

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-5720	1	25

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

CROCKETT, S.C.

LANE, R. W.

INVESTIGATED BY RWL

DRAWN BY HILL, M. J.

CHECKED BY HUNSBERGER, W. S.

SUBMITTED BY FALCON

DATE FEBRUARY 2019

**ROADWAY  
SUBSURFACE INVESTIGATION**

COUNTY WAKE  
PROJECT DESCRIPTION PROPOSED GRADE-SEPARATION  
OF DURANT ROAD (SR 2006) OVER CSX S LINE  
RAILROAD IN RALEIGH

**INVENTORY**

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	11+00.00 - 47+67.48	4-6	7-8
-Y2-	10+00.00 - 16+67.41	5	9
-Y3-	10+90.00 - 15+72.87	5	9

CROSS SECTIONS

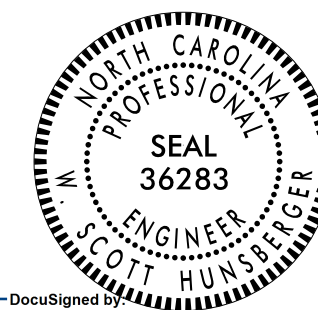
LINE	STATION	SHEETS
-L-	13+00.00 - 18+50.00	10-12

APPENDIX

APPENDIX	TITLES	SHEETS
A	PAVEMENT INVESTIGATION RESULTS	13-23
B	LABORATORY RESULTS	24-25

REFERENCE: P-5720

PROJECT: 46932



DocuSigned by:  
W. Scott Hunsberger

2/5/2019 10:00:00 AM EST

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

Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. Includes sub-sections like SOIL LEGEND AND AASHTO CLASSIFICATION, CONSISTENCY OR DENSENESS, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, and INDURATION.

09/28/17

TIP PROJECT: P-5720

TIP PROJECT: P-5720

CONTRACT: 46932

STATE OF NORTH CAROLINA  
RAIL DIVISION

**WAKE COUNTY**

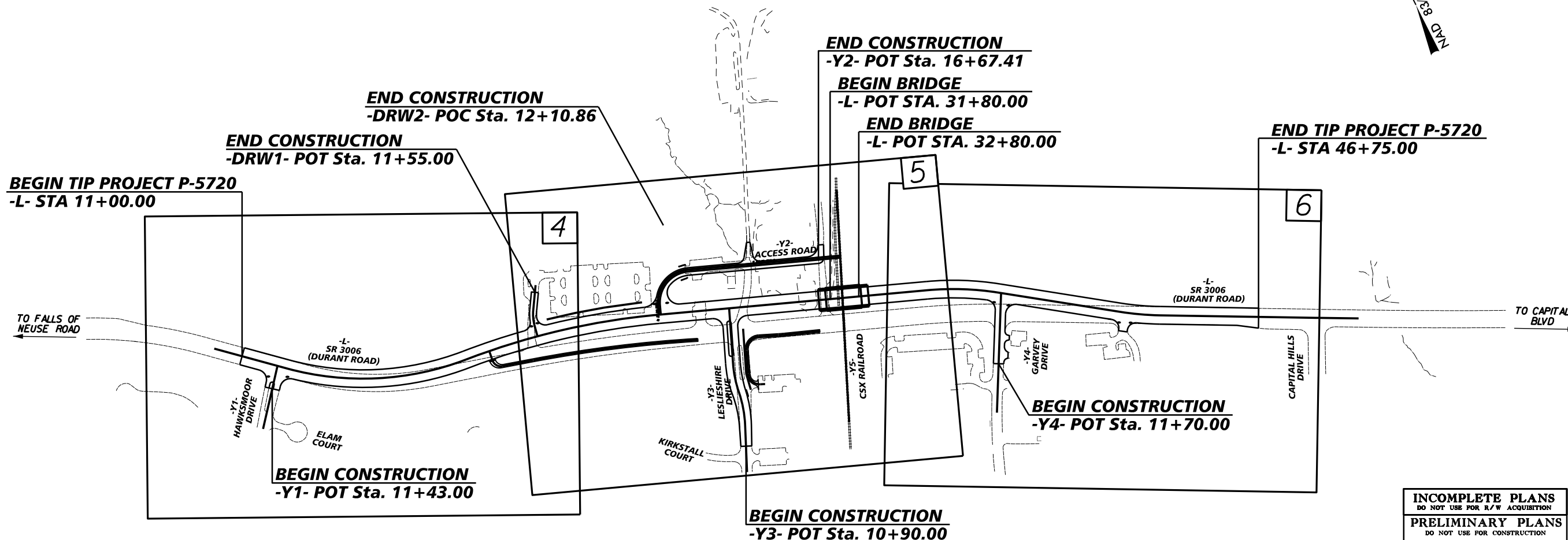
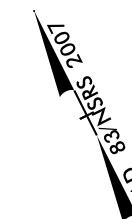
LOCATION: PROPOSED GRADE-SEPARATION OF DURANT ROAD (SR 2006)  
OVER CSX S LINE RAILROAD IN RALEIGH

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5720	3	25
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
46932.1.1		PE	

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

25% APPROVED PLANS



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

SUBMITTAL:  
DATE: September 26, 2017

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ?

<p><b>GRAPHIC SCALES</b></p> <p>50 25 0 50 100 PLANS</p> <p>50 25 0 50 100 PROFILE (HORIZONTAL)</p> <p>10 5 0 10 20 PROFILE (VERTICAL)</p>	<p><b>DESIGN DATA</b></p> <p>ADT 2019 = 21,000 ADT 2040 = 31,100 K = 8% D = 55% T = 3%* V = 50 MPH</p> <p>CLASSIFICATION: URBAN COLLECTOR</p> <p>* 1% TTST 2% DUAL SUBREGIONAL TIER</p>	<p><b>PROJECT LENGTH</b></p> <p>LENGTH ROADWAY TIP PROJECT P-5720 = 0.658 MILES LENGTH STRUCTURE TIP PROJECT P-5720 = 0.019 MILES TOTAL LENGTH TIP PROJECT P-5720 = 0.677 MILES</p>	<p>Prepared In the Office of:</p> <p><b>Kimley»Horn</b></p> <p>2018 STANDARD SPECIFICATIONS</p> <p>RIGHT OF WAY DATE: MARCH 15, 2018</p> <p>LETTING DATE: MARCH 19, 2019</p> <p>GREGORY BREW, P.E. PROJECT ENGINEER</p> <p>RACHEL ABROMAITIS, P.E. PROJECT DESIGN ENGINEER</p> <p>KUMAR TRIVEDI, P.E. PROJECT MANAGER NCDOT RAIL DIVISION</p>	<p>HYDRAULICS ENGINEER</p> <p>_____ SIGNATURE: P.E.</p> <p>ROADWAY DESIGN ENGINEER</p> <p>_____ SIGNATURE: P.E.</p>	<p>NC DEPARTMENT OF TRANSPORTATION <b>RAIL DIVISION</b> ENGINEERING COORDINATION AND SAFETY</p>
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\$DATE\$



**WBS:** 46932.1.1  
**TIP:** P-5720  
**COUNTY:** Wake  
**DESCRIPTION:** Proposed Grade Separation of Durant Road (SR 2006)  
 Over CSX S Line Railroad in Raleigh  
**SUBJECT:** Roadway Subsurface Investigation – Inventory

## Roadway Subsurface Investigation Report - Inventory

**Proposed Grade – Separation of Durant Road (SR 2006)**  
**Over CSX S Line Railroad in Raleigh**  
**Wake County, North Carolina**  
**WBS: 46932.1.1 TIP: P-5720**  
**Falcon Project No.: G17058.00**

**Prepared for:**

Kimley-Horn and Associates  
 421 Fayetteville Street, Suite 600  
 Raleigh, NC 27601

Submitted by:

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

February 5, 2019

## PROJECT DESCRIPTION

This project consists of constructing a new grade separation on Durant Road over the CSX S line railroad in Wake County. The current at grade crossing will be replaced with a bridge just north of the current crossing. Durant Road will be shifted north to allow the current crossing to remain in place during construction. In addition to the roadway realignment, a bridge structure and multiple retaining walls will be constructed. Investigations for structures will be provided under separate cover.

The investigation was conducted between November 27<sup>th</sup>, 2017 and December 14<sup>th</sup>, 2017 in general accordance with our Proposal to Provide Geotechnical Engineering Services, dated August 24<sup>th</sup>, 2017.

A total of thirteen (13) Standard Penetration Test (SPT) borings and six (6) hand auger borings were performed for the proposed roadway alignments. All mechanical borings were drilled using a CME 550 ATV mounted drill 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, one (1) bulk sample was collected for standard Proctor compaction and California Bearing Ratio (CBR) testing. Twelve (12) locations along the existing roadway were cored, measured and Dual Mass Dynamic Cone Penetrometer (DCP) testing completed to correlate in-situ CBR values for the existing subgrade to depths of up to three feet below subgrade. 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 0.91 miles were investigated.

<u>Alignment</u>	<u>Station (ft)</u>
-L- (Durant Road)	11+00 to 46+75
-Y2- (Access Road)	10+00 to 16+67.41
-Y3- (Leslieshire Drive)	10+00 to 15+72.87

## AREAS OF SPECIAL GEOTECHNICAL INTEREST

- A. The following locations contain highly plastic soils with plasticity indices (PI) greater than 25 within 3 feet of proposed subgrade elevations:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	13+50 to 18+00
-L-	42+00 to 44+00

- B. The following locations contain very soft to soft/very loose soils with an N-value less than 4 near the ground surface:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	20+00 to 23+00
-L-	28+00 to 30+00

- C. Alluvial soils were not encountered at the locations explored. Isolated alluvial soils may exist elsewhere on the site between borings in proximity to natural waterways and/or constructed drainage features.

- D. Two retaining walls are proposed to be constructed along the roadway alignments at the following locations:

	<u>Alignment</u>	<u>Station (ft)</u>
Wall #1	-L-	22+00.04 to 25+29.95, 42.5' LT
Wall #2	-Y3-	12+75, 42.0' RT to 15+00, 43.54' RT

## 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 the CSX S line. The existing corridor is populated with residential (multi-family as well as single family) to the south and commercial and municipal properties to the north. A small stream approaches the alignment from the north and crosses the proposed -Y2- alignment. The proposed alignment shift to the north will cross over landscaped and wooded areas.

## SOIL PROPERTIES

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

Topsoil and rootmat was encountered in grassy, brushy, and wooded areas ranging in thickness from 0.2 to 0.5 feet, typically on the order of 0.3 feet, and consisting of sandy clay.

Roadway Embankment soils were encountered beneath and adjacent to existing roadways. These soils consist of up to 8.5 feet of dry to moist, very loose to medium dense, silty and clayey sand (A-2-4, A-2-6) and soft to very stiff, silty and sandy clay (A-6, A-7).

Residual soils were encountered consisting of dry to saturated, loose to medium dense, clayey and silty sand (A-2-4, A-2-6) and medium stiff to hard, sandy silt, and silty and sandy clays (A-4, A-6, A-7).

## 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 were backfilled immediately after completion due to safety considerations. Groundwater was encountered in borings at depths of 22.8 ft to 24.7 ft, corresponding to elevations ranging from 252.7 ft to 273.3 ft.



Detailed groundwater measurements are included in the attached subsurface profiles and cross sections.

## ADDITIONAL LABORATORY TESTING

The following bulk sample was obtained:

<u>Sample</u>	<u>Location</u>	<u>Location</u>	<u>Test</u>
BS-1	39+00, 20' LT, -L-	1.0 – 7.0	California Bearing Ratio, Standard Proctor

Classification test results for these samples are included in the subsurface profiles. Standard Proctor and California Bearing Ratio (CBR) data is attached in Appendix A.

### FALCON ENGINEERING, INC.

Report Prepared By:

Report Reviewed By:

A handwritten signature in blue ink, appearing to read "W. Scott Hunsberger".

