

REFERENCE: B-5412

PROJECT: 55042

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY HARNETT
PROJECT DESCRIPTION BRIDGE NO. 7 ON -L-
(SR 1516) OVER WEST BUIES CREEK AT
STA. 15 + 46

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5412	1	14

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

PERSONNEL

J. L. PEDRO

O. B. OTI

D. G. PINTER

R. E. SMITH

J. M. EDMUNDSON

INVESTIGATED BY J. L. PEDRO
 DRAWN BY J. L. PEDRO
 CHECKED BY N. T. ROBERSON
 SUBMITTED BY N. T. ROBERSON
 DATE AUGUST 2016



DocuSigned by:
Jaime Love Pedro 9/8/2016

 SIGNATURE DATE

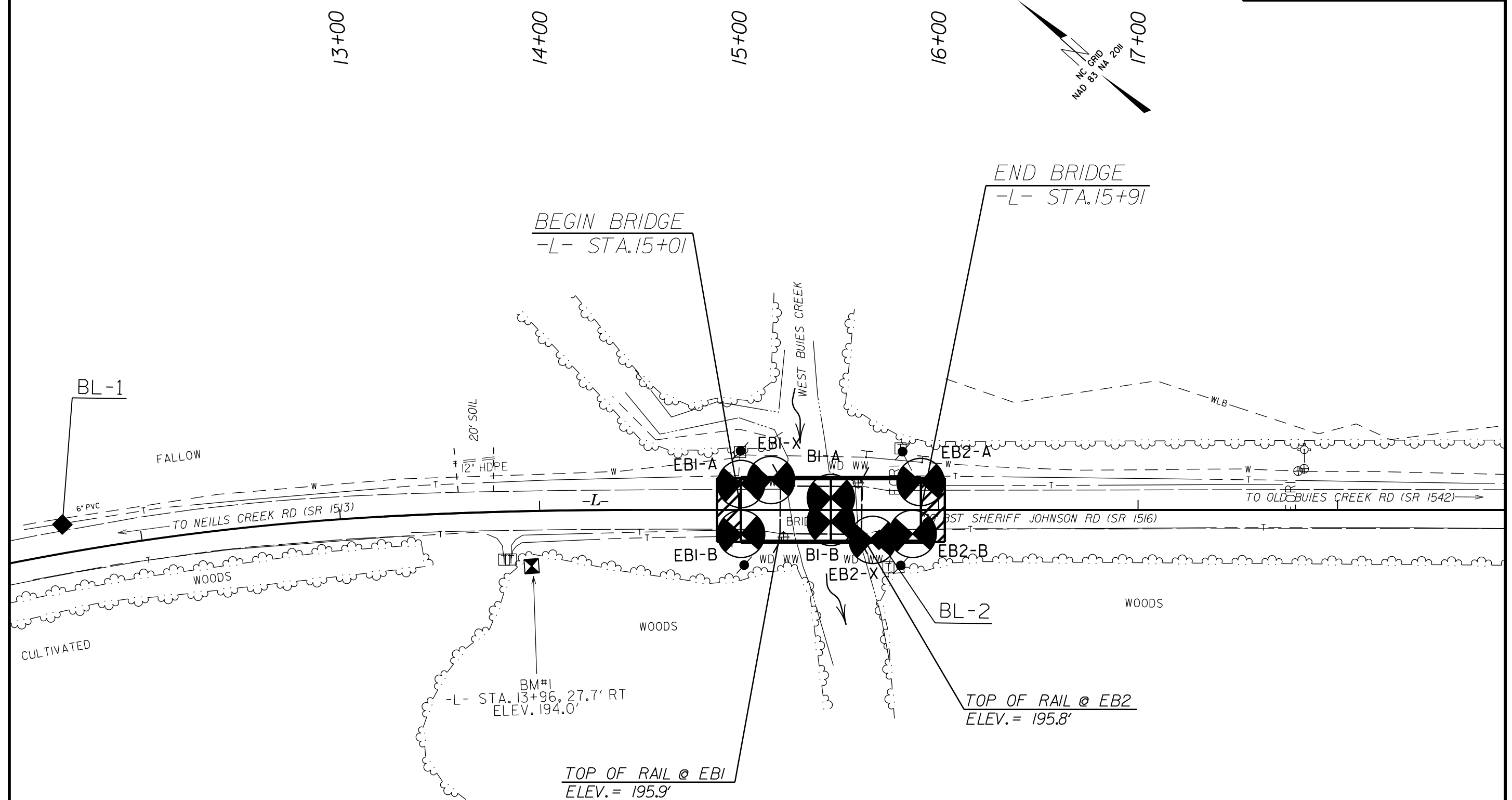
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

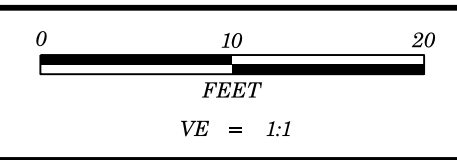
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

