

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45355.1.31 (BD-5109AE)	1	9

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45355.1.31 (BD-5109AE) F.A. PROJ. _____
COUNTY STOKES
PROJECT DESCRIPTION BRIDGE #45 ON SR 1998
(MOUNTAIN VIEW CHURCH RD.) OVER BRUSHY FORK
CREEK BETWEEN SR 1122 AND SR 2019
SITE DESCRIPTION _____

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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) 707-6650. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

J. K. STICKNEY

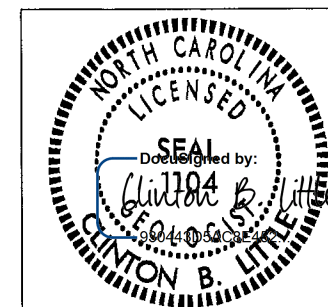
C. L. SMITH

INVESTIGATED BY J. E. BEVERLY

CHECKED BY C. B. LITTLE

SUBMITTED BY C. B. LITTLE

DATE AUGUST 2014



9/8/2014

DRAWN BY: C.E. BURRIS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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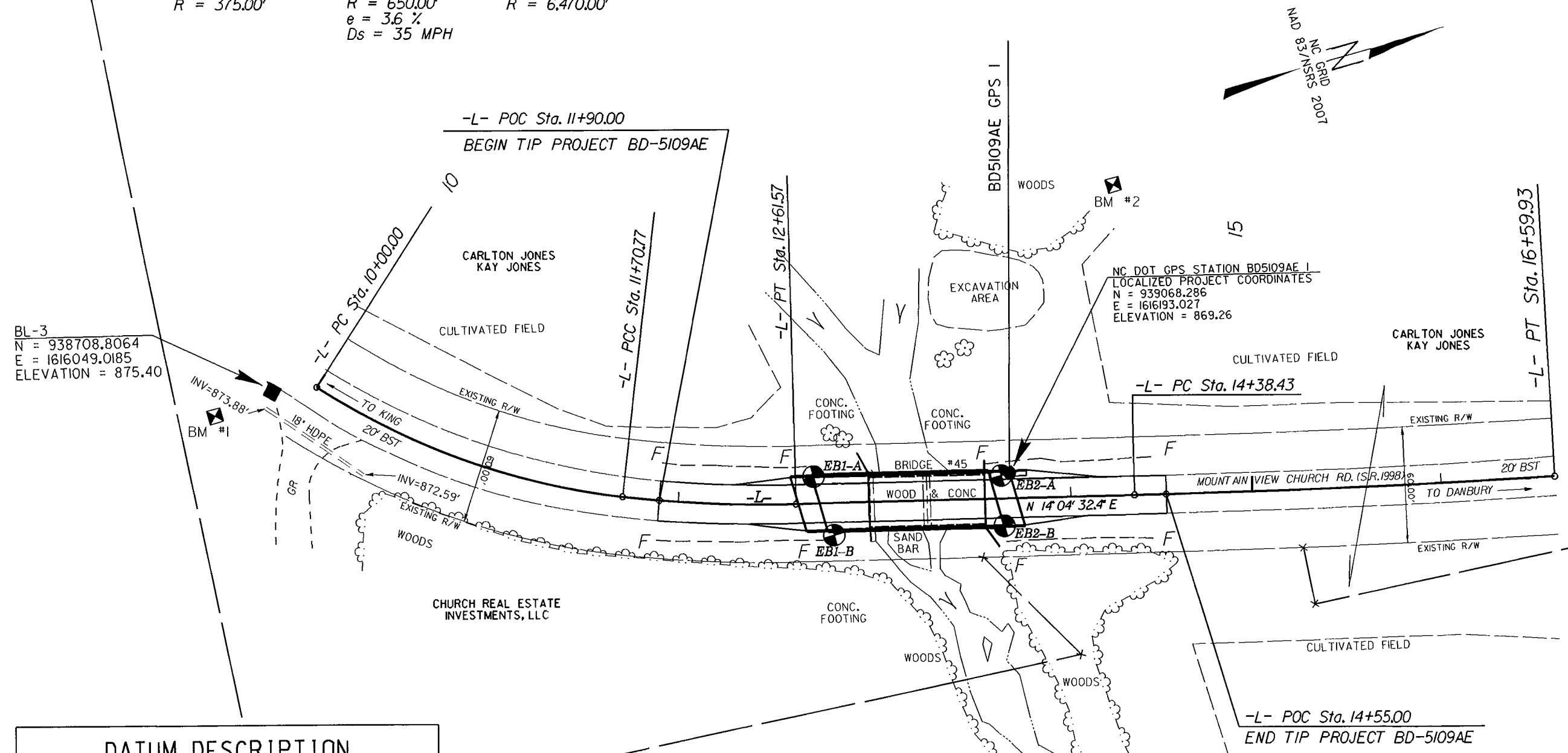
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																																																																																															
<p>SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY-SILT CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, MOD. PLASTIC, A-7-6</i></p>		<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, 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 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 (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.</p>																																																																																																																															
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th colspan="2">A-1</th> <th colspan="2">A-3</th> <th colspan="2">A-2</th> <th colspan="3">A-4</th> <th colspan="2">A-5</th> <th colspan="2">A-6</th> <th colspan="3">A-7</th> <th colspan="2">A-1, A-2</th> <th colspan="2">A-4, A-5</th> <th colspan="2">A-6, A-7</th> </tr> <tr> <th>SYMBOL</th> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="3">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="3">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> </tr> <tr> <th>% PASSING</th> <td colspan="2">10</td> <td colspan="2">40</td> <td colspan="2">200</td> <td colspan="3">10</td> <td colspan="2">40</td> <td colspan="3">200</td> <td colspan="2">10</td> <td colspan="2">40</td> <td colspan="3">200</td> </tr> </thead> </table>		GENERAL CLASS.	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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</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>COMPRESSION</p> <p>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p> <p>LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50</p>		<p>PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> </thead> <tbody> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY</td> </tr> </tbody> </table>			GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p>GROUND WATER</p> <p>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p>STATIC WATER LEVEL AFTER 24 HOURS</p> <p>PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p>SPRING OR SEEP</p>		<p>WEATHERING</p> <p>FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V SL.): ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SL.): ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>MODERATE (MOD.): SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>MODERATELY SEVERE (MOD. SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>SEVERE (SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i></p> <p>VERY SEVERE (V SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i></p> <p>COMPLETE: ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>		<p>CONSISTENCY OR DENSITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> </thead> <tbody> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </tbody> </table>		PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A	GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4
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<p>SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET. USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMI-SOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </tbody> </table>		SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET. USUALLY FROM BELOW THE GROUND WATER TABLE	PLASTIC RANGE (PI)	- WET - (W)	SEMI-SOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE	SL - SHRINKAGE LIMIT	- 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 HI. - 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 W - UNIT WEIGHT W_d - DRY UNIT WEIGHT</p> <p>SAMPLE ABBREVIATIONS</p> <p>S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL RATIO CBR - CALIFORNIA BEARING RATIO</p>		<p>EQUIPMENT USED ON SUBJECT PROJECT</p> <p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG.-CARBIDE INSERTS _____</p> <p>CASING _____ w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG.-CARB. _____</p> <p>CORE BIT _____</p> <p>HAMMER TYPE:</p> <p><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE:</p> <p>B _____</p> <p>N _____</p> <p>H _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p>		<p>FRACTURE SPACING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TERM</th> <th>SPACING</th> </tr> </thead> <tbody> <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 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </tbody> </table> <p>BEDDING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>		TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FEET	VERY CLOSE	LESS THAN 0.16 FEET	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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-L- CURVE DATA

