

DRAFT SEISMIC HAZARD REPORT

I-85 SBL REPLACEMENT BRIDGE OVER NORFOLK SOUTHERN RAILROAD

SCDOT FILE NO. 11.039094.11

SCDOT PIN NO. 39094_RD11

CHEROKEE COUNTY, SOUTH CAROLINA

S&ME PROJECT NO. 1261-10-391

Prepared For:

STV/Ralph Whitehead Associates
4975 Lacross Road Suite 314
North Charleston, South Carolina 29406-6531

Prepared by:



301 Zima Park Drive
Spartanburg, South Carolina 29301

May 12, 2011



May 12, 2011

STV/Ralph Whitehead Associates
4975 Lacross Road Suite 314
North Charleston, South Carolina 29406-6531

Attention: Mr. Dan Moses, P.E.

Reference: **DRAFT SEISMIC HAZARD REPORT**
I-85 SBL Replacement Bridge over Norfolk Southern Railroad
SCDOT File No. 11.039094.11
SCDOT PIN No. 39094_RD11
Cherokee County, South Carolina
S&ME Project No. 1261-10-391

Dear Mr. Moses:

We have completed our seismic evaluation for the replacement bridge over Norfolk Southern Railroad in Cherokee County, South Carolina. Our services are being performed in general accordance with the Subcontract for Professional Services between STV/Ralph Whitehead Associates (STV) and S&ME, Inc. for this project dated December 16, 2010 and executed on February 24, 2011. This letter supplements our *Geotechnical Data Summary Report* dated March 8, 2011.

Our evaluation of the sites seismic classification is based on the Shear Wave Velocity profiles (SW-1 through SW-4) obtained at the site from the MASW testing, the generalized subsurface stratification from the soil test borings (B-1 and B-2), and the Site Class definitions given in Table 12-22 of the SCDOT Geotechnical Design Manual. For the proposed replacement bridge, the top 100 ft of the site soils classify as Site Class D with a characteristic average shear wave velocity of 1,060 fps.

Based on the seismic hazard information¹ provided by the SCDOT, seismic design parameters (based on the three-point method) are presented in Table 1 below. The complete ADRS curve is presented in the Appendix.

Table 1 - Seismic Design Parameters for Site Class D

Event	PGA	S _{DS}	S _{D1}
SEE	0.15g	0.23g	0.13g
FEE	0.06g	0.10g	0.06g

¹ Consultant Geotechnical Seismic Response requested April 1, 2011, and included in the Appendix of this report.

This report has been prepared in accordance with generally applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made. The Geotechnical Engineer of Record for the project must review the data submitted in this report for application to their design.

S&ME appreciates this opportunity to work with STV/Ralph Whitehead as your local geotechnical consultant on this project. If you have any questions or need further information in regard to this letter, please do not hesitate to contact us at 864-547-2360.

Sincerely,
S&ME, Inc.