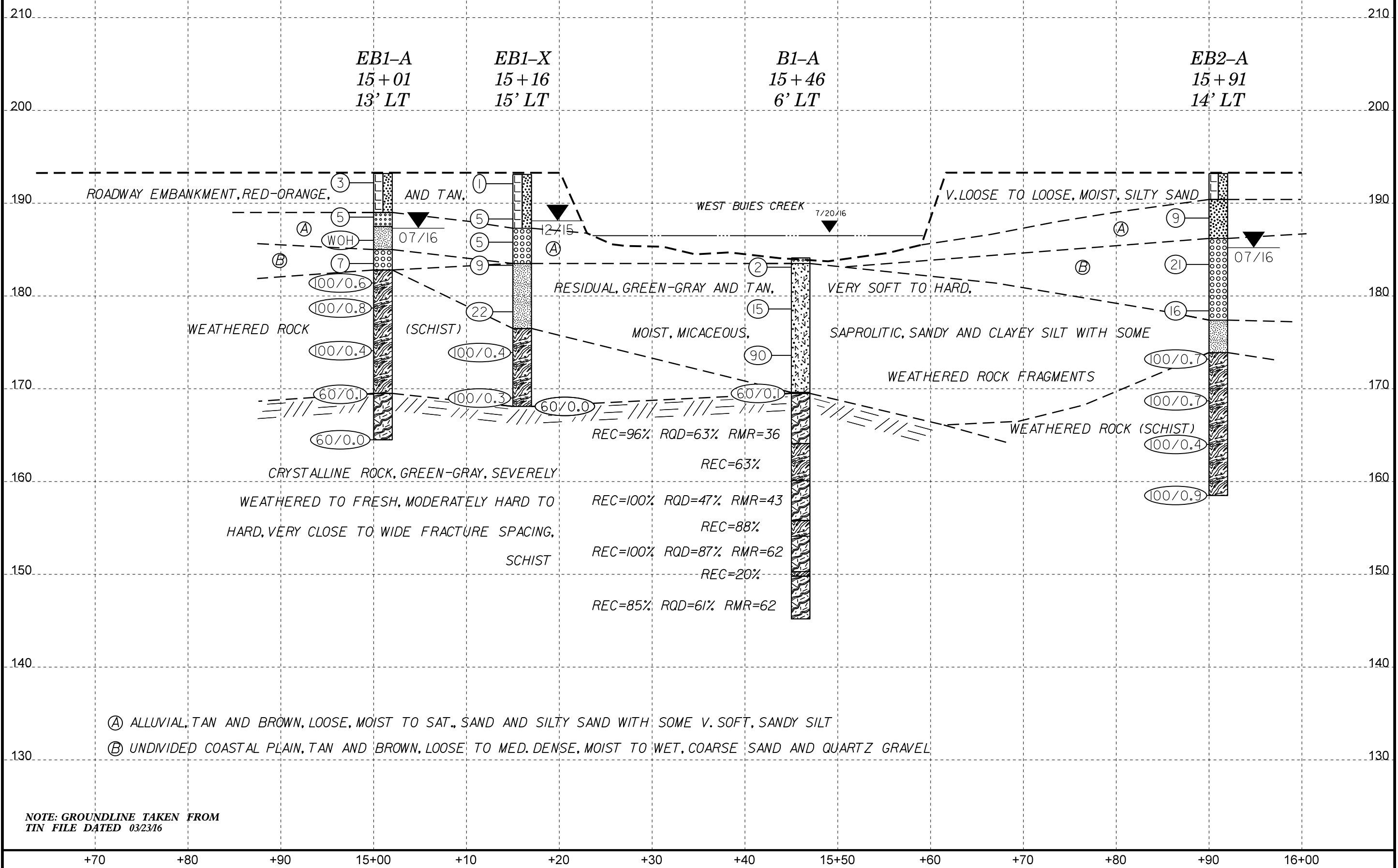
SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																			
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING 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 DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																			
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										CRYSTALLINE ROCK (CR)										NON-CRYSTALLINE ROCK (NCR)										COASTAL PLAIN SEDIMENTARY ROCK (CP)									
<p>GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS</p>										<p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p>										<p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p>										<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>									
<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>WEATHERED ROCK (WR)</p>										<p>WEATHERED ROCK (WR)</p>										<p>WEATHERED ROCK (WR)</p>									
COMPRESSION										PERCENTAGE OF MATERIAL										WEATHERING										MISCELLANEOUS SYMBOLS																			
<p>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</p>										<p>ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE</p>										<p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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. 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. IF TESTED, WOULD YIELD SPT REFUSAL 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. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF VERY SEVERE (V. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF 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>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY</p>										<p>DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE</p>									
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS										ABBREVIATIONS										EQUIPMENT USED ON SUBJECT PROJECT																			
<p>U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053</p>										<p>UNDERCUT SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</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 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 VST - VANE SHEAR TEST WEA. - WEATHERED W - UNIT WEIGHT Wg - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p>										<p>DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE 2 7/8" TUNG-CARB. CORE BIT</p>																			
SOIL MOISTURE - CORRELATION OF TERMS										FRACTURE SPACING										BEDDING										INDURATION																			
<p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</p>										<p>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>										<p>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</p>										<p>FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																			
PLASTICITY										NOTES:										ELEVATION: 194.00 FEET										INDURATION																			
<p>NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH</p>										<p>TOP OF RAIL AT EB1 - 15+20, 13' RT ELEV. = 195.9' TOP OF RAIL AT EB2 - 15+60, 13' RT ELEV. = 195.8'</p>										<p>ELEVATION: 194.00 FEET</p>										<p>INDURATION</p>																			
COLOR										INDURATION										INDURATION										INDURATION																			
<p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>																			

