SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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REFERENCE

SHEET NO. **DESCRIPTION** LEGEND (SOIL & ROCK) SUPPLEMENTAL LEGEND, GSI TABLES SITE PLAN

CROSS SECTIONS

LINE	STATION	<u>SHEETS</u>
-L-	15+00-30+85	6-10
-RABI-	11+00-13+00	11
-RAB2-	11+00-12+75	12
-RPA-	14+00	13
-RPB-	14+50	14
-RPC-	12+00-14+00	15
-RPD-	15+00	16

APPENDICES

APPENDIX

<u>TITLE</u> LABORATORY TEST RESULTS

SHEETS

STATE OF NORTH CAROLINA

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY DAVIDSON

PROJECT DESCRIPTION REPLACE BRIDGE NO. 58 ON NC 109 OVER US 64

INVENTORY

\sim m) S 4 PROJEC

STATE PROJECT REFERENCE NO. STATE TOTAL SHEETS NO. B-5777 N.C 1

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) TOT-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAIL

CENERAL SOL 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 BORNOS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-FLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DECREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLL 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 UBSUIFACE 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 CONSTRUCTIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDENSATIONS FOR ON RESULTING THE SUBFIRING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES: I. 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. 2. BY HAVING REQUESTED THS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAMS 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

- 399DBE42874A494URE

Amanda R. Suttle

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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06/12/2024

DATE

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
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	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTE ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK.
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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT ROCK (WR) 100 BLOWS PER FOOT IF TESTED.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE
CLASS. (≤ 35%, PASSING *200) (> 35%, PASSING *200) Orderate (HereLine) GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	RUCK (CR) GNEISS, GABBRO, SCHIST, ETC.
CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTA ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL
SYMBOL COCCORDENCE CONTRACTOR CONTRACTO	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT
7 Passing	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SANDS SPT REFUSAL ROCK TYPE INCLUDES LIMESTONE, SANDS
*10 50 MX *40 30 MX 50 MX 51 MN SOILS SOILS CLAY PEAT	PERCENTAGE OF MATERIAL	
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL <u>SOILS OTHER MATERIAL</u>	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.
PASSING *40	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY C (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER H
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 11 MN 11 MN 11 MN 10 MX 11 MN 11 MN 11 MN MODERATE ORGANIC	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.
GRUUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NU MX AMUUNIS UF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO RO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL
OF MAIOR CRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR UNSUITABLE	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLA DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH
AS SUBGRADE LACECULAR TO GOOD FRINT TO TOUL POOR FOUL ONOT TOUL PI OF A-7-5 SUBGRAUP IS ≤ LL - 30 + PI OF A-7-6 SUBGRAUP IS > LL - 30 PI OF A-7-6 SUBGRAUP IS > LL - 30 PI OF A-7-6 SUBGRAUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL F SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE L
COMPACTNESS OF RANGE OF STANDARD RANGE OF UNCONFINED		(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND
PRIMARY SOIL TYPE CONFIGURESS ON PENETRATION RESISTENCE COMPRESSIVE STRENGTH CONSISTENCY (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND E
VERY LODSE < 4		(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS 4
GENERALLY LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A		TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER OUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS AR
VERT DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	INFERRED SOIL BOUNDARY	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N V</u>
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0 MATERIAL STIFF 8 TO 15 1 TO 2	TIETTE INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4		SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS ALSO AN EXAMPLE.
		ROCK HARDNESS
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMEN
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT ZUNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BI
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DE
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE D BY MODERATE BLOWS.
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE O
SOIL MOISTURE - CORRELATION OF TERMS	CLCLAY MODMODERATELY γ -UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_{d} -DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD POINT OF A GEOLOGIST'S PICK.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN
(ATTERBERG LIMITS) DESCRIPTION GOIDE FOR FILED MOISTONE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT,) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS SPLIT SPOON F - FINE SL SILT, SILTY ST SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK.
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCH FINGERNAIL.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING
	HI HIGHLY V - VERY RATIO	TERM SPACING TERM
- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED WIDE 3 TO 10 FEET THICKLY BEDDED 1
OM _ OPTIMUM MOISTURE - MOIST - KM/ SOLID; HT OK KEHK OFTIMUM MOISTORE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.1
		CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.0 VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.00
- DRY - (D) ATTAIN OPTIMUM MOISTURE	CME-55 CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED <
PLASTICITY	■	INDURATION
PLASTICITY INDEX (PI) DRY STRENGTH	CME-750X HARD FACED FINGER BITS X -N Q2	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HE
NON PLASTIC Ø-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY PLASTIC 16-25 MEDIUM	CASING X W/ ADVANCER	CRAINS CAN BE SERADATED FROM SAMPLE WITH ST
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.
COLOR		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL DIFFICULT TO BREAK WITH HAMMER.
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	X CORE BIT VANE SHEAR TEST	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE SAMPLE BREAKS ACROSS GRAINS.

PROJECT REFERENCE NO.

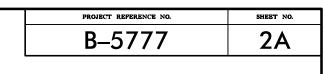
B-5777

ED. AN INFERRED	
D SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
1 FOOT PER 60 IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
T N VALUES >	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.
OCK THAT NCLUDES GRANITE,	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.
AL PLAIN IF TESTED. TC.	$\underline{\text{COLLUVIUM}}$ - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
MAY NOT YIELD STONE, CEMENTED	$\frac{\text{CORE}}{\text{BY TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED}{\text{BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.}$
	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
RINGS UNDER	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
COATINGS IF OPEN. HAMMER BLOWS IF	DIPLOTEL: DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
OCK UP TO AL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
R BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
IS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
AY. ROCK HAS H AS COMPARED	PARENT MATERIAL.
IT HS COM HILD	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FELDSPARS DULL LOSS OF STRENGTH	F <u>ORMATION (FM.)</u> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ARE KAOLINIZED	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
RE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
of strong rock T only minor <i>Values < 100 BPF</i>	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
S. SAPROLITE IS	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.
NS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BLOWS REQUIRED	<u>SILL</u> - 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 BEODING OR SCHISTOSITY OF THE INTRUDEO ROCKS.
DEEP CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D BLOWS OF THE	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.
N FRAGMENTS NT. SMALL, THIN	<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
. PIECES 1 INCH HED READILY BY	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:
THICKNESS	BM-I (N737693 EI673323)
4 FEET 1.5 - 4 FEET	STA. 23+07, 121' RT ELEVATION: 779.6 FEET
.16 - 1.5 FEET	NOTES:
03 - 0.16 FEET 108 - 0.03 FEET	ROADWAY DESIGN FILES, DTM FILE PROVIDED BY NCDOT.
< 0.008 FEET	
EAT, PRESSURE, ETC.	NORTHING AND EASTINGS OBTAINED USING A TRIMBLE GEO7X. ELEVATIONS FOR BRIDGE BORINGS OBTAINED USING BENCHMARK
2, I NESSONE, E I C.	BM-I (N737693 EI673323)
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

