APPENDIX I

GEOPHYSICAL TESTING REPORT

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SEISMIC REFRACTION AND MASW SURVEYS AT THE BLUE SKY WEST POWER PROJECT BINGHAM, MAINE

INTRODUCTION

At the request of S.W. Cole Engineering Inc., seismic refraction and MASW (multichannel analysis of shear waves) surveys were conducted at eight locations at the proposed Blue Sky West Wind Power Project located east of the town of Bingham, Maine. The purpose of the surveys was to collect pressure wave (P-wave or V_p) and shear wave (S-wave or V_s) seismic velocities at each location. This information can be used to calculate Poisson's ratio, shear modulus, and Young's modulus. The field survey for Sites T-5 and T-28 was undertaken on November 6, 2012 and the field survey for Sites T-12, T-18, T-22, T-36, T-56 and T-73 was done on November 21-26, 2013 by Rudy Rawcliffe and Wayne Campbell of Northeast Geophysical Services. This report describes the equipment and methods used and the results of the surveys, and includes calculated S-wave and P-wave velocities for each area.

LOCATION AND SITE CONDITIONS

The Blue Sky West Wind Power Project Site is located along a northeast trending ridgeline extending from Bingham in the southwest into Mayfield Township to the northeast. The locations of the eight proposed turbine locations that were tested are shown on the Seismic Line Location Map (following page). Surface conditions were generally rocky, wooded and with uneven topography.

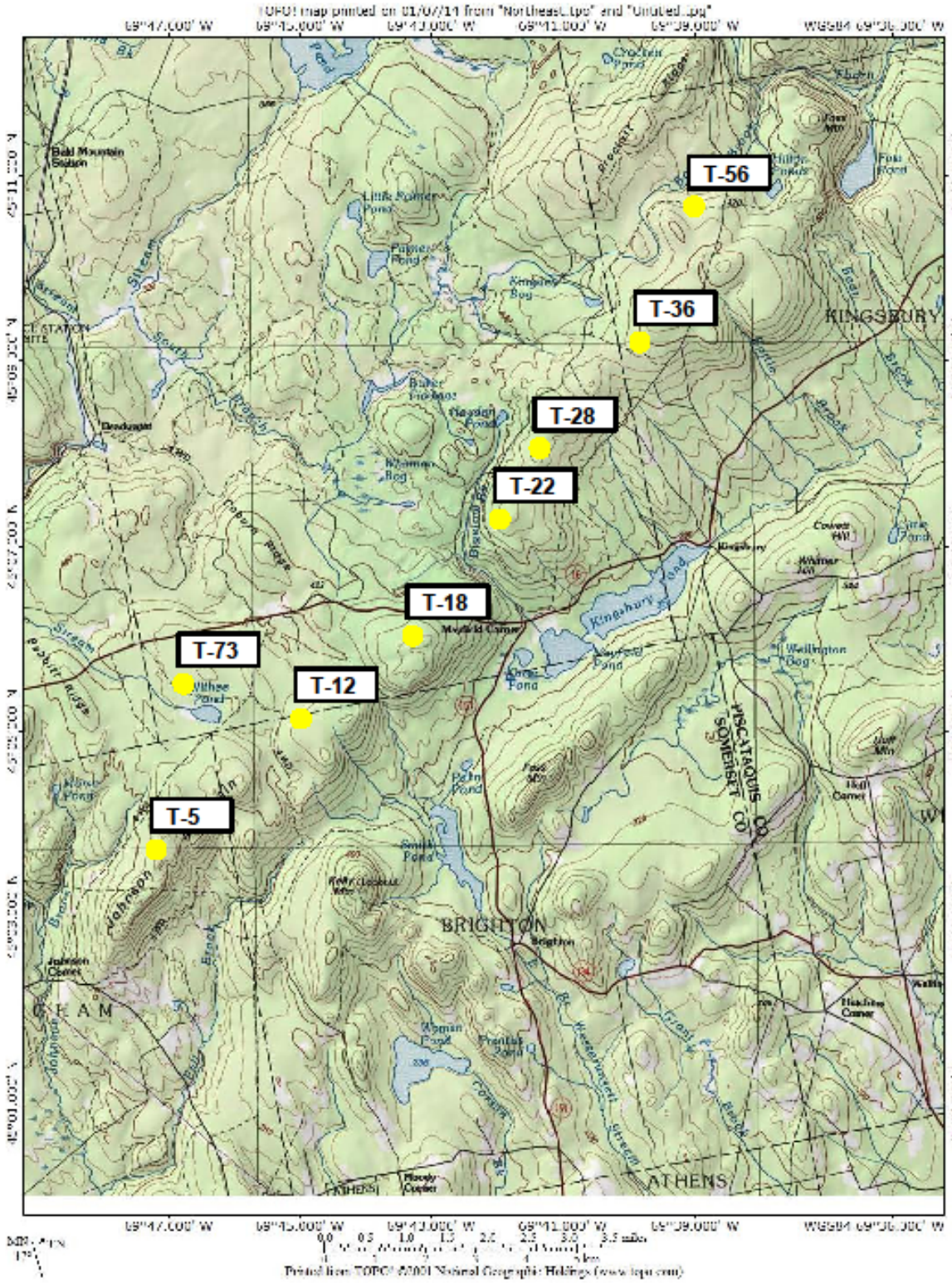
SEISMIC METHODS AND INSTRUMENTATION

The seismic refraction and MASW surveys were conducted using a Geometrics Geode, 24-channel seismograph and 4.5 Hzt vertical geophones spaced four feet apart. This resulted in a spread length of 92 feet. Each geophone spread was tested with eight shots. The general shot configuration consisted of shots spaced 4, 24, 48 and 92 feet off from either end of the spread. The energy source consisted of a small explosive charge buried 1 to 2 feet deep.

Each shot produces seismic energy that travels through subsurface as a number of different seismic waves that include pressure waves (P-waves), shear waves (S-waves) and surface waves called Rayleigh and Love waves. Of these, the P-wave is the fastest and will be the first to arrive at the geophones. S-waves travel slower, roughly about 40 to 50% slower than the P-waves. The surface waves are slightly slower than the S-waves, roughly about 20% slower.

The seismic refraction method relies on travel times of P-waves, measured in milliseconds, traveling through and refracting from subsurface layers with contrasting densities. The velocity of the P-waves can be calculated be dividing the distance from the shot point to the geophone by the travel time. In order to get an accurate P-wave velocity, shots must be measured from both ends of the geophone spread. The seismic refraction data were processed and interpreted using the RIMRock Geophysics SIPT-2 (formerly U.S.G.S. SIPT-2) seismic interpretation program. This program calculates seismic velocities by regression and by the Hobson-Overton method.

Seismic Test Site Location Map



Locations are approximate

The MASW method is a recently developed technique that measures the dispersion pattern of the different wavelength frequencies produced by surface waves. The high frequency surface waves travel near to the surface and the low frequency waves penetrate more deeply into the subsurface. Scientists have discovered that this dispersion pattern can be used to calculate S-wave velocities and also how that S-wave velocity changes with depth. A more thorough discussion of the MASW method can be found at http://www.masw.com/. The surface wave (MASW) data were processed and interpreted by Dr Choon Park, one of the developers of the MASW method.

