REFERENCE: SF-600101

PROJECT: 17BP.13.R.184

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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-L-	10+00 - 24+39.27	4 - 5
-Y-	10+00 - 10+81.21	4

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *MITCHELL*

PROJECT DESCRIPTION *BRIDGE 101 OVER BIG CRABTREE CREEK ON SR 1002 (CRABTREE ROAD)*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-600101	1	

CAUTION NOTICE

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

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

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

NOTES:

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

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CHECKED BY *RIGGS, Jr., A. F.*

SUBMITTED BY *RIGGS JR,. A. F.*

DATE *JUNE 2023*

Prepared in the Office of:

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NC REGISTERED GEOLOGIC FIRM: C-367

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DocuSigned by:
Abner F. Riggs, Jr. 08/11/2023
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SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
SF-600101	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	< 4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	> 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 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-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] GEOPROBE (TER2101)
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] MUD ROTARY
- [X] 3¼" SOLID STEM AUGERS

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [X] 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: TOP OF BORING ELEVATIONS ESTIMATED USING PROJECT
PROVIDED TIN FILE: B5158_ls_tnl.tin; DATED: 03/13/2023
ELEVATION: N/A FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

PROJECT REFERENCE NO.	SHEET NO.
SF–600101	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 ⇨

90			N/A	N/A
80				
70				
60				
50				
40				
30				
20				
10				
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

70	A			
60				
50		B	C	D E
40				
30				F
20				
10			G	H

DATE: 8-19-16

09/08/09

TIP PROJECT: SF-600101

CONTRACT: 17BP.13.R.184

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

MITCHELL COUNTY

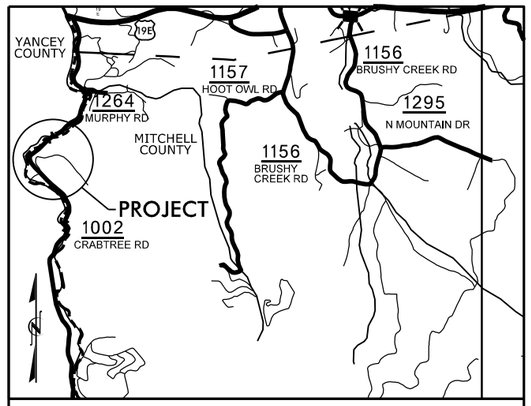
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.13.R.184	3	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
17BP.13.R.184		PE,RW,UTIL,CON

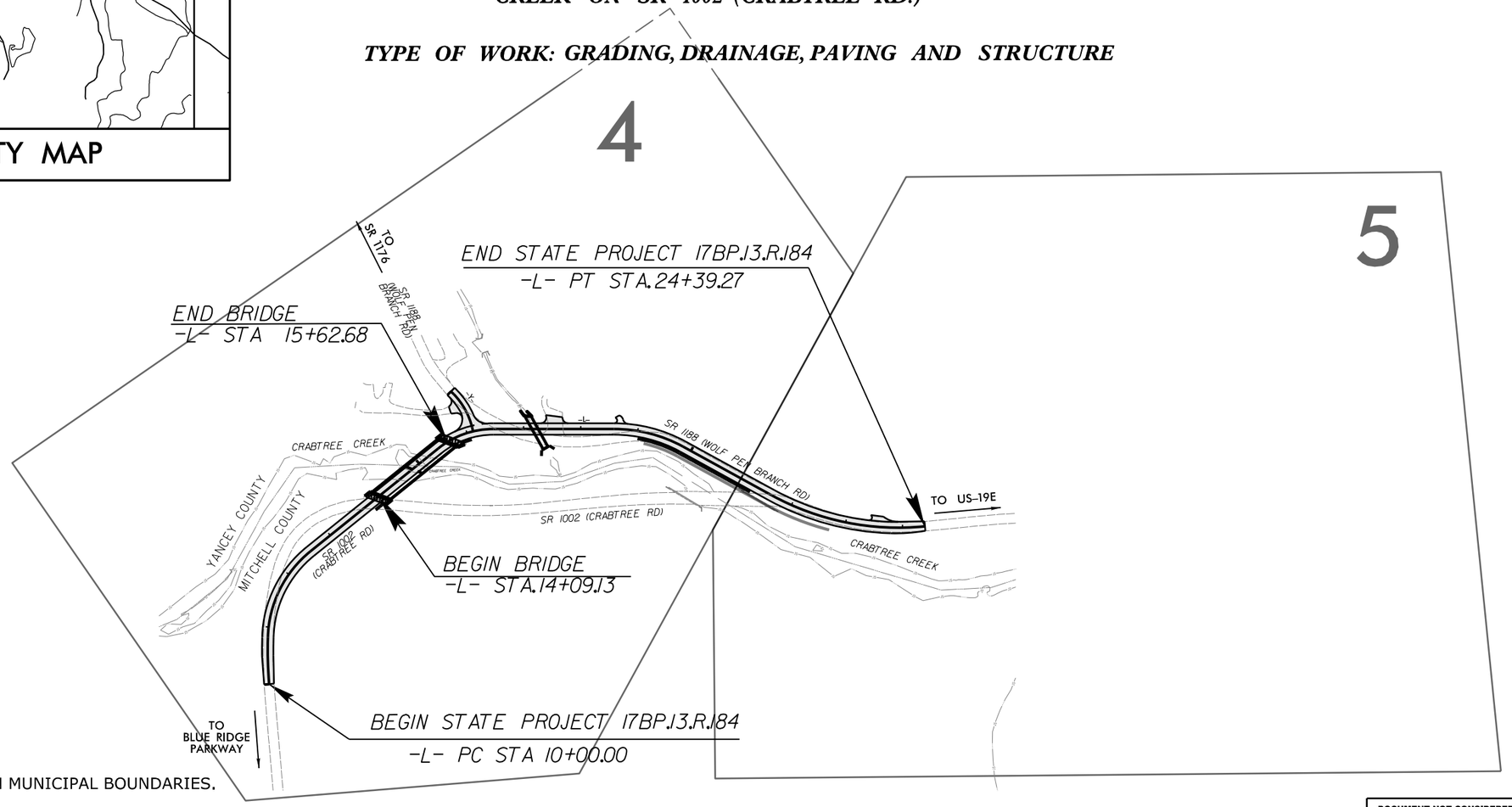
R/W PLANS

LOCATION: REPLACE BRIDGE NO. 600101 OVER BIG CRABTREE CREEK ON SR 1002 (CRABTREE RD.)

TYPE OF WORK: GRADING, DRAINAGE, PAVING AND STRUCTURE



VICINITY MAP



THIS PROJECT IS NOT WITHIN MUNICIPAL BOUNDARIES.

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100

PROFILE (HORIZONTAL): 50 25 0 50 100

PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2016 = 554
ADT 2036 = 708
K = 12 %
D = 60 %
T = 15 % *
V = 30 MPH
* TTST = 2 DUAL = 13
FUNC CLASS = Rural Local

SUBREG TIER

PROJECT LENGTH

LENGTH OF ROADWAY PROJECT 17BP.13.R.184	=	.244 MILES
LENGTH OF STRUCTURE PROJECT 17BP.13.R.184	=	.029 MILES
TOTAL LENGTH OF PROJECT 17BP.13.R.184	=	.273 MILES

Prepared In the Office of:

KCI ASSOCIATES OF N.C., P.A.
4505 Falls of Neuse Road, Suite 400
Raleigh, NC 27609
Phone (919) 783-9214
NC Firm License No: C-0764

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JULY 2024

LETTING DATE: JUNE 2025

NCDOT CONTACT: EDDIE DOUGLAS
NCDOT DIVISION 13

Plans Prepared For:

DIVISION 13
55 Orange Street
Asheville, NC 28801

CHARLES L. FLOWE, P.E.
KCI ROADWAY PRACTICE LEAD

BEN R. CRAWFORD, P.E.
KCI ROADWAY PROJECT MANAGER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

Date: June 30, 2023

WBS Number: 17BP.13.R.184
TIP Number: SF-600101
County: Mitchell
Description: Bridge 101 over Big Crabtree Creek on SR 1002 (Crabtree Road)

Subject: Roadway Geotechnical Report - Inventory

Project Description

The project is located along SR 1002 (Crabtree Road) and SR 1188 (Wolfe Pen Branch Road) in Mitchell County, North Carolina. We understand that the project will consist of construction of 0.248 miles of new roadway realignment and widening for Crabtree Road (-L-) and new drive access for Wolfe Pen Branch Road (-Y1-). This work will also include the construction of a retaining wall, a culvert, and a 2-span bridge structure. The project corridor is in a rural residential setting with some of the surrounding land being undeveloped.

