



# Shear Wave Velocity Profiling Using Spectral Analysis of Surface Waves (SASW) at Williams Street Park & Coyote Creek Borehole San Jose, CA

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Asten, M.W., and Boore, D.M., eds., Blind comparisons of shear-wave velocities at closely spaced sites in San Jose, California: U.S. Geological Survey Open-File Report 2005-1169. [available on the World Wide Web at <http://pubs.usgs.gov/of/2005/1169/> ].

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**U.S. DEPARTMENT OF THE INTERIOR  
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Utah State University Shear Wave Velocity Profiling

Using

Spectral Analysis of Surface Waves (SASW)

at

Williams Street Park  
&  
Coyote Creek Borehole

San Jose, CA

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SECTION I - Iterative Forward Modeling Analysis

SECTION II - Alternative Analysis – Automated Inversion and IRF Filtering

SECTION III - Comparison between Analyses

## Section I

### Iterative Forward Modeling Analysis

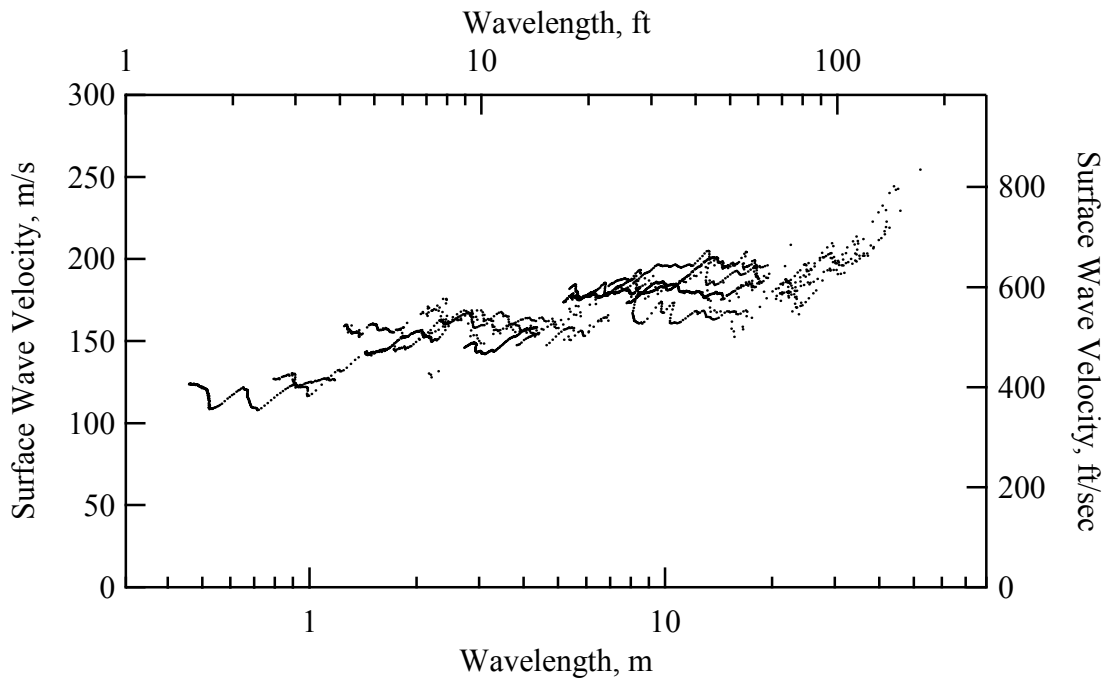


Figure 1 Experimental dispersion curve measured at Coyote Creek Borehole

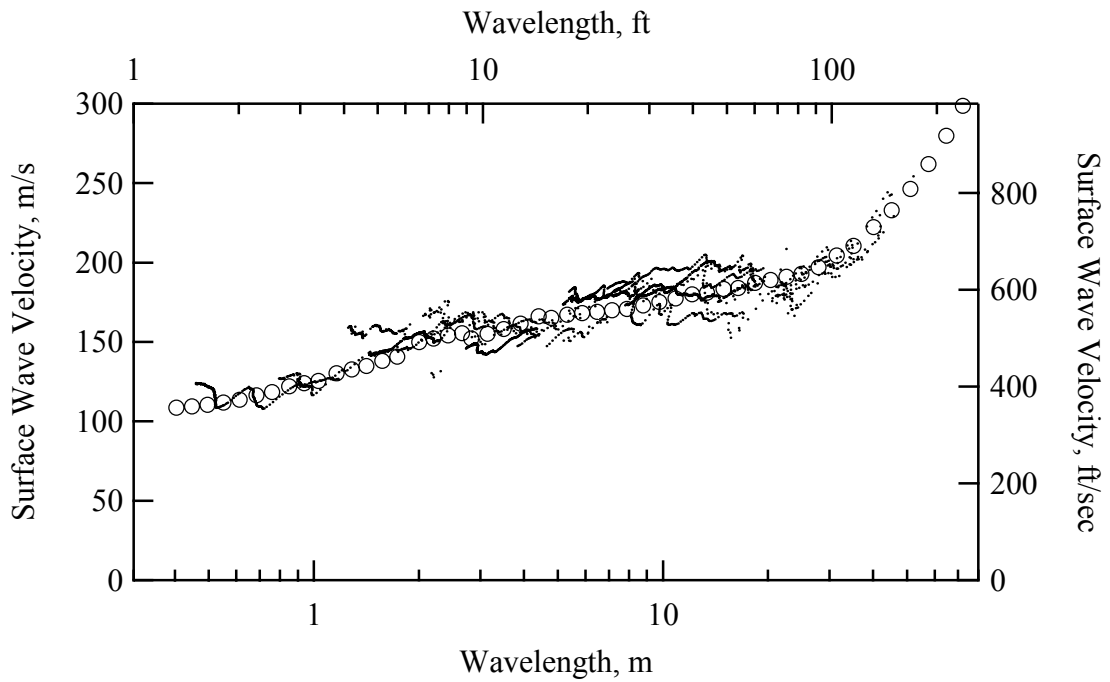


Figure 2 Comparison between theoretical & experimental dispersion curve measured at Coyote Creek Borehole