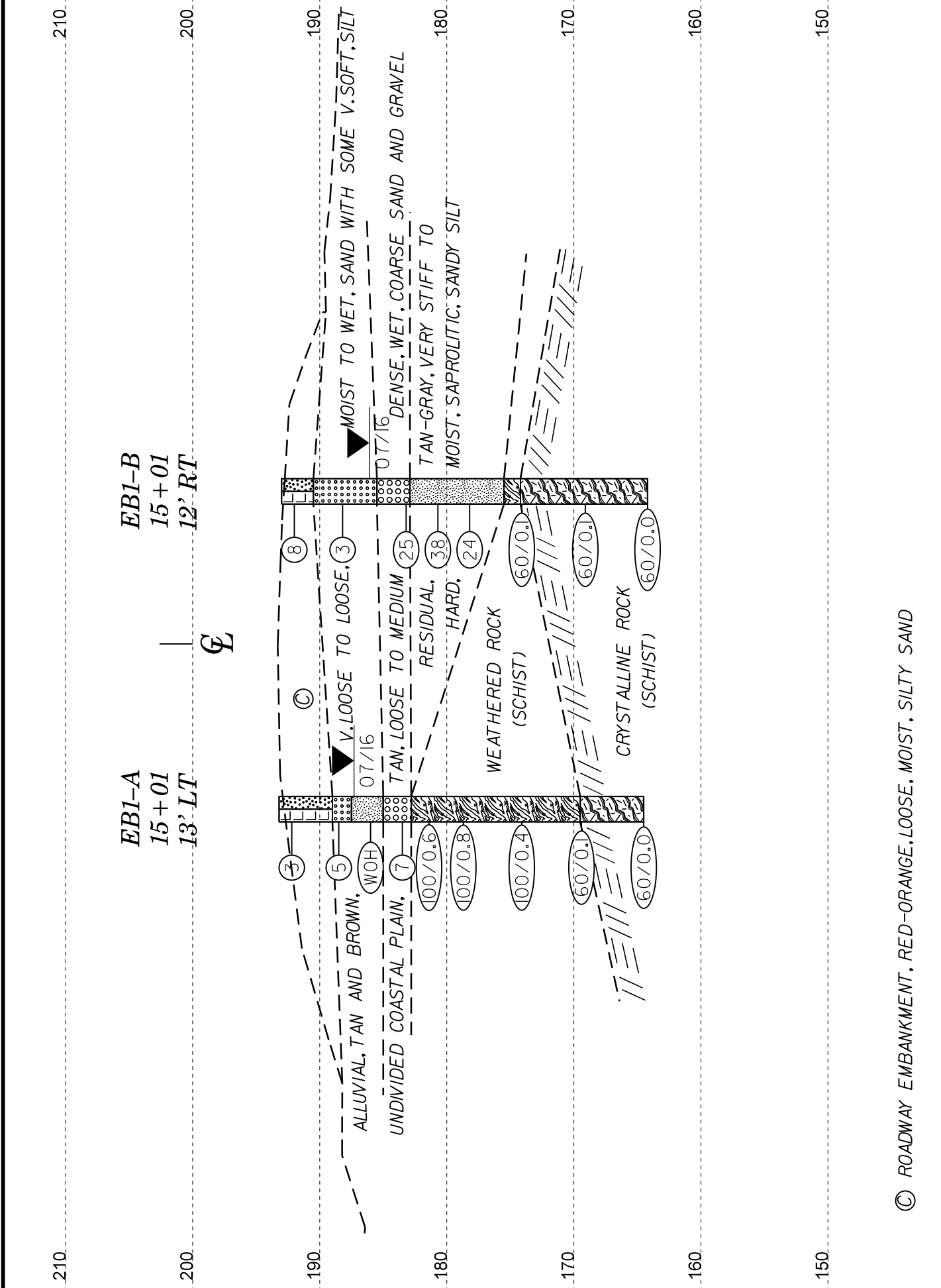


SKEW ANGLE = 90°



PROJECT REFERENCE NO.	SHEET NO.
B-5412	4
FENCE DIAGRAM OF BORINGS PROJECTED ALONG -L- PROFILE	

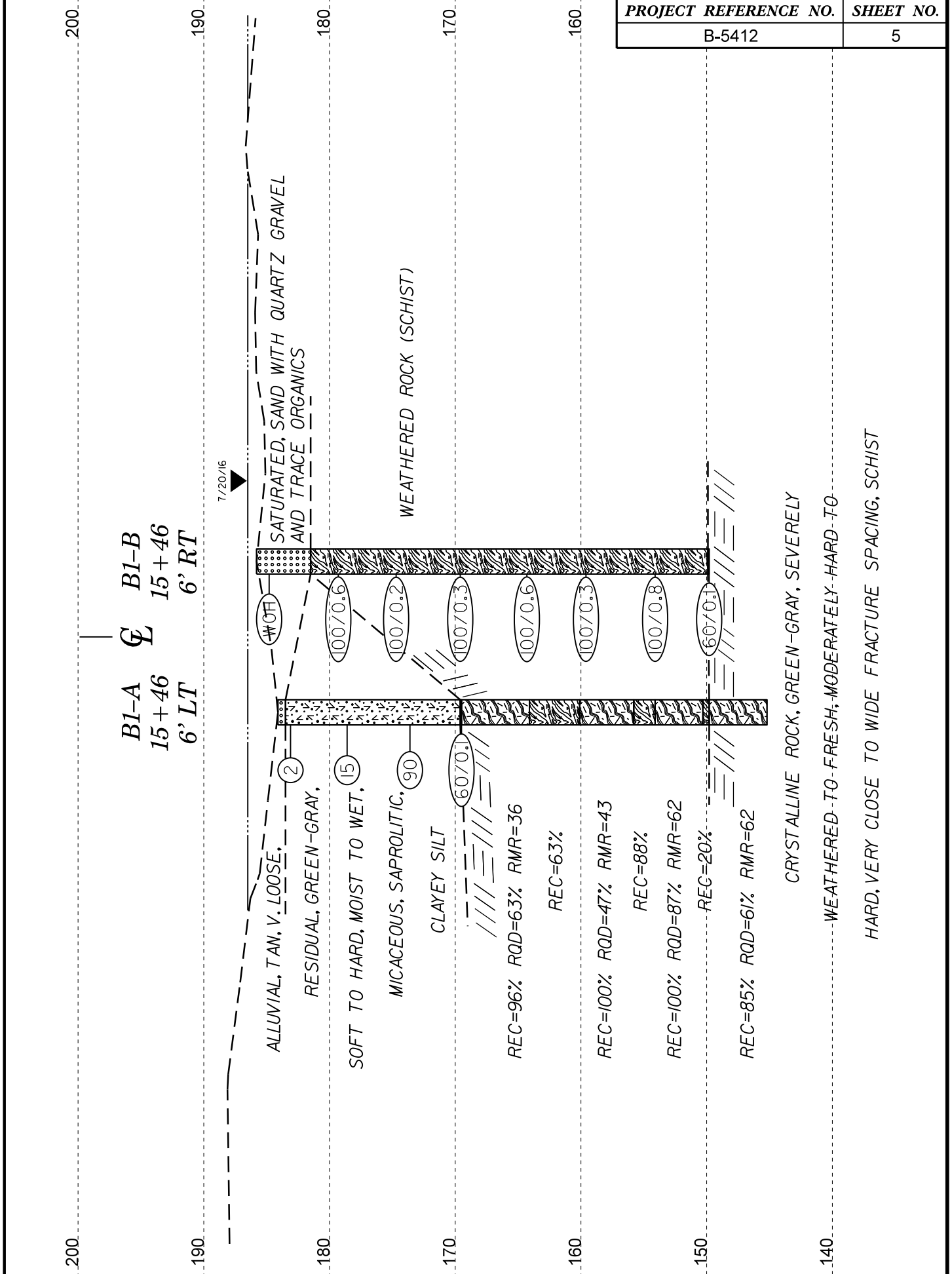




HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

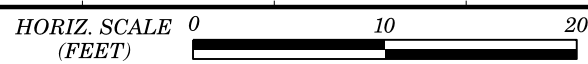
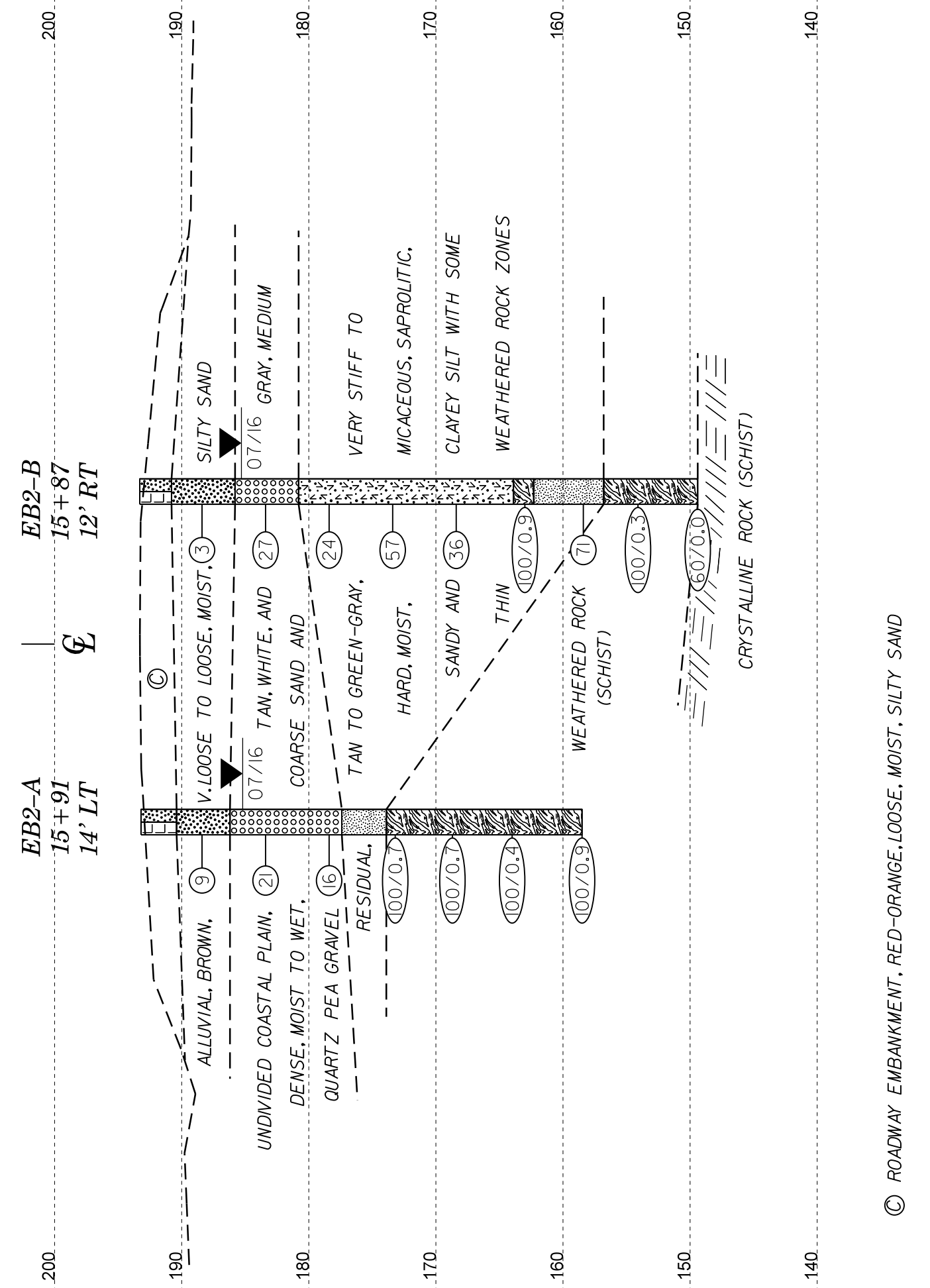
CROSS SECTION THROUGH EBI



HORIZ. SCALE 0 10 20 (FEET)

