



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS  
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3637	33185.1.1	2	15

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 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: <i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY 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. ANGULARITY OF GRAINS 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 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. FLOAT - 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 - 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.															
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION				WEATHERING																			
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.				FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V.SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) 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. MODERATELY SEVERE (MOD. SEV.) 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. IF TESTED, WOULD YIELD SPT REFUSAL. SEVERE (SEV.) 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. IF TESTED, YIELDS SPT N VALUES > 100 BPF VERY SEVERE (V. SEV.) 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. IF TESTED, YIELDS SPT N VALUES < 100 BPF COMPLETE 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.				COMPRESSIONIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 PERCENTAGE OF MATERIAL 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 GROUND WATER 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				WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V.SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) 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. MODERATELY SEVERE (MOD. SEV.) 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. IF TESTED, WOULD YIELD SPT REFUSAL. SEVERE (SEV.) 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. IF TESTED, YIELDS SPT N VALUES > 100 BPF VERY SEVERE (V. SEV.) 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. IF TESTED, YIELDS SPT N VALUES < 100 BPF COMPLETE 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.											
CONSISTENCY OR DENSENESS				MISCELLANEOUS SYMBOLS				ROCK HARDNESS																			
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )				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 AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL				VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S 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 GEOLOGIST'S 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 GEOLOGIST'S 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 HI. - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL W. - MOISTURE CONTENT V. - VERY VST - VANE SHEAR TEST γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT				VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S 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 GEOLOGIST'S 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 GEOLOGIST'S 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.							
TEXTURE OR GRAIN SIZE				ABBREVIATIONS				EQUIPMENT USED ON SUBJECT PROJECT				FRACTURE SPACING				BEDDING											
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.75 2.0 0.42 0.25 0.075 0.053				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 HI. - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL W. - MOISTURE CONTENT V. - VERY VST - VANE SHEAR TEST γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT				MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST OTHER OTHER				ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT OTHER				HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIOPER HAND AUGER SOUNDING ROD VANE SHEAR TEST OTHER				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 SPACING 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			
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				BENCH MARK:															
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL - PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM - OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST OTHER OTHER				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.				ELEVATION: NOTES:															
PLASTICITY				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				BENCH MARK:															
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH 0-5 VERY LOW 6-15 SLIGHT 16-25 MEDIUM 26 OR MORE HIGH				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST OTHER OTHER				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.				ELEVATION: NOTES:															
COLOR				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				BENCH MARK:															
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST OTHER OTHER				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.				ELEVATION: NOTES:															

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

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

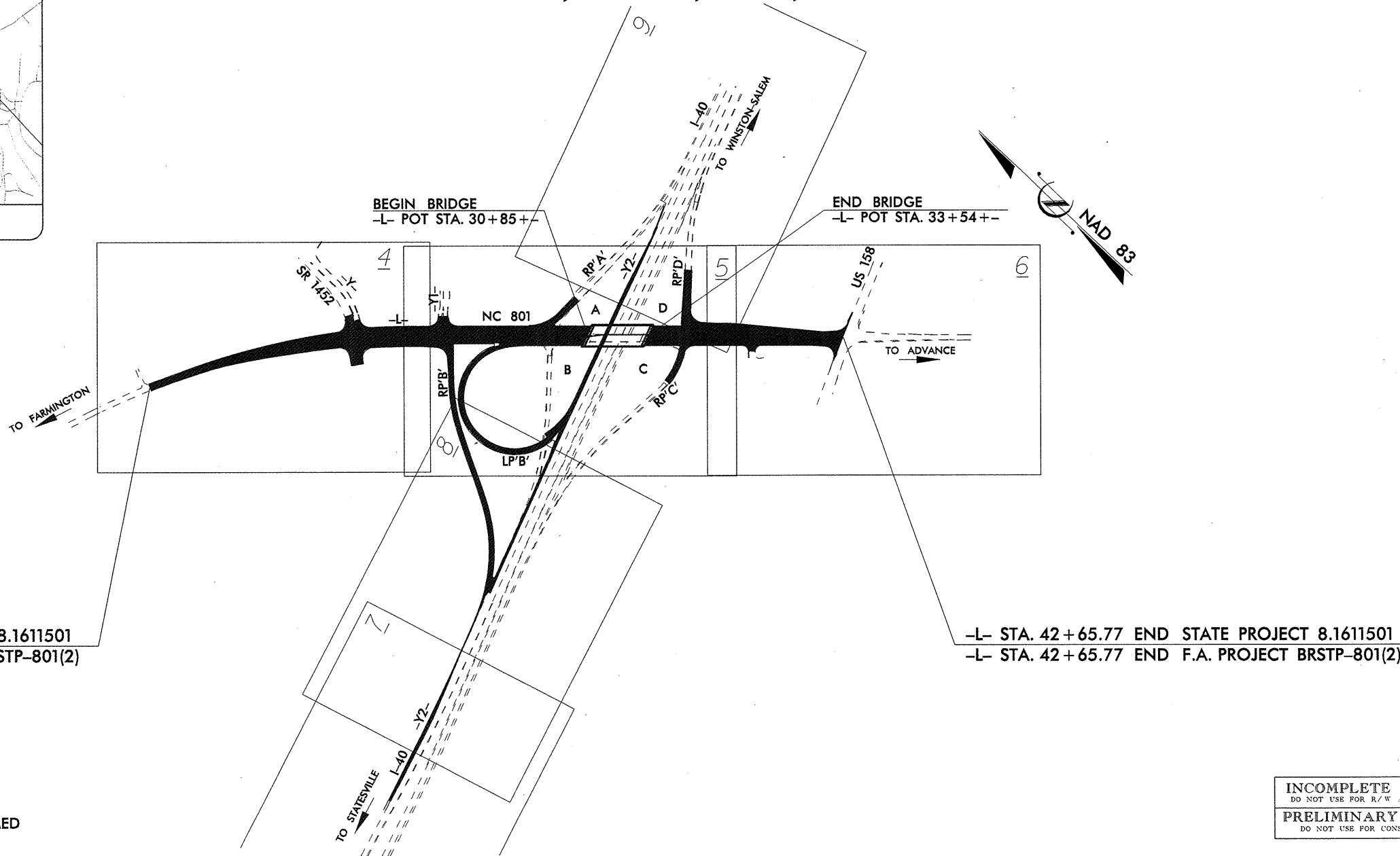
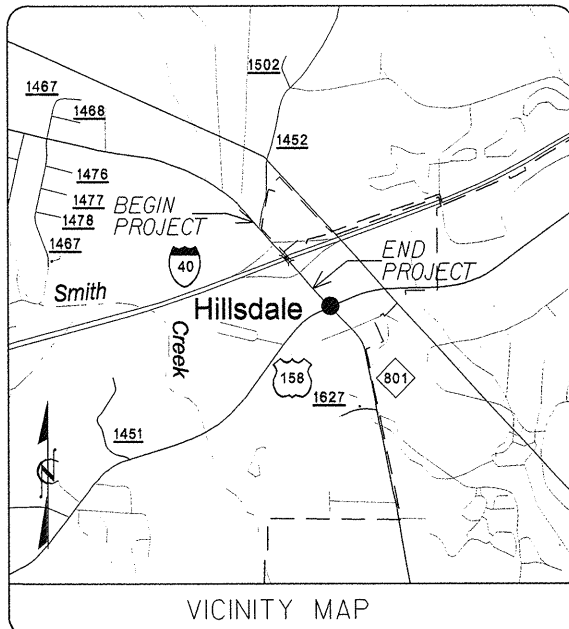
**DAVIE COUNTY**

**LOCATION: BRIDGE NO. 37 OVER I-40 ON NC 801**  
**TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3637	2A	15
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
8.1611501	BRSTP-801(2)	PE, UTIL.	

**B-3637**

**PROJECT: 8.1611501**

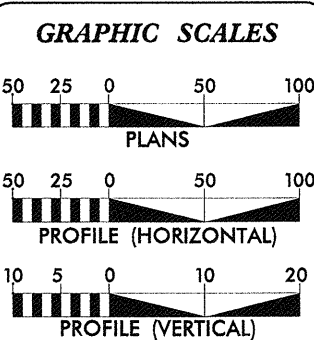


-L- STA. 10+50.00 BEGIN STATE PROJECT 8.1611501  
-L- STA. 10+50.00 BEGIN F.A. PROJECT BRSTP-801(2)

-L- STA. 42+65.77 END STATE PROJECT 8.1611501  
-L- STA. 42+65.77 END F.A. PROJECT BRSTP-801(2)

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

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



**DESIGN DATA**

ADT 2004 =	14,000
ADT 2024 =	21,200
DHV =	10 %
D =	60 %
T =	6 % *
V =	40 MPH
* TTST 3%	DUAL 3%

**PROJECT LENGTH**

LENGTH ROADWAY F.A. PROJECT BRSTP-801(2) =	0.558 MI
LENGTH STRUCTURE F.A. PROJECT BRSTP-801(2) =	0.051 MI
TOTAL LENGTH STATE PROJECT 8.1611501 =	0.609 MI

PLANS PREPARED BY:  
TGS ENGINEERS  
975 WALNUT STREET, SUITE 141  
CARY, NC 27511  
PH (919) 319-8850  
2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: \_\_\_\_\_

LETTING DATE: \_\_\_\_\_

PLANS PREPARED FOR:  
DIVISION OF HIGHWAYS  
1000 Birch Ridge Dr.  
Raleigh, NC 27610

**CHARLES L. FLOWE, P.E.**  
PROJECT ENGINEER

**W. CRAIG PARKER, P.E.**  
PROJECT DESIGN ENGINEER

**HYDRAULICS ENGINEER**

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

**ROADWAY DESIGN ENGINEER**

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

**DIVISION OF HIGHWAYS  
STATE OF NORTH CAROLINA**

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

STATE DESIGN ENGINEER

**DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION**

APPROVED  
DIVISION ADMINISTRATOR

DATE \_\_\_\_\_

DATE PLOTTED: 08/27/2024 10:00 AM  
PLOTTER: HP PLOTTER  
SCALE: AS SHOWN  
SHEET: 2A OF 15  
PROJECT: 8.1611501



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

November 16, 2004

**State Project:** 33185.1.1 (B-3637)  
**Federal Project:** BRSTP-801(2)  
**County:** Davie  
**Description:** Bridge 37 over I-40 (Y2), on NC 801 (-L-)  
**Subject:** Geotechnical Report - Inventory

**Project Description**

This is a report of an English-units geotechnical investigation for a design-build project that will upgrade the ramps and approaches and raise the grade, where NC 801 crosses I-40, just west of the Davie-Forsyth county line. The roadway portion, including ramps and loops totals about 0.5miles, and the bridge will be over 300' long. The following lines were investigated for an inclusive total of 11,648': The preliminary bridge investigation is included as an addendum at the end of this report.