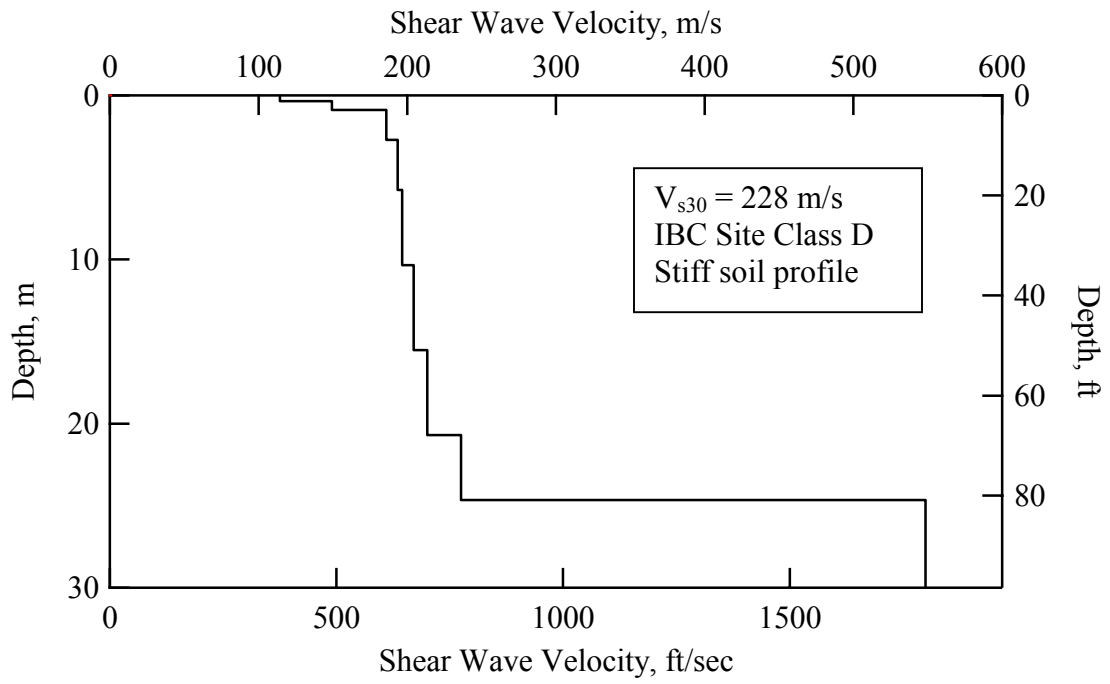


Figure 3 Shear wave velocity profile determined from SASW testing at Coyote Creek Borehole

Table 1 Tabulated shear wave velocity profile from Coyote Creek Borehole

Depth to Top of Layer (m)	Layer Thickness (m)	Shear Wave Velocity (m/s)	Assumed P-Wave Velocity (m/s)	Assumed Unit Weight (t/m <sup>3</sup> )
0.00	0.34	114	214	1.89
0.34	0.55	149	279	1.89
0.89	1.83	186	348	1.92
2.72	3.05	194	362	1.92
5.77 <sup>a</sup>	4.57	197	1524	1.92
10.34	5.18	204	1524	1.92
15.5	5.18	213	1524	1.92
20.7	3.96	236	1524	1.92
24.7	30.18 <sup>b</sup>	549 <sup>c</sup>	1524	2.00

