

SEE SHEET 2A FOR PLAN SHEET LAYOUT  
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705A	1	16

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

PERSONNEL

TRIGON EXPLORATION

GOODNIGHT, D.J.

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INVESTIGATED BY FALCON ENG.

DRAWN BY HILL, M.J.

CHECKED BY HUNSBERGER, W.S.

SUBMITTED BY FALCON ENG.

DATE FEBRUARY 2019

**ROADWAY  
SUBSURFACE INVESTIGATION**

COUNTY MECKLENBURG  
PROJECT DESCRIPTION CHARLOTTE GATEWAY STATION  
- RAIL (STI) WYE CONNECTION TRACK  
AT CHARLOTTE JUNCTION

**INVENTORY**

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	11+00.00 - 31+24.55	4,5	4,5
-RI_PR-	27+30.09 - 46+85.22	5,6	6,7

CROSS SECTIONS

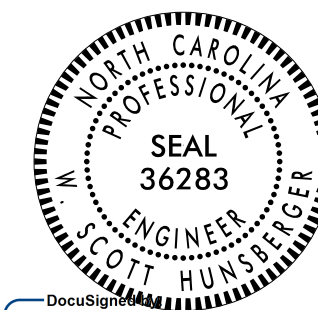
LINE	STATION	SHEETS
-L-	10+50.00 - 13+50.00	8-10

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY RESULTS	11-12

REFERENCE: P-5705A

PROJECT: 44475



DocuSigned by  
*W. Scott Hunsberger*

2/22/2019 10:49E...

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

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

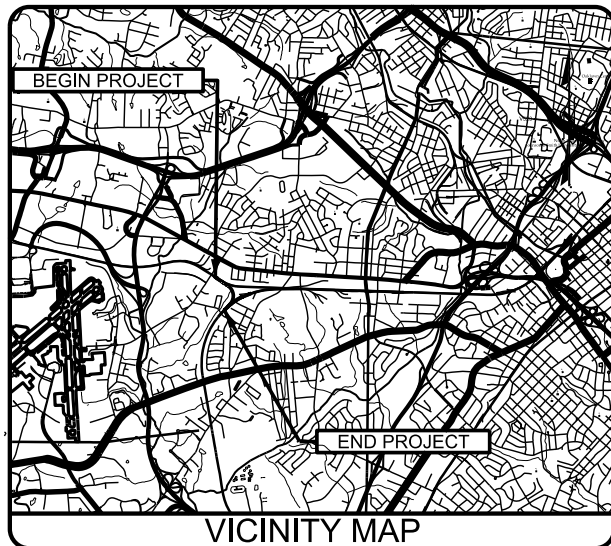
## SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																		
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <b>GAP-GRADED</b> - 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><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - 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. <b>ARTESIAN</b> - 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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (ROD)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - 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. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																		
<p><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-2</th><th>A-3</th><th>A-4</th><th>A-5</th> <th>A-6</th><th>A-7</th><th>A-8</th><th>A-9</th><th>A-10</th> <th>A-11</th><th>A-12</th><th>A-13</th><th>A-14</th><th>A-15</th> <th>A-16</th><th>A-17</th><th>A-18</th><th>A-19</th><th>A-20</th> </tr> <tr> <td>GROUP CLASS.</td> <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-8</td><td>A-9</td><td>A-10</td><td>A-11</td><td>A-12</td><td>A-13</td><td>A-14</td><td>A-15</td><td>A-16</td><td>A-17</td> </tr> <tr> <td>SYMBOL</td> <td colspan="5">[Pattern]</td><td colspan="5">[Pattern]</td><td colspan="5">[Pattern]</td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	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-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	SYMBOL	[Pattern]					[Pattern]					[Pattern]					<p><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR</b>, <b>SUBANGULAR</b>, <b>SUBROUNDED</b>, OR <b>ROUNDED</b>.</p>										<p><b>WEATHERED ROCK (WR)</b></p> <p><b>CRYSTALLINE ROCK (CR)</b></p> <p><b>NON-CRYSTALLINE ROCK (NCR)</b></p> <p><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b></p>										<p><b>WEATHERING</b></p> <p><b>FRESH</b> - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p><b>VERY SLIGHT (IV SL.)</b> - 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><b>SLIGHT (SL.)</b> - 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><b>MODERATE (MOD.)</b> - 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><b>MODERATELY SEVERE (MOD. SEV.)</b> - 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><b>SEVERE (SEV.)</b> - 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 &gt; 100 BPF</i></p> <p><b>VERY SEVERE (IV SEV.)</b> - 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 &lt; 100 BPF</i></p> <p><b>COMPLETE</b> - 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>									
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<p><b>MINERALOGICAL COMPOSITION</b></p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p><b>COMPRESSION</b></p> <p>SLIGHTLY COMPRESSIBLE LL &lt; 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL &gt; 50</p>										<p><b>PERCENTAGE OF MATERIAL</b></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>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY 35% AND ABOVE</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	<p><b>GROUND WATER</b></p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p>																																																														
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**TIP PROJECT: P-5705A**

**CONTRACT: C204176**



STATE OF NORTH CAROLINA  
RAIL DIVISION

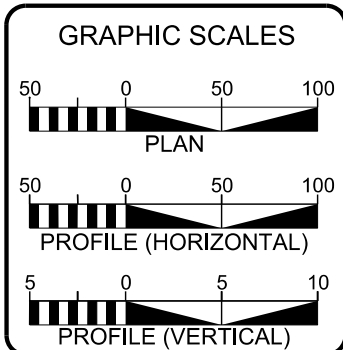
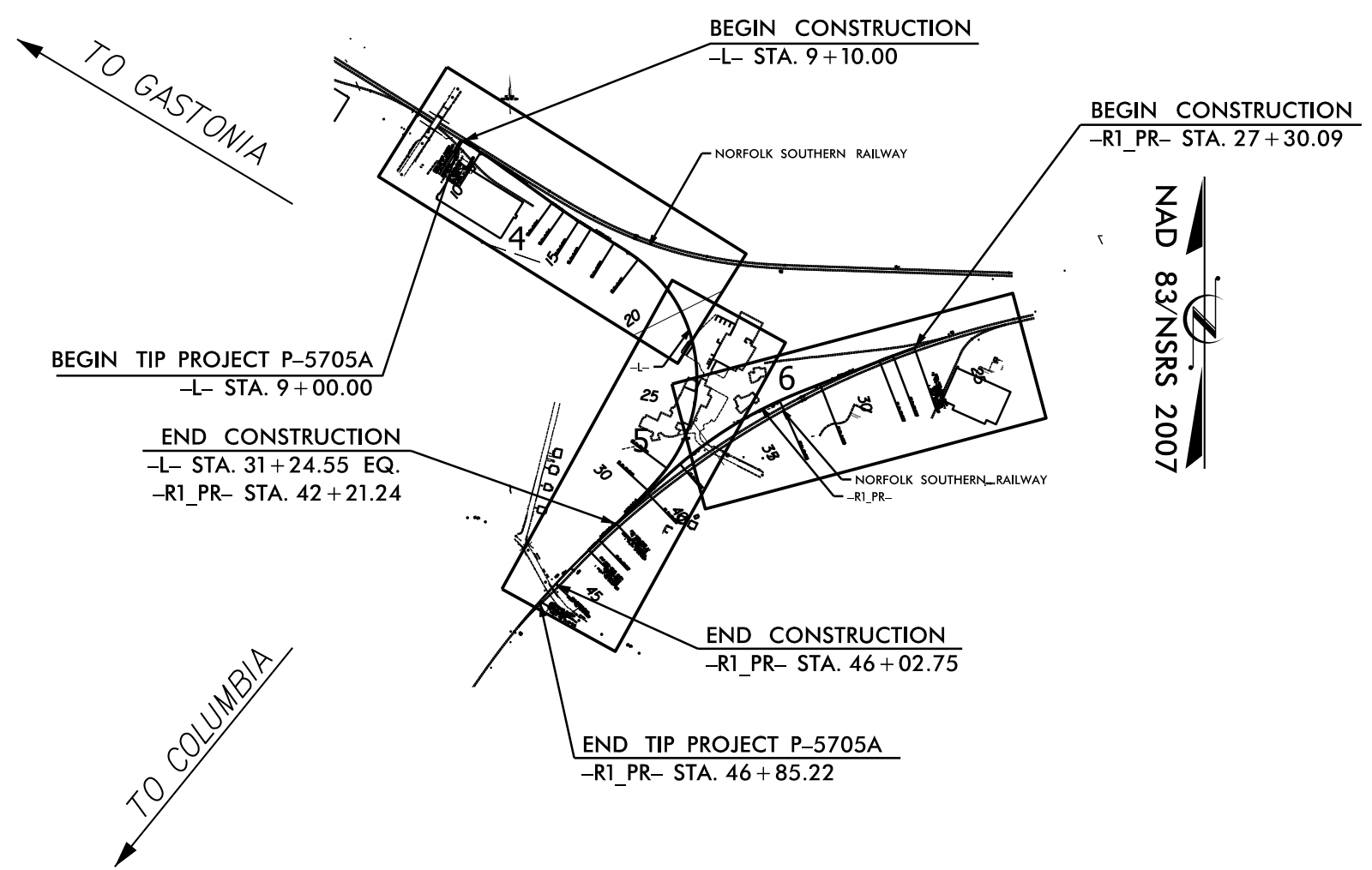
**MECKLENBURG COUNTY**