The geotechnical subsurface investigation was performed in April 2023. The site was investigated with a total of twenty-two (22) standard penetration test (SPT) borings and two (2) hand auger borings. The hand auger borings were performed at locations that could not be easily accessed by the drill rig to depths of 3.5 to 7.0 feet beneath the surface. Standard penetration test (SPT) borings were advanced using a Geoprobe 3230DT drill rig equipped with a recently calibrated automatic hammer. SPT borings were advanced utilizing hollow stem augers, wash boring, NW casing advancer and NQ2 coring techniques to depths of 8.6 to 53.5 feet beneath the surface.

Representative soil samples were collected in the field for visual classification and selected samples were submitted for laboratory analysis by Terracon's soil testing laboratory. Laboratory testing was performed in a NCDOT materials and testing certified laboratory in accordance with the AASHTO Soil Classification System.

The following alignments were investigated by soil testing and visual reconnaissance:

Alignment	Stations (±)
-L-	10+00 to 24+39
-Y1-	10+00 to 10+81

Terracon Consultants, Inc. 2401 Brentwood Road Raleigh, NC 27604
P [919] 873 2211 F [919] 873 9555 terracon.com NC Registered Firm F-0869

Physiography and Geology

The site is located within the Eastern Blue Ridge Physiographic Province and is part of the Tugaloo terrane west of Spruce Pine, North Carolina. The Tugaloo terrane is intensely deformed and metamorphosed. It spans the eastern portions of the Blue Ridge Physiographic Province into the western section of the Piedmont. Topography in the area is rolling to steep. The existing elevations along the investigated corridor range from approximately 2,540 feet to 2592 feet.

Geologically, the site is located within the Blue Ridge Belt and Alligator Back Formation. As mapped on the North Carolina Geologic Map 1985, the underlying rock formation at this site consist of metamorphic rocks of Late Proterozoic Age (100 to 542 million years old). Based on the recovered rock samples, previous mapping and our knowledge of the local geology, the parent rock is interpreted to be predominately gneiss. These rocks typically weather in an irregular pattern with deep residual soils overlying saprolite to bedrock. The typical residual profile consists of finer grain clays and silts near the ground surface which gradually transition to coarser and denser material with depth and contain varying amounts of mica.

Soil Properties

Soils encountered during this investigation are separated into four categories based on their origin. The soils encountered consist of roadway embankment fill, alluvial soils, and residual soil and rock materials.

Roadway embankment soils were encountered along the existing roadways of Crabtree Road and Wolfe Pen Branch Road. The roadway embankment soils appear to be reworked near-by residual soils. The roadway embankment soils extend to a depth of at least 13.0 feet beneath the ground surface. The roadway embankment soils consist of slightly plastic, very soft to soft, moist to wet, silty to fine to coarse sandy clay (A-6, A-7-6) and slightly plastic, very soft to medium stiff, moist to saturated, clayey silt (A-5). Layers of very loose to medium dense, moist to saturated, coarse to fine sand-gravel and silty fine to coarse sand (A-2-4, A-2-5, A-1-b) with trace to little gravel and micaceous were also encountered within the roadway embankments. The plasticity indices of the clayey soils range from 6 to 13 with 41 to 47 percent passing the #200 sieve and natural moisture contents of 25.2 to 43.1 percent based on laboratory testing.

Alluvial soils are present adjacent to Big Crabtree Creek on along Crabtree Road and Wolfe Pen Branch Road as indicated by the alluvial boundary area shown on the plan sheets. Approximately 5.5 to 14.5 feet of alluvial soils are present below about elevations 2553.1 and 2562.1 feet adjacent to Big Crabtree Creek. These soils consist primarily of slightly plastic, very soft to stiff, saturated, fine sandy silt (A-4). Layers of very loose to very dense, moist to saturated, coarse to fine sand-gravel, coarse to fine sand, and silty coarse to fine sand (A-1-b, A-3, A-2-4) were also encountered within the alluvial materials. The plasticity index of the silty soils tested was 6 with 39 percent passing the #200 sieve and a natural moisture content of 26.2 percent.

Residual soils are present at the surface and beneath the roadway embankment soils, asphalt pavement sections, and alluvial soils. The residual soils have weathered irregularly ranging in depths from 2.5 feet to greater than boring termination depths of 19.0 feet. The residual soils can be generalized as moderately plastic, medium stiff to stiff, moist to wet, silty clay (A-7-6, A-7-5) and sands consisting of very loose to very

dense, moist to wet, silty to clayey coarse to fine sands, coarse to fine sand-gravel (A-2-4, A-2-5, A-2-6, A-2-7, A-1-b). The plasticity indices of the clayey soils range from 19 to 20 with 46 to 47 percent passing the #200 sieve and natural moisture contents of 24.9 to 28.7 percent based on laboratory testing.

Rock Properties

Weathered rock was encountered during the roadway investigation. It originates from the underlying crystalline rock (gneiss). Weathered rock is present at depths of 3.4 feet to 29.4 feet beneath the ground surface, on the -L- alignment, at elevations of approximately 2,527 to 2,571 feet.

Crystalline rock was encountered during the roadway investigation and consists of gneiss. Refer to the "Areas of Geotechnical Interest" for areas of rock which may impact grading operations. Crystalline rock is present at depths of 6.0 feet to 33.5 feet beneath the ground surface, on the -L- alignment, at elevations of approximately 2,523 to 2,555 feet.

Groundwater

In general, the corridor drains to Big Crabtree Creek throughout the project site. In these areas groundwater was encountered at depths as shallow as 6.0 feet to 13.2 feet below the existing ground surface, approximate elevations 2,546 to 2,553 feet. The depth of groundwater, beneath the ground surface, will fluctuate with seasonal precipitation and may occur at higher levels at other times of the year above less permeable clayey soils and rock materials.

Areas of Special Geotechnical Interest

1) Very Soft to Soft Wet Soils- Very soft to soft wet near surface soils which have the potential to cause embankment stability/settlement problems occur through the following sections:

Alignment	Stations (±)
-L-	15+63 to 16+35
-L-	16+75 to 17+25
-L-	18+75 to 19+75
-L-	21+25 to 21+75
-L-	22+50 to 23+00

A discussion of these soft wet alluvial near surface soils is located above in the section titled "Soil Properties".

2) Groundwater- High water tables, seasonal high ground water, as well as, potential perched groundwater were encountered at the following locations:

Alignment	Station (±)
-L-	16+25 to 16+75
-L-	19+25 to 19+75

3) Groundwater Well – A groundwater well located within and close to the project corridor is at the following location:

Alignment	Station (±)	Offset (ft.)
-L-	18+50	26 LT

4) Crystalline Rock– The following locations were found to contain rock within 6 feet of grade:

Alignment	Stations (±)
-L-	13+50 to 14+09
-L-	17+25 to 17+75
-L-	19+25 to 23+50

Sincerely,
Terracon Consultants, Inc.

