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REFERENCE: N/A

PROJECT: DF18314.2045380

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *EMERGENCY DESIGN FOR SR 1605 (MIDDLE FORK ROAD/TOMS FALLS ROAD)*

SITE DESCRIPTION *SITE 5*

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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

SOIL 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 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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] MOBILE B-29
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 YEILD 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 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.
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.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL 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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED 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

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

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 (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.

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 (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.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY RS&H DATED MAY 2025.

BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 GPS.

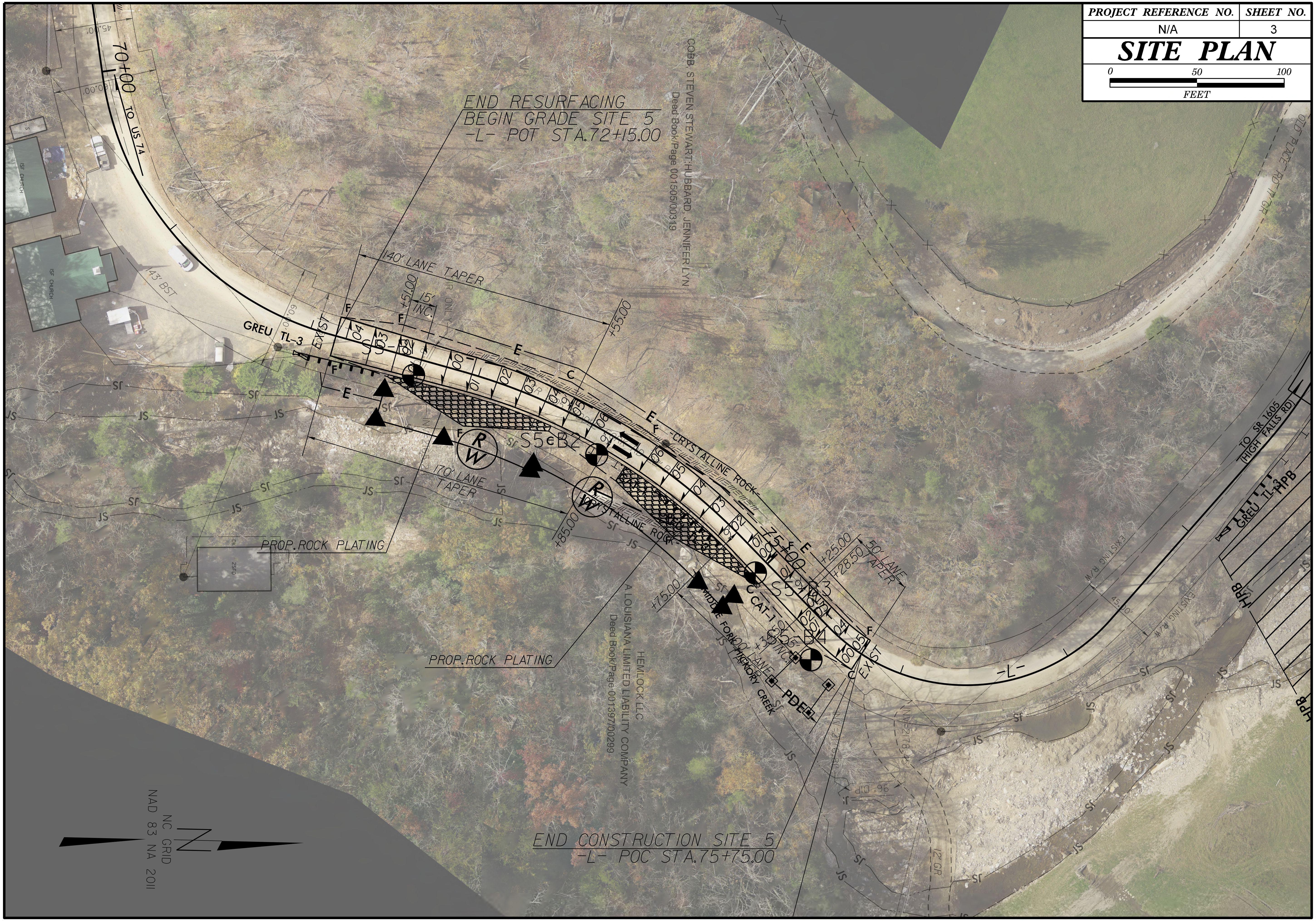
REF = REFUSAL

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
N/A	3

SITE PLAN

0 50 100
FEET



5/14/99

–L–

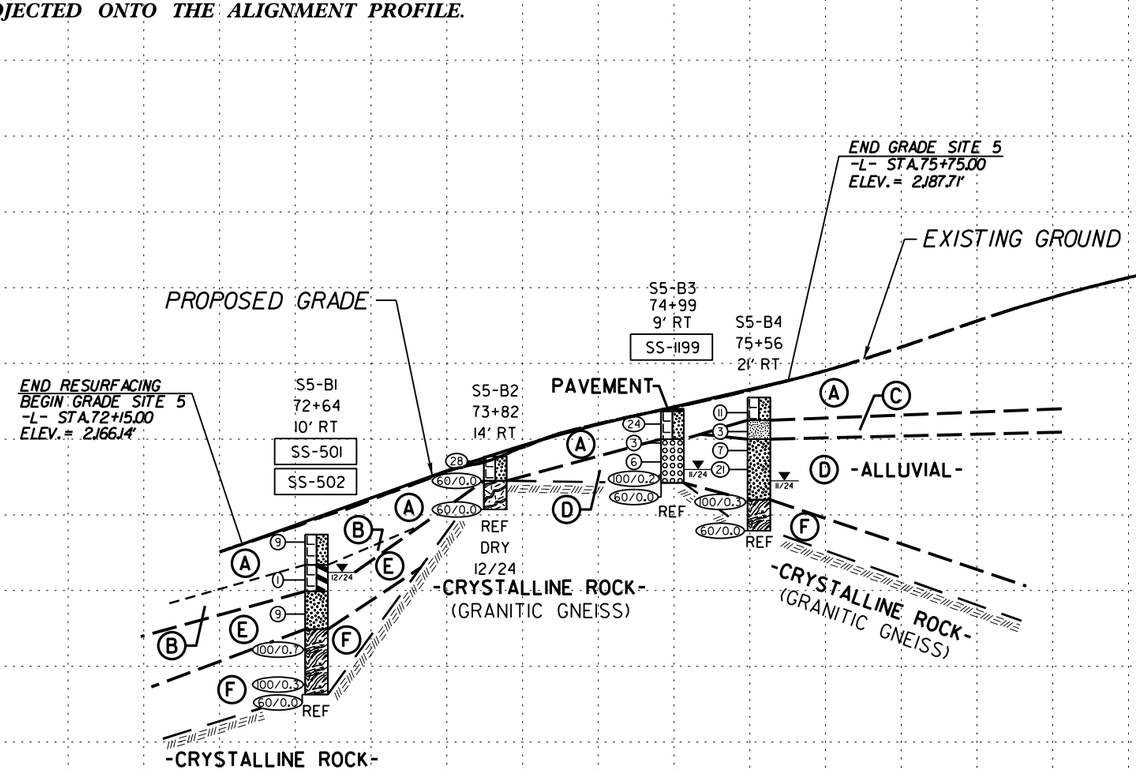
Prepared in the Office of: CAROLINAS GEOTECHNICAL GROUP

0 100 200
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET NO.
N/A	4

PROJECTED ALONG –L– ROADWAY ALIGNMENT

EXISTING GROUND LINE AND PROPOSED SITE 5 CONFIGURATION ALONG –L– ALIGNMENT TAKEN FROM DESIGN FILES PROVIDED BY RS&H, DATED MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE ALIGNMENT PROFILE.



(A) -ROADWAY EMBANKMENT- LOOSE TO MEDIUM DENSE, MOIST, RED-TAN-BROWN-GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE MICA, ORGANICS, AND GRAVEL

(B) -ROADWAY EMBANKMENT- VERY SOFT, WET, GRAY-BROWN, SLIGHTLY PLASTIC SILTY CLAY (A-7-5), WITH TRACE MICA AND GravEL

(C) -COLLUVIAL- SOFT, MOIST, BROWN, FINE SANDY SILT (A-4), WITH TRACE ORGANICS AND GRAVEL

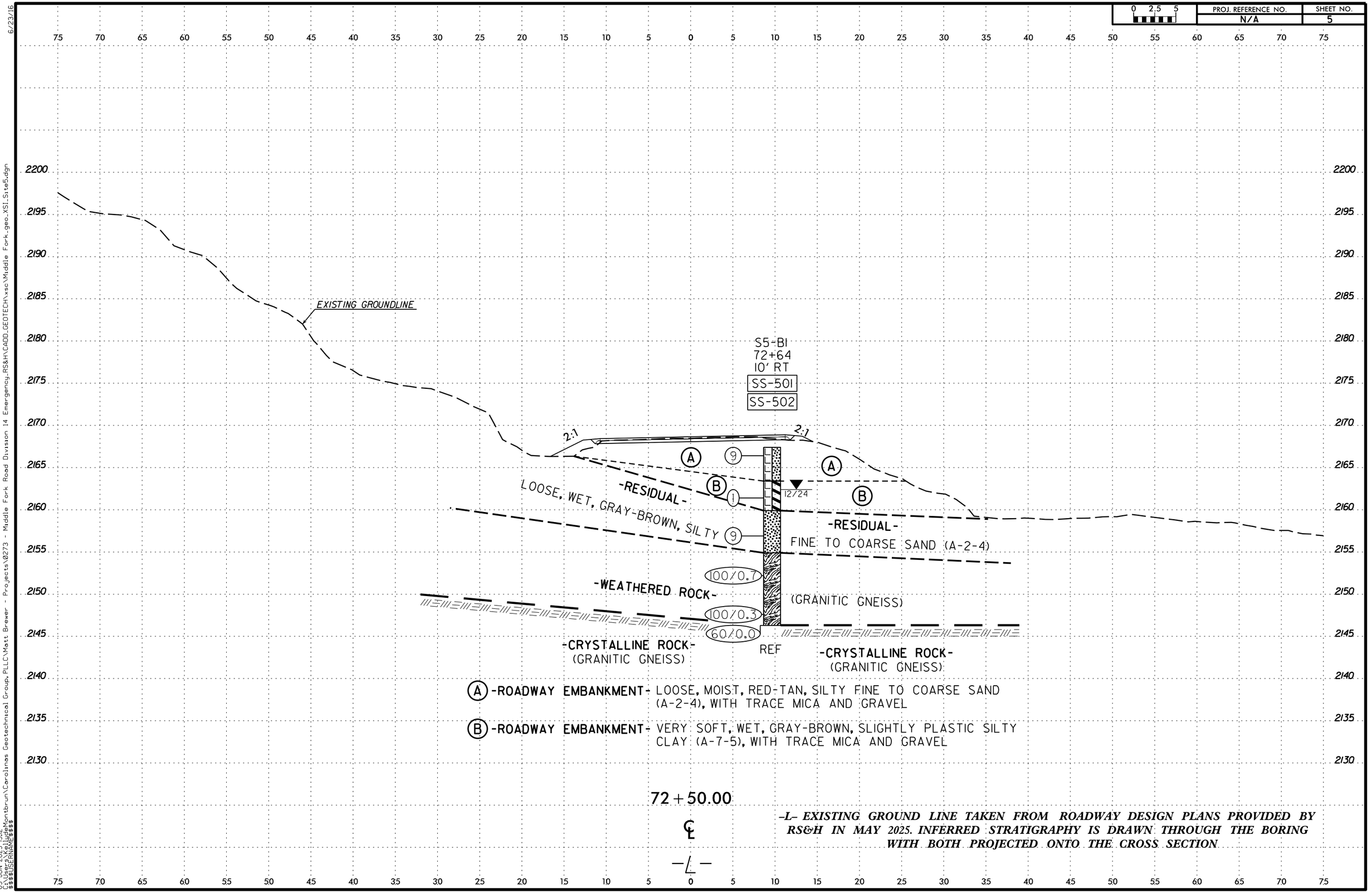
(D) -ALLUVIAL- LOOSE TO VERY DENSE, MOIST, BROWN-ORANGE, GRAVELLY FINE TO COARSE SAND (A-1-b) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE MICA AND GRAVEL

(E) -RESIDUAL- LOOSE, WET, GRAY-BROWN, SILTY FINE TO COARSE SAND (A-2-4)

(F) -WEATHERED ROCK- (GRANITIC GNEISS)

2,230 2,220 2,210 2,200 2,190 2,180 2,170 2,160 2,150 2,140 2,130 2,120 2,110 2,100 2,090 2,080 2,070 2,060 2,050

68+00 69+00 70+00 71+00 72+00 73+00 74+00 75+00 76+00 77+00 78+00 79+00 80+00 81+00 82+00



(A) -ROADWAY EMBANKMENT- LOOSE, MOIST, RED-TAN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE MICA AND GRAVEL

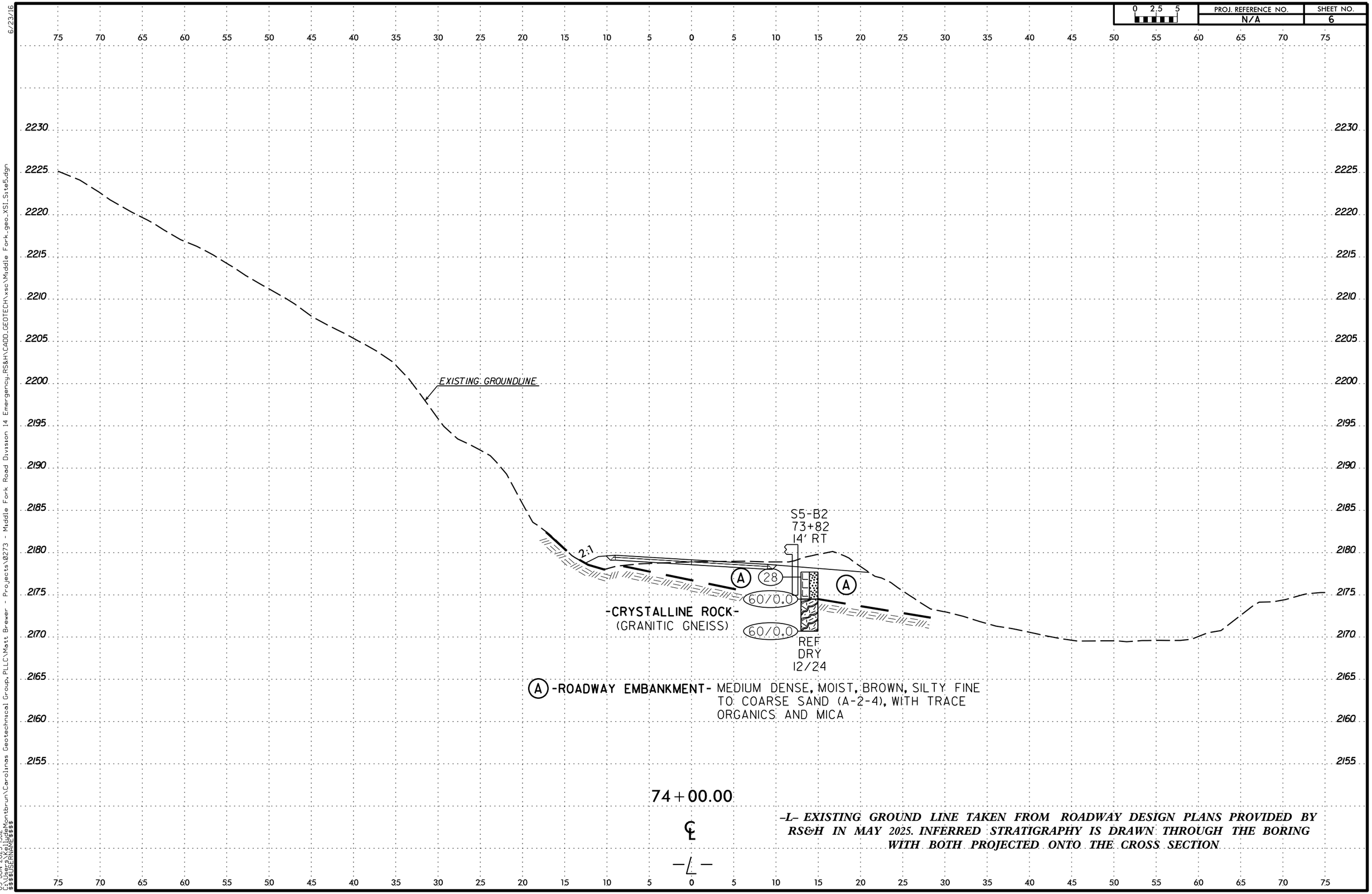
(B) -ROADWAY EMBANKMENT- VERY SOFT, WET, GRAY-BROWN, SLIGHTLY PLASTIC SILTY CLAY (A-7-5), WITH TRACE MICA AND GRAVEL

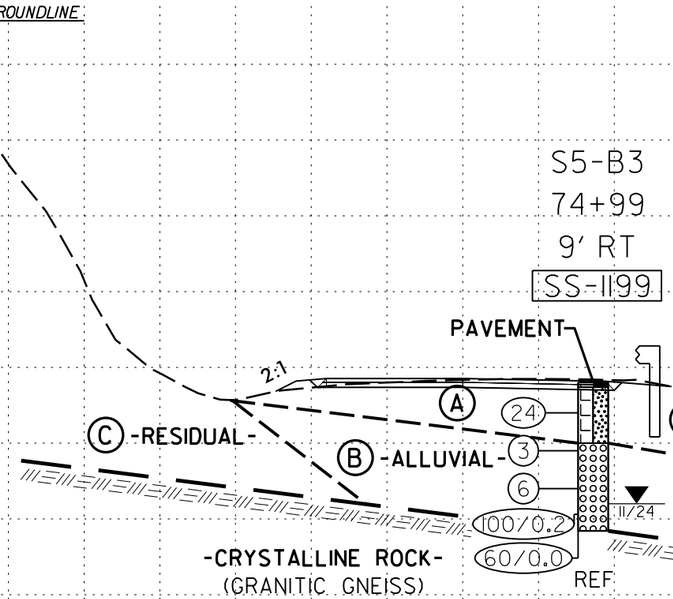
72+50.00

℄

—L—

–L– EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION





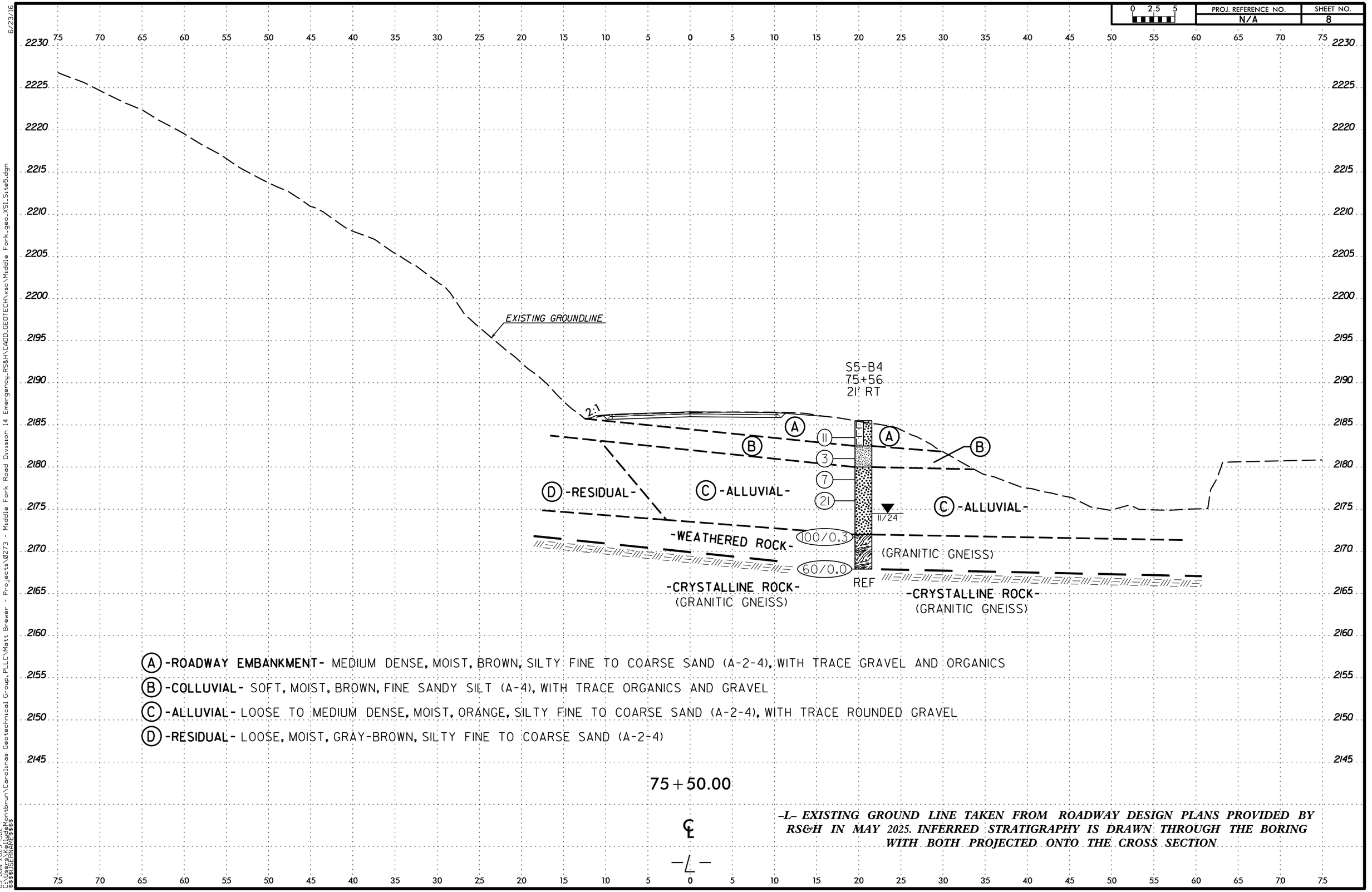
(A) **-ROADWAY EMBANKMENT-** MEDIUM DENSE, MOIST, BROWN-GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL AND MICA

(B) **-ALLUVIAL-** LOOSE TO VERY DENSE, MOIST, BROWN-ORANGE, GRAVELLY FINE TO COARSE SAND (A-1-b), WITH TRACE MICA

(C) **-RESIDUAL-** LOOSE, MOIST, GRAY-BROWN, SILTY FINE TO COARSE SAND (A-2-4)

75+00.00
℄
-L-

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



(A) **-ROADWAY EMBANKMENT-** MEDIUM DENSE, MOIST, BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL AND ORGANICS

(B) **-COLLUVIAL-** SOFT, MOIST, BROWN, FINE SANDY SILT (A-4), WITH TRACE ORGANICS AND GRAVEL

(C) **-ALLUVIAL-** LOOSE TO MEDIUM DENSE, MOIST, ORANGE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE ROUNDED GRAVEL

(D) **-RESIDUAL-** LOOSE, MOIST, GRAY-BROWN, SILTY FINE TO COARSE SAND (A-2-4)

75+50.00

℄

—L—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045380	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** R. Welch	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 5				**GROUND WTR (ft)**
BORING NO. S5-B1	**STATION** 72+64	**OFFSET** 10 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,167.4 ft	**TOTAL DEPTH** 21.1 ft	**NORTHING** 643,161	**EASTING** 1,016,136	**24 HR.** 5.0
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
2170										
	2,167.4	0.0								2,167.4 GROUND SURFACE 0.0
			5	3	6	9	SS-501	15%		**ROADWAY EMBANKMENT** Loose, Red-Tan, Silty Fine to Coarse SAND (A-2-4), with trace mica and gravel
2165										2,163.4 4.0
	2,162.4	5.0	1	0	1	1	SS-502	38%		Very Soft, Gray-Brown, Slightly Plastic Silty CLAY (A-7-5(5)), with trace mica and gravel
2160										2,159.9 7.5
	2,157.9	9.5	2	4	5	9		W		**RESIDUAL** Loose, Gray-Brown, Silty Fine to Coarse SAND (A-2-4)
2155										2,154.9 12.5
	2,152.9	14.5	62	38/0.2		100/0.7				**WEATHERED ROCK** Gray-White, (Granitic Gneiss)
2150										
	2,147.9	19.5	100/0.3			100/0.3				
	2,146.3	21.1	60/0.0			60/0.0				2,146.3 21.1
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,146.3 ft On Crystalline Rock (Granitic Gneiss)

WBS DF18314.2045380	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** R. Welch	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 5				**GROUND WTR (ft)**
BORING NO. S5-B2	**STATION** 73+82	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,177.7 ft	**TOTAL DEPTH** 7.0 ft	**NORTHING** 643,289	**EASTING** 1,016,190	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2180										
	2,177.7	0.0								2,177.7 GROUND SURFACE 0.0
			3	14	14	28		M		**ROADWAY EMBANKMENT** Medium Dense, Brown, Silty Fine to Coarse SAND (A-2-4), with trace organics and mica
2175	2,174.5	3.2	60/0.0			60/0.0				2,174.5 3.2
										CRYSTALLINE ROCK (Granitic Gneiss)
	2,170.7	7.0	60/0.0			60/0.0				2,170.7 7.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,170.7 ft In Crystalline Rock (Granitic Gneiss) Offset perfromed due to presence of Roadway Embankment boulders Higher N-values in the Roadway Embankment likely the result of boulders/rock encountered

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045380	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 5				**GROUND WTR (ft)**
BORING NO. S5-B3	**STATION** 74+99	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,184.0 ft	**TOTAL DEPTH** 9.8 ft	**NORTHING** 643,360	**EASTING** 1,016,245	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 11/13/24	**COMP. DATE** 11/13/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2185											
										2,184.9 GROUND SURFACE	0.0
	2,183.9	0.1								**ROADWAY EMBANKMENT** Asphalt 0.3'	0.1
	2,183.0	1.0	9	11	13	24		M			
2180	2,180.5	3.5	4	2	1	3		M		2,180.0 Medium Dense, Brown-Gray, Silty Fine to Coarse SAND (A-2-4), with trace gravel and mica	4.0
	2,178.0	6.0	4	2	4	6	SS-1199	10%		**ALLUVIAL** Loose to Very Dense, Brown-Orange, Gravelly Fine to Coarse SAND (A-1-b), with trace mica	
2175	2,175.5	8.5	100/0.2			100/0.2		M		2,174.2	9.8
	2,174.2	9.8	60/0.0			60/0.0				Boring Terminated with Standard Penetration Test Refusal at Elevation 2,174.2 ft On Crystalline Rock (Granitic Gneiss)	

Higher N-values in the Alluvial likely the result of boulders/rock encountered

WBS DF18314.2045380	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 5				**GROUND WTR (ft)**
BORING NO. S5-B4	**STATION** 75+56	**OFFSET** 21 ft RT	**ALIGNMENT** -L-	**0 HR.** 10.4
COLLAR ELEV. 2,185.5 ft	**TOTAL DEPTH** 17.6 ft	**NORTHING** 643,393	**EASTING** 1,016,294	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 11/13/24	**COMP. DATE** 11/13/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
2190											
										2,185.5 GROUND SURFACE	0.0
2185	2,184.5	1.0	8	7	4	11		M		**ROADWAY EMBANKMENT** Medium Dense, Brown, Silty Fine to Coarse SAND (A-2-4), with trace gravel and organics	
	2,182.5	3.0								2,182.5	3.0
	2,182.0	3.5	3	2	1	3		M		**COLLUVIAL** Soft, Brown, Fine Sandy SILT (A-4), with trace organics and gravel	
2180	2,179.5	6.0	5	4	3	7		M		2,180.0	5.5
	2,177.0	8.5	3	8	13	21				**ALLUVIAL** Loose to Medium Dense, Orange, Silty Fine to Coarse SAND (A-2-4), with trace rounded gravel	
2175								M			
	2,172.0	13.5	100/0.3			100/0.3				2,172.0	13.5
2170	2,167.9	17.6	60/0.0			60/0.0				**WEATHERED ROCK** Orange-White-Brown, (Granitic Gneiss)	
										2,167.9	17.6
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,167.9 ft On Crystalline Rock (Granitic Gneiss)	

PROJECT REFERENCE NO.	SHEET NO.
N/A	11

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
S5–B1	SS–501	10' RT	72+64 –L–	641225	1016136	0.0 – 1.5'	A–2–4	29	6	22.2	35.8	25.8	16.2	63.3	55.1	30.2	14.7	ND
S5–B1	SS–502	10' RT	72+64 –L–	641225	1015596	5.0 – 6.5'	A–7–5(5)	46	15	19.1	33.8	24.8	22.3	98.1	88.9	51.1	37.6	ND
S5–B3	SS–1199	9' RT	74+99 –L–	643393	1016294	6.0 – 7.5'	A–1–b	24	2	25.0	37.2	19.6	18.2	53.8	46.7	23.7	10.4	ND

Alex M Atmathy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SOUTH CAROLINA
NCDOT LAB CERT. NO. 130–0212

REFERENCE: N/A

PROJECT: DF18314.2045379

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *EMERGENCY DESIGN FOR SR 1605 (MIDDLE FORK ROAD/TOMS FALLS ROAD)*

SITE DESCRIPTION *SITE 6*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4	PROFILE
5	CROSS SECTION
6	BORE LOG
7	SOIL TEST RESULTS

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 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 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:
1. 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 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

P. PERRY, E.I.T.

CG2 EXPLORATION

INVESTIGATED BY *CG2, PLLC*

DRAWN BY *M. MALISHER, E.I.T.*

CHECKED BY *K. DE MONTBRUN, P.E.*

SUBMITTED BY *CG2, PLLC*

DATE *JUNE 2025*

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP

1805 SARDIS ROAD NORTH
SUITE 100
CHARLOTTE, NC 28270
(980) 339-8684

NORTH CAROLINA PROFESSIONAL SEAL 045542 ENGINEER KELLY DE MONTBRUN

Signed by: Kelly N. de Montbrun 06/04/2025

BAB66070E9D747C...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
N/A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL 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 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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 YEILD 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 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.
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.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL 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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED 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

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

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 (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.