**LOCATION: CHARLOTTE GATEWAY STATION - RAIL (STI)  
WYE CONNECTION TRACK AT CHARLOTTE JUNCTION  
TYPE OF WORK: DRAINAGE, PAVING, GRADING**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705A	3	16
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
44475.1.1		P.E.	
44475.2.1		ROW / UTIL P.E.	
44475.3.1		CONST./UTIL CONST.	

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

TO CHARLOTTE →



PROJECT LENGTH	
LENGTH OF RAIL TIP PROJECT	0.509 MILES
LENGTH OF STRUCTURES TIP PROJECT	0.000 MILES
TOTAL LENGTH OF RAIL TIP PROJECT	0.509 MILES
LENGTH MEASURED ALONG -L- AND -R1_PR-	
NCDOT CONTACT:	MATTHEW SIMMONS, P.E. NCDOT PROJECT MANAGER

**HNTB** HNTB NORTH CAROLINA, P.C.  
343 E. Six Forks Road, Suite 200  
Raleigh, North Carolina 27609  
NC License No: C-1554

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: 03/09/2018	COREY VERNIER, P.E. RAIL PROJECT ENGINEER
LETTING DATE: 01/20/2019	DAVID HAWKINS, P.E. STRUCTURE PROJECT ENGINEER
	JAMES BYRD, P.E. HYDRAULICS PROJECT ENGINEER
	MATTHEW SIMMONS, P.E. NCDOT PROJECT MANAGER

RAIL ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
<b>SUBMITTAL: 90%</b> <b>DATE: OCTOBER 19, 2018</b>	
SIGNATURE: _____ P.E.	SIGNATURE: _____ P.E.

NC DEPARTMENT OF TRANSPORTATION  
**RAIL DIVISION**  
DESIGN AND CONSTRUCTION



## Roadway Subsurface Investigation Report - Inventory

**Charlotte Gateway Station – Rail (STI)  
WYE Connection Track at Charlotte Junction  
Mecklenburg County, North Carolina  
WBS: 44475.1.1 TIP: P-5705A  
Falcon Project No.: G18044.00**

**Prepared for:**

HNTB North Carolina, PC  
343 Six Forks Road, Suite 200  
Raleigh, NC 27609

Submitted by:

Falcon Engineering, Inc.  
1210 Trinity Road, Suite 110  
Cary, North Carolina 27513  
(919) 871-0800  
www.falconengineers.com

February 12, 2019

**WBS:** 44475.1.1  
**TIP:** P-5705A  
**COUNTY:** Mecklenburg  
**DESCRIPTION:** Charlotte Gateway Station – Rail (STI)  
WYE Connection Track at Charlotte Junction  
**SUBJECT:** Roadway Subsurface Investigation – Inventory

### PROJECT DESCRIPTION

This project consists of 0.4 miles of proposed new track alignment between Gastonia and Columbia tying the existing Norfolk South Mainline and R line (-L- and -R1\_PR-) together in Mecklenburg County. A portion of track along -L- will be shifted/improved just before the new connector tie-in. A portion of track along -R1\_PR- will be shifted/improved just before and for some distance beyond the new connector tie-in.

Included in this project are one reinforced concrete box culvert and various drainage pipes facilitating water crossing along the mainline. Culvert and pipe borings are included in this report. Culvert structure recommendations will be submitted under separate cover.

The investigation was conducted between October 29<sup>th</sup> and November 2<sup>nd</sup>, 2018 in general accordance with our Subconsultant Agreement, dated July 18<sup>th</sup>, 2018. The information provided in this report are based solely on our site reconnaissance, soil test borings and laboratory test data, engineering evaluation of these data, and generally accepted soil and foundation engineering practices and principles.

A total of twenty (20) Standard Penetration Test (SPT) borings and one (1) hand auger boring were drilled for the proposed alignments. All mechanical borings were drilled using a CME-850 track rig equipped with 2 ¼-inch inside diameter hollow-stem augers, and SPT testing was performed with an NCDOT approved and recently calibrated automatic hammer. Representative soil samples, collected with a split-barrel sampler or hand auger, were selected for laboratory testing to verify visual field classifications. In addition, bulk samples were collected for standard Proctor compaction testing.





The following alignments, totaling approximately 0.75 miles were explicitly investigated.

<u>Alignment</u>	<u>Station (ft)</u>
-L- (Proposed WYE Track)	11+00.00—31+24.55
-R1_PR- (Proposed R-Line)	27+30.09—46+85.22

**AREAS OF SPECIAL GEOTECHNICAL INTEREST**

- I. The following locations contains highly plastic soils with plasticity indices (PI) greater than 35:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	11+87
-L-	30+53

- II. Shallow ground water was encountered within 4 feet of the proposed ground surface within the following areas and may cause groundwater related stability problems during construction:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	24+00
-R1_PR-	36+50
-R1_PR-	37+96

- III. Alluvial soils were encountered near the following locations. The potential for shallow groundwater and wet, soft or organic soils should be anticipated at these locations:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	14+39
-L-	20+00
-L-	21+85
-R1_PR-	29+18

Isolated alluvial soils are likely to exist elsewhere on the site between borings in proximity to natural waterways and artificial drainage features.

- IV. Artificial fill soils containing varying amounts of waste and debris was encountered throughout the project site, at varying depths from surficial soils to 18 feet below existing ground surface, except the following areas:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	10+00
-R1_PR-	40+03

Evidence of prior industrial development was noted throughout the area. This includes prior building foundations and industrial materials. Old utilities or other buried structures may be present in these areas.







## PHYSIOGRAPHY AND GEOLOGY

According to the *Geologic Map of North Carolina* (1985), the site is in the Charlotte Belt Physiographic Province of North Carolina. Specifically, rocks at the site are noted as Granitic Rock (**DOg**), consisting of locally pinkish gray, massive to weakly foliated; contains hornblende. The Granitic Rock is of the Devonian/Ordovician Period.

Existing site topography is typical of North Carolina's Western Piedmont. Topography along the project is generally rolling, with a steep ravine in the vicinity of the stream crossing through the project area. The existing ground surface generally grades downward from either side of the project corridor towards the existing stream bed, with elevations ranging from a high of around 730 feet to a low of around 700 feet.

