

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PAT MCCRORY GOVERNOR ANTHONY J. TATA SECRETARY

January 12, 2015

MEMORANDUM TO:

Joey Hopkins, P.E.

Division 5 Engineer

ATTENTION:

Lisa B. Gilchrist, E.I.

Division Bridge Program Manager

FROM:

Kyung (K. J.) Kim, Ph.D., P.E.

Eastern Regional Geotechnical Manager

STATE PROJECT:

17BP.5.R.53 (BMU-380062)

COUNTY:

Granville

DESCRIPTION:

Bridge No. 62 on SR 1004 (Butner Rd.) over Knap of Reeds Creek

SUBJECT:

Geotechnical Report - Design and Construction Recommendations

I. Slope/Embankment Stability

A. Slope Design

Recommend that all slopes be constructed at a ratio of 2:1 (H:V) or flatter.

B. Undercut

A quantity of 100 cubic yards of undercut for embankment stability should be included in the project contract as a contingency item to be used at the discretion of the Engineer.

C. Geotextile for Soil Stabilization

A quantity of 100 square yards of geotextile for soil stabilization should be included in the project contract as a contingency item to be used at the discretion of the Engineer.

II. Subgrade Stability

A. Subgrade Undercut

Recommend a quantity of 100 cubic yards of subgrade undercut be included in the project contract as a contingency item for areas of unsuitable subgrade soil to be used at the discretion of the Engineer.

MAILING ADDRESS:
EASTERN REGIONAL OFFICE
GEOTECHNICAL ENGINEERING UNIT
1570 MAIL SERVICE CENTER
RALEIGH NC 27699-1570

TELEPHONE: 919-662-4710 FAX: 919-662-3095

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:

3301 JONES SAUSAGE RD., SUITE 100 GARNER, NC 27529-9489

B. Geotextile for Soil Stabilization

Recommend a quantity of 100 square yards of geotextile for soil stabilization be included in the project contract as a contingency item to be used at the discretion of the Engineer.

III. Borrow Specifications

A. Select Granular Material

Select Granular Material for embankment construction on geotextile for soil stabilization shall meet the criteria outlined in Standard Specification, Article 1016-3 Class II or Class III. Include 200 cubic yards of this material in the project contract as a contingency item. The backfill material should be placed on geotextile for soil stabilization to a height not less than three (3) feet above geotextile for soil stabilization.

B. Shrinkage Factor

A shrinkage factor of 20 percent is recommended in the calculation of all earthwork quantities. This is to compensate for loss of soils due to erosion, clearing and grubbing of fill areas, and an increase in embankment quantities required due to consolidation of underlying soils and other factors.

IV. Miscellaneous

- A. Reduction of Unclassified Excavation Clearing and Grubbing

 No significant loss of unclassified excavation is anticipated due to clearing and grubbing.
- B. Reduction of Unclassified Excavation Unsuitable Unclassified Unclassified excavation will be derived from cut slope, ditch, and abutment embankment excavation. It is anticipated that 100 percent of unclassified excavation is suitable for embankment construction.

Prepared by,

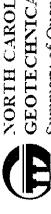
Nadia Al-Dhalimy, P.E. Geotechnical Operations Engineer Prepared by,

Nathan Mohs, L.G.

Transportation Engineering Geologist

Mh 1/15/15

JLP/CAK/NAA/NDM



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL ENGINEERING UNIT

Summary of Quantities

WBS Number: 17BP.5.R.53

TIP Number: BMU-380062

County: Granville Raleigh Field Office:

Project Engineer: NAA Project Geologist: NDM

Description: Bridge No. 62 on SR 1004 (Butner Rd.) over Knap of Reeds Creek

Units/	1 Quantity %	100 CY	100 CY	n = 200 CY	200	200 200 200	200 200 200 100	200 200 200 100 100
End	Station	N/A	N/A	ut Excavation	nt Excavation N/A	nt Excavation N/A ular Materia	ut Excavation N/A ular Materia N/A	ut Excavation N/A ular Materia N/A N/A
Begin	Station	N/A	N/A	y of Underer	y of Undercu	of Undercu N/A Select Gran	y of Undercu N/A Select Gram	y of Undercu N/A Select Grant N/A N/A
	Alignment	I. B Contingency	II. A Contingency	Total Quantity of Undercut Excavation =	Total Quantity III. A Contingency	Total Quantity of Undercut Excavation = II. A Contingency N/A N/A Total Quantity of Select Granular Material =	Otal Quantity Contingency Quantity of 6 Contingency	otal Quantity Contingency Quantity of S Contingency
Report	Section	I. B	II. A	L	T III. A	T III. A Total	T III. A Total	T III. A Total
Spec Book Section No. or	Special Provision (SP) Reference	225 - Roadway Excavation	225 - Roadway Excavation	0.000000	265 - Select Granular Material	265 - Select Granular Material	Total Quantity 265 - Select Granular Material III. A Contingency Total Quantity of S 270 - Geotextile for Soil Stabilization I. C Contingency	
Pay Item/	Quantity Adjustment	Undercut Excavation	Undercut Excavation		Select Granular Material	Select Granular Material	Select Granular Material Geotextile for Soil Stabilization	Select Granular Material Geotextile for Soil Stabilization Geotextile for Soil Stabilization
Pay Item	No.	0036000000-E	0036000000-E		0195000000-E	0195000000-E		

		%	
		20	
		N/A	
		N/A	
tale	2	N/A	
rthwork Totals		III. B	
These Items Only Impact Earth	Carron Carro	235 - Embankments	
		Shrinkage Factor	
		N/A	



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PAT MCCRORY GOVERNOR ANTHONY J. TATA
SECRETARY

January 12, 2015

STATE PROJECT:

17BP.5.R.53 (BMU-380062)

COUNTY:

Granville

DESCRIPTION:

Bridge No. 62 on SR 1004 (Butner Rd.) over Knap of Reeds

Creek

SUBJECT:

Geotechnical Report – Inventory

The Geotechnical Engineering Unit has completed a subsurface investigation for this project and presents the following inventory. No plans, profiles, or cross-sections will be submitted for this roadway project.

Project Description

The project consists of the replacement of Bridge No. 62 on SR 1004 (Butner Rd.) over Knap of Reeds Creek. The total length of the roadway portion of the project is 0.2 miles. Bore logs from the bridge subsurface investigation in December 2014 were referenced for this project.

Physiography & Geology

The project is located in gently rolling terrain of southern Granville County. Knap of Reeds Creek is part of the Neuse River Basin. Geologically the site is characterized by sands and clays associated with weathered sedimentary rock of the Durham Triassic Basin.

Soil Properties

Soils encountered at the site are roadway embankment, alluvial, and Triassic residual soils. Roadway embankment soils consist of soft to medium stiff, sandy and silty clay (A-6, A-7). This material varies in depth up to 9.6 feet at the bridge approaches. Alluvial soils deposited by Knap of Reeds Creek consist primarily of very loose, silty to fine sand (A-2-4, A-3). Triassic residual soils consist of moist, loose to medium dense, coarse sand (A-1) with gravel and some cobbles encountered on the End Bent 2 side of the bridge.

Groundwater

Groundwater is not expected to cause any problems during construction.

MAILING ADDRESS: EASTERN REGIONAL OFFICE GEOTECHNICAL ENGINEERING UNIT 1570 MAIL SERVICE CENTER RALEIGH NC 27699-1570 TELEPHONE: 919-662-4710 FAX: 919-662-3095

FAX: 919-662-3095

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:

3301 JONES SAUSAGE RD., SUITE 100 GARNER, NC 27529-9489 Prepared by,

SEAL 2124

Nathan Mohs, L.G.

