

REFERENCE: B-4407

PROJECT: 38356

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY ANSON

PROJECT DESCRIPTION REPLACE BRIDGE NO 70 OVER
ROCKY RIVER ON US 52

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N.C.	B-4407	1	31

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

J. GARRICK

A. SUTTLE

HPC

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INVESTIGATED BY ECS SOUTHEAST, LLP

DRAWN BY K. DE MONTBRUN, P.E.

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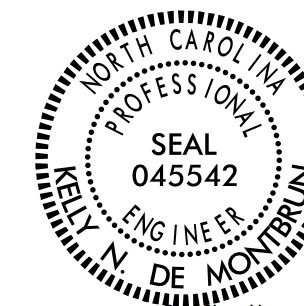
SUBMITTED BY ECS SOUTHEAST, LLP

DATE OCTOBER 2019

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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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</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 (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. 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 IN 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 (SRC.) - 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>																																																																																																																																																									
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1-a</th> <th>A-1-b</th> <th>A-3</th> <th>A-2-4</th> <th>A-2-5</th> <th>A-2-6</th> <th>A-2-7</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7-a</th> <th>A-7-b</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> </tr> <tr> <td>GROUP CLASS.</td> <td colspan="5">[Symbol]</td> <td colspan="5">[Symbol]</td> <td colspan="5">[Symbol]</td> </tr> <tr> <td>SYMBOL</td> <td colspan="5">[Symbol]</td> <td colspan="5">[Symbol]</td> <td colspan="5">[Symbol]</td> </tr> <tr> <td>% PASSING #10 #40 #200</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> </tr> <tr> <td>MATERIAL PASSING #40 LL PI</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> </tr> <tr> <td>GROUP INDEX</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> <td colspan="5">[Table]</td> </tr> <tr> <td>GEN. RATING AS SUBGRADE</td> <td colspan="5">EXCELLENT TO GOOD</td> <td colspan="5">FAIR TO POOR</td> <td colspan="5">FAIR TO POOR, POOR, UNSUITABLE</td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-a	A-7-b	A-1, A-2	A-3	A-4, A-5	A-6, A-7	GROUP CLASS.	[Symbol]					[Symbol]					[Symbol]					SYMBOL	[Symbol]					[Symbol]					[Symbol]					% PASSING #10 #40 #200	[Table]					[Table]					[Table]					MATERIAL PASSING #40 LL PI	[Table]					[Table]					[Table]					GROUP INDEX	[Table]					[Table]					[Table]					USUAL TYPES OF MAJOR MATERIALS	[Table]					[Table]					[Table]					GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD					FAIR TO POOR					FAIR TO POOR, POOR, UNSUITABLE					<p>ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>										<p>WEATHERING</p> <p>FRESH</p> <p>VERY SLIGHT (V SL.)</p> <p>SLIGHT (SL.)</p> <p>MODERATE (MOD.)</p> <p>MODERATELY SEVERE (MOD. SEV.)</p> <p>SEVERE (SEV.)</p> <p>VERY SEVERE (V SEV.)</p> <p>COMPLETE</p>									
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<p>SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td rowspan="2">LL - LIQUID LIMIT PL - PLASTIC LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td rowspan="2">OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>										SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL - LIQUID LIMIT PL - PLASTIC LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	<p>ABBREVIATIONS</p> <p>AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL. - HIGHLY</p> <p>MED. - MEDIUM MICA. - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY</p> <p>VST - VANE SHEAR TEST WEA. - WEATHERED γ_u - UNIT WEIGHT γ_d - DRY UNIT WEIGHT</p> <p>SAMPLE ABBREVIATIONS</p> <p>S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p>																																																																																																																																																																
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<p>COLOR</p> <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>FRACTURE SPACING</p> <table border="1"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table>										TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FOOT	VERY CLOSE	LESS THAN 0.16 FEET	<p>BEDDING</p> <table border="1"> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table>										TERM	THICKNESS	VERY THICKLY BEDDED	4 FEET	THICKLY BEDDED	1.5 - 4 FEET	THINLY BEDDED	0.16 - 1.5 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	THINLY LAMINATED	< 0.008 FEET																																																																																																																																
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<p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE</p> <p>MODERATELY INDURATED</p> <p>INDURATED</p> <p>EXTREMELY INDURATED</p>										<p>NOTES:</p> <p>EXISTING GROUND SURFACE INFORMATION PROVIDED BY NCDOT ON JULY 1, 2019.</p>																																																																																																																																																																													
<p>ELEVATION: 222.78 FEET</p>										<p>DATE: 8-15-14</p>																																																																																																																																																																													

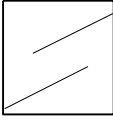
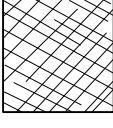
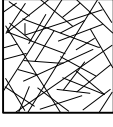

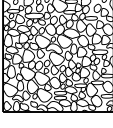
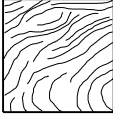
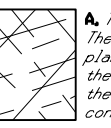


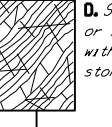
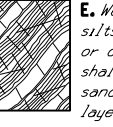
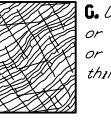
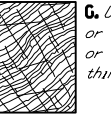
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

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)

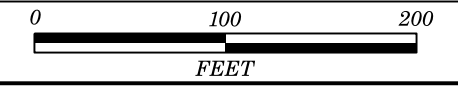
<p>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</p> <p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. 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>	<p>SURFACE CONDITIONS</p> <p>VERY GOOD Very rough, fresh unweathered surfaces</p> <p>GOOD Rough, slightly weathered, iron stained surfaces</p> <p>FAIR Smooth, moderately weathered and altered surfaces</p> <p>POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments</p> <p>VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings</p> <p align="center">DECREASING SURFACE QUALITY →</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>SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)</p> <p>VERY GOOD - Very Rough, fresh unweathered surfaces</p> <p>GOOD - Rough, slightly weathered surfaces</p> <p>FAIR - Smooth, moderately weathered and altered surfaces</p> <p>POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments</p> <p>VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings</p>	
<p>DECREASING INTERLOCKING OF ROCK PIECES</p> <p>↓</p> <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>	<p align="center">90 80 70 60 50 40 30 20 10</p> <p align="center">N/A N/A</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>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.</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>	<p align="center">70 60 50 40 30 20 10</p> <p align="center">A B C D E F G H</p>

R = 3390.00
SE = .04
Ds = 60 mph

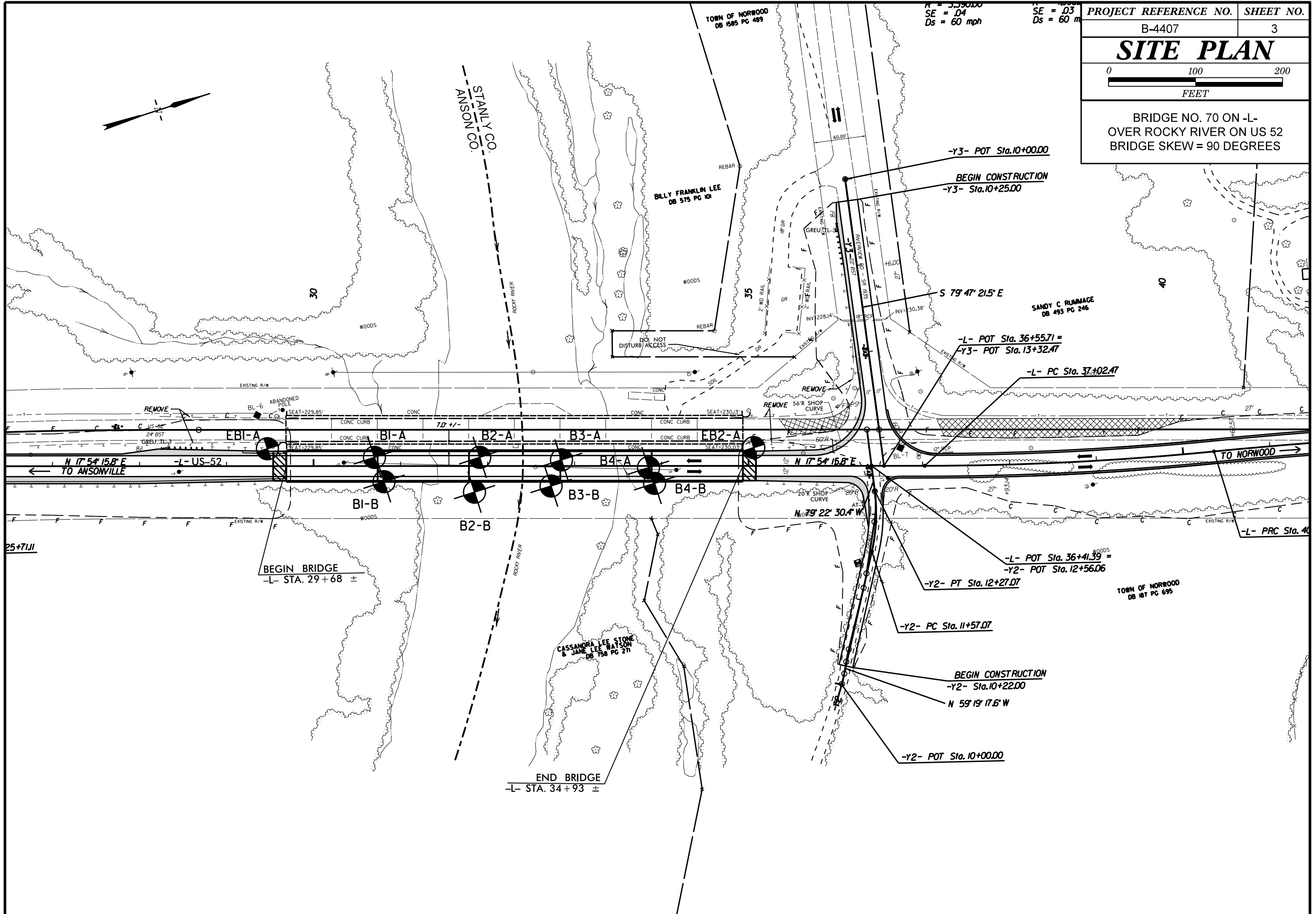
R = 3390.00
SE = .03
Ds = 60 mph

PROJECT REFERENCE NO.	SHEET NO.
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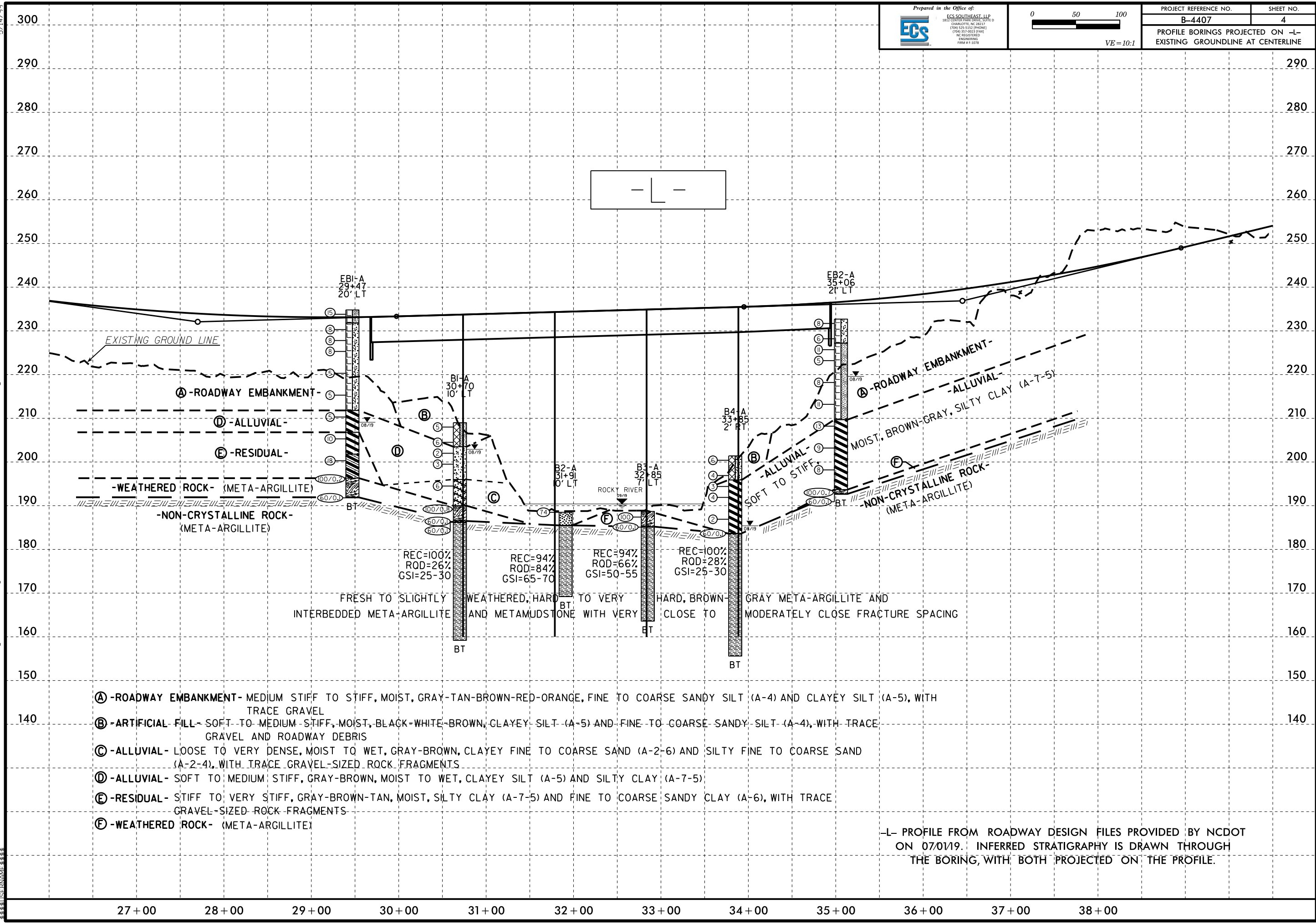
SITE PLAN