Adjacent existing land use is a mix of residential, industrial, and commercial, with portions of the project in undeveloped fields or wooded areas. Evidence of prior industrial use including remnants of prior building foundations and scattered industrial materials were noted throughout the area. Large concrete foundations are present throughout the central portion of the project site. Currently developed areas are predominantly at the exterior limits of the project as well as near various roadway crossings and tie-ins.

## SOIL PROPERTIES

A variety of soils were encountered along the project, including existing artificial fill, alluvial deposits, residual soils, weathered rock and crystalline rock. Areas where soils at the ground surface are of a unique origin (i.e. not residual soils) are approximately delineated on the boring location plans based on subsurface conditions encountered in nearby borings, and various topographical, vegetative, or other visual surface features.

Topsoil and rootmat was encountered in grassy, brushy, and wooded areas ranging in thickness from 0.1 to 0.5 feet, and typically on the order of 0.3 feet.

Artificial Fill soils were encountered at the ground surface beneath thin layers of topsoil. These consist of 1 to 18 feet of moist to wet, very loose to very dense, silty and clayey sands (A-2-4, A-2-6) and soft to hard, sandy silts and sandy and silty clays (A-4, A-6, A-7). These soils contains varying amounts of organics, gravel, cobbles and debris.

Alluvial soils were encountered beneath artificial fill soils. These soils extended to depths of up to approximately 23 feet below existing ground surface and consist of moist to wet, very soft to soft, sandy and silty clays (A-6, A-7) and loose, clayey sands (A-2-5) with trace amounts of organic material.

Residual soils were encountered at the ground surface, or beneath artificial fill or alluvial deposits. These soils consist of moist to saturated, loose to very dense, clayey and silty sands (A-2-4 and A-2-6) and soft to hard, sandy clay and silt and silty clays (A-4, A-6, A-7).

Weathered Rock (WR) is a very hard material with properties intermediate of soil and rock. WR is classified as having an N-value of greater than 100 blows per one foot. WR encountered on the project generally consists of tan, brown, and gray weathered granite.

Crystalline Rock (CR) is classified as material that yields auger refusal or SPT refusal (blow count of 60/0.0 or 60/0.1 feet.) CR consisting of tan-brown granite was encountered beneath weathered rock or residual soils at various locations throughout the site and is presumed to exist at some depth beyond the termination of remaining borings.





## GROUNDWATER PROPERTIES

Groundwater levels were measured at the time of boring completion, and in many cases after a waiting period of at least 24 hours. Borings drilled within and in close proximity to existing roadways, and within residential areas were backfilled immediately after completion due to safety considerations.

Groundwater levels across the site were generally deep, with the exception of areas near streams and existing low, wet areas. One existing stream was noted crossing the -L- alignment, and standing water was present on the site between approximately 29+50 and 30+90 of the -L- alignment.

## ADDITIONAL LABORATORY TESTING

The following bulk samples were obtained:

<u>Sample</u>	<u>Location</u>	<u>Depth (ft)</u>	<u>Test</u>
BS-1	10+00, 30' RT, -L-	1.0 – 4.0	Standard Proctor
BS-2	36+50, CL, -R1_PR-	1.0 – 4.0	Standard Proctor

Classification test results for bulk samples are included in the subsurface profiles and cross sections and Standard Proctor data is attached in the Appendix.

## CLOSING

Falcon appreciates the opportunity to have provided our geotechnical engineering services for the above referenced project. If you have any questions concerning the contents of this report or need additional information, please do not hesitate to contact our office.

### FALCON ENGINEERING, INC.

Report Prepared By:

W. Scott Hunsberger, PE  
*Geotechnical Engineer*

Report Reviewed By:

Jeremy R. Hamm, PE  
*Geotechnical Engineering Manager*



**HNTB**  
 HNTB NORTH CAROLINA, P.C.  
 343 E. Six Forks Road, Suite 200  
 Raleigh, North Carolina 27609  
 NC License No: C-1554

PROJECT REFERENCE NO. P-5705A  
 SHEET NO. 4

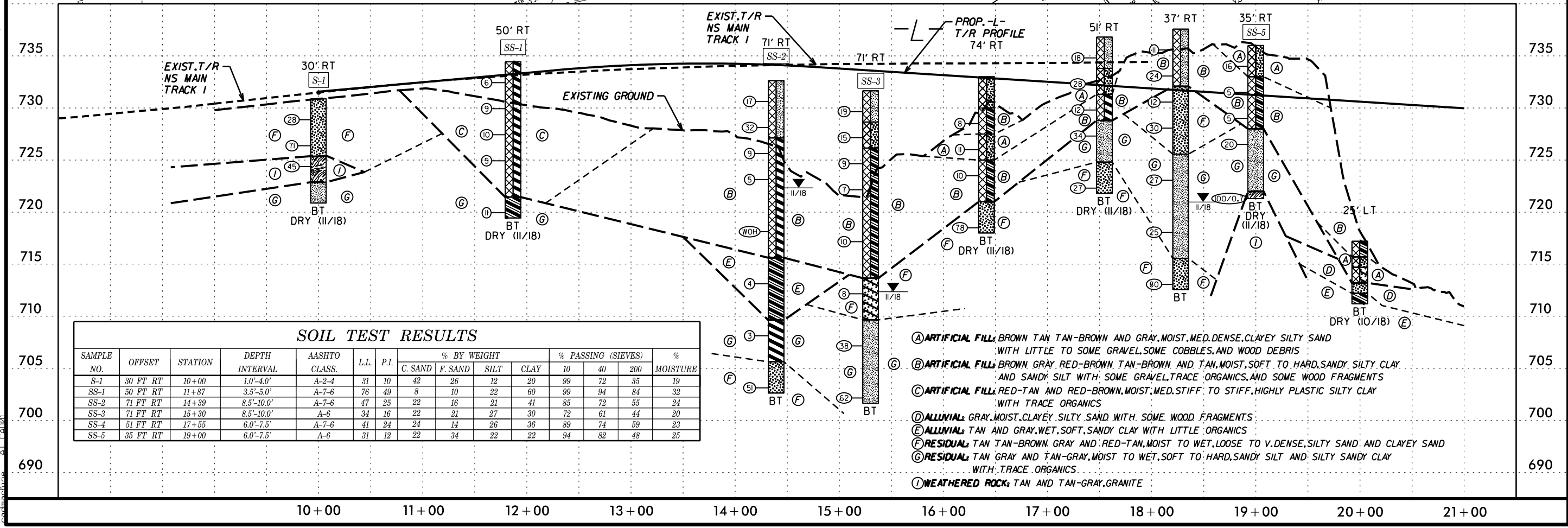
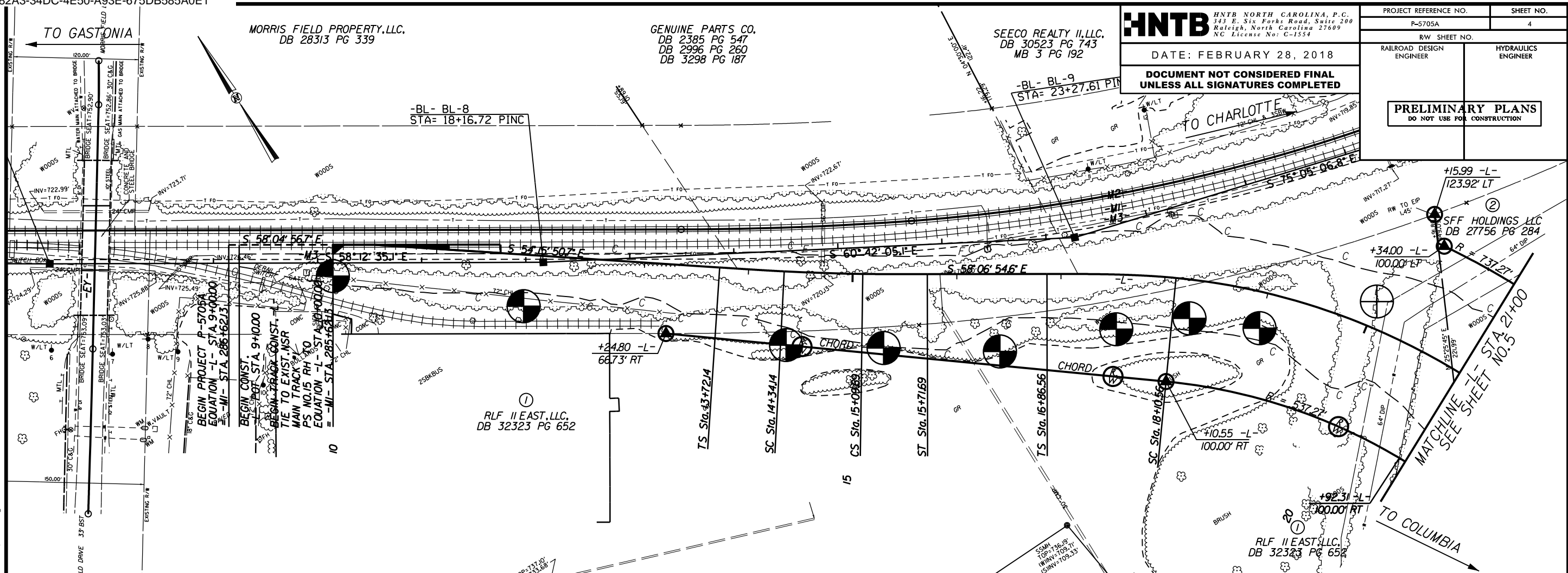
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 SHEET NO. 4

