| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | SF-280099 | 1 | 33 |

PROJECT: 17BP.9.R.91 REFERENCE: SF-280099

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

# STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *DAVIDSON*

PROJECT DESCRIPTION *BRIDGE NO. 99 ON SR 1810 (CLODFELTER RD) OVER BRUSHY FORK CREEK BETWEEN SR 1816 AND SR 1806*

SITE DESCRIPTION *STA. 15+62.00 -L-*

## CONTENTS



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DATE *MAY, 2018*


Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES

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## 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.

NORTH CAROLINA LICENSED SEAL 2390 GEOLOGIST BRETT C. SMITH

DocuSigned by:
BE61A49304C542E...

5/18/2018

SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

| PROJECT REFERENCE NO. | SHEET NO. |
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| SF-280099 | 2 |

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

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
### (PAGE 1 OF 2)

## 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<br>A-3 | A-4, A-5<br>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,<br>A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING<br>#10<br>#40<br>#200 | 50 MX<br>30 MX<br>15 MX | 50 MX<br>25 MX | 51 MN<br>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<br>LL<br>PI | —<br>6 MX | | —<br>NP | 40 MX<br>10 MX | 41 MN<br>10 MX | 40 MX<br>11 MN | 41 MN<br>11 MN | 40 MX<br>10 MX | 41 MN<br>10 MX | 40 MX<br>11 MN | 41 MN<br>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 RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE | < 4 | N/A |
| | LOOSE | 4 TO 10 | |
| | MEDIUM DENSE | 10 TO 30 | |
| | DENSE | 30 TO 50 | |
| | VERY DENSE | > 50 | |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT | < 2 | < 0.25 |
| | SOFT | 2 TO 4 | 0.25 TO 0.5 |
| | MEDIUM STIFF | 4 TO 8 | 0.5 TO 1.0 |
| | STIFF | 8 TO 15 | 1 TO 2 |
| | VERY STIFF | 15 TO 30 | 2 TO 4 |
| | HARD | > 30 | > 4 |

## TEXTURE OR GRAIN SIZE

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

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

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

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT | | |
| PLASTIC RANGE (PI) | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| PL — PLASTIC LIMIT | | |
| OM — OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| SL — SHRINKAGE LIMIT | | |
| | - 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 |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | > 10% | > 20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| 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
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

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

## EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q2

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

| PROJECT REFERENCE NO. | SHEET NO. |
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| SF-280099 | 2A |

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

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
### (PAGE 2 OF 2)

## 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 ORIG,NAL 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: BL-2 (N: 793543 E: 1650501)

ELEVATION: 704.42 FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF–280099 | 2B |

*NORTH CAROLINA DEPARTMENT OF TRANSPORTATION*
*DIVISION OF HIGHWAYS*
## *GEOTECHNICAL ENGINEERING UNIT*

# *SUBSURFACE INVESTIGATION*

### *SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 1 OF 2)*

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

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

SURFACE CONDITIONS

**VERY GOOD** Very rough, fresh unweathered surfaces

**GOOD** Rough, slightly weathered, iron stained surfaces

**FAIR** Smooth, moderately weathered and altered surfaces

**POOR** Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

**VERY POOR** Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

DECREASING INTERLOCKING OF ROCK PIECES ⇩

INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities

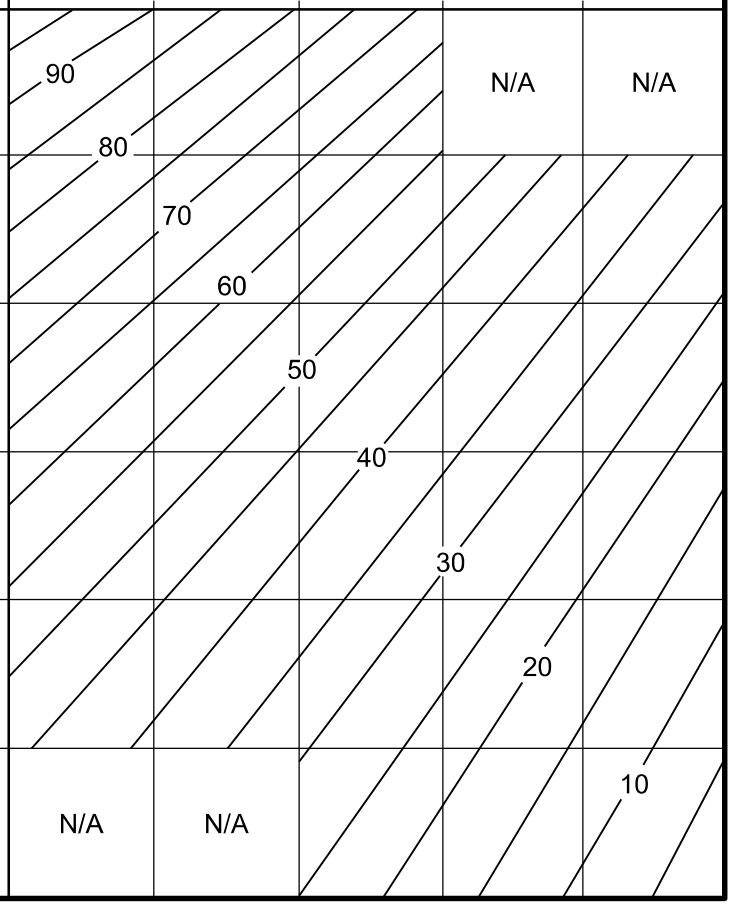
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets

VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets

BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity

DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces

LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes



| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF–280099 | 2C |

*NORTH CAROLINA DEPARTMENT OF TRANSPORTATION*
*DIVISION OF HIGHWAYS*
## *GEOTECHNICAL ENGINEERING UNIT*

# *SUBSURFACE INVESTIGATION*

### *SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)*

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

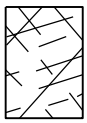
GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

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

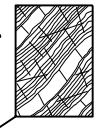


**A.** *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

**B.** *Sandstone with thin interlayers of siltstone*

**C.** *Sandstone and siltstone in similar amounts*

**D.** *Siltstone or silty shale with sandstone layers*



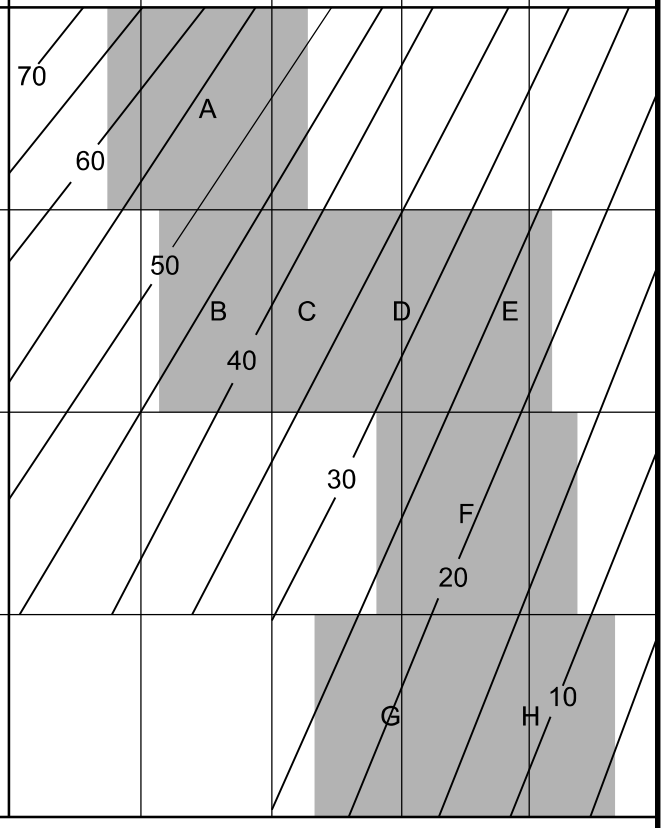
**E.** *Weak siltstone or clayey shale with sandstone layers*

**C, D, E,** and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

**F.** *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

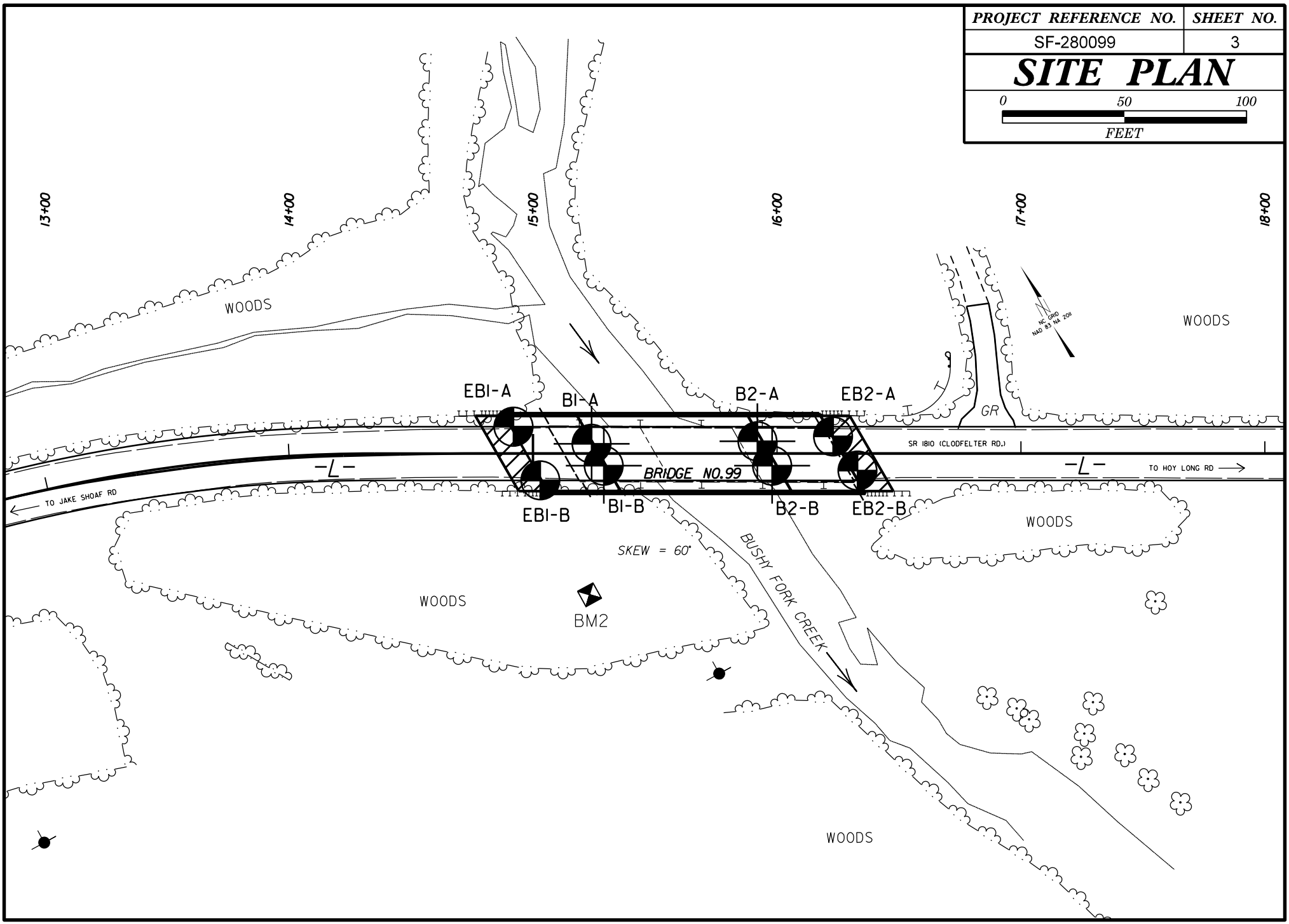
**G.** *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*