-L- Line, (NC 801):	10+50 to 42+65	3215ft
-Y-:	10+00 to 15+08	508ft
-Y1-:	10+00 to 12+00	200ft
-Y2-(I-40):	10+00 to 50+72	4072ft
-RpA-:	00+00 to 03+00	300ft
-RpB-:	00+00 to 14+30	1430ft
-RpC-:	00+50 to 02+75	225ft
-RpD-:	06+00 to 09+50	350ft
-LpB-:	00+00 to 13+48	1348ft

**Areas of Special Geotechnical Interest**

**Highly Plastic Soil**

The interval below is based on analyzed drill samples and is not necessarily conclusive.

**Highly Plastic Soil Within 10' of Finished Grade**

Interval	PI of Samples	Average PI
-L- 10+00 to 29+00	43,39,33,36,28,33,42	36

**High Groundwater**

Shallow groundwater was measured in the bore holes in the intervals listed below.

**Groundwater Within 10' of Existing Grade**

Interval	Soil Type
-L-16+00 to 19+50	A-7 Residual Soil
-Y2-30+00 to 36+00	A-7 Residual Soil

**MAILING ADDRESS:**

NC DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL ENGINEERING UNIT  
1589 MAIL SERVICE CENTER  
RALEIGH NC 27699-1589

TELEPHONE: 919-250-4088  
FAX: 919-250-4237

WEBSITE: WWW.DOH.DOT.STATE.NC.US

**LOCATION:**

CENTURY CENTER COMPLEX  
ENTRANCE B-2  
1020 BIRCH RIDGE DRIVE  
RALEIGH NC

**Physiography and Geology**

The project is within the Piedmont physiographic province in the Charlotte Belt litho-tectonic province.

**Topographic Setting**

The NC801 alignment follows a ridge top at about elevation 800. The I-40 segment included in this project begins near Smith Creek on the south at -Y2-10+00, elevation 750, then climbs to the ridge top, elevation 775 at -Y2-35+70, where it crosses under NC 801 then it stays at elevation 780 to -Y2-50+00.

**Drainage and Geomorphology**

NC highway 801 is at a drainage divide between two unnamed ephemeral streams. The precipitation that lands northeast of -L- flows to the northeast and then directly into the Yadkin River. Southwest of -L- water flows to the southwest and into Smith Creek which reaches the Yadkin by a more circuitous route

**Surface Drainage**

North of -L- from 10+00 to 28+00 the existing northeast directed drainage heads have been filled, and the lot runoff has been directed to drains that discharge to the southwest side of -L-.

**Geology**

The geologic map, buttressed by information gained through drilling indicates that this area is underlain by micaceous metamorphic rock with steeply dipping compositional banding with a northeast strike. The result is that the rock character tends to change abruptly in a northwest-southeast direction, and be more consistent in a northeast-southwest direction. I-40 is nearly parallel to the strike direction, and NC801 is almost parallel to the dip direction.

**Soil Properties**

The soil in this area is classified as alluvial, (moved by water) or residual, (deeply weathered rock). The residual soil follows the rock geometry and changes character rapidly across the strike direction, but is consistent along strike.

**Engineering Properties**

Properties of a soil sample, determined by analysis are used to assign a classification that generally predicts the engineering properties of the soil. The soil types found on this project include granular soils: A-1 and A-2-4, and silt-clay soils: A-4, A-5, A-6 and A-7. The silt-clay group predominates.

**Soil Descriptions**

**Alluvial Soil**

Alluvial soil was found in the ephemeral stream channels and likely was derived from the nearby residual soil. This A-6 or A-7 clayey soil is soft and usually less than 10' thick.

The acceleration lane at the beginning of the -Y2- alignment encroaches on the Smith Creek floodplain. This location could have a large interval of sediment.

**Residual Soil**

The residual soil seen in the borings was either a thin layer over dark rocks or a 70 to 90 foot thick layer over micaceous rock. Because residual soil properties reflect the parent rock, two soil occurrence areas will be discussed as Thick Soil or Thin Soil.

**Thin Soil**

In the high ground adjacent to NC 801, from -L-10+00 to -L- 25+50, soil is

generally less than 10' thick over rock or weathered rock. The tested soil has a high PI, liquid limit over 50, and often supports a water table. One interpretation is that this topographic high continues to the southwest, forming the west side of the ephemeral stream. The transition zone at the soil- weathered rock contact yields the only occurrences of granular soil on the project.

**Thick Soil**

East of -L-25+50, soil is thick, 70' at the grade separation, there is A-7 soil at the surface, followed by A-5. The A-7 / A-5 boundary appears to deepen to the southeast. The A-7 may be restricted to the ridge-top. Along I-40, to the southwest, A-5 soil occurs at ground surface. Though both the Thin Soil and Thick Soil areas have A-7 at the surface, the Thick Soil A-7 has a lower PI and liquid limit.

**Rock Properties**

Cobbles of black hornblende gneiss, probably meta-mafic rock, occur at the surface in the Thin Soil area. This area is probably underlain by meta-gabbro consistent with the Geology map unit Pzzm. The Thick Soil area of the interstate overpass is consistently described as micaceous, and the A-5 soil column is consistent with a micaceous soil. This would be consistent with granitic gneiss, Czg, which occurs nearby.

**Groundwater Properties**

Areas of shallow groundwater are listed in the Areas of Special Geotechnical Interest section above, this report. At the time of this investigation, (May 2004), water was flowing in the ephemeral stream, indicating a very shallow water table in the stream channel. Groundwater was 5 to 10' below land surface at the ridge top in the Thin Soil area at -L-15+00 to 20+00. Water was encountered near the base of fill in the grade separation cut and along the Y2 alignment. Where there were sufficient borings the water table appeared to be draining toward the ephemeral stream.

**Geotechnical Descriptive Analysis of the Project**

The project was divided into 4 segments based on subsurface geology. Segment 1 includes the -L- line, -Y-, -Y1-, -RPA- RPC, and RPD. Segment 2 is -RPB-. Segment 3 is -LPB-. Segment 4 is -Y2-.

**Segment 1. Station -L-10+50 to -L- 42+65, (Including Intersecting Lines as Noted Above).**

This segment is on a ridge, on grade up to -L-25+00, where a 5' raise in grade begins and continues nearly to the end.

**Physical Description**

This segment begins 1000' east of the intersection of NC 801 and SR 1452, at elevation 821'. The roadway is built on grade, following the ridge-top, and gradually loses elevation to 797' at -L- 24+75. The roadway then gains elevation on fill to the bridge center at -L- 32+25, elevation 803. The road continues on fill to the end of the segment where the fill tapers out to grade at -L-42+, and elevation 806.

**Cuts and Fills**

The significant (more than 5' thick) cuts and fills of this segment, are listed in the table below. Most of the segment will be built on or near existing grade with little fill or cut.

Cut		Fill	
From	To	From	To
		-L-24+50	-L-42+00

**Soil**

The soil at the ground surface from the start at -L-10+00 to -L-18+00 is A-7 with a PI from 30 to 40. From -L-18+00 to -L-25+00 where the topography breaks toward the ephemeral stream, the surface A-7 is thin to absent, with A-2-4 to A-1 at or near the surface. From -L-25+00 to the limit of our drilling at -L-34+00, we found up to 50' of medium stiff A-7 soil with a PI around 15.

**Groundwater**

The static water table was measured at less than 10' below land surface from -L-15+00 to 20+00, and in the preliminary bridge borings, at the I-40 roadbed elevation.

**Segment2: Ramp B, (RPB 0+00 to 14+30)**

This segment is the on ramp from NC801 to westbound I-40

**Physical Description**

This segment is a new alignment that begins at elevation 767' at RPB 0+00 (-Y2-20+28.99), and rises in a gradual arc to elevation 797 at RPB 14+30, (-L- 24+65)

**Cuts and Fills**

The centerline profile shows fill up to 20' thick over most of the segment.

**Soil**

**Residual Soil**

Two borings were completed in this segment. The +00 boring was interpreted to be in the "Thick Soil" terrain, with a thin A-7 interval over stiff A-5, then medium dense moist sand, all micaceous. The other boring was in the "Thin Soil" terrain with dense to very dense A-2-4 and A-1 over weathered rock.

**Alluvial Soil**

The interval from -RPB 4+00 to 7+00 is probably underlain by alluvial soil similar to that encountered in the adjacent LPB borehole.

**Fill Soil**

No fill soil was identified on this segment.

**Groundwater**

Groundwater was at the surface expressed by the surface elevation of the small stream.

**Segment3:Loop B**

This segment is the exit loop from I-40 (south)west bound to NC 801 south(east) bound.

**Physical Description**

This segment begins at elevation 776.48 as it exits I-40, then rises as a loop of 250' radius is traversed. The segment ends at elevation 800.75 at -L-28+52.

**Cuts and Fills**

Almost the entire segment will be on fill up to 20' thick.

**Soil**

Because the segment is a loop, it crosses the ephemeral stream, then loops around and crosses both upstream forks of the same stream.

**Residual Soil**

The loop begins in the "Thick Soil" terrain, near the overpass, crosses a tributary to the "Thin Soil" terrain, crosses another tributary back to the "Thick Soil" terrain,

then ends. The borings at the beginning of the segment are in A-5 soil medium stiff to soft, and micaceous. The "Thin Soil" borings go through 2' of A-7, then 2' of very dense A-1, then weathered rock. About 300 feet away, a boring in the "Thick Soil" terrain ends in medium stiff clayey soil at 10'.

**Alluvial Soil**

As reported above this segment includes three intervals of alluvial soil. The most head-ward crossing found 8' of soft to medium stiff alluvial soil.

**Fill Soil**

Roadway fill was identified from 10+50 to 13+50, on the left, but not drilled.

**Groundwater**

In the borings, groundwater was seen to occur near the I-40 base course elevation, and sloping toward the stream. The water in the stream probably is "held up" by the water table. No water was seen at the top of the loop near NC 801.

