REFERENCE: B-5845

PROJECT: 45798

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	12+50 - 32+00	4-5	N/A
-DR-	10+00 - 12+30	4	N/A

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	16+00 - 32+00	6-27
-DR-	11+00	28

APPENDICES

APPENDIX	TITLE	SHEETS
A	SOIL TEST RESULTS	29-30

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *CLEVELAND*

PROJECT DESCRIPTION *BRIDGE NO. 025 OVER BUFFALO CREEK ON SR 2033 BETWEEN SR 2047 AND SR 2044*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5845	1	30

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.

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DATE *APRIL 2023*

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04/21/2023
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-5845	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-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-50
- [X] MOBILE B-29

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.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B ____ [ ] -H ____
- [X] -N 0

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: N/A

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES PROVIDED BY TGS ENGINEERS

ELEVATION SURVEY FOR BORINGS EBI-A, EBI-B, EB2-A, AND EB2-B PROVIDED BY TGS ENGINEERS

F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING
H.A.R. = HAND AUGER REFUSAL
CT = CORING TERMINATED

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-5845	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)

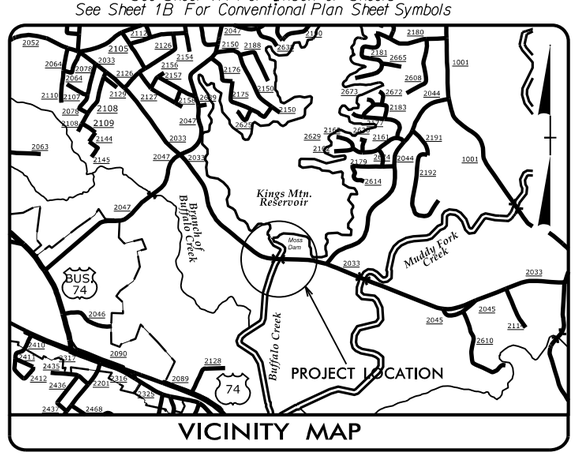
VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered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

TIP PROJECT: B-5845

CONTRACT:



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CLEVELAND COUNTY

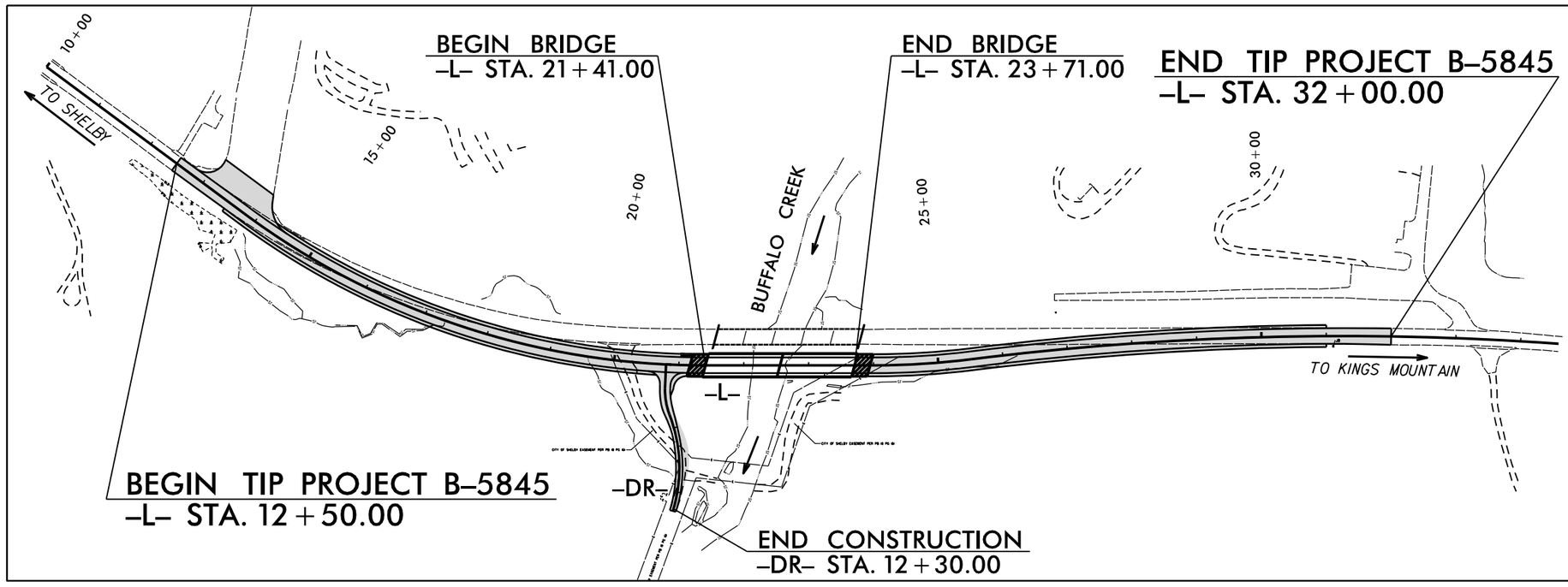
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5845	3	35

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
45798.1.1	N/A	PE
45798.2.1	N/A	ROW, UTIL.
45798.3.1	N/A	CONST.

LOCATION: BRIDGE #220025 ON SR 2033 (OAK GROVE RD.) OVER BUFFALO CREEK

TYPE OF WORK: GRADING, PAVING, DRAINAGE, & STRUCTURE

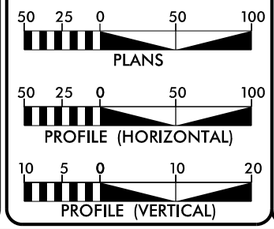
NAD 83/2011



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD __
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES
A DESIGN EXCEPTION WILL BE REQUIRED FOR SAG VERTICAL CURVE K, AND VERTICAL SSD

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

GRAPHIC SCALES



DESIGN DATA

ADT 2020 = 6,800
ADT 2040 = 7,800
K = 9 %
D = 55 %
T = 6 % *
V = 60 MPH
* TTST = 2% DUAL = 4%
FUNC CLASS =
RURAL COLLECTOR
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-5845	=	0.325 MILES
LENGTH STRUCTURE TIP PROJECT B-5845	=	0.044 MILES
TOTAL LENGTH TIP PROJECT B-5845	=	0.369 MILES

NCDOT CONTACT: STEVE RACKLEY, PE

PLANS PREPARED BY:
TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

PLANS PREPARED FOR:
NORTH CAROLINA DEPARTMENT OF TRANSPORATION
DIVISION 12
1710 E. Marion St
Shelby, NC 28150

RIGHT OF WAY DATE: DEC. 2020

LETTING DATE: DEC. 2021

2018 STANDARD SPECIFICATIONS

JIMMY L. TERRY, PE
PROJECT ENGINEER

AUSTIN R. TURNER, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION ·

4/21/2023

STATE PROJECT: 45798.1.1
TIP NO.: B-5845
I.D. NO.: SF-220025
COUNTY: Cleveland
DESCRIPTION: Bridge No. 025 over Buffalo Creek on SR 2033 between SR 2047 and SR 2044

SUBJECT: Geotechnical Roadway Inventory Report

PROJECT DESCRIPTION

Based on a review of the plans provided to us by TGS, we understand this project consists of a bridge replacement and roadway realignment to SR 2033 (Oak Grove Road) over Buffalo Creek. The realignment of SR 2033 begins approximately 890 feet west of the proposed bridge over Buffalo Creek and ends approximately 829 feet east of the proposed bridge. The project is approximately 0.369 miles in length, measured along -L- (SR 2033) from Station 12+50 to 32+00. The proposed construction consists of a new bridge, roadway improvements, and associated drainage. The following alignments are included as part of this investigation:

Alignment	Stations
-L- (SR 2033)	12+50 to 32+00
-DR-	10+00 to 12+30

The provided roadway plans generally indicate fill on the order of 5 to 20 feet are planned along the alignment from -L- Stations 13+00 to 14+50, 16+50 to 17+25, 19+50 to 21+00, and 24+00 to 26+00. Fills on the order of 5 to 15 feet are planned along the left and right side of -DR-. Cuts on the order of 5 to 16 feet are planned along -L- from Station 17+50 to 19+25 and 26+50 to 31+50. Additional sliver cuts and fills are shown on the plans at other locations.

The geotechnical field investigation was conducted by CG2 during the period of May 2020 and March 2022. This investigation was performed in several phases due to project schedule and contract requirements. A subcontracted drilling crew was used to drill and sample each of the thirteen (13) borings included in this report. The drill rigs utilized were a truck-mounted Mobile B-29 and a track-mounted Diedrich D-50 both equipped with an automatic hammer. Standard Penetration Tests (SPT) were performed at selected depths within each boring except for L_1600 and L_2500R which were performed utilizing hand auger equipment due to utility and access conflicts. Rock coring was performed in two end bent borings to evaluate the presence and consistency of the bedrock. Representative soil samples were collected for visual-manual classification in the field and evaluated in the office by a staff geologist under the supervision of a licensed engineer or licensed geologist. Selected soil samples were submitted for laboratory analysis by an approved NCDOT M&T testing facility.

PHYSIOGRAGHY AND GEOLOGY

The project corridor is located within the Piedmont Physiographic Province (Piedmont) of North Carolina. The Piedmont generally consists of hills and ridges which are intertwined with an established system of draws and streams. The Piedmont is predominately underlain by igneous and metamorphic rock.

The 1985 Geologic Map of North Carolina shows the project area is within the Inner Piedmont Belt, which is comprised of an upper and lower suite with associated intrusive igneous plutons. The upper suite is mostly metasedimentary and consists of interlayered Mica Schist and Biotite Paragneiss. The lower suite of the Inner Piedmont Belt generally consists of Biotite Gneiss, Amphibolite, Mica Schist, and layered Granitoid Gneiss. Within the Inner Piedmont Belt is the Cherryville Pluton which consists of Monzogranite known as the Cherryville Granite. Rock encountered during the investigation was classified as Granite and Mica Schist and was also encountered within some roadway borings.

Within the project alignment, much of the bedrock is overlain by near-surface material consisting of residual and alluvial soils. Residual soils are derived from in situ chemical and physical weathering of the rock in the area and vary in thickness. The residual soils in this region are typically finer grained with a higher clay content near the surface due to advanced weathering, and typically become more coarse grained with increasing depth as the degree of weathering decreases. As the degree of weathering decreases, the residual soils generally retain the overall appearance and fabric of the parent rock (sometimes referred to as “saprolite”). The boundary between soil and rock is not always sharply defined. A transitional zone termed “weathered rock” is often found overlying the parent bedrock. Weathered rock is defined as material requiring 100 blows with less than one foot of penetration from the SPT hammer.

Alluvial soils are transported and deposited by water and are naturally variable in character, consistency/density, and often contain organic materials. Alluvial soil deposits of varying age were observed within the project alignment in low lying areas adjacent to Buffalo Creek but were not encountered within borings performed for the roadway investigation.

Soil Properties

Soils and rock encountered within the borings during the roadway investigation include roadway embankment, residual, weathered rock, and crystalline rock.

A pavement system consisting of asphalt pavement and aggregate base course (ABC) was encountered at Borings EB2-A and L_1799L in the existing travel lanes. The pavement encountered was on the order of 1.0 to 1.4 feet thick.

Roadway embankment soils are similar in nature to residual soils and may be derived from nearby sources. Roadway embankment soils were observed in five borings (EB2-A, EB1-A, EB1-B, L_1600R, and L_1799L) during the roadway investigation due to the presence of state-maintained roadways. This material generally consists of loose to medium dense silty sand (A-2-4) and soft to very stiff sandy silt (A-4), sandy, clayey silt (A-5), sandy clay (A-6), and sandy, silty clay (A-7), with trace mica and gravel.