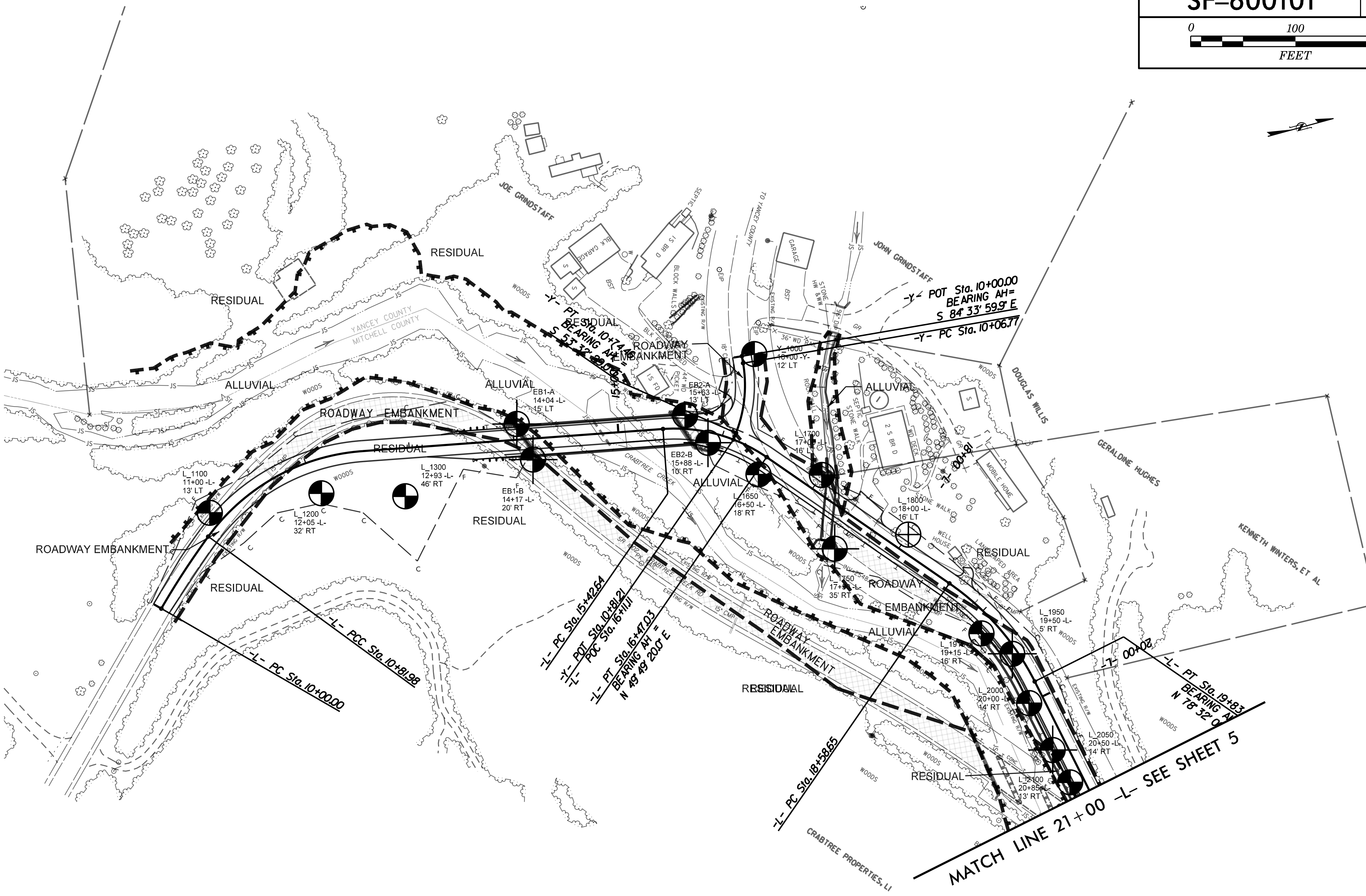
Hiba Almulla
Engineering Assistant

Abner F. Riggs Jr. P.E.
Senior Geotechnical Engineer
N. C. Registration No. 14155

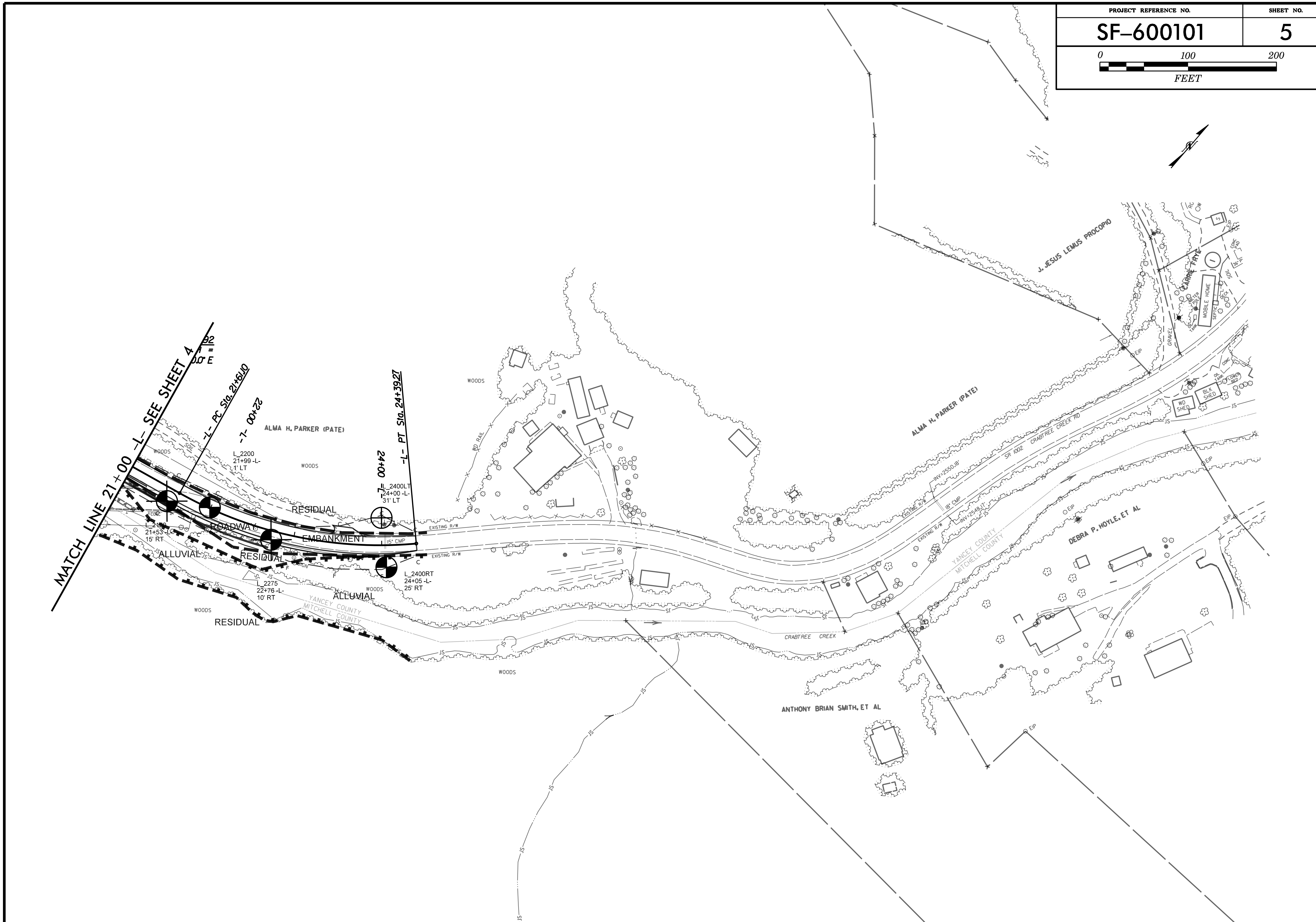
PROJECT REFERENCE NO.	SHEET NO.
SF-600101	4

0 100 200

FEET



PROJECT REFERENCE NO.	SHEET NO.
SF-600101	5



0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	6

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

2575
2570
2565
2560
2555
2550
2545

SS-2
L_1100
11+00 -L-
13 LT

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

EXISTING PAVEMENT

3:1

4:1

13
2
2
2
10

BT
FIAD
04/23

ALLUVIAL, VERY LOOSE TO LOOSE, BROWN, SILTY FINE TO COARSE SAND, MOIST TO WET (A-2-4)

RESIDUAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, MOIST, MICACEOUS (A-2-4)

WEATHERED ROCK, (BROWN, GRAY, GNEISS)

RESIDUAL, VERY DENSE, BROWN, GRAY, SILTY COARSE TO FINE SAND, MOIST (A-2-4)

