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REFERENCE: U-5315

PROJECT: 45429

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.	U-5315	1	63

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LINE	STATION	PLAN	PROFILE
-L-	57+00 - 85+00	4-5	9
-LPB-	10+00 - 22+11.35	4	10
-RPD-	10+00 - 30+42.73	4,7	11
-LPD-	10+00 - 23+54.20	4-6	12
-RPD-	10+00 - 31.02.03	5, 8	13
-YI-	10+00 - 23+46.90	5-6	14

**CROSS SECTIONS**

LINE	STATION	SHEETS
-L-	59+00 - 62+00	15-17
-L-	62+50 - 66+50	18-21
-LPB-	11+00 - 18+00	22-32
-RPD-	15+00 - 18+00	33-37
-LPD-	13+50 - 16+50	38-40
-RPD-	15+00 - 24+16	41-52

# ROADWAY SUBSURFACE INVESTIGATION

COUNTY WAKE  
PROJECT DESCRIPTION MORRISVILLE PARKWAY  
EXTENSION AND NC540 INTERCHANGE FROM  
SR 1625 (GREEN LEVEL CHURCH RD) TO NC 55  
**INVENTORY**

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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

EVANS, T. E.

SDS

INVESTIGATED BY EVANS, T. E.

DRAWN BY EVANS, T. E.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE FEBRUARY 2015



*Jeremy R. Hamm*

2-2-15

SIGNATURE

DATE

**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><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 DISLOADED 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 (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 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>																																																																																																																																																																																																																			
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<p align="center"><b>GROUND WATER</b></p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING   STATIC WATER LEVEL AFTER 24 HOURS   PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA   SPRING OR SEEP</p>				<p align="center"><b>MISCELLANEOUS SYMBOLS</b></p> <p> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION   SOIL SYMBOL   ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT   INFERRED SOIL BOUNDARY   INFERRED ROCK LINE   ALLUVIAL SOIL BOUNDARY</p> <p> DIP &amp; DIP DIRECTION OF ROCK STRUCTURES   TEST BORING   AUGER BORING   CORE BORING   MONITORING WELL   PIEZOMETER INSTALLATION</p> <p> SLOPE INDICATOR INSTALLATION   CONE PENETROMETER TEST   SOUNDING ROD   TEST BORING WITH CORE   SPT N-VALUE</p>																																																																																																																																																																																																																											
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<p align="center"><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>				<p align="center"><b>BENCH MARK:</b></p> <p>BORING ELEVATIONS BASED ON .TIN FILES ELEVATION: FEET</p> <p>NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLED REF - REFUSAL (SOUNDING ROD)</p>																																																																																																																																																																																																																											

# TOWN of CARY

## NORTH CAROLINA



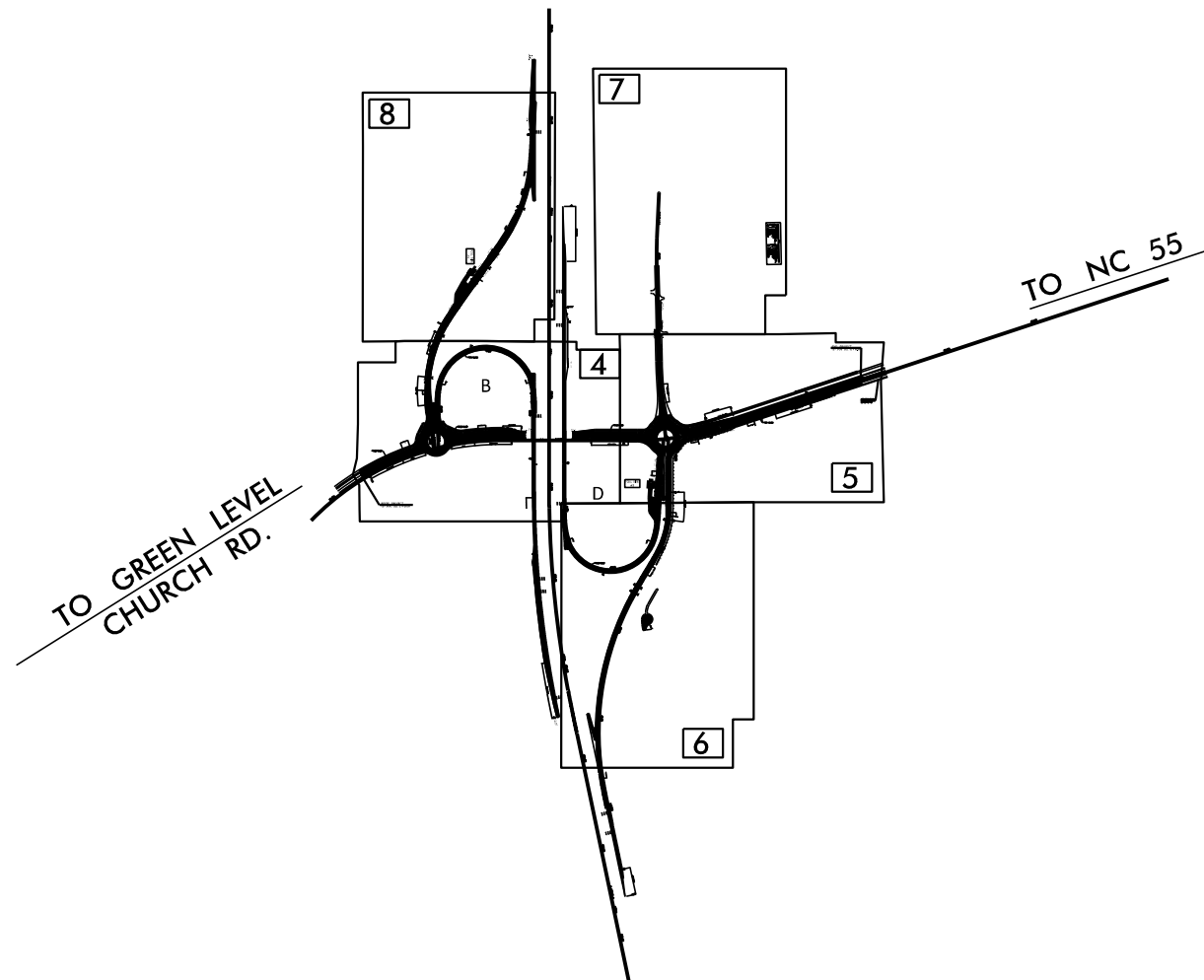
316 North Academy Street  
 Cary, N.C. 27513  
 Tel: 919-469-4030 Fax: 919-460-4935  
 www.townofcary.org

STATE PROJECT REFERENCE NO.	SHEET
45429.1.1(U-5315)	2A

## MORRISVILLE PARKWAY

Project Limits - Morrisville Parkway Extension and NC 540 Interchange  
 from SR 1625 (Green Level Church Rd.) to NC 55  
 Project No. ST 1123/1220

Contact Information:  
 project.manager@townofcary.org  
 919.460.0000



Revisions	
Date	Description

Survey for this project was completed by Town of Cary professional land surveyors. Coordinate control based on the following:  
 Horizontal \_\_\_\_\_ Vertical \_\_\_\_\_

Drawn By : \_\_\_\_\_

Designed By: \_\_\_\_\_

Date: \_\_\_\_\_

Project Engineer:  
 Engineer Name \_\_\_\_\_

\_\_\_\_\_  
 Signature Date SEAL

Director of Transportation & Facilities  
 Laura L. Cove, P.E.

\_\_\_\_\_  
 Signature Date SEAL

Internal Control Approval Authorizing Release By The Town of Cary  
 Transportation & Facilities Dept. (Check Indicating Type of Plan)

\_\_\_\_ Final Drawings (No Marking)

Certification Optional:

\_\_\_\_ Preliminary Drawings - Do Not Use For Construction

\_\_\_\_ Progress Drawing - Do Not Use For Construction

\_\_\_\_ Final Drawing - Not Released For Construction

\_\_\_\_ Final Drawing - For Review Purposes Only

\_\_\_\_ Not a Certified Document as to the Original Document but ONLY as to the Revisions



## Roadway Subsurface Investigation Report - Inventory

**Morrisville Parkway Extension and NC 540 Interchange**  
**From SR 1625 (Green Level Church Rd) to NC 55**  
**Town of Cary**  
**Wake County, North Carolina**  
**WBS: 45429.1.1 TIP: U-5315**  
**Falcon Project No.: G14001.00**

**Prepared for:**

RK&K  
900 Ridgefield Drive, Suite 350  
Raleigh, NC 27609

Submitted by:

Falcon Engineering, Inc.  
1210 Trinity Road, Suite 110  
Raleigh, North Carolina 27607  
(919) 871-0800  
www.falconengineers.com

January 12, 2015

## PREFACE

This roadway subsurface investigation was conducted between September 8<sup>th</sup> and September 16<sup>th</sup>, 2014 in general accordance with our Proposal to Provide Geotechnical Engineering Services, dated December 2, 2013 (Proposal No.: F2012-045R1). 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 thirty-nine (39) Standard Penetration Test (SPT) borings were drilled for the new roadway alignments. All SPT borings were drilled using a CME-550X all-terrain-vehicle (ATV) mounted drill rig equipped with 2 ¼-inch inside diameter hollow-stem augers and an automatic hammer. Four (4) additional hand auger borings with rod soundings were performed where SPT borings were offset significantly from centerline to develop a comprehensive cross section of subsurface conditions. Representative soil samples, collected with a split-barrel sampler, were selected for laboratory testing to verify visual field classifications. In addition, bulk samples were collected for additional laboratory testing for use in our geotechnical engineering analyses.

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:

Thomas E. Evans, PE  
Geotechnical Engineer

Jeremy R. Hamm, PE  
Geotechnical Engineering Manager



**WBS:** 45429.1.1  
**TIP:** U-5315  
**COUNTY:** Wake  
**DESCRIPTION:** Morrisville Parkway Extension and NC 540 Interchange  
 From SR1625 (Green Level Church Rd) to NC 55  
**SUBJECT:** Roadway Subsurface Investigation – Inventory

## PROJECT DESCRIPTION

This project consists of a portion of the Morrisville Parkway extension from the end of an existing section west of NC 540 near Westfalen Drive to NC 55 in western Wake County, North Carolina. The project has been divided into three sections, and the section which has been investigated for this report extends from station 57+00 to 82+55 -L- (-MPE3-). Beyond these limits on -L- (-MPE3-) design and investigation is the responsibility of others. The project also includes a new partial cloverleaf interchange with NC 540 and the corresponding alignments listed below for ramps and loops in two quadrants. In addition, Twyla Road (SR 3068) will be partially relocated along -Y1- in the same vicinity of the existing alignment to provide an intersection with Morrisville Parkway. All other alignments will consist of new location roadway constructed through what are currently heavily wooded, residential, and agricultural lands. A bridge structure and associated approach embankments have been previously constructed spanning NC 540 as part of the NC 540 construction. The bridge will carry the planned two lane section of -L- across NC 540 with a future matching structure planned to create duals as needed to facilitate a four lane section. The planned alignments cross a few small waterways which will be facilitated by pipe crossings. A reinforced concrete box culvert (RCBC) is planned near station 83+50 -L- beyond the limits of our investigation. An onsite detour -Y1DET- is also planned near -Y1-, for which no investigation was scoped. The following alignments, totaling approximately 10,612 feet (2.01 miles) were explicitly investigated.

<u>Alignment</u>	<u>Station</u>
-L- (Morrisville Parkway)	57+00.00 – 82+55.00
-Y1- (Twyla Road)	10+00.00 – 23+46.90
-LPB-	10+00.00 – 22+11.35
-RPB-	10+00.00 – 30+42.73
-LPD-	10+00.00 – 23+54.20
-RPD-	10+00.00 – 31+02.03

## AREAS OF SPECIAL GEOTECHNICAL INTEREST

The following sections contain cohesive soils which have the potential to cause embankment or subgrade stability problems during construction:

### Station

57+00 to 81+50, -L-  
 12+00 to 21+02.62, -LPB-  
 14+00 to 29+30.63, -RPB-  
 13+00 to 22+88.66, -LPD-  
 15+00 to 30+33.64, -RPD-  
 10+00 to 19+50.00, -Y1-

Shallow ground water was measured within the following areas and may cause groundwater related stability problems during construction:

### Station

61+00 to 66+00 -L-  
 73+00 to 83+00 -L-  
 12+00 to 15+00 -LPB-  
 13+00 to 16+00 -LPD-  
 22+00 to 23+00 -LPD-  
 15+00 to 24+00 -RPD-  
 29+00 to 31+00 -RPD-  
 11+00 to 13+00 -Y1-

Alluvial soils and natural waterways, seasonally high groundwater, perched water, and/or surficial water due to poor drainage was observed in the areas below. The potential for wet, soft or organic soils should be anticipated in these areas.

### Station

72+55 - 72+82 -L-  
 74+95 - 75+21 -L-  
 82+55 -L- to beyond project limits



## PHYSIOGRAPHY AND GEOLOGY

The project site is in the western portion of the Coastal Plain Physiographic Province of North Carolina. According to the *Geologic Map of North Carolina* (1985), the site is underlain by the Chatham Group, Undivided (TRc) of the Triassic Basin Formation in the Piedmont Physiographic Province. This unit is noted to consist of conglomerate, fanglomerate, sandstone and mudstone. Residual soils encountered indicate a geologic setting consistent with the published data.

Existing site topography is gently sloping with some steep slopes near creeks; typical of this area of the piedmont region. Predominantly wide and shallow drainage swales parallel existing roadway alignments, and carry roadway drainage toward various natural drainage features and creeks. Topography is relatively flat in agricultural areas within the project corridor.

Large cut slopes exist on the project corridor near NC 540 which the proposed ramps for the interchange will traverse. These slopes were observed at 3:1 (HV) or shallower and appeared to be stable within the vicinity of the proposed corridor. Some exposed weathered rock was observed along these cut slopes. Subsurface cross sections depict the top of weathered rock day lighting into the cut slopes where appropriate.

## SOIL PROPERTIES

A variety of soils were encountered along the project, including existing roadway embankments, alluvial deposits, and Triassic residual soils, weathered rock, and intrusive crystalline rock.

Roadway Embankment soils were encountered at the ground surface or beneath existing pavements in and adjacent to existing roadways. These consist of 1.5 to 3 feet of dry to wet, very loose to medium dense, clayey and silty sand (A-2-4, A-2-6) and medium stiff to stiff, sandy clay and silt (A-4, A-6) with trace gravel.

Alluvial soils were encountered at the ground surface in a few locations. These soils were found at the ground surface and beneath embankment materials to depths of approximately 8.5 feet deep and consist of dry to wet, very loose to medium dense, silty sand and poorly-graded sand (A-2-4, A-1-b) with trace amounts of organic material.

Triassic Residual soils were encountered at the ground surface, or beneath roadway embankment and/or alluvial soils. These soils consist of dry to wet, loose to very dense, clayey and silty sand (A-2-6, A-2-4) and medium stiff to hard, fine sandy clay and silt and silty clays (A-4, A-6, A-7).

Weathered rock was encountered in many borings throughout the project area at depths of 0.5 feet to 21 feet, consisting of red-brown, tan, gray, blue, and purple, Triassic Siltstone and Triassic Sandstone. Some borings were terminated before encountering weathered rock, at depths of up to 25 feet. Many of the borings were terminated in weathered rock before non-crystalline rock was encountered. However, intrusive crystalline rock was encountered at two locations (along -Y1-, and near the roundabout where -LPD-, -RPD-, and -L- intersect). This material consisted of black, gray, and brown Intrusive Diabase, likely part of a dike formation, and was encountered at 14 to 20 feet below existing ground. The presence of other Diabase dikes or other formations within the project limits is also likely.

## GROUNDWATER PROPERTIES

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

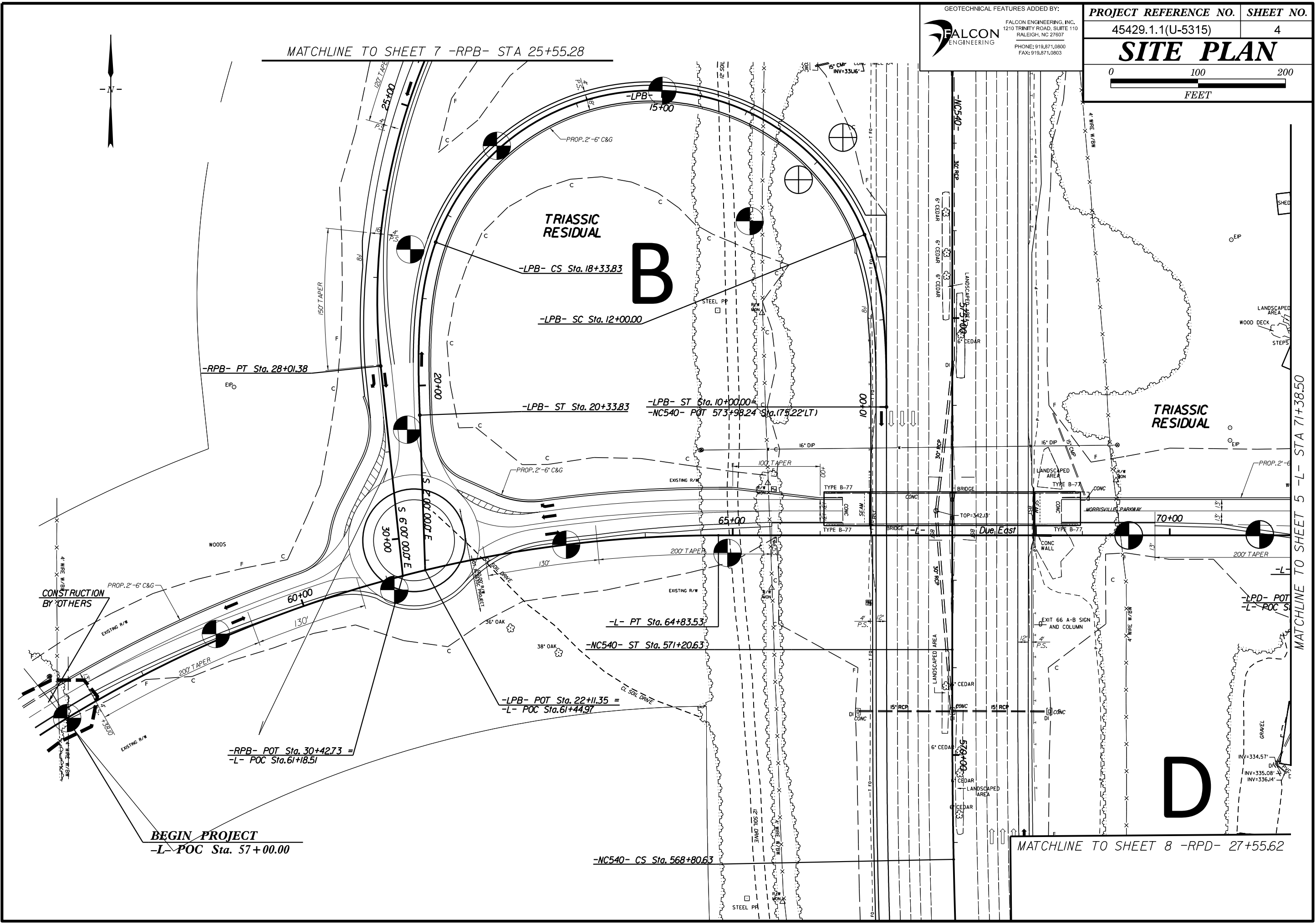
The project crosses small streams and tributaries as well as natural drainage ditches. Groundwater was observed at shallow depths near these streams and in low lying areas. In addition, perched and/or static groundwater was encountered in proposed cut areas and will likely be encountered during site excavation. Detailed groundwater measurements are included in the attached subsurface profiles and cross sections.

The ground surface between 72+55 and 72+82 -L-, was saturated with standing water in the area at the time of our investigation due to poor drainage. Perched water and/or shallow groundwater, flowing surface water, and saturated, soft soils are likely to be encountered in this area during construction.



**FALCON ENGINEERING**  
 FALCON ENGINEERING, INC.  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
 FAX: 919.871.0803

<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
45429.1.1(U-5315)	4
<b>SITE PLAN</b>	



MATCHLINE TO SHEET 7 -RPB- STA 25+55.28

MATCHLINE TO SHEET 8 -RPD- 27+55.62

MATCHLINE TO SHEET 5 -L- STA 71+38.50

CONSTRUCTION BY OTHERS

BEGIN PROJECT  
 -L- POC Sta. 57+00.00

**TRIASSIC RESIDUAL**  
**B**

**TRIASSIC RESIDUAL**

**D**

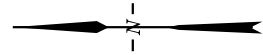
Duel East

MORRISVILLE PARKWAY

INV=334.57'  
 INV=335.08'  
 INV=336.14'

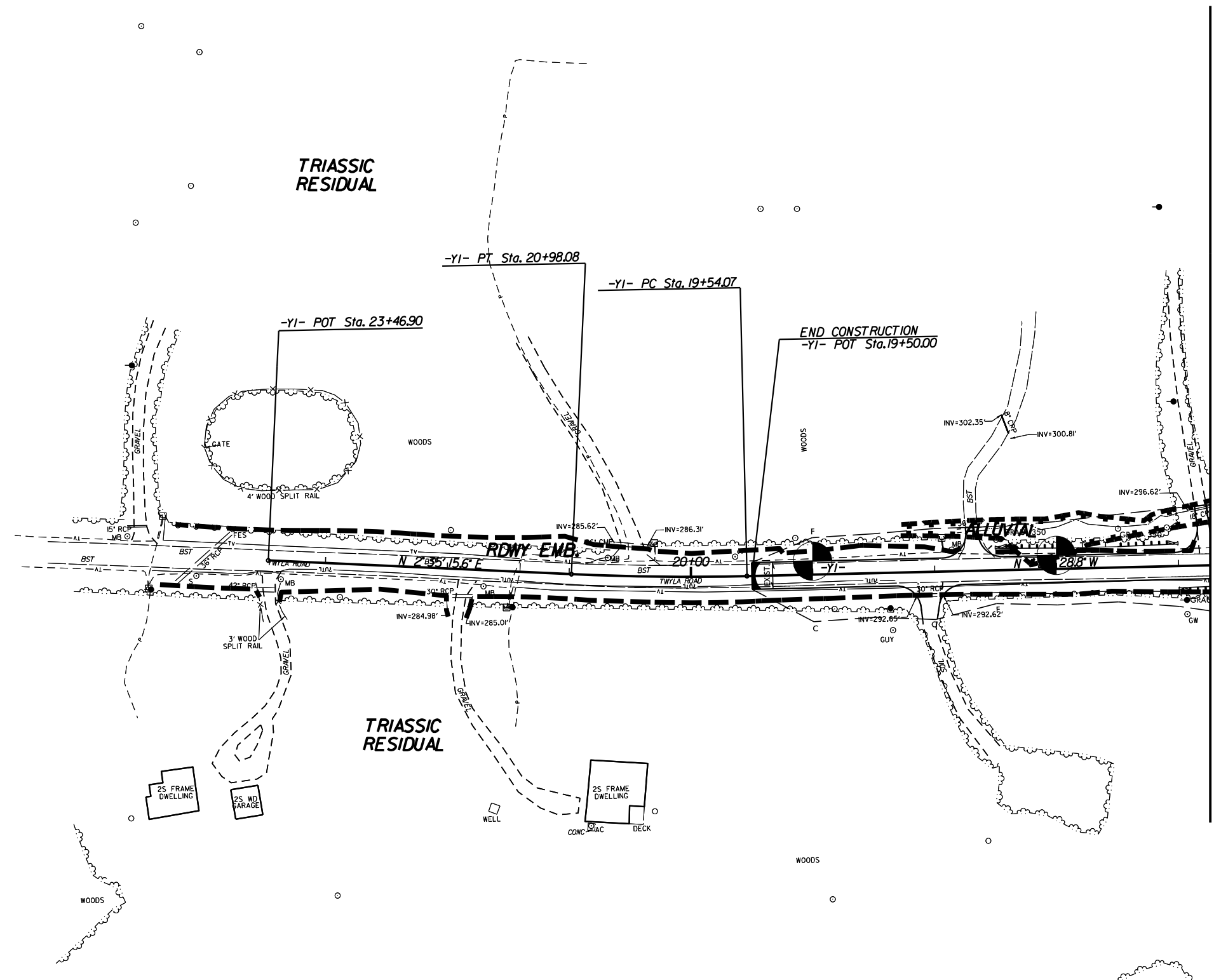






GEOTECHNICAL FEATURES ADDED BY:  
**FALCON**  
ENGINEERING  
FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
RALEIGH, NC 27607  
PHONE: 919.871.0800  
FAX: 919.871.0803

<b>PROJECT REFERENCE NO.</b> 45429.1.1(U-5315)	<b>SHEET NO.</b> 6
<b>SITE PLAN</b>	
0                      100                      200 ————— FEET	



MATCHLINE TO SHEET 5 -YI- STA 15+73.91

590+00

INV=309.20'

INV=309.13'

TOP=315.94'

INV=309.16'

30' RCP

Dupe North

585+00

INV=316.88'

INV=316.77'

TOP=323.07'

30' RCP


-NC540-

INV=320.57'

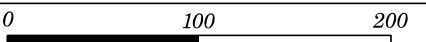
INV=319.43'

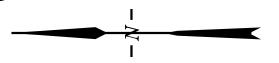
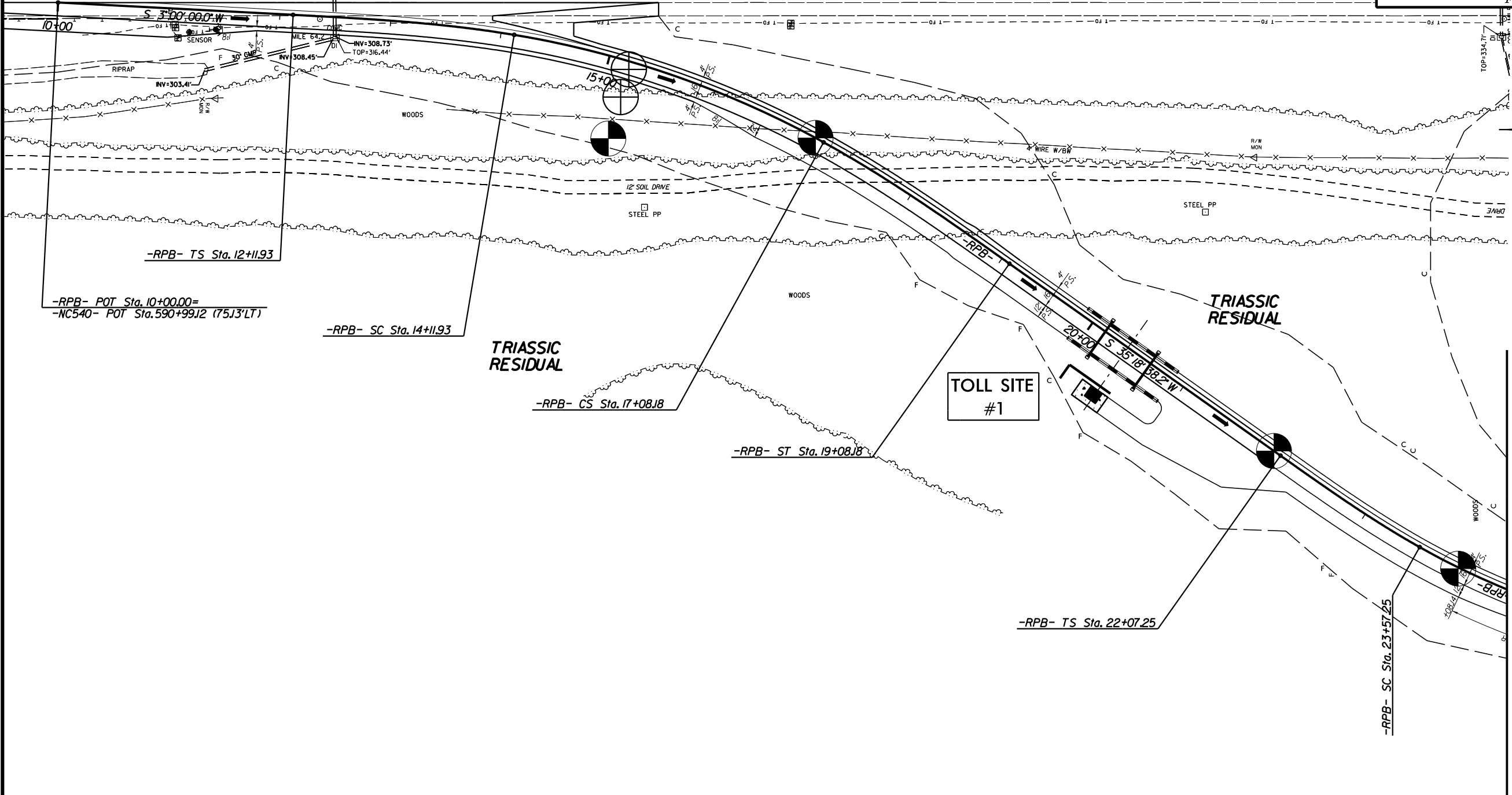
TOP=329.81'

GEOTECHNICAL FEATURES ADDED BY:



FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
RALEIGH, NC 27607  
PHONE: 919.871.0800  
FAX: 919.871.0803