W. Scott Hunsberger, PE  
*Geotechnical Engineer*

A handwritten signature in blue ink, appearing to read "Jeremy R. Hamm".

Jeremy R. Hamm, PE  
*Geotechnical Engineering Manager*



PROJECT REFERENCE NO. <i>P-5720</i>	SHEET NO. 4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	

<b>-L-</b>	<b>-DRWI-</b>
PI Sta 15+89.00 Δ = 36° 14' 39.9" (LT) D = 5' 43' 46.5" L = 632.58' T = 327.28' R = 1,000.00' SE = 0.04	PI Sta 22+40.96 Δ = 15° 47' 19.4" (RT) D = 2' 17' 30.6" L = 688.91' T = 346.65' R = 2,500.00' SE = 0.03
	PI Sta 10+66.76 Δ = 20° 22' 45.8" (RT) D = 38' 11' 49.9" L = 53.35' T = 26.96' R = 150.00'

DB 8529 - PG 944  
BM 1976 - PG 28  
BM 2000 - PG 2010  
BM 2014 - PG 1348

DB 14386 - PG 2347  
BM 2013 - PG 204  
BM 1982 - PG 677  
BM 2000 - PG 2012

**-DRWI- POT Sta. 11+60.00**  
**END CONSTRUCTION**  
**-DRWI- POT Sta. 11+58.00**  
 N 32° 08' 24.5" E  
**-DRWI- PT Sta. 10+93.15**  
**-DRWI- PC Sta. 10+39.79**  
 N 11° 45' 38.7" E  
**-L- POC Sta. 21+55.00**  
**-DRWI- POT Sta. 10+00.00**

**-L- PRC Sta. 18+94.31**

**BEGIN TIP PROJECT P-5720**  
**-L- POT Sta. 11+00.00**

**-L- POT Sta. 12+27.38 =**  
**-Y1- POT Sta. 12+24.40**

**-L- POT Sta. 10+00.00**

**BEGIN CONSTRUCTION**  
**-Y1- POT Sta. 11+43.00**

**-L- POT Sta. 10+00.00**

DB 13957 - PG 764  
BM 1992 - PG 204

MATCHLINE -L- STA 22+00.00  
SEE PLAN SHEET 5

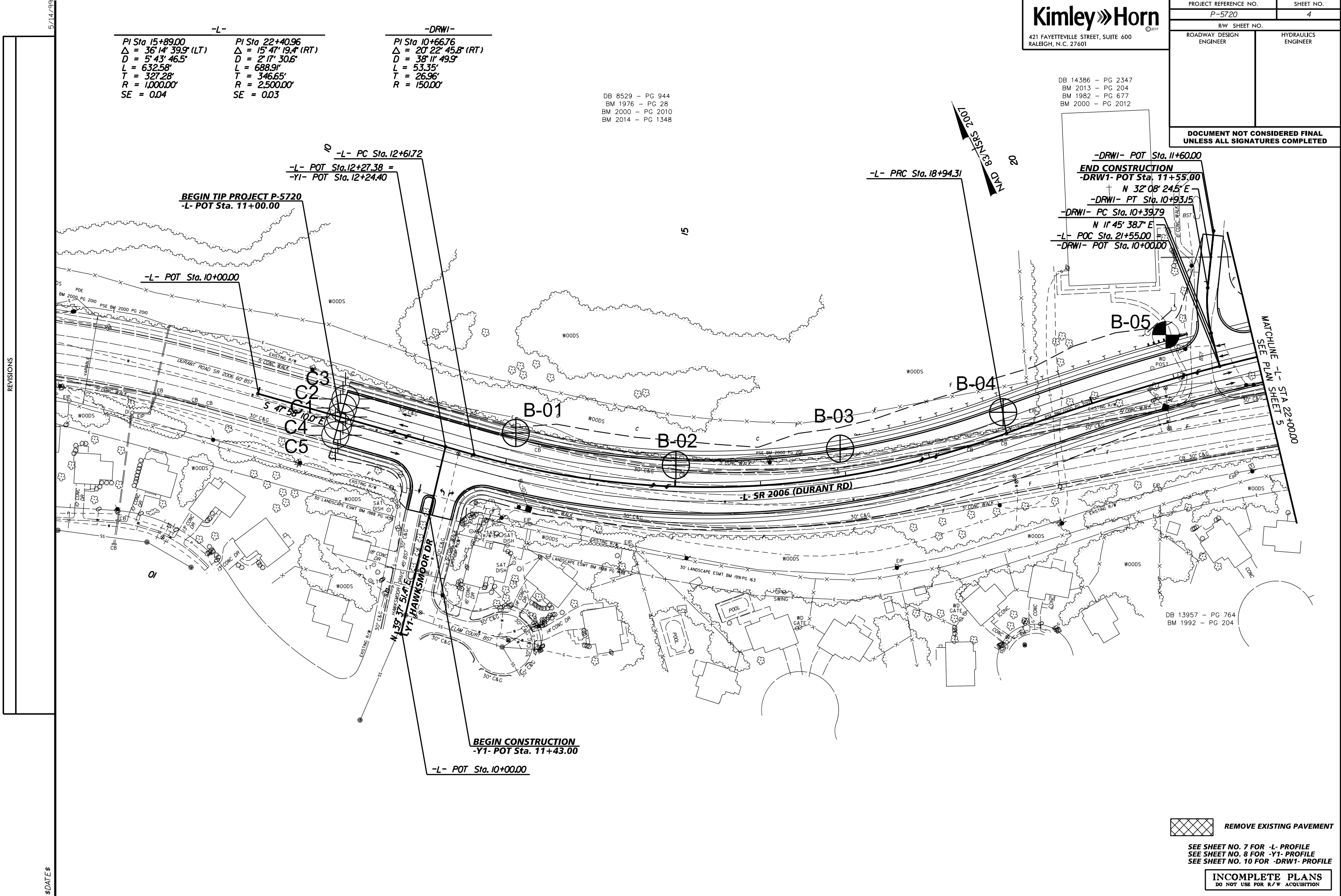
REVISIONS

\$DATE\$

 REMOVE EXISTING PAVEMENT

SEE SHEET NO. 7 FOR -L- PROFILE  
SEE SHEET NO. 8 FOR -Y1- PROFILE  
SEE SHEET NO. 10 FOR -DRWI- PROFILE

**INCOMPLETE PLANS**  
DO NOT USE FOR R/W ACQUISITION



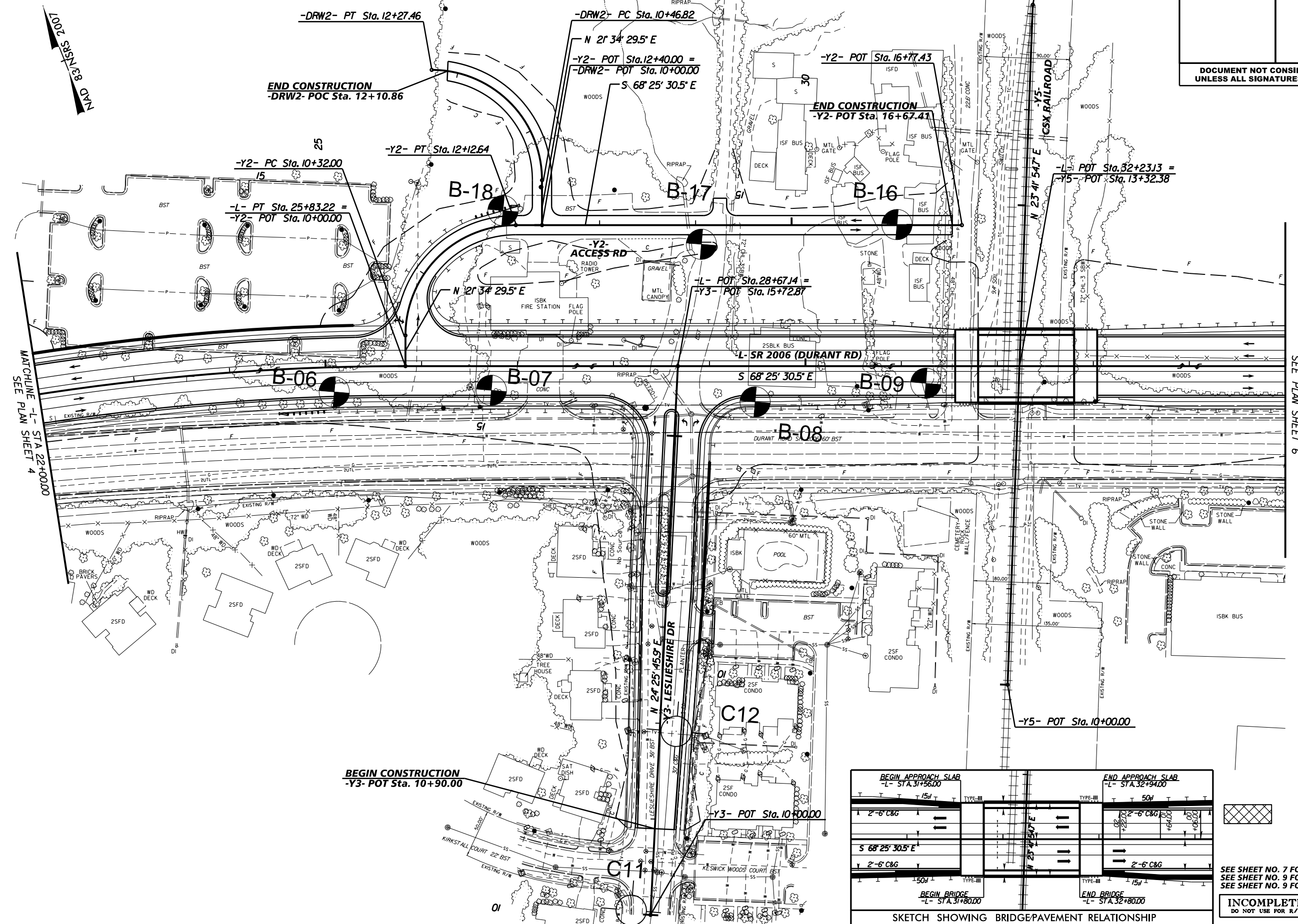
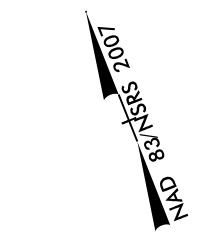
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# Kimley»Horn

421 FAYETTEVILLE STREET, SUITE 600  
RALEIGH, N.C. 27601

PROJECT REFERENCE NO. <i>P-5720</i>	SHEET NO. 5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

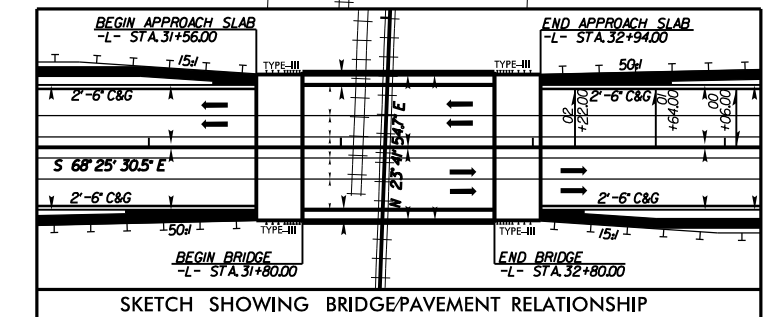
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED



REVISIONS

MATCHLINE -L- STA 22+00.00  
SEE PLAN SHEET 4

MATCHLINE -L- STA 35+00.00  
SEE PLAN SHEET 6



SEE SHEET NO. 7 FOR -L- PROFILE  
SEE SHEET NO. 9 FOR -Y2- PROFILE  
SEE SHEET NO. 9 FOR -Y3- PROFILE

**INCOMPLETE PLANS**  
DO NOT USE FOR R/W ACQUISITION

\$DATE\$



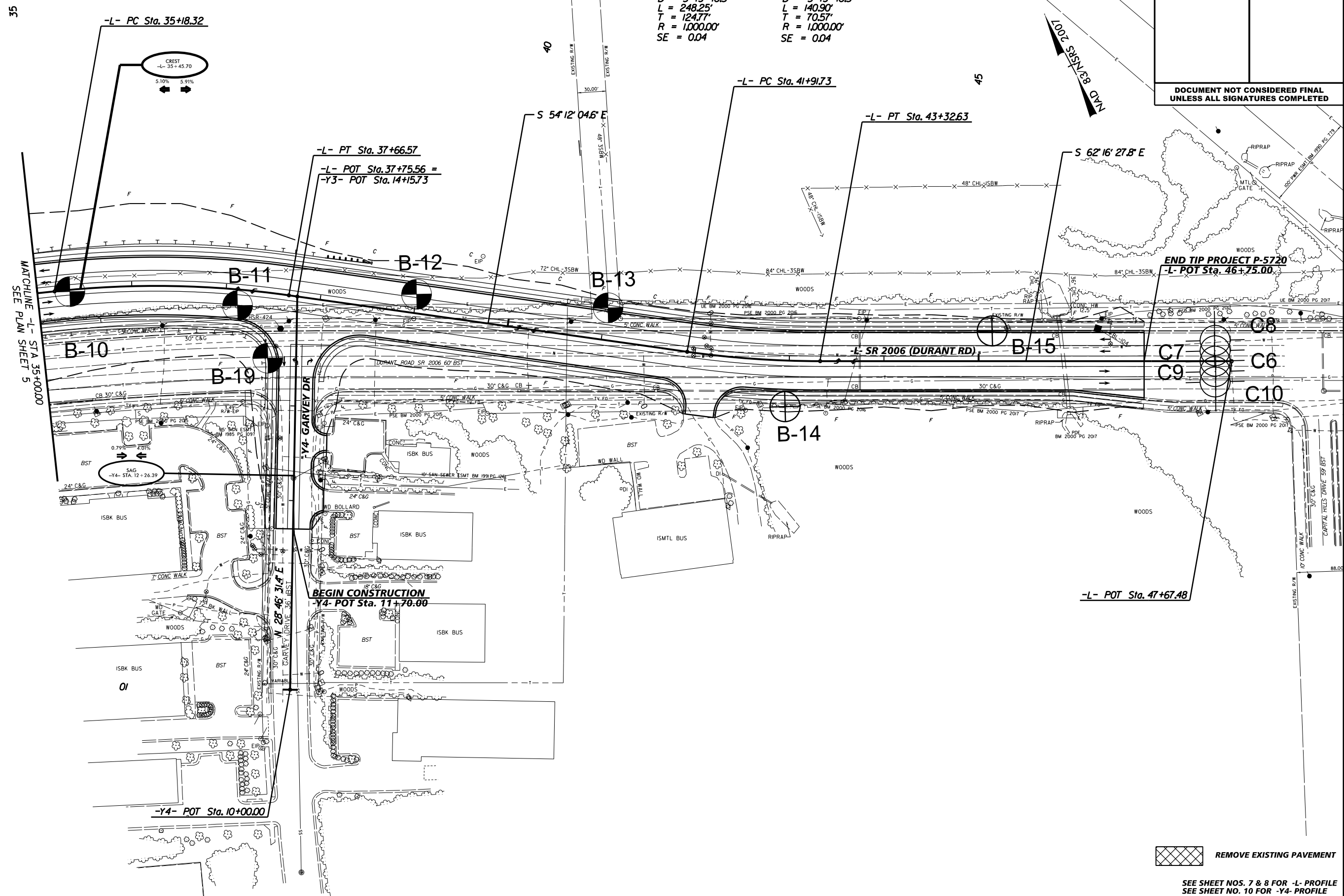
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**Kimley»Horn**  
421 FAYETTEVILLE STREET, SUITE 600  
RALEIGH, N.C. 27601

PROJECT REFERENCE NO. P-5720	SHEET NO. 6
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	

-L-

PI Sta 36+43.09 Δ = 14' 13" 25.9' (RT) D = 5' 43" 46.5" L = 248.25' T = 124.77' R = 1,000.00' SE = 0.04	PI Sta 42+62.30 Δ = 8' 04" 23.2' (LT) D = 5' 43" 46.5" L = 140.90' T = 70.57' R = 1,000.00' SE = 0.04
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MATCHLINE -L- STA 35+00.00  
SEE PLAN SHEET 5

REVISIONS

\$DATE\$

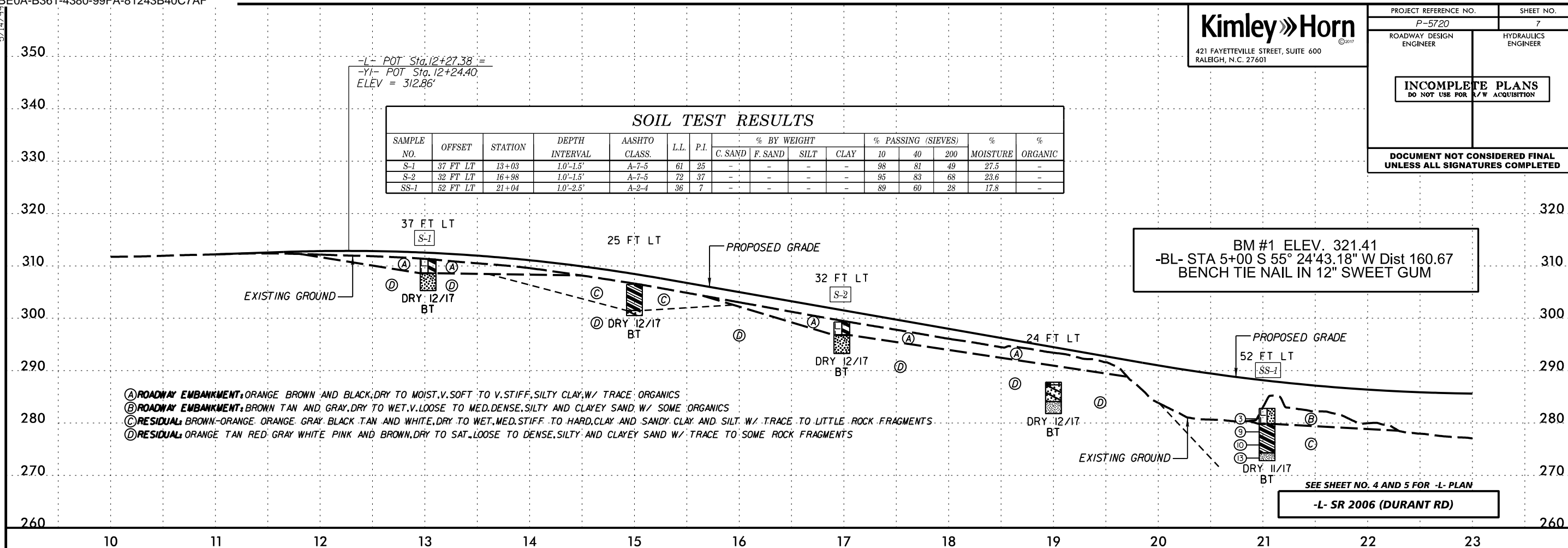
REMOVE EXISTING PAVEMENT

SEE SHEET NOS. 7 & 8 FOR -L- PROFILE  
SEE SHEET NO. 10 FOR -Y4- PROFILE

**INCOMPLETE PLANS**  
DO NOT USE FOR R/W ACQUISITION

**INCOMPLETE PLANS**  
DO NOT USE FOR A/W ACQUISITION

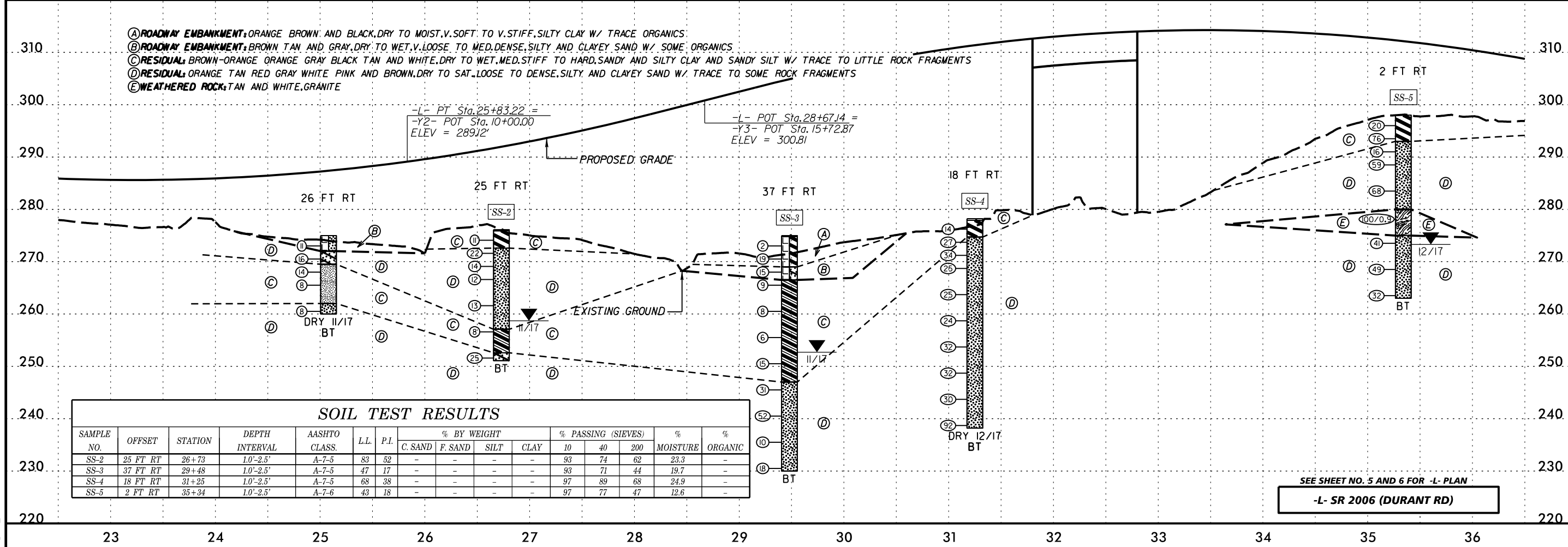
**DOCUMENT NOT CONSIDERED FINAL**  
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**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-1	37 FT LT	13+03	1.0'-1.5'	A-7-5	61	25	-	-	-	-	98	81	49	27.5	-
S-2	32 FT LT	16+98	1.0'-1.5'	A-7-5	72	37	-	-	-	-	95	83	68	23.6	-
SS-1	52 FT LT	21+04	1.0'-2.5'	A-2-4	36	7	-	-	-	-	89	60	28	17.8	-

- (A) ROADWAY EMBANKMENT: ORANGE BROWN AND BLACK, DRY TO MOIST, V. SOFT TO V. STIFF, SILTY CLAY W/ TRACE ORGANICS
- (B) ROADWAY EMBANKMENT: BROWN TAN AND GRAY, DRY TO WET, V. LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND W/ SOME ORGANICS
- (C) RESIDUAL: BROWN-ORANGE, ORANGE GRAY, BLACK TAN AND WHITE, DRY TO WET, MED. STIFF TO HARD, SANDY AND SILTY CLAY AND SANDY SILT W/ TRACE TO LITTLE ROCK FRAGMENTS
- (D) RESIDUAL: ORANGE TAN RED, GRAY WHITE PINK AND BROWN, DRY TO SAT., LOOSE TO DENSE, SILTY AND CLAYEY SAND W/ TRACE TO SOME ROCK FRAGMENTS



