

REFERENCE: B-4961

PROJECT: 40152

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

Table with 4 columns: STATE, STATE PROJECT REFERENCE NO., SHEET NO., TOTAL SHEETS. Values: N.C., B-4961, 1, 11

ROADWAY SUBSURFACE INVESTIGATION

COUNTY Guilford PROJECT DESCRIPTION Bridge #208 on SR 3051 over Little Alamance Creek

INVENTORY

CONTENTS

Table with 3 columns: LINE, STATION, PLAN. Rows for -L- and -Y- with station ranges and plan numbers.

CROSS SECTIONS

Table with 3 columns: LINE, STATION, SHEETS. Rows for -L- and -Y- with station ranges and sheet numbers.

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.

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 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.

- 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

D. Racey S. Davis J. Basham D. Jenks

INVESTIGATED BY F&R, Inc. DRAWN BY D. Racey CHECKED BY P. Alton, PE SUBMITTED BY F&R, Inc. DATE December 2014



DocuSigned by: W. Patrick Alton A270EF78A6DF442... 12/31/2014 SIGNATURE DATE

**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 (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 style="text-align: center;">ANGULARITY OF GRAINS</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 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>WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>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.</p> <p>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.</p> <p>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.</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 (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>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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<p>GENERAL CLASS.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <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 colspan="2">A-1</th> <th colspan="3">A-3</th> <th colspan="2">A-2</th> <th colspan="3">A-4</th> <th colspan="2">A-5</th> <th colspan="3">A-6</th> <th colspan="2">A-7</th> <th colspan="3">A-1, A-2</th> <th colspan="3">A-3</th> <th colspan="3">A-4, A-5</th> <th colspan="3">A-6, A-7</th> </tr> <tr> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-1, A-2</td> <td>A-3</td> <td>A-4, A-5</td> <td>A-6, A-7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>SYMBOL</p> <p>% PASSING</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>#10</th> <th>#40</th> <th>#200</th> <th colspan="5">GRANULAR SOILS</th> <th colspan="5">SILT-CLAY SOILS</th> <th colspan="5">MUCK, PEAT</th> </tr> <tr> <td>50 MX</td> <td>30 MX</td> <td>15 MX</td> <td>50 MX</td> <td>25 MX</td> <td>10 MX</td> <td>5 MN</td> <td>35 MX</td> <td>35 MX</td> <td>35 MX</td> <td>35 MX</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td>36 MN</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>MATERIAL PASSING #40</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>LL</th> <th>PI</th> <th colspan="5">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</th> <th colspan="5">HIGHLY ORGANIC SOILS</th> </tr> <tr> <td>-</td> <td>6 MX</td> <td>NP</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td>40 MX</td> <td>41 MN</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>GROUP INDEX</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>GROUP INDEX</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> <th>12</th> <th>13</th> <th>14</th> <th>15</th> <th>16</th> <th>17</th> <th>18</th> <th>19</th> <th>20</th> <th>21</th> <th>22</th> <th>23</th> <th>24</th> <th>25</th> <th>26</th> <th>27</th> <th>28</th> <th>29</th> <th>30</th> <th>31</th> <th>32</th> <th>33</th> <th>34</th> <th>35</th> <th>36</th> <th>37</th> <th>38</th> <th>39</th> <th>40</th> <th>41</th> <th>42</th> <th>43</th> <th>44</th> <th>45</th> <th>46</th> <th>47</th> <th>48</th> <th>49</th> <th>50</th> </tr> </table> <p>USUAL TYPES OF MAJOR MATERIALS</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>GEN. RATING AS SUBGRADE</th> <th colspan="5">EXCELLENT TO GOOD</th> <th colspan="5">FAIR TO POOR</th> <th colspan="5">FAIR TO POOR</th> <th colspan="5">POOR</th> <th colspan="5">UNSATURABLE</th> </tr> </table> <p>PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p>										GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					A-1		A-3			A-2		A-4			A-5		A-6			A-7		A-1, A-2			A-3			A-4, A-5			A-6, A-7			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															#10	#40	#200	GRANULAR SOILS					SILT-CLAY SOILS					MUCK, PEAT					50 MX	30 MX	15 MX	50 MX	25 MX	10 MX	5 MN	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN													LL	PI	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER					HIGHLY ORGANIC SOILS					-	6 MX	NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN														GROUP INDEX	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD					FAIR TO POOR					FAIR TO POOR					POOR					UNSATURABLE					<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>> 10%</td> <td>> 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </table> <p style="text-align: center;">GROUND WATER</p> <p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▽ STATIC WATER LEVEL AFTER 24 HOURS ▽ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA ○ SPRING OR SEEP</p> <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <table border="1" style="width: 100%;"> <tr> <td> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td> DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td> SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td> SOIL SYMBOL</td> <td> SPT TEST BORING</td> <td> CONE PENETROMETER TEST</td> </tr> <tr> <td> ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td> AUGER BORING</td> <td> SOUNDING ROD</td> </tr> <tr> <td> INFERRED SOIL BOUNDARY</td> <td> CORE BORING</td> <td> MONITORING WELL</td> </tr> <tr> <td> INFERRED ROCK LINE</td> <td> PIEZOMETER INSTALLATION</td> <td> SPT N-VALUE</td> </tr> <tr> <td> ALLUVIAL SOIL BOUNDARY</td> <td></td> <td></td> </tr> </table>										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	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	DIP & DIP DIRECTION OF ROCK STRUCTURES	SLOPE INDICATOR INSTALLATION	SOIL SYMBOL	SPT TEST BORING	CONE PENETROMETER TEST	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	AUGER BORING	SOUNDING ROD	INFERRED SOIL BOUNDARY	CORE BORING	MONITORING WELL	INFERRED ROCK LINE	PIEZOMETER INSTALLATION	SPT N-VALUE	ALLUVIAL SOIL BOUNDARY			<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 SLI.) - 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 (SLI.) - 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 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. <i>IF TESTED, WOULD YIELD 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 style="text-align: center;">TEXTURE OR GRAIN SIZE</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> </table> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CSE, SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>GRAIN SIZE: MM 305, 75, 2.0, 0.25, 0.05, 0.005; IN. 12, 3</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	BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE, SD.)	FINE SAND (F SD.)	SILT (SL.)	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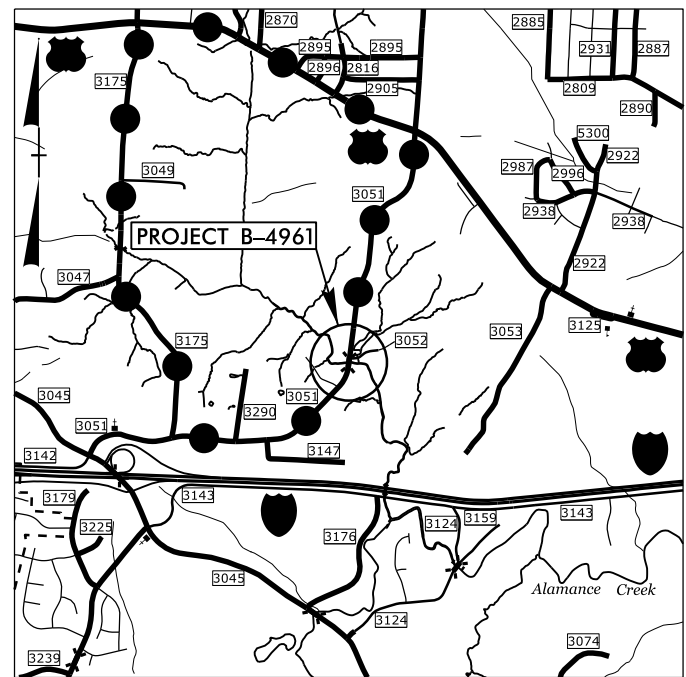
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4961	3	11
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
40152.1.1	BRZ-3051(1)	PE	