SEISMIC SURVEY RESULTS

The results of the seismic refraction P-wave and MASW S-wave analysis are attached as Attachments A and B respectively. Table 1 summarizes the calculated seismic velocities in feet per second (fps).

Table 1 - Blue Sky West Sites - Calculated Seismic Velocities

Site	material	Vp (fps)	Vs (fps)	Poisson's Ratio
5	soil	3,285	1,369	0.39
5	bedrock	11,271	5,548	0.34
12	soil	4,171	2,072	0.34
12	bedrock	12,308	5,793	0.36
18	bedrock	13,178	6,554	0.34
22	bedrock	11,844	5,738	0.35
28	bedrock	18,571	8,730	0.36
36	bedrock	12,290	6,705	0.29
56	soil	2,042	1,047	0.32
56	bedrock	14,744	7,234	0.34
73	bedrock	12,685	6,654	0.31

Following is a summary of each site:

Turbine Site 5 At Turbine Site 5 a spread was done trending 332 degrees magnetic centered near Boring T-5. The drilling log for T-5 shows the upper 17 feet is composed of till and weathered bedrock. From 17 feet to the bottom of the borehole at 55 feet the rock is generally described as a moderately to highly fractured meta-sandstone.

At Site 5 the median calculated P-wave velocity for the soil and/or weathered rock from 0 to 17 feet was 3,285 fps. The P-wave velocity for the bedrock was about 10,925 fps

The modeled S-wave velocity at Site 5 for the soil and/or weathered rock from 0 to 17 feet was 1,370 fps. The modeled S-wave velocity for the deeper bedrock (over 17 feet) was 5,548 fps.

Turbine Site 12 At Turbine Site 12 a spread was done trending 310 degrees magnetic centered near Boring T-12. Depth to bedrock for T-12 was reported to be 44 feet below ground surface. At Site 12 the calculated P-wave velocity for the soil and/or weathered rock from 0 to 44 feet was 4,171 fps. The P-wave velocity for the bedrock was about 12,308 fps.

The modeled S-wave velocity at Site 12 for the soil and/or weathered rock from 0 to about 45 feet was 2,072 fps. The modeled S-wave weighted mean velocity for the deeper bedrock (over 50 feet) was 5,793 fps.

Turbine Site 18 At Turbine Site 18 a spread was done trending 326 degrees magnetic centered near Boring T-18. Depth to bedrock for T-18 was reported to be 2 feet below ground surface. At Site 18 the calculated P-wave velocity for the bedrock was about 13,307 fps.

The modeled S-wave weighted mean velocity at Site 18 for the bedrock was 6,554 fps.

Turbine Site 22 At Turbine Site 22 a spread was done trending 323 degrees magnetic centered near Boring T-22. Depth to bedrock for T-22 was reported to be 3 feet below ground surface. At Site 22 the calculated P-wave velocity for the bedrock was about 12,046 fps.

The modeled S-wave weighted mean velocity for the bedrock at Site 28 was 5,738 fps.

Turbine Site 28 At Turbine Site 28 a spread was done trending 65 degrees magnetic centered near Boring T-28. The drilling log for T-28 shows that the upper 9 feet is composed of till. From 9 feet to the bottom of the borehole at 55 feet the rock is generally described as a moderately fractured pelite or meta-sandstone.

At Site 28 the median calculated P-wave velocity for bedrock was about 18,410 fps

The modeled S-wave weighted mean velocity at Site 28 was 8,730 fps for the bedrock from 0 to 100 feet.

Turbine Site 36 At Turbine Site 36 a spread was done trending 126 degrees magnetic centered near Boring T-36. Depth to bedrock for T-36 was reported to be about 5 feet below ground surface. At Site 22 the calculated P-wave velocity for the bedrock was about 12,737 fps.

The modeled S-wave weighted mean velocity for the bedrock at Site 36 was 6,705 fps.

Turbine Site 56 At Turbine Site 56 a spread was done trending 126 degrees magnetic centered near Boring T-56. Depth to bedrock for T-56 was reported to be about 12 feet below ground surface. At Site 56 the median calculated P-wave velocity for the soil and/or weathered rock from 0 to 12 feet was 2,042 fps. The P-wave velocity for the bedrock was about 14,371 fps.

The modeled S-wave velocity at Site 56 for the soil and/or weathered rock from 0 to 12 feet was 1,047 fps. The modeled S-wave weighted mean velocity for the bedrock at Site 56 was 7,234 fps.

Turbine Site 73 At Turbine Site 73 a spread was done trending 102 degrees magnetic centered near Boring T-73. Depth to bedrock for T-73 was reported to be about 5 feet below ground surface. At Site 73 the calculated P-wave velocity for the bedrock was about 13,111 fps.

The modeled S-wave weighted mean velocity for the bedrock at Site 73 was 6,654 fps.

DISCUSSION OF THE SEISMIC RESULTS

The P-wave velocities were estimated the RIMRock Geophysics SIPT-2 (formerly U.S.G.S. SIPT-2) seismic interpretation program and also graphically by plotting the time/distance graph of the first arrival times of the P-waves. In general, both methods agreed quite closely (averaging within 5%). Overall the P-wave velocities of the bedrock ranged from a high of 18,410 fps at Turbine Site 28 to 11,271 fps at Turbine Site 5. Median P-wave velocity for all the sites was 12,924 fps. The higher velocities may represent competent rock and the lower velocities may represent more weathered or fractured rock. The tabulated results of the P-wave data are in Attachment A.

The shear wave velocities were estimated using the MASW method as described earlier. The modeled results are presented in Attachment B in tables that give the depth, the Vs (final) and the upper and lower ranges (Vs (lower) and Vs (upper)) for each layer depth. The accuracy of each model was assessed in three ways. The first is an assessment of the quality of the field data, which is given as Dispersion (%). This is essentially a qualitative

index of the signal to noise ratio. Noise, due to such things as wind, vibrations from the drill rigs, etc. would result in a lower Dispersion percentage. The Dispersion percentage should be greater than 50% for interpretation. At the Blue Sky West Wind Power Site the Dispersion percentage was very good; all the sites were 85% or greater

The second way the modeled results were assessed was the Inversion (%). This is how closely the modeled data mathematically fits the field data. In general an Inversion percentage of 80% or greater is considered very good. At the Blue Sky West Wind Power Site the Inversion percentages was very good for all of the sites with the exception of Site T-73 which was 79% and the inversion percentage for T-5 was fair at 65%.

The third way the accuracy of the model is assessed is by its uniqueness. In other words, are there other velocities that can fit the field data almost equally as well as the Vs (final) velocities? This is shown graphically and in the tables by the range between the upper and lower velocities (Attachment B). This range represents velocities that will fit the data to within 10% of the Vs Final velocity. A broad range indicates that the model is not very unique whereas a narrow, tightly constrained range increases the confidence that the Vs Final is accurate.

The modeled MASW results show a that some sites have a fairly tight range of shear velocities such as Site T-28 and others such as Site T-5 have a broader range indicating that its modeled value is less precise.

