

Structure Foundation Recommendation Report REV1 Bridge No. 750352 on SR 2143 over Bush Creek Randolph County, North Carolina ID No. SF-750352 WBS Element No. 17BP.8.R.132 S&ME Project No. 6235-18-011

PREPARED FOR

CH Engineering, PLLC 3220 Glen Royal Road Raleigh, North Carolina 27617

PREPARED BY

S&ME, Inc. 9751 Southern Pine Boulevard Charlotte, North Carolina 28273

March 28, 2019



March 28, 2019

CH Engineering, PLLC 3220 Glen Royal Road Raleigh, North Carolina 27617

Attention: Mr. Brian A. Wiles, P.E.

Reference: Structure Foundation Recommendation Report REV1

Bridge No. 750352 on SR 2143 over Bush Creek

Randolph County, North Carolina

ID No. SF-750352

WBS Element No. 17BP.8.R.132 S&ME Project No. 6235-18-011 NC PE Firm License No. F-0176

Dear Mr. Wiles:

S&ME, Inc. (S&ME) has completed the authorized foundation recommendation report for the above-referenced project. Our services were performed in general accordance with the subcontract agreement between CH Engineering, PLLC (CH) and S&ME.

This report presents the Foundation Recommendations, Notes, and Comments prepared by S&ME. Structure plans and dimensions were provided by CH between June and December 2018. The supporting Structure Subsurface Investigation Report and Geotechnical Calculation Package for this project are being provided under separate cover.

S&ME appreciates the opportunity to provide our services on this project. Please contact us if you have any questions regarding this report or if we may be of further assistance.

Sincerely,

S&ME. Inc.

Docusigned by:

Luis A. Campos, P.E. Project Engineer

NC Registration No. 037845

SEAL 037845

NG INE EN SIGNATURE 1845

Stewart S. Laney, P.E. Senior Project Engineer

NC Registration No. 031013

Senior Review By: Kristen H. Hill, P.E., P.G.

Structure Foundation Recommendation Report REV1 Bridge No. 750352 on SR 2143 over Bush Creek

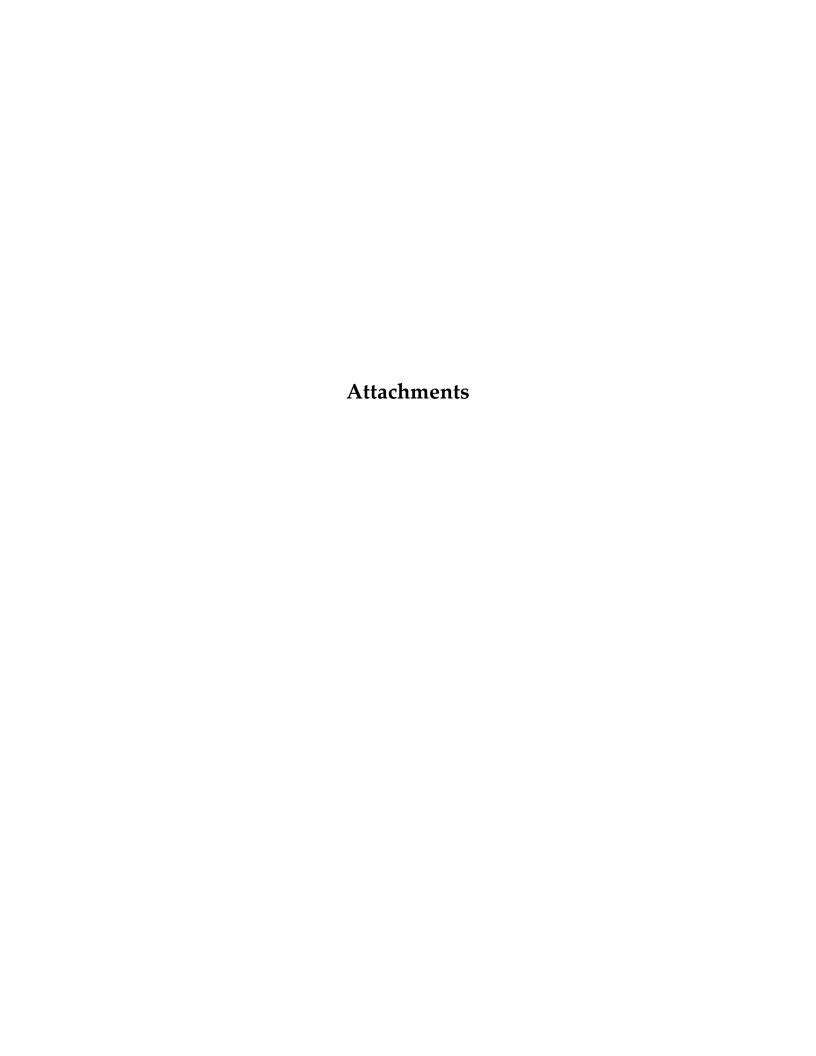
Randolph County, North Carolina ID No. SF-750352 WBS Element No. 17BP.8.R.132 S&ME Project No. 6235-18-011



