

**This electronic collection of documents is provided  
for the convenience of the user  
and is Not a Certified Document –**

**The documents contained herein were originally issued  
and sealed by the individuals whose names and license  
numbers appear on each page, on the dates appearing  
with their signature on that page.**

**This file or an individual page  
shall not be considered a certified document.**

REFERENCE: SF-340040

PROJECT: 17BP.5.R.82

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY GRANVILLE  
PROJECT DESCRIPTION BRIDGE NO. 40 ON US 158  
(WILLIAMSBORO RD.) OVER TABBS CREEK

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	BORING LOCATION PLAN
4	PROFILE
5-6	CROSS-SECTIONS
7-8	BORE LOGS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-340040	1	8

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- 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.
  - 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

TRIGON

GOODNIGHT, D.J.

INVESTIGATED BY GOODNIGHT, D.J.

DRAWN BY HILL, M.J.

CHECKED BY HUNSBERGER, W.S.

SUBMITTED BY FALCON ENG.

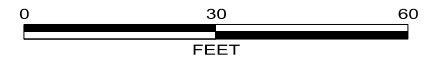
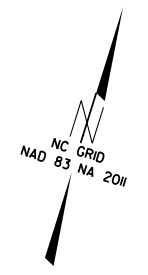
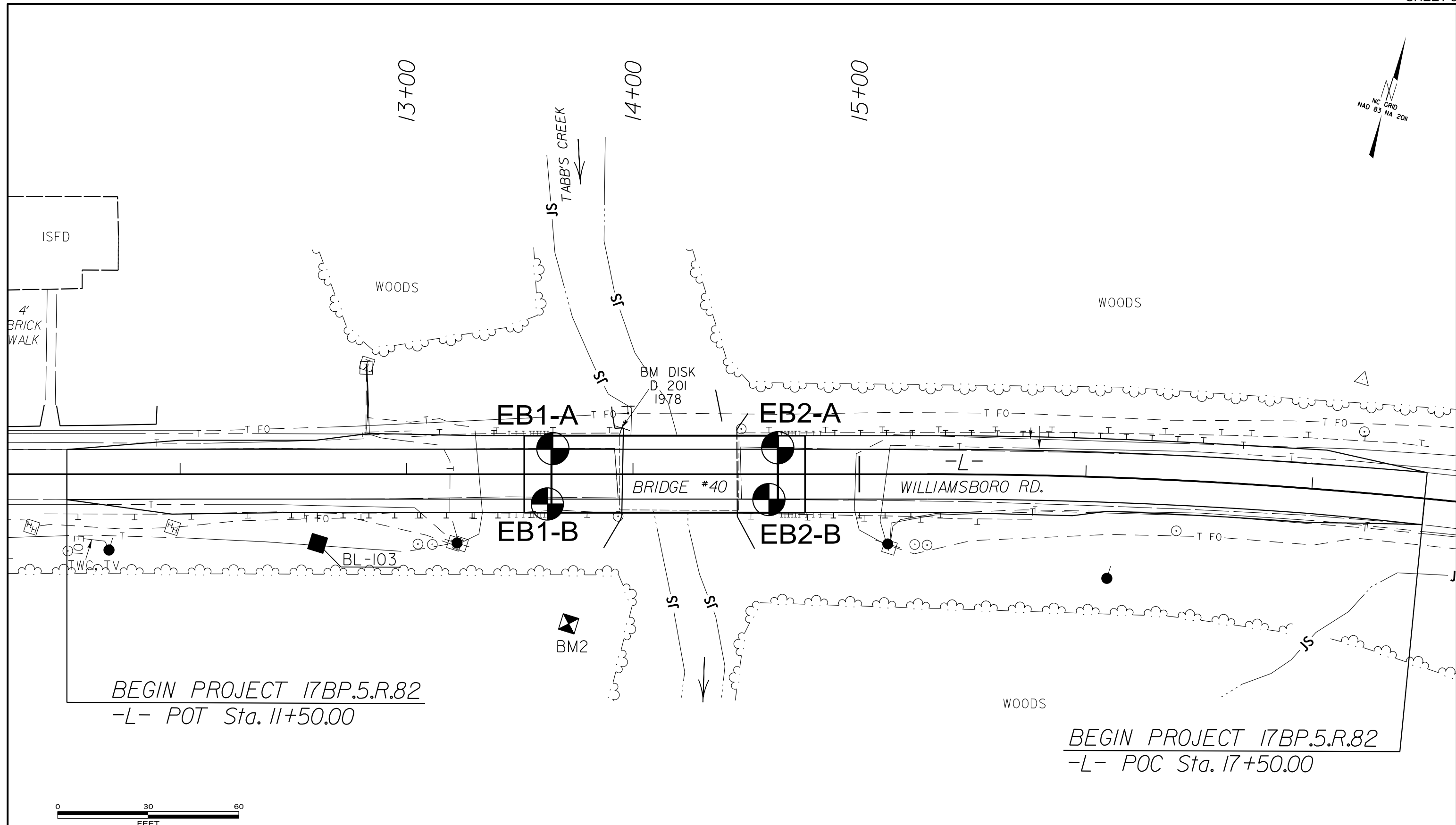
DATE DECEMBER 2017