Project Geological Engineer

JLP/NTR/NDM



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PAT MCCRORY GOVERNOR ANTHONY J. TATA SECRETARY

	January 12, 2015
MEMORANDUM TO:	Joey Hopkins, P.E. Division 5 Engineer
ATTENTION:	Lisa B. Gilchrist, E.I. Division Bridge Program Manager
FROM:	Kyung (K. J.) Kim, Ph.D., P.E. Eastern Regional Geotechnical Manager
STATE PROJECT: FEDERAL PROJECT: COUNTY:	17BP.5.R.53 (BMU-380062) N/A Granville
DESCRIPTION:	Bridge No. 62 on SR 1004 (Butner Road) over Knap of Reeds Creek between SR 1120 and SR 1121
SUBJECT:	Bridge Foundation Recommendations
-	eering Unit has completed the subsurface investigation and has an recommendations for the above structure and presents the
X Bridge Inventory (12)	pages
_X Foundation Design Re	ecommendations (5) pages
Design Calculations () pages
Special Provisions ()	pages

Please call Nadia Al-Dhalimy, P.E. or Chris Kreider, P.E. at (919) 662-4710 if there are any questions concerning this memorandum.

KJK/CAK/NAA

MAILING ADDRESS: EASTERN REGIONAL OFFICE GEOTECHNICAL ENGINEERING UNIT 1570 MAIL SERVICE CENTER RALEIGHNC 27699-1570 TELEPHONE: 919-662-4710 FAX: 919-662-3095

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:

3301 JONES SAUSAGE RD., SUITE 100 GARNER, NC 27529-9489

FOUNDATION RECOMMENDATIONS

PROJECT 17BP.5.R.53 DESCRIPTION Bridge No. 62 on SR 1004

T.I.P. NO. BMU-380062 over Knap of Reeds Creek between SR 1120 and

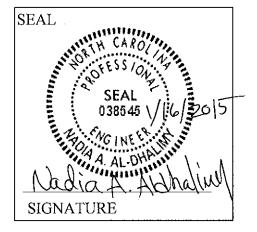
COUNTY Granville SR 1121

DESIGN NAA 1/12/2015

CHECK AL 1/16/15

APPROVAL KAK 1/16/15

STA0TION 15+65.00 -L-



BENT NO.	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT 1	14+96.25 -L-	Cap on HP 12 x 53 Steel Piles	55 Tons/Pile	Bottom of Cap Elevation = 278.1 ft. ± Estimated Pile Length = 15 ft. ± Number of Piles = 7
BENT 1	15+22.44 -L-	42 in. Diameter Drilled Piers	360 Tons/Pier	Bottom of Cap Elevation = 280.6 ft. ± Estimated Drilled Pier Top El. = 271.6 ft. ± Point of Fixity Elevation = 261 ft. ± Tip Elevation No Higher Than = 254 ft. Number of Piers = 3
BENT 2	15+92.56 -L-	42 in. Diameter Drilled Piers	425 Tons/Pier	Bottom of Cap Elevation = 280.8 ft. ± Estimated Drilled Pier Top El. = 271.1 ft. ± Point of Fixity Elevation = 256 ft. ± Tip Elevation No Higher Than = 247 ft. Number of Piers = 3
END BENT 2	16+33.75 -L-	Cap on HP 12 x 53 Steel Piles	65 Tons/Pile	Bottom of Cap Elevation = 278.5 ft. ± Estimated Pile Length = 15 ft. ± Number of Piles = 7

<u>COMMENTS & NOTES</u> (See Following Page)

FOUNDATION RECOMMENDATION NOTES ON PLANS

- 1. FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 2. PILES AT END BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 55 TONS PER PILE.
- 3. DRIVE PILES AT END BENT NO. 1 TO A REQUIRED DRIVING RESISTANCE OF 95 TONS PER PILE.
- 4. PILES AT END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 65 TONS PER PILE.
- 5. DRIVE PILES AT END BENT NO. 2 TO A REQUIRED DRIVING RESISTANCE OF 110 TONS PER PILE.
- 6. STEEL H-PILE POINTS ARE REQUIRED FOR STEEL H-PILES AT END BENT NO. 1 AND END BENT NO. 2. FOR STEEL PILE POINTS, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 7. FOR DRILLED PIERS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.
- 8. DRILLED PIERS AT BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 360 TONS PER PIER. CHECK FIELD CONDITIONS FOR THE REQUIRED TIP RESISTANCE OF 55 TSF.
- 9. DRILLED PIERS AT BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 425 TONS PER PIER. CHECK FIELD CONDITIONS FOR THE REQUIRED TIP RESISTANCE OF 55 TSF.
- 10. PERMANENT STEEL CASINGS MAY BE REQUIRED FOR DRILLED PIERS AT BENT NO. 1. IF REQUIRED, DO NOT EXTEND PERMANENT CASINGS BELOW ELEVATION 265 FT WITHOUT PRIOR APPROVAL FROM THE ENGINEER. THE ENGINEER WILL DETERMINE THE NEED FOR PERMANENT CASINGS.
- 11. PERMANENT STEEL CASINGS ARE REQUIRED FOR DRILLED PIERS AT BENT NO. 2. DO NOT EXTEND PERMANENT CASINGS BELOW ELEVATION 262 FT WITHOUT PRIOR APPROVAL FROM THE ENGINEER.
- 12. INSTALL DRILLED PIERS AT BENT NO. 1 TO A TIP ELEVATION NO HIGHER THAN 254 FT AND WITH THE REQUIRED TIP RESISTANCE.
- 13. INSTALL DRILLED PIERS AT BENT NO. 2 TO A TIP ELEVATION NO HIGHER THAN 247 FT AND WITH THE REQUIRED TIP RESISTANCE.
- 14. DRILLED PIER EXCAVATIONS AT BENT NO. 1 AND BENT NO. 2 WILL EXTEND INTO MATERIALS THAT DETERIORATE WHEN EXPOSED TO THE AIR AND WATER. CHECK FIELD CONDITIONS FOR THE REQUIRED TIP RESISTANCE AND PLACE CONCRETE IMMEDIATELY AFTER THE EXCAVATION IS COMPLETED.

Designed by: NAA Date: 1/12/2015 Checked by: CAK Date: 1/16/15

- 15. THE SCOUR CRITICAL ELEVATION AT BENT NO. 1 IS ELEVATION 264.5 FEET. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
- 16. THE SCOUR CRITICAL ELEVATION AT BENT NO. 2 IS ELEVATION 260 FEET. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
- 17. SPT MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR SPT. FOR SPT TESTING, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.
- 18. CSL TUBES ARE REQUIRED AND CSL TESTING MAY BE REQUIRED FOR DRILLED PIERS AT BENT NO.1 AND BENT NO. 2. FOR CSL TESTING, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.
- 19. SID INSPECTIONS MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR SID INSPECTIONS. FOR SID INSPECTIONS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

SPECIAL NOTE ON PLANS

20. IF THE DRILLED PIER HOLE LEFT OPEN MORE THAN 24 HOURS AFTER COMPLETION OF EXCAVATION TO THE TIP ELEVATION, THE HOLE MUST BE OVERREAMED.