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUILFORD COUNTY

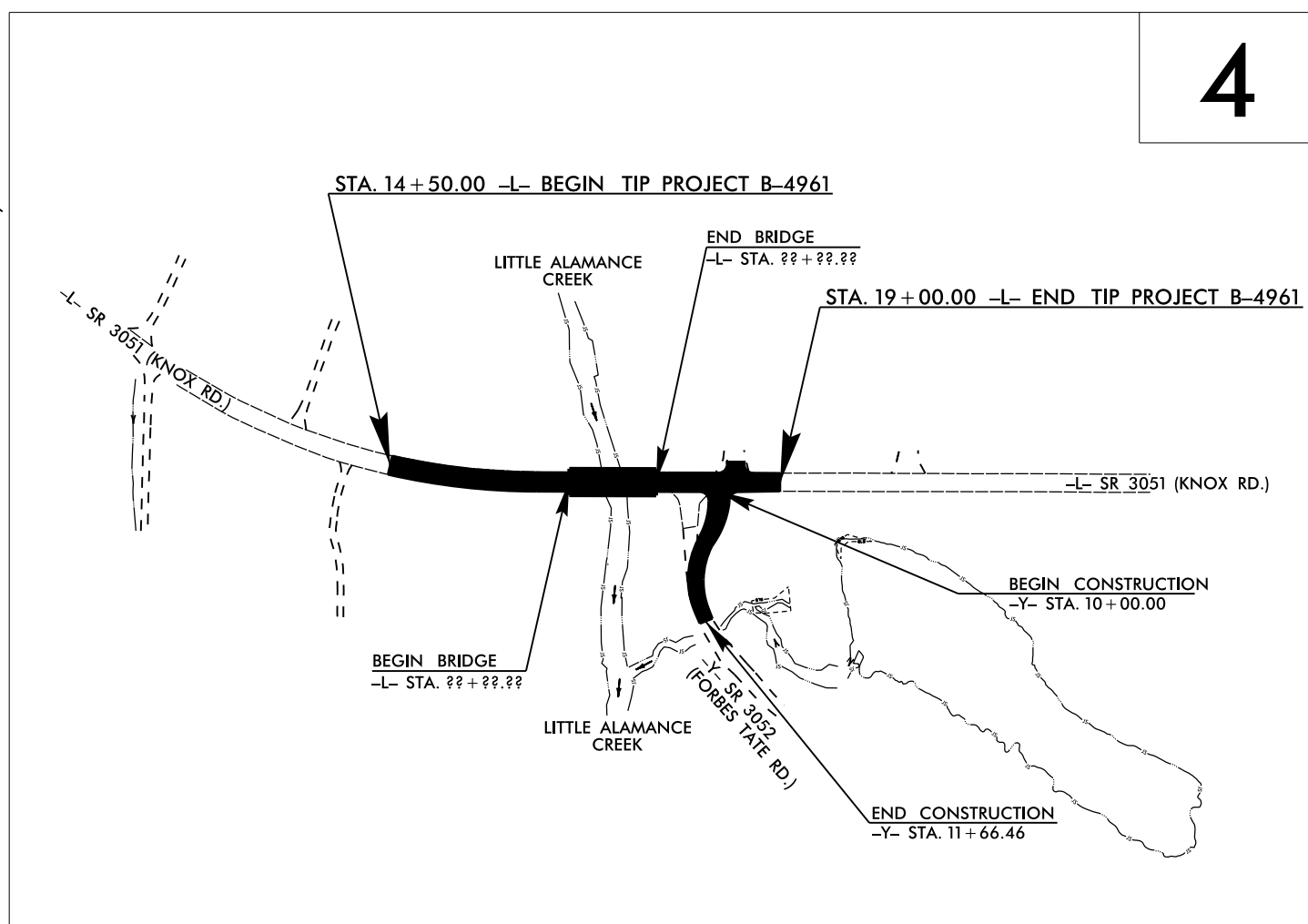
LOCATION: BRIDGE NO. 208 ON SR 3051 (KNOX ROAD)
OVER LITTLE ALAMANCE CREEK