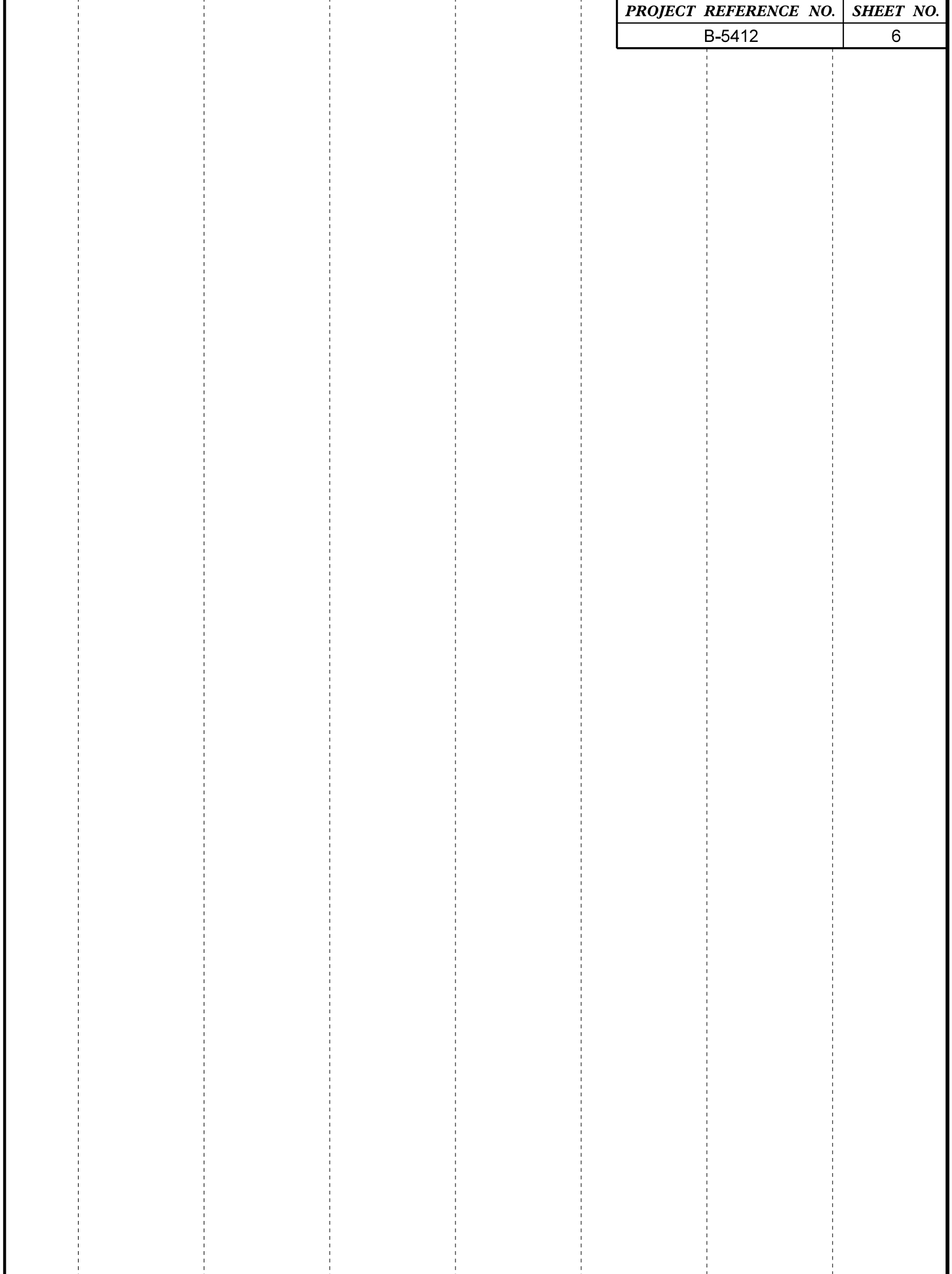
VE = 1:1

CROSS SECTION THROUGH BI



VE = 1:1

CROSS SECTION THROUGH EB2



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT		GEOLOGIST Pedro, J. L.									
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 15+01		OFFSET 13 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 193.2 ft		TOTAL DEPTH 28.7 ft		NORTHING 613,037		EASTING 2,069,266									
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015		DRILL METHOD NW Casing w/ Advancer		HAMMER TYPE Automatic											
DRILLER Pinter, D. G.		START DATE 07/21/16		COMP. DATE 07/21/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
195	193.2	0.0	2	1	2							M		193.2 GROUND SURFACE 0.0	
190	189.5	3.7	5	3	2							M		189.0 ROADWAY EMBANKMENT 4.2	
	187.0	6.2	WOH	WOH	WOH							M		187.5 ALLUVIAL 5.7	
185	184.5	8.7	2	2	5							W		185.0 BROWN, SANDY SILT 8.2	
	182.0	11.2	65	35/0.1								W		182.8 UNDIVIDED COASTAL PLAIN 10.4	
180	179.5	13.7	56	44/0.3										WEATHERED ROCK (SCHIST)	
175	174.5	18.7	100/0.4												
170	169.5	23.7	60/0.1												
165	164.5	28.7	60/0.0												
Boring Terminated with Standard Penetration Test Refusal at Elevation 164.5 ft IN CRYSTALLINE ROCK (SCHIST)															

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT		GEOLOGIST Pedro, J. L.									
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 15+01		OFFSET 12 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 193.0 ft		TOTAL DEPTH 28.8 ft		NORTHING 613,020		EASTING 2,069,248									
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015		DRILL METHOD NW Casing w/ Advancer		HAMMER TYPE Automatic											
DRILLER Pinter, D. G.		START DATE 07/21/16		COMP. DATE 07/21/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
195	193.0	0.0	3	4	4							M		193.0 GROUND SURFACE 0.0	
190	189.2	3.8	2	2	1							M		190.5 ROADWAY EMBANKMENT 2.5	
	187.5	5.5										M		ALLUVIAL TAN, SAND WITH SOME GRAVEL (PEA-SIZE TO 0.2') 7.5	
185	184.2	8.8	4	7	18							W		182.9 UNDIVIDED COASTAL PLAIN 10.1	
	181.7	11.3	17	18	20							M		**DRIVE AT 8.8' HAD NO RECOVERY DUE TO LARGE PIECE OF QUARTZ LODGED IN SHOE.**	
180	179.2	13.8	8	12	12							M		RESIDUAL TAN-GRAY, SAPROLITIC, SANDY SILT 17.5	
175	174.2	18.8	60/0.1											WEATHERED ROCK (SCHIST) 18.8	
170	169.2	23.8	60/0.1											CRYSTALLINE ROCK (SCHIST)	
165	164.2	28.8	60/0.0												
Boring Terminated with Standard Penetration Test Refusal at Elevation 164.2 ft IN CRYSTALLINE ROCK (SCHIST)															

