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REFERENCE: I-4400BB

PROJECT: 34232

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4400BB	1	10

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION I-26 FROM US-64 (EXIT 49) TO US-25 BUSINESS (EXIT 44)

SITE DESCRIPTION REPLACE BRDG #0221 OVER I-26 & ON SR-1528 (BROOKSIDE CAMP RD)

CONTENTS

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.

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NOTES:
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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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PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	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		—	—	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:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

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

BEDDING

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

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK:

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

**NOTE: FROM GEU: BRIDGE BORINGS ALOS HAVE THE ORIGINAL "B-x" DESIGNATOR INCLUDED IN THE BOREHOLE NAME TO CORRELATE w/ THE ORIGINAL NAME OF THAT BORING FROM THE 2018 RDWY DRILLING PROGRAM

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	3

SITE PLAN

0 50 100
FEET

BEGIN RETAINING WALL –RW8–
–L– STA. 538+87.00, 80.50' LT

–L– SC Sta. 538+26.96

540

BY16-70

EB1-B
(B-18)
18+Ø3
25' RT

EB1-A
(B-19)
18+25
7.3' RT

18

BATTING CAGE

MTL CAN

END RETAINING WALL –RW8–
–L– STA. 540+68.00, 80.50' LT

I-26 EB 38' CONC

–L–

BL-22

B1-B
(B-2Ø)
19+Ø7.3
22' RT

B1-A
(B-21)
19+26
28' LT

CONC BRIDGE

I-26 WB 38' CONC

DI

20

BEGIN RETAINING
WALL –RW9–
–L– STA. 539+30.00,
80.50' RT

EB2-B
(B-22)
2Ø+12.8
23' RT

EB2-A
(B-23)
2Ø+29
2' RT

END RETAINING WALL –RW9–
–L– STA. 541+29.00, 80.50' RT

–Y5–

NCGS "HOOPER"

SR 1528 BROOKSIDE CAMP RD

12' GR

HTR

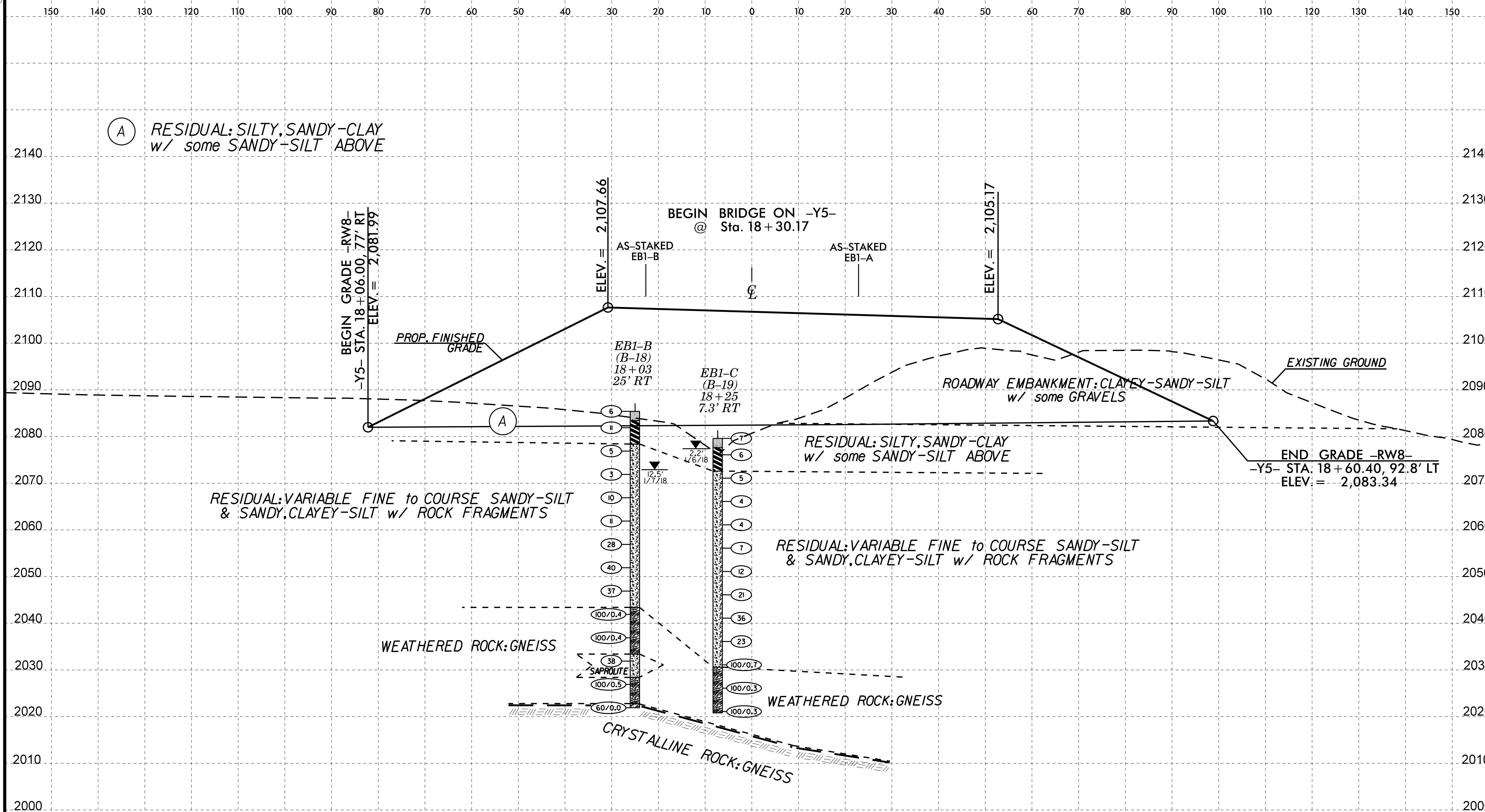
DK

HTR

DK

BST

–Y5– PT Sta. 21+27.52



SECTION ALONG END BENT 1

V:H = 1:1

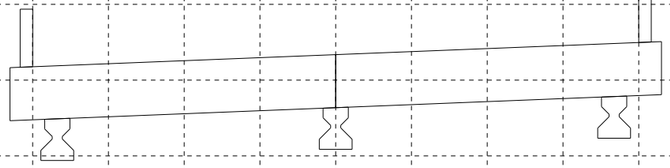
-Y5-

**NOTE: FROM GEU: BRIDGE BORINGS ALSO HAVE THE ORIGINAL "B-x" DESIGNATOR INCLUDED IN THE BOREHOLE NAME TO CORRELATE w/ THE ORIGINAL NAME OF THAT BORING FROM THE 2018 RDWY DRILLING PROGRAM

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	I-4400BB	5

A

ROADWAY EMBANKMENT: BROWN
CLAYEY, SILTY, FINE to COURSE SAND
w/ some GRAVELS



B1-A
(B-21)
19+26
28' LT

B1-B
(B-20)
19+07.3
22' RT

A

RESIDUAL: FINE SANDY, SILTY-CLAY

7
5
2
4
13
6
22
100/0.7
100/0.7
100/0.5
100/0.3
60/0.1
60/0.0
60/0.0

3.5'
2/15/18

ROADWAY EMBANKMENT

6.0'
2/10/18

5
3
2
5
9
14
11
22
24
54
100/0.7
100/0.2
100/0.2
100/0.2
60/0.0

ROADWAY EMBANKMENT: BROWN
CLAYEY, SILTY, FINE to COURSE SAND

RESIDUAL

RESIDUAL: FINE to COURSE SANDY-SILT
& FINE SANDY, CLAYEY-SILT;
w/ MANGENESE DEPOSITS

RESIDUAL: FINE to COURSE SANDY-SILT
& FINE SANDY, CLAYEY-SILT;
w/ MANGENESE DEPOSITS

WEATHERED ROCK: GNEISS

CRYSTALLINE ROCK: GNEISS

CRYSTALLINE ROCK: GNEISS

WEATHERED ROCK: GNEISS

SECTION ALONG 19+00.00
-Y5-

**NOTE: FROM GEU: BRIDGE BORINGS ALSO HAVE THE ORIGINAL "B-x" DESIGNATOR INCLUDED IN THE BOREHOLE NAME TO CORRELATE w/ THE ORIGINAL NAME OF THAT BORING FROM THE 2018 RDWY DRILLING PROGRAM

