

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5746	1	9

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.

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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:

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

PERSONNEL

C.M. SWAFFORD

INVESTIGATED BY C. SWAFFORD

DRAWN BY C. SWAFFORD

CHECKED BY P. ZHANG

SUBMITTED BY P. ZHANG

DATE JULY, 2024

CONTENTS

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-Y6-	18+96.18 - 21+76.11	6	8

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	25+00	9

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY WAKE
PROJECT DESCRIPTION US 401 (FAYETTEVILLE RD)
FROM SR 1467/2839 (ALLEN ST) TO NORTH OF
SR 1010 (TEN-TEN RD)

INVENTORY

REFERENCE: 54032.1.1

PROJECT: U-5746



SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																																				
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</p>																																																																																																																																																																																																							
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RATING AS SUBGRADE	[Tables for soil properties]			[Tables for soil properties]			[Tables for soil properties]			[Tables for soil properties]	<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> <p 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 style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> </thead> <tbody> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>> 10%</td> <td>> 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </tbody> </table> <p style="text-align: center;">GROUND WATER</p> <p>▽ 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</p> <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>[Symbol] ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td>[Symbol] 25/825 DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td>[Symbol] SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td>[Symbol] SOIL SYMBOL</td> <td>[Symbol] TEST BORING</td> <td>[Symbol] CONE PENETROMETER TEST</td> </tr> <tr> <td>[Symbol] ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td>[Symbol] AUGER BORING</td> <td>[Symbol] SOUNDING ROD</td> </tr> <tr> <td>[Symbol] INFERRERD SOIL BOUNDARY</td> <td>[Symbol] CORE BORING</td> <td>[Symbol] TEST BORING WITH CORE</td> </tr> <tr> <td>[Symbol] INFERRERD ROCK LINE</td> <td>[Symbol] MONITORING WELL</td> <td>[Symbol] SPT N-VALUE</td> </tr> <tr> <td>[Symbol] ALLUVIAL SOIL BOUNDARY</td> <td>[Symbol] PIEZOMETER INSTALLATION</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">RECOMMENDATION SYMBOLS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>[Symbol] UNDERCUT</td> <td>[Symbol] UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td>[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td>[Symbol] SHALLOW UNDERCUT</td> <td>[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">ABBREVIATIONS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>AR - AUGER REFUSAL</td> <td>MED. - MEDIUM</td> <td>VST - VANE SHEAR TEST</td> </tr> <tr> <td>BT - BORING TERMINATED</td> <td>MICA - MICACEOUS</td> <td>WEA. - WEATHERED</td> </tr> <tr> <td>CL - CLAY</td> <td>MOD. - MODERATELY</td> <td>W - UNIT WEIGHT</td> </tr> <tr> <td>CPT - CORE PENETRATION TEST</td> <td>NP - NON PLASTIC</td> <td>W_g - DRY UNIT WEIGHT</td> </tr> <tr> <td>CSE - COARSE</td> <td>ORG. - ORGANIC</td> <td>SAMPLE ABBREVIATIONS</td> </tr> <tr> <td>DMT - DILATOMETER TEST</td> <td>PMT - PRESSUREMETER TEST</td> <td>S - BULK</td> </tr> <tr> <td>DPT - DYNAMIC PENETRATION TEST</td> <td>SAP. - SAPROLITE</td> <td>SS - SPLIT SPOON</td> </tr> <tr> <td>e - VOID RATIO</td> <td>SD. - SAND, SANDY</td> <td>ST - SHELBY TUBE</td> </tr> <tr> <td>F - FINE</td> <td>SL. - SILTY, SILTY</td> <td>RS - ROCK</td> </tr> <tr> <td>FOSS. - FOSSILIFEROUS</td> <td>SLI. - SLIGHTLY</td> <td>RT - RECOMPACTED TRIAXIAL</td> </tr> <tr> <td>FRAC. - FRACTURED, FRACTURES</td> <td>TCR - TRICONE REFUSAL</td> <td>CBR - CALIFORNIA BEARING RATIO</td> </tr> <tr> <td>FRAGS. - FRAGMENTS</td> <td>w - MOISTURE CONTENT</td> <td></td> </tr> <tr> <td>HI. - HIGHLY</td> <td>V - VERY</td> <td></td> </tr> </tbody> </table>	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	[Symbol] ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	[Symbol] 25/825 DIP & DIP DIRECTION OF ROCK STRUCTURES	[Symbol] SLOPE INDICATOR INSTALLATION	[Symbol] SOIL SYMBOL	[Symbol] TEST BORING	[Symbol] CONE PENETROMETER TEST	[Symbol] ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	[Symbol] AUGER BORING	[Symbol] SOUNDING ROD	[Symbol] INFERRERD SOIL BOUNDARY	[Symbol] CORE BORING	[Symbol] TEST BORING WITH CORE	[Symbol] INFERRERD ROCK LINE	[Symbol] MONITORING WELL	[Symbol] SPT N-VALUE	[Symbol] ALLUVIAL SOIL BOUNDARY	[Symbol] PIEZOMETER INSTALLATION		[Symbol] UNDERCUT	[Symbol] UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	[Symbol] SHALLOW UNDERCUT	[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK		AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST	BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED	CL - CLAY	MOD. - MODERATELY	W - UNIT WEIGHT	CPT - CORE PENETRATION TEST	NP - NON PLASTIC	W _g - DRY UNIT WEIGHT	CSE - COARSE	ORG. - ORGANIC	SAMPLE ABBREVIATIONS	DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	S - BULK	DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITE	SS - SPLIT SPOON	e - VOID RATIO	SD. - SAND, SANDY	ST - SHELBY TUBE	F - FINE	SL. - SILTY, SILTY	RS - ROCK	FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RT - RECOMPACTED TRIAXIAL	FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	CBR - CALIFORNIA BEARING RATIO	FRAGS. - FRAGMENTS	w - MOISTURE CONTENT		HI. - HIGHLY	V - VERY		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRERD 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>WEATHERED ROCK (WR): NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p style="text-align: center;">WEATHERING</p> <p>FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (IV SLI.): ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SLI.): 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. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u></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. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u></p> <p>VERY SEVERE (IV 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></p> <p>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.</p> <p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD: CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD: CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD: CAN BE GROUDED OR GOUGED 0.25 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.</p> <p>SOFT: CAN BE GROUDED 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.</p> <p>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.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">FRACTURE SPACING</th> <th colspan="2">BEDDING</th> </tr> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> </thead> <tbody> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </tbody> </table> <p style="text-align: center;">INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	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	<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, SUCH 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 DISLOADED 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 (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.</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 (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.</p> <p>TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> <p>BENCH MARK:</p> <p style="text-align: center;">ELEVATION: _____ FEET</p> <p>NOTES:</p> <p>BORING AND GROUND SURFACE ELEVATIONS OBTAINED FROM '2721-1s.tin' FILE DATED 2/15/19</p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> <p>[Symbol] - PAVEMENT</p>
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COLOR																																																																																																																																																																																																							
<p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>																																																																																																																																																																																																							
EQUIPMENT USED ON SUBJECT PROJECT																																																																																																																																																																																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td> DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> _____ <input type="checkbox"/> _____ </td> <td> ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE _____ * STEEL TEETH <input type="checkbox"/> TRICONE _____ * TUNG.-CARB. <input checked="" type="checkbox"/> 6" THIN WALL CORE BIT <input type="checkbox"/> _____ </td> <td> HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input type="checkbox"/> -N _____ HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> _____ </td> </tr> </tbody> </table>				DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> _____ <input type="checkbox"/> _____	ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE _____ * STEEL TEETH <input type="checkbox"/> TRICONE _____ * TUNG.-CARB. <input checked="" type="checkbox"/> 6" THIN WALL CORE BIT <input type="checkbox"/> _____	HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input type="checkbox"/> -N _____ HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> _____																																																																																																																																																																																																	
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09/08/19

