

PROJECT: 50133.1.FSI REFERENCE: I-5716

SEE SHEET 3 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.	I-5716	1	42

**CONTENTS**

LINE	STATION	PLAN	CROSS SECTIONS
-L-	25+00-43+00	4-6	7-15
-RPA-	20+00-32+00	5-6	16-22
-LPA-	10+00-20+00	5	23-33
-RPB-	10+00-15+50	4-5	11-14
-RPC-	23+50-27+00	4-5	34-41

**ROADWAY**  
**SUBSURFACE INVESTIGATION**

COUNTY CATAWBA  
PROJECT DESCRIPTION I-40 & SR 1007 (LENOIR RHYNE  
BOULEVARD) INTERCHANGE IMPROVEMENTS

**INVENTORY**

**CONTENTS**

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**CAUTION NOTICE**

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

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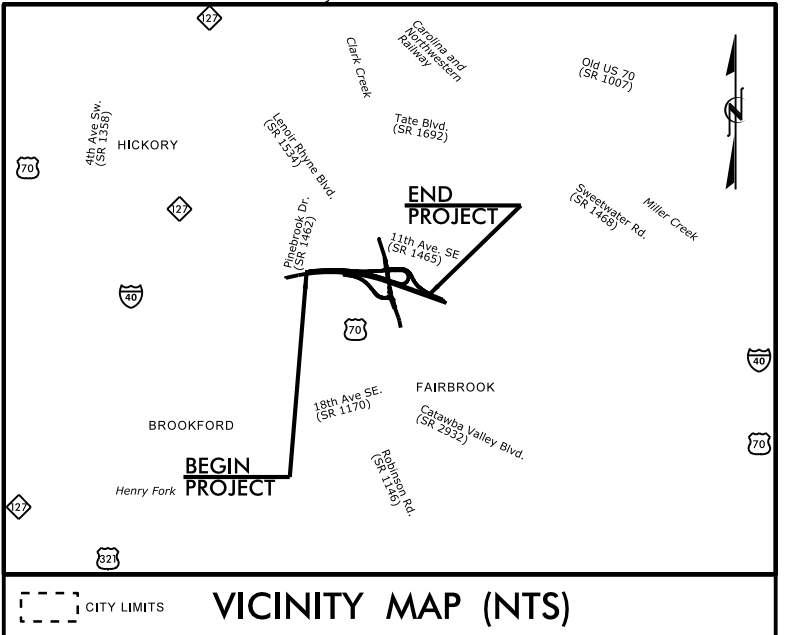
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**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT  
SUBSURFACE INVESTIGATION  
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS									
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										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.										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 60 BLOWS PER FOOT 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.										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 (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 INTRODUCED 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 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.									
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>ANGULARITY OF GRAINS</b>										<b>WEATHERING</b>																			
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.																			
GROUP CLASS. A-1, A-1-b, A-3, 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										MINERALOGICAL COMPRESSION										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.																			
SYMBOL										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										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.																			
% PASSING #10, #40, #200										COMPRESSIONIBILITY										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.																			
MATERIAL PASSING #40, LL, PI										PERCENTAGE OF MATERIAL										SEVERE (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																			
GROUP INDEX										GROUND WATER										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																			
USUAL TYPES OF MAJOR MATERIALS										MISCELLANEOUS SYMBOLS										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.																			
GEN. RATING AS SUBGRADE										RECOMMENDATION SYMBOLS										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.																			
PI OF A-7-5 SUBGROUP IS <= LL - 30, PI OF A-7-6 SUBGROUP IS > LL - 30										ABBREVIATIONS										MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 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.																			
CONSISTENCY OR DENSENESS										EQUIPMENT USED ON SUBJECT PROJECT										SOFT CAN BE GROVED 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.																			
PRIMARY SOIL TYPE										DRILL UNITS:										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.																			
COMPACTNESS OR CONSISTENCY										ADVANCING TOOLS:										FRACTURE SPACING										BEDDING									
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)										HAMMER TYPE:										TERM THICKNESS										TERM THICKNESS									
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )										CORE SIZE:										VERY WIDE MORE THAN 10 FEET										VERY THICKLY BEDDED 4 FEET									
GENERALY GRANULAR MATERIAL (NON-COHESIVE)										HAND TOOLS:										WIDE 3 TO 10 FEET										THICKLY BEDDED 1.5 - 4 FEET									
GENERALY SILT-CLAY MATERIAL (COHESIVE)										INDURATION										MODERATELY CLOSE 1 TO 3 FEET										THINLY BEDDED 0.16 - 1.5 FEET									
TEXTURE OR GRAIN SIZE										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.										CLOSE 0.16 TO 1 FOOT										VERY THINLY BEDDED 0.03 - 0.16 FEET									
U.S. STD. SIEVE SIZE OPENING (MM)										FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.										VERY CLOSE LESS THAN 0.16 FEET										THICKLY LAMINATED 0.008 - 0.03 FEET									
BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F. SD.), SILT (SL.), CLAY (CL.)										MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.																													
GRAIN SIZE MM, IN.										INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.																													
SOIL MOISTURE - CORRELATION OF TERMS										EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.																													
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																																							
FIELD MOISTURE DESCRIPTION																																							
GUIDE FOR FIELD MOISTURE DESCRIPTION																																							
LIQUID LIMIT																																							
PLASTIC LIMIT																																							
OPTIMUM MOISTURE SHRINKAGE LIMIT																																							
PLASTICITY																																							
PLASTICITY INDEX (PI)																																							
DRY STRENGTH																																							
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.																																							

**TIP PROJECT: I-5716**

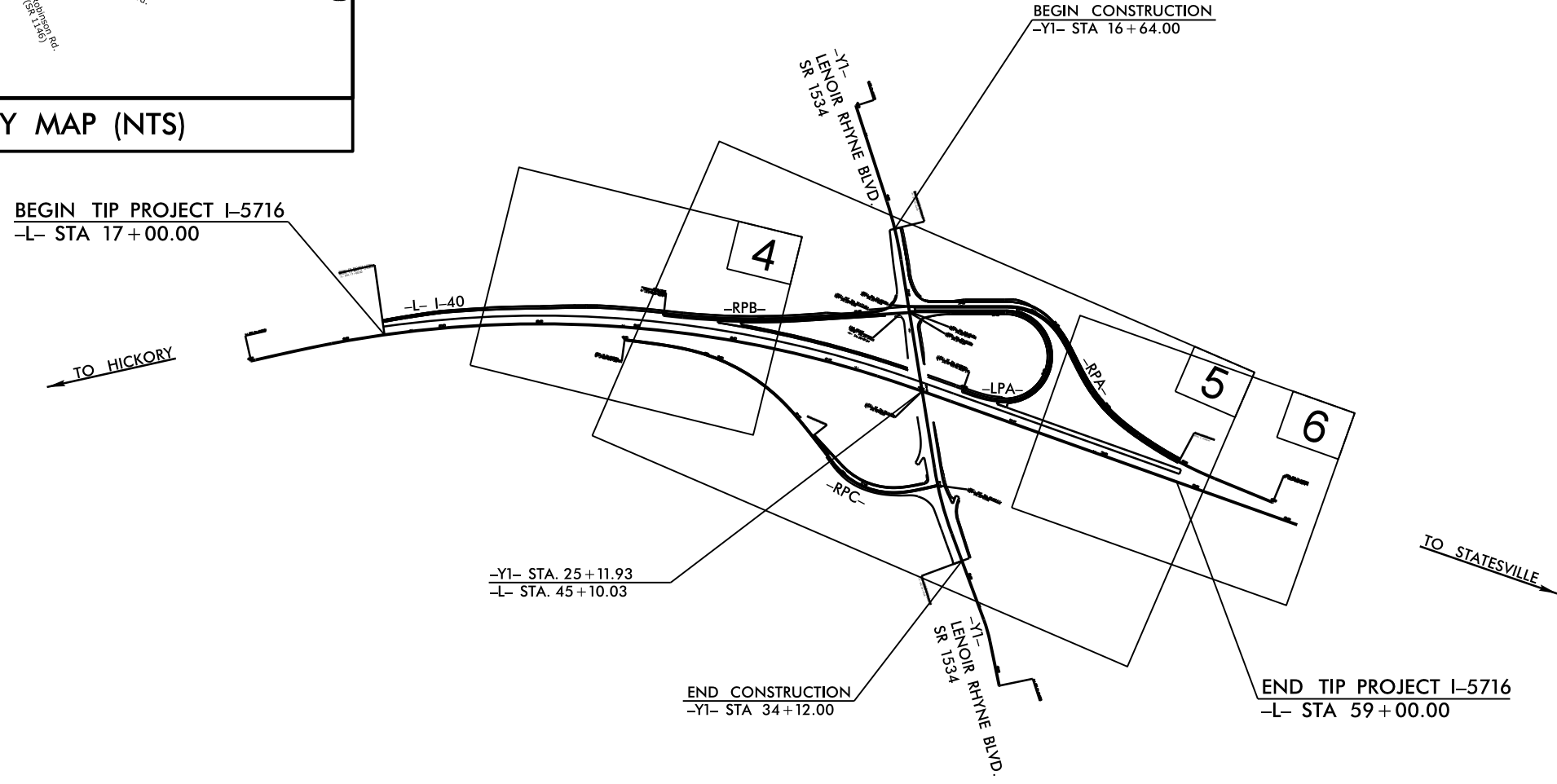
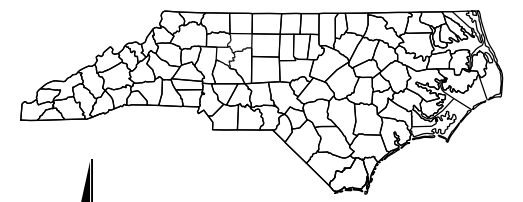
See Sheet 1-A For Index of Sheets  
See Sheet 1-B For Conventional Symbols



STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS  
**CATAWBA COUNTY**

**LOCATION: I-40 AND SR 107 (LENOIR RHYNE BOULEVARD) INTERCHANGE**  
**TYPE OF WORK: DRAINAGE, GRADING, PAVING & RETAINING WALLS**

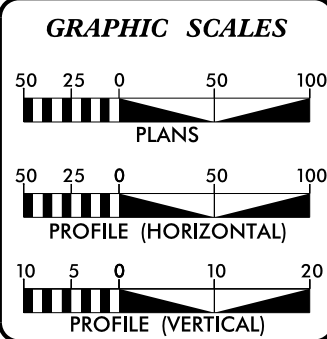
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5716	3	42
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
50133.1.FS1	NHPP-040-2(166)131	PE	



- NOTES:  
1. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD \_\_\_\_  
2. THIS IS A CONTROL OF ACCESS PROJECT

**INCOMPLETE PLANS**  
DO NOT USE FOR R/W ACQUISITION  
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

**CONTRACT:**



**DESIGN DATA**

ADT 2020 =	69049
ADT 2040 =	77200
K =	9 %
D =	55 %
T =	10 % *
V =	70 MPH
* TTST =	7% DUAL=3%
TIER =	STATEWIDE
FUNC CLASS =	INTERSTATE

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT I-5716 =	0.800 MI.
LENGTH STRUCTURE TIP PROJECT I-5716 =	0.000 MI.
TOTAL LENGTH TIP PROJECT I-5716 =	0.800 MI.

**AMT**  
NCBELS LICENSE # F-1049

Prepared for the North Carolina Department of Transportation in the Office of:  
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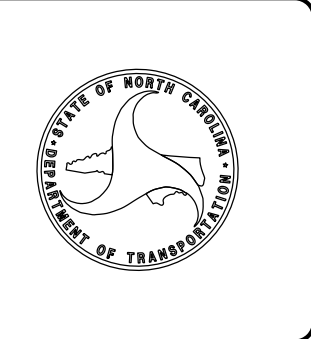
2018 STANDARD SPECIFICATIONS  RIGHT OF WAY DATE: JUNE 21, 2019  LETTING DATE: AUGUST 18, 2020	NICK RAMIREZ, PE PROJECT ENGINEER
	JAMES CROUSE, PE PROJECT DESIGN ENGINEER
	KEVIN E. MOORE, PE NCDOT CONTACT

**HYDRAULICS ENGINEER**

SIGNATURE: \_\_\_\_\_ P.E.

**ROADWAY DESIGN ENGINEER**

SIGNATURE: \_\_\_\_\_ P.E.





June 5, 2019

State Project No.: 50133.1.FS1  
 TIP No.: I-5716  
 Project ID: 31860  
 County: Catawba  
 Description: I-40 and SR 1007 (Lenoir Rhyne Boulevard) Interchange Improvements

**SUBJECT: Geotechnical Report – Inventory**

**Project Description**

This project primarily involves improvements to the interchange of I-40 (-L-) and Lenoir Rhyne Boulevard (-Y1-) in Hickory, Catawba County, North Carolina. As shown on plan sheets initially received on 7/9/18, the project consisted of: the realignment of Ramp A; the addition of Loop A; outside widening of westbound I-40 up to Ramp B to accommodate the acceleration lane from Loop A; and slight realignment and widening of Ramp C to accommodate a second right turn lane. The project also included the construction of two (2) retaining walls. This subsurface investigation was performed based on the plans provided on 7/9/18, with additional subsurface investigation performed for retaining wall 1 on -RPA- from station 27+00 to 31+29.31, right, and retaining wall 2 on -RPC- from station 23+00 to 26+00, right.

Based on revised plans received on 4/26/19, the interchange design was revised. The revision includes a re-design of Ramp A and Loop A, which eliminates the need for retaining wall 1 and requires less widening of westbound I-40 up to Ramp B, and widening to the inside shoulder of Ramp C which eliminates the need for retaining wall 2. This report is based on these most-recent plans.

The majority of the project generally remains within existing right-of-way, with the exception of Ramp A and Loop A, which extend onto commercial property.

The geotechnical field investigation was performed in July 2018. During this time period, a total of 31 Standard Penetration Test (SPT) borings and one auger boring were advanced with an ATV-mounted CME-55 drill rig with an automatic hammer. Additionally, 3 sounding rods were performed in May 2019 to aid in determining the potential presence of rock along Ramp A where subsurface information was needed based on the revised plans. 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>Alignment</u>	<u>Station (±)</u>
-L-	25+00 to 43+00, left
-RPA-	20+00 to 32+00
-LPA-	10+00 to 20+00
-RPB-	10+00 to 15+50
-RPC-	23+50 to 27+00, right

**Areas of Special Geotechnical Interest**

1) Crystalline Rock: The following areas were found to contain crystalline rock above or within six feet of the proposed grade and will likely require ripping or blasting for removal:

<u>Alignment</u>	<u>Station (±)</u>
-L-	32+25 to 34+25, left
-RPA-	15+50 to 24+25
-LPA-	14+75 to 16+25

2) Weathered Rock: The following areas were found to contain weathered rock above or within six feet of the proposed grade and have a potential to require ripping or blasting for removal:

<u>Alignment</u>	<u>Station (±)</u>
-L-	30+75 to 34+75, left
-LPA-	22+25 to 22+75, right

3) Soft, Loose and/or Wet Soils: The following areas contain relatively soft or loose (clay N≤5, sand N≤7) and/or wet, near-surface soils that have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-LPA-	16+75 to 21+25
-RPC-	24+00 to 24+50, right

4) Cohesive Soils: The following areas contain cohesive soils (AASHTO A-5, A-6 & A-7 soils) at existing subgrade in fill areas or at/near proposed subgrade that have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	36+25 to 36+75, left
-LPA-	10+50 to 11+00, left
-LPA-	19+25 to 20+25, right

- 5) **Cohesive Soils:** The following areas contain deeper deposits of relatively soft cohesive soils (AASHTO A-5, A-6 & A-7 soils) that have the potential to cause embankment instability or long-term settlement problems:

<u>Alignment</u>	<u>Station (±)</u>
-L-	36+25 to 36+75, left
-LPA-	20+00 to 22+75, right

- 6) **Groundwater:** The following area exhibited groundwater within three feet of existing grade, which has the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-LPA-	16+75 to 17+25, left

- 7) **Artificial Fill:** The following locations contain artificial fill. These soils have the potential to be highly variable, which could cause subgrade problems during construction if undetected pockets of organics, debris, or soft/loose/wet soils are present.

<u>Alignment</u>	<u>Station (±)</u>
-RPA-	22+50 to 25+30, right
-RPA-	29+85 to 31+75, right
-LPA-	15+75 to 17+50
-LPA-	21+50 to 23+50, right
-RPC-	24+75 to 25+00, right

**Physiography and Geology**

The proposed interchange improvements will require expanding the existing ramps to accommodate additional lanes, and adding an entrance loop onto westbound I-40, which will require additional right-of-way from undeveloped commercial properties. The construction along the -L- centerline will typically match existing roadway grades.

The project is located near the western edge of the Piedmont Physiographic Province of North Carolina within the Inner Piedmont Belt. More-specifically, it is located in an area mapped as Biotite Gneiss and Schist (CZbg). Typical weathered and crystalline rock samples recovered from our borings primarily exhibit the characteristics of Gneiss. Soils weathered from the parent rock generally consist of sandy silts and silty 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 cross sections. 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 encountered within the area of this project have been divided into four categories: artificial fill, roadway embankment, alluvial soils, and residual soils.

