8 REFERENCE **CONTENTS** 

**DESCRIPTION** 

LEGEND (SOIL & ROCK)

SUPPLEMENTAL LEGEND (GSI)

BORE LOGS, CORE LOGS, AND ROCK CORE PHOTOS

TITLE SHEET

SITE PLAN PROFILE

CROSS SECTIONS

LAB RESULTS SITE PHOTOGRAPHS

SHEET NO.

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#### STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

## **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY \_SURRY

PROJECT DESCRIPTION REPLACE BRIDGE NO. 062 ON SR 1350 (RED BRUSH ROAD) OVER STEWARTS CREEK

STATE PROJECT REFERENCE NO. 19 BP11.R004

#### **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 (1991) 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 BORCHOLE. 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 INCLORDED TO CLIMATIC CONDITIONS INCLOURS CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLOURING 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 INTERRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS, AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

CG2 EXPLORATION
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DATE SEPTEMBER 2022



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11/4/2022

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

PROJECT REFERENCE NO.

BP11.R004

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

## SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
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	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.	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	ALLUYIUM (ALLUY) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  AQUIFER - A WATER BEARING FORMATION OR STRATA.
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:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	ANGULARITY OF GRAINS  THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION  GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	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
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR)  WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE.
CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 B-2-7 A-1-a A-3 A-6, A-7	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.  COMPRESSIBILITY	NON CRYCTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-5 A-1-5 A-2-4 A-2-5 A-2-6 A-2-7 A-2-6 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR)  ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.  COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
000000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD  SEDIMENTARY ROCK  SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
7. PASSING SILT- MUCK, CRANULAR SILT- MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40   30 MX   50 MX   51 MN   PEAT   *200   15 MX   25 MX   10 MX   35 MX   35 MX   35 MX   36 MN   36	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40	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	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	OF A CRYSTALLINE NATURE.  SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRACS. OF MAJOR LORAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SANU GRAVEL AND SANU SUILS SUILS	STATIC WATER LEVEL AFTER 24 HOURS    PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	FLOAT - ROCK FRACMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GUOUD FAIR TO POUR POUR UNSUITABLE	E SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30  CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAQLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PANCE OF STANDARD PANCE OF UNCONFINED		(MOD.SEV.) AND CAN BE EXCAYATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (IN-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL  SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
CENERALLY VERY LOOSE < 4	SLOPE INDICATOR	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR LUUSE 4 IU IU	The second secon	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50 (NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETRUMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	INFERRED SOIL BOUNDARY CORE BORING    SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BFF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	PIEZOMETER CON DOUBLES A PIEZOMETER	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK QUALITY DESIGNATION (ROD) - 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
HARD > 30 > 4	TTTTT ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY SPI N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM)         4.76         2.00         0.42         0.25         0.075         0.053	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER	ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED  CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	MEDIUM 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DICHTOMETER TEST FMT - PRESSOREMETER TEST SAME CE ADDITECTATIONS	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	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC   SEMICOLIDA DEGLIDES DRVING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE  - WET - (W)  ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING  TERM SPACING TERM THICKNESS	BENCH MARK:
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: FEET
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	
PEGLIBES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES:
- DRY - (D) ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING ROADWAY DESIGN AND SURVEY INFORMATION PROVIDED BY TGS
PLASTICITY	M 8 HULLUW AUGERS   □-B □-H	INDURATION	ENGINEERS.
PLASTICITY INDEX (PI)  DRY STRENGTH	CME-550 HARD FACED FINGER BITS X-N Q	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.  RUBBING WITH FINGER FREES NUMEROUS GRAINS;	LOCATION DATA & SUBSURFACE CONDITIONS FOR EBI-A OBTAINED FROM
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST VICASING VILLA ADVANCED HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	"STRUCTURE SUBSURFACE INVESTIGATION" PREPARED BY F&R, INC. DATED APRIL 20, 2016.
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	VANE SHEAR TEST X CASING X W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	CT = CORING TERMINATED
COLOR	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER TRICONE TUNG-CARB. SQUINDING POD	BREAKS EASILY WHEN HIT WITH HAMMER.  GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
	X DIEDRICH D-50 X CORE BIT SOUNDING ROD VANE SHEAR TEST	INDURATED ORANGE DIFFICULT TO SEPARATE WITH STEEL PROBE;  DIFFICULT TO BREAK WITH HAMMER.	
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.	X MOBILE B-29	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	

