REFERENCE: BR-0069

PROJECT: 67069

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	XSC	PROFILE
-L-	12+40.00 to 26+50.00	4	6-17	-
-LDET-	10+40.00 to 23+33.02	4	6-17	5

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY TESTS RESULTS SUMMARY	18-19
B	SOIL TEST BORING LOG	20-21

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *CASWELL*

PROJECT DESCRIPTION *REPLACE BRIDGE NO. 160001 ON US 158 OVER COUNTRY LINE CREEK*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0069	1	23

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

P.M. WEAVER

C.R. PASTRANA

P.B. GONZALEZ

Summit Design & Engineering

INVESTIGATED BY *ESP Associates, INC.*

DRAWN BY *P.B. GONZALEZ*

CHECKED BY *P.M. WEAVER*

SUBMITTED BY *ESP Associates, INC.*

DATE *June 2022*

ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
WWW.ESPASSOCIATES.COM

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

DocuSigned by: Paul Weaver 01847D3739AD48C... 07/21/2022

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	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] CME 550X
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [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: TIN FILE "br0069_ls.tin.tin" WAS USED TO DETERMINE GROUND ELEVATION FOR ALL BORINGS

ELEVATION: FEET

NOTES:

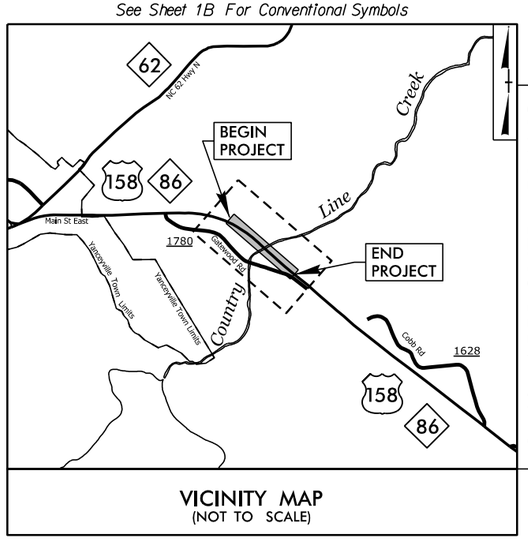
F.I.A.D. FILLED IN AFTER DRILLING

DATE: 8-15-14

09/08/99

CONTRACT: TIP PROJECT: BR-0069

See Sheet 1B For Conventional Symbols



VICINITY MAP
(NOT TO SCALE)

25% APPROVED PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CASWELL COUNTY

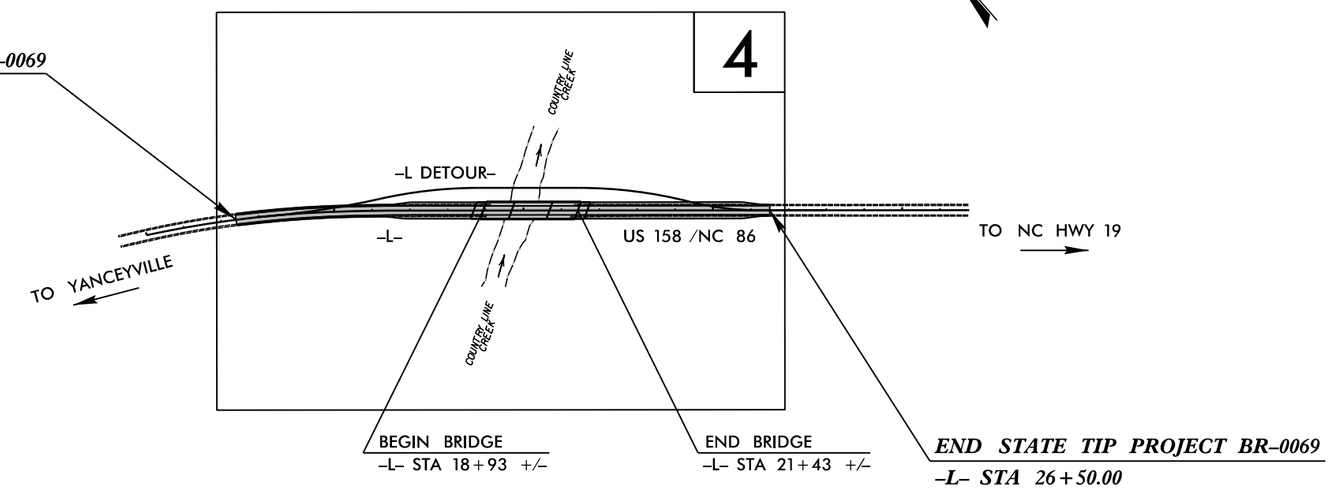
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0069	3	23

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
67069.1.1	N/A	PE

LOCATION: BRIDGE NO. 160001 OVER COUNTRY LINE CREEK ON US 158 /NC 86

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

NAD 83/NA 2011



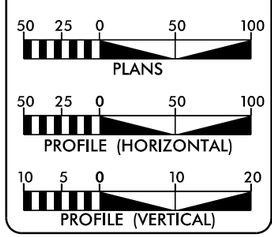
BEGIN STATE TIP PROJECT BR-0069
–L– STA 12+40.00

THIS IS CONTROLLED OF ACCESS PROJECT.

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

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

GRAPHIC SCALES



DESIGN DATA

ADT 2023 = 8,525
ADT 2043 = 10,025
K = TBD %
D = TBD %
T = 10 % *
V = 60 MPH
* TTST = 6% DUAL 4%
FUNC CLASS =
PRINCIPAL RURAL ARTERIAL
–REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT BR-0069	=	0.220
LENGTH STRUCTURE TIP PROJECT BR-0069	=	0.047
TOTAL LENGTH TIP PROJECT BR-0069	=	0.267

Prepared for NCDOT In the Office of:
moffatt & nichol
4700 FALLS OF NEUSE ROAD, SUITE 300
RALEIGH, NORTH CAROLINA 27609
(919) 781-4626 VOICE (919) 781-4869 FAX
NC License NO.: F-0105

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
MAY 2, 2022

LETTING DATE:
APRIL 18, 2023

TRENT HUFFMAN, P.E.
PROJECT ENGINEER

GRAY MODLIN, P.E.
PROJECT DESIGN ENGINEER

DAVID STUTTS, P.E.
NCDOT CONTACT

HYDRAULICS ENGINEER
moffatt & nichol
P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER
moffatt & nichol
P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

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W:\Projects\2020 (I)\SI4.300 (NCDOT 2020-2022 On-Call Contract)\SI4.319 (BR-0069 Roadway)\BR0069_GEO_RDWY\CADD_GEOTECH\PlanProf\BR-0069_rdy_tsh.dgn
rpastrana

June 9, 2022

STATE PROJECT NO.: 67069.1.1
TIP: BR-0069
COUNTY: Caswell
DESCRIPTION: Replace Bridge 160001 on US 158 over Country Line Creek
SUBJECT: Geotechnical Report – Roadway Inventory

Project Description

This proposed project is located on the east side of Yanceyville, North Carolina. The project begins at -L- (US 158) Station 12+40.00 and continues to -L-Station 26+50.00. The total length of the project is 0.267 miles. The existing -L- within the project corridor is generally a two-lane road. The project area is undeveloped.

The proposed project construction consists of the following:

- The replacement of the existing bridge on the -L- alignment over Country Line Creek
- The construction of a detour roadway (-LDET-) on the north side of the existing -L- alignment
- The construction of an approximately 170-foot-long detour bridge on the north side of the existing -L- alignment between approximately -LDET- Stations 16+25 and 17+95
- Widening of -L-

The proposed maximum new embankment fill heights are approximately 20 feet. The maximum cuts proposed for the project are approximately 22 feet.

The drainage along the project is generally handled by side ditches.