**Artificial Fill:** Artificial fill (AF) was encountered at the surface of 5 borings and was related to different features: B-8 to concrete drainage backfill, B-17 through B-19 to a parking lot on commercial property, and B-27 to an overhead power line access road. Additionally, asphalt fragments were observed on the ground surface near B-35 which is likely indicative of an apparent stockpile associated with a nearby asphalt paving company. Borings B-17 through B-19 encountered asphalt and ABC at the surface with a combined thickness of approximately 5 to 6 inches. The AF extended to depths ranging from about 1 to 32 feet, with most extending to about 2 feet or less in depth. The deepest areas of AF were related to the stockpile right of Ramp A and Loop A, and were estimated based on topographic features. The sampled artificial fill was typically described as moist, medium dense silty SAND (A-2-4), and medium stiff to stiff sandy SILT (A-4). A majority of the samples contained trace organic matter and gravel.

**Roadway Embankment:** Roadway embankment (RE) soils were encountered at the surface of 8 borings. The RE extended to depths ranging from about 2 to 17 feet. The fill was typically described as moist, medium dense, silty SAND (A-2-4), and moist, medium stiff to stiff, sandy SILT (A-4). A majority of the samples contained trace organic matter, gravel and mica. Possible boulders were encountered in boring B-2 at -L- station 26+97, left, and may also be encountered in other unexplored areas of the project.

**Alluvial Soil:** Alluvial soils were encountered in 4 borings along Ramp A. The alluvial soils were typically encountered at the ground surface. The alluvium extended to depths ranging from about 2 to 12 feet, with an average depth of about 5 feet. The alluvium was variable and typically described as moist to wet, very loose, silty and clayey SAND (A-2-4 & A-2-6), and soft to medium stiff, sandy CLAY (A-6). A majority of the soil samples contained trace organic matter.

**Residual Soil:** A majority of the soils encountered on this project were residual soils. Residual soils were encountered at the surface of 16 borings, below artificial fill at 5 borings, below alluvial soils at 3 borings, and below roadway embankment at 5 borings. No residual soils were encountered in 2 borings, and these borings were terminated in roadway embankment. The residual soils were variable and typically described as moist, loose to medium dense, silty SAND (A-2-4), medium stiff to very stiff, sandy SILT (A-4), and stiff to very stiff, silty and sandy CLAY (A-6 & A-7). Most of the samples contained varying amounts of mica, organic matter, manganese deposits, and rock fragments.

**Rock Properties**

Weathered Rock (WR) was encountered in 8 borings. Of these 8 borings, 3 of the borings were terminated in WR, and 5 terminated in Crystalline Rock (CR). WR was encountered at depths ranging from about 2 to 19 feet and elevations ranging from about 1,049 to 1,090 feet.


Crystalline Rock (CR) was encountered in 10 borings as indicated by auger and SPT refusal. CR was also assumed to be encountered in 2 of the 3 sounding rods as suggested by driving refusal. All of these 10 borings were terminated in CR. Five of the 10 borings encountered WR before being terminated, while the five remaining borings transitioned directly from residual soil to CR. The WR layers above the CR varied in thickness from about 2 to 5.5 feet. The CR was encountered at depths ranging from about 6 to 25 feet and elevations ranging from about 1,045 to 1,081 feet. The rock typically consisted of Biotite Gneiss. 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.

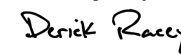
**Groundwater Properties**

Generally, groundwater measurements were attempted in a majority of the borings immediately upon their completion and after a stabilization period of approximately 24 hours. Immediately upon completion, groundwater was encountered in 5 borings at depths ranging from 1.1 to 23.1 feet, and elevations ranging from about 1,065.5 to 1,048.2 feet. Four (4) borings were then backfilled immediately upon their completion. Stabilized groundwater was encountered in 6 borings at depths ranging from 3 to 19.5 feet, and elevations ranging from 1,052.3 to 1,062.0 feet. Groundwater was not encountered in the remaining borings. The recovered soil samples were generally described as moist above the groundwater level and wet or saturated below the groundwater level. 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:  
  
 W. Patrick Alton, P.E.  
 Transportation Services Manager

DocuSigned by:  
  
 Derrick Racey  
 Geotechnical Project Manager

**Appendix A**

**Bulk Samples**

Bulk samples were not requested to be collected as part of this investigation.


**Undisturbed Samples**

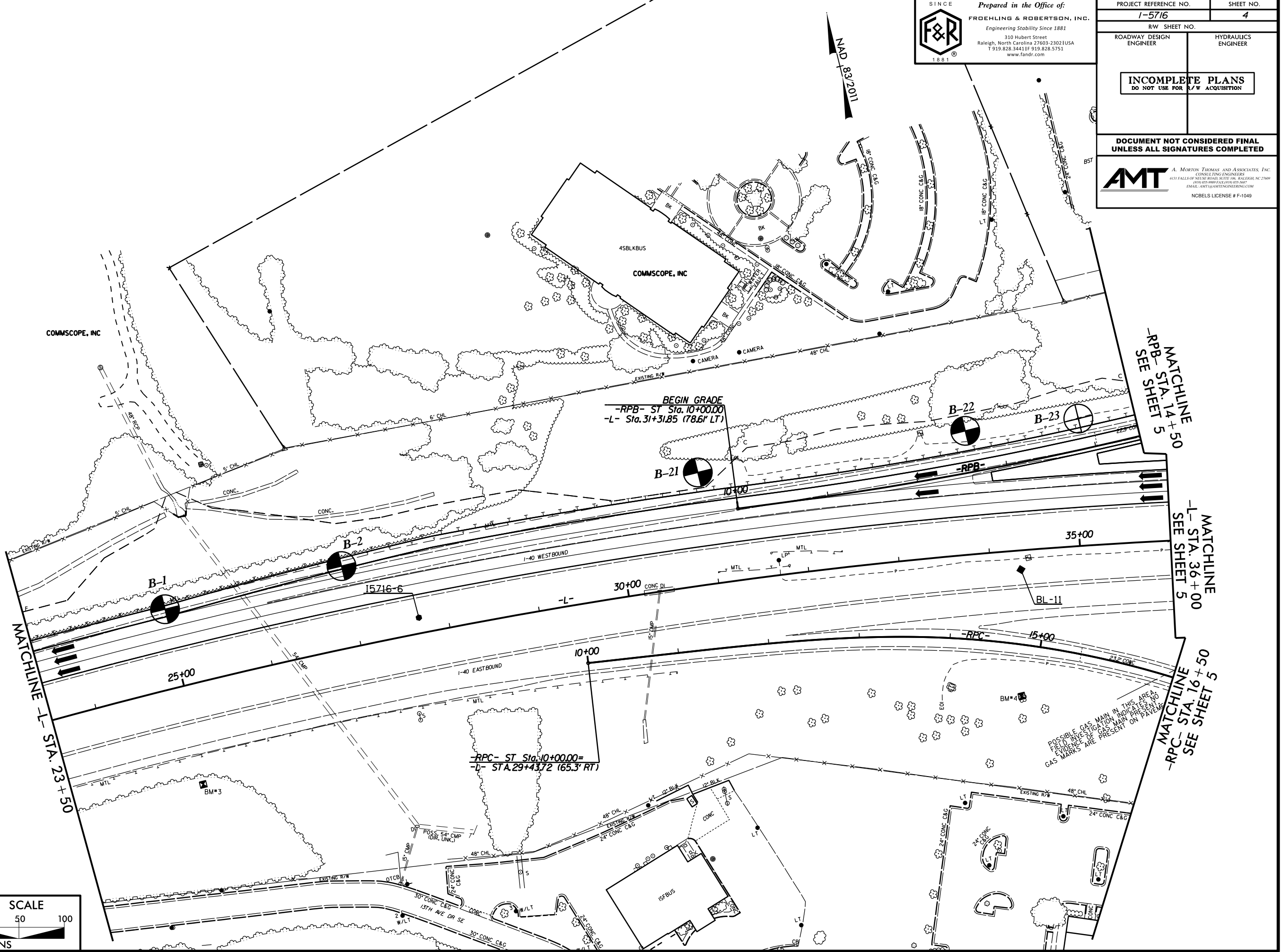
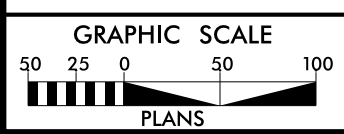
Undisturbed Shelby tube samples were not requested to be collected as part of this investigation.

8/17/99

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User: jrb

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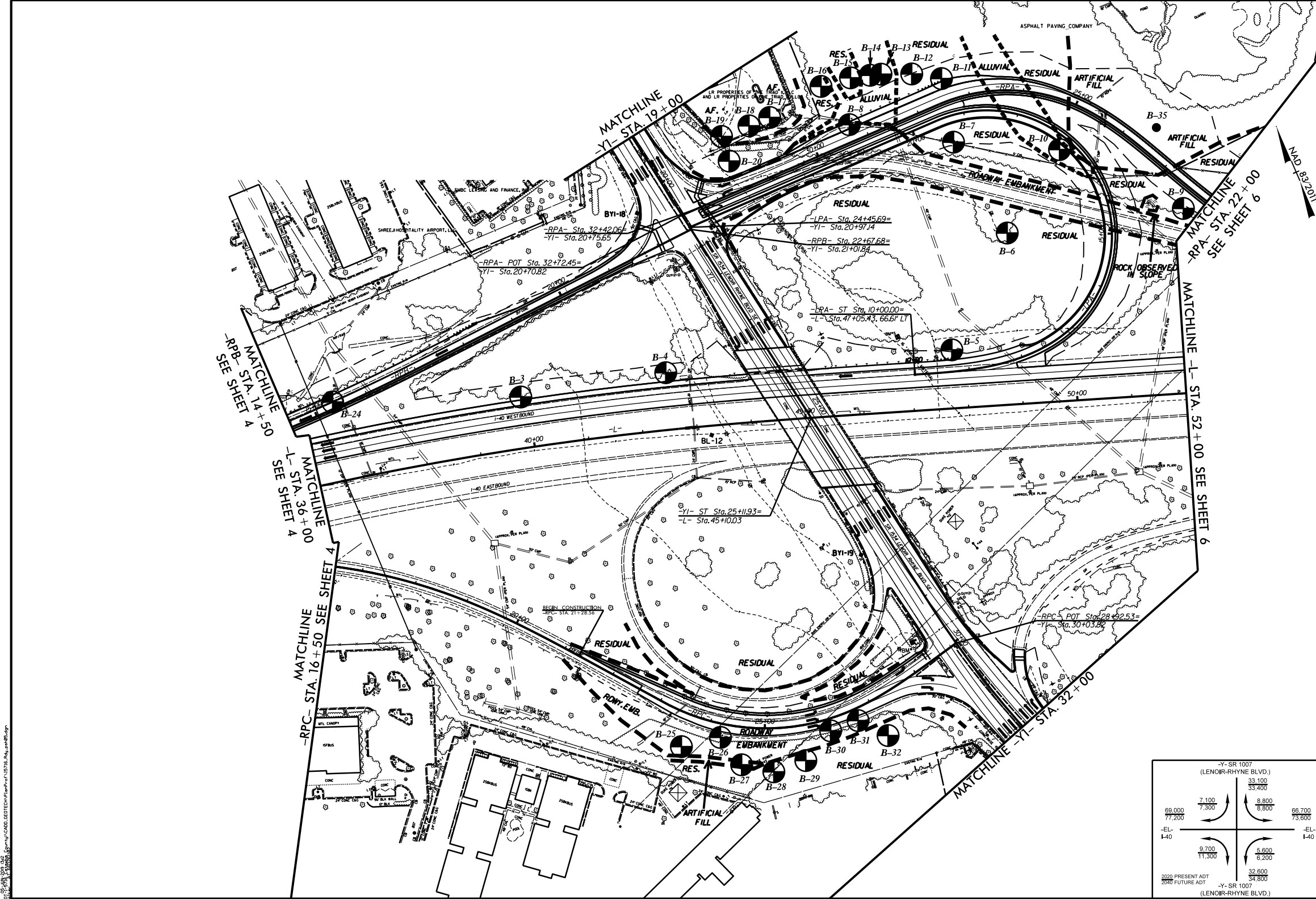
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RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	
	
<small>A. MORTON THOMAS AND ASSOCIATES, INC.        CONSULTING ENGINEERS        601 FALLS OF NEUSE ROAD, SUITE 100, RALEIGH, NC 27609        919.828.9899 FAX 919.828.5867        EMAIL: AMT@AMTENGINEERING.COM        NCBELS LICENSE # F-1049</small>	



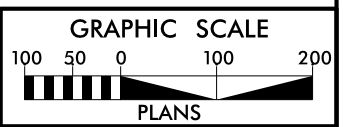
POSSIBLE GAS MAIN IN THIS AREA  
 FIELD INVESTIGATION INDICATES  
 EVIDENCE OF GAS MAIN PRESENT  
 GAS MARKS ARE PRESENT ON SYSTEM

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PROJECT REFERENCE NO. <b>1-5716</b>	SHEET NO. <b>5</b>
R/W SHEET NO. ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
<b>AMT</b> <small>A. MORTON TARRANT AND ASSOCIATES, INC.        CONSULTING ENGINEER        4015 FALCON RIDGE DRIVE, SUITE 100, RALEIGH, NC 27616        PHONE: 919.877.8800        FAX: 919.877.8801        WWW.AMTCONSULTING.COM        NCBELS LICENSE # F-1049</small>	




-Y- SR 1007 (LENOIR-RHYNE BLVD.) 33.100 33.400	7.100 7.300	8.800 8.800	66.700 73.600
-EL- I-40	9.700 11.300	8.600 6.200	-EL- I-40
2020 PRESENT ADT 2040 FUTURE ADT		32.600 34.800	
		-Y- SR 1007 (LENOIR-RHYNE BLVD.)	

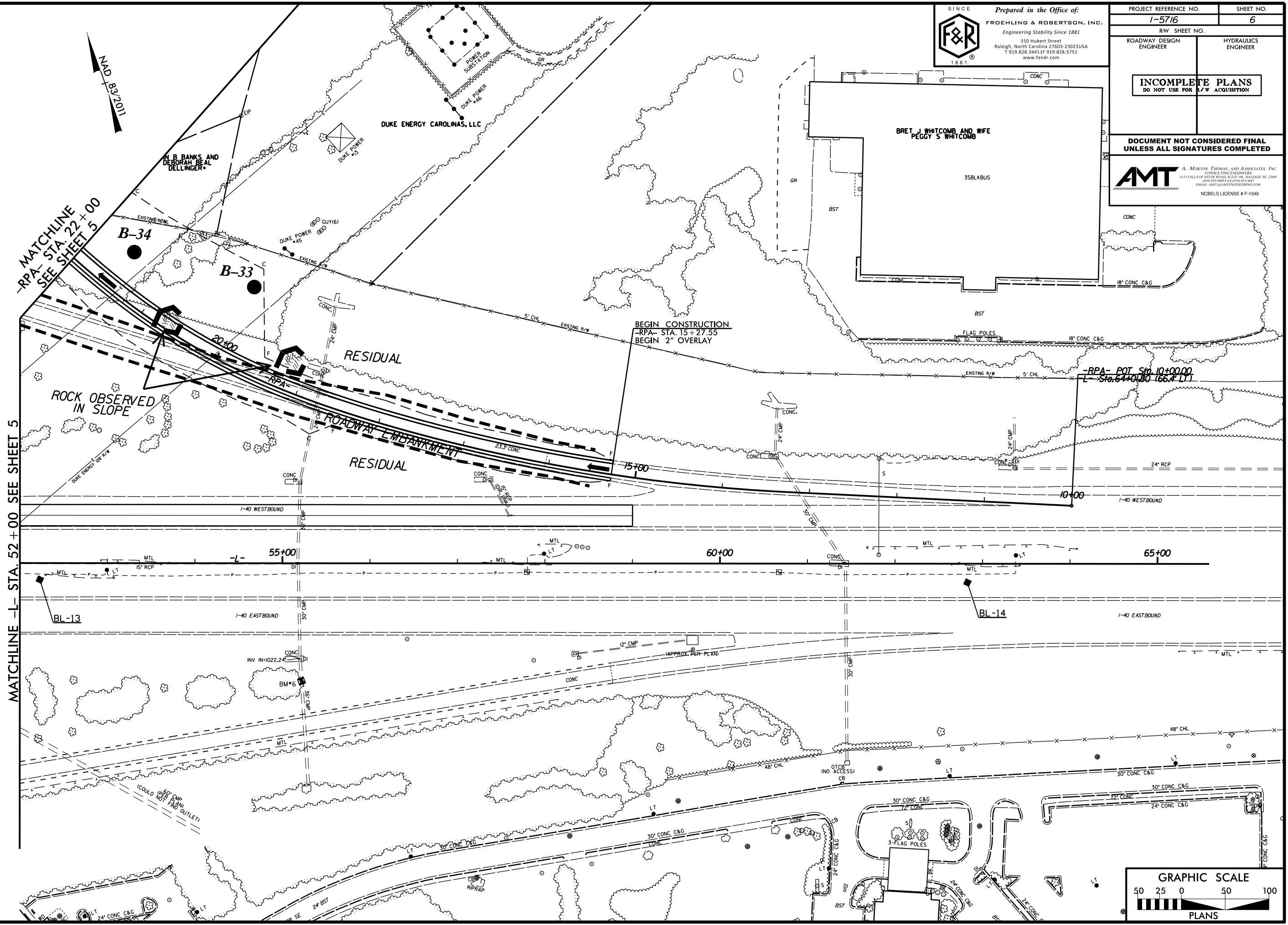


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8/17/99

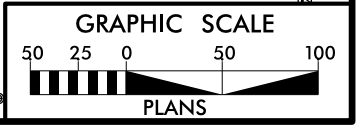
SINCE  
  
 Prepared in the Office of:  
**FROEHLING & ROBERTSON, INC.**  
 Engineering Stability Since 1881  
 310 Hubert Street  
 Raleigh, North Carolina 27603-2302 USA  
 T 919.828.3441 F 919.828.5751  
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PROJECT REFERENCE NO. <b>1-5716</b>	SHEET NO. <b>6</b>
RW SHEET NO. ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	
 <small>A. MORTON THOMAS AND ASSOCIATES, INC.        CONSULTING ENGINEERS        601 FALLS OF NEUSE ROAD, SUITE 100, RALEIGH, NC 27609        919.828.9999 FAX 919.828.5847        EMAIL: AMT@AMTENGINEERING.COM        NCBELS LICENSE # F-1049</small>	