- a. Depth to water table
- b. Half-space in model
- c. Unresolved velocity

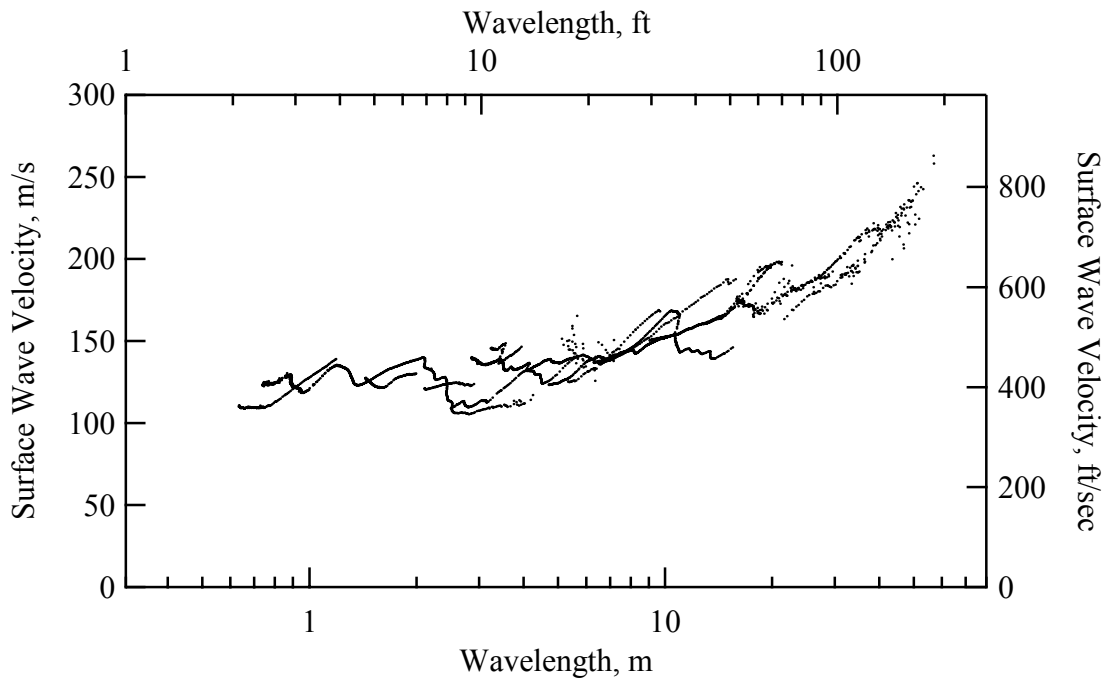


Figure 4 Experimental dispersion curve measured at Williams Street Park

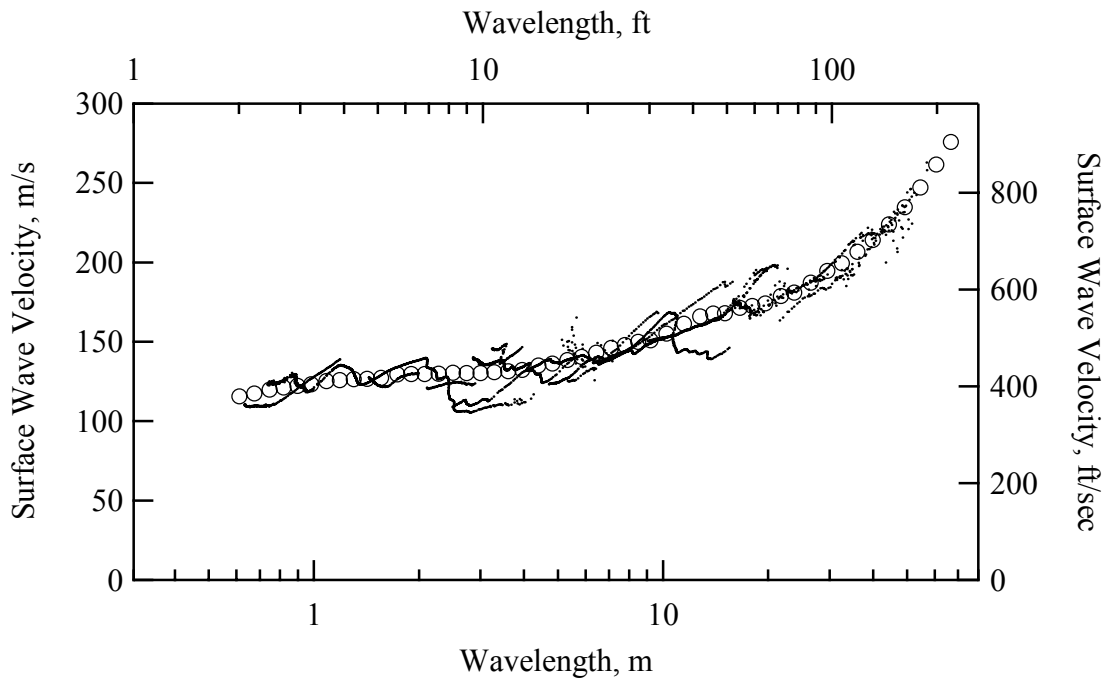


Figure 5 Comparison between theoretical & experimental dispersion curve measured at Williams Street Park



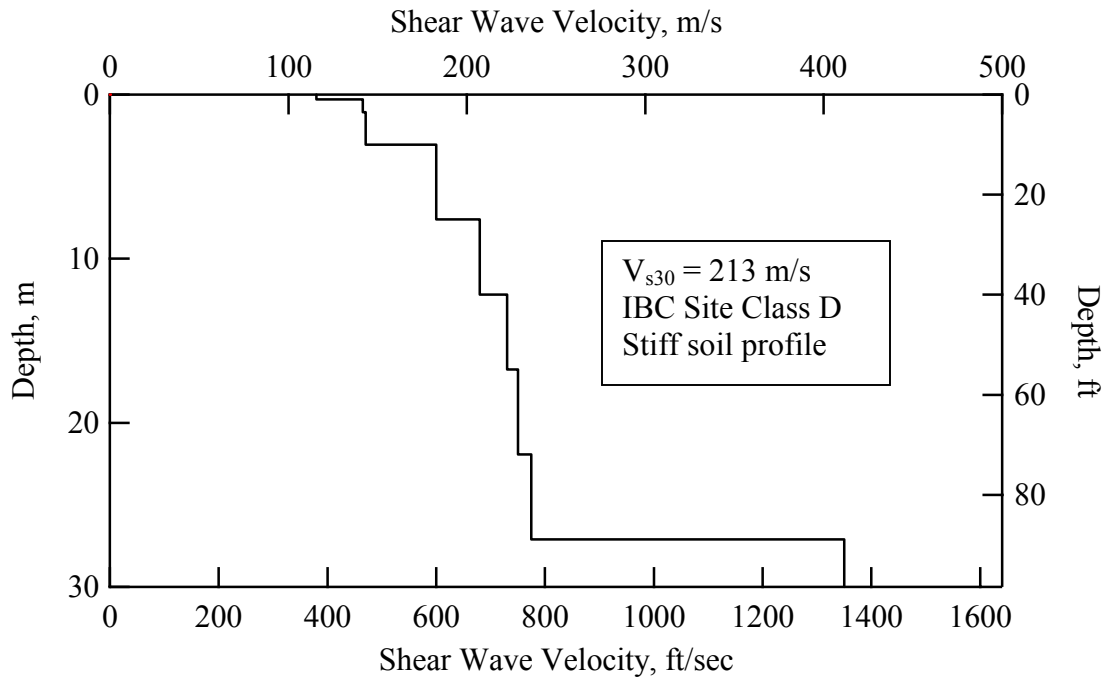


Figure 6 Shear wave velocity profile determined from SASW testing at Williams Street Park

Table 2 Tabulated shear wave velocity profile from Williams Street Park

Depth to Top of Layer (m)	Layer Thickness (m)	Shear Wave Velocity (m/s)	Assumed P-Wave Velocity (m/s)	Assumed Unit Weight (t/m <sup>3</sup> )
0.00	0.30	116	217	1.89
0.30	0.76	142	265	1.89
1.06	1.98	143	268	1.89
3.04	4.57	183	342	1.92
7.61 <sup>a</sup>	4.57	207	1524	1.92
12.18	4.57	223	1524	1.92
16.8	5.18	229	1524	1.92
21.9	5.18	236	1524	1.92
27.1	30.18 <sup>b</sup>	412 <sup>c</sup>	1524	2.00

