

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-5715	1	24

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	11+10.00 - 32+40.00	4-6	7
-YI-	10+00.00 - 13+50.00	4	8
-DRWYI-	10+32.50 - 13+24.00	6	9

APPENDICES

APPENDIX	TITLE	SHEETS
A	PAVEMENT INVESTIGATION	10-19
B	LABORATORY RESULTS	20,21

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY WAKE
PROJECT DESCRIPTION NEW HOPE CHURCH ROAD
GRADE SEPARATION

INVENTORY

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

CAROLINA DRILLING

WEIS, J.M.

LANE, R.W.

INVESTIGATED BY FALCON ENG.

DRAWN BY HILL, M. J.

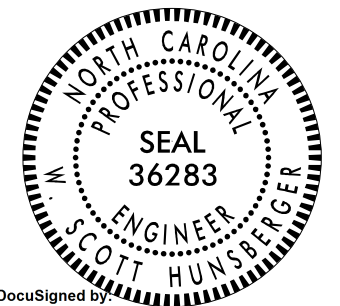
CHECKED BY HUNSBERGER, W. S.

SUBMITTED BY FALCON ENG.

DATE DECEMBER 2018

REFERENCE: P-5715

PROJECT: 46927



DocuSigned by:

W. Scott Hunsberger

12/20/2018

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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (<= 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="6">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-1-b</th><th>A-2</th><th>A-2-4</th><th>A-2-5</th><th>A-2-6</th><th>A-2-7</th> <th>A-4</th><th>A-5</th><th>A-6</th><th>A-7</th> <th>A-1, A-2</th><th>A-3</th><th>A-4, A-5</th><th>A-6, A-7</th> <th>A-1, A-2</th><th>A-3</th><th>A-4, A-5</th><th>A-6, A-7</th> </tr> <tr> <th>GROUP CLASS.</th> <td>A-1-a</td><td>A-1-b</td><td>A-2</td><td>A-2-4</td><td>A-2-5</td><td>A-2-6</td><td>A-2-7</td> <td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> </tr> <tr> <th>SYMBOL</th> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <th>% PASSING</th> <td>50 MX</td><td>30 MX</td><td>25 MX</td><td>10 MX</td><td>5 MN</td><td>35 MX</td><td>35 MX</td><td>35 MX</td><td>35 MX</td><td>35 MX</td><td>36 MN</td><td>36 MN</td><td>36 MN</td><td>36 MN</td> <td>GRANULAR SOILS</td> <td>SILT-CLAY SOILS</td> <td>MUCK, PEAT</td> <td></td><td></td><td></td><td></td> </tr> <tr> <th>MATERIAL PASSING #40</th> <td>LL</td><td>PI</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> <td></td> <td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> <td></td> <td></td> <td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td>STONE FRAGS. GRAVEL, AND SAND</td><td>FINE SAND</td><td>SILTY OR CLAYEY GRAVEL AND SAND</td><td>SILTY SOILS</td><td>CLAYEY SOILS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> <td></td> <td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="7">EXCELLENT TO GOOD</td><td colspan="7">FAIR TO POOR</td><td>FAIR TO POOR</td><td>POOR</td><td>UNSATURABLE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td colspan="10">PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30</td> <td colspan="10"></td> <td colspan="10"></td> <td colspan="10"></td> </tr> <tr> <td colspan="10"> <p>CONSISTENCY OR DENSENESS</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table> </td> <td colspan="10"> <p>MISCELLANEOUS SYMBOLS</p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>TEST BORING</td> <td></td> <td>CONE PENETROMETER TEST</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>AUGER BORING</td> <td></td> <td>SOUNDING ROD</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>CORE BORING</td> <td></td> <td>MONITORING WELL</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> <td></td> <td>SPT N-VALUE</td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> </td> <td colspan="10"> <p>RECOMMENDATION SYMBOLS</p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td></td> <td>SHALLOW UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> <td></td> </tr> </table> </td> <td colspan="10"> <p>ROCK HARDNESS</p> <table border="1" style="width: 100%;"> <tr> <td>VERY HARD</td> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</td> </tr> <tr> <td>HARD</td> <td>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</td> </tr> <tr> <td>MODERATELY HARD</td> <td>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.</td> </tr> <tr> <td>MEDIUM HARD</td> <td>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.</td> </tr> <tr> <td>SOFT</td> <td>CAN BE GROOVED 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.</td> </tr> <tr> <td>VERY SOFT</td> <td>CAN BE CARVED WITH KNIFE. 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PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		DIP & DIP DIRECTION OF ROCK STRUCTURES		SLOPE INDICATOR INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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	UNDERCUT		UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE		UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
	SHALLOW UNDERCUT		UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
MEDIUM HARD	CAN BE 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.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
SOFT	CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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GRAIN SIZE	305	75	2.0	0.25	0.05	0.005																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Roadway Subsurface Investigation Report - Inventory

New Hope Church Road Separation
Wake County, North Carolina
WBS: 46927.1.1 TIP: P-5715
Falcon Project No.: G17062.00

Prepared for:

STANTEC
 801 Jones Franklin Road, Suite 300
 Raleigh, NC 27606

Submitted by:

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

December 20, 2018

WBS: 46927.1.1
TIP: P-5715
COUNTY: Wake
DESCRIPTION: New Hope Church Road Grade Separation
SUBJECT: Roadway Subsurface Investigation – Inventory

PROJECT DESCRIPTION

This project is centered around constructing a new grade separation on New Hope Church Road over CSX Railroad in Wake County. The current at grade crossing will be replaced with a single span bridge at approximately the same location.

Included in this project are a single span bridge over the CSX Railroad with an MSE vertical abutment at End Bent One and sloped spill through abutment at End Bent Two. In addition, the abutment wall at End Bent One extends approximately XXX feet downstation left, and a separate retaining wall accommodates the right side of the End Bent One approach as well as turning down -Y2-. Temporary shoring will be constructed near the centerline of -L- and integrated into the abutment wall to accommodate the phasing of construction while maintaining traffic through the site. Borings for the bridge structure, temporary shoring and retaining walls are not included herein and will be submitted under separate cover.

The investigation was conducted between July 26th, and August 8th, 2018 in general accordance with the Scope of Services, dated September 4, 2017. The recommendations 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 eleven (11) Standard Penetration Test (SPT) borings were performed for the proposed roadway alignments. All mechanical borings were drilled using either a CME-55 truck or CME 550 ATV mounted rig equipped with 2 ¼-inch inside diameter hollow-stem augers, and SPT testing was performed with an 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 and California Bearing Ratio (CBR) testing. At ten (10) locations along the existing roadway, existing pavements were cored, measured, and Dual Mass Dynamic Cone Penetrometer (DCP) testing completed on the subgrade to depths of up to three feet to correlate in-situ CBR values. The dual mass DCP used is manufactured by Kessler Soils Engineering Products, Inc. CBR values were estimated using software provided by the manufacturer which utilizes correlations established by the Army Corps of Engineers Waterways Experiment Station.





The following alignments, totaling approximately 0.52 miles were explicitly investigated. Other minor Y-lines and driveways are included on the project but improvements are not anticipated to be significant enough to warrant investigation.

<u>Alignment</u>	<u>Station (ft)</u>
-L- (New Hope Church Road)	11+10 - 32+40
-Y1- (Craftsman Drive)	10+00 - 13+50
-DRWY1-	10+33 - 13+24

PHYSIOGRAPHY AND GEOLOGY

According to the *Geologic Map of North Carolina* (1985), the site is in the Raleigh Belt Physiographic Province of North Carolina. Specifically, rocks at the site are noted as Injected Gneiss (**CZig**), consisting of biotite gneiss and schist intruded by numerous sills and dikes of granite, pegmatite, and aplite; minor hornblende gneiss.

Existing site topography is relatively flat, sloping gently from west to east. The site lies in northeast Raleigh and is currently an at-grade crossing for a CSX rail line. The existing corridor is populated by primarily commercial and industrial properties, with some residential properties to the southeast and southwest of the site.

SOIL PROPERTIES

A variety of soils were encountered along the project, including existing roadway embankments, artificial fill, residual soils, weathered rock and crystalline rock.

Artificial Fill soils were encountered at the ground surface beneath thin layers of topsoil associated with prior grading of private properties adjacent to the roadway. These soils consist of up to 12 feet of dry to moist, very loose to loose, clayey sand (A-2-6) and medium stiff to stiff, sandy clay (A-6).

Roadway Embankment soils were encountered at the ground surface adjacent to or beneath existing roadways. These soils consist of 3 to 6 feet of dry to moist, loose to medium dense, silty and clayey sands (A-2-4, A-2-5, A-2-6) and medium stiff to stiff, sandy silts and sandy and silty clays (A-4, A-6, A-7).

Residual soils were encountered at the ground surface, or beneath artificial fill or roadway embankments. These soils consist of dry to moist, loose to very dense, clayey and silty sands (A-2-4 and A-2-6) and soft to very stiff, sandy silt and sandy 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 black and white gneiss.

Crystalline Rock, also consisting of gneiss, was encountered beneath weathered rock at various locations throughout the site. CR is classified as material that yields auger refusal or SPT refusal (blow count of 60/0.0 or 60/0.1 feet.)