**H.** ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***




→ Means deformation after tectonic disturbance

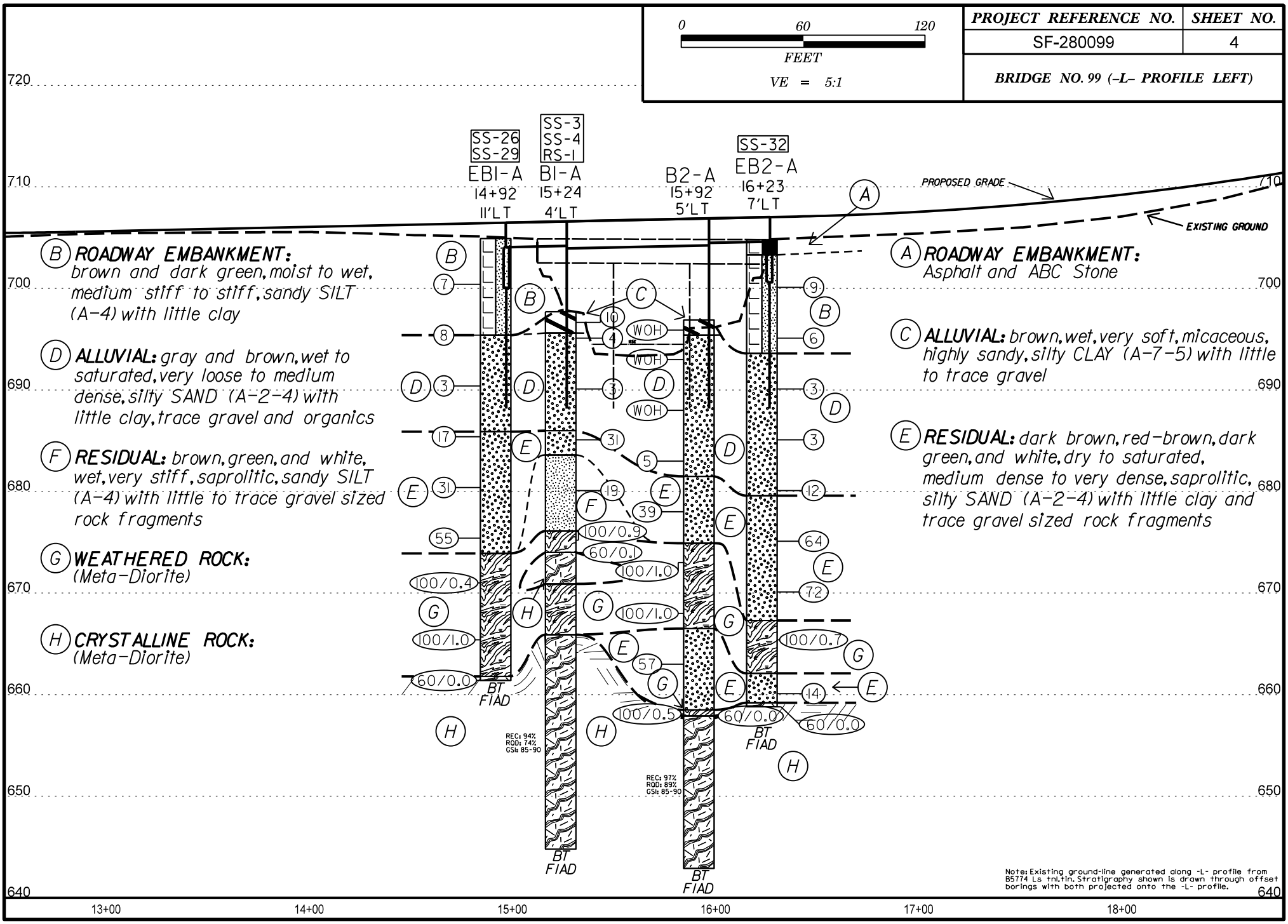
DATE: 8-19-16


PROJECT REFERENCE NO.
SF-280099
SHEET NO.
3
SITE PLAN
0
50
100
FEET
13+00
14+00
15+00
16+00
17+00
18+00
WOODS
WOODS
WOODS
WOODS
WOODS
NC GRID
NAD 83 NA 2011
EB1-A
B1-A
B2-A
EB2-A
GR
SR 1810 (CLODFELTER RD.)
-L-
-L-
BRIDGE NO.99
TO JAKE SHOAF RD
TO HOY LONG RD
EB1-B
B1-B
B2-B
EB2-B
SKEW = 60°
BM2
BUSHY FORK CREEK

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF-280099 | 4 |

BRIDGE NO. 99 (-L- PROFILE LEFT)

0 60 120
FEET
VE = 5:1




**(A) ROADWAY EMBANKMENT:** Asphalt and ABC Stone

**(B) ROADWAY EMBANKMENT:** brown and dark green, moist to wet, medium stiff to stiff, sandy SILT (A-4) with little clay

**(C) ALLUVIAL:** brown, wet, very soft, micaceous, highly sandy, silty CLAY (A-7-5) with little to trace gravel

**(D) ALLUVIAL:** gray and brown, wet to saturated, very loose to medium dense, silty SAND (A-2-4) with little clay, trace gravel and organics

**(E) RESIDUAL:** dark brown, red-brown, dark green, and white, dry to saturated, medium dense to very dense, saprolitic, silty SAND (A-2-4) with little clay and trace gravel sized rock fragments

**(F) RESIDUAL:** brown, green, and white, wet, very stiff, saprolitic, sandy SILT (A-4) with little to trace gravel sized rock fragments

**(G) WEATHERED ROCK:** (Meta-Diorite)

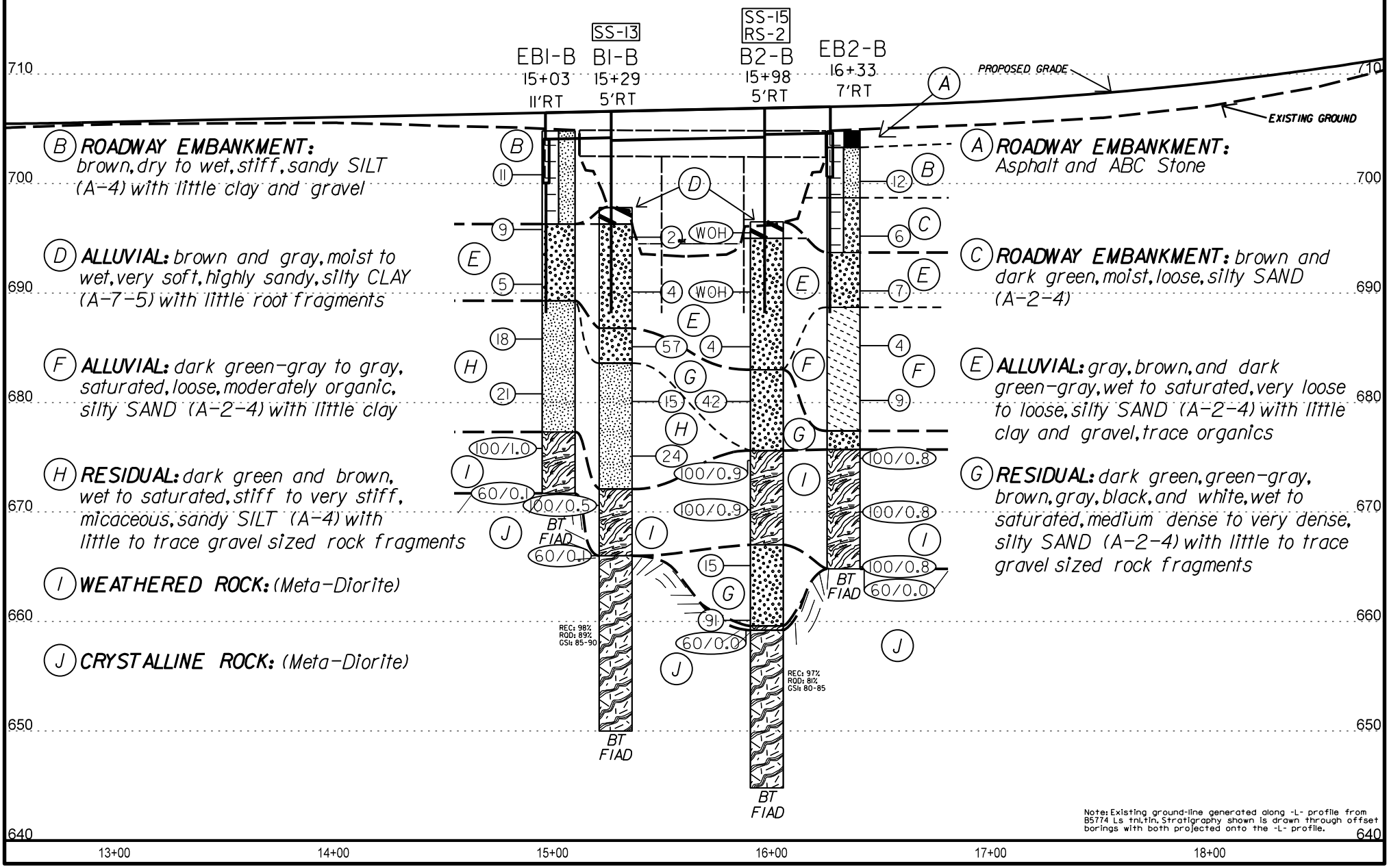
**(H) CRYSTALLINE ROCK:** (Meta-Diorite)

Note: Existing ground-line generated along -L- profile from B5774 Ls tnl.tin. Stratigraphy shown is drawn through offset borings with both projected onto the -L- profile.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF-280099 | 5 |

**BRIDGE NO. 99 (-L- PROFILE RIGHT)**

0 60 120
FEET
VE = 5:1




**(B) ROADWAY EMBANKMENT:** brown, dry to wet, stiff, sandy SILT (A-4) with little clay and gravel

**(D) ALLUVIAL:** brown and gray, moist to wet, very soft, highly sandy, silty CLAY (A-7-5) with little root fragments

**(F) ALLUVIAL:** dark green-gray to gray, saturated, loose, moderately organic, silty SAND (A-2-4) with little clay

**(H) RESIDUAL:** dark green and brown, wet to saturated, stiff to very stiff, micaceous, sandy SILT (A-4) with little to trace gravel sized rock fragments