**Segment 4:-Y2-**

This segment covers the limits of I-40 affected by the project

**Physical Description**

This segment begins at elevation 760', with the road gradually climbing to the east. Where -Y- crosses under -L- it is at elevation 776. At the end of the project, -Y2- 50+00 is at elevation 785.

**Cuts and Fills**

There may be new fill required at the beginning of the segment on the north side, where an acceleration lane merges into -Y2-.

**Soil**

From the data available, -Y2- is over an area of deep soil. Nearly all of the sampling done shows the roadway is built on residual A-5 micaceous soil or A-7 clayey soil. The possible fill at the beginning of the segment is on floodplain and may be over alluvial soil.

**Groundwater**

In preliminary bridge borings adjacent to the -L- grade separation, water was found at the base of the roadbed at the median, and slightly higher in the proposed endbent sites. Near the intersection with the proposed loop, groundwater was found slightly below the roadbed.

If any significant changes are made in the design or location of the proposed roadway, the subsurface information and interpretations will have to be reviewed and modified as necessary.

Respectfully Submitted,



R.Q. Callaway  
Project Geologist



## EARTHWORK BALANCE SHEET

Volumes in Cubic Yards

PROJECT B-3637

COUNTY Davie County

DATE 15-May-07

REVISED: WCP  
COMPILED BY: JLT

SHEET 3C OF 15 SHEETS

LINE	STATION	STATION	EXCAVATION					EMBANKMENT				BORROW	WASTE		
			TOTAL (UNCL.)	ROCK	UNDERCUT	UNSUIT. UNCLASS.	SUITABLE UNCLASS.	TOTAL	ROCK	EARTH	EMB. +%		ROCK	SUITABLE	UNSUIT
-L-	10+50.00	31+00.00	3,343				3,343	15,564		15,564	18,677	15,334			
-RPA-	15+00.00	18+78.51	431				431	1,561		1,561	1,873	1,442			
-RPB-	10+00.00	24+06.81	2,902				2,902	35,365		35,365	42,438	39,536			
-LPB-	10+00.00	23+48.06	1,398				1,398	40,242		40,242	48,290	46,892			
-Y2-	11+48.99	41+50.00	9,491				9,491	315		315	378			9,113	
<b>SUB-TOTAL 1</b>			17,565				17,565	93,047		93,047	111,656	103,204		9,113	
-L-	33+50.00	42+65.77	278				278	8,785		8,785	10,542	10,264			
-RPC-	10+50.00	12+36.60	863				863	121		121	145			718	
-RPD-	16+00.00	18+67.87	233				233	1,383		1,383	1,660	1,427			
-LPBTEMP-	10+00.00	12+65.80	3				3	5,109		5,109	6,131	6,128			
-RPBTEMP-	21+46.29	24+16.39	597				597	4,524		4,524	5,429	4,832			
-LPBTEMP2-	10+00.00	13+04.30	147				147	111		111	133			14	
-RPBTEMP2-	21+46.29	24+54.81	337				337	47		47	56			281	
<b>SUB-TOTAL 2</b>			2,458				2,458	20,080		20,080	24,096	22,651		1,013	
<b>TOTAL</b>			20,023				20,023	113,127		113,127	135,752	125,855		10,126	
Loss due to Clearing & Grubbing			-2,500				-2,500					2,500			
Earth Waste to replace Borrow												-10,126		-10,126	
Shoulder Material								3,500		3,500	4,200	4,200			
<b>PROJECT TOTAL</b>			17,523				17,523	116,627		116,627	139,952	122,429			
Est. 5% to replace Topsoil on Borrow Pits												6,121			
<b>GRAND TOTAL</b>			17,523				17,523	116,627		116,627	139,952	128,550		0	
Estimated Undercut					2,166										
<b>SAY</b>			<b>18,000</b>		2,166							<b>132,400</b>			

Pavement Structure Volume = 3,265 yd<sup>3</sup>

DDE = 2,340 yd<sup>3</sup>

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

CURVE -L-	CURVE -Y-
PI Sta 16+59.00	PI Sta 11+48.52
$\Delta = 22^{\circ} 08' 45.2" (RT)$	$\Delta = 30^{\circ} 05' 37.3" (RT)$
$D = 1^{\circ} 45' 00.0"$	$D = 16^{\circ} 25' 00.0"$
$L = 1,265.48'$	$L = 183.31'$
$T = 640.74'$	$T = 93.82'$
$R = 3,274.04'$	$R = 349.01'$
$SE = 0.025$	$SE = \text{See Plans}$
Runoff = See Plans	Runoff = See Plans

**DATUM DESCRIPTION**

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "12102-8"

WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 828802.9093(11) EASTING: 1584445.2714(11)


THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99993054

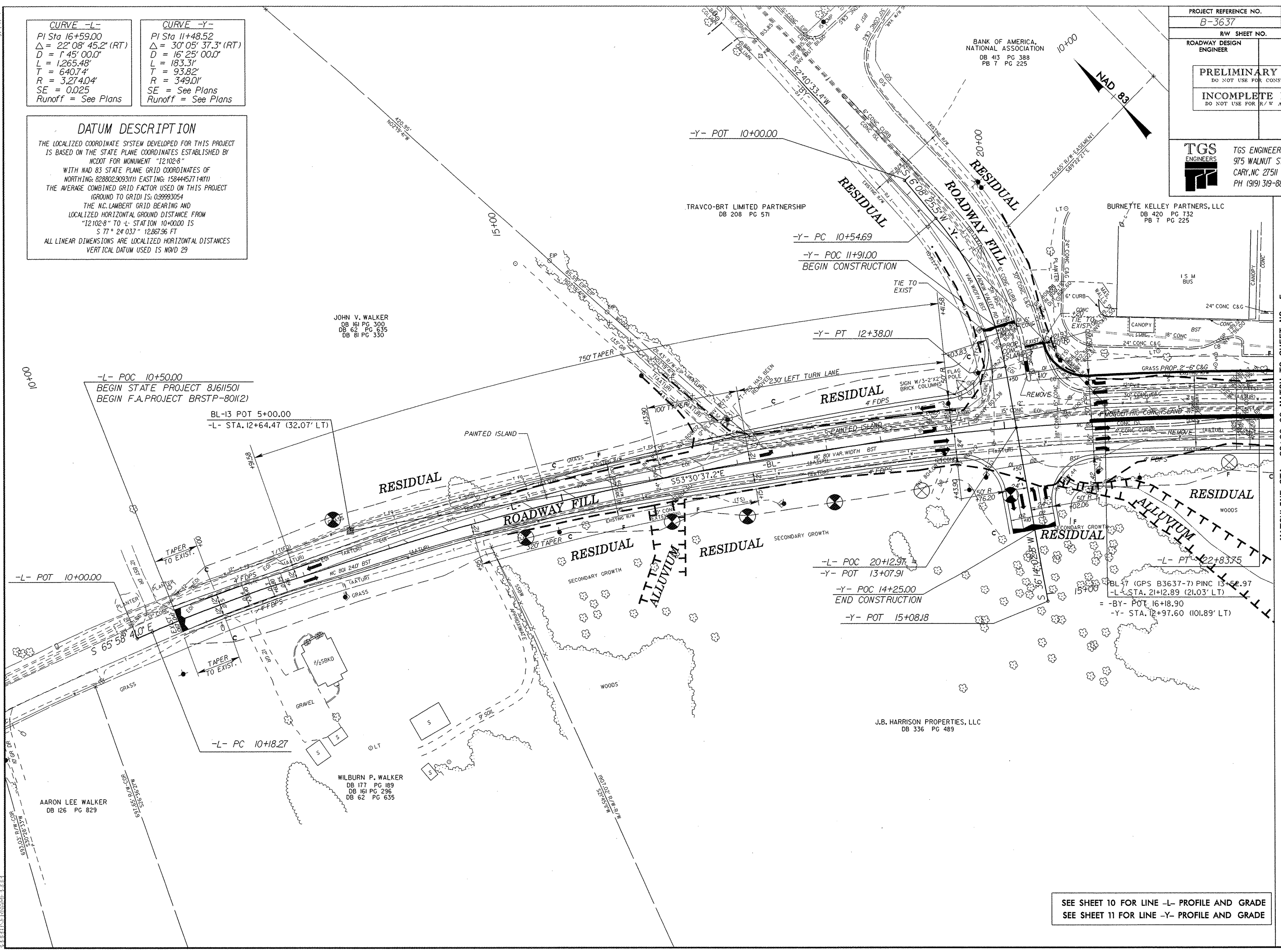
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "12102-8" TO L- STATION 10+00.00 IS

