APPENDIX

Table of Contents

1.0 STEEL PILES REMOVED WITH VIBRATORY HAMMER

STEEL PILE REMOVAL 1 (SP-1)

January 19, 2018

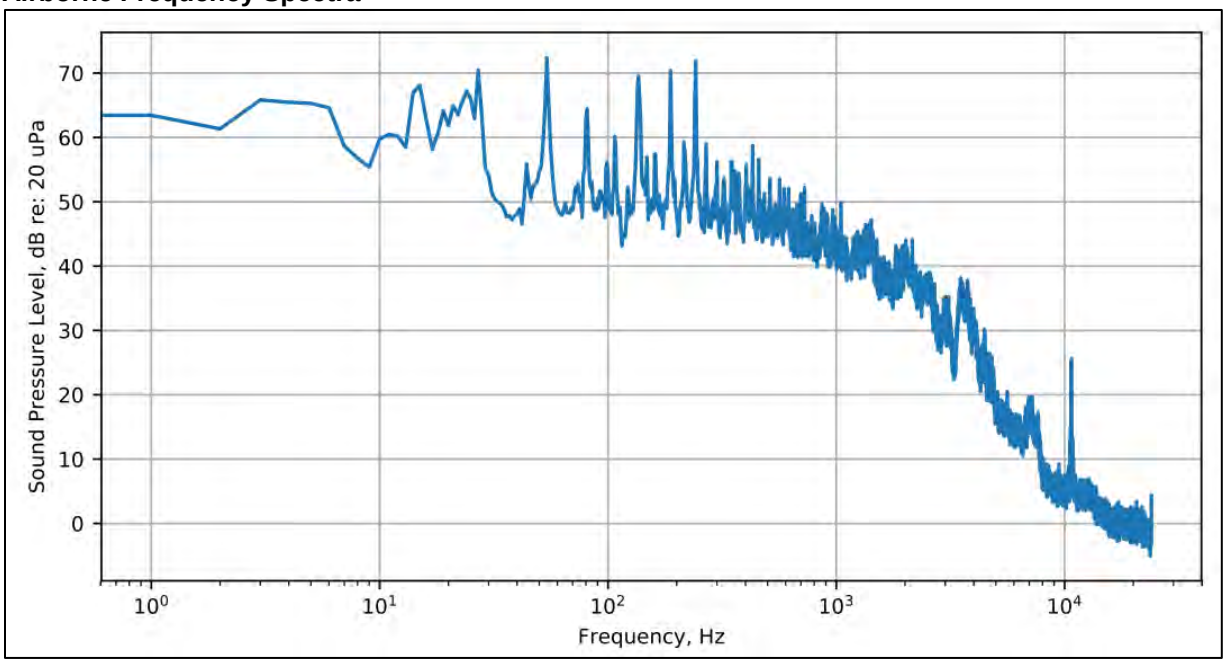
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	30	230	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	98	65

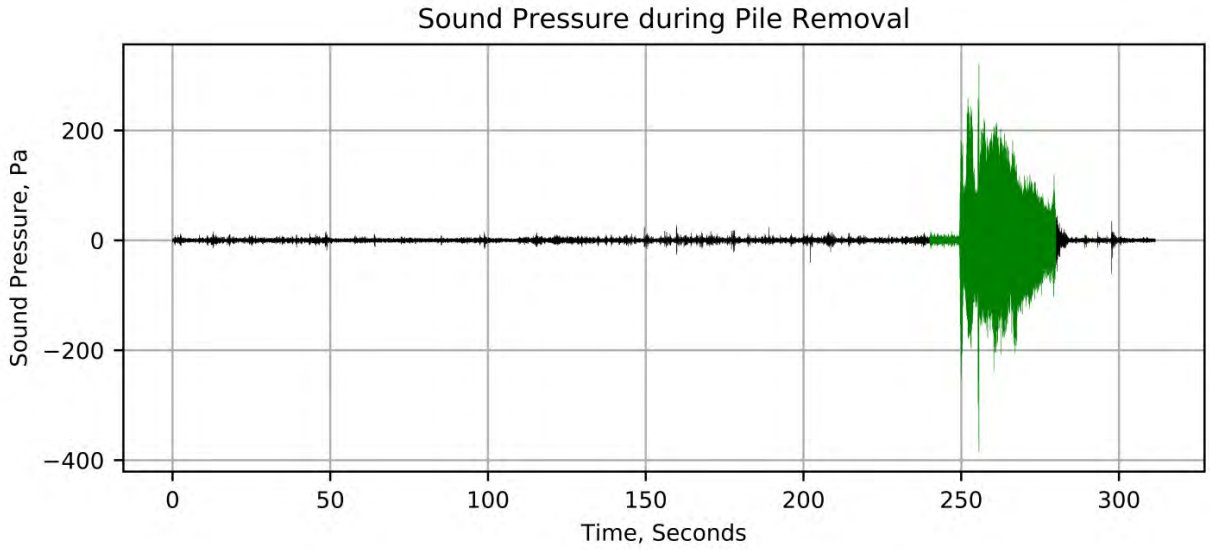
Airborne Frequency Spectra

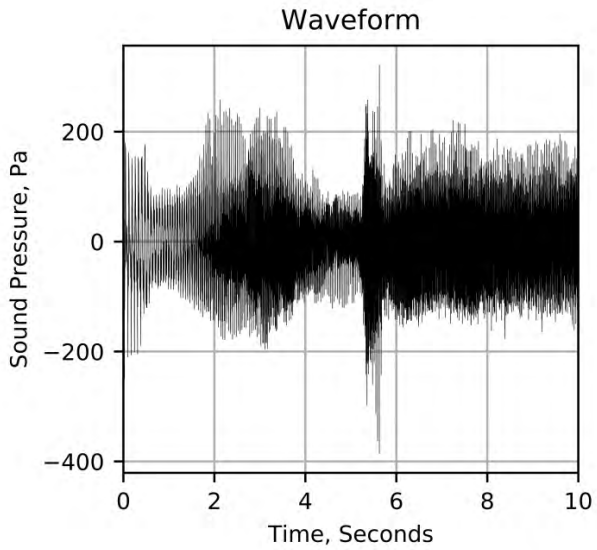


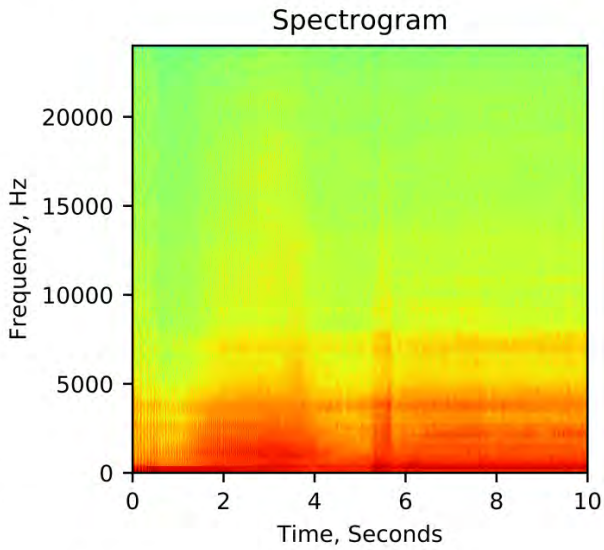
Underwater Sound Levels, dB re: 1 μPa

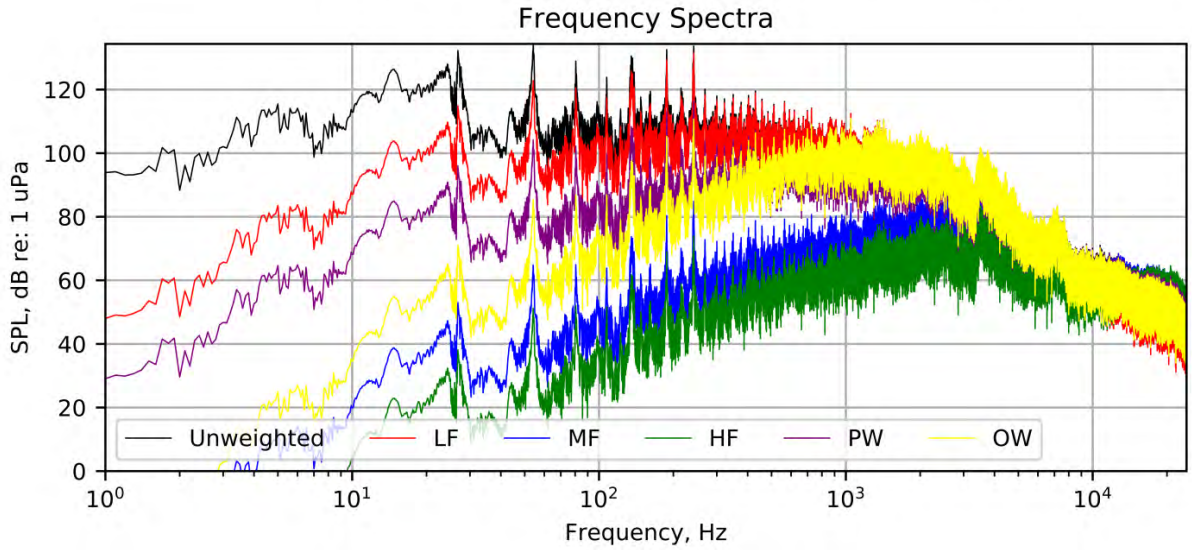
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	147	165	7.8	161	122	147	11.3	144	132	157	11.3	154
Low Frequency Cetacean	147	165	7.8	161	111	142	13.7	138	121	152	13.7	148
Mid Frequency Cetacean	147	165	7.8	161	116	141	11.3	138	126	151	11.3	148
High Frequency Cetacean	147	165	7.8	161	117	142	11.3	138	127	152	11.3	148
Phocid Pinnipeds	147	165	7.8	161	109	139	13.1	135	119	149	13.1	145
Otariid Pinnipeds	147	165	7.8	161	108	141	14.1	136	118	151	14.1	146
Lower Hydrophone												
Unweighted	161	170	3.6	166	142	155	5.4	152	152	165	5.4	162
Low Frequency Cetacean	161	170	3.6	166	125	146	9.7	144	135	156	9.7	154
Mid Frequency Cetacean	161	170	3.6	166	136	148	5.5	146	146	158	5.5	156
High Frequency Cetacean	161	170	3.6	166	137	149	5.5	146	147	159	5.5	156
Phocid Pinnipeds	161	170	3.6	166	127	143	7.3	140	137	153	7.3	150
Otariid Pinnipeds	161	170	3.6	166	124	143	8.4	139	134	153	8.4	149

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
200
0
−200
−400
0
50
100
150
200
250
300
Time, Seconds


Waveform
Sound Pressure, Pa
200
0
−200
−400
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
120
100
80
60
40
20
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

STEEL PILE REMOVAL 2 (SP-2)

January 22, 2018

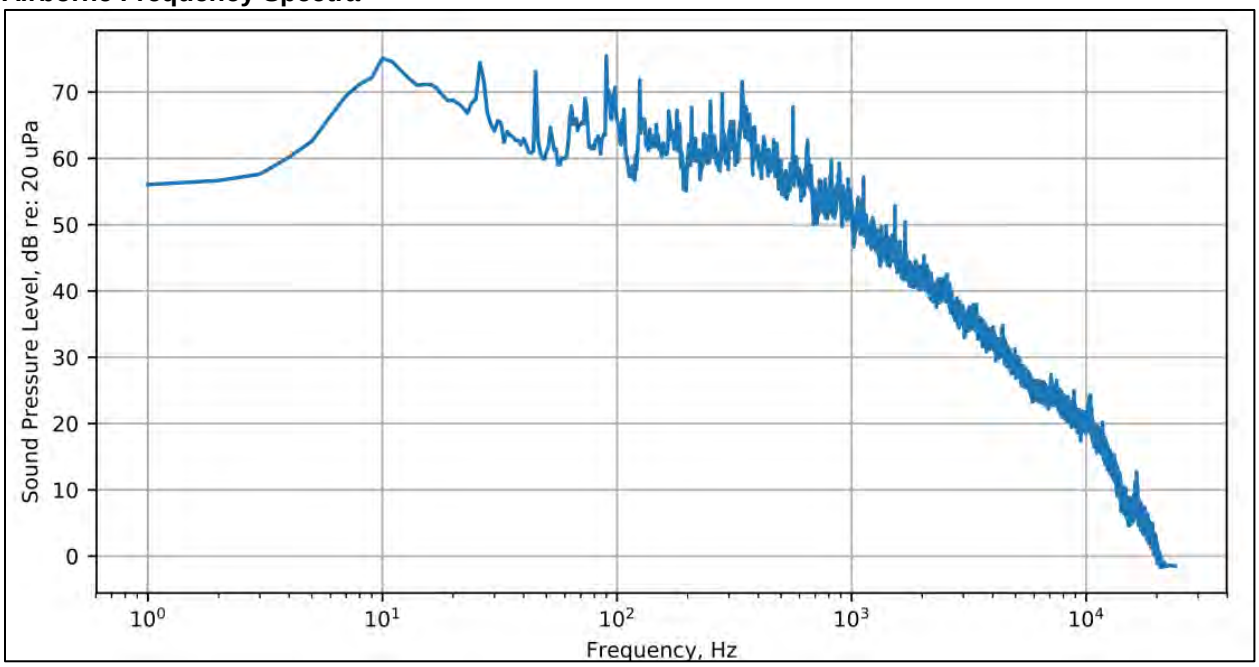
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	33	200	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
91	97	85

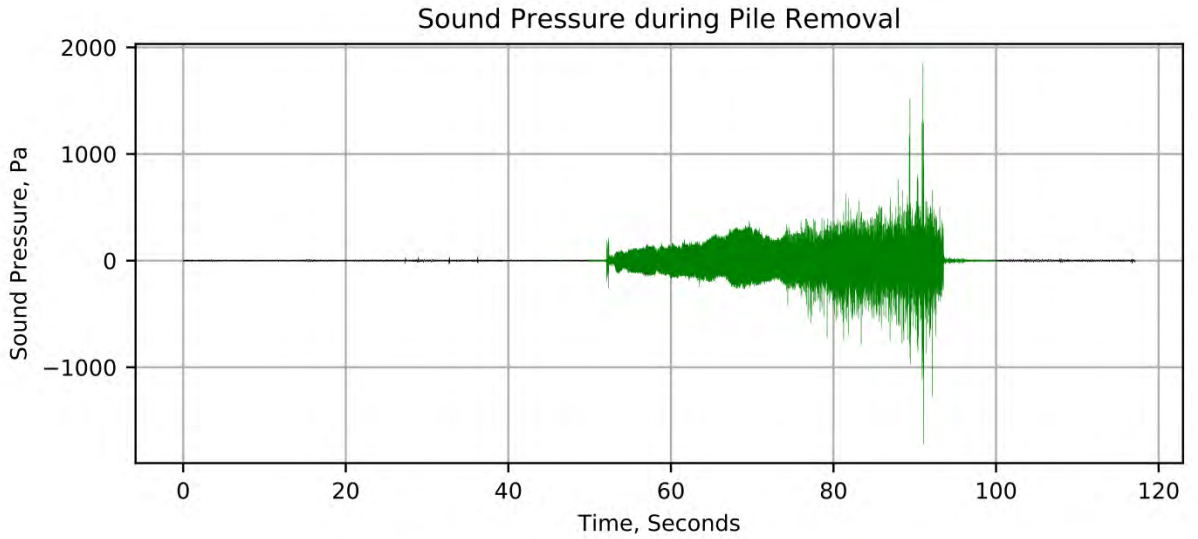
Airborne Frequency Spectra

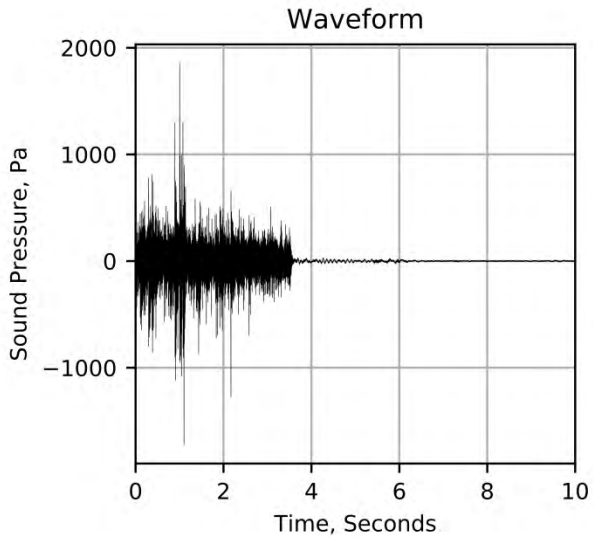


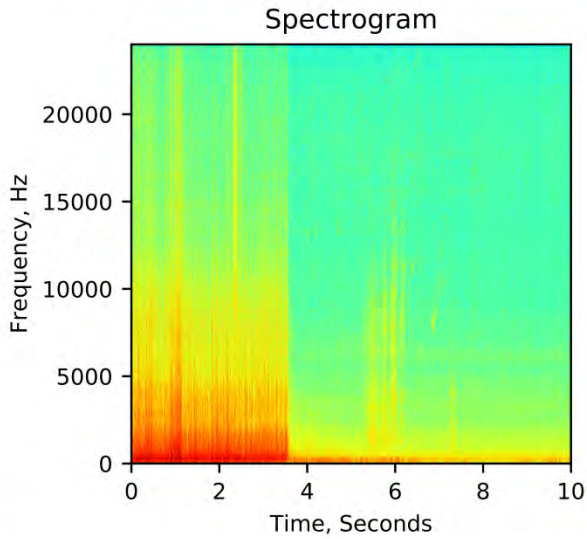
Underwater Sound Levels, dB re: 1 μPa

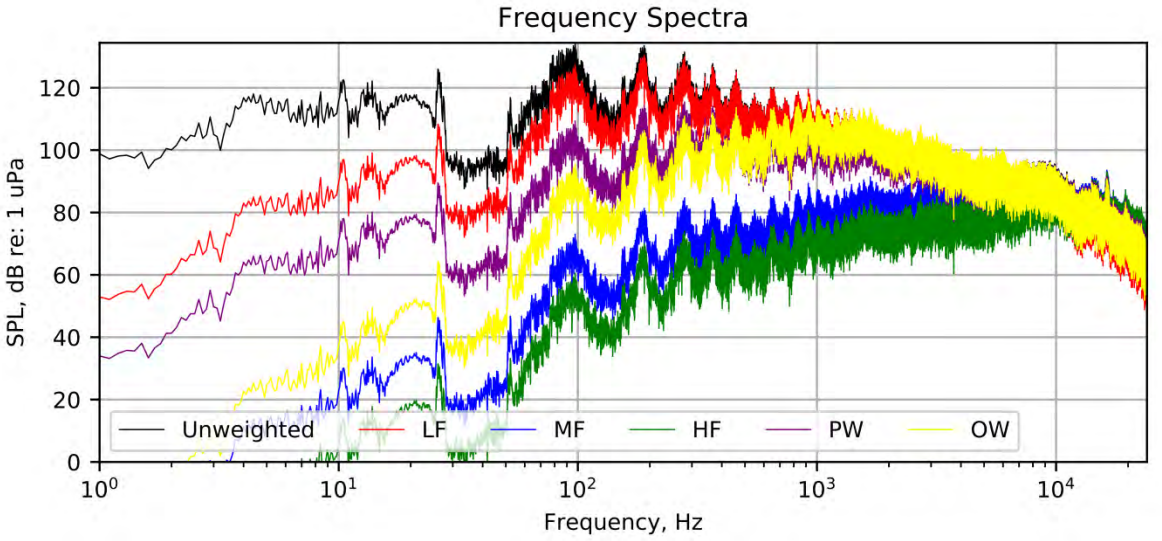
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	157	181	10.3	177	140	157	6.6	153	150	167	6.6	163
Low Frequency Cetacean	157	181	10.3	177	133	150	6.8	147	143	160	6.8	157
Mid Frequency Cetacean	157	181	10.3	177	134	151	6.3	147	144	161	6.3	157
High Frequency Cetacean	157	181	10.3	177	135	151	6.4	147	145	161	6.4	157
Phocid Pinnipeds	157	181	10.3	177	131	147	6.1	143	141	157	6.1	153
Otariid Pinnipeds	157	181	10.3	177	131	148	6.2	144	141	158	6.2	154
Lower Hydrophone												
Unweighted	166	185	8.3	181	149	162	4.8	158	159	172	4.8	168
Low Frequency Cetacean	166	185	8.3	181	141	154	5.0	151	151	164	5.0	161
Mid Frequency Cetacean	166	185	8.3	181	143	156	4.6	152	153	166	4.6	162
High Frequency Cetacean	166	185	8.3	181	144	156	4.7	153	154	166	4.7	163
Phocid Pinnipeds	166	185	8.3	181	139	150	4.4	147	149	160	4.4	157
Otariid Pinnipeds	166	185	8.3	181	138	150	4.4	146	148	160	4.4	156

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW
Frequency, Hz

2.0 TIMBER PILES REMOVED WITH VIBRATORY HAMMER

TIMBER PILE REMOVAL 1 (TP-1)

January 19, 2018

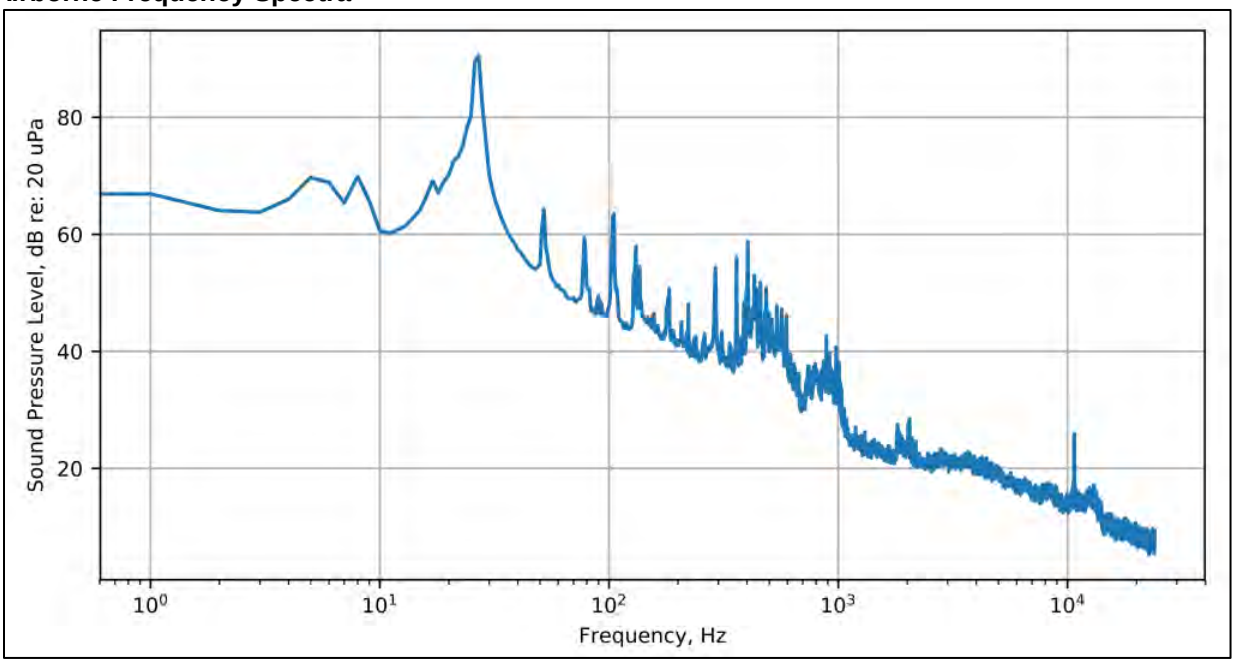
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	31	240	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	106	65

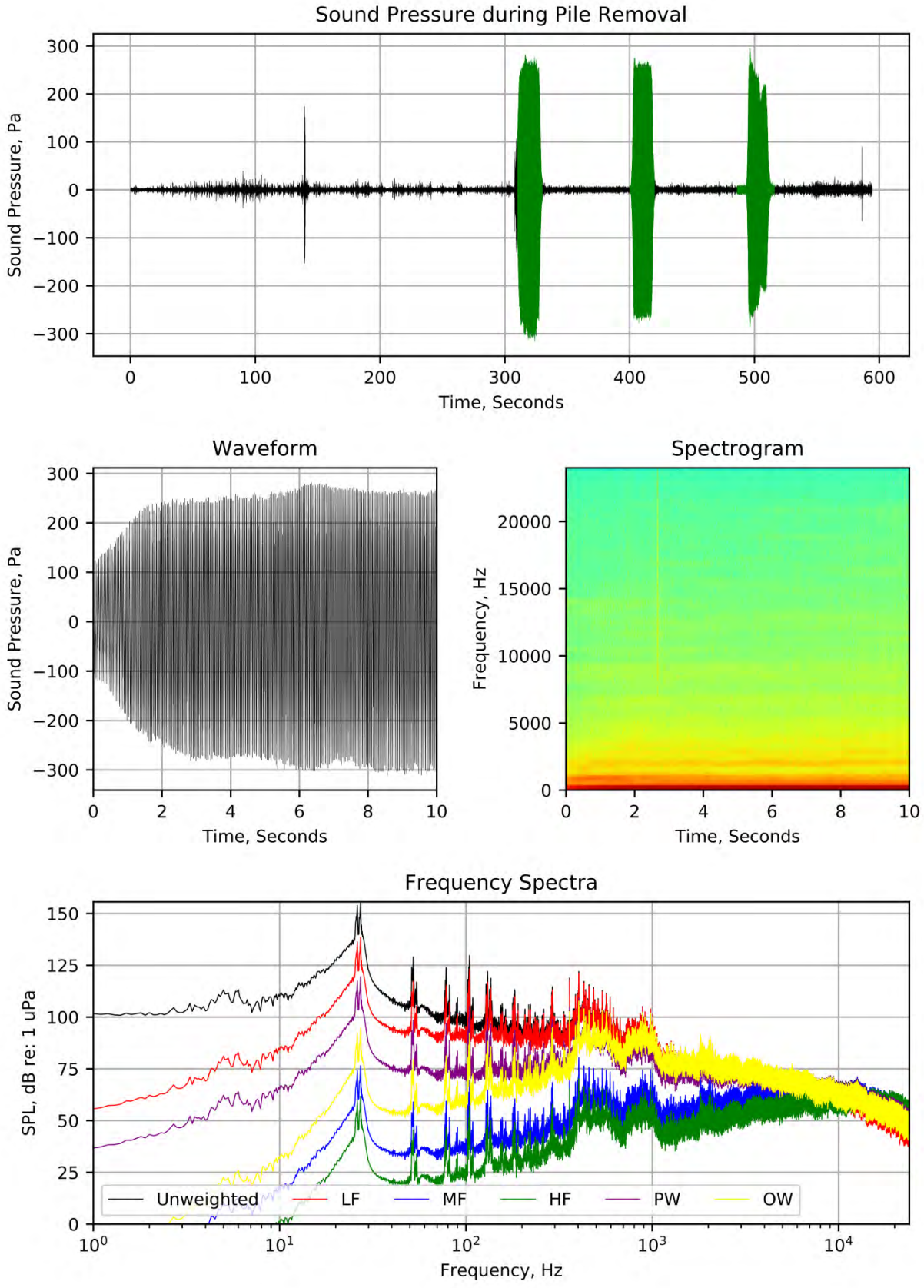
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	149	153	1.2	151	134	144	3.7	142	144	154	3.7	152
Low Frequency Cetacean	149	153	1.2	151	120	130	3.4	128	130	140	3.4	138
Mid Frequency Cetacean	149	153	1.2	151	127	138	3.7	135	137	148	3.7	145
High Frequency Cetacean	149	153	1.2	151	128	138	3.7	136	138	148	3.7	146
Phocid Pinnipeds	149	153	1.2	151	119	129	3.3	127	129	139	3.3	137
Otariid Pinnipeds	149	153	1.2	151	118	126	3.0	124	128	136	3.0	134
Lower Hydrophone												
Unweighted	166	169	0.8	168	155	164	3.6	162	165	174	3.6	172
Low Frequency Cetacean	166	169	0.8	168	138	147	3.6	145	148	157	3.6	155
Mid Frequency Cetacean	166	169	0.8	168	148	158	3.6	156	158	168	3.6	166
High Frequency Cetacean	166	169	0.8	168	149	158	3.6	157	159	168	3.6	167
Phocid Pinnipeds	166	169	0.8	168	139	148	3.6	147	149	158	3.6	157
Otariid Pinnipeds	166	169	0.8	168	136	145	3.6	144	146	155	3.6	154

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 2 (TP-2)

January 19, 2018

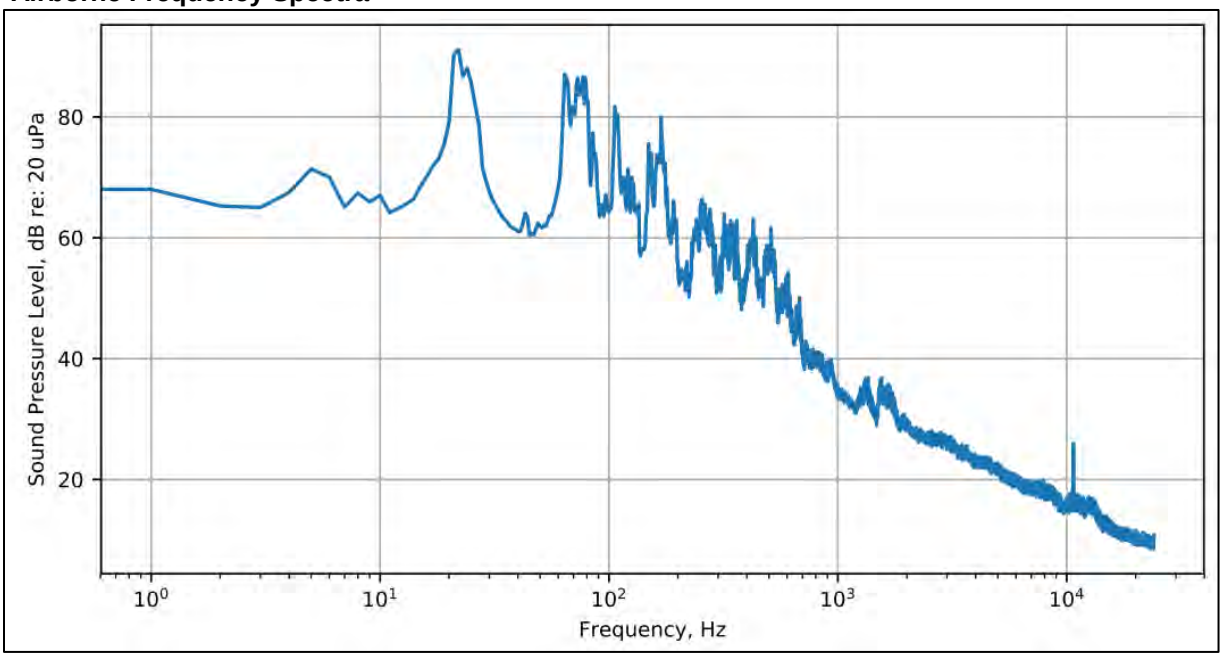
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	240	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
82	110	69

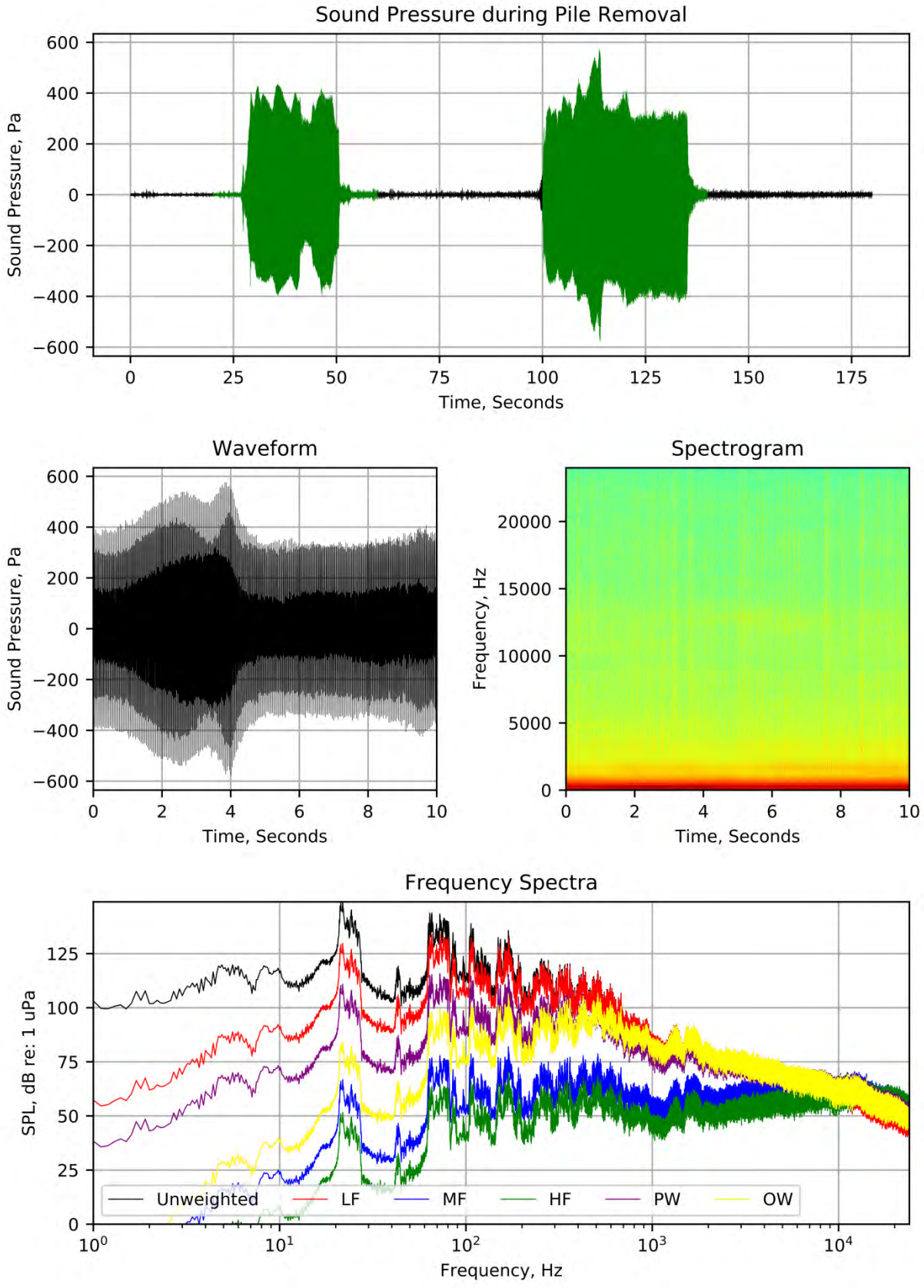
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	158	166	2.3	162	138	159	6.6	153	148	169	6.6	163
Low Frequency Cetacean	158	166	2.3	162	127	147	6.5	142	137	157	6.5	152
Mid Frequency Cetacean	158	166	2.3	162	132	152	6.6	147	142	162	6.6	157
High Frequency Cetacean	158	166	2.3	162	133	153	6.6	148	143	163	6.6	158
Phocid Pinnipeds	158	166	2.3	162	124	144	6.5	138	134	154	6.5	148
Otariid Pinnipeds	158	166	2.3	162	121	140	6.4	135	131	150	6.4	145
Lower Hydrophone												
Unweighted	169	175	2.0	172	149	167	6.1	163	159	177	6.1	173
Low Frequency Cetacean	169	175	2.0	172	137	155	6.0	151	147	165	6.0	161
Mid Frequency Cetacean	169	175	2.0	172	142	161	6.1	157	152	171	6.1	167
High Frequency Cetacean	169	175	2.0	172	143	162	6.1	158	153	172	6.1	168
Phocid Pinnipeds	169	175	2.0	172	134	152	6.0	148	144	162	6.0	158
Otariid Pinnipeds	169	175	2.0	172	131	149	5.9	145	141	159	5.9	155

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 3 (TP-3)

January 19, 2018

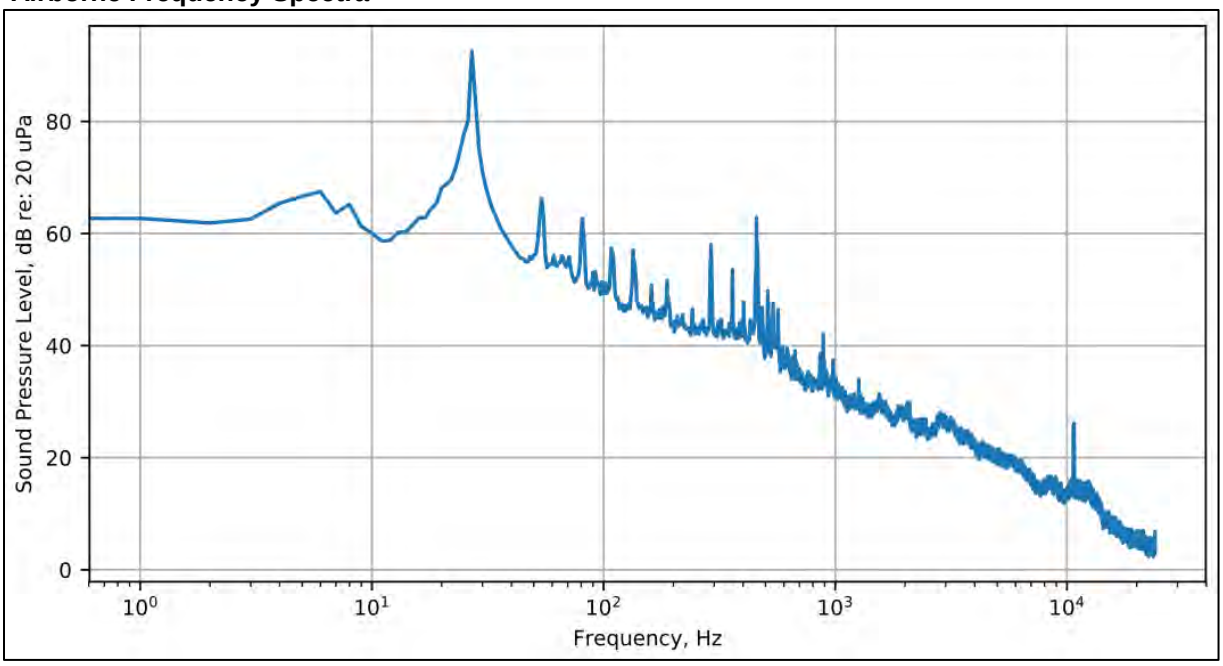
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	240	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	102	73

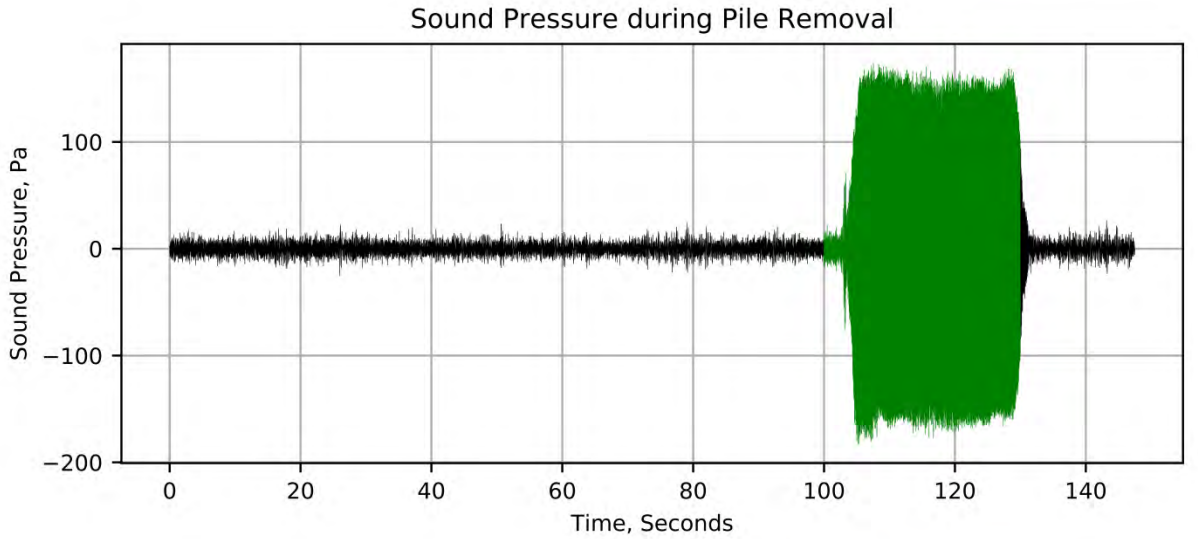
Airborne Frequency Spectra

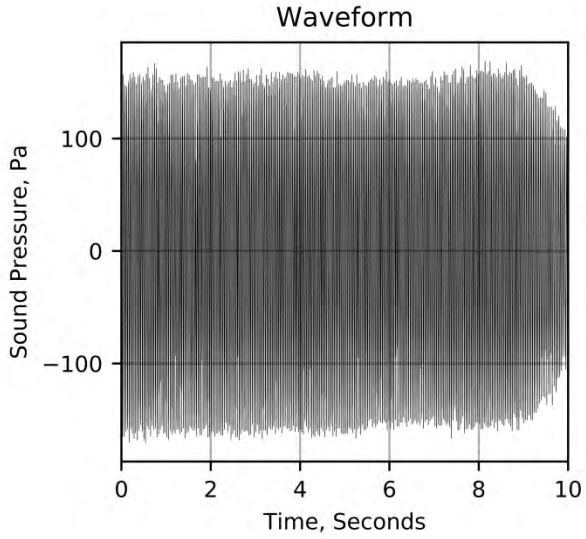


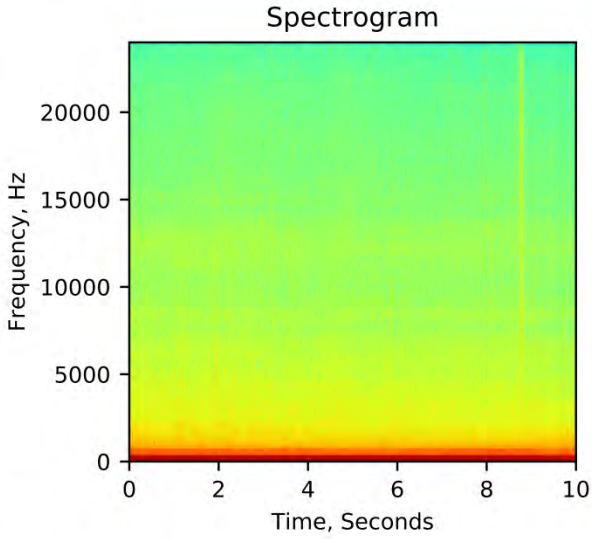
Underwater Sound Levels, dB re: 1 μPa

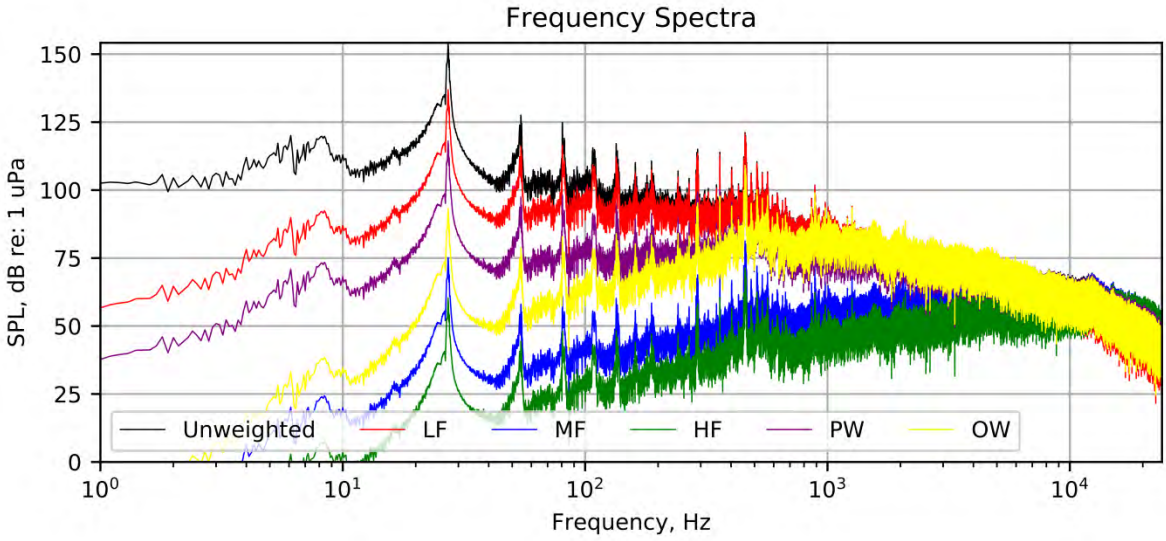
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	148	154	3.0	151	139	140	0.6	139	149	150	0.6	149
Low Frequency Cetacean	148	154	3.0	151	126	128	1.0	127	136	138	1.0	137
Mid Frequency Cetacean	148	154	3.0	151	132	133	0.6	133	142	143	0.6	143
High Frequency Cetacean	148	154	3.0	151	133	134	0.6	134	143	144	0.6	144
Phocid Pinnipeds	148	154	3.0	151	124	125	0.9	125	134	135	0.9	135
Otariid Pinnipeds	148	154	3.0	151	121	124	1.2	123	131	134	1.2	133
Lower Hydrophone												
Unweighted	165	165	0.1	165	158	160	1.3	160	168	170	1.3	170
Low Frequency Cetacean	165	165	0.1	165	141	144	1.3	143	151	154	1.3	153
Mid Frequency Cetacean	165	165	0.1	165	152	154	1.3	153	162	164	1.3	163
High Frequency Cetacean	165	165	0.1	165	152	155	1.3	154	162	165	1.3	164
Phocid Pinnipeds	165	165	0.1	165	142	145	1.3	144	152	155	1.3	154
Otariid Pinnipeds	165	165	0.1	165	139	142	1.3	141	149	152	1.3	151