FOUNDATION RECOMMENDATION COMMENTS

- 1. 1.5:1 (H:V) SLOPES FOR END BENTS WITH SLOPE PROTECTION TO BERM ARE OK.
- 2. NO WAITING PERIOD IS REQUIRED BEFORE BEGINNING ANY WORK FOR END BENT CONSTRUCTION AFTER COMPLETION OF THE EMBANKMENT AT EACH END BENT.
- 3. USE REINFORCED BRIDGE APPROACH FILL DETAILS AT BOTH END BENTS.
- 4. DESIGN SCOUR ELEVATIONS AT BENT NO. 1 IS 266.4 FEET.
- 5. DESIGN SCOUR ELEVATIONS AT BENT NO. 2 IS 262.0 FEET.

Designed by: NAA Date: 1/12/2015 Checked by: (AL Date: 1/16/15

DRILLED PIER PAY ITEMS

(For LRFD Projects - Revised 8/15/12)

WBS ELEMENT _	17BP.5.R.53	DATE_	1/12/2015
TIP NO	BMU-380062	DESIGNED BY_	NAA
COUNTY_	Granville	CHECKED BY_	CAK
STATION_	15+65.00 -L-		
DESCRIPTION_	<u> </u>	4 over Knap of Reeds Creek 120 and SR 1121	
	OF BENTS WITH DRILLED PIERS	2	
	ER OF DRILLED PIERS PER BENT END BENTS WITH DRILLED PIERS	3	
NUMBER O	F DRILLED PIERS PER END BENT		

	D	RILLED PIER PA	AY ITEM QUA	NTITIES	
Bent # or End Bent #	Permanent Steel Casing For 42" Dia. Drilled Pier (yes/no/maybe)	42" Dia. *\times Drilled Piers Not In Soil (per linear ft)	SID Inspections (per each)	SPT Testing (per each)	CSL Testing (per each)
Bent # 1	maybe				
Bent # 2	yes	····			
		 			
				<u> </u>	
TOTALS		0	2	2	2

Notes:

Blanks or "no" represent quantity of zero.



If drilled piers not in soil are required, calculate quantity of "42" Dia. Drilled Piers in Soil" as the difference between the total drilled pier length and the "42" Dia. Drilled Piers Not in Soil" from the table above. If there is none or zero quantity for drilled piers not in soil in the table above, calculate quantity of "42" Dia. Drilled Piers" as the total drilled pier length and do not use the "42" Dia. Drilled Piers in Soil" pay item.

If permanent steel casing is or may be required, calculate quantity of "Permanent Steel Casing for 42" Dia. Drilled Pier" as the difference between the ground line or top of drilled pier elevation, whichever is higher, and the elevation the permanent casing can not extend below from the foundation recommendations.

If "SID Inspections", "SPT Testing" or "CSL Testing" may be required, show quantities of these pay items on the plans as totals only. If "SID Inspections", "SPT Testing" or "CSL Testing" is required, show quantities of these pay items on the plans for each bent or end bent.

The number of CSL tubes required per drilled pier is equal to one tube per foot of design pier diameter with at least 4 tubes per pier. Calculate the length of each CSL tube as the total drilled pier length plus 1.5 ft.

PILE PAY ITEMS

(Revised 8/15/12)

WBS ELEMENT_	17BP.5.R.53	DATE_	1/12/2015
TIP NO.	BMU-380062	DESIGNED BY	NAA
COUNTY	Granville	CHECKED BY	CAK
STATION_	15+65.00 -L-	_	
DESCRIPTION		04 over Knap of Reeds Creek 1120 and SR 1121	
NUMI NUMBER OF	R OF BENTS WITH PILES BER OF PILES PER BENT END BENTS WITH PILES OF PILES PER END BENT	Only required for "Predrilling for Piles" & "Pile Excavation" pay items	

		PI	LE PAY ITEN	1 QUANTII	TES		
]	Pile	
	Steel				Exca	avation	
	Pile	Pipe Pile	Predrilling	Pile	(per l	inear ft)	PDA
Bent # or	Points	Plates	For Piles	Redrives	In	Not In	Testing
End Bent#	(yes/no)	(yes/no/maybe)	(per linear ft)	(per each)	Soil	Soil	(per each
End Bent #1	yes						\setminus
End Bent #2	yes						[\ /
							\ /
							X
							/ \
							/ \
							/ `
TOTAL		-	- 0	0	0	0	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.

REFERENCE 7BP 5.R.53

380062

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

CONTENTS

SHEET NO. DESCRIPTION TITLE SHEET LEGEND SITE PLAN **PROFILE** 5,6 CROSS SECTION 7-11 BORE LOGS & CORE REPORTS

CORE PHOTOGRAPH

STRUCTURE SUBSURFACE INVESTIGATION

DUNTY GRANVILLE ROJECT DESCRIPTION	NO. 62 ON	V SR 1004
BUTNER RD.) OVE		
TE DESCRIPTION		

STATE PROJECT REFERENCE NO. STATE 17BP.5.R.53

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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 1999 TOT-680D. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE, INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSUBFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSUBFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERITY IN THE STANDARD TEST METHOD, THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSUBFACE 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 HINSELF 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 SUTUL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

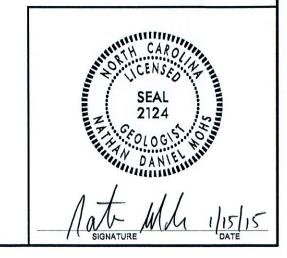
IES:
THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

N.D. MOHS O.B. OTI D.G. PINTER J.R. SWARTLEY N.T. ROBERSON INVESTIGATED BY _ N.D. MOHS W.D. FIELDS N.T. ROBERSON

PERSONNEL

N.T. ROBERSON

JANUARY 2015



SUBMITTED BY

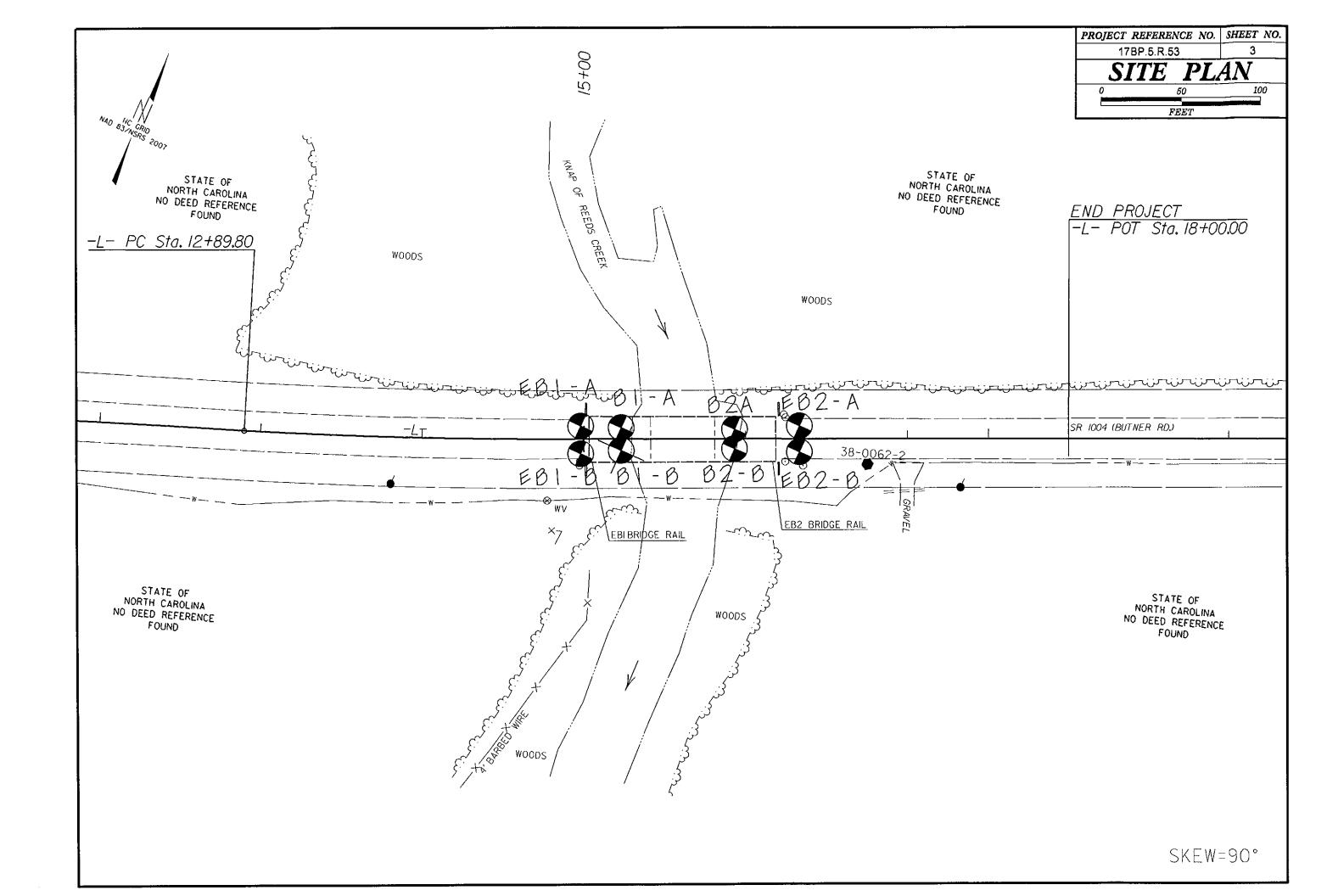
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17BP.5.R.53	2