RAILROAD DESIGN ENGINEER  
 HYDRAULICS ENGINEER

**PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION**



**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE
							C. SAND	F. SAND	SILT	CLAY	10	40	200	
S-1	30 FT RT	10+00	1.0'-4.0'	A-2-4	31	10	42	26	12	20	99	72	35	19
SS-1	50 FT RT	11+87	3.5'-5.0'	A-7-6	76	49	8	10	22	60	99	94	84	32
SS-2	71 FT RT	14+39	8.5'-10.0'	A-7-6	47	25	22	16	21	41	85	72	55	24
SS-3	71 FT RT	15+30	8.5'-10.0'	A-6	34	16	22	21	27	30	72	61	44	20
SS-4	51 FT RT	17+55	6.0'-7.5'	A-7-6	41	24	24	14	26	36	89	74	59	23
SS-5	35 FT RT	19+00	6.0'-7.5'	A-6	31	12	22	34	22	22	94	82	48	25

- (A) **ARTIFICIAL FILL:** BROWN TAN TAN-BROWN AND GRAY, MOIST, MED. DENSE, CLAYEY SILTY SAND WITH LITTLE TO SOME GRAVEL, SOME COBBLES, AND WOOD DEBRIS
- (B) **ARTIFICIAL FILL:** BROWN GRAY RED-BROWN TAN-BROWN AND TAN, MOIST, SOFT TO HARD, SANDY SILTY CLAY AND SANDY SILT WITH SOME GRAVEL, TRACE ORGANICS, AND SOME WOOD FRAGMENTS
- (C) **ARTIFICIAL FILL:** RED-TAN AND RED-BROWN, MOIST, MED. STIFF TO STIFF, HIGHLY PLASTIC SILTY CLAY WITH TRACE ORGANICS
- (D) **ALLUVIAL:** GRAY, MOIST, CLAYEY SILTY SAND WITH SOME WOOD FRAGMENTS
- (E) **ALLUVIAL:** TAN AND GRAY, WET, SOFT, SANDY CLAY WITH LITTLE ORGANICS
- (F) **RESIDUAL:** TAN TAN-BROWN GRAY AND RED-TAN, MOIST TO WET, LOOSE TO V. DENSE, SILTY SAND AND CLAYEY SAND
- (G) **RESIDUAL:** TAN GRAY AND TAN-GRAY, MOIST TO WET, SOFT TO HARD, SANDY SILT AND SILTY SANDY CLAY WITH TRACE ORGANICS
- (H) **WEATHERED ROCK:** TAN AND TAN-GRAY, GRANITE

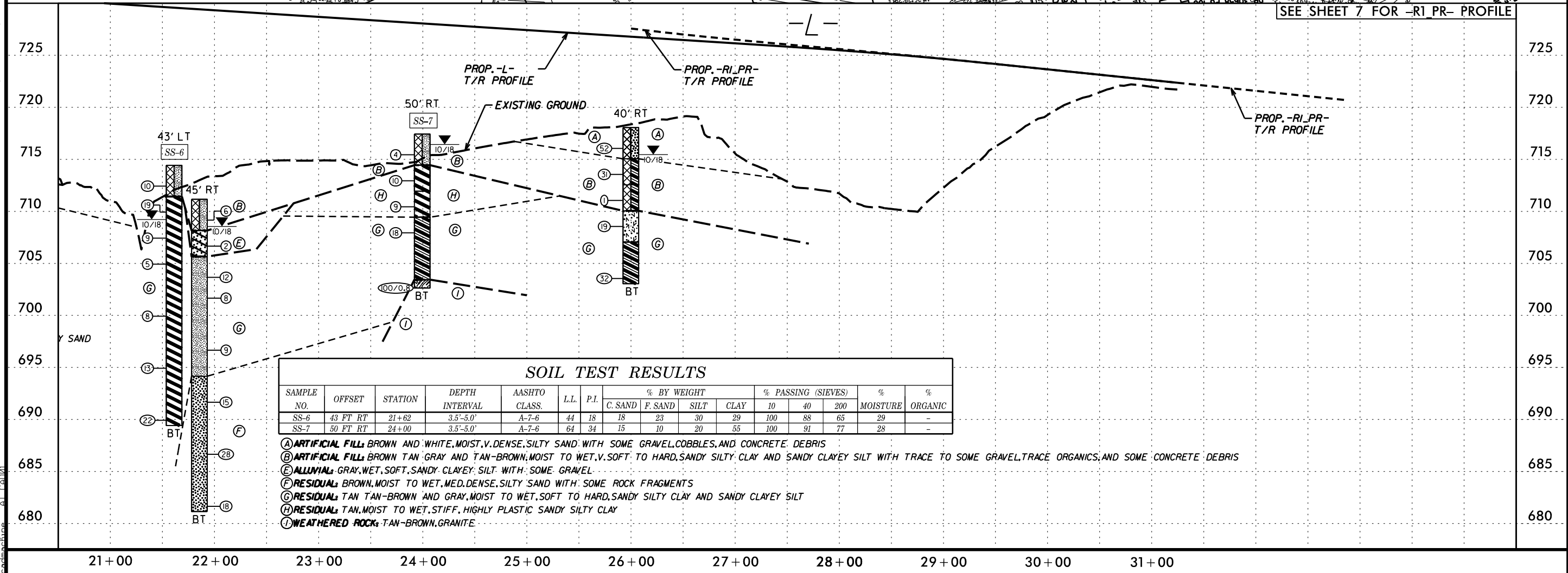
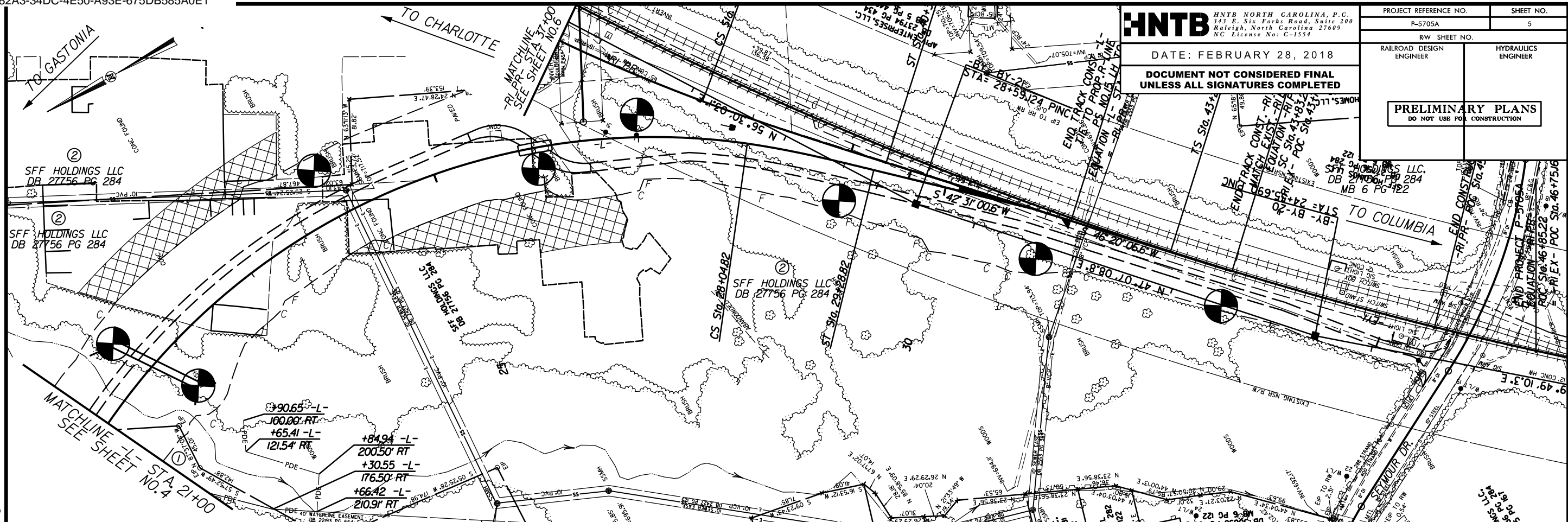
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PROJECT REFERENCE NO.	SHEET NO.
P-5705A	5
RW SHEET NO.	
RAILROAD DESIGN ENGINEER	HYDRAULICS ENGINEER
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DATE: FEBRUARY 28, 2018