DocuSigned by:  
Jeremy R Hamm 12/22/2017  
ED7938089E22487  
SIGNATURE DATE

**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																																																																																																																																																																																																	
<p>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 208, 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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.  <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>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:</p>										<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.  <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  <b>ARGILLACEOUS</b> - 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.  <b>ARTESIAN</b> - 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.  <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.  <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.  <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  <b>ROCK QUALITY DESIGNATION (ROD)</b> - 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.  <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  <b>SILL</b> - 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.  <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (IN 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.  <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  <b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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.  <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																	
<p style="text-align: center;"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th></th> <th></th> <th></th> <th></th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-1, A-2</td> <td>A-3</td> <td>A-4, A-5</td> <td>A-6, A-7</td> <td></td> </tr> <tr> <td>SYMBOL</td> <td colspan="5">[Pattern]</td> <td colspan="5">[Pattern]</td> <td colspan="5">[Pattern]</td> </tr> <tr> <td>% PASSING #10 #40 #200</td> <td>50 MX 30 MX 15 MX</td> <td>50 MX 25 MX</td> <td>51 MN 35 MX 35 MX</td> <td>40 MX 41 MN 10 MX 11 MN</td> <td>40 MX 41 MN 11 MN 11 MN</td> <td>40 MX 41 MN 11 MN 11 MN</td> <td>36 MN 36 MN 36 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> </tr> <tr> <td>MATERIAL PASSING #40 LL PI</td> <td colspan="5"></td> <td colspan="5"></td> <td colspan="5"></td> </tr> <tr> <td>GROUP INDEX</td> <td colspan="5">0</td> <td colspan="5">0</td> <td colspan="5">0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td colspan="2">STONE FRAGS. GRAVEL, AND SAND</td> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="5">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> </tr> <tr> <td>GEN. RATING AS SUBGRADE</td> <td colspan="5">EXCELLENT TO GOOD</td> <td colspan="5">FAIR TO POOR</td> <td colspan="5">FAIR TO POOR, POOR, UNSUITABLE</td> </tr> <tr> <td colspan="10">PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS &gt; LL - 30</td> <td colspan="10"></td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7					GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7		SYMBOL	[Pattern]					[Pattern]					[Pattern]					% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 35 MX 35 MX	40 MX 41 MN 10 MX 11 MN	40 MX 41 MN 11 MN 11 MN	40 MX 41 MN 11 MN 11 MN	36 MN 36 MN 36 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	MATERIAL PASSING #40 LL PI																GROUP INDEX	0					0					0					USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER					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																				<p style="text-align: center;"><b>MINERALOGICAL COMPOSITION</b></p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p style="text-align: center;"><b>WEATHERING</b></p> <p>FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (IV 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.</p> <p>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.</p> <p>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.</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>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. <i>IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</i></p> <p>VERY SEVERE (IV 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. <i>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</i></p> <p>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.</p>										<p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </table>										ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%	HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE
GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS																																																																																																																																																																																																																				
	A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7																																																																																																																																																																																																																				
GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7																																																																																																																																																																																																																	
SYMBOL	[Pattern]					[Pattern]					[Pattern]																																																																																																																																																																																																																				
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 35 MX 35 MX	40 MX 41 MN 10 MX 11 MN	40 MX 41 MN 11 MN 11 MN	40 MX 41 MN 11 MN 11 MN	36 MN 36 MN 36 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN																																																																																																																																																																																																															
MATERIAL PASSING #40 LL PI																																																																																																																																																																																																																															
GROUP INDEX	0					0					0																																																																																																																																																																																																																				
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER																																																																																																																																																																																																																				
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																																																																																																																																																																																																																															
ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL																																																																																																																																																																																																																												
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%																																																																																																																																																																																																																												
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%																																																																																																																																																																																																																												
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%																																																																																																																																																																																																																												
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE																																																																																																																																																																																																																												
<p style="text-align: center;"><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>&lt; 4 4 TO 10 10 TO 30 30 TO 50 &gt; 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>&lt; 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 &gt; 30</td> <td>&lt; 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 &gt; 4</td> </tr> </table>										PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A	GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4	<p style="text-align: center;"><b>GROUND WATER</b></p> <p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p>▽/24 STATIC WATER LEVEL AFTER 24 HOURS</p> <p>▽/PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p>○ SPRING OR SEEP</p>										<p style="text-align: center;"><b>MISCELLANEOUS SYMBOLS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>[Symbol] ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td>[Symbol] DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</td> <td>[Symbol] SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td>[Symbol] SOIL SYMBOL</td> <td>[Symbol] TEST BORING</td> <td>[Symbol] CONE PENETROMETER TEST</td> </tr> <tr> <td>[Symbol] ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td>[Symbol] AUGER BORING</td> <td>[Symbol] SOUNDING ROD</td> </tr> <tr> <td>[Symbol] INFERRED SOIL BOUNDARY</td> <td>[Symbol] CORE BORING</td> <td>[Symbol] TEST BORING WITH CORE</td> </tr> <tr> <td>[Symbol] INFERRED ROCK LINE</td> <td>[Symbol] MONITORING WELL</td> <td>[Symbol] SPT N-VALUE</td> </tr> <tr> <td>[Symbol] ALLUVIAL SOIL BOUNDARY</td> <td>[Symbol] PIEZOMETER INSTALLATION</td> <td></td> </tr> </table>										[Symbol] ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	[Symbol] DIP & DIP DIRECTION OF ROCK STRUCTURES	[Symbol] SLOPE INDICATOR INSTALLATION	[Symbol] SOIL SYMBOL	[Symbol] TEST BORING	[Symbol] CONE PENETROMETER TEST	[Symbol] ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	[Symbol] AUGER BORING	[Symbol] SOUNDING ROD	[Symbol] INFERRED SOIL BOUNDARY	[Symbol] CORE BORING	[Symbol] TEST BORING WITH CORE	[Symbol] INFERRED ROCK LINE	[Symbol] MONITORING WELL	[Symbol] SPT N-VALUE	[Symbol] ALLUVIAL SOIL BOUNDARY	[Symbol] PIEZOMETER INSTALLATION																																																																																																																																																																					
PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )																																																																																																																																																																																																																												
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A																																																																																																																																																																																																																												
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4																																																																																																																																																																																																																												
[Symbol] ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	[Symbol] DIP & DIP DIRECTION OF ROCK STRUCTURES	[Symbol] SLOPE INDICATOR INSTALLATION																																																																																																																																																																																																																													
[Symbol] SOIL SYMBOL	[Symbol] TEST BORING	[Symbol] CONE PENETROMETER TEST																																																																																																																																																																																																																													
[Symbol] ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	[Symbol] AUGER BORING	[Symbol] SOUNDING ROD																																																																																																																																																																																																																													
[Symbol] INFERRED SOIL BOUNDARY	[Symbol] CORE BORING	[Symbol] TEST BORING WITH CORE																																																																																																																																																																																																																													
[Symbol] INFERRED ROCK LINE	[Symbol] MONITORING WELL	[Symbol] SPT N-VALUE																																																																																																																																																																																																																													
[Symbol] ALLUVIAL SOIL BOUNDARY	[Symbol] PIEZOMETER INSTALLATION																																																																																																																																																																																																																														
<p style="text-align: center;"><b>TEXTURE OR GRAIN SIZE</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.75</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <td>Boulder (BLDR.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cobble (COB.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gravel (GR.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Coarse Sand (CSE. SD.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fine Sand (F SD.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Silt (SL.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Clay (CL.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>GRAIN SIZE</td> <td>305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> <tr> <td>MM</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>IN.</td> <td>12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>										U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270		4.75	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	305	75	2.0	0.25	0.05	0.005	MM							IN.	12	3					<p style="text-align: center;"><b>RECOMMENDATION SYMBOLS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>[Symbol] UNDERCUT</td> <td>[Symbol] UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td>[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td>[Symbol] SHALLOW UNDERCUT</td> <td>[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> </tr> </table>										[Symbol] UNDERCUT	[Symbol] UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	[Symbol] SHALLOW UNDERCUT	[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK		<p style="text-align: center;"><b>ROCK HARDNESS</b></p> <p>VERY HARD: CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD: CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD: CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT: CAN BE GROUDED 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.</p> <p>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 FINGER NAIL.</p>																																																																																																																	
U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270																																																																																																																																																																																																																									
	4.75	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	305	75	2.0	0.25	0.05	0.005																																																																																																																																																																																																																									
MM																																																																																																																																																																																																																															
IN.	12	3																																																																																																																																																																																																																													
[Symbol] UNDERCUT	[Symbol] UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL																																																																																																																																																																																																																													