Residual soils were encountered in Borings DR_1103L, EB1-A, EB1-B, EB2-B, L_1600, L_1799R, L_2009L, L_2554R, L_2731R, L_2905R, and L_3106R. The residual fine-grained soils generally consist of medium stiff to hard sandy silt (A-4), sandy, clayey silt (A-5), sandy clay (A-6), and moderately to highly

plastic silty clay (A-7-5/6) The coarse-grained soils generally consist of very loose to very dense silty, sandy gravel (A-1-a), gravelly sand (A-1-b), and clayey, silty sand (A-2-4). Trace to little mica and rock fragments were encountered intermittently within the residual soils.

Weathered rock was also encountered along the project corridor within Borings DR_1103L, EB1-B, L_1799L, L_1799R, and L_2009L. The weathered rock consisted of Mica Schist and Granite. The weathered rock was encountered at depths ranging from approximately 5.0 to 19 feet below existing grades near the proposed bridge end bents and along the project corridor.

Crystalline rock was encountered within Borings EB1-A, EB2-A, EB2-B, L_1799L, and L_1799R. The crystalline rock consisted of Mica Schist and Granite and was encountered at depths ranging from approximately 2.2 to 33.5 feet below existing grades.

Groundwater

Groundwater measurements were taken during May 2020 and March 2022. Groundwater measurements were attempted at the completion of drilling in each boring, at which time groundwater was encountered in Borings EB1-A, EB1-B, L_2731R, L_2905R, and L_3106R at depths of approximately 12.2 to 32.9 feet below the existing grades, respectively. Subsequent groundwater measurements were attempted after at least 24 hours following the completion of drilling in each boring, except Borings EB2-A and L_1800L, which were backfilled upon completion of drilling due to safety concerns. At the time of subsequent water level measurements groundwater was encountered in Borings EB1-A, EB1-B, L_2731R, L_2905R, and L_3106R at depths of approximately 15.8 to 19.7 feet below existing grades. The remaining borings were recorded as dry at the bottom of the boring cylinder. The soils encountered were generally described as moist to wet above and below groundwater elevation.

An underground tributary was observed southeast of the proposed bridge near -L- Station 23+57. A spring was encountered within the project corridor at the following location:

Alignment	Stations	Offsets (ft)
-L-	23+21	54 LT

Water Wells: There are several residences and the T.J. Ellison Water Treatment Plant near the project site which could indicate that water wells may be present. Water wells were not observed within the proposed construction corridor. However, wells may be encountered that were not observed during our field services.

Areas of Special Geotechnical Interest

The following borehole locations encountered soft or loose soils which have the potential to cause embankment stability and/or long-term settlement problems:

Alignment	Stations	Offsets (ft)
-L-	17+99	91 RT
-L-	21+20	9 LT
-L-	23+89	37 LT

Highly Plastic Clays: Highly plastic clays (PI > 25) were encountered at the following borehole locations:

Alignment	Stations	Offsets (ft)
-L-	27+31	41 RT

Shallow groundwater was encountered within 6 feet of proposed subgrade at the following borehole locations:

Alignment	Stations	Offsets (ft)
-L-	27+31 to 31+06	41 to 42 RT

In addition, shallow groundwater may be encountered within 3 feet of the existing ground at the following locations:

Alignment	Stations	Offsets (ft)
-L-	23+57	18 RT

Crystalline rock was encountered above or within 6 feet of proposed grade at the following borehole location:

Alignment	Stations	Offsets (ft)
-L-	17+99	91 RT

We anticipate that crystalline rock may be encountered during construction of the cut slopes at the following locations:

Alignment	Stations	Offset
-L-	17+50 to 19+25	RT

Rock Outcrops: Rock outcrops were exposed within the proposed project corridor and generally consist of Mica Schist and Granite at the following locations:

Alignment	Stations	Offsets
-L-	17+00 to 19+00	RT
-L-	23+25 to 24+25	LT

Geotechnical Testing

Four split-spoon samples were selected for laboratory testing including Atterberg limits, grain size distribution analysis with hydrometer, and natural moisture. No thin-wall Shelby tube samples or bulk samples were collected during the investigation.

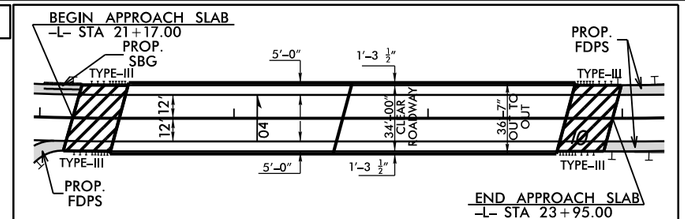
Sincerely,
Carolinas Geotechnical Group, PLLC

Robert E. Kral, P.E.
Senior Project Engineer

D. Matthew Brewer, P.E.
Senior Project Engineer

PAVEMENT REMOVAL

BEGIN APPROACH SLAB
–L– STA 21+17.00



BRIDGE/ROADWAY RELATIONSHIP SKETCH

FOR STRUCTURE PLANS, SEE SHEET S–1 THRU S–XX

NAD 83/2011

PROJECT REFERENCE NO.	SHEET NO.
B–5845	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

REVISIONS 8/17/99

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WOODS
ISFD
ROCK WALL W/ 72" CHL
MOSS LAKE CAMPGROUND VARIOUS UNDERGROUND UTILITIES
SR 2033 OAK GROVE RD. 24 BST
S 50°21'40"E
-L- PC 13+78.82
R= 300'
R= 30'
TIE TO EXIST GUARDRAIL
PROP. ASPHALT DRIVE
8", DI
R= 50'
DO NOT DISTURB FENCE
100' TAPER TO EXISTING
30' TYP.
BEGIN TIP PROJECT B-5845
–L– STA 12+50.00
UT TO BUFFALO CREEK (SB)
BUFFALO CREEK (SC)
L.1600R
L.1799L
ROCK OUTCROP
BM#1
L.1799R2
HEARTLEAF COMMUNITY
BEGIN BRIDGE
–L– STA 21+41.00
BEGIN SBG
–L– STA. 21+01.62
-DR- POT 10+00.00 =
-L- POC 20+80.11
96" CHL W/ 35BW
10' CONC HW
SR 2033 OAK GROVE RD. 24 BST
L.2009R
EB1-A
EB1-B
BL-3
GR R=20'
-DR- PC 10+37.00
-DR- PRC 10+77.62
DR.1103L
UT TO BUFFALO CREEK (SD)
10' SAFETY LANE
-DR- PT 12+25.74
PRESSURE REDUCER CAP
6" CPL W/ 3500 PSI
END CONSTRUCTION
–DR– STA 12+30.00
END BRIDGE
–L– STA 23+71.00
-L- PT 21+38.59
REMOVE EXIST. BRIDGE
BUFFALO CREEK
12" DI EXPOSED IN CREEK BED
ROCK OUTCROP
GROUND WATER FLOWS OUT 4" PVC
BRIDGE #25
CONC
SPRING
EB2-A
EB2-B
S 86°56'33"E
UT FLOWS UNDERGROUND
-L- PRC 25+50.97
-L- PC 24+02.45
CONC WATER TANK
MTL WATER TANK
BRK PUMP CONTROL BLDG
20", CI
12", DI
30' TYP.
L.2554R
BM#2
MATCH LINE STA. -L- 26+00
MATCH TO SHEET NO. 4

(A) –ROADWAY EMBANKMENT–

(B) –RESIDUAL–

(C) –ALLUVIAL–

-L- CURVE DATA

PI Sta 17+72.16	PI Sta 24+76.81
Δ = 36° 34' 52.4" (LT)	Δ = 7° 09' 04.0" (LT)
D = 4° 48' 53.2"	D = 4° 48' 53.2"
L = 759.77'	L = 148.52'
T = 393.34'	T = 74.36'
R = 1190.00'	R = 1190.00'
DS = 55 MPH	DS = 55 MPH
SE = 0.04	SE = 0.04

-DR- CURVE DATA

PI Sta 10+57.59	PI Sta 11+54.35
Δ = 23° 16' 17.8" (LT)	Δ = 36° 53' 55.1" (RT)
D = 57° 17' 44.8"	D = 24° 54' 40.4"
L = 40.62'	L = 148.12'
T = 20.59'	T = 76.73'
R = 100.00'	R = 230.00'
SE = 0.02	SE = -0.02

B1 = S 5° 14' 49.1" W
B2 = S 18° 52' 26.4" W

ALL DRIVE RADII ARE 20' UNLESS OTHERWISE NOTED

SEE SHEET 6 FOR –L– AND –DR– GRADE

PROJECT REFERENCE NO.	SHEET NO.
B-5845	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
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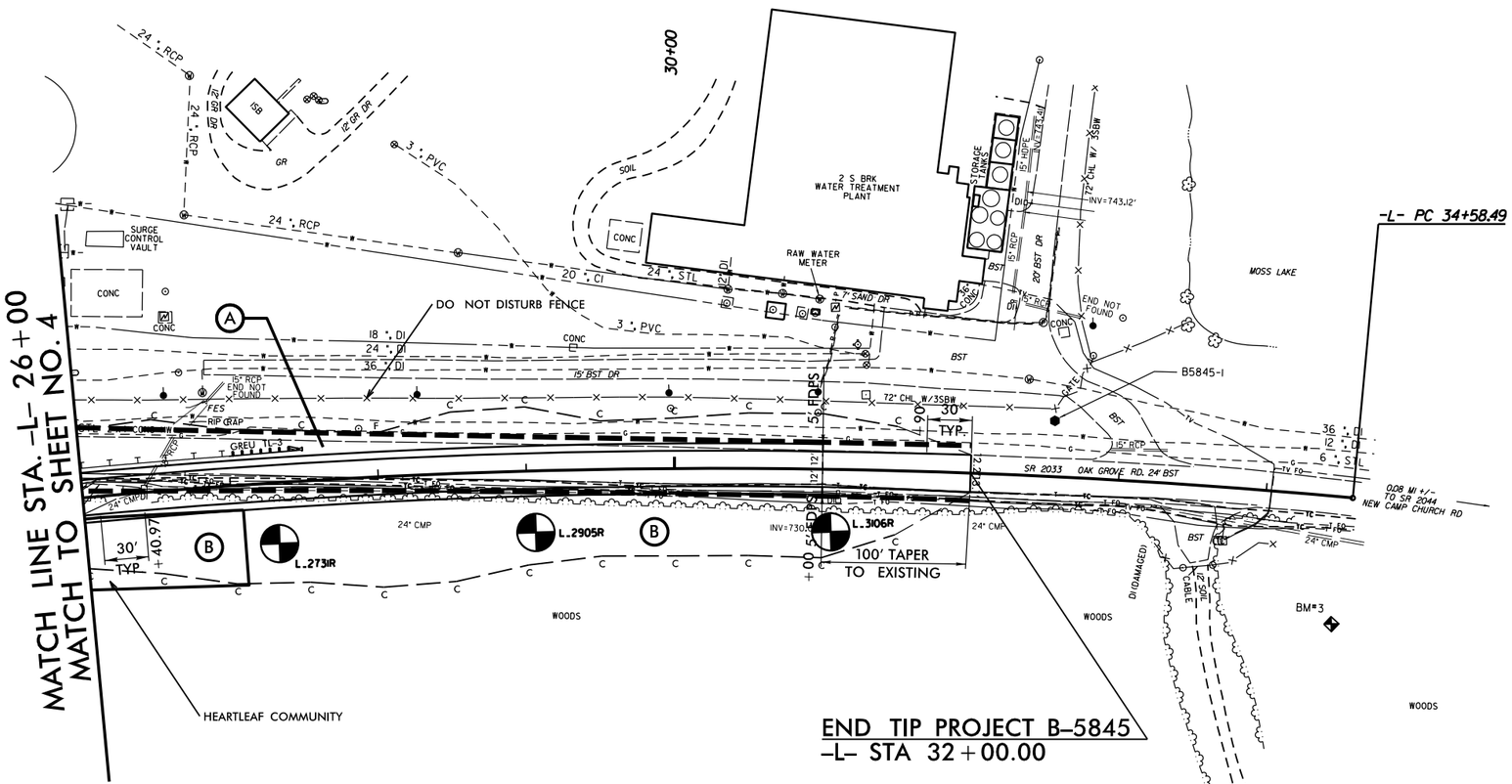
NAD 83/2011