**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-2	25 FT RT	26+73	1.0'-2.5'	A-7-5	83	52	-	-	-	-	93	74	62	23.3	-
SS-3	37 FT RT	29+48	1.0'-2.5'	A-7-5	47	17	-	-	-	-	93	71	44	19.7	-
SS-4	18 FT RT	31+25	1.0'-2.5'	A-7-5	68	38	-	-	-	-	97	89	68	24.9	-
SS-5	2 FT RT	35+34	1.0'-2.5'	A-7-6	43	18	-	-	-	-	97	77	47	12.6	-

- (A) ROADWAY EMBANKMENT: ORANGE BROWN AND BLACK, DRY TO MOIST, V. SOFT TO V. STIFF, SILTY CLAY W/ TRACE ORGANICS
- (B) ROADWAY EMBANKMENT: BROWN TAN AND GRAY, DRY TO WET, V. LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND W/ SOME ORGANICS
- (C) RESIDUAL: BROWN-ORANGE, ORANGE GRAY, BLACK TAN AND WHITE, DRY TO WET, MED. STIFF TO HARD, SANDY AND SILTY CLAY AND SANDY SILT W/ TRACE TO LITTLE ROCK FRAGMENTS
- (D) RESIDUAL: ORANGE TAN RED, GRAY WHITE PINK AND BROWN, DRY TO SAT., LOOSE TO DENSE, SILTY AND CLAYEY SAND W/ TRACE TO SOME ROCK FRAGMENTS
- (E) WEATHERED ROCK: TAN AND WHITE, GRANITE

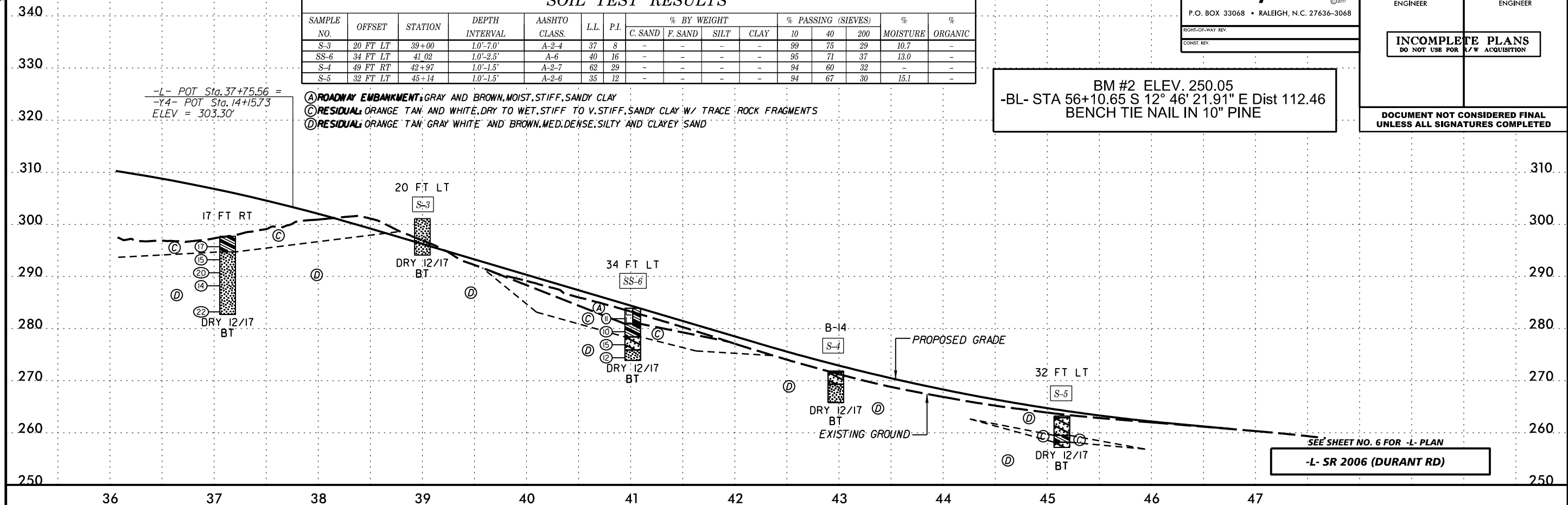
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**Kimley»Horn**  
 P.O. BOX 33068 • RALEIGH, N.C. 27636-3068  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

PROJECT REFERENCE NO. P-5720	SHEET NO. 8
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	

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		
S-3	20 FT LT	39+00	1.0'-7.0'	A-2-4	37	8	-	-	-	-	99	75	29	10.7	-
SS-6	34 FT LT	41.02	1.0'-2.5'	A-6	40	16	-	-	-	-	95	71	37	13.0	-
S-4	49 FT RT	42+97	1.0'-1.5'	A-2-7	62	29	-	-	-	-	94	60	32	-	-
S-5	32 FT LT	45+14	1.0'-1.5'	A-2-6	35	12	-	-	-	-	94	67	30	15.1	-



\$DATE\$

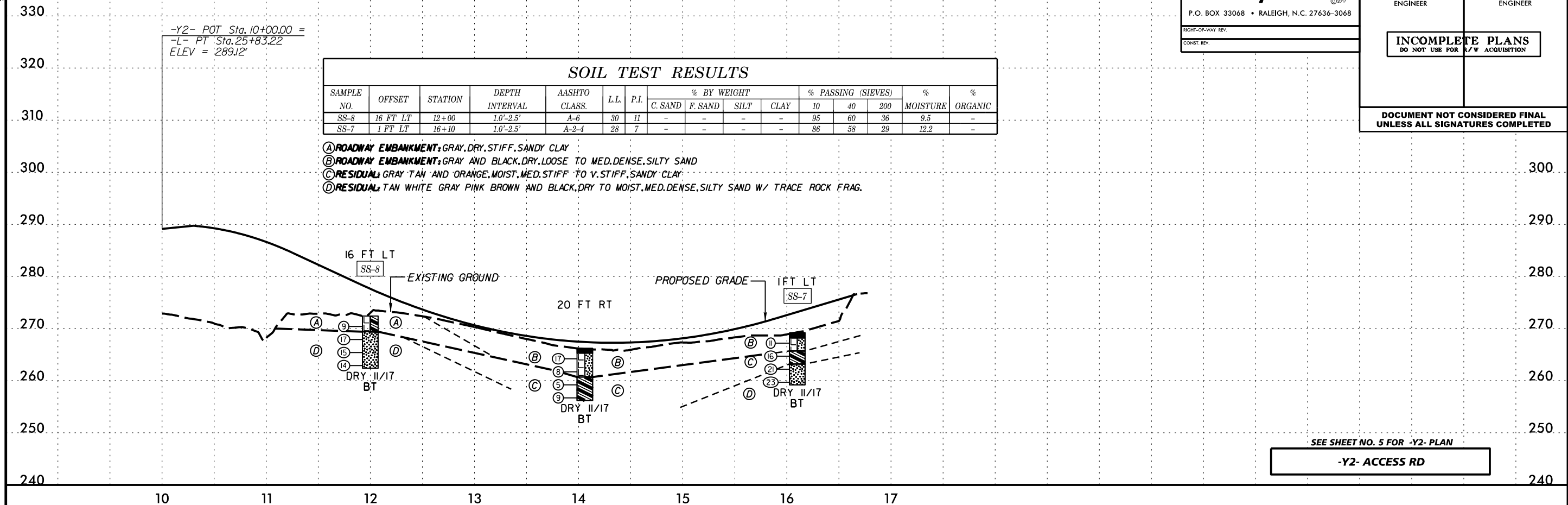
5/14/99

**Kimley»Horn**  
 P.O. BOX 33068 • RALEIGH, N.C. 27636-3068  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

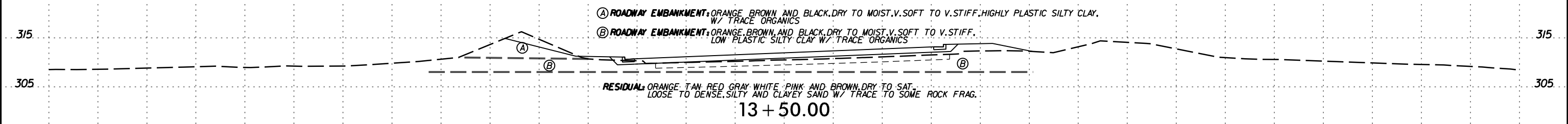
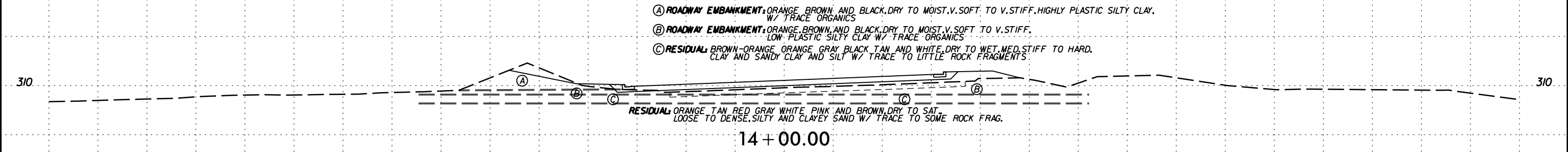
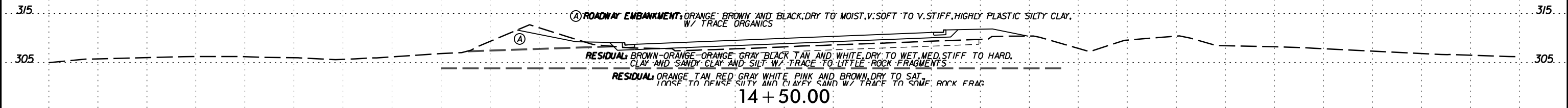
PROJECT REFERENCE NO. P-5720	SHEET NO. 9
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-8	16 FT LT	12+00	1.0'-2.5'	A-6	30	11	-	-	-	-	95	60	36	9.5	-
SS-7	1 FT LT	16+10	1.0'-2.5'	A-2-4	28	7	-	-	-	-	86	58	29	12.2	-

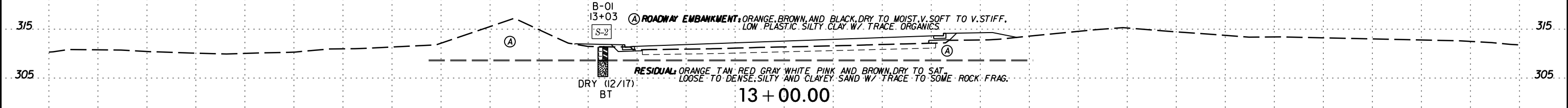
- Ⓐ ROADWAY EMBANKMENT: GRAY, DRY, STIFF, SANDY CLAY
- Ⓑ ROADWAY EMBANKMENT: GRAY AND BLACK, DRY, LOOSE TO MED. DENSE, SILTY SAND
- Ⓒ RESIDUAL: GRAY TAN AND ORANGE, MOIST, MED. STIFF TO V. STIFF, SANDY CLAY
- Ⓓ RESIDUAL: TAN WHITE GRAY PINK BROWN AND BLACK, DRY TO MOIST, MED. DENSE, SILTY SAND W/ TRACE ROCK FRAG.