Overall the data quality was good at these sites and the modeled results appear to be consistent with the expected velocities for these rocks. However, as with any indirect method, the S-wave and P-wave estimates for these sites cannot be guaranteed to be accurate.

January 8, 2014
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ATTACHMENT A
P-WAVE
SEISMIC REFRACTION MODEL RESULTS

Calculated Bedrock P-Wave Velocities - Blue Sky West Site

Turbine Site	SP pair	delta distance	delta time	time/distance velocity (fps)	time/distance Average P-wave Velocity (in fps)	SIPT Calculated P-wave Velocity (fps)	Combined average P-wave velocity (fps)
T-5	1-8	15	90	12,000			
	2-7	15	87	11,600	11,270	11,272	11,271
	3-6	17.8	81.5	9,157			
	4-5	5.85	32	10,940			
T-12*	3 to 6	68	15.8	8,608			
	2 to 7	92	21.15	8,700	9,872	10,997	10,435
	1 to 8	16	2.6	12,308			
T-18	3 to 6	80	12.6	12,698			
	2 to 7	87	13.25	13,132	13,307	13,050	13,178
	1 to 8	87	12.35	14,089			
T-22	2 to 7	88	14.1	12,482			
	3 to 6	80	15.2	10,526	12,046	11,641	11,844
	1 to 8	86	13.1	13,130			
T-28	1-8	10.5	92	17,524			
	2-7	9.72	92	18,930	18,853	18,288	18,571
	3-6	9.8	92	18,776			
	4-5	4.3	44	20,465			
T-36	2 to 7	92	14.55	12,646			
	1 to 8	90	14.5	12,414	12,737	11,843	12,290
	3 to 6	48	7.3	13,151			
T-56	3 to 6	44	6.45	13,643			
	2 to 7	92	12.9	14,264	14,371	15,117	14,744
	1 to 8	92	12.1	15,207			
T-73	3 to 6	84	13.8	12,174			
	2 to 7	92	13.6	13,529	13,111	12,260	12,685
	1 to 8	92	13.5	13,630			

12,033 = estimated bedrock P-wave velocity in feet per second (fps)

*Site T-12 had 44 feet of soil thickness. It is believed that the lower velocity calculations are due to soil velocities incorporated into the calculations. The actual bedrock velocity is believed to be closer to the velocity derived from the outermost shotpoints (1 and 8) which is 12,308 fps.

ATTACHMENT B
SHEAR-WAVE
MASW MODEL RESULTS

MASW Modeled Results - Blue Sky West Site

*Overall S/N of dispersion curve, **Overall inversion integrity
***Weighted average Vs down to 100-ft depth
Note: Depths are in feet and velocities (Vs and Vp) are in ft/sec.

	Soil
	Bedrock

Site T-5

Dispersion (%)*		90	
Inversion (%)**		65	
Vs-100ft***		4,799	
Depth	**Vs(Final)**	**Vs(Lower)**	**Vs(Upper)**
4	1,894	1,865	1,923
10	950	921	979
17	2,274	2,135	2,414
26	3,398	2,878	4,076
37	4,828	2,978	8,306
50	5,485	2,543	13,808
67	5,739	3,452	14,446
89	5,860	4,244	9,902
115	6,206	4,875	10,201
Half Space	7,975	6,753	11,153

Site T-28

Dispersion (%)*		94	
Inversion (%)**		96	
Vs-100ft***		8,730	
Depth	**Vs(Final)**	**Vs(Lower)**	**Vs(Upper)**
2	7,751	5,590	11,113
5	7,812	5,714	12,087
9	7,803	6,433	11,912
13	7,596	6,655	9,793
19	7,218	6,473	8,336
26	7,176	6,509	8,139
35	7,609	6,902	8,552
46	8,464	7,590	9,600
59	9,412	8,343	10,967
Half Space	9,623	8,629	10,617

Blue Sky West Site - Modeled Shear Wave Velocities

*Overall S/N (%) of dispersion curve, **Overall inversion integrity (%)
***Weighted average of Vs down to 100-ft depths
[a]Theoretical lower and upper limits of Vs solution for 99% confidence
Note: Depths are in feet and velocities (Vs) are in ft/sec.

	Soil[+]
	Bedrock[+]

([+]Soil and bedrock are interpreted based on values and overall changing trend of Vs)

Site 12

Dispersion (%)*		**92**	
Inversion (%)**		**88**	
Vs-100ft***		**2,524**	
Depth	**Vs(Final)**	**Vs(Lower)[a]**	**Vs(Upper)[a]**
2	435	435	435
4	536	536	536
6	1,123	265	1,981
8	2,071	572	3,570
10	2,099	841	3,357
13	2,128	1,121	3,134
17	2,298	1,185	3,411
24	2,326	1,530	3,123
32	2,355	2,355	2,355
38	2,496	2,116	2,876
49	2,808	2,808	2,808
62	2,986	2,986	2,986
79	3,603	2,995	4,211
100	7,546	3,156	11,936
Half Space	9,759	4,763	14,754
		weighted bedrock Vs	**5,793**
		weighted bedrock Vs	**2,072**

Site 18

Dispersion (%)*		**88**	
Inversion (%)**		**89**	
Vs-100ft***		**4,982**	
Depth	**Vs(Final)**	**Vs(Lower)[a]**	**Vs(Upper)[a]**
1	345	345	345
3	1,422	1,422	1,422
4	2,657	2,151	3,162
6	3,812	2,524	5,099
9	6,264	4,774	7,753
13	6,304	3,871	8,736
17	6,297	3,623	8,970
23	6,324	4,206	8,441
30	6,318	5,046	7,591
38	6,502	5,905	7,098
49	6,491	6,491	6,491
62	6,561	6,561	6,561
79	6,699	6,009	7,389
100	6,768	4,785	8,752
Half Space	6,884	4,063	9,705
		weighted bedrock Vs	**6,554**

Blue Sky West Site - Modeled Shear Wave Velocities

*Overall S/N (%) of dispersion curve, **Overall inversion integrity (%)
***Weighted average of Vs down to 100-ft depths
[a]Theoretical lower and upper limits of Vs solution for 99% confidence
Note: Depths are in feet and velocities (Vs) are in ft/sec.

	Soil[+]
	Bedrock[+]

([+]Soil and bedrock are interpreted based on values and overall changing trend of Vs)

Site 22

Dispersion (%)*		**90**	
Inversion (%)**		**90**	
Vs-100ft***		**4,437**	
Depth	**Vs(Final)**	**Vs(Lower)[a]**	**Vs(Upper)[a]**
1	334	334	334
3	1,895	1,312	2,478
5	2,249	1,240	3,259
7	3,562	1,587	5,536
9	4,062	1,622	6,501
11	4,132	1,694	6,571
14	4,191	1,739	6,644
17	4,200	1,961	6,439
23	4,255	3,090	5,421
30	4,421	4,388	4,454
44	5,198	5,198	5,198
62	6,145	6,145	6,145
79	6,624	5,305	7,943
100	6,645	4,300	8,990
Half Space	6,770	3,837	9,702
	weighted bedrock Vs		**5,738**

Site 36

Dispersion (%)*		**85**	
Inversion (%)**		**88**	
Vs-100ft***		**5,370**	
Depth	**Vs(Final)**	**Vs(Lower)[a]**	**Vs(Upper)[a]**
1	229	229	229
4	3,259	3,259	3,259
6	3,306	3,028	3,585
9	3,244	3,244	3,244
13	3,431	3,431	3,431
17	4,062	4,062	4,062
23	4,540	4,540	4,540
30	4,575	4,575	4,575
38	7,526	7,526	7,526
49	7,693	7,693	7,693
62	7,938	7,938	7,938
79	7,962	7,962	7,962
100	8,036	7,710	8,361
Half Space	8,183	7,109	9,257
	weighted bedrock Vs		**6,705**

Blue Sky West Site - Modeled Shear Wave Velocities

*Overall S/N (%) of dispersion curve, **Overall inversion integrity (%)
***Weighted average of Vs down to 100-ft depths
[a]Theoretical lower and upper limits of Vs solution for 99% confidence
Note: Depths are in feet and velocities (Vs) are in ft/sec.