PROJECT REFERENCE NO.	SHEET NO.
45429.1.1(U-5315)	7
<b>SITE PLAN</b>	
 0 100 200 FEET	







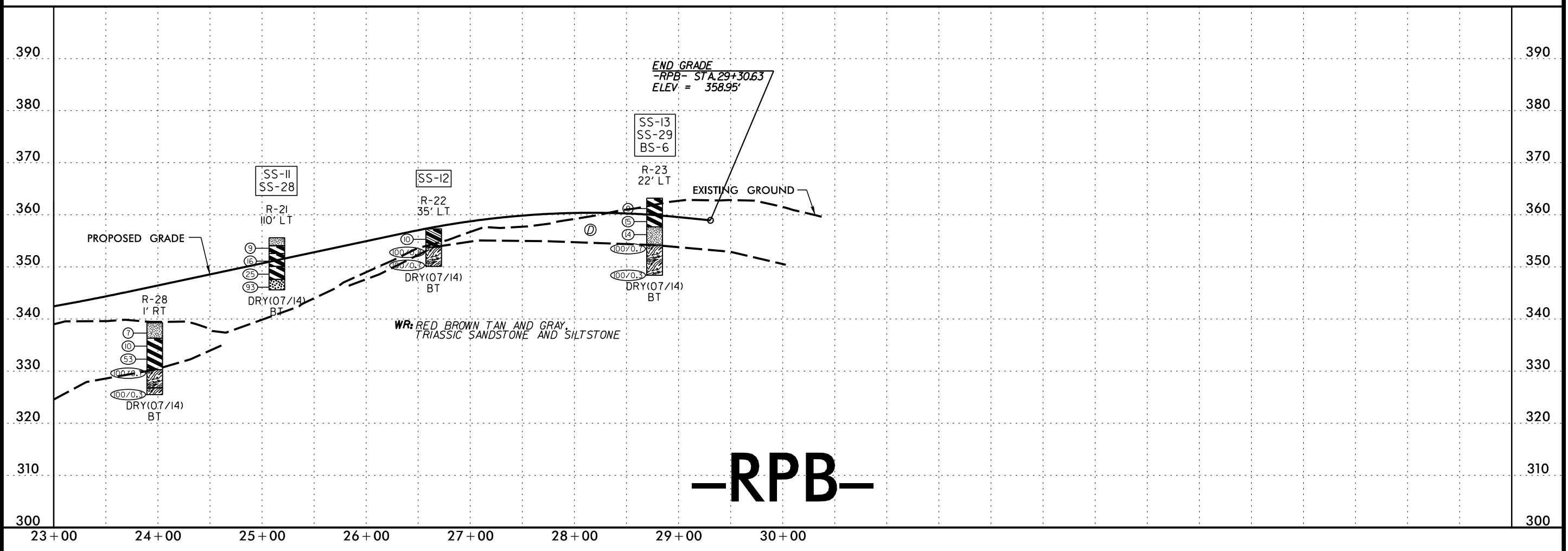
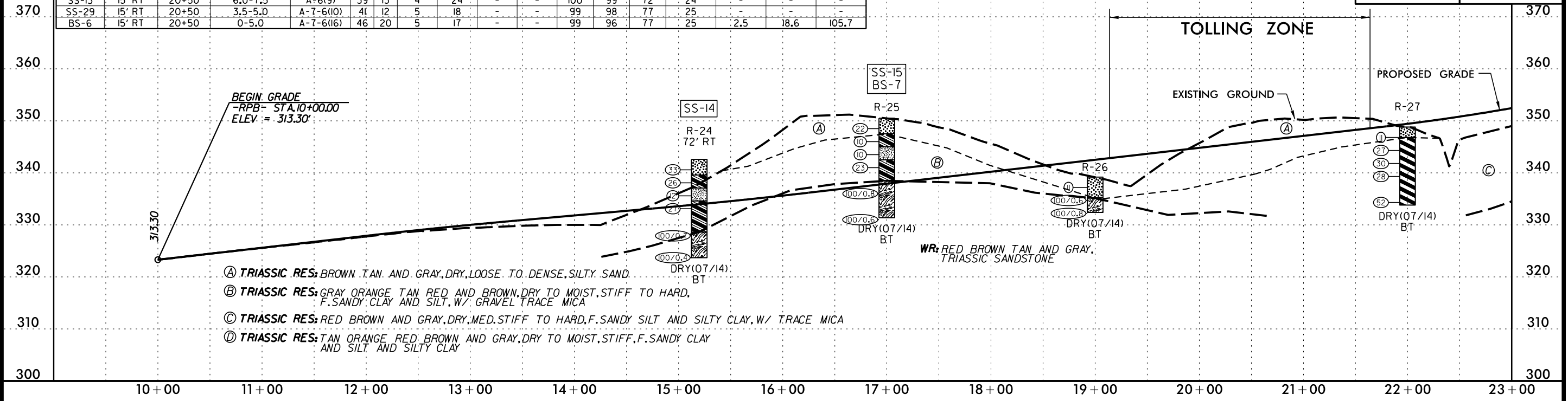


5/28/99

**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L <sub>c</sub>	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT	CLAY	10	40	200				
SS-14	72' RT	15+20	8.5-10.0	A-6(8)	36	13	3	27	-	-	100	99	70	14	-	-	-
SS-15	CL	17+00	8.5-10.0	A-6(9)	36	13	2	22	-	-	100	99	76	16	-	-	-
BS-7	CL	17+00	0-10.0	A-7-6(17)	50	28	13	20	-	-	99	92	67	21	2.9	13.2	116.9
SS-11	4' RT	17+03	1.0-2.5	A-4(4)	29	10	22	14	-	-	99	83	62	8	-	-	-
SS-28	4' RT	17+03	3.5-5.0	A-7-6(24)	52	30	7	15	-	-	100	96	78	15	-	-	-
SS-12	25' RT	18+50	1.0-2.5	A-6(7)	39	20	29	15	-	-	97	76	52	12	-	-	-
SS-13	15' RT	20+50	6.0-7.5	A-6(9)	39	13	4	24	-	-	100	99	72	24	-	-	-
SS-29	15' RT	20+50	3.5-5.0	A-7-6(10)	41	12	5	18	-	-	99	98	77	25	-	-	-
BS-6	15' RT	20+50	0-5.0	A-7-6(16)	46	20	5	17	-	-	99	96	77	25	2.5	18.6	105.7

PROJECT REFERENCE NO. <b>U-5315</b>	SHEET NO. <b>11</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

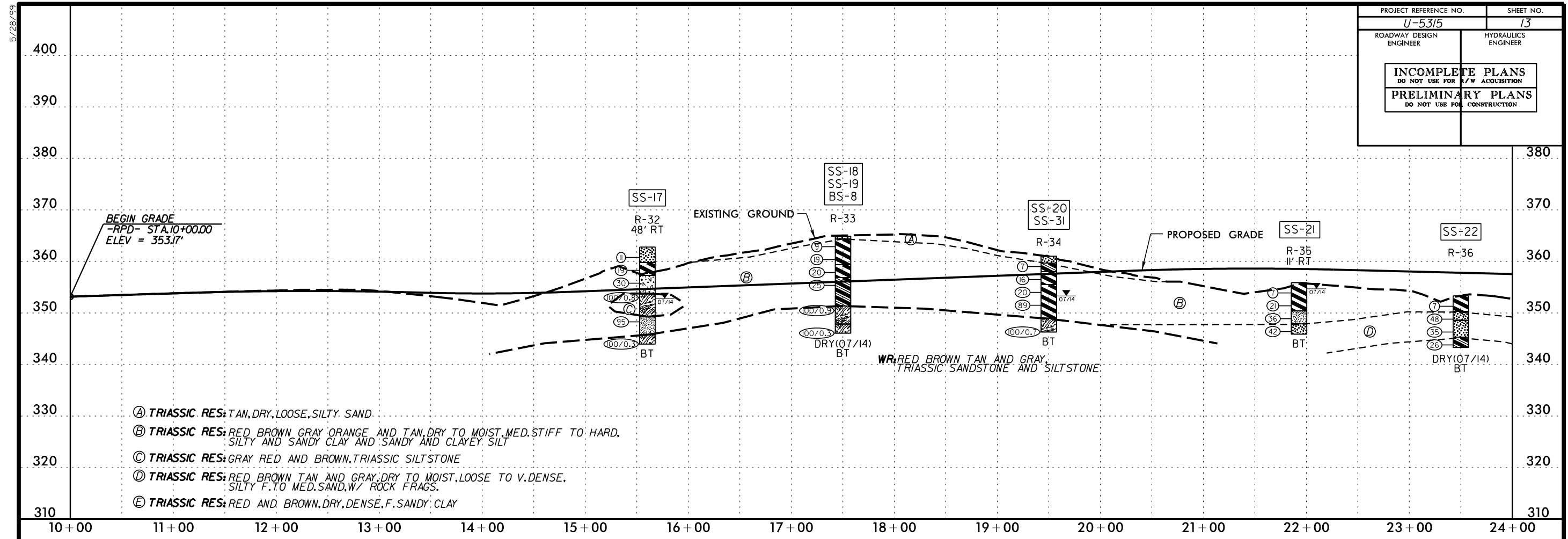


**-RPB-**

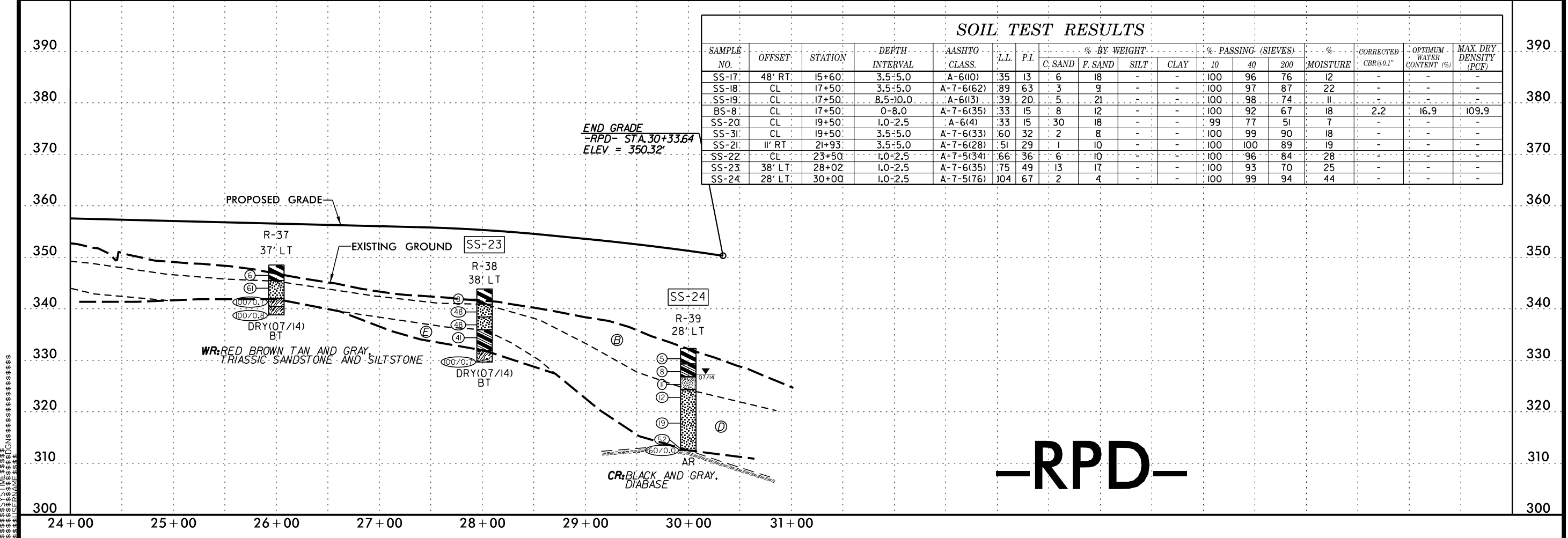
5/28/99







SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT	CLAY	10	40	200				
SS-17	48' RT	15+60	3.5-5.0	A-6(10)	35	13	6	18	-	-	100	96	76	12	-	-	-
SS-18	CL	17+50	3.5-5.0	A-7-6(62)	89	63	3	9	-	-	100	97	87	22	-	-	-
SS-19	CL	17+50	8.5-10.0	A-6(13)	39	20	5	21	-	-	100	98	74	11	-	-	-
BS-8	CL	17+50	0-8.0	A-7-6(35)	33	15	8	12	-	-	100	92	67	18	2.2	16.9	109.9
SS-20	CL	19+50	1.0-2.5	A-6(4)	33	15	30	18	-	-	99	77	51	7	-	-	-
SS-31	CL	19+50	3.5-5.0	A-7-6(33)	60	32	2	8	-	-	100	99	90	18	-	-	-
SS-21	11' RT	21+93	3.5-5.0	A-7-6(28)	51	29	1	10	-	-	100	100	89	19	-	-	-
SS-22	CL	23+50	1.0-2.5	A-7-5(34)	66	36	6	10	-	-	100	96	84	28	-	-	-
SS-23	38' LT	28+02	1.0-2.5	A-7-6(35)	75	49	13	17	-	-	100	93	70	25	-	-	-
SS-24	28' LT	30+00	1.0-2.5	A-7-5(76)	104	67	2	4	-	-	100	99	94	44	-	-	-



**-RPD-**

5/28/99

SYTIME\$\$\$\$\$

\$\$\$\$\$

5/28/99

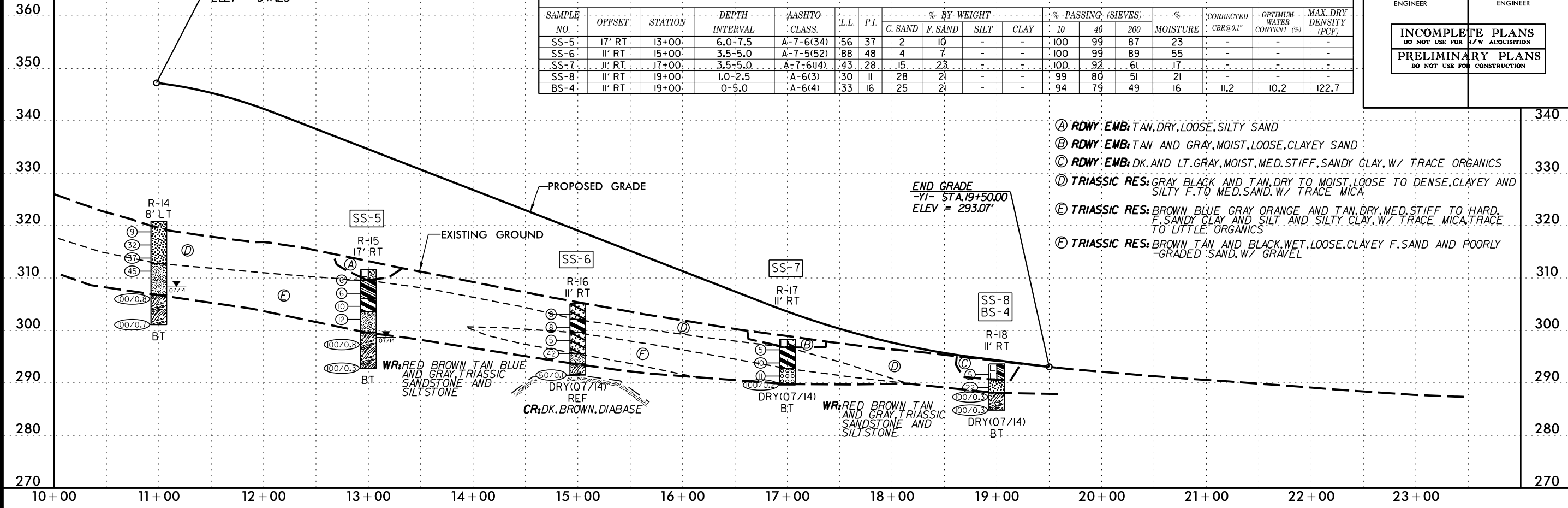
BEGIN GRADE  
-YI- STA.10+97.75  
ELEV = 347.23'

### SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT	CLAY	10	40	200			
SS-5	17' RT	13+00	6.0-7.5	A-7-6(34)	56	37	2	10	-	-	100	99	87	23	-	-
SS-6	11' RT	15+00	3.5-5.0	A-7-5(52)	88	48	4	7	-	-	100	99	89	55	-	-
SS-7	11' RT	17+00	3.5-5.0	A-7-6(4)	43	28	15	23	-	-	100	92	61	17	-	-
SS-8	11' RT	19+00	1.0-2.5	A-6(3)	30	11	28	21	-	-	99	80	51	21	-	-
BS-4	11' RT	19+00	0-5.0	A-6(4)	33	16	25	21	-	-	94	79	49	16	11.2	102.7

PROJECT REFERENCE NO. <b>U-5315</b>	SHEET NO. <b>14</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

- (A) RDWY EMB: TAN, DRY, LOOSE, SILTY SAND
- (B) RDWY EMB: TAN AND GRAY, MOIST, LOOSE, CLAYEY SAND
- (C) RDWY EMB: DK. AND LT. GRAY, MOIST, MED. STIFF, SANDY CLAY, W/ TRACE ORGANICS
- (D) TRIASSIC RES: GRAY BLACK AND TAN, DRY TO MOIST, LOOSE TO DENSE, CLAYEY AND SILTY F. TO MED. SAND, W/ TRACE MICA
- (E) TRIASSIC RES: BROWN BLUE GRAY ORANGE AND TAN, DRY, MED. STIFF TO HARD, F. SANDY CLAY AND SILT AND SILTY CLAY, W/ TRACE MICA, TRACE TO LITTLE ORGANICS
- (F) TRIASSIC RES: BROWN TAN AND BLACK, WET, LOOSE, CLAYEY F. SAND AND POORLY GRADED SAND, W/ GRAVEL



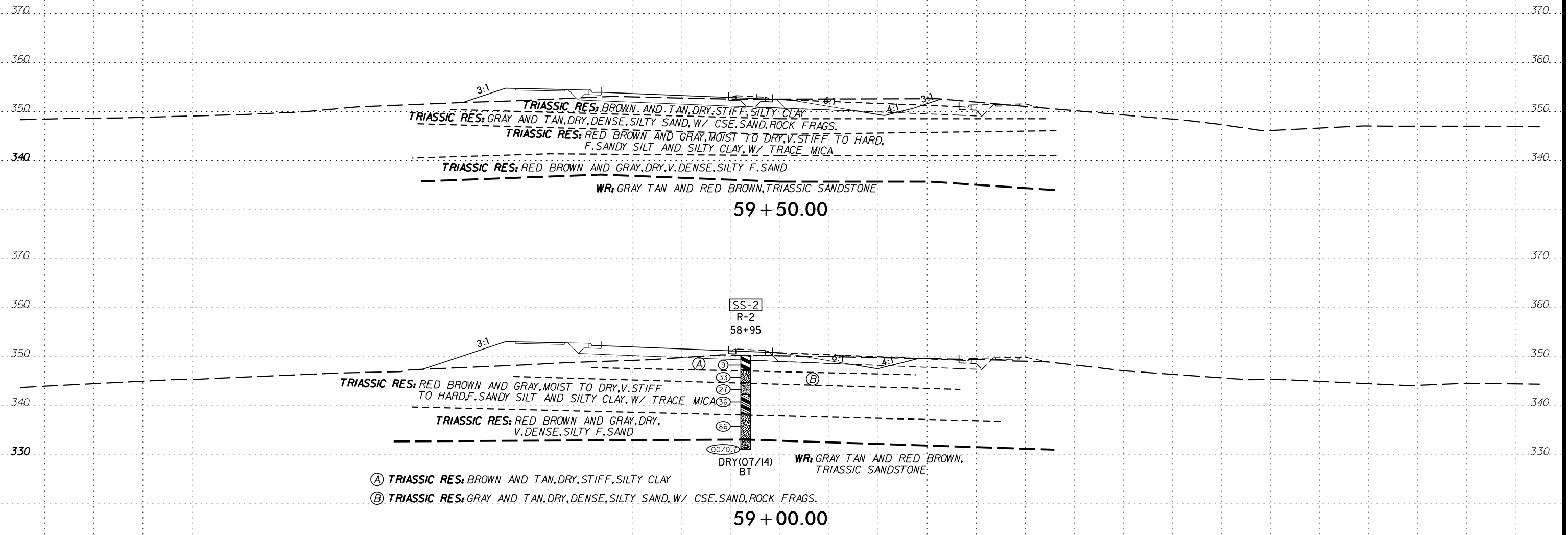
-Y1-

\*\*\*\*\*SYTIME\*\*\*\*\*  
\*\*\*\*\*CSDON\*\*\*\*\*  
\*\*\*\*\*\*\*\*\*\*

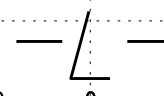
8/23/99

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.	LL	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-2	7' LT	58+95	8.5-10.0	A-6(14)	36	15	1	8	91	100	99	91	11	-	-	-



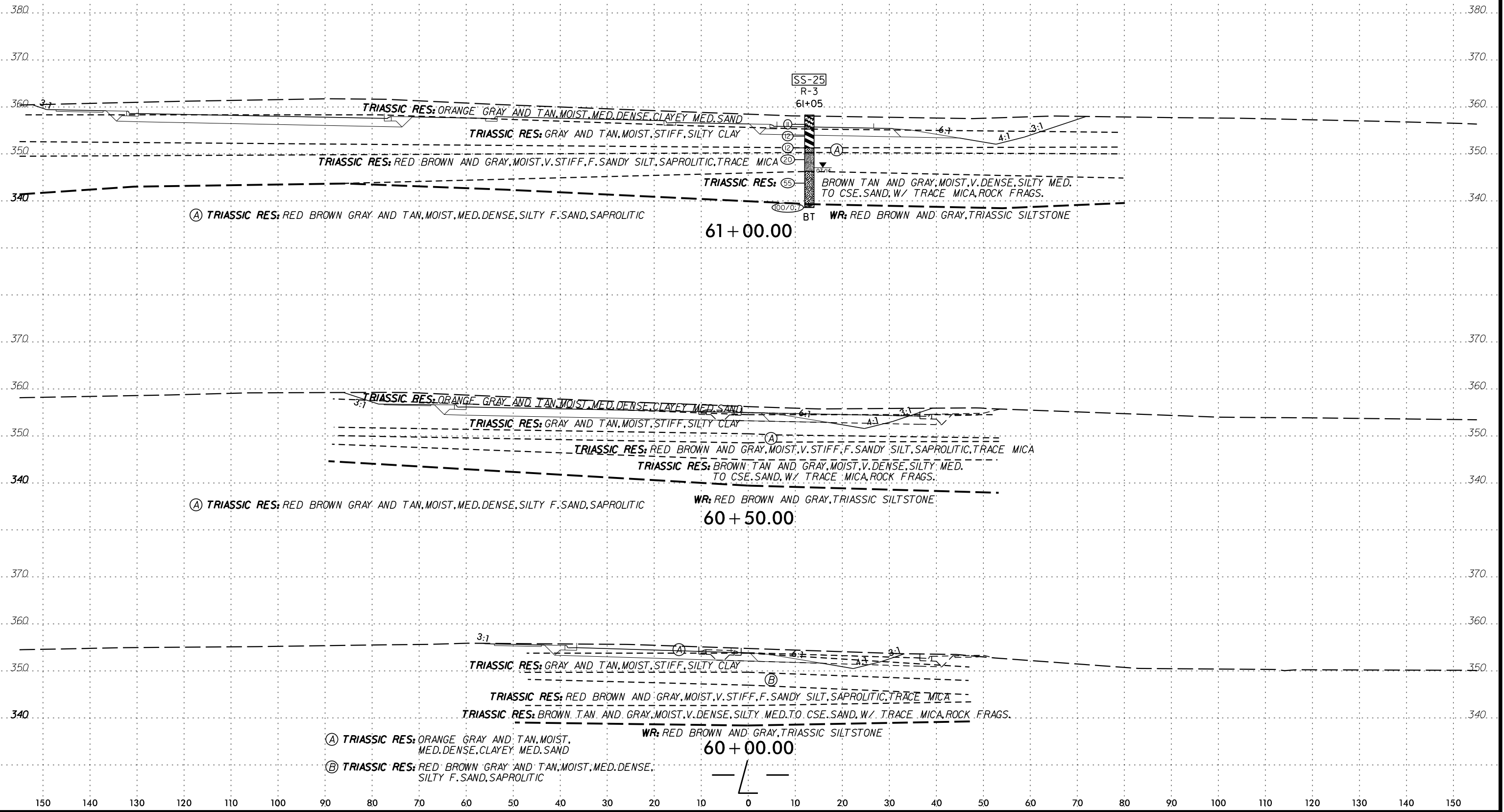
TIME 8:58 AM 8/23/99



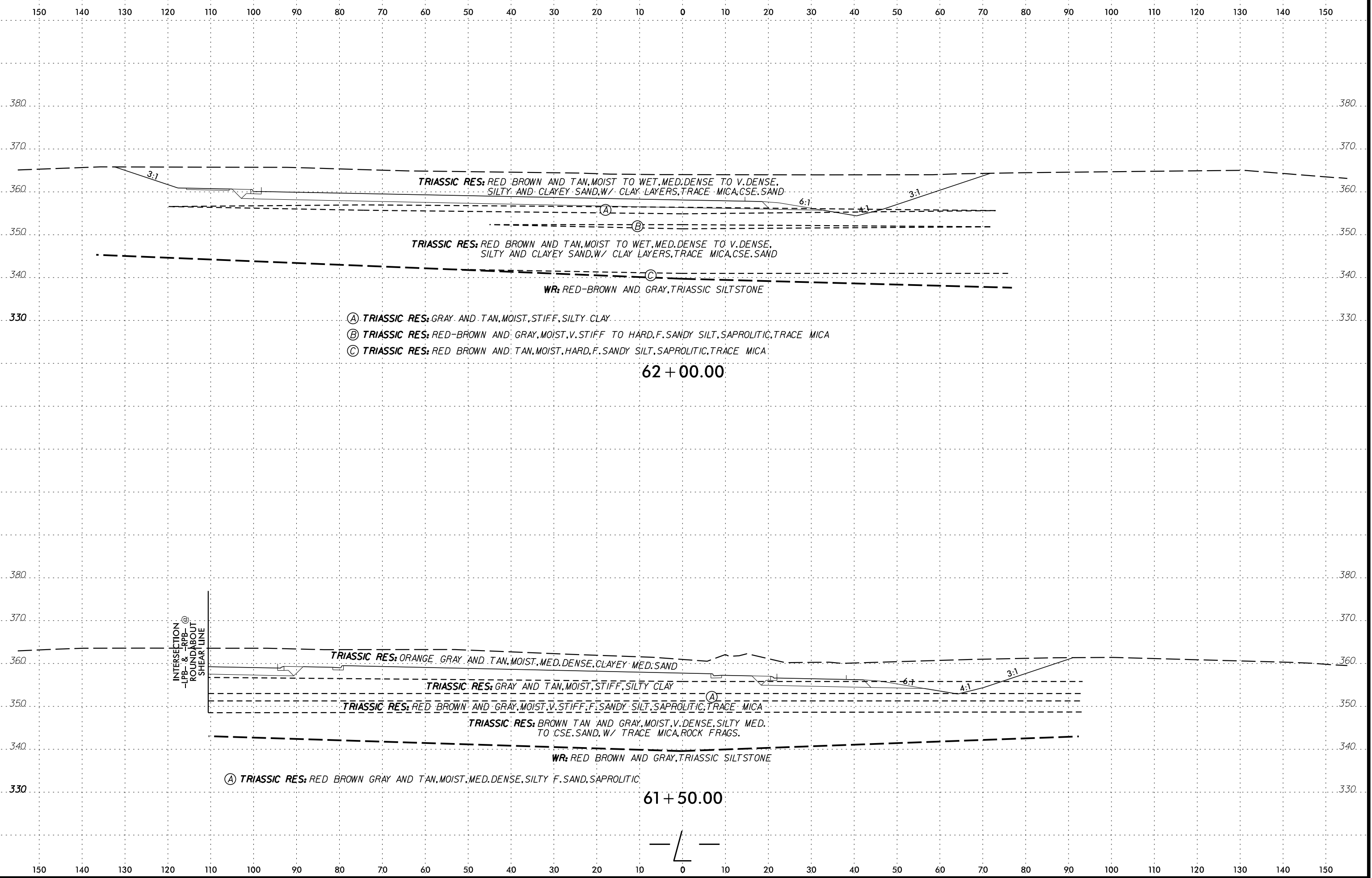
8/23/99

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.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	MOISTURE	10	40	200			
SS-25	13' RT	61+50	3.5+5.0	A-7-6(25)	56	29	9	10	81	100	94	81	23	-	-	-



DATE: 8/23/99  
DRAWN BY: [illegible]  
CHECKED BY: [illegible]  
SCALE: AS SHOWN



TRIASSIC RES: RED BROWN AND TAN, MOIST TO WET, MED. DENSE TO V. DENSE, SILTY AND CLAYEY SAND, W/ CLAY LAYERS, TRACE MICA, COARSE SAND

TRIASSIC RES: RED BROWN AND TAN, MOIST TO WET, MED. DENSE TO V. DENSE, SILTY AND CLAYEY SAND, W/ CLAY LAYERS, TRACE MICA, COARSE SAND

WR: RED-BROWN AND GRAY, TRIASSIC SILTSTONE

- (A) TRIASSIC RES: GRAY AND TAN, MOIST, STIFF, SILTY CLAY
- (B) TRIASSIC RES: RED-BROWN AND GRAY, MOIST, V. STIFF TO HARD, F. SANDY SILT, SAPROLITIC, TRACE MICA
- (C) TRIASSIC RES: RED BROWN AND TAN, MOIST, HARD, F. SANDY SILT, SAPROLITIC, TRACE MICA

62 + 00.00

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SHEAR LINE

TRIASSIC RES: ORANGE GRAY AND TAN, MOIST, MED. DENSE, CLAYEY MED. SAND

TRIASSIC RES: GRAY AND TAN, MOIST, STIFF, SILTY CLAY

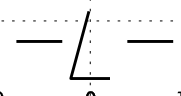
TRIASSIC RES: RED BROWN AND GRAY, MOIST, V. STIFF, F. SANDY SILT, SAPROLITIC, TRACE MICA

TRIASSIC RES: BROWN TAN AND GRAY, MOIST, V. DENSE, SILTY MED. TO COARSE SAND, W/ TRACE MICA, ROCK FRAGS.

