

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34915.1.1 (U-3308)	1	34
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34915.1.1	STP-55 (20)	P.E.	
		RAW & UTIL.	

NOTE: SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

**ROADWAY
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 34915.1.1 (U-3308) F.A. PROJ. STP-55 (20)
COUNTY DURHAM
PROJECT DESCRIPTION DURHAM-NC 55 (ALSTON AVE.) FROM NC 147 (BUCK DEAN FREEWAY) TO US 70 BUS/NC 98 (HOLLOWAY ST.)

INVENTORY

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CAUTION NOTICE

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PERSONNEL
N.D. MOHS

TIERRA
PERSONNEL
J. HOWARD

C. BRUINSMA

S. HAN

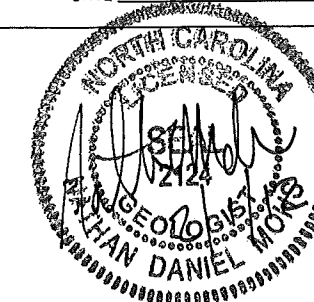
F. COX

INVESTIGATED BY **N.D. MOHS**

CHECKED BY **N.T. ROBERSON**

SUBMITTED BY **N.T. ROBERSON**

DATE **FEBRUARY 2012**



ID: U-3308

CONTRACT:

DRAWN BY: **T.T. WALKER, N.D. MOHS**

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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.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. 34915.11(U-3308) SHEET NO. 2

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																							
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. 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, SANDY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i></p>		<p>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)</p> <p>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>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.</p> <p>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.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>STRATA ROCK QUALITY DESIGNATION (SRQD) - 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.</p> <p>TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																							
<p style="text-align: center;">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th>GRANULAR MATERIALS (≤ 3% PASSING #200)</th> <th>SILT-CLAY MATERIALS (> 3% PASSING #200)</th> <th>ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1, A-3, A-2-4, A-2-5, A-2-6, A-2-7</td> <td>A-4, A-5, A-6, A-7</td> <td>A-1, A-2, A-3, A-4, A-5, A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>50 HX, 30 HX, 15 HX, 10 HX, 5 HX, 2 HX</td> <td>5 HX, 10 HX, 15 HX, 20 HX, 30 HX, 40 HX, 50 HX, 60 HX, 70 HX, 80 HX, 90 HX, 100 HX</td> <td>5 HX, 10 HX, 15 HX, 20 HX, 30 HX, 40 HX, 50 HX, 60 HX, 70 HX, 80 HX, 90 HX, 100 HX</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6 HX</td> <td>10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX</td> <td>10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0 HX</td> <td>0 HX, 1 HX, 2 HX, 3 HX, 4 HX, 5 HX, 6 HX, 7 HX, 8 HX, 9 HX, 10 HX, 11 HX, 12 HX, 13 HX, 14 HX, 15 HX, 16 HX, 17 HX, 18 HX, 19 HX, 20 HX, 21 HX, 22 HX, 23 HX, 24 HX, 25 HX, 26 HX, 27 HX, 28 HX, 29 HX, 30 HX, 31 HX, 32 HX, 33 HX, 34 HX, 35 HX, 36 HX, 37 HX, 38 HX, 39 HX, 40 HX, 41 HX, 42 HX, 43 HX, 44 HX, 45 HX, 46 HX, 47 HX, 48 HX, 49 HX, 50 HX, 51 HX, 52 HX, 53 HX, 54 HX, 55 HX, 56 HX, 57 HX, 58 HX, 59 HX, 60 HX, 61 HX, 62 HX, 63 HX, 64 HX, 65 HX, 66 HX, 67 HX, 68 HX, 69 HX, 70 HX, 71 HX, 72 HX, 73 HX, 74 HX, 75 HX, 76 HX, 77 HX, 78 HX, 79 HX, 80 HX, 81 HX, 82 HX, 83 HX, 84 HX, 85 HX, 86 HX, 87 HX, 88 HX, 89 HX, 90 HX, 91 HX, 92 HX, 93 HX, 94 HX, 95 HX, 96 HX, 97 HX, 98 HX, 99 HX, 100 HX</td> <td>10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX</td> </tr> <tr> <td>GROUP INDEX</td> <td>0 HX</td> <td>0 HX, 1 HX, 2 HX, 3 HX, 4 HX, 5 HX, 6 HX, 7 HX, 8 HX, 9 HX, 10 HX, 11 HX, 12 HX, 13 HX, 14 HX, 15 HX, 16 HX, 17 HX, 18 HX, 19 HX, 20 HX, 21 HX, 22 HX, 23 HX, 24 HX, 25 HX, 26 HX, 27 HX, 28 HX, 29 HX, 30 HX, 31 HX, 32 HX, 33 HX, 34 HX, 35 HX, 36 HX, 37 HX, 38 HX, 39 HX, 40 HX, 41 HX, 42 HX, 43 HX, 44 HX, 45 HX, 46 HX, 47 HX, 48 HX, 49 HX, 50 HX, 51 HX, 52 HX, 53 HX, 54 HX, 55 HX, 56 HX, 57 HX, 58 HX, 59 HX, 60 HX, 61 HX, 62 HX, 63 HX, 64 HX, 65 HX, 66 HX, 67 HX, 68 HX, 69 HX, 70 HX, 71 HX, 72 HX, 73 HX, 74 HX, 75 HX, 76 HX, 77 HX, 78 HX, 79 HX, 80 HX, 81 HX, 82 HX, 83 HX, 84 HX, 85 HX, 86 HX, 87 HX, 88 HX, 89 HX, 90 HX, 91 HX, 92 HX, 93 HX, 94 HX, 95 HX, 96 HX, 97 HX, 98 HX, 99 HX, 100 HX</td> <td>10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS, GRAVEL, AND SAND</td> <td>FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND, SILTY SOILS, CLAYEY SOILS</td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>GENERATING AS A SUBGRADE</td> <td>EXCELLENT TO GOOD</td> <td>FAIR TO POOR</td> <td>FAIR TO POOR, POOR, UNSUITABLE</td> </tr> </table>		GENERAL CLASS.	GRANULAR MATERIALS (≤ 3% PASSING #200)	SILT-CLAY MATERIALS (> 3% PASSING #200)	ORGANIC MATERIALS	GROUP CLASS.	A-1, A-3, A-2-4, A-2-5, A-2-6, A-2-7	A-4, A-5, A-6, A-7	A-1, A-2, A-3, A-4, A-5, A-6, A-7	SYMBOL				% PASSING	50 HX, 30 HX, 15 HX, 10 HX, 5 HX, 2 HX	5 HX, 10 HX, 15 HX, 20 HX, 30 HX, 40 HX, 50 HX, 60 HX, 70 HX, 80 HX, 90 HX, 100 HX	5 HX, 10 HX, 15 HX, 20 HX, 30 HX, 40 HX, 50 HX, 60 HX, 70 HX, 80 HX, 90 HX, 100 HX	LIQUID LIMIT	6 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX	PLASTIC INDEX	0 HX	0 HX, 1 HX, 2 HX, 3 HX, 4 HX, 5 HX, 6 HX, 7 HX, 8 HX, 9 HX, 10 HX, 11 HX, 12 HX, 13 HX, 14 HX, 15 HX, 16 HX, 17 HX, 18 HX, 19 HX, 20 HX, 21 HX, 22 HX, 23 HX, 24 HX, 25 HX, 26 HX, 27 HX, 28 HX, 29 HX, 30 HX, 31 HX, 32 HX, 33 HX, 34 HX, 35 HX, 36 HX, 37 HX, 38 HX, 39 HX, 40 HX, 41 HX, 42 HX, 43 HX, 44 HX, 45 HX, 46 HX, 47 HX, 48 HX, 49 HX, 50 HX, 51 HX, 52 HX, 53 HX, 54 HX, 55 HX, 56 HX, 57 HX, 58 HX, 59 HX, 60 HX, 61 HX, 62 HX, 63 HX, 64 HX, 65 HX, 66 HX, 67 HX, 68 HX, 69 HX, 70 HX, 71 HX, 72 HX, 73 HX, 74 HX, 75 HX, 76 HX, 77 HX, 78 HX, 79 HX, 80 HX, 81 HX, 82 HX, 83 HX, 84 HX, 85 HX, 86 HX, 87 HX, 88 HX, 89 HX, 90 HX, 91 HX, 92 HX, 93 HX, 94 HX, 95 HX, 96 HX, 97 HX, 98 HX, 99 HX, 100 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX	GROUP INDEX	0 HX	0 HX, 1 HX, 2 HX, 3 HX, 4 HX, 5 HX, 6 HX, 7 HX, 8 HX, 9 HX, 10 HX, 11 HX, 12 HX, 13 HX, 14 HX, 15 HX, 16 HX, 17 HX, 18 HX, 19 HX, 20 HX, 21 HX, 22 HX, 23 HX, 24 HX, 25 HX, 26 HX, 27 HX, 28 HX, 29 HX, 30 HX, 31 HX, 32 HX, 33 HX, 34 HX, 35 HX, 36 HX, 37 HX, 38 HX, 39 HX, 40 HX, 41 HX, 42 HX, 43 HX, 44 HX, 45 HX, 46 HX, 47 HX, 48 HX, 49 HX, 50 HX, 51 HX, 52 HX, 53 HX, 54 HX, 55 HX, 56 HX, 57 HX, 58 HX, 59 HX, 60 HX, 61 HX, 62 HX, 63 HX, 64 HX, 65 HX, 66 HX, 67 HX, 68 HX, 69 HX, 70 HX, 71 HX, 72 HX, 73 HX, 74 HX, 75 HX, 76 HX, 77 HX, 78 HX, 79 HX, 80 HX, 81 HX, 82 HX, 83 HX, 84 HX, 85 HX, 86 HX, 87 HX, 88 HX, 89 HX, 90 HX, 91 HX, 92 HX, 93 HX, 94 HX, 95 HX, 96 HX, 97 HX, 98 HX, 99 HX, 100 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND, SILTY SOILS, CLAYEY SOILS	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS	GENERATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR, POOR, UNSUITABLE	<p style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>		<p style="text-align: center;">WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V SL.) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS OR A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>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.</p> <p>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.</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i></p> <p>SEVERE (SEV.) - ALL ROCK 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 > 100 BPF.</i></p> <p>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. 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GROUP CLASS.	A-1, A-3, A-2-4, A-2-5, A-2-6, A-2-7	A-4, A-5, A-6, A-7	A-1, A-2, A-3, A-4, A-5, A-6, A-7																																																										
SYMBOL																																																													
% PASSING	50 HX, 30 HX, 15 HX, 10 HX, 5 HX, 2 HX	5 HX, 10 HX, 15 HX, 20 HX, 30 HX, 40 HX, 50 HX, 60 HX, 70 HX, 80 HX, 90 HX, 100 HX	5 HX, 10 HX, 15 HX, 20 HX, 30 HX, 40 HX, 50 HX, 60 HX, 70 HX, 80 HX, 90 HX, 100 HX																																																										
LIQUID LIMIT	6 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX																																																										
PLASTIC INDEX	0 HX	0 HX, 1 HX, 2 HX, 3 HX, 4 HX, 5 HX, 6 HX, 7 HX, 8 HX, 9 HX, 10 HX, 11 HX, 12 HX, 13 HX, 14 HX, 15 HX, 16 HX, 17 HX, 18 HX, 19 HX, 20 HX, 21 HX, 22 HX, 23 HX, 24 HX, 25 HX, 26 HX, 27 HX, 28 HX, 29 HX, 30 HX, 31 HX, 32 HX, 33 HX, 34 HX, 35 HX, 36 HX, 37 HX, 38 HX, 39 HX, 40 HX, 41 HX, 42 HX, 43 HX, 44 HX, 45 HX, 46 HX, 47 HX, 48 HX, 49 HX, 50 HX, 51 HX, 52 HX, 53 HX, 54 HX, 55 HX, 56 HX, 57 HX, 58 HX, 59 HX, 60 HX, 61 HX, 62 HX, 63 HX, 64 HX, 65 HX, 66 HX, 67 HX, 68 HX, 69 HX, 70 HX, 71 HX, 72 HX, 73 HX, 74 HX, 75 HX, 76 HX, 77 HX, 78 HX, 79 HX, 80 HX, 81 HX, 82 HX, 83 HX, 84 HX, 85 HX, 86 HX, 87 HX, 88 HX, 89 HX, 90 HX, 91 HX, 92 HX, 93 HX, 94 HX, 95 HX, 96 HX, 97 HX, 98 HX, 99 HX, 100 HX	10 HX, 15 HX, 20 HX, 25 HX, 30 HX, 35 HX, 40 HX, 45 HX, 50 HX, 55 HX, 60 HX, 65 HX, 70 HX, 75 HX, 80 HX, 85 HX, 90 HX, 95 HX, 100 HX																																																										
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USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND, SILTY SOILS, CLAYEY SOILS	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS																																																										
GENERATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR, POOR, UNSUITABLE																																																										
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3308	2A	34
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34915.1.1	STP-55 (20)	PE	

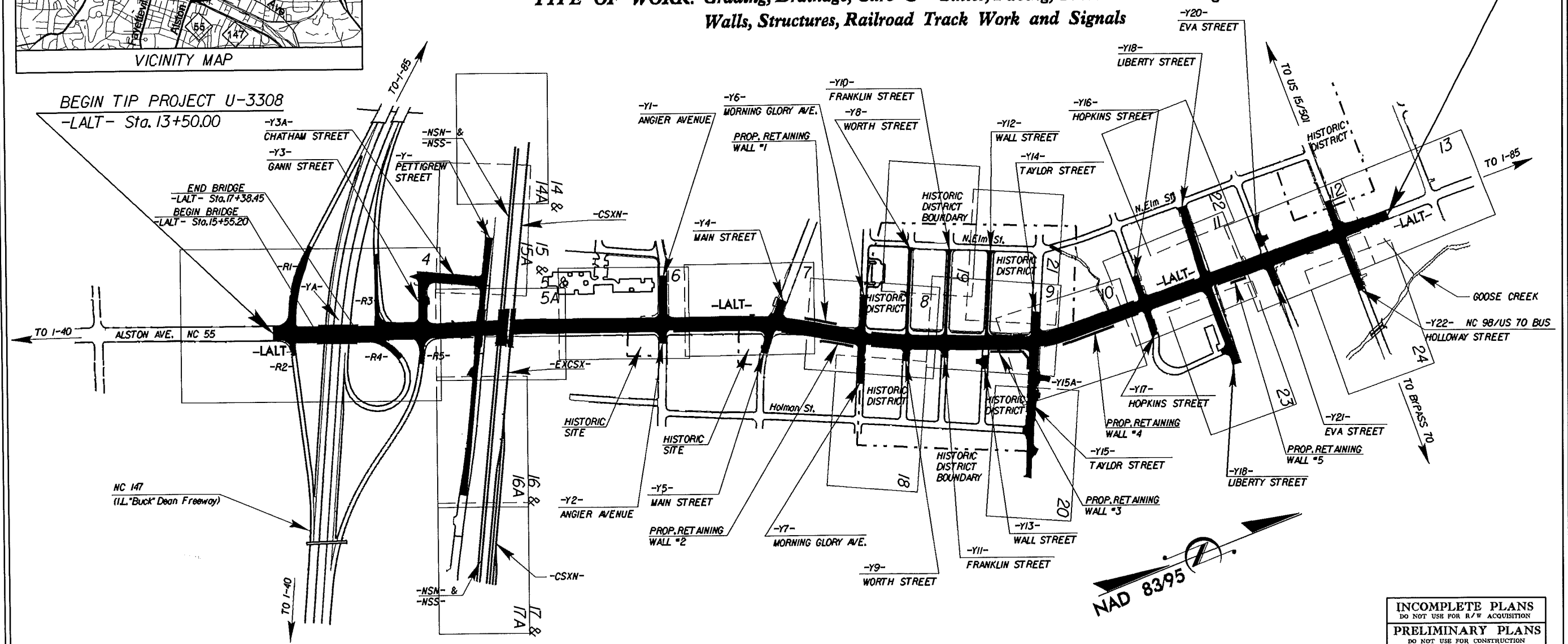
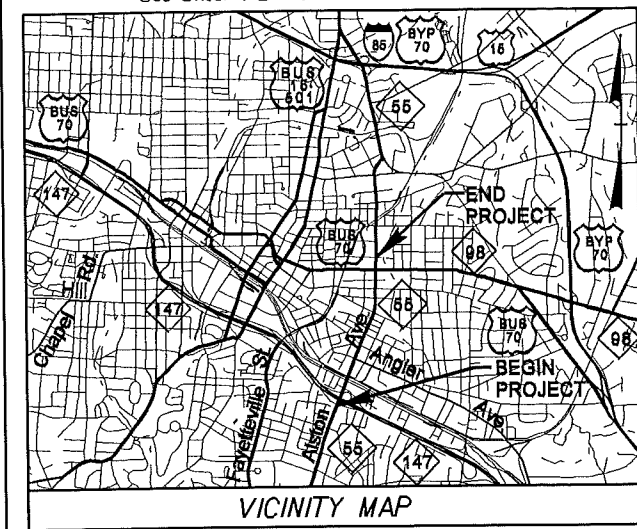
STATE OF NORTH CAROLINA
 DIVISION OF HIGHWAYS
DURHAM COUNTY

LOCATION: NC 55 (ALSTON AVE.) FROM NC 147 (I.L. "BUCK" DEAN FREEWAY) TO NORTH OF US 70 BUSNC 98 (HOLLOWAY ST.)