	Soil[+]
	Bedrock[+]

([+]Soil and bedrock are interpreted based on values and overall changing trend of Vs)

Site 56

Dispersion (%)*		**90**	
Inversion (%)**		**86**	
Vs-100ft***		**4,196**	
Depth	**Vs(Final)**	**Vs(Lower)[a]**	**Vs(Upper)[a]**
1	322	322	322
3	484	484	484
5	1,110	1,110	1,110
8	1,522	1,522	1,522
10	4,424	2,934	5,914
15	5,169	3,396	6,942
20	5,233	3,508	6,957
25	5,328	3,675	6,981
32	5,391	3,719	7,063
39	7,452	5,054	9,851
50	7,801	5,329	10,273
64	7,896	5,391	10,402
85	7,944	5,579	10,309
103	8,118	6,132	10,105
130	8,205	7,771	8,638
Half Space	8,769	8,768	8,768
	weighted bedrock Vs		**7,234**
	weighted soil Vs		**1,047**

Site 73

Dispersion (%)*		**86**	
Inversion (%)**		**79**	
Vs-100ft***		**5,685**	
Depth	**Vs(Final)**	**Vs(Lower)[a]**	**Vs(Upper)[a]**
1	368	368	368
2	2,412	2,412	2,412
5	5,104	5,104	5,104
8	5,371	4,472	6,269
11	5,638	4,958	6,318
14	5,760	4,912	6,607
17	5,760	5,760	5,760
23	5,881	5,881	5,881
30	5,930	5,930	5,930
38	6,124	6,124	6,124
49	6,440	6,440	6,440
62	6,951	5,826	8,075
79	7,282	5,266	9,298
100	7,540	4,990	10,090
Half Space	8,360	5,295	11,424
	weighted bedrock Vs		**6,654**

1-D Vs Analysis of MASW Surveys at Bingham Site Wind-Turbine Sites (T-5 and T-28)

Report Prepared by
Choon B. Park, Ph.D.

Disclaimer

Park Seismic LLC does not guarantee this report to be free from errors or inaccuracies and disclaims any responsibility or liability for decisions made based on the information provided in this report.

Revised Report
To

Rudy Rawcliffe

Northeast Geophysical Services
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November 19, 2012

Summary

- MASW records collected from two (2) wind-turbine sites (T-5 and T-28) in Bingham site have been processed to produce 1-D shear-velocity (Vs) profile down to approximately 100 ft depth range at each site.
- At each site, data acquisition was made with four different source offsets (X1's) on each side of the receiver array. They are called forward (FWRD) and reverse (REVS) shot records for those collected with seismic source on the first and the last channel sides, respectively.
- Dispersion imaging process was applied to prepare three sets of images: one prepared by stacking all (8) dispersion images per site, one by stacking only forward shot dispersion images, and the last one by stacking only reverse shot dispersion images.
- After examining all three sets of dispersion images, then the one with most reliable trend of fundamental-mode (M0) dispersion was chosen to go through a complete inversion process to produce a 1-D shear-wave velocity (Vs) profile at each site. No soil presence has been detected from surface wave analysis indicating little or very-thin soil layer (i.e., ≤ one receiver spacing, 4 ft). **Analysis results based on this approach had been submitted in a report on November 13.**
- **However, "under-estimation" of velocities (Vs) was suspected at both sites based on observation of field geology. This raised the possibility of "near-field" effects responsible for it, and the same sequence of analysis has been re-applied to the walk-away record at each site that has an extended offset range (almost twice as wide as that of the original field records).**
- **Dispersion image of the walk-away record at T-5 showed a constant phase velocity at frequencies approximately in 15-100 Hz with a value close to the air-wave velocity, which is now interpreted as soil signature. However, its thickness as roughly estimated from this image trend becomes somewhat subjective, indicating the soil thickness may have varied significantly throughout the survey line.**
- For each site, dispersion image, extracted M0 curve, and final 1-D Vs profile are graphically presented in this report.
- Complete set of numerical values of Vs is provided in a separate excel file [*.xls].
- Summary of velocity (Vs) values is presented in a table next page.