WR: RED BROWN AND GRAY, TRIASSIC SILTSTONE

- (A) TRIASSIC RES: RED BROWN GRAY AND TAN, MOIST, MED. DENSE, SILTY F. SAND, SAPROLITIC

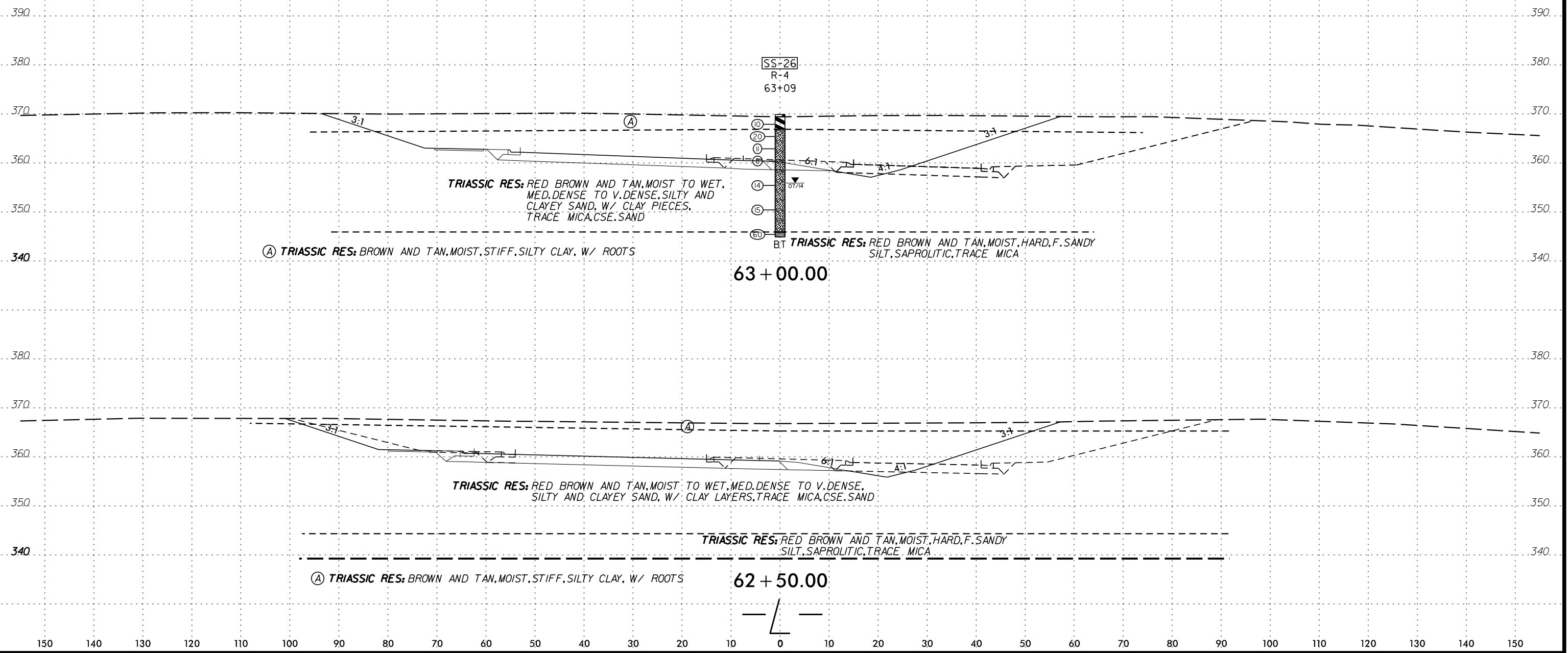
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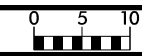
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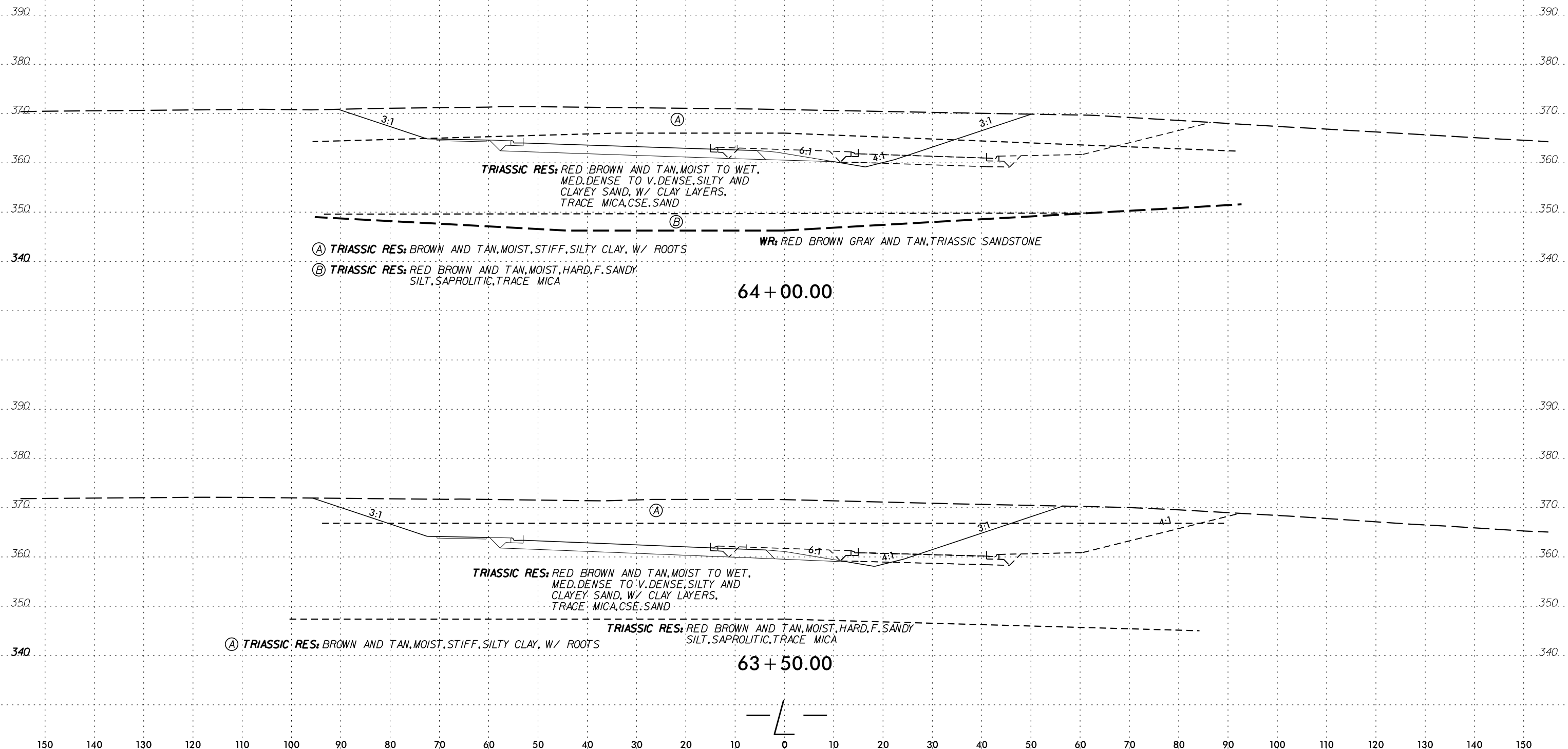
SOIL TEST RESULTS																	
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY		10	40	200				
SS-26	CL	63+09	1.0-2.5	A-7-6(34)	72	43	13	11	75	99	89	75	21	-	-	-	



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TRIASSIC RES: RED BROWN AND TAN, MOIST TO WET,  
MED. DENSE TO V. DENSE, SILTY AND  
CLAYEY SAND, W/ CLAY LAYERS,  
TRACE MICA, CSE. SAND

(A) TRIASSIC RES: BROWN AND TAN, MOIST, STIFF, SILTY CLAY, W/ ROOTS  
(B) TRIASSIC RES: RED BROWN AND TAN, MOIST, HARD, F. SANDY  
SILT, SAPROLITIC, TRACE MICA

WR: RED BROWN GRAY AND TAN, TRIASSIC SANDSTONE

64 + 00.00

TRIASSIC RES: RED BROWN AND TAN, MOIST TO WET,  
MED. DENSE TO V. DENSE, SILTY AND  
CLAYEY SAND, W/ CLAY LAYERS,  
TRACE MICA, CSE. SAND

(A) TRIASSIC RES: BROWN AND TAN, MOIST, STIFF, SILTY CLAY, W/ ROOTS

TRIASSIC RES: RED BROWN AND TAN, MOIST, HARD, F. SANDY  
SILT, SAPROLITIC, TRACE MICA

63 + 50.00

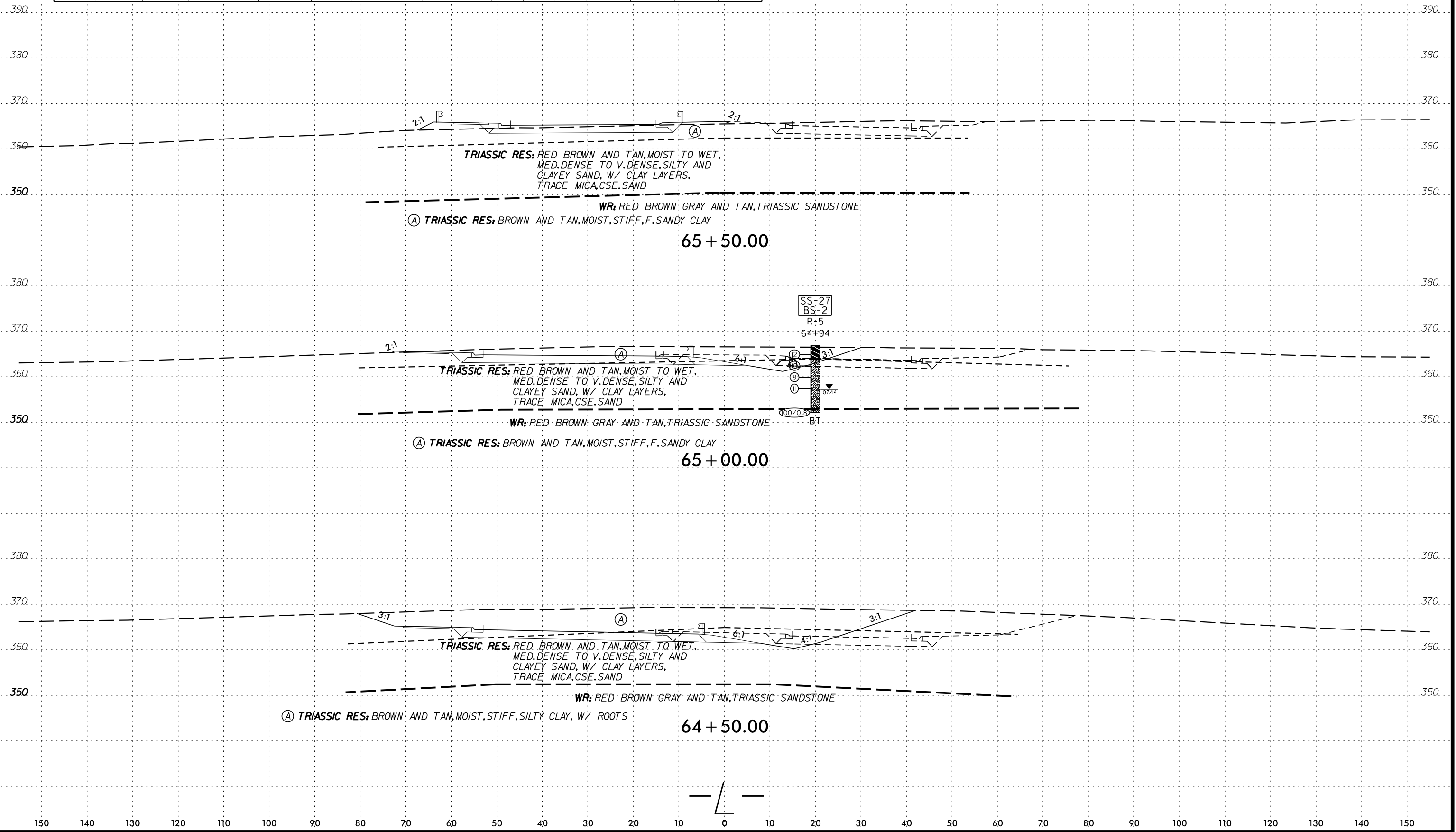
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### SOIL TEST RESULTS

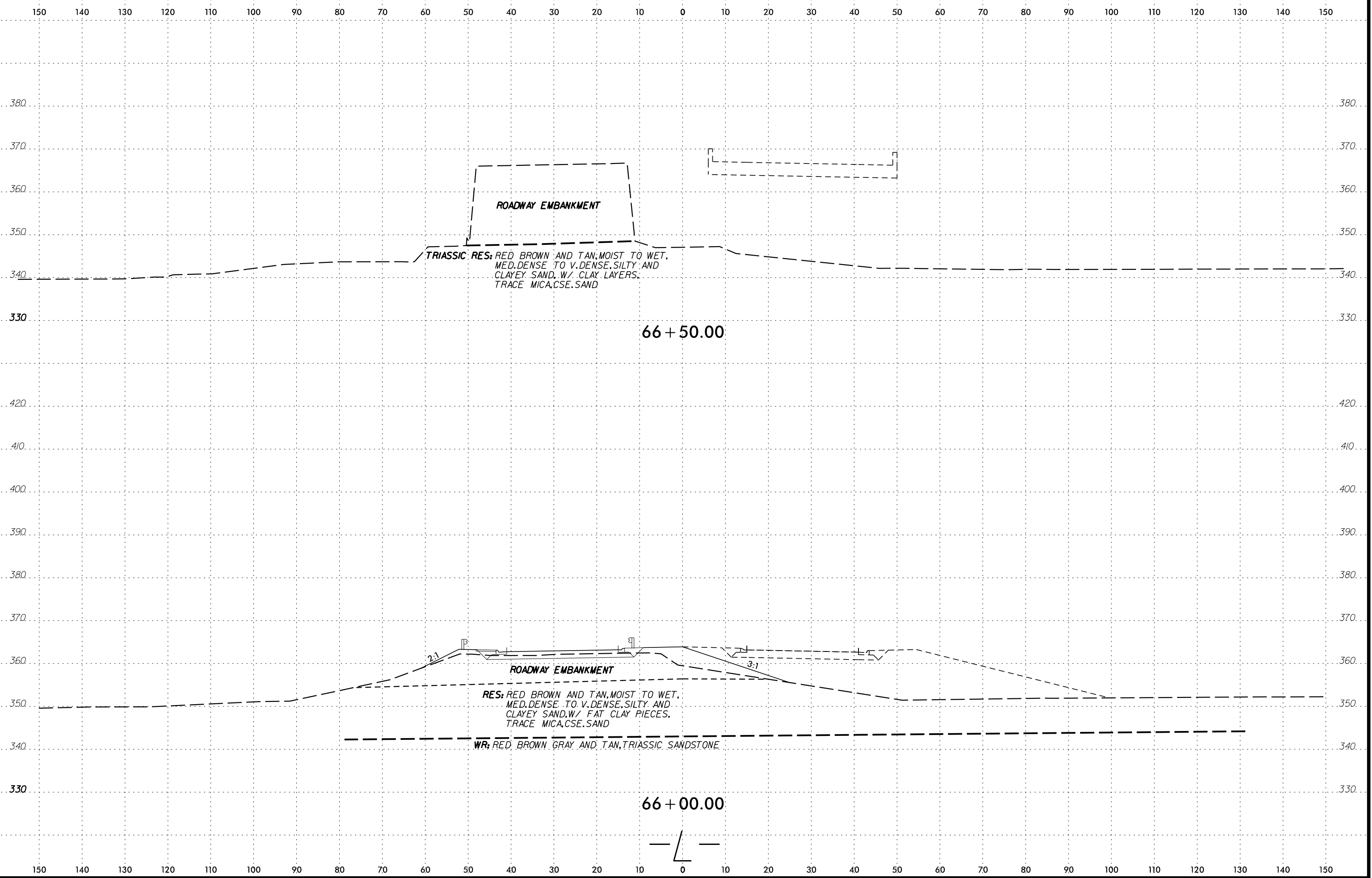
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PI	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-27	CL	64+94	1.0-2.5	A-7-5(27)	87	56	35	8	55	98	69	55	15	-	-	-
BS-2	20' RT	64+94	0-4.0	A-7-6(II)	57	35	41	12	46	98	65	46	18	6.2	13.8	115.2



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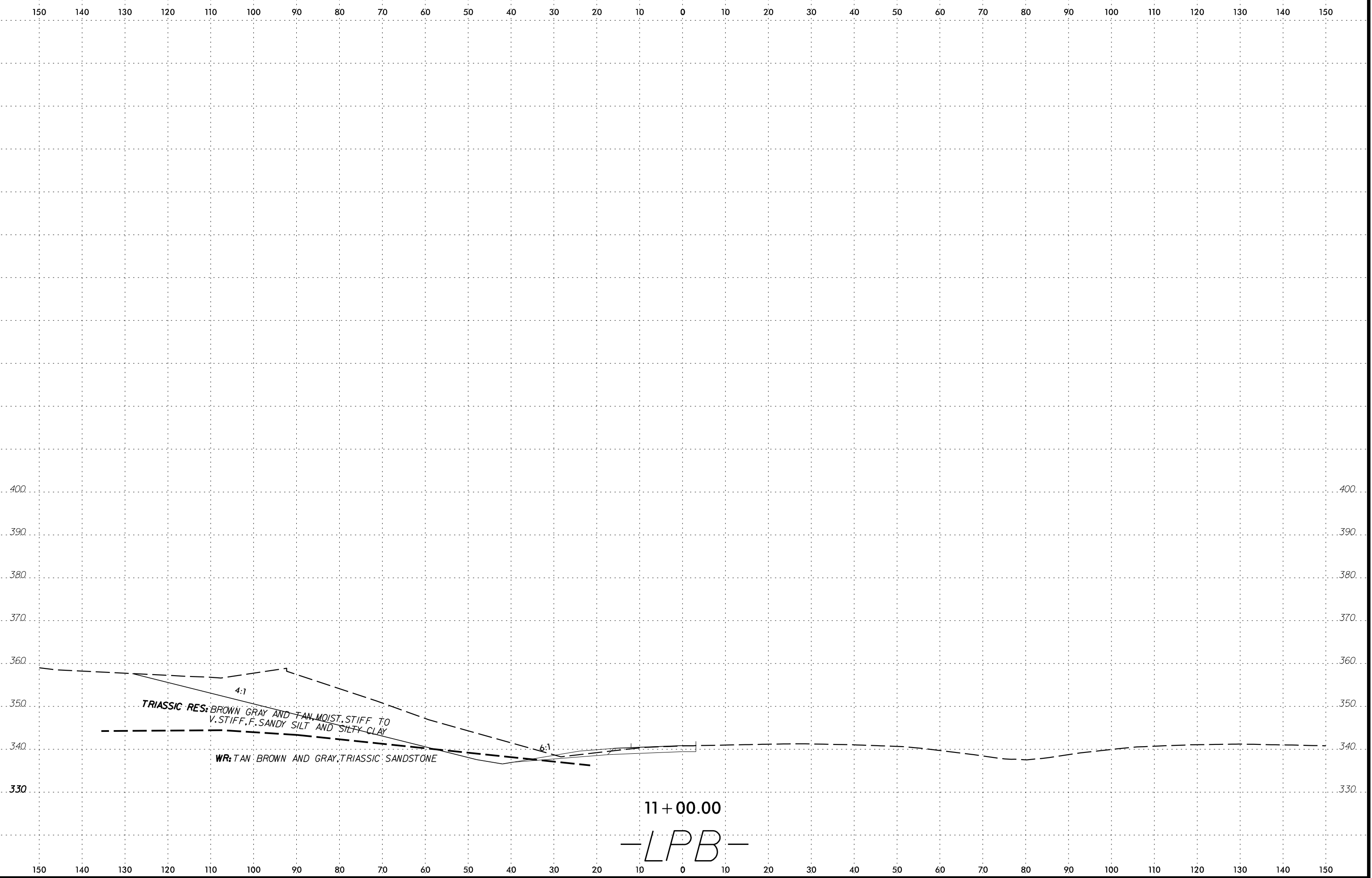


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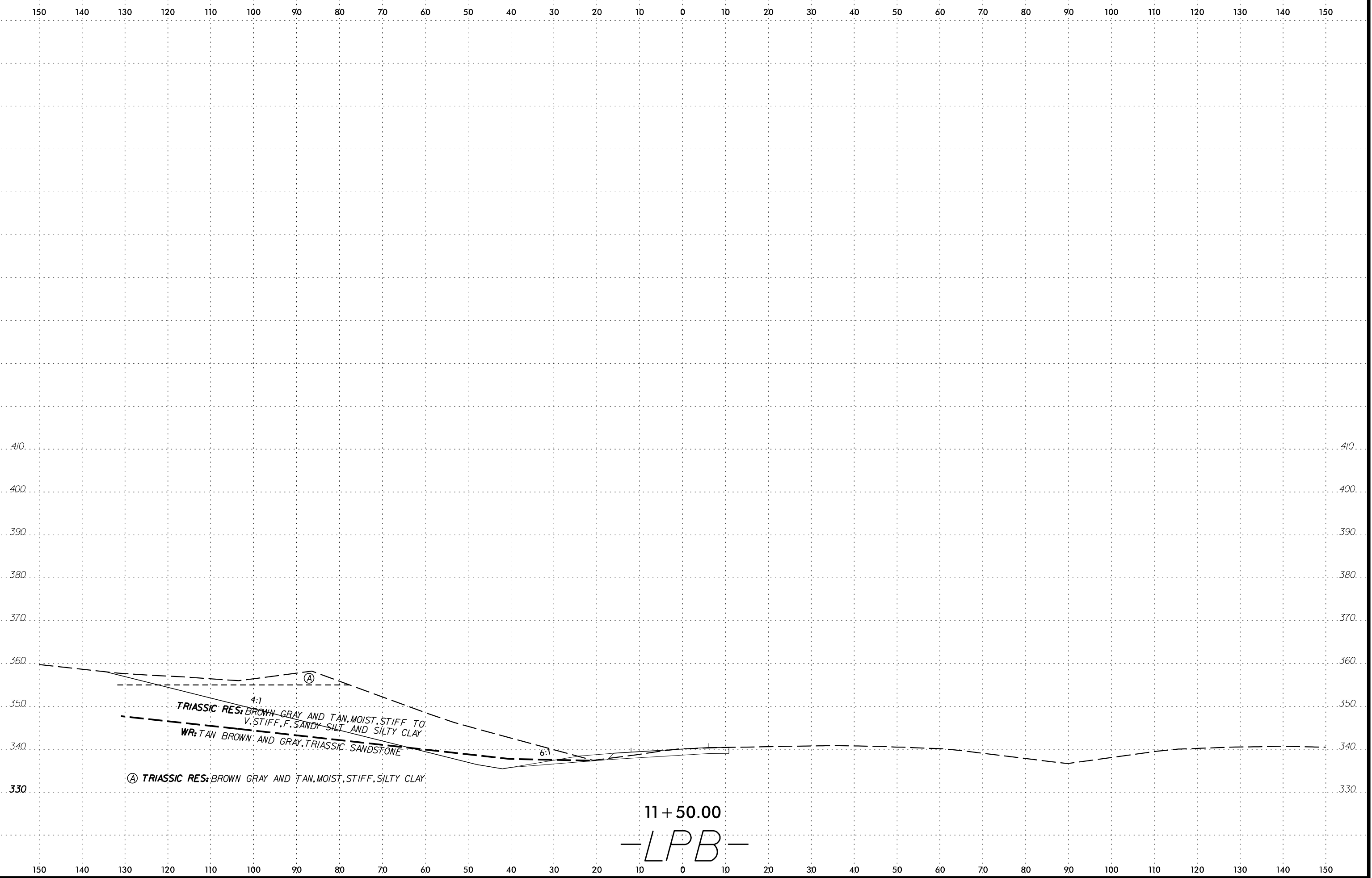


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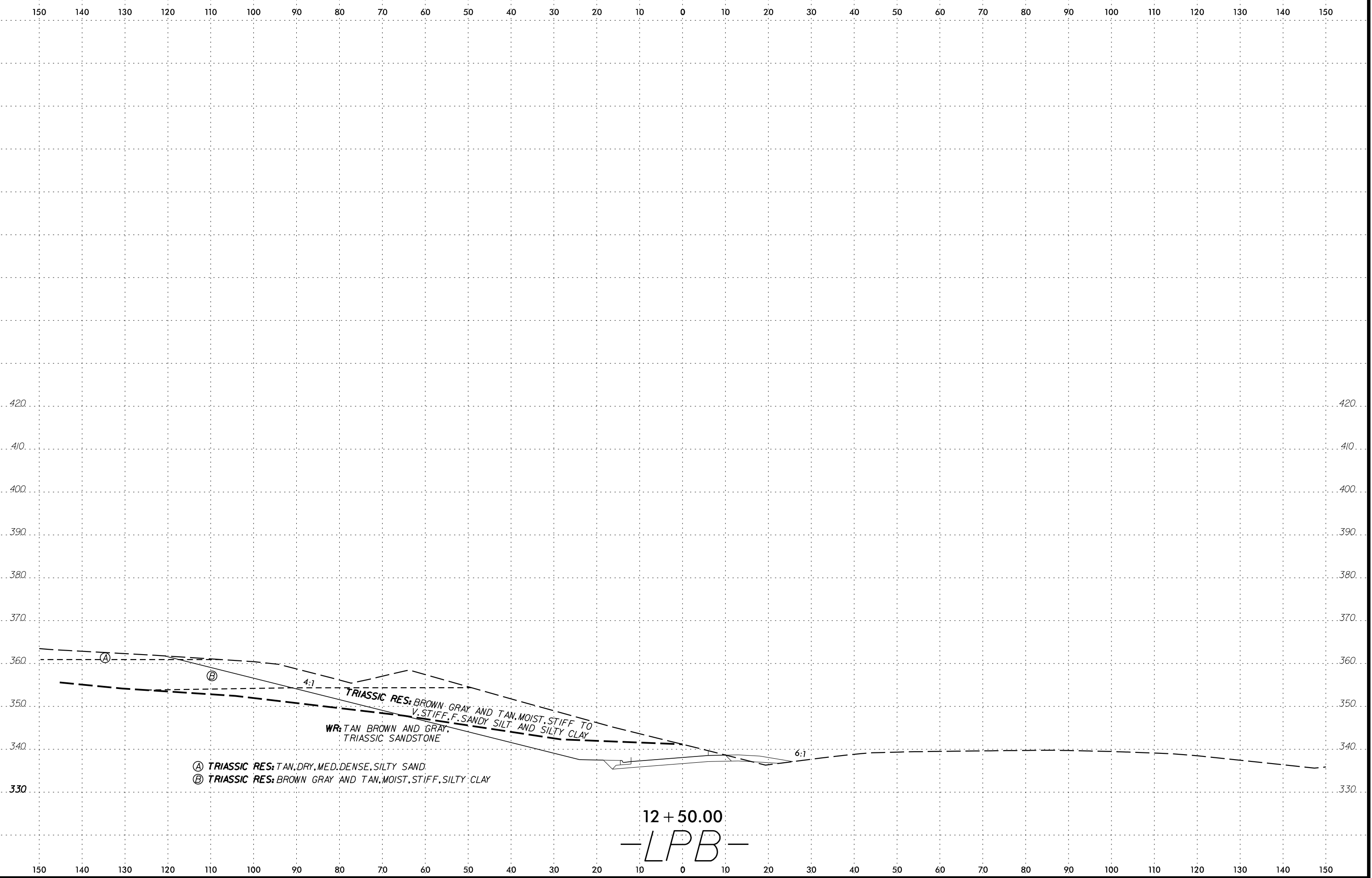