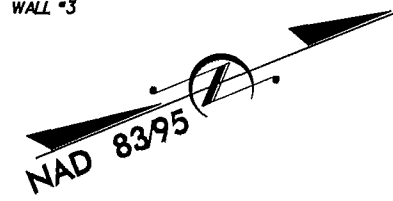
TYPE OF WORK: Grading, Drainage, Curb & Gutter, Paving, Sidewalks Retaining Walls, Structures, Railroad Track Work and Signals

END TIP PROJECT U-3308
 -LALT- Sta. 66+10.00

See Sheet 1-A For Index of Sheets
 See Sheet 1-B For CONVENTIONAL SYMBOLS



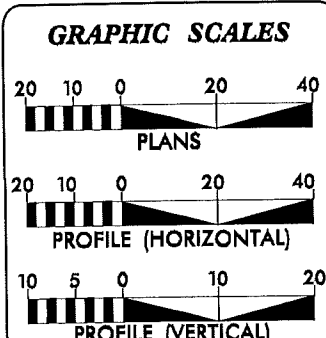
THIS PROJECT IS WITHIN THE CITY LIMITS OF DURHAM.
 METHOD OF CLEARING III.



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

TIP PROJECT: U-3308

CONTRACT:



DESIGN DATA

ADT 2011 =	20800 VPD
ADT 2035 =	28400 VPD
DHV =	10 %
D =	55 %
T =	6 % *
V =	35 MPH
* TTST 1% DUAL 5%	
Regional Tier	

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-3308 =	0.961 mi
LENGTH STRUCTURE TIP PROJECT U-3308 =	0.035 mi
TOTAL LENGTH TIP PROJECT U-3308 =	0.996 mi

Prepared in the Office of:
DIVISION OF HIGHWAYS
 1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
 SEPTEMBER 21, 2012

LETTING DATE:
 DECEMBER 16, 2014

JAMES A. SPEER, PE
 PROJECT ENGINEER

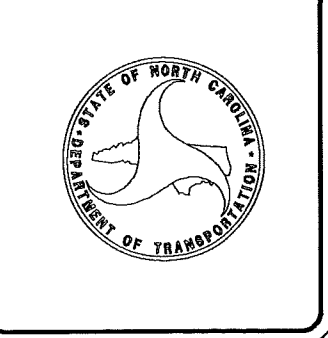
JOHN C. LANSFORD, PE
 PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Beverly Eaves Perdue
GOVERNOR

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

Gene A. Conti, Jr.
SECRETARY

February 1, 2012

STATE PROJECT: 34915.1.1 (U-3308)
FEDERAL PROJECT: STP-55 (20)
COUNTY: Durham
DESCRIPTION: NC 55 (Alston Ave.) from NC 147 (Buck Dean Freeway) to North of US 70 Business/NC 98 (Holloway St.)
SUBJECT: Geotechnical Report – Inventory

Project Description

This project consists of widening Alston Ave. (-L-, NC 55) in Durham to four lanes with median and turn lanes. The project begins just south of the intersection of the Durham Expressway (NC 147, -L- Sta. 16+42) and extends 1 mile north to Gilbert St. Replacement bridges will be constructed at the Durham Expressway crossing. Replacement structures will also be placed over Alston Ave. on Pettigrew St. (-Y- Sta. 18+19), Norfolk Southern Railroad (-NSS- Sta. 21+21, and -NSN- Sta. 21+11), and CSX Railroad (-CSXN- Sta. 13+22). Some of the smaller intersecting streets are being re-aligned during the widening. Six retaining walls are also planned along the project.

The geotechnical field investigation was conducted during January and July of 2006. Tierra Engineering was contracted to perform the subsurface investigation, they in turn subcontracted Mid-Atlantic Drilling for drilling only. Geologists from Tierra Engineering sampled and logged the borings. ATV-mounted CME-45 and truck mounted D-50 drill machines were used during the field investigation. Standard Penetration Tests were performed in selected borings and additional borings were advanced using continuous flight augers. Representative soil samples were collected for visual classification in the field and submitted for laboratory analysis by NCDOT's Materials and Tests Unit.

The following alignments, totaling 2.22 miles, were investigated. Subsurface soil profiles, or cross-sections, of these alignments are included in this report:

<u>Line</u>	<u>Station</u>		<u>Station</u>
-LALT-	13+50	to	66+10
-Y-	14+00	to	21+49
-Y4-	10+00	to	13+85

-Y7-	10+43	to	14+05
-Y8-	10+00	to	13+89
-Y10-	10+00	to	14+05
-Y13-	10+00	to	11+22
-Y14-	10+00	to	11+40
-Y15-	10+00	to	12+05
-Y18-	10+20	to	17+83
-Y20-	10+00	to	11+52
-Y22-	12+55	to	17+90
-R1-	11+00	to	15+11
-R3-	10+00	to	13+60
-NSN-	12+00	to	30+40

Areas of Special Geotechnical Interest

1) Highly Plastic Clay Soils: Occurrences of highly plastic clay soil (Plasticity Index greater than 25) are noted below:

<u>Alignment</u>	<u>Station</u>	<u>Offset</u>
-LALT-	14+89	72' RT
-LALT-	21+78	37' LT
-LALT-	25+02	67' LT
-LALT-	30+06	15' RT
-LALT-	30+07	63' LT
-LALT-	30+45	56' LT
-LALT-	35+53	7' RT
-LALT-	37+20	6' LT
-LALT-	58+96	35' LT
-Y-	13+92	27' LT
-Y18-	10+32	35' LT
-NSN-	12+05	26' LT
-NSN-	14+04	23' LT
-NSN-	15+92	15' LT
-NSN-	16+34	34' RT
-NSN-	17+95	21' LT
-NSN-	19+87	29' LT
-NSN-	22+46	32' LT
-NSN-	24+58	47' RT
-NSN-	24+79	32' RT
-NSN-	30+03	27' RT
-R1-	14+03	22' RT

2) Non-Crystalline Rock: Non-Crystalline (Sedimentary Triassic) rock was encountered in the following borings:

<u>Alignment</u>	<u>Station</u>	<u>Offset</u>
-LALT-	50+51	68' RT
-Y-	19+90	34' RT
-Y4-	12+84	38' LT
-Y14-	11+10	22' RT
-Y14-	11+63	19' RT

Physiography and Geology

The project is located in the gently rolling terrain of the Eastern Piedmont area of North Carolina. A mixture of businesses, single-family homes, and churches are located along the project corridor. Small creeks and ephemeral streams run across the project corridor, generally from right to left across the alignment.

Geologically the project lies within the Durham Triassic Basin which is part of a series of failed rifts stretching northward from South Carolina to New Jersey. These rift valleys formed during extensional, normal faulting in the Triassic Period some 200 million years ago. This rifting and separation of Africa from North America eventually formed the Atlantic Ocean.

The geology of the project area consists of Triassic age sedimentary rocks, primarily siltstone and sandstone, and recent alluvial soils. The depositional nature of the Triassic sediments created alternating beds of siltstone, mudstone and sandstone. Combined with the active tectonic environment at the time of deposition, the soils derived from these deposits are highly variable and often laterally discontinuous.

Soil Properties

Soils encountered at the project site include roadway embankment soils, alluvial sediments, and Triassic residual soils.

Roadway embankment soil is common along the -L- alignment. The embankments range up to 24 feet in height. Where sampled, the embankment soil consists of dry to moist, stiff to very stiff, silty clay, sandy clay and sandy silt (AASHTO classifications of A-7-6, A-6, and A-4), with some loose to medium dense, dry to moist, silty sand (A-2-4).

Alluvial soils were deposited along small creeks, which flow across the alignment in several areas (-L- 52+50, -Y22- 18+90, -NSN- 17+95 -NSN- 30+03). These soils consist of moist to wet, very loose to medium dense, silty sand (A-2-4) and soft to stiff, silty clay (A-7-6).

The Triassic residual soils are derived from the in-place weathering of the underlying sedimentary bedrock. These soils consist primarily of moist, medium stiff to hard, silty clay (A-7-5 and A-7-6) and moist to dry, loose to dense, silty sand (A-2-4 and A-2-5). Silty soils consisting of moist, medium stiff to very stiff, sandy silt (A-4) occur within the project area as well. Areas containing highly plastic soils

(plasticity indices of greater than 25) are listed above in the section "Areas of Special Geotechnical Interest".

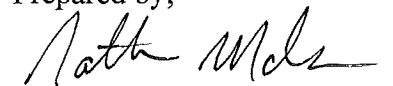
Rock Properties

Weathered rock and non-crystalline rock occur in several areas of the project. The weathered rock is derived from the underlying sedimentary rock of the Durham Triassic Basin, and consists of sandstone and siltstone. Weathered and non-crystalline siltstone in this area is known to be highly degradable when exposed to air and water.

Groundwater

Groundwater was encountered in several borings completed on this project. Groundwater, when encountered in Triassic residual soil or weathered rock, was variable across the project, ranging from 2 feet to 12 feet below the ground surface. Groundwater in borings located in alluvial areas ranged from 5 feet to 6 feet in depth. Based on the investigation, groundwater is not anticipated to cause problems during construction.

Prepared by,



Nathan Mohs, LG
Project Geologic Engineer

BEGIN TIP PROJECT NO. U-3308
 -LALT- STA 13+50.00

BEGIN CONSTRUCTION
 -R1- POT Sta. 11+00.00
 -R1- PC Sta. 11+27.17

END CONSTRUCTION
 -R3- POC Sta. 13+60.00
 -R3- PC Sta. 13+59.09

BEGIN RESURFACING
 -Y3A- POT Sta. 10+00.00
 -Y3- POT Sta. 9+99.63

-Y3- POT Sta. 10+65.00
 BEGIN GRADE

-LALT- POT Sta. 20+39.12
 -Y3- POT Sta. 12+49.64

-LALT- POT Sta. 16+42.70 =
 -YA- POT Sta. 13+31.37

-LALT- POC Sta. 18+28.75 =
 -R3- POT Sta. 10+00.00

-R1- PT Sta. 14+55.67
 -LALT- POT Sta. 14+39.63 =
 -R1- POT Sta. 15+11.05

-LALT- POT Sta. 14+55.00
 BEGIN GRADE

NAD 8395

-R2- POT Sta. 11+00.00
 END CONSTRUCTION

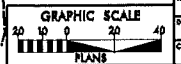
-LALT- POT Sta. 14+30.60 =
 -R2- POT Sta. 10+00.00

-R4- PC Sta. 10+52.68
 -LALT- POT Sta. 17+40.00 =
 -R4- POT Sta. 10+00.00
 31.08' Rt.

-R4- POC Sta. 12+30.00
 END CONSTRUCTION

END CONSTRUCTION
 -R5- POT Sta. 11+50.00

- Paint Stripping
- Pavement Removal
- Bridge Approach Slab
- Concrete Island or Sidewalk



DATE	BY	CHECKED	DATE

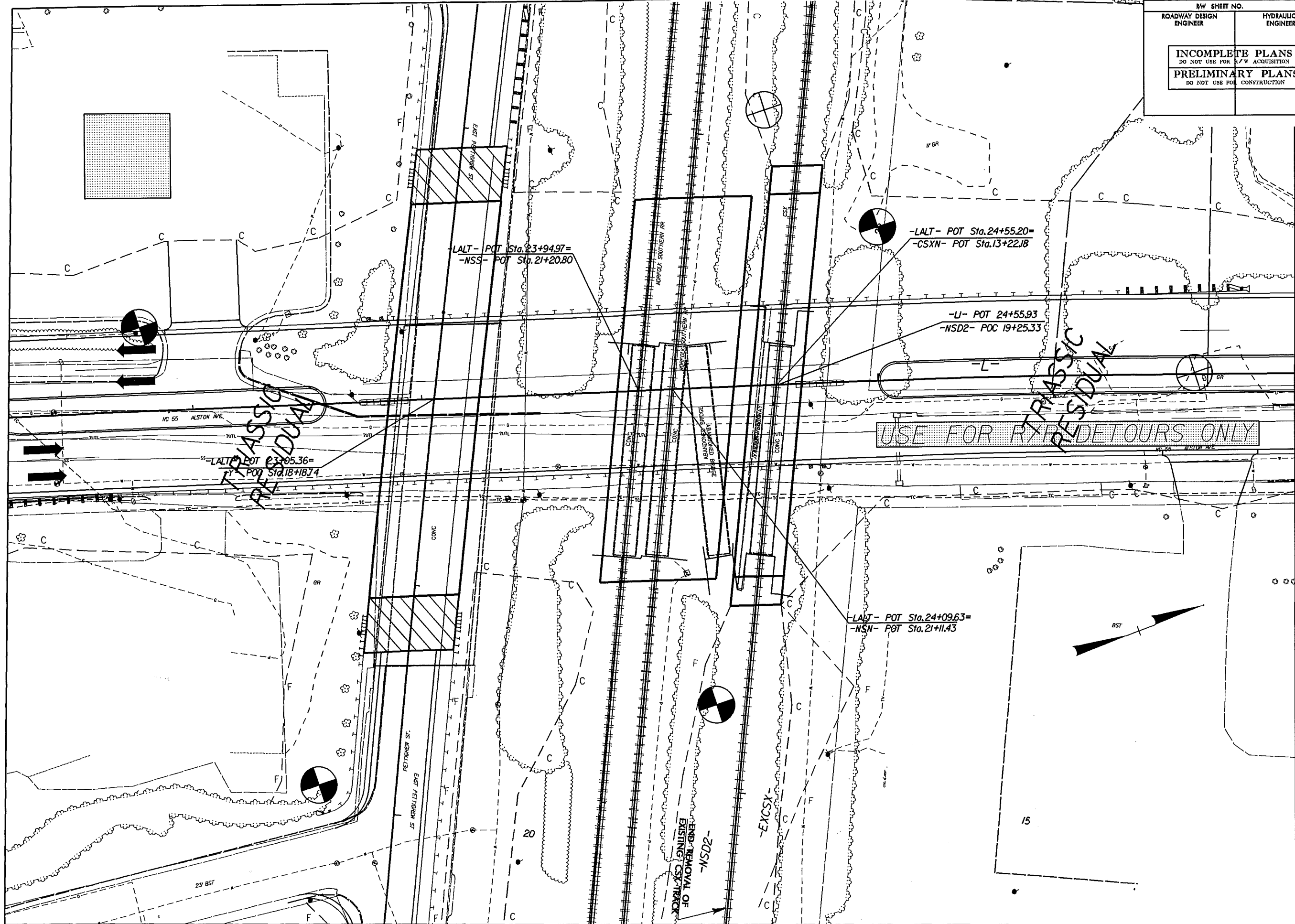
MATCH LINE SHEET 5

8/17/99
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13:21
11/15/2012
11/15/2012

MATCH LINE SHEET 15A

PROJECT REFERENCE NO. U-3308	SHEET NO. 5A
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR L/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

MATCH LINE SHEET 4



MATCH LINE SHEET 6

MATCH LINE SHEET 16A

8/17/99

\\MAN-2012\3516\PROJECTS\99\station\TIP\U3308_CEO_RDWY_REV\CADD_GEO\TECH\Plan\U3308_geo_inv_009.dgn