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 were backfilled immediately after completion due to safety considerations.

Groundwater was only encountered in a boring in low lying area well below proposed grades.





AREAS OF SPECIAL GEOTECHNICAL INTEREST

- I. Roadway Embankment associated with the existing roadway was encountered at the following locations:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	11+97
-L-	13+01
-L-	13+98
-L-	23+57
-L-	29+55
-L-	31+14
-Y11-	12+44

- II. Artificial fill was encountered at the following locations:

<u>Alignment</u>	<u>Station (ft)</u>
-DRWY1-	13+03

ADDITIONAL LABORATORY TESTING

The following bulk sample was obtained:

<u>Sample</u>	<u>Location</u>	<u>Depth (ft)</u>	<u>Test</u>
BS-2	27+52, 37' RT, -L-	3.5-13.5	California Bearing Ratio, Standard Proctor

Classification test results for the bulk sample are included in the subsurface profiles and cross sections and Standard Proctor and California Bearing Ratio (CBR) 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:

Report Reviewed By:

W. Scott Hunsberger, PE
Geotechnical Engineer

Jeremy R. Hamm, PE
Geotechnical Engineering Manager



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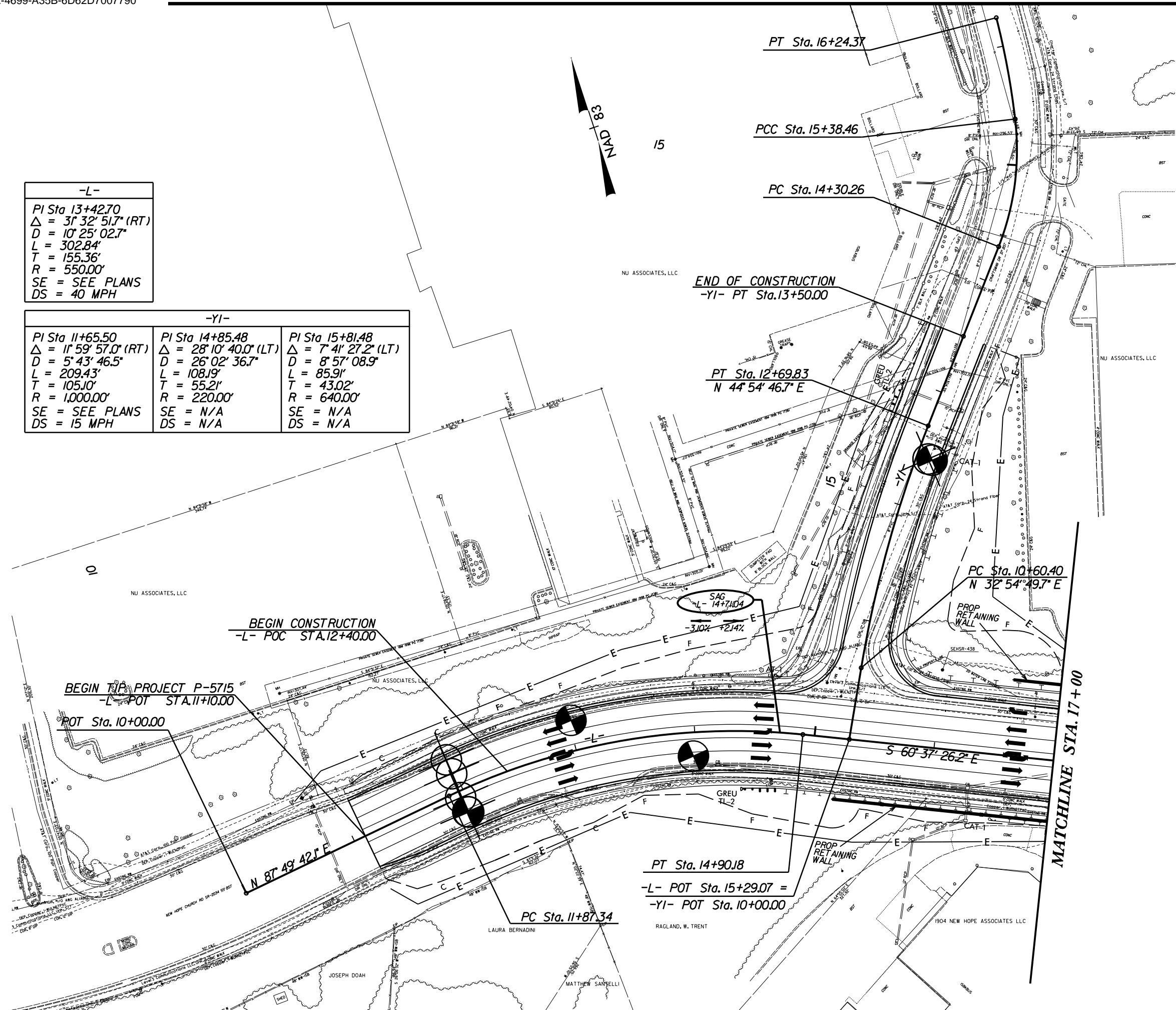
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INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



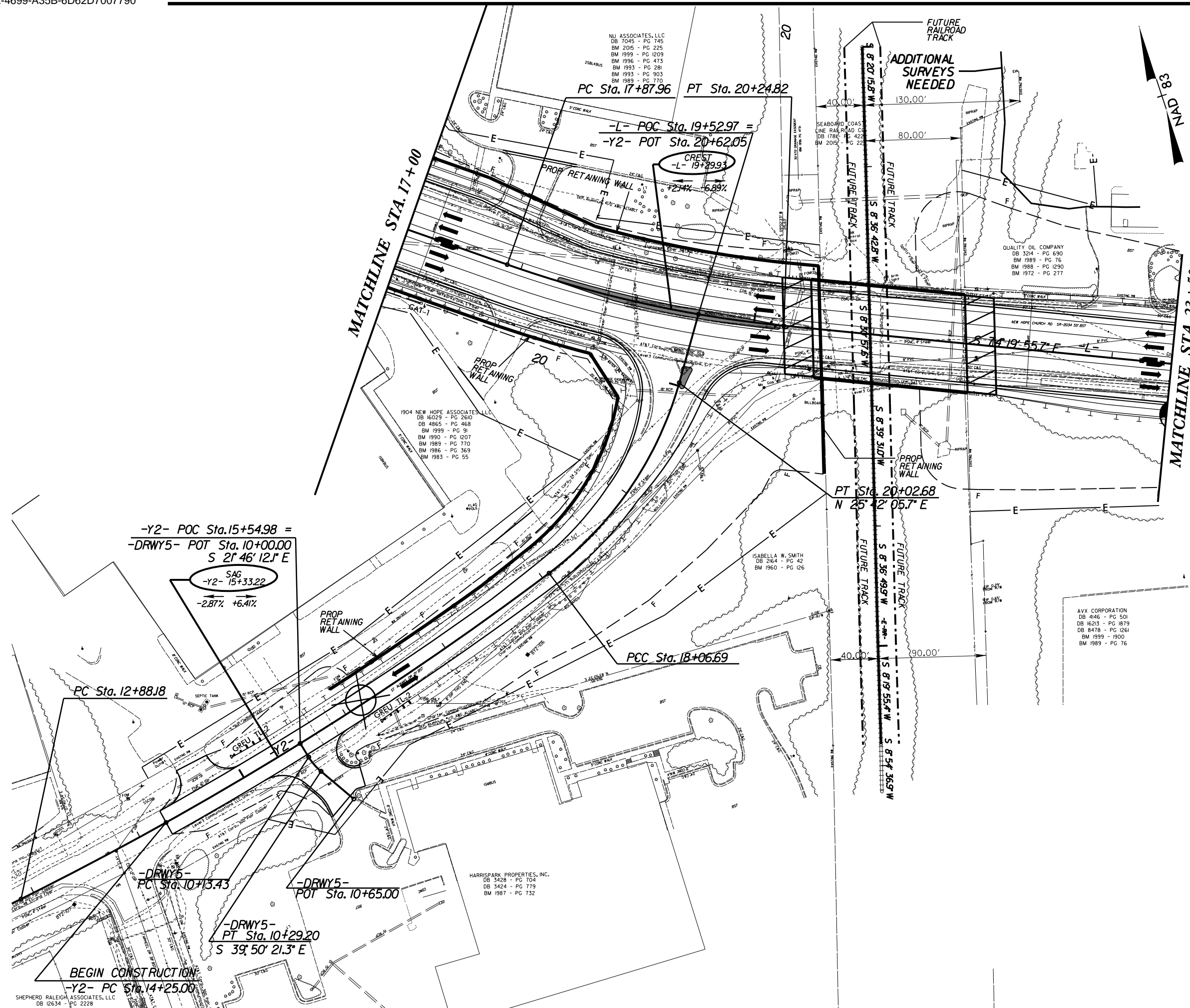
Stantec Consulting Services Inc.
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 Suite 300
 Raleigh, NC 27606
 Tel. (919) 851-6866
 Fax. (919) 851-7024
 www.stantec.com
 License No. F-0672

-L-
PI Sta 13+42.70 $\Delta = 3^\circ 32' 51.7" (RT)$ $D = 10^\circ 25' 02.7"$ $L = 302.84'$ $T = 155.36'$ $R = 550.00'$ SE = SEE PLANS DS = 40 MPH