BRIDGE NO. 70 ON -L-
OVER ROCKY RIVER ON US 52
BRIDGE SKEW = 90 DEGREES



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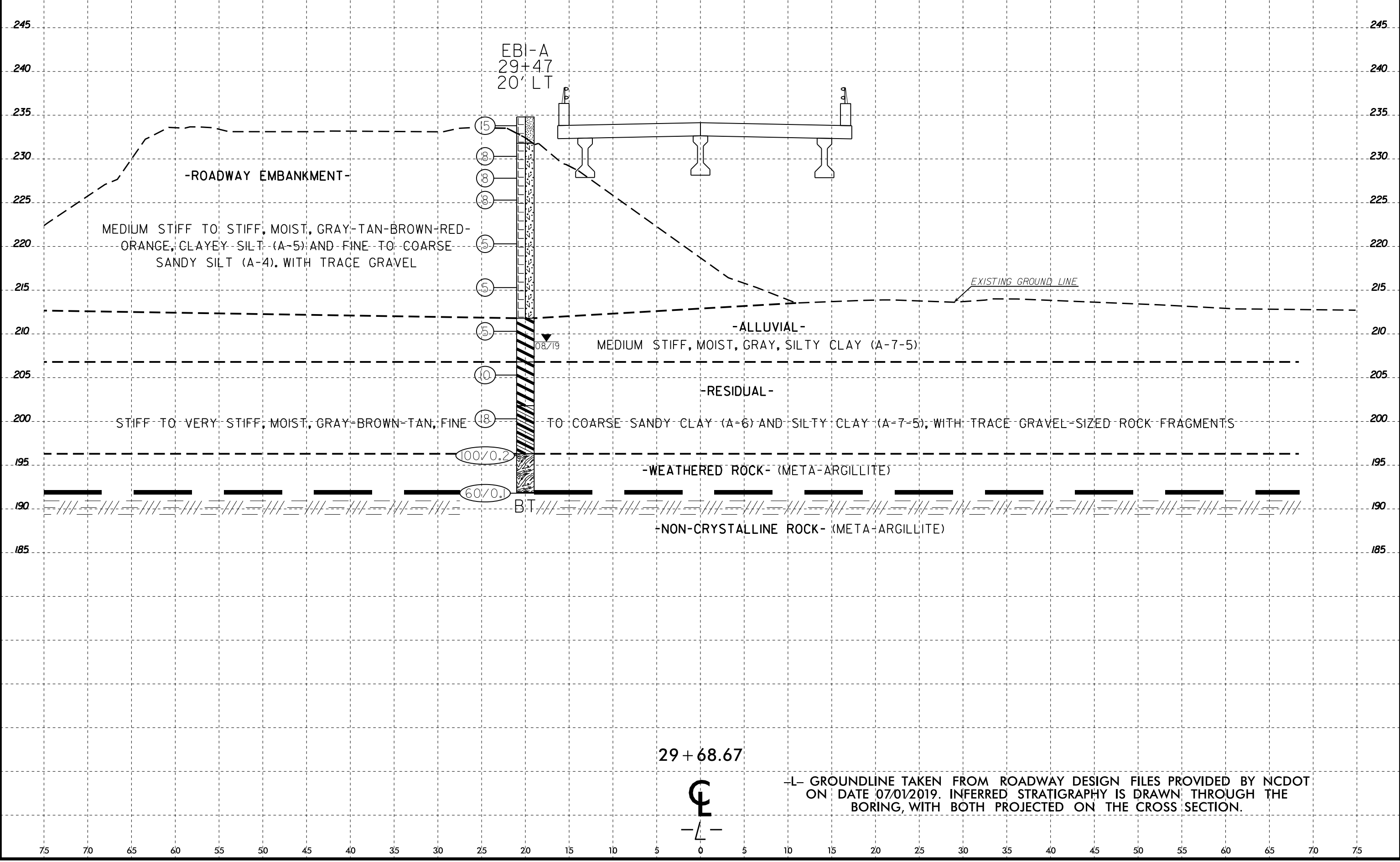


- Ⓐ -ROADWAY EMBANKMENT- MEDIUM STIFF TO STIFF, MOIST, GRAY-TAN-BROWN-RED-ORANGE, FINE TO COARSE SANDY SILT (A-4) AND CLAYEY SILT (A-5), WITH TRACE GRAVEL
- Ⓑ -ARTIFICIAL FILL- SOFT TO MEDIUM STIFF, MOIST, BLACK-WHITE-BROWN, CLAYEY SILT (A-5) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL AND ROADWAY DEBRIS
- Ⓒ -ALLUVIAL- LOOSE TO VERY DENSE, MOIST TO WET, GRAY-BROWN, CLAYEY FINE TO COARSE SAND (A-2-6) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS
- Ⓓ -ALLUVIAL- SOFT TO MEDIUM STIFF, GRAY-BROWN, MOIST TO WET, CLAYEY SILT (A-5) AND SILTY CLAY (A-7-5)
- Ⓔ -RESIDUAL- STIFF TO VERY STIFF, GRAY-BROWN-TAN, MOIST, SILTY CLAY (A-7-5) AND FINE TO COARSE SANDY CLAY (A-6), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS
- Ⓕ -WEATHERED ROCK- (META-ARGILLITE)

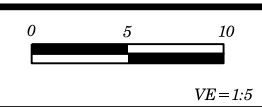
REC=100% ROD=26% GSI=25-30
 FRESH TO SLIGHTLY WEATHERED, HARD INTERBEDDED META-ARGILLITE
 REC=94% ROD=84% GSI=65-70
 WEATHERED, HARD TO VERY HARD, BROWN CLOSE TO
 REC=94% ROD=66% GSI=50-55
 GRAY META-ARGILLITE AND MODERATELY CLOSE FRACTURE SPACING
 REC=100% ROD=28% GSI=25-30

27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00

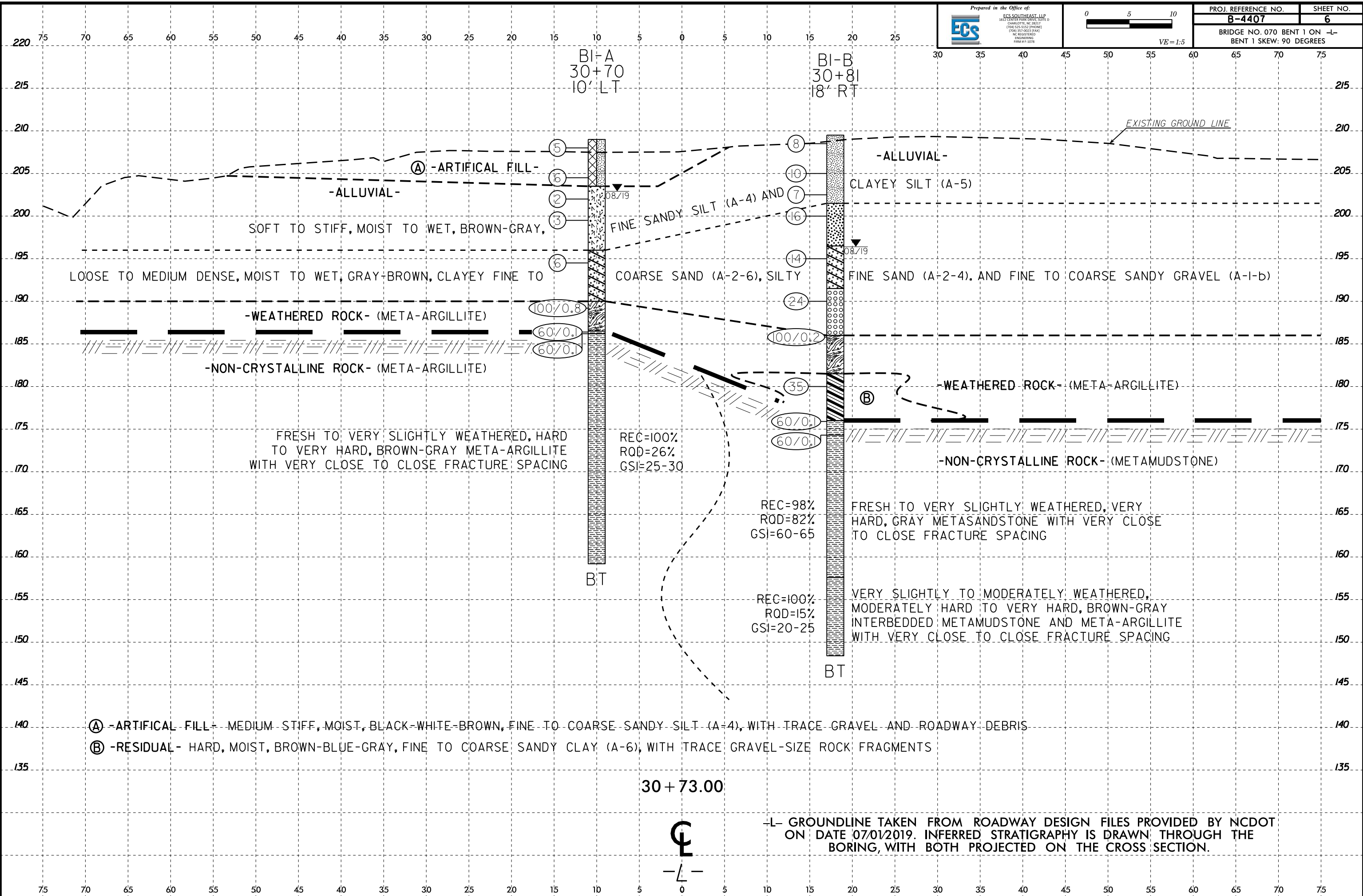
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\$\$\$\$SUBSERIALNAME\$\$\$\$



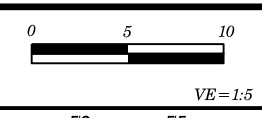
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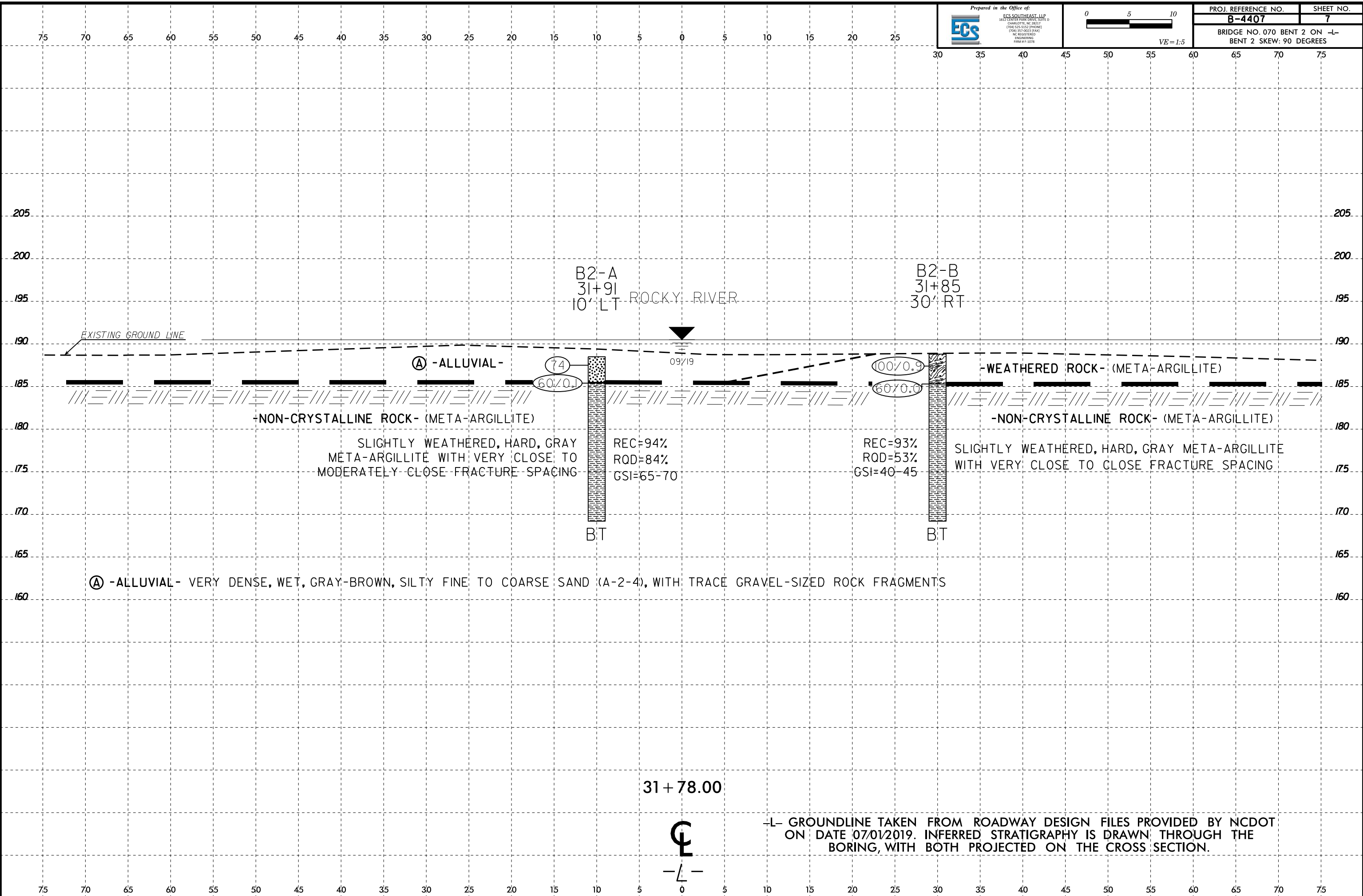
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BRIDGE NO. 070 BENT 1 ON -L- BENT 1 SKEW: 90 DEGREES	



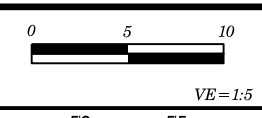
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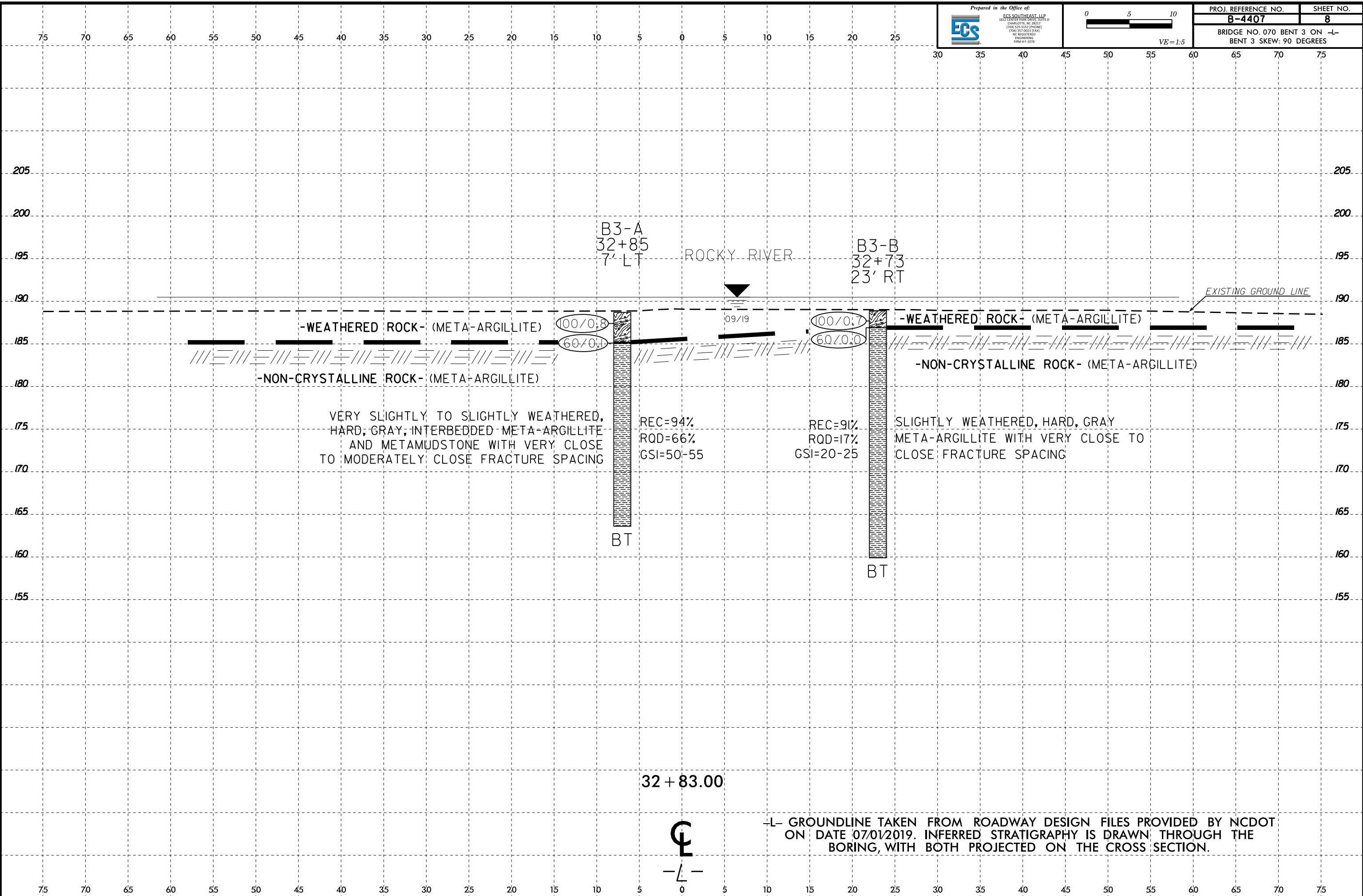
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BRIDGE NO. 070 BENT 2 ON -L- BENT 2 SKEW: 90 DEGREES	