Tripp Ford, PE
Project Engineer
tford@smeinc.com


Michael Revis, PE
Senior Engineer
mrevis@smeinc.com

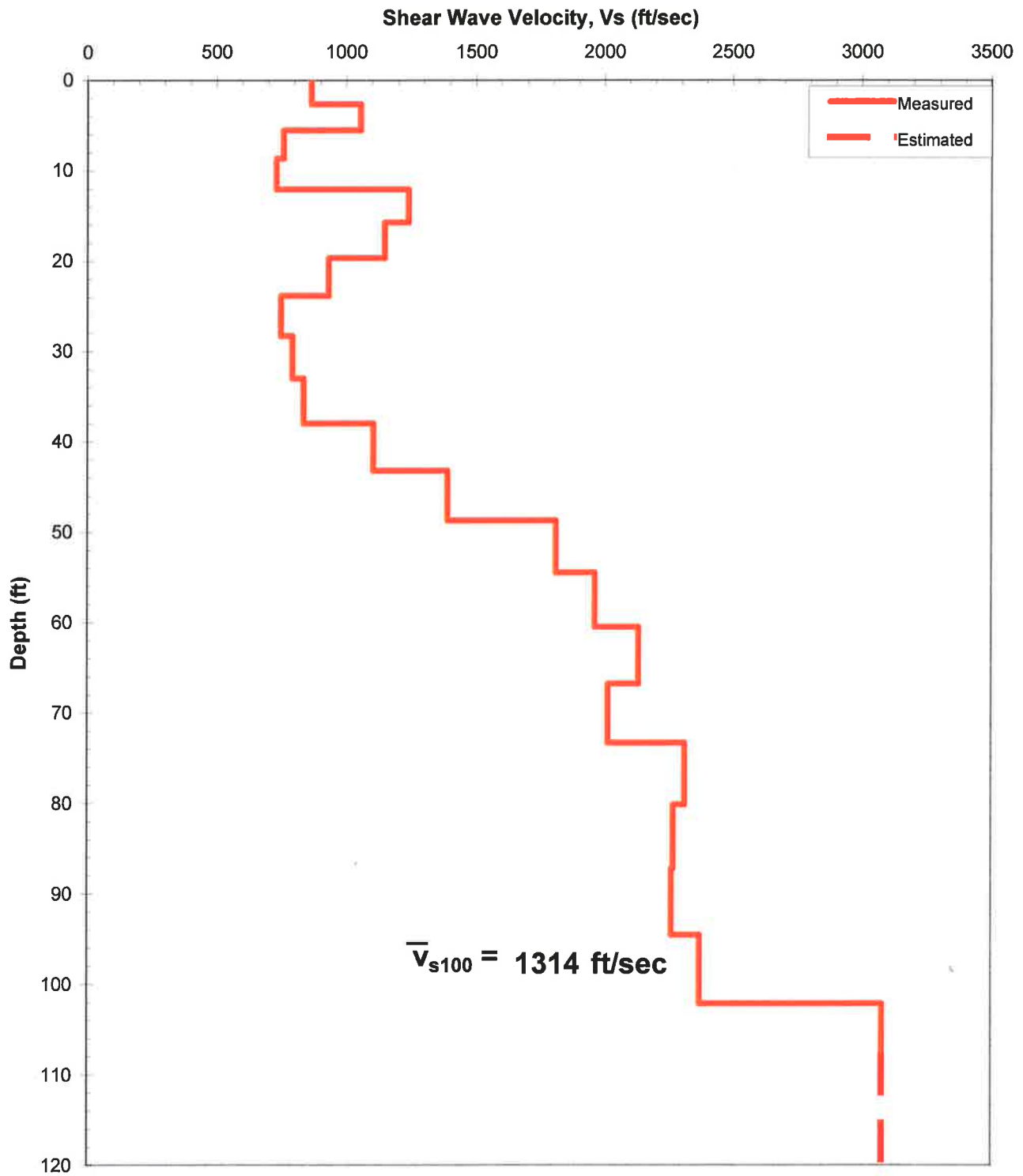
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APPENDIX I

SCPT Shear Wave Velocity Profiles (SW-1 through SW-4)
Consultant Geotechnical Seismic Response
Acceleration Design Response Spectrum (ADRS)