a. Depth to water table

b. Half-space in model

c. Unresolved velocity

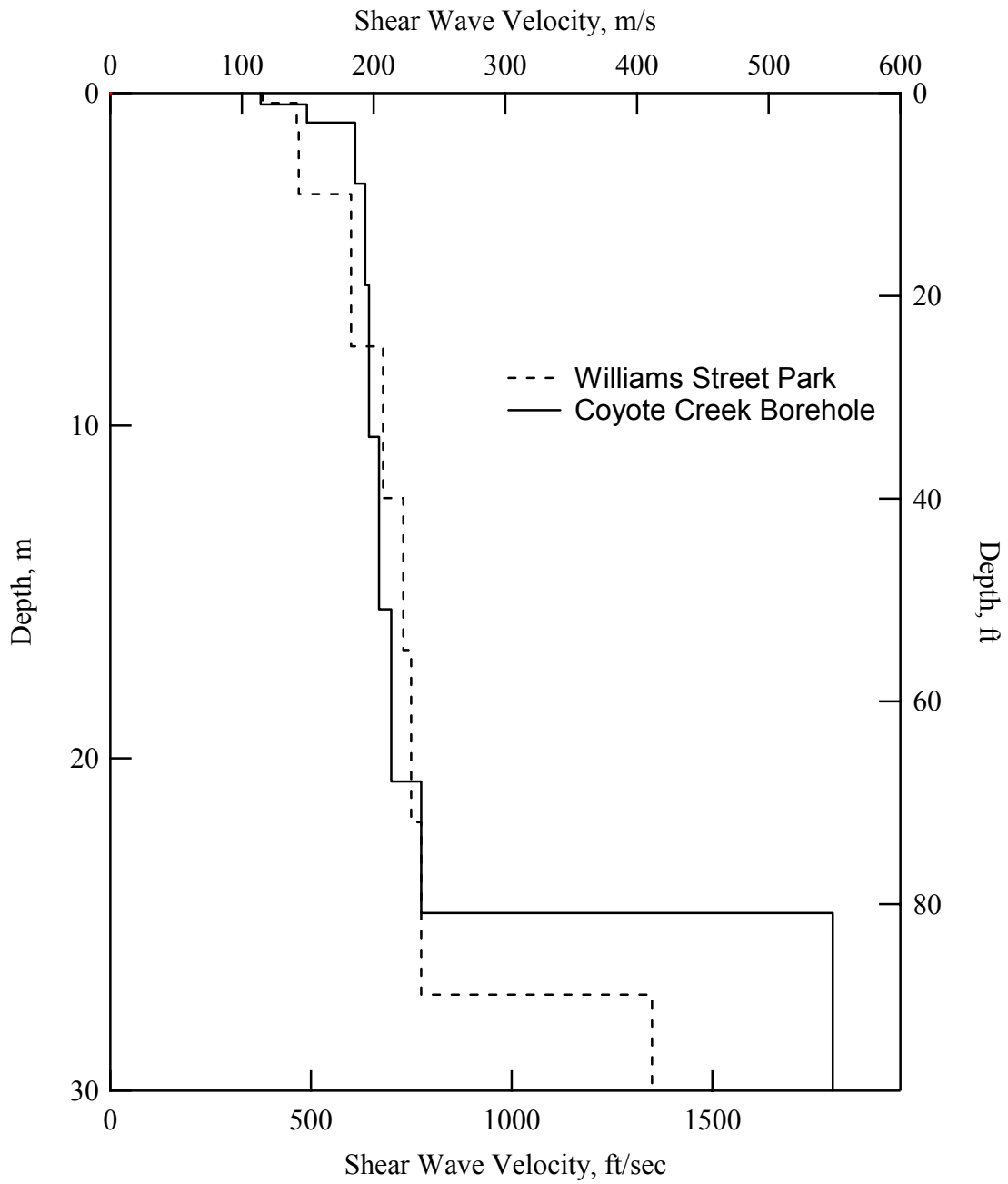


Figure 7 Comparison of Coyote Creek Borehole & Williams Street Park shear wave velocity profiles determined from SASW testing and iterative forward modeling analysis

## Section II

### Alternative Analysis and IRF Filtering

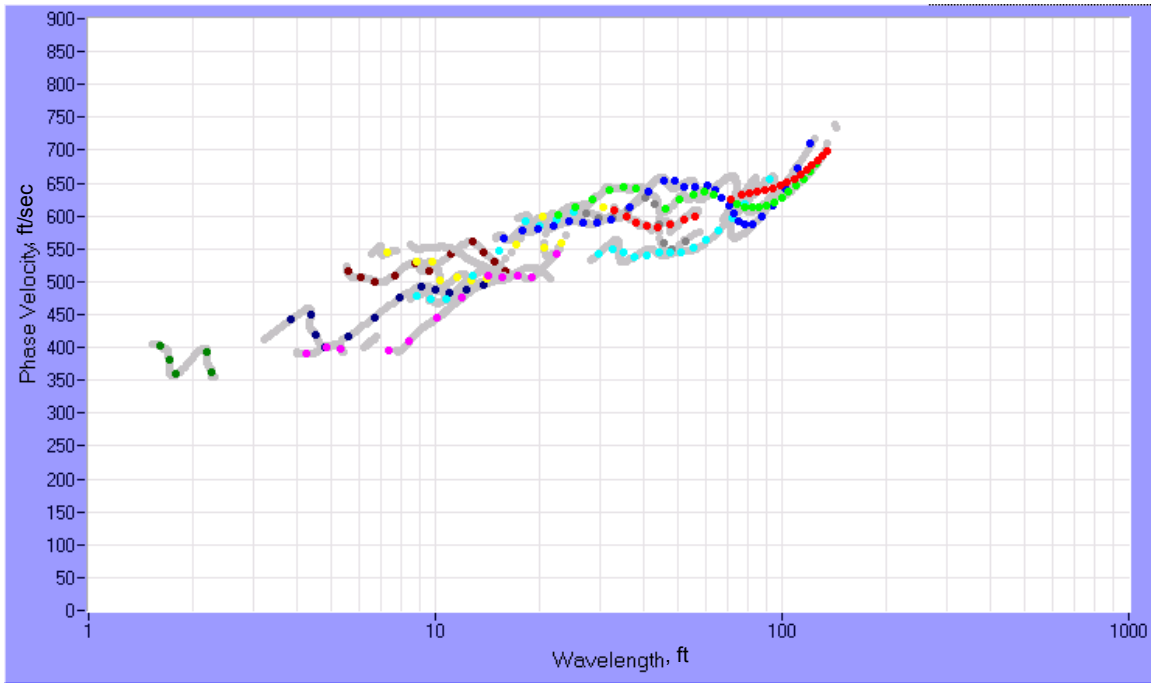


Figure 8 Experimental and representative dispersion curves measured at Coyote Borehole (dimensions are in English units). Gray shadows indicate experimental dispersion curve and color-coded dots represent array representative curve.