11+00

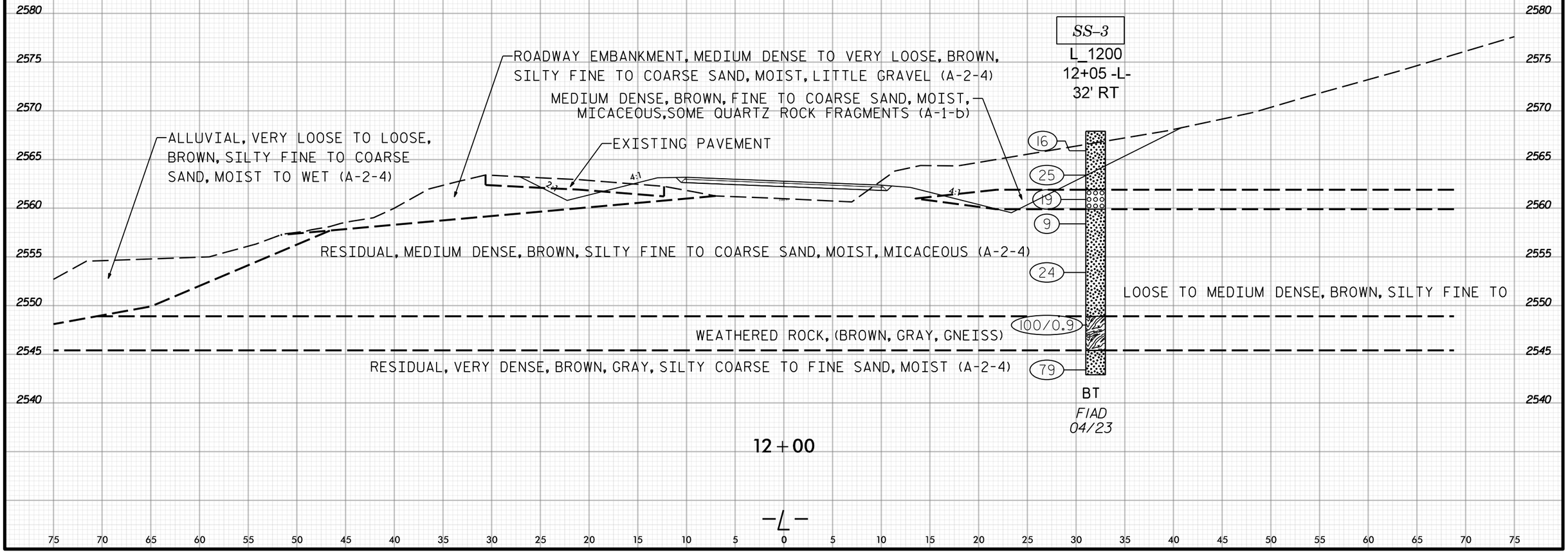
-L-

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

PROJ. REFERENCE NO.	SHEET NO.
SF-600101	7

0 10 20 FEET

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



0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	8

40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110

2590 2585 2580 2575 2570 2565 2560 2555 2550

SS-4
L_1300
12+93 -L-
46 RT

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

EXISTING PAVEMENT

2:1

4:1

GRADE TO MATCH –DET– SURFACE

RESIDUAL, MEDIUM STIFF, BROWN, SILTY CLAY, WET (A-7-5)

7
15
17

MEDIUM DENSE, BROWN, CLAYEY COARSE TO FINE SAND, MOIST (A-2-7)

WEATHERED ROCK (BROWN, GNEISS) 100/0.9 WEATHERED ROCK (BROWN, GNEISS)

RESIDUAL, VERY DENSE, BROWN, SILTY FINE TO 66 COARSE SAND, MOIST (A-2-4)

WEATHERED ROCK (BROWN, GNEISS) 100/0.4

RESIDUAL, MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, MOIST (A-2-4)

12

BT

CAVED DRY @ 14.3'
04/23

13+00

–L–

40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	9

35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115

2585 2580 2575 2570 2565 2560 2555 2550 2545 2540 2535 2530 2525 2520 2515

ALLUVIAL, VERY LOOSE, BROWN, COARSE TO FINE SAND, MOIST (A-3)

SS-5
EB1-A
14+04 -L-
15 LT

ROADWAY EMBANKMENT, LOOSE, BROWN, SILTY FINE TO COARSE SAND, MOIST, TRACE GRAVEL (A-2-4)

EB1-B
14+17 -L-
20 RT

PAVEMENT (0.8' ASPHALT)

RESIDUAL, MEDIUM DENSE, BROWN, CLAYEY COARSE TO FINE SAND, MOIST (A-2-7)

WEATHERED ROCK (BROWN, GNEISS)

RESIDUAL, MEDIUM DENSE TO VERY DENSE, BROWN, SILTY COARSE TO FINE SAND, MOIST TO WET, MICACEOUS (A-2-4)

2:1

4:1

-DET- SURFACE

-DET- SURFACE

8 2 2 2

37 100/0.4 60/0.0 60/0.0

WEATHERED ROCK (BROWN, GRAY, GNEISS)

CRYSTALLINE ROCK, GRAY, BLACK, WHITE, GNEISS

20 41 100/0.9 100/0.6 60/0.0

WEATHERED ROCK (BROWN, GRAY, GNEISS)

VERY SLIGHTLY TO MODERATELY WEATHERED, HARD, CLOSE TO WIDE FRACTURE SPACING
REC=98%
RQD=81%
GSI=70-80

BT

FIAD
04/23

REC=41%
RQD=30%
GSI=60-70

SLIGHTLY TO MODERATELY WEATHERED, HARD, CLOSE TO MODERATELY CLOSE FRACTURE SPACING

BT

CAVED DRY @ 5.0'
04/23

14+00

-L-

35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	10

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

2575
2570
2565
2560
2555
2550
2545
2540
2535
2530
2525
2520

ALLUVIAL, VERY SOFT, BROWN, FINE TO COARSE SANDY SILT, WET (A-4)

EXISTING PAVEMENT

WOLF PEN BRANCH ROAD
SR 1188

SS-6
EB2-B
15+88 -L-
10 RT

2:1

2
2
9
100/0.9
04/23

RESIDUAL, LOOSE. BROWN, RED, SILTY FINE TO COARSE SAND, WET, MICACEOUS (A-2-4)

WEATHERED ROCK (BLACK, WHITE, GNEISS)