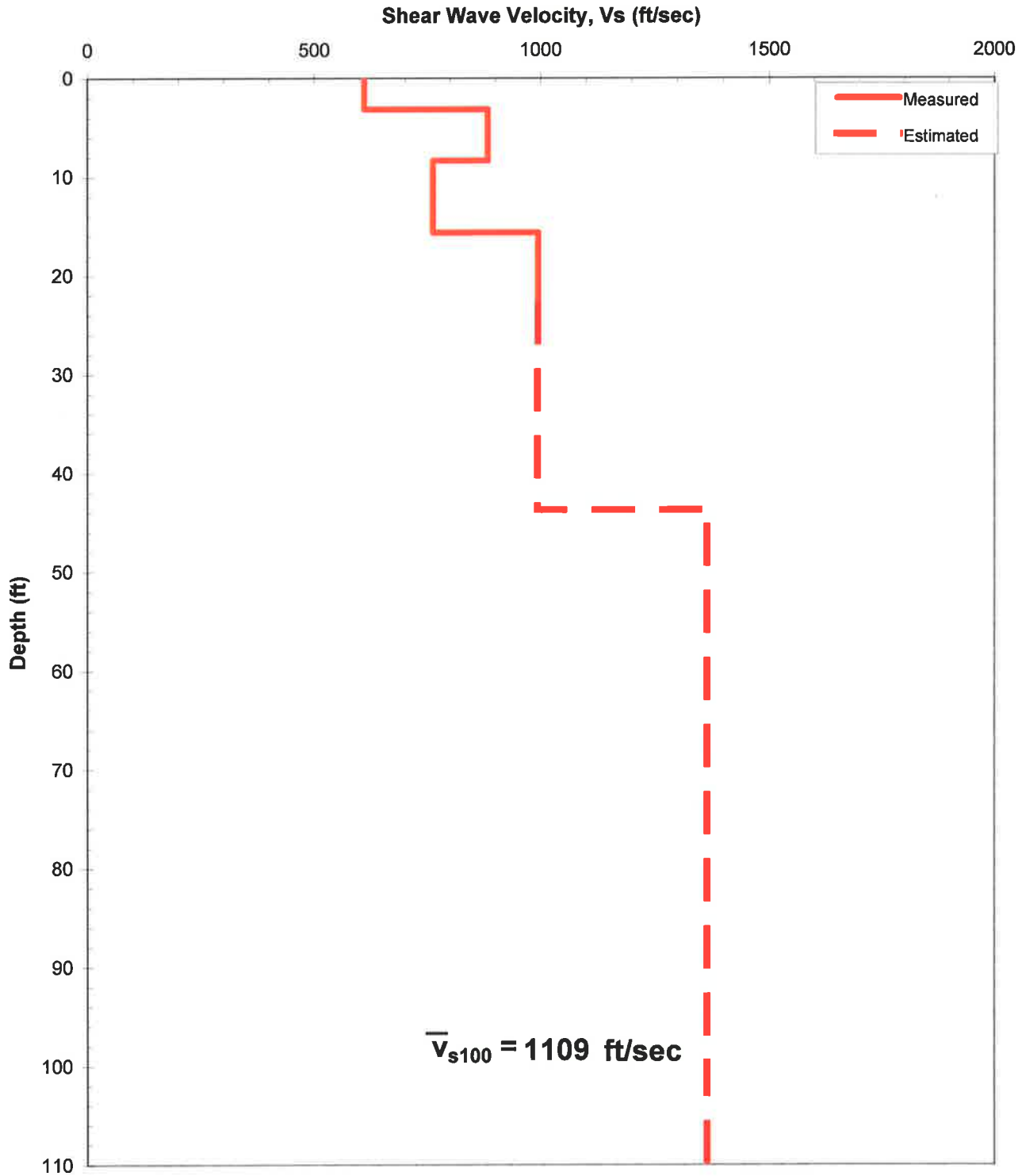


Shear Wave Velocity Profile SW-1
I-85 RBO Norfolk Southern RR
Gaffney, South Carolina
1261-10-391