NCDOT BORE DOUBLE B5412_GEO_BH.GPJ NC_DOT.GDT 8/8/16

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT			GEOLOGIST Crenshaw, J. K.							
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK								GROUND WTR (ft)						
BORING NO. EB1-X		STATION 15+16		OFFSET 15 ft LT		ALIGNMENT -L-		0 HR. N/A						
COLLAR ELEV. 193.1 ft		TOTAL DEPTH 25.0 ft		NORTHING 613,027		EASTING 2,069,278		24 HR. 5.0						
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015						DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Pinter, D. G.			START DATE 12/02/15		COMP. DATE 12/02/15		SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
195														
	193.1	0.0			1									GROUND SURFACE 193.1 0.0
			WOH	WOH										ROADWAY EMBANKMENT ORANGE AND TAN, SILTY SAND WITH SOME GRAVEL
190	189.3	3.8	3	2	3	5								
	186.8	6.3	2	2	3	5								
185	184.3	8.8	1	2	7	9								ALLUVIAL ORANGE-TAN, SAND AND GRAVEL 5.8
180	179.3	13.8	16	12	10	22								RESIDUAL GRAY-GREEN, SAPROLITIC, MICACEOUS, SANDY SILT 9.6
175	174.3	18.8												WEATHERED ROCK (SCHIST) 16.6
170	169.3	23.8												
	168.1	25.0												
														Boring Terminated with Standard Penetration Test Refusal at Elevation 168.1 ft ON CRYSTALLINE ROCK (SCHIST) 25.0

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT		GEOLOGIST Pedro, J. L.											
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK							GROUND WTR (ft)										
BORING NO. B1-A		STATION 15+46		OFFSET 6 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 184.1 ft		TOTAL DEPTH 38.9 ft		NORTHING 612,999		EASTING 2,069,291											
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015			DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic											
DRILLER Pinter, D. G.		START DATE 07/20/16		COMP. DATE 07/20/16		SURFACE WATER DEPTH 2.4ft											
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)			
185	184.1	0.0	WOH	1	1												
180	179.6	4.5		8	8												
175	174.6	9.5		20	28												
170	169.6	14.5		60/0.1													
165																	
160																	
155																	
150																	

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT		GEOLOGIST Pedro, J. L.					
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK							GROUND WTR (ft)				
BORING NO. B1-A		STATION 15+46		OFFSET 6 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 184.1 ft		TOTAL DEPTH 38.9 ft		NORTHING 612,999		EASTING 2,069,291					
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015			DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic					
DRILLER Pinter, D. G.		START DATE 07/20/16		COMP. DATE 07/20/16		SURFACE WATER DEPTH 2.4ft					
CORE SIZE NXWL			TOTAL RUN 24.3 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
					REC. (%)	RQD (%)		REC. (%)	RQD (%)		
169.5	169.5	14.6	1.5	0:54/0.5	(1.4)	(1.3)	RS-1	(5.2)	(3.4)		Begin Coring @ 14.6 ft
165	168.0	16.1	5.0	1:09/1.0	93%	87%		96%	63%		GREEN-GRAY, SLIGHTLY WEATHERED TO FRESH, MODERATELY HARD, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, SCHIST WITH QUARTZ VEIN (19.1-20.0)
160	163.0	21.1	4.2	1:19/1.0	(4.2)	(2.3)		(2.5)	63%		WEATHERED ROCK GREEN-GRAY, MODERATELY SEVERE TO SEVERELY WEATHERED, MEDIUM TO MODERATELY HARD, CLOSE FRACTURE SPACING, MICA SCHIST
155	158.8	25.3	4.7	1:13/1.0	(3.0)	(1.0)	RS-2	(4.3)	(2.0)		CRYSTALLINE ROCK GREEN-GRAY TO GRAY, SLIGHTLY WEATHERED TO FRESH, MODERATELY HARD TO HARD, CLOSE FRACTURE SPACING, SCHIST
150	154.1	30.0	5.0	1:23/1.0	(4.2)	(2.3)		(1.5)	88%		WEATHERED ROCK GREEN-GRAY, MODERATELY SEVERE TO SEVERELY WEATHERED, MODERATELY HARD, CLOSE FRACTURE SPACING, MICA SCHIST
145.2	149.1	35.0	3.9	1:05/1.0	(5.0)	(3.7)	RS-3	(3.8)	(3.3)		CRYSTALLINE ROCK GRAY, FRESH, HARD, MODERATELY CLOSE FRACTURE SPACING, SCHIST
	145.2	38.9		1:06/1.0	(3.8)	(2.4)		(0.1)	20%		WEATHERED ROCK GRAY, SEVERELY WEATHERED, MODERATELY HARD, VERY CLOSE FRACTURE SPACING, MICA SCHIST
				1:08/0.9				(3.9)	85%		CRYSTALLINE ROCK GRAY, FRESH, HARD, MODERATELY CLOSE TO WIDE FRACTURE SPACING, SCHIST WITH PYRITE CRYSTALS IN SMALL CAVITIES