REVISIONS

8/17/99



-L- CURVE DATA
PI Sta 30+06.20
Δ = 11° 15' 17.1" (RT)
D = 1° 14' 24.6"
L = 907.52'
T = 455.22'
R = 4,620.00'
DS = 55 MPH
SE = 0.04

(A) –ROADWAY EMBANKMENT–

(B) –RESIDUAL–

SEE SHEET 6 FOR -L- GRADE

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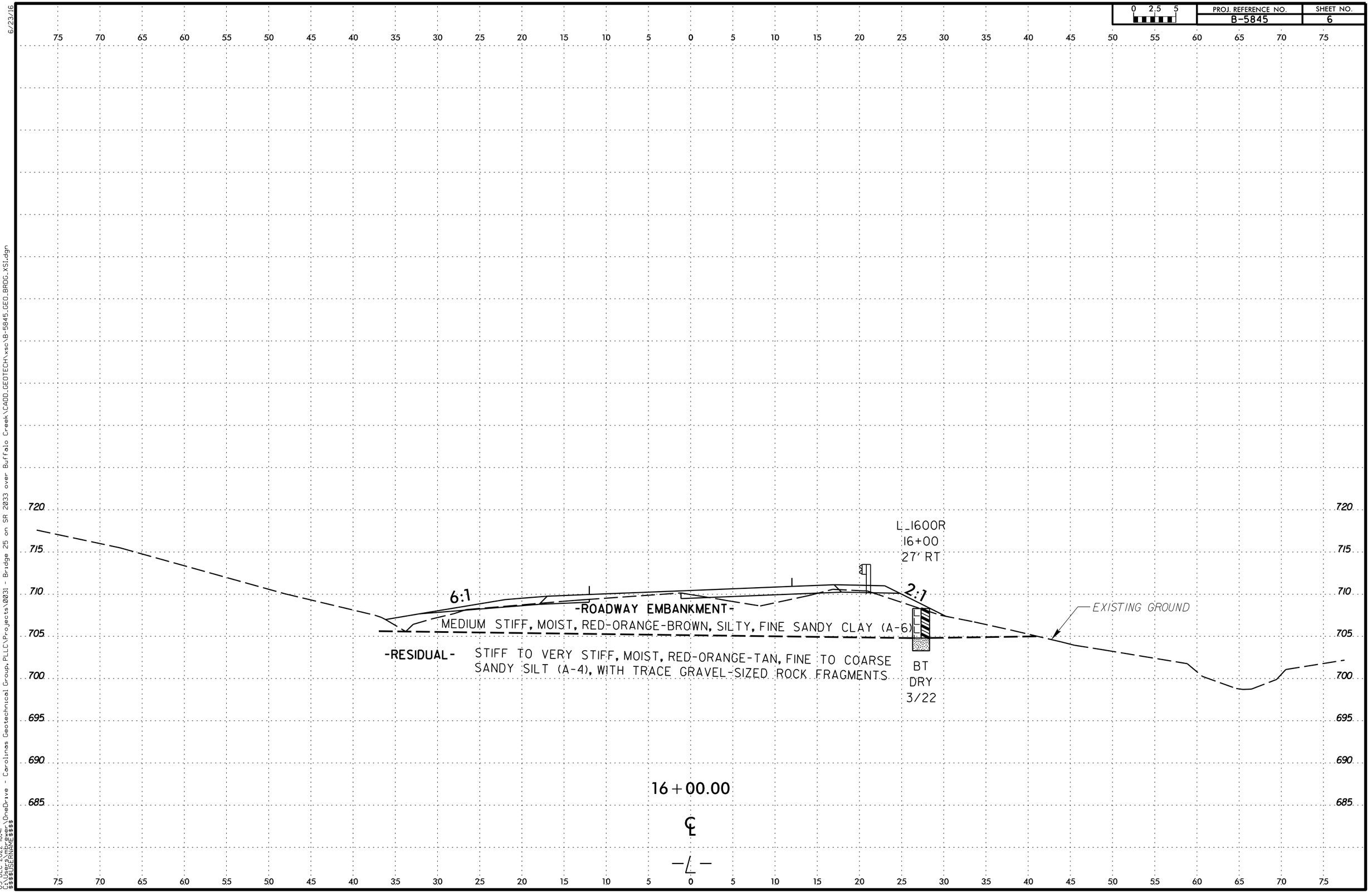
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	6



6/23/16

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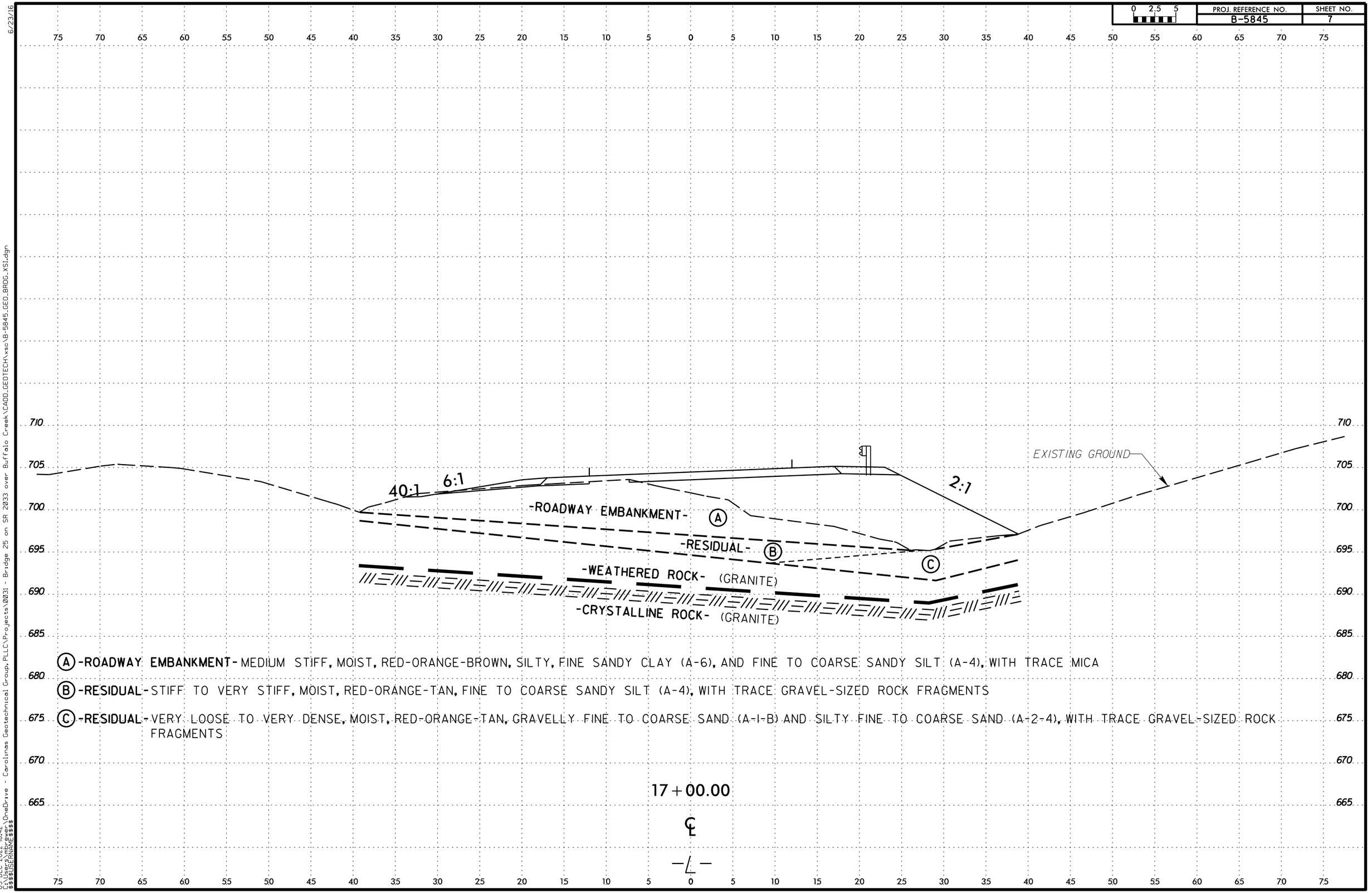
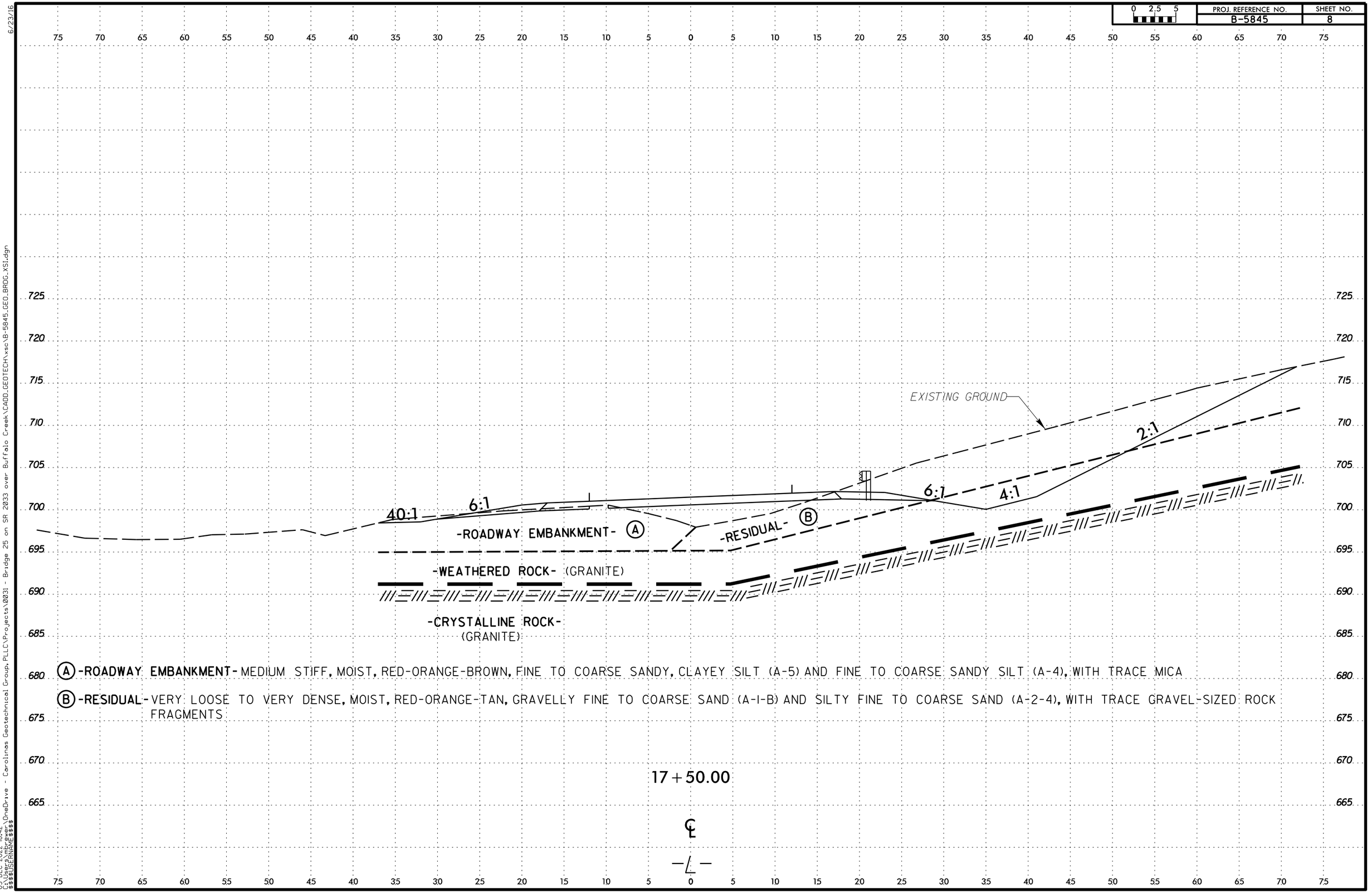