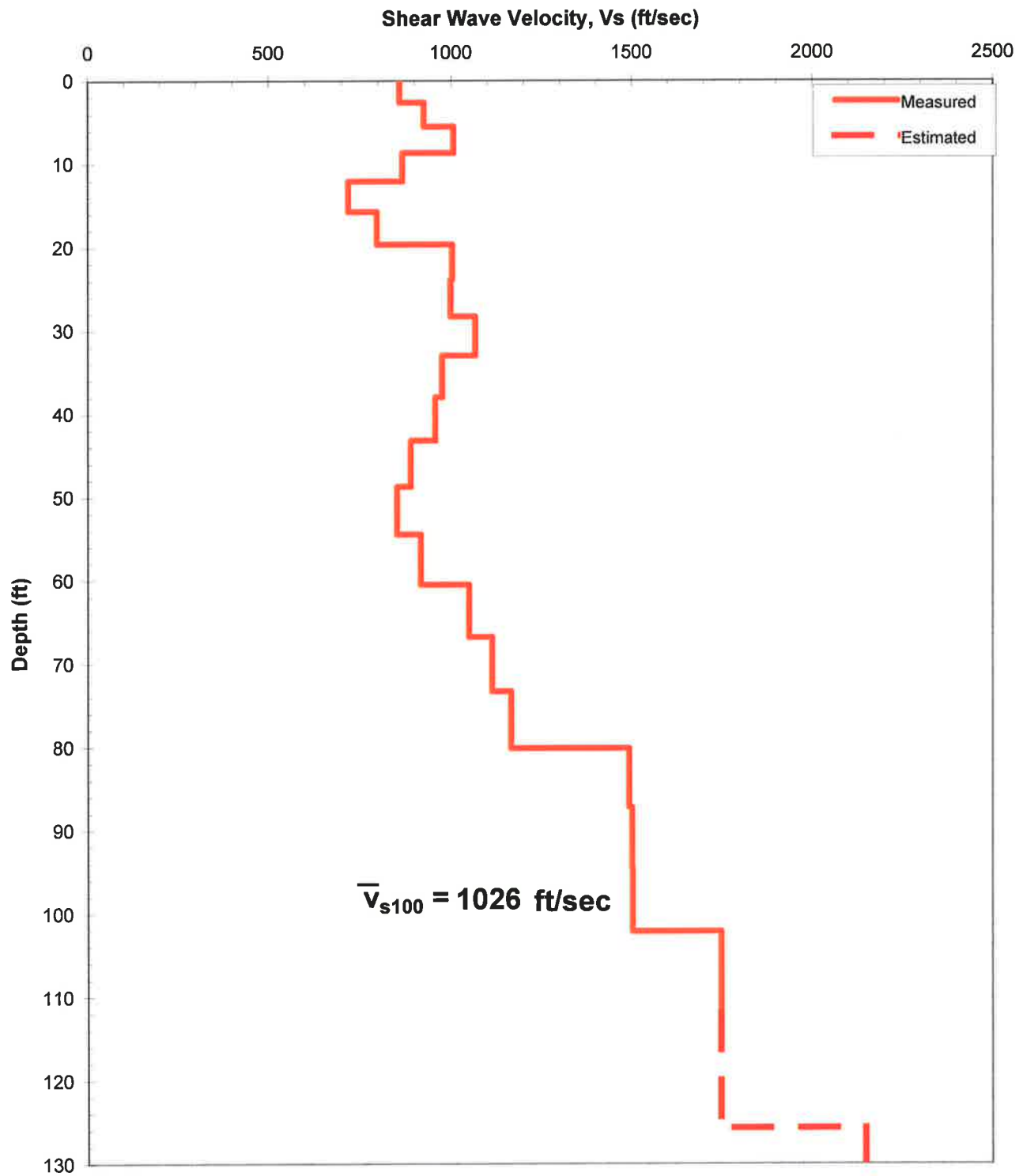


Shear Wave Velocity Profile SW-2
I-85 RBO Norfolk Southern RR
Gaffney, South Carolina
1261-10-391