[Symbol] SHALLOW UNDERCUT	[Symbol] UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK																																																																																																																																																																																																																														
<p style="text-align: center;"><b>SOIL MOISTURE - CORRELATION OF TERMS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE SHRINKAGE LIMIT</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>										SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	OM - OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE	SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	<p style="text-align: center;"><b>ABBREVIATIONS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>AR - AUGER REFUSAL</td> <td>MED. - MEDIUM</td> <td>VST - VANE SHEAR TEST</td> </tr> <tr> <td>BT - BORING TERMINATED</td> <td>MICA - MICACEOUS</td> <td>WEA. - WEATHERED</td> </tr> <tr> <td>CL - CLAY</td> <td>MOD. - MODERATELY</td> <td>UNIT WEIGHT</td> </tr> <tr> <td>CPT - CONE PENETRATION TEST</td> <td>NP - NON PLASTIC</td> <td>DRY UNIT WEIGHT</td> </tr> <tr> <td>CSE - COARSE</td> <td>ORG. - ORGANIC</td> <td>SAMPLE ABBREVIATIONS</td> </tr> <tr> <td>DPT - DILATOMETER TEST</td> <td>PMT - PRESSUREMETER TEST</td> <td>S - BULK</td> </tr> <tr> <td>DY - DYNAMIC PENETRATION TEST</td> <td>SAP. - SAPROLITIC</td> <td>SS - SPLIT SPOON</td> </tr> <tr> <td>e - VOID RATIO</td> <td>SD. - SAND, SANDY</td> <td>ST - SHELBY TUBE</td> </tr> <tr> <td>F - FINE</td> <td>SL. - SILT, SILTY</td> <td>RS - ROCK</td> </tr> <tr> <td>FOSS. - FOSSILIFEROUS</td> <td>SLI. - SLIGHTLY</td> <td>RT - RECOMPACTED TRIAXIAL</td> </tr> <tr> <td>FRAC. - FRACTURED, FRACTURES</td> <td>TCR - TRICONE REFUSAL</td> <td>CBR - CALIFORNIA BEARING RATIO</td> </tr> <tr> <td>FRAGS. - FRAGMENTS</td> <td>w - MOISTURE CONTENT</td> <td></td> </tr> <tr> <td>HI. - HIGHLY</td> <td>V - VERY</td> <td></td> </tr> </table>										AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST	BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED	CL - CLAY	MOD. - MODERATELY	UNIT WEIGHT	CPT - CONE PENETRATION TEST	NP - NON PLASTIC	DRY UNIT WEIGHT	CSE - COARSE	ORG. - ORGANIC	SAMPLE ABBREVIATIONS	DPT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	S - BULK	DY - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	SS - SPLIT SPOON	e - VOID RATIO	SD. - SAND, SANDY	ST - SHELBY TUBE	F - FINE	SL. - SILT, SILTY	RS - ROCK	FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RT - RECOMPACTED TRIAXIAL	FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	CBR - CALIFORNIA BEARING RATIO	FRAGS. - FRAGMENTS	w - MOISTURE CONTENT		HI. - HIGHLY	V - VERY																																																																																																																																																							
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION																																																																																																																																																																																																																													
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE																																																																																																																																																																																																																													
PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE																																																																																																																																																																																																																													
OM - OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE																																																																																																																																																																																																																													
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE																																																																																																																																																																																																																													
AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST																																																																																																																																																																																																																													
BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED																																																																																																																																																																																																																													
CL - CLAY	MOD. - MODERATELY	UNIT WEIGHT																																																																																																																																																																																																																													
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	DRY UNIT WEIGHT																																																																																																																																																																																																																													
CSE - COARSE	ORG. - ORGANIC	SAMPLE ABBREVIATIONS																																																																																																																																																																																																																													
DPT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	S - BULK																																																																																																																																																																																																																													
DY - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	SS - SPLIT SPOON																																																																																																																																																																																																																													
e - VOID RATIO	SD. - SAND, SANDY	ST - SHELBY TUBE																																																																																																																																																																																																																													
F - FINE	SL. - SILT, SILTY	RS - ROCK																																																																																																																																																																																																																													
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RT - RECOMPACTED TRIAXIAL																																																																																																																																																																																																																													
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	CBR - CALIFORNIA BEARING RATIO																																																																																																																																																																																																																													
FRAGS. - FRAGMENTS	w - MOISTURE CONTENT																																																																																																																																																																																																																														
HI. - HIGHLY	V - VERY																																																																																																																																																																																																																														
<p style="text-align: center;"><b>PLASTICITY</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NON PLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table>										NON PLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH		0-5	VERY LOW	SLIGHTLY PLASTIC	6-15	SLIGHT	MODERATELY PLASTIC	16-25	MEDIUM	HIGHLY PLASTIC	26 OR MORE	HIGH	<p style="text-align: center;"><b>EQUIPMENT USED ON SUBJECT PROJECT</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>DRILL UNITS:</td> <td>ADVANCING TOOLS:</td> <td>HAMMER TYPE:</td> </tr> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input checked="" type="checkbox"/> CME-55</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td>CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input checked="" type="checkbox"/> 8" HOLLOW AUGERS</td> <td><input type="checkbox"/> -B <input type="checkbox"/> -H</td> </tr> <tr> <td><input type="checkbox"/> VANE SHEAR TEST</td> <td><input type="checkbox"/> HARD FACED FINGER BITS</td> <td><input type="checkbox"/> -N</td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td>HAND TOOLS:</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> TRICONE *STEEL TEETH</td> <td><input type="checkbox"/> HAND AUGER</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> TRICONE *TUNG-CARB.</td> <td><input type="checkbox"/> SOUNDING ROD</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> </tr> <tr> <td><input type="checkbox"/></td> <td></td> <td></td> </tr> </table>										DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:	<input type="checkbox"/> CME-45C	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL	<input checked="" type="checkbox"/> CME-55	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:	<input type="checkbox"/> CME-550	<input checked="" type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B <input type="checkbox"/> -H	<input type="checkbox"/> VANE SHEAR TEST	<input type="checkbox"/> HARD FACED FINGER BITS	<input type="checkbox"/> -N	<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	HAND TOOLS:	<input type="checkbox"/>	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	<input type="checkbox"/> POST HOLE DIGGER	<input type="checkbox"/>	<input type="checkbox"/> TRICONE *STEEL TEETH	<input type="checkbox"/> HAND AUGER	<input type="checkbox"/>	<input type="checkbox"/> TRICONE *TUNG-CARB.	<input type="checkbox"/> SOUNDING ROD	<input type="checkbox"/>	<input type="checkbox"/> CORE BIT	<input type="checkbox"/> VANE SHEAR TEST	<input type="checkbox"/>																																																																																																																																																														
NON PLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH																																																																																																																																																																																																																													
	0-5	VERY LOW																																																																																																																																																																																																																													
SLIGHTLY PLASTIC	6-15	SLIGHT																																																																																																																																																																																																																													
MODERATELY PLASTIC	16-25	MEDIUM																																																																																																																																																																																																																													
HIGHLY PLASTIC	26 OR MORE	HIGH																																																																																																																																																																																																																													
DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:																																																																																																																																																																																																																													
<input type="checkbox"/> CME-45C	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL																																																																																																																																																																																																																													
<input checked="" type="checkbox"/> CME-55	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:																																																																																																																																																																																																																													
<input type="checkbox"/> CME-550	<input checked="" type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B <input type="checkbox"/> -H																																																																																																																																																																																																																													
<input type="checkbox"/> VANE SHEAR TEST	<input type="checkbox"/> HARD FACED FINGER BITS	<input type="checkbox"/> -N																																																																																																																																																																																																																													
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	HAND TOOLS:																																																																																																																																																																																																																													
<input type="checkbox"/>	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	<input type="checkbox"/> POST HOLE DIGGER																																																																																																																																																																																																																													
<input type="checkbox"/>	<input type="checkbox"/> TRICONE *STEEL TEETH	<input type="checkbox"/> HAND AUGER																																																																																																																																																																																																																													
<input type="checkbox"/>	<input type="checkbox"/> TRICONE *TUNG-CARB.	<input type="checkbox"/> SOUNDING ROD																																																																																																																																																																																																																													
<input type="checkbox"/>	<input type="checkbox"/> CORE BIT	<input type="checkbox"/> VANE SHEAR TEST																																																																																																																																																																																																																													
<input type="checkbox"/>																																																																																																																																																																																																																															
<p style="text-align: center;"><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table>										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	<p style="text-align: center;"><b>BEDDING</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td> <td>&lt; 0.008 FEET</td> </tr> </table>										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																																																																																																																																																																								
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																																																																																																																																																																																																																														
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																																																																																																																																																																																																																														
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>NOTES:</b></p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>										<p style="text-align: center;"><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>																																																																																																																																																																																																																					
<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED: GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																																																																																																																																																																																																																															