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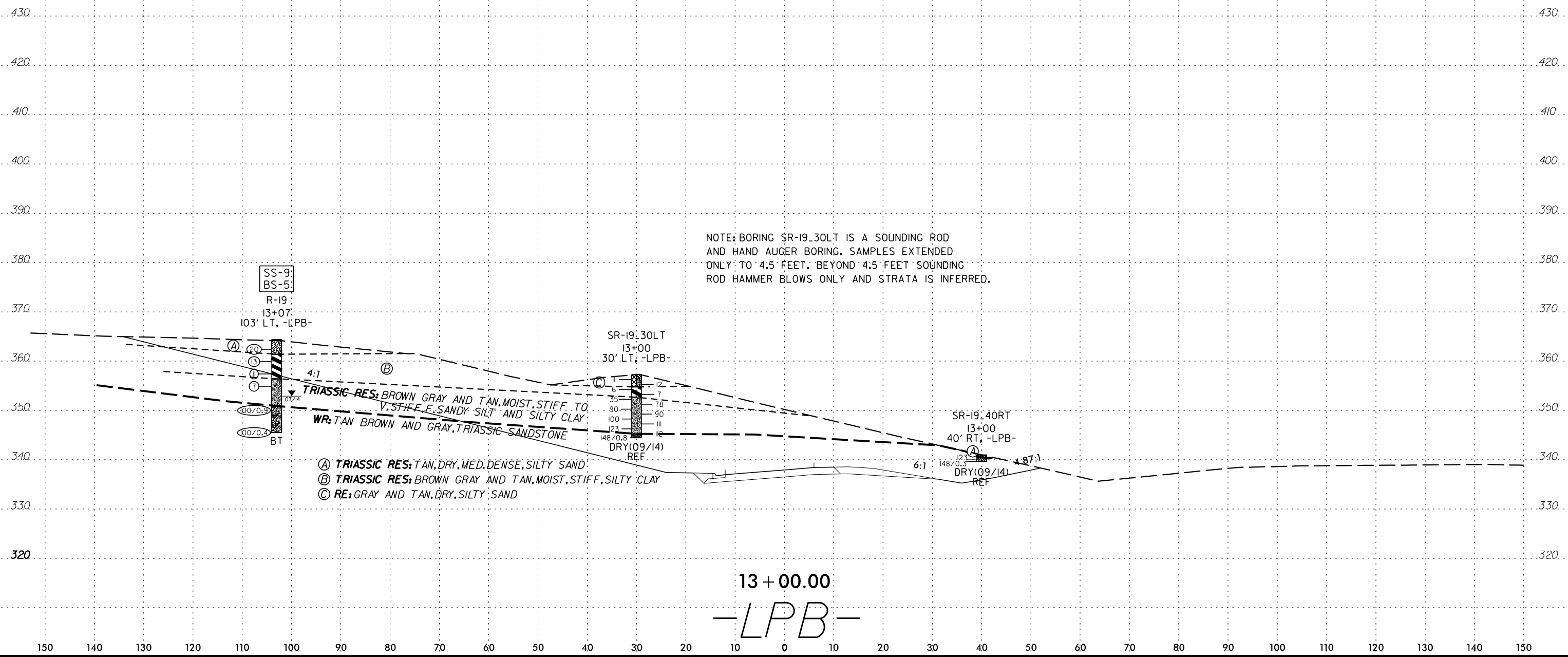


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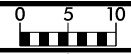
### SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-9	103' LT	13+07	6.0-7.5	A-7-6(30)	66	37	7	17	76	100	97	76	29	-	-	-
BS-5	103' LT	13+07	0-10.0	A-7-6(33)	69	42	10	16	75	100	94	75	26	3.3	17.1	107.9



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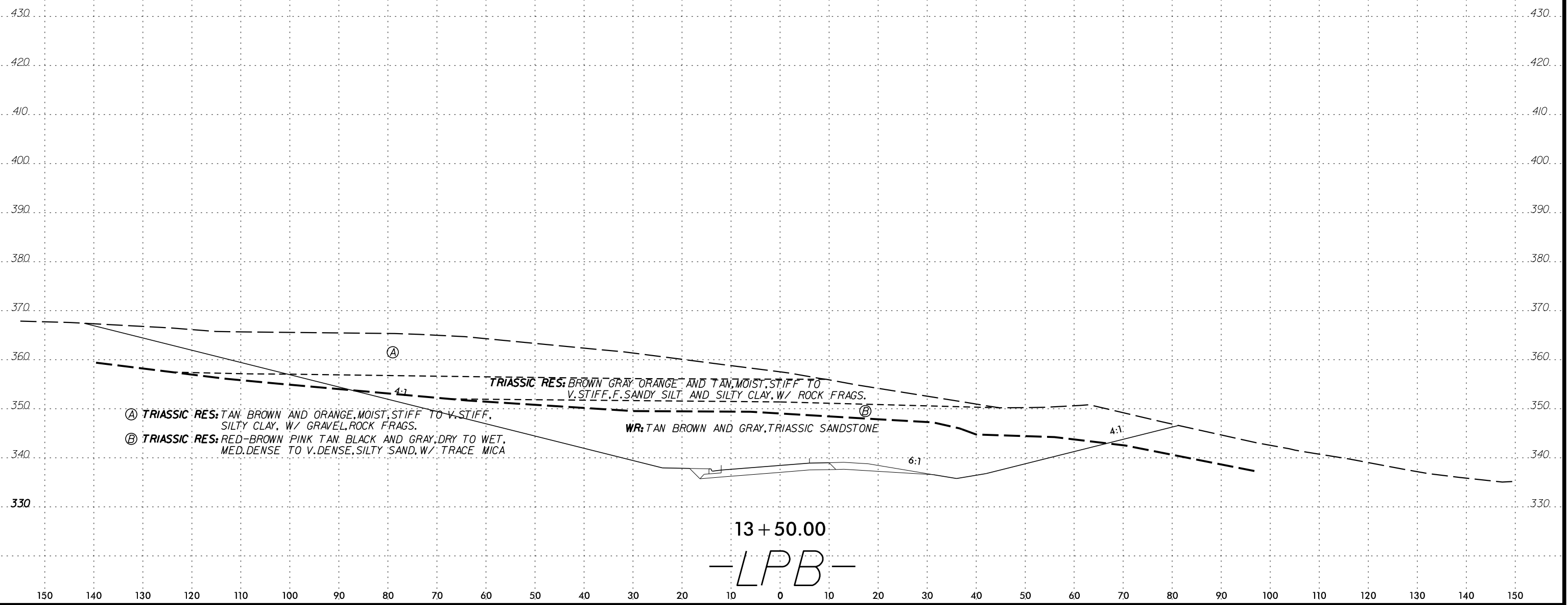
8/23/99



PROJ. REFERENCE NO.  
U-5315

SHEET NO.  
27

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SHEET NO.: 27  
PROJECT NO.: U-5315

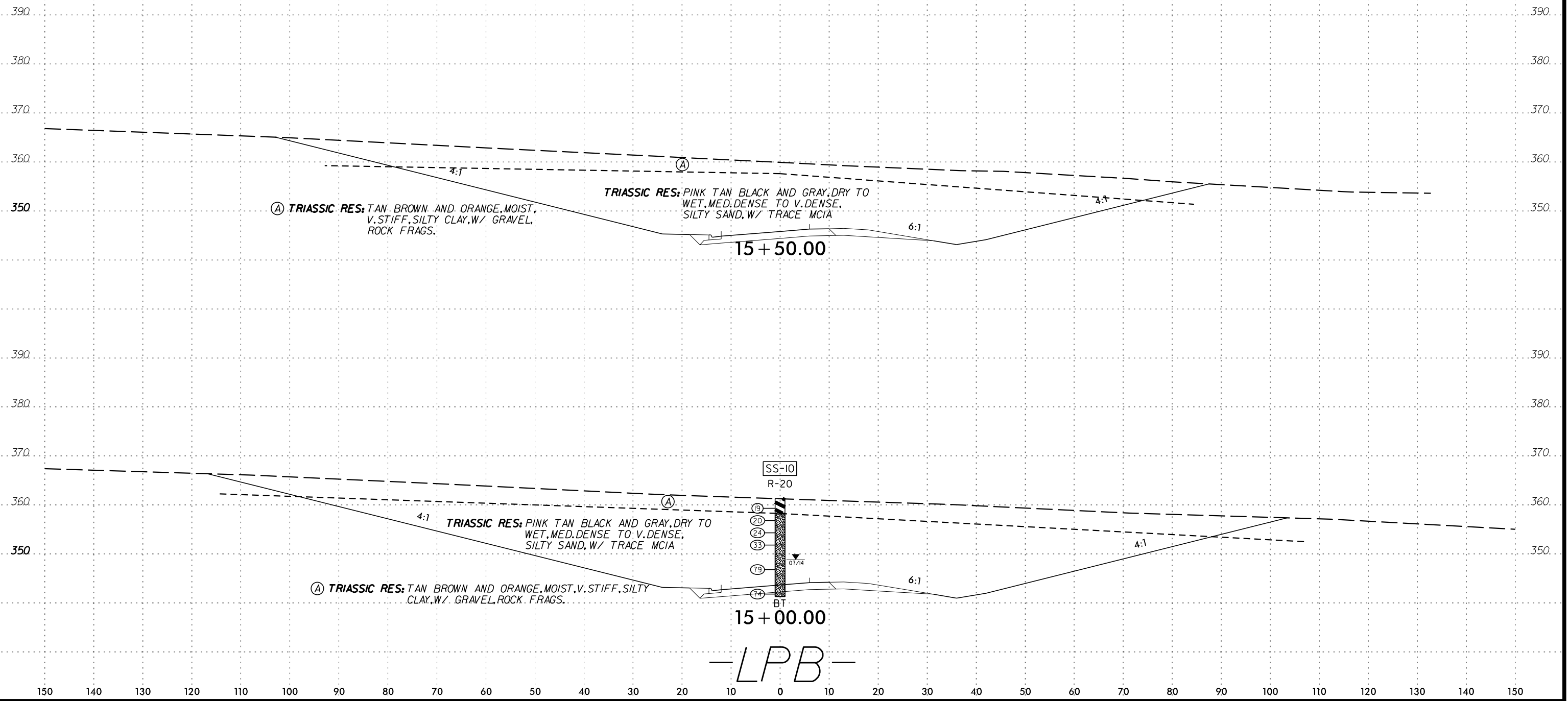




8/23/99

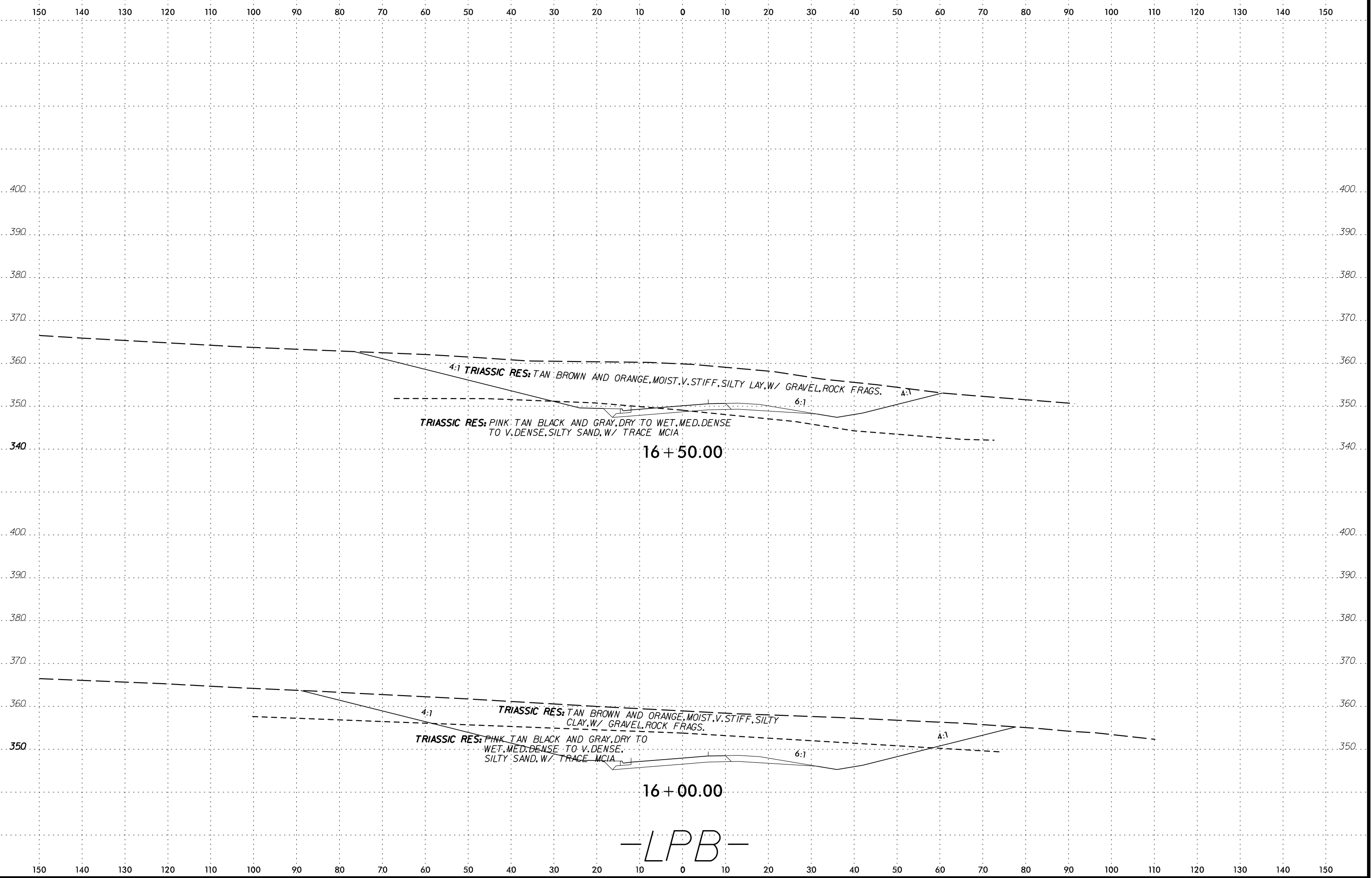
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SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-10	CL	15+00	1.0-2.5	A-7-6(10)	59	32	38	15	45	97	69	45	14	-	-	-



TIME: 11:00 AM DATE: 8/23/99

8/23/99



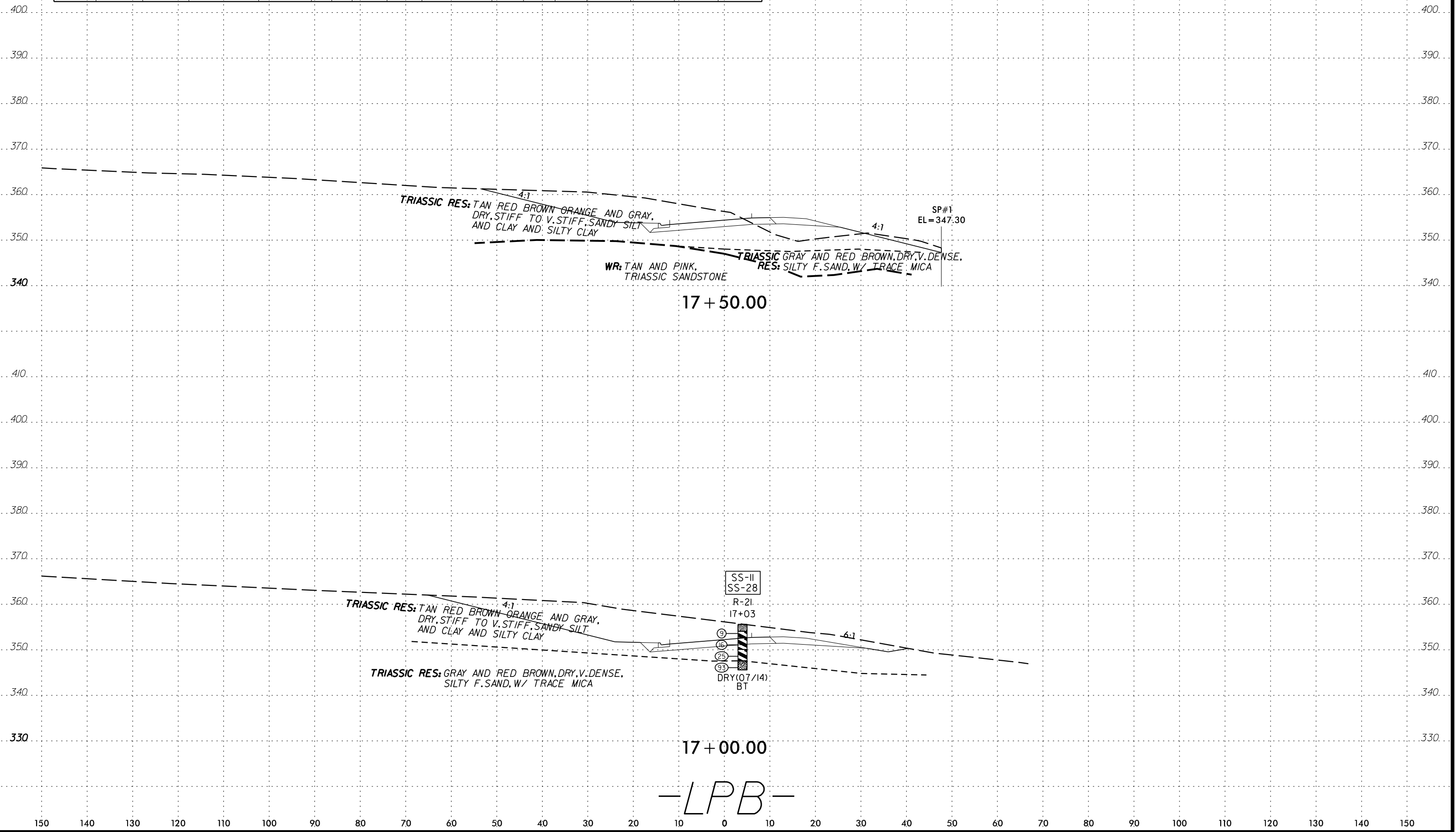
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SHEET NO.: 30  
PROJECT: U-5315

8/23/99

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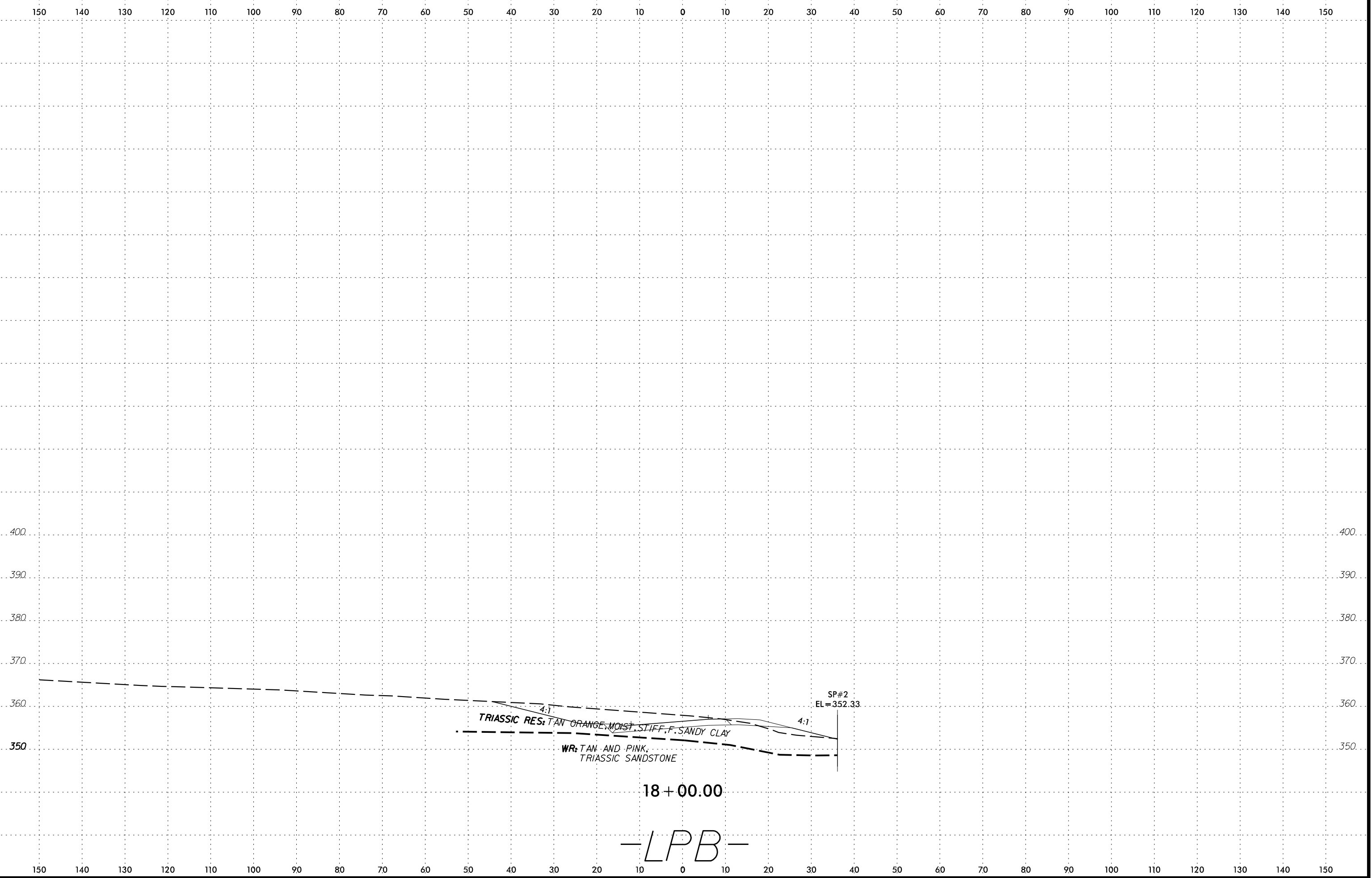
SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-II	4' RT	17+03	1.0-2.5	A-4(4)	29	10	22	14	62	99	83	62	8	-	-	-
SS-28	4' RT	17+03	3.5-5.0	A-7-6(24)	52	30	7	15	78	100	96	78	15	-	-	-



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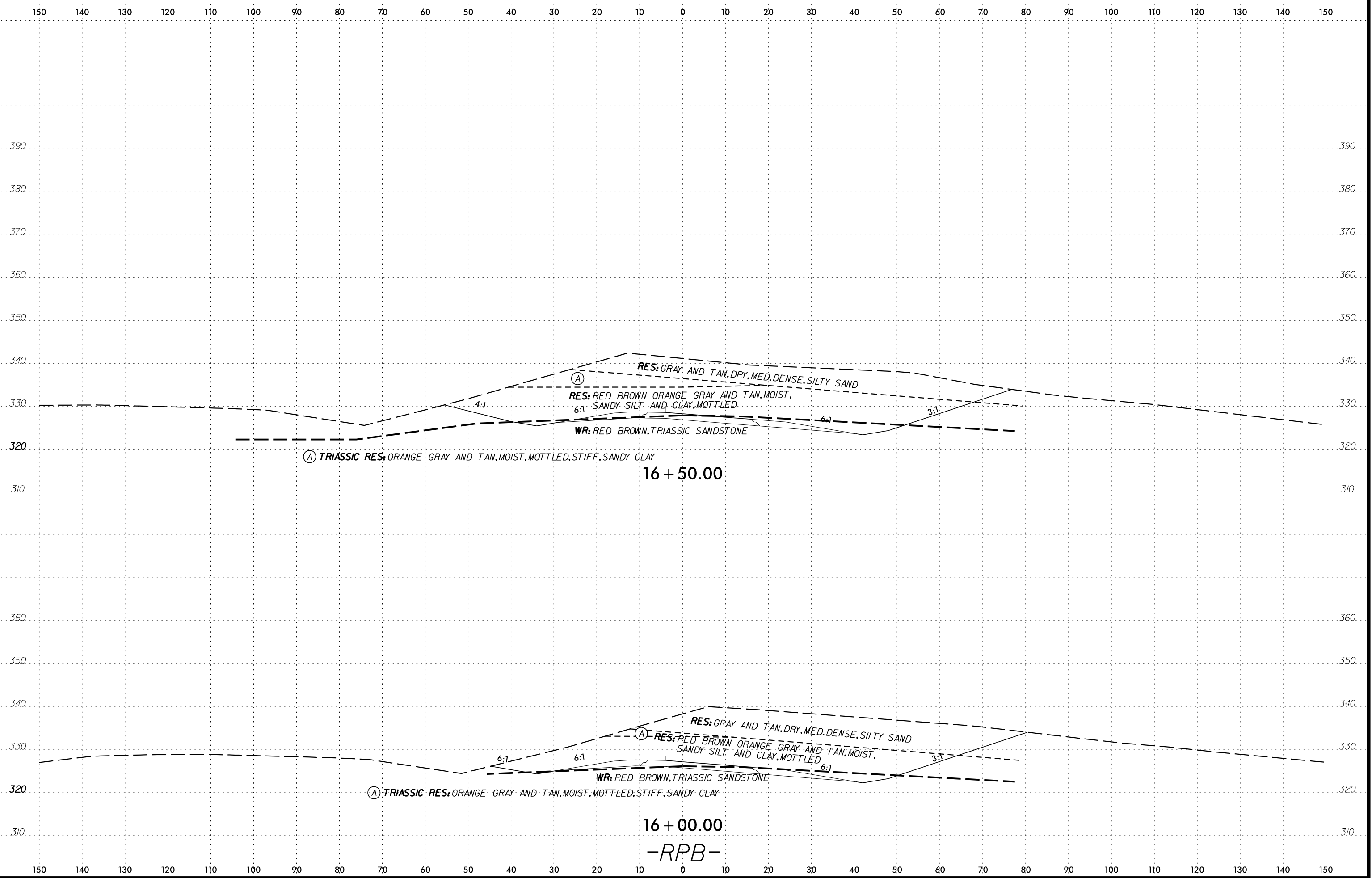


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SHEET NO.: 32 OF 32



8/23/99



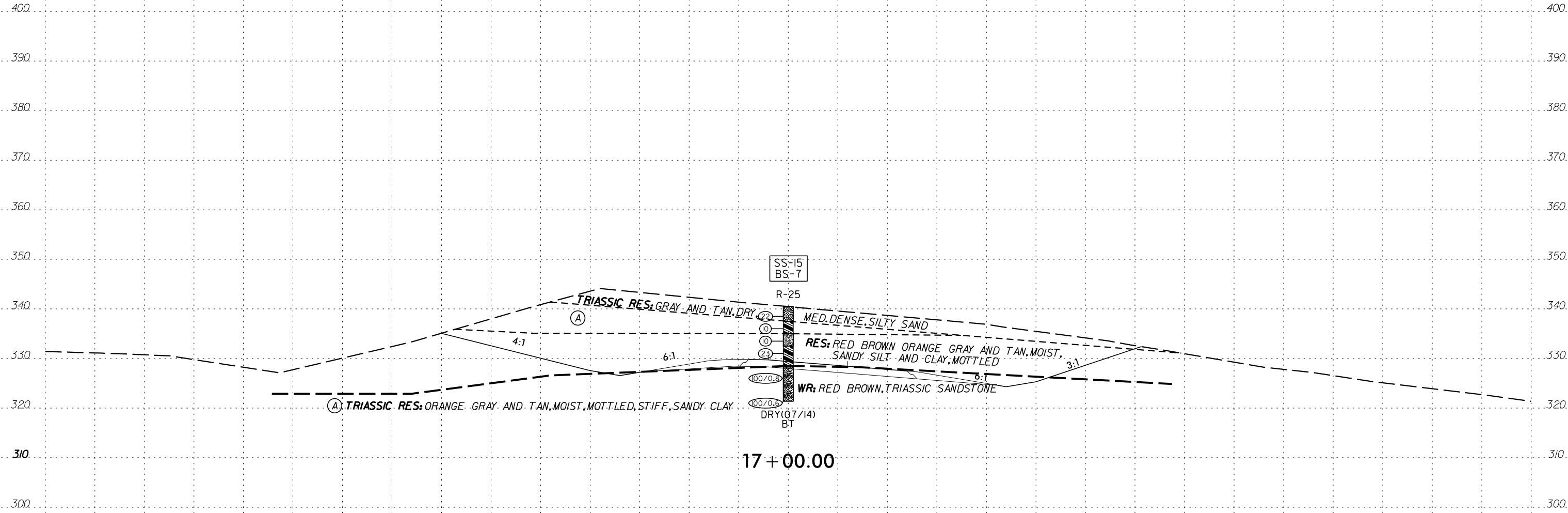
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8/23/99

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### SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-15	CL	17+00	8.5-10.0	A-6(9)	36	13	2	22	76	100	99	98	16	-	-	-
BS-7	CL	17+00	0-10.0	A-7-6(17)	50	28	13	20	67	99	92	67	21	2.9	13.2	116.9