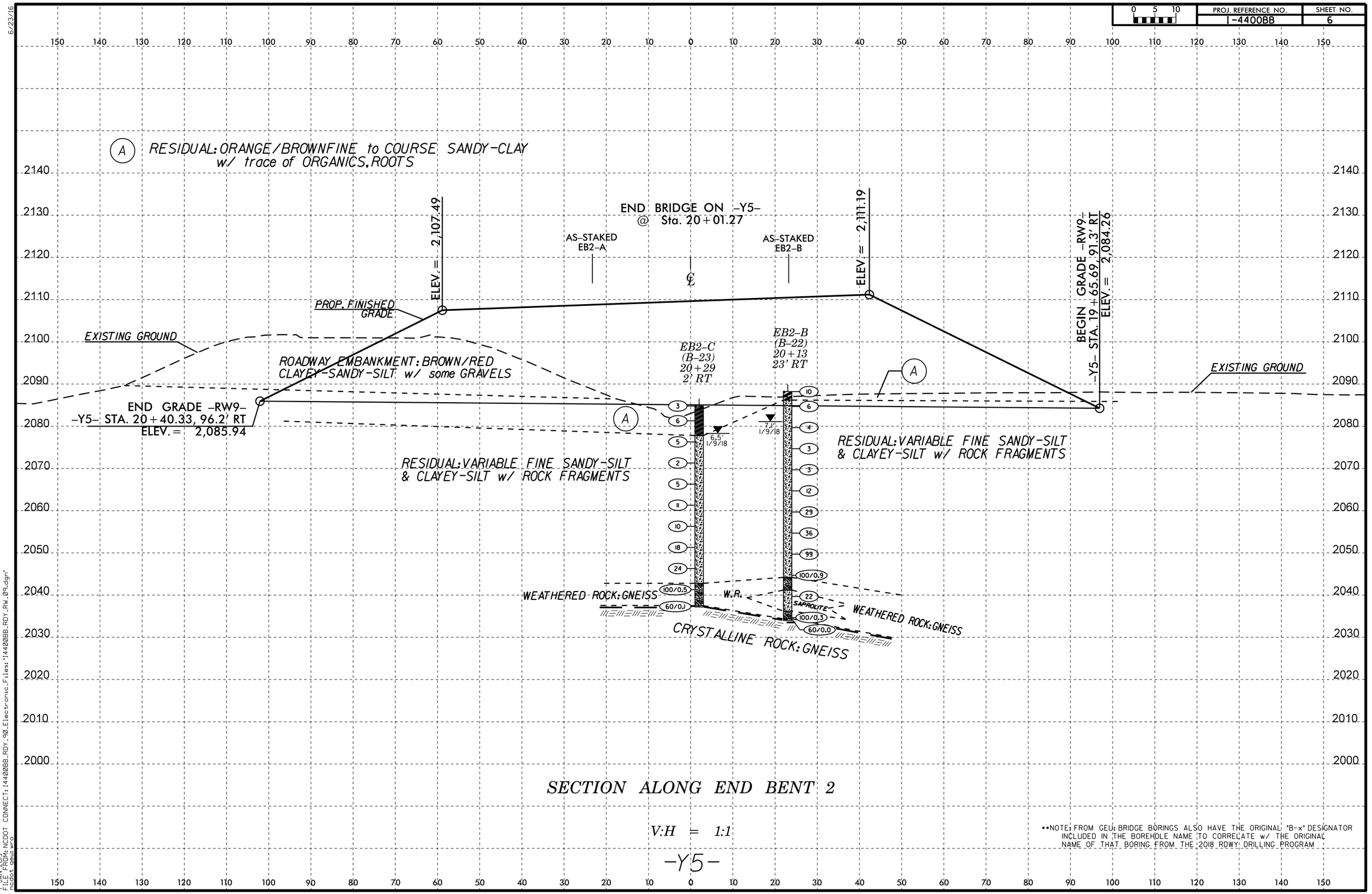
2110 2100 2090 2080 2070 2060 2050 2040 2030 2020

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

09-JAN-2019
FILE FROM: NCDOT CONNECT: I4400BB_RDY_CFI_CADD: I4400BB_RDY_XSC_Y5.dgn*
ncdot: geu: wro

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-4400BB	6



SECTION ALONG END BENT 2

V:H = 1:1

-Y5-

**NOTE: FROM GEU: BRIDGE BORINGS ALSO HAVE THE ORIGINAL "B-x" DESIGNATOR INCLUDED IN THE BOREHOLE NAME TO CORRELATE w/ THE ORIGINAL NAME OF THAT BORING FROM THE 2018 RDWY DRILLING PROGRAM

7-JAN-2019
FILE FROM: NCDOT CONNECT: I4400BB_RDY_90_Electronic_Files: 'I4400BB_RDY_RW_09.dgn'
ncdot_geu.wrc

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** M. Arnold	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on SR1528 Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. **EB1-C** (B-19)	**STATION** 18+25	**OFFSET** 7.3 ft RT	**ALIGNMENT** -Y5-	**0 HR.** 7.4
COLLAR ELEV. 2,079.6 ft	**TOTAL DEPTH** 58.8 ft	**NORTHING** 609,645	**EASTING** 964,118	**24 HR.** 2.2
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/05/18	**COMP. DATE** 01/06/18	**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
2080										
	2,079.6	0.0	2	2	5	7		M		2,079.6 GROUND SURFACE 0.0
2075	2,076.1	3.5	4	3	3	6		M		**RESIDUAL** 2,077.6 Brown, Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots) and Clay / Tan-Orange-Brown, Fine to Coarse Sandy CLAY (A-7) 2.0
2070	2,071.1	8.5	1	2	3	5		Sat.		2,072.6 Orange-Brown-White, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica and Rock Fragments 7.0
2065	2,066.1	13.5	2	1	3	4		Sat.		
2060	2,061.1	18.5	2	1	3	4		W		
2055	2,056.1	23.5	2	2	5	7		W		
2050	2,051.1	28.5	3	5	7	12		W		
2045	2,046.1	33.5	7	9	12	21		M		2,047.6 White-Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica and Rock Fragments 32.0
2040	2,041.1	38.5	10	12	24	36		M		
2035	2,036.1	43.5	4	9	14	23		M		
2030	2,031.1	48.5	12	48	52/0.2	100/0.7				2,030.6 **WEATHERED ROCK** Tan-Brown (GNEISS) 49.0
2025	2,026.1	53.5	100/0.3			100/0.3				
	2,021.1	58.5	100/0.3			100/0.3				2,020.8 Boring Terminated at Elevation 2,020.8 ft in GNEISS (Weathered Rock) 58.8

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** M. Arnold	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on SR1528 Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. **EB1-B** (B-18)	**STATION** 18+03	**OFFSET** 25 ft RT	**ALIGNMENT** -Y5-	**0 HR.** 9.8
COLLAR ELEV. 2,085.4 ft	**TOTAL DEPTH** 63.5 ft	**NORTHING** 609,617	**EASTING** 964,122	**24 HR.** 12.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/06/18	**COMP. DATE** 01/06/18	**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)
2090										
2085	2,085.4	0.0	1	3	3	6		M		2,085.4 GROUND SURFACE 0.0
2080	2,081.9	3.5	6	5	6	11		M		**RESIDUAL** 2,083.4 Brown, Fine Sandy SILT (A-4) with Trace Organics (Roots) and Clay / Orange-Tan-Brown, Silty Fine Sandy CLAY (A-7) 2.0
2075	2,076.9	8.5	3	2	3	5		W		2,078.4 Gray-White and Orange-Brown, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica and Rock Fragments 7.0
2070	2,071.9	13.5	2	1	2	3		Sat.		
2065	2,066.9	18.5	2	4	6	10		W		2,068.4 Orange-Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica and Rock Fragments 17.0
2060	2,061.9	23.5	4	4	7	11		W		2,063.4 White-Orange-Brown, Fine Sandy Clayey SILT (A-5) with Trace Mica, Rock Fragments, and Manganese Deposits 22.0
2055	2,056.9	28.5	9	12	16	28		M		2,058.4 Orange-White-Gray, Fine Sandy SILT (A-4) with Trace Mica and Rock Fragments 27.0
2050	2,051.9	33.5	9	13	27	40		W		
2045	2,046.9	38.5	47	22	15	37		M		
2040	2,041.9	43.5	100/0.4			100/0.4				2,043.4 **WEATHERED ROCK** Gray-Brown (GNEISS) 42.0
2035	2,036.9	48.5	100/0.4			100/0.4				
2030	2,031.9	53.5	42	21	17	38		M		2,033.4 Orange-Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica and Rock Fragments 52.0
2025	2,026.9	58.5	100/0.5			100/0.5				2,028.4 **WEATHERED ROCK** Tan-Gray (GNEISS) 57.0
	2,021.9	63.5	60/0.0			60/0.0				2,022.8 62.6 / 2,021.9 **CRYSTALLINE ROCK** Gray (GNEISS) 63.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,021.9 ft in GNEISS (Crystalline Rock)

Note:
1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** M. Durway	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. B1-A (B-21)	**STATION** 19+26	**OFFSET** 28 ft LT	**ALIGNMENT** -Y5-	**0 HR.** 4.9
COLLAR ELEV. 2,084.0 ft	**TOTAL DEPTH** 66.0 ft	**NORTHING** 609,750	**EASTING** 964,137	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/14/18	**COMP. DATE** 02/14/18	**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
2085										
	2,084.0	0.0	1	3	4	7		M		2,084.0 GROUND SURFACE 0.0
										RESIDUAL
										2,082.0 Orange, Fine Sandy Silty CLAY (A-7) 2.0
2080	2,080.5	3.5	2	2	3	5		M		Orange-Gray-Brown, Fine Sandy SILT (A-4) with Trace Mica
2075	2,075.5	8.5	1	1	1	2		M		
2070	2,070.5	13.5	1	2	2	4		M		
2065	2,065.5	18.5	4	6	7	13		M		
										2,062.0 22.0
2060	2,060.5	23.5	1	3	3	6		W		Orange-Brown, Fine Sandy Clayey SILT (A-5) with Trace Mica
2055	2,055.5	28.5	14	11	11	22		W		
										2,054.4 29.6
2050	2,050.5	33.5	45	55/0.2		100/0.7				White, Coarse SAND (A-3) with Trace Rock Fragments
										2,050.5 33.5
2045	2,045.5	38.5	48	52/0.2		100/0.7				**WEATHERED ROCK** Gray-Brown (GNEISS)
2040	2,040.5	43.5	100/0.5			100/0.5				
2035	2,035.5	48.5	100/0.3			100/0.3				
										2,032.0 52.0
2030	2,030.5	53.5	60/0.1			60/0.1				**CRYSTALLINE ROCK** Gray (GNEISS)
	2,028.1	55.9	60/0.0			60/0.0				2,028.1 55.9
2025										
	2,023.1	60.9	60/0.1			60/0.1				
2020										2,018.0 66.0
										Boring Terminated at Elevation 2,018.0 ft in GNEISS (Crystalline Rock)

