

REFERENCE: B-5166

PROJECT: 42342

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY GRANVILLE
 PROJECT DESCRIPTION BRIDGE NO. 138 OVER GRASSY CREEK ON SR 1300 (CORNWALL ROAD) BETWEEN SR 1410 AND SR 1413 AT STA. 16+34
 SITE DESCRIPTION _____

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5166	1	17

CAUTION NOTICE

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PERSONNEL

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Z. AGHAZADEH

INVESTIGATED BY M. WITMORE
 DRAWN BY S. CROCKETT
 CHECKED BY Z. AGHAZADEH
 SUBMITTED BY AECOM
 DATE DECEMBER, 2015



DocuSigned by:
Gabriel Lang 1/18/2016
 1E651E26B73E4AF
 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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS ($\leq 35\%$ PASSING #200)						SILT-CLAY MATERIALS ($> 35\%$ PASSING #200)						ORGANIC MATERIALS			
	A-1	A-1-b	A-2	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	
GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7		
SYMBOL	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	
% PASSING #10 #40 #200	50 30 15	50 25	51 10 MN	35 35	35 35	35 35	35 35	36 MN	36 MN	36 MN		GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT		
MATERIAL PASSING #40 LL PI			40 MN NP	41 MN	41 MN	41 MN	40 MN	41 MN	40 MN	41 MN						
GROUP INDEX	0	0	0	4 MX	8 MX	12 MX	16 MX	36 MN	36 MN							
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS											
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD					FAIR TO POOR			FAIR TO POOR	POOR	UNSATURABLE					

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (IN-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)	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 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
BOULDER (BLDR.)						
COBBLE (COB.)						
GRAVEL (GR.)						
COARSE SAND (CSE. SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL PL	LIQUID LIMIT	
	PLASTIC LIMIT	
	OPTIMUM MOISTURE SHRINKAGE LIMIT	
OM SL		

PLASTICITY

NON PLASTIC	SLIGHTLY PLASTIC	MODERATELY PLASTIC	HIGHLY PLASTIC

COLOR

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.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LL < 31
MODERATELY COMPRESSIBLE LL = 31 - 50
HIGHLY COMPRESSIBLE LL > 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
STATIC WATER LEVEL AFTER 24 HOURS
PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
SPRING OR SEEP

MISCELLANEOUS SYMBOLS

RECOMMENDATION SYMBOLS

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - COARSE 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
UNIT WEIGHT
DRY UNIT WEIGHT
SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
 CME-45C
 CME-55
 CME-550
 VANE SHEAR TEST
 PORTABLE HOIST
 D-50

ADVANCING TOOLS:
 CLAY BITS
 6" CONTINUOUS FLIGHT AUGER
 8" HOLLOW AUGERS
 HARD FACED FINGER BITS
 TUNG-CARBIDE INSERTS
 CASING
 W/ ADVANCR
 TRICONE *STEEL TEETH
 TRICONE *TUNG-CARB.
 CORE BIT

HAMMER TYPE:
 AUTOMATIC
 MANUAL

CORE SIZE:
 -B
 -H

HAND TOOLS:
 POST HOLE DIGGER
 HAND AUGER
 SOUNDING ROD
 VANE SHEAR TEST

ROCK DESCRIPTION

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:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	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.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

WEATHERING	ROCK DESCRIPTION
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.

ROCK HARDNESS

ROCK HARDNESS	DESCRIPTION
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROUDED OR GOUGED 0.25 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.

FRACTURE SPACING

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

BEDDING

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

INDURATION

INDURATION	DESCRIPTION
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.

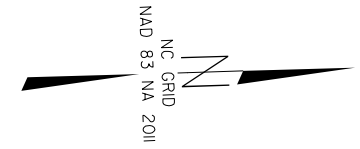
TERMS AND DEFINITIONS

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 (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.

BENCH MARK: BM-50, RR SPIKE IN I4" BLACK OAK
N: 99163 E: 2098814
ELEVATION: 391.21 FEET

NOTES:
WOH = WEIGHT OF HAMMER
FIAD = FILLED IMMEDIATELY AFTER DRILLING
TOP OF RAIL EL. - SOUTH END OF BRIDGE (EB-1): 385.3
TOP OF RAIL EL. - NORTH END OF BRIDGE (EB-2): 386.8

