



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

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
U-3456	8.1581301	2	

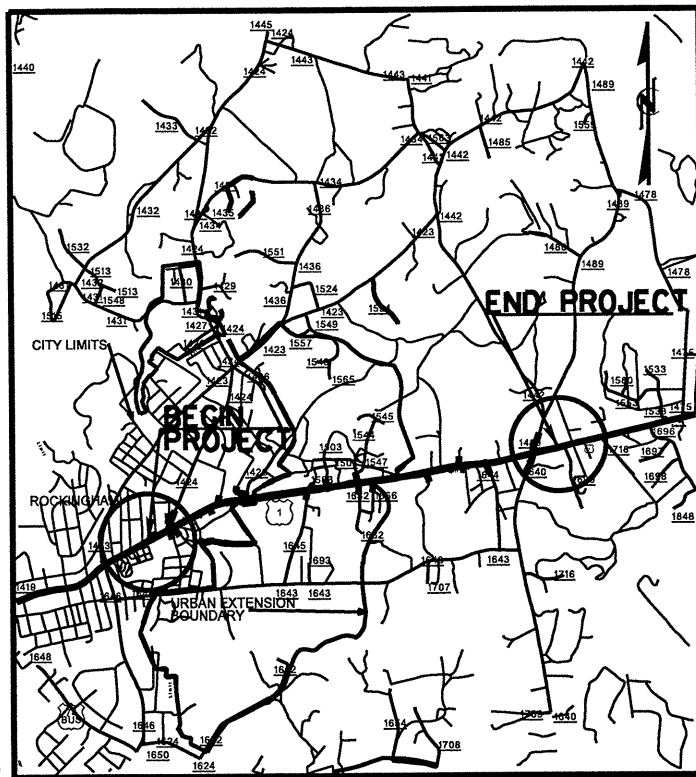
**SUBSURFACE INVESTIGATION**

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																								
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLES:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERMEDIATE FINE SAND UNITS, HARD PLASTIC, A-7-6</i></p>	<p><b>WELL GRADED:</b> INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE  <b>UNIFORM:</b> INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. ALSO  <b>POORLY GRADED</b>  <b>CAP GRADED:</b> INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;"><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: <b>ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</b></p>	<p><b>HARD ROCK</b> IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, 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><b>WEATHERED ROCK (WR)</b> </p> <p><b>CRYSTALLINE ROCK (CR)</b> </p> <p><b>NON-CRYSTALLINE ROCK (NCR)</b> </p> <p><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b> </p>	<p><b>ALLUVIUM (ALLUV.)</b> - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.  <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.  <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.  <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.  <b>CALCAREOUS (CALC.)</b> - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOSED FROM PARENT MATERIAL.  <b>FLOOD PLAIN (F.P.)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.  <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  <b>RESIDUAL SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  <b>ROCK QUALITY DESIGNATION (R.Q.D.)</b> - 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.  <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.  <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN OR B.P.F. 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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.  <b>STRATA CORE RECOVERY (SPEC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  <b>STRATA ROCK QUALITY DESIGNATION (S.R.Q.)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.  <b>TOPSOIL (T.S.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																								
<p style="text-align: center;"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (5% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (5% PASSING #200)</th> <th colspan="4">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</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></th> <th></th> <th></th> </tr> <tr> <th>SYMBOL</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>Z PASSING</th> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> <td>30 MM</td> </tr> <tr> <th>LIQUID LIMIT</th> <td>5</td> <td>10</td> <td>15</td> <td>20</td> <td>25</td> <td>30</td> <td>40</td> <td>40</td> <td>40</td> <td>40</td> <td>40</td> <td>40</td> <td>40</td> <td>40</td> </tr> <tr> <th>PLASTIC INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td>STONE FRAGS. 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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;"><b>COMPRESSIBILITY</b></p> <p>SLIGHTLY COMPRESSIBLE          MODERATELY COMPRESSIBLE          HIGHLY COMPRESSIBLE</p> <p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> </table> <p style="text-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 SEEPAGE</p> <p style="text-align: center;"><b>MISCELLANEOUS SYMBOLS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>ROADWAY EMBANKMENT WITH SOIL DESCRIPTION</td> <td>SOIL SYMBOL</td> <td>ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS</td> <td>INFERRED SOIL BOUNDARIES</td> <td>INFERRED ROCK LINE</td> <td>ALLUVIAL SOIL BOUNDARY</td> <td>DIP/DIP DIRECTION OF ROCK STRUCTURES</td> <td>SOUNDING ROD</td> <td>TEST BORING</td> <td>AUGER BORING</td> <td>CORE BORING</td> <td>MONITORING WELL</td> <td>PIEZOMETER INSTALLATION</td> <td>SLOPE INDICATOR INSTALLATION</td> <td>SPT N-VALUE</td> <td>SPT REFUSAL</td> </tr> </table>	ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY																	ROADWAY EMBANKMENT WITH SOIL DESCRIPTION	SOIL SYMBOL	ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS	INFERRED SOIL BOUNDARIES	INFERRED ROCK LINE	ALLUVIAL SOIL BOUNDARY	DIP/DIP DIRECTION OF ROCK STRUCTURES	SOUNDING ROD	TEST BORING	AUGER BORING	CORE BORING	MONITORING WELL	PIEZOMETER INSTALLATION	SLOPE INDICATOR INSTALLATION	SPT N-VALUE	SPT REFUSAL	<p style="text-align: center;"><b>WEATHERING</b></p> <p><b>FRESH</b> - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.  <b>VERY SLIGHT (V. SL.)</b> - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.  <b>SLIGHT (SL.)</b> - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.  <b>MODERATE (MOD.)</b> - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.  <b>MODERATELY SEVERE (MOD. SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i>  <b>SEVERE (SEV.)</b> - ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES 2-100 B.P.F.</i>  <b>VERY SEVERE (V. SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 B.P.F.</i>  <b>COMPLETE</b> - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p> <p style="text-align: center;"><b>ROCK HARDNESS</b></p> <p><b>VERY HARD</b> - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.  <b>HARD</b> - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.  <b>MODERATELY HARD</b> - 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.  <b>MEDIUM HARD</b> - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.  <b>SOFT</b> - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.  <b>VERY SOFT</b> - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.</p>
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BREAKS EASILY WHEN HIT WITH HAMMER.  <b>INDURATED</b> - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.  <b>EXTREMELY INDURATED</b> - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	TERM	SPACING	TERM	THICKNESS	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET	WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET	MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET			THINLY LAMINATED	< 0.008 FEET																																																																																																										
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U-3456

PROJECT: 8.1581301



VICINITY MAP FOR PROJECT U-3456

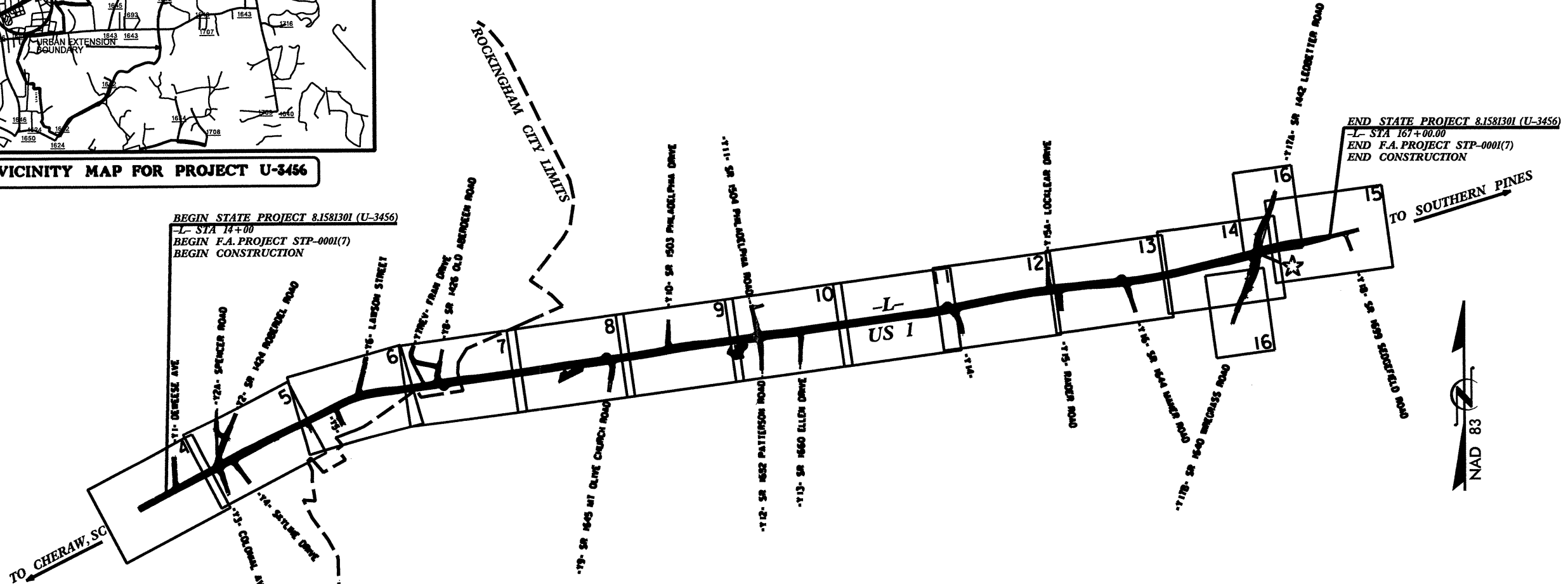
STATE OF NORTH CAROLINA  
 DIVISION OF HIGHWAYS  
 RICHMOND COUNTY

25% SUBMITTAL

LOCATION: US 1 FROM SR 1424 (ROBERDEL ROAD)  
 TO SR 1640 (WIREGRASS ROAD)/SR 1442  
 (LEDBETTER ROAD) IN ROCKINGHAM

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3456	2A	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
8.1581301	STP-0001(7)	PE	



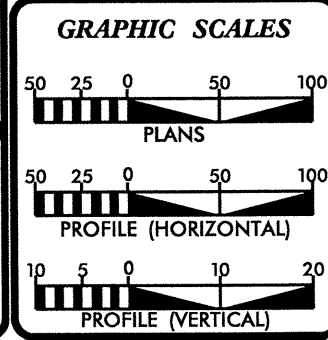
BEGIN STATE PROJECT 8.1581301 (U-3456)  
 -L- STA 14+00  
 BEGIN F.A. PROJECT STP-0001(7)  
 BEGIN CONSTRUCTION

END STATE PROJECT 8.1581301 (U-3456)  
 -L- STA 167+00.00  
 END F.A. PROJECT STP-0001(7)  
 END CONSTRUCTION

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

A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF ROCKINGHAM.  
 CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD M, EXCEPT IN WETLANDS.  
 NCDOT CONTACT : TERESA M. BRUTON, P.E., PROJECT ENGINEER, DESIGN SERVICES

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



DESIGN DATA

ADT 2005 =	13900
ADT 2025 =	22100
DHV =	10%
D =	60%
T =	11%
TTST 6% DUAL 5%	
V =	50mph

PROJECT LENGTH

LENGTH ROADWAY F.A. PROJECT STP-0001(7)	= 2.898 MILES
LENGTH STRUCTURES F.A. PROJECT STP-0001(7)	= 0.000 MILES
TOTAL LENGTH STATE PROJECT 8.1581301	= 2.898 MILES

2008 STANDARD SPECIFICATIONS	
R/W PROD. DATE:	July, 2004
R/W DATE:	October, 2004
LETTING PROD. DATE:	July, 2006
LETTING DATE:	October, 2006

GLENDA GIBSON, P.E.
EARTH TECH PROJECT MANAGER
MIKE PEKAREK, P.E.
EARTH TECH PROJECT DESIGN ENGINEER

Prepared in the Office of:

**EARTH TECH**

A tyco INTERNATIONAL LTD. COMPANY

FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

701 Corporate Center Drive  
 Suite 475  
 Raleigh, N.C. 27607  
 (919) 854-6200  
 FAX (919) 854-6259

HYDRAULICS ENGINEER

JOHN MARK KAMPRATH, P.E.

SIGNATURE: \_\_\_\_\_

ROADWAY DESIGN ENGINEER

GLENDA GIBSON, P.E.

SIGNATURE: \_\_\_\_\_

DIVISION OF HIGHWAYS  
 STATE OF NORTH CAROLINA

DEBBIE BARBOUR, P.E.

STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION

APPROVED

DIVISION ADMINISTRATOR

DATE \_\_\_\_\_



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
P.O. BOX 25201, RALEIGH, N.C. 27611-5201

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

May 21, 2002

**State Project:** 8.1581301 (U-3456)  
**Federal Project:** srp-0001(7)  
**County:** Richmond  
**Description:** Grading and Paving: US 1 from SR 1424 (Roberdel Road) to SR 1640 (Wiregrass Road / SR 1442 (Ledbetter Road) in Rockingham  
**Subject:** Geotechnical Report - Inventory

**Project Description**

This is a report of an English-units geotechnical investigation for a project that will upgrade a nearly 3 mile section of Highway US 1. It starts within the east side of Rockingham and heads to parts east. The total length will be 2.898 miles. US-1 will be widened to four lanes or more and the intersections with adjacent roads will be improved. The new roadway will include sections of four travel lanes with a median and left turn at intersections, with a center turn lane, and with right turn lanes. A retaining wall associated with a right turn lane into the high school athletic field was investigated. The following lines were investigated:

-L- Line: .....	10+00 to 167+00 .....	15,700ft
-Y1-: .....	10+00 to 12+32 .....	232ft
-Y2-: .....	11+80 to 17+35 .....	555ft
-Y3-: .....	10+00 to 12+50 .....	250ft
-Y4-: .....	10+00 to 12+05 .....	205ft
-Y5A-: .....	10+00 to 12+98 .....	298ft
-Y5-: .....	10+00 to 10+83 .....	83ft
-Y6-: .....	10+80 to 13+32 .....	250ft
-Y7-: .....	10+00 to 15+38 .....	538ft
-Y8-: .....	10+00 to 12+75 .....	275ft
-Y9-: .....	10+00 to 12+70 .....	270ft
-Y10-: .....	10+70 to 13+19 .....	249ft
-Y11-: .....	11+50 to 14+07 .....	257ft
-Y12-: .....	10+00 to 12+55 .....	255ft
-Y13-: .....	10+00 to 12+20 .....	131ft
-Y14-: .....	10+00 to 11+05 .....	220ft
-Y15A-: .....	11+50 to 13+57 .....	207ft
-Y15-: .....	10+00 to 11+80 .....	180ft
-Y16-: .....	10+00 to 12+15 .....	215ft
-Y17A-: .....	10+50 to 18+13 .....	763ft
-Y17B-: .....	10+00 to 18+00 .....	800ft

**Areas of Special Geotechnical Interest**

**Unsuitable Soil**

**Left side-L-107+00, to left side -L-113+50: Filled Area.** The owner reports this property was used for borrow and also for the disposal of soil generated by excavations in the county. Some wood was seen in the most recent slope. Our boring found no deleterious material, but the SPT blow count at -L-111+50, 50 left, 8.7 foot depth, was N=2, so this material was probably not compacted.

**Highly Plastic Soil**

Occurrences of high PI soil were sampled, but they are from thin discontinuous beds within the coastal plain stratigraphy usually 8 to 10' below grade and should not present a problem.

**High Groundwater**

Wetlands are shown on the plans from -L-66+50 to -L- 70+50, and from -L- 88+00 to -L-92+00. An abandoned sandpit from -L-52+00 to -L-60+00 shows evidence of groundwater at the surface. From -L- 62+00 to -L- 74+00 groundwater was found within 10 feet of the proposed grade. At -L-93+50 a single boring found water within 3' of proposed grade. From -L-107+00 to -L-109+00, water was found within 5 feet of proposed grade. From -L-113 to -L-116 perched water was found at proposed finished grade.

**Physiography and Geology**

The project is within the Piedmont physiographic province in the Carolina Slate Belt litho-tectonic province. Coastal plain sediments cover the area.

**Topographic Setting**

This roadway follows a northeast trending ridge, near the crest of the ridge. The ridge crest and the roadway gradually climb from an elevation of 300' in Rockingham to an elevation of 360' at the end of the project.

**Surface Drainage and Geomorphology**

Hitchcock Creek, to the north, flows parallel to the project, and Falling Creek, to the south, flows parallel to the project. Small, unnamed tributaries flow from the project to these larger streams.

**Geology**

Only the geology of the coastal plain soil is pertinent to this project.

**Soils Properties**

A general description follows immediately below, and a detailed description of the subsurface may be found under the segment descriptions in the **Geotechnical Descriptive Analysis** section, farther along in the report. Correlating relationships in the available outcrop and the drilling allowed a tentative identification of a three unit stratigraphic column for the project. (See following):

**Pinehurst Formation:**

The Pinehurst is a named formation that occurs on sandhill ridge-tops in Richmond, Hoke, Scotland and Moore Counties. It is white, medium grained, poorly graded sand, with very little clay content. It was closely sampled in the last part of the project and showed a decrease in the coarse sand fraction relative to depth. It is typically non plastic A-2-4 or A-1 sand.