Note:
1. 0.0'-0.2' = SURFICIAL ORGANIC SOILS

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** M. Durway	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. B1-A (B-21)	**STATION** 19+26	**OFFSET** 28 ft LT	**ALIGNMENT** -Y5-	**0 HR.** 4.9
COLLAR ELEV. 2,084.0 ft	**TOTAL DEPTH** 66.0 ft	**NORTHING** 609,750	**EASTING** 964,137	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/14/18	**COMP. DATE** 02/14/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE N	**TOTAL RUN** 10.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
2028.1											Begin Coring @ 55.9 ft
	2,028.1	55.9	5.0	*N=60/0.0* 1:00/1.0 0:57/1.0 0:49/1.0 0:54/1.0 1:15/1.0	(0.9) 18%	(0.0) 0%		(5.7) 56%	(2.1) 21%		2,028.1 55.9
2025	2,023.1	60.9									
	2,023.0	61.0	5.0	*N=60/0.1* 0:47/1.0 1:02/1.0 1:08/1.0 0:47/1.0 0:50/1.0	(4.8) 96%	(2.1) 42%					
2020	2,018.0	66.0									2,018.0 66.0
											**NOTE: NO CORE PHOTOGRAPH AVAILABLE

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. **B1-B** (B-20)	**STATION** 19+07	**OFFSET** 22 ft RT	**ALIGNMENT** -Y5-	**0 HR.** 10.7
COLLAR ELEV. 2,083.7 ft	**TOTAL DEPTH** 65.4 ft	**NORTHING** 609,710	**EASTING** 694,172	**24 HR.** 6.0
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/09/18	**COMP. DATE** 02/09/18	**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)
2085											
	2,083.7	0.0								2,083.7 GROUND SURFACE	0.0
			1	2	3	5		M		**ROADWAY EMBANKMENT**	
2080	2,080.2	3.5								2,081.7 Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots)	2.0
			1	1	2	3		M		Tan, Fine to Coarse SAND (A-3) with Trace Silt	
2075	2,075.2	8.5								2,076.7	7.0
			2	1	1	2		Sat.		**RESIDUAL** Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica and Manganese Deposits	
2070	2,070.2	13.5									
			2	2	3	5		W			
2065	2,065.2	18.5								2,066.7	17.0
			3	3	6	9		W		Orange-Gray-Tan, Fine Sandy Clayey SILT (A-5) with Trace Mica and Manganese Deposits	
2060	2,060.2	23.5									
			4	6	8	14		W			
2055	2,055.2	28.5									
			6	5	6	11		W			
2050	2,050.2	33.5									
			7	10	12	22		M			
2045	2,045.2	38.5									
			6	9	15	24		M			
2040	2,040.2	43.5								2,041.7	42.0
			21	27	27	54		M		Orange-Tan, Fine to Coarse Sandy SILT (A-4)	
2035	2,035.2	48.5								2,036.1	47.6
			15	50	50/0.2	100/0.7				**WEATHERED ROCK** Brown to Orange-Brown (GNEISS)	
2030	2,030.2	53.5	100/0.2			100/0.2					
2025	2,025.2	58.5	100/0.2			100/0.2					
2020	2,020.2	63.5	100/0.2			100/0.2					
	2,018.3	65.4	60/0.0			60/0.0				2,018.3	65.4
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,018.3 ft on GNEISS (Crystalline Rock)	

NCDOT BORE DOUBLE I4400B_GEO_BH_RDWY_Y5.GPJ NC_DOT.GDT 1/3/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** M. Arnold	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. EB2-C (B-23)	**STATION** 20+29	**OFFSET** 2 ft RT	**ALIGNMENT** -Y5-	**0 HR.** 7.2
COLLAR ELEV. 2,084.8 ft	**TOTAL DEPTH** 47.6 ft	**NORTHING** 609,828	**EASTING** 964,210	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/08/18	**COMP. DATE** 01/08/18	**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
2085	2,084.8	0.0	WOH	1	2	3		W		2,084.8 GROUND SURFACE 0.0
	2,081.3	3.5								**RESIDUAL** Brown, Fine to Coarse Sandy CLAY (A-6) with Trace Organics (Roots)
2080			3	2	4	6		W		
	2,076.3	8.5								2,077.8 7.0
2075			2	2	3	5		W		White-Tan-Orange, Clayey SILT (A-5) with Trace Mica and Manganese Deposits, Trace to Little Rock Fragments
	2,071.3	13.5								
2070			WOH	1	1	2		Sat.		
	2,066.3	18.5								
2065			2	2	3	5		Sat.		
	2,061.3	23.5								
2060			4	5	6	11		W		
	2,056.3	28.5								
2055			4	4	6	10		W		
	2,051.3	33.5								2,052.8 32.0
2050			5	8	10	18		W		Tan-Orange-Brown, Fine Sandy SILT (A-4) with Trace Mica, Clay, and Rock Fragments
	2,046.3	38.5								
2045			15	9	15	24		M		
	2,041.3	43.5								2,042.8 42.0
2040			100/0.5			100/0.5				**WEATHERED ROCK** Gray-Brown (GNEISS)
	2,037.3	47.5	60/0.1			60/0.1				2,037.5 47.3
										2,037.2 47.6
										CRYSTALLINE ROCK Gray (GNEISS)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,037.2 ft in GNEISS (Crystalline Rock)
										Note: 1. 0.0'-0.2' = SURFICIAL ORGANIC SOILS 2. Auger Refusal at 47.5'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** M. Arnold	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44): Y5 BRDG 0221 on Brookside Camp Rd				**GROUND WTR (ft)**
BORING NO. EB2-B (B-22)	**STATION** 20+13	**OFFSET** 23 ft RT	**ALIGNMENT** -Y5-	**0 HR.** 14.8
COLLAR ELEV. 2,088.2 ft	**TOTAL DEPTH** 54.2 ft	**NORTHING** 609,804	**EASTING** 964,222	**24 HR.** 7.1
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/08/18	**COMP. DATE** 01/08/18	**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)
2090	2,088.2	0.0	2	4	6	10		W		2,088.2 GROUND SURFACE 0.0
2085	2,084.7	3.5	3	3	3	6		W		**RESIDUAL** 2,086.2 Orange-Brown, Fine to Coarse Sandy CLAY (A-7) with Trace Organics (Roots) 2.0
2080	2,079.7	8.5	1	2	2	4		W		Orange-Brown, Fine Sandy SILT (A-4) with Trace Mica and Organics (Roots)
2075	2,074.7	13.5	1	1	2	3		Sat.		2,081.2 7.0
2070	2,069.7	18.5	2	1	2	3		Sat.		Orange-Tan-Brown, Clayey SILT (A-5) with Trace Mica, Manganese Deposits, and Rock Fragments
2065	2,064.7	23.5	3	5	7	12		M		
2060	2,059.7	28.5	6	9	20	29		M		
2055	2,054.7	33.5	10	16	20	36		M		
2050	2,049.7	38.5	25	28	71	99		M		
2045	2,044.7	43.5	27	40	60/0.4	100/0.9				2,044.2 44.0
2040	2,039.7	48.5	4	8	14	22		W		**WEATHERED ROCK** Orange-Gray (GNEISS)
2035	2,034.7	53.5	100/0.3			100/0.3				2,041.2 47.0
	2,034.0	54.2	60/0.0			60/0.0				Dark Brown, Clayey SILT (A-5) with Trace Manganese Deposits and Mica
										2,036.2 52.0
										2,034.4 53.8
										2,034.0 54.2
										CRYSTALLINE ROCK Dark Gray (GNEISS)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,034.0 ft in GNEISS (Crystalline Rock)
										Note: 1. 0.0'-0.2' = SURFICIAL ORGANIC SOILS 2. Auger Refusal at 54.2'

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I4400B	1	11

REFERENCE: I4400B

PROJECT: 34232

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *REPLACE BRIDGE 440217 ON CLEAR CREEK RD. (SR 1503) OVER I-26*

SITE DESCRIPTION

CONTENTS

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

S. WOODS

C.D. JOHNSON

M. DURWAY

S. DAVIS

D.O. CHEEK

C.J. COFFEY

INVESTIGATED BY *D.M. MULLEN*

DRAWN BY *D.M. MULLLEN*

CHECKED BY *JCK*

SUBMITTED BY

DATE *1.2.2019*

NORTH CAROLINA PROFESSIONAL SEAL 029878 ENGINEER D.M. MULLEN

DocuSigned by:
D Matt Mullen 1/2/2019
18909BD3C9D5400... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
34232	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	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY), MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

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

BEDDING

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

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BM-13

ELEVATION: 2131.63 FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-4400B	3

SITE PLAN

0 50 100
FEET

SKEW = 120.98 DEG.