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
100
0
−100
−200
0
20
40
60
80
100
120
140
Time, Seconds


Waveform
Sound Pressure, Pa
100
0
−100
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
150
125
100
75
50
25
0
10^0
10^1
10^2
10^3
10^4
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 4 (TP-4)

January 19, 2018

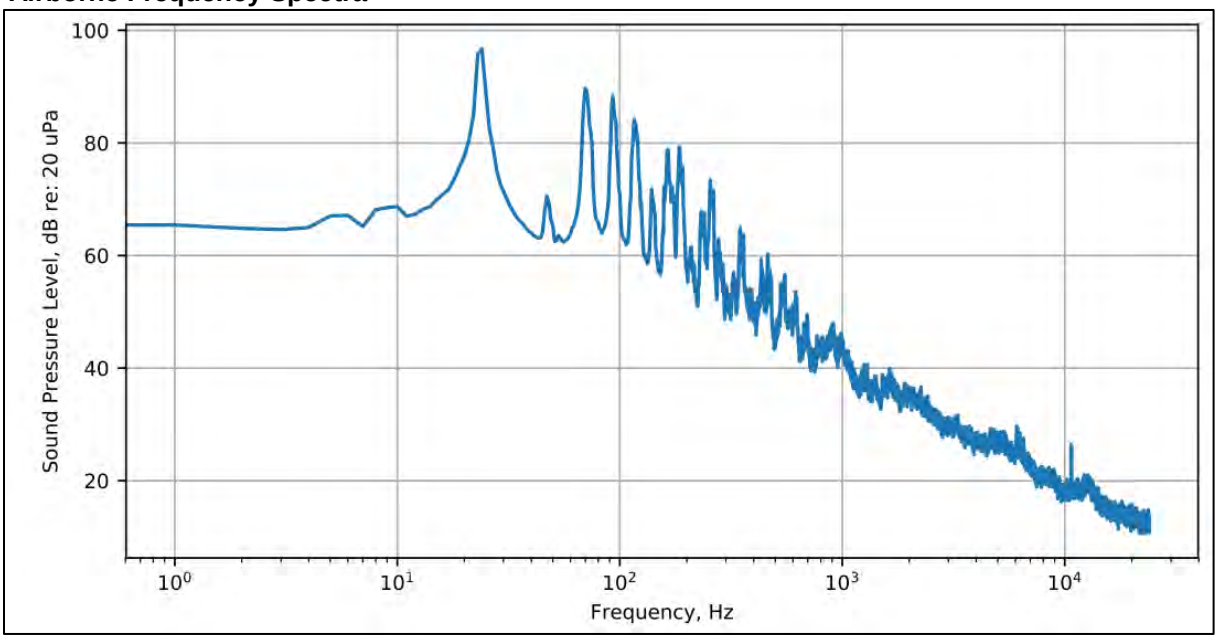
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	240	44	44

Airborne Sound Levels, dB re: 20 µPa

Median	Maximum	Minimum
78	109	69

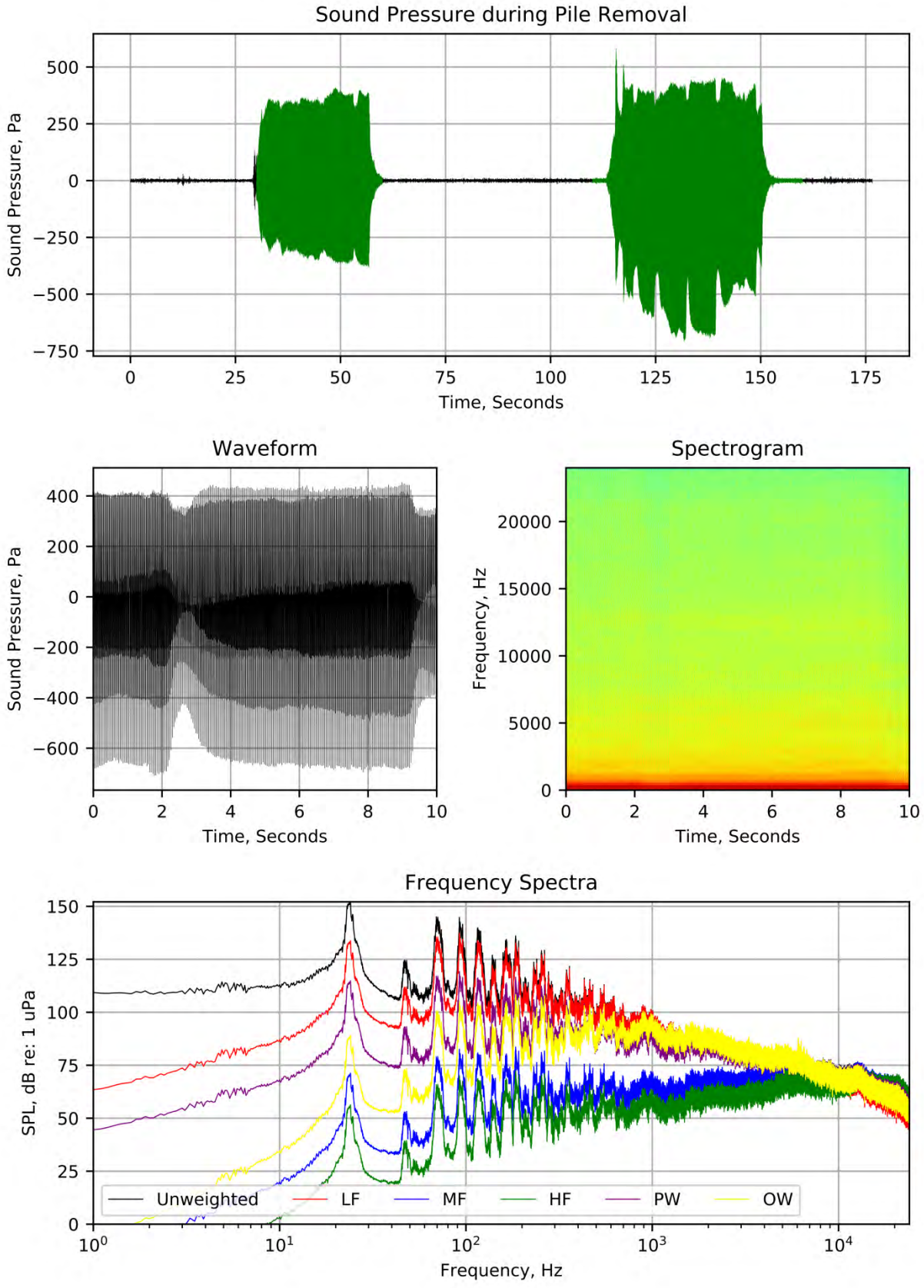
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 µPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	158	162	1.4	161	136	153	5.7	151	146	163	5.7	161
Low Frequency Cetacean	158	162	1.4	161	125	143	5.7	140	135	153	5.7	150
Mid Frequency Cetacean	158	162	1.4	161	130	147	5.6	145	140	157	5.6	155
High Frequency Cetacean	158	162	1.4	161	131	148	5.6	146	141	158	5.6	156
Phocid Pinnipeds	158	162	1.4	161	122	139	5.5	137	132	149	5.5	147
Otariid Pinnipeds	158	162	1.4	161	120	136	5.4	134	130	146	5.4	144
Lower Hydrophone												
Unweighted	171	175	1.4	173	154	168	4.6	165	164	178	4.6	175
Low Frequency Cetacean	171	175	1.4	173	138	156	5.5	153	148	166	5.5	163
Mid Frequency Cetacean	171	175	1.4	173	147	162	4.6	159	157	172	4.6	169
High Frequency Cetacean	171	175	1.4	173	148	163	4.6	160	158	173	4.6	170
Phocid Pinnipeds	171	175	1.4	173	138	153	4.7	150	148	163	4.7	160
Otariid Pinnipeds	171	175	1.4	173	135	150	4.7	147	145	160	4.7	157

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 5 (TP-5)

January 19, 2018

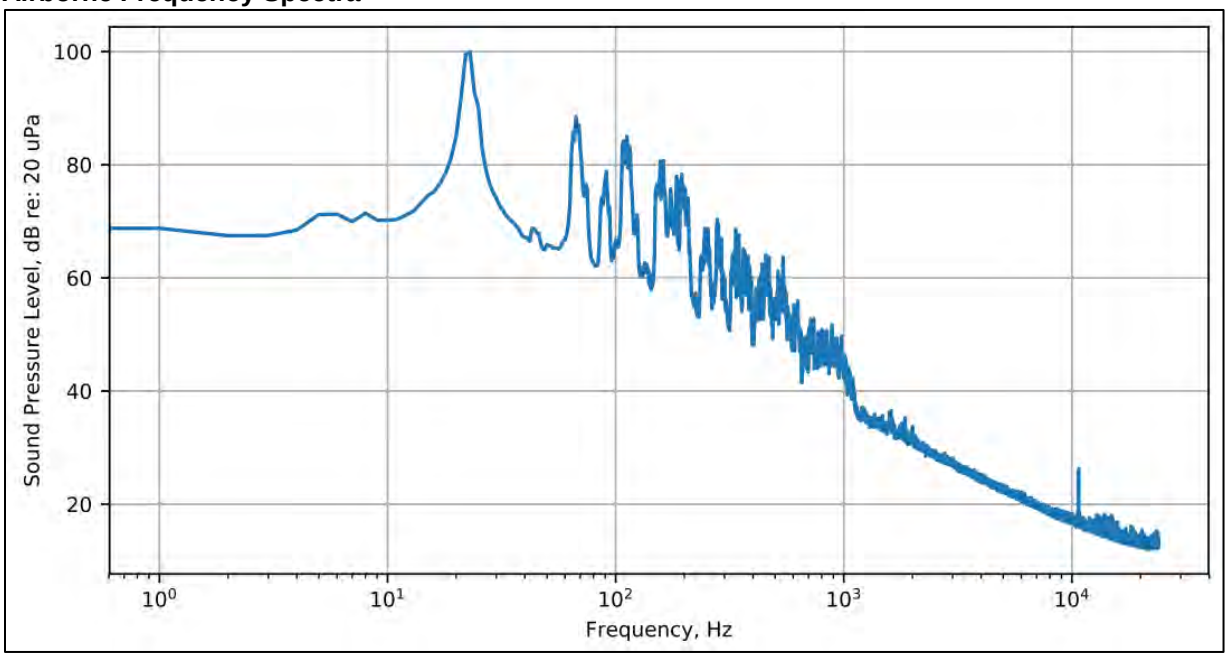
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	240	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
105	110	69

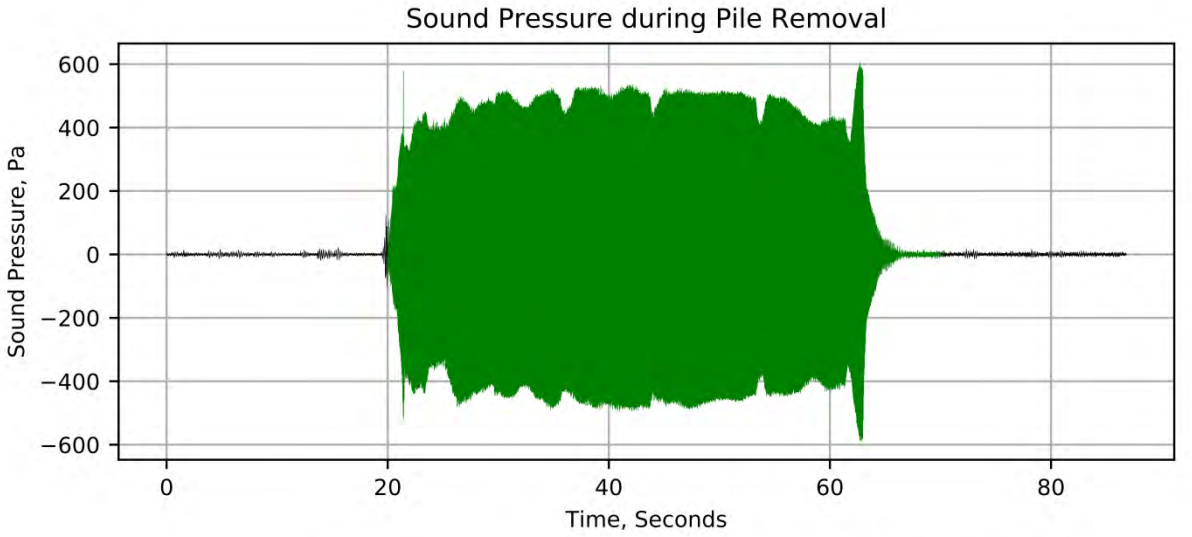
Airborne Frequency Spectra

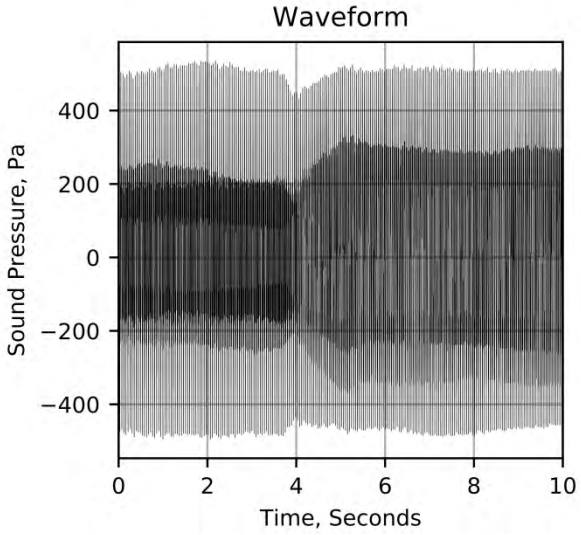


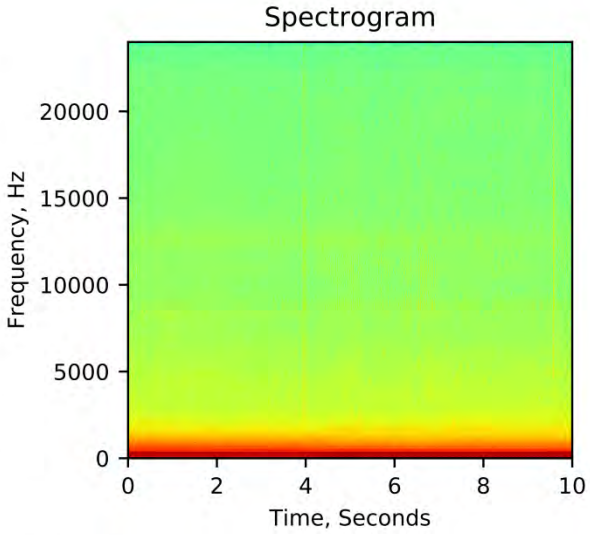
Underwater Sound Levels, dB re: 1 μPa

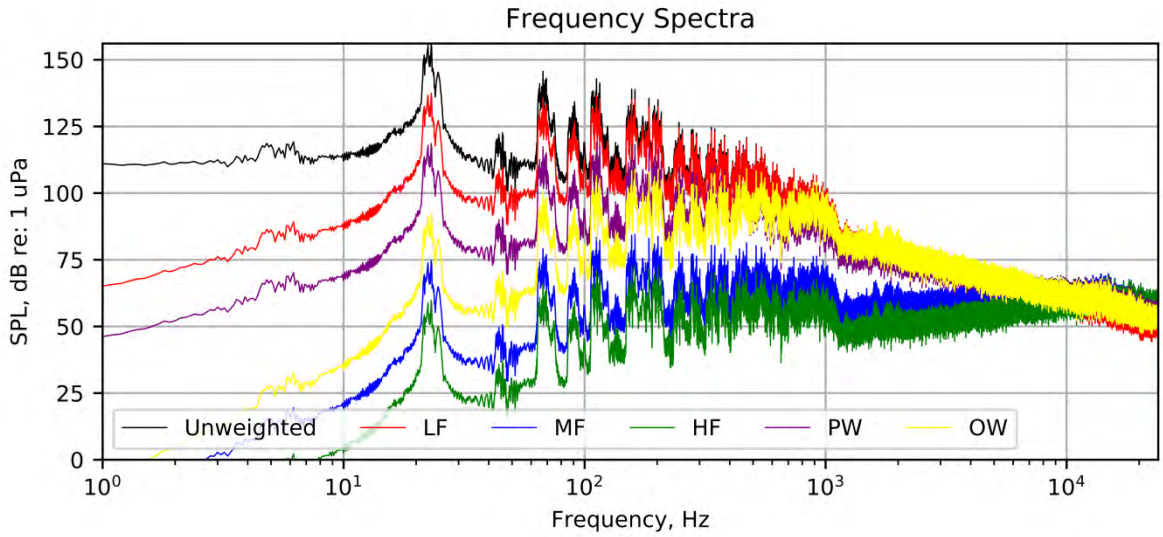
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	160	163	1.5	162	146	152	2.5	151	156	162	2.5	161
Low Frequency Cetacean	160	163	1.5	162	135	142	3.0	141	145	152	3.0	151
Mid Frequency Cetacean	160	163	1.5	162	140	145	2.5	145	150	155	2.5	155
High Frequency Cetacean	160	163	1.5	162	140	146	2.5	145	150	156	2.5	155
Phocid Pinnipeds	160	163	1.5	162	131	138	2.7	137	141	148	2.7	147
Otariid Pinnipeds	160	163	1.5	162	129	135	2.7	134	139	145	2.7	144
Lower Hydrophone												
Unweighted	174	176	0.6	175	164	169	1.7	167	174	179	1.7	177
Low Frequency Cetacean	174	176	0.6	175	149	153	1.8	152	159	163	1.8	162
Mid Frequency Cetacean	174	176	0.6	175	158	162	1.7	160	168	172	1.7	170
High Frequency Cetacean	174	176	0.6	175	159	163	1.7	161	169	173	1.7	171
Phocid Pinnipeds	174	176	0.6	175	149	153	1.7	151	159	163	1.7	161
Otariid Pinnipeds	174	176	0.6	175	146	150	1.7	148	156	160	1.7	158

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 6 (TP-6)

January 19, 2018

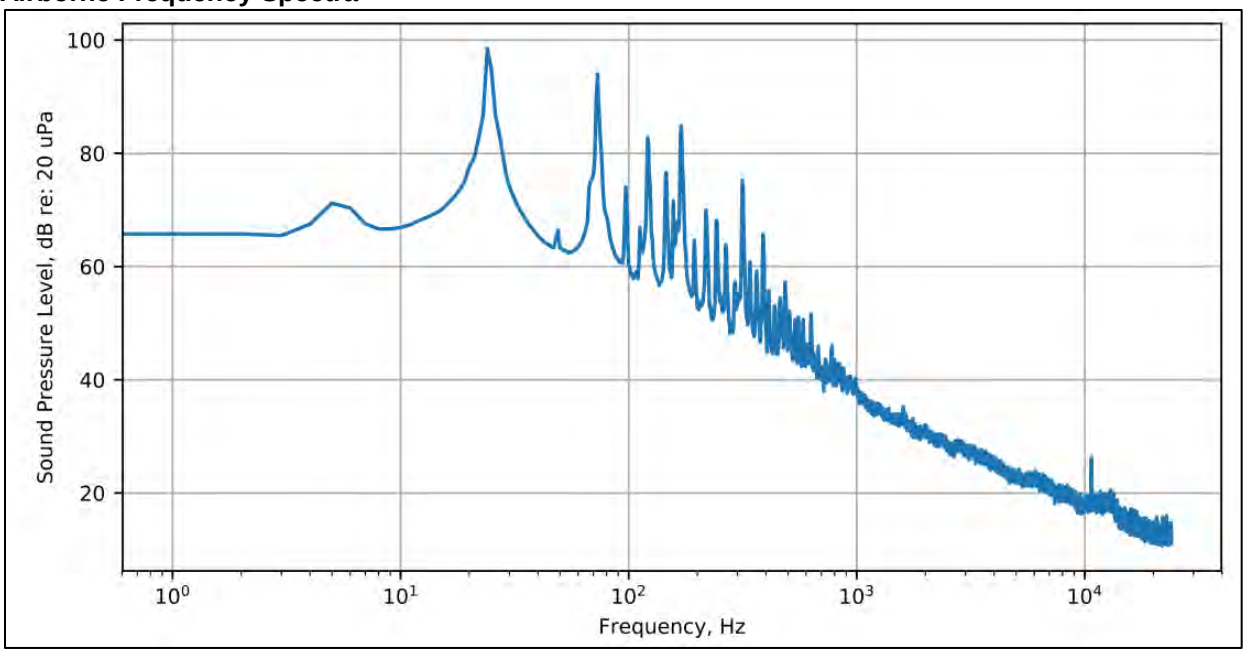
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	240	44	44

Airborne Sound Levels, dB re: 20 µPa

Median	Maximum	Minimum
83	107	73

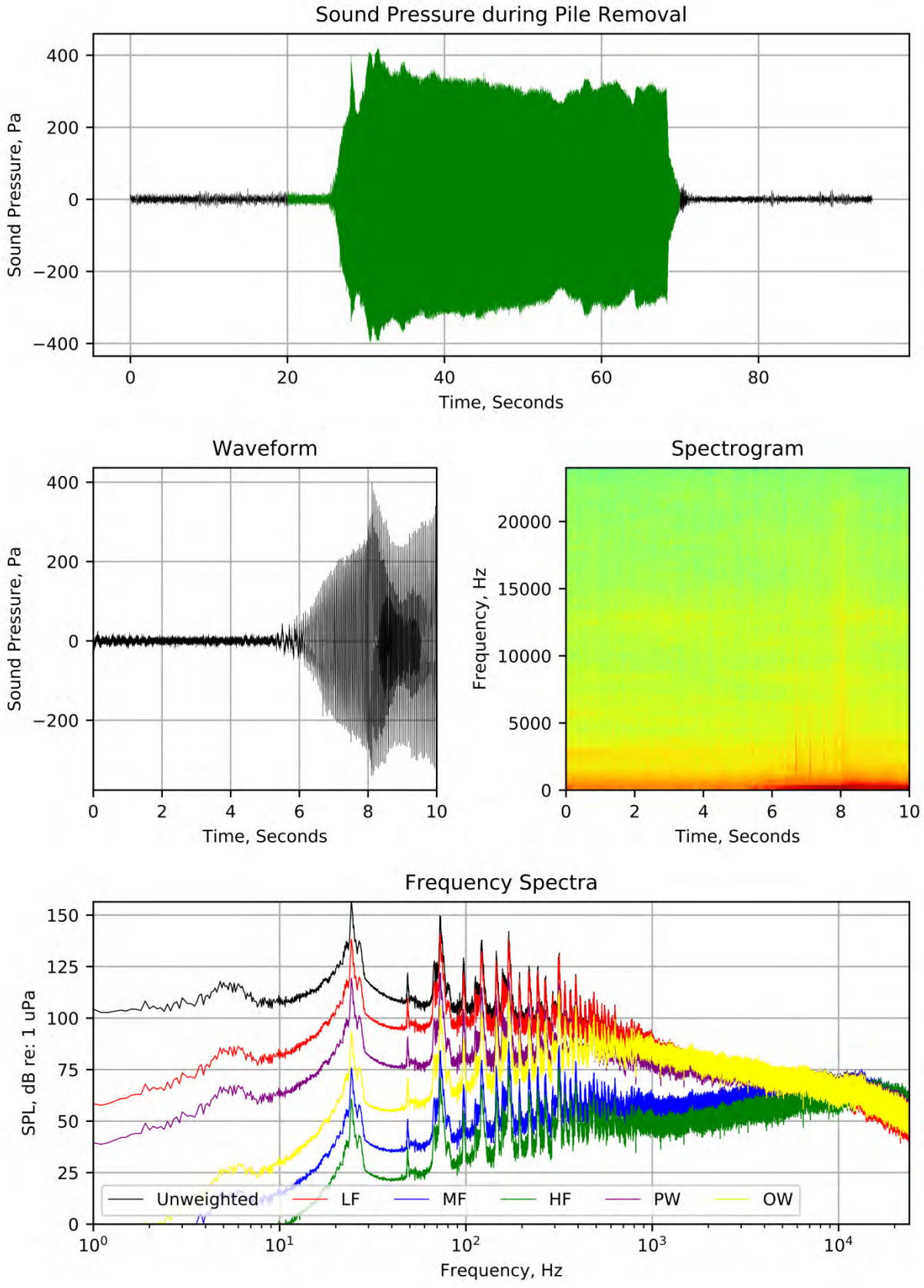
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 µPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	159	162	1.2	160	145	153	3.3	151	155	163	3.3	161
Low Frequency Cetacean	159	162	1.2	160	134	142	3.0	140	144	152	3.0	150
Mid Frequency Cetacean	159	162	1.2	160	138	147	3.3	145	148	157	3.3	155
High Frequency Cetacean	159	162	1.2	160	139	147	3.3	145	149	157	3.3	155
Phocid Pinnipeds	159	162	1.2	160	130	138	3.1	136	140	148	3.1	146
Otariid Pinnipeds	159	162	1.2	160	128	135	2.9	133	138	145	2.9	143
Lower Hydrophone												
Unweighted	170	172	0.9	171	159	166	2.8	165	169	176	2.8	175
Low Frequency Cetacean	170	172	0.9	171	145	152	3.2	151	155	162	3.2	161
Mid Frequency Cetacean	170	172	0.9	171	153	160	2.8	158	163	170	2.8	168
High Frequency Cetacean	170	172	0.9	171	154	160	2.8	159	164	170	2.8	169
Phocid Pinnipeds	170	172	0.9	171	144	151	2.9	149	154	161	2.9	159
Otariid Pinnipeds	170	172	0.9	171	141	148	2.8	146	151	158	2.8	156

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 7 (TP-7)

January 19, 2018

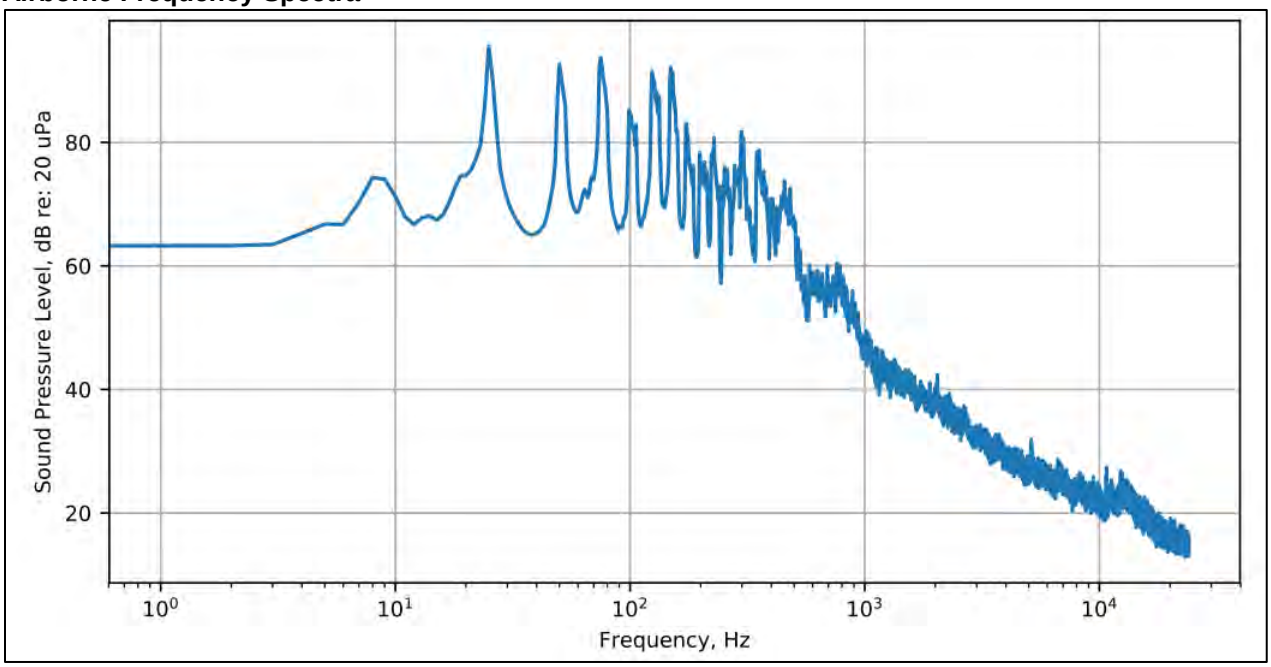
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	27	230	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
78	113	72

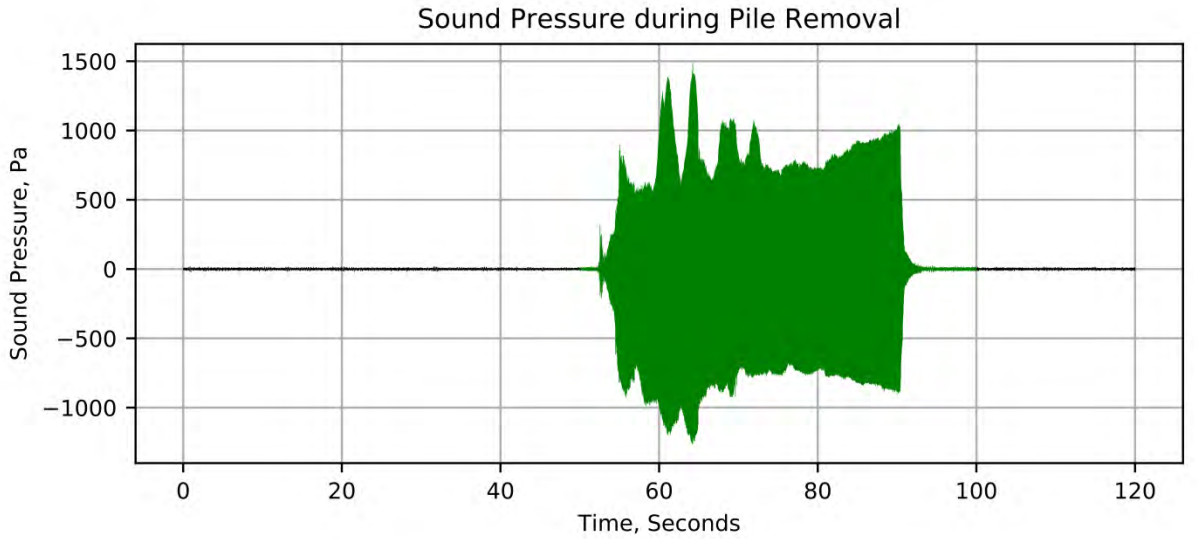
Airborne Frequency Spectra

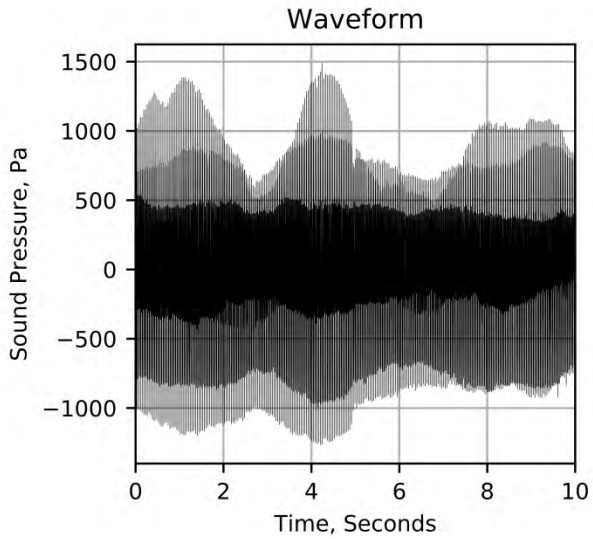


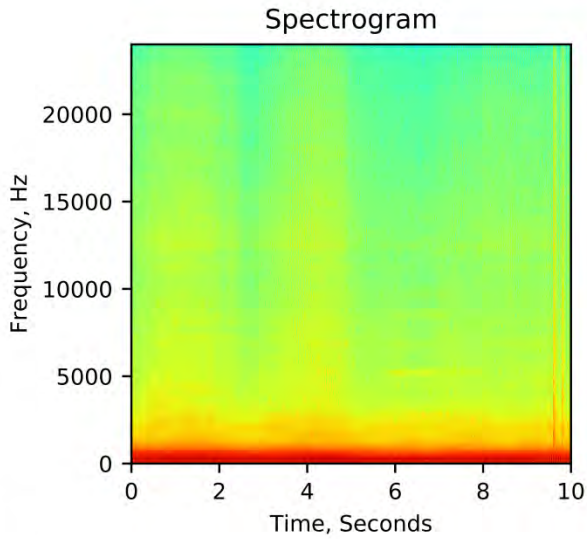
Underwater Sound Levels, dB re: 1 μPa

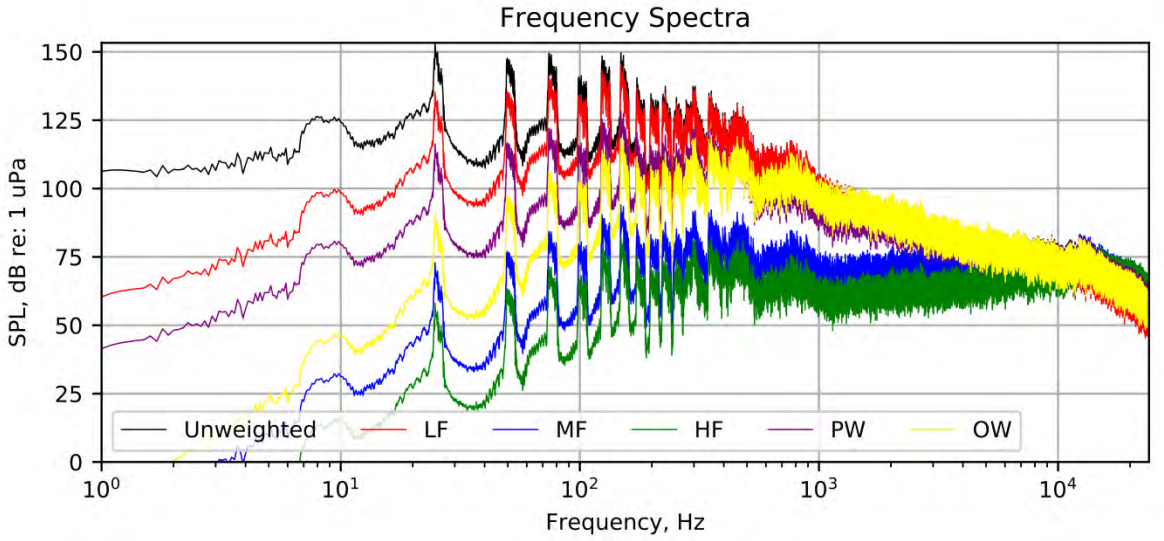
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	170	176	2.0	173	149	164	5.9	161	159	174	5.9	171
Low Frequency Cetacean	170	176	2.0	173	139	155	6.2	152	149	165	6.2	162
Mid Frequency Cetacean	170	176	2.0	173	142	157	5.9	155	152	167	5.9	165
High Frequency Cetacean	170	176	2.0	173	143	158	5.9	155	153	168	5.9	165
Phocid Pinnipeds	170	176	2.0	173	135	150	6.0	147	145	160	6.0	157
Otariid Pinnipeds	170	176	2.0	173	132	147	6.0	144	142	157	6.0	154
Lower Hydrophone												
Unweighted	178	182	1.5	179	158	170	4.8	168	168	180	4.8	178
Low Frequency Cetacean	178	182	1.5	179	148	161	5.1	158	158	171	5.1	168
Mid Frequency Cetacean	178	182	1.5	179	152	163	4.8	161	162	173	4.8	171
High Frequency Cetacean	178	182	1.5	179	153	164	4.8	162	163	174	4.8	172
Phocid Pinnipeds	178	182	1.5	179	144	156	4.9	153	154	166	4.9	163
Otariid Pinnipeds	178	182	1.5	179	140	153	5.0	150	150	163	5.0	160

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 8 (TP-8)

January 19, 2018

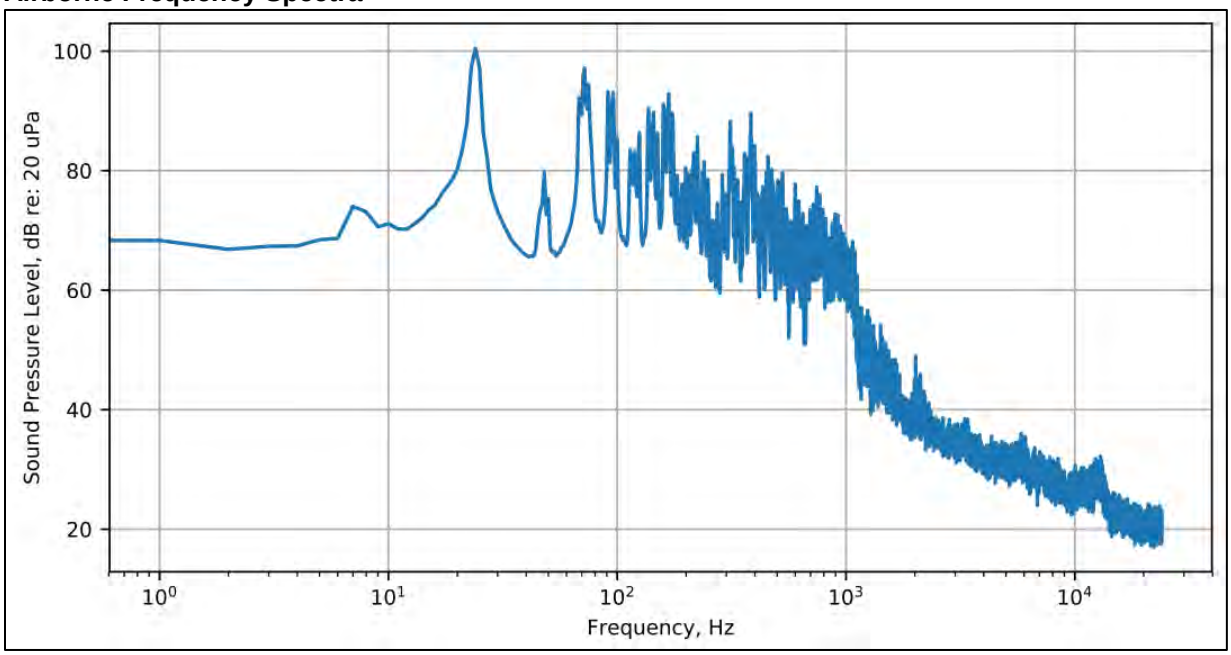
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	28	230	44	44