PROJECT REFERENCE NO.	SHEET
B-5166	3
SITE PLAN	
FEET	



OLD MOUNTAIN CREEK, LLC
DB 1417 PG 628

WOODS

WOODS

WOODS

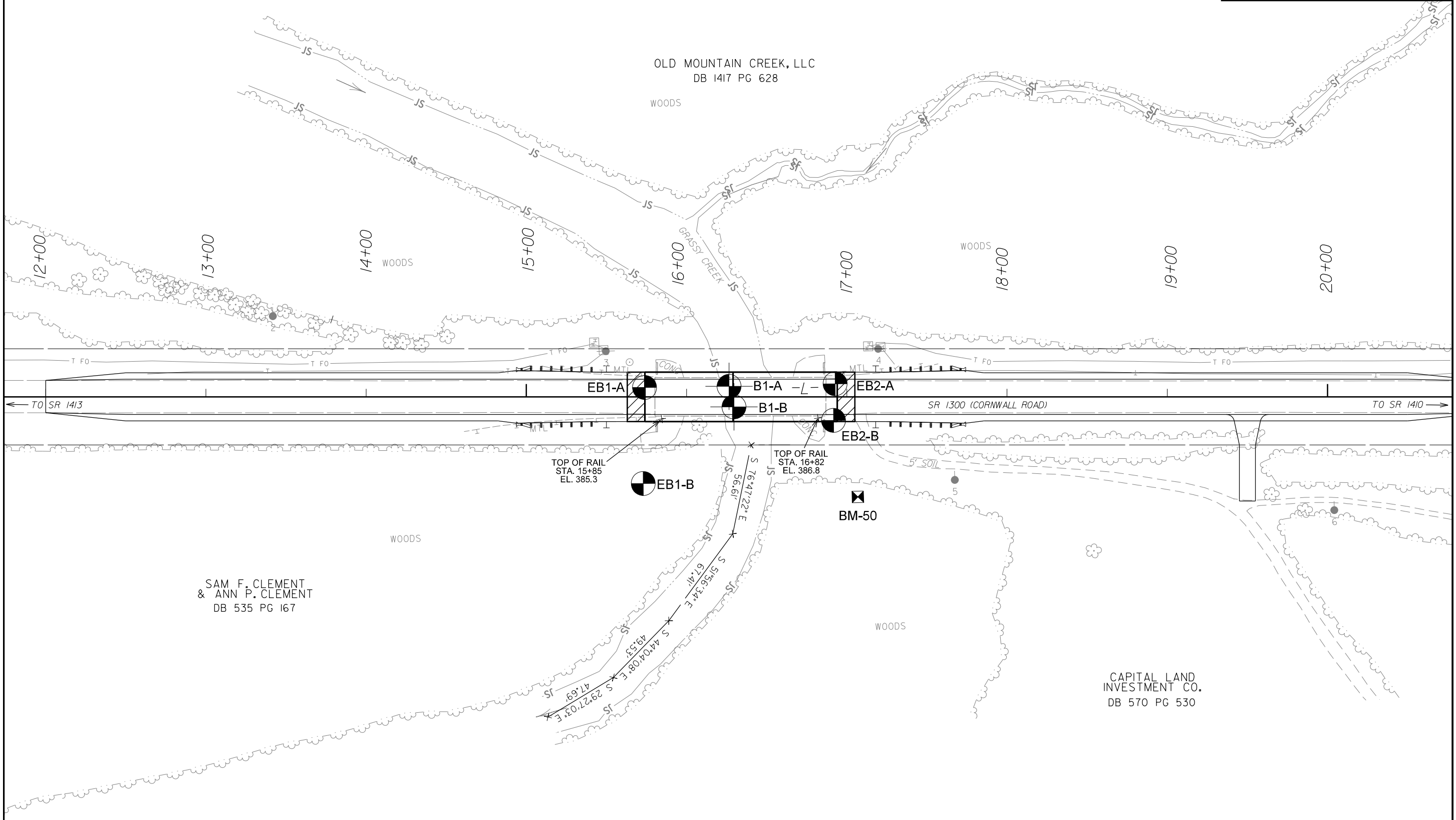
WOODS

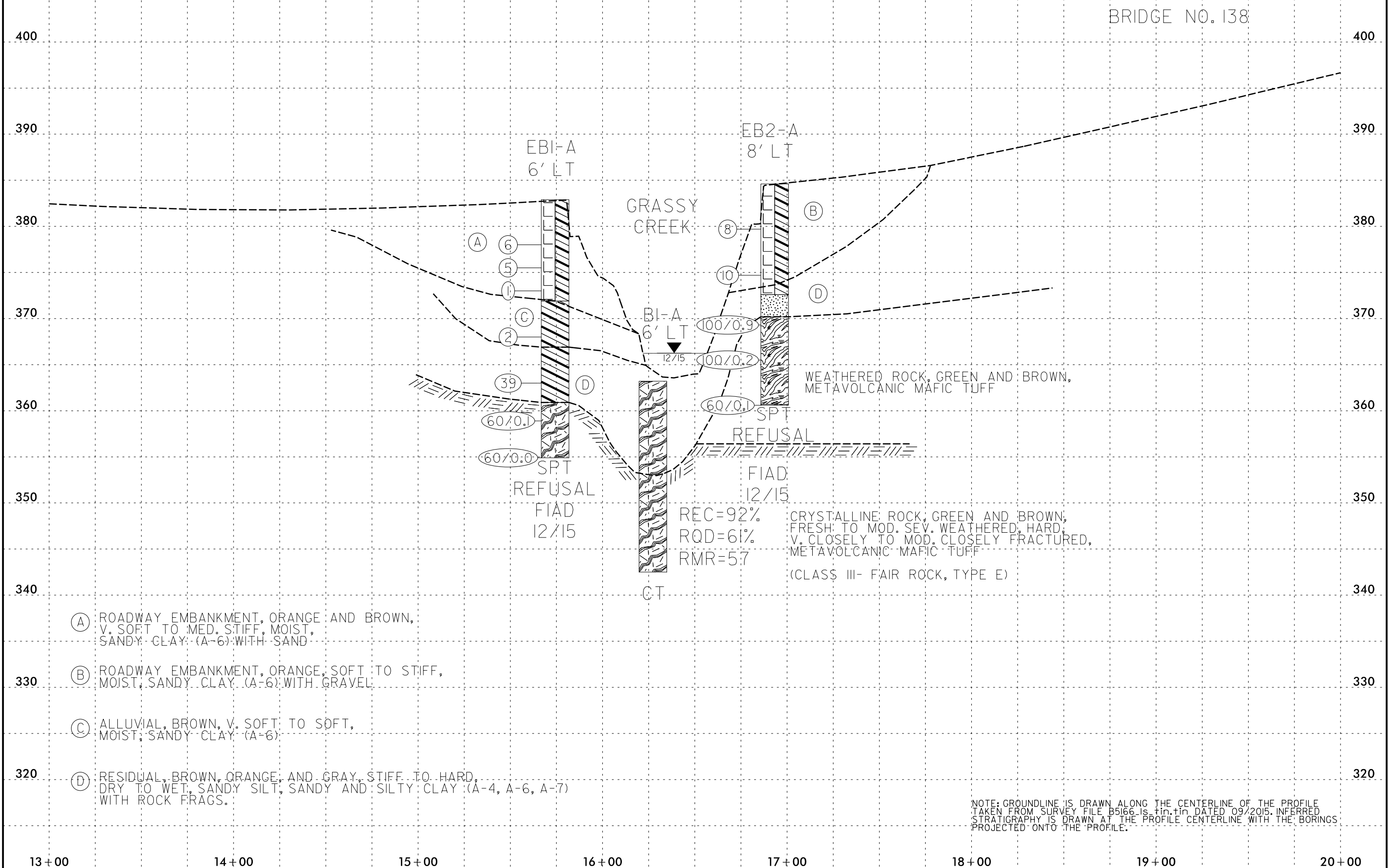
WOODS

CAPITAL LAND
INVESTMENT CO.
DB 570 PG 530

SAM F. CLEMENT
& ANN P. CLEMENT
DB 535 PG 167

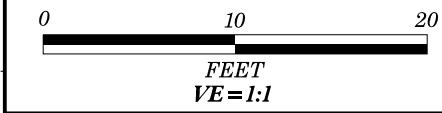
BRIDGE NO. 138
OVER GRASSY CREEK
SKEW = 90°