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 (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.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY RS&H DATED MAY 2025.

BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 GPS.

REF = REFUSAL

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
N/A	3

SITE PLAN

-L-

EXISTING GROUND LINE AND PROPOSED SITE 6 CONFIGURATION ALONG -L- ALIGNMENT TAKEN FROM DESIGN FILES PROVIDED BY RS&H, DATED MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE ALIGNMENT PROFILE.

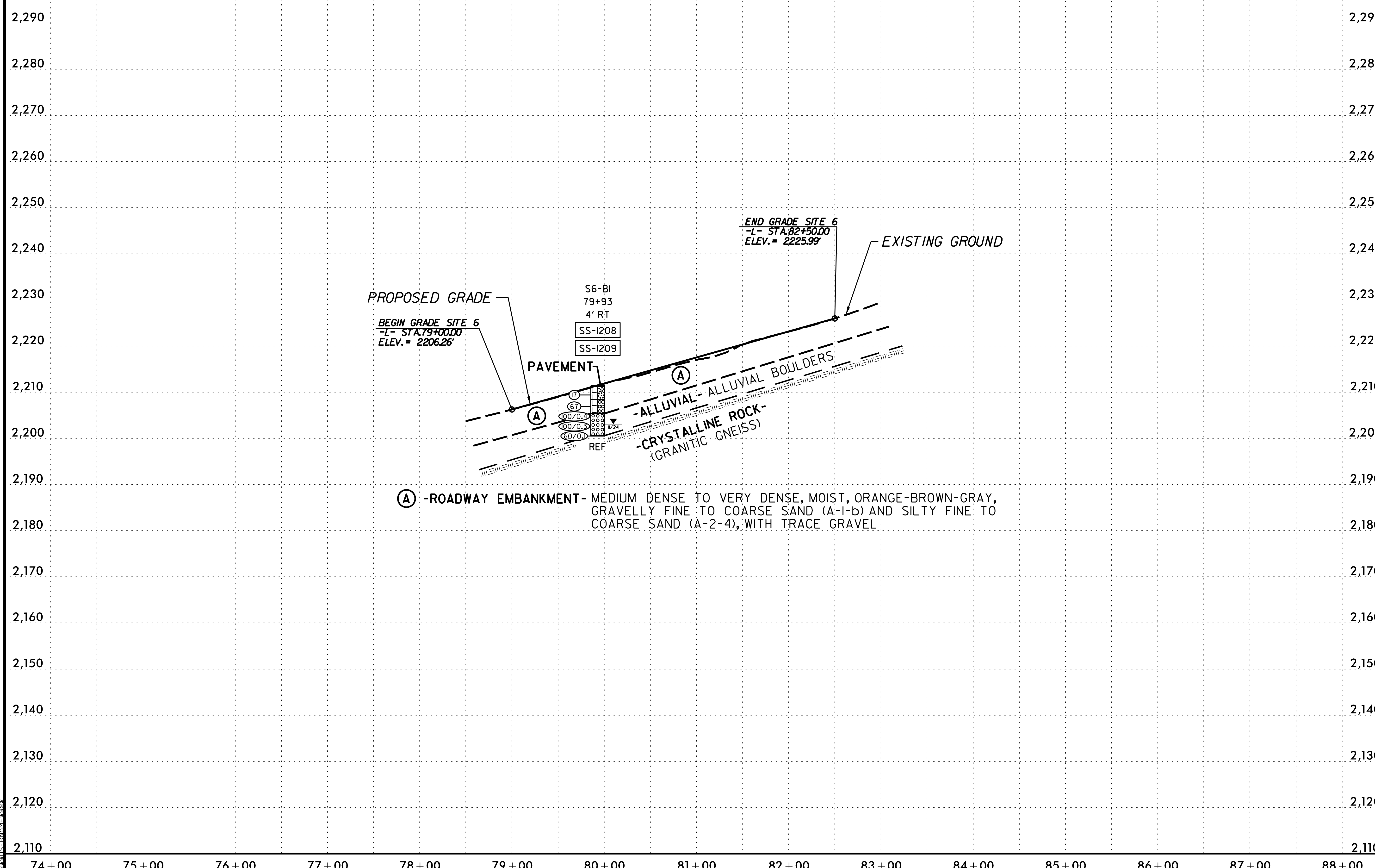
Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP

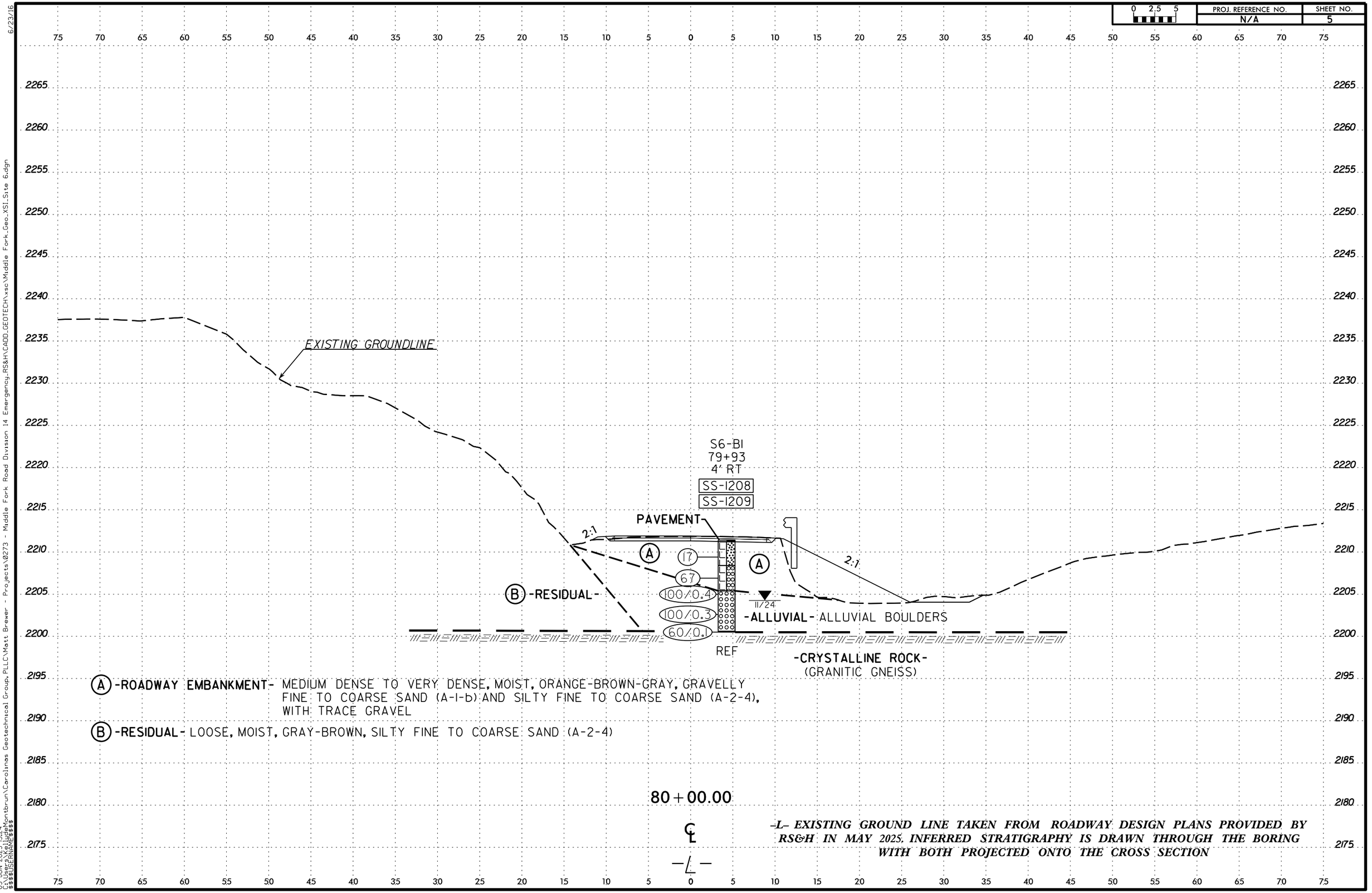
0 100 200
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET NO.
N/A	4

PROJECTED ALONG -L- ROADWAY ALIGNMENT



(A) -ROADWAY EMBANKMENT- MEDIUM DENSE TO VERY DENSE, MOIST, ORANGE-BROWN-GRAY, GRAVELLY FINE TO COARSE SAND (A-1-b) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL



(A) **-ROADWAY EMBANKMENT-** MEDIUM DENSE TO VERY DENSE, MOIST, ORANGE-BROWN-GRAY, GRAVELLY FINE TO COARSE SAND (A-1-b) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL

(B) **-RESIDUAL-** LOOSE, MOIST, GRAY-BROWN, SILTY FINE TO COARSE SAND (A-2-4)

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045379	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 6				**GROUND WTR (ft)**
BORING NO. S6-B1	**STATION** 79+93	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,211.4 ft	**TOTAL DEPTH** 10.9 ft	**NORTHING** 643,712	**EASTING** 1,016,054	**24 HR.** 8.3
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Ard	**START DATE** 11/13/24	**COMP. DATE** 11/13/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2215											
										2,211.4 GROUND SURFACE	0.0
2210	2,210.4	1.0	7	13	4	17	SS-1208	9%		**ROADWAY EMBANKMENT** Asphalt (0.2')	
	2,207.9	3.5	29	49	18	67	SS-1209	6%		2,208.4 Medium Dense, Orange-Brown-Gray, Silty Fine to Coarse SAND (A-2-4), with trace gravel	3.0
2205	2,205.4	6.0	100/0.4			100/0.4				2,205.4 Very Dense, Orange-Brown, Gravelly Fine to Coarse SAND (A-1-b)	6.0
	2,202.9	8.5	100/0.3			100/0.3				**ALLUVIAL** Alluvial Boulders	
	2,200.6	10.8	60/0.1			60/0.1				2,200.6 2,200.5 **CRYSTALLINE ROCK** (Granitic Gneiss)	10.8 10.9
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,200.5 ft In Crystalline Rock (Granitic Gneiss)	

PROJECT REFERENCE NO.	SHEET NO.
N/A	7

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
S6–B1	SS–1208	4' RT	79+93 –L–	643712	1016054	1.0 – 2.5'	A–2–4	NP	NP	29.6	38.5	17.8	14.1	76.9	63.5	29.1	8.9	ND
S6–B1	SS–1209	4' RT	79–93 –L–	643712	1016054	3.5 – 5.0'	A–1–b	NP	NP	36.9	39.3	19.8	4.0	47.5	36.0	14.3	5.8	ND

Alex M. Abmuthy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SOUTH CAROLINA
NCDOT LAB CERT. NO. 130–0212

REFERENCE: N/A

PROJECT: DF18314.2045417

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *EMERGENCY DESIGN FOR SR 1605 (MIDDLE FORK ROAD/TOMS FALLS ROAD)*

SITE DESCRIPTION *SITE 7*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3-5	SITE PLAN
6-7	PROFILE
8-21	CROSS SECTIONS
22-45	BORE LOG(S), CORE REPORT(S), & CORE PHOTOGRAPH(S)
46	SOIL TEST RESULTS

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 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 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:
1. 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 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

P. PERRY, E.I.T.

R. WELCH, G.I.T.

P. TOMASIC, P.G.

CG2 EXPLORATION

INVESTIGATED BY *CG2, PLLC*

DRAWN BY *P. PERRY, E.I.T.*

CHECKED BY *K. DE MONTBRUN, P.E.*

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DATE *JUNE 2025*

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SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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N/A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL 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 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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] MOBILE B-29
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 YEILD 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 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.
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.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL 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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED 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

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

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 (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.

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 (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.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY RS&H DATED MAY 2025.

BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 GPS.

REF = REFUSAL

CT = CORE TERMINATED

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
N/A	2A

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

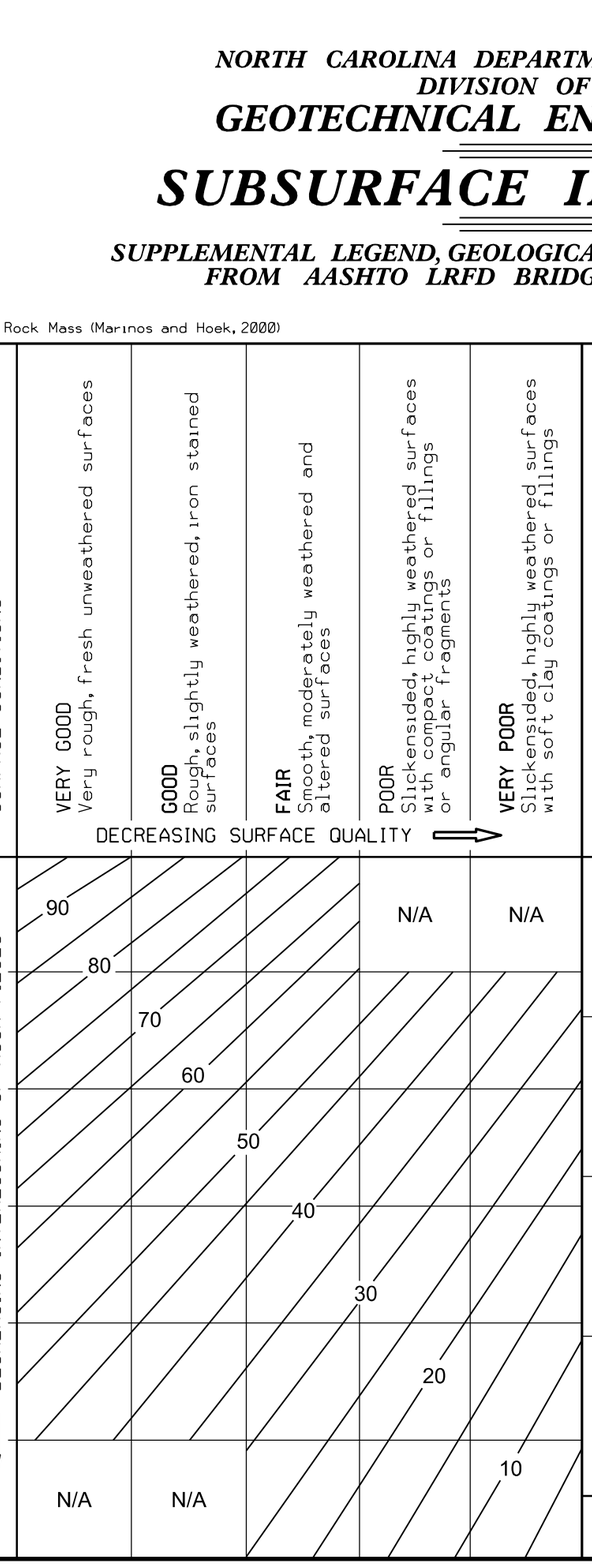
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

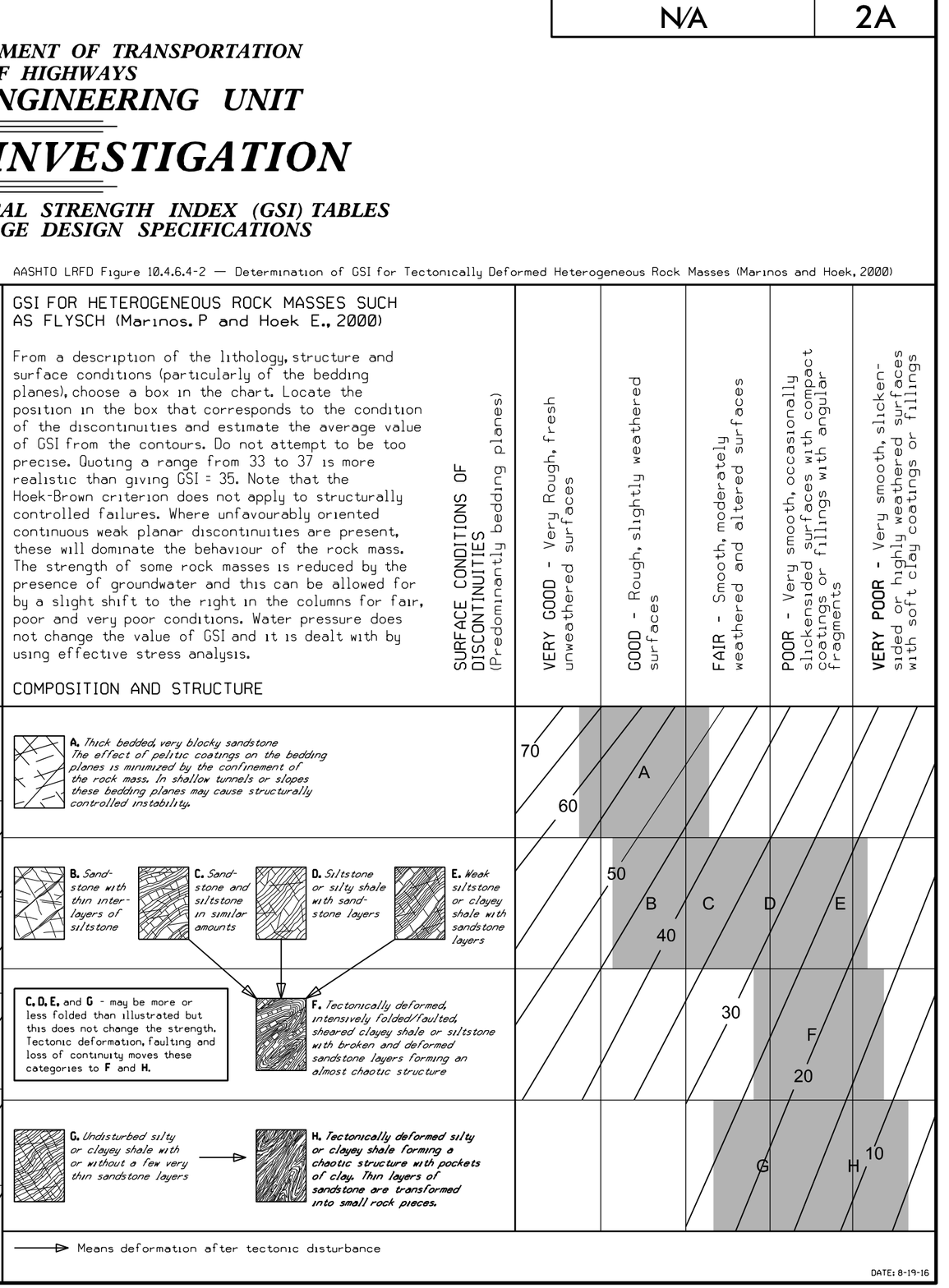


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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 fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE



DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
N/A	3

SITE PLAN

0 50 100
FEET

NC GRID
NAD 83 NA 2011

RAINEY, MICHAEL L.RAINEY, SANDRA Q.
Deed Book/Page 001411/00339

BEGIN CONSTRUCTION SITE 7
-L- STA.85+00.00

50' LANE
APER LT/RT

-CRYSTALLINE ROCK-

EXISTING R/W

INV. 748.74'

+50.00

+25.62

15' INC.

90+00

INV. 763.48'

18' INC.

+07.48'

18' INC.

TO SR 1605
(HIGH FALLS RD)

S7-B1

S7-B2

S7-B3

S7-B4

S7-B6

PUE

PDE

-L- +40.00
36.00' RT
EX. R/W

-L- +21.00
32.00' RT
EX. R/W

-L- +38.00
52.00' RT
32.00' RT
EX. R/W

-L- +99.48
52.00' RT

-L- +50.00
52.00' RT
EX. R/W

PROP. ROCK PLATING

PROP. ROCK PLATING

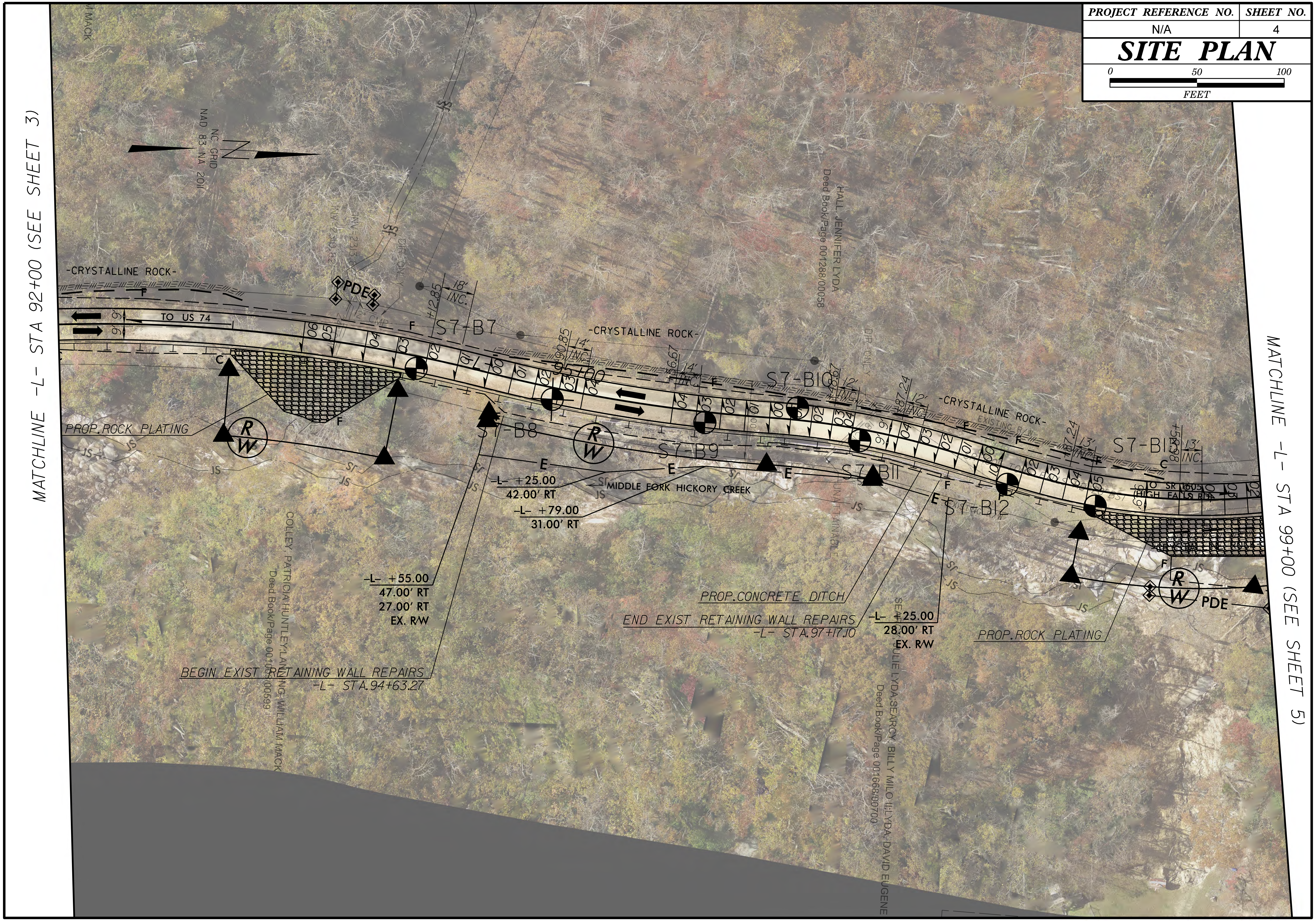
32

MATCHLINE -L- STA 92+00 (SEE SHEET 4)

PROJECT REFERENCE NO.	SHEET NO.
N/A	4

SITE PLAN

0 50 100
FEET



PROJECT REFERENCE NO.	SHEET NO.
N/A	5

SITE PLAN

0 50 100
FEET

END CONSTRUCTION SITE 7
BEGIN CONSTRUCTION SITE 8
-L- POC. STA. 104+56.79

END GRADE SITE 7
BEGIN RESURFACING
-L- POC. STA. 104+00.00

MATCHLINE -L- STA 99+00 (SEE SHEET 4)

NC GRID
NAD 83 NA 2011

STANZI, PAUL STANZI, LISA
Deed Book/Page 003962/00514

-L- +48.00
32.00' LT
-L- +45.00
EX. R/W
-L- +29.00
32.00' LT
-L- +25.00
EX. R/W

105' LANE TAPER LT

-CRYSTALLINE ROCK-

-L- 105+00

TO SR 1605
(HIGH FALLS RD)

EXISTING

S7-B14

S7-B15

S7-B16

100+00

INV=2363.25

R=10'

R=13'

R=12'

PDE

DUE

GREU TL-3

7' LANE TAPER RT

-L- +20.00
48.00' RT
EX. R/W

-L- +49.00
48.00' RT
EX. R/W

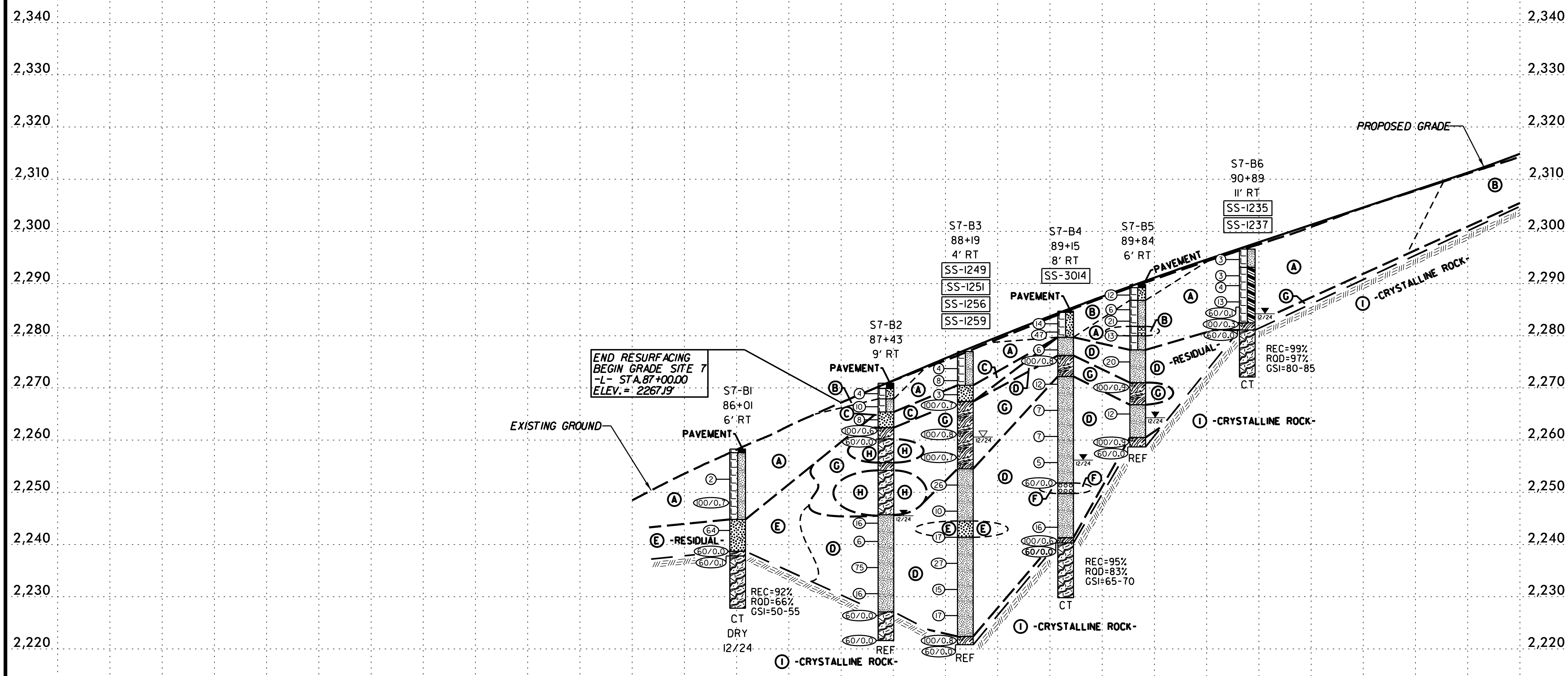
PROP. ROCK PLATING

PROP. ROCK PLATING

CAMPBELL, GEORGE CAMPBELL, ALIZA THE G & S TRUST
Deed Book/Page 004057/00407

-L-		Prepared in the Office of: CAROLINAS GEOTECHNICAL GROUP	0 100 200 FEET VE = 5:1	PROJECT REFERENCE NO.	SHEET NO.
				N/A	6
				PROJECTED ALONG -L- ROADWAY ALIGNMENT	

EXISTING GROUND LINE AND PROPOSED SITE 7 CONFIGURATION ALONG -L- ALIGNMENT TAKEN FROM DESIGN FILES PROVIDED BY RS&H, DATED MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE ALIGNMENT PROFILE.