Attachments

Foundation Recommendation Summary Sheet Foundation Recommendation Notes on Plans and Comments Bearing Pile Pay Item Quantities Drilled Pier Pay Item Quantities

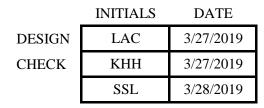
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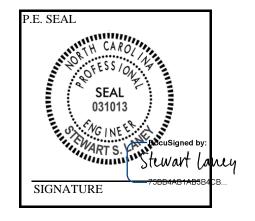


FOUNDATION RECOMMENDATIONS

PROJECT	17BP.8.R.132
TIP NO.	SF-750352
COUNTY	Randolph
STATION	15+62.50 -L-

DESCRIPTION Bridge No. 750352 on SR 2143
(Carl Allred Road) over Bush Creek





	BENT STATION	FOUNDATION TYPE	FACTORED RESISTANCE	ADDITIONAL INFORMATION	
END BENT 1	14+91.21 -L-	Cap on HP 12 x 53 Steel H-Piles	55 Tons/Pile	Bottom of Cap Elev. = 578.3 ft Average Estimated Pile Length = 25' LT / 35' RT Number of Piles/Cap = 7	
BENT 1	15+27.44 -L-	Cap on 36 Inch Diameter Drilled Pier	360 Tons/Pier	Bottom of Cap Elev. = 579.0 ft Top of Pier Elev. = 562 ft LEFT Point of Fixity Elev. = 553.0 ft LEFT Tip No Higher Than = 550.8 ft CENTER Point of Fixity Elev. = 544.0 ft CENTER Tip No Higher Than = 528.1 ft RIGHT Point of Fixity Elev. = 544.0 ft RIGHT Tip No Higher Than = 528.1 ft Number of Piers = 3 ft	
BENT 2	15+92.57 -L-	I hameter		Bottom of Cap Elev. = 579.3 ft Top of Pier Elev. = 560 ft LEFT Point of Fixity Elev. = 547.0 ft LEFT Tip No Higher Than = 542.0 ft CENTER Point of Fixity Elev. = 545.0 ft CENTER Tip No Higher Than = 537.2 ft RIGHT Point of Fixity Elev. = 545.0 ft RIGHT Tip No Higher Than = 537.2 ft Number of Piers = 3 ft	
END BENT 2	16+33.80 -L-	Cap on HP 12 x 53 Steel H-Piles	59 Tons/Pile	Bottom of Cap Elev. = 578.8 ft Average Estimated Pile Length = 35' LT / 30' RT Number of Piles/Cap = 7	

(SEE NOTES ON PLANS AND COMMENTS ON FOLLOWING PAGES.)

Randolph County

FOUNDATION RECOMMENDATIONS NOTES ON PLANS

- 1. FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 2. FOR DRILLED PIERS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.
- 3. PILES AT END BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 55 TONS PER PILE.
- 4. PILES AT END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 59 TONS PER PILE
- 5. DRIVE PILES AT END BENT NO. 1 TO A REQUIRED DRIVING RESISTANCE OF 95 TONS PER PILE.
- 6. DRIVE PILES AT END BENT NO. 2 TO A REQUIRED DRIVING RESISTANCE OF 100 TONS PER PILE.
- 7. IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 30 TO 40 FT-KIPS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT END BENT NO. 1 AND END BENT NO. 2. THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH SUBARTICLE 450-3(D)(2) OF THE STANDARD SPECIFICATIONS.
- 8. DRILLED PIERS AT BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 360 TONS PER PIER. NO TIP RESISTANCE REQUIRED.
- 9. DRILLED PIERS AT BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 360 TONS PER PIER. CHECK FIELD CONDITIONS FOR THE REQUIRED TIP RESITANCE OF 40 TSF.
- 10. INSTALL DRILLED PIERS AT BENT NO. 1 LEFT TO A TIP ELEVATION NO HIGHER THAN 550.8 FT AND A PENETRATION OF AT LEAST 4.5 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
- 11. INSTALL DRILLED PIERS AT BENT NO. 1 CENTER AND RIGHT TO A TIP ELEVATION NO HIGHER THAN 528.1 FT AND A PENETRATION OF AT LEAST 4.5 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
- 12. INSTALL DRILLED PIERS AT BENT NO. 2 LEFT TO A TIP ELEVATION NO HIGHER THAN 542.0 FT AND A PENETRATION OF AT LEAST 7 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
- 13. INSTALL DRILLED PIERS AT BENT NO. 2 CENTER AND RIGHT TO A TIP ELEVATION NO HIGHER THAN 537.2 FT AND A PENETRATION OF AT LEAST 7 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
- 14. PERMANENT STEEL CASINGS MAY BE REQUIRED FOR DRILLED PIERS AT BENT NO. 1 AND BENT NO 2. IF REQUIRED, DO NOT EXTEND PERMANENT CASINGS BELOW ELEVATION 558.5 FT AT BENT NO. 1 AND 556 FT AT BENT NO. 2 WITHOUT PRIOR APPROVAL FROM THE ENGINEER. THE ENGINEER WILL DETERMINE THE NEED FOR PERMANENT CASINGS.