NCDOT BORE DOUBLE B5412_GEO_BH.GPJ_NC_DOT.GDT 8/3/16

NCDOT CORE DOUBLE B5412_GEO_BH.GPJ_NC_DOT.GDT 8/3/16

GEOTECHNICAL BORING REPORT

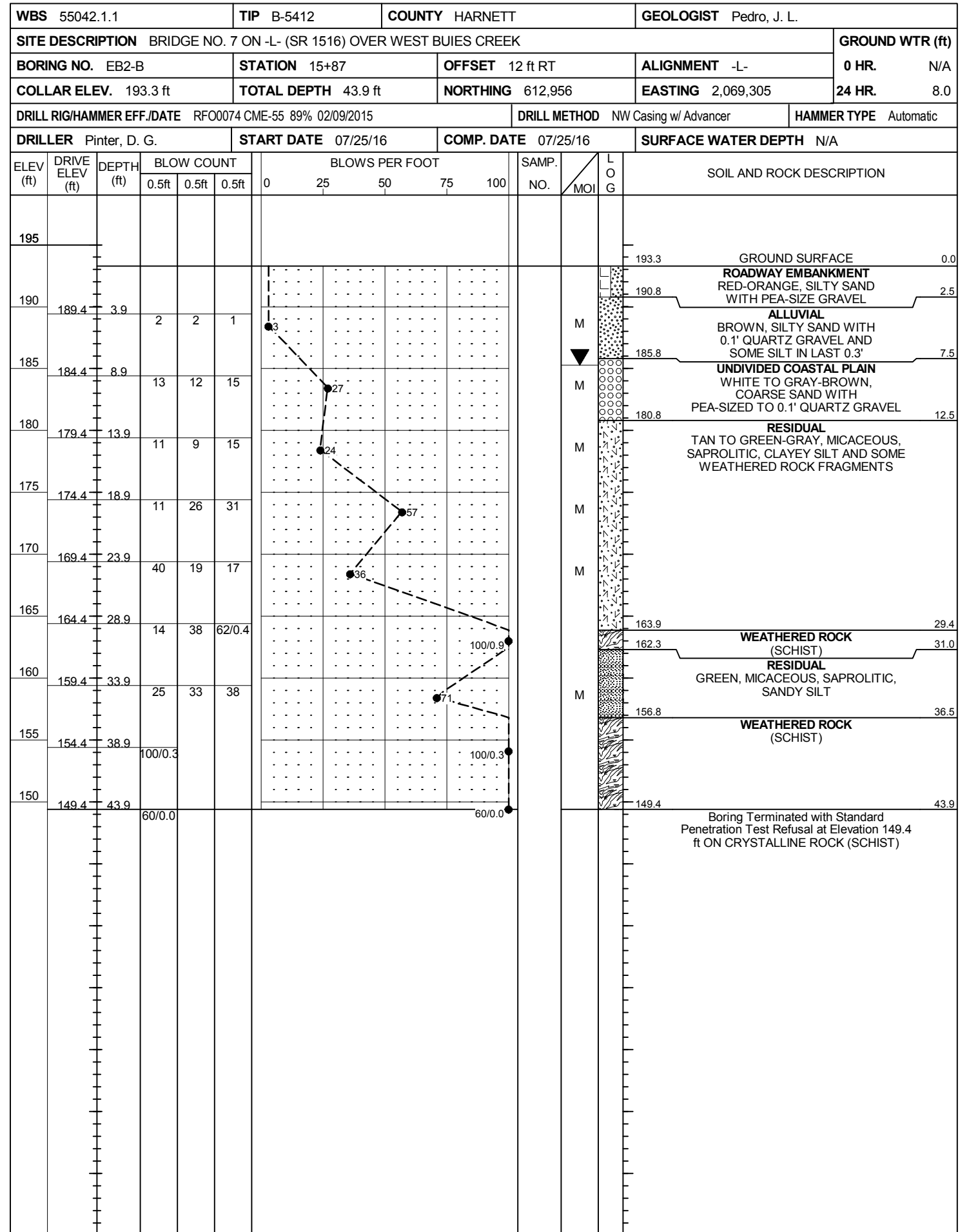
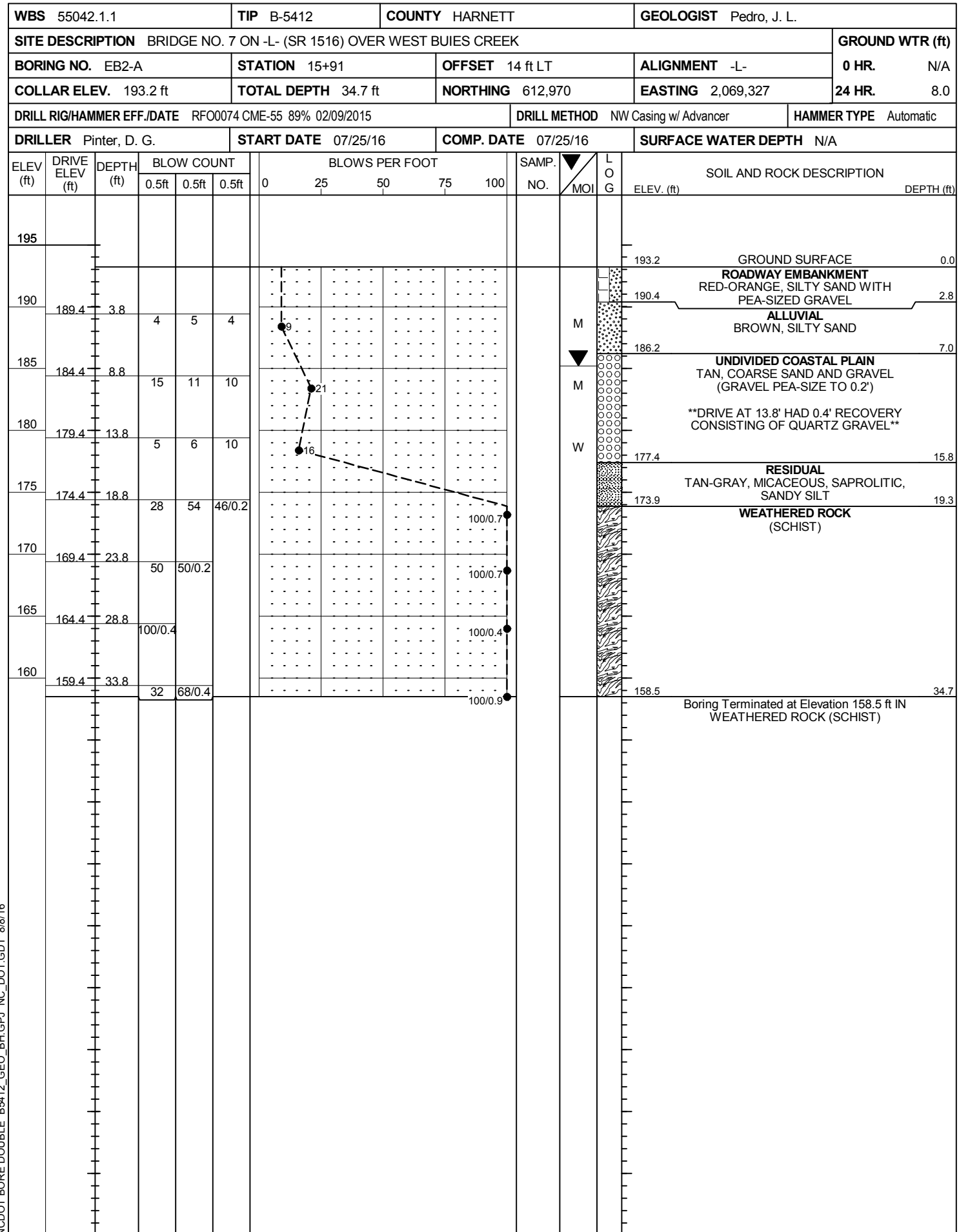
BORE LOG