PI Sta 10+86.89 Δ = 26°05'30.2" (LT) D = 15°16'43.9" L = 170.77' T = 86.89' R = 375.00'	PI Sta 12+16.24 Δ = 8°00'13.4" (LT) D = 8°48'53.0" L = 90.80' T = 45.47' R = 650.00' e = 3.6 % Ds = 35 MPH	PI Sta 15+49.19 Δ = 1°57'41.5" (LT) D = 0°53'08.0" L = 221.50' T = 110.76' R = 6,470.00'
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DATUM DESCRIPTION

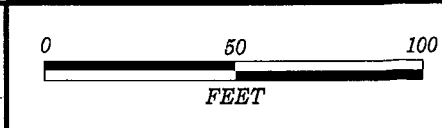
THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "BD5109AE GPS 1" WITH NAD 83/NSRS 2007 STATE PLANE GRID COORDINATES OF NORTHING: 939068.286(ft) EASTING: 1616193.027(ft) THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 1.0000111742 THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "BD5109AE GPS 1" TO -L- STATION 10+00.00 IS S 22 34 18.13 W 364.45'

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS NAVD 88

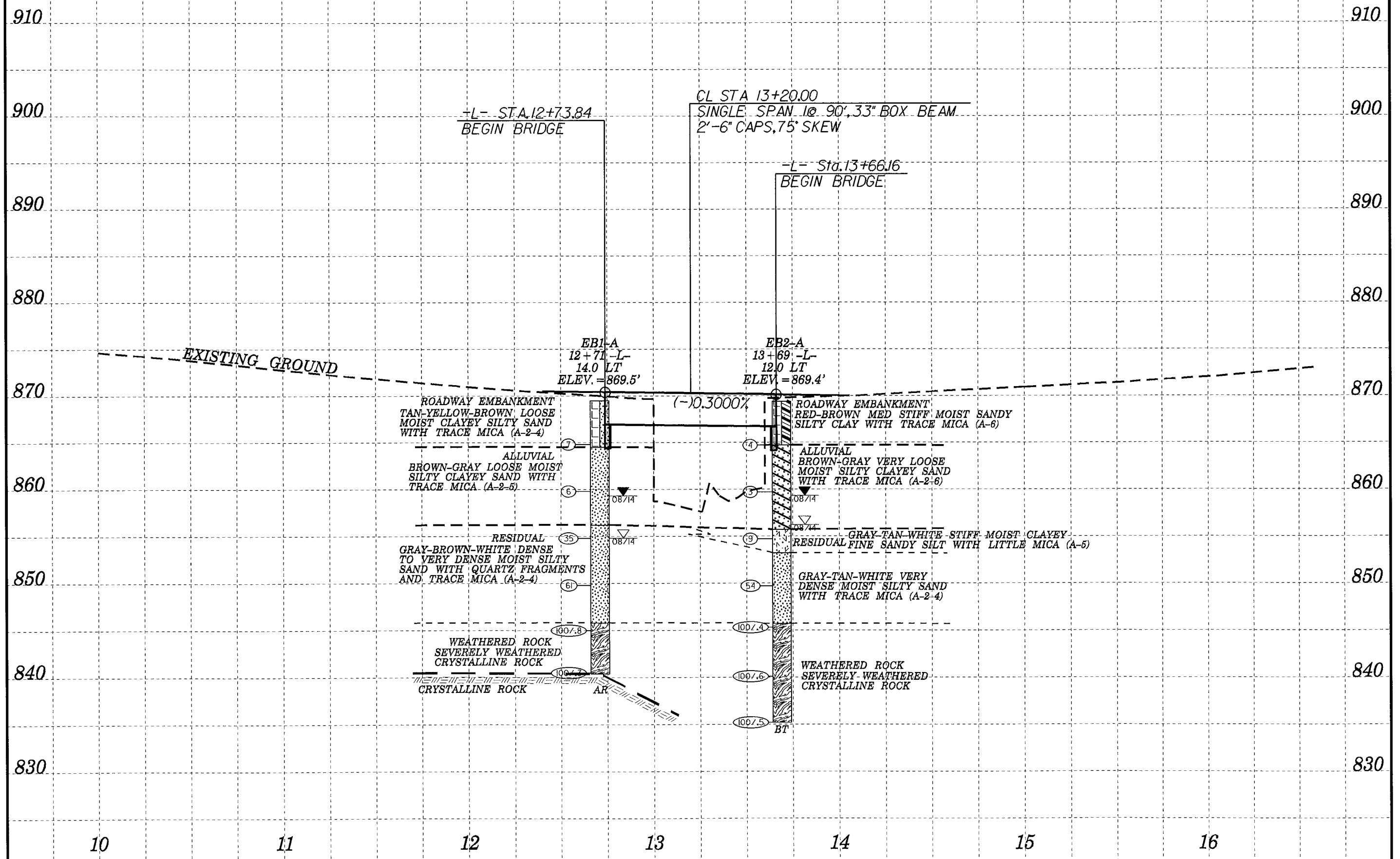
 BM #1 (51) ELEVATION = 882.95
 N 938676 E 1616053
 BL STATION 5+00.00
 S 07°07'20.64" E DIST 32.60
 RAILROAD SPIKE SET IN 40" DOUBLE POPLAR

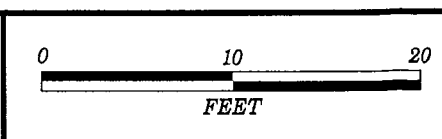
 BM #2 (52) ELEVATION = 867.47
 N 939161 E 1616064
 BL STATION 9+57.00 143 LEFT
 RAILROAD SPIKE SET IN 12" WALNUT

RICHARD G. HABERKERN, TRUSTEE FOR
 THE RICHARD G. HABERKERN LIVING
 TRUST DATED NOVEMBER 19, 2010 AND
 ALL AMENDMENTS THERETO