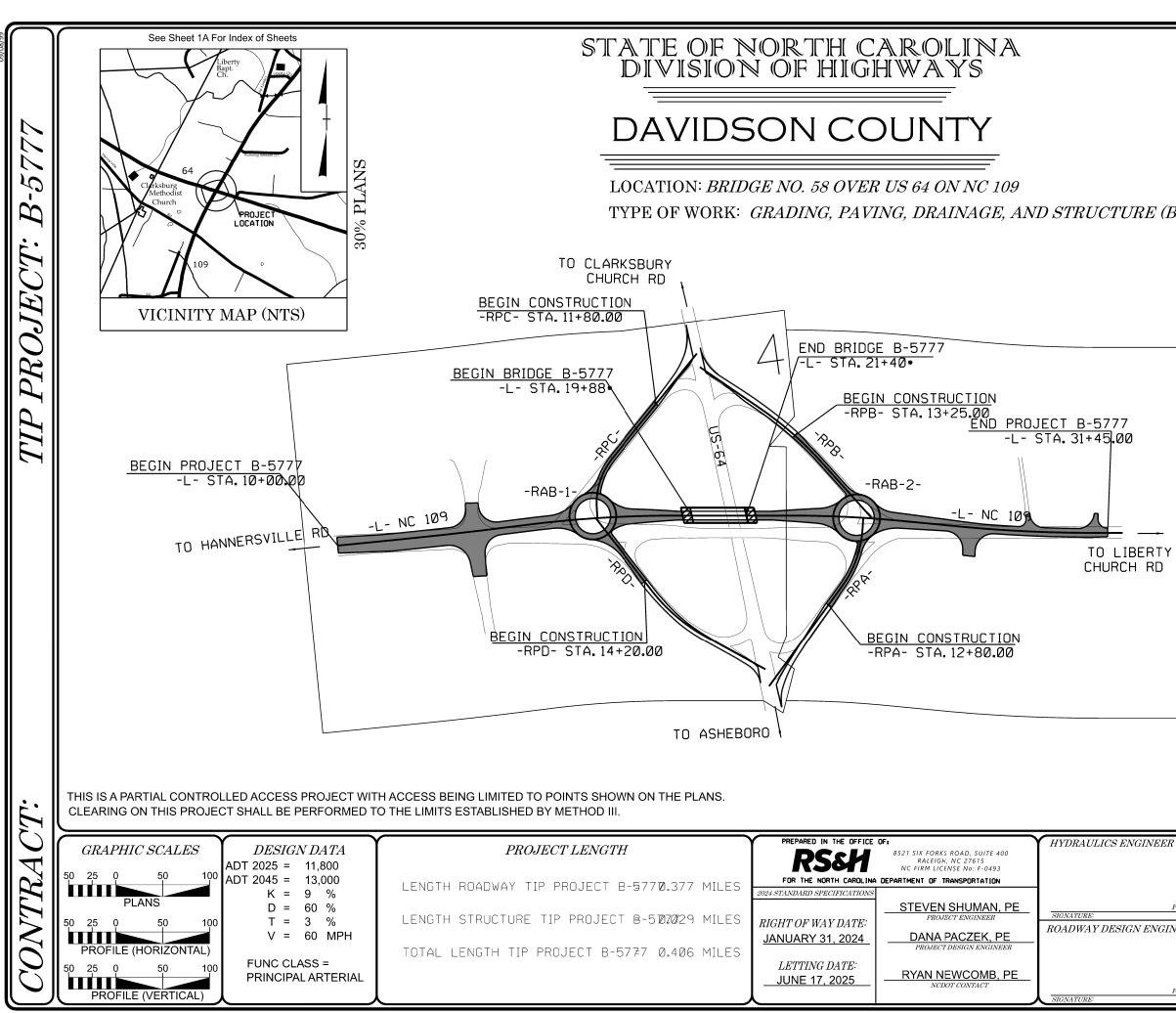
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed P	Rock Mass (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4-2 $-$ Determination of GSI for T	
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed F GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fail poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.	
STRUCTURE		REASING SU		ALITY	COMPOSITION AND STRUCTURE		
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	
BLOCKY - well interlocked un- disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 60				B. Sand- stone with thin inter-	
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			layers of siltstone amounts stone layers	
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C. D. E. and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H .	
discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers	
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Into small rock pr	



Tectonically Defo	ormed Heteroo	geneous Rock	Masses (Marır	nos and Hoek	, 2000)		
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings		
E. Weak siltstone or clayey shale with sandstone layers	70 60	A 50 B 40	с [30	D E			
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DATE: 8-19-16



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## ECS Southeast, LLC

1812 Center Park Drive, Suite D Charlotte, NC 28217 T 704.525.5152 | F 704.357.0023 www.ecslimited.com

## May 14, 2024

The following alignments are included as a part of this investigation:

		Line	<u>Statio</u>
WBS NO:	45733.1.1	-L- (NC 109)	10+00
TIP NO:	B-5777	-RPA-	10+26
PROJECT ID:	43907	-RPB-	10+00
COUNTY:	Davidson	-RPC-	10+00
DESCRIPTION:	Replace Bridge No. 58 on NC 109 over US 64	-RPD-	10+00
		-RAB1- (NC 109)	10+00
SUBJECT:	Geotechnical Report – Inventory	-RAB2- (NC 109)	10+00

## **Project Description**

The project consists of the replacement of Bridge No. 58 on NC 109 over US 64 in Thomasville, Davidson County, North Carolina. As a part of the replacement, a portion of NC 109 (-L- alignment), from Station 10+00 to Station 31+45 for an overall length of 2,145 feet (0.406 miles) will be realigned to the northwest to incorporate the new bridge structure. Roadway improvements will be made to Ramp A (-RPA- alignment), Ramp B (-RPB- alignment), Ramp C (-RPC- alignment), and Ramp D (-RPD- alignment) as well as the addition of two (2) new roundabouts (-RAB1-, -RAB2-) where they intersect with NC 109.

A new 150-foot long, 2-span bridge will be constructed on NC 109 (-L- alignment) over US64. The bridge will be located on new alignment and will begin at Station 19+89 and end at Station 21+39. The new bridge will likely be founded on a deep foundation system consisting of driven steel piles at the end bents and spread footings at the interior bent. Mechanically Stabilized Earth (MSE) walls will be constructed at the bridge abutments.

The provided roadway plans generally indicate new maximum embankment fill heights of approximately 15 feet along the -L- and -RAB2- alignments, and maximum cut depths of approximately 3 feet along the -L- and -RPD- alignments. Slopes are planned to be oriented at a 2:1 (horizontal:vertical) geometry.

A geotechnical field investigation was performed by ECS between April 2024 and May 2024. During this time period, a total of twenty-three (23) standard penetration test (SPT) roadway/structure borings were advanced using a Diedrich D-70 drill rig equipped with an automatic hammer. Representative soil samples were collected for visual classification in the field and selected for laboratory analysis by ECS's NCDOT approved testing laboratory.

#### Physiography and Geology

The site is located in the Carolina Slate Belt within the Piedmont Physiographic Province of North Carolina. In accordance with the Geologic Map of North Carolina, 1985, the predominant rock types under this site are mapped meta-argillite, interbedded with metasandstone, metaconglomerate and metavolcanic rock. Weathered rock and non-crystalline rock encountered during this investigation consists of Meta-Argillite. The virgin soils are the residual product of in-place chemical weathering of rock that was similar to the rock presently underlying the site.

#### **Soil Properties**

Soils within the area of this project have been divided into five categories: surficial materials (topsoil), roadway embankment, and residual soils.

Surficial Materials: The surficial organic soils (topsoil/rootmat) that were encountered ranged in thickness from approximately 0.1 to 0.6 feet.

**Roadway Embankment:** Roadway Embankment (R.E.) soils from the previous bridge construction are present throughout the project and generally consist of very dense, fine to coarse sandy gravel (a-1-b), medium dense, fine to coarse silty sand (A-2-4); medium stiff to hard, fine to coarse sandy/clayey silt (A-4, A-5); and stiff, slightly to highly plastic, sandy/silty clay (A-6, A-7-5/6). Varying amounts of gravel and asphalt were encountered throughout the roadway embankment soils. The roadway embankment extends to depths up to approximately 18.5 feet below existing grades. Laboratory testing of the Roadway Embankment soils indicated PI's ranging from 5 to 9 for the silty (A-4) soils, and PI's ranging from 12 to 30 for the clayey (A-7-5/6) soils.