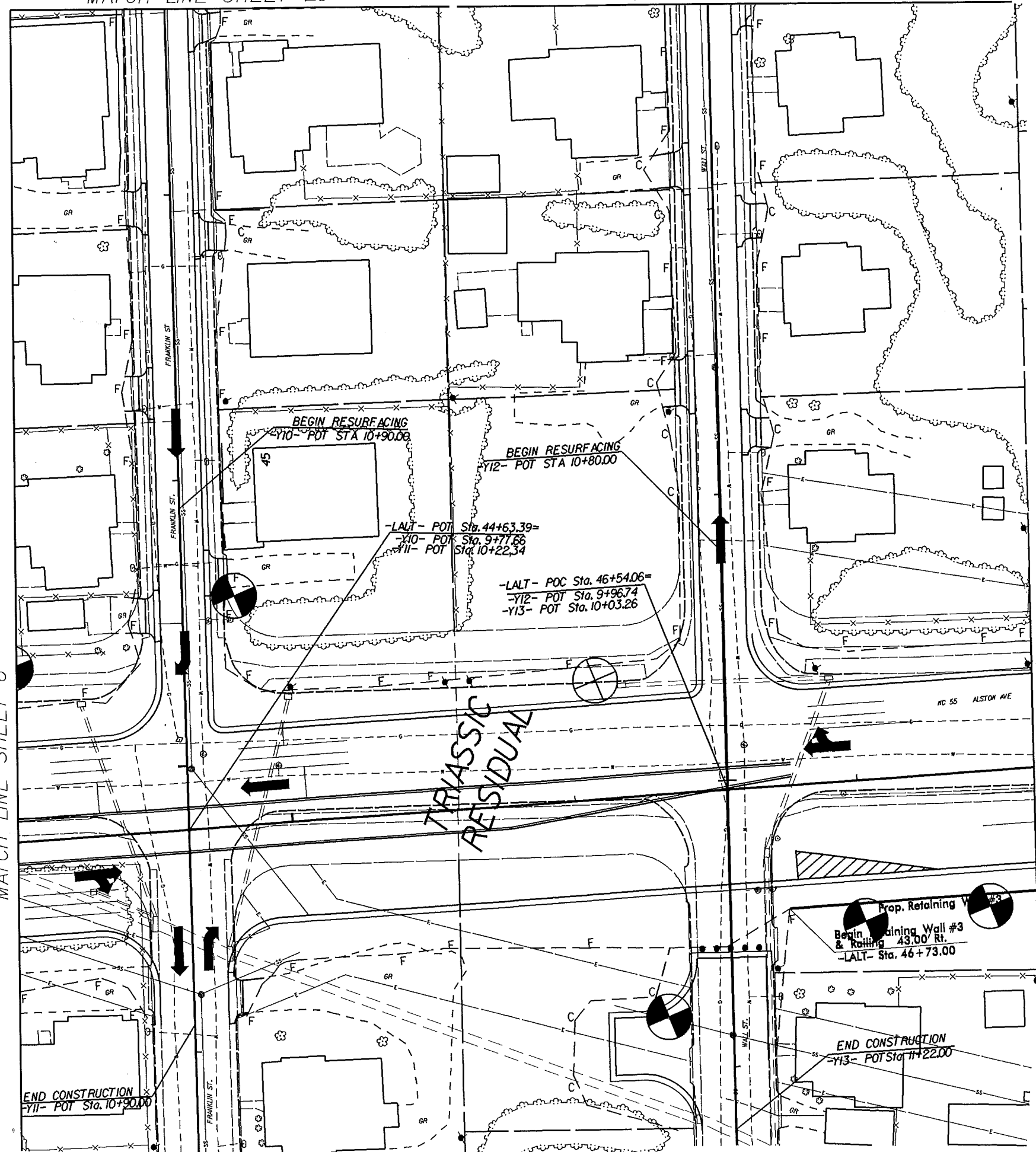
MATCH LINE SHEET 20

MATCH LINE SHEET 22

PROJECT REFERENCE NO. <i>U-3308</i>	SHEET NO. <i>9</i>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

MATCH LINE SHEET 8

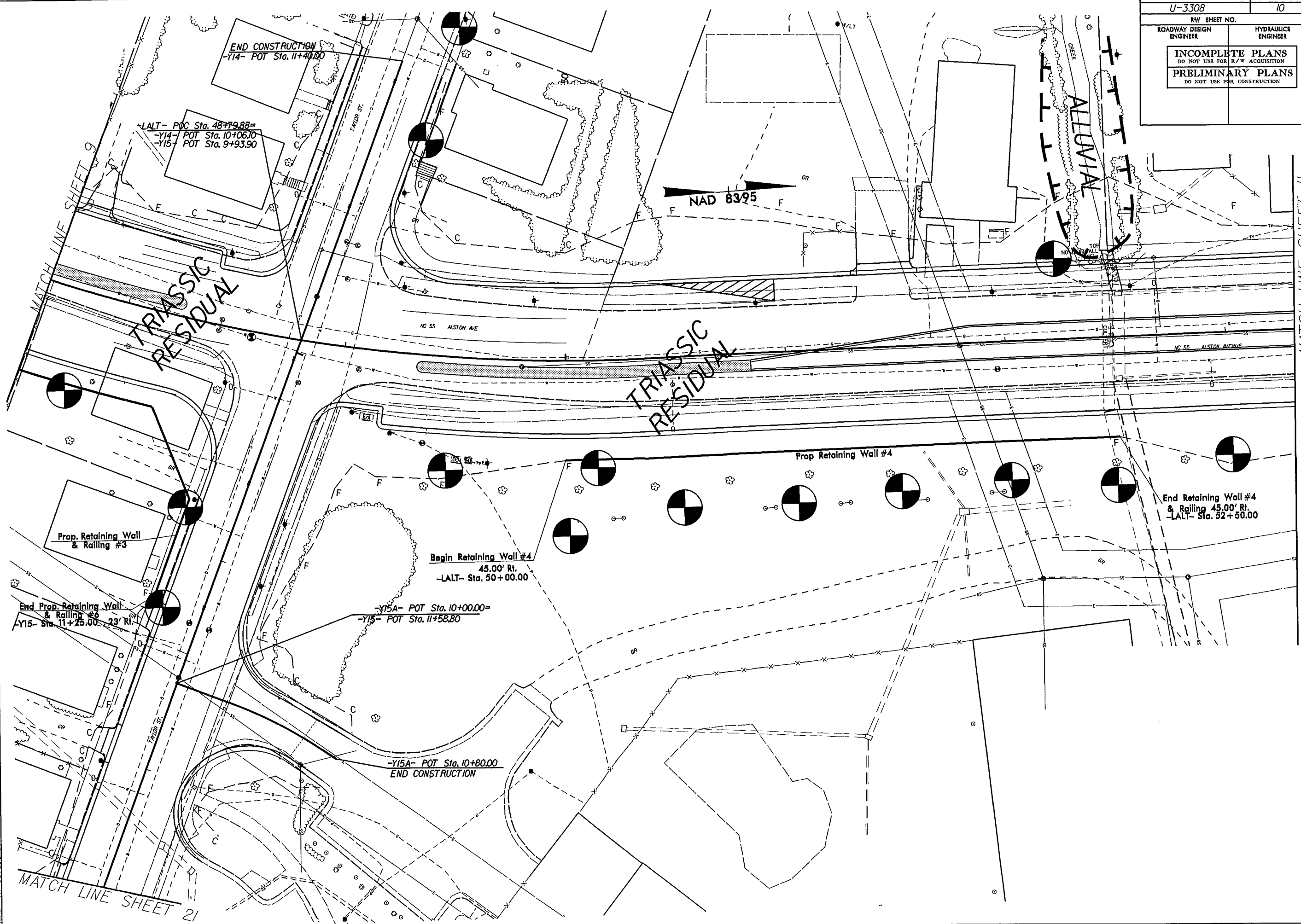
MATCH LINE SHEET 10



NAD 8395

8/17/99
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1-FEB-2012 09:03
LEROY

PROJECT REFERENCE NO. U-3308	SHEET NO. 10
BY SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



MATCH LINE SHEET 21

MATCH LINE SHEET 11

8/17/99

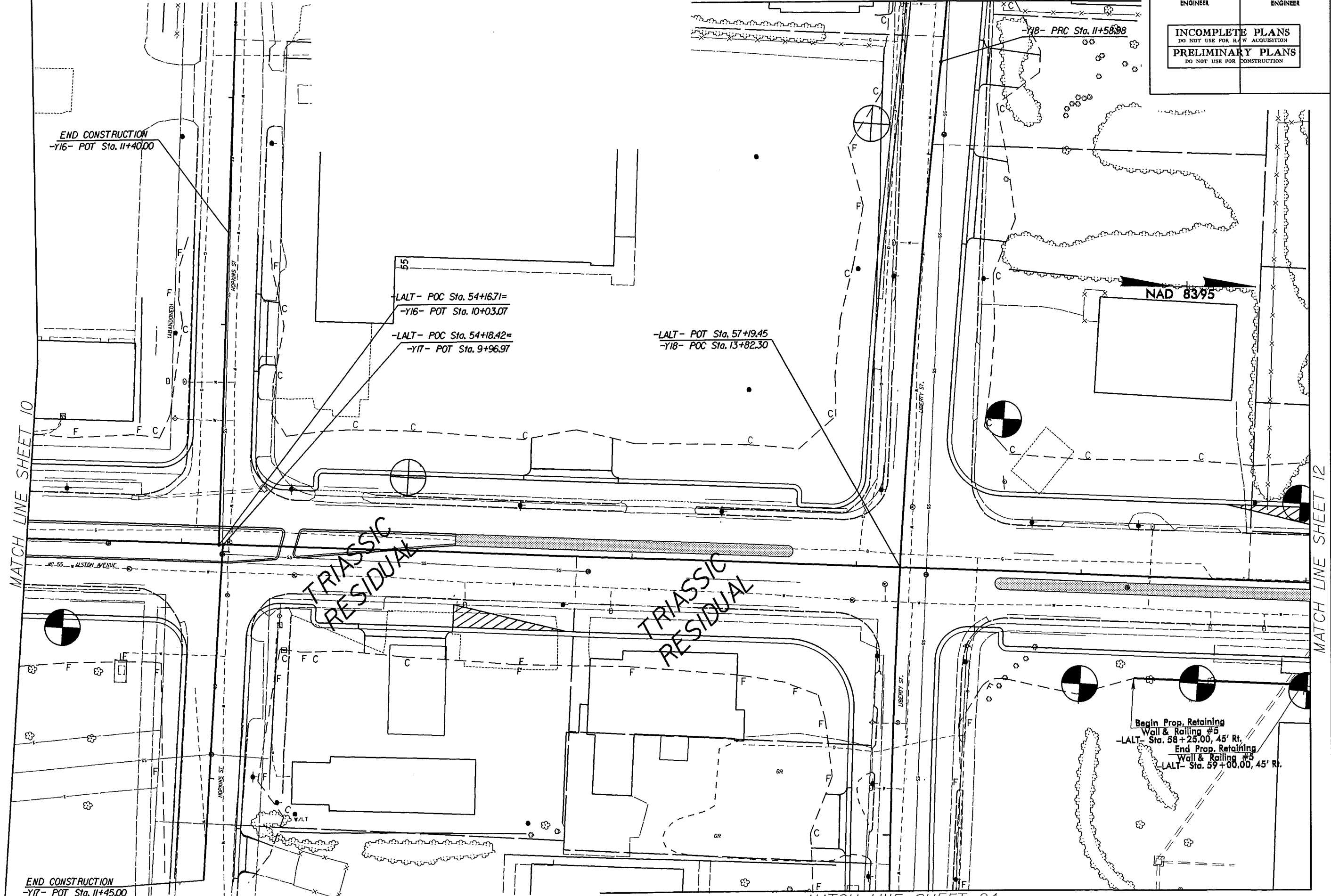
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12/29/99
12/29/99

PROJECT REFERENCE NO. U-3308		SHEET NO. 11	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

MATCH LINE SHEET 23

MATCH LINE SHEET 10

MATCH LINE SHEET 12

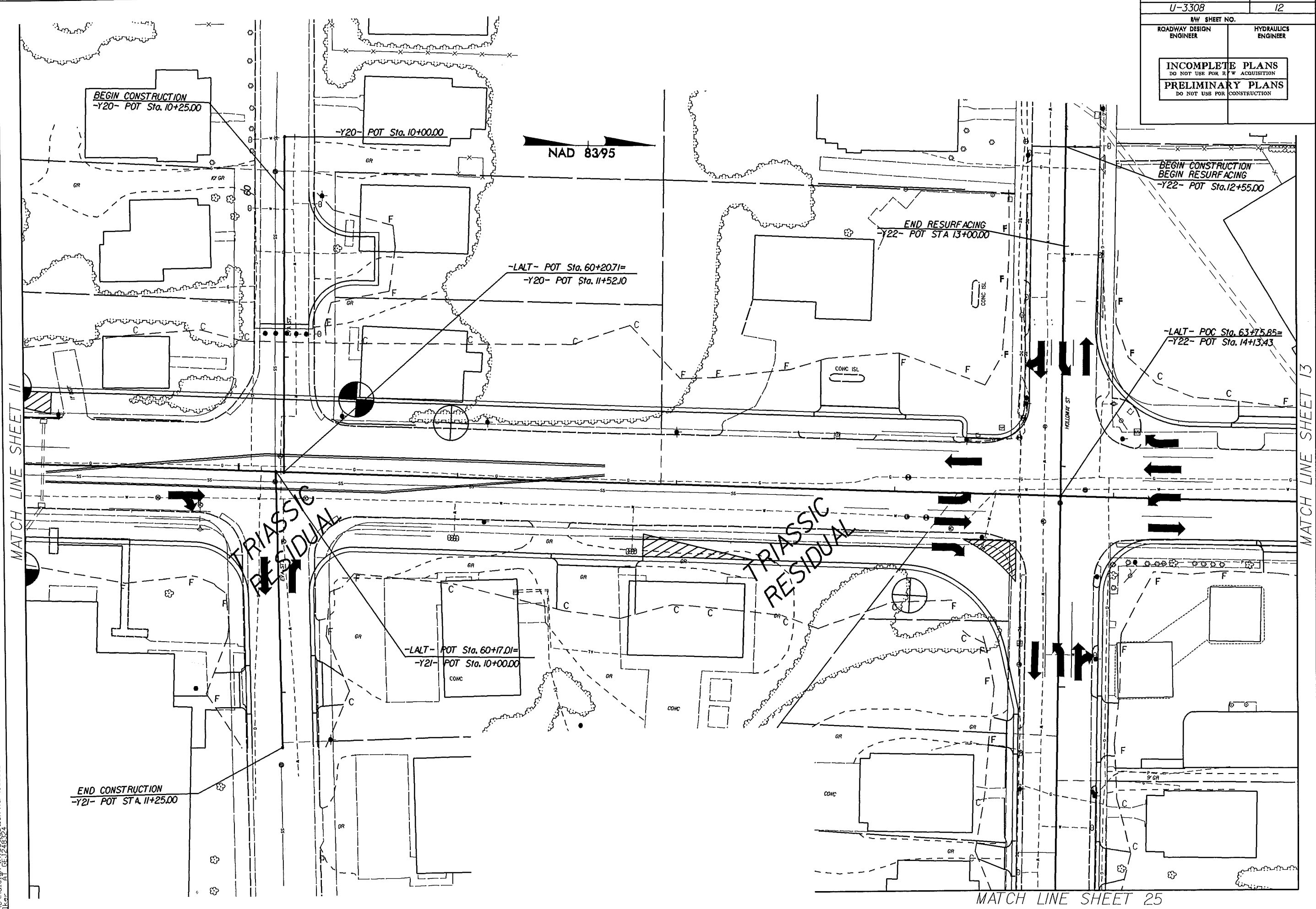


MATCH LINE SHEET 24

8/17/99

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:\TECHN\Plan\U3308_geo_mv_012.dgn

PROJECT REFERENCE NO. U-3308	SHEET NO. 12
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

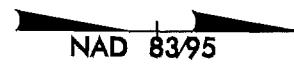


MATCH LINE SHEET 25

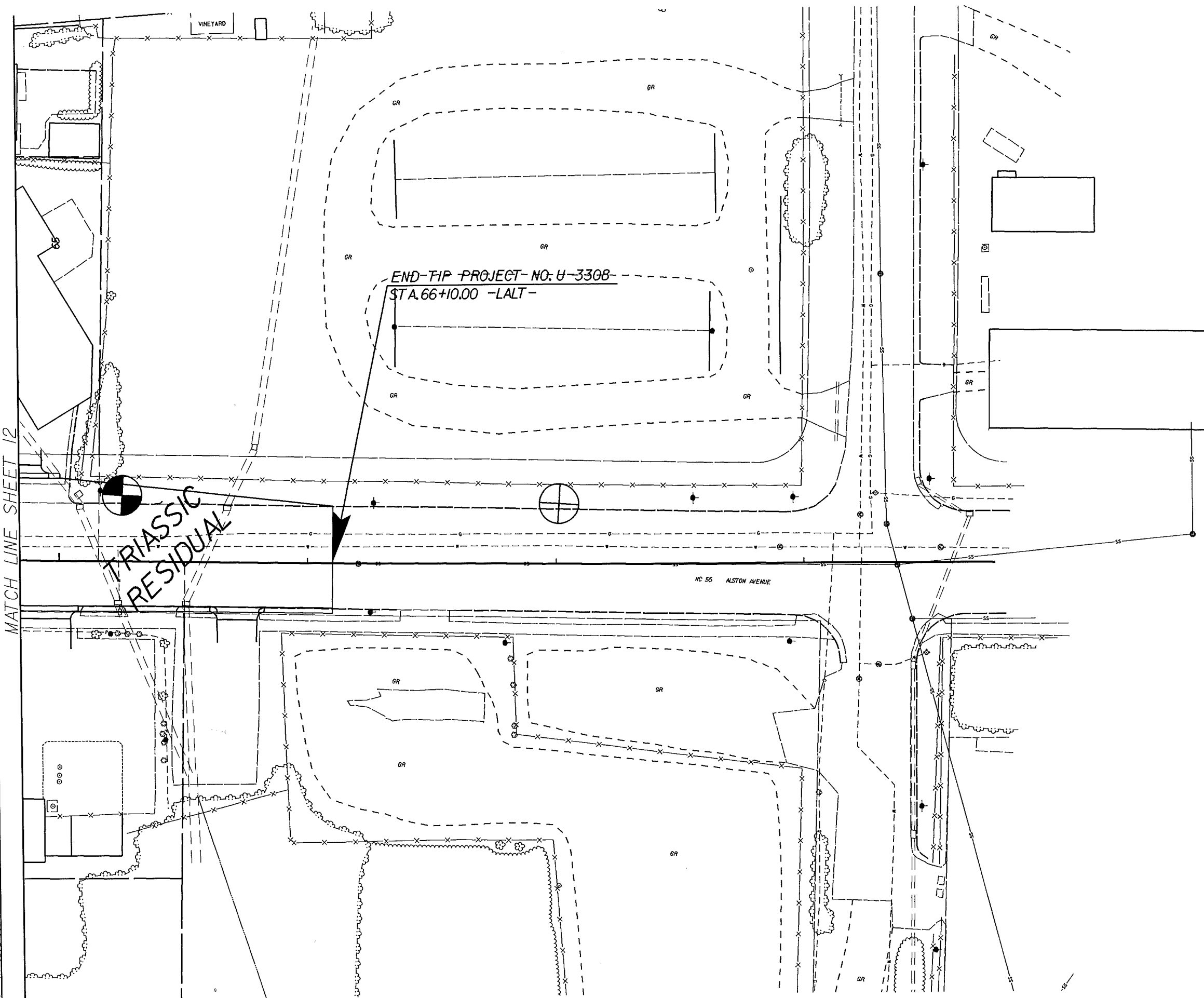
8/17/99

I:\JAN-2012\348 - JVS\559\station\TIP\U3308_GEO_RDWY_REV\CADD_GEO\TECH\PlanPr\U3308_goo.in\013.dgn
walkor AT 02/23/2012