**(I) WEATHERED ROCK:** (Meta-Diorite)

**(J) CRYSTALLINE ROCK:** (Meta-Diorite)

**(A) ROADWAY EMBANKMENT:** Asphalt and ABC Stone

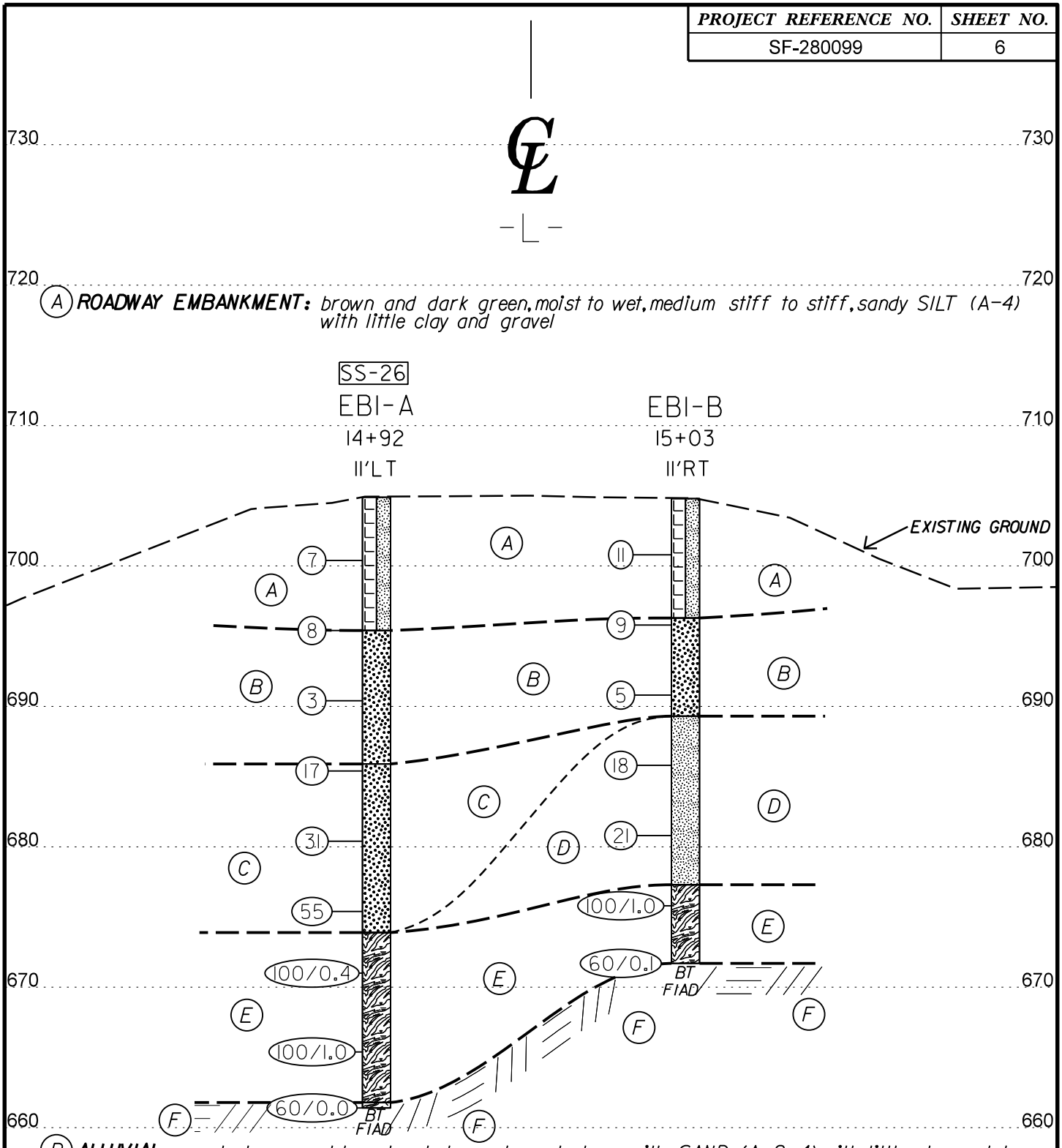
**(C) ROADWAY EMBANKMENT:** brown and dark green, moist, loose, silty SAND (A-2-4)

**(E) ALLUVIAL:** gray, brown, and dark green-gray, wet to saturated, very loose to loose, silty SAND (A-2-4) with little clay and gravel, trace organics

**(G) RESIDUAL:** dark green, green-gray, brown, gray, black, and white, wet to saturated, medium dense to very dense, silty SAND (A-2-4) with little to trace gravel sized rock fragments

Note: Existing ground-line generated along -L- profile from B5774 Ls tnl.tin. Stratigraphy shown is drawn through offset borings with both projected onto the -L- profile.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF-280099 | 6 |




(A) **ROADWAY EMBANKMENT:** *brown and dark green, moist to wet, medium stiff to stiff, sandy SILT (A-4) with little clay and gravel*

(B) **ALLUVIAL:** *gray to brown, wet to saturated, very loose to loose, silty SAND (A-2-4) with little clay and trace organics*

(C) **RESIDUAL:** *dark brown to dark green, dry to moist, medium dense to very dense, saprolitic, silty SAND (A-2-4) with little clay and trace gravel sized rock fragments*

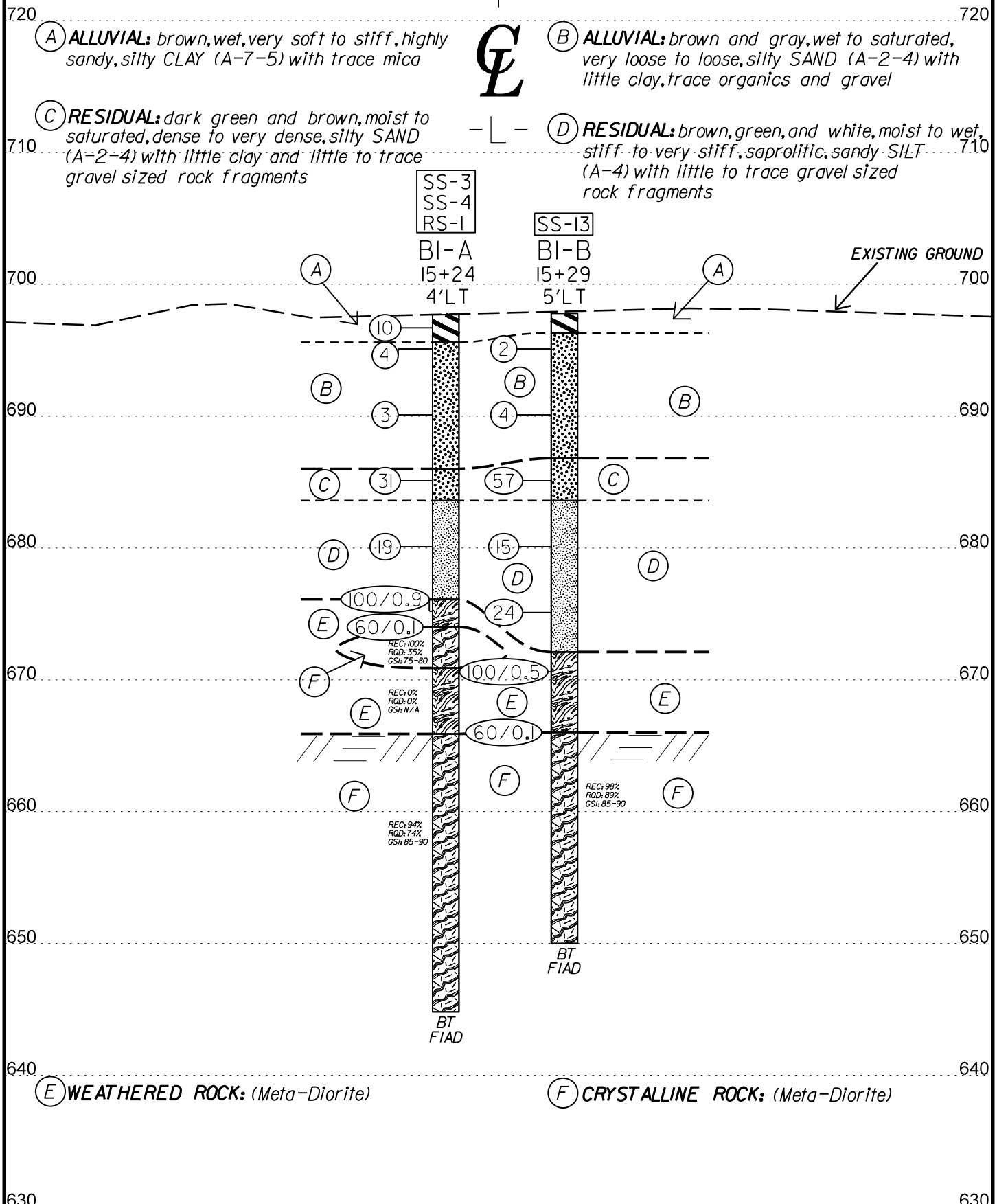
(D) **RESIDUAL:** *brown and dark green, wet to saturated, very stiff, micaceous, sandy SILT (A-4) with little to trace gravel sized rock fragments*

(E) **WEATHERED ROCK:** *(Meta-Diorite)* (F) **CRYSTALLINE ROCK:** *(Meta-Diorite)*

Note: Existing ground-line generated along End Bent 1 from B5774_ls_tnl.tin. Stratigraphy shown is drawn through offset borings with both projected onto the bent line.
Bent skew = 60°

| HORIZ. SCALE (FEET) 0 10 20 | VE = 1:1 | **BRIDGE NO. 99 (END BENT 1)** |
|---|---|---|

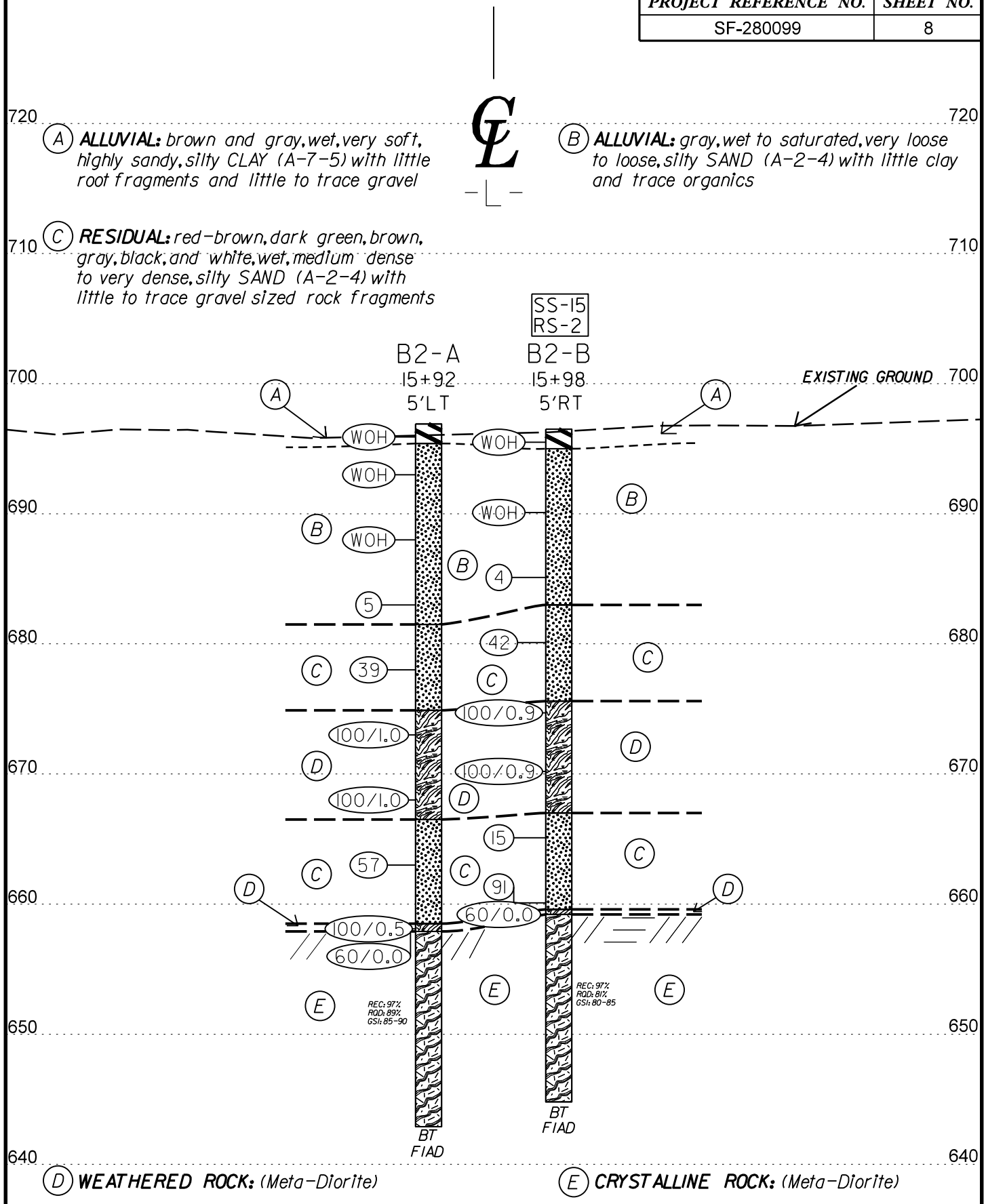
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF-280099 | 7 |