**Red Clayey Sand:**

This is a field unit identified during this project. It is at the very top of the Middendorf Sand, and may not exist elsewhere. It is red, homogenous, slightly indurated clayey sand with almost no bedding or cross beds. Filled iron-stained burrow casts are common. On an open cut, it forms bluffs as it apparently is more resistant to erosion than the units above and below. It is about 6' thick, and yields A-2-7 and A-2-6 analyses, some with high PI values.



COMPUTED BY: mdp DATE: 04/17/03

CHECKED BY: jmkd DATE: 03/27/07

### EARTHWORK BALANCE CARD

Volumes in Cubic Yards

PROJECT: U-3456

COUNTY: Richmond

DATE

6/3/03

Sheet 3A of 25 Sheets

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 20	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
<b>LEFT SIDE</b>																
L (LT)	14+00.	23+00.	339				339	261			261	313		26		26
-Y1-																
-Y2A-	9+00.	12+75.64	188				188	396			396	475	287			
-Y2-	10+00.	16+98.55	1,396				1,396	286			286	343		1,053		1,053
-DR11-	10+15.	11+80.	8				8	80			80	96	88			
SUBTOTAL			1,931				1,931	1,023			1,023	1,227	375	1,079		1,079
L (LT)	23+00.	33+50.	7,638				7,638	320			320	384		7,254		7,254
-DR8-	10+00.	10+69.99	186				186							186		186
-DR9-	10+10.	10+64.61	96				96							96		96
SUBTOTAL			7,920				7,920	320			320	384		7,536		7,536
L (LT)	33+50.	44+00.	73				73	4,095			4,095	4,914	4,841			
-Y6-	10+80.	12+95.88	15				15	1,178			1,178	1,414	1,399			
SUBTOTAL			88				88	5,273			5,273	6,328	6,240			
L (LT)	44+00.	52+50.	77				77	489			489	587	510			
-Y7REV-	10+05.	15+22.5	855				855	236			236	283		572		572
-Y8-	10+00.	12+58.39	339				339	333			333	400	61			
SUBTOTAL			1,271				1,271	1,058			1,058	1,270	571	572		572
L (LT)	52+50.	80+00.	474				474	1,467			1,467	1,760	1,286			
SUBTOTAL			474				474	1,467			1,467	1,760	1,286			
L (LT)	80+00.	110+00.	8,334				8,334	3,720			3,720	4,464		3,870		3,870
-Y10-	10+70.	12+79.92	777				777							777		777
-Y11-	11+50.	13+66.36	962				962	37			37	44		918		918
SUBTOTAL			10,073				10,073	3,757			3,757	4,508		5,565		5,565
L (LT)	110+00.	120+00.	42				42	3,458			3,458	4,150	4,108			
SUBTOTAL			42				42	3,458			3,458	4,150	4,108			
L (LT)	120+00.	132+00.	98				98	878			878	1,054	956			
-Y15A-	9+00.	13+17.89	176				176	113			113	136		40		40
SUBTOTAL			274				274	991			991	1,190	956	40		40
L (LT)	132+00.	156+75.	176				176	13,133			13,133	15,760	15,584			

COMPUTED BY: mdp DATE: 04/17/03

CHECKED BY: jmkd DATE: 03/27/07

**EARTHWORK BALANCE CARD**

Volumes in Cubic Yards

PROJECT: U-3456

COUNTY: Richmond

DATE

6/3/03

Sheet 38 of 25 Sheets

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 20	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
SUBTOTAL			176				176	13,133			13,133	15,760	15,584			
L (LT)	156+75.	167+00.	1,221				1,221	496			496	595		626		626
-Y17A-	10+50.	17+72.73	2,552				2,552	1,860			1,860	2,232		320		320
SUBTOTAL			3,773				3,773	2,356			2,356	2,827		946		946
SUBTOTAL LEFT SIDE			26,022				26,022	32,836			32,836	39,404	29,120	15,738		15,738
<b>RIGHT SIDE</b>																
L (RT)	14+00.	23+00.	119				119	556			556	667	548			
-Y3-	10+34.91	12+50.	478				478	316			316	379		99		99
SUBTOTAL			597				597	872			872	1,046	548	99		99
L (RT)	23+00.	33+50.	7,836				7,836	89			89	107		7,729		7,729
-Y4-	10+30.44	12+40.	191				191	136			136	163		28		28
-DR6-	10+30.	10+95.	209				209							209		209
-DR7-	10+30.54	10+95.	142				142	2			2	2		140		140
-DR10-	10+30.	10+90.	93				93							93		93
SUBTOTAL			8,471				8,471	227			227	272		8,199		8,199
L (RT)	33+50.	44+00.	653				653	816			816	979	326			
-Y5-																
SUBTOTAL			653				653	816			816	979	326			
L (RT)	44+00.	52+50.	44				44	5,737			5,737	6,884	6,840			
SUBTOTAL			44				44	5,737			5,737	6,884	6,840			
L (RT)	52+50.	80+00.	125				125	26,702			26,702	32,042	31,917			
-Y9-	9+00.	12+70.	89				89	396			396	475	386			
SUBTOTAL			214				214	27,098			27,098	32,517	32,303			
L (RT)	80+00.	110+00.	275				275	5,039			5,039	6,047	5,772			
-Y12-	10+41.29	12+60.	132				132	387			387	464	332			

COMPUTED BY: mdp DATE: 04/17/03

CHECKED BY: jmkd DATE: 03/27/07

### EARTHWORK BALANCE CARD

Volumes in Cubic Yards

PROJECT: U-3456

COUNTY: Richmond

DATE

6/3/03

Sheet 36 of 25 Sheets

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 20	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
-Y13-	10+39.66	12+20.	53				53	51			51	61	8			
SUBTOTAL			460				460	5,477			5,477	6,572	6,112			
L (RT)	110+00.	120+00.	2,025				2,025	1,238			1,238	1,486		539		539
-Y14-																
SUBTOTAL			2,025				2,025	1,238			1,238	1,486		539		539
L (RT)	120+00.	132+00.	189				189	7,831			7,831	9,397	9,208			
-Y15-	10+39.68	13+00.	149				149	404			404	485	336			
-DR1-	10+32.75	11+45.	5				5	551			551	661	656			
-DR2-	10+34.52	11+04.	5				5	77			77	92	87			
-DR3-	10+38.47	11+00.	7				7	32			32	38	31			
-DR4-	10+42.52	11+00.	8				8	52			52	62	54			
SUBTOTAL			363				363	8,947			8,947	10,735	10,372			
L (RT)	132+00.	156+75.	232				232	2,523			2,523	3,028	2,796			
-Y16-	10+41.49	12+15.	404				404	43			43	52		352		352
-DR5-	10+32.76	11+00.	6				6	34			34	41	35			
SUBTOTAL			642				642	2,600			2,600	3,121	2,831	352		352
L (RT)	156+75.	167+00.	376				376	205			205	246		130		130
-Y17B-	10+40.84	19+00.	1,871				1,871	1,969			1,969	2,363	492			
SUBTOTAL			2,247				2,247	2,174			2,174	2,609	492	130		130
SUBTOTAL RIGHT SIDE			15,716				15,716	55,186			55,186	66,221	59,824	9,319		9,319
<b>TOTAL</b>			41,738				41,738	88,022			88,022	105,625	88,944	25,057		25,057
ADJUSTMENTS DUE TO:																
Est. Loss Due To Clearing And Grubbing			-1,000				-1,000						1,000			
Earth Waste to Replace Borrow													-25,057	-25,057		-25,057
Est. Shoulder Material								2,950			2,950	3,540	3,540			
Additional Undercut																
<b>PROJECT TOTAL</b>			<b>40,738</b>				<b>40,738</b>	<b>90,972</b>			<b>90,972</b>	<b>109,165</b>	<b>68,427</b>			
Est. for repl. Topsoil on Borrow Pits													3,421			

COMPUTED BY: mdp DATE: 04/17/03

CHECKED BY: jmkd DATE: 03/27/07

### EARTHWORK BALANCE CARD

Volumes in Cubic Yards

PROJECT: U-3456

COUNTY: Richmond

DATE

6/3/03

Sheet 30 of 35 Sheets

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 20	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
<b>GRAND TOTAL</b>			40,738										71,848			
<b>SAY</b>			41,200										73,100			
<b>DDE = 90 C.Y.</b>																
<b>Estimated Undercut = 3,000 C.Y.</b>																
<b>-L-, -Y17A, &amp; -Y17B- Pavement Structure Volume = 6,550 C.Y.</b>																

Note: Earthwork quantities are calculated by the Roadway Design Unit. These earthwork quantities are based in part on subsurface data provided by the Geotechnical Engineering Unit.







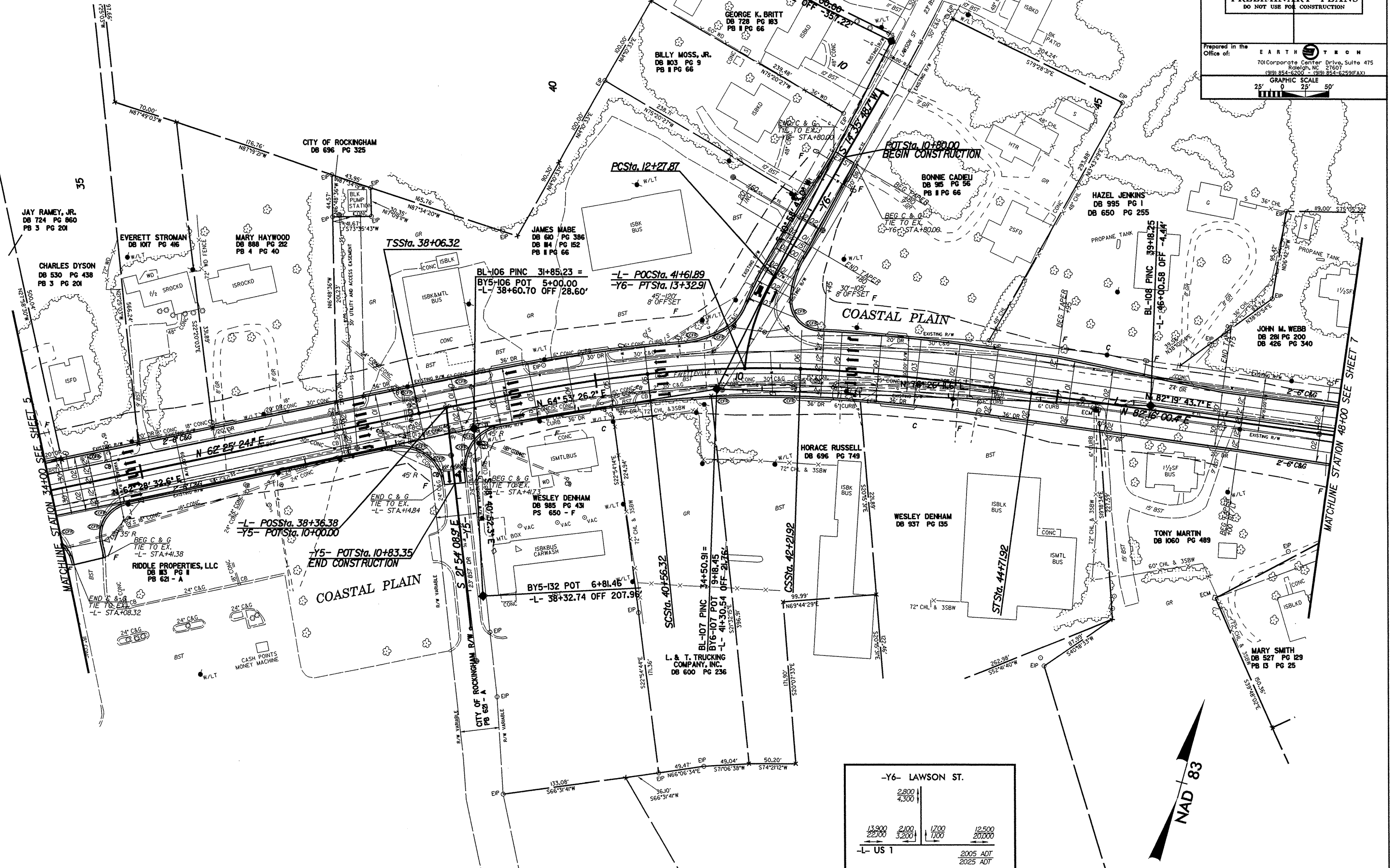
PROJECT REFERENCE NO.	SHEET NO.
U-3456	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR A/W ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
Prepared in the Office of: <b>EARTH SYSTEM</b>	
701 Corporate Center Drive, Suite 475 Raleigh, NC 27607 (919) 854-5200 - (919) 854-5259(FAX)	
GRAPHIC SCALE 25' 0 25' 50'	

**-L-**  
 Pls Sta 39+73.08  
 $\Theta s = 5' 58'' 05.9''$   
 $L s = 250.00'$   
 $L T = 166.76'$   
 $S T = 83.42'$

**-Y6-**  
 Pls Sta 12+81.17  
 $\Delta = 2' 04'' 21.5'' (LT)$   
 $D = 22' 55'' 05.9''$   
 $L = 105.04'$   
 $T = 53.30'$   
 $R = 250.00'$

**-L-**  
 Pls Sta 41+39.25  
 $\Delta = 7' 54'' 24.4'' (RT)$   
 $D = 4' 46'' 28.7''$   
 $L = 165.60'$   
 $T = 82.93'$   
 $R = 1,200.00'$   
 $S E = .06$

**-L-**  
 Pls Sta 43+05.34  
 $\Theta s = 5' 58'' 05.9''$   
 $L s = 250.00'$   
 $L T = 166.76'$   
 $S T = 83.42'$



**-Y6- LAWSON ST.**

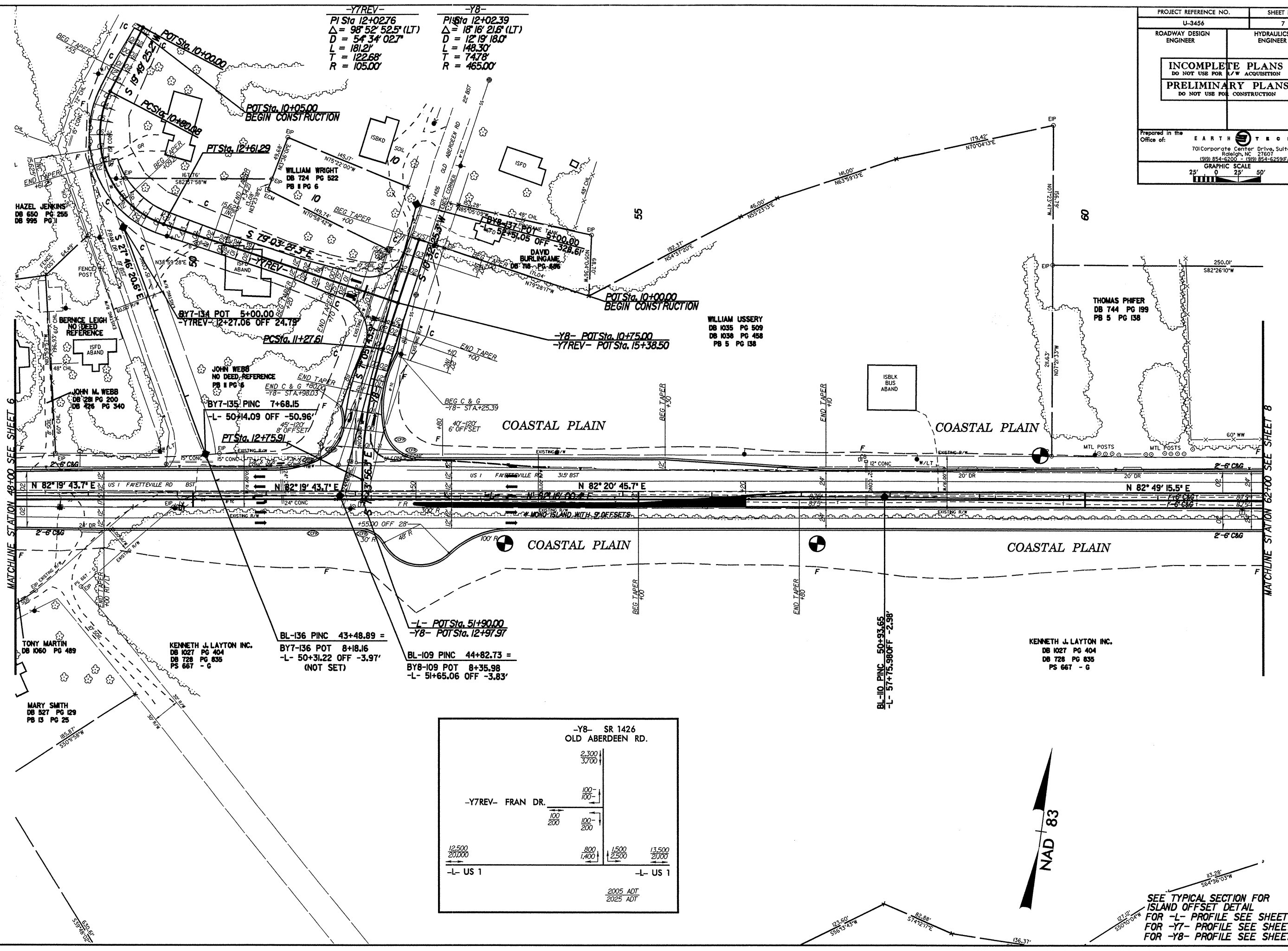
2,800	4,300
13,900	2,100
22,100	3,200
1,700	12,500
1,100	20,000