Bridge No. 750352 on SR 2143 (Carl Allred Road) over Bush Creek

Randolph County

FOUNDATION RECOMMENDATIONS NOTES ON PLANS

- 15. INSTALL PERMANENT STEEL CASING AT BENT NO. 1 AND BENT NO. 2 BY VIBRATING, SCREWING OR DRIVING PERMANENT CASINGS BEFORE EXCAVATION OR DISTRUBING ANY MATERIAL BELOW ELEVATION 558.5 AND 556 FT, RESPECTIVELY.
- 16. THE SCOUR CRITICAL ELEVATIONS FOR BENT NO. 1 IS ELEVATION 556.8 FT FOR THE LEFT SIDE AND ELEVATION 542.6 FT FOR THE CENTER AND RIGHT SIDE. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
- 17. THE SCOUR CRITICAL ELEVATIONS FOR BENT NO. 2 IS ELEVATION 554.1 FT. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
- 18. 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.
- 19. CSL TUBES ARE REQUIRED AND CSL TESTING MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR CSL TESTING. FOR CSL TESTING, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

Bridge No. 750352 on SR 2143 (Carl Allred Road) over Bush Creek

Randolph County

FOUNDATION RECOMMENDATIONS COMMENTS

- 1. Bridge end bent slopes of 1.5:1 (H:V) are ok with slope protection.
- 2. For sub-regional tier bridges, use Type II Modified Bridge Approach Fill.
- 3. The factored axial load for End Bent No. 1 is 55 tons per pile.
- 4. The factored axial load for End Bent No. 2 is 59 tons per pile.
- 5. The design scour elevation at Bent No. 1 is 560.5 feet.
- 6. The design scour elevation at Bent No. 2 is 558 feet.
- 7. No waiting period is required between embankment construction and end bent construction.

(Revised 8/15/12)

WBS ELEMENT_	17BP.8.R.132	DATE	3/28/2019
TIP NO.		DESIGNED BY	LAC
COUNTY	Randolph	CHECKED BY	КНН
STATION_	15+62.50 -L-		
DESCRIPTION_	Bridge No. 750352 on SR 2143 (Ca	arl Allred Road) over Bush Cre	ek
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	

	PILE PAY ITEM QUANTITIES						
	Steel					Pile 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	no	no	no	0	0	0	\ /
End Bent 2	no	no	no	0	0	0	\ /
							\ /
							\wedge
							/ \
							/
							/ \
							/
TOTALS	$\triangleright\!$	$>\!\!<$	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.

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

WBS ELEMENT_	17BP.8.R.132	DATE_	3/28/2019
TIP NO.		DESIGNED BY	LAC
COUNTY	Randolph	CHECKED BY	КНН
STATION	15+62.50 -L-		
-			
DESCRIPTION _	Bridge No. 750352 on SR 2143	(Carl Allred Road) over Bush	Creek
_			
NUMBER (OF BENTS WITH DRILLED PIERS	2	
NUMBE	R OF DRILLED PIERS PER BENT	3	
NUMBER OF EN	ID BENTS WITH DRILLED PIERS		
NUMBER OF	DRILLED PIERS PER END BENT	<u>-</u>	

	DRILLED PIER PAY ITEM QUANTITIES					
	Permanent					
	Steel Casing	36'' Dia.				
	For 36'' Dia.	Drilled Piers	SID	SPT	CSL	
Bent # or	Drilled Pier	Not In Soil	Inspections	Testing	Testing	
End Bent #	(yes/no/maybe)	(per linear ft)	(per each)	(per each)	(per each)	
Bent 1	maybe	14	1		1	
Bent 2	maybe	22	1		1	
TOTALS	$>\!\!<$	36	2	0	2	

Notes:

Blanks or "no" represent quantity of zero.

If drilled piers not in soil are required, calculate quantity of 36" Dia. Drilled Piers in Soil" as the difference between the total drilled pier length and the 36" 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 36" Dia. Drilled Piers" as the total drilled pier length and do not use the 36" Dia. Drilled Piers in Soil" pay item.

If permanent steel casing is or may be required, calculate quantity of "Permanent Steel Casing for <u>36"</u> 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.