) 88%	(2.2) 44%		2,011.7	CRYSTALLINE ROCK Moderate to Slightly Weathered, Hard, Gray-White METAGRAYWACKE, with Very Close to Close Fracture Spacing					49.0	
	2,006.7	54.0		1:03/1.0 0:56/1.0 1:38/1.0 1:40/1.0 1:29/1.0	(5.0) 100%	(3.3) 66%		(15.0) 100%	(11.9) 79%		2,006.7	GSI = 35-40					54.0	
2005			5.0	1:03/1.0 0:56/1.0 1:38/1.0 1:40/1.0 1:29/1.0	(5.0) 100%	(3.3) 66%	RS-3	(15.0) 100%	(11.9) 79%		CRYSTALLINE ROCK Moderately Weathered to Fresh, Hard to Very Hard, Gray-White GNEISS, with Very Close to Moderately Close Fracture Spacing							
	2,001.7	59.0		2:02/1.0 1:58/1.0 1:30/1.0 1:45/1.0 1:36/1.0	(5.0) 100%	(4.3) 86%					GSI = 60-65							
2000			5.0	2:02/1.0 2:02/1.0 2:10/1.0 1:50/1.0 2:32/1.0	(5.0) 100%	(4.3) 86%	RS-4				RS-3: 54.7' - 55.1' Unit Weight = 163.0 pcf Unconfined Compressive Strength = 2,290 psi / 330 k							
	1,996.7	64.0																
1995			5.0															
	1,991.7	69.0										1,991.7	Boring Terminated at Elevation 1,991.7 ft In Crystalline Rock (GNEISS)					69.0