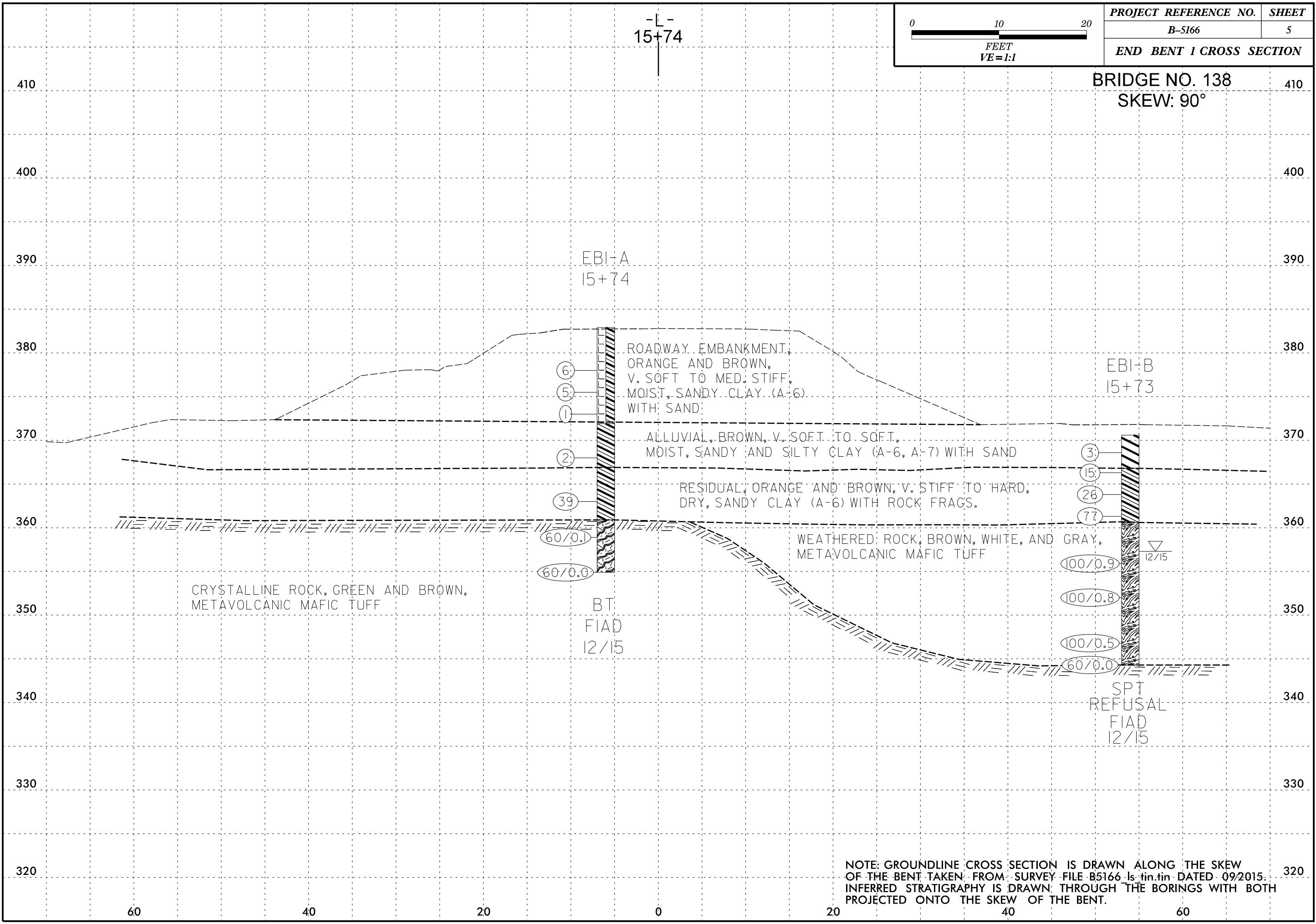


- (A) ROADWAY EMBANKMENT, ORANGE AND BROWN, V. SOFT TO MED. STIFF, MOIST, SANDY CLAY (A-6) WITH SAND
- (B) ROADWAY EMBANKMENT, ORANGE, SOFT TO STIFF, MOIST, SANDY CLAY (A-6) WITH GRAVEL
- (C) ALLUVIAL, BROWN, V. SOFT TO SOFT, MOIST, SANDY CLAY (A-6)
- (D) RESIDUAL, BROWN, ORANGE, AND GRAY, STIFF TO HARD, DRY TO WET, SANDY SILT, SANDY AND SILTY CLAY (A-4, A-6, A-7) WITH ROCK FRAGS.

NOTE: GROUNDLINE IS DRAWN ALONG THE CENTERLINE OF THE PROFILE TAKEN FROM SURVEY FILE B5166 Is tin tin DATED 09/2015. INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE CENTERLINE WITH THE BORINGS PROJECTED ONTO THE PROFILE.



BRIDGE NO. 138
SKEW: 90°



-L-
15+74

EBI-A
15+74

EBI-B
15+73

- ⑥
- ⑤
- ①
- ②
- ③⑨
- ⑥⑦/0.1
- ⑥⑦/0.0

- ③
- ⑮
- ②⑥
- ⑦⑦
- ⑩⑦/0.9
- ⑩⑦/0.8
- ⑩⑦/0.5
- ⑥⑦/0.0

ROADWAY EMBANKMENT,
ORANGE AND BROWN,
V. SOFT TO MED. STIFF,
MOIST, SANDY CLAY (A-6)
WITH SAND

ALLUVIAL, BROWN, V. SOFT TO SOFT,
MOIST, SANDY AND SILTY CLAY (A-6, A-7) WITH SAND

RESIDUAL, ORANGE AND BROWN, V. STIFF TO HARD,
DRY, SANDY CLAY (A-6) WITH ROCK FRAGS.

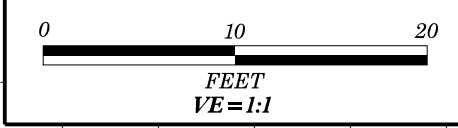
WEATHERED ROCK, BROWN, WHITE, AND GRAY,
METAVOLCANIC MAFIC TUFF

CRYSTALLINE ROCK, GREEN AND BROWN,
METAVOLCANIC MAFIC TUFF

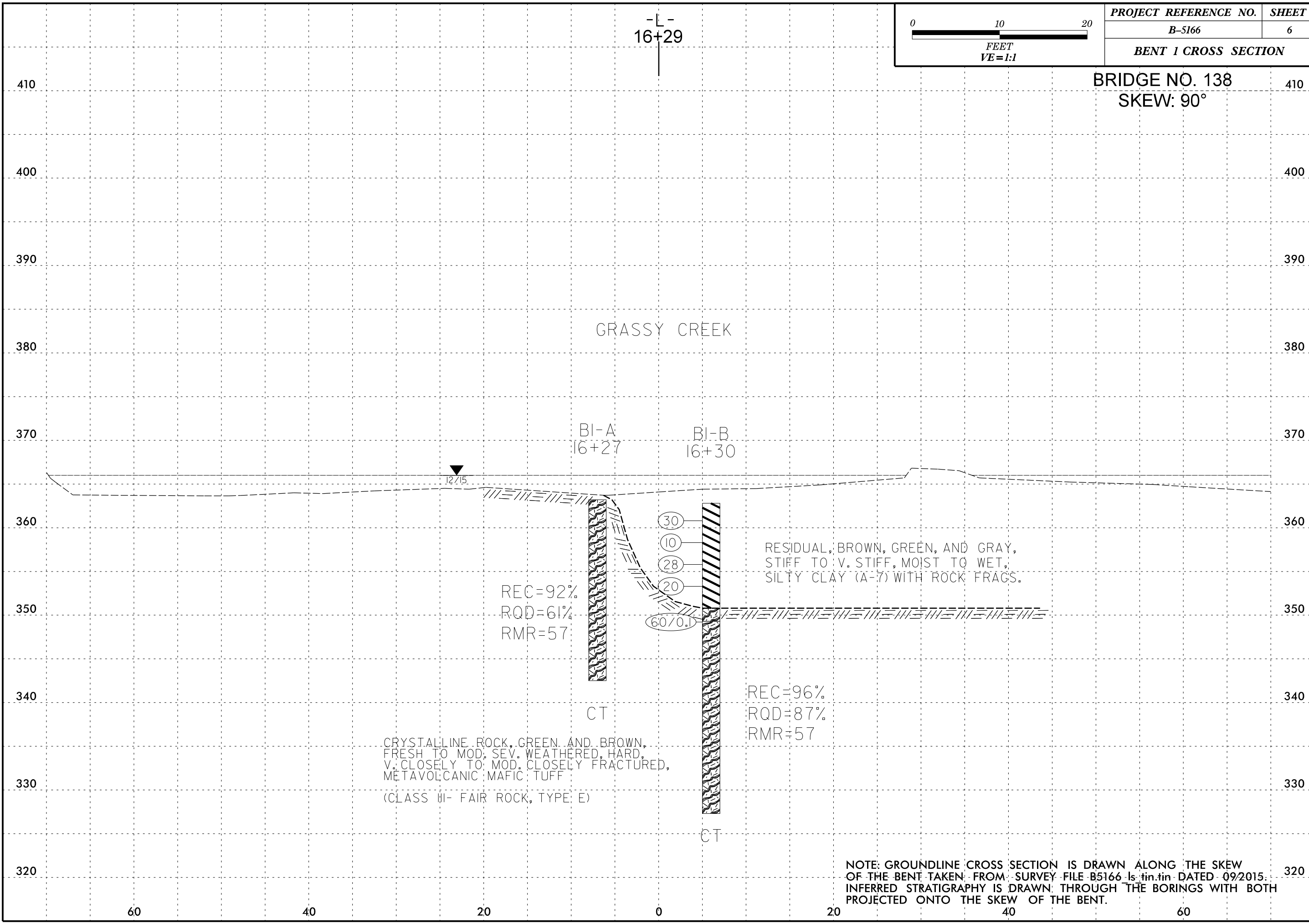
BT
FIAD
12/15

SPT
REFUSAL
FIAD
12/15

NOTE: GROUNDLINE CROSS SECTION IS DRAWN ALONG THE SKEW OF THE BENT TAKEN FROM SURVEY FILE B5166 IS.TIN.DATED 09/2015. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE SKEW OF THE BENT.