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\$\$\$\$SUBSERIALNAME\$\$\$\$



PROJ. REFERENCE NO.	SHEET NO.
B-4407	8
BRIDGE NO. 070 BENT 3 ON -L- BENT 3 SKEW: 90 DEGREES	



B3-A
32+85
7' LT

ROCKY RIVER

B3-B
32+73
23' RT

EXISTING GROUND LINE

-WEATHERED ROCK- (META-ARGILLITE)

-NON-CRYSTALLINE ROCK- (META-ARGILLITE)

VERY SLIGHTLY TO SLIGHTLY WEATHERED,
HARD, GRAY, INTERBEDDED META-ARGILLITE
AND METAMUDSTONE WITH VERY CLOSE
TO MODERATELY CLOSE FRACTURE SPACING

REC=94%
RQD=66%
GSI=50-55

BT

REC=91%
RQD=17%
GSI=20-25

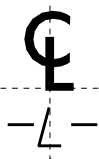
BT

-WEATHERED ROCK- (META-ARGILLITE)

-NON-CRYSTALLINE ROCK- (META-ARGILLITE)

SLIGHTLY WEATHERED, HARD, GRAY
META-ARGILLITE WITH VERY CLOSE TO
CLOSE FRACTURE SPACING

32 + 83.00

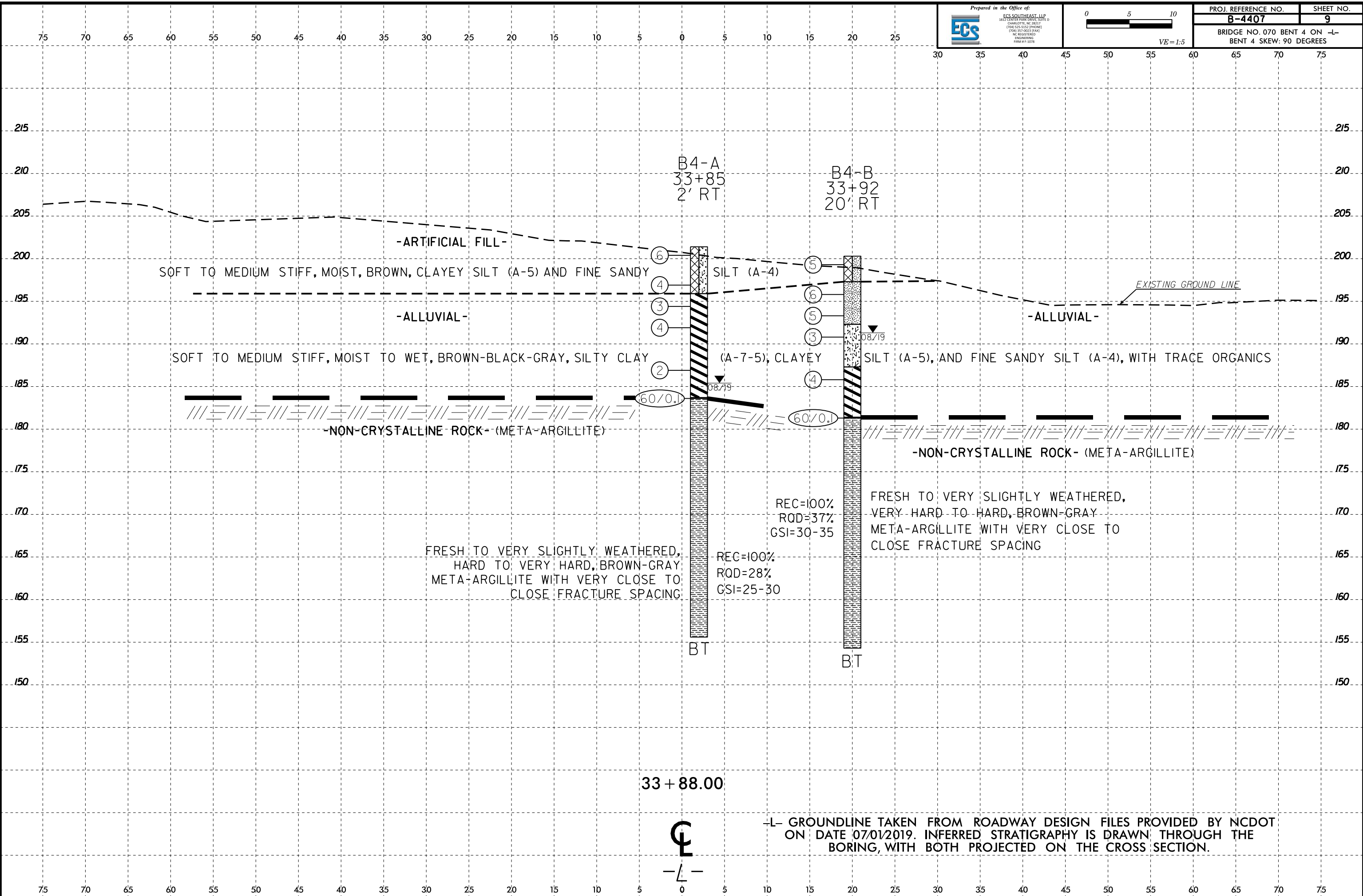


-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT
ON DATE 07/01/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE
BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

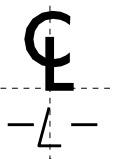
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 \$\$\$SUBENAME\$\$\$



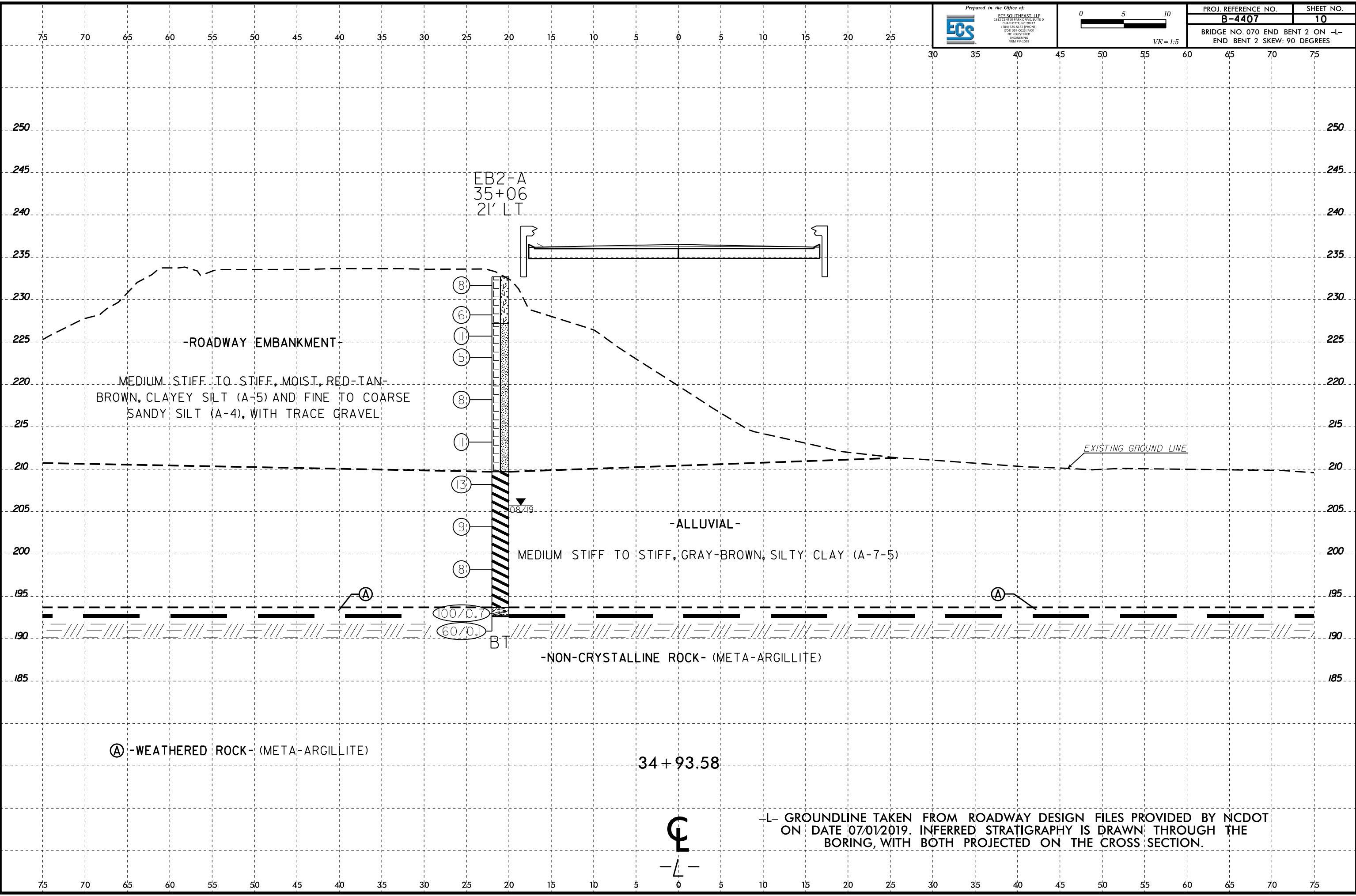
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B-4407	9
BRIDGE NO. 070 BENT 4 ON -L- BENT 4 SKEW: 90 DEGREES	



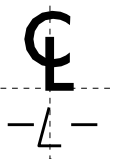
-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON DATE 07/01/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.



17-OCT-2019 14:23
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 \$\$\$SUBSERIALNAME\$\$\$



34 + 93.58



L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON DATE 07/01/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