(A) **-ROADWAY EMBANKMENT-** MEDIUM STIFF, MOIST, RED-ORANGE-BROWN, SILTY, FINE SANDY CLAY (A-6), AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

(B) **-RESIDUAL-** STIFF TO VERY STIFF, MOIST, RED-ORANGE-TAN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

(C) **-RESIDUAL-** VERY LOOSE TO VERY DENSE, MOIST, RED-ORANGE-TAN, GRAVELLY FINE TO COARSE SAND (A-1-B) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

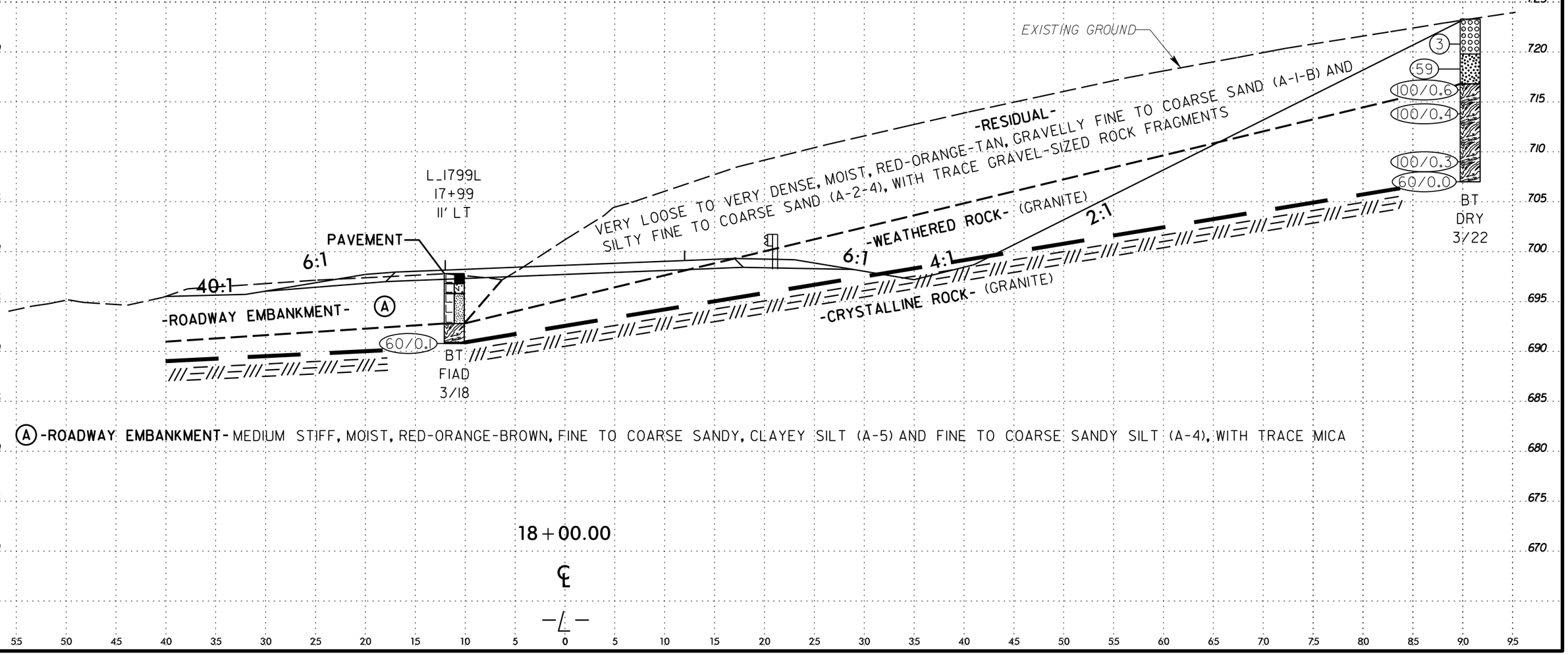


(A) **-ROADWAY EMBANKMENT-** MEDIUM STIFF, MOIST, RED-ORANGE-BROWN, FINE TO COARSE SANDY, CLAYEY SILT (A-5) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

(B) **-RESIDUAL-** VERY LOOSE TO VERY DENSE, MOIST, RED-ORANGE-TAN, GRAVELLY FINE TO COARSE SAND (A-1-B) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	91' RT	17+99 -L-	1.5 - 3.0'	A-1-B	33	4	43.8	19.4	16.6	20.2	59.6	39.0	23.9	21.2	-



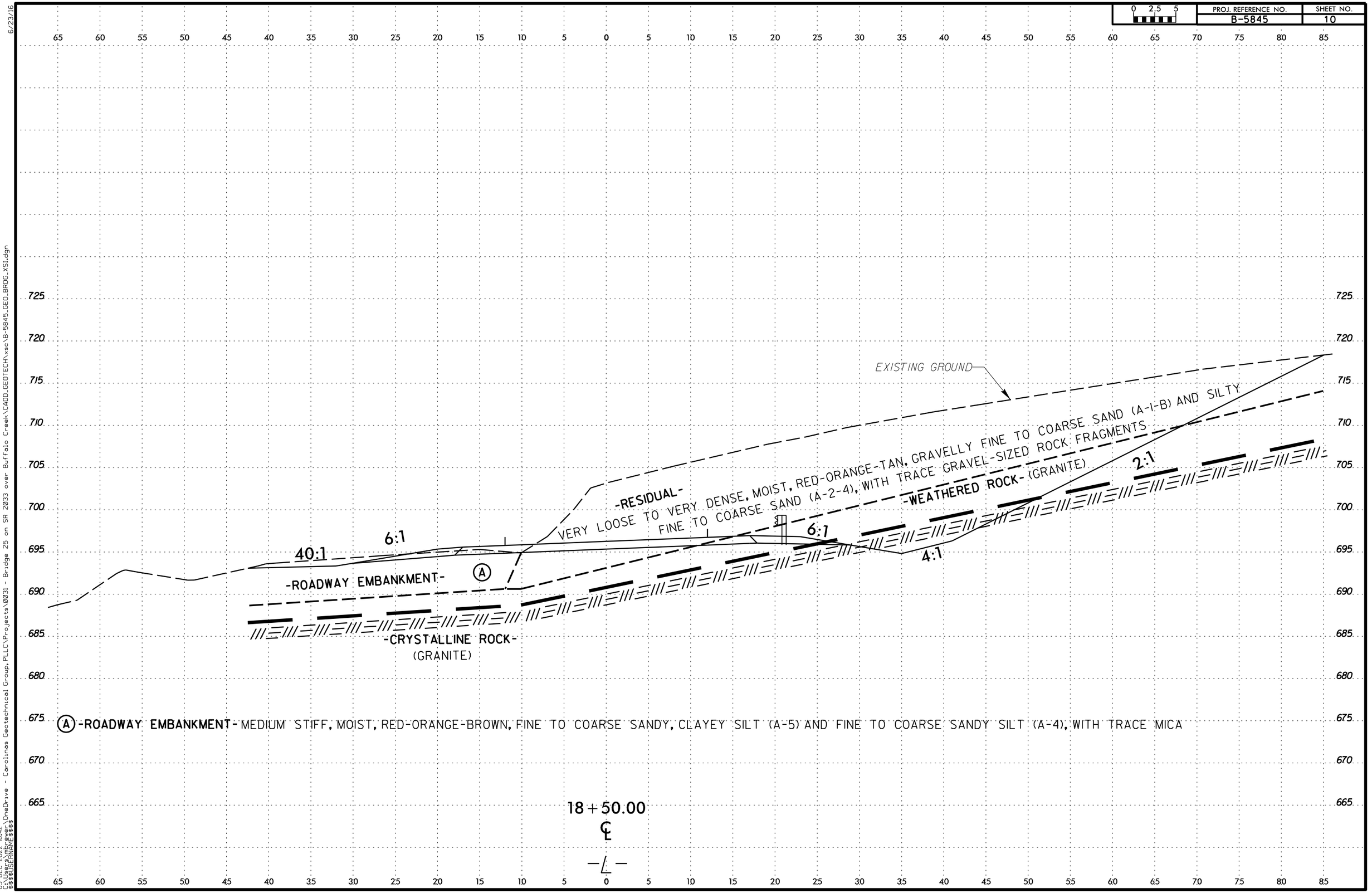
Ⓐ **-ROADWAY EMBANKMENT-** MEDIUM STIFF, MOIST, RED-ORANGE-BROWN, FINE TO COARSE SANDY, CLAYEY SILT (A-5) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

18+00.00

℄

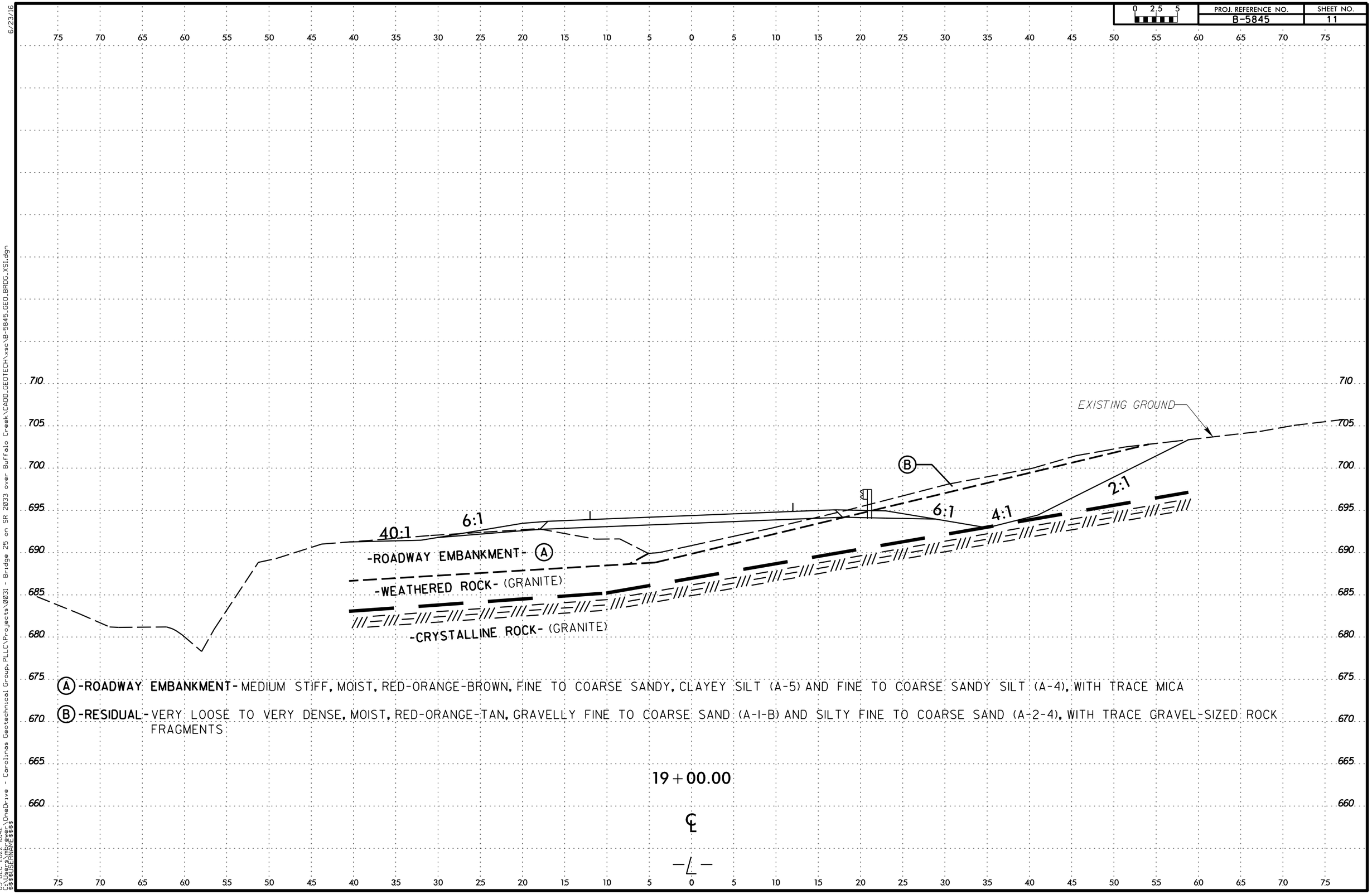
-L-

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	10



Ⓐ **-ROADWAY EMBANKMENT-** MEDIUM STIFF, MOIST, RED-ORANGE-BROWN, FINE TO COARSE SANDY, CLAYEY SILT (A-5) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	11