\$DATE\$



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
S-1	37 FT LT	13+03	1.0'-1.5'	A-7-5	61	25	-	-	-	-	98	81	49	27.5	-

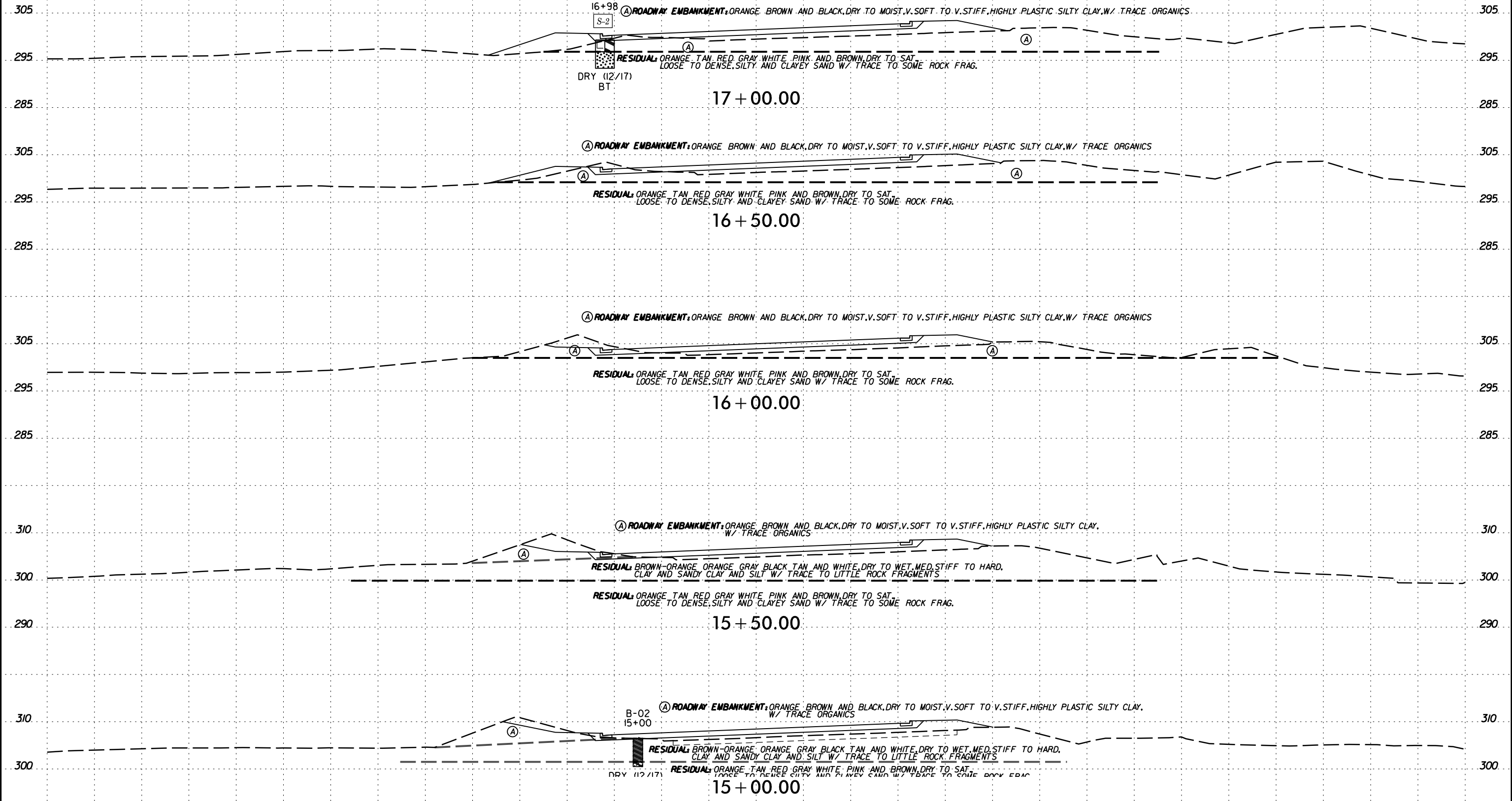


-L- SR 2006 (DURANT ROAD)

8/23/09

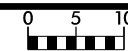
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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		
S-2	32 FT LT	16+98	1.0'-1.5'	A-7-5	72	37	-	-	-	-	-	-	68	23.6	-



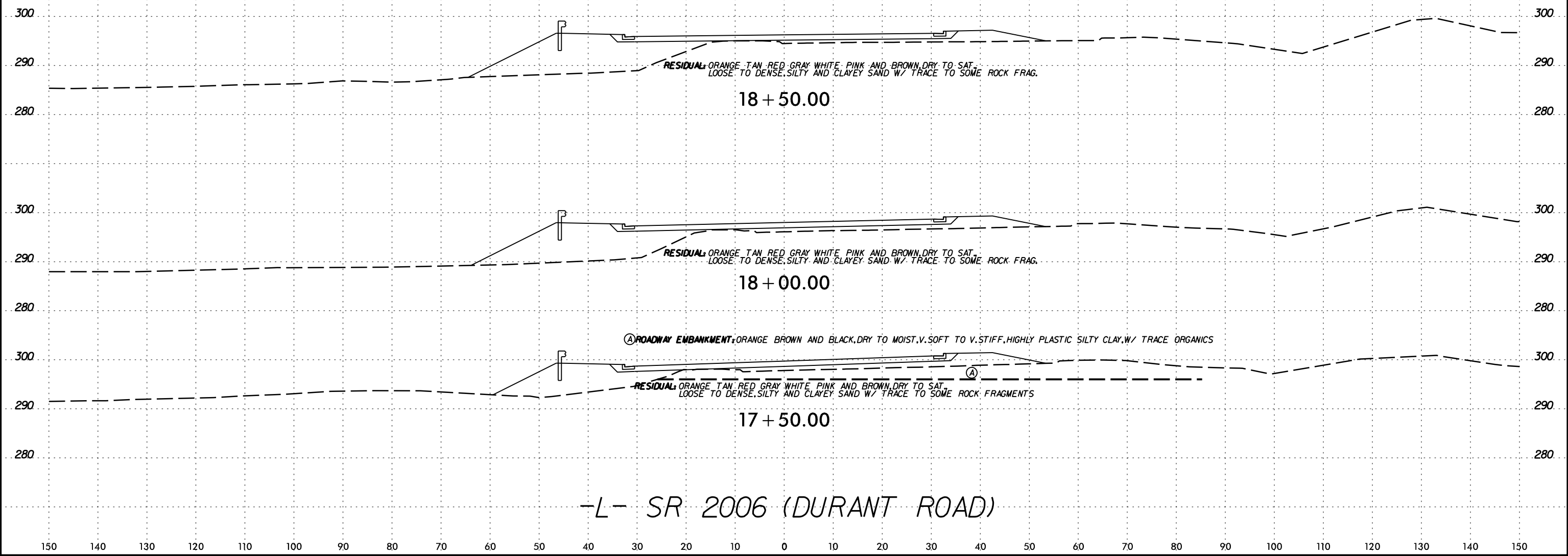
-L- SR 2006 (DURANT ROAD)

8/23/09



8/23/09

SCALE\$



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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

---

***SUBSURFACE INVESTIGATION***

---

*APPENDIX A  
PAVEMENT INVESTIGATION RESULTS*

**REFERENCE: P-5720**

**PROJECT: 46932**

BS  
*WSH*  
2/5/2019  
INITIALS DATE





PAVEMENT CORE C-01



PAVEMENT CORE C-02



PAVEMENT CORE C-03



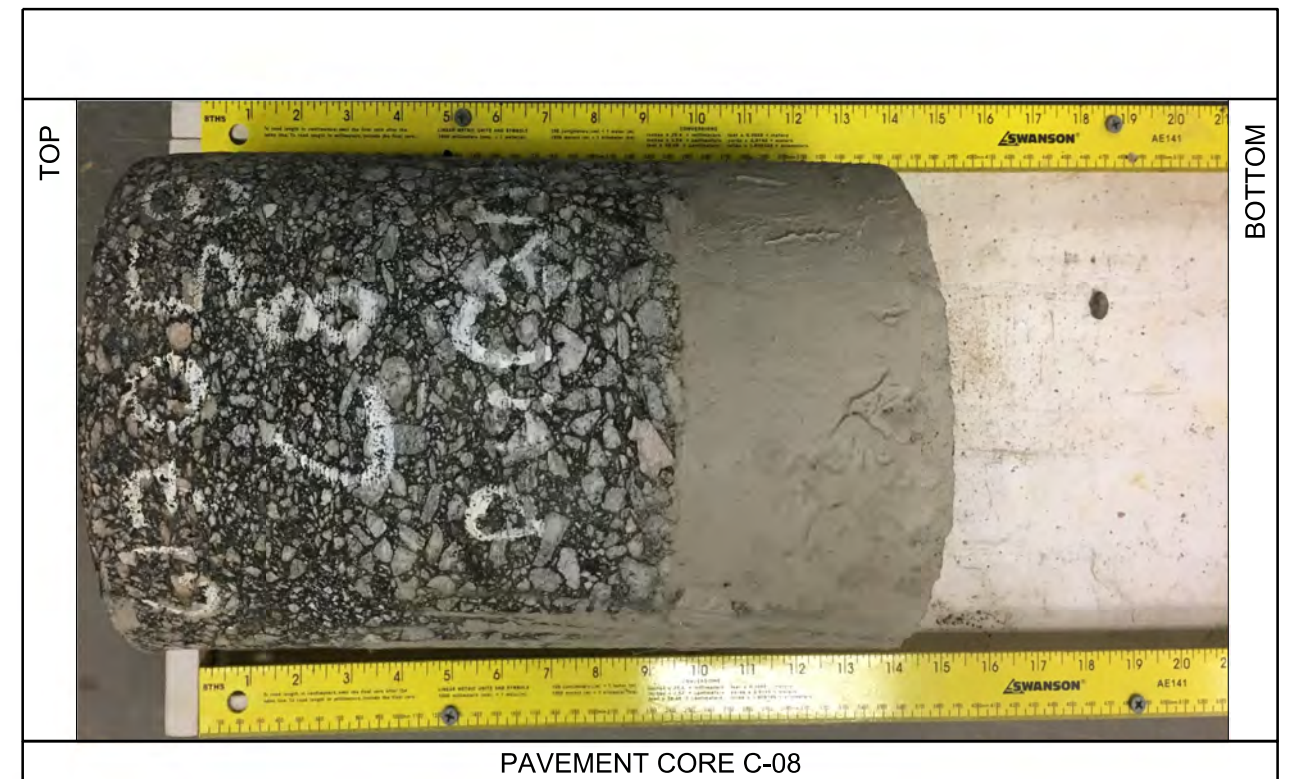
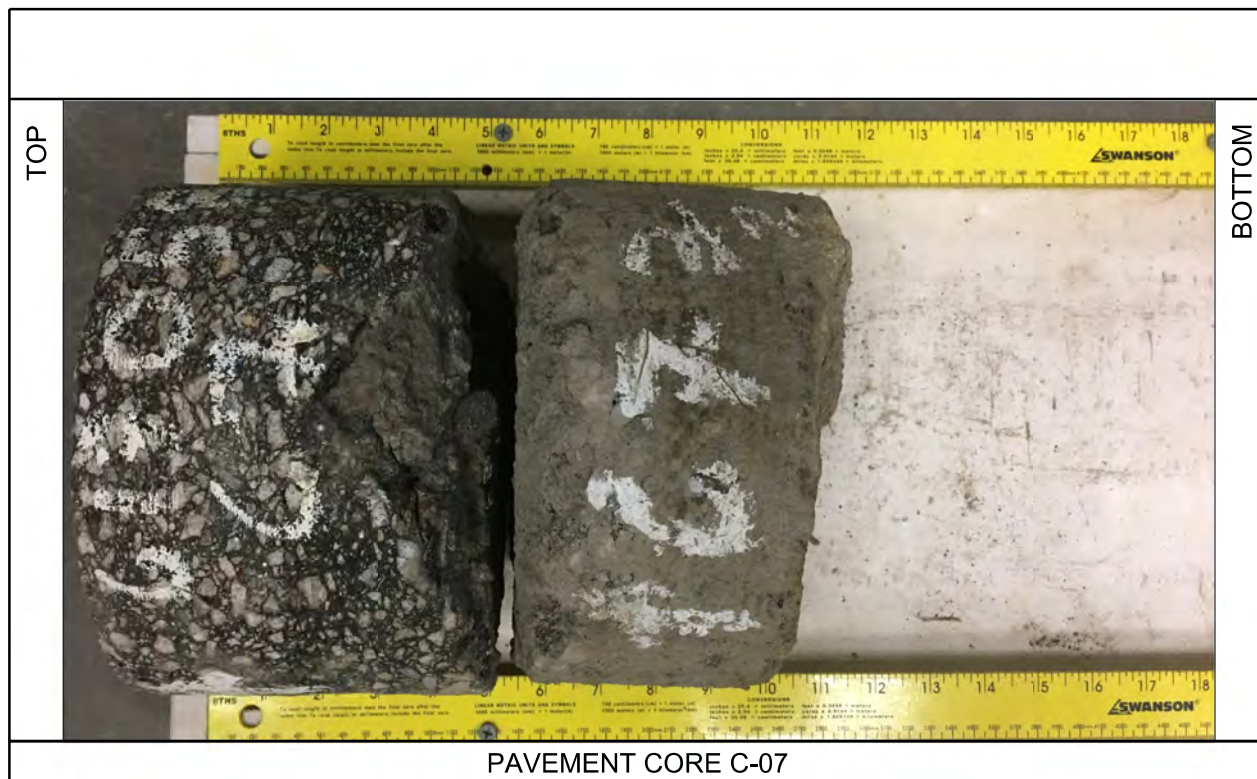
PAVEMENT CORE C-04