-YI-		
PI Sta 11+65.50 $\Delta = 1^\circ 59' 57.0" (RT)$ $D = 5^\circ 43' 46.5"$ $L = 209.43'$ $T = 105.10'$ $R = 1,000.00'$ SE = SEE PLANS DS = 15 MPH	PI Sta 14+85.48 $\Delta = 28^\circ 10' 40.0" (LT)$ $D = 26^\circ 02' 36.7"$ $L = 108.19'$ $T = 55.21'$ $R = 220.00'$ SE = N/A DS = N/A	PI Sta 15+81.48 $\Delta = 7^\circ 41' 27.2" (LT)$ $D = 8^\circ 57' 08.9"$ $L = 85.91'$ $T = 43.02'$ $R = 640.00'$ SE = N/A DS = N/A



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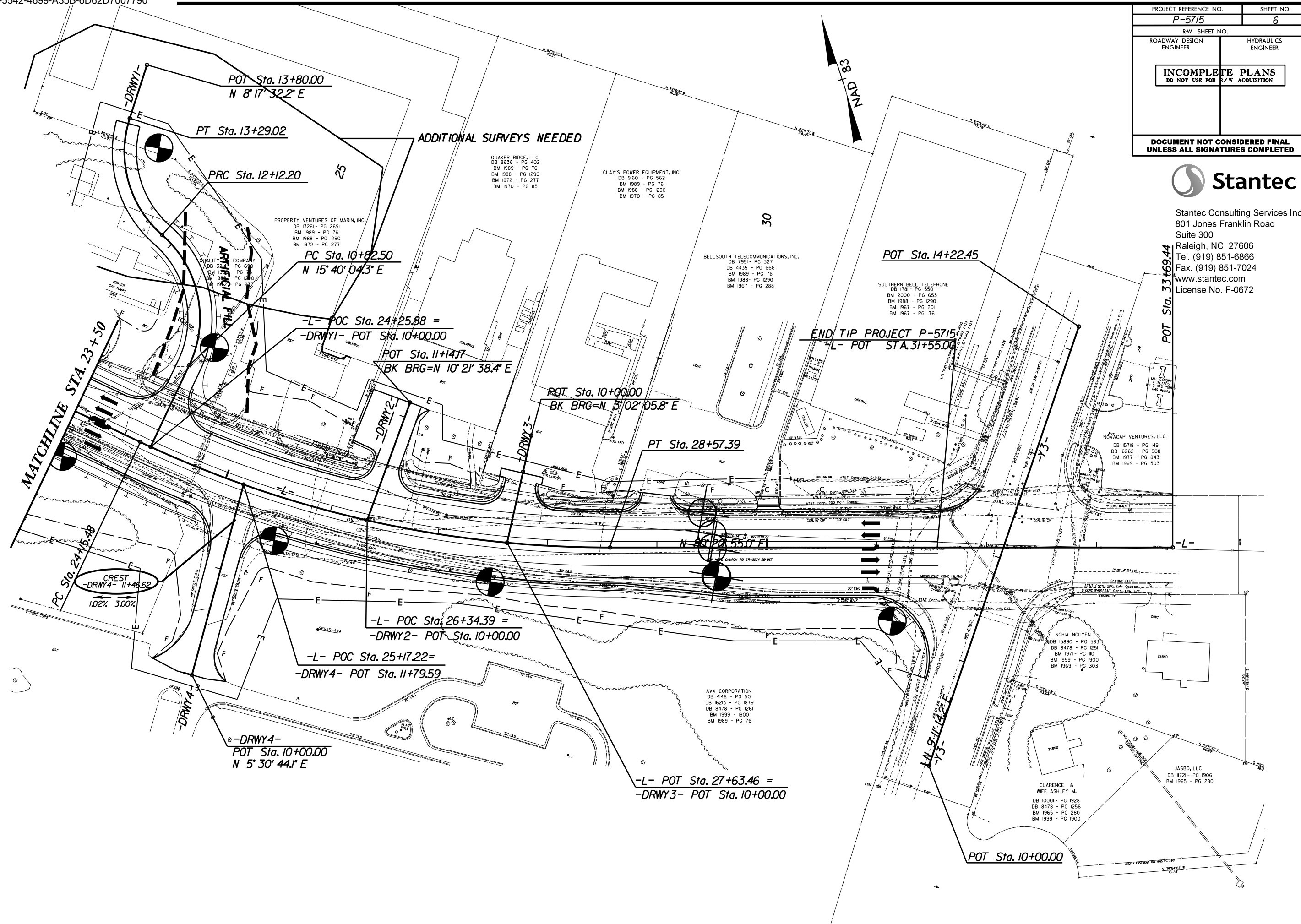


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INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION	
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8/17/19



PROJECT REFERENCE NO.	SHEET NO.
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www.stantec.com
License No. F-0672

POT Sta. 33+69.44

NOVACAP VENTURES, LLC
DB 1578 - PG 149
DB 16262 - PG 508
BM 1977 - PG 843
BM 1969 - PG 303

NGHIA NGUYEN
DB 1590 - PG 583
DB 8478 - PG 1251
BM 1971 - PG 110
BM 1999 - PG 1900
BM 1969 - PG 303

CLARENCE & WIFE ASHLEY M.
DB 10001 - PG 1928
DB 8478 - PG 1256
BM 1965 - PG 280
BM 1999 - PG 1900

JASBO, LLC
DB 11721 - PG 1906
BM 1965 - PG 280

AVX CORPORATION
DB 4146 - PG 501
DB 16213 - PG 1879
DB 8478 - PG 1261
BM 1999 - 1900
BM 1989 - PG 76

CLAY'S POWER EQUIPMENT, INC.
DB 9160 - PG 562
BM 1989 - PG 76
BM 1988 - PG 1290
BM 1970 - PG 85

BELLSOUTH TELECOMMUNICATIONS, INC.
DB 7951 - PG 327
DB 4435 - PG 666
BM 1989 - PG 76
BM 1988 - PG 1290
BM 1967 - PG 288

PROPERTY VENTURES OF MARIN, INC.
DB 13261 - PG 269
BM 1989 - PG 76
BM 1988 - PG 1290
BM 1972 - PG 277

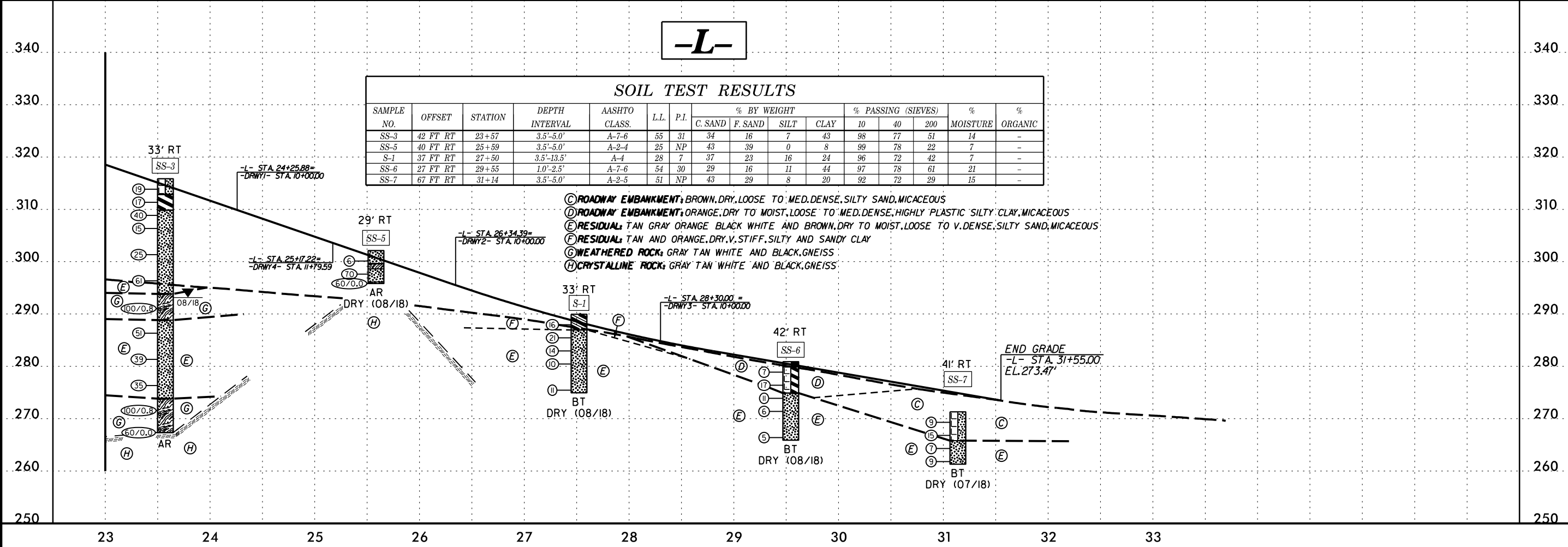
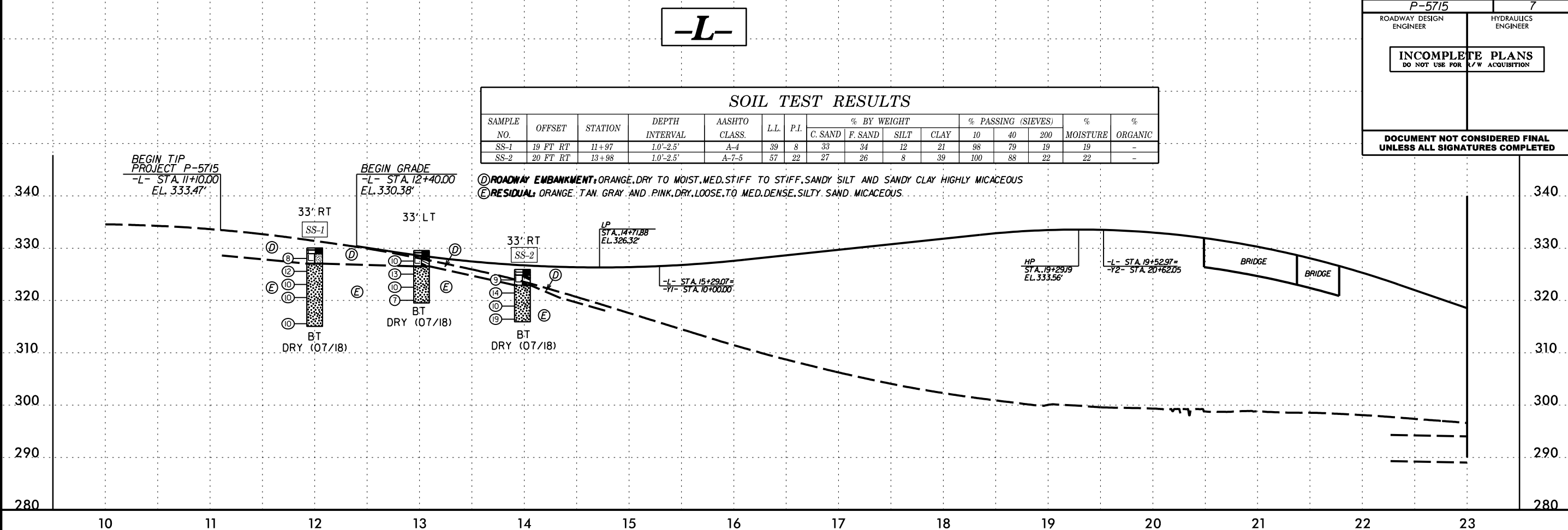
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BM 1970 - PG 85