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 CONTRACT: U-5746

TIP PROJECT: U-5746

CONTRACT:

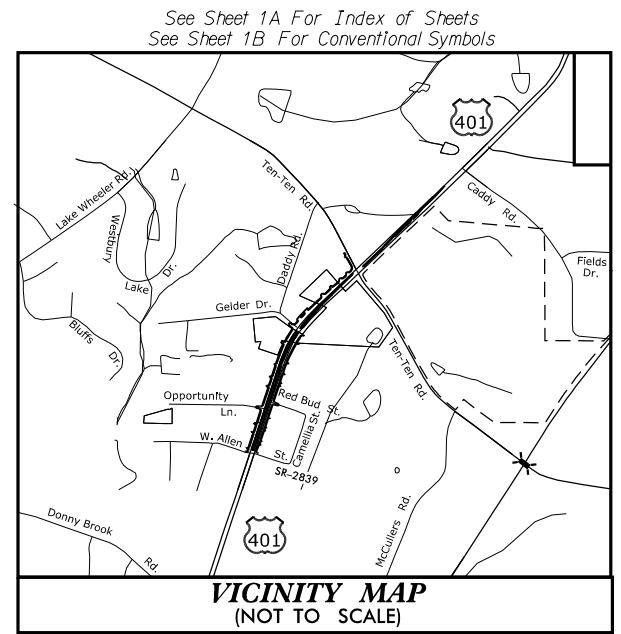
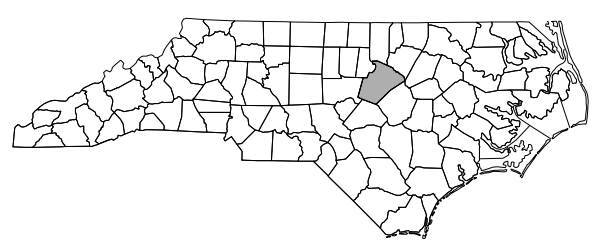
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY

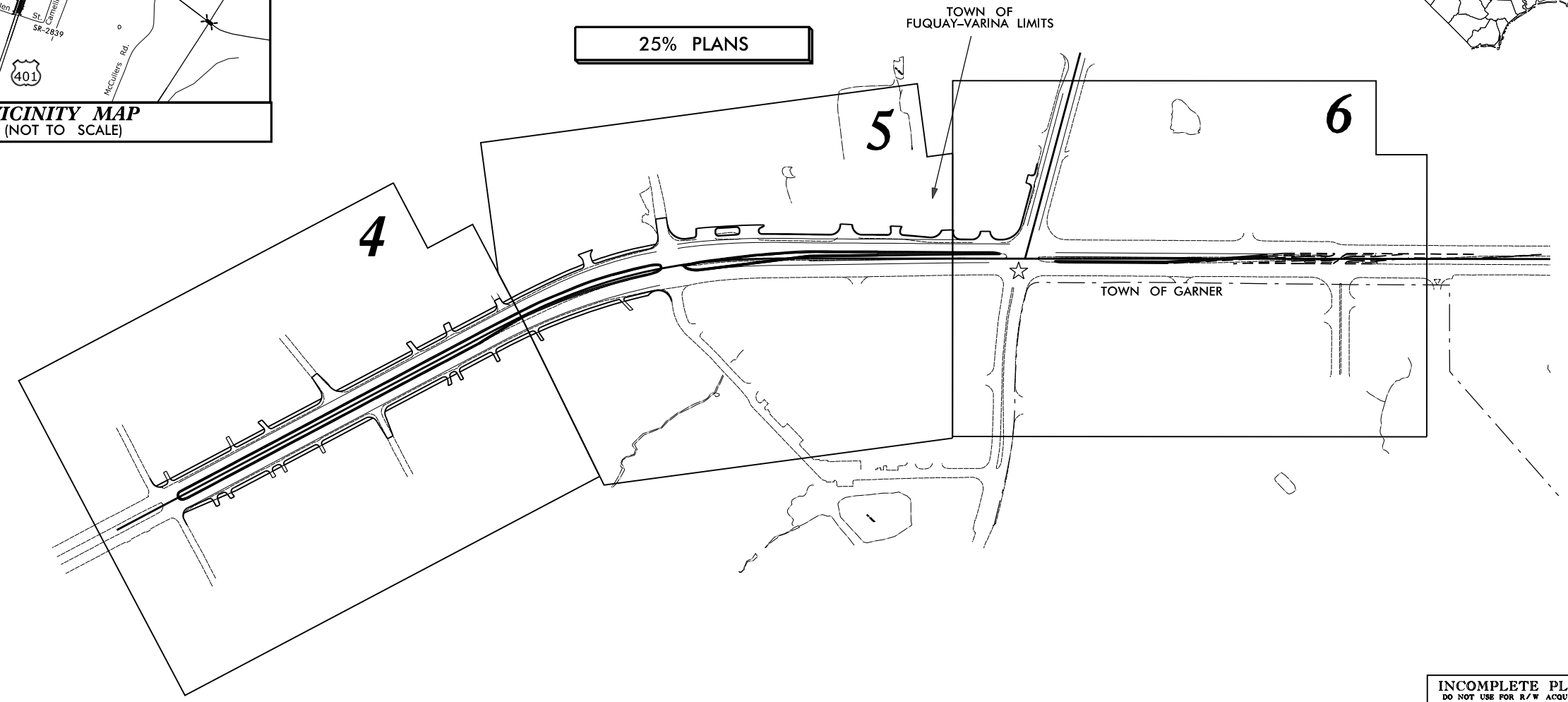
LOCATION: US 401 (FAYETTEVILLE RD) FROM SR 1467/2839 (ALLEN ST) TO NORTH OF SR 1010 (TEN-TEN RD)