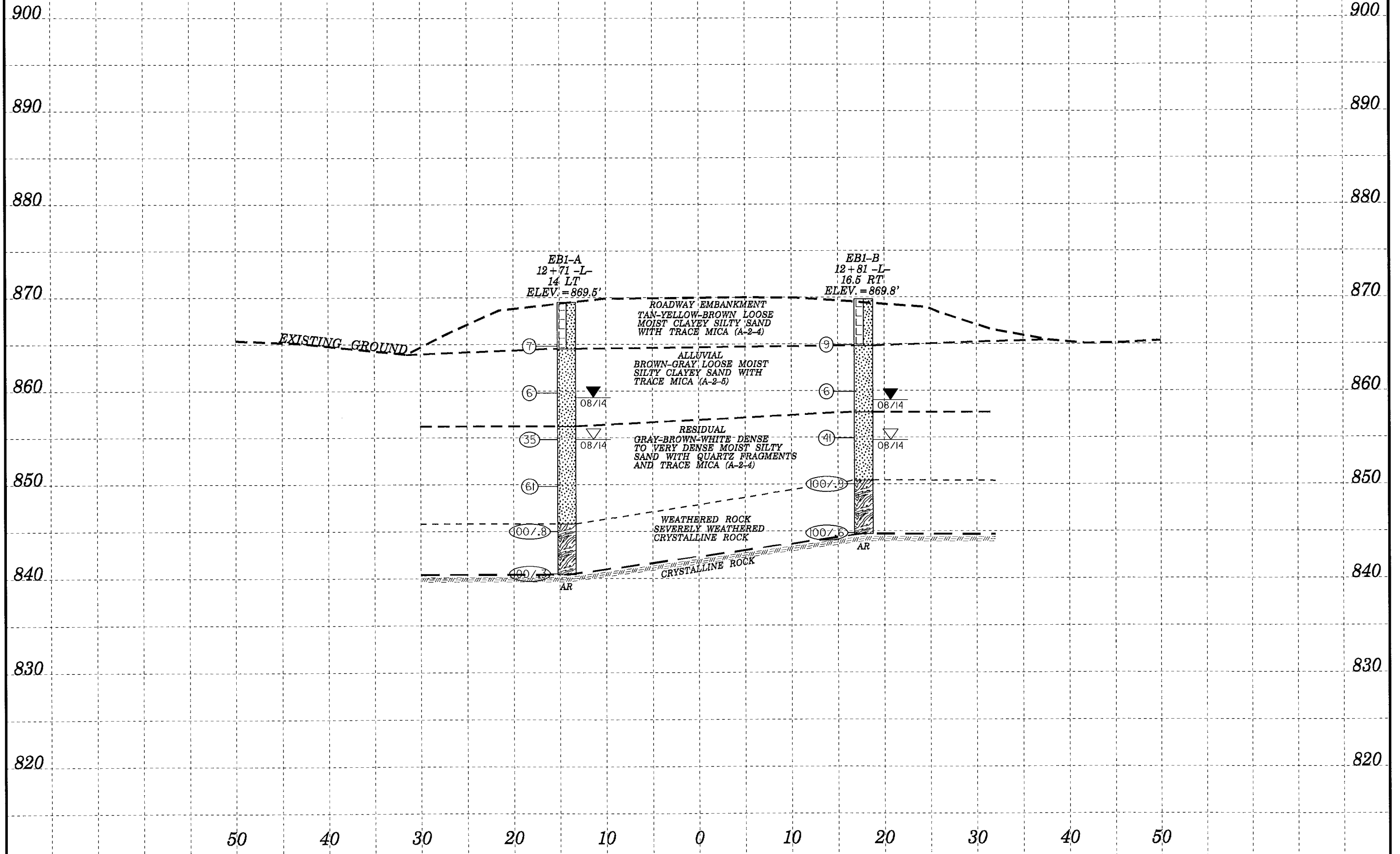
PROJECT REFERENCE NO.	SHEET
45355.1.31 (BD-5109AE)	4
BRIDGE 45 STOKES CO. PROFILE ALONG -L- VE=5:1	

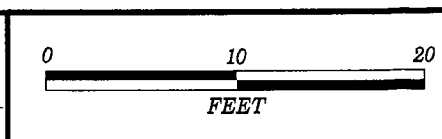




PROJECT REFERENCE NO.	SHEET
45355.1.31 (BD-5109AE)	5
SECTION THROUGH EBI STA. 12+73.84 -L- SKEW=75°00'00"	

