

REFERENCE: U-5604

PROJECT: 45832

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.	U-5604	1	25

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<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>PROFILE</u>
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-Y5-	10+55 - 13+50.00	5	9
-Y6-	10+55 - 12+00.00	5	9
-Y7-	11+00 - 13+32.84	6	9
-Y8-	14+00 - 16+03.63	6	10
-R1-	10+00 - 12+61.13	5	11
-WL1-	35+25 - 36+50	12	12
-WL2-	38+25 - 40+50	12	12
-WL3-	10+72.75 - 12+80	12	12

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ROADWAY SUBSURFACE INVESTIGATION

COUNTY MACON

PROJECT DESCRIPTION US 441 BUSINESS INTERSECTION

IMPROVEMENTS AT WOMACK STREET, MAPLE

STREET, PORTER STREET, AND DEPOT STREET

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:

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

PERSONNEL

GOODNIGHT, D. J.

LANE, R. W.

TRIGON EXP.

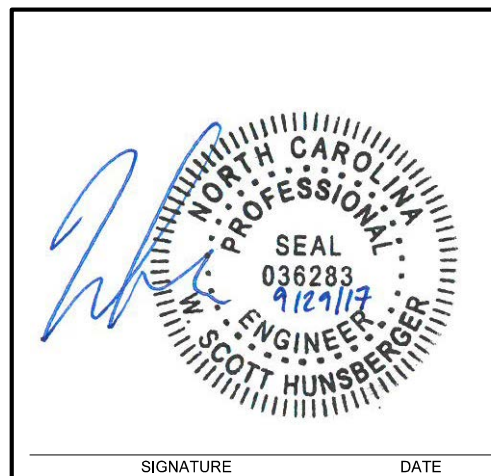
INVESTIGATED BY GOODNIGHT, D. J.

DRAWN BY HILL, M.J.

CHECKED BY HAMM, J.R.

SUBMITTED BY FALCON

DATE SEPTEMBER 2017



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 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>												<p>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><u>ALLUVIUM (ALLUV.)</u> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <u>AQUIFER</u> - A WATER BEARING FORMATION OR STRATA. <u>ARENACEOUS</u> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <u>ARGILLACEOUS</u> - 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. <u>ARTESIAN</u> - 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. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <u>FAULT</u> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <u>FISSILE</u> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <u>FLOAT</u> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <u>FLOOD PLAIN (FP)</u> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <u>FORMATION (FM)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <u>JOINT</u> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <u>LEDGE</u> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <u>LENS</u> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <u>MOTTLED (MOT.)</u> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <u>PERCHED WATER</u> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <u>RESIDUAL (RES.) SOIL</u> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <u>ROCK QUALITY DESIGNATION (ROD)</u> - 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. <u>SAPROLITE (SAP.)</u> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <u>SILL</u> - 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. <u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</u> - 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. <u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <u>STRATA ROCK QUALITY DESIGNATION (SROD)</u> - 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. <u>TOPSOIL (TS.)</u> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <thead> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="6">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="6">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="6">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-3</th><th>A-2</th><th>A-2-6</th><th>A-4</th><th>A-5</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 colspan="6"></th> </tr> </thead> <tbody> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td><td>A-1-b</td><td>A-2-4</td><td>A-2-5</td><td>A-2-6</td><td>A-2-7</td><td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td><td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td><td colspan="6"></td> </tr> <tr> <td>SYMBOL</td> <td colspan="6">[Pattern]</td> <td colspan="6">[Pattern]</td> <td colspan="6">[Pattern]</td> </tr> <tr> <td>% PASSING #10 #40 #200</td> <td>50 MX 30 MX 15 MX</td><td>50 MX 25 MX</td><td>51 MN 35 MX 35 MX</td><td>40 MX 41 MN 10 MX</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td>40 MX 41 MN 11 MN</td><td colspan="6"></td> </tr> <tr> <td>MATERIAL PASSING #40 LL PI</td> <td colspan="6"></td> <td colspan="6"></td> <td colspan="6">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> </tr> <tr> <td>GROUP INDEX</td> <td colspan="6"></td> <td colspan="6"></td> <td colspan="6">HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td colspan="2">STONE FRAGS. GRAVEL, AND SAND</td> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="6"></td> </tr> <tr> <td>GEN. RATING AS SUBGRADE</td> <td colspan="6">EXCELLENT TO GOOD</td> <td colspan="6">FAIR TO POOR</td> <td colspan="6">FAIR TO POOR POOR UNSUITABLE</td> </tr> <tr> <td colspan="12">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</td> <td colspan="12"></td> <td colspan="12"></td> </tr> <tr> <td colspan="12"> <p>CONSISTENCY OR DENSENESS</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table> </td> <td colspan="12"> <p>MISCELLANEOUS SYMBOLS</p> <table border="1"> <tr> <td>[Symbol]</td><td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td>[Symbol]</td><td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td>[Symbol]</td><td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td>[Symbol]</td><td>SOIL SYMBOL</td> <td>[Symbol]</td><td>SPT TEST BORING</td> <td>[Symbol]</td><td>CONE PENETROMETER TEST</td> </tr> <tr> <td>[Symbol]</td><td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td>[Symbol]</td><td>AUGER BORING</td> <td>[Symbol]</td><td>SOUNDING ROD</td> </tr> <tr> <td>[Symbol]</td><td>INFERRED SOIL BOUNDARY</td> <td>[Symbol]</td><td>CORE BORING</td> <td>[Symbol]</td><td>TEST BORING WITH CORE</td> </tr> <tr> <td>[Symbol]</td><td>INFERRED ROCK LINE</td> <td>[Symbol]</td><td>MONITORING WELL</td> <td>[Symbol]</td><td>SPT N-VALUE</td> </tr> <tr> <td>[Symbol]</td><td>ALLUVIAL SOIL BOUNDARY</td> <td>[Symbol]</td><td>PIEZOMETER INSTALLATION</td> <td></td><td></td> </tr> </table> </td> <td colspan="12"> <p>ROCK HARDNESS</p> <table border="1"> <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 GROUDED 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 GROUDED 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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A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7							SYMBOL	[Pattern]						[Pattern]						[Pattern]						% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 35 MX 35 MX	40 MX 41 MN 10 MX	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN	40 MX 41 MN 11 MN							MATERIAL PASSING #40 LL PI													SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER						GROUP INDEX													HIGHLY ORGANIC SOILS						USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS								GEN. 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09.08/99

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

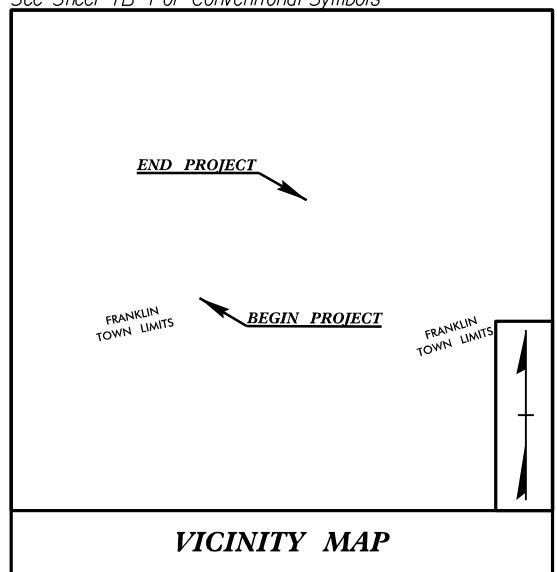
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

MACON COUNTY

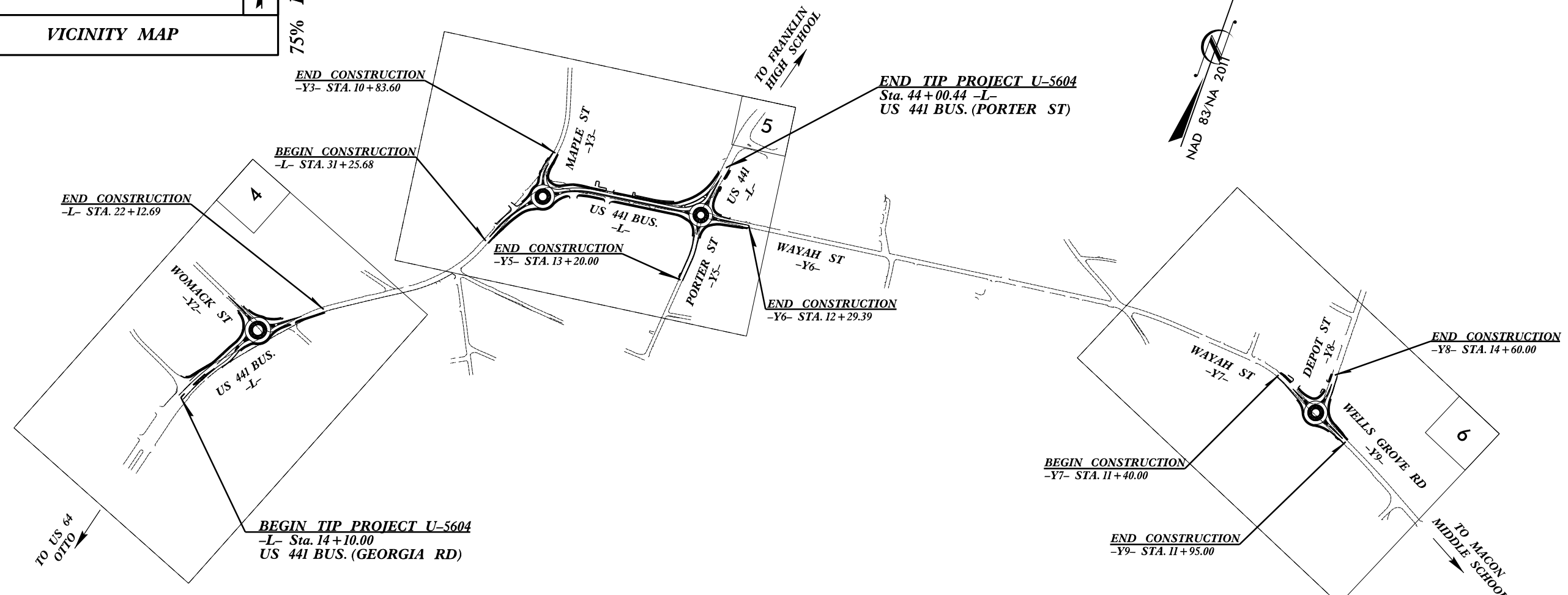
LOCATION: US 441 BUSINESS INTERSECTION IMPROVEMENTS AT WOMACK STREET, MAPLE STREET, PORTER STREET, AND DEPOT STREET
TYPE OF WORK: GRADING, PAVING, DRAINAGE, AND RETAINING WALLS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5604	3	25
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
45832.1.1	N/A	PE	
45832.2.1	N/A	RW/UTIL	

CONTRACT: TIP PROJECT: U-5604



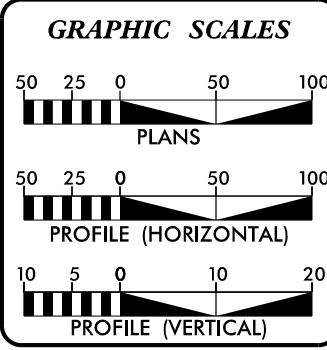
75% PLANS



A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF FRANKLIN.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.
THIS IS A NO CONTROL OF ACCESS PROJECT

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

CONTRACT:



DESIGN DATA

ADT 2015 =	14,308
ADT 2040 =	20,800
K =	10 %
D =	55 %
T =	2 % *
V =	40 MPH
REGIONAL TIER =	URBAN COLLECTOR

PROJECT LENGTH

LENGTH OF -L- TIP PROJECT U-5604 =	0.395 miles
LENGTH OF -Y7- TIP PROJECT U-5604 =	0.047 miles
LENGTH OF -Y9- TIP PROJECT U-5604 =	0.037 miles
TOTAL LENGTH TIP PROJECT U-5604 =	0.479 miles

Prepared In The Office of:

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Raleigh, NC 27606
Tel. (919) 851-6866 Fax. (919) 851-7024
www.stantec.com License No. F-0672

for the North Carolina Department of Transportation

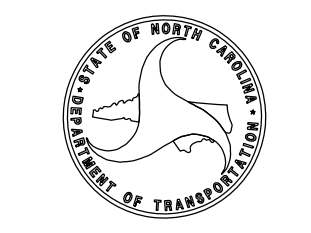
2012 STANDARD SPECIFICATIONS	STANTEC CONTACT
RIGHT OF WAY DATE: APRIL 21, 2017	STEVE SMALLWOOD, P.E. PROJECT ENGINEER
LETTING DATE: June 19, 2018	KENNETH MCDOWELL

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



29-SEP-2017 14:56 I:\Projects\2015\GIS062.00 U-5604 US-441 Intersection Improvements\U5604_GEO_RDWY\CADD_GEO\U5604_GEO_+sh.dgn cadmachine AT GEO1-I-0



Roadway Subsurface Investigation Report - Inventory

**US 441 Business Intersection Improvements Womack Street, Maple Street, and
Depot Street
Macon County, North Carolina
TIP: U-5604 WBS: 45832.1.1
Falcon Project No.: G15062.00**

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

September 29, 2017

TIP: U-5604
WBS: 45832.1.1
COUNTY: Macon
DESCRIPTION: US 441 Business Intersection Improvements Womack Street, Maple Street, and Depot Street
SUBJECT: Roadway Subsurface Investigation – Inventory

PROJECT DESCRIPTION

This project consists of approximately roundabout construction and intersection improvements at four intersections along US-441 Business in Franklin, Macon County, North Carolina.

Also included in this project are three retaining wall structures, two along -L- (left) and one along -Y5- (right). Investigation data for the retaining walls are incorporated into this report.

The investigation was conducted in two mobilizations; the first on March 9th and 10th, 2017 and the second between June 9th and July 11th, 2017 in general accordance with our Scope and Fee Estimates for Geotechnical Investigation and Engineering Services. 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 seventeen (17) Standard Penetration Test (SPT) borings were drilled for the proposed roadway alignments and retaining walls. All mechanical borings were drilled using a Mobile B-57 ATV 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, bulk samples were collected for standard Proctor compaction and California Bearing Ratio (CBR) testing. Ten (10) pavement core borings were also performed as part of this investigation, and in-situ CBR testing was performed using Kessler Dynamic Cone Penetrometer to depths of up to three feet below subgrade. An additional ten (10) hand auger borings were performed along retaining wall alignments which were added to the project after our initial mobilization. Hand auger borings were necessary at most locations due to overhead utilities.