S 77° 24' 03.7" 12,867.96 FT

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES

VERTICAL DATUM USED IS NGVD 29

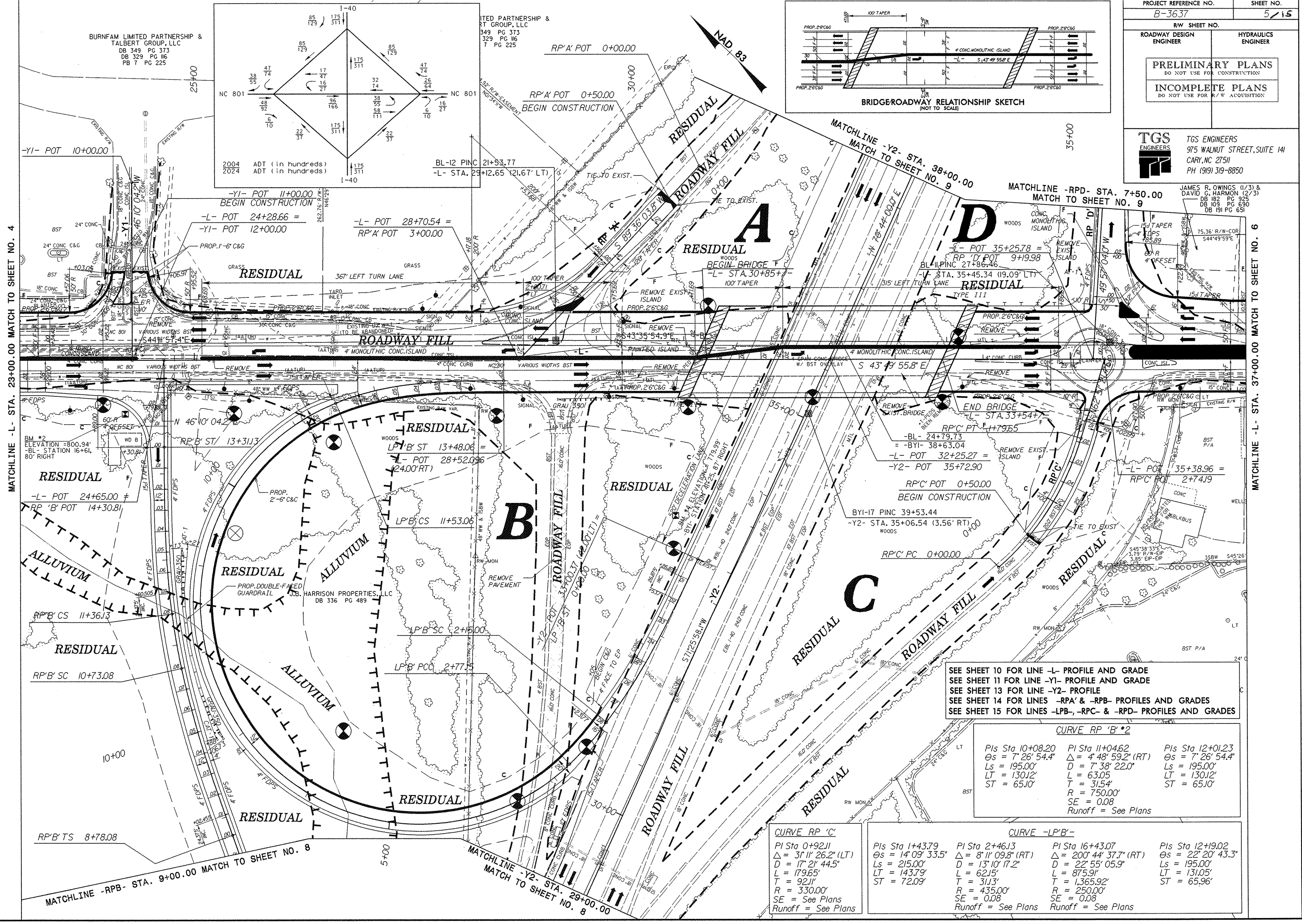
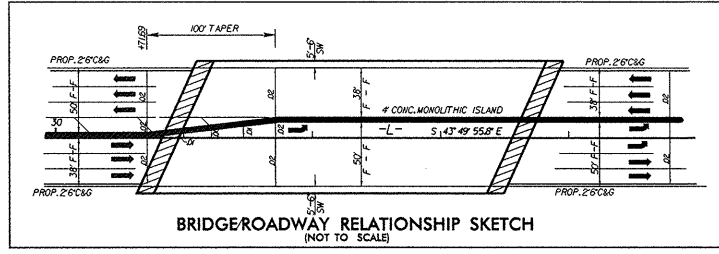
PROJECT REFERENCE NO. B-3637	SHEET NO. 4/15
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
 <b>TGS ENGINEERS</b> 975 WALNUT STREET, SUITE 141 CARY, NC 27511 PH (919) 319-8850	



MATCHLINE STA. 23+00.00 MATCH TO SHEET NO. 5

SEE SHEET 10 FOR LINE -L- PROFILE AND GRADE  
SEE SHEET 11 FOR LINE -Y- PROFILE AND GRADE





SEE SHEET 10 FOR LINE -L- PROFILE AND GRADE  
 SEE SHEET 11 FOR LINE -Y1- PROFILE AND GRADE  
 SEE SHEET 13 FOR LINE -Y2- PROFILE  
 SEE SHEET 14 FOR LINES -RPA- & -RPB- PROFILES AND GRADES  
 SEE SHEET 15 FOR LINES -LPB-, -RPC- & -RPD- PROFILES AND GRADES

**CURVE RP 'B' \*2**

Pls Sta 10+08.20 Os = 7° 26' 54.4" Ls = 195.00' LT = 130.12' ST = 65.10'	Pls Sta 11+04.62 Δ = 4° 48' 59.2" (RT) D = 7° 38' 22.0" L = 63.05' T = 31.54' R = 750.00' SE = 0.08 Runoff = See Plans	Pls Sta 12+01.23 Os = 7° 26' 54.4" Ls = 195.00' LT = 130.12' ST = 65.10'
--	---	--

**CURVE RP 'C'**

Pls Sta 0+92.11 Δ = 31° 11' 26.2" (LT) D = 17° 21' 44.5" L = 179.65' T = 92.11' R = 330.00' SE = See Plans Runoff = See Plans
--

**CURVE -LP'B'-**

Pls Sta 1+43.79 Os = 14° 09' 33.5" Ls = 215.00' LT = 143.79' ST = 72.09'	Pls Sta 2+46.13 Δ = 8° 11' 09.8" (RT) D = 13° 10' 17.2" L = 62.15' T = 31.13' R = 435.00' SE = 0.08 Runoff = See Plans	Pls Sta 16+43.07 Δ = 200° 44' 37.7" (RT) D = 22° 55' 05.9" L = 875.91' T = 1,365.92' R = 250.00' SE = 0.08 Runoff = See Plans	Pls Sta 12+19.02 Os = 22° 20' 43.3" Ls = 195.00' LT = 131.05' ST = 65.96'
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MATCHLINE -L- STA. 23+00.00 MATCH TO SHEET NO. 4

MATCHLINE -L- STA. 37+00.00 MATCH TO SHEET NO. 6

MATCHLINE -RPB- STA. 9+00.00 MATCH TO SHEET NO. 8

MATCHLINE -Y2- STA. 29+00.00 MATCH TO SHEET NO. 8

MATCHLINE -Y2- STA. 38+00.00 MATCH TO SHEET NO. 9

MATCHLINE -RPD- STA. 7+50.00 MATCH TO SHEET NO. 9

BURNFAM LIMITED PARTNERSHIP & TALBERT GROUP, LLC  
 DB 349 PG 373  
 DB 329 PG 116  
 PB 7 PG 225

UNITED PARTNERSHIP & TALBERT GROUP, LLC  
 DB 349 PG 373  
 DB 329 PG 116  
 PB 7 PG 225

JAMES R. OWINGS (1/3) & DAVID G. HARMON (2/3)  
 DB 182 PG 325  
 DB 109 PG 650  
 DB 191 PG 651



**CURVE -Y2-**

Pls Sta 11+33.33	PI Sta 14+27.82	Pls Sta 17+22.22
$\theta_s = 0^\circ 36' 00.0''$	$\Delta = 2^\circ 44' 00.0''$ (LT)	$\theta_s = 0^\circ 36' 00.0''$
$L_s = 200.00'$	$D = 0^\circ 36' 00.0''$	$L_s = 200.00'$
$LT = 133.33'$	$L = 455.56'$	$LT = 133.33'$
$ST = 66.67'$	$T = 227.82'$	$ST = 66.67'$
	$R = 9,549.30'$	

WILBURN P. WALKER  
 DB 177 PG 189  
 DB 161 PG 296  
 DB 62 PG 635

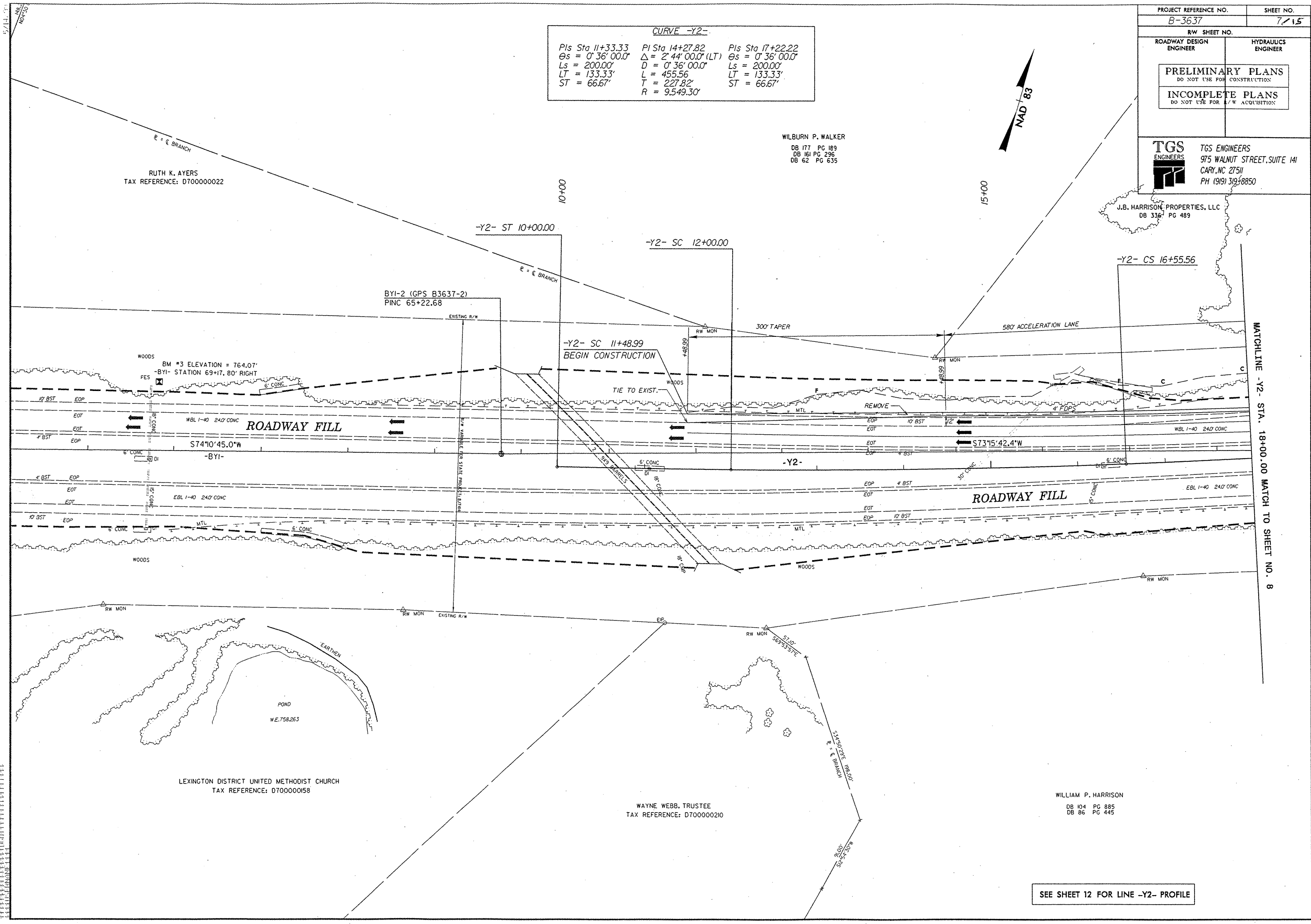
J.B. HARRISON PROPERTIES, LLC  
 DB 336 PG 489