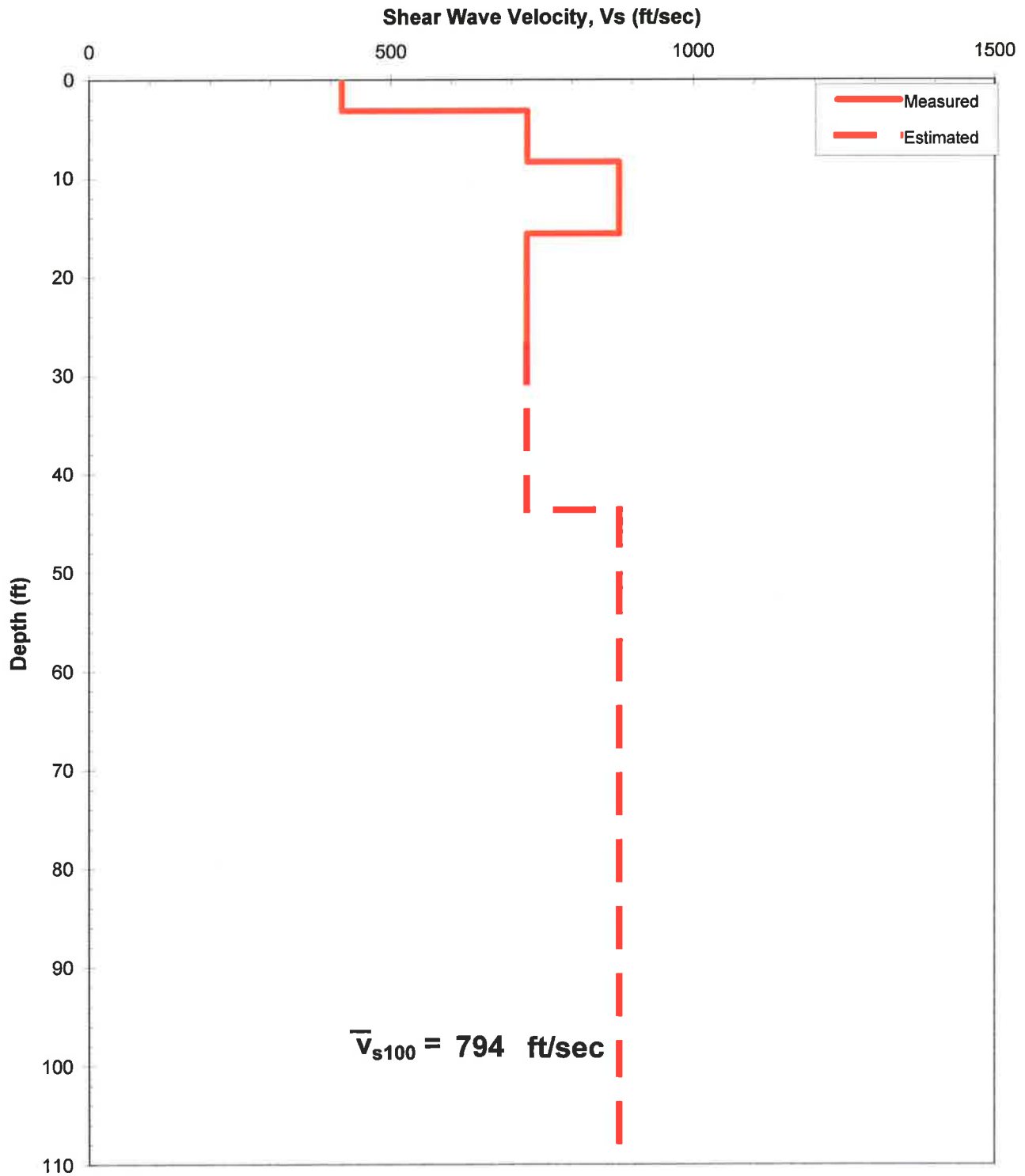


Shear Wave Velocity Profile SW-3
I-85 RBO Norfolk Southern RR
Gaffney, South Carolina
1261-10-391





Shear Wave Velocity Profile SW-4
I-85 RBO Norfolk Southern RR
Gaffney, South Carolina
1261-10-391