This geotechnical investigation was confined to the areas of proposed construction.

Initial site scoping was performed on April 20, 2022. The field investigation was performed from April 28, 2022 to May 2, 2022. Standard Penetration Test borings were advanced with a CME 550X drilling machine equipped with an automatic hammer. Three borings were performed via hand auger with Dynamic Cone Penetrometer (DCP) testing due to inaccessibility to machine drilling equipment. Representative soil samples were collected for visual classification in the field and for laboratory analyses.

The following alignments were investigated. Subsurface cross sections of the -L- alignment (which also show the -LDET- alignment), as well as a subsurface profile for -LDET-, are included in this report:

Alignment	Station (±)
-L-	12+40.00 to 26+50.00
-LDET-	10+40.00 to 23+33.02

Physiography and Geography

The project corridor is located in the Milton Belt of the Piedmont physiographic province. “The Milton Belt is characterized by strongly foliated gneiss and schist, commonly with compositional layering and having felsic composition; quartzite, calc-silicate gneiss, and marble are minor units” (*The Geology of the Carolinas*, Horton and Zullo, 1991). Gneiss and schist of the Milton belt may overlie mafic intrusive rocks of the Charlotte Belt along part of the boundary with the Charlotte Belt. Sillimanite and kyanite zones of regional metamorphism comprise the majority of the Milton Belt and the eastern boundary with the Carolina Slate Belt is a lithologic discontinuity with locally sheared rocks indicating that the boundary may be a fault zone. Existing evidence suggest that the rocks of the Milton Belt are mainly Precambrian in age with metamorphosis and deformation occurring during the early to middle Paleozoic. According to the Geologic Map of North Carolina, 1985, the rock underlying the project corridor consists of biotite gneiss and schist which is inequigranular and magacrystic with abundant potassic feldspar and garnet, and that it is interlayered and gradational with calc-silicate rock, sillimanite-mica schist, mica schist, and amphibolite with small masses of granitic rock. The weathered rock encountered in some of the soil test borings performed for the project indicates that the underlying rock at the project site if biotite gneiss.

The topography along the project corridor generally consists of rolling hills. The roadways along US 158 (-L-) and along the proposed -LDET- slope down from each end of the project to the bridge over Country Line Creek with elevations ranging from approximately 460 feet (MSL) to approximately 405 feet (MSL) at the bottom of the creek. The project grading work west of Country Line Creek will primarily consist of cut while the grading work east of the creek will primarily consist of fill.

Soil Properties

Soils encountered within this project area have been divided into four categories: roadway embankment, alluvial soils, residual soils, and weathered rock.

Alluvial material is present outside of the existing roadway embankment on the east side of the existing bridge over County Line Creek (the existing embankment was constructed within the Country Line Creek floodplain). The alluvium ranges in thickness from less than 1 foot to approximately 2 feet. The alluvial materials encountered consist of soft to medium stiff sandy silt (A-4), and of very loose silty sand (A-2-4).

Roadway embankment is present on the east side of Country Line Creek. The roadway embankment ranges in thickness from approximately 8 feet to 19 feet and consist of very stiff silty clay (A-7-5), and of loose to dense sand and gravel (A-1-b) and silty sand (A-2-4).

Residual soils were encountered in all the borings drilled for this project. The residual soils consist of very loose to very dense silty sand (A-2-4) and of medium stiff to hard sandy silt (A-4) and silty clay (A-7-6). Plasticities within the cohesive residual soils range from non-plastic to moderately plastic with laboratory plasticity index results ranging from 3 to 16.

Weathered rock classified as Biotite Gneiss was encountered underlying the residual soils within the depths explored in 7 of the borings drilled as part of this investigation. The top of the weathered rock was encountered at depths ranging from 4.0 feet to 24.0 feet below the existing ground surface and at elevations ranging from 468.0 feet to 443.6 feet above sea level.

Rock Properties

Crystalline rock classified as Biotite Gneiss with Granitic Rock was encountered underlying the weathered rock in 6 borings drilled as part of this investigation. The depth to the top of the crystalline rock ranged from 6.0 feet to 23.1 feet and at elevations ranging from 466.0 feet to 444.4 feet above sea level. The crystalline rock was visible in areas of existing cut on the left side of the existing roadway west of Country Line Creek and was

encountered at depths within the borings that will affect project roadway construction based on the 25 percent project plans.

Groundwater Properties

Groundwater data was collected in April and May 2022. Groundwater was not encountered in the borings drilled on the west side of Country Line Creek but was encountered in the borings on the east side of Country Line Creek. Water depths at the time of drilling was recorded in all of the borings but a 24-hour water reading was only obtainable in one boring (LDET_1800). The groundwater depths ranged from approximately 4 feet to 16 feet below the existing ground surface which corresponds with groundwater elevations ranging from approximately 413 to 408 feet above sea level. Groundwater was not encountered within 6 feet of the proposed grade in any boring.

Areas of Special Geotechnical Interest

1) The following areas contains loose sands or soft cohesive material at the base of proposed embankments which have the potential to cause embankment, subgrade, and/or slope stability problems during construction:

Alignment	STA (±) to STA (±)	Offset (±)
-LDET-	17+50 to 22+25	20’ left to 120’+ left
-L-	22+25 to 23+25	50’ right to 70’+ right

2) The following area contains wet to saturated soils at the base of proposed embankments which have the potential to cause embankment, subgrade, and/or slope stability problems during construction:

Alignment	STA (±) to STA (±)	Offset (±)
-LDET-	17+50 to 22+25	20’ left to 120’+ left

3) The following areas contain rock above or within 6 feet of the proposed grade:

Alignment	STA (±) to STA (±)	Offset (±)
-LDET-	10+40 to 16+25	Across extents of construction
-L-	12+40 to 19+25	Across extents of construction

Water Wells

No water wells were identified within or adjacent to the proposed right-of-way on the plans provided to ESP or by ESP personnel in the field.

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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8/17/99

1

2

10

15

20

-LDET- PC Sta. 10+00.00

-LDET- PRC Sta. 13+22.04

-LDET- PT Sta. 15+86.65

-LDET- PC Sta. 18+45.65

-LDET- PRC Sta. 21+47.61

RESIDUAL

WEATHERED ROCK

WEATHERED ROCK

ALLUVIUM

RESIDUAL

RESIDUAL

ALLUVIUM

ROADWAY EMBANKMENT

CRYSTALLINE ROCK

ALLUVIUM

LDET_1250

LDET_1300

LDET_1350F

LDET_1400

LDET_1405

LDET_1450

LDET_1492

LDET_1800

LDET_2000

LDET_2200

L_2294

L_2496

-LDET- S 48° 58' 31.0" E

BRIDGE #001

COUNTY LINE CREEK

COUNTY LINE CREEK

-LDET- PRC Sta. 10+40.71

BEGIN CONSTRUCTION
-LDET- STA 10+40.00

BEGIN BRIDGE
-LDET- STA 16+25 +/-

END BRIDGE
-LDET- STA 17+95 +/-

END CONSTRUCTION
-LDET- PT STA 23+33.02

-LDET-

PI Sta 10+20.35	PI Sta 11+81.57	PI Sta 14+54.89	PI Sta 20+00.39	PI Sta 22+40.79
Δ = 0° 49' 58.7" (RT)	Δ = 7° 19' 37.1" (LT)	Δ = 12° 38' 03.3" (RT)	Δ = 14° 07' 51.7" (RT)	Δ = 14° 09' 50.6" (LT)
D = 2° 02' 46.6"	D = 2° 36' 15.7"	D = 4° 46' 28.7"	D = 4° 46' 28.7"	D = 7° 38' 22.0"
L = 40.71'	L = 281.34'	L = 264.61'	L = 295.96'	L = 185.41'
T = 20.35'	T = 140.86'	T = 132.84'	T = 148.73'	T = 93.18'
R = 2,800.00'	R = 2,200.00'	R = 1,200.00'	R = 1,200.00'	R = 750.00'
		RO = 126'	RO = 126'	
		DS = 45 MPH	DS = 45 MPH	
		SE = 06	SE = 06	