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5746	3	9
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
54032.1.1	N/A	P.E.	



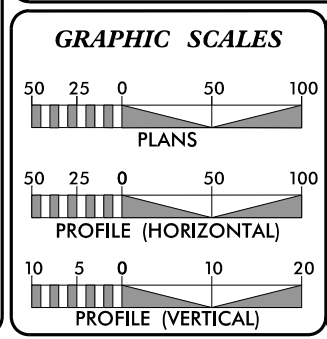
25% PLANS



THERE IS NO CONTROL OF ACCESS ON THIS PROJECT
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

☆ MODIFIED TRAFFIC SIGNAL

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



DESIGN DATA

ADT 2016 =	37,600
ADT 2040 =	60,200
K =	9 %
D =	70 %
T =	4 % *
V =	50 MPH
(* TTST 1% + DUAL 3%)	
FUNC CLASS =	RURAL ARTERIAL
STATEWIDE TIER	

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-5746 =	0.648 MILES
TOTAL LENGTH TIP PROJECT U-5746 =	0.648 MILES

Prepared by the Office of:
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

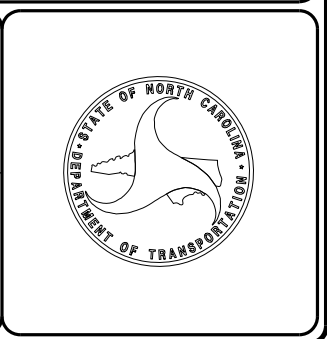
2018 STANDARD SPECIFICATIONS	PROJECT ENGINEER
RIGHT OF WAY DATE: MAY 17, 2019	CASEY HARRIS, PE
LETTING DATE: TBD	SEAN PEREIRA, EI PROJECT DESIGN ENGINEER
	BEN UPSHAW, PE NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



June 26th, 2024

STATE PROJECT: 54032.1.1

TIP NUMBER: U-5746

COUNTY: Wake

DESCRIPTION: US 401 (Fayetteville Rd) from SR 1467/2839 (Allen St) to North of SR 1010 (Ten-Ten Rd)

SUBJECT: Geotechnical Roadway Inventory report

PROJECT DESCRIPTION

The U-5746 project is designed to improve traffic flow and ease congestion at the intersection of US 401 (Fayetteville Rd) and SR 1010 (Ten-Ten Rd) in Wake County. The project consists of widening a portion of US 401 and SR 1010 from SR 1467/2839 (Allen St) to north of SR 1010 (Ten-Ten Rd). There are no structures to be designed as part of this project. The total project length is approximately 0.8 miles.

The field investigation was conducted in March of 2019 using a track mounted CME 45C with an automatic hammer. Standard Penetration Tests (SPT) were performed at selected locations. Borings were cored through the pavement using a thin-walled core bit, and then advanced with hollow stem augers. Hand augers were advanced in areas where utilities or other existing site features made equipment access impractical. Representative soil samples were collected and forwarded to an approved NCDOT M&T testing facility for soil quality analysis, moisture content, and AASHTO classification.

The following alignments were explored. Subsurface profiles and/or cross-sections of these alignments are included in this report.

Line	Station
-L-	11+57 to 45+78
-Y6-	12+93 to 21+76

Physiography and Geology

The project is located along the boundary between the Piedmont and Coastal Plain Physiographic Provinces. Geologically, it is located in an area where upland terrace deposits and Middendorf Formation soils overlie Piedmont residual soils and rock of the Raleigh Belt. Topography in the area is characterized by well drained, gently rolling hills.

Soil Properties

Soils encountered on the project site include roadway embankment and residual soils. Due to the shallow drilling depth of the borings, no weathered rock or crystalline rock was encountered.

Roadway embankment soils are present in the borings advanced on the shoulders and in the pavement of the existing roadways and typically consists of fine to coarse silty sand, clayey sand (A-2-4, A-2-6/7), clay (A-7-6), silt (A-4), and sand and gravel (A-1-b). These soils range from dry to moist in moisture content and vary in thickness from 1.0 to 2.9 feet.

Residual soils consisting of very loose to medium dense, coarse to fine sand and clayey to silty sand (A-3, A-2-4, A-2-6/7), medium stiff silt (A-4), and soft to very stiff, sandy clay (A-6, A-7-5/6) were encountered throughout the area. These soils range in moisture content from 11 to 21 percent, with Plasticity Index (PI) values between 13 and 16, and vary in thickness from less than one foot to 10.3 feet.