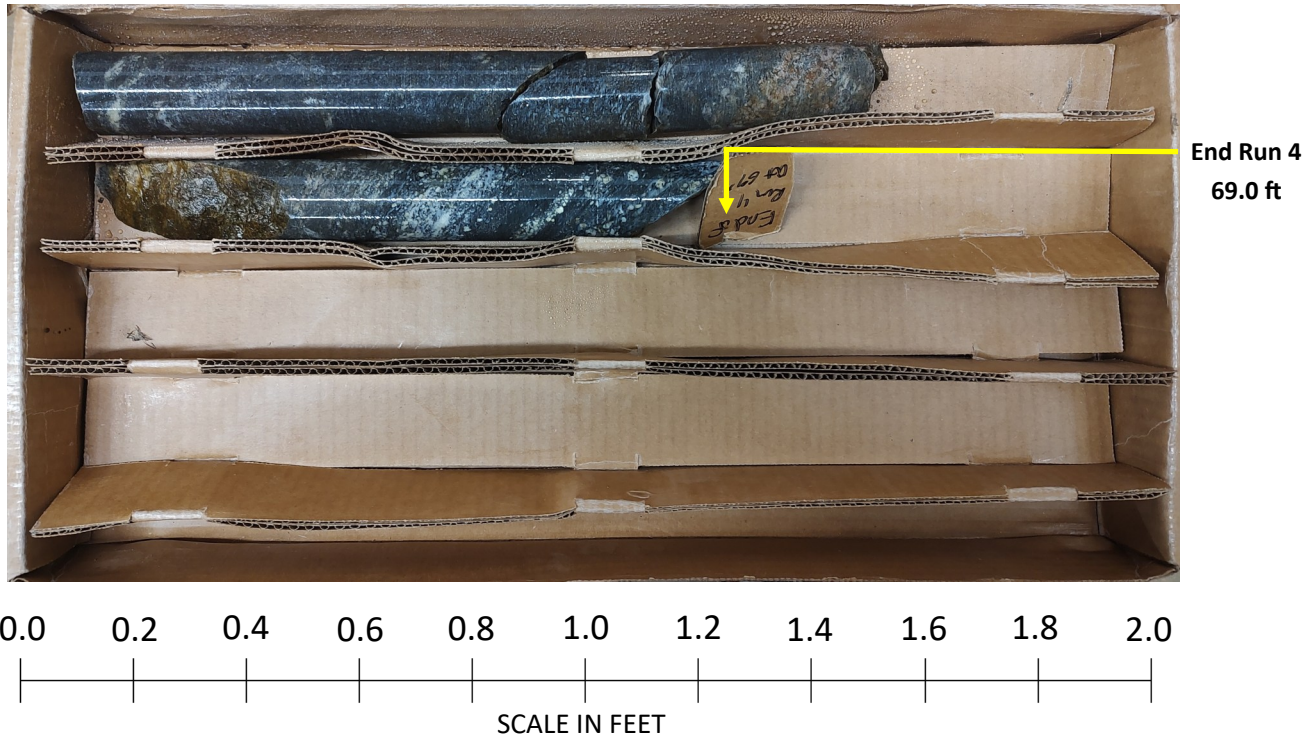
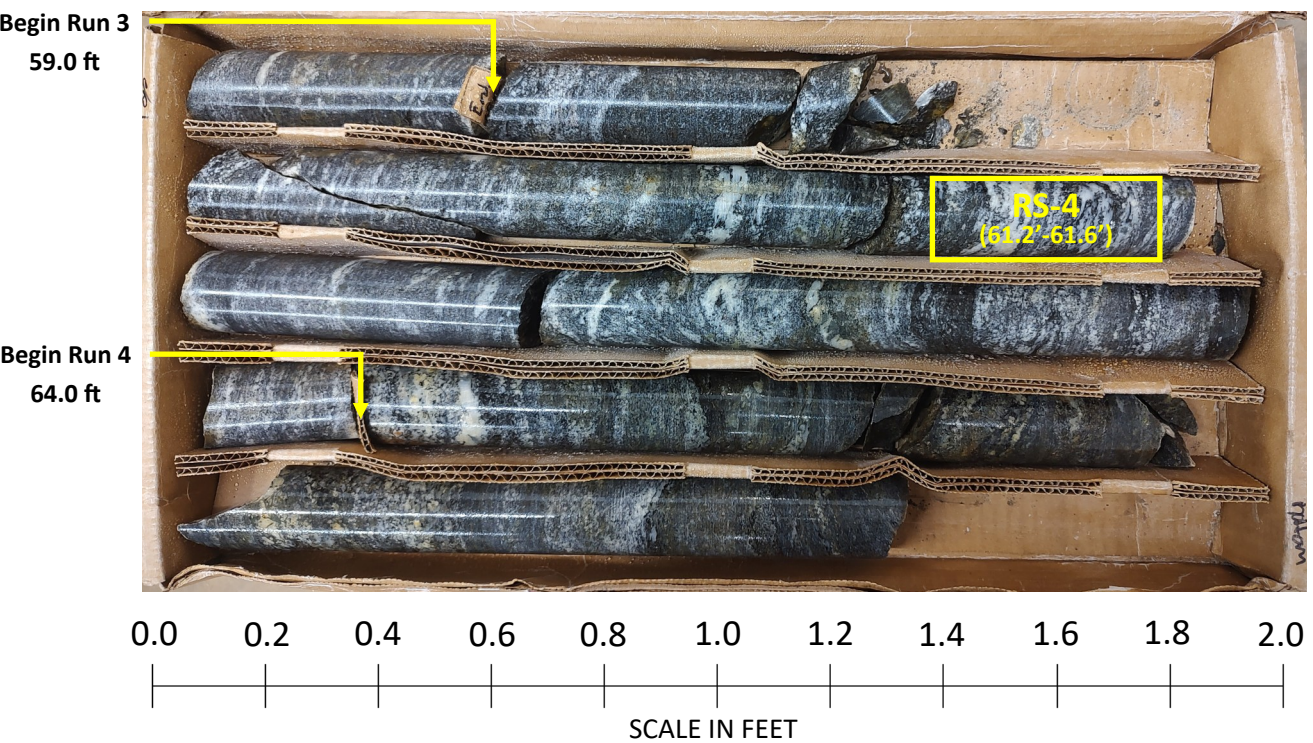
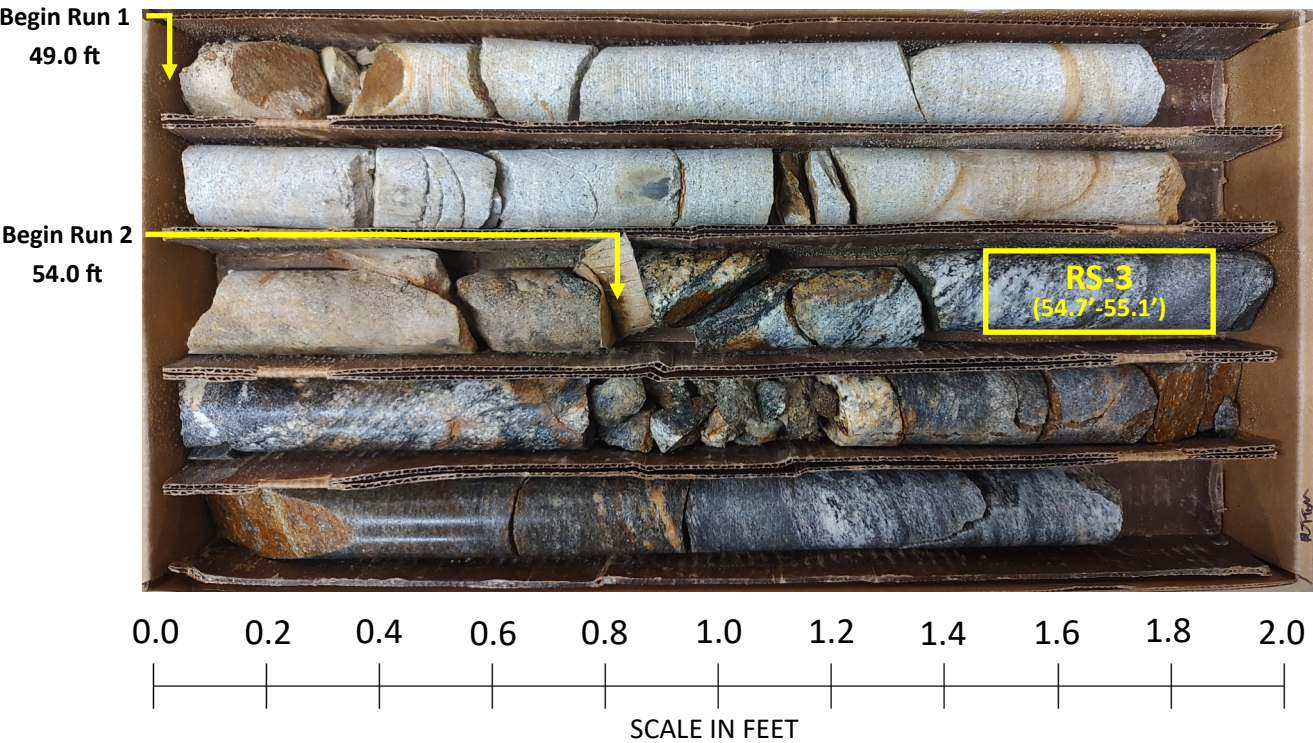