Airborne Sound Levels, dB re: 20 µPa

Median	Maximum	Minimum
106	115	74

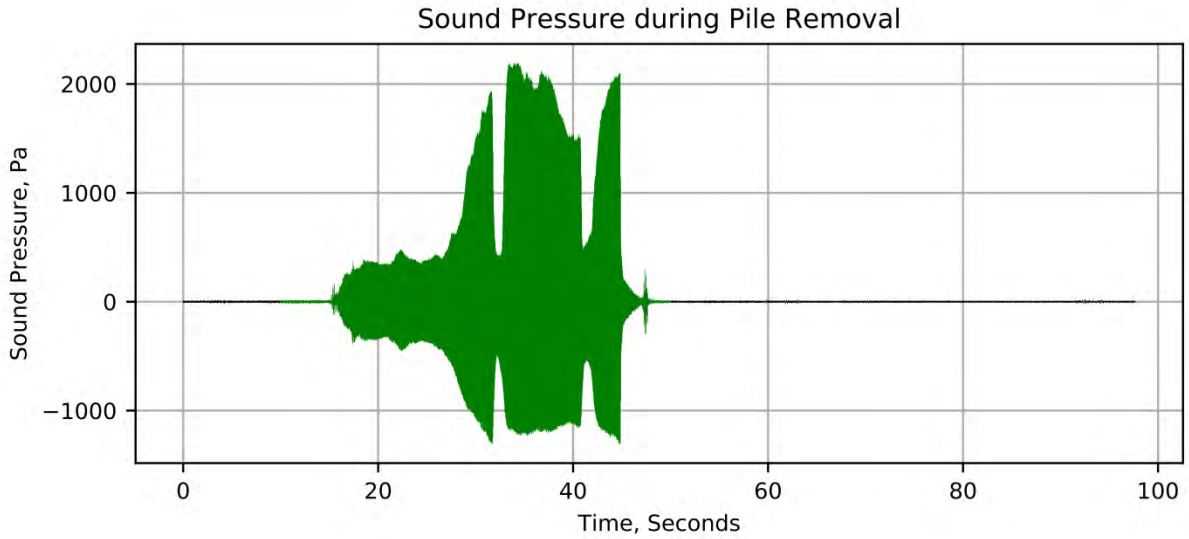
Airborne Frequency Spectra

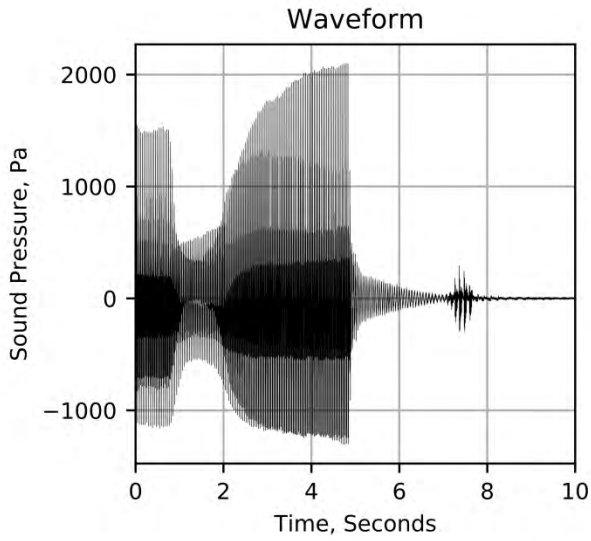


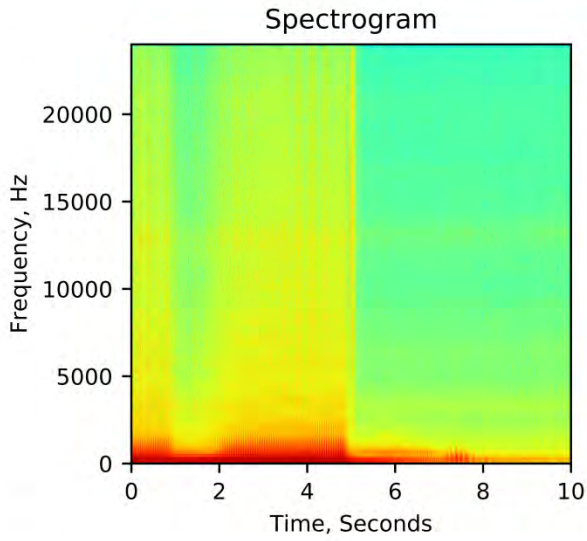
Underwater Sound Levels, dB re: 1 µPa

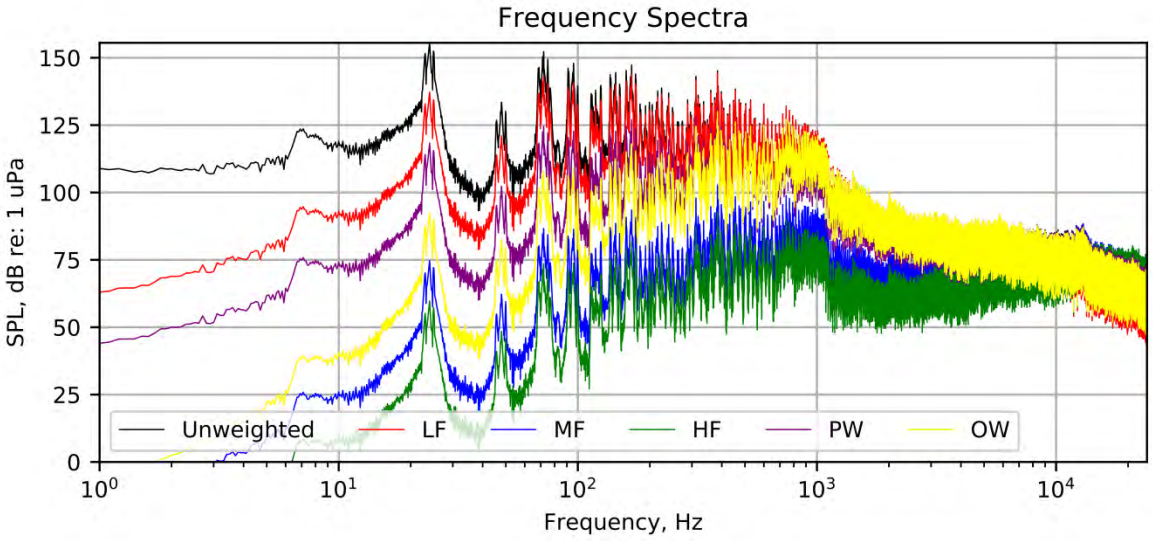
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	160	174	6.7	172	147	161	6.0	158	157	171	6.0	168
Low Frequency Cetacean	160	174	6.7	172	137	153	6.9	149	147	163	6.9	159
Mid Frequency Cetacean	160	174	6.7	172	141	155	6.0	151	151	165	6.0	161
High Frequency Cetacean	160	174	6.7	172	141	155	6.0	152	151	165	6.0	162
Phocid Pinnipeds	160	174	6.7	172	133	148	6.4	144	143	158	6.4	154
Otariid Pinnipeds	160	174	6.7	172	131	146	6.7	142	141	156	6.7	152
Lower Hydrophone												
Unweighted	171	186	7.1	184	160	172	5.3	169	170	182	5.3	179
Low Frequency Cetacean	171	186	7.1	184	148	163	6.7	160	158	173	6.7	170
Mid Frequency Cetacean	171	186	7.1	184	154	166	5.3	163	164	176	5.3	173
High Frequency Cetacean	171	186	7.1	184	154	167	5.3	163	164	177	5.3	173
Phocid Pinnipeds	171	186	7.1	184	145	159	5.9	155	155	169	5.9	165
Otariid Pinnipeds	171	186	7.1	184	142	157	6.3	153	152	167	6.3	163

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
2000
1000
0
−1000
0
20
40
60
80
100
Time, Seconds


Waveform
Sound Pressure, Pa
2000
1000
0
−1000
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
150
125
100
75
50
25
0
10^0
10^1
10^2
10^3
10^4
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 9 (TP-9)

January 19, 2018

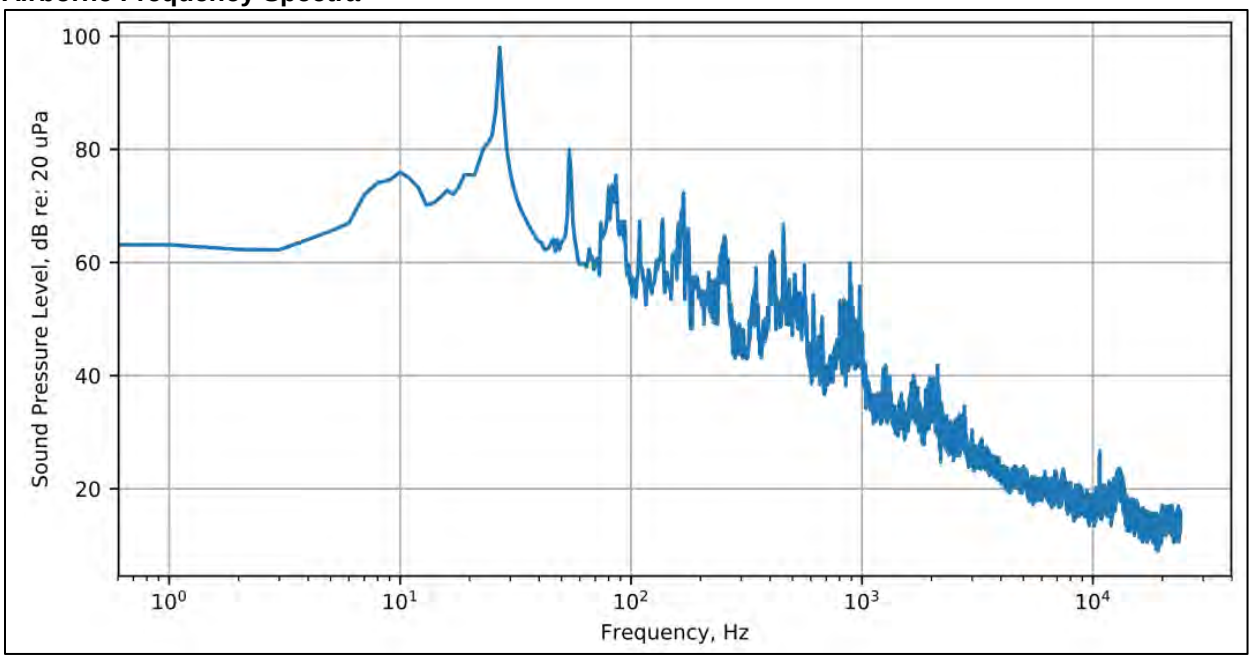
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	20	220	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	104	68

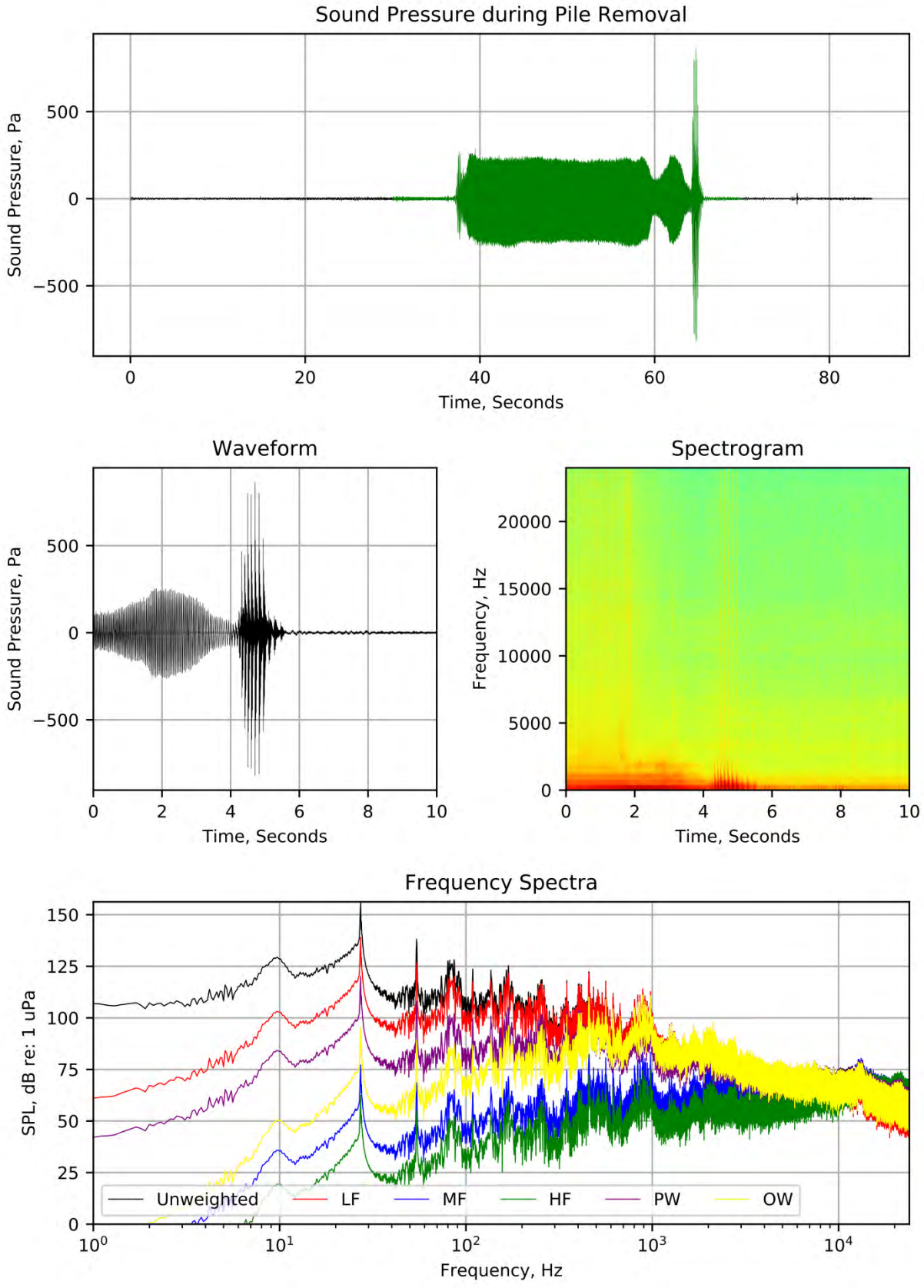
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	149	164	6.6	159	137	142	2.0	140	147	152	2.0	150
Low Frequency Cetacean	149	164	6.6	159	125	131	2.6	129	135	141	2.6	139
Mid Frequency Cetacean	149	164	6.6	159	131	135	2.0	133	141	145	2.0	143
High Frequency Cetacean	149	164	6.6	159	131	136	2.0	134	141	146	2.0	144
Phocid Pinnipeds	149	164	6.6	159	124	128	1.9	126	134	138	1.9	136
Otariid Pinnipeds	149	164	6.6	159	124	128	1.9	126	134	138	1.9	136
Lower Hydrophone												
Unweighted	164	175	5.3	170	153	160	3.6	158	163	170	3.6	168
Low Frequency Cetacean	164	175	5.3	170	136	144	3.5	142	146	154	3.5	152
Mid Frequency Cetacean	164	175	5.3	170	147	154	3.6	152	157	164	3.6	162
High Frequency Cetacean	164	175	5.3	170	147	155	3.6	152	157	165	3.6	162
Phocid Pinnipeds	164	175	5.3	170	137	145	3.5	142	147	155	3.5	152
Otariid Pinnipeds	164	175	5.3	170	135	142	3.4	140	145	152	3.4	150

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
500
0
−500
0
20
40
60
80
Time, Seconds
Waveform
Sound Pressure, Pa
500
0
−500
0
2
4
6
8
10
Time, Seconds
Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
150
125
100
75
50
25
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

TIMBER PILE REMOVAL 10 (TP-10)

January 19, 2018

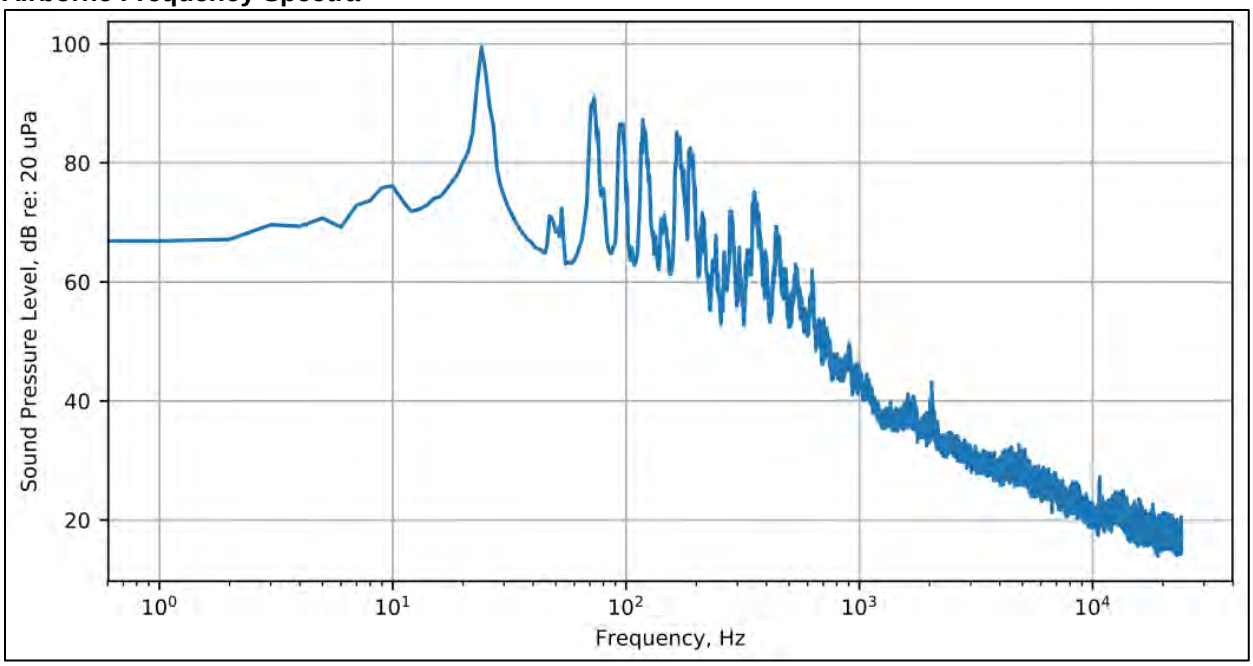
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	20	220	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
79	112	69

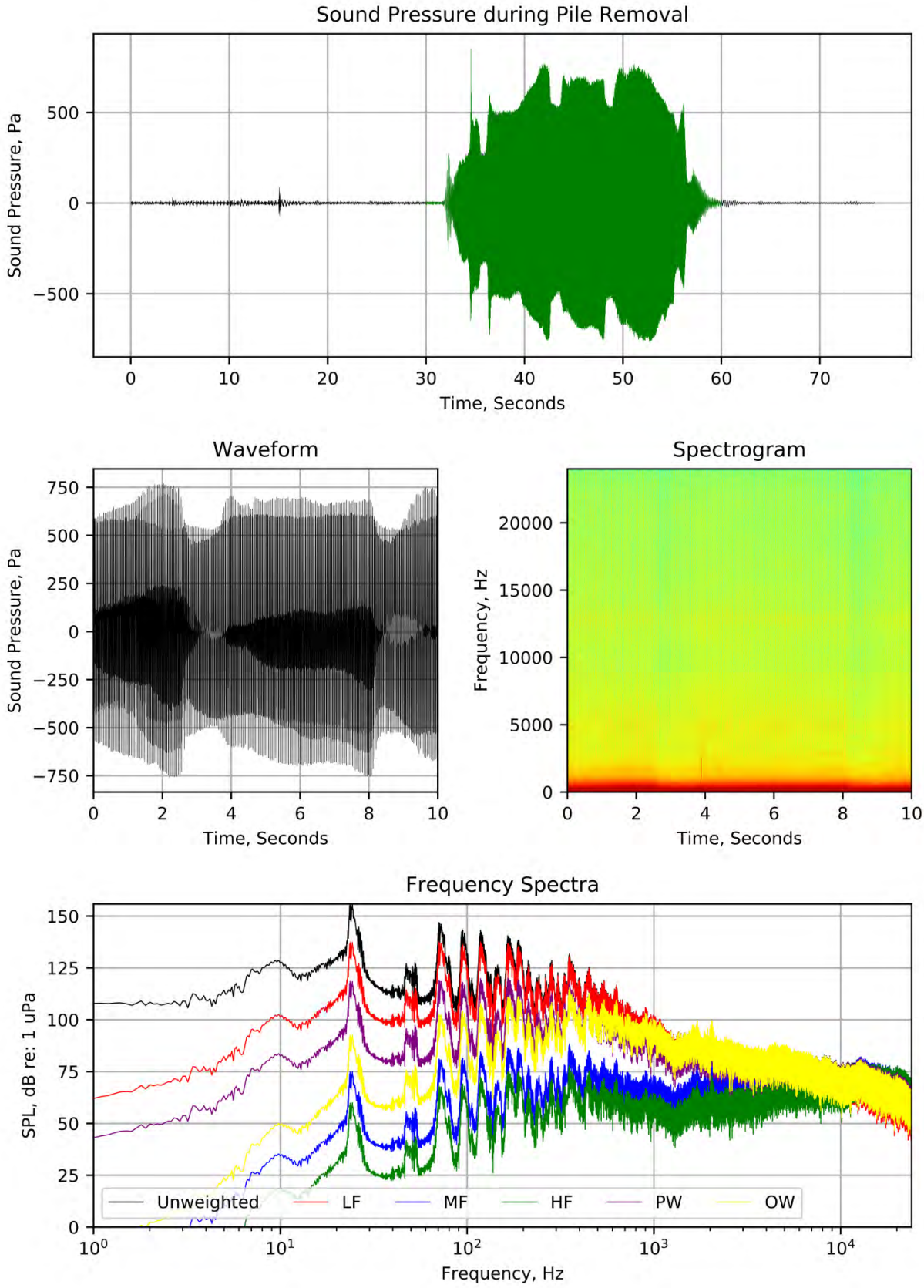
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	162	163	0.7	163	147	153	2.9	151	157	163	2.9	161
Low Frequency Cetacean	162	163	0.7	163	138	144	3.4	142	148	154	3.4	152
Mid Frequency Cetacean	162	163	0.7	163	141	147	2.9	144	151	157	2.9	154
High Frequency Cetacean	162	163	0.7	163	142	147	2.9	145	152	157	2.9	155
Phocid Pinnipeds	162	163	0.7	163	133	139	3.0	137	143	149	3.0	147
Otariid Pinnipeds	162	163	0.7	163	131	137	2.7	135	141	147	2.7	145
Lower Hydrophone												
Unweighted	174	175	0.5	175	163	167	2.2	165	173	177	2.2	175
Low Frequency Cetacean	174	175	0.5	175	150	155	2.6	153	160	165	2.6	163
Mid Frequency Cetacean	174	175	0.5	175	156	161	2.2	159	166	171	2.2	169
High Frequency Cetacean	174	175	0.5	175	157	161	2.2	159	167	171	2.2	169
Phocid Pinnipeds	174	175	0.5	175	147	152	2.3	150	157	162	2.3	160
Otariid Pinnipeds	174	175	0.5	175	144	149	2.3	147	154	159	2.3	157

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 11 (TP-11)

January 19, 2018

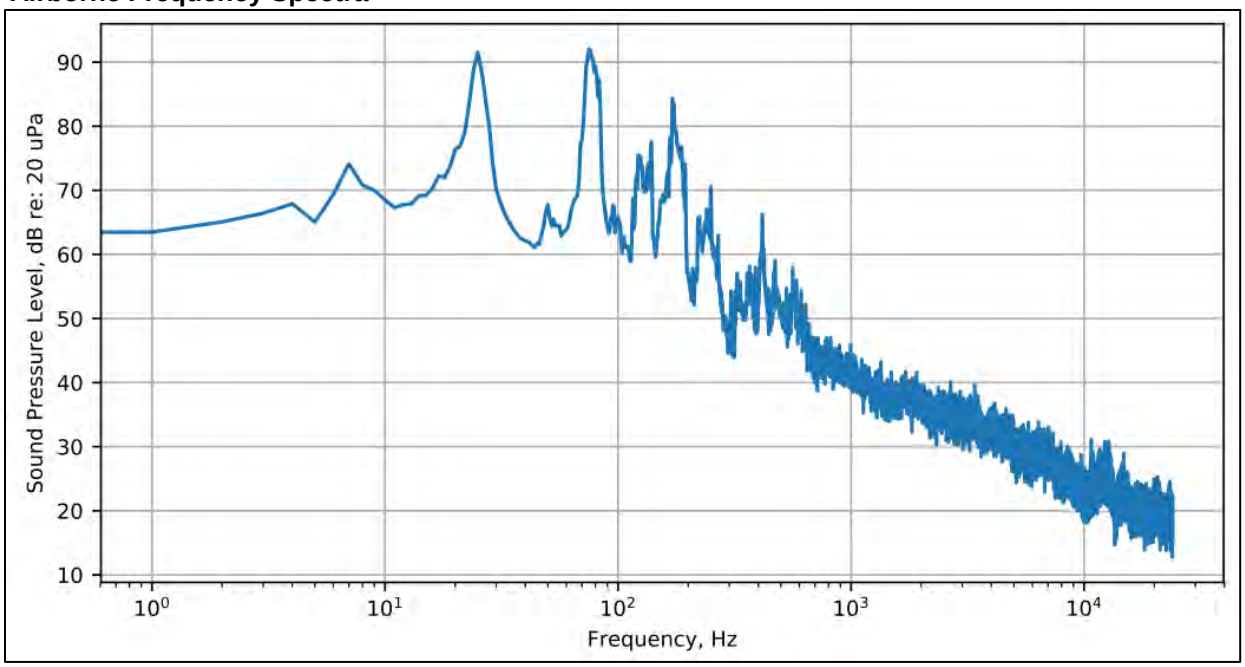
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	25	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
74	111	65

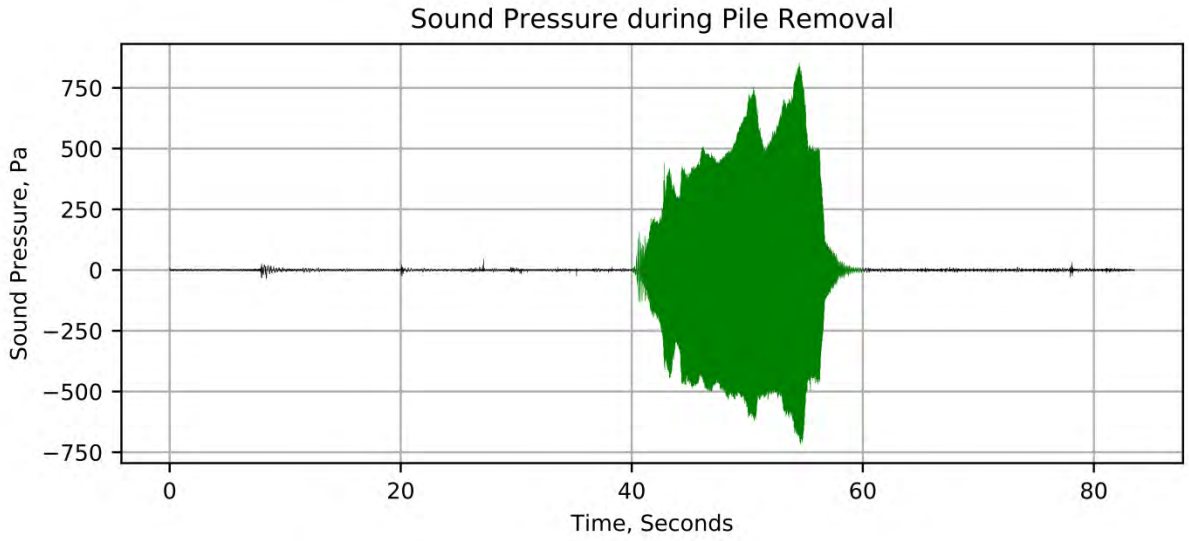
Airborne Frequency Spectra

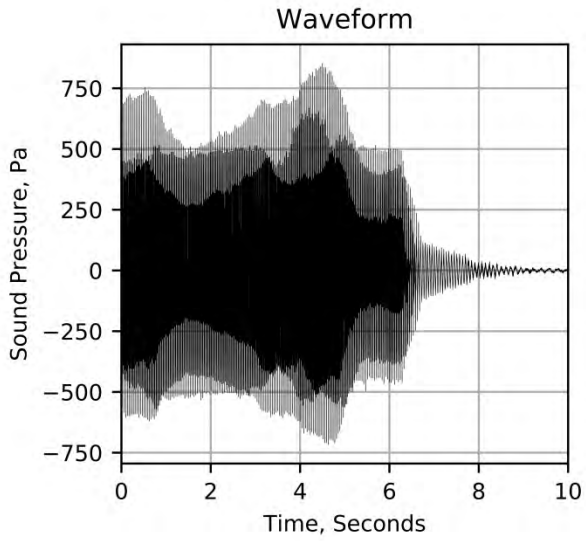


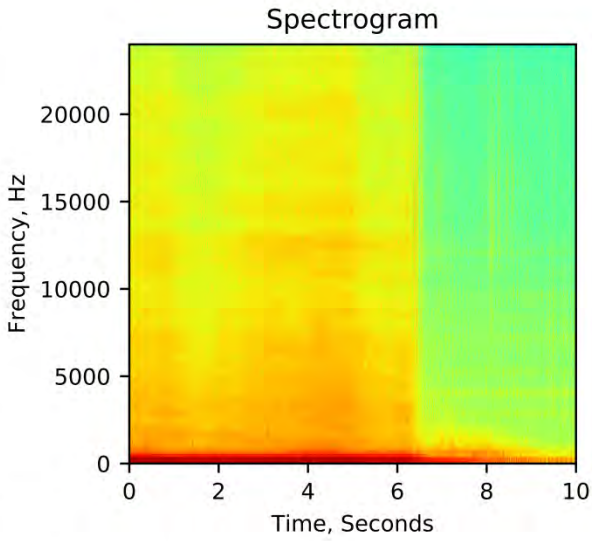
Underwater Sound Levels, dB re: 1 μPa

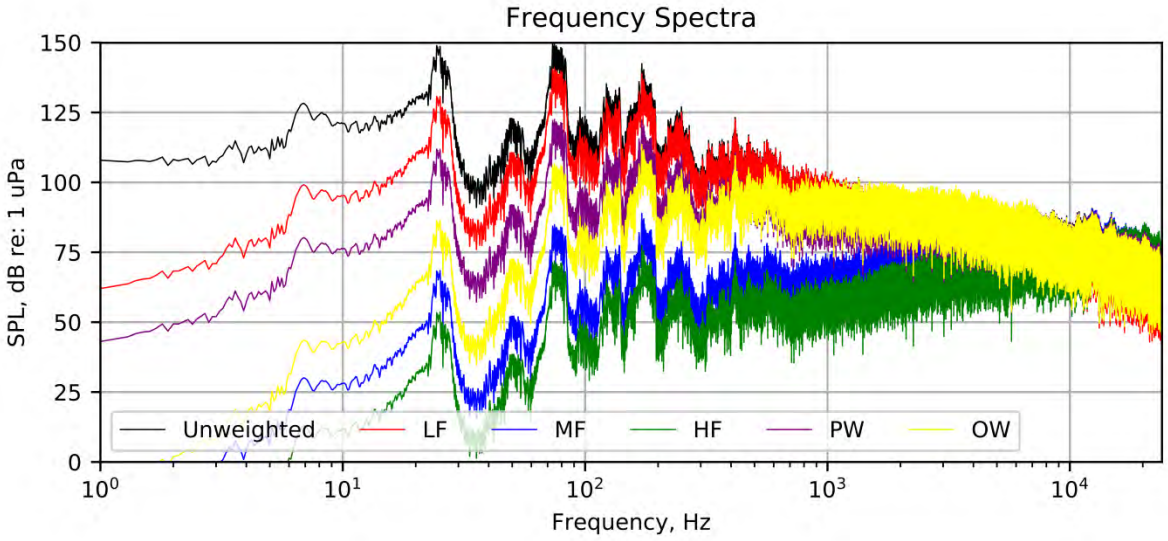
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	163	165	1.9	164	154	155	0.7	154	164	165	0.7	164
Low Frequency Cetacean	163	165	1.9	164	142	144	1.0	143	152	154	1.0	153
Mid Frequency Cetacean	163	165	1.9	164	147	148	0.7	148	157	158	0.7	158
High Frequency Cetacean	163	165	1.9	164	148	149	0.7	149	158	159	0.7	159
Phocid Pinnipeds	163	165	1.9	164	139	140	1.0	140	149	150	1.0	150
Otariid Pinnipeds	163	165	1.9	164	136	138	1.2	137	146	148	1.2	147
Lower Hydrophone												
Unweighted	174	177	1.7	176	165	166	0.7	165	175	176	0.7	175
Low Frequency Cetacean	174	177	1.7	176	153	154	1.2	154	163	164	1.2	164
Mid Frequency Cetacean	174	177	1.7	176	158	160	0.7	159	168	170	0.7	169
High Frequency Cetacean	174	177	1.7	176	159	160	0.7	160	169	170	0.7	170
Phocid Pinnipeds	174	177	1.7	176	150	151	0.8	150	160	161	0.8	160
Otariid Pinnipeds	174	177	1.7	176	147	148	0.8	147	157	158	0.8	157

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
750
500
250
0
−250
−500
−750
0
20
40
60
80
Time, Seconds


Waveform
Sound Pressure, Pa
750
500
250
0
−250
−500
−750
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
150
125
100
75
50
25
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

TIMBER PILE REMOVAL 12 (TP-12)

January 19, 2018

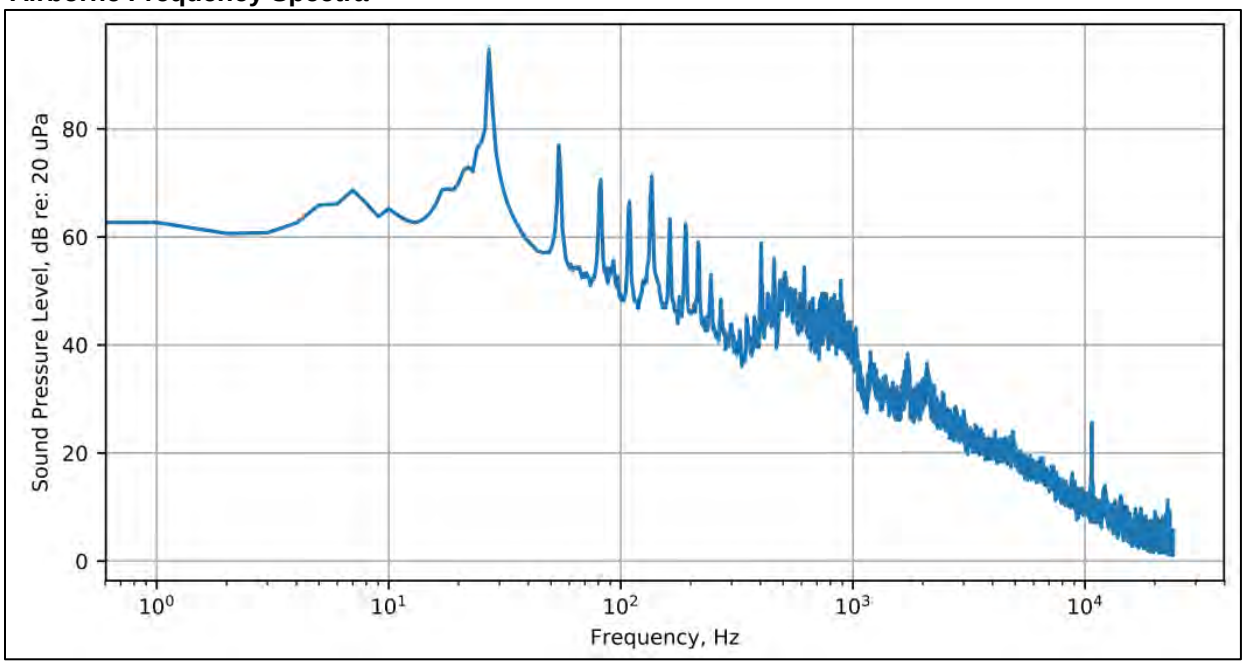
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	30	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	101	69

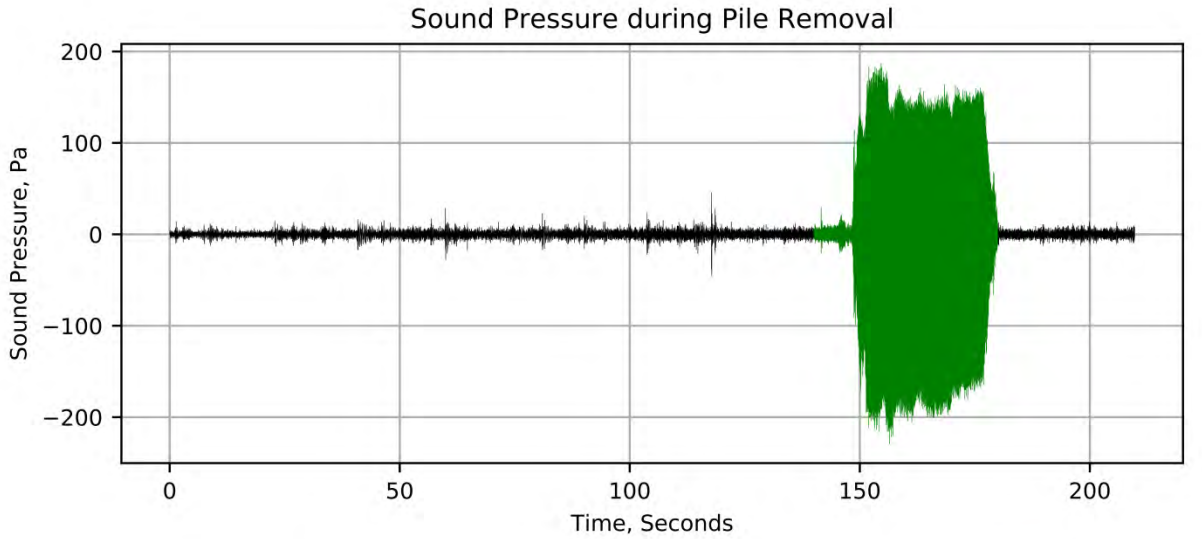
Airborne Frequency Spectra

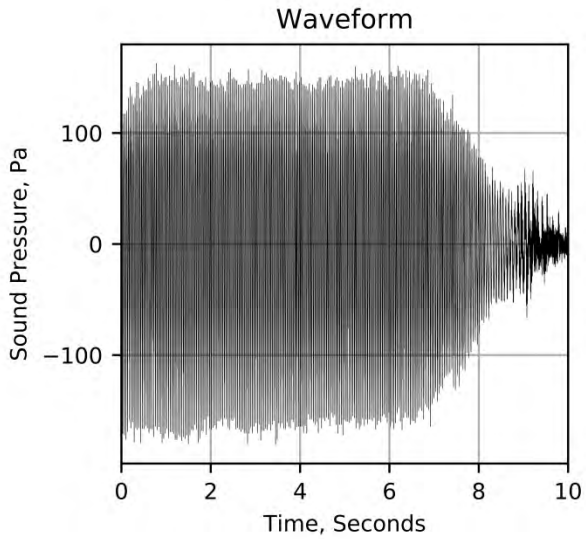


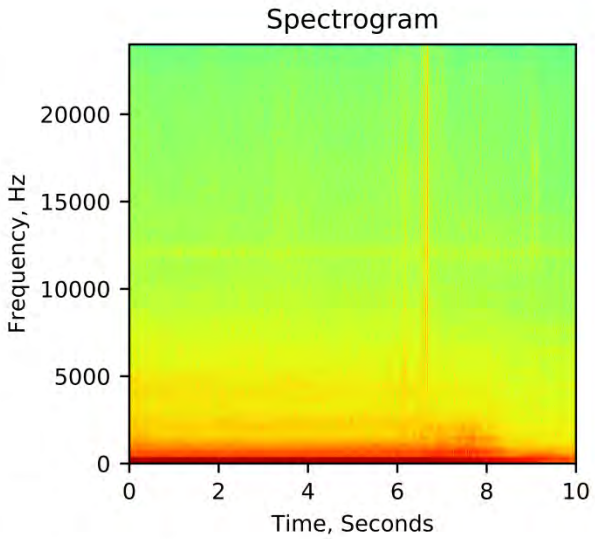
Underwater Sound Levels, dB re: 1 μPa

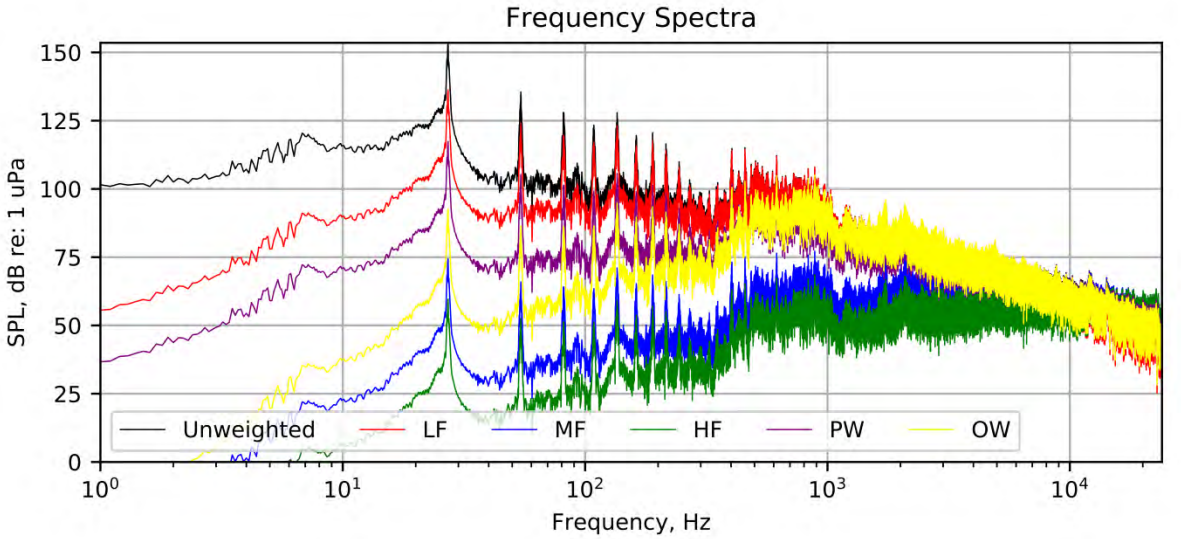
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	150	161	4.8	156	129	140	5.3	139	139	150	5.3	149
Low Frequency Cetacean	150	161	4.8	156	120	131	5.2	129	130	141	5.2	139
Mid Frequency Cetacean	150	161	4.8	156	123	134	5.2	132	133	144	5.2	142
High Frequency Cetacean	150	161	4.8	156	124	134	5.2	133	134	144	5.2	143
Phocid Pinnipeds	150	161	4.8	156	118	127	4.5	126	128	137	4.5	136
Otariid Pinnipeds	150	161	4.8	156	118	126	4.0	125	128	136	4.0	135
Lower Hydrophone												
Unweighted	162	165	1.4	164	145	160	7.0	158	155	170	7.0	168
Low Frequency Cetacean	162	165	1.4	164	130	144	6.3	142	140	154	6.3	152
Mid Frequency Cetacean	162	165	1.4	164	139	153	7.0	151	149	163	7.0	161
High Frequency Cetacean	162	165	1.4	164	139	154	7.0	152	149	164	7.0	162
Phocid Pinnipeds	162	165	1.4	164	130	144	6.7	142	140	154	6.7	152
Otariid Pinnipeds	162	165	1.4	164	129	141	6.0	139	139	151	6.0	149

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 13 (TP-13)