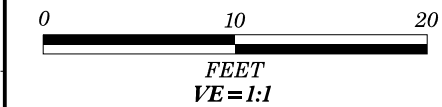
BRIDGE NO. 138
SKEW: 90°



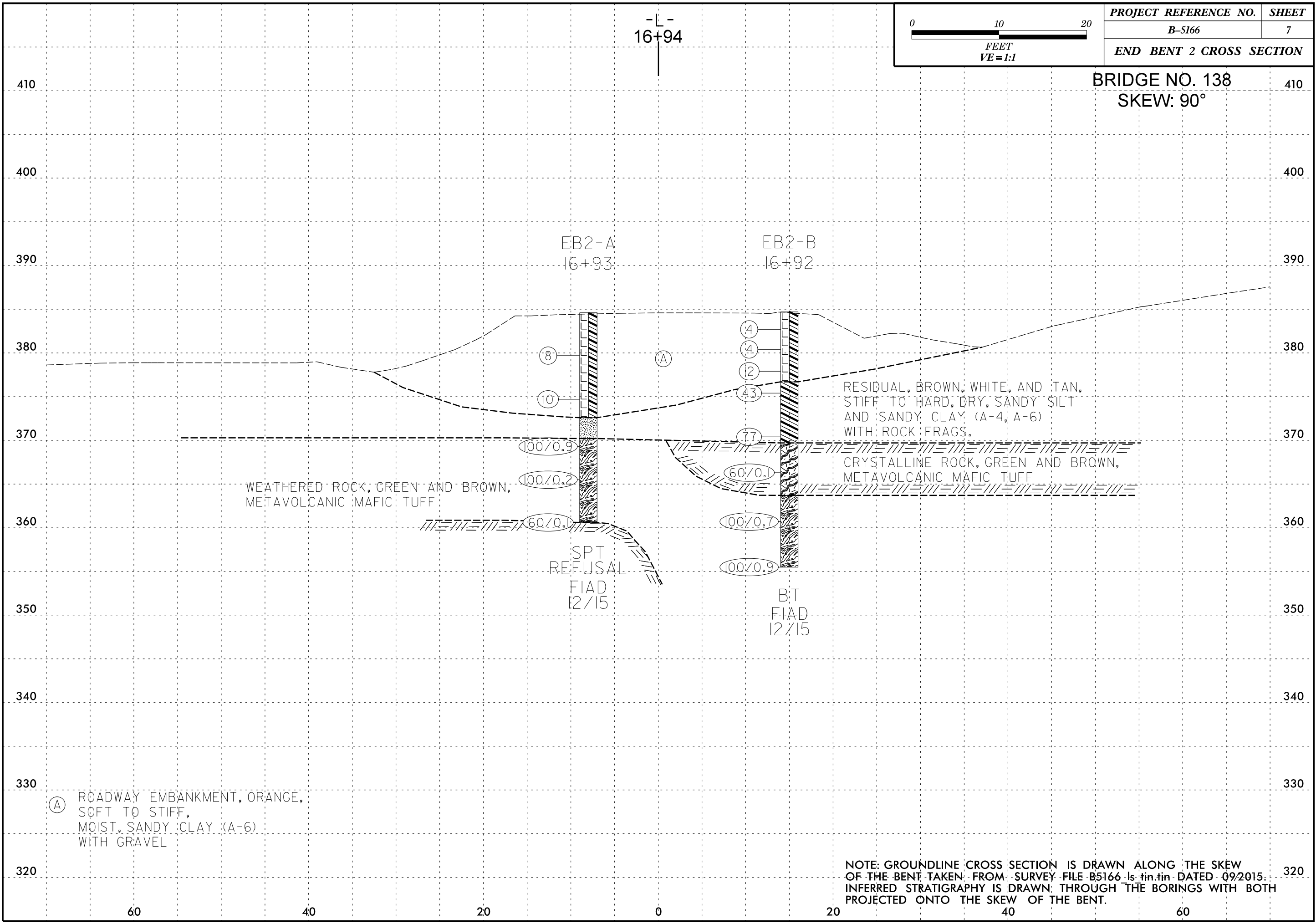
410
400
390
380
370
360
350
340
330
320

410
400
390
380
370
360
350
340
330
320

60 40 20 0 20 40 60



BRIDGE NO. 138
SKEW: 90°



-L-
16+94

EB2-A
16+93

EB2-B
16+92

RESIDUAL, BROWN, WHITE, AND TAN,
STIFF TO HARD, DRY, SANDY SILT
AND SANDY CLAY (A-4, A-6)
WITH ROCK FRAGS.

CRYSTALLINE ROCK, GREEN AND BROWN,
METAVOLCANIC MAFIC TUFF

WEATHERED ROCK, GREEN AND BROWN,
METAVOLCANIC MAFIC TUFF

(A) ROADWAY EMBANKMENT, ORANGE,
SOFT TO STIFF,
MOIST, SANDY CLAY (A-6)
WITH GRAVEL

SPT
REFUSAL
FIAD
12/15

BT
FIAD
12/15

NOTE: GROUNDLINE CROSS SECTION IS DRAWN ALONG THE SKEW
OF THE BENT TAKEN FROM SURVEY FILE B5166-Is-1in.tin DATED 09/2015.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE SKEW OF THE BENT.