Note: Existing ground-line generated along Bent 1 from B5774_Ls_tnl.tin. Stratigraphy shown is drawn through offset borings with both projected onto the bent line.
Bent skew = 60°

| HORIZ. SCALE (FEET) 0 10 20 | VE = 1:1 | BRIDGE NO. 99 (BENT 1) |
|---|---|---|

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF-280099 | 8 |




Note: Existing ground-line generated along Bent 2 from B5774_Ls_tnl.tin. Stratigraphy shown is drawn through offset borings with both projected onto the bent line.
Bent skew = 60°

| HORIZ. SCALE (FEET) 0 10 20 | VE = 1:1 | BRIDGE NO. 99 (BENT 2) |
|---|---|---|

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| SF-280099 | 9 |

730

(A) **ROADWAY EMBANKMENT:** Asphalt & ABC Stone

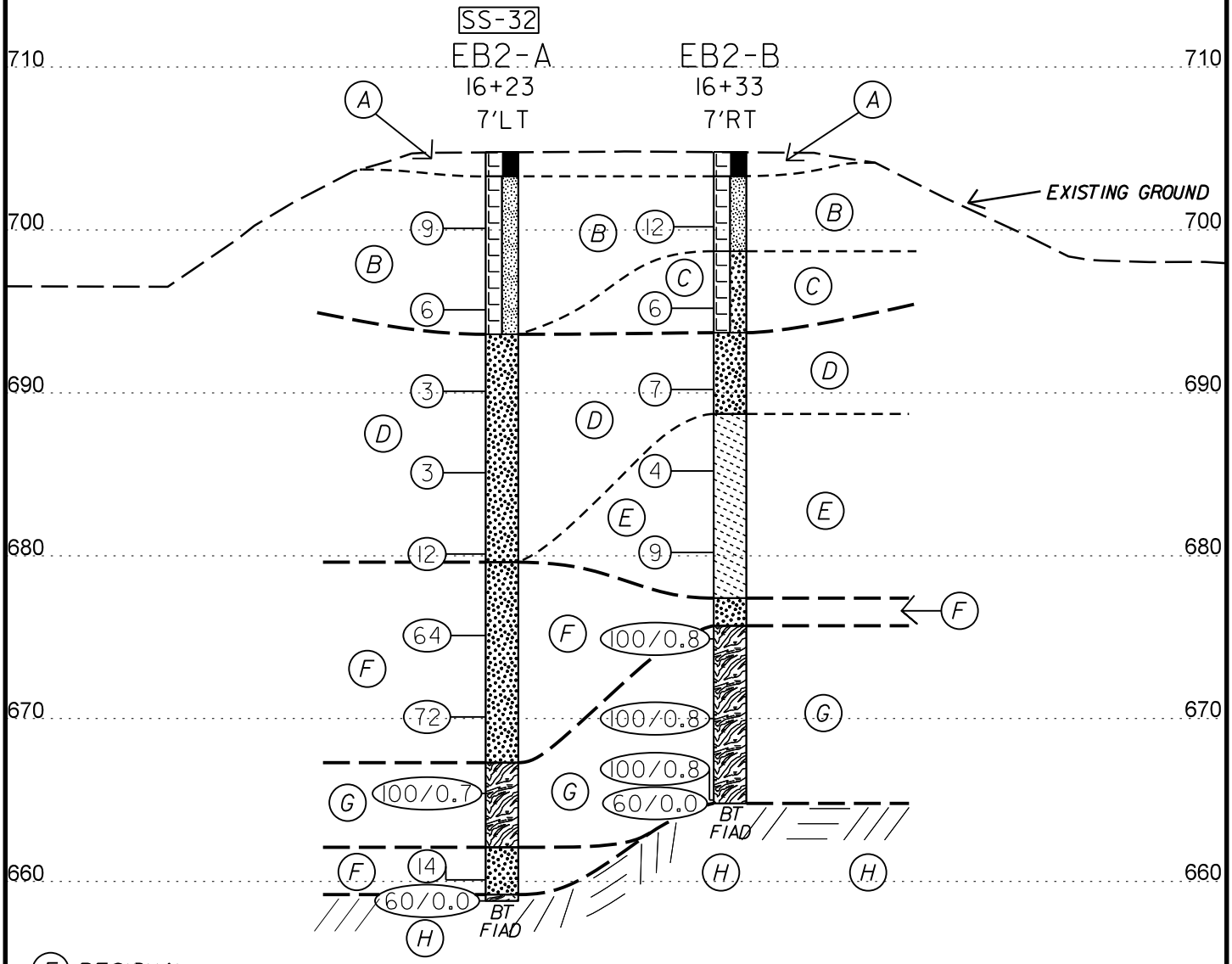
(B) **ROADWAY EMBANKMENT:** brown and dark green, dry to wet, medium stiff to stiff, sandy SILT (A-4) with little clay

(C) **ROADWAY EMBANKMENT:** brown and dark green, moist, loose, silty SAND (A-2-4)

720

(D) **ALLUVIAL:** gray to dark green-gray, saturated, very loose to medium dense, silty SAND (A-2-4) with little clay, trace gravel and organics

(E) **RESIDUAL:** dark green-gray to gray, saturated, loose, moderately organic, silty SAND (A-2-4) with little clay




(F) **RESIDUAL:** dark green and white, wet to saturated, medium dense to very dense, saprolitic, silty SAND (A-2-4) with little clay

(G) **WEATHERED ROCK:** (Meta-Diorite)

(H) **CRYSTALLINE ROCK:** (Meta-Diorite)

Note: Existing ground-line generated along End Bent 2 from B5774_Ls_tnl.tin. Stratigraphy shown is drawn through offset borings with both projected onto the bent line.
Bent skew = 60°

| HORIZ. SCALE (FEET) 0 10 20 | VE = 1:1 | BRIDGE NO. 99 (END BENT 2) |
|---|---|---|

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | |
|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-A | **STATION** 14+92 | **OFFSET** 11 ft LT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 704.9 ft | **TOTAL DEPTH** 43.5 ft | **NORTHING** 793,545 | **EASTING** 1,650,493 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing w/ SPT | **HAMMER TYPE** Automatic |
| **DRILLER** Gonzalez, L. | **START DATE** 04/09/18 | **COMP. DATE** 04/09/18 | **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) |
| 705 | | | | | | | | | | 704.9 GROUND SURFACE 0.0 |
| | 701.4 | 3.5 | 3 | 4 | 3 | 7 | SS-26 | 18% | | **ROADWAY EMBANKMENT** brown and dark green, sandy SILT (A-4) with little clay |
| 700 | | | | | | | | | | |
| | 696.4 | 8.5 | 2 | 3 | 5 | 8 | | W | | 695.4 9.5 |
| 695 | | | | | | | | | | **ALLUVIAL** gray, silty SAND (A-2-4) with little clay |
| | 691.4 | 13.5 | 1 | 1 | 2 | 3 | | Sat. | | |
| 690 | | | | | | | | | | |
| | 686.4 | 18.5 | 1 | 7 | 10 | 17 | | W | | 685.9 19.0 |
| 685 | | | | | | | | | | **RESIDUAL** dark brown to dark green, saprolitic, silty SAND (A-2-4) with little clay and trace gravel sized rock fragments |
| | 681.4 | 23.5 | 8 | 11 | 20 | 31 | SS-29 | 9% | | |
| 680 | | | | | | | | | | |
| | 676.4 | 28.5 | 16 | 27 | 28 | 55 | | D | | |
| 675 | | | | | | | | | | 673.9 31.0 |
| | 671.4 | 33.5 | 100/0.4 | | | 100/0.4 | | | | **WEATHERED ROCK** (Meta-Diorite) |
| 670 | | | | | | | | | | |
| | 666.4 | 38.5 | 34 | 66/0.5 | | 100/1.0 | | | | |
| 665 | | | | | | | | | | |
| | 661.4 | 43.5 | 60/0.0 | | | 60/0.0 | | | | 661.8 43.1<br>661.4 43.5 **CRYSTALLINE ROCK** (Meta-Diorite) |
| | | | | | | | | | | Boring Terminated with Standard Penetration Test Refusal at Elevation 661.4 ft in Crystalline Rock (Meta-Diorite) |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | |
|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-B | **STATION** 15+03 | **OFFSET** 11 ft RT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 704.8 ft | **TOTAL DEPTH** 33.1 ft | **NORTHING** 793,521 | **EASTING** 1,650,492 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing w/ SPT | **HAMMER TYPE** Automatic |
| **DRILLER** Gonzalez, L. | **START DATE** 04/09/18 | **COMP. DATE** 04/09/18 | **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) |
| 705 | | | | | | | | | | 704.8 GROUND SURFACE 0.0 |
| | 701.8 | 3.0 | 4 | 5 | 6 | 11 | | W | | **ROADWAY EMBANKMENT** brown, sandy SILT (A-4) with little clay and gravel |
| 700 | | | | | | | | | | |
| | 696.8 | 8.0 | 3 | 4 | 5 | 9 | | W | | 696.3 8.5 |
| 695 | | | | | | | | | | **ALLUVIAL** gray to brown, silty SAND (A-2-4) with little clay and trace organics |
| | 691.8 | 13.0 | 1 | 2 | 3 | 5 | | W | | |
| 690 | | | | | | | | | | 689.3 15.5 |
| | 686.8 | 18.0 | 5 | 8 | 10 | 18 | | W | | **RESIDUAL** brown and dark green, micaceous, sandy SILT (A-4) with little to trace gravel sized rock fragments |
| 685 | | | | | | | | | | |
| | 681.8 | 23.0 | 11 | 11 | 10 | 21 | | Sat. | | |
| 680 | | | | | | | | | | |
| | 676.8 | 28.0 | 43 | 57/0.5 | | 100/1.0 | | | | 677.3 27.5 **WEATHERED ROCK** (Meta-Diorite) |
| 675 | | | | | | | | | | |
| | 671.8 | 33.0 | 60/0.1 | | | 60/0.1 | | | | 671.7 33.1 **CRYSTALLINE ROCK** (Meta-Diorite) Boring Terminated with Standard Penetration Test Refusal at Elevation 671.7 ft on Crystalline Rock (Meta-Diorite) |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-A | **STATION** 15+24 | **OFFSET** 4 ft LT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 697.7 ft | **TOTAL DEPTH** 52.9 ft | **NORTHING** 793,524 | **EASTING** 1,650,517 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | **HAMMER TYPE** Automatic | |
| **DRILLER** Gonzalez, L. | **START DATE** 04/02/18 | **COMP. DATE** 04/02/18 | **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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700 | | | | | | | | | | | |
| | 697.7 | 0.0 | | | | | | | | 697.7 GROUND SURFACE | 0.0 |
| | 696.1 | 1.6 | WOH | WOH | 10 | Concrete 10 | | W | | **ALLUVIAL** | |
| 695 | | | 17 | 3 | 1 | 4 | | Sat. | | 695.6 brown, highly sandy, silty CLAY (A-7-5) with trace mica | 2.1 |
| | | | | | | | | | | (Toe of concrete abutment from 1.4-2.1 ft) | |
| | 691.1 | 6.6 | | | | | | | | brown and gray, silty SAND (A-2-4) with little clay and trace organics | |
| 690 | | | WOH | 1 | 2 | 3 | SS-3 | 24% | | | |
| | 686.1 | 11.6 | | | | | | | | 686.0 | 11.7 |
| 685 | | | 7 | 13 | 18 | 31 | SS-4 | 11% | | **RESIDUAL** | |
| | | | | | | | | | | 683.6 green and brown, silty SAND (A-2-4) with little clay | 14.1 |
| | 681.1 | 16.6 | | | | | | | | brown, green, and white, saprolitic, sandy SILT (A-4), with little to trace gravel sized rock fragments | |
| 680 | | | 6 | 8 | 11 | 19 | | W | | | |
| | 676.1 | 21.6 | | | | | | | | 676.1 | 21.6 |
| 675 | | | 20 | 80/0.4 | | | | | | **WEATHERED ROCK** | |
| | 674.1 | 23.6 | 60/0.1 | | | 100/0.9 60/0.1 | | | | 674.0 (Meta-Diorite) | 23.7 |
| | | | | | | | | | | **CRYSTALLINE ROCK** | |
| | | | | | | | | | | (Meta-Diorite) | |
| | | | | | | | | | | 670.9 REC: 100% RQD: 35% GSI: 75-80 | 26.8 |
| 670 | | | | | | | | | | **WEATHERED ROCK** | |
| | | | | | | | | | | (Meta-Diorite) | |
| | | | | | | | | | | REC: 0% RQD: 0% GSI: N/A | |
| | | | | | | | | | | 665.9 | 31.8 |
| 665 | | | | | | | | | | **CRYSTALLINE ROCK** | |
| | | | | | | | RS-1 | | | (Meta-Diorite) | |
| | | | | | | | | | | REC: 94% RQD: 74% GSI: 85-90 | |
| 660 | | | | | | | | | | | |
| 655 | | | | | | | | | | | |
| 650 | | | | | | | | | | | |
| 645 | | | | | | | | | | 644.8 | 52.9 |
| | | | | | | | | | | Boring Terminated at Elevation 644.8 ft in Crystalline Rock (Meta-Diorite) | |
| | | | | | | | | | | - Boring drilled through existing bridge deck. | |
| | | | | | | | | | | - Casing advancer refusal at 23.6 feet. | |