50' POWER EASEMENT

BM2

FOR -L- PROFILE, SEE SHEET NO. 5

0	100	200

FEET

VE = 0.2

PROJECT REFERENCE NO.	SHEET NO.
BR-0069	5

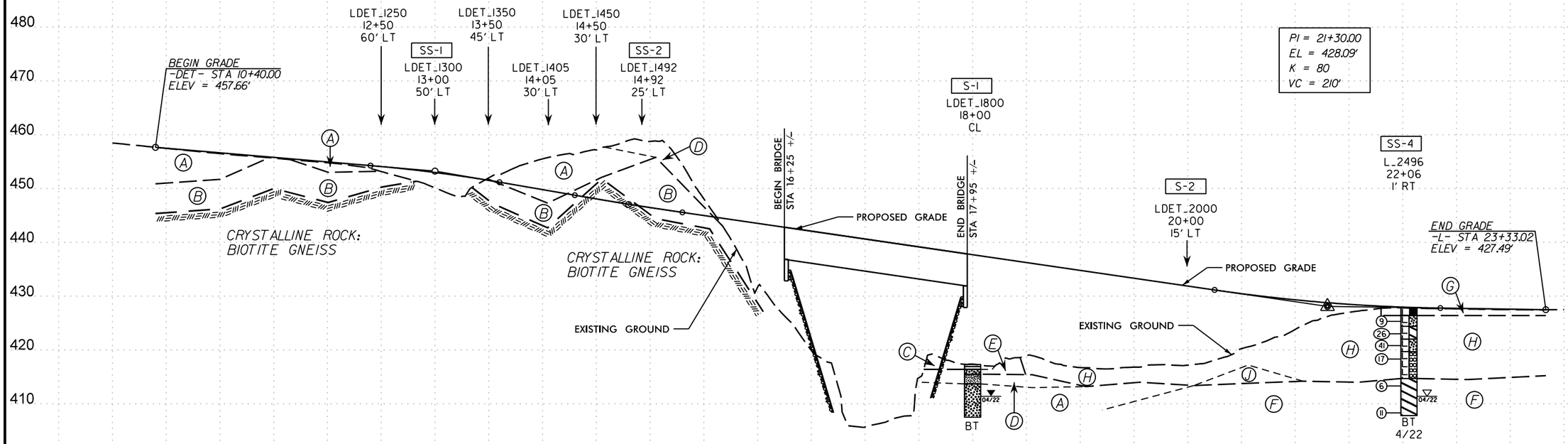
PROFILE ALONG -LDET-

PI = 13+00.00
EL = 453.24'
K = 69
VC = 120'

PI = 14+80.00
EL = 447.03'
K = 186
VC = 100'

PI = 21+30.00
EL = 428.09'
K = 80
VC = 210'

NOTE: SOME BORINGS, DESIGNATED BY THE ARROW BELOW BORING DESIGNATIONS, FOR CLARITY ARE NOT SHOWN ON PROFILE DUE TO OFFSET FROM -LDET- CL SEE CROSS SECTIONS FOR DETAILS.



Ⓐ RESIDUAL: Brown and Gray with Orange and White, Very Loose to Very Dense, Silty Coarse to Fine SAND (A-2-4), Trace Mica, Moist to Saturated

Ⓑ WEATHERED ROCK: BIOTITE GNEISS

Ⓒ ALLUVIAL: Brown, Soft to Medium Stiff, Fine Sandy SILT (A-4), Moderately Organic, Moist

Ⓓ RESIDUAL: Brown with Orange, Stiff to Hard, Fine Sandy SILT (A-4), Moist to Wet

Ⓔ ALLUVIAL: Brown with Orange, Very Loose to Loose, Silty Coarse to Fine SAND (A-2-4), Moist

Ⓕ RESIDUAL: Brown and Orange with Gray, Medium Stiff to Hard, Silty CLAY (A-7-6), Moist to Wet

Ⓖ ROADWAY EMBANKMENT: Exisiting PAVEMENT STRUCTURE

Ⓗ ROADWAY EMBANKMENT: Orange, Brown, and White with Gray, Medium Dense, Silty Coarse to Fine SAND and GRAVEL (A-1-b and A-2-4), with a Layer of Orange, Very Stiff, Silty CLAY (A-7-5), Moist

Ⓙ ROADWAY EMBANKMENT: Dark Gray, Medium Stiff to Stiff, Coarse to Fine Sandy SILT (A-4), Moist