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT		GEOLOGIST Pedro, J. L.								
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK							GROUND WTR (ft)							
BORING NO. B1-B		STATION 15+46		OFFSET 6 ft RT		ALIGNMENT -L-								
COLLAR ELEV. 185.8 ft		TOTAL DEPTH 36.0 ft		NORTHING 612,991		EASTING 2,069,282								
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015			DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic								
DRILLER Pinter, D. G.		START DATE 07/20/16		COMP. DATE 07/20/16		SURFACE WATER DEPTH 0.9ft								
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)
190														
185	185.8	0.0	WOH	WOH	WOH									GROUND SURFACE (07/20/16) GROUND SURFACE
180	179.9	5.9												ALLUVIAL TAN, SAND WITH SOME LEAFY DEBRIS
175	174.9	10.9												WEATHERED ROCK (SCHIST)
170	169.9	15.9												
165	164.9	20.9												
160	159.9	25.9												
155	154.9	30.9												
150	149.9	35.9												CRYSTALLINE ROCK (SCHIST) Boring Terminated with Standard Penetration Test Refusal at Elevation 149.8 ft IN CRYSTALLINE ROCK (SCHIST)

WBS 55042.1.1		TIP B-5412		COUNTY HARNETT		GEOLOGIST Crenshaw, J. K.								
SITE DESCRIPTION BRIDGE NO. 7 ON -L- (SR 1516) OVER WEST BUIES CREEK							GROUND WTR (ft)							
BORING NO. EB2-X		STATION 15+67		OFFSET 15 ft RT		ALIGNMENT -L-								
COLLAR ELEV. 193.1 ft		TOTAL DEPTH 38.0 ft		NORTHING 612,969		EASTING 2,069,290								
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 89% 02/09/2015			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic								
DRILLER Pinter, D. G.		START DATE 12/01/15		COMP. DATE 12/01/15		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)
195														
190	193.1	0.0	WOH	WOH	3									GROUND SURFACE
	190.6	2.5												ROADWAY EMBANKMENT ORANGE, BROWN, AND GRAY, SILTY SAND WITH SOME COARSE SAND AND GRAVEL
	189.1	4.0												
	186.6	6.5												ALLUVIAL BROWN AND ORANGE, SAND
	184.1	9.0												UNDIVIDED COASTAL PLAIN BROWN, COARSE SAND AND GRAVEL
	181.6	11.5												RESIDUAL BROWN AND GREEN-GRAY, SAPROLITIC, CLAYEY SILT
	179.1	14.0												
	176.6	16.5												
	174.1	19.0												GREEN-GRAY, SAPROLITIC, MICACEOUS, SANDY SILT
	171.6	21.5												
	169.1	24.0												
	164.1	29.0												
	159.1	34.0												WEATHERED ROCK (SCHIST)
	155.1	38.0												Boring Terminated with Standard Penetration Test Refusal at Elevation 155.1 ft ON CRYSTALLINE ROCK (SCHIST)

NCDOT BORE DOUBLE B5412_GEO_BH.GPJ NC_DOT.GDT 8/8/16

GEOTECHNICAL BORING REPORT BORE LOG



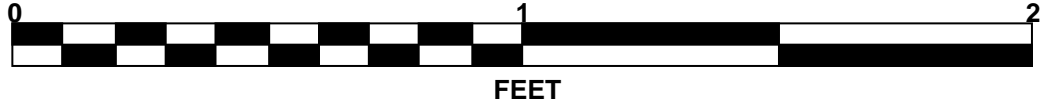
PROJ. NO. - 55042.1.1
ID NO. - B-5412
COUNTY - HARNETT

BL-A -L-

ROCK TEST RESULTS							
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	ROCK TYPE	UNIT WT LB/FT ³	UNCONFINED COMP. STRENGTH, KSI	SECTION MOD. @ 40% MPSI
RS-1	6' LT	15+46	15.1-15.7	SCHIST	162.0	3.73	1.16
RS-2	6' LT	15+46	26.5-27.1	SCHIST	171.2	4.24	3.02
RS-3	6' LT	15+46	35.9-36.5	SCHIST	173.1	2.26	3.55

CORE PHOTOGRAPHS

B1-A
BOXES 1 - 3: 14.6 - 38.9 FEET



SITE PHOTOGRAPH

Bridge No. 7 on -L- (SR 1516) over West Buies Creek



Looking South towards End Bent 2