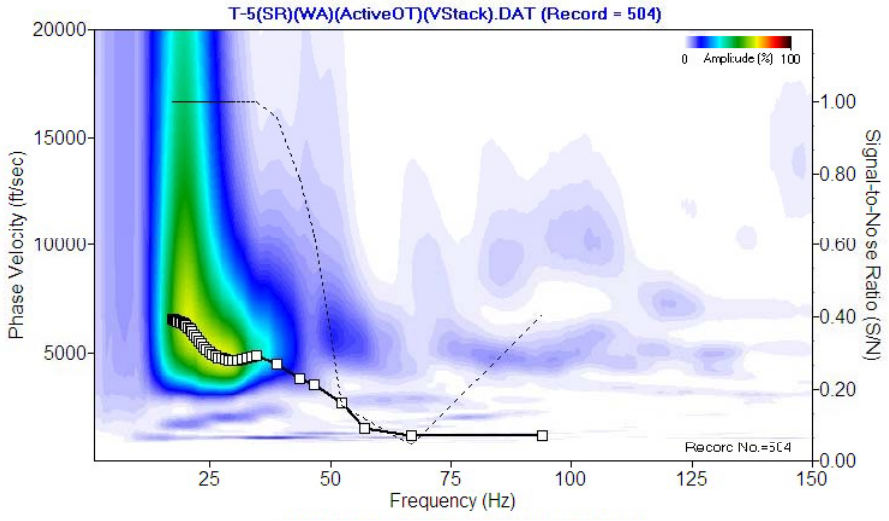
Summary of Vs*

	T-5	T-28
Vs (ft/sec)	**4799**	**8730**

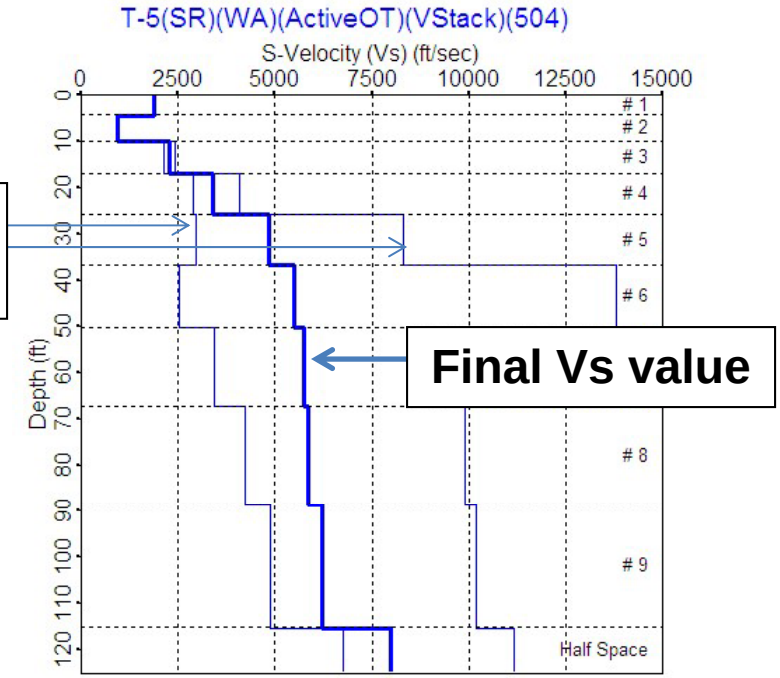
*Weighted average of shear-wave velocity down to 100 ft depth calculated from1-D Vs profile.

Dispersion Curve and Vs Profile (T-5)

Dispersion Image and Extracted Dispersion Curve (M0)



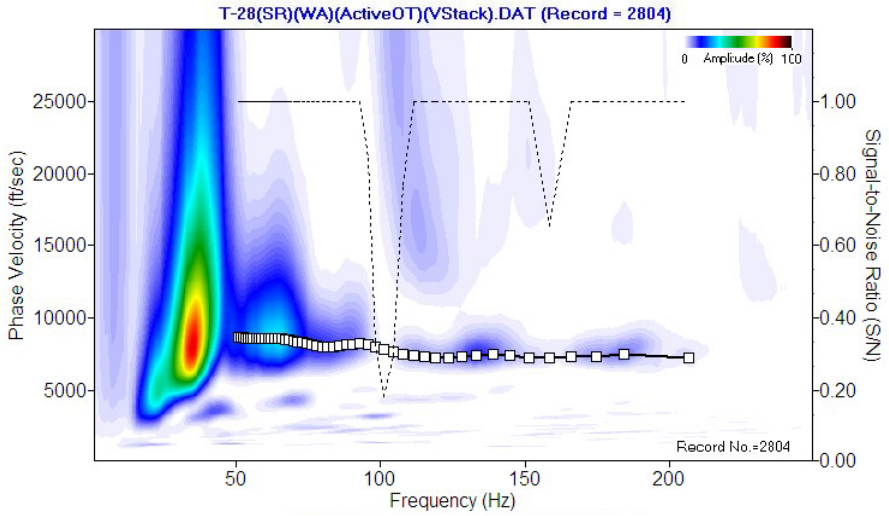
Lower and Upper Bounds of Vs

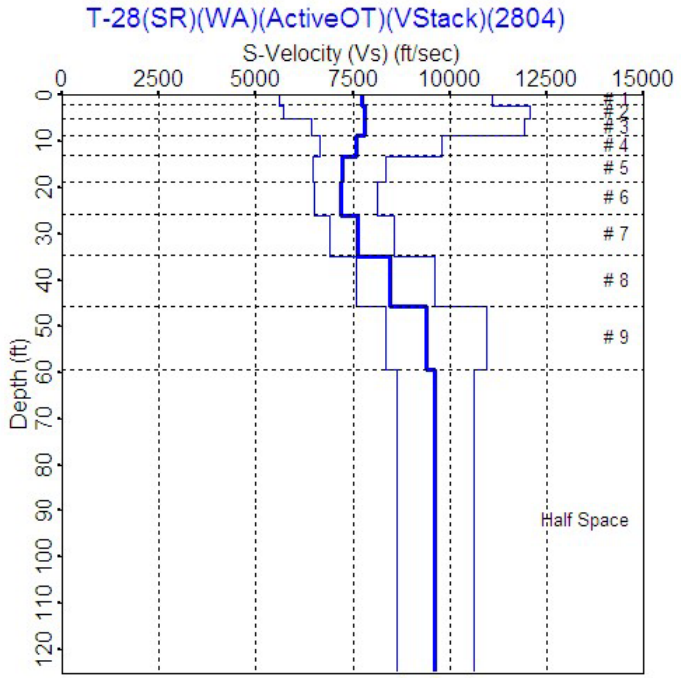


Final Vs value

Dispersion Curve and Vs Profile (T-28)

Dispersion Image and Extracted Dispersion Curve (M0)





1-D Vs Analysis of MASW Surveys at Bingham Wind Mill Turbine Sites (Sites 12, 18, 22, 36, and 73)

Report Prepared by
Choon B. Park, Ph.D.

Disclaimer

Park Seismic LLC does not guarantee this report to be free from errors or inaccuracies and disclaims any responsibility or liability for decisions made based on the information provided in this report.

Draft Report
To

Rudy Rawcliffe

Northeast Geophysical Services
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Bangor, ME 04401

December 2, 2013

Summary

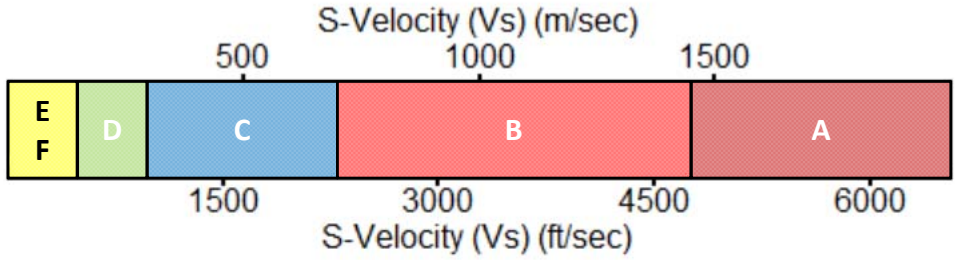
- MASW records collected from five (5) wind-turbine sites (12, 18, 22, 36, and 73) at Biangham Windmill have been processed to produce 1-D shear-velocity (Vs) profile down to approximately 100 ft depth range at each site.
- At each site, data acquisition was made with four different source offsets (X1's) on each side of the receiver array. They are called forward (FWRD) and reverse (REVS) shot records for those collected with seismic source on the first and the last channel sides, respectively.
- Dispersion imaging process was applied to individual field records from both FWRD and REVS shots, and all of them from the same site were stacked to produce one dispersion image of the highest signal-to-noise ratio (S/N), which was then used to produce one fundamental-mode dispersion curve (M0).
- Each M0 curve was then inverted to produce a 1-D (depth) shear-velocity (Vs) profile.
- For each site, dispersion image, extracted M0 curve, and final 1-D Vs profile are graphically presented in this report. Complete set of numerical values of Vs is provided in a separate excel file [*.xlsx].
- Based on the average Vs for 100-ft depth (i.e., Vs-100ft), each site is classified according to the designation set by National Earthquake Hazard Reduction Program (NEHRP). The designation table is provided in this report.
- Summary of velocity (Vs) values is presented in a table presented in the next page along with corresponding NEHRP site classes.