**Residual Soils:** Residual soils were encountered throughout the project corridor are derived from the weathering of the underlying parent bedrock. The residual soils encountered generally consist of stiff to hard, fine to coarse sandy/clayey silt (A-4, A-5); and medium stiff to very stiff, slightly to moderately plastic,

tion (±) 00 to 31+45 +26 to 15+46 00 to 16+40 +00 to 15+50 +00 to 16+42 +00 to 14+08 00 to 14+08

sandy/silty clay (A-6, A-7-5). Varying amounts of rock fragments were encountered throughout the residual soils. Laboratory testing of the residual soils indicated a PI of 9 for the silty (A-4, A-5) soils, and PI's ranging from 15 to 23 for the clayey (A-6, A-7-5) soils.

## **Rock Properties**

**Weathered Rock:** The top of the weathered rock varied significantly along the corridor and was encountered at depths ranging from approximately 0.0 to 18.5 feet below the existing ground surface; corresponding to elevations ranging from approximately 780.5 feet to 755.8 feet. The weathered rock encountered generally consists of Meta-Argillite.

**Non-Crystalline Rock:** The top of the crystalline rock varied significantly along the corridor and was encountered at depths ranging from approximately 2.4 to 38.6 feet below the existing ground surface; corresponding to elevations ranging from approximately 778.7 feet to 743.2 feet. The non-crystalline rock encountered generally consists of Meta-Argillite.

## **Groundwater Properties**

At the time of drilling, Groundwater was encountered in one (1) boring at depth of approximately 36.3 feet below the existing ground surface; corresponding to an approximate elevation 745.6 feet. After a stabilization period of at least 24 hours, groundwater was encountered in three (3) borings at depths ranging from approximately 8.5 to 15.4 feet below the existing ground surface; corresponding to elevations ranging from approximately 768.7 to 762.1 feet. The recovered soil samples were generally described as moist above the groundwater level and moist below the groundwater level.

## **Areas of Special Geotechnical Interest**

1) <u>High Plasticity Soils</u>: The following areas contain high plasticity soils with plasticity indices (PI's) in excess of 25. High plasticity soils have the potential to cause subgrade instability during construction, embankment stability or long term settlement problems.

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	26+50 to 28+00	LT

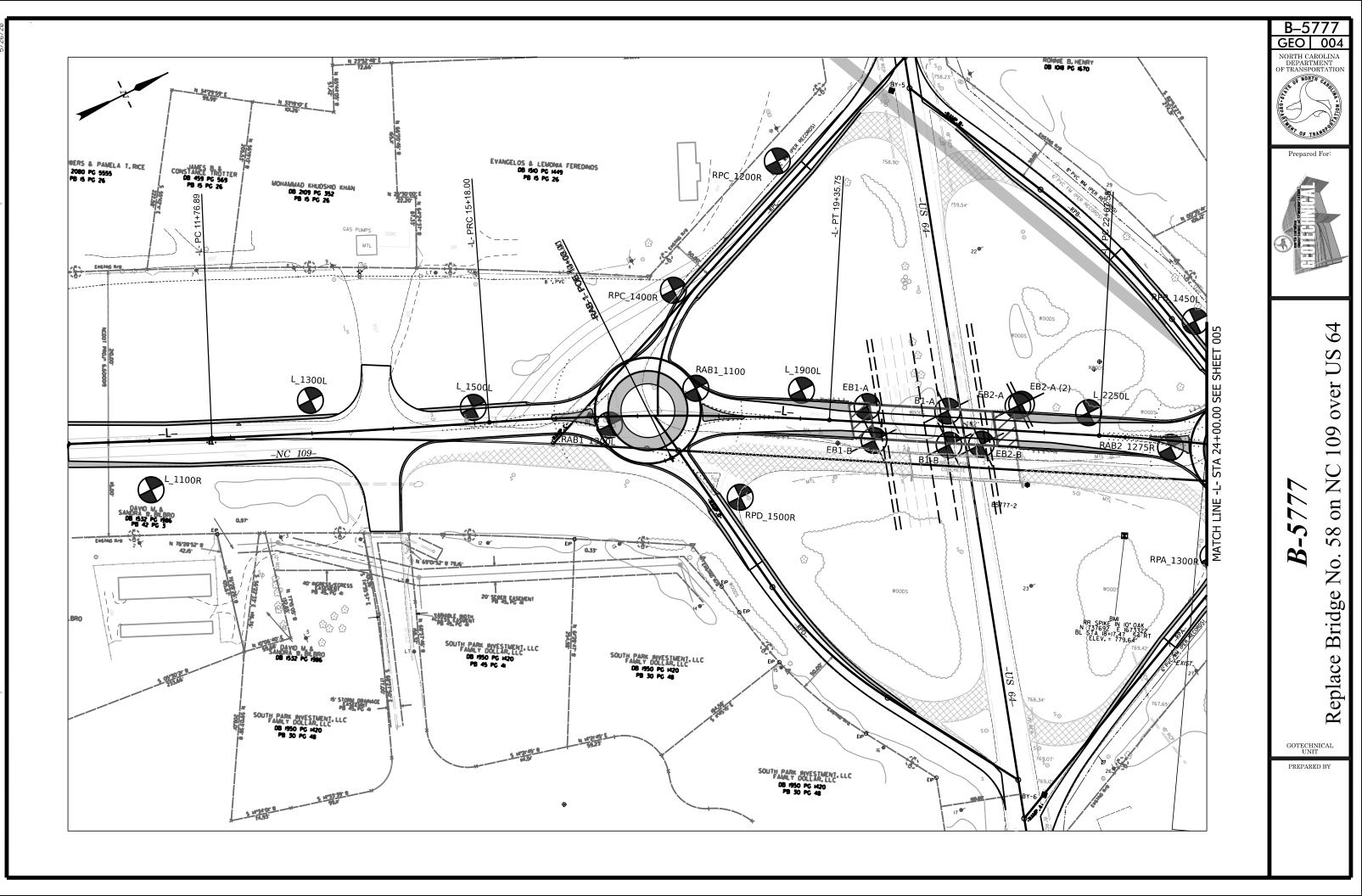
2) <u>Shallow Rock</u>: The following areas were found to contain rock above or within 6 feet of proposed subgrade:

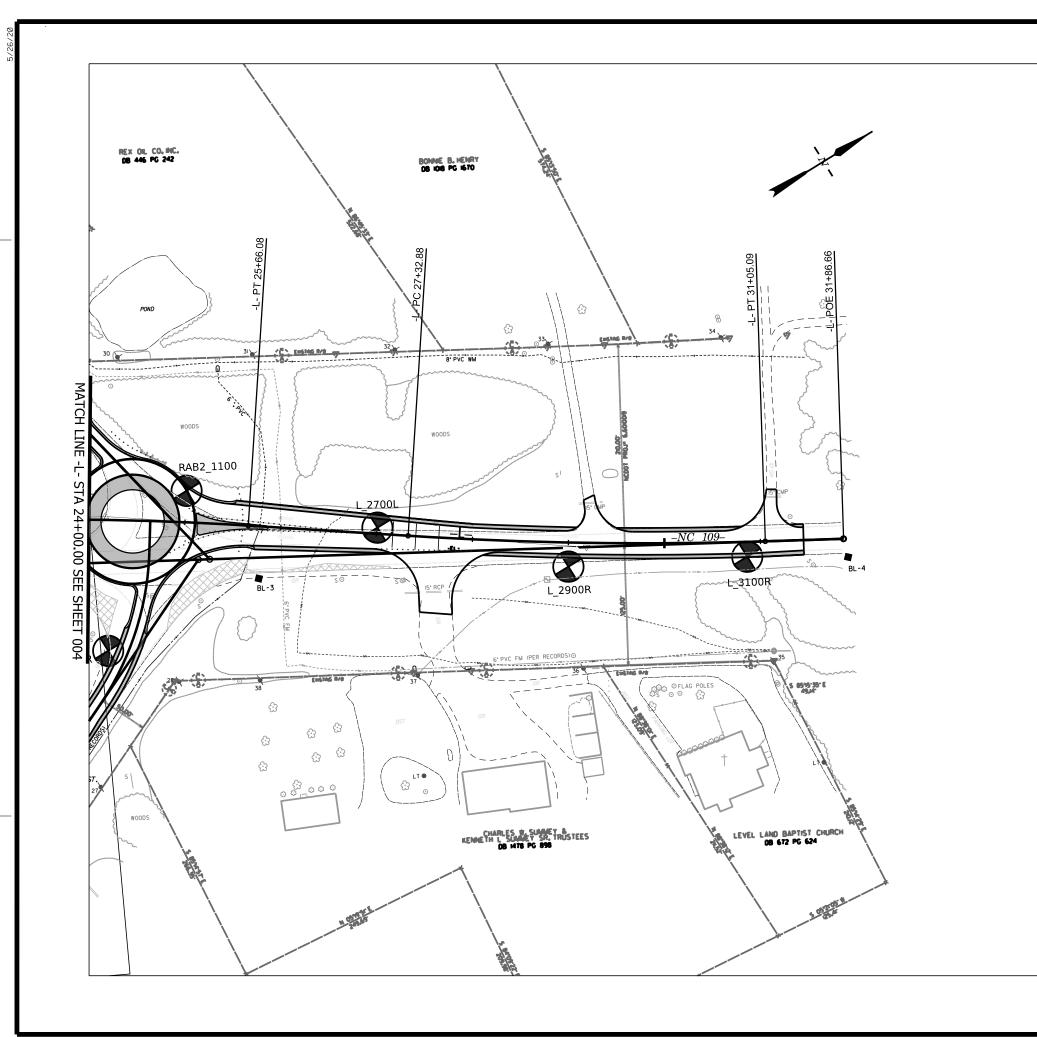
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-RPC-	11+50 to 12+50	RT
-RPD-	14+25 to 15+50	RT

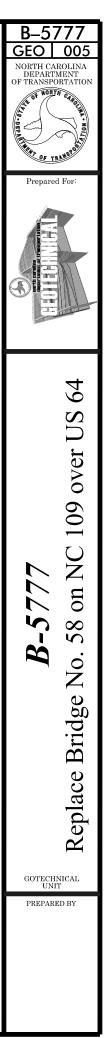
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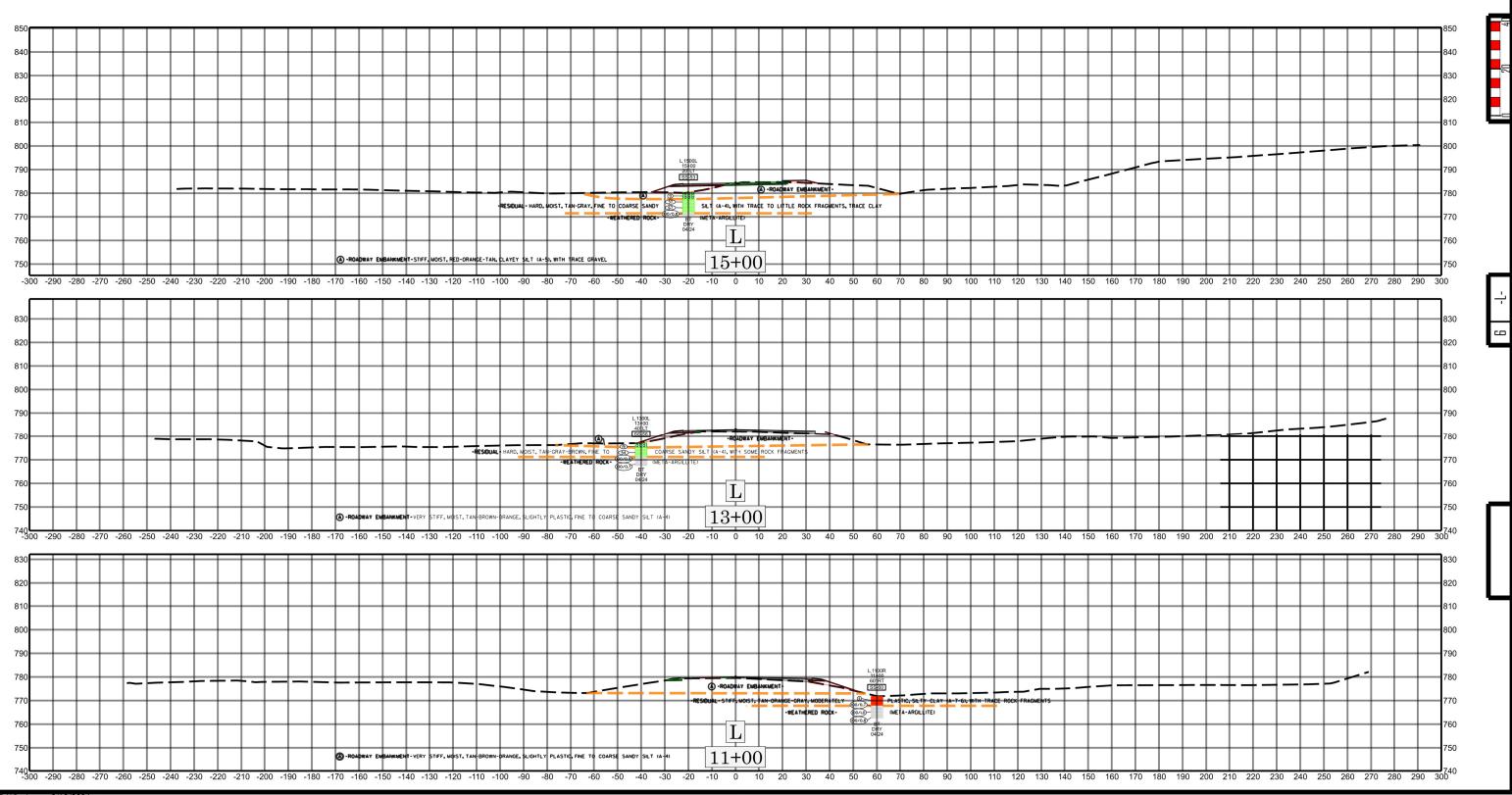
Iman Ja K. Suttle Amanda R. Suttle, P.G. Project Geologist Molianmed I. Mulla Molianmed I. Mulla Mohammed A. Mulla, P.E. Principal Engineer