QUALITY COMPANY
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BM 1989 - PG 76
BM 1988 - PG 1290
BM 1972 - PG 277

SOUTHERN BELL TELEPHONE
DB 1781 - PG 550
BM 2000 - PG 653
BM 1988 - PG 1290
BM 1967 - PG 201
BM 1967 - PG 176

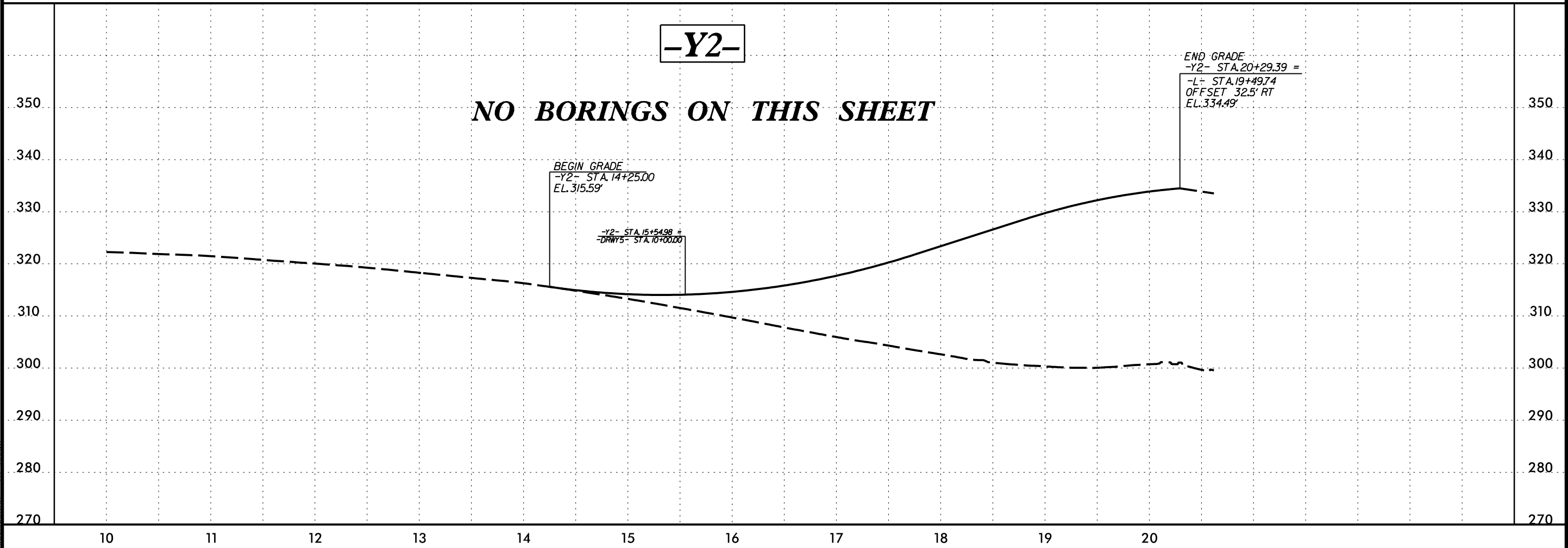
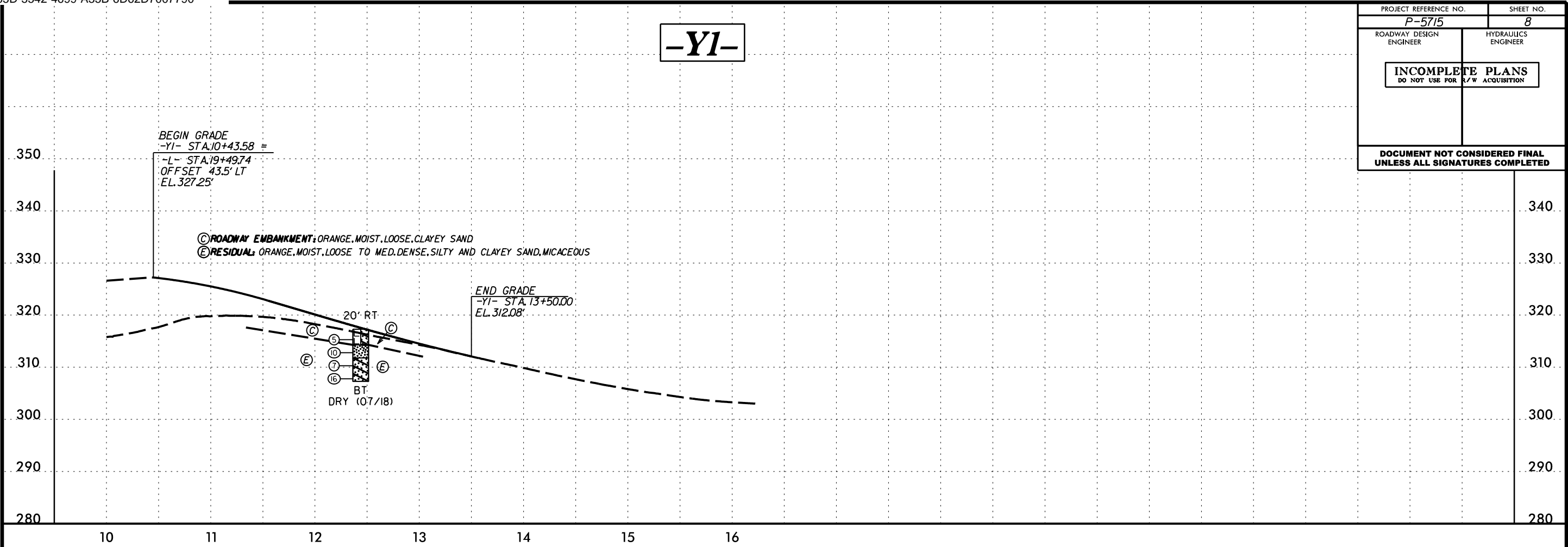
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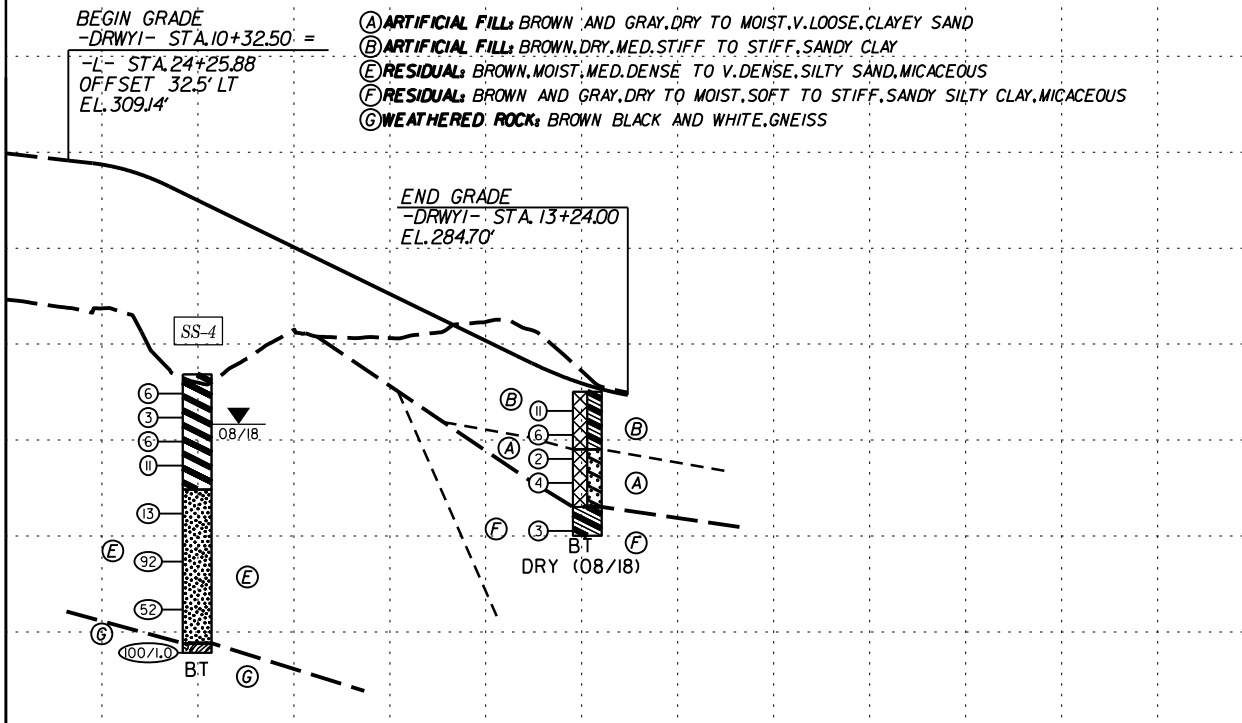