RUTH K. AYERS  
 TAX REFERENCE: D70000022

LEXINGTON DISTRICT UNITED METHODIST CHURCH  
 TAX REFERENCE: D700000158

WAYNE WEBB, TRUSTEE  
 TAX REFERENCE: D700000210

WILLIAM P. HARRISON  
 DB 104 PG 885  
 DB 86 PG 445




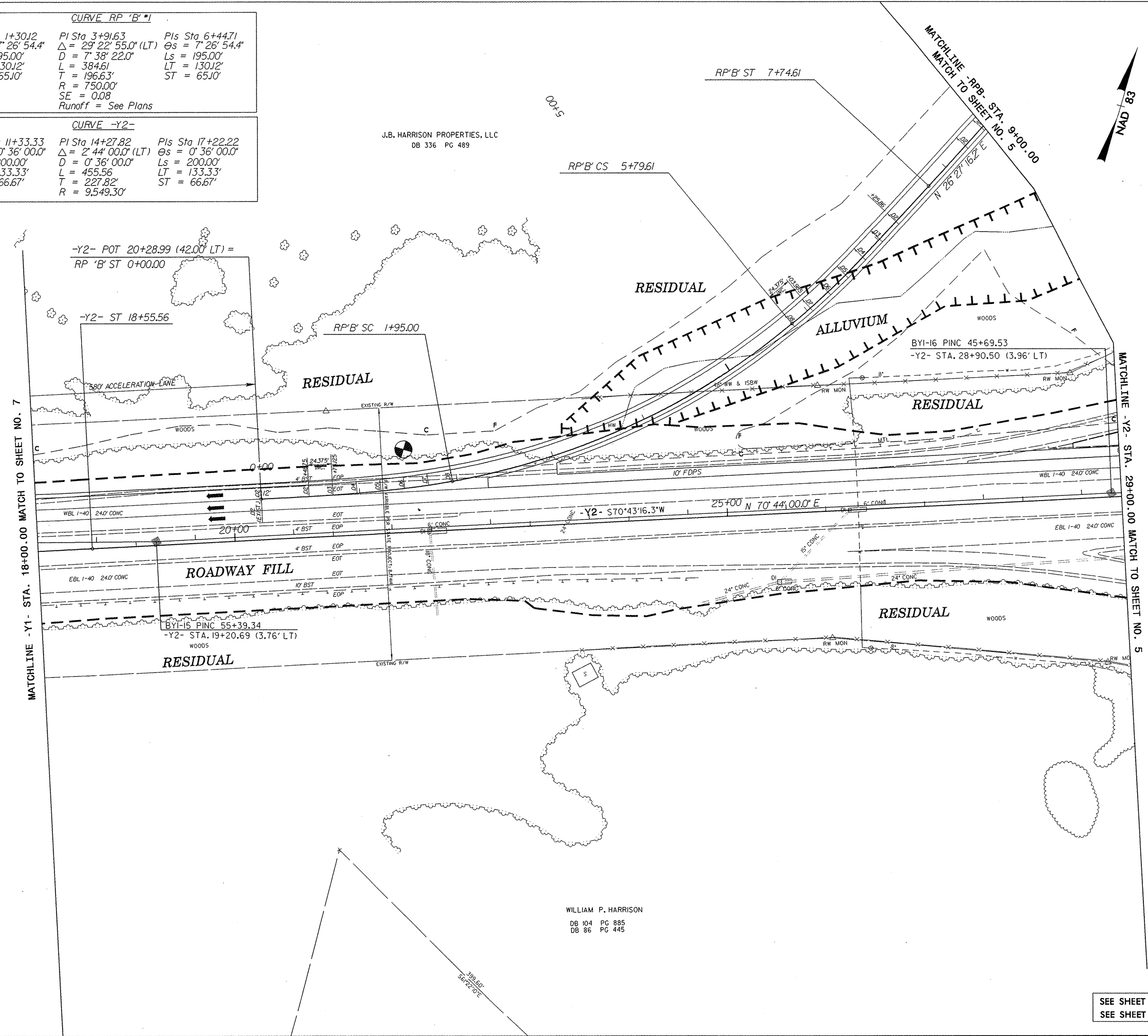
SEE SHEET 12 FOR LINE -Y2- PROFILE

CURVE RP 'B' *1		
PIs Sta 1+30.12	PI Sta 3+91.63	PIs Sta 6+44.71
$\Theta_s = 7' 26' 54.4"$	$\Delta = 29' 22' 55.0" (LT)$	$\Theta_s = 7' 26' 54.4"$
$L_s = 195.00'$	$D = 7' 38' 22.0"$	$L_s = 195.00'$
$LT = 130.12'$	$L = 384.61'$	$LT = 130.12'$
$ST = 65.10'$	$T = 196.63'$	$ST = 65.10'$
	$R = 750.00'$	
	$SE = 0.08$	
	Runoff = See Plans	

CURVE -Y2-		
PIs Sta 11+33.33	PI Sta 14+27.82	PIs Sta 17+22.22
$\Theta_s = 0' 36' 00.0"$	$\Delta = 2' 44' 00.0" (LT)$	$\Theta_s = 0' 36' 00.0"$
$L_s = 200.00'$	$D = 0' 36' 00.0"$	$L_s = 200.00'$
$LT = 133.33'$	$L = 455.56'$	$LT = 133.33'$
$ST = 66.67'$	$T = 227.82'$	$ST = 66.67'$
	$R = 9,549.30'$	


J.B. HARRISON PROPERTIES, LLC  
DB 336 PG 489

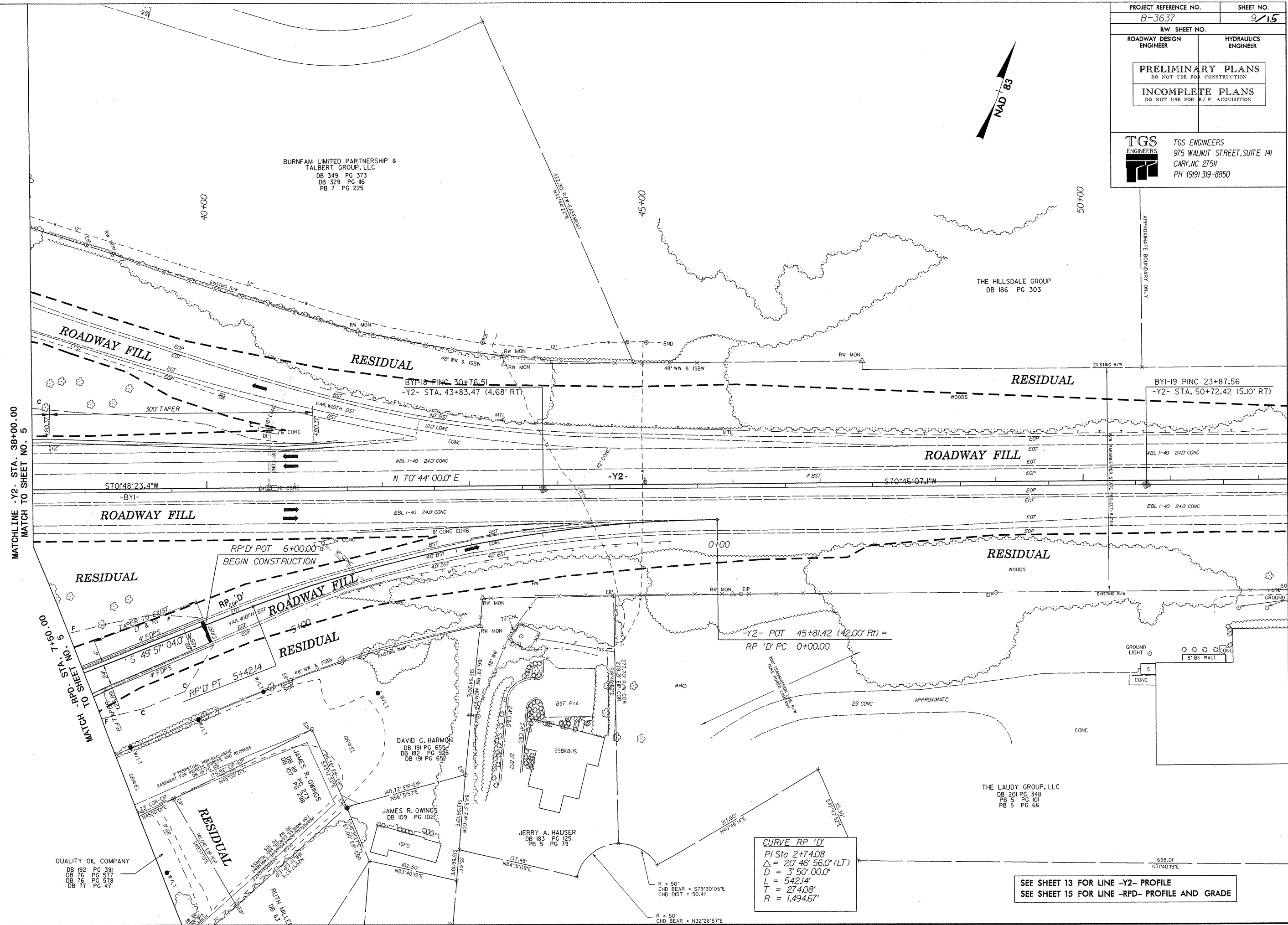
PROJECT REFERENCE NO. B-3637	SHEET NO. 8/15
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
 <b>TGS ENGINEERS</b> 975 WALNUT STREET, SUITE 141 CARY, NC 27511 PH (919) 319-8850	



WILLIAM P. HARRISON  
DB 104 PG 885  
DB 86 PG 445

SEE SHEET 12 FOR LINE -Y2- PROFILE  
SEE SHEET 14 FOR LINE -RPB- PROFILE AND GRADE

PROJECT REFERENCE NO. B-3637	SHEET NO. 9/15
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
 <b>TGS ENGINEERS</b> 975 WALNUT STREET, SUITE 141 CARY, NC 27511 PH (919) 319-8850	