(A) **-ROADWAY EMBANKMENT-** MEDIUM STIFF, MOIST, RED-ORANGE-BROWN, FINE TO COARSE SANDY, CLAYEY SILT (A-5) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

(B) **-RESIDUAL-** VERY LOOSE TO VERY DENSE, MOIST, RED-ORANGE-TAN, GRAVELLY FINE TO COARSE SAND (A-1-B) AND SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

19+00.00

℄

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	12

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

690 685 680 675 670 665 660 655 650 645 640 635 630

40:1

6:1

2:1

EXISTING GROUND

-RESIDUAL-
STIFF TO HARD, MOIST, RED-TAN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

-WEATHERED ROCK-
(MICA SCHIST)

-RESIDUAL- Ⓐ

-CRYSTALLINE ROCK-
(MICA SCHIST)

-WEATHERED ROCK-
(GRANITE)

-CRYSTALLINE ROCK-
(GRANITE)

Ⓐ -RESIDUAL- HARD, MOIST, TAN-ORANGE-WHITE, FINE TO COARSE SANDY SILT (A-4), WITH LITTLE MICA AND TRACE GRAVEL-SIZED ROCK FRAGMENTS

19+50.00

℄

—L—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	13

L_2009L
20+09
2' LT

40:1

6:1

2:1

-RESIDUAL-
STIFF TO HARD, MOIST, RED-TAN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA

-WEATHERED ROCK- (MICA SCHIST)

-RESIDUAL- HARD, MOIST, TAN-ORANGE-WHITE, FINE TO COARSE

-CRYSTALLINE ROCK-
(MICA SCHIST)

EXISTING GROUND

12	
66	
86	
100/0.9	
63	
60/0.0	

BT
DRY
3/22

SANDY SILT (A-4), WITH LITTLE MICA AND TRACE GRAVEL-SIZED ROCK FRAGMENTS

20+00.00
℄

700 695 690 685 680 675 670 665 660 655 650 645 640

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

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0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	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

700 695 690 685 680 675 670 665 660 655 650 645 640 635

EBI-A
21+20
9' LT

EBI-B
21+20
20' RT

EXISTING GROUND

7:1

2:1

-ROADWAY EMBANKMENT-
SOFT TO VERY STIFF, HIGHLY PLASTIC, FINE

3 3 19 25

MOIST, GRAY-RED-BROWN-SANDY, SILTY CLAY (A-7)

7 5 28 44

TAN-WHITE, MODERATELY TO WITH TRACE MICA AND GRAVEL

-RESIDUAL-
DENSE TO VERY DENSE, MOIST, COARSE SAND (A-2-4), WITH FRAGMENTS

34 19 23 62 60/0.0 60/0.0

BT

05/20

GRAY-TAN-ORANGE-RED-TRACE MICA AND

42 100/0.8 100/0.9 100/0.9 100/0.2

BT

05/20

WHITE, SILTY FINE TO GRAVEL-SIZED ROCK

-WEATHERED ROCK-
(MICA SCHIST)

-RESIDUAL-
(A)

-CRYSTALLINE ROCK-
(MICA SCHIST)

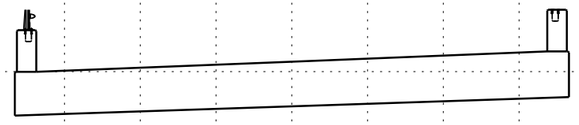
(A) -RESIDUAL- VERY STIFF, MOIST, ORANGE-TAN-WHITE, FINE TO COARSE SANDY, CLAYEY SILT (A-5), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS AND MICA

21+00.00

℄

—L—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	15



EB2-B
23+57
18' RT

EXISTING GROUND

-RESIDUAL-
HARD, WET, GRAY-BROWN, SILTY, FINE TO COARSE SANDY GRAVEL (A-1-A)

03/22

-CRYSTALLINE ROCK-
(GRANITE)

60/0.0
Ⓐ
REC: 95%
ROD: 74%
GSI: 55-60
CT

Ⓐ -CRYSTALLINE ROCK- FRESH TO SLIGHTLY WEATHERED, HARD, GRAY-WHITE, (GRANITE), WITH MODERATELY CLOSE TO VERY CLOSE FRACTURE SPACING, THINLY TO VERY THICKLY BEDDED

23+50.00
℄
—/—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	16

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

710 705 700 695 690 685 680 675 670 665 660 655 650

EB2-A
23+89
37' LT

PAVEMENT

40:1

-ROADWAY EMBANKMENT-

6:1

2:1

EXISTING GROUND

(9) (6) (5) (5) (11)

LOOSE TO MEDIUM DENSE, MOIST, TO COARSE SAND (A-2-4), WITH

WHITE-TAN-BROWN, SILTY FINE TRACE MICA AND GRAVEL

60/0.0

-CRYSTALLINE ROCK-
(GRANITE)

(B)

REC: 93%
RQD: 68%
GSI: 50-55

CT
FIAD
3/22

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

(B) **-CRYSTALLINE ROCK-** SLIGHTLY WEATHERED, MODERATELY HARD, GRAY-WHITE, (GRANITE), WITH VERY CLOSE TO CLOSE FRACTURE SPACING

24+00.00

℄

—L—

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0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	17

EXISTING GROUND

L_2554R
25+54
4' RT

6:1

22:1

4:1

-RESIDUAL-

STIFF TO VERY STIFF, MOIST, RED-TAN-ORANGE, SILTY, FINE TO COARSE SANDY CLAY (A-6), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

HAR
DRY
03/22

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

25+50.00

℄

—/—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	18

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

720 715 710 705 700 695 690

EXISTING GROUND

Ⓐ 6:1 19:1

-RESIDUAL-

STIFF TO VERY STIFF, MOIST, RED-TAN-ORANGE, SILTY, FINE TO COARSE SANDY CLAY (A-6), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

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

6:1 4:1 2:1

26+50.00

720 715 710 705 700 695 690 685

EXISTING GROUND

Ⓐ 6:1 22:1

-RESIDUAL-

STIFF TO VERY STIFF, MOIST, RED-TAN-ORANGE, SILTY, FINE TO COARSE SANDY CLAY (A-6), WITH TRACE GRAVEL-SIZED ROCK FRAGMENTS

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

6:1 4:1 2:1

26+00.00

℄

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

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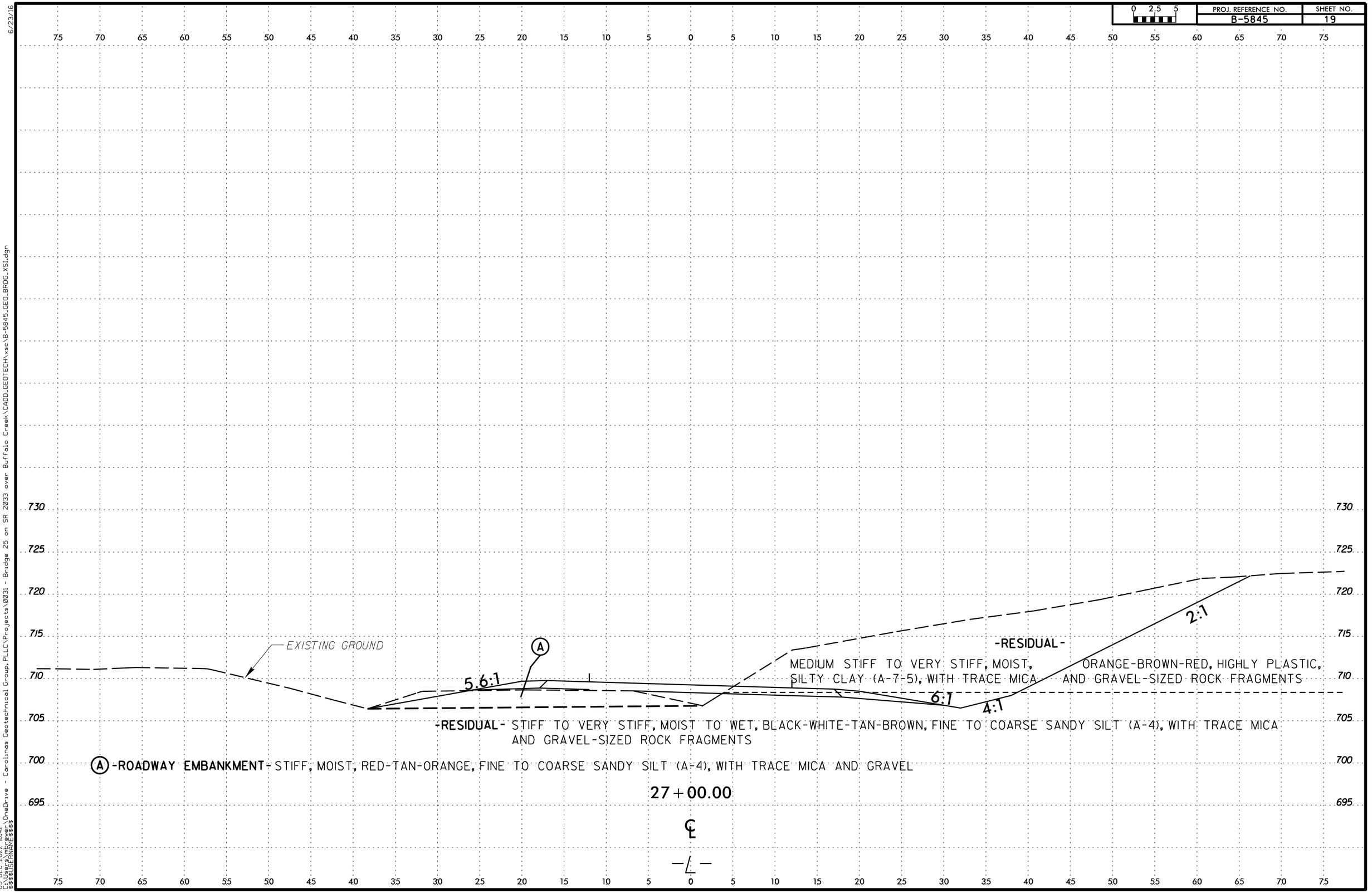
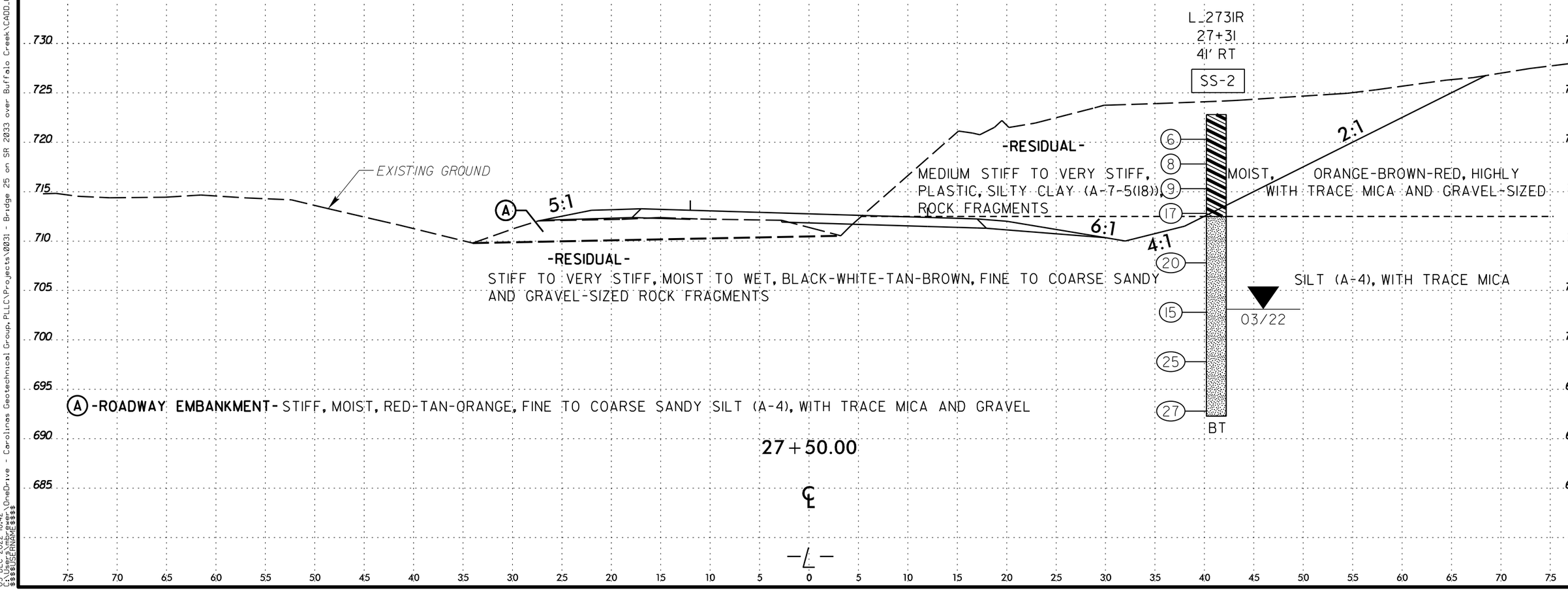
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	19