PROJECT REFERENCE NO.	SHEET NO.
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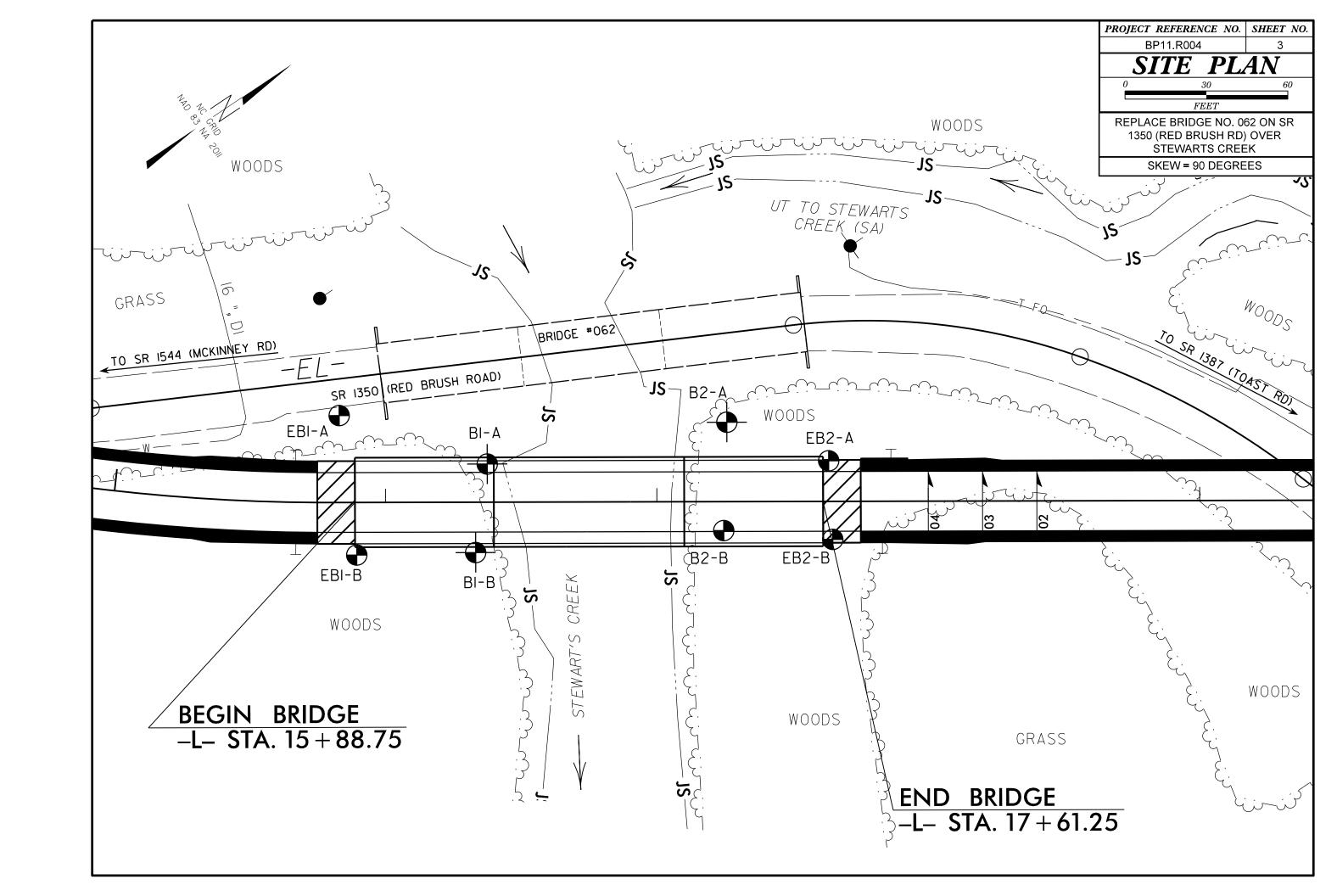
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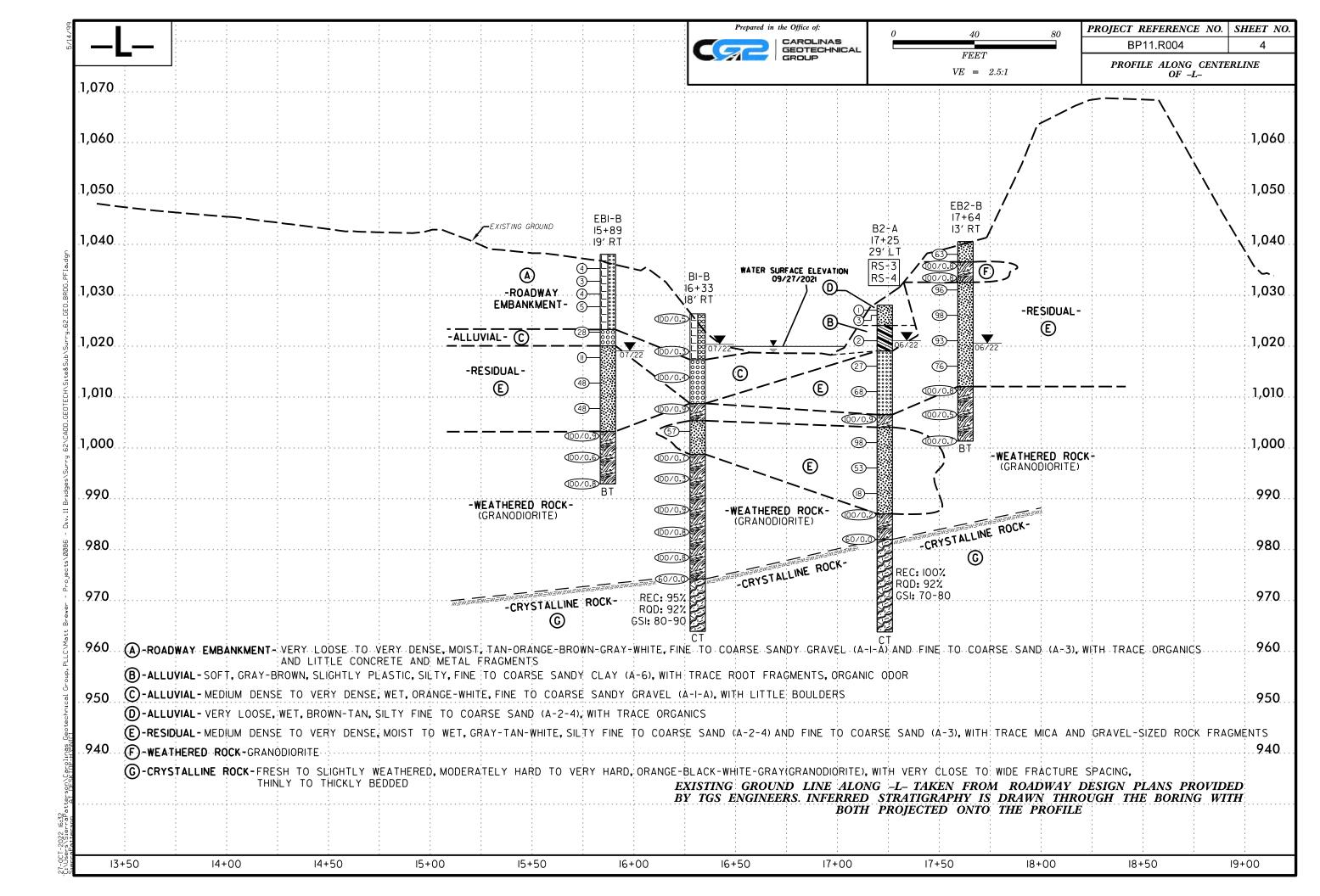
#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

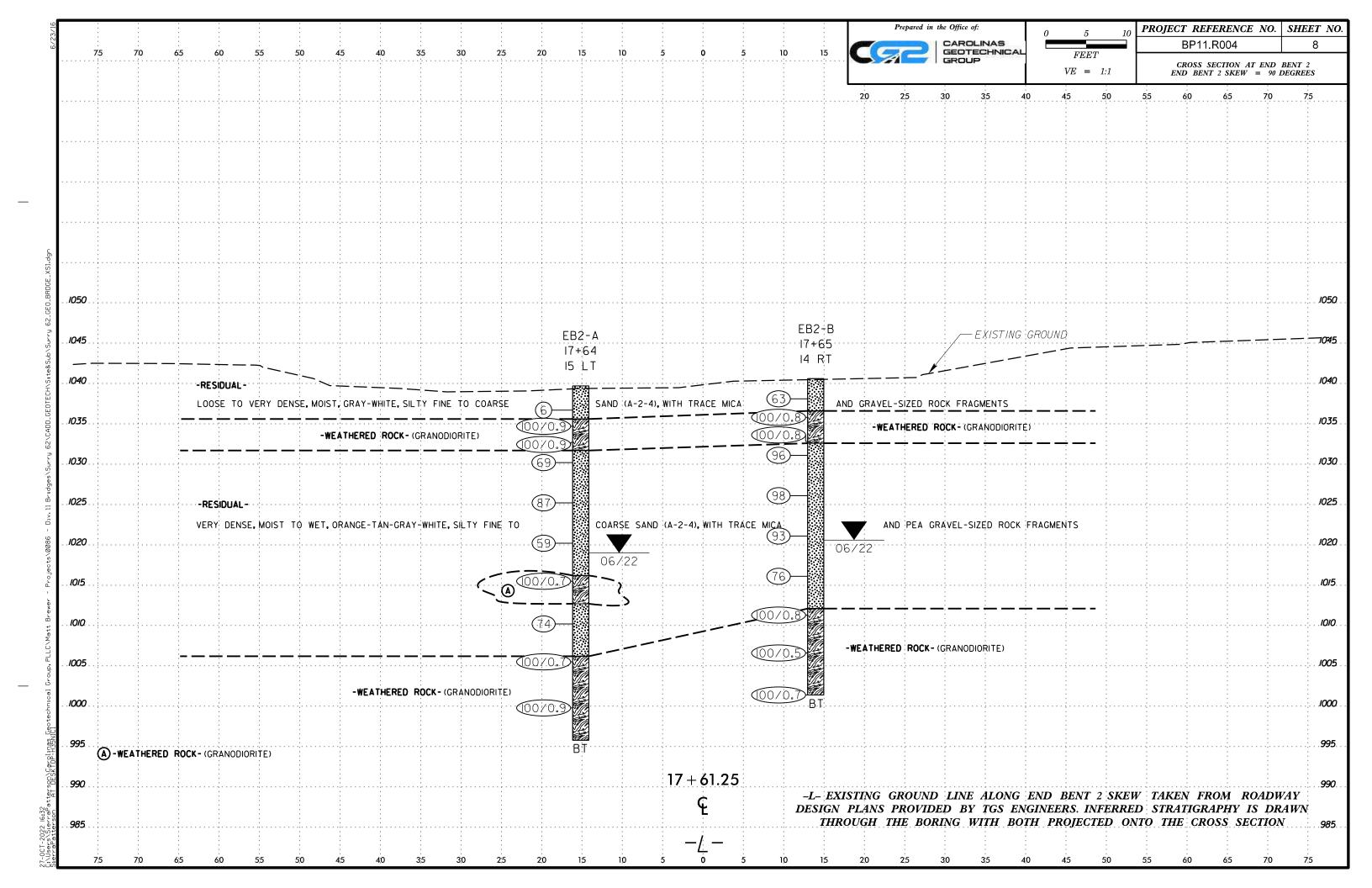
## SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES

FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS  $\hbox{AASHTO LRFD Figure 10.4.6.4-2} \ - \ \hbox{Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)} \\$ AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000) GEOLOGICAL STRENGTH INDEX (GSI) FOR GSI FOR HETEROGENEOUS ROCK MASSES SUCH JOINTED ROCKS (Hoek and Marinos, 2000) AS FLYSCH (Marinos, P and Hoek E., 2000) From a description of the lithology, structure and ed surfē fillings VERY POOR - Very smooth, slicken-sided or highly weathered surfaces with soft clay coatings or fillings From the lithology, structure and surface athered surf or fillings smooth, occasionally surfaces with compaci fillings with angular and conditions of the discontinuities, estimate the average value of GSI. Do not try to surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not planes) weather position in the box that corresponds to the condition weathered there of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too eď, apply to structurally controlled failures. Where weak planar structural planes are precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the highly wea coatings ragments weather slightly present in an unfavorable orientation SURFACE CONDITIONS (DISCONTINUITIES) Hoek-Brown criterion does not apply to structurally with respect to the excavation face, CONDITIONS these will dominate the rock mass controlled failures. Where unfavourably oriented behaviour. The shear strength of surfaces continuous weak planar discontinuities are present, in rocks that are prone to deterioration slightly es POOR Slickensided, h with compact c these will dominate the behaviour of the rock mass. Rough, as a result of changes in moisture content will be reduced if water is GOOD -thered - Very : ensided ings or f The strength of some rock masses is reduced by the **G00D** rough, presence of groundwater and this can be allowed for present. When working with rocks in the by a slight shift to the right in the columns for fair, fair to very poor categories, a shift to th, r FAIR - weather poor and very poor conditions. Water pressure does the right may be made for wet conditions. GOOD Rough, s surface POOR -slicker coatin fragme VERY I VERY Very FAIR Smoot alter VERY Slick With not change the value of GSI and it is dealt with by Water pressure is dealt with by effective stress analysis. using effective stress analysis. COMPOSITION AND STRUCTURE STRUCTURE DECREASING SURFACE QUALITY INTACT OR MASSIVE - intact A. Thick bedded, very blocky sandstone 90 rock specimens or massive in 7Ó N/A N/A The effect of pelitic coatings on the bedding situ rock with few widely spaced planes is minimized by the confinement of PIECES discontinuities the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally 80 controlled instability. 60 BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets 50 B. Sand C. Sand-D. Siltstone F. Weak 60 or silty shale si/tstone stone with stone and or clayey С thin inter siltstone with sandshale with layers of in similar stone layers VERY BLOCKY - interlocked. amounts sands tone siltstone 40 partially disturbed mass with 50 multi-faceted angular blocks formed by 4 or more joint sets INTERL C. D. E. and G - may be more or F. Tectonically deformed, BLOCKY/DISTURBED/SEAMY -30 less folded than illustrated but intensively folded/faulted, folded with angular blocks this does not change the strength. sheared clayey shale or siltstone formed by many intersecting Tectonic deformation, faulting and with broken and deformed CREASING loss of continuity moves these discontinuity sets. Persistence sandstone layers forming an 30 categories to F and H. of bedding planes or schistosity almost chaotic structure 20 DISINTEGRATED - poorly interlocked, heavily broken rock mass H 20 G. Undisturbed silty H. Tectonically deformed silty with mixture of angular and or clayey shale with or clayey shale forming a 10 rounded rock pieces or without a few very chaotic structure with pockets thin sandstone layers of clay. Thin layers of sandstone are transformed nto small rock pieces. 10 LAMINATED/SHEARED - Lack of blockiness due to close spacing N/A N/A → Means deformation after tectonic disturbance of weak schistosity or shear planes







#### GEOLOGIST C. Wang COUNTY SURRY WBS BP11.R004 **TIP** SF-850062 SITE DESCRIPTION BRIDGE NO. 62 ON SR 1350 OVER STEWART'S CREEK **GROUND WTR (ft) STATION** 15+83 OFFSET 32 ft LT ALIGNMENT N/A BORING NO. EB1-A 0 HR. 23.0 TOTAL DEPTH 34.9 ft COLLAR ELEV. 1,042.3 ft **NORTHING** 1,003,960 **EASTING** 1,515,952 24 HR. 22.8 DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016 DRILL METHOD H.S. Augers HAMMER TYPE Automatic DRILLER D. Tignor **START DATE** 03/23/16 COMP. DATE 03/23/16 SURFACE WATER DEPTH N/A ELEV CRIVE CRIPT BLOW COUNT (ft) (ft) (ft) DEPTH 0.5ft 0.5ft 0.5ft **BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION 0.5ft 0.5ft 0.5ft 75 100 NO. 1045 **GROUND SURFACE** 1,042.3 ROADWAY EMBANKMENT W Orange-Brown, Fine to Coarse Sandy Clayey SILT (A-4) with Trace to Little 1040 1,038.8 . . . . Gravel and Roots W . . . . 1035 1,033.8 8.5 Gray-Brown, Silty Fine SAND (A-2-4) with W Trace Organics and Gravel 1,030.3 RESIDUAL 1030 1,028.8 13.5 Gray-Brown, Silty Fine to Coarse SAND W (A-1-b) with Some Gravel-Sized Rock Fragments 1025 1,023.8 18.5 . . . . W WEATHERED ROCK . . . . 1020 Tan and Brown (GRANO-DIORITE) 1,019.2 23.1 78 22/0.4 100/0.9 1015 1,013.8 28.5 25 100/0.4 100/0.4 1010 1,008.8 33.5 18 40 60/0.4 . 100/0.9 Boring Terminated at Elevation 1,007.4 ft in WEATHERED ROCK (GRANO-DIORITE) 1) 0.0'-0.2'= Surficial Organic Soil 2) SPT Drive at 23.1' in Case Boulders Present