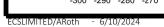
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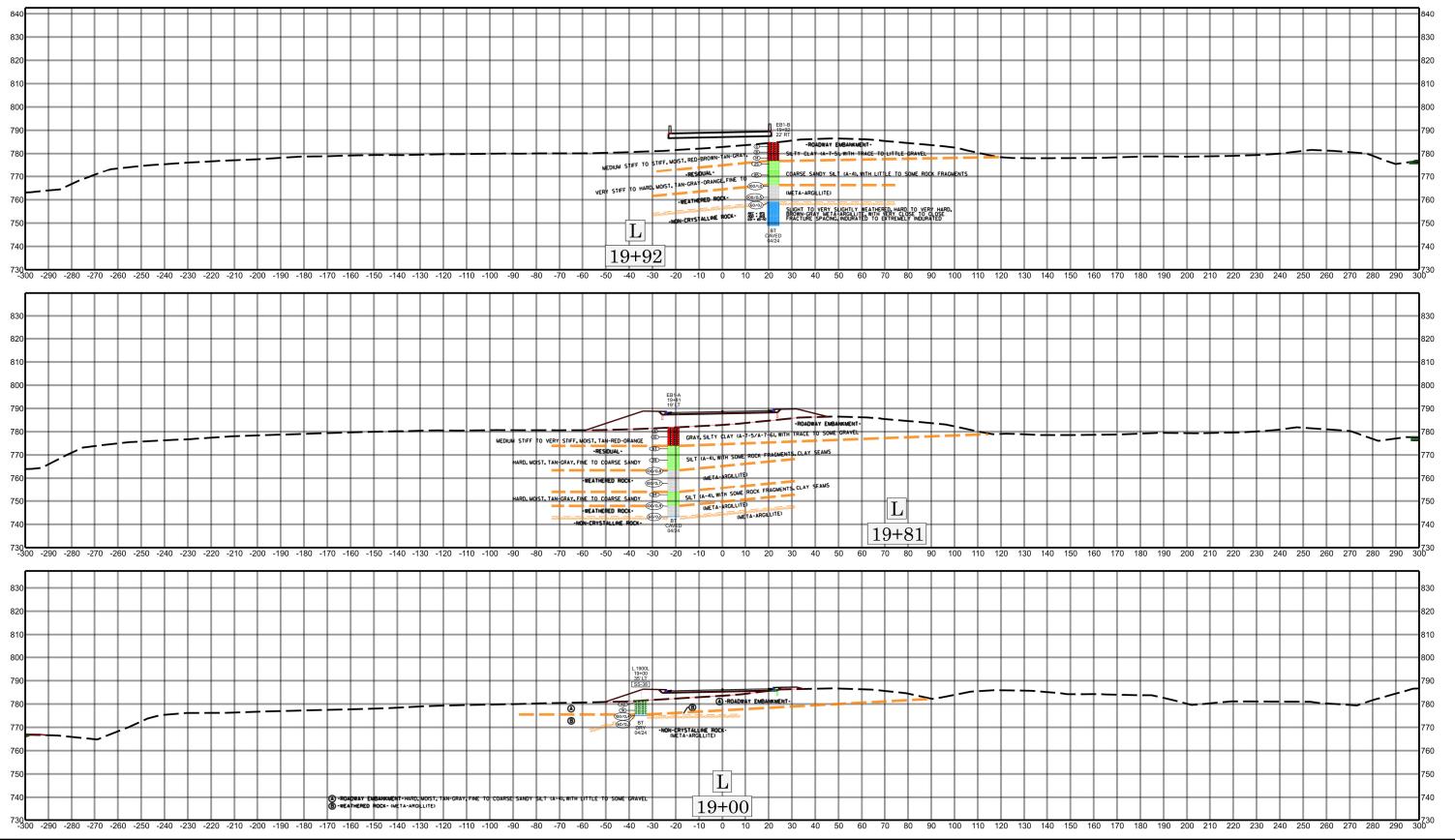