**NOTES:**

- PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD, DATED MAY 2017.
- BRIDGE SKEW: 90°

**FALCON ENGINEERING**

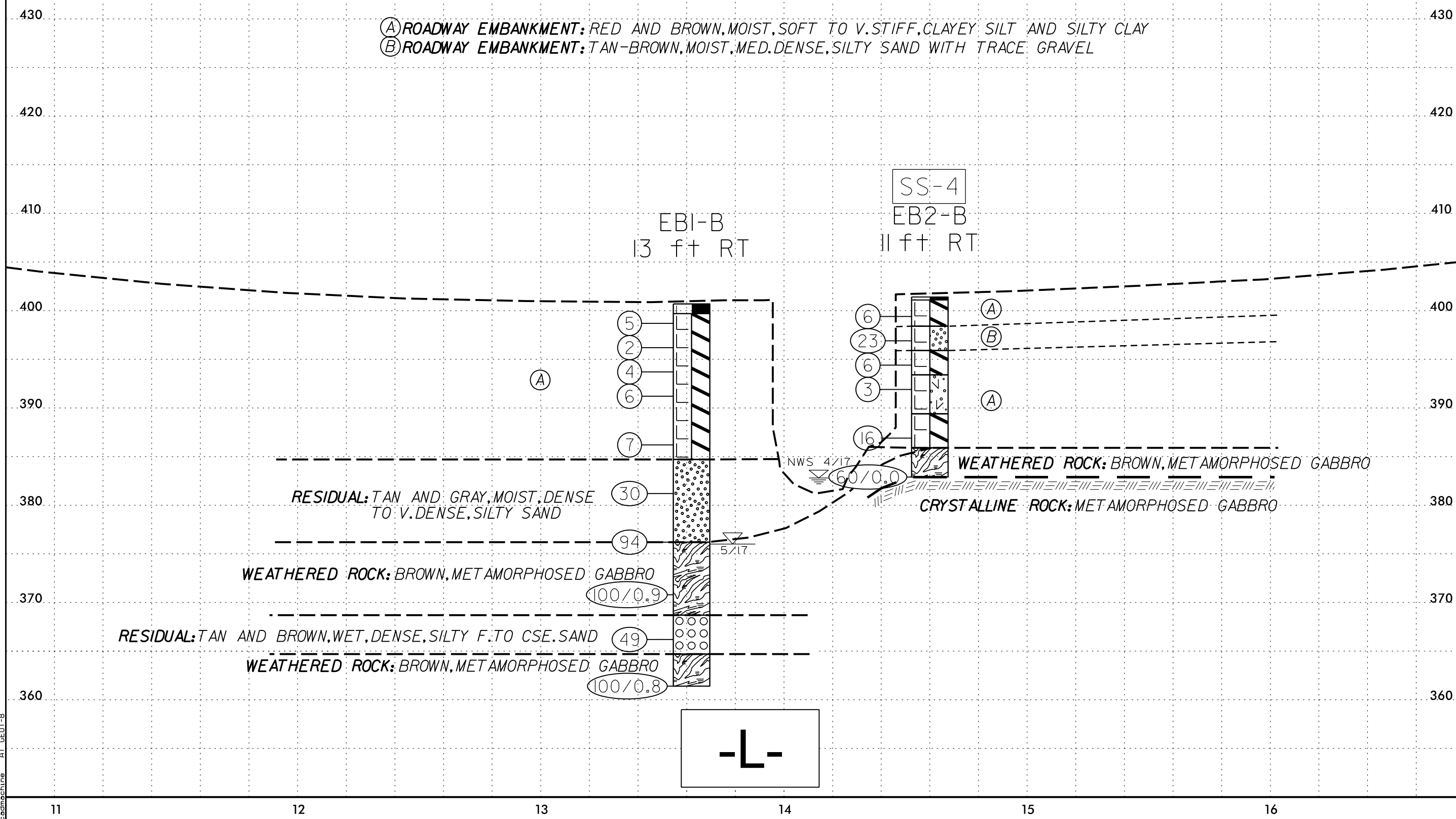
FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
CARY, NC 27513  
919.871.0800

**BORING LOCATION PLAN**

BRIDGE NO. 40 ON US 158 (WILLIAMSBORO RD.)  
OVER TABBS CREEK  
GRANVILLE COUNTY, NORTH CAROLINA  
WBS NO.: 17BP.5.R.82 | TIP NO.: SF-380040  
FALCON PROJECT NO.: G16029.05

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-4	11' RT	14+60	1.0'-2.5'	A-7-6	43	22	-	-	-	-	95	80	61	26	-

(A) ROADWAY EMBANKMENT: RED AND BROWN, MOIST, SOFT TO V. STIFF, CLAYEY SILT AND SILTY CLAY  
 (B) ROADWAY EMBANKMENT: TAN-BROWN, MOIST, MED. DENSE, SILTY SAND WITH TRACE GRAVEL