Consultant Geotechnical Seismic Response

To:	Mike Revis						
Consultant:	S&ME, Inc.						
Date Requested:	1/13/2011						
PROJECT INFORMATION							
File No.				Project No. (PIN): 39094			
County: Cherokee				Route: I-85			
Description: I-85 over SBL over Norfolk Southern Railroad							
Latitude (4 decimals): 35.1599				Longitude (4 decimals): -81.4677			
Bridge Category / Seismic OC:				I			
Type of Seismic Information Requested:				Consultant Seismic Request			
Seismic Site Class:				D			
Pseudo-Spectral Acceleration (PSA)							
The SCDOT Geotechnical Design Section has generated the required Design Earthquake the pseudo-spectral acceleration (PSA) oscillator response for frequencies 0.5, 1.0, 2.0, 3.3, 5.0, 6.7 and 13 Hz, for 5% critical damping and peak horizontal ground acceleration (PGA) at the B-C Boundary.							
SEE – 3% Probability of Exceedance in 75 years							
PSA and PGA as Percentage of g							
0.5Hz	1.0Hz	2.0Hz	3.3Hz	5.0Hz	6.7Hz	13.0Hz	PGA
2.74552	5.54214	8.58112	11.63408	14.10771	14.25708	16.57377	9.34473
Thickness of sediments:		0					
FEE – 15% Probability of Exceedance in 75 years							
PSA and PGA as Percentage of g							
0.5Hz	1.0Hz	2.0Hz	3.3Hz	5.0Hz	6.7Hz	13.0Hz	PGA
1.04215	2.41389	3.11135	5.45787	6.48235	6.34539	6.82532	3.83856
Thickness of sediments:		0					
Time Series							
Unscaled and Scaled time series were generated for the B-C Boundary in Shake91 data format. The Scaled time series are based on the earthquake magnitude (Mw) and Epicentral distance requested.							
The Time Series Files are Attached:				Yes <input type="checkbox"/>		No <input checked="" type="checkbox"/>	
Design Response Spectrum							
Two-Point Method				<input type="checkbox"/>			
Three-Point Method				<input checked="" type="checkbox"/>			
The Design Response Spectrum is Attached:				Yes <input checked="" type="checkbox"/>		No <input type="checkbox"/>	
Geotechnical Designer:		Melissa A. Jackson <i>my</i>			RPG¹:		Midlands
Date:		4/14/2011		Phone Number:		(803) 737-9929	
Geotechnical Review:		Sara M. Stone, PE <i>SS</i>			RPG^{1,2}:		3 - Midlands

¹RPG – Region Production Group

Lowcountry - Beaufort, Berkeley, Charleston, Colleton, Dorchester, Hampton, Jasper

Pee Dee - Chesterfield, Clarendon, Darlington, Dillon, Florence, Georgetown, Horry, Kershaw, Lee, Marion, Marlboro, Sumter, Williamsburg

Midlands - Aiken, Allendale, Bamberg, Barnwell, Calhoun, Chester, Fairfield, Lancaster, Lexington, Newberry, Orangeburg, Richland, Union, York

Upstate - Abbeville, Anderson, Cherokee, Edgefield, Greenville, Greenwood, Laurens, McCormick, Oconee, Pickens, Saluda, Spartanburg

²RPG – PreConstruction Support – Geotechnical Design Section (PCS/GDS)