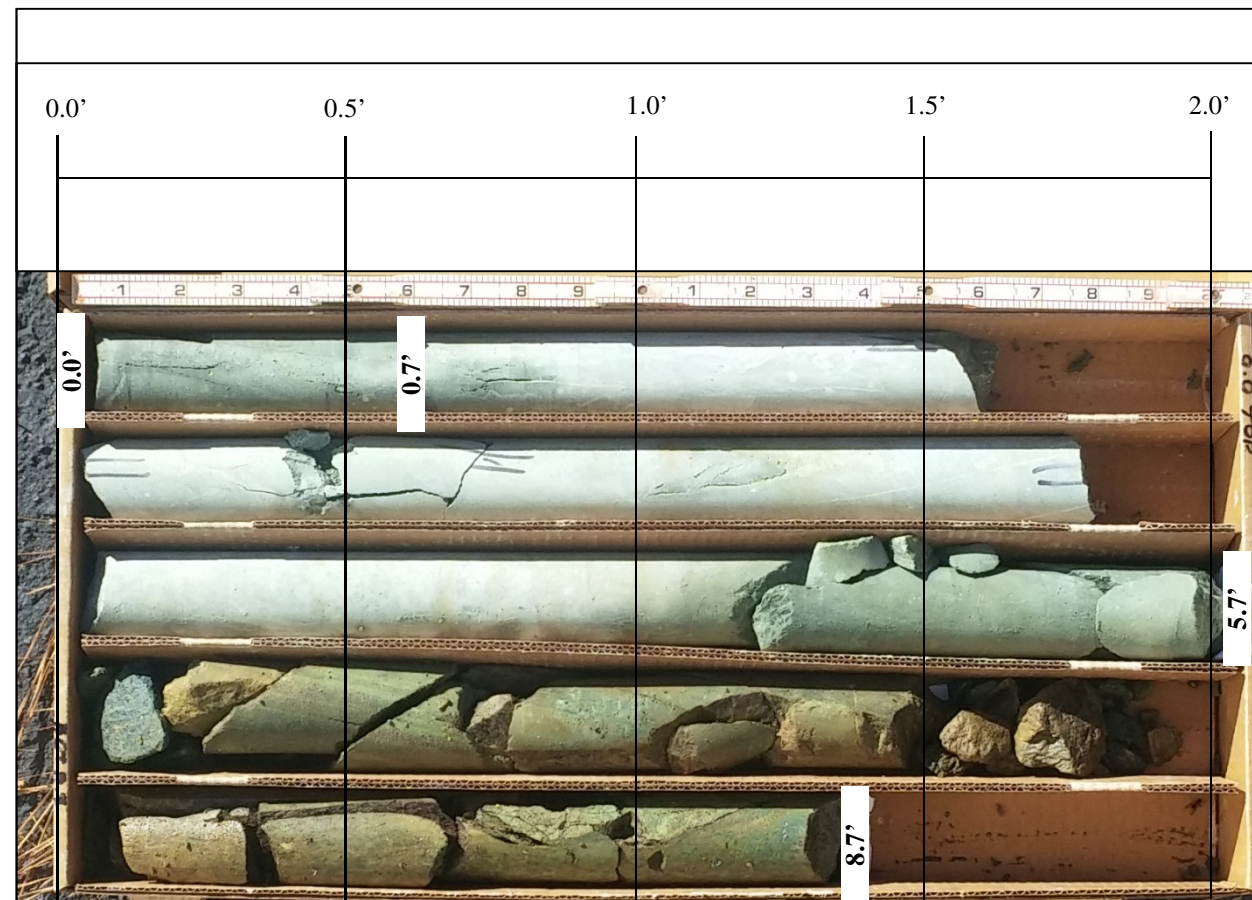
GEOTECHNICAL BORING REPORT

BORE LOG

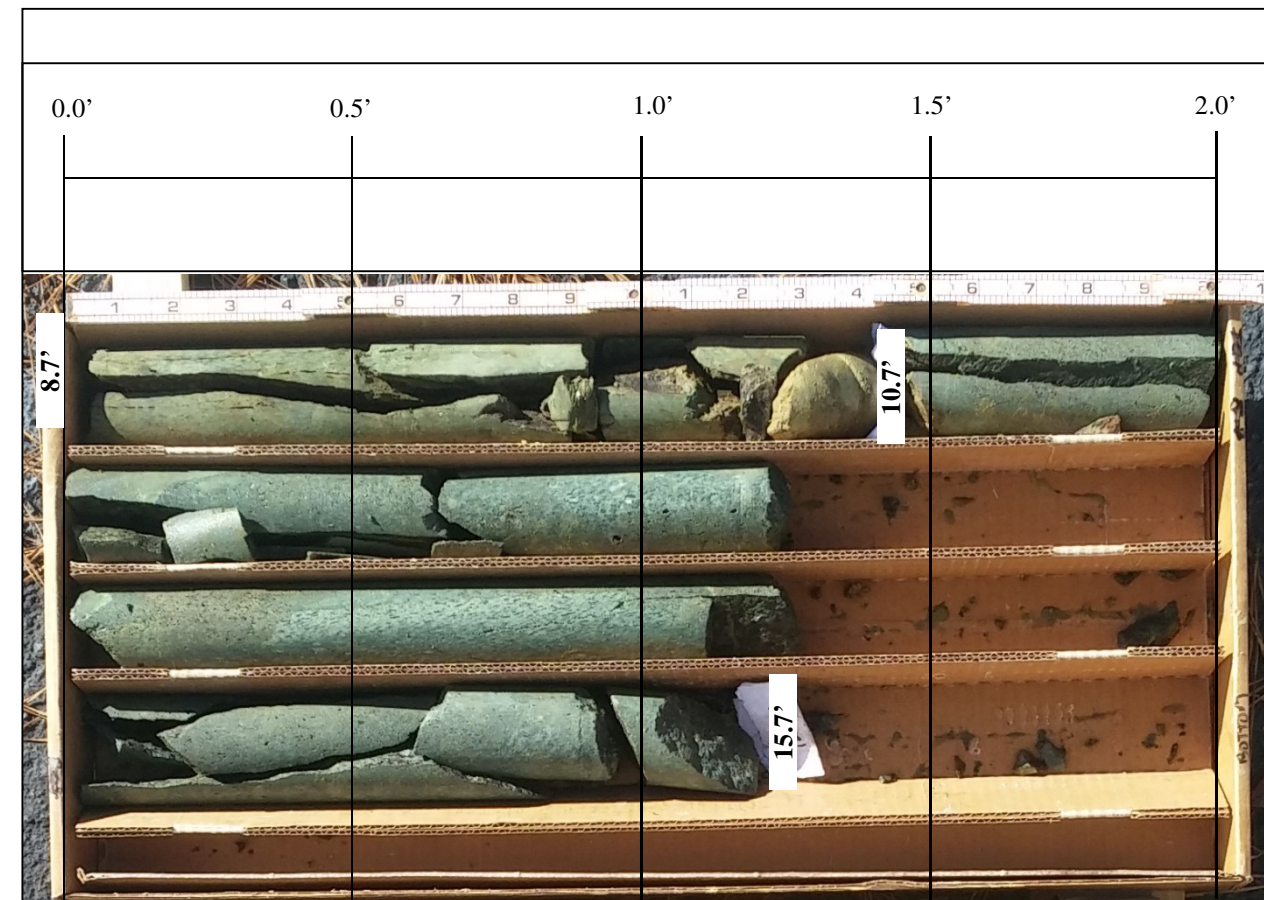
WBS 42342.1.1		TIP B-5166		COUNTY GRANVILLE		GEOLOGIST M. WITMORE									
SITE DESCRIPTION Bridge No. 138 over Grassy Creek on SR 1300 (Cornwall Road) Between SR 1410 and SR 1413 at Sta. 16+34							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 15+74		OFFSET 6 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 382.9 ft		TOTAL DEPTH 28.0 ft		NORTHING 991,032		EASTING 2,098,742									
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER J. BARE		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	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
385															
380	379.0	3.9	2	2	4								M	GROUND SURFACE ROADWAY EMBANKMENT ORANGE AND BROWN, V. SOFT TO MED. STIFF, SANDY CLAY (A-6)	0.0
	376.5	6.4	2	3	2								M		
375	374.0	8.9	WOH	WOH	1								M		
	369.0	13.9	WOH	WOH	2								M		
370	364.0	18.9	11	15	24								D	ALLUVIAL BROWN, V. SOFT TO SOFT, SANDY CLAY (A-6)	11.0
	360.9													RESIDUAL ORANGE, HARD, SANDY CLAY (A-6)	16.0
365	359.0	23.9	60/0.1											CRYSTALLINE ROCK GREEN AND BROWN, METAVOLCANIC MAFIC TUFF	22.0
360	354.9	28.0	60/0.0											Boring Terminated with Standard Penetration Test Refusal at Elevation 354.9 ft IN CR: METAVOLCANIC MAFIC TUFF	28.0

WBS 42342.1.1		TIP B-5166		COUNTY GRANVILLE		GEOLOGIST M. WITMORE									
SITE DESCRIPTION Bridge No. 138 over Grassy Creek on SR 1300 (Cornwall Road) Between SR 1410 and SR 1413 at Sta. 16+34							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 15+73		OFFSET 54 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 370.6 ft		TOTAL DEPTH 26.3 ft		NORTHING 991,030		EASTING 2,098,802									
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER J. BARE		START DATE 12/04/15		COMP. DATE 12/04/15		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
375															
370	369.6	1.0	1	1	2								M	GROUND SURFACE	0.0
	367.3	3.3	3	8	7								D	ALLUVIAL BROWN, V. SOFT, SILTY CLAY (A-7)	3.8
365	364.8	5.8	8	6	20								D	RESIDUAL BROWN V. STIFF TO HARD, SANDY CLAY (A-6) WITH ROCK FRAGMENTS	10.0
	362.3	8.3	27	34	43								D		
360	357.3	13.3	42	64	36/0.4									WEATHERED ROCK BROWN, WHITE, AND GRAY, METAVOLCANIC MAFIC TUFF	10.0
	352.3	18.3	36	100/0.3											
355	347.3	23.3	100/0.5												
350	344.3	26.3	60/0.0											Boring Terminated with Standard Penetration Test Refusal at Elevation 344.3 ft ON CR: METAVOLCANIC MAFIC TUFF	26.3

NCDOT BORE DOUBLE B5166_GEO_BRDG.GPJ NC_DOT.GDT 12/21/15



B1-A, Box 1 of 3, 0.0 to 8.7 feet.