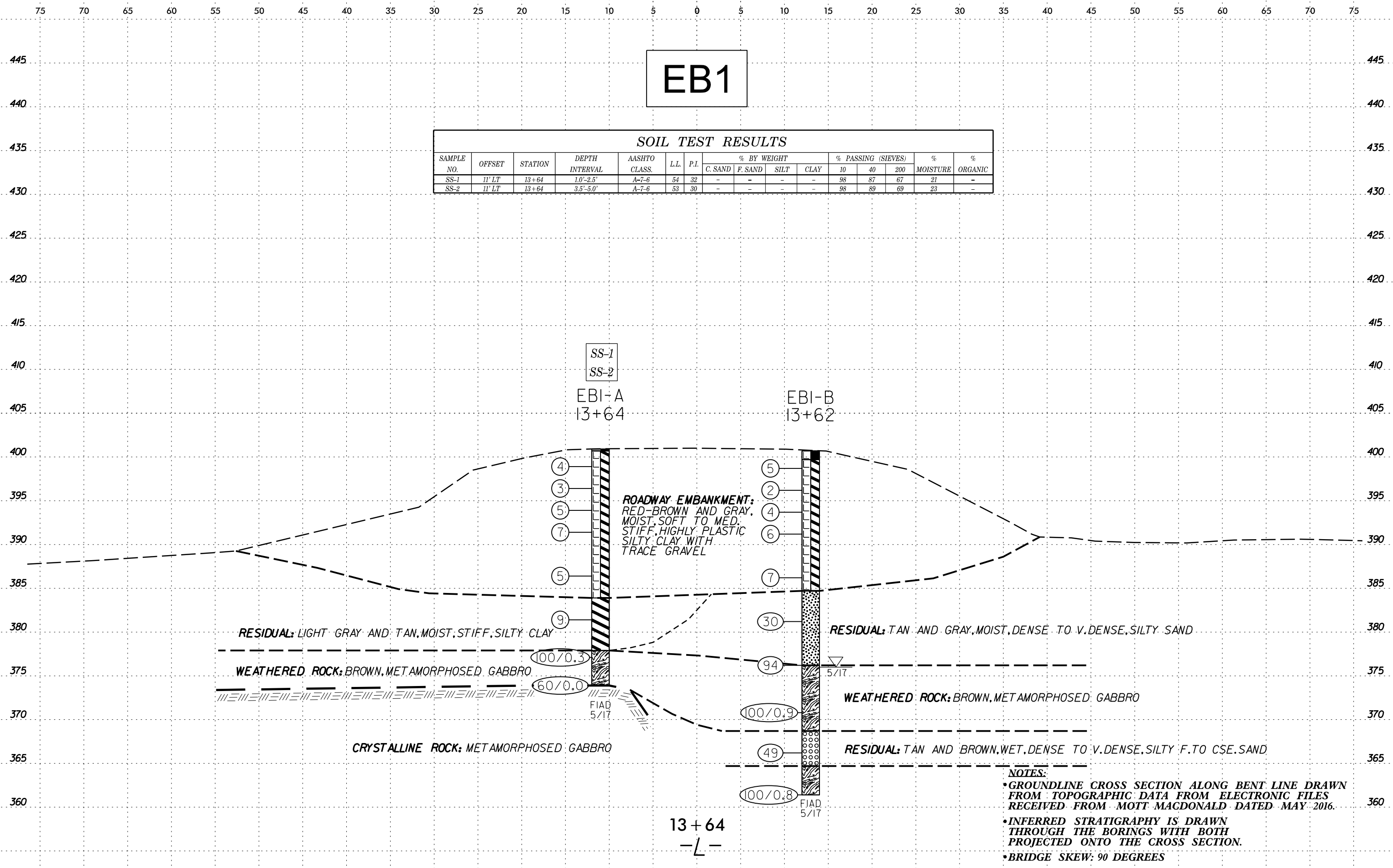


\$DATE\$\$ 22-DEC-2017 10:35  
 T:\Projects\2016\G16029\00 MM - 7 Bridges in Division 5\340040\NC00T\_Electronic\_File\_Tree\Geotech\InvestigationDesign\340040\_GEO\_BRDC40\CADD\_GEO TECH\Site&Sub\340040\_GEO.pfl.psh.dgn  
 cadmachine AT GEOT-8

22-DEC-2017 10:30  
 I:\Projects\2016\G16029\00 MM - 7 Bridges in Division 5\340040\NCDOT\_Electronic\_Files\_Tree\Geotech\InvestigationDesign\340040\_GEO\_BROG40\CADD\_GEO\GEO\340040\_geo.XSL.dgn  
 8/23/99

# EB1

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	11' LT	13+64	1.0'-2.5'	A-7-6	54	32	-	-	-	-	98	87	67	21	-
SS-2	11' LT	13+64	3.5'-5.0'	A-7-6	53	30	-	-	-	-	98	89	69	23	-



**NOTES:**

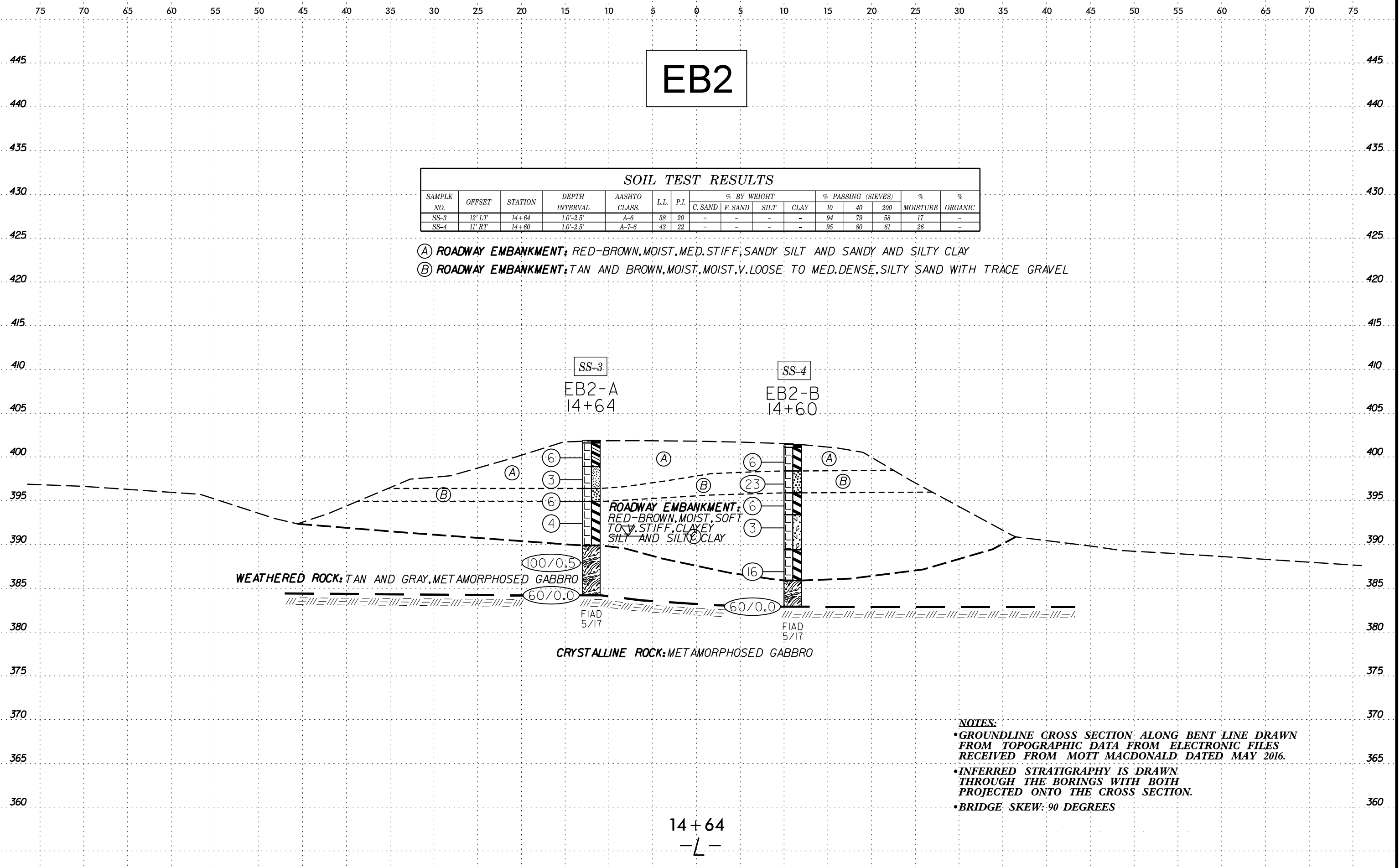
- GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD DATED MAY 2016.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.
- BRIDGE SKEW: 90 DEGREES