BURNFAM LIMITED PARTNERSHIP & TALBERT GROUP, LLC  
 DB 349 PG 373  
 DB 329 PG 116  
 PB 7 PG 225

THE HILLSDALE GROUP  
 DB 186 PG 303

BYI-19 PINC 23+87.56  
 -Y2- STA. 50+72.42 (5.10' RT)

MATCHLINE -Y2- STA. 38+00.00  
MATCH TO SHEET NO. 5

MATCH -RPD- STA. 7+50.00  
MATCH TO SHEET NO. 5

QUALITY OIL COMPANY  
 DB 192 PG 391  
 DB 76 PG 577  
 DB 76 PG 578  
 DB 77 PG 47

DAVID G. HARMON  
 DB 191 PG 655  
 DB 182 PG 935  
 DB 191 PG 655

JAMES R. OWINGS  
 DB 109 PG 102

JERRY A. HAUSER  
 DB 183 PG 125  
 PB 5 PG 79

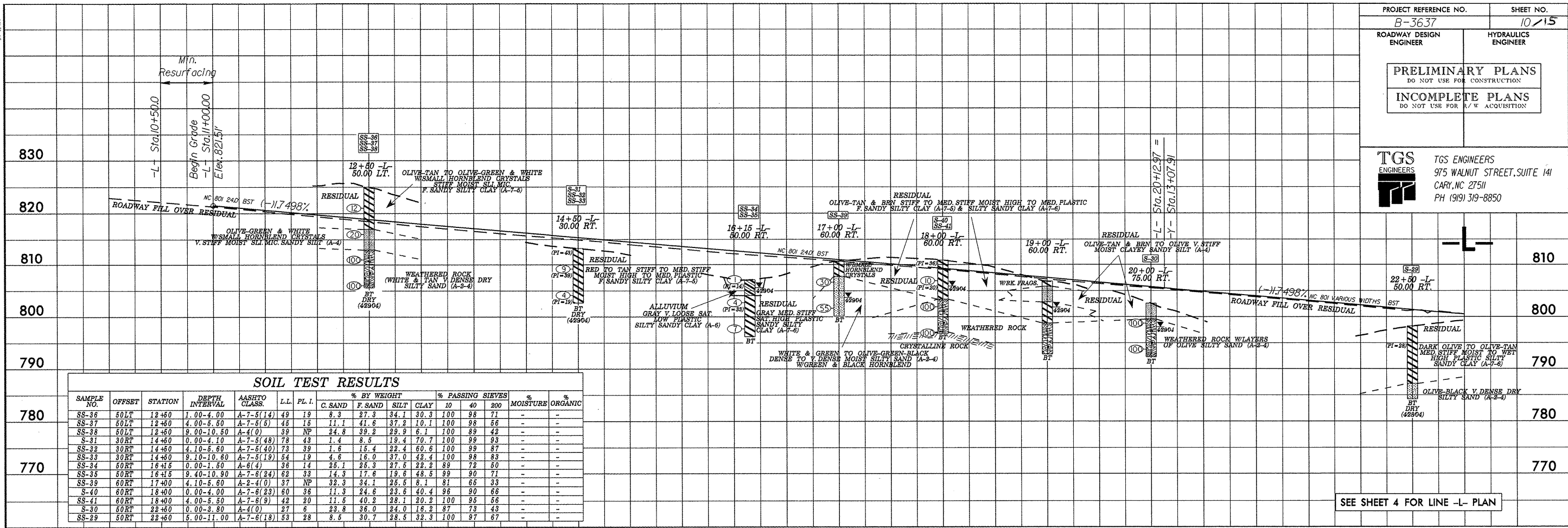
THE LAUDY GROUP, LLC  
 DB 201 PG 348  
 PB 5 PG 101  
 PB 5 PG 66

SEE SHEET 13 FOR LINE -Y2- PROFILE  
 SEE SHEET 15 FOR LINE -RPD- PROFILE AND GRADE

5/14/12



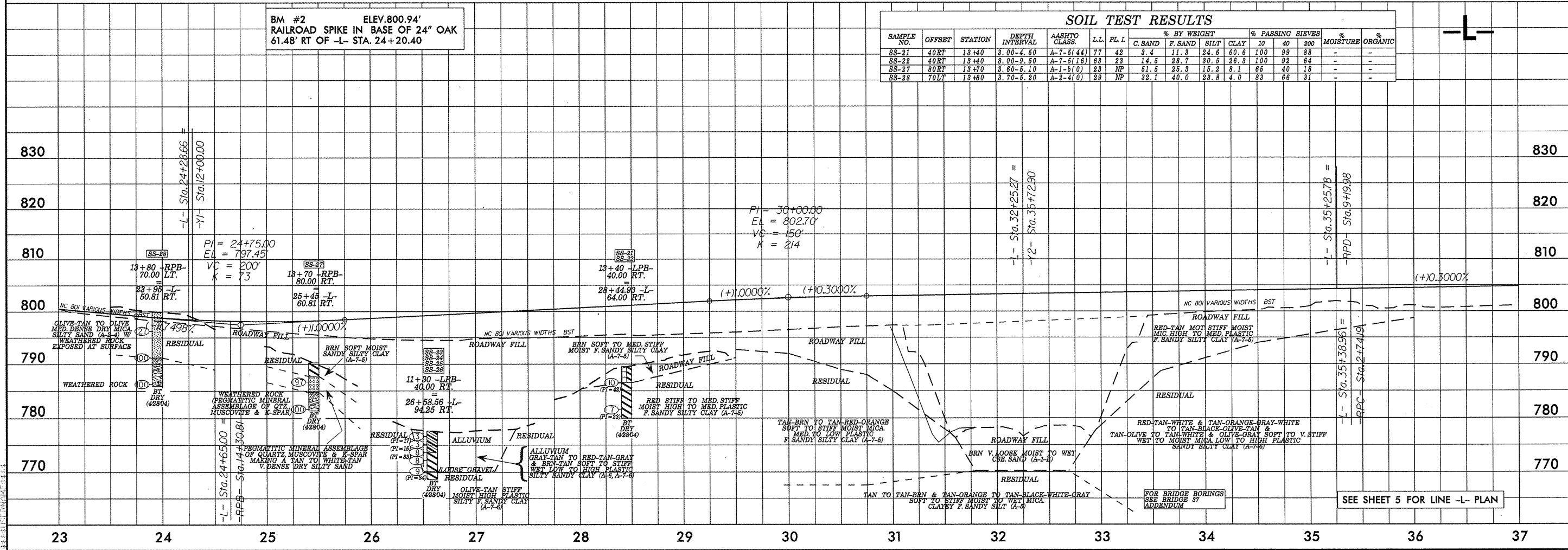
**TGS ENGINEERS**  
 TGS ENGINEERS  
 975 WALNUT STREET, SUITE 141  
 CARY, NC 27511  
 PH (919) 319-8850



**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-36	50LT	12+50	1.00-4.00	A-7-5(14)	49	19	8.3	27.3	34.1	30.3	100	98	71	-	-
SS-37	50LT	12+50	4.00-5.50	A-7-5(6)	46	15	11.1	41.6	37.2	10.1	100	98	56	-	-
SS-38	50LT	12+50	9.00-10.50	A-4(0)	39	NP	24.8	39.2	29.9	6.1	100	89	42	-	-
S-31	30RT	14+50	0.00-4.10	A-7-5(48)	78	43	1.4	8.5	19.4	70.7	100	99	93	-	-
SS-32	30RT	14+50	4.10-5.60	A-7-5(40)	73	39	1.6	15.4	22.4	60.6	100	99	87	-	-
SS-33	30RT	14+50	9.10-10.60	A-7-5(19)	54	19	4.6	16.0	37.0	42.4	100	98	83	-	-
SS-34	60RT	16+15	0.00-1.50	A-6(4)	36	14	26.1	26.3	27.6	22.2	89	72	50	-	-
SS-35	60RT	16+15	9.40-10.90	A-7-6(24)	62	33	14.3	17.6	19.6	48.5	99	90	71	-	-
SS-39	60RT	17+00	4.10-5.60	A-2-4(0)	37	NP	32.3	34.1	26.5	8.1	81	66	33	-	-
S-40	60RT	18+00	0.00-4.00	A-7-6(23)	60	36	11.3	24.6	23.6	40.4	96	90	66	-	-
SS-41	60RT	18+00	4.00-5.50	A-7-6(9)	42	20	11.6	40.2	28.1	20.2	100	95	56	-	-
S-30	60RT	22+50	0.00-3.80	A-4(0)	27	6	23.8	36.0	24.0	16.2	87	73	43	-	-
SS-29	50RT	22+50	5.00-11.00	A-7-6(18)	53	28	8.5	30.7	28.5	32.3	100	97	87	-	-

SEE SHEET 4 FOR LINE -L- PLAN



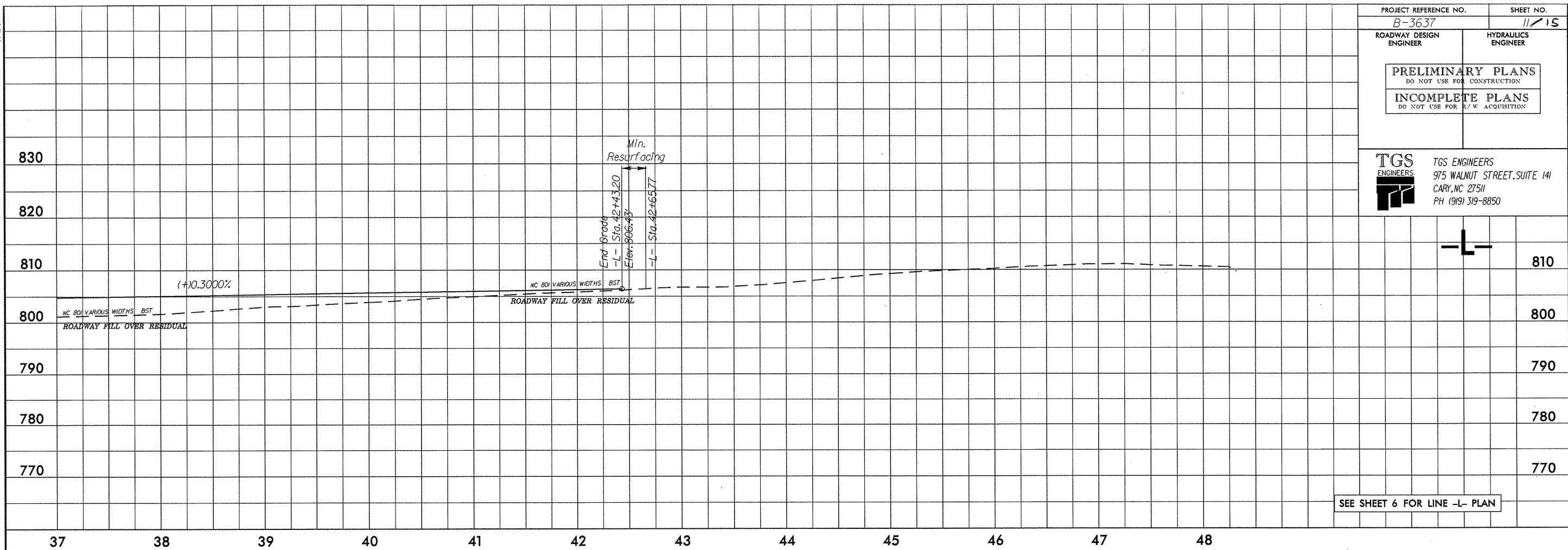
BM #2 ELEV. 800.94'  
 RAILROAD SPIKE IN BASE OF 24" OAK  
 61.48' RT OF -L- STA. 24+20.40