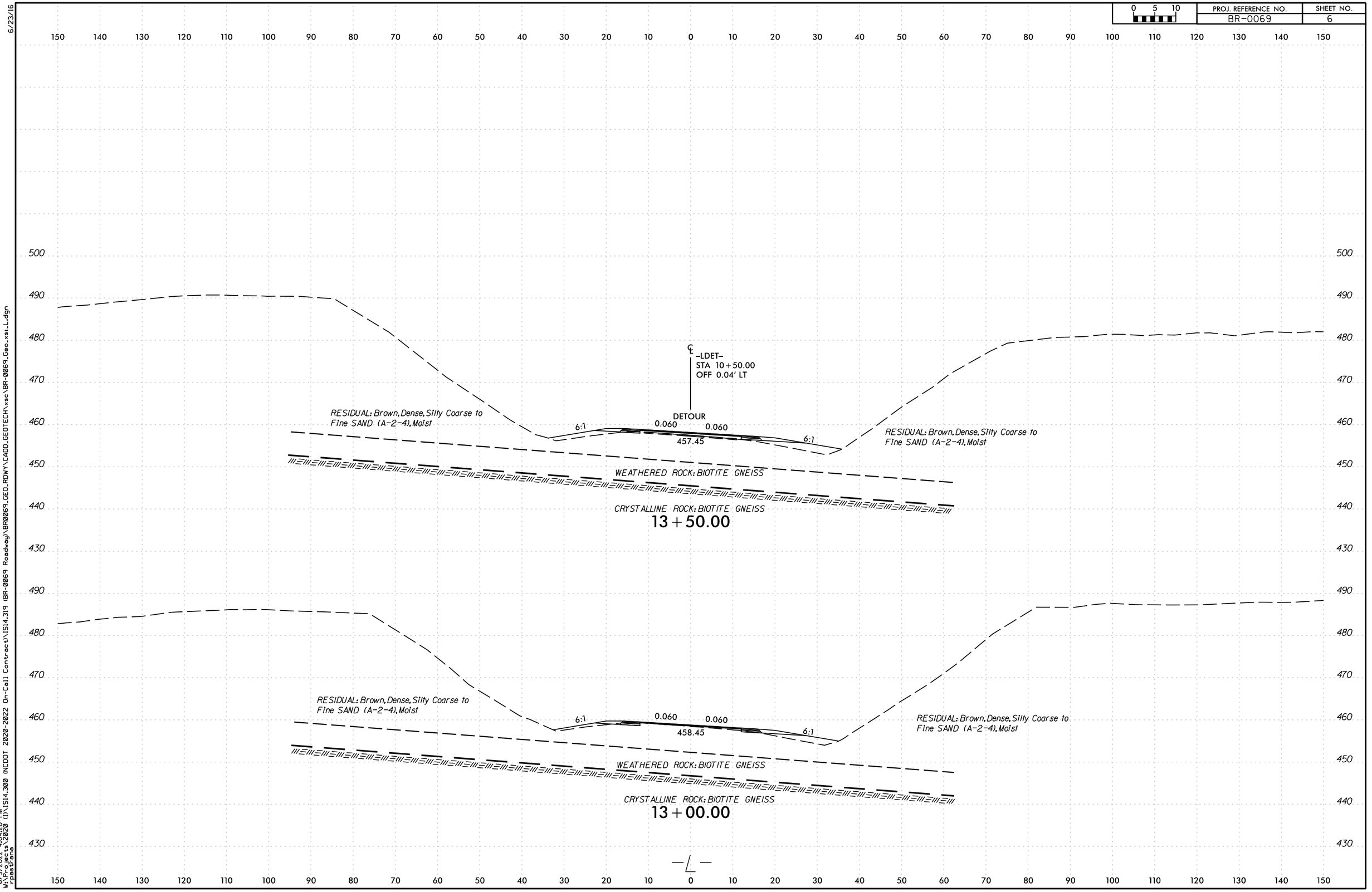
SOIL TEST RESULTS

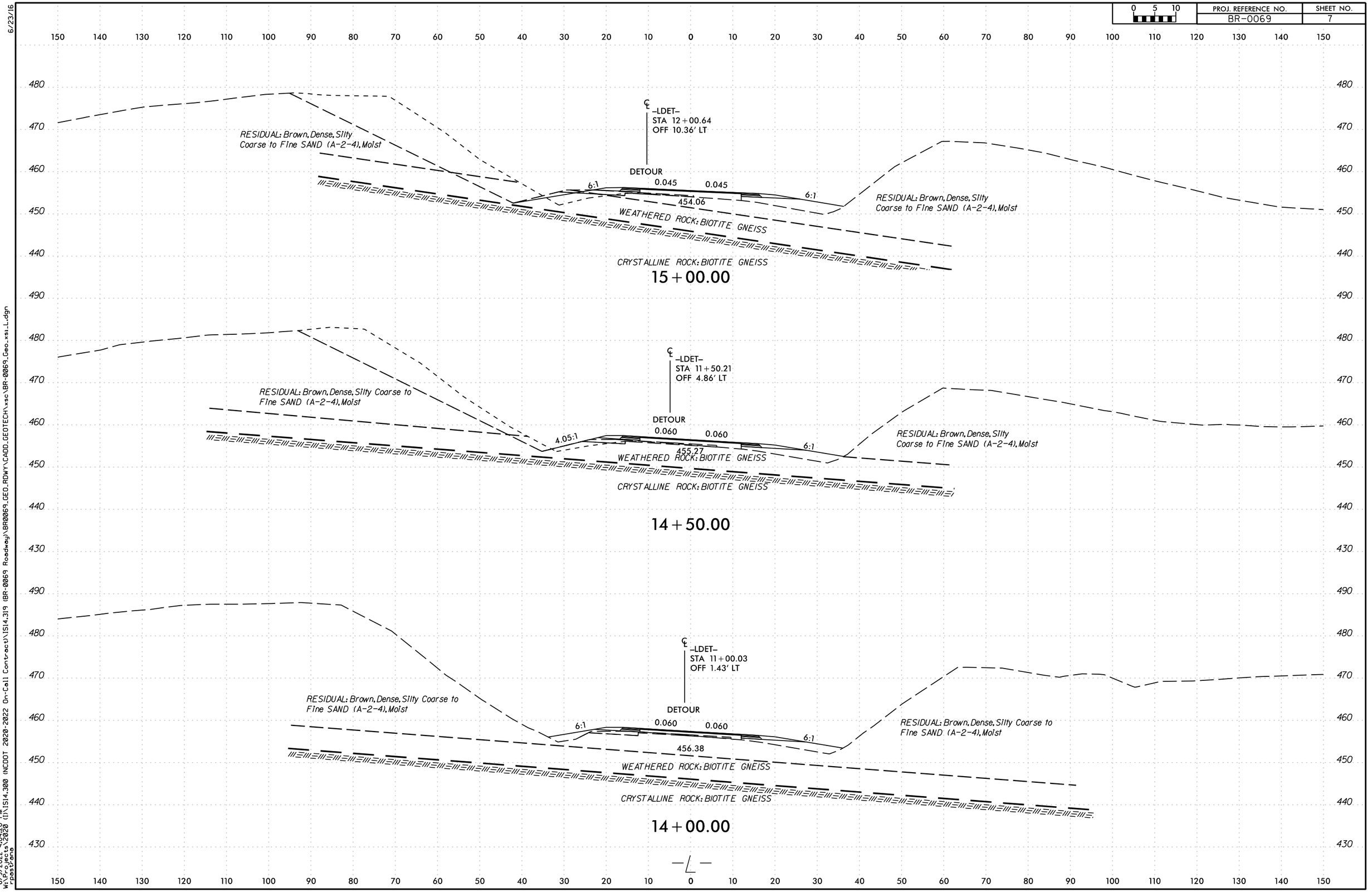
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	50' LT	13+00	1.0-2.5	A-2-4(0)	NP	NP	31	46	20	3	100	81	31	6.5	-
SS-2	25' LT	14+92	3.5-5.0	A-4(0)	21	3	20	48	19	13	99	90	40	6.3	-
S-1	CL	18+00	1.8-3.6	A-4(5)	28	6	3	12	44	41	99	98	88	19.0	-
S-2	15' LT	20+00	2.2-4.0	A-7-6(12)	43	16	1	47	26	26	100	100	73	33.5	-
SS-4	10' LT	24+96	8.5-10.0	A-1-b(0)	NP	NP	43	36	12	9	49	34	14	-	-

* NOTE: STATION AND OFFSET FOR SS-4 REFER TO -L- ALIGNMENT

-LDET-

- PROFILE TAKEN FROM "BR-0069_rdy_pro.dgn" FILE PROVIDED BY NCDOT ON 04/19/22





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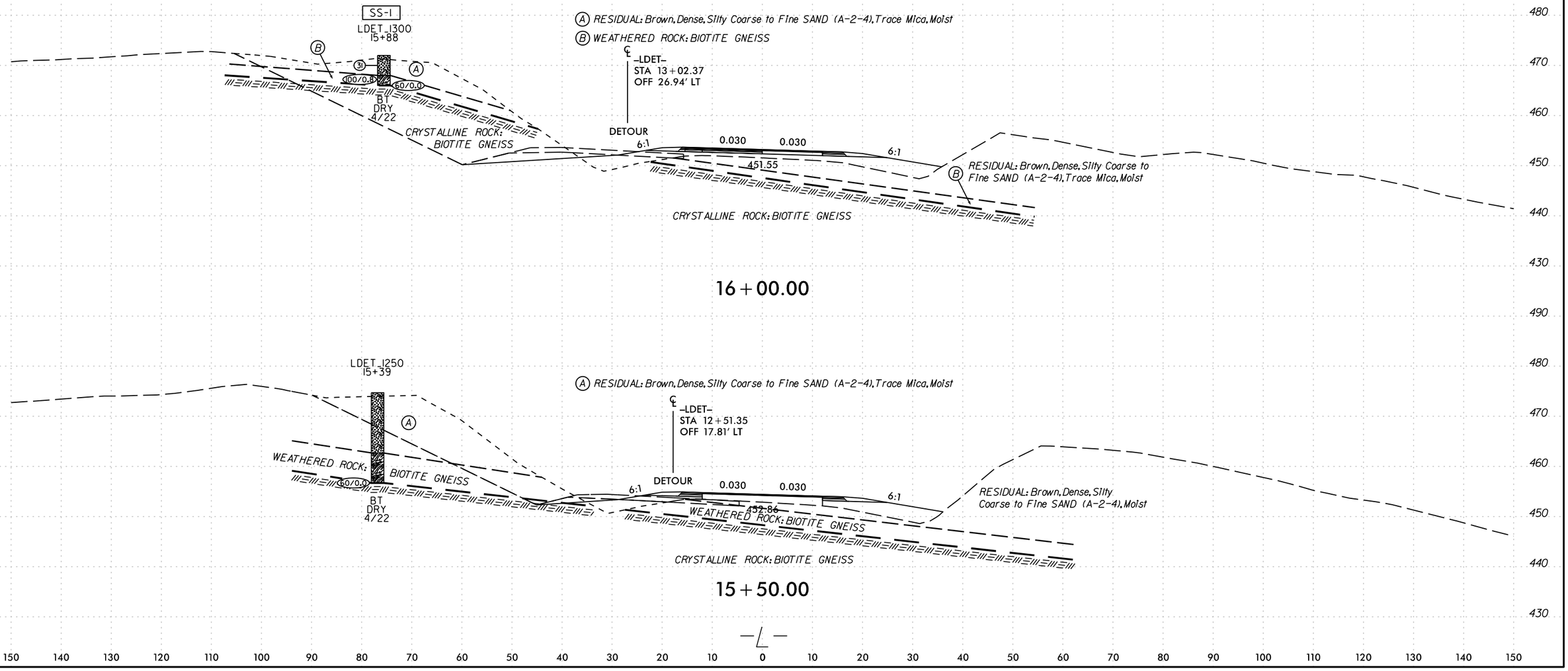
rpastrana