NAD 83

SR 1503 CLEAR CREEK RD 24' BST

-Y2-

440

20

B-12

BY12-59

END RETAINING WALL -RW7-
-L- STA. 439+48.79, 87.50' LT

BEGIN RETAINING WALL -RW7-
-L- STA. 437+73.79, 87.50' LT

BM #13

B-14A

I-26 EB 38' CONC

-L-

B-14B

B-14

I-26 WB 38' CONC

BEGIN RETAINING WALL -RW6-
-L- STA. 438+85.46, 87.50' RT

B-16

END RETAINING WALL -RW6-
-L- STA. 440+60.46, 87.50' RT

B-17

-Y2-

BY12-60

BM #46

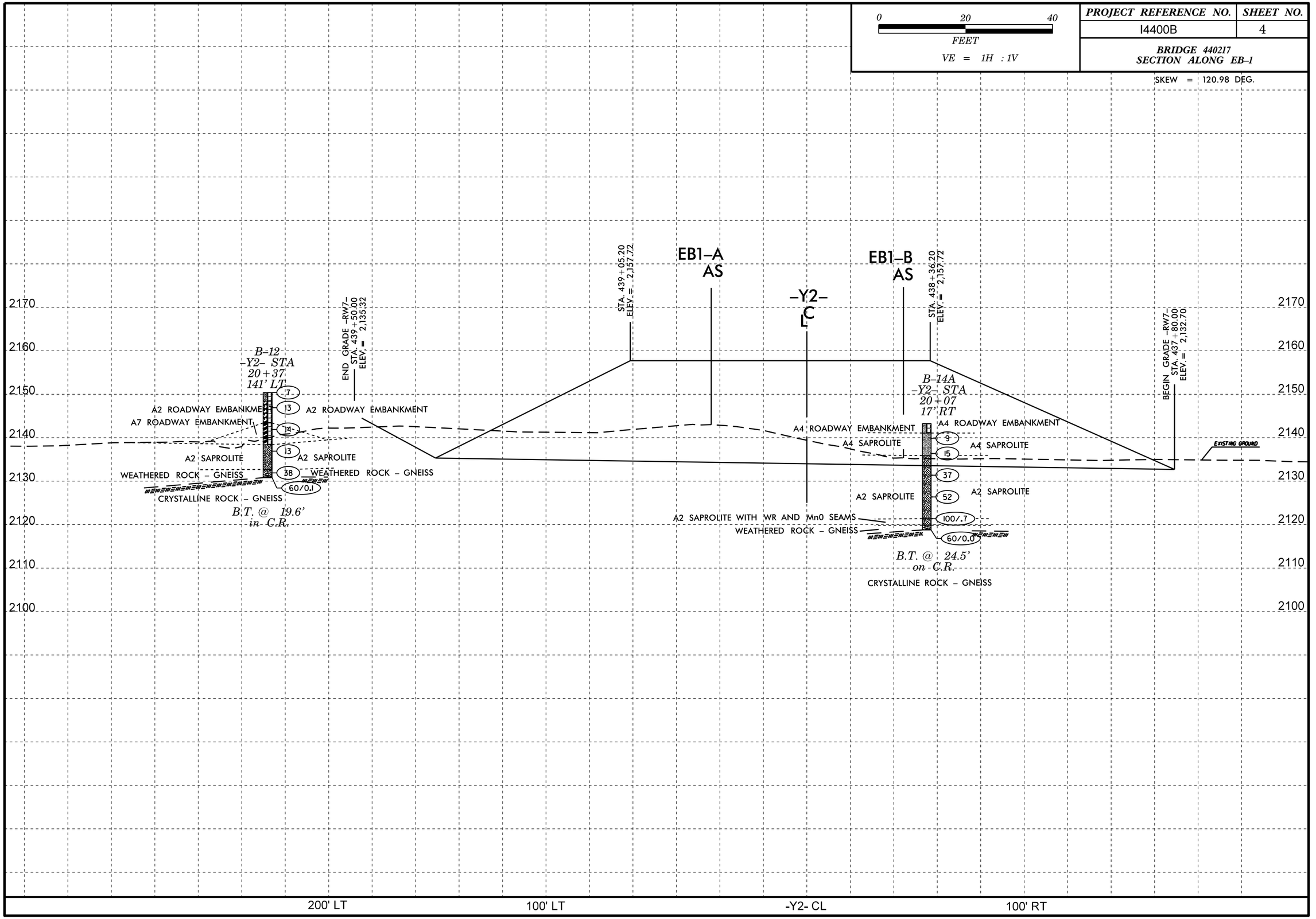
25

PROJECT REFERENCE NO.	SHEET NO.
I4400B	4

BRIDGE 440217
SECTION ALONG EB–1

0 20 40
FEET
VE = 1H : 1V

SKEW = 120.98 DEG.



0	10	20

FEET

VE = 1H : 1V

PROJECT REFERENCE NO.	SHEET NO.
I-4400B	5

REPLACE HENDERSON COUNTY BRIDGE 440217 CLEAR CREEK RD OVER I-26

SKEW = 120.98 DEG.

2156.61

0.020 0.020

B–14
–Y2– STA
21+55
33' LT

B–14B
–Y2– STA
21+23
18.5' RT

A2 ROADWAY EMBANKMENT

A2 ROADWAY EMBANKMENT

A4 ROADWAY EMBANKMENT

A4 SAPROLITE

A4 SAPROLITE

WEATHERED ROCK – GNEISS

A4 SAPROLITE WITH WR AND Mn0 SEAMS

A4 SAPROLITE WITH WR AND Mn0 SEAMS

A2 SAPROLITE

A2 SAPROLITE

A5 SAPROLITE

A5 SAPROLITE

A5 SAPROLITE

WEATHERED ROCK – GNEISS

WEATHERED ROCK – GNEISS

WEATHERED ROCK – GNEISS

CRYSTALLINE ROCK – GNEISS

CRYSTALLINE ROCK – GNEISS

B–14		B–14B	
10		10	
10		6	
100/.7		9	
100/.7		35	
100/.7		61	
100/.7		60/0.1	
10		100/0.2	
100/0.3		100/0.3	
100/0.4		100/0.4	
60/0.0			

B.T. @ 49.9'
in C.R.

B.T. @ 43.5'
in W.R.