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**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-6	43 FT RT	21+62	3.5'-5.0'	A-7-6	44	18	18	23	30	29	100	88	65	29	-
SS-7	50 FT RT	24+00	3.5'-5.0'	A-7-6	64	34	15	10	20	55	100	91	77	28	-

- (A) ARTIFICIAL FILL: BROWN AND WHITE, MOIST, V. DENSE, SILTY SAND WITH SOME GRAVEL, COBBLES, AND CONCRETE DEBRIS
- (B) ARTIFICIAL FILL: BROWN TAN GRAY AND TAN-BROWN, MOIST TO WET, V. SOFT TO HARD, SANDY SILTY CLAY AND SANDY CLAYEY SILT WITH TRACE TO SOME GRAVEL, TRACE ORGANICS, AND SOME CONCRETE DEBRIS
- (E) ALLUVIAL: GRAY, WET, SOFT, SANDY CLAYEY SILT WITH SOME GRAVEL
- (F) RESIDUAL: BROWN, MOIST TO WET, MED. DENSE, SILTY SAND WITH SOME ROCK FRAGMENTS
- (G) RESIDUAL: TAN TAN-BROWN AND GRAY, MOIST TO WET, SOFT TO HARD, SANDY SILTY CLAY AND SANDY CLAYEY SILT
- (H) RESIDUAL: TAN, MOIST TO WET, STIFF, HIGHLY PLASTIC SANDY SILTY CLAY
- (I) WEATHERED ROCK: TAN-BROWN, GRANITE

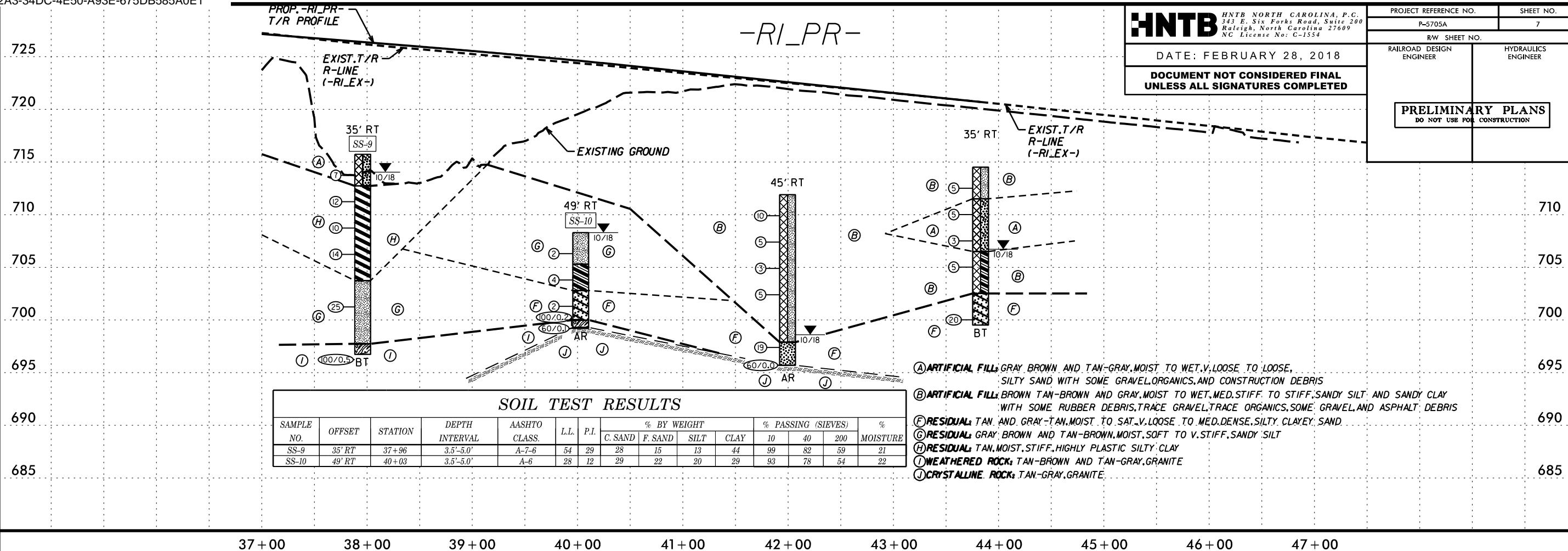
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PROJECT REFERENCE NO. P-5705A	SHEET NO. 7
RW SHEET NO.	
RAILROAD DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