Bridge No. 242 on NC 191 (Brevard Road) over I-26/I-240

WBS - 34165 TIP No. I-2513AC

Rock Core Photographs: Boring - Y2_B1-B

Station: 22+89 Offset: 40' RT





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WBS: 34165.1.13	TIP: I-2513AC	COUNTY: BUNCOMBE	GEOLOGIST: A. Blackmore	
SITE DESCRIPTION: BRIDGE NO. 242 ON NC 191 (BREVARD ROAD) OVER I-26/I-240				GROUND WTR (ft)
BORING NO.: WALL01_B-15	STATION: 23+35	OFFSET: 25 ft LT	ALIGNMENT: -Y2-	0 HR. Dry
COLLAR ELEV.: 2,071.7 ft	TOTAL DEPTH: 38.8 ft	NORTHING: 679,354	EASTING: 931,248	24 HR. Dry

DRILL RIG/HAMMER EFF./DATE: GEO366 Diedrich D-50 80% 03/18/2022	DRILL METHOD: H.S. Augers	HAMMER TYPE: Automatic
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DRILLER: J. Messick	START DATE: 01/26/23	COMP. DATE: 01/26/23	SURFACE WATER DEPTH: N/A
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[illegible]

Boring Terminated with Standard Penetration
Test Refusal at Elevation 2,034.4 ft On
Crystalline Rock (GNEISS)

Boring Terminated at Elevation 2,032.9 ft In
Weathered Rock (GNEISS)