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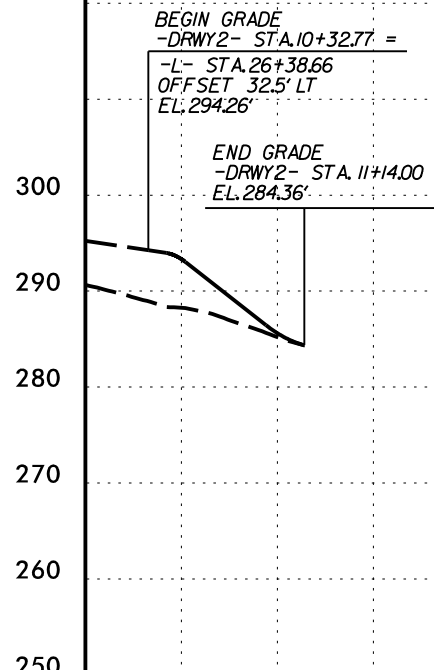
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-4	16 FT RT	11+03	6.0'-7.5'	A-7-6	43	23	32	20	9	39	96	77	49	20	-



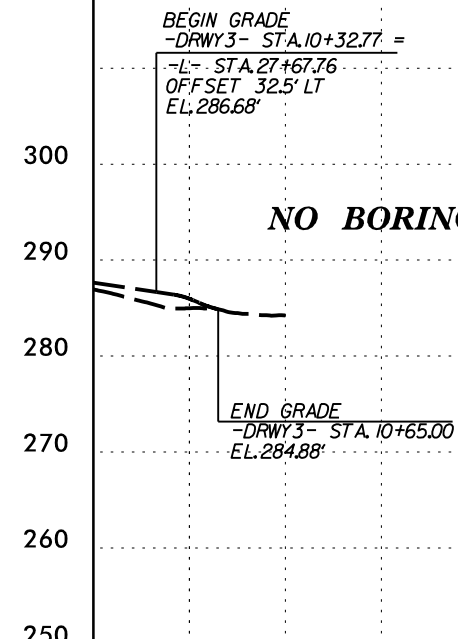
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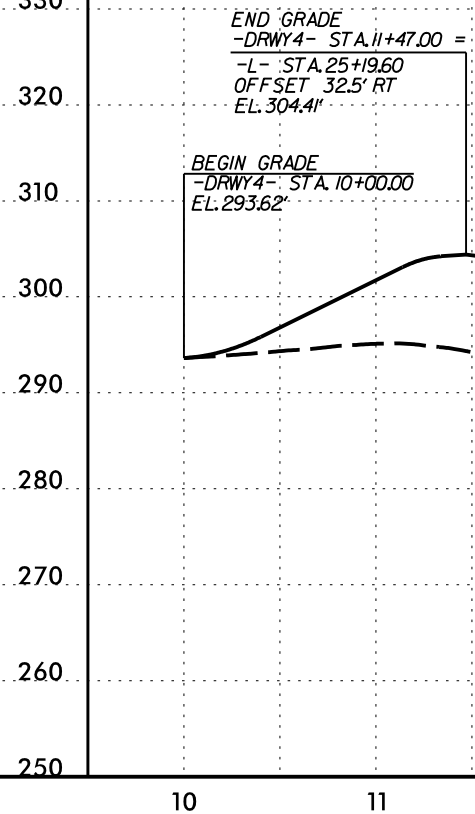
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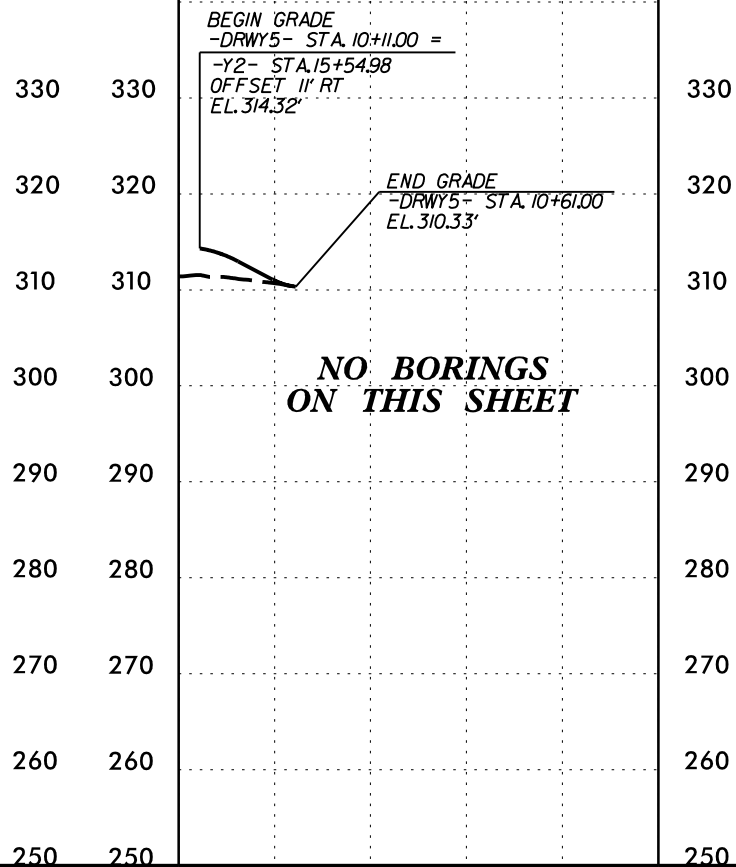
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NO BORINGS ON THIS SHEET



PROJECT REFERENCE NO. P-5715	SHEET NO. 9
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INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