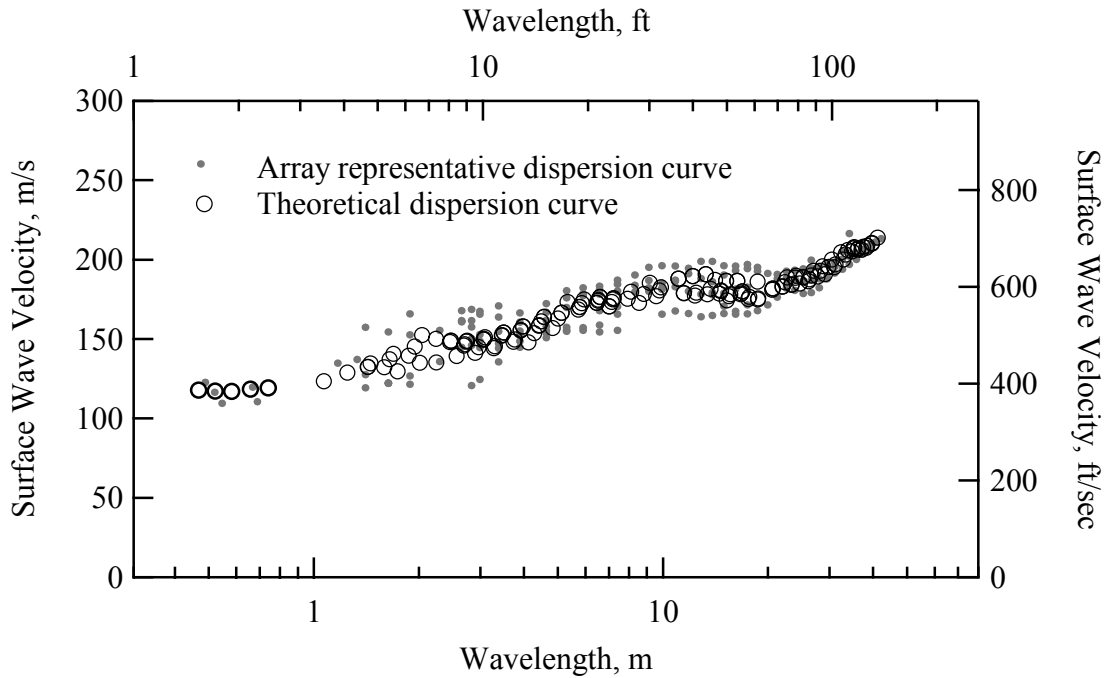


Figure 9 Comparison between representative and theoretical dispersion curves measured at Coyote Borehole using automated inversion process

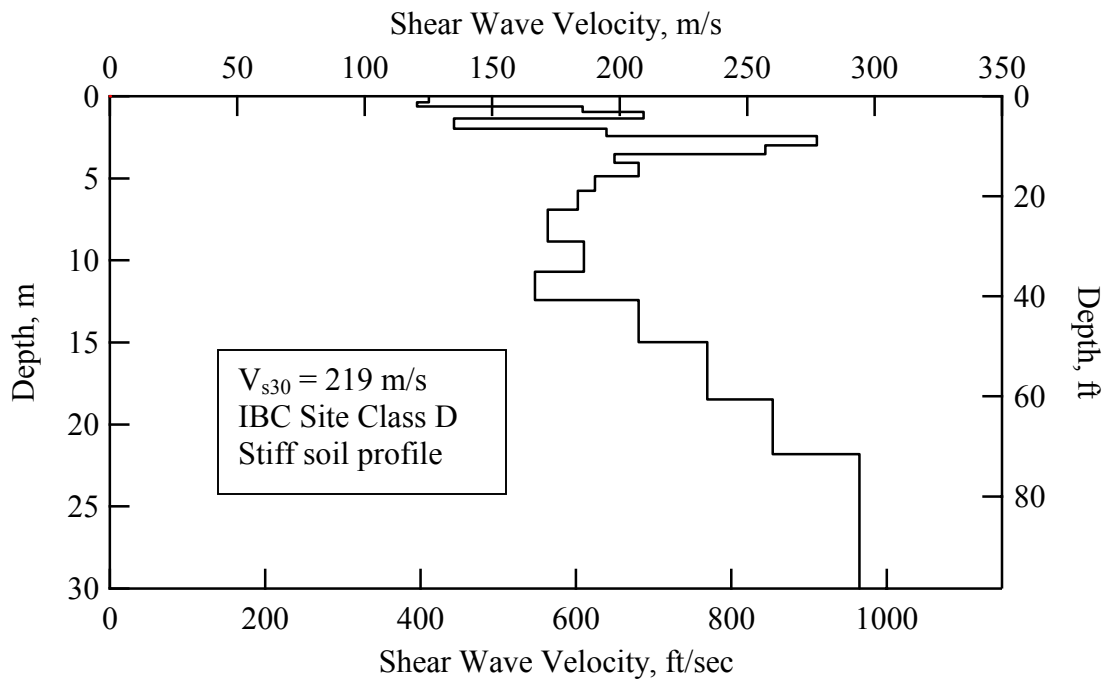


Figure 10 Shear wave velocity profile determined from SASW testing at Coyote Borehole using automated inversion process

Table 3 Tabulated layer properties determined from automated inversion process at Coyote Borehole

Depth to Top Layer, m	Layer Thickness, m	Shear Wave Velocity, m/s	P-Wave Velocity, m/s	Mass density, t/m <sup>3</sup>	Poisson's ratio
0.00	0.36	125	234	1.8	0.300
0.36	0.26	121	225	1.8	0.300
0.62	0.34	185	347	1.8	0.300
0.96	0.40	209	392	1.8	0.300
1.36	0.63	135	253	1.8	0.300
1.99	0.44	195	365	1.8	0.300
2.43	0.57	277	519	1.8	0.300
2.99	0.54	257	481	1.8	0.300
3.54	0.52	198	370	1.8	0.300
4.06 <sup>a</sup>	0.80	207	1585	2.0	0.491
4.86	0.91	190	1585	2.0	0.493
5.77	1.15	184	1585	2.0	0.493
6.91	1.93	172	1585	2.0	0.494
8.84	1.85	186	1585	2.0	0.493
10.69	1.73	167	1585	2.0	0.494
12.43	2.56	207	1585	2.0	0.491
14.98	3.49	234	1585	2.0	0.489
18.47	3.34	260	1585	2.0	0.486
21.80	8.20	294	1585	2.0	0.482