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

PAVEMENT CORE PHOTOGRAPHS

PROPOSED GRADE-SEPARATION OF DURANT ROAD  
 (SR 2006) OVER CSX S LINE RAILROAD IN RALEIGH  
 WAKE COUNTY, NORTH CAROLINA  
 WBS NO.: 46932.1.1 | TIP NO.: P-5720  
 FALCON PROJECT NO.: G17058.00



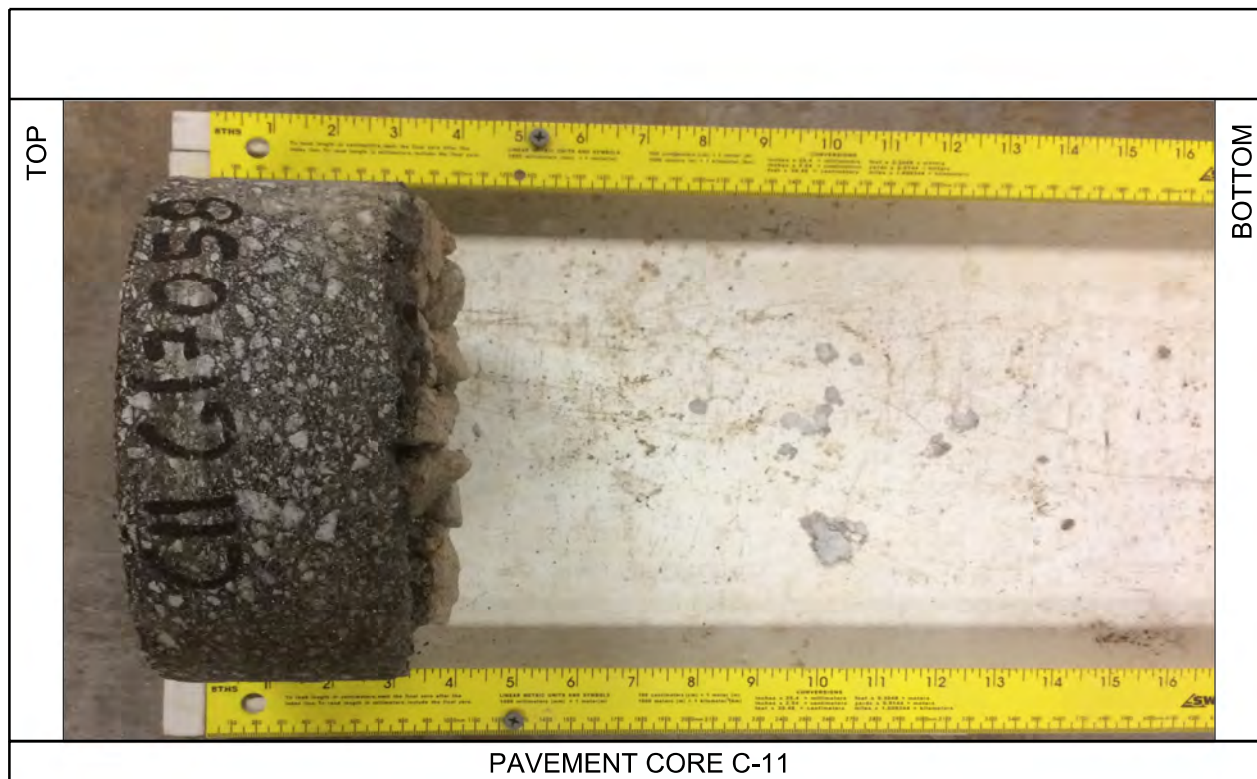
**FALCON**  
ENGINEERING

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

PHONE: 919.871.0800  
FAX: 919.871.0803

**PAVEMENT CORE PHOTOGRAPHS**

PROPOSED GRADE-SEPARATION OF DURANT ROAD  
(SR 2006) OVER CSX S LINE RAILROAD IN RALEIGH  
WAKE COUNTY, NORTH CAROLINA  
WBS NO.: 46932.1.1 | TIP NO.: P-5720  
FALCON PROJECT NO.: G17058.00




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

**PAVEMENT CORE PHOTOGRAPHS**

PROPOSED GRADE-SEPARATION OF DURANT ROAD (SR 2006) OVER CSX S LINE RAILROAD IN RALEIGH WAKE COUNTY, NORTH CAROLINA  
WBS NO.: 46932.1.1 | TIP NO.: P-5720  
FALCON PROJECT NO.: G17058.00

### DCP TEST DATA

File Name: C-01

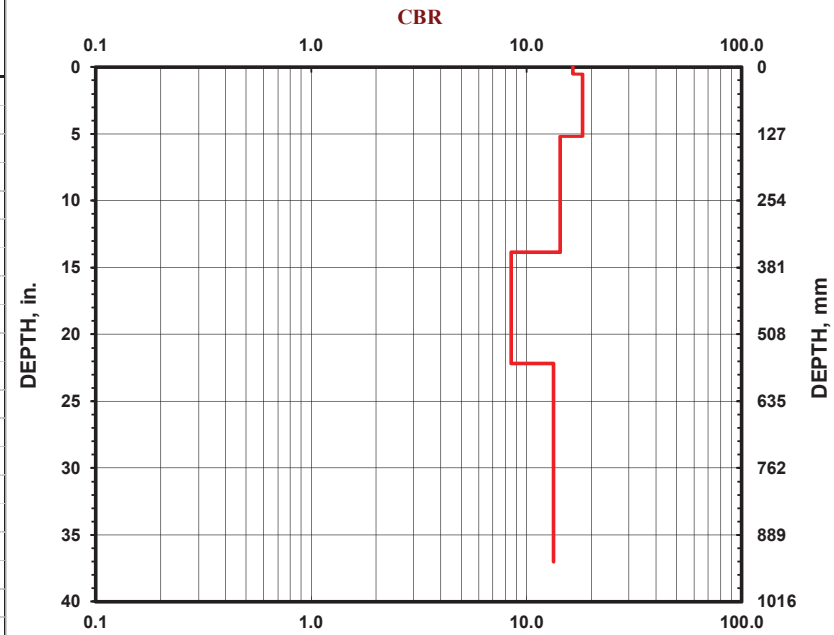
Project: G17058.00  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	0	1
1	13	1
10	132	1
15	352	1
9	564	1
24	940	1



### DCP TEST DATA

File Name: C-02

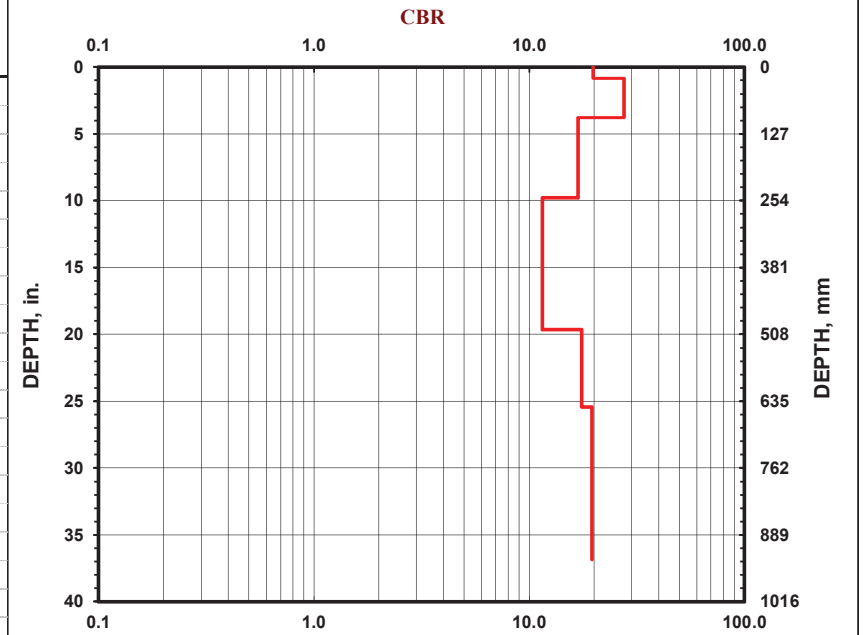
Project: G17058.00  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	0	1
2	22	1
9	96	1
12	249	1
14	500	1
12	647	1
26	936	1



### DCP TEST DATA

File Name: C-03

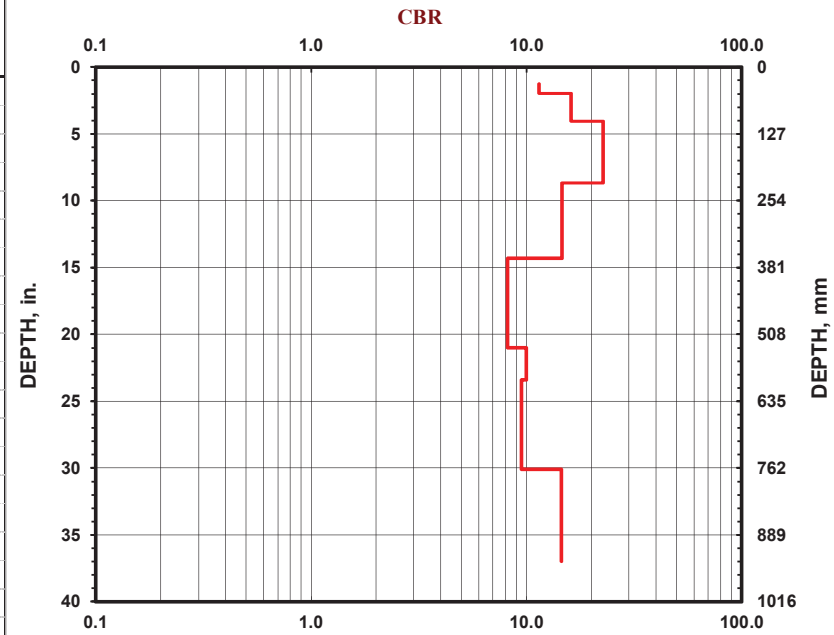
Project: G17058  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

Hammer  
 10.1 lbs.  
 17.6 lbs.  
 Both hammers used

Soil Type  
 CH  
 CL  
 All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	32	1
1	50	1
4	103	1
12	220	1
10	364	1
7	534	1
3	595	1
8	765	1
12	939	1