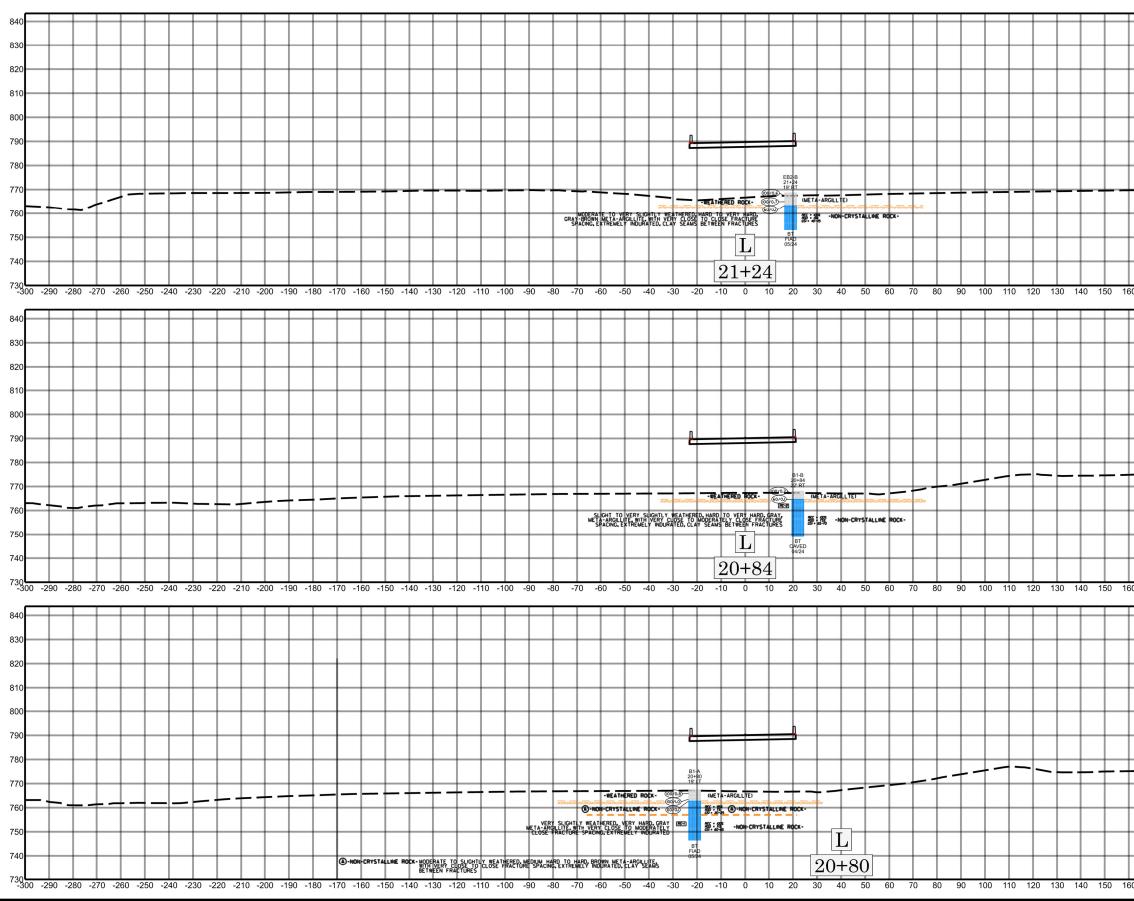




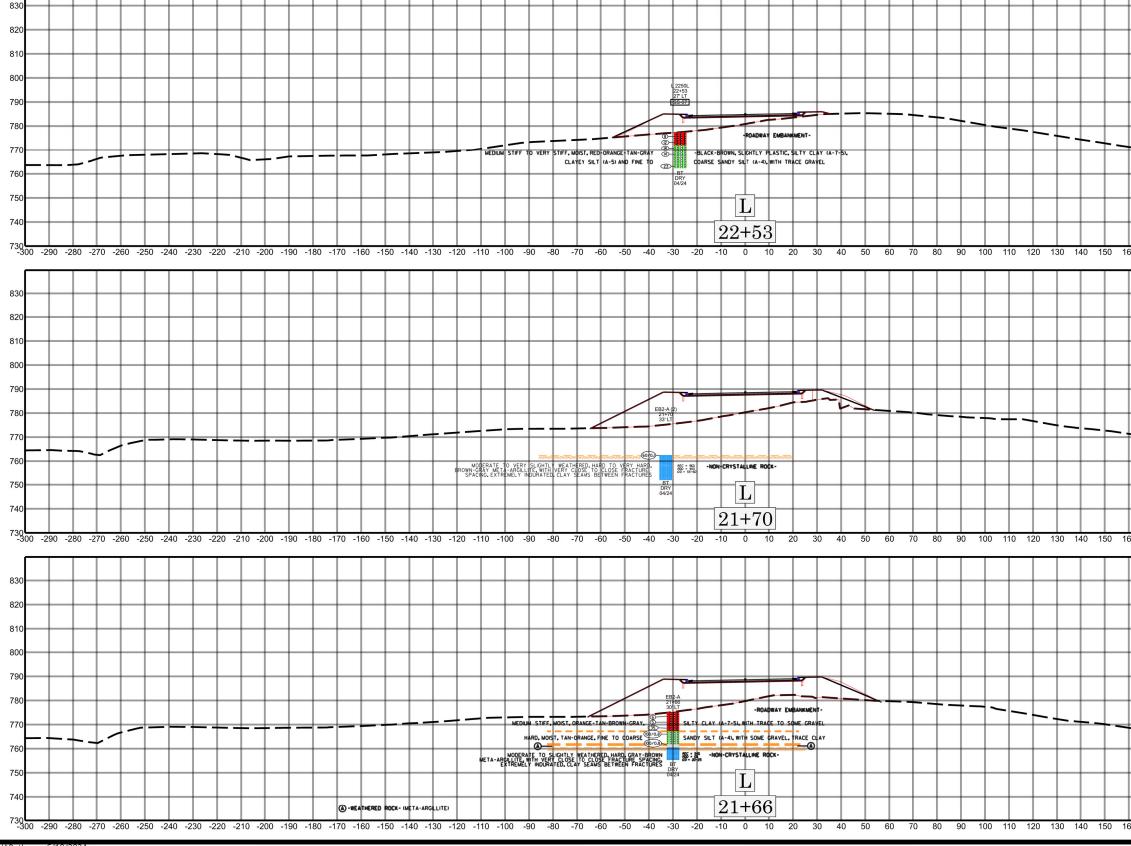








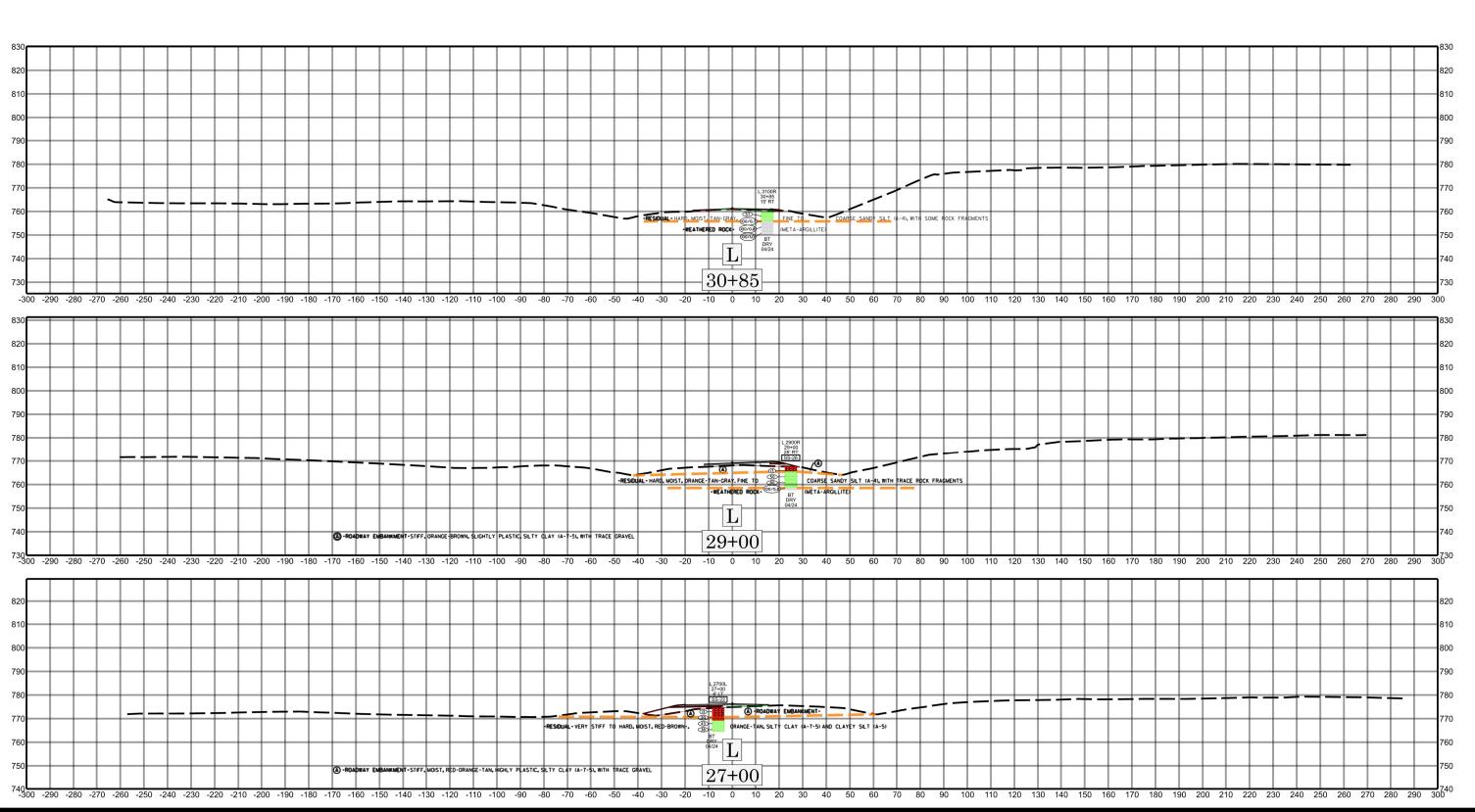
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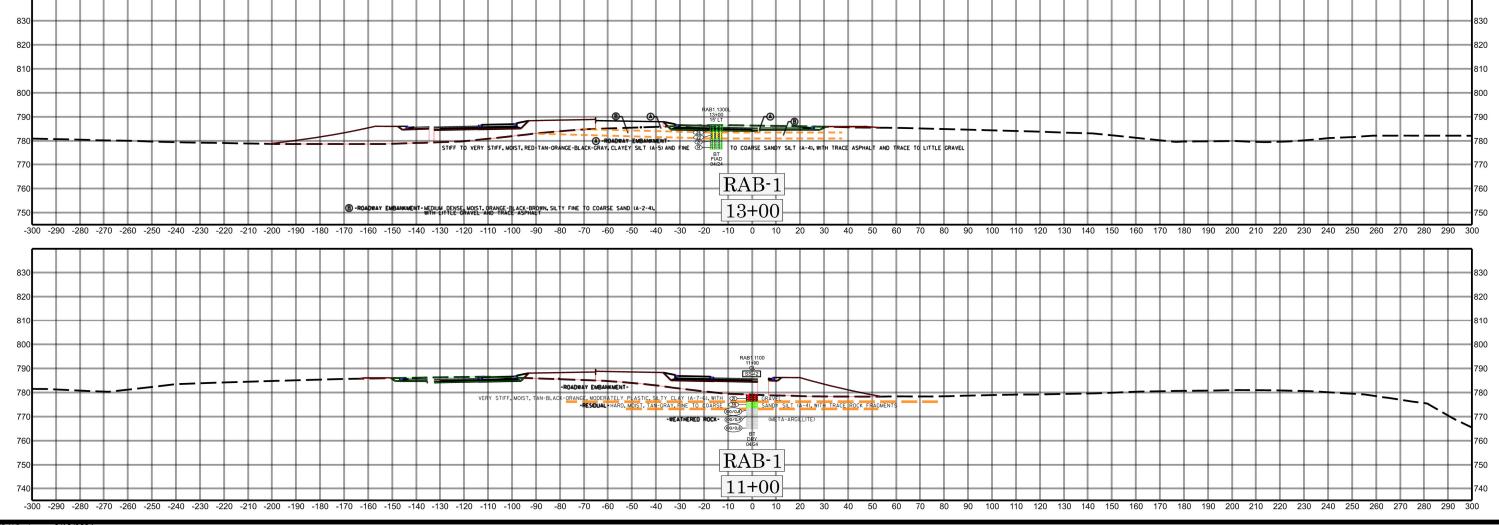