a. Depth to water table

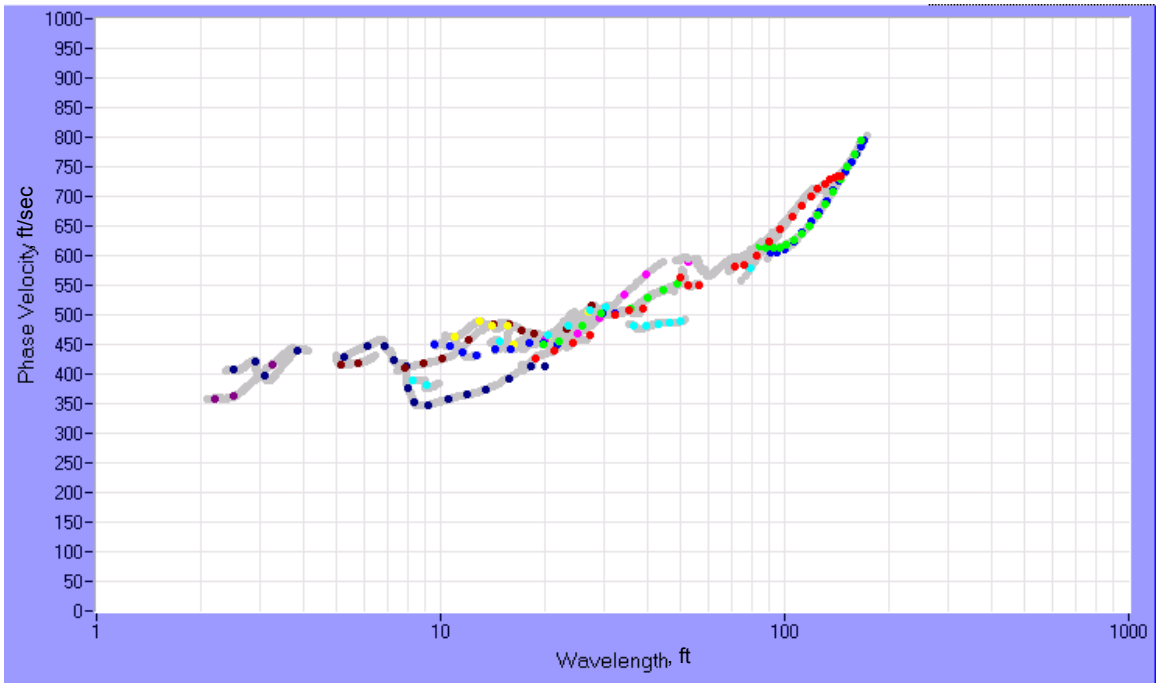


Figure 11 Experimental and representative dispersion curves measured at Williams Street Park (dimensions are in English units). Gray shadows indicate experimental dispersion curve and color-coded dots represent array representative curve.

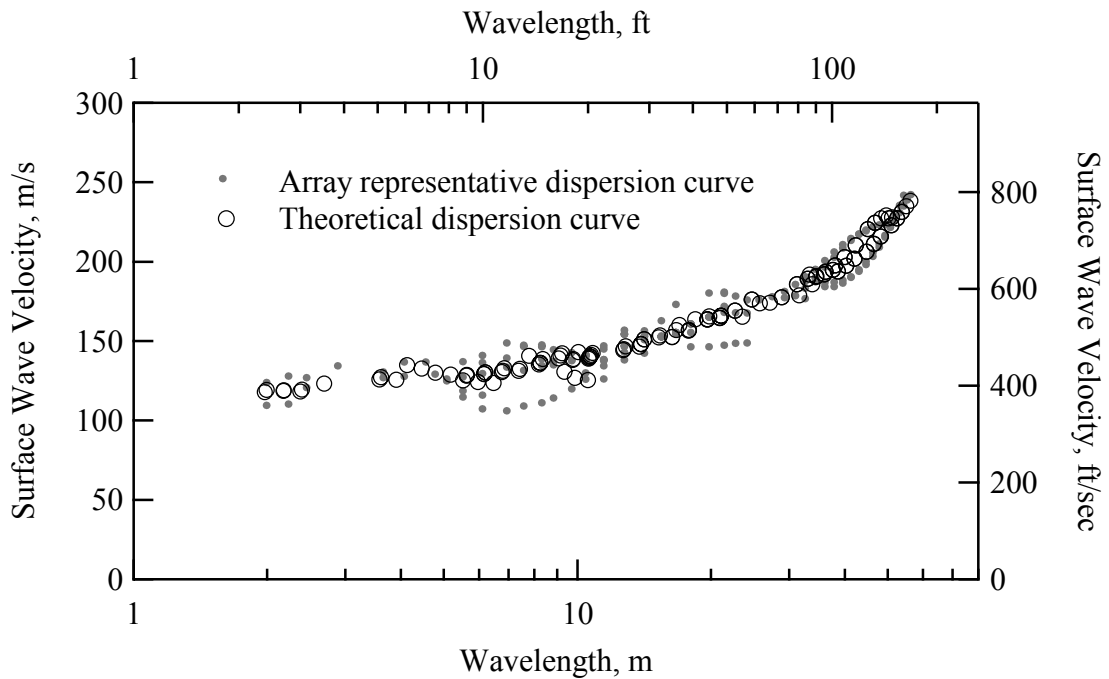


Figure 12 Comparison between representative and theoretical dispersion curves measured at Williams Street Park using automated inversion process



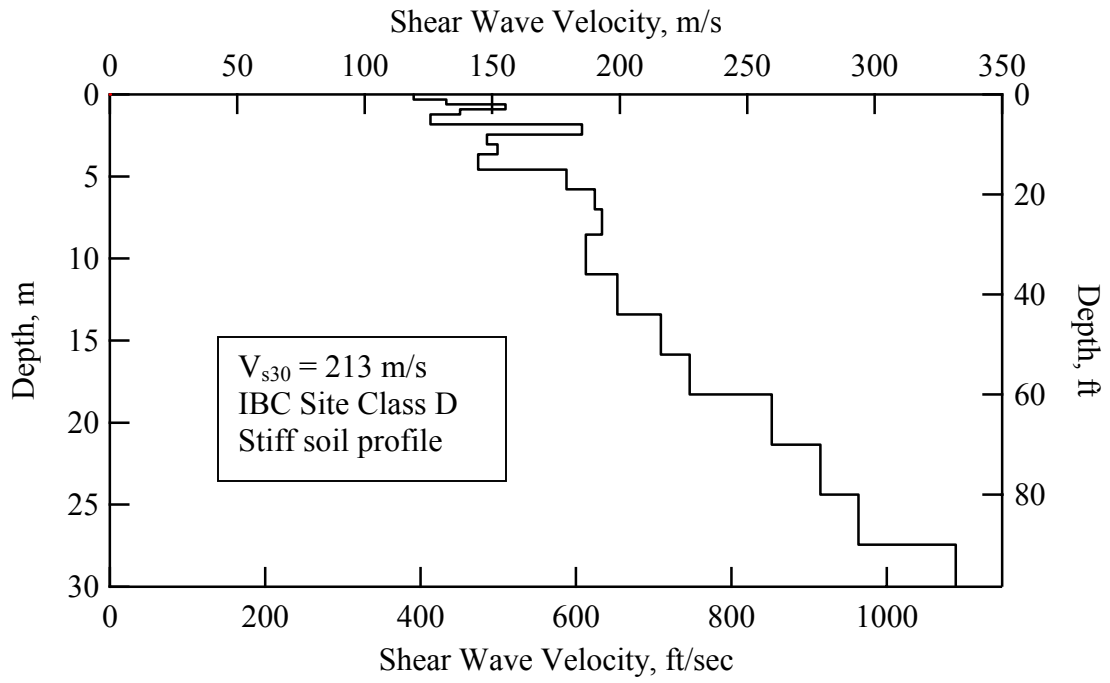


Figure 13 Shear wave velocity profile determined from SASW testing at Williams Street Park using automated inversion process

Table 4 Tabulated layer properties determined from automated inversion process at Williams Street Park