PROJECT REFERENCE NO. <i>U-3308</i>	SHEET NO. <i>13</i>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



MATCH LINE SHEET 12



TRIASSIC RESIDUAL

END-TIP PROJECT- NO. U-3308
STA. 66+10.00 -LALT-

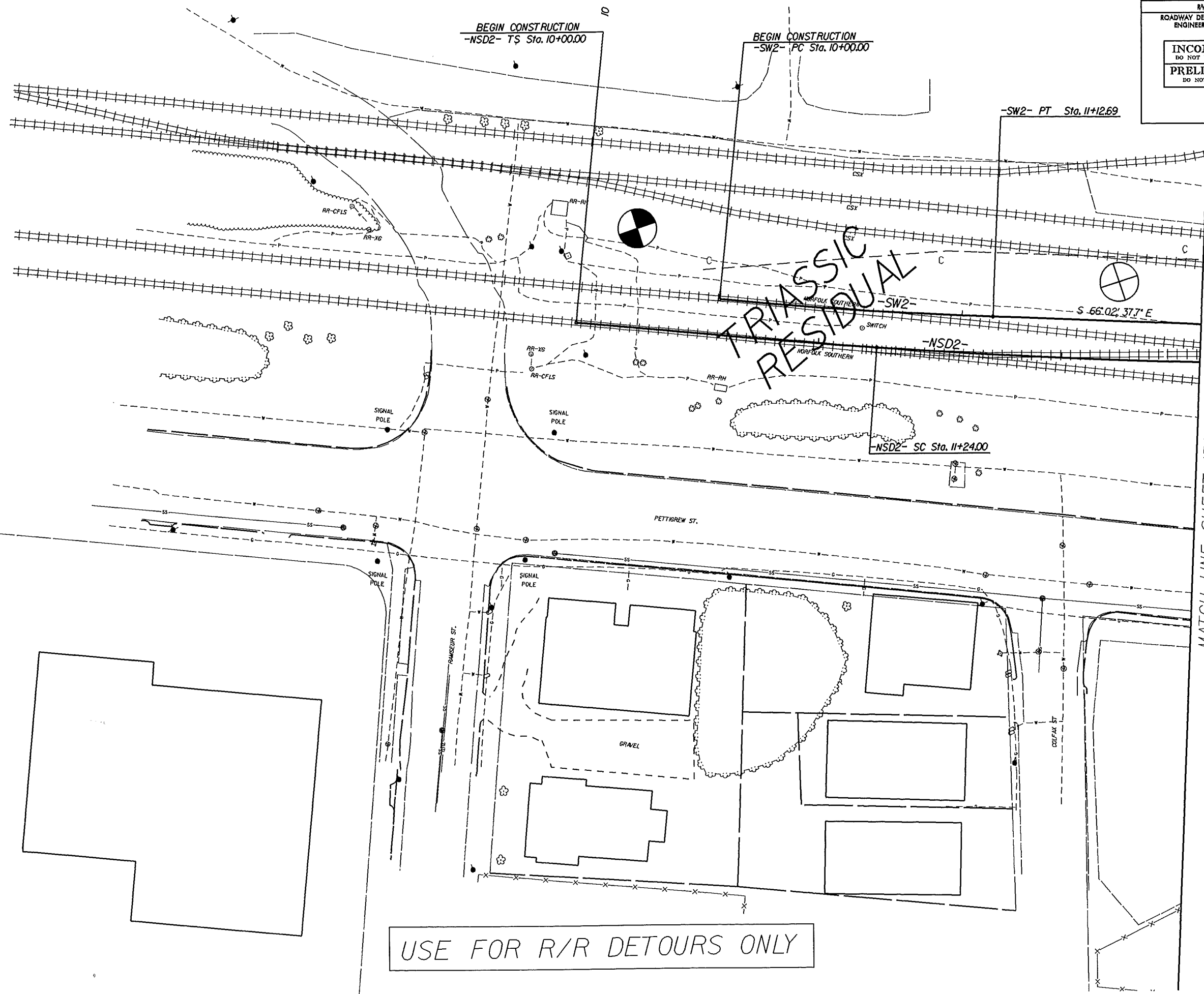
NC 55 ALSTON AVENUE

VINEYARD

8/17/99

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PROJECT REFERENCE NO. U-3308	SHEET NO. 14A
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



TRIASSIC
RESIDUAL

MATCH LINE SHEET 15A

USE FOR R/R DETOURS ONLY

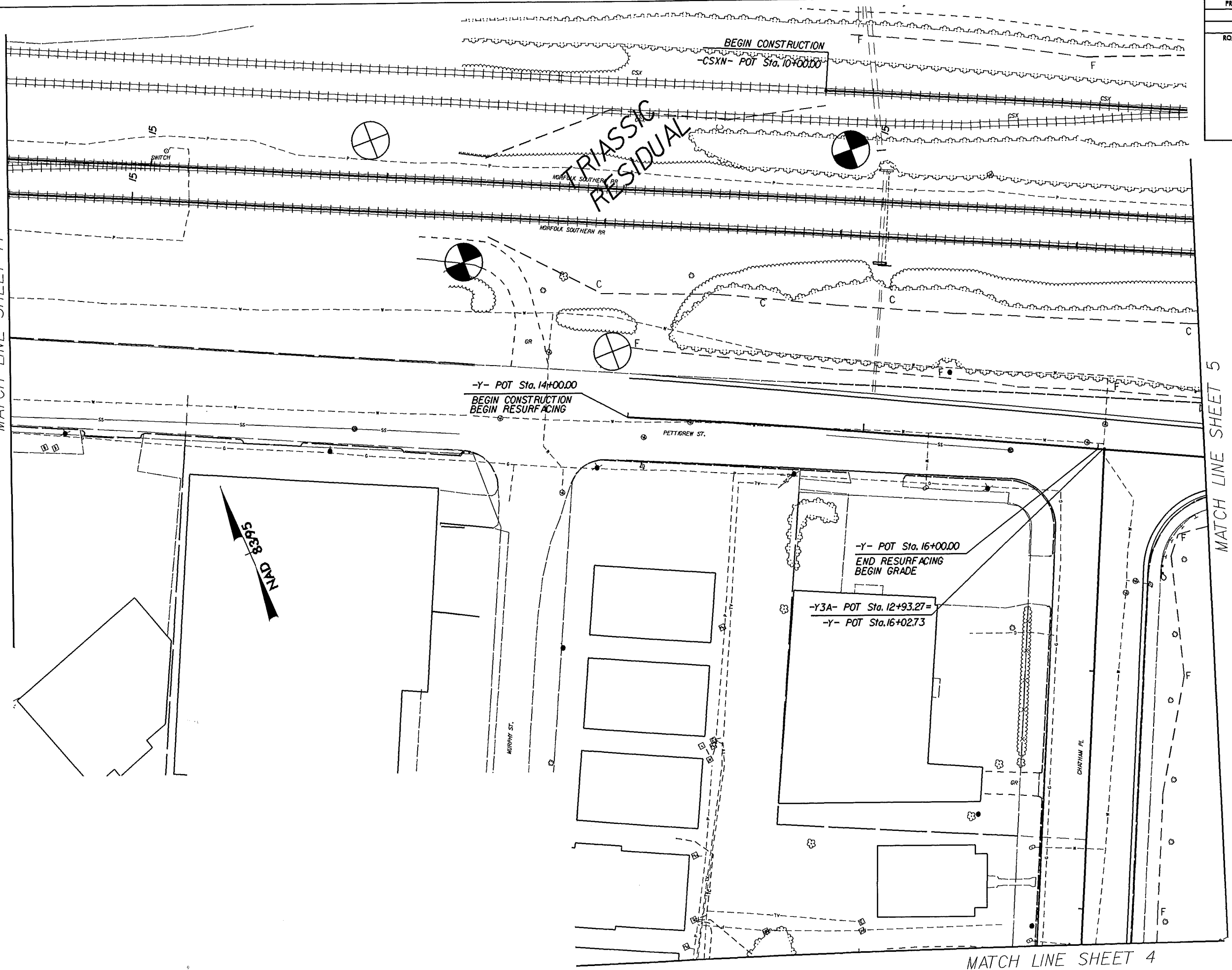
8/17/99

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11/17/99 10:59:24
AT 02/23/02

PROJECT REFERENCE NO.		SHEET NO.	
U-3308		15	
RWY SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/F ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

MATCH LINE SHEET 14

MATCH LINE SHEET 5

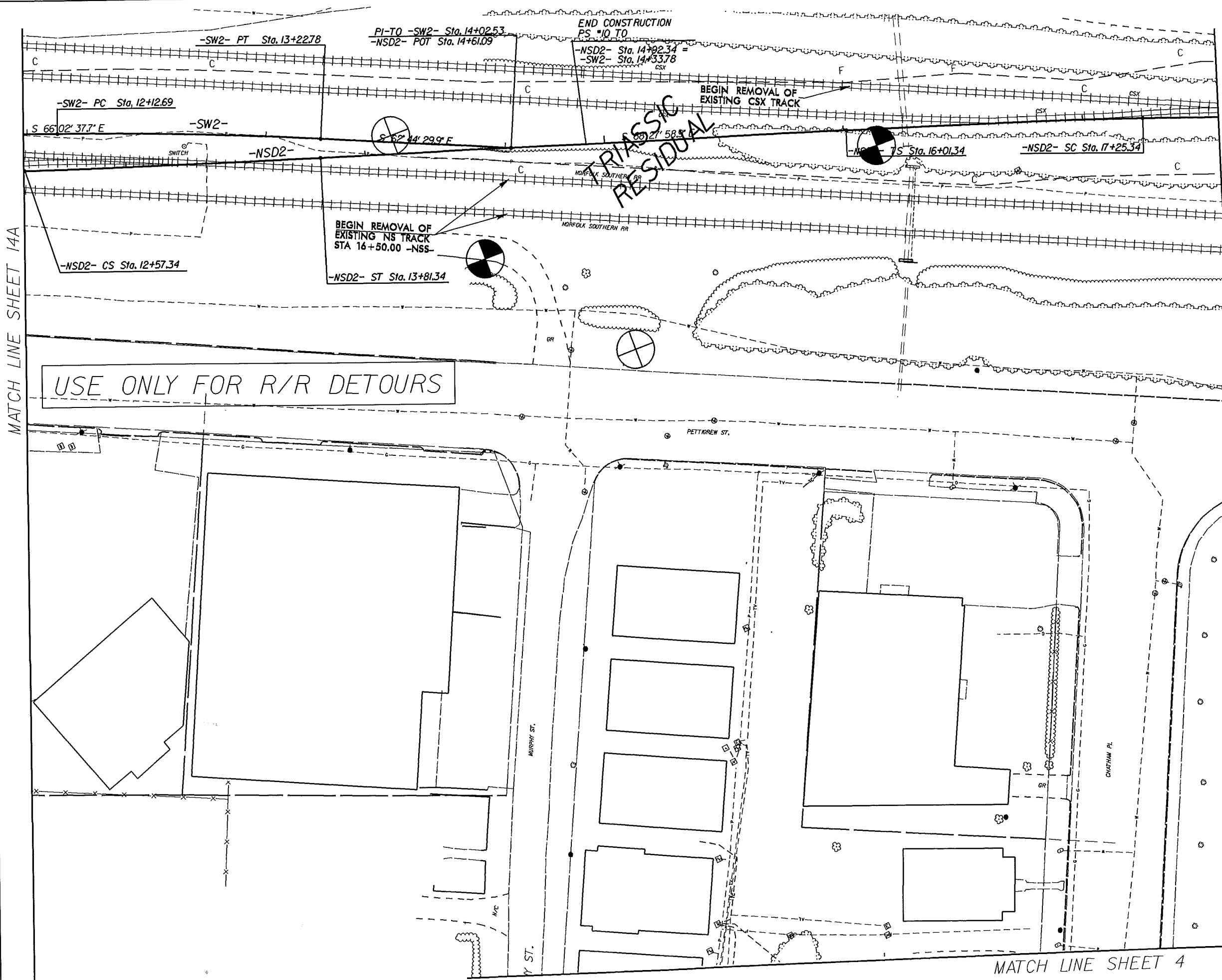


MATCH LINE SHEET 4

8/17/99

\\MAN-2012.1348\Engineering\station\TIP\U3308_GED.RDW_REV\CADD_GEDTECH\Plan\Ref\U3308_geo_mv_015a.dgn

PROJECT REFERENCE NO. U-3308	SHEET NO. 15A
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



MATCH LINE SHEET 14A

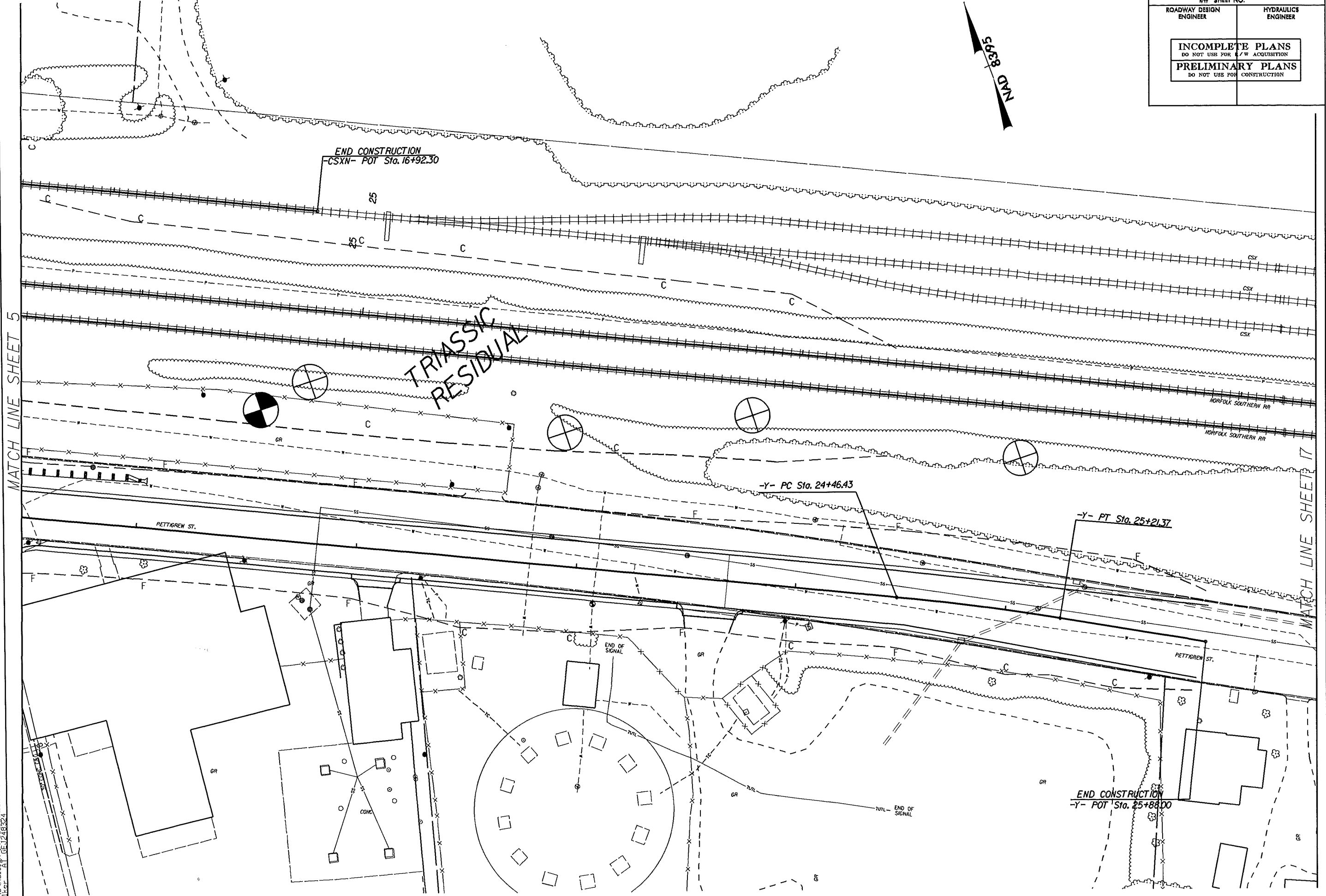
MATCH LINE SHEET 5A

MATCH LINE SHEET 4

8/17/99

11-MAN-2012 13:19
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REVISED BY DATE
11/19/99
11/19/99