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-1	50' LT	13+00	1.0-2.5	A-2-4(0)	NP	NP	31	46	20	3	100	81	31	6.5	-

* NOTE: STATION AND OFFSET REFER TO -LDET- ALIGNMENT



0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0069	9

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

480 470 460 450 440 430 420

LDET-1405
16+96

RESIDUAL: Brown, Medium Dense to Dense, Silty Coarse to Fine SAND (A-2-4), Trace Mica, Moist

℄ -LDET-
STA 14+04.66
OFF 45.77' LT

DETOUR

6:1

0.013 0.020

448.65

6:1

447.78

4:1

2:1

RESIDUAL: Brown, Medium Dense to Dense, Silty Coarse to Fine SAND (A-2-4), Trace Mica, Moist

100/0.4

WEATHERED ROCK: BIOTITE GNEISS

60/0.1

BT
DRY
4/22

CRYSTALLINE ROCK: BIOTITE GNEISS

WEATHERED ROCK: BIOTITE GNEISS

CRYSTALLINE ROCK: BIOTITE GNEISS

17+00.00

LDET-1350
16+38

Ⓐ RESIDUAL: Brown, Dense, Silty Coarse to Fine SAND (A-2-4), Trace Mica, Moist

℄ -LDET-
STA 13+53.69
OFF 37.12' LT

RESIDUAL: Brown, Medium Dense, Silty Coarse to Fine SAND (A-2-4), Trace Mica, Moist

27

100/0.5

WEATHERED ROCK: BIOTITE GNEISS

60/0.0

BT
DRY
4/22

CRYSTALLINE ROCK: BIOTITE GNEISS

DETOUR

6:1

0.030 0.030

450.14

6:1

Ⓐ

WEATHERED ROCK: BIOTITE GNEISS

CRYSTALLINE ROCK: BIOTITE GNEISS

16+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

6/23/16

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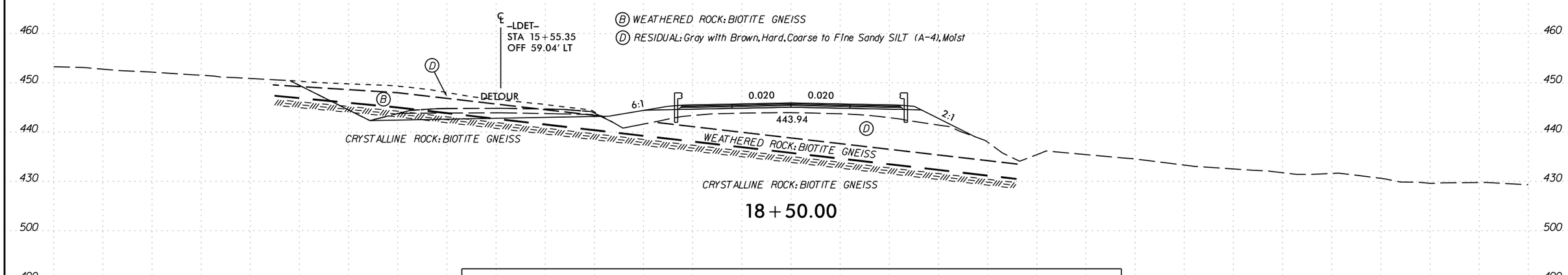
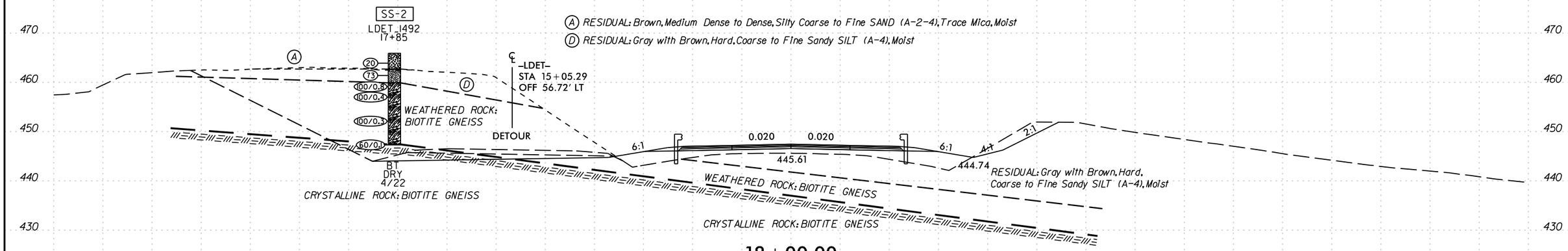
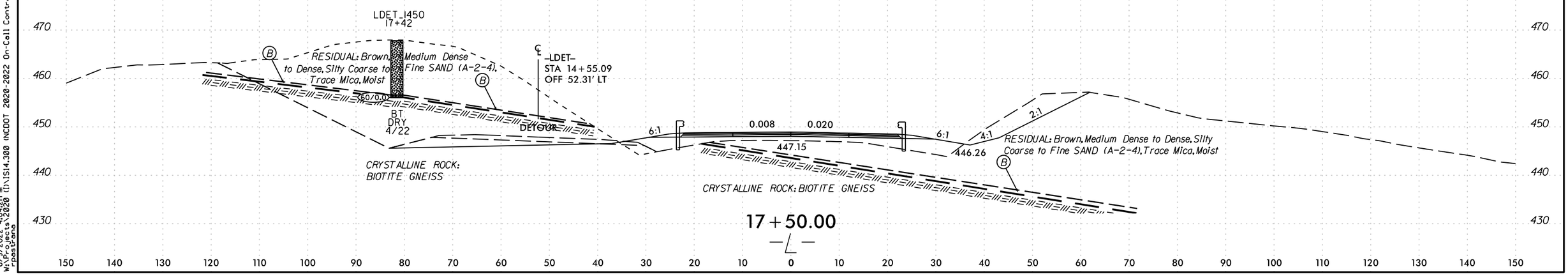


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-2	25' LT	14+92	3.5-5.0	A-4(0)	21	3	20	48	19	13	99	90	40	6.3	-