GEOTECHNICAL BORING REPORT BORE LOG

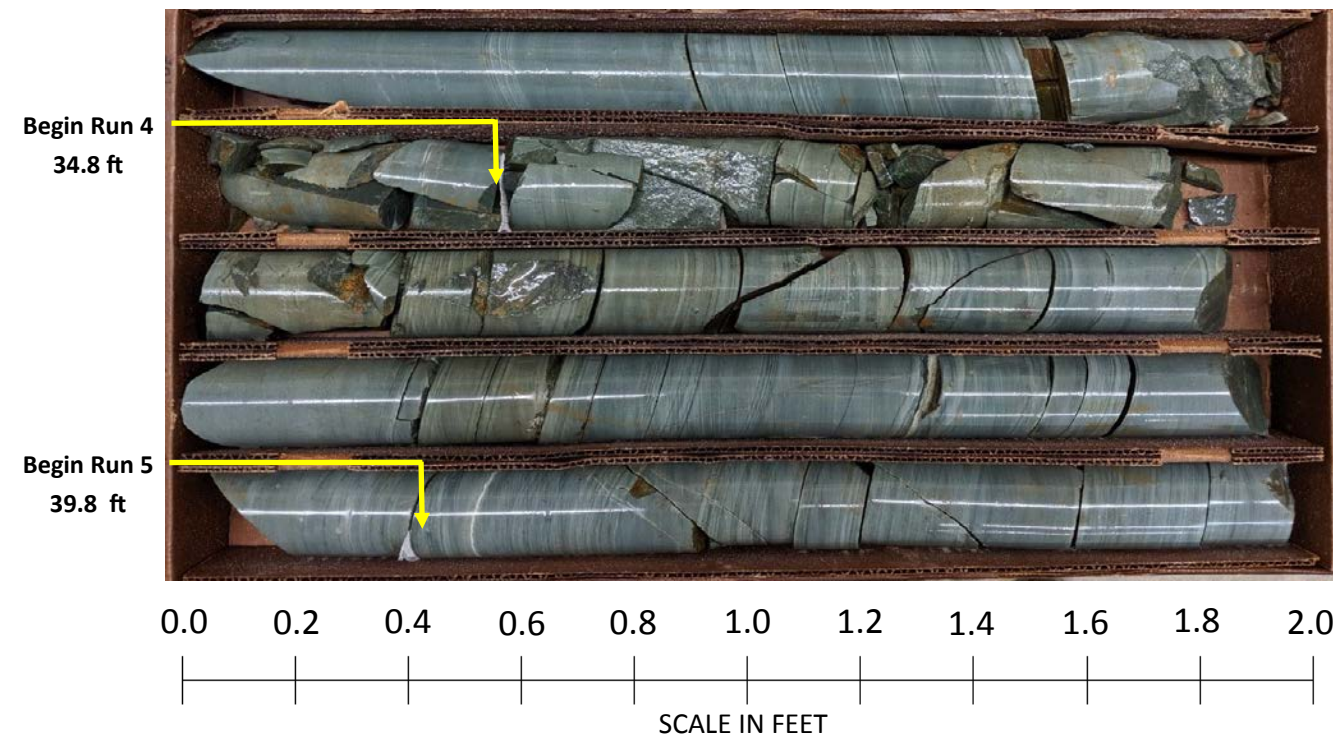
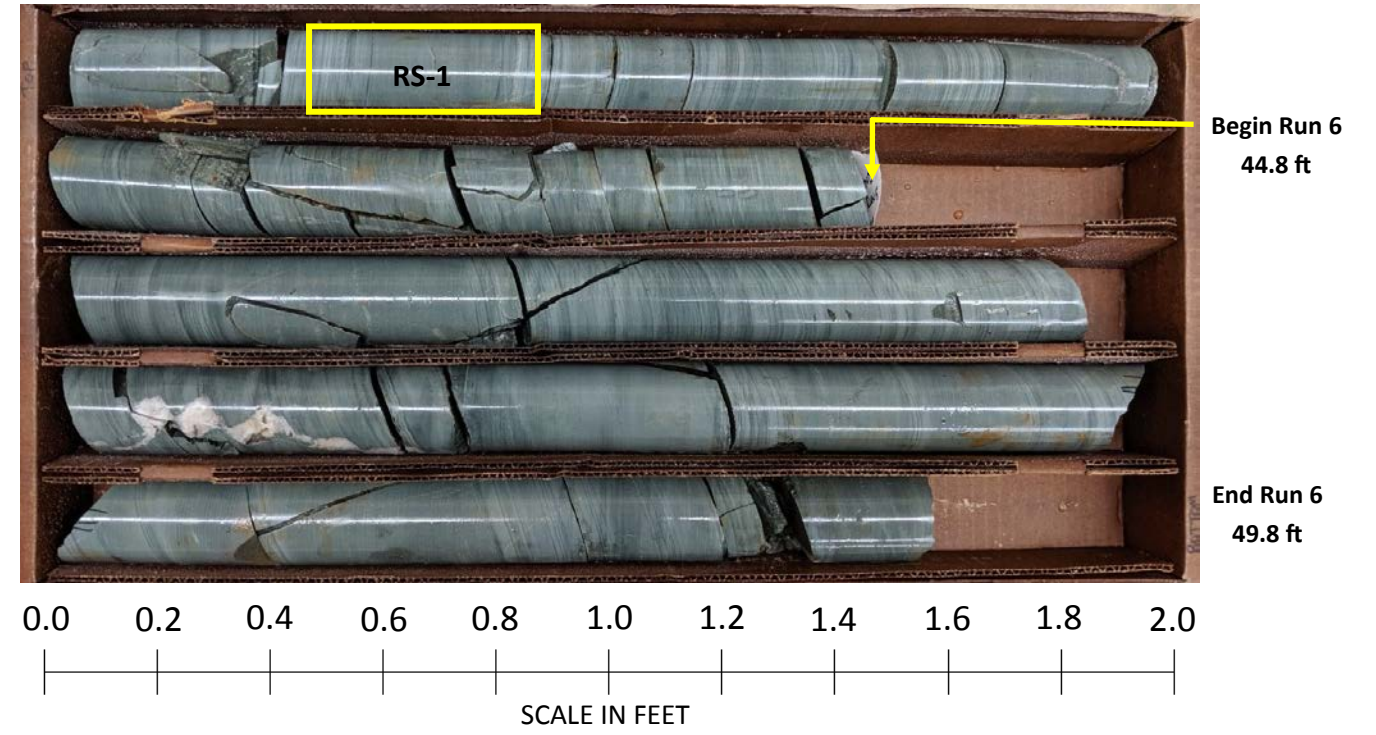
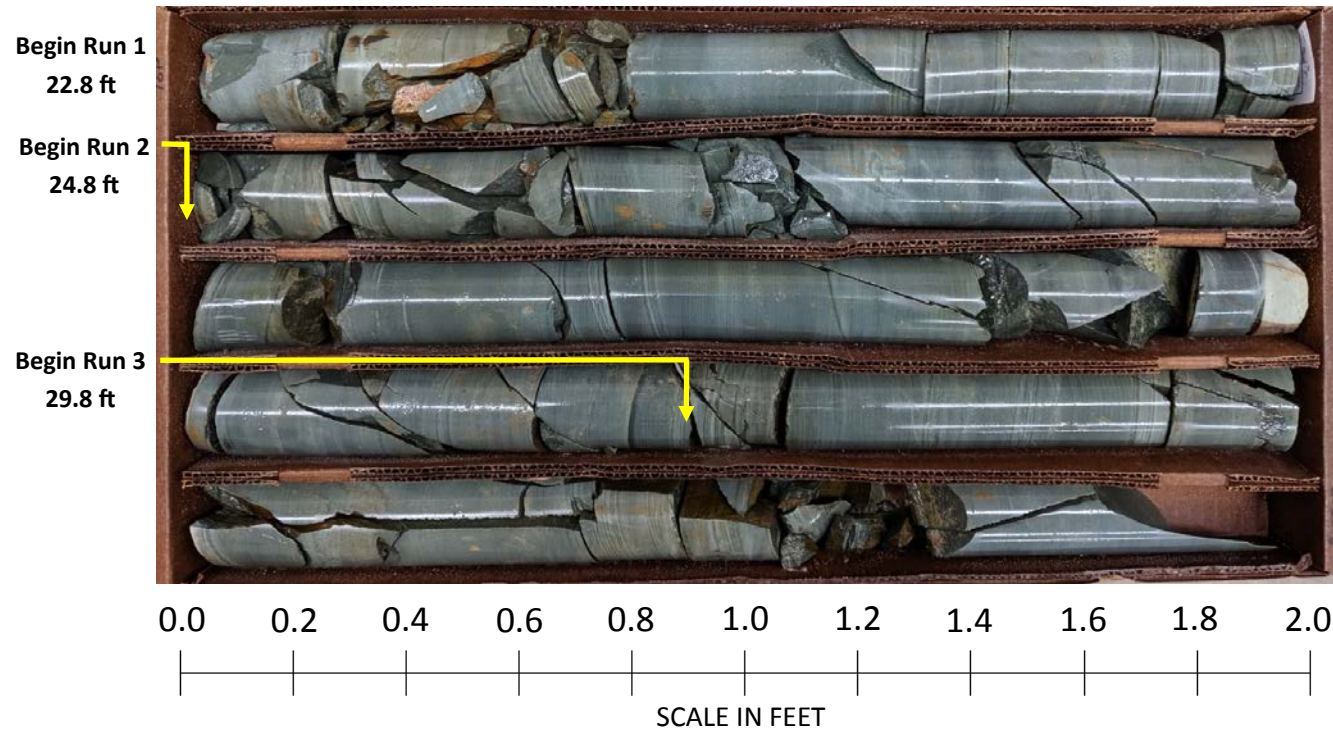
WBS 38356.1.2		TIP B-4407		COUNTY ANSON		GEOLOGIST J. Garrick	
SITE DESCRIPTION Replace Bridge No. 70 over Rocky River on US 52							GROUND WTR (ft)
BORING NO. EB1-A		STATION 29+47		OFFSET 20 ft LT		ALIGNMENT -L-	
COLLAR ELEV. 234.8 ft		TOTAL DEPTH 43.0 ft		NORTHING 527,140		EASTING 1,667,349	
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 82% 02/06/2019				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER J. Cain		START DATE 08/12/19		COMP. DATE 08/12/19		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				
235	234.8	0.0	6	8	7								GROUND SURFACE	0.0
	231.3	3.5	4	4	4								ROADWAY EMBANKMENT Stiff, Gray-Tan-Brown, Fine to Coarse Sandy SILT (A-4), with trace gravel	3.0
230	228.8	6.0	3	3	5								Medium Stiff, Red-Tan-Orange-Brown, Clayey SILT (A-5)	
	226.3	8.5	3	3	5									
225	221.3	13.5	2	2	3									
	216.3	18.5	1	2	3									
220	211.3	23.5	2	2	3									
	206.3	28.5	2	4	6								ALLUVIAL Medium Stiff, Gray, Silty CLAY (A-7-5)	23.0
215	201.3	33.5	6	9	9								RESIDUAL Stiff, Gray-Brown, Silty CLAY (A-7-5)	28.0
	196.3	38.5	100/0.2										Very Stiff, Gray-Tan-Brown, Fine to Coarse Sandy CLAY (A-6), with trace gravel-sized rock fragments	33.0
210	191.9	42.9	60/0.1										WEATHERED ROCK Tan-Gray (META-ARGILLITE)	38.5
													NON-CRYSTALLINE ROCK Tan-Gray (META-ARGILLITE) Boring Terminated with Standard Penetration Test Refusal at Elevation 191.8 ft in Non-Crystalline Rock (META-ARGILLITE)	42.9
														43.0

NCDOT BORE DOUBLE B-4407 - BRIDGE NO. 070 ROCKY RIVER.GPJ NC_DOT.GDT 10/9/19

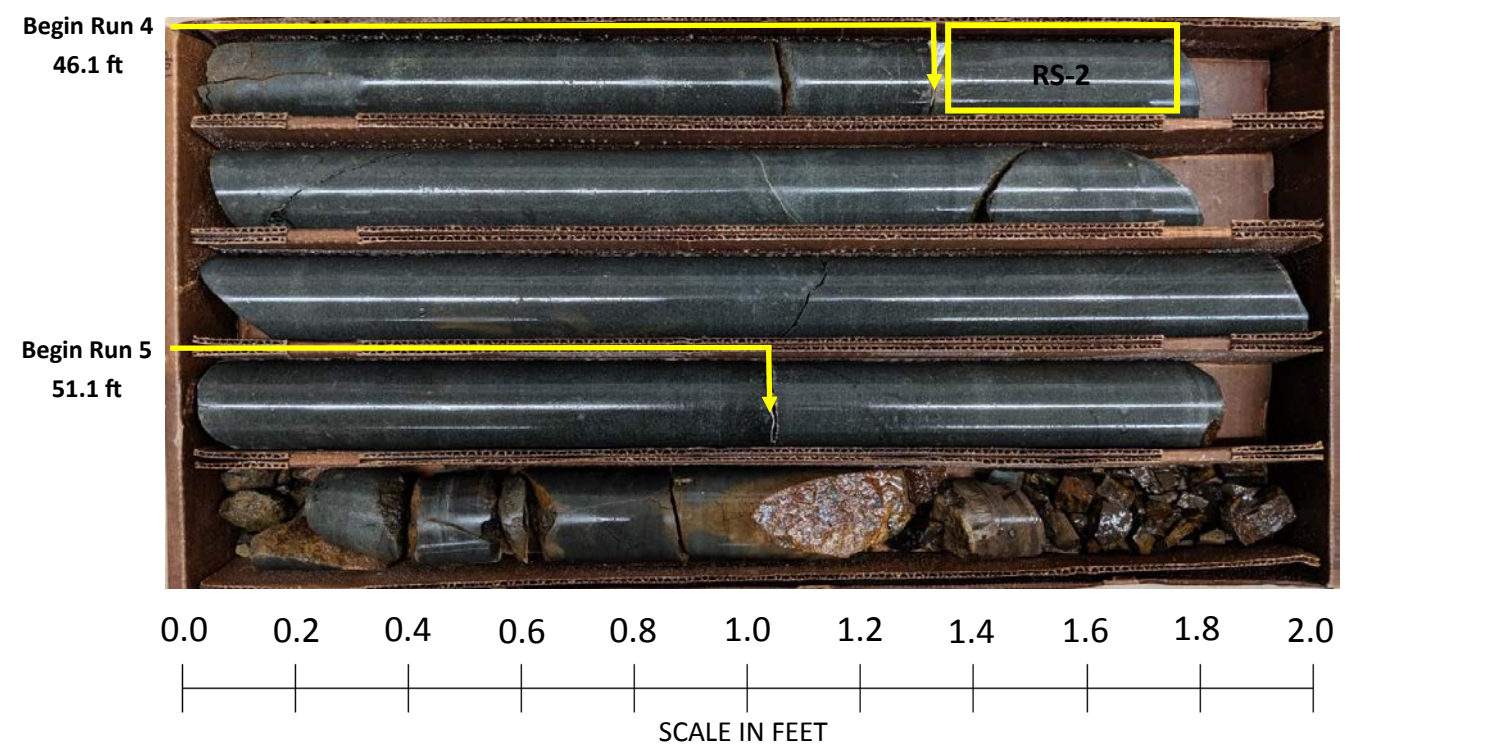
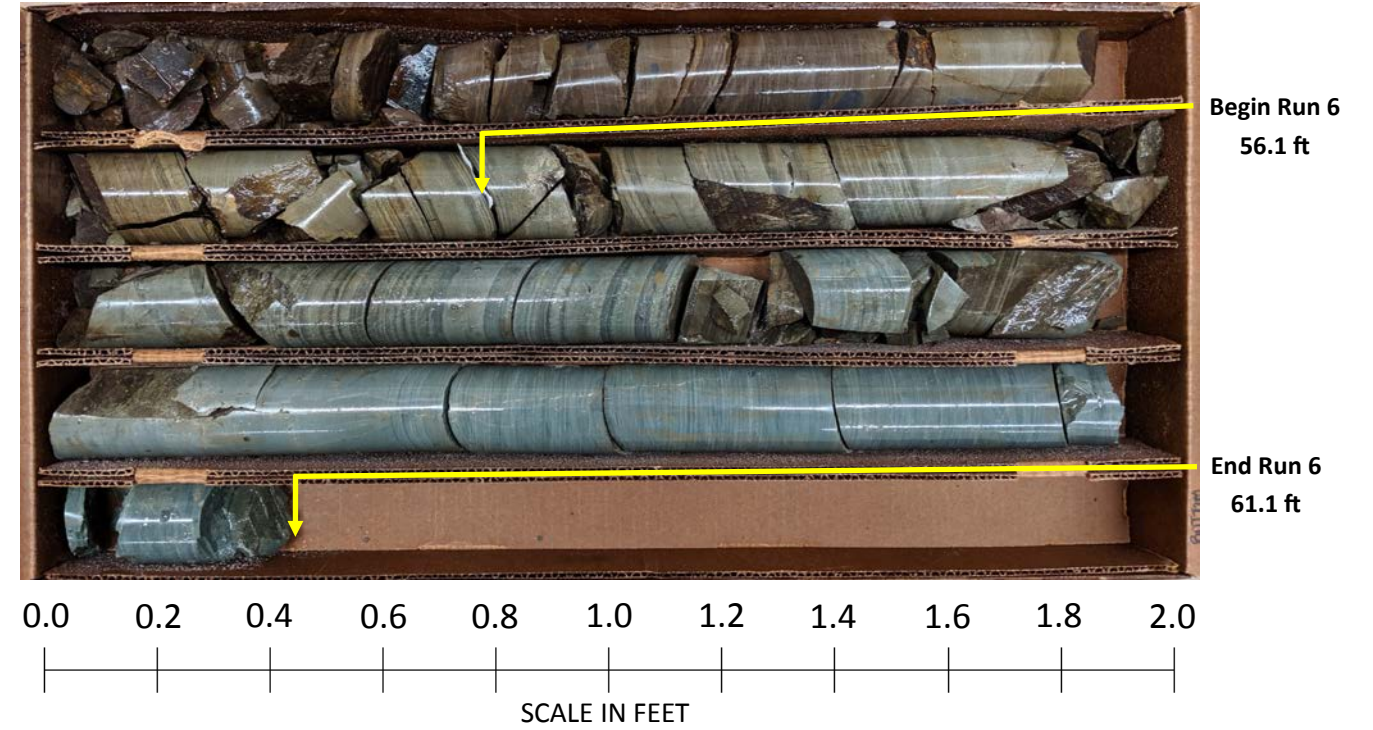
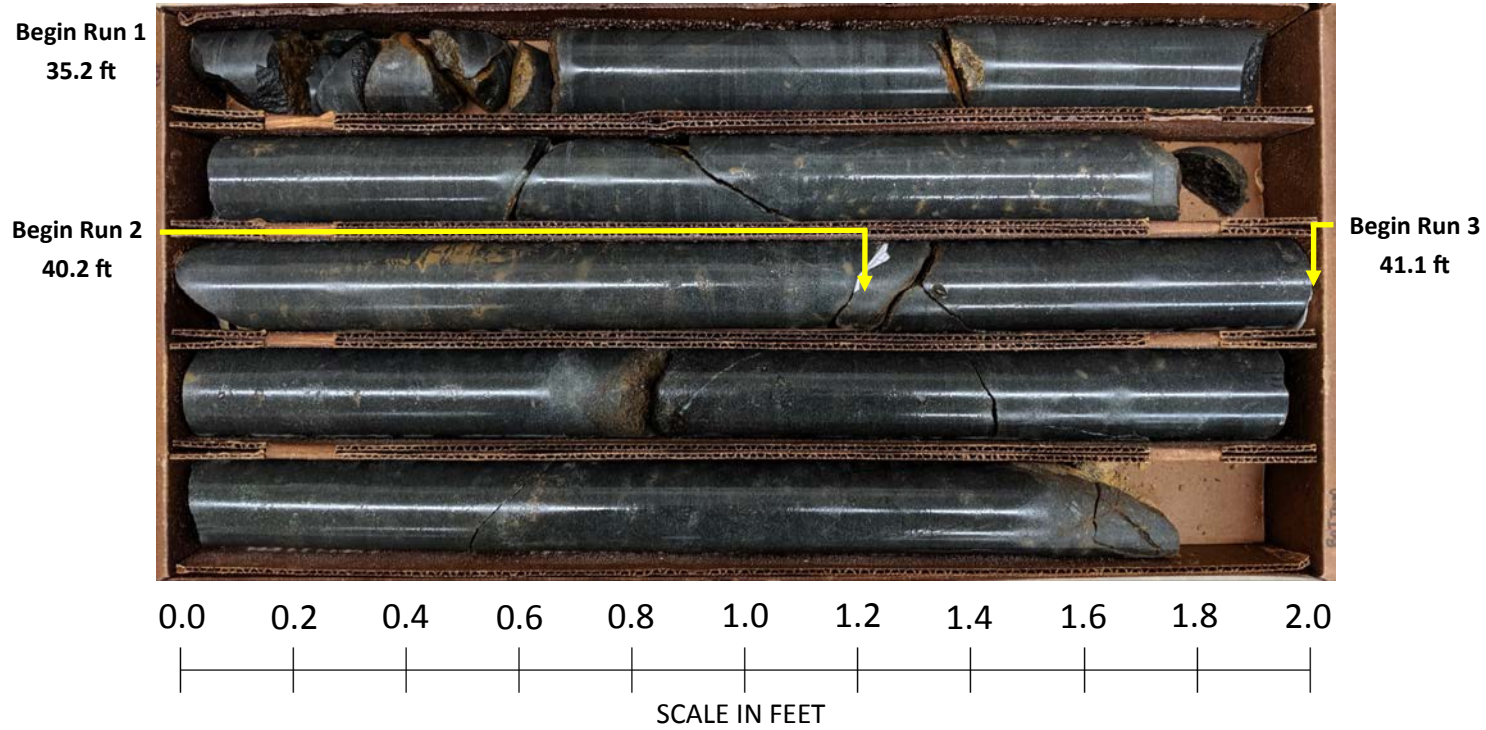