100/0.9

60/0.1

CRYSTALLINE ROCK GRAY, BLACK, WHITE, GNEISS

60/0.0

VERY SLIGHT TO MODERATE WEATHERING, HARD, CLOSE TO MODERATELY CLOSE FRACTURE SPACING

REC=76%
RQD=72%
GSI=80-90

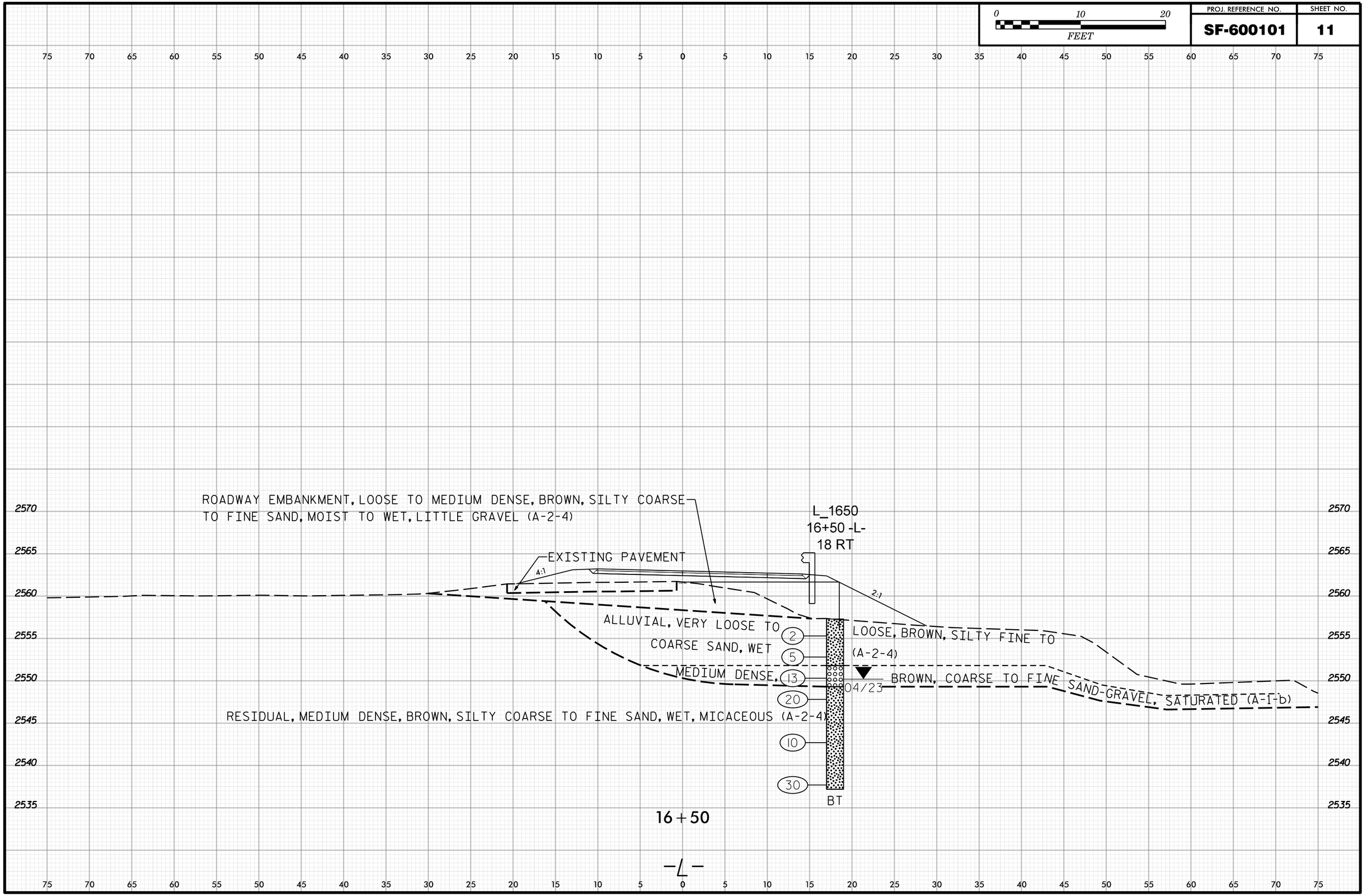
BT

16+00

-L-

0 10 20
FEET

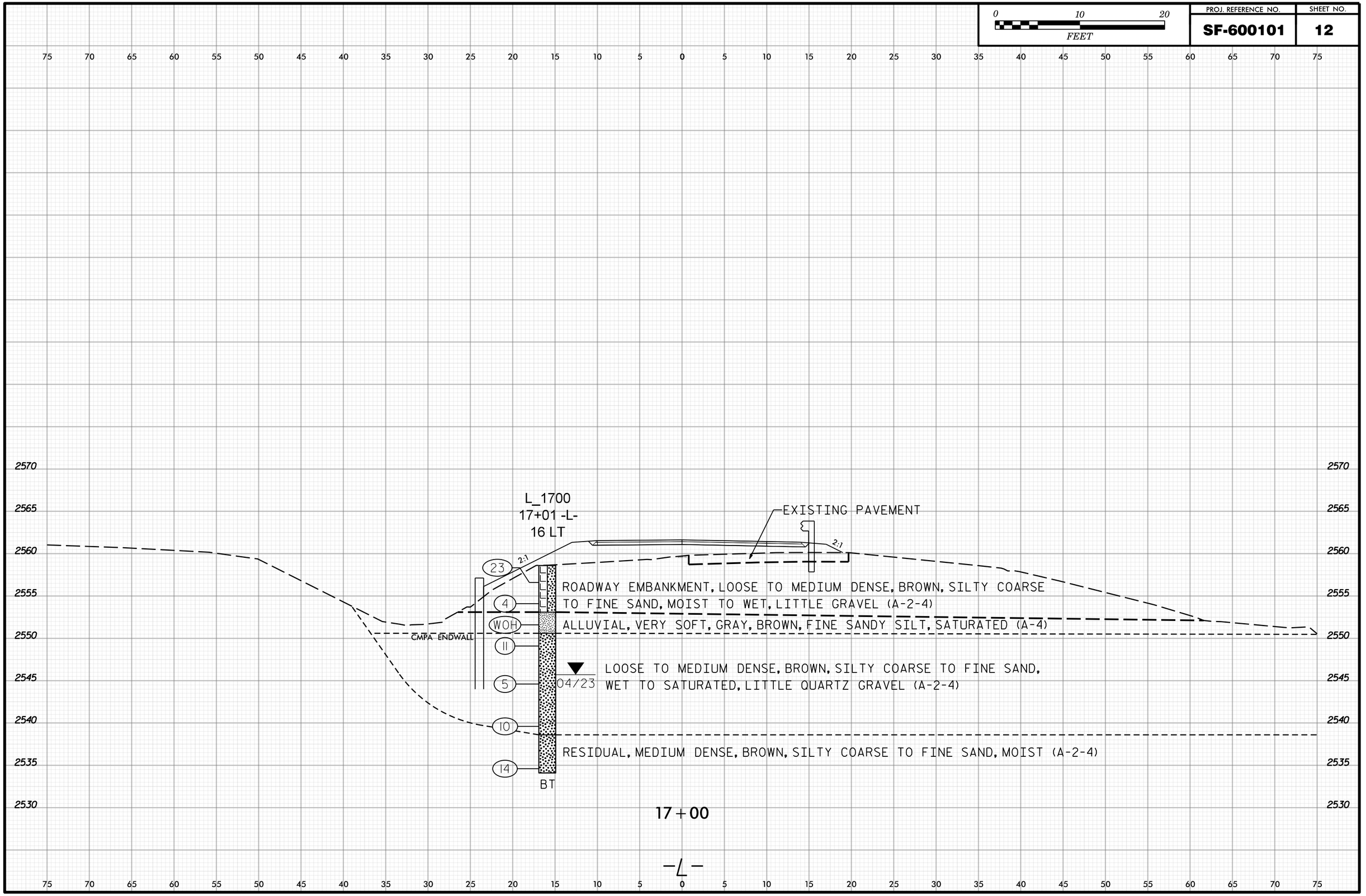
PROJ. REFERENCE NO.	SHEET NO.
SF-600101	11



16 + 50

-L-

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	12



17+00

-L-

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	13

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

2570 2565 2560 2555 2550 2545 2540 2535 2530

SS-7
L_1750
17+50 -L-
35 RT

ROADWAY EMBANKMENT, VERY LOOSE, BROWN, SILTY COARSE TO FINE SAND, WET, TRACE GRAVEL (A-2-5)

EXISTING PAVEMENT (DRIVEWAY)

EXISTING DRIVEWAY 10:1

EXISTING PAVEMENT

2:1

ALLUVIAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED (A-2-4)

3
3
10
6
18
60/0.0

CMPA ENDWALL

04/23

RESIDUAL, MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET (A-2-4)

CRYSTALLINE ROCK, GRAY, BLACK, WHITE, GNEISS

SLIGHT TO MODERATELY WEATHERED, HARD, CLOSE FRACTURE SPACING

BT

REC=69%
RQD=31%
GSI=60-70

17+50

-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

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	14

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

2580 2580

2575 2575

2570 2570

2565 2565

2560 2560

2555 2555

2550 2550

2545 2545

2540 2540

ROADWAY EMBANKMENT, VERY LOOSE, BROWN, SILTY COARSE TO FINE SAND, WET, TRACE GRAVEL (A-2-5)

S-1

L_1800
18+00 -L-
16 LT

RESIDUAL, LOOSE, BROWN, RED, CLAYEY FINE TO COARSE SAND, MOIST (A-2-6)

2:1

BT

CAVED DRY @ 6.7'
04/23

EXISTING PAVEMENT

3:1

2:1

ALLUVIAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED (A-2-4)

MEDIUM STIFF TO STIFF, BROWN, SILTY CLAY, MOIST (A-7-6)