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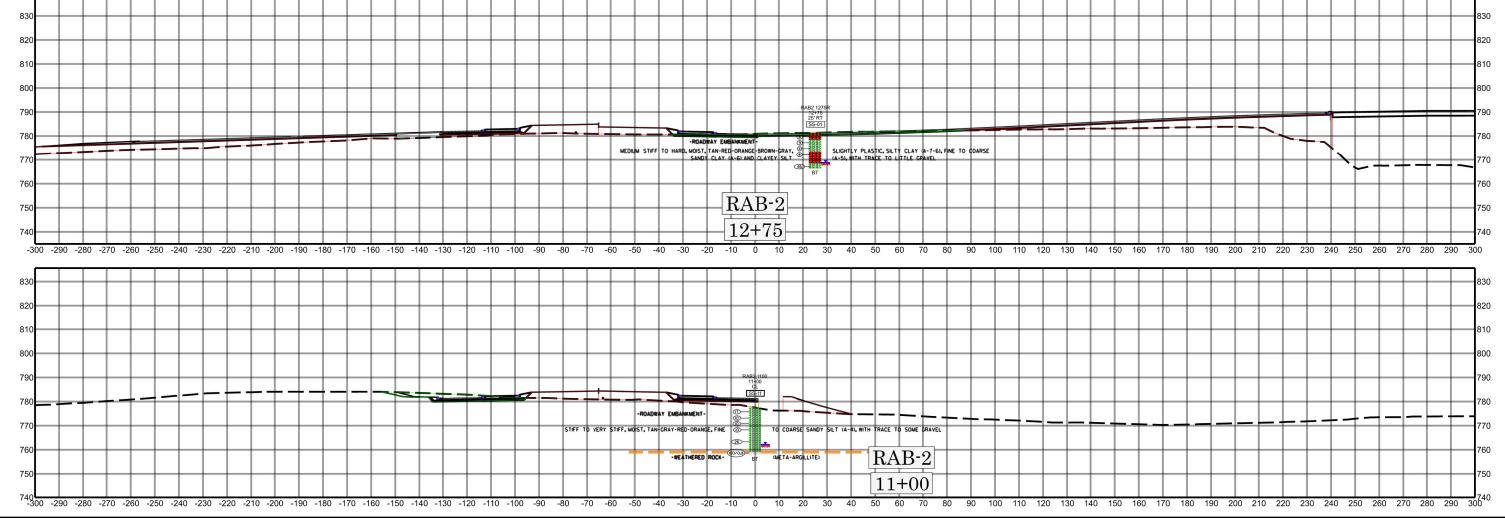


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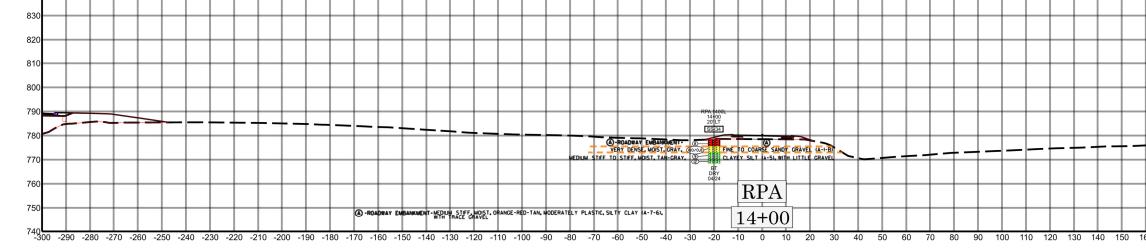