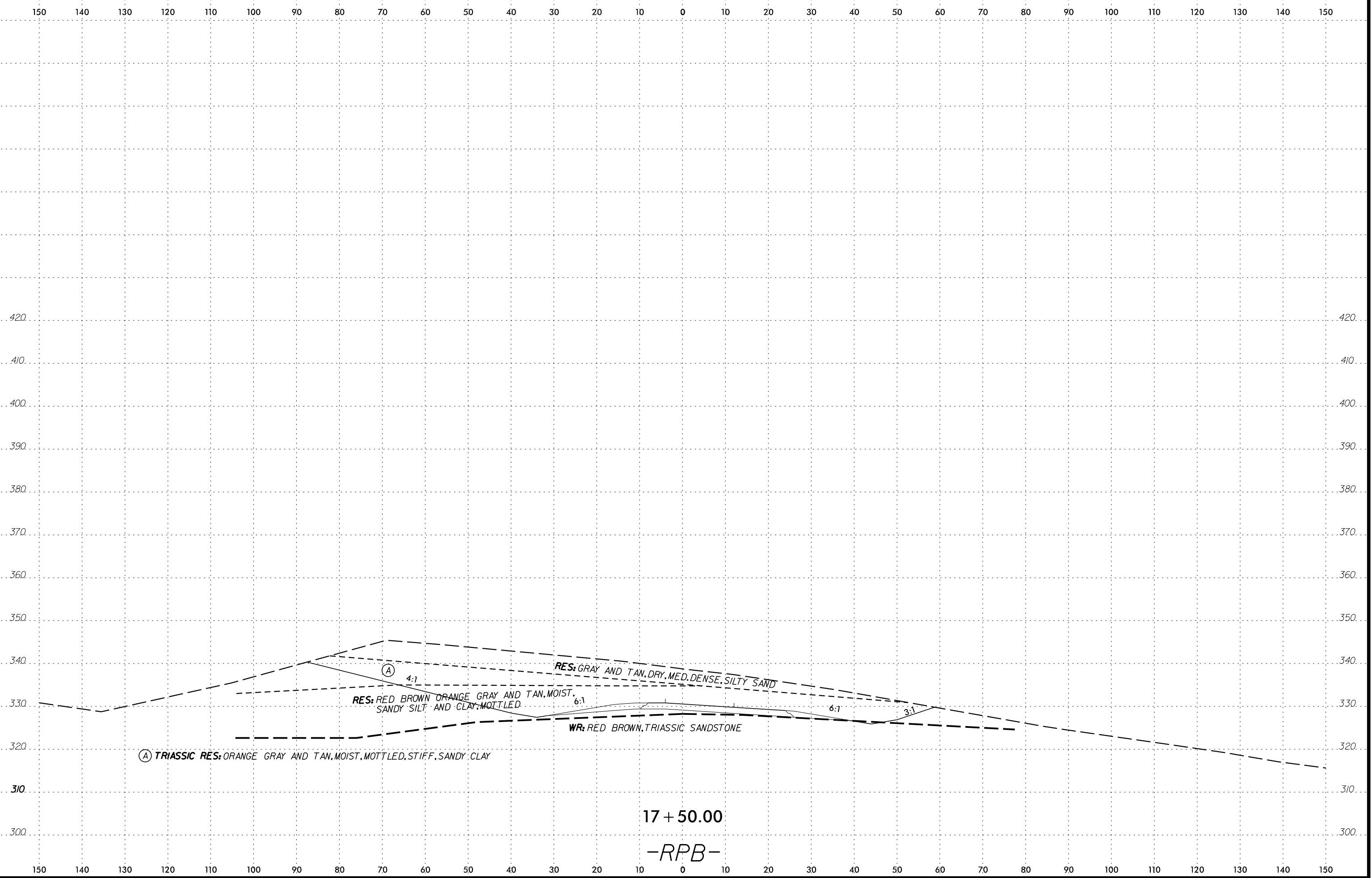


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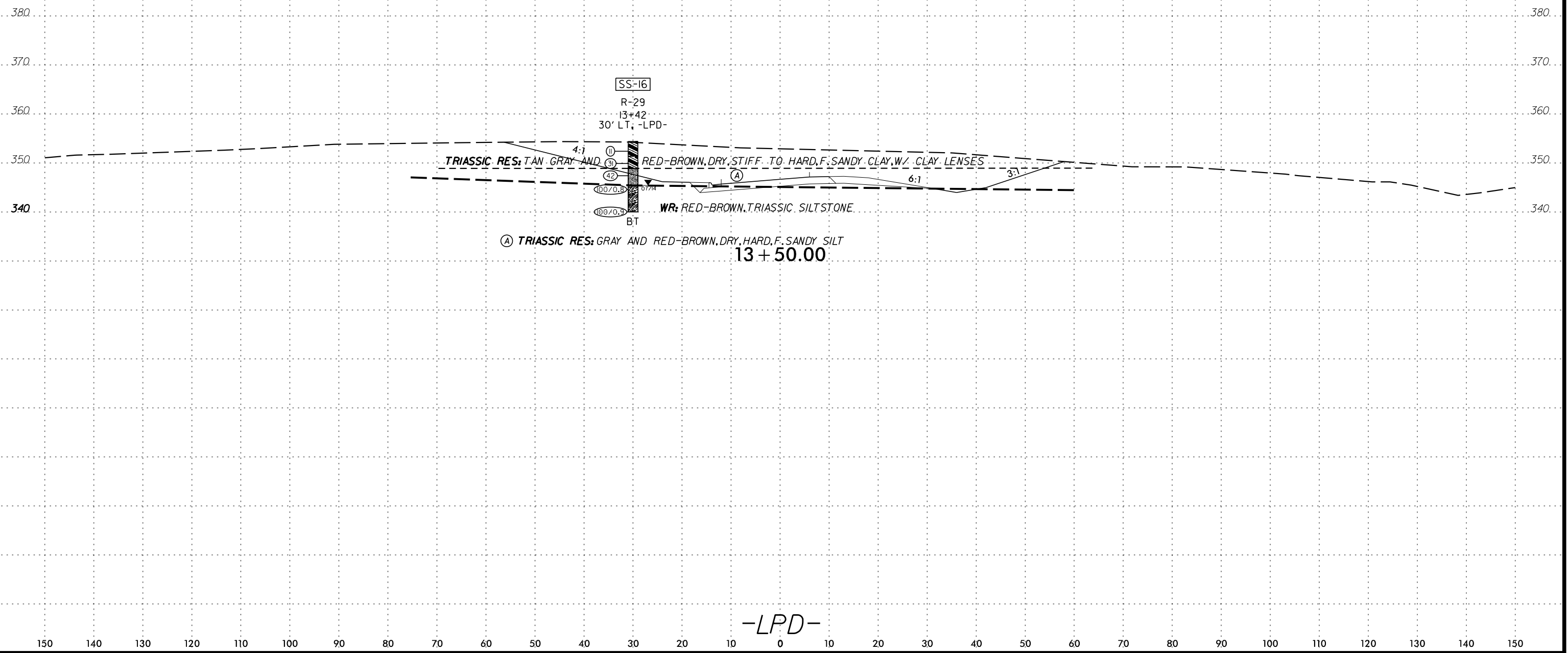
PROJ. REFERENCE NO.  
U-5315

SHEET NO.  
38

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### SOIL TEST RESULTS

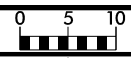
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							C. SAND	F. SAND	SILT & CLAY	#10	#40	#200				
SS-16	30' LT	13+42	3.5-5.0	A-6(9)	34	13	2	18	80	100	99	80	10	-	-	-



8/23/99

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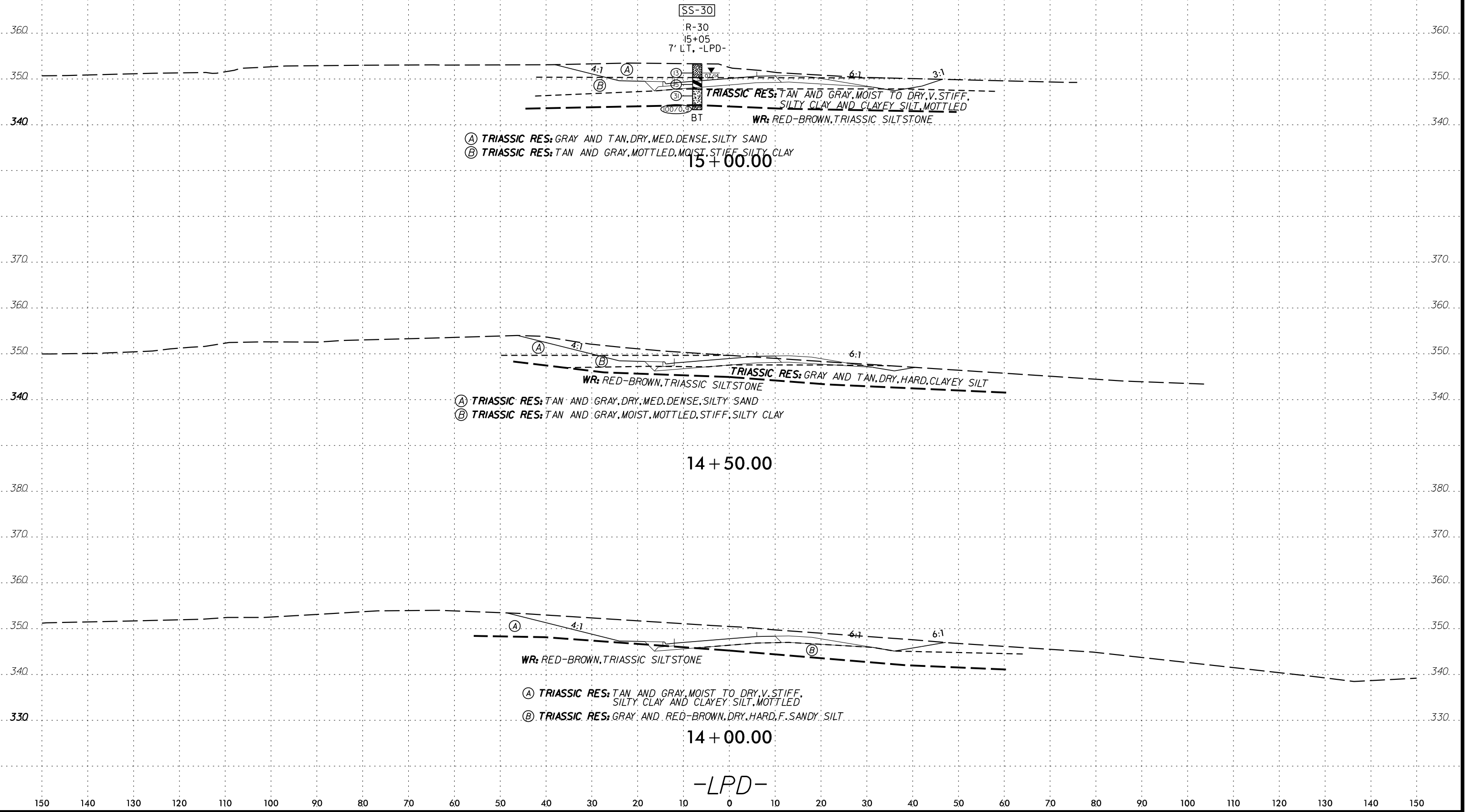
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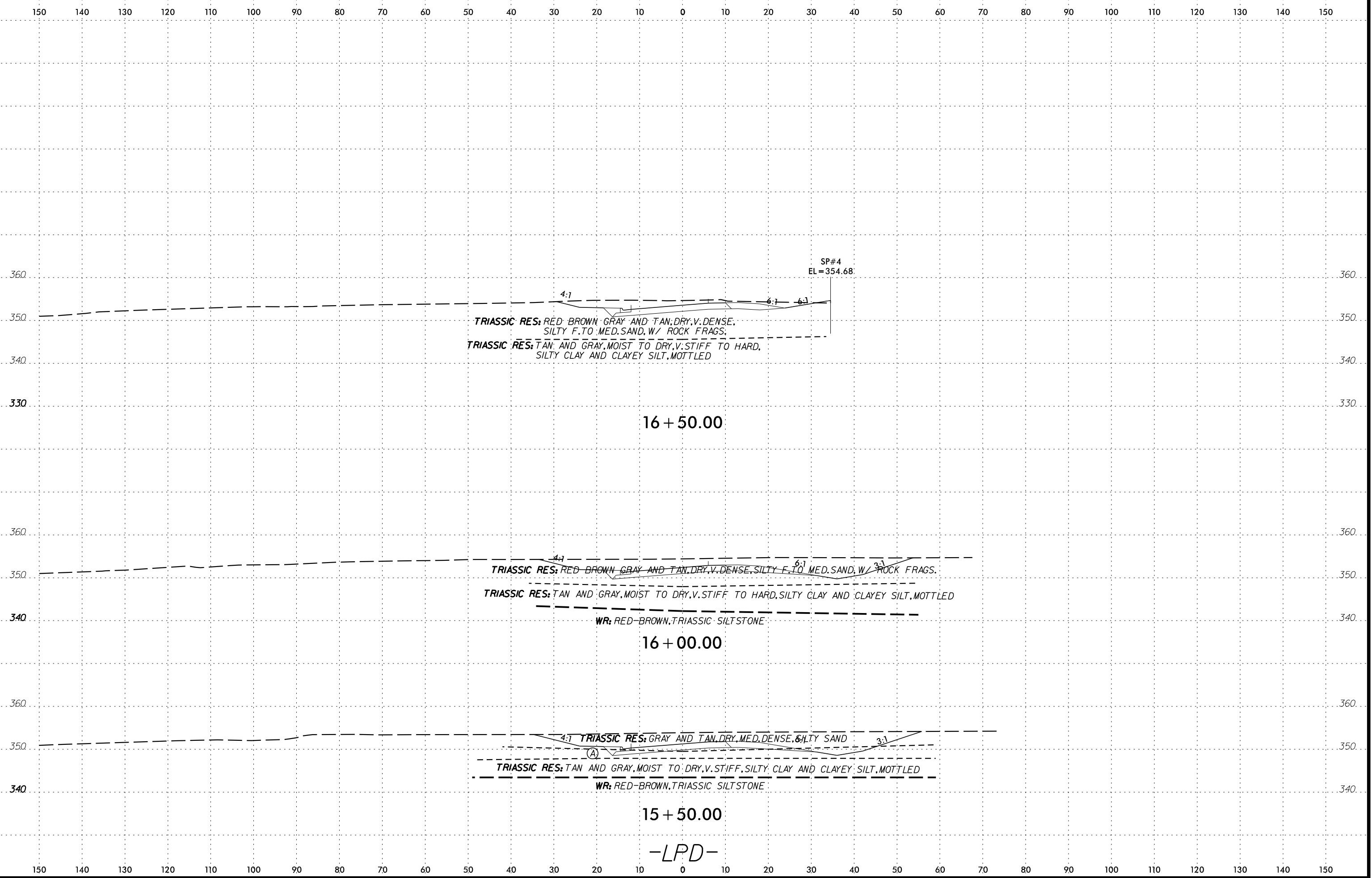
### SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	LL	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	#10	#40	#200				
SS-30	7' LT	15+05	3.5-5.0	A-7-6(39)	74	53	12	15	73	99	91	73	19	-	-	-



TIME 8:58 AM 8/23/99

8/23/99



SP#4  
EL = 354.68

4:1 6:1 6:1

TRIASSIC RES: RED-BROWN GRAY AND TAN, DRY, V. DENSE,  
SILTY F. TO MED. SAND, W/ ROCK FRAGS.

TRIASSIC RES: TAN AND GRAY, MOIST TO DRY, V. STIFF TO HARD,  
SILTY CLAY AND CLAYEY SILT, MOTTLED

16 + 50.00

4:1 6:1 3:1

TRIASSIC RES: RED-BROWN GRAY AND TAN, DRY, V. DENSE, SILTY F. TO MED. SAND, W/ ROCK FRAGS.

TRIASSIC RES: TAN AND GRAY, MOIST TO DRY, V. STIFF TO HARD, SILTY CLAY AND CLAYEY SILT, MOTTLED

WR: RED-BROWN, TRIASSIC SILTSTONE

16 + 00.00

4:1 3:1

TRIASSIC RES: GRAY AND TAN, DRY, MED. DENSE, SILTY SAND

TRIASSIC RES: TAN AND GRAY, MOIST TO DRY, V. STIFF, SILTY CLAY AND CLAYEY SILT, MOTTLED

WR: RED-BROWN, TRIASSIC SILTSTONE

15 + 50.00

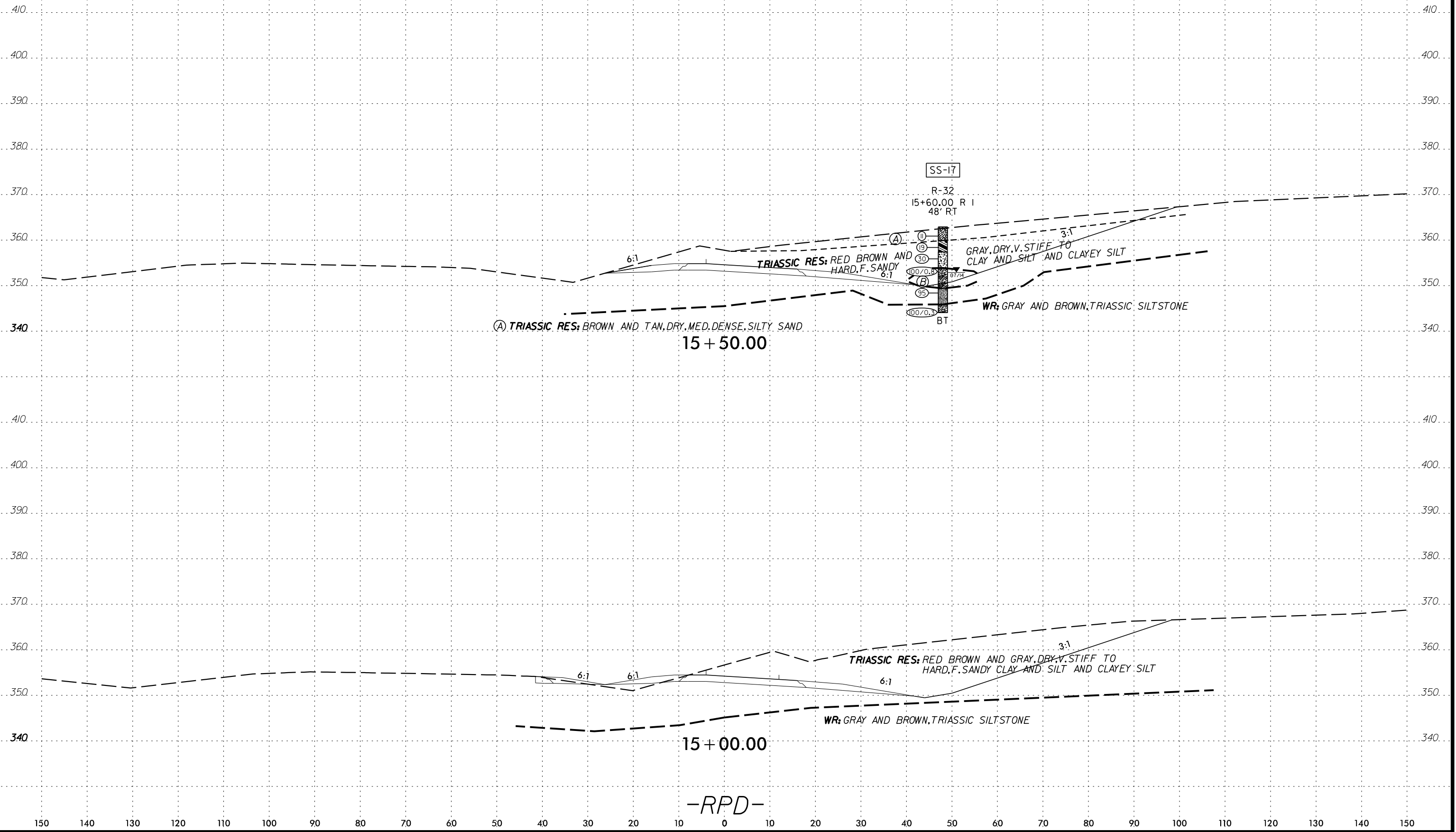
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TIME: 08:00 AM DATE: 8/23/99

8/23/99

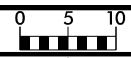
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SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY		10	40	200				
SS-17	48' RT	15+60	3.5+5.0	A-6(10)	35	13	6	18	76	100	96	76	12	-	-	-	



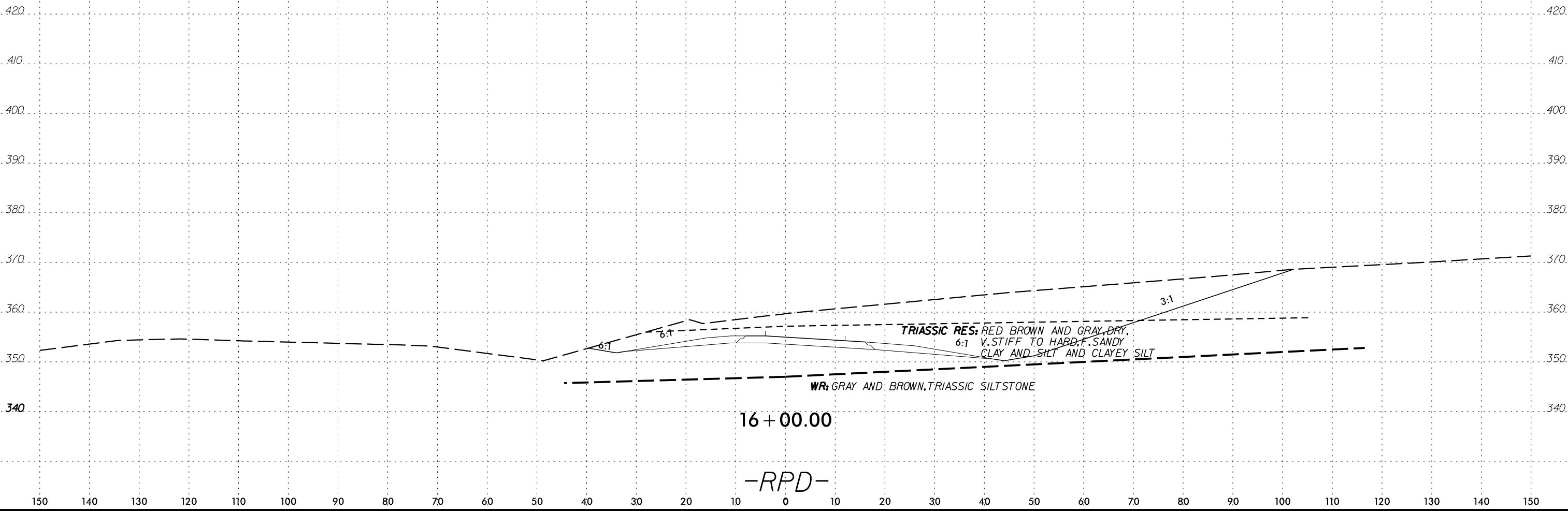
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PROJ. REFERENCE NO.	SHEET NO.
U-5315	42

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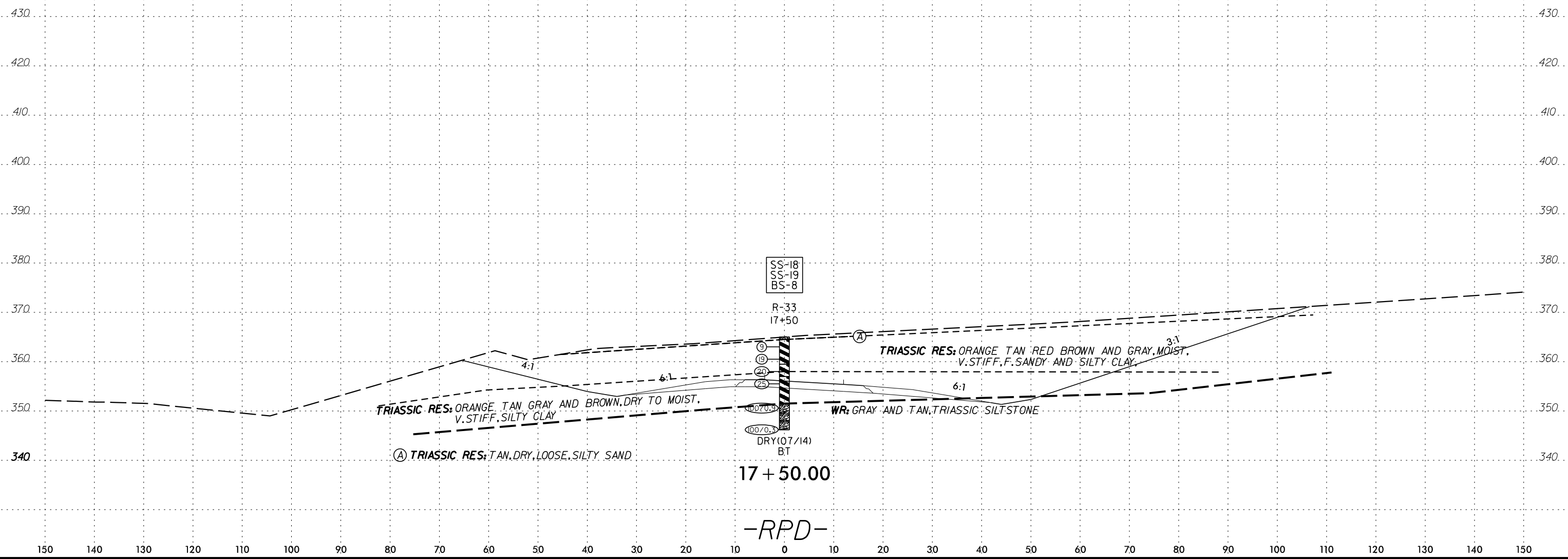




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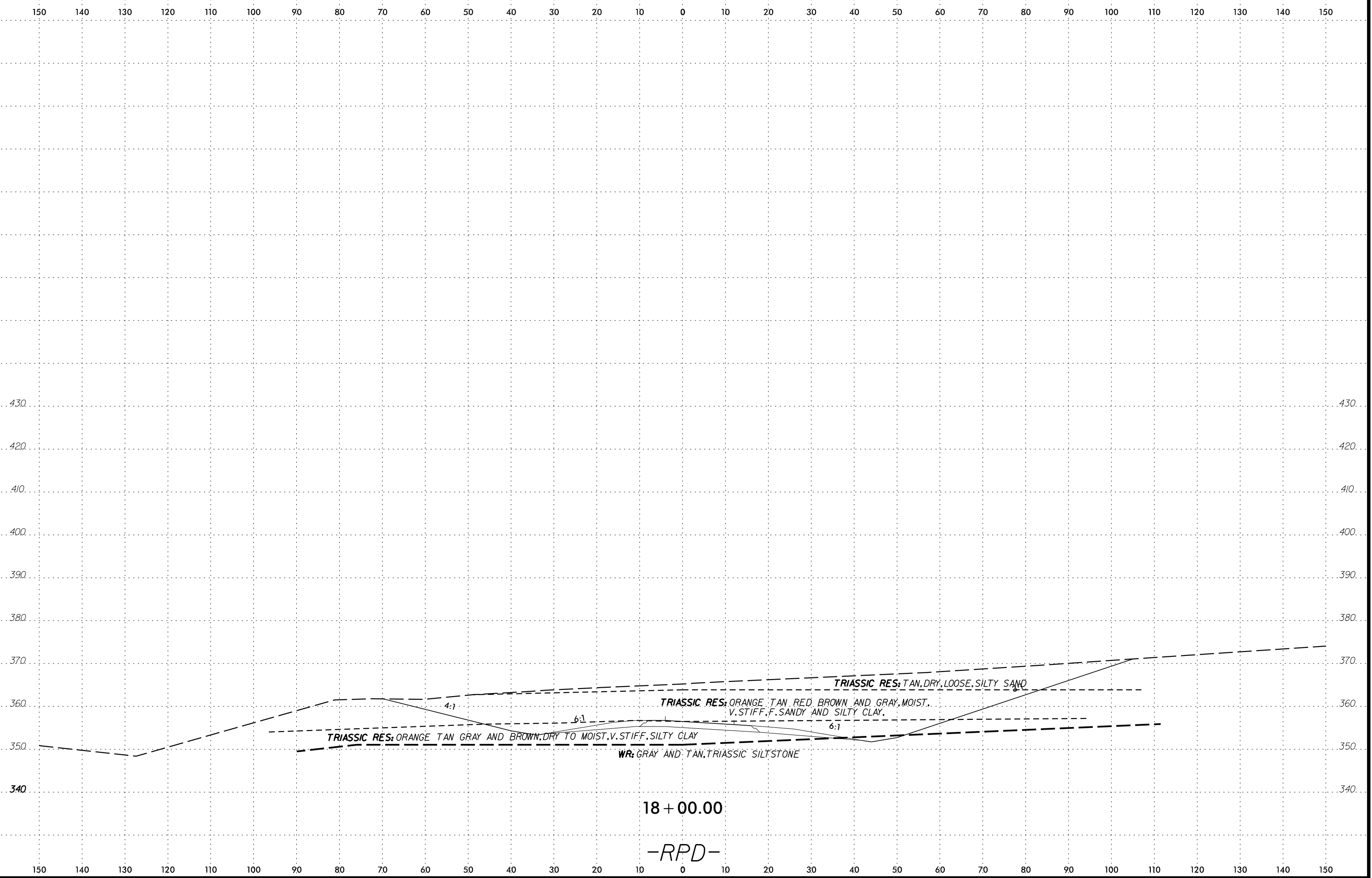
SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-18	CL	17+50	3.5-5.0	A-7-6(62)	89	63	3	9	87	100	97	87	22	-	-	-
SS-19	CL	17+50	8.5-10.0	A-6(13)	39	20	5	21	74	100	98	74	11	-	-	-
BS-8	CL	17+50	0-8.0	A-7-6(35)	62	42	8	12	80	100	95	80	18	2.2	16.9	109.9