The following alignments, totaling approximately 0.9 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- (US 441 Business)	14+10.00—44+00.44
-Y2- (Womack Street)	10+00.00—14+09.48
-Y3- (Maple Street)	10+00.00—13+02.70
-Y5- (Porter Street)	10+00.00—14+66.69
-Y6- (Wayah Street)	10+00.00—13+82.43

AREAS OF SPECIAL GEOTECHNICAL INTEREST

- I. 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-	16+00 to 18+00
-L-	32+00 to 36+00
-L-	38+00 to 40+00
-Y5-	10+50 to 12+00
-Y8-	15+50 to 16+50

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

<u>Alignment</u>	<u>Station (ft)</u>
-L-	34+50 to 36+00
-L-	38+50 to 42+00
-Y7-	12+50 to 13+50
-Y8-	15+50 to 16+50
-R1-	11+50 to 12+50

- III. Roadway Embankment was encountered at the following locations:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	35+50 to 38+50
-Y6-	10+00 to 10+75

PHYSIOGRAPHY AND GEOLOGY

The project site is in the Blue Ridge Belt Physiographic Province of North Carolina. According to the *Geologic Map of North Carolina* (1985), the site is underlain by two major geologic units of the Coweeta Group (**ZYba** and **ZYbn**) in the Blue Ridge Belt Physiographic Province. These units are of the Middle/Late Proterozoic Period. The site is bound on the north and south by the Coweeta Group (**ZYba**) which is noted to consist of Amphibiolite – equigranular, massive to well foliated, rarely discordant, metamorphosed intrusive to extrusive mafic rock and may include metasedimentary rock. The majority of the middle of the site consists of a different unit of the Coweeta Group (**ZYbn**). This unit consists of Biotite Gneiss – migmatitic; interlayered and gradational with bitotite-garnett gneiss and amphibiolite; locally abundant quartz and alumino-silicates.

Existing site topography is typical of North Carolina’s mountain region. The site lies predominantly within the Little Tennessee River valley, generally sloping west to east towards the river. The Womack, Maple, and Porter/Wayah sites lie atop a minor local high point/ridge line, while the Depot/Wayah site is much closer to the river and at a significantly lower elevation. Although frequent and large exposed rock outcroppings are common in the mountain region, no such features were observed at the site. None of the sites are close enough to notable water features to observe rock present in the bed or banks.

Sparse vegetation, occasional mature trees, landscaping, and maintained ground cover is present adjacent within proposed improvement areas, but otherwise much of the site is developed. Mixed industrial, commercial, and residential properties featuring various buildings, driveways, and parking lots line both sides of the road in all directions throughout most of the site.

SOIL PROPERTIES

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

Topsoil and rootmat was encountered in grassy, brushy, and wooded areas ranging in thickness from 0.3 to 0.7 feet, and typically on the order of 0.4 feet.

Artificial Fill soils were encountered at the ground surface beneath and adjacent to existing roadways. These consist of up to 0 to 10 feet of moist, very loose to loose, silty sand (A-2-4) and moist, very soft to medium stiff, sandy silt and sandy and silty clay (A-4, A-5, A-6, A-7).

Roadway Embankment soils were encountered at the ground surface beneath and adjacent to existing roadways. These consist of up to 3 to 12 feet of moist, very loose to medium dense, silty sand (A-2-5) and moist, medium stiff, silty clay (A-7).

Residual soils were encountered at the ground surface, or beneath artificial fill, roadway embankments or alluvial deposits. These soils consist of moist to wet, loose to dense, silty sand (A-1-b, A-2-4, A-2-5) and soft to stiff, sandy clay and silt, clayey silt and silty clays (A-4, A-5, 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, and within residential or commercial areas were backfilled immediately after completion due to safety considerations.

Detailed groundwater measurements are included in the attached subsurface profiles and cross sections, and noted areas of shallow groundwater are included in the Areas of Special Geotechnical Interest earlier in this report.

ADDITIONAL LABORATORY TESTING

The following bulk samples were obtained:

<u>Sample</u>	<u>Location</u>	<u>Depth(ft)</u>	<u>Test</u>
BS-1	16+96, 25' LT, -L-	1.0 – 8.5	California Bearing Ratio, Standard Proctor
BS-2	10+97, 24' RT, -Y6-	1.0 – 8.5	California Bearing Ratio, Standard Proctor

Classification test results for bulk samples 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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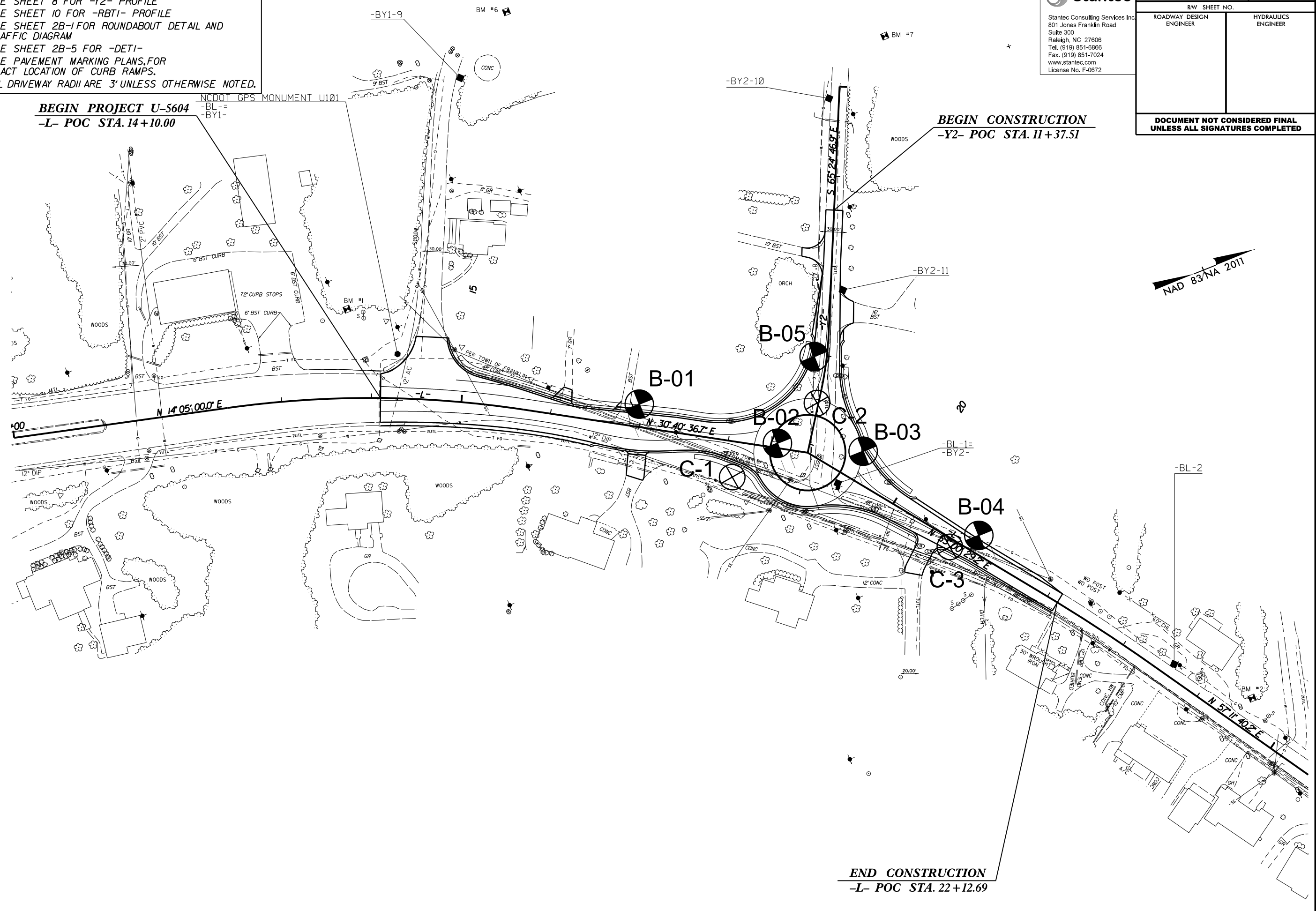
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RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

SEE SHEET 7 FOR -L- PROFILE
 SEE SHEET 8 FOR -Y2- PROFILE
 SEE SHEET 10 FOR -RBT1- PROFILE
 SEE SHEET 2B-1 FOR ROUNDABOUT DETAIL AND TRAFFIC DIAGRAM
 SEE SHEET 2B-5 FOR -DET1-
 SEE PAVEMENT MARKING PLANS FOR EXACT LOCATION OF CURB RAMPS.
 ALL DRIVEWAY RADII ARE 3' UNLESS OTHERWISE NOTED.

BEGIN PROJECT U-5604
-L- POC STA. 14+10.00

BEGIN CONSTRUCTION
-Y2- POC STA. 11+37.51

END CONSTRUCTION
-L- POC STA. 22+12.69

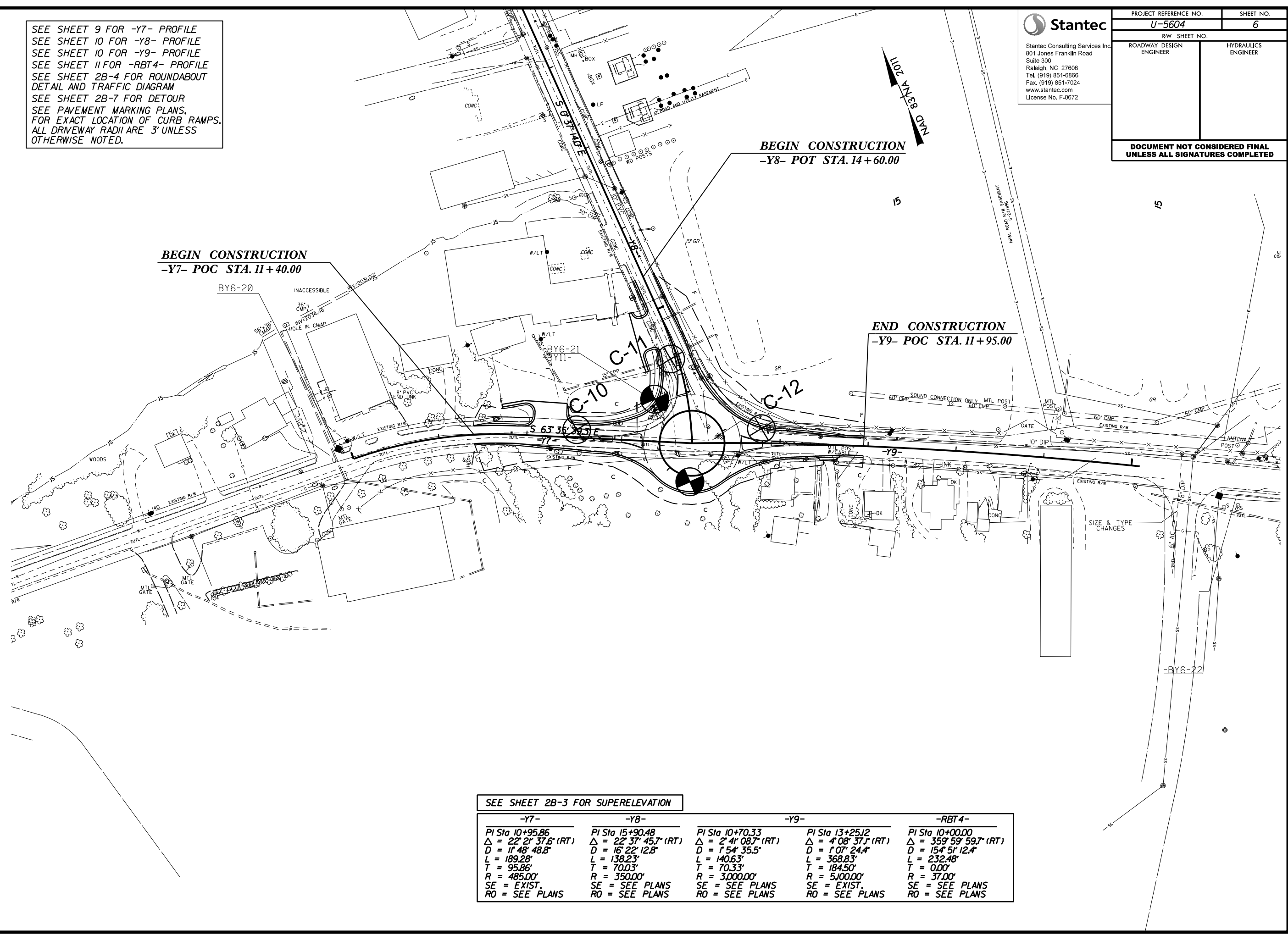


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 cadmachine

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PROJECT REFERENCE NO. U-5604	SHEET NO. 6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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SEE SHEET 9 FOR -Y7- PROFILE
 SEE SHEET 10 FOR -Y8- PROFILE
 SEE SHEET 10 FOR -Y9- PROFILE
 SEE SHEET 11 FOR -RBT4- PROFILE
 SEE SHEET 2B-4 FOR ROUNDABOUT
 DETAIL AND TRAFFIC DIAGRAM
 SEE SHEET 2B-7 FOR DETOUR
 SEE PAVEMENT MARKING PLANS,
 FOR EXACT LOCATION OF CURB RAMPS.
 ALL DRIVEWAY RADII ARE 3' UNLESS
 OTHERWISE NOTED.