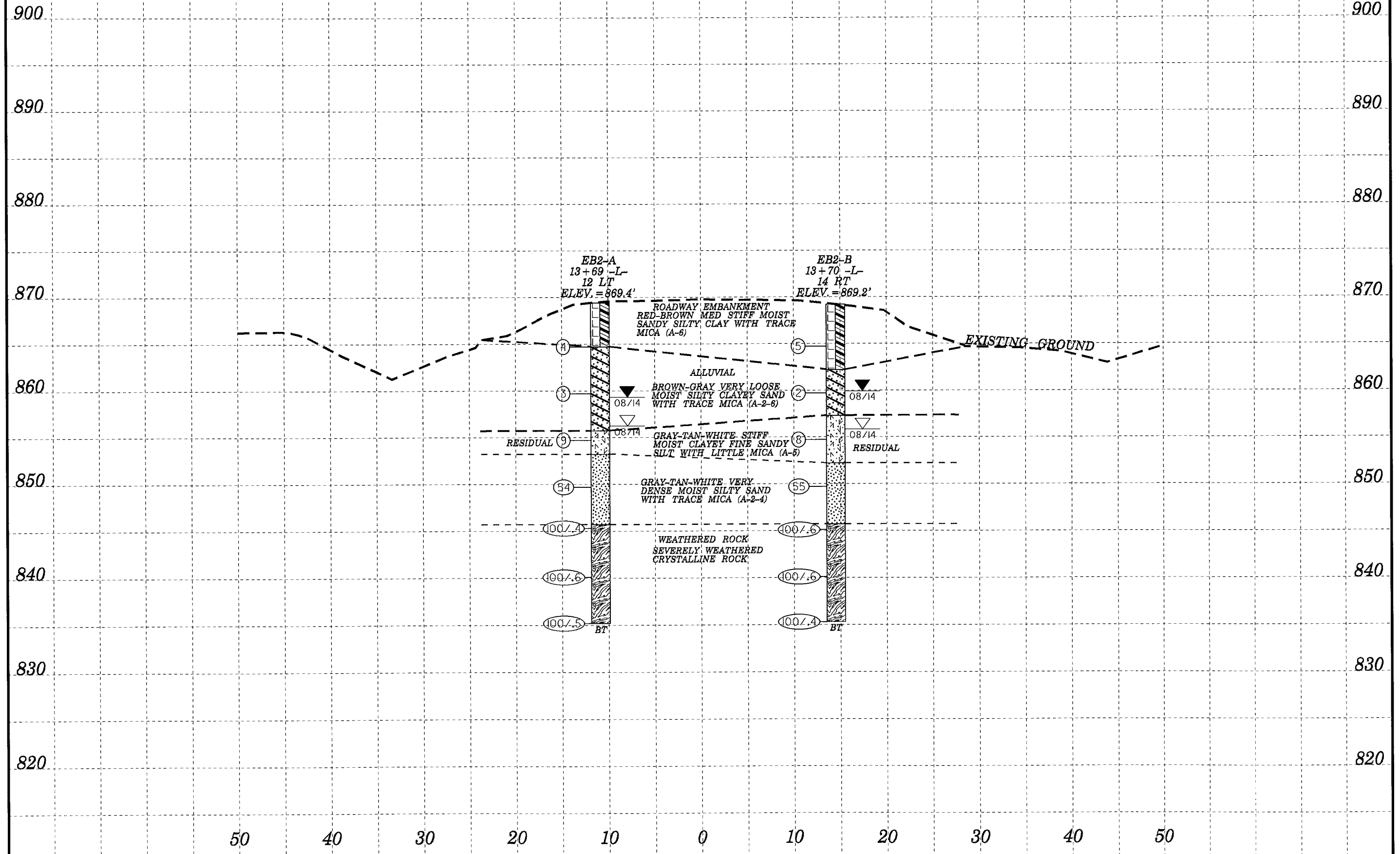
-L-





PROJECT REFERENCE NO.	SHEET
45355.1.31 (BD-5109AE)	6
SECTION THROUGH EB2 STA. 13+66.16 -L- SKEW = 75°00'00"	