CRYSTALLINE ROCK (GRAY, BLACK, WHITE, GNEISS)

18+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

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	15

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

2585 2580 2575 2570 2565 2560 2555 2550 2545 2540 2535

ROADWAY EMBANKMENT, SOFT TO MEDIUM STIFF, BROWN, RED, CLAYEY SILT, MOIST TO SATURATED (A-5)

SS-8
L_1915
19+15 -L-
16 RT

EXISTING ARTIFICIAL FILL (GRAVEL)

4:1

2:1

PAVEMENT (0.5' ASPHALT)

ALLUVIAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED (A-2-4)

6
2
2
5

WEATHERED ROCK (BROWN, GRAY, GNEISS)

100/0.8

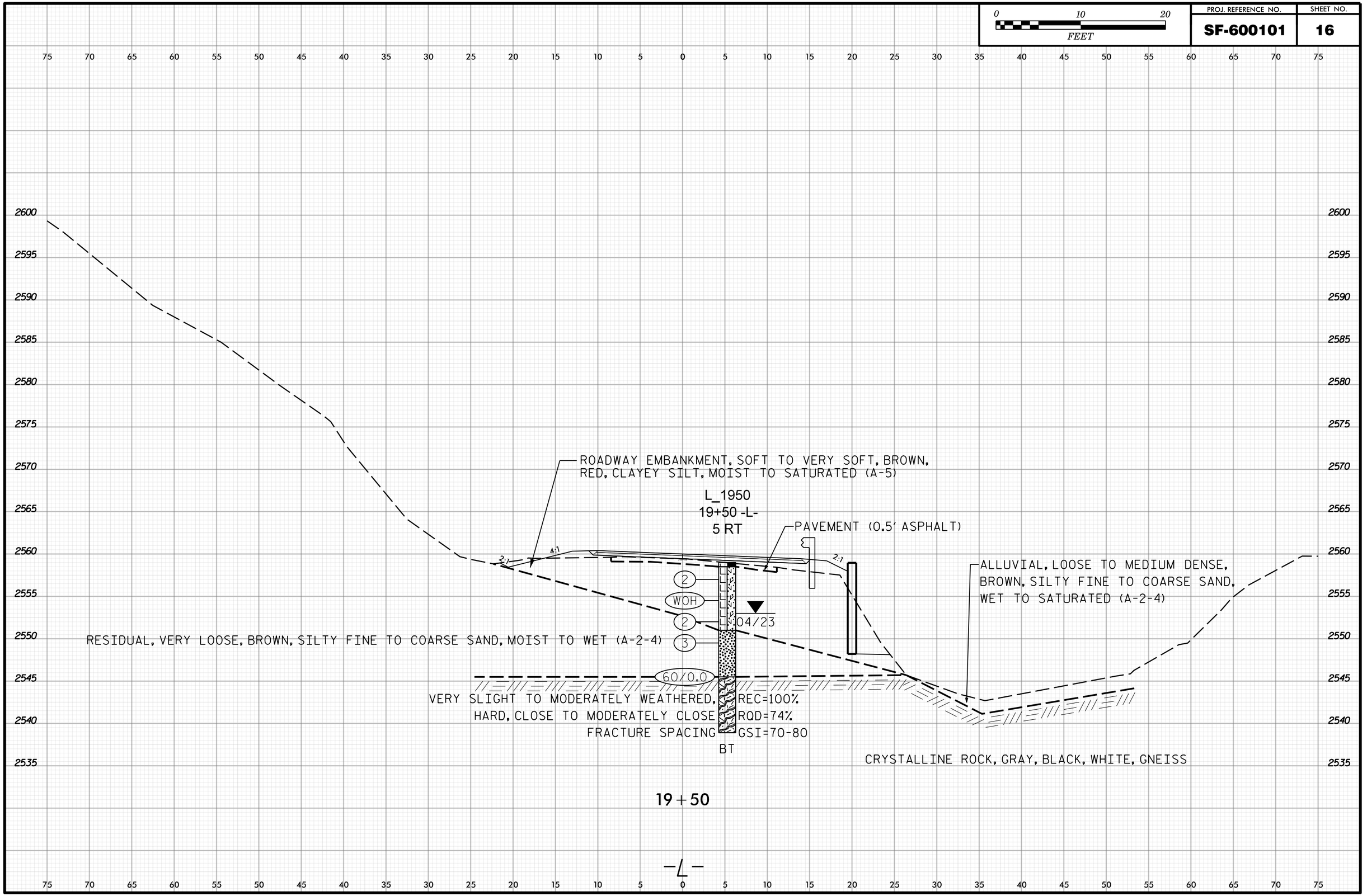
100/0.9

BT
FIAD
04/23

19+15

-L-

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	16



0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	17

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

2605 2600 2595 2590 2585 2580 2575 2570 2565 2560 2555 2550 2545 2540

EXISTING PAVEMENT

2:1 3:1 2:1

L_2000
20+00 -L-
14 RT

ROADWAY EMBANKMENT, VERY LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, MOIST TO SATURATED, TRACE TO SOME MICA (A-2-4)

2
15
9
6
60/0.0

BT

ALLUVIAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED (A-2-4)

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

CAVED DRY @ 8.0'
04/23

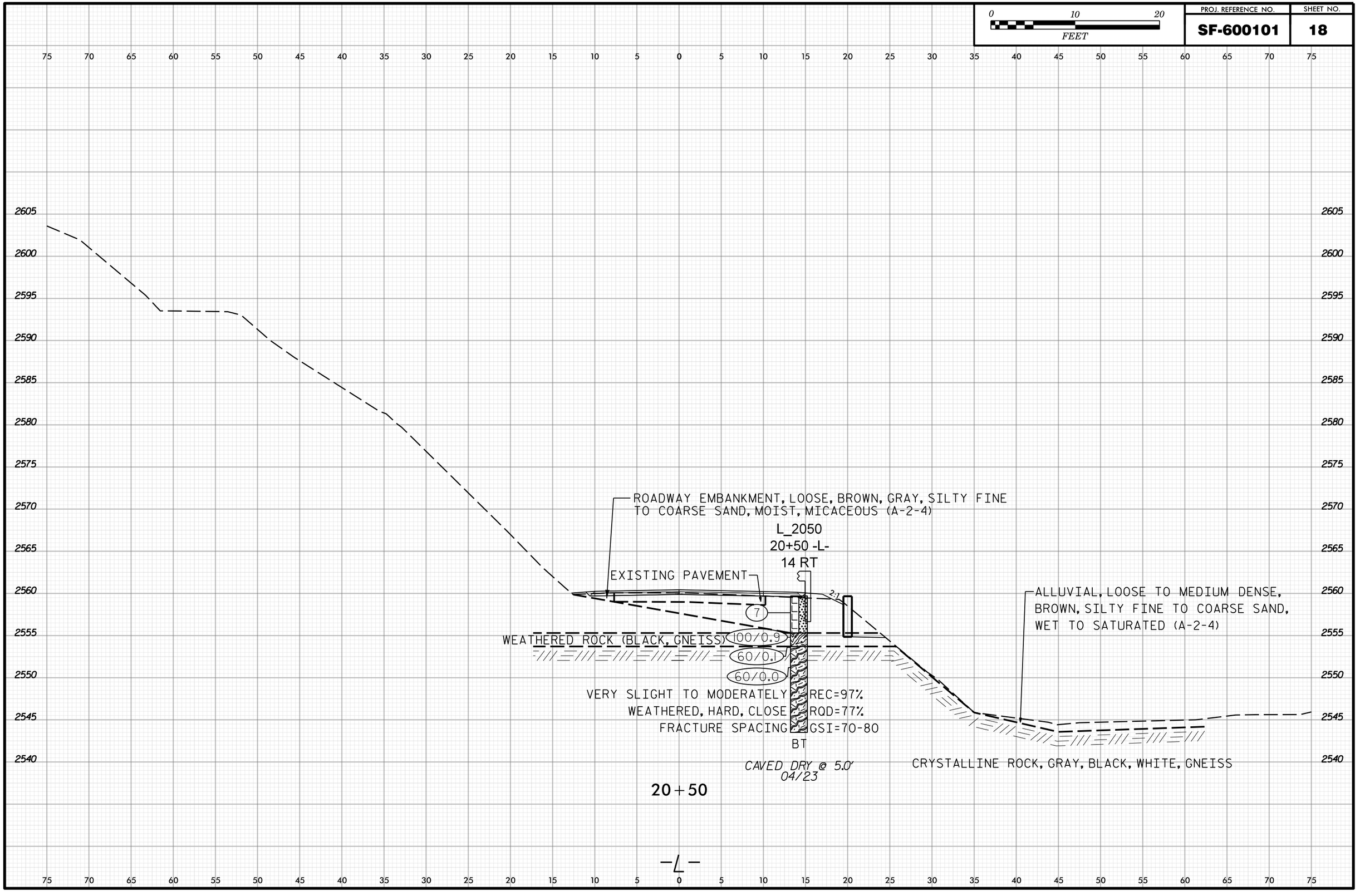
CRYSTALLINE ROCK (GRAY, BLACK, WHITE, GNEISS)