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE



VICINITY MAP

● ● ● OFFSITE DETOUR



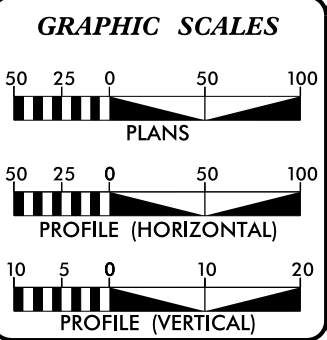
4

DESIGN EXCEPTION REQUIRED FOR SAG VERTICAL CURVES AND ASSOCIATED STOPPING SIGHT DISTANCES.
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.
CLEARING ON THIS PROJECT SHALL BE PREPARED TO THE LIMITS ESTABLISHED BY METHOD _____.

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

TIP PROJECT: B-4961

CONTRACT:



DESIGN DATA

ADT 2016	=	2,080
ADT 2035	=	3,600
DHV	=	14 %
D	=	55 %
T	=	5 % *
V	=	55 MPH
* TTST	=	1% DUAL = 4%
FUNC CLASS = COLLECTOR		
"SUBREGIONAL TIER"		

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-4961	=	????? MILES
LENGTH STRUCTURE TIP PROJECT B-4961	=	????? MILES
TOTAL LENGTH OF TIP PROJECT B-4961	=	0.085 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
NOVEMBER 20, 2015

LETTING DATE:
NOVEMBER 15, 2016

JAMES A. SPEER, PE
PROJECT ENGINEER

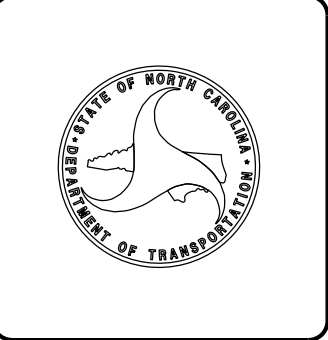
DANIEL W. GARDNER, JR., PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



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December 19, 2014

State Project No.: 40152.1.1
TIP No.: B-4961
F.A. Number: BRZ-3051(1)
County: Guilford
Description: Bridge No. 208 on SR 3051 (Knox Road) over Little Alamance Creek

SUBJECT: Geotechnical Report – Inventory

Project Description

This project involves the replacement of Bridge No. 208 on SR 3051 (Knox Road) over Little Alamance Creek in Gibsonville, Guilford County, North Carolina. The bridge replacement will require a slight widening of Knox Road (-L-) for a distance of approximately 200 feet south and 130 feet north from each end of the proposed bridge or approximately 450 feet total. Forbes Tate Road (-Y-) currently intersects Knox Road at approximate -L- station 17+95, but will be realigned approximately 35 feet farther north of the proposed bridge, which will require approximately 154 feet of new alignment. The existing bridge is a 3-span, approximately 65-feet long, and is constructed with timber abutments and a timber deck. Specific information regarding the proposed bridge is unavailable at this time. The subject portion of the roadway generally extends through wooded property and pastures with widely-spaced residences.

The geotechnical field investigation was performed on September 9th of 2014. During this time period, a total of four (4) standard penetration test (SPT) borings were advanced with an ATV-mounted CME-55 drill rig with an automatic hammer. Representative soil samples were collected from the split spoon for visual classification in the field and for analysis by F&R’s testing laboratory.

The following alignments were investigated:

<u>Line</u>	<u>Station(±)</u>
-L-	14+50 to 19+00
-Y-	10+00 to 11+66.46

Areas of Special Geotechnical Interest

- 1) Artificial Fill: The following area contains artificial fill likely associated with previous utility installation through the area. These soils have the potential to be highly variable, which could cause subgrade problems during construction if undetected pockets of organics or soft/loose soils are present. In addition, some of these soils are cohesive, which may cause embankment instability or long-term settlement problems.

<u>Line</u>	<u>Station (±)</u>
-Y-	10+00 to 11+66.46

Physiography and Geology

The existing road generally runs south to north through a rural area consisting of widely-spaced single-family homes, open fields and agricultural land, and wooded/undeveloped areas. The existing ground surface along the centerline of the proposed road generally slopes downward from an elevation of ±630 feet at the beginning of the project to an elevation of ±621 feet near the existing bridge. The ground surface then generally slopes upward to an elevation of ±629 feet at the end of the project. The existing ground surface elevation along the creek is at an elevation of ±607 feet.

The surface water across the project is generally drained by Little Alamance Creek, which generally flows across the site in a west-to-east direction. The creek runs beneath Bridge 208 at approximate -L- station 17+10. During our field investigation, we observed numerous boulders and/or rock outcrops within the stream bottom. A pond, impounded by an earthen dam on its south side, is present approximately 200 feet north of the proposed bridge.

At the bridge end bents, existing fills appear to be on the order of approximately 10 feet and less. The existing cut and fill slopes are typically 2:1 (H:V) or flatter.

The project is located in the Piedmont Physiographic Province of North Carolina within the Carolina Slate Belt. More-specifically, it is located in an area mapped as metamorphosed granitic rock (CZg). Weathered rock fragments recovered from our borings and exposed boulders exhibits the characteristics of granitic rock. Soils weathered from the parent rock generally consist of silty, fine to coarse sands. The in-situ soils are the residual product of in-place chemical weathering of rock that was similar to the rock presently underlying the site.