**-L- US 1**

2005 ADT  
2025 ADT

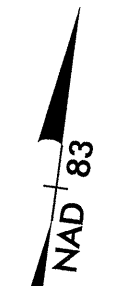
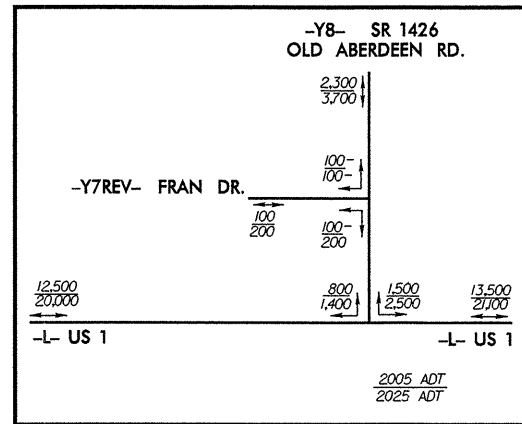
FOR -L- PROFILE SEE SHEET 18  
 FOR -Y6- PROFILE SEE SHEET 23

sec AT  
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 24-JUN-2003 09:08  
 \$\$\$DATE\$\$\$



**-Y7REV-**  
 PI Sta 12+02.76  
 $\Delta = 98^{\circ} 52' 52.5''$  (LT)  
 $D = 54^{\circ} 34' 02.7''$   
 $L = 181.21'$   
 $T = 122.68'$   
 $R = 105.00'$

**-Y8-**  
 PI Sta 12+02.39  
 $\Delta = 18^{\circ} 16' 21.6''$  (LT)  
 $D = 12^{\circ} 19' 18.0''$   
 $L = 148.30'$   
 $T = 74.78'$   
 $R = 465.00'$



SEE TYPICAL SECTION FOR ISLAND OFFSET DETAIL  
 FOR -L- PROFILE SEE SHEET 18  
 FOR -Y7- PROFILE SEE SHEET 23  
 FOR -Y8- PROFILE SEE SHEET 24

\$\$\$\$\$USERNAME\$\$\$\$\$  
 \$\$\$DATE\$\$\$\$\$

MATCHLINE STATION 48+00 SEE SHEET 6

MATCHLINE STATION 62+00 SEE SHEET 8

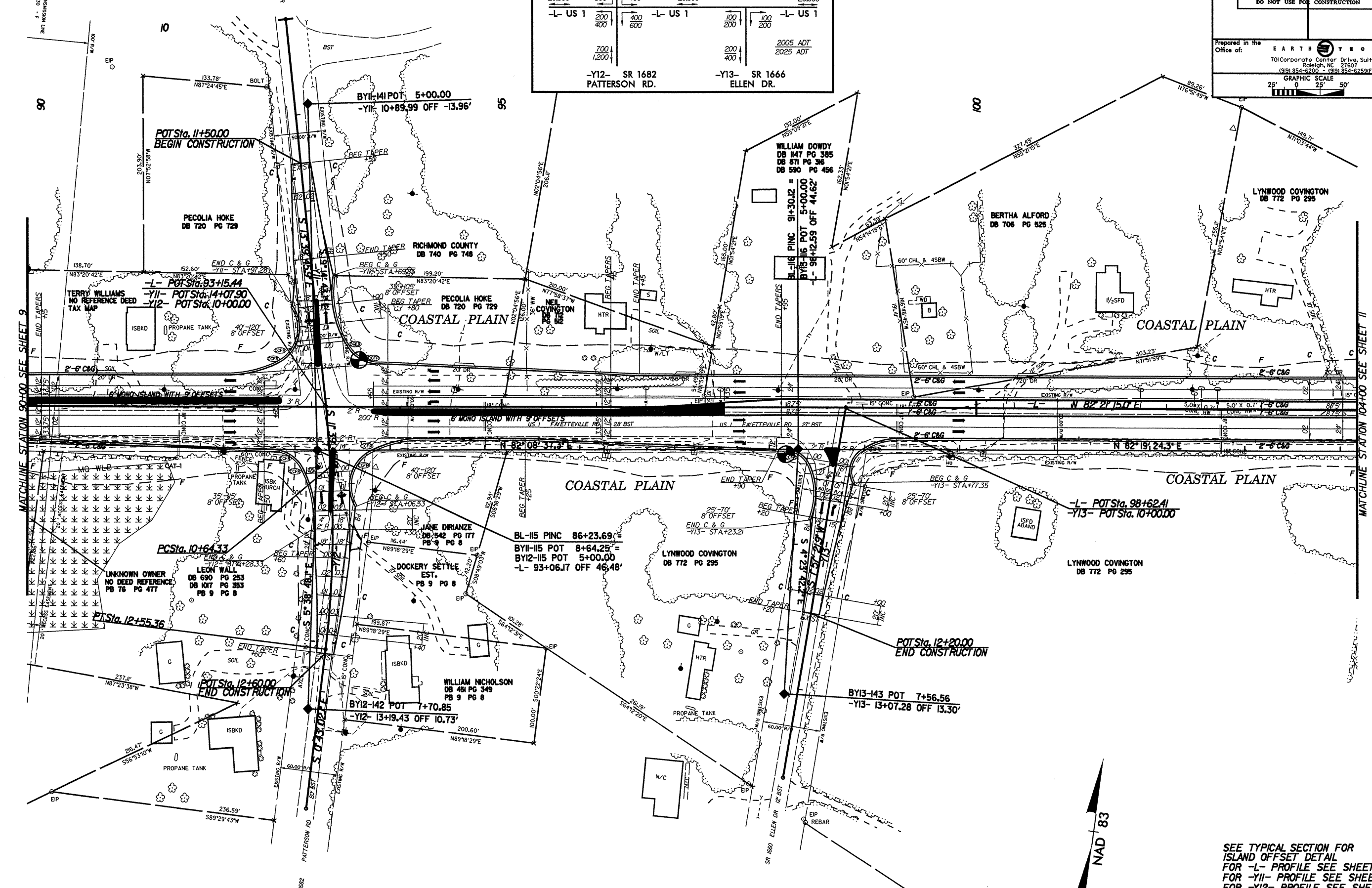






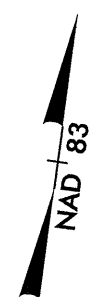
-Y12-  
 PI Sta 11+60.14  
 $\Delta = 10^{\circ} 56' 43.7" (RT)$   
 $D = 5^{\circ} 43' 46.5"$   
 $L = 191.03'$   
 $T = 95.81'$   
 $R = 1,000.00'$

-Y11- SR 1504 PHILADELPHIA DR.			
700 1,000	400 500	200 400	12,800 20,600
-L- US 1	200 400	-L- US 1	100 200
700 1,200	400 600	200 400	12,800 20,600
-Y12- SR 1682 PATTERSON RD.		-Y13- SR 1666 ELLEN DR.	
2005 ADT 2025 ADT			



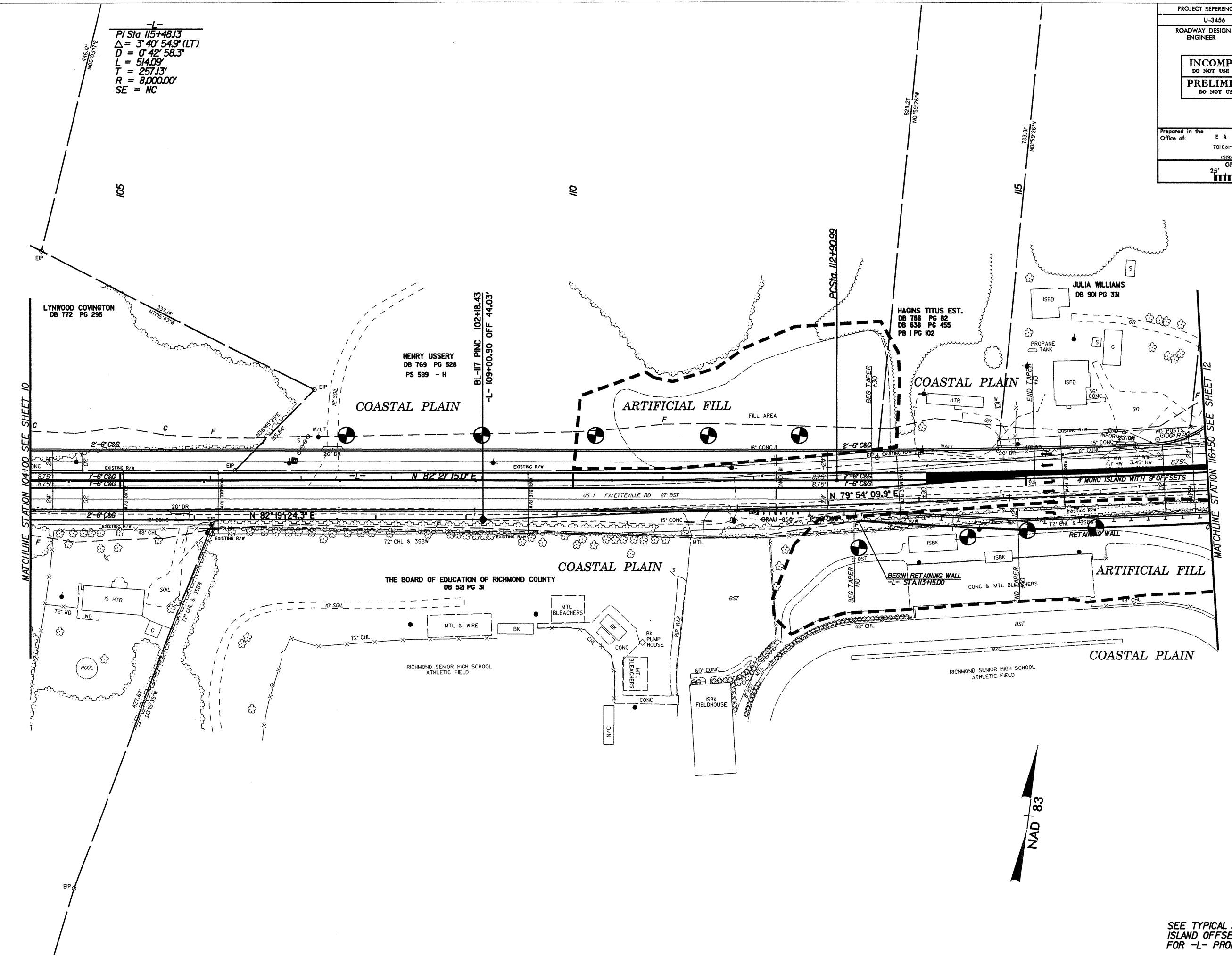
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 #####  
 #####  
 #####

SEE TYPICAL SECTION FOR ISLAND OFFSET DETAIL  
 FOR -L- PROFILE SEE SHEET 20  
 FOR -Y11- PROFILE SEE SHEET 24  
 FOR -Y12- PROFILE SEE SHEET 24  
 FOR -Y13- PROFILE SEE SHEET 24



PROJECT REFERENCE NO.	SHEET NO.
U-3456	11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
Prepared in the Office of:	
<b>EARTH TECH</b> 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607 (919) 854-6200 - (919) 854-6258(FAX)	
GRAPHIC SCALE 25' 0 25' 50'	

-L-  
 PI Sta 115+48.13  
 $\Delta = 3^{\circ} 40' 54.9" (LT)$   
 $D = 0^{\circ} 42' 58.3"$   
 $L = 514.09'$   
 $T = 257.13'$   
 $R = 8,000.00'$   
 SE = NC



MATCHLINE STATION 104+00 SEE SHEET 10

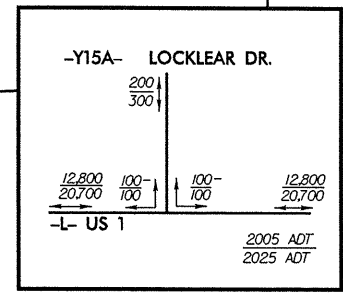
MATCHLINE STATION 116+50 SEE SHEET 12



SEE TYPICAL SECTION FOR ISLAND OFFSET DETAIL FOR -L- PROFILE SEE SHEET 20

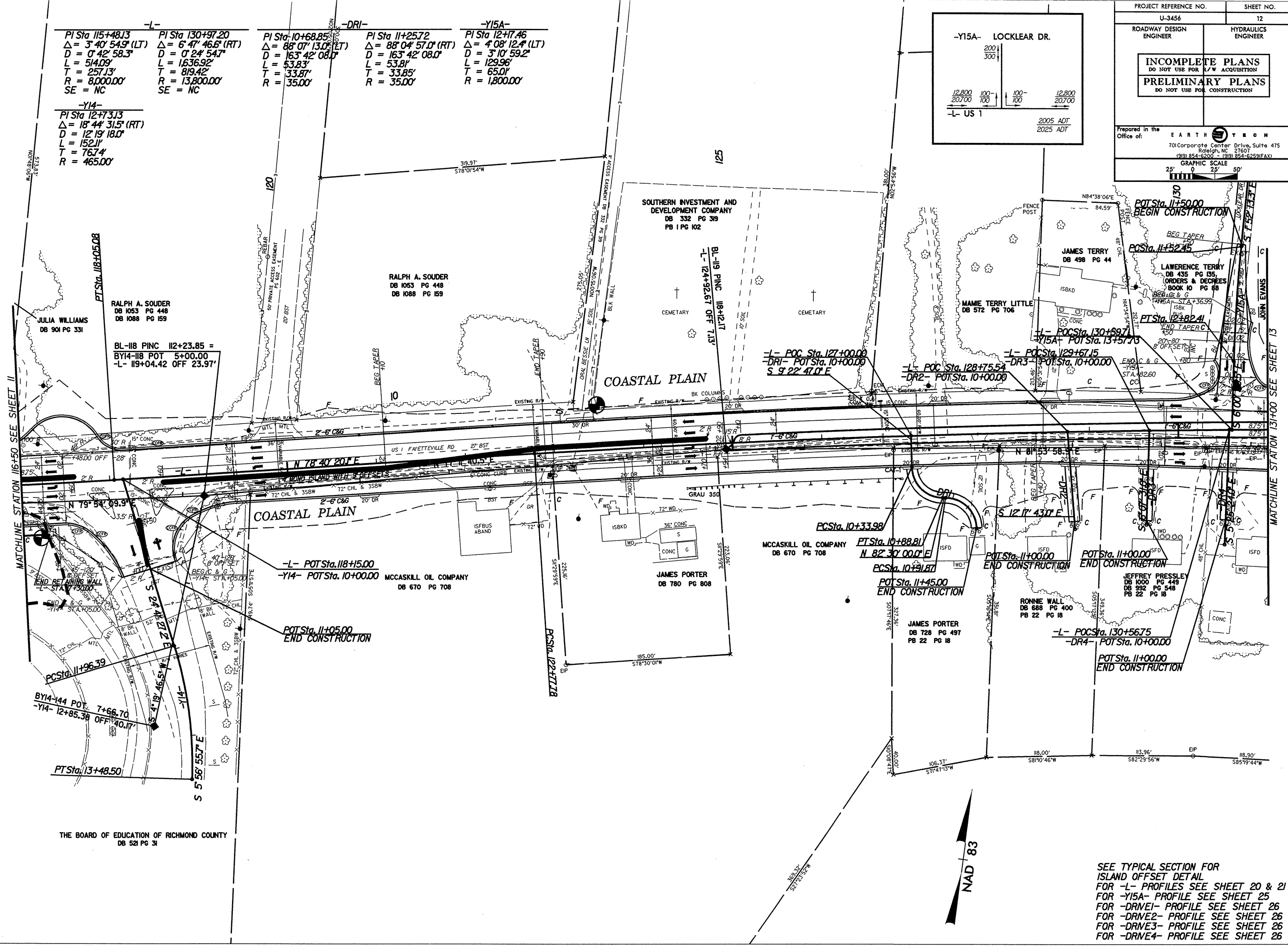
AT  
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 23-JUN-2003 07:44  
 \$\$\$DATE\$\$\$



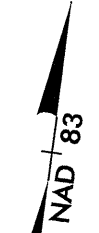


-L-		-DRI-		-Y15A-	
PI Sta 115+48.13	PI Sta 130+97.20	PI Sta 10+68.85	PI Sta 11+25.72	PI Sta 12+17.46	
$\Delta = 3^{\circ} 40' 54.9''$ (LT)	$\Delta = 6^{\circ} 47' 46.6''$ (RT)	$\Delta = 88^{\circ} 07' 13.0''$ (LT)	$\Delta = 88^{\circ} 04' 57.0''$ (RT)	$\Delta = 4^{\circ} 08' 12.4''$ (LT)	
D = 0' 42' 58.3"	D = 0' 24' 54.7"	D = 163' 42' 08.0"	D = 163' 42' 08.0"	D = 3' 10' 59.2"	
L = 514.09'	L = 1636.92'	L = 53.83'	L = 53.81'	L = 129.96'	
T = 257.13'	T = 819.42'	T = 33.87'	T = 33.85'	T = 65.01'	
R = 8,000.00'	R = 13,800.00'	R = 35.00'	R = 35.00'	R = 1,800.00'	
SE = NC	SE = NC				