Shear-Wave Velocity (Vs)*

Site	Site 12	Site 18	Site 22	Site 36	Site 73
Vs (ft/sec)	2524	4982	4437	5370	5685
Site Class**	B (Rock)	B (Rock)	B (Rock)	A (Hard Rock)	A (Hard Rock)

*Weighted average of shear-wave velocity (vs) at each site down to 100 ft depth calculated from1-D Vs profile.
**Designated by NEHRP (www.nehrp.gov) (see table on next page)

Seismic Site Classification (Vs^{30})



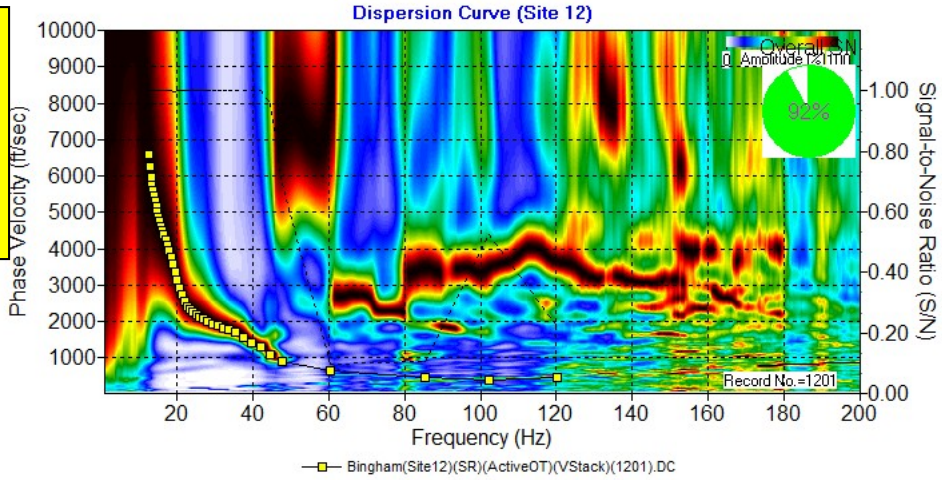
NEHRP* Seismic site classification based on shear-velocity (Vs) ranges.

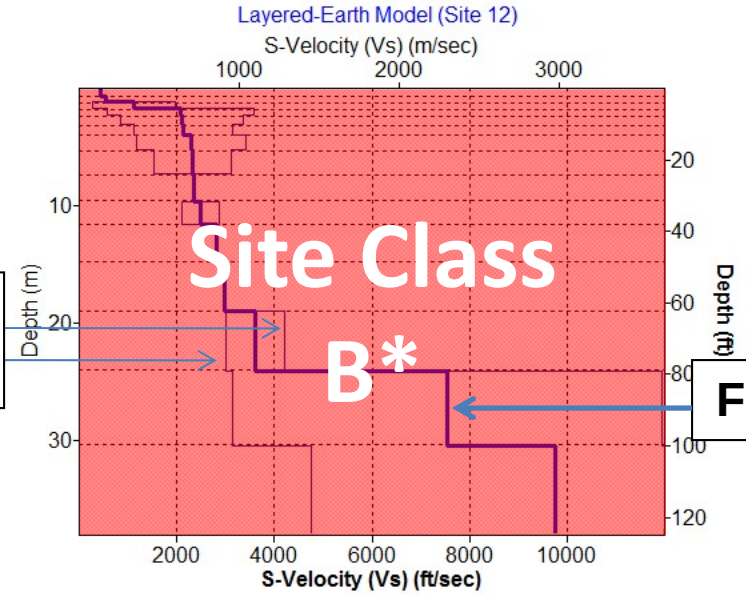
Site Class	S-Velocity (Vs) (ft/sec)	S-Velocity (Vs) (m/sec)
A (Hard Rock)	**> 5,000**	> 1500
B (Rock)	**2,500 – 5000**	760 – 1500
C (Very Dense Soil and Soft Rock)	**1,200 – 2,500**	360 – 760
D (Stiff Soil)	**600 – 1,200**	180 – 360
E (Soft Clay Soil)	**< 600**	< 180
F (Soils Requiring Add'l Response)	**< 600, and meeting some additional conditions.**	< 180, and meeting some additional conditions.

*** National Earthquake Hazard Reduction Program (www.nehrp.gov)**

Dispersion Curve and Vs Profile (Site 12)

Dispersion Image and Extracted Dispersion Curve (M0)