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

SUBSURFACE INVESTIGATION

*APPENDIX A
PAVEMENT INVESTIGATION*

REFERENCE: P-5715

PROJECT: 46927

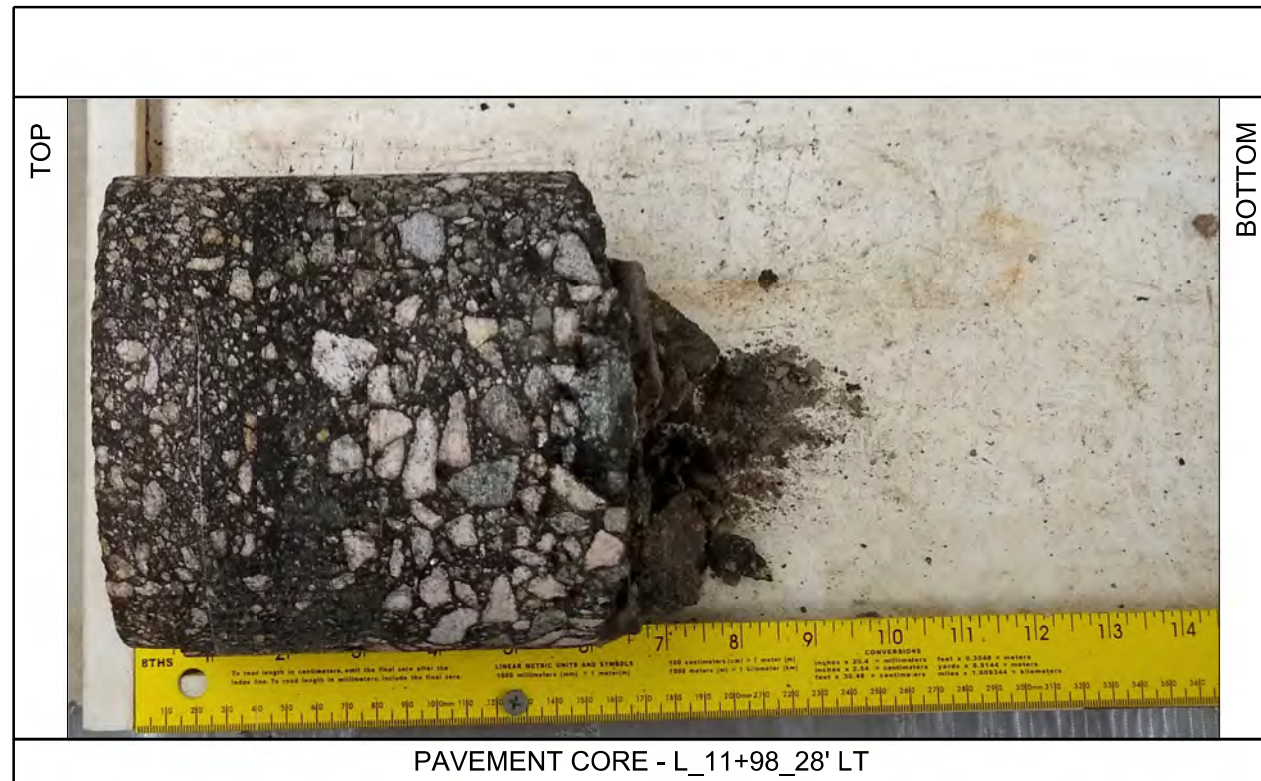
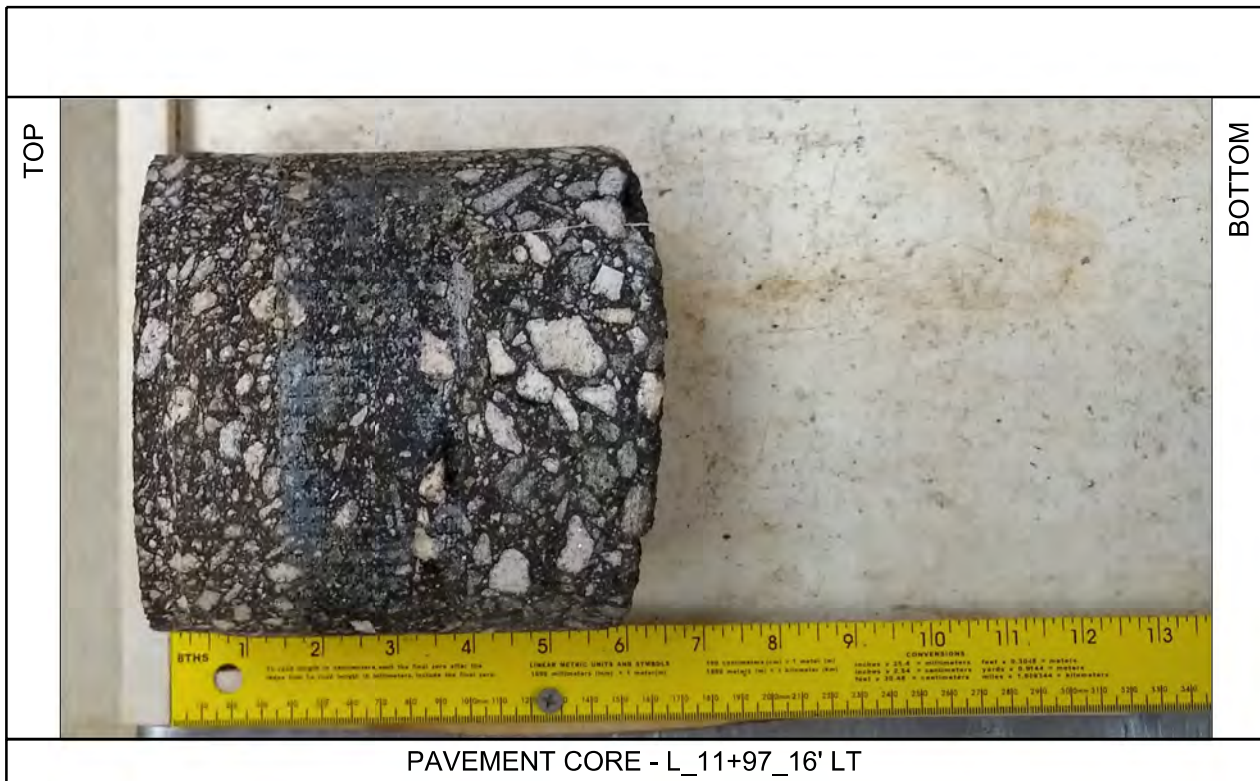
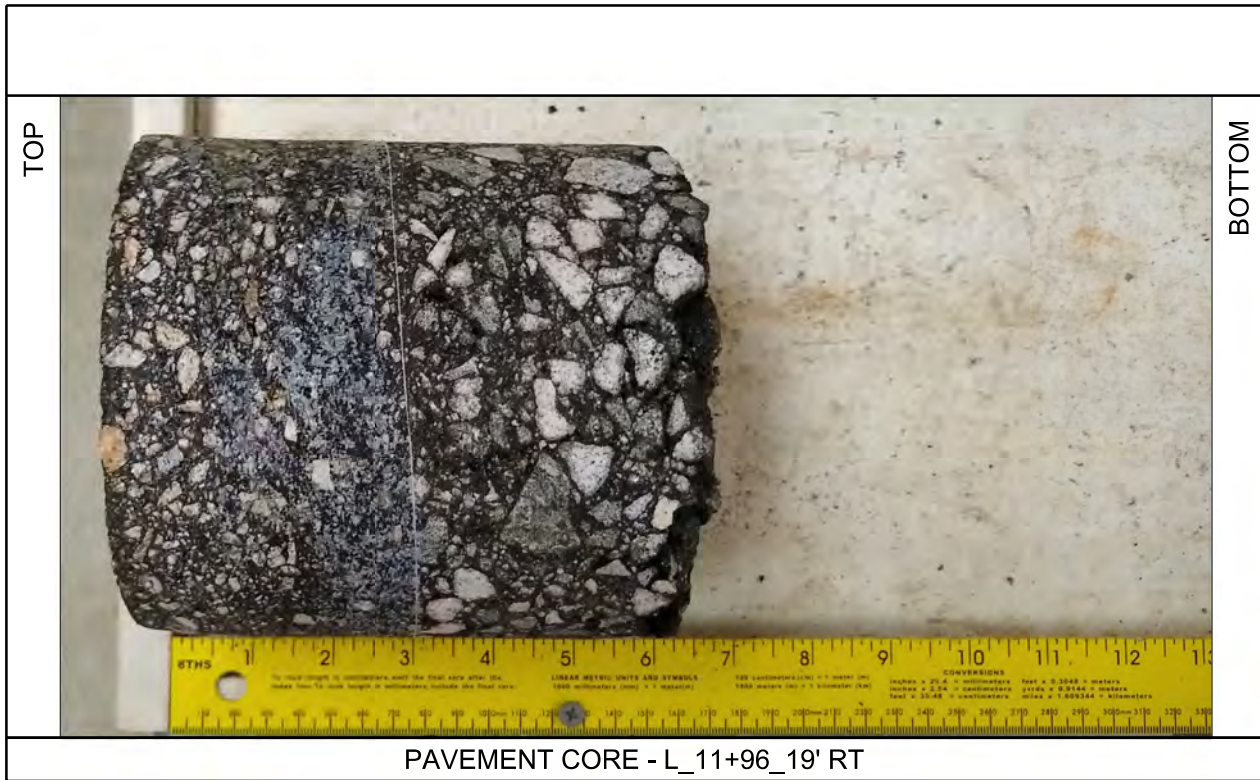
Falcon Engineering, Inc.