SEE SHEET 2B-3 FOR SUPERELEVATION

-Y7-	-Y8-	-Y9-	-RBT4-
PI Sta 10+95.86	PI Sta 15+90.48	PI Sta 10+70.33	PI Sta 10+00.00
$\Delta = 22^\circ 21' 37.6''$ (RT)	$\Delta = 22^\circ 37' 45.7''$ (RT)	$\Delta = 2^\circ 41' 08.7''$ (RT)	$\Delta = 359^\circ 59' 59.7''$ (RT)
D = 11' 48" 48.8"	D = 16' 22" 12.8"	D = 1' 54" 35.5"	D = 15' 51" 12.4"
L = 189.28'	L = 138.23'	L = 140.63'	L = 232.48'
T = 95.86'	T = 70.03'	T = 70.33'	T = 0.00'
R = 485.00'	R = 350.00'	R = 3,000.00'	R = 5,000.00'
SE = EXIST.	SE = SEE PLANS	SE = SEE PLANS	SE = EXIST.
RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS

REVISIONS
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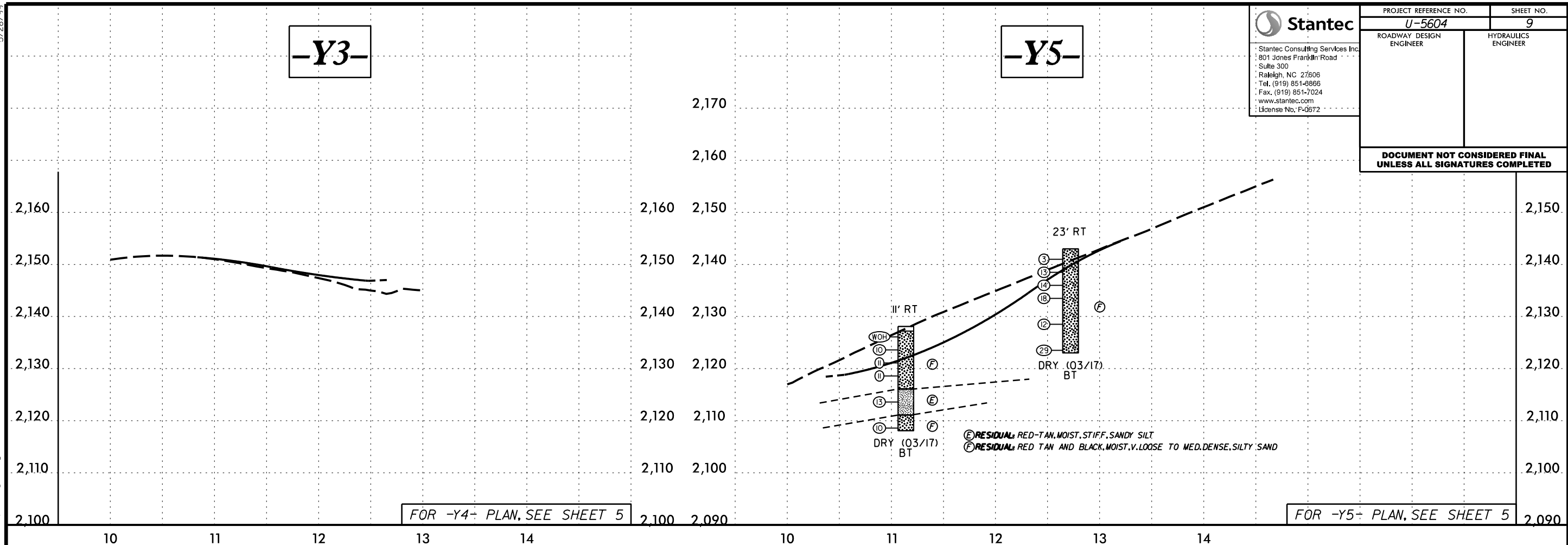
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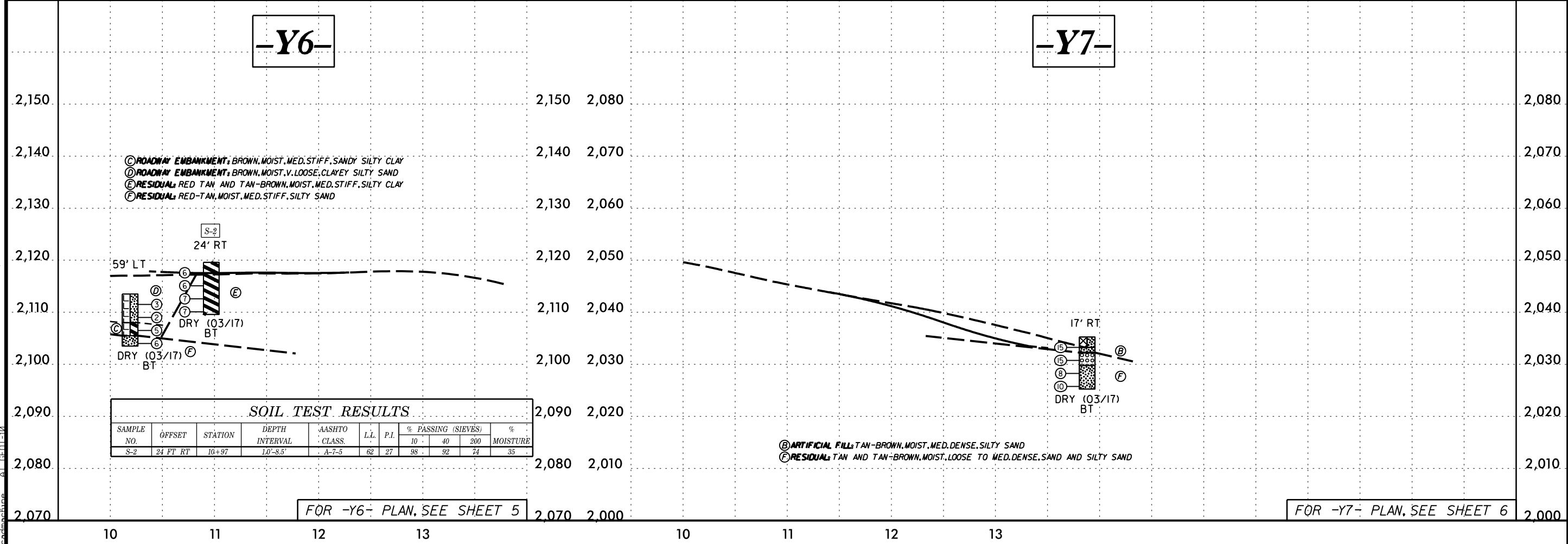
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ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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FOR -Y4- PLAN, SEE SHEET 5

FOR -Y5- PLAN, SEE SHEET 5



SOIL TEST RESULTS										
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% PASSING (SIEVES)			% MOISTURE
							10	40	200	
S-2	24 FT RT	10+97	1.0'-8.5'	A-7-5	62	27	98	92	74	35

FOR -Y6- PLAN, SEE SHEET 5

FOR -Y7- PLAN, SEE SHEET 6

5/28/99
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-Y8-

-Y9-

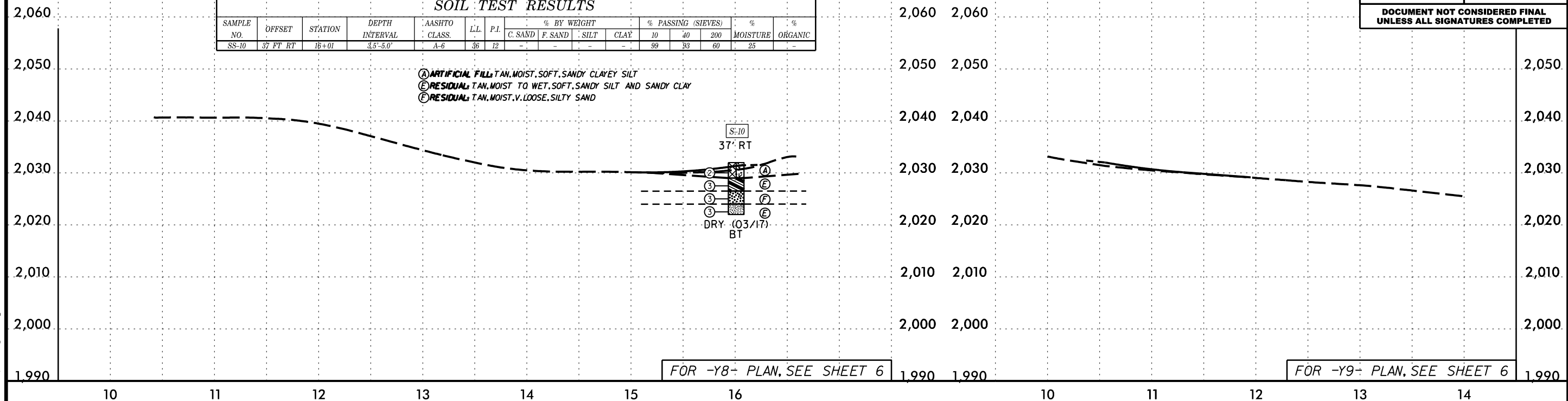
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PROJECT REFERENCE NO. U-5604	SHEET NO. 10
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE ORGANIC	
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	37 FT RT	16+01	3.5'-5.0'	A-6	36	12	-	-	-	99	93	60	25	-	

- Ⓐ ARTIFICIAL FILL: TAN, MOIST, SOFT, SANDY CLAYEY SILT
- Ⓔ RESIDUAL: TAN, MOIST TO WET, SOFT, SANDY SILT AND SANDY CLAY
- Ⓕ RESIDUAL: TAN, MOIST, V. LOOSE, SILTY SAND

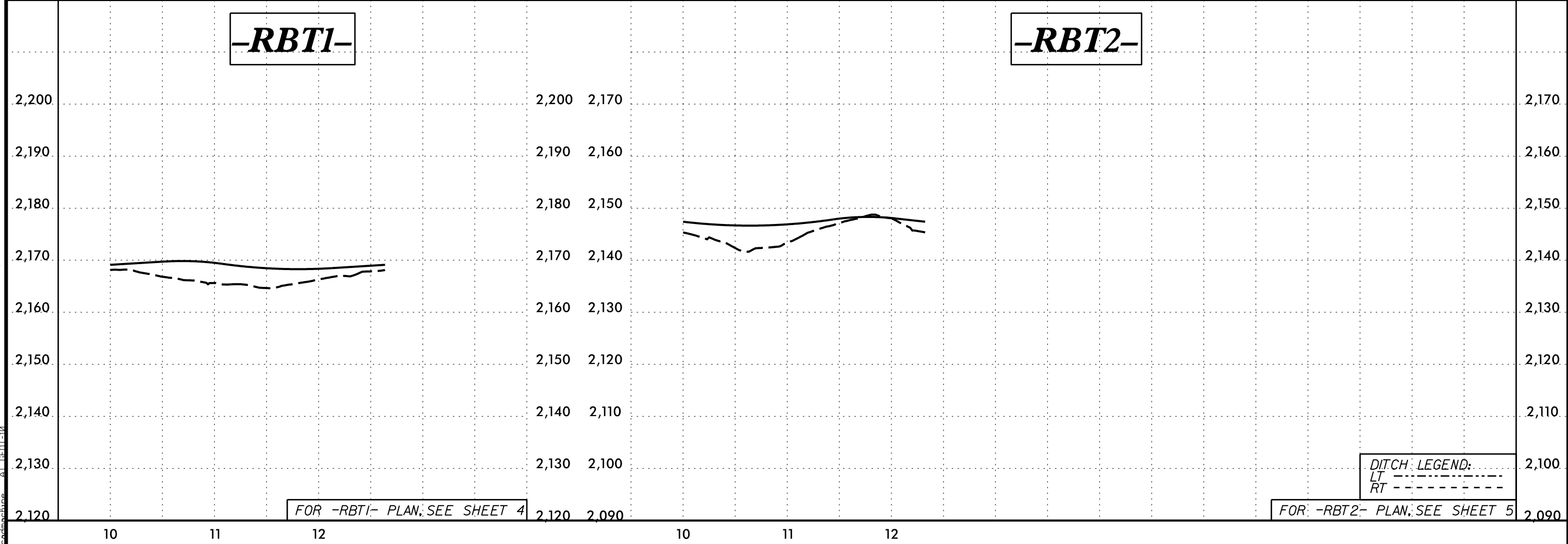


FOR -Y8- PLAN, SEE SHEET 6

FOR -Y9- PLAN, SEE SHEET 6

-RBT1-

-RBT2-



DITCH LEGEND:
 LT -----
 RT -----

FOR -RBT1- PLAN, SEE SHEET 4

FOR -RBT2- PLAN, SEE SHEET 5

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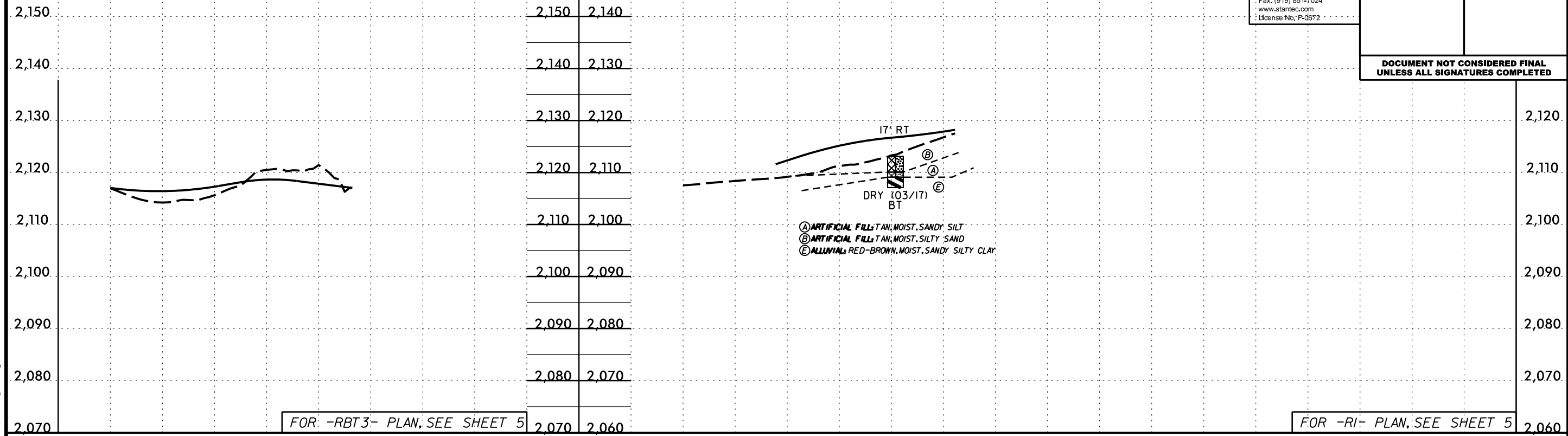
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-RI-

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PROJECT REFERENCE NO. U-5604	SHEET NO. 11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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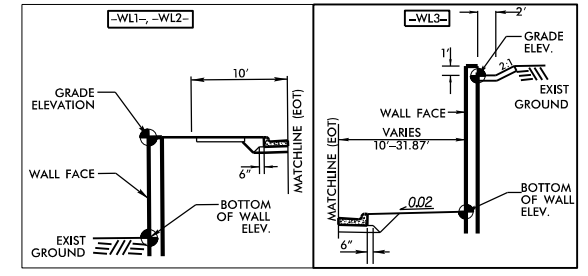
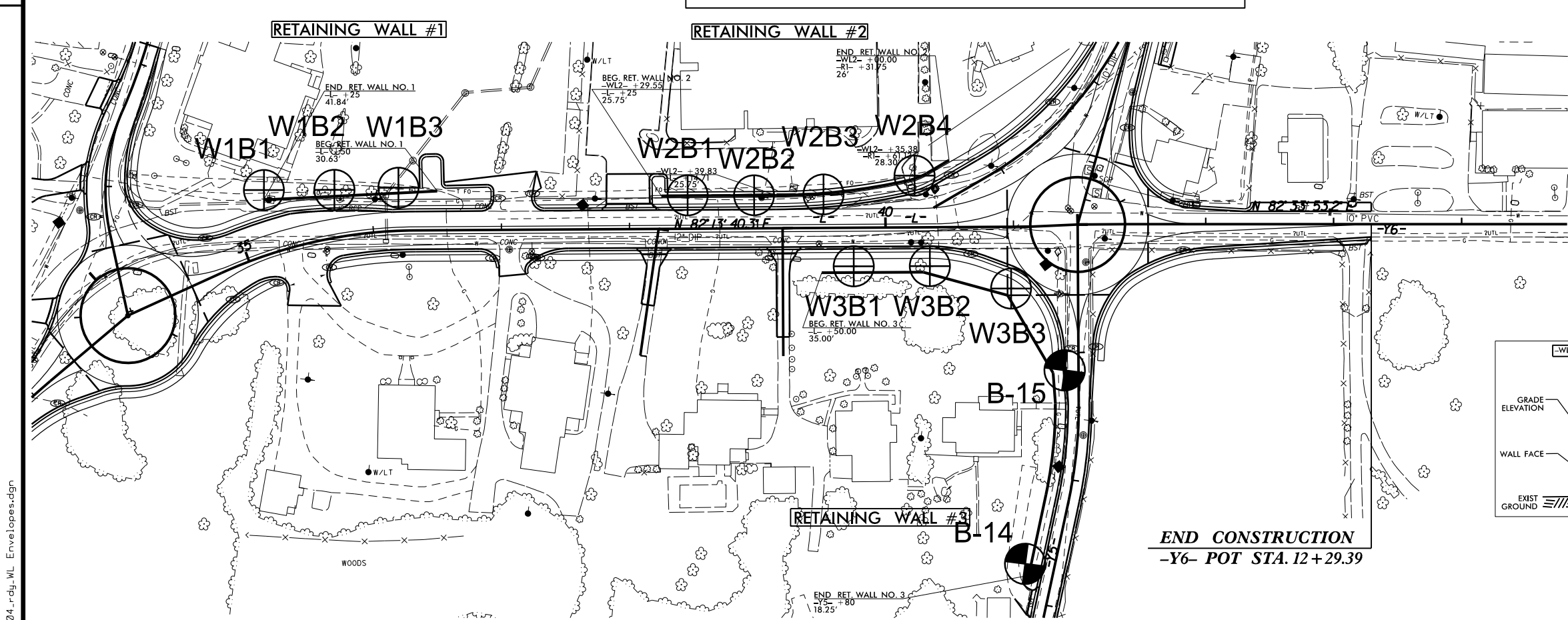