### DCP TEST DATA

File Name: C-04

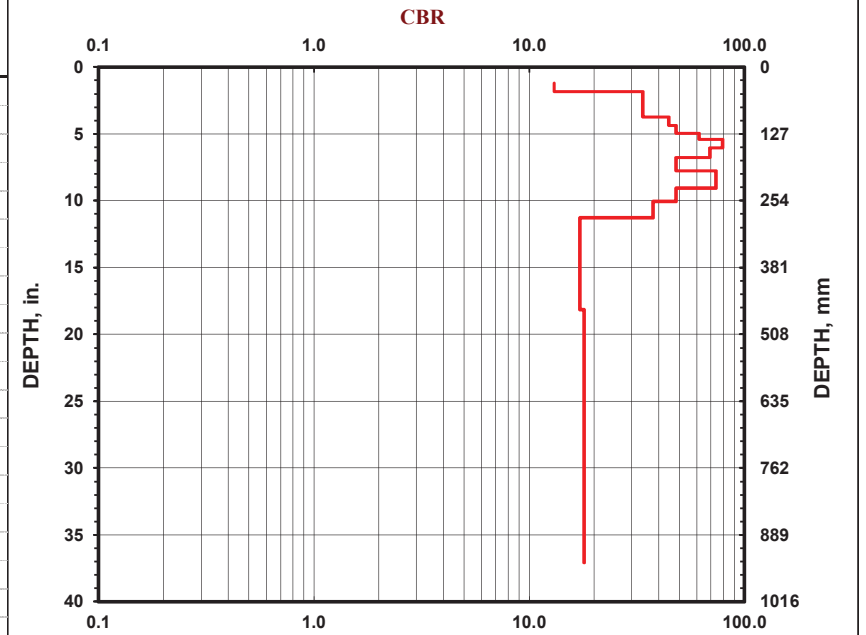
Project: G17058  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

Hammer  
 10.1 lbs.  
 17.6 lbs.  
 Both hammers used

Soil Type  
 CH  
 CL  
 All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	31	1
1	47	1
7	95	1
3	111	1
3	126	1
3	138	1
5	154	1
5	172	1
5	197	1
5	214	1
5	231	1
5	256	1
5	287	1
14	462	1
40	942	1



### DCP TEST DATA

File Name: C-05

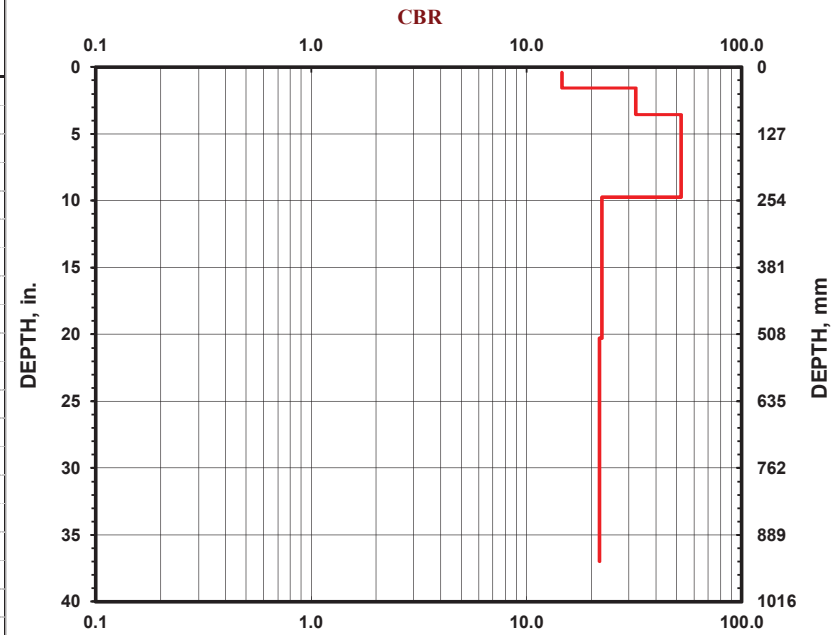
Project: G17058  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	11	1
2	40	1
7	90	1
34	248	1
27	515	1
42	939	1



### DCP TEST DATA

File Name: C-06

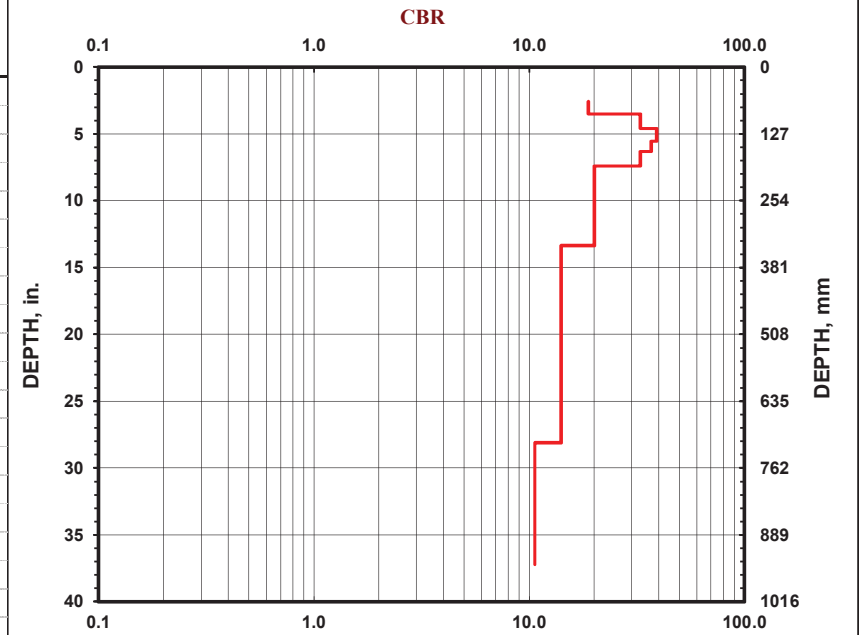
Project: G17058  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	66	1
2	89	1
2	103	1
2	117	1
2	129	1
2	141	1
3	160	1
4	188	1
14	340	1
25	714	1
12	945	1



### DCP TEST DATA

File Name: C-07

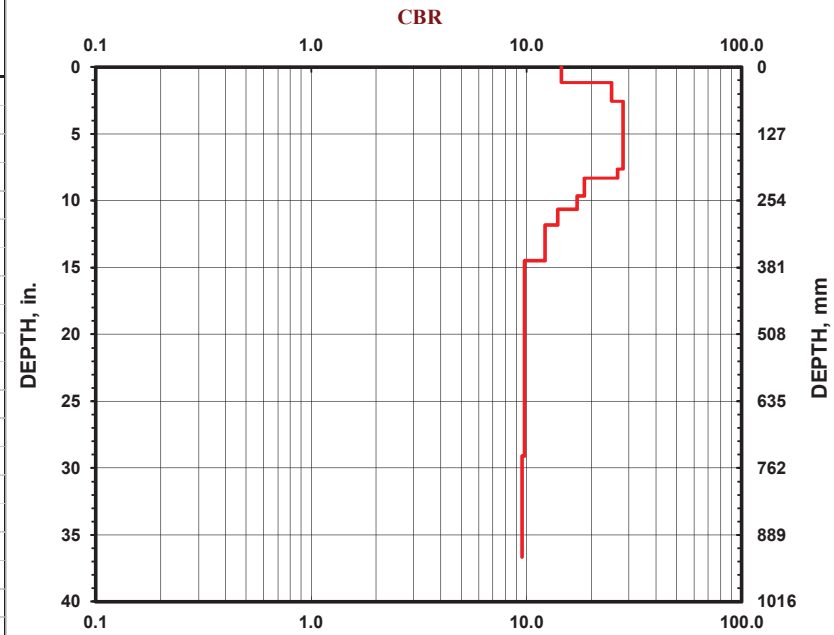
Project: G17058  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	0	1
2	29	1
2	47	1
2	65	1
16	194	1
2	211	1
3	246	1
2	271	1
2	301	1
2	335	1
2	369	1
18	740	1
9	931	1



### DCP TEST DATA

File Name: C-08

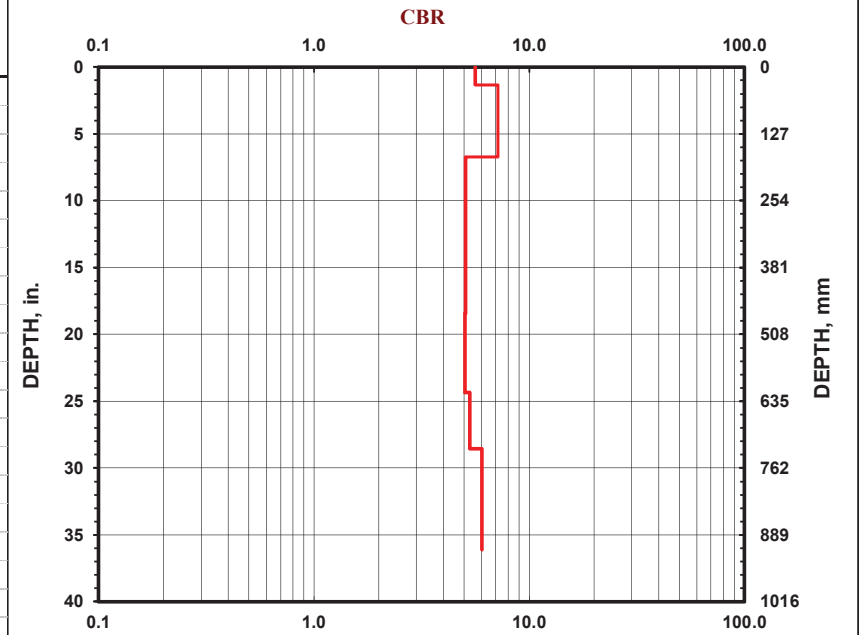
Project: G17058  
 Location: Durant Road

Date: 5-Dec-17  
 Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	0	1
1	34	1
5	171	1
8	469	1
4	619	1
3	726	1
6	917	1



### DCP TEST DATA

File Name: C-09

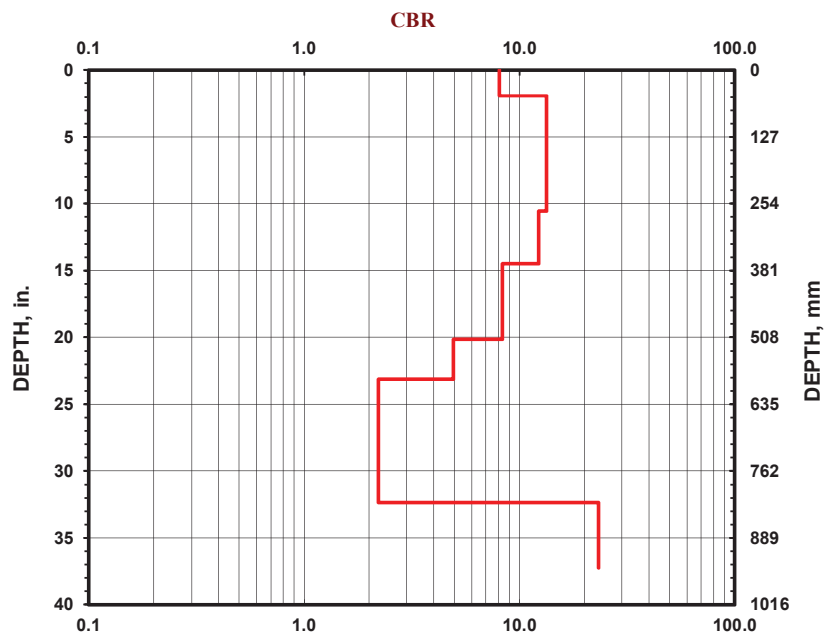
Project: G17058  
Location: Durant Road

Date: 5-Dec-17  
Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	0	1
2	49	1
14	268	1
6	369	1
6	512	1
2	588	1
3	822	1
13	946	1



### DCP TEST DATA

File Name: C-10

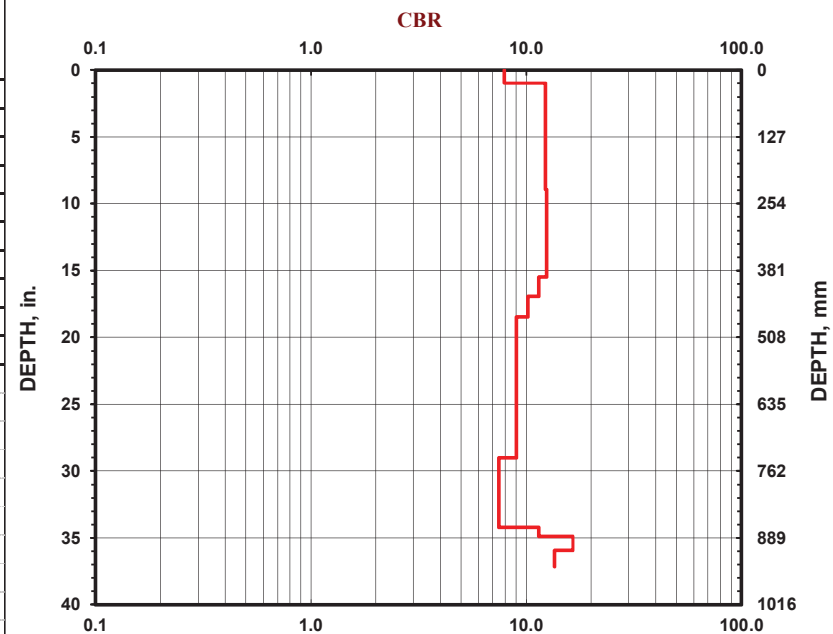
Project: G17058  
Location: Durant Road

Date: 5-Dec-17  
Soil Type(s): CL

- Hammer
- 10.1 lbs.
  - 17.6 lbs.
  - Both hammers used

- Soil Type
- CH
  - CL
  - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
Start	0	1
1	25	1
12	227	1
10	394	1
2	430	1
2	470	1
12	737	1
5	869	1
1	887	1
2	913	1
2	944	1







Falcon Engineering, Inc.