## GEOTECHNICAL BORING REPORT BORE LOG

										В	OR	<u>E</u> L	.(	JĠ							
WBS	BP11.	R004			TI	P SF-8	35006	32	С	OUNT	Y SU	RRY					GEOLOGI	ST S. N. Pat	terson		
SITE	DESCR	IPTION	Repl	lace Br	idge N	o. 062 c	n SR	1350	over S	Stewar	ts Cree	k					•			GROUN	ID WTR (ft)
BOR	ING NO.	EB1-	В		S	ATION	15-	+89			OFF	SET	19	ft RT			ALIGNME	NT -L-		0 HR.	20.1
COL	LAR ELI	<b>EV.</b> 1,	038.1	ft	TO	OTAL D	EPTH	<b>1</b> 45.	1 ft		NOR	THING	<u> </u>	1,003,	937		EASTING	1,515,998		24 HR.	19.0
	RIG/HAN				<u></u> 20446 D	edrich D	50 87%	% 05/10/	2022				_	ORILL M		) H.S			НАММ	ER TYPE	Automatic
	LER C					ART D					СОМ	P. DA	_	<b>=</b> 07/0				WATER DEF			
ELEV	DRIVE	DEPTH	_	ow co		T				R F00			_	SAMP.	<b>V</b> /	1 [	7001417102				
(ft)	ELEV (ft)	(ft)	0.5ft			0	25		50		75	100		NO.	MOI	O G	ELEV. (ft)	SOIL AND RO	CK DES	CRIPTION	DEPTH (ft)
	. ,												T		<i>y</i> 10101	Ť	LLL V. (II)				DEI III (II)
1040																					
1040		‡															- 1,038.1	GROUN	ID SURF	ΔCE	0.0
	1 026 2	1.8				<del>                                     </del>							1				-	ROADWAY	EMBAN	KMENT	
1035	1,036.3	1.8	2	2	2	<b>.</b> .			:   :						М		. Ver _ F	y Loose to Loos ine to Coarse S	SAND (A-	Orange-Br 3), with tra	rown, ace
	1,033.8-	4.3	1	1	2	j			:   :		:   : :				М			or	ganics		
	1,031.3	6.8				1									IVI						
1030	4 000 0	Ī ,,	2	2	2	4_									М		_				
	1,028.8-	9.3	3	2	3	<b>6</b> 5·					:   : :				М		•				
1025		‡				1.7.					:   : :	: :					•				
1025	1,023.8-	14.3	<u> </u>			<i>i</i> :			-   -								1,023.3				14.8
		‡	4	12	16			<b>P</b> 28			.				М	000	•		LUVIAL	ongo Fina	
1020	_	ţ					• •	<u> </u>							_		1,020.1	ledium Dense, \ _Coarse Sand	y GRAVE		18.0
	1,018.8-	19.3	2	4	7	1 : 1			-   -		.				M	<u> </u>	•	<b>RE</b> Medium D	SIDUAL ense to [	Dense.	
		Ŧ	-	'		. •1	.1.		:   :		:   : :				IVI			Drange-Black-G arse SAND (A-2	ray-Tan,	Silty Fine	
1015	<u>.</u>	‡						<u>, , , , , , , , , , , , , , , , , , , </u>	-   -								- 002	gravel-sized			a anu
	1,013.8-	24.3	14	21	27		: :	`.			:   : :				W		•				
		‡					: :			 	.										
1010	1.008.8-	29.3				<del></del>			-#-		<del>.  </del>					<u> </u>	<del>-</del>				
	-,000.0	- 20.0	15	23	25				48		.				W	-	•				
1005		Ŧ				: :			-:   :		:   : :	: :									
	1,003.8-	34.3	10	40	E 4/0 4				-i -								1,003.3				34.8
		‡	16	46	54/0.4		: :		: 1		: <del>                                    </del>	00/0.9					•	<b>WEATH</b> Orange-Black	ERED RO		
1000	-	ţ								· · ·	·   · ·						_	(GRAN	IODIORI	ΓE)	
	998.8	39.3	62	38/0.1	-		: :				.										
		+							-   -		.   . :	00/0.6									
995	993.8 -	44.3									-						<del>-</del>				
	993.8 -	44.3	42	58/0.3	<u> </u>							00/0.8	$\blacksquare$			THE STATE OF	993.0	ring Terminated	t at Eleva	tion 993 0	45.1
		‡																Weathered Roc	k (GRAN	ODIORIT	E)
	-	‡															<del>-</del>	SPT blow cour	nts influer	nced by the	e
		‡																presence of	_		
	_	ţ															: _	Hard Drilling approximatel			
	-	F															•	аррголіпассі	y 10.0 to	17.0 1661	
		‡															•				
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#### SHEET 10

#### GEOTECHNICAL BORING REPORT BORE LOG

								<u>ORE L</u>						
WBS	BP11.	R004			TI	<b>P</b> SF-850062	COUNT	Y SURRY				GEOLOGIST S. N. Patterson		
SITE	DESCR	IPTION	Rep	lace Br	idge N	o. 062 on SR 1350 ove	er Stewart	s Creek					GROUN	D WTR (ft)
BORI	NG NO.	B1-A			S	<b>FATION</b> 16+37		OFFSET 1	4 ft LT			ALIGNMENT -L-	0 HR.	N/A
COLI	LAR ELE	<b>EV.</b> 1,	022.2	ft	TO	OTAL DEPTH 45.2 ft	:	NORTHING	1,003,9	995		<b>EASTING</b> 1,515,997	24 HR.	Caved
DRILL	.RIG/HAIV	IMER EF	F./DAT	E CG	20446 D	iedrich D50 87%05/10/202	22		DRILL M	ETHO	SP	Γ Core Boring <b>HAMIV</b>	ER TYPE	Automatic
DRIL	LER C	. Odom	l		S	TART DATE 06/30/2	2	COMP. DAT	<b>E</b> 06/3	0/22		SURFACE WATER DEPTH N	Ά	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft	UNT 0.5ft		PER FOOT 50	75 100	SAMP.	MOI	L O G	SOIL AND ROCK DES	CRIPTION	DEPTH (ft
025	1,022.2		1	2	4	1	1			M	-	1,022.2 GROUND SURF	ACE	0.
020	1,020.5	1.7	4	2	3	70				W	000	Loose, Brown, Silty Fine to (A-2-4), with trace grav	Coarse SA	AND r
015	1,015.0 - - - - -	7.2	100/0.:	3				100/0.3			000000000000000000000000000000000000000	Loose, Orange-Tan-Brown Coarse Sandy GRAVE  WEATHERED R  Black-Gray-White, (GRA	n, Silty, Fine EL (A-1-a)	e to 7.
010	1,009.8	12.4										_ 1,009.8		12.
005	- - - -	- - - -	60/0.0									CRYSTALLINE R Black-Gray-White, (GRA  REC: 95% RQD: 87% GSI: 65-75		E)
000	- - -	-										1,002.2  WEATHERED R Black-Gray-White, (GRA		
995	-	-								W	000000000000000000000000000000000000000	998.1  RESIDUAL  Loose, Gray-Brown-Tan, F  SAND (A-3)		rse 24.
990	993.5	28.7	2	3 69/0.4	97/0.4			100/0.8				993.0 <b>WEATHERED R</b> Black-Gray-White, (GRA		29. E)
985	985.0_	37.2	24	17	12	l		100/0.9				987.2  RESIDUAL  Medium Dense, Orange-G Fine to Coarse SAND (A-2	- — — — - Gray-Tan, S	35.
980	- - - 980.0	42.2				0.00				W		mica 980.0	·	42.
	-	<u> </u>	36	64/0.3				- 100/0.8				WEATHERED R White, (GRANODIO		
	977.0	- 45.2 	60/0.0					60/0.0				Boring Terminated with Penetration Test Refusal at ft On Crystalline Rock (GR Hard Drilling encount approximately 5.0 to 12.4 fe feet, and 44.0 to 45 Rock Coring performed from feet  Sand Seam from approximately 29.2 feet	n Standard Elevation 9 ANODIORI ered from eet, 33.0 to 5.2 feet m 12.4 to 2	977.0 ITE) 36.0 28.7