PROJECT REFERENCE NO. U-3308	SHEET NO. 16
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



MATCH LINE SHEET 5

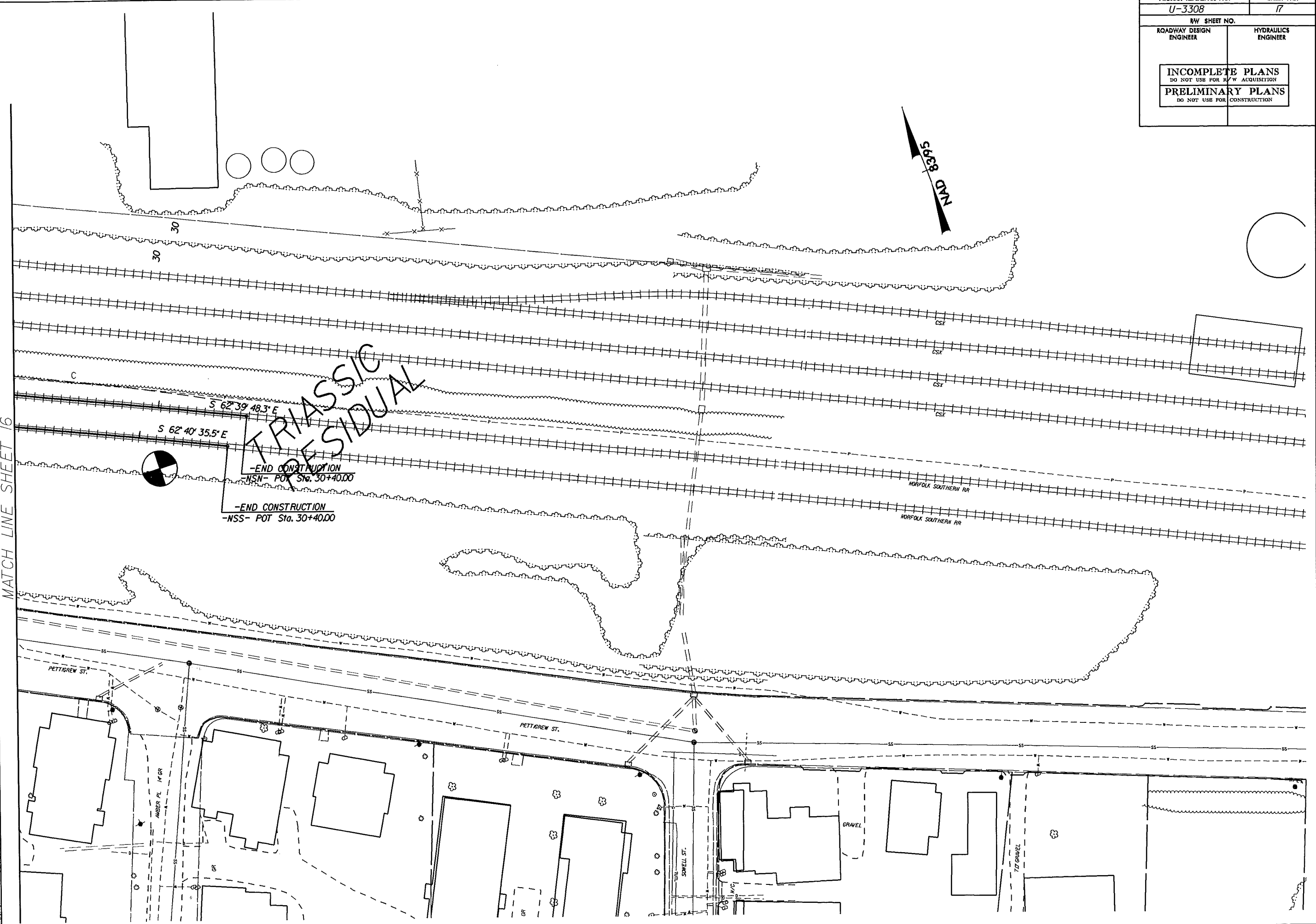
MATCH LINE SHEET 17

8/17/99

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11/19/99 10:59:59 AM
C:\Users\jwalker\Documents\U3308.dgn

MATCH LINE SHEET 16

PROJECT REFERENCE NO. U-3308		SHEET NO. 17	
RW SHEET NO.		HYDRAULICS ENGINEER	
ROADWAY DESIGN ENGINEER			
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

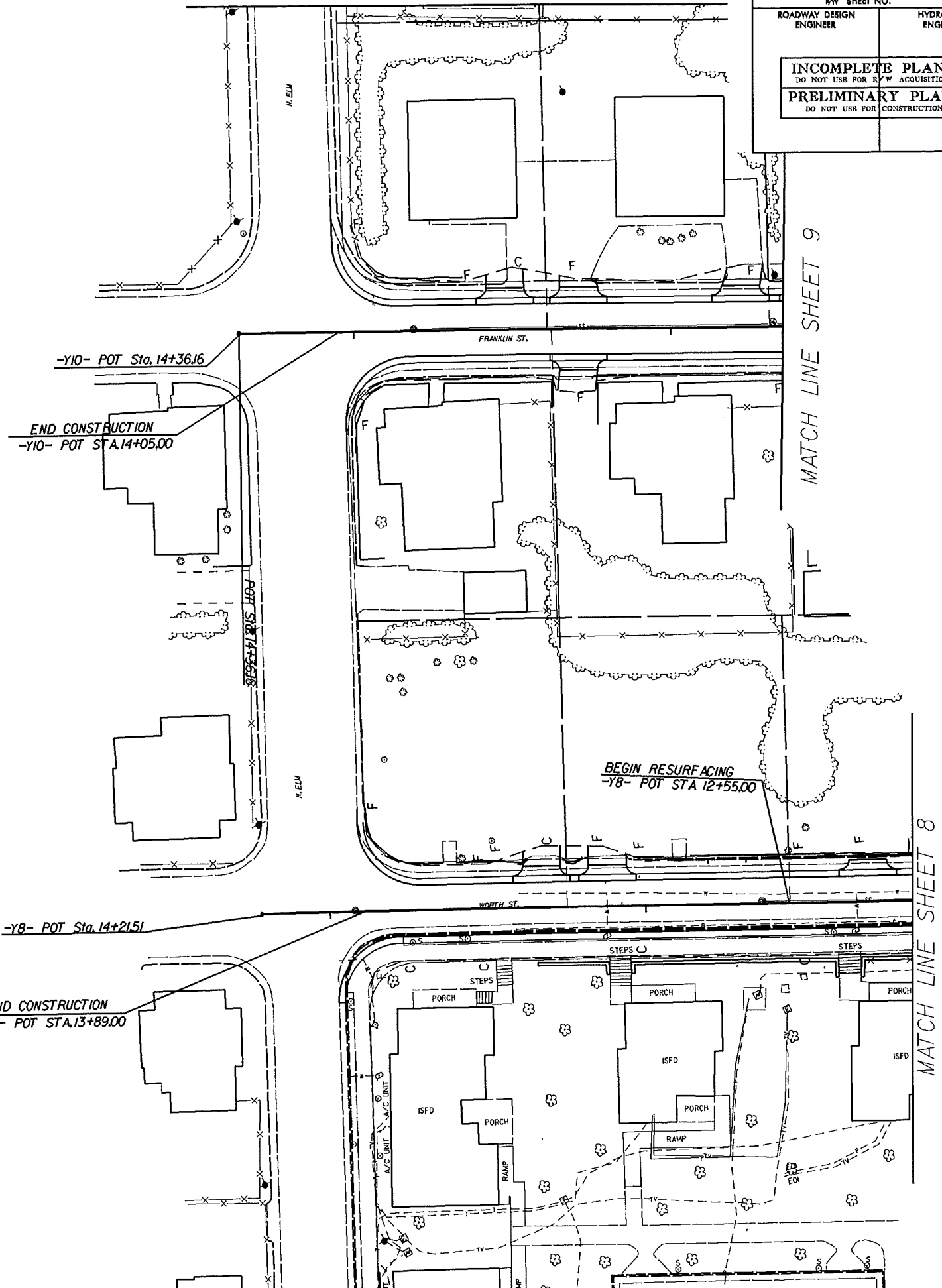


8/17/99

\\MAN-2012.13.20\1\NEP\YR\design\AT\02\25344\TIP\U3308_GED.RODY_REV\CADD_GEDTECH\PlanPr\U3308_geo_inv_019.dgn

MATCH LINE SHEET 22

PROJECT REFERENCE NO. U-3308	SHEET NO. 19
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



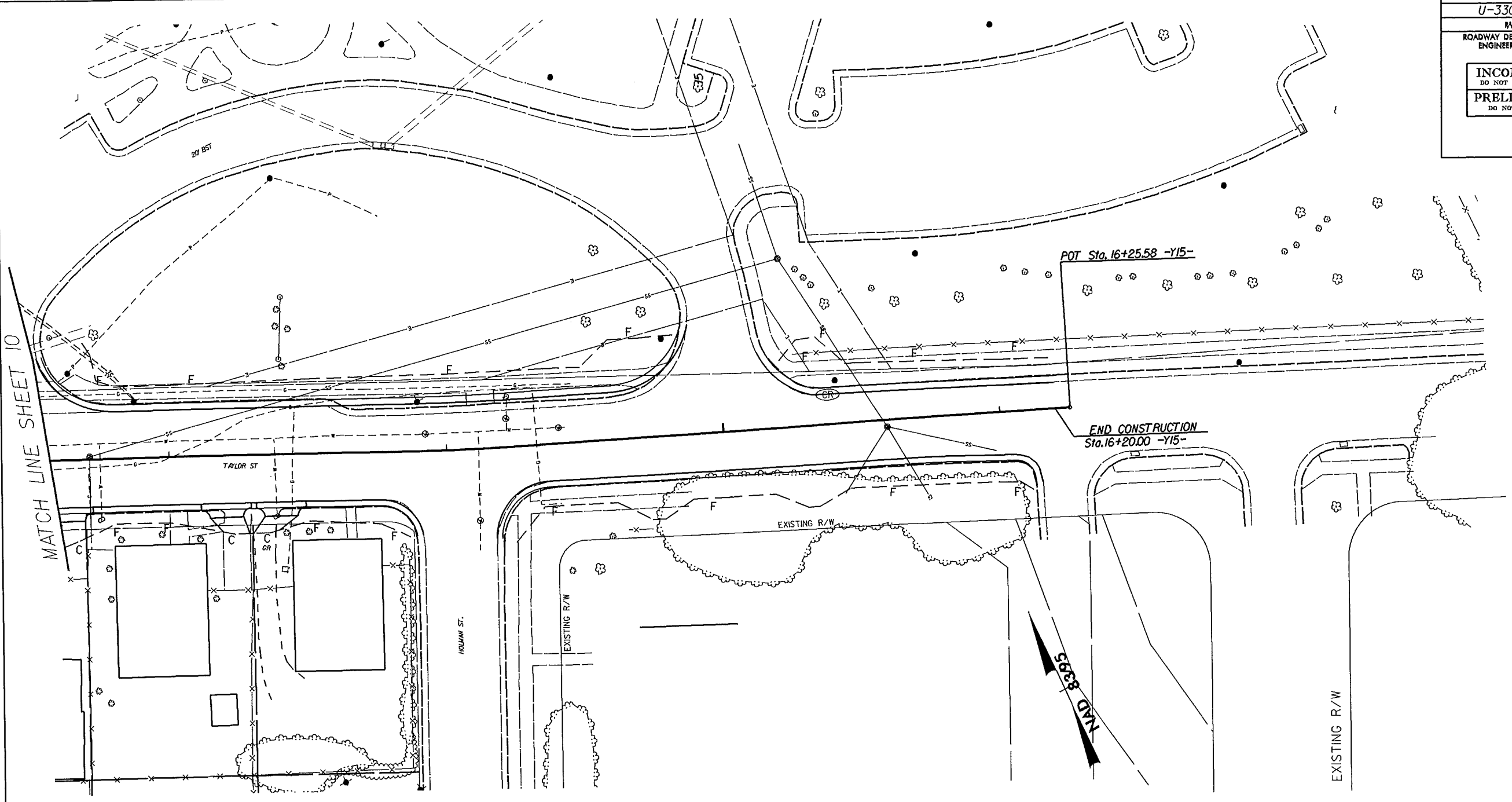
MATCH LINE SHEET 8

MATCH LINE SHEET 9

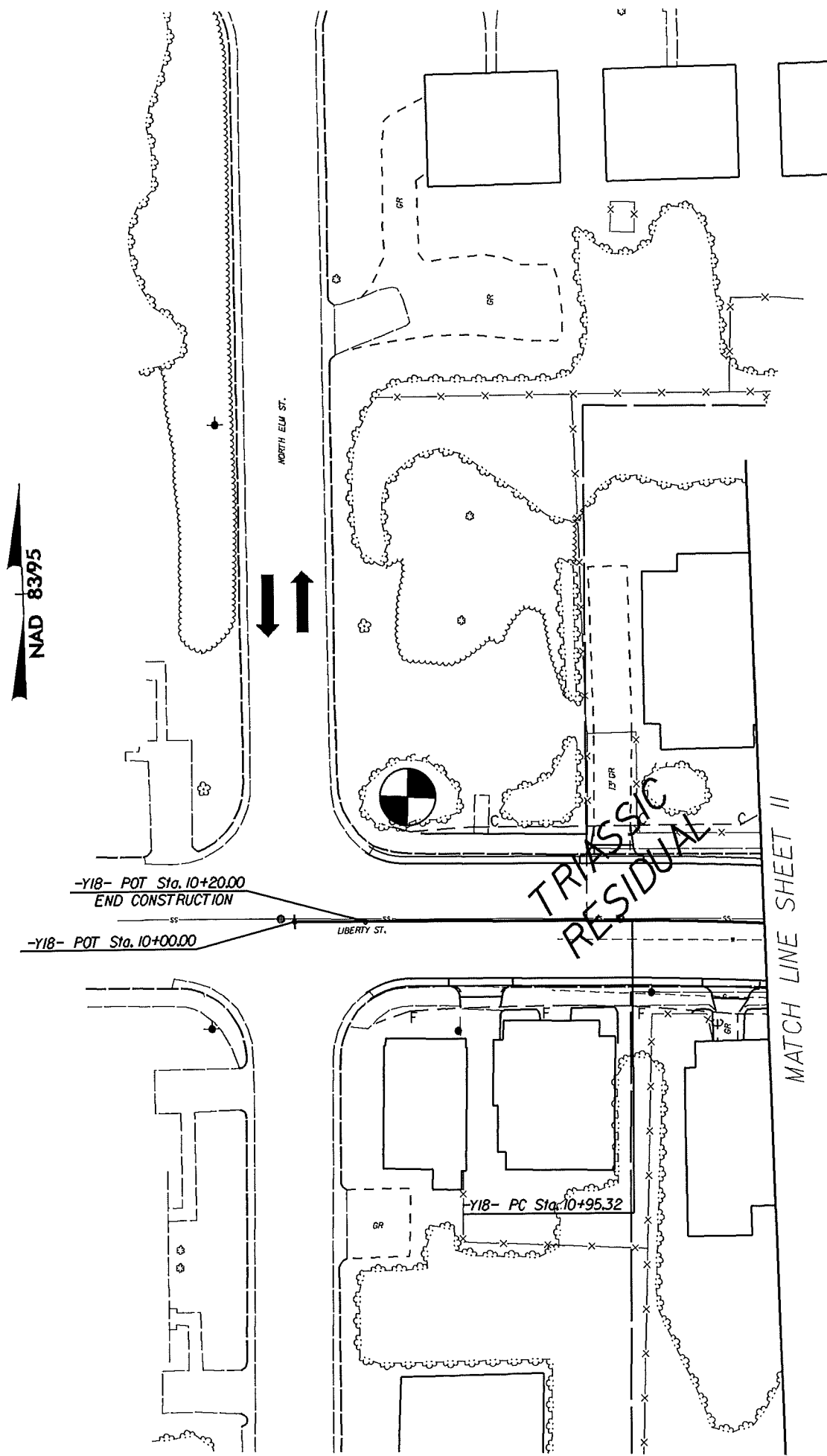
8/17/99

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12/28/99
12/28/99

PROJECT REFERENCE NO. U-3308	SHEET NO. 20
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