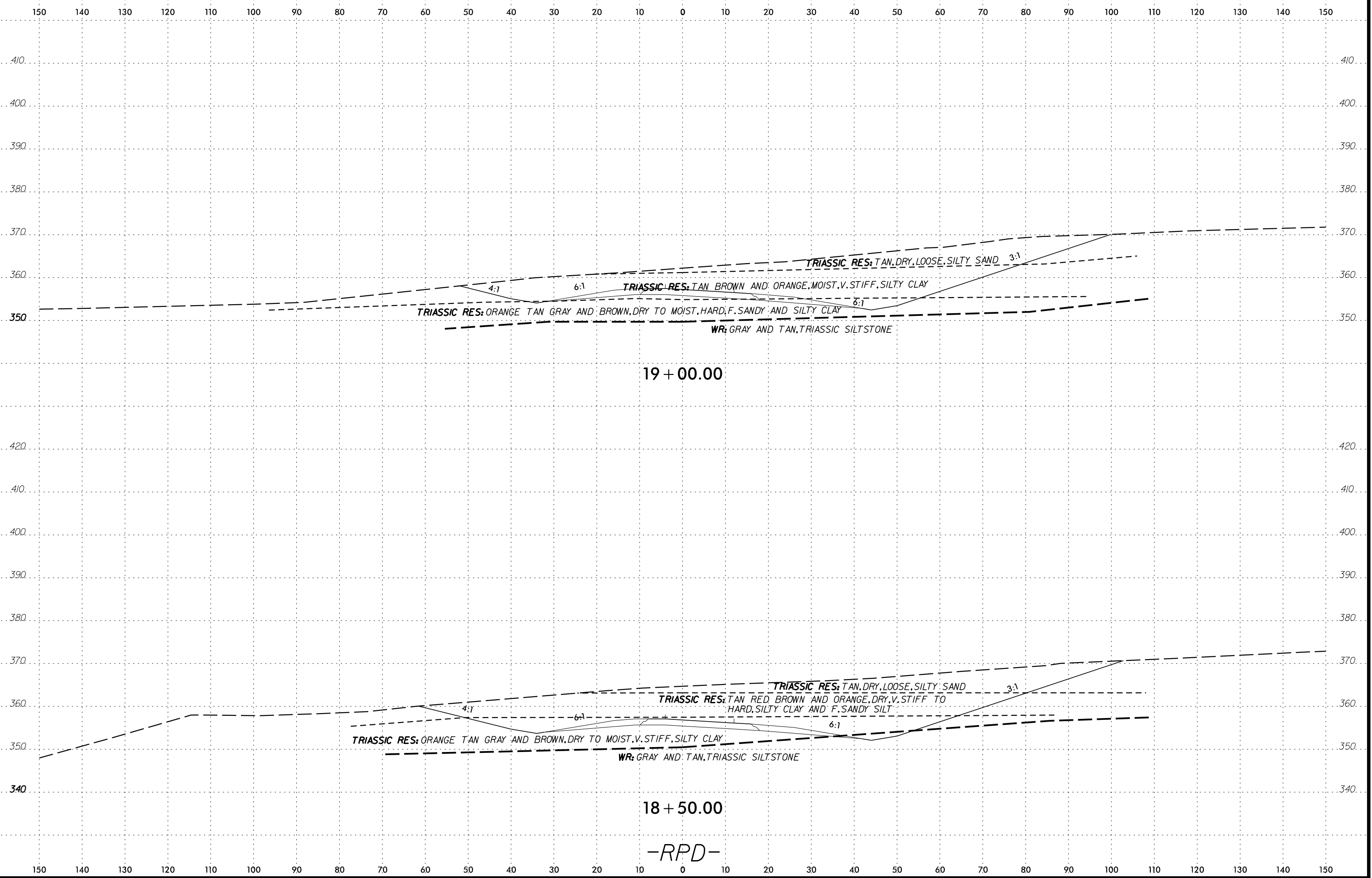
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DATE \$\$\$\$\$\$  
BY \$\$\$\$\$\$  
CHECKED \$\$\$\$\$\$  
SCALE \$\$\$\$\$\$  
SHEET \$\$\$\$\$\$  
TOTAL \$\$\$\$\$\$

17 + 50.00  
-RPD-

8/23/99



8/23/99



19 + 00.00

18 + 50.00

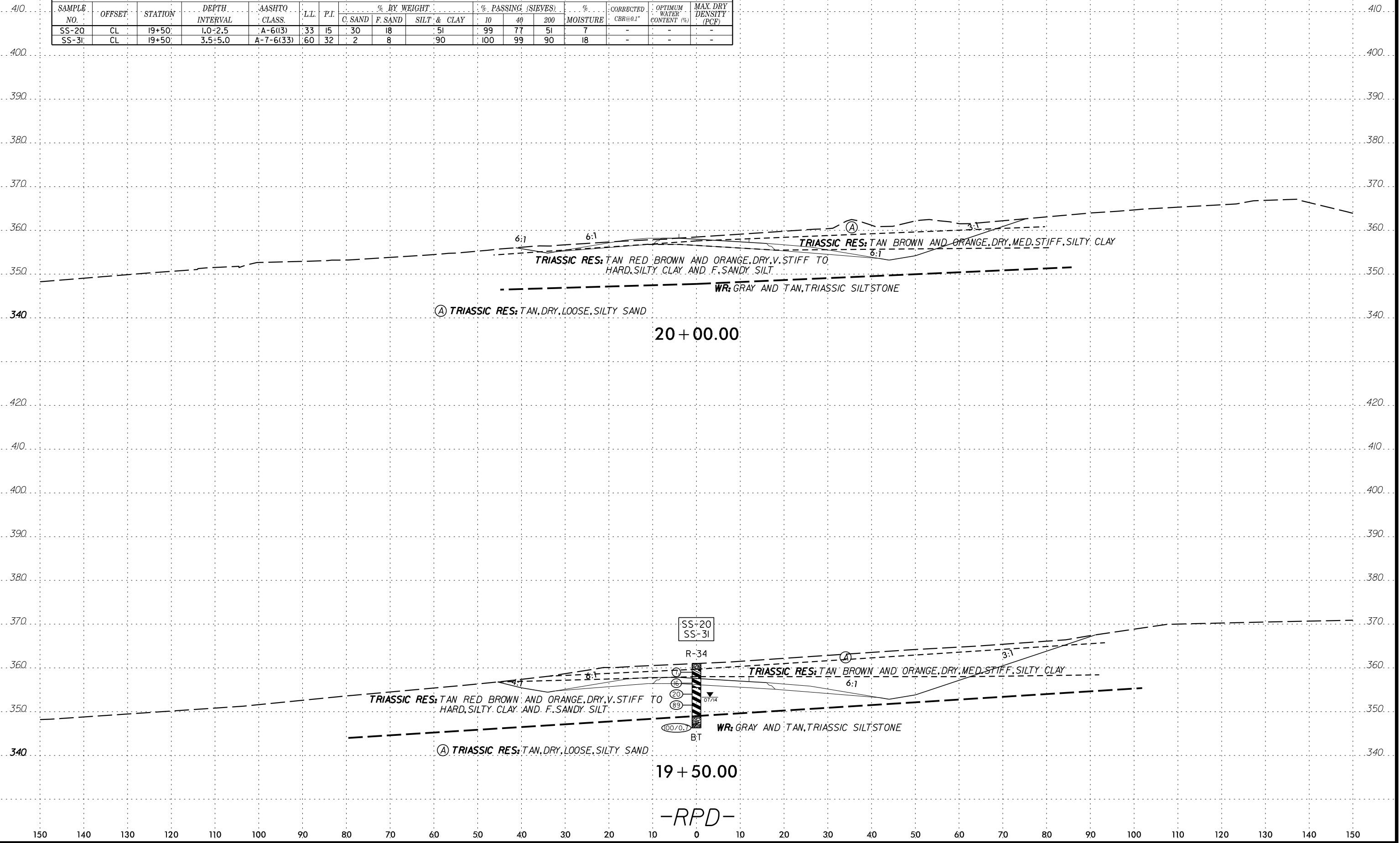
-RPD-

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TIME: 10:00 AM  
BY: J. S. [unreadable]  
CHECKED BY: [unreadable]  
SCALE: AS SHOWN  
PROJECT: [unreadable]  
SHEET NO.: 47

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	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
							SS-20	CL	19+50	1.0-2.5	A-6(13)	33				
SS-31	CL	19+50	3.5-5.0	A-7-6(33)	60	32	2	8	90	100	99	90	18	-	-	-



Ⓐ TRIASSIC RES: TAN, DRY, LOOSE, SILTY SAND

20 + 00.00

SS-20  
SS-31

R-34

17  
16  
20  
89

07/74

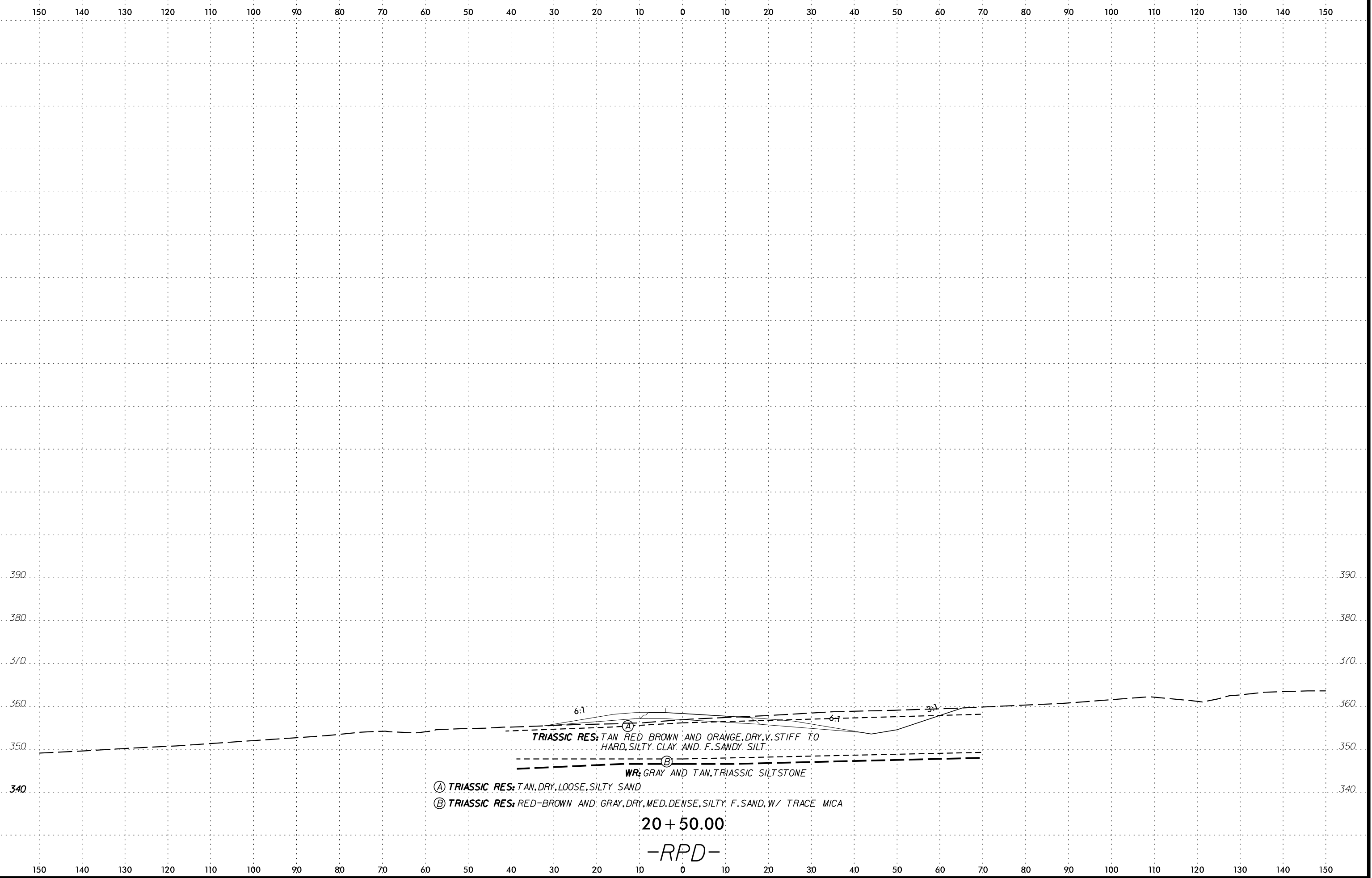
100/0.7  
BT

19 + 50.00

-RPD-

TIME  
BY  
DATE  
SCALE  
US  
FR  
MAN

8/23/99  
TIME  
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E



TRIASSIC RES: TAN RED BROWN AND ORANGE, DRY, V. STIFF TO HARD, SILTY CLAY AND F. SANDY SILT

WR: GRAY AND TAN, TRIASSIC SILTSTONE

- (A) TRIASSIC RES: TAN, DRY, LOOSE, SILTY SAND
- (B) TRIASSIC RES: RED-BROWN AND GRAY, DRY, MED. DENSE, SILTY F. SAND, W/ TRACE MICA

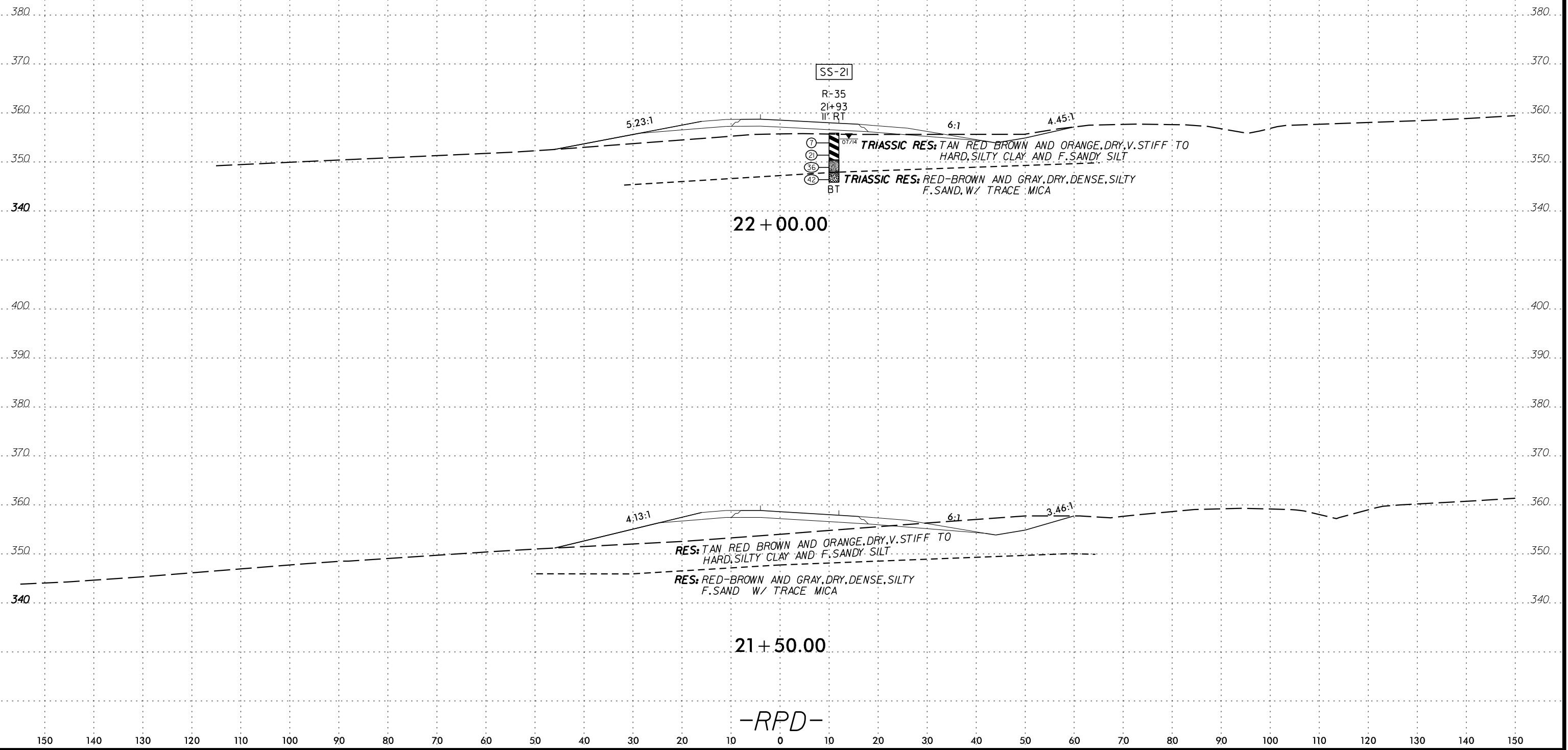
20+50.00

-RPD-

8/23/99

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	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-21	11' RT	21+93	3.5-5.0	A-7-6(2B)	51	29	1	10	89	100	100	89	19	-	-	-

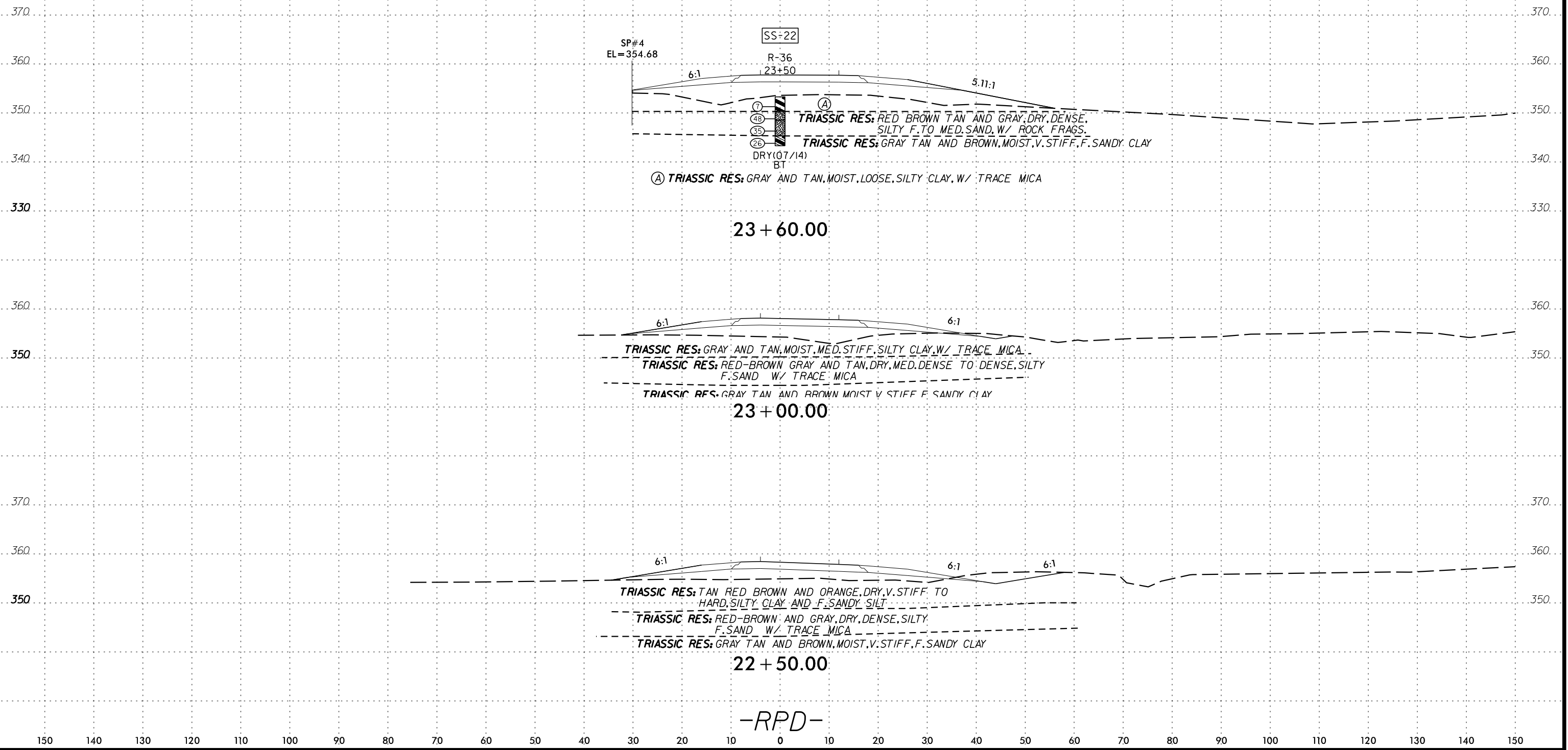


TIME \$\$\$\$\$\$  
DATE \$\$\$\$\$\$  
BY \$\$\$\$\$\$  
CHECKED \$\$\$\$\$\$  
SCALE \$\$\$\$\$\$  
SHEET \$\$\$\$\$\$

8/23/99

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.	LL	PI	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	CORRECTED CBR@0.1"	OPTIMUM WATER CONTENT (%)	MAX. DRY DENSITY (PCF)
							C. SAND	F. SAND	SILT & CLAY	10	40	200				
SS-22	CL	23+50	1.0-2.5	A-7-5(34)	66	36	6	10	84	100	96	84	28	-	-	-



TIME \$\$\$\$\$\$  
DATE \$\$\$\$\$\$  
BY \$\$\$\$\$\$  
CHECKED \$\$\$\$\$\$  
SCALE \$\$\$\$\$\$  
SHEET \$\$\$\$\$\$

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

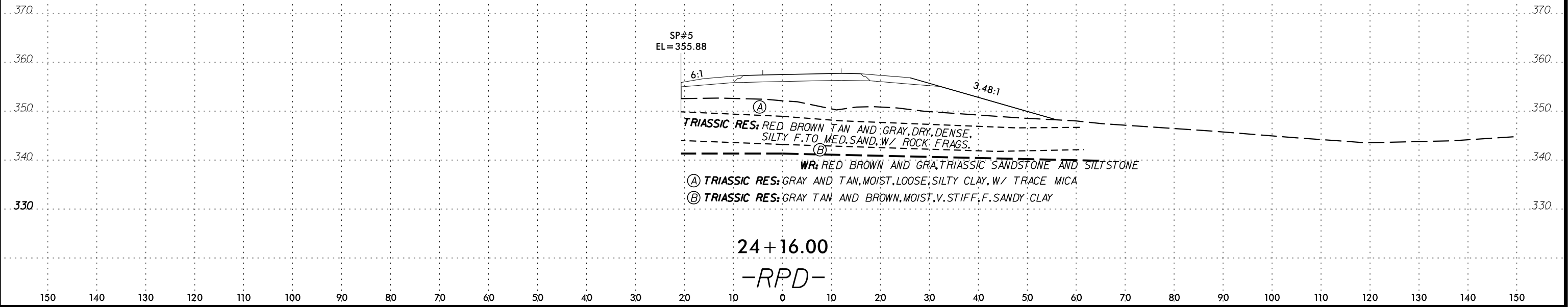
8/23/99



PROJ. REFERENCE NO.  
U-5315

SHEET NO.  
52

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



C:\P\89\8911\8911.DWG



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**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

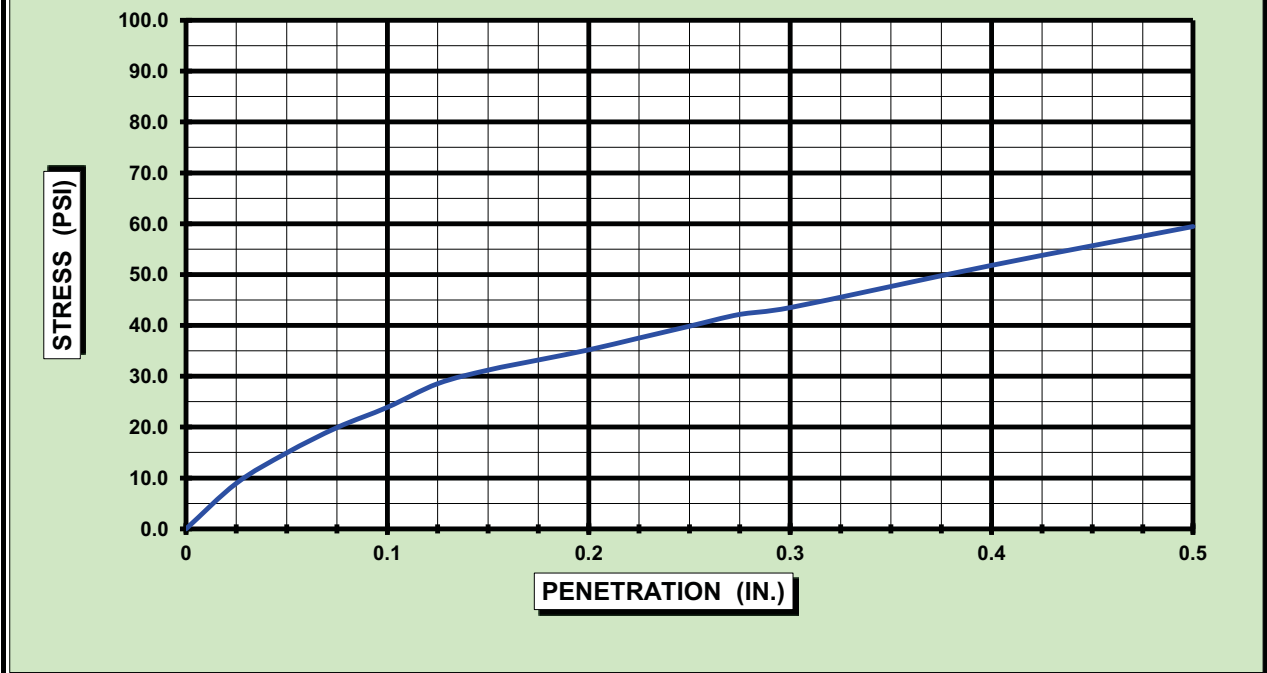
PROJECT #:	G14001.00	DATE:	8/22/2014
PROJECT NAME:	Morrisville Parkway Interchange		
BORING:	R-1	SAMPLE:	BS-1
		DEPTH:	0-5

SOIL DESCRIPTION: Brown FAT CLAY with SAND (A-7-6)

COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	102.6 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	19.2%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	97.6 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	20.5%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	95.1%	SWELL	4.18%

	ACTUAL	CORRECTED
CBR VALUE AT .1"	2.4	N/A
CBR VALUE AT .2"	2.3	N/A

**STRESS-PENETRATION CURVE**



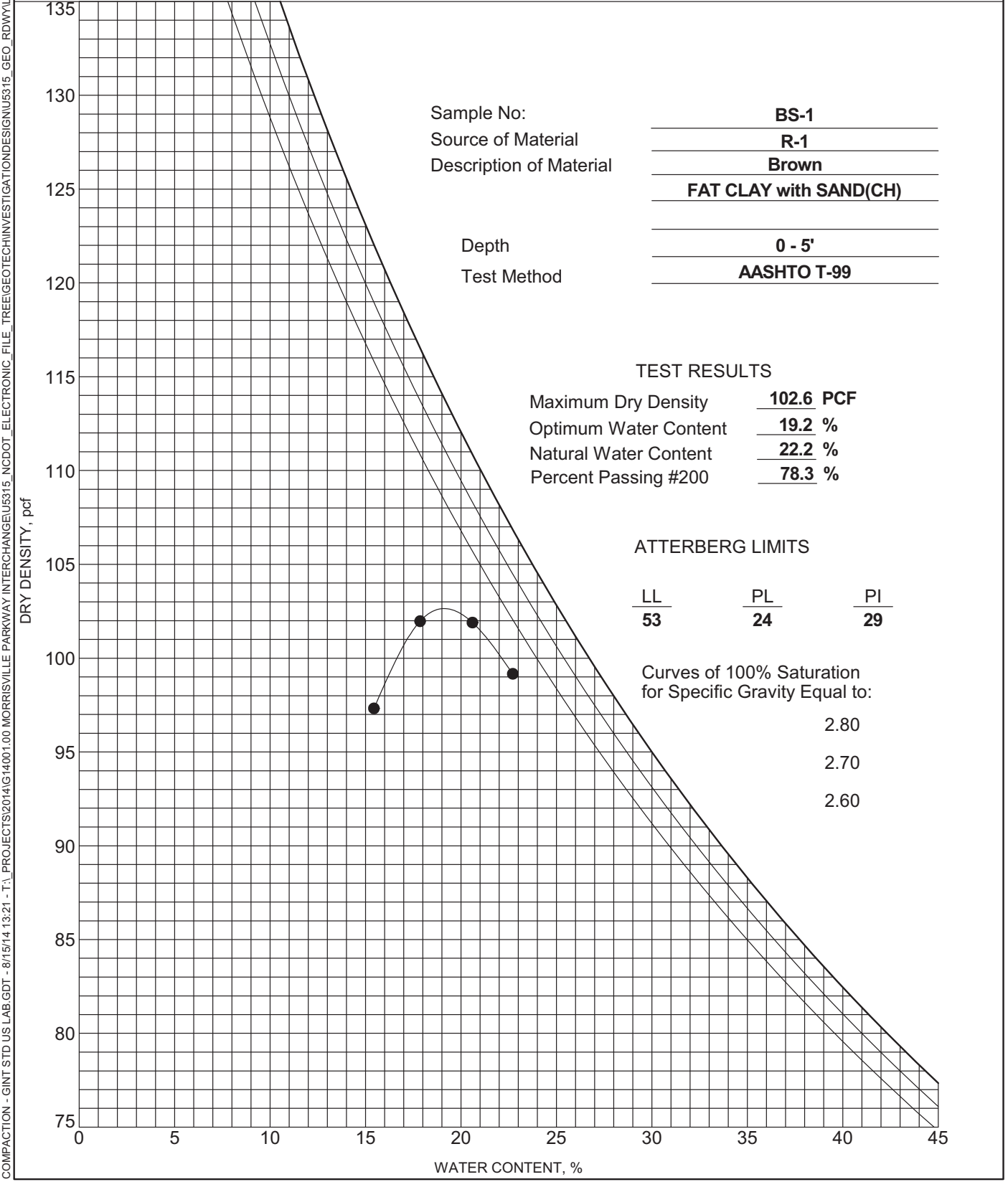
LIQUID LIMIT	53	PLASTIC LIMIT	24	PLASTIC INDEX	29
Percent Passing #200 Sieve = 78.3%			Natural Moisture Content = 22.2%		