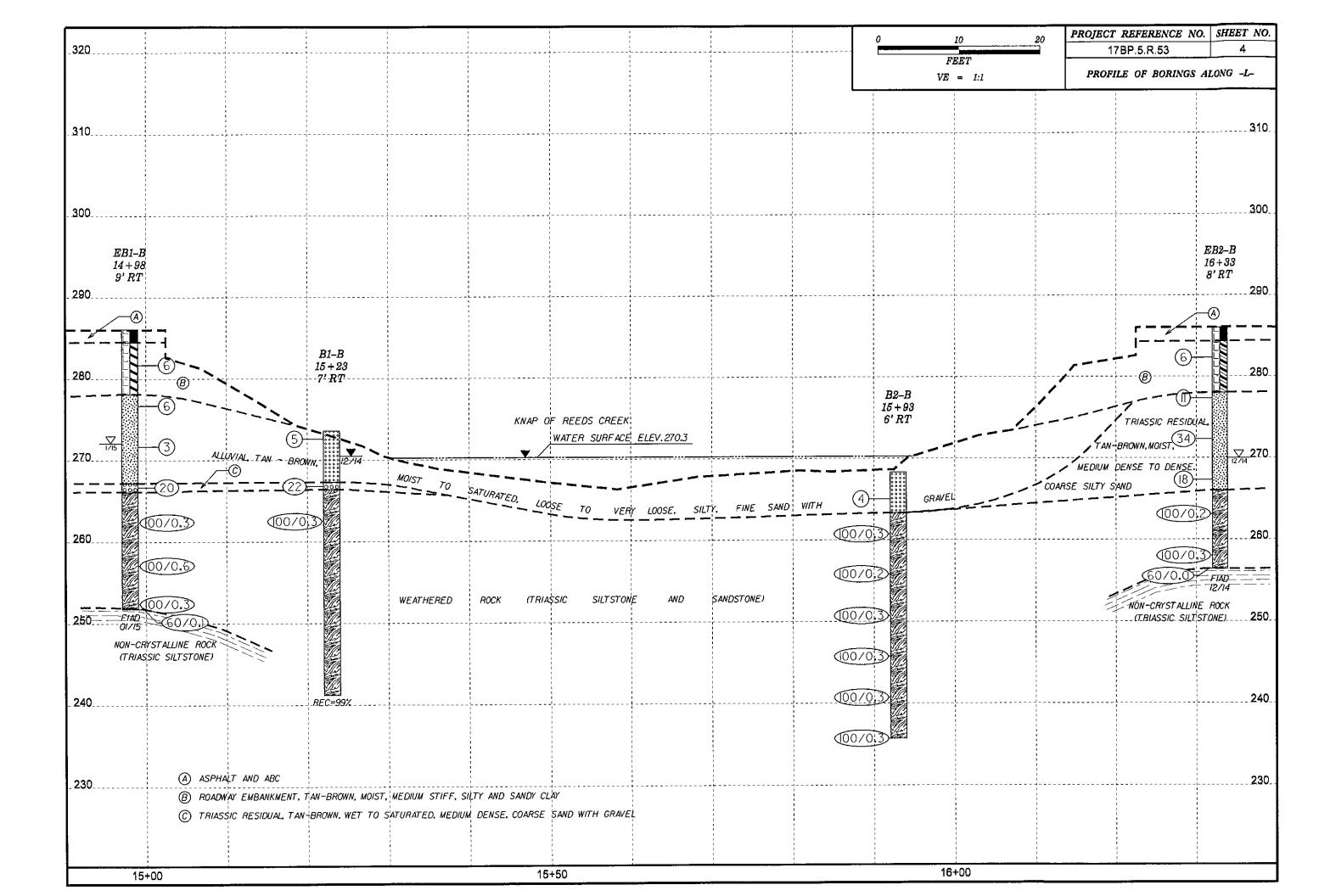
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