Replace Bridge No. 70 over Rocky River on US 52
WBS: 38356.1.2 Tip No.: B-4407
Rock Core Photographs: Boring: B1-A
Station: 30+70 Offset: 10' LT





Replace Bridge No. 70 over Rocky River on US 52
WBS: 38356.1.2 Tip No.: B-4407
Rock Core Photographs: Boring: B1-B
Station: 30+81 Offset: 18' RT



GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 38356.1.2		TIP B-4407		COUNTY ANSON		GEOLOGIST J. Garrick										
SITE DESCRIPTION Replace Bridge No. 70 over Rocky River on US 52							GROUND WTR (ft)									
BORING NO. B2-A		STATION 31+91		OFFSET 10 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 188.5 ft		TOTAL DEPTH 19.3 ft		NORTHING 527,369		EASTING 1,667,433										
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019			DRILL METHOD Wash Boring		HAMMER TYPE Automatic											
DRILLER B. Fowler		START DATE 09/20/19		COMP. DATE 09/20/19		SURFACE WATER DEPTH 1.9ft										
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)		
190																
	188.5	0.0	15	36	38									188.5	0.0	WATER SURFACE (09/20/19)
														188.5	0.0	GROUND SURFACE
185	185.5	3.0	60/0.1											185.5	3.0	ALLUVIAL Very Dense, Gray-Brown, Silty Fine to Coarse SAND (A-2-4), with trace gravel-sized rock fragments
														185.4	3.1	NON-CRYSTALLINE ROCK Gray (META-ARGILLITE)
														185.4	3.1	NON-CRYSTALLINE ROCK Slightly Weathered, Hard, Gray META-ARGILLITE with Very Close to Moderately Close Fracture Spacing
180																REC = 94%, RQD = 84%, GSI = 65 - 70
																RS-3: 9.4' - 9.8' Unit Weight = 173.4 pcf Unconfined Compressive Strength = 17,640 psi / 2,540 ksf
175																
170																
																Boring Terminated at Elevation 169.2 ft In Non-Crystalline Rock (META-ARGILLITE)
																1) Loss of water circulation during coring at 9.3 feet. Water did not return.

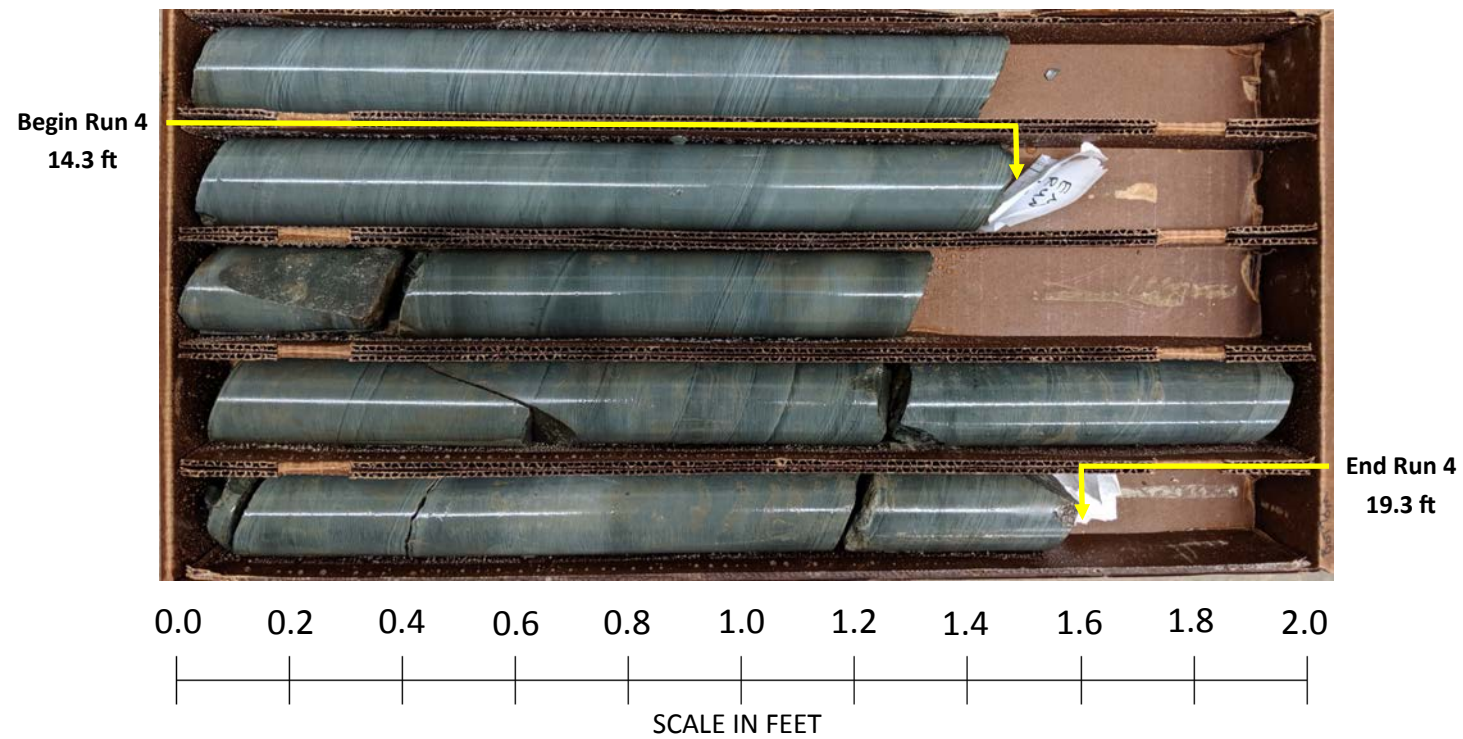
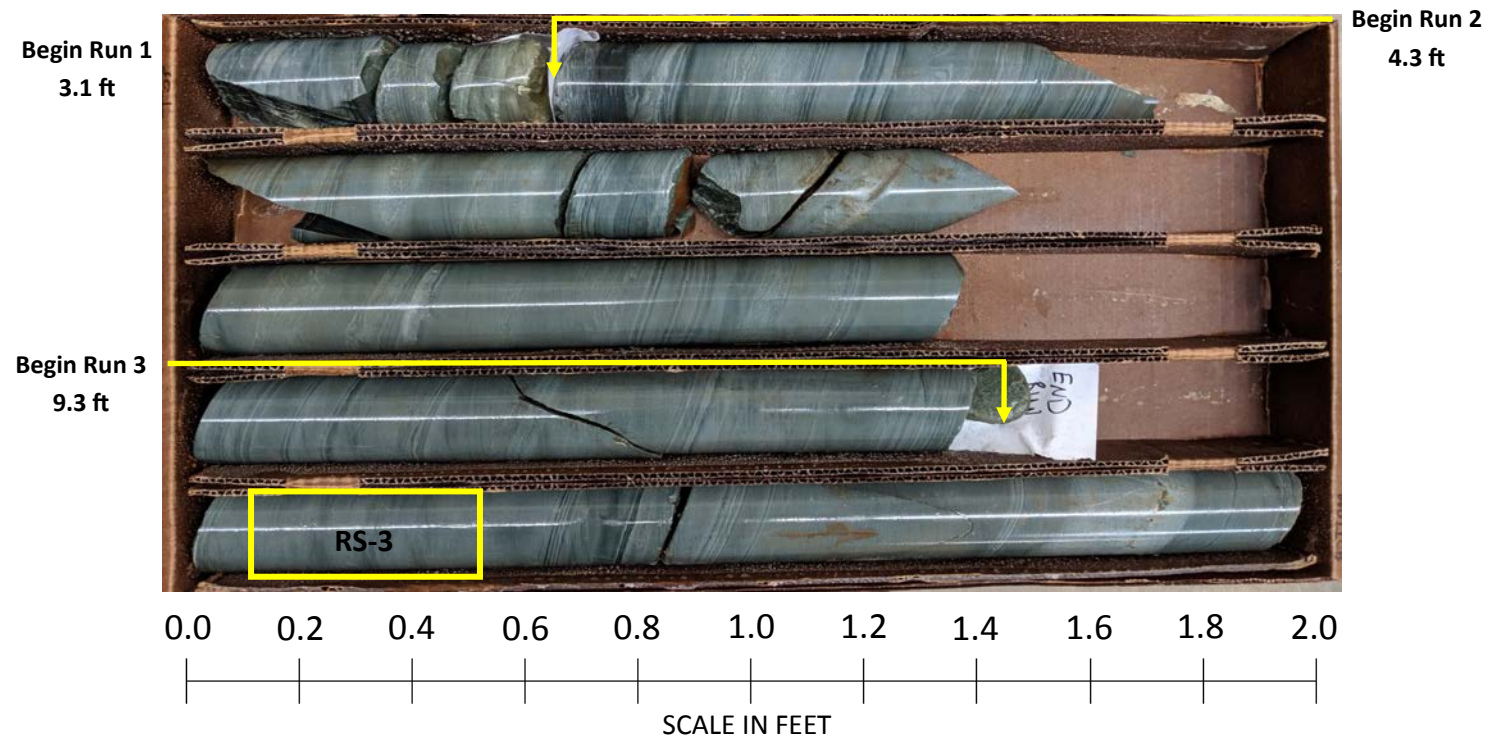
NCDOT BORE DOUBLE B-4407 - BRIDGE NO. 070 ROCKY RIVER.GPJ NC_DOT.GDT 10/17/19

WBS 38356.1.2		TIP B-4407		COUNTY ANSON		GEOLOGIST J. Garrick					
SITE DESCRIPTION Replace Bridge No. 70 over Rocky River on US 52							GROUND WTR (ft)				
BORING NO. B2-A		STATION 31+91		OFFSET 10 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 188.5 ft		TOTAL DEPTH 19.3 ft		NORTHING 527,369		EASTING 1,667,433					
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019			DRILL METHOD Wash Boring		HAMMER TYPE Automatic						
DRILLER B. Fowler		START DATE 09/20/19		COMP. DATE 09/20/19		SURFACE WATER DEPTH 1.9ft					
CORE SIZE NQ2		TOTAL RUN 16.2 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
185.4	185.4	3.1	1.2	2:49/1.0	(0.7)	(0.0)		(15.3)	(13.6)		Begin Coring @ 3.1 ft
	184.2	4.3	5.0	1:01/0.2	58%	0%		94%	84%		NON-CRYSTALLINE ROCK Slightly Weathered, Hard, Gray META-ARGILLITE with Very Close to Moderately Close Fracture Spacing
				4:43/1.0	(5.0)	(4.2)					
				4:22/1.0	100%	84%					
180		9.3	5.0	4:53/1.0							
				4:46/1.0							
				5:35/1.0							
				6:01/1.0	(4.9)	(4.9)	RS-3				
				4:38/1.0	98%	98%					
				5:09/1.0							
175		14.3	5.0	5:35/1.0							
				5:54/1.0							
				5:14/1.0	(4.7)	(4.5)					
				5:02/1.0	94%	90%					
				5:29/1.0							
170		19.3	5.0	7:11/1.0							
				8:23/1.0							
											Boring Terminated at Elevation 169.2 ft In Non-Crystalline Rock (META-ARGILLITE)
											1) Loss of water circulation during coring at 9.3 feet. Water did not return.