COMPACTION - GINT STD US LAB.GDT - 8/15/14 13:21 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US315\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ

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 Fax: (919) 871-0803

**MOISTURE-DENSITY RELATIONSHIP**

CLIENT	RK & K	PROJECT NAME	Morrisville Parkway Interchange
PROJECT NUMBER	G14001.00	PROJECT LOCATION	Morrisville, NC



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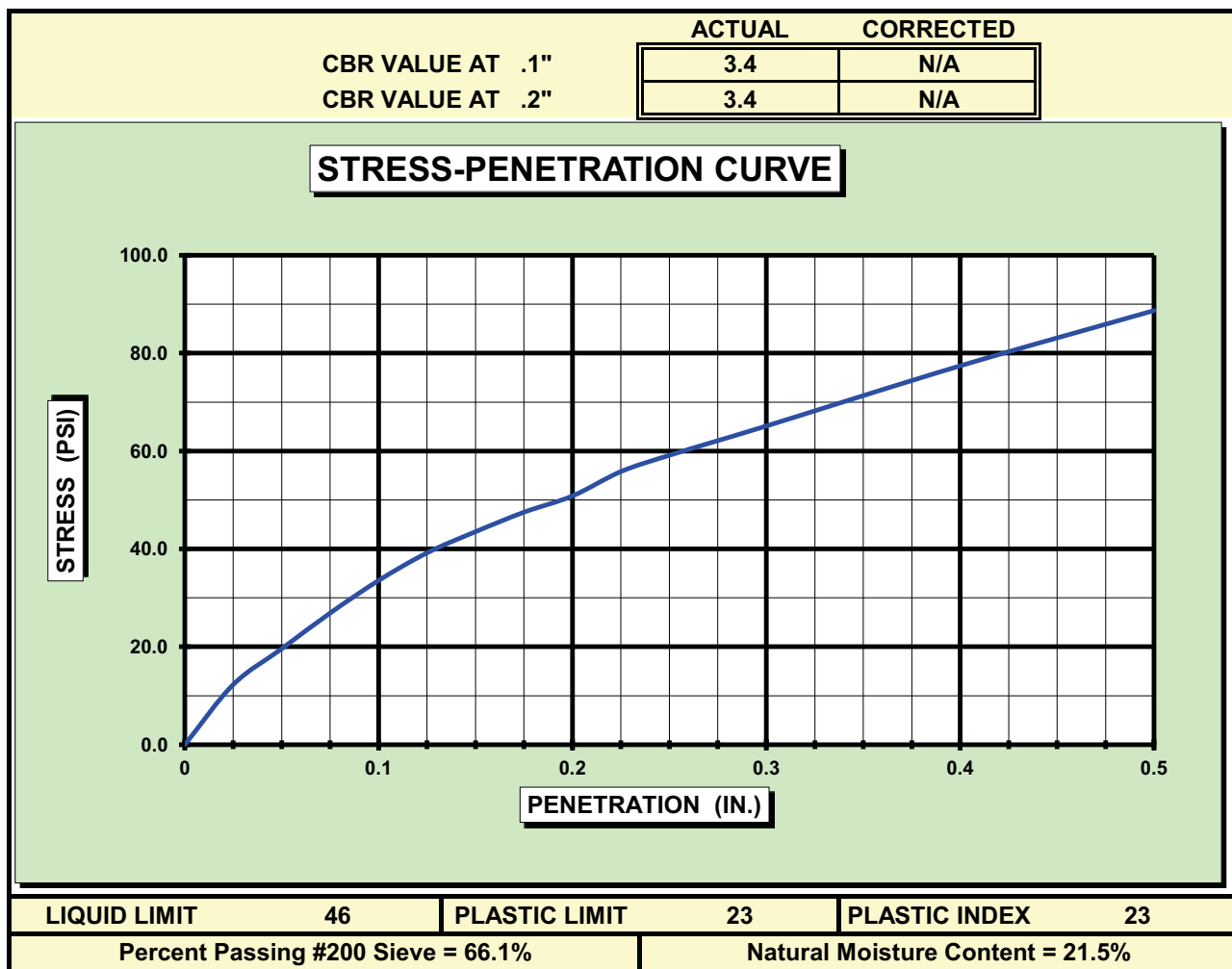
**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

PROJECT #:	G14001.00	DATE:	8/22/2014
PROJECT NAME:	Morrisville Parkway Interchange		
BORING:	R-12	SAMPLE:	BS-3
		DEPTH:	0-8

SOIL DESCRIPTION: Light Brown/Orange SANDY LEAN CLAY (A-7-6)

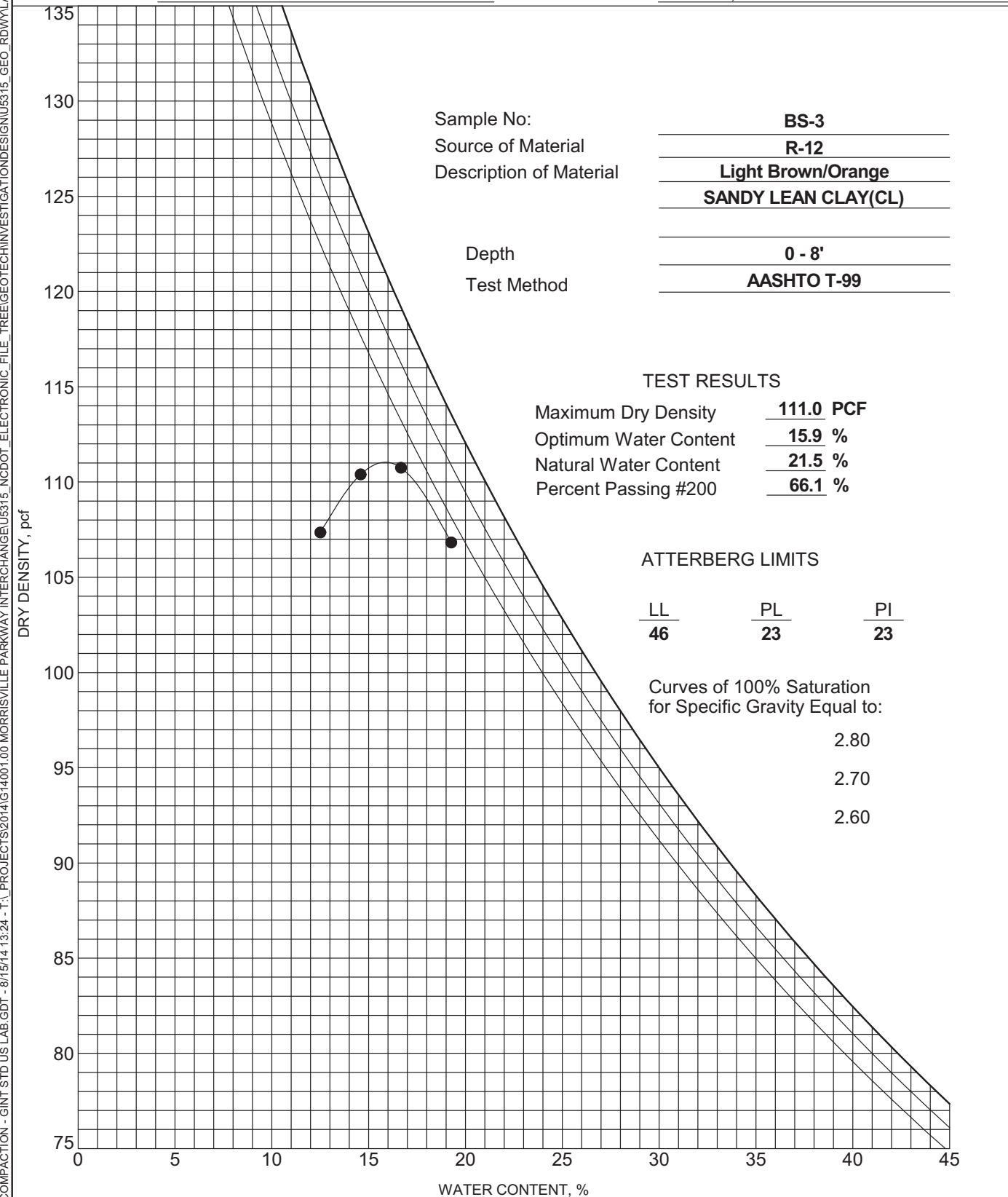
COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	111.0 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	15.9%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	105.5 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	16.0%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	95.0%	SWELL	3.07%



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**MOISTURE-DENSITY RELATIONSHIP**

CLIENT	RK & K	PROJECT NAME	Morrisville Parkway Interchange
PROJECT NUMBER	G14001.00	PROJECT LOCATION	Morrisville, NC



COMPACTION - GINT STD US LAB.GDT - 8/15/14 13:24 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US15\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ

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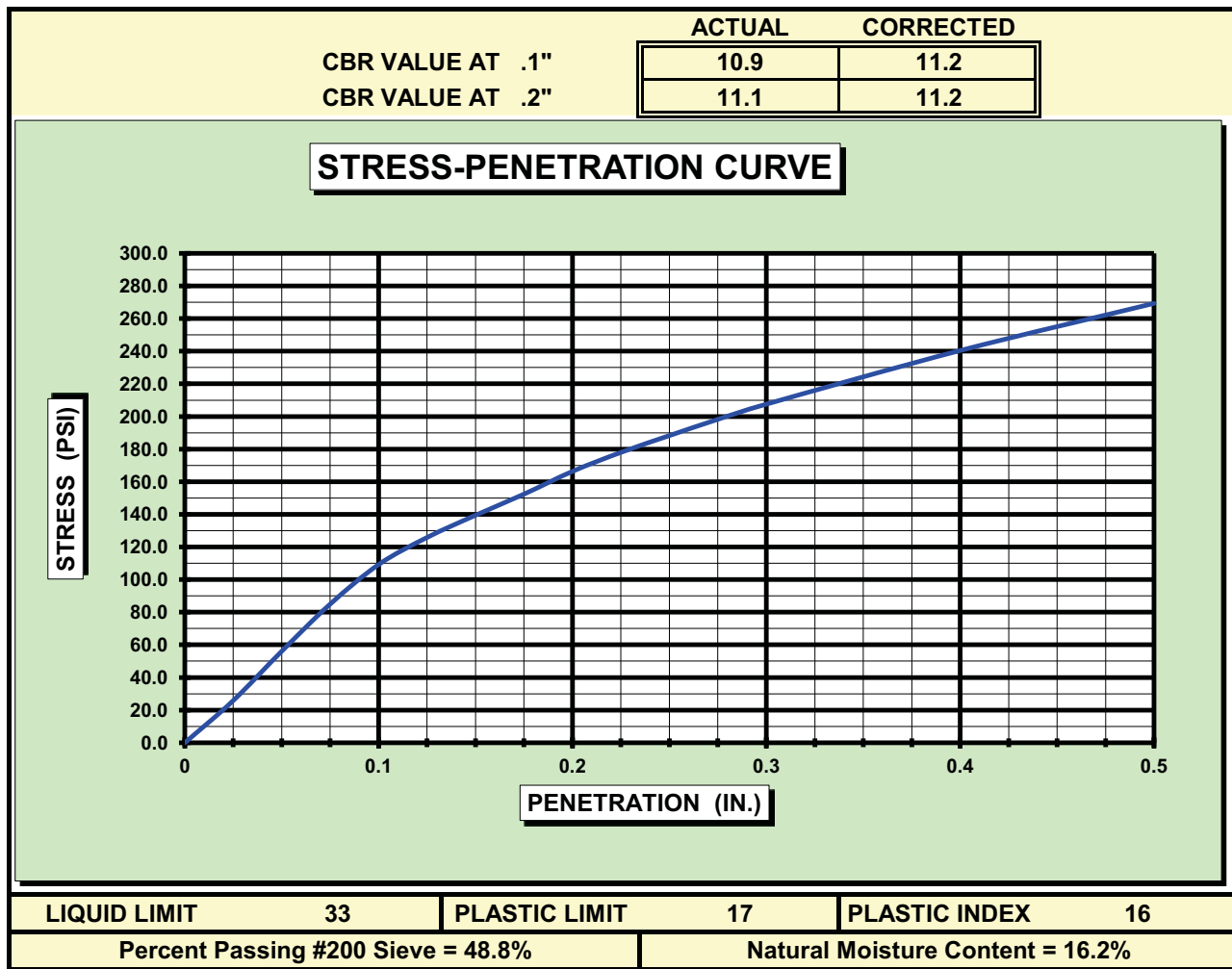
**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

PROJECT #: **G14001.00** DATE: **8/22/2014**  
 PROJECT NAME: **Morrisville Parkway Interchange**  
 BORING: **R-18** SAMPLE: **BS-4** DEPTH: **0-5**

SOIL DESCRIPTION: **Light Brown/Gray CLAYEY SAND (A-6)**

COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	122.7 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	10.2%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	118.9 PCF	10 lb.	
MOISTURE CONTENT	10.4%	SURCHARGE PER SQUARE FOOT	
PERCENT COMPACTION	96.9%	51 lbs/sq.ft.	
		FINAL MOISTURE CONTENT	N/A
		SWELL	0.69%

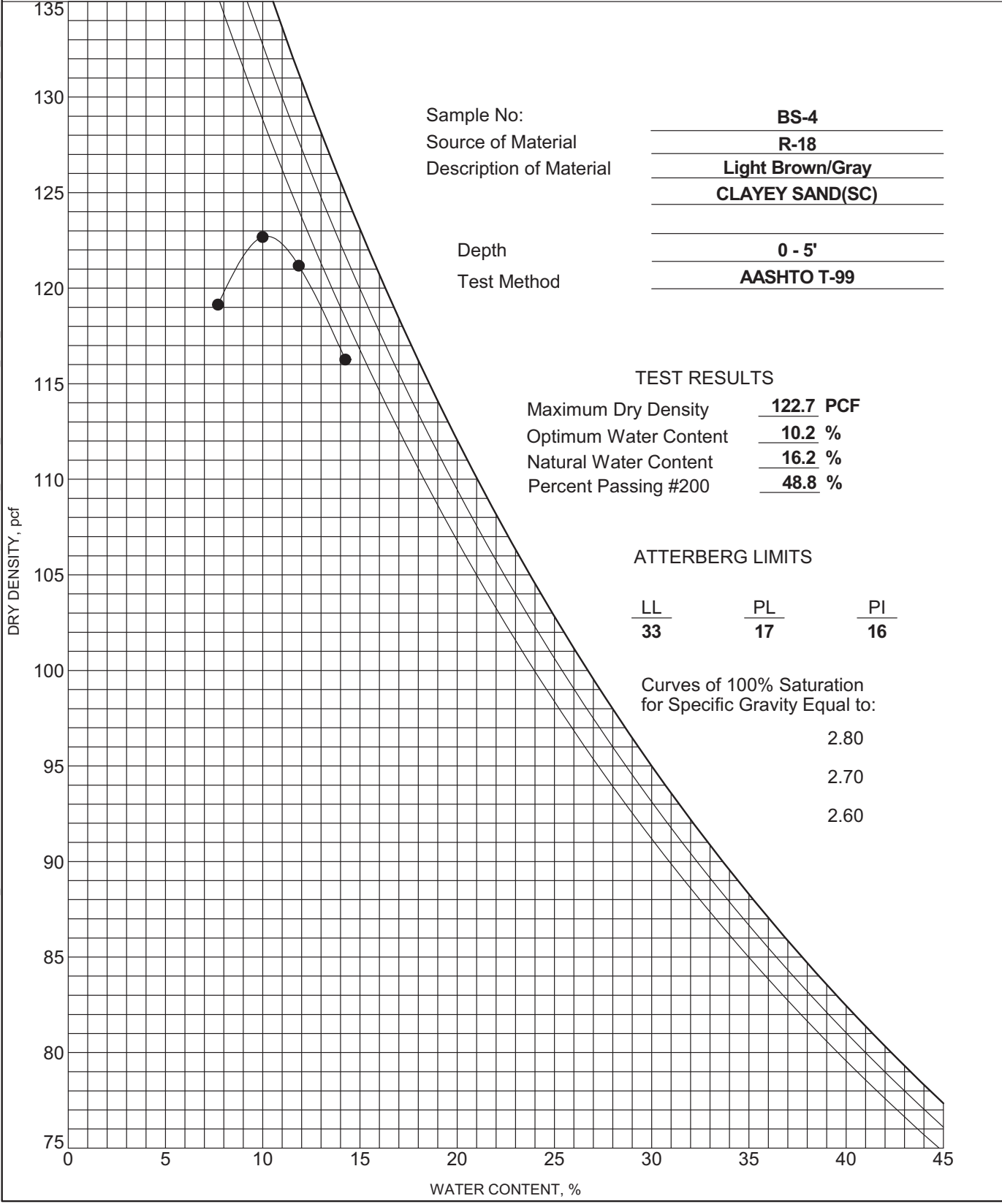


COMPACTON - GINT STD US LAB.GDT - 8/15/14 13:25 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US315\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ

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**MOISTURE-DENSITY RELATIONSHIP**

CLIENT **RK & K** PROJECT NAME **Morrisville Parkway Interchange**  
 PROJECT NUMBER **G14001.00** PROJECT LOCATION **Morrisville, NC**



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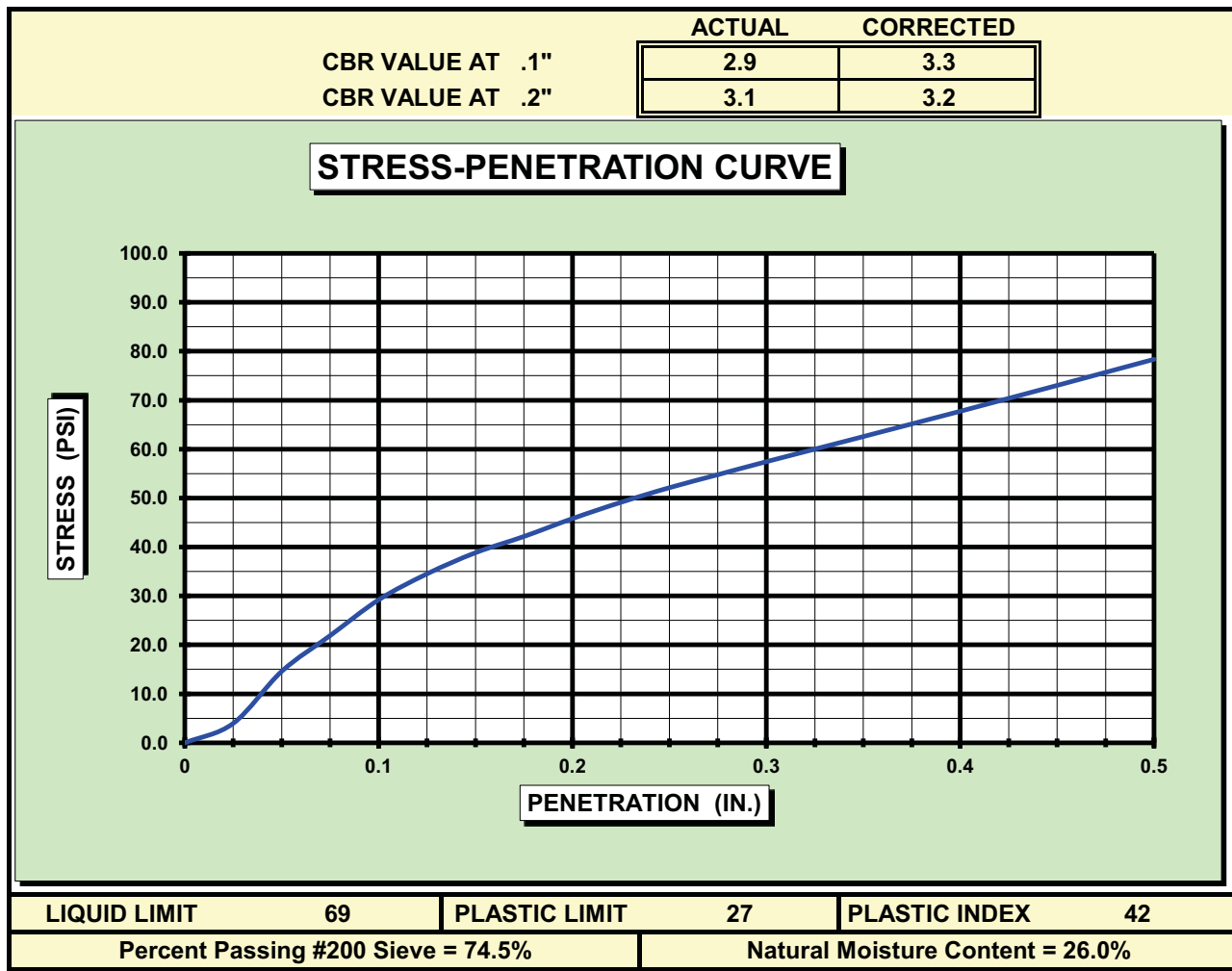
**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

PROJECT #: **G14001.00** DATE: **8/22/2014**  
 PROJECT NAME: **Morrisville Parkway Interchange**  
 BORING: **R-19** SAMPLE: **BS-5** DEPTH: **0-10**

SOIL DESCRIPTION: **Orange/White FAT CLAY with SAND (A-7-6)**

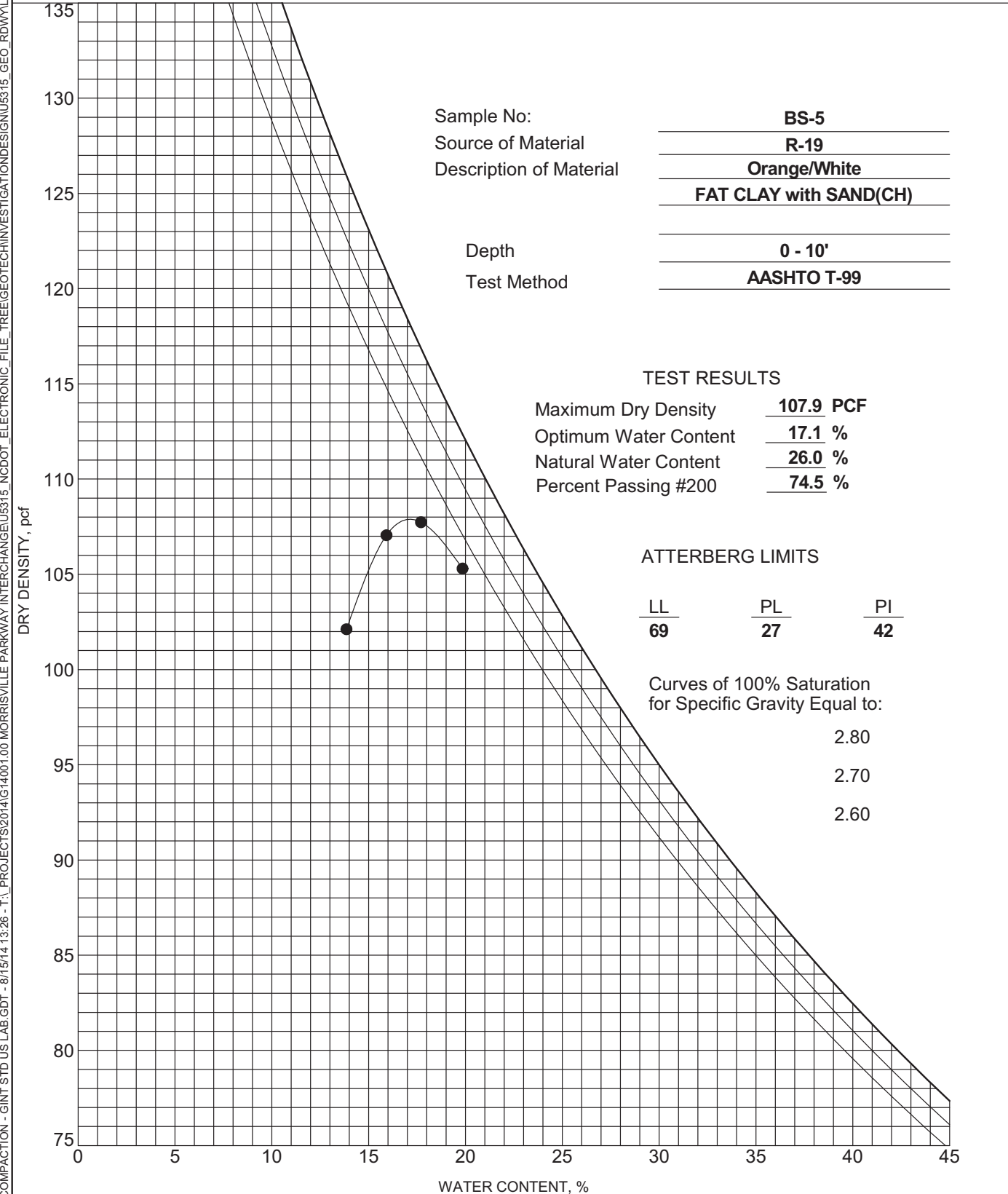
COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	107.9 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	17.1%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	102.8 PCF	SURCHARGE PER SQUARE FOOT	10 lb.
MOISTURE CONTENT	17.9%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	95.3%	SWELL	3.09%



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**MOISTURE-DENSITY RELATIONSHIP**

CLIENT **RK & K** PROJECT NAME **Morrisville Parkway Interchange**  
 PROJECT NUMBER **G14001.00** PROJECT LOCATION **Morrisville, NC**



COMPACTION - GINT STD US LAB.GDT - 8/15/14 13:26 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US315\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ

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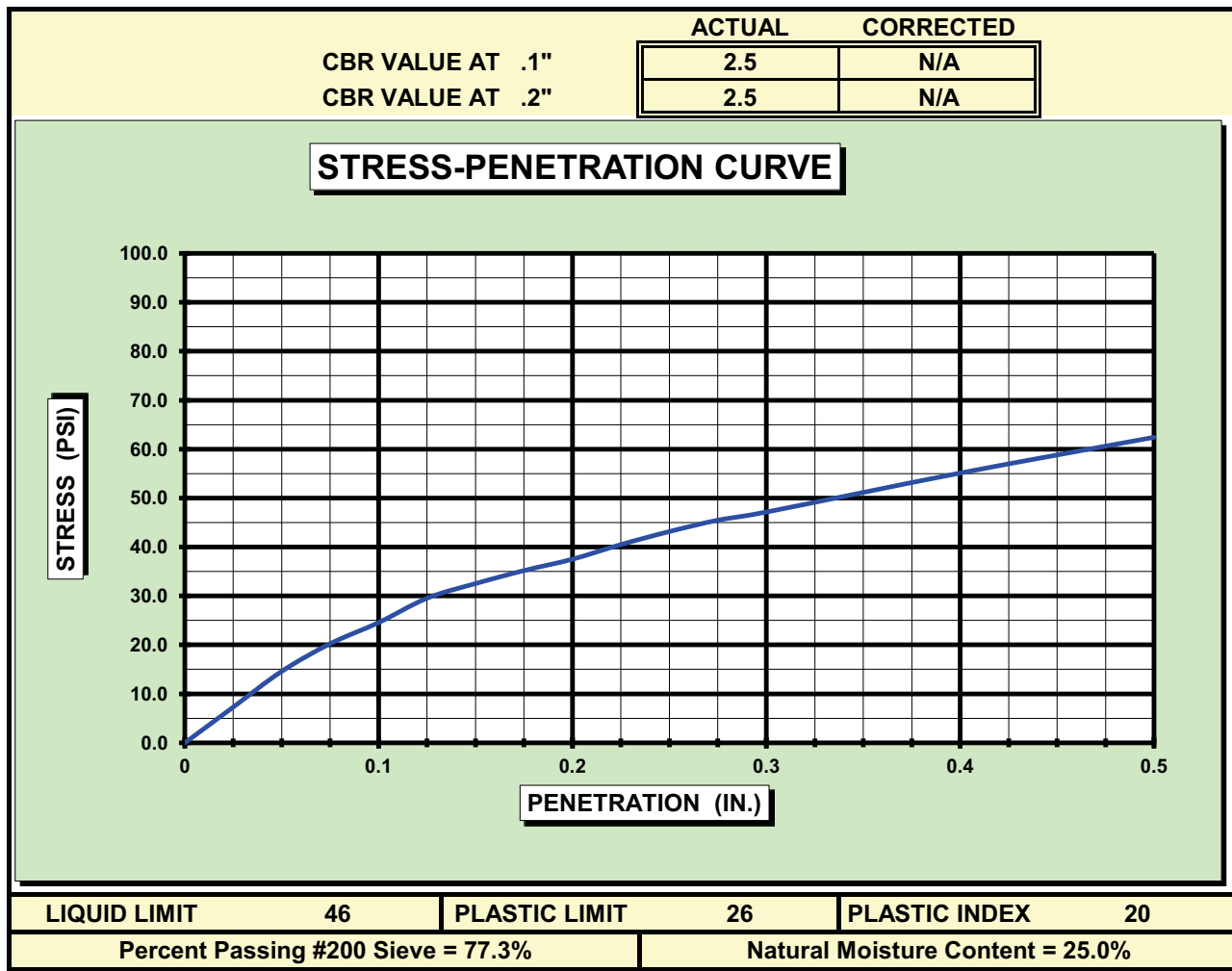
**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

PROJECT #:	G14001.00	DATE:	8/22/2014
PROJECT NAME:	Morrisville Parkway Interchange		
BORING:	R-23	SAMPLE:	BS-6
		DEPTH:	0-5