REVISIONS

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 Author: E.L. GIBBINS

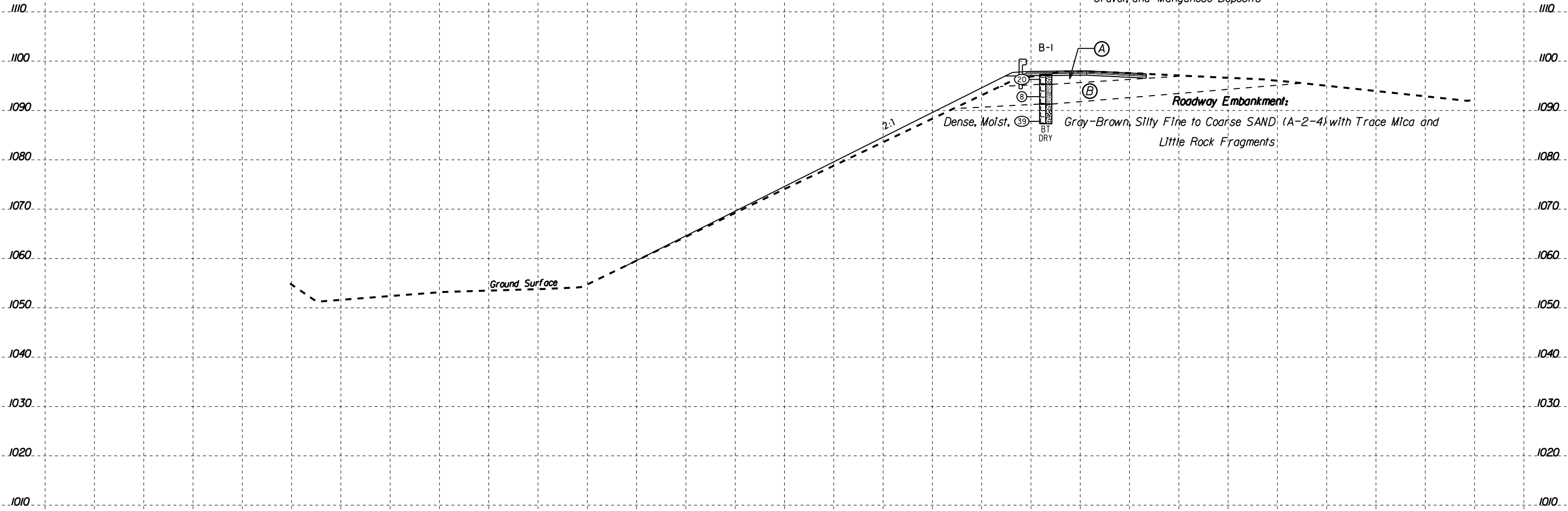


6/23/16



PROJ. REFERENCE NO.	SHEET NO.
I-5716	7

280 260 240 220 200 180 160 140 120 100 80 60



- Ⓐ **Roadway Embankment:** Medium Dense, Moist, Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel and Clay
- Ⓑ **Roadway Embankment:** Medium Stiff to Stiff, Moist, Red-Gray-Brown, Fine Sandy SILT (A-4) with Trace Mica, Gravel, and Manganese Deposits

B-1

Ⓐ

Ⓑ

**Roadway Embankment:**

Dense, Moist, Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Little Rock Fragments

Ground Surface

2:1

BT  
DRY

25+00.00

—L—  
0

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

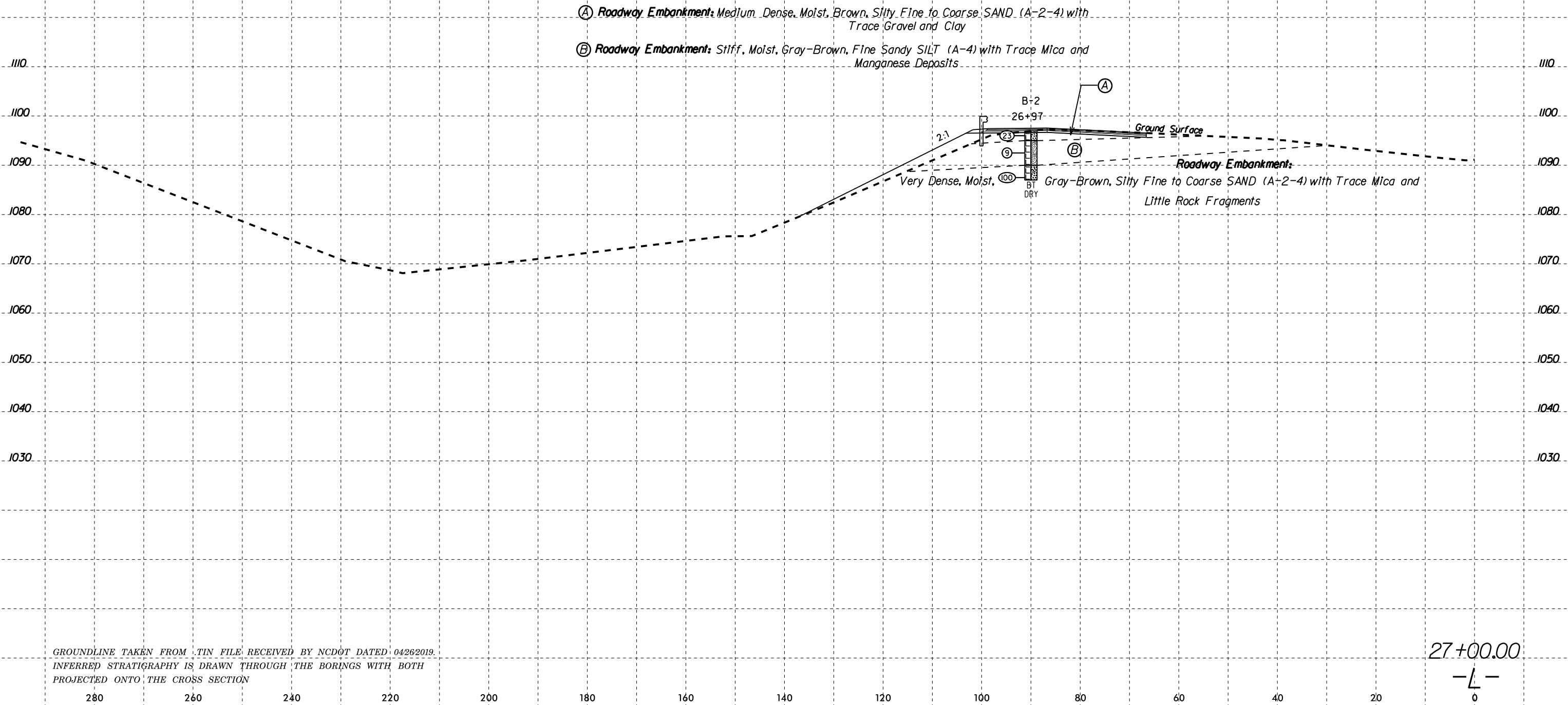
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6/23/16



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GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
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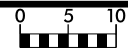
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 Walker

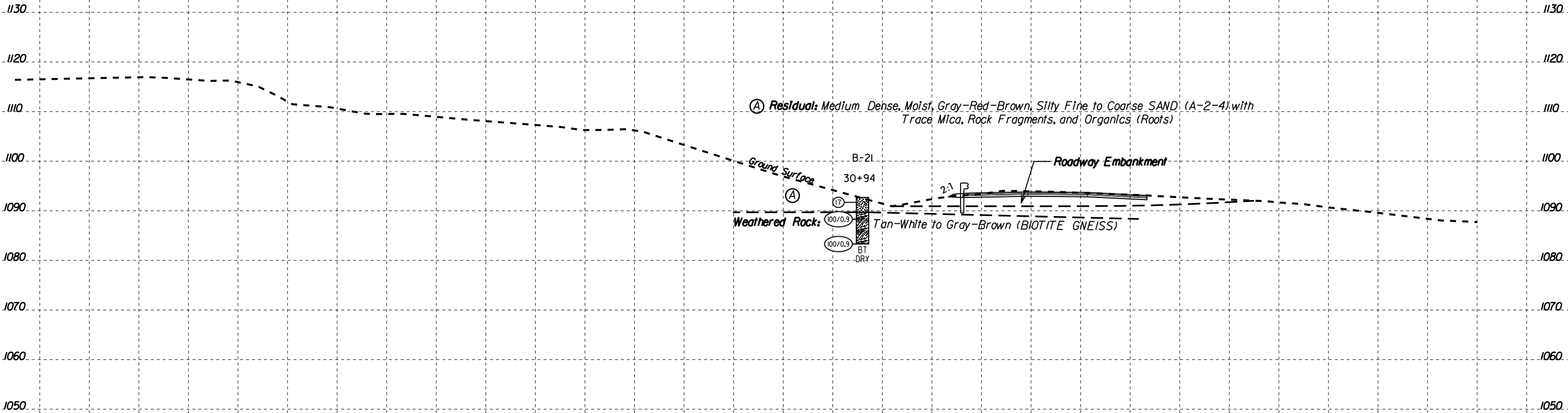
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PROJ. REFERENCE NO.  
I-5716

SHEET NO.  
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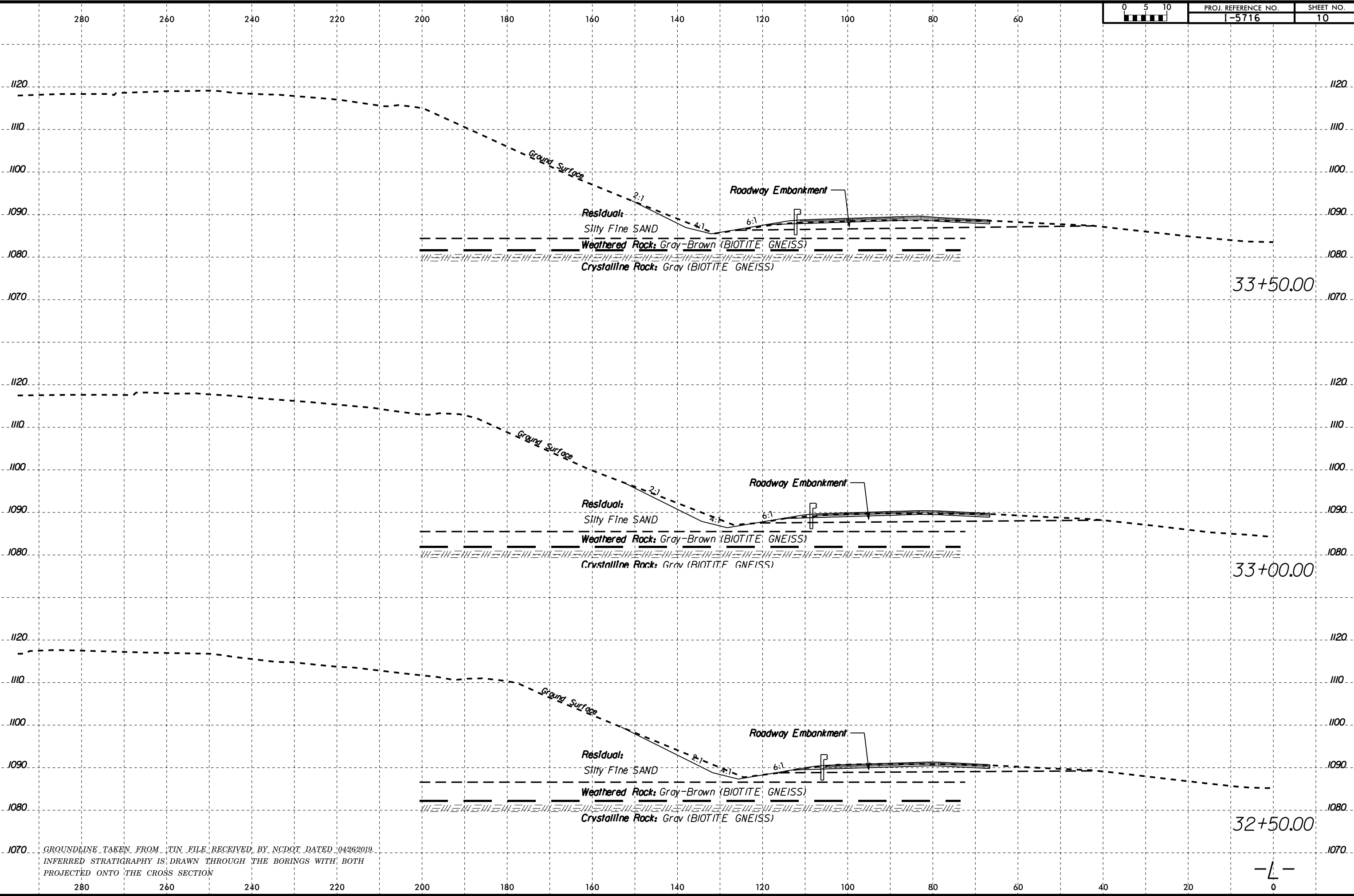


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INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

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Walker

6/23/16

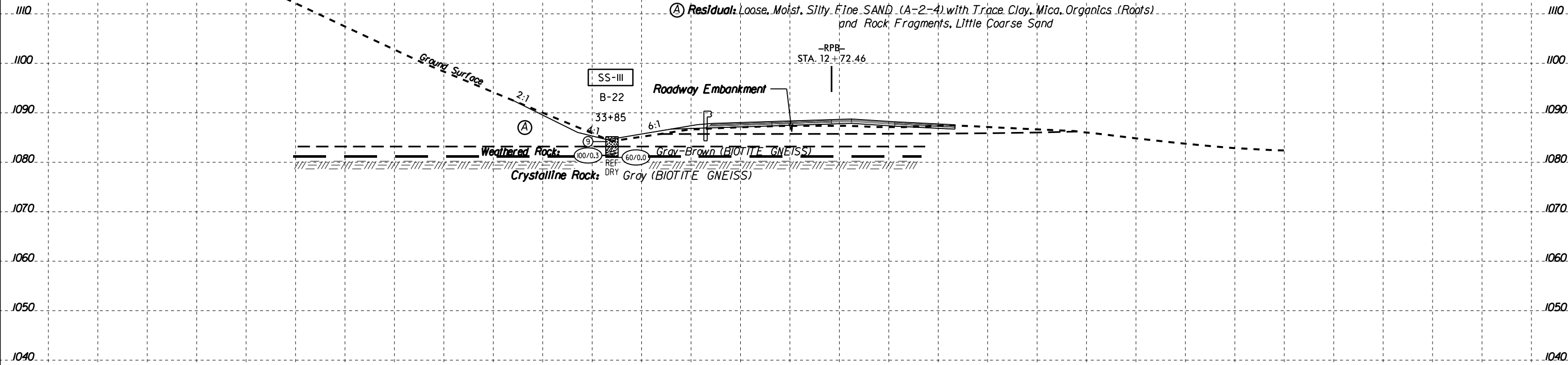


05-JUN-2019 13:00  
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 Walker A 660261102

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04262019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

-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-111	136' LT	33+85	0.1-1.5	A-2-4(0)	NP	NP	16.7	63.0	10.1	10.2	84.8	80.0	24.5	20.6	-



Ⓐ Residual: Loose, Moist, Silty, Fine SAND (A-2-4) with Trace Clay, Mica, Organics (Roots) and Rock Fragments, Little Coarse Sand