2170 2160 2150 2140 2130 2120 2110 2100 2090 2080

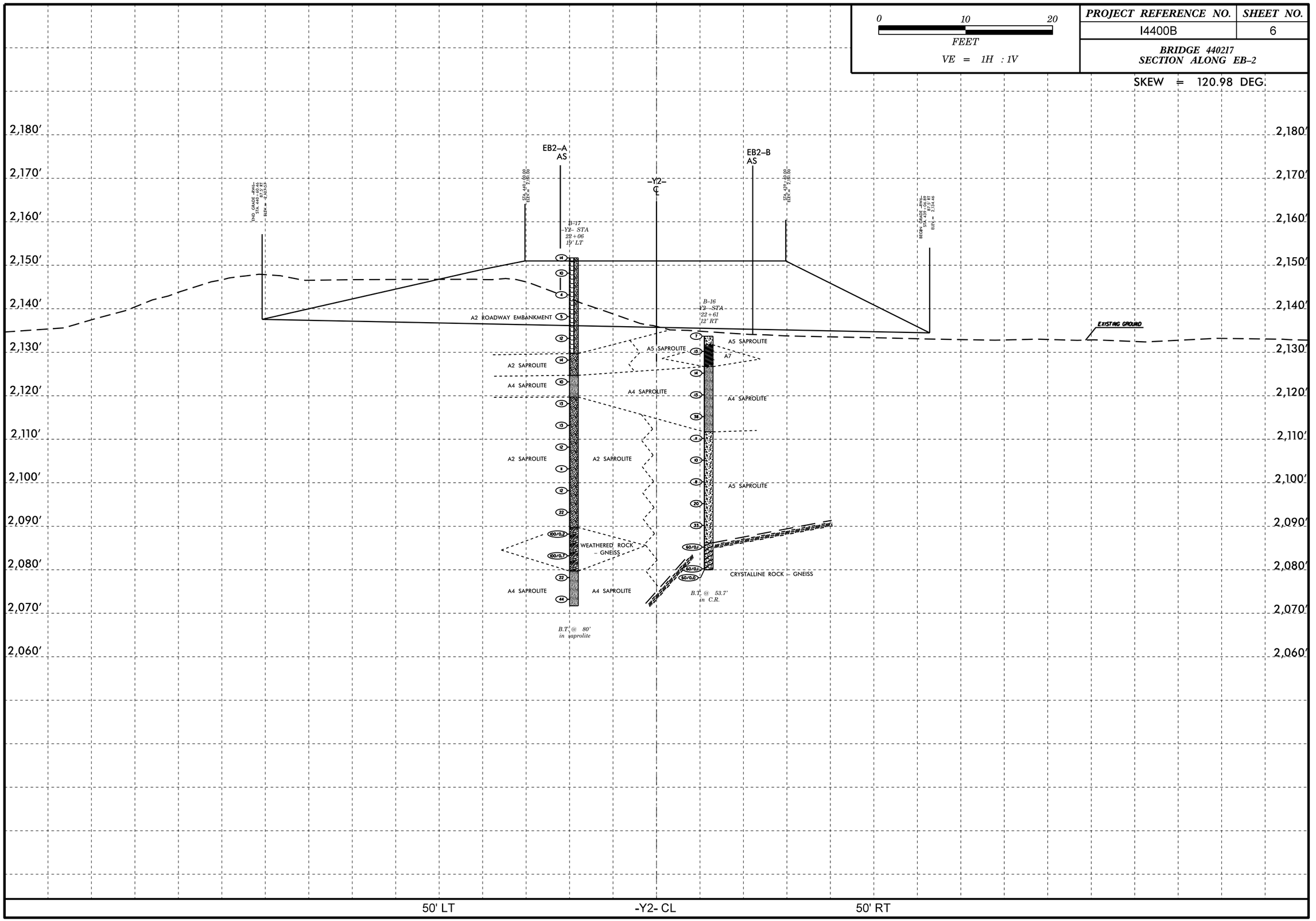
50' LT -Y2- CL 50 RT

PROJECT REFERENCE NO.	SHEET NO.
I4400B	6

BRIDGE 440217
SECTION ALONG EB–2

0 10 20
FEET
VE = 1H : 1V

SKEW = 120.98 DEG.



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-12	**STATION** 20+37	**OFFSET** 141 ft LT	**ALIGNMENT** -Y2-	**0 HR.** Dry
COLLAR ELEV. 2,150.4 ft	**TOTAL DEPTH** 19.6 ft	**NORTHING** 601,542	**EASTING** 969,718	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 12/12/17	**COMP. DATE** 12/12/17	**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)
2155											
2150	2,150.4	0.0	1	2	2	4		W		2,150.4 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT	
										2,148.4 Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots)	2.0
	2,146.9	3.5	1	2	3	5		W		Brown, Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots) and Little Gravel	
2145										2,143.4	7.0
	2,141.9	8.5	WOH	1	2	3		W		Gray-Brown, Fine Sandy CLAY (A-6)	
2140										2,138.4	12.0
	2,136.9	13.5	2	3	3	6		M		**RESIDUAL** Gray, Silty Fine to Coarse SAND (A-2-4)	
2135										2,132.7	17.7
	2,131.9	18.5	100/0.4			100/0.4				**WEATHERED ROCK**	
	2,130.9	19.5	60/0.1			60/0.1				2,130.9 White-Gray (GNEISS)	19.5
										2,130.8 **CRYSTALLINE ROCK** White-Gray (GNEISS)	19.6
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,130.8 ft in GNEISS (Crystalline Rock)	

Note:
1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS
2. Auger Refusal at 19.5'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** M. Durway	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-14	**STATION** 21+55	**OFFSET** 33 ft LT	**ALIGNMENT** -Y2-	**0 HR.** NM
COLLAR ELEV. 2,130.9 ft	**TOTAL DEPTH** 49.9 ft	**NORTHING** 601,570	**EASTING** 969,876	**24 HR.** 21.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/14/18	**COMP. DATE** 02/14/18	**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)
2135											
										2,130.9 GROUND SURFACE	0.0
2130	2,130.9	0.0	1	2	5	7		M		2,130.0 **ROADWAY EMBANKMENT**	0.9
										2,128.9 Orange-Gray, Clayey Fine SAND (A-2-6)	2.0
	2,127.4	3.5								Orange-Gray, Silty Fine to Coarse SAND (A-2-4)	
2125			2	5	5	10		M		**RESIDUAL**	
										2,123.9 Gray-Tan, Fine Sandy SILT (A-4)	7.0
	2,122.4	8.5								**WEATHERED ROCK**	
2120			95	5/0.1		100/0.6				Orange-Gray (GNEISS)	
	2,117.4	13.5									
2115			100/0.4			100/0.4					
	2,112.4	18.5									
2110			71	29/0.1		100/0.6					
										2,108.9	22.0
	2,107.4	23.5								**RESIDUAL** Gray-Orange, Silty Fine to Coarse SAND (A-2-4) with Trace Rock Fragments	
2105			54	46							
										2,103.9	27.0
	2,102.4	28.5								Gray-Orange, Clayey Fine Sandy SILT (A-5)	
2100			6	5	7	12		M			
										2,098.9	32.0
	2,097.4	33.5								**WEATHERED ROCK** Gray-Orange (GNEISS)	
2095			100/0.2			100/0.2					
										2,093.9	37.0
	2,092.4	38.5								**RESIDUAL**	
	2,091.0	39.9	10	39	61/0.1					2,091.9 Gray-Orange, Fine Sandy Clayey SILT (A-5)	39.0
2090			60/0.0			100/0.6 60/0.0				2,091.0 **WEATHERED ROCK** Gray-Orange (GNEISS)	39.9
										CRYSTALLINE ROCK (GNEISS)	
2085											
										2,081.0	49.9
										Boring Terminated at Elevation 2,081.0 ft in GNEISS (Crystalline Rock)	

Note:
1. 0.0'-0.3' = SURFICIAL ORGANIC SOILS

NCDOT BORE DOUBLE I4400B_GEO_BH_RDWY_DRAFT.GPJ NC_DOT.GDT 12/11/18

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** M. Durway	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-14	**STATION** 21+55	**OFFSET** 33 ft LT	**ALIGNMENT** -Y2-	**0 HR.** NM
COLLAR ELEV. 2,130.9 ft	**TOTAL DEPTH** 49.9 ft	**NORTHING** 601,570	**EASTING** 969,876	**24 HR.** 21.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/14/18	**COMP. DATE** 02/14/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE N	**TOTAL RUN** 10.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2091											Begin Coring @ 39.9 ft	
2090	2,091.0	39.9	5.0	1:27/1.0 1:22/1.0 2:23/1.0 2:45/1.0 3:00/1.0	(4.1) 82%	(3.2) 64%		(8.2) 82%	(6.4) 64%		2,091.0 **CRYSTALLINE ROCK**	39.9
	2,086.0	44.9										
2085			5.0	3:12/1.0 3:43/1.0 3:15/1.0 1:29/1.0 1:53/1.0	(4.1) 82%	(3.2) 64%						
	2,081.0	49.9									2,081.0	49.9
											Boring Terminated at Elevation 2,081.0 ft in GNEISS (Crystalline Rock)	

Note:
1. 0.0'-0.3' = SURFICIAL ORGANIC SOILS

NCDOT CORE DOUBLE I4400B_GEO_BH_RDWY_DRAFT.GPJ NC_DOT.GDT 12/20/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44), Clear Creek Bridge			**GROUND WTR (ft)**
BORING NO. B-14A	**STATION** 20+07	**OFFSET** 17 ft RT	**ALIGNMENT** -Y2-	**0 HR.** Dry
COLLAR ELEV. 2,138.0 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 601,422	**EASTING** 969,825	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 11/16/18	**COMP. DATE** 11/16/18	**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
2140										ELEV. (ft) DEPTH (ft)
										2,138.0 GROUND SURFACE 0.0
2135										**ROADWAY EMBANKMENT** 2,135.8 RED/BRN SANDY SILT 2.2
	2,134.6	3.4	2	5	4	9				**SAPROLITE** BRN CLAY-SILT-SAND W/ COARSE SAND LAYERS, MIC
2130	2,129.6	8.4	5	8	7	15				2,130.6 7.4
2125	2,124.6	13.4	3	10	27	37				**SAPROLITE** WHT/GRAY SILTY SAND W/ MICA AND RK FRAGS. SEAMY WEATHERED ROCK STARTING 15.1' TO 23.4'
2120	2,119.8	18.2	37	25	27	WR SEAM 52				
2115	2,114.6	23.4	36	64/0.2	60/0.0	100				2,114.6 23.4 2,113.5 24.5 **WEATHERED ROCK** GRAY/WHT/BLK WEATHERED BIOTITE GNEISS Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,113.5 ft ON GNEISS (CRYSTALLINE ROCK)

WBS 36030.1.1	**TIP** I-4400BB	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.
SITE DESCRIPTION REPLACE BRIDGE #217 ON SR1503 (CLEAR CREEK RD) OVER I-26			**GROUND WTR (ft)**
BORING NO. B-14B	**STATION** 21+23	**OFFSET** 18 ft RT	**ALIGNMENT** -Y2-	**0 HR.** Dry
COLLAR ELEV. 2,129.8 ft	**TOTAL DEPTH** 43.5 ft	**NORTHING** 601,512	**EASTING** 969,897	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/06/18	**COMP. DATE** 12/06/18	**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
2130										ELEV. (ft) DEPTH (ft)
										2,129.8 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT RED-BROWN-GREY, SL MICACEOUS, CLAYEY-SND-SLT
2125	2,126.8	3.0	3	5	5	10		M		2,126.2 3.6 **RESIDUAL** GREY-WHITE, MIC, CLAYEY-SND-SLT, IN/OUT WR SEAMS, HARD GRAVEL-SIZE RK FRAGS, W/MnO SEAMS
2120	2,121.8	8.0	2	3	3	6		M		
2115	2,116.8	13.0	2	4	5	9		M		
2110	2,111.7	18.1	29	18	19	37		M		
2105	2,106.7	23.1	60	31	30	61		M		2,107.1 22.7 IN/OUT WR SEAMS
2100	2,101.7	28.1	60/0.1			60/0.1 ROCK LEDGE				2,101.7 28.1 **WEATHERED ROCK** GREY, WEATHERED AUGEN GNEISS
2095	2,096.7	33.1	50	50/0.2		100/0.2				
2090	2,091.7	38.1	100/0.3			100/0.3				
	2,086.7	43.1	100/0.4			100/0.4				2,086.3 43.5 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,086.3 ft IN WEATHERED ROCK