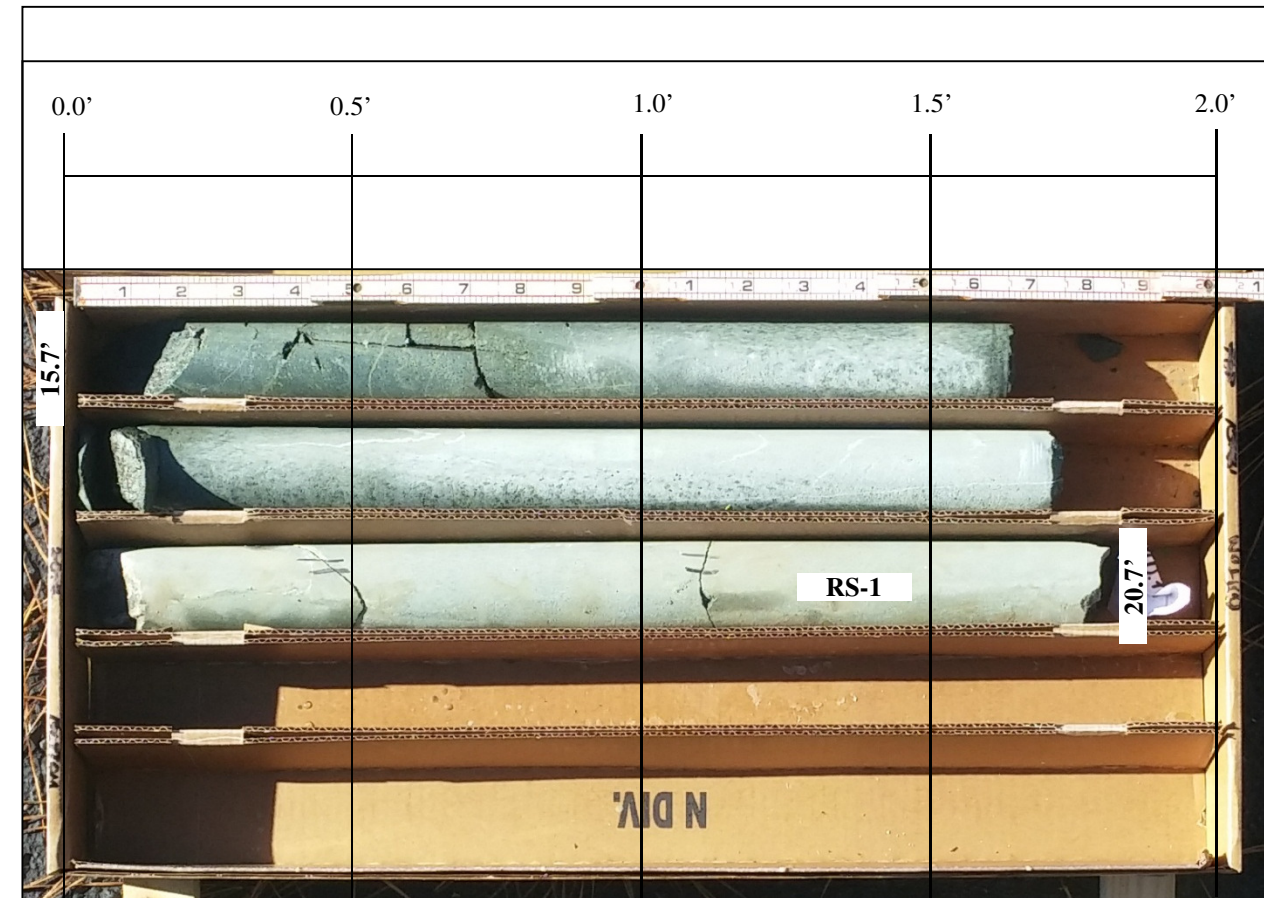
B1-A, Box 2 of 3, 8.7 to 15.7 feet.

ROCK CORE PHOTOGRAPHS

**BRIDGE NO. 138 ON SR 1300
OVER GRASSY CREEK
GRANVILLE COUNTY, NORTH CAROLINA
WBS NO.: 42342.1.1, TIP NO.: B-5166**



AECOM – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, NC 27560
Tel: 919-461-1100 Fax: 919-46-1415



B1-A, Box 3 of 3, 15.7 to 20.7 feet.

ROCK CORE PHOTOGRAPHS

**BRIDGE NO. 138 ON SR 1300
OVER GRASSY CREEK
GRANVILLE COUNTY, NORTH CAROLINA
WBS NO.: 42342.1.1, TIP NO.: B-5166**

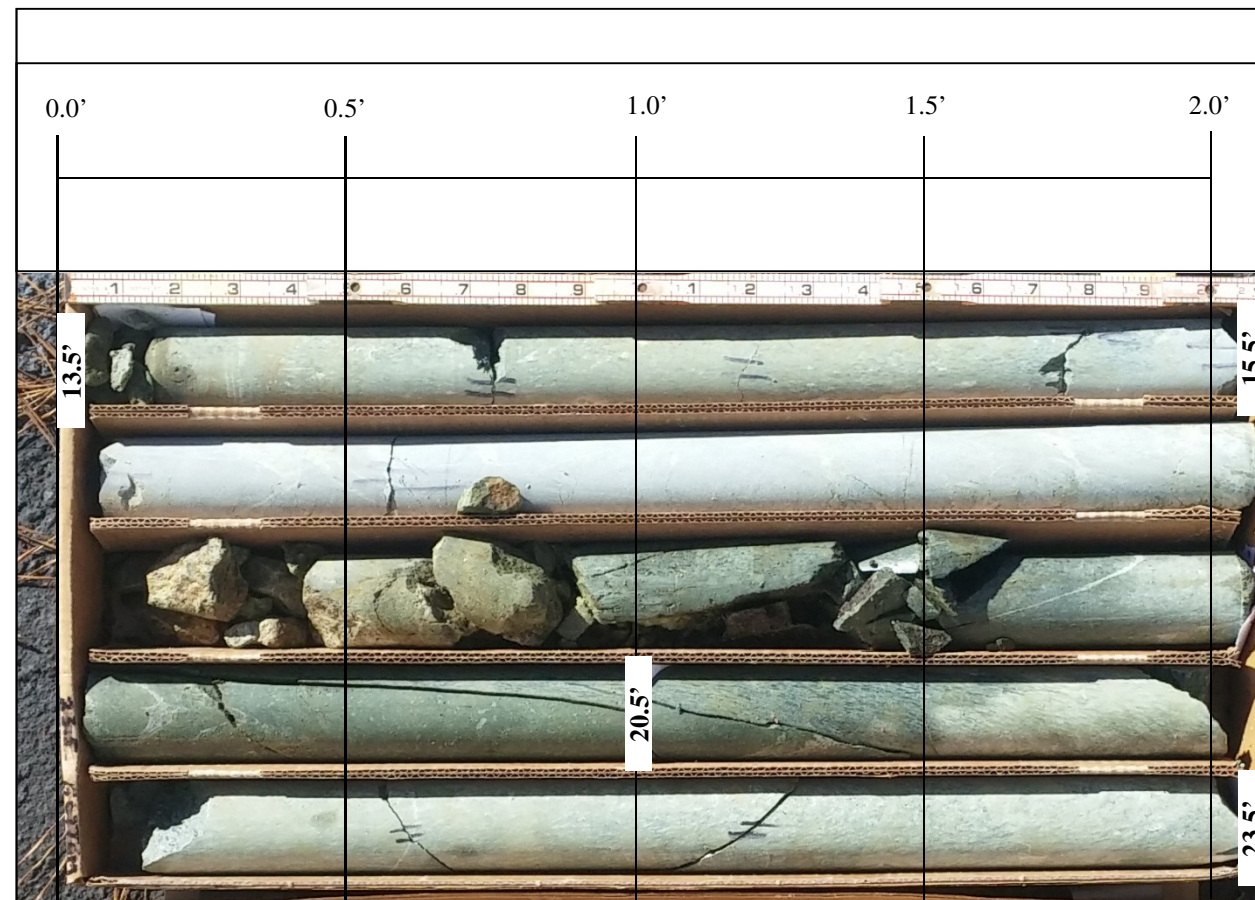


AECOM – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, NC 27560
Tel: 919-461-1100 Fax: 919-46-1415