Surficial Organic Soil 0.0 to 0.3 feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS: 34165.1.13	TIP: I-2513AC	COUNTY: BUNCOMBE	GEOLOGIST: A. Blackmore
SITE DESCRIPTION: BRIDGE NO. 242 ON NC 191 (BREVARD ROAD) OVER I-26/I-240			
BORING NO.: Y2_EB2-B	STATION: 23+56	OFFSET: 44 ft RT	ALIGNMENT: -Y2-
COLLAR ELEV.: 2,067.1 ft	TOTAL DEPTH: 38.6 ft	NORTHING: 679,338	EASTING: 931,178
DRILL RIG/HAMMER EFF./DATE: GEO366 Diedrich D-50 80% 03/18/2022		DRILL METHOD: H.S. Augers	HAMMER TYPE: Automatic
DRILLER: J. Messick	START DATE: 01/25/23	COMP. DATE: 01/25/23	SURFACE WATER DEPTH: N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
2070															
														2,067.1	0.0
														GROUND SURFACE	
2065	2,066.1	1.0	5	6	9							M		RESIDUAL	
														Stiff, Brown-Tan-Orange-Gray, Fine to	
	2,063.6	3.5	7	7	5							M		Coarse Sandy SILT (A-4), with trace mica	
2060	2,061.1	6.0	5	6	5							M			
	2,058.6	8.5	5	5	7							M			
2055															
	2,053.6	13.5	4	5	5							M			
2050															
	2,048.6	18.5	4	7	9							M		2,049.1	18.0
2045														Medium Dense, Tan-White-Brown, Silty Fine	
	2,043.6	23.5	19	73	27/0.2									to Coarse SAND (A-2-4)	
2040														2,043.1	24.0
	2,038.6	28.5	76	24/0.1										WEATHERED ROCK	
2035														Gray (GNEISS)	
	2,033.6	33.5	100/0.3												
2030															
	2,028.6	38.5	60/0.1											2,028.6	38.5
														CRYSTALLINE ROCK	
														(GNEISS)	
														Boring Terminated with Standard Penetration	
														Test Refusal at Elevation 2,028.5 ft In	
														Crystalline Rock (GNEISS)	
														Suficial Organic Soil 0.0 to 0.3 feet	

NC DOT BORE DOUBLE I-2513AC_GEO_BRDG242_ECS.GPJ ECS_GINT_DATA_TEMPLATE.GDT 7/25/25

ROCK TEST RESULTS												
<i>BORING ID.</i>	<i>SAMPLE NO.</i>	<i>ALIGN.</i>	<i>STATION</i>	<i>OFFSET</i>	<i>EASTING (US FT.)</i>	<i>NORTHING (US FT.)</i>	<i>DEPTH INTERVAL</i>	<i>RUN REC (%)</i>	<i>RUN RQD (%)</i>	<i>ROCK TYPE</i>	<i>UNIT WEIGHT (LB/FT3)</i>	<i>UNCONFINED COMPRESSIVE STRENGTH (PSI/KSF)</i>
Y2_B1-A	RS-1	-Y2-	22+50	41' LT	931,269	679,439	33.4-33.8	100	78	Muscovite-Biotite Gneiss	166.8	5,750 psi / 828 ksf
Y2_B1-A	RS-2	-Y2-	22+50	41' LT	931,269	679,439	38.8-39.2	100	80	Muscovite-Biotite Gneiss	175.9	4,360 psi / 628 ksf
Y2_B1-B	RS-3	-Y2-	22+91	41' RT	931,185	679,403	54.7-55.1	100	66	Muscovite-Biotite Gneiss	163.0	2,290 psi / 330 ksf
Y2_B1-B	RS-4	-Y2-	22+91	41' RT	931,185	679,403	61.2-61.6	100	86	Muscovite-Biotite Gneiss	168.6	7,630 psi / 1,099 ksf
Y2_B1-C	RS-5	-Y2-	22+70	CL	931,227	679,421	38.5-38.9	100	100	Muscovite-Biotite Gneiss	188.3	6,600 psi / 951 ksf
Y2_B1-C	RS-6	-Y2-	22+70	CL	931,227	679,421	45.2-45.6	100	86	Muscovite-Biotite Gneiss	181.3	3,590 psi / 517 ksf

RS = NQ2 Rock Core Barrel Sample (ASTM D-2113)

SITE PHOTOGRAPHS



PHOTO 1: VIEW FROM PROPOSED BRIDGE 242 AT END BENT 2, FACING NORTH-NORTHEAST



PHOTO 2: VIEW FROM PROPOSED BRIDGE 242 AT END BENT 1, FACING SOUTH-SOUTHWEST



PHOTO 3: VIEW FROM PROPOSED BRIDGE 242 ALONG I-26/I-240 (-L-), FACING DOWNSTATION



PHOTO 4: VIEW FROM PROPOSED BRIDGE 242 ALONG I-26/I-240 (-L-), FACING UPSTATION