-L-

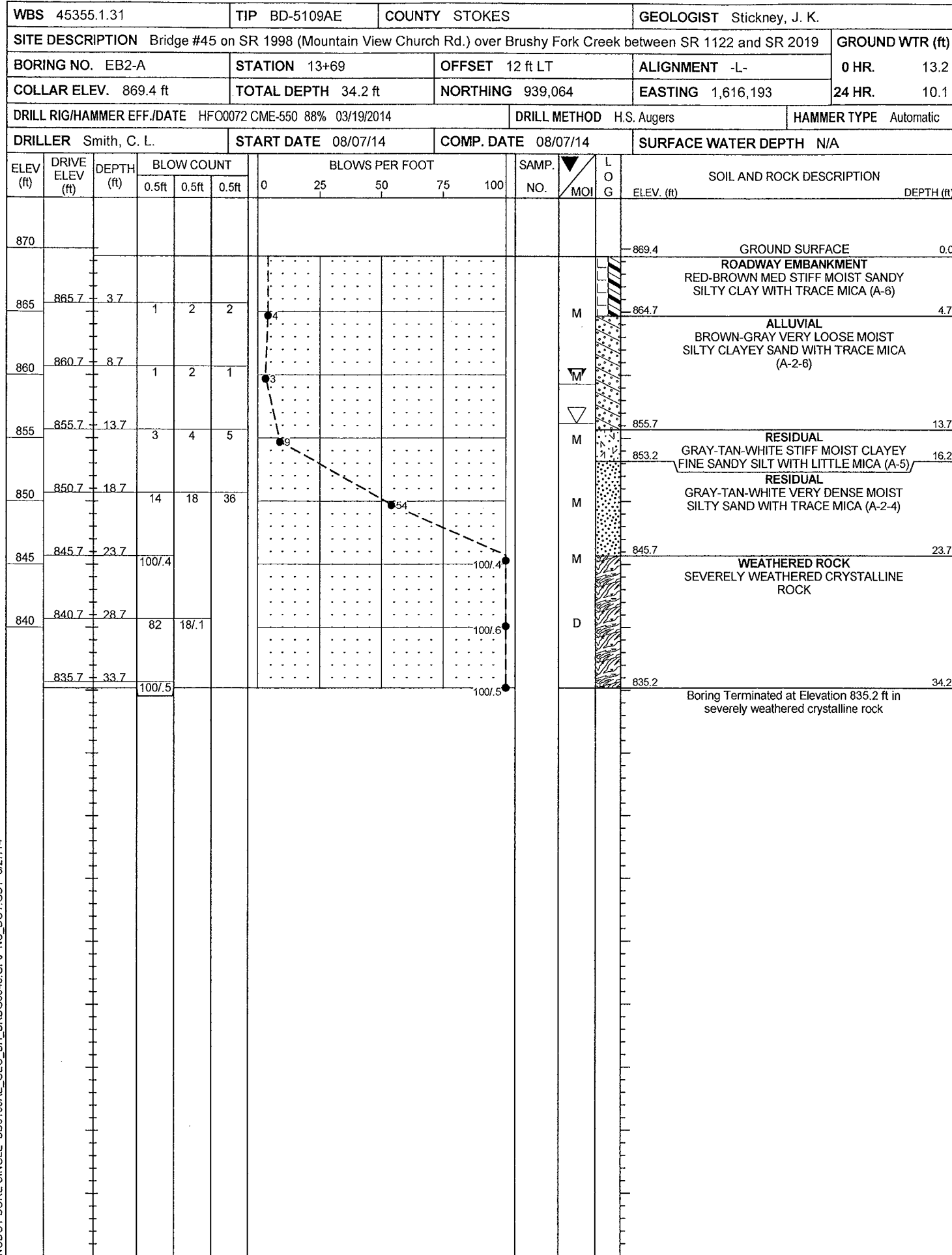


WBS 45355.1.31		TIP BD-5109AE		COUNTY STOKES		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge #45 on SR 1998 (Mountain View Church Rd.) over Brushy Fork Creek between SR 1122 and SR 2019							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 12+71		OFFSET 14 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 869.5 ft		TOTAL DEPTH 29.1 ft		NORTHING 938,969		EASTING 1,616,167										
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 88% 03/19/2014		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER Smith, C. L.		START DATE 08/06/14		COMP. DATE 08/06/14		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
870														869.5	GROUND SURFACE	0.0
865	865.8	3.7	3	3	4								M	ROADWAY EMBANKMENT TAN-YELLOW-BROWN LOOSE MOIST CLAYEY SILTY SAND WITH TRACE MICA (A-2-4)	5.0	
860	860.8	8.7	4	3	3								M	ALLUVIAL BROWN-GRAY LOOSE MOIST SILTY CLAYEY SAND WITH TRACE MICA (A-2-5)		
855	855.8	13.7	12	14	21								M	RESIDUAL GRAY-BROWN-WHITE DENSE TO VERY DENSE MOIST SILTY SAND WITH QUARTZ FRAGMENTS AND TRACE MICA (A-2-4)	13.3	
850	850.8	18.7	25	49	12								W			
845	845.8	23.7	23	77/3									D	WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	23.7	
	840.8	28.7	100/3												Boring Terminated by Auger Refusal at Elevation 840.4 ft on crystalline rock	29.1