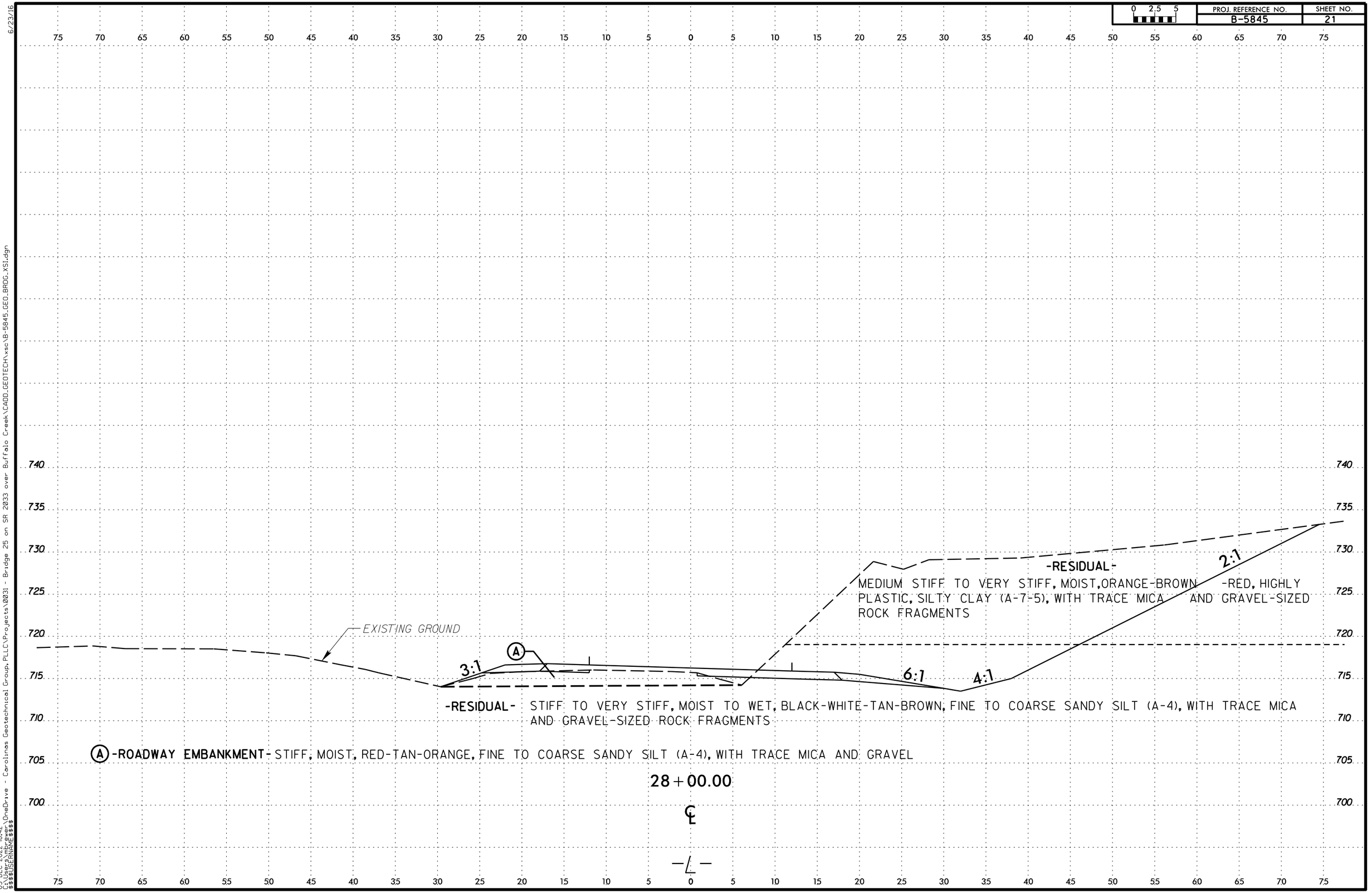


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-2	41' RT	27+31 -L-	4.0 - 5.5'	A-7-5(18)	62	27	23.4	12.3	19.7	44.7	97.2	79.3	65.1	28.8	-



0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	21



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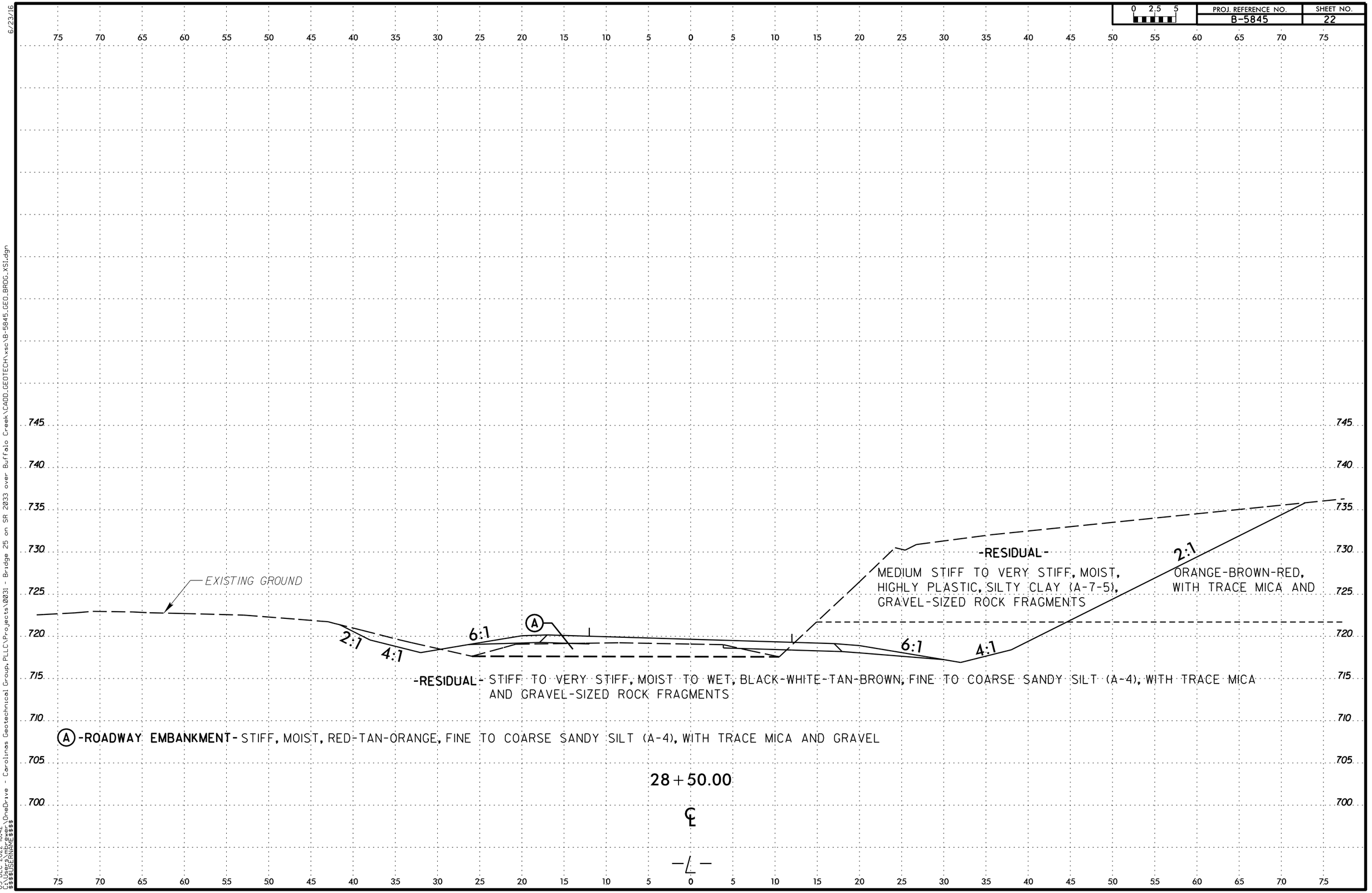
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	22