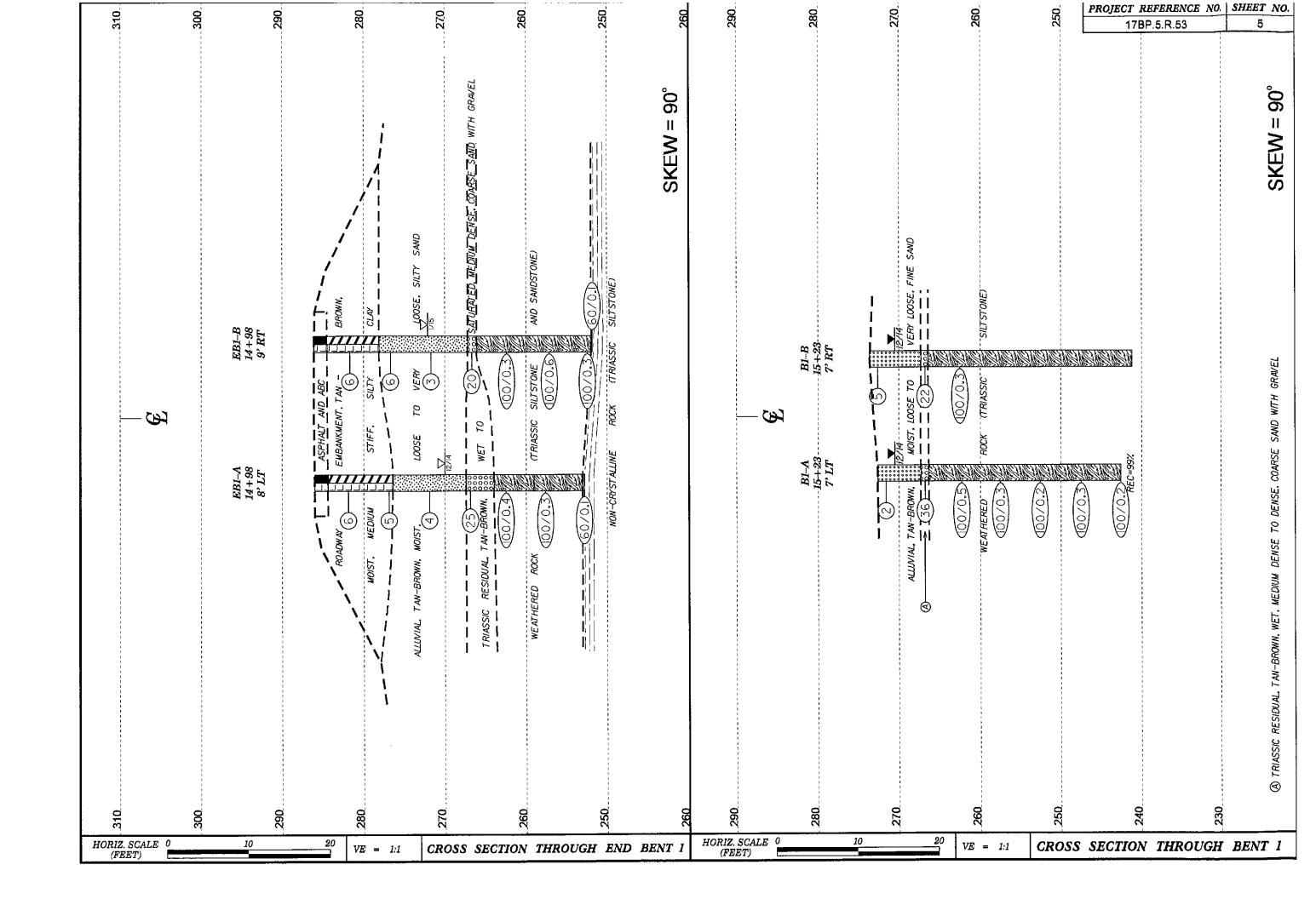
SUBSURFACE INVESTIGATION

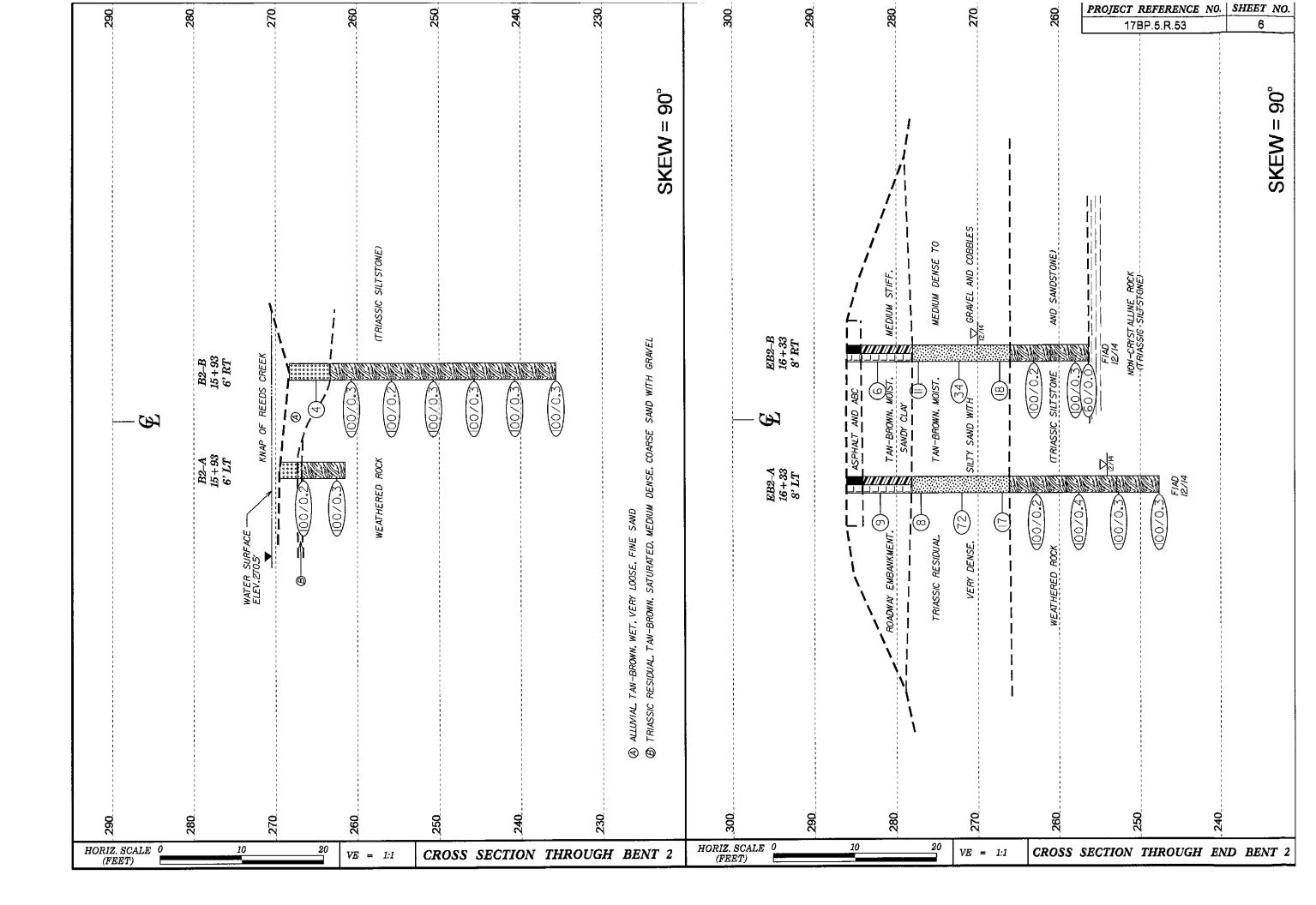
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			TERMS AND DEFINITION
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED	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	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE 10 COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. ADDIFER - A WATER BEARING FORMATION OR STRATA.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DISBS). 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 DR MORE SIZES.	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 BETVEEN SOIL AND ROCK IS OFTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, ARSHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	ANGULARITY OF GRAINS	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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: 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	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSABILY RISE TO OR ABOVE THE GROUND
GENERAL GRAINLAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. (\$35X PASSING *228) (>35X PASSING *228) ORGANIC MATERIALS	MINERAL NAMES SUCH AS DUARTZ, FELDSPAR, MICA, TALC, KADLIN, ETC.	CRYSTALLINE CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE,	SURFACE.
GROUP A-1 A-3 R-2 A-4 A-5 A-5 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	GNEISS, GABBRO, SCHIST, ETC. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A1-a A1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6.A-7	COMPRESSIBILITY	NON-CHISTALLING SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED.	COLLUMIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 3) MODERATELY COMPRESSIBLE LL = 3) - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
2 PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
10 53 MX SIGNALER CLAY DICK.	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
*288 15 MX 25 MX 18 MX 35 MX 35 MX 35 MX 35 MX 36 MX 36 MX 36 MX 36 MX 36 MX	ORGANIC MATERIAL SOILS SOILS DIHER MATERIAL LOSS DE ROCCHES MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING #40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL - 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 5ULS MATH	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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.
PI 6 MX NP 18 MX 18 MX 11 MX 11 MX 18 MX 18 MX 11 MN 11 MN MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
LICIAN TYPES CTOME FOACS SOILS		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELOSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STORE FRACS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER OF HAJOR GRAYEL, AND SAND SOILS SOILS		CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SWAD DRUTTEE HERD SWAD SUILS SUILS		MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRAVITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	FLDAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GENLRATING EXCELLENT TO GOOD FAIR TO POOR POOR POOR UNSUITABLE	<u> </u>	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 1PI OF A-7-5 SUBGROUP IS > LL - 38	O-MM→ SPRING OR SEEP	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN 8E RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOU\$ SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR PANGE OF STANDARD RANGE OF UNCONFINED PENETHATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (REI 25/925 DIP & DIP DIRECTION	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPI, REFUSAL	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURADD. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
PRIMARY SOIL TYPE CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (TONS/F12)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLDRED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE (4	SOIL SYMBOL SITEST BORING SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELOSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS DUT IN ONE DR MORE DIRECTIONS.