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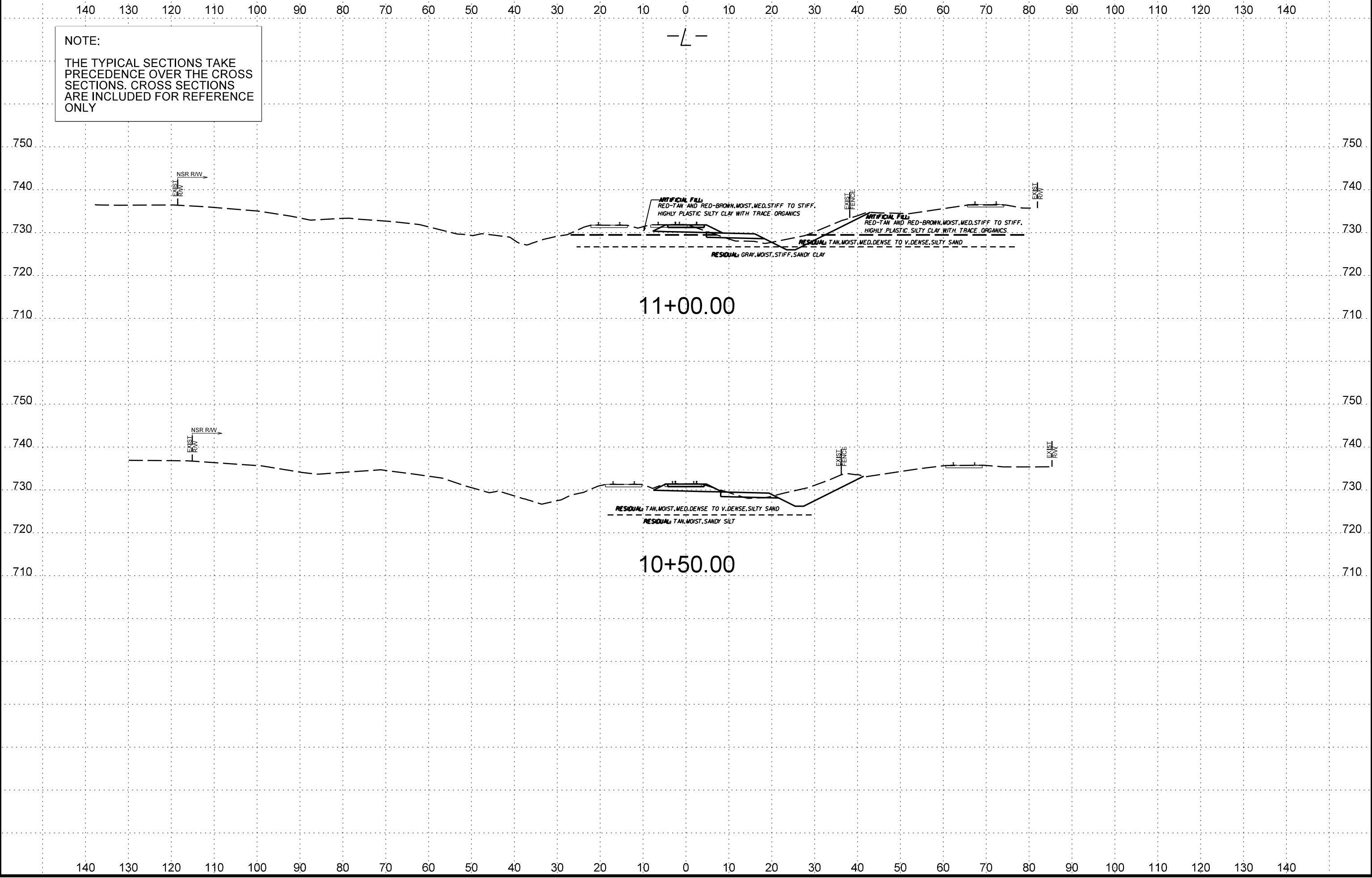
**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE
							C. SAND	F. SAND	SILT	CLAY	10	40	200	
SS-9	35' RT	37+96	3.5'-5.0'	A-7-6	54	29	28	15	13	44	99	82	59	21
SS-10	49' RT	40+03	3.5'-5.0'	A-6	28	12	29	22	20	29	93	78	54	22

- (A) **ARTIFICIAL FILL:** GRAY BROWN AND TAN-GRAY, MOIST TO WET, V. LOOSE TO LOOSE, SILTY SAND WITH SOME GRAVEL, ORGANICS, AND CONSTRUCTION DEBRIS
- (B) **ARTIFICIAL FILL:** BROWN TAN-BROWN AND GRAY, MOIST TO WET, MED. STIFF TO STIFF, SANDY SILT AND SANDY CLAY WITH SOME RUBBER DEBRIS, TRACE GRAVEL, TRACE ORGANICS, SOME GRAVEL AND ASPHALT DEBRIS
- (F) **RESIDUAL:** TAN AND GRAY-TAN, MOIST TO SAT, V. LOOSE TO MED. DENSE, SILTY CLAYEY SAND
- (G) **RESIDUAL:** GRAY BROWN AND TAN-BROWN, MOIST, SOFT TO V. STIFF, SANDY SILT
- (H) **RESIDUAL:** TAN, MOIST, STIFF, HIGHLY PLASTIC SILTY CLAY
- (I) **WEATHERED ROCK:** TAN-BROWN AND TAN-GRAY, GRANITE
- (J) **CRYSTALLINE ROCK:** TAN-GRAY, GRANITE

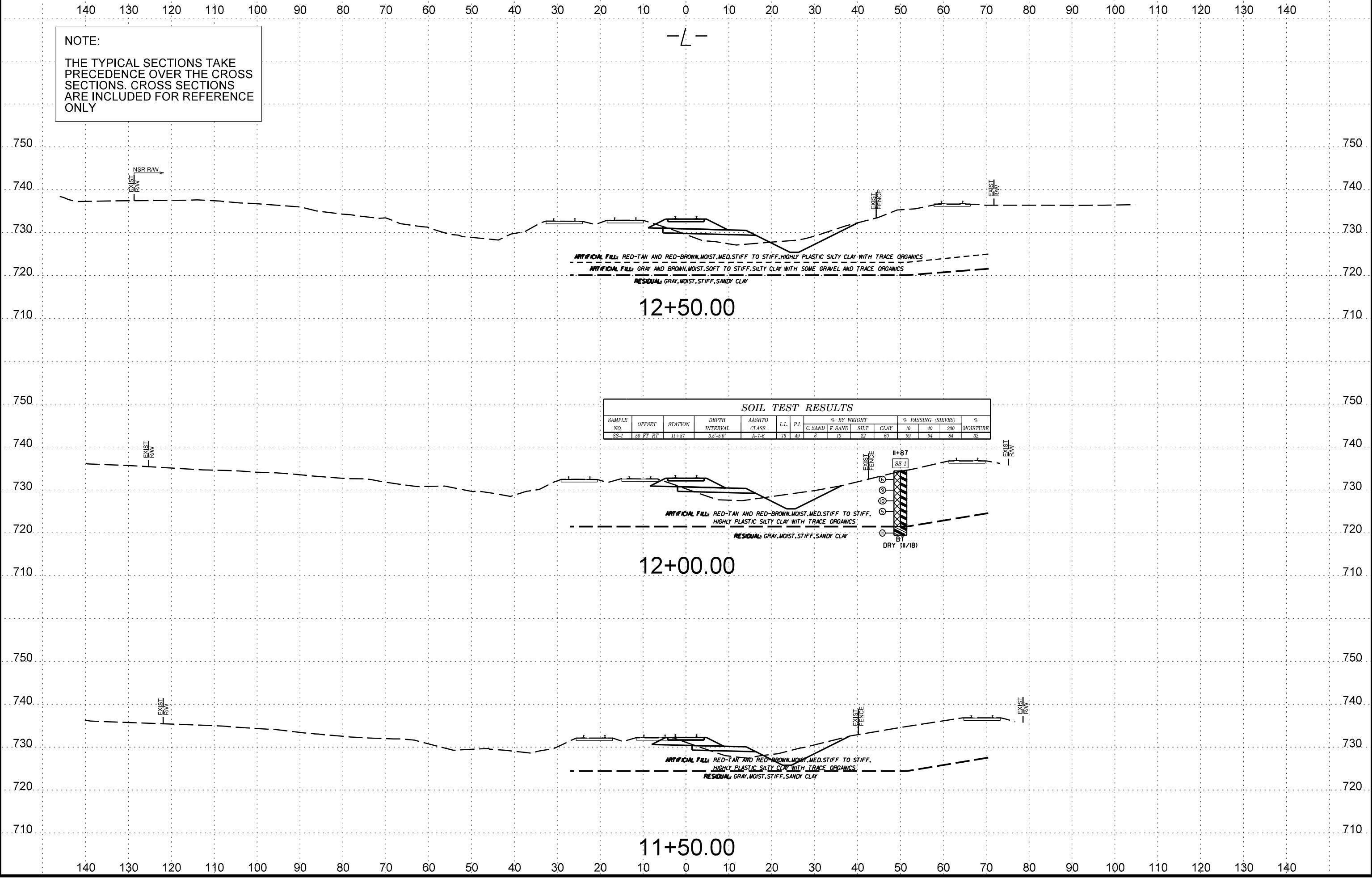
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NOTE:  
THE TYPICAL SECTIONS TAKE  
PRECEDENCE OVER THE CROSS  
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ARE INCLUDED FOR REFERENCE  
ONLY