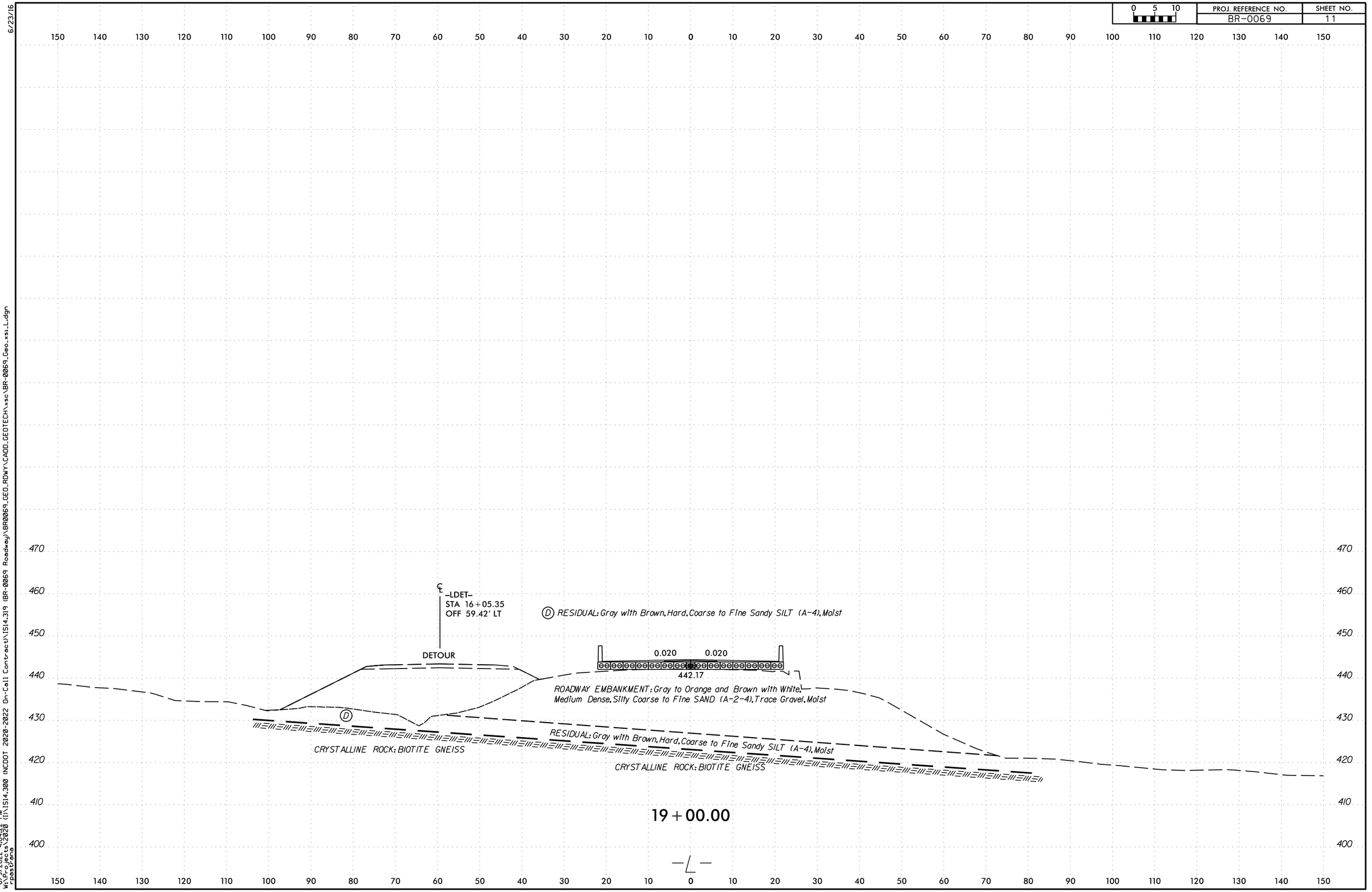
✱ NOTE: STATION AND OFFSET REFER TO -LDET- ALIGNMENT





6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0069	11



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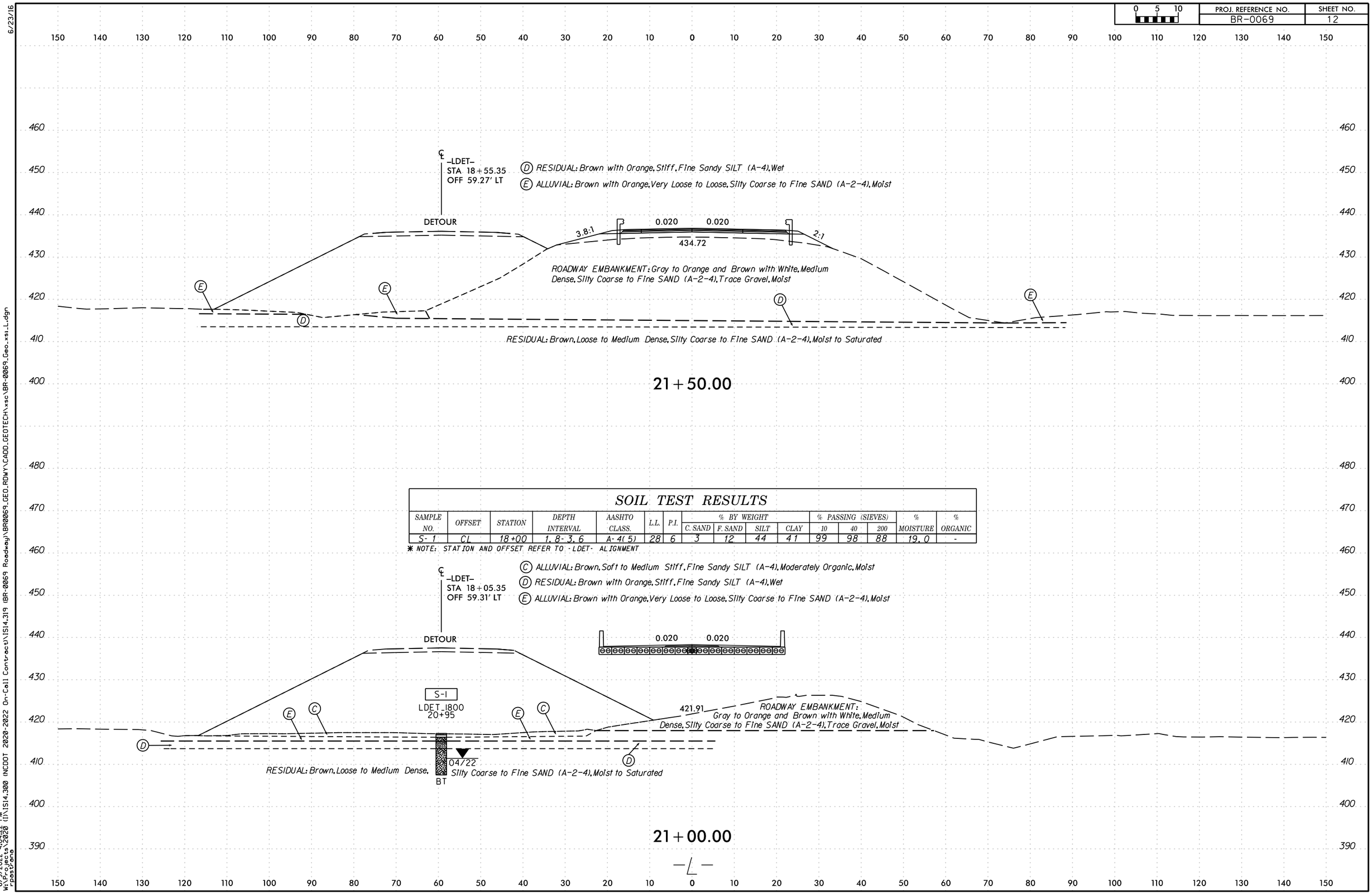
rpastrana



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-1	CL	18+00	1.8-3.6	A-4(5)	28	6	3	12	44	41	99	98	88	19.0	-

* NOTE: STATION AND OFFSET REFER TO -LDET- ALIGNMENT

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0069	13

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

460 450 440 430 420 410 400

℄ –LDET–
STA 19+55.48
OFF 54.73' LT

Ⓔ ALLUVIAL: Brown with Orange, Very Loose to Loose, Silty Coarse to Fine SAND (A-2-4), Moist