Weathered Rock: Gray-Brown (BIOTITE GNEISS)  
 Crystalline Rock: Gray (BIOTITE GNEISS)

34+00.00

-L-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:00  
 F:\Projects\66V\66V-0340 (NCDOT-I-5716 Catawba County)\CADD\_GEO\TECH\SSC\15716\_geo\_xst1.dgn  
 TWalker-A 660261102

6/23/16  
05-JUN-2019 13:01  
F:\Projects\66V\66V-0340\NCDOT-I-5716-Catawba County\CADD\_GEO\GEO\15716\_geo\_xst.L.dgn  
Walker

240

220

200

180

160

140

120

100

80

60

40

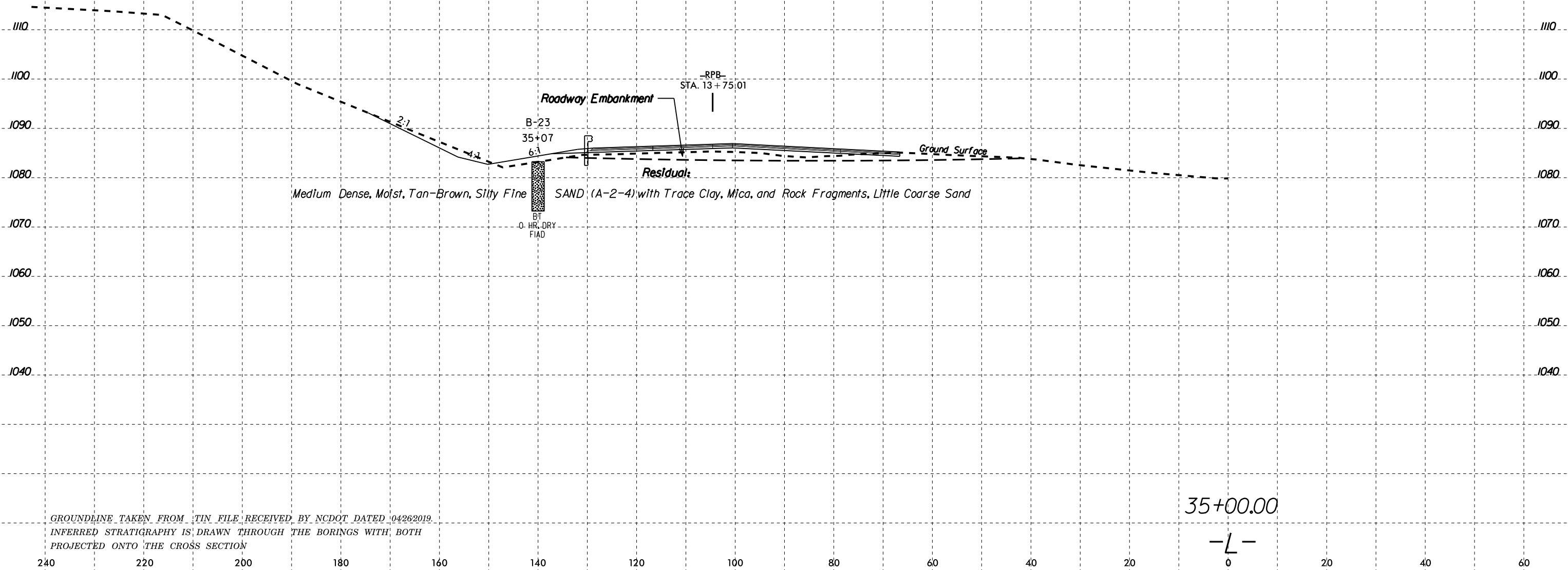
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0



PROJ. REFERENCE NO.  
I-5716

SHEET NO.  
12



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

35+00.00

-L-

240

220

200

180

160

140

120

100

80

60

40

20

0

20

40

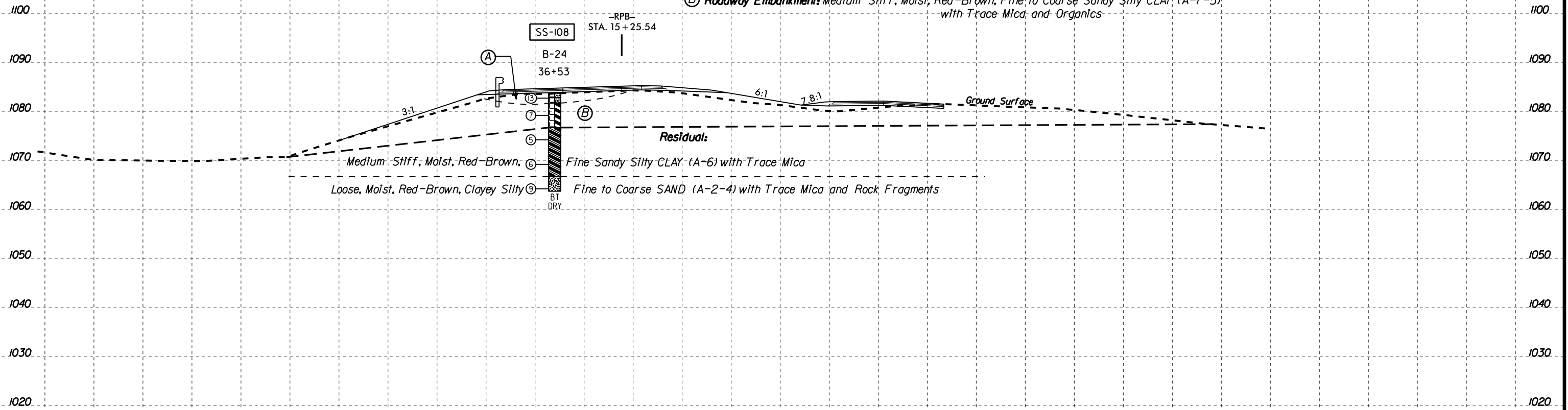
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 T:\Walker\A\660261102

240 220 200 180 160 140 120 100 80 60 40 20

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-108	146' LT	36+53	3.5-5.0	A-7-5(13)	55	20	17.5	20.6	6.5	55.4	98.8	88.9	64.1	24.5	-

- (A) Roadway Embankment: Medium Dense, Moist, Gray-Red-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel, Mica, and Organics, ABC Stone from 0.9'-2.0'
- (B) Roadway Embankment: Medium Stiff, Moist, Red-Brown, Fine to Coarse Sandy Silty CLAY (A-7-5) with Trace Mica and Organics



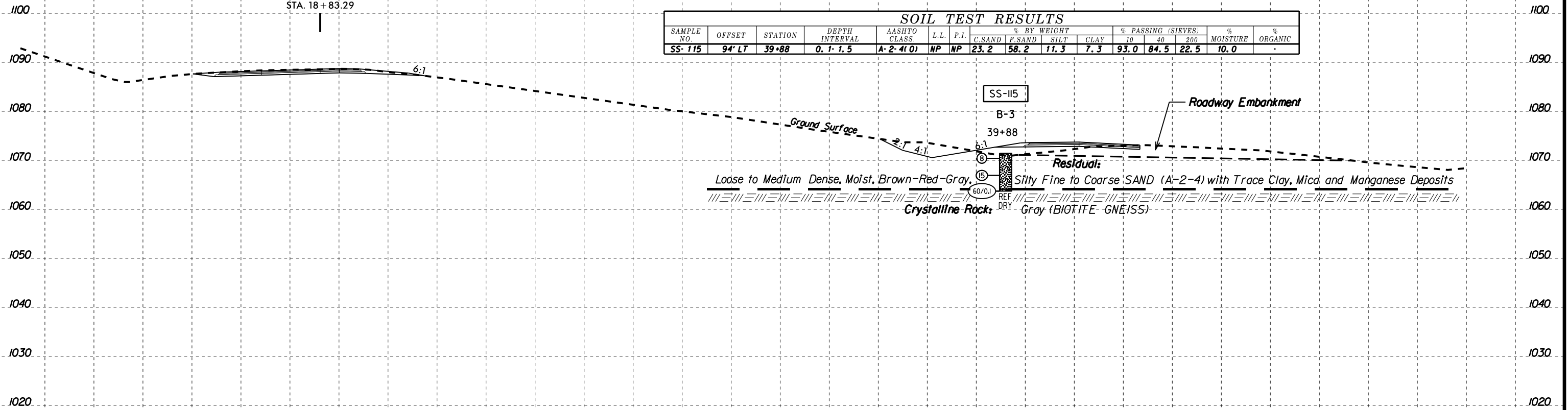
36+50.00

-L-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

240 220 200 180 160 140 120 100 80 60 40 20 0 20 40

280 260 240 220 200 180 160 140 120 100 80 60



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-115	94' LT	39+88	0.1-1.5	A-2-4(0)	NP	NP	23.2	58.2	11.3	7.3	93.0	84.5	22.5	10.0	-

Loose to Medium Dense, Moist, Brown-Red-Gray,  
 Crystalline Rock:  
 REF DRY Gray (BIOTITE-GNEISS)  
 Residual:  
 Silty Fine to Coarse SAND (A-2-4) with Trace Clay, Mica and Manganese Deposits

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

40+00.00  
 -L-

280 260 240 220 200 180 160 140 120 100 80 60 40 20 0

05-JUN-2019 13:01 P:\Projects\66V\66V-0340 (NCDOT-I-5716 Catawba County)\CADD\_GEO\TECH\SSC\15716\_geo\_xss1.dgn Walker-A 660261102

6/23/16

280

260

240

220

200

180

160

140

120

100

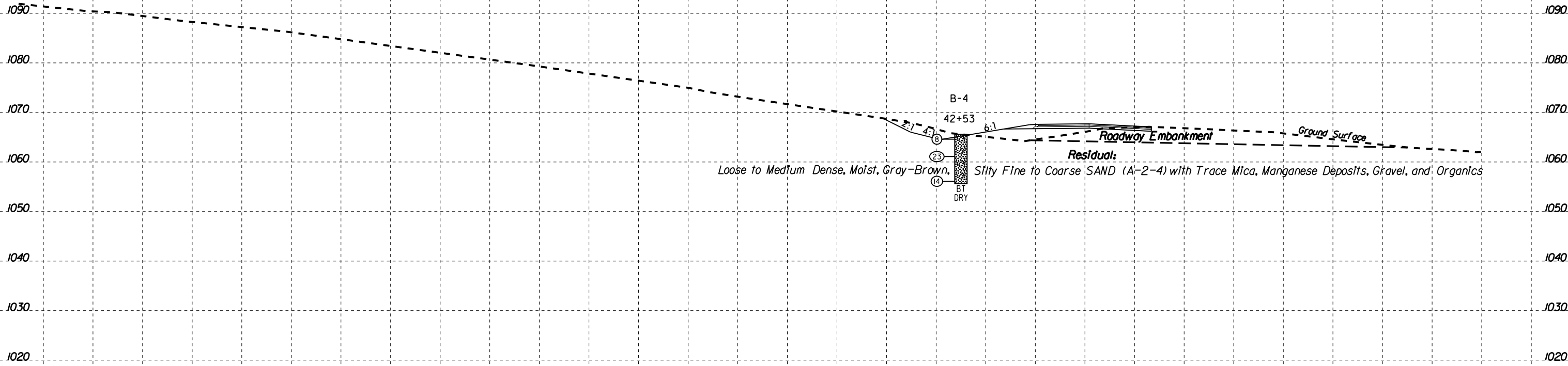
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PROJ. REFERENCE NO. I-5716

SHEET NO. 15



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GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04262019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

42+50.00

-L-

280

260

240

220

200

180

160

140

120

100

80

60

40

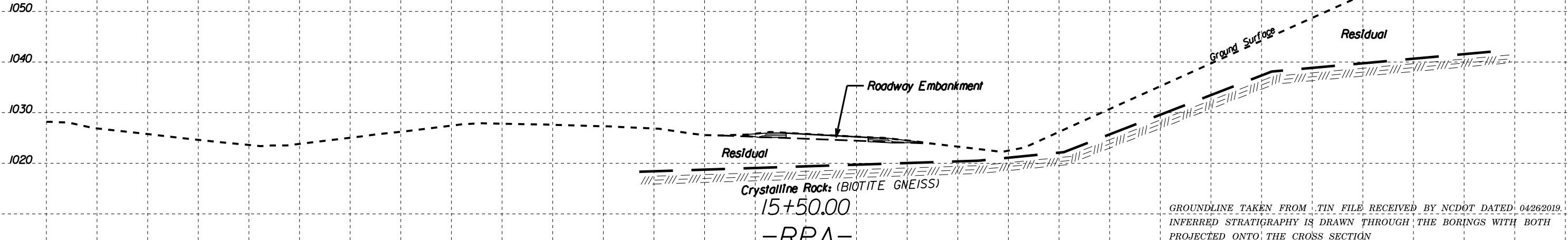
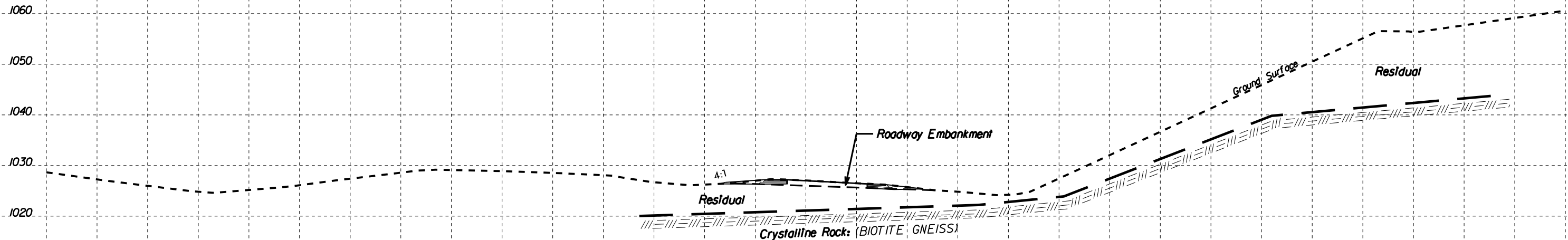
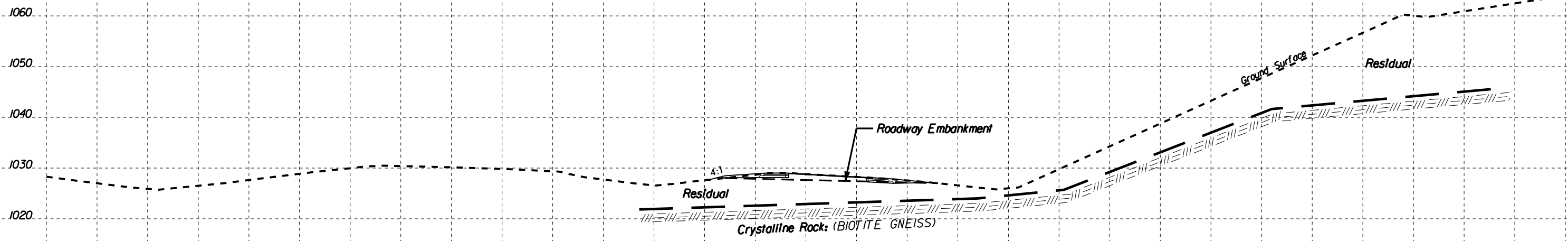
20