-Y14-	
PI Sta 12+73.13	
$\Delta = 18^{\circ} 44' 31.5''$ (RT)	
D = 12' 19' 18.0"	
L = 152.11'	
T = 767.4'	
R = 465.00'	



THE BOARD OF EDUCATION OF RICHMOND COUNTY  
DB 521 PG 31



SEE TYPICAL SECTION FOR ISLAND OFFSET DETAIL  
 FOR -L- PROFILES SEE SHEET 20 & 21  
 FOR -Y15A- PROFILE SEE SHEET 25  
 FOR -DRIE1- PROFILE SEE SHEET 26  
 FOR -DRIE2- PROFILE SEE SHEET 26  
 FOR -DRIE3- PROFILE SEE SHEET 26  
 FOR -DRIE4- PROFILE SEE SHEET 26

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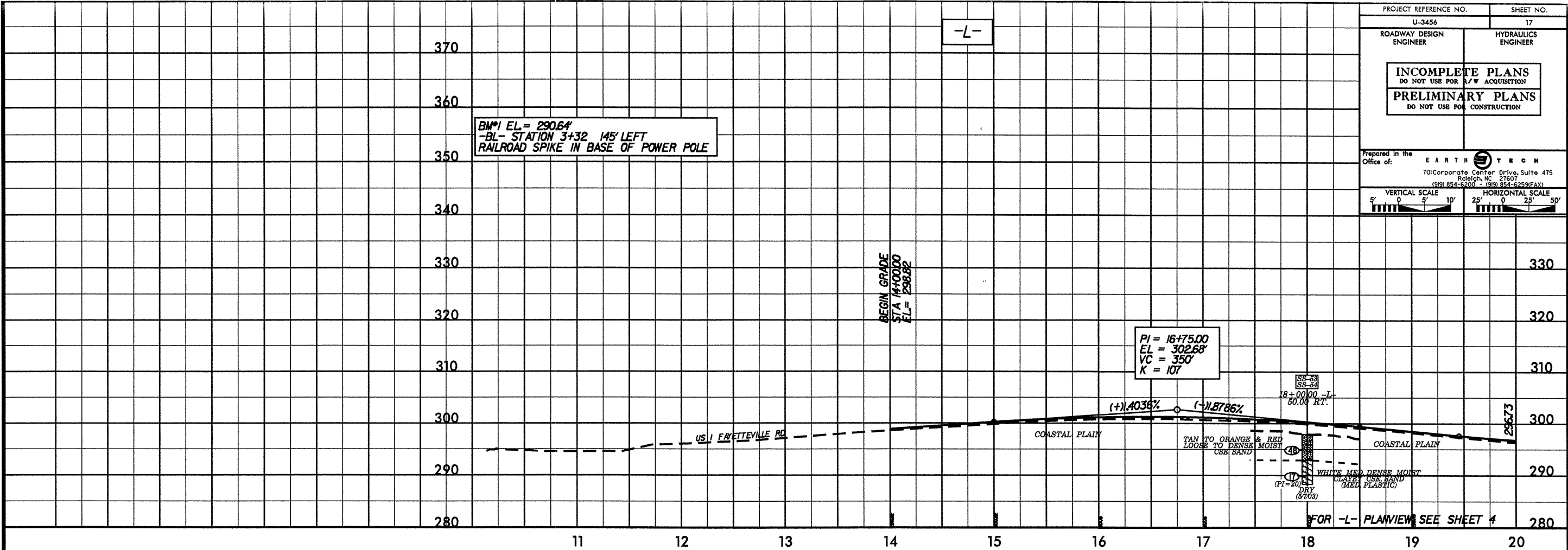






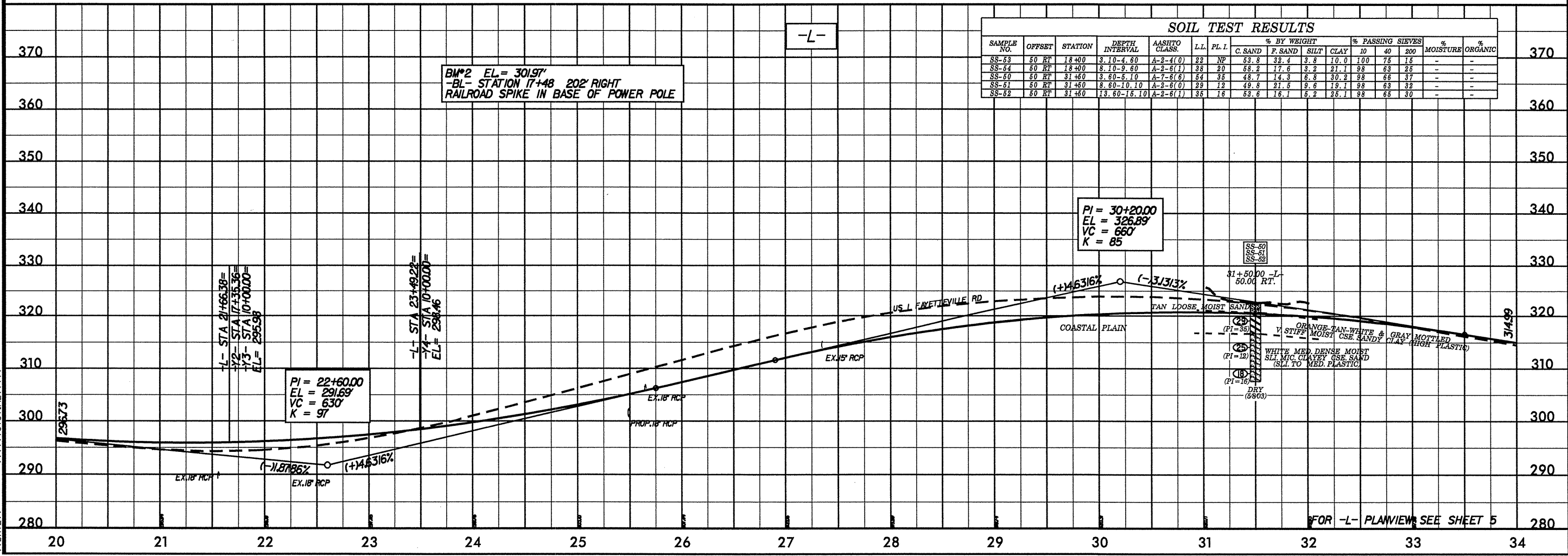






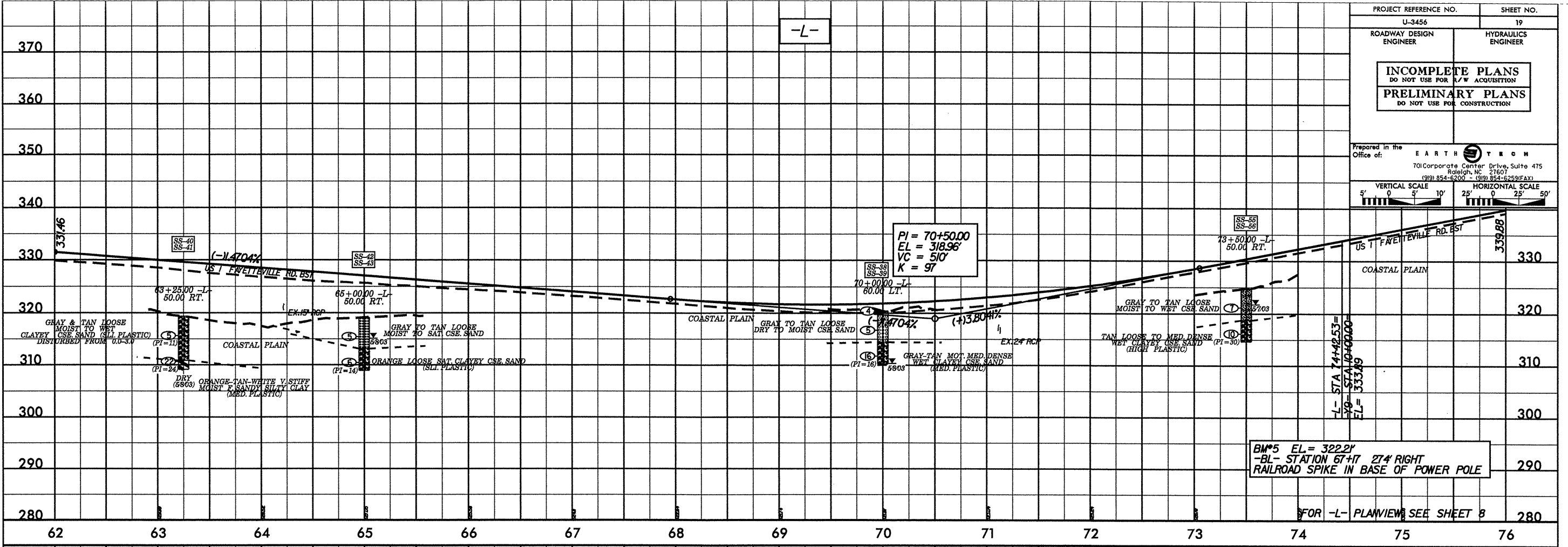
**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-53	50 RT	18+00	3.10-4.60	A-2-4(0)	22	NP	53.8	32.4	3.8	10.0	100	75	15	-	-
SS-54	50 RT	18+00	8.10-9.60	A-2-6(1)	38	20	68.2	17.6	3.2	21.1	98	63	28	-	-
SS-50	50 RT	31+50	3.60-5.10	A-7-6(6)	54	35	48.7	14.3	6.8	30.2	98	66	37	-	-
SS-51	50 RT	31+50	8.60-10.10	A-2-6(0)	29	12	49.8	21.5	9.6	19.1	98	63	32	-	-
SS-52	50 RT	31+50	13.60-15.10	A-2-6(1)	35	16	63.8	16.1	6.2	25.1	98	65	30	-	-

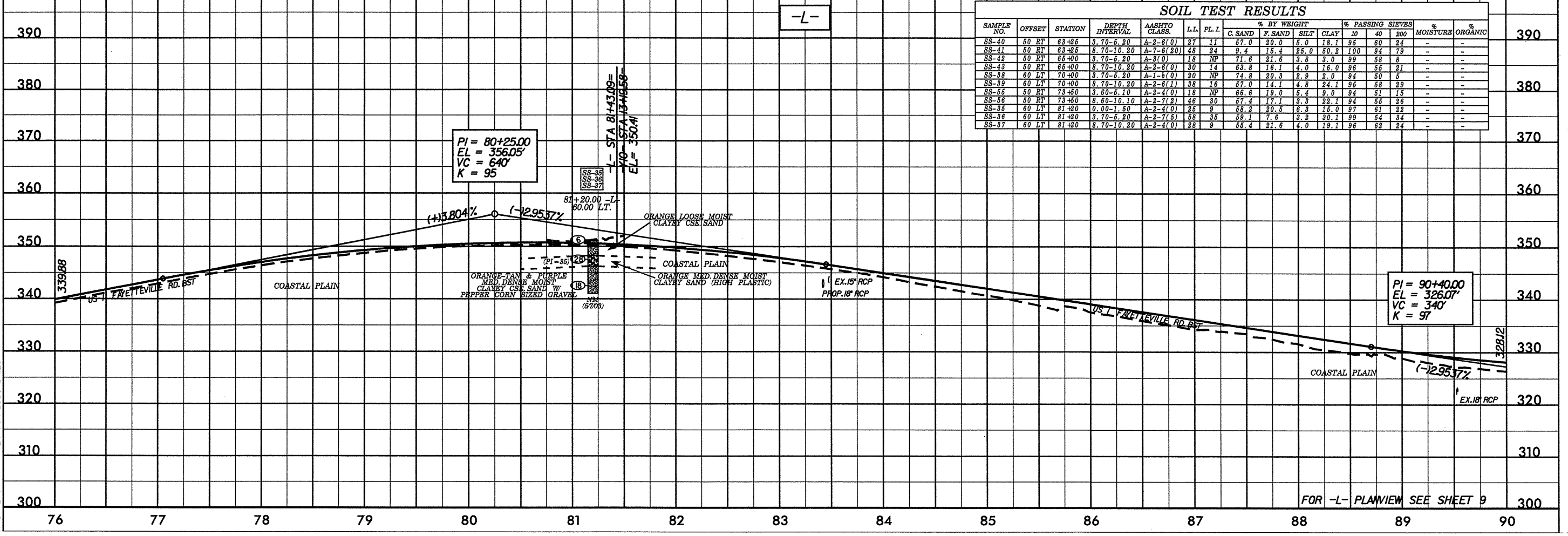


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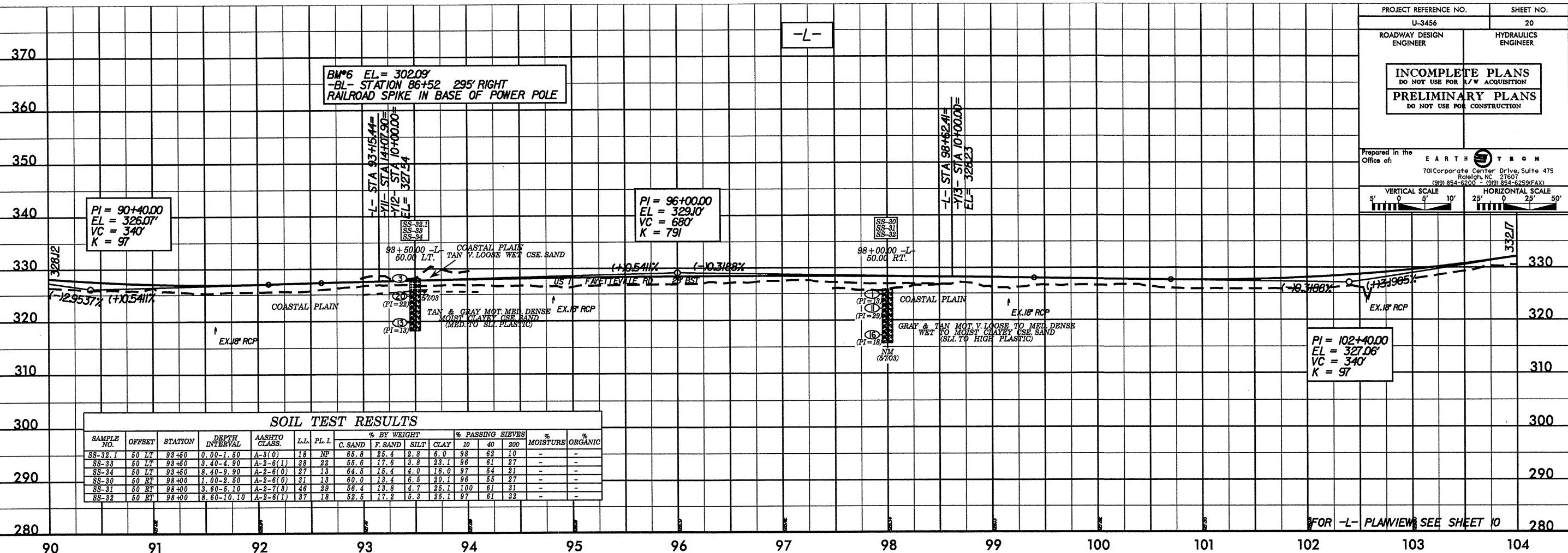


SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-40	50 RT	63+25	3.70-5.20	A-2-6(0)	27	11	57.0	20.0	5.0	18.1	95	60	24	-	-
SS-41	50 RT	63+25	5.70-10.20	A-7-6(20)	48	24	9.4	15.4	25.0	60.2	100	94	79	-	-
SS-42	50 RT	65+00	3.70-5.20	A-3(0)	18	NP	71.6	21.6	3.8	3.0	99	58	8	-	-
SS-43	50 RT	65+00	5.70-10.20	A-2-6(0)	30	14	63.8	16.1	4.0	15.0	96	55	21	-	-
SS-38	60 LT	70+00	3.70-5.20	A-1-6(0)	20	NP	74.8	20.3	3.9	2.0	94	50	5	-	-
SS-39	60 LT	70+00	5.70-10.20	A-2-6(1)	35	16	57.0	14.1	4.8	24.1	95	58	29	-	-
SS-55	50 RT	73+50	3.60-5.10	A-2-4(0)	18	NP	66.6	19.0	5.4	9.0	94	51	15	-	-
SS-56	50 RT	73+50	5.60-10.10	A-2-7(2)	46	30	57.4	17.1	3.3	22.1	94	55	26	-	-
SS-35	60 LT	81+20	0.00-1.50	A-2-4(0)	25	9	58.2	20.5	6.3	15.0	97	61	26	-	-
SS-36	60 LT	81+20	3.70-5.20	A-2-7(5)	68	35	59.1	7.6	3.2	30.1	99	54	34	-	-
SS-37	60 LT	81+20	5.70-10.20	A-2-4(0)	28	9	55.4	21.6	4.0	19.1	96	62	24	-	-