NCDOT BORE DOUBLE B-4407 - BRIDGE NO. 070 ROCKY RIVER.GPJ NC_DOT.GDT 10/17/19

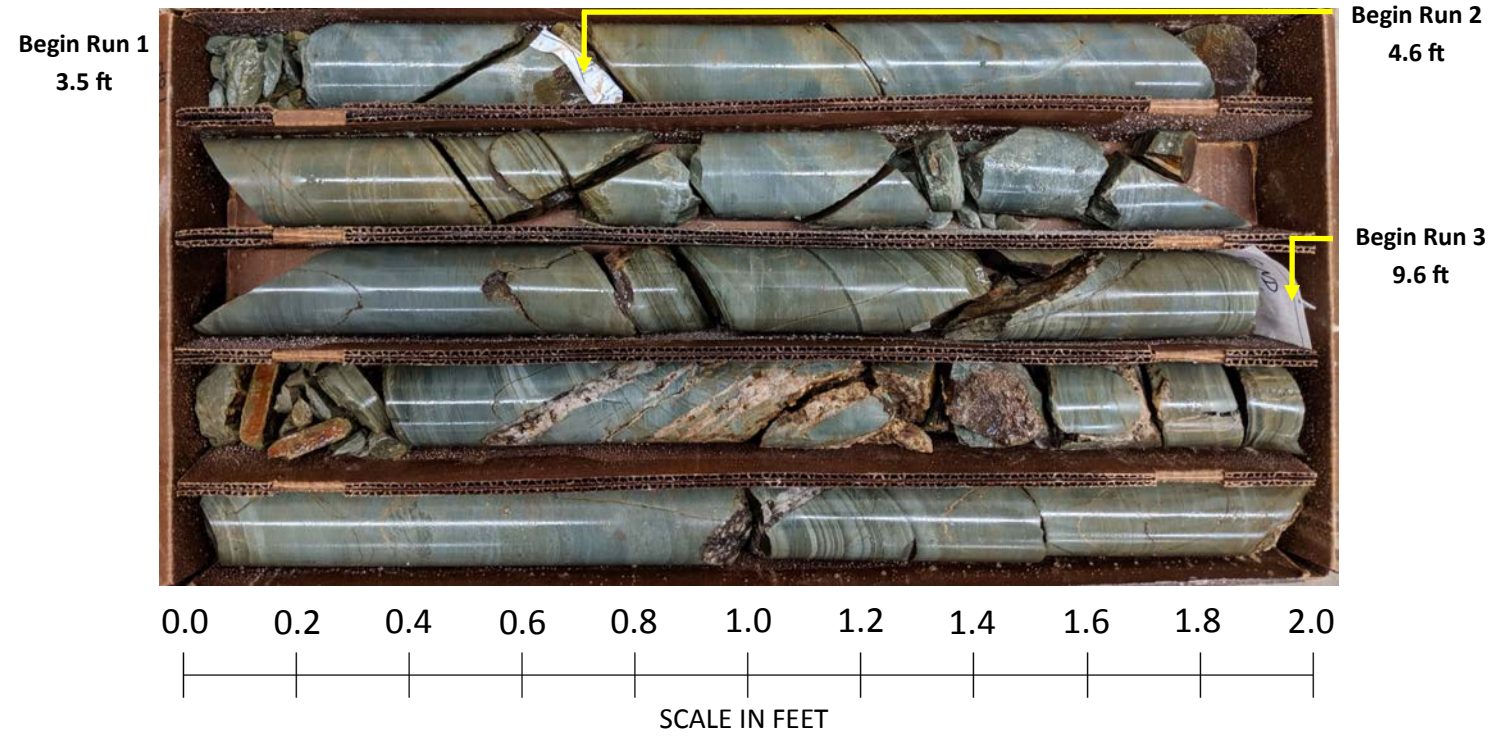


Replace Bridge No. 70 over Rocky River on US 52
WBS: 38356.1.2 Tip No.: B-4407
Rock Core Photographs: Boring: B2-A
Station: 31+91 Offset: 10' LT



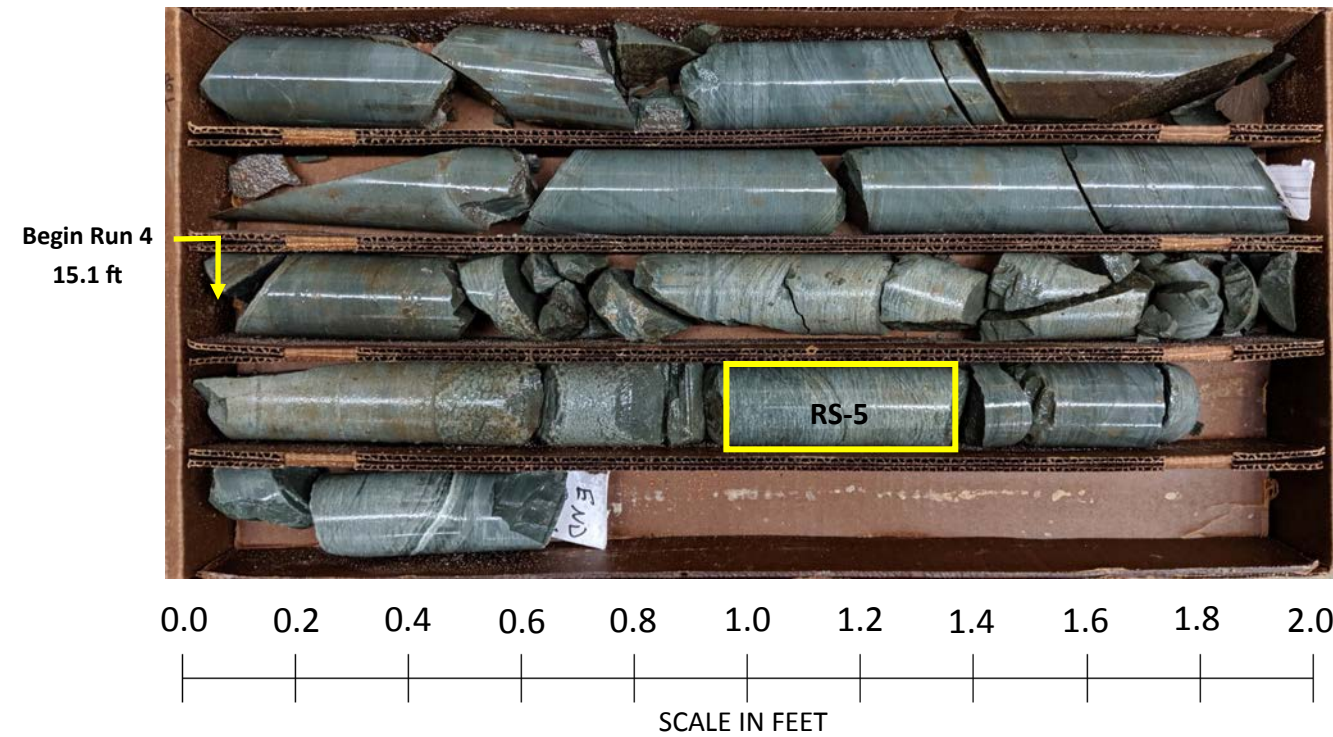
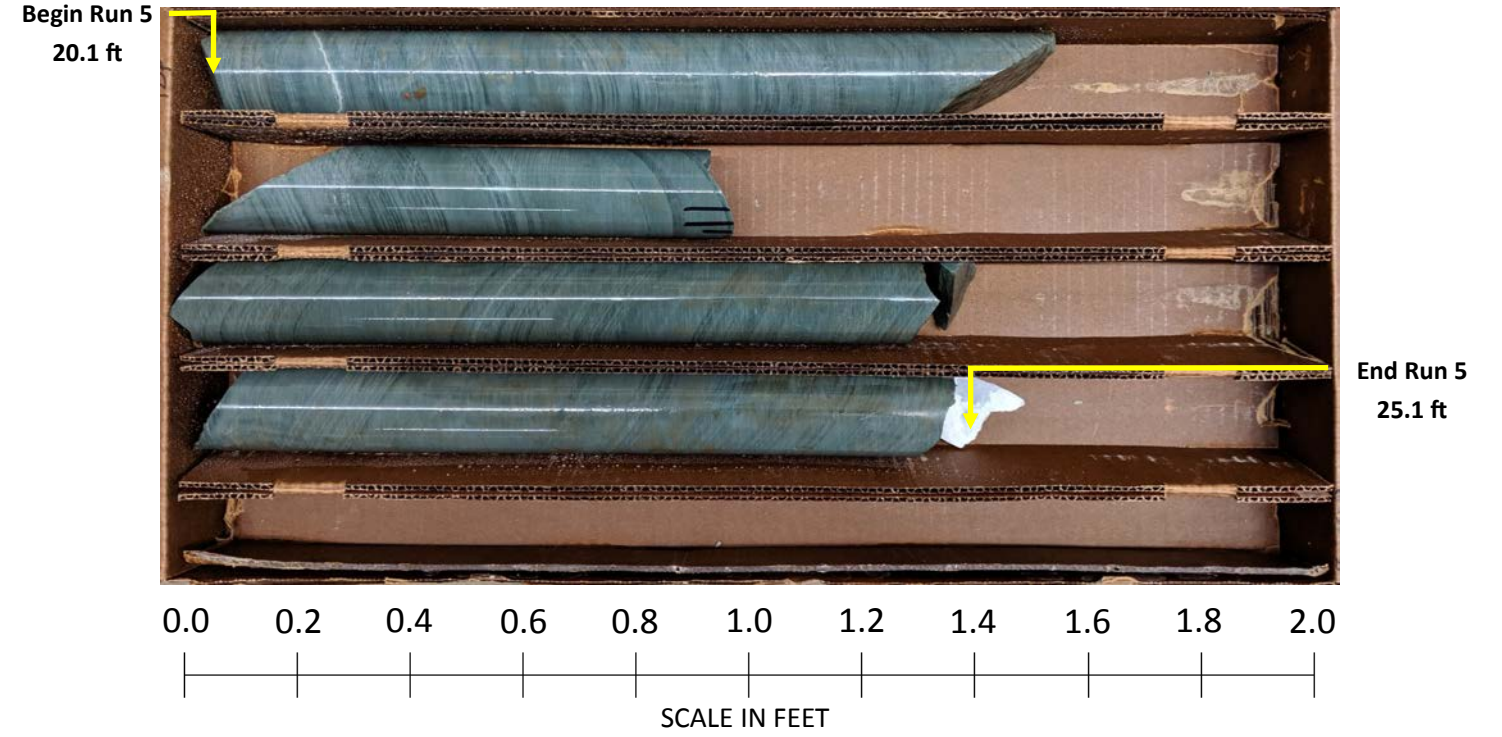
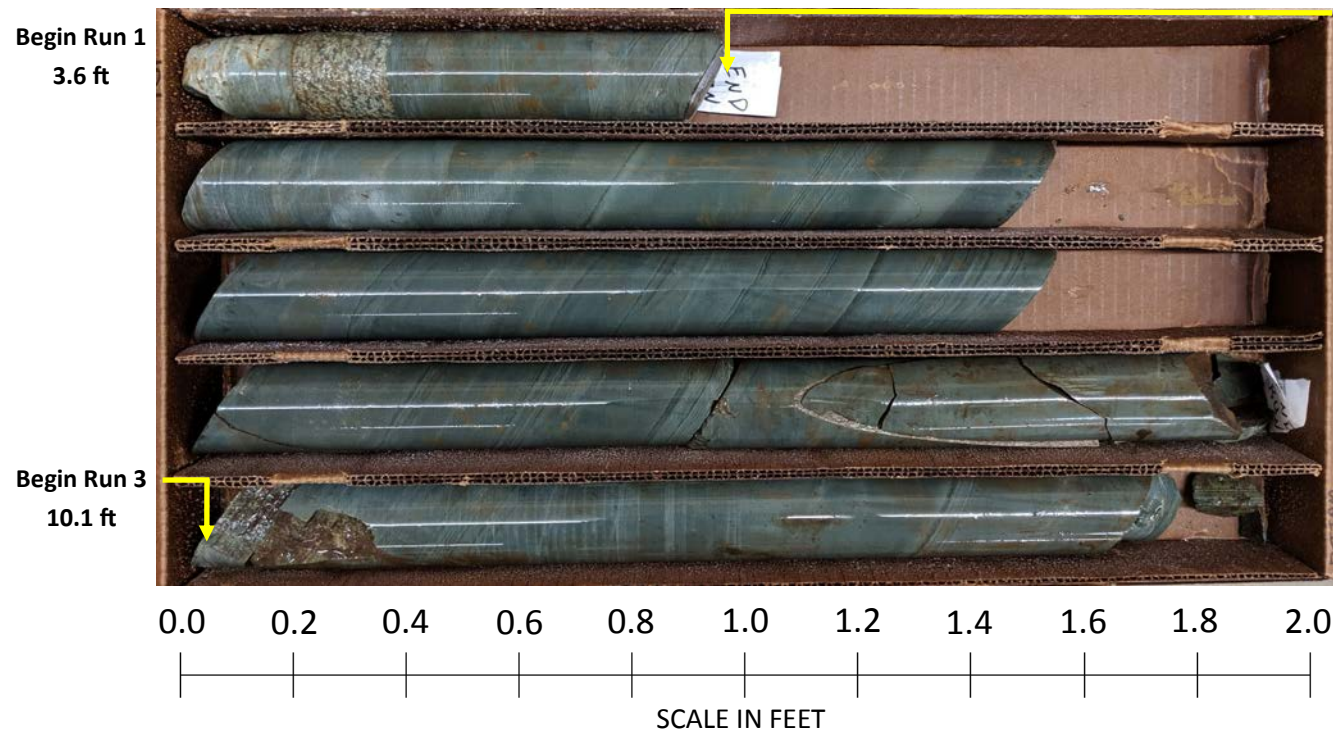


Replace Bridge No. 70 over Rocky River on US 52
WBS: 38356.1.2 Tip No.: B-4407
Rock Core Photographs: Boring: B2-B
Station: 31+85 Offset: 30' RT





Replace Bridge No. 70 over Rocky River on US 52
WBS: 38356.1.2 Tip No.: B-4407
Rock Core Photographs: Boring: B3-A
Station: 32+85 Offset: 7' LT



GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 38356.1.2		TIP B-4407		COUNTY ANSON		GEOLOGIST J. Garrick										
SITE DESCRIPTION Replace Bridge No. 70 over Rocky River on US 52							GROUND WTR (ft)									
BORING NO. B3-B		STATION 32+73		OFFSET 23 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 188.9 ft		TOTAL DEPTH 29.0 ft		NORTHING 527,437		EASTING 1,667,490										
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		DRILL METHOD Wash Boring		HAMMER TYPE Automatic												
DRILLER B. Fowler		START DATE 09/19/19		COMP. DATE 09/19/19		SURFACE WATER DEPTH 1.5ft										
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)		
190	188.9	0.0													188.9	
			6	43	57/0.2											
	186.9	2.0	60/0.0												186.9	2.0
185																
180																
175																
170																
165																
160																
															159.9	29.0
Boring Terminated at Elevation 159.9 ft In Non-Crystalline Rock (META-ARGILLITE)																