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NOTE:  
THE TYPICAL SECTIONS TAKE PRECEDENCE OVER THE CROSS SECTIONS. CROSS SECTIONS ARE INCLUDED FOR REFERENCE ONLY



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NOTE:  
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 ONLY

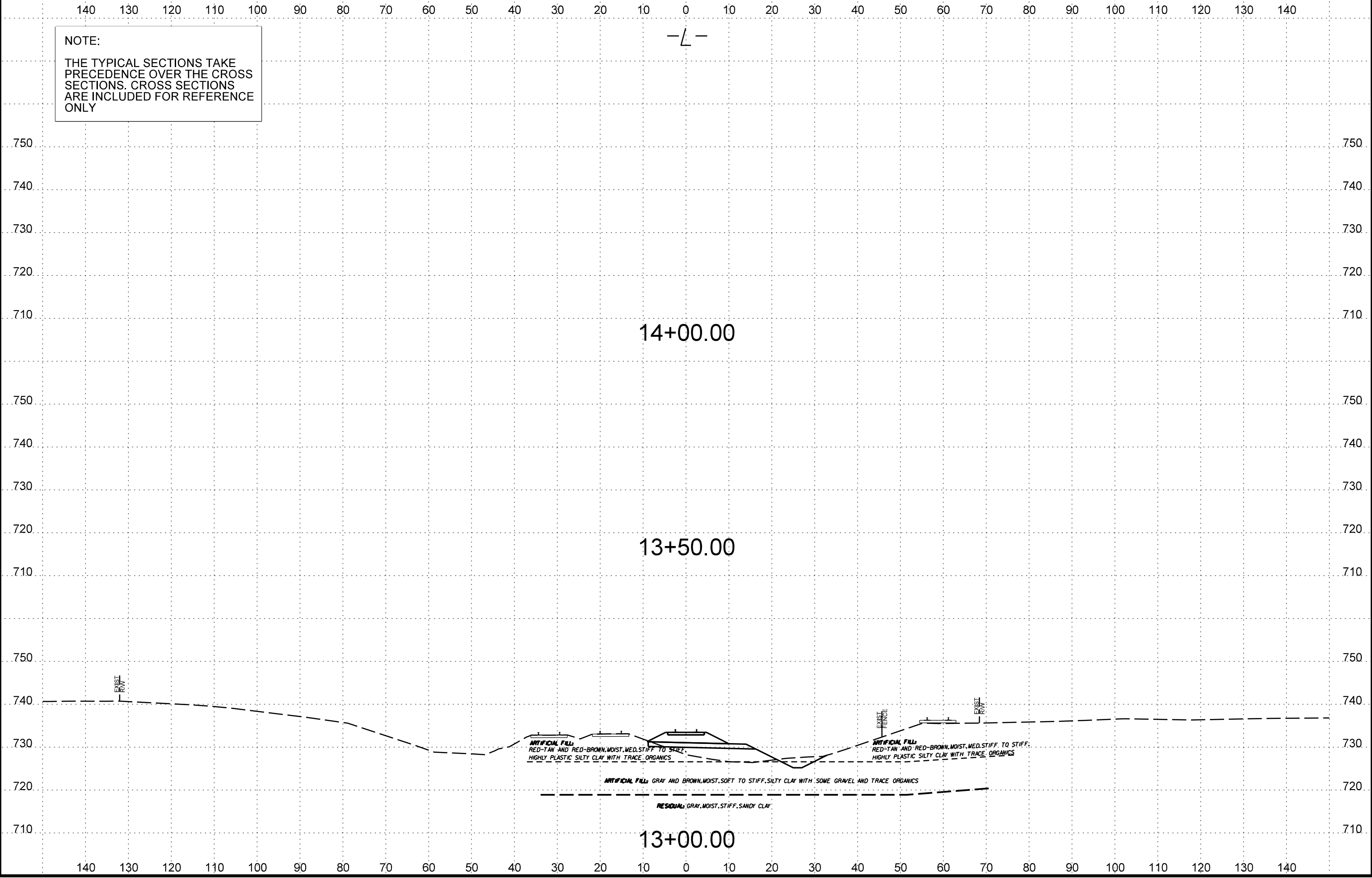
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ARTIFICIAL FILL: RED-TAN AND RED-BROWN, MOIST, MED. STIFF TO STIFF, HIGHLY PLASTIC SILTY CLAY WITH TRACE ORGANICS

ARTIFICIAL FILL: GRAY AND BROWN, MOIST, SOFT TO STIFF, SILTY CLAY WITH SOME GRAVEL AND TRACE ORGANICS

RESIDUAL: GRAY, MOIST, STIFF, SANDY CLAY

PROJECT REFERENCE NO.	SHEET NO.
P-5705A	11

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

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***SUBSURFACE INVESTIGATION***

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*APPENDIX A  
LABORATORY RESULTS*

**REFERENCE: P-5705A**

**PROJECT: 44475**

DS <i>WSH</i>	2/22/2019
INITIALS	DATE



FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
CARY, NC 27513

PHONE: 919.871.0800  
www.falconengineers.com

**LABORATORY COMPACTION TEST RESULTS**

PAGE 1 OF 1

**Project No.:** G18044.00  
**Project Name:** Charlotte Junction (P-5705A)  
**Sample No.:** BS-01  
**Source of Material:** 1000  
**Color:** Tan  
**Visual/Manual Description:**  
**USCS Classification:** CLAYEY SAND(SC)  
**AASHTO Classification:** A-2-4  
**Test Method:** AASHTO T-99 Method A