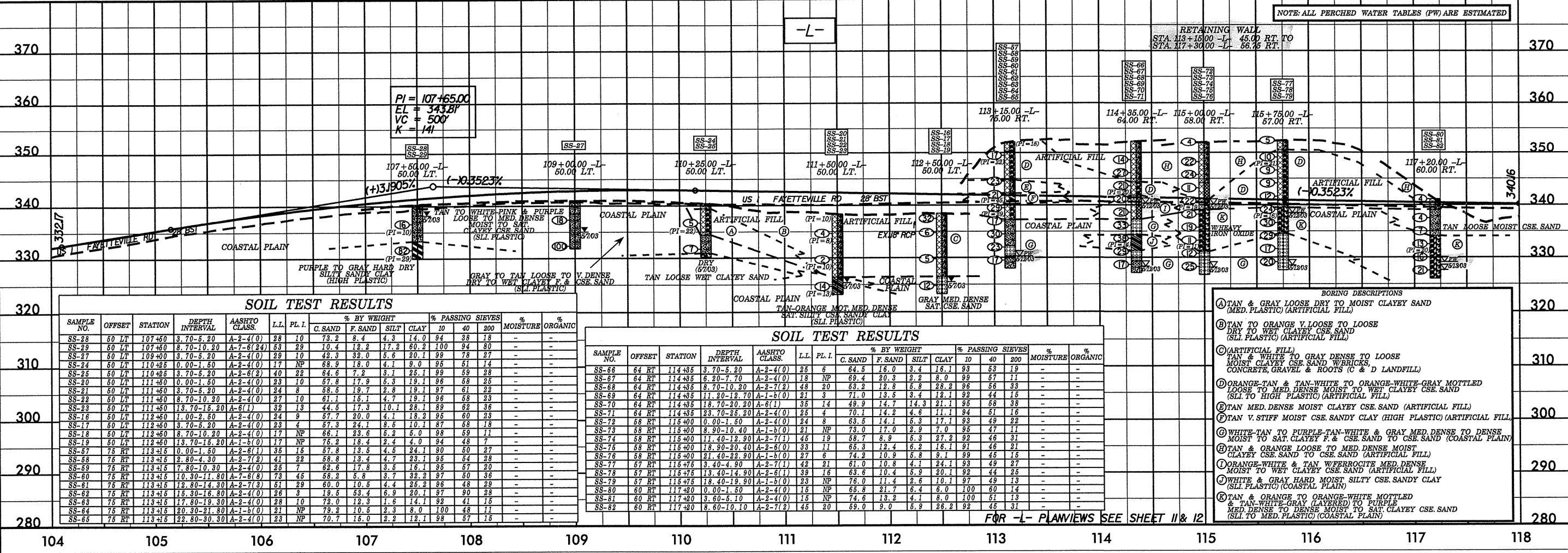
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**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-32.1	50 LT	93+60	0.00-1.50	A-3(0)	18	NP	66.8	25.4	2.8	6.0	98	62	10	-	-
SS-33	50 LT	93+60	3.40-4.90	A-2-6(1)	38	22	55.6	17.6	3.8	23.1	96	61	27	-	-
SS-34	50 LT	93+60	8.40-9.90	A-2-6(0)	27	13	64.5	16.4	4.0	16.0	97	54	21	-	-
SS-30	50 RT	98+00	1.00-2.50	A-2-6(0)	31	13	60.0	13.4	6.5	20.1	96	55	27	-	-
SS-31	50 RT	98+00	3.60-5.10	A-2-7(3)	46	29	56.4	13.8	4.7	25.1	100	67	31	-	-
SS-32	50 RT	98+00	8.60-10.10	A-2-6(1)	37	18	52.5	17.2	5.3	25.1	97	61	32	-	-



**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-28	50 LT	107+60	3.70-5.20	A-2-4(0)	28	10	73.2	8.4	4.3	14.0	94	38	18	-	-
SS-29	50 LT	107+60	8.70-10.20	A-7-6(24)	53	29	10.4	13.2	17.3	60.2	100	94	80	-	-
SS-27	50 LT	109+00	3.70-5.20	A-2-4(0)	29	10	42.3	32.0	5.6	20.1	99	78	27	-	-
SS-24	50 LT	110+35	0.00-1.50	A-2-4(0)	17	NP	68.9	18.0	4.1	9.0	95	51	14	-	-
SS-25	50 LT	110+35	3.70-5.20	A-2-6(2)	40	22	64.6	7.2	3.1	25.1	99	59	28	-	-
SS-20	50 LT	111+60	0.00-1.50	A-2-4(0)	23	10	57.8	17.9	5.3	19.1	96	58	25	-	-
SS-21	50 LT	111+60	3.70-5.20	A-2-4(0)	24	8	58.5	19.7	2.8	19.1	97	61	23	-	-
SS-22	50 LT	111+60	8.70-10.20	A-2-4(0)	27	10	61.1	15.1	4.7	19.1	96	58	23	-	-
SS-23	50 LT	111+60	13.70-15.20	A-6(1)	32	13	44.5	17.3	10.1	28.1	89	62	36	-	-
SS-16	50 LT	112+60	1.00-2.50	A-2-4(0)	24	9	57.7	20.0	4.1	18.2	95	60	23	-	-
SS-17	50 LT	112+60	3.70-5.20	A-2-4(0)	23	4	57.3	24.1	8.5	10.1	87	68	18	-	-
SS-18	50 LT	112+60	8.70-10.20	A-2-4(0)	17	NP	66.1	23.6	5.2	5.0	98	59	11	-	-
SS-19	50 LT	112+60	13.70-15.20	A-1-6(0)	17	NP	76.2	18.4	2.4	4.0	94	48	7	-	-
SS-67	75 RT	113+15	0.00-1.50	A-2-6(1)	36	15	57.8	13.5	4.5	24.1	90	50	27	-	-
SS-68	75 RT	113+15	2.80-4.30	A-2-7(2)	41	22	58.8	13.4	4.7	23.1	95	54	28	-	-
SS-69	75 RT	113+15	7.80-10.30	A-2-4(0)	25	7	62.6	17.8	3.5	16.1	95	57	20	-	-
SS-60	75 RT	113+15	10.30-11.80	A-7-6(8)	73	45	58.2	5.8	3.7	32.2	97	60	35	-	-
SS-61	75 RT	113+15	12.80-14.30	A-2-7(3)	51	29	60.0	10.5	4.4	26.2	96	48	29	-	-
SS-62	75 RT	113+15	15.30-16.80	A-2-4(0)	26	3	19.5	53.4	1.9	20.1	97	90	25	-	-
SS-63	75 RT	113+15	17.80-19.30	A-2-4(0)	28	10	72.0	13.3	1.6	14.1	92	41	15	-	-
SS-64	75 RT	113+15	20.30-21.80	A-1-6(0)	21	NP	79.2	10.5	2.3	8.0	100	48	11	-	-
SS-65	75 RT	113+15	22.80-24.30	A-2-4(0)	23	NP	70.7	15.0	2.2	12.1	98	57	15	-	-

**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-66	64 RT	114+35	3.70-5.20	A-2-4(0)	25	6	64.5	16.0	3.4	16.1	93	63	19	-	-
SS-67	64 RT	114+35	6.20-7.70	A-2-4(0)	18	NP	69.4	20.3	2.2	8.0	99	57	11	-	-
SS-68	64 RT	114+35	8.70-10.20	A-2-7(2)	48	20	53.2	12.8	5.8	28.9	96	56	33	-	-
SS-69	64 RT	114+35	11.20-12.70	A-1-6(0)	21	3	71.0	13.5	3.4	12.1	92	44	15	-	-
SS-70	64 RT	114+35	13.70-15.20	A-6(1)	35	14	49.9	14.7	14.3	21.1	95	58	38	-	-
SS-71	64 RT	114+35	16.20-17.70	A-2-4(0)	25	4	70.1	14.2	4.6	11.1	94	51	18	-	-
SS-72	58 RT	115+00	0.00-1.50	A-2-4(0)	24	8	63.5	14.1	5.3	17.1	93	49	22	-	-
SS-73	58 RT	115+00	3.50-5.00	A-1-6(0)	21	NP	73.0	17.0	2.9	7.0	95	47	11	-	-
SS-74	58 RT	115+00	5.50-7.00	A-2-7(1)	45	19	58.7	8.9	5.3	27.2	92	46	31	-	-
SS-75	58 RT	115+00	7.50-9.00	A-2-6(0)	33	11	65.3	12.4	6.2	16.1	91	46	21	-	-
SS-76	58 RT	115+00	11.50-13.00	A-1-6(0)	27	6	74.2	10.9	5.8	9.1	99	45	15	-	-
SS-77	57 RT	115+75	3.40-4.90	A-2-7(1)	42	21	61.0	10.8	4.1	24.1	93	49	27	-	-
SS-78	57 RT	115+75	6.40-7.90	A-2-6(1)	39	16	63.6	10.4	5.9	20.1	92	44	26	-	-
SS-79	57 RT	115+75	9.40-10.90	A-1-6(0)	23	NP	76.0	11.4	2.6	10.1	97	49	13	-	-
SS-80	60 RT	117+20	0.00-1.50	A-2-4(0)	15	NP	65.8	21.7	6.4	6.0	100	60	14	-	-
SS-81	60 RT	117+20	3.60-5.10	A-2-4(0)	15	NP	74.6	13.2	4.1	8.0	100	51	13	-	-
SS-82	60 RT	117+20	8.60-10.10	A-2-7(2)	45	20	69.0	9.0	5.9	26.2	92	45	31	-	-

- BORING DESCRIPTIONS**
- (A) TAN & GRAY LOOSE DRY TO MOIST CLAYEY SAND (MED. PLASTIC) (ARTIFICIAL FILL)
  - (B) TAN TO ORANGE V. LOOSE TO LOOSE DRY TO WET CLAYEY CSE. SAND (SLT. PLASTIC) (ARTIFICIAL FILL)
  - (C) ARTIFICIAL FILL TAN & WHITE TO GRAY DENSE TO LOOSE MOIST CLAYEY CSE. SAND BRICKS, CONCRETE, GRAVEL & ROOTS (C & D LANDFILL)
  - (D) ORANGE-TAN & TAN-WHITE TO ORANGE-WHITE GRAY MOTTLED LOOSE TO MED. DENSE MOIST TO WET CLAYEY CSE. SAND (SLT. TO HIGH PLASTIC) (ARTIFICIAL FILL)
  - (E) TAN MED. DENSE MOIST CLAYEY CSE. SAND (ARTIFICIAL FILL)
  - (F) TAN V. STIFF MOIST CSE. SANDY CLAY (HIGH PLASTIC) (ARTIFICIAL FILL)
  - (G) WHITE-TAN TO PURPLE-TAN-WHITE & GRAY MED. DENSE TO DENSE MOIST TO SAT. CLAYEY F. & CSE. SAND TO CSE. SAND (COASTAL PLAIN)
  - (H) TAN & ORANGE LOOSE TO MED. DENSE MOIST CLAYEY CSE. SAND TO CSE. SAND (ARTIFICIAL FILL)
  - (I) ORANGE-WHITE & TAN W/FERROCHROME MED. DENSE MOIST TO WET CLAYEY CSE. SAND (ARTIFICIAL FILL)
  - (J) WHITE & GRAY HARD MOIST SILTY CSE. SANDY CLAY (SLT. PLASTIC) (COASTAL PLAIN)
  - (K) TAN & ORANGE TO ORANGE-WHITE MOTTLED TAN & WHITE GRAY (LAYERED) TO PURPLE MED. DENSE TO DENSE MOIST TO SAT. CLAYEY CSE. SAND (SLT. TO MED. PLASTIC) (COASTAL PLAIN)

9/26/03 AT U-3456 Geotech PFLS420(30).dgn  
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Prepared in the Office of: **EARTH TECH**  
 701 Corporate Center Drive, Suite 475  
 Raleigh, NC 27607  
 (919) 854-6200 - (919) 854-6259(FAX)  
 VERTICAL SCALE 1" = 5'  
 HORIZONTAL SCALE 1" = 25'

BM#7 EL = 337.6'  
 -BL- STATION 112+37 108' RIGHT  
 RAILROAD SPIKE IN BASE OF 15' PINE TREE

PI = 126+55.00  
 EL = 359.53'  
 VC = 770'  
 K = 191

PI = 119+60.00  
 EL = 339.60'  
 VC = 320'  
 K = 99

BM#8 EL = 344.95'  
 -BL- STATION 125+36 314' RIGHT  
 RAILROAD SPIKE IN BASE OF POWER POLE

**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.L.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-13	50 LF	123+60	0.00-1.50	A-2-4(0)	18	NP	67.7	21.1	6.2	5.0	96	51	12	-	-
SS-14	50 LF	123+60	3.70-5.20	A-2-7(4)	53	32	66.6	9.3	6.0	28.3	98	58	36	-	-
SS-15	50 LF	123+60	8.70-10.20	A-2-6(1)	34	14	62.5	19.8	7.6	20.2	95	60	29	-	-

FOR -L- PLANVIEWS SEE SHEET 12 & 13

118 119 120 121 122 123 124 125 126 127 128 129 130 131 132

-L-

PI = 134+35.00  
 EL = 350.39'  
 VC = 580'  
 K = 299

PI = 141+80.00  
 EL = 356.10'  
 VC = 350'  
 K = 328

**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.L.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	50 LF	141+00	0.00-1.50	A-1-b(0)	16	NP	77.1	16.1	4.7	3.0	99	41	9	-	-
SS-11	50 LF	141+00	3.70-5.20	A-1-b(0)	17	NP	73.0	14.6	4.4	8.1	88	33	13	-	-
SS-12	50 LF	141+00	8.70-10.20	A-2-6(1)	36	16	68.1	12.7	4.9	24.2	97	58	30	-	-

NOTE: INCREASED WEDGING FROM STA 141+00 TO 149+00 TO IMPROVE DRAINAGE

FOR -L- PLANVIEWS SEE SHEET 13 & 14

132 133 134 135 136 137 138 139 140 141 142 143 144 145 146

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BM#9 EL = 355.16'  
 -BL- STATION 140+60 286' RIGHT  
 RAILROAD SPIKE IN BASE OF POWER POLE

PI = 152+00.00  
 EL = 353.03'  
 VC = 470'  
 K = 513

STA 157+49.81 =  
 STA 18+19.01 =  
 STA 10+00.00 =  
 EL = 356.41'

**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-7	50 LT	150+00	0.00-1.50	A-1-b(0)	18	NP	78.6	13.7	4.6	5.0	99	43	10	-	-
SS-8	50 LT	150+00	3.00-4.50	A-1-b(0)	18	NP	74.6	16.6	2.7	6.1	91	42	9	-	-
SS-9	50 LT	150+00	8.00-9.50	A-2-4(0)	27	10	69.6	11.9	1.3	17.2	93	47	18	-	-
SS-4	50 LT	158+50	0.00-1.50	A-2-4(0)	18	NP	71.5	18.3	4.1	6.1	98	64	11	-	-
SS-5	50 LT	158+50	3.70-5.20	A-3(0)	17	NP	75.6	16.6	2.7	5.0	96	61	8	-	-
SS-6	50 LT	158+50	8.70-10.20	A-2-6(0)	31	13	69.6	15.7	3.5	21.2	99	62	25	-	-