8/17/99

PRELIMINARY RETAINING WALL ENVELOPES

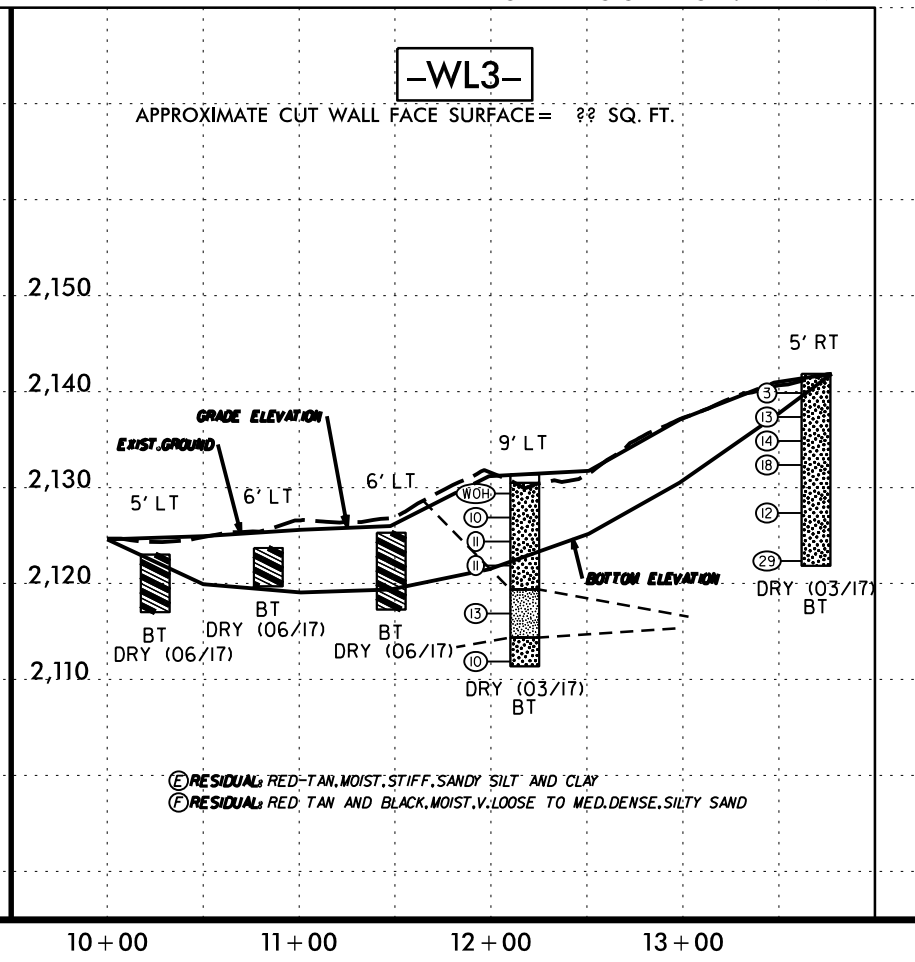
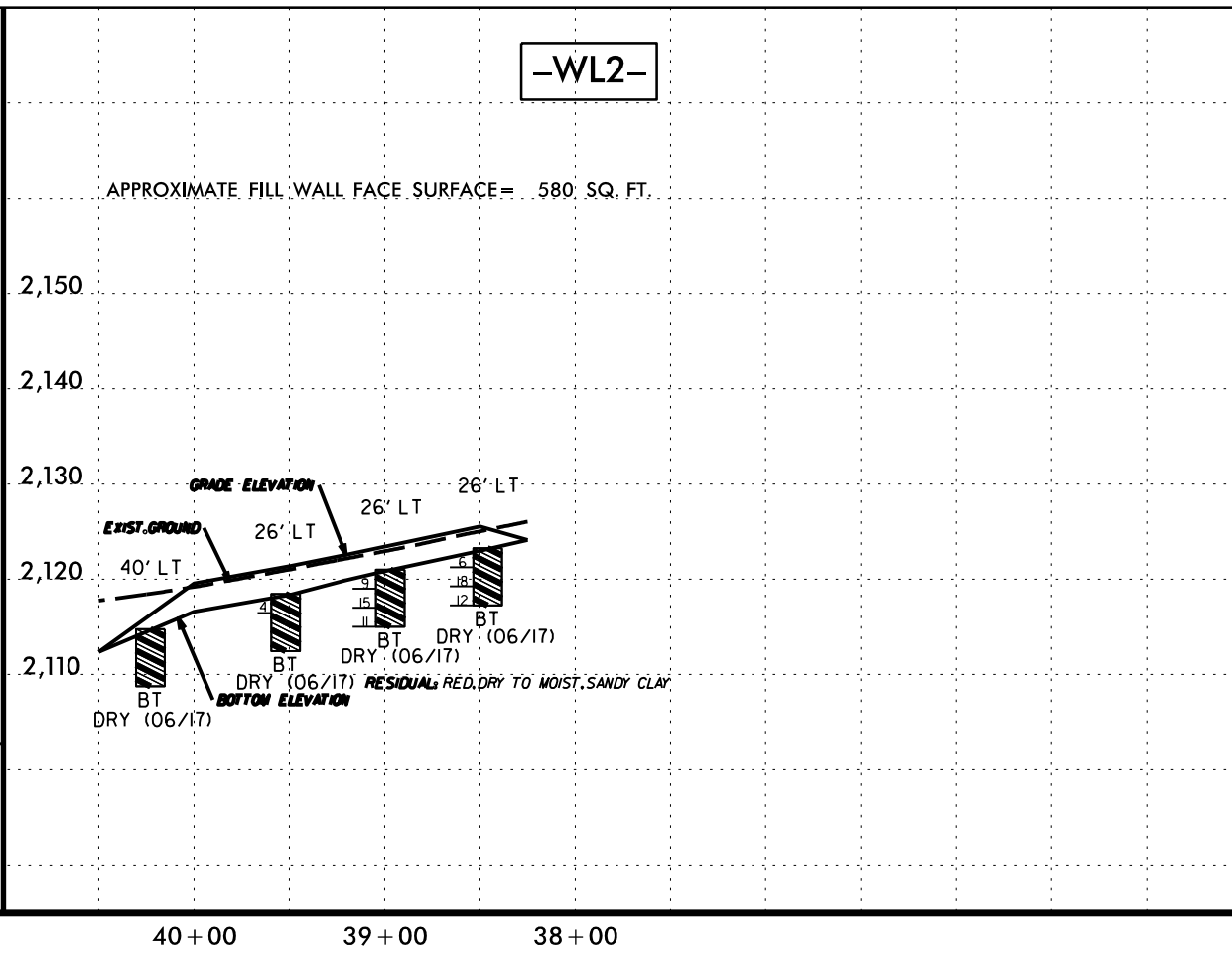
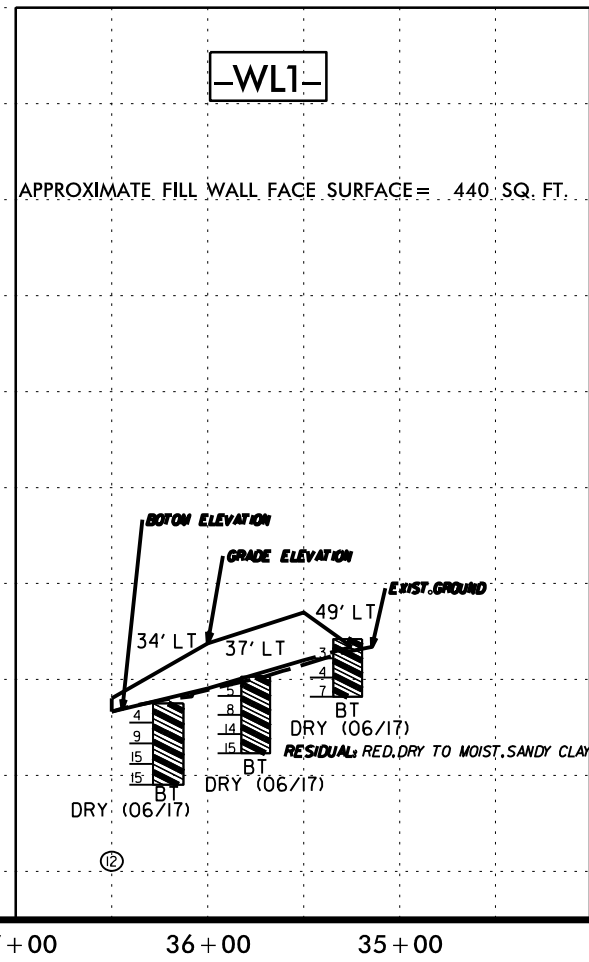
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INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

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END CONSTRUCTION
 -Y6- POT STA. 12+29.39

THE WALL ENVELOPE DOES NOT ACCURATELY
 DEPICT THE ACTUAL FACE OF THE WALL



REVISIONS
 29-SEP-2017 14:58
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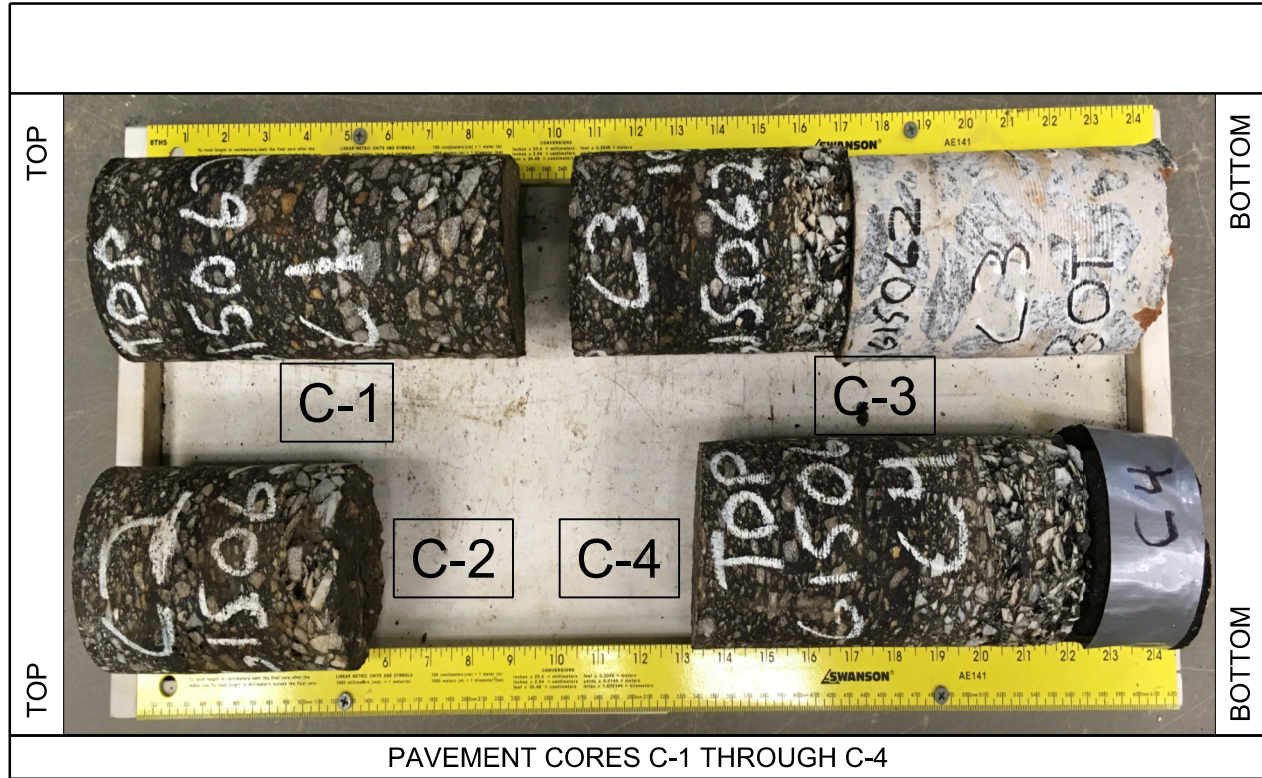
*NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT*