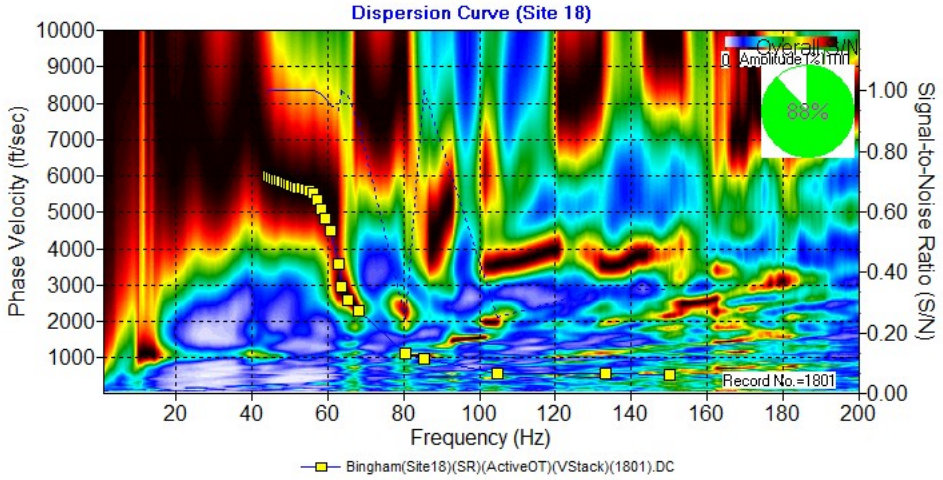


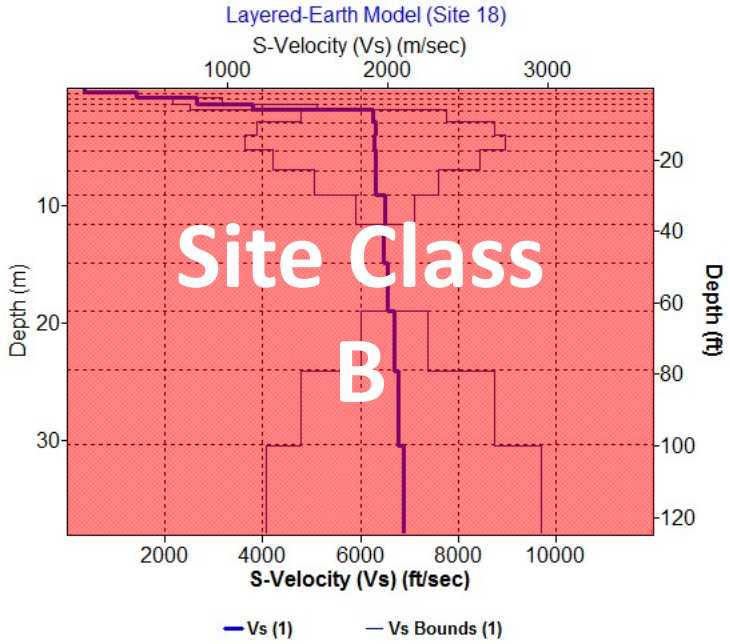
Lower and Upper Bounds of Vs

Final Vs value

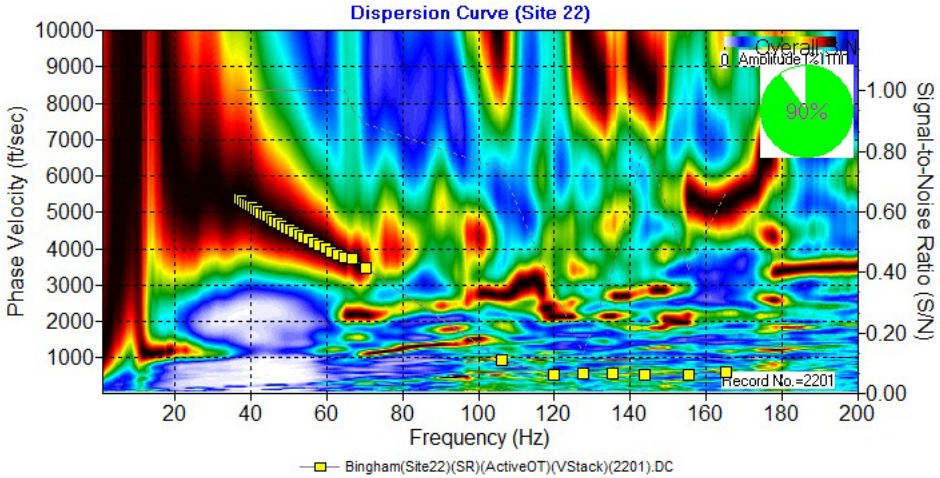
*Seismic site classification by NEHRP

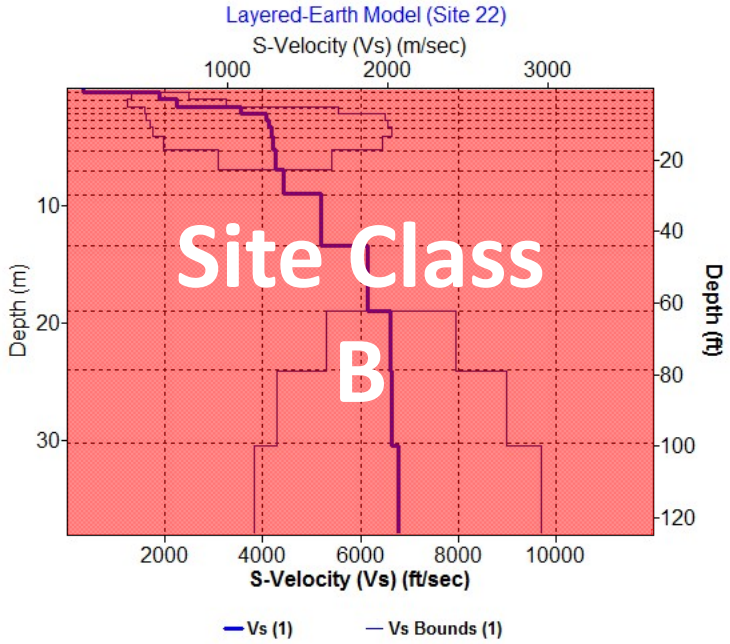
Dispersion Curve and Vs Profile (Site 18)



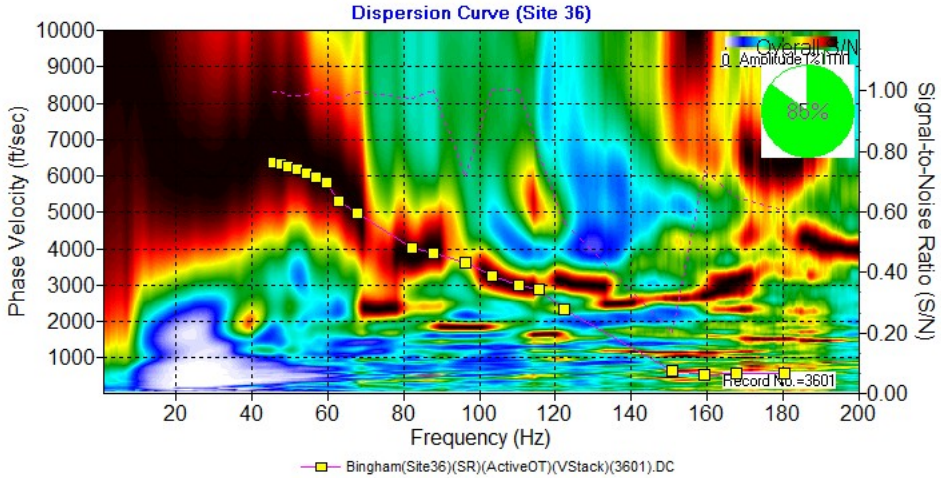


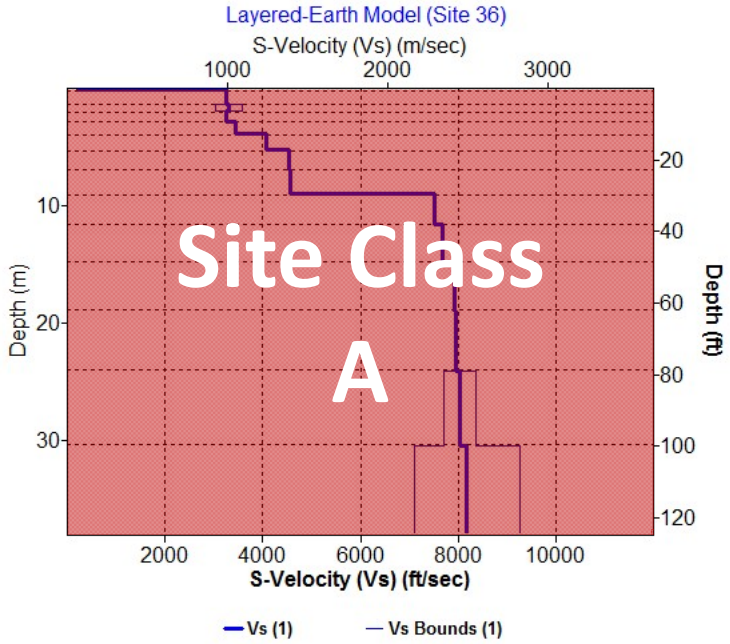
Dispersion Curve and Vs Profile (Site 22)