PROJECT REFERENCE NO. U-3308	SHEET NO. 22
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

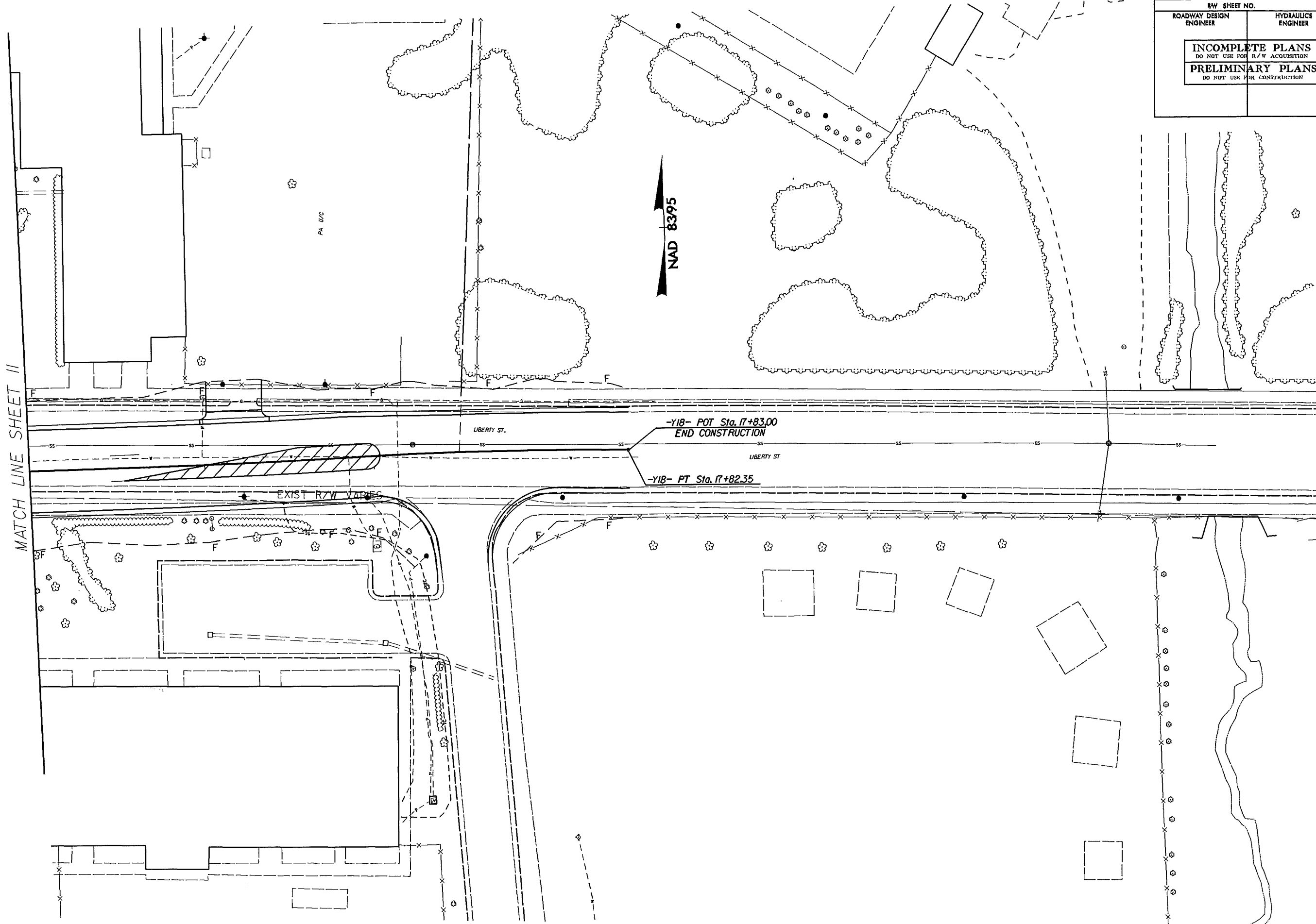


TRIASSIC
 RESIDUAL
 MATCH LINE SHEET II

8/17/99

I:\projects\station\TIP\U3308_GEO.RDWY_REV\ACADD_GEO\TECH\Plan\Prof\U3308_gpo_inv_023.dgn
1/2/99
1/2/99
1/2/99

MATCH LINE SHEET II

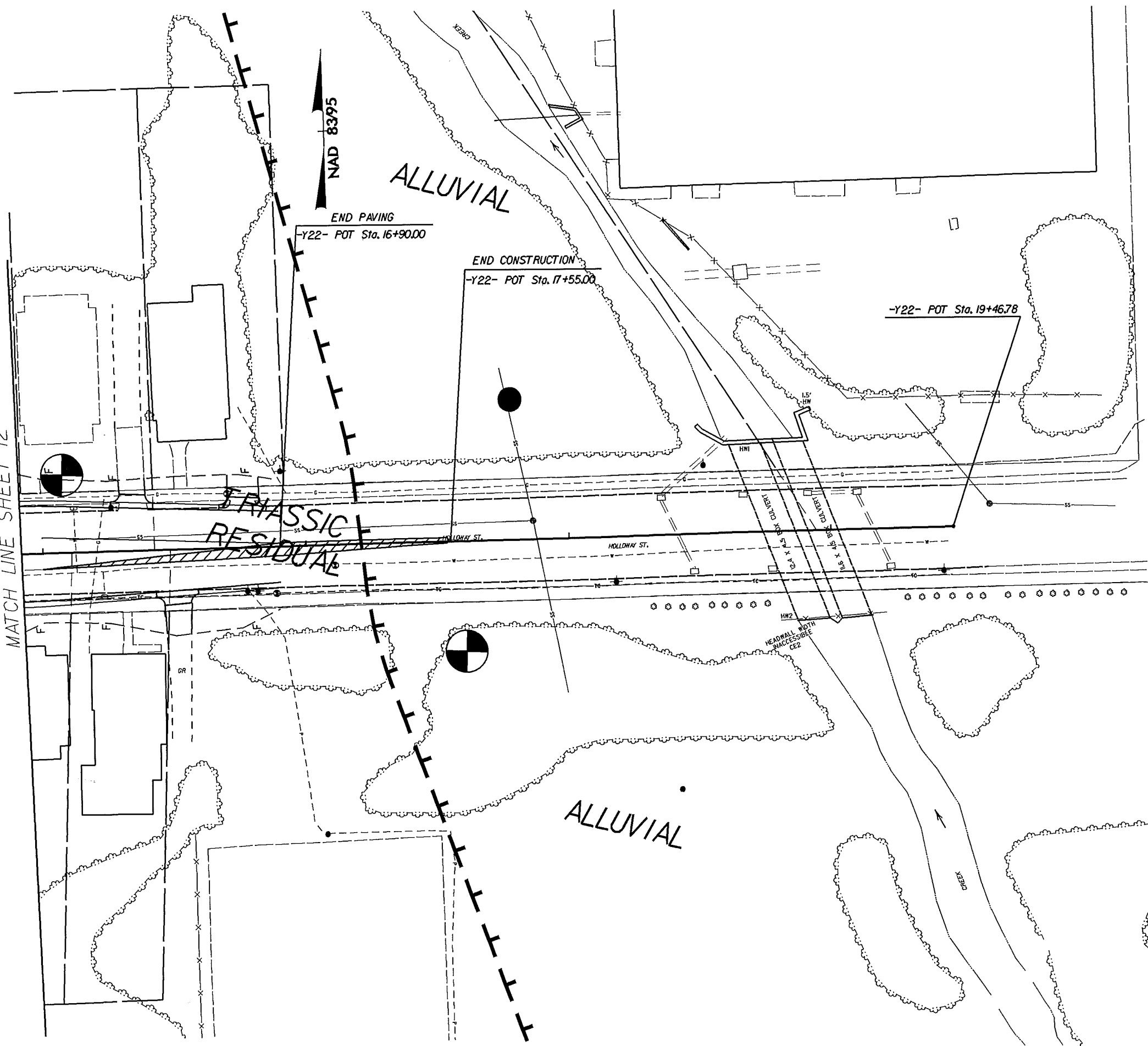


PROJECT REFERENCE NO. <i>U-3308</i>	SHEET NO. <i>23</i>
BY SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

8/17/99

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1/21/2012 13:21
REV: 01
DATE: 08/17/99

MATCH LINE SHEET 12

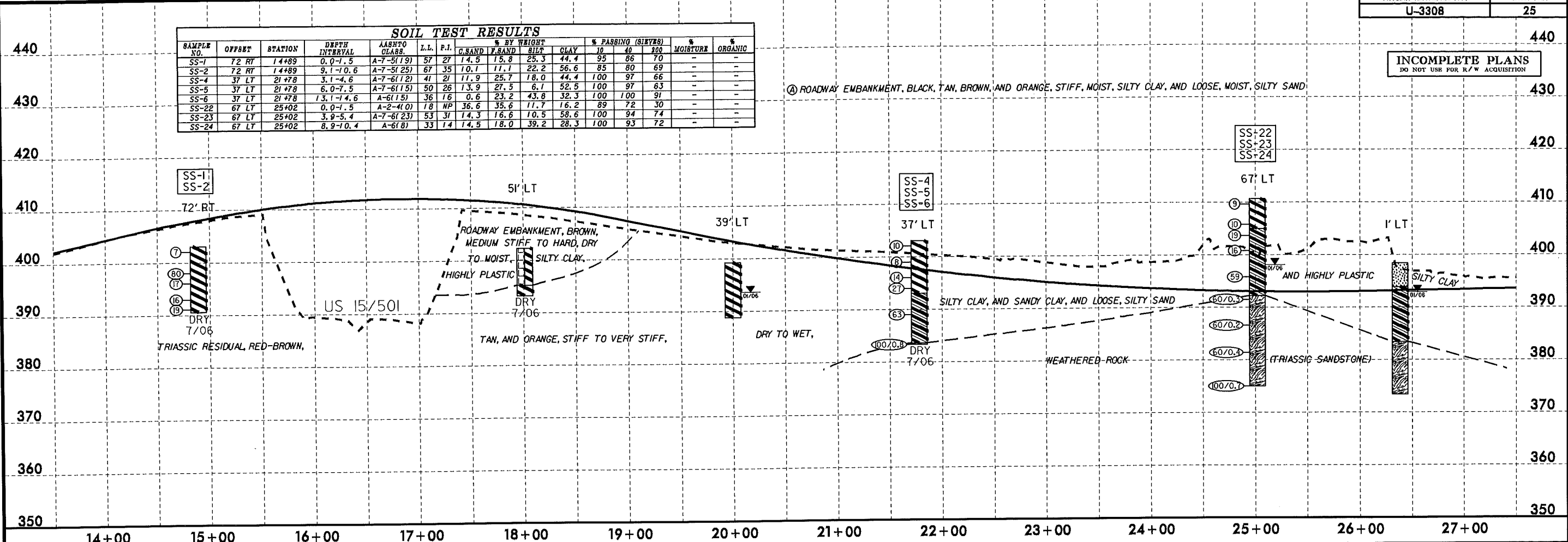


PROJECT REFERENCE NO.		SHEET NO.	
U-3308		24	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			

SOIL TEST RESULTS

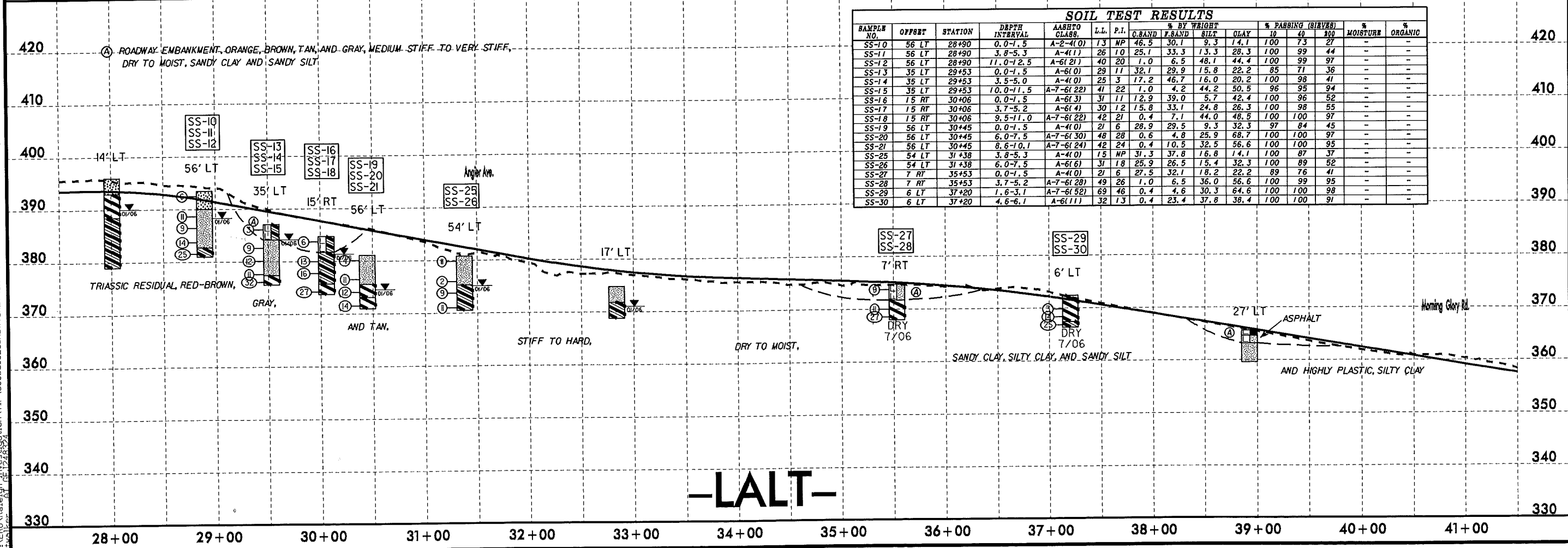
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	LABHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							G.SAND	F.SAND	SILT	10	40	100			
SS-1	72 RT	14+89	0.0-1.5	A-7-5(19)	57	27	14.5	15.8	25.3	44.4	95	86	70	-	-
SS-2	72 RT	14+89	9.1-10.6	A-7-5(25)	67	35	10.1	11.1	22.2	56.6	85	80	69	-	-
SS-4	37 LT	21+78	3.1-4.6	A-7-6(12)	41	21	11.9	25.7	18.0	44.4	100	97	66	-	-
SS-5	37 LT	21+78	6.0-7.5	A-7-6(15)	50	26	13.9	27.5	6.1	52.5	100	97	63	-	-
SS-6	37 LT	21+78	13.1-14.6	A-6(15)	36	16	0.6	23.2	43.8	32.3	100	100	91	-	-
SS-22	67 LT	25+02	0.0-1.5	A-2-4(0)	18	NP	36.6	35.6	11.7	16.2	89	72	30	-	-
SS-23	67 LT	25+02	3.9-5.4	A-7-6(23)	53	31	14.3	16.6	10.5	58.6	100	94	74	-	-
SS-24	67 LT	25+02	8.9-10.4	A-6(8)	33	14	14.5	18.0	39.2	28.3	100	93	72	-	-

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	LABHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							G.SAND	F.SAND	SILT	10	40	100			
SS-10	56 LT	28+90	0.0-1.5	A-2-4(0)	13	NP	46.5	30.1	9.3	14.1	100	73	27	-	-
SS-11	56 LT	28+90	3.8-5.3	A-4(1)	26	10	25.1	33.3	13.3	28.3	100	99	44	-	-
SS-12	56 LT	28+90	11.0-12.5	A-6(2)	40	20	1.0	6.5	48.1	44.4	100	99	97	-	-
SS-13	35 LT	29+53	0.0-1.5	A-6(0)	29	11	32.1	29.9	15.8	22.2	85	71	36	-	-
SS-14	35 LT	29+53	3.5-5.0	A-4(0)	25	3	17.2	46.7	16.0	20.2	100	98	41	-	-
SS-15	35 LT	29+53	10.0-11.5	A-7-6(22)	41	22	1.0	4.2	44.2	50.5	96	95	94	-	-
SS-16	15 RT	30+06	0.0-1.5	A-6(3)	31	11	12.9	39.0	5.7	42.4	100	96	52	-	-
SS-17	15 RT	30+06	3.7-5.2	A-6(4)	30	12	15.8	33.1	24.8	26.3	100	98	55	-	-
SS-18	15 RT	30+06	9.5-11.0	A-7-6(22)	42	21	0.4	7.1	44.0	48.5	100	100	97	-	-
SS-19	56 LT	30+45	0.0-1.5	A-4(0)	21	6	28.9	29.5	9.3	32.3	97	84	45	-	-
SS-20	56 LT	30+45	6.0-7.5	A-7-6(30)	48	28	0.6	4.8	25.9	68.7	100	100	97	-	-
SS-21	56 LT	30+45	8.6-10.1	A-7-6(24)	42	24	0.4	10.5	32.5	56.6	100	100	95	-	-
SS-25	54 LT	31+38	3.8-5.3	A-4(0)	15	NP	31.3	37.8	16.8	14.1	100	87	37	-	-
SS-26	54 LT	31+38	6.0-7.5	A-6(6)	31	18	25.9	26.5	15.4	32.3	100	89	52	-	-
SS-27	7 RT	35+53	0.0-1.5	A-4(0)	21	6	27.5	32.1	18.2	22.2	89	76	41	-	-
SS-28	6 LT	37+20	1.6-3.1	A-7-6(52)	69	46	0.4	4.6	30.3	64.6	100	100	98	-	-
SS-29	6 LT	37+20	4.6-6.1	A-6(11)	32	13	0.4	23.4	37.8	38.4	100	100	91	-	-