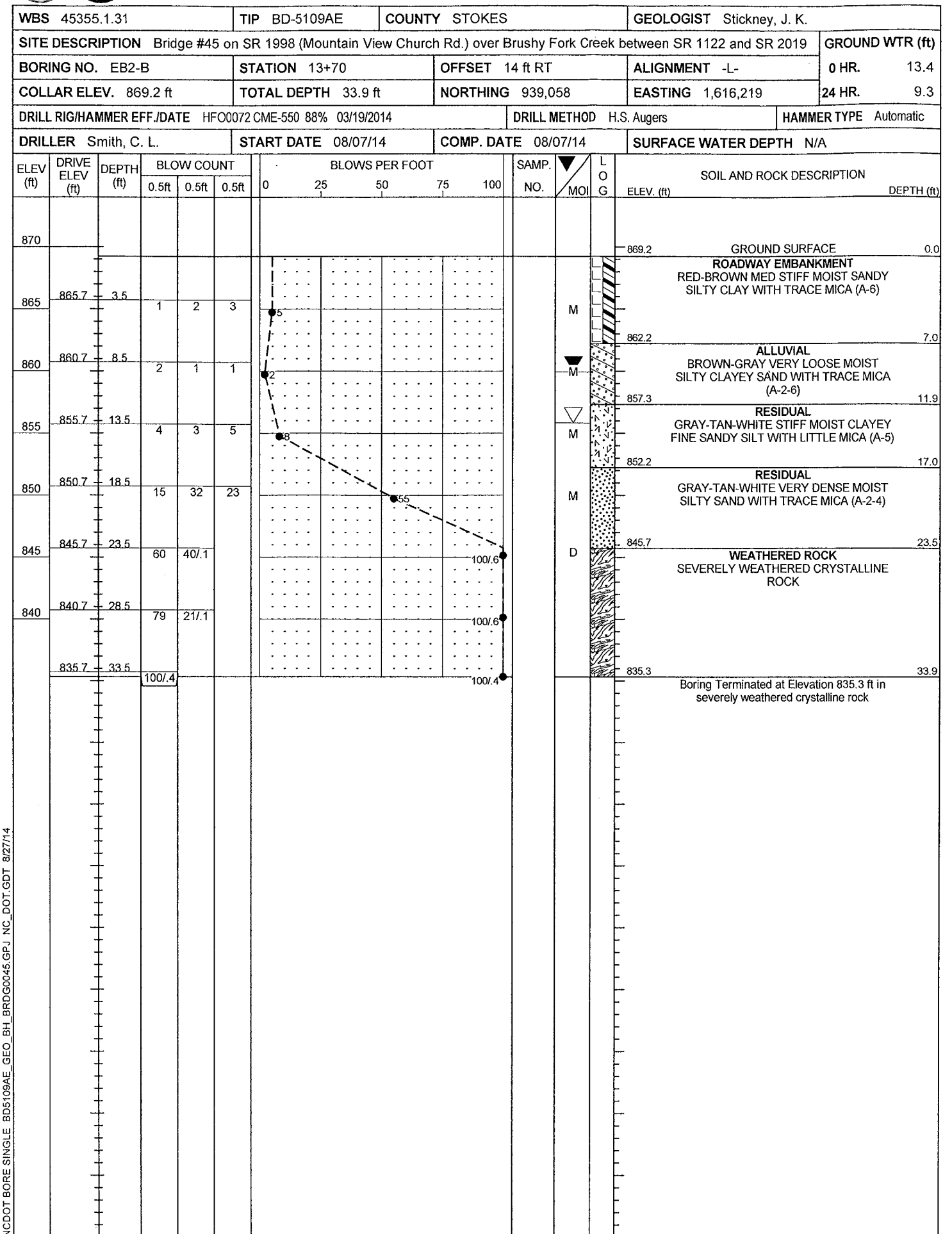
NCDOT BORE SINGLE BD5109AE_GEO_BH_BRDG0045.GPJ NC_DOT_GDT 8/27/14

WBS 45355.1.31		TIP BD-5109AE		COUNTY STOKES		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge #45 on SR 1998 (Mountain View Church Rd.) over Brushy Fork Creek between SR 1122 and SR 2019							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 12+81		OFFSET 17 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 869.8 ft		TOTAL DEPTH 25.1 ft		NORTHING 938,971		EASTING 1,616,199										
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 88% 03/19/2014		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
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870														869.8	GROUND SURFACE	0.0
865	865.9	3.9	3	4	5								M	ROADWAY EMBANKMENT TAN-YELLOW-BROWN LOOSE MOIST CLAYEY SILTY SAND WITH TRACE MICA (A-2-4)	5.0	
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855	855.9	13.9	14	19	22								M	RESIDUAL GRAY-BROWN-WHITE VERY DENSE MOIST SILTY SAND WITH QUARTZ SAND AND TRACE MICA (A-2-4)	12.1	
850	850.9	18.9	27	59	41/4								M			
845	845.9	23.9	15	65	35/1								D	WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	19.4	
															Boring Terminated by Auger Refusal at Elevation 844.7 ft on crystalline rock	25.1