January 19, 2018

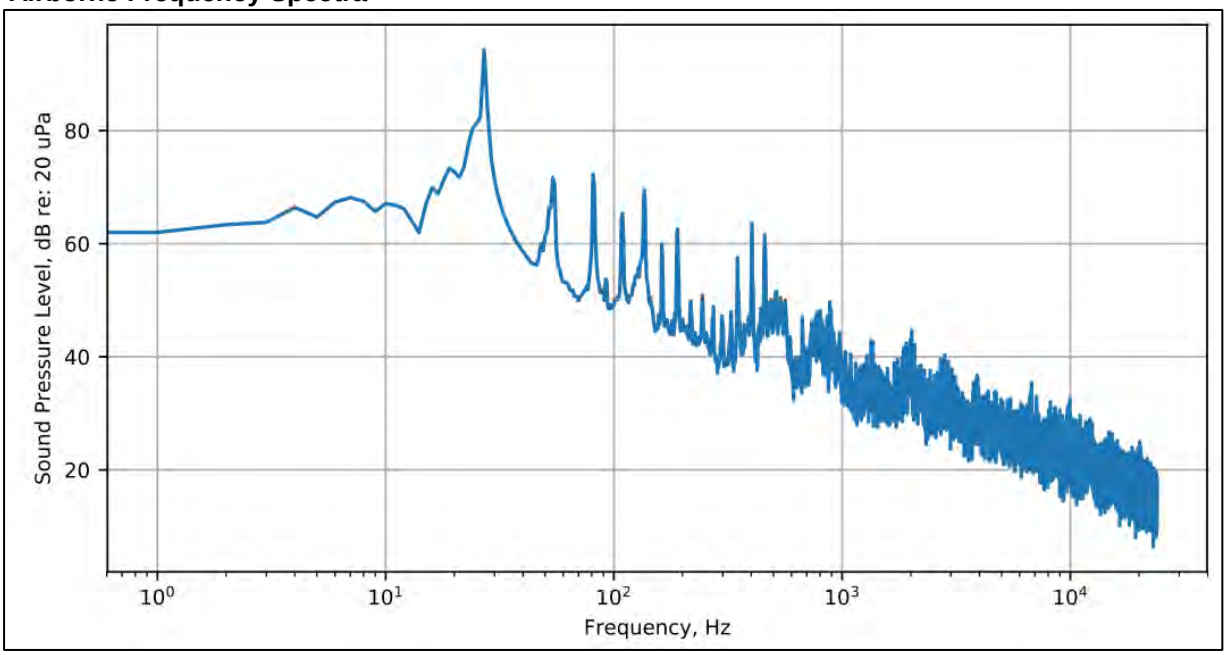
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	20	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
74	104	68

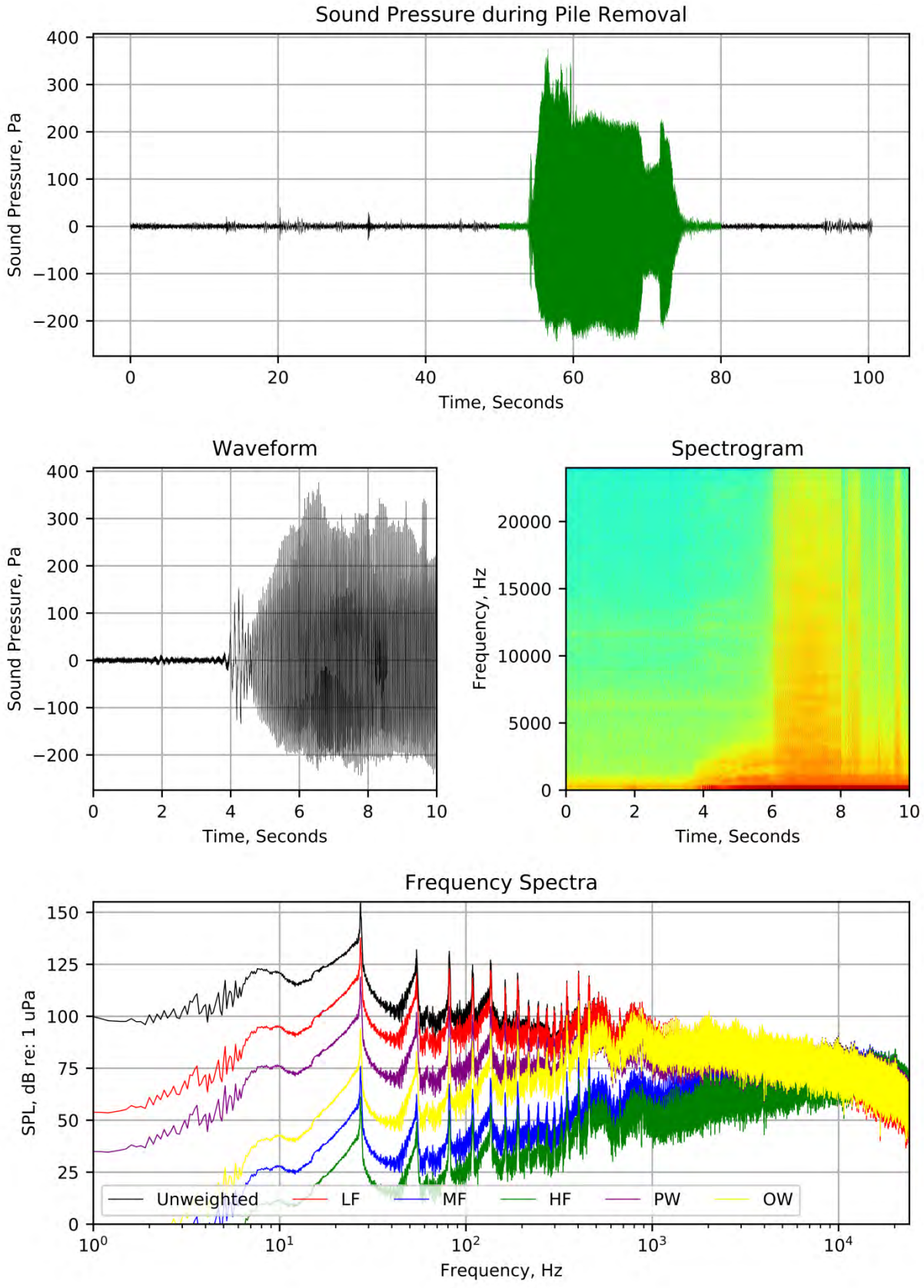
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	148	166	8.9	161	133	139	3.4	138	143	149	3.4	148
Low Frequency Cetacean	148	166	8.9	161	125	131	3.2	129	135	141	3.2	139
Mid Frequency Cetacean	148	166	8.9	161	127	136	4.4	133	137	146	4.4	143
High Frequency Cetacean	148	166	8.9	161	128	136	4.1	133	138	146	4.1	143
Phocid Pinnipeds	148	166	8.9	161	121	132	5.8	129	131	142	5.8	139
Otariid Pinnipeds	148	166	8.9	161	120	132	6.2	128	130	142	6.2	138
Lower Hydrophone												
Unweighted	164	168	2.3	166	152	159	3.7	157	162	169	3.7	167
Low Frequency Cetacean	164	168	2.3	166	136	142	3.6	140	146	152	3.6	150
Mid Frequency Cetacean	164	168	2.3	166	145	153	3.7	150	155	163	3.7	160
High Frequency Cetacean	164	168	2.3	166	146	153	3.7	151	156	163	3.7	161
Phocid Pinnipeds	164	168	2.3	166	136	143	3.7	141	146	153	3.7	151
Otariid Pinnipeds	164	168	2.3	166	133	140	3.7	139	143	150	3.7	149

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 14 (TP-14)

January 19, 2018

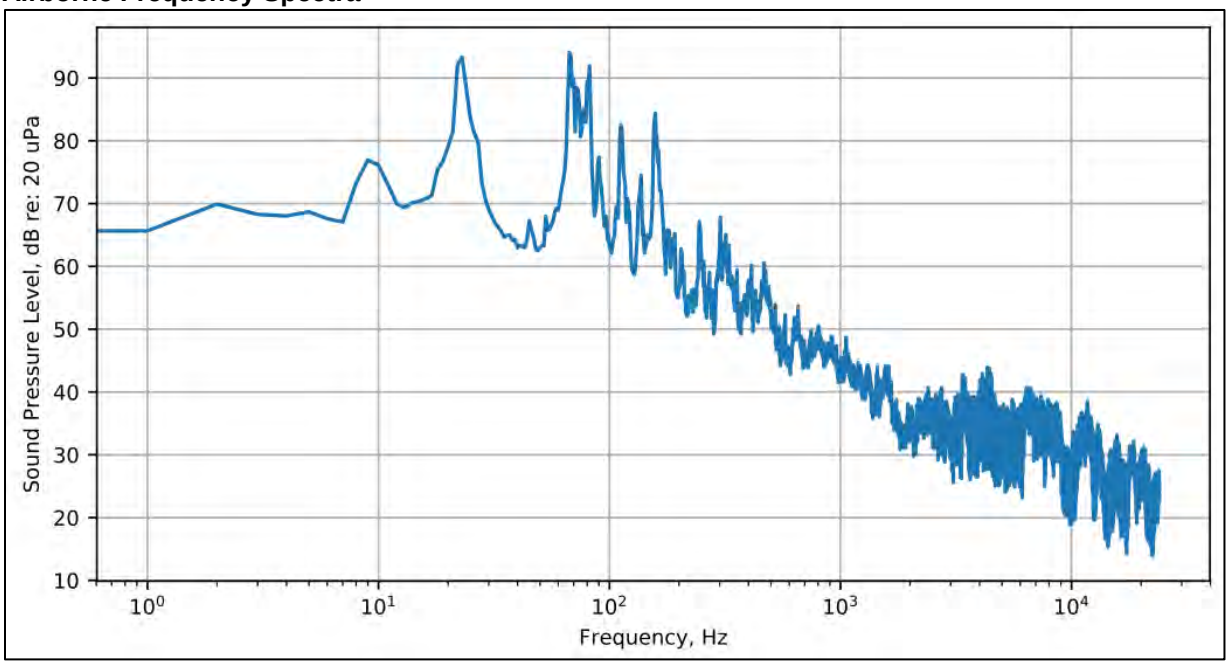
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	25	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
77	114	69

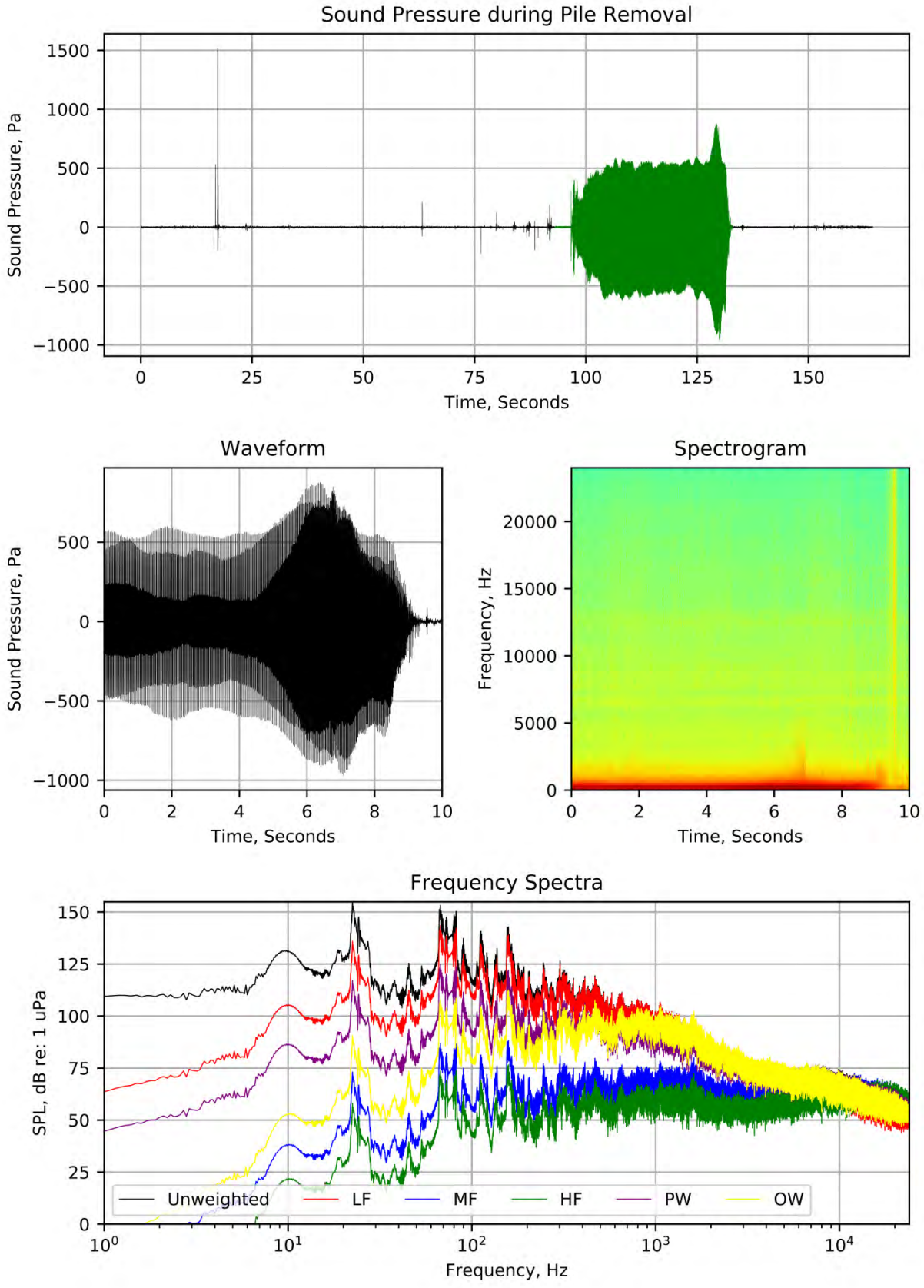
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	161	167	2.4	164	150	156	3.0	155	160	166	3.0	165
Low Frequency Cetacean	161	167	2.4	164	139	145	2.5	143	149	155	2.5	153
Mid Frequency Cetacean	161	167	2.4	164	143	150	3.0	148	153	160	3.0	158
High Frequency Cetacean	161	167	2.4	164	144	151	3.0	149	154	161	3.0	159
Phocid Pinnipeds	161	167	2.4	164	135	142	2.7	140	145	152	2.7	150
Otariid Pinnipeds	161	167	2.4	164	133	138	2.3	137	143	148	2.3	147
Lower Hydrophone												
Unweighted	172	177	2.2	174	162	169	3.1	167	172	179	3.1	177
Low Frequency Cetacean	172	177	2.2	174	150	157	2.9	155	160	167	2.9	165
Mid Frequency Cetacean	172	177	2.2	174	155	162	3.0	161	165	172	3.0	171
High Frequency Cetacean	172	177	2.2	174	156	163	3.1	161	166	173	3.1	171
Phocid Pinnipeds	172	177	2.2	174	147	153	3.0	152	157	163	3.0	162
Otariid Pinnipeds	172	177	2.2	174	144	150	2.8	149	154	160	2.8	159

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 15 (TP-15)

January 19, 2018

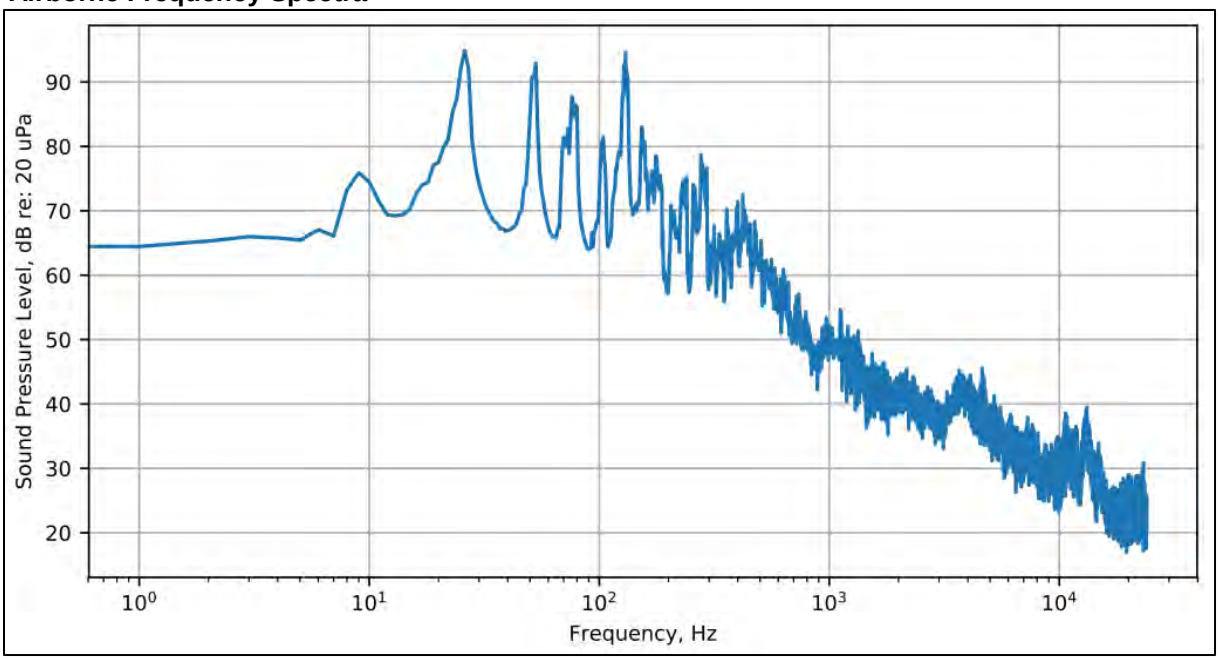
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	25	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
98	112	71

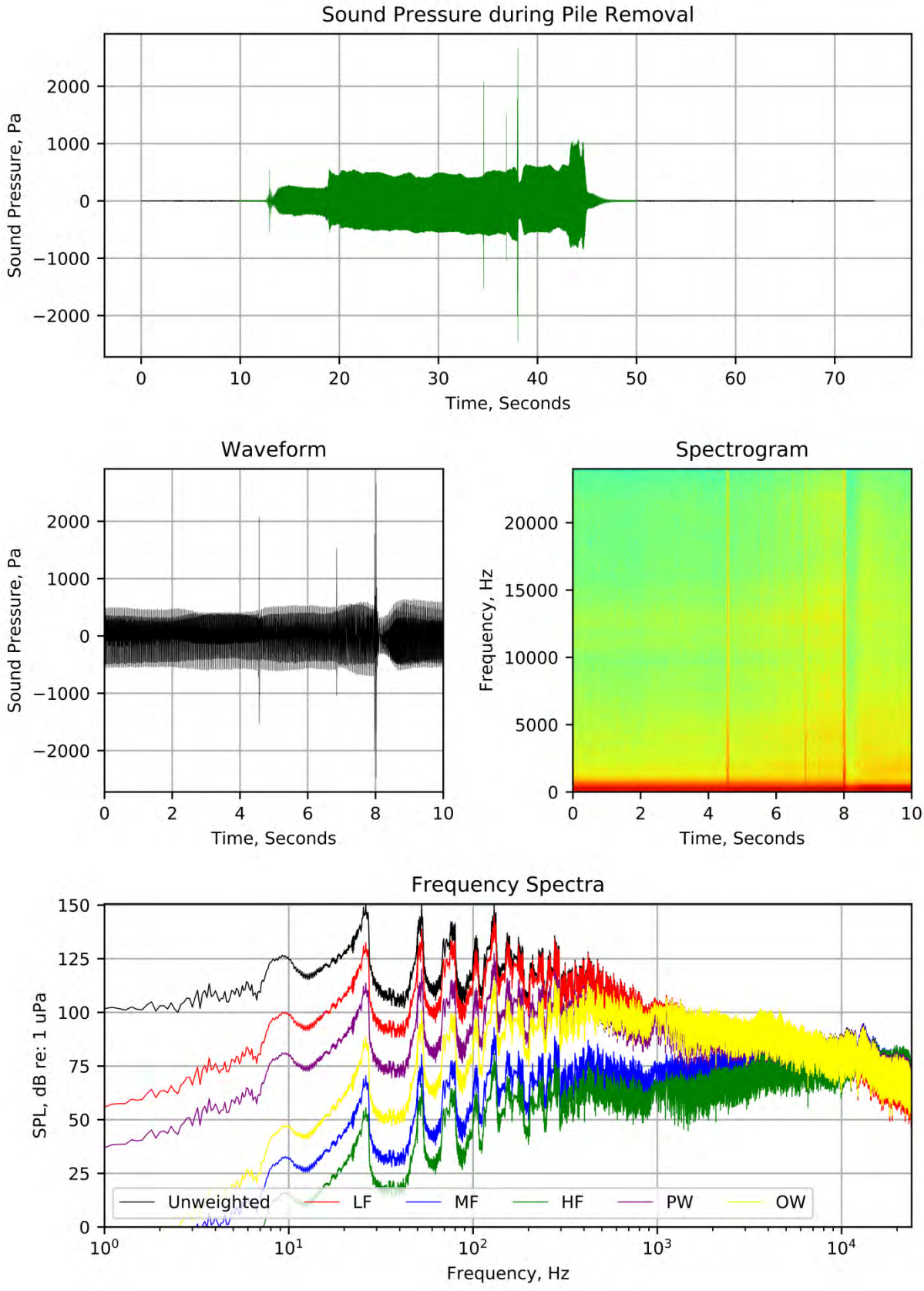
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	165	178	5.6	173	147	158	5.4	156	157	168	5.4	166
Low Frequency Cetacean	165	178	5.6	173	137	149	5.7	148	147	159	5.7	158
Mid Frequency Cetacean	165	178	5.6	173	141	152	5.4	150	151	162	5.4	160
High Frequency Cetacean	165	178	5.6	173	141	153	5.4	151	151	163	5.4	161
Phocid Pinnipeds	165	178	5.6	173	133	145	5.5	143	143	155	5.5	153
Otariid Pinnipeds	165	178	5.6	173	130	142	5.5	140	140	152	5.5	150
Lower Hydrophone												
Unweighted	173	187	6.4	182	160	167	2.7	165	170	177	2.7	175
Low Frequency Cetacean	173	187	6.4	182	146	156	4.5	154	156	166	4.5	164
Mid Frequency Cetacean	173	187	6.4	182	154	160	2.7	159	164	170	2.7	169
High Frequency Cetacean	173	187	6.4	182	155	161	2.7	159	165	171	2.7	169
Phocid Pinnipeds	173	187	6.4	182	145	152	3.2	150	155	162	3.2	160
Otariid Pinnipeds	173	187	6.4	182	142	149	3.1	147	152	159	3.1	157

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 16 (TP-16)

January 19, 2018

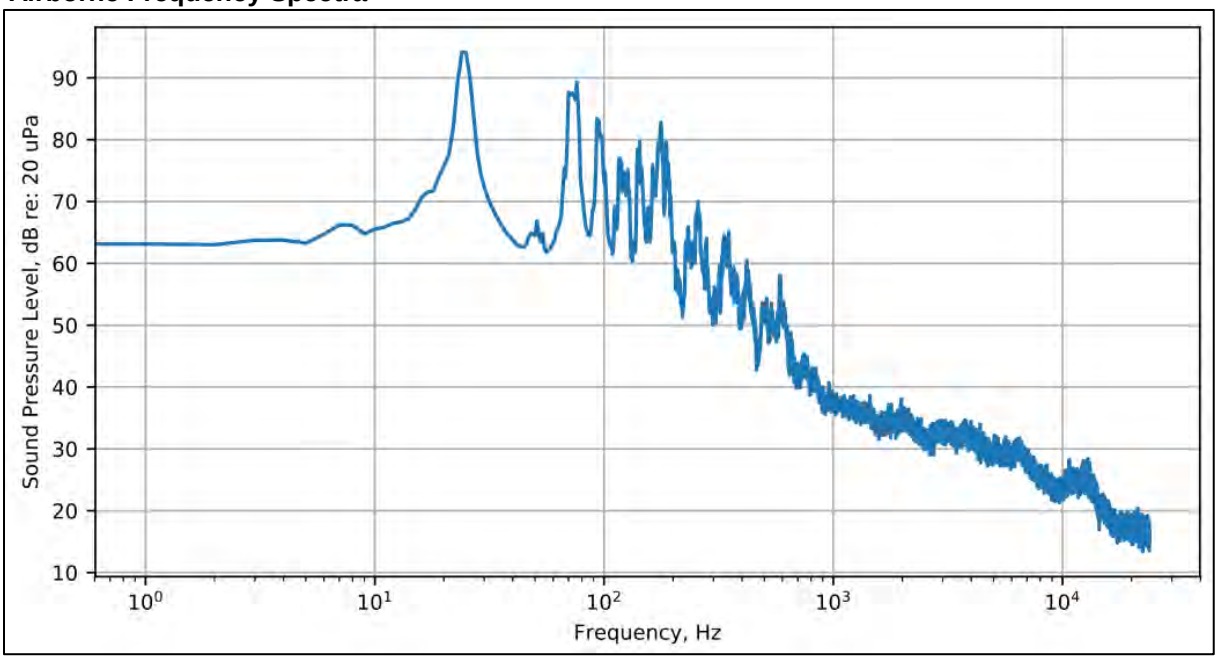
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	110	71

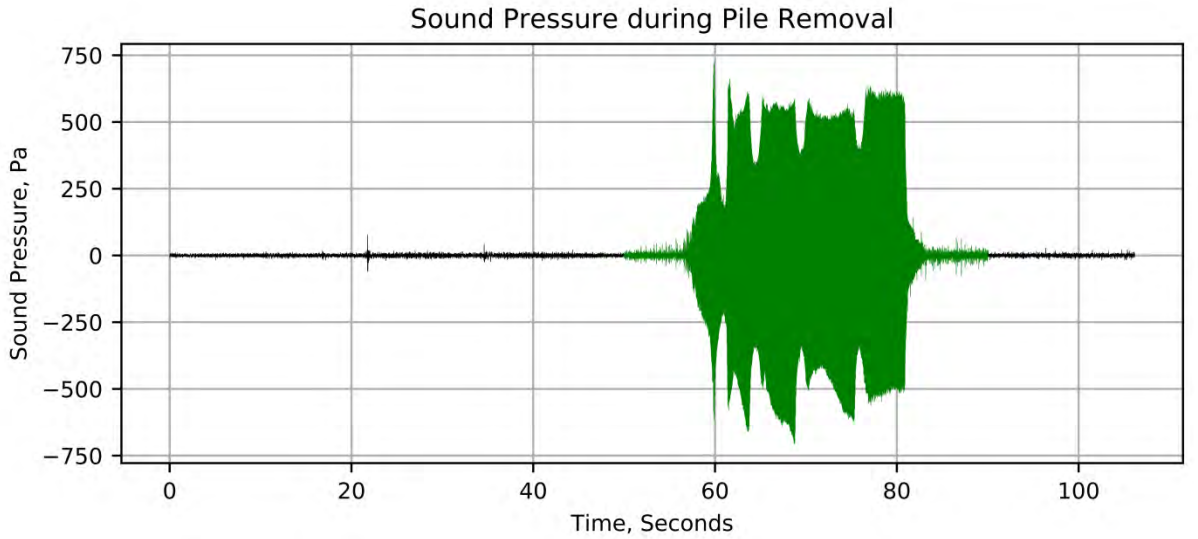
Airborne Frequency Spectra

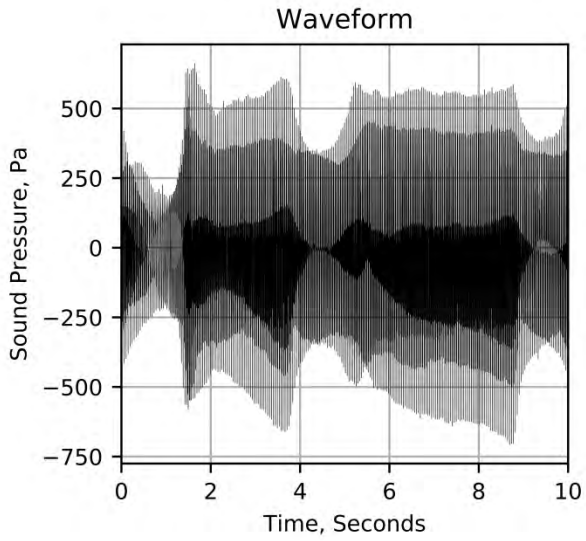


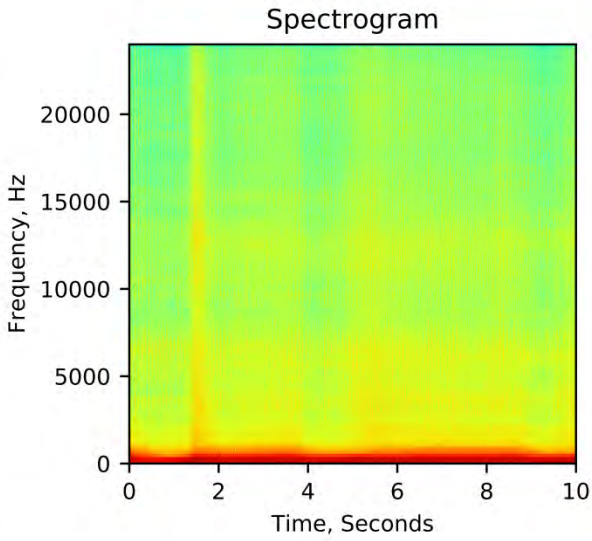
Underwater Sound Levels, dB re: 1 μPa

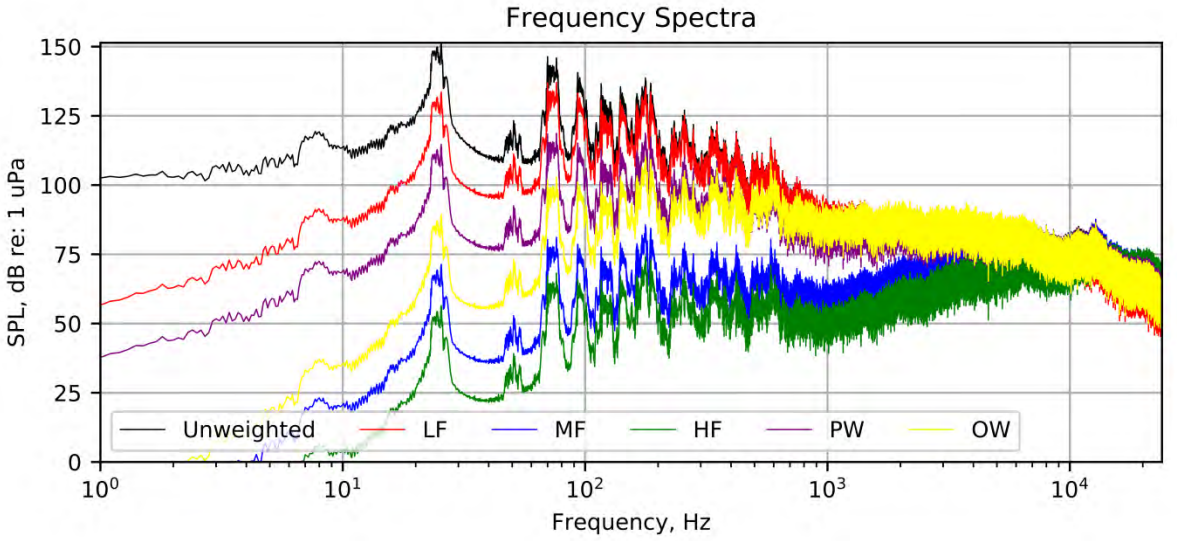
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	162	165	1.5	164	142	155	7.0	152	152	165	7.0	162
Low Frequency Cetacean	162	165	1.5	164	132	144	6.8	141	142	154	6.8	151
Mid Frequency Cetacean	162	165	1.5	164	135	149	6.9	146	145	159	6.9	156
High Frequency Cetacean	162	165	1.5	164	136	149	7.0	146	146	159	7.0	156
Phocid Pinnipeds	162	165	1.5	164	128	140	6.6	138	138	150	6.6	148
Otariid Pinnipeds	162	165	1.5	164	126	137	6.1	135	136	147	6.1	145
Lower Hydrophone												
Unweighted	176	177	0.6	176	158	169	5.5	166	168	179	5.5	176
Low Frequency Cetacean	176	177	0.6	176	144	156	6.2	153	154	166	6.2	163
Mid Frequency Cetacean	176	177	0.6	176	152	163	5.5	159	162	173	5.5	169
High Frequency Cetacean	176	177	0.6	176	152	163	5.5	160	162	173	5.5	170
Phocid Pinnipeds	176	177	0.6	176	143	154	5.6	151	153	164	5.6	161
Otariid Pinnipeds	176	177	0.6	176	140	151	5.5	147	150	161	5.5	157

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 17 (TP-17)

January 19, 2018

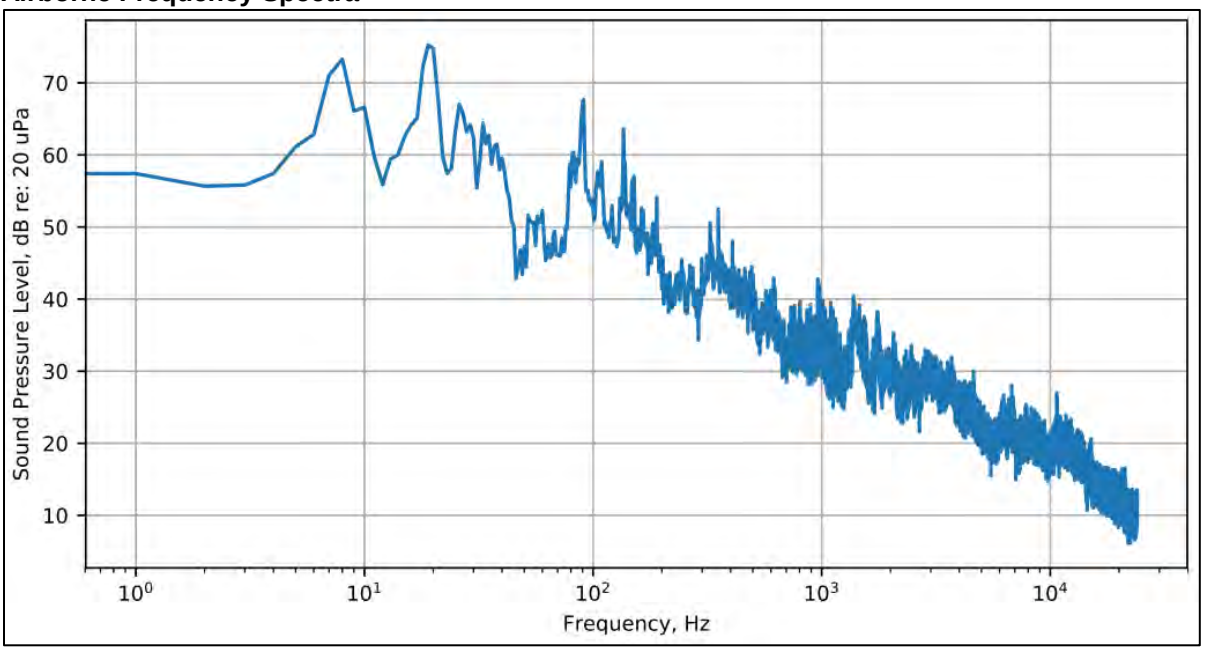
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
74	98	67

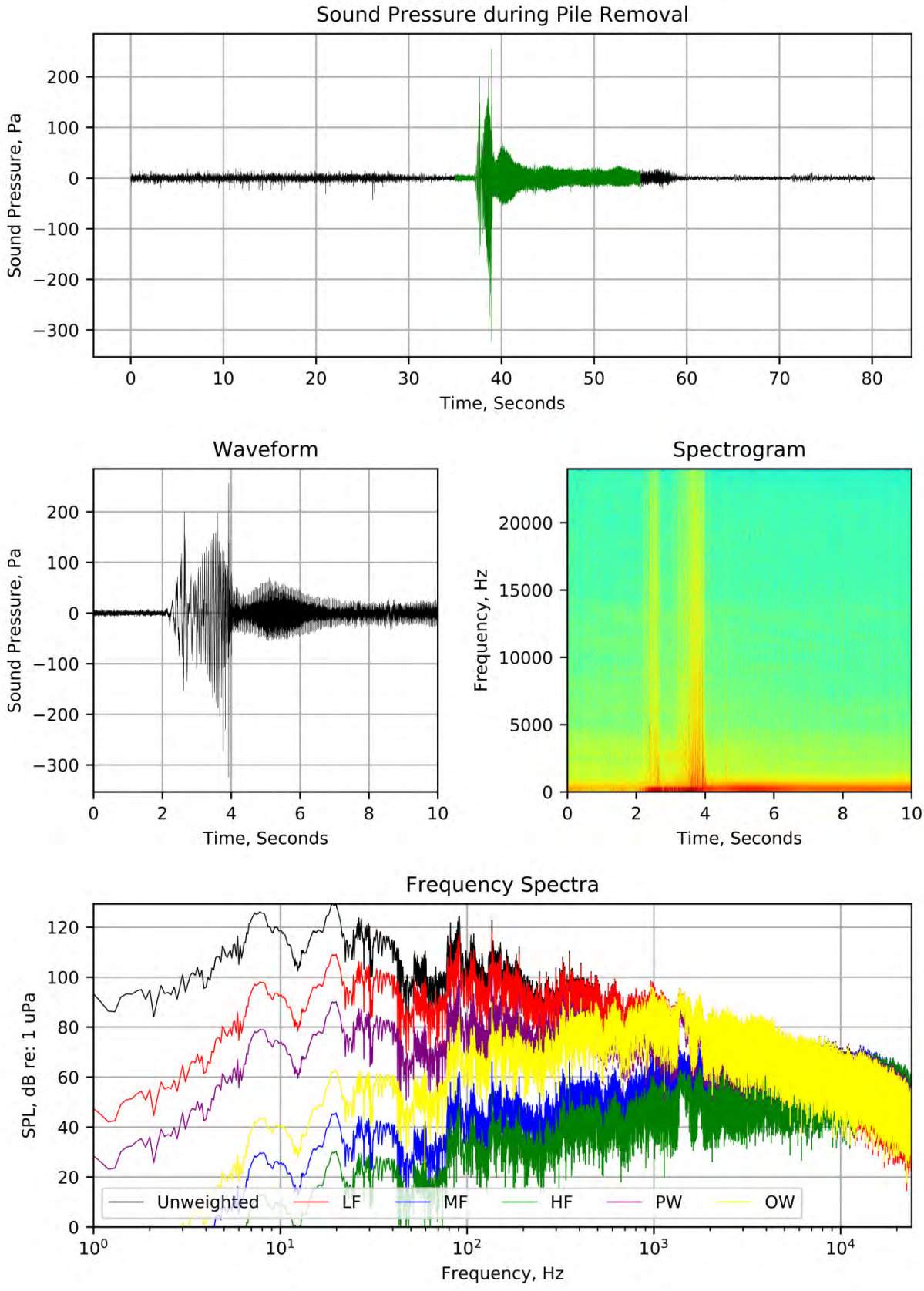
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	140	163	15.9	160	128	136	5.4	134	138	146	5.4	144
Low Frequency Cetacean	140	163	15.9	160	119	127	5.4	125	129	137	5.4	135
Mid Frequency Cetacean	140	163	15.9	160	122	130	5.6	128	132	140	5.6	138
High Frequency Cetacean	140	163	15.9	160	123	130	5.5	128	133	140	5.5	138
Phocid Pinnipeds	140	163	15.9	160	115	125	7.0	122	125	135	7.0	132
Otariid Pinnipeds	140	163	15.9	160	112	124	8.4	122	122	134	8.4	132
Lower Hydrophone												
Unweighted	149	168	13.6	165	137	150	9.0	147	147	160	9.0	157
Low Frequency Cetacean	149	168	13.6	165	127	135	6.0	133	137	145	6.0	143
Mid Frequency Cetacean	149	168	13.6	165	131	143	9.0	141	141	153	9.0	151
High Frequency Cetacean	149	168	13.6	165	131	144	9.0	141	141	154	9.0	151
Phocid Pinnipeds	149	168	13.6	165	123	135	8.5	132	133	145	8.5	142
Otariid Pinnipeds	149	168	13.6	165	120	133	9.1	130	130	143	9.1	140

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 18 (TP-18)

January 19, 2018

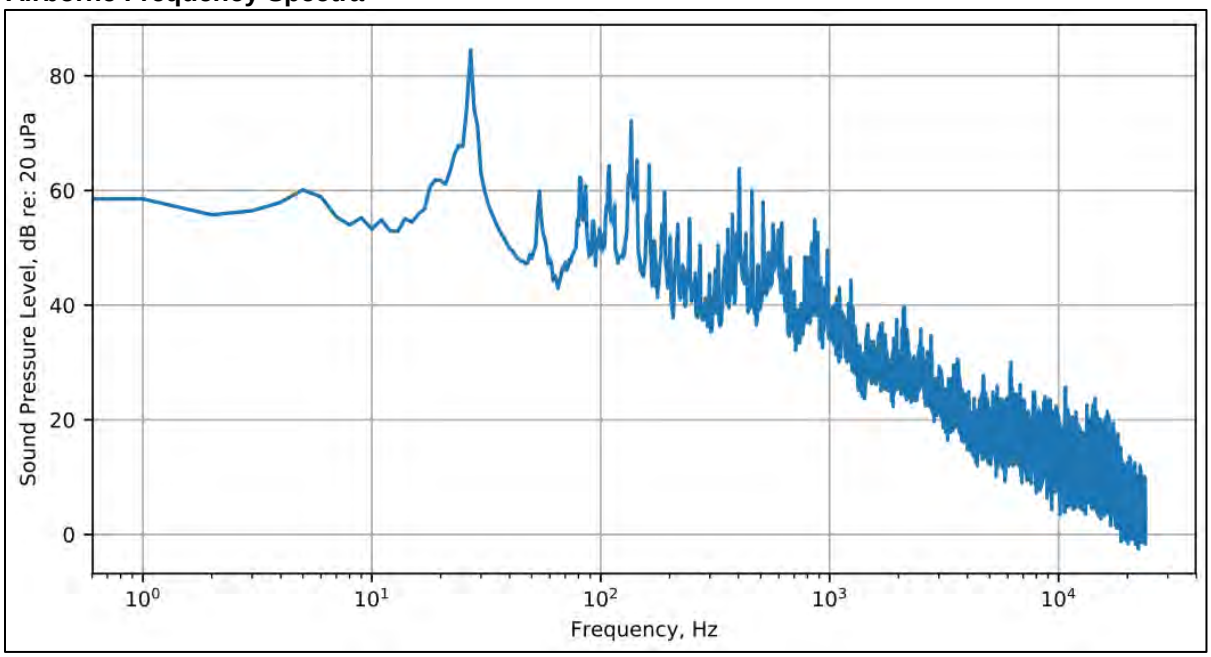
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
73	94	64