Ground Water


Borings were left open for at least 24 hours if possible to allow ground water levels within the borehole to equilibrate with the surrounding hydrologic conditions. Due to safety concerns, some of the borings had to be backfilled immediately after completion and no 24 hour water level could be obtained. Groundwater elevations ranged from approximately 415 feet to 386 feet. It should be noted that the groundwater levels fluctuate depending on seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

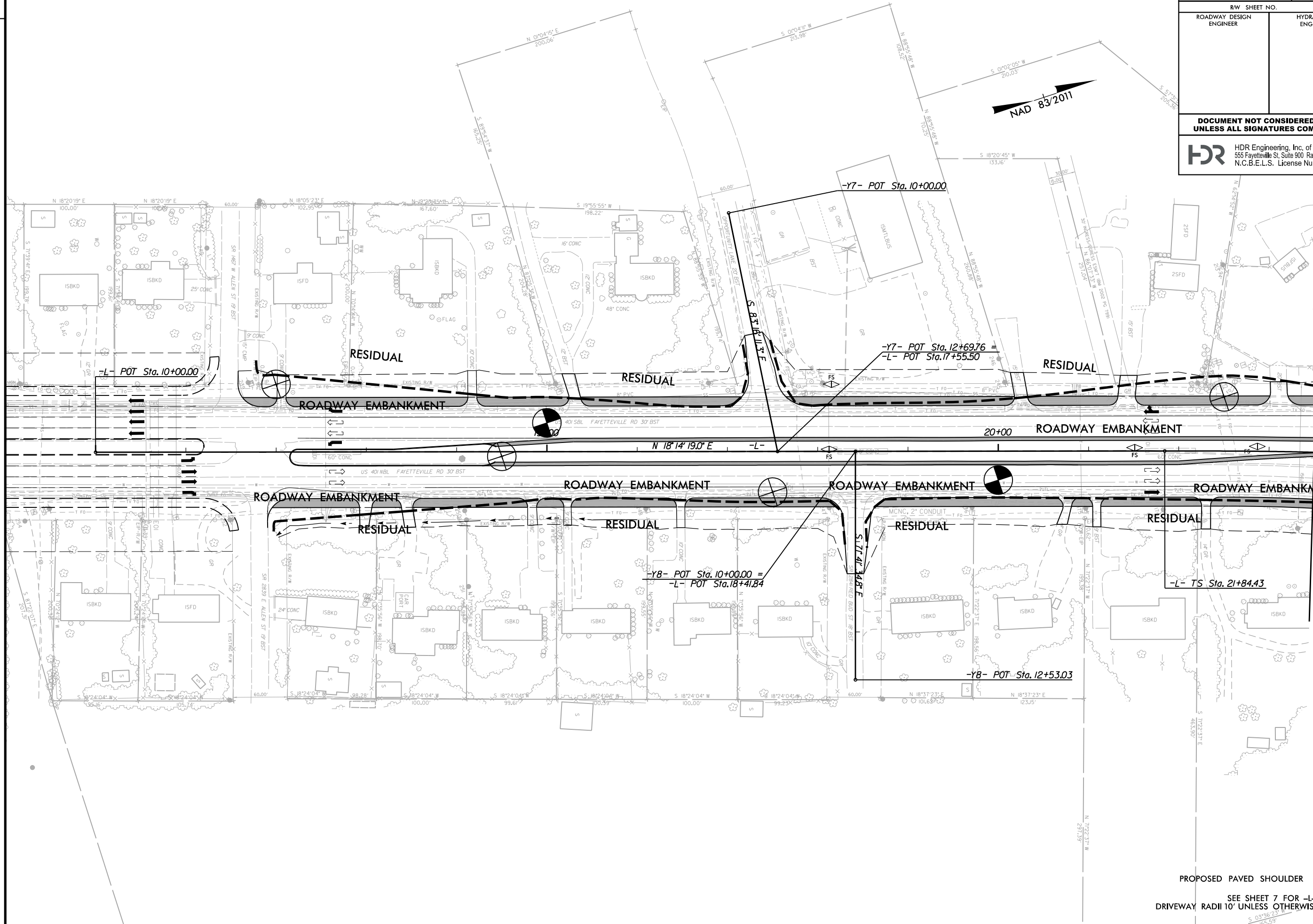
Sincerely,

HDR ENGINEERING, INC. OF THE CAROLINAS



Paul Zhang, Ph.D., P.E.
Senior Geotechnical Project Manager


PROJECT REFERENCE NO.		SHEET NO.	
U-5746		4	
RW SHEET NO.		HYDRAULICS ENGINEER	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
 HDR Engineering, Inc. of the Carolinas 555 Fayetteville St. Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116			