20+00

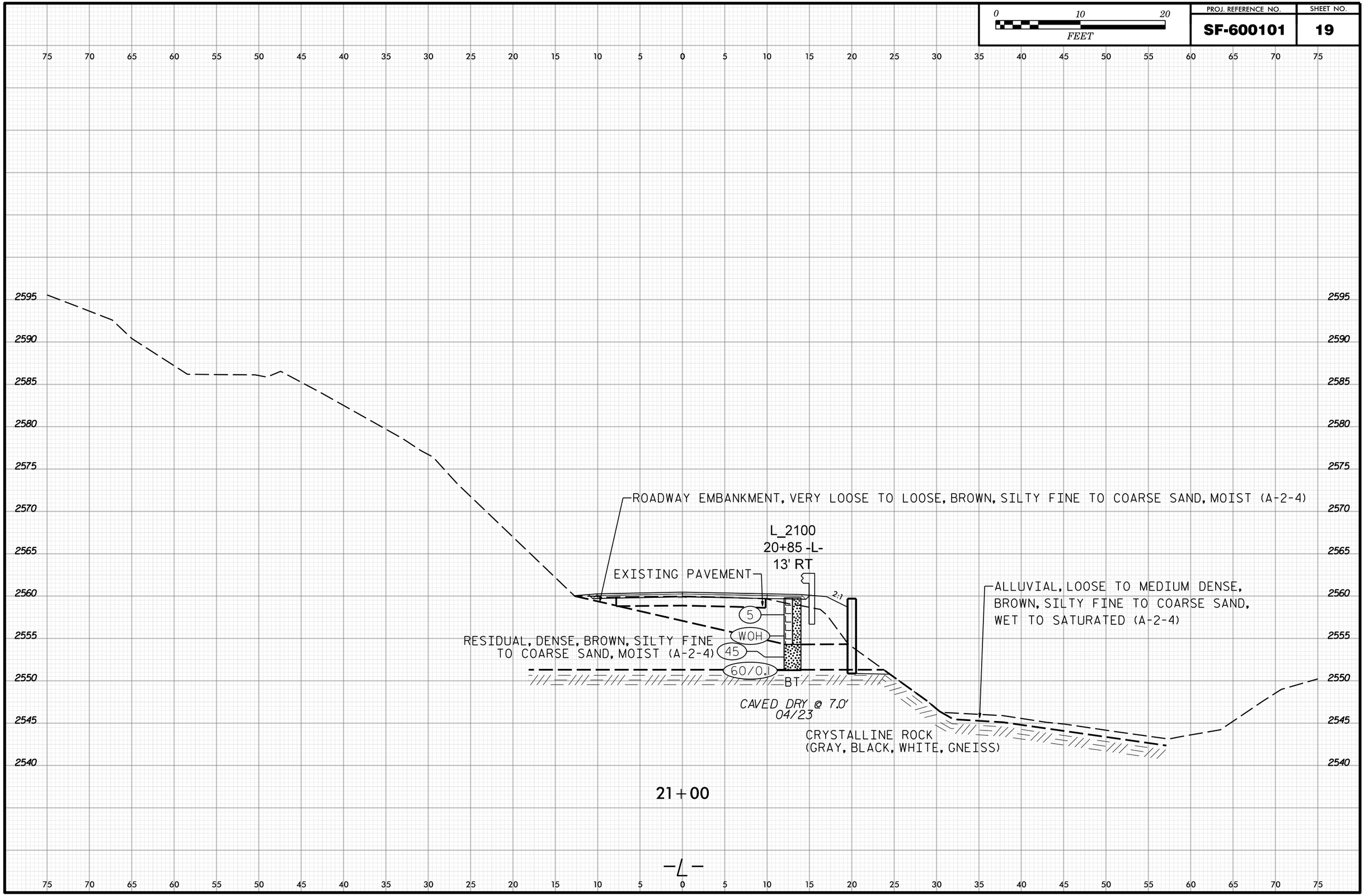
-L-

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

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	18



0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	19



0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	20

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

2595 2590 2585 2580 2575 2570 2565 2560 2555 2550 2545 2540 2535 2530 2525

SS–9
SS–10
L_2150
21+53 -L-
15 RT

PAVEMENT (0.7' ASPHALT)

15:1

2:1

2:1

ROADWAY EMBANKMENT, LOOSE, BROWN, COARSE TO FINE SAND-GRAVEL, MOIST (A-1-b)

SOFT, BROWN, FINE TO COARSE SANDY CLAY, MOIST (A-6)

ALLUVIAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED (A-2-4)

7
2
7
7

RESIDUAL, LOOSE TO MEDIUM DENSE, BROWN, COARSE SAND, MOIST,

16

CLAYEY FINE TO MICACEOUS (A-2-5)

WEATHERED ROCK (BLACK, GNEISS)

100/0.4

60/0.0

VERY SLIGHT TO MODERATELY WEATHERED, HARD, WIDE TO MODERATELY CLOSE FRACTURE SPACING

REC=87%
RQD=86%
GSI=80-90

CRYSTALLINE ROCK, GRAY, BLACK, WHITE, GNEISS

BT
FIAD
04/23

21+50
-L-

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	21

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

2585
2580
2575
2570
2565
2560
2555
2550
2545
2540

PAVEMENT (0.3' ASPHALT)

L_2200
21+99 -L-
1 LT

ROADWAY EMBANKMENT, VERY LOOSE TO LOOSE, BROWN, SILTY FINE TO COARSE SAND, MOIST, TRACE CLAY (A-2-4)

2:1 3:1 2:1

2
4
52
100/0.9
60/0.0

RESIDUAL, VERY DENSE, BROWN, GRAY, SILTY FINE TO COARSE SAND, MOIST (A-2-4)

WEATHERED ROCK (BLACK, GNEISS)

BT

FIAD
04/23

CRYSTALLINE ROCK (GRAY, BLACK, WHITE, GNEISS)

ALLUVIAL, LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED (A-2-4)

22+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

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	22

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

2585 2580 2575 2570 2565 2560 2555 2550 2545 2540 2535

ROADWAY EMBANKMENT, VERY SOFT TO SOFT, BROWN, RED, COARSE TO FINE SANDY CLAY, MOIST TO WET (A-6)

SS-11
L_2275
22+76 -L-
10 RT

EXISTING PAVEMENT

2:1

WOH
WOH
2
31

ALLUVIAL, VERY LOOSE TO MEDIUM DENSE, BROWN, SILTY FINE TO COARSE SAND, WET TO SATURATED, TRACE GRAVEL (A-2-4)

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

60/0.0

VERY SLIGHT TO MODERATELY SEVERE WEATHERING, HARD, MODERATELY CLOSE TO WIDE FRACTURE SPACING

REC=96%
RQD=96%
GSI=70-80

BT

FIAD
04/23

CRYSTALLINE ROCK, GRAY, BLACK, WHITE, GNEISS

22+75

-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

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	23

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

2585 2580 2575 2570 2565 2560 2555 2550 2545 2540 2535 2530

L_2400LT
24+00 -L-
31 LT

BT
CAVED DRY @ 2.5'
04/23

ROADWAY EMBANKMENT, VERY SOFT TO SOFT, BROWN,
RED, COARSE TO FINE SANDY CLAY, MOIST TO WET (A-6)