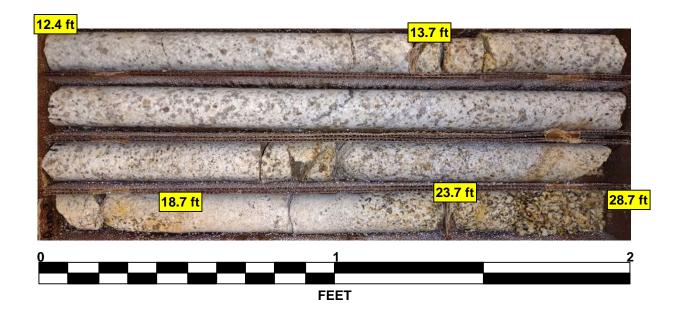
### GEOTECHNICAL BORING REPORT CORE LOG

WRS	BP11.	DOD4			TID	SF-85	0062	C	OLINIT		URRY		GEOLOGIST S. N. Pat	torcon		
			Don	Jaco Drid									GEOLOGIST S. N. Pat	leison	GROUND V	ACTD (ft)
				lace Brid	<del>-</del>			ou ove	er Stev	_			ALICAIMENT I			` '
	NG NO.			r.			16+37	0.4		<del>                                     </del>	SET 14 ft LT		ALIGNMENT -L-		0 HR.	N/A
	AR ELE	-			l		<b>PTH</b> 45.			NO	RTHING 1,003,995		<b>EASTING</b> 1,515,997	l	24 HR.	Caved
				TE CG204					<u>′</u>	-	DRILL METHO		<del>.                                      </del>		ER TYPE Au	tomatic
	LER C.						TE 06/3 N 16.3 f			CO	MP. DATE 06/30/22		SURFACE WATER DEP	TH N/	A	
	RUN			DRILL	RU			STR	ATA	L						
ELEV (ft)	ELEV (ft)	DEPTH (ft)	RUN (ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	Ö G			DESCRIPTION AND REMARKS	3		DEDTU (4)
1000 0	(11)			(IVIIII/IL)	- %	%		%	- %		ELEV. (ft)		Pagin Caring @ 12.4 ft			DEPTH (ft)
009.8	1,809.8	- 1 <del>2.4</del>	1.3	N=60/0.0 8:05/1.0	(1.3)	(1.3)		(7.2)	(6.6) 87%		1,009.8		Begin Coring @ 12.4 ft CRYSTALLINE ROCK			12.4
	, , , , ,	-	5.0	1:03/0.3	\100%/ (4.8)	\ <u>100%</u> / (4.1)		95%	87%		Hard, Fresh,	Black-G	Gray-White (GRANODIORITE), fracture spacing	with very	y close to wide	
1005	- 1	-		2:15/1.0 3:32/1.0 2:46/1.0	96%	82%					<del>-</del>		GSI: 65-75			
}	1,003.5-	- 18.7 -	5.0	3:15/1.0 2:49/1.0 2:00/1.0	(1.3)	(1.2)					1,002.2					20.0
1000	1	-		1:52/1.0 1:32/1.0	26%	24%		(0.6) 15%	(0.0) 0%		Moder	rately to	WEATHERED ROCK Completely Weathered, Soft, E	Black-Gra	v-White	
1000	998.5	- - 23.7		1:15/1.0 1:17/1.0				1070	070				RITE), with very close to close			24.1
	1	-	5.0	1:18/1.0 0:46/1.0	(0.4) 8%	(0.0) 0%		(0.0) 0%	(0.0) 0%	0000			GSI: 15-20			
995		-		0:38/1.0 0:54/1.0				0 70	070	0000	– Lo	oose, Gr	<b>RESIDUAL</b> ay-Brown-Tan, Fine to Coarse	SAND (A	<del>\</del> -3)	
	993.5	- 28.7 -		0:41/1.0 N=100/0.8						 	993.0		WEATHERED ROCK			29.2
990	1	-										Bla	ack-Gray-White, (GRANODIOF	RITE)		
330	1	-		N=100/0.9							<del>-</del>					
	1	-									987.2		RESIDUAL			35.0
985	1	-		N=29							Medium Dens	se, Oran	nge-Gray-Tan, Silty Fine to Coa trace mica	arse SAN	D (A-2-4), with	ı
	1	-		14-29									trace milea			
980	1	-									980.0					42.2
300	7	-		N=100/0.8									WEATHERED ROCK White, (GRANODIORITE)			72.2
-		-		N=60/0.0						970	977.0	minated	with Standard Penetration Tes	et Refues	l at Elevation	45.2
	- 1	-		74-00/0.0							– Boning Term	977.0 ft	On Crystalline Rock (GRANO	DIORITE	E)	
	1	- - -									Hard Drilling	encount	ered from approximately 5.0 to feet, and 44.0 to 45.2 feet	12.4 fee	et, 33.0 to 36.0	
	-	- - -									<del>-</del> ·		Coring performed from 12.4 to			
	1	-										Sand Se	am from approximately 24.1 t	:o 29.2 fe	eet	
	7	-									<del>-</del> ·					
	1	-														
	- 1	-									<del>-</del>					
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## Replace Bridge No. 062 on SR 1350 (Red Brush Road) over Stewarts Creek, Surry County, NC Rock Core Photographs Boring: B1-A

12.4 to 28.7 Feet



									UKE L	UG				
WBS	BP11	.R004			TI	<b>P</b> SF-8500	62	COUNTY	SURRY				GEOLOGIST S. N. Patterson	
SITE	DESCF	RIPTION	Repl	lace B	ridge N	o. 062 on SF	R 1350 ove	r Stewarts	Creek					GROUND WTR (ft)
BOR	ING NO	. B1-B			S <sup>-</sup>	TATION 16	5+33		OFFSET	19 ft RT			ALIGNMENT -L-	<b>0 HR.</b> N/A
COL	LAR EL	<b>EV.</b> 1,	026.4	ft	T	OTAL DEPT	<b>H</b> 62.4 ft		NORTHING	1,003,	974		<b>EASTING</b> 1,516,022	<b>24 HR.</b> 6.0
DRIL	RIG/HAI	MMER EF	F./DAT	E CG	20446 D	iedrich D50 87	% 05/10/202	2		DRILL M	ETHOD	SP1	Γ Core Boring <b>HAMME</b>	R TYPE Automatic
DRIL	LER C	C. Odom			S	TART DATE	06/30/22	2	COMP. DA	TE 07/0	)1/22		SURFACE WATER DEPTH N/A	4
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	'——	0.5ft	0.5ft	0 2	BLOWS P		75 100 	SAMP. NO.	MOI	L O G	SOIL AND ROCK DESC	CRIPTION DEPTH (fi
1030		  -  -										  -  -	-	
1025	1,026.4	+ 0.0	8	91	9/0.1						М	<u>-</u>	1,026.4 GROUND SURFA  ROADWAY EMBANY	
1023	-	‡							100/0.6	'			Very Dense, White-Brown- Coarse Sandy GRAVEL (A-	Gray, Fine to
		‡							: : : :				concrete and metal fra	
1020	4 040 -	‡											_	
	1,019.3	7.1	100/0.3	3					100/0.3	•	М		1 017 4	0.4
		<u> </u>											ALLUVIAL	9.0
1015	1,014.3	12.1	100:-						+		w	000 000 000	Very Dense, Orange-Whit (A-1-a), with little bo	e, GRAVEL ulders
		Ŧ	100/0.4	9			: : : :		100/0.4	'	**	000 <b>-</b>		
1010		Ŧ					: : : :		: : : :			0000		
.5.0	1,009.3	† 17.1 †	9	35	65/0.4						w	000 000 -	1,008.8	17.6
		‡							100/0.9	)	''		<b>WEATHERED RO</b> Black-Gray-White, (GRAN	
1005	1.004.3	22.1							<del>   </del>				1,005.4 RESIDUAL	21.0
	1,004.3	<del>                                     </del>	20	27	30			57			w		Very Dense, Black-Gray-Whi Coarse SAND (A-2-4), wit	te, Silty Fine to
		<u></u>							: : : :			liii l	Coarse SAND (A-2-4), WIT	n uace mica
1000	999.3	I 27.1	<u> </u>		100/2			1				<u> </u>	998.8	27.6
		Ŧ	24	62	38/0.2				100/0.7	•			WEATHERED RO	CK
995		‡					: : : :		: : : :				Black-Gray-White, (GRAN	IUDIUKITE)
333	994.3	32.1	100/0.3	3					100/0.3	,			-	
		‡	100/0.3	1					100/0.3					
990		Ī				L: : : : :	L <u>.</u>		<u> </u>				_	
	989.3	<del>†</del> 37.1 †	31	44	56/0.4								-	
		‡							100/0.9	<u>'</u>				
985	984.3	† † <sub>42.1</sub>											-	
	JU4.3	+ 75.1	49	51/0.3	3				- 100/0.8	•				
		<u></u>							: : : :					
980	979.3	47.1		E0/0.0	5				<del>   </del>				_	
		f	50	50/0.3					- 100/0.8					
975		Ŧ					: : : :							
510	974.3	<u>† 52.1</u>	60/0.0						60/0.0	•			-974.3 CRYSTALLINE RO	52. <sup>-</sup>
		‡					: : : :		: : : :				Orange-Gray-Black- (GRANODIORIT	White,
970		‡								RS-1			_	<b>-</b> )
		<u></u>							: : : :				REC: 95% RQD: 92%	
		Ŧ								RS-2			GSI: 80-90	
965	-	Ŧ								110-2			964.0	62.4
		‡							<del>'  </del>			-	Boring Terminated at Eleva	tion 964.0 ft In
		‡											Crystalline Rock (GRANG	•
	-	‡											<ul> <li>Hard Drilling/boulders enco approximately 0.0 to 4.0 fee</li> </ul>	et, 7.0 to 10.0
		‡										l E	feet, and 12.0 to 14.	0 feet
		Ī										E	_	
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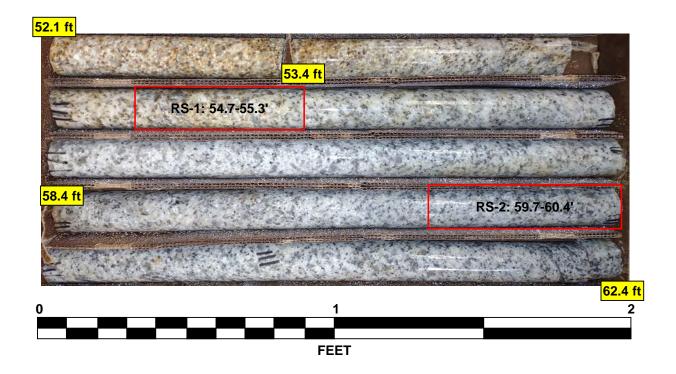
#### GEOTECHNICAL BORING REPORT CORE LOG