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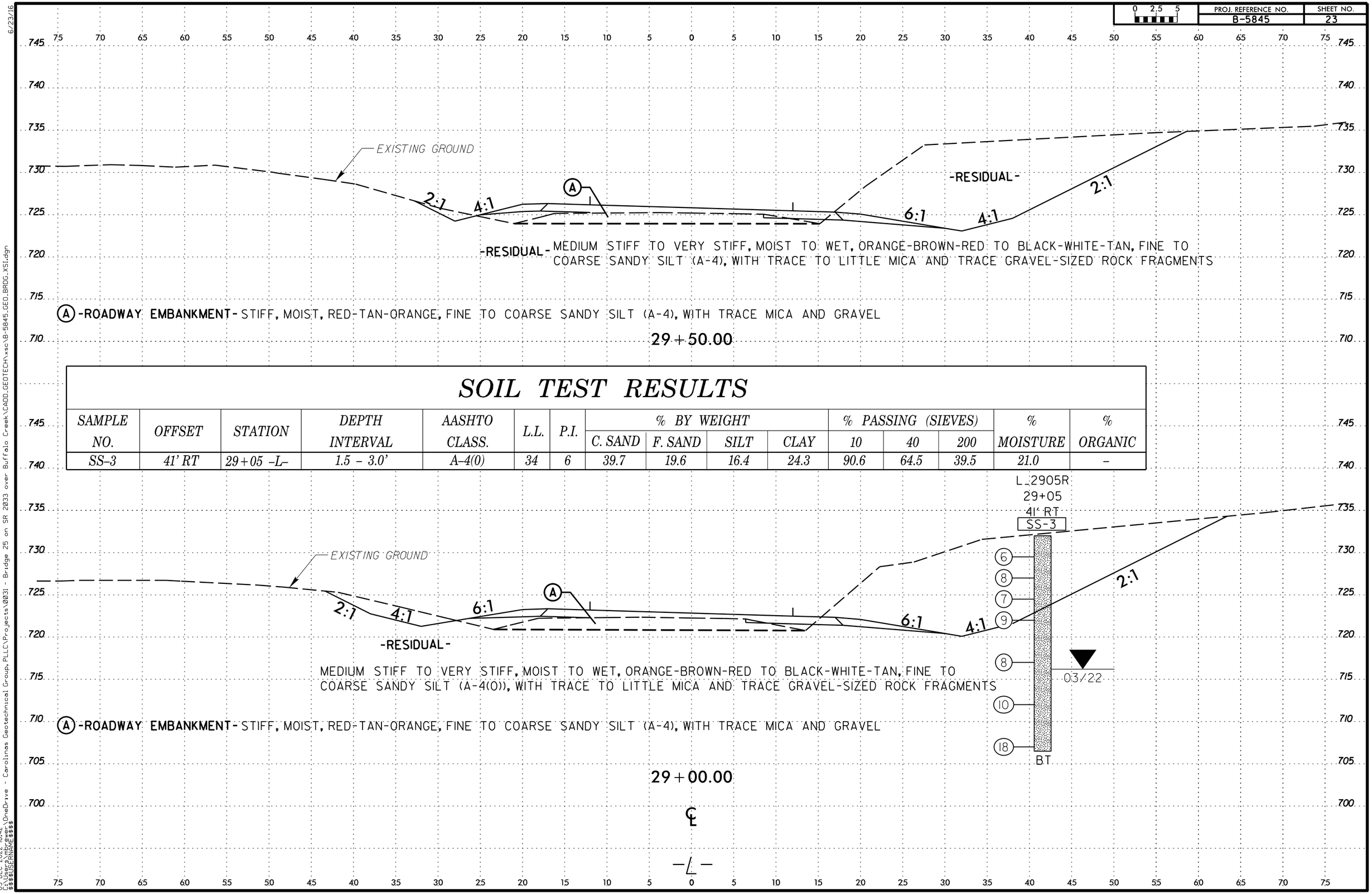
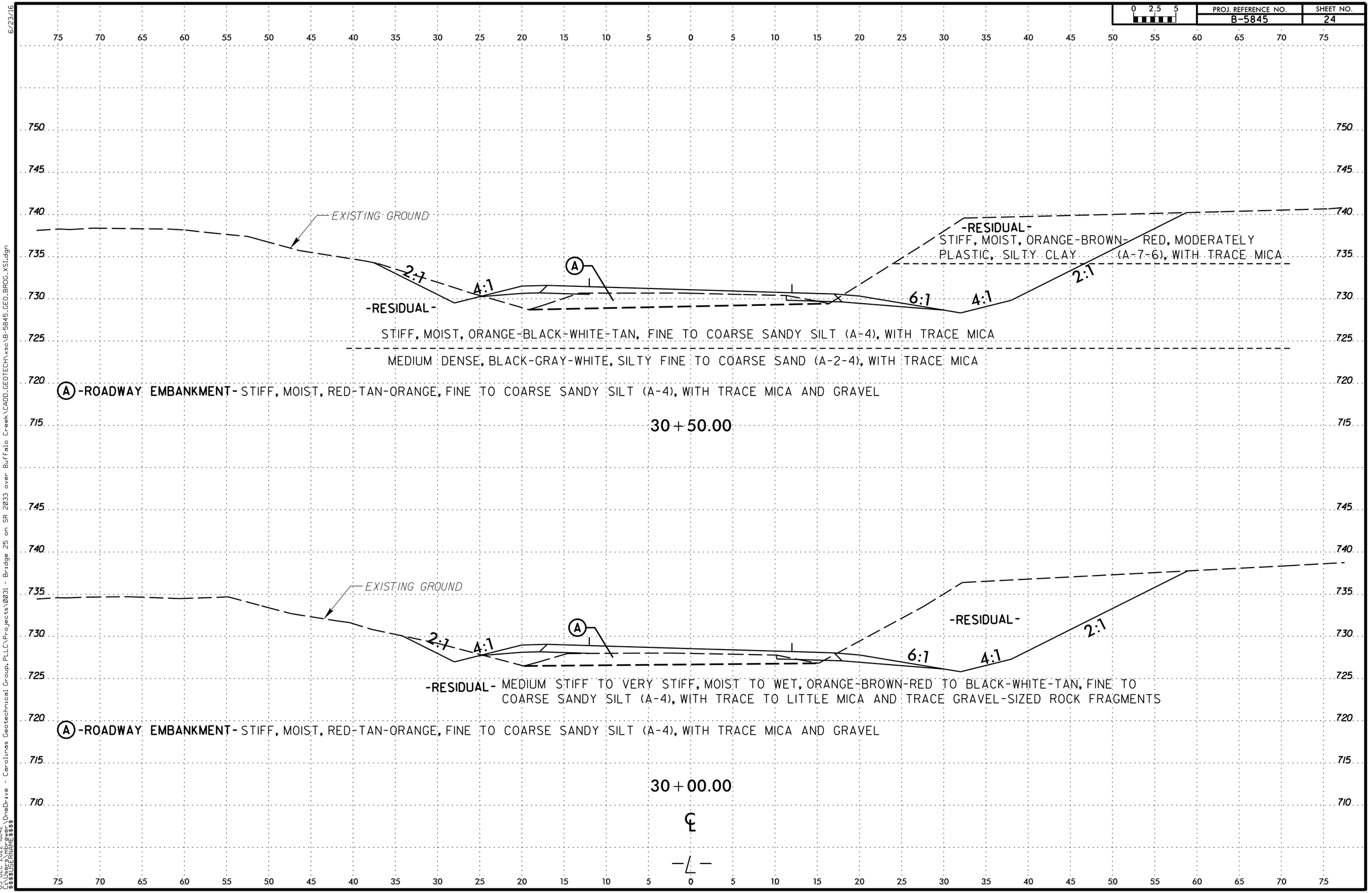


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-3	41' RT	29+05 -L-	1.5 - 3.0'	A-4(0)	34	6	39.7	19.6	16.4	24.3	90.6	64.5	39.5	21.0	-



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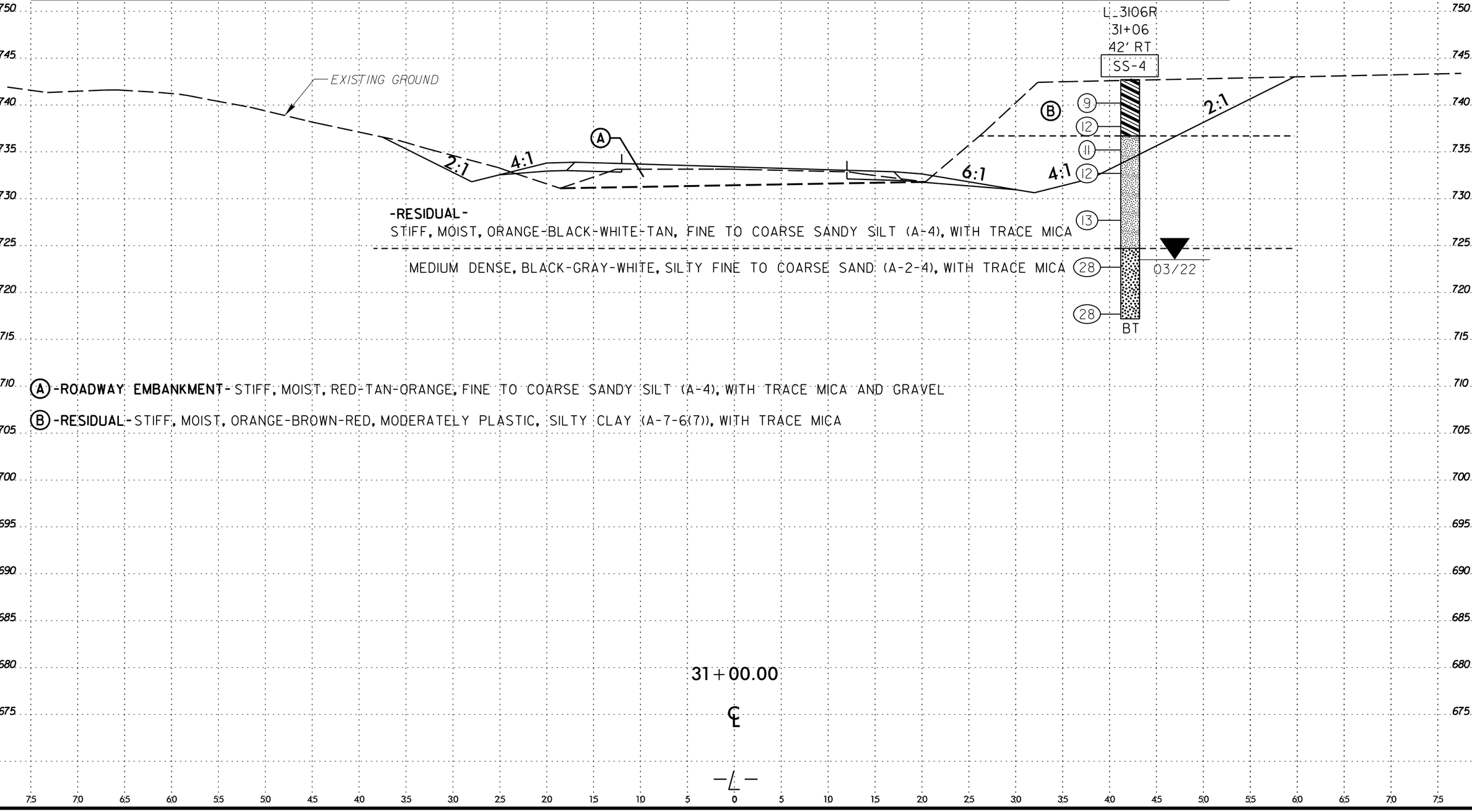
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-4	42' RT	31+06 -L-	1.5 - 3.0'	A-7-6(7)	51	22	30.7	19.2	16.6	36.5	87.0	67.3	48.5	25.9	-