(A) -ROADWAY EMBANKMENT- SOFT TO VERY STIFF, MOIST TO WET, BROWN-GRAY-TAN-ORANGE, FINE SANDY SILT (A-4) AND SLIGHTLY PLASTIC FINE TO COARSE SANDY CLAY (A-6), WITH TRACE MICA, ORGANICS, AND GRAVEL

(B) -ROADWAY EMBANKMENT- VERY LOOSE TO DENSE, MOIST, BROWN-TAN-ORANGE-WHITE-GRAY, GRAVELLY FINE TO COARSE SAND (A-1-b) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE ASPHALT FRAGMENTS, GRAVEL, AND ORGANICS

(C) -COLLUVIAL- VERY LOOSE TO LOOSE, MOIST, ORANGE-BROWN-GRAY-WHITE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE ORGANICS AND MICA

(D) -RESIDUAL- MEDIUM STIFF TO HARD, MOIST TO WET, BROWN-WHITE-GRAY-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS, TRACE TO LITTLE MICA, AND MANGANESE OXIDE STAINING

(E) -RESIDUAL- MEDIUM DENSE TO VERY DENSE, WET, GRAY-BROWN-WHITE-ORANGE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE MICA

(F) -RESIDUAL- (BOULDER)

(G) -WEATHERED ROCK- (GRANITIC GNEISS)

(H) -CRYSTALLINE ROCK- (BOULDER) MODERATELY SEVERELY WEATHERED TO FRESH, MEDIUM HARD TO HARD, GRAY-WHITE, (BOULDER), WITH VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING

(I) -CRYSTALLINE ROCK- VERY SLIGHTLY WEATHERED TO FRESH, MEDIUM HARD TO VERY HARD, GRAY-WHITE-ORANGE, (GRANITIC GNEISS), WITH VERY CLOSE TO WIDE FRACTURE SPACING

80+00 81+00 82+00 83+00 84+00 85+00 86+00 87+00 88+00 89+00 90+00 91+00 92+00 93+00

-L-

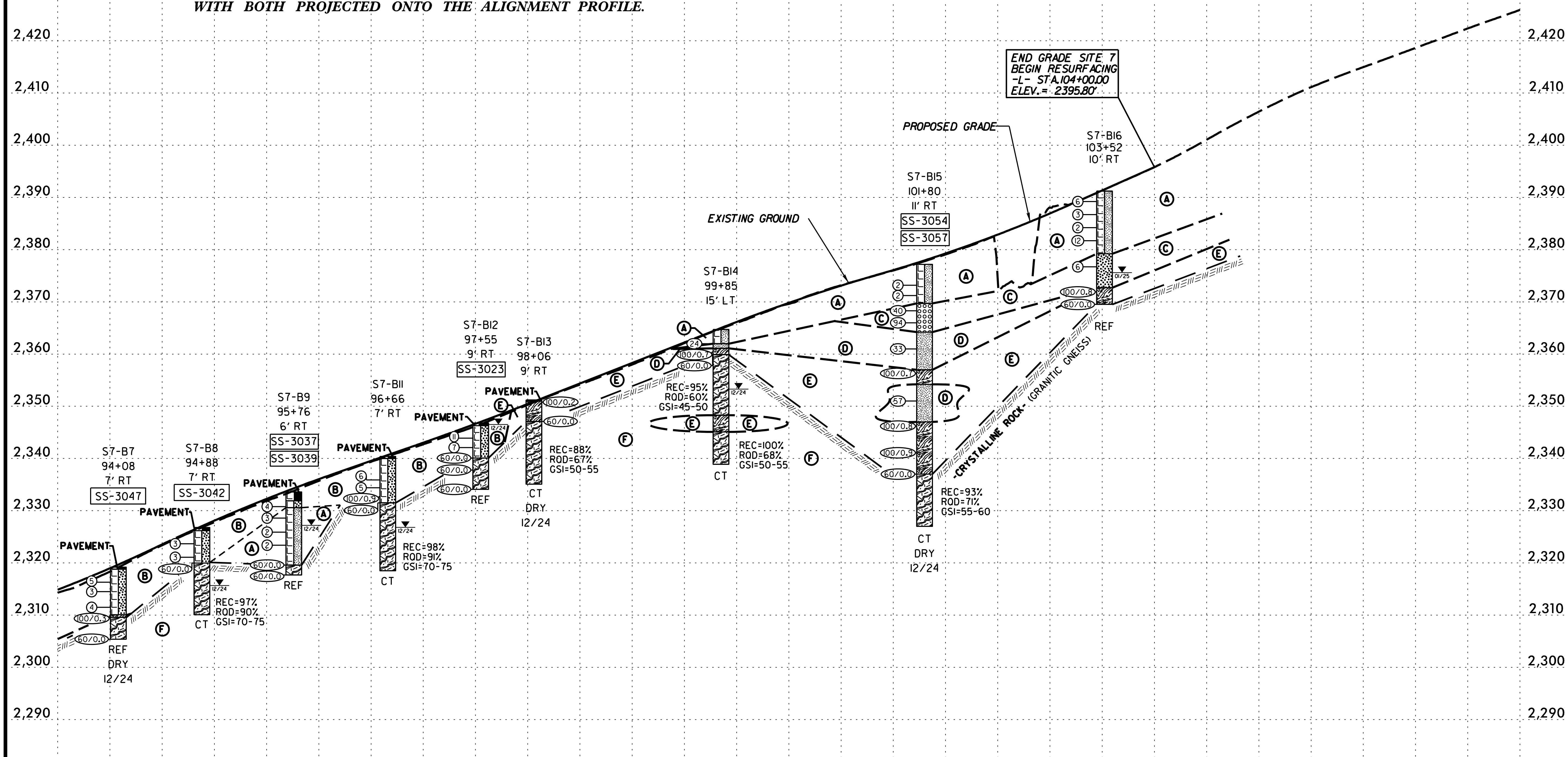
Prepared in the Office of: CAROLINAS GEOTECHNICAL GROUP

PROJECT REFERENCE NO.	SHEET NO.
N/A	7

PROJECTED ALONG -L- ROADWAY ALIGNMENT

0 100 200 FEET VE = 5:1

EXISTING GROUND LINE AND PROPOSED SITE 7 CONFIGURATION ALONG -L- ALIGNMENT TAKEN FROM DESIGN FILES PROVIDED BY RS&H, DATED MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE ALIGNMENT PROFILE.



(A) **-ROADWAY EMBANKMENT-** SOFT TO VERY STIFF, MOIST TO WET, TAN-ORANGE-BROWN-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA, ORGANICS, AND GRAVEL

(B) **-ROADWAY EMBANKMENT-** VERY LOOSE TO MEDIUM DENSE, MOIST TO WET, ORANGE-BROWN-BLACK-GRAY-WHITE, FINE TO COARSE SANDY GRAVEL (A-1-a) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL AND ORGANICS

(C) **-ALLUVIAL-** LOOSE TO VERY DENSE, WET, TAN-ORANGE-BROWN, SILTY FINE TO COARSE SANDY GRAVEL (A-1-a) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE GRAVEL

(D) **-RESIDUAL-** VERY STIFF TO HARD, MOIST, GRAY-BROWN, FINE SANDY SILT (A-4), WITH MANGANESE OXIDE STAINING

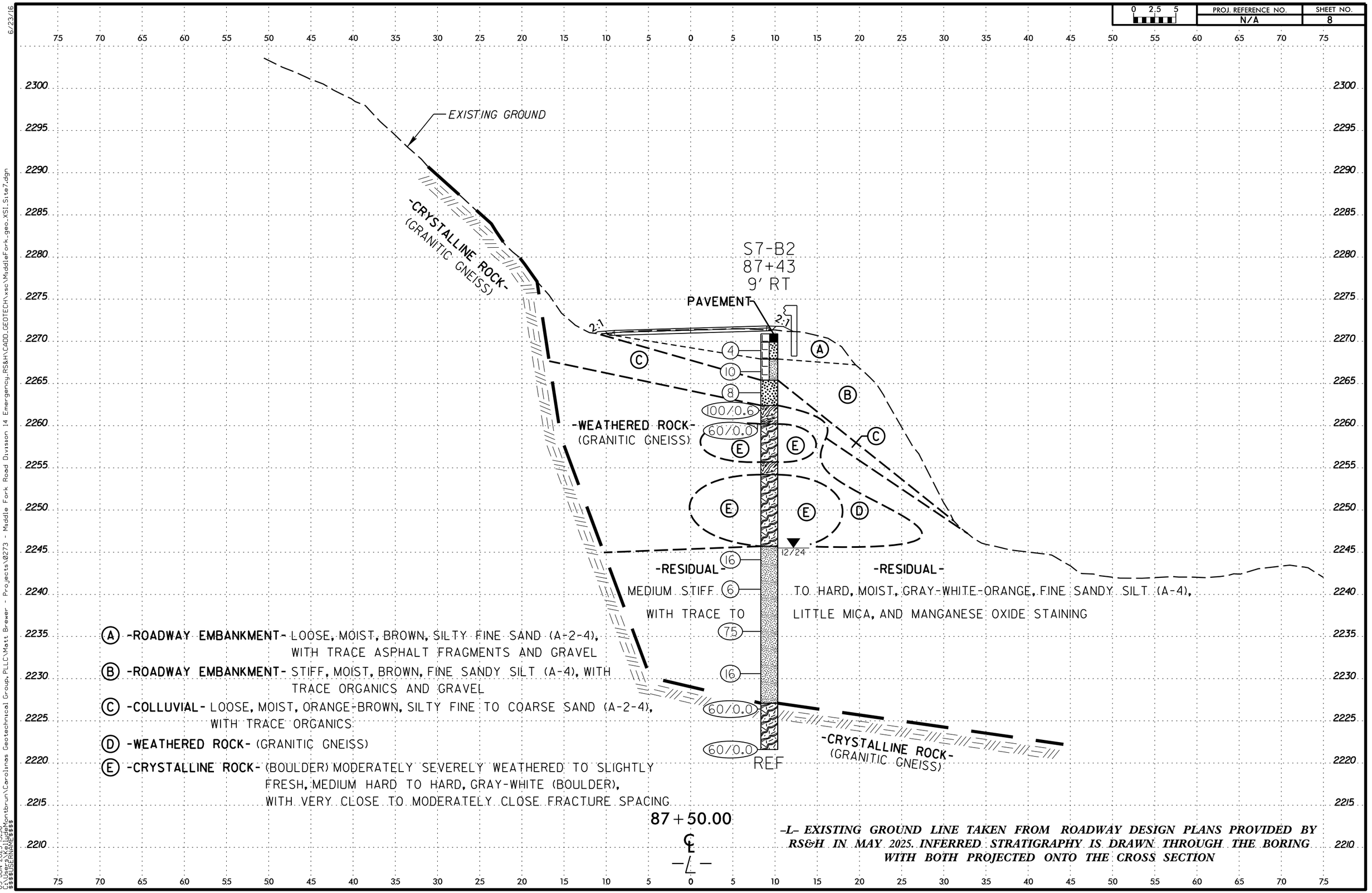
(E) **-WEATHERED ROCK-** (GRANITIC GNEISS)

(F) **-CRYSTALLINE ROCK-** MODERATELY SEVERE WEATHERING TO FRESH, VERY SOFT TO VERY HARD, WHITE-TAN-BLACK-GRAY-ORANGE, (GRANITIC GNEISS), WITH VERY CLOSE TO WIDE FRACTURE SPACING

5/14/99

03-JUN-2025 13:56 ... Carolinas Geotechnical Group, PLLC\Matt Brewer - Projects\0273 - Middle Fork Road Division 14 Emergency_RS&H\CADD_GEOTECH\Site&Sub\Middle Fork_geo_pfl_Site 7_02.dgn

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	N/A	8



Ⓐ **-ROADWAY EMBANKMENT-** LOOSE, MOIST, BROWN, SILTY FINE SAND (A-2-4), WITH TRACE ASPHALT FRAGMENTS AND GRAVEL

Ⓑ **-ROADWAY EMBANKMENT-** STIFF, MOIST, BROWN, FINE SANDY SILT (A-4), WITH TRACE ORGANICS AND GRAVEL

Ⓒ **-COLLUVIAL-** LOOSE, MOIST, ORANGE-BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE ORGANICS

Ⓓ **-WEATHERED ROCK-** (GRANITIC GNEISS)

Ⓔ **-CRYSTALLINE ROCK-** (BOULDER) MODERATELY SEVERELY WEATHERED TO SLIGHTLY FRESH, MEDIUM HARD TO HARD, GRAY-WHITE (BOULDER), WITH VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING

87+50.00

℄

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

S7-B3
88+19
4' RT

SS-1249
SS-1251
SS-1256
SS-1259

4
8
3
100/0.7
100/0.8
12/24
100/0.7
26
10
17
27
15
17
100/0.8
60/0.0

2:1
1.5:1

EXISTING GROUND

-RESIDUAL-
-RESIDUAL-
-CRYSTALLINE ROCK- (GRANITIC GNEISS)

STIFF TO FINE

VERY STIFF, MOIST TO WET, GRAY-WHITE-ORANGE, TO COARSE SANDY SILT (A-4), WITH TRACE MICA, GRAVEL-SIZED ROCK FRAGMENTS, AND MANGANESE OXIDE STAINING

REF

88+00.00
℄
–L–

Ⓐ **-ROADWAY EMBANKMENT-** SOFT TO MEDIUM STIFF, MOIST, TAN-BROWN-ORANGE, FINE SANDY SILT (A-4), WITH TRACE GRAVEL, MICA, AND ORGANICS

Ⓑ **-COLLUVIAL-** VERY LOOSE, MOIST, WHITE-GRAY-ORANGE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE MICA

Ⓒ **-RESIDUAL-** MEDIUM DENSE, WET, WHITE-GRAY-ORANGE, SILTY FINE TO COARSE SAND (A-2-4)

Ⓓ **-WEATHERED ROCK-** (GRANITIC GNEISS)

–L– EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

EXISTING GROUND

S7-B4
89+15
8' RT
SS-3014

2:1

1.5:1

14
47
A
-RESIDUAL-
6
100/0.8
C
MEDIUM STIFF TO
12
BROWN, FINE SANDY
-RESIDUAL-
7
VERY STIFF, MOIST, ORANGE-WHITE-GRAY-
SILT (A-4), WITH TRACE MICA, AND MANGANESE
OXIDE STAINING
7
12/24
5
B
60/0.0
-CRYSTALLINE ROCK-
(GRANITIC GNEISS)
16
C
100/0.6
60/0.0
CT
REC=95%
RQD=83%
GSI=65-70

Ⓐ -ROADWAY EMBANKMENT- MEDIUM DENSE TO DENSE, MOIST, TAN-ORANGE-WHITE-BROWN, SILTY FINE SAND (A-2-4), WITH TRACE GRAVEL AND ORGANICS

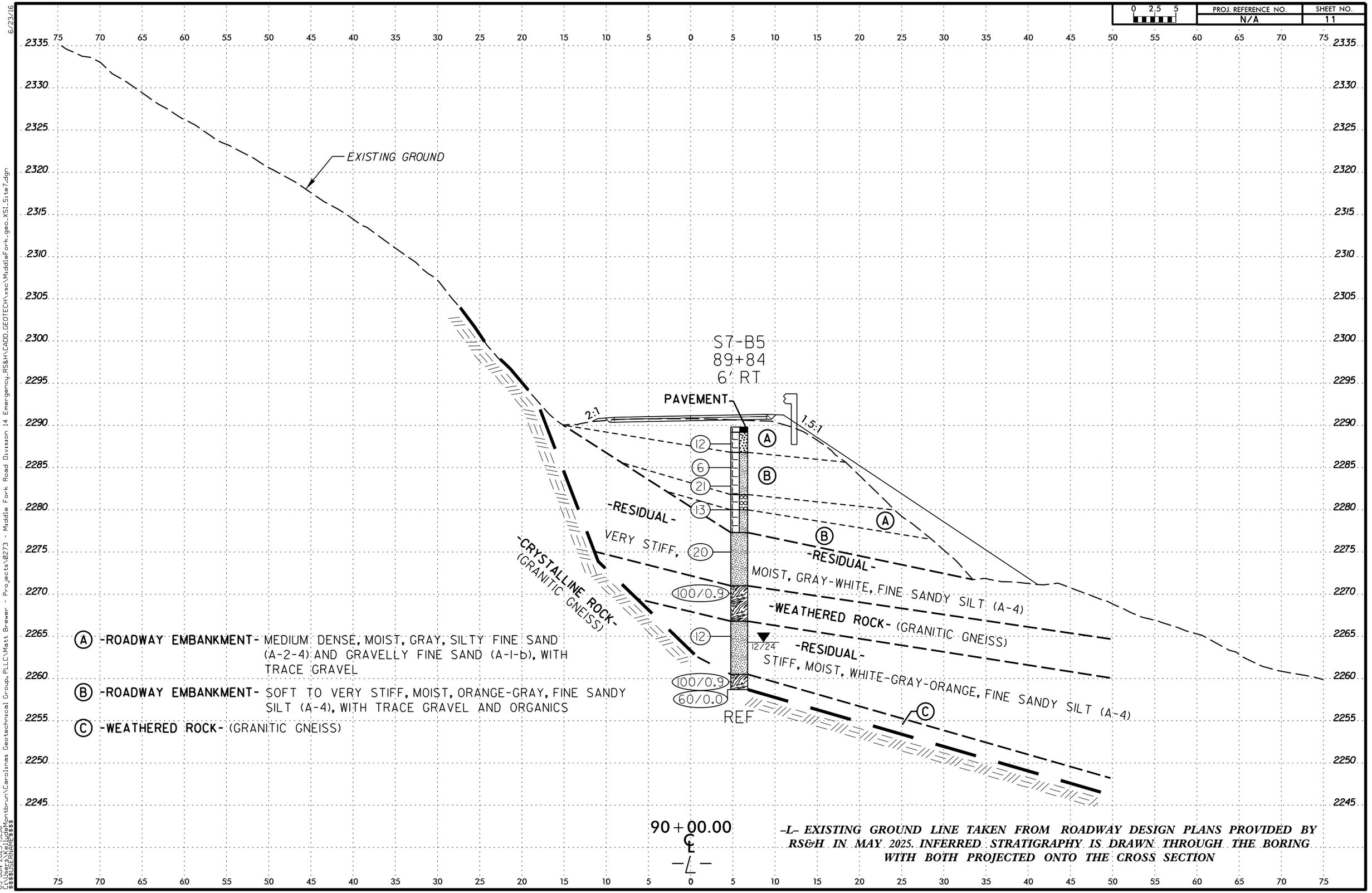
Ⓑ -RESIDUAL- BOULDER

Ⓒ -WEATHERED ROCK- (GRANITIC GNEISS)

-CRYSTALLINE ROCK-
VERY SLIGHTLY WEATHERED TO FRESH, MEDIUM HARD TO VERY HARD, GRAY-WHITE (GRANITIC GNEISS), WITH VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING

89+00.00
℄
—L—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

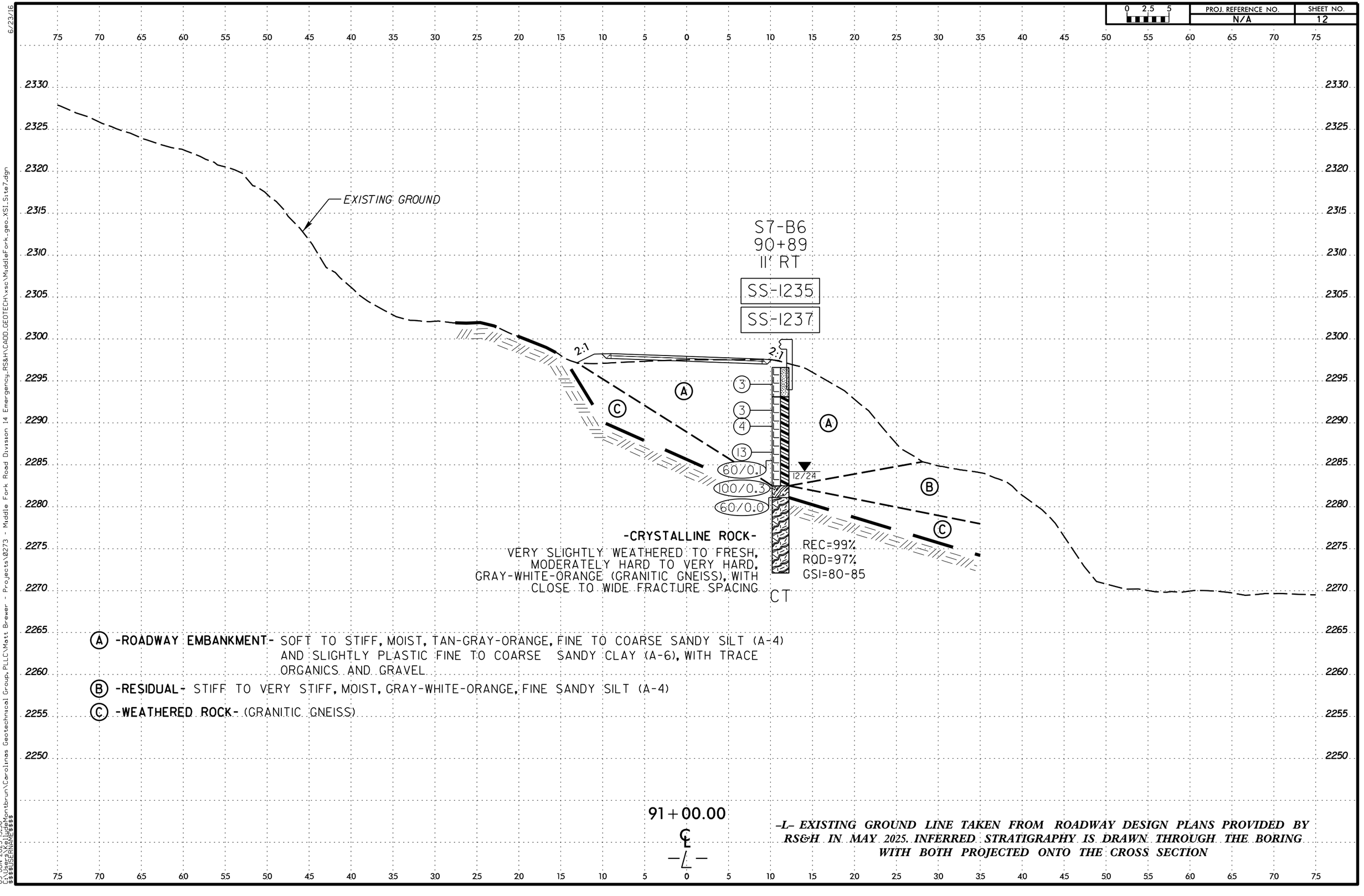


Ⓐ **-ROADWAY EMBANKMENT-** MEDIUM DENSE, MOIST, GRAY, SILTY FINE SAND (A-2-4) AND GRAVELLY FINE SAND (A-1-b), WITH TRACE GRAVEL

Ⓑ **-ROADWAY EMBANKMENT-** SOFT TO VERY STIFF, MOIST, ORANGE-GRAY, FINE SANDY SILT (A-4), WITH TRACE GRAVEL AND ORGANICS

Ⓒ **-WEATHERED ROCK-** (GRANITIC GNEISS)

–L– EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



(A) **-ROADWAY EMBANKMENT-** SOFT TO STIFF, MOIST, TAN-GRAY-ORANGE, FINE TO COARSE SANDY SILT (A-4) AND SLIGHTLY PLASTIC FINE TO COARSE SANDY CLAY (A-6), WITH TRACE ORGANICS AND GRAVEL

(B) **-RESIDUAL-** STIFF TO VERY STIFF, MOIST, GRAY-WHITE-ORANGE, FINE SANDY SILT (A-4)

(C) **-WEATHERED ROCK-** (GRANITIC GNEISS)

91+00.00
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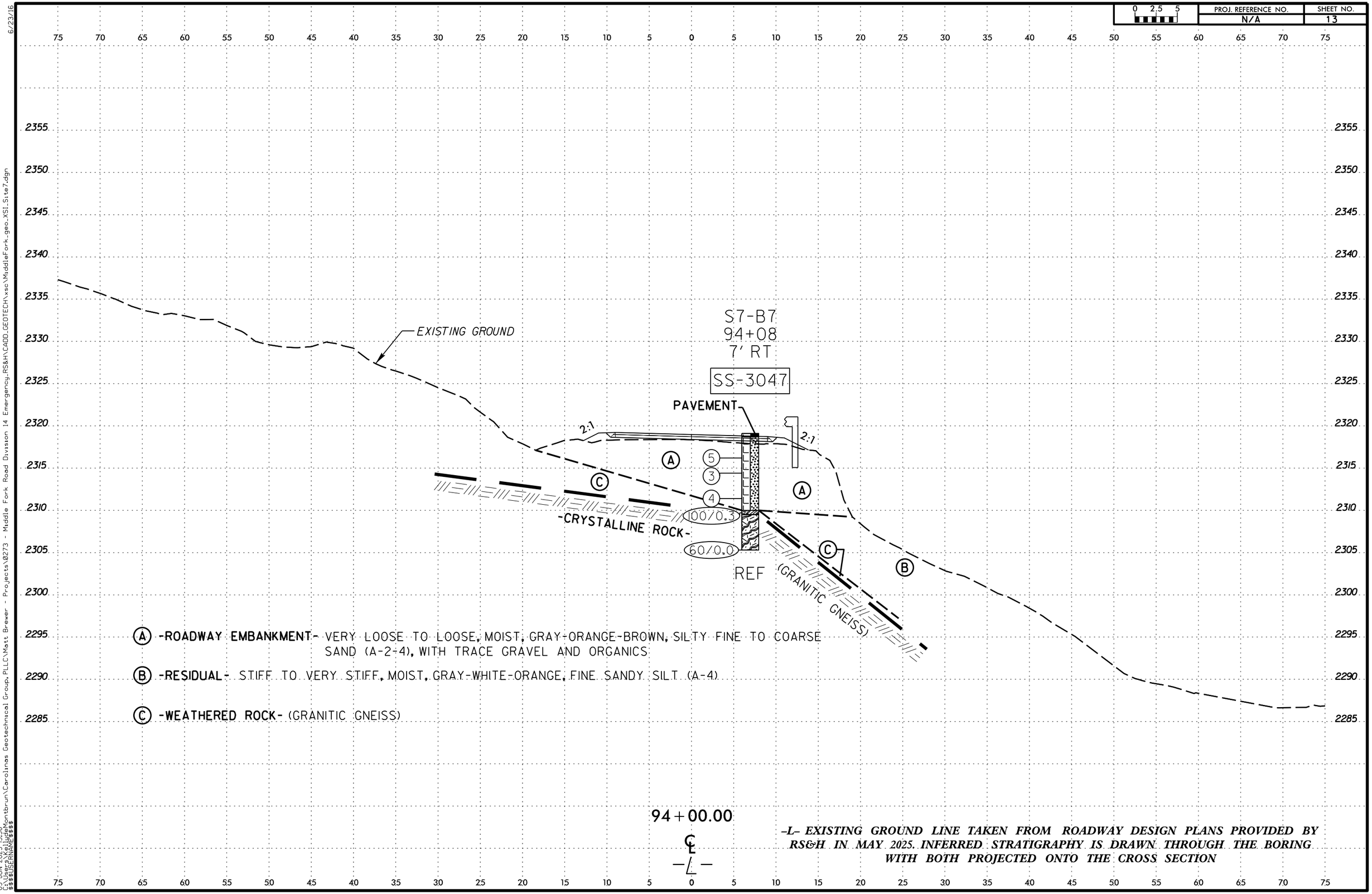
—/—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



Ⓐ **-ROADWAY EMBANKMENT-** VERY LOOSE TO LOOSE, MOIST, GRAY-ORANGE-BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL AND ORGANICS

Ⓑ **-RESIDUAL-** STIFF TO VERY STIFF, MOIST, GRAY-WHITE-ORANGE, FINE SANDY SILT (A-4)