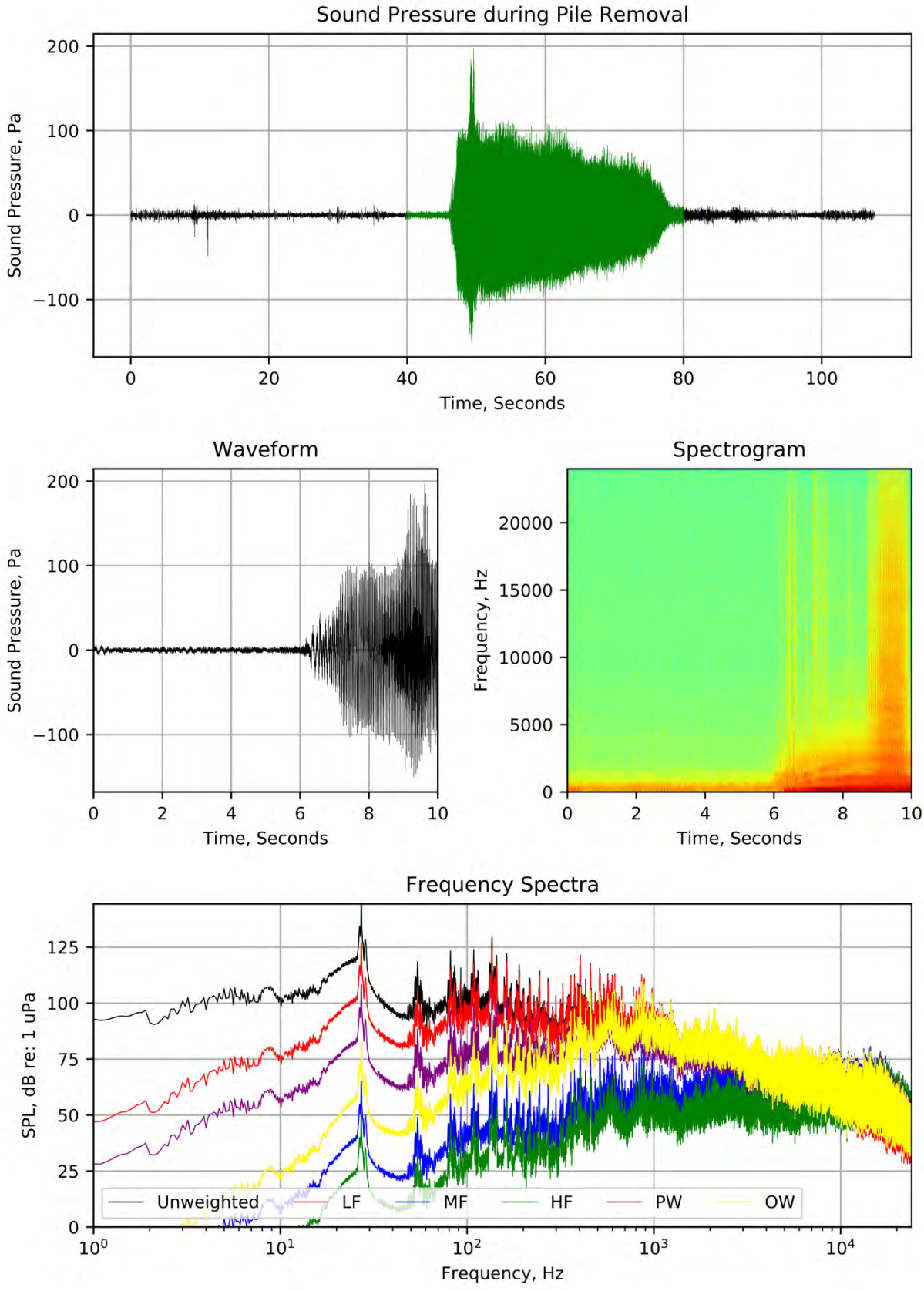
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	145	165	8.9	159	131	140	3.7	137	141	150	3.7	147
Low Frequency Cetacean	145	165	8.9	159	124	131	3.1	129	134	141	3.1	139
Mid Frequency Cetacean	145	165	8.9	159	125	133	4.0	131	135	143	4.0	141
High Frequency Cetacean	145	165	8.9	159	125	134	3.9	132	135	144	3.9	142
Phocid Pinnipeds	145	165	8.9	159	120	130	4.2	127	130	140	4.2	137
Otariid Pinnipeds	145	165	8.9	159	120	130	4.2	126	130	140	4.2	136
Lower Hydrophone												
Unweighted	157	166	3.5	162	146	153	2.8	150	156	163	2.8	160
Low Frequency Cetacean	157	166	3.5	162	134	140	2.3	137	144	150	2.3	147
Mid Frequency Cetacean	157	166	3.5	162	140	146	2.8	144	150	156	2.8	154
High Frequency Cetacean	157	166	3.5	162	141	147	2.8	145	151	157	2.8	155
Phocid Pinnipeds	157	166	3.5	162	132	138	2.4	136	142	148	2.4	146
Otariid Pinnipeds	157	166	3.5	162	131	135	2.0	133	141	145	2.0	143

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 19 (TP-19)

January 19, 2018

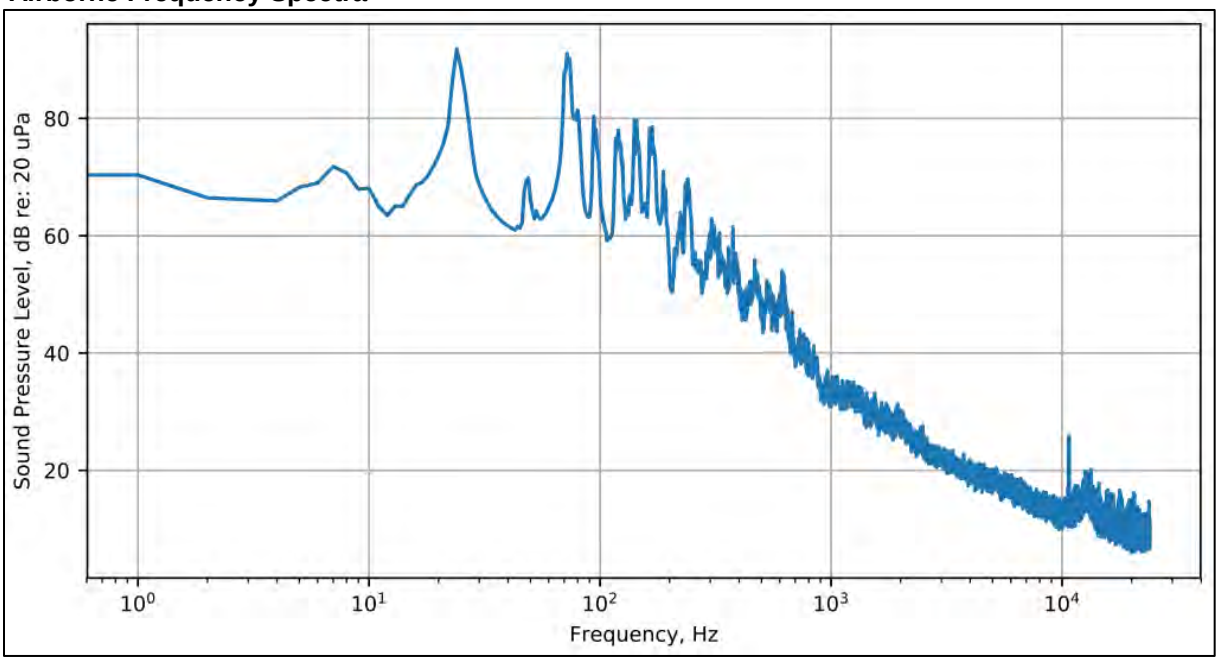
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
79	108	64

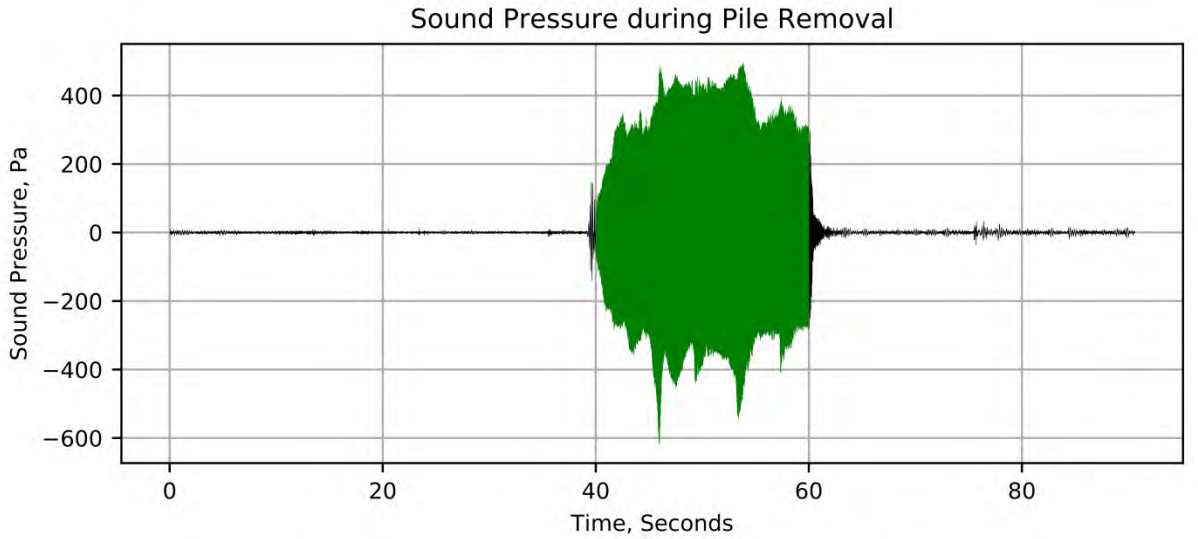
Airborne Frequency Spectra

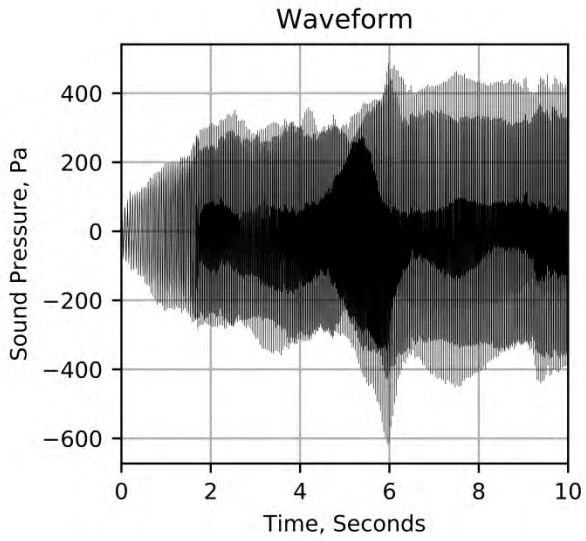


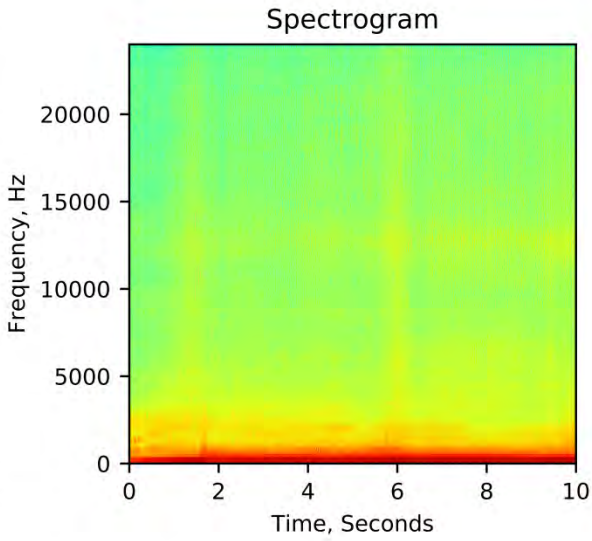
Underwater Sound Levels, dB re: 1 μPa

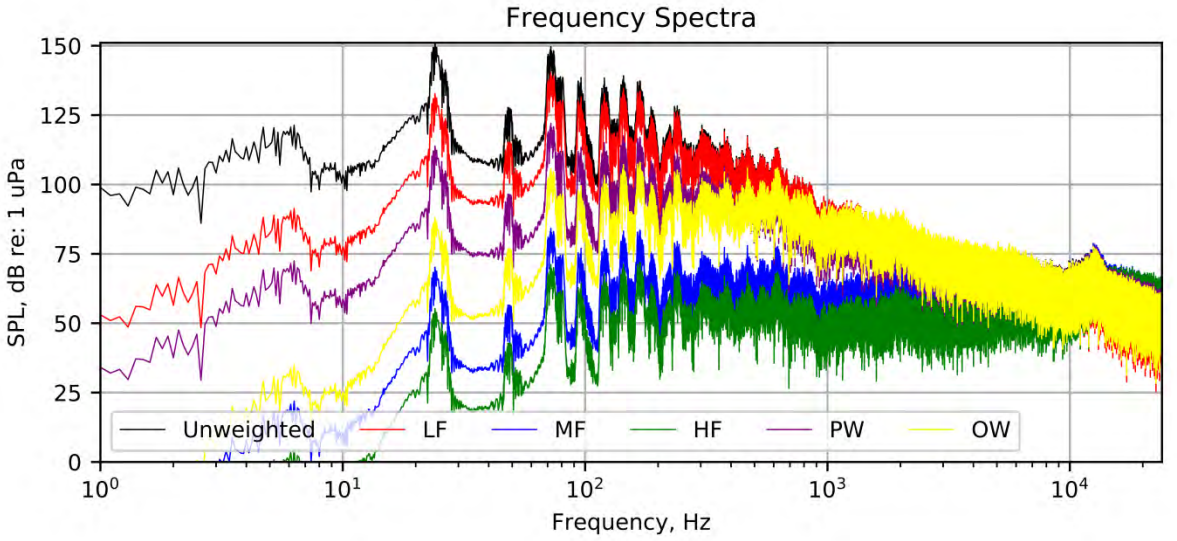
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	163	165	1.2	164	154	154	0.2	154	164	164	0.2	164
Low Frequency Cetacean	163	165	1.2	164	143	143	0.1	143	153	153	0.1	153
Mid Frequency Cetacean	163	165	1.2	164	148	148	0.2	148	158	158	0.2	158
High Frequency Cetacean	163	165	1.2	164	148	149	0.2	149	158	159	0.2	159
Phocid Pinnipeds	163	165	1.2	164	139	140	0.2	139	149	150	0.2	149
Otariid Pinnipeds	163	165	1.2	164	136	136	0.2	136	146	146	0.2	146
Lower Hydrophone												
Unweighted	174	174	0.1	174	166	166	0.4	166	176	176	0.4	176
Low Frequency Cetacean	174	174	0.1	174	153	154	0.7	154	163	164	0.7	164
Mid Frequency Cetacean	174	174	0.1	174	159	160	0.4	160	169	170	0.4	170
High Frequency Cetacean	174	174	0.1	174	160	161	0.4	160	170	171	0.4	170
Phocid Pinnipeds	174	174	0.1	174	150	151	0.5	151	160	161	0.5	161
Otariid Pinnipeds	174	174	0.1	174	147	148	0.4	148	157	158	0.4	158

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 20 (TP-20)

January 19, 2018

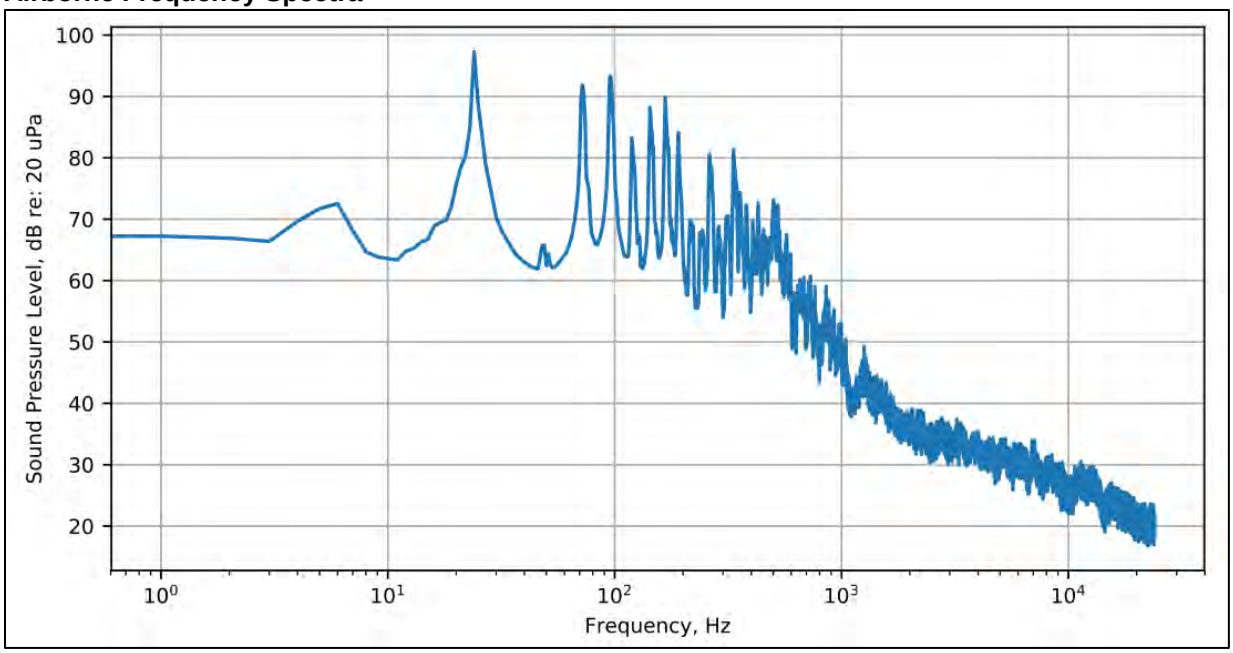
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	210	44	44

Airborne Sound Levels, dB re: 20 µPa

Median	Maximum	Minimum
82	111	70

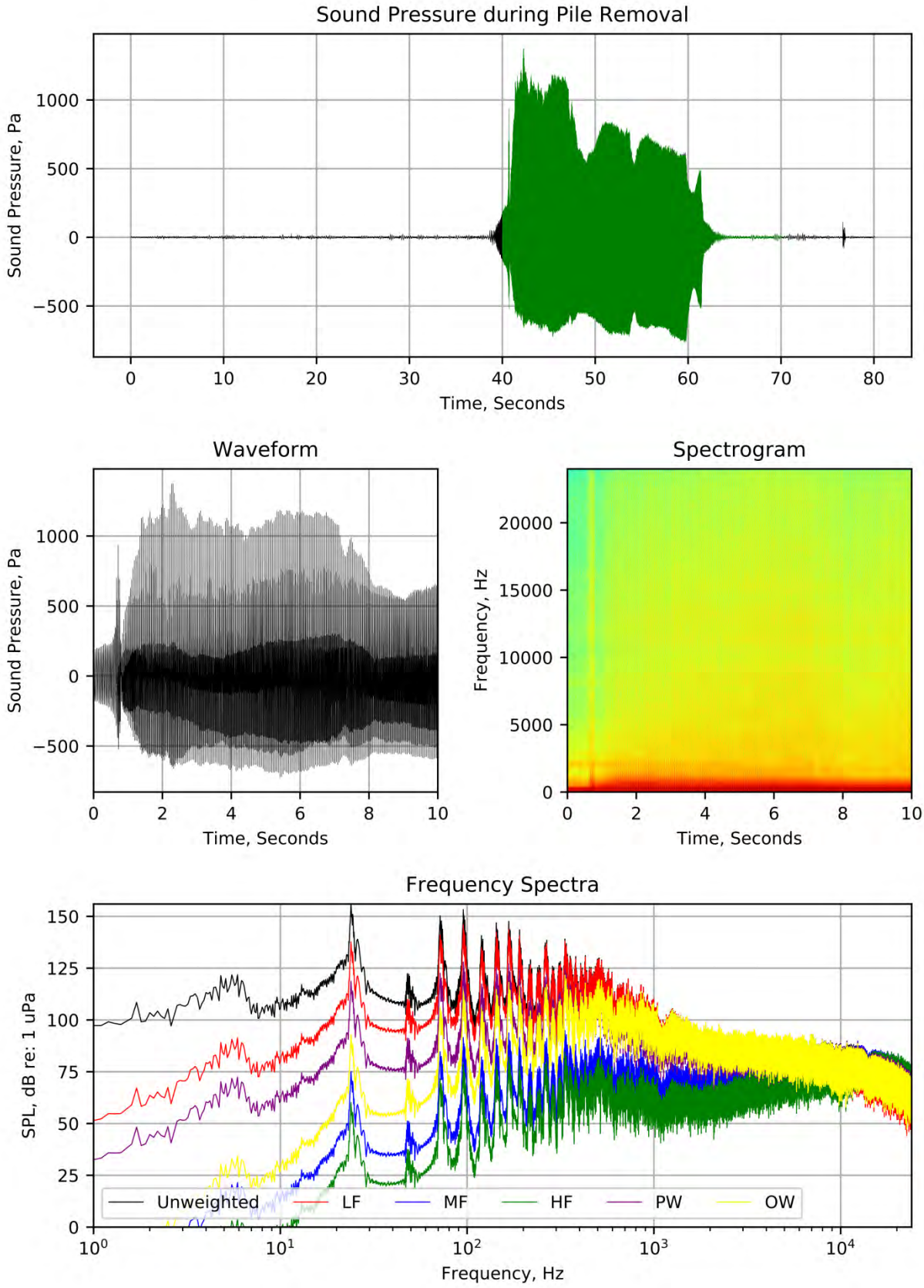
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 µPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	163	171	4.0	169	143	158	8.2	156	153	168	8.2	166
Low Frequency Cetacean	163	171	4.0	169	134	150	8.9	148	144	160	8.9	158
Mid Frequency Cetacean	163	171	4.0	169	137	151	8.2	149	147	161	8.2	159
High Frequency Cetacean	163	171	4.0	169	138	152	8.2	150	148	162	8.2	160
Phocid Pinnipeds	163	171	4.0	169	130	145	8.5	143	140	155	8.5	153
Otariid Pinnipeds	163	171	4.0	169	127	143	8.6	140	137	153	8.6	150
Lower Hydrophone												
Unweighted	174	183	4.5	180	159	170	6.3	168	169	180	6.3	178
Low Frequency Cetacean	174	183	4.5	180	146	160	8.0	158	156	170	8.0	168
Mid Frequency Cetacean	174	183	4.5	180	152	164	6.3	162	162	174	6.3	172
High Frequency Cetacean	174	183	4.5	180	153	164	6.3	162	163	174	6.3	172
Phocid Pinnipeds	174	183	4.5	180	143	156	6.8	154	153	166	6.8	164
Otariid Pinnipeds	174	183	4.5	180	140	152	6.8	151	150	162	6.8	161

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 21 (TP-21)

January 19, 2018

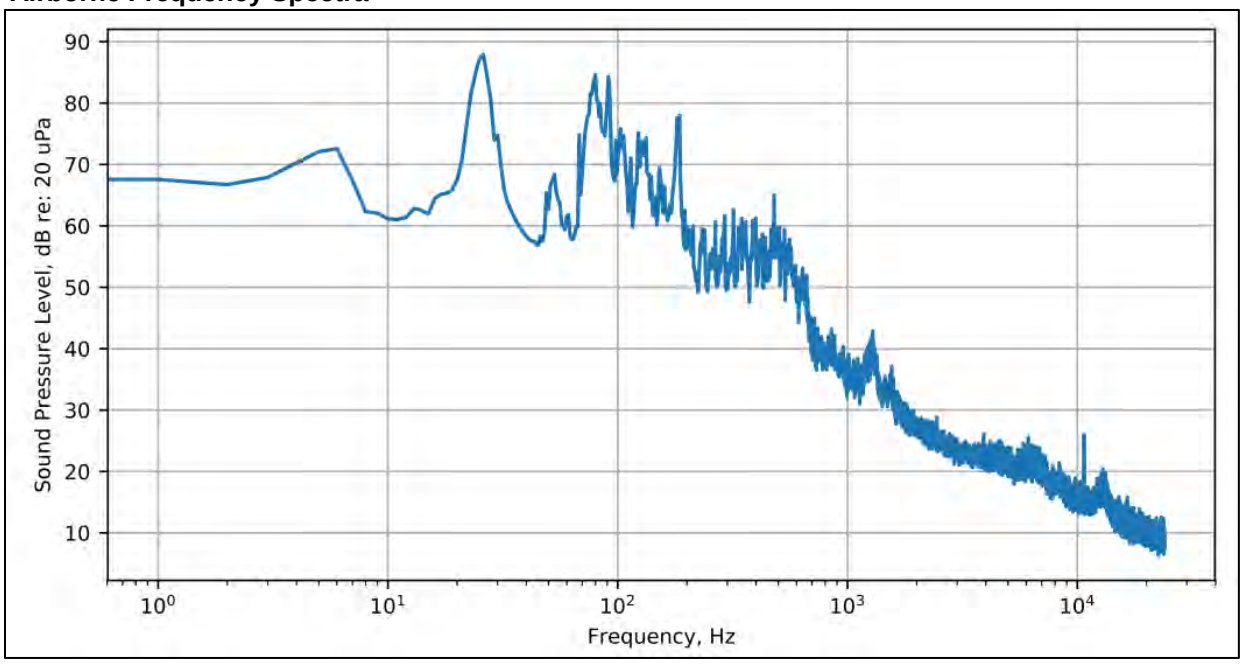
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	2104	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
79	107	71

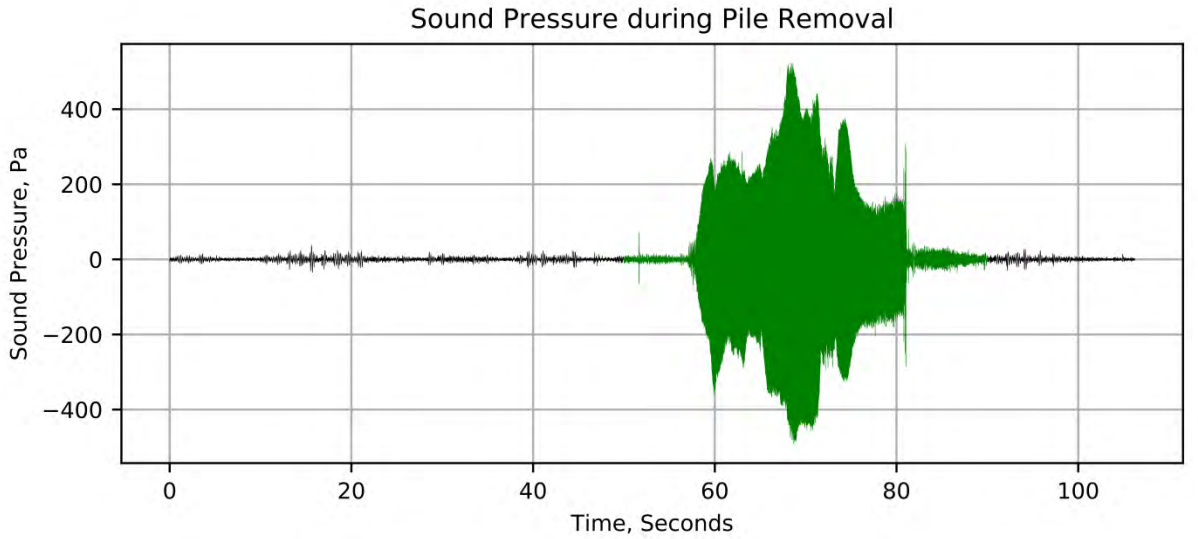
Airborne Frequency Spectra

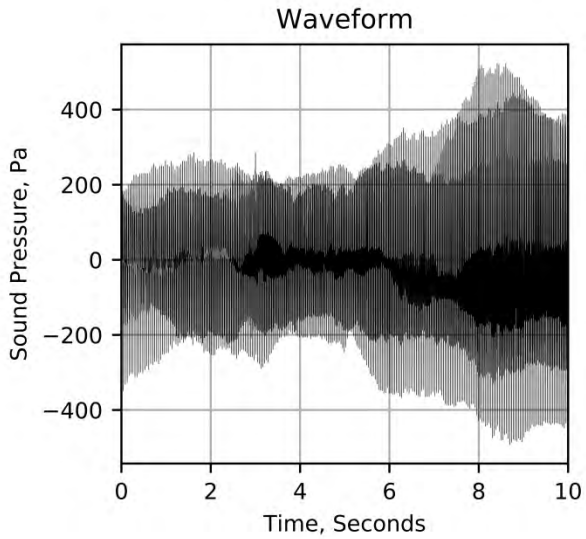


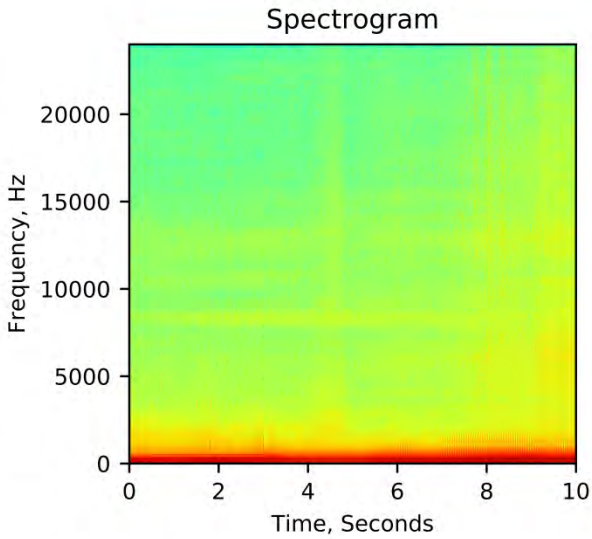
Underwater Sound Levels, dB re: 1 μPa

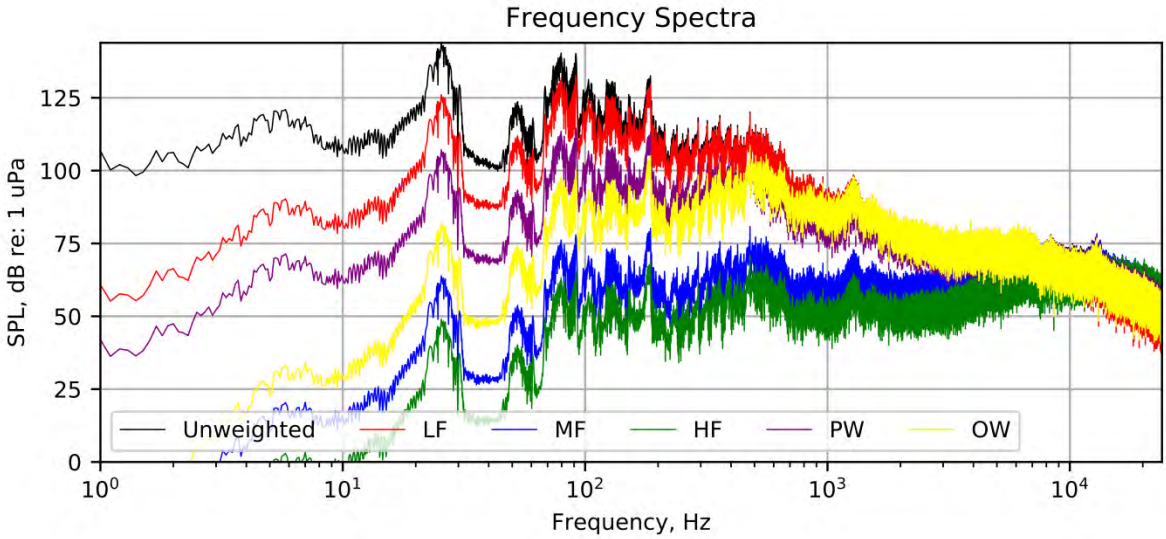
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	155	167	5.9	165	135	152	8.8	148	145	162	8.8	158
Low Frequency Cetacean	155	167	5.9	165	124	143	9.2	139	134	153	9.2	149
Mid Frequency Cetacean	155	167	5.9	165	129	146	8.7	142	139	156	8.7	152
High Frequency Cetacean	155	167	5.9	165	130	146	8.7	142	140	156	8.7	152
Phocid Pinnipeds	155	167	5.9	165	121	138	8.5	134	131	148	8.5	144
Otariid Pinnipeds	155	167	5.9	165	119	136	8.1	132	129	146	8.1	142
Lower Hydrophone												
Unweighted	169	174	2.7	172	147	164	7.7	161	157	174	7.7	171
Low Frequency Cetacean	169	174	2.7	172	137	152	8.1	149	147	162	8.1	159
Mid Frequency Cetacean	169	174	2.7	172	141	158	7.7	154	151	168	7.7	164
High Frequency Cetacean	169	174	2.7	172	142	158	7.7	155	152	168	7.7	165
Phocid Pinnipeds	169	174	2.7	172	133	149	7.5	146	143	159	7.5	156
Otariid Pinnipeds	169	174	2.7	172	131	146	7.0	143	141	156	7.0	153

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 22 (TP-22)

January 19, 2018

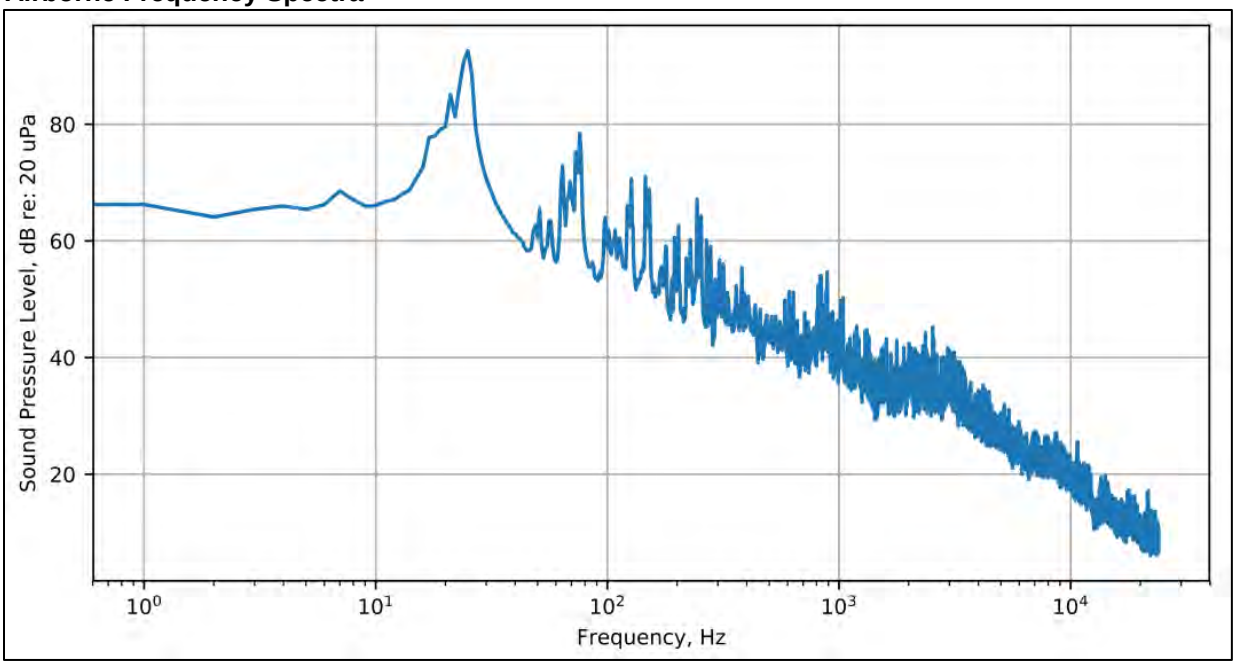
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/41	38	33	210	44	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
78	108	70

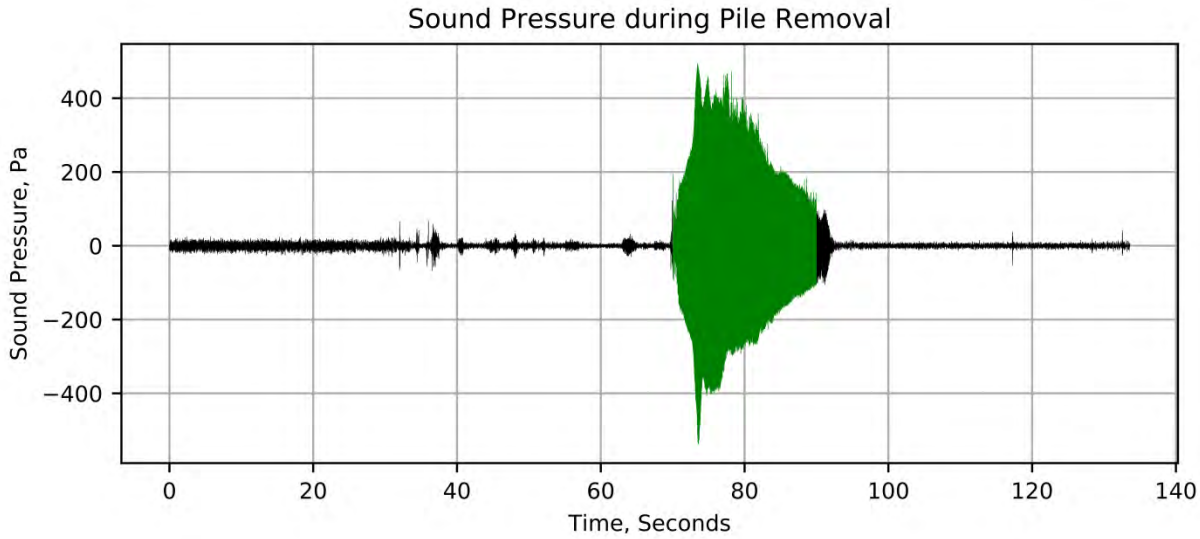
Airborne Frequency Spectra

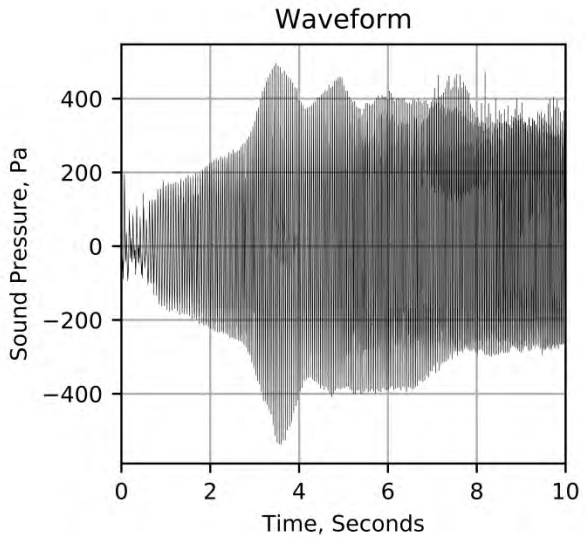


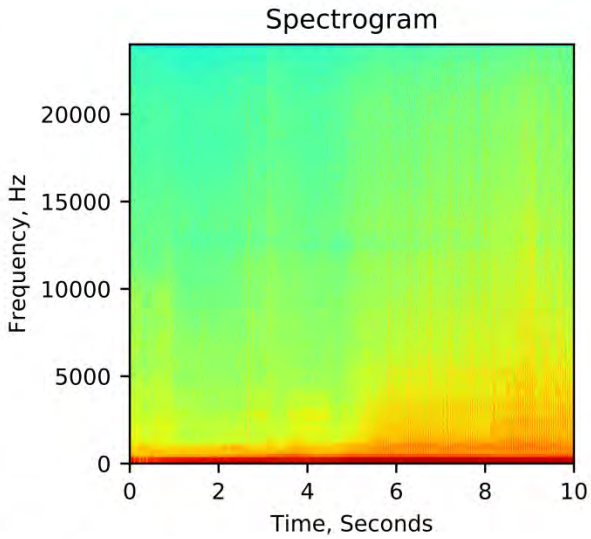
Underwater Sound Levels, dB re: 1 μPa

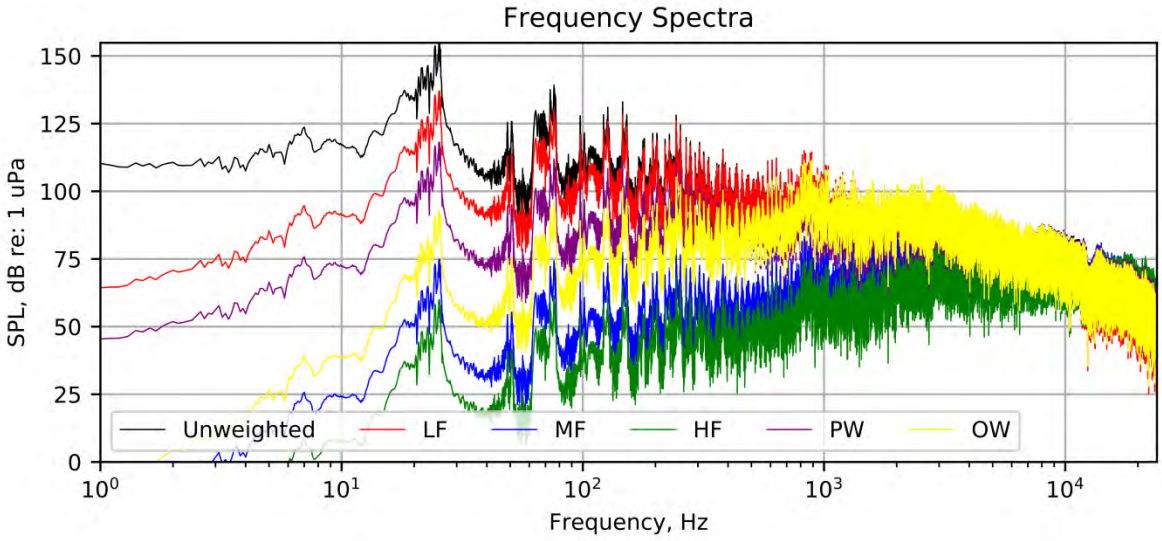
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	164	167	2.4	166	149	153	2.4	152	159	163	2.4	162
Low Frequency Cetacean	164	167	2.4	166	140	143	2.2	142	150	153	2.2	152
Mid Frequency Cetacean	164	167	2.4	166	143	147	2.4	145	153	157	2.4	155
High Frequency Cetacean	164	167	2.4	166	144	147	2.4	146	154	157	2.4	156
Phocid Pinnipeds	164	167	2.4	166	137	140	2.0	139	147	150	2.0	149
Otariid Pinnipeds	164	167	2.4	166	136	139	1.9	138	146	149	1.9	148
Lower Hydrophone												
Unweighted	172	174	1.6	173	163	166	2.4	165	173	176	2.4	175
Low Frequency Cetacean	172	174	1.6	173	147	150	2.1	148	157	160	2.1	158
Mid Frequency Cetacean	172	174	1.6	173	156	160	2.4	158	166	170	2.4	168
High Frequency Cetacean	172	174	1.6	173	157	160	2.4	159	167	170	2.4	169
Phocid Pinnipeds	172	174	1.6	173	147	150	2.3	149	157	160	2.3	159
Otariid Pinnipeds	172	174	1.6	173	145	148	2.3	146	155	158	2.3	156

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 23 (TP-23)