									C	<u>UI</u>	KE L	UG						
WBS	BP11.	R004			TIP	SF-85	0062	C	OUNT	Y S	URRY			GEOLOGI	<b>ST</b> S. N. Pa	atterson		
SITE	DESCR	IPTION	Rep	ace Bridg	e No. 0	)62 on	SR 1350	over S	Stewar	ts Cr	eek						GROUI	ND WTR (ft)
BOR	NG NO.	B1-B			STA	ΓΙΟΝ	16+33			OF	FSET 1	9 ft RT		ALIGNME	NT -L-		0 HR.	N/A
COLI	LAR ELE	<b>EV.</b> 1,	026.4	ft	тот	AL DE	<b>PTH</b> 62.	4 ft		NC	RTHING	1,003,974		EASTING	1,516,022		24 HR.	6.0
DRILL	. RIG/HAN	IMER EF	F./DAT	E CG204	46 Diedr	ich D50	87% 05/10	/2022				DRILL METHOD	SPT	Core Boring		HAMN	IER TYPE	Automatic
DRIL	LER C	. Odom	ı		STAI	RT DA	<b>TE</b> 06/3	0/22		СС	MP. DA	E 07/01/22			WATER DE	PTH N	/A	
COR	E SIZE	NQ			TOTA	AL RU	<b>N</b> 10.3 f	t					1					
ELEV	RUN	DEPTH	RUN	DRILL	REC.	JN RQD	SAMP.	STR REC.	ATA RQD	Ļ			D.F	CODIDTION	LAND DEMAG	1/0		
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	O G	ELEV. (1	t)	DE	ESCRIPTION	I AND REMAR	KKS .		DEPTH (f
974.3															ing @ 52.1 ft			
	974.3 - 973.0	52.1 53.4	1.3 5.0	N=60/0.0 7:09/1.0 2:37/0.3	(0.8) (62% )	(0.5) 38%	ļ	(9.8) 95%	(9.5) 92%		974.3	Hard, Fres	sh to S	Slightly Weat	LLINE ROCK hered, Orange	e-Gray-Bla	ack-White	52.
970	-	Ŧ		6:20/1.0 4:14/1.0	(5.0) 100%	(5.0) 100%	RS-1	1			F	(GRANOE	DIORI	ITE), with ver	ry close to clos	se fracture	e spacing	
	968.0	T 58.4		6:20/1.0 4:14/1.0 4:16/1.0 6:05/1.0 8:25/1.0							F			GS	SI: 80-90			
	-		4.0	10:54/1.0 6:13/1.0	(4.0) 100%	(4.0) 100%	RS-2	-			[			Unit Wei	54.7-55.3' ght: 162.4 pcf			
965	964.0	62.4		10:54/1.0 6:13/1.0 19:21/1.0 19:08/1.0			110-2				964.0	Unconfir	ned Co	ompressive	Strength: 16,4	30 psi (2,	366 ksf)	62.4
		l												RS-2: Unit Wei	59.7-60.4' ght: 163.8 pcf			
	_	E									_			ompressive	Strength: 18,9 ation 964.0 ft li	40 psi (2,		
	-	[									E	Boring 16	ermin	GRAN	IODIORITE)	1 Crystalli	пе коск	
	-	Ī									[	Hard Drilling/bou					0 to 4.0 fee	et, 7.0
	-	ł									_		το	) 10.0 teet, a	nd 12.0 to 14.0	теет		
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# Replace Bridge No. 062 on SR 1350 (Red Brush Road) over Stewarts Creek, Surry County, NC Rock Core Photographs Boring: B1-B