# GEOTECHNICAL BORING REPORT
# CORE LOG

| | | | |
|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-A | **STATION** 15+24 | **OFFSET** 4 ft LT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 697.7 ft | **TOTAL DEPTH** 52.9 ft | **NORTHING** 793,524 | **EASTING** 1,650,517 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | **HAMMER TYPE** Automatic |
| **DRILLER** Gonzalez, L. | **START DATE** 04/02/18 | **COMP. DATE** 04/02/18 | **SURFACE WATER DEPTH** N/A |
| **CORE SIZE** NQ-2 | **TOTAL RUN** 29.2 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) |
| 674 | | | | | | | | | | | Begin Coring @ 23.7 ft |
| | 674.0 | 23.7 | 4.2 | 0:25/0.2<br>1:59/1.0<br>2:42/1.0<br>3:22/1.0 | (3.1)<br>74% | (1.1)<br>26% | | (3.1)<br>100% | (1.1)<br>35% | | 674.0 / 23.7 **CRYSTALLINE ROCK**<br>green-gray, gray, and white, slight weathering, hard, close fracture spacing, META-DIORITE. |
| 670 | 669.8 | 27.9 | | 0:58/1.0 | | | | | | | 670.9 / 26.8 GSI = 75-80 |
| | | | 5.0 | 1:31/1.0<br>1:07/1.0<br>1:55/1.0<br>2:05/1.0 | (0.4)<br>8% | (0.4)<br>8% | | (0.0)<br>0% | (0.0)<br>0% | | **WEATHERED ROCK**<br>No Recovery - Interpreted as Weathered Rock (Meta-Diorite) |
| 665 | 664.8 | 32.9 | | 2:00/1.0 | | | | | | | 665.9 / 31.8 |
| | 663.8 | 33.9 | 1.0 | 2:16/1.0 | (1.0)<br>100% | (0.7)<br>70% | RS-1 | (19.8)<br>94% | (15.6)<br>74% | | **CRYSTALLINE ROCK**<br>green-gray, gray, black, and white, moderate to fresh weathering, hard, close to wide fracture spacing, META-DIORITE.<br>GSI = 85-90 |
| | | | 4.0 | 1:29/1.0<br>1:34/1.0<br>1:43/1.0<br>1:48/1.0 | (3.7)<br>93% | (2.6)<br>65% | | | | | |
| 660 | 659.8 | 37.9 | | | | | | | | | |
| | | | 5.0 | 1:19/1.0<br>1:39/1.0<br>1:29/1.0<br>1:41/1.0 | (5.0)<br>100% | (3.5)<br>70% | | | | | |
| 655 | 654.8 | 42.9 | | 1:59/1.0 | | | | | | | |
| | | | 5.0 | 1:36/1.0<br>1:55/1.0<br>2:02/1.0<br>1:27/1.0 | (5.0)<br>100% | (3.6)<br>72% | | | | | |
| 650 | 649.8 | 47.9 | | 1:54/1.0 | | | | | | | |
| | | | 5.0 | 1:42/1.0<br>1:35/1.0<br>1:37/1.0<br>1:55/1.0 | (4.7)<br>94% | (4.7)<br>94% | | | | | |
| 645 | 644.8 | 52.9 | | 1:40/1.0 | | | | | | | 644.8 / 52.9 |
| | | | | | | | | | | | Boring Terminated at Elevation 644.8 ft in Crystalline Rock (Meta-Diorite)<br><br>- Boring drilled through existing bridge deck.<br>- Casing advancer refusal at 23.6 feet. |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-B | **STATION** 15+29 | **OFFSET** 5 ft RT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 697.8 ft | **TOTAL DEPTH** 47.8 ft | **NORTHING** 793,513 | **EASTING** 1,650,517 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | | **HAMMER TYPE** Automatic |
| **DRILLER** Gonzalez, L. | **START DATE** 04/04/18 | **COMP. DATE** 04/04/18 | **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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700 | | | | | | | | | | | |
| | | | | | | | | | | 697.8 GROUND SURFACE | 0.0 |
| | 696.1 | 1.7 | | | | | | | | 696.3 **ALLUVIAL** | 1.5 |
| 695 | | | 1 | 1 | 1 | 2 | | Sat. | | brown, highly sandy, silty CLAY (A-7-5) (Toe of concrete abutment from about 1.0 to 1.5 ft) | |
| | 691.1 | 6.7 | | | | | | | | brown to gray, silty SAND (A-2-4) with little to trace gravel | |
| 690 | | | 1 | 2 | 2 | 4 | | Sat. | | | |
| | 686.1 | 11.7 | | | | | | | | 686.8 | 11.0 |
| 685 | | | 27 | 26 | 31 | 57 | | Sat. | | **RESIDUAL** dark green, silty SAND (A-2-4) with little to trace gravel sized rock fragments | |
| | 681.1 | 16.7 | | | | | | | | 683.6 dark green to brown, sandy SILT (A-4) | 14.2 |
| 680 | | | 4 | 4 | 11 | 15 | SS-13 | 24% | | | |
| | 676.1 | 21.7 | | | | | | | | | |
| 675 | | | 6 | 10 | 14 | 24 | | W | | | |
| | 671.1 | 26.7 | | | | | | | | 672.1 | 25.7 |
| 670 | | | 100/0.5 | | | 100/0.5 | | | | **WEATHERED ROCK** (Meta-Diorite) | |
| | 666.1 | 31.7 | | | | | | | | 666.0 | 31.8 |
| 665 | | | 60/0.1 | | | 60/0.1 | | | | **CRYSTALLINE ROCK** (Meta-Diorite) REC: 98% RQD: 89% GSI: 85-90 | |
| 660 | | | | | | | | | | | |
| 655 | | | | | | | | | | | |
| 650 | | | | | | | | | | 650.0 | 47.8 |
| | | | | | | | | | | Boring Terminated at Elevation 650.0 ft in Crystalline Rock (Meta-Diorite) | |
| | | | | | | | | | | - Boring drilled through existing bridge deck. | |

# GEOTECHNICAL BORING REPORT
# CORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-B | **STATION** 15+29 | **OFFSET** 5 ft RT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 697.8 ft | **TOTAL DEPTH** 47.8 ft | **NORTHING** 793,513 | **EASTING** 1,650,517 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | **HAMMER TYPE** Automatic | |
| **DRILLER** Gonzalez, L. | **START DATE** 04/04/18 | **COMP. DATE** 04/04/18 | **SURFACE WATER DEPTH** N/A | |
| **CORE SIZE** NQ-2 | **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) |
| 666 | | | | | | | | | | | Begin Coring @ 31.8 ft |
| 665 | 666.0 / 665.0 | 31.8 / 32.8 | 1.0 | 1:50/1.0 | (0.8) 80% | (0.5) 50% | | (15.7) 98% | (14.2) 89% | | 666.0 **CRYSTALLINE ROCK** 31.8<br>green-gray, gray, black, and white, moderate to fresh weathering, hard, v. close to wide fracture spacing, META-DIORITE.<br>GSI = 85-90 |
| | | | 5.0 | 1:34/1.0<br>2:03/1.0<br>2:19/1.0<br>2:10/1.0<br>2:33/1.0 | (4.9) 98% | (4.0) 80% | | | | | |
| 660 | 660.0 | 37.8 | 5.0 | 2:26/1.0<br>2:55/1.0<br>3:11/1.0<br>3:09/1.0<br>2:51/1.0 | (5.0) 100% | (5.0) 100% | | | | | |
| 655 | 655.0 | 42.8 | 5.0 | 2:09/1.0<br>3:21/1.0<br>3:38/1.0<br>2:43/1.0<br>2:22/1.0 | (5.0) 100% | (4.7) 94% | | | | | |
| 650 | 650.0 | 47.8 | | | | | | | | | 650.0 47.8<br>Boring Terminated at Elevation 650.0 ft in Crystalline Rock (Meta-Diorite)<br>- Boring drilled through existing bridge deck. |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B2-A | **STATION** 15+92 | **OFFSET** 5 ft LT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 696.9 ft | **TOTAL DEPTH** 54.0 ft | **NORTHING** 793,492 | **EASTING** 1,650,577 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | **HAMMER TYPE** Automatic | |
| **DRILLER** Gonzalez, L. | **START DATE** 04/03/18 | **COMP. DATE** 04/03/18 | **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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700 | | | | | | | | | | | |
| | 696.9 | 0.0 | | | | | | | | 696.9 GROUND SURFACE | 0.0 |
| 695 | | | WOH | WOH | WOH | 0 | | W | | 695.4 **ALLUVIAL** brown, micaceous, highly sandy, silty CLAY (A-7-5) with little to trace gravel | 1.5 |
| | 694.0 | 2.9 | WOH | WOH | WOH | 0 | | W | | gray, silty SAND (A-2-4) with little clay and trace organics | |
| 690 | | | | | | | | | | | |
| | 689.0 | 7.9 | 1 | WOH | WOH | 0 | | Sat. | | | |
| 685 | | | | | | | | | | | |
| | 684.0 | 12.9 | 1 | 1 | 4 | 5 | | Sat. | | 681.5 **RESIDUAL** red-brown, silty SAND (A-2-4) | 15.4 |
| 680 | | | | | | | | | | | |
| | 679.0 | 17.9 | 7 | 10 | 29 | 39 | | W | | | |
| 675 | | | | | | | | | | 674.9 **WEATHERED ROCK** (Meta-Diorite) | 22.0 |
| | 674.0 | 22.9 | 38 | 62/0.5 | | 100/1.0 | | | | | |
| 670 | | | | | | | | | | | |
| | 669.0 | 27.9 | 30 | 37 | 63/0.5 | 100/1.0 | | | | | |
| 665 | | | | | | | | | | 666.5 **RESIDUAL** brown, black and white, silty SAND (A-2-4) | 30.4 |
| | 664.0 | 32.9 | 12 | 25 | 32 | 57 | | W | | | |
| 660 | | | | | | | | | | | |
| | 659.0 | 37.9 | | | | | | | | 658.5 | 38.4 |
| | 657.9 | 39.0 | 8 | 100/0.5 | | 100/0.5 - 60/0.0 | | | | 657.9 **WEATHERED ROCK** (Meta-Diorite) | 39.0 |
| 655 | | | 60/0.0 | | | | | | | **CRYSTALLINE ROCK** (Meta-Diorite) REC: 97% RQD: 89% GSI: 85-90 | |
| 650 | | | | | | | | | | | |
| 645 | | | | | | | | | | 642.9 | 54.0 |
| | | | | | | | | | | Boring Terminated at Elevation 642.9 ft in Crystalline Rock (Meta-Diorite) | |

- Boring drilled through existing bridge deck.
- Casing advancer refusal at 39.0 feet.