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** M. Arnold	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-16	**STATION** 22+61	**OFFSET** 12 ft RT	**ALIGNMENT** -Y2-	**0 HR.** 27.6
COLLAR ELEV. 2,133.7 ft	**TOTAL DEPTH** 53.7 ft	**NORTHING** 601,626	**EASTING** 969,976	**24 HR.** 25.6
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 01/08/18	**COMP. DATE** 01/08/18	**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
2135										
	2,133.7	0.0								2,133.7 GROUND SURFACE 0.0
			1	3	4	7		M		**RESIDUAL**
2130	2,130.2	3.5								2,131.7 Red-Brown, Fine Sandy Clayey SILT (A-5) with Trace Mica and Organics (Roots) 2.0
			4	6	7	13		M		Red-Brown, Silty CLAY (A-6)
2125	2,125.2	8.5								2,126.7 7.0
			6	7	7	14		M		White-Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica, Manganese Deposits, and Rock Fragments
2120	2,120.2	13.5								
			6	6	7	13		M		
2115	2,115.2	18.5								
			17	19	19	38		M		
2110	2,110.2	23.5								2,111.7 22.0
			4	6	5	11		M		Tan-Orange-Brown, Clayey SILT (A-5) with Trace Mica, Manganese Deposits, and Trace to Little Rock Fragments
2105	2,105.2	28.5								
			4	4	6	10		W		
2100	2,100.2	33.5								
			2	4	4	8		W		
2095	2,095.2	38.5								
			4	10	10	20		W		
2090	2,090.2	43.5								
			5	18	15	33		W		
2085	2,085.2	48.5								2,086.2 47.5
			60/0.1			60/0.1				**CRYSTALLINE ROCK** Orange-Brown (GNEISS)
2080	2,080.2	53.5								2,080.0 53.7
	2,080.0	53.7	60/0.1			60/0.1				Boring Terminated at Elevation 2,080.0 ft in GNEISS (Crystalline Rock)
			60/0.0			60/0.0				

Note:
1. 0.0'-0.2' = SURFICIAL ORGANIC SOILS
2. Auger Refusal at 53.7'

NCDOT BORE DOUBLE I4400B_GEO_BH_RDWY_DRAFT.GPJ NC_DOT.GDT 12/11/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-17	**STATION** 22+06	**OFFSET** 19 ft LT	**ALIGNMENT** -Y2-	**0 HR.** 50.7
COLLAR ELEV. 2,151.7 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 601,732	**EASTING** 969,948	**24 HR.** 47.1
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/29/18	**COMP. DATE** 01/29/18	**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)
2155												
	2,151.7	0.0								GROUND SURFACE	2,151.7	0.0
2150			1	6	8	14		M		**ROADWAY EMBANKMENT** Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel, Mica, and Asphalt		
	2,148.2	3.5										
2145			4	5	5	10		M				
	2,143.2	8.5										
2140			2	2	2	4		M				
	2,138.2	13.5										
2135			2	3	2	5		W				
	2,133.2	18.5										
2130			3	6	6	12		M				
	2,128.2	23.5									2,129.7	22.0
2125			4	7	7	14		M		**RESIDUAL** Orange-Tan, Silty Fine to Coarse SAND (A-2-4) with Trace Mica		
	2,123.2	28.5									2,124.7	27.0
2120			4	4	6	10		M		Gray-Tan, Fine Sandy SILT (A-4) with Trace Mica		
	2,118.2	33.5									2,119.7	32.0
2115			6	6	7	13		M		Gray-Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica, Manganese Deposits, and Rock Fragments		
	2,113.2	38.5										
2110			6	6	7	13		M				
	2,108.2	43.5										
2105			5	5	7	12		M				
	2,103.2	48.5										
2100			3	4	7	11		W				
	2,098.2	53.5										
2095			3	5	7	12		W				
	2,093.2	58.5										
2090			5	9	13	22		W				
	2,088.2	63.5	100/0.2			100/0.2					2,089.7	62.0
2085										**WEATHERED ROCK** Brown (GNEISS)		
	2,083.2	68.5	8	86	14/0.2	100/0.7						
2080											2,079.7	72.0
	2,078.2	73.5	6	9	13	22		W		**RESIDUAL** Brown-Gray, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits		
2075												

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-17	**STATION** 22+06	**OFFSET** 19 ft LT	**ALIGNMENT** -Y2-	**0 HR.** 50.7
COLLAR ELEV. 2,151.7 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 601,732	**EASTING** 969,948	**24 HR.** 47.1
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/29/18	**COMP. DATE** 01/29/18	**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
2075						Match Line				
	2,073.2	78.5	12	18	26	44		W		2,071.7 80.0 Boring Terminated at Elevation 2,071.7 ft in SILT (Residual)

REFERENCE: I-4400BB

PROJECT: 34232.1.1

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	34232.1.1	I-4400BB	1	9

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION I-26 FROM EXIT 44 (US 64) TO EXIT 49 (US 25)

SITE DESCRIPTION REPLACE BRIDGE #223 ON SR 1534 (NAPLES RD) OVER I-26

CONTENTS

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

DO CHEEK

CJ COFFEY

CD JOHNSON

INVESTIGATED BY JC KUHNE

DRAWN BY CD JOHNSON

CHECKED BY

SUBMITTED BY

DATE

NORTH CAROLINA LICENSED SEAL 1878 GEOLOGIST JODY C KUHNE

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1/24/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	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:
- [X] CME-45C
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [ ] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

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

BEDDING

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

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: ELEVATIONS TAKEN FROM ROADWAY PLANS

ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.		SHEET NO.
34232.1.1	I-4400BB	3

SITE PLAN

0 40
FEET

N

NCGS "NAPLES"

B-28

SR 1534 (NAPLES RD)

TO US 25
(ASHEVILLE HWY.)

15

B-26

EBI-A

EBI-C

EBI-B

BEGIN BRIDGE -Y7-
STA.16 + 06.92

640

SKEW 56

SKEW 48

B-168

TO SR 1006
(HOWARD GAP RD.)

20

B-169

SKEW 40

GR

B-154

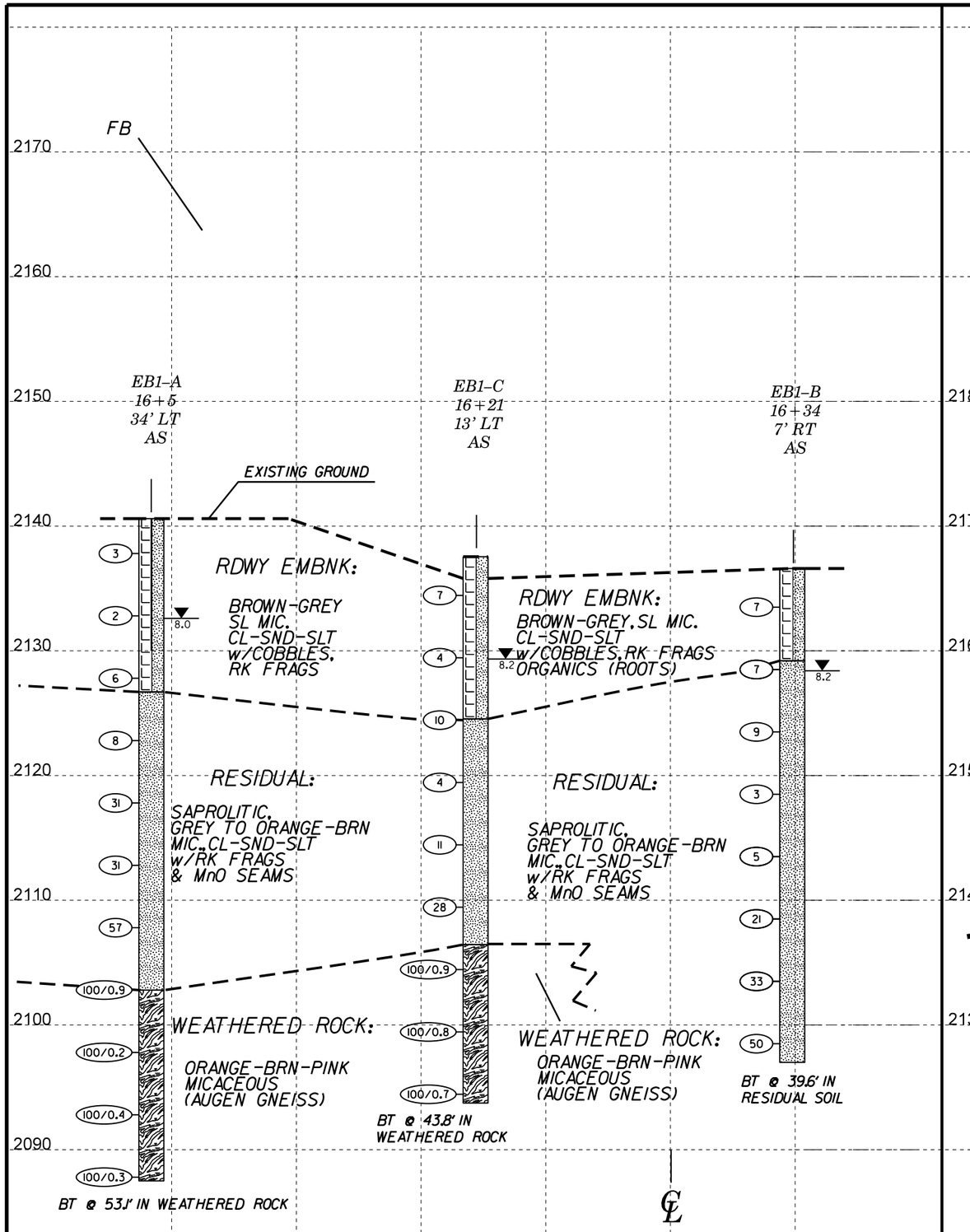
SR 1669 (OLD NAPLES RD)