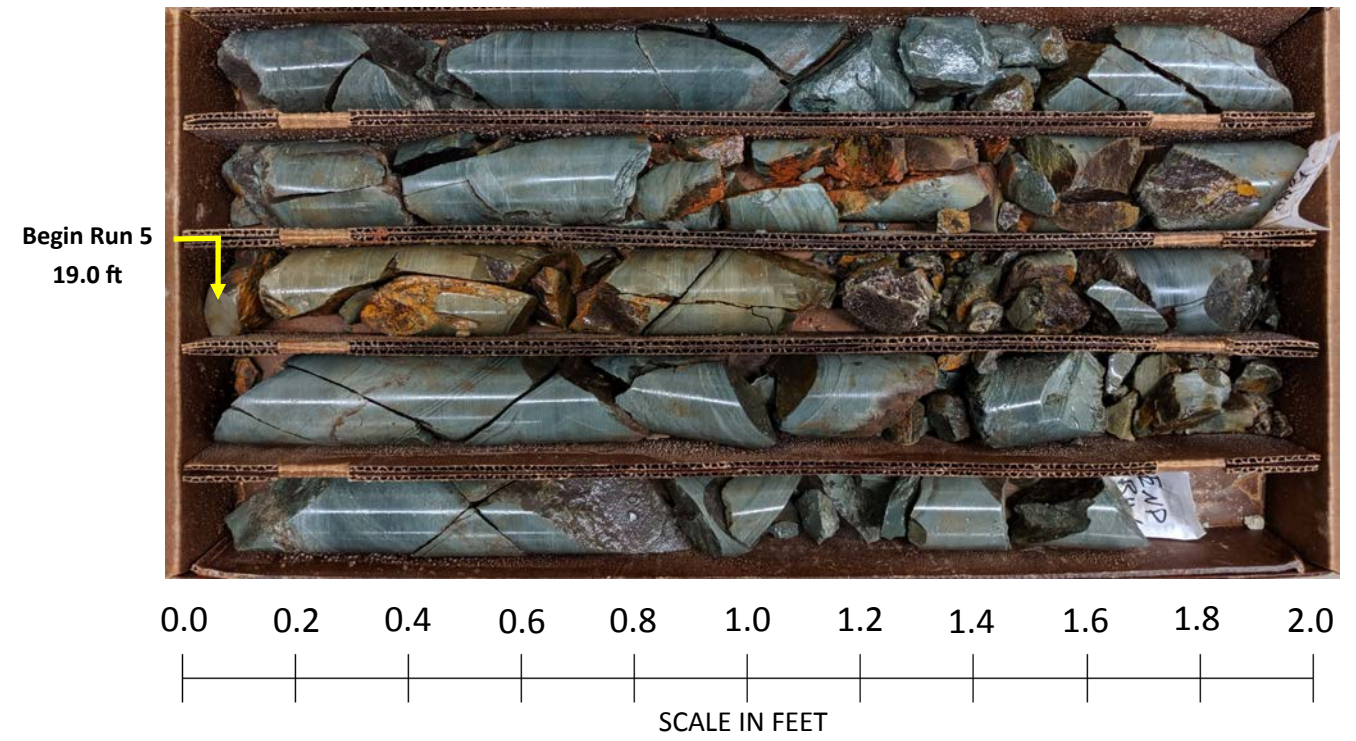
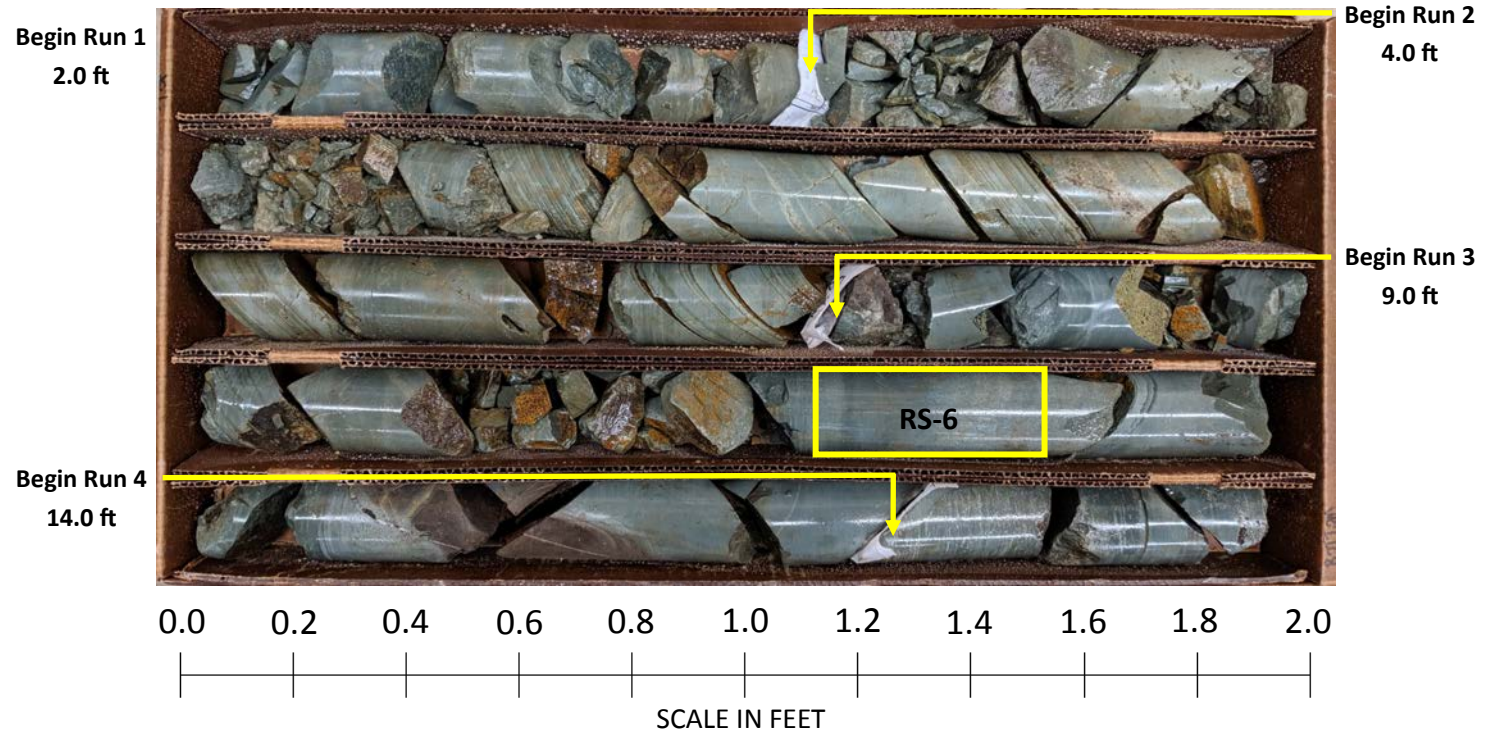
WBS 38356.1.2		TIP B-4407		COUNTY ANSON		GEOLOGIST J. Garrick	
SITE DESCRIPTION Replace Bridge No. 70 over Rocky River on US 52							GROUND WTR (ft)
BORING NO. B3-B		STATION 32+73		OFFSET 23 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 188.9 ft		TOTAL DEPTH 29.0 ft		NORTHING 527,437		EASTING 1,667,490	
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 86% 02/21/2019		DRILL METHOD Wash Boring		HAMMER TYPE Automatic			
DRILLER B. Fowler		START DATE 09/19/19		COMP. DATE 09/19/19		SURFACE WATER DEPTH 1.5ft	
CORE SIZE NQ2		TOTAL RUN 27.0 ft		L O G		DESCRIPTION AND REMARKS	
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.
186.9	186.9	2.0	2.0	N=60/0.0 2:57/1.0 3:40/1.0	(1.2) 60%	(0.0) 0%	
185	184.9	4.0	5.0	4:47/1.0 10:18/1.0 4:36/1.0 7:25/1.0 7:44/1.0	(4.1) 82%	(0.8) 16%	
180	179.9	9.0	5.0	5:33/1.0 7:29/1.0 6:03/1.0 5:14/1.0 3:33/1.0	(4.4) 88%	(1.2) 24%	RS-6
175	174.9	14.0	5.0	4:24/1.0 8:37/1.0 3:11/1.0 7:37/1.0 4:28/1.0	(5.0) 100%	(0.7) 14%	
170	169.9	19.0	5.0	3:03/1.0 2:16/1.0 3:59/1.0 7:45/1.0 3:21/1.0	(5.0) 100%	(0.7) 14%	
165	164.9	24.0	5.0	3:20/1.0 5:36/1.0 3:40/1.0 8:40/1.0 4:01/1.0	(5.0) 100%	(1.2) 24%	
160	159.9	29.0					
Boring Terminated at Elevation 159.9 ft In Non-Crystalline Rock (META-ARGILLITE)							

NCDOT BORE DOUBLE B-4407 - BRIDGE NO. 070 ROCKY RIVER.GPJ NC_DOT.GDT 10/17/19

NCDOT CORE DOUBLE B-4407 - BRIDGE NO. 070 ROCKY RIVER.GPJ NC_DOT.GDT 10/17/19



Replace Bridge No. 70 over Rocky River on US 52
WBS: 38356.1.2 Tip No.: B-4407
Rock Core Photographs: Boring: B3-B
Station: 32+73 Offset: 23' RT



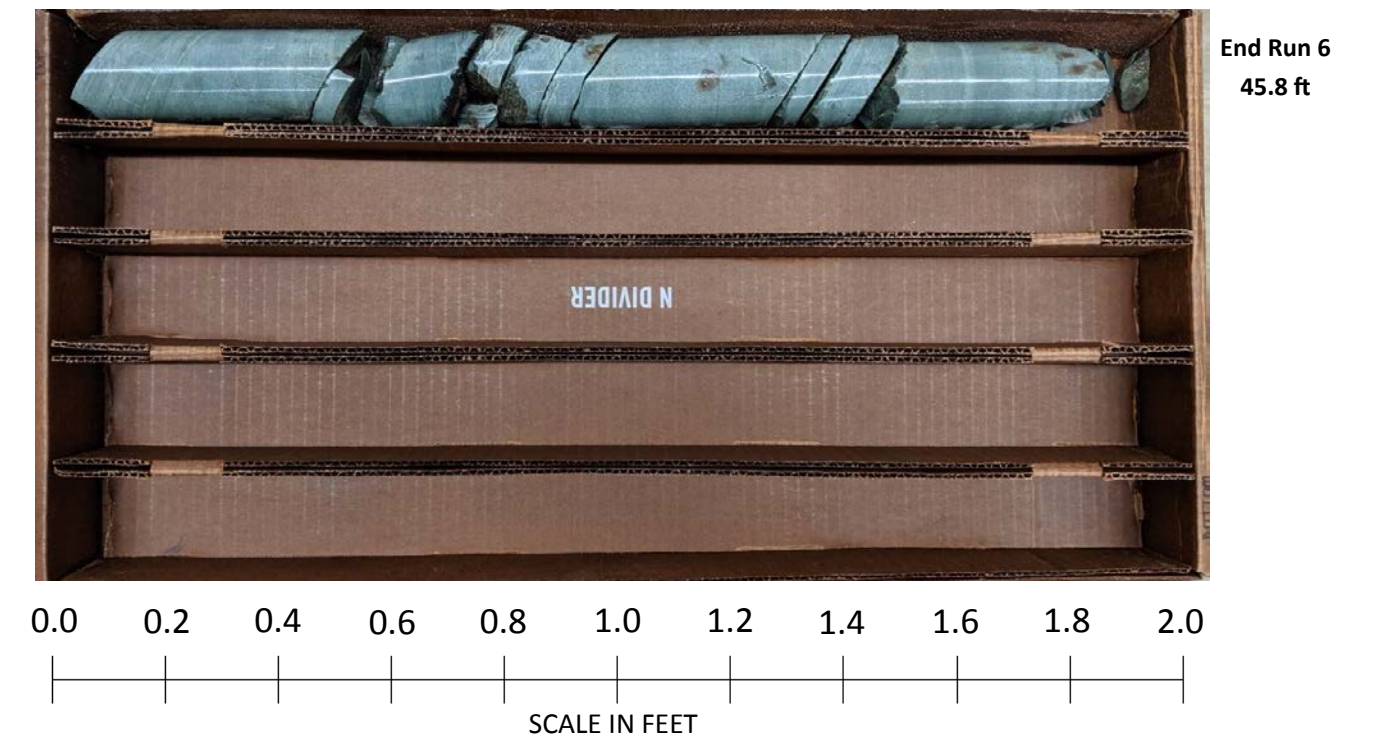
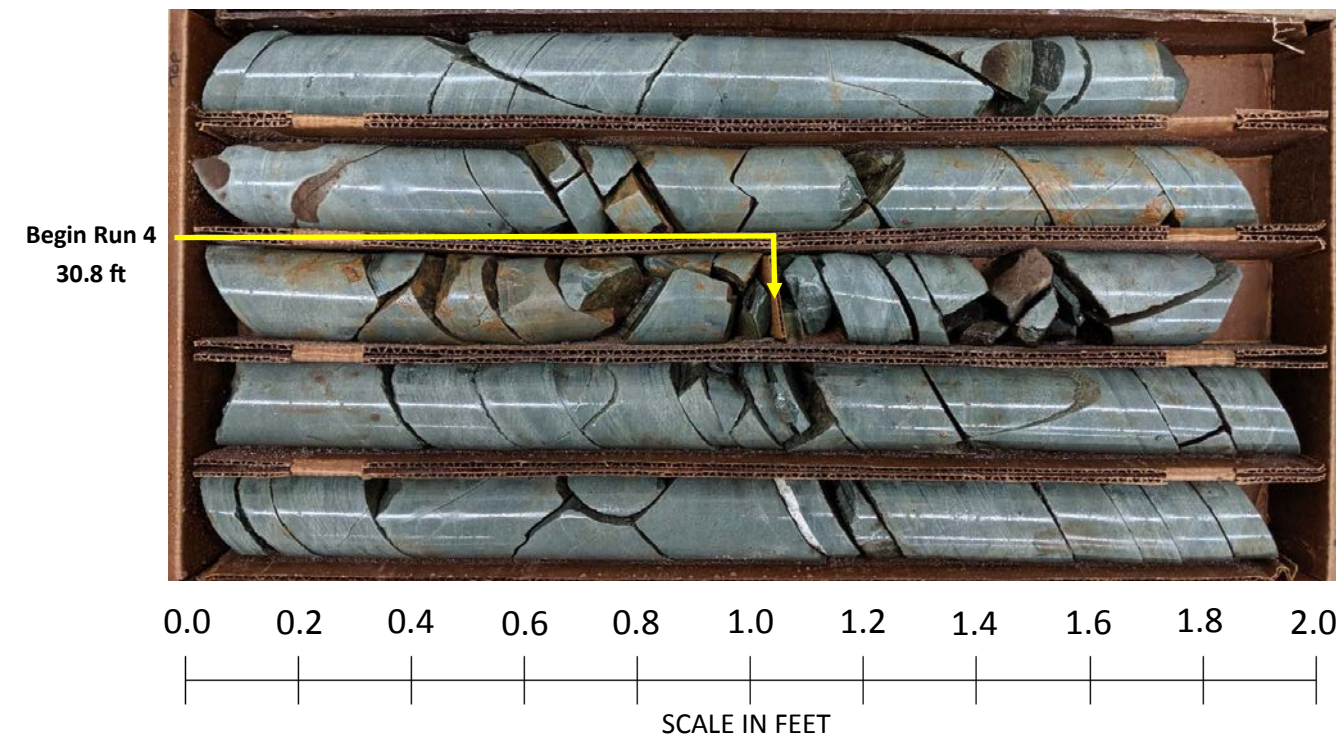
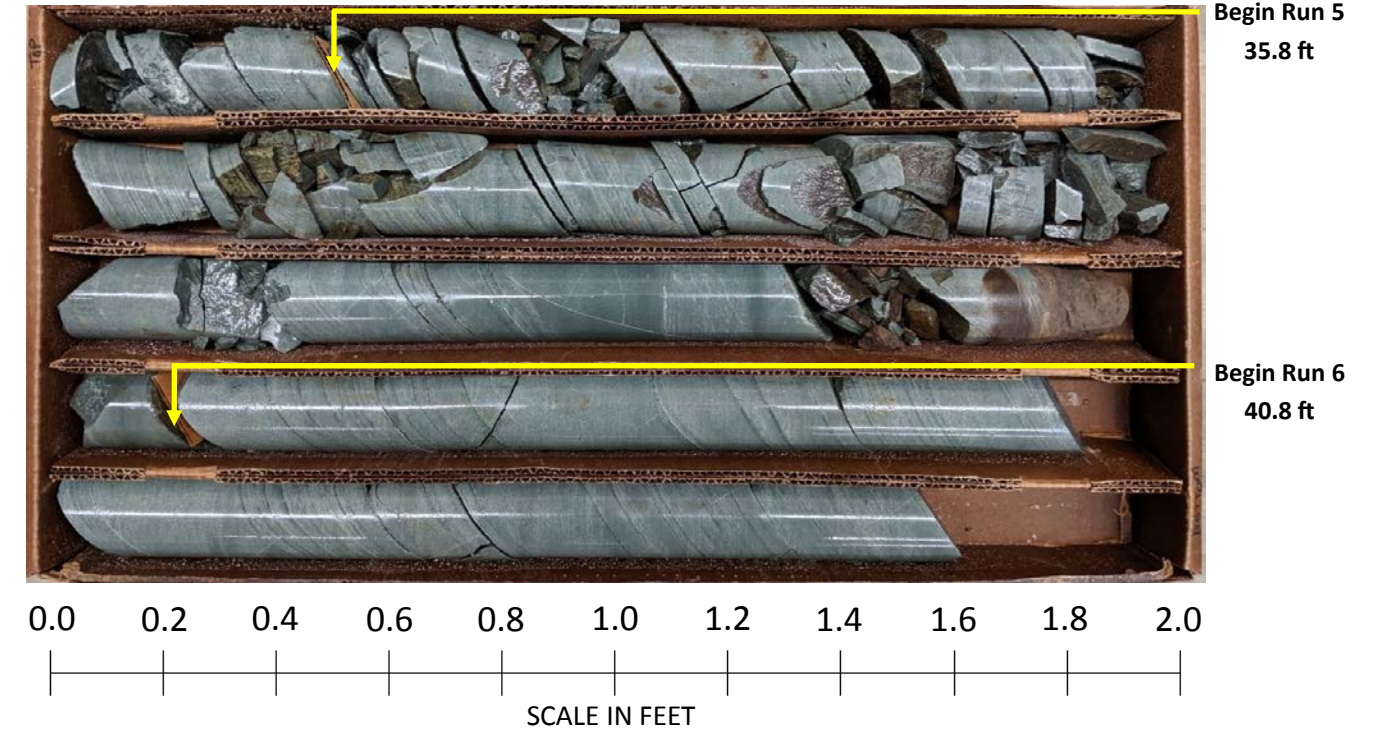