22-DEC-2017 10:31  
 I:\Projects\2016\G16029\00 MM - 7 Bridges in Division 5\340040\_NCDOT\_Electronic\_Files\_Tree\Geotech\InvestigationDesign\340040\_GEO\CADD\_BRDG40\CADD\_GEO\TECH\340040\_geo\_XSI.dgn  
 8/23/99

# EB2

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-3	12' LT	14+64	1.0'-2.5'	A-6	38	20	-	-	-	-	94	79	58	17	-
SS-4	11' RT	14+60	1.0'-2.5'	A-7-6	43	22	-	-	-	-	95	80	61	26	-

- (A) ROADWAY EMBANKMENT; RED-BROWN, MOIST, MED. STIFF, SANDY SILT AND SANDY AND SILTY CLAY
- (B) ROADWAY EMBANKMENT; TAN AND BROWN, MOIST, MOIST, V. LOOSE TO MED. DENSE, SILTY SAND WITH TRACE GRAVEL



SS-3  
EB2-A  
14+64

SS-4  
EB2-B  
14+60

ROADWAY EMBANKMENT:  
RED-BROWN, MOIST, SOFT  
TO V. STIFF, CLAYEY  
SILTY AND SILTY CLAY

WEATHERED ROCK: TAN AND GRAY, METAMORPHOSED GABBRO

CRYSTALLINE ROCK: METAMORPHOSED GABBRO

- NOTES:**
- GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD, DATED MAY 2016.
  - INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.
  - BRIDGE SKEW: 90 DEGREES

14+64  
-L-

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 17BP.5.R.82		TIP SF-380040		COUNTY GRANVILLE		GEOLOGIST Goodnight, D.									
SITE DESCRIPTION BRIDGE NO. 40 ON US 158 (WILLIAMSBORO RD.) OVER TABBS CREEK							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 13+64		OFFSET 11 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 400.9 ft		TOTAL DEPTH 27.0 ft		NORTHING 933,732		EASTING 2,137,613									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 77% 02/22/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Toothman, R.		START DATE 05/03/17		COMP. DATE 05/03/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
405															
400	399.9	1.0	4	2	2									0.2' BITUMINOUS CONCRETE	0.0
	397.4	3.5	2	2	1									ROADWAY EMBANKMENT RED-BROWN AND DARK BROWN, SILTY CLAY (A-7-6) WITH TRACE GRAVEL	
395	394.9	6.0	2	2	3										
	392.4	8.5	4	3	4										
390															
	387.4	13.5	1	2	3										
385															
	382.4	18.5	2	4	5									RESIDUAL LIGHT GRAY AND TAN, SILTY CLAY (A-7), SAPROLITIC	17.0
380															
	377.4	23.5	100/0.3											WEATHERED ROCK TAN, METAMORPHOSED GABBRO	23.0
375															
	373.9	27.0	60/0.0											Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 373.9 ft ON CR: METAMORPHOSED GABBRO	27.0

WBS 17BP.5.R.82		TIP SF-380040		COUNTY GRANVILLE		GEOLOGIST Goodnight, D.									
SITE DESCRIPTION BRIDGE NO. 40 ON US 158 (WILLIAMSBORO RD.) OVER TABBS CREEK							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 13+62		OFFSET 13 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 400.7 ft		TOTAL DEPTH 39.3 ft		NORTHING 933,708		EASTING 2,137,618									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 77% 02/22/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Toothman, R.		START DATE 05/02/17		COMP. DATE 05/02/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
405															
400	399.7	1.0	5	3	2									1.0' BITUMINOUS CONCRETE	1.0
	397.2	3.5	2	1	1									ROADWAY EMBANKMENT BROWN RED-BROWN AND GRAY, SILTY CLAY (A-7) WITH TRACE GRAVEL	
395	394.7	6.0	2	2	2										
	392.2	8.5	2	2	4										
390															
	387.2	13.5	2	3	4										
385															
	382.2	18.5	10	14	16									RESIDUAL TAN AND GRAY, SILTY SAND (A-2-4)	16.0
380															
	377.2	23.5	31	44	50									WEATHERED ROCK BROWN, METAMORPHOSED GABBRO	24.5
375															
	372.2	28.5	30	58	42/0.4										
370															
	367.2	33.5	26	18	31									RESIDUAL TAN AND BROWN, SILTY F. TO CSE. SAND (A-1-b)	32.0
365														WEATHERED ROCK BROWN, METAMORPHOSED GABBRO	36.0
	362.2	38.5	55	45/0.3										Boring Terminated BY AUGER REFUSAL at Elevation 361.4 ft IN WR: METAMORPHOSED GABBRO	39.3

NCDOT BORE DOUBLE BR40 FRANKLIN CO.GPJ NC\_DOT.GDT 12/22/17



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 17BP.5.R.82		TIP SF-380040		COUNTY GRANVILLE		GEOLOGIST Goodnight, D.										
SITE DESCRIPTION BRIDGE NO. 40 ON US 158 (WILLIAMSBORO RD.) OVER TABBS CREEK							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 14+64		OFFSET 12 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 401.9 ft		TOTAL DEPTH 17.7 ft		NORTHING 933,762		EASTING 2,137,708										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 77% 02/22/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Toothman, R.		START DATE 05/02/17		COMP. DATE 05/02/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
405																
400	400.9	1.0	4	3	3									SS-3	17%	401.8 0.3' BITUMINOUS CONCRETE
	398.4	3.5	2	1	2										M	398.9 ROADWAY EMBANKMENT RED-BROWN, SANDY CLAY (A-6) WITH TRACE GRAVEL
	395.9	6.0	3	3	3										M	396.4 RED-TAN, SANDY SILT (A-4)
	393.4	8.5	2	2	2										M	394.9 TAN AND BROWN, SILTY CSE. TO F. SAND (A-2-4) WITH LITTLE GRAVEL
	389.4	11.0													M	394.9 RED-BROWN, SILTY CLAY (A-7-6) WITH TRACE GRAVEL AND ORGANICS
	388.4	13.5	100/0.5													389.9 WEATHERED ROCK TAN- GRAY, METAMORPHOSED GABBRO
	384.2	17.7	60/0.0													384.2 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 384.2 ft ON CR: METAMORPHOSED GABBRO