Ⓒ **-WEATHERED ROCK-** (GRANITIC GNEISS)

94+00.00

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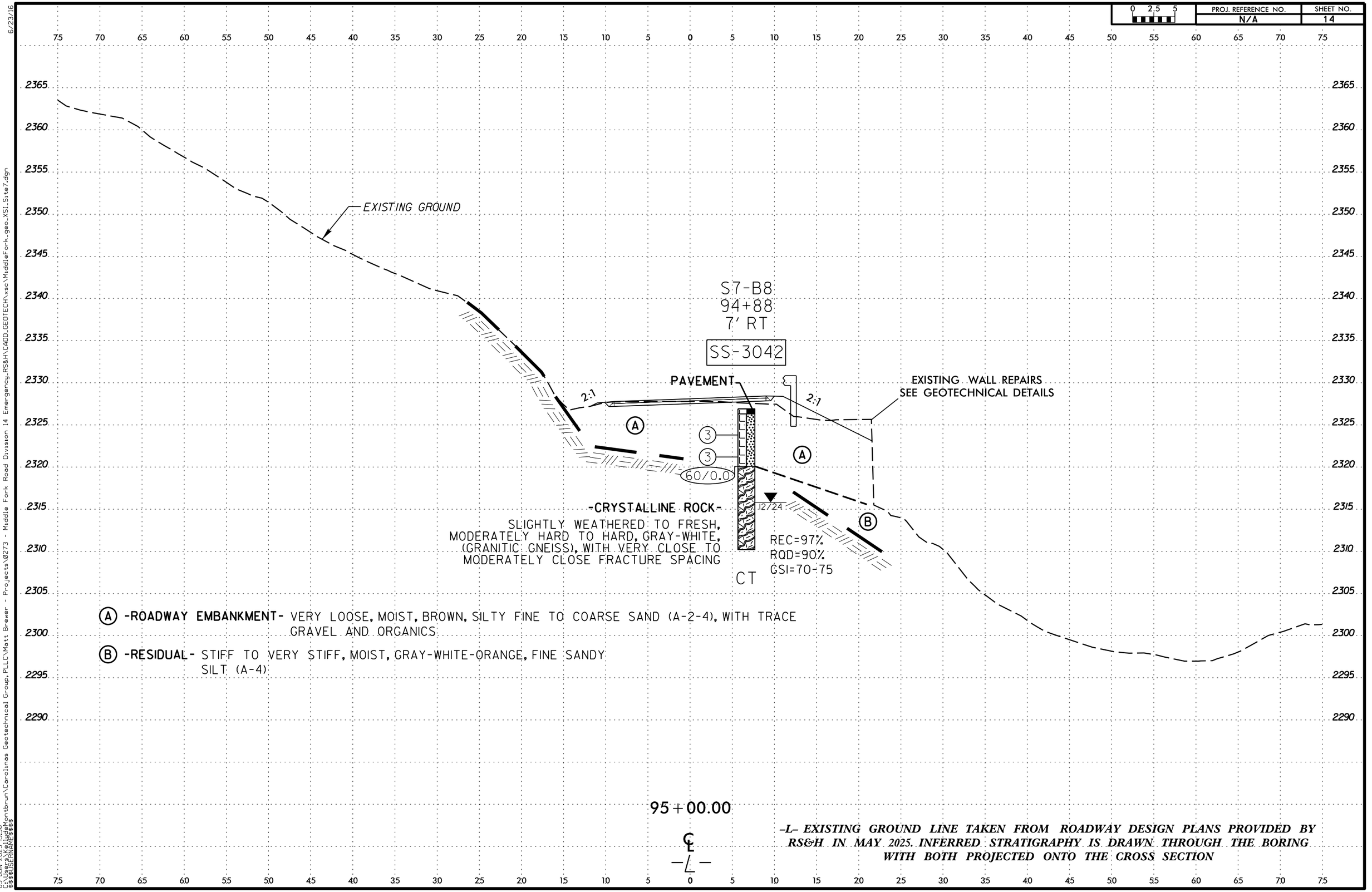
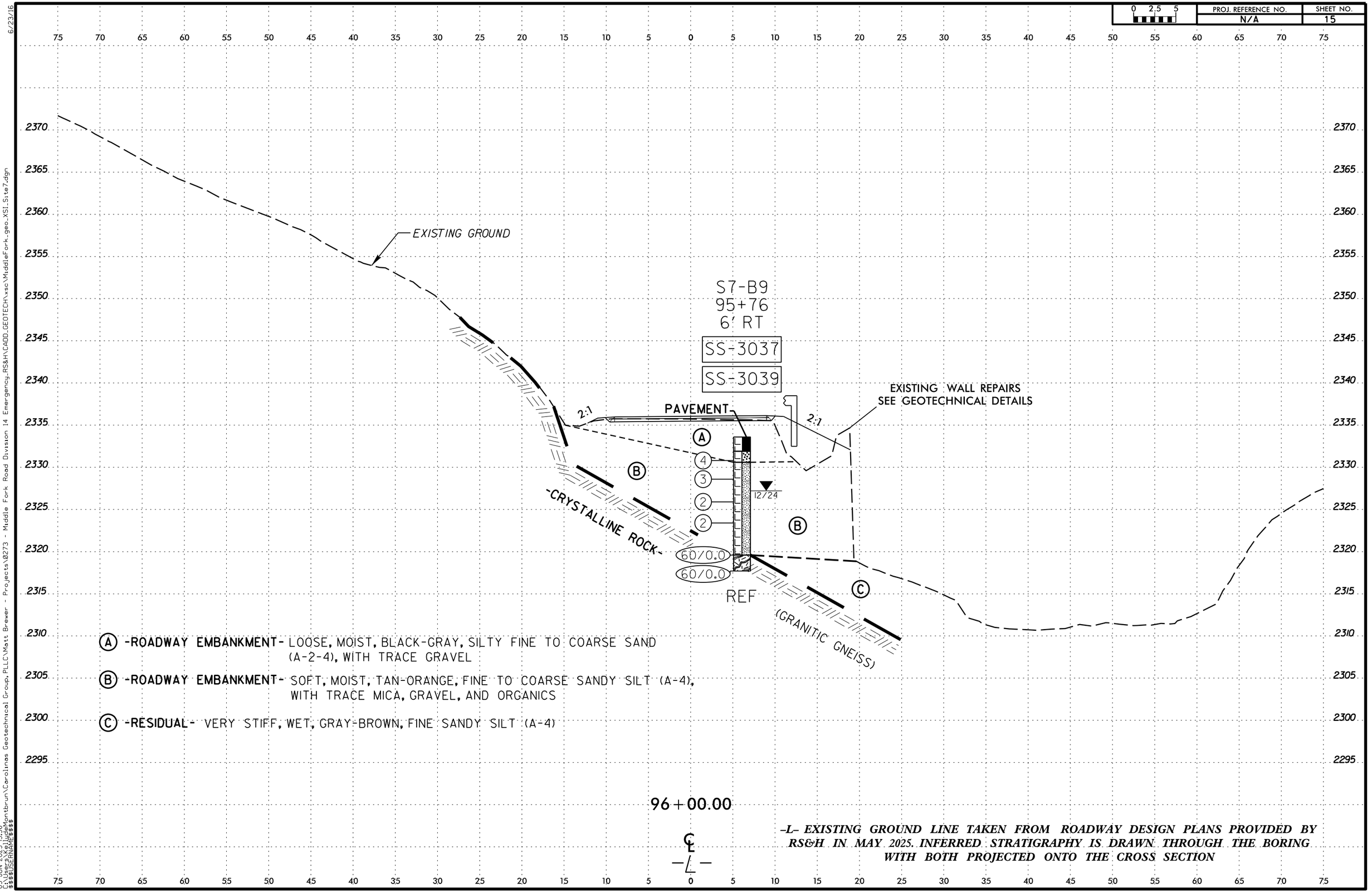
-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



(A) **-ROADWAY EMBANKMENT-** VERY LOOSE, MOIST, BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL AND ORGANICS

(B) **-RESIDUAL-** STIFF TO VERY STIFF, MOIST, GRAY-WHITE-ORANGE, FINE SANDY SILT (A-4)

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



Ⓐ **-ROADWAY EMBANKMENT-** LOOSE, MOIST, BLACK-GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL

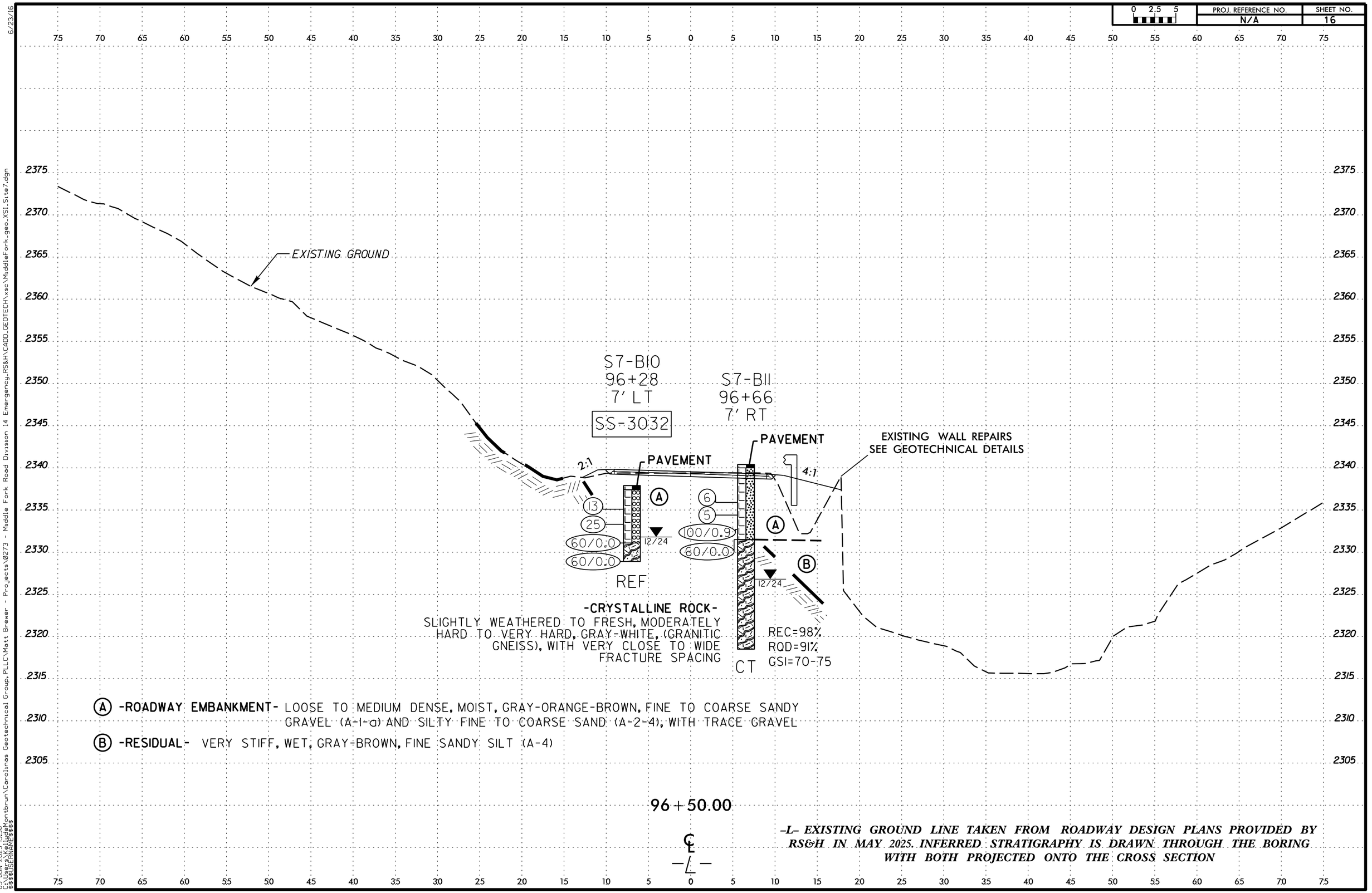
Ⓑ **-ROADWAY EMBANKMENT-** SOFT, MOIST, TAN-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA, GRAVEL, AND ORGANICS

Ⓒ **-RESIDUAL-** VERY STIFF, WET, GRAY-BROWN, FINE SANDY SILT (A-4)

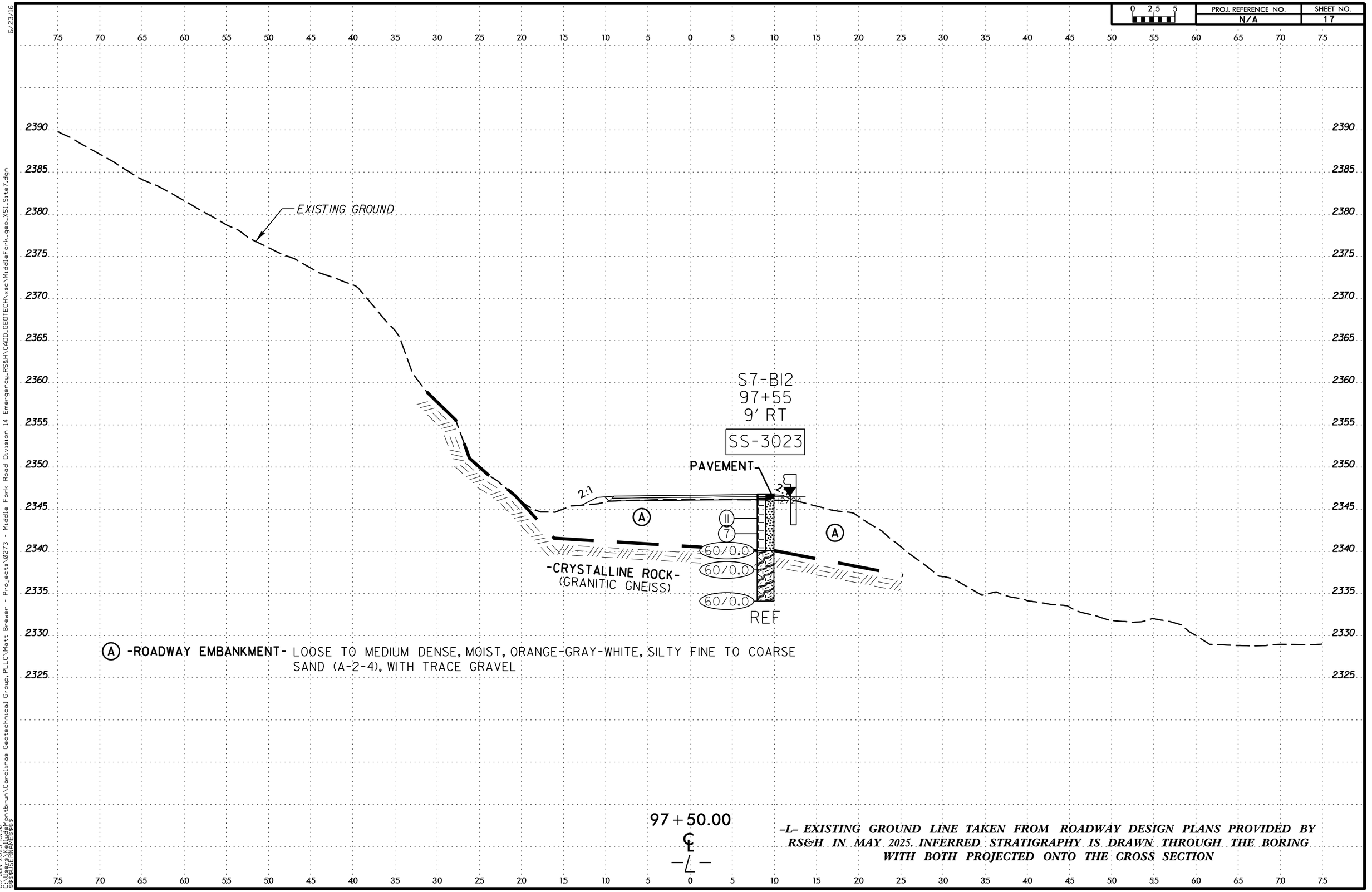
96+00.00

℄

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



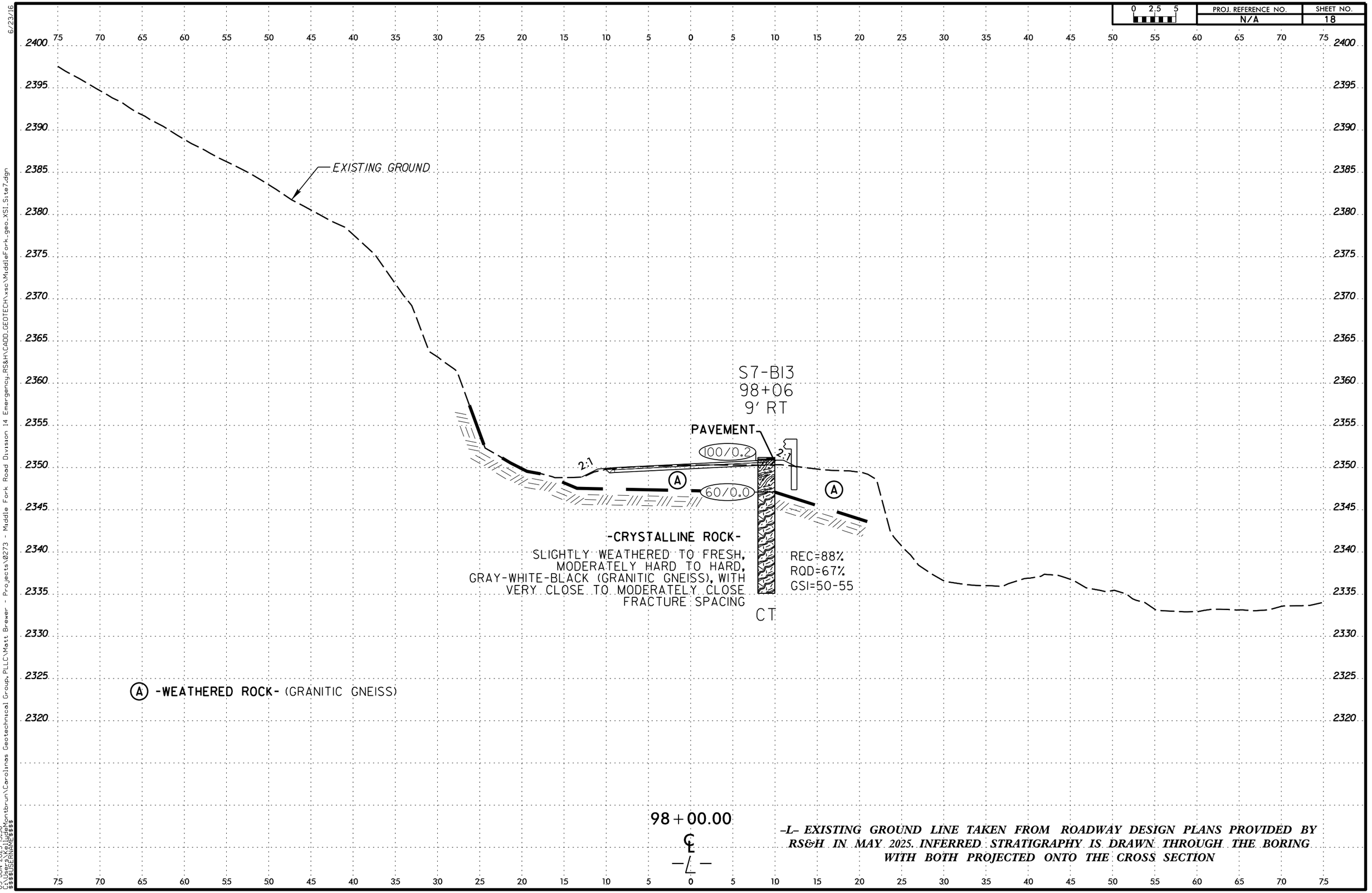
-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



(A) **-ROADWAY EMBANKMENT-** LOOSE TO MEDIUM DENSE, MOIST, ORANGE-GRAY-WHITE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	N/A	18



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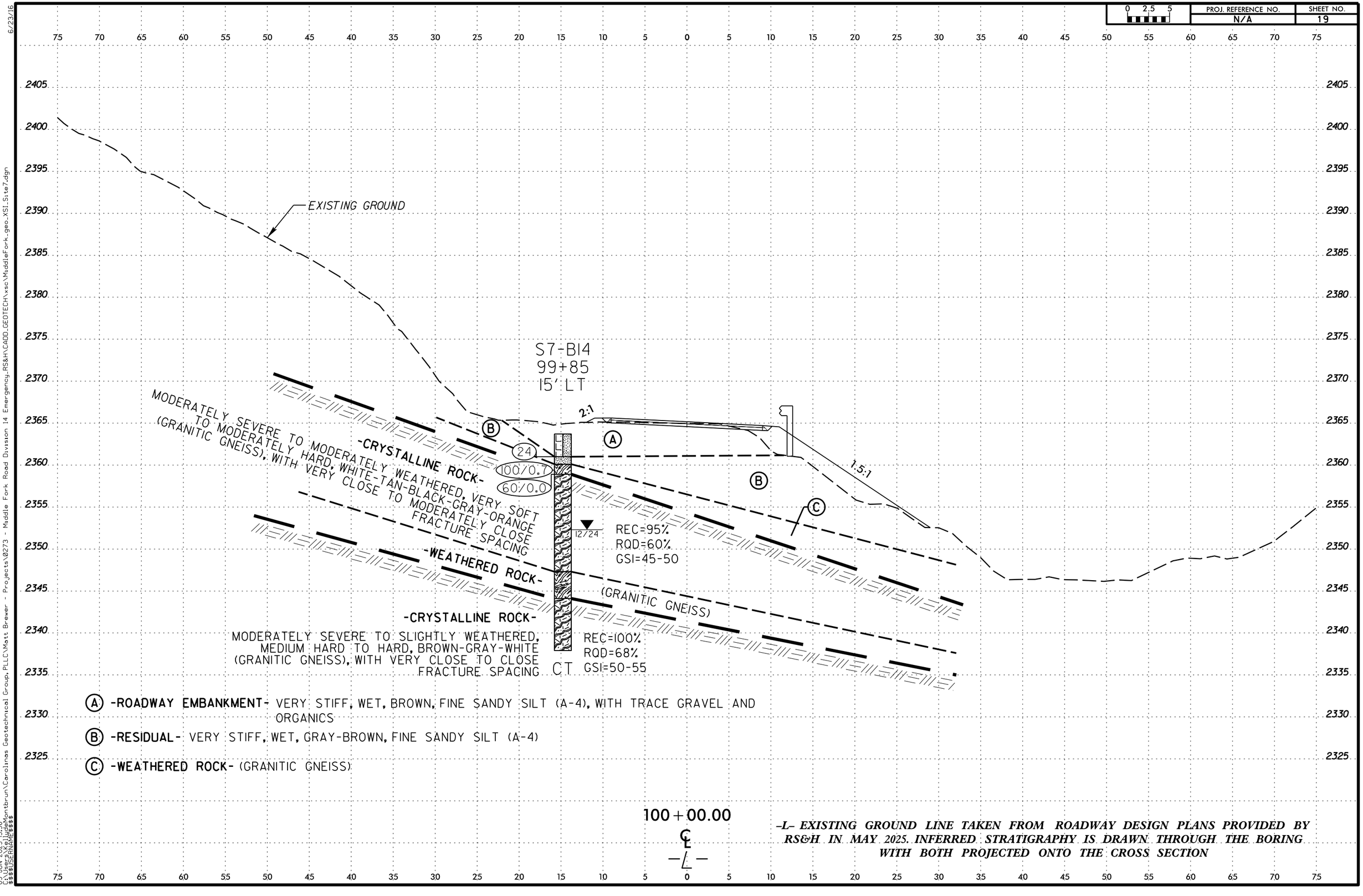


(A) **-ROADWAY EMBANKMENT-** VERY STIFF, WET, BROWN, FINE SANDY SILT (A-4), WITH TRACE GRAVEL AND ORGANICS

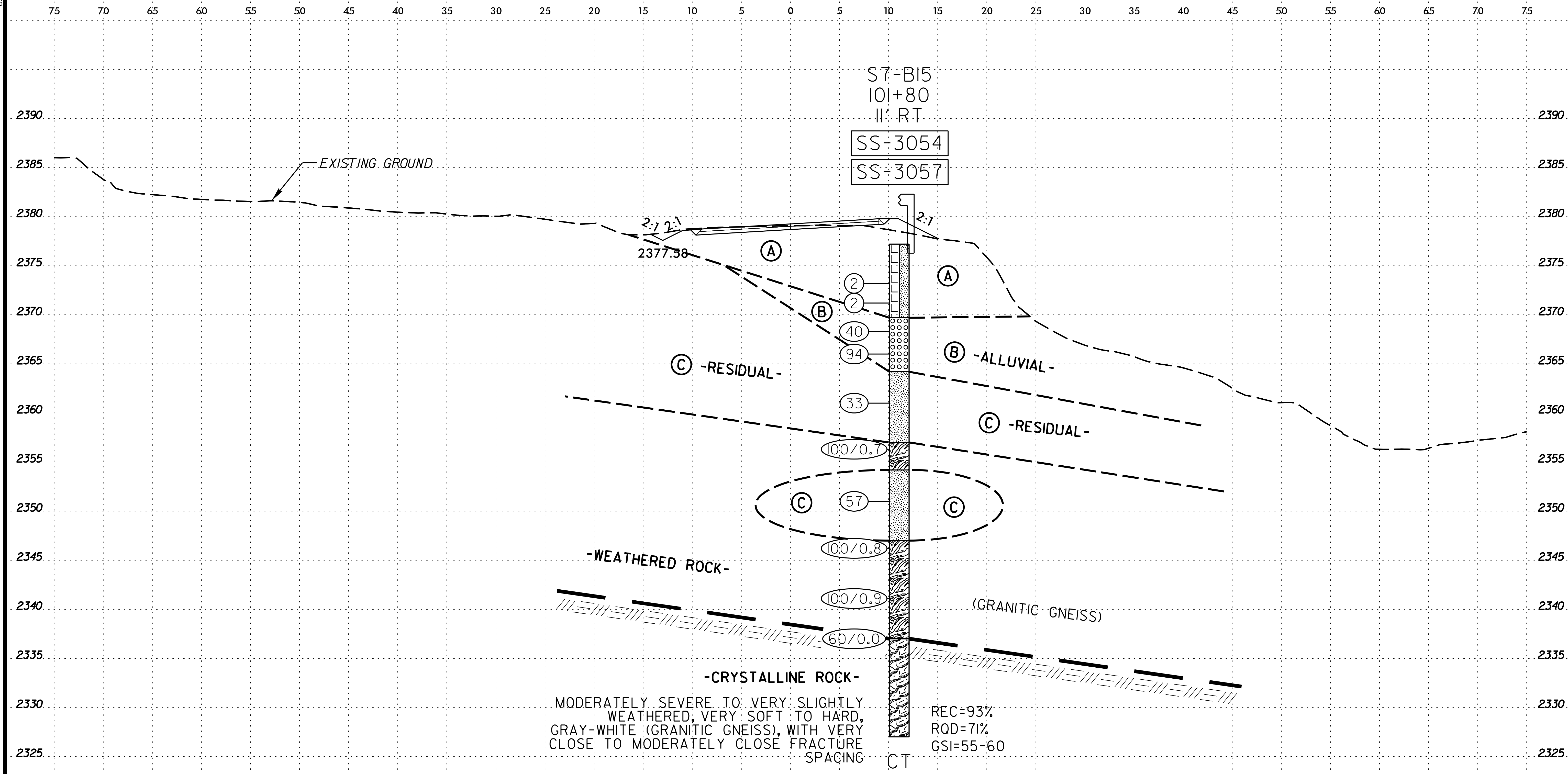
(B) **-RESIDUAL-** VERY STIFF, WET, GRAY-BROWN, FINE SANDY SILT (A-4)

(C) **-WEATHERED ROCK-** (GRANITIC GNEISS)

100+00.00
℄
—/—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	N/A	20



(A) **-ROADWAY EMBANKMENT-** SOFT, WET, BROWN-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL AND ORGANICS

(B) **-ALLUVIAL-** DENSE TO VERY DENSE, WET, TAN, SILTY FINE TO COARSE SANDY GRAVEL (A-1-a)

(C) **-RESIDUAL-** HARD, MOIST, BROWN-GRAY, FINE SANDY SILT (A-4), WITH MANGANESE OXIDE STAINING

102+00.00

℄
-L-

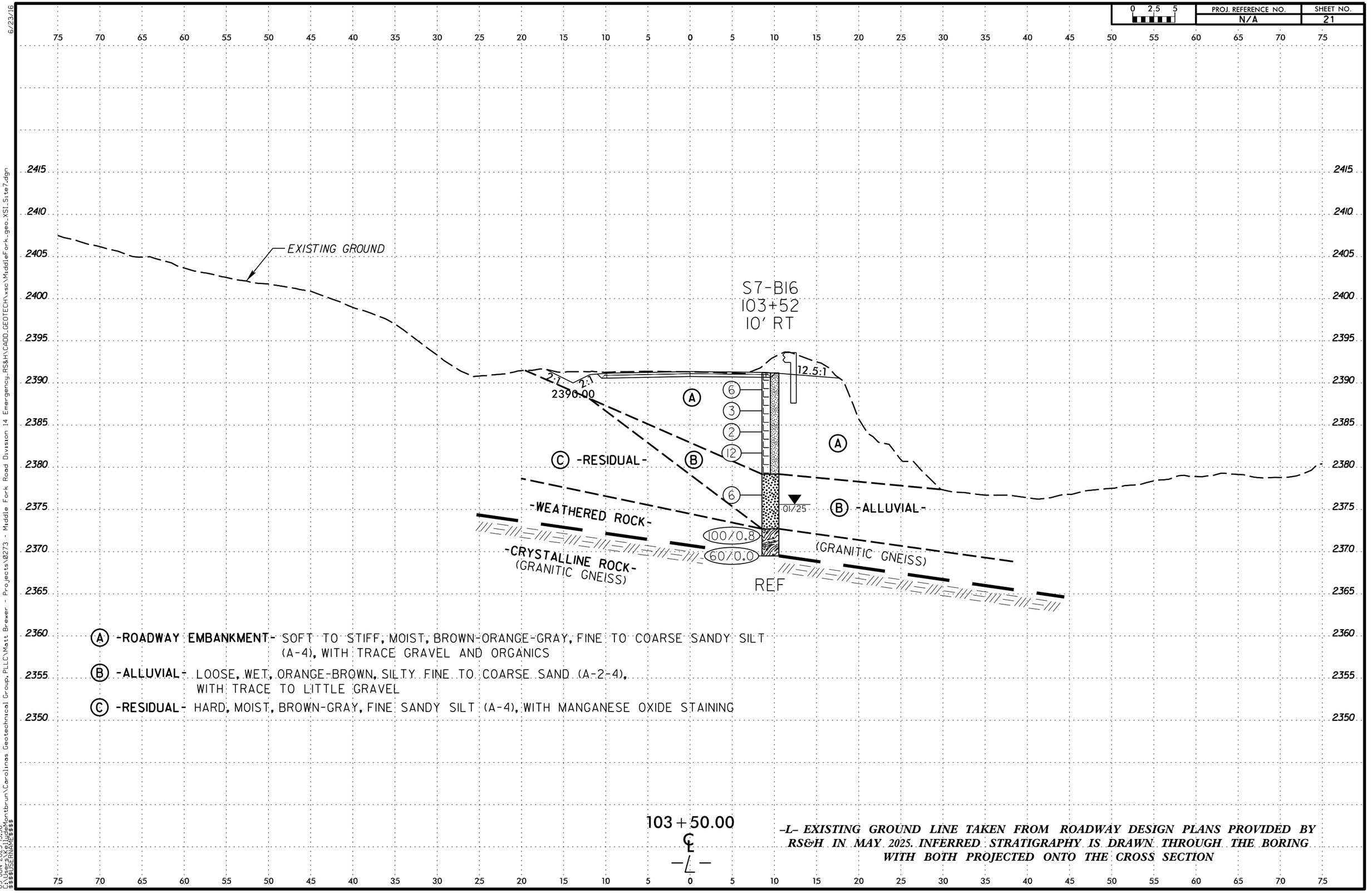
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16

03-JUN-2025 13:56
C:\Users\KelliadeMontbrun\Carolinas Geotechnical Group, PLLC\Matt Brewer - Projects\0273 - Middle Fork Road Division 14 Emergency_RS&H\CADD_GEOTECH\xsc\MiddleFork_geo_XSI_Site7.dgn
$$$$USERNAME$$$$

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	N/A	21



(A) **-ROADWAY EMBANKMENT-** SOFT TO STIFF, MOIST, BROWN-ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL AND ORGANICS

(B) **-ALLUVIAL-** LOOSE, WET, ORANGE-BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE GRAVEL

(C) **-RESIDUAL-** HARD, MOIST, BROWN-GRAY, FINE SANDY SILT (A-4), WITH MANGANESE OXIDE STAINING

103+50.00
℄
—L—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** R. Welch	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B1	**STATION** 86+01	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,258.3 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 644,249	**EASTING** 1,015,963	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2260											
										2,258.3 GROUND SURFACE	0.0
										2,257.6 **ROADWAY EMBANKMENT** Asphalt (0.7')	0.7
2255										Soft, Brown-Gray, Fine Sandy SILT (A-4), with trace mica	
	2,253.5	4.8	WOH	1	1	2		W		Boulder ~ 9.7 ft	
2250	2,248.7	9.6	1	99/0.2		100/0.7		W			
2245										2,244.8	13.5
	2,243.7	14.6	9	7	57	64		W		**RESIDUAL** Very Dense, Gray-Brown-White, Silty Fine to Coarse SAND (A-2-4), with trace mica	
2240	2,238.7	19.6								2,238.7	19.6
	2,237.9	20.4	60/0.0			60/0.0				2,237.8 **CRYSTALLINE ROCK** Gray-White, (Granitic Gneiss)	20.5
2235			60/0.1			60/0.1				Gray-White, (Granitic Gneiss)	
										REC = 92% RQD = 66% GSI = 50-55	
2230											
										2,227.8	30.5
										Boring Terminated at Elevation 2,227.8 ft In Crystalline Rock (Granitic Gneiss)	

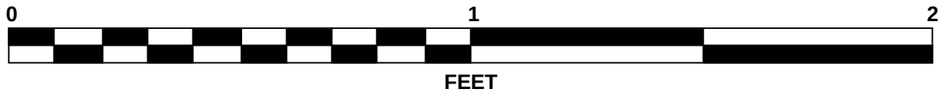
GEOTECHNICAL BORING REPORT
CORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** R. Welch	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B1	**STATION** 86+01	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,258.3 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 644,249	**EASTING** 1,015,963	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 10.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2237.83											Begin Coring @ 20.5 ft	
	2,237.8	20.5	5.0	2:32/1.0 3:28/1.0 3:34/1.0 2:08/1.0 0:47/1.0	(4.6) 92%	(2.5) 50%		(9.2) 92%	(6.6) 66%		2,237.8 Very Slightly Weathered to Fresh, Moderately Hard to Hard, Gray-White, (Granitic Gneiss), with Close to Moderately Close Fracture Spacing	20.5
2235											GSI = 50-55	
	2,232.8	25.5	5.0	2:37/1.0 3:21/1.0 3:34/1.0 3:18/1.0 2:45/1.0	(4.6) 92%	(4.1) 82%						
2230												
	2,227.8	30.5									2,227.8	30.5
											Boring Terminated at Elevation 2,227.8 ft In Crystalline Rock (Granitic Gneiss)	

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B1
20.5 to 30.5 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B2	**STATION** 87+43	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,270.9 ft	**TOTAL DEPTH** 49.3 ft	**NORTHING** 644,389	**EASTING** 1,015,945	**24 HR.** 25.4
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 11/13/24	**COMP. DATE** 12/13/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2275											
2270	2,269.9	1.0	3	3	1	4		M		2,270.9 GROUND SURFACE	0.0
	2,267.4	3.5	1	3	7	10		M		2,269.9 **ROADWAY EMBANKMENT** Asphalt (1.0')	1.0
2265	2,264.9	6.0	3	4	4	8		M		2,267.9 Loose, Brown, Silty Fine SAND (A-2-4), with trace asphalt fragments and gravel	3.0
	2,262.4	8.5	60	40/0.1		100/0.6				2,265.4 Stiff, Brown, Fine Sandy SILT (A-4), with trace organics and gravel	5.5
2260	2,260.2	10.7	60/0.0			60/0.0				**COLLUVIAL** 2,262.4 Loose, Orange-Brown, Silty Fine to Coarse SAND (A-2-4), with trace organics	8.5
2255										2,260.2 **WEATHERED ROCK** White-Orange-Brown, (Granitic Gneiss)	10.7
										CRYSTALLINE ROCK Gray-White (Boulder)	
2250										2,255.7 **WEATHERED ROCK** (Granitic Gneiss)	15.2
										2,254.2 **CRYSTALLINE ROCK** Gray-White (Granitic Gneiss)	16.7
2245	2,245.1	25.8	5	8	8	16		M		2,245.7 **RESIDUAL** Medium Stiff to Hard, Gray-White-Orange, Fine Sandy SILT (A-4), with trace to little mica, Manganese Oxide staining	25.2
	2,241.6	29.3	1	2	4	6		M			
2240											
	2,236.6	34.3	24	26	49	75		M			
2235											
	2,231.6	39.3	11	10	6	16		M			
2230											
	2,226.4	44.5	60/0.0			60/0.0				2,227.1 **CRYSTALLINE ROCK** (Granitic Gneiss)	43.8
2225											
	2,221.6	49.3	60/0.0			60/0.0				2,221.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,221.6 ft In Crystalline Rock (Granitic Gneiss) Note: Very Hard Drilling at 43.8'	49.3

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
CORE LOG

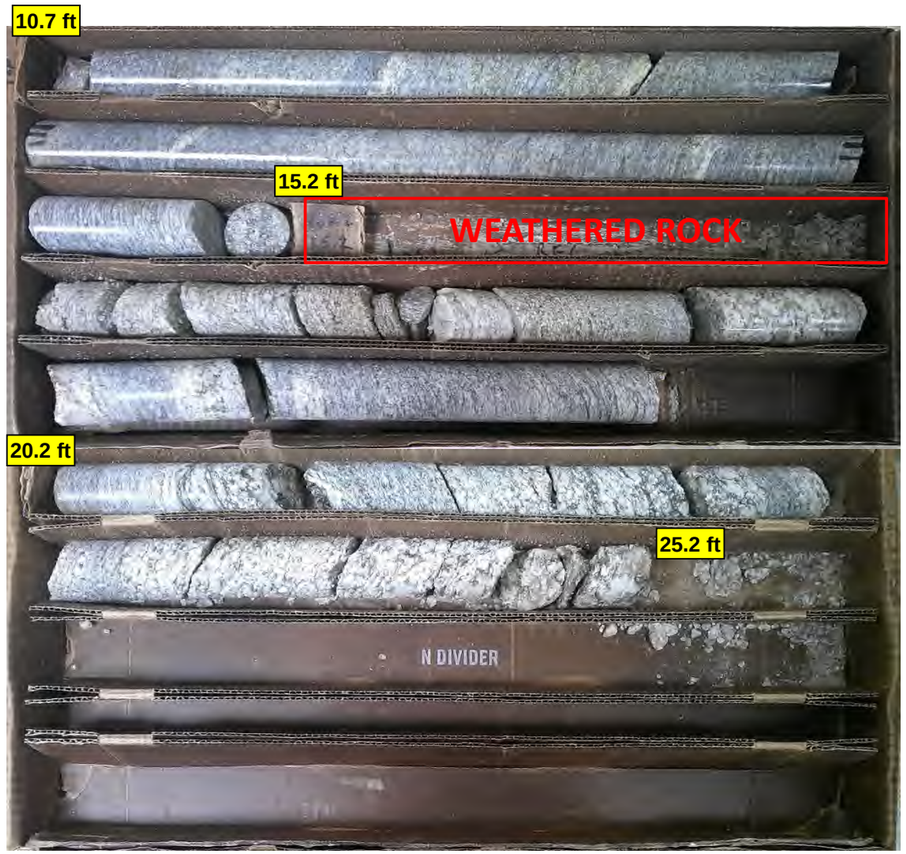
WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B2	**STATION** 87+43	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,270.9 ft	**TOTAL DEPTH** 49.3 ft	**NORTHING** 644,389	**EASTING** 1,015,945	**24 HR.** 25.4
DRILL RIG/HAMMER EFF./DATE CG24113 CME-550X 78% 05/06/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 11/13/24	**COMP. DATE** 12/13/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 14.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2260											Begin Coring @ 10.7 ft	
	2,260.2	10.7	4.5	N=60/0.0 3:02/1.0 2:25/1.0 2:55/1.0 2:03/1.0 0:15/0.5	(4.3) 96%	(4.1) 91%		(4.3) 96%	(4.1) 91%		2,260.2 **CRYSTALLINE ROCK (BOULER)**	10.7
2255	2,255.7	15.2	5.0	0:36/1.0 0:59/1.0 3:09/1.0 1:36/1.0 0:49/1.0	(3.3) 66%	(2.1) 42%		(0.0) 0%	(0.0) 0%		2,255.7 Very Slightly Weathered to Fresh, Moderately Hard to Hard, Gray-White (Boulder), with Very Close to Moderately Close Fracture Spacing	15.2
								(6.6) 78%	(3.0) 35%		2,254.2 **WEATHERED ROCK** (Granitic Gneiss)	16.7
2250	2,250.7	20.2	5.0	1:05/1.0 0:47/1.0 0:41/1.0 0:37/1.0 0:37/1.0	(3.3) 66%	(0.9) 18%					**CRYSTALLINE ROCK (BOULER)** Moderately Severely to Slightly Weathered, Medium Hard to Hard, Gray-White (Boulder), with Very Close to Close Fracture Spacing	
2245	2,245.7	25.2		N=16							2,245.7 **RESIDUAL** Medium Stiff to Hard, Gray-White-Orange, Fine Sandy SILT (A-4), with trace to little mica, Manganese Oxide staining	25.2
2240				N=6								
2235				N=75								
2230				N=16								
2225				N=60/0.0							2,227.1 **CRYSTALLINE ROCK** (Granitic Gneiss)	43.8
				N=60/0.0							2,221.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,221.6 ft In Crystalline Rock (Granitic Gneiss) Note: Very Hard Drilling at 43.8'	49.3

NCDOT CORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B2
10.7 to 25.2 Feet



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FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B3	**STATION** 88+19	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** 16.4
COLLAR ELEV. 2,277.0 ft	**TOTAL DEPTH** 56.2 ft	**NORTHING** 644,464	**EASTING** 1,015,927	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Ard	**START DATE** 12/12/24	**COMP. DATE** 12/13/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2280										2,277.0 GROUND SURFACE 0.0
2275	2,274.7	2.3								**ROADWAY EMBANKMENT** Soft to Medium Stiff, Tan-Brown-Orange, Fine Sandy SILT (A-4(0)), with trace gravel, mica, and organics
	2,272.4	4.6	3	2	2	4	SS-1249	22%		
2270	2,269.7	7.3	1	1	7	8		M		2,270.5 6.5
	2,267.4	9.6	6	2	1	3	SS-1251	15%		**COLLUVIAL** Very Loose, White-Gray-Orange, Silty Fine to Coarse SAND (A-2-4), with trace mica 2,267.4 9.6
2265			52	48/0.2		100/0.7				**WEATHERED ROCK** White-Gray-Brown, (Granitic Gneiss)
	2,262.4	14.6	9	36	64/0.3	100/0.8				
2260										
	2,257.4	19.6	73	27/0.2		100/0.7				
2255										2,254.5 22.5
	2,252.4	24.6	1	8	18	26		M		**RESIDUAL** Stiff to Very Stiff, Gray-White-Orange, Fine Sandy SILT (A-4(0)), with trace mica, Manganese Oxide staining
2250										
	2,247.4	29.6	9	6	4	10	SS-1256	37%		
2245										2,244.5 32.5
	2,242.4	34.6	14	9	8	17		W		Medium Dense, White-Gray-Orange, Silty Fine to Coarse SAND (A-2-4) 2,241.4 35.6
2240										Stiff to Very Stiff, Orange-Gray-White, Fine to Coarse Sandy SILT (A-4(0)), with trace gravel-sized rock fragments and mica
	2,237.4	39.6	10	13	14	27		W		
2235										
	2,232.4	44.6	3	5	10	15	SS-1259	34%		
2230										
	2,227.4	49.6	5	6	11	17		M		
2225										
	2,222.4	54.6	6	94/0.3		100/0.8				2,222.4 54.6
	2,220.8	56.2	60/0.0			60/0.0				**WEATHERED ROCK** Gray-White, (Granitic Gneiss) 2,220.8 56.2 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,220.8 ft On Crystalline Rock (Granitic Gneiss)

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Tomasic	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B4	**STATION** 89+15	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** 26.6
COLLAR ELEV. 2,284.7 ft	**TOTAL DEPTH** 54.9 ft	**NORTHING** 644,559	**EASTING** 1,015,914	**24 HR.** 27.2
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/16/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2285										2,284.7 GROUND SURFACE	0.0
	2,283.3	1.4	4	7	7	14 47		M		2,284.5 **ROADWAY EMBANKMENT** Asphalt (0.2')	0.2
	2,281.7	3.0	5	29	18			M		Medium Dense to Dense, Tan-Orange-White-Brown, Silty Fine SAND (A-2-4), with trace gravel and organics	
2280										2,279.7	5.0
	2,278.3	6.4	3	4	2	6		M		**RESIDUAL** Medium Stiff, Orange-White-Gray, Fine Sandy SILT (A-4), with trace mica	
	2,276.7	8.0	4	8	92/0.3	100/0.8				2,276.2	8.5
2275										**WEATHERED ROCK** Gray-White-Orange, (Granitic Gneiss)	
	2,271.7	13.0	2	4	8	12		M		2,272.2	12.5
2270										**RESIDUAL** Medium Stiff to Stiff, Brown-Gray-White-Orange, Fine Sandy SILT (A-4(0)), with trace mica, Manganese Oxide staining	
	2,266.7	18.0	4	3	4	7	SS-3014	25%			
2265											
	2,261.7	23.0	3	2	5	7		M			
2260											
	2,256.7	28.0	2	2	3	5		M			
2255											
	2,251.8	32.9	60/0.0			60/0.0				2,251.8 (Boulder)	32.9
2250										2,249.8	34.9
										Very Stiff, Orange-Gray-White, Fine Sandy SILT (A-4), with trace mica, Manganese Oxide staining	
2245											
	2,244.3	40.4	4	5	11	16		M			
	2,241.8	42.9	7	70	30/0.1					2,241.3	43.4
	2,240.3	44.4	60/0.0			100/0.6 60/0.0				2,240.3 **WEATHERED ROCK** Gray-White, (Granitic Gneiss)	44.4
2240										**CRYSTALLINE ROCK** (Granitic Gneiss)	
2235										REC = 95% RQD = 83% GSI = 65-70	
2230										2,229.8	54.9
										Boring Terminated at Elevation 2,229.8 ft In Crystalline Rock (Granitic Gneiss)	

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
CORE LOG

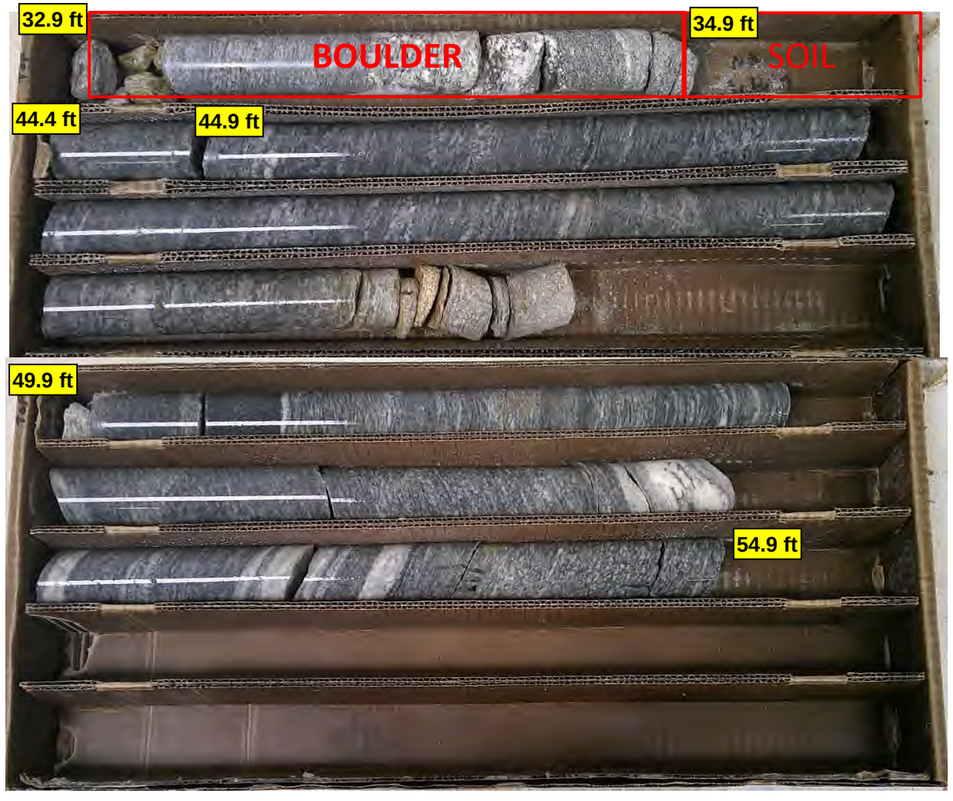
WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Tomasic	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B4	**STATION** 89+15	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** 26.6
COLLAR ELEV. 2,284.7 ft	**TOTAL DEPTH** 54.9 ft	**NORTHING** 644,559	**EASTING** 1,015,914	**24 HR.** 27.2
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/16/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 17.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2251.8											Begin Coring @ 32.9 ft	
2250	2,251.8	32.9	2.0	N=60/0.0 3:17/1.0 0:50/1.0	(1.6) 80%	(0.8) 40%		(1.6) 80%	(0.8) 40%		2,251.8 (Boulder)	32.9
	2,249.8	34.9	5.0	0:28/1.0 0:35/1.0 0:36/1.0 0:35/1.0 0:24/1.0	(0.0) 0%	(0.0) 0%					2,249.8 Very Stiff, Orange-Gray-White, Fine Sandy SILT (A-4), with trace mica, Manganese Oxide staining	34.9
2245	2,244.8	39.9		N=16								
2240	2,240.3	44.4		N=100/0.6							2,241.3	43.4
	2,239.8	44.9	0.5	N=60/0.0 2:38/0.5	(0.4) 80%	(0.4) 80%		(10.0) 95%	(8.7) 83%		2,240.3 **WEATHERED ROCK** (Granitic Gneiss)	44.4
			5.0	4:09/1.0 3:00/1.0 3:18/1.0 3:21/1.0 1:21/1.0	(4.8) 96%	(4.2) 84%					**CRYSTALLINE ROCK** Very Slightly Weathered to Fresh, Medium Hard to Very Hard, Gray-White, (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing	
2235	2,234.8	49.9									GSI = 65-70	
			5.0	4:27/1.0 4:02/1.0 4:45/1.0 5:34/1.0 5:20/1.0	(4.8) 96%	(4.1) 82%						
2230	2,229.8	54.9									2,229.8	54.9
											Boring Terminated at Elevation 2,229.8 ft In Crystalline Rock (Granitic Gneiss)	

NCDOT CORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B4
32.9 to 54.9 Feet



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FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B5	**STATION** 89+84	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** 22.8
COLLAR ELEV. 2,289.8 ft	**TOTAL DEPTH** 31.1 ft	**NORTHING** 644,626	**EASTING** 1,015,899	**24 HR.** 25.5
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/11/24	**COMP. DATE** 12/12/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2290										2,289.8 GROUND SURFACE	0.0
	2,288.8	1.0	20	6	6	12		M		2,289.2 **ROADWAY EMBANKMENT** Asphalt (0.6')	0.6
	2,286.0	3.8	3	4	2	6		M		2,286.8 Medium Dense, Gray, Silty Fine SAND (A-2-4), with trace gravel	3.0
2285	2,283.8	6.0	2	2	19	21		M		Medium Stiff to Very Stiff, Orange-Gray, Fine Sandy SILT (A-4), with trace gravel and organics	
	2,281.0	8.8	54	11	2	13		M		2,281.8 Medium Dense, Gray, Gravelly Fine SAND (A-1-b)	8.0
2280										2,280.0 Soft, Orange, Fine Sandy SILT (A-4)	9.8
	2,276.0	13.8	5	8	12	20		M		2,277.3 **RESIDUAL** Very Stiff, Gray-White, Fine Sandy SILT (A-4)	12.5
2275											
	2,271.0	18.8	15	85/0.4		100/0.9				2,271.0 **WEATHERED ROCK** Gray, (Granitic Gneiss)	18.8
2270											
	2,266.0	23.8	11	7	5	12		M		2,266.8 **RESIDUAL** Stiff, White-Gray-Orange, Fine Sandy SILT (A-4)	23.0
2265											
	2,261.0	28.8	5	7	93/0.4	100/0.9		M		2,260.5 **WEATHERED ROCK**	29.3
2260	2,258.7	31.1	60/0.0			60/0.0				2,258.7 Gray-Orange-White, (Granitic Gneiss) Boring Terminated with Standard Penetration Test Refusal at Elevation 2,258.7 ft On Crystalline Rock (Granitic Gneiss)	31.1

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B6	**STATION** 90+89	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,296.6 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 644,730	**EASTING** 1,015,883	**24 HR.** 12.4
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/11/24	**COMP. DATE** 12/13/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2300										
										2,296.6 GROUND SURFACE 0.0
2295	2,295.6	1.0	2	2	1	3	SS-1235	24%		**ROADWAY EMBANKMENT** Soft, Tan-Gray, Fine to Coarse Sandy SILT (A-4(0)), with trace organics, gravel, and mica
	2,292.5	4.1	1	2	1	3		M		2,293.1 3.5
2290	2,290.6	6.0	2	2	2	4	SS-1237	24%		Soft to Stiff, Orange, Slightly Plastic Fine to Coarse Sandy CLAY (A-6(4)), with trace organics and gravel
	2,287.5	9.1	2	5	8	13		M		Boulder ~ 11.0 ft
2285	2,285.6	11.0	60/0.1			60/0.1				
	2,282.5	14.1								2,282.5 14.1
	2,281.1	15.5	100/0.3			100/0.3				**WEATHERED ROCK** Gray-White-Orange, (Granitic Gneiss) 2,281.1 15.5
2280			60/0.0			60/0.0				**CRYSTALLINE ROCK** Gray-White-Orange, (Granitic Gneiss)
2275										REC= 99% RQD= 97% GSI= 80-85
										2,272.1 24.5
										Boring Terminated at Elevation 2,272.1 ft In Crystalline Rock (Granitic Gneiss)

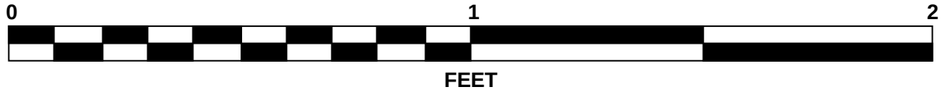
GEOTECHNICAL BORING REPORT
CORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B6	**STATION** 90+89	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,296.6 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 644,730	**EASTING** 1,015,883	**24 HR.** 12.4
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 12/11/24	**COMP. DATE** 12/13/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 9.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft) / DEPTH (ft)
2281.08											Begin Coring @ 15.5 ft
2280	2,281.1	15.5	4.0	*N=60/0.0* 4:43/1.0 4:00/1.0 4:51/1.0 4:31/1.0	(3.9) 98%	(3.8) 95%		(8.9) 99%	(8.7) 97%		2,281.1 **CRYSTALLINE ROCK** 15.5 Very Slightly Weathered to Fresh, Moderately Hard to Very Hard, Gray-White-Orange (Granitic Gneiss), with Close to Wide Fracture Spacing
	2,277.1	19.5									GSI = 80-85
2275			5.0	3:24/1.0 5:20/1.0 7:06/1.0 12:16/1.0 13:28/1.0	(5.0) 100%	(4.9) 98%					
	2,272.1	24.5									2,272.1 24.5
											Boring Terminated at Elevation 2,272.1 ft In Crystalline Rock (Granitic Gneiss)

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B6
15.5 to 24.5 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B7	**STATION** 94+08	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,319.1 ft	**TOTAL DEPTH** 13.8 ft	**NORTHING** 645,044	**EASTING** 1,015,872	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** Wash Boring		**HAMMER TYPE** Automatic
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2320										2,319.1 / 0.0 GROUND SURFACE
	2,317.2	1.9	2	2	3	5		M		2,318.7 / 0.4 **ROADWAY EMBANKMENT** Asphalt (0.4')
2315	2,315.4	3.7	2	2	1	3		M		Very Loose to Loose, Gray-Orange-Brown, Silty Fine to Coarse SAND (A-2-4), with trace gravel and organics
	2,312.4	6.7	3	2	2	4	SS-3047	29%		
2310	2,310.0	9.1	100/0.3			100/0.3				2,310.0 / 9.1 2,309.5 / 9.6 **WEATHERED ROCK** White-Gray, (Granitic Gneiss) **CRYSTALLINE ROCK** (Granitic Gneiss)
	2,305.3	13.8	60/0.0			60/0.0				2,305.3 / 13.8 Boring Terminated at Elevation 2,305.3 ft In Crystalline Rock (Granitic Gneiss) Note: Very Hard Drilling at 9.6'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B8	**STATION** 94+88	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,326.9 ft	**TOTAL DEPTH** 16.7 ft	**NORTHING** 645,123	**EASTING** 1,015,886	**24 HR.** 11.1
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2330											
										2,326.9 GROUND SURFACE	0.0
										2,326.3 **ROADWAY EMBANKMENT** Asphalt (0.6')	0.6
2325	2,324.8	2.1	3	2	1	3	SS-3042	33%		**ROADWAY EMBANKMENT** Very Loose, Brown, Silty Fine to Coarse SAND (A-2-4), with trace gravel and organics	
	2,322.2	4.7	1	1	2	3		M			
2320	2,320.1	6.8	60/0.0			60/0.0				2,320.1 **CRYSTALLINE ROCK** (Granitic Gneiss)	6.8
2315										REC = 97% RQD = 90% GSI = 70-75	
										2,310.2 Boring Terminated at Elevation 2,310.2 ft In Crystalline Rock (Granitic Gneiss)	16.7

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
CORE LOG

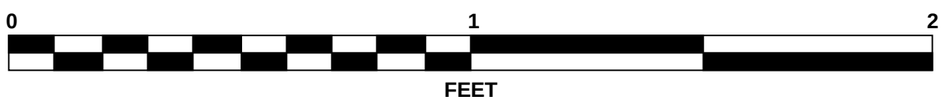
WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B8	**STATION** 94+88	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,326.9 ft	**TOTAL DEPTH** 16.7 ft	**NORTHING** 645,123	**EASTING** 1,015,886	**24 HR.** 11.1
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 9.9 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2320											Begin Coring @ 6.8 ft	
	2,320.1	6.8	4.9	*N=60/0.0* 2:09/1.0 2:39/1.0 2:22/1.0 2:32/1.0 2:05/1.0	(4.6) 94%	(4.1) 84%		(9.6) 97%	(8.9) 90%		2,320.1 **CRYSTALLINE ROCK** Slightly Weathered to Fresh, Moderately Hard to Hard, Gray-White, (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing	6.8
2315	2,315.2	11.7	5.0	4:23/1.0 2:29/1.0 2:46/1.0 3:25/1.0 6:14/1.0	(5.0) 100%	(4.8) 96%					GSI = 70-75	
	2,310.2	16.7									2,310.2 Boring Terminated at Elevation 2,310.2 ft In Crystalline Rock (Granitic Gneiss)	16.7

NCDOT CORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B8
6.8 to 16.7 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B9	**STATION** 95+76	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,333.6 ft	**TOTAL DEPTH** 15.9 ft	**NORTHING** 645,211	**EASTING** 1,015,895	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2335										
										2,333.6 GROUND SURFACE 0.0
	2,331.8	1.8	3	2	2	4				2,331.9 **ROADWAY EMBANKMENT** Asphalt (1.7') 1.7
2330	2,329.6	4.0	2	2	1	3	SS-3037	M 25%		2,330.6 Loose, Black-Gray, Silty Fine to Coarse SAND (A-2-4), with trace gravel 3.0
	2,326.9	6.7	1	1	1	2		M		Soft, Tan-Orange, Fine to Coarse Sandy SILT (A-4(0), A-4(3)), with trace mica, organics, and gravel
2325	2,324.4	9.2	WOH	WOH	2	2	SS-3039	25%		
2320	2,319.6	14.0	60/0.0			60/0.0				2,319.6 **CRYSTALLINE ROCK** (Granitic Gneiss) 14.0
	2,317.7	15.9	60/0.0			60/0.0				2,317.7 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,317.7 ft In Crystalline Rock (Granitic Gneiss) 15.9

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B10	**STATION** 96+28	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,337.9 ft	**TOTAL DEPTH** 9.0 ft	**NORTHING** 645,264	**EASTING** 1,015,884	**24 HR.** 6.1
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2340										
										2,337.9 GROUND SURFACE 0.0
	2,336.1	1.8	10	6	7	13				2,337.4 **ROADWAY EMBANKMENT** Asphalt (0.5') 0.5
2335	2,334.3	3.6	6	9	16	25	SS-3032	M		Medium Dense, Gray, Fine to Coarse Sandy GRAVEL (A-1-a)
	2,331.1	6.8	60/0.0			60/0.0				2,331.1 **CRYSTALLINE ROCK** (Granitic Gneiss) 6.8
2330	2,328.9	9.0	60/0.0			60/0.0				2,328.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,328.9 ft In Crystalline Rock (Granitic Gneiss) 9.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B11	**STATION** 96+66	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,340.4 ft	**TOTAL DEPTH** 21.9 ft	**NORTHING** 645,300	**EASTING** 1,015,901	**24 HR.** 13.6
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2345										
2340										2,340.4 / 0.0 GROUND SURFACE
										2,340.0 / 0.4 **ROADWAY EMBANKMENT** Asphalt (0.4')
	2,336.9	3.5	5	4	2			M		Loose, Orange-Brown, Silty Fine to Coarse SAND (A-2-4), with trace gravel
2335	2,335.4	5.0	2	2	3	6 5		M		
	2,333.6	6.8	2	98/0.4		100/0.9				(Boulder)
	2,331.5	8.9	60/0.0			60/0.0				2,331.5 / 8.9 **CRYSTALLINE ROCK** (Granitic Gniess)
2330										REC=98% RQD=91% GSI=70-75
2325										
2320										2,318.5 / 21.9 Boring Terminated at Elevation 2,318.5 ft In Crystalline Rock (Granitic Gneiss)

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
CORE LOG

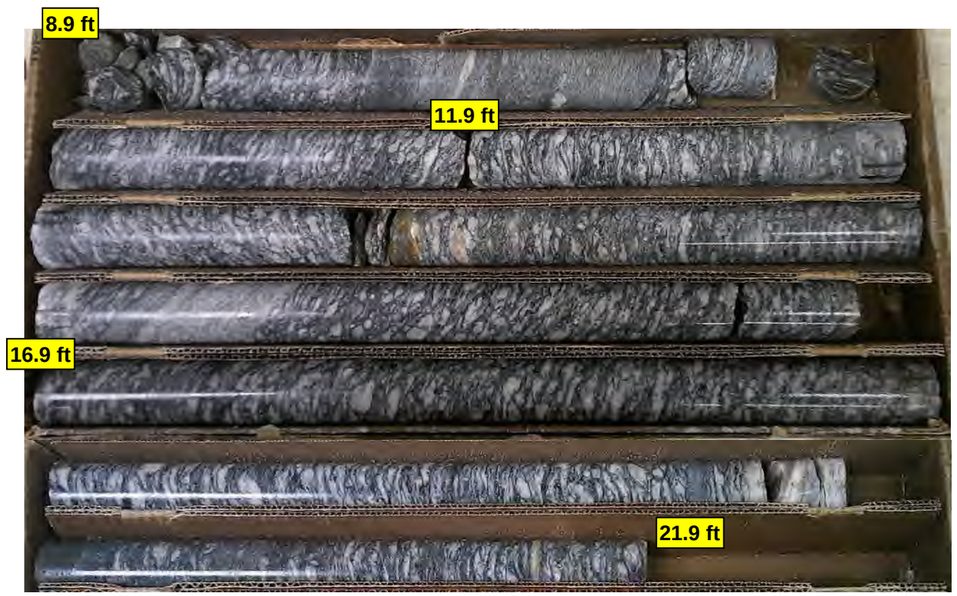
WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B11	**STATION** 96+66	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,340.4 ft	**TOTAL DEPTH** 21.9 ft	**NORTHING** 645,300	**EASTING** 1,015,901	**24 HR.** 13.6
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 13.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft) / DEPTH (ft)
2331.49											Begin Coring @ 8.9 ft
2330	2,331.5	8.9	3.0	*N=60/0.0* 2:24/1.0 3:02/1.0 3:21/1.0	(2.8) 93%	(2.1) 70%		(12.8) 98%	(11.8) 91%		2,331.5 / 8.9 **CRYSTALLINE ROCK** Slightly Weathered to Fresh, Moderately Hard to Very Hard, Gray-White, (Granitic Gneiss), with Very Close to Wide Fracture Spacing
	2,328.5	11.9	5.0	2:31/1.0 2:36/1.0 2:45/1.0 4:20/1.0 3:42/1.0	(5.0) 100%	(4.8) 96%					GSI=70-75
2325	2,323.5	16.9	5.0	3:57/1.0 2:59/1.0 2:43/1.0 2:51/1.0 2:42/1.0	(5.0) 100%	(4.9) 98%					
2320	2,318.5	21.9									2,318.5 / 21.9 Boring Terminated at Elevation 2,318.5 ft In Crystalline Rock (Granitic Gneiss)

NCDOT CORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B11
8.9 to 21.9 Feet



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FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B12	**STATION** 97+55	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,346.8 ft	**TOTAL DEPTH** 12.7 ft	**NORTHING** 645,386	**EASTING** 1,015,922	**24 HR.** 0.3
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2350											
										2,346.8 GROUND SURFACE	0.0
										2,346.3 **ROADWAY EMBANKMENT** Asphalt (0.5')	0.5
2345	2,344.9	1.9	2	4	7	11	SS-3023	20%		Loose to Medium Dense, Orange-Gray-White, Silty Fine to Coarse SAND (A-2-4), with trace gravel	
	2,343.1	3.7	7	4	3	7		M			
2340	2,340.1	6.7	60/0.0			60/0.0				2,340.1 **CRYSTALLINE ROCK** (Granitic Gneiss)	6.7
	2,337.8	9.0	60/0.0			60/0.0					
2335	2,334.1	12.7	60/0.0			60/0.0				2,334.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,334.1 ft In Crystalline Rock (Granitic Gneiss)	12.7

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B13	**STATION** 98+06	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,351.2 ft	**TOTAL DEPTH** 16.1 ft	**NORTHING** 645,437	**EASTING** 1,015,932	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2355											
	2,351.0	0.2	100/0.2			100/0.2				2,351.2 GROUND SURFACE	0.0
2350										2,351.0 **ROADWAY EMBANKMENT** Asphalt (0.2')	0.2
	2,347.1	4.1	60/0.0			60/0.0				2,347.1 **WEATHERED ROCK** Gray-White, (Granitic Gneiss)	4.1
2345										**CRYSTALLINE ROCK** (Granitic Gneiss) REC=88% RQD=67% GSI=50-55	
2340										2,335.1 Boring Terminated at Elevation 2,335.1 ft In Crystalline Rock (Granitic Gneiss)	16.1

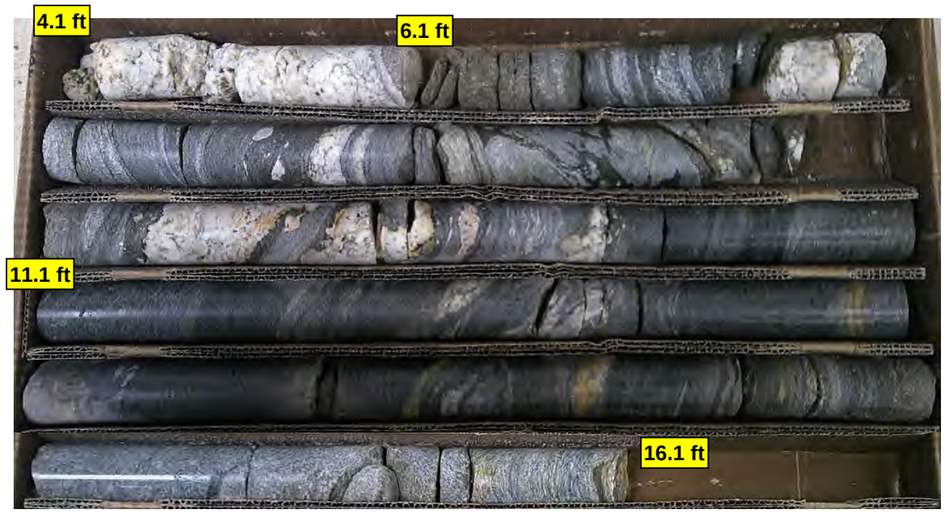
GEOTECHNICAL BORING REPORT
CORE LOG

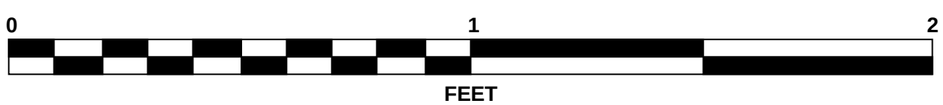
WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B13	**STATION** 98+06	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,351.2 ft	**TOTAL DEPTH** 16.1 ft	**NORTHING** 645,437	**EASTING** 1,015,932	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/17/24	**COMP. DATE** 12/17/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 12.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2347.09											Begin Coring @ 4.1 ft	
	2,347.1	4.1	2.0	*N=60/0.0* 3:16/1.0	(2.0) 100%	(1.7) 85%		(10.6) 88%	(8.0) 67%		2,347.1 **CRYSTALLINE ROCK** Slightly Weathered to Fresh, Moderately Hard to Hard, Gray-White-Black, (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing GSI=50-55	4.1
2345	2,345.1	6.1		5:10/1.0								
			5.0	2:05/1.0 1:49/1.0 2:33/1.0 3:24/1.0 2:33/1.0	(4.5) 90%	(2.9) 58%						
2340	2,340.1	11.1										
			5.0	3:32/1.0 3:58/1.0 3:20/1.0 2:06/1.0 1:54/1.0	(4.1) 82%	(3.4) 68%						
	2,335.1	16.1									2,335.1 Boring Terminated at Elevation 2,335.1 ft In Crystalline Rock (Granitic Gneiss)	16.1

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B13
4.1 to 16.1 Feet





GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B14	**STATION** 99+85	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,364.7 ft	**TOTAL DEPTH** 25.8 ft	**NORTHING** 645,616	**EASTING** 1,015,898	**24 HR.** 11.4
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2365										2,364.7 GROUND SURFACE	0.0
	2,363.0	1.7	3	7	17	24		W		**ROADWAY EMBANKMENT** Very Stiff, Brown, Fine Sandy SILT (A-4), with trace gravel and organics 2,362.0	2.7
	2,361.1	3.6								2,361.1 **RESIDUAL**	3.6
2360	2,359.9	4.8	43	57/0.2		100/0.7				Very Stiff, Gray-Brown, Fine Sandy SILT (A-4) 2,359.9	4.8
			60/0.0			60/0.0				**WEATHERED ROCK** Brown-Gray, (Granitic Gneiss)	
2355										**CRYSTALLINE ROCK** (Granitic Gneiss)	
										REC=95% RQD=60% GSI=45-50	
2350										2,348.3 Weathered Zone: 5.6' to 6.1'	16.4
										WEATHERED ROCK Brown, (Granitic Gneiss)	
2345										2,345.1 **CRYSTALLINE ROCK** (Granitic Gneiss)	19.6
										REC= 100% RQD=68%	
2340										2,338.9 GSI=50-55	25.8
										Boring Terminated at Elevation 2,338.9 ft In Crystalline Rock (Granitic Gneiss)	

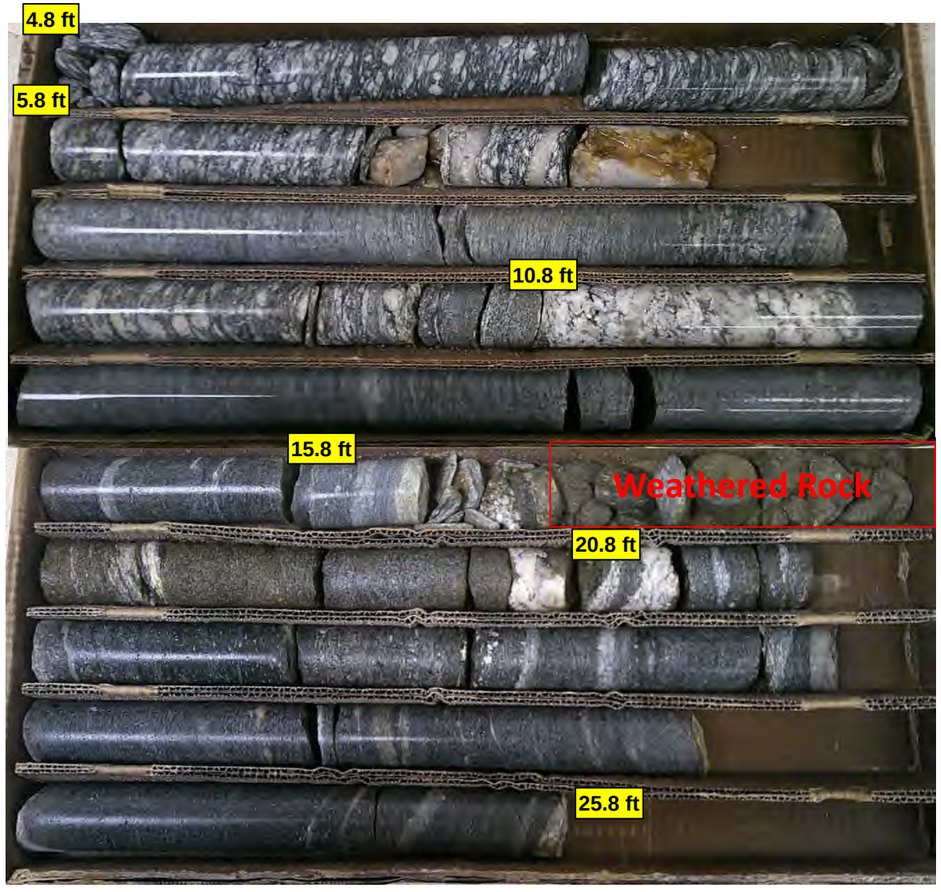
GEOTECHNICAL BORING REPORT
CORE LOG

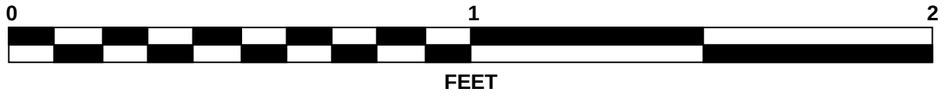
WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B14	**STATION** 99+85	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,364.7 ft	**TOTAL DEPTH** 25.8 ft	**NORTHING** 645,616	**EASTING** 1,015,898	**24 HR.** 11.4
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 21.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2359.89											Begin Coring @ 4.8 ft	
	2,359.9	4.8	1.0	*N=60/0.0*	(0.8)	(0.0)		(11.0)	(7.0)		2,359.9 **CRYSTALLINE ROCK**	4.8
	2,358.9	5.8	5.0	1:40/1.0	80%	0%		95%	60%		Moderately Severe to Moderately Weathered, Very Soft to Moderately Hard, White-Tan-Black-Gray-Orange, (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing	
2355				1:35/1.0 1:45/1.0 1:30/1.0 1:50/1.0	(5.0) 100%	(3.2) 64%					GSI=45-50	
	2,353.9	10.8	5.0	2:14/1.0 2:01/1.0	(4.6)	(3.8)					Weathered Zone: 5.6' to 6.1'	
2350				1:10/1.0 1:15/1.0 1:09/1.0	92%	76%					2,348.3	16.4
	2,348.9	15.8	5.0	1:28/1.0 1:21/1.0	(2.5)	(0.0)		(0.7)	(0.0)		**WEATHERED ROCK**	
2345				1:03/1.0 1:11/1.0 1:36/1.0	50%	0%		22%	0%		Brown, (Granitic Gneiss) 2,345.1	19.6
	2,343.9	20.8	5.0	1:12/1.0 2:41/1.0	(5.0)	(4.2)		(6.2)	(4.2)		**CRYSTALLINE ROCK**	
2340				2:07/1.0 1:49/1.0 2:14/1.0	100%	84%		100%	68%		Moderately Severe to Slightly Weathered, Medium Hard to Hard, Brown-Gray-White, (Granitic Gneiss), with Very Close to Close Fracture Spacing	
	2,338.9	25.8		2:10/1.0							2,338.9 GSI=50-55	25.8
											Boring Terminated at Elevation 2,338.9 ft In Crystalline Rock (Granitic Gneiss)	

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B14
4.8 to 25.8 Feet





GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B15	**STATION** 101+80	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,377.2 ft	**TOTAL DEPTH** 50.2 ft	**NORTHING** 645,803	**EASTING** 1,015,966	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2380										
										2,377.2 GROUND SURFACE 0.0
2375	2,374.2	3.0	3	1	1	2		W		**ROADWAY EMBANKMENT** Soft, Brown-Orange, Fine to Coarse Sandy SILT (A-4(0)), with trace gravel and organics
	2,372.2	5.0	WOH	1	1	2	SS-3054	34%		
2370	2,369.3	7.9	7	9	31	40 94		W		2,369.7 7.5 **ALLUVIAL** Dense to Very Dense, Tan, Silty Fine to Coarse Sandy GRAVEL (A-1-a)
	2,367.0	10.2	32	62	32			W		
2365	2,362.0	15.2	6	13	20	33	SS-3057	21%		2,364.2 13.0 **RESIDUAL** Hard, Brown-Gray, Fine Sandy SILT (A-4(0))
2360	2,357.0	20.2	65	35/0.2		100/0.7				2,357.0 20.2 **WEATHERED ROCK** Brown-Gray, (Granitic Gneiss)
2355	2,354.2	23.0								**RESIDUAL** Hard, Brown-Gray, Fine Sandy SILT (A-4), Manganese Oxide staining
	2,352.0	25.2	9	24	33	57		M		
2350	2,347.0	30.2	28	72/0.3		100/0.8				2,347.0 30.2 **WEATHERED ROCK** Gray-Brown, (Granitic Gneiss)
2345	2,342.0	35.2	37	63/0.4		100/0.9				
2340	2,337.0	40.2	60/0.0			60/0.0				2,337.0 40.2 **CRYSTALLINE ROCK** Gray-White, (Granitic Gneiss) REC= 93% RQD= 71% GSI=55-60
2335										2,327.0 50.2 Boring Terminated at Elevation 2,327.0 ft In Crystalline Rock (Granitic Gneiss)
2330										

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
CORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B15	**STATION** 101+80	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,377.2 ft	**TOTAL DEPTH** 50.2 ft	**NORTHING** 645,803	**EASTING** 1,015,966	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG23639 CME-550X 90% 03/10/2023		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Kiker	**START DATE** 12/18/24	**COMP. DATE** 12/18/24	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 10.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
2337.04											Begin Coring @ 40.2 ft
2335	2,337.0	40.2	5.0	*N=60/0.0* 1:28/1.0 1:31/1.0 1:59/1.0 2:38/1.0 3:05/1.0	(4.3) 86%	(2.8) 56%		(9.3) 93%	(7.1) 71%		2,337.0 **CRYSTALLINE ROCK** 40.2 Moderately Severe to Very Slightly Weathered, Very Soft to Hard, Gray-White (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing GSI= 55-60
	2,332.0	45.2	5.0	3:19/1.0 3:22/1.0 2:44/1.0 3:03/1.0 4:20/1.0	(5.0) 100%	(4.3) 86%					
2330	2,327.0	50.2									2,327.0 50.2 Boring Terminated at Elevation 2,327.0 ft In Crystalline Rock (Granitic Gneiss)

NCDOT CORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 7.GPJ NC_DOT.GDT 2/4/25

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7
Henderson County, North Carolina
Rock Core Photographs
Boring: S7-B15
40.2 to 50.2 Feet

0 1 2

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045417	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 7				**GROUND WTR (ft)**
BORING NO. S7-B16	**STATION** 103+52	**OFFSET** 10 ft RT	**ALIGNMENT** -L-	**0 HR.** 17.0
COLLAR ELEV. 2,391.2 ft	**TOTAL DEPTH** 21.7 ft	**NORTHING** 645,974	**EASTING** 1,015,932	**24 HR.** 15.6
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/07/25	**COMP. DATE** 01/07/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2395										
										2,391.2 GROUND SURFACE 0.0
2390	2,390.2	1.0	2	3	3	6		M		**ROADWAY EMBANKMENT** Soft to Stiff, Brown-Orange-Gray, Fine to Coarse Sandy SILT (A-4), with trace gravel and organics
	2,387.7	3.5	2	1	2	3		M		
2385	2,385.2	6.0	1	1	1	2		M		
	2,382.7	8.5	6	5	7	12		M		
2380										2,379.2 12.0
	2,377.7	13.5	2	4	2	6		W		**ALLUVIAL** Loose, Orange-Brown, Silty Fine to Coarse SAND (A-2-4), with trace to little gravel
2375										
	2,372.7	18.5	30	70/0.3		100/0.8				2,372.7 18.5 **WEATHERED ROCK** Gray-Orange, (Granitic Gneiss)
2370	2,369.5	21.7	60/0.0			60/0.0				2,369.5 21.7 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,369.5 ft On Crystalline Rock (Granitic Gneiss)

PROJECT REFERENCE NO.	SHEET NO.
N/A	46

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
S7–B3	SS–1249	4' RT	88+19 –L–	644464	1015927	2.3 – 3.8'	A–4(0)	33	4	18.0	38.3	27.6	16.1	98.8	91.0	48.3	22.2	–
S7–B3	SS–1251	4' RT	88+19 –L–	644464	1015927	7.3 – 8.8'	A–2–4	NP	NP	29.2	38.2	28.6	4.0	90.2	75.0	31.8	14.5	–
S7–B3	SS–1256	4' RT	88+19 –L–	644464	1015927	29.6 – 30.9'	A–4(0)	NP	NP	14.7	47.6	33.7	4.0	98.9	94.2	45.2	37.4	–
S7–B3	SS–1259	4' RT	88+19 –L–	644464	1015927	44.6 – 46.1'	A–4(0)	NP	NP	16.5	49.2	32.3	2.0	99.0	95.2	39.8	33.5	–
S7–B4	SS–3014	8' RT	89+15 –L–	644559	1015914	18.0 – 19.5'	A–4(0)	NP	NP	20.7	43.2	30.1	6.0	94.6	86.5	40.3	25.3	–
S7–B6	SS–1235	11' RT	90+89 –L–	644730	1015883	1.0 – 2.5'	A–4(0)	NP	NP	18.0	44.4	23.4	14.2	89.4	82.5	40.2	24.1	–
S7–B6	SS–1237	11' RT	90+89 –L–	644730	1015883	6.0 – 7.5'	A–6(4)	35	13	20.5	31.7	13.4	34.4	97.4	87.3	51.0	24.1	–
S7–B7	SS–3047	7' RT	94+08 –L–	645044	1015872	6.7 – 8.2	A–2–4	NP	NP	24.9	39.4	21.6	14.1	64.4	55.0	27.2	29.2	–
S7–B8	SS–3042	7' RT	94+88 –L–	645123	1015886	2.1 – 3.6'	A–2–4	26	5	14.5	41.2	26.1	18.2	68.4	65.3	35.1	32.7	–
S7–B9	SS–3037	6' RT	95+76 –L–	645211	1015895	4.0 – 5.5'	A–4(0)	NP	NP	25.4	38.5	24.0	12.1	85.7	73.6	36.3	25.1	–
S7–B9	SS–3039	6' RT	95+76 –L–	645211	1015895	9.2 – 10.7'	A–4(3)	30	9	19.5	29.3	22.7	28.5	97.5	86.6	54.5	25.3	–
S7–B10	SS–3032	7' LT	96+28 –L–	645264	1015884	1.8 – 3.3'	A–1–a	NP	NP	42.6	36.3	15.0	6.1	26.9	19.0	7.3	–	–
S7–B12	SS–3023	9' RT	97+55 –L–	645386	1015922	1.9 – 3.5'	A–2–4	NP	NP	27.2	39.4	27.3	6.1	76.3	65.2	29.4	20.2	–
S7–B15	SS–3054	11' RT	101+80 –L–	645803	1015966	5.0 – 6.5'	A–4(0)	27	7	26.0	38.5	21.4	14.1	92.2	79.5	38.0	34.0	–
S7–B15	SS–3057	11' RT	101+80 –L–	645803	1015966	15.2 – 16.7'	A–4(0)	NP	NP	9.9	60.4	25.7	4.0	86.5	84.2	36.2	21.4	–

Alex M Atmathy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SOUTH CAROLINA
NCDOT LAB CERT. NO. 130–0212

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	11

REFERENCE: N/A

PROJECT: DF18314.2045378

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *EMERGENCY DESIGN FOR SR 1605 (MIDDLE FORK ROAD/TOMS FALLS ROAD)*

SITE DESCRIPTION *SITE 8*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	PROFILE
5-6	CROSS SECTIONS
7-10	BORE LOG(S), CORE REPORT(S), & CORE PHOTOGRAPH(S)
11	SOIL TEST RESULTS

CAUTION NOTICE

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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

SOIL 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 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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] MOBILE B-29
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 YEILD 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 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.
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.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL 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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED 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

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

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 (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.

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 (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.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY RS&H DATED MAY 2025.

BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 GPS.

REF = REFUSAL

CT = CORING TERMINATED

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
N/A	2A

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

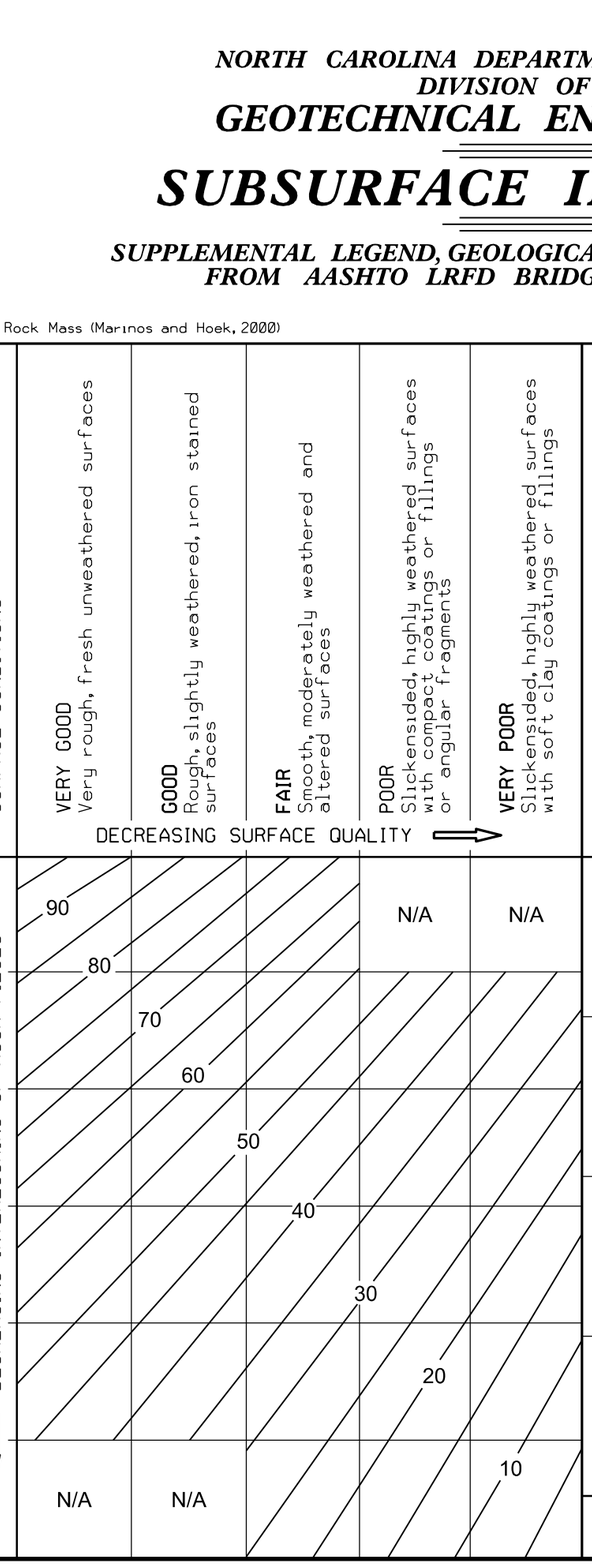
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

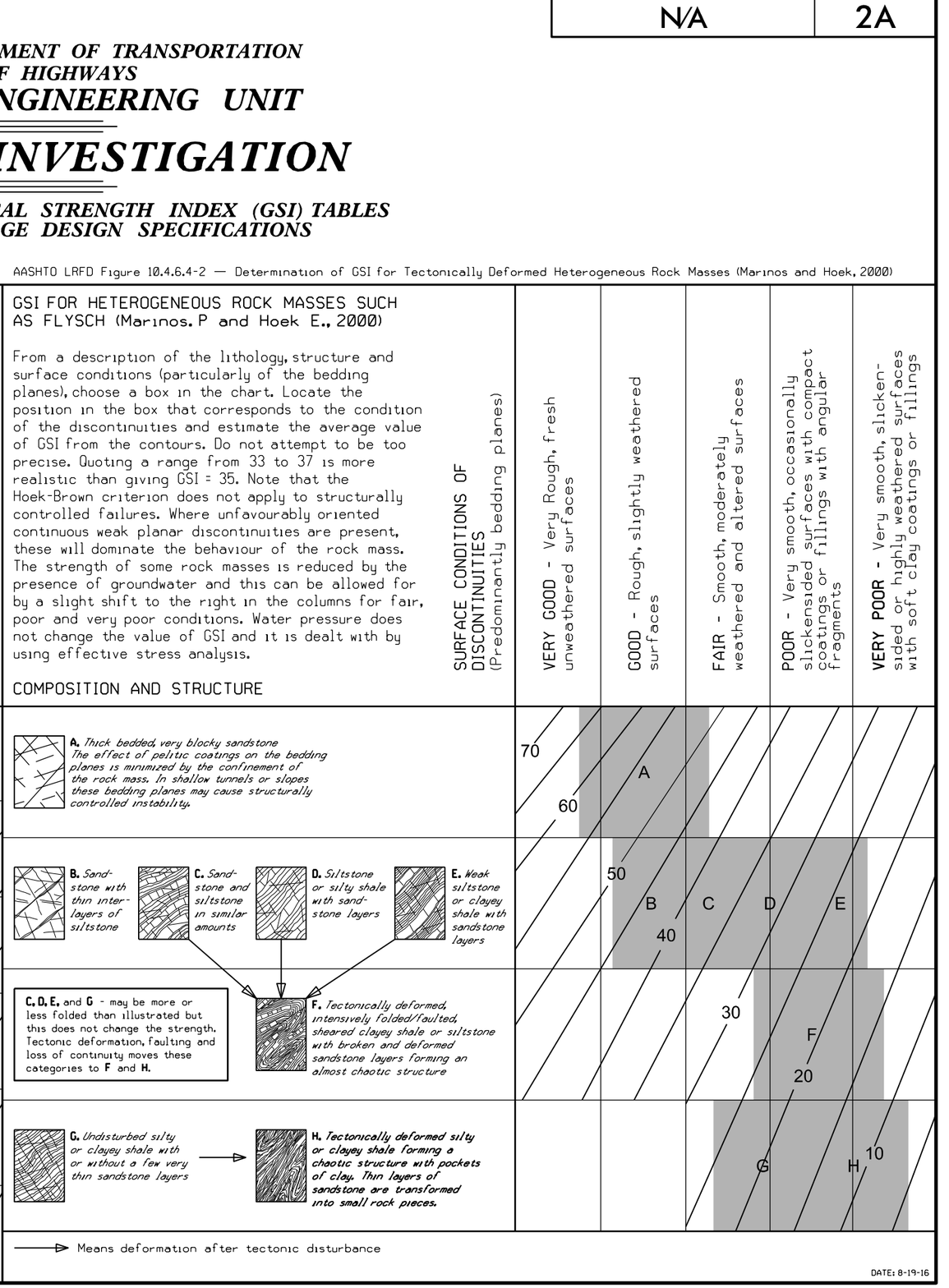


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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 fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE



DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
N/A	3

SITE PLAN

0 50 100

FEET

NC GRID NAD 83 NA 2011

STANZI, PAUL-STANZI, LISA

END RESURFACING
BEGIN GRADE SITE 8
-L- POC STA.105+80.00

END CONSTRUCTION SITE 8
BEGIN CONSTRUCTION SITE 9
-L- STA.111+50.00

-CRYSTALLINE ROCK-

PUE

F

105+00

TO US 74

MIDDLE FORK RD

45.00

EXISTING R/W

E

C

PDE

JS

ST

DR ONLY

S8-B1

-L- 110+00

MIDDLE FORK HICKORY CREEK

S8-B2

TO SR 1605
(HIGH FALLS RD)

END PROP.RET.WALL RW08A
-L- STA.107+20.00,16' RT

BEGIN PROP.RET.WALL RW08A
-L- STA.106+34.00,16' RT

BEGIN PROP.RET.WALL RW08B
-L- STA.108+35.00,16' RT

END PROP.RET.WALL RW08B
-L- STA.111+71.00,16' RT

HILL, T B
Deed Book/Page 000247

5/14/99

–L–

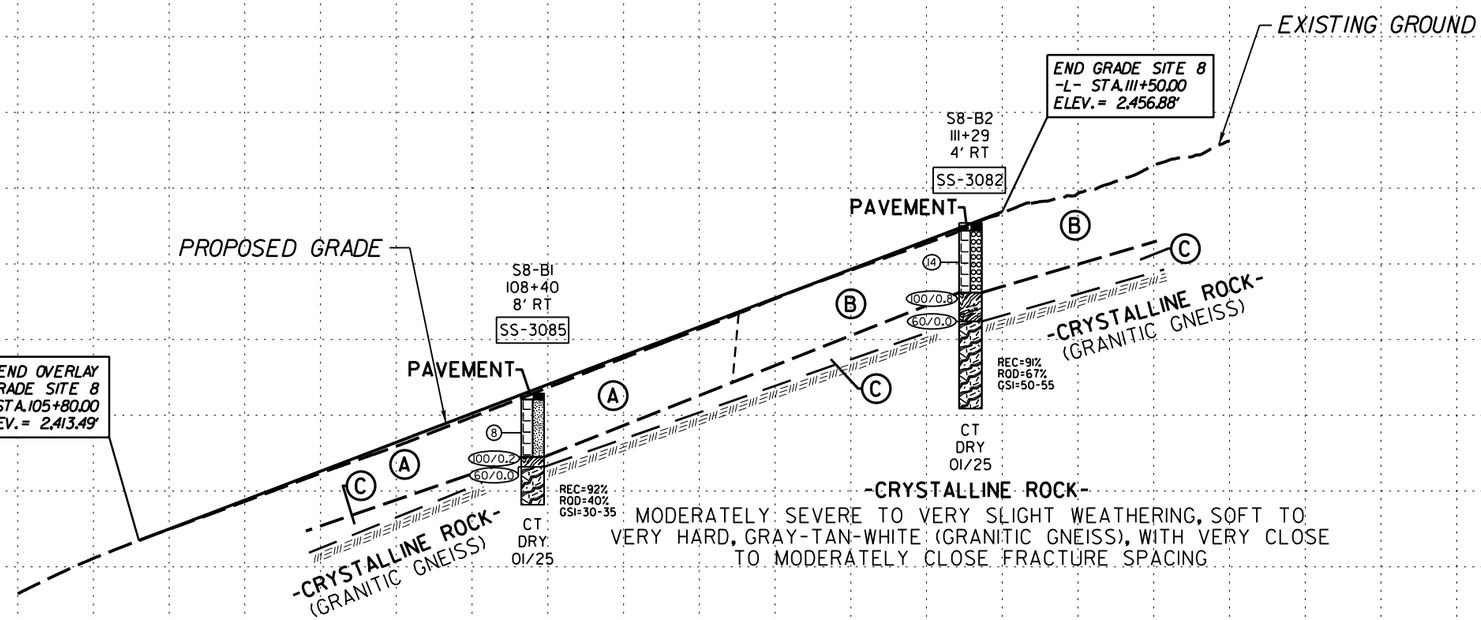
EXISTING GROUND LINE AND PROPOSED SITE 8 CONFIGURATION ALONG –L– ALIGNMENT TAKEN FROM DESIGN FILES PROVIDED BY RS&H, DATED MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE ALIGNMENT PROFILE.

Prepared in the Office of:
CAROLINAS GEOTECHNICAL GROUP

0 100 200
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET NO.
N/A	4

PROJECTED ALONG –L– ROADWAY ALIGNMENT



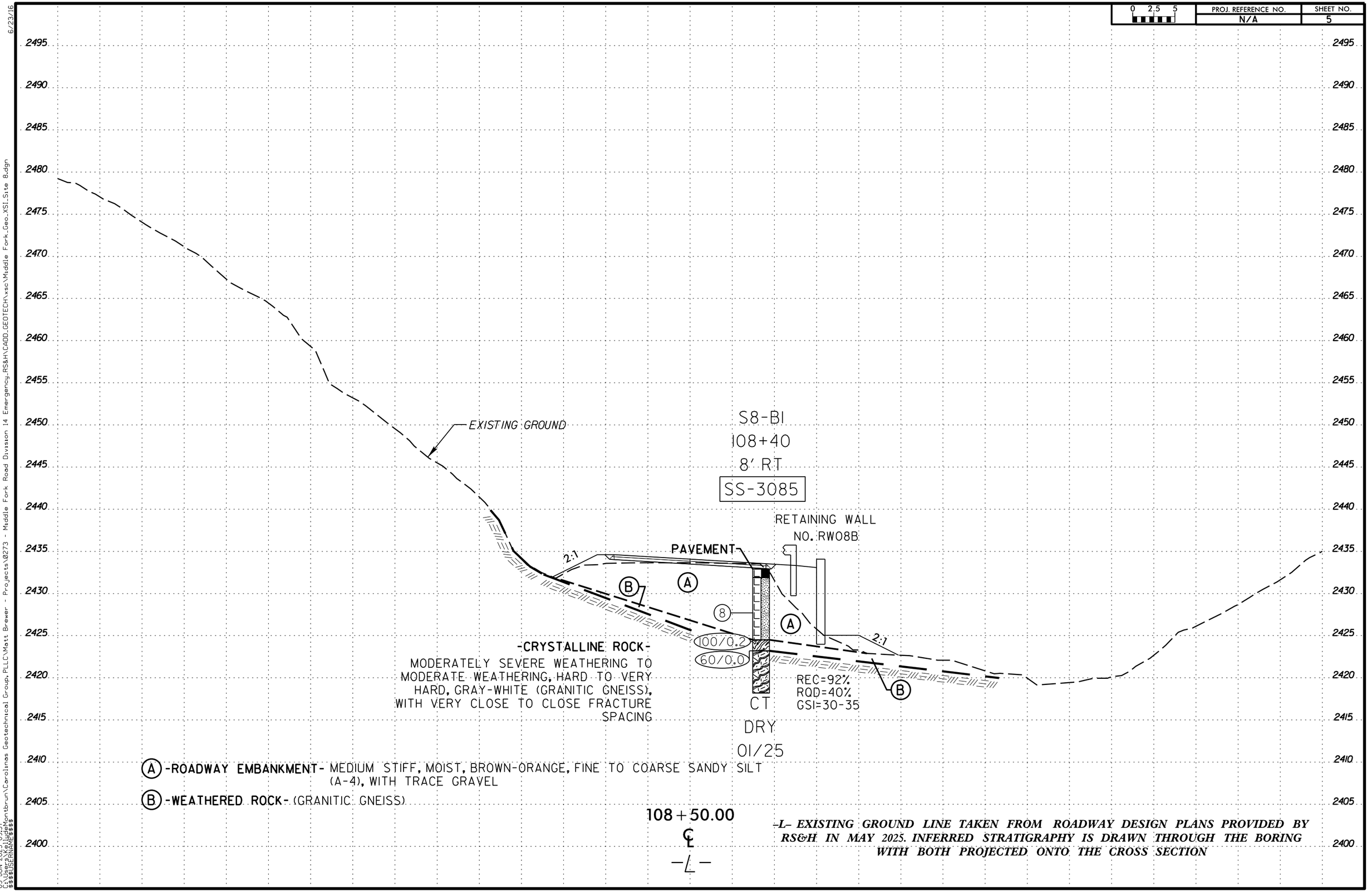
2,510 2,500 2,490 2,480 2,470 2,460 2,450 2,440 2,430 2,420 2,410 2,400 2,390 2,380 2,370 2,360 2,350 2,340 2,330

103+00 104+00 105+00 106+00 107+00 108+00 109+00 110+00 111+00 112+00 113+00 114+00 115+00 116+00 117+00

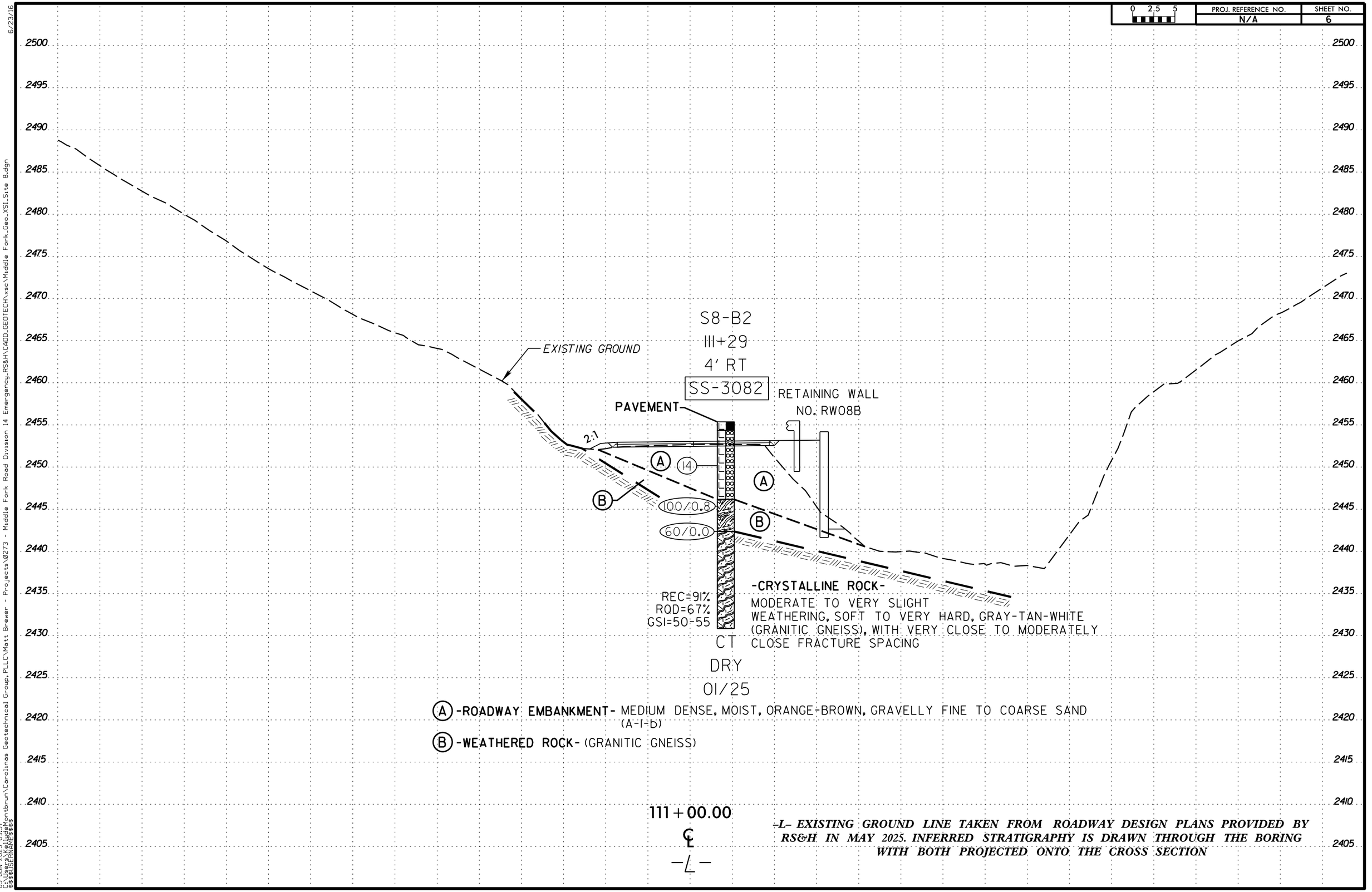
Ⓐ **-ROADWAY EMBANKMENT-** MEDIUM STIFF, MOIST, BROWN-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL

Ⓑ **-ROADWAY EMBANKMENT-** MEDIUM DENSE, MOIST, ORANGE-BROWN, GRAVELLY FINE TO COARSE SAND (A-1-b)

Ⓒ **-WEATHERED ROCK-** (GRANITIC GNEISS)



-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045378	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8				**GROUND WTR (ft)**
BORING NO. S8-B1	**STATION** 108+40	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,432.9 ft	**TOTAL DEPTH** 14.7 ft	**NORTHING** 646,451	**EASTING** 1,015,933	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/06/25	**COMP. DATE** 01/06/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2435										ELEV. (ft) DEPTH (ft)
										2,432.9 GROUND SURFACE 0.0
										2,431.9 **ROADWAY EMBANKMENT** 1.0 Asphalt (0.2'), ABC (0.8') Medium Stiff, Brown-Orange, Fine to Coarse Sandy SILT (A-4(0)), with trace gravel
2430	2,428.7	4.2	2	4	4	8	SS-3085	15%		
2425	2,424.5	8.4	100/0.2			100/0.2				2,424.5 8.4
	2,423.2	9.7	60/0.0			60/0.0				2,423.2 **WEATHERED ROCK** 9.7 Gray-Orange, (Granitic Gneiss) **CRYSTALLINE ROCK** Gray-White, (Granitic Gneiss)
2420										2,418.2 14.7 REC = 92% RQD = 40% GSI = 30-35 Boring Terminated at Elevation 2,418.2 ft In Crystalline Rock (Granitic Gneiss)

NCDOT BORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 8.GPJ NC_DOT.GDT 2/4/25

GEOTECHNICAL BORING REPORT
CORE LOG

WBS DF18314.2045378	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8				**GROUND WTR (ft)**
BORING NO. S8-B1	**STATION** 108+40	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,432.9 ft	**TOTAL DEPTH** 14.7 ft	**NORTHING** 646,451	**EASTING** 1,015,933	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/06/25	**COMP. DATE** 01/06/25	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 5.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
2423.25											ELEV. (ft) DEPTH (ft) Begin Coring @ 9.7 ft
	2,423.2	9.7	5.0	*N=60/0.0* 6:40/1.0 12:04/1.0 10:04/1.0 4:47/1.0 7:27/1.0	(4.6) 92%	(2.0) 40%		(4.6) 92%	(2.0) 40%		2,423.2 **CRYSTALLINE ROCK** 9.7 Moderately Severe to Moderate Weathering, Hard to Very Hard, Gray-White (Granitic Gneiss), with Very Close to Close Fracture Spacing
2420	2,418.2	14.7									2,418.2 GSI = 30-35 14.7 Boring Terminated at Elevation 2,418.2 ft In Crystalline Rock (Granitic Gneiss)

NCDOT CORE DOUBLE MIDDLE FORK ROAD DIVISION 14 EMERGENCY - SITE 8.GPJ NC_DOT.GDT 2/4/25

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8
Henderson County, North Carolina
Rock Core Photographs
Boring: S8-B1
9.7 to 14.7 Feet

0 1 2

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045378	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8				**GROUND WTR (ft)**
BORING NO. S8-B2	**STATION** 111+29	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,455.4 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 646,727	**EASTING** 1,016,015	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/06/25	**COMP. DATE** 01/06/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2460											
2455										2,455.4 GROUND SURFACE	0.0
										2,454.4 **ROADWAY EMBANKMENT** Asphalt (0.2'), ABC (0.8') Medium Dense, Orange-Brown, Gravelly Fine to Coarse SAND (A-1-b)	1.0
	2,451.2	4.2	6	8	6	14	SS-3082	15%			
2450											
	2,446.2	9.2	53	47/0.3		100/0.8				2,446.2 **WEATHERED ROCK** Gray-Orange, (Granitic Gneiss)	9.2
2445											
	2,442.4	13.0	60/0.0			60/0.0				2,442.4 **CRYSTALLINE ROCK** Gray-Tan-White, (Granitic Gneiss) REC = 91% RQD = 67% GSI = 50-55	13.0
2440											
2435										2,430.9 Boring Terminated at Elevation 2,430.9 ft In Crystalline Rock (Granitic Gneiss)	24.5

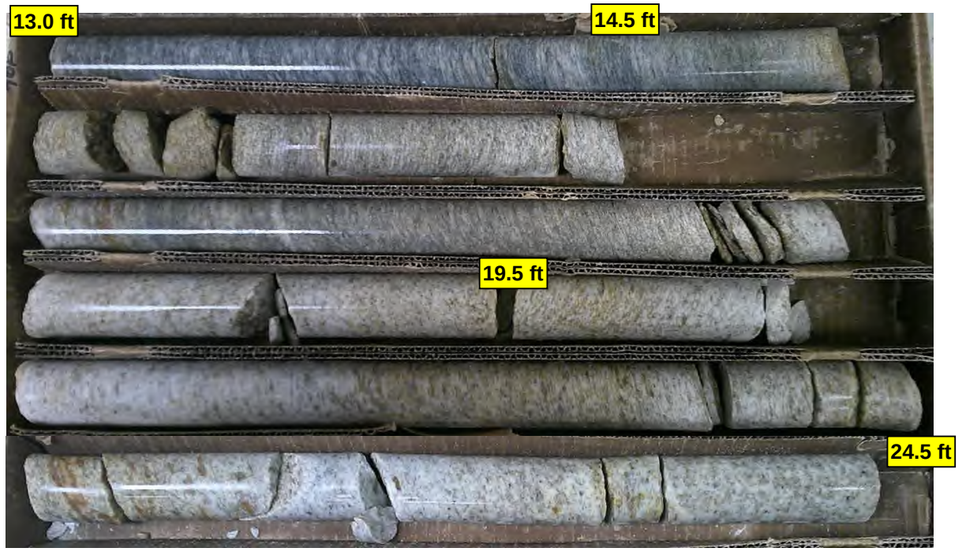
GEOTECHNICAL BORING REPORT
CORE LOG

WBS DF18314.2045378	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8				**GROUND WTR (ft)**
BORING NO. S8-B2	**STATION** 111+29	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,455.4 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 646,727	**EASTING** 1,016,015	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/06/25	**COMP. DATE** 01/06/25	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 11.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2442.39											Begin Coring @ 13.0 ft	
	2,442.4	13.0	1.5	*N=60/0.0*	(1.3)	(1.1)		(10.5)	(7.7)		2,442.4 **CRYSTALLINE ROCK**	13.0
	2,440.9	14.5		2:27/1.0	87%	73%		91%	67%		Moderately to Very Slight Weathering, Soft to Very Hard, Gray-Tan-White (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing	
2440			5.0	2:17/0.5								
				3:16/1.0	(4.8)	(3.6)					GSI = 50-55	
				3:04/1.0	96%	72%						
				4:39/1.0								
				2:58/1.0								
	2,435.9	19.5		6:06/1.0								
2435			5.0	5:10/1.0	(4.4)	(3.0)						
				10:04/1.0	88%	60%						
				6:34/1.0								
				8:32/1.0								
	2,430.9	24.5		22:42/1.0							2,430.9 Boring Terminated at Elevation 2,430.9 ft In Crystalline Rock (Granitic Gneiss)	24.5

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8
Henderson County, North Carolina
Rock Core Photographs
Boring: S8-B2
13.0 to 24.5 Feet



0 1 2

FEET

PROJECT REFERENCE NO.	SHEET NO.
N/A	11

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
S8–B1	SS–3085	8' RT	108+40 –L–	646451	1015933	4.2 – 5.7'	A–4(0)	NP	NP	28.0	36.5	19.4	16.1	91.1	77.2	37.5	15.4	ND
S8–B2	SS–3082	4' RT	111+29 –L–	646727	1016015	4.2 – 5.7'	A–1–b	18	3	38.1	37.1	16.8	8.0	45.5	34.5	13.7	14.9	ND

Alex M. Abmuthy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SOUTH CAROLINA
NCDOT LAB CERT. NO. 130–0212

REFERENCE: N/A

PROJECT: DF18314.2045377

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *EMERGENCY DESIGN FOR SR 1605 (MIDDLE FORK ROAD/TOMS FALLS ROAD)*

SITE DESCRIPTION *SITE 9*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	PROFILE
5-8	CROSS SECTIONS
9-12	BORE LOG(S), CORE REPORT(S), & CORE PHOTOGRAPH(S)
13	SOIL TEST RESULTS

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 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 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:
1. 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 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

P. PERRY, E.I.T.

CG2 EXPLORATION

INVESTIGATED BY *CG2, PLLC*

DRAWN BY *P. PERRY, E.I.T.*

CHECKED BY *K. DE MONTBRUN, P.E.*

SUBMITTED BY *CG2, PLLC*

DATE *JUNE 2025*

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP

1805 SARDIS ROAD NORTH
SUITE 100
CHARLOTTE, NC 28270
(980) 339-8684

NORTH CAROLINA PROFESSIONAL SEAL 045542 ENGINEER KELLY DE MONTBRUN

Signed by: Kelly N. de Montbrun 06/04/2025

BAB66070E9D747C...

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
N/A	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL 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 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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] MOBILE B-29
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 YEILD 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 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.
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.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL 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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED 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

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

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 (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.

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 (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.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY RS&H DATED MAY 2025.

BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 GPS.

REF = REFUSAL

CT = CORE TERMINATED

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
N/A	2A

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 Rock Mass (Marinos and Hoek, 2000)

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.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
90				N/A	N/A
80					
70					
60					
50					
40					
30					
20					
10					N/A
	N/A	N/A			

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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 fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

- **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.*
- **B.** *Sandstone with thin interlayers of siltstone*
- **C.** *Sandstone and siltstone in similar amounts*
- **D.** *Siltstone or silty shale with sandstone layers*
- **E.** *Weak siltstone or clayey shale with sandstone layers*
- **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.**
- **F.** *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*
- **G.** *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*
- **H.** ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

→ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
70		A			
60					
50		B	C	D	E
40					
30				F	
20					
10			G	H	

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
N/A	3

SITE PLAN

-L-

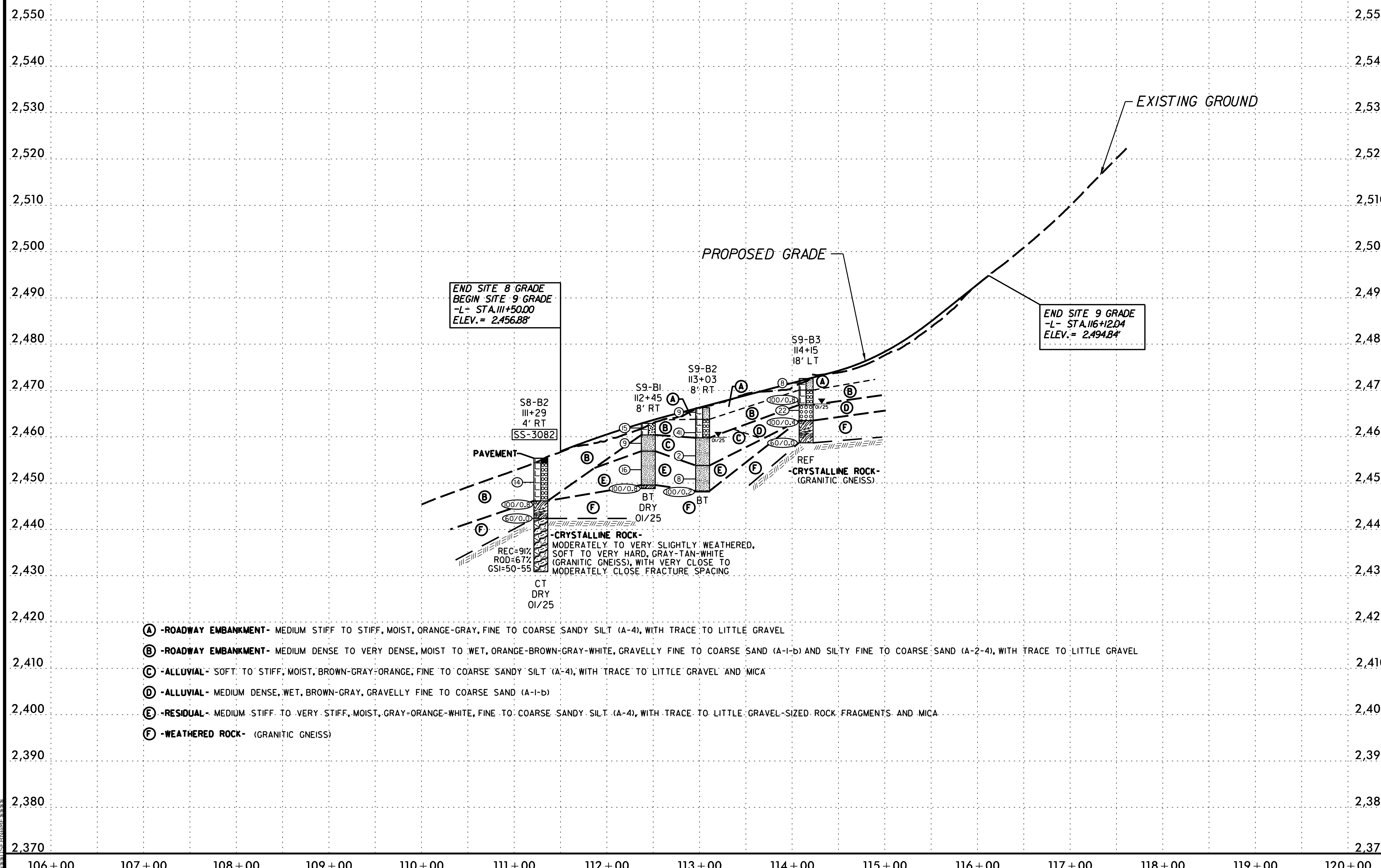
Prepared in the Office of: CAROLINAS GEOTECHNICAL GROUP

PROJECT REFERENCE NO.	SHEET NO.
N/A	4

PROJECTED ALONG -L- ROADWAY ALIGNMENT

0 100 200 FEET
VE = 5:1

EXISTING GROUND LINE AND PROPOSED SITE 9 CONFIGURATION ALONG -L- ALIGNMENT TAKEN FROM DESIGN FILES PROVIDED BY RS&H, DATED MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE ALIGNMENT PROFILE.



(A) **-ROADWAY EMBANKMENT-** MEDIUM STIFF TO STIFF, MOIST, ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE GRAVEL

(B) **-ROADWAY EMBANKMENT-** MEDIUM DENSE TO VERY DENSE, MOIST TO WET, ORANGE-BROWN-GRAY-WHITE, GRAVELLY FINE TO COARSE SAND (A-1-b) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE GRAVEL

(C) **-ALLUVIAL-** SOFT TO STIFF, MOIST, BROWN-GRAY-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE GRAVEL AND MICA

(D) **-ALLUVIAL-** MEDIUM DENSE, WET, BROWN-GRAY, GRAVELLY FINE TO COARSE SAND (A-1-b)

(E) **-RESIDUAL-** MEDIUM STIFF TO VERY STIFF, MOIST, GRAY-ORANGE-WHITE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE GRAVEL-SIZED ROCK FRAGMENTS AND MICA

(F) **-WEATHERED ROCK-** (GRANITIC GNEISS)

5/14/99

03-JUN-2025 09:59
C:\Users\LudeMontbrun\Carolinas Geotechnical Group, PLLC\Matt Brewer - Projects\0273 - Middle Fork Road Division 14 Emergency_RS&H\CADD_GEOTECH\Site&Sub\Middle Fork_geo_pfl_Site 9.dgn

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	N/A	5

EXISTING GROUND

S8-B2
111+29
4' RT
SS-3082

RETAINING WALL
NO. RW08B

PAVEMENT

2:1

(A)

14

100/0.8

60/0.0

(B)

-CRYSTALLINE ROCK-
MODERATELY TO VERY SLIGHTLY WEATHERED, SOFT TO VERY HARD, GRAY-TAN-WHITE (GRANITIC GNEISS), WITH VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING

REC=91%
RQD=67%
CSI=50-55

CT
DRY
01/25

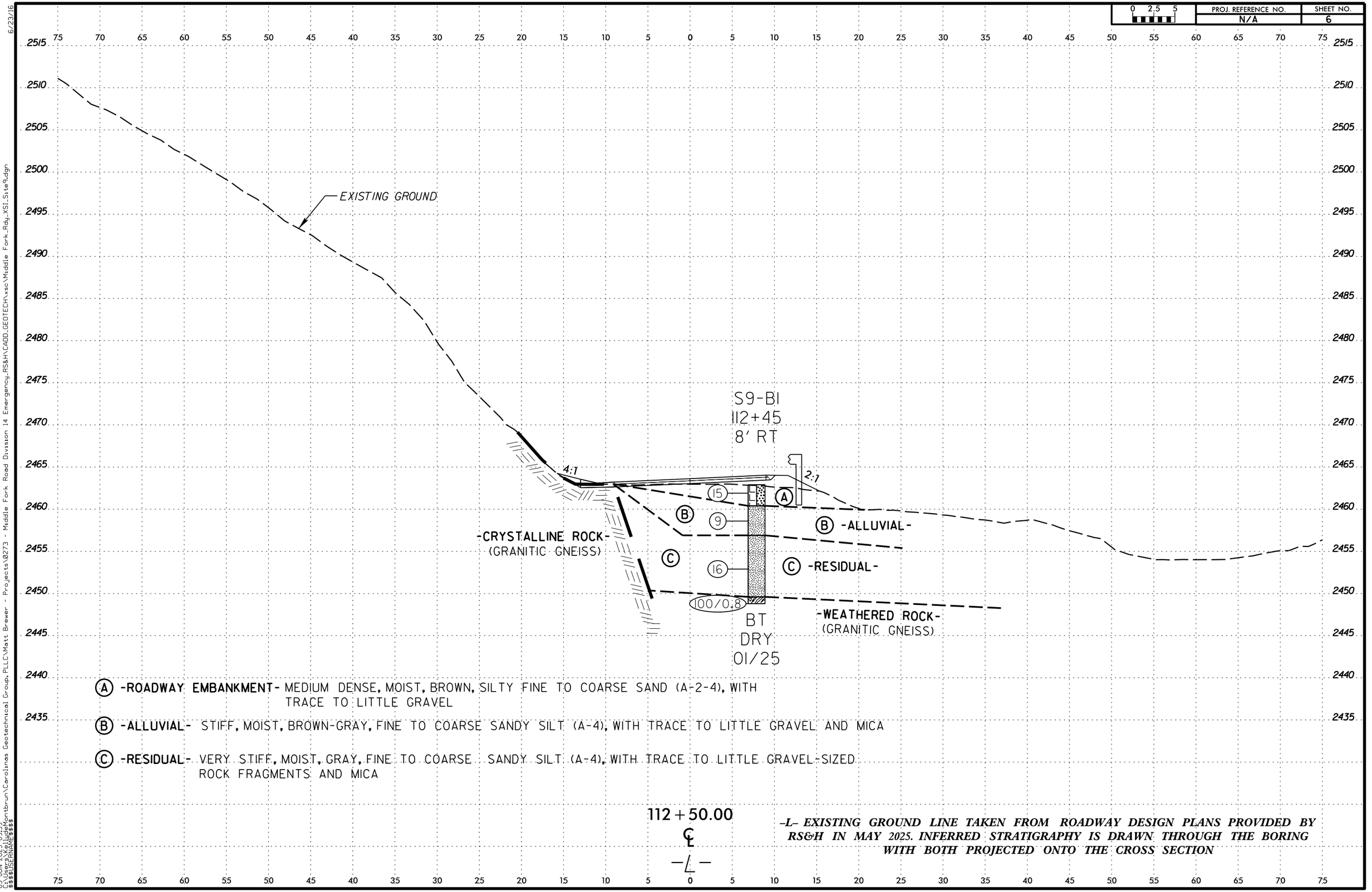
(A) -ROADWAY EMBANKMENT- MEDIUM DENSE, MOIST, ORANGE-BROWN, GRAVELLY FINE TO COARSE SAND (A-1-b)

(B) -WEATHERED ROCK- (GRANITIC GNEISS)

111+50.00

℄
–L–

–L– EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

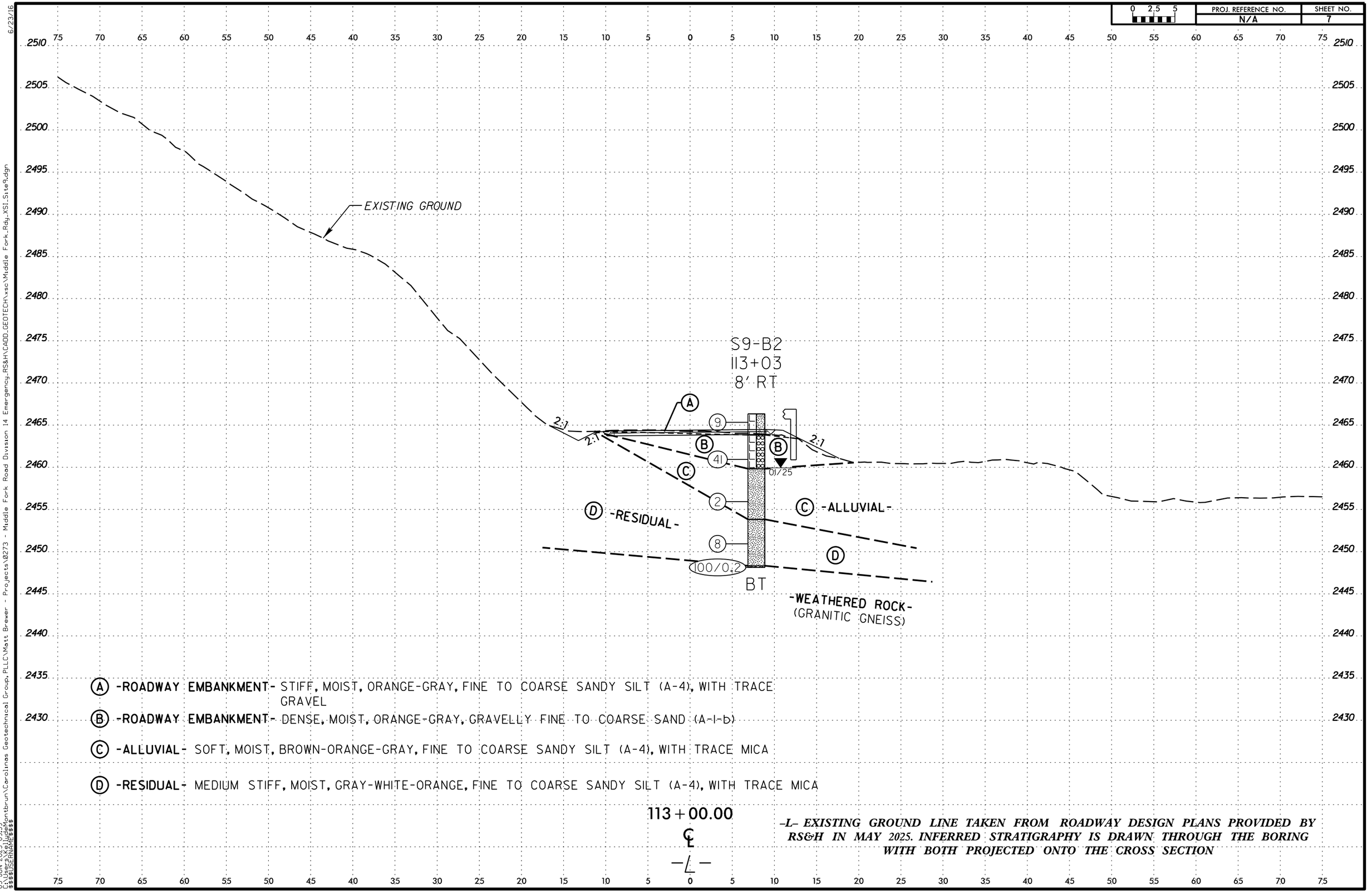


(A) **-ROADWAY EMBANKMENT-** MEDIUM DENSE, MOIST, BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE GRAVEL

(B) **-ALLUVIAL-** STIFF, MOIST, BROWN-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE GRAVEL AND MICA

(C) **-RESIDUAL-** VERY STIFF, MOIST, GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE GRAVEL-SIZED ROCK FRAGMENTS AND MICA

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



(A) **-ROADWAY EMBANKMENT-** STIFF, MOIST, ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL

(B) **-ROADWAY EMBANKMENT-** DENSE, MOIST, ORANGE-GRAY, GRAVELLY FINE TO COARSE SAND (A-1-b)

(C) **-ALLUVIAL-** SOFT, MOIST, BROWN-ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

(D) **-RESIDUAL-** MEDIUM STIFF, MOIST, GRAY-WHITE-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

113+00.00
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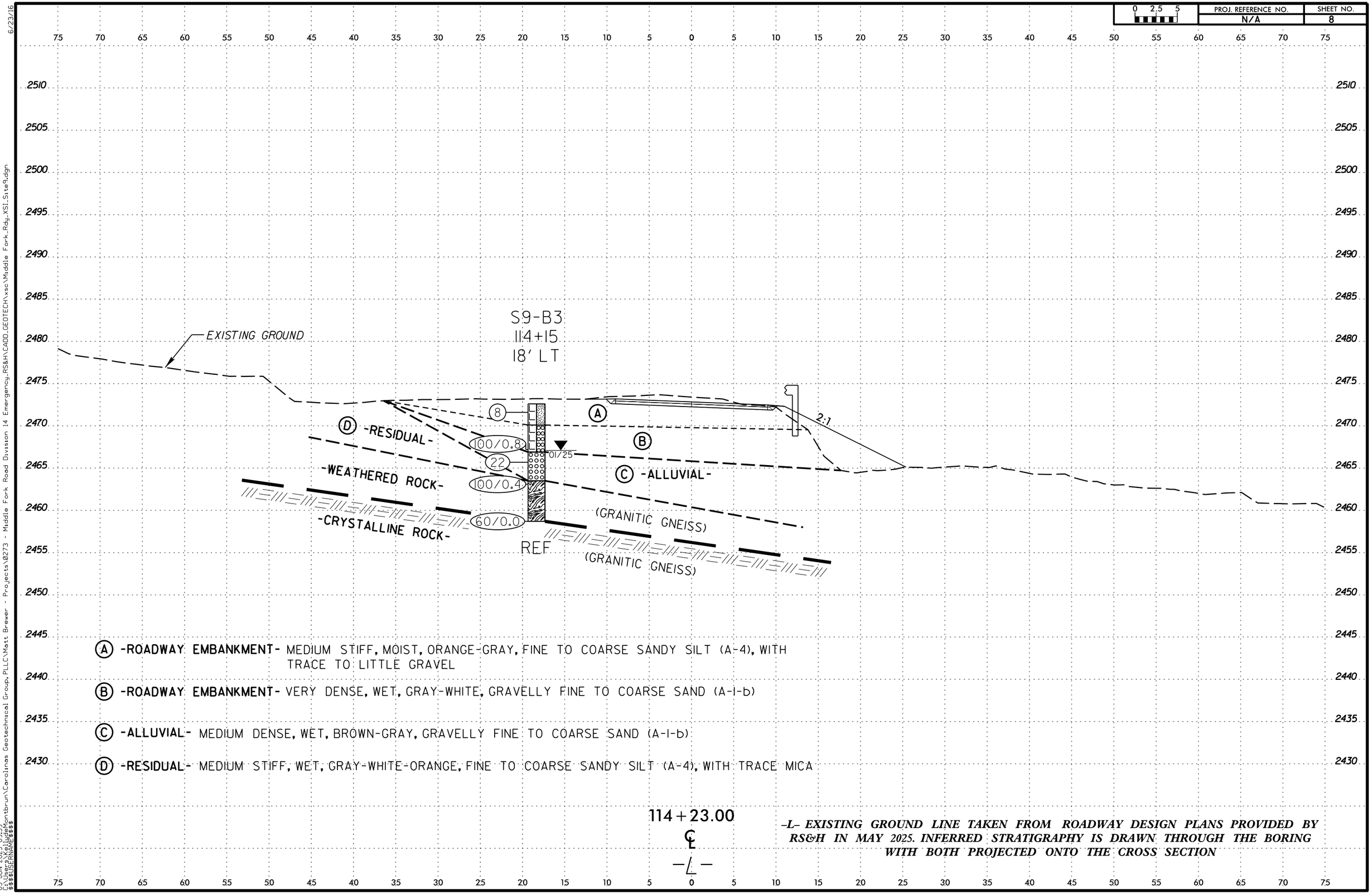
—/—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	N/A	8



(A) -ROADWAY EMBANKMENT- MEDIUM STIFF, MOIST, ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE GRAVEL

(B) -ROADWAY EMBANKMENT- VERY DENSE, WET, GRAY-WHITE, GRAVELLY FINE TO COARSE SAND (A-1-b)

(C) -ALLUVIAL- MEDIUM DENSE, WET, BROWN-GRAY, GRAVELLY FINE TO COARSE SAND (A-1-b)

(D) -RESIDUAL- MEDIUM STIFF, WET, GRAY-WHITE-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

114+23.00
℄
—L—

-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY RS&H IN MAY 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045377	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8				**GROUND WTR (ft)**
BORING NO. S8-B2	**STATION** 111+29	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,455.4 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 646,727	**EASTING** 1,016,015	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/06/25	**COMP. DATE** 01/06/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2460											
2455										2,455.4 GROUND SURFACE	0.0
										2,454.4 **ROADWAY EMBANKMENT** Asphalt (0.2'), ABC (0.8') Medium Dense, Orange-Brown, Gravelly Fine to Coarse SAND (A-1-b)	1.0
	2,451.2	4.2	6	8	6	14	SS-3082	15%			
2450											
	2,446.2	9.2	53	47/0.3		100/0.8				2,446.2 **WEATHERED ROCK** Gray-Orange, (Granitic Gneiss)	9.2
2445											
	2,442.4	13.0	60/0.0			60/0.0				2,442.4 **CRYSTALLINE ROCK** Gray-Tan-White, (Granitic Gneiss) REC = 91% RQD = 67% GSI = 50-55	13.0
2440											
2435										2,430.9 Boring Terminated at Elevation 2,430.9 ft In Crystalline Rock (Granitic Gneiss)	24.5

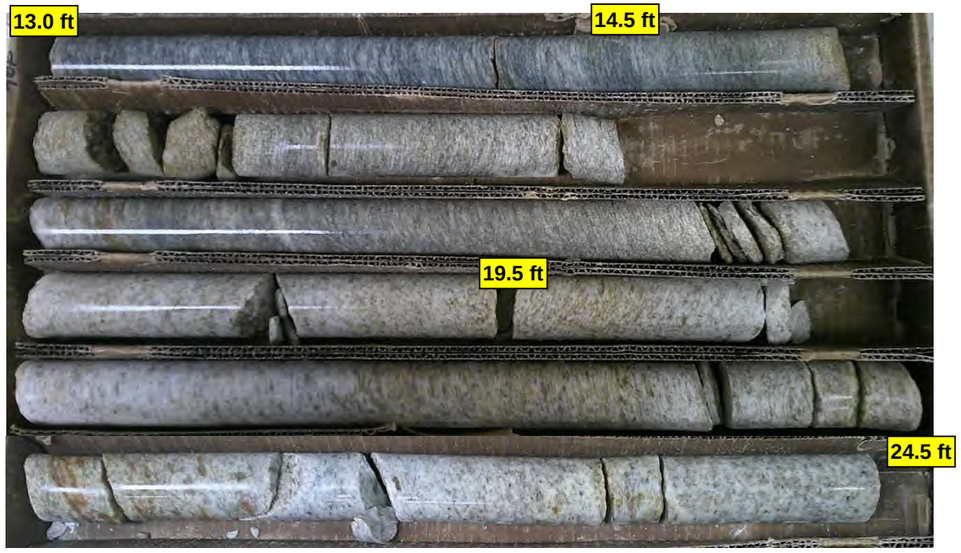
GEOTECHNICAL BORING REPORT
CORE LOG

WBS DF18314.2045377	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8				**GROUND WTR (ft)**
BORING NO. S8-B2	**STATION** 111+29	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,455.4 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 646,727	**EASTING** 1,016,015	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/06/25	**COMP. DATE** 01/06/25	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 11.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2442.39											Begin Coring @ 13.0 ft	
	2,442.4	13.0	1.5	*N=60/0.0*	(1.3)	(1.1)		(10.5)	(7.7)		2,442.4 **CRYSTALLINE ROCK**	13.0
	2,440.9	14.5		2:27/1.0	87%	73%		91%	67%		Moderately to Very Slightly Weathered, Soft to Very Hard, Gray-Tan-White (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing	
2440			5.0	2:17/0.5 3:16/1.0 3:04/1.0 4:39/1.0	(4.8) 96%	(3.6) 72%					GSI = 50-55	
	2,435.9	19.5		2:58/1.0 6:06/1.0								
2435			5.0	5:10/1.0 10:04/1.0 6:34/1.0 8:32/1.0	(4.4) 88%	(3.0) 60%						
	2,430.9	24.5		22:42/1.0							2,430.9 Boring Terminated at Elevation 2,430.9 ft In Crystalline Rock (Granitic Gneiss)	24.5

CAROLINAS GEOTECHNICAL GROUP

Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 8
Henderson County, North Carolina
Rock Core Photographs
Boring: S8-B2
13.0 to 24.5 Feet



0 1 2

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045377	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 9				**GROUND WTR (ft)**
BORING NO. S9-B1	**STATION** 112+45	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,462.9 ft	**TOTAL DEPTH** 14.1 ft	**NORTHING** 646,840	**EASTING** 1,016,046	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2465											
	2,462.9	0.0	5	11	4	15		M		2,462.9 GROUND SURFACE	0.0
2460										**ROADWAY EMBANKMENT**	
	2,459.6	3.3	7	2	7	9		M		Medium Dense, Brown, Silty Fine to Coarse SAND (A-2-4), with trace to little gravel 2,460.4	2.5
										ALLUVIAL	
2455										Stiff, Brown-Gray, Fine to Coarse Sandy SILT (A-4), with trace to little gravel and mica 2,456.9	6.0
	2,453.9	9.0	7	7	9	16		M		**RESIDUAL**	
										Very Stiff, Gray, Fine to Coarse Sandy SILT (A-4), with trace to little gravel-sized rock fragments and mica	
2450	2,449.6	13.3	57	43/0.3		100/0.8				2,449.6	13.3
										2,448.8 **WEATHERED ROCK**	14.1
										Gray-White, (Granitic Gneiss)	
										Boring Terminated at Elevation 2,448.8 ft In Weathered Rock (Granitic Gneiss)	

WBS DF18314.2045377	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 9				**GROUND WTR (ft)**
BORING NO. S9-B2	**STATION** 113+03	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,466.3 ft	**TOTAL DEPTH** 18.2 ft	**NORTHING** 646,899	**EASTING** 1,016,044	**24 HR.** 6.4
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2470										
	2,466.3	0.0	6	4	5	9 41		M		2,466.3 GROUND SURFACE 0.0
2465										**ROADWAY EMBANKMENT**
	2,461.9	4.4	22	8	33			M		Stiff, Orange-Gray, Fine to Coarse Sandy SILT (A-4), with trace gravel 2,463.8 2.5
2460										Dense, Orange-Gray, Gravelly Fine to Coarse SAND (A-1-b)
	2,456.9	9.4	1	1	1	2				2,459.8 6.5
										ALLUVIAL
2455										Soft, Brown-Orange-Gray, Fine to Coarse Sandy SILT (A-4), with trace mica
	2,451.9	14.4	2	2	6	8		M		2,453.8 12.5
										RESIDUAL
2450	2,448.3	18.0	100/0.2			100/0.2				Medium Stiff, Gray-White-Orange, Fine to Coarse Sandy SILT (A-4), with trace mica
										2,448.3 18.0
										2,448.1 **WEATHERED ROCK** 18.2
										Gray-White, (Granitic Gneiss)
										Boring Terminated at Elevation 2,448.1 ft In Weathered Rock (Granitic Gneiss)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045377	**TIP** N/A	**COUNTY** HENDERSON	**GEOLOGIST** P. Perry	
SITE DESCRIPTION Emergency Design for SR 1605 (Middle Fork Road/Toms Falls Road) - Site 9				**GROUND WTR (ft)**
BORING NO. S9-B3	**STATION** 114+15	**OFFSET** 18 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,472.6 ft	**TOTAL DEPTH** 13.9 ft	**NORTHING** 647,019	**EASTING** 1,016,040	**24 HR.** 5.5
DRILL RIG/HAMMER EFF./DATE CG29022 Mobile B-29 92% 04/09/2024		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER M. Brewer	**START DATE** 01/03/25	**COMP. DATE** 01/03/25	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2475											
	2,472.6	0.0	4	3	5	8		M		2,472.6 GROUND SURFACE	0.0
2470										**ROADWAY EMBANKMENT**	
	2,468.5	4.1								2,470.1 Medium Stiff, Orange-Gray, Fine to Coarse Sandy SILT (A-4), with trace to little gravel	2.5
			17	50	50/0.3	100/0.8		W		Very Dense, Gray-White, Gravelly Fine to Coarse SAND (A-1-b)	
	2,466.7	5.9								2,466.9	5.7
2465			8	12	10	22		W		**ALLUVIAL**	
	2,463.5	9.1								Medium Dense, Brown-Gray, Gravelly Fine to Coarse SAND (A-1-b)	
			100/0.4			100/0.4				2,463.5 **WEATHERED ROCK** Gray-White, (Granitic Gneiss)	9.1
2460											
	2,458.7	13.9								2,458.7	13.9
			60/0.0			60/0.0				Boring Terminated with Standard Penetration Test Refusal at Elevation 2,458.7 ft On Crystalline Rock (Granitic Gneiss)	
										Higher N-values in the Roadway Embankment likely the result of boulders/rock encountered	

PROJECT REFERENCE NO.	SHEET NO.
N/A	13

SOIL TEST RESULTS

BORING ID	SAMPLE NO.	OFFSET	STATION	NORTHING	EASTING	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
										C. SAND	F. SAND	SILT	CLAY	10	40	200		
S8–B2	SS–3082	4' RT	111+29 –L–	646727	1016015	4.2 – 5.7'	A–1–b	18	3	38.1	37.1	16.8	8.0	45.5	34.5	13.7	14.9	ND

Alex M. Abmuthy

AUTHORIZED SIGNATURE
NCDOT CERT NO. 130–04–0212

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SOUTH CAROLINA
NCDOT LAB CERT. NO. 130–0212