-LALT-

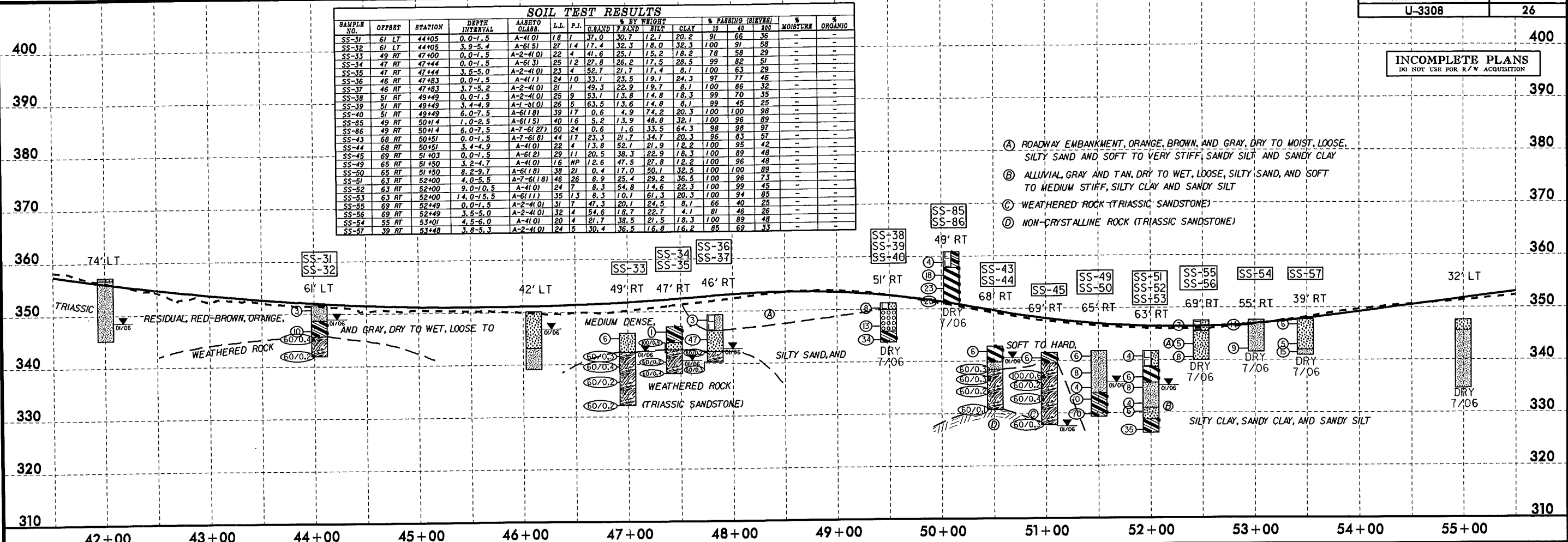
5/28/99
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SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	LABORATORY CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							G.SAND	F.SAND	SILT	10	40	60			
SS-31	61 LT	44+05	0.0-1.5	A-4(10)	18	1	37.0	30.7	12.1	20.2	91	66	36	-	-
SS-32	61 LT	44+05	3.9-5.4	A-6(5)	27	14	17.4	32.3	18.0	32.3	100	91	58	-	-
SS-33	49 RT	47+00	0.0-1.5	A-2(410)	22	4	41.6	25.1	15.2	18.2	78	58	29	-	-
SS-34	47 RT	47+44	0.0-1.5	A-6(3)	25	12	27.8	26.2	17.5	28.5	99	82	51	-	-
SS-35	47 RT	47+44	3.5-5.0	A-2(410)	23	4	52.7	21.7	17.4	8.1	100	63	29	-	-
SS-36	46 RT	47+83	0.0-1.5	A-4(1)	24	10	33.1	23.5	19.1	24.3	97	77	46	-	-
SS-37	46 RT	47+83	3.7-5.2	A-2(410)	21	1	49.3	22.9	19.7	8.1	100	86	32	-	-
SS-38	51 RT	49+49	0.0-1.5	A-2(410)	25	9	53.1	13.8	14.8	18.3	99	70	35	-	-
SS-39	51 RT	49+49	3.4-4.9	A-1(810)	26	5	63.5	13.6	14.8	8.1	99	45	25	-	-
SS-40	51 RT	49+49	6.0-7.5	A-1(810)	39	17	0.6	4.9	74.2	20.3	100	98	-	-	-
SS-41	49 RT	50+14	1.0-2.5	A-6(15)	40	16	5.2	13.9	48.8	32.1	100	96	89	-	-
SS-42	49 RT	50+14	6.0-7.5	A-7(6(27))	50	24	0.6	1.6	33.5	64.3	98	98	97	-	-
SS-43	68 RT	50+51	0.0-1.5	A-7(6(1))	44	17	23.3	21.7	34.7	20.3	96	83	57	-	-
SS-44	68 RT	50+51	3.4-4.9	A-4(10)	22	4	13.8	52.1	21.9	12.2	100	95	42	-	-
SS-45	69 RT	51+03	0.0-1.5	A-6(2)	29	11	20.5	38.3	22.9	18.3	100	89	48	-	-
SS-49	65 RT	51+50	3.2-4.7	A-4(10)	16	NP	12.6	47.5	27.8	12.2	100	96	48	-	-
SS-50	65 RT	51+50	8.2-9.7	A-6(18)	38	21	0.4	17.0	50.1	32.5	100	100	89	-	-
SS-51	63 RT	52+00	4.0-5.5	A-7(6(18))	48	26	8.9	25.4	29.2	36.5	100	86	73	-	-
SS-52	63 RT	52+00	9.0-10.5	A-4(10)	24	7	8.3	54.8	14.6	22.3	100	99	45	-	-
SS-53	63 RT	52+00	14.0-15.5	A-6(11)	35	13	8.5	10.1	61.3	20.3	100	94	85	-	-
SS-55	69 RT	52+49	0.0-1.5	A-2(410)	31	7	47.3	20.1	24.5	8.1	66	40	25	-	-
SS-56	69 RT	52+49	3.5-5.0	A-2(410)	32	4	54.6	18.7	22.7	4.1	81	46	26	-	-
SS-54	35 RT	53+01	4.5-6.0	A-4(10)	20	4	21.7	38.5	21.5	18.3	100	89	48	-	-
SS-57	39 RT	53+48	3.8-5.3	A-2(410)	24	5	30.4	36.5	16.8	16.2	85	69	33	-	-

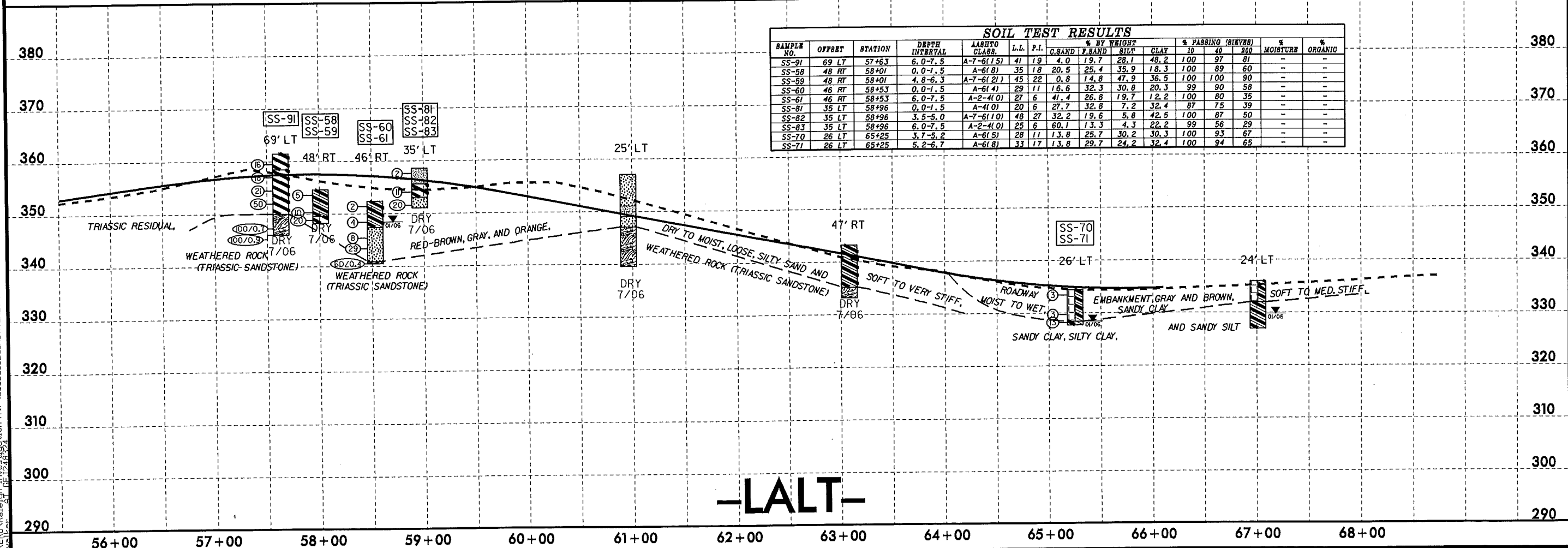
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

- (A) ROADWAY EMBANKMENT, ORANGE, BROWN, AND GRAY, DRY TO MOIST, LOOSE, SILTY SAND AND SOFT TO VERY STIFF, SANDY SILT AND SANDY CLAY
- (B) ALLUVIAL, GRAY AND TAN, DRY TO WET, LOOSE, SILTY SAND, AND SOFT TO MEDIUM STIFF, SILTY CLAY AND SANDY SILT
- (C) WEATHERED ROCK (TRIASSIC SANDSTONE)
- (D) NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	LABORATORY CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							G.SAND	F.SAND	SILT	10	40	60			
SS-91	69 LT	57+63	6.0-7.5	A-7(6(15))	41	19	4.0	19.7	28.1	48.2	100	97	81	-	-
SS-58	48 RT	58+01	0.0-1.5	A-6(8)	35	18	20.5	25.4	35.9	18.3	100	89	60	-	-
SS-59	48 RT	58+01	4.8-6.3	A-7(6(27))	45	22	0.8	14.8	47.9	36.5	100	100	90	-	-
SS-60	46 RT	58+53	0.0-1.5	A-6(4)	29	11	16.6	32.3	30.8	20.3	99	90	58	-	-
SS-61	46 RT	58+53	6.0-7.5	A-2(410)	27	6	41.4	26.8	19.7	12.2	100	80	35	-	-
SS-81	35 LT	58+96	0.0-1.5	A-4(10)	20	6	27.7	32.8	7.2	32.4	87	75	39	-	-
SS-82	35 LT	58+96	3.5-5.0	A-7(6(10))	48	27	32.2	19.6	5.8	42.5	100	87	50	-	-
SS-83	35 LT	58+96	6.0-7.5	A-2(410)	25	6	60.1	13.3	4.3	22.2	99	56	29	-	-
SS-70	26 LT	65+25	3.7-5.2	A-6(5)	28	11	13.8	25.7	30.2	30.3	100	93	67	-	-
SS-71	26 LT	65+25	5.2-6.7	A-6(8)	33	17	13.8	29.7	24.2	32.4	100	94	65	-	-

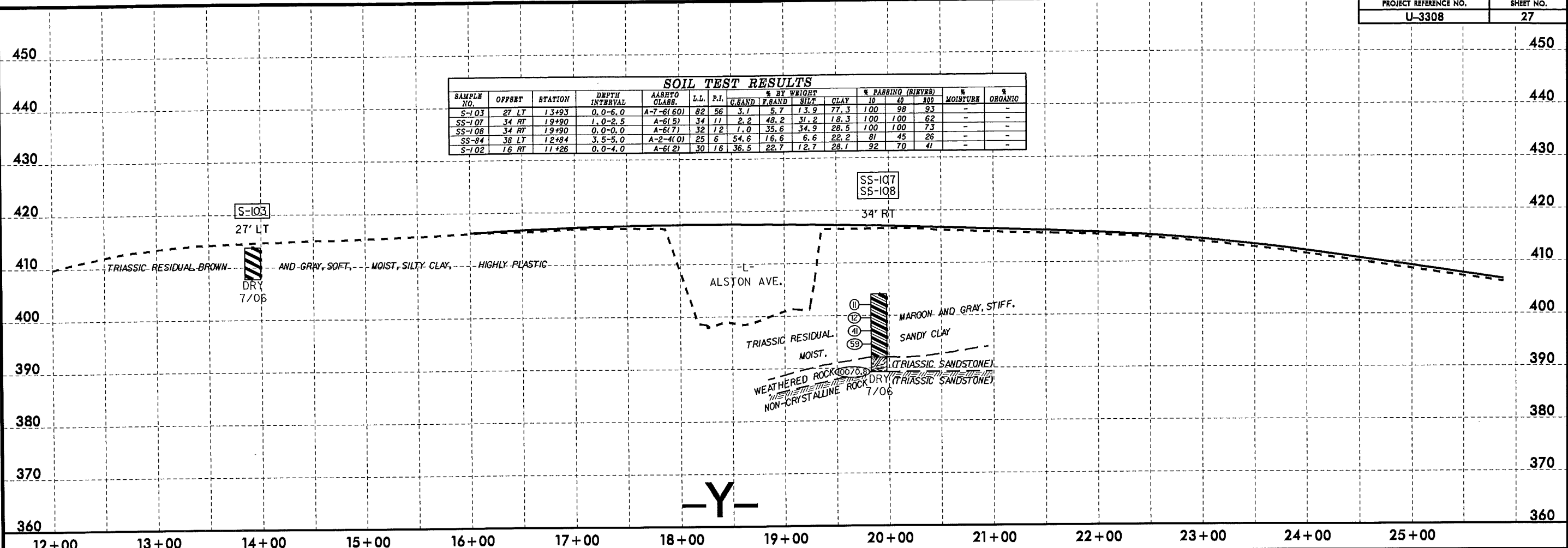


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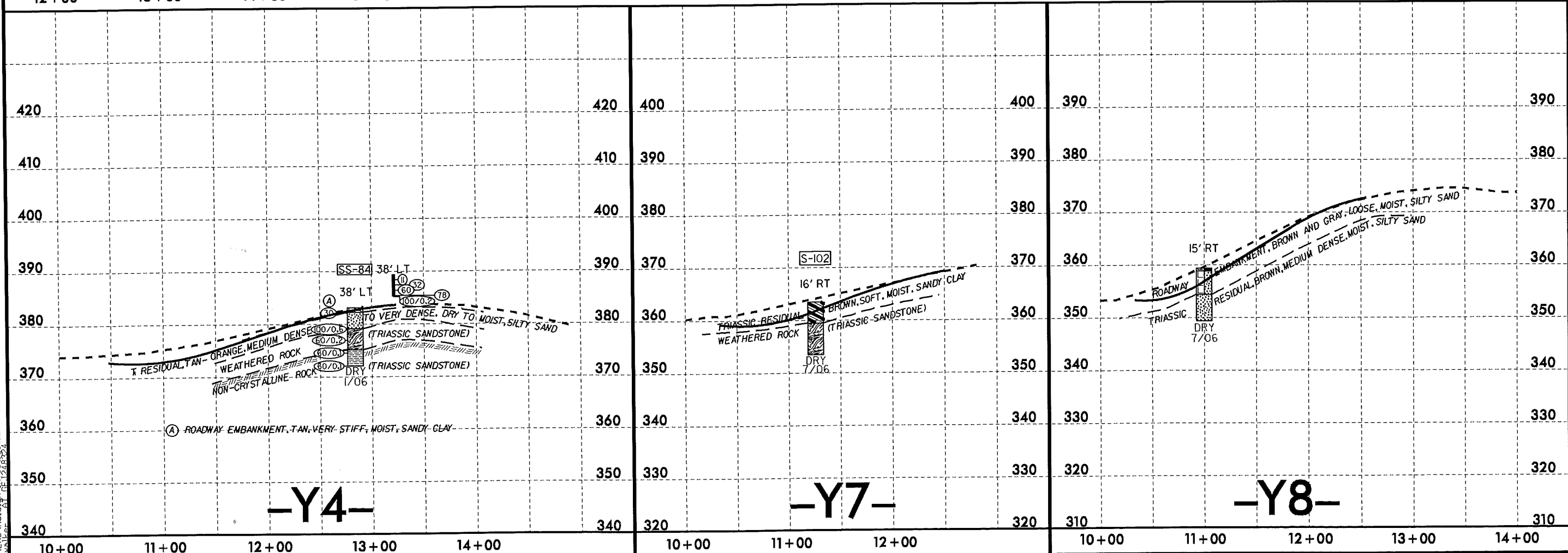
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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							G.SAND	F.SAND	SILT	10	40	60			
S-103	27' LT	13+93	0.0-5.0	A-7-6(60)	82	56	3.1	5.7	13.9	77.3	100	98	93	-	-
SS-107	34' RT	19+90	1.0-2.5	A-6(5)	34	11	2.2	48.2	37.2	18.3	100	100	62	-	-
SS-108	34' RT	19+90	0.0-0.0	A-6(7)	32	12	1.0	35.6	34.9	28.5	100	100	73	-	-
SS-84	38' LT	12+84	3.5-5.0	A-2-4(0)	25	6	54.6	16.6	6.6	22.2	81	45	26	-	-
S-102	16' RT	11+26	0.0-4.0	A-6(2)	30	16	36.5	22.7	12.7	26.1	92	70	41	-	-