January 19, 2018

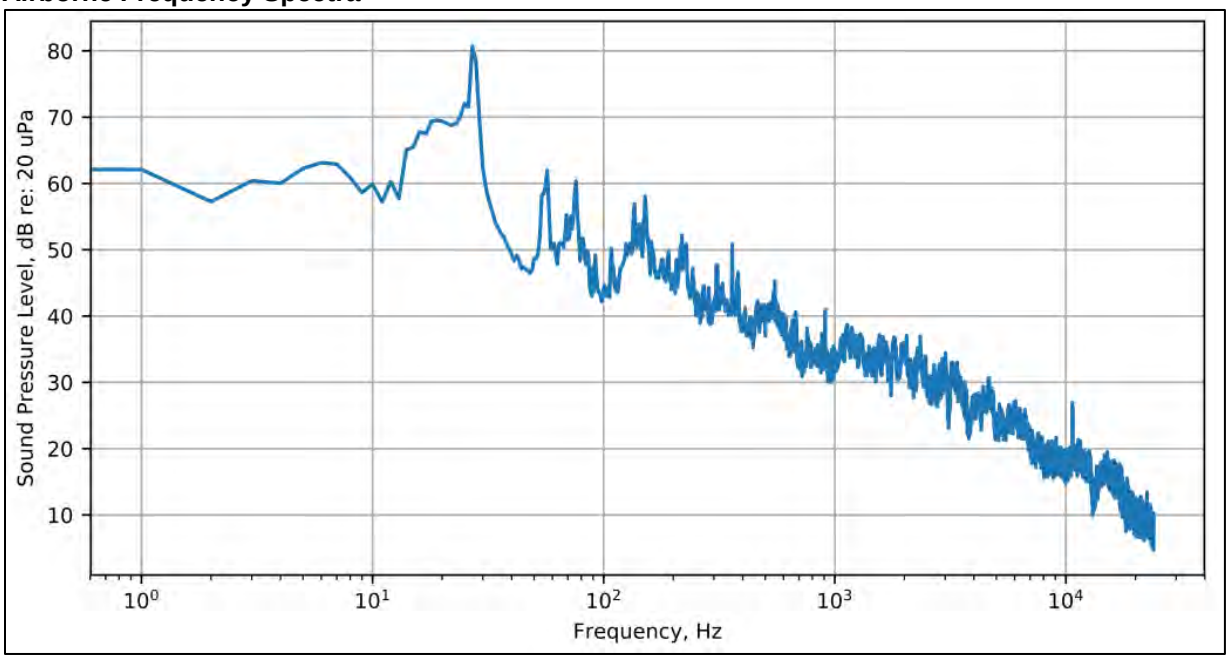
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	33	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	104	72

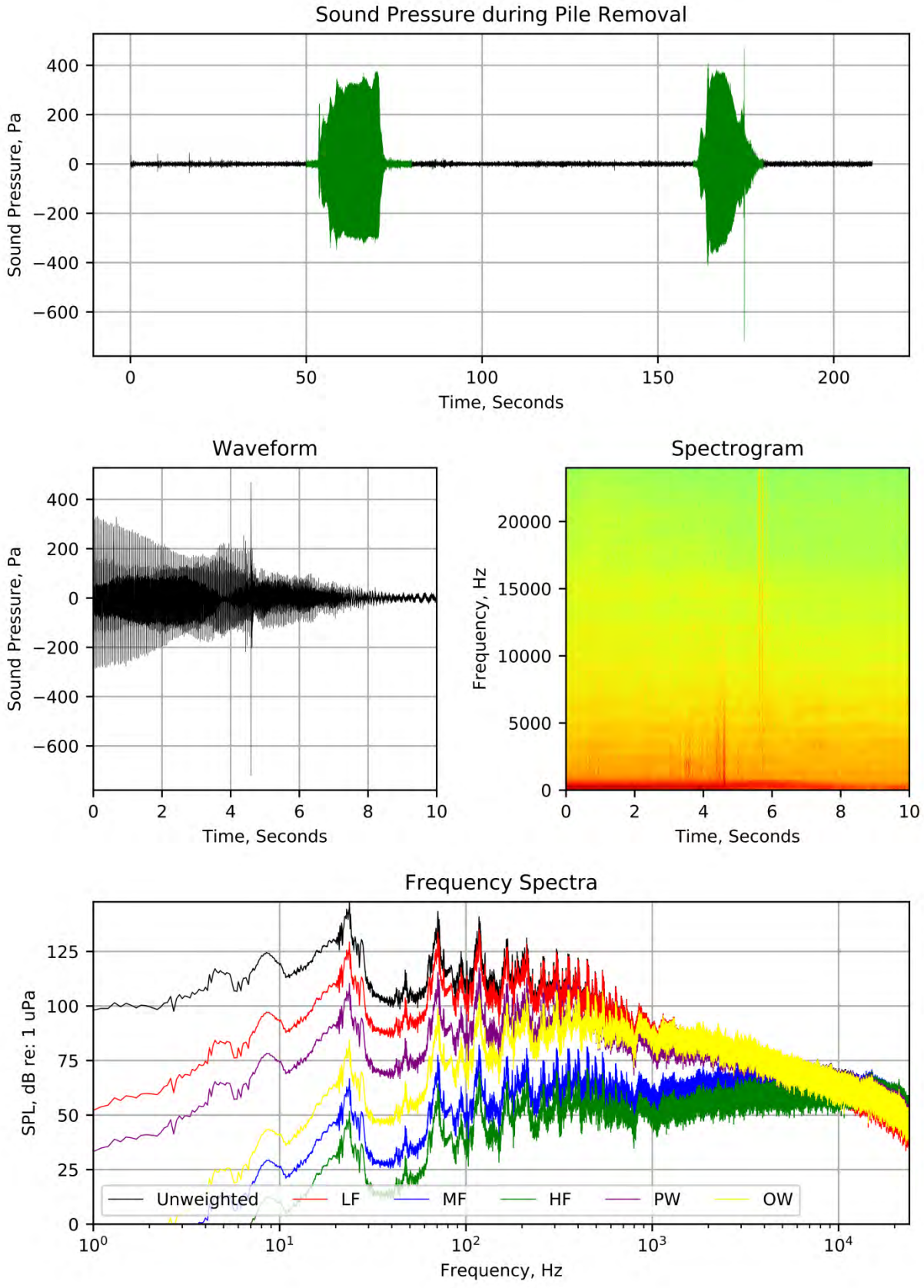
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	161	166	1.9	164	144	155	4.1	152	154	165	4.1	162
Low Frequency Cetacean	161	166	1.9	164	134	145	4.2	142	144	155	4.2	152
Mid Frequency Cetacean	161	166	1.9	164	138	149	4.1	145	148	159	4.1	155
High Frequency Cetacean	161	166	1.9	164	139	150	4.1	146	149	160	4.1	156
Phocid Pinnipeds	161	166	1.9	164	130	141	4.1	137	140	151	4.1	147
Otariid Pinnipeds	161	166	1.9	164	127	138	4.1	134	137	148	4.1	144
Lower Hydrophone												
Unweighted	171	173	1.0	172	154	163	3.6	160	164	173	3.6	170
Low Frequency Cetacean	171	173	1.0	172	140	152	4.2	148	150	162	4.2	158
Mid Frequency Cetacean	171	173	1.0	172	147	156	3.6	153	157	166	3.6	163
High Frequency Cetacean	171	173	1.0	172	148	157	3.6	154	158	167	3.6	164
Phocid Pinnipeds	171	173	1.0	172	138	148	3.7	145	148	158	3.7	155
Otariid Pinnipeds	171	173	1.0	172	135	145	3.6	142	145	155	3.6	152

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 24 (TP-24)

January 19, 2018

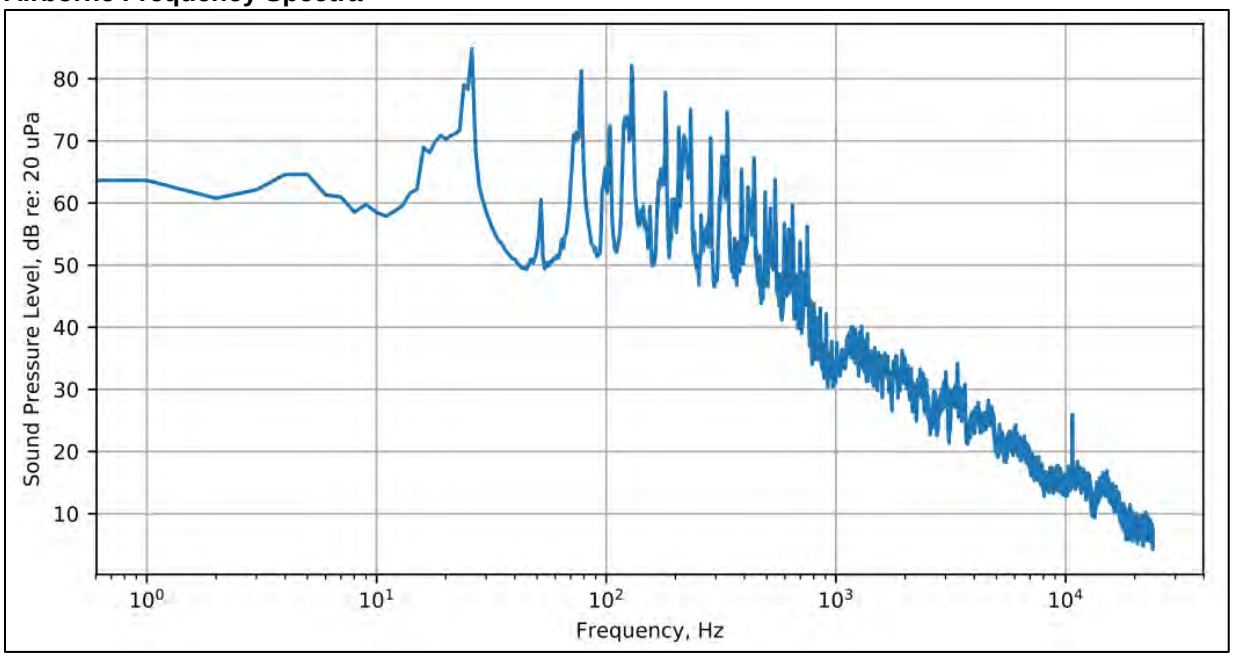
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	33	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	103	69

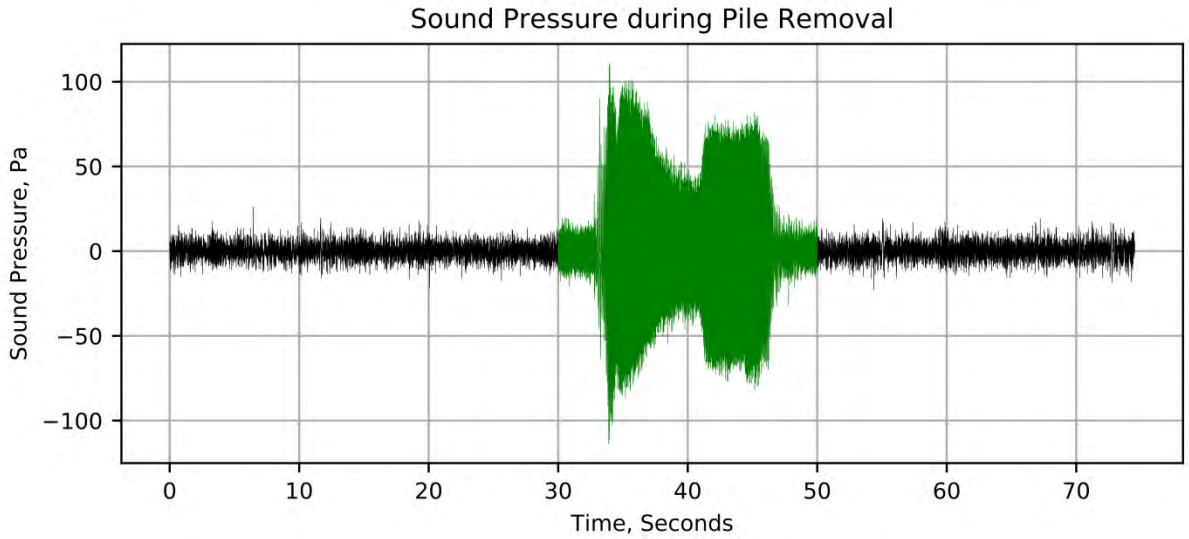
Airborne Frequency Spectra

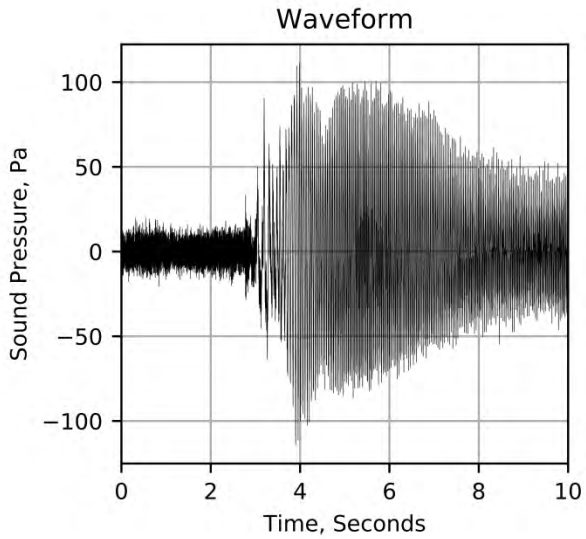


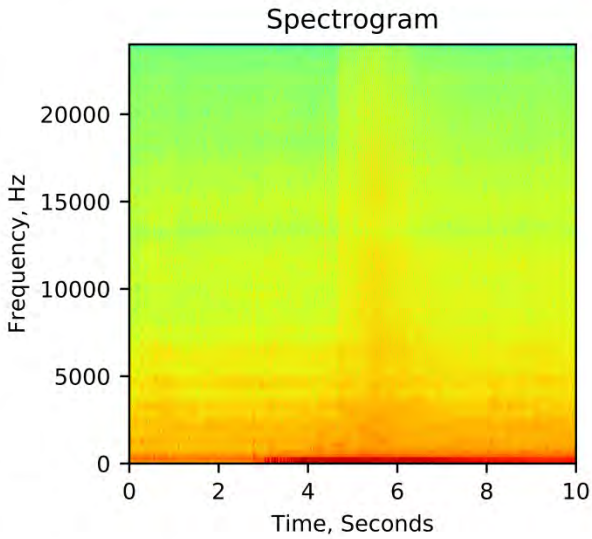
Underwater Sound Levels, dB re: 1 μPa

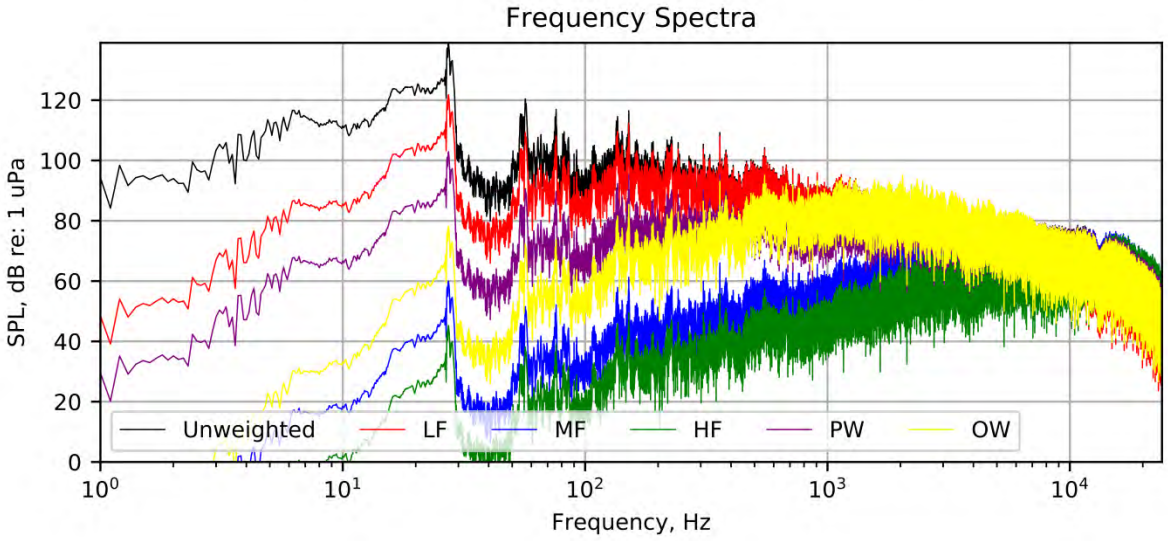
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	149	157	5.1	154	133	135	1.6	134	143	145	1.6	144
Low Frequency Cetacean	149	157	5.1	154	126	127	1.1	126	136	137	1.1	136
Mid Frequency Cetacean	149	157	5.1	154	127	129	1.6	128	137	139	1.6	138
High Frequency Cetacean	149	157	5.1	154	127	130	1.6	129	137	140	1.6	139
Phocid Pinnipeds	149	157	5.1	154	124	126	1.3	125	134	136	1.3	135
Otariid Pinnipeds	149	157	5.1	154	124	126	1.3	125	134	136	1.3	135
Lower Hydrophone												
Unweighted	158	161	1.9	160	150	150	0.1	150	160	160	0.1	160
Low Frequency Cetacean	158	161	1.9	160	134	134	0.3	134	144	144	0.3	144
Mid Frequency Cetacean	158	161	1.9	160	143	143	0.1	143	153	153	0.1	153
High Frequency Cetacean	158	161	1.9	160	144	144	0.1	144	154	154	0.1	154
Phocid Pinnipeds	158	161	1.9	160	134	135	0.2	134	144	145	0.2	144
Otariid Pinnipeds	158	161	1.9	160	132	132	0.2	132	142	142	0.2	142

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 25 (TP-25)

January 19, 2018

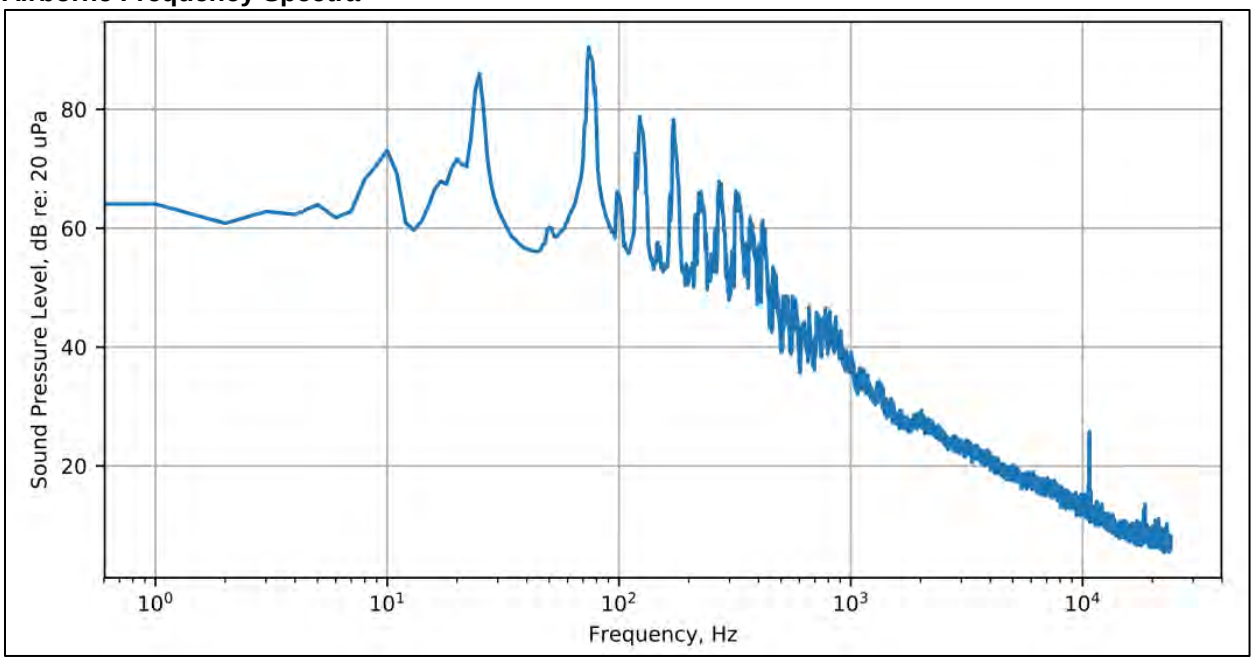
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	33	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	104	68

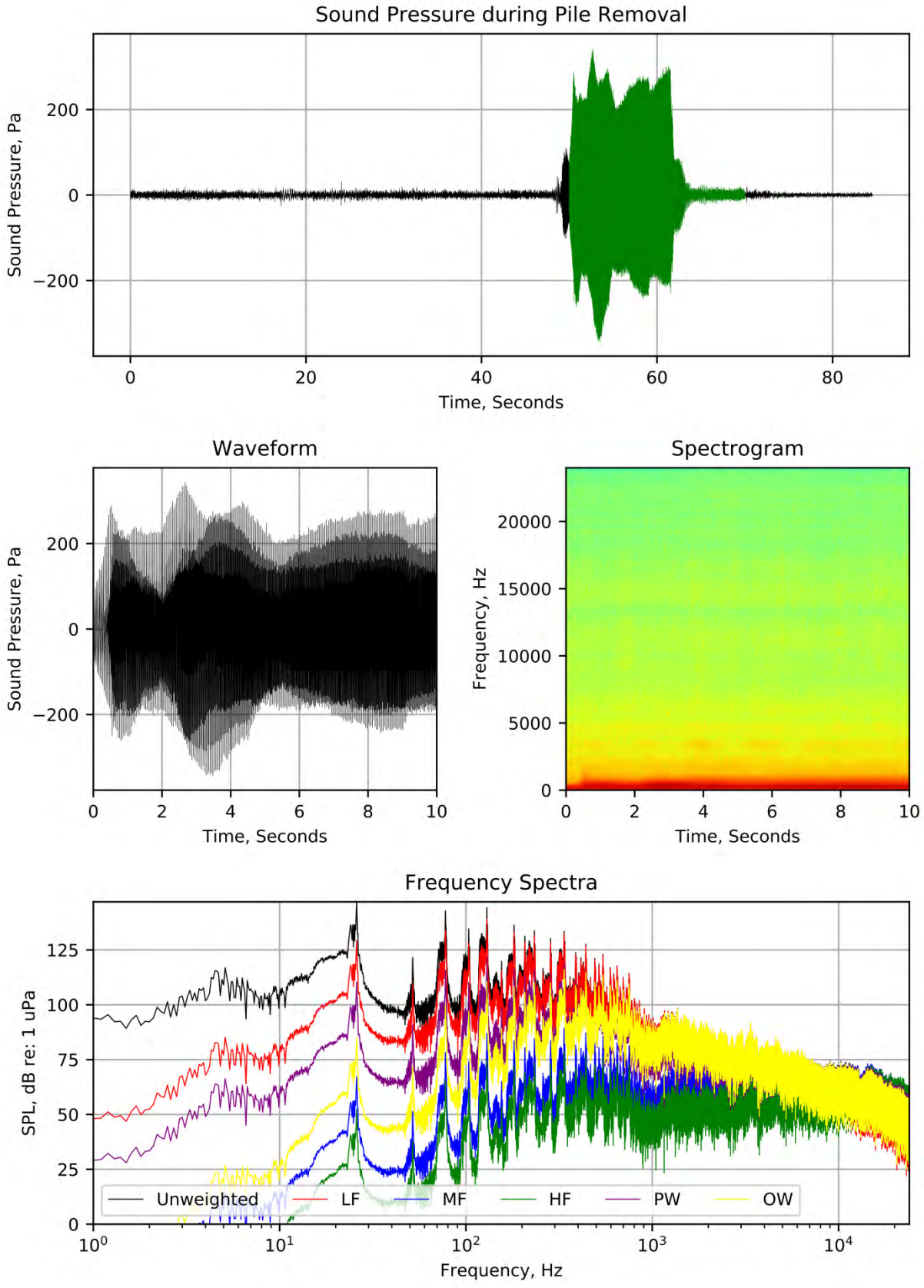
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	164	165	0.3	165	147	154	5.0	152	157	164	5.0	162
Low Frequency Cetacean	164	165	0.3	165	138	145	4.7	143	148	155	4.7	153
Mid Frequency Cetacean	164	165	0.3	165	140	147	5.0	145	150	157	5.0	155
High Frequency Cetacean	164	165	0.3	165	141	148	5.0	146	151	158	5.0	156
Phocid Pinnipeds	164	165	0.3	165	133	140	4.7	138	143	150	4.7	148
Otariid Pinnipeds	164	165	0.3	165	131	137	4.5	135	141	147	4.5	145
Lower Hydrophone												
Unweighted	170	171	0.8	170	154	161	4.6	158	164	171	4.6	168
Low Frequency Cetacean	170	171	0.8	170	144	151	5.0	149	154	161	5.0	159
Mid Frequency Cetacean	170	171	0.8	170	148	154	4.6	152	158	164	4.6	162
High Frequency Cetacean	170	171	0.8	170	148	155	4.6	153	158	165	4.6	163
Phocid Pinnipeds	170	171	0.8	170	140	147	4.8	144	150	157	4.8	154
Otariid Pinnipeds	170	171	0.8	170	137	144	4.7	141	147	154	4.7	151

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 26 (TP-26)

January 19, 2018

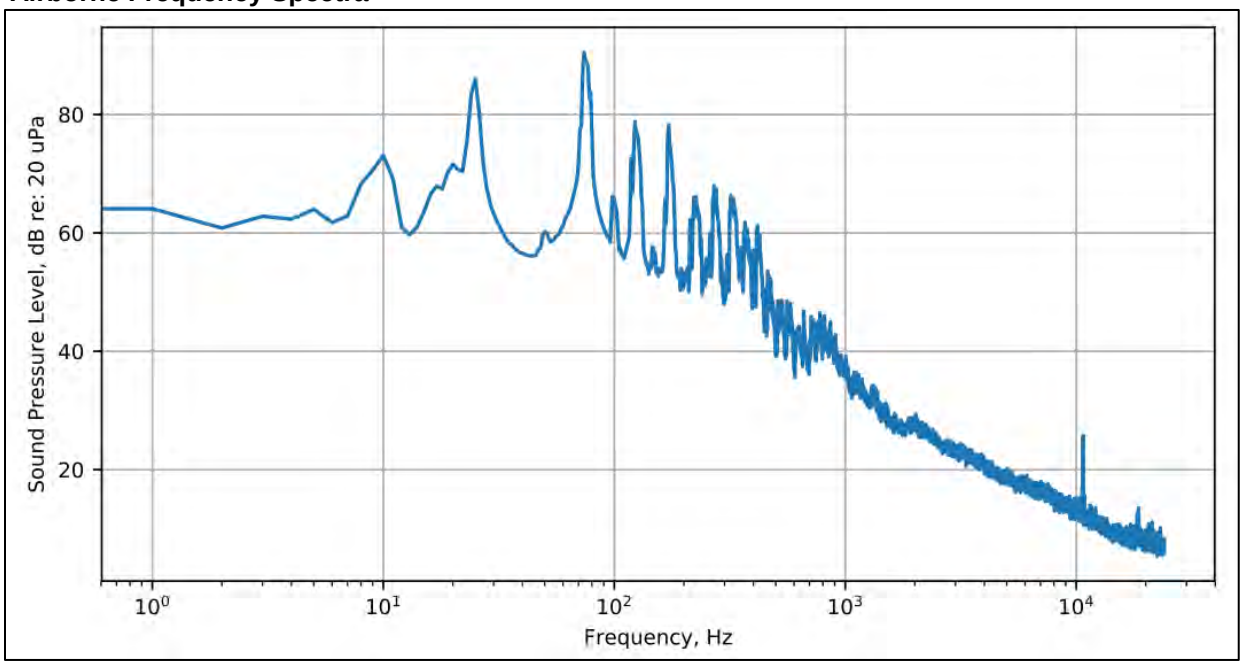
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	33	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	104	68

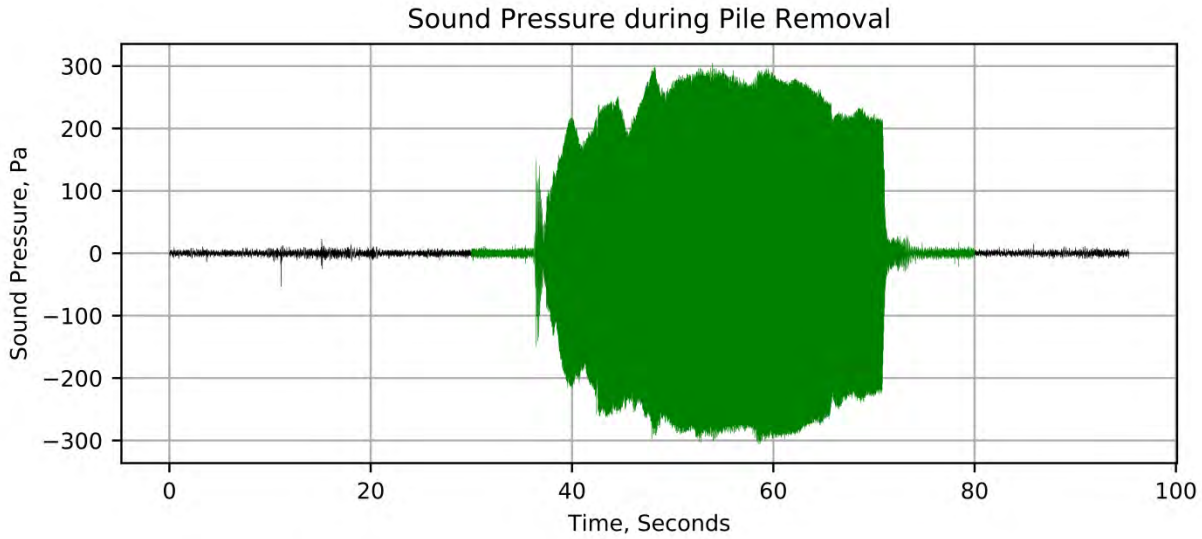
Airborne Frequency Spectra

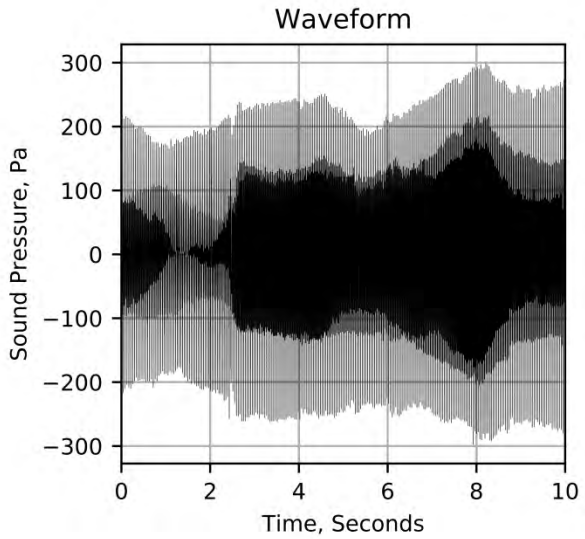


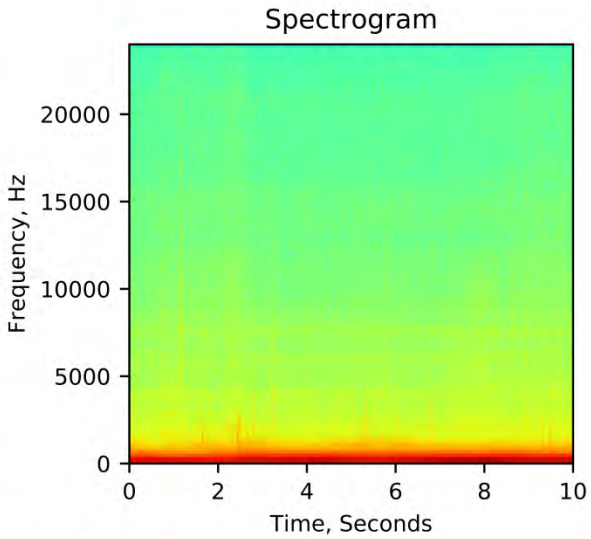
Underwater Sound Levels, dB re: 1 μPa

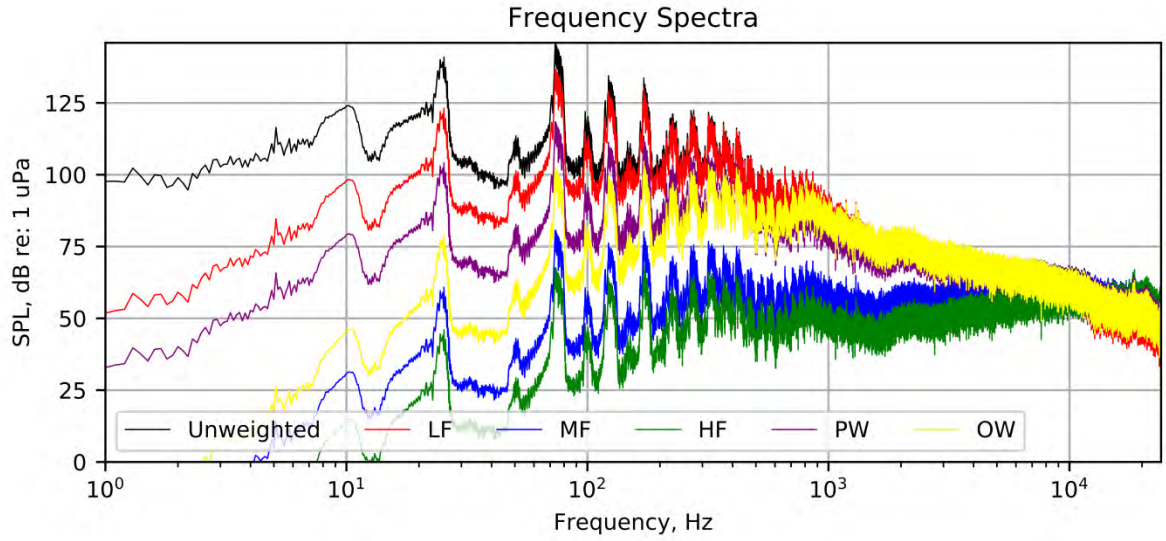
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	158	162	1.7	161	138	156	8.0	152	148	166	8.0	162
Low Frequency Cetacean	158	162	1.7	161	127	144	7.7	141	137	154	7.7	151
Mid Frequency Cetacean	158	162	1.7	161	132	149	7.9	146	142	159	7.9	156
High Frequency Cetacean	158	162	1.7	161	132	150	7.9	147	142	160	7.9	157
Phocid Pinnipeds	158	162	1.7	161	124	141	7.7	138	134	151	7.7	148
Otariid Pinnipeds	158	162	1.7	161	121	137	7.4	134	131	147	7.4	144
Lower Hydrophone												
Unweighted	167	170	1.4	169	150	163	6.0	160	160	173	6.0	170
Low Frequency Cetacean	167	170	1.4	169	139	151	6.5	149	149	161	6.5	159
Mid Frequency Cetacean	167	170	1.4	169	143	157	6.0	154	153	167	6.0	164
High Frequency Cetacean	167	170	1.4	169	144	157	6.0	154	154	167	6.0	164
Phocid Pinnipeds	167	170	1.4	169	135	148	6.1	145	145	158	6.1	155
Otariid Pinnipeds	167	170	1.4	169	132	145	5.9	142	142	155	5.9	152

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 27 (TP-27)

January 19, 2018

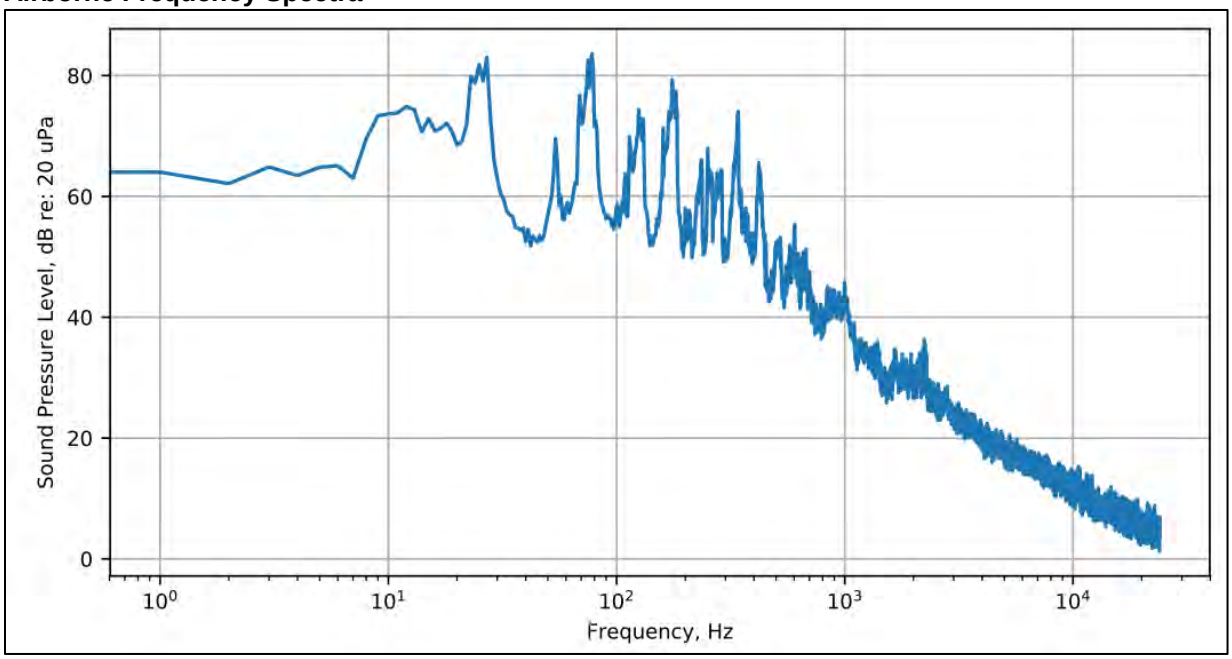
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	33	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	104	69

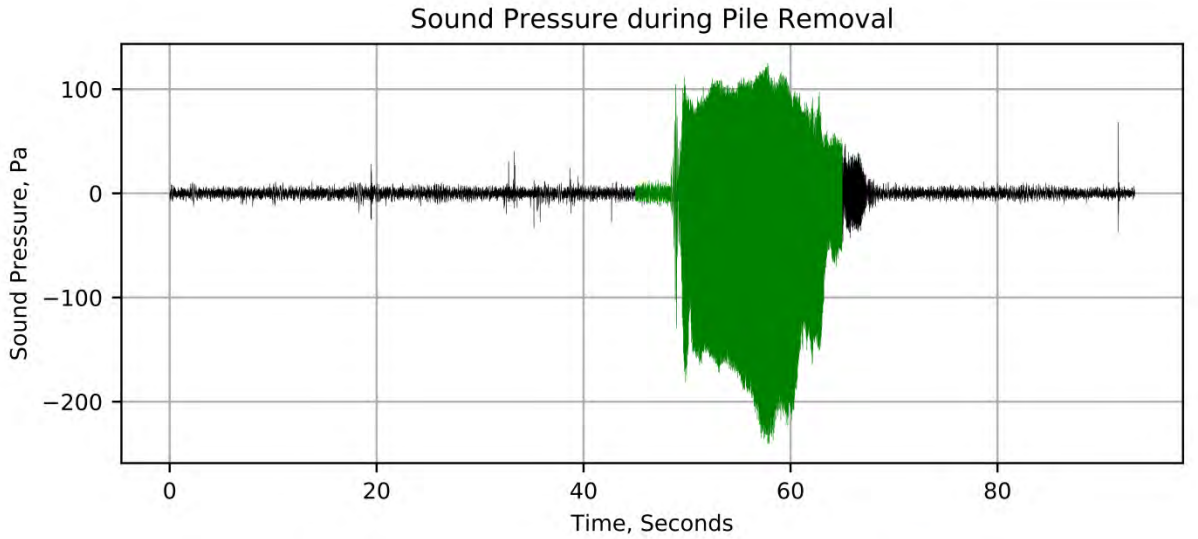
Airborne Frequency Spectra

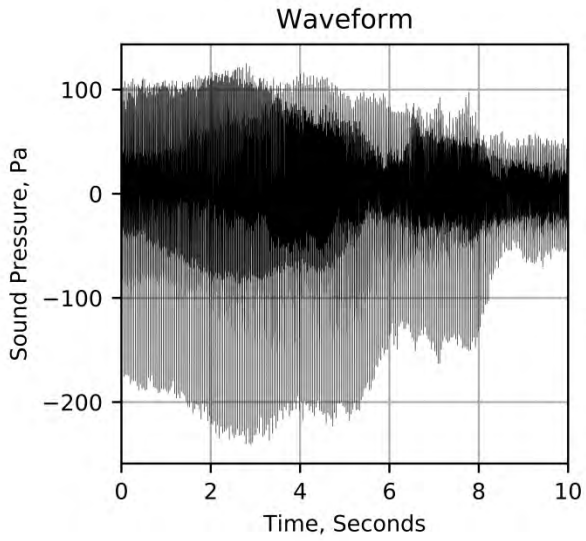


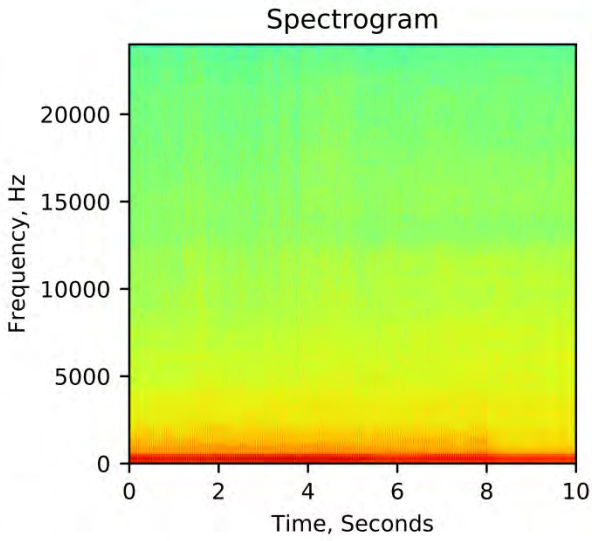
Underwater Sound Levels, dB re: 1 μPa

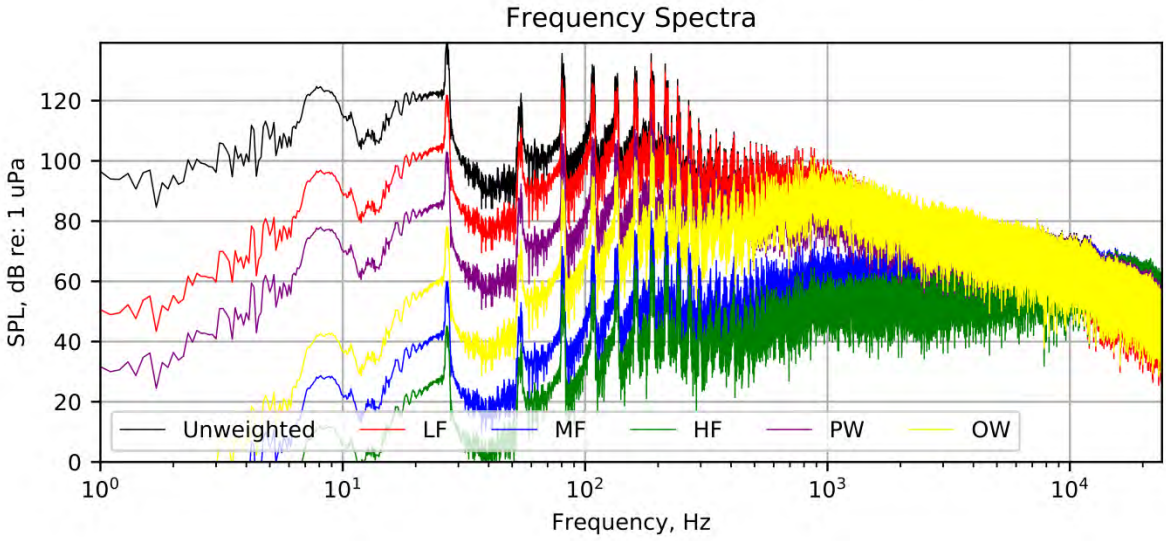
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	154	157	1.8	156	139	144	3.6	142	149	154	3.6	152
Low Frequency Cetacean	154	157	1.8	156	130	135	3.7	133	140	145	3.7	143
Mid Frequency Cetacean	154	157	1.8	156	133	137	3.5	136	143	147	3.5	146
High Frequency Cetacean	154	157	1.8	156	133	138	3.5	136	143	148	3.5	146
Phocid Pinnipeds	154	157	1.8	156	126	131	3.1	129	136	141	3.1	139
Otariid Pinnipeds	154	157	1.8	156	125	129	2.5	127	135	139	2.5	137
Lower Hydrophone												
Unweighted	161	162	0.7	161	152	154	1.4	153	162	164	1.4	163
Low Frequency Cetacean	161	162	0.7	161	141	145	2.8	143	151	155	2.8	153
Mid Frequency Cetacean	161	162	0.7	161	146	148	1.4	147	156	158	1.4	157
High Frequency Cetacean	161	162	0.7	161	147	149	1.4	148	157	159	1.4	158
Phocid Pinnipeds	161	162	0.7	161	137	140	1.9	139	147	150	1.9	149
Otariid Pinnipeds	161	162	0.7	161	135	137	1.8	136	145	147	1.8	146