SUBSURFACE INVESTIGATION

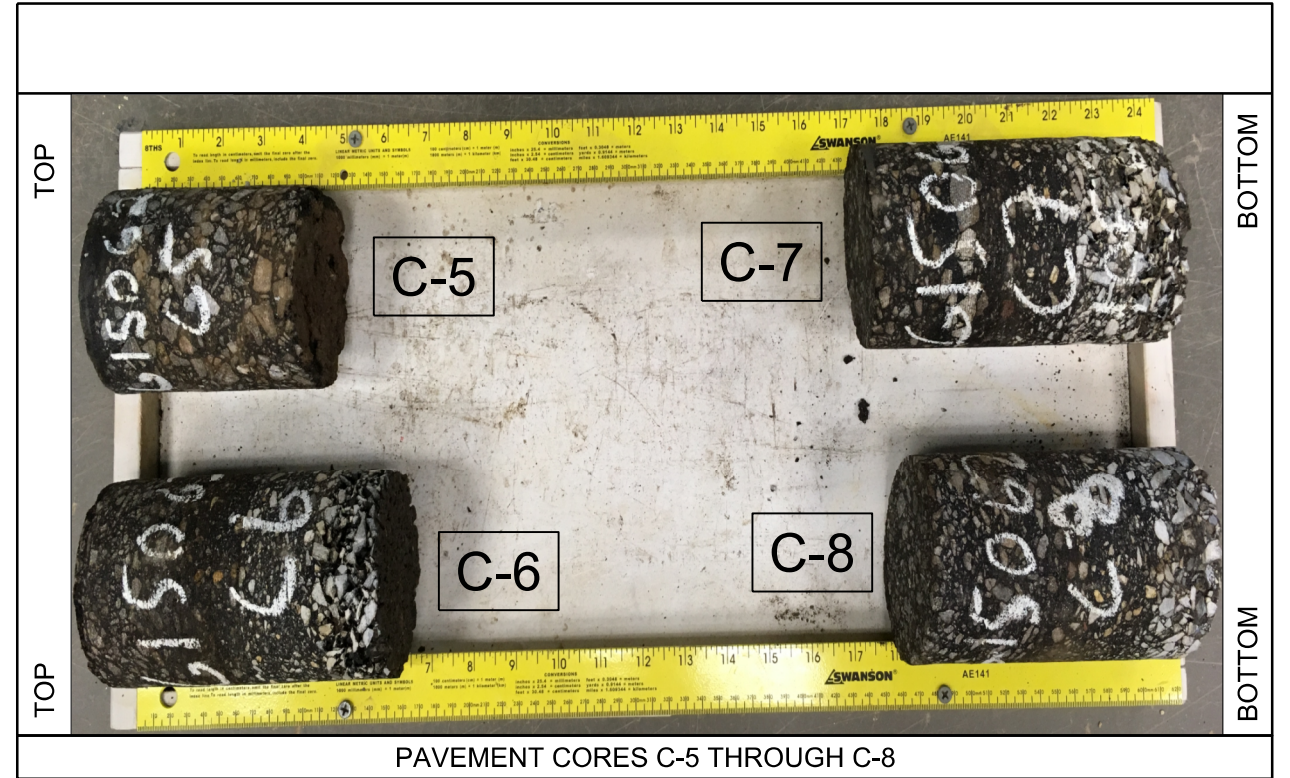
*APPENDIX A
PAVEMENT INVESTIGATION RESULTS*

REFERENCE: U-5604

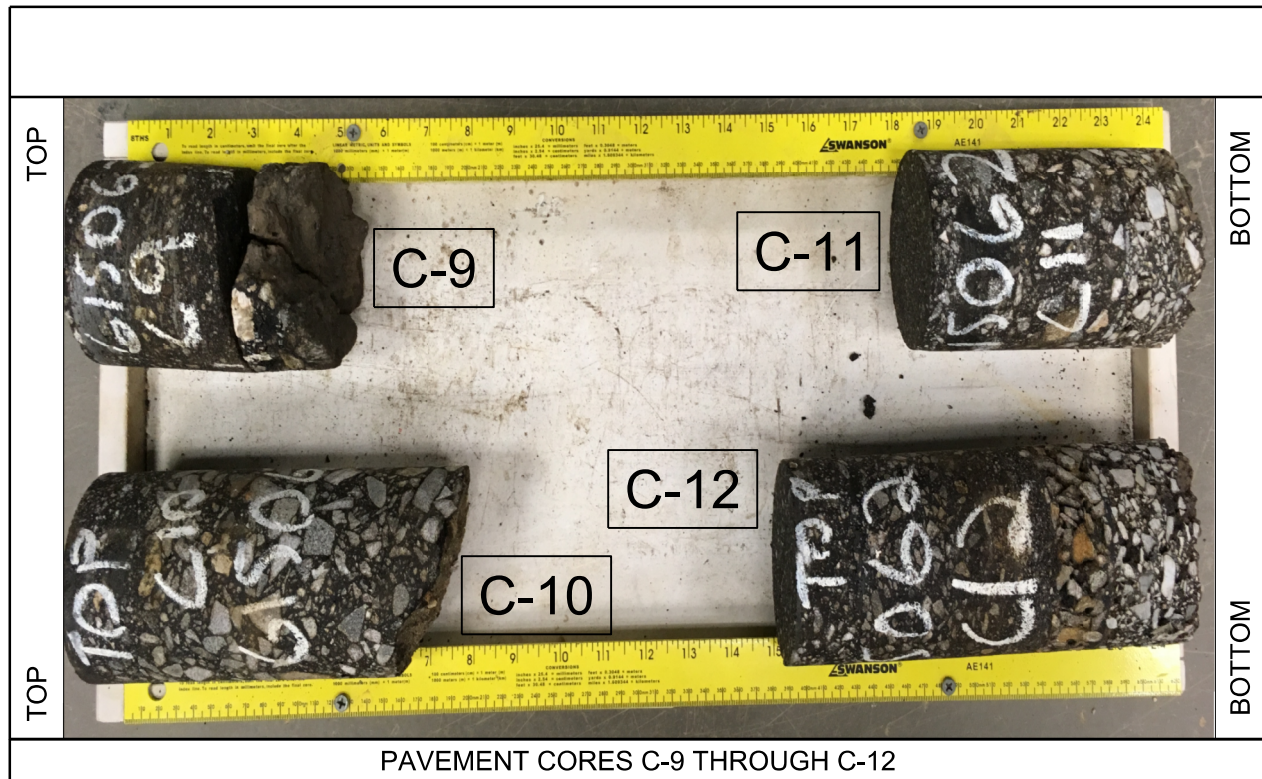
PROJECT: N/A




PAVEMENT CORES C-1 THROUGH C-4



PAVEMENT CORES C-5 THROUGH C-8



PAVEMENT CORES C-9 THROUGH C-12

 <p>FALCON ENGINEERING, INC. 1210 TRINITY ROAD, SUITE 110 RALEIGH, NC 27607 PHONE: 919.871.0800 FAX: 919.871.0803</p>	<p>PAVEMENT CORE PHOTOGRAPHS</p> <p>US 23/ US 64/ US 441 TO PORTER STREET INTERSECTION IMPROVEMENTS AT WOMAK MACON COUNTY, NC TIP NO. :U-5604 FALCON PROJECT NO.: G15062.00</p>
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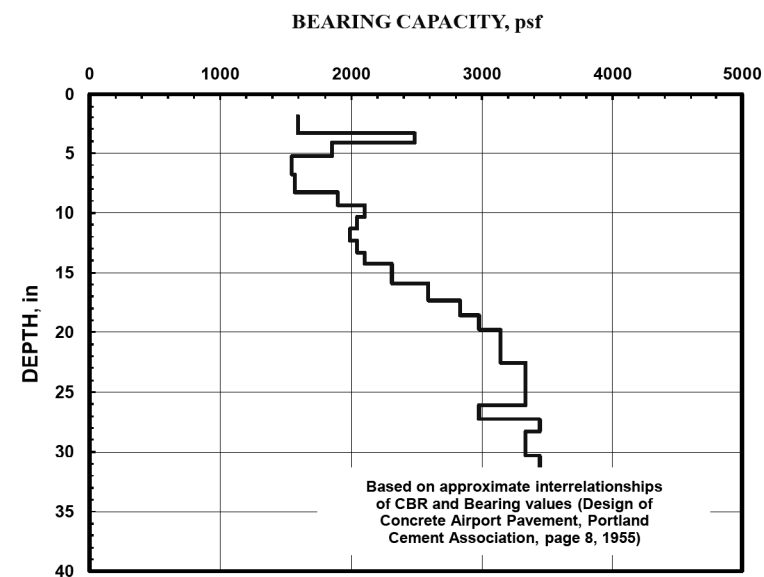
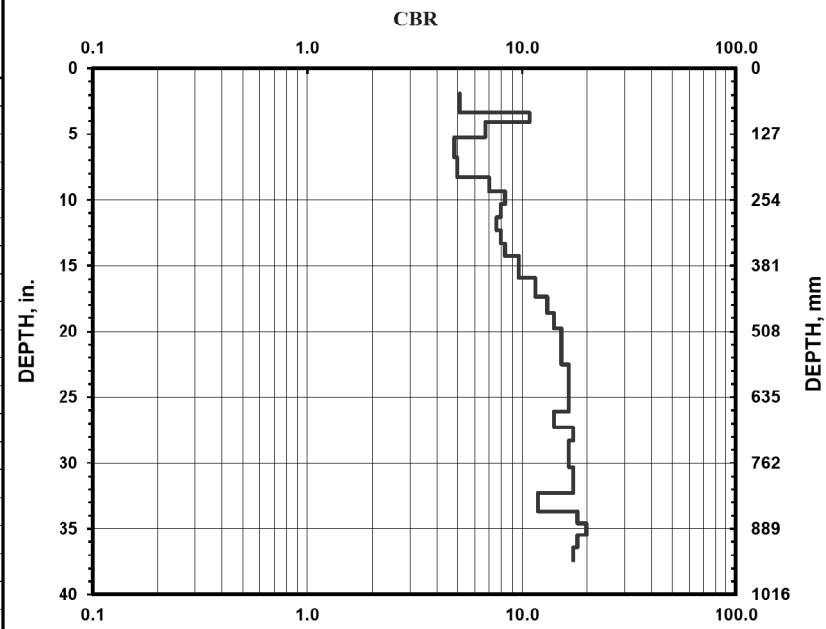
Project: G15062.00
 Location: Macon County, NC

Date: 14-Jul-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
1	48	1
1	85	1
1	104	1
1	133	1
1	172	1
1	210	1
1	238	1
1	262	1
1	287	1
1	313	1
1	313	1
1	338	1
1	362	1
2	404	1
2	440	1
2	472	1
2	502	1
2	530	1
3	572	1
2	598	1
3	637	1
2	663	1
2	693	1
2	718	1
2	744	1
2	770	1
2	795	1
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2	901	1
2	925	1
2	950	1



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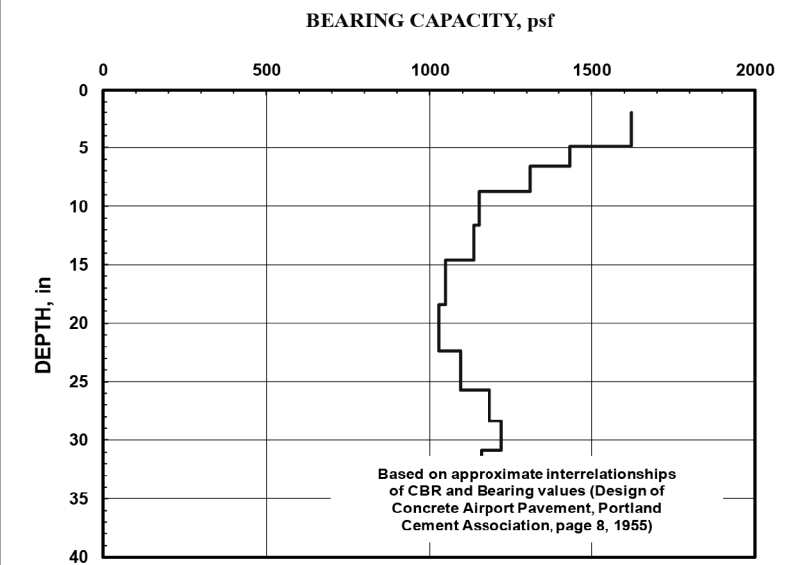
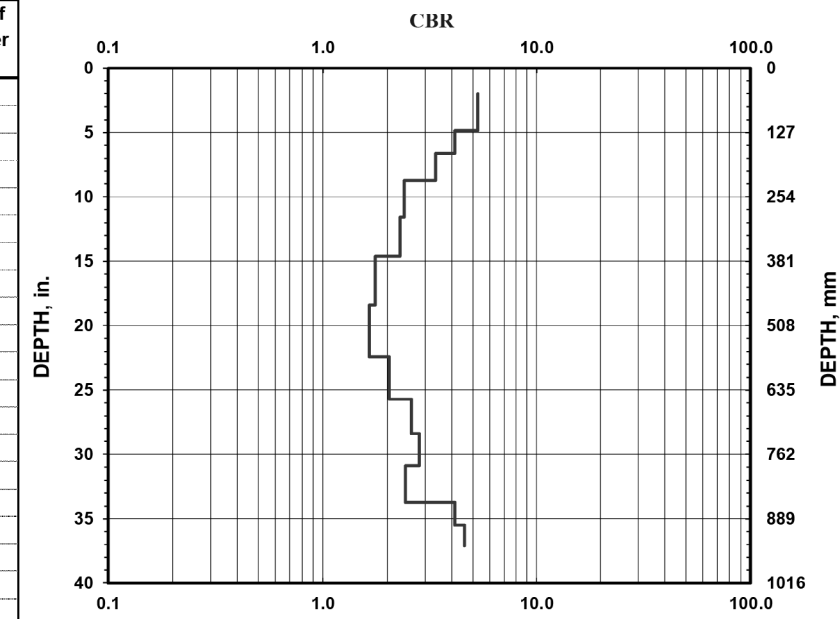
Project: G15062.00
 Location: Macon County, NC

Date: 15-Jul-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
1	51	1
1	87	1
1	123	1
1	168	1
1	222	1
1	295	1
1	371	1
1	467	1
1	569	1
1	653	1
1	721	1
1	784	1
1	856	1
1	901	1
1	942	1



DCP TEST DATA

File Name: C-3

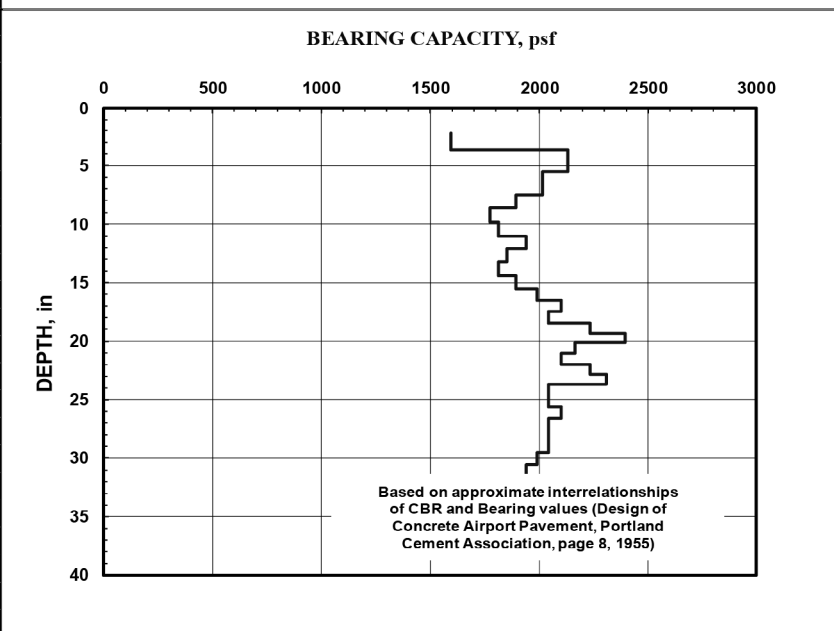
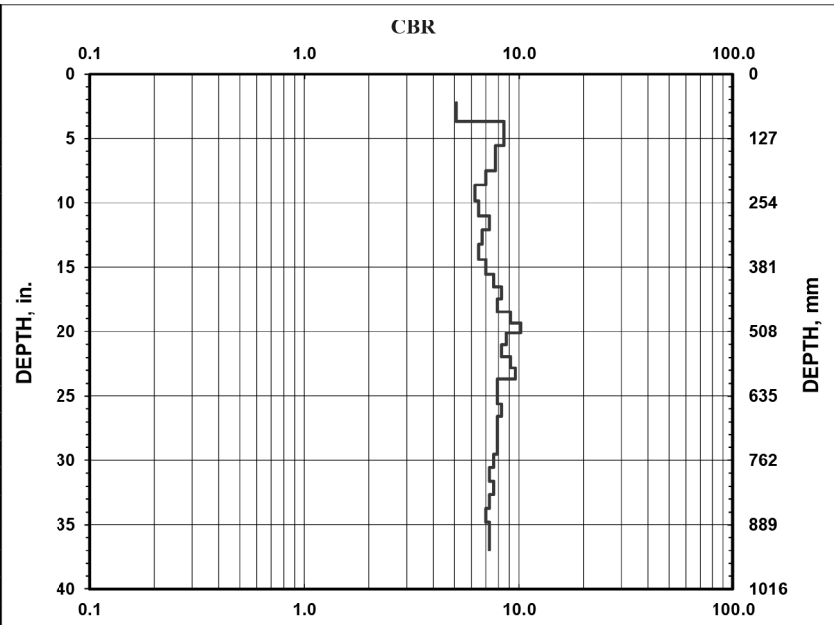
Project: G15062.00
 Location: Macon County, NC