NOTE: INCREASED WEDGING FROM STA 14+00 TO 149+00 TO IMPROVE DRAINAGE

FOR -L- PLANVIEW SEE SHEET 14

BM#10 EL = 356.29'  
 -BL- STATION 162+70 287' RIGHT  
 RAILROAD SPIKE IN BASE OF POWER POLE

PI = 164+70.00  
 EL = 360.62'  
 VC = 290'  
 K = 556

PI = 10+70.00  
 EL = 267.69'  
 VC = 140'  
 K = 29

**SOIL TEST RESULTS**

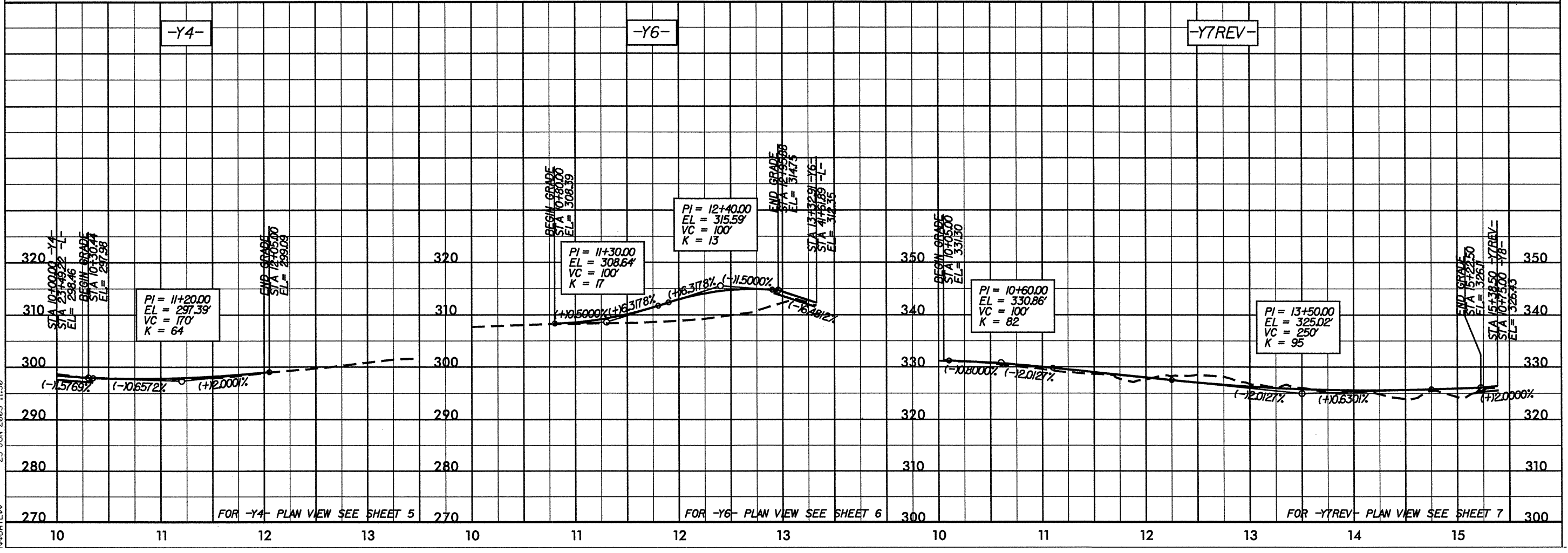
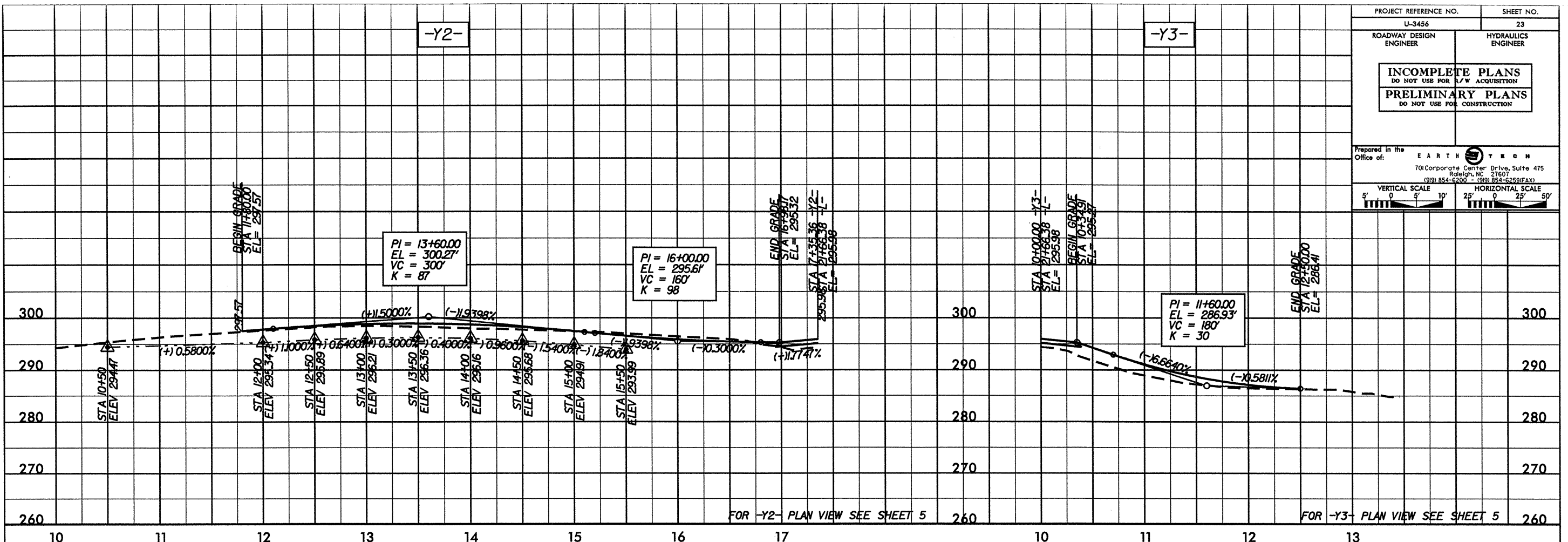
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	50 LT	165+50	0.00-1.50	A-1-b(0)	15	NP	76.7	15.0	4.2	4.0	99	44	9	-	-
SS-2	50 LT	165+50	3.10-4.60	A-1-b(0)	17	NP	75.7	15.8	3.4	5.0	92	40	9	-	-
SS-3	50 LT	165+50	8.10-9.60	A-2-6(0)	39	16	68.3	9.2	3.3	19.2	97	37	23	-	-

FOR -L- PLANVIEW SEE SHEET 15

FOR -Y2A- PLANVIEW SEE SHEET 5

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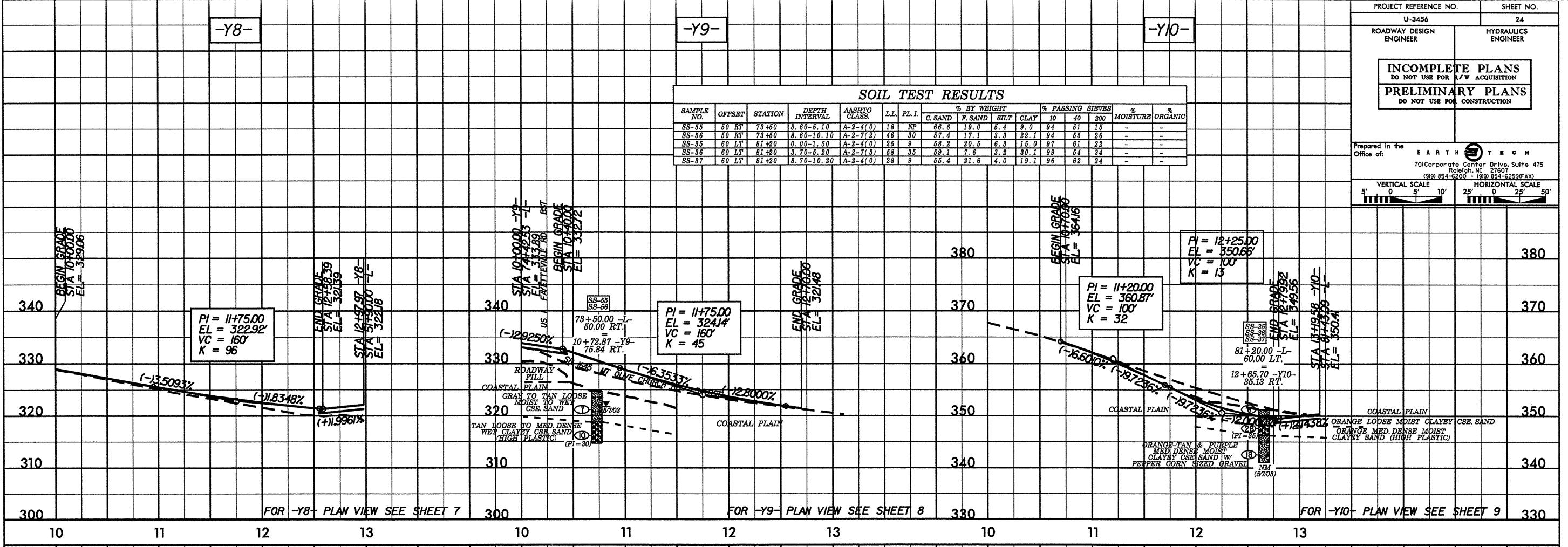


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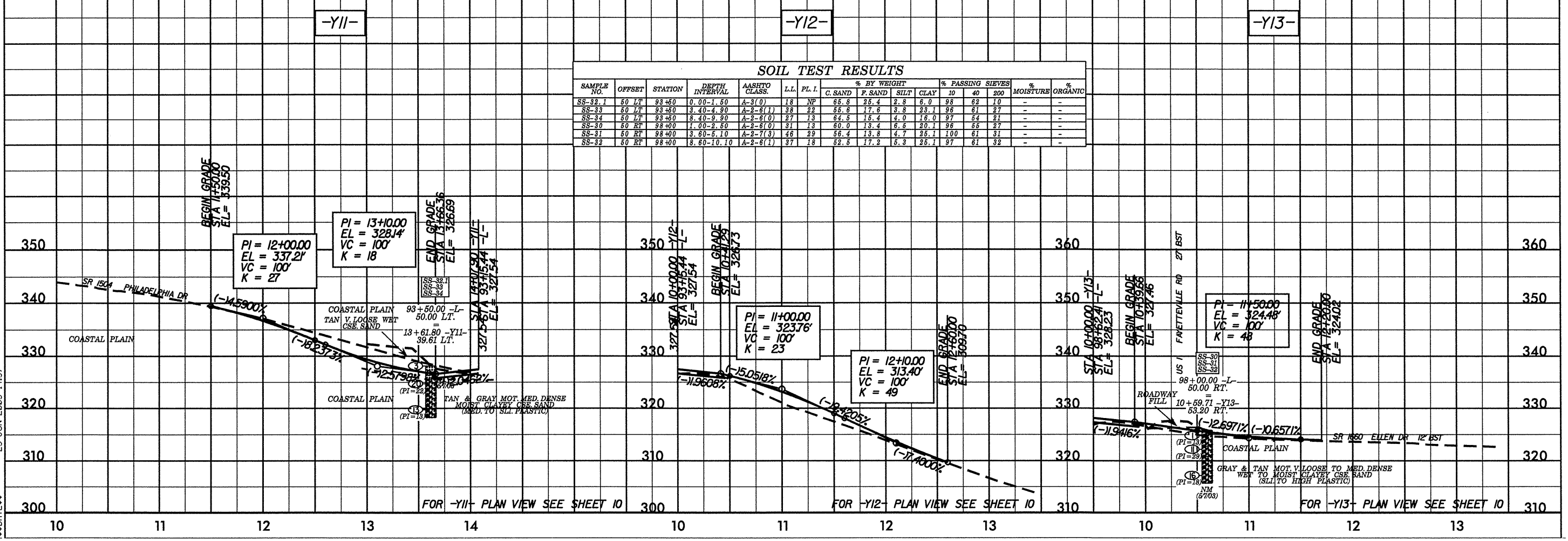
### SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.L.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-55	60 RT	73+50	3.60-5.10	A-2-4(0)	18	NP	66.6	19.0	5.4	9.0	94	51	15	-	-
SS-56	60 RT	73+50	8.60-10.10	A-2-7(2)	46	30	57.4	17.1	3.3	22.1	94	55	26	-	-
SS-35	60 LT	81+20	0.00-1.50	A-2-4(0)	25	9	58.2	20.5	6.3	15.0	97	61	22	-	-
SS-36	60 LT	81+20	3.70-5.20	A-2-7(5)	68	35	59.1	7.6	3.2	30.1	99	54	34	-	-
SS-37	60 LT	81+20	8.70-10.20	A-2-4(0)	28	9	55.4	21.6	4.0	19.1	96	62	24	-	-

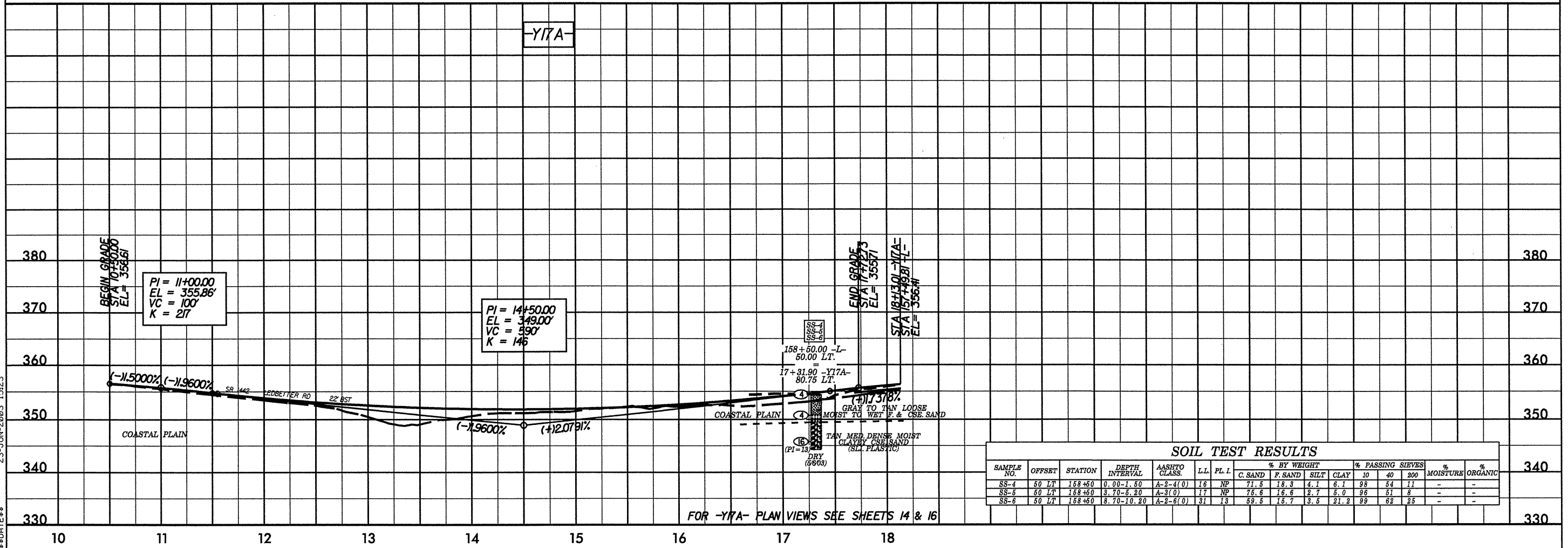
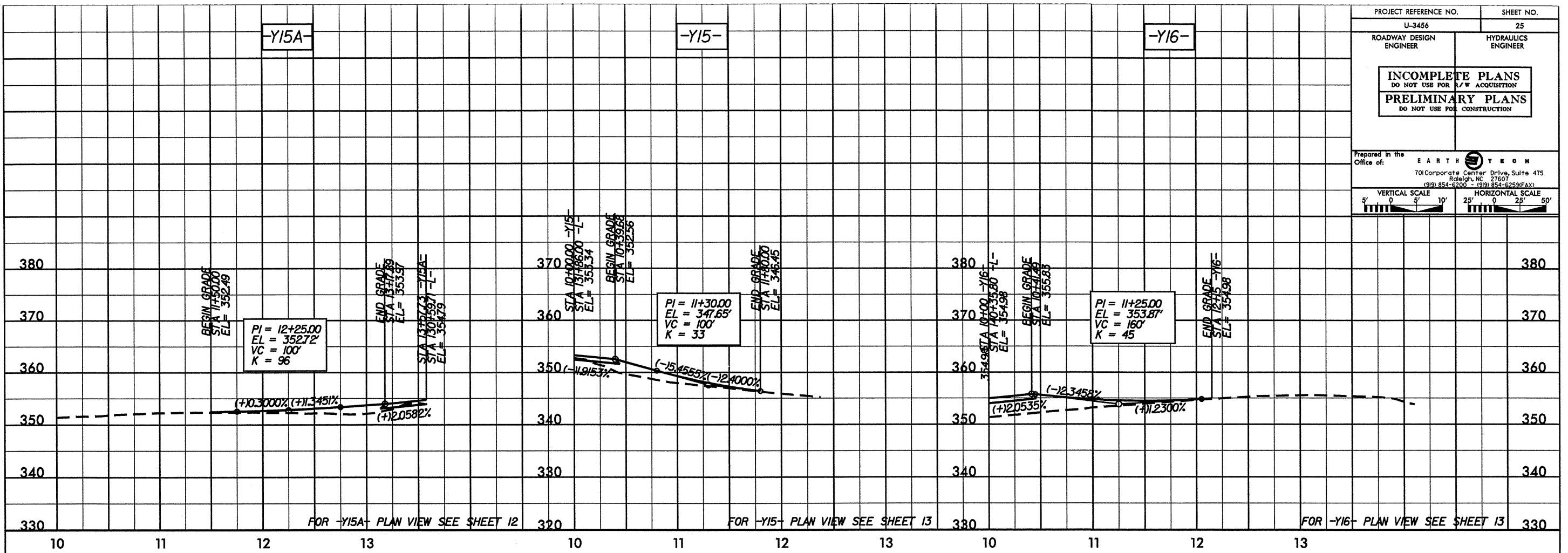


### SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.L.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-32.1	60 LT	93+60	0.00-1.50	A-3(0)	18	NP	66.8	25.4	2.8	6.0	98	62	10	-	-
SS-33	60 LT	93+60	3.40-4.90	A-2-6(1)	38	22	55.6	17.6	3.8	23.1	96	61	27	-	-
SS-34	60 LT	93+60	8.40-9.90	A-2-6(0)	27	13	64.5	16.4	4.0	18.0	97	54	21	-	-
SS-30	60 RT	98+20	1.00-2.50	A-2-6(0)	31	13	60.0	13.4	6.5	20.1	96	55	27	-	-
SS-31	60 RT	98+40	3.60-5.10	A-2-7(3)	46	29	56.4	13.8	4.7	25.1	100	61	31	-	-
SS-32	60 RT	98+40	8.60-10.10	A-2-6(1)	37	18	52.5	17.2	6.3	25.1	97	61	32	-	-



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PROJECT: 8.1581301 ID. U-3456

# STATE OF NORTH CAROLINA

## DEPARTMENT OF TRANSPORTATION

### DIVISION OF HIGHWAYS

#### GEOTECHNICAL UNIT

## STRUCTURE

# SUBSURFACE INVESTIGATION RETAINING WALL INVENTORY

STATE PROJECT 8.1581301 I.D. NO. U-3456

F.A. PROJECT \_\_\_\_\_

COUNTY RICHMOND

PROJECT DESCRIPTION US 1 FROM SR 1424 (ROBERDEL ROAD)  
TO SR 1640 (WIREGRASS ROAD)/SR 1442 (LEDBETTER ROAD)  
IN ROCKINGHAM

SITE DESCRIPTION RETAINING WALL STA. 113+15.00 -L- 45.00' RT.  
TO STA. 114+90.00 -L- 56.75' RT. TO STA. 117+30.00 -L- 56.75' RT.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3456	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
8.1581301		P.E.	
		CONST.	

### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT # (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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 THIS 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.

INVESTIGATED BY R.Q. CALLAWAY PERSONNEL C.C. MURRAY

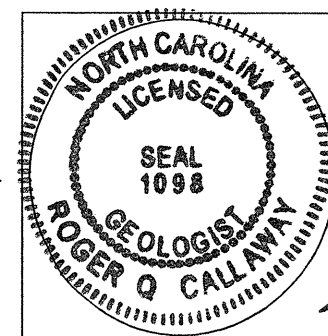
CHECKED BY C.B. LITTLE J.E. ESTEP

SUBMITTED BY C.B. LITTLE D.K. BRATTON

DATE JULY 2003

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.



SEAL  
*Roger Q. Callaway*  
SIGNATURE

DRAWN BY: J.K. McClure

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
U-3456	8.1581301	2	

## SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																						
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASHTO T200, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE ASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, ASHTO CLASSIFICATION AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLES:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>	<p><b>WELL GRADED</b>- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM. INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)</p> <p><b>GAP-GRADED</b>- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>	<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, 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.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>	<p><b>ALLUVIUM (ALLUV.)</b> - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.</p> <p><b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.</p> <p><b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p><b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p><b>ARTESIAN</b> - 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.</p> <p><b>CALCAREOUS (CALC.)</b> - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p><b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p><b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p><b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p><b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p><b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p><b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p><b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p><b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p><b>FLOOD PLAIN (F.P.)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p><b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p><b>JOINT</b> - A FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p><b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p><b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p><b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p><b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p><b>RESIDUAL SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p><b>ROCK QUALITY DESIGNATION (R.Q.D.)</b> - 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.</p> <p><b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p><b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p><b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p><b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.</p> <p><b>STRATA CORE RECOVERY (SREC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p><b>STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.</p> <p><b>TOPSOIL (T.S.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																						
<p><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (&lt; 95% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (&gt; 95% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</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-4, A-5</th> <th>A-6, A-7</th> </tr> <tr> <th>SYMBOL</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>% PASSING</th> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <th>LIQUID LIMIT</th> <td>≤ 5</td> <td>≤ 10</td> <td>≤ 15</td> <td>≤ 20</td> <td>≤ 25</td> <td>≤ 30</td> <td>≤ 40</td> <td>≤ 40</td> <td>≤ 40</td> <td>≤ 40</td> </tr> <tr> <th>PLASTIC INDEX</th> <td>≤ 0</td> <td>≤ 1</td> <td>≤ 2</td> <td>≤ 3</td> <td>≤ 4</td> <td>≤ 5</td> <td>≤ 10</td> <td>≤ 10</td> <td>≤ 10</td> <td>≤ 10</td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td>STONE FRAGS, GRAVEL AND SAND</td> <td>FINE SAND</td> <td>SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY GRAVEL</td> <td>SILTY SAND</td> <td>CLAYEY SAND</td> <td>CLAYEY SILT</td> <td>CLAYEY SILT</td> <td>CLAYEY SILT</td> <td>CLAYEY SILT</td> </tr> <tr> <th>GEN. RATING AS A SUBGRADE</th> <td colspan="3">EXCELLENT TO GOOD</td> <td colspan="3">FAIR TO POOR</td> <td>POOR</td> <td>UNSATURABLE</td> <td></td> <td></td> </tr> </table> <p style="text-align: center;">P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 &gt; L.L. - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (< 95% PASSING #200)				SILT-CLAY MATERIALS (> 95% PASSING #200)				ORGANIC MATERIALS		GROUP CLASS.	A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7	SYMBOL											% PASSING	100	100	100	100	100	100	100	100	100	100	LIQUID LIMIT	≤ 5	≤ 10	≤ 15	≤ 20	≤ 25	≤ 30	≤ 40	≤ 40	≤ 40	≤ 40	PLASTIC INDEX	≤ 0	≤ 1	≤ 2	≤ 3	≤ 4	≤ 5	≤ 10	≤ 10	≤ 10	≤ 10	GROUP INDEX	0	0	0	0	0	0	0	0	0	0	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY GRAVEL	SILTY SAND	CLAYEY SAND	CLAYEY SILT	CLAYEY SILT	CLAYEY SILT	CLAYEY SILT	GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD			FAIR TO POOR			POOR	UNSATURABLE			<p><b>MINERALOGICAL COMPOSITION</b></p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p><b>COMPRESSIBILITY</b></p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p> <p><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> </table> <p><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 SEEPAGE</p>		GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p><b>WEATHERING</b></p> <p><b>FRESH</b> - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p><b>VERY SLIGHT (V. SL.)</b> - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p><b>SLIGHT (SL.)</b> - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p><b>MODERATE (MOD.)</b> - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p><b>MODERATELY SEVERE (MOD. SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p><b>SEVERE (SEV.)</b> - ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i></p> <p><b>VERY SEVERE (V. SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i></p> <p><b>COMPLETE</b> - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>
GENERAL CLASS.	GRANULAR MATERIALS (< 95% PASSING #200)				SILT-CLAY MATERIALS (> 95% PASSING #200)				ORGANIC MATERIALS																																																																																																																
GROUP CLASS.	A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7																																																																																																															
SYMBOL																																																																																																																									
% PASSING	100	100	100	100	100	100	100	100	100	100																																																																																																															
LIQUID LIMIT	≤ 5	≤ 10	≤ 15	≤ 20	≤ 25	≤ 30	≤ 40	≤ 40	≤ 40	≤ 40																																																																																																															
PLASTIC INDEX	≤ 0	≤ 1	≤ 2	≤ 3	≤ 4	≤ 5	≤ 10	≤ 10	≤ 10	≤ 10																																																																																																															
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USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY GRAVEL	SILTY SAND	CLAYEY SAND	CLAYEY SILT	CLAYEY SILT	CLAYEY SILT	CLAYEY SILT																																																																																																															
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STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

P.O. BOX 25201,  
RALEIGH, N.C. 27611-5201

LYNDO TIPPETT  
SECRETARY

July 18, 2003

NCDOT  
Geotechnical Unit  
12033-D Independence Blvd.  
Matthews, NC 28105

STATE PROJECT: 8.1581301  
TIP NUMBER: U-3456  
F.A. PROJECT NO.: STP-0001(7)  
COUNTY: Richmond  
DESCRIPTION: US-1 from SR 1424 to SR 1640 in Rockingham  
SUBJECT: Geotechnical Report – Structure Foundation Investigation  
Retaining Wall – Station 113+15-L- to Station 117+30-L-

**PROJECT DESCRIPTION**

This is the report for a English Units project Structure Foundation Investigation for a planned retaining wall on the right side of -L- in the vicinity of 113+15 to 117+30 as part of the US-1 improvement project.

Location: The site is located east of the town of Rockingham in south central Richmond County, on I-74 at the Richmond Senior High School Athletic Field. This investigation was based on the structure and location portrayed on the Preliminary Plans delivered to Geotech on March 21, 2003.

Proposed Structure (s): The proposed structure is a retaining wall up to 12 feet high, along a portion of US-1, that will support the slope adjacent to a new right turn lane.

Equipment: A CME 550 off-road rig with automatic hammer, hollow stem augers and SPT sampling equipment was used on this project

Drilling: The Geotechnical Unit completed 5 borings with SPT through hollow stem auger.

**PHYSIOGRAPHY and GEOLOGY**

Physiography: The project is at an elevation of 350 feet, in the Piedmont Physiographic Province.

It is on a divide between the Falling Creek Drainage to the south, and Hitchcock Creek Drainage to the north, both tributaries to the Pee Dee River

Geology: The project is located west of the Orangeburg scarp in the Piedmont Physiographic Province, but is in an area underlain by coastal plain stratigraphy.

Site Conditions: The proposed cut is in a 100' wide mound of fill placed above highway grade during construction of the athletic field. The above grade portion of the wall will be backed by fill.

**FOUNDATION MATERIALS**

**Stratigraphy:**

The stratigraphy consisted entirely of coastal plain materials or fill soil derived from coastal plain soil.

**Fill:** The fill soil sand or clayey sand. PI values in the A-2-4 are non plastic. The PI values for the A-2-6 soil range from 16 to 45, with the bulk of the results falling around PI =20. 50. The following soil types were identified as fill soil:

(A-2-4): medium dense tan to orange, clayey sand

(A-2-6): loose to medium dense moist clayey sand

(A-1-b), medium dense coarse sand with gravel

**Coastal Plain:** The coastal plain soil contains sand, coarse sand and clayey sand in a layered configuration, possibly with the layers tilted to the east.

(A-1): Purple white and tan mottled medium dense to dense coarse sand with pea gravel, often wet.

(A-2-4): Mottled sand as in A-1, slightly clayey, medium dense to dense, moist to wet.

(A-2-6): Variegated multicolored medium dense to dense moist clayey sand.

(A-6): White and gray hard moist to dry silty sandy clay.

**Hydrology:**

A "water table" was found expressed in almost all of the borings at an elevation of about 329'. Perched water or saturated zones, which did not persist for 24 hours, were found higher in the coastal plain section, and in the fill.

**CLOSING STATEMENT**

The geotechnical foundation investigation, and analysis and recommendations are based on Preliminary Plans marked "25% Submittal". If any significant changes are made in the design or location of the proposed structure, the subsurface information and recommendations will have to be reviewed and modified as necessary.

Respectfully Submitted

Roger Q Callaway, L.G.# 1098

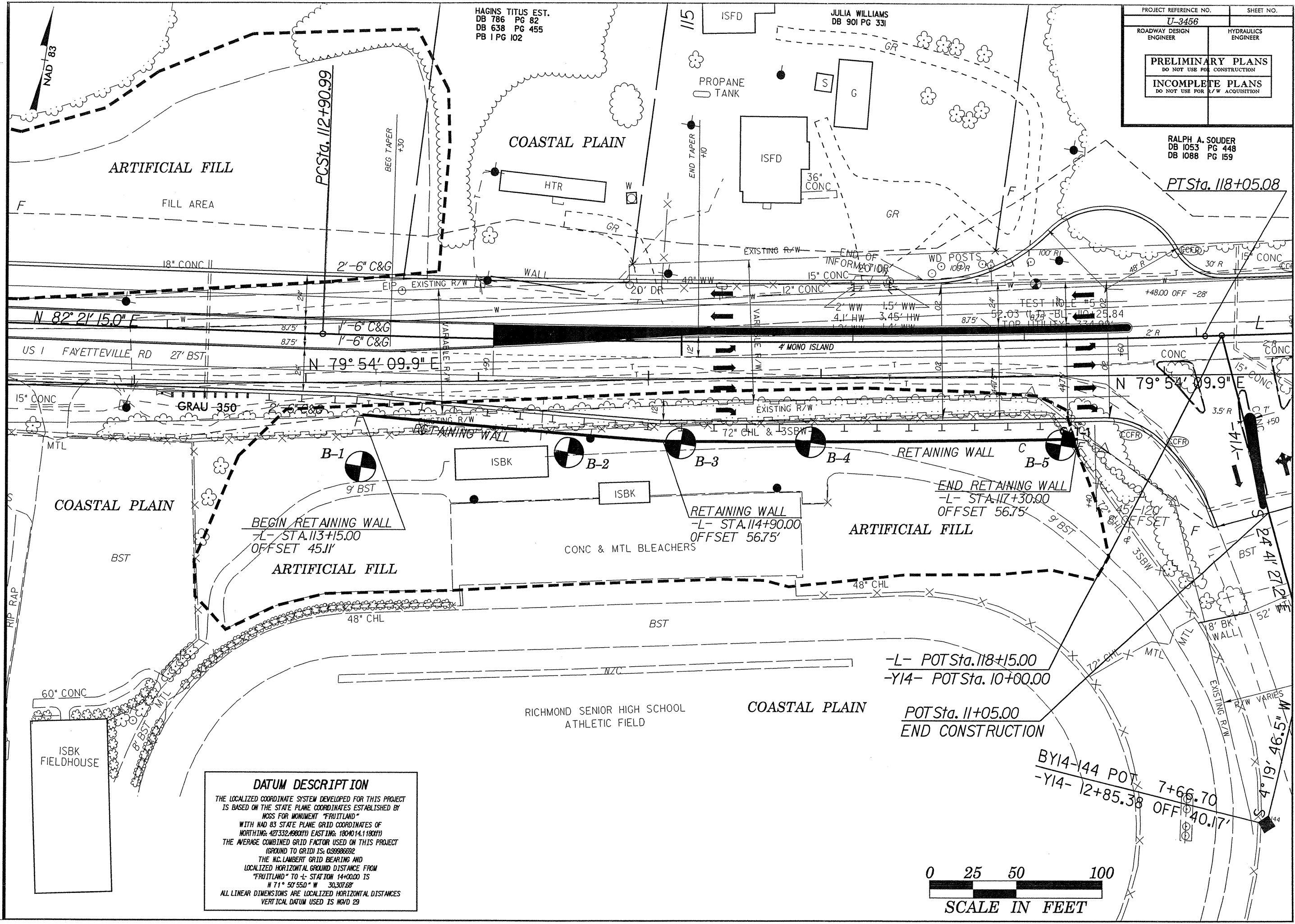
Project Geologist

Geotechnical Unit, Matthews Field Office



PROJECT REFERENCE NO.	SHEET NO.
U-3456	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	

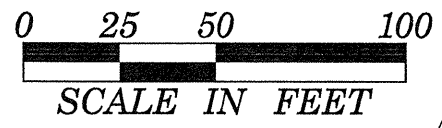
RALPH A. SOULDER  
DB 1053 PG 448  
DB 1088 PG 159



HAGINS TITUS EST.  
DB 786 PG 82  
DB 638 PG 455  
PB 1 PG 102

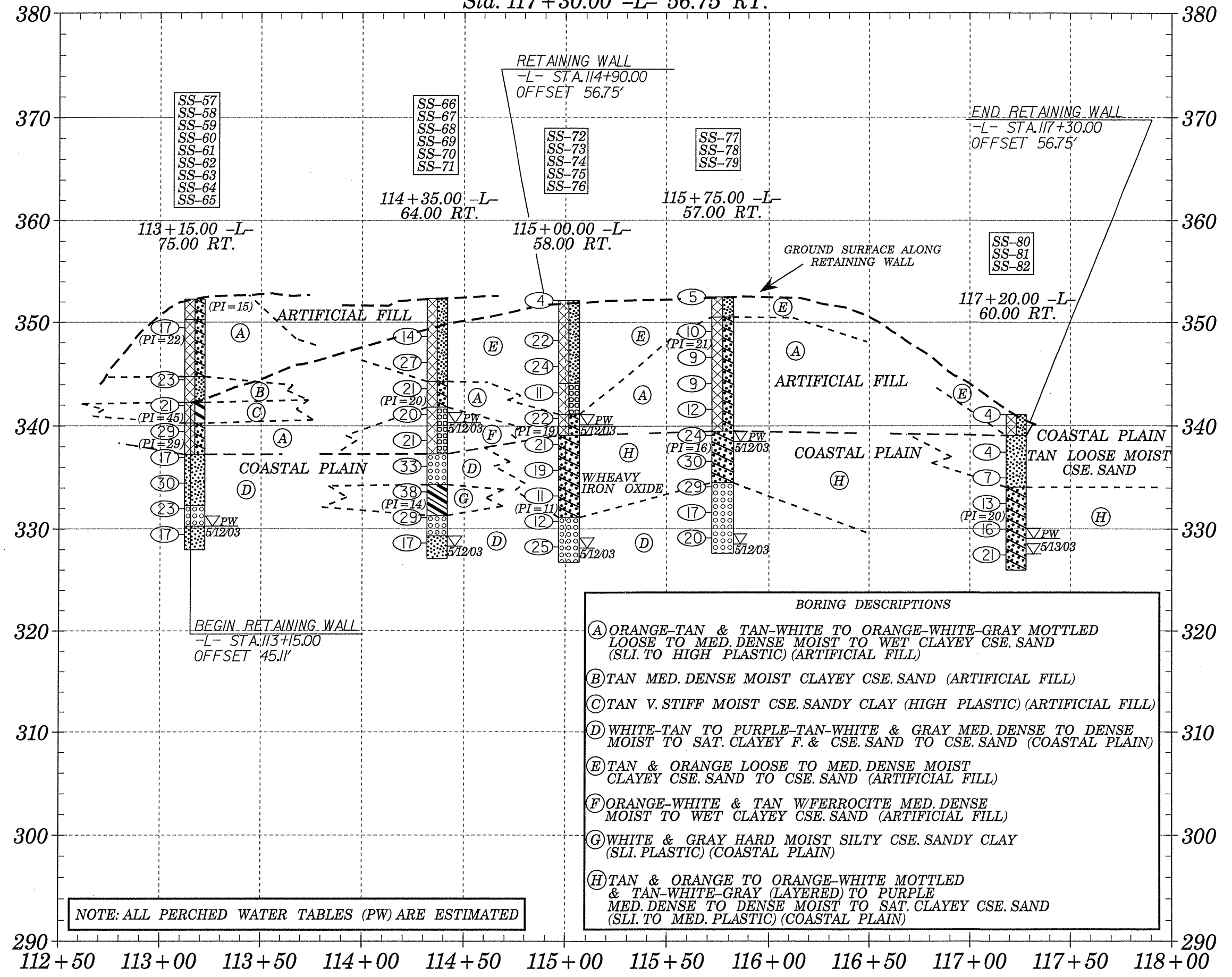
JULIA WILLIAMS  
DB 901 PG 331

**DATUM DESCRIPTION**  
THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY MOGS FOR MONUMENT "FRUITLAND" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 427332.490(11) EASTING: 1804014.1180(11) THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99986692 THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "FRUITLAND" TO -L- STATION 14+00.00 IS N 71° 50' 55.0" W 30,307.68' ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS MVD 29



# Profile Along Retaining Wall

Sta. 113+15.00 -L- 45.11' RT. to  
Sta. 114+90.00 -L- 56.75' RT. to  
Sta. 117+30.00 -L- 56.75' RT.