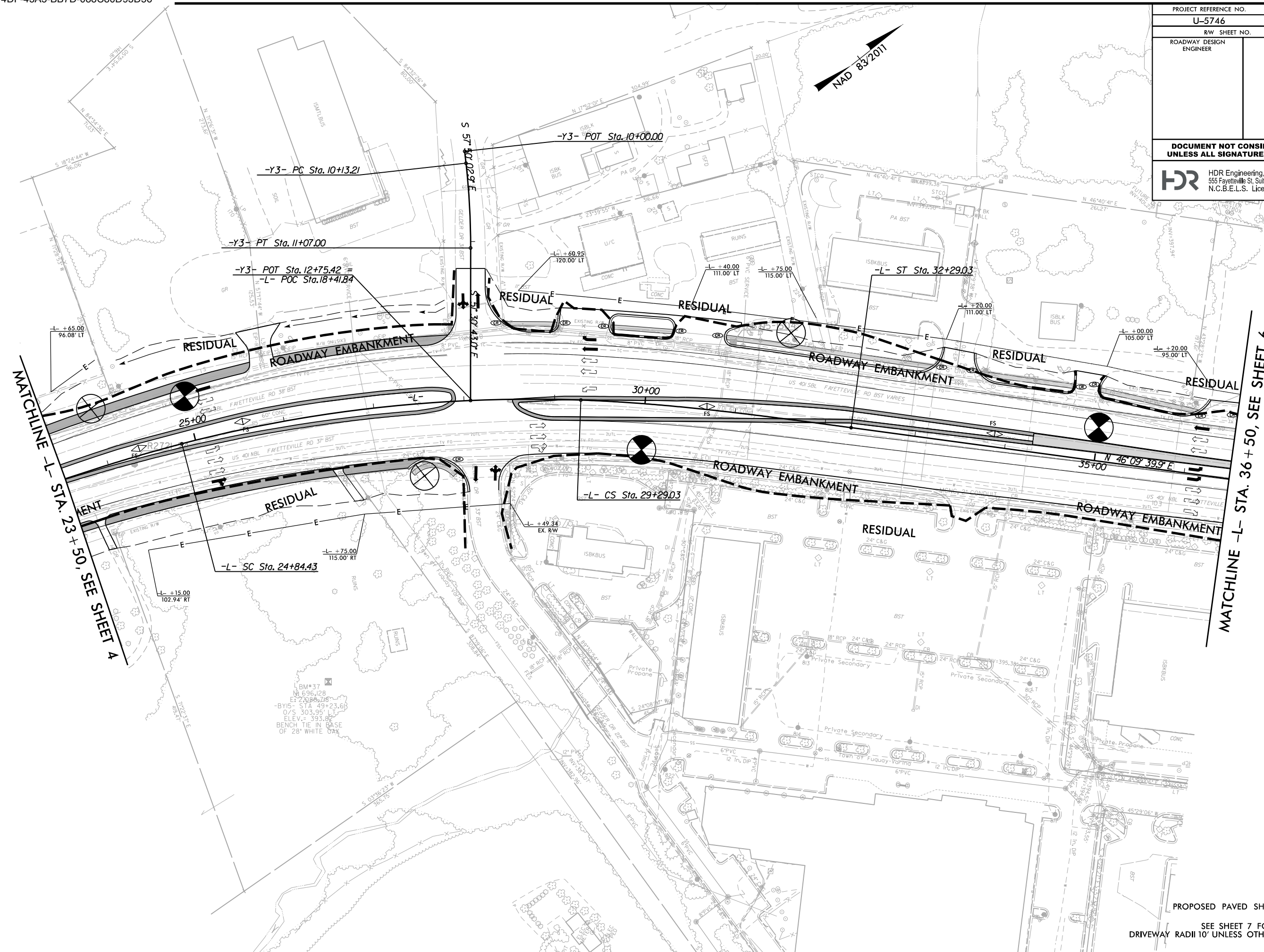


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 REVISIONS


MATCHLINE -L- STA. 23 + 50, SEE SHEET 5


PROPOSED PAVED SHOULDER
 SEE SHEET 7 FOR -L- PROFILE
 DRIVEWAY RADII 10' UNLESS OTHERWISE NOTED

PROJECT REFERENCE NO.		SHEET NO.	
U-5746		5	
RW SHEET NO.		HYDRAULICS ENGINEER	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
 HDR Engineering, Inc. of the Carolinas 555 Fayetteville St. Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116			



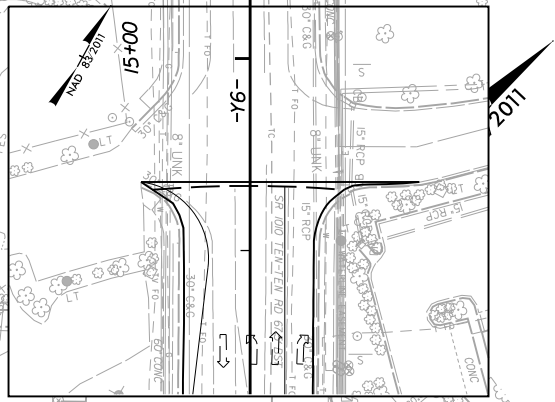
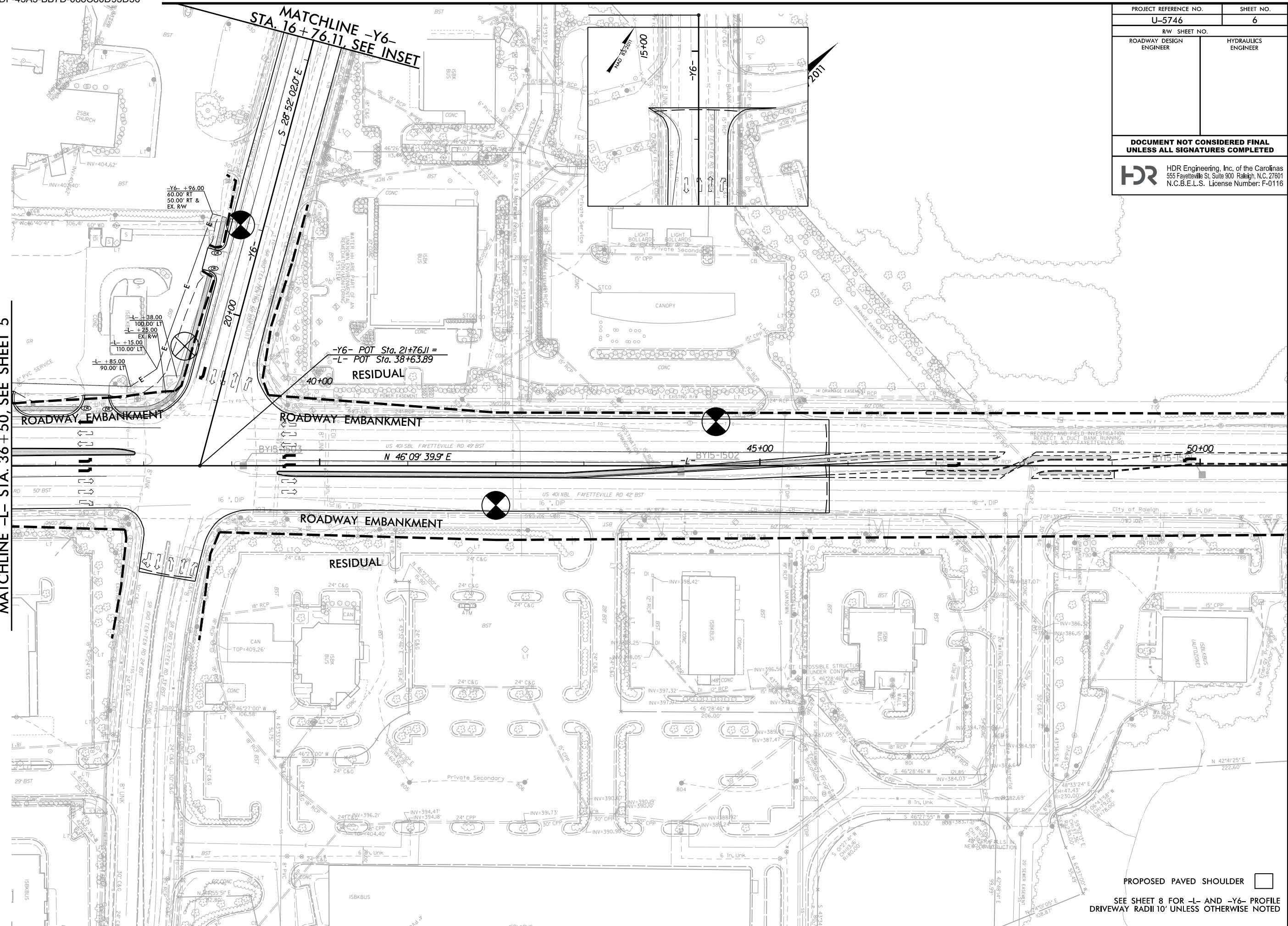
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 REVISIONS