1210 Trinity Road, Suite 110 Raleigh, NC 27607

## PAVEMENT SECTION AND SUBGRADE CONDITION SUMMARY

## PROPOSED GRADE SEPARATION OF DURANT ROAD (SR 2006) OVER CSX S-LINE RAILROAD

## WAKE COUNTY, NORTH CAROLINA

TIP No.: P-7520 WBS No. 46932.1.1 Falcon Project No.: G17063.00

TEST LOCATION					PAVEMENT SECTION THICKNESS (INCHES)			SUBGRADE	NOTES
LOCATION	ALIGNMENT	LANE	STATION	OFFSET	HMA	AGGREGATE BASE	TOTAL	IN-SITU CBR	
C-01	-L-	CTL	11+00, -L-	CL	14.00	0.00	14.00	10	-
C-02	-L-	WB, ISL	11+00, -L-	11' LT	14.00	0.00	14.00	11	-
C-03	-L-	WB, OSL	11+00, -L-	22' LT	15.00	0.00	15.00	10	-
C-04	-L-	EB, ISL	11+00, -L-	11' RT	15.00	0.00	15.00	11	-
C-05	-L-	EB, OSL	11+00, -L-	22' RT	14.00	0.00	14.00	11	-
C-06	-L-	CTL	46+50, -L-	CL	14.00	0.00	14.00	11	-
C-07	-L-	WB, ISL	46+50, -L-	11' LT	11.00	0.00	11.00	10	-
C-08	-L-	WB, OSL	46+50, -L-	22' LT	13.00	0.00	13.00	6	-
C-09	-L-	EB, ISL	46+50, -L-	11' RT	15.00	0.00	15.00	5	-
C-10	-L-	EB, OSL	46+50, -L-	22' RT	14.00	0.00	14.00	10	-
C-11	-L-	SB	10+04, -Y3-	20' LT	3.00	9.00	12.00	8	-
C-12	-L-	NB	11+93, -Y3-	17' RT	2.00	7.00	9.00	25	-
REPRESENTATIVE AVERAGE					12.00	1.33	13	11	-

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

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

*REFERENCE: P-5720*

*PROJECT: 46932*

DS  
*WSH*  
2/5/2019  
INITIALS DATE

**REPORT OF LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORT**

*Performed in general accordance with ASTM D 698, Method A*

January 10, 2018



**REPORT OF CALIFORNIA BEARING RATIO (CBR) OF LABORATORY-COMPACTED SOILS**

*Performed in General Accordance with ASTM D 1883*

January 10, 2018



PROJECT NAME: P-5720 Durant Road Grade Separation

PROJECT NUMBER: G17058.00

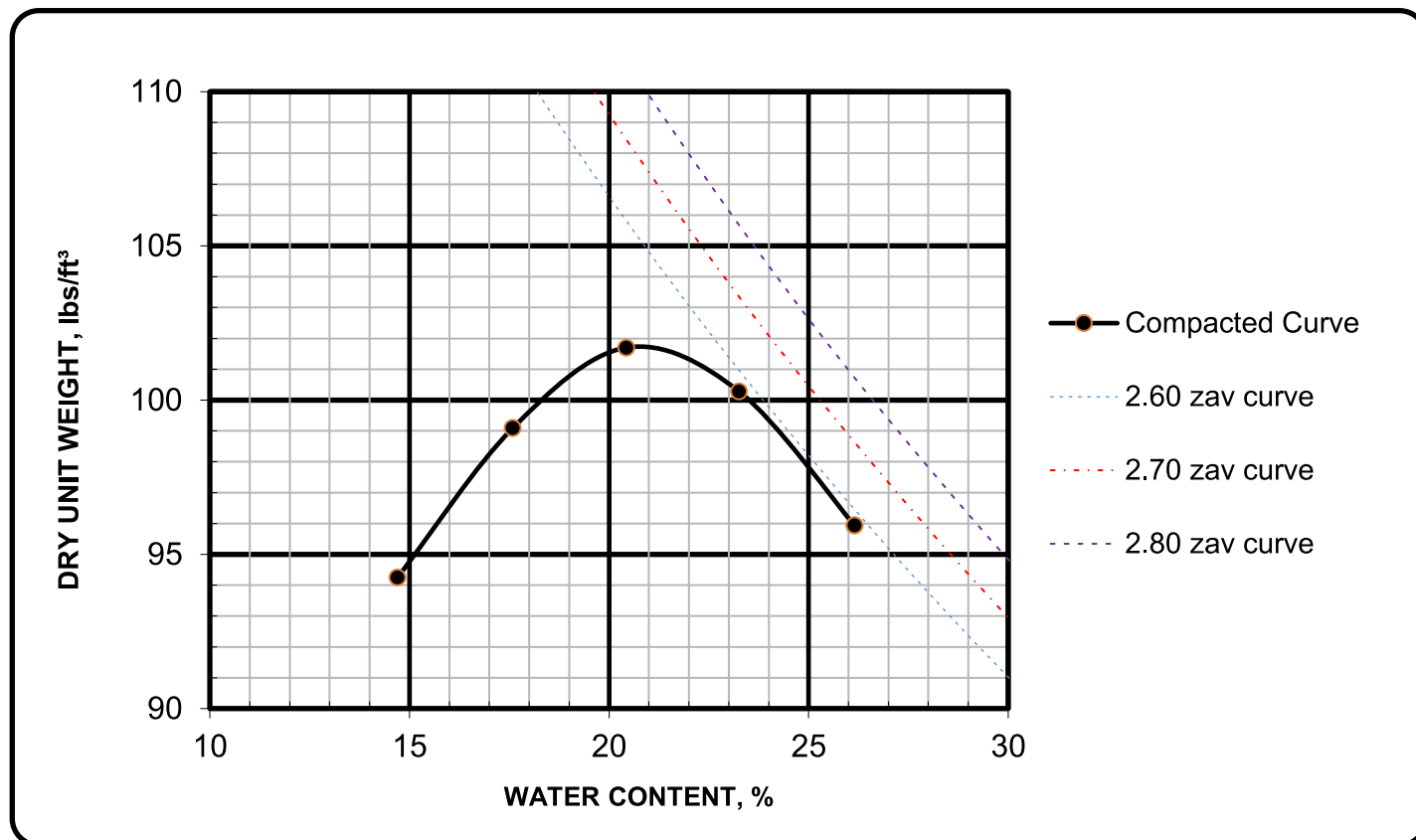
SAMPLE IDENTIFICATION: B-12, BS-01, 1.0-7.0'

SAMPLE DESCRIPTION: Brown silty sand

PROJECT NAME: P-5720 Durant Road Grade Separation

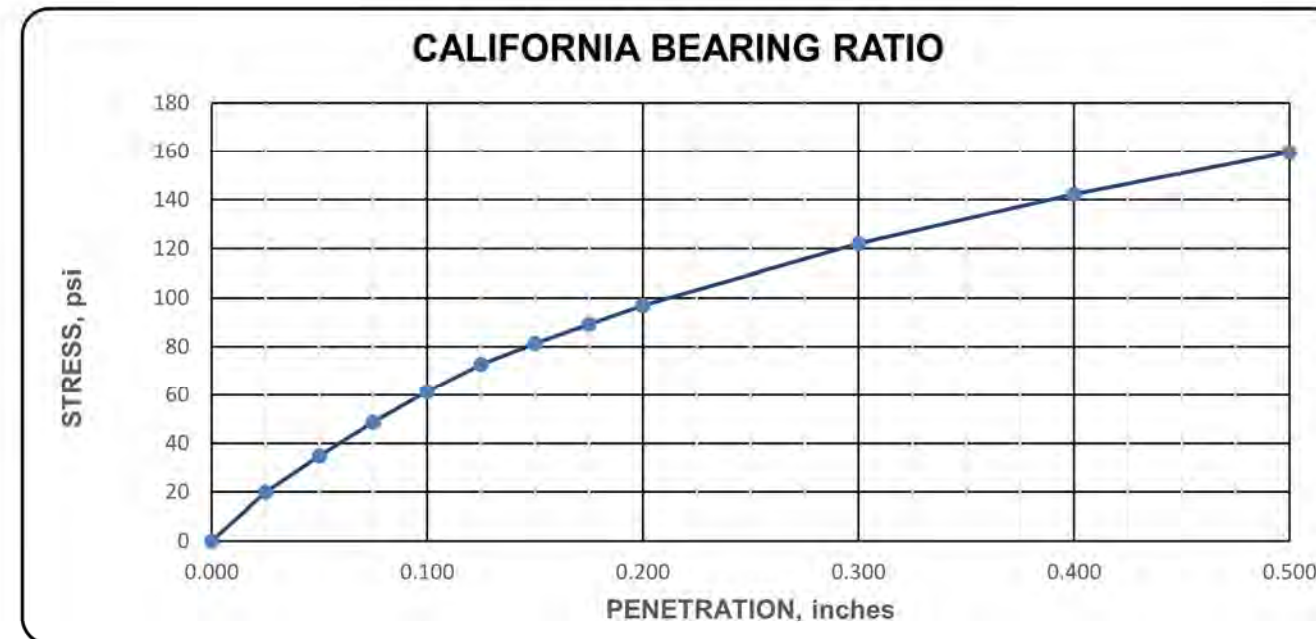
PROJECT NUMBER: G17058.00

SAMPLE IDENTIFICATION: B-12, BS-01, 1.0-7.0



STANDARD MAXIMUM DRY UNIT WEIGHT, lbs/ft³: 101.8  
STANDARD OPTIMUM WATER CONTENT, %: 20.8

AS-RECEIVED WATER CONTENT: 10.7  
LIQUID LIMIT: 37  
PLASTIC LIMIT: 29  
PLASTICITY INDEX: 8  
PERCENT FINER NO. 200: 29  
USCS CLASSIFICATION: SM



BEARING RATIO:	at 0.1 inches of penetration:	<u>uncorrected</u>	<u>corrected</u>
		6.1	6.1
	at 0.2 inches of penetration:	6.5	6.5

Compaction Method: ASTM D698  
Maximum Dry Unit Weight, lbs/ft³: 101.8  
Optimum Water Content, %: 20.8  
Compacted Dry Unit Weight, lbs/ft³: 100.8  
Compacted Water Content, %: 20.7  
Compaction Percentage: 99.0  
Water Content, Top one-inch after test, %: 28.2  
Surcharge amount, lbs: 10  
Immersion period, hours: 97  
Swell, %: 1.4

REMARKS:

REVIEWED BY: John Dailly

Reviewed by: John Dailly