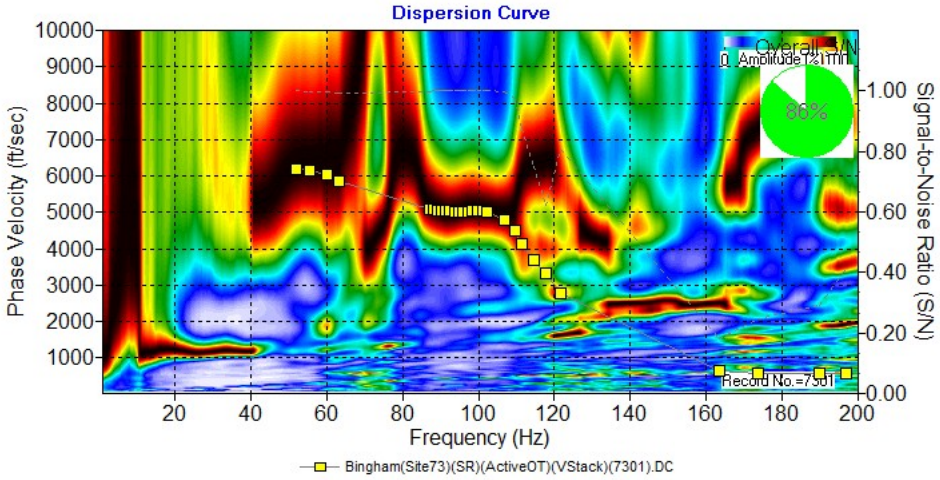


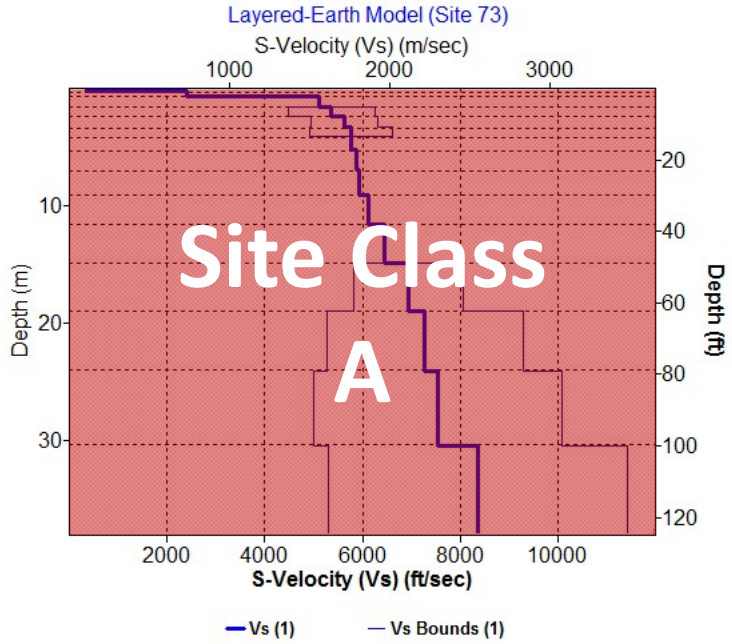
Dispersion Curve and Vs Profile (Site 36)





Dispersion Curve and Vs Profile (Site 73)





1-D Vs Analysis of MASW Surveys at Bingham Wind Mill Turbine Sites (Site 56)

Report Prepared by
Choon B. Park, Ph.D.

Disclaimer

Park Seismic LLC does not guarantee this report to be free from errors or inaccuracies and disclaims any responsibility or liability for decisions made based on the information provided in this report.

Draft Report
To

Rudy Rawcliffe

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December 19, 2013

Summary

- MASW data set collected at Site 56 of Bingham Windmill has been processed to produce 1-D shear-wave velocity (Vs) profile down to approximately 100 ft depth range.
- All data-processing procedures taken during the analysis are identical to those adopted for the previous data sets at five other sites (12, 18, 22, 36, and 73). They were outlined in the report submitted on December 2, 2013.
- Numerical values of velocities at different depths are provided in a separate excel file (*.xlsx) submitted with this report.

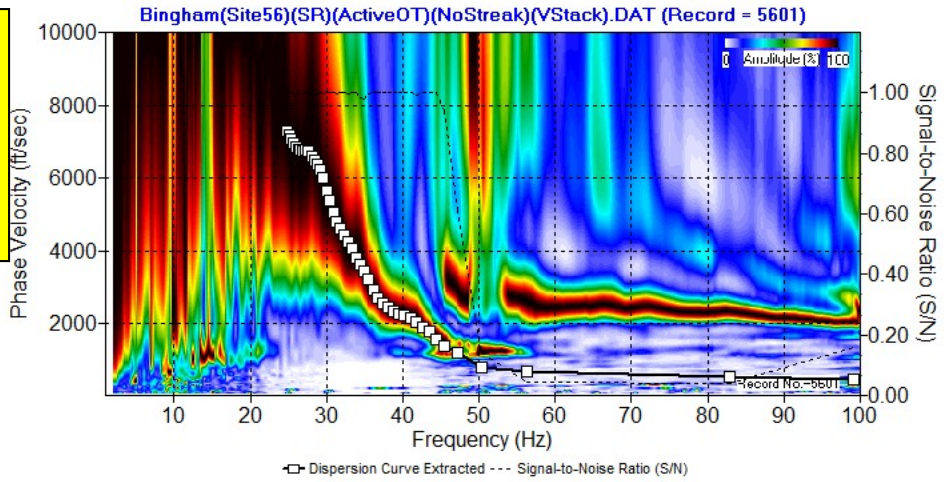
Shear-Wave Velocity (Vs)*

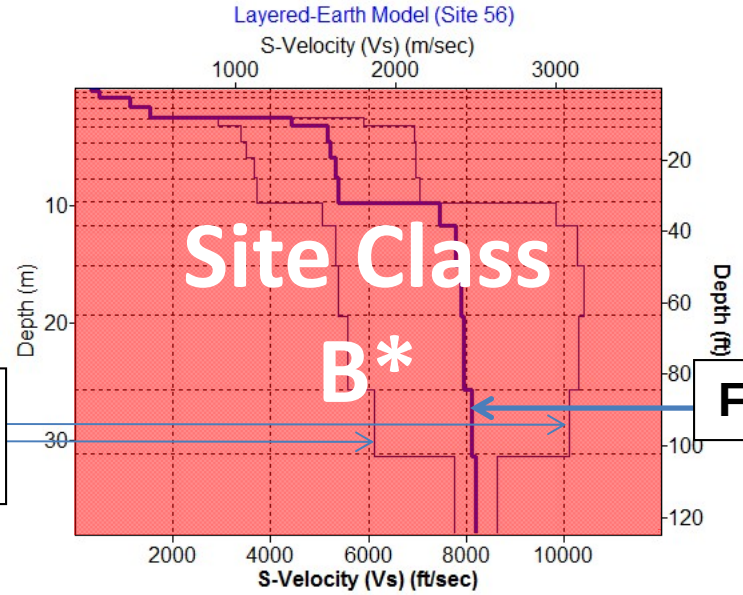
Site	Site 56
Vs (ft/sec)	4196
Site Class**	B (Rock)

*Weighted average of shear-wave velocity (Vs) down to 100 ft depth calculated from1-D Vs profile.
**Designated by NEHRP (www.nehrp.gov) (see table on next page)

Dispersion Curve and Vs Profile (Site 56)

Dispersion Image and Extracted Dispersion Curve (M0)





Lower and Upper Bounds of Vs

Final Vs value

*Seismic site classification by NEHRP