**TEST RESULTS**

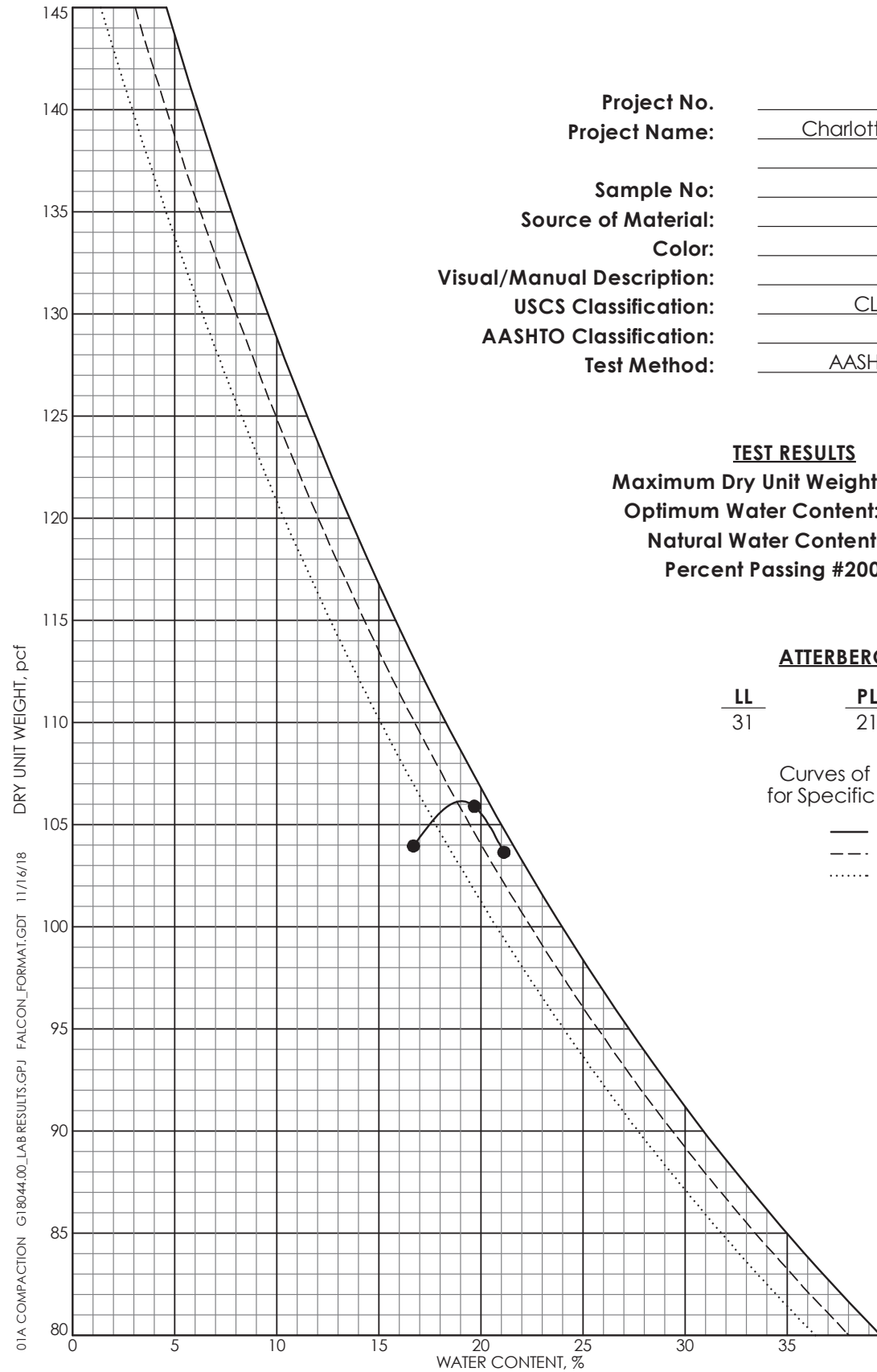
**Maximum Dry Unit Weight:** 106.1 PCF  
**Optimum Water Content:** 19.0 %  
**Natural Water Content:** 19.3 %  
**Percent Passing #200:** 35.3 %

**ATTERBERG LIMITS**

LL	PL	PI
31	21	10

Curves of 100% Saturation  
for Specific Gravity Equal to:

- 2.6
- - - 2.5
- ..... 2.4



01A COMPACTION G18044.00\_LAB RESULTS.GPJ FALCON\_FORMAT.GDT 11/16/18



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**LABORATORY COMPACTION TEST RESULTS**

PAGE 1 OF 1

**Project No.:** G18044.00  
**Project Name:** Charlotte Junction (P-5705A)  
**Sample No.:** BS-02  
**Source of Material:** 3650  
**Color:** Red-Yellow  
**Visual/Manual Description:**  
**USCS Classification:** SANDY FAT CLAY(CH)  
**AASHTO Classification:** A-7-6  
**Test Method:** AASHTO T-99 Method A

**TEST RESULTS**

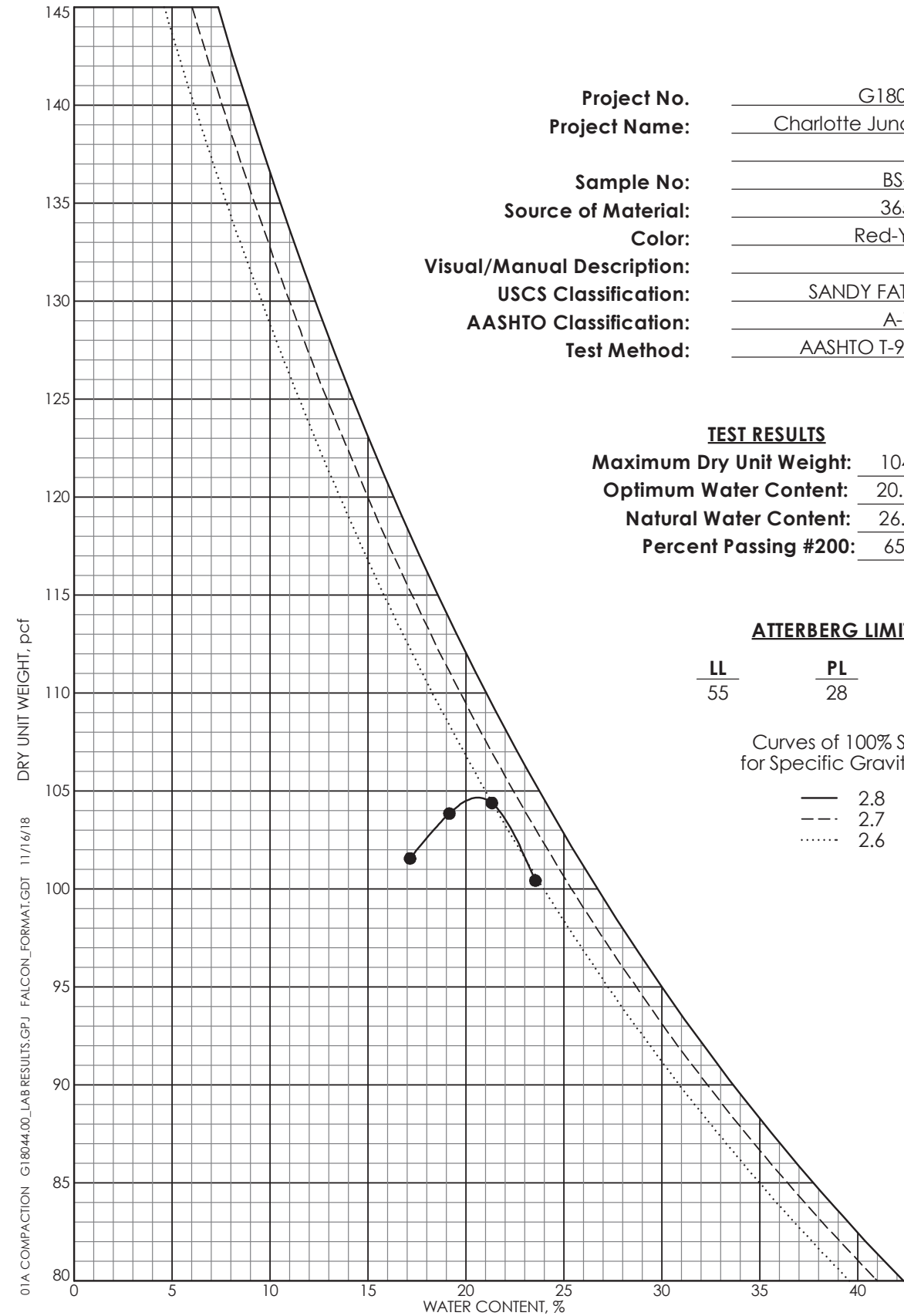
**Maximum Dry Unit Weight:** 104.7 PCF  
**Optimum Water Content:** 20.6 %  
**Natural Water Content:** 26.3 %  
**Percent Passing #200:** 65.7 %

**ATTERBERG LIMITS**

LL	PL	PI
55	28	27

Curves of 100% Saturation  
for Specific Gravity Equal to:

- 2.8
- - - 2.7
- ..... 2.6



01A COMPACTION G18044.00\_LAB RESULTS.GPJ FALCON\_FORMAT.GDT 11/16/18