0

6/23/16



140 120 100 80 60 40 20 0 20 40 60 80

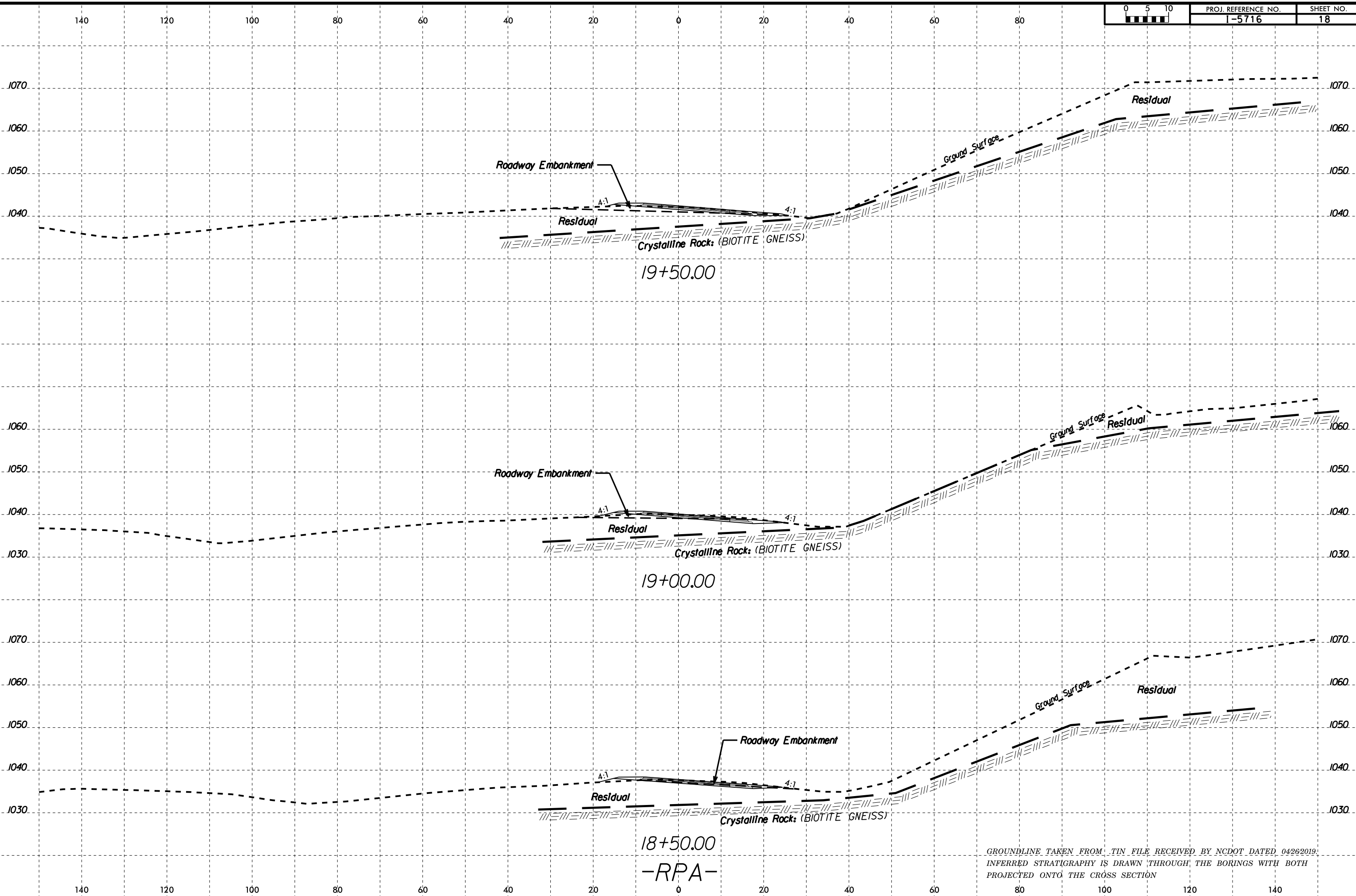


GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:01 P:\Projects\661666V-0340\NCDOT-1-5716 Catawba County\CADD\_GEO\TECH\15716\_geo\_xst\_RPA.dgn Walker-A 660261102



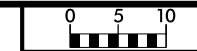
6/23/16



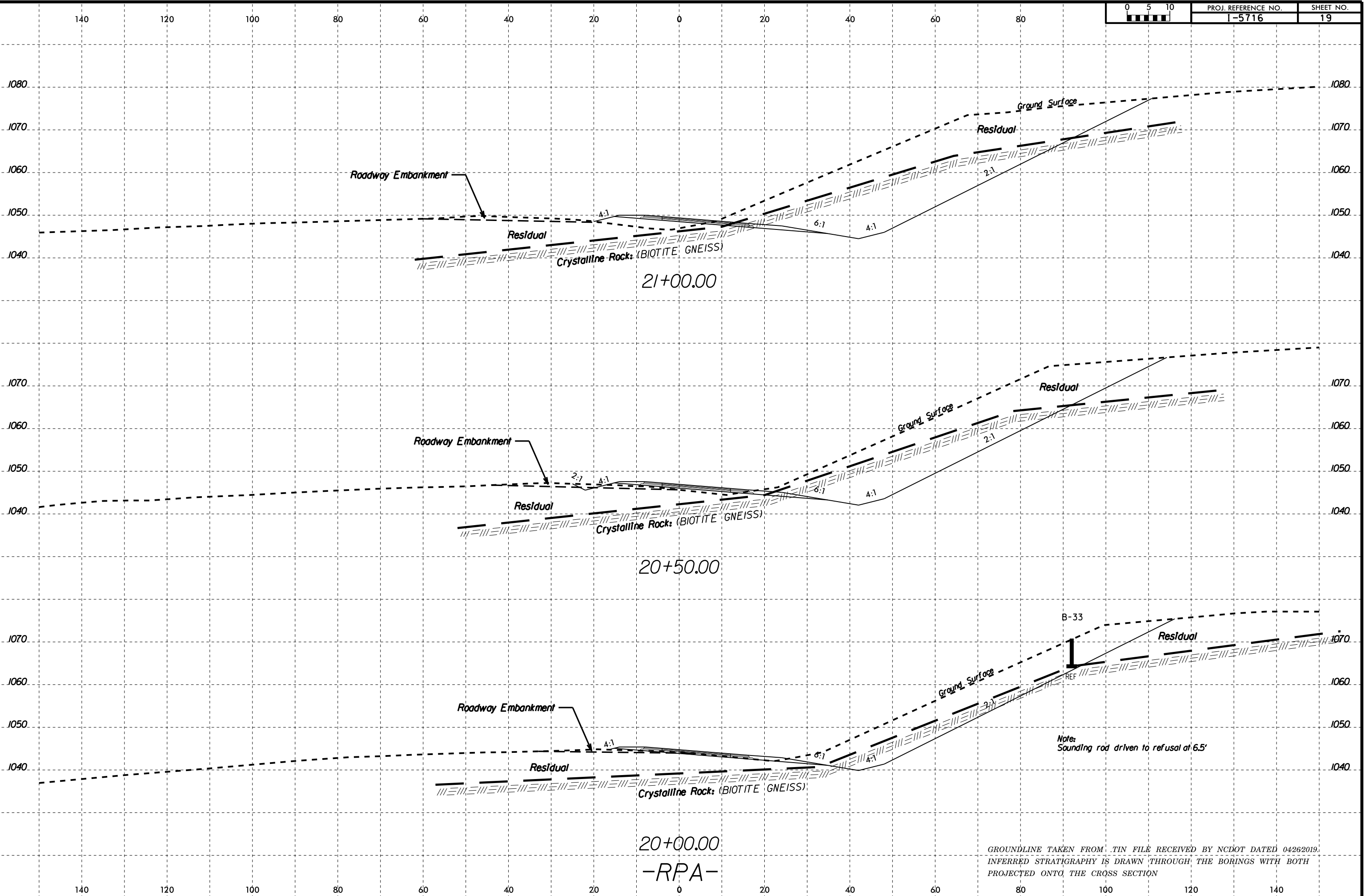
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T.Walker

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

6/23/16



PROJ. REFERENCE NO.	SHEET NO.
I-5716	19



GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:01 \\601\666V-0340 (NCDDOT-I-5716 Catawba County)\CADD\_GEO\GEO\15716\_geo\_xst\_RPA.dgn  
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 Walker

6/23/16

140

120

100

80

60

40

20

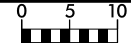
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20

40

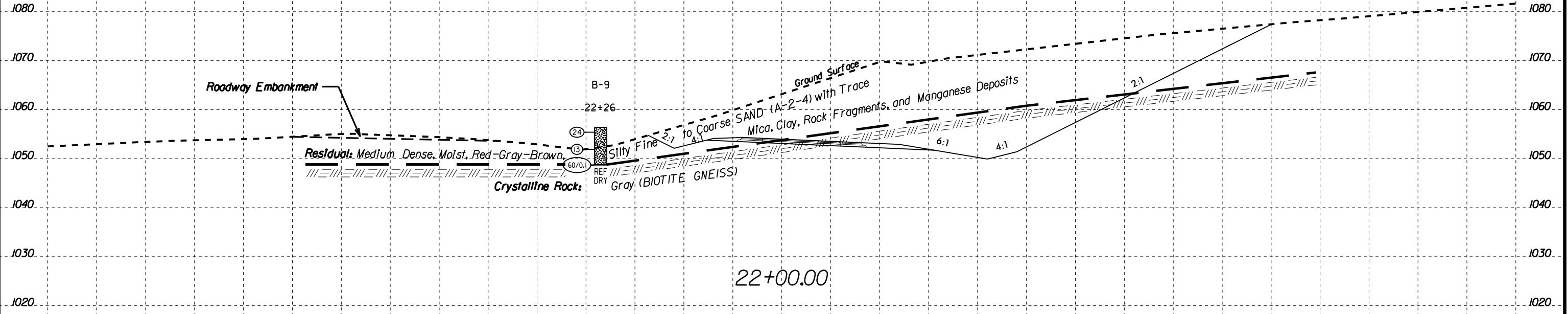
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80

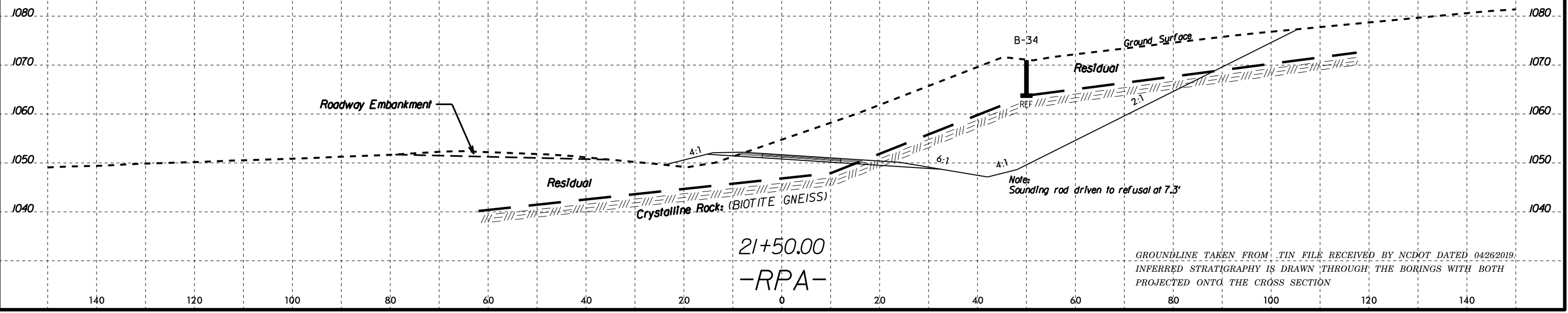


PROJ. REFERENCE NO. 1-5716

SHEET NO. 20



22+00.00



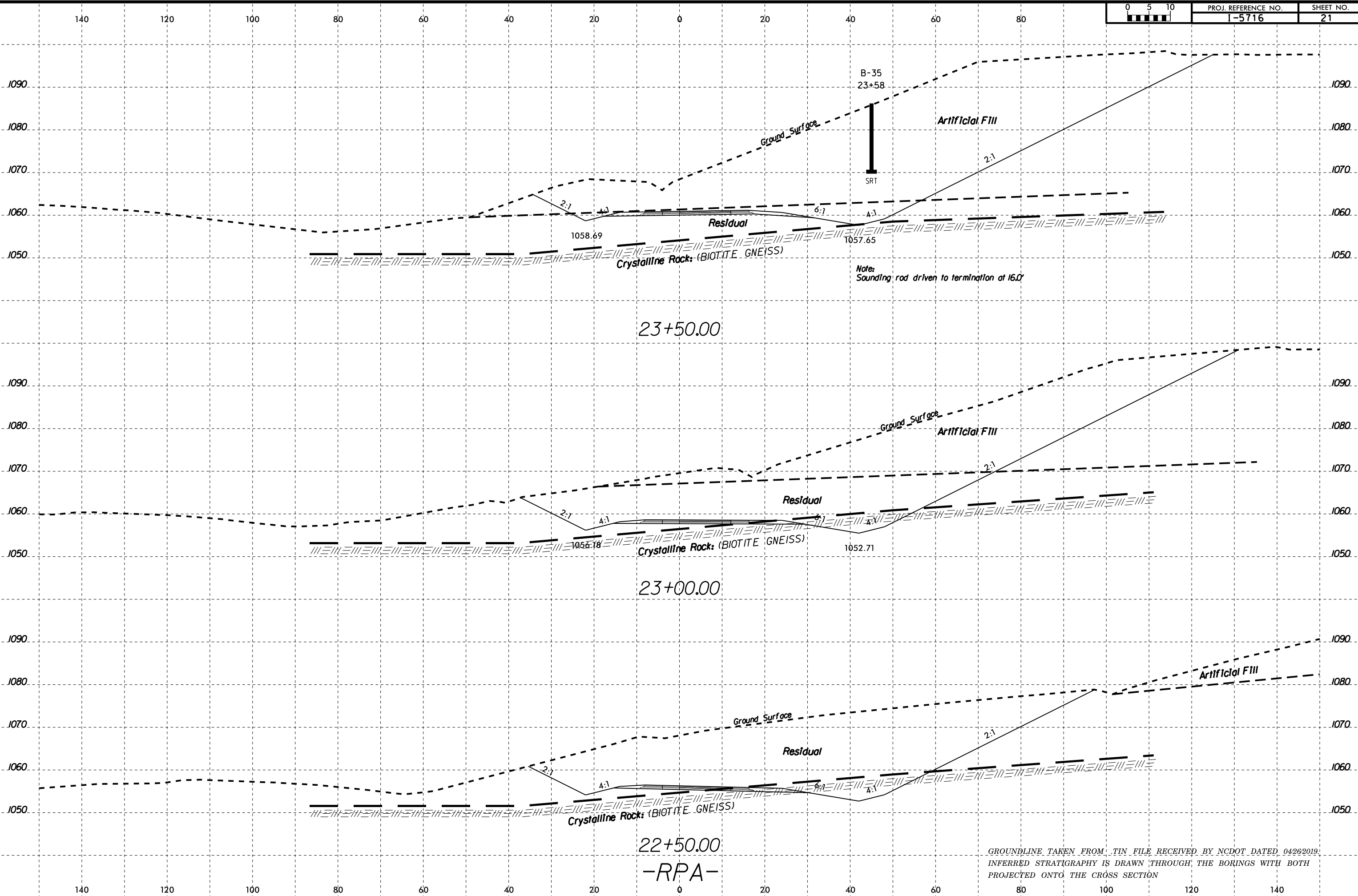
21+50.00

-RPA-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

05 JUN 2019 14:33 661.9240 (NCDOT-I-5716 Catawba County\CADD\_GEO\TECH\15716\_geo\_xsl-RPA.cdn  
 Project: RPA  
 User: jk  
 Path:

6/23/16



05-JUN-2019 13:01 \\601\666\666-0340 (NCDDOT-I-5716 Catawba County)\CADD\_GEO\TECH\asc\15716\_geo\_xst\_RPA.dgn  
 P:\Projects\666\666-0340\666-0340\666-0340.dwg  
 T.Walker

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

22+50.00  
 -RPA-

6/23/16



PROJ. REFERENCE NO.  
I-5716

SHEET NO.  
22

140

120

100

80

60

40

20

0

20

40

60

80

1090

1080

1070

1060

1050

1090

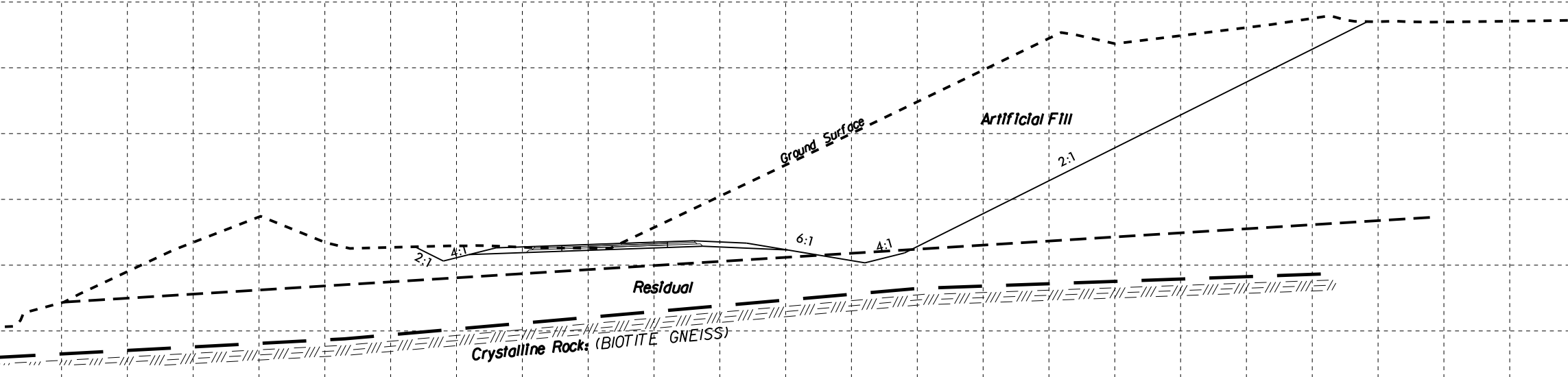
1080

1070

1060

1050

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Walker, A. 66026102



24+00.00

-RPA-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

80

100

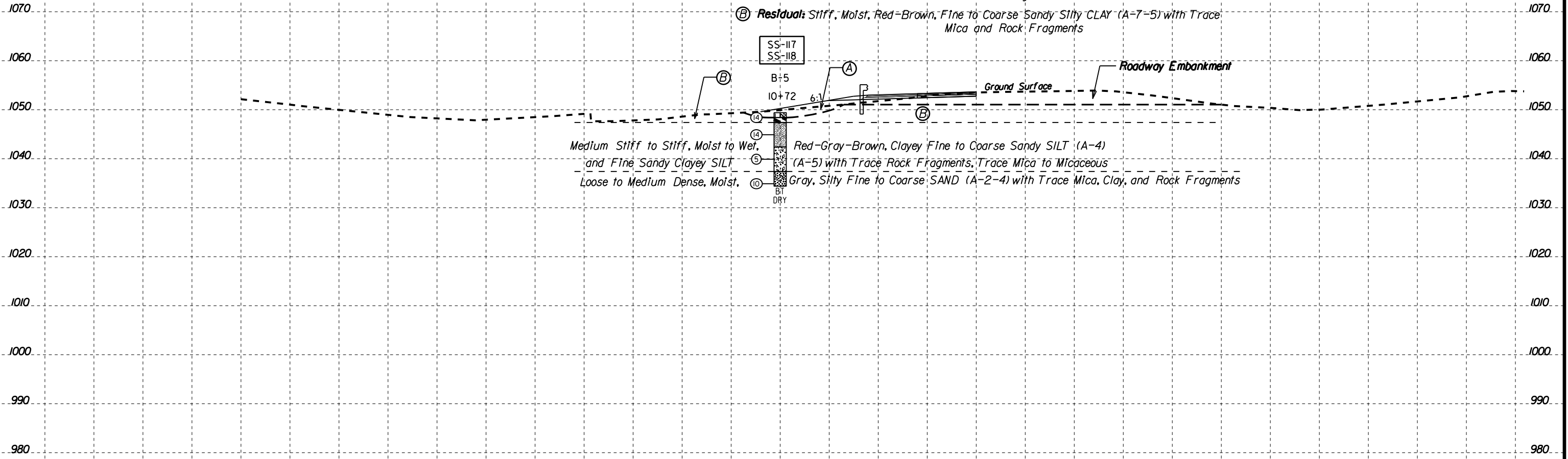
120

140

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-117	40' LT	10+72	1.0-1.5	A-7.5(B)	49	13	14.3	25.8	13.3	46.6	95.6	88.0	61.9	18.4	-
SS-118	40' LT	10+72	3.5-5.0	A-4(O)	34	3	20.8	36.7	14.4	28.1	71.6	63.4	35.6	20.3	-