Soils Properties

The subsurface conditions discussed below and those shown on the attached drawings, represent an estimate of the subsurface conditions based on interpretation of the boring data using normally-accepted geotechnical engineering judgments. The transitions between different soil strata are usually less distinct than those shown on the profile. Sometimes the relatively small sample obtained in the field is insufficient to definitively describe the origin of the subsurface material. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Soils within the area of this project have been divided into five categories: organic topsoil, artificial fill, roadway embankment fill, alluvial soils, and residual soils.

Root Mat/Organic Topsoil: Root mat and organic topsoil was encountered at the surface of borings L_1525L, L_1650R, and L_1775L and ranged in thickness from 0.2 to 0.3 feet (2 to 3.5 inches).

Artificial Fill: Artificial fill was encountered in boring Y_1050 to a depth of approximately 5.8 feet and is likely associated with installation of the adjacent sewer line. The artificial fill was described as varying layers of moist to wet, loose, silty SAND (A-2-4) and sandy and silty CLAY (A-6 & A-7-6). The soil samples also contained trace organic matter.

Roadway Embankment Fill: Roadway embankment fill was encountered in borings L_1650R and L_1775L and extended to a depth of approximately 2 and 4.7 feet, respectively. The fill was described as moist, stiff to very stiff, sandy and silty CLAY (A-6 & A-7-6). The tested sandy CLAY (A-6) had a plasticity index of 14% and a water content of 18.2% while the tested silty CLAY (A-7-6) had a plasticity index of 22% and a water content of 22.6%.

Alluvial Soil: Alluvial soils were encountered below the roadway embankment fill in boring L_1775L at a depth of 4.7 feet and extended to boring termination at a depth of 10 feet. These soils were generally described as wet, medium dense, silty SAND (A-2-4).

Residual Soil: Residual soils were encountered at the ground surface of boring L_1525L and below the roadway embankment at boring L_1650R at a depth of approximately 2 feet. The residual soils extended to depths of 10.8 and 8.0 feet, respectively. These soils were generally described as moist to wet, stiff, sandy SILT (A-4) and silty CLAY (A-7-6) and moist medium dense silty SAND (A-2-4). The tested silty CLAY (A-7-6) had a plasticity index of 20% and a water content of 19.8%.

Rock Properties

Weathered Rock (WR) was only encountered in boring L_1525L at a depth of 10.8 feet and an elevation of 617.3 feet. Crystalline Rock (CR) was encountered in borings L_1525L, L_1650R, and Y_1050 as indicated by auger and SPT refusal. The CR was encountered at depths ranging from approximately 5.8 to 12.4 feet, or elevations ranging from approximately 611.8 to 615.7 feet. The rock consisted of brown, gray-tan, and black metamorphosed granitic rock. Refusal is a designation applied to any material that cannot be penetrated by the soil auger, and is typically caused by encountering boulders, hard rock lenses/ledges or bedrock. The nature of the materials causing refusal was not explored in these borings, but is anticipated to represent the CR level.

Groundwater Properties

Groundwater measurements were collected in all borings immediately after completion of drilling and after a stabilization period of approximately 24 hours had elapsed. No groundwater was encountered. It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

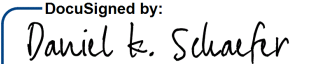
We appreciate the opportunity to work with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

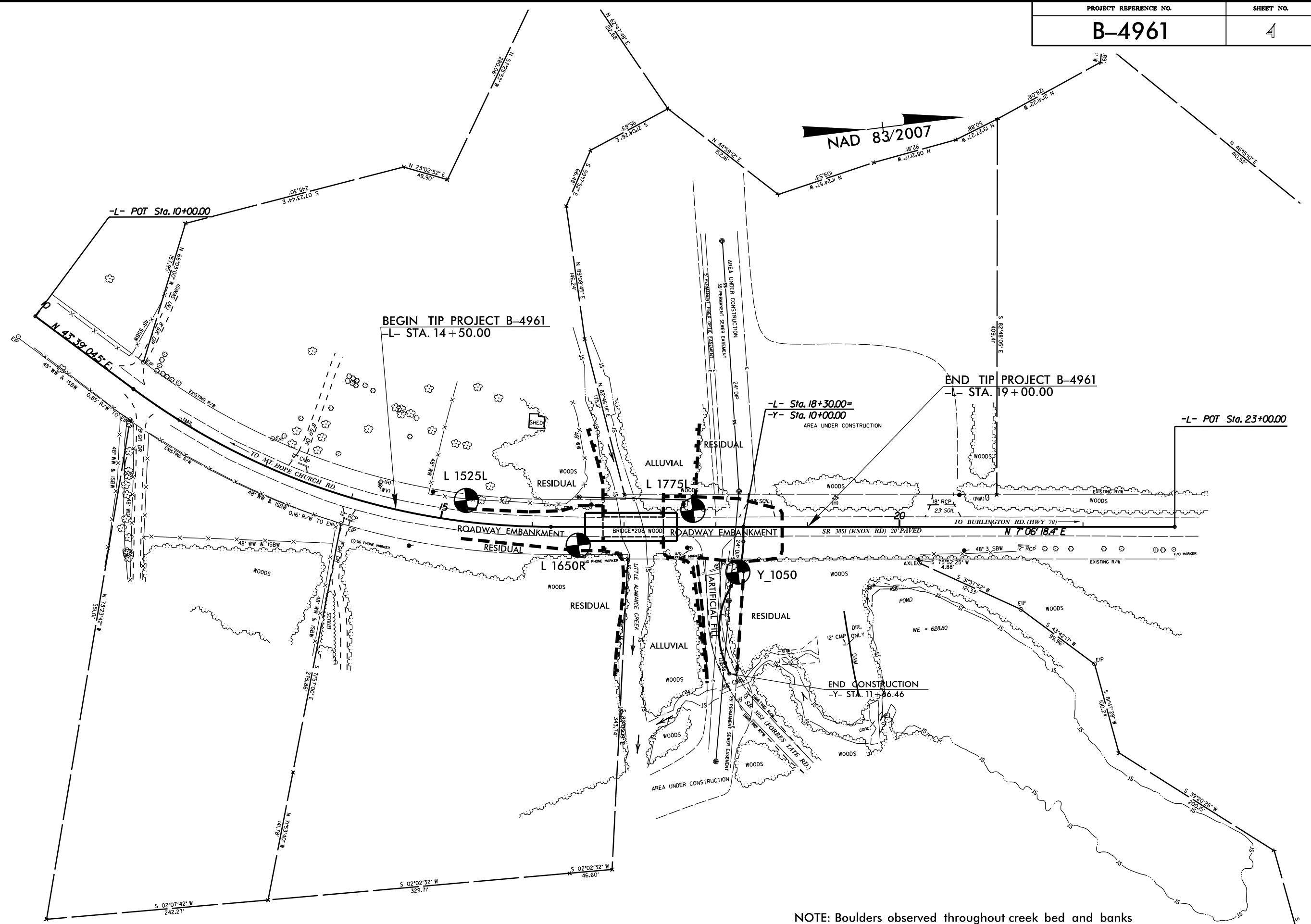
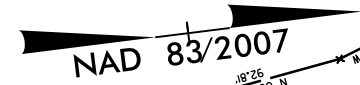
Sincerely,
FROEHLING & ROBERTSON, INC.