Depth to Top Layer, m	Layer Thickness, m	Shear Wave Velocity, m/s	P-Wave Velocity, m/s	Mass density, t/m <sup>3</sup>	Poisson's ratio
0.00	0.30	119	223	1.8	0.300
0.30	0.30	132	247	1.8	0.300
0.61	0.30	155	290	1.8	0.300
0.91	0.30	137	257	1.8	0.300
1.22	0.61	126	235	1.8	0.300
1.83	0.61	185	347	1.8	0.300
2.44	0.61	148	277	1.8	0.300
3.05	0.61	152	284	1.8	0.300
3.66 <sup>a</sup>	0.91	144	1585	2.0	0.496
4.57	1.22	179	1585	2.0	0.494
5.79	1.22	190	1585	2.0	0.493
7.01	1.52	193	1585	2.0	0.492
8.53	2.44	187	1585	2.0	0.493
10.97	2.44	199	1585	2.0	0.492
13.41	2.44	216	1585	2.0	0.491
15.85	2.44	228	1585	2.0	0.489
18.29	3.05	260	1585	2.0	0.486
21.34	3.05	279	1585	2.0	0.484
24.38	3.05	294	1585	2.0	0.482
27.43	2.57	332	1585	2.0	0.477

a. Depth to water table

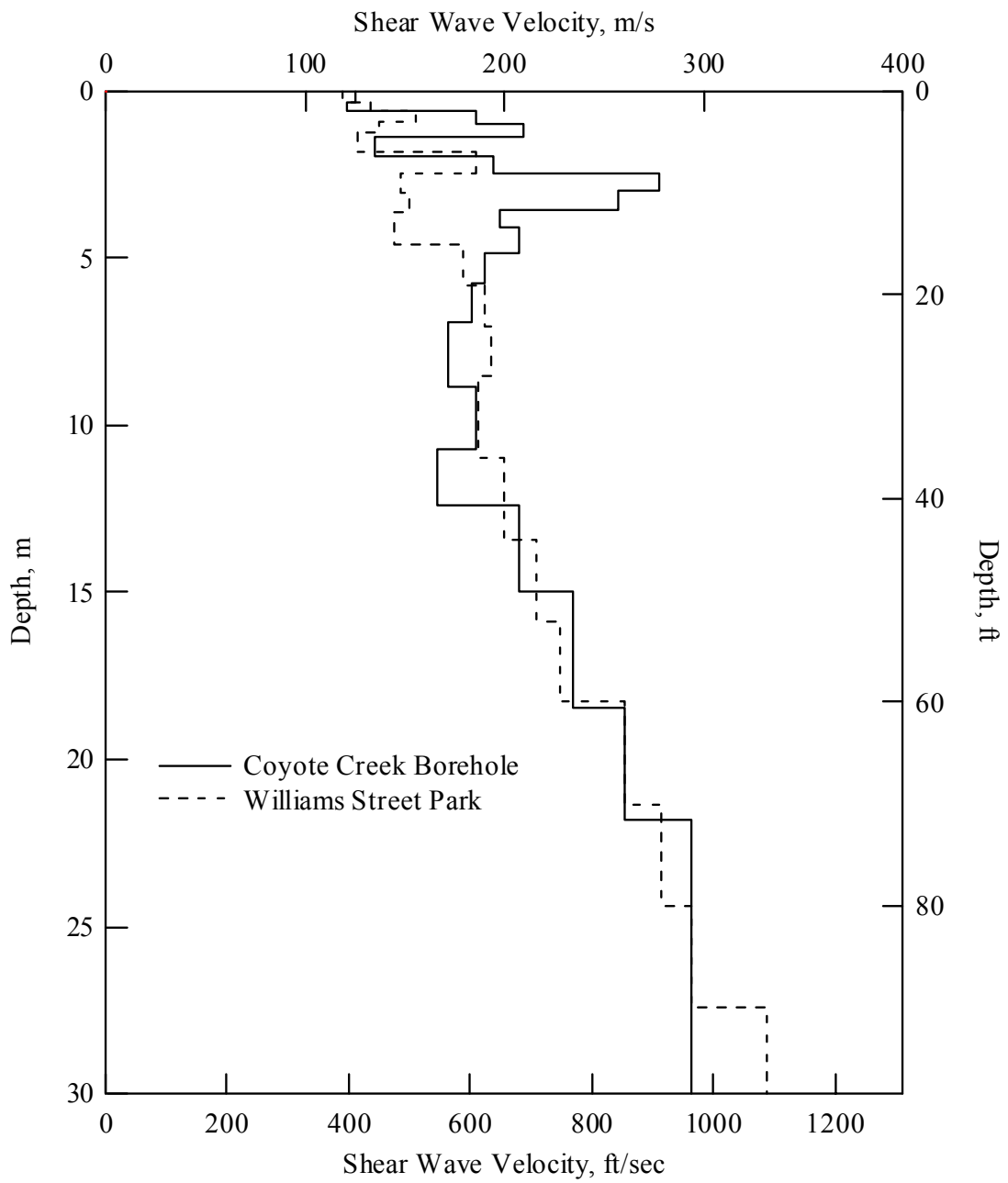


Figure 14 Shear wave velocity profiles of Coyote Borehole and Williams Street Park sites determined from SASW testing with automated inversion process