(A) **Roadway Embankment:** Medium Dense, Moist, Red-Brown, Silty Fine SAND (A-2-4) with Trace Organics and Gravel

(B) **Residual:** Stiff, Moist, Red-Brown, Fine to Coarse Sandy Silty CLAY (A-7-5) with Trace Mica and Rock Fragments



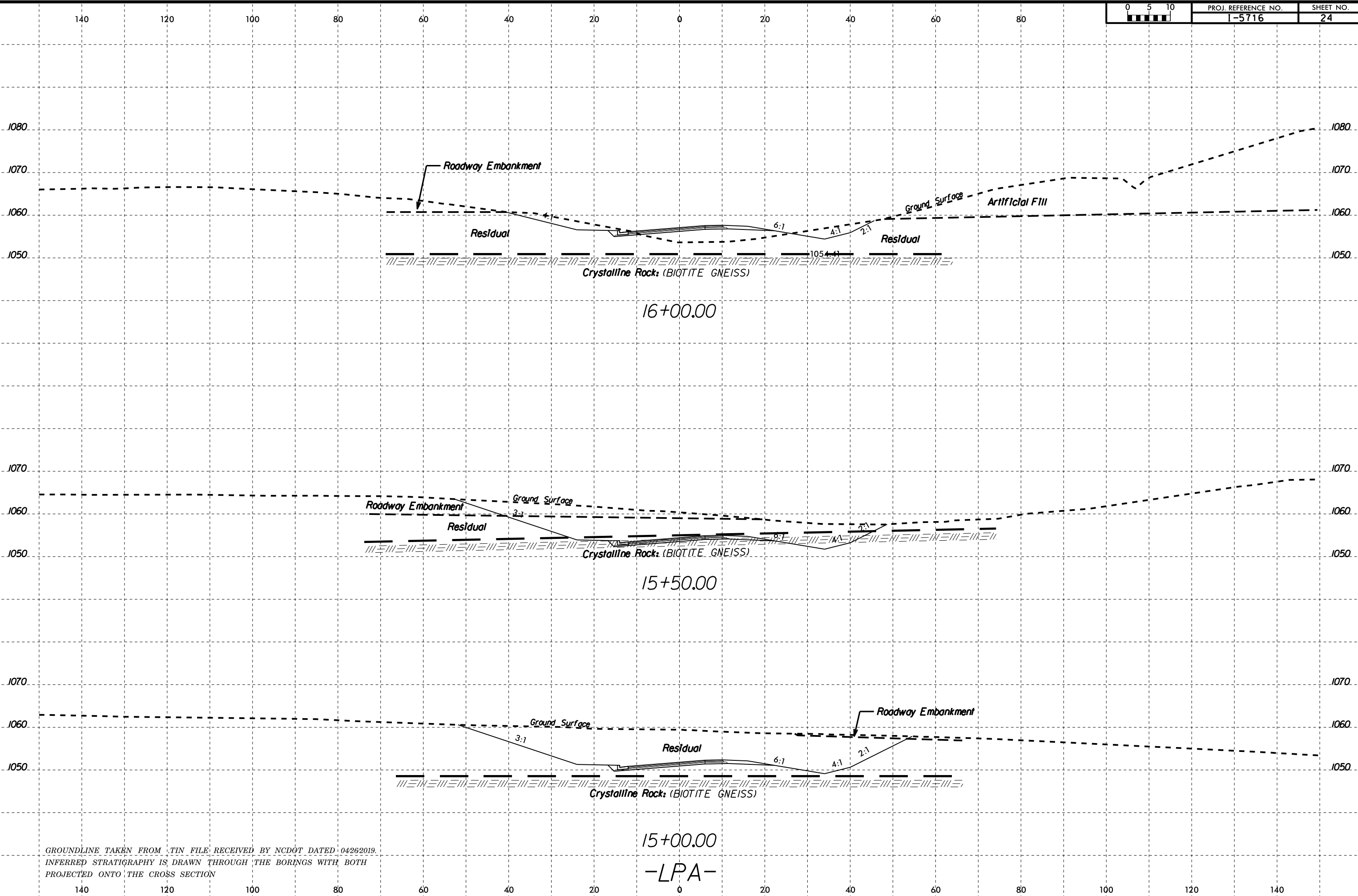
Medium Stiff to Stiff, Moist to Wet, and Fine Sandy Clayey SILT (A-5) with Trace Rock Fragments, Trace Mica to Micaceous  
 Loose to Medium Dense, Moist, Gray, Silty Fine to Coarse SAND (A-2-4) with Trace Mica, Clay, and Rock Fragments

10+50.00

-LPA-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

6/23/16



05-JUN-2019 13:01 C:\Projects\66V\66V-0340 (NCDOT-I-5716 Catawba County)\CADD\_GEOTECH\15716\_geo\_xst.LPA.dgn  
T Walker

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

15+00.00  
-LPA-

6/23/16

180

160

140

120

100

80

60

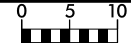
40

20

0

20

40

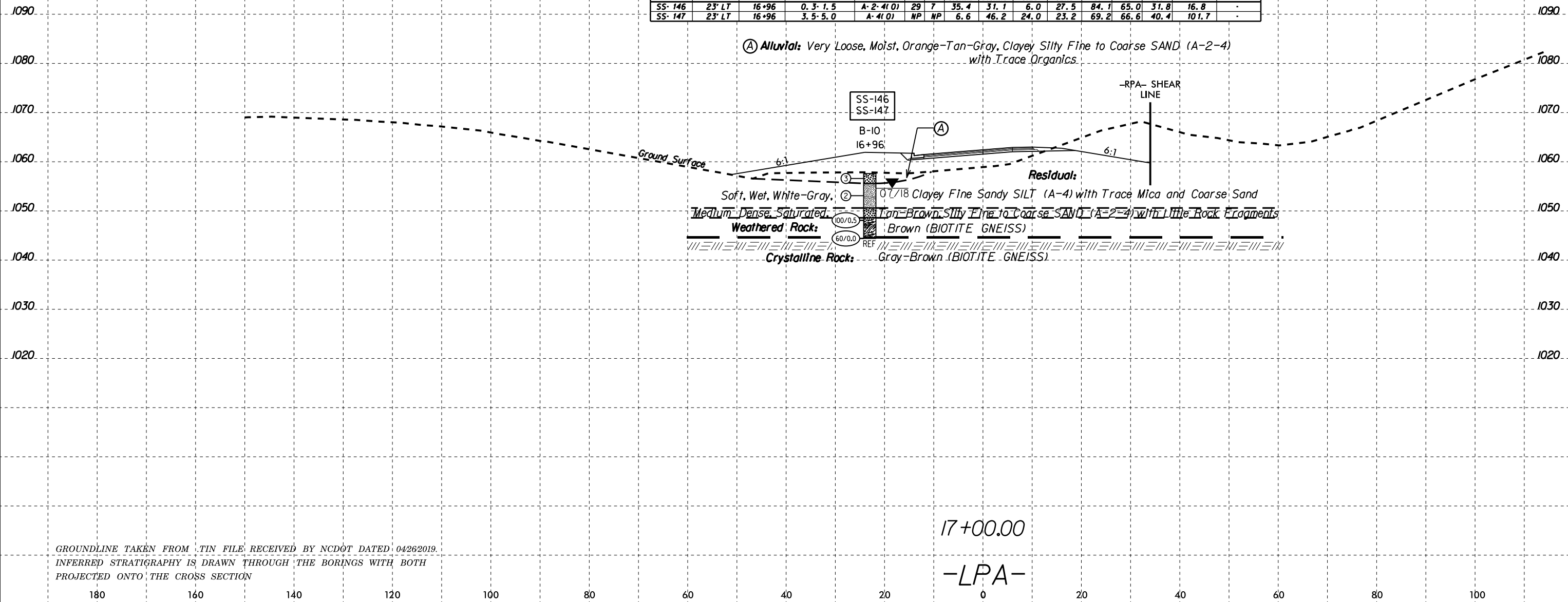


PROJ. REFERENCE NO. I-5716

SHEET NO. 25

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-146	23' LT	16+96	0.3-1.5	A-2-4(0)	29	7	35.4	31.1	6.0	27.5	84.1	65.0	31.8	16.8	-
SS-147	23' LT	16+96	3.5-5.0	A-4(0)	NP	NP	6.6	46.2	24.0	23.2	69.2	66.6	40.4	101.7	-

(A) Alluvial: Very Loose, Moist, Orange-Tan-Gray, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics



SS-146  
SS-147

B-10  
16+96

RPA-SHEAR LINE

Ground Surface

Residual:

Soft, Wet, White-Gray, (2) 0/18 Clayey Fine Sandy SILT (A-4) with Trace Mica and Coarse Sand

Medium-Dense, Saturated, Tan-Brown Silty Fine to Coarse SAND (A-2-4) with Little Rock Fragments

Weathered Rock: Brown (BIOTITE GNEISS)

Crystalline Rock: Gray-Brown (BIOTITE GNEISS)

17+00.00

-LPA-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

05 JUN 2019 14:38 C:\Projects\I-5716 Catamba County\CADD\_GEO\GEO\GEO\15716-geo-ssi-LPA.dgn

180

160

140

120

100

80

60

40

20

0

20

40

60

80

100

140

120

100

80

60

40

20

0

20

40

60

80

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-128	70' RT	19+22	8.5-10.0	A-2-4(0)	NP	NP	19.3	60.1	6.3	14.3	84.6	79.2	23.0	24.8	-

1090

1090

1080

1080

1070

1070

1060

1060

1050

1050

1040

1040

1030

1030

1020

1020

1010

1010

-RPA-  
STA. 27+16.32

SS-128

B-II

19+22

Ground Surface

4:1

4

2

1

B-I

DRY

6:1

4:1

2:1

Loose to Medium Dense, Wet to Moist, Red-Orange-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace

Residual:

Organics (0.0-1.5'), MnO<sub>2</sub> and Manganese Deposits, Little Clay

19+00.00

-LPA-

140

120

100

80

60

40

20

0

20

40

60

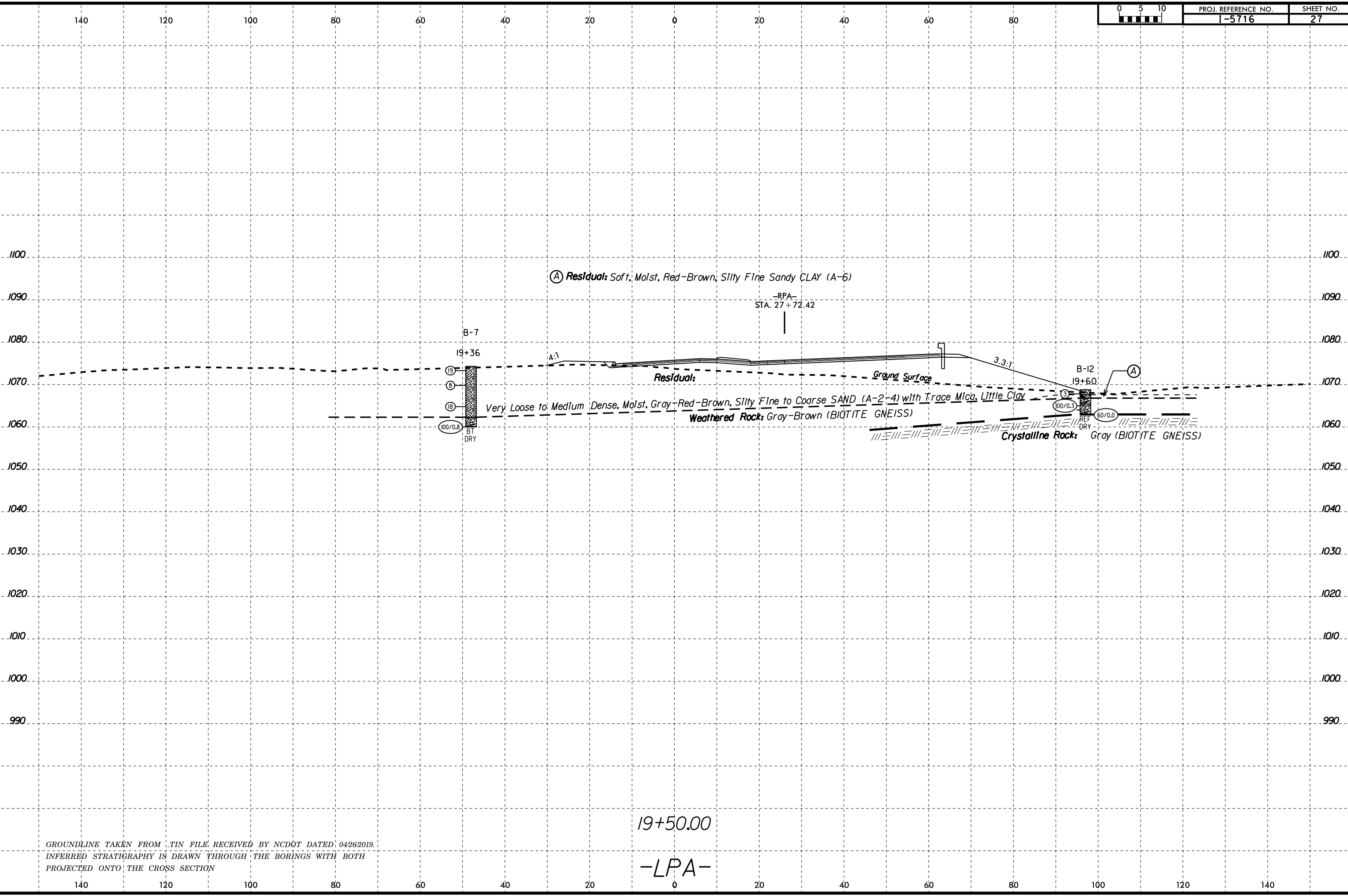
80

100

120

140

6/23/16

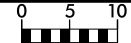


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GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