**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-21	40RT	13+40	3.00-4.50	A-7-5(44)	77	42	3.4	11.3	24.6	60.6	100	99	88	-	-
SS-22	40RT	13+40	8.00-9.50	A-7-5(16)	63	23	14.5	28.7	30.5	26.3	100	92	64	-	-
SS-27	80RT	13+70	3.60-5.10	A-1-b(0)	23	NP	51.6	25.3	15.2	8.1	66	40	18	-	-
SS-28	70LT	13+80	3.70-5.20	A-2-4(0)	29	NP	32.1	40.0	23.8	4.0	83	66	31	-	-

SEE SHEET 5 FOR LINE -L- PLAN

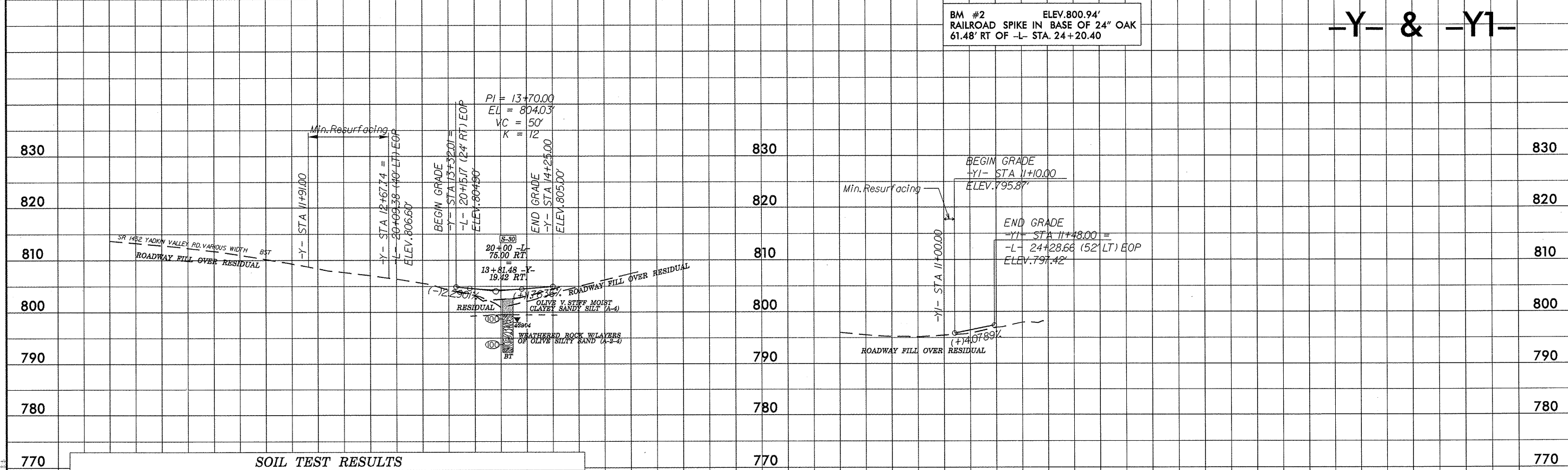




SEE SHEET 6 FOR LINE -L- PLAN

BM #2 ELEV. 800.94'  
 RAILROAD SPIKE IN BASE OF 24" OAK  
 61.48' RT OF -L- STA. 24+20.40

**-Y- & -Y1-**



SEE SHEET 4 FOR LINE -Y- PLAN  
 SEE SHEET 5 FOR LINE -Y1- PLAN

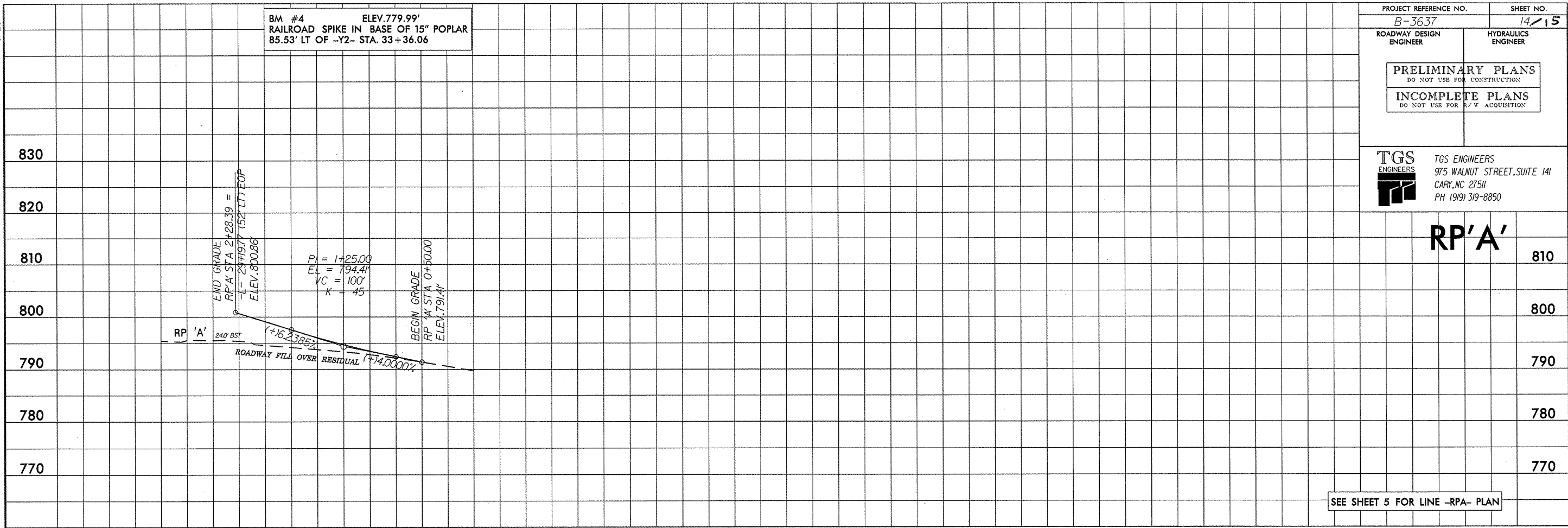
**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.L.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-30	75RT	20+00	0.00-3.80	A-4(0)	27	6	23.8	36.0	24.0	16.2	87	73	43	-	-



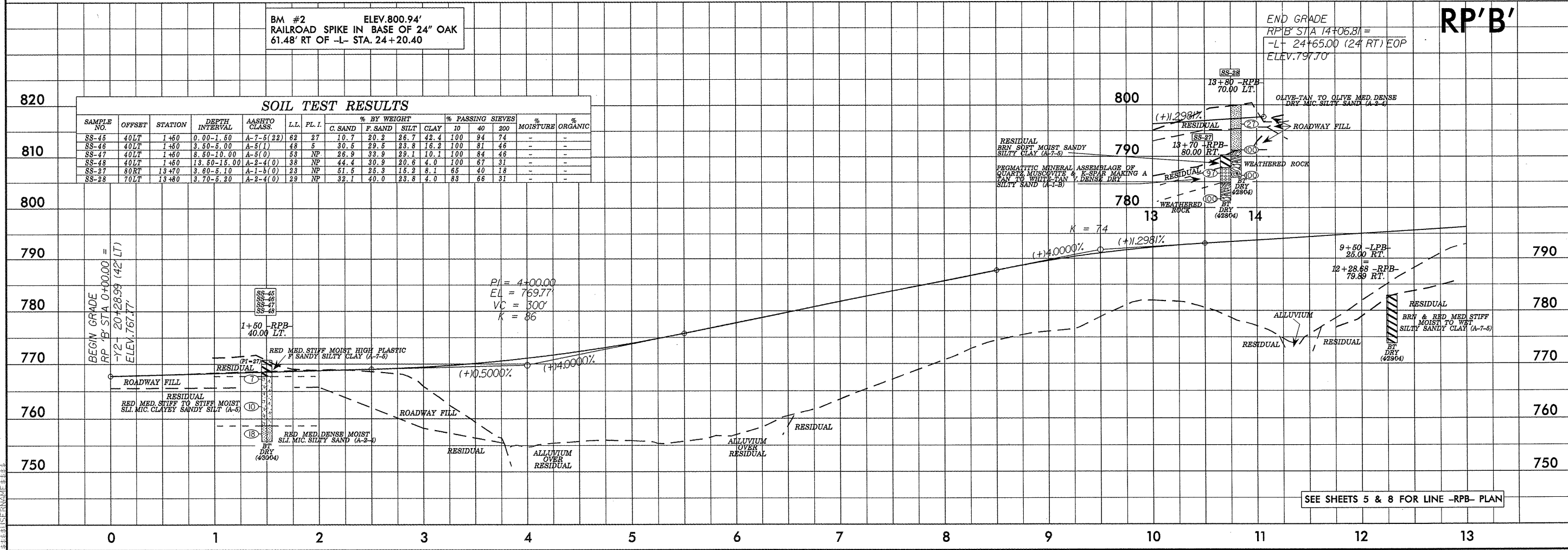


**RP'A'**



SEE SHEET 5 FOR LINE -RPA- PLAN

**RP'B'**



**SOIL TEST RESULTS**

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	L.L.	P.L.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-45	40LT	1+50	0.00-1.50	A-7-5(22)	62	27	10.7	20.2	26.7	42.4	100	94	74	-	-
SS-46	40LT	1+50	3.50-5.00	A-5(1)	48	5	30.5	29.5	23.8	16.2	100	81	46	-	-
SS-47	40LT	1+50	8.50-10.00	A-5(0)	59	NP	26.9	33.9	22.1	10.1	100	84	46	-	-
SS-48	40LT	1+50	13.50-15.00	A-2-4(0)	38	NP	44.4	30.9	20.6	4.0	100	67	31	-	-
SS-27	80RT	13+70	3.50-5.10	A-1-b(0)	23	NP	51.5	25.3	15.2	8.1	65	40	18	-	-
SS-28	70LT	13+80	3.70-5.20	A-2-4(0)	29	NP	32.1	40.0	23.8	4.0	83	66	31	-	-