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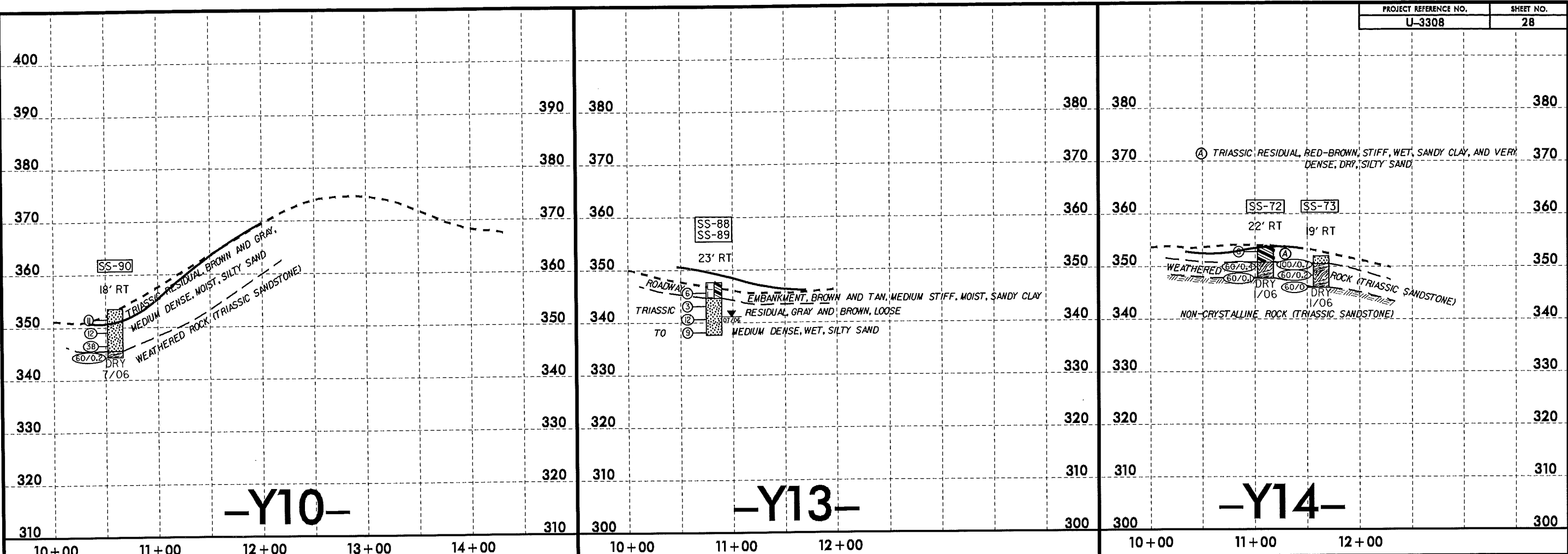


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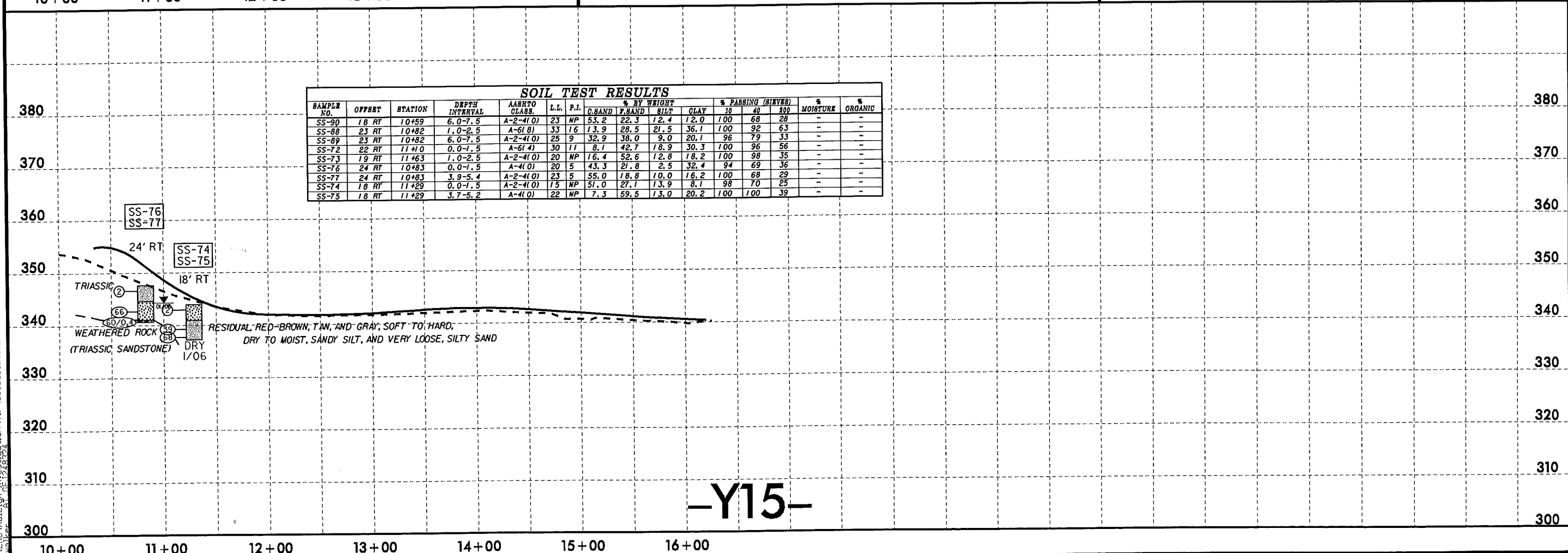
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SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	10	40	100		
SS-90	18 RT	10+59	6.0-7.5	A-2-4(0)	23	MP	53.2	22.3	12.4	100	68	28	-	-
SS-88	23 RT	10+82	1.0-2.5	A-6(0)	33	16	13.9	28.5	21.5	36.1	100	92	63	-
SS-89	23 RT	10+82	6.0-7.5	A-2-4(0)	25	9	32.9	38.0	9.0	20.1	96	79	33	-
SS-72	22 RT	11+10	0.0-1.5	A-6(4)	30	11	8.1	42.7	18.9	30.3	100	96	56	-
SS-73	19 RT	11+63	1.0-2.5	A-2-4(0)	20	MP	16.4	52.6	12.8	18.2	100	98	35	-
SS-76	24 RT	10+83	0.0-1.5	A-4(0)	20	5	43.3	21.8	2.5	32.4	94	69	36	-
SS-77	24 RT	10+83	3.9-5.4	A-2-4(0)	23	5	55.0	18.8	10.0	16.2	100	68	29	-
SS-74	18 RT	11+29	0.0-1.5	A-2-4(0)	15	MP	51.0	27.1	13.9	6.1	98	70	25	-
SS-75	18 RT	11+29	3.7-5.2	A-4(0)	22	MP	7.3	59.5	13.0	20.2	100	100	39	-



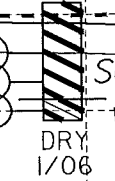
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 Plot: 11/28/99

8/23/99

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							G.BAND	F.BAND	SILT	CLAY	10	40	200		
SS-29	6' LT	37+20	1.6-3.1	A-7-6(52)	69	46	0.4	4.6	30.3	64.6	100	100	98	-	-
SS-30	6' LT	37+20	4.6-6.1	A-6(11)	32	13	0.4	23.4	37.8	38.4	100	100	91	-	-

SS-29
SS-30

37+20



A:1

TRIASSIC RESIDUAL, RED-BROWN, MOIST,
RED-BROWN, DRY,

SOFT TO STIFF, HIGHLY PLASTIC, SILTY CLAY
VERY STIFF, SANDY CLAY

37+29.90

TRIASSIC RESIDUAL, RED-BROWN, MOIST, SOFT TO STIFF, HIGHLY PLASTIC, SILTY CLAY

37+02.08

TRIASSIC RESIDUAL, RED-BROWN, MOIST, SOFT TO STIFF, HIGHLY PLASTIC, SILTY CLAY

36+87

TRIASSIC RESIDUAL, RED-BROWN, MOIST, SOFT TO STIFF, HIGHLY PLASTIC, SILTY CLAY

36+50

A:1

ROADWAY EMBANKMENT, GRAY, MOIST, STIFF, SANDY SILT

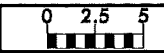
TRIASSIC RESIDUAL, RED-BROWN, AND GRAY, DRY TO MOIST, STIFF TO VERY STIFF, HIGHLY PLASTIC SILTY CLAY

36+29.92

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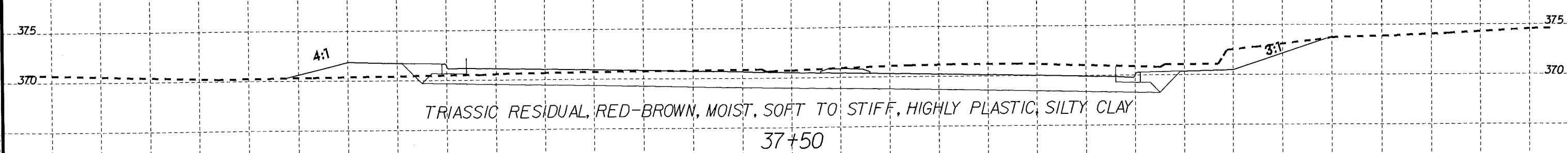
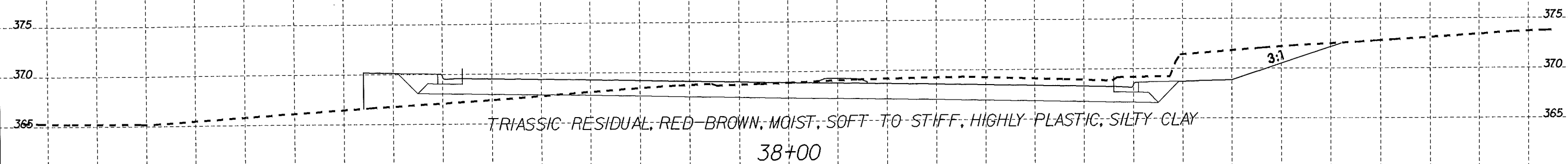
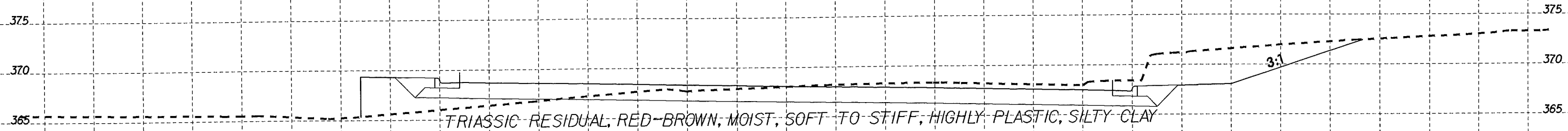
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PROJ. REFERENCE NO. U-3308 SHEET NO. 33

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SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							G.BAND	F.BAND	SILT	CLAY	10	40	200		
SS-62	48 RT	59+02	3.8-5.3	A-6(3)	27	11	18.9	30.8	26.0	24.3	99	89	56	-	-
SS-63	48 RT	59+02	8.8-10.3	A-2-4(0)	23	6	52.7	20.5	14.8	12.2	99	66	30	-	-
SS-81	35 LT	58+96	0.0-1.5	A-4(0)	20	6	27.7	32.8	7.2	32.4	87	75	39	-	-
SS-82	35 LT	58+96	3.5-5.0	A-7-6(10)	48	27	32.2	19.6	5.8	42.5	100	87	50	-	-
SS-83	35 LT	58+96	6.0-7.5	A-2-4(0)	25	6	60.1	13.3	4.3	22.2	99	56	29	-	-

SS-81
SS-82
SS-83

SS-62
SS-63

DRY TRIASSIC RESIDUAL, ORANGE, RED, AND BROWN, SOFT TO HARD, DRY TO MOIST, SANDY CLAY 1/06

DRY 1/06

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							G.BAND	F.BAND	SILT	CLAY	10	40	200		
SS-41	79 RT	50+02	0.0-1.5	A-6(3)	31	12	29.8	24.3	21.5	24.3	94	76	47	-	-
SS-42	79 RT	50+02	3.5-5.0	A-6(8)	30	13	1.6	33.3	40.8	24.3	100	100	75	-	-
SS-46	37 LT	52+23	0.0-1.5	A-6(3)	31	14	30.6	24.1	16.8	28.4	96	78	48	-	-
SS-47	37 LT	52+23	8.0-9.5	A-6(13)	37	23	13.2	24.3	30.0	32.5	100	95	67	-	-
SS-48	37 LT	52+23	13.5-15.0	A-4(1)	26	10	40.2	20.5	23.1	16.2	100	83	42	-	-

SS-46
SS-47
SS-48

ROADWAY EMBANKMENT, BROWN, RED, AND GRAY, SOFT TO HARD, DRY TO MOIST, SANDY CLAY

ALLUVIAL, GRAY AND TAN, STIFF, MOIST, SANDY CLAY

TRIASSIC RESIDUAL, RED-BROWN, HARD, DRY, SANDY SILT

ROADWAY EMBANKMENT, GRAY, SOFT, WET, SANDY CLAY

TRIASSIC RESIDUAL, RED-BROWN, VERY HARD, DRY, SANDY CLAY

WEATHERED ROCK (TRIASSIC SANDSTONE)

SS-41
SS-42

DRY 1/06

50+00

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

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY DURHAM
PROJECT DESCRIPTION NC 55- WIDENING AND IMPROVEMENTS FROM NC 147 (DURHAM FREEWAY) TO US 70/NC 98 (HOLLOWAY ST.)
SITE DESCRIPTION TEMPORARY SHORING ALONG -LALT-

REFERENCE: U-3308

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2, 2A	LEGEND
3	SITE PLAN
4, 5	BORE LOGS

PROJECT: 34915

PERSONNEL
TERRACON
N.D. MOHS

INVESTIGATED BY N.D. MOHS
DRAWN BY N.D. MOHS
CHECKED BY N.T. ROBERSON
SUBMITTED BY N.T. ROBERSON
DATE SEPTEMBER 2014

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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



DocuSigned by:
Nathan D. Mohs 10/8/2014
CB814151D7B34AE...
SIGNATURE DATE

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

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 1 OF 2)

SOIL DESCRIPTION										GRADATION																																																												
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.																																																												
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS																																																												
GRANULAR MATERIALS (≤ 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.																																																												
MINERALOGICAL COMPOSITION										COMPRESSIBILITY																																																												
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50																																																												
PERCENTAGE OF MATERIAL										GROUND WATER																																																												
<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>> 10%</td> <td>> 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	▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▼ STATIC WATER LEVEL AFTER 24 HOURS ▽PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP																																								
ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL																																																																			
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HIGHLY ORGANIC	> 10%	> 20%	HIGHLY																																																																			
CONSISTENCY OR DENSENESS										MISCELLANEOUS SYMBOLS																																																												
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> </thead> <tbody> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </tbody> </table>										PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A	GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES SOIL SYMBOL TEST BORING SLOPE INDICATOR INSTALLATION ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER TEST INFERRED SOIL BOUNDARY CORE BORING SOUNDING ROD INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE ALLUVIAL SOIL BOUNDARY PIEZOMETER INSTALLATION SPT N-VALUE																																																
PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																																																																			
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A																																																																			
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4																																																																			
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**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)**

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		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 SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

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. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>
SEVERE (SEV.)	ALL ROCK 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. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u>
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>
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.

ROCK HARDNESS

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 PIECES 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 FINGERNAIL.

FRACTURE SPACING**BEDDING**

TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF 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.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT 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, SUCH 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 THAT 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 DISLODGED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - 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 (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (ROD) - 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 THAT 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, THAT 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 BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
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 (SROD) - 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 (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