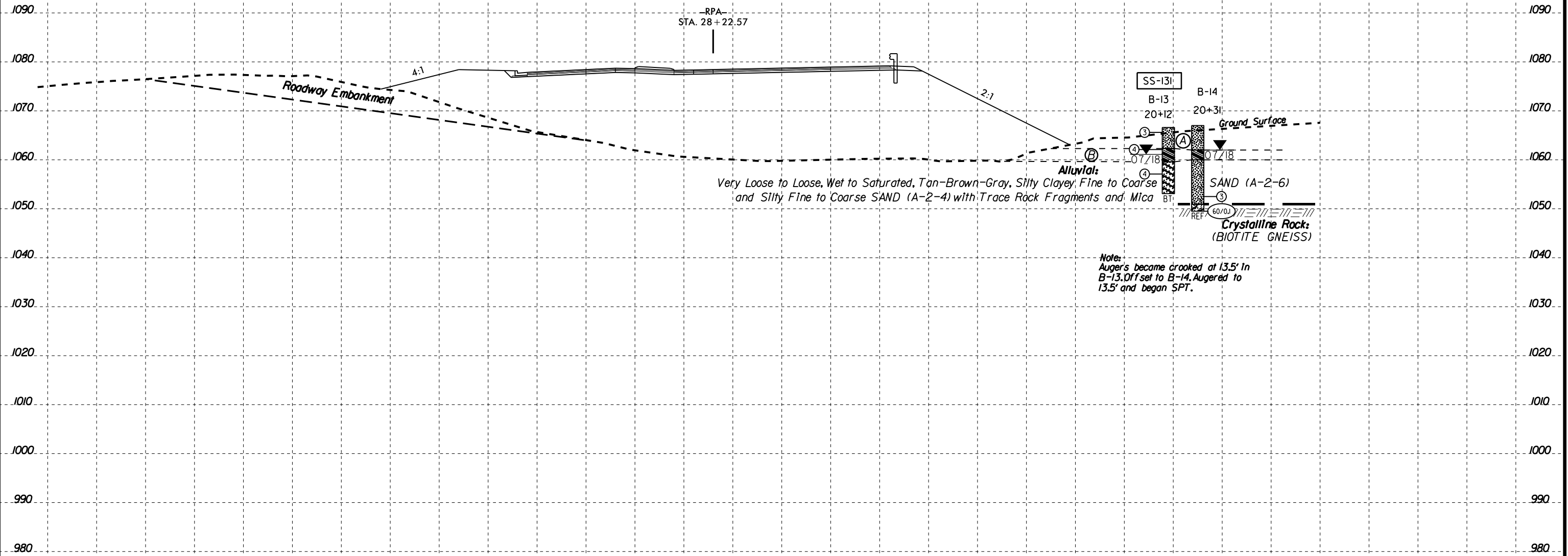
19+50.00  
 -LPA-

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 6/23/16



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-131	119' RT	20+12	4.3-5.0	A-6(2)	30	12	28.5	27.5	10.6	33.4	97.3	82.2	46.4	18.9	-

- (A) **Alluvial:** Very Loose, Wet, Red-Brown to Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Clay and Organics
- (B) **Alluvial:** Soft to Medium Stiff, Wet, Gray, Silty Fine to Coarse Sandy CLAY (A-6) with Trace Organics

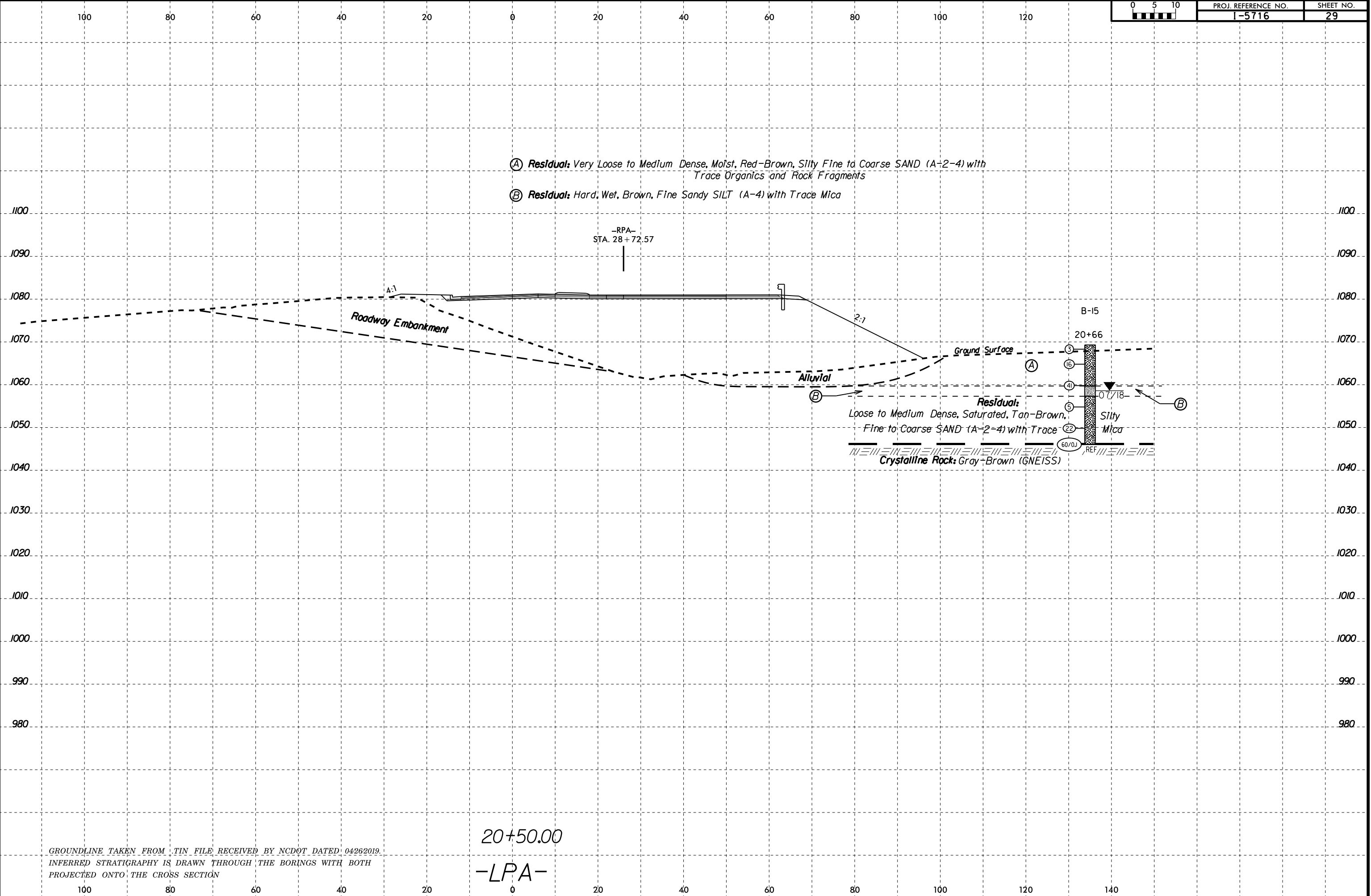
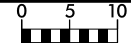


20+00.00

-LPA-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

6/23/16

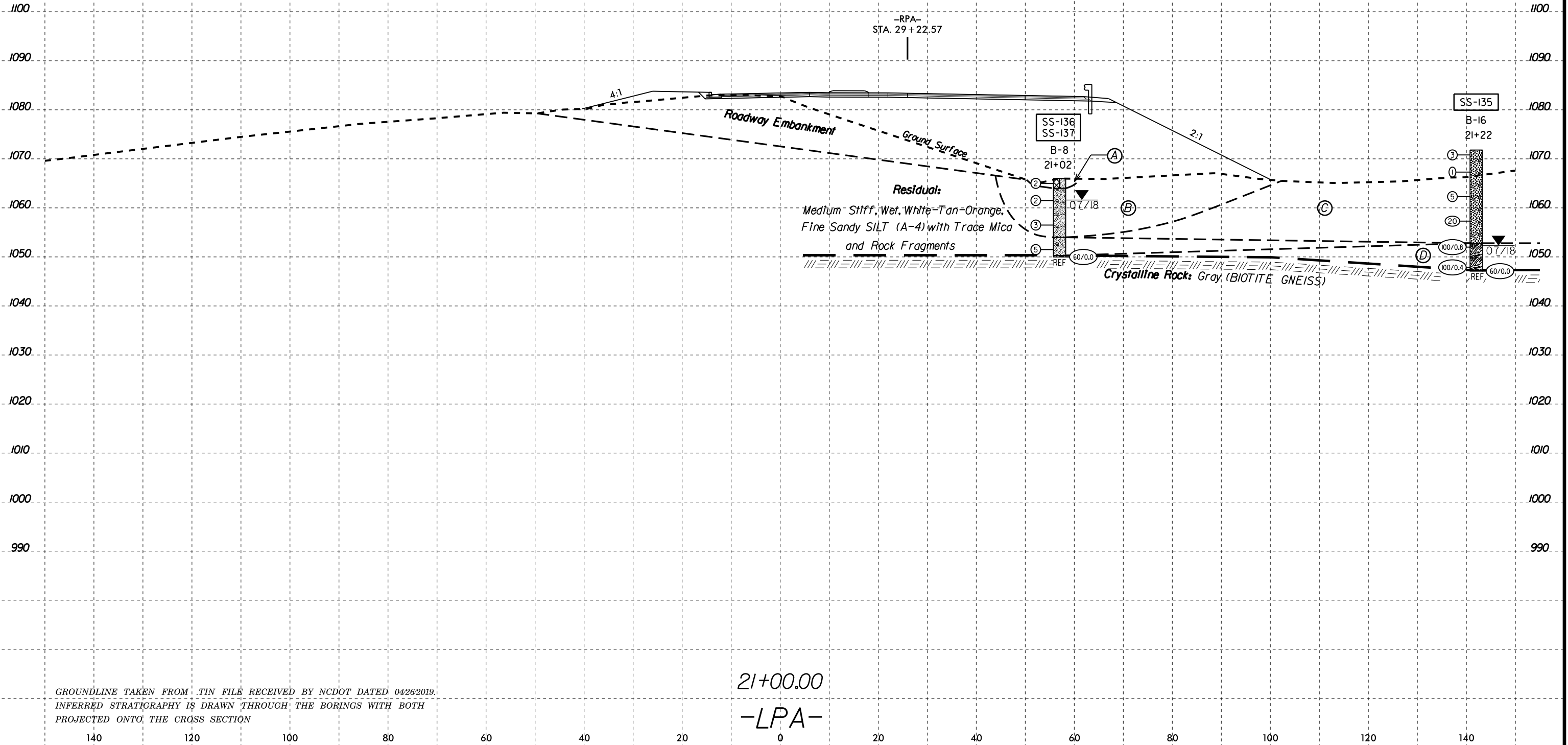


GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

05 JUN 2019 13:20 C:\Users\jg3140\OneDrive\Documents\Projects\I-5716\2019\06\23\16\062316.dgn  
 I:\Projects\I-5716\2019\06\23\16\062316.dgn  
 I:\Projects\I-5716\2019\06\23\16\062316.dgn

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-135	142' RT	21+22	8.5-10.0	A-2-4(0)	34	9	41.2	25.2	4.1	29.5	96.1	71.9	35.0	23.2	-
SS-136	58' RT	21+02	0.2-1.5	A-4(1)	29	8	20.6	36.5	11.6	31.3	98.2	89.0	46.9	18.7	-
SS-137	58' RT	21+02	8.5-10.0	A-4(0)	26	7	31.2	34.1	8.6	26.1	93.2	77.5	36.3	22.1	-

- (A) Artificial Fill: Soft, Moist, Red-Brown, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Organics
- (B) Alluvial: Soft, Wet, Tan-Gray, Clayey Fine to Coarse Sandy SILT (A-4) with Trace Organics
- (C) Residual: Loose to Medium, Dense, Wet, Red-Orange-Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics (0.0-1.5%), Trace Mica, and Trace to Little Rock Fragments
- (D) Weathered Rock: Gray-Brown (BIOTITE GNEISS)

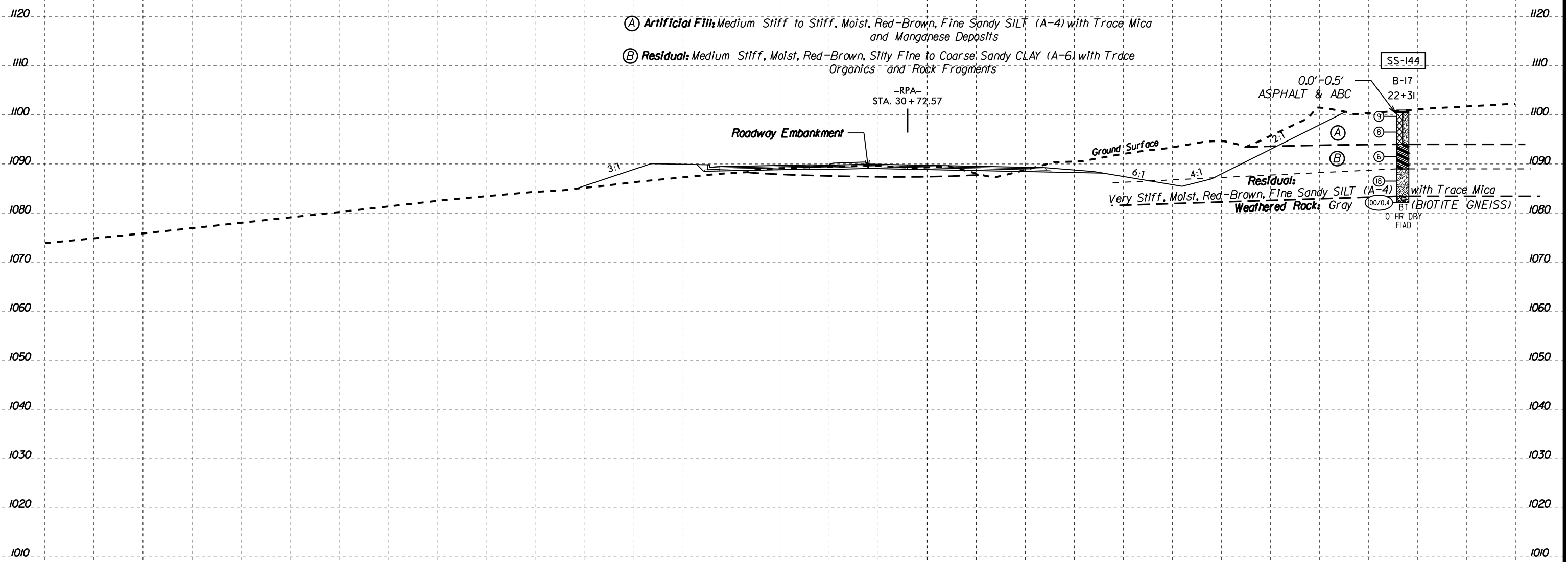


21+00.00  
-LPA-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04262019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

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-144	126' RT	22+31	8.5-10.0	A-6(5)	38	15	19.6	25.1	10.1	45.2	83.9	74.4	49.5	20.6	-

- Ⓐ **Artificial Fill:** Medium Stiff to Stiff, Moist, Red-Brown, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits
- Ⓑ **Residual:** Medium Stiff, Moist, Red-Brown, Silty Fine to Coarse Sandy CLAY (A-6) with Trace Organics and Rock Fragments



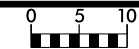
22+50.00  
-LPA-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:02  
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Walker-A 66026102

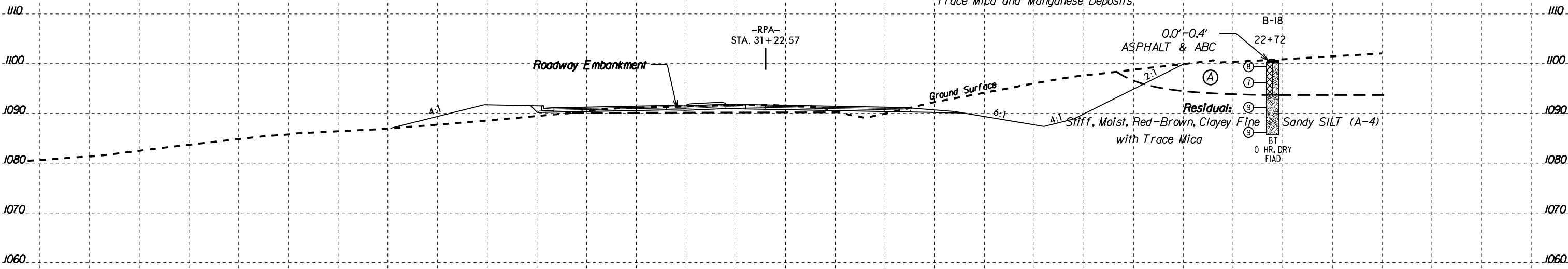
6/23/16

120 100 80 60 40 20 0 20 40 60 80 100 120



PROJ. REFERENCE NO.  
I-5716

SHEET NO.  
32



(A) Artificial Fill: Medium Stiff to Stiff, Moist, Gray-Brown, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits

-RPA-  
STA. 31+22.57

Roadway Embankment

0.0'-0.4'  
ASPHALT & ABC

B-18  
22+72

Residual:  
Stiff, Moist, Red-Brown, Clayey, Fine Sandy SILT (A-4)  
with Trace Mica

BT  
0 HR. DRY  
FIAD

23+00.00

-LPA-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:02  
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Walker-A 660261102

120 100 80 60 40 20 0 20 40 60 80 100 120 140 160

6/23/16

140

120

100

80

60

40

20

0

20

40

60

80



PROJ. REFERENCE NO. -5716

SHEET NO. 33

1120

1110

1100

1090

1080

1070

1060

1050

1040

1030

1020

1120

1110

1100

1090

1080

1070

1060

1050

1040

1030

1020

(A) Artificial Fill: Medium Dense, Moist, Red-Brown, Clayey Silty Fine SAND (A-2-4) with Trace Gravel