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
100
0
−100
−200
0
20
40
60
80
Time, Seconds


Waveform
Sound Pressure, Pa
100
0
−100
−200
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
120
100
80
60
40
20
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

TIMBER PILE REMOVAL 28 (TP-28)

January 19, 2018

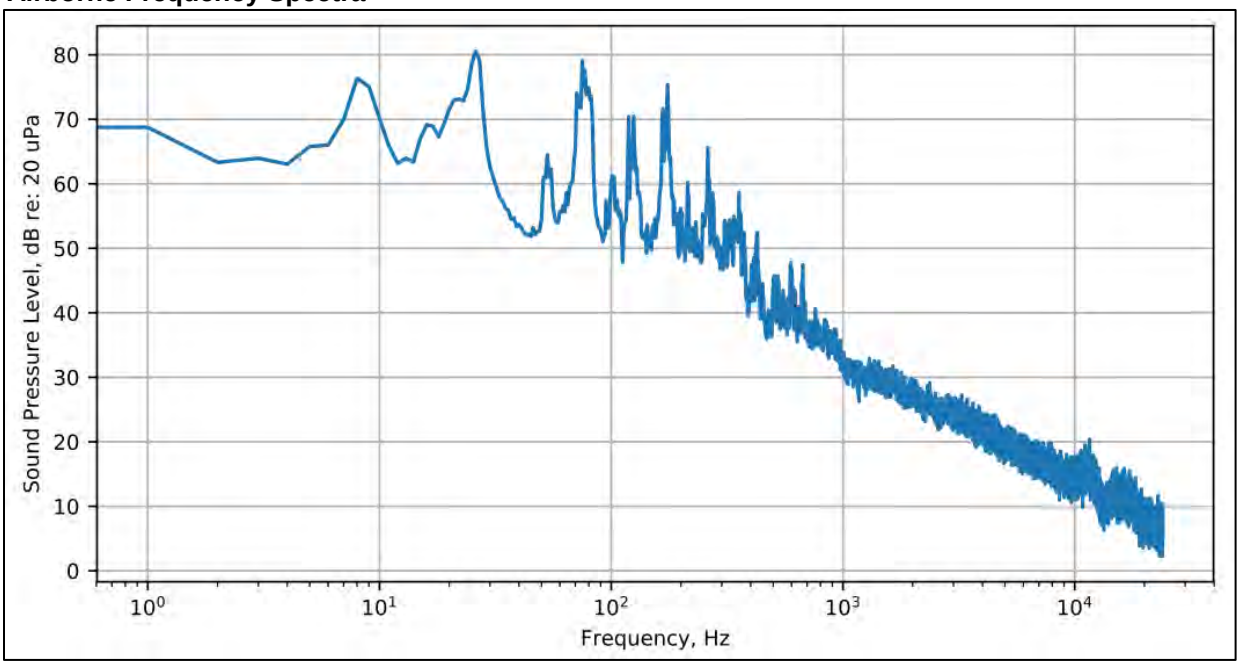
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
78	99	71

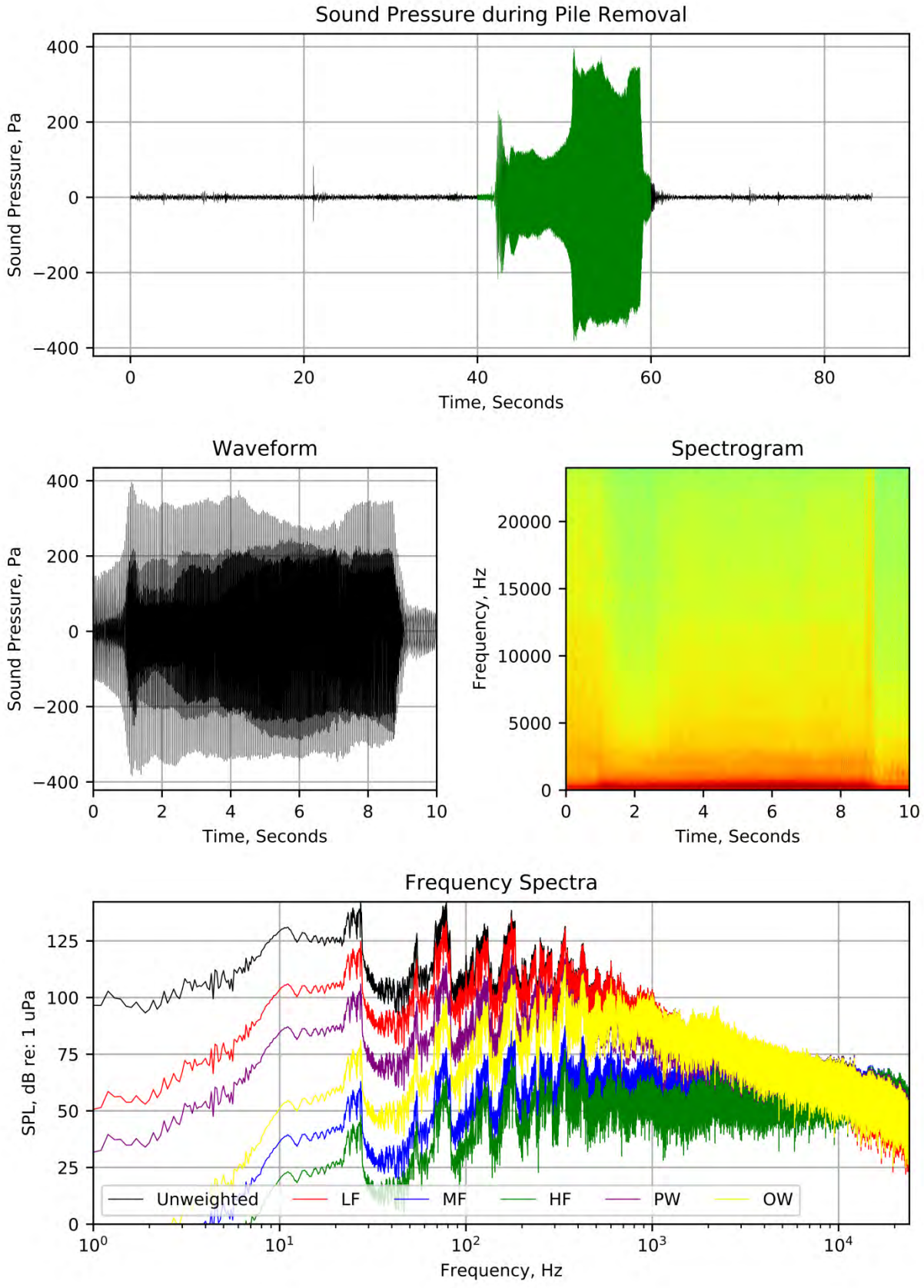
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	153	163	6.7	160	140	154	9.3	151	150	164	9.3	161
Low Frequency Cetacean	153	163	6.7	160	129	144	10.8	141	139	154	10.8	151
Mid Frequency Cetacean	153	163	6.7	160	134	147	9.3	144	144	157	9.3	154
High Frequency Cetacean	153	163	6.7	160	135	148	9.3	145	145	158	9.3	155
Phocid Pinnipeds	153	163	6.7	160	126	140	9.6	137	136	150	9.6	147
Otariid Pinnipeds	153	163	6.7	160	124	137	9.2	134	134	147	9.2	144
Lower Hydrophone												
Unweighted	167	171	3.4	170	155	162	4.9	160	165	172	4.9	170
Low Frequency Cetacean	167	171	3.4	170	139	152	9.7	149	149	162	9.7	159
Mid Frequency Cetacean	167	171	3.4	170	148	155	5.0	153	158	165	5.0	163
High Frequency Cetacean	167	171	3.4	170	149	156	4.9	154	159	166	4.9	164
Phocid Pinnipeds	167	171	3.4	170	139	148	6.0	145	149	158	6.0	155
Otariid Pinnipeds	167	171	3.4	170	136	144	5.8	142	146	154	5.8	152

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 29 (TP-29)

January 19, 2018

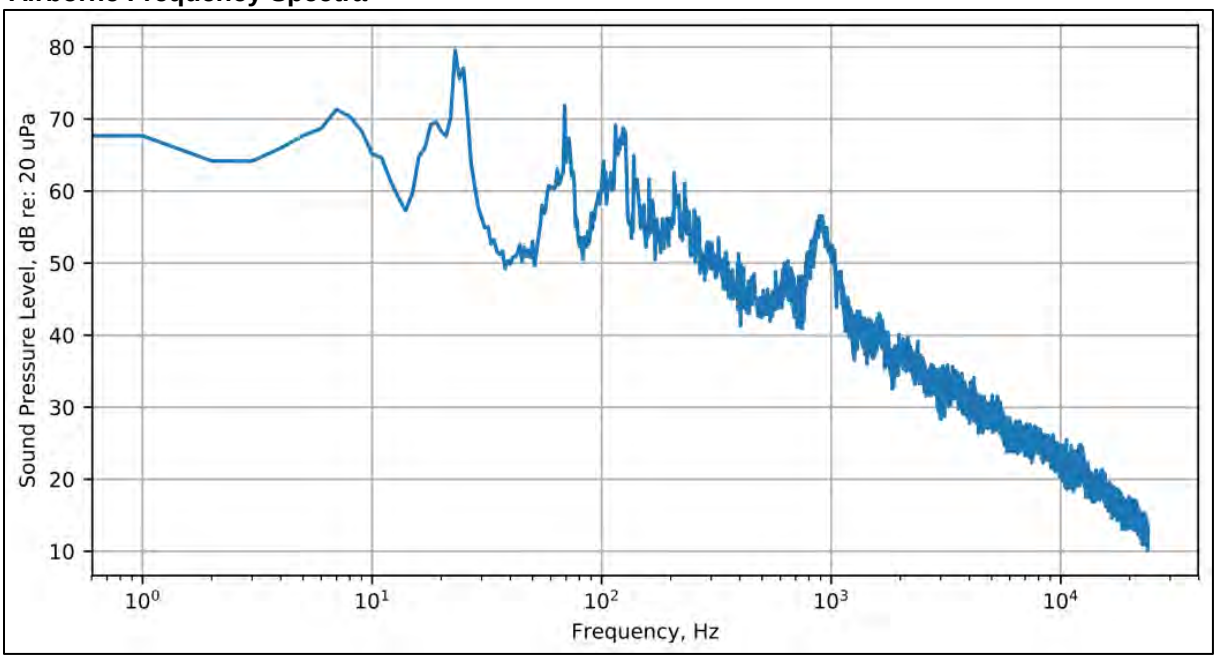
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
81	99	78

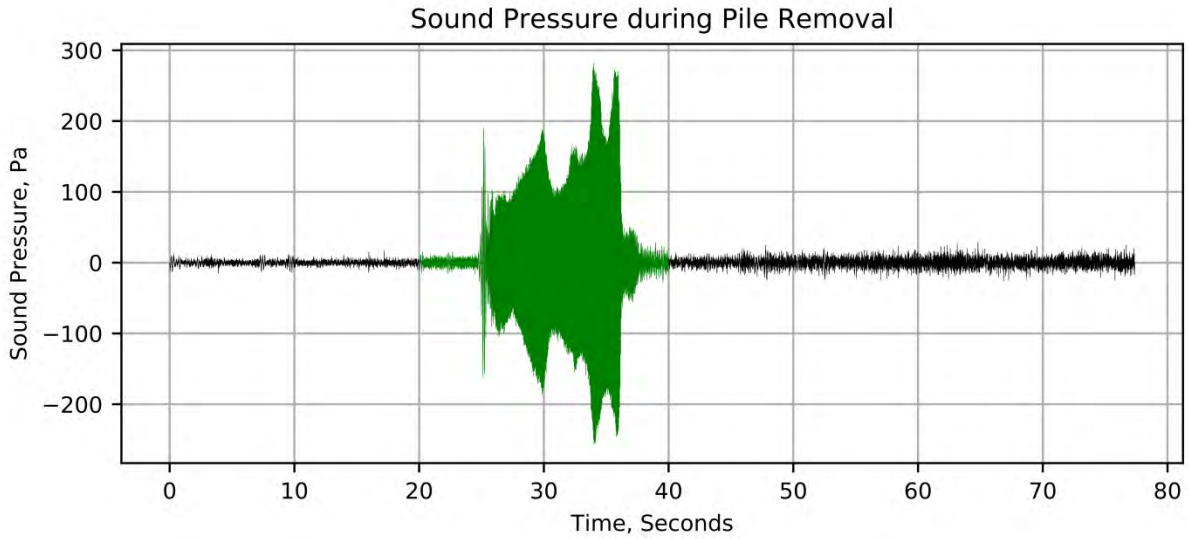
Airborne Frequency Spectra

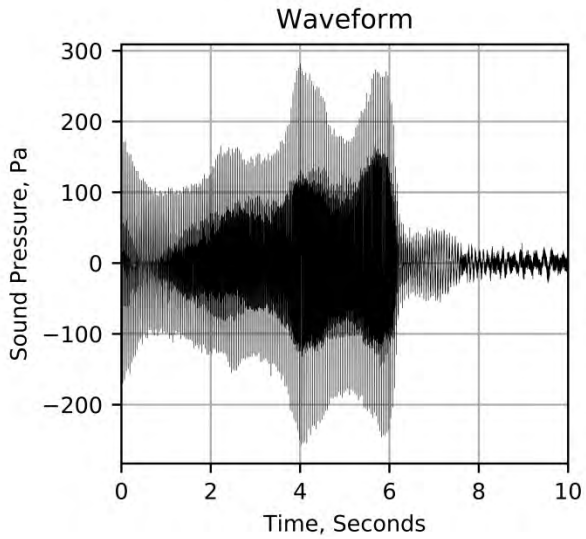


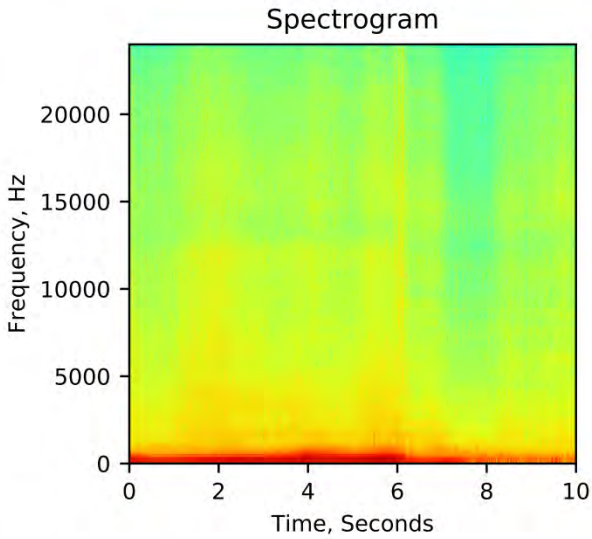
Underwater Sound Levels, dB re: 1 μPa

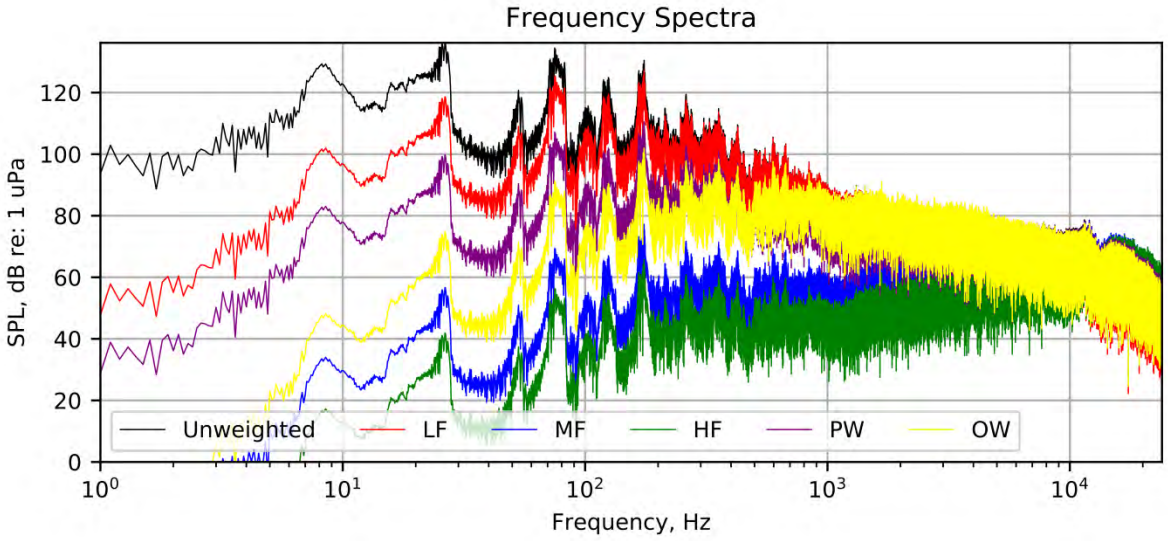
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	152	159	5.1	157	139	146	5.4	144	149	156	5.4	154
Low Frequency Cetacean	152	159	5.1	157	127	137	6.6	134	137	147	6.6	144
Mid Frequency Cetacean	152	159	5.1	157	132	140	5.3	138	142	150	5.3	148
High Frequency Cetacean	152	159	5.1	157	133	141	5.3	138	143	151	5.3	148
Phocid Pinnipeds	152	159	5.1	157	124	132	5.7	130	134	142	5.7	140
Otariid Pinnipeds	152	159	5.1	157	122	130	5.7	127	132	140	5.7	137
Lower Hydrophone												
Unweighted	165	168	2.4	167	152	154	1.7	153	162	164	1.7	163
Low Frequency Cetacean	165	168	2.4	167	136	144	5.2	142	146	154	5.2	152
Mid Frequency Cetacean	165	168	2.4	167	146	148	1.7	147	156	158	1.7	157
High Frequency Cetacean	165	168	2.4	167	146	149	1.7	148	156	159	1.7	158
Phocid Pinnipeds	165	168	2.4	167	136	140	2.4	138	146	150	2.4	148
Otariid Pinnipeds	165	168	2.4	167	134	137	2.2	135	144	147	2.2	145

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 30 (TP-30)

January 19, 2018

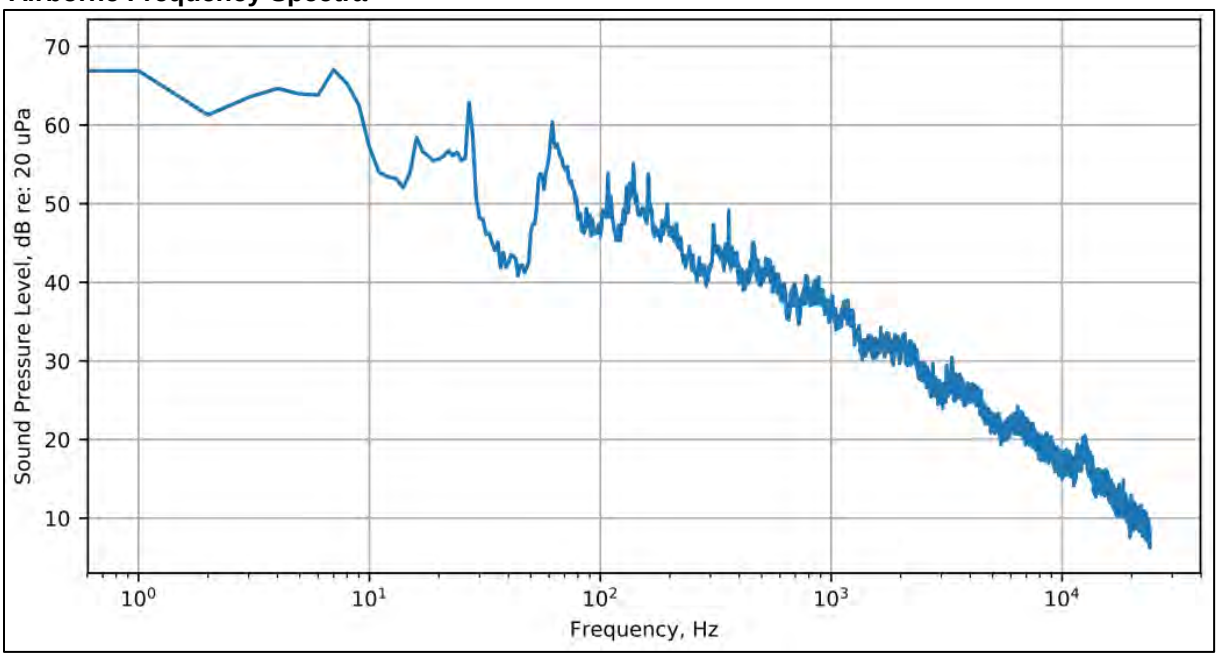
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
78	92	73

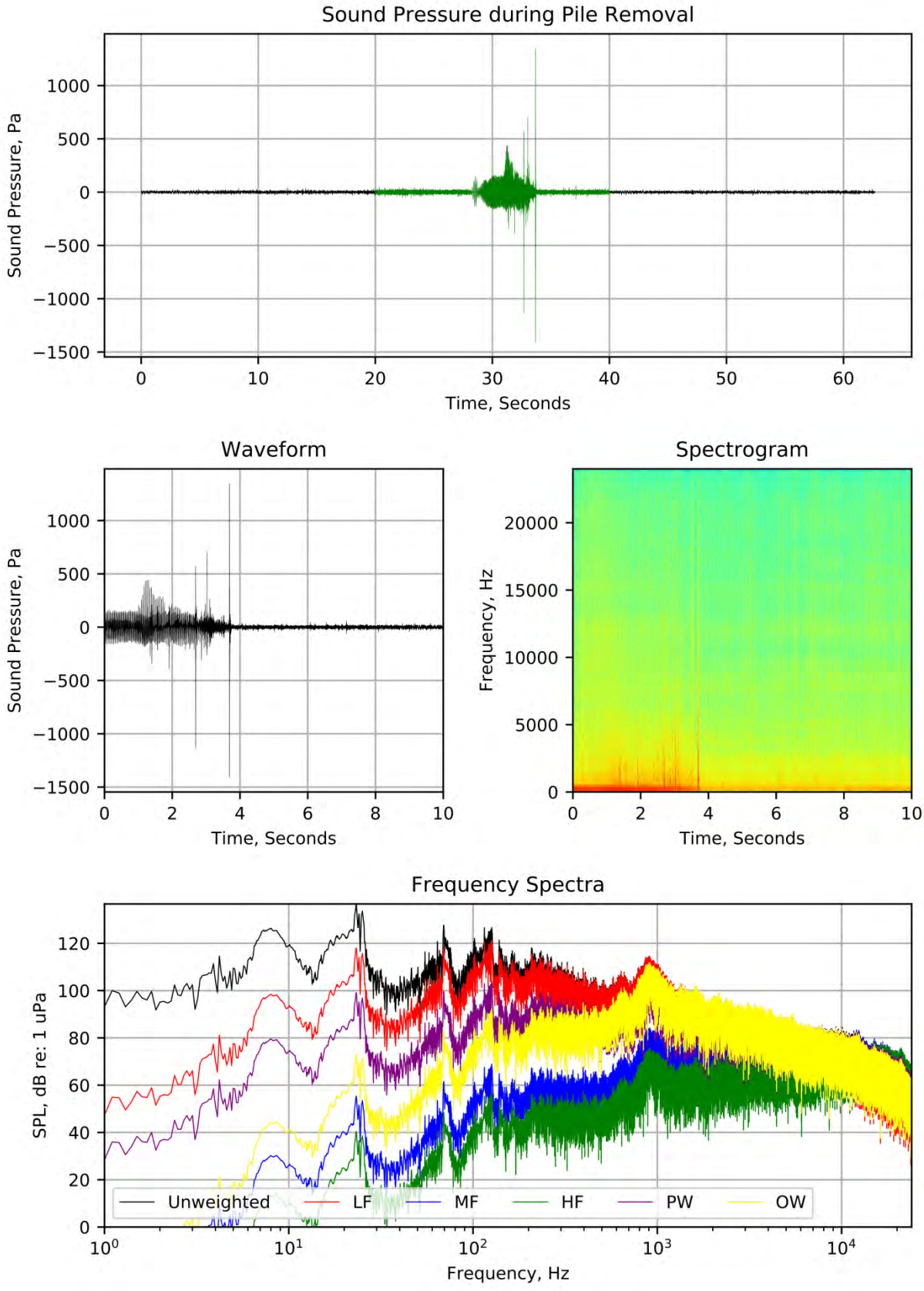
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	158	178	14.2	175	137	145	5.9	142	147	155	5.9	152
Low Frequency Cetacean	158	178	14.2	175	128	138	6.6	135	138	148	6.6	145
Mid Frequency Cetacean	158	178	14.2	175	131	139	5.8	137	141	149	5.8	147
High Frequency Cetacean	158	178	14.2	175	131	140	5.8	137	141	150	5.8	147
Phocid Pinnipeds	158	178	14.2	175	126	135	6.4	133	136	145	6.4	143
Otariid Pinnipeds	158	178	14.2	175	126	136	7.0	133	136	146	7.0	143
Lower Hydrophone												
Unweighted	163	182	13.5	179	147	153	3.9	151	157	163	3.9	161
Low Frequency Cetacean	163	182	13.5	179	133	144	7.6	141	143	154	7.6	151
Mid Frequency Cetacean	163	182	13.5	179	141	147	4.0	145	151	157	4.0	155
High Frequency Cetacean	163	182	13.5	179	142	147	3.9	145	152	157	3.9	155
Phocid Pinnipeds	163	182	13.5	179	132	141	5.8	138	142	151	5.8	148
Otariid Pinnipeds	163	182	13.5	179	130	141	7.2	138	140	151	7.2	148

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 31 (TP-31)

January 19, 2018

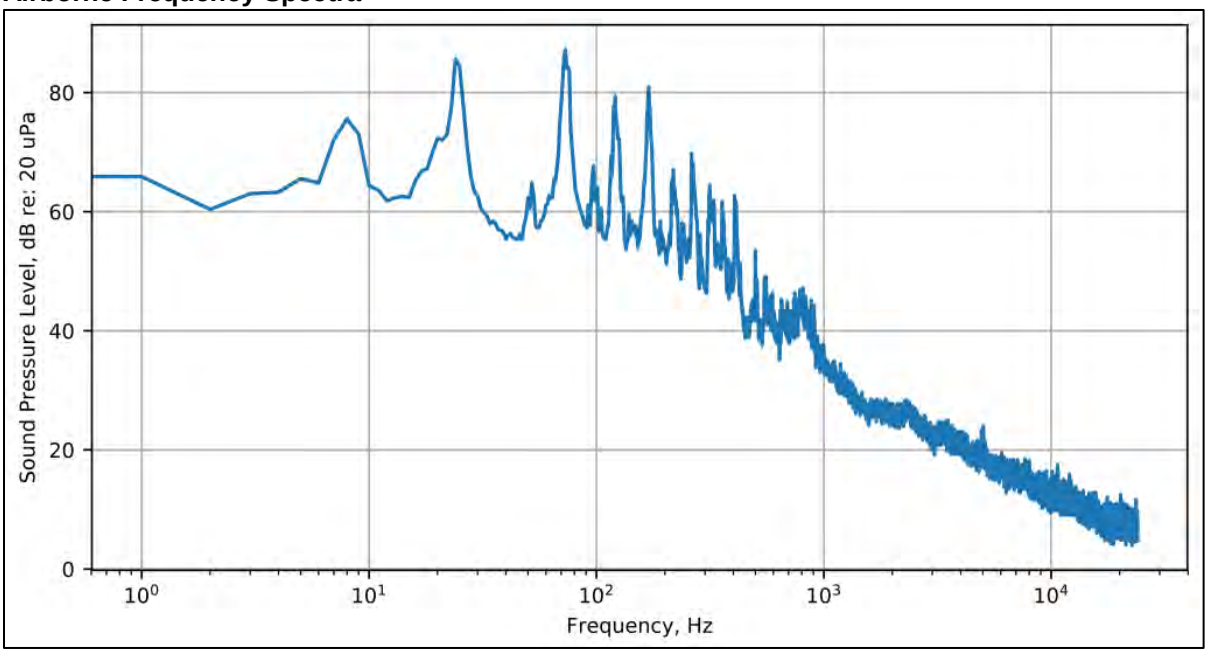
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
83	107	73

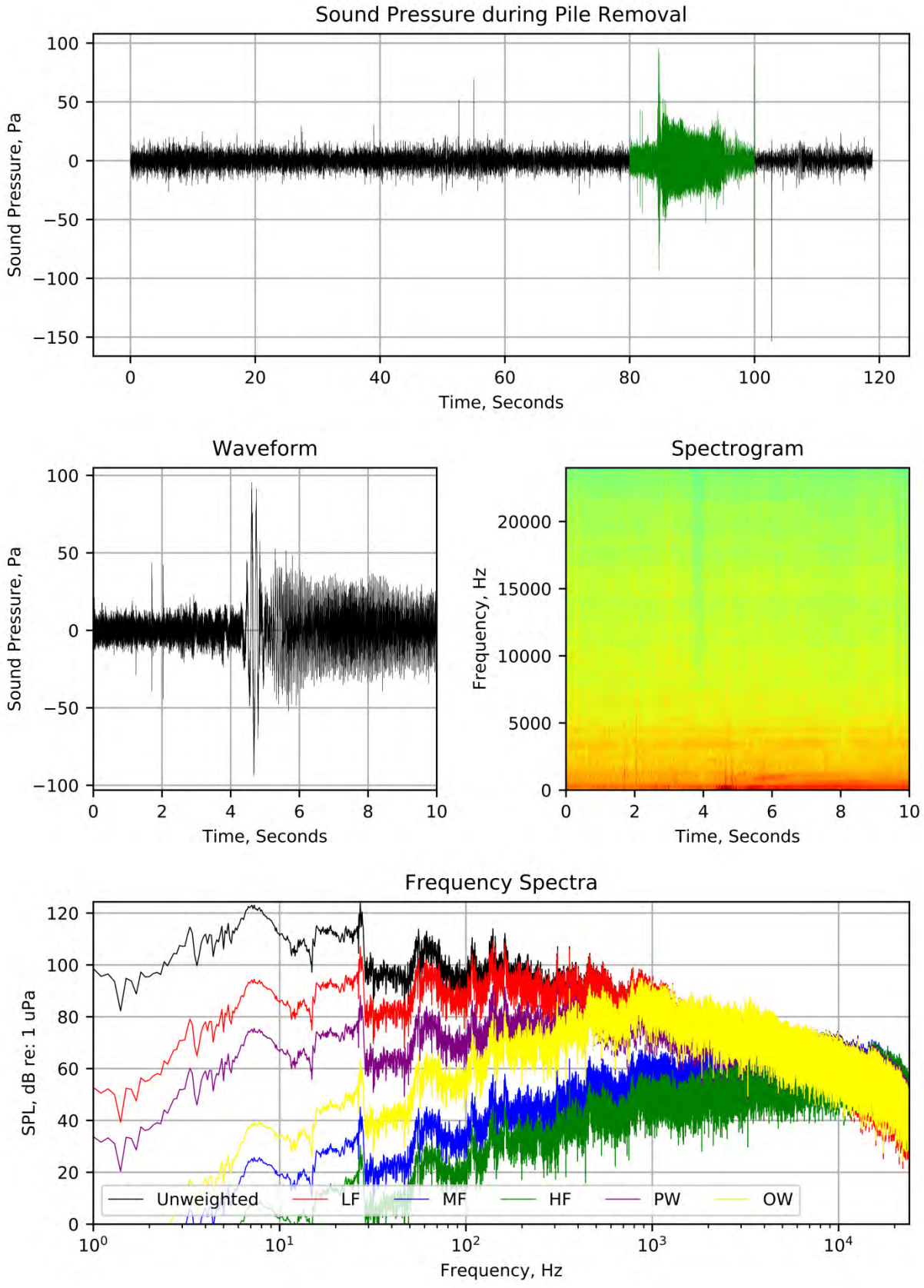
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	152	154	1.2	153	131	132	0.8	131	141	142	0.8	141
Low Frequency Cetacean	152	154	1.2	153	124	125	0.6	124	134	135	0.6	134
Mid Frequency Cetacean	152	154	1.2	153	125	126	0.9	126	135	136	0.9	136
High Frequency Cetacean	152	154	1.2	153	125	127	0.9	126	135	137	0.9	136
Phocid Pinnipeds	152	154	1.2	153	121	122	0.7	122	131	132	0.7	132
Otariid Pinnipeds	152	154	1.2	153	122	122	0.5	122	132	132	0.5	132
Lower Hydrophone												
Unweighted	158	159	1.0	158	137	142	3.2	140	147	152	3.2	150
Low Frequency Cetacean	158	159	1.0	158	128	129	1.2	129	138	139	1.2	139
Mid Frequency Cetacean	158	159	1.0	158	131	136	3.2	134	141	146	3.2	144
High Frequency Cetacean	158	159	1.0	158	132	136	3.2	135	142	146	3.2	145
Phocid Pinnipeds	158	159	1.0	158	125	128	2.2	127	135	138	2.2	137
Otariid Pinnipeds	158	159	1.0	158	124	126	1.7	125	134	136	1.7	135

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 32 (TP-32)

January 19, 2018

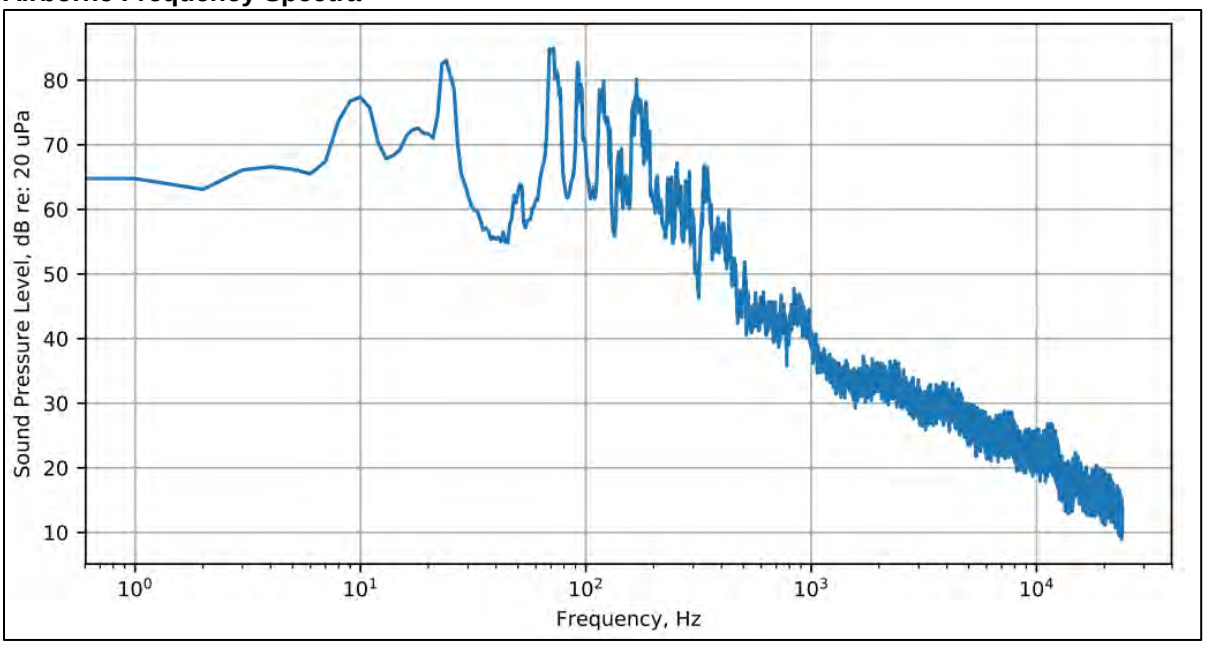
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	105	69

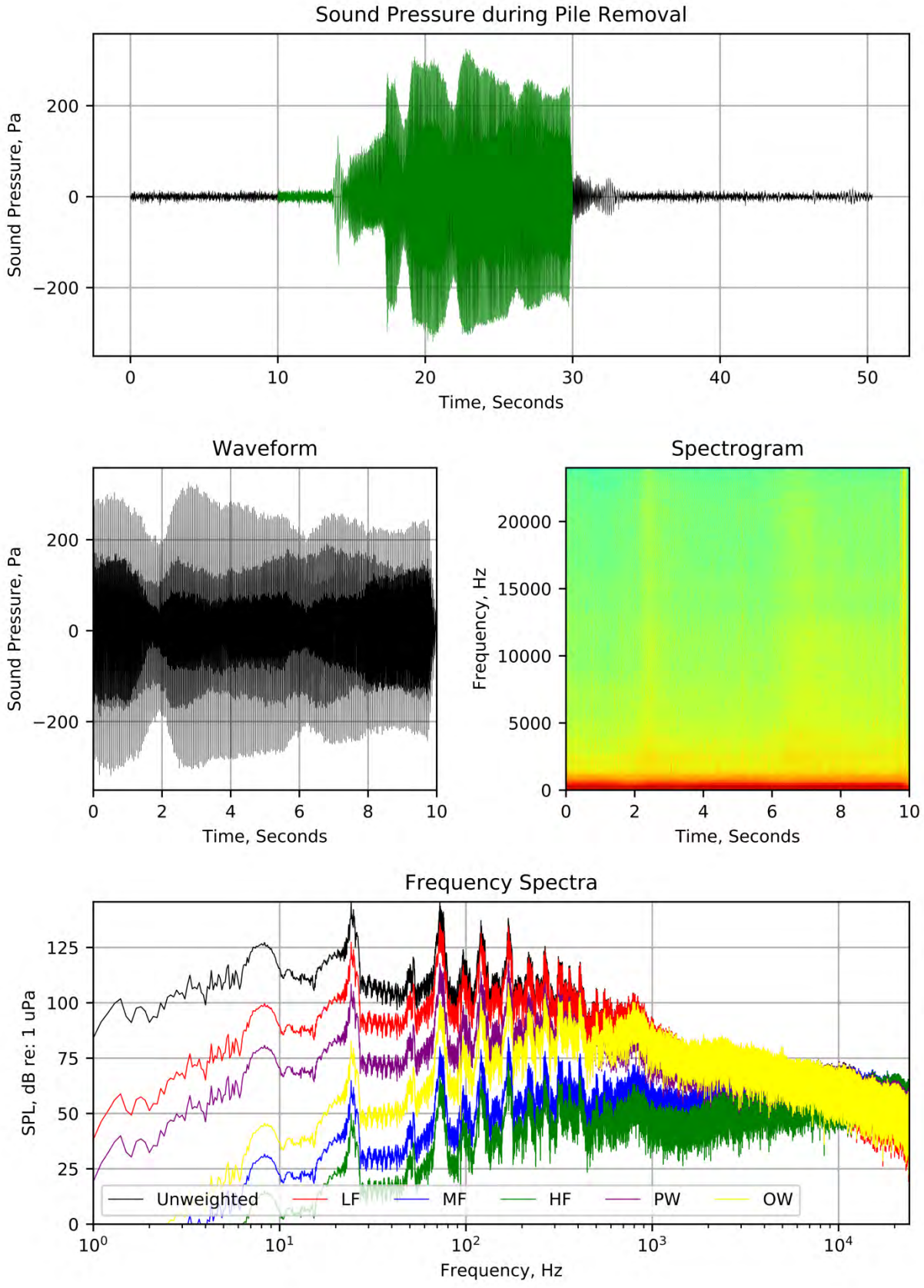
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	158	159	0.4	159	145	152	4.7	150	155	162	4.7	160
Low Frequency Cetacean	158	159	0.4	159	134	141	4.9	139	144	151	4.9	149
Mid Frequency Cetacean	158	159	0.4	159	139	146	4.7	143	149	156	4.7	153
High Frequency Cetacean	158	159	0.4	159	140	146	4.7	144	150	156	4.7	154
Phocid Pinnipeds	158	159	0.4	159	131	137	4.6	135	141	147	4.6	145
Otariid Pinnipeds	158	159	0.4	159	128	134	4.4	132	138	144	4.4	142
Lower Hydrophone												
Unweighted	169	170	0.4	169	155	161	4.2	159	165	171	4.2	169
Low Frequency Cetacean	169	170	0.4	169	143	149	4.9	147	153	159	4.9	157
Mid Frequency Cetacean	169	170	0.4	169	148	154	4.2	152	158	164	4.2	162
High Frequency Cetacean	169	170	0.4	169	149	155	4.2	153	159	165	4.2	163
Phocid Pinnipeds	169	170	0.4	169	140	146	4.3	144	150	156	4.3	154
Otariid Pinnipeds	169	170	0.4	169	136	142	4.2	140	146	152	4.2	150