638

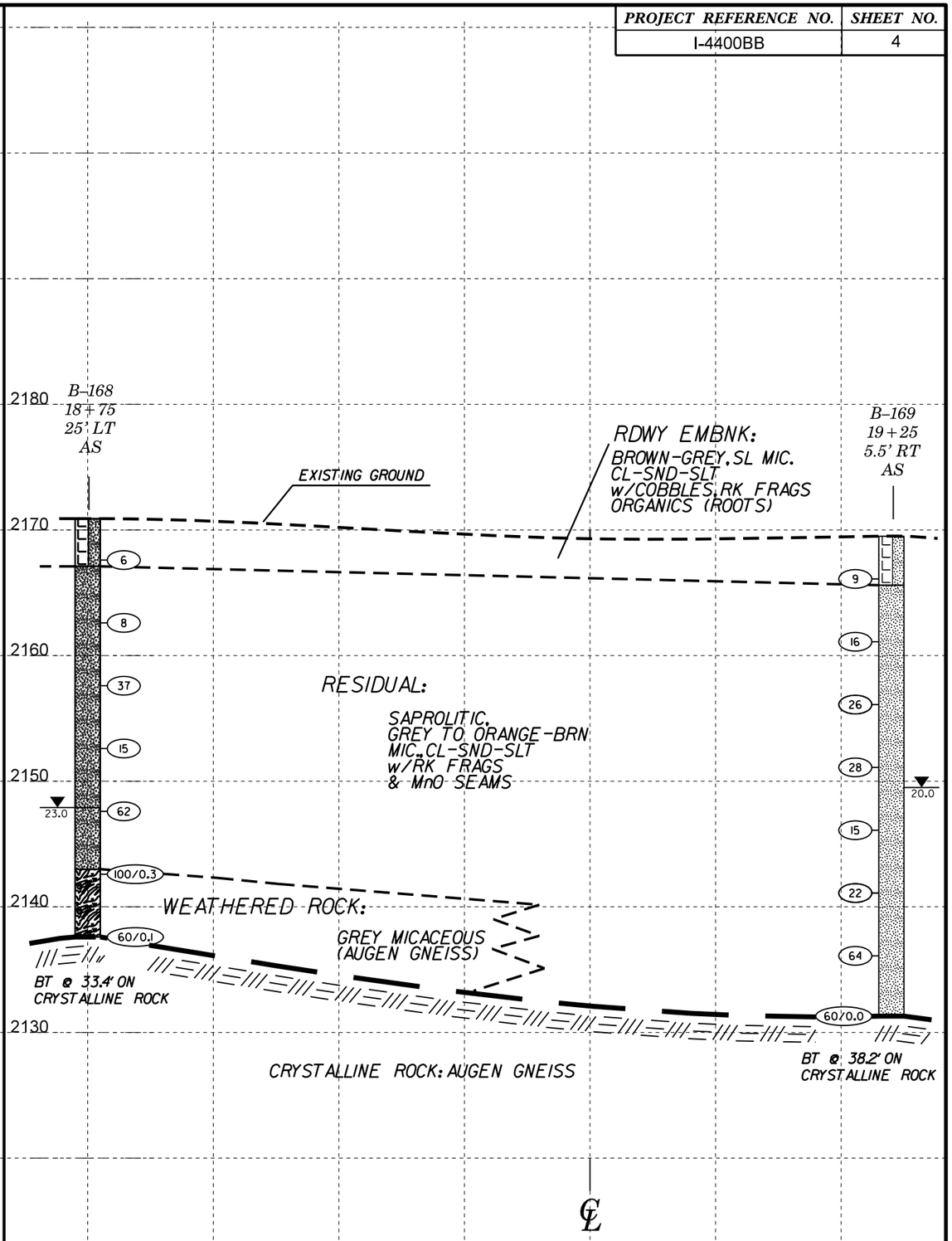
I-26 EB 38' CONC

I-26 WB 385' CONC

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	4



HORIZ. SCALE (FEET) 0 10 20 | VE = 1:1 | **SECTION THROUGH END BENT 1**



HORIZ. SCALE (FEET) 0 10 20 | VE = 1:1 | **SECTION THROUGH END BENT 2**

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	5

SECTION THROUGH INTERIOR BENT 1

0 10 20
FEET
VE = 1:1
SKEW = 48

2170
2160
2150
2140
2130
2120
2110
2100
2090

2168.31
0.060
0.060

B–26
16+70
50' LT
AS

EXISTING GROUND

RE

9
10
5
9
19
33
100/0.3
100/0.2
35.7
60/0.1
60/0.0

ROADWAY EMBANKMENT:
BROWN,CLAYEY,FN-CRS SAND
TR ORGANICS,MnO DEPOSITS

RESIDUAL:
BROWN,FN SNDY SLT.
w/:
TR MICA,
MnO DEPOSITS,RK FRAGS

WEATHERED ROCK:
BROWN GNEISS

CRYSTALLINE ROCK:
BROWN-GREY GNEISS

BT @ 56' IN CRYSTALLINE ROCK

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE #0223 ON SR1534 (NAPLES RD) OVER I-26				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 16+05	**OFFSET** 34 ft LT	**ALIGNMENT** -Y7-	**0 HR.** Dry
COLLAR ELEV. 2,140.6 ft	**TOTAL DEPTH** 53.1 ft	**NORTHING** 617,230	**EASTING** 957,909	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 11/29/18	**COMP. DATE** 11/29/18	**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
2145										ELEV. (ft) DEPTH (ft)
2140										2,140.6 GROUND SURFACE 0.0
	2,137.8	2.8	1	1	2	3		M		**ROADWAY EMBANKMENT** BROWN-GREY, SL MIC, CL-SND-SLT, w/ROCK FRAGS
2135										
	2,132.8	7.8	WOH	WOH	2	2		M		
2130										
	2,127.8	12.8	2	2	4	6		M		2,126.7 13.9
2125										**RESIDUAL** GREY TO ORANGE-BROWN, SL MIC, CL-SND-SLT, w/ROCK FRAGS
	2,122.8	17.8	2	4	4	8		M		
2120										
	2,117.8	22.8	14	16	15	31		M		
2115										
	2,112.8	27.8	15	17	14	31		W		
2110										
	2,107.8	32.8	4	17	40	57		W		
2105										
	2,102.8	37.8	32	68/0.4		100/0.9				2,102.8 37.8
2100										**WEATHERED ROCK** DARK ORANGE BROWN, MICACEOUS w/MnO SEAMS
	2,097.8	42.8	100/0.2			100/0.2				
2095										
	2,092.8	47.8	100/0.4			100/0.4				
2090										
	2,087.8	52.8	100/0.3			100/0.3				Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,087.5 ft IN WEATHERED ROCK
										2,080.5 60.1

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE #0223 ON SR1534 (NAPLES RD) OVER I-26				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 16+21	**OFFSET** 13 ft LT	**ALIGNMENT** -Y7-	**0 HR.** N/A
COLLAR ELEV. 2,137.5 ft	**TOTAL DEPTH** 43.8 ft	**NORTHING** 617,218	**EASTING** 957,932	**24 HR.** 8.2
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 11/30/18	**COMP. DATE** 11/30/18	**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
2140										
										2,137.5 GROUND SURFACE 0.0
2135										**ROADWAY EMBANKMENT** BROWN-GREY, CL-SND-SLT, w/WOOD-ROOTS
	2,134.4	3.1	1	3	4	7		M		
2130										
	2,129.4	8.1	WOH	2	2	4		M		
2125										2,124.5 13.0
	2,124.4	13.1	1	4	6	10		M		**RESIDUAL** GREY TO ORANGE BROWN, SAPROLITIC, SL MIC, CL-SND-SLT, w/ROCK FRAGS; MnO SEAMS
2120										
	2,119.4	18.1	1	2	2	4		M		
2115										
	2,114.4	23.1	1	4	7	11		M		
2110										
	2,109.4	28.1	5	11	17	28		M		
2105										2,106.4 31.1
	2,104.4	33.1	17	51	49/0.4	100/0.9				**WEATHERED ROCK** ORANGE-PINK MICACEOUS WEATHERED ROCK
2100										
	2,099.4	38.1	17	83/0.3		100/0.8				
2095										
	2,094.4	43.1	44	56/0.2		100/0.7				2,093.7 43.8
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,093.7 ft IN WEATHERED ROCK