-RPA- STA. 31+72.57

Roadway Embankment

4:1

Medium Stiff to Very Stiff, Moist, White-Gray-Brown,

B-20

23+31

(24)

(19)

(18)

BT DRY

4:1

0.0'-0.8' ASPHALT & ABC

B-19

23+26

(A)

Ground Surface

2:1

Residual:

Clayey Fine Sandy SILT (A-4) with Trace Mica and Rock Fragments

(22)

(13)

BT

0 HR DRY

FIAD

23+50.00

-LPA-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

80

100

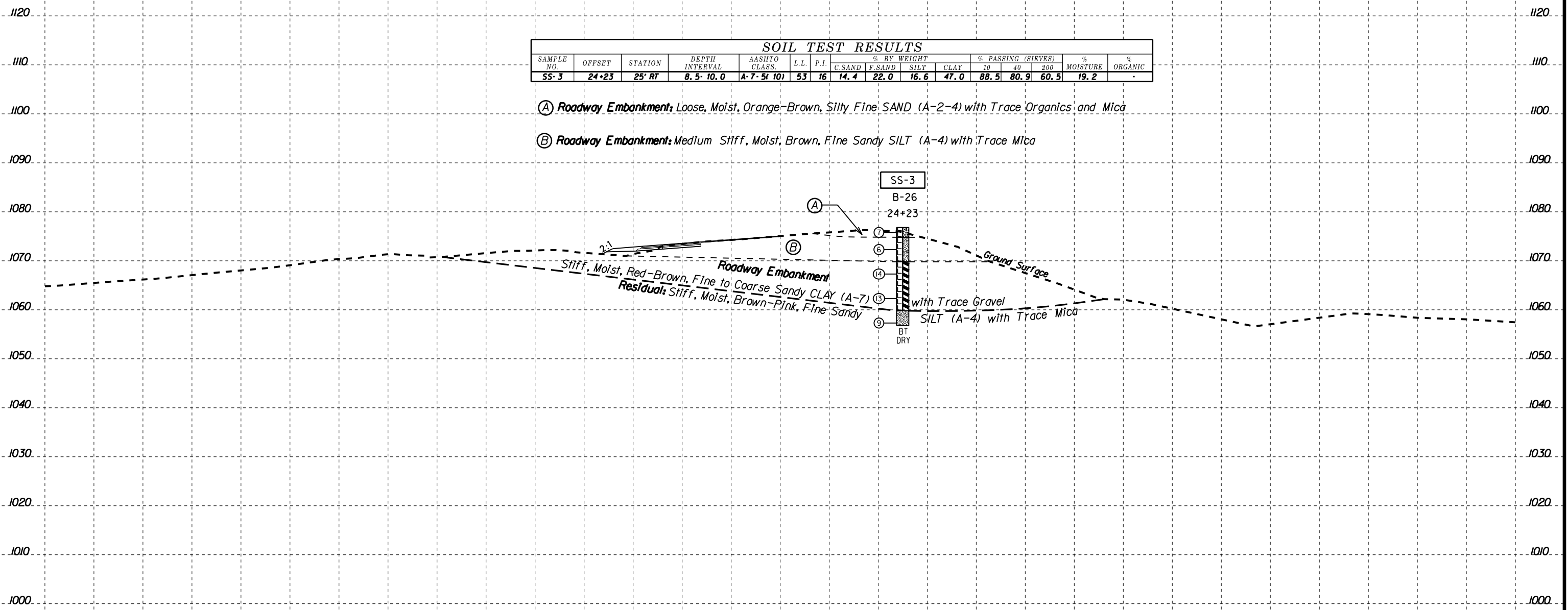
120

140

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Walker-A 660261102

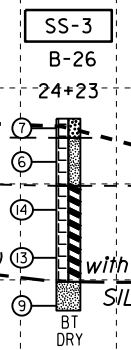


140 120 100 80 60 40 20 0 20 40 60 80



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-3	24+23	25' RT	8.5-10.0	A-7-5f 10	53	16	14.4	22.0	16.6	47.0	88.5	80.9	60.5	19.2	-

- (A) Roadway Embankment: Loose, Moist, Orange-Brown, Silty Fine SAND (A-2-4) with Trace Organics and Mica
- (B) Roadway Embankment: Medium Stiff, Moist, Brown, Fine Sandy SILT (A-4) with Trace Mica



Stiff, Moist, Red-Brown, Fine to Coarse Sandy CLAY (A-7) with Trace Gravel  
 Residual: Stiff, Moist, Brown-Pink, Fine Sandy SILT (A-4) with Trace Mica

24+00.00  
 -RPC-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

140 120 100 80 60 40 20 0 20 40 60 80 100 120 140



140

120

100

80

60

40

20

0

20

40

60

80

1080

1070

1060

1050

1040

1030

1020

1010

1000

990

1080

1070

1060

1050

1040

1030

1020

1010

1000

990

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-101	80' RT	25+14	3.5-5.0	A-7-5(10)	75	22	8.5	15.2	16.2	60.1	99.9	94.3	80.6	35.6	-

EXIST.

Roadway Embankment

2:1

Ground Surface

SS-101

B-28

25+14

Residual:

Loose to Medium Dense, Moist, Red-Brown, Clayey Silty (10) Fine to Coarse SAND (A-2-4) with Trace Organics

Stiff, Moist, Red-Brown, Fine to Coarse Sandy (14) Silty CLAY (A-7-5) with Trace Mica

Medium Stiff, Moist, Red-Orange-Brown, Fine Sandy (6) SILT (A-4) with Trace Mica and Manganese Deposits

BT DRY

25+00.00

-RPC-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:02 P:\Projects\651666\651666-0340 (NCDOT-1-5716 Catawba County)\CADD\_GEO\TECH\XSEC\15716\_geo\_xsi\_RPC.dgn Walker A 660261102

140

120

100

80

60

40

20

0

20

40

60

80

100

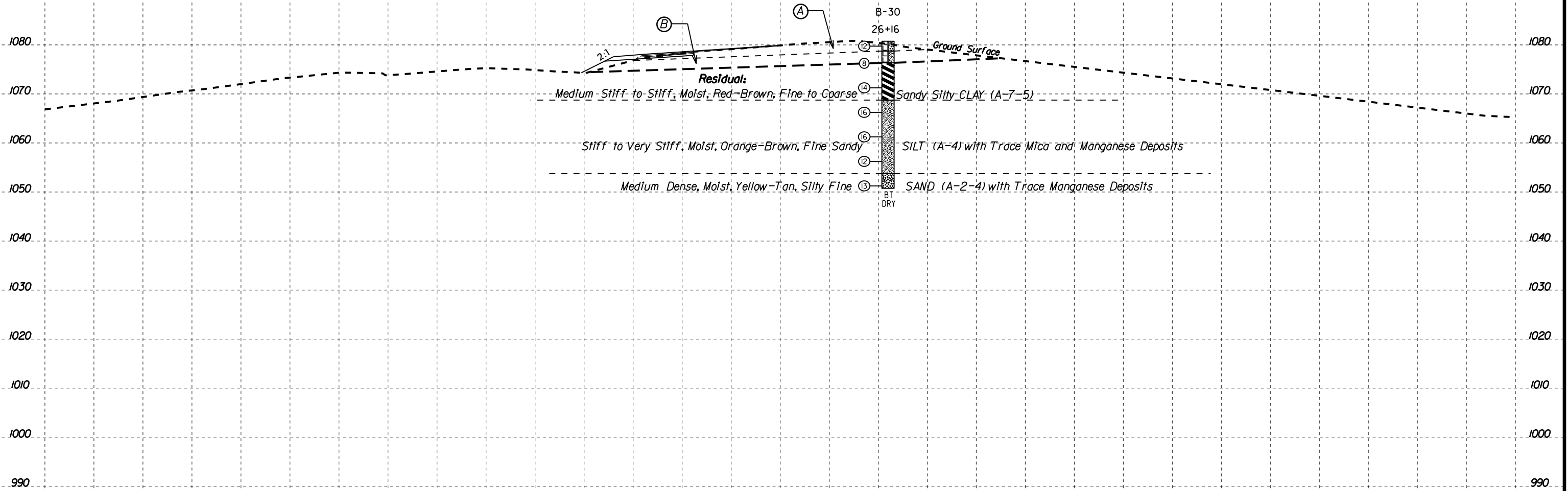
120

140



140 120 100 80 60 40 20 0 20 40 60 80

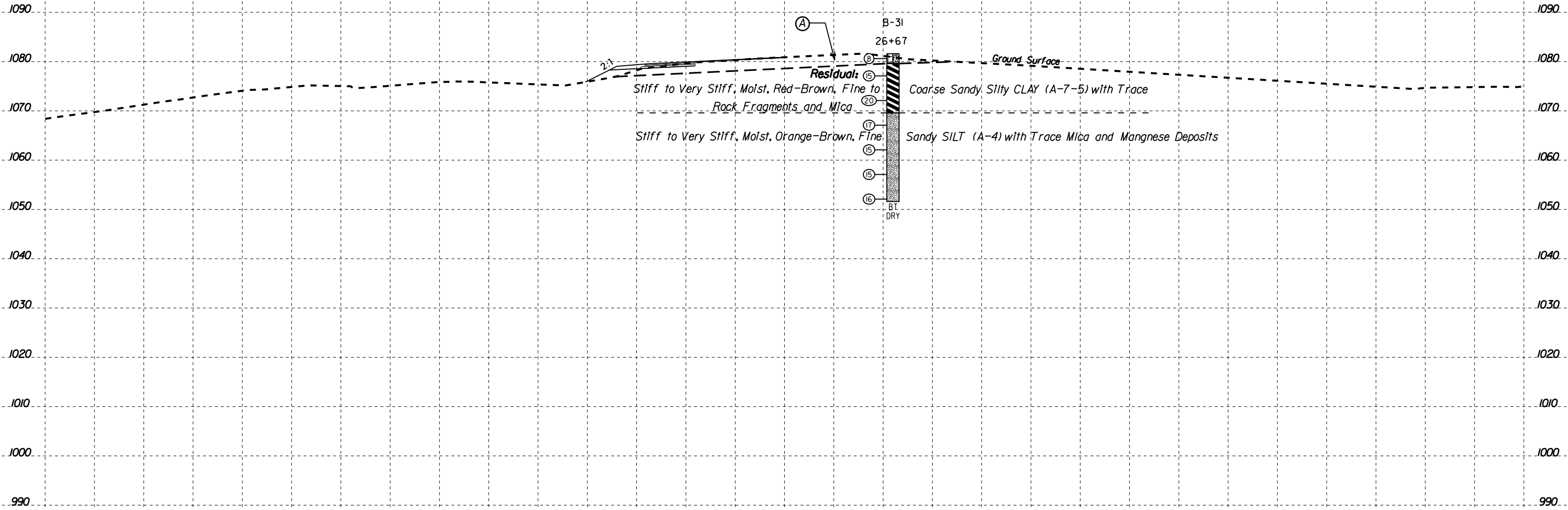
- Ⓐ **Roadway Embankment:** Medium Dense, Moist, Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica, Gravel, and Organics
- Ⓑ **Roadway Embankment:** Medium Stiff to Stiff, Moist, Brown, Fine Sandy SILT (A-4) with Trace Mica



26+00.00  
-RPC-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION

140 120 100 80 60 40 20 0 20 40 60 80 100 120 140



(A) Roadway Embankment: Loose, Moist, Gray-Brown, Silty Fine SAND (A-2-4) with Trace Gravel, Mica, Maganese Deposits, and Organics

(A)

B-31  
26+67

Ground Surface

Residual:

Stiff to Very Stiff, Moist, Red-Brown, Fine to  
Rock Fragments and Mica

Coarse Sandy Silty CLAY (A-7-5) with Trace

Stiff to Very Stiff, Moist, Orange-Brown, Fine

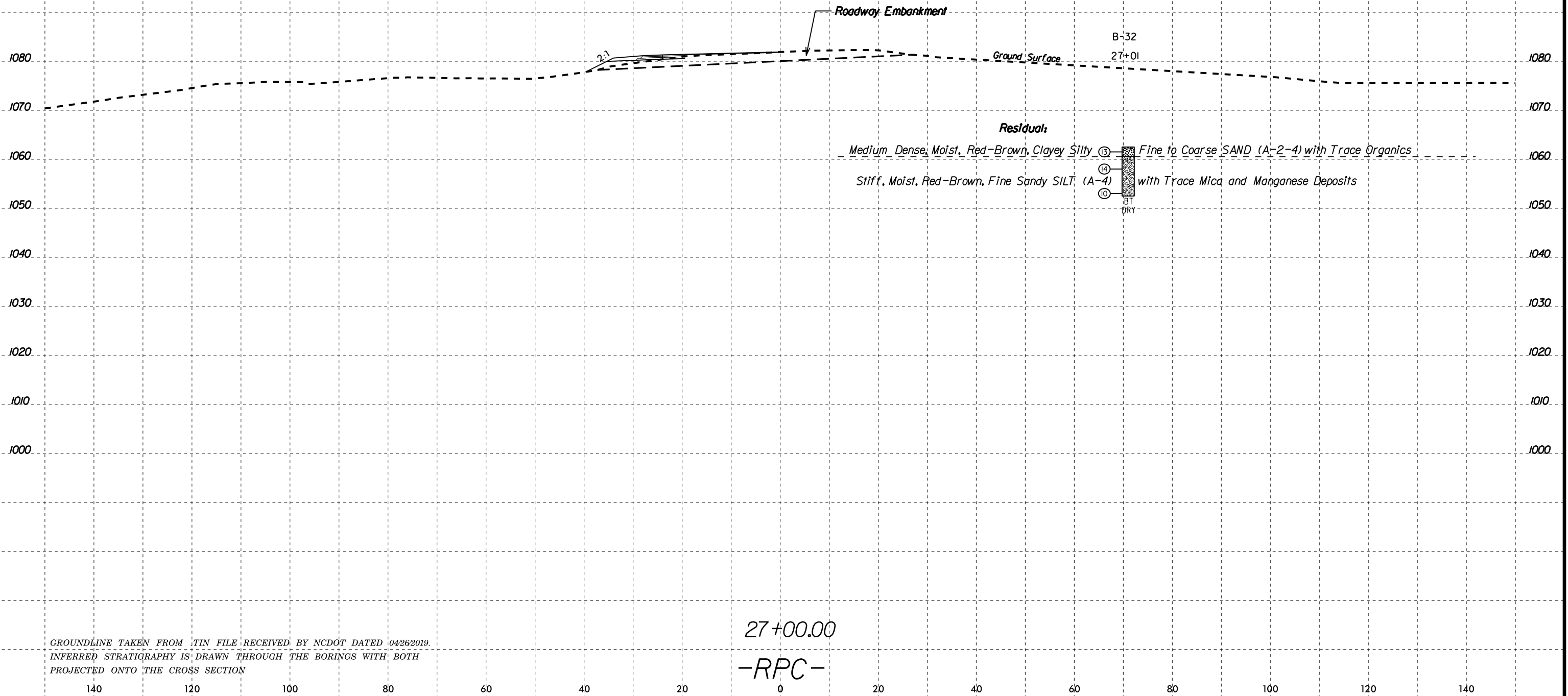
Sandy SILT (A-4) with Trace Mica and Mangnese Deposits

BT  
DRY

26+50.00

-RPC-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 04/26/2019.  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE CROSS SECTION

05-JUN-2019 13:03  
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 Walker-A 660261102

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 50133.1.FS1	TIP I-5716	COUNTY CATAWBA	GEOLOGIST M. Arnold
SITE DESCRIPTION I-40 & SR 1007 (Lenoir Rhyne Boulevard) Interchange Improvements			GROUND WTR (ft)
BORING NO. B-6	STATION 15+25	OFFSET 192 ft LT	ALIGNMENT -LPA-
COLLAR ELEV. 1,063.4 ft	TOTAL DEPTH 8.9 ft	NORTHING 722,773	EASTING 1,313,937
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 07/24/18	COMP. DATE 07/24/18	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				
1065	1,063.4	0.0											GROUND SURFACE	0.0
1060	1,059.9	3.5	4	5	7	12						M	<b>RESIDUAL</b> Red-Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Clay and Mica, Trace to Little Rock Fragments	
			14	23	26							M		
1055	1,054.9	8.5											<b>WEATHERED ROCK</b> Gray (BIOTITE GNEISS)	8.8
	1,054.5	8.9	100/0.3			60/0.0							<b>CRYSTALLINE ROCK</b> Gray (BIOTITE GNEISS)	8.9
													Boring Terminated with Standard Penetration Test Refusal at Elevation 1,054.5 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)	

Notes:  
1. Surficial Organic Soil=0.0'-0.2'  
2. Auger Refusal at 8.9'

NCDOT BORE DOUBLE I-5716\_GEO\_BH\_RDWY.GPJ NC\_DOT\_GDT 6/5/19