1210 Trinity Road, Suite 110 Cary, NC 27513

PAVEMENT SECTION AND SUBGRADE CONDITION SUMMARY**NEW HOPE CHURCH ROAD GRADE SEPARATION****WAKE COUNTY, NORTH CAROLINA****TIP No.: P-5715 WBS No.46927.1.FS1 Falcon Project No.: G17062.00**

TEST LOCATION				PAVEMENT SECTION THICKNESS (INCHES)			SUBGRADE	NOTES
ALIGNMENT	LANE	STATION	OFFSET	HMA	AGGREGATE BASE	TOTAL	IN-SITU CBR	
-L-	EB, OTL	11+96	19' RT	6.00	7.00	13.00	>20	Multiple Layers
-L-	EB, ISL	11+96	5' RT	6.00	6.00	12.00	>20	Multiple Layers, delamination at 1 inch
-L-	WB, ISL	11+97	16' LT	6.00	8.00	14.00	>20	Multiple Layers
-L-	WB, OSL	11+98	28' LT	6.00	6.00	12.00	19	Multiple Layers, base course crumbling
-L-	WB, OSL	29+41	32' LT	8.00	7.00	15.00	7	Multiple Layers
-L-	WB, ISL	29+50	12' LT	14.00	10.00	24.00	>20	Multiple Layers, delamination at 14 inches
-L-	EB, ISL	29+50	1' RT	18.00	5.00	23.00	15	Multiple Layers, delamination at 15 inches
-L-	EB, OTL	29+53	26' RT	6.00	6.00	12.00	8	Multiple Layers
-Y1-	SB	12+44	10' RT	3.00	4.00	7.00	5	-
-Y2-	NB	16+17	3' LT	8.00	7.00	15.00	8	-
REPRESENTATIVE AVERAGE				8.3	6.9	15	10	-

LEGEND: NB - NORTHBOUND, SB - SOUTHBOUND, EB - EASTBOUND, WB - WESTBOUND, OSL - OUTSIDE LANE, ISL - INSIDE LANE, CTL - CENTRAL TURN LANE



FALCON ENGINEERING, INC.
 1210 TRINITY ROAD, SUITE 110
 CARY, NC 27513
 PHONE: 919.871.0800
 FAX: 919.871.0803

PAVEMENT CORE PHOTOGRAPHS

NEW HOPE CHURCH ROAD GRADE SEPARATION
 WAKE COUNTY, NORTH CAROLINA
 WBS NO.:46927.1.1 | TIP NO.:P-5715
 FALCON PROJECT NO.: G17062.00



PAVEMENT CORE - L_29+41_32' LT



PAVEMENT CORE - L_29+50_12' LT



PAVEMENT CORE - L_29+50_01' RT



PAVEMENT CORE - L_29+53_26' RT




FALCON ENGINEERING, INC.
 1210 TRINITY ROAD, SUITE 110
 CARY, NC 27513
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 FAX: 919.871.0803

PAVEMENT CORE PHOTOGRAPHS

NEW HOPE CHURCH ROAD GRADE SEPARATION
 WAKE COUNTY, NORTH CAROLINA
 WBS NO.:46927.1.1 | TIP NO.:P-5715
 FALCON PROJECT NO.: G17062.00

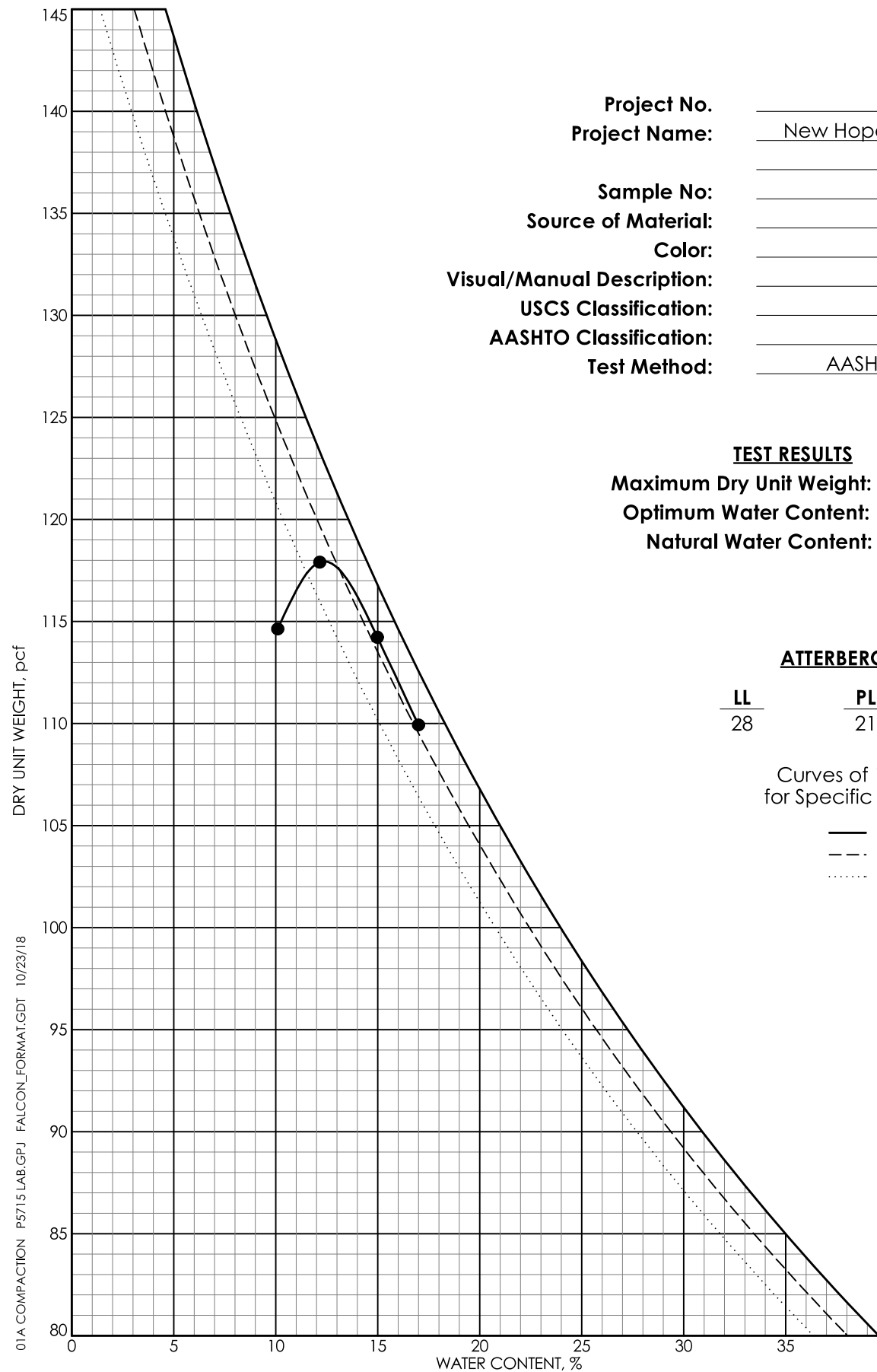


 <p>FALCON ENGINEERING, INC. 1210 TRINITY ROAD, SUITE 110 CARY, NC 27513 PHONE: 919.871.0800 FAX: 919.871.0803</p>	PAVEMENT CORE PHOTOGRAPHS
	<p>NEW HOPE CHURCH ROAD GRADE SEPARATION WAKE COUNTY, NORTH CAROLINA WBS NO.:46927.1.1 TIP NO.:P-5715 FALCON PROJECT NO.: G17062.00</p>

REFERENCE: P-5715

PROJECT: 46927

*NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX B
LABORATORY RESULTS*



Project No: P-5715
 Project Name: New Hope Church Road Grade Separation
 Sample No: BS-2
 Source of Material: B-09
 Color: Tan
 Visual/Manual Description:
 USCS Classification:
 AASHTO Classification:
 Test Method: AASHTO T-99 Method A

TEST RESULTS
 Maximum Dry Unit Weight: 117.9 PCF
 Optimum Water Content: 12.3 %
 Natural Water Content: 6.8 %

ATTERBERG LIMITS

LL	PL	PI
28	21	7

Curves of 100% Saturation for Specific Gravity Equal to:
 — 2.6
 - - - 2.5
 ···· 2.4

FALCON ENGINEERING

1210 TRINITY RD., SUITE 110, Cary, NC 27513

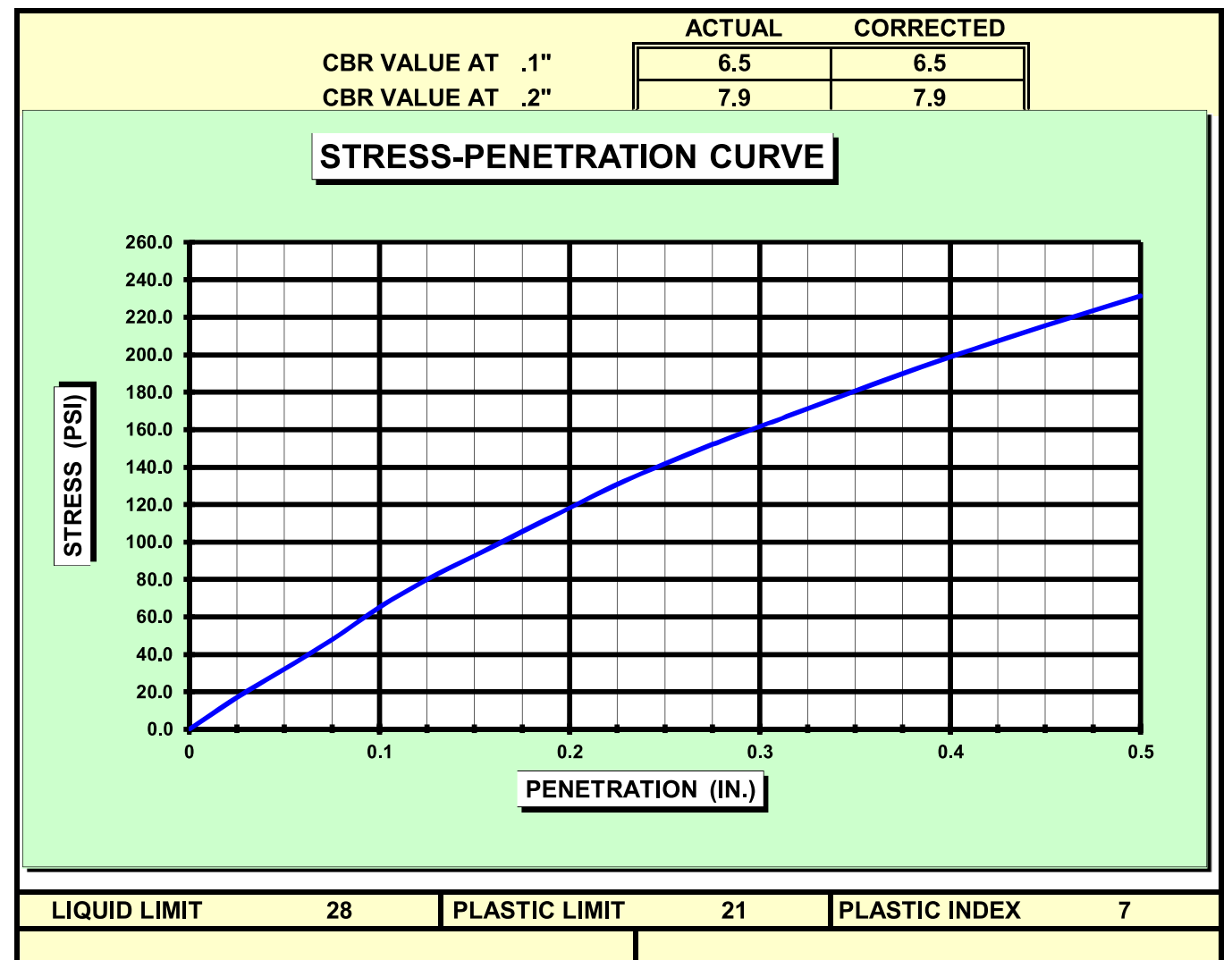
CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T-193