PROPOSED PAVED SHOULDER 
 SEE SHEET 7 FOR -L- PROFILE
 DRIVEWAY RADII 10' UNLESS OTHERWISE NOTED

PROJECT REFERENCE NO.	SHEET NO.
U-5746	6
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
 HDR Engineering, Inc. of the Carolinas 555 Fayetteville St. Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116	

MATCHLINE -L- STA. 36 + 50, SEE SHEET 5

MATCHLINE -Y6- STA. 16 + 76.11, SEE INSET



PROPOSED PAVED SHOULDER

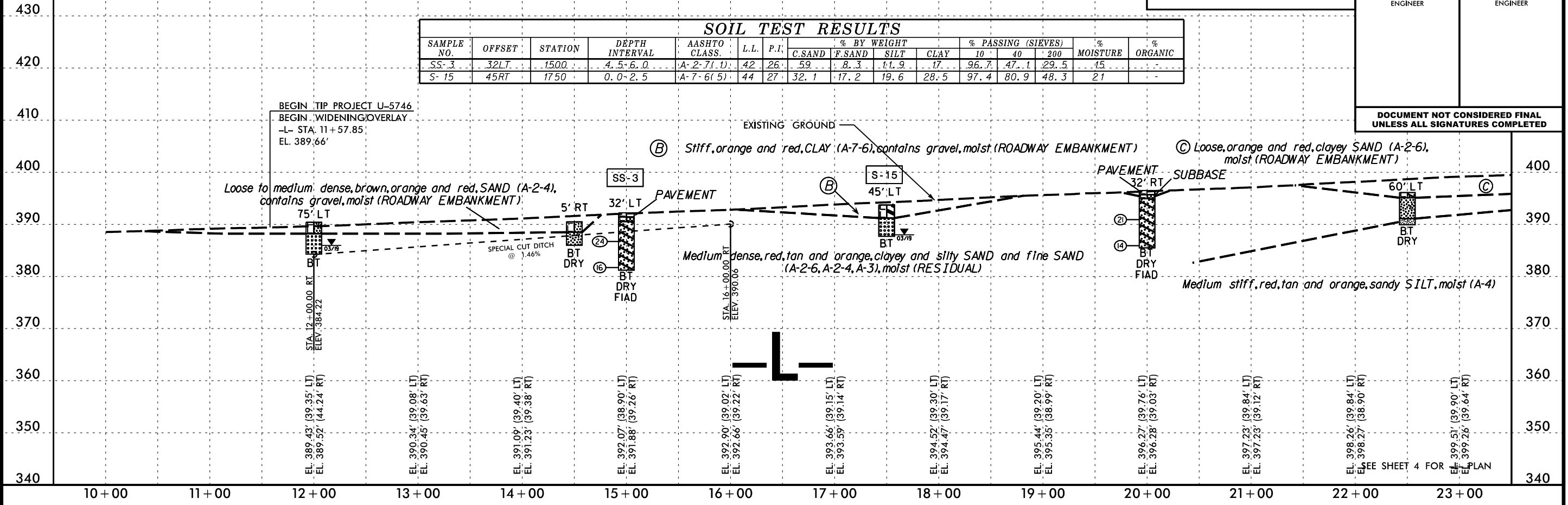
SEE SHEET 8 FOR -L- AND -Y6- PROFILE
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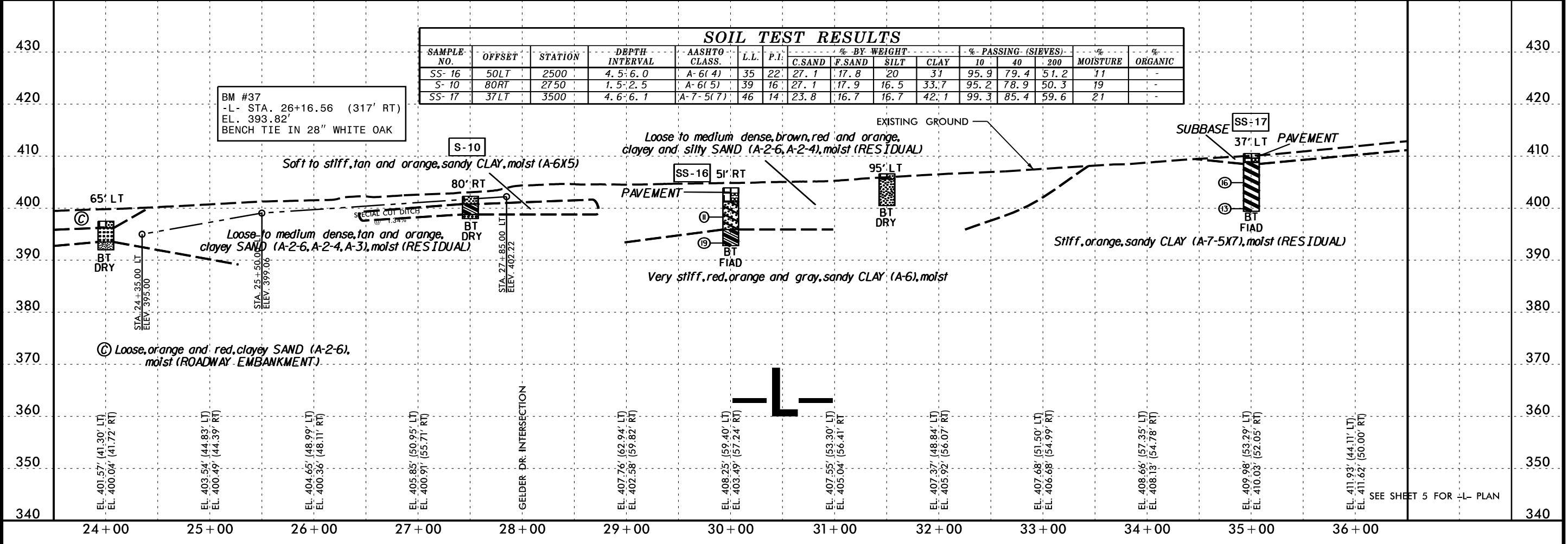
REVISIONS