DocuSigned by:

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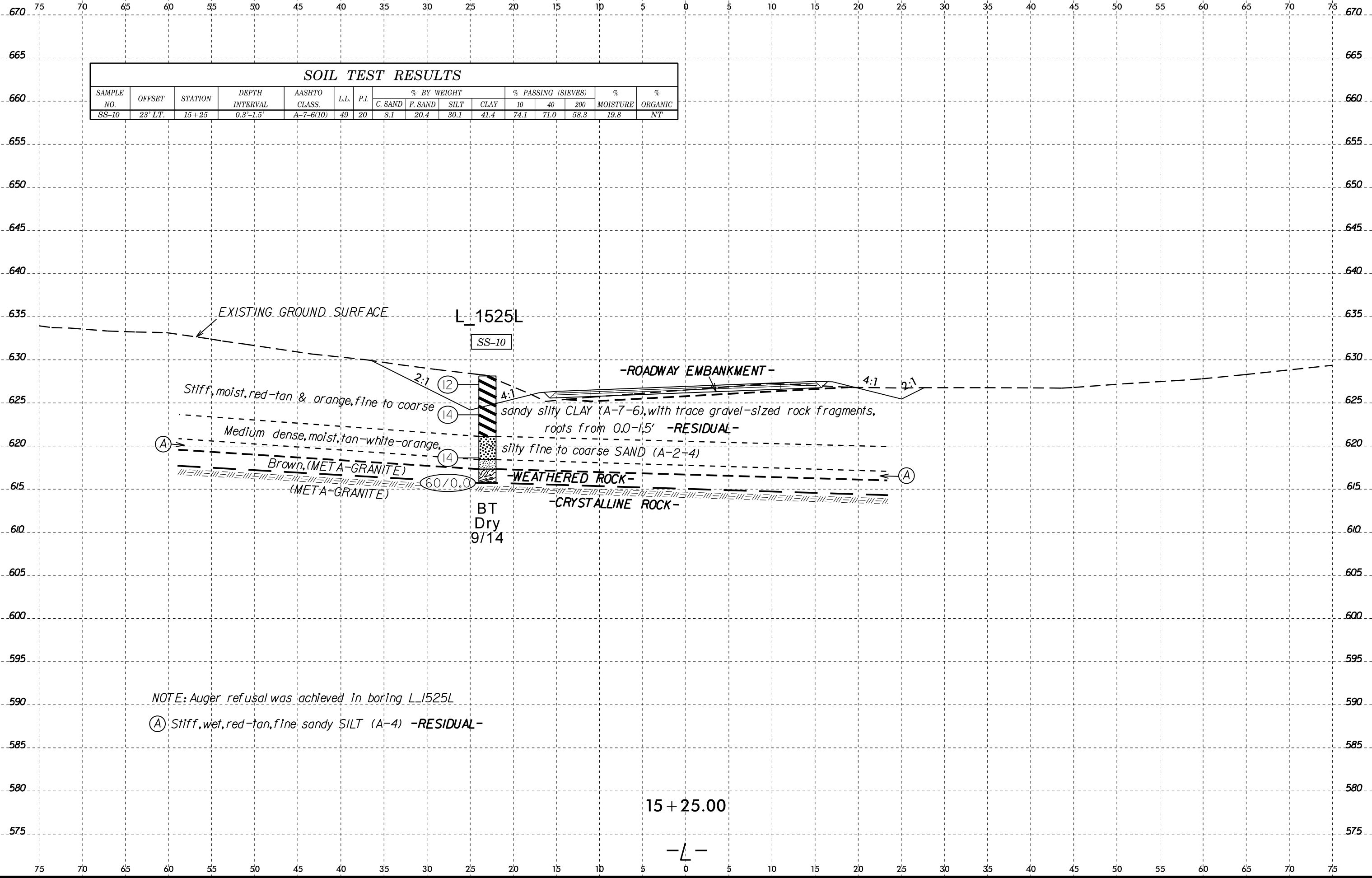
W. Patrick Alton, P.E.
 Geotechnical Services Manager

DocuSigned by:

6113E431716C478...
 Daniel K. Schaefer, P.E.
 Raleigh Branch Manager



NOTE: Boulders observed throughout creek bed and banks

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	23' LT.	15+25	0.3'-1.5'	A-7-6(10)	49	20	8.1	20.4	30.1	41.4	74.1	71.0	58.3	19.8	NT