PROJECT #: G17062.00 DATE: 9/16/2018
 PROJECT NAME: New Hope Church Road
 BORING: B-09 SAMPLE: BS-2 DEPTH: 3.5-13.5

SOIL DESCRIPTION: Tan Silt (A-4)

COMPACTION METHOD	AASHTO T-99A	SOAK	96 HRS.
MAXIMUM DRY DENSITY	117.9 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	12.3%	LOAD CELL	6000
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	114.6 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	14.0%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	97.2%	SWELL	0.79%



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TIP PROJECT: P-5715

CONTRACT: 46927

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

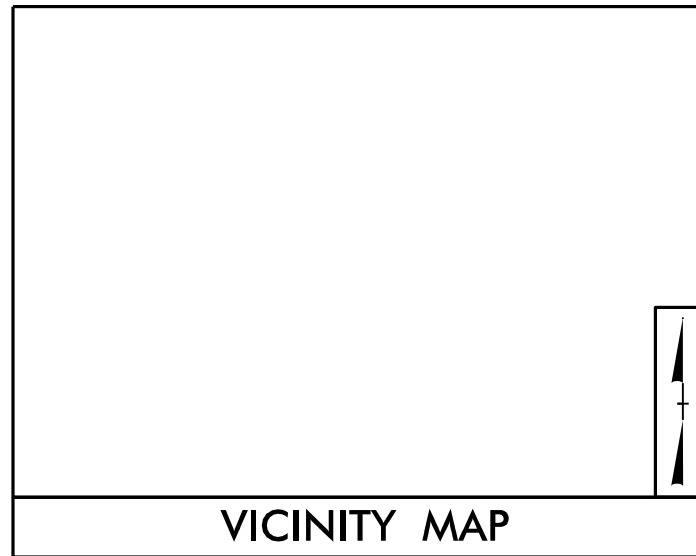
WAKE COUNTY

LOCATION: NEW HOPE CHURCH ROAD GRADE SEPARATION

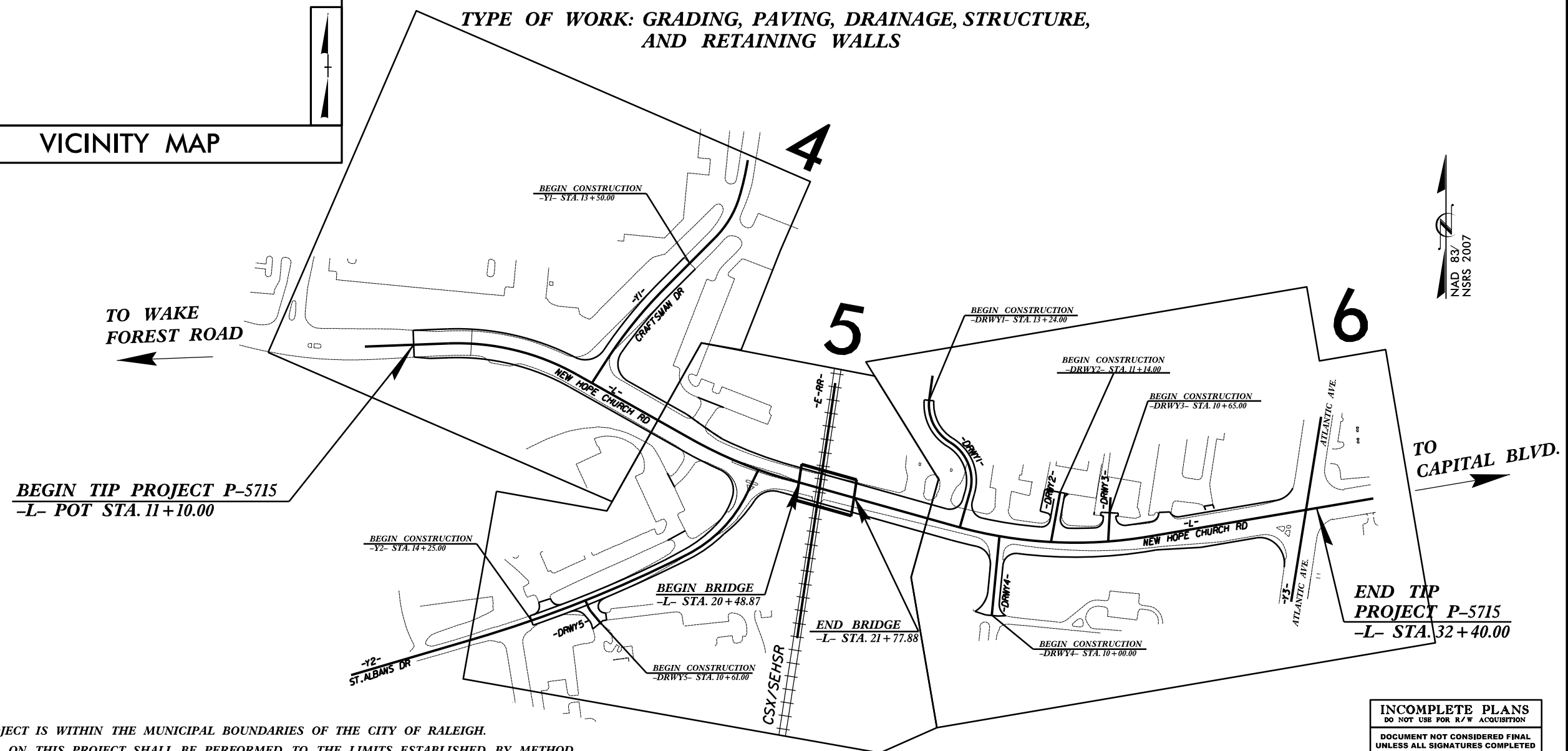
TYPE OF WORK: GRADING, PAVING, DRAINAGE, STRUCTURE,
AND RETAINING WALLS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5715	2A	24
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
47117.1.1	N/A	P.E.	
47117.2.1	N/A	ROW, UTIL.	
47117.3.1	N/A	CONSTR.	

25% PLANS

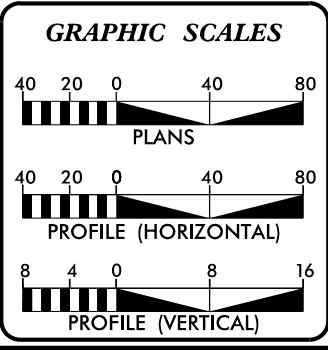


VICINITY MAP



THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF RALEIGH.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD _____

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



DESIGN DATA

ADT 2020 =	23,496
ADT 2040 =	28,800
K =	8%
D =	65%
T =	3%*
V =	35
*TTST	1% DUAL 2%
FUNC CLASS =	MINOR ARTERIAL

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT P-5715 =	0.379 MILES
LENGTH OF STRUCTURES TIP PROJECT P-5715 =	0.024 MILES
TOTAL LENGTH OF TIP PROJECT P-5715 =	0.403 MILES

Prepared In the Office of:

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for the North Carolina Department of Transportation

2018 STANDARD SPECIFICATIONS	STANTEC CONTACT
RIGHT OF WAY DATE: NOVEMBER 20, 2018	STEVE SMALLWOOD, PE PROJECT ENGINEER
LETTING DATE: JUNE 16, 2020	NCDOT CONTACT: KUMAR TRIVEDI, PE

HYDRAULICS ENGINEER

P.E.

SIGNATURE: _____

ROADWAY DESIGN ENGINEER

P.E.

SIGNATURE: _____