# GEOTECHNICAL BORING REPORT
# CORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B2-A | **STATION** 15+92 | **OFFSET** 5 ft LT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 696.9 ft | **TOTAL DEPTH** 54.0 ft | **NORTHING** 793,492 | **EASTING** 1,650,577 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | **HAMMER TYPE** Automatic | |
| **DRILLER** Gonzalez, L. | **START DATE** 04/03/18 | **COMP. DATE** 04/03/18 | **SURFACE WATER DEPTH** N/A | |
| **CORE SIZE** NQ-2 | **TOTAL RUN** 15.0 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 657.9 | | | | | | | | | | | Begin Coring @ 39.0 ft |
| 655 | 657.9 | 39.0 | 5.0 | *N=60/0.0*<br>2:48/1.0<br>2:26/1.0<br>2:11/1.0<br>2:48/1.0<br>2:53/1.0 | (5.0)<br>100% | (3.9)<br>78% | | (14.6)<br>97% | (13.4)<br>89% | | 657.9 **CRYSTALLINE ROCK** 39.0<br>dark geen, light to dark gray, black, and white, slight to fresh weathering, hard, close to mod. close fracture spacing, META-DIORITE.<br>GSI = 85-90 |
| 650 | 652.9 | 44.0 | 5.0 | 3:02/1.0<br>3:05/1.0<br>2:33/1.0<br>2:46/1.0<br>2:57/1.0 | (5.0)<br>100% | (5.0)<br>100% | | | | | |
| 645 | 647.9 | 49.0 | 4.4 | 2:58/1.0<br>3:20/1.0<br>2:50/1.0<br>2:38/1.0<br>2:05/0.4 | (4.1)<br>93% | (4.0)<br>91% | | | | | |
| | 643.5<br>642.9 | 53.4<br>54.0 | 0.6 | 1:59/0.6 | (0.5)<br>83% | (0.5)<br>83% | | | | | 642.9 54.0<br>Boring Terminated at Elevation 642.9 ft in Crystalline Rock (Meta-Diorite)<br><br>- Boring drilled through existing bridge deck.<br>- Casing advancer refusal at 39.0 feet. |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B2-B | **STATION** 15+98 | **OFFSET** 5 ft RT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 696.5 ft | **TOTAL DEPTH** 51.7 ft | **NORTHING** 793,480 | **EASTING** 1,650,578 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | | **HAMMER TYPE** Automatic |
| **DRILLER** Gonzalez, L. | **START DATE** 04/05/18 | **COMP. DATE** 04/05/18 | **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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700 | | | | | | | | | | | |
| | 696.5 | 0.0 | | | | | | | | 696.5 GROUND SURFACE | 0.0 |
| 695 | | | WOH | WOH | WOH | 0 | SS-15 | 29% | | 695.0 **ALLUVIAL** brown and gray, highly sandy, silty CLAY (A-7-5) with little root fragments | 1.5 |
| | 691.1 | 5.4 | | | | | | | | gray, silty SAND (A-2-4) with little clay and trace organics | |
| 690 | | | WOH | WOH | WOH | 0 | | Sat. | | | |
| | 686.1 | 10.4 | | | | | | | | | |
| 685 | | | 2 | 2 | 2 | 4 | | Sat. | | | |
| | 681.1 | 15.4 | | | | | | | | 683.0 | 13.5 |
| 680 | | | 10 | 18 | 24 | 42 | | W | | **RESIDUAL** dark green and white, silty SAND (A-2-4) | |
| | 676.1 | 20.4 | | | | | | | | 675.6 | 20.9 |
| 675 | | | 7 | 43 | 57/0.4 | 100/0.9 | | | | **WEATHERED ROCK** (Meta-Diorite) | |
| | 671.1 | 25.4 | | | | | | | | | |
| 670 | | | 58 | 42/0.4 | | 100/0.9 | | | | | |
| | 666.1 | 30.4 | | | | | | | | 667.0 | 29.5 |
| 665 | | | 6 | 6 | 9 | 15 | | W | | **RESIDUAL** dark green, gray to dark gray, brown, black, and white, silty SAND (A-2-4) with little to trace gravel sized rock fragments | |
| | 661.1 | 35.4 | | | | | | | | | |
| 660 | | | 13 | 30 | 61 | 91 | | W | | 659.6 | 36.9 |
| | 659.2 | 37.3 | 60/0.0 | | | 60/0.0 | | | | 659.2 **WEATHERED ROCK** (Meta-Diorite) | 37.3 |
| 655 | | | | | | | RS-2 | | | **CRYSTALLINE ROCK** (Meta-Diorite) REC: 97% RQD: 81% GSI: 80-85 | |
| 650 | | | | | | | | | | | |
| 645 | | | | | | | | | | 644.8 | 51.7 |
| | | | | | | | | | | Boring Terminated at Elevation 644.8 ft in Crystalline Rock (Meta-Diorite) - Boring drilled through existing bridge deck. - Casing advancer refusal at 37.3 feet. | |

# GEOTECHNICAL BORING REPORT
# CORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** B2-B | **STATION** 15+98 | **OFFSET** 5 ft RT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 696.5 ft | **TOTAL DEPTH** 51.7 ft | **NORTHING** 793,480 | **EASTING** 1,650,578 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing W/SPT & Core | **HAMMER TYPE** Automatic | |
| **DRILLER** Gonzalez, L. | **START DATE** 04/05/18 | **COMP. DATE** 04/05/18 | **SURFACE WATER DEPTH** N/A | |
| **CORE SIZE** NQ-2 | **TOTAL RUN** 14.4 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 659.2 | | | | | | | | | | | Begin Coring @ 37.3 ft |
| | 659.2 | 37.3 | 4.4 | *N=60/0.0*<br>1:22/0.4<br>2:57/1.0<br>2:04/1.0<br>2:37/1.0 | (4.3)<br>98% | (3.6)<br>82% | | (13.9)<br>97% | (11.7)<br>81% | | 659.2 **CRYSTALLINE ROCK** 37.3<br>dark green, gray, and white, moderate to fresh weathering, hard, v. close to mod. close fracture spacing, META-DIORITE.<br>GSI = 80-85 |
| 655 | 654.8 | 41.7 | | 2:28/1.0 | | | | | | | |
| | 652.6 | 43.9 | 2.2 | 2:18/1.0<br>2:55/1.0 | (2.0)<br>91% | (0.8)<br>36% | RS-2 | | | | |
| | | | 2.8 | 1:25/0.2<br>1:34/0.8<br>2:27/1.0 | (2.8)<br>100% | (2.8)<br>100% | | | | | |
| 650 | 649.8 | 46.7 | | 2:49/1.0 | | | | | | | |
| | | | 5.0 | 2:39/1.0<br>2:55/1.0<br>3:16/1.0<br>3:38/1.0 | (4.8)<br>96% | (4.5)<br>90% | | | | | |
| 645 | 644.8 | 51.7 | | 2:57/1.0 | | | | | | | 644.8 51.7<br>Boring Terminated at Elevation 644.8 ft in Crystalline Rock (Meta-Diorite)<br><br>- Boring drilled through existing bridge deck.<br>- Casing advancer refusal at 37.3 feet. |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | | |
|---|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. | |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 16+23 | **OFFSET** 7 ft LT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 704.8 ft | **TOTAL DEPTH** 46.0 ft | **NORTHING** 793,479 | **EASTING** 1,650,606 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing w/ SPT | **HAMMER TYPE** Automatic | |
| **DRILLER** Gonzalez, L. | **START DATE** 04/09/18 | **COMP. DATE** 04/09/18 | **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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 705 | | | | | | | | | | 704.8 GROUND SURFACE | 0.0 |
| | | | | | | | | | | 703.3 **ROADWAY EMBANKMENT** Asphalt and ABC Stone | 1.5 |
| 700 | 701.1 | 3.7 | 2 | 3 | 6 | 9 | | W | | brown and dark green, sandy SILT (A-4) with little clay | |
| 695 | 696.1 | 8.7 | 2 | 3 | 3 | 6 | SS-32 | 15% | | 693.6 | 11.2 |
| 690 | 691.1 | 13.7 | WOH | WOH | 3 | 3 | | Sat. | | **ALLUVIAL** gray, silty SAND (A-2-4) with little clay, trace gravel and organics | |
| 685 | 686.1 | 18.7 | 1 | 1 | 2 | 3 | | | | | |
| 680 | 681.1 | 23.7 | WOH | 3 | 9 | 12 | | Sat. | | 679.6 | 25.2 |
| 675 | 676.1 | 28.7 | 12 | 30 | 34 | 64 | | Sat. | | **RESIDUAL** dark green and white, saprolitic, silty SAND (A-2-4) | |
| 670 | 671.1 | 33.7 | 23 | 30 | 42 | 72 | | W | | 667.3 | 37.5 |
| 665 | 666.1 | 38.7 | 70 | 30/0.2 | | 100/0.7 | | | | **WEATHERED ROCK** (Meta-Diorite) | |
| 660 | 661.1 | 43.7 | 17 | 7 | 7 | 14 | | W | | 662.1 | 42.7 |
| | 658.8 | 46.0 | 60/0.0 | | | 60/0.0 | | | | **RESIDUAL** dark green, saprolitic, silty SAND (A-2-4) with little clay | |
| | | | | | | | | | | 659.2 | 45.6 |
| | | | | | | | | | | 658.8 **CRYSTALLINE ROCK** (Meta-Diorite) | 46.0 |
| | | | | | | | | | | Boring Terminated with Standard Penetration Test Refusal at Elevation 658.8 ft in Crystalline Rock (Meta-Diorite) | |
| | | | | | | | | | | - Casing advancer refusal at 46.0 feet. | |