52.1 to 62.4 Feet



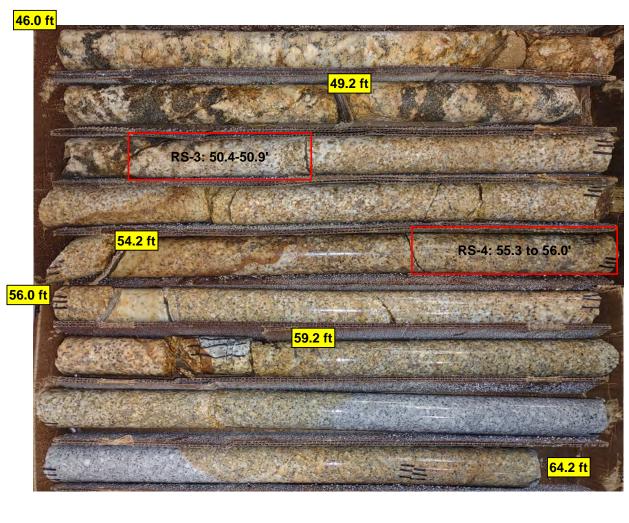
# GEOTECHNICAL BORING REPORT CORE LOG

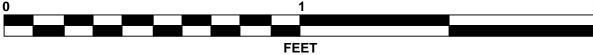
	BORE I	_OG										OR	RE LOG		
<b>WBS</b> BP11.R004	TIP SF-850062 COUNTY SURRY		GEOLOGIST S. N. Patterson		WB	<b>S</b> BP11.R004			TIP SF-8	350062	COUNT	Y SI	JRRY	GEOLOGIST S. N. Pat	terson
SITE DESCRIPTION Replace Bridg	ge No. 062 on SR 1350 over Stewarts Creek			GROUND WTR (ft)	SITE	E DESCRIPTION	<b>I</b> Replac	ce Brid	ge No. 062	on SR 1350	over Ste	warts	Creek		GROUND WTR (ft)
BORING NO. B2-A	STATION 17+25 OFFSET	29 ft LT	ALIGNMENT -L-	<b>0 HR</b> . N/A	BOF	RING NO. B2-A	١		STATION	17+25		OFF	SET 29 ft LT	ALIGNMENT -L-	<b>0 HR.</b> N/A
COLLAR ELEV. 1,028.1 ft	TOTAL DEPTH 64.2 ft NORTHIN	<b>3</b> 1,004,077	<b>EASTING</b> 1,516,033	<b>24 HR.</b> 7.0	COL	LAR ELEV. 1,	028.1 ft		TOTAL DE	<b>EPTH</b> 64.21	t	NOF	<b>RTHING</b> 1,004,077	<b>EASTING</b> 1,516,033	<b>24 HR.</b> 7.0
DRILL RIG/HAMMER EFF./DATE CG204	146 Diedrich D50 87% 05/10/2022	DRILL METHOD SP	T Core Boring HAMM	ER TYPE Automatic	DRIL	L RIG/HAMMER E	FF./DATE	CG20	446 Diedrich [	050 87% 05/10/	2022		DRILL METHOD S	PT Core Boring	HAMMER TYPE Automatic
DRILLER C. Odom	START DATE 06/28/22 COMP. DA	TE 06/29/22	SURFACE WATER DEPTH N/	'A	DRI	LLER C. Odon	1		START DA	ATE 06/28/2	22	CON	MP. DATE 06/29/22	SURFACE WATER DEP	TH N/A
ELEV DRIVE DEPTH BLOW COUN	I	SAMP. L O	SOIL AND ROCK DES	CRIPTION	COF	RE SIZE NQ			TOTAL RU		OTDATA	<u> </u>			
(ft) (ft) (ft) 0.5ft 0.5ft 0	0.5ft 0 25 50 75 100	NO. MOI G	ELEV. (ft)	DEPTH (ft)	ELEV (ft)	LLL V   /ft\	TON F	ORILL RATE	RUN REC. RQD (ft) (ft)	SAMP. R NO. (	STRATA EC. RQD ft) (ft) %	O		DESCRIPTION AND REMARKS	
						(It)	(14) (1	Min/ft)	% %				ELEV. (ft)		DEPTH (ft)
1030			- ODOLIND OLIDE	405	982.1	982.1 7 46.0	3.2 N=	=60/0.0	(3.2) (2.5) 100% 78%	(1	3.2) (16.8		982.1	continued from previous page CRYSTALLINE ROCK	46.0
1,027.1 1.0			1,028.1 GROUND SURF		980	978.9 49.2	3:	.077,1.0		_   10	0%   92%		Fresh to Slightly W (GRANODIORITE)	/eathered, Moderately Hard to V ), with very close to wide fracture	e spacing and thinly to
1025	2   •3	M	Very Loose, Brown-Tan, Coarse SAND (A-2-4), with			‡	5.0 \ <u>0:</u>	: <u>21/0.2</u> / :30/1.0	(5.0) (4.6) 100% 92%	RS-3	3.2) (16.8 0% 92%			thickly bedded	
1.022.1 6.0			Soft, Gray-Brown, Slightly Fine to Coarse Sandy CL	Plastic, Silty,	975	973.9 1 54.2	3:	30/1.0 40/1.0 46/1.0 24/1.0 20/1.0					-	GSI: 70-80	
1020 1,022.1 6.0	1		trace root fragments, or	rganic odor		973.9 _ 54.2	5.0 4:	: <u>20/1.0</u> :30/1.0 :15/1.0	(5.0) (4.7) 100% 94%	DC 4				RS-3: 50.4-50.9' Unit Weight: 159.2 pcf	
+	<u> </u>	W	1,019.1 RESIDUAL	9.0	970	‡	3:	:20/1.0 :48/1.0	100% 94%	RS-4			Unconfine	ed Compressive Strength: 4,760	psi (685 ksf)
1,017.1 11.0 10 12	15	W 0000	Medium Dense to Very Der Fine to Coarse SAND (A-3),	nse, Gray-Tan,	070	968.9 59.2	4:	02/1 0	(5.0) (5.0)				-	RS-4: 55.3-56.0' Unit Weight: 161.5 pcf	
1015	2/	0000	- Time to obtaine of the (140),	with trace milea			5:	:02/1.0	(5.0) (5.0) 100% 100%				Unconfined	Compressive Strength: 16,060	psi (2,313 ksf)
1.012.1 16.0			•		965	963.9 1 64.2	4:	:05/1.0					963.9		64.2
1010	36	W 0000	- -			‡						F	Boring Tern	ninated at Elevation 963.9 ft In C (GRANODIORITE)	Crystalline Rock
1,007.1 21.0 20 36 64	4/0 4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	- - 1,006.6	21.5		<del> </del>							- Hard Drilling 6	encountered from approximately	22.0 to 23.0 feet
1005	100/0.9	1   🗐 🗐	WEATHERED R - 1,004.1 White-Gray, (GRANO			†						[	Sandy So	il Seam from approximately 34.	0 to 39.0 feet
1,002.1 26.0			RESIDUAL  Medium Dense to Ver	ry Dense,		1 - 1						E	-		
1000 30 54	44	98   W	Orange-Gray-White, Silty I SAND (A-2-4), with trace	mica and pea		1 1						<u> </u>			
			gravel-sized rock fra	agments								<u> </u>	_		
997.1 31.0 25 25 2	28											-			
995			<del>-</del> •			‡									
992.1 36.0 5 7	: : : :   : : : :   : : : : : :		•									-	-		
990	• 18	W	<del>-</del>			‡									
987.1 41.0			987.1	41.0		†						F	-		
985	100/0.2		WEATHERED R White-Gray, (GRANO									l E			
				,								E	_		
982.1 7 46.0 60/0.0	60/0.0		982.1 CRYSTALLINE R	46.0 ROCK		1 1						<u> </u>			
980			White-Gray, (GRANO	•											
		RS-3	REC: 100% RQD: 92%			‡							-		
8 975			GSI: 70-80			‡									
			• •			‡							-		
970		RS-4	•			‡									
5 <del>1</del>			<del>-</del>			‡									
			•			‡						F	-		
965		RS-3 / RS-4	- - - 	640		‡									
4,62.(			Boring Terminated at Eleva Crystalline Rock (GRAN			‡							-		
H				•		‡									
			<ul> <li>Hard Drilling encount approximately 22.0 to</li> </ul>	23.0 feet		‡							_		
			Sandy Soil Seam from app	roximately 34.0		<del>-</del>						F	-		
H			to 39.0 feet									1 E			
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ŎZ T			-			<u> </u>						<u> </u>			



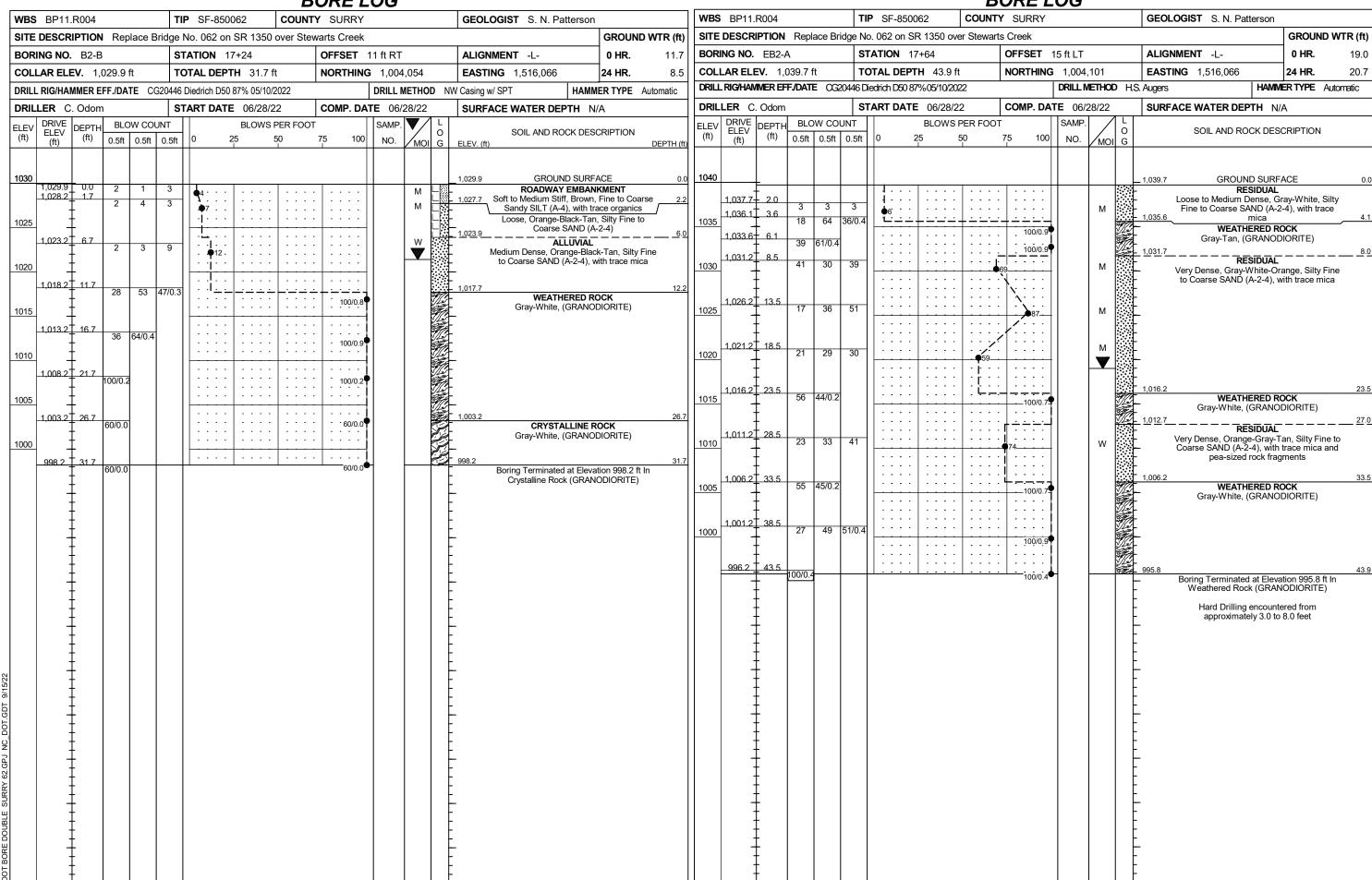
# Replace Bridge No. 062 on SR 1350 (Red Brush Road) over Stewarts Creek, Surry County, NC Rock Core Photographs Boring: B2-A