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE #0223 ON SR1534 (NAPLES RD) OVER I-26				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 16+34	**OFFSET** 7 ft RT	**ALIGNMENT** -Y7-	**0 HR.** 16.2
COLLAR ELEV. 2,135.8 ft	**TOTAL DEPTH** 39.6 ft	**NORTHING** 617,204	**EASTING** 957,952	**24 HR.** 8.2
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/03/18	**COMP. DATE** 12/03/18	**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)
2140											
										2,135.8 GROUND SURFACE	0.0
2135										**ROADWAY EMBANKMENT** RED-BROWN, CLAYEY-SAND-SILT, SL MICACEOUS, W/COBBLES	
	2,132.7	3.1	7	3	4	7		M			
2130										2,128.4	7.4
	2,127.7	8.1	2	4	3	7		M		**RESIDUAL** GREY-BROWN TO ORANGE-BROWN, SAPROLITITC, MICACEOUS, CLAYEY-SAND-SILT, W/ROCK FRAGS; MnO SEAMS	
2125											
	2,122.7	13.1	2	3	6	9		M			
2120											
	2,117.7	18.1	WOH	1	2	3		M			
2115											
	2,112.7	23.1	WOH	2	3	5		M			
2110											
	2,107.7	28.1	5	10	11	21		M			
2105											
	2,102.7	33.1	6	12	21	33		M			
2100											
	2,097.7	38.1	7	20	30	50		M		2,096.2	39.6
										Boring Terminated at Elevation 2,096.2 ft IN RESIDUAL	

NCDOT BORE DOUBLE I4400BB_GEO_BRDG_0223_HENDERSON_NAPLESRD.GPJ NC_DOT.GDT 1/15/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-26	**STATION** 16+70	**OFFSET** 50 ft LT	**ALIGNMENT** -Y7-	**0 HR.** NM
COLLAR ELEV. 2,142.1 ft	**TOTAL DEPTH** 56.0 ft	**NORTHING** 617,271	**EASTING** 957,969	**24 HR.** 35.7
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/06/18	**COMP. DATE** 02/09/18	**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)
2145										
	2,142.1	0.0	WOH	4	5	9		M		2,142.1 GROUND SURFACE 0.0
2140										**ROADWAY EMBANKMENT**
	2,138.6	3.5	3	5	5	10		M		2,140.1 Brown, Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots) and Manganese Deposits 2.0
2135										**RESIDUAL**
	2,133.6	8.5	2	2	3	5		W		Brown, Fine Sandy SILT (A-4) with Trace Mica, Manganese Deposits, and Rock Fragments
2130										
	2,128.6	13.5	2	4	5	9		M		
2125										
	2,123.6	18.5	4	7	12	19		M		
2120										
	2,118.6	23.5	10	15	18	33		M		
2115										2,115.1 27.0
	2,113.6	28.5	100/0.3			100/0.3				**WEATHERED ROCK**
2110										Brown (GNEISS)
	2,108.6	33.5	100/0.2			100/0.2				
2105										2,105.1 37.0
	2,103.6	38.5	60/0.1			60/0.1				**CRYSTALLINE ROCK**
	2,102.1	40.0	60/0.0			60/0.0				Brown-Gray (GNEISS)
2100										2,102.1 40.0
2095										
2090										
										2,086.1 56.0
										Boring Terminated at Elevation 2,086.1 ft in GNEISS (Crystalline Rock)

NCDOT BORE DOUBLE I4400BB_GEO_BRDG_0223_HENDERSON_NAPLESRD.GPJ NC_DOT.GDT 1/15/19

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-26	**STATION** 16+70	**OFFSET** 50 ft LT	**ALIGNMENT** -Y7-	**0 HR.** NM
COLLAR ELEV. 2,142.1 ft	**TOTAL DEPTH** 56.0 ft	**NORTHING** 617,271	**EASTING** 957,969	**24 HR.** 35.7
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 02/06/18	**COMP. DATE** 02/09/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE N	**TOTAL RUN** 16.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
2102.1											Begin Coring @ 40.0 ft
	2,102.1	40.0	1.0	*N=60/0.0*	(0.7)	(0.0)					2,102.1 40.0
2100	2,101.1	41.0	5.0	2:54/1.0	67%	0%					
				1:26/1.0	(2.8)	(0.0)					
				1:20/1.0							
				1:44/1.0	56%	0%					
	2,096.1	46.0		1:15/1.0							
2095			5.0	1:55/1.0							
				2:12/1.0	(3.0)	(0.5)					
				1:58/1.0	60%	10%					
				1:30/1.0							
	2,091.1	51.0		1:27/1.0							
2090				2:03/1.0							
			5.0	1:14/1.0	(1.7)	(0.4)					
				1:36/1.0	33%	8%					
				1:54/1.0							
				1:36/1.0							
	2,086.1	56.0		1:42/1.0							2,086.1 56.0

NCDOT CORE SINGLE I4400BB_GEO_BRDG_0223_HENDERSON_NAPLESRD.GPJ NC_DOT.GDT 1/15/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE #0223 ON SR1534 (NAPLES RD) OVER I-26				**GROUND WTR (ft)**
BORING NO. B-168	**STATION** 18+75	**OFFSET** 25 ft LT	**ALIGNMENT** -Y7-	**0 HR.** Dry
COLLAR ELEV. 2,170.9 ft	**TOTAL DEPTH** 33.4 ft	**NORTHING** 617,289	**EASTING** 958,181	**24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/04/18	**COMP. DATE** 12/04/18	**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)
2175										
2170										2,170.9 GROUND SURFACE 0.0
	2,167.6	3.3	3	3	3	6		M		**ROADWAY EMBANKMENT** BROWN, SL MICACEOUS, CLAYEY-SND-SLT, W/ORGANIC PIECES (WOOD, ROOTS) 2,167.1 3.8
2165										**RESIDUAL** BROWN-ORANGE TO GREY, SAPROLITIC, MICACEOUS, CLAYEY-SND-SLT, W/GRAVEL-SIZE ROCK FRAGS, SOME MnO SEAMS
	2,162.6	8.3	3	3	5	8		M		
2160										
	2,157.6	13.3	6	15	22	37		M		
2155										
	2,152.6	18.3	6	8	7	15		M		
2150										
	2,147.6	23.3	16	27	35	62		M		
2145										
	2,142.6	28.3	100/0.5			100/0.5				2,143.0 27.9 **WEATHERED ROCK** GREY WEATHERED AUGEN GNEISS
2140										
	2,137.6	33.3	60/0.1			60/0.1				2,137.6 33.3 2,137.5 33.4 **CRYSTALLINE ROCK** GREY AUGEN GNEISS Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,137.5 ft IN CRYSTALLINE ROCK

NCDOT BORE DOUBLE I4400BB_GEO_BRDG_0223_HENDERSON_NAPLESRD.GPJ NC_DOT.GDT 1/24/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.1	**TIP** I4400BB	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE #0223 ON SR1534 (NAPLES RD) OVER I-26				**GROUND WTR (ft)**
BORING NO. B-169	**STATION** 19+25	**OFFSET** 6 ft RT	**ALIGNMENT** -Y7-	**0 HR.** Dry
COLLAR ELEV. 2,169.5 ft	**TOTAL DEPTH** 38.2 ft	**NORTHING** 617,255	**EASTING** 958,235	**24 HR.** 20.0
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 12/05/18	**COMP. DATE** 12/05/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2170										2,169.5 GROUND SURFACE 0.0
	2,166.1	3.4	4	5	4	9		M		**ROADWAY EMBANKMENT** RED-BROWN, SL MICACEOUS, CLAYEY-SND-SLT, W/ORGANIC PIECES (WOOD, ROOTS) 2,165.6 3.9
2165										**RESIDUAL** GREY, SL MICACEOUS, CLAYEY-SND-SLT, W/GRAVEL-SIZE ROCK FRAGS, MnO SEAMS
	2,161.1	8.4	2	8	8	16		M		
2160										
	2,156.1	13.4	3	9	17	26		M		
2155										
	2,151.1	18.4	9	14	14	28		M		
2150										
	2,146.1	23.4	5	8	7	15		M		
2145										
	2,141.1	28.4	4	9	13	22		M		
2140										
	2,136.1	33.4	9	14	50	64		M		
2135										
	2,131.3	38.2	60/0.0			60/0.0				2,131.3 38.2 **CRYSTALLINE ROCK** GREY, AUGEN GNEISS Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,131.3 ft ON CRYSTALLINE ROCK

NCDOT BORE SINGLE I4400BB_GEO_BRDG_0223_HENDERSON_NAPLESRD.GPJ NC_DOT.GDT 1/24/19