Replace Bridge No. 70 over Rocky River on US 52

WBS: 38356.1.2 Tip No.: B-4407

Rock Core Photographs: Boring: B4-A

Station: 33+85 Offset: 2' RT



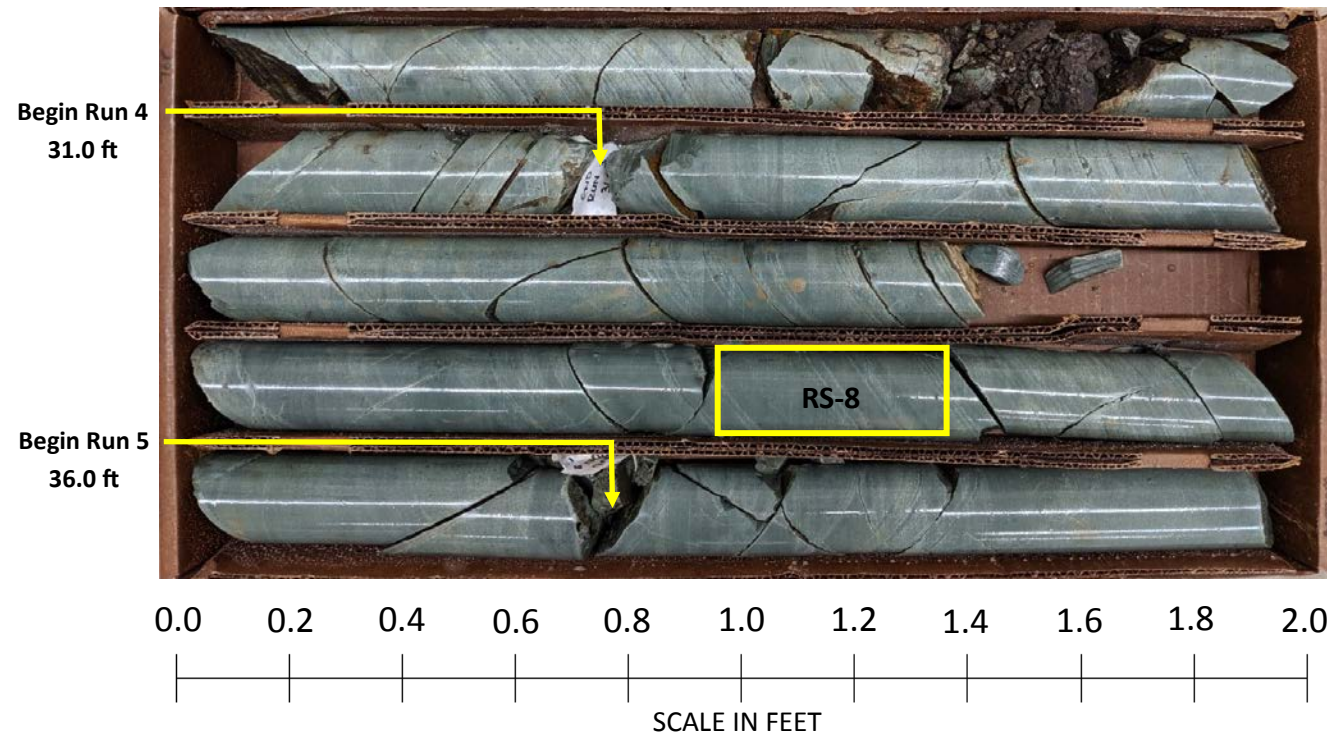
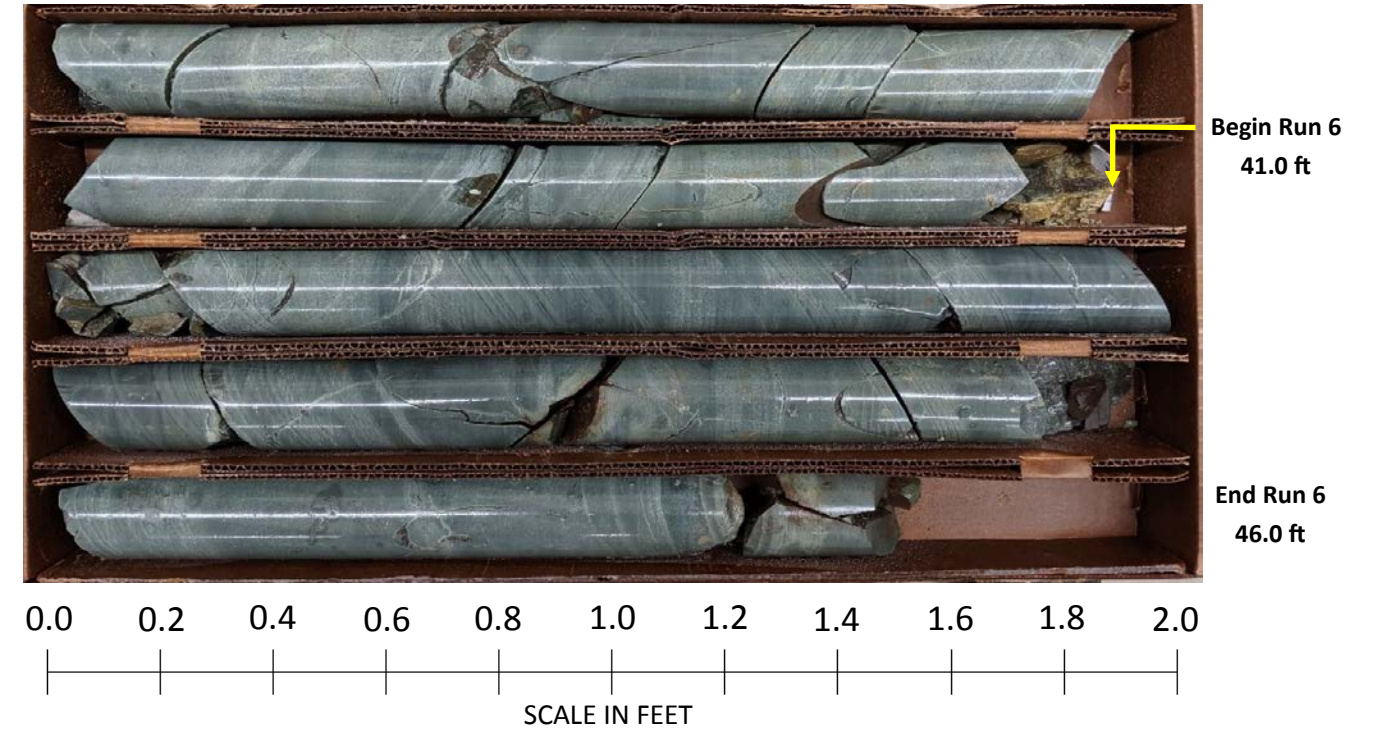
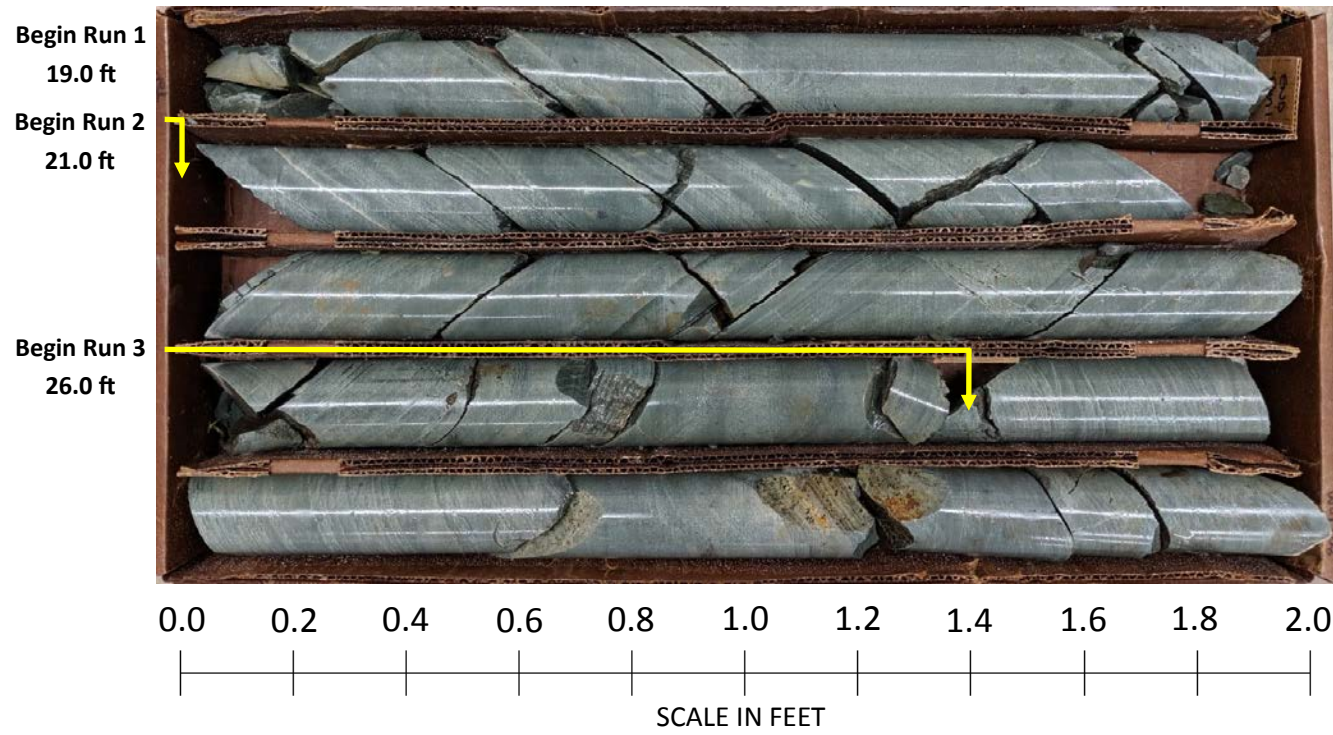


Replace Bridge No. 70 over Rocky River on US 52

WBS: 38356.1.2 Tip No.: B-4407

Rock Core Photographs: Boring: B4-B

Station: 33+92 Offset: 20' RT



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38356.1.2	TIP B-4407	COUNTY ANSON	GEOLOGIST J. Garrick
SITE DESCRIPTION Replace Bridge No. 70 over Rocky River on US 52			GROUND WTR (ft)
BORING NO. EB2-A	STATION 35+06	OFFSET 21 ft LT	ALIGNMENT -L-
COLLAR ELEV. 232.7 ft	TOTAL DEPTH 40.1 ft	NORTHING 527,672	EASTING 1,667,520
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 85% 02/06/2019		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER J. Cain	START DATE 08/12/19	COMP. DATE 08/12/19	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)		
235																	
	232.7	0.0													232.7	GROUND SURFACE	0.0
230	229.2	3.5	5	5	3	8								M	ROADWAY EMBANKMENT Medium Stiff, Red-Tan-Brown, Clayey SILT (A-5), with trace gravel		
	226.7	6.0	2	2	4	6								M			
225	224.2	8.5	3	7	4	11								M	Medium Stiff to Stiff, Red-Brown-Tan, Fine to Coarse Sandy SILT (A-4), with trace gravel		
	219.2	13.5	4	3	2	5								M			
220	214.2	18.5	3	3	5	8								M			
215	209.2	23.5	5	7	4	11								M			
210	204.2	28.5	4	5	8	13								M	ALLUVIAL Medium Stiff to Stiff, Gray-Brown, Silty CLAY (A-7-5)		
205	199.2	33.5	3	4	5	9								M			
200	194.2	38.5	2	3	5	8								M			
195	192.7	40.0	5	12	88/0.2									M			
			60/0.1												193.7	WEATHERED ROCK Gray (META-ARGILLITE)	39.0
															192.7	NON-CRYSTALLINE ROCK Gray (META-ARGILLITE)	40.0
															192.6	Boring Terminated with Standard Penetration Test Refusal at Elevation 192.6 ft In Non-Crystalline Rock (META-ARGILLITE)	

NCDOT BORE DOUBLE B-4407 - BRIDGE NO. 070 ROCKY RIVER.GPJ NC_DOT.GDT 10/9/19

ROCK TEST RESULTS

ROCK TEST RESULTS									
SAMPLE NO.	BORING	STATION -L-	OFFSET	DEPTH INTERVAL	RUN REC (%)	RUN RQD (%)	Rock Type	Unit Weight LB/FT ³	Unconfined Compressive Strength (PSI/KSF)
RS-1	B1-A	30+70	10' LT	41.8' - 42.2'	100	22	Meta-Argillite	173.5	8,810 psi / 1,268 ksf
RS-2	B1-B	30+81	18' RT	46.1' - 46.5'	100	86	Meta-Sandstone	185.4	13,390 psi / 1,928 ksf
RS-3	B2-A	31+91	10' LT	9.4' - 9.8'	98	98	Meta-Argillite	173.4	17,640 psi / 2,540 ksf
RS-4	B2-B	31+85	30' RT	16.6' - 17.0'	100	62	Meta-Argillite	173.5	18,640 psi / 2,684 ksf
RS-5	B3-A	32+85	7' LT	18.1' - 18.5'	88	32	Meta-Argillite	173.1	16,230 psi / 2,337 ksf
RS-6	B3-B	32+73	23' RT	11.0' - 11.4'	88	24	Meta-Argillite	173.3	14,100 psi / 2,030 ksf
RS-7	B4-A	33+85	2' RT	24.5' - 24.9'	100	54	Meta-Argillite	173.3	16,110 psi / 2,320 ksf
RS-8	B4-B	33+92	20' RT	34.2' - 34.6'	100	36	Meta-Argillite	166.1	9,230 psi / 1,329 ksf

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

SITE PHOTOS

BRIDGE NO. 70 ON -L-
OVER ROCKY RIVER ON US 52



PHOTO 1: VIEW AT BENT 2 FACING DOWNSTATION ALONG PROPOSED NEW ALIGNMENT TOWARD END BENT 1.



PHOTO 2: VIEW NEAR BENT 1, FACING UPSTATION.



PHOTO 3: VIEW FROM BENT 4 FACING DOWNSTATION.



PHOTO 4: VIEW NEAR BENT 4, FACING EAST ALONG ROCKY RIVER.