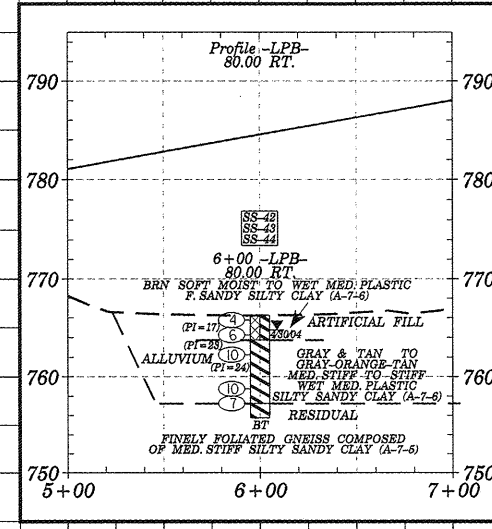
SEE SHEETS 5 & 8 FOR LINE -RPB- PLAN

**TGS ENGINEERS**  
 TGS ENGINEERS  
 975 WALNUT STREET, SUITE 141  
 CARY, NC 27511  
 PH (919) 319-8850

BM #4 ELEV. 779.99'  
 RAILROAD SPIKE IN BASE OF 15" POPLAR  
 85.53' LT OF -Y2- STA. 33+36.06

**SOIL TEST RESULTS**

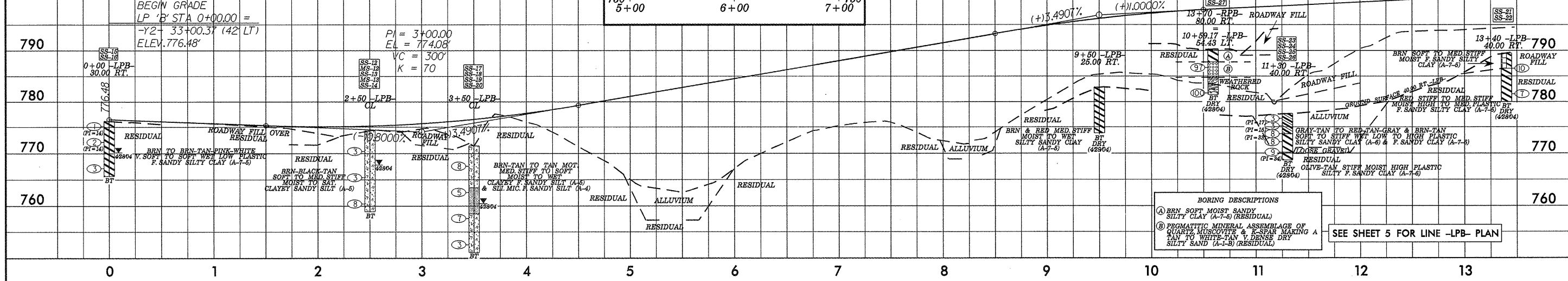
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	PL. I.	% BY WEIGHT				% PASSING SIEVES			MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-15	30RT	0+00	1.00-2.50	A-7-5(13)	54	14	4.6	30.1	41.0	24.2	100	99	74	-	-
SS-16	30RT	0+00	4.00-5.50	A-7-5(13)	57	14	5.1	32.9	45.9	16.2	100	99	71	-	-
SS-12	CL	2+50	3.90-5.40	A-6(2)	48	NP	10.6	33.6	43.8	12.1	100	96	67	57.8	-
SS-13	CL	2+50	8.90-10.40	A-5(1)	54	NP	16.8	43.6	34.5	6.1	100	94	51	58.8	-
SS-14	CL	2+50	13.90-15.40	A-5(0)	51	NP	37.0	34.9	26.1	2.0	100	73	37	-	-
SS-17	CL	3+50	3.90-9.40	A-5(0)	47	NP	18.4	38.2	29.3	14.1	100	90	52	-	-
SS-18	CL	3+50	8.90-10.40	A-4(0)	35	NP	26.3	41.0	26.7	6.1	100	85	40	-	-
SS-19	CL	3+50	13.90-15.40	A-5(0)	61	NP	22.6	44.2	29.1	4.0	100	87	43	77.3	-
SS-20	CL	3+50	18.90-20.40	A-5(4)	53	NP	8.7	28.1	49.1	14.1	100	96	71	-	-
SS-42	80RT	6+00	0.50-2.00	A-7-6(12)	42	17	7.1	26.1	32.5	34.3	100	97	73	-	-
SS-43	80RT	6+00	2.00-3.50	A-7-6(13)	48	23	19.7	25.7	21.2	38.4	99	93	63	-	-
SS-44	80RT	6+00	4.00-5.50	A-7-6(9)	46	24	21.0	29.1	17.6	32.3	99	81	51	-	-
SS-27	80RT	13+70RPB	3.60-5.10	A-1-6(0)	23	NP	61.5	25.3	15.2	8.1	65	40	18	-	-
SS-23	40RT	11+30	1.00-2.50	A-6(4)	36	17	25.3	28.7	23.8	22.2	89	74	46	-	-
SS-24	40RT	11+30	2.50-4.00	A-6(3)	32	15	28.7	28.1	21.0	24.2	91	73	46	-	-
SS-25	40RT	11+30	4.00-5.50	A-7-6(23)	53	33	12.7	32.2	22.6	42.4	98	90	73	-	-
SS-26	40RT	11+30	7.70-9.00	A-7-6(24)	62	34	9.7	35.9	24.0	40.4	100	95	70	-	-
SS-21	40RT	13+40	3.00-4.50	A-7-5(44)	77	42	3.4	11.3	24.6	60.6	100	99	88	-	-
SS-22	40RT	13+40	8.00-9.50	A-7-5(16)	68	23	14.5	28.7	30.5	26.3	100	92	64	-	-



PI = 9+50.00  
 EL = 796.77  
 VC = 200'  
 K = 80

END GRADE  
 LP'B' STA 13+48.06 =  
 -L- 28+52.96 (24' RT)  
 ELEV. 800.75'

**LP'B'**

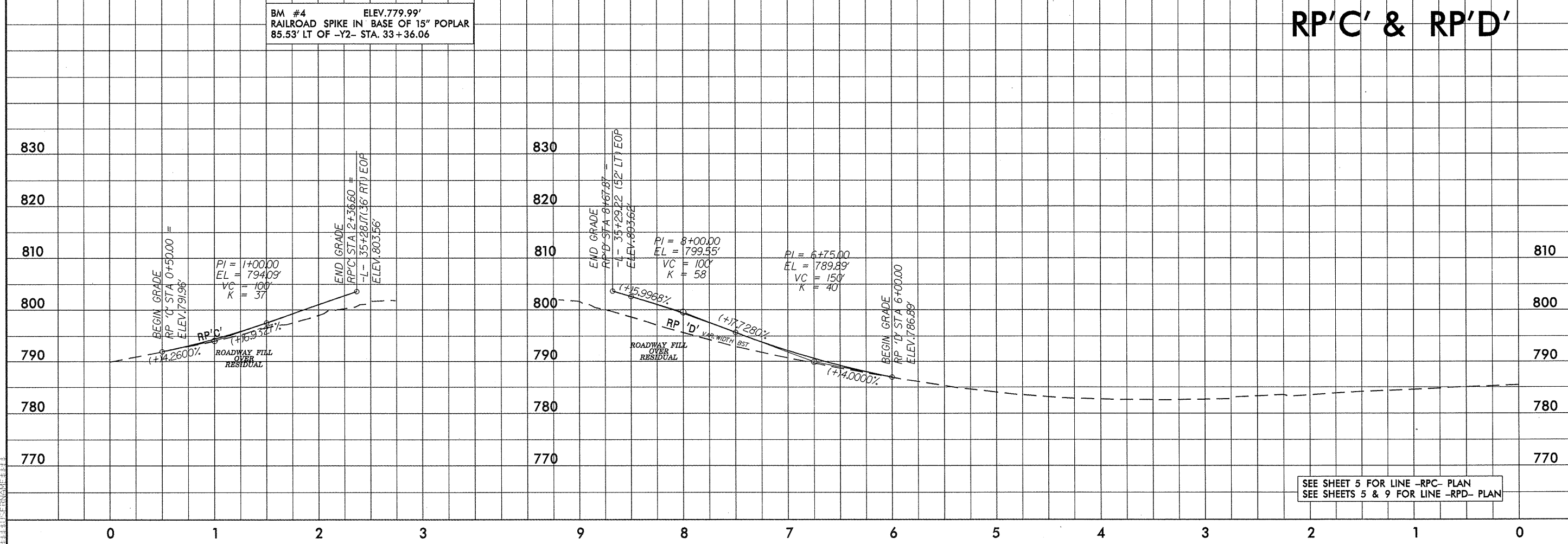


**BORING DESCRIPTIONS**  
 (A) BRN SOFT MOIST SANDY SILTY CLAY (A-7-5) (RESIDUAL)  
 (B) PEGMATITIC MINERAL ASSEMBLAGE OF QUARTZ, MUSCOVITE & K-SPAR MAKING A TAN TO WHITE-TAN V. DENSE DRY SILTY SAND (A-1-B) (RESIDUAL)

SEE SHEET 5 FOR LINE -LPB- PLAN

BM #4 ELEV. 779.99'  
 RAILROAD SPIKE IN BASE OF 15" POPLAR  
 85.53' LT OF -Y2- STA. 33+36.06

**RP'C' & RP'D'**



PI = 8+00.00  
 EL = 799.55'  
 VC = 100'  
 K = 58

PI = 6+75.00  
 EL = 789.89'  
 VC = 150'  
 K = 40

SEE SHEET 5 FOR LINE -RPC- PLAN  
 SEE SHEETS 5 & 9 FOR LINE -RPD- PLAN