46.0 to 64.2 Feet





## GEOTECHNICAL BORING REPORT BORE LOG



										ים			<u> </u>					
WBS	BP11.I	R004			TI	<b>P</b> SF-85	50062	2	COI	UNTY	'SU	RRY				GEOLOGIST S. N. Patterson		
SITE	DESCRI	PTION	Repl	lace Br	idge N	o. 062 on	SR 1	1350 ov	er Ste	warts	Cree	k				1	GROU	ND WTR (ft)
BOR	ING NO.	EB2-l	В		S	TATION	17+6	35			OFF	SET 1	4 ft RT			ALIGNMENT -L-	0 HR.	22.5
COL	LAR ELE	<b>V</b> . 1,	040.6	ft	TO	OTAL DE	PTH	39.2 f	t		NOR	THING	1,004,	086		<b>EASTING</b> 1,516,091	24 HR.	20.0
DRILL	RIG/HAM	MER EF	F./DAT	E CG	20446 D	iedrich D50	87%	05/10/20	22				DRILL N	<b>IETHO</b> E	) HS	. Augers HAM	VIER TYPE	Automatic
DRIL	LER C.	Odom	ı		S	TART DA	TE	06/27/2	22		COM	IP. DAT	TE 06/2	27/22		SURFACE WATER DEPTH	/A	
ELEV	DRIVE	DEPTH	BLC	ow co	UNT		E	BLOWS	PER F	OOT			SAMP.	<b>V</b> /			CODIDITION	\ <u></u>
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25		50	,	75 I	100	NO.	МОІ	O G	SOIL AND ROCK DE ELEV. (ft)	SCRIPTIO	DEPTH (ft)
1045																		
	-	-													l F	-		
	-	-														1,040.6 GROUND SUR	EACE	0.0
1040	1,039.1	15					-		-	+	-					- RESIDUAI		
			19	22	41					<b>●</b> 63-	: :			М		Very Dense, Gray-Whit Coarse SAND (A-2-4), wit	trace mic	a and
1035	1,036.6-	- 4.0 -	41	59/0.3					: :	÷÷	- -:-	00/0.8				1,036.6 gravel-sized rock fi		4.0
1000	1,034.1	6.5	35	61	39/0.3				<b> </b>		<u> </u>					Gray-White, (GRAN		
	1,032.1	8.5	30	47	49				: :	· · ·		100/0.8		١				8.0
1030	-	-	30	47	49				<u>  : :</u>			•96		M		Very Dense, Gray-Whit Coarse SAND (A-2-4), v	e, Silty Fine	e to nica
	-	-														000.00 07.112 (7.2.1),		
	1,027.1	_ 13.5	23	36	62				: :			 	 8	М				
1025	-	-				<del> </del>	-		+		+	$\frac{I}{I}$	Ì		<u> </u>	-		
	1.022.1	18.5										· [		М	-			
1020	-	-	12	32	61		-   -		: :		: :	●93		V	ĮF			
	] -	-									٠,	/				=		
	1,017.1	23.5	19	27	49				: :		/.			l w				
1015	_	-	"		"				: :		76			**		-		
	-	-							: :		j:::					1,012.1		28.5
1010	1,012.1_	_ 28.5 -	40	60/0.3					: :		<b>-</b> -	100/0.8				WEATHERED I		
1010	-	-							+		+					Gray-White, (GRAN)	DDIORITE)	)
	1,007.1	33.5	100/0						: :	 	: :	:::1						
1005	_	_	100/0.	3			-		ļ		- 1	100/0.5				_		
	_	-																
	1,002.1	38.5	61	39/0.2							Ŀ,	100/0.7	1			1,001.4	l' - 4 004	39.2
	-											100/0.7			1 E	Boring Terminated at Elev Weathered Rock (GRA	NODIORIT	.4 π In E)
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PROJECT REFERENCE	E NO.	SHEET NO.
BP11.R004		18
LAB RI	ESU.	ULTS

				ROCK	X TEST RESULTS		
SAMPLE NO.	BORING	STATION	OFFSET	DEPTH INTERVAL	ROCK TYPE	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH
RS-1	B1–B	16+33 -L-	19' RT	54.7 - 55.3'	GRANODIORITE	162.4	16,430 psi/2,366 ksf
RS–2	B1–B	16+33 -L-	19' RT	59.7 - 60.4'	GRANODIORITE	163.8	18,940 psi/2,727 ksf
RS-3	B2-A	17+25 -L-	29' $LT$	50.4 - 50.9'	GRANODIORITE	159.2	4,760 psi/685 ksf
RS-4	B2-A	17+25 -L-	29' $LT$	55.3 - 56.0'	GRANODIORITE	161.5	16,060 psi/2,313 ksf

LAB TESTING PERFORMED BY NCDOT LAB CERT NO. 117-1104

PROJECT REFERENCE NO	O.   SHEET NO.
BP11.R004	19
SITE PHOTOS	



PHOTO #1: NORTH EAST SIDE OF EXISTING BRIDGE LOOKING WEST (DOWNSTATION)

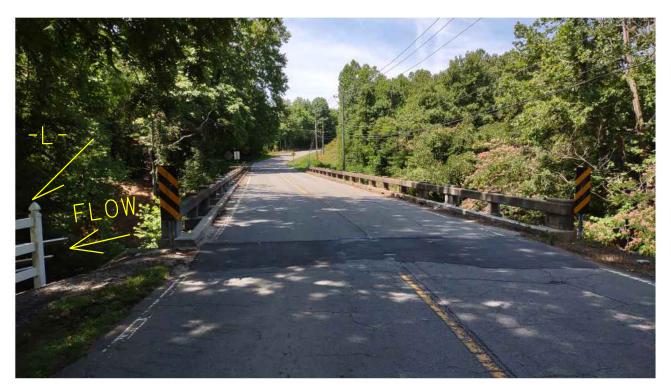


PHOTO #2: NORTH EAST END OF BENT 2 SIDE OF EXISTING BRIDGE LOOKING SOUTHWEST (DOWNSTATION)