# GEOTECHNICAL BORING REPORT
# BORE LOG

| | | | |
|---|---|---|---|
| **WBS** 17BP.9.R.91 | **TIP** SF-280099 | **COUNTY** DAVIDSON | **GEOLOGIST** Shipman, M. |
| **SITE DESCRIPTION** Bridge No. 99 on SR 1810 (Clodfelter Rd.) over Brushy Fork Creek | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-B | **STATION** 16+33 | **OFFSET** 7 ft RT | **ALIGNMENT** -L- | **0 HR.** N/A |
| **COLLAR ELEV.** 704.8 ft | **TOTAL DEPTH** 40.0 ft | **NORTHING** 793,462 | **EASTING** 1,650,608 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** SUM3123 CME-550X 95% 11/30/2017 | | **DRILL METHOD** NW Casing w/ SPT | **HAMMER TYPE** Automatic |
| **DRILLER** Gonzalez, L. | **START DATE** 04/06/18 | **COMP. DATE** 04/06/18 | **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) |
| 705 | | | | | | | | | | 704.8 GROUND SURFACE 0.0 |
| | | | | | | | | | | 703.3 **ROADWAY EMBANKMENT** Asphalt and ABC Stone 1.5 |
| 700 | 701.2 | 3.6 | 1 | 4 | 8 | 12 | | D | | brown, sandy SILT (A-4) with little clay |
| | | | | | | | | | | 698.7 6.1 |
| 695 | 696.2 | 8.6 | 3 | 3 | 3 | 6 | | M | | brown and dark green, silty SAND (A-2-4) |
| | | | | | | | | | | 693.7 11.1 |
| 690 | 691.2 | 13.6 | 1 | 4 | 3 | 7 | | Sat. | | **ALLUVIAL** dark green-gray, silty SAND (A-2-4) with little clay |
| | | | | | | | | | | 688.7 16.1 |
| 685 | 686.2 | 18.6 | 1 | 2 | 2 | 4 | | Sat. | | dark green-gray to gray, moderately organic, silty SAND (A-2-4) with little clay |
| 680 | 681.2 | 23.6 | 1 | 2 | 7 | 9 | | Sat. | | |
| | | | | | | | | | | 677.4 27.4 |
| 675 | 676.2 | 28.6 | 22 | 66 | 34/0.3 | 100/0.8 | | | | **RESIDUAL** 675.7 dark green, silty SAND (A-2-4) 29.1 |
| | | | | | | | | | | **WEATHERED ROCK** (Meta-Diorite) |
| 670 | 671.3 | 33.5 | 26 | 50 | 50/0.3 | 100/0.8 | | | | |
| 665 | 666.3 | 38.5 | 43 | 16 | 84/0.3 | 100/0.8 | | | | |
| | 664.8 | 40.0 | 60/0.0 | | | 60/0.0 | | | | 664.8 40.0 |
| | | | | | | | | | | **CRYSTALLINE ROCK** (Meta-Diorite) Boring Terminated with Standard Penetration Test Refusal at Elevation 664.8 ft on Crystalline Rock (Meta-Diorite) |
| | | | | | | | | | | - Casing advancer refusal at 40.0 feet. |

M & T Form 503

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAY
## MATERIALS & TESTS UNIT
## SOILS LABORATORY

**T. I. P. No.** SF-280099

**REPORT ON SAMPLES OF** Bridge 99 on SR 1810 over Brushy Fork Creek

| | | | | | |
|---|---|---|---|---|---|
| **Project** | 17BP.9.R.91 | **County** | Davidson | **Owner** | B. Worley, OG |
| **Date: Sampled** | 4/2/18 to 4/9/18 | **Received** | 4/20/18 | **Reported** | 4/27/18 |
| **Sampled from** | Roadway and Structure | | **By** | M. Shipman | |
| **Submitted by** | B. Worley | | | 2008 | **Standard Specifications** |

4/27/18

### TEST RESULTS

| Proj. Sample No. | | SS-3 | SS-4 | SS-13 | SS-15 | SS-26 | SS-29 |
|---|---|---|---|---|---|---|---|
| Boring No. | | B1-A | B1-A | B1-B | B2-B | EB1-A | EB1-A |
| Retained #4 Sieve | % | 0 | 3 | 0 | 0 | 1 | 5 |
| Passing #10 Sieve | % | 100 | 89 | 100 | 100 | 97 | 81 |
| Passing #40 Sieve | % | 85 | 72 | 93 | 98 | 86 | 61 |
| Passing #200 Sieve | % | 26 | 35 | 54 | 66 | 46 | 31 |

### MINUS NO. 10 FRACTION

| SOIL MORTAR - 100% | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coarse Sand Ret - #60 | % | 39.2 | 29.3 | 13.4 | 4.8 | 19.8 | 34.4 |
| Fine Sand Ret - #270 | % | 40.9 | 40.9 | 49.4 | 38.4 | 44.8 | 36.6 |
| Silt 0.05 - 0.005 mm | % | 10.0 | 17.1 | 29.3 | 28.8 | 23.0 | 19.0 |
| Clay < 0.005 mm | % | 10.0 | 12.7 | 8.0 | 28.0 | 12.4 | 10.0 |
| Passing #40 Sieve | % | 85.6 | 81.4 | 92.9 | 98.3 | 88.4 | 75.9 |
| Passing #200 Sieve | % | 25.8 | 38.9 | 53.6 | 66.2 | 47.4 | 38.8 |

| L. L. | | 20 | 26 | 34 | 46 | 27 | 25 |
|---|---|---|---|---|---|---|---|
| P. I. | | 1 | 1 | 1 | 11 | 1 | 0 |
| AASHTO Classification | | A-2-4 | A-2-4 | A-4 | A-7-5 | A-4 | A-2-4 |
| Group Index | | 0 | 0 | 0 | 8 | 0 | 0 |
| pH | | N/A | N/A | N/A | N/A | N/A | N/A |
| Station | | 15+24 | 15+24 | 15+29 | 15+98 | 14+92 | 14+92 |
| OFFSET | | 4'LT | 4'LT | 5'RT | 5'RT | 11'LT | 11'LT |
| ALIGNMENT | | -L- | -L- | -L- | -L- | -L- | -L- |
| Depth (Ft) | | 6.6 | 11.6 | 16.7 | 0.0 | 3.5 | 23.5 |
| | to | 8.1 | 13.1 | 18.2 | 1.5 | 5.0 | 25.0 |
| Natural Moisture % | | 24.3 | 11.4 | 23.9 | 28.8 | 17.5 | 8.9 |

Aaron Hackett
Soils Engineer

M & T Form 503

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAY
## MATERIALS & TESTS UNIT
## SOILS LABORATORY

**T. I. P. No.** SF-280099

**REPORT ON SAMPLES OF** Bridge 99 on SR 1810 over Brushy Fork Creek

| | | | | | |
|---|---|---|---|---|---|
| **Project** | 17BP.9.R.91 | **County** | Davidson | **Owner** | B. Worley, OG |
| **Date: Sampled** | 4/2/18 to 4/9/18 | **Received** | 4/20/18 | **Reported** | 4/27/18 |
| **Sampled from** | Roadway and Structure | | | **By** | M. Shipman |
| **Submitted by** | B. Worley | | | 2008 | **Standard Specifications** |

4/27/18

### TEST RESULTS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Proj. Sample No. | | **SS-32** | | | | | |
| Boring No. | | **EB2-A** | | | | | |
| Retained #4 Sieve | % | **6** | | | | | |
| Passing #10 Sieve | % | **82** | | | | | |
| Passing #40 Sieve | % | **69** | | | | | |
| Passing #200 Sieve | % | **40** | | | | | |

### MINUS NO. 10 FRACTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SOIL MORTAR - 100% | | | | | | | |
| Coarse Sand Ret - #60 | % | **23.1** | | | | | |
| Fine Sand Ret - #270 | % | **39.8** | | | | | |
| Silt 0.05 - 0.005 mm | % | **19.1** | | | | | |
| Clay < 0.005 mm | % | **18.0** | | | | | |
| Passing #40 Sieve | % | **84.4** | | | | | |
| Passing #200 Sieve | % | **49.1** | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| L. L. | **28** | | | | | |
| P. I. | **1** | | | | | |
| AASHTO Classification | **A-4** | | | | | |
| Group Index | **0** | | | | | |
| pH | **N/A** | | | | | |
| Station | **16+23** | | | | | |
| OFFSET | **7'LT** | | | | | |
| ALIGNMENT | **-L-** | | | | | |
| Depth (Ft) | **8.7** | | | | | |
| to | **10.2** | | | | | |
| Natural Moisture % | **14.8** | | | | | |

Aaron Hackett

Soils Engineer

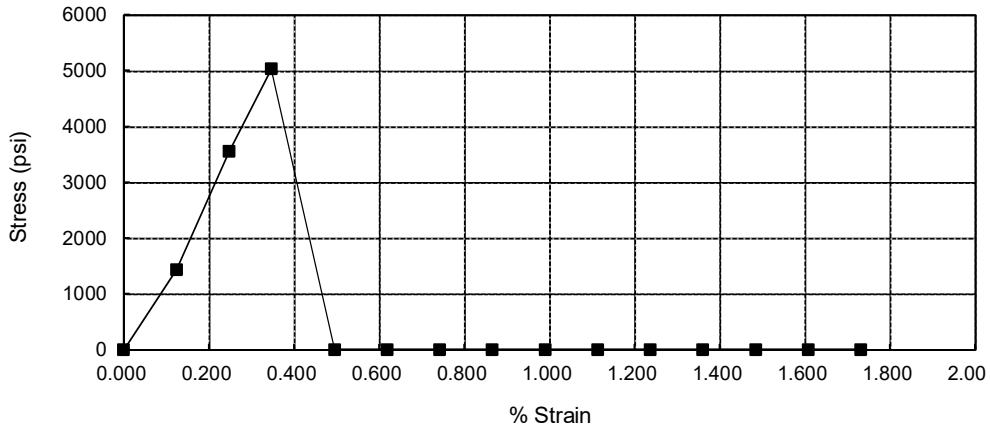
# ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

**ASTM D-7012-10 METHOD C**

| | | | |
|---|---|---|---|
| Job No.: | G17017.02 | Job Name: | SF-280099 Bridge 99 |
| Date: | 5/7/2018 | Sample No.: | RS-1 |
| Boring No.: | B1-A | Depth (ft): | 33.9-34.5 |
| Description: | | | |
| | | | 1728 |
| Length (in.): | 4.043 | Volume ($in^3$): | 12.43612879 |
| Diameter (in.): | 1.979 | Volume (cf): | 0.007196834 |
| Area (sq. in.): | 3.076 | Unit Weight (pcf): | 188.1216 |

Compressive Strength (psi): 5033

| Deflection (in.) | Strain (%) | Load (lbf) | Compressive Strength (psi) | Young's Modulus (psi) |
|---|---|---|---|---|
| | | | | |
| 0.000 | 0.000 | 0 | 0.0 | |
| 0.005 | 0.124 | 4410 | 1433.7 | 1,159,287 |
| 0.010 | 0.247 | 10930 | 3553.4 | 1,436,622 |
| 0.014 | 0.346 | 15480 | 5032.6 | 1,453,333 |
| 0.020 | 0.495 | | 0.0 | 0 |
| 0.025 | 0.618 | | 0.0 | 0 |
| 0.030 | 0.742 | | 0.0 | 0 |
| 0.035 | 0.866 | | 0.0 | 0 |
| 0.040 | 0.989 | | 0.0 | 0 |
| 0.045 | 1.113 | | 0.0 | 0 |
| 0.050 | 1.237 | | 0.0 | 0 |
| 0.055 | 1.360 | | 0.0 | 0 |
| 0.060 | 1.484 | | 0.0 | 0 |
| 0.065 | 1.608 | | 0.0 | 0 |
| 0.070 | 1.731 | | 0.0 | 0 |




Notes:

Young's modulus is calculatied using the secant modulus at each data interval per Figure 2 (C) in ASTM D 7012.