NCDOT BORE SINGLE BD5109AE_GEO_BH_BRDG0045.GPJ NC_DOT_GDT 8/27/14



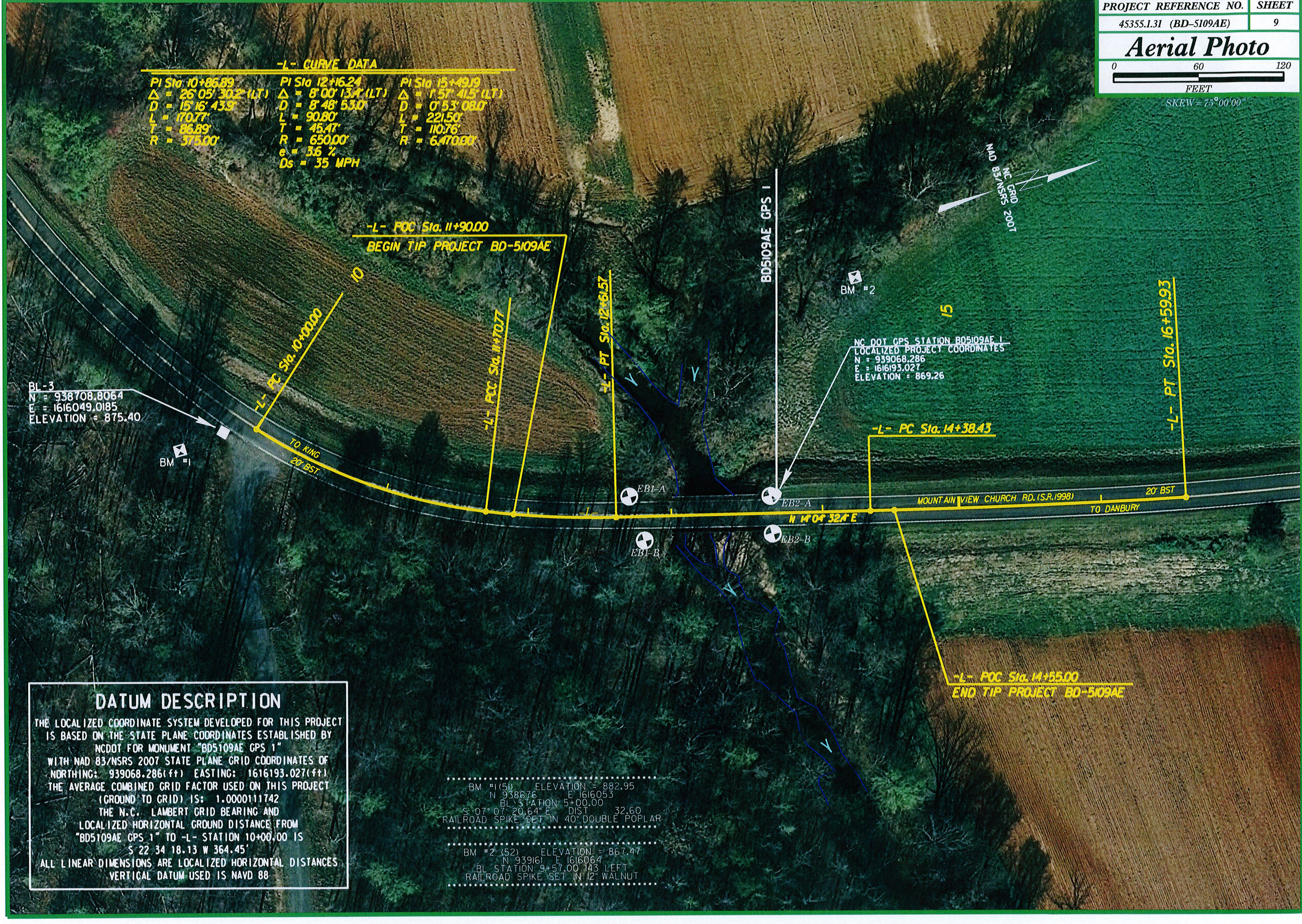
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NCDOT BORE SINGLE_BD5109AE_GEO_BH_BRD0045.GPJ NC_DOT_GDT_8/27/14

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PI Sta 10+86.89	PI Sta 12+16.24	PI Sta 15+49.19
Δ = 26°05'30.2 (LT)	Δ = 8°00'13.4 (LT)	Δ = 1°57'41.5 (LT)
D = 15'16.439	D = 8'48.530	D = 0'53.080
L = 170.77'	L = 90.80'	L = 221.50'
T = 86.89'	T = 45.47'	T = 110.76'
R = 375.00'	R = 650.00'	R = 6,470.00'
e = 3.6 %		
Ds = 35 MPH		



BL-3
 N = 938708.8064
 E = 1616049.0185
 ELEVATION = 875.40

NC DOT GPS STATION BD5109AE 1
 LOCALIZED PROJECT COORDINATES
 N = 939068.286
 E = 1616193.027
 ELEVATION = 869.26

DATUM DESCRIPTION

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 VERTICAL DATUM USED IS NAVD 88

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