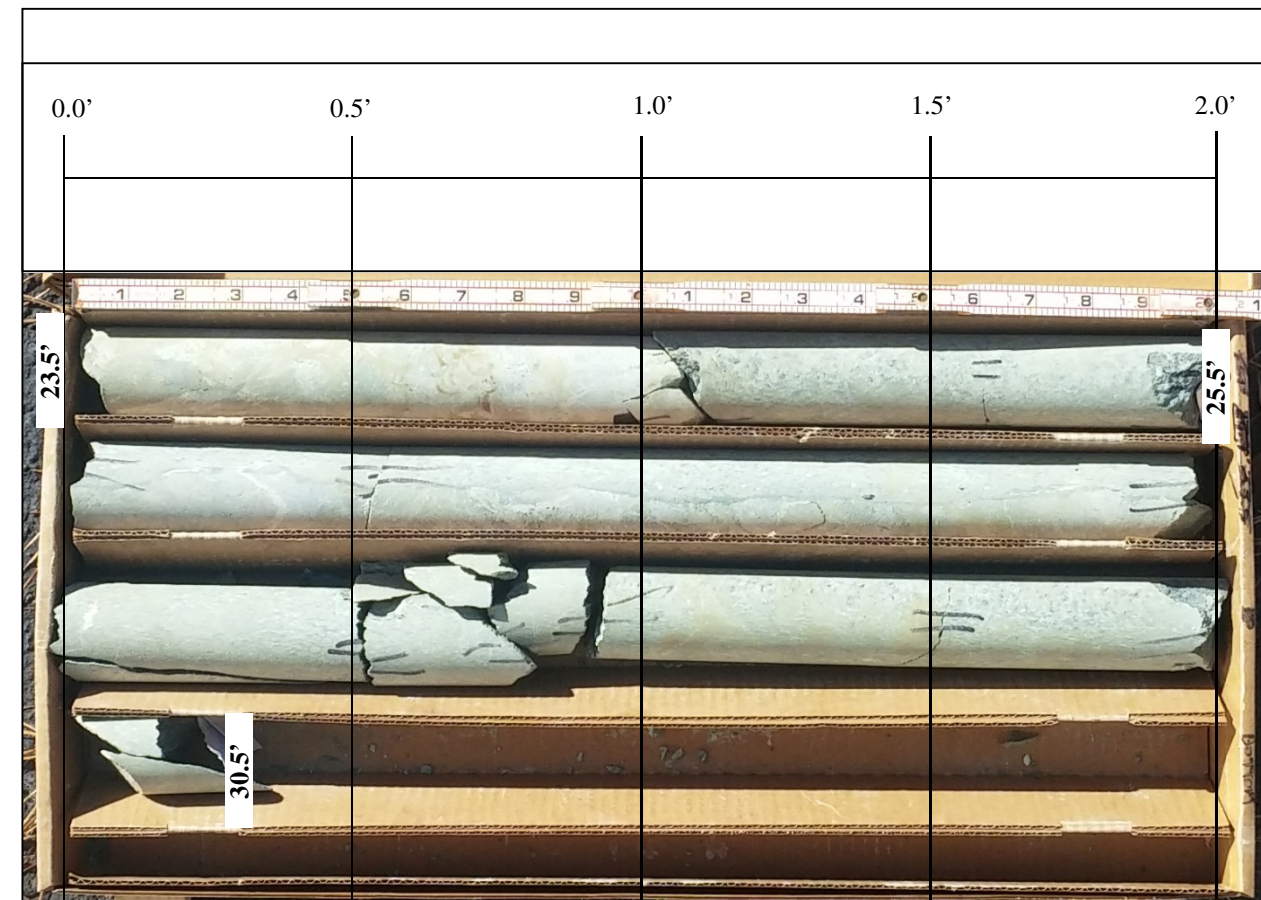
GEOTECHNICAL BORING REPORT BORE LOG

WBS 42342.1.1		TIP B-5166		COUNTY GRANVILLE		GEOLOGIST M. WITMORE										
SITE DESCRIPTION Bridge No. 138 over Grassy Creek on SR 1300 (Cornwall Road) Between SR 1410 and SR 1413 at Sta. 16+34							GROUND WTR (ft)									
BORING NO. B1-B		STATION 16+30		OFFSET 6 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 362.8 ft		TOTAL DEPTH 35.5 ft		NORTHING 991,088		EASTING 2,098,756										
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015		DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic												
DRILLER J. BARE		START DATE 12/02/15		COMP. DATE 12/03/15		SURFACE WATER DEPTH 3.2ft										
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						
WATER SURFACE (12/02/15)																
365													▼			
													▼	362.8 GROUND SURFACE 0.0		
360	361.8	1.0	4	17	13								M	RESIDUAL BROWN, GREEN, AND GRAY, STIFF TO V. STIFF, SILTY CLAY (A-7) WITH ROCK FRAGMENTS		
	359.3	3.5	5	6	4								W			
	356.8	6.0	8	12	16								W			
	354.3	8.5	10	9	11								W			
355																
350	349.3	13.5	60/0.1											M	350.8 12.0	
														M	349.3 GREEN, METAVOLCANIC MAFIC TUFF 13.5	
														M	327.3 Boring Terminated at Elevation 327.3 ft IN CR: METAVOLCANIC MAFIC TUFF 35.5	
345																
340																
335																
330																

WBS 42342.1.1		TIP B-5166		COUNTY GRANVILLE		GEOLOGIST M. WITMORE					
SITE DESCRIPTION Bridge No. 138 over Grassy Creek on SR 1300 (Cornwall Road) Between SR 1410 and SR 1413 at Sta. 16+34							GROUND WTR (ft)				
BORING NO. B1-B		STATION 16+30		OFFSET 6 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 362.8 ft		TOTAL DEPTH 35.5 ft		NORTHING 991,088		EASTING 2,098,756					
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 88% 11/05/2015		DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic							
DRILLER J. BARE		START DATE 12/02/15		COMP. DATE 12/03/15		SURFACE WATER DEPTH 3.2ft					
CORE SIZE NQ		TOTAL RUN 22.0 ft		DESCRIPTION AND REMARKS							
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (%)	RQD (%)	SAMP. NO.	STRATA REC. (%)	RQD (%)	LOG	DEPTH (ft)
349.3	349.3	13.5	2.0	4:51/1.0	(2.0)	(1.8)		(21.2)	(19.1)	▼	349.3
	347.3	15.5	5.0	3:48/1.0	100%	90%		96%	87%	M	13.5
345				4:46/1.0	(5.0)	(3.1)				M	
				4:20/1.0	100%	62%				M	
				2:14/1.0						M	
				2:02/1.0						M	
				3:16/1.0						M	
340	342.3	20.5	5.0	3:48/1.0	(5.0)	(5.0)				M	
				4:05/1.0	100%	100%				M	
				3:59/1.0						M	
				4:10/1.0						M	
				5:35/1.0						M	
335	337.3	25.5	5.0	4:28/1.0	(4.3)	(4.3)				M	
				4:05/1.0	86%	86%				M	
				3:43/1.0						M	
				3:20/1.0						M	
				3:08/1.0						M	
330	332.3	30.5	5.0	4:09/1.0	(4.9)	(4.9)				M	
				3:53/1.0	98%	98%				M	
				4:06/1.0						M	
				3:33/1.0						M	
				4:05/1.0						M	
							RS-2			M	
	327.3	35.5								M	35.5
Boring Terminated at Elevation 327.3 ft IN CR: METAVOLCANIC MAFIC TUFF											



B1-B, Box 1 of 3, 13.5 to 23.5 feet.