GRANULAR LUUSE. 4 10 10 1	gi	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MDT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT TEST	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	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY DENSE > 50 VERY SOFT < 2	INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT DNLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, NOW, D. YIELD SPT. N. VALUES S. 188 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY	INFERRED ROCK LINE O MONITORING WELL WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS, CUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES QUYIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4	PIEZOMETER	ALSO AN EXAMPLE,	RUN AND EXPRESSED AS A PERCENTAGE.
HARD 380 > 4 TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPPOLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIG STRUCTURE OR FABRIC OF THE PARENT ROCK.
		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 DPENING (MM) 4.76 2,00 0,42 0.25 0.075 0.053	EXCAVATION	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULOER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - EMBANKMENT OR BACKFILL ACCEPTABLE DEGRADABLE ROCK	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE, SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED 8Y HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	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 IPENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEDUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD 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 DUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC 70- 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	CSE COARSE ORG ORGANIC OMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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.
(ATTERBERG CIMITS) DESCRIPTION	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEMENTS WITHIN A STRATUM EQUAL TO DR GREATER THAN 4 INCHES DIVIDED BY
- SATURATED - USUALLY LIDUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES J INCH	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.
LL _ LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY R5 - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSDIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLASTIC SEMISOLID; REQUIRES DRYING TO SEMISOLID; REQUIRES DRYING	FRAC FRACTURED, FRACTURES TOR - TRICONE REFUSAL RI - RECOMPACTED TRIAXIAL FRACS FRACMENTS # - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: 38-0062-2, N: 875,692,1510 E: 2,066,937,6440
PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HICHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	DENOTE 1 11 11 10 20 000 2, 11 0 10 10 22 10 10 12 2,000,30 10 110
- MOIST - IM) SOLIDI AT DR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 10 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 285.4 FEET
OM DPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
PERHAPES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 8.16 TO 1 FOOT VERY THINLY BEDDED 8.03 - 8.16 FEET VERY CLOSE LESS THAN 8.16 FEET THICKLY LAMINATED 8.008 - 8.03 FEET	<u> </u>
- DRY - (D) ATTAIN OPTIMUM MOISTURE	X CME-55 STONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	EBI BRIDGE RAIL: 288.3' EB2 BRIDGE RAIL: 288.3'
PLASTICITY	X 8. HOLLOW ADDERS	INDURATION	1
PLASTICITY INDEX (P1) ORY STRENGTH	CME-550 HARD FACED FINGER BITS X-N X	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS	
NON PLASTIC 0-5 VERY LDW SLIGHTLY PLASTIC 6-15 SLIGHT	YANE SHEAR TEST X TUNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINDER FREES NUMEROUS GRAINS] GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	X CASING X W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST X TRICONE STEEL TEETH HAND AUGER	SHEAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNG,-CARB. SOUNDING ROD	INDURATED SRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	X CORE BIT VANE SHEAR TEST	SHARD HANNER BLOWS REDUIDED TO BREAK SAMPLE.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14
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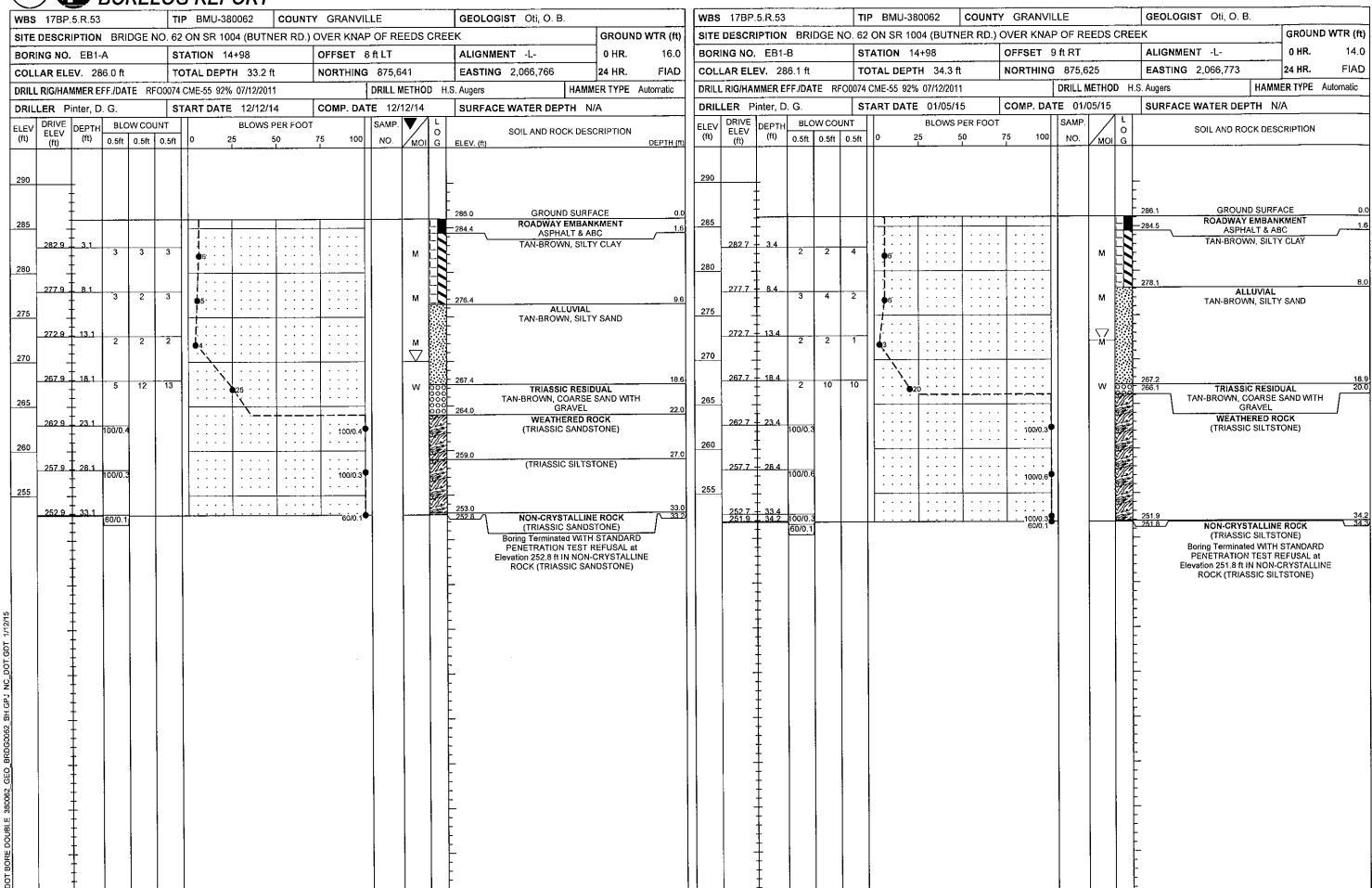








NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT



SHEET 8

BORING NO. B1-A STATION 15+23 OFFSET 7 ft.LT ALIGNMENT -L- 0 HR. N/A	SITE DESCRIPTION BRIDGE NO. 62 ON SR 1004 (BUTNER RD.) OVER KNAP OF REEDS CREEK GROUND WTR (ft)																T			
BORING NO. B1-A STATION 15+23 OFFSET 7 ft LT ALIGNMENT -L O HR. N/A	BORING NO. B1-A STATION 15+23 OFFSET 7 ft.LT ALIGNMENT -L. 0 HR. N/A																			D WTD (#)
COLLAR ELEV. 272.6 ft	COLLAR ELEV. 272.6 ft					DGE N				IINE	R RU.)				EUS	CRE				•
DRILL RIGHAMMER EFF./DATE RF00074 CME-55 92% 07/12/2011 DRILL METHOD NW Casing w/ Advancer HAMMER TYPE Automatic DRILL RIGHAMMER EFF./DATE RF00074 CME-55 92% 07/12/2011 DRILL METHOD NW Casing w/ Advancer HAMMER TYPE Automatic Automatic Automatic Automatic DRILL METHOD NW Casing w/ Advancer HAMMER TYPE Automatic A	DRILL RIGHAMMER EFF. DATE RF00074 CME-55 92% 07/12/2011 DRILL METHOD NW Casing wf Advancer HAMMER TYPE Automatic DRILL RIGHAMMER EFF. DATE DATE 12/30/14 COMP. DATE 12/30/14 SURFACE WATER DEPTH N/A									0.0		-								
DRILLER Pinter, D. G. START DATE 12/30/14 COMP. DATE 12/30/14 SURFACE WATER DEPTH N/A	DRILLER Pinter, D. G. START DATE 12/30/14 COMP. DATE 12/30/14 SURFACE WATER DEPTH N/A											NOH	CIHING			D NI				
DRIVE CITY	DRIVE CITY CITY					IE RE						001	ID D4			ט אי			CITE	Automatic
ELEV (ft)	ELEV (ft)					M COI		ART DA				<u> </u>	IP. UA	т —	30/14	1 L T	SURFACE WATER DEP	IH IN/A		
276	270 271 272 6		ELEV					0					100		MOI	0	SOIL AND ROC	K DESCR	IPTION	
		275 270 265 260 255	267.8 267.8 257.8 257.8	(ft) 0.0 4.8 9.8 14.8	0.5ft 1 5 100/0.5 100/0.2	0.5ft	0.5ft		25	50		75	100/0.5	NO.	₩	G	272.6 GROUND ALL TAN-BROW 267.3 266.3 RES TAN-BROWN, CC GR WEATHE (TRIASSIC	SURFAC UVIAL N, FINE S/ IDUAL JARSE SA ARSE ROC RED ROC SILTSTO!	E AND ND WIT K NE)	30.0

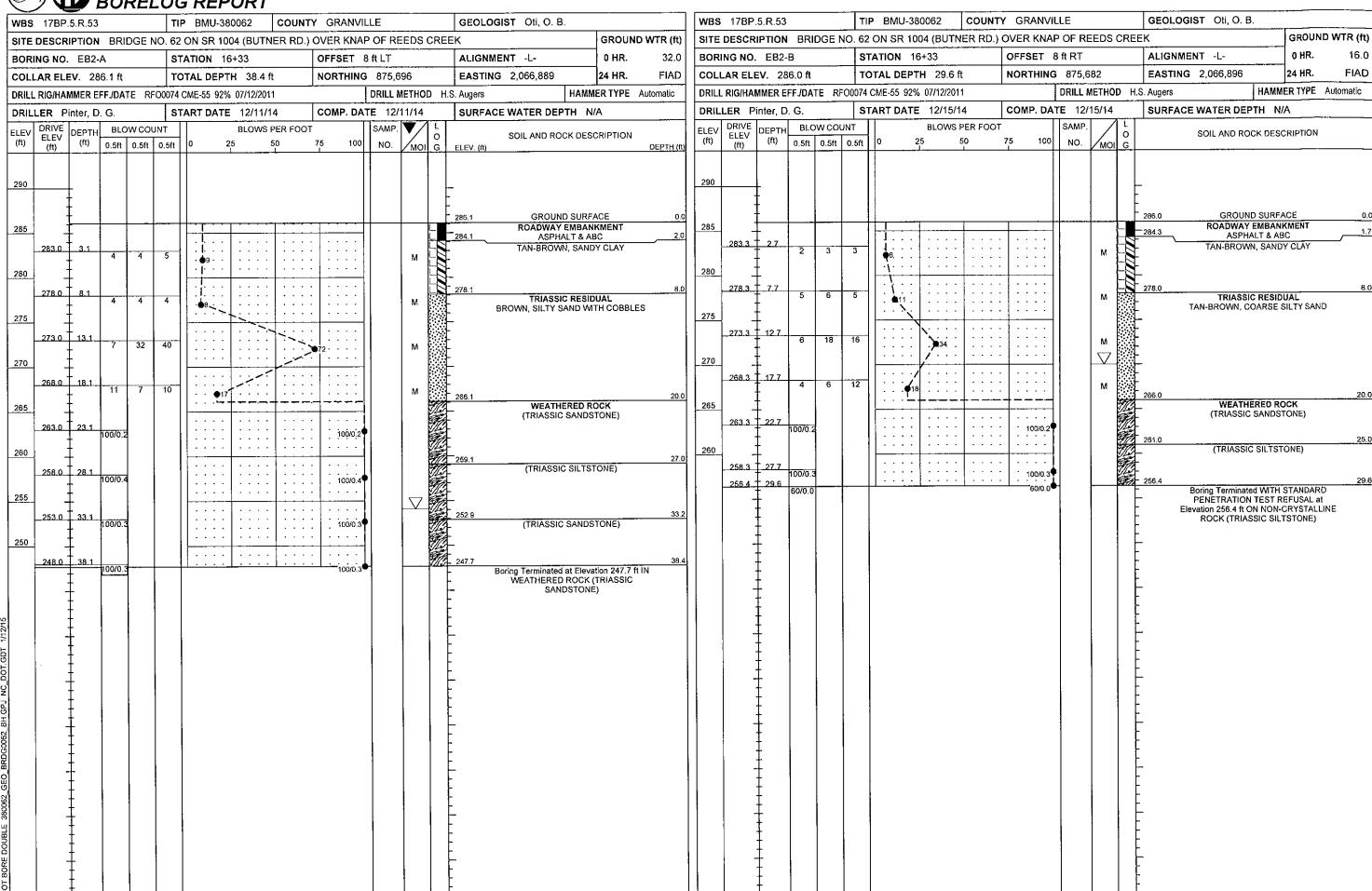
NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

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		-		IDGE			N SR 1004 (BUTN	ER RD.)			EEDS	CRE			ROUND	
	ING NO						TION 15+23		OFFSET				ALIGNMENT -L-		HR.	N/A
COL	LAR EL	EV. 2	73.6 ft		T	OTA	AL DEPTH 32.4 ft		NORTHING				EASTING 2,066,795		HR.	3.1
				ATE R	FO0074	CME	1E-55 92% 07/12/201					D N/	W Casing W/SPT & Core	HAMMER	TYPE A	utomatic
DRIL	LER F					TAR	RT DATE 12/31/1		COMP. DA		31/14	1	SURFACE WATER DEF	TH N/A		
ELEV	DRIVE ELEV	DC II	· 	OW CC				PER FOOT		SAMP.	▼/		SOIL AND RO	CK DESCRI	PTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	10	25	50 -	75 100	NO.	MOI	G	ELEV. (ft)			DEPTH (fi
275	272.0	+										-	_ - 273.6 GROUN	D SURFACE	;	0.0
	273.6	+ O.O	WOH	1	4	1	4 5				M	0000	ALI	UVIAL FINE SAND		<u> </u>
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		Ŧ										{	WEATHERED SILT	ROCK (TRI STONE)	ASSIC	
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CORE BORING REPORT