Date: 14-Jul-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
1	56	1
1	93	1
2	140	1
2	191	1
1	219	1
1	250	1
1	280	1
1	307	1
1	336	1
1	366	1
1	394	1
1	420	1
1	444	1
1	469	1
1	491	1
1	511	1
1	534	1
1	558	1
1	580	1
1	601	1
2	651	1
1	675	1
1	700	1
1	725	1
1	750	1
1	776	1
1	803	1
1	829	1
1	856	1
1	884	1
1	911	1
1	938	1



DCP TEST DATA

File Name: C-4

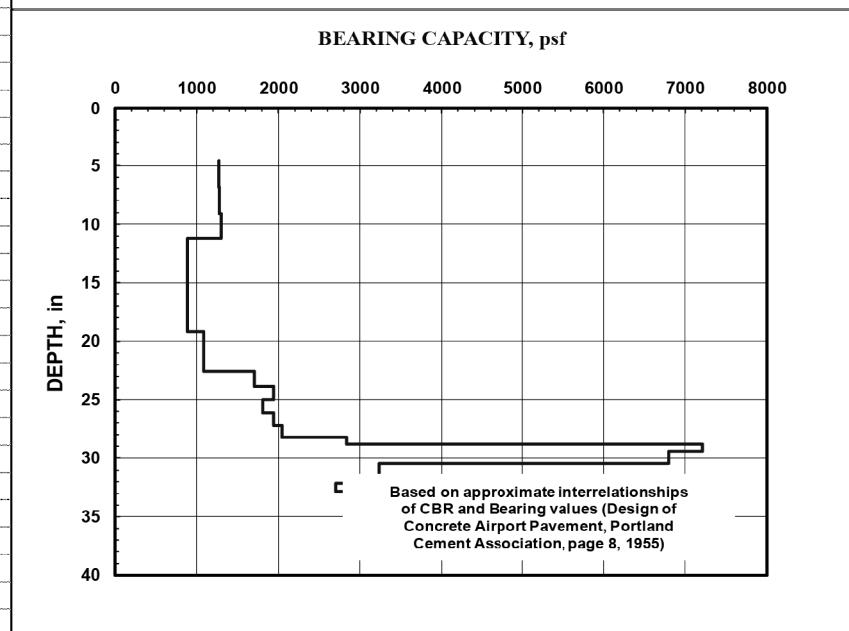
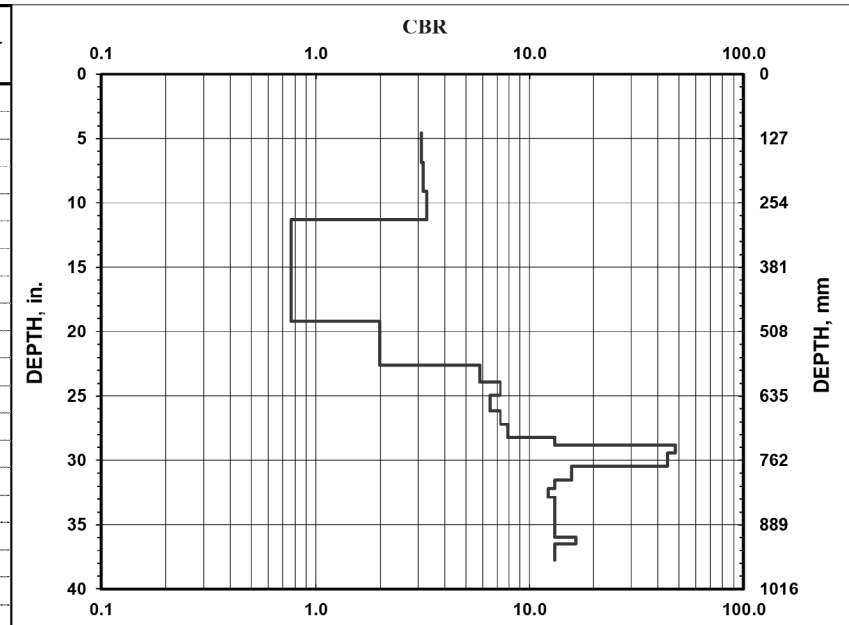
Project: G15062.00
 Location: Macon County, NC

Date: 14-Jul-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
1	116	1
1	174	1
1	231	1
1	286	1
1	488	1
1	574	1
1	607	1
1	634	1
1	664	1
1	691	1
1	716	1
1	732	1
3	747	1
5	774	1
2	801	1
1	817	1
1	834	1
1	850	1
1	866	1
1	882	1
1	898	1
1	914	1
1	927	1
1	943	1
1	959	1



DCP TEST DATA

File Name: C-5

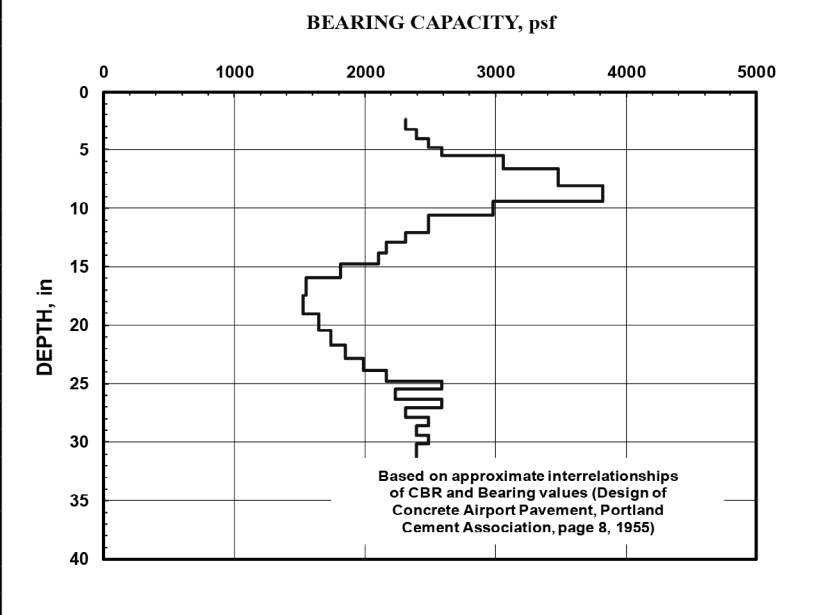
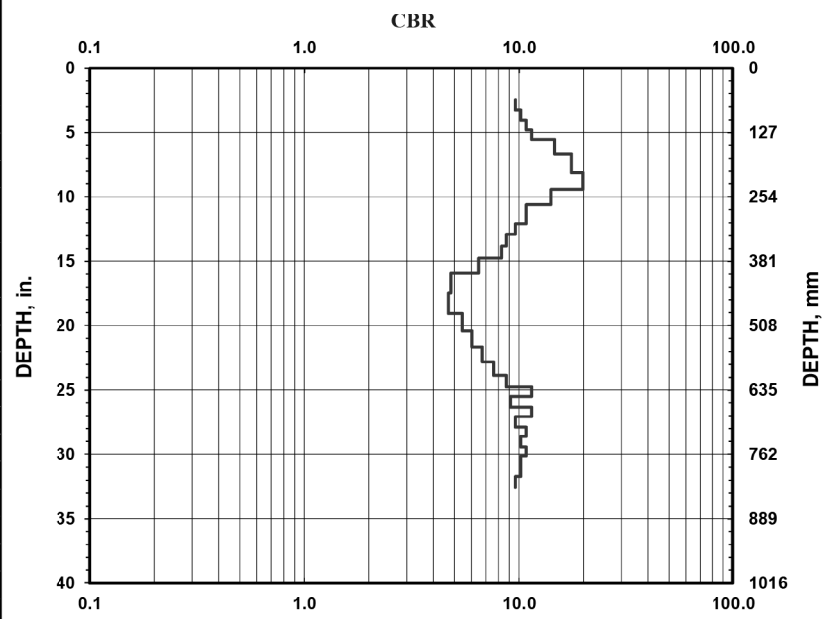
Project: G15062.00
 Location: Macon County, NC

Date: 15-Jul-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
1	62	1
1	83	1
1	103	1
1	122	1
1	140	1
2	169	1
3	206	1
3	239	1
2	269	1
1	288	1
1	307	1
1	328	1
1	351	1
1	375	1
1	405	1
1	444	1
1	484	1
1	519	1
1	551	1
1	580	1
1	606	1
1	629	1
1	647	1
1	669	1
1	687	1
1	708	1
1	727	1
1	747	1
1	766	1
1	786	1
1	806	1
1	827	1



DCP TEST DATA

File Name: C-6

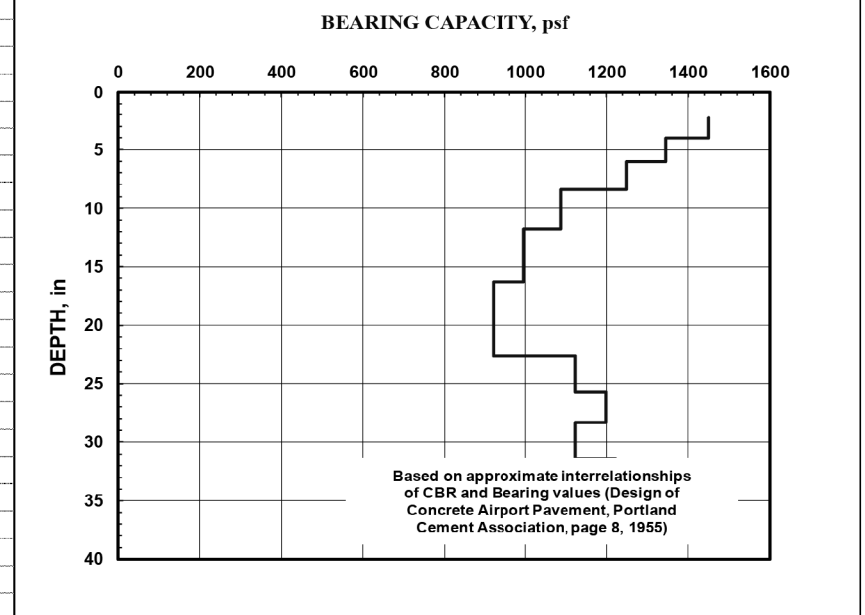
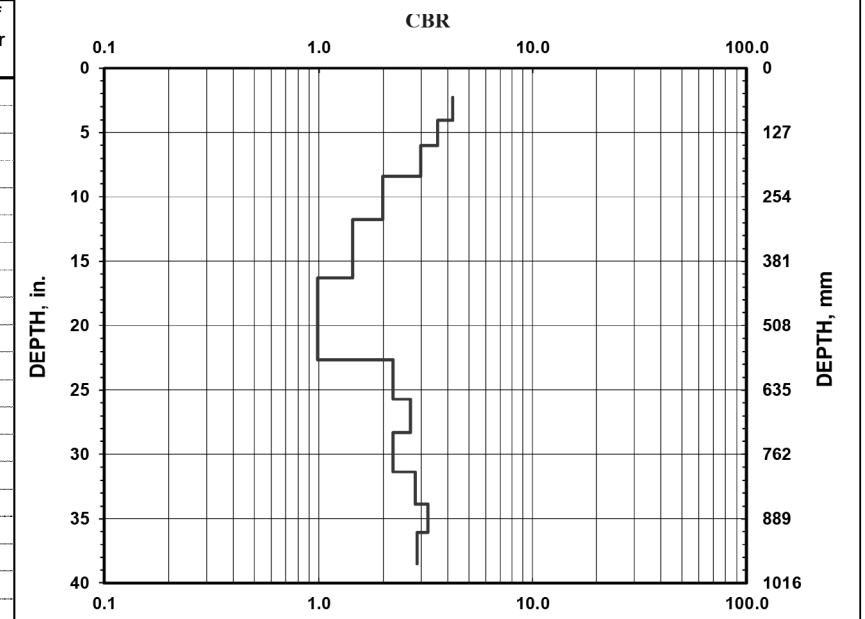
Project: G15062.00
 Location: Macon County, NC

Date: 14-Jul-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
1	58	1
1	102	1
1	153	1
1	213	1
1	299	1
1	414	1
1	575	1
1	653	1
1	719	1
1	797	1
1	860	1
1	916	1
1	978	1