DETOUR

0.020 0.020

432.19

2:1 2:1

ROADWAY EMBANKMENT: Gray to Orange and Brown with White, Medium Dense, Silty Coarse to Fine SAND (A-2-4), Trace Gravel, Moist

RESIDUAL: Brown, Loose to Medium Dense, Silty Coarse to Fine SAND (A-2-4), Moist to Saturated

RESIDUAL: Brown with Orange and Gray, Very Stiff to Hard, Silty CLAY (A-7-6), Wet

22+50.00

℄ –LDET–
STA 19+05.37
OFF 58.05' LT

Ⓓ RESIDUAL: Brown with Orange, Stiff, Fine Sandy SILT (A-4), Wet

Ⓔ ALLUVIAL: Brown with Orange, Very Loose to Loose, Silty Coarse to Fine SAND (A-2-4), Moist

DETOUR

0.020 0.020

433.26

2:1 2:1

ROADWAY EMBANKMENT: Gray to Orange and Brown with White, Medium Dense, Silty Coarse to Fine SAND (A-2-4), Trace Gravel, Moist

RESIDUAL: Brown, Loose to Medium Dense, Silty Coarse to Fine SAND (A-2-4), Moist to Saturated

22+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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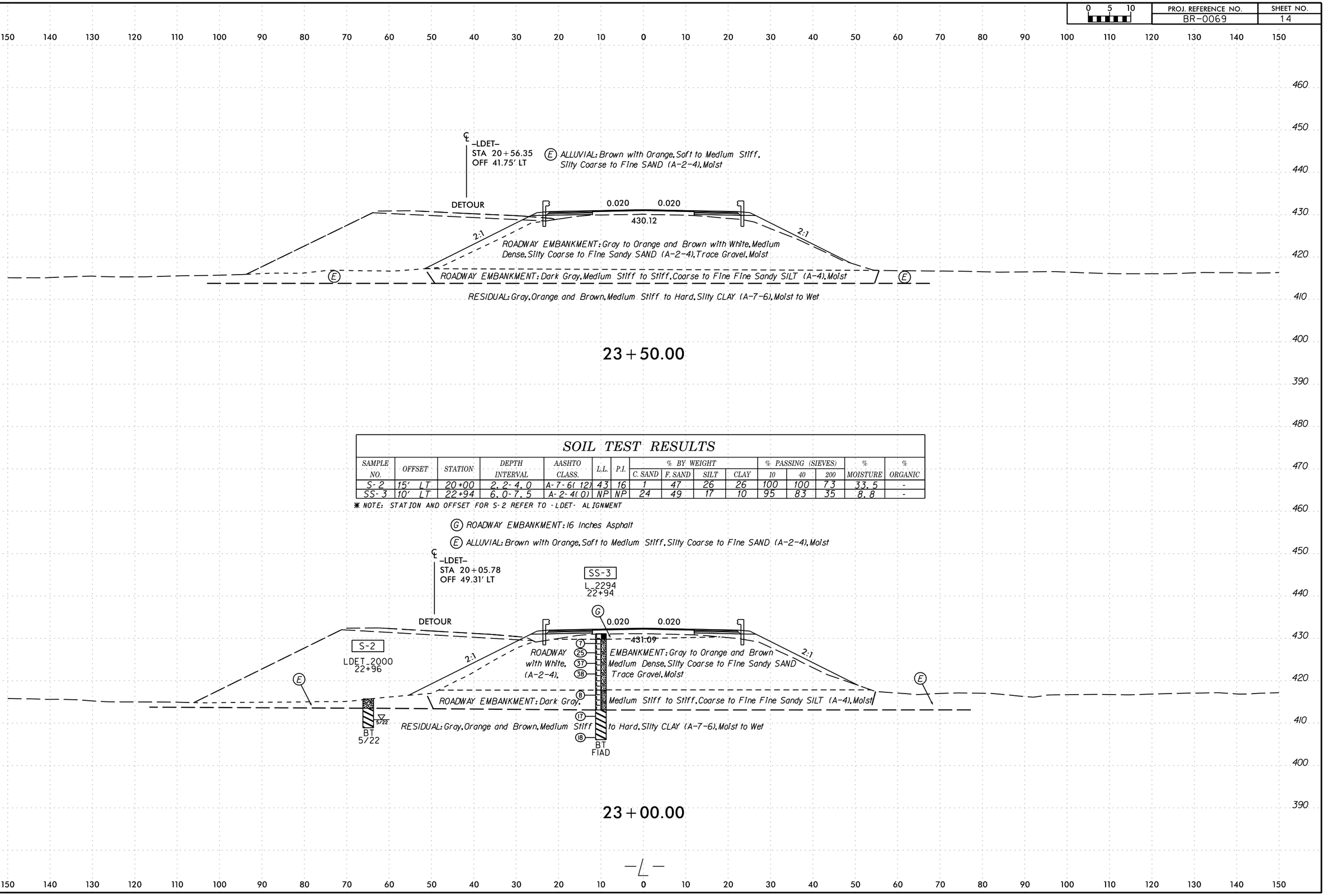
rpestrone



6/23/16

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W:\Projects\2020 (1)\1514.300 (NCDOT 2020-2022 On-Call Contract)\1514.319 (BR-0069 Roadway)\BR0069_GEO_RDWY\CADD_GEOTECH\xsc\BR-0069_Geo_xsL.dgn
rpastrana

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0069	15

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

460 450 440 430 420 410 400

Ⓔ ALLUVIAL: Brown with Orange, Soft to Medium Stiff, Silty Coarse to Fine SAND (A-2-4), Moist

℄ –LDET–
STA 21+58.68
OFF 20.17' LT

DETOUR

0.020 0.020
428.62

2:1 2:1

ROADWAY EMBANKMENT: Orange, Brown, and White with Gray, Medium Dense, Silty Coarse to Fine SAND and GRAVEL (A-1-b and A-2-4) with a Layer of Orange, Very Stiff, Silty CLAY (A-7-5), Moist

Ⓔ Ⓔ

RESIDUAL: Orange and Gray, Medium Stiff to Stiff, Silty CLAY (A-7-6), Moist to Wet

24+50.00

℄ –LDET–
STA 21+07.30
OFF 32.00' LT

Ⓔ ALLUVIAL: Brown with Orange, Soft to Medium Stiff, Silty Coarse to Fine SAND (A-2-4), Moist

DETOUR

0.020 0.020
429.37

2:1 2:1

ROADWAY EMBANKMENT: Gray to Orange and Brown with White, Medium Dense, Silty Coarse to Fine Sandy SAND (A-2-4), Trace Gravel, Moist