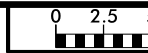


NOTE: Auger refusal was achieved in boring L_1525L

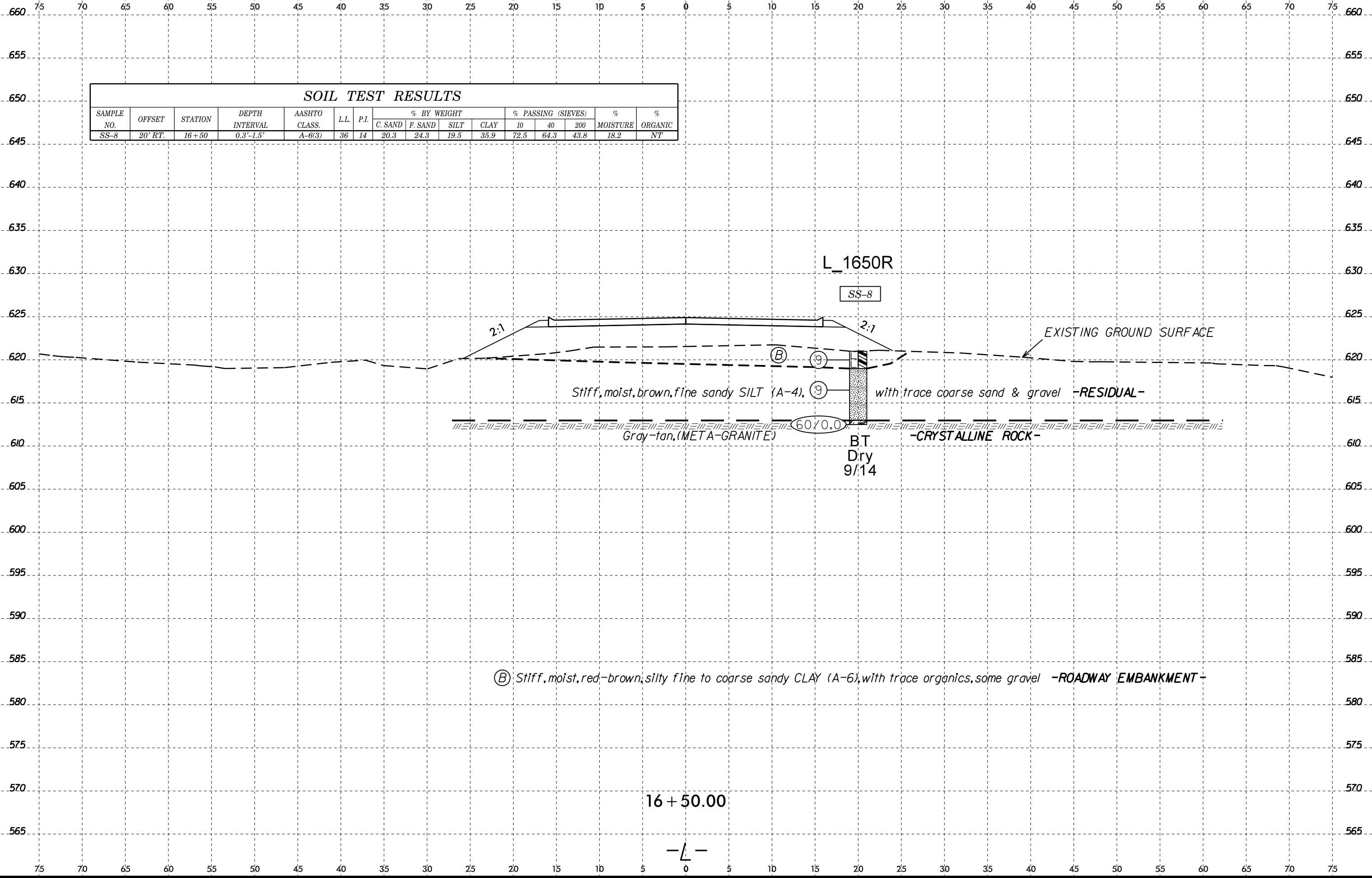
(A) Stiff, wet, red-tan, fine sandy SILT (A-4) -RESIDUAL-

15 + 25.00

-L-



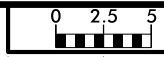
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-8	20' RT.	16+50	0.3'-1.5'	A-6(3)	36	14	20.3	24.3	19.5	35.9	72.5	64.3	43.8	18.2	NT