DCP TEST DATA

File Name: C-7

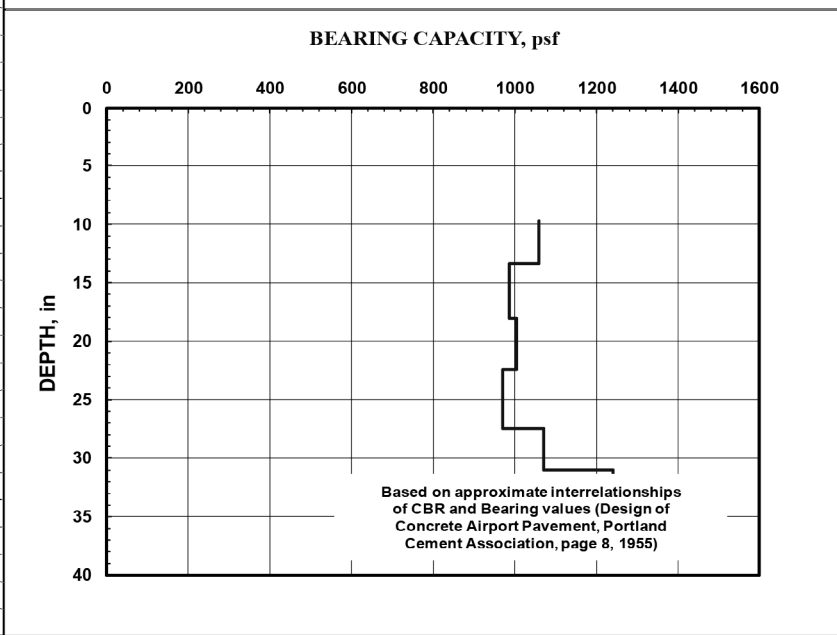
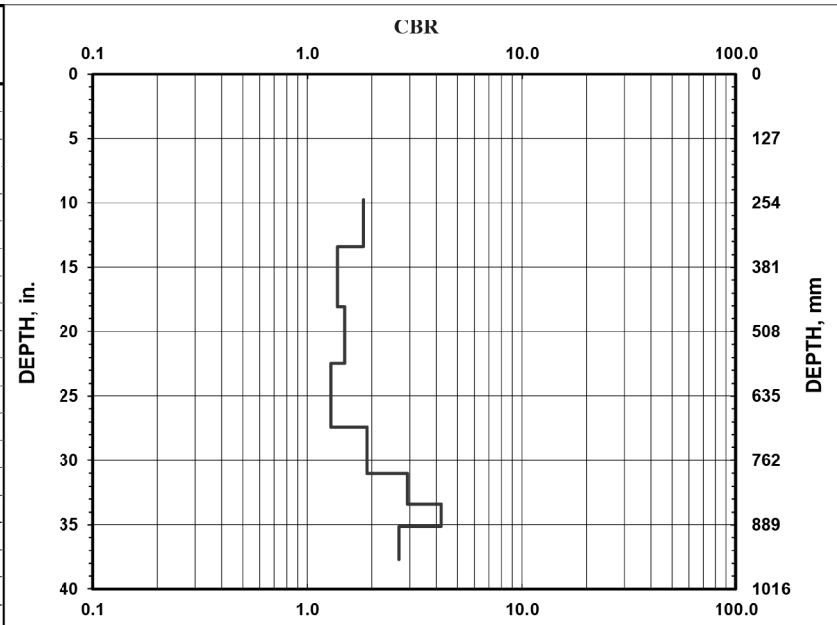
Project: G15062.00
 Location: Macon County, NC

Date: 15-Jul-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
1	247	1
1	340	1
1	459	1
1	570	1
1	697	1
1	787	1
1	848	1
1	892	1
1	958	1



DCP TEST DATA

File Name: C-8

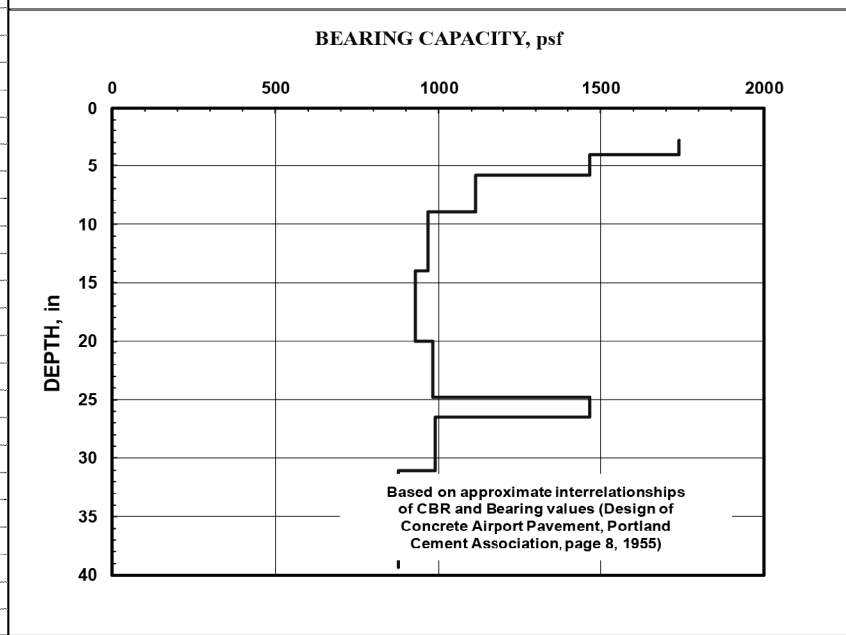
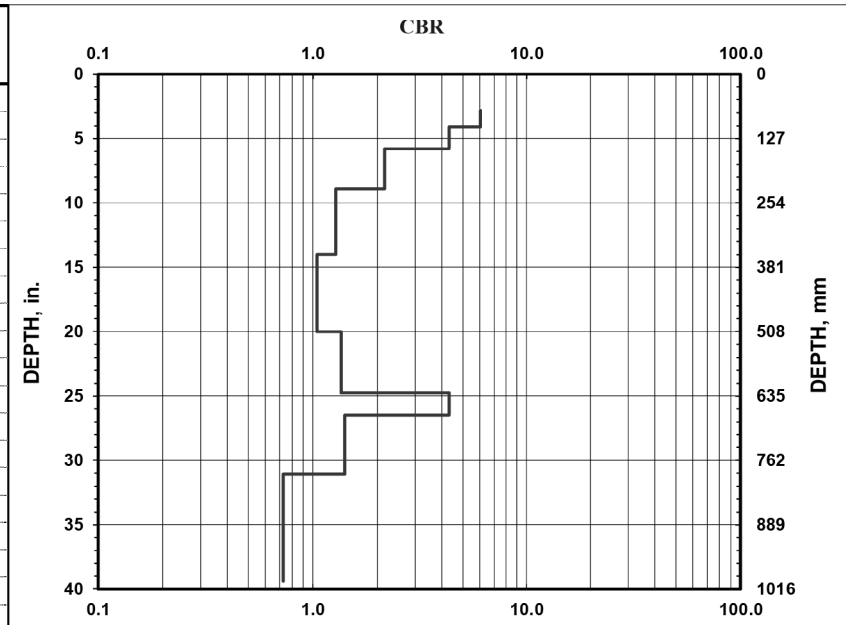
Project: G15062.00
 Location: Macon County, NC

Date: 15-Jul-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
1	72	1
1	104	1
1	147	1
1	227	1
1	355	1
1	508	1
1	629	1
1	672	1
1	789	1
1	1000	1



DCP TEST DATA

File Name: C-9

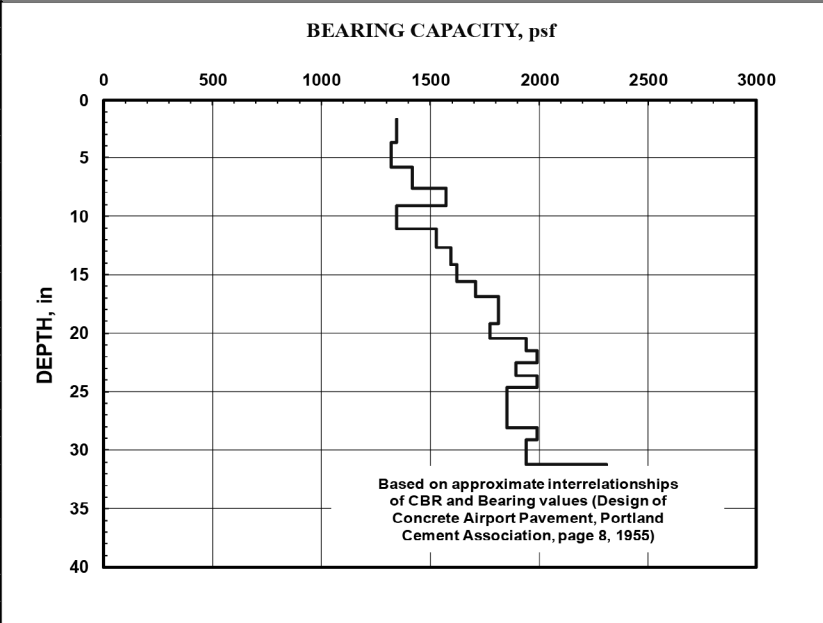
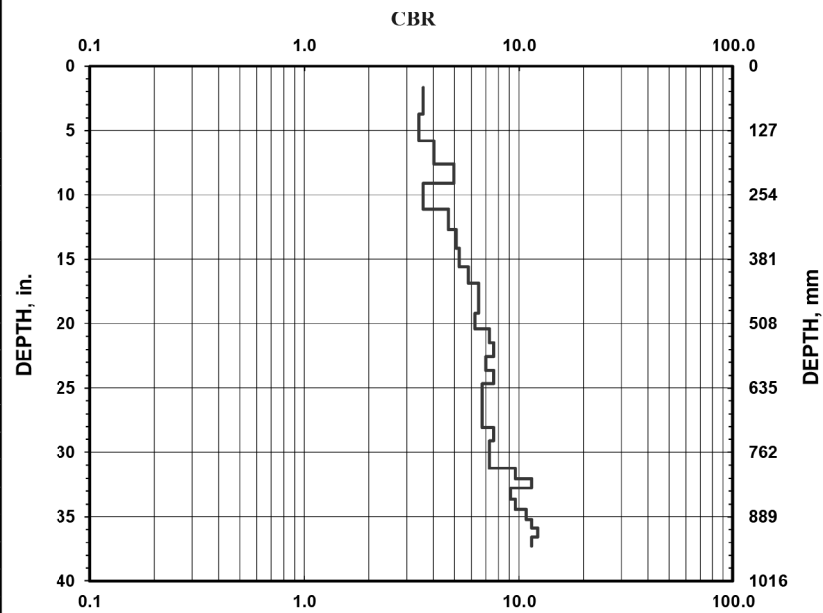
Project: G15062.00
 Location: Macon County, NC

Date: 14-Jul-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
1	43	1
1	94	1
1	147	1
1	193	1
1	231	1
1	282	1
1	322	1
1	359	1
1	395	1
1	428	1
1	458	1
1	488	1
1	519	1
1	546	1
1	572	1
1	600	1
1	626	1
1	655	1
1	684	1
1	713	1
1	739	1
1	766	1
1	793	1
1	814	1
1	832	1
1	854	1
1	875	1
1	894	1
1	912	1
1	929	1
1	947	1



DCP TEST DATA

File Name: C-10

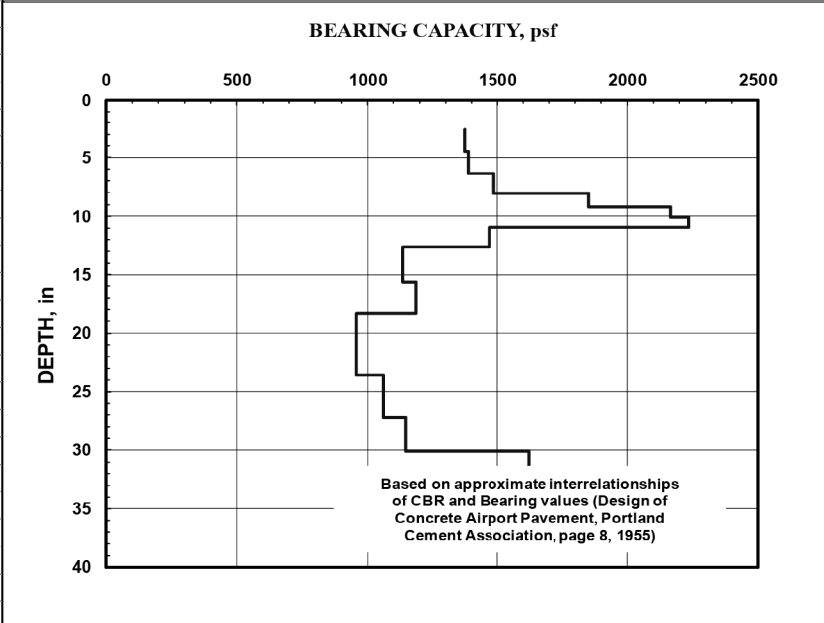
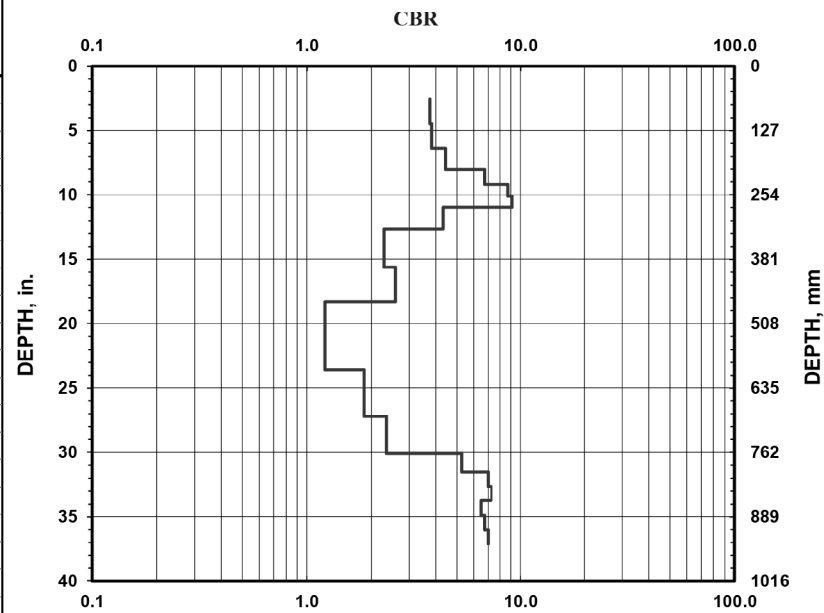
Project: G15062.00
 Location: Macon County, NC

Date: 15-Jul-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
1	65	1
1	114	1
1	162	1
1	204	1
1	233	1
1	256	1
1	278	1
1	321	1
1	397	1
1	465	1
1	599	1
1	691	1
1	765	1
1	801	1
1	829	1
1	856	1
1	886	1
1	915	1
1	943	1



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

SUBSURFACE INVESTIGATION

***APPENDIX B
LABORATORY RESULTS***

REFERENCE: U-5604

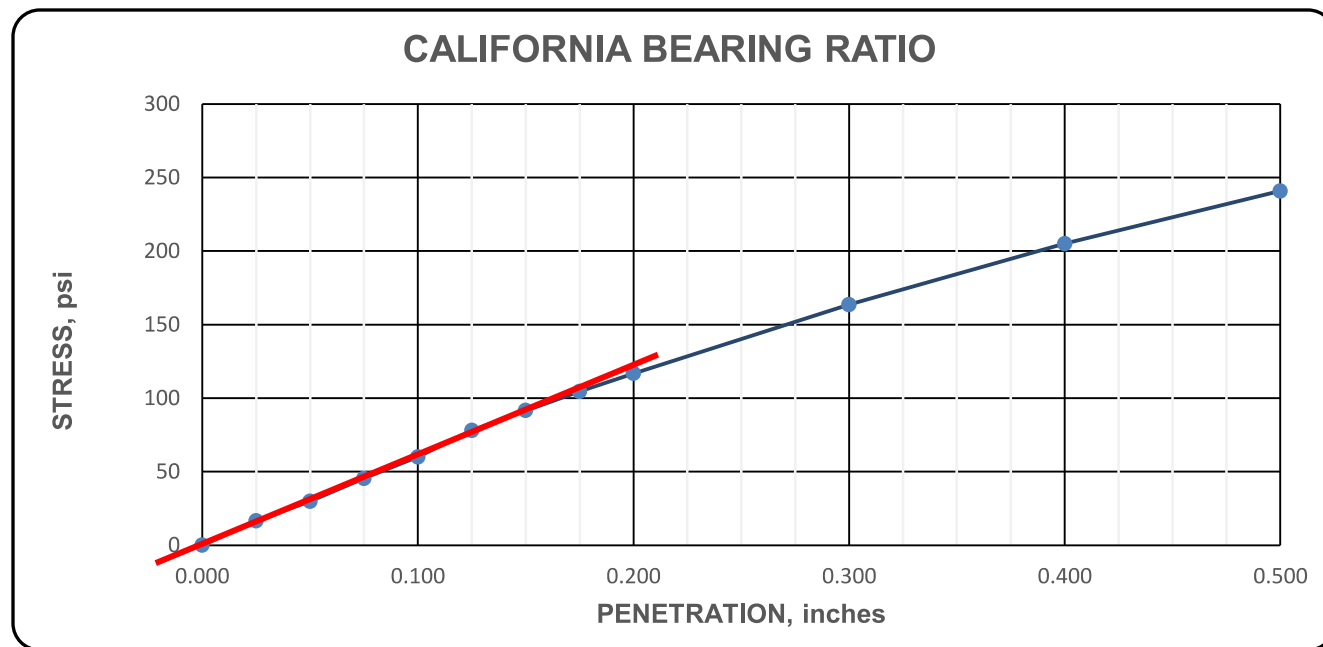
PROJECT: N/A



May 12, 2017

**REPORT OF CALIFORNIA BEARING RATIO (CBR)
AASHTO T 193**

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-01, BS-1, 1-8.5'