### Section III

#### Comparison between Analyses

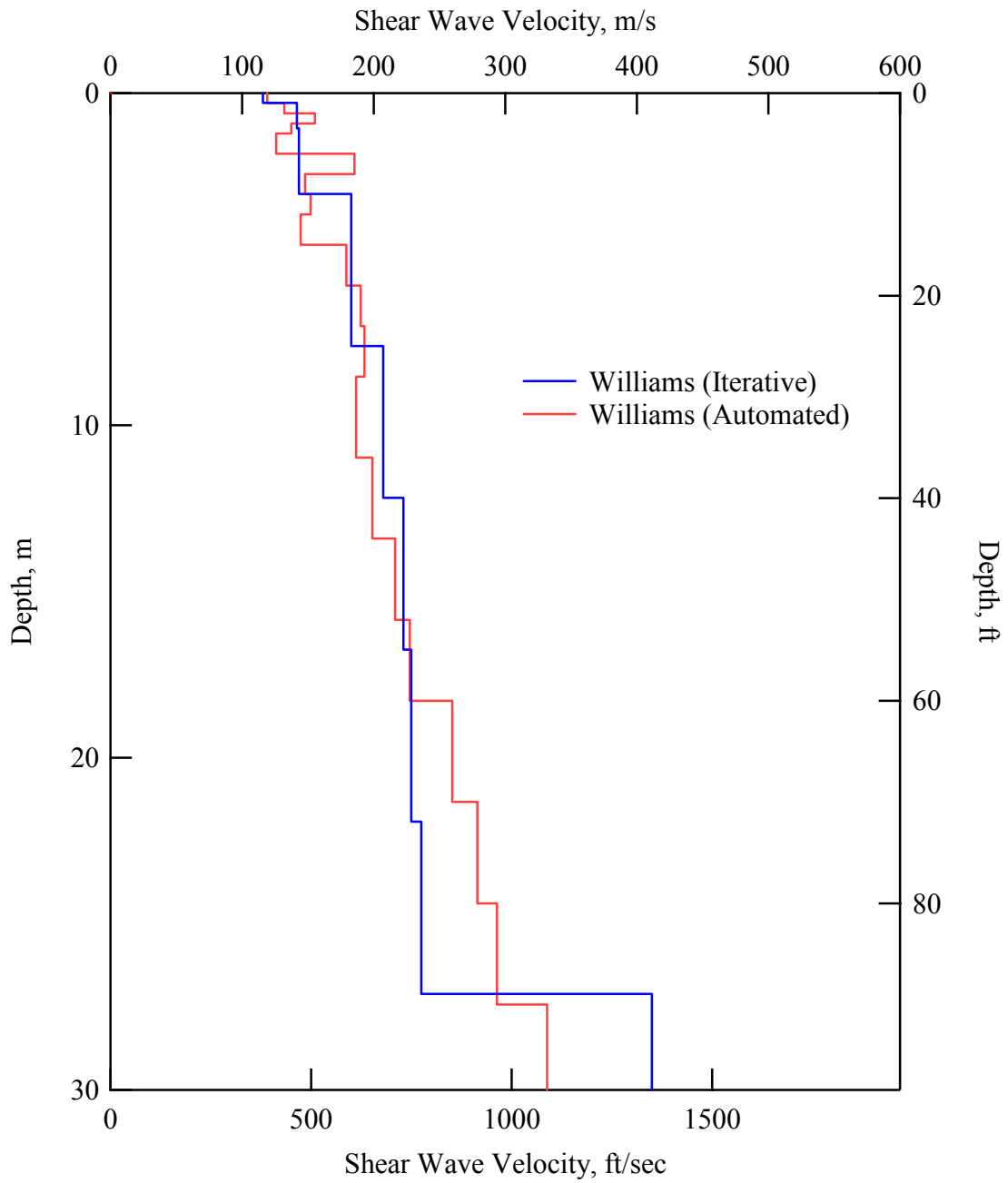


Figure 15 Comparison of automated and iterative methods at Williams Street Park

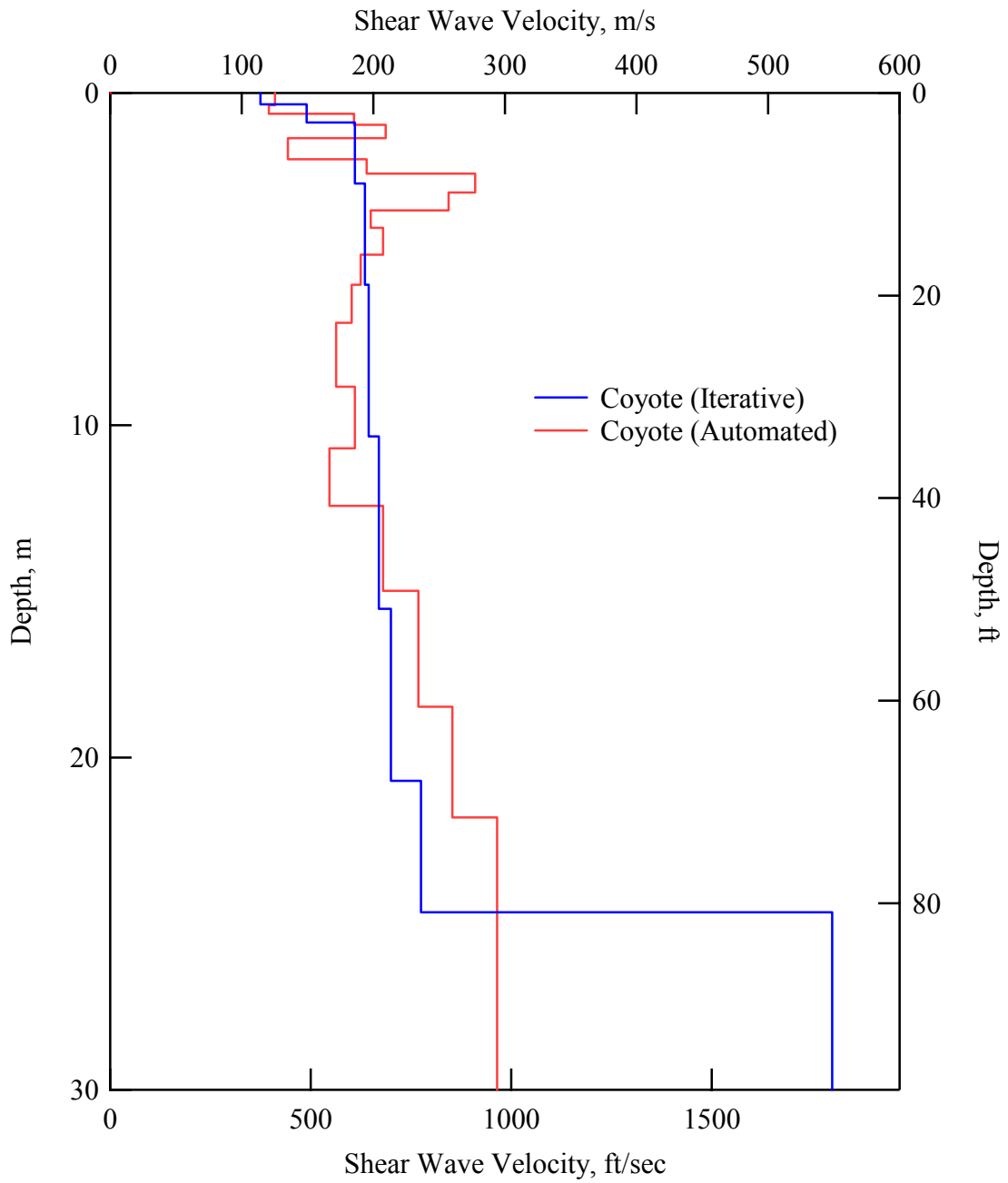


Figure 16 Comparison of automated and iterative methods at Coyote Creek Borehole