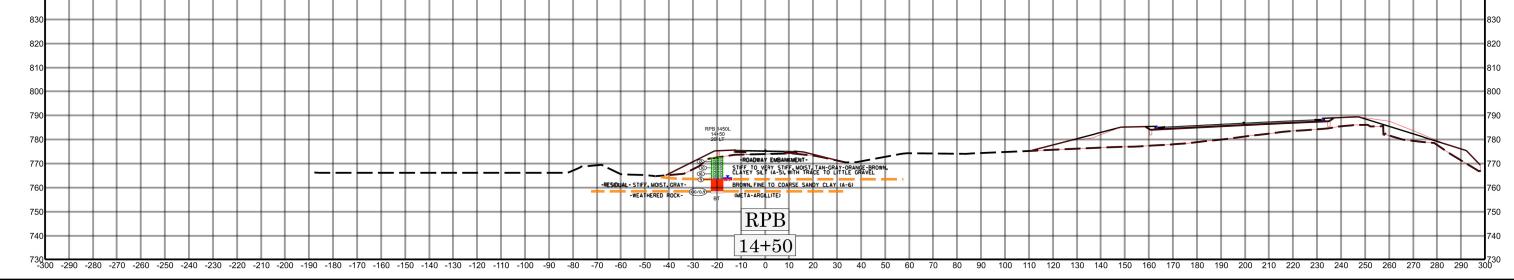






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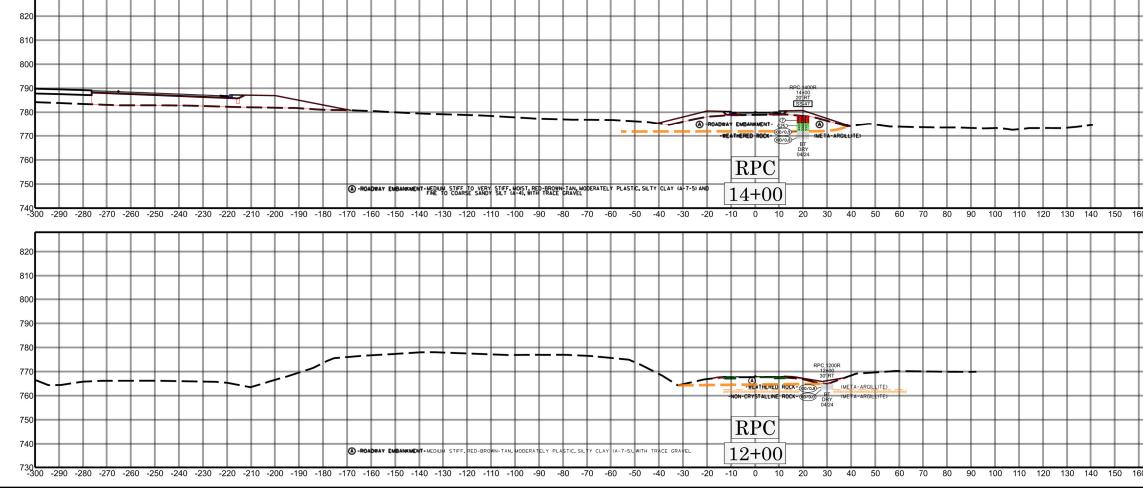
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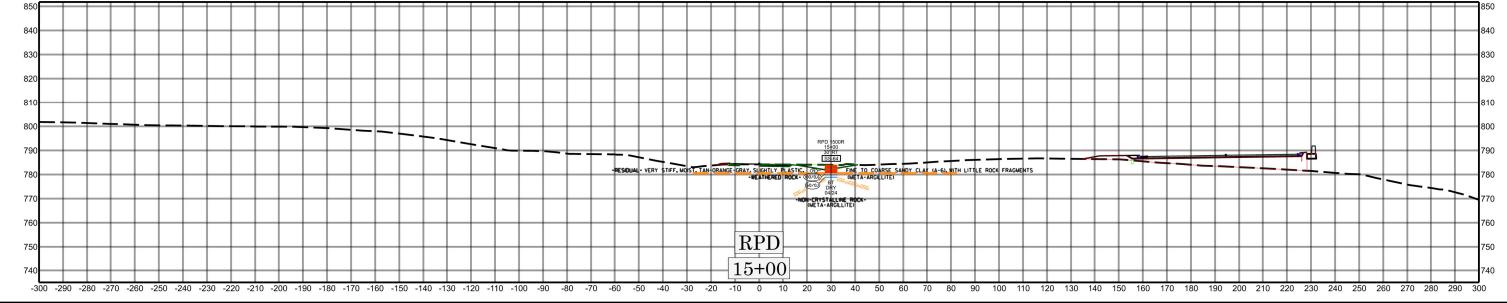
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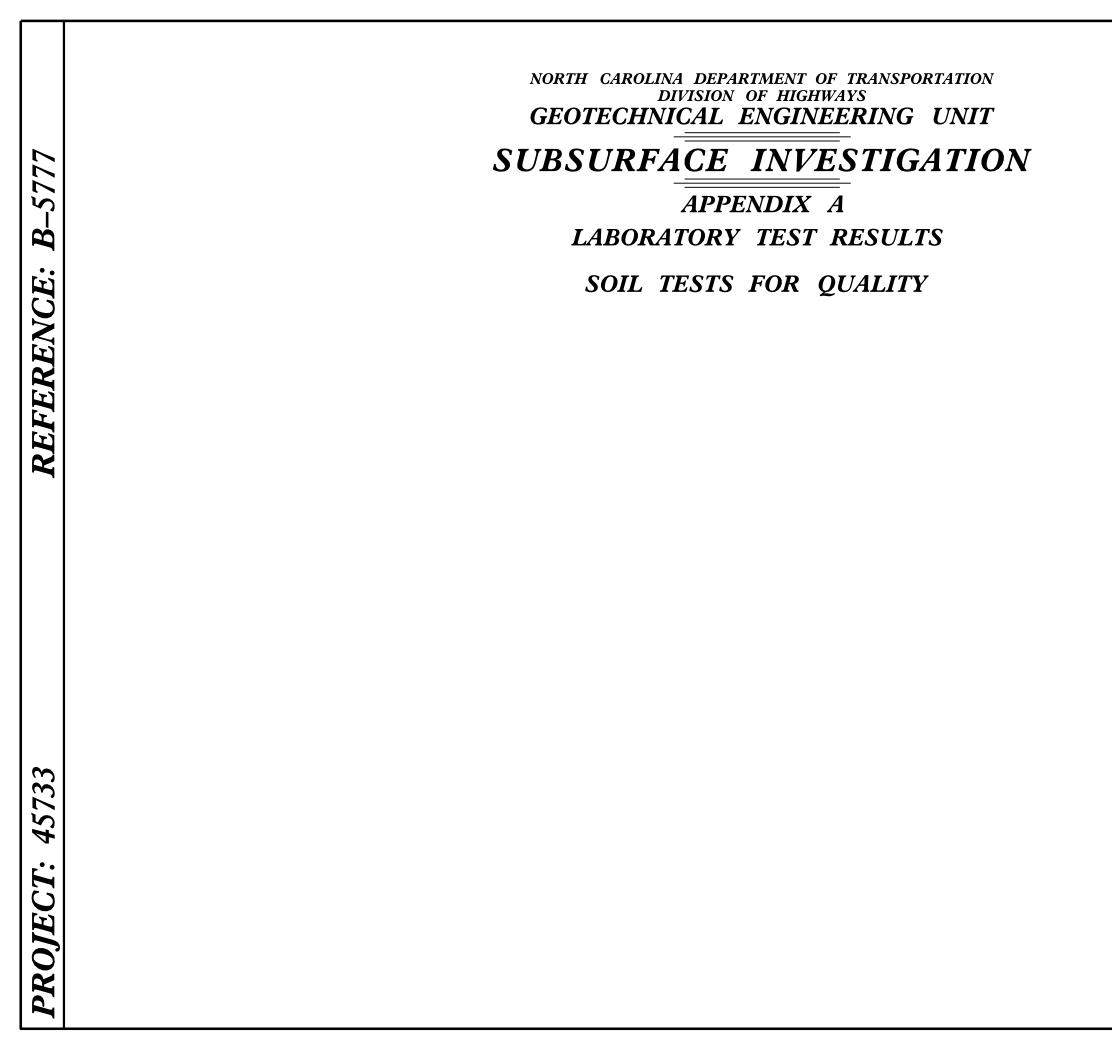


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L_1100R	SS-60	60' RT	11+00 -L-	1.0-2.5	A-7-6(16)	51	23	28.3	2.2	25.2	44.3	80.3	72.8	70.0	11.3	-
L_1300L	SS-56	40' LT	13+00 -L-	1.0-2.5	A-4(9)	35	9	10.7	1.5	53.5	34.3	97.0	90.1	88.1	14.8	-
L_1500L	SS-53	20' LT	15+00 -L-	3.5-5.0	A-4(10)	37	9	3.6	0.9	72.0	23.5	99.8	96.9	95.5	12.1	-
L_1900L	SS-38	35' LT	19+00 -L-	1.0-2.5	A-4(2)	26	5	13.8	12.1	57.1	17.0	96.7	88.8	77.9	9.9	-
L_2250L	SS-07	27' LT	22+53 -L-	3.5-5.0	A-7-5(18)	46	15	3.1	1.1	48.8	47.0	<i>99.3</i>	97.4	96.1	25.1	-
L_2700L	SS-22	6' LT	27+00 -L-	1.0-2.5	A-7-5(36)	61	30	0.9	1.5	40.4	57.2	100.0	99,3	97.6	33.9	-
L_2900R	SS-26	25' RT	29+00 -L-	1.0-2.5	A-7-5(15)	42	12	1.4	0.9	62.5	35.2	<i>99.5</i>	98.9	97.9	18.2	-
RAB1_1100	SS-42	CL	11+00 -RAB1-	1.0-2.5	A-7-6(8)	41	17	36.6	6.7	29.8	26.9	97.6	67.3	57.9	14.7	-
RAB2_1100	SS-11	CL	11+00 -RAB2-	1.0-2.5	A-4(1)	32	9	48.1	6.6	23.1	22.2	86.6	56.2	46.2	10.4	-
RAB2_1275R	SS-01	25' RT	12+75 -RAB2-	1.0-2.5	A-7-6(10)	41	12	18.0	4.5	38.0	39.5	100.0	84.6	78.1	22.0	-
RPA_1400L	SS-34	20' LT	13+00 -RPA-	1.0-2.5	A-7-6(17)	43	16	6.2	1.6	53.3	38.9	<i>98.5</i>	94.5	92.6	17.6	-
RPC_1400R	SS-47	20' RT	14+00 -RPC-	1.0-2.5	A-7-5(19)	46	16	2.2	1.1	37.6	59.1	<i>99.</i> 7	98.1	97.1	42.1	-
RPD_1500R	SS-64	30' RT	15+00 -RPD-	1.0-2.5	A-6(11)	36	15	13.5	14.0	47.6	24.9	97.1	89.2	78.1	15.5	-

LAB TECHNICIAN: AMANDA SUTTLE, P.G. NCDOT CERTIFICATION NO. 112–09–1003