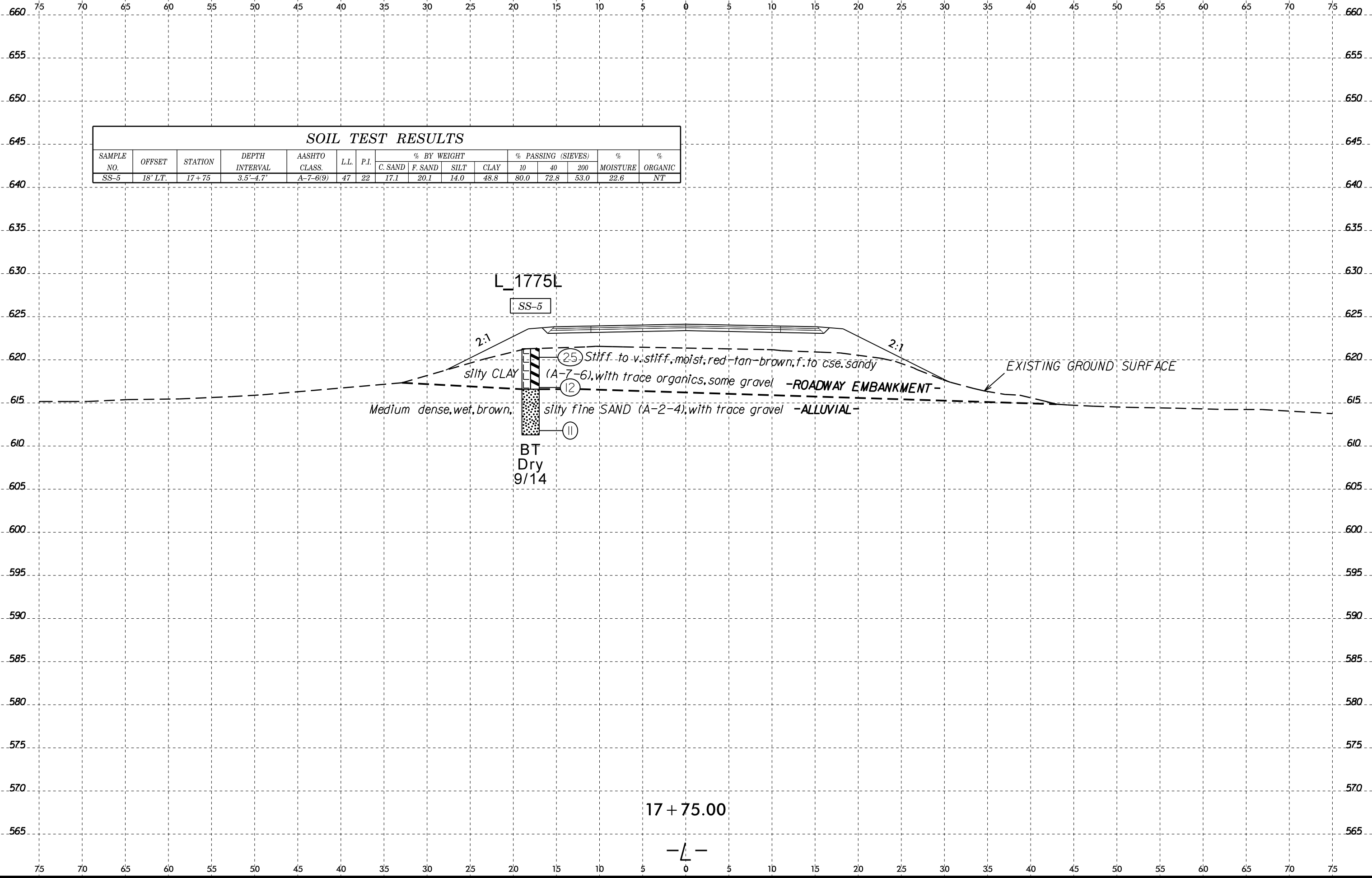
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16 + 50.00

-L-



SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-5	18' LT.	17+75	3.5'-4.7'	A-7-6(9)	47	22	17.1	20.1	14.0	48.8	80.0	72.8	53.0	22.6	NT



L_1775L

SS-5

2:1

2:1

(25)

(12)

(11)

silty CLAY

Stiff to v. stiff, moist, red-tan-brown, f. to cse. sandy (A-7-6), with trace organics, some gravel