WBS 17BP.5.R.82		TIP SF-380040		COUNTY GRANVILLE		GEOLOGIST Goodnight, D.										
SITE DESCRIPTION BRIDGE NO. 40 ON US 158 (WILLIAMSBORO RD.) OVER TABBS CREEK							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 14+60		OFFSET 11 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 401.4 ft		TOTAL DEPTH 18.5 ft		NORTHING 933,739		EASTING 2,137,711										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 77% 02/22/2016			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Toothman, R.		START DATE 05/02/17		COMP. DATE 05/02/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
405																
400	400.4	1.0	3	3	3										SS-4	26%
	397.9	3.5	3	6	17											398.4 ROADWAY EMBANKMENT RED, SILTY CLAY (A-7-6) WITH TRACE GRAVEL
	395.4	6.0	3	3	3											395.9 TAN-BROWN, SILTY SAND (A-2-4) WITH TRACE GRAVEL
	392.9	8.5	1	2	1											393.4 RED, SILTY CLAY (A-7-6) WITH TRACE GRAVEL
	389.4	11.0														389.4 TAN-RED, CLAYEY SILT (A-5) WITH TRACE GRAVEL
	387.9	13.5	4	7	9											389.4 RED, SILTY CLAY (A-7-6) WITH SOME GRAVEL
	382.9	18.5	60/0.0													385.9 WEATHERED ROCK GRAY, METAMORPHOSED GABBRO
	382.9	18.5	60/0.0													382.9 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 382.9 ft ON CR: METAMORPHOSED GABBRO

NCDOT BORE DOUBLE BR40 FRANKLIN CO.GPJ NC\_DOT.GDT 12/22/17



December 22, 2017

Tim Jordan, PE  
Mott MacDonald  
7621 Purfoy Road, Suite 115  
Fuquay-Varina, NC 27526

Project: 17BP.5.R.82 (SF-340040)  
County: Granville  
Description: Bridge No. 40 on US 158 (Williamsboro Rd) over Tabbs Creek  
Subject: Foundation Recommendations

Dear Mr. Jordan:

As authorized, Falcon Engineering Inc. (Falcon) has completed the Structure Foundation Recommendations for the above referenced project based on current NCDOT LRFD bridge design policy and procedures.

Foundation recommendations, notes on plans, and pay item quantities are presented in the attachments. These recommendations are based on subsurface data obtained by Falcon as presented in the Subsurface Investigation Report submitted under separate cover. Bridge geometry and scour data used in our analysis were obtained from the approved Bridge Survey and Hydraulic Design Report (BSR).

Falcon appreciates the opportunity to have provided Mott MacDonald with geotechnical engineering services. If you have any questions concerning the contents of this report or need additional information, please do not hesitate to contact our office.

Respectfully submitted:

**FALCON ENGINEERING, INC.**

A handwritten signature in black ink that reads "Stephen Crockett".

Stephen Crockett, EI  
Geotechnical Professional

A handwritten signature in blue ink that reads "Jeremy R. Hamm".

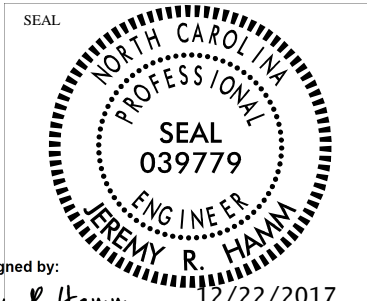
Jeremy R. Hamm, PE  
Geotechnical Engineering Manager

Attachments: Foundation Recommendations  
Notes on Plans  
Pay Item Quantities

# FOUNDATION RECOMMENDATIONS

WBS # 17BP.5.R.82 DESCRIPTION Bridge No. 40 on US 158 (Williamsboro Rd)  
 T.I.P. NO. SF-340040 over Tabbs Creek  
 COUNTY Granville  
 STATION 14+14 -L-

	INITIALS	DATE
DESIGN	SCC	12/8/2017
CHECK	JRH	12/22/2017
APPROVAL		



DocuSigned by:  
*Jeremy R Hamm*  
 SIGNATURE 12/22/2017  
 ED7938089E22487...

	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT NO. 1	13+64 -L-	Cap on HP 12x53 Steel Piles	130 tons/pile	Average Bottom of Cap Elev. = ±392.2 ft Estimated Length of Pile = 20 ft Number of Piles = 7 Pile Spacing = 7 feet 0 inches
END BENT NO. 2	14+64 -L-	Cap on HP 12x53 Steel Piles	130 tons/pile	Average Bottom of Cap Elev. = ±392.5 ft Estimated Length of Pile = 10 ft Number of Piles = 7 Pile Spacing = 7 feet 0 inches

TIP # SF-340040

County Granville

### **FOUNDATION RECOMMENDATION NOTES ON PLANS**

---

1. FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
2. PILES AT END BENTS NO. 1 AND 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 130 TONS PER PILE.
3. DRIVE PILES AT END BENT NO. 1 TO A REQUIRED DRIVING RESISTANCE OF 220 TONS PER PILE.
4. TESTING THE FIRST PRODUCTION PILE WITH THE PDA DURING DRIVING IS REQUIRED AT END BENT NO. 1. FOR PDA TESTING, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
5. CONCRETE OR GROUT IS REQUIRED TO FILL HOLES FOR PILE EXCAVATION AT BENT 2.

### **SPECIAL NOTE ON PLANS**

---

1. DRILLED-IN PILES ARE REQUIRED FOR END BENT NO. 2. EXCAVATE HOLES AT PILE LOCATIONS TO ELEVATION 384.2 FT LT, 382.9 FT RT, AND TO COMPETENT ROCK. FOR PILE EXCAVATION SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
2. DO NOT DRIVE PILES AT END BENT NO. 2 AFTER PLACING PILES IN EXCAVATED HOLES.

### **FOUNDATION RECOMMENDATION COMMENTS**

---

1. 1.5:1 (H:V) slopes at both end bents are ok with slope protection.
2. The factored axial load at End Bent No. 1 is 126 tons per pile.
3. The factored axial load at End Bent No. 2 is 126 tons per pile.
4. Two (2) piles End Bent No. 1 should be battered away from the approach fill.
4. Only vertical piles should be used at End Bent No. 2.
5. A waiting period is not required for End Bents No. 1 and 2.
6. Recommend Type II - Modified Bridge Approach Fills. See 2018 Roadway Standard Drawing 422.02.
7. Pile restrikes are not necessary for piles at both end bents.