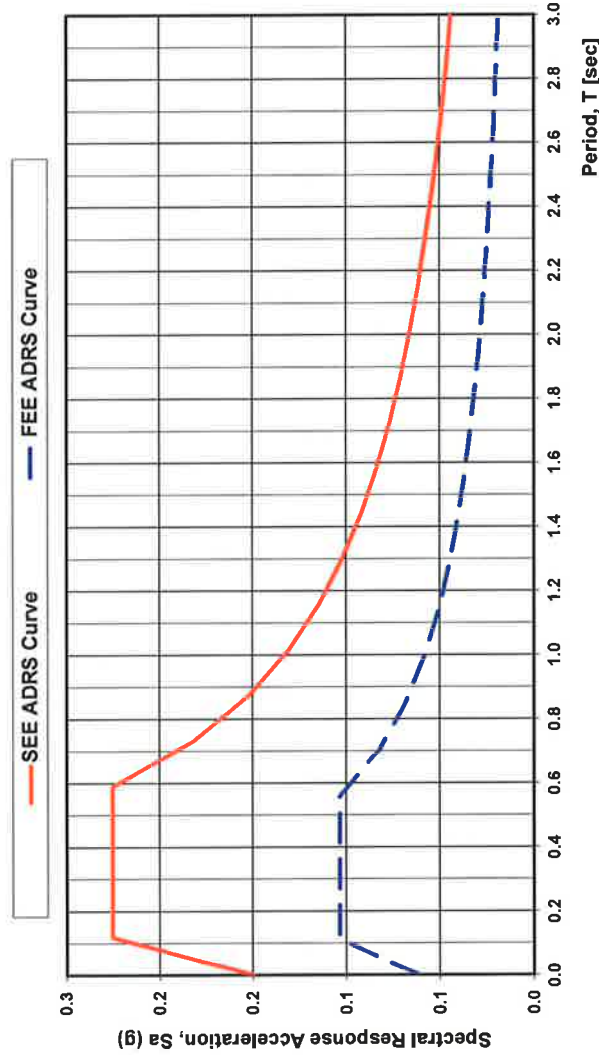
SC Seismic Hazard Map
Three-Point ADRS Curves

PIN No. 39084	File No. 11.039094.11	Latitude: 35.1599
Route: I-85	County: Cherokee	Longitude: 81.4677
Project: SBL Norfolk Southern Rail Road		

Designer: M. Jackson - Midlands RPG
Date: 4/14/2011

Design EQ	PGA	S _{0.5}	S _{0.1}	M ₀	R (km)	Geologic Condition	Site Class	Damping
FEE	0.06	0.10	0.06	7.38	225.25	Hard Rock Basement Outcrop	D	5%
SEE	0.15	0.23	0.13	7.35	223.6	Hard Rock Basement Outcrop	D	

SC Seismic Hazard Map Three-Point ADRS Curve From Ground Surface



FEE ADRS Curve Three-Point Method			SEE ADRS Curve Three-Point Method		
T	S _a	T ₀	T	S _a	T ₀
0.00	0.06		0.00	0.15	
0.02	0.07		0.02	0.16	
0.04	0.08		0.04	0.17	
0.06	0.08		0.06	0.19	
0.07	0.09		0.07	0.20	
0.09	0.10		0.09	0.21	
0.11	0.10		0.11	0.23	
0.15	0.10		0.15	0.23	
0.19	0.10		0.19	0.23	
0.22	0.10		0.22	0.23	
0.26	0.10		0.26	0.23	
0.30	0.10		0.30	0.23	
0.34	0.10		0.34	0.23	
0.37	0.10		0.37	0.23	
0.41	0.10		0.41	0.23	
0.45	0.10		0.45	0.23	
0.48	0.10		0.48	0.23	
0.52	0.10		0.52	0.23	
0.56	0.10		0.56	0.23	
0.70	0.08		0.70	0.18	
0.85	0.07		0.85	0.15	
0.99	0.06		0.99	0.13	
1.13	0.05		1.13	0.12	
1.28	0.05		1.28	0.10	
1.42	0.04		1.42	0.09	
1.56	0.04		1.56	0.08	
1.71	0.03		1.71	0.08	
1.85	0.03		1.85	0.07	
1.99	0.03		1.99	0.07	
2.14	0.03		2.14	0.06	
2.28	0.03		2.28	0.06	
2.43	0.02		2.43	0.05	
2.57	0.02		2.57	0.05	
2.71	0.02		2.71	0.05	
2.85	0.02		2.85	0.05	
3.00	0.02		3.00	0.04	