Bearing Ratio: at 0.1 inches of penetration: 6.1
at 0.2 inches of penetration: 7.8

Compaction Method: AASHTO T 99, AASHTO T 193: 5.1.1

Maximum Dry Unit Weight, lbs/ft³: 107.1

Optimum Water Content, %: 18.2

Compacted Dry Unit Weight, lbs/ft³: 105.0

Compacted Water Content, %: 20.3

Compaction Percentage: 98.0

Water Content, Top one-inch after test, %: 23.9

Surcharge, lbs: 10

Immersion period, hours: 97

Swell, %: 0.6

Remarks: Soaked specimen

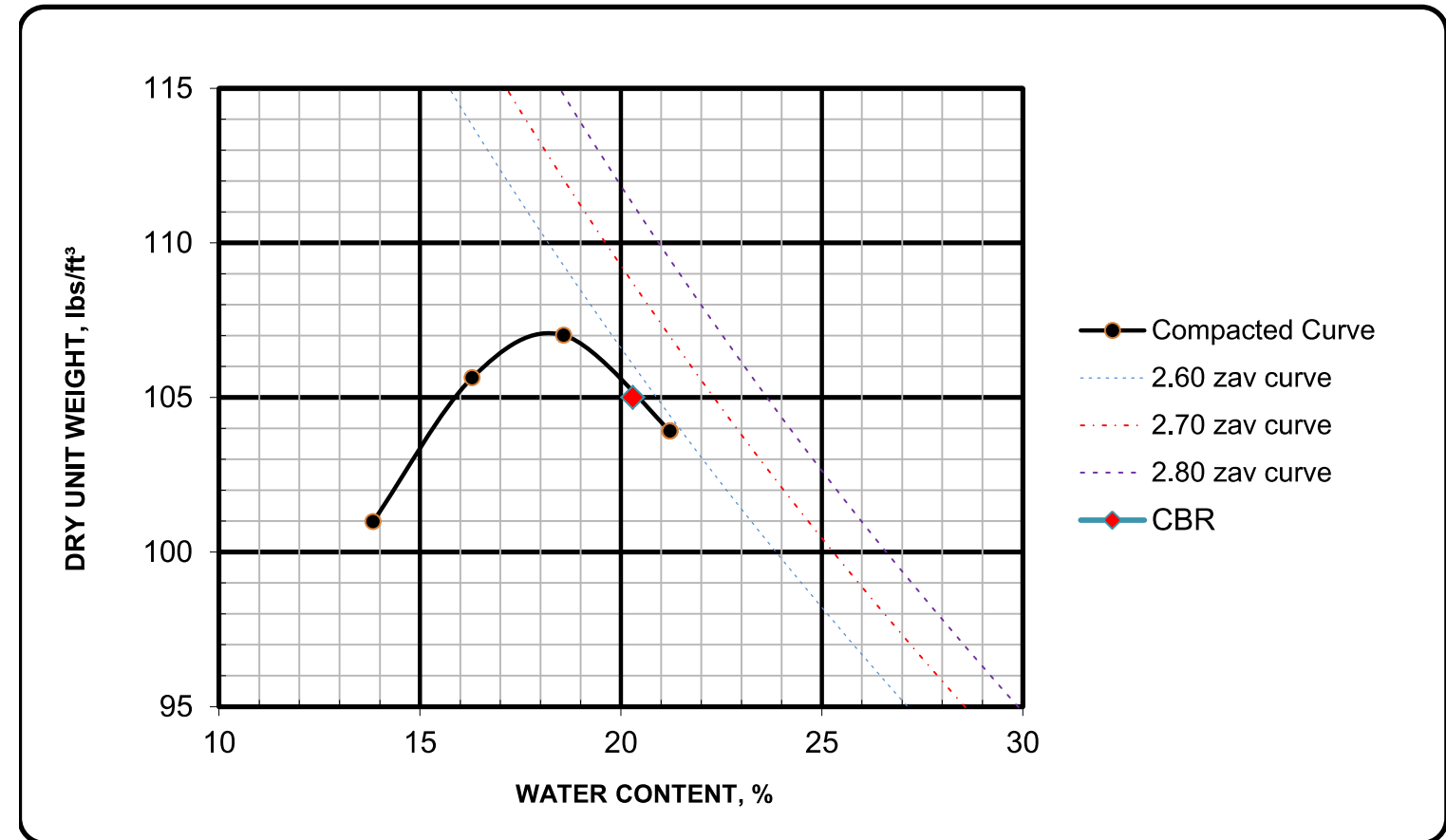
Reviewed by:

Document ID: BS-1 CBR



**REPORT OF MOISTURE-DENSITY RELATIONS OF SOILS
USING A 5.5-LB RAMMER AND A 12-IN. DROP**
Performed in general accordance with AASHTO T 99, Method A
May 12, 2017

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-01, BS-1, 1-8.5'
VISUAL DESCRIPTION: Brown sandy clay



MAXIMUM DENSITY, lbs/ft³: 107.1
OPTIMUM MOISTURE CONTENT, %: 18.2

AS-RECEIVED WATER CONTENT: 22.7
LIQUID LIMIT: 40
PLASTIC LIMIT: 25
PLASTICITY INDEX: 15
PERCENT FINER NO. 200: 53.6
AASHTO CLASSIFICATION: A-6 (6)

REMARKS:

REVIEWED BY:

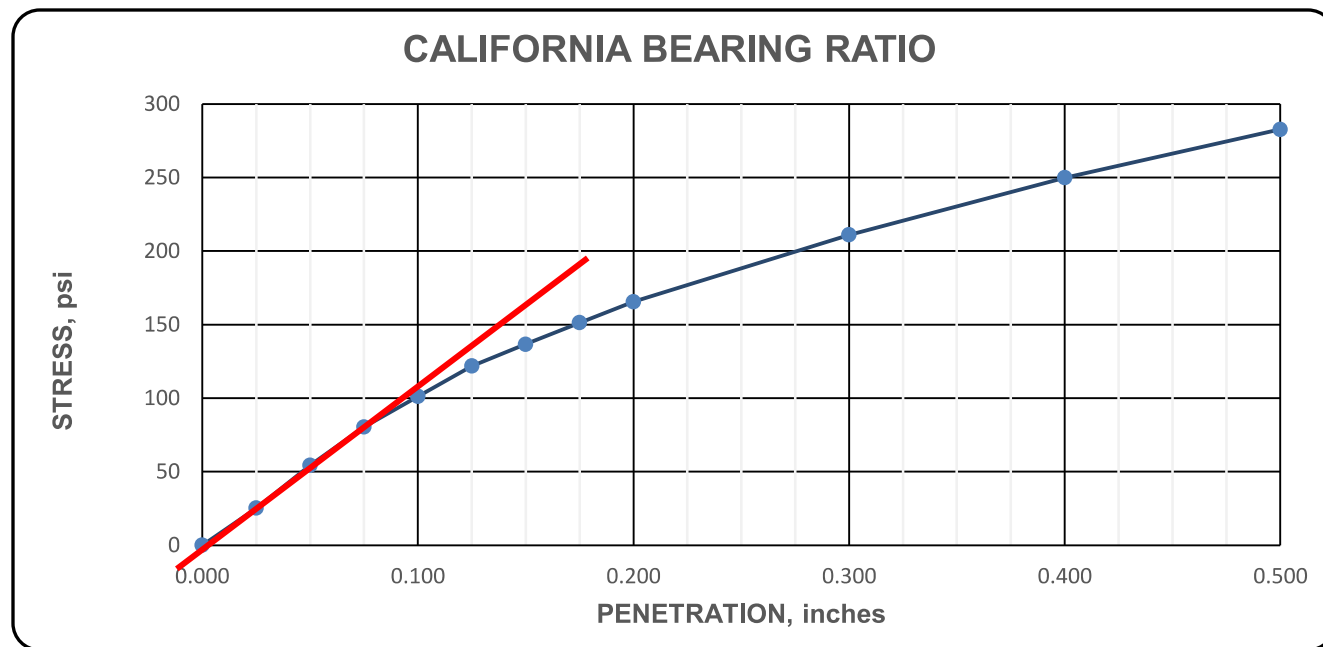
Document ID: BS-1 Laboratory Compaction



May 12, 2017

**REPORT OF CALIFORNIA BEARING RATIO (CBR)
AASHTO T 193**

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-13, BS-2, 1-8.5'



Bearing Ratio: at 0.1 inches of penetration: 10.3
at 0.2 inches of penetration: 11.1

Compaction Method: AASHTO T 99, AASHTO T 193: 5.1.1

Maximum Dry Unit Weight, lbs/ft³: 94.3

Optimum Water Content, %: 28.0

Compacted Dry Unit Weight, lbs/ft³: 92.1

Compacted Water Content, %: 30.2

Compaction Percentage: 97.7

Water Content, Top one-inch after test, %: 34.0

Surcharge, lbs: 10

Immersion period, hours: 97

Swell, %: 0.5

Remarks: Soaked specimen

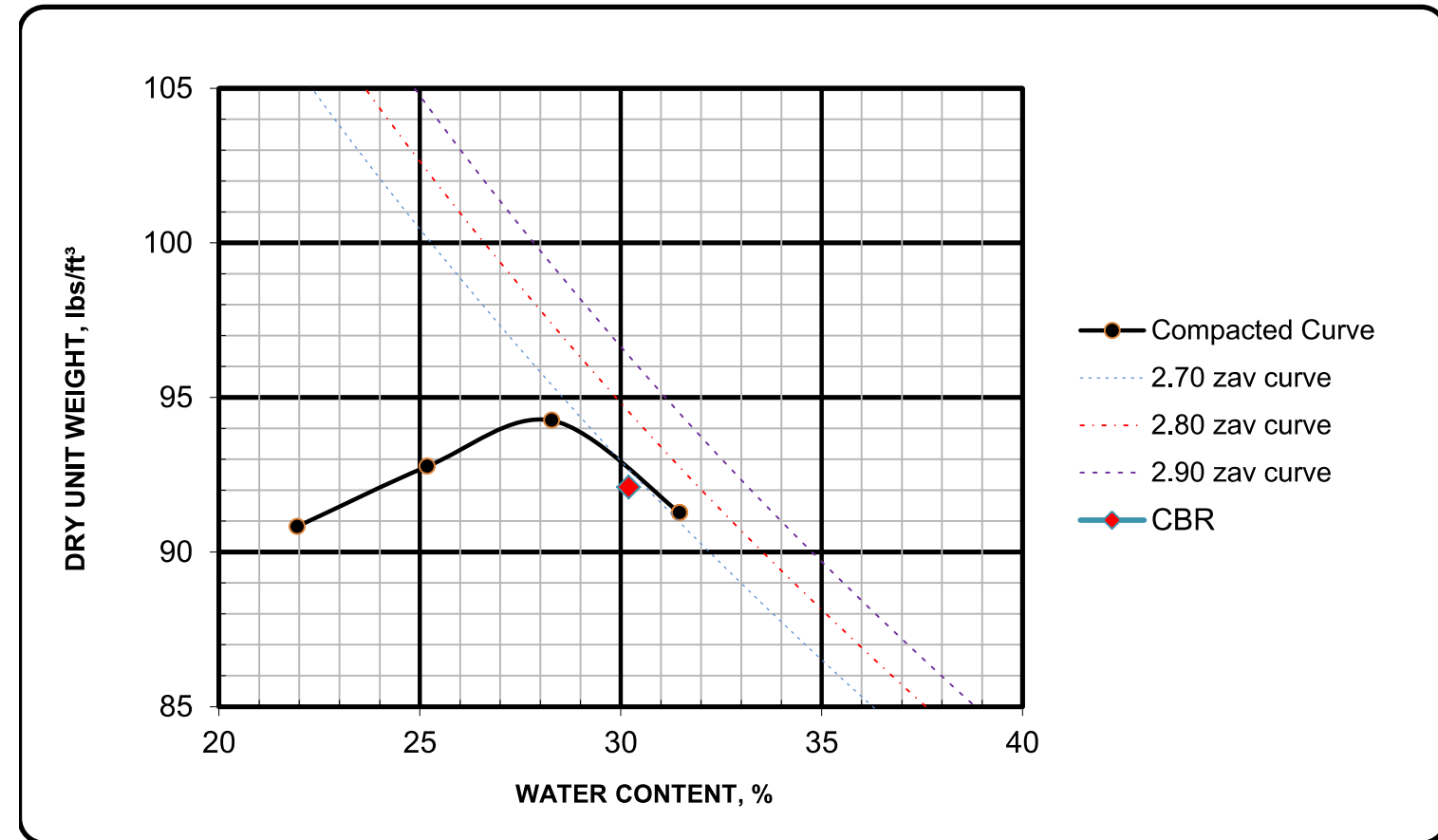
Reviewed by:

Document ID: BS-2 CBR



**REPORT OF MOISTURE-DENSITY RELATIONS OF SOILS
USING A 5.5-LB RAMMER AND A 12-IN. DROP**
Performed in general accordance with AASHTO T 99, Method A
May 12, 2017

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-13, BS-2, 1-8.5'
VISUAL DESCRIPTION: Red sandy clay



MAXIMUM DENSITY, lbs/ft³: 94.3
OPTIMUM MOISTURE CONTENT, %: 28.0

AS-RECEIVED WATER CONTENT: 34.7
LIQUID LIMIT: 62
PLASTIC LIMIT: 35
PLASTICITY INDEX: 27
PERCENT FINER NO. 200: 73.9
AASHTO CLASSIFICATION: A-7-5 (22)

REMARKS:

REVIEWED BY:

Document ID: BS-2 Laboratory Compaction