SOIL DESCRIPTION: Brown/Light Orange LEAN CLAY with SAND (A-7-6)

COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	105.7 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	18.6%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	102.4 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	18.6%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	96.9%	SWELL	3.89%

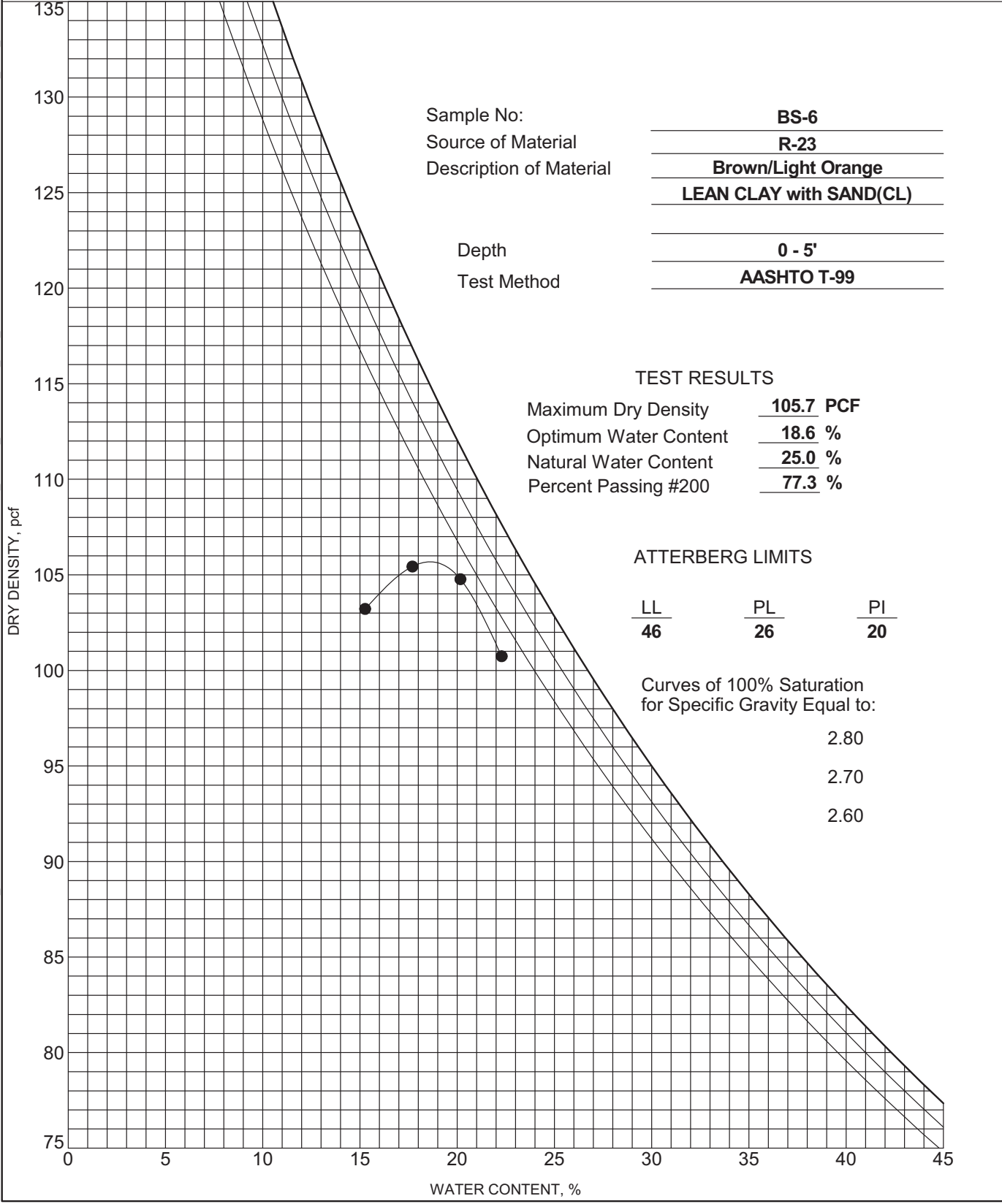


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**MOISTURE-DENSITY RELATIONSHIP**

CLIENT RK & K PROJECT NAME Morrisville Parkway Interchange  
 PROJECT NUMBER G14001.00 PROJECT LOCATION Morrisville, NC

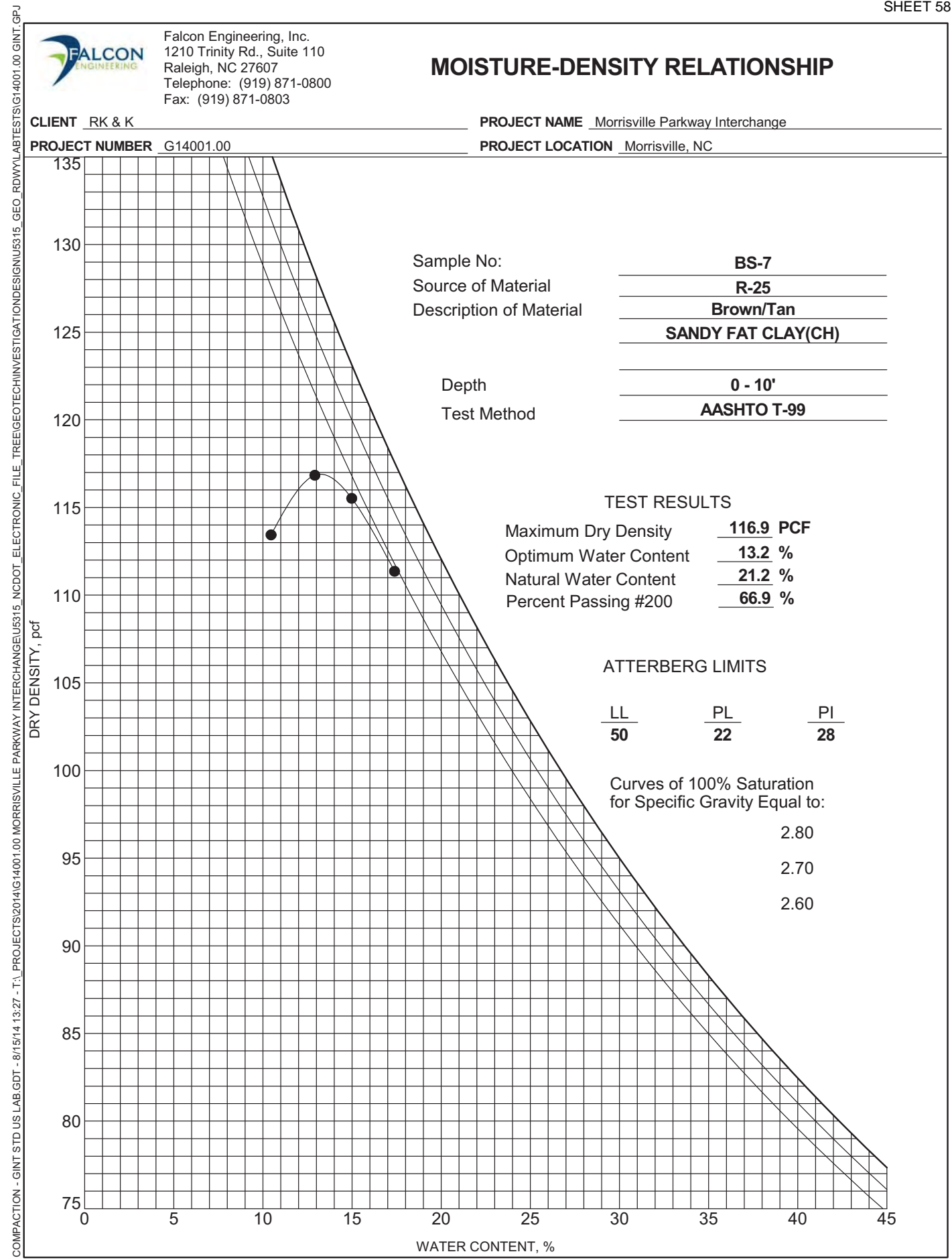
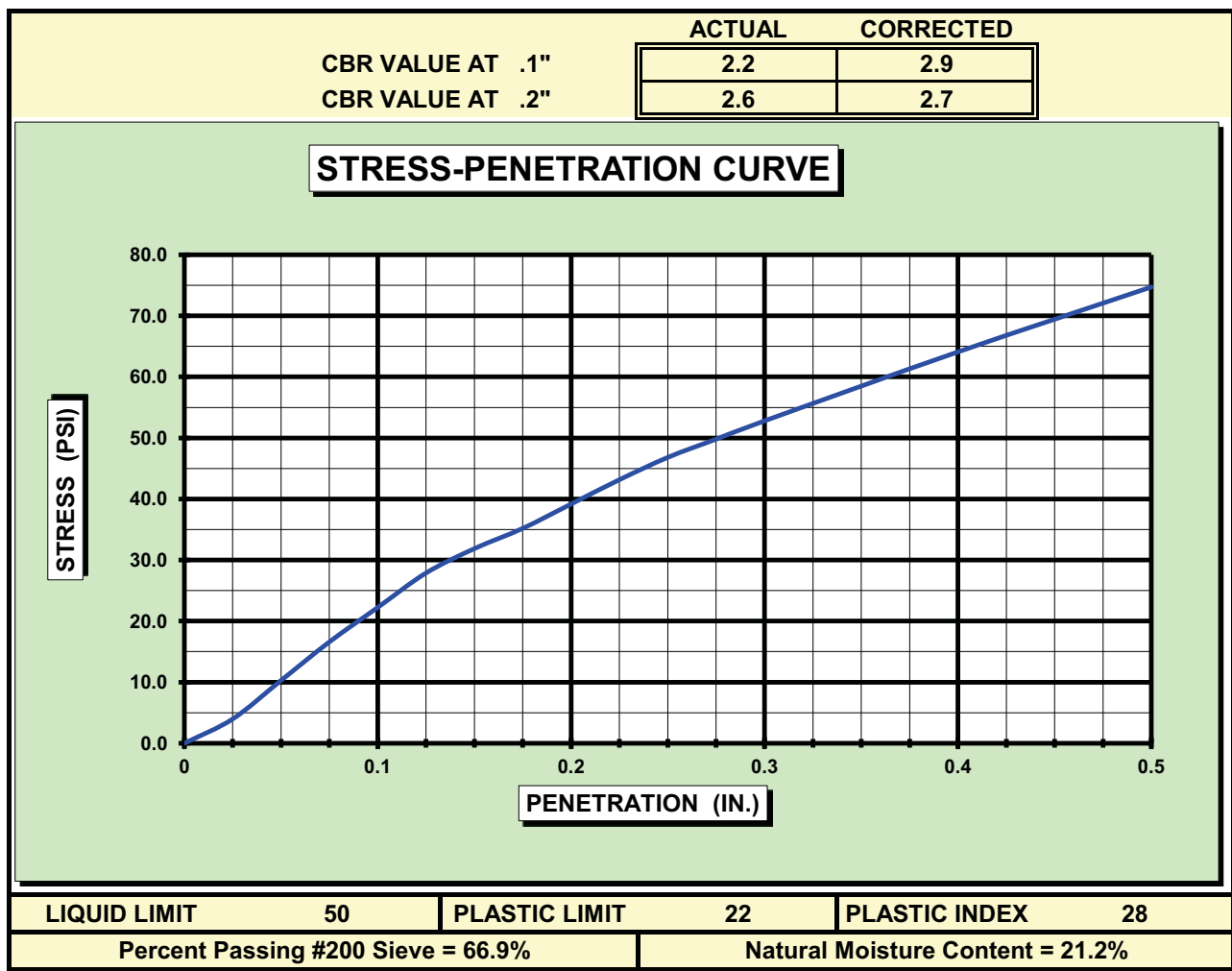


**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**  
AASHTO T-193 \ ASTM D-1883

PROJECT #: G14001.00 DATE: 8/22/2014  
PROJECT NAME: Morrisville Parkway Interchange  
BORING: R-25 SAMPLE: BS-7 DEPTH: 0-10

SOIL DESCRIPTION: Brown/Tan SANDY FAT CLAY (A-7-6)

COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	116.9 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	13.2%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	111.3 PCF	SURCHARGE PER SQUARE FOOT	10 lb.
MOISTURE CONTENT	12.7%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	95.2%	SWELL	2.87%



COMPACTON - GINT STD US LAB.GDT - 8/15/14 13:27 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US315\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ

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**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

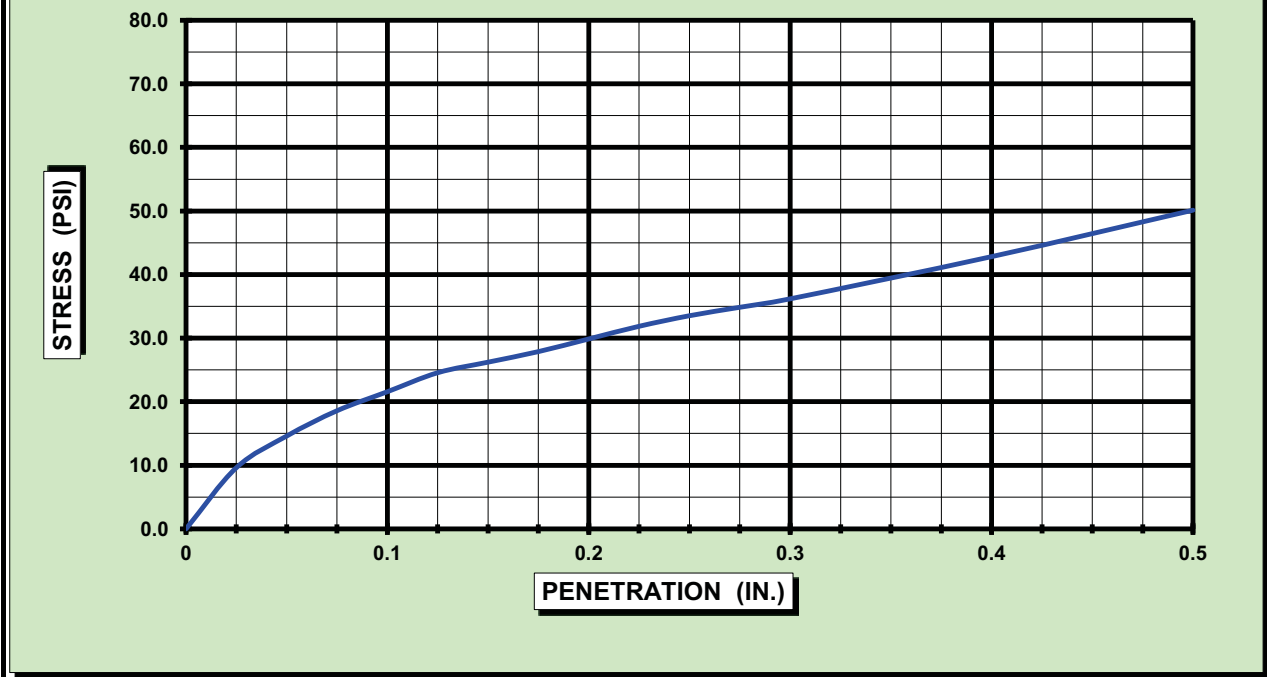
PROJECT #:	G14001.00	DATE:	8/22/2014
PROJECT NAME:	Morrisville Parkway Interchange		
BORING:	R-33	SAMPLE:	BS-8
		DEPTH:	0-8

SOIL DESCRIPTION: Brown/Tan SANDY FAT CLAY (A-7-6)

COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	109.9 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	16.9%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	106.5 PCF	10 lb.	
MOISTURE CONTENT	16.7%	SURCHARGE PER SQUARE FOOT	
		51 lbs/sq.ft.	
PERCENT COMPACTION	96.9%	FINAL MOISTURE CONTENT	N/A
		SWELL	3.98%

	ACTUAL	CORRECTED
CBR VALUE AT .1"	2.2	N/A
CBR VALUE AT .2"	2.0	N/A

**STRESS-PENETRATION CURVE**



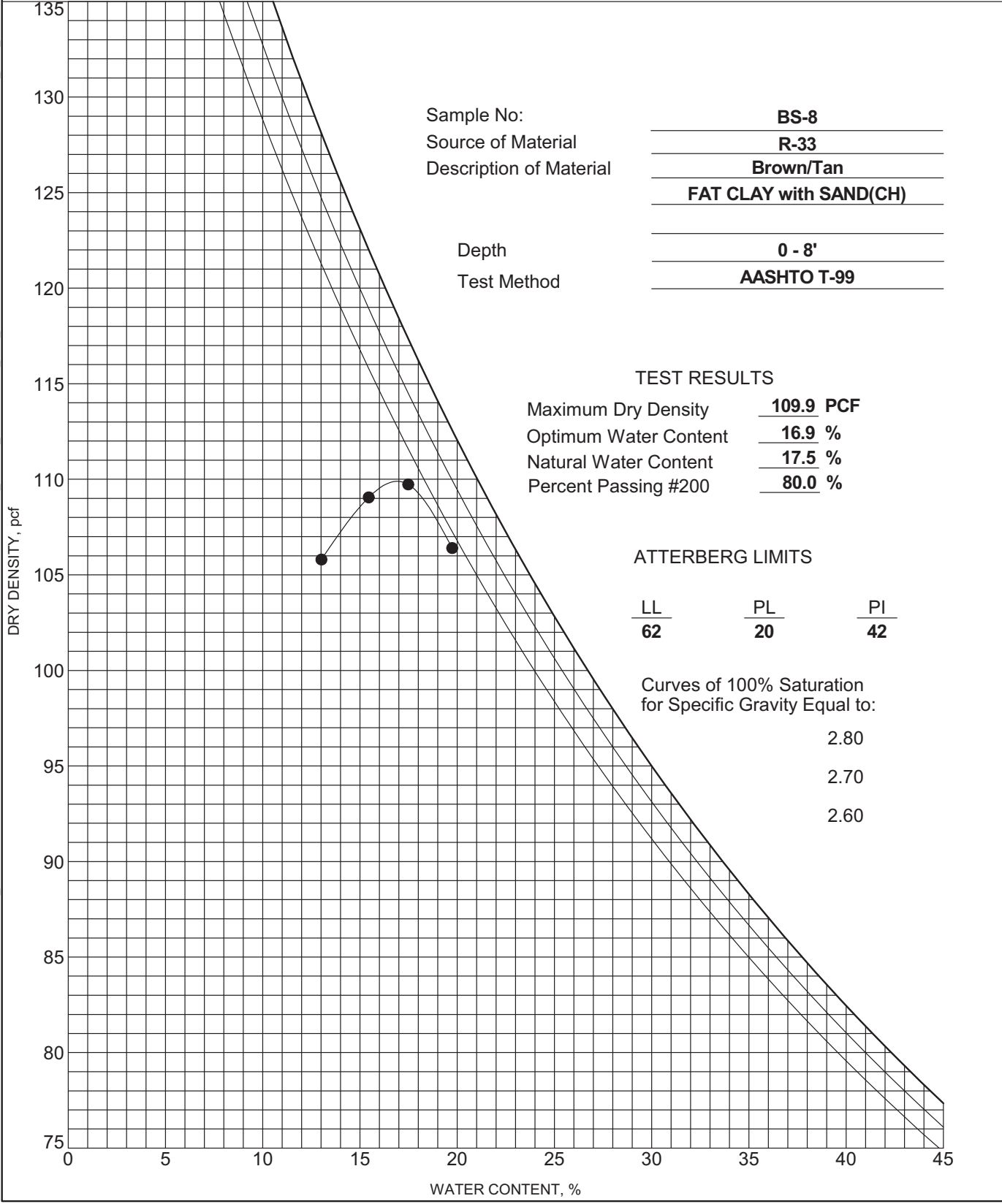
LIQUID LIMIT	62	PLASTIC LIMIT	20	PLASTIC INDEX	42
Percent Passing #200 Sieve = 80.0%			Natural Moisture Content = 17.5%		

COMPACTION - GINT STD US LAB.GDT - 8/15/14 13:28 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US315\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ

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**MOISTURE-DENSITY RELATIONSHIP**

CLIENT	RK & K	PROJECT NAME	Morrisville Parkway Interchange
PROJECT NUMBER	G14001.00	PROJECT LOCATION	Morrisville, NC



Sample No:	BS-8
Source of Material	R-33
Description of Material	Brown/Tan FAT CLAY with SAND(CH)
Depth	0 - 8'
Test Method	AASHTO T-99

**TEST RESULTS**

Maximum Dry Density	109.9 PCF
Optimum Water Content	16.9 %
Natural Water Content	17.5 %
Percent Passing #200	80.0 %

**ATTERBERG LIMITS**

LL	PL	PI
62	20	42

Curves of 100% Saturation for Specific Gravity Equal to:

- 2.80
- 2.70
- 2.60

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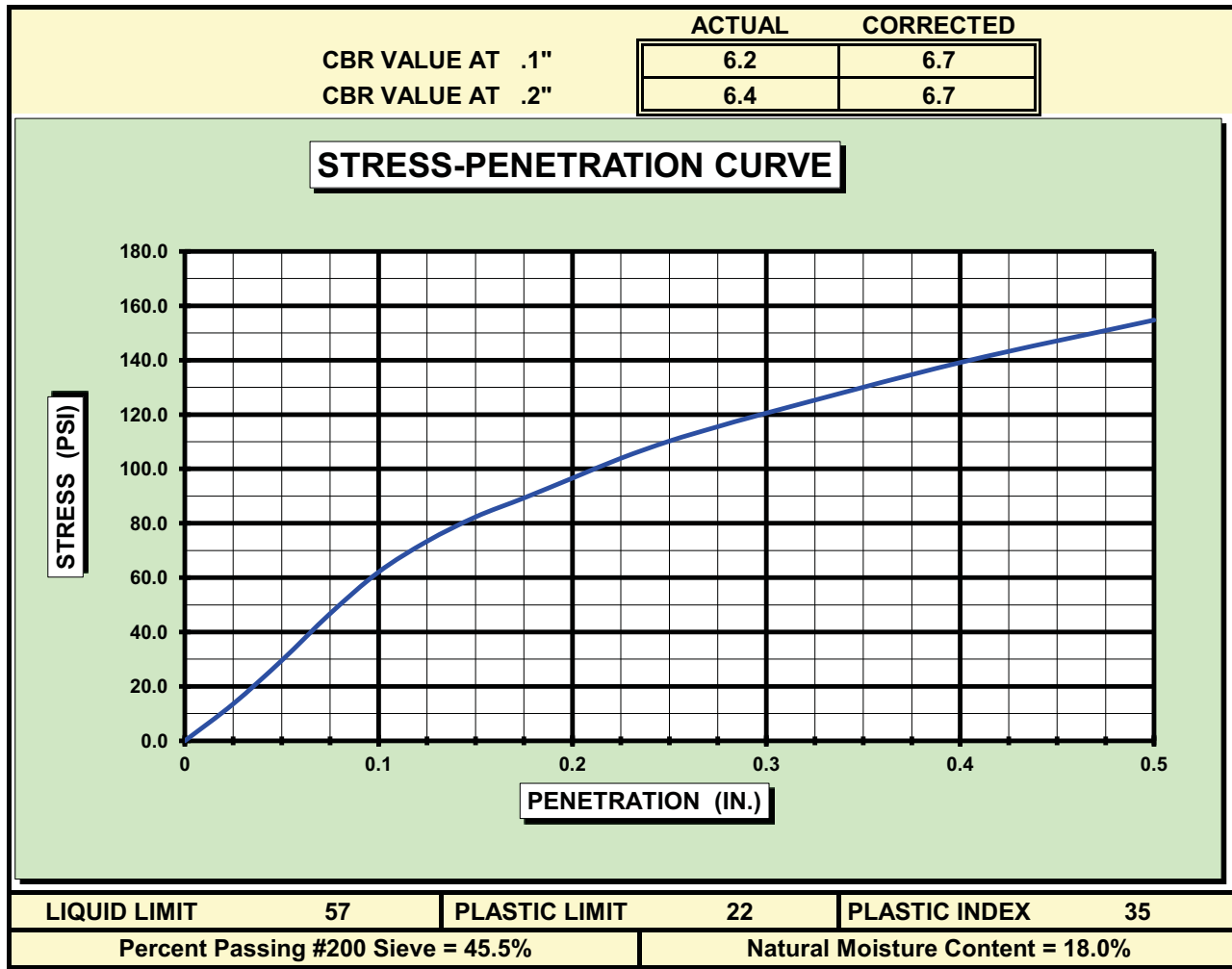
**CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL**

AASHTO T-193 \ ASTM D-1883

PROJECT #: **G14001.00** DATE: **8/22/2014**  
 PROJECT NAME: **Morrisville Parkway Interchange**  
 BORING: **R-5** SAMPLE: **BS-2** DEPTH: **0-4**

SOIL DESCRIPTION: **Light Brown/Orange CLAYEY SAND (A-7-6)**

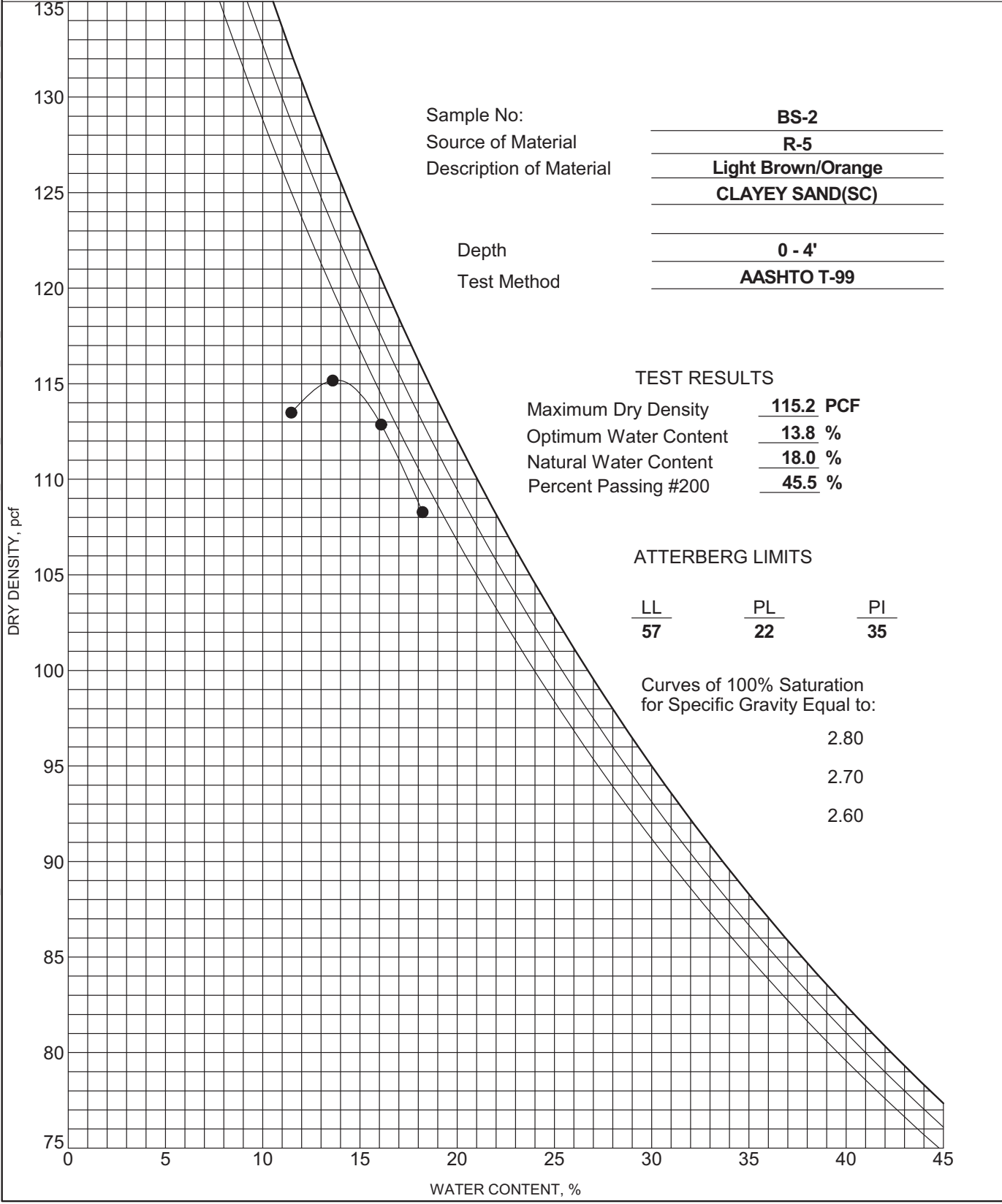
COMPACTION METHOD	AASHTO T-99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	115.2 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	13.8%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	
DRY DENSITY	110.0 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	13.8%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	95.5%	SWELL	1.49%



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**MOISTURE-DENSITY RELATIONSHIP**

CLIENT **RK & K** PROJECT NAME **Morrisville Parkway Interchange**  
 PROJECT NUMBER **G14001.00** PROJECT LOCATION **Morrisville, NC**



COMPACTION - GINT STD US LAB.GDT - 8/15/14 13:22 - T:\PROJECTS\2014\G14001.00 MORRISVILLE PARKWAY INTERCHANGE\US315\_NCDOT\_ELECTRONIC\_FILE\_TREE\GEO\TECH\INVESTIGATION\DESIGN\US315\_GEO\_RD\WYLAB\TESTS\G14001.00 GINT.GPJ