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 33 (TP-33)

January 19, 2018

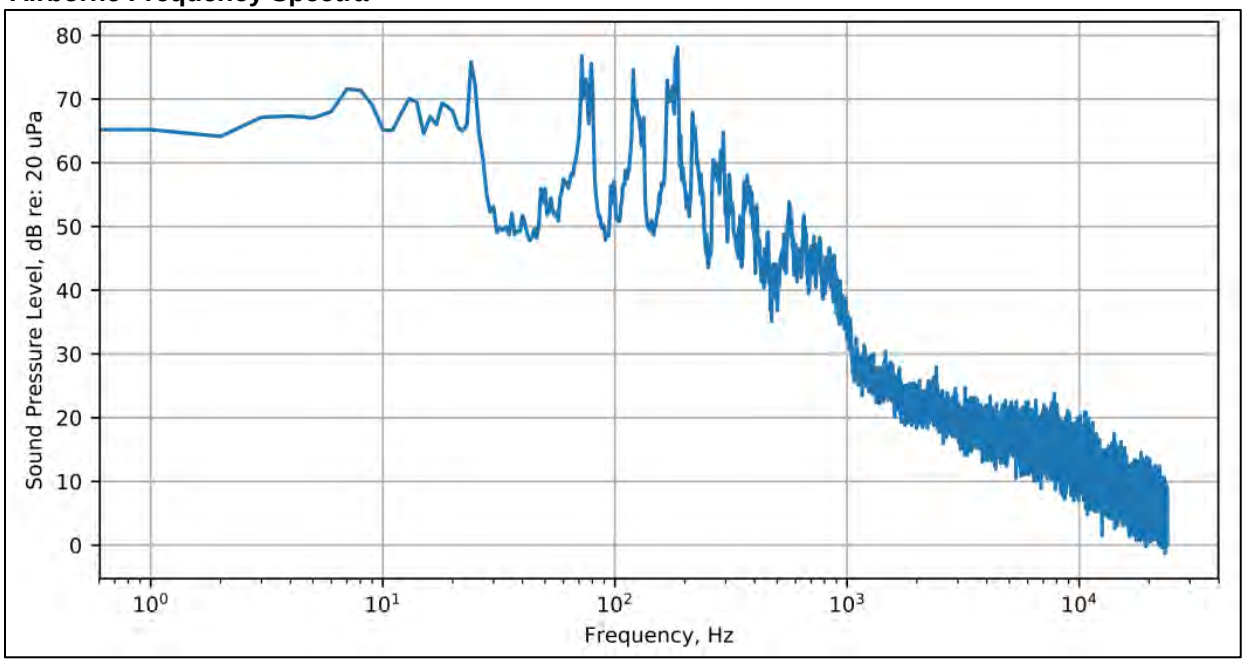
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	20	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
74	104	70

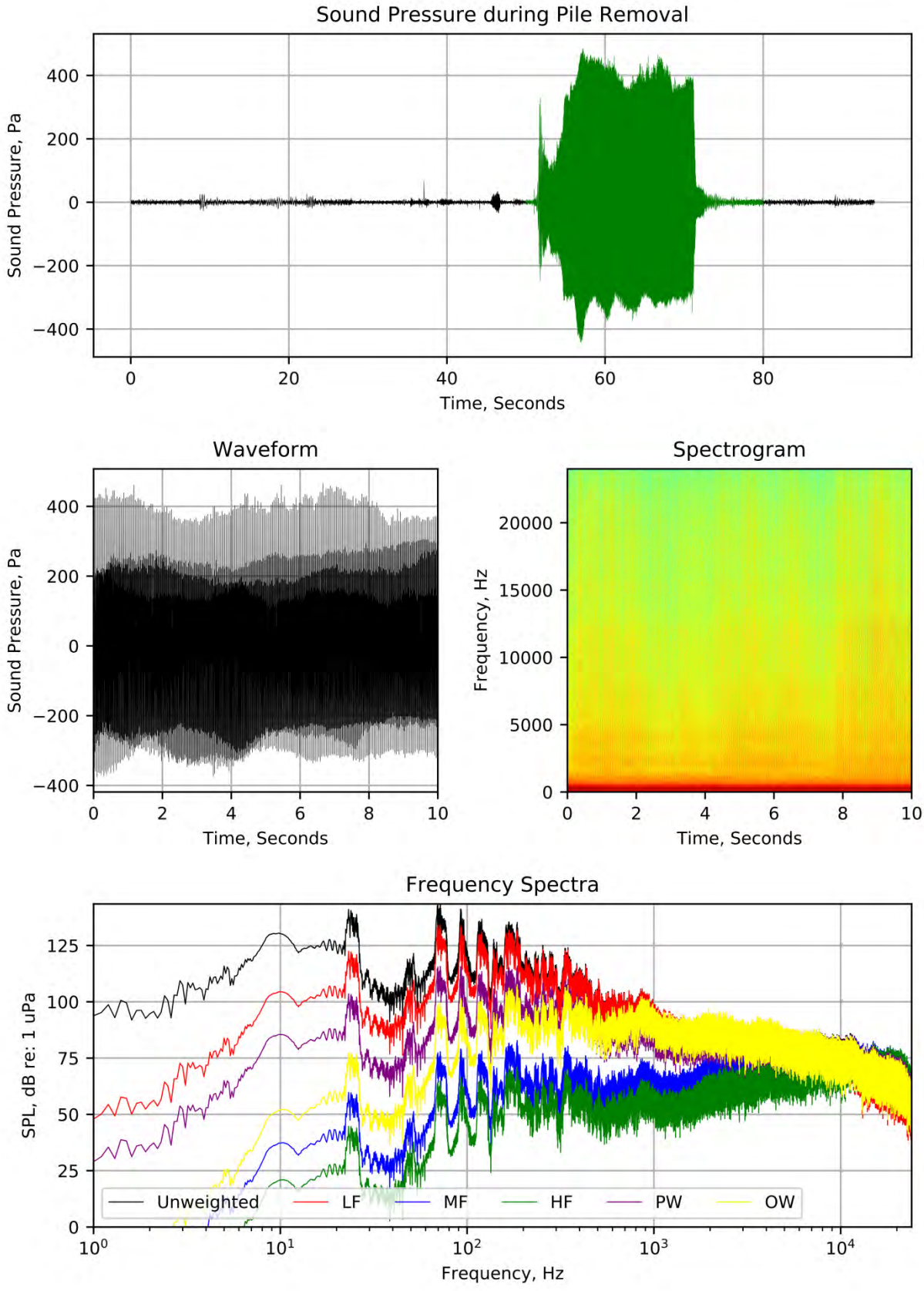
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	159	162	1.1	161	144	153	4.7	150	154	163	4.7	160
Low Frequency Cetacean	159	162	1.1	161	133	143	4.8	140	143	153	4.8	150
Mid Frequency Cetacean	159	162	1.1	161	137	147	4.7	144	147	157	4.7	154
High Frequency Cetacean	159	162	1.1	161	138	147	4.7	144	148	157	4.7	154
Phocid Pinnipeds	159	162	1.1	161	130	139	4.5	136	140	149	4.5	146
Otariid Pinnipeds	159	162	1.1	161	128	137	4.2	134	138	147	4.2	144
Lower Hydrophone												
Unweighted	169	170	0.9	170	152	161	4.7	158	162	171	4.7	168
Low Frequency Cetacean	169	170	0.9	170	141	150	4.8	148	151	160	4.8	158
Mid Frequency Cetacean	169	170	0.9	170	145	154	4.7	152	155	164	4.7	162
High Frequency Cetacean	169	170	0.9	170	146	155	4.7	153	156	165	4.7	163
Phocid Pinnipeds	169	170	0.9	170	137	146	4.7	144	147	156	4.7	154
Otariid Pinnipeds	169	170	0.9	170	134	143	4.7	140	144	153	4.7	150

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 34 (TP-34)

January 19, 2018

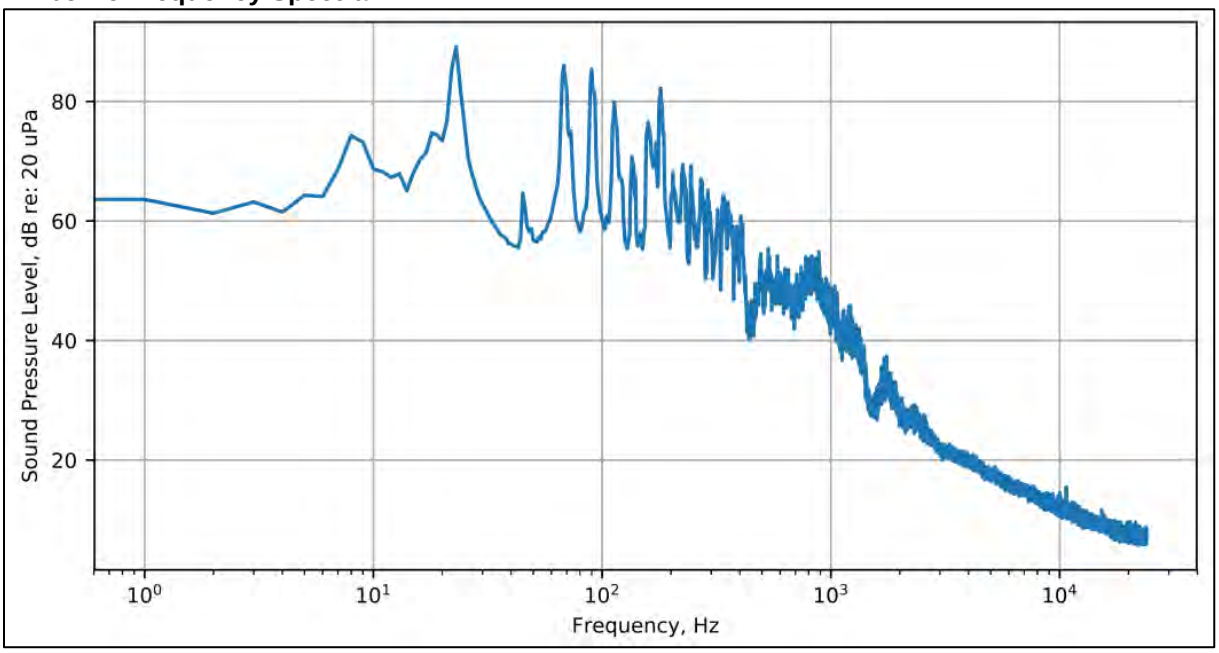
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	25	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
72	106	67

Airborne Frequency Spectra

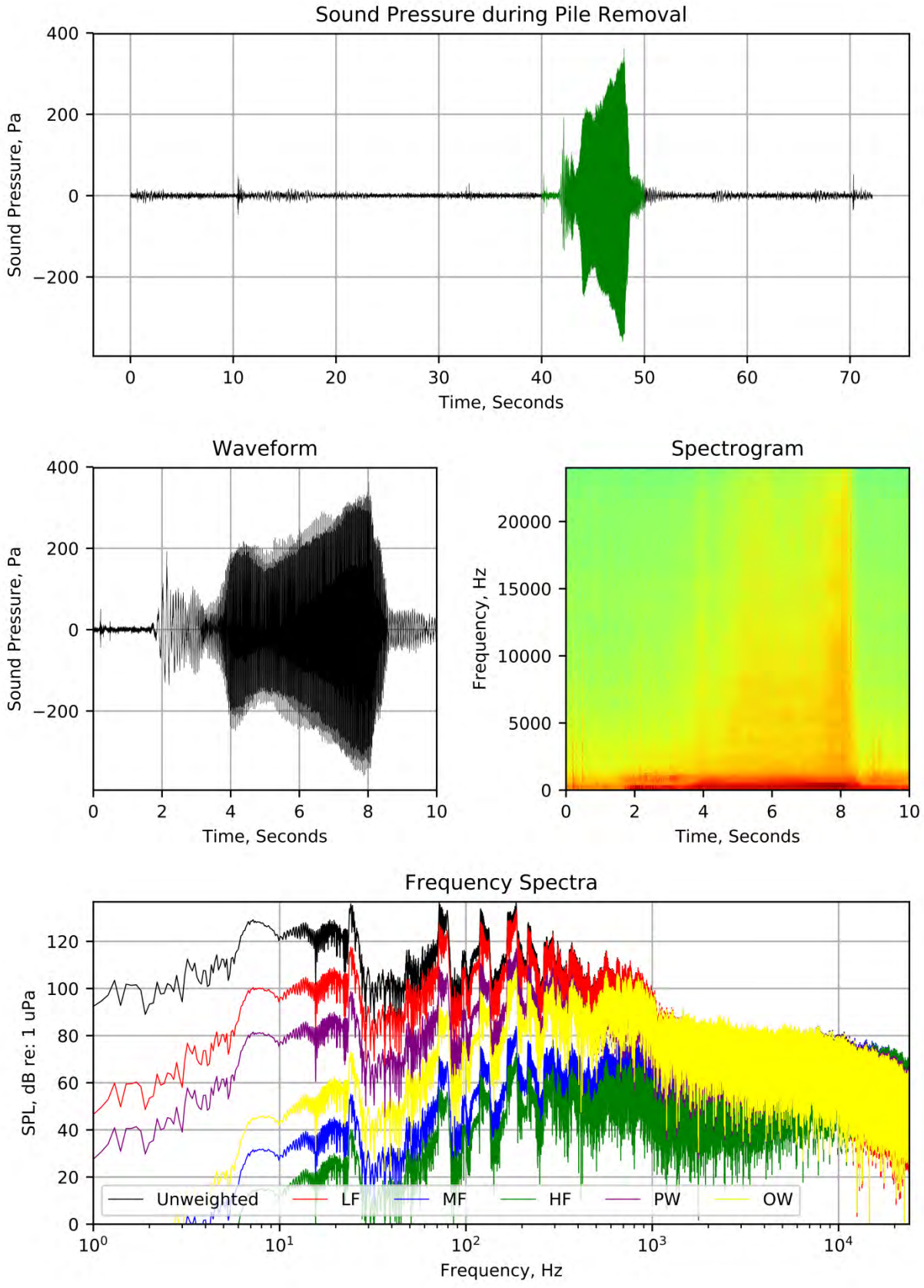


Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	160	160	-	160	146	146	-	146	156	156	-	156
Low Frequency Cetacean	160	160	-	160	138	138	-	138	148	148	-	148
Mid Frequency Cetacean	160	160	-	160	140	140	-	140	150	150	-	150
High Frequency Cetacean	160	160	-	160	141	141	-	141	151	151	-	151
Phocid Pinnipeds	160	160	-	160	133	133	-	133	143	143	-	143
Otariid Pinnipeds	160	160	-	160	131	131	-	131	141	141	-	141
Lower Hydrophone												
Unweighted	169	169	-	169	156	156	-	156	166	166	-	166
Low Frequency Cetacean	169	169	-	169	147	147	-	147	157	157	-	157
Mid Frequency Cetacean	169	169	-	169	150	150	-	150	160	160	-	160
High Frequency Cetacean	169	169	-	169	150	150	-	150	160	160	-	160
Phocid Pinnipeds	169	169	-	169	142	142	-	142	152	152	-	152
Otariid Pinnipeds	169	169	-	169	139	139	-	139	149	149	-	149

Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 35 (TP-35)

January 19, 2018

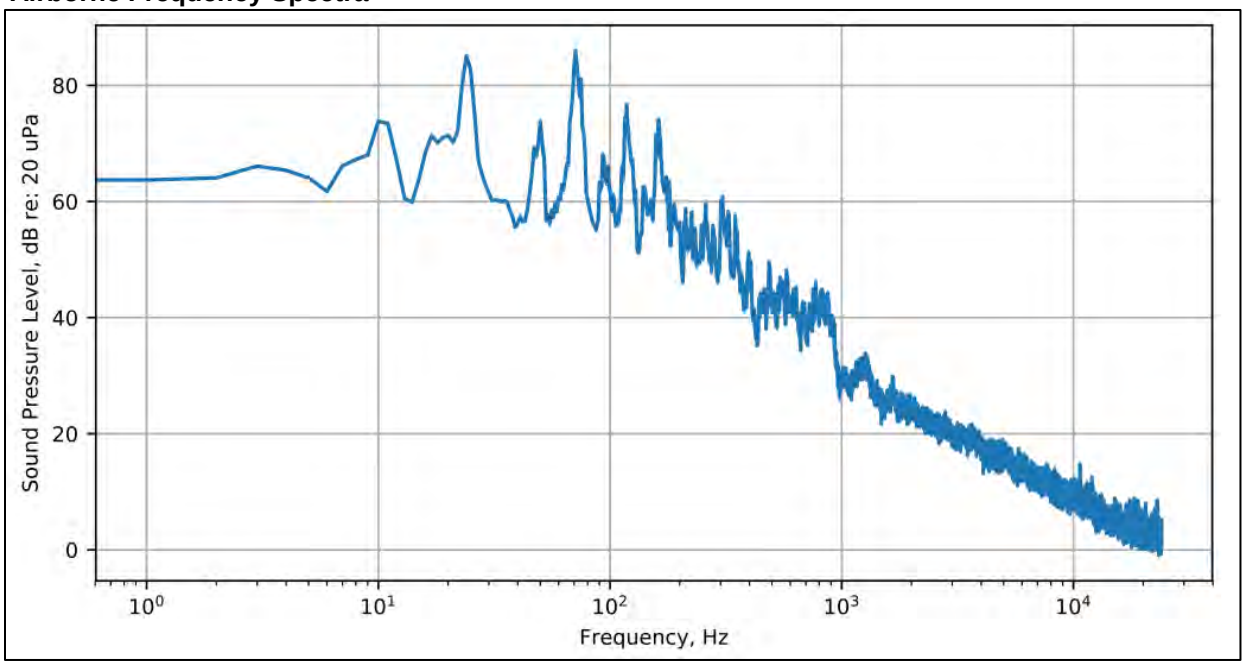
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
74	104	69

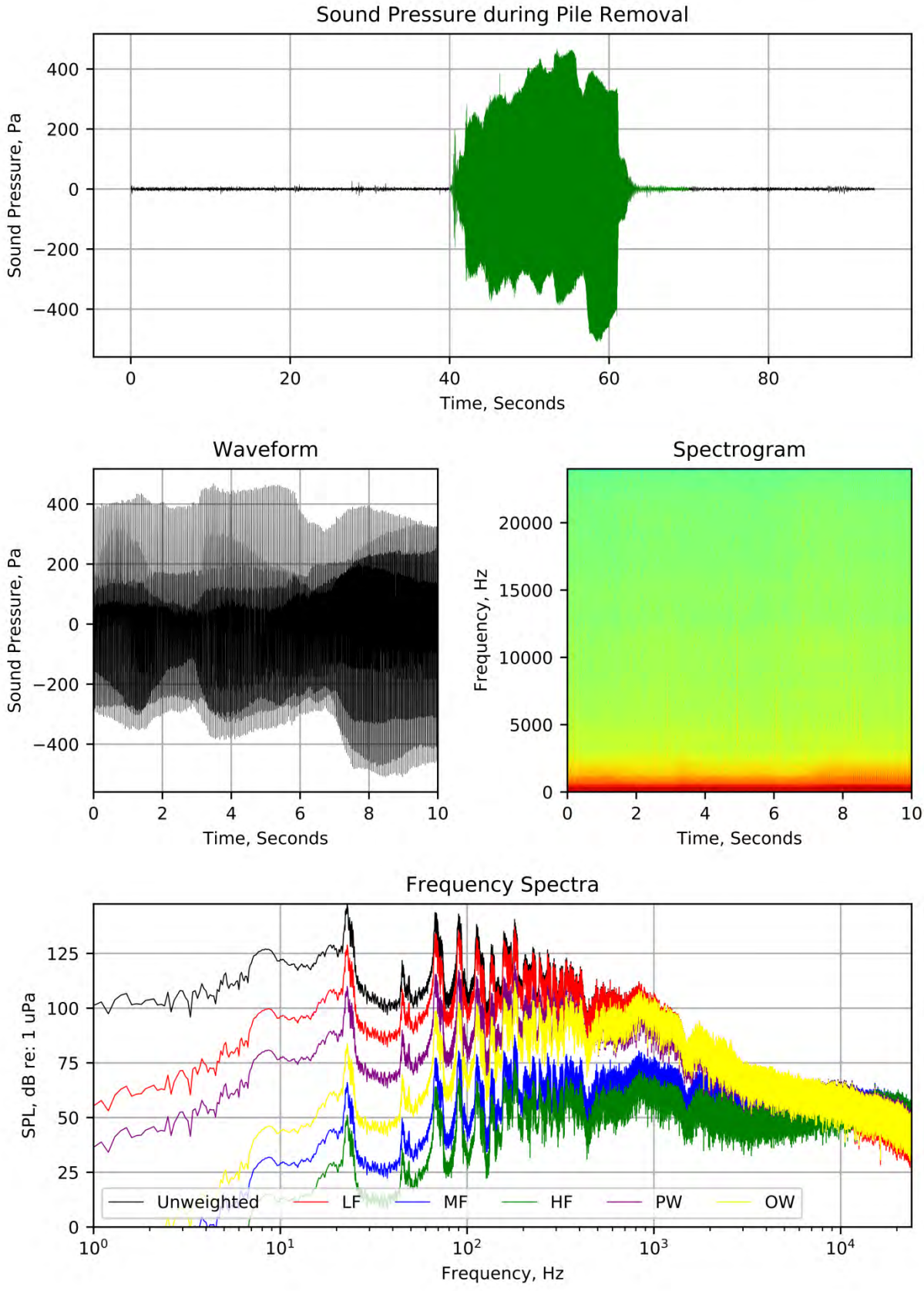
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	161	165	2.2	163	147	156	4.5	153	157	166	4.5	163
Low Frequency Cetacean	161	165	2.2	163	138	146	4.4	143	148	156	4.4	153
Mid Frequency Cetacean	161	165	2.2	163	141	150	4.5	146	151	160	4.5	156
High Frequency Cetacean	161	165	2.2	163	142	150	4.5	147	152	160	4.5	157
Phocid Pinnipeds	161	165	2.2	163	133	142	4.5	138	143	152	4.5	148
Otariid Pinnipeds	161	165	2.2	163	130	138	4.4	135	140	148	4.4	145
Lower Hydrophone												
Unweighted	170	173	1.4	172	155	164	4.4	161	165	174	4.4	171
Low Frequency Cetacean	170	173	1.4	172	145	154	4.3	151	155	164	4.3	161
Mid Frequency Cetacean	170	173	1.4	172	149	158	4.4	155	159	168	4.4	165
High Frequency Cetacean	170	173	1.4	172	150	159	4.4	156	160	169	4.4	166
Phocid Pinnipeds	170	173	1.4	172	141	150	4.3	147	151	160	4.3	157
Otariid Pinnipeds	170	173	1.4	172	138	146	4.2	144	148	156	4.2	154

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 36 (TP-36)

January 19, 2018

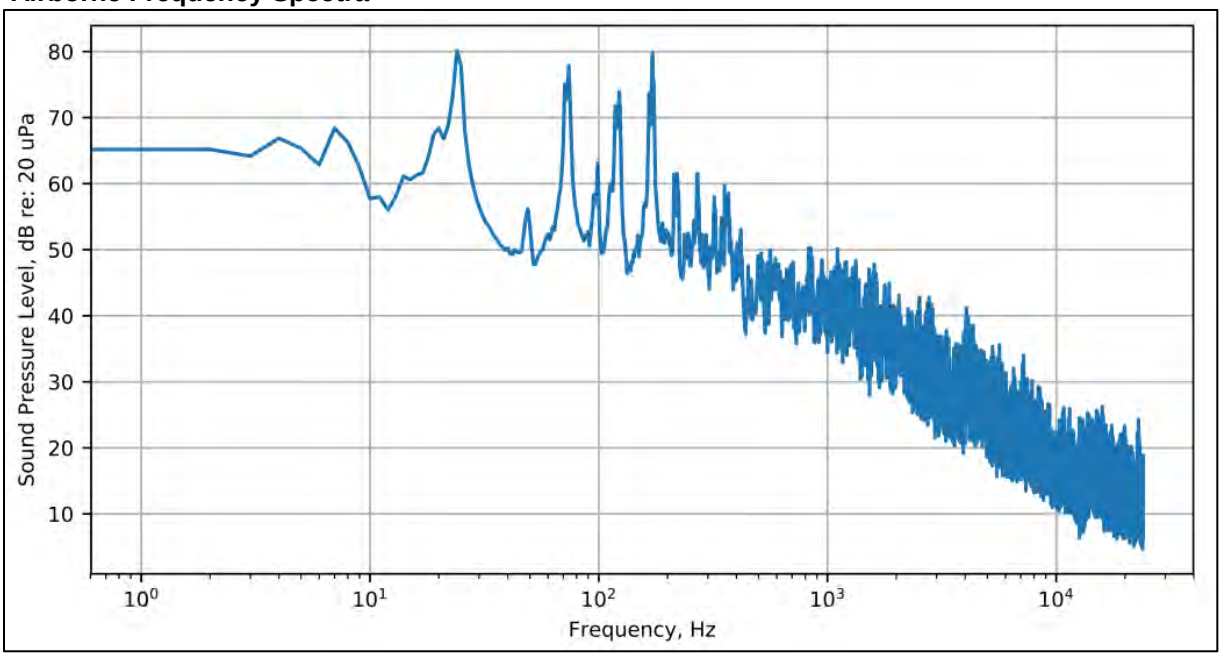
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	102	66

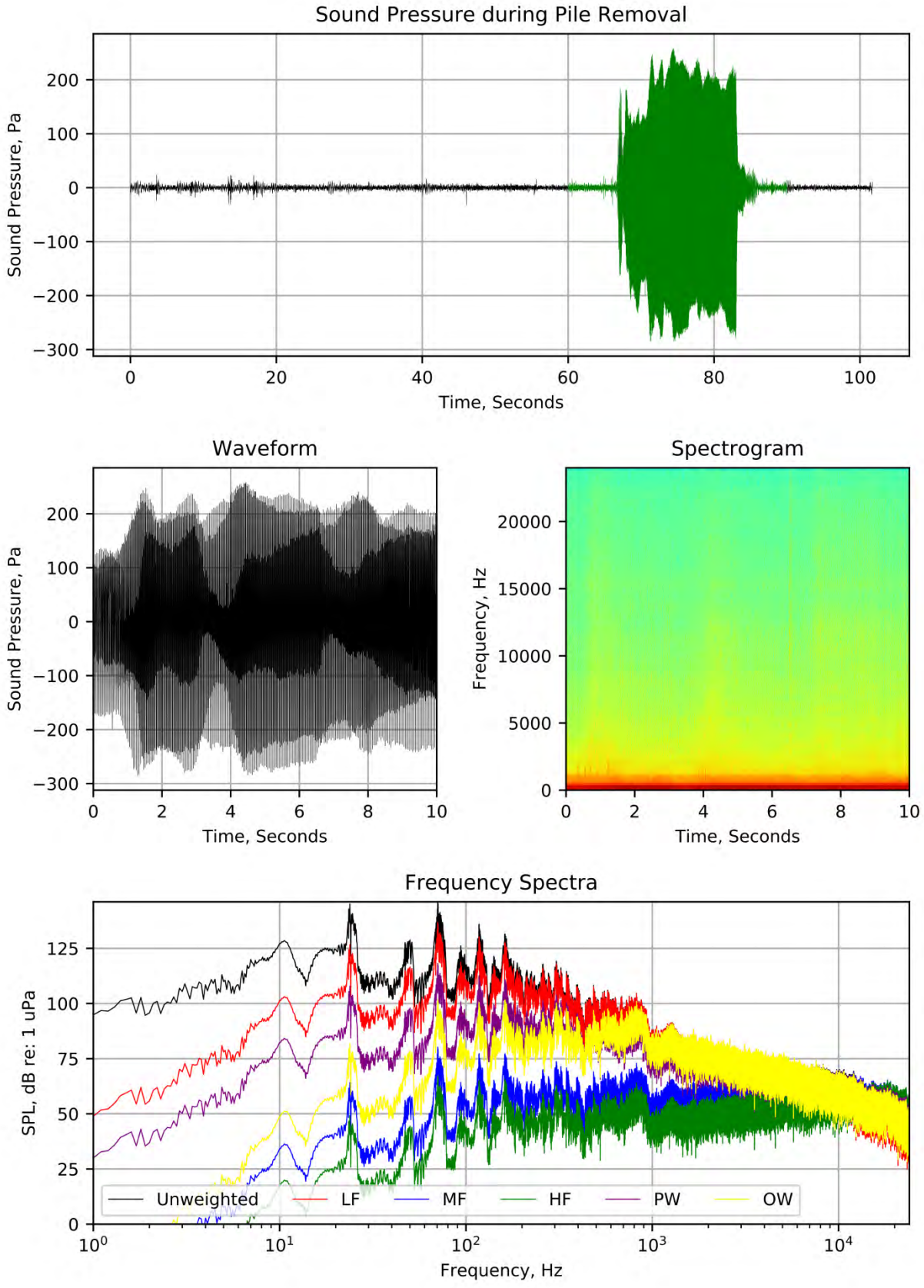
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	157	161	2.3	160	140	153	6.2	149	150	163	6.2	159
Low Frequency Cetacean	157	161	2.3	160	129	142	6.5	139	139	152	6.5	149
Mid Frequency Cetacean	157	161	2.3	160	134	146	6.2	143	144	156	6.2	153
High Frequency Cetacean	157	161	2.3	160	135	147	6.2	144	145	157	6.2	154
Phocid Pinnipeds	157	161	2.3	160	125	138	6.3	135	135	148	6.3	145
Otariid Pinnipeds	157	161	2.3	160	122	135	6.2	131	132	145	6.2	141
Lower Hydrophone												
Unweighted	165	168	1.5	166	152	162	4.7	158	162	172	4.7	168
Low Frequency Cetacean	165	168	1.5	166	137	149	6.0	146	147	159	6.0	156
Mid Frequency Cetacean	165	168	1.5	166	146	155	4.7	152	156	165	4.7	162
High Frequency Cetacean	165	168	1.5	166	147	156	4.7	152	157	166	4.7	162
Phocid Pinnipeds	165	168	1.5	166	137	146	4.8	143	147	156	4.8	153
Otariid Pinnipeds	165	168	1.5	166	134	143	4.6	140	144	153	4.6	150

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 37 (TP-37)

January 19, 2018

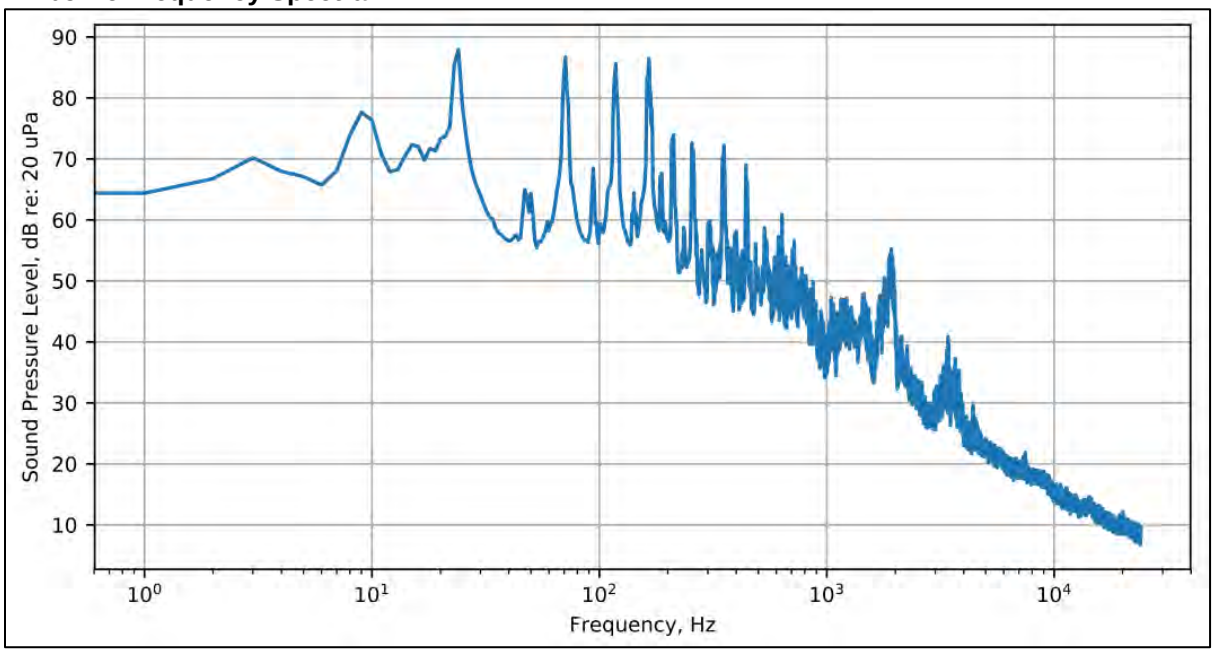
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	25	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	108	69

Airborne Frequency Spectra

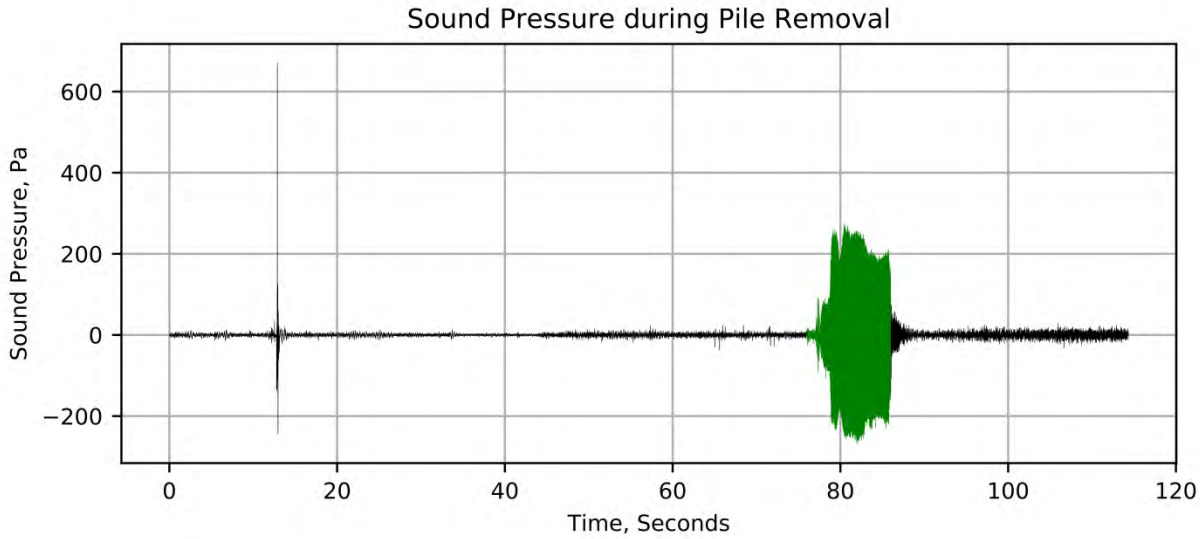


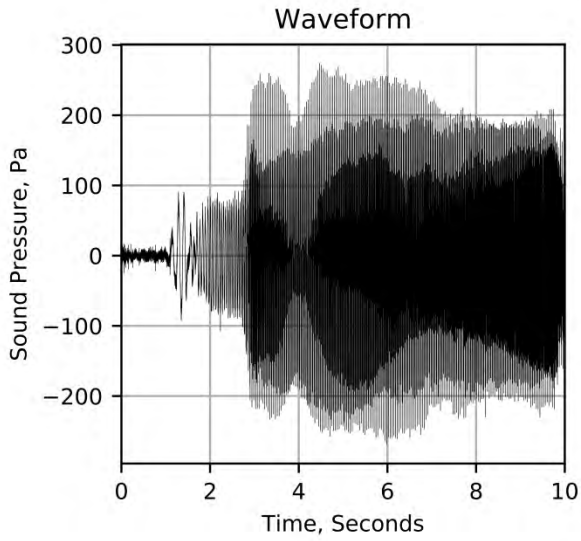
Underwater Sound Levels, dB re: 1 μPa

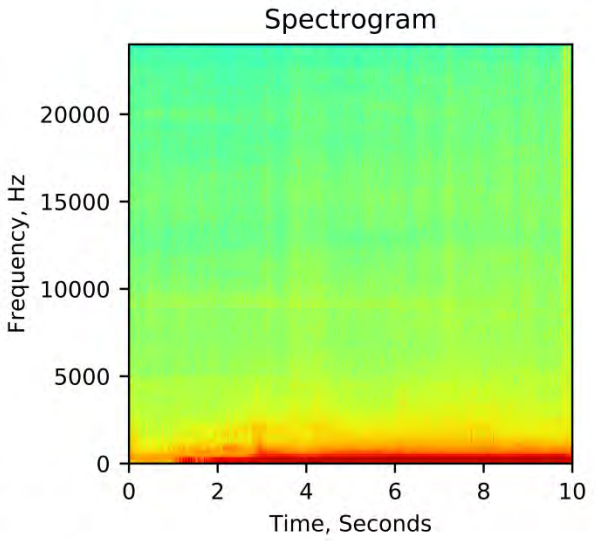
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	158	158	-	158	147	147	-	147	157	157	-	157
Low Frequency Cetacean	158	158	-	158	138	138	-	138	148	148	-	148
Mid Frequency Cetacean	158	158	-	158	141	141	-	141	151	151	-	151
High Frequency Cetacean	158	158	-	158	141	141	-	141	151	151	-	151
Phocid Pinnipeds	158	158	-	158	133	133	-	133	143	143	-	143
Otariid Pinnipeds	158	158	-	158	130	130	-	130	140	140	-	140
Lower Hydrophone												
Unweighted	167	167	-	167	158	158	-	158	168	168	-	168
Low Frequency Cetacean	167	167	-	167	148	148	-	148	158	158	-	158
Mid Frequency Cetacean	167	167	-	167	151	151	-	151	161	161	-	161
High Frequency Cetacean	167	167	-	167	152	152	-	152	162	162	-	162
Phocid Pinnipeds	167	167	-	167	143	143	-	143	153	153	-	153
Otariid Pinnipeds	167	167	-	167	140	140	-	140	150	150	-	150

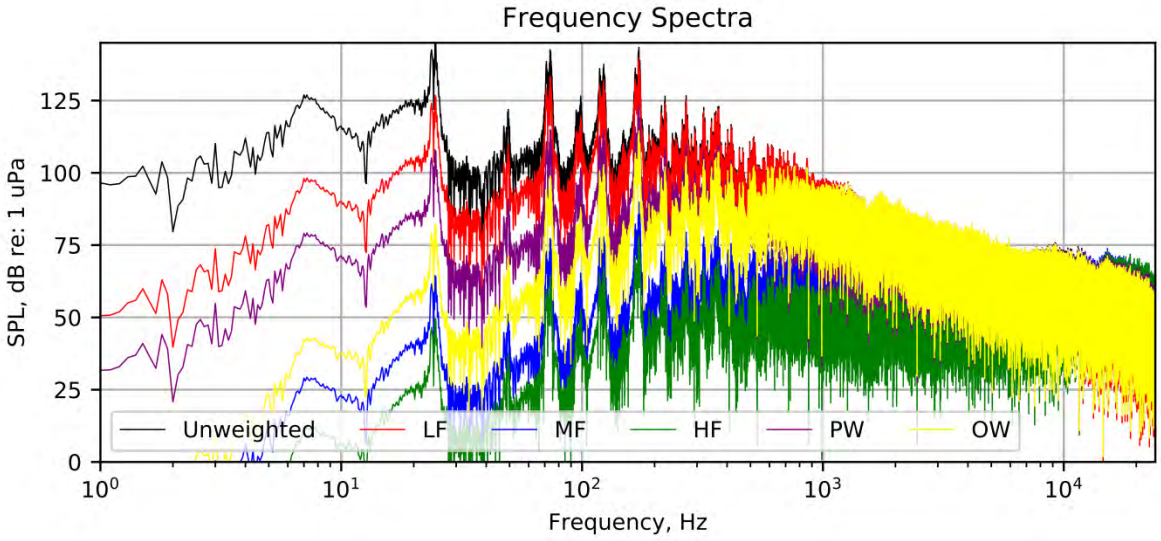
Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
600
400
200
0
−200
0
20
40
60
80
100
120
Time, Seconds


Waveform
Sound Pressure, Pa
300
200
100
0
−100
−200
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
125
100
75
50
25
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

TIMBER PILE REMOVAL 38 (TP-38)

January 19, 2018

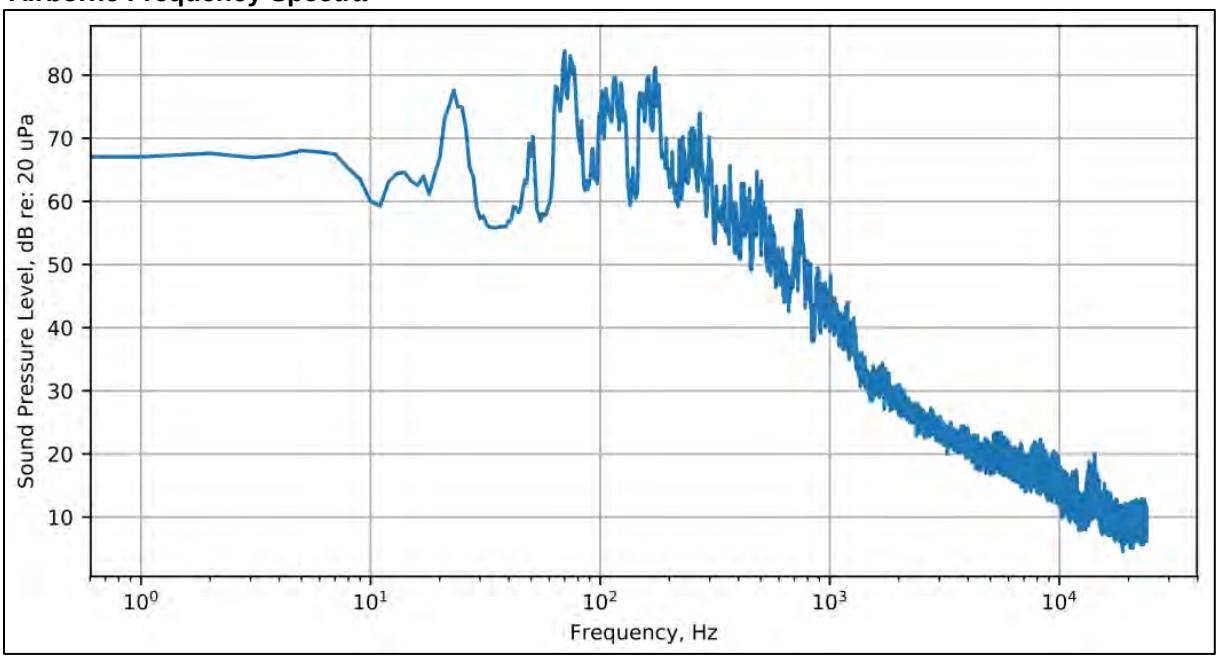
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	15	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
78	107	69