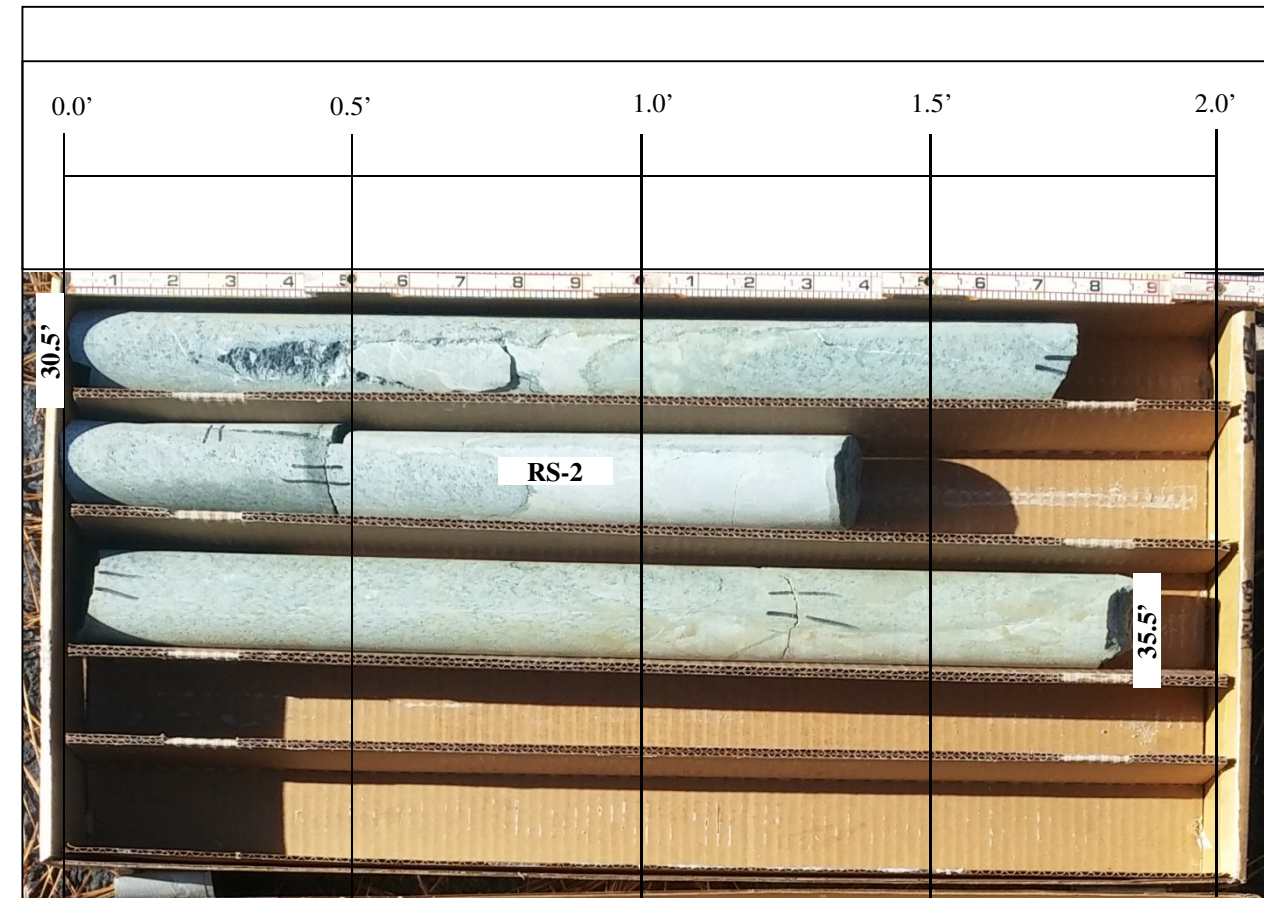
B1-B, Box 2 of 3, 23.5 to 30.5 feet.

ROCK CORE PHOTOGRAPHS

**BRIDGE NO. 138 ON SR 1300
OVER GRASSY CREEK
GRANVILLE COUNTY, NORTH CAROLINA
WBS NO.: 42342.1.1, TIP NO.: B-5166**



AECOM – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, NC 27560
Tel: 919-461-1100 Fax: 919-46-1415



B1-B, Box 3 of 3, 30.5 to 35.5 feet.

ROCK CORE PHOTOGRAPHS

**BRIDGE NO. 138 ON SR 1300
OVER GRASSY CREEK
GRANVILLE COUNTY, NORTH CAROLINA
WBS NO.: 42342.1.1, TIP NO.: B-5166**



AECOM – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, NC 27560
Tel: 919-461-1100 Fax: 919-46-1415

UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C

(This method does not report Strain Rate or Deformation)

Sample Prep and Conformance Verification: ASTM D4543-08

Client: AECOM Boring No.: B1-A
 Client Reference: B-5166 Bridge over Grassy Creek 60447478 Depth (ft): 20.0-20.7
 Project No.: 2015-648-001 Sample No.: RS-1
 Lab ID: 2015-648-001-001 Moisture Condition: As Received-Unpreserved

UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C

(This method does not report Strain Rate or Deformation)

Sample Prep and Conformance Verification: ASTM D4543-08

Client: AECOM Boring No.: B1-B
 Client Reference: B-5166 Bridge over Grassy Creek 60447478 Depth (ft): 32.8-33.7
 Project No.: 2015-648-001 Sample No.: RS-2
 Lab ID: 2015-648-001-002 Moisture Condition: As Received-Unpreserved

SPECIMEN LENGTH (in)

Reading 1: 4.03
 Reading 2: 4.03
 Reading 3: 4.03
Average Length: 4.03

SPECIMEN DIAMETER (in):

Reading 1: 1.99
 Reading 2: 1.99
 Average Diameter: **1.99**
 Area (in²): 3.11
 Length/Diameter: 2.03

Total Load (lb): 27,780
Uniaxial Compressive Strength (psi): 8,920

Fracture Type: **Cone & Split**

Rate of Loading (lb/sec): 138
 Time to Break (min:sec): 3:21.38
 Deviation from Straitness⁽²⁾:
 Axial: Pass Top: Pass Bottom: Pass

SPECIMEN LENGTH (in)

Reading 1: 3.98
 Reading 2: 3.99
 Reading 3: 3.99
Average Length: 3.99

SPECIMEN DIAMETER (in):

Reading 1: 1.99
 Reading 2: 1.99
 Average Diameter: **1.99**
 Area (in²): 3.11
 Length/Diameter: 2.00

Total Load (lb): 33,770
Uniaxial Compressive Strength (psi): 10,840

Fracture Type: **Cone & Split**

Rate of Loading (lb/sec): 146
 Time to Break (min:sec): 3:51.94
 Deviation from Straitness⁽²⁾:
 Axial: Pass Top: Pass Bottom: Pass



Physical Properties: ROCK CORE

Notes:

- 1) Moisture conditions at time of the test are: As Received-Unpreserved
- 2) Deviation from straightness, Procedure A of ASTM D 4543-08
Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
- 3) Temperature is laboratory room temperature.
- 4) Geotechnics Equipment Used: G788 Compression Tester, G1122 Digital Calipers, G1380 Dial Gauge, G1557 Straight Edge, G1571 Feeler Gauge, G1633 V-Block, G1634 Rock Saw, G1635 Grinder.



Physical Properties: ROCK CORE

Notes:

- 1) Moisture conditions at time of the test are: As Received-Unpreserved
- 2) Deviation from straightness, Procedure A of ASTM D 4543-08
Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
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- 4) Geotechnics Equipment Used: G788 Compression Tester, G1122 Digital Calipers, G1380 Dial Gauge, G1557 Straight Edge, G1571 Feeler Gauge, G1633 V-Block, G1634 Rock Saw, G1635 Grinder.

Tested By: JAC Date: 12/9/15 Checked By: KC Date: 12/9/15

DCN: CT45A, Revision No.: 2e, Revision Date: 08/25/15

Tested By: JAC Date: 12/9/15 Checked By: KC Date: 12/9/15


DCN: CT45A, Revision No.: 2e, Revision Date: 08/25/15



GRASSY CREEK, LOOKING UPSTREAM TOWARDS EXISTING BRIDGE.



-L-, LOOKING DOWNSTATION FROM STA. 17+00.

SITE PHOTOGRAPHS	
BRIDGE NO. 138 ON SR 1300 (CORNWALL RD) OVER GRASSY CREEK WBS NO.: 42342.1.1, TIP NO.: B-5166	
	AECOM – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560 Tel: 919-461-1100 Fax: 919-46-1415