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U-5746	7
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

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	CLAY	10	40	200		
SS-3	32LT	1500	4.5-6.0	A-2-7(1)	42	26	59	8.3	11.9	17	96.7	47.1	29.5	15	-
S-15	45RT	1750	0.0-2.5	A-7-6(5)	44	27	32.1	17.2	19.6	28.5	97.4	80.9	48.3	21	-



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	CLAY	10	40	200		
SS-16	50LT	2500	4.5-6.0	A-6(4)	35	22	27.1	17.8	20	31	95.9	79.4	51.2	11	-
S-10	80RT	2750	1.5-2.5	A-6(5)	39	16	27.1	17.9	16.5	33.7	95.2	78.9	50.3	19	-
SS-17	37LT	3500	4.6-6.1	A-7-5(7)	46	14	23.8	16.7	16.7	42.1	99.3	85.4	59.6	21	-

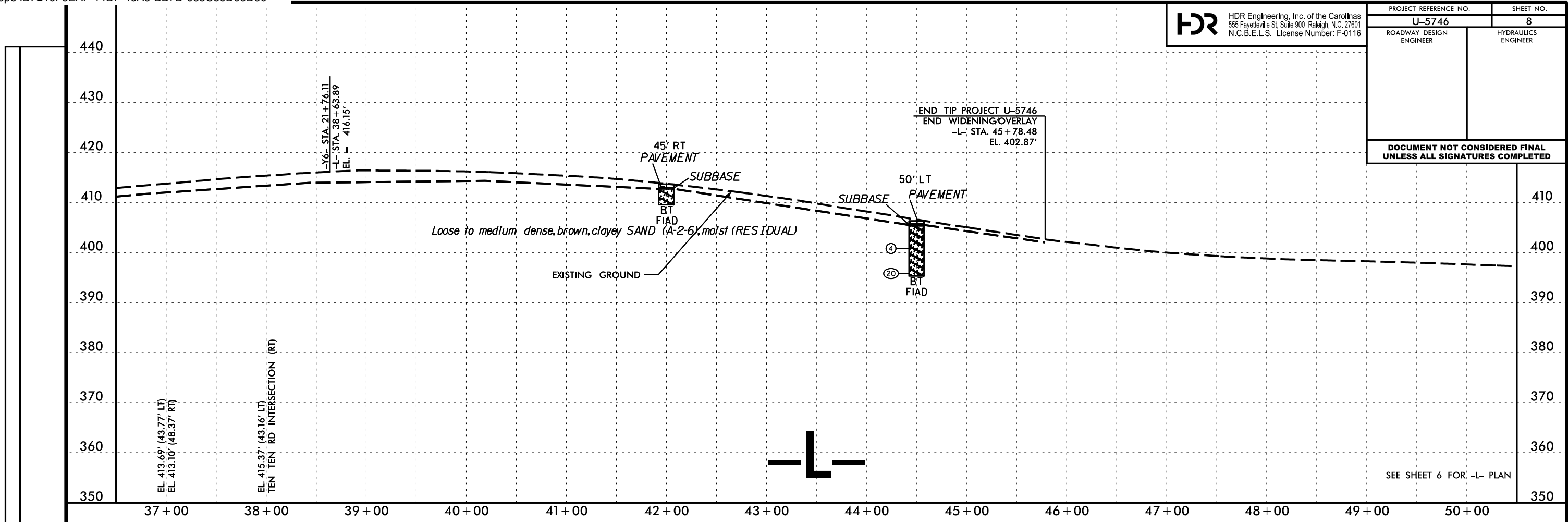