## PILE PAY ITEMS

(Revised 8/15/12)

WBS ELEMENT	17BP.5.R.82		DATE	12/8/2017
TIP NO.	SF-340040		DESIGNED BY	SCC
COUNTY	Granville		CHECKED BY	JRH
STATION	14+14 -L-			
DESCRIPTION	Bridge No. 40 on US 158 (Williamsboro Rd)			
	over Tabbs Creek			

NUMBER OF BENTS WITH PILES		}	Only required for "Predrilling for Piles" & "Pile Excavation" pay items
NUMBER OF PILES PER BENT			
NUMBER OF END BENTS WITH PILES	1		
NUMBER OF PILES PER END BENT	7		

	<b>PILE PAY ITEM QUANTITIES</b>								
	<b>Bent # or End Bent #</b>	<b>Steel Pile Points (yes/no)</b>	<b>Pipe Pile Plates (yes/no/maybe)</b>	<b>Predrilling For Piles (per linear ft)</b>	<b>Pile Redrives (per each)</b>	<b>Pile Excavation (per linear ft)</b>		<b>PDA Testing (per each)</b>	
						<b>In Soil</b>			<b>Not In Soil</b>
End Bent # 1	yes						X		
End Bent # 2	no				50	20			
<b>TOTALS</b>			0	0	50	20	0		

Notes:

Blanks or "no" represent quantity of zero.

If steel pile points are required, calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

If pipe pile plates are or may be required, calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

Show quantity of "PDA Testing" on the plans as total only.

If quantity of "PDA Testing" is 3 or less, reference "Pile Driving Criteria" provision in PDA notes on plans and include "Pile Driving Criteria" provision in the contract.



December 13, 2017

Tim Jordan, PE  
Mott MacDonald  
7621 Purfoy Road, Suite 115  
Fuquay-Varina, NC 27526

Project: 17BP.5.R.82 (SF-340040)  
County: Granville  
Description: Bridge No. 40 on US 158 (Williamsboro Rd) over Tabbs Creek  
Subject: Roadway Recommendations

Dear Mr. Reck:

As authorized, Falcon Engineering, Inc. (Falcon) has completed the geotechnical subsurface investigation for the approach modifications of US 158 (Williamsboro Rd) associated with the proposed replacement of Bridge No. 40 over Tabbs Creek in Granville County, North Carolina. Our subsurface investigation data is presented under separate cover. Based on that data, Falcon has prepared this report including roadway geotechnical recommendations for the preparation of final design, right of way plans, construction cost estimates, and construction procedures.

Recommendations and evaluations provided by Falcon are based on the information provided by Mott MacDonald and established NCDOT standards. Modifications of our recommendations and evaluations may be required if there are changes to the design. Recommendations in this report are in part based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

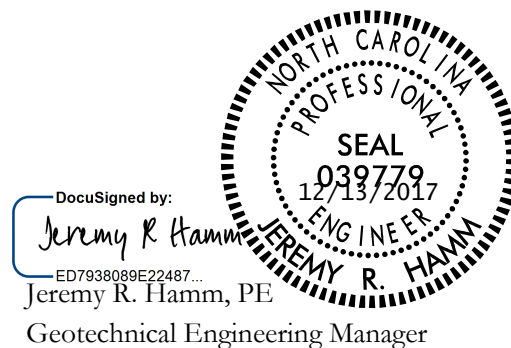
Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Falcon appreciates the opportunity to have provided you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Respectfully submitted:

**FALCON ENGINEERING, INC.**

A handwritten signature in black ink that reads "Stephen Crockett".

Stephen Crockett, EI  
Geotechnical Professional



**TIP:** SF-340040  
**COUNTY:** Granville  
**DESCRIPTION:** Bridge No. 40 on US 158 (Williamsboro Rd) over Tabbs Creek  
**SUBJECT:** Roadway Subsurface Investigation - Recommendations

Falcon has completed the subsurface investigation for this project and submits the following recommendations:

**I. Slope/Embankment Stability**

A. Slope Design

It is recommended that all roadway embankment fill and cut slopes be constructed at a 2:1 (H:V) ratio or flatter for this project. The stability of all slopes are subject to proper fill placement and stabilization of any unstable areas identified in construction.

**II. Subgrade Stability**

A. Undercut for Subgrade Stability

Highly plastic soils or unstable pavement subgrades may be encountered in some areas of proposed new pavement. If unsuitable subgrades are encountered, we recommend undercut be performed to a depth of up to three feet beneath subgrade or to competent material, whichever is less, and a width of one foot laterally outside edge of proposed pavement.

It is recommended a quantity of **150 CY** of Undercut for Subgrade Stability be included in the contract as a contingency to be used at the discretion of the engineer.

B. Geotextile for Soil Stabilization

The use of Geotextile for Soil Stabilization is anticipated in conjunction with Undercut for Subgrade Stabilization as discussed in Section II.A.

It is recommended that a quantity of **150 SY** of Geotextile for Soil Stabilization be included in the contract as a contingency item to be used at the discretion of the Engineer.

**III. Borrow Specifications**

A. Disposal of Waste Materials

Waste Materials may be disposed of in non-structural areas, such as outside of the embankment slopes at the discretion of the engineer.

B. Common Borrow

Common borrow for embankment fill shall meet the Statewide Criteria outlined in the Standard Specification, Article 1018-2, Section II (A).

C. Select Granular Material

Select granular material for embankment/backfill for geotextile for soil stabilization if required or back fill in water shall meet the criteria outlined in the Standard Specifications, Article 1016-3,

Class II and/or III. The select granular material should be placed to a height of 3 feet above geotextile for soil stabilization and/or water level.

It is recommended a quantity of **150 CY** of Select Granular Material be included in the contract as a contingency item to be used on Geotextile for Soil Stabilization or at the discretion of the Engineer.

D. Shrinkage Factor

A shrinkage factor of 20 percent is recommended to be used in the earthwork computations for this project.

**IV. Miscellaneous**

A. Reduction of Unclassified Excavation

It is recommended that Unclassified Excavation on the project be reduced by **100 CY** due to a combination of Clearing and Grubbing and Unsuitable Unclassified Excavation (highly plastic soils).





**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**GEOTECHNICAL ENGINEERING UNIT**

Summary of Quantities

WBS Number: 17BP.5.R.82

County: Granville

Project Engineer: Hamm, J. R.

TIP Number: SF-340040

Field Office: Consultant

Project Geologist: Goodnight, D. J.

Description: Bridge No. 40 on US 158 (Williamsboro Rd) over Tabbs Creek

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	Contingency	N/A	N/A	150	CY
<b>Total Quantity of Undercut Excavation =</b>							<b>150</b>	<b>CY</b>
0195000000-E	Select Granular Material	265 - Select Granular Material	III. C	Contingency	N/A	N/A	150	CY
<b>Total Quantity of Select Granular Material =</b>							<b>150</b>	<b>CY</b>
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	150	SY
<b>Total Quantity of Geotextile for Soil Stabilization =</b>							<b>150</b>	<b>SY</b>

<b>These Items Only Impact Earthwork Totals</b>								
N/A	Shrinkage Factor	235 - Embankments	III. C	N/A	N/A	N/A	20	%
N/A	Unclassified Excavation - Unsuitable Waste	225 - Roadway Excavation	IV. A	N/A	N/A	N/A	100	CY