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WBS	17BP.						380062			~~~~	GRANVILLE	GEOLOGIST Swartley	J. R.										
SITE	DESCR	IPTION	BRII	DGE NO	62 OI	N SR 1	1004 (BU	TNER	RD.)	OVE	R KNAP OF REEDS CREE	K	GROUND WTR (ft)										
BOR	ING NO.	B1-B		·	STAT	ION	15+23			OF	FSET 7 ft RT	ALIGNMENT -L-		0 HR.	N/A								
COLI	LAR ELE	V. 27	3.6 ft		TOTA	AL DEI	PTH 32.	.4 ft		NO	RTHING 875,637	EASTING 2,066,795		24 HR.	3.1								
DRILL	RIG/HAN	MER E	FF./DA	re RFO0	074 CM	E-55 9:	2% 07/12/	2011			DRILL METHOD NW	Casing W/SPT & Core	НАММ	IER TYPE	Automatic								
DRIL	LER Pi	nter, D	. G.		STAF	RT DA	TE 12/3	1/14		co	MP. DATE 12/31/14	SURFACE WATER DEP	TH N	/A									
COR	E SIZE	NX					N 21.3 f																
ELEV (ft)	RUN ELEV (ft)	(f) RATE (fi) (fi) NO DESCRIPTION AND REMARK												DEPTH (ft)									
262.5										402-27		Begin Coring @ 11.1 ft			 .								
260	267.5 261.2		5.0	0:30/0.3 3:00/1.0 2:21/1.0 1:43/1.0 1:22/1.0 1:57/1.0 2:30/1.0	(1.2) \92% / (5.0) 100%	N/A N/A					- - - - -	WEATHERED ROCK (TRIASSIC SILTSTONE) REC=99% (continued)											
255 250	251.2		5.0	2:20/1.0 1:20/1.0 1:07/1.0 1:26/1.0 1:00/1.0 1:48/1.0	(5.0) 100%	N/A N/A					- - - - -												
245	246.2	27.4	5.0	1:03/1.0 1:11/1.0 1:43/1.0 1:35/1.0 2:20/1.0	(5.0) 100% (5.0) 100%	N/A																	
	241.2	- - 32.4		2:00/1.0 1:45/1.0 1:51/1.0 2:10/1.0	100%						241.2	Elevation 241.2 ft IN WEATHE	050 0	SOV (TDIA	32.4								
												SILTSTONE)											

	17BP.5.					REF			OUNT	Y GR	RANVIL	LE			GEO	LOGIST Oti,	O. B.			WB	S 17E	3P.5.R.5	53		TIF	P BMU-38	0062	COUNTY	GRANVI	LLE			GEOLOGIST Oti, O.	
ITE C	ESCRIP	TION	BRIDG	SE NO.	62 C)N SR 10	004 (BL	JTNER	RD.)	OVER	KNAF	OF R	EEDS	CRE	EK			GROUND	WTR (ft)	SITE	E DESC	CRIPTIC	N BR	IDGE N	NO. 62	ON SR 100)4 (BUTNE	ER RD.) (OVER KNA	P OF RI	EEDS	CRE	EK	GROUND WTR
ORIN	IG NO.	32-A			STA	TION 1	5+93			OFFS	SET 6	ft LT			ALIC	NMENT -L-		0 HR.	N/A	ВОР	RING N	IO. B2	-B		ST	TATION 15	+93		OFFSET	6 ft RT			ALIGNMENT -L-	0 HR.
OLL	AR ELEV	269	.5 ft		τοτ	AL DEPT	TH 8.0	0 ft		NORT	THING	875,6	378		EAS	TING 2,066,8	54	24 HR.	N/A	COL	LLARE	ELEV.	268.3 ft	:	TC	TAL DEPT	H 32.6 ft		NORTHING	875,6	367		EASTING 2,066,859	24 HR.
RILL F	RIG/HAMN	ER EF	./DATE	RF00	074 CI	VIE-55 92%	% 07/12/	/2011				DRILL I	METH	OD N	W Casing	y w/ Advancer	HAMN	MERTYPE A	utomatic	DRIL	L RIG/	HAMMER	EFF./DA	ATE RE	FO0074	CME-55 92%	07/12/2011			DRILL	METHO	N QC	W Casing w/ Advancer	HAMMER TYPE Automa
RILL	ER Pint	er, D.	G		STA	RT DATE	E 12/1	18/14		COM		ΓE 12/			SUR	FACE WATER	DEPTH 0	.6ft		<i>-</i>		Pinter,			ST	ART DATE	12/16/14	1	COMP. DA	TE 12/	17/14		SURFACE WATER DE	PTH 1.2ft
EV ft)		· · · · · · · · · · · · · · · · · · ·		COUNT		0 :	BLOV 25	WS PER	R FOOT	75 1	100	SAMP. NO.	ΓZ		ELEV. (ROCK DES	CRIPTION	DEPTH (ft	/ft\	DRIV ELE			OW COL		0 2	BLOWS P		75 100	SAMP. NO.	моі	0 I G	SOIL AND RO	OCK DESCRIPTION
,													A		000 f	· WATER	SURFACE (12/18/14)		270											W		WATER SII	RFACE (12/16/14)
Т	267.8	1.7										 					ALLUVIAL			, , , , , , , , , , , , , , , , , , , ,		Ŧ							· · · · · · · · · · · · · · · · · · ·				- 268,3 GROU	ND SURFACE
	207.0. †	' v	VOH T	14 100/	/0.2		· · · ·		 		100/0.2	ŀ			267.3 266.8	TRI	V-BROWN, S ASSIC RESID		2.2		266	0 T 23				1						0000		"L UVIA L WN, SAND
	‡				-	• • • •			· · · ·						-	BRC	WN, SILTY S			265	_	+	3	2	2	4					w	3000		
•	262.8	ì.7	0/0.0					-		1					- - - - 261.5	(TRIA	SSIC SANDS					‡				<u></u>	++-:-						- 263.3 - (TRIASS) - (TRIASS) - (TRIASS) - (TRIASS) - (TRIASS) - (TRIASS)	IERED ROCK
_	+	10	0/0.3	+	+			} -		- 10	100/0,3	-		7//5	· 261.5 ·	Donnig Terrini	ated at Eleva	tion 261.5 ft If	8.0 N	260	261.	0 ‡ 7.3	100/0.	Įr.					100/0,3				(TRIASSI	C SILTSTONE)
	‡			İ											-	WEATHE	RED ROCK (TRIASSIC		200	1	‡	100/0.]									- -	
	‡															*CASING BRO	·	•	3"			‡											<u>.</u>	
	+															CASIN	IG LEFT IN B	ORING		255	256.	0 12.3	100/0.	2				· · ·	100/0.2	•			- -	
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	‡														-						236	0 32.3	100/0.	3		<u> </u>			100/0.3				235.7 Boring Terminated	at Elevation 235.7 ft IN
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CORE PHOTOGRAPHS

B1-BBOXES 1 - 3: 11.1 - 32.4 FEET