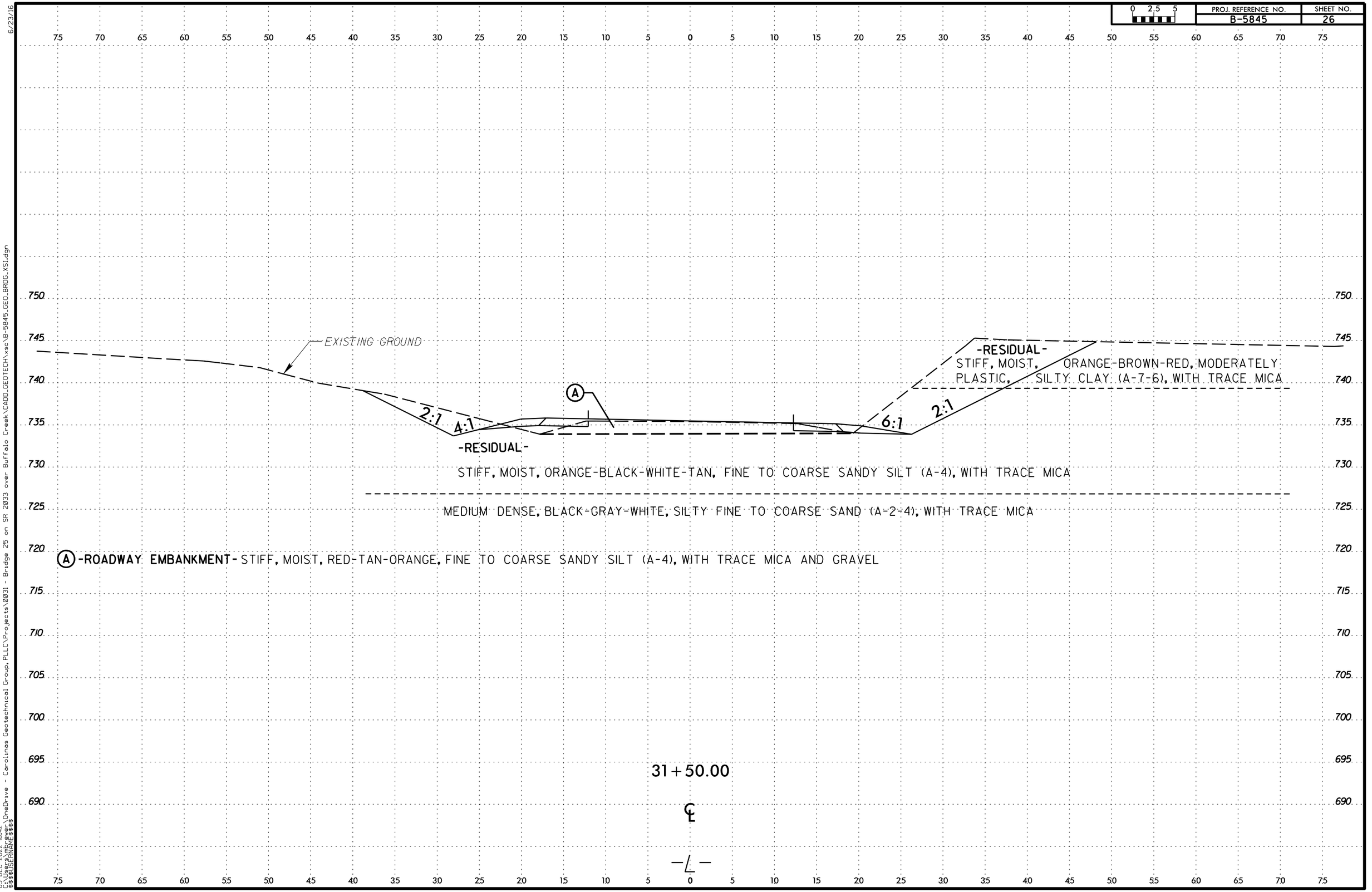
(A) **-ROADWAY EMBANKMENT-** STIFF, MOIST, RED-TAN-ORANGE, FINE TO COARSE SANDY SILT (A-4), WITH TRACE MICA AND GRAVEL

(B) **-RESIDUAL-** STIFF, MOIST, ORANGE-BROWN-RED, MODERATELY PLASTIC, SILTY CLAY (A-7-6(7)), WITH TRACE MICA

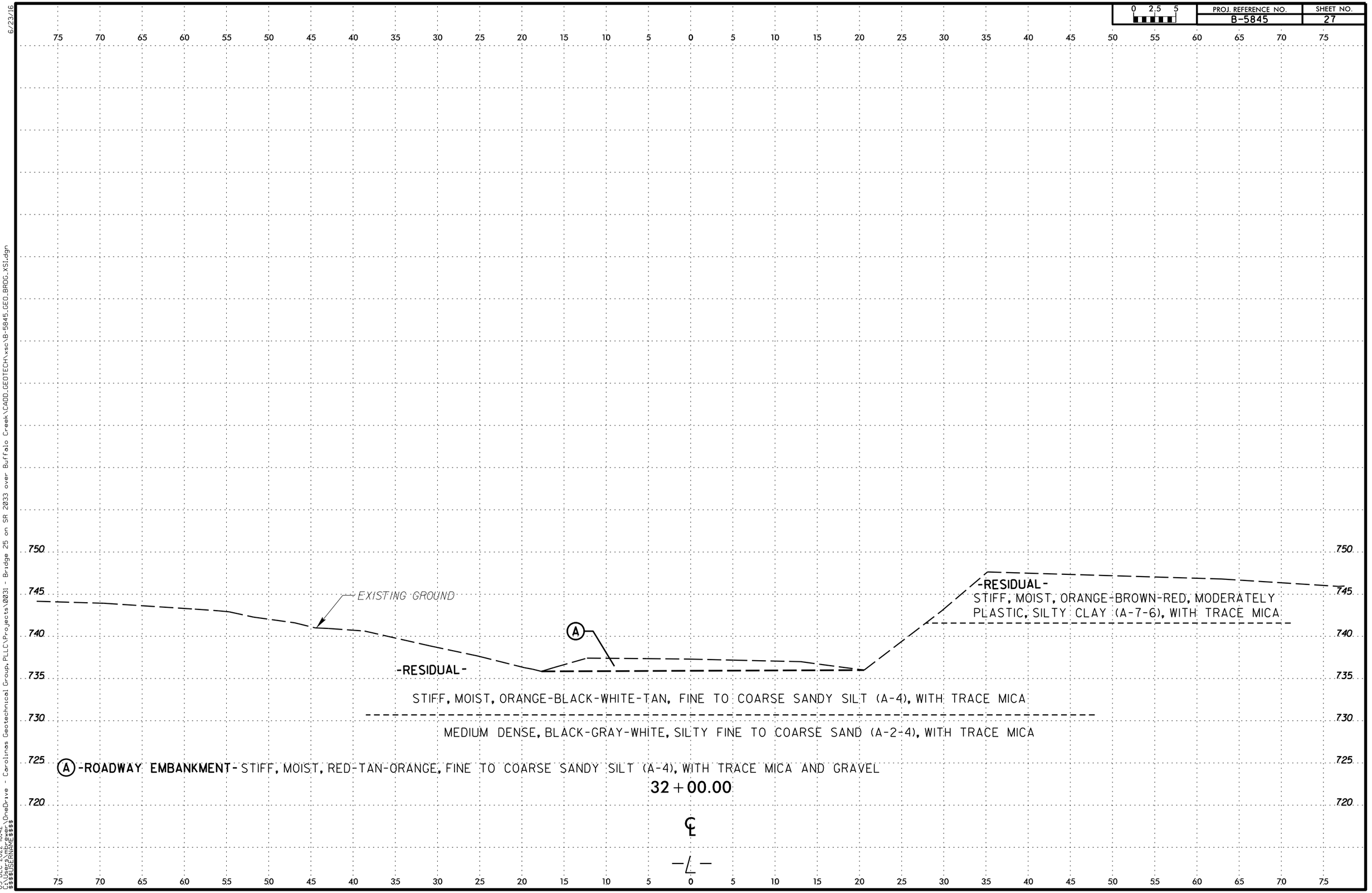
31+00.00

℄

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	26



0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5845	27



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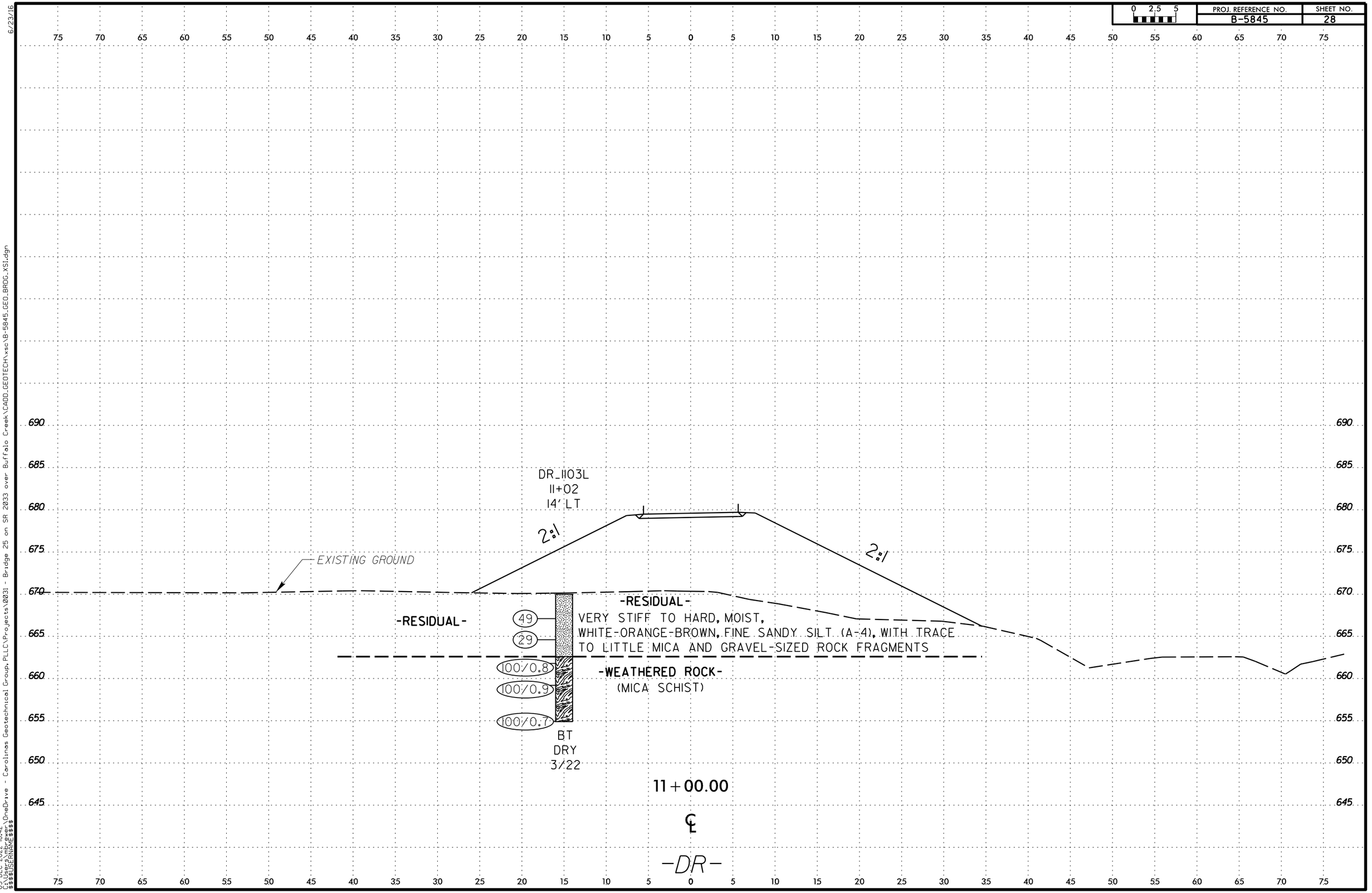

PROJECT REFERENCE NO.	SHEET NO.
B–5845	29

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
SOIL TEST RESULTS

REFERENCE: B–5845

PROJECT: 45798

Prepared in the Office of:
F&ME CONSULTANTS, INC.
COLUMBIA, SC
NCDOT LAB CERT. NO. 130–04–0212

PROJECT REFERENCE NO.	SHEET NO.
B–5845	30

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS–1	91' RT	17+99 –L–	1.5 – 3.0'	A–1–B	33	4	43.8	19.4	16.6	20.2	59.6	39.0	23.9	21.2	–
SS–2	41' RT	27+31 –L–	4.0 – 5.5'	A–7–5(18)	62	27	23.4	12.3	19.7	44.7	97.2	79.3	65.1	28.8	–
SS–3	41' RT	29+05 –L–	1.5 – 3.0'	A–4(0)	34	6	39.7	19.6	16.4	24.3	90.6	64.5	39.5	21.0	–
SS–4	42' RT	31+06 –L–	1.5 – 3.0'	A–7–6(7)	51	22	30.7	19.2	16.6	36.5	87.0	67.3	48.5	25.9	–

LAB TESTING PERFORMED BY NCDOT LAB CERT NO. 130–0212