Medium dense, wet, brown,

silty fine SAND (A-2-4), with trace gravel

ROADWAY EMBANKMENT

ALLUVIAL

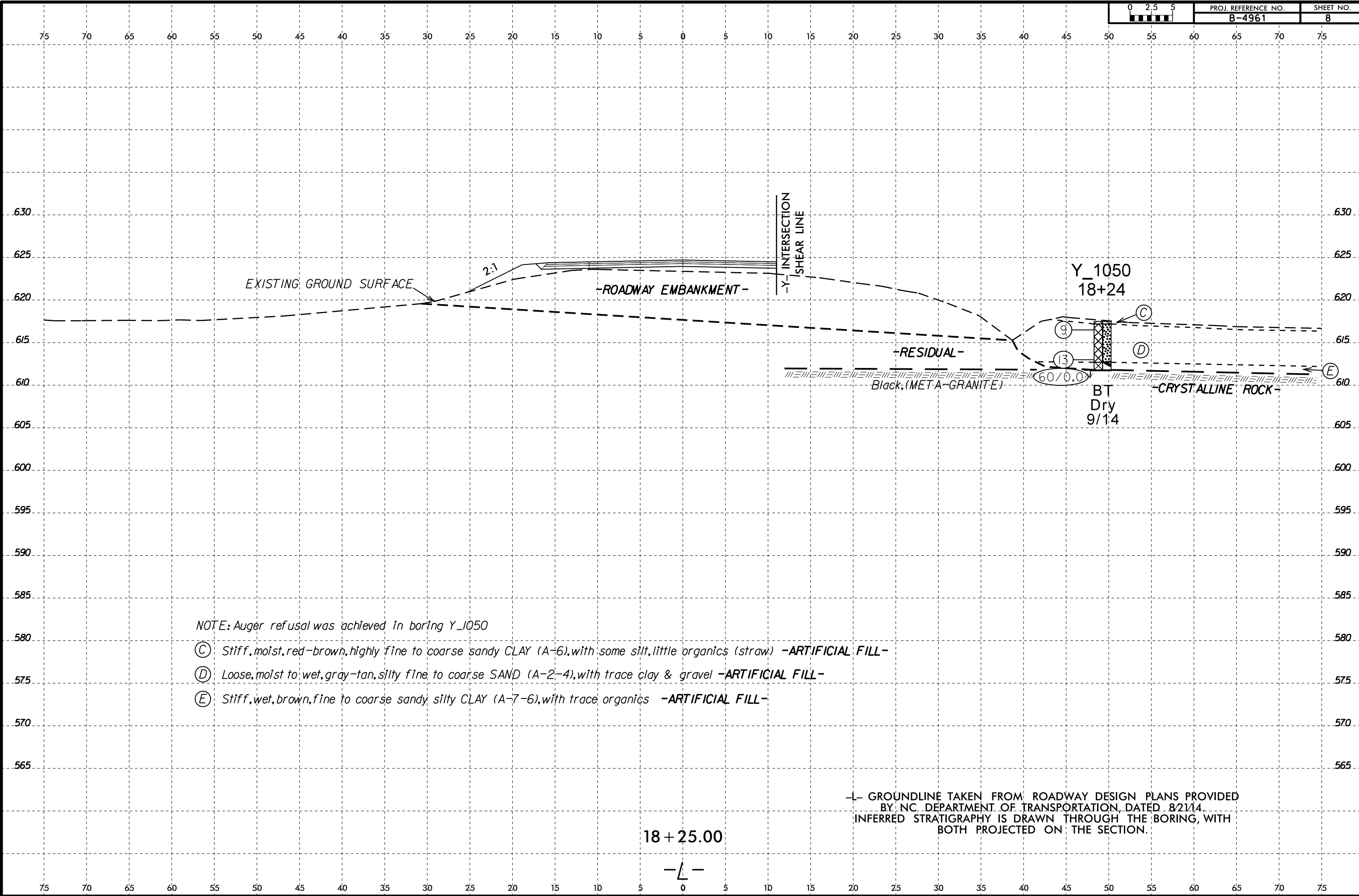
EXISTING GROUND SURFACE

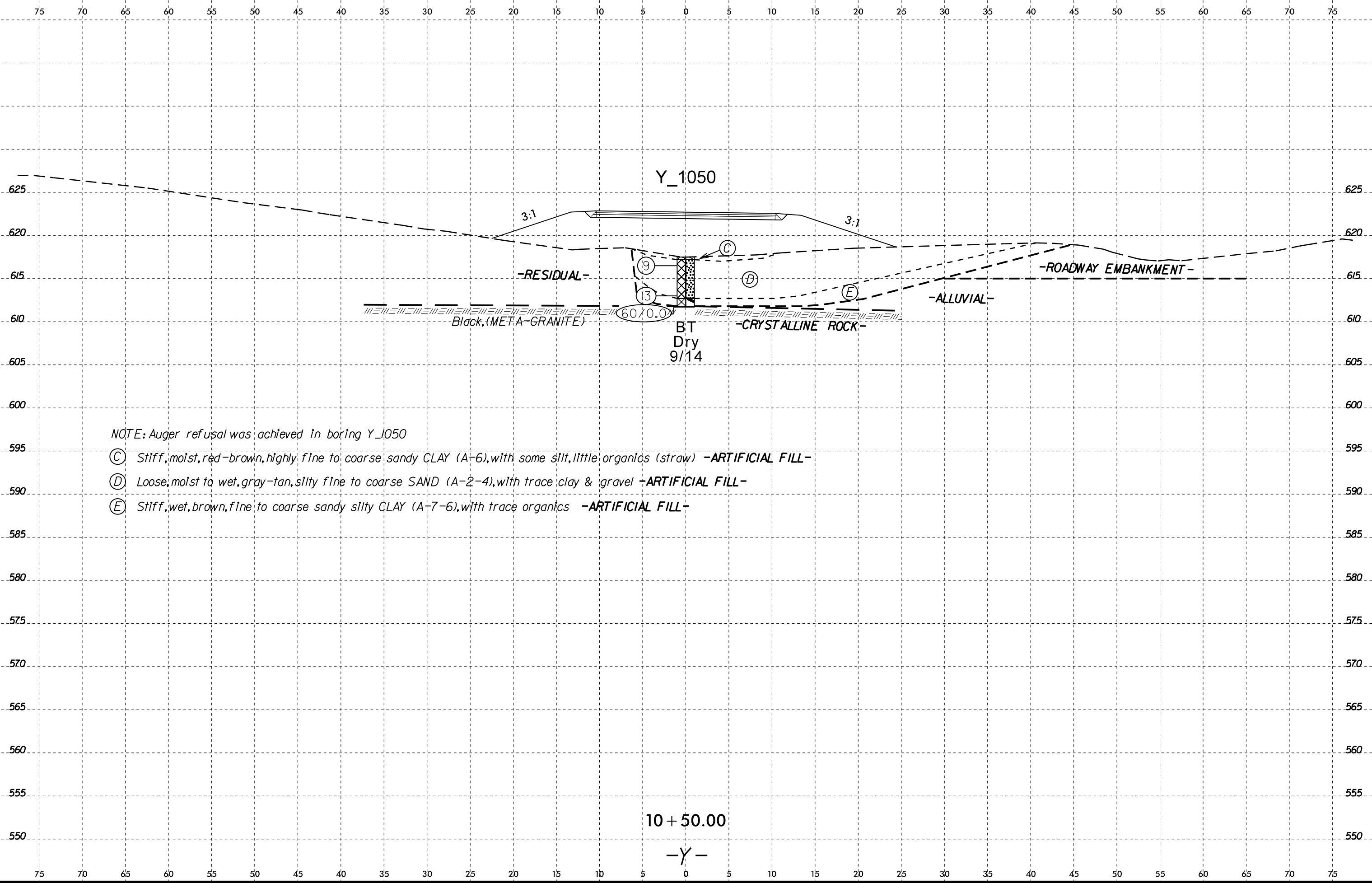
BT Dry 9/14

17 + 75.00

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NOTE: Auger refusal was achieved in boring Y_1050

- (C) Stiff, moist, red-brown, highly fine to coarse sandy CLAY (A-6), with some silt, little organics (straw) -ARTIFICIAL FILL-
- (D) Loose, moist to wet, gray-tan, silty fine to coarse SAND (A-2-4), with trace clay & gravel -ARTIFICIAL FILL-
- (E) Stiff, wet, brown, fine to coarse sandy silty CLAY (A-7-6), with trace organics -ARTIFICIAL FILL-

10 + 50.00

-Y-