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REVISIONS

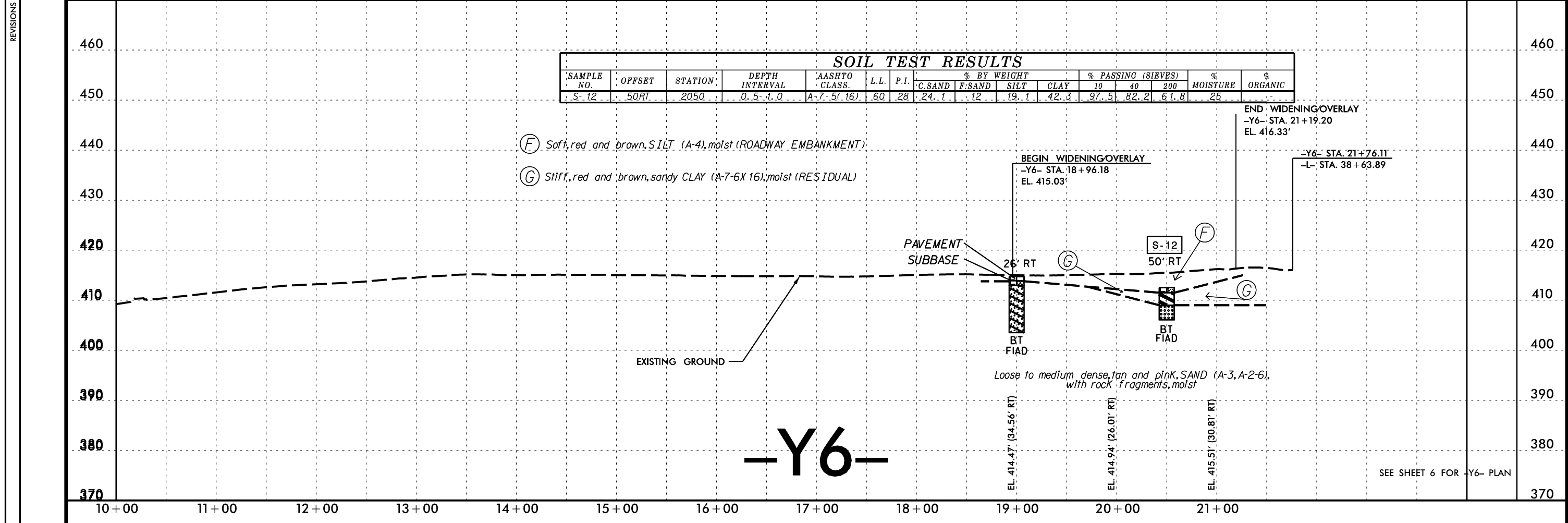
SEE SHEET 5 FOR -L- PLAN

PROJECT REFERENCE NO. U-5746	SHEET NO. 8
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



SOIL TEST RESULTS

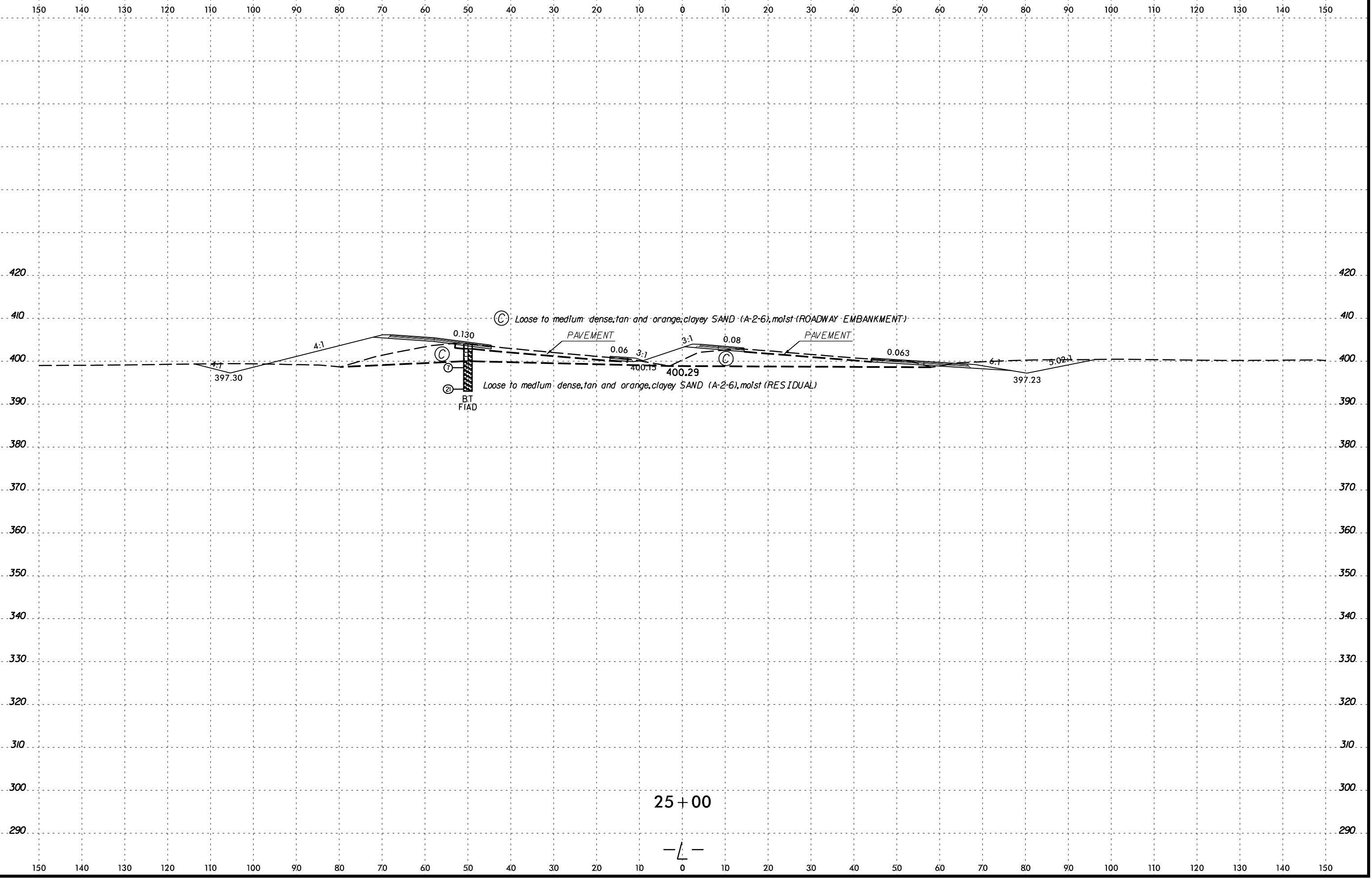
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-12	50RT	2050	0.5-1.0	A-7-5(16)	60	28	24.1	12	19.1	42.3	97.5	82.2	61.8	25	



PLOT DRIVER: \$PLTDVRS\$
 USER: \$USER\$
 FILE: \$FILE\$
 DATE: \$DATE\$
 TIME: \$TIME\$
 PENTABLE: \$PENTBL\$
 \$\$\$\$

REVISIONS

SEE SHEET 6 FOR Y6- PLAN



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PENTABLE: \$PENTBL\$
 TIME: \$TIME\$

DATE: \$DATE\$

25 + 00