Michael J Bauer

NCDOT Cert No. 105-02-0803

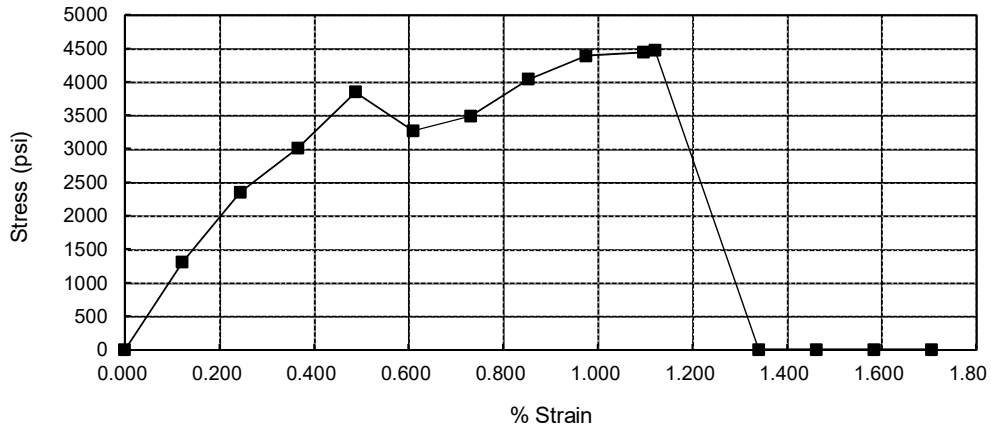
# ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

**ASTM D-7012-10 METHOD C**

| | | | |
|---|---|---|---|
| Job No.: | G17017.02 | Job Name: | SF-280099 Bridge 99 |
| Date: | 5/7/2018 | Sample No.: | RS-2 |
| Boring No.: | B2-B | Depth (ft): | 42.0-42.6 |
| Description: | | | |
| | | | 1728 |
| Length (in.): | 4.105 | Volume ($in^3$): | 12.67793355 |
| Diameter (in.): | 1.983 | Volume (cf): | 0.007336767 |
| Area (sq. in.): | 3.088 | Unit Weight (pcf): | 194.6988 |

Compressive Strength (psi): 4468

| Deflection (in.) | Strain (%) | Load (lbf) | Compressive Strength (psi) | Young's Modulus (psi) |
|---|---|---|---|---|
| | | | | |
| 0.000 | 0.000 | 0 | 0.0 | |
| 0.005 | 0.122 | 4040 | 1308.1 | 1,073,963 |
| 0.010 | 0.244 | 7260 | 2350.7 | 964,971 |
| 0.015 | 0.365 | 9310 | 3014.5 | 824,966 |
| 0.020 | 0.487 | 11890 | 3849.9 | 790,187 |
| 0.025 | 0.609 | 10110 | 3273.5 | 537,513 |
| 0.030 | 0.731 | 10780 | 3490.5 | 477,612 |
| 0.035 | 0.853 | 12480 | 4040.9 | 473,941 |
| 0.040 | 0.974 | 13560 | 4390.6 | 450,586 |
| 0.045 | 1.096 | 13720 | 4442.4 | 405,247 |
| 0.046 | 1.121 | 13800 | 4468.3 | 398,749 |
| 0.055 | 1.340 | | 0.0 | 0 |
| 0.060 | 1.462 | | 0.0 | 0 |
| 0.065 | 1.583 | | 0.0 | 0 |
| 0.070 | 1.705 | | 0.0 | 0 |




Notes:
Young's modulus is calculatied using the secant modulus at each data interval per Figure 2 (C) in ASTM D 7012.

Michael J Bauer

NCDOT Cert No. 105-02-0803

# CORE PHOTOGRAPHS

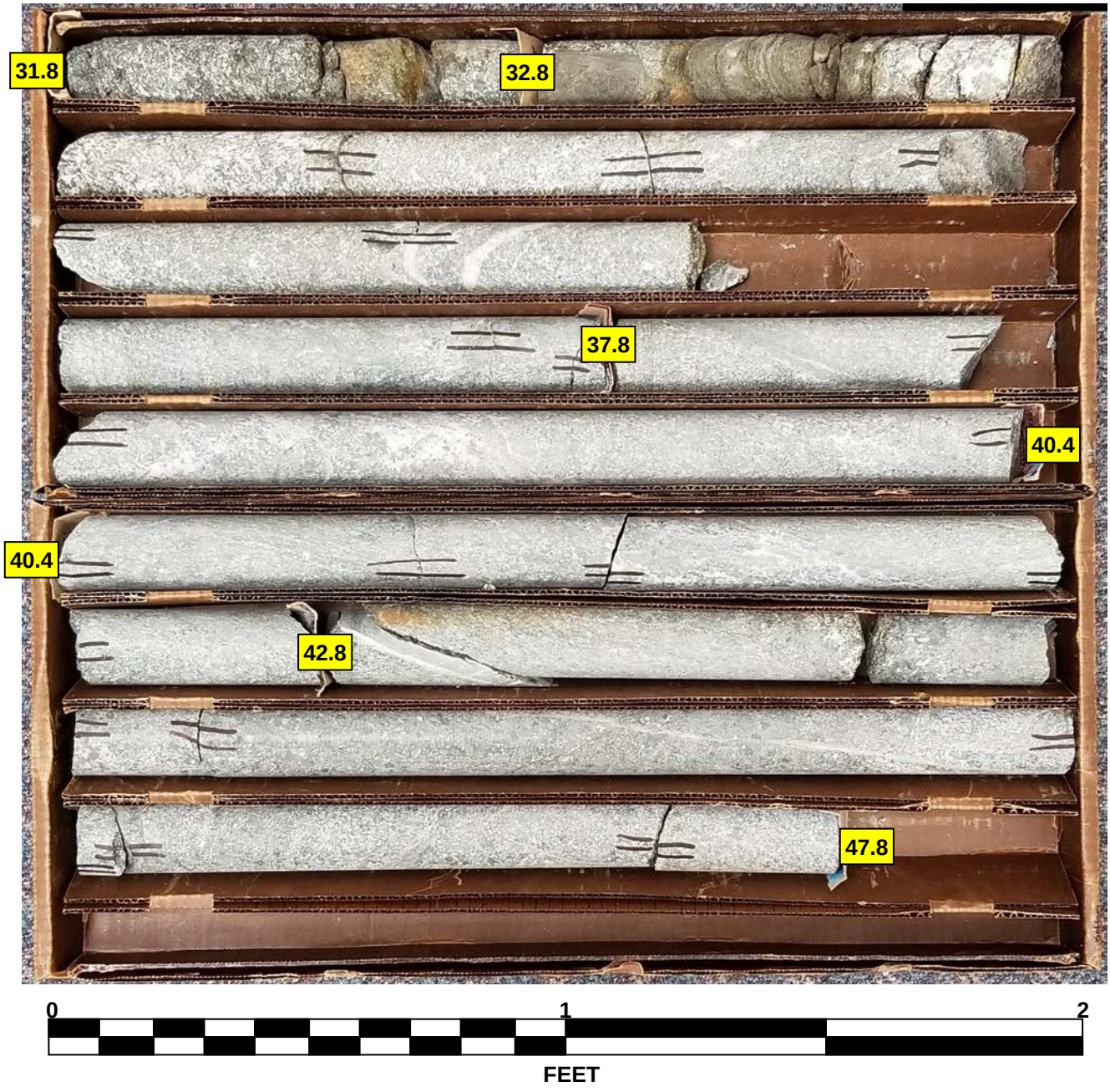
## B1-A

**BOXES 1 through 3: 23.7 - 52.9 FEET**

# CORE PHOTOGRAPHS

## B1-B

### BOXES 1 & 2: 31.8 - 47.8 FEET



# CORE PHOTOGRAPHS

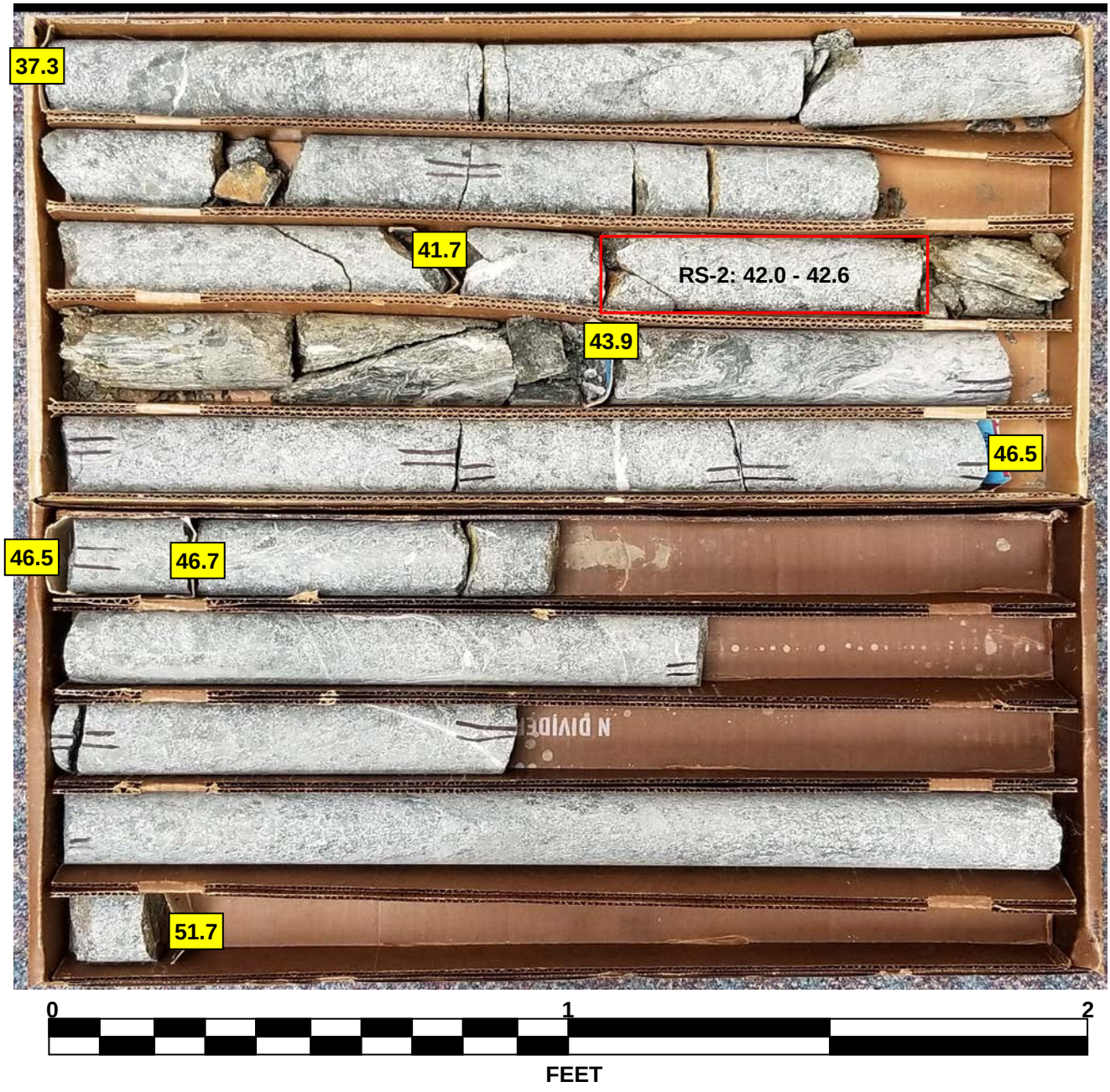
## B2-A

### BOXES 1 & 2: 39.0 - 54.0 FEET

# CORE PHOTOGRAPHS

## B2-B

### BOXES 1 & 2: 37.3 - 51.7 FEET



# SITE PHOTOGRAPHS

Bridge No. 99 on SR 1810 (Clodfelter Road) over Brushy Fork Creek


Standing at End Bent 1 and looking East


Standing at End Bent 2 and looking West