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1581301		ID. U-3456		COUNTY RICHMOND		GEOLOGIST MURRAY C.C.								
SITE DESCRIPTION US 1 WIDENING FROM SR 1424 TO SR 1640/SR 1442							GROUND WATER							
BORING NO. B-1		BORING LOCATION 113+15.00		OFFSET 75.00		ALIGNMENT L								
COLLAR ELEVATION 352.26		NORTHING 438960.2901		EASTING 1784764.1239										
TOTAL DEPTH 24.3		DRILL MACHINE MOBILE B-57		DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC								
START DATE 5/12/03		COMPLETION DATE 5/12/03		SURFACE WATER DEPTH		DEPTH TO ROCK								
ELEV. (FT.)	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT					SAMPLE NUMBER	LOG MOI.	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75	100				
352.27														
350.00	2.8	9	9	8	1							SS-57	M	(ARTIFICIAL FILL) ORANGE-TAN LOOSE CLAYEY SAND (A-2-6)
												SS-58	M	TAN MED. DENSE MED. PLASTIC (PI=22) CLAYEY SAND (A-2-7)
345.00	7.8	7	10	13	1							SS-59	M	TAN MED. DENSE CLAYEY SAND (A-2-4)
	10.3	12	7	14	1							SS-60	M	
340.00	12.8	12	14	15	1							SS-61	M	TAN V. STIFF SANDY CLAY (A-7-6) HIGH PLASTIC (PI=45)
	15.3	5	5	12	1							SS-62	M/W	TAN-WHITE MED. DENSE CLAYEY SAND, HIGH PLASTIC (PI=29) (A-2-7)
335.00	17.8	10	15	15	1							SS-63	M/W	(COASTAL PLAIN) TAN-WHITE TO PURPLE-TAN-WHITE MED. DENSE TO DENSE SLI. MIC. SILTY CLAYEY SAND (A-2-4)
	20.3	9	11	12	1							SS-64	W	
330.00	22.8	8	8	9	1							SS-65	SAT.	PURPLE-TAN-WHITE MED. DENSE CSE. SAND (A-1-b)
														PURPLE-TAN-WHITE MED. DENSE CLAYEY CSE. SAND (A-2-4)
325.00														
320.00														
315.00														
310.00														
305.00														
300.00														
295.00														
290.00														
285.00														
280.00														
275.00														

BORING TERMINATED AT  
 ELEV. 327.96 IN MED. DENSE  
 CSE. SAND

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1581301		ID. U-3456		COUNTY RICHMOND		GEOLOGIST MURRAY C.C.								
SITE DESCRIPTION US 1 WIDENING FROM SR 1424 TO SR 1640/SR 1442							GROUND WATER							
BORING NO. B-2		BORING LOCATION 114+35.00		OFFSET 64.00		ALIGNMENT L								
COLLAR ELEVATION 352.32		NORTHING 438988.5393		EASTING 1784882.3355										
TOTAL DEPTH 25.2		DRILL MACHINE MOBILE B-57		DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC								
START DATE 5/12/03		COMPLETION DATE 5/12/03		SURFACE WATER DEPTH		DEPTH TO ROCK								
ELEV. (FT.)	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT					SAMPLE NUMBER	LOG MOI.	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75	100				
352.32														
350.00	3.7	4	6	8	1							SS-66	M	(ARTIFICIAL FILL) ORANGE-TAN MED. DENSE CLAYEY CSE. SAND (A-2-4)
	6.2	9	13	14	1							SS-67	M	
345.00	8.7	7	8	13	1							SS-68	W	ORANGE-WHITE AND TAN MED. DENSE CLAYEY CSE. SAND MED. PLASTIC (PI=20) (A-2-7)
	11.2	7	8	12	1							SS-69	PW	ORANGE-WHITE AND TAN MED. DENSE MIC. CLAYEY CSE. SAND WITH SMALL GRAVEL (A-1-b)
340.00	13.7	7	10	11	1							M/W		
	16.2	8	13	20	1							M		(COASTAL PLAIN) PURPLE-TAN-WHITE DENSE CSE. SAND (A-1-b)
335.00	18.7	15	17	21	1							SS-70	M	WHITE & GRAY HARD SILTY CSE. SANDY CLAY (A-6) LOW PLASTIC (PI=14)
	21.2	13	14	15	1							M		
330.00	23.7	6	8	9	1							SS-71	W	PURPLE-WHITE-TAN MED. DENSE CSE. SAND (A-1-b)
														PURPLE-WHITE-TAN MED. DENSE CLAYEY CSE. SAND
325.00														
320.00														
315.00														
310.00														
305.00														
300.00														
295.00														
290.00														
285.00														
280.00														
275.00														

BORING TERMINATED AT  
 ELEV. 327.12 IN MED. DENSE  
 CLAYEY CSE. SAND

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1581301		ID. U-3456		COUNTY RICHMOND		GEOLOGIST MURRAY C.C.								
SITE DESCRIPTION US 1 WIDENING FROM SR 1424 TO SR 1640/SR 1442							GROUND WATER							
BORING NO. B-3		BORING LOCATION 115+00.00		OFFSET 58.00		ALIGNMENT L								
COLLAR ELEVATION 352.14		NORTHING 439004.6110		EASTING 1784946.1113										
TOTAL DEPTH 25.4		DRILL MACHINE MOBILE B-57		DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC								
START DATE 5/12/03		COMPLETION DATE 5/12/03		SURFACE WATER DEPTH		DEPTH TO ROCK								
ELEV. (FT.)	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT					SAMPLE NUMBER	LOG MOI.	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75	100				
352.15	0	2	2	2		X 4						SS-72	M	(ARTIFICIAL FILL) ORANGE LOOSE TO MED. DENSE CLAYEY CSE. SAND (A-2-4)
350.00	3.9	9	10	12		X 22							M	
345.00	6.4	8	12	12		X 24							M	
	8.9	3	4	7		X 11						SS-73	M	ORANGE MED. DENSE CSE. SAND (A-1-b)
340.00	11.4	12	11	11		X 22						SS-74	W	ORANGE AND GRAY MOTTLED MED. DENSE CLAYEY CSE. SAND MED. PLASTIC (PI=19) (A-2-7)
	13.9	9	11	10		X 21								(COASTAL PLAIN) TAN AND ORANGE MED. DENSE CLAYEY CSE. SAND WITH HEAVY IRON OXIDE
335.00	16.4	7	8	11		X 19						SS-75	MW	LOW PLASTIC (PI=11) (A-2-6)
	18.9	5	5	6		X 11								
330.00	21.4	5	5	7		X 12						SS-76	WS	PURPLE-WHITE AND TAN MED. DENSE CSE. SAND (A-1-b)
	23.9	6	12	13		X 25							SAT.	(LAMINATED SEDIMENTS 12" BEDS, SOME CLAY, SOME SAT. SAND)
NOTE: ALL PERCHED WATER TABLES (PW) ARE ESTIMATED														
BORING TERMINATED AT ELEV. 326.74 IN MED. DENSE CSE. SAND														

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1581301		ID. U-3456		COUNTY RICHMOND		GEOLOGIST MURRAY C.C.								
SITE DESCRIPTION US 1 WIDENING FROM SR 1424 TO SR 1640/SR 1442							GROUND WATER							
BORING NO. B-4		BORING LOCATION 115+75.00		OFFSET 57.00		ALIGNMENT L								
COLLAR ELEVATION 352.51		NORTHING 439017.9496		EASTING 1785020.4698										
TOTAL DEPTH 24.9		DRILL MACHINE MOBILE B-57		DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC								
START DATE 5/13/03		COMPLETION DATE 5/13/03		SURFACE WATER DEPTH		DEPTH TO ROCK								
ELEV. (FT.)	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT					SAMPLE NUMBER	LOG MOI.	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75	100				
352.51	0	2	2	3		X 5							M	(ARTIFICIAL FILL) ORANGE LOOSE SAND
350.00	3.4	5	5	5		X 10						SS-77	M	ORANGE MED. DENSE CLAYEY CSE. SAND (A-2-7)
	5.9	5	4	5		X 9								MED. PLASTIC (PI=21)
345.00	8.4	4	4	5		X 9							M	
	10.9	5	6	6		X 12								
340.00	13.4	11	12	12		X 24						SS-78	W	(COASTAL PLAIN) ORANGE-WHITE MOTTLED MED. DENSE TO DENSE CLAYEY CSE. SAND (A-2-6)
	15.9	12	14	16		X 30							MW	MED. PLASTIC (PI=16)
335.00	18.4	9	13	16		X 29						SS-79	MW	PURPLE-WHITE AND TAN MOTTLED MED. DENSE CLAYEY CSE. SAND (A-1-b)
	20.9	8	8	9		X 17								
330.00	23.4	7	9	11		X 20							SAT.	
NOTE: ALL PERCHED WATER TABLES (PW) ARE ESTIMATED														
BORING TERMINATED AT ELEV. 327.61 IN MED. DENSE CLAYEY CSE. SAND														



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL UNIT BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1581301		ID. U-3456		COUNTY RICHMOND		GEOLOGIST MURRAY C.C.									
SITE DESCRIPTION US 1 WIDENING FROM SR 1424 TO SR 1640/SR 1442							GROUND WATER								
BORING NO. B-5		BORING LOCATION 117+20.00		OFFSET 60.00		ALIGNMENT L									
COLLAR ELEVATION 341.09		NORTHING 439040.8597		EASTING 1785164.7514		0 HR. 12.0 24 HR. (PW) 12.0									
TOTAL DEPTH 15.1		DRILL MACHINE MOBILE B-57		DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC									
START DATE 5/13/03		COMPLETION DATE 5/13/03		SURFACE WATER DEPTH		DEPTH TO ROCK									
ELEV.	DEPTH (FT.)	BLOW COUNT			PEN. (FT.)	BLOWS PER FOOT					SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5'	0.5'	0.5'		0	25	50	75	100					
341.09	0	2	2	2	1	X 4						SS-80	M	X	(ARTIFICIAL FILL) TAN TO GRAY
340.00															LOOSE CSE. SAND (A-2-4)
	3.6	5	2	2	1	X 4						SS-81	M	X	(COASTAL PLAIN) TAN LOOSE
335.00	6.1	4	3	4	1	X 7									CSE. SAND (A-2-4)
	8.6	5	6	7	1	X 13						SS-82	M	X	TAN-WHITE-GRAY (LAYERED CLAY
330.00	11.1	7	8	8	1	X 16									AND SAND) TO PURPLE MED. DENSE
	13.6	7	8	13	1	X 21									CLAYEY CSE. SAND (A-2-7)
															MED. PLASTIC (PI=20)
325.00															
320.00															
315.00															
310.00															
305.00															
300.00															
295.00															
290.00															
285.00															
280.00															
275.00															
270.00															
265.00															

BORING TERMINATED AT  
ELEV. 325.99 IN MED. DENSE  
CLAYEY CSE. SAND



TEST RESULTS

PROJECT: 8.1581301 U-3456

COUNTY: RICHMOND

SITE DESCRIPTION: RETAINING WALL @ STA. 113+15.00 -L- 45.00' RT. TO STA. 114+90.00 -L- 56.75' RT. TO STA. 117+30.00 -L- 56.75' RT.

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVES			UNIT WT. (d)	VOID RATIO
								C. SAND	F. SAND	SILT	CLAY	10	40	200		
<b>B-1</b>																
SS-57	75 RT	113+15	0.00-1.50	A-2-6(1)		35	15	57.8	13.5	4.5	24.1	90	50	27		
SS-58	75 RT	113+15	2.80-4.30	A-2-7(2)	17	41	22	58.8	13.4	4.7	23.1	95	54	28		
SS-59	75 RT	113+15	7.80-10.30	A-2-4(0)	23	25	7	62.6	17.8	3.5	16.1	95	57	20		
SS-60	75 RT	113+15	10.30-11.80	A-7-6(8)	21	73	45	58.2	5.8	3.7	32.2	97	50	36		
SS-61	75 RT	113+15	12.80-14.30	A-2-7(3)	29	51	29	60.0	10.5	4.4	25.2	96	48	29		
SS-62	75 RT	113+15	15.30-16.80	A-2-4(0)	17	26	3	19.5	53.4	6.9	20.1	97	90	28		
SS-63	75 RT	113+15	17.80-19.30	A-2-4(0)	30	28	10	72.0	12.3	1.6	14.1	92	41	15		
SS-64	75 RT	113+15	20.30-21.80	A-1-b(0)	23	21	NP	79.2	10.5	2.3	8.0	100	48	11		
SS-65	75 RT	113+15	22.80-30.30	A-2-4(0)	17	23	NP	70.7	15.0	2.2	12.1	98	57	15		
<b>B-2</b>																
SS-66	64 RT	114+35	3.70-5.20	A-2-4(0)	14	25	6	64.5	16.0	3.4	16.1	93	53	19		
SS-67	64 RT	114+35	6.20-7.70	A-2-4(0)	27	18	NP	69.4	20.3	2.2	8.0	99	57	11		
SS-68	64 RT	114+35	8.70-10.20	A-2-7(2)	21	48	20	53.2	12.8	5.8	28.2	96	56	33		
SS-69	64 RT	114+35	11.20-12.70	A-1-b(0)	20	21	3	71.0	13.5	3.4	12.1	92	44	15		
SS-70	64 RT	114+35	18.70-20.20	A-6(1)	38	35	14	49.9	14.7	14.3	21.1	95	58	38		
SS-71	64 RT	114+35	23.70-25.20	A-2-4(0)	17	25	4	70.1	14.2	4.6	11.1	94	51	16		
<b>B-3</b>																
SS-72	58 RT	115+00	0.00-1.50	A-2-4(0)	4	24	8	63.5	14.1	5.3	17.1	93	49	22		
SS-73	58 RT	115+00	8.90-10.40	A-1-b(0)	11	21	NP	73.0	17.0	2.9	7.0	95	47	11		
SS-74	58 RT	115+00	11.40-12.90	A-2-7(1)	22	45	19	58.7	8.9	5.3	27.2	92	46	31		
SS-75	58 RT	115+00	18.90-20.40	A-2-6(0)	11	33	11	65.3	12.4	6.2	16.1	91	46	21		
SS-76	58 RT	115+00	21.40-22.90	A-1-b(0)	12	27	6	74.2	10.9	5.8	9.1	99	45	15		
<b>B-4</b>																
SS-77	57 RT	115+75	3.40-4.90	A-2-7(1)	10	42	21	61.0	10.8	4.1	24.1	93	49	27		
SS-78	57 RT	115+75	13.40-14.90	A-2-6(1)	24	39	16	63.6	10.4	5.9	20.1	92	44	25		
SS-79	57 RT	115+75	18.40-19.90	A-1-b(0)	29	23	NP	76.0	11.4	2.6	10.1	97	49	13		
<b>B-5</b>																
SS-80	60 RT	117+20	0.00-1.50	A-2-4(0)	4	15	NP	65.8	21.7	6.4	6.0	100	60	14		
SS-81	60 RT	117+20	3.60-5.10	A-2-4(0)	4	15	NP	74.6	13.2	4.1	8.0	100	51	13		
SS-82	60 RT	117+20	8.60-10.10	A-2-7(2)	13	45	20	59.0	9.0	5.9	26.2	92	45	31		

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT	Q(MPa) (MPsi)	E(MPa) (MPsi)
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