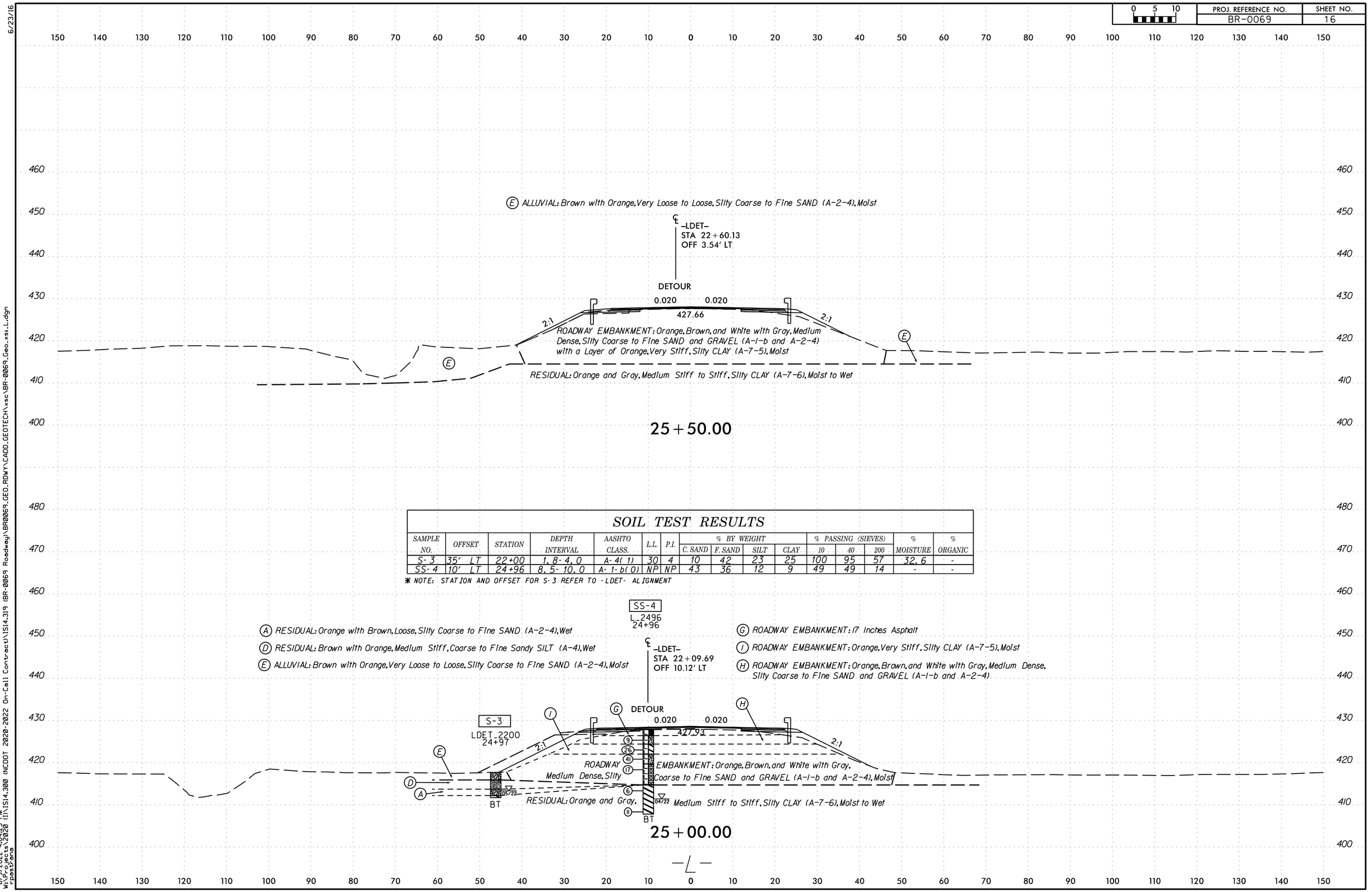
Ⓔ Ⓔ

RESIDUAL: Gray, Orange and Brown, Medium Stiff to Hard, Silty CLAY (A-7-6), Moist to Wet

24+00.00

460 450 440 430 420 410 400

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



6/23/16

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rpastrana

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0069	17

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

440 430 420 410 460 450 440 430 420 410 400

Ⓔ ALLUVIAL: Brown with Orange, Very Loose to Loose, Silty Coarse to Fine SAND (A-2-4), Moist

0.018 0.016

427.51

2:1 2:1

ROADWAY EMBANKMENT: Orange, Brown, and White with Gray, Medium Dense, Silty Coarse to Fine SAND and GRAVEL (A-1-b and A-2-4) with a Layer of Orange, Very Stiff, Silty CLAY (A-7-5), Moist

RESIDUAL: Orange and Gray, Medium Stiff to Stiff, Silty CLAY (A-7-6), Moist to Wet

26 + 50.00

Ⓔ ALLUVIAL: Brown with Orange, Very Loose to Loose, Silty Coarse to Fine SAND (A-2-4), Moist

℄ –LDET–
STA 23 + 10.24
OFF 0.35' LT

DETOUR

0.020 0.020

427.48

2:1 2:1

ROADWAY EMBANKMENT: Orange, Brown, and White with Gray, Medium Dense, Silty Coarse to Fine SAND and GRAVEL (A-1-b and A-2-4) with a Layer of Orange, Very Stiff, Silty CLAY (A-7-5), Moist

RESIDUAL: Orange and Gray, Medium Stiff to Stiff, Silty CLAY (A-7-6), Moist to Wet

26 + 00.00

PROJECT REFERENCE NO.	SHEET NO.
BR–0069	18

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
LABORATORY TESTS RESULTS SUMMARY

REFERENCE: BR–0069

PROJECT: 67069

ESP
ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
WWW.ESPASSOCIATES.COM

SOILS LABORATORY TESTS RESULTS

WBS NO.: 67069.1.1

TIP NO.: BR-0069

COUNTY: Caswell

SITE DESCRIPTION: Replace Bridge No. 160001 on US 158 Over Country Line Creek

BORING NO.	SAMPLE NO.	BORING LOCATION	DEPTH INTERVAL (FT)	AASHTO CLASS	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
								CSE. SAND	F. SAND	SILT	CLAY	10	40	200		
LDET_1300	SS-1	-LDET- STA. 13+00, 50' LT	1.0-2.5	A-2-4 (0)	31	NP	NP	31	46	20	3	100	81	31	6.5	-
LDET_1492	SS-2	-LDET- STA. 14+92, 25' LT	3.5-5.0	A-4 (0)	73	21	3	20	48	19	13	99	90	40	6.3	-
LDET_1800	S-1	-LDET- STA. 18+00, CL	1.8-3.6	A-4 (5)	*13	28	6	3	12	44	41	99	98	88	19.0	-
LDET_2000	S-2	-LDET- STA. 20+00, 15' LT	2.2-4.0	A-7-6 (12)	*5	43	16	1	47	26	26	100	100	73	33.5	-
L_2294	SS-3	-L- STA. 22+94, 10' LT	6.0-7.5	A-2-4 (0)	37	NP	NP	24	49	17	10	95	83	35	8.8	-
LDET_2200	S-3	-LDET- STA. 22+00, 35' LT	1.8-4.0	A-4 (1)	*6	30	4	10	42	23	25	100	95	57	32.6	-
L_2496	SS-4	-L- STA. 24+96, 10' LT	8.5-10.0	A-1-b (0)	17	NP	NP	43	36	12	9	49	34	14	-	-

*Note: Inferred N-Value from DCP

Certification No. 144-02-0718

PROJECT REFERENCE NO.	SHEET NO.
BR–0069	20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX B
SOIL TEST BORING LOG

REFERENCE: BR–0069

PROJECT: 67069

ESP
ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
WWW.ESPASSOCIATES.COM

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67069.1.1	**TIP** BR-0069	**COUNTY** CASWELL	**GEOLOGIST** Gonzales, P.B.	
SITE DESCRIPTION Replace Bridge 160001 on US 158 over Country Line Creek				**GROUND WTR (ft)**
BORING NO. LDET_1400	**STATION** 14+00	**OFFSET** 30 ft LT	**ALIGNMENT** -LDET-	**0 HR.** Dry
COLLAR ELEV. 467.6 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 966,492	**EASTING** 1,912,164	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/2/2021		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Moseley, M.	**START DATE** 04/29/22	**COMP. DATE** 04/29/22	**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)
470										467.6 GROUND SURFACE	0.0
465										**RESIDUAL** Brown, Medium Dense to Dense, Silty Coarse to Fine SAND, Trace Mica, Moist	
460											
455											
450											
445										443.6	24.0
440										**WEATHERED ROCK** BIOTITE GNEISS Note: Possible Rock Layer from 24.0'-25.7'	
										437.6 Boring Terminated at Elevation 437.6 ft in Weathered Rock: BIOTITE GNEISS	30.0