SS-12

EXISTING PAVEMENT

L_2400RT
24+05 -L-
25 RT

4:1

2:1

2
3
3
23

ALLUVIAL, VERY LOOSE TO
MEDIUM DENSE, BROWN, SILTY
FINE TO COARSE SAND, WET
TO SATURATED, TRACE GRAVEL (A-2-4)

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

WEATHERED ROCK (BROWN, GRAY, GNEISS)

100/0.8

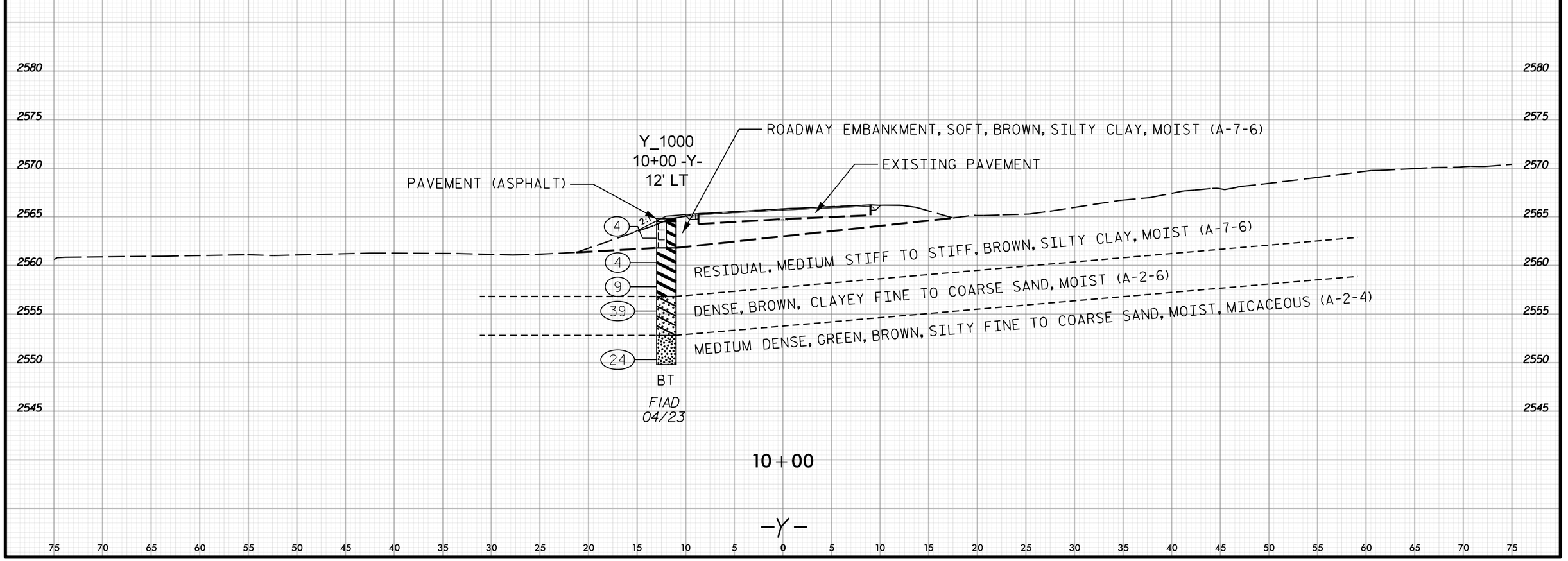
BT
FIAD
04/23

24+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

0 10 20 FEET	PROJ. REFERENCE NO.	SHEET NO.
	SF-600101	24



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF–600101	25	

REFERENCE: SF–600101

PROJECT: 17BP.13.R.184

APPENDIX A

BORING LOG – EB2–A
LABORATORY TESTING SUMMARY

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.13.R.184	**TIP** SF-600101	**COUNTY** MITCHELL	**GEOLOGIST** MARPLES, Z.
SITE DESCRIPTION BRIDGE 101 OVER BIG CRABTREE CREEK ON SR 1002 (CRABTREE ROAD)			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 15+63	**OFFSET** 13 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2,562.1 ft	**TOTAL DEPTH** 23.7 ft	**NORTHING** 794,761	**EASTING** 1,067,352	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE TER2101 Geoprobe 3230DT 91% 01/20/2023		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W.	**START DATE** 04/03/23	**COMP. DATE** 04/03/23	**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)
2565										
										2,562.1 GROUND SURFACE 0.0
	2,561.1	1.0	1	4	8	12		M		**ALLUVIAL**
2560	2,558.6	3.5	15	35	50	85	SS-13	M		STIFF, MEDIUM DENSE, BROWN, FINE TO COARSE SANDY SILT, MOIST (A-4) 2,559.1 3.0
	2,556.1	6.0	19	28	21	49		M		VERY DENSE, BROWN, COARSE SAND-GRAVEL, MOIST, MICACEOUS (A-1-b) 2,556.6 5.5
2555	2,553.6	8.5	12	18	11	29		M		**RESIDUAL** VERY LOOSE TO VERY DENSE, BROWN, SILTY FINE TO COARSE SAND, MOIST (A-2-4)
2550	2,548.4	13.7	7	14	16	30		M		
2545	2,543.4	18.7	4	1	1	2		M		
2540	2,538.4	23.7	60/0.0			60/0.0				2,538.4 23.7 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,538.4 ft ON CRYSTALLINE ROCK (GNEISS)
										CAVED DRY @ 5.0'

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 17BP.13.R.184 **TIP:** SF-600101 **COUNTY:** MITCHELL

DESCRIPTION: BRIDGE 101 OVER BIG CRABTREE CREEK ON SR 1002 (CRABTREE ROAD)

Sample No.	Station	Alignment	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200		
SS-1	10+00	-Y-	12 LT	3.5 - 5.0	A-7-6 (6)	46	19	33.1	16.8	23.9	26.2	6	89	68	47	28.7	--
SS-2	11+00	-L-	13 LT	8.5 - 10.0	A-2-4 (0)	NP	NP	12.0	61.8	19.9	6.3	2	97	94	33	--	--
SS-3	12+00	-L-	32 RT	6.0 - 7.5	A-1-b (0)	NP	NP	66.4	19.2	13.9	0.5	0	98	48	17	--	--
SS-4	12+93	-L-	46 RT	3.5 - 5.0	A-2-7 (0)	48	12	51.0	19.5	16.6	12.9	0	98	62	32	20.3	--
SS-5	14+04	-L-	15 LT	8.5 - 10.0	A-3 (0)	NP	NP	57.9	34.8	6.0	1.3	14	85	58	8	--	--
SS-6	15+88	-L-	10 RT	3.5 - 5.0	A-4 (0)	34	6	18.6	48.8	18.4	14.2	1	98	89	39	26.2	--
SS-7	17+50	-L-	35 RT	3.5 - 5.0	A-2-5 (0)	42	2	39.5	32.3	24.8	3.4	5	92	68	31	--	--
SS-8	19+15	-L-	16 RT	3.5 - 5.0	A-5 (2)	54	6	16.3	42.2	25.8	15.7	1	98	92	47	43.1	--
SS-9	21+54	-L-	15 RT	1.0 - 2.5	A-1-b (0)	NP	NP	61.9	21.1	14.5	2.5	33	60	32	12	--	--
SS-10	21+54	-L-	15 RT	8.5 - 10.0	A-2-5 (0)	41	9	59.7	19.1	13.6	7.6	4	92	53	22	--	--
SS-11	22+76	-L-	10 RT	6.0 - 7.5	A-6 (2)	40	13	32.7	28.7	23.9	14.7	0	97	77	41	25.2	--
SS-12	24+05	-L-	25 RT	3.5 - 5.0	A-2-4 (0)	NP	NP	29.4	52.5	16.0	2.1	1	99	91	23	--	--
S-1	18+00	-L-	16 LT	3.0 - 4.0	A-7-6 (5)	41	20	27.0	25.3	24.3	23.4	6	91	75	46	24.9	--

NP - NON-PLASTIC

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number