

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34528.1.1	1	46
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34528.1.1	STPNHF-70(43)	P.E.	
		CONST.	

NOTE: SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

CONTENTS:

LINE	STATION	PLAN	PROFILE	XSECTS
-L-	17+00.00 - 207+95.09	4 - 19	----	----
-Y2-	10+00.00 - 32+40.08	9, 20, 21	----	----
-Y3-	10+66.00 - 30+50.00	12, 22, 23	----	----

**INFILTRATION**  
**BASIN INVESTIGATION**

STATE PROJ. 34528.1.1 I.D. R-3307 F.A. PROJ. STPNHF-70(43)

COUNTY CARTERET

PROJECT DESCRIPTION US 70 IMPROVEMENTS:

FOUR LANES AT RADIO ISLAND

TO NORTH OF BEAUFORT NEAR OLGA ROAD (SR 1429)

SUBJECT:

NCDOT Geotechnical Engineering Unit Soiland Rock Classification Sheet	Sheet 2
Roadway Title Sheet	Sheet 3
Geotechnical/K <sub>SAT</sub> Report	Sheets 3A - 3C
Boring Location Plans	Sheets 4 - 23
Amoozemeter Results	Sheets 24 - 32
Hand Auger Soil Profile Descriptions	Sheets 33 - 41
Summary of Laboratory Test Data	Sheet 42
Grain Size Curves	Sheets 43 - 46

**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 FOLEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING 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.

**CONTRACT: ID: R-3307**

**FOR LETTING**

PERSONNEL

J. DAVIS

J. VOLKER

P. PHELPS

T. PEREZ

INVESTIGATED BY S&ME, INC.

CHECKED BY A.F. RIGGS, JR.

SUBMITTED BY S&ME, INC.

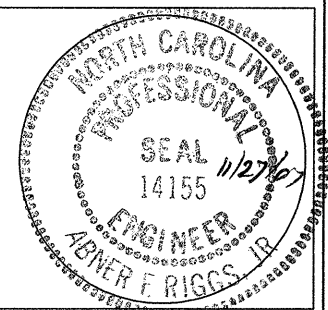
DATE NOVEMBER 2, 2007

DRAWN BY: T. PEREZ

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT 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.

*Albert F. Riggs, Jr.*



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
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**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 (AASHTO T206, 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. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRN 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  <b>UNIFORM</b>- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)  <b>GAP-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: <u>ANGULAR</u>, <u>SUBANGULAR</u>, <u>SUBROUNDED</u>, OR <u>ROUNDED</u>.</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. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p><b>WEATHERED ROCK (WR)</b>  NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES &gt; 100 BLOWS PER FOOT.</p> <p><b>CRYSTALLINE ROCK (CR)</b>  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p><b>NON-CRYSTALLINE ROCK (NCR)</b>  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p><b>COASTAL PLAIN SEDIMENTARY ROCK (CPI)</b>  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</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 DISLOGGED 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> - A FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHALE-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.D.)</b> - 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.  <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;"> <thead> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (&gt;5% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (&gt;85% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-3</th><th colspan="2">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 colspan="2">A-4, A-5</th><th colspan="3"></th> <th>A-1, A-2</th><th>A-3</th><th>A-6, A-7</th> </tr> </thead> <tbody> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td><td>A-1-b</td><td>A-2-4</td><td>A-2-5</td><td>A-2-6</td><td>A-2-7</td><td></td><td></td> <td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-6, A-7</td> </tr> <tr> <td>SYMBOL</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>% PASSING</td> <td>100</td><td>60</td><td>40</td><td>35</td><td>30</td><td>25</td><td>15</td><td>10</td> <td>5</td><td>0</td><td></td><td></td> <td>10</td><td>10</td><td>10</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6</td><td>N.P.</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><td>40</td><td>40</td> <td>40</td><td>40</td><td>40</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. 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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>	<p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> </thead> <tbody> <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> </tbody> </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
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ARE USED TO DESCRIBE APPEARANCE.</p>	<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>FRIABLE</td> <td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td> </tr> <tr> <td>MODERATELY INDURATED</td> <td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td> </tr> <tr> <td>INDURATED</td> <td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td> <td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </tbody> </table>	FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	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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.D.)</b> - 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.  <b>TOPSOIL (T.S.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC</p>																																																																																																																																																																								
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09/08/09

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

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

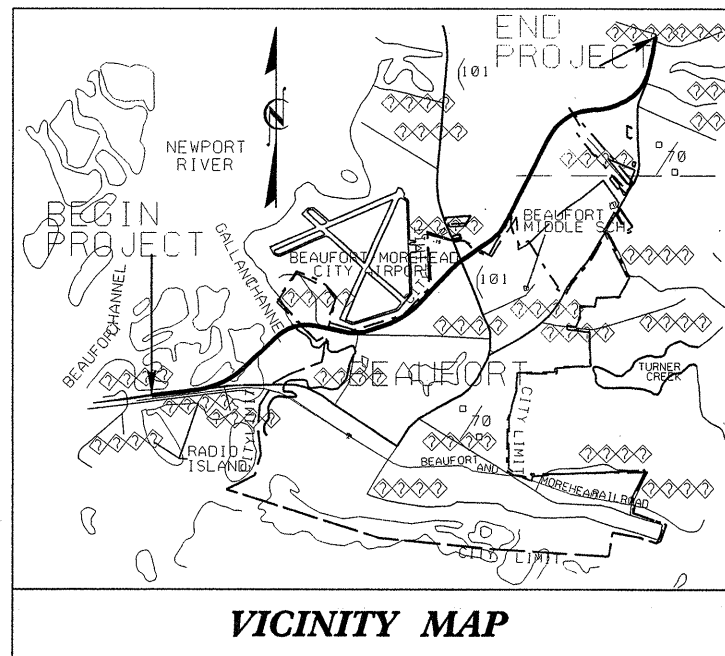
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3307	3	46
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34528.1.1	STPNHF-70(43)	PE	

# CARTERET COUNTY

**LOCATION: US 70 FROM EXISTING FOUR LANES AT RADIO ISLAND TO US 70 NORTH OF SR 1429 (OLGA ROAD)**

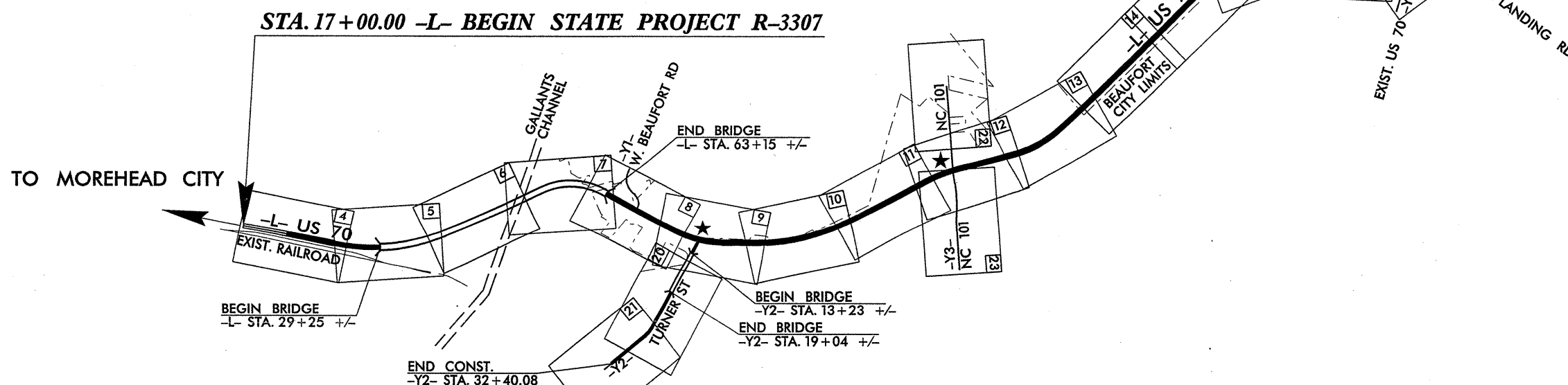
**TYPE OF WORK: GRADING, PAVING, DRAINAGE, CURB & GUTTER SIGNALS, CULVERT AND STRUCTURES**

**STA. 207+95.09 -L- END STATE PROJECT R-3307**



**TIP PROJECT: R-3307**

**VICINITY MAP**



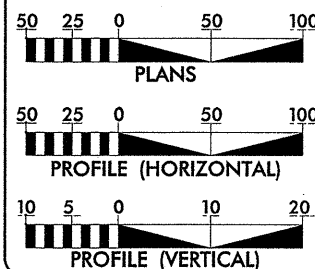
★ PROPOSED TRAFFIC SIGNAL

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ???.  
A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF BEAUFORT.  
THIS IS A PARTIAL CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.

\*\* DESIGN EXCEPTION REQUIRED FOR HORIZONTAL CURVE RADIUS (50 MPH), HORIZONTAL STOPPING SIGHT DISTANCE (38 MPH), AND MAXIMUM VERTICAL GRADE (6%).

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

**GRAPHIC SCALES**



**DESIGN DATA**

ADT 2011 = 27620  
ADT 2031 = 39389  
DHV = 11 %  
D = 60 %  
T = 5 % \*  
V (SHOULDER) = 60 MPH\*\*  
V (CURB & GUTTER) = 50 MPH  
\* (TTST 1.1% + DUAL 4) %  
FUNC. CLASS = ARTERIAL

**PROJECT LENGTH**

LENGTH OF ROADWAY PROJECT R-3307 = 2.974 MI  
LENGTH OF STRUCTURE PROJECT R-3307 = 0.642 MI  
TOTAL LENGTH OF F.A. PROJECT STPNHF-70(43) = 3.616 MI

Prepared In the Office of:

**DIVISION OF HIGHWAYS**

1000 Birch Ridge Dr., Raleigh NC, 27610

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
JULY 18, 2008

LETTING DATE:  
JANUARY 18, 2011 (PROD)

BRENDA MOORE, PE  
PROJECT ENGINEER

REKHA PATEL, PE  
PROJECT DESIGN ENGINEER

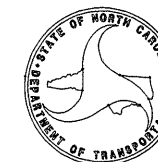
**HYDRAULICS ENGINEER**

SIGNATURE: \_\_\_\_\_ P.E.

**ROADWAY DESIGN ENGINEER**

SIGNATURE: \_\_\_\_\_ P.E.

**DIVISION OF HIGHWAYS  
STATE OF NORTH CAROLINA**



STATE HIGHWAY DESIGN ENGINEER

**CONTRACT:**

\$\$\$ SYSTEM TIME \$\$\$  
\$\$\$ DESIGNER \$\$\$  
\$\$\$ USERNAME \$\$\$

STATE PROJECT NO.: 34528.1.1  
 I.D. NO.: R-3307  
 FEDERAL PROJECT NO.: STPNHF-70(43)  
 COUNTY: Carteret

DESCRIPTION: U.S. 70 Improvements: Four Lanes at Radio Island to North of Beaufort near Olga Road (SR1429)  
 Infiltration Basin Investigation

SUBJECT: Infiltration Basin Investigation – Addendum to Inventory Report

#### Project Description

The project site is located along existing U.S. 70 at Radio Island and extends north over the Newport River to Beaufort just south of the Beaufort-Morehead City Airport to north of Beaufort at Olga Road (SR1429) in Carteret County, North Carolina. The proposed project is part of the widening of U.S. 70 in which infiltration basins are to be constructed adjacent to the new alignment. The proposed infiltration basins will be located between existing U.S. 70 on Radio Island and Olga Road (SR 1429). Grading plans of the proposed infiltration basin were not provided at the time of our investigation.

The sites are located within commercial, residential and cultivated areas. The sites consist of grassed lawns, roadway shoulders, undeveloped wooded areas and cultivated fields. Underground utilities including fiber optic cables, water, sewer and power are located along the roadway shoulders of the adjacent roads.

A geotechnical investigation was conducted to determine hydraulic conductivity, depth to the seasonal groundwater table and the depth to observed water levels. S&ME personnel conducted seventeen (17) in-situ saturated hydraulic conductivity tests for the proposed Infiltration Basins between October 11 and October 30, 2007. The field test locations were selected by NCDOT and located in the field using a non-survey quality sub-meter Global Positioning System (GPS). The reported elevations were determined by S&ME personnel in the field utilizing survey techniques referencing the bench marks provided by NCDOT. The soil borings/hydraulic conductivity test locations selected by the NCDOT are shown on (Sheets 5, 7-9 and 18-22) at the following stations:

Site	Station	Offset
B-1	-L- 29+92	+/- 97' Right
B-2	-L- 61+90	+/- 0'
B-3	-L- 65+10	+/- 100' Left
B-4	-L- 70+50	+/- 75' Left
B-5	-Y2- 11+25	+/- 78' Left
B-6	-L- 80+61	+/- 98' Right
B-7	-L- 80+80	+/- 82' Left
B-8	-Y2- 19+49	+/- 60' Left
B-9	-Y2- 24+00	+/- 90' Right
B-10	-Y2- 27+41	+/- 156' Right
B-11	-Y2- 27+84	+/- 140' Right
B-12	-Y3- 14+50	+/- 85' Right
B-13	-Y3- 16+80	+/- 82' Right

B-14	-L- 192+00	+/- 78' Right
B-15	-L- 193+99	+/- 89' Left
B-16	-L- 202+29	+/- 93' Left
B-17	-L- 199+00	+/- 110' Left

In-situ saturated hydraulic conductivity (Ksat) measurements were performed with a compact constant head permeameter (cchp). Test locations evaluated were B-1 through B-17. The in-situ hydraulic conductivity measurements were performed in the unsaturated material above the observed water table on the date of field testing. Hand auger borings were conducted and the material was described from the surface down to depths of 21 to 54 inches below the existing surface. The hand auger borings were generally terminated when water was encountered. The seasonal groundwater table was also determined by soil type and groundwater encountered in the hand auger borings. The seasonally high water table ranged from less than 1.0 to 3.8 feet below the surface. See attached soil profile description for each location for seasonally high water table determinations.

#### Test Results

Representative soil samples were tested in S&ME's laboratory to determine the soil index properties and to verify field classification. Eight (8) soil samples from the site were analyzed for grain size distribution (including hydrometer) T88-90 and determination of liquid limit (T89-90), plastic limit and plasticity index in accordance with AASHTO T90-87 and NCDOT modifications to AASHTO T88-90, T89-90 and T90-87. Results of the laboratory tests are presented on the test data sheets in the Appendix.

#### Physiography and Geology

The site is located within the eastern portion of the Coastal Plain Physiographic and Geologic Province of North Carolina in Carteret County. The Coastal Plain Province is typically characterized by marine and eolian sediments that were deposited during the transgressive and regressive depositional sequences. As such, the Coastal Plain Province is characterized by subdued topographic features and flat, low-lying terrain. The geology of the eastern quadrant of Carteret County, near the project site, primarily consists of recent alluvial sediments underlain by Undifferentiated Coastal Plain Deposits and the Yorktown Formation. Typically, the alluvium consists of gray coarse to fine silty sands and highly organic silty sands. These deposits are underlain by the Yorktown Formation of the Middle Tertiary Age. The Yorktown Formation consists of green-gray to gray silty clays and green-gray to gray silty sands with varying amounts of shell material and cemented sands.

#### Materials

The soil test borings were advanced to depths of 1.8 to 4.5 feet below the ground surface at collar elevations ranging from 3.0 to 9.1 feet.

Artificial fill materials were encountered in borings B-1 through B-4 and B-8 through B-13 to depths of about 0.7 to 4.5 feet below the collar elevation. The fill materials encountered in the borings consist of tan and gray silty coarse to fine sand (A-2-4, A-3) with trace of clay and little shell fragments.

Coastal Plain deposits were encountered beneath the fill materials at the ground surface in the remaining borings to depths of 4.5 feet beneath collar elevations. Typically, Coastal Plain deposits encountered consist of gray and tan silty to clayey coarse to fine sand (A-3 and A-2-4) with little shell fragments. A layer of gray clayey sandy silt (A-4) was encountered in boring B-16 from about 1.3 to 3.8 feet below the collar elevation.

Ksat Testing Results

The in-situ saturated hydraulic conductivity values were calculated based on field measurements using the Glover Equation. Saturated hydraulic conductivity measurements ranged from 0.45 to 231.77 gallons per day per square foot (gpd/ft<sup>2</sup>) (Appendix). A detailed soil profile description was performed at each Ksat location to determine the most limiting horizon at which the test should be performed.

Table 1 below summarizes hydraulic conductivity measurements for each location, including the location, and depth.

**Table 1: Hydraulic Conductivity Measurements**

Test Location	Depth (Feet)	Hydraulic Conductivity	
		gpd/ft <sup>2</sup>	in/hour
B-1	2.0	231.77	15.49
B-2	1.3	3.74	0.25
B-3	2.0	1.20	0.08
B-4	0.6	43.20	2.89
B-5	0.9	69.83	4.67
B-6	1.0	20.95	1.40
B-7	1.0	2.69	0.18
B-8	0.7	76.58	5.12
B-9	0.8	120.34	8.04
B-10	1.0	40.11	2.68
B-11	1.0	36.66	2.45
B-12	1.0	0.45	0.03
B-13	2.9	6.23	0.42
B-14	1.0	2.99	0.20
B-15	1.3	6.55	0.44
B-16	1.3	4.60	0.31
B-17	1.0	10.22	0.68

Groundwater

Groundwater depths were measured at the time of drilling operations for all of the borings. Groundwater depths ranging from about 1.3 to greater than 4.5 feet beneath the collar elevation were measured in the borings. Based on the hand auger borings and observation of soil mottling in near surface soils, the seasonal high water table was estimated at depths ranging from less than 1 to 3.5 feet.

Table 2 below summarizes the location, ground surface elevation, seasonal high ground water and measured water levels at the time of boring completion for each location.

**Table 2: Season High Water Ground Water Estimates**

Location	Elevation Ground Surface (feet)	Depths to Seasonal High Ground Water (feet)	Water Levels Depth (Feet)	Date 2007
B-1	8.0	3.5	>4.5	10-12-07
B-2	4.9	1.8	2.5	10-12-07
B-3	6.1	2.8	>4.5	10-12-07
B-4	3.0	1.3	1.3	10-12-07
B-5	5.2	1.8	2.8	10-18-07
B-6	4.6	<1.0	2.5	10-18-07
B-7	4.5	<1.0	2.5	10-18-07
B-8	3.4	<1.0	1.8	10-18-07
B-9	3.2	<1.0	1.8	10-18-07
B-10	3.4	<1.0	2.3	10-12-07
B-11	2.9	<1.0	2.1	10-12-07
B-12	6.7	<1.0	2.7	10-12-07
B-13	9.0	2.4	4.2	10-19-07
B-14	8.3	<1.0	3.3	10-19-07
B-15	9.1	<1.0	2.8	10-11-07
B-16	8.0	1.3	2.5	10-11-07
B-17	8.9	<1.0	1.8	10-30-07

Qualifications of Report


This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The findings contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, expressed or implied, is made.


The findings submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of subsurface variations between the borings may not become evident until construction. If variations appear evident, then the findings contained in this report may need to be re-evaluated. In the event that any changes in the nature, design, or location of the structure are planned, the findings contained in this report will not be considered valid unless the changes are reviewed by S&ME, and the findings of the report are modified or verified in writing.

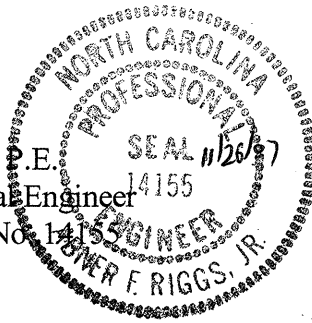
S&ME appreciates the opportunity to be your geotechnical consultant on this project. If you have any questions or need additional information in regard to this report, please contact us.

Very truly yours,

**S&ME, Inc.**

  
John R. Davis, LSS  
Project Manager

  
Abner F. Riggs, Jr. P.E.  
Senior Geotechnical Engineer  
N.C. Registration No. 14155



Attachments

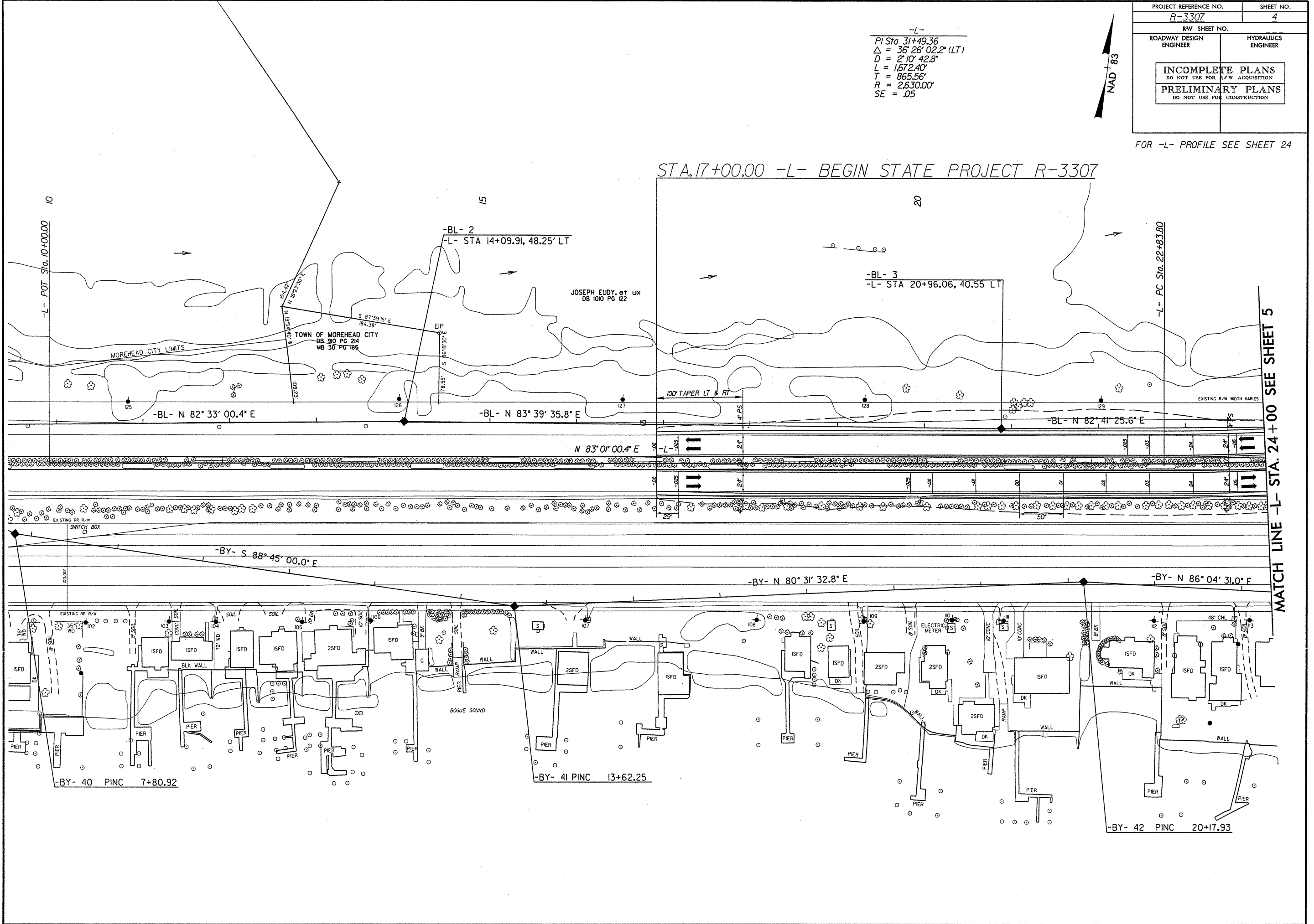
PROJECT REFERENCE NO. <b>R-3307</b>	SHEET NO. <b>4</b>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

-L-  
 PI Sta 31+49.36  
 $\Delta = 36^{\circ} 26' 02.2" (LT)$   
 $D = 2^{\circ} 10' 42.8"$   
 $L = 1672.40'$   
 $T = 865.56'$   
 $R = 2630.00'$   
 $SE = .05$



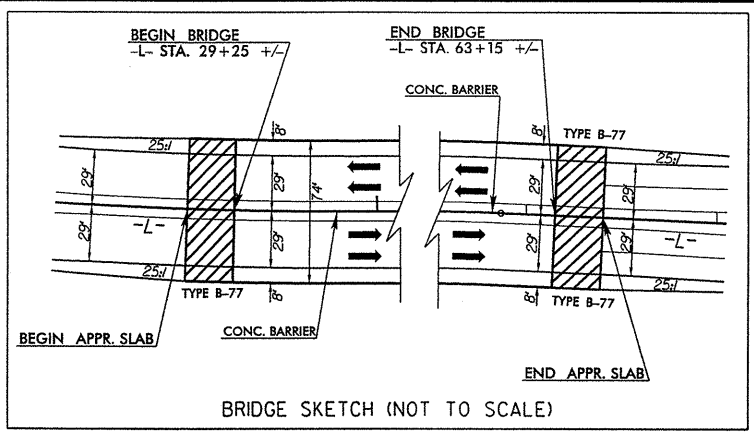
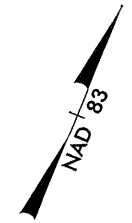
FOR -L- PROFILE SEE SHEET 24

STA. 17+00.00 -L- BEGIN STATE PROJECT R-3307



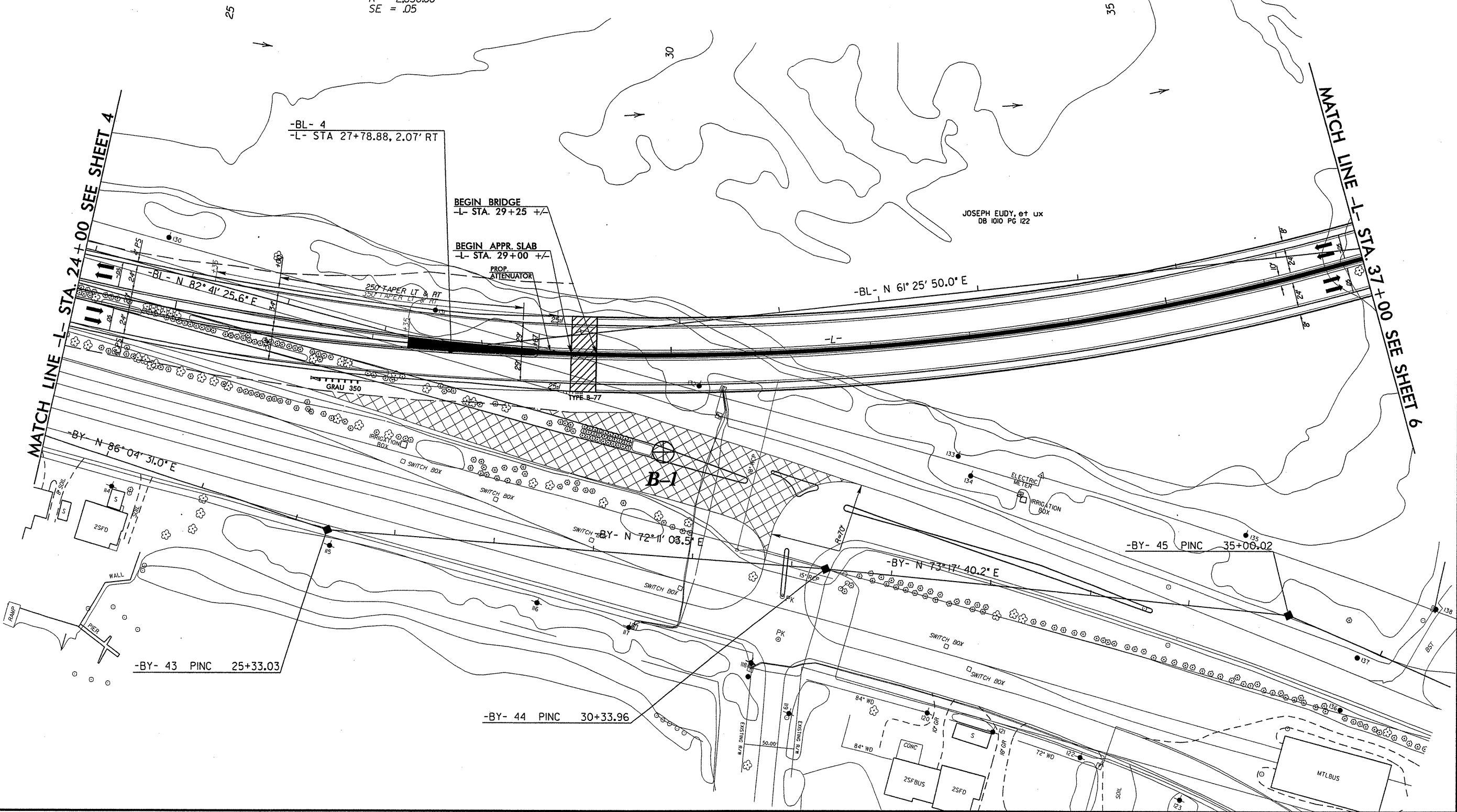
MATCH LINE -L- STA. 24+00 SEE SHEET 5

PROJECT REFERENCE NO. R-3307	SHEET NO. 5
RW SHEET NO.	
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	



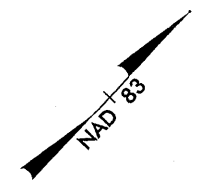
FOR -L- PROFILE SEE SHEET 24

-L-  
 PI Sta 31+49.36  
 $\Delta = 36^\circ 26' 02.2''$  (LT)  
 $D = 2^\circ 10' 42.8''$   
 $L = 1672.40'$   
 $T = 865.56'$   
 $R = 2630.00'$   
 $SE = .05$



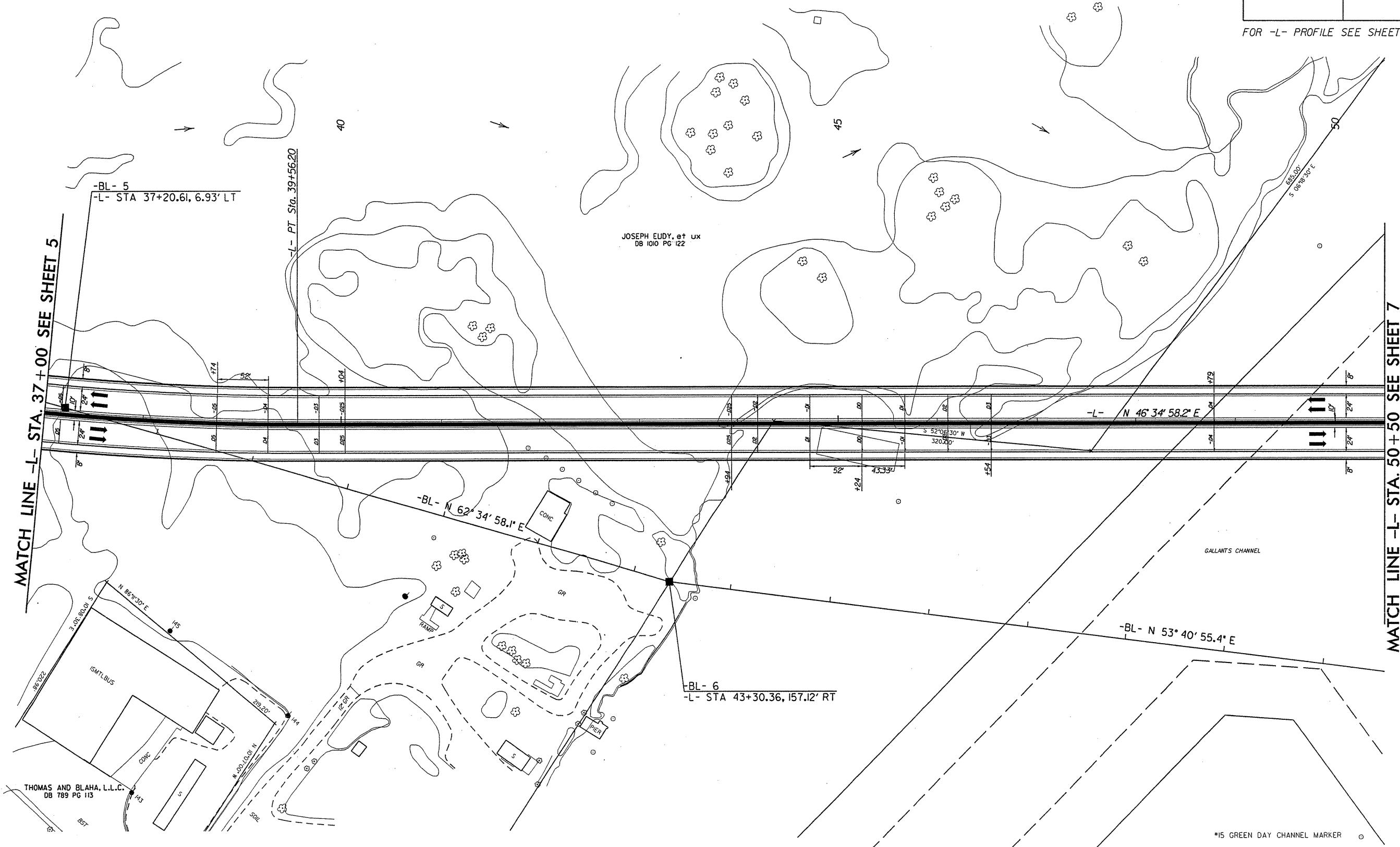


PROJECT REFERENCE NO. R-3307		SHEET NO. 6	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION			



FOR -L- PROFILE SEE SHEET 25

-L-  
 PI Sta 31+49.36  
 $\Delta = 36^{\circ} 26' 02.2''$  (LT)  
 $D = 2^{\circ} 10' 42.8''$   
 $L = 1672.40'$   
 $T = 865.56'$   
 $R = 2630.00'$   
 $SE = .05$



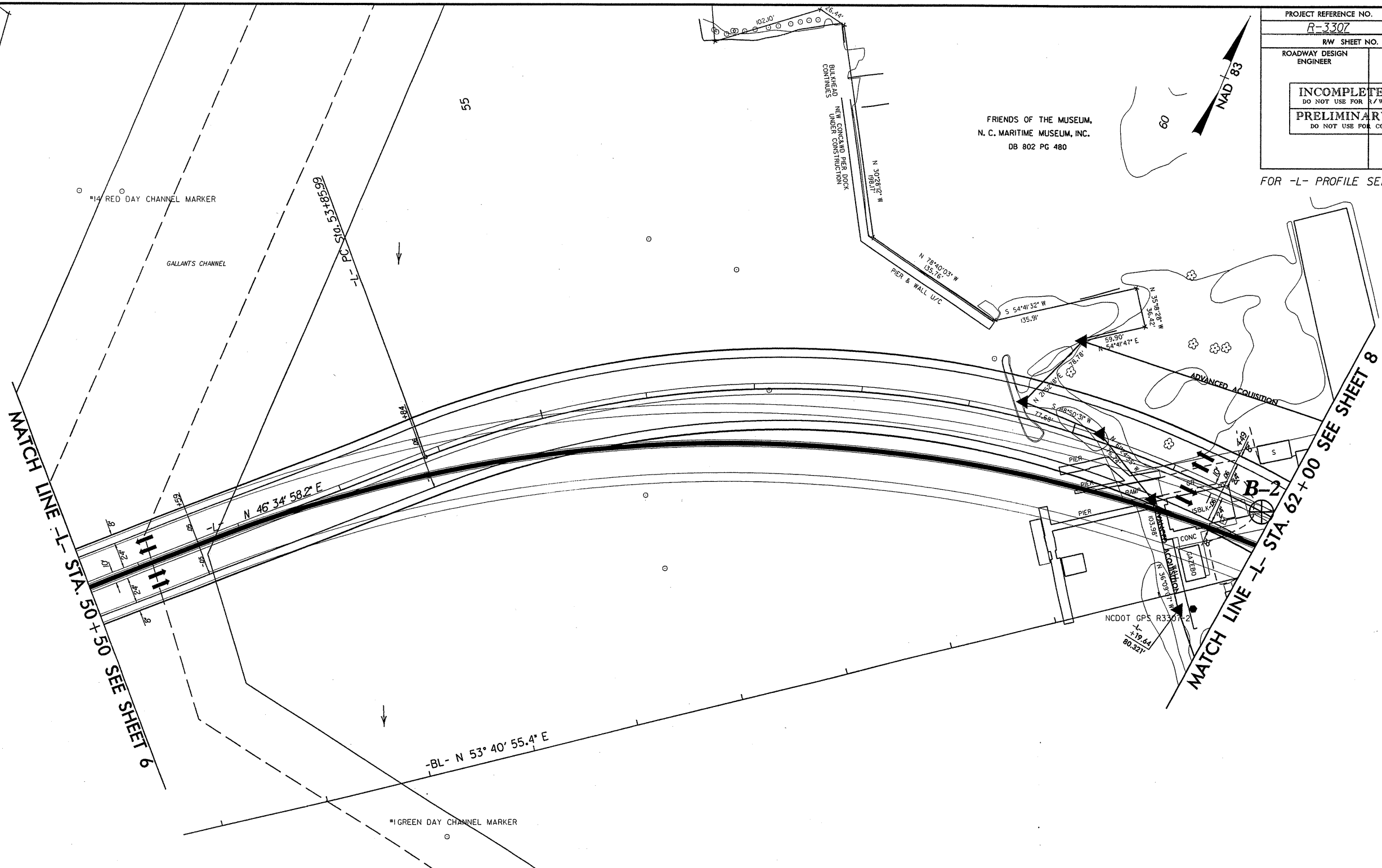
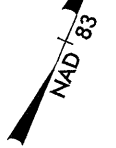
MATCH LINE -L- STA. 37+00 SEE SHEET 5

MATCH LINE -L- STA. 50+50 SEE SHEET 7

PROJECT REFERENCE NO. R-3307		SHEET NO. 7	
RW SHEET NO.			
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			

FOR -L- PROFILE SEE SHEET 26

FRIENDS OF THE MUSEUM,  
N. C. MARITIME MUSEUM, INC.  
DB 802 PG 480



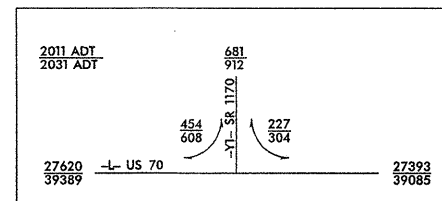
MATCH LINE -L- STA. 50+50 SEE SHEET 6

MATCH LINE -L- STA. 62+00 SEE SHEET 8

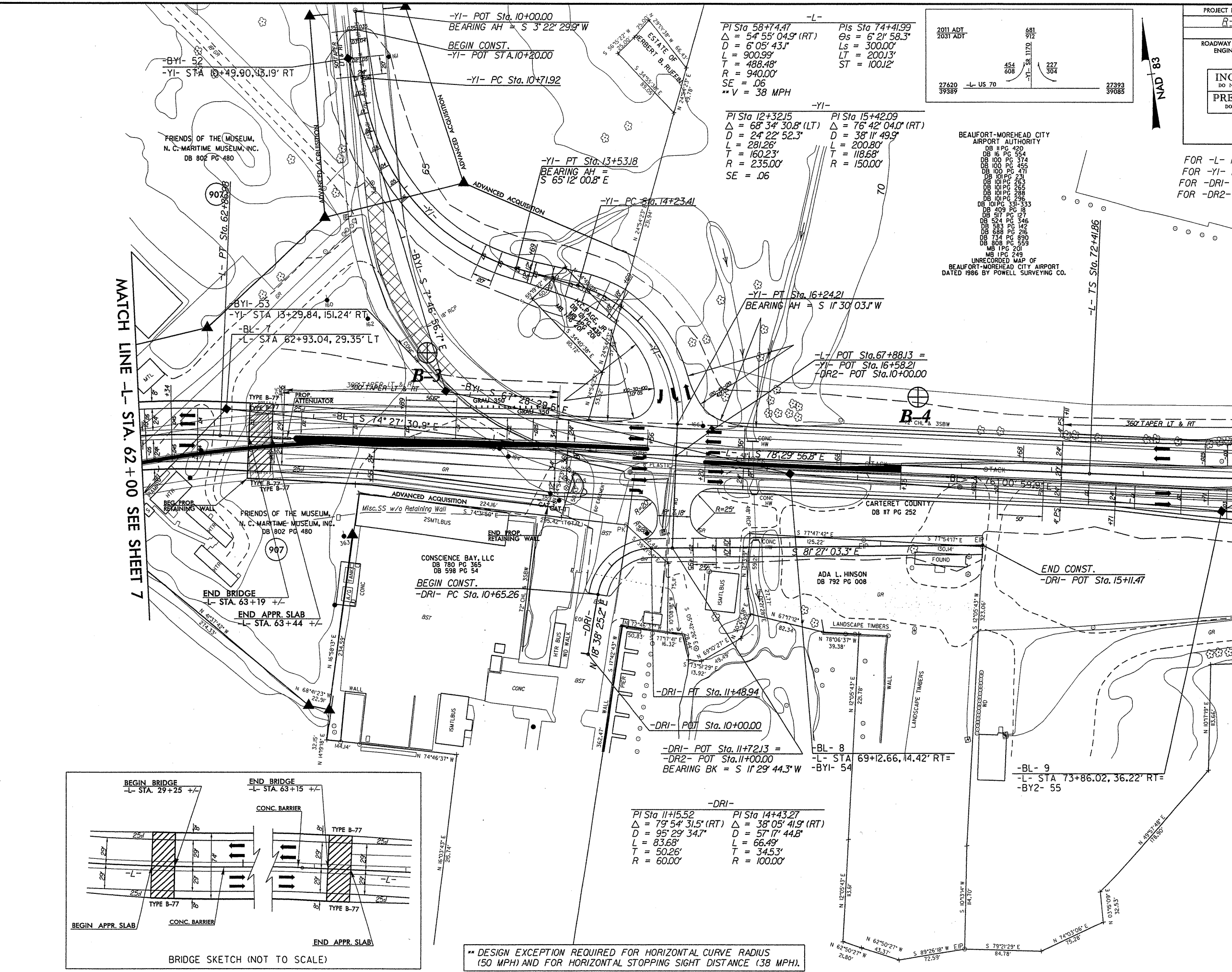
-L-  
 PI Sta 58+74.47  
 $\Delta = 54^\circ 55' 04.9''$  (RT)  
 $D = 6' 05'' 43.1''$   
 $L = 900.99'$   
 $T = 488.48'$   
 $R = 940.00'$   
 $SE = .06$   
 $V = 38$  MPH

\*\* DESIGN EXCEPTION REQUIRED FOR HORIZONTAL CURVE RADIUS (50 MPH) AND FOR HORIZONTAL STOPPING SIGHT DISTANCE (38 MPH).

PROJECT REFERENCE NO.	SHEET NO.
R-3307	8
RW SHEET NO.	
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	



FOR -L- PROFILE SEE SHEET 27  
 FOR -YI- PROFILE SEE SHEET 33  
 FOR -DRI- PROFILE SEE SHEET 36  
 FOR -DR2- PROFILE SEE SHEET 36



MATCH LINE -L- STA. 62+00 SEE SHEET 7

MATCH LINE -L- STA. 74+00 SEE SHEET 9

-L-  
 PI Sta 58+74.47  
 $\Delta = 54^{\circ} 55' 04.9''$  (RT)  
 $D = 6' 05' 43.1''$   
 $L = 900.99'$   
 $T = 488.48'$   
 $R = 940.00'$   
 $SE = .06$   
 $**V = 38$  MPH

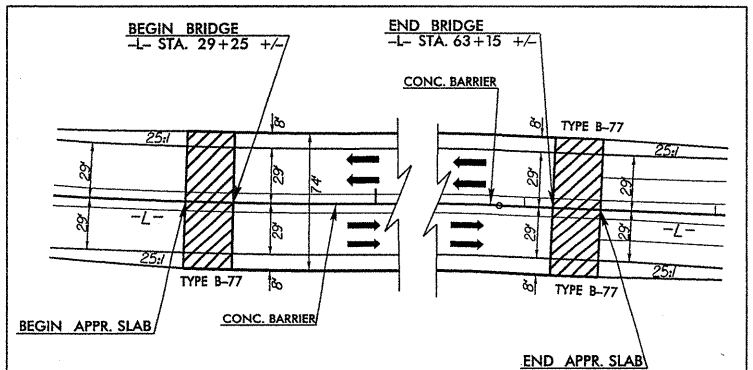
-YI-  
 PI Sta 12+32.15  
 $\Delta = 68^{\circ} 34' 30.8''$  (LT)  
 $D = 24' 22' 52.3''$   
 $L = 281.26'$   
 $T = 160.23'$   
 $R = 235.00'$   
 $SE = .06$

-YI-  
 PI Sta 15+42.09  
 $\Delta = 76^{\circ} 42' 04.0''$  (RT)  
 $D = 38' 11' 49.9''$   
 $L = 200.80'$   
 $T = 118.68'$   
 $R = 150.00'$

BEAUFORT-MOREHEAD CITY AIRPORT AUTHORITY  
 DB 1 PG 420  
 DB 16 PG 554  
 DB 100 PG 374  
 DB 100 PG 459  
 DB 100 PG 459  
 DB 101 PG 231  
 DB 101 PG 265  
 DB 101 PG 288  
 DB 101 PG 291  
 DB 101 PG 331-333  
 DB 409 PG 18  
 DB 517 PG 124  
 DB 524 PG 346  
 DB 583 PG 142  
 DB 688 PG 216  
 DB 714 PG 890  
 DB 808 PG 559  
 MB 1 PG 201  
 MB 1 PG 249  
 UNRECORDED MAP OF BEAUFORT-MOREHEAD CITY AIRPORT DATED 1986 BY POWELL SURVEYING CO.

-DRI-  
 PI Sta 11+15.52  
 $\Delta = 79^{\circ} 54' 31.5''$  (RT)  
 $D = 95' 29' 34.7''$   
 $L = 83.68'$   
 $T = 50.26'$   
 $R = 60.00'$

-DRI-  
 PI Sta 14+43.27  
 $\Delta = 38^{\circ} 05' 41.9''$  (RT)  
 $D = 57' 17' 44.8''$   
 $L = 66.49'$   
 $T = 34.53'$   
 $R = 100.00'$



\*\* DESIGN EXCEPTION REQUIRED FOR HORIZONTAL CURVE RADIUS (50 MPH) AND FOR HORIZONTAL STOPPING SIGHT DISTANCE (38 MPH).

★ PROPOSED SIGNAL

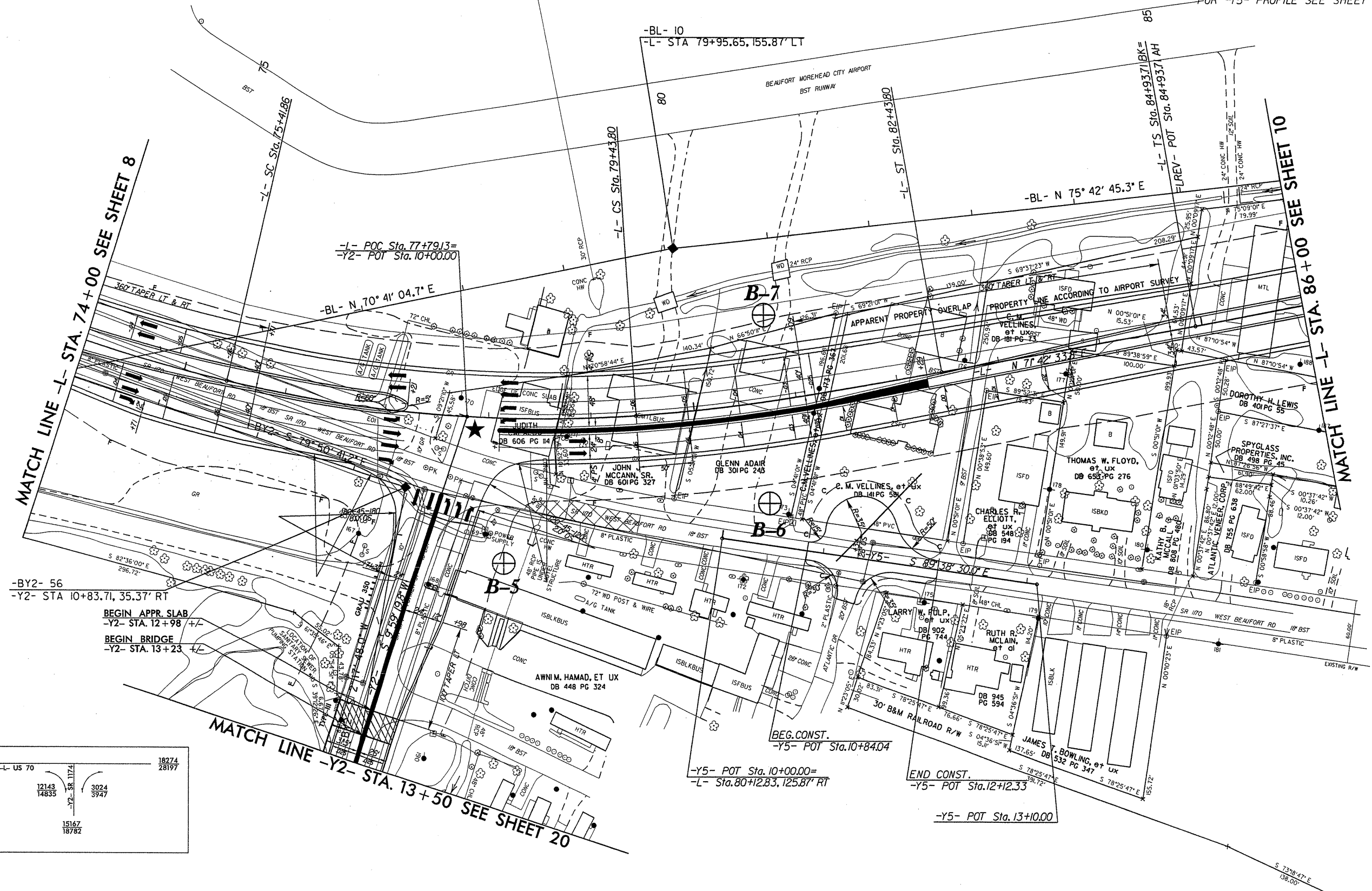
PROJECT REFERENCE NO. R-3307	SHEET NO. 9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

-L-

Pls Sta 74+41.99 θs = 6° 21' 58.3" Ls = 300.00' LT = 200.13' ST = 100.12'	PI Sta 77+44.33 Δ = 17° 03' 32.8" (LT) D = 414' 38.9" L = 401.95' T = 202.47' R = 1,350.00' SE = .06	Pls Sta 80+43.92 θs = 6° 21' 58.3" Ls = 300.00' LT = 200.13' ST = 100.12'	Pls Sta 86+60.40 θs = 2° 42' 09.5" Ls = 250.00' LT = 166.69' ST = 83.35'
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FOR -L- PROFILE SEE SHEET 27  
 FOR -LREV- PROFILE SEE SHEET 27  
 FOR -Y2- PROFILE SEE SHEET 33  
 FOR -Y5- PROFILE SEE SHEET 35

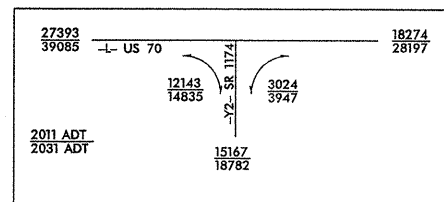


MATCH LINE -L- STA. 74+00 SEE SHEET 8

MATCH LINE -L- STA. 86+00 SEE SHEET 10

-BY2- 56  
 -Y2- STA 10+83.71, 35.37' RT  
 BEGIN APPR. SLAB  
 -Y2- STA. 12+98 +/-  
 BEGIN BRIDGE  
 -Y2- STA. 13+23 +/-

MATCH LINE -Y2- STA. 13+50 SEE SHEET 20



-Y5- POT Sta. 10+00.00=  
 -L- Sta. 80+12.83, 125.87' RT

END CONST.  
 -Y5- POT Sta. 12+12.33

-Y5- POT Sta. 13+10.00

~~-L-~~

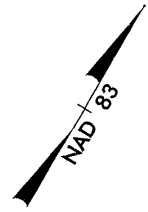
Pls Sta 86+60.40	Rl Sta 92+95.72	Pls Sta 99+15.51
$\Theta s = 2' 42' 09.5''$	$\Delta = 23' 32' 00.0''$ (LT)	$\Theta s = 2' 42' 09.5''$
$Ls = 250.00'$	$D = 2' 09' 43.6''$	$Ls = 250.00'$
$LT = 166.69'$	$L = 1088.45'$	$LT = 166.69'$
$ST = 83.35'$	$T = 552.01'$	$ST = 83.35'$
	$R = 2650.00'$	
	$SE = .05$	

~~-LREV-~~

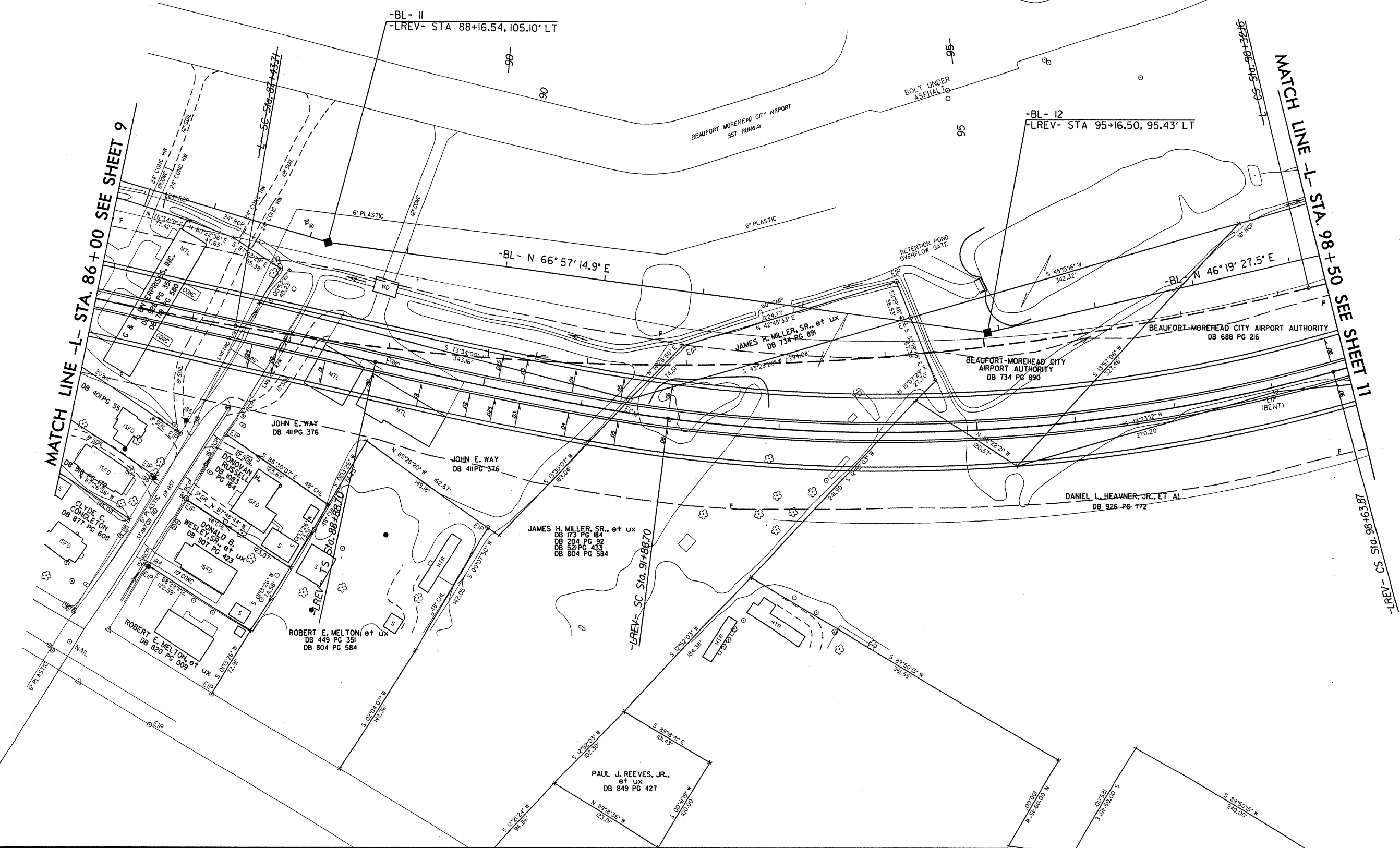
Pls Sta 90+88.79	Pls Sta 95+30.80	Pls Sta 99+63.95
$\Theta s = 5' 03' 19.8''$	$\Delta = 22' 45' 19.9''$ (LT)	$\Theta s = 5' 03' 19.8''$
$Ls = 300.00'$	$D = 3' 22' 13.2''$	$Ls = 300.00'$
$LT = 200.08'$	$L = 675.17'$	$LT = 200.08'$
$ST = 100.07'$	$T = 342.09'$	$ST = 100.07'$
	$R = 1700.00'$	
	$SE = .06$	

BEAUFORT-MOREHEAD CITY  
AIRPORT AUTHORITY  
DB 11 PG 420  
DB 16 PG 554  
DB 100 PG 374  
DB 100 PG 455  
DB 100 PG 471  
DB 101 PG 231  
DB 101 PG 263  
DB 101 PG 265  
DB 101 PG 288  
DB 101 PG 296  
DB 101 PG 331-333  
DB 409 PG 18  
DB 517 PG 127  
DB 524 PG 345  
DB 583 PG 142  
DB 688 PG 216  
DB 734 PG 890  
DB 808 PG 559  
MB 1 PG 201  
MB 1 PG 249  
UNRECORDED MAP OF  
BEAUFORT-MOREHEAD CITY AIRPORT  
DATED 1986 BY POWELL SURVEYING CO.

PROJECT REFERENCE NO. R-3307	SHEET NO. 10
RW SHEET NO.	
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	



FOR -LREV- PROFILE SEE SHEET 28



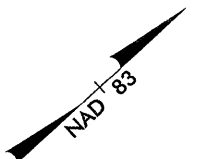
~~-L-~~  
~~Pls Sta 99+15.81~~  
 ~~$\theta_s = 2^\circ 42' 09.5''$~~   
~~Ls = 280.00'~~  
~~LT = 166.69'~~  
~~ST = 83.35'~~

~~-LREV-~~  
~~Pls Sta 99+63.95~~  
 ~~$\theta_s = 5^\circ 03' 19.8''$~~   
~~Ls = 300.00'~~  
~~LT = 200.08'~~  
~~ST = 100.07'~~

~~-L-~~  
~~Pls Sta 112+19.96~~  
 ~~$\theta_s = 4^\circ 38' 44.2''$~~   
~~Ls = 300.00'~~  
~~LT = 200.07'~~  
~~ST = 100.06'~~

~~-LREV-~~  
~~Pls Sta 111+38.35~~  
 ~~$\theta_s = 4^\circ 38' 44.2''$~~   
~~Ls = 300.00'~~  
~~LT = 200.07'~~  
~~ST = 100.06'~~

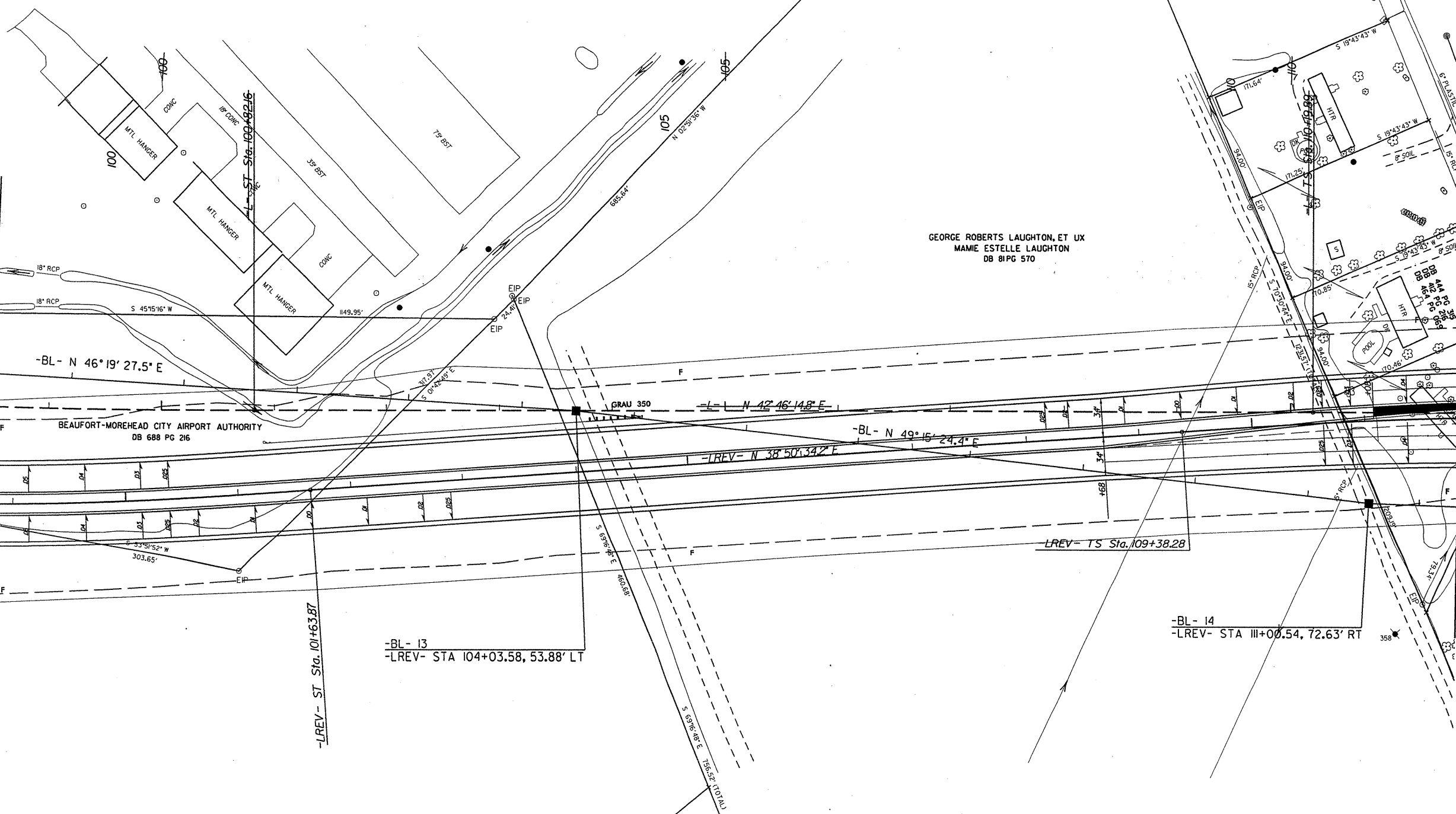
PROJECT REFERENCE NO.	SHEET NO.
R-3307	11
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	



FOR -LREV- PROFILE SEE SHEET 28

MATCH LINE -L- STA. 98+50 SEE SHEET 10

MATCH LINE -L- STA. 111+50 SEE SHEET 12



-BL- N 46°19' 27.5" E

BEAUFORT-MOREHEAD CITY AIRPORT AUTHORITY  
DB 688 PG 216

GEORGE ROBERTS LAUGHTON, ET UX  
MAMIE ESTELLE LAUGHTON  
DB 81PG 570

-L- N 42°46' 14.8" E

-BL- N 49°15' 24.4" E

-LREV- N 38°50' 34.2" E

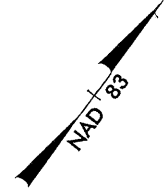
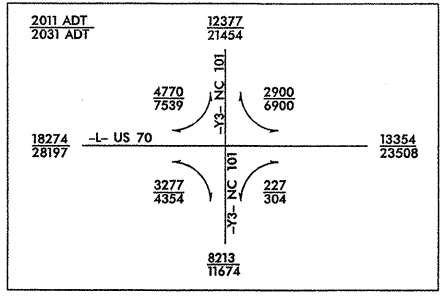
LREV- TS Sta. 109+38.28

-BL- 13  
-LREV- STA 104+03.58, 53.88' LT

-BL- 14  
-LREV- STA 111+00.54, 72.63' RT

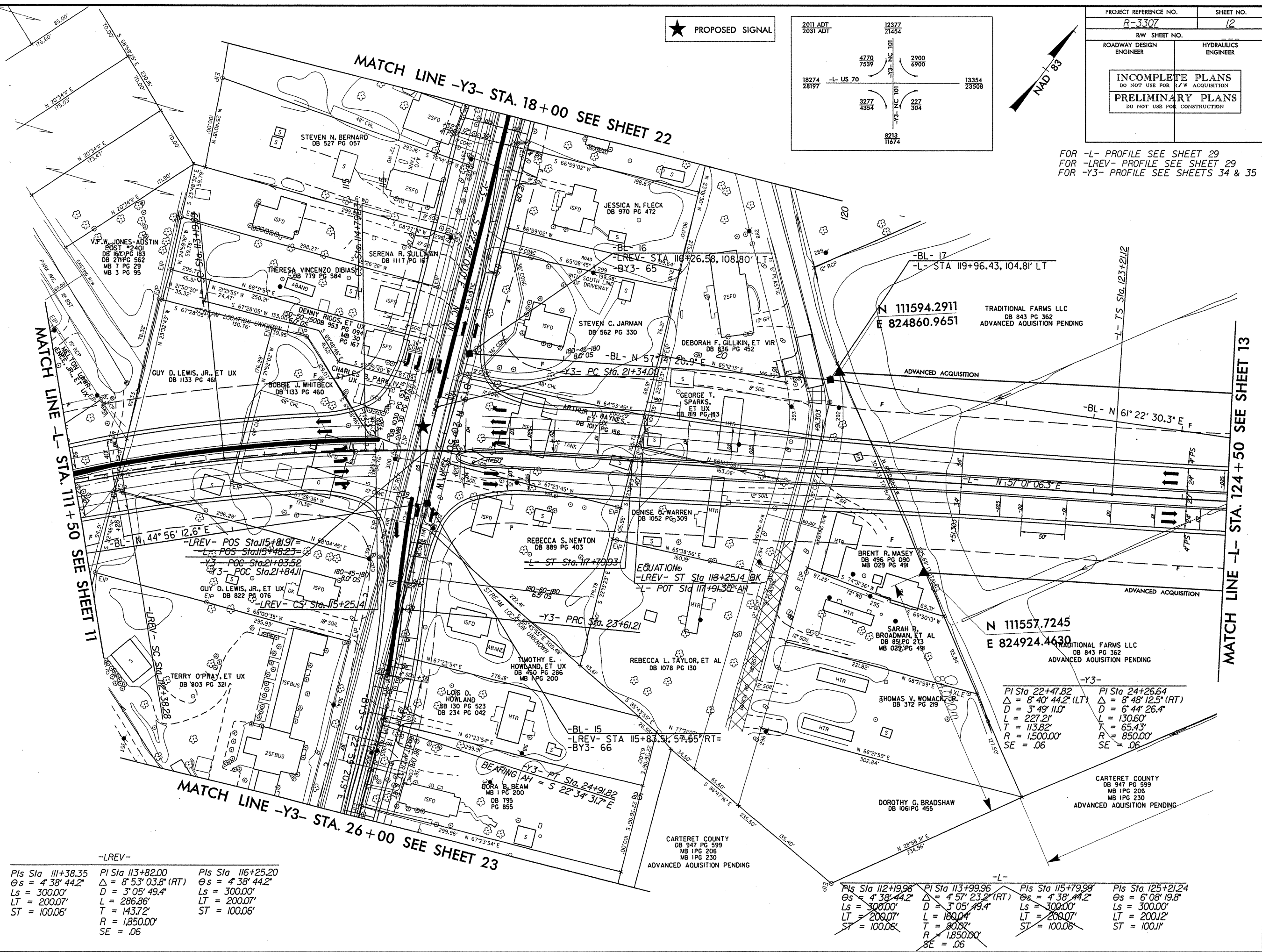
-LREV- ST Sta. 101+63.87

★ PROPOSED SIGNAL



PROJECT REFERENCE NO. R-3307		SHEET NO. 12	
RW SHEET NO.			
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			

FOR -L- PROFILE SEE SHEET 29  
FOR -LREV- PROFILE SEE SHEET 29  
FOR -Y3- PROFILE SEE SHEETS 34 & 35



-LREV-

PIs Sta 111+38.35 θs = 4° 38' 44.2" Ls = 300.00' LT = 200.07' ST = 100.06'	PI Sta 113+82.00 Δ = 8° 53' 03.8" (RT) D = 3° 05' 49.4" L = 286.86' T = 143.72' R = 1,850.00' SE = .06	PIs Sta 116+25.20 θs = 4° 38' 44.2" Ls = 300.00' LT = 200.07' ST = 100.06'
--	--	--

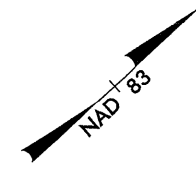
-Y3-

PI Sta 22+47.82 Δ = 8° 40' 44.2" (LT) D = 3° 49' 11.0" L = 227.21' T = 113.82' R = 1,500.00' SE = .06	PI Sta 24+26.64 Δ = 8° 48' 12.5" (RT) D = 6° 44' 26.4" L = 130.60' T = 65.43' R = 850.00' SE = .06
---	--

-L-

PIs Sta 112+19.96 θs = 4° 38' 44.2" Ls = 300.00' LT = 200.07' ST = 100.06'	PI Sta 113+99.96 Δ = 4° 57' 23.2" (RT) D = 3° 05' 49.4" L = 160.04' T = 80.02' R = 1,850.00' SE = .06	PIs Sta 115+79.98 θs = 4° 38' 44.2" Ls = 300.00' LT = 200.07' ST = 100.06'	PIs Sta 125+21.24 θs = 6° 08' 19.8" Ls = 300.00' LT = 200.12' ST = 100.11'
--	---	--	--

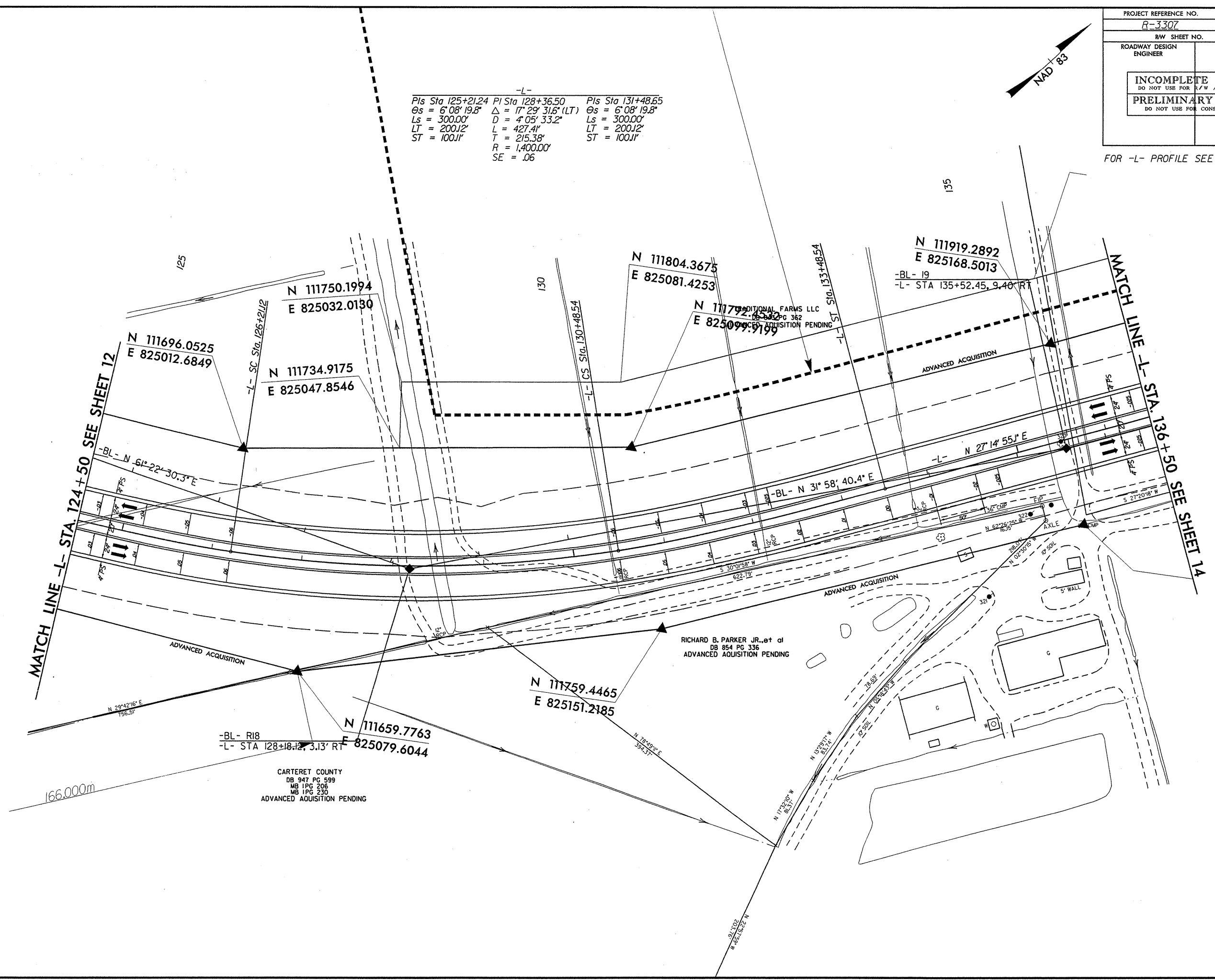
PROJECT REFERENCE NO.		SHEET NO.	
R-3307		13	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION			
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION			



-L-

Pls Sta 125+21.24	PI Sta 128+36.50	Pls Sta 131+48.65
$\Theta_s = 6'08''19.8''$	$\Delta = 17'29''31.6''(LT)$	$\Theta_s = 6'08''19.8''$
$L_s = 300.00'$	$D = 4'05''33.2''$	$L_s = 300.00'$
$LT = 200.12'$	$L = 427.41'$	$LT = 200.12'$
$ST = 100.11'$	$T = 215.38'$	$ST = 100.11'$
	$R = 1,400.00'$	
	$SE = .06$	

FOR -L- PROFILE SEE SHEET 29



MATCH LINE -L- STA. 124+50 SEE SHEET 12

MATCH LINE -L- STA. 136+50 SEE SHEET 14

166,000m

-BL- R18  
-L- STA 128+18.12, 3.13' RT

CARTERET COUNTY  
DB 947 PG 599  
MB 1PG 206  
MB 1PG 230  
ADVANCED ACQUISITION PENDING

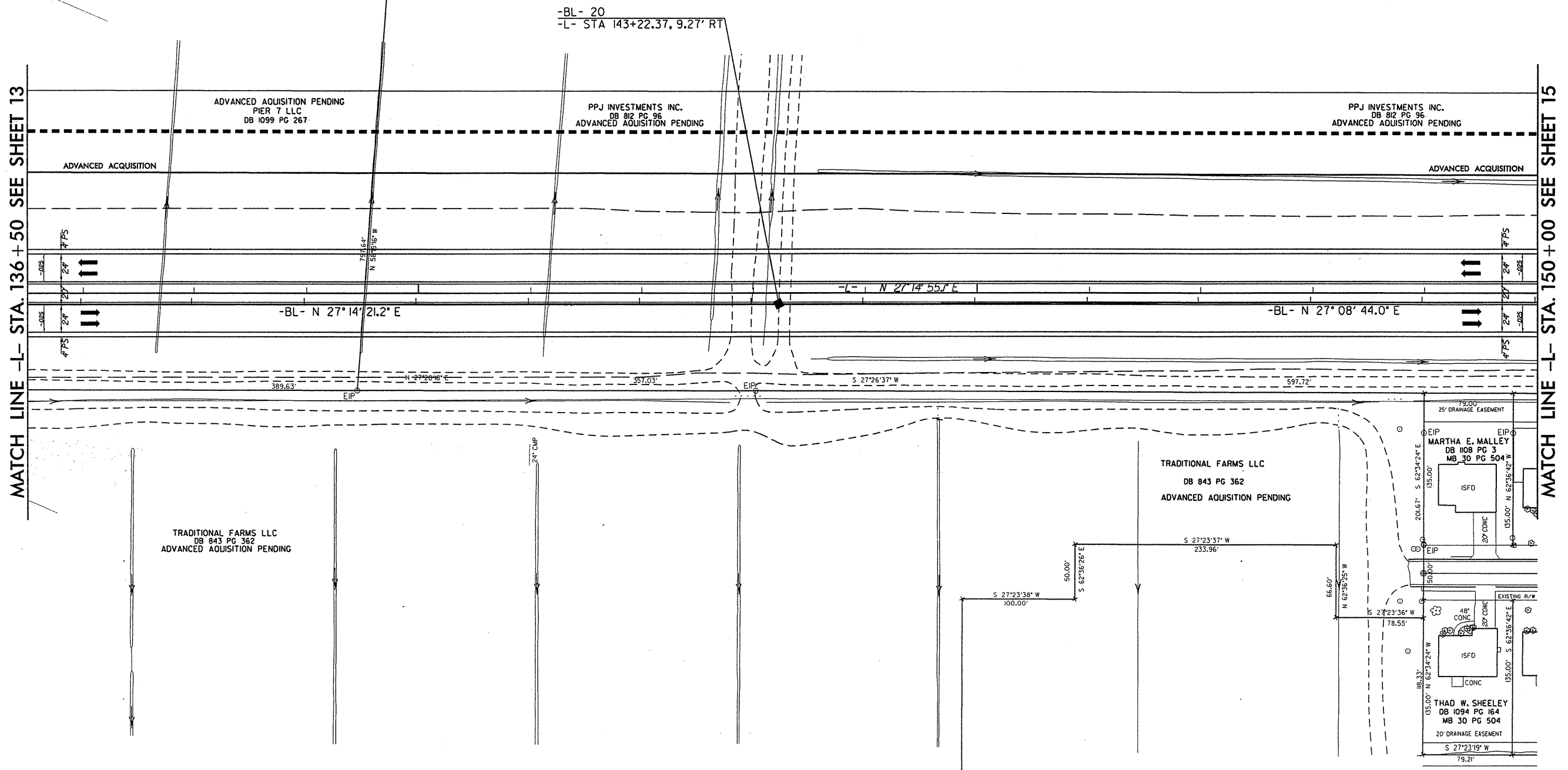
RICHARD B. PARKER JR., et al  
DB 854 PG 336  
ADVANCED ACQUISITION PENDING



PROJECT REFERENCE NO. R-3307		SHEET NO. 14	
RW SHEET NO.			
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			



FOR -L- PROFILE SEE SHEET 30



PROJECT REFERENCE NO.		SHEET NO.	
R-3307		15	
RW SHEET NO.			
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			

FOR -L- PROFILE SEE SHEET 30

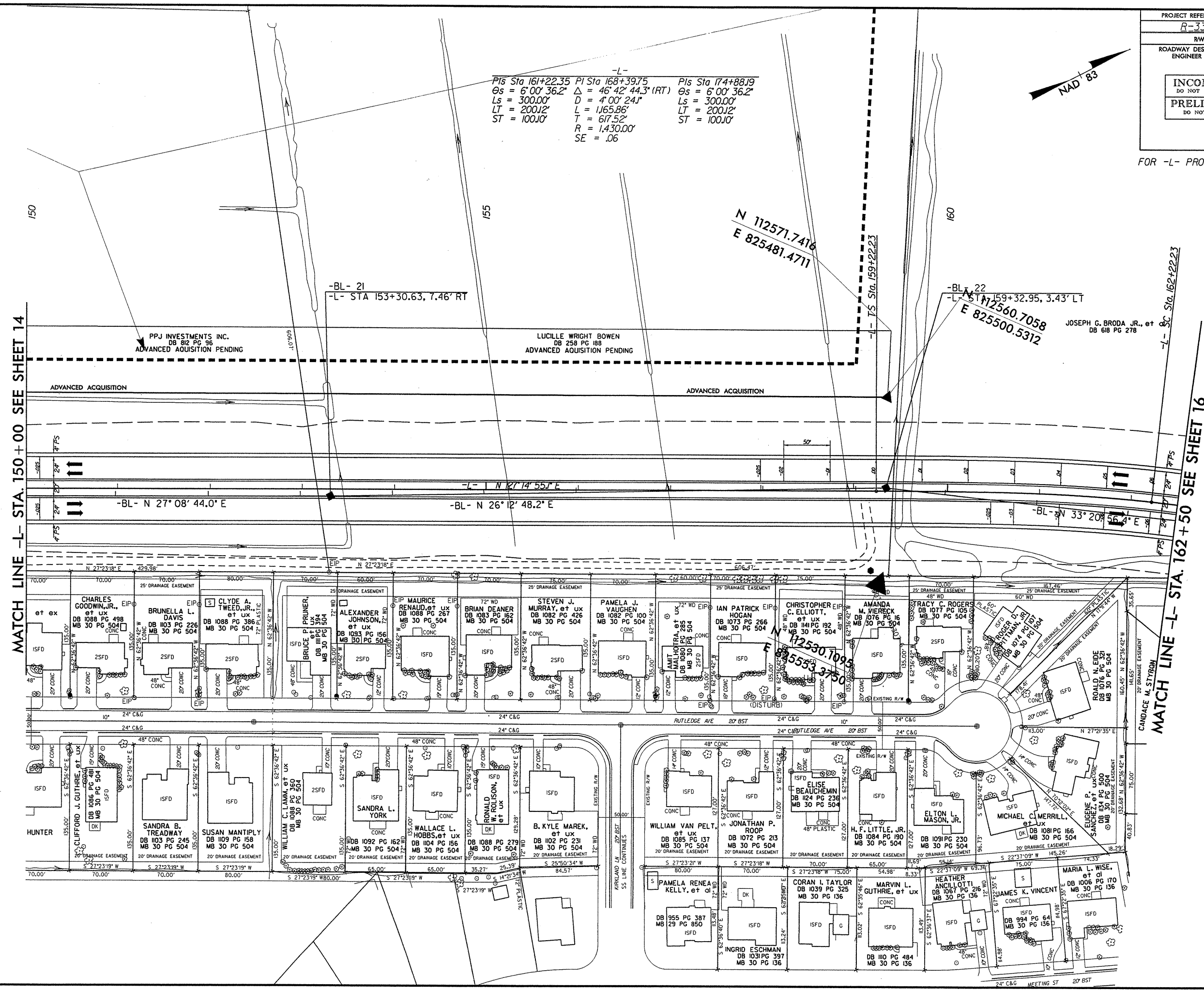
-L-

Pis Sta 161+22.35	PI Sta 168+39.75	Pis Sta 174+88.19
Os = 6'00'36.2"	Δ = 46'42'44.3" (RT)	Os = 6'00'36.2"
Ls = 300.00'	D = 4'00'24.1"	Ls = 300.00'
LT = 200.12'	L = 1,165.86'	LT = 200.12'
ST = 100.10'	T = 617.52'	ST = 100.10'
	R = 1,430.00'	
	SE = .06	



MATCH LINE -L- STA. 150 + 00 SEE SHEET 14

MATCH LINE -L- STA. 162 + 50 SEE SHEET 16



150

155

160

N 112571.7416  
E 825481.4711

-BL- 22  
-L- STA 159+32.95, 3.43' LT  
E 825500.5312

JOSEPH G. BRODA JR., et al  
DB 618 PG 278

-L- STA 162+22.23

-BL- 21  
-L- STA 153+30.63, 7.46' RT

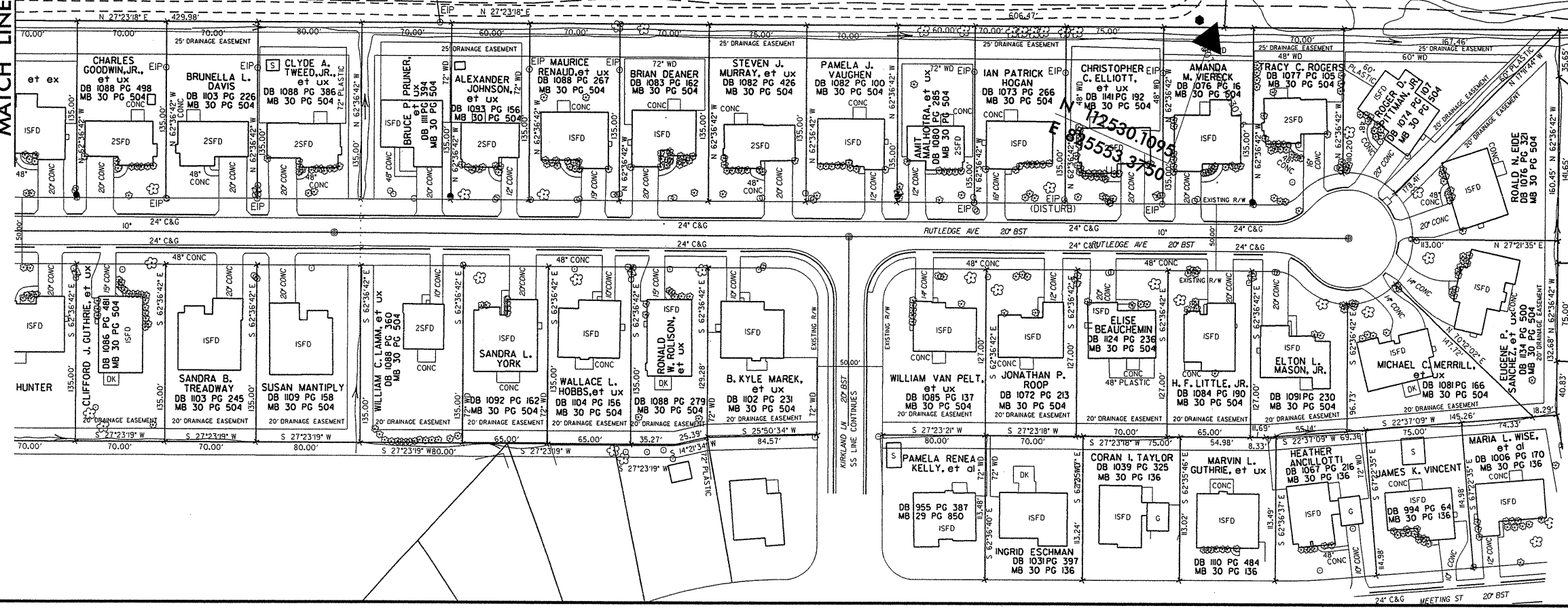
PPJ INVESTMENTS INC.  
DB 812 PG 96  
ADVANCED ACQUISITION PENDING

LUCILLE WRIGHT BOWEN  
DB 258 PG 188  
ADVANCED ACQUISITION PENDING

-BL- N 27° 08' 44.0" E

-BL- N 26° 12' 48.2" E

-BL- N 33° 20' 56.4" E



HUNTER

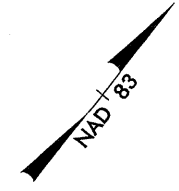
CANDACE M. STYRON

N 12530.1095  
E 82553.3750

MIRKLAND W 20' BST  
SS LINE CONTINUES

24' C&G MEETING ST 20' BST

PROJECT REFERENCE NO.		SHEET NO.	
R-3307		16	
RW SHEET NO.			
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			

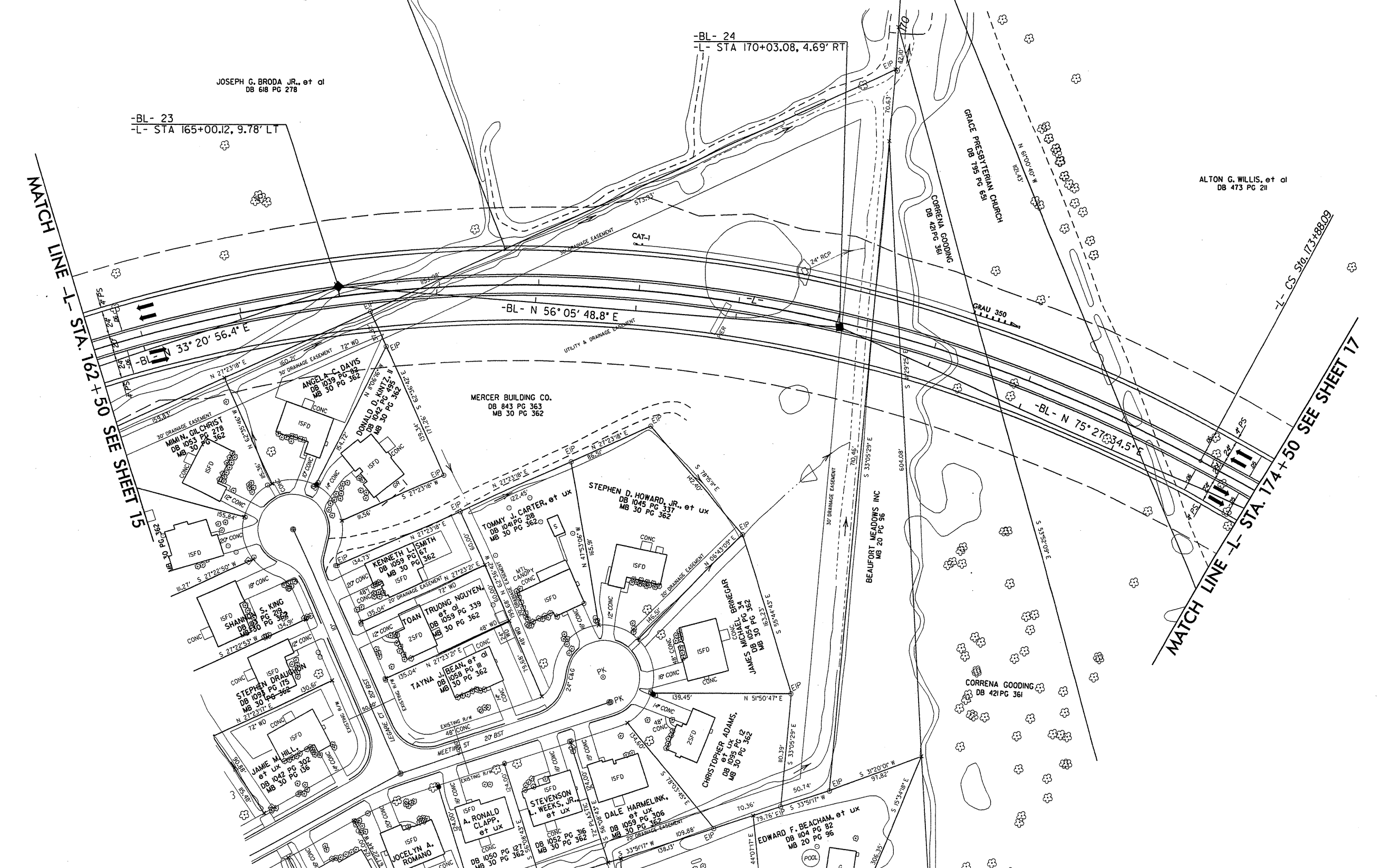


-L-

Pls Sta 161+22.35	PI Sta 168+39.75	Pls Sta 174+88.19
Os = 6' 00" 36.2"	Δ = 46' 42" 44.3" (RT)	Os = 6' 00" 36.2"
Ls = 300.00'	D = 4' 00" 24.1"	Ls = 300.00'
LT = 200.12'	L = 1165.86'	LT = 200.12'
ST = 100.10'	T = 617.52'	ST = 100.10'
	R = 1,430.00'	
	SE = .06	

J. BRINSON WEBB, JR. et al  
DB 862 PG 697

FOR -L- PROFILE SEE SHEET 31



MATCH LINE -L- STA. 162+50 SEE SHEET 15

MATCH LINE -L- STA. 174+50 SEE SHEET 17

-BL- 23  
-L- STA 165+00.12, 9.78' LT

-BL- 24  
-L- STA 170+03.08, 4.69' RT

-BL- N 56° 05' 48.8" E

-BL- N 75° 27' 34.5" E

JOSEPH G. BRODA JR., et al  
DB 618 PG 278

ALTON G. WILLIS, et al  
DB 473 PG 211

MERCER BUILDING CO.  
DB 843 PG 363  
MB 30 PG 362

STEPHEN D. HOWARD, JR. et ux  
DB 1045 PG 331  
MB 30 PG 362

MINNIE GIL CHRIST  
DB 1053 PG 278  
MB 30 PG 362

ANGELA C. DAVIS  
DB 1039 PG 324  
MB 30 PG 362

TOAN TRUONG NGUYEN  
et ux  
DB 1059 PG 339  
MB 30 PG 362

TAYNA J. BEAN, et ux  
DB 1058 PG 338  
MB 30 PG 362

TOMMY J. CARTER, et ux  
DB 804 PG 218  
MB 30 PG 362

KENNETH L. SMITH  
et ux  
DB 1059 PG 339  
MB 30 PG 362

JAMES MICHAEL BRINSON  
et ux  
DB 1054 PG 362  
MB 30 PG 362

SHANNON S. KING  
et ux  
DB 1054 PG 362  
MB 30 PG 362

STEPHEN DRALON  
et ux  
DB 1091 PG 175  
MB 30 PG 362

JAMIE M. HILL  
et ux  
DB 1042 PG 156  
MB 30 PG 362

STEVENSON L. WEEKS, JR.  
et ux  
DB 1052 PG 362  
MB 30 PG 362

DALE HARMELINK,  
et ux  
DB 1059 PG 306  
MB 30 PG 362

EDWARD F. BEACHAM, et ux  
DB 1004 PG 82  
MB 20 PG 96

CORRENA GOODING  
DB 421 PG 361

BEAUFORT MEADOWS INC  
MB 20 PG 96

GRACE PRESBYTERIAN CHURCH  
DB 156 PG 631

CORRENA GOODING  
DB 421 PG 361

GRAU 350

A. RONALD CLAPP, et ux  
DB 1050 PG 121  
MB 30 PG 362

CHRISTOPHER ADAMS,  
et ux  
DB 1055 PG 12  
MB 30 PG 362

EDWARD F. BEACHAM, et ux  
DB 1004 PG 82  
MB 20 PG 96

CHRISTOPHER ADAMS,  
et ux  
DB 1055 PG 12  
MB 30 PG 362

EDWARD F. BEACHAM, et ux  
DB 1004 PG 82  
MB 20 PG 96

EDWARD F. BEACHAM, et ux  
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MB 20 PG 96

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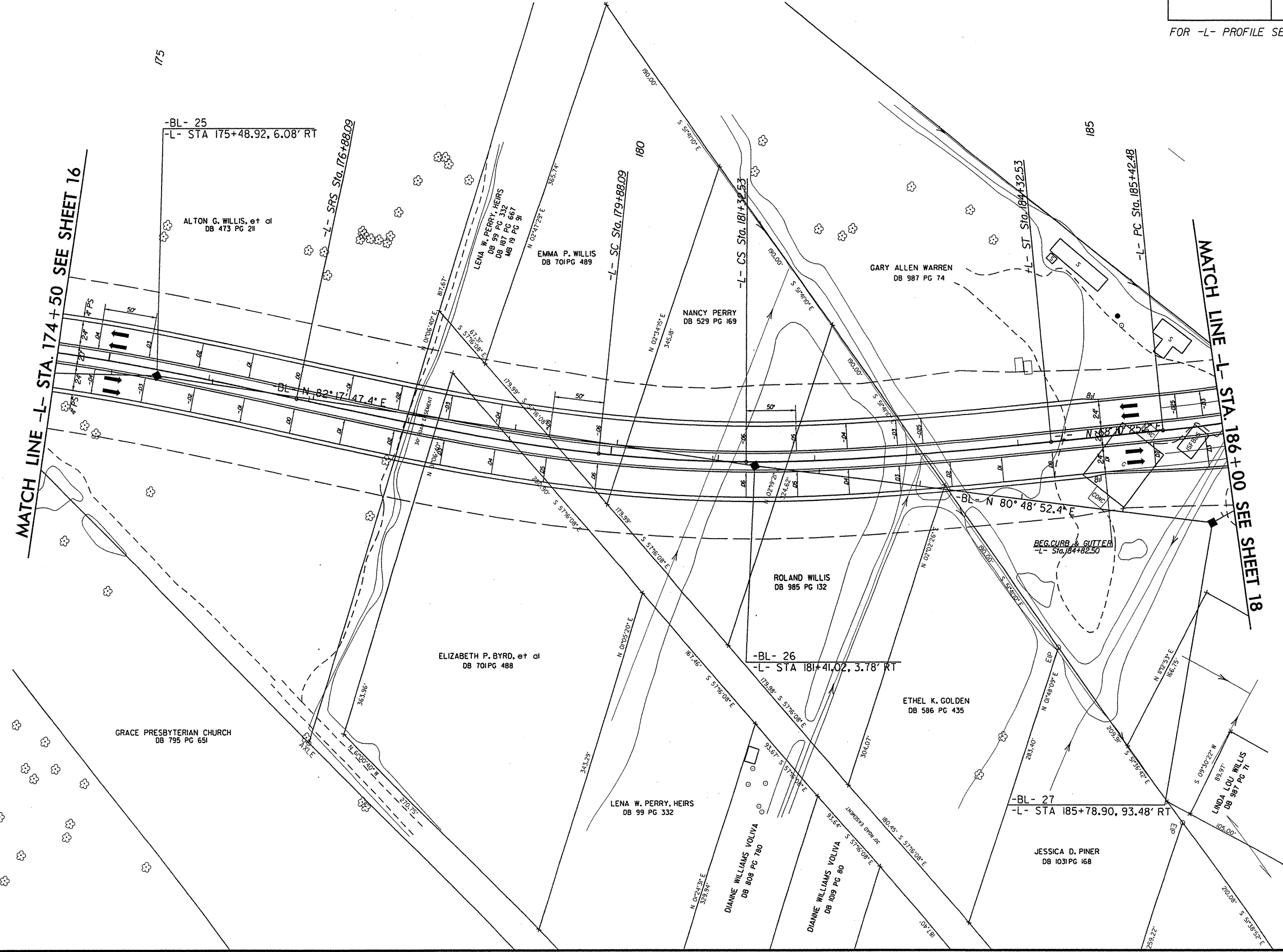
PROJECT REFERENCE NO. R-330Z		SHEET NO. 17	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION			



-L-

Pls Sta 174+88.19 Os = 6'00'36.2" Ls = 300.00' LT = 200.12' ST = 100.10'	Pls Sta 178+88.20 Os = 6'00'36.2" Ls = 300.00' LT = 200.12' ST = 100.10'	Pls Sta 180+60.37 Δ = 5'47'14.2" (LT) D = 4'00'24.1" L = 144.44' T = 72.28' R = 1,430.00' SE = .06	Pls Sta 182+32.63 Os = 6'00'36.2" Ls = 300.00' LT = 200.12' ST = 100.10'	Pls Sta 192+23.85 Δ = 5'41'09.2" (LT) D = 4'18'28.6" L = 1259.36' T = 681.37' R = 1,330.00' SE = .05
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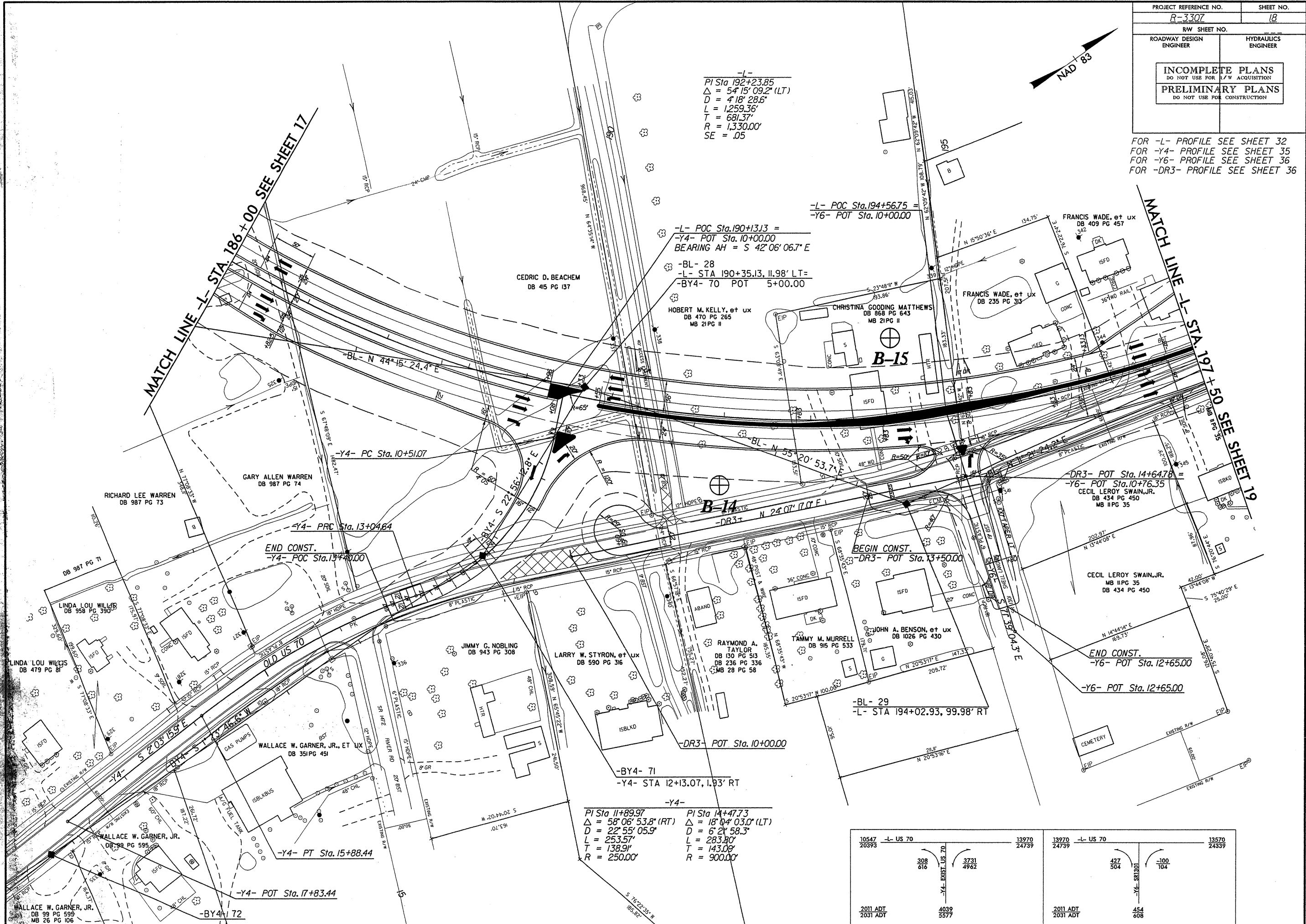
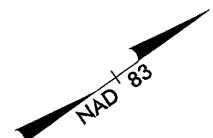
FOR -L- PROFILE SEE SHEET 31



MATCH LINE -L- STA. 174+50 SEE SHEET 16

MATCH LINE -L- STA. 186+00 SEE SHEET 18

FOR -L- PROFILE SEE SHEET 32  
 FOR -Y4- PROFILE SEE SHEET 35  
 FOR -Y6- PROFILE SEE SHEET 36  
 FOR -DR3- PROFILE SEE SHEET 36



-L-  
 PI Sta 192+23.85  
 $\Delta = 54^{\circ}15'09.2''$  (LT)  
 $D = 418'28.6''$   
 $L = 1,259.36'$   
 $T = 681.37'$   
 $R = 1,330.00'$   
 $SE = .05$

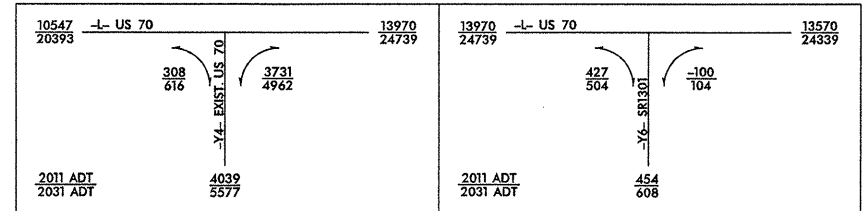
-L- POC Sta.190+13.13 =  
 -Y4- POT Sta.10+00.00  
 BEARING AH = S 42°06'06.7\" E  
 -BL- 28  
 -L- STA 190+35.13, 11.98' LT=  
 -BY4- 70 POT 5+00.00

-L- POC Sta.194+56.75 =  
 -Y6- POT Sta.10+00.00

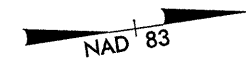
-DR3- POT Sta.14+64.78 =  
 -Y6- POT Sta.10+76.35  
 CECIL LEROY SWAIN, JR.  
 DB 434 PG 450  
 MB 11 PG 35

-Y4-  
 PI Sta 11+89.97  
 $\Delta = 58^{\circ}06'53.8''$  (RT)  
 $D = 22^{\circ}55'05.9''$   
 $L = 253.57'$   
 $T = 138.91'$   
 $R = 250.00'$

-Y4-  
 PI Sta 14+47.73  
 $\Delta = 18^{\circ}04'03.0''$  (LT)  
 $D = 6^{\circ}21'58.3''$   
 $L = 283.80'$   
 $T = 143.09'$   
 $R = 900.00'$



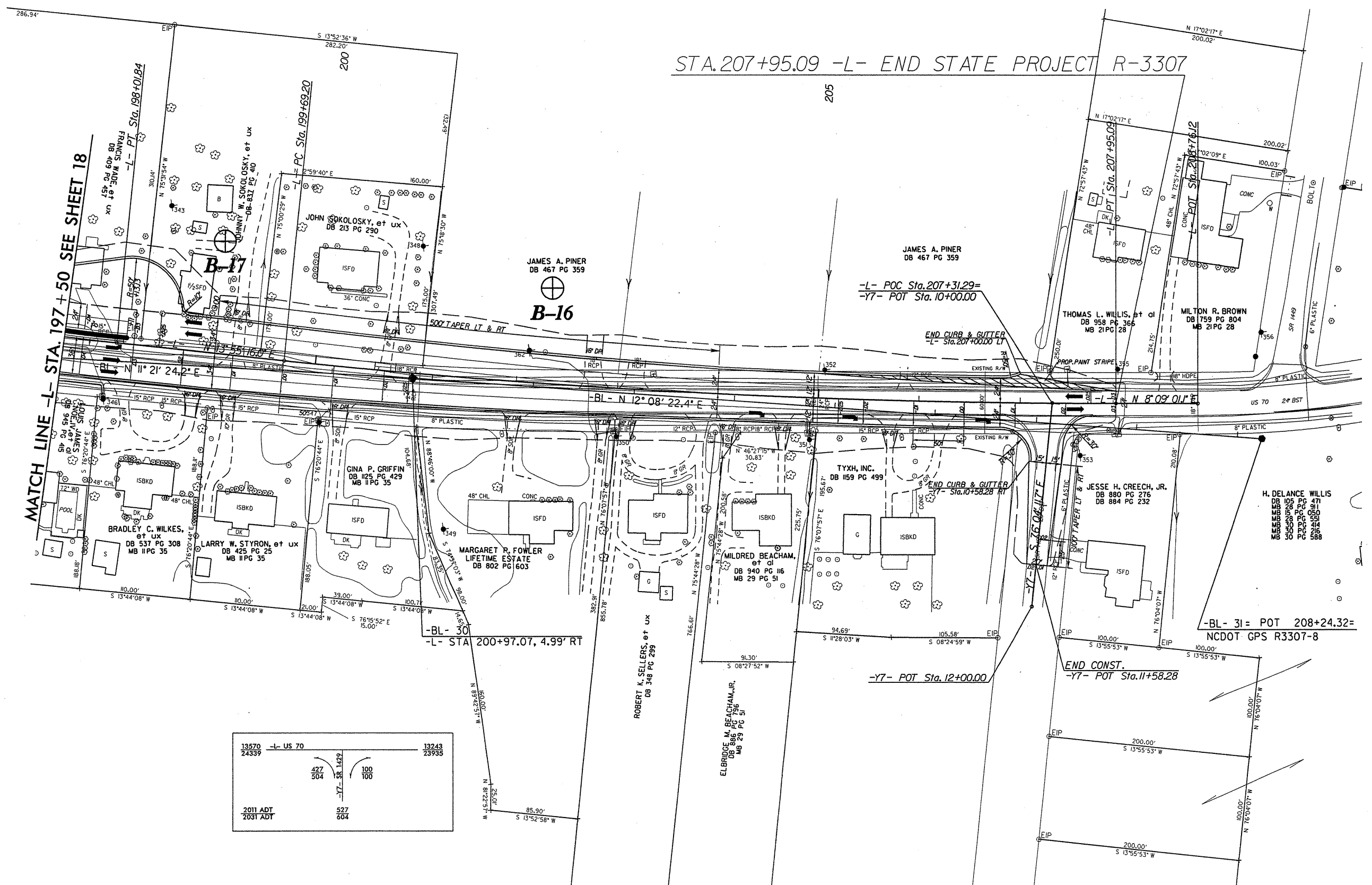
PROJECT REFERENCE NO.	SHEET NO.
R-3307	19
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	



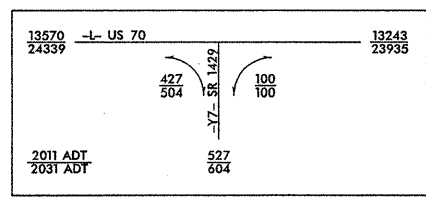
-L-

PI Sta 192+23.85	PI Sta 203+82.50
$\Delta = 54^{\circ}15'09.2"$ (LT)	$\Delta = 5^{\circ}46'14.8"$ (LT)
$D = 418'28.6"$	$D = 0'41'55.4"$
$L = 1,259.36'$	$L = 825.90'$
$T = 681.37'$	$T = 413.30'$
$R = 1,330.00'$	$R = 8,200.00'$
$SE = .05$	$SE = NC$

STA. 207+95.09 -L- END STATE PROJECT R-3307



MATCH LINE -L- STA. 197+50 SEE SHEET 18



-BL- 31= POT 208+24.32= NCDOT GPS R3307-8

-Y7- POT Sta. 12+00.00

END CONST. -Y7- POT Sta. 11+58.28

-L- POC Sta. 207+31.29= -Y7- POT Sta. 10+00.00

END CURB & GUTTER -L- Sta. 207+00.00 LT

END CURB & GUTTER -Y7- Sta. 10+58.28 RT

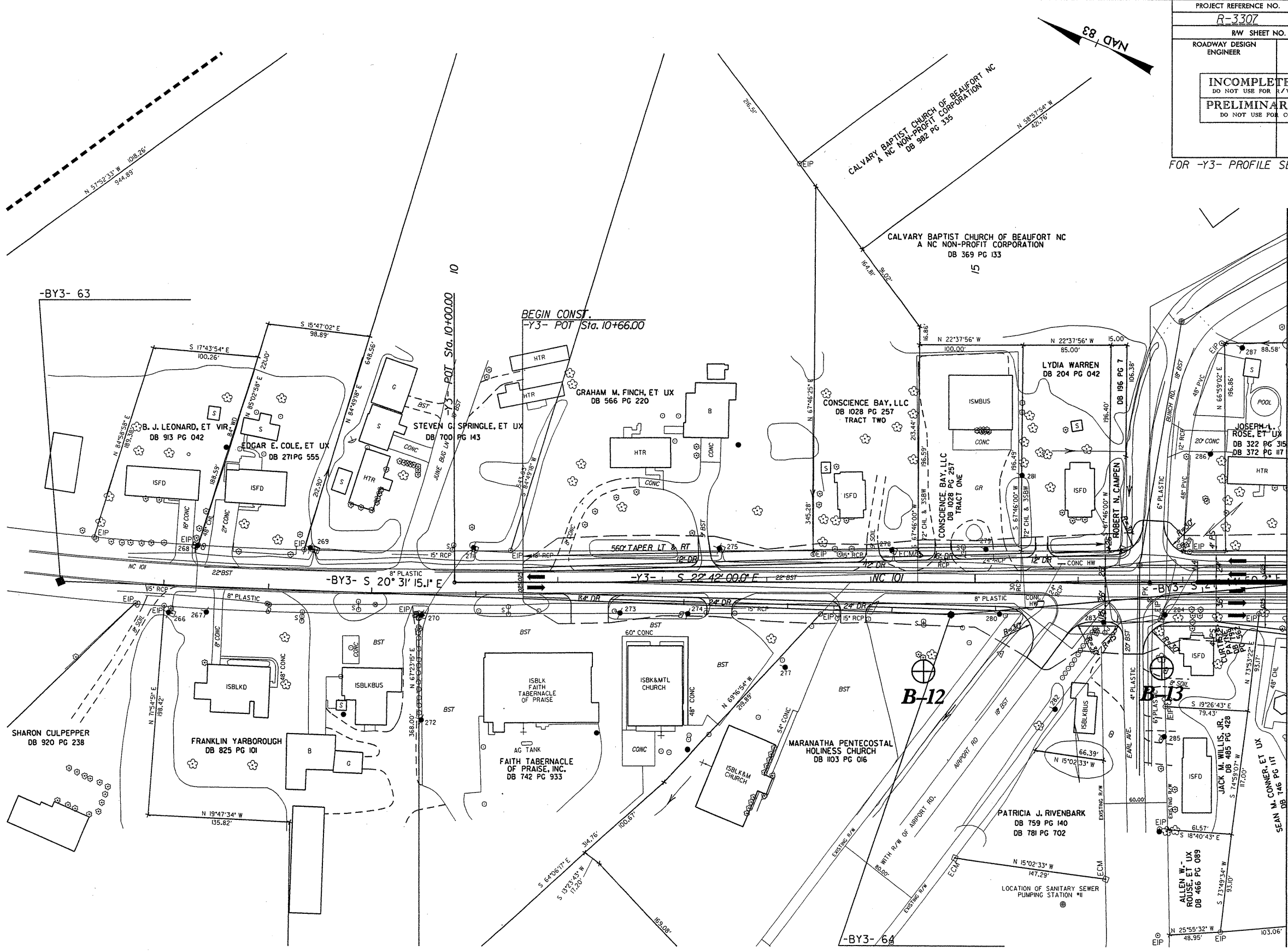






PROJECT REFERENCE NO. <b>R-3307</b>	SHEET NO. <b>22</b>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

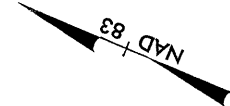
FOR -Y3- PROFILE SEE SHEET 34



MATCH LINE -Y3- STA. 18+00 SEE SHEET 12

PROJECT REFERENCE NO. R-3307	SHEET NO. 23
RW SHEET NO.	
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	

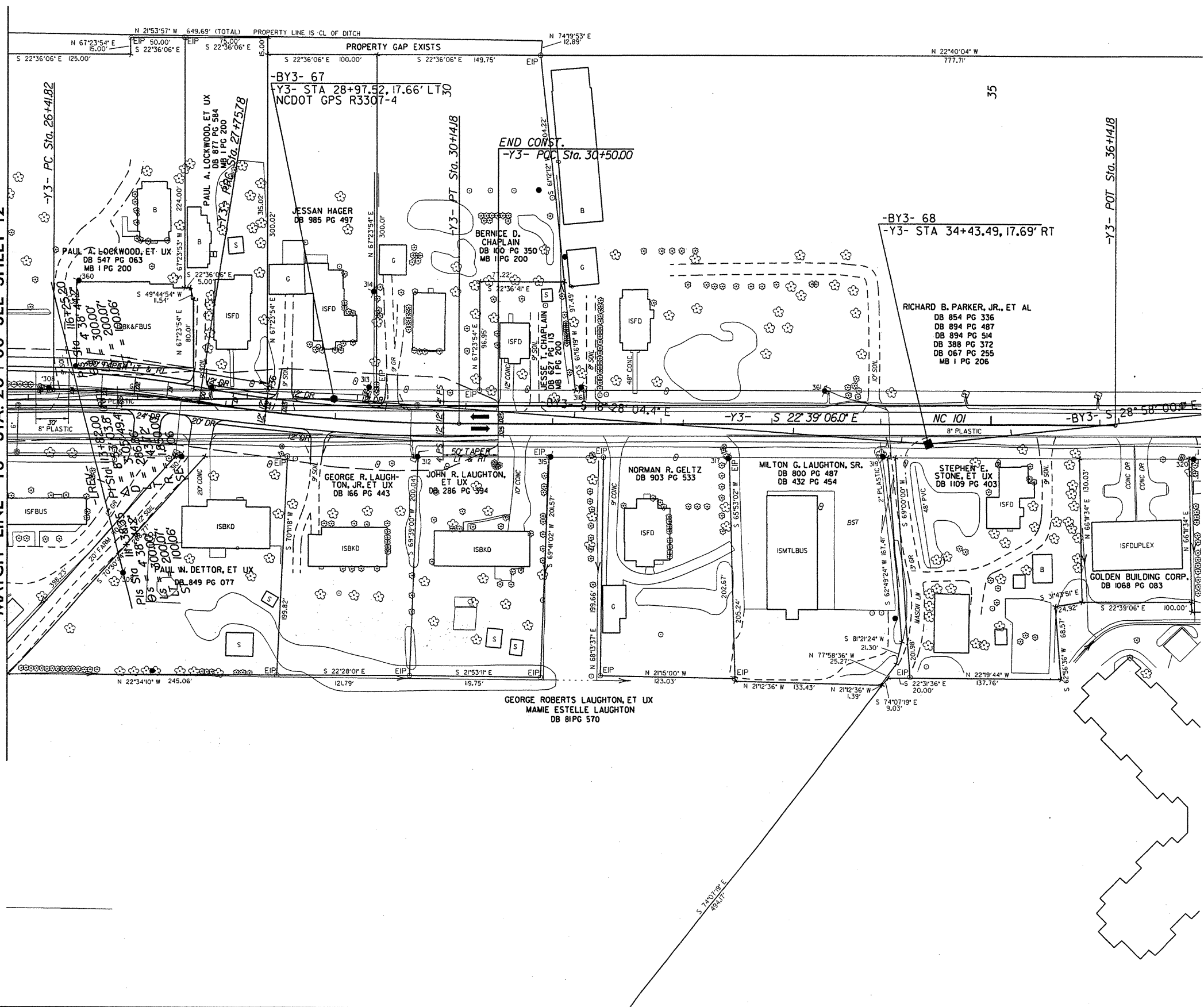
FOR -Y3- PROFILE SEE SHEET 35



-Y3-

PI Sta 27+08.94	PI Sta 28+95.23
$\Delta = 9^{\circ}01'47.9"$ (RT)	$\Delta = 9^{\circ}06'22.2"$ (LT)
$D = 6^{\circ}44'26.4"$	$D = 3^{\circ}49'11.0"$
$L = 133.96'$	$L = 238.40'$
$T = 67.12'$	$T = 119.45'$
$R = 850.00'$	$R = 1,500.00'$
$SE = .06$	$SE = .06$

MATCH LINE -Y3- STA. 26+00 SEE SHEET 12



S 74°07'19" E  
9.03'

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/12/2007  
 Location: B-1 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: > 54" below ground surface

Hole Depth:	2.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	2.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.79	Feet

Chamber Used:	0.11	ft <sup>2</sup>
---------------	------	-----------------

Initial Water in Hole:	0.42	Feet
Final Water in Hole:	0.46	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number  
 H = Height of water in hole (cm)  
 r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)  
 = Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$C = \frac{1.47}{207.71} \text{ Gallons/Day}$$

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
2.5	0.000	
3	0.089	2.7
3.5	0.082	2.5
4	0.092	2.8
4.5	0.089	2.7
5	0.085	2.6
5.5	0.082	2.5
6	0.085	2.6
6.5	0.085	2.6
7	0.085	2.6
Avg.	0.085	

Time Interval (min) = 0.5

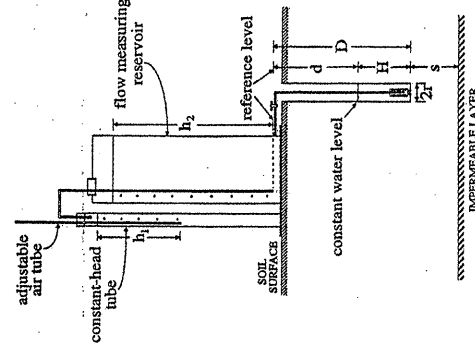
$$\text{Cross Sectional Area} = 0.11 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 245.67 \text{ ft/day}$$

$$K_{sat} = 231.77 \text{ Gallons/Day/ft}^2$$

Cm/Hour = 39.35  
 Inches/Hour = 15.49  
 Feet/Day = 30.99

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/12/2007  
 Location: B-2 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 21" below ground surface

Hole Depth:	1.33	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.63	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.13	Feet

Chamber Used:	0.02	ft <sup>2</sup>
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Initial Water in Hole:	0.48	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number  
 H = Height of water in hole (cm)  
 r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)  
 = Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$C = \frac{1.54}{3.80} \text{ Gallons/Day}$$

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.000	0.0
20	0.548	16.7
22	0.030	0.9
23	0.016	0.5
24	0.016	0.5
25	0.016	0.5
26	0.016	0.5
Avg.	0.016	

Time Interval (min) = 1

$$\text{Cross Sectional Area} = 0.02 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 23.62 \text{ ft/day}$$

$$K_{sat} = 3.74 \text{ Gallons/Day/ft}^2$$

Cm/Hour = 0.64  
 Inches/Hour = 0.25  
 Feet/Day = 0.50

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/12/2007  
 Location: B-3 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 34" below ground surface

Hole Depth:	2.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	2.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.79	Feet

Chamber Used:	0.02	▼ Ft <sup>2</sup>
---------------	------	-------------------

Initial Water in Hole:	0.44	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.000	0.0
5	0.085	2.6
10	0.016	0.5 (adjusted tube setting)
15	0.072	2.2
20	0.043	1.3
25	0.026	0.8
30	0.023	0.7
35	0.030	0.9
40	0.026	0.8
Avg.	0.026	

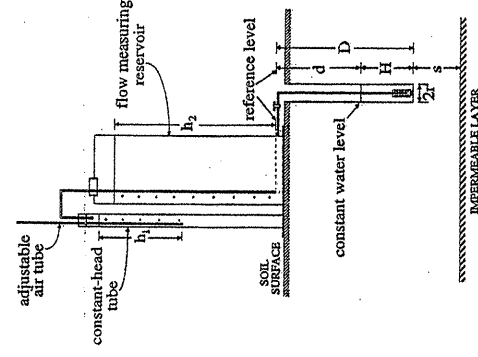
Time Interval (min) = 5

Cross Sectional Area = 0.02 ft<sup>2</sup>  
 Length of Drop in Water Column = 7.56 ft/day

K<sub>sat</sub> = 1.20 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 0.20  
 Inches/Hour = 0.08  
 Feet/Day = 0.16

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/12/2007  
 Location: B-4 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 16" below ground surface

Hole Depth:	0.58	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	0.88	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.38	Feet

Chamber Used:	0.11	▼ Ft <sup>2</sup>
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Initial Water in Hole:	0.48	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
5	0.302	9.2
7	0.082	2.5
10	0.118	3.6
12	0.079	2.4
14	0.072	2.2
16	0.075	2.3
18	0.075	2.3
20	0.072	2.2
22	0.072	2.2
24	0.072	2.2
Avg.	0.072	

Time Interval (min) = 2

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 51.97 ft/day

K<sub>sat</sub> = 43.20 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 7.33  
 Inches/Hour = 2.89  
 Feet/Day = 5.78

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/12/2007  
 Location: B-5 R3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 22" below ground surface

Hole Depth:	0.92	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.21	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.71	Feet

Chamber Used:	0.11	ft <sup>2</sup>
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Initial Water in Hole:	0.44	Feet
Final Water in Hole:	0.46	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \frac{r}{H} \right]^2 + 1 \Big)^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

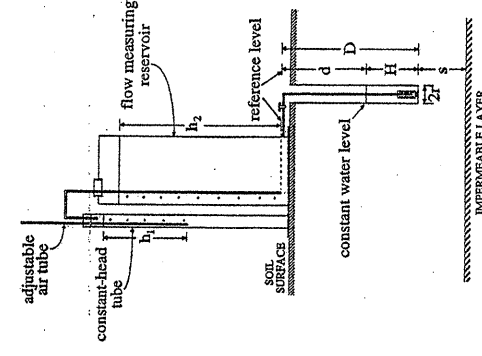
Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

C =	1.47	
Q =	62.58 Gallons/Day	
r =	0.09 ft	
H =	0.46 ft	
Drop in Water Column		
Time (min)	(ft)	(cm)
0	0.000	0.0
8	0.676	20.6
9	0.066	2.0
10	0.059	1.8
12	0.125	3.8
15	0.171	5.2
16	0.052	1.6
17	0.049	1.5
18	0.049	1.5
19	0.049	1.5
20	0.052	1.6
21	0.052	1.6
Avg.	0.051	
Cross Sectional Area =	0.11	ft <sup>2</sup>
Length of Drop in Water Column =	74.02	ft/day
K <sub>sat</sub> =	69.83	Gallons/Day/ft <sup>2</sup>
Cm/Hour	11.86	
Inches/Hour =	4.67	
Feet/Day	9.34	

Time Interval (min) = 1

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/18/2007  
 Location: B-6 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 6" below ground surface

Hole Depth:	0.96	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.25	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.75	Feet

Chamber Used:	0.11	ft <sup>2</sup>
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Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \frac{r}{H} \right]^2 + 1 \Big)^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

C =	1.54	
Q =	21.30 Gallons/Day	
r =	0.09 ft	
H =	0.50 ft	
Drop in Water Column		
Time (min)	(ft)	(cm)
0	0.000	0.0
15	0.472	14.4
20	0.108	3.3
25	0.092	2.8
30	0.095	2.9
35	0.092	2.8
36	0.016	0.5
37	0.020	0.6
38	0.016	0.5
39	0.016	0.5
Avg.	0.017	
Cross Sectional Area =	0.11	ft <sup>2</sup>
Length of Drop in Water Column =	25.20	ft/day
K <sub>sat</sub> =	20.95	Gallons/Day/ft <sup>2</sup>
Cm/Hour	3.56	
Inches/Hour =	1.40	
Feet/Day	2.80	

Time Interval (min) = 1

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/18/2007  
 Location: B-7 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 5" below ground surface

Hole Depth:	0.96	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.25	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.75	Feet

Chamber Used:	0.02	▼	Ft <sup>2</sup>
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Initial Water in Hole:	0.46	Feet
Final Water in Hole:	0.46	Feet

$$K_{sat} = CQ/(2\pi H^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \left( \frac{r}{H} \right)^2 + 1 \right]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

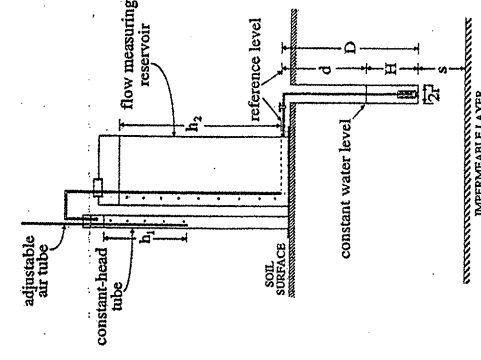
C =	1.47	
Q =	2.41 Gallons/Day	
r =	0.09	ft
H =	0.46	ft
Time (min)	Drop in Water Column (cm)	
30	0.5 (adjusted tube setting)	
37	0.016	
39	0.013	
42	0.030	
44	0.020	
46	0.023	
48	0.020	
Avg.	0.021	
Time Interval (min) = 2		

Cross Sectional Area = 0.02 ft<sup>2</sup>  
 Length of Drop in Water Column = 14.96 ft/day

$$K_{sat} = 2.69 \text{ Gallons/Day/ft}^2$$

Cm/Hour = 0.46  
 Inches/Hour = 0.18  
 Feet/Day = 0.36

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/18/2007  
 Location: B-8 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 9" below ground surface

Hole Depth:	0.67	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	0.96	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.46	Feet

Chamber Used:	0.11	▼	Ft <sup>2</sup>
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Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2\pi H^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \left( \frac{r}{H} \right)^2 + 1 \right]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

C =	1.54	
Q =	77.89 Gallons/Day	
r =	0.09	ft
H =	0.50	ft
Time (min)	Drop in Water Column (cm)	
0	13.3	
5	0.436	
10	0.322	
15	0.240	
20	0.318	
21	0.062	
22	0.066	
Avg.	0.064	
Time Interval (min) = 1		

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 92.13 ft/day

$$K_{sat} = 76.58 \text{ Gallons/Day/ft}^2$$

Cm/Hour = 13.00  
 Inches/Hour = 5.12  
 Feet/Day = 10.24

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/18/2007  
 Location: B-9 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 10" below ground surface

Hole Depth:	0.79	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.08	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.58	Feet

Chamber Used:	0.11	▼	ft <sup>2</sup>
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Initial Water in Hole:	0.48	Feet
Final Water in Hole:	0.46	Feet

$$K_{sat} = CQ / (2PH^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \left( \frac{r}{H} \right)^2 + 1 \right]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

Drop in Water Column

Time (min)

(ft)

(cm)

0			
11	1.145		34.9
12	0.095		2.9
13	0.089		2.7
14	0.089		2.7
15	0.089		2.7
Avg.	0.089		

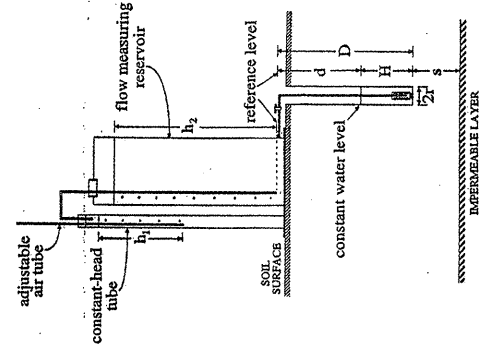
Time Interval (min) = 1

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 127.56 ft/day

K<sub>sat</sub> = 120.34 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 20.43  
 Inches/Hour = 8.04  
 Feet/Day = 16.09

Note: K<sub>sat</sub> calculations are based on average drop in Water Column (ft) after equilibrium is reached.



S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/12/2007  
 Location: B-10 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: <12" below ground surface

Hole Depth:	1.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.79	Feet

Chamber Used:	0.11	▼	ft <sup>2</sup>
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Initial Water in Hole:	0.40	Feet
Final Water in Hole:	0.46	Feet

$$K_{sat} = CQ / (2PH^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \left( \frac{r}{H} \right)^2 + 1 \right]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

Drop in Water Column

Time (min)

(ft)

(cm)

0	0.000		
5	0.272		8.3
8	0.098		3.0
10	0.066		2.0
12	0.062		1.9
15	0.105		3.2
20	0.161		4.9
23	0.112		3.4
25	0.062		1.9
26	0.030		0.9
27	0.030		0.9
28	0.030		0.9
Avg.	0.030		

Time Interval (min) = 1

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 42.52 ft/day

K<sub>sat</sub> = 40.11 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 6.81  
 Inches/Hour = 2.68  
 Feet/Day = 5.36

Note: K<sub>sat</sub> calculations are based on average drop in Water Column (ft) after equilibrium is reached.

**S&ME**  
**"IN-SITU" CONSTANT HEAD PERMEAMETER**

Date: 10/12/2007  
 Location: B-11 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: <12" below ground surface

Hole Depth:	1.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.79	Feet

Chamber Used:	0.11	ft <sup>2</sup>
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Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2\pi H^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \frac{r}{H} \right]^2 + 1^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

	Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
C =	0	0.000	9.2
Q =	5	0.302	4.5
	10	0.148	0.9
	11	0.030	1.0
	12	0.033	0.9
	13	0.030	0.9
	14	0.030	1.0
	15	0.033	1.0
	AVG.	0.031	

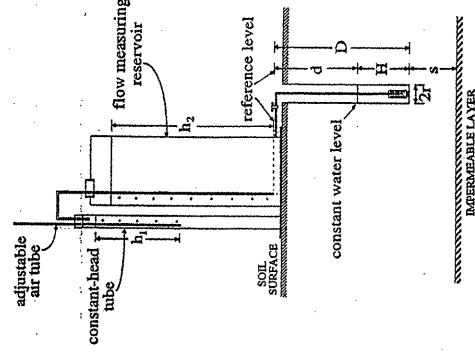
Time Interval (min) = 1

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 44.09 ft/day

K<sub>sat</sub> = 36.66 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 6.22  
 Inches/Hour = 2.45  
 Feet/Day = 4.90

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
**"IN-SITU" CONSTANT HEAD PERMEAMETER**

Date: 10/19/2007  
 Location: B-12 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: <12" below ground surface

Hole Depth:	1.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.79	Feet

Chamber Used:	0.02	ft <sup>2</sup>
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Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2\pi H^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \frac{r}{H} \right]^2 + 1^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

	Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
C =	0	0.000	0.8
Q =	6	0.000	3.4
	14	0.026	0.3
	70	0.112	0.3
	75	0.010	0.3
	80	0.010	0.3
	85	0.010	0.3
	AVG.	0.010	

Time Interval (min) = 5

Cross Sectional Area = 0.02 ft<sup>2</sup>  
 Length of Drop in Water Column = 2.83 ft/day

K<sub>sat</sub> = 0.45 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 0.08  
 Inches/Hour = 0.03  
 Feet/Day = 0.06

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/19/2007  
 Location: B-13 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: 29" below ground surface

Hole Depth:	2.92	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	3.21	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h):	2.71	Feet

Chamber Used:	0.02	ft <sup>2</sup>
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Initial Water in Hole:	0.42	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PIH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09 \text{ ft}}{H = \frac{0.50 \text{ ft}}$$

$$C = 1.54$$

$$Q = 6.34 \text{ Gallons/Day}$$

Drop in Water Column  
 Time (min) (ft) (cm)

0	0.000	9.6
8	0.315	5.8 (adjusted tube setting)
35	0.190	4.1
40	0.135	4.1
45	0.135	4.1
50	0.141	4.3
Avg.	0.137	

Time Interval (min) = 5

$$\text{Length of Drop in Water Column} = \frac{\text{Cross Sectional Area} = 0.02 \text{ ft}^2}{39.37 \text{ ft/day}}$$

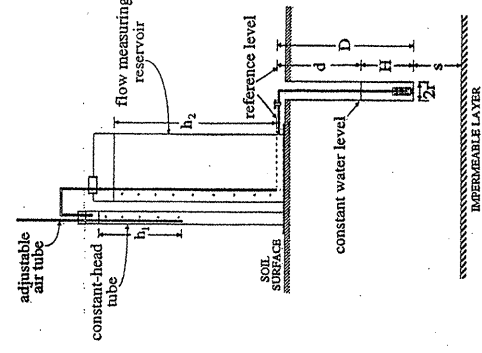
$$K_{sat} = 6.23 \text{ Gallons/Day/ft}^2$$

$$\text{Cm/Hour} = 1.06$$

$$\text{Inches/Hour} = 0.42$$

$$\text{Feet/Day} = 0.83$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/19/2007  
 Location: B-14 R-3307  
 Horizon:  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: <12" below ground surface

Hole Depth:	1.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h):	0.79	Feet

Chamber Used:	0.02	ft <sup>2</sup>
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Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PIH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09 \text{ ft}}{H = \frac{0.50 \text{ ft}}$$

$$C = 1.54$$

$$Q = 3.04 \text{ Gallons/Day}$$

Drop in Water Column  
 Time (min) (ft) (cm)

0	0.709	21.6
8	0.167	5.1
16	0.607	18.5 (adjusted tube setting)
54	0.013	0.4
55	0.013	0.4
56	0.013	0.4
57	0.013	0.4
Avg.	0.013	

Time Interval (min) = 1

$$\text{Length of Drop in Water Column} = \frac{\text{Cross Sectional Area} = 0.02 \text{ ft}^2}{18.90 \text{ ft/day}}$$

$$K_{sat} = 2.99 \text{ Gallons/Day/ft}^2$$

$$\text{Cm/Hour} = 0.51$$

$$\text{Inches/Hour} = 0.20$$

$$\text{Feet/Day} = 0.40$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/11/2007  
Location: B-15 R-3307

Horizon:

Client: NCDOT

Project Name: US 70 Improvements- Radio Island

Project #: 34528.1.1

SHWT: <12" below ground surface

Hole Depth:	1.25	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.54	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.04	Feet

Chamber Used:	0.11	▼	ft <sup>2</sup>
---------------	------	---	-----------------

Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{0.50} \text{ ft}$$

$$H = \frac{0.50}{0.50} \text{ ft}$$

C = 1.54  
Q = 6.66 Gallons/Day

Drop in Water Column

Time (min)	(ft)	(cm)
0	0.000	
100	0.564	17.2
105	0.026	0.8
108	0.016	0.5
Avg.	0.016	

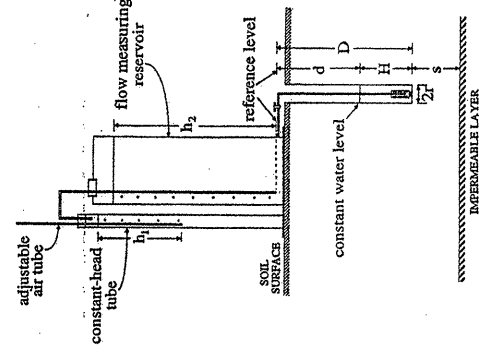
Time Interval (min) = 3

Cross Sectional Area = 0.11 ft<sup>2</sup>  
Length of Drop in Water Column = 7.87 ft/day

K<sub>sat</sub> = 6.55 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 1.11  
Inches/Hour = 0.44  
Feet/Day = 0.88

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/11/2007

Location: B-16 R-3307

Horizon:

Client: NCDOT

Project Name: US 70 Improvements- Radio Island

Project #: 34528.1.1

SHWT: 1.5" below ground surface

Hole Depth:	1.25	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.54	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.04	Feet

Chamber Used:	0.02	▼	ft <sup>2</sup>
---------------	------	---	-----------------

Initial Water in Hole:	0.52	Feet
Final Water in Hole:	0.52	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{0.52} \text{ ft}$$

$$H = \frac{0.52}{0.52} \text{ ft}$$

C = 1.58  
Q = 4.97 Gallons/Day

Drop in Water Column

Time (min)	(ft)	(cm)
0	0.000	
8	0.000	
13	0.125	3.8
18	0.112	3.4
23	0.112	3.4
28	0.108	3.3
33	0.108	3.3
38	0.108	3.3
43	0.105	3.2
48	0.108	3.3
53	0.108	3.3
Avg.	0.107	

Time Interval (min) = 5

Cross Sectional Area = 0.02 ft<sup>2</sup>  
Length of Drop in Water Column = 30.87 ft/day

K<sub>sat</sub> = 4.60 Gallons/Day/ft<sup>2</sup>

Cm/Hour = 0.78  
Inches/Hour = 0.31  
Feet/Day = 0.62

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

S&ME  
 "IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 10/30/2007  
 Location: B-17 R-3307  
 Horizon: A/E  
 Client: NCDOT  
 Project Name: US 70 Improvements- Radio Island  
 Project #: 34528.1.1  
 SHWT: <12" below ground surface

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} \left( \frac{H}{r} \right) - \left[ \left( \frac{r}{H} \right)^2 + 1 \right]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (cm)

r = radius of hole (cm)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09 \text{ ft}}{H = \frac{0.50 \text{ ft}}{1.54}}$$

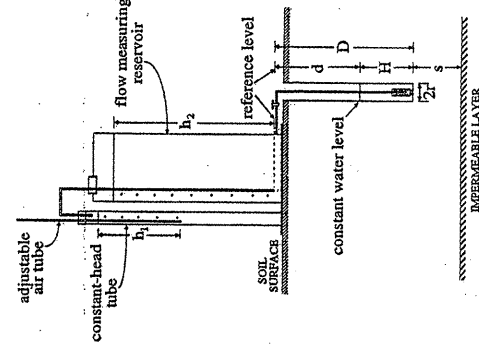
$$Q = \frac{10.40 \text{ Gallons/Day}}{1.37}$$

$$\text{Length of Drop in Water Column} = \frac{\text{Cross Sectional Area} = 0.02 \text{ ft}^2}{10.22 \text{ Gallons/Day/ft}^2} = 64.57 \text{ ft/day}$$

$$\begin{aligned} \text{Cm/Hour} &= 1.74 \\ \text{Inches/Hour} &= 0.68 \\ \text{Feet/Day} &= 1.37 \end{aligned}$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

Hole Depth:	1.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.29	Feet
Reference Tube to Hole Bottom (D):	1.29	Feet
Water Depth in Hole (H):	0.50	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.79	Feet
Chamber Used:	0.02	ft <sup>2</sup>
Initial Water in Hole:	0.50	Feet
Final Water in Hole:	0.50	Feet



Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
38	0.000	
53	0.177	5.4
54	0.043	1.3
55	0.046	1.4
56	0.046	1.4
57	0.043	1.3
58	0.046	1.4
Avg.	0.045	

Time Interval (min) = 1

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/12/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>Radio Island</u>	Site/Field No.:	<u>B-1</u>
Northing:	<u>362102</u>	Easting:	<u>2698773</u>
Elevation (ft):	<u>7.97</u>		
Apparent Water Table:	<u>&gt; 54" below ground surface</u>	Seasonal High Water Table:	<u>42"</u>
Vegetation:	<u>LANDSCAPING</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>54"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 10	10 YR 3/3	-	SL	gr	vfr	-
Fill 2	10 - 54	10 YR 7/3	-	LS	Gr/sg	loose	w/crushed shells

COMMENTS:

S-1 2.0-2.5 FT Tan Coarse to Fine Sand With Little Shell Fragments (A-3) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
S - Sand	sg - Single grain
LS - Loamy Sand	1,m,sbk - Weak, Medium, Subangular Blocky
SiC - Silty Clay	vfr - Very friable
	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/12/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-2</u>
Elevation (ft):	<u>4.89</u>		
Northing:	<u>363948</u>	Easting:	<u>2701318</u>
Apparent Water Table:	<u>30" below ground surface</u>	Seasonal High Water Table:	<u>21"</u>
Vegetation:	<u>gravel parking lot</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>54"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 4		-	gravel	sg	loose	-
Fill 2	4 - 21		-	SL	sr/sg	loose	w/crushed shells
A	21 - 26	10 YR 3/2	10 YR 5/6	SL	gr	vfr	
Btg	26 - 50	10 YR 5/2	10 YR 5/6	SC	massive	fr	

COMMENTS:

S-2 2.0-2.5 FT Gray Slightly Silty Clayey Fine Sand With Trace of Coarse Sand (A-2-4) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
S - Sand	sg - Single grain
LS - Loamy Sand	1,m,sbk - Weak, Medium, Subangular Blocky
SiC - Silty Clay	vfr - Very friable
	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/12/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-3</u>
Elevation (ft):	<u>6.14</u>		
Northing:	<u>363987</u>	Easting:	<u>2701652</u>
Apparent Water Table:	<u>&gt; 54" below ground surface</u>	Seasonal High Water Table:	<u>34"</u>
Vegetation:	<u>grass</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>54"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 28	MC	-	SL	gr	vfr	-
Fill 2	28 - 34	MC	-	SL	gr	fr	w/crushed shells
Fill 3	34 - 48	10 YR 7/3	-	SL	gr	fr	
Btg	48 - 54	10 YR 7/3	10 YR 4/8	SC	massive	firm	

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
S - Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/12/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-4</u>
Elevation (ft):	<u>2.97</u>		
Northing:	<u>363855</u>	Easting:	<u>2702176</u>
Apparent Water Table:	<u>16"</u>	Seasonal High Water Table:	<u>16"</u>
Vegetation:	<u>grass</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>36"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill	0 - 9	MC	-	SL	gr	vfr	w/crushed shells
Fill	9 - 16	10 YR 6/4	-	Sand	gr	vfr	w/crushed shells
Fill	16 - 36		-	Sand	gr	vfr	w/crushed shells

COMMENTS:

S-3 1.0-1.5 FT Tan Fine to Coarse Sand With Little Shell Fragments (A-3) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
S - Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/18/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location:	BEAUFORT	Site/Field No.:	B-5
Elevation (ft):	5.21		
Northing:	363557	Easting:	2702937
Apparent Water Table:	33"	Seasonal High Water Table:	22"
Vegetation:	grass	Slope:	0%
Boring Terminated at	35"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 10	10 YR 5/3	10 YR 6/1	Fine Sand	gr	loose	w/clay pockets
B	10 - 22	2.5 YR 5/4	7.5 YR 5/8	Fine Sand	gr	loose	w/crushed shells
C	22 - 35	10 YR 6/2	-	Fine Sand	gr	loose	w/crushed shells

COMMENTS:

Few mottles were observed in clay pockets.

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
S - Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/18/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location:	BEAUFORT	Site/Field No.:	B-6
Elevation (ft):	4.62		
Northing:	363652	Easting:	2703185
Apparent Water Table:	30"	Seasonal High Water Table:	<12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	35"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes	
A	0 - 6	10 YR 3/2		Fine SiS	gr	vfr		
B	6 - 14	10 YR 5/2	10 YR 4/6	Fine SiS	gr	vfr		
Debris	14 - 22	Appears to be similar to particle board material						
C	22 - 35	10 YR 3/1	10 YR 6/1	Fine SiS	gr	vfr		

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/18/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-7</u>
Elevation (ft):	<u>4.45</u>		
Northing:	<u>363831</u>	Easting:	<u>2703153</u>
Apparent Water Table:	<u>30"</u>	Seasonal High Water Table:	<u>&lt;12"</u>
Vegetation:	<u>grass</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>30"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 6	2.5 Y 5/1		Fine S	gr	loose	
B1	6 - 14	2.5 Y 4/1	2.5Y 6/1 10 YR 5/8	Fine SiS	gr	vfr	Cemented regions are present
B2	14 - 22	2.5 Y 6/3		Fine SiS	gr	vfr	
C	22 - 35	2.5 Y 7/1	10 YR 6/8	SC	massive	fr	

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/18/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-8</u>
Elevation (ft):	<u>3.42</u>		
Northing:	<u>362747</u>	Easting:	<u>2702776</u>
Apparent Water Table:	<u>21"</u>	Seasonal High Water Table:	<u>&lt;12"</u>
Vegetation:	<u>grass</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>21"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 5	10YR 4/2		Fine S	gr	loose	
Fill 2	5 - 9	2.5 Y 4/1	2.5Y 6/1	Fine S	gr	vfr	
Fill 3	9 - 21	2.5 Y 6/2	2.5 Y 7/1	SC	1,m,sbk	fr	

COMMENTS:

Potential fill material from road.

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/18/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location:	BEAUFORT	Site/Field No.:	B-9
Elevation (ft):	3.23		
Northing:	362340	Easting:	2702550
Apparent Water Table:	21"	Seasonal High Water Table:	<12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	30"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 5	10YR 2/2		Fine S	sg	loose	
Fill	5 - 8	10YR 5/4		Fine S	gr	vfr	Shelly
A2	8 - 10	10YR 4/2	2.5 Y 7/1	Fine S	gr	vfr	
C	10 - 30	10YR 2/2	Streaking	LS	gr	vfr	

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/12/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location:	BEAUFORT	Site/Field No.:	B-10
Elevation (ft):	3.39		
Northing:	362100	Easting:	2702343
Apparent Water Table:	27"	Seasonal High Water Table:	<12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	42" A. R.		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 8	10YR 2/2		Fine S	gr	vfr	
Fill 2	8 - 42	MC		Fine S	gr	vfr	Shelly

COMMENTS:

S-4 1.5 - 2.0 FT Brown Coarse to Fine Sand With Trace of Clay (A-3) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm



S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/12/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location (ft):	BEAUFORT	Site/Field No.:	B-11
Elevation:	2.92		
Northing:	362056	Easting:	2702334
Apparent Water Table:	25"	Seasonal High Water Table:	< 12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	42"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 30	10YR 2/2		LS	gr	fr	
Fill 2	30 - 42	10YR 3/2		LS	gr	fr	Shelly

COMMENTS:

S-5 1.5 - 2.0 FT Brown Fine to Coarse Sand With Trace of Silt and Clay (A-3) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/12/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location (ft):	BEAUFORT	Site/Field No.:	B-12
Elevation (ft):	6.88		
Northing:	366418	Easting:	2705549
Apparent Water Table:	32.5"	Seasonal High Water Table:	< 12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	36"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 2	10YR 3/2	Oxidized root chnls.	Fine S	gr	vfr	
Fill	2 - 12	10YR 2/2		SCL	1,m,sbk	fr	
Btg	12-36	10YR 4/2		SC	1,m,sbk	fr	

COMMENTS:

S-6 1.0 - 1.5 FT Gray Silty Clayey Coarse to Fine Sand (A-2-4) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
SiC - Silty Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/19/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location:	BEAUFORT	Site/Field No.:	B-13
Elevation (ft):	8.96		
Northing:	366207	Easting:	2705640
Apparent Water Table:	50"	Seasonal High Water Table:	29"
Vegetation:	grass	Slope:	0%
Boring Terminated at	50"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 8	10YR 3/2		LS	gr	vfr	
Fill mix	8 - 19	10YR 2/2	10YR 5/3	LS	gr	fr	Clay pockets
Fill mix	19 - 29	10YR 4/3	10YR 5/6	SCL	1,m,sbk	fr	
Btg	29 - 40	10YR 5/2	10YR 5/6	FSC	1,m,sbk	fi	
CB	40 - 50	10YR 4/1		SCL	1,m,sbk	fr	

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
FSC - Fine Sandy Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/19/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.:	34528.1.1
County:	CARTERET	State:	NC
Location:	BEAUFORT	Site/Field No.:	B-14
Elevation (ft):	8.30		
Northing:	370692	Easting:	2711215
Apparent Water Table:	40"	Seasonal High Water Table:	<12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	54"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 4	10YR 3/2		FSL	gr	vfr	
E	4 - 10	10YR 5/2		SL	gr	vfr	
Btg1	10 - 30	10YR 6/2	10YR 5/6	SCL	1,m,sbk	fr	
Btg2	30 - 48	10YR 6/1		SCL	1,m,sbk	fr	
C	48 - 54	10YR 6/1	10YR 6/6	SL	massive	fr	SCL pockets

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
FSC - Fine Sandy Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/11/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-15</u>
Elevation (ft):	<u>9.13</u>		
Northing:	<u>370949</u>	Easting:	<u>2711194</u>
Apparent Water Table:	<u>33"</u>	Seasonal High Water Table:	<u>&lt;12"</u>
Vegetation:	<u>grass</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>54"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 10	10YR 3/1		SL	gr	fr	
E	10 - 15	10YR 5/2		SL	gr	fr	
Btg1	15 - 30	10YR 6/2	10YR 5/6	SCL	1,m,sbk	fi	
Btg2	30 - 54	10YR 6/2		SCL	1,m,sbk	fi	

COMMENTS:

S-7 2.5 - 3.0 FT Gray Silty Clayey Coarse to Fine Sand (A-2-4) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
FSC - Fine Sandy Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>10/11/07</u>
Project Name:	<u>U.S. 70 BYPASS (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>CARTERET</u>	State:	<u>NC</u>
Location:	<u>BEAUFORT</u>	Site/Field No.:	<u>B-16</u>
Elevation (ft):	<u>7.95</u>		
Northing:	<u>371709</u>	Easting:	<u>2711433</u>
Apparent Water Table:	<u>30.5"</u>	Seasonal High Water Table:	<u>15"</u>
Vegetation:	<u>fallow corn field</u>	Slope:	<u>0%</u>
Boring Terminated at	<u>54"</u>		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 12	10YR 2/2		FSL	gr	fr	
E	12 - 15	10YR 4/3		SL	gr	fr	
Btg1	15 - 24	10YR 6/2	10YR 5/6	SCL	2,m,sbk	fi	
Btg2	24 - 46	10YR 6/2		SCL	1,m,sbk	fi	
C	46 - 54	10YR 6/2		SL	gr	fr	

COMMENTS:

S-8 1.5 - 2.0 FT Gray Clayey Coarse to Fine Sandy Silt (A-4) (0)

ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
FSC - Fine Sandy Clay	fr - Friable
	fi - firm

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	10/30/07
Project Name:	U.S. 70 BYPASS (R-3307)	Project No.	34528.1.1
County:	CARTERET	State	NC
Location:	BEAUFORT	Site/Field No.	B-17
Elevation (ft):	8.94		
Northing:	371709.25	Eastng:	2711341
Apparent Water Table:	22"	Seasonal High Water Table:	<12"
Vegetation:	grass	Slope:	0%
Boring Terminated at	50"		

Horizon	Depth (in.)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0 - 12	10YR 2/1		FSL	gr	vfr	
E	12 - 15	10YR 4/2		FSL	gr	vfr	
Btg1	15 - 24	10YR 5/1		SCL	1,m,sbk	fr	
Btg2	24 - 48	10YR 5/1	10YR 5/4	SCL	massive	fr	

COMMENTS:


ABBREVIATIONS:

10YR 3/2 - Munsell Color Chip #	gr - Granular
MC - multi-colored	sg - Single grain
SiS - Silty Sand	1,m,sbk - Weak, Medium, Subangular Blocky
LS - Loamy Sand	vfr - Very friable
FSC - Fine Sandy Clay	fr - Friable
	fi - firm

**SUMMARY OF LABORATORY TEST DATA**



Soil Classification and Gradation

<b>S&amp;ME Project #:</b>	<b>1051-07-432</b>	<b>Test Date(s):</b>	<b>10/27/2007</b>
<b>State Project No.:</b>	34528.1.1	<b>County:</b>	Carteret : <b>Report Date</b> 10/23 - 10/27/07
<b>Federal ID No.:</b>	STPNHF-70(43)	<b>TIP No. R-3307</b>	
<b>Project Name:</b>	<b>Carteret County</b>		
<b>Client Name:</b>	NCDOT		
<b>Client Address:</b>			

Boring No.	Sample No.	Sample Depth (Feet)	AASHTO Classification	Total % Passing					Total Mortar Fraction				LL	PL	PI	Moisture Content %
				Sieve #					Coarse Sand	Fine Sand	Silt	Clay				
				10	40	60	200	270								
B-1	S-1	2 - 2.5	A-3 (0)	80	63	43	2.0	1.7	46	52	1	1	23	0	N.P.	7.8
B-2	S-2	2 - 2.5	A-2-4 (0)	100	100	97	34.0	31.6	3	65	8	24	28	19	9	22.1
B-4	S-3	1 - 1.5	A-3 (0)	80	56	32	3.0	2.6	60	37	1	2	20	0	N.P.	16.1
B-10	S-4	1.5 - 2	A-3 (0)	92	84	65	3.0	2.0	29	69	1	1	20	0	N.P.	17.3
B-11	S-5	1.5 - 2	A-3 (0)	97	87	50	7.0	6.7	48	45	4	3	22	0	N.P.	19.8
B-12	S-6	1 - 1.5	A-2-4 (0)	100	100	89	35.0	33.9	11	55	10	24	21	15	6	17.8
B-15	S-7	2.5 - 3	A-2-4 (0)	100	100	85	35.0	31.4	15	53	11	21	18	16	2	25.8
B-16	S-8	1.5 - 2	A-4 (0)	100	100	86	36.0	32.1	14	54	11	21	20	16	4	18.9

Notes: NP=Nonplastic

Technical Responsibility:

B. Riggs

*Signature*

Geotechnical Engineer

*Position*

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

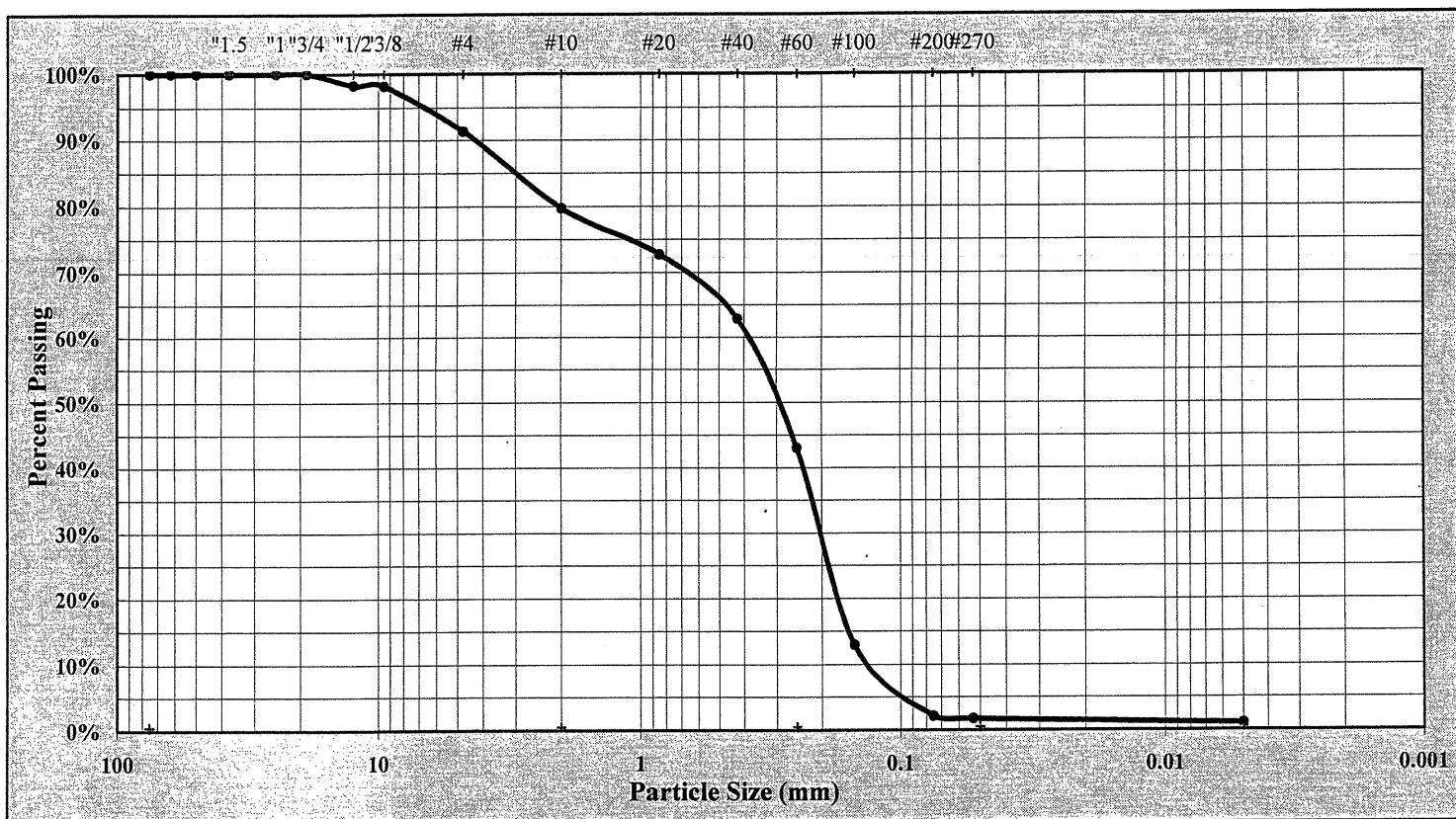


S&ME Project #: 1051-07-432  
 Project Name: Carteret County U.S. 70 Improvements  
 Client Name: NCDOT

Report Date: 10/27/2007  
 Test Date(s): 10/23 - 10/27/07

Client Address:  
 State Project #: 34528.1.1 F.A. Project No: STPNHF-70(43) TIP NO: R-3307

Boring #:	B-1	Sample #:	S-1	Sample Date:	10/23/07
Location:	Site-Borehole	Offset:	N/A	Depth:	2 - 2.5 ft.
Sample Description:	Tan Coarse to Fine SAND with Little Shell Fragments A-3 (0)				



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	3/4"	Coarse Sand	36.7%	Silt	1.0%
Gravel	20.3%	Fine Sand	41.3%	Clay	1.0%
Apparent Relative Density		Moisture Content	7.8%	% Passing #200	2.1%
Liquid Limit	23	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)					
Coarse Sand	46.1%	Fine Sand	51.8%	Clay	1.3%
Description of Sand & Gravel Particles: Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>					
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter					

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes  
 AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Krajan Laboratory Supervisor

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

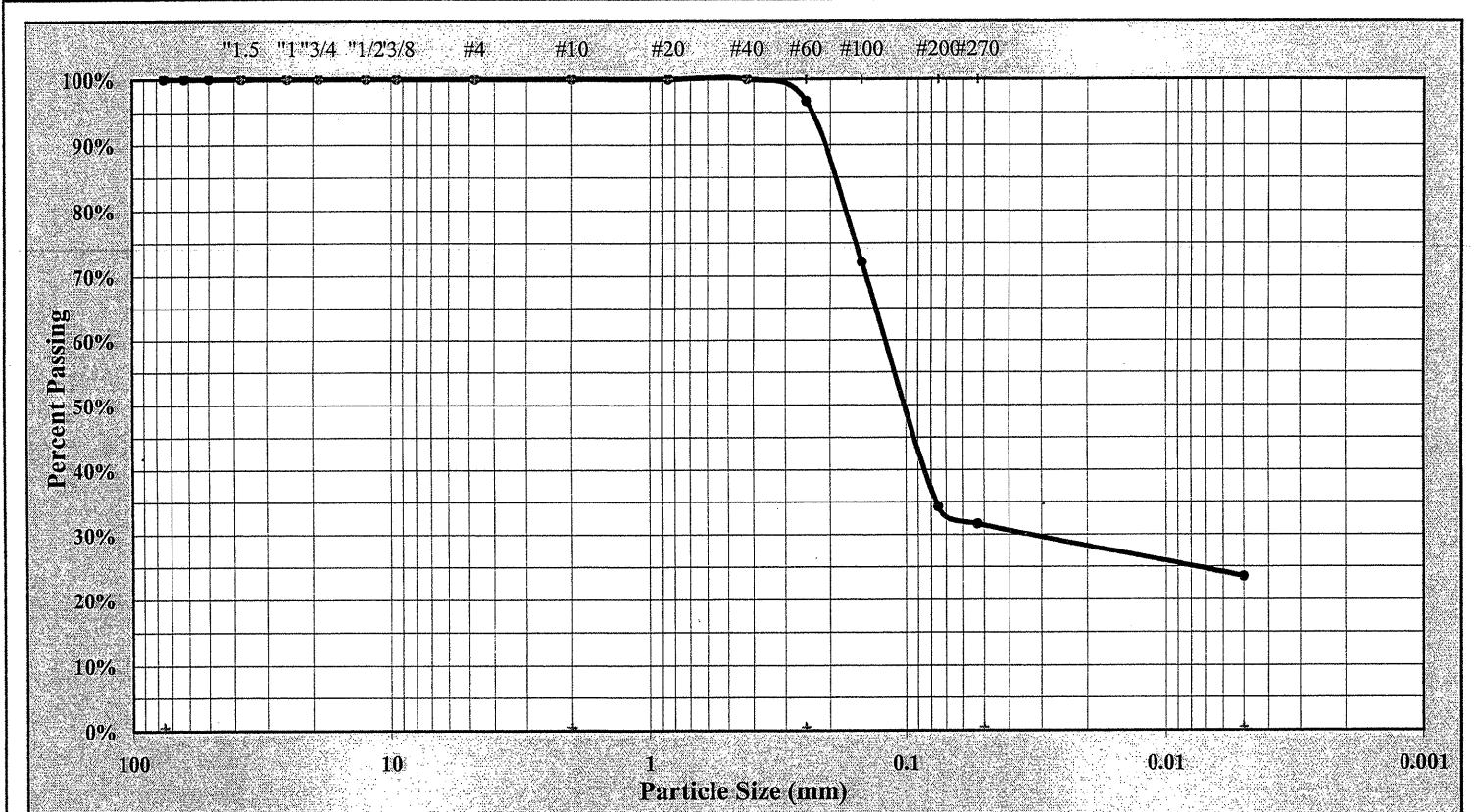


S&ME Project #: 1051-07-432  
 Project Name: Carteret County U.S. 70 Improvements  
 Client Name: NCDOT

Report Date: 10/27/2007  
 Test Date(s): 10/23 - 10/27/07

Client Address:  
 State Project #: 34528.1.1 F.A. Project No: STPNHF-70(43) TIP NO: R-3307

Boring #:	B-2	Sample #:	S-2	Sample Date:	10/23/07
Location:	Site-Borehole	Offset:	N/A	Depth:	2 - 2.5 ft.
Sample Description:	Gray Slightly Silty Clayey Fine SAND With Trace of Coarse Sand A-2-4 (0)				



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#20	Coarse Sand	3.3%	Silt	8.0%
Gravel	0.0%	Fine Sand	65.1%	Clay	24.0%
Apparent Relative Density		Moisture Content	22.1%	% Passing #200	34.3%
Liquid Limit	28	Plastic Limit	19	Plastic Index	9

Soil Mortar (-#10 Sieve)					
Coarse Sand	3.3%	Fine Sand	65.1%	Clay	23.5%
Description of Sand & Gravel Particles: Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>					
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter					

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes  
 AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Krajan Laboratory Supervisor

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

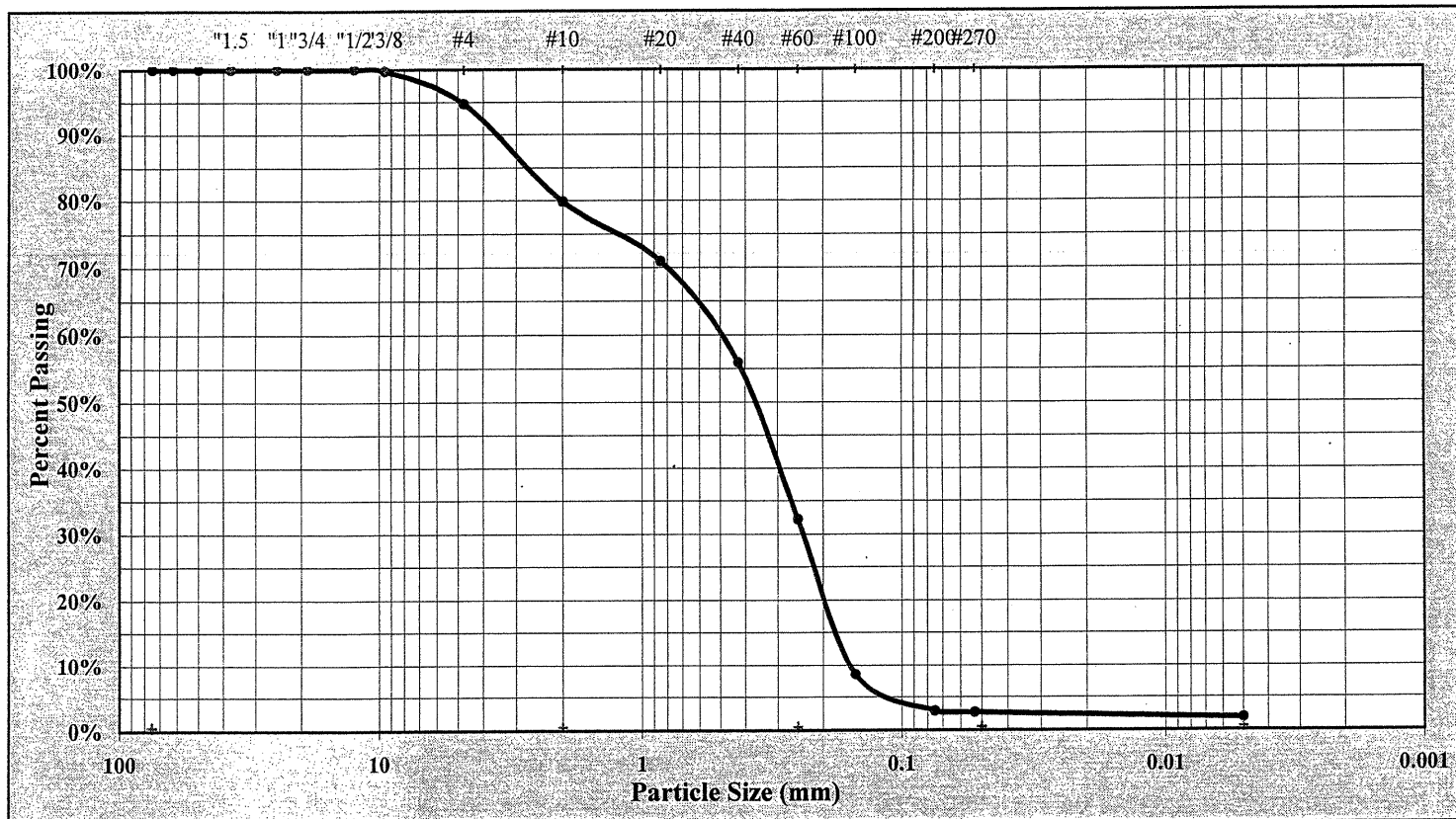


S&ME Project #: 1051-07-432  
Project Name: Carteret County U.S. 70 Improvements  
Client Name: NCDOT

Report Date: 10/27/2007  
Test Date(s): 10/23 - 10/27/07

Client Address:  
State Project #: 34528.1.1 F.A. Project No: STPNHF-70(43) TIP NO: R-3307

Boring #: B-4 Sample #: S-3 Sample Date: 10/23/07  
Location: Site-Borehole Offset: N/A Depth: 1 - 1.5 ft.  
Sample Description: Tan Fine to Coarse SAND with Little Shell Fragments A-3 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm
Maximum Particle Size	1/2"	Coarse Sand	47.6%
		Silt	1.0%
Gravel	20.2%	Fine Sand	29.6%
		Clay	2.0%
Apparent Relative Density		Moisture Content	16.1%
		% Passing #200	2.8%
Liquid Limit	20	Plastic Limit	0
		Plastic Index	N.P.

Soil Mortar (-#10 Sieve)				
Coarse Sand	59.7%	Fine Sand	37.0%	Silt 1.0% Clay 2.3%

Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable   
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test AASHTO T265: Laboratory Determination of Moisture Content of Soils  
AASHTO T89: Determining the Liquid Limit of Soils AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Krajan Laboratory Supervisor  
*Signature* *Signature*

### Particle Size Analysis of Soils

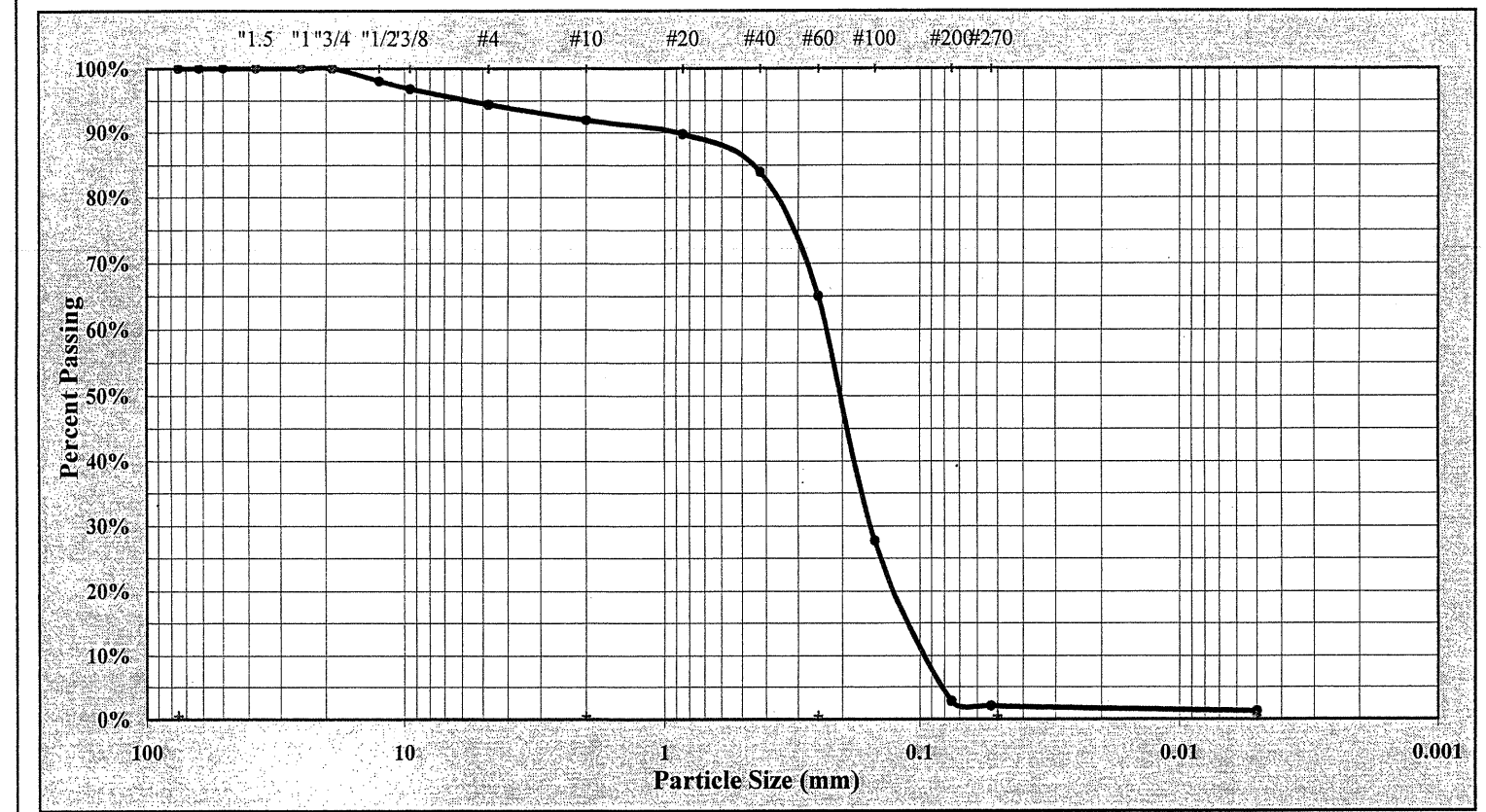
AASHTO T 88 as Modified by NCDOT

S&ME Project #: 1051-07-432  
Project Name: Carteret County U.S. 70 Improvements  
Client Name: NCDOT

Report Date: 10/27/2007  
Test Date(s): 10/23 - 10/27/07

Client Address:  
State Project #: 34528.1.1 F.A. Project No: STPNHF-70(43) TIP NO: R-3307

Boring #: B-10 Sample #: S-4 Sample Date: 10/23/07  
Location: Site-Borehole Offset: N/A Depth: 1.5 - 2.0 ft.  
Sample Description: Brown Coarse to Fine SAND with a trace of Clay A-3 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm
Maximum Particle Size	3/4"	Coarse Sand	26.9%
		Silt	1.0%
Gravel	8.1%	Fine Sand	63.0%
		Clay	1.0%
Apparent Relative Density		Moisture Content	17.3%
		% Passing #200	2.7%
Liquid Limit	20	Plastic Limit	0
		Plastic Index	N.P.

Soil Mortar (-#10 Sieve)				
Coarse Sand	29.3%	Fine Sand	68.5%	Silt 0.9% Clay 1.3%

Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable   
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test AASHTO T265: Laboratory Determination of Moisture Content of Soils  
AASHTO T89: Determining the Liquid Limit of Soils AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Krajan Laboratory Supervisor  
*Signature* *Signature*



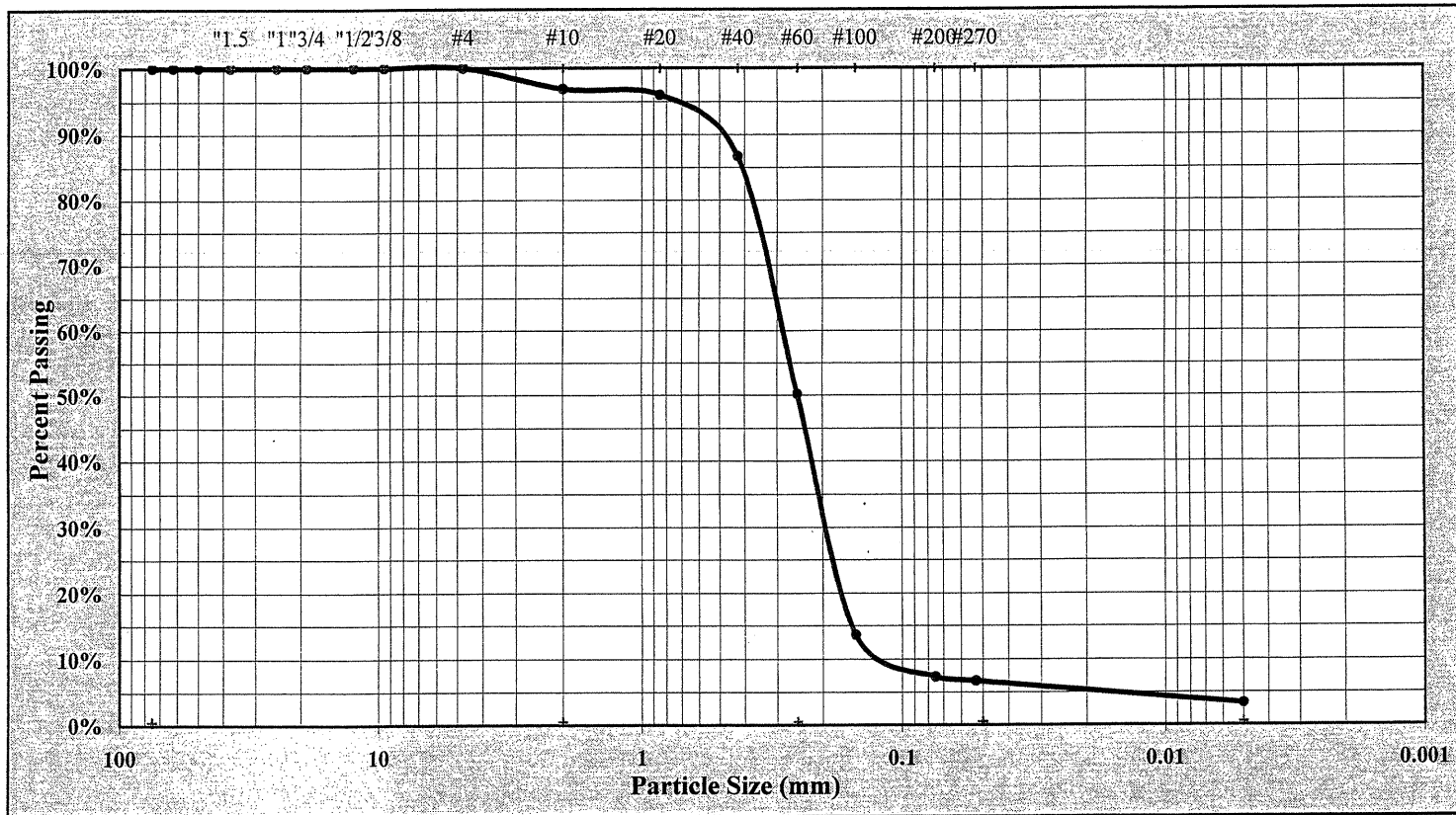
### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #: **1051-07-432**  
 Project Name: **Carteret County U.S. 70 Improvements**  
 Client Name: NCDOT  
 Client Address:  
 State Project #: 34528.1.1      F.A. Project No: STPNHF-70(43)      TIP NO: R-3307

Report Date: 10/27/2007  
 Test Date(s): 10/23 - 10/27/07

Boring #: B-11      Sample #: S-5      Sample Date: 10/23/07  
 Location: Site-Borehole      Offset: N/A      Depth: 1.5 - 2.0 ft.  
 Sample Description: Brown Fine to Coarse SAND with a trace of Silt and Clay      A-3 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm		
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	#4	Coarse Sand	46.8%	Silt	3.0%
Gravel	3.1%	Fine Sand	43.4%	Clay	3.0%
Apparent Relative Density		Moisture Content	19.8%	% Passing #200	7.3%
Liquid Limit	22	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)					
Coarse Sand	48.3%	Fine Sand	44.8%	Clay	3.4%

Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable   
 Mechanical Stirring Apparatus (A)      Length of Dispersion Period: 1 min.      Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      ASTM D 854: Specific Gravity of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan      Laboratory Supervisor



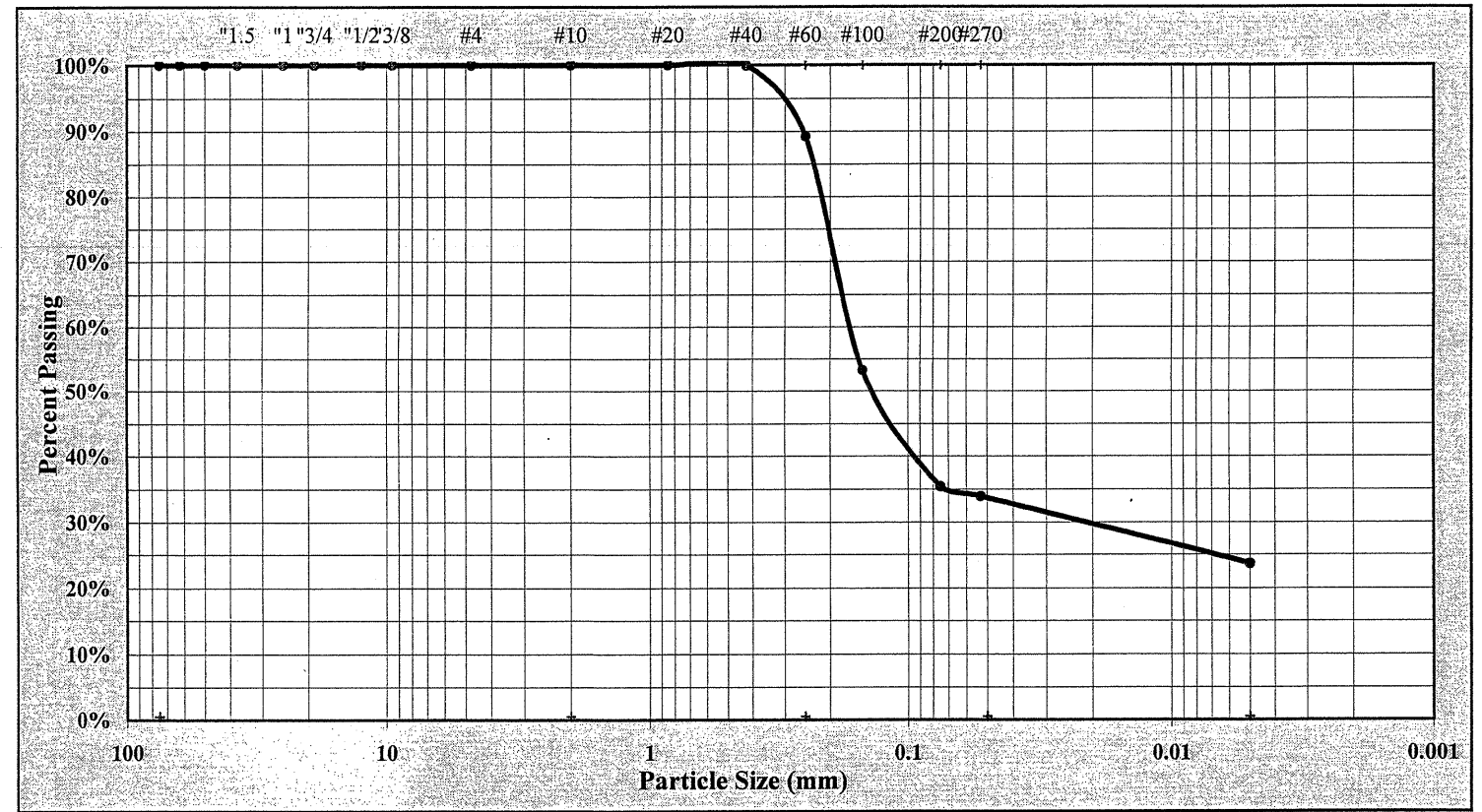
### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #: **1051-07-432**  
 Project Name: **Carteret County U.S. 70 Improvements**  
 Client Name: NCDOT  
 Client Address:  
 State Project #: 34528.1.1      F.A. Project No: STPNHF-70(43)      TIP NO: R-3307

Report Date: 10/27/2007  
 Test Date(s): 10/23 - 10/27/07

Boring #: B-12      Sample #: S-6      Sample Date: 10/23/07  
 Location: Site-Borehole      Offset: N/A      Depth: 1 - 1.5 ft.  
 Sample Description: Gray Silty Clayey Coarse to Fine SAND      A-2-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm		
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	#20	Coarse Sand	10.8%	Silt	10.0%
Gravel	0.0%	Fine Sand	55.3%	Clay	24.0%
Apparent Relative Density		Moisture Content	17.8%	% Passing #200	35.4%
Liquid Limit	21	Plastic Limit	15	Plastic Index	6

Soil Mortar (-#10 Sieve)					
Coarse Sand	10.8%	Fine Sand	55.3%	Clay	23.6%

Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable   
 Mechanical Stirring Apparatus (A)      Length of Dispersion Period: 1 min.      Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      ASTM D 854: Specific Gravity of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan      Laboratory Supervisor



### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

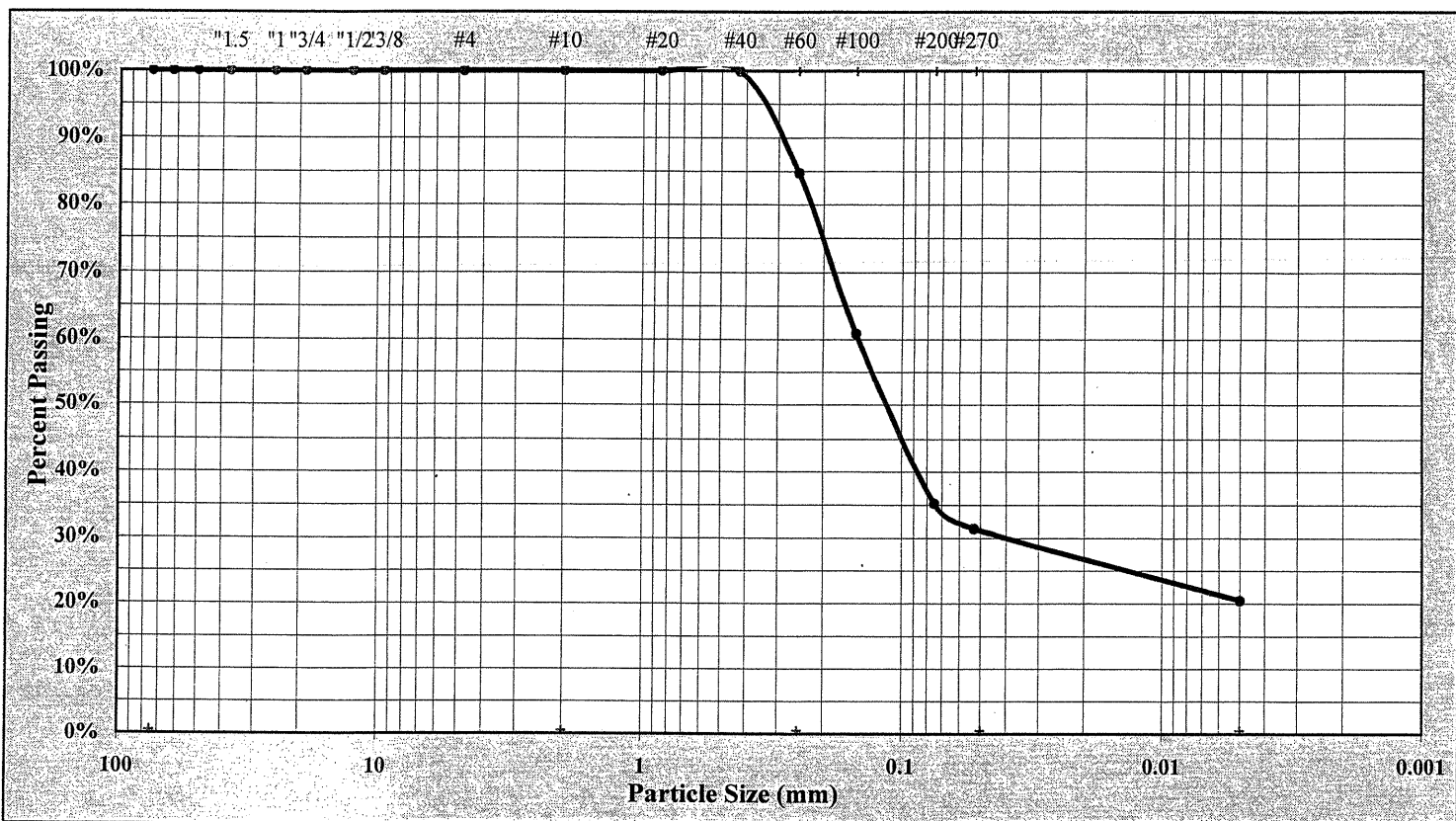


S&ME Project #: **1051-07-432**  
 Project Name: **Carteret County U.S. 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **34528.1.1**

Report Date: **10/27/2007**  
 Test Date(s): **10/23 - 10/27/07**

F.A. Project No: **STPNHF-70(43)**      TIP NO: **R-3307**

Boring #: **B-15**      Sample #: **S-7**      Sample Date: **10/23/07**  
 Location: **Site-Borehole**      Offset: **N/A**      Depth: **2.5 - 3 ft.**  
 Sample Description: **Gray Silty Clayey Coarse to Fine SAND A-2-4 (0)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#20	Coarse Sand	15.3%	Silt	11.0%
Gravel	0.0%	Fine Sand	53.3%	Clay	20.0%
Apparent Relative Density		Moisture Content	25.8%	% Passing #200	35.2%
Liquid Limit	18	Plastic Limit	16	Plastic Index	2

#### Soil Mortar (-#10 Sieve)

Coarse Sand	15.3%	Fine Sand	53.3%	Silt	11.0%	Clay	20.4%
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Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable   
 Mechanical Stirring Apparatus (A)      Length of Dispersion Period: 1 min.      Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes      ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Krajan      \_\_\_\_\_      Laboratory Supervisor  
 Signature      Signature

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

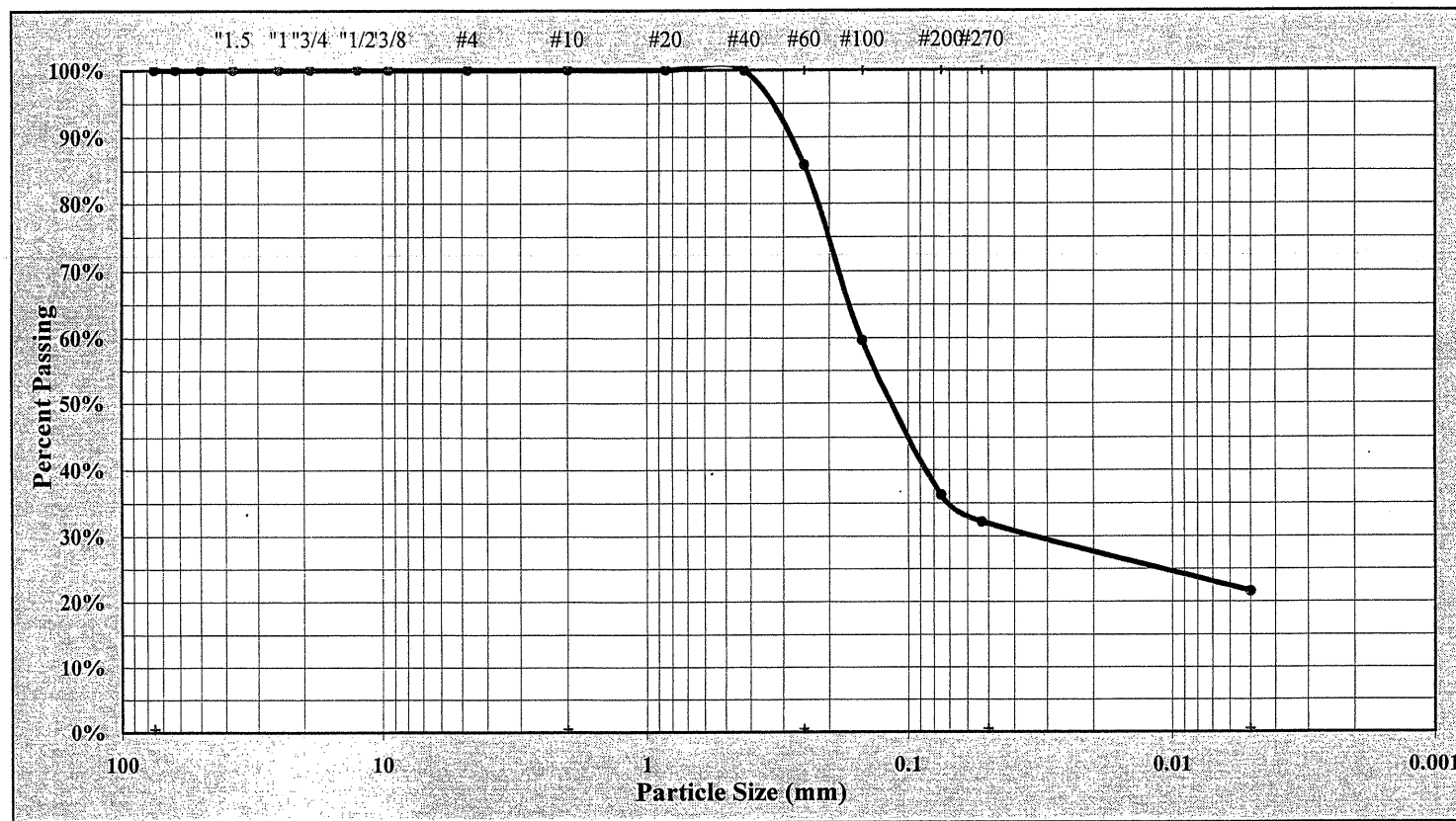


S&ME Project #: **1051-07-432**  
 Project Name: **Carteret County U.S. 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **34528.1.1**

Report Date: **10/27/2007**  
 Test Date(s): **10/23 - 10/27/07**

F.A. Project No: **STPNHF-70(43)**      TIP NO: **R-3307**

Boring #: **B-16**      Sample #: **S-8**      Sample Date: **10/23/07**  
 Location: **Site-Borehole**      Offset: **N/A**      Depth: **1.5 - 2 ft.**  
 Sample Description: **Gray Clayey Coarse to Fine Sandy SILT A-4 (0)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#20	Coarse Sand	14.2%	Silt	11.0%
Gravel	0.0%	Fine Sand	53.7%	Clay	22.0%
Apparent Relative Density		Moisture Content	18.9%	% Passing #200	36.2%
Liquid Limit	20	Plastic Limit	16	Plastic Index	4

#### Soil Mortar (-#10 Sieve)

Coarse Sand	14.2%	Fine Sand	53.7%	Silt	10.6%	Clay	21.5%
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Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable   
 Mechanical Stirring Apparatus (A)      Length of Dispersion Period: 1 min.      Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes      ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Krajan      \_\_\_\_\_      Laboratory Supervisor  
 Signature      Signature

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34528.1.1	1	31
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34528.1.1	STPNHF-70(43)	P.E. CONST.	

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

**INFILTRATION  
BASIN INVESTIGATION**

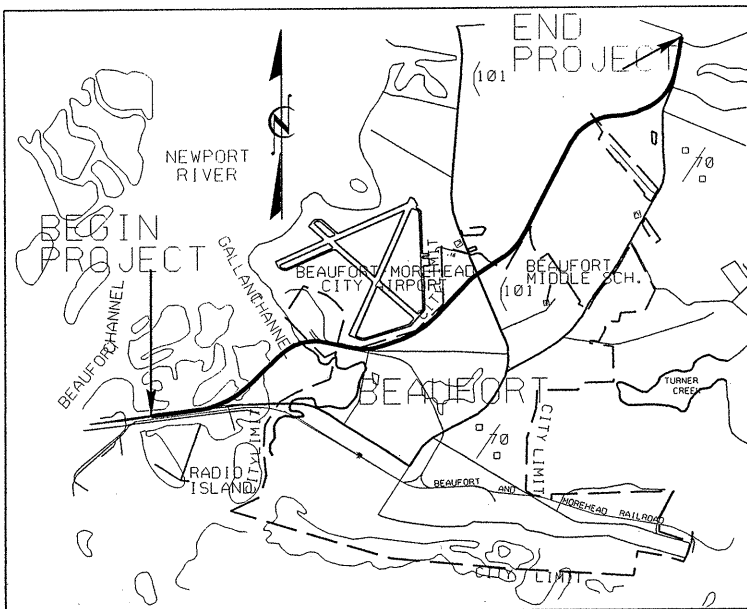
STATE PROJ. 34528.1.1 I.D. R-3307 F.A. PROJ. STPNHF-70(43)  
COUNTY CARTERET  
PROJECT DESCRIPTION US 70 IMPROVEMENTS:  
FOUR LANES AT RADIO ISLAND  
TO NORTH OF BEAUFORT NEAR OLGA ROAD (SR 1429)

**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 ENGINEERING UNIT # 0919 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 RELED 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.



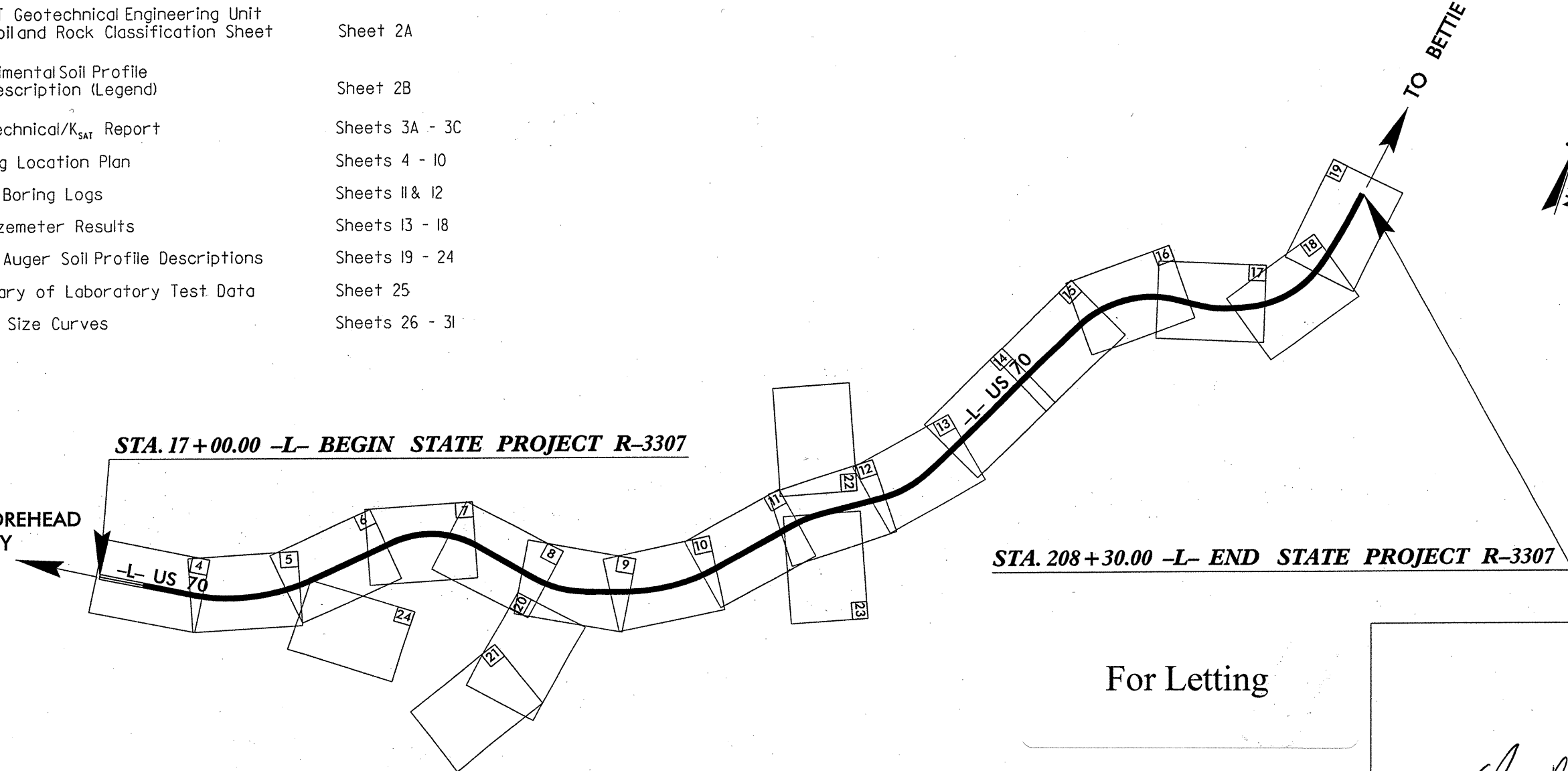
**VICINITY MAP**

**CONTENTS:**

NCDOT Geotechnical Engineering Unit Soil and Rock Classification Sheet	Sheet 2A
Supplemental Soil Profile Description (Legend)	Sheet 2B
Geotechnical/K <sub>SAT</sub> Report	Sheets 3A - 3C
Boring Location Plan	Sheets 4 - 10
Test Boring Logs	Sheets 11 & 12
Amoozemeter Results	Sheets 13 - 18
Hand Auger Soil Profile Descriptions	Sheets 19 - 24
Summary of Laboratory Test Data	Sheet 25
Grain Size Curves	Sheets 26 - 31

**ID: R-3307**

**CONTRACT:**



TO MOREHEAD CITY

**STA. 17+00.00 -L- BEGIN STATE PROJECT R-3307**

**STA. 208+30.00 -L- END STATE PROJECT R-3307**



DRAWN BY: T. PEREZ

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

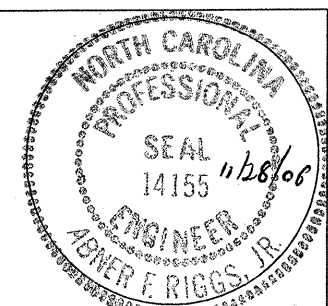
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

For Letting

PERSONNEL  
J. DAVIS  
P. PHELPS  
T. PEREZ

INVESTIGATED BY S&ME, INC.  
CHECKED BY A.F. RIGGS, JR.  
SUBMITTED BY S&ME, INC.

DATE NOVEMBER 13, 2006







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

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-3307	34528.1.1	2A	31

**SUBSURFACE INVESTIGATION**

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

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																			
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 UNIFORM 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. EXAMPLE: <i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HEAVY PLASTIC, A-7-6</i>										WELL GRADED - 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) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. <b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										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. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED ROCK (WR)  CRYSTALLINE ROCK (CR)  NON-CRYSTALLINE ROCK (NCR)  COASTAL PLAIN SEDIMENTARY ROCK (CP)										ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - A FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR 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. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																			
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>MINERALOGICAL COMPOSITION</b>										<b>WEATHERING</b>																													
GENERAL CLASS. GRANULAR MATERIALS (<35% PASSING #200) SILT-CLAY MATERIALS (>35% PASSING #200) ORGANIC MATERIALS										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.										FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.																													
<b>COMPRESSIONIBILITY</b>										<b>PERCENTAGE OF MATERIAL</b>										<b>GROUND WATER</b>										<b>MISCELLANEOUS SYMBOLS</b>																			
SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE										ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE										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 HOLE CAVED										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 SPT TEST BORING DMT TEST BORING CPT TEST BORING GEO-PROBE AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SAMPLE DESIGNATIONS S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CBR SAMPLE																			
<b>CONSISTENCY OR DENSENESS</b>										<b>TEXTURE OR GRAIN SIZE</b>										<b>ROCK HARDNESS</b>										<b>ABBREVIATIONS</b>																			
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )										U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.0 0.42 0.25 0.075 0.053										VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.										AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F. - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED FRAGS. - FRAGMENTS MED. - MEDIUM PMT - PRESSUREMETER TEST SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT w - MOISTURE CONTENT v. - VERY VST - VANE SHEAR TEST																			
<b>TEXTURE OR GRAIN SIZE</b>										<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>										<b>FRACTURE SPACING</b>										<b>BEDDING</b>									
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F. SD.) SILT (SL.) CLAY (CL.)										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										DRILL UNITS: MOBILE B- BK-51 CME-550x CME-750 PORTABLE HOIST OTHER GEOPROBE OTHER										TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET										TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET									
<b>PLASTICITY</b>										<b>PLASTICITY</b>										<b>INDURATION</b>										<b>INDURATION</b>										<b>INDURATION</b>									
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY										PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.										FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										BENCH MARK: STAMPED STATION ELEVATION (FEET) GPS R-3307-2 ---- 3.57 BL-3 18+88.04 5.62 BL-9 71+00.14 4.49 BL-11 85+18.16 4.66 BL-13 100+47.87 8.35 BL-14 107+54.74 8.18 BY2-56 8+53.79 4.97 BY2-59 21+83.87 3.08									
DESCRIPTORS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																																																	

**S&ME, INC.**  
**SOIL PROFILE DESCRIPTIONS**  
**(LEGEND)**

**Mottles – example: (f1f)**

## (1) Abundance

Few	-	(mottles <2% of surface)	-	f
Common	-	(mottles 2 – 20% of surface)	-	c
Many	-	(mottles >20% of surface)	-	m

## (2) Size

Fine	-	(<5 mm.)	-	1
Medium	-	(5-15 mm.)	-	2
Coarse	-	(>15 mm.)	-	3

## (3) Contrast

Faint	-	(Hue and Chroma of matrix and mottles closely related)
Distinct	-	(Matrix and Mottles vary 1-2 hues and several units in Chroma and value)
Prominent	-	(Matrix and Mottles vary several units in hue, value and chroma)

**Texture – example: scl**

Sand	-	s	Loam	-	l
Fine Sand	-	fs	Silt	-	si
Very Fine Sand	-	vfs	Silt Loam	-	sil
Loamy Sand	-	ls	Clay Loam	-	cl
Loamy Fine Sand	-	lfs	Silty Clay Loam	-	sicl
Sandy Loam	-	sl	Sandy Clay Loam	-	scl
Fine Sandy Loam	-	fsl	Silty Clay	-	sic
Very Fine Sandy Loam	-	vfs1	Clay	-	c

**Structure – example: scl**

## (1) Grade:

Structureless	(No observable aggregation or no orderly arrangement of natural lines of weakness)	-	0
Weak	(Poorly formed indistinct peds, barely observable in place)	-	1
Moderate	(Well-formed distinct peds, moderately durable and evident, but not distinct in undisturbed soil)	-	2
Strong	(Durable peds that are quite evident in undisplaced soil, adhere weakly to one another, withstand displacement and become separated when soil is disturbed)	-	3

## (2) Size:

Very Fine	-	vf	Coarse	-	c
Fine	-	f	Very Coarse	-	vc
Medium	-	m			

## (3) Form or Type:

Platy	-	pl	Granular	-	gr
Prismatic	-	pr	Crumb	-	cr
Columnar	-	cpr	Single Grain	-	sg
Blocky	-	bk	Massive	-	m
Angular Blocky	-	abk	Subangular Blocky	-	sbk

**Consistence – example: mfr**

## (1) Moist Soil:

Loose	-	ml	Firm	-	mf
Very Friable	-	mvfr	Very Firm	-	mvf
Friable	-	mfr	Extremely Firm	-	mef

**Boundary – Example: gw**

## (1) Distinctness:

Abrupt (< 1")	-	a	Gradual (2 ½" – 5")	-	g
Clear (1" – 2 ½")	-	c	Diffuse (> 5")	-	d

## (2) Topography of Boundary

Smooth (nearly a plane)	-	s
Wavy (pockets with width > depth)	-	w
Irregular (pockets with depth > width)	-	I
Broken (discontinuous)	-	b

STATE PROJECT NO.: 34528.1.1  
 I.D. NO.: R-3307  
 FEDERAL PROJECT NO.: STPNHF-70(43)  
 COUNTY: Carteret

DESCRIPTION: U.S. 70 Improvements: Four Lanes at Radio Island to North of Beaufort near Olga Road (SR1429)  
 Infiltration Basin Investigation

SUBJECT: Infiltration Basin Investigation – Addendum to Inventory Report

#### Project Description

The project site is located along existing U.S. 70 at Radio Island and extends north over the Newport River to Beaufort just south of the Beaufort-Morehead City Airport to north of Beaufort at Olga Road (SR1429) in Carteret County, North Carolina. The proposed project is part of the widening of U.S. 70 in which infiltration basins are to be constructed adjacent to the new alignment. The proposed infiltration basins will be located between U.S. 70 and N.C. Highway 101. Grading plans of the proposed infiltration basin were not provided at the time of our investigation.

The sites are located within commercial, residential and cultivated areas. The sites consist of grassed lawns and soybean fields. Underground utilities including fiber optic cables, water, sewer and power located along the roadway shoulders of the adjacent roads.

A geotechnical investigation was conducted to determine hydraulic conductivity, depth to the seasonal groundwater table and the depth to observed water levels. S&ME personnel conducted eleven (11) in-situ saturated hydraulic conductivity tests for the proposed Infiltration Basins on November 2 and November 3, 2006. The field test locations were selected by NCDOT and located in the field using a non-survey quality sub-meter Global Positioning System (GPS). The reported elevations were determined by S&ME personnel in the field utilizing survey techniques referencing the bench marks provided by NCDOT. The soil borings/hydraulic conductivity test locations selected by the NCDOT are shown on (Sheets 5, 8-12 and 20) at the following stations:

Site	Station	Offset
1	-L- Station 24+25 +/-	61 Feet Left
2	-L- Station 61+74 +/-	73 Feet Right
3	-L- Station 73+00 +/-	97 Feet Right
4	-Y2- Station 22+73 +/-	79 Feet Left
5	-L- Station 80+95 +/-	135 Feet Right
6	-L- Station 89+90 +/-	75 Feet Right
7	-L- Station 87+88 +/-	95 Feet Right
8	-L- Station 92+48 +/-	78 Feet Right
9	-L- Station 103+91 +/-	84 Feet Right
10	-L- Station 109+71 +/-	76 Feet Left
11	-L- Station 113+22 +/-	65 Feet Left

In-situ saturated hydraulic conductivity (K<sub>sat</sub>) measurements were performed with a compact constant head permeameter (cchp). Test locations evaluated were B-1 through B-11. The in-situ hydraulic conductivity measurements were performed in the unsaturated material above the observed water table on the date of field testing. Hand auger borings were conducted beside temporary test wells and the material was described from the surface down to depths of 36 to 54 inches below the existing surface. The hand auger borings were generally terminated when water was encountered. The seasonal groundwater table was also determined by soil type and groundwater encountered in the hand auger borings. The seasonally high water table ranged from less than 1.0 to 3.8 feet below the surface. See attached soil profile description for each location for seasonally high water table determinations.

In addition to the hand auger borings and hydraulic conductivity measurements, eleven soil borings were performed on October 31 and November 2, 2006 to install 1 inch diameter PVC temporary piezometers to determine the depth of ground water. Borings B-1 through B-11 were performed at the locations provided by NCDOT and are shown on the Boring Location Plan (Sheets 5, 8-12 and 20). All soil test borings were performed with a Geoprobe 7720 DT drill rig mounted on a track carrier. All borings were advanced to depths of 10 feet below the ground surface. Representative soil samples were collected for visual classification in the field and for laboratory classification analysis by the NCDOT accredited S&ME soil testing laboratory.

#### Test Results

Representative soil samples were tested in S&ME's laboratory to determine the soil index properties and to verify field classification. Eleven (11) soil samples from the site were analyzed for grain size distribution (including hydrometer) T88-90 and determination of liquid limit (T89-90), plastic limit and plasticity index in accordance with AASMT0 T90-87 and NCDOT modifications to AAMTO T88-90, T89-90 and T90-87. Results of the laboratory tests are presented on the test data sheets in the Appendix.

#### Physiography and Geology

The site is located within the eastern portion of the Coastal Plain Physiographic and Geologic Province of North Carolina in Carteret County. The Coastal Plain Province is typically characterized by marine and eolian sediments that were deposited during the transgressive and regressive depositional sequences of the oceans moving into and out of North Carolina. As such, the Coastal Plain Province is characterized by subdued topographic features and flat, low-lying terrain. The geology of the eastern quadrant of Carteret County, near the project site, primarily consist of recent alluvial sediments underlain by Undifferentiated Coastal Plain Deposits and the Yorktown Formation. Typically, the alluvium consists of gray coarse to fine silty sands and highly organic silty sands. These deposits are underlain by the Yorktown Formation of the Middle Tertiary Age. The Yorktown Formation consists of green-gray to gray silty clays and green-gray to gray silty sands with varying amounts of shell material and cemented sands.

#### Materials

The soil test borings were advanced to depths of 10 feet below the ground surface at collar elevations ranging from 4.2 to 8.7 feet.

Artificial fill materials were encountered in borings B-1, B-2, B-3, B-4 and B-5 to depths of about 2.0 to 3.5 feet below the collar elevation. The fill materials encountered in the boring consists of dark brown, dark gray and gray-brown silty fine sand (A-2-4, A-3) with little to trace of organics and dark gray silty clay (A-7-6).

Coastal Plain deposits were encountered beneath the fill materials in borings B-1, B-2, B-3, B-4 and B-5 and at the ground surface in the remaining borings to depths of 10 feet beneath collar elevations. Typically, Coastal Plain deposits encountered consist of gray and tan silty, orange-tan and green-tan silty to clayey fine to coarse sand (A-1-b, A-3, A-2-4 and A-2-6) with trace to little organic matter and trace of shells and tan-orange, gray-brown and tan-gray silty to fine sandy clay (A-6 and A-7-6). A layer of light gray silt (A-4) was encountered in boring B-4 from 3.5 to 8.0 feet below the collar elevation.

#### Ksat Testing Results

The in-situ saturated hydraulic conductivity values were calculated based on field measurements using the Glover Equation. Saturated hydraulic conductivity measurements ranged from 0.67 to 130.34 gallons per day per square foot (gpd/ft<sup>2</sup>) (Appendix). A detailed soil profile description was performed at each Ksat location to determine the most limiting horizon at which the test should be performed.

Table 1 below summarizes hydraulic conductivity measurements for each location, including the location, and depth.

**Table 1: Hydraulic Conductivity Measurements**

Test Location	Depth (Feet)	Hydraulic Conductivity	
		gpd/ft <sup>2</sup>	in/hour
B-1	2.0	130.34	8.71
B-2	0.8	20.77	1.39
B-3	1.5	8.48	0.57
B-4	0.8	8.82	0.59
B-5	1.0	16.01	1.07
B-6	0.6	11.32	0.76
B-7	0.6	8.04	0.54
B-8	0.7	13.54	0.91
B-9	2.0	0.67	0.04
B-10	1.9	0.74	0.05
B-11	1.6	2.16	0.14

#### Groundwater

Groundwater depths were measured at the time of drilling operations for all of the borings. Groundwater depths ranging from about 1.6 to 4.1 feet beneath the collar elevation were measured in the borings. Based on the hand auger borings and observation of soil mottling in near surface soils, the seasonal high water table was estimated at depths ranging from less than 1 to 3.8 feet.

Table 2 below summarizes the location, ground surface elevation, seasonal high ground water and measured water levels at the time of boring completion for each location.

**Table 2: Season High Water Ground Water Estimates**

Location	Elevation Ground Surface	Depths to Seasonal High Ground Water	Water Levels Depth (Feet) 11/3/06
B-1	5.4'	2.0	4.1'
B-2	4.2'	1.7	1.8'
B-3	6.7'	1.5	4.0'
B-4	3.8'	1.3	1.7'
B-5	4.8'	2.0	2.2'
B-6	4.9'	1.2	1.8'
B-7	4.4'	<1.0	1.6'
B-8	5.8'	1.3	1.7'
B-9	8.7'	3.8	3.8'
B-10	8.5'	1.3	2.9'
B-11	8.2'	<1.0	2.2'

Qualifications of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The findings contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, expressed or implied, is made.

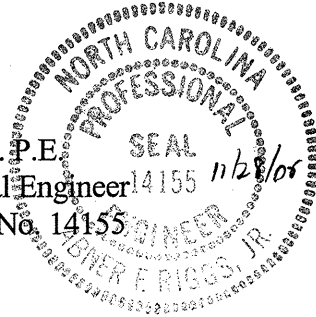
The findings submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of subsurface variations between the borings may not become evident until construction. If variations appear evident, then the findings contained in this report may need to be re-evaluated. In the event that any changes in the nature, design, or location of the structure are planned, the findings contained in this report will not be considered valid unless the changes are reviewed by S&ME, and the findings of the report are modified or verified in writing.

S&ME appreciates the opportunity to be your geotechnical consultant on this project. If you have any questions or need additional information in regard to this report, please contact us.

Very truly yours,  
**S&ME, Inc.**

*John R. Davis - gj*  
John R. Davis, LSS  
Project Manager

*Abner F. Riggs, Jr.*  
Abner F. Riggs, Jr. P.E.  
Chief Geotechnical Engineer  
N.C. Registration No. 14155

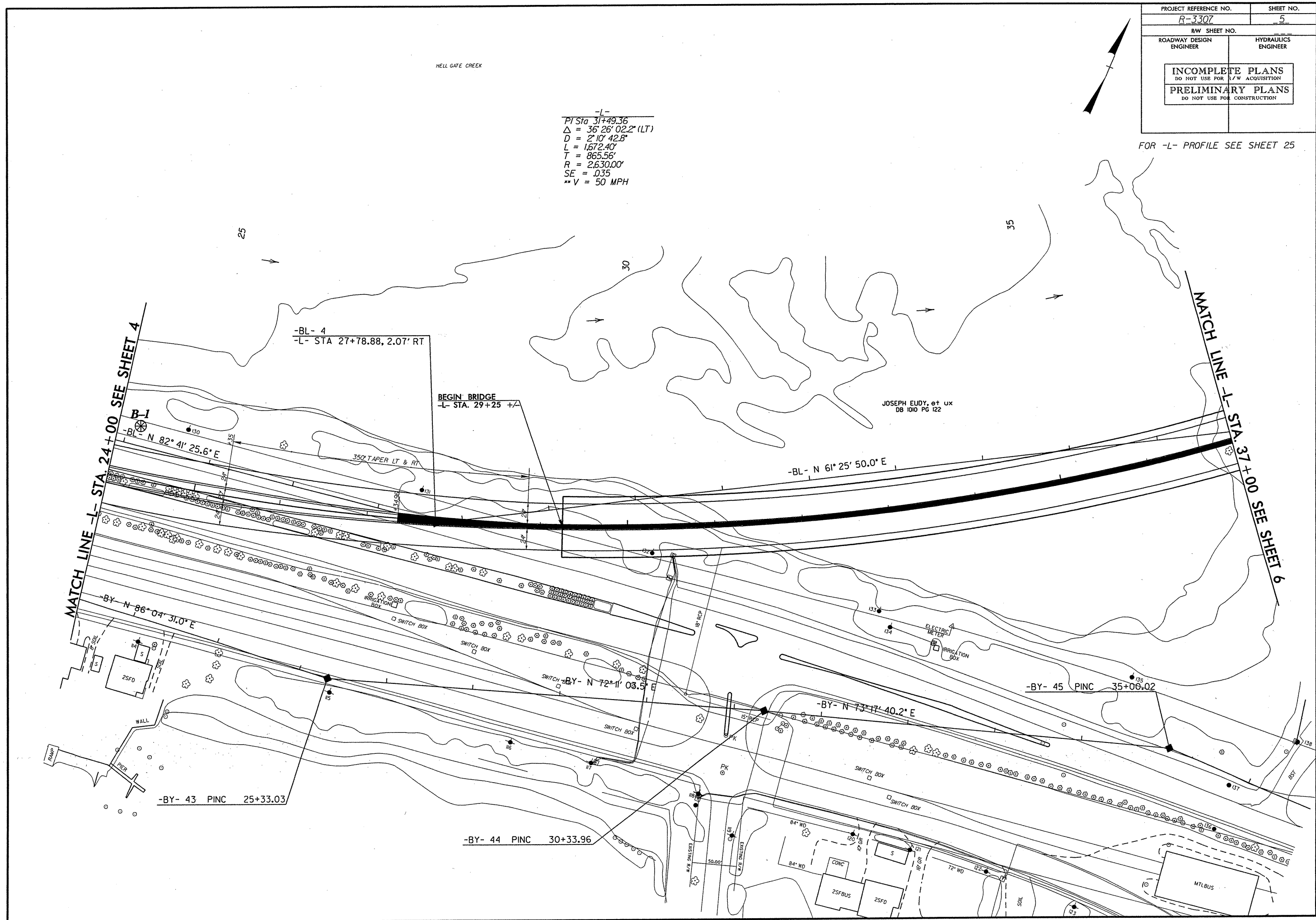


Attachments

PROJECT REFERENCE NO. R-3307	SHEET NO. 5
RW SHEET NO.	
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	

FOR -L- PROFILE SEE SHEET 25

-L-  
 PI Sta 31+49.36  
 $\Delta = 36^{\circ} 26' 02.2''$  (LT)  
 $D = 2^{\circ} 10' 42.8''$   
 $L = 1,672.40'$   
 $T = 865.56'$   
 $R = 2,630.00'$   
 $SE = .035$   
 $**V = 50$  MPH



-BL- 4  
 -L- STA 27+78.88, 2.07' RT

BEGIN BRIDGE  
 -L- STA. 29+25 +/-

JOSEPH EUDY, et ux  
 DB 1010 PG 122

MATCH LINE -L- STA. 24+00 SEE SHEET 4

MATCH LINE -L- STA. 37+00 SEE SHEET 6

-BY- N 86° 04' 31.0" E

-BL- N 61° 25' 50.0" E

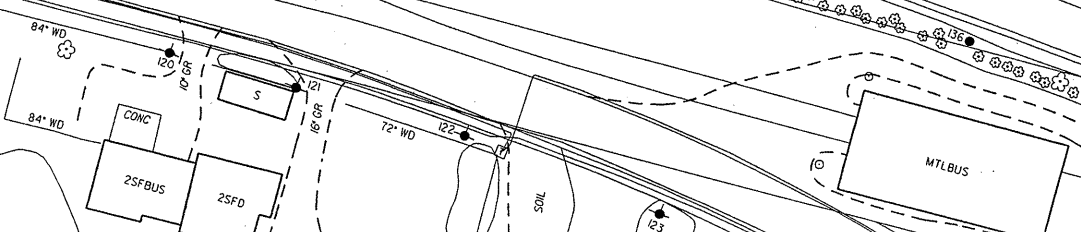
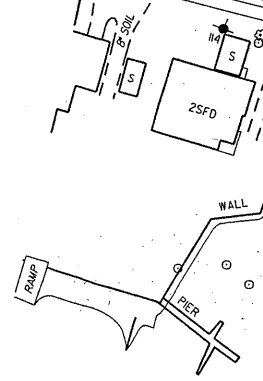
-BY- N 72° 11' 03.5" E

-BY- N 73° 17' 40.2" E

-BY- 45 PINC 35+06.02

-BY- 43 PINC 25+33.03

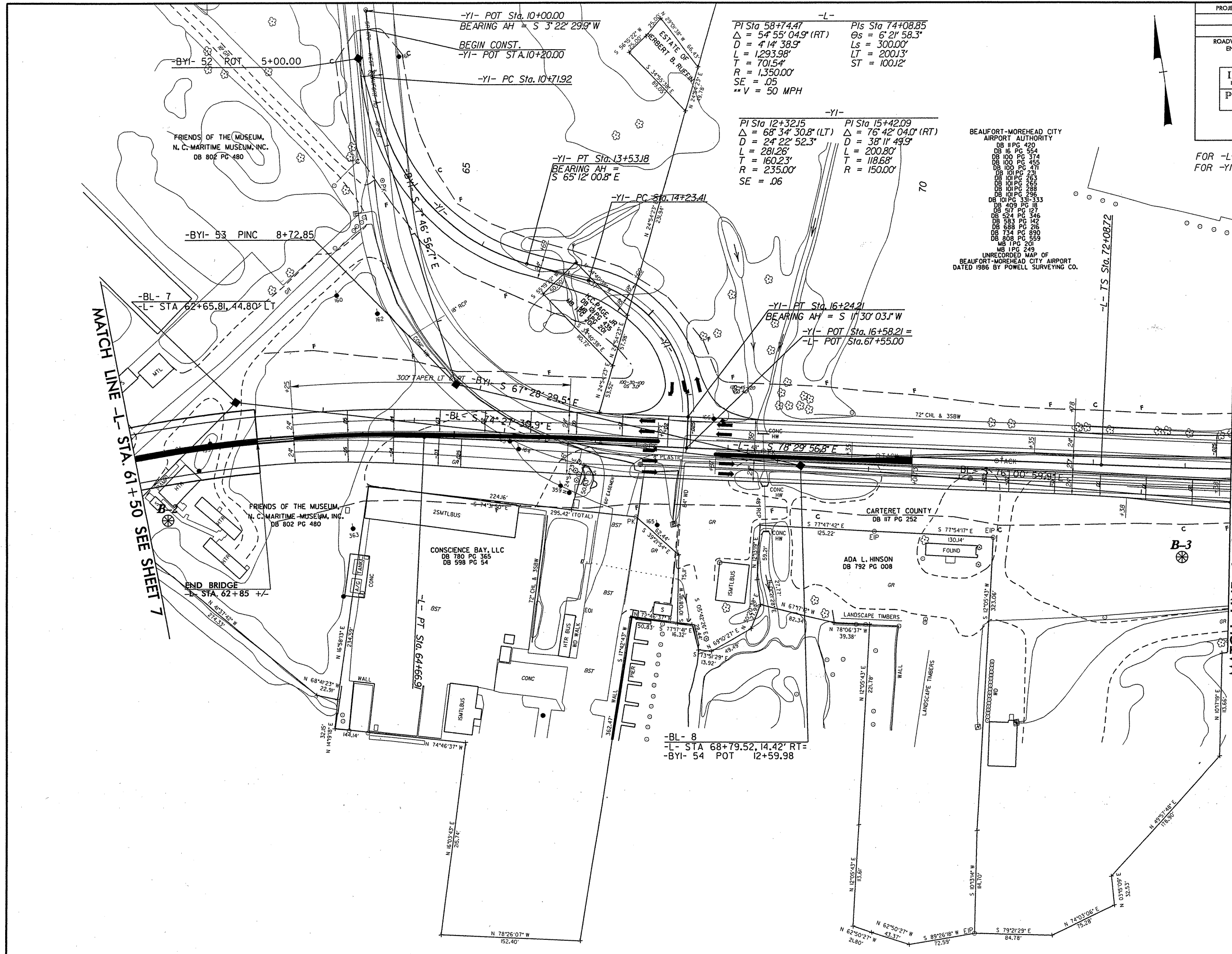
-BY- 44 PINC 30+33.96





PROJECT REFERENCE NO.	SHEET NO.
R-3307	8
RW SHEET NO.	
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	

FOR -L- PROFILE SEE SHEET 28  
 FOR -YI- PROFILE SEE SHEET 34



- BEAUFORT-MOREHEAD CITY AIRPORT AUTHORITY
- DB 11 PG 420
  - DB 16 PG 554
  - DB 100 PG 374
  - DB 100 PG 455
  - DB 100 PG 471
  - DB 101 PG 231
  - DB 101 PG 263
  - DB 101 PG 265
  - DB 101 PG 288
  - DB 101 PG 296
  - DB 101 PG 331-333
  - DB 409 PG 18
  - DB 517 PG 127
  - DB 524 PG 346
  - DB 583 PG 142
  - DB 688 PG 216
  - DB 734 PG 890
  - DB 808 PG 559
  - MB 1 PG 201
  - MB 1 PG 249
- UNRECORDED MAP OF BEAUFORT-MOREHEAD CITY AIRPORT DATED 1986 BY POWELL SURVEYING CO.

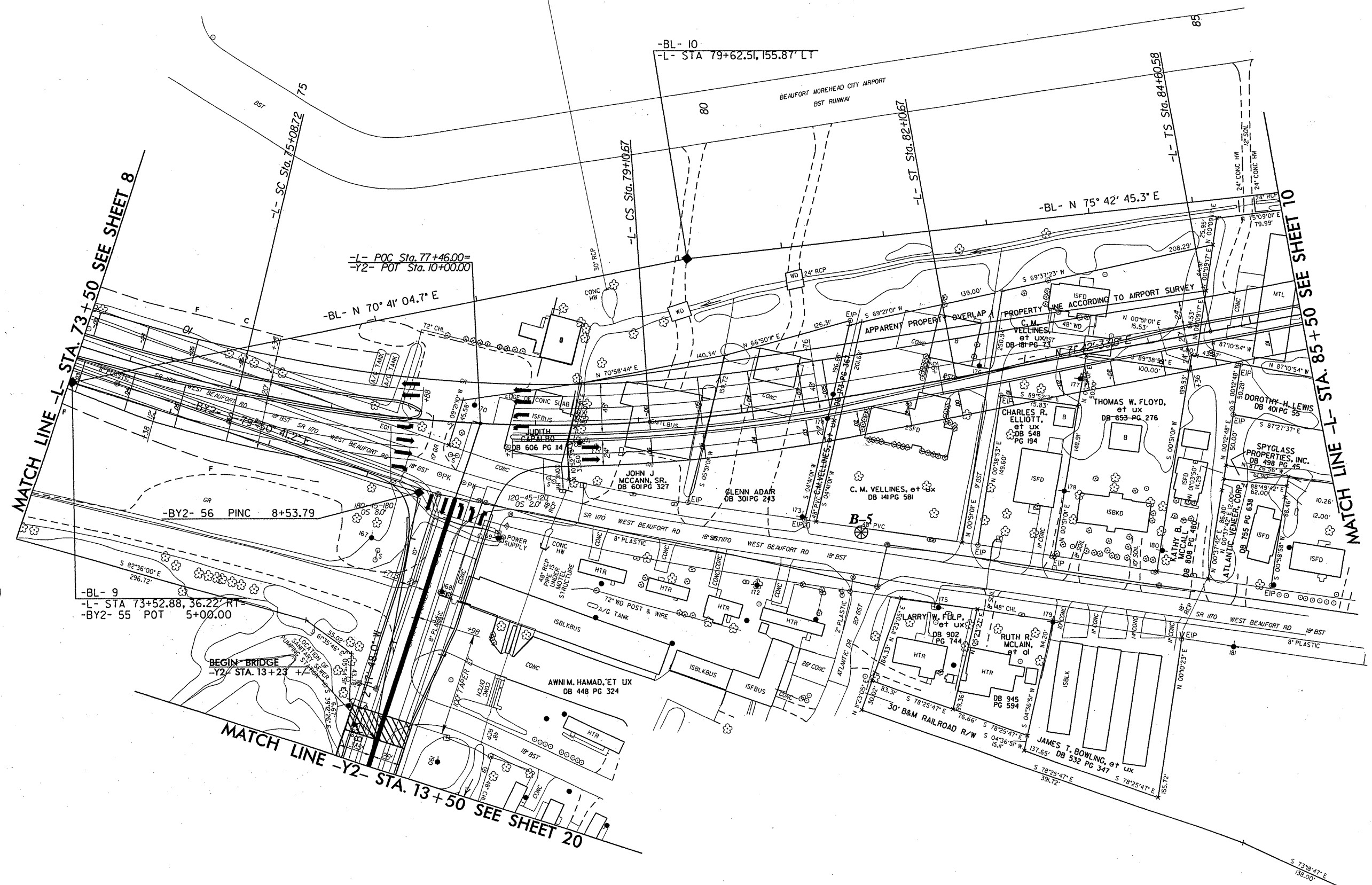
MATCH LINE -L- STA. 61+50 SEE SHEET 7

MATCH LINE -L- STA. 73+50 SEE SHEET 9

FOR -L- PROFILE SEE SHEET 28

-L-

Pls Sta 74+08.85 Os = 6' 2" 58.3" Ls = 300.00' LT = 200.13' ST = 100.12'	PI Sta 77+11.19 Δ = 17' 03" 32.8" (LT) D = 4' 14" 38.9" L = 401.95' T = 202.47' R = 1,350.00' SE = .06	Pls Sta 80+10.78 Os = 6' 2" 58.3" Ls = 300.00' LT = 200.13' ST = 100.12'	Pls Sta 86+27.27 Os = 2' 42" 09.5" Ls = 250.00' LT = 166.69' ST = 83.35'
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MATCH LINE -L- STA. 73+50 SEE SHEET 8

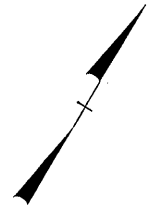
MATCH LINE -L- STA. 85+50 SEE SHEET 10

MATCH LINE -Y2- STA. 13+50 SEE SHEET 20

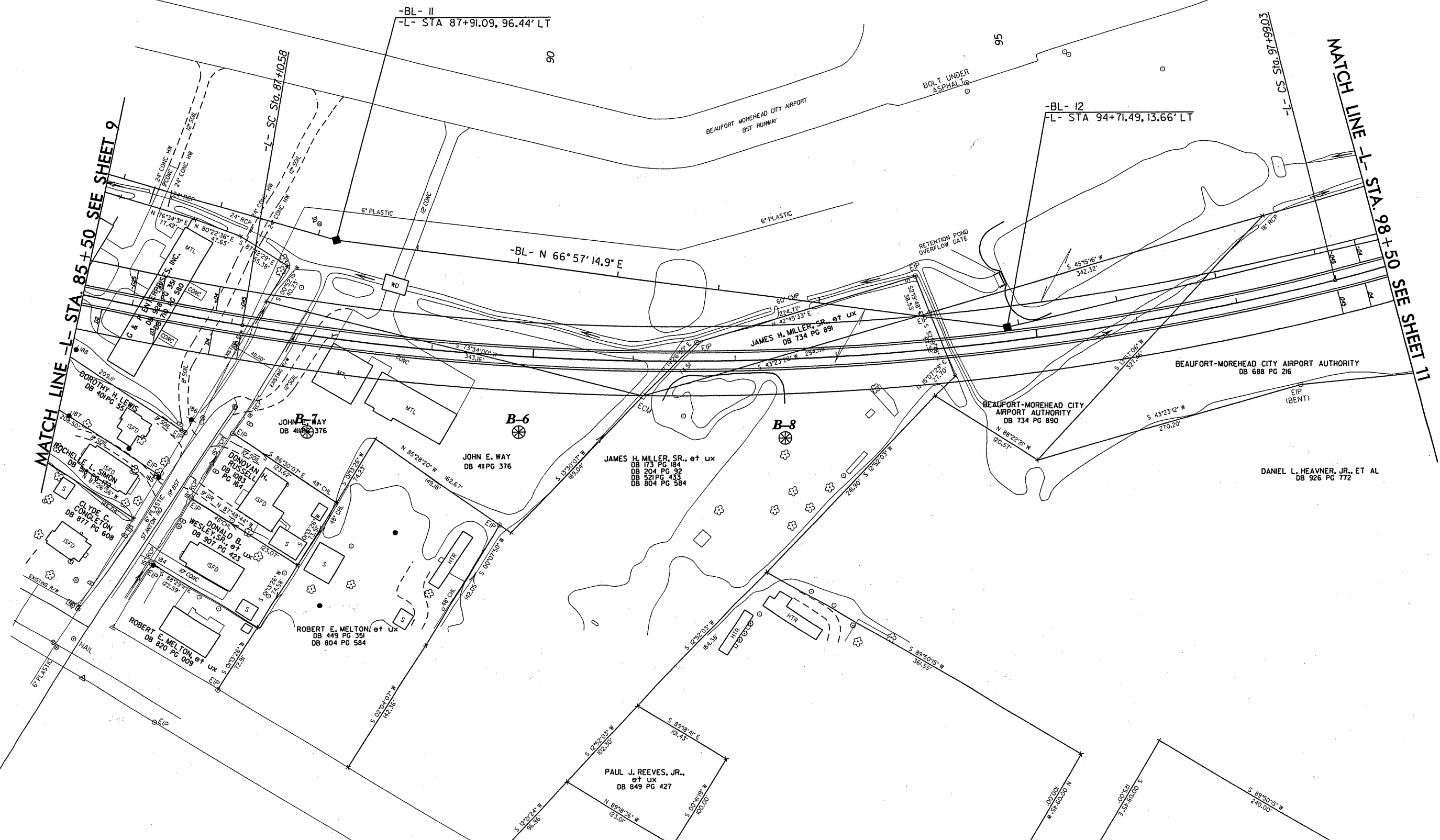
BEAUFORT-MOREHEAD CITY  
AIRPORT AUTHORITY  
 DB 11 PG 420  
 DB 16 PG 554  
 DB 100 PG 374  
 DB 100 PG 455  
 DB 100 PG 471  
 DB 101 PG 231  
 DB 101 PG 263  
 DB 101 PG 265  
 DB 101 PG 288  
 DB 101 PG 296  
 DB 101 PG 331-333  
 DB 409 PG 18  
 DB 517 PG 127  
 DB 524 PG 346  
 DB 583 PG 142  
 DB 588 PG 216  
 DB 734 PG 890  
 DB 808 PG 559  
 MB 1 PG 201  
 MB 1 PG 249  
 UNRECORDED MAP OF  
 BEAUFORT-MOREHEAD CITY AIRPORT  
 DATED 1986 BY POWELL SURVEYING CO.

-L-

Pls Sta 86+27.27	PI Sta 92+62.58	Pls Sta 98+82.38
$\theta_s = 2^\circ 42' 09.5''$	$\Delta = 23^\circ 32' 00.0'' (LT)$	$\theta_s = 2^\circ 42' 09.5''$
$L_s = 250.00'$	$D = 2^\circ 09' 43.6''$	$L_s = 250.00'$
$LT = 166.69'$	$L = 1,088.45'$	$LT = 166.69'$
$ST = 83.35'$	$T = 552.01'$	$ST = 83.35'$
	$R = 2,650.00'$	
	$SE = .045$	



FOR -L- PROFILE SEE SHEET 29



MATCH LINE -L- STA 85+50 SEE SHEET 9

MATCH LINE -L- STA 98+50 SEE SHEET 11

-BL- II  
-L- STA 87+91.09, 96.44' LT

-BL- 12  
-L- STA 94+71.49, 13.66' LT

-BL- N 66° 57' 14.9° E

DOROTHY H. LEWIS  
DB 40 PG 55

ROCHELLE L. SIMON  
DB 31 PG 87

C. YDE C. CONGLETON  
DB 877 PG 608

ROBERT E. MELTON, et ux  
DB 820 PG 405

ROBERT E. MELTON, et ux  
DB 449 PG 351  
DB 804 PG 584

WESLEY SR., et ux  
DB 907 PG 423

DONALD B. RUSSELL, et ux  
DB 683 PG 184

DINOVIN M. RUSSELL, et ux  
DB 683 PG 184

JOHN E. WAY  
DB 41 PG 376

JOHN E. WAY  
DB 41 PG 376

JAMES H. MILLER, SR., et ux  
DB 173 PG 184  
DB 204 PG 92  
DB 521 PG 453  
DB 804 PG 584

BEAUFORT-MOREHEAD CITY AIRPORT AUTHORITY  
DB 734 PG 890

BEAUFORT-MOREHEAD CITY AIRPORT AUTHORITY  
DB 688 PG 216

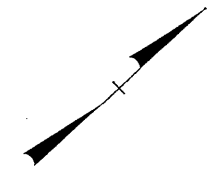
DANIEL L. HEAVNER, JR., ET AL  
DB 926 PG 772

PAUL J. REEVES, JR., et ux  
DB 849 PG 427

PROJECT REFERENCE NO.	SHEET NO.
R-330Z	11
RW SHEET NO.	
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	

-L-

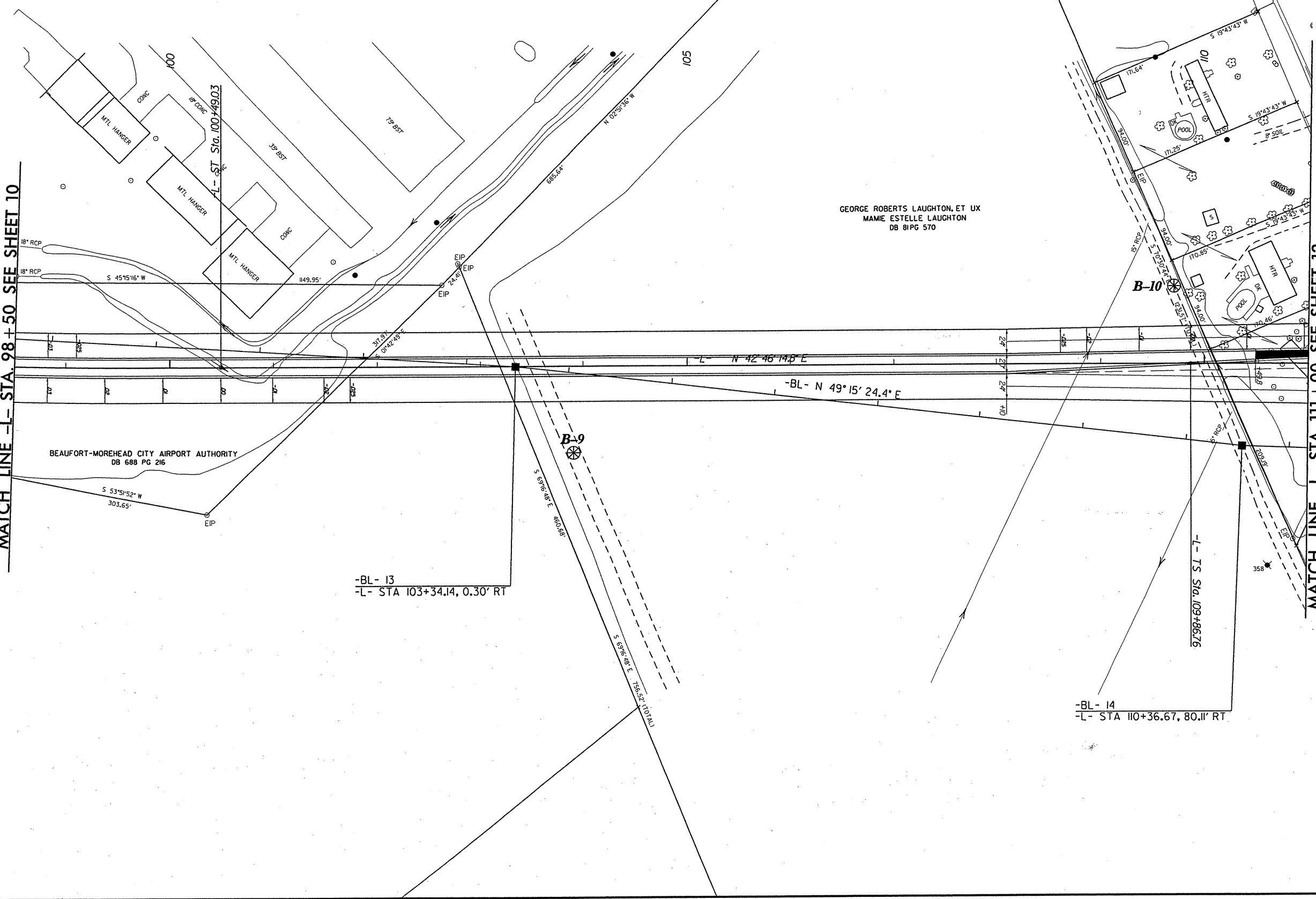
Pls Sta 98+82.38	Pls Sta 111+86.83
$\theta_s = 2^\circ 42' 09.5''$	$\theta_s = 4^\circ 38' 44.2''$
$L_s = 250.00'$	$L_s = 300.00'$
$LT = 166.69'$	$LT = 200.07'$
$ST = 83.35'$	$ST = 100.06'$



FOR -L- PROFILE SEE SHEET 29

MATCH LINE -L- STA 98+50 SEE SHEET 10

MATCH LINE -L- STA. 111+00 SEE SHEET 12



BEAUFORT-MOREHEAD CITY AIRPORT AUTHORITY  
DB 688 PG 216

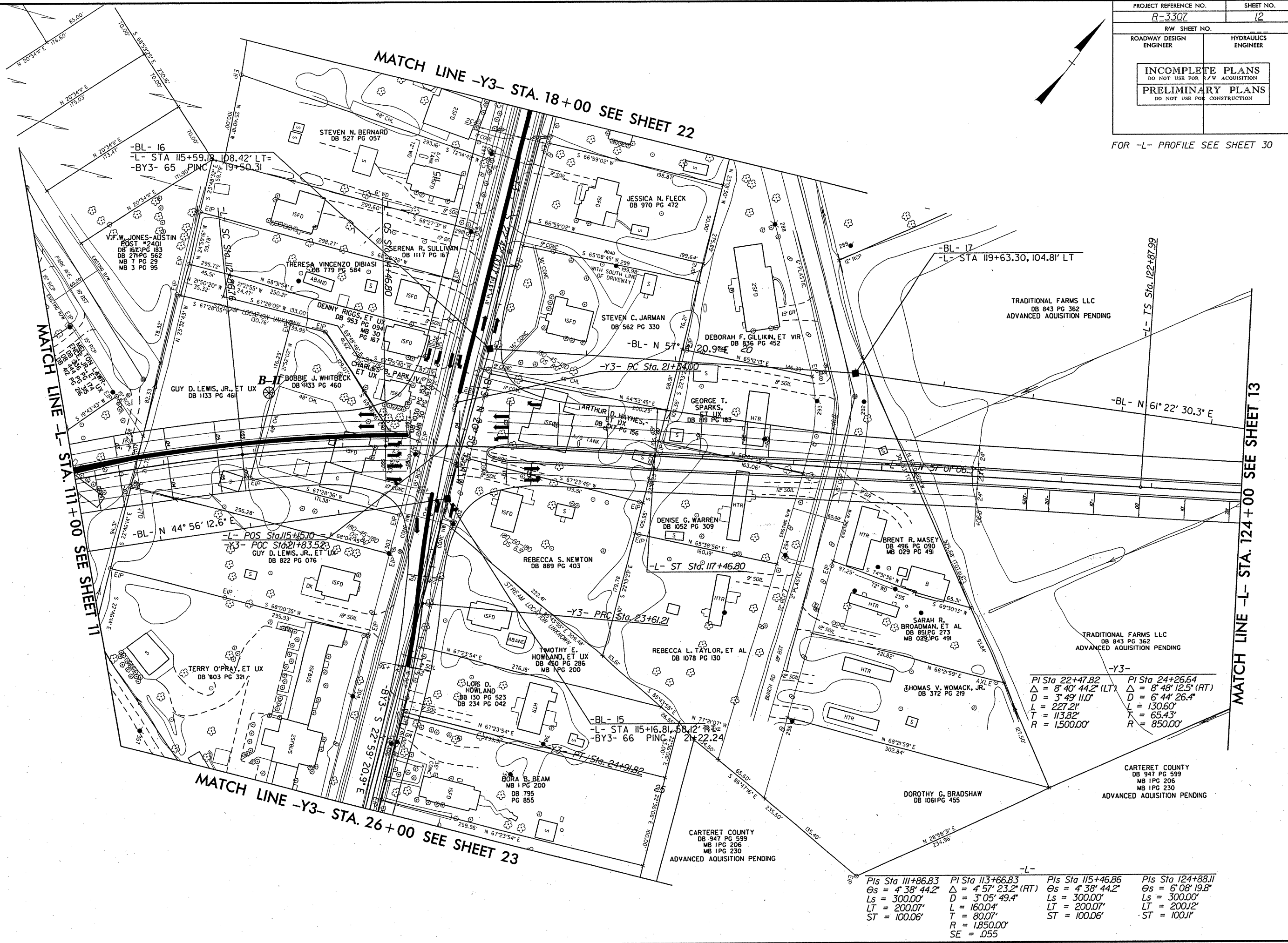
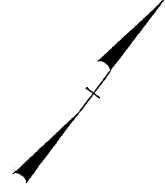
GEORGE ROBERTS LAUGHTON, ET UX  
MAMIE ESTELLE LAUGHTON  
DB 81 PG 570

-BL- 13  
-L- STA 103+34.14, 0.30' RT

-BL- 14  
-L- STA 110+36.67, 80.11' RT

PROJECT REFERENCE NO. <b>R-3307</b>	SHEET NO. <b>12</b>
RAW SHEET NO.	
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	

FOR -L- PROFILE SEE SHEET 30



MATCH LINE -Y3- STA. 18+00 SEE SHEET 22

MATCH LINE -L- STA. 111+00 SEE SHEET 11

MATCH LINE -Y3- STA. 26+00 SEE SHEET 23

MATCH LINE -L- STA. 124+00 SEE SHEET 13

-BL- 16  
-L- STA 115+59.18, 108.42' LT=  
-BY3- 65 PINC 119+50.31

-BL- 17  
-L- STA 119+63.30, 104.81' LT

TRADITIONAL FARMS LLC  
DB 843 PG 362  
ADVANCED ACQUISITION PENDING

-BL- N 61° 22' 30.3" E

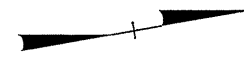
-BL- N 44° 56' 12.6" E  
-L- POS Sta 115+51.0  
-Y3- POC Sta 21+83.523  
GUY D. LEWIS, JR., ET UX  
DB 822 PG 076

-Y3-  
PI Sta 22+47.82    PI Sta 24+26.64  
Δ = 8° 40' 44.2" (LT)    Δ = 8° 48' 12.5" (RT)  
D = 3' 49' 11.0"    D = 6' 44' 26.4"  
L = 227.21'    L = 130.60'  
T = 113.82'    T = 65.43'  
R = 1500.00'    R = 850.00'

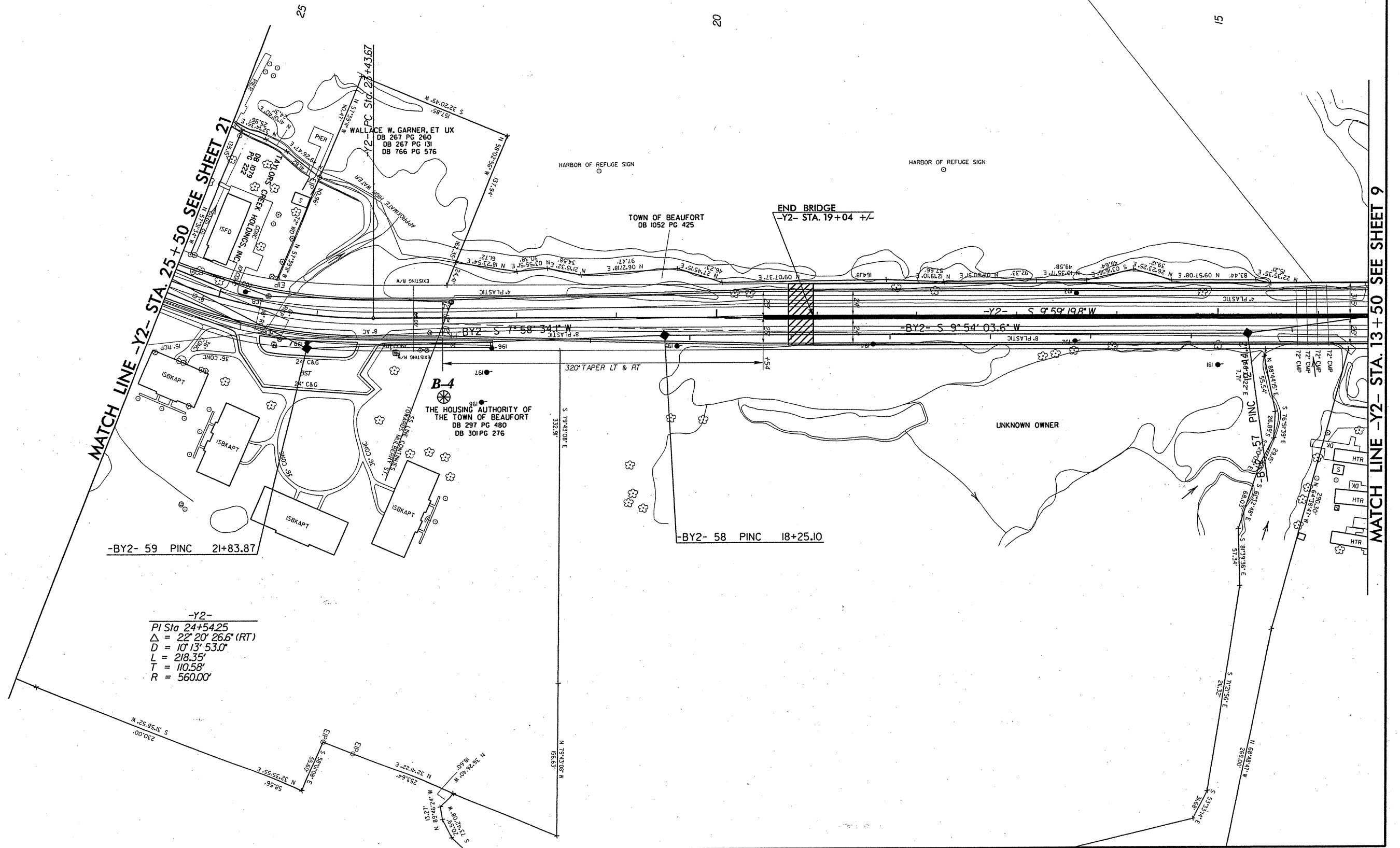
CARTERET COUNTY  
DB 947 PG 599  
MB 1PG 206  
MB 1PG 230  
ADVANCED ACQUISITION PENDING

-L-  
Pis Sta 111+86.83    PI Sta 113+66.83    Pis Sta 115+46.86    Pis Sta 124+88.11  
Os = 4° 38' 44.2"    Δ = 4° 57' 23.2" (RT)    Os = 4° 38' 44.2"    Os = 6° 08' 19.8"  
Ls = 300.00'    D = 3° 05' 49.4"    Ls = 300.00'    Ls = 300.00'  
LT = 200.07'    T = 160.04'    LT = 200.07'    LT = 200.12'  
ST = 100.06'    R = 80.07'    ST = 100.06'    ST = 100.11'  
SE = .055

PROJECT REFERENCE NO. R-3307	SHEET NO. 20
RW SHEET NO.	
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	



FOR -Y2- PROFILE SEE SHEETS 34 & 35



MATCH LINE -Y2- STA. 25+50 SEE SHEET 21

MATCH LINE -Y2- STA. 13+50 SEE SHEET 9

-Y2-  
 PI Sta 24+54.25  
 $\Delta = 22^\circ 20' 26.6''$  (RT)  
 $D = 10^\circ 13' 53.0''$   
 $L = 218.35'$   
 $T = 110.58'$   
 $R = 560.00'$

-BY2- 59 PINC 21+83.87

-BY2- 58 PINC 18+25.10

**B-4**  
 THE HOUSING AUTHORITY OF  
 THE TOWN OF BEAUFORT  
 DB 297 PG 480  
 DB 301 PG 276

WALLACE W. GARNER, ET UX  
 DB 267 PG 260  
 DB 267 PG 131  
 DB 766 PG 576

**END BRIDGE**  
 -Y2- STA. 19+04 +/-

TOWN OF BEAUFORT  
 DB 1052 PG 425

UNKNOWN OWNER

320' TAPER LT & RT

S 79°43'08" E  
 333.97

N 79°43'08" W  
 158.63

S 71°56'16" E  
 212.22

S 53°33'16" E  
 318.08

S 81°39'36" E  
 517.34

S 67°27'48" E  
 68.03

S 67°27'48" E  
 29.26

S 89°44'15" E  
 269.00

S 89°44'15" E  
 269.00

S 89°44'15" E  
 269.00

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 269.00



SUMMARY OF GEOPROBE DATA

Project Name: U.S. Improvements-Radio Island to Olga Road (S.R. 1429)  
 Project Location: Carteret County, North Carolina  
 Tip No. R-3307  
 State Project No. 34528.1.1  
 Project No. 1051-06-457

DATE	GEOPROBE NO.	DEPTH (FEET)	SOIL DESCRIPTION
11/2/2006	B-1	0.0 - 0.9	Dark Brown Silty Fine SAND (A-2-4) With Little Organics (ARTIFICIAL FILL)
		0.9-3.0	Brown Silty Fine Sand (A-3) With Trace of Shells (ARTIFICIAL FILL)
		3.0-5.0	Tan-Brown Slightly Silty Fine to Coarse SAND (A-3) With Trace of Shells (S-1)
		5.0 - 8.0	Tan-Brown Slightly Silty Fine to Coarse SAND (A-2-4) With Trace of Shells
		8.0 - 10.0	Gray Slightly Silty Fine SAND (A-2-4) With Trace of Shells
11/2/2006	B-2	0.0-1.0	Dark Gray and Brown Silty Fine SAND (A-2-4) With Trace of Organics (ARTIFICIAL FILL)
		1.0-3.0	Tan Fine SAND (A-3)
		3.0 - 7.0	Tan-Orange Fine Sandy CLAY (A-6) (S-2)
		7.0 - 9.0	Tan-Orange Silty Fine SAND (A-2-4)
		9.0 - 10.0	Gray Fine SAND (A-3)
10/31/2006	B-3	0.0 - 1.5	Brown Silty Fine SAND (A-3) (ARTIFICIAL FILL)
		1.5 - 2.5	Dark Gray Silty CLAY (A-7-6) (ARTIFICIAL FILL) (S-3)
		2.5 - 3.0	Tan Fine to Coarse SAND (A-1-b) With Little Shells
		3.0 - 5.0	Gray Fine SAND (A-3)
		5.0 - 9.0	Gray Silty Fine to Coarse SAND (A-2-4) With Little Shells
		9.0 - 10.0	Dark Gray Silty CLAY (A-7-5)
			<i>Boring terminated at 10.0 feet. Water at 5.0 feet.</i>
11/2/2006	B-4	0.0 - 1.0	Dark Gray-Brown Silty Fine SAND (A-2-4) With Little Organics (ARTIFICIAL FILL)
		1.0-3.5	Gray-Brown Silty Fine Sand (A-2-4) (ARTIFICIAL FILL)
		3.5-8.0	Light Gray Fine Sandy SILT (A-4) (S-4)
		8.0 - 10.0	Gray and Tan Silty Fine Sandy Silty CLAY (A-7-6) (S-5)



SUMMARY OF GEOPROBE DATA

Project Name: U.S. Improvements-Radio Island to Olga Road (S.R. 1429)  
 Project Location: Carteret County, North Carolina  
 Tip No. R-3307  
 State Project No. 34528.1.1  
 Project No. 1051-06-457

DATE	GEOPROBE NO.	DEPTH (FEET)	SOIL DESCRIPTION
11/2/2006	B-5	0.0-2.0	Dark Gray Silty Fine SAND (A-2-4) With Little Organics (ARTIFICIAL FILL)
		2.0-4.0	Gray and Tan Fine Sandy CLAY (A-7-6) (S-6)
		4.0 - 10.0	Light Gray Fine SAND (A-3)
10/31/2006	B-6	0.0 - 1.0	Dark Gray Silty Fine SAND (A-2-4) With Little Organics
		1.0 - 4.0	Gray and Tan Fine Sandy CLAY (A-2-6) (S-7)
		4.0 - 6.0	Gray and Tan Silty Fine SAND (A-2-4)
		6.0 - 9.0	Light Gray Fine SAND (A-3)
		9.0 - 10.0	Dark Gray Clayey Fine SAND (A-2-6)
10/31/2006	B-7	0.0 - 1.4	Dark Gray Silty Fine SAND (A-2-4) With Little Organics
		1.4 - 5.0	Gray and Tan Silty Clayey Fine SAND (A-2-4) (S-8)
		5.0 - 9.0	Light Gray Fine SAND (A-3)
		9.0 - 10.0	Dark Gray Fine SAND (A-3)
10/31/2006	B-8	0.0 - 1.3	Dark Gray Silty Fine SAND (A-2-4) With Little Organics
		1.3 - 5.0	Orange-Tan Coarse to Fine SAND (A-3) (S-9)
		5.0 - 7.5	Green-Tan Silty Fine SANDY (A-3)
		7.5 - 10.0	Light Gray Slightly Silty Fine SAND (A-3)



**SUMMARY OF GEOPROBE DATA**

**Project Name:** U.S. Improvements-Radio Island to Olga Road (S.R. 1429)  
**Project Location:** Carteret County, North Carolina  
**Tip No.** R-3307  
**State Project No.** 34528.1.1  
**Project No.** 1051-06-457

DATE	GEOPROBE NO.	DEPTH (FEET)	SOIL DESCRIPTION
10/31/2006	B-9	0.0 - 1.0	Dark Gray Silty Fine SAND (A-2-4) with Little Organics
		1.0 - 5.0	Gray-Tan Clayey Fine SAND (A-2-6) (S-10)
		5.0 - 9.0	Light Gray Fine Sand (A-3)
		9.0 - 10.0	Dark Gray Silty Fine SAND (A-2-4)
			<i>Boring terminated at 10.0 feet. Water at 3.5 feet.</i>
10/31/2006	B-10	0.0 - 1.8	Dark Gray Silty Fine SAND (A-2-4) With Little Organics
		1.8 - 6.0	Gray Clayey Coarse to Fine SAND (A-2-4) (S-11)
		6.0 - 10.0	Tan-Gray Slightly Silty Fine SAND (A-3)
			<i>Boring terminated at 10.0 feet. Water at 3.4 feet.</i>
10/31/2006	B-11	0.0 - 1.2	Dark Gray Silty Fine SAND (A-2-4) With Little Organics
		1.2 - 6.0	Gray-Tan Slightly Coarse to Fine SAND (A-3) (S-12)
		6.0 - 9.0	Brown-Tan Fine SAND (A-3)
		9.0 - 10.0	Gray Fine SAND (A-3)
	<i>Boring terminated at 10.0 feet. Water at 2.0 feet.</i>		



S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/3/2006      Northing      Easting  
 Location: Ksat No.B-1      362093.5      2698183.1  
 Horizon: 12+24"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	2.03	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	2.34	Feet
Water Depth in Hole (H):	0.85	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.49	Feet

Chamber Used:	0.11	▼ Ft <sup>2</sup>
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Initial Water in Hole:	0.46	Feet
Final Water in Hole:	0.46	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{ft}$$

$$H = \frac{0.46}{ft}$$

$$C = 1.47$$

$$Q = 117.17 \text{ Gallons/Day}$$

Drop in Water Column

Time (min)	Drop (ft)	Drop (cm)
0		0.00
1	0.033	1.00
2	0.115	3.50
3	0.102	3.10
4	0.095	2.90
5	0.095	2.90
6	0.098	3.00

Avg. 0.096

$$\text{Cross Sectional Area} = 0.11 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 138.58 \text{ ft/day}$$

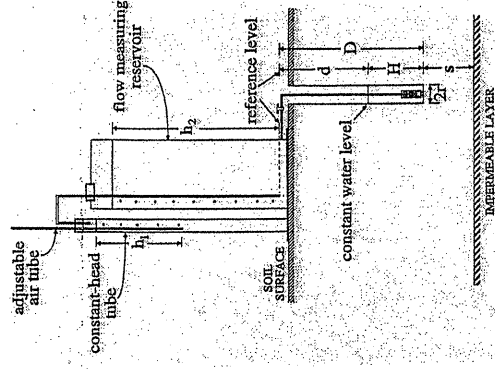
$$K_{sat} = 130.34 \text{ Gallons/Day/ft}^2$$

$$\text{Cm/Hour} = 22.13$$

$$\text{Inches/Hour} = 8.71$$

$$\text{Feet/Day} = 17.42$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



Time (min) = 1

S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/3/2006      Northing      Easting  
 Location: Ksat No.B-2      363845.2      2701332.1  
 Horizon: 2+10"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	0.82	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	1.13	Feet
Water Depth in Hole (H):	0.66	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.47	Feet

Chamber Used:	0.11	▼ Ft <sup>2</sup>
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Initial Water in Hole:	0.59	Feet
Final Water in Hole:	0.62	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{ft}$$

$$H = \frac{0.62}{ft}$$

$$C = 1.73$$

$$Q = 29.29 \text{ Gallons/Day}$$

Drop in Water Column

Time (min)	Drop (ft)	Drop (cm)
0		0.00
1	0.043	1.36
2	0.030	0.90
3	0.030	0.90
4	0.023	0.70
5	0.026	0.80
6	0.023	0.70

Avg. 0.024

$$\text{Cross Sectional Area} = 0.11 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 34.65 \text{ ft/day}$$

$$K_{sat} = 20.77 \text{ Gallons/Day/ft}^2$$

$$\text{Cm/Hour} = 3.53$$

$$\text{Inches/Hour} = 1.39$$

$$\text{Feet/Day} = 2.78$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/3/2006      Northing      Easting  
 Location: Ksat No.B-3      363630.1      2702420.3  
 Horizon: 6-18"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

$K_{sat} = CQ/(2PH^2)$

$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$r = \frac{0.09 \text{ ft}}{0.46 \text{ ft}}$

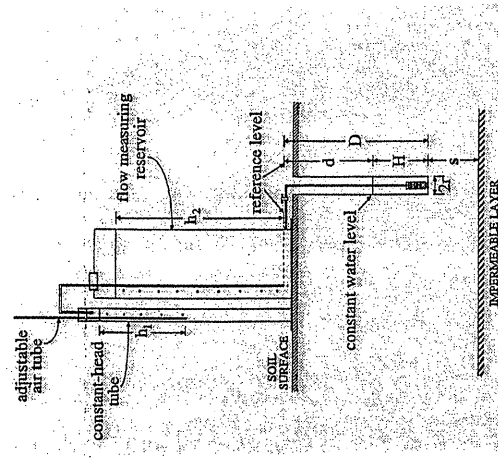
C = 1.47  
 Q = 7.63 Gallons/Day

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 9.02 ft/day

$K_{sat} = 8.48$  Gallons/Day/ft<sup>2</sup>  
 Cm/Hour = 1.44  
 Inches/Hour = 0.57  
 Feet/Day = 1.13

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

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 Martin Mabe



Time (min) = 11

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
2	0.046	1.40
8	0.066	2.00
10	0.013	0.40
13	0.026	0.80
16	0.013	0.40
18	0.020	0.60
22	0.030	0.90
33	0.069	2.10
Avg.	0.069	

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/3/2006      Northing      Easting  
 Location: Ksat No.B-4      362426.5      2702738.9  
 Horizon: 2-9"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

$K_{sat} = CQ/(2PH^2)$

$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$r = \frac{0.09 \text{ ft}}{0.54 \text{ ft}}$

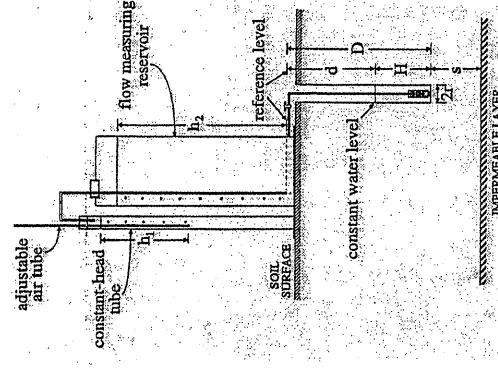
C = 1.60  
 Q = 9.99 Gallons/Day

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 11.81 ft/day

$K_{sat} = 8.82$  Gallons/Day/ft<sup>2</sup>  
 Cm/Hour = 1.50  
 Inches/Hour = 0.59  
 Feet/Day = 1.18

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

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 Martin Mabe



Time (min) = 2

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
2	0.026	0.80
4	0.016	0.50
6	0.016	0.50
8	0.016	0.50
Avg.	0.016	

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/2/2006      Northing      Easting  
 Location: Ksat No.B-5      363637.3      2703263.3  
 Horizon: 4-12'  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	0.95	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	1.26	Feet
Water Depth in Hole (H):	0.66	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.61	Feet

Chamber Used:	0.11	▼	ft <sup>2</sup>
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Initial Water in Hole:	0.57	Feet
Final Water in Hole:	0.57	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number  
 H = Height of water in hole (ft)  
 r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)  
 = Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{0.57} \text{ ft}$$

$$C = 1.66$$

$$Q = 19.97 \text{ Gallons/Day}$$

$$\text{Cross Sectional Area} = 0.11 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 23.62 \text{ ft/day}$$

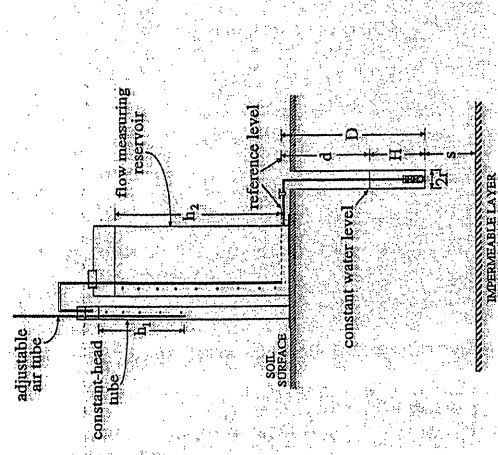
$$K_{sat} = 16.01 \text{ Gallons/Day/ft}^2$$

$$Cm/Hour = 2.72$$

$$Inches/Hour = 1.07$$

$$Feet/Day = 2.14$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



Time (min) = 2

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
8	0.033	1.00
12	0.010	0.30
14	0.033	1.00
16	0.033	1.00
18	0.033	1.00

Avg. 0.033

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/2/2006      Northing      Easting  
 Location: Ksat No.B-6      364009.1      2704095.5  
 Horizon: 2-8'  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	0.62	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	0.93	Feet
Water Depth in Hole (H):	0.56	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.38	Feet

Chamber Used:	0.02	▼	ft <sup>2</sup>
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Initial Water in Hole:	0.54	Feet
Final Water in Hole:	0.54	Feet

$$K_{sat} = CQ/(2PH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number  
 H = Height of water in hole (ft)  
 r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)  
 = Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{0.54} \text{ ft}$$

$$C = 1.61$$

$$Q = 12.93 \text{ Gallons/Day}$$

$$\text{Cross Sectional Area} = 0.02 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 80.31 \text{ ft/day}$$

$$K_{sat} = 11.32 \text{ Gallons/Day/ft}^2$$

$$Cm/Hour = 1.92$$

$$Inches/Hour = 0.76$$

$$Feet/Day = 1.51$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/2/2006      Northing      Easting  
 Location: Ksat No. B-7      363903.4      2703914.9  
 Horizon: 2-8"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	0.62	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	0.93	Feet
Water Depth in Hole (H):	0.56	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.38	Feet

Chamber Used:	0.11	ft <sup>2</sup>
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Initial Water in Hole:	0.52	Feet
Final Water in Hole:	0.49	Feet

$K_{sat} = CQ/(2PH^2)$

$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

Time (min) = 2

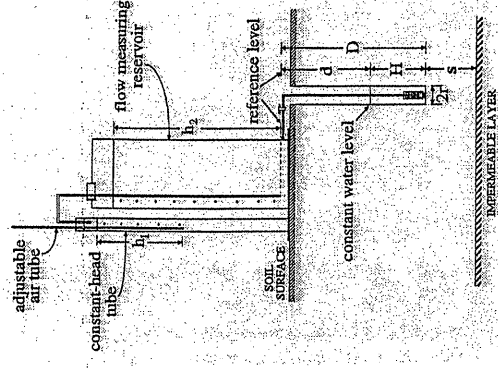
Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
6	0.056	1.70
18	0.125	3.80
21	0.023	0.70
25	0.039	1.20
27	0.013	0.40
29	0.013	0.40

Avg. 0.013

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 9.45 ft/day

$K_{sat}$  = 8.04 Gallons/Day/ft<sup>2</sup>  
 Cm/Hour = 1.36  
 Inches/Hour = 0.54  
 Feet/Day = 1.07

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



S&ME  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/2/2006      Northing      Easting  
 Location: Ksat No. B-8      364137.6      2704325.8  
 Horizon: 1-8"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	0.67	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	0.98	Feet
Water Depth in Hole (H):	0.66	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	0.33	Feet

Chamber Used:	0.11	ft <sup>2</sup>
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Initial Water in Hole:	0.66	Feet
Final Water in Hole:	0.66	Feet

$K_{sat} = CQ/(2PH^2)$

$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

Time (min) = 2

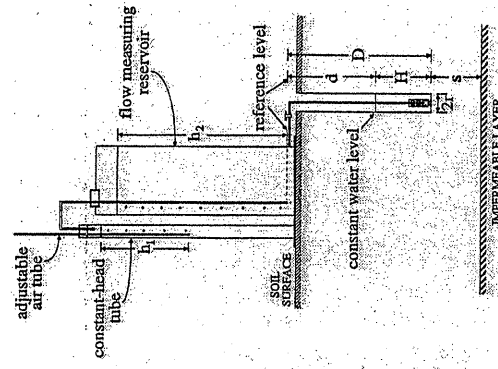
Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
4	0.148	4.50
6	0.023	0.70
8	0.033	1.00
10	0.033	1.00
12	0.036	1.10

Avg. 0.034

Cross Sectional Area = 0.11 ft<sup>2</sup>  
 Length of Drop in Water Column = 24.41 ft/day

$K_{sat}$  = 13.54 Gallons/Day/ft<sup>2</sup>  
 Cm/Hour = 2.30  
 Inches/Hour = 0.91  
 Feet/Day = 1.81

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.



**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/2/2006  
 Location: Ksat No.B-9  
 Horizon: 12-24"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	2.00	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	2.31	Feet
Water Depth in Hole (H):	1.00	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.31	Feet

Chamber Used:	0.02	ft <sup>2</sup>
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Initial Water in Hole:	0.52	Feet
Final Water in Hole:	0.56	Feet

$$K_{sat} = CQ/(2PIH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{0.56} \text{ ft}$$

$$C = 1.64$$

$$Q = 0.80 \text{ Gallons/Day}$$

$$\text{Cross Sectional Area} = 0.02 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 4.95 \text{ ft/day}$$

$$K_{sat} = 0.67 \text{ Gallons/Day/ft}^2$$

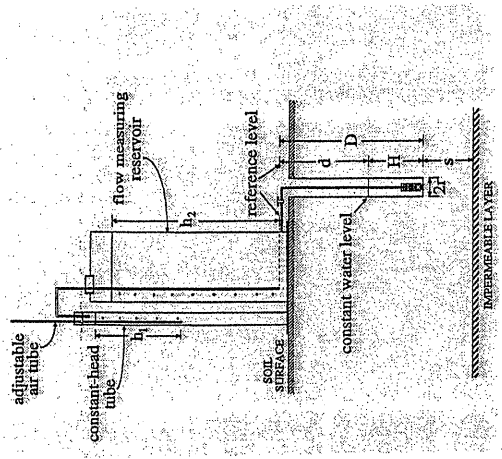
$$\text{Cm/Hour} = 0.11$$

$$\text{Inches/Hour} = 0.04$$

$$\text{Feet/Day} = 0.09$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

Prepared by: S&ME, Inc.  
 Martin Mabe



Time (min) = 7

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
4	0.558	17.00
8	0.089	2.70
15	0.043	1.30
22	0.023	0.70
29	0.026	0.80
36	0.023	0.70

Avg. 0.024

**S&ME**  
"IN-SITU" CONSTANT HEAD PERMEAMETER

Date: 11/2/2006  
 Location: Ksat No.B-10  
 Horizon: 13-23"  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	1.87	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	2.18	Feet
Water Depth in Hole (H):	0.82	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.36	Feet

Chamber Used:	0.02	ft <sup>2</sup>
---------------	------	-----------------

Initial Water in Hole:	0.72	Feet
Final Water in Hole:	0.75	Feet

$$K_{sat} = CQ/(2PIH^2)$$

$$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$$

$\sinh^{-1}$  = inverse hyperbolic sin of a number

H = Height of water in hole (ft)

r = radius of hole (ft)

Q = Constant Flow Rate (Gal/day)

= Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$$r = \frac{0.09}{0.75} \text{ ft}$$

$$C = 1.90$$

$$Q = 1.39 \text{ Gallons/Day}$$

$$\text{Cross Sectional Area} = 0.02 \text{ ft}^2$$

$$\text{Length of Drop in Water Column} = 8.66 \text{ ft/day}$$

$$K_{sat} = 0.74 \text{ Gallons/Day/ft}^2$$

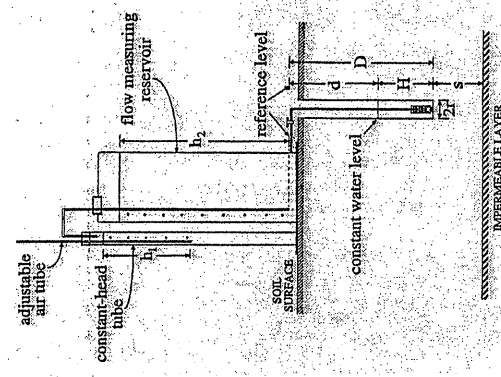
$$\text{Cm/Hour} = 0.13$$

$$\text{Inches/Hour} = 0.05$$

$$\text{Feet/Day} = 0.10$$

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

Prepared by: S&ME, Inc.  
 Martin Mabe



Time (min) = 6

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
4	0.010	0.30
10	0.033	1.00
18	0.046	1.40
24	0.036	1.10
34	0.043	1.30
40	0.036	1.10

Avg. 0.036

**S&ME**  
**"IN-SITU" CONSTANT HEAD PERMEAMETER**

Date: 11/2/2006      Northing      Easting  
 Location: Ksat No. B-11      365703.6      2705716.9  
 Horizon: 6-16'  
 Client: NCDOT  
 Project Name: US 70 Hwy Improvements (R-3307)  
 Project #: 34528.1.1

Hole Depth:	1.58	Feet
Hole Radius (r):	0.094	Feet
Bubble Tube to Surface:	0.31	Feet
Reference Tube to Hole Bottom (D):	1.89	Feet
Water Depth in Hole (H):	0.82	Feet
CHT Tube(s) Setting (h <sub>1</sub> ):	1.07	Feet

Chamber Used: 0.02  Ft<sup>2</sup>

Initial Water in Hole:	0.85	Feet
Final Water in Hole:	0.88	Feet

$K_{sat} = CQ/(2PH^2)$

$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$

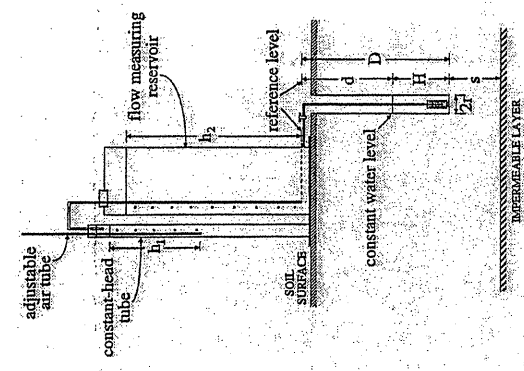
$\sinh^{-1}$  = inverse hyperbolic sin of a number  
 H = Height of water in hole (ft)  
 r = radius of hole (ft)  
 Q = Constant Flow Rate (Gal/day)  
 = Cross Sectional Area of Reservoir x Length of Drop in Water Column over Time

$r = \frac{0.09}{0.88} \text{ ft}$   
 $H = \frac{\quad}{\quad} \text{ ft}$

C = 2.03  
 Q = 5.14 Gallons/Day

Cross Sectional Area = 0.02 ft<sup>2</sup>  
 Length of Drop in Water Column = 31.89 ft/day

$K_{sat} = 2.16 \text{ Gallons/Day/ft}^2$   
 Cm/Hour = 0.37  
 Inches/Hour = 0.14  
 Feet/Day = 0.29



Drop in Water Column

Time (min)	Drop in Water Column (ft)	Drop in Water Column (cm)
0	0.00	0.00
3	0.020	0.60
6	0.018	0.55
9	0.018	0.55
12	0.084	2.55
15	0.087	2.65
17	0.044	1.35
19	0.069	2.10

Time (min) = 2

Avg. 0.044

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

**S&ME, INC**  
**SOIL PROFILE DESCRIPTIONS**

Client:	<u>NCDOT</u>	Date:	<u>11/3/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-1</u>
Northing:	<u>362093.5</u>	Easting:	<u>2698183.1</u>
Elevation:	<u>5.4'</u>		
Apparent Water Table:	<u>4.1 feet below ground surface</u>	Seasonal High Water Table:	<u>24"</u>
Vegetation:	<u>Grass</u>	Slope:	<u>0-2%</u>
Boring Terminated at	<u>36 Inches (Refusal)</u>		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0 - 8"	10 YR 3/2	-	LS	Gr	Vfr	
Fill 2	8 - 36"	10 YR 5/3	-	S and Shells	Sg	Loose	

COMMENTS:

LEGEND:

Abbreviations  
 10YR 2/2 - Munsell Color Chip #  
 S - Sand  
 LS - Loamy Sand  
 Gr - Granular  
 Sg - Single grain  
 Vfr - Very friable  
 fr - Friable

**S&ME, INC**  
**SOIL PROFILE DESCRIPTIONS**

Client:	<u>NCDOT</u>	Date:	<u>11/3/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-2</u>
Northing:	<u>363845.2</u>	Easting:	<u>2701332.1</u>
Elevation:	<u>4.2'</u>		
Apparent Water Table:	<u>1.8 feet below ground surface</u>	Seasonal High Water Table:	<u>20"</u>
Vegetation:	<u>Grass</u>	Slope:	<u>0-2%</u>
Boring Terminated at	<u>48 Inches</u>		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill	0-12"	Mixed color	-	LS	Gr	Loose	
A	12-18"	10 YR 3/2	-	LS	Gr	Loose	
E	18 - 22"	10YR 6/4		LS	Gr	Loose	
Bt1	22 -33"	5YR 5/4	10YR 6/2	SL	Gr	Vfr	Common Fine Mottles
Bt2	33 -48"	10YR 6/1	10YR 5/6	SCL	Massive		Many med mottles

COMMENTS:

LEGEND:

Abbreviations  
 10YR 2/2 - Munsell Color Chip #  
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 Gr - Granular  
 Sg - Single grain  
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S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>11/3/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-3</u>
Northing:	<u>363630.1</u>	Easting:	<u>2702420.3</u>
Elevation:	<u>6.7'</u>		
Apparent Water Table:	<u>4.0 feet below ground surface</u>	Seasonal High Water Table:	<u>18"</u>
Vegetation:	<u>Grass</u>	Slope:	<u>0-2%</u>
Boring Terminated at	<u>54 Inches</u>		

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	<u>NCDOT</u>	Date:	<u>11/2/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-4</u>
Northing:	<u>362426.5</u>	Easting:	<u>2702738.9</u>
Elevation:	<u>3.8'</u>		
Apparent Water Table:	<u>1.7 feet below ground surface</u>	Seasonal High Water Table:	<u>16"</u>
Vegetation:	<u>Grass</u>	Slope:	<u>0-2%</u>
Boring Terminated at	<u>40 Inches</u>		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0-18"	10 YR 4/3	-	SL	Gr	Vfr	Shell bits
Fill 2	18-26"	10 YR 4/4	-	Silty Clay	Massive		
C1	26-48"	Gley2 4/10B	-	Silt Loam	Massive		
C2	48-54"	10 YR 6/3	-	Coarse Sand	Loose		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0-14"	10 YR 3/3	-	SL	Gr	Vfr	
Fill 2	14-33"	10 YR 6/1	-	Fine Sand	Sg	Loose	
Fill 3	33-40"	10 YR 2/1		SL	Gr	Vfr	Old Surface

COMMENTS:

LEGEND:

Abbreviations  
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COMMENTS:

LEGEND:

Abbreviations  
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**S&ME, INC**  
**SOIL PROFILE DESCRIPTIONS**

Client:	<u>NCDOT</u>	Date:	<u>11/2/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-5</u>
Northing:	<u>363637.3</u>	Easting:	<u>2703263.3</u>
Elevation:	<u>4.8'</u>	Seasonal High Water Table:	<u>24"</u>
Apparent Water Table:	<u>2.2 feet below ground surface</u>	Slope:	<u>0-2%</u>
Vegetation:	<u>Grass</u>		
Boring Terminated at	<u>54 Inches</u>		

**S&ME, INC**  
**SOIL PROFILE DESCRIPTIONS**

Client:	<u>NCDOT</u>	Date:	<u>11/2/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-6</u>
Northing:	<u>364009.1</u>	Easting:	<u>2704095.5</u>
Elevation:	<u>4.9'</u>	Seasonal High Water Table:	<u>14"</u>
Apparent Water Table:	<u>1.8 feet below ground surface</u>	Slope:	<u>0-2%</u>
Vegetation:	<u>Grass</u>		
Boring Terminated at	<u>50 Inches</u>		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0-13"	10 YR 2/2	-	SL	Gr	Vfr	
Fill 2	13-26"	10 YR 2/2 10 YR 4/2	-	SL	Gr	Vfr	
Bt1	26-34"	10YR 5/2	10 YR 5/6	SCL	Sbk		Common Med Mottles
Btg2	34-54"	10YR 5/2	10 YR 5/6 10YR 6/1	SCL	Sbk		Common Med Mottles

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-13"	10 YR 2/1	-	SL	Gr	Vfr	
E	13-16"	10 YR 5/2	10 YR5/6	SL	Sbk	Vfr	Com Med Mottles
Bt1	16-26"	10YR 5/2	10 YR5/6	SCL	Sbk	Vfr	Com Med Mottles
Btg2	26-36"	10 YR 5/2	10 YR5/6	SCL	Massive		Com Med Mottles
C	36-50"	10 YR 6/2	10 YR 5/6	SL	Massive		Com Med Mottles

COMMENTS:

LEGEND:

Abbreviations  
10YR 2/2 - Munsell Color Chip #  
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COMMENTS:

**S&ME, INC  
SOIL PROFILE DESCRIPTIONS**

Client:	<u>NCDOT</u>	Date:	<u>11/2/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-7</u>
Northing:	<u>363903.4</u>	Easting:	<u>2703914.9</u>
Elevation:	<u>4.4'</u>		
Apparent Water Table:	<u>1.6 feet below ground surface</u>	Seasonal High Water Table:	<u>&lt;12"</u>
Vegetation:	<u>Grass</u>	Slope:	<u>0-2%</u>
Boring Terminated at	<u>36 Inches</u>		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-18"	10 YR 2/1	-	LS	Gr	Vfr	
C	18-36"	10 YR 5/2	-	LS	Gr	Vfr	

COMMENTS:

LEGEND:

Abbreviations  
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 S – Sand  
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 Gr – Granular  
 Sg – Single grain  
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**S&ME, INC  
SOIL PROFILE DESCRIPTIONS**

Client:	<u>NCDOT</u>	Date:	<u>11/3/05</u>
Project Name:	<u>US 70 Improvements (R-3307)</u>	Project No.:	<u>34528.1.1</u>
County:	<u>Carteret</u>	State:	<u>NC</u>
Location:	<u>Beaufort NC</u>	Site/Field No.:	<u>No. B-8</u>
Northing:	<u>364137.6</u>	Easting:	<u>2704325.8</u>
Elevation:	<u>5.8'</u>		
Apparent Water Table:	<u>1.7 feet below ground surface</u>	Seasonal High Water Table:	<u>15"</u>
Vegetation:	<u>Grass</u>	Slope:	<u>0-2%</u>
Boring Terminated at	<u>30 Inches</u>		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-10"	10 YR 2/1	-	SL	Gr	Vfr	
E	10-14"	10 YR 4/3	-	SL	Gr	Vfr	
Bt	14-18"	10YR 5/4		SL	Gr	Fr	
C	18-30"	10 YR 5/4	10 YR 6/2	SL	Massive		Many Med Mottles

COMMENTS:

LEGEND:

Abbreviations  
 10YR 2/2 – Munsell Color Chip #  
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 Sg – Single grain  
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S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	11/2/05
Project Name:	US 70 Improvements (R-3307)	Project No.:	34528.1.1
County:	Carteret	State:	NC
Location:	Beaufort NC	Site/Field No.:	No. B-9
Northing:	364921.6	Easting:	2705181.2
Elevation:	8.7'		
Apparent Water Table:	3.8 feet below ground surface	Seasonal High Water Table:	45" with ditches open
Vegetation:	Grass	Slope:	0-2%
Boring Terminated at	53 Inches		

S&ME, INC  
SOIL PROFILE DESCRIPTIONS

Client:	NCDOT	Date:	11/2/05
Project Name:	US 70 Improvements (R-3307)	Project No.:	34528.1.1
County:	Carteret	State:	NC
Location:	Beaufort NC	Site/Field No.:	No. B-10
Northing:	365455.8	Easting:	2705457.7
Elevation:	8.5'		
Apparent Water Table:	2.9 feet below ground surface	Seasonal High Water Table:	16"
Vegetation:	Grass	Slope:	0-2%
Boring Terminated at	36 Inches		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-12"	10 YR 2/2	-	SL	Gr	Vfr	
Bt1	12-16"	10 YR 6/3	10 YR5/6	SL	Gr	Vfr	Com Med Mottles
Btg2	16-30"	10YR 6/2	10 YR5/6	SL	Gr	Vfr	Com Med Mottles
Btg3	30-45"	10 YR 5/6	10 YR6/2	SL	Gr	Fr	Com Med Mottles
C	45-53"	10 YR 6/2		SL	Massive		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
Ap	0-16"	10 YR 2/1	-	SL	Gr	Vfr	
Bt	16-33"	10 YR 5/1	-	SCL	Sbk	Fi	
C	33-36"	10 YR 5/1		SL	Sbk	Fr	

COMMENTS:

LEGEND: Abbreviations  
 10YR 2/2 - Munsell Color Chip #  
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COMMENTS:

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**S&ME, INC  
SOIL PROFILE DESCRIPTIONS**

Client:	NCDOT	Date:	11/2/05
Project Name:	US 70 Improvements (R-3307)	Project No.	34528.1.1
County:	Carteret	State	NC
Location:	Beaufort NC	Site/Field No.	No. B-11
Northing:	365703.6	Easting:	2705716.9
Elevation:	8.2'		
Apparent Water Table:	2.2 feet below ground surface	Seasonal High Water Table:	<12"
Vegetation:	Grass	Slope:	0-2%
Boring Terminated at	54 Inches		

Horizon	Depth	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-20"	10 YR 2/1	-	SL	Gr	Vfr	
Bh	20-54"	10 YR 4/3	-	SL	Gr	Fr	

COMMENTS:

LEGEND:

- Abbreviations  
 10YR 2/2 – Munsell Color Chip #  
 S – Sand  
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 Gr – Granular  
 Sg – Single grain  
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 fr – Friable

**SUMMARY OF LABORATORY TEST DATA**

Soil Classification and Gradation

Boring No.	Sample No.	Sample Depth Feet	AASHTO Classification	% Passing Sieve #				Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Moisture Content %
				10	40	60	200								
B-1	S-1	3.0 - 5.0	A-3 (0)	83	62	38	3.0	62	35	1	2	23	NP	NP	17
B-2	S-2	3.0 - 7.0	A-6 (2)	100	99	96	40.0	4	58	8	30	31	15	16	22
B-3	S-3	1.5 - 2.5	A-7-6 (39)	100	100	99	93.0	1	7	33	59	65	29	36	66.4
B-4	S-4	3.5 - 8.0	A-4 (0)	100	99	93	60.0	7	40	45	8	16	15	1	12.5
B-4	S-5	8.0 - 10.0	A-7-6 (13)	100	99	97	54.0	3	48	10	39	49	17	32	32.1
B-5	S-6	2.0 - 4.0	A-7-6 (5)	100	99	95	37.0	5	63	5	27	49	18	31	23.5
B-6	S-7	1.0 - 4.0	A-6 (5)	100	99	95	48.0	5	50	7	38	36	19	17	23.3
B-7	S-8	1.4 - 5.0	A-2-4 (0)	100	100	97	26.0	3	77	7	13	25	NP	NP	31.3
B-8	S-9	1.3 - 5.0	A-3 (0)	100	90	72	4.0	28	69	0	3	20	NP	NP	21.9
B-9	S-10	1.0 - 5.0	A-2-6 (0)	100	99	94	28.0	6	68	5	21	20	9	11	28
B-10	S-11	1.8 - 6.0	A-2-4 (0)	100	98	86	29.0	14	58	1	27	19	15	4	18.1
B-11	S-12	1.2 - 6.0	A-3 (0)	100	98	89	6.0	11	84	1	4	19	NP	NP	21

Project Name: US 70 Improvements

S&ME Project No.:

1051-06-457

State Project No.: 34528.1.1

County:

Carteret

Federal ID No.: STPNHF-70(43)

TIP No.:

R-3307

Checked By: AFR

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

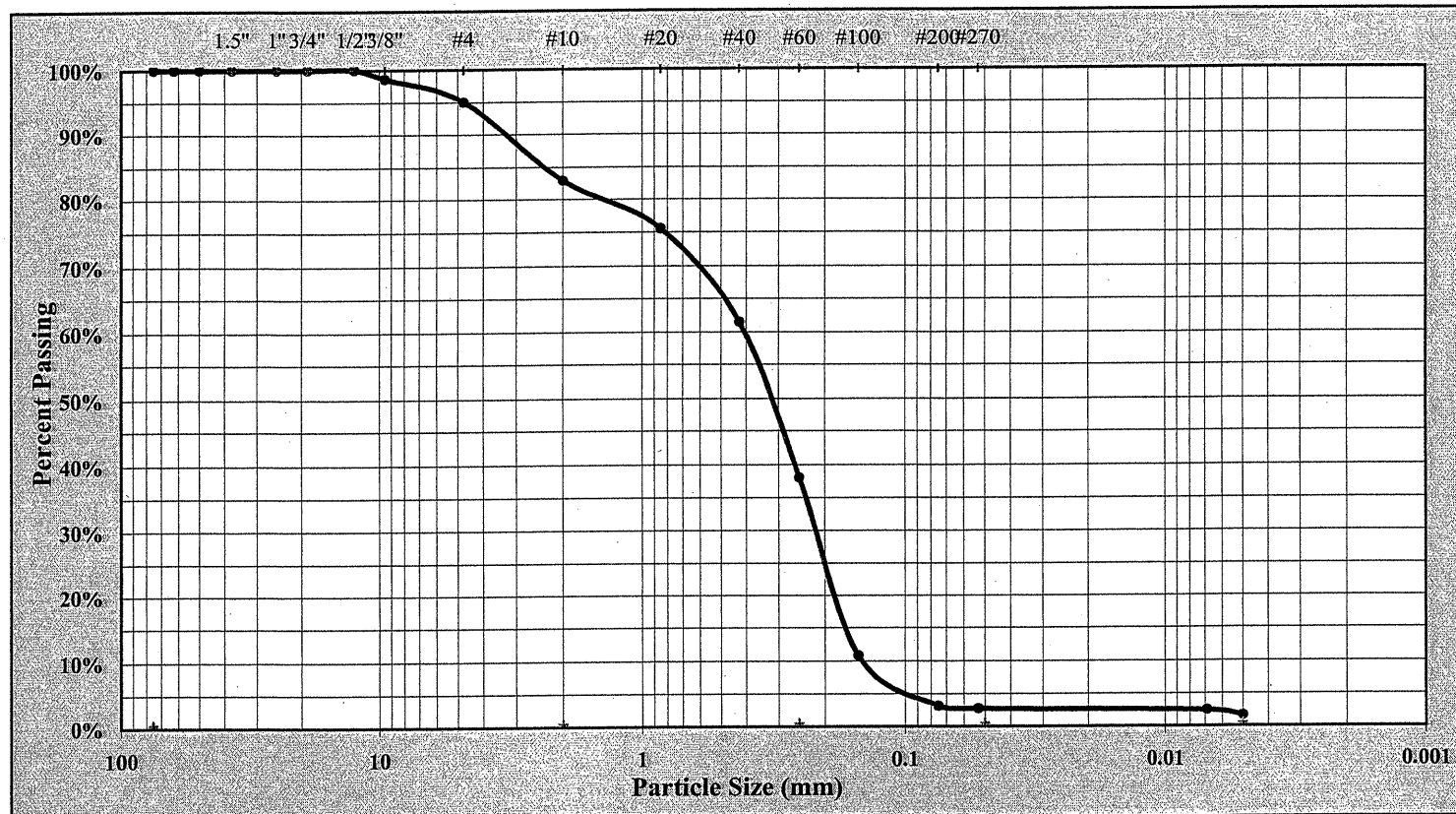


S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **34528.1.1**

Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **STPNHF-70(43)**      TIP NO: **R-3307**

Boring #: **B-1**      Sample #: **S-1**      Sample Date: **Unknown**  
 Location: **Carteret County**      Offset: **N/A**      Depth: **3.0-5.0'**  
 Sample Description: **Tan-Brown Slightly Silty Fine to Coarse SAND with Trace of Shells**      **A-3 (0)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm		
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	1/2"	Coarse Sand	44.8%	Silt	0.0%
Gravel	17.1%	Fine Sand	35.4%	Clay	2.0%
Apparent Relative Density		Moisture Content	17.0%	% Passing #200	3.1%
Liquid Limit	23	Plastic Limit	0	Plastic Index	N.P.

#### Soil Mortar (-#10 Sieve)

Coarse Sand 54.0%      Fine Sand 42.8%      Silt 0.3%      Clay 2.9%

Description of Sand & Gravel Particles:    Rounded     Angular     Hard & Durable     Soft     Weathered & Friable   
 Mechanical Stirring Apparatus (A)    Length of Dispersion Period: 1 min.    Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

**References:**    AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT    AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test    AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes    ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan      Laboratory Supervisor  
 Signature      Signature

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

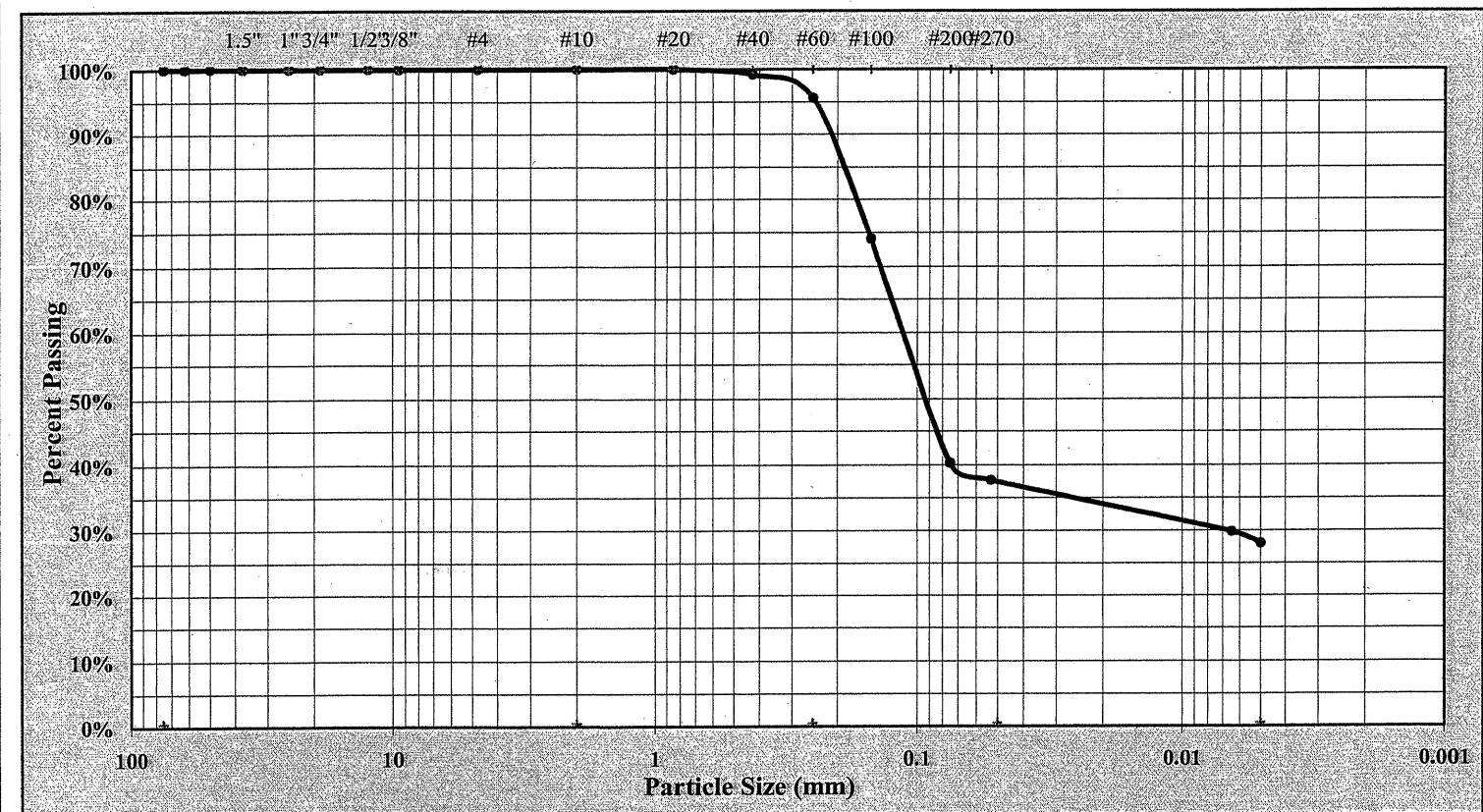


S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**      TIP NO: **R-3307**

Boring #: **B-2**      Sample #: **S-2**      Sample Date: **Unknown**  
 Location: **Carteret County**      Offset: **N/A**      Depth: **3.0 - 7.0'**  
 Sample Description: **Tan-Orange Fine Sandy CLAY**      **A-6 (2)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm		
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	#20	Coarse Sand	4.4%	Silt	8.0%
Gravel	0.0%	Fine Sand	57.9%	Clay	30.0%
Apparent Relative Density		Moisture Content	22.0%	% Passing #200	40.3%
Liquid Limit	31	Plastic Limit	15	Plastic Index	16

#### Soil Mortar (-#10 Sieve)

Coarse Sand 4.4%      Fine Sand 57.9%      Silt 7.9%      Clay 29.8%

Description of Sand & Gravel Particles:    Rounded     Angular     Hard & Durable     Soft     Weathered & Friable   
 Mechanical Stirring Apparatus (A)    Length of Dispersion Period: 1 min.    Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

**References:**    AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT    AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test    AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes    ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan      Laboratory Supervisor  
 Signature      Signature



Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #: 1051-06-457
Project Name: US 70 Improvements
Client Name: NCDOT
Client Address:
State Project #: STPNHF-70(43)

Report Date: 11/9/2006
Test Date(s): 11/06 - 11/09/2006

F.A. Project No: 34528.1.1 TIP NO: R-3307

Table with 3 columns: Boring #, Sample #, Sample Date; Location, Offset, Depth; Sample Description.

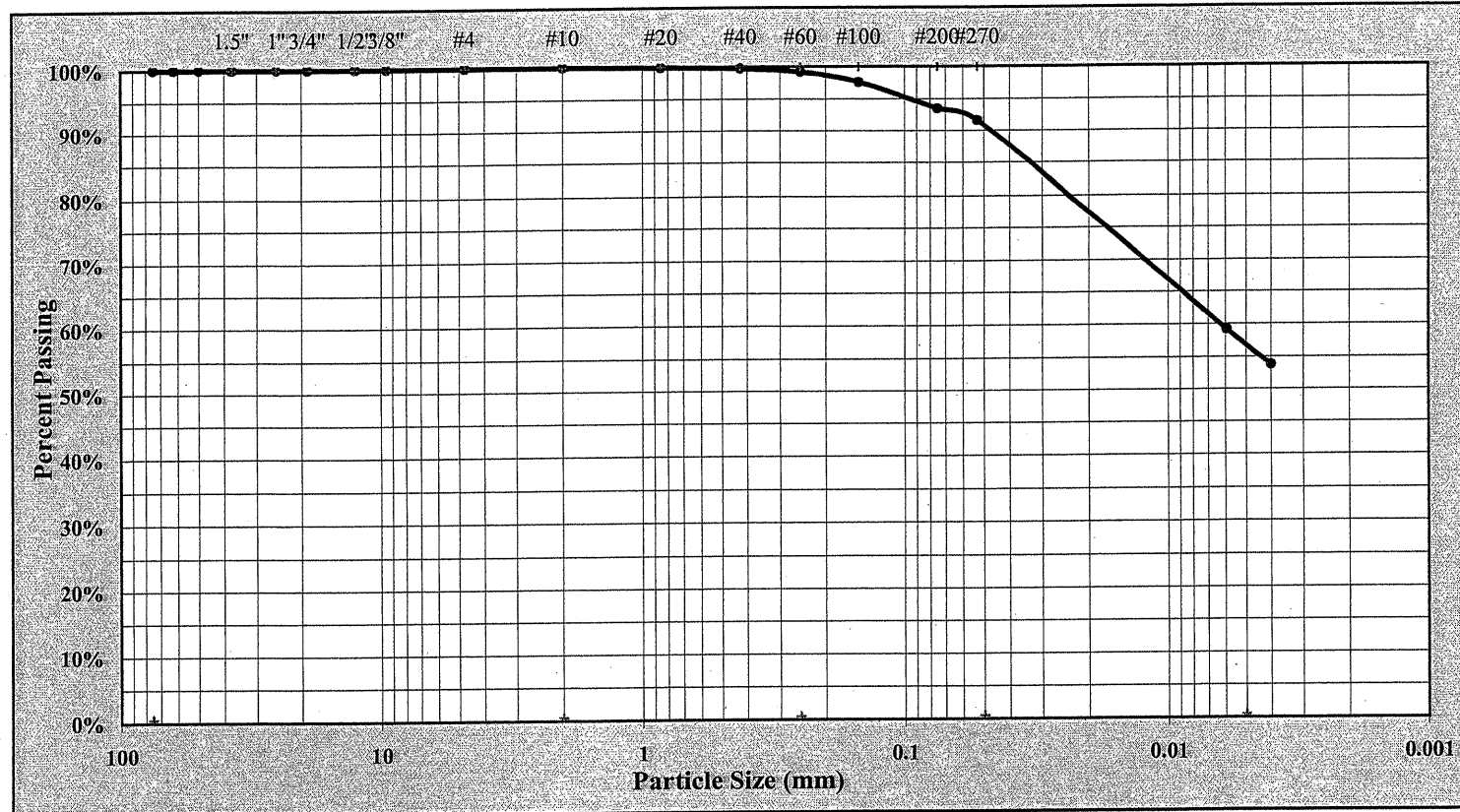


Table defining soil classifications (Gravel, Coarse Sand, Fine Sand, Silt, Clay) and their respective particle size ranges. Includes data for Maximum Particle Size, Gravel, Apparent Relative Density, Liquid Limit, Plastic Limit, Plastic Index, Moisture Content, and % Passing #200.

Soil Mortar (-#10 Sieve)

Table showing Soil Mortar composition: Coarse Sand 0.8%, Fine Sand 7.6%, Silt 32.5%, Clay 59.1%.

Description of Sand & Gravel Particles: Rounded [ ] Angular [ ] Hard & Durable [ ] Soft [ ] Weathered & Friable [ ]
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Signature)



Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #: 1051-06-457
Project Name: US 70 Improvements
Client Name: NCDOT
Client Address:
State Project #: STPNHF-70(43)

Report Date: 11/9/2006
Test Date(s): 11/06 - 11/09/2006

F.A. Project No: 34528.1.1 TIP NO: R-3307

Table with 3 columns: Boring #, Sample #, Sample Date; Location, Offset, Depth; Sample Description.

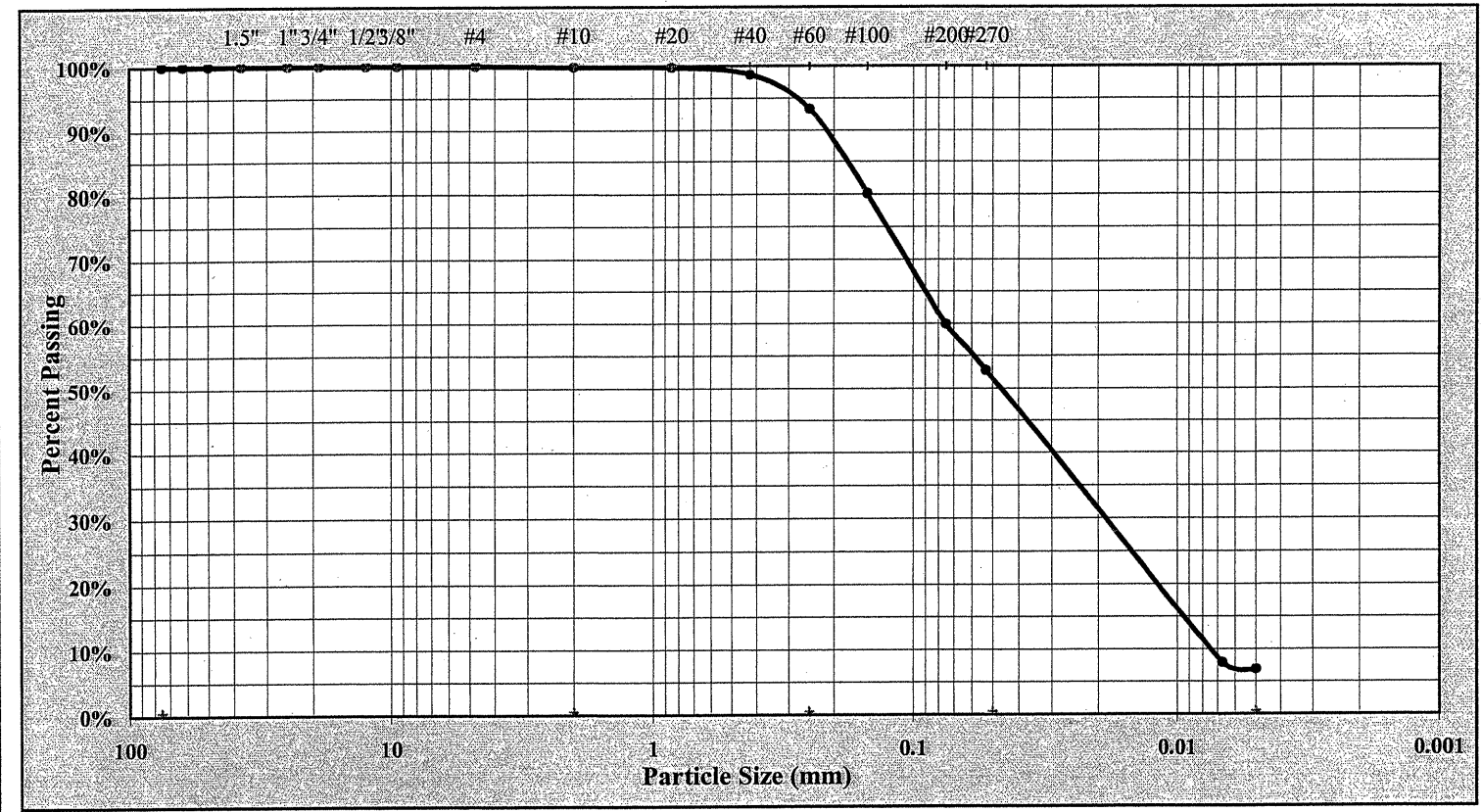


Table defining soil classifications (Gravel, Coarse Sand, Fine Sand, Silt, Clay) and their respective particle size ranges. Includes data for Maximum Particle Size, Gravel, Apparent Relative Density, Liquid Limit, Plastic Limit, Plastic Index, Moisture Content, and % Passing #200.

Soil Mortar (-#10 Sieve)

Table showing Soil Mortar composition: Coarse Sand 6.5%, Fine Sand 40.6%, Silt 45.0%, Clay 7.9%.

Description of Sand & Gravel Particles: Rounded [ ] Angular [ ] Hard & Durable [ ] Soft [ ] Weathered & Friable [ ]
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Signature)

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



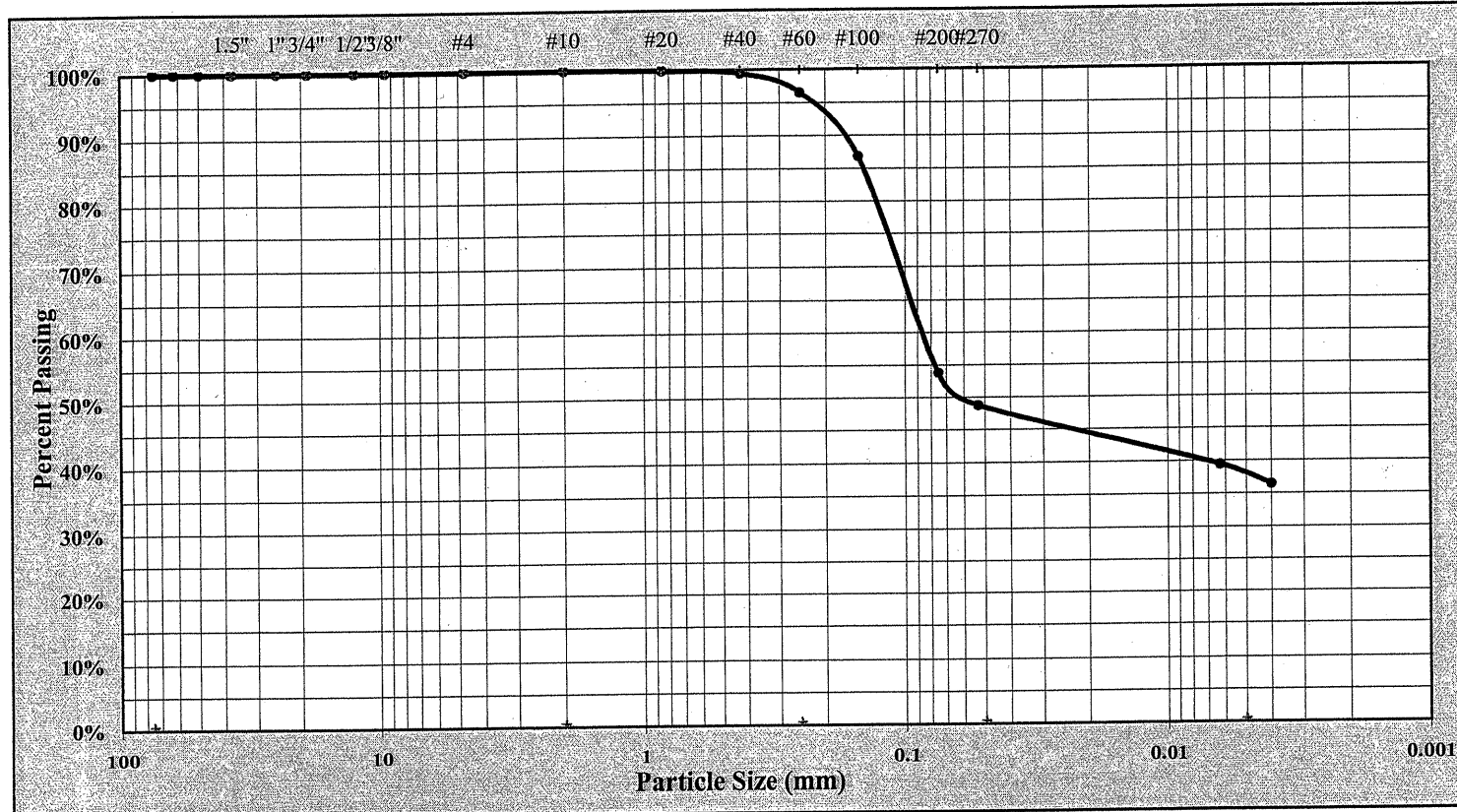
S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**

TIP NO: **R-3307**

Boring #: **B-4** Sample #: **S-5** Sample Date: **Unknown**  
 Location: **Carteret County** Offset: **N/A** Depth: **8.0 - 10.0'**  
 Sample Description: **Green Yellow Silty CLAY A-7-6 (13)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm	
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm	
Maximum Particle Size	#10	Coarse Sand	3.5%	Silt 9.0%
Gravel	0.0%	Fine Sand	47.8%	Clay 39.0%
Apparent Relative Density		Moisture Content	32.1%	% Passing #200 53.8%
Liquid Limit	49	Plastic Limit	17	Plastic Index 32

Soil Mortar (-#10 Sieve)				
Coarse Sand	3.5%	Fine Sand	47.8%	Clay 39.4%
Description of Sand & Gravel Particles: Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>				
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter				

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes  
 AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan Laboratory Supervisor  
 Signature Signature

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



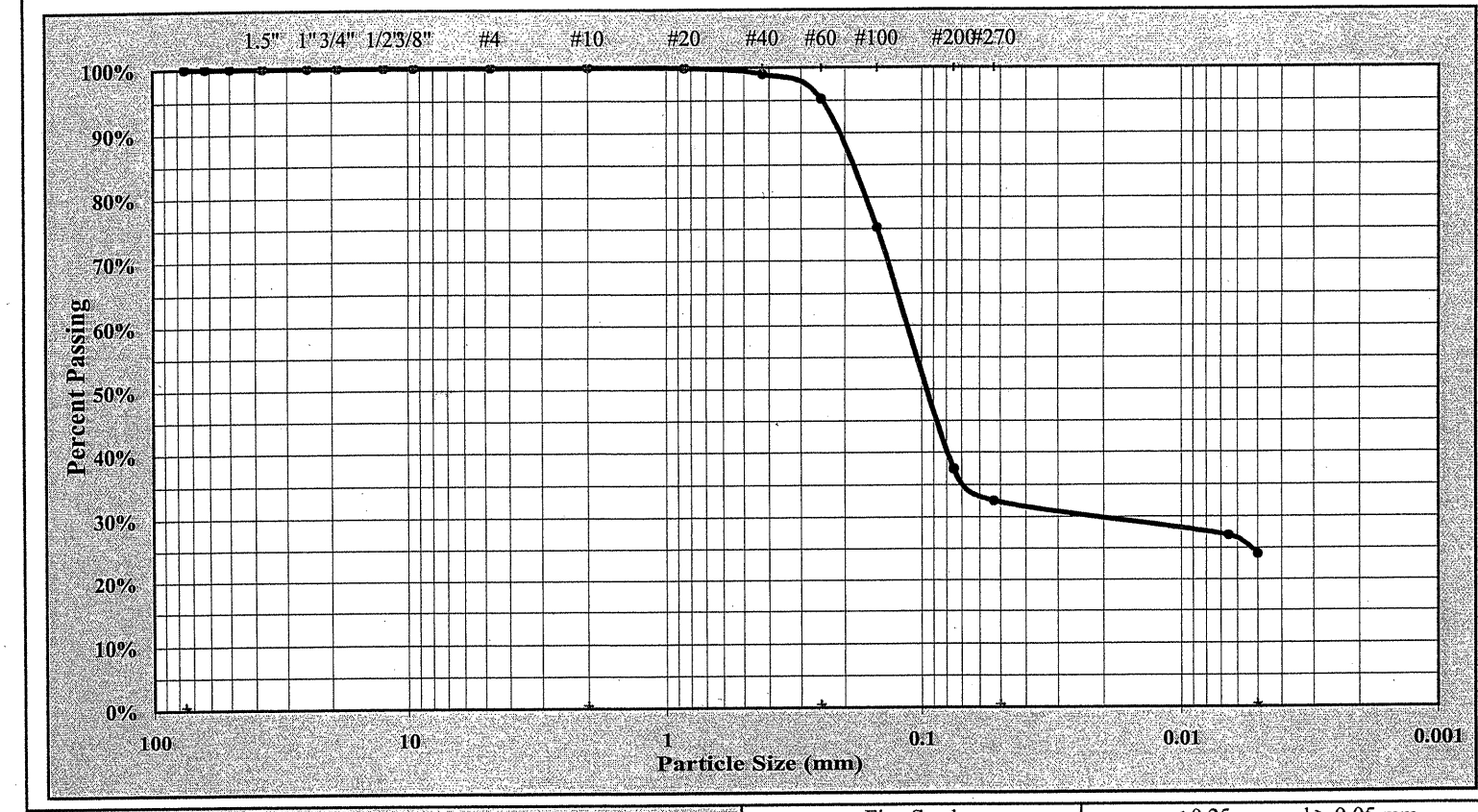
S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**

TIP NO: **R-3307**

Boring #: **B-5** Sample #: **S-6** Sample Date: **Unknown**  
 Location: **Carter County** Offset: **N/A** Depth: **2.0 - 4.0'**  
 Sample Description: **Gray and Tan Fine Sandy CLAY A-7-6 (5)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm	
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm	
Maximum Particle Size	#10	Coarse Sand	4.8%	Silt 6.0%
Gravel	0.0%	Fine Sand	62.7%	Clay 27.0%
Apparent Relative Density		Moisture Content	23.5%	% Passing #200 37.5%
Liquid Limit	49	Plastic Limit	18	Plastic Index 31

Soil Mortar (-#10 Sieve)				
Coarse Sand	4.8%	Fine Sand	62.7%	Clay 27.0%
Description of Sand & Gravel Particles: Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>				
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter				

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes  
 AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan Laboratory Supervisor  
 Signature Signature



### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

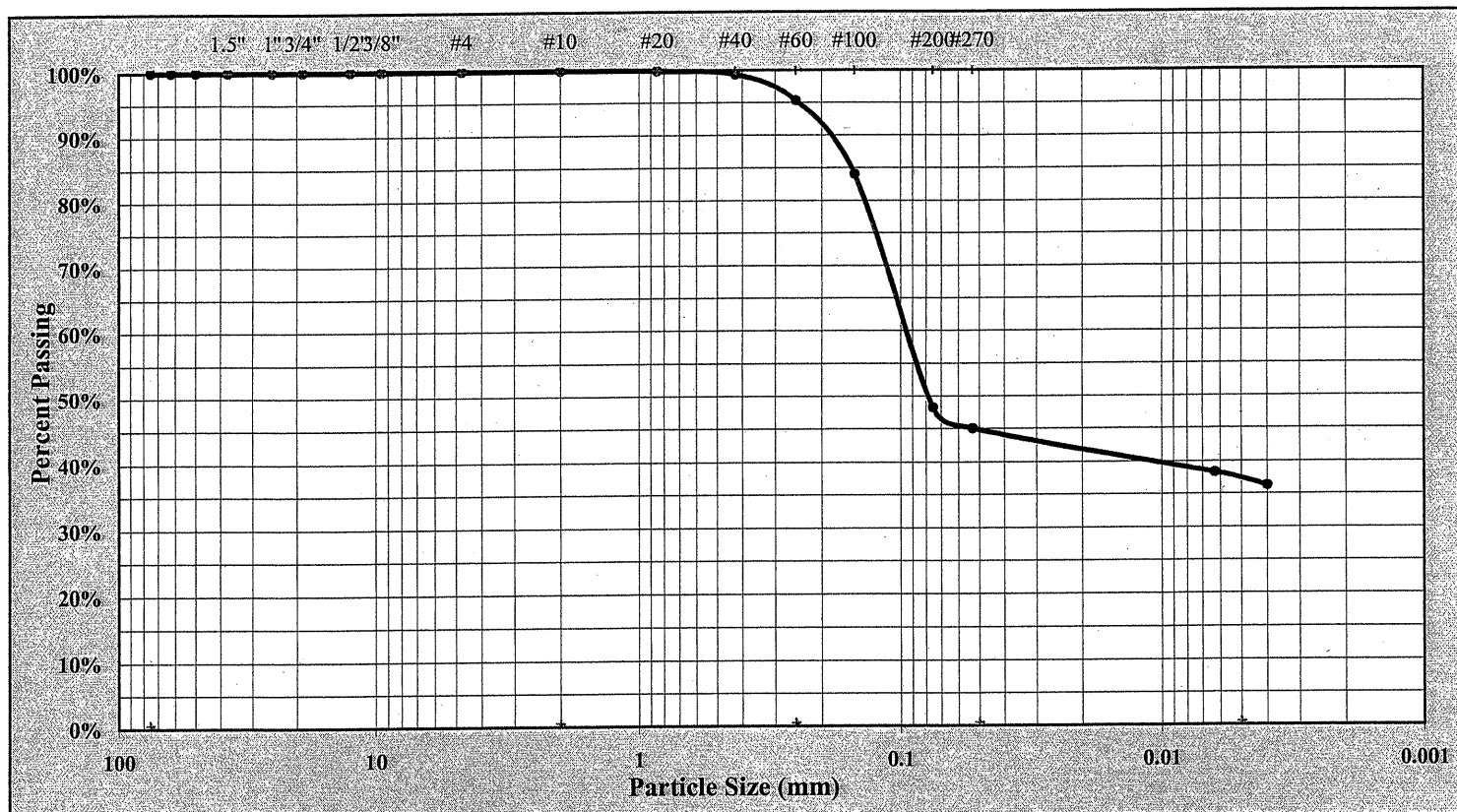


S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**

Report Date: 11/9/2006  
 Test Date(s): 11/06 - 11/09/2006

Client Address:  
 State Project #: **STPNHF-70(43)** F.A. Project No: **34528.1.1** TIP NO: **R-3307**

Boring #:	B-6	Sample #:	S-7	Sample Date:	Unknown
Location:	Carteret County	Offset:	N/A	Depth:	1.0 - 4.0'
Sample Description:	Gray and Tan Fine Sandy CLAY A-6 (5)				



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm	
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm	
Maximum Particle Size	#10	Coarse Sand	4.7%	Silt 7.0%
Gravel	0.0%	Fine Sand	50.3%	Clay 38.0%
Apparent Relative Density		Moisture Content	23.3%	% Passing #200 48.2%
Liquid Limit	36	Plastic Limit	19	Plastic Index 17

Soil Mortar (-#10 Sieve)				
Coarse Sand	4.7%	Fine Sand	50.3%	Clay 38.3%
Description of Sand & Gravel Particles: Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>				
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter				

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes  
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 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan \_\_\_\_\_ Laboratory Supervisor \_\_\_\_\_  
 Signature Signature

### Particle Size Analysis of Soils

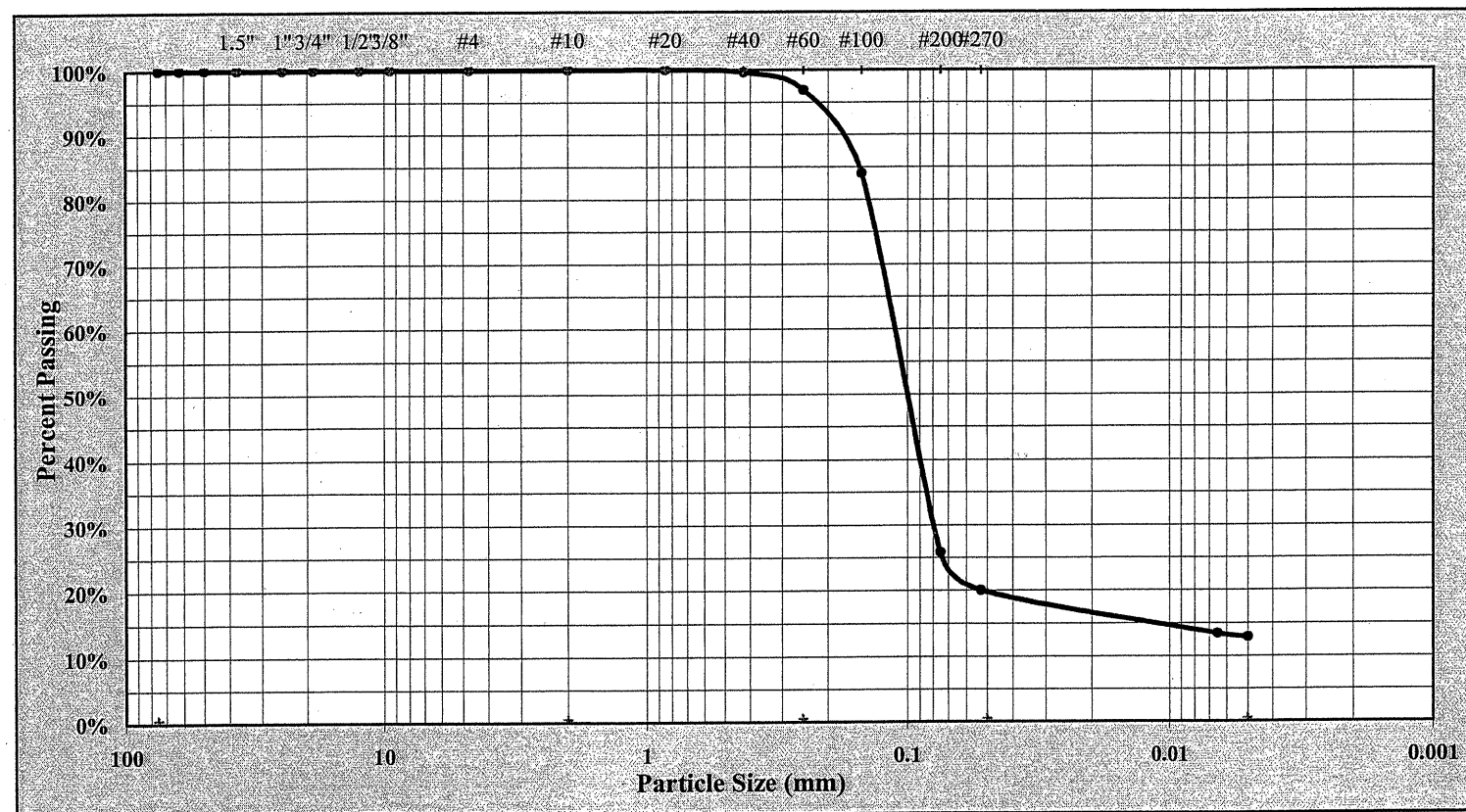
AASHTO T 88 as Modified by NCDOT

S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**

Report Date: 11/9/2006  
 Test Date(s): 11/06 - 11/09/2006

Client Address:  
 State Project #: **STPNHF-70(43)** F.A. Project No: **34528.1.1** TIP NO: **R-3307**

Boring #:	B-7	Sample #:	S-8	Sample Date:	Unknown
Location:	Carteret County	Offset:	N/A	Depth:	1.4 - 5.0'
Sample Description:	Gray and Tan Silty Clayey Fine SAND A-2-4 (0)				



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm	
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm	
Maximum Particle Size	#10	Coarse Sand	3.1%	Silt 7.0%
Gravel	0.0%	Fine Sand	76.9%	Clay 13.0%
Apparent Relative Density		Moisture Content	31.3%	% Passing #200 25.8%
Liquid Limit	25	Plastic Limit	0	Plastic Index N.P.

Soil Mortar (-#10 Sieve)				
Coarse Sand	3.1%	Fine Sand	76.9%	Clay 13.4%
Description of Sand & Gravel Particles: Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>				
Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter				

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test  
 AASHTO T89: Determining the Liquid Limit of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes  
 AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan \_\_\_\_\_ Laboratory Supervisor \_\_\_\_\_  
 Signature Signature

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

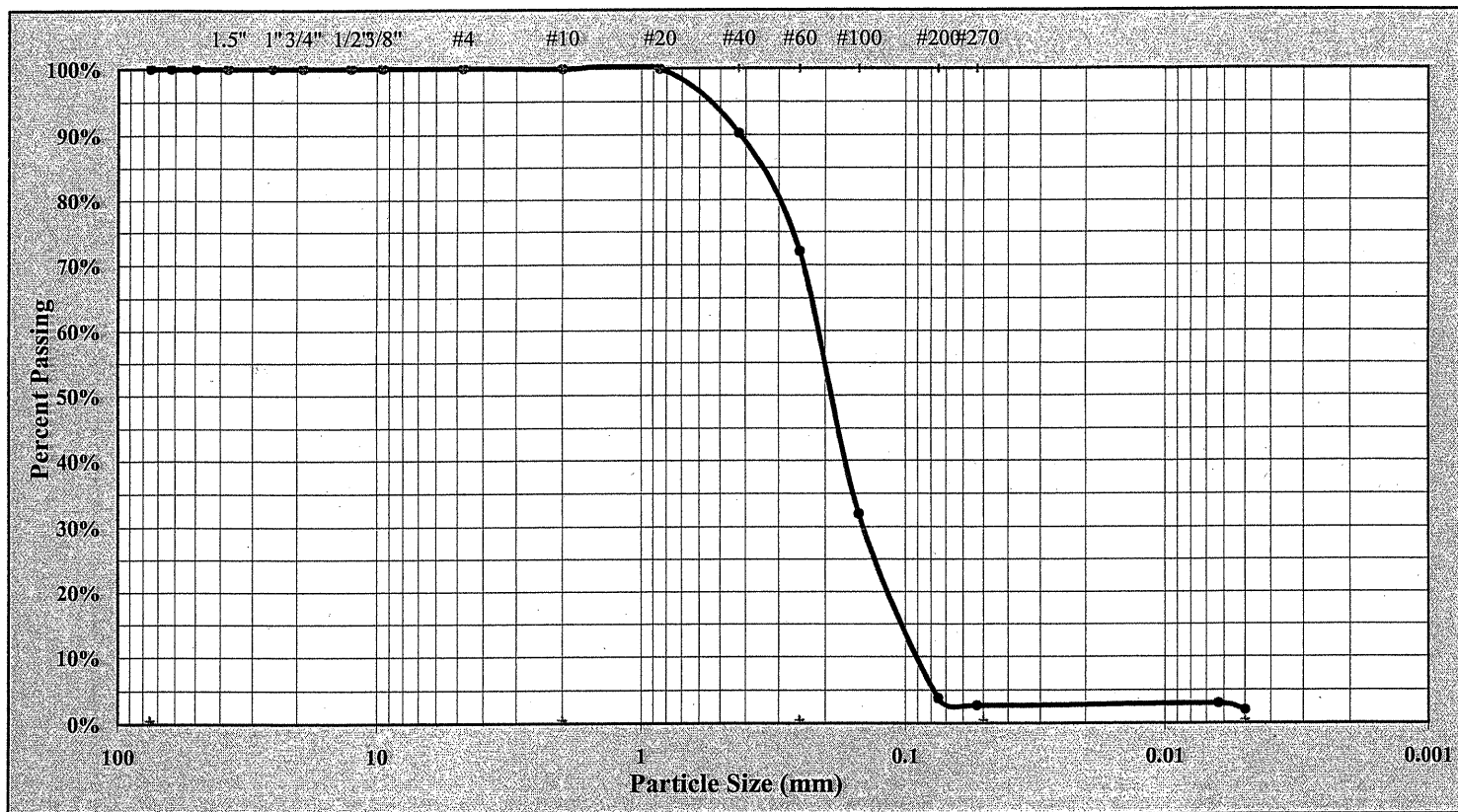


S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**      TIP NO: **R-3307**

Boring #: <b>B-8</b>	Sample #: <b>S-9</b>	Sample Date: <b>Unknown</b>
Location: <b>Carteret County</b>	Offset: <b>N/A</b>	Depth: <b>1.3 - 5.0'</b>
Sample Description: <b>Orange -Tan Coarse to Fine SAND A-3 (0)</b>		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm
Maximum Particle Size	#4	Coarse Sand	27.9%
		Fine Sand	69.3%
Gravel	0.1%	Silt	0.0%
		Clay	3.0%
Apparent Relative Density		Moisture Content	21.9%
		% Passing #200	3.8%
Liquid Limit	20	Plastic Limit	0
		Plastic Index	N.P.

#### Soil Mortar (-#10 Sieve)

Coarse Sand	27.9%	Fine Sand	69.4%	Silt	-0.3%	Clay	3.0%
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Description of Sand & Gravel Particles:	Rounded <input type="checkbox"/>	Angular <input type="checkbox"/>	Hard & Durable <input type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus (A)	Length of Dispersion Period: 1 min.		Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter		

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes      ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan      Laboratory Supervisor

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

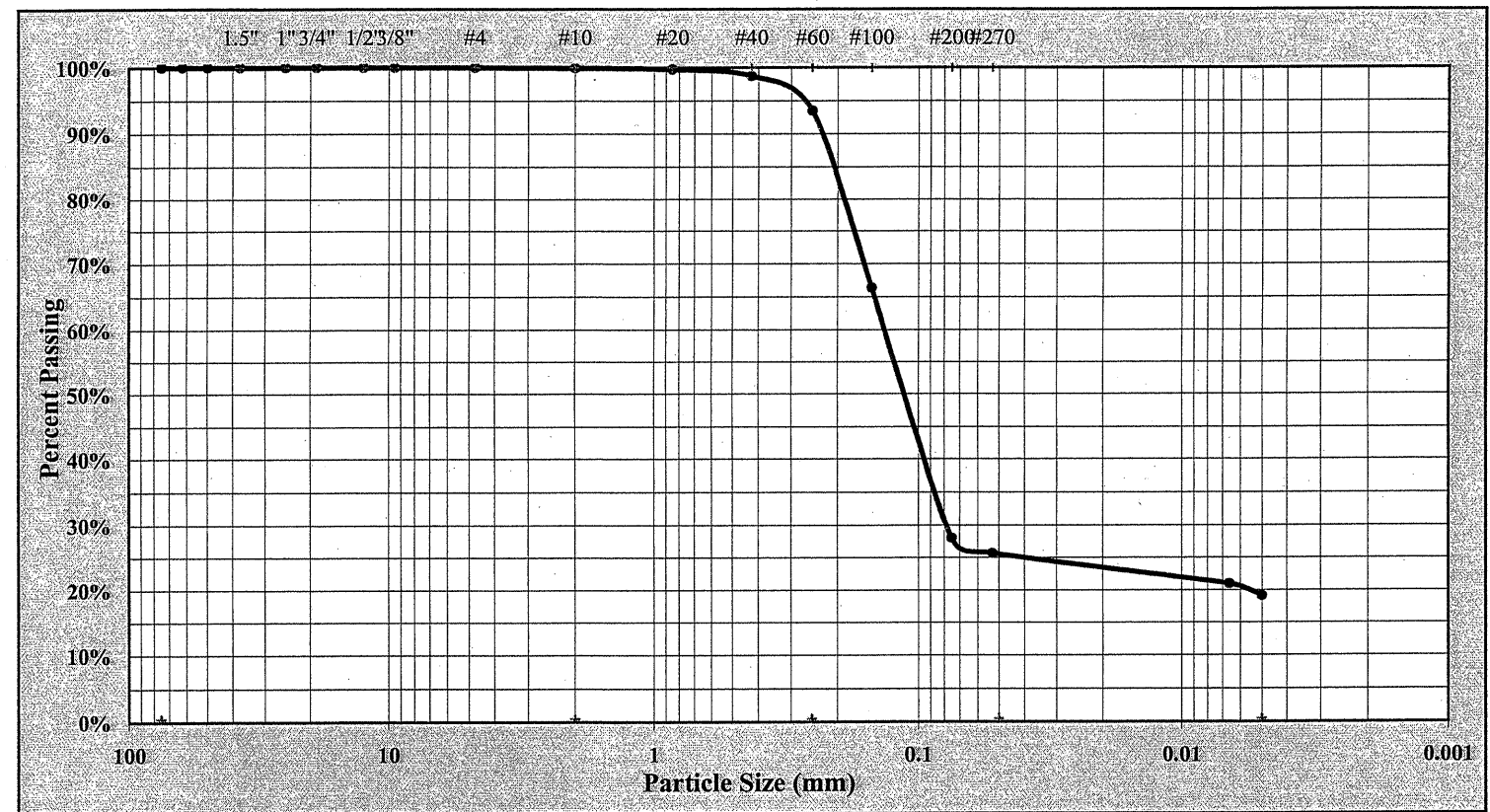


S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**      TIP NO: **R-3307**

Boring #: <b>B-9</b>	Sample #: <b>S-10</b>	Sample Date: <b>Unknown</b>
Location: <b>Carteret County</b>	Offset: <b>N/A</b>	Depth: <b>1.0 - 5.0'</b>
Sample Description: <b>Gray -Tan Clayey Fine SAND A-2-6 (0)</b>		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm
Maximum Particle Size	#4	Coarse Sand	6.4%
		Fine Sand	67.8%
Gravel	0.1%	Silt	5.0%
		Clay	21.0%
Apparent Relative Density		Moisture Content	28.0%
		% Passing #200	28.0%
Liquid Limit	20	Plastic Limit	9
		Plastic Index	11

#### Soil Mortar (-#10 Sieve)

Coarse Sand	6.4%	Fine Sand	67.9%	Silt	4.7%	Clay	21.0%
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Description of Sand & Gravel Particles:	Rounded <input type="checkbox"/>	Angular <input type="checkbox"/>	Hard & Durable <input type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus (A)	Length of Dispersion Period: 1 min.		Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter		

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes      ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan      Laboratory Supervisor

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

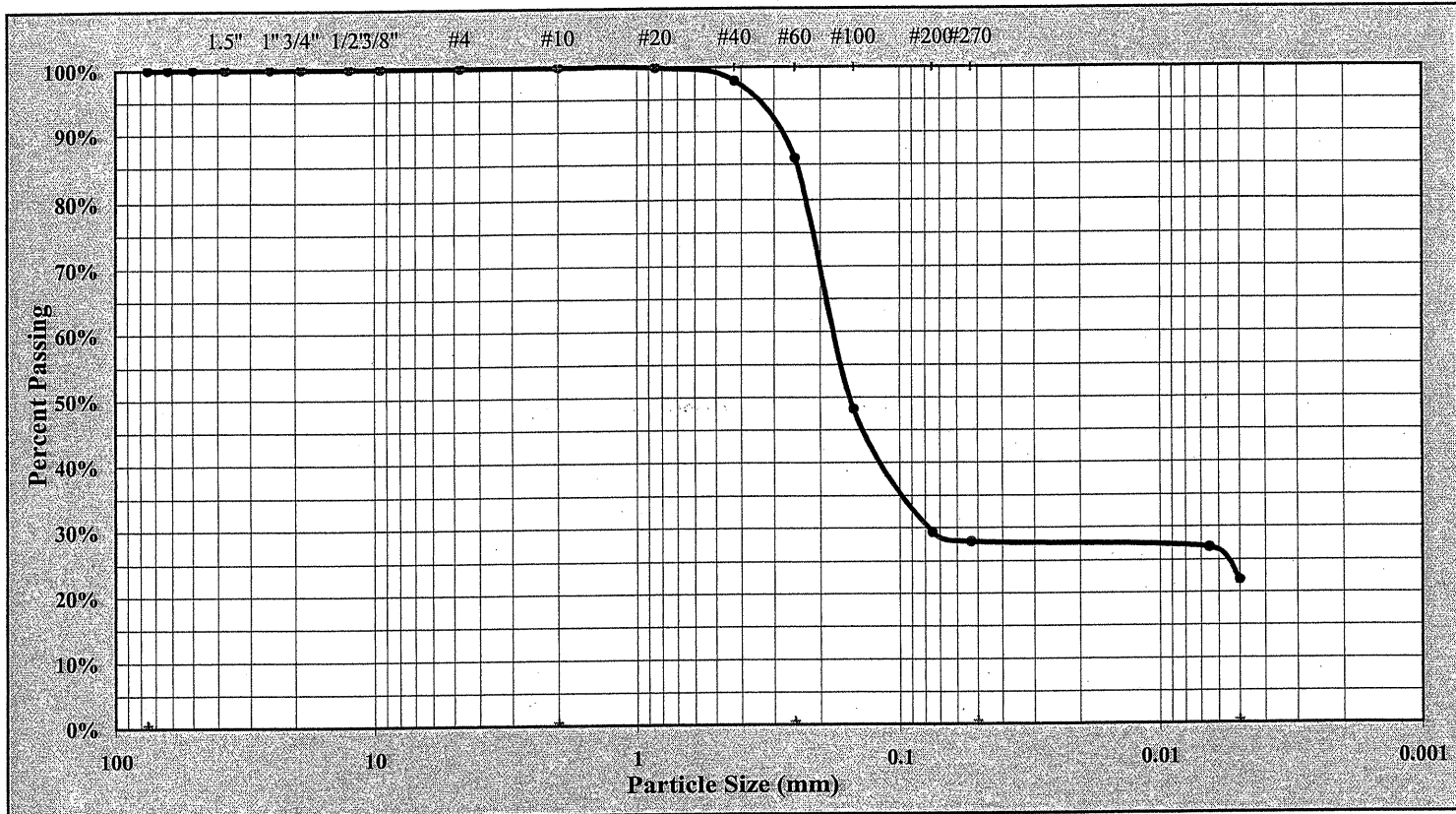
Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**

TIP NO: **R-3307**

Boring #: **B-10**      Sample #: **S-11**      Sample Date: **Unknown**  
 Location: **Carteret County**      Offset: **N/A**      Depth: **1.8 - 6.0'**

Sample Description: **Gray Clayey Coarse to Fine SAND A-2-4 (0)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	14.1%	Silt	1.0%
Gravel	0.0%	Fine Sand	58.0%	Clay	27.0%
Apparent Relative Density		Moisture Content	18.1%	% Passing #200	29.3%
Liquid Limit	19	Plastic Limit	15	Plastic Index	4

#### Soil Mortar (-#10 Sieve)

Coarse Sand	14.1%	Fine Sand	58.0%	Silt	1.0%	Clay	26.9%
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Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes      ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan

Laboratory Supervisor  
*Signature*

### Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



S&ME Project #: **1051-06-457**  
 Project Name: **US 70 Improvements**  
 Client Name: **NCDOT**  
 Client Address:  
 State Project #: **STPNHF-70(43)**

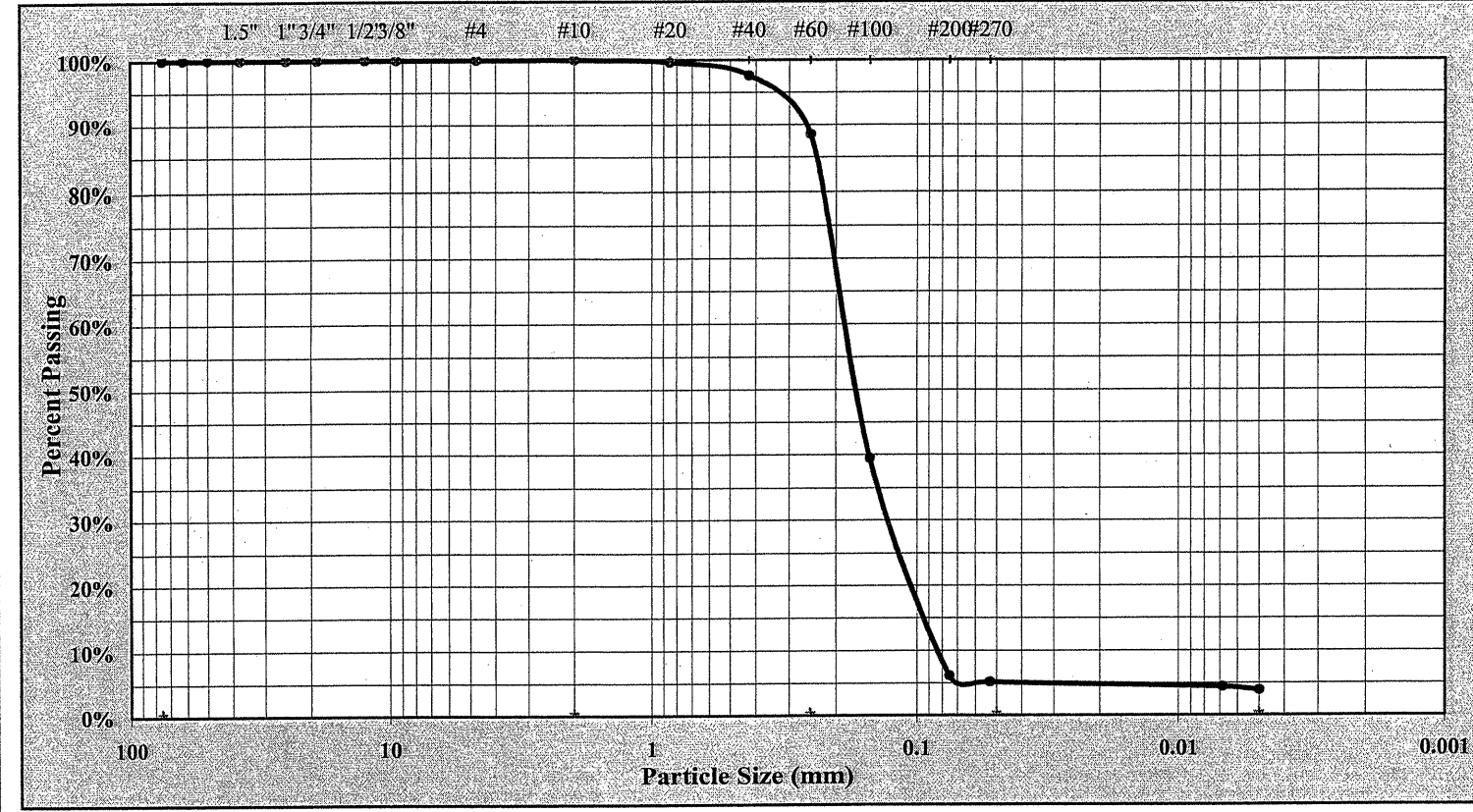
Report Date: **11/9/2006**  
 Test Date(s): **11/06 - 11/09/2006**

F.A. Project No: **34528.1.1**

TIP NO: **R-3307**

Boring #: **B-11**      Sample #: **S-12**      Sample Date: **Unknown**  
 Location: **Carteret County**      Offset: **N/A**      Depth: **1.2 - 6.0'**

Sample Description: **Gray-Tan Slightly Coarse to Fine SAND A-3 (0)**



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	11.5%	Silt	1.0%
Gravel	0.0%	Fine Sand	83.3%	Clay	4.0%
Apparent Relative Density		Moisture Content	21.0%	% Passing #200	6.1%
Liquid Limit	19	Plastic Limit	0	Plastic Index	N.P.

#### Soil Mortar (-#10 Sieve)

Coarse Sand	11.5%	Fine Sand	83.3%	Silt	0.8%	Clay	4.4%
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Description of Sand & Gravel Particles: Rounded  Angular  Hard & Durable  Soft  Weathered & Friable

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

**References:** AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT  
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test      AASHTO T265: Laboratory Determination of Moisture Content of Soils  
 AASHTO T89: Determining the Liquid Limit of Soils      AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils  
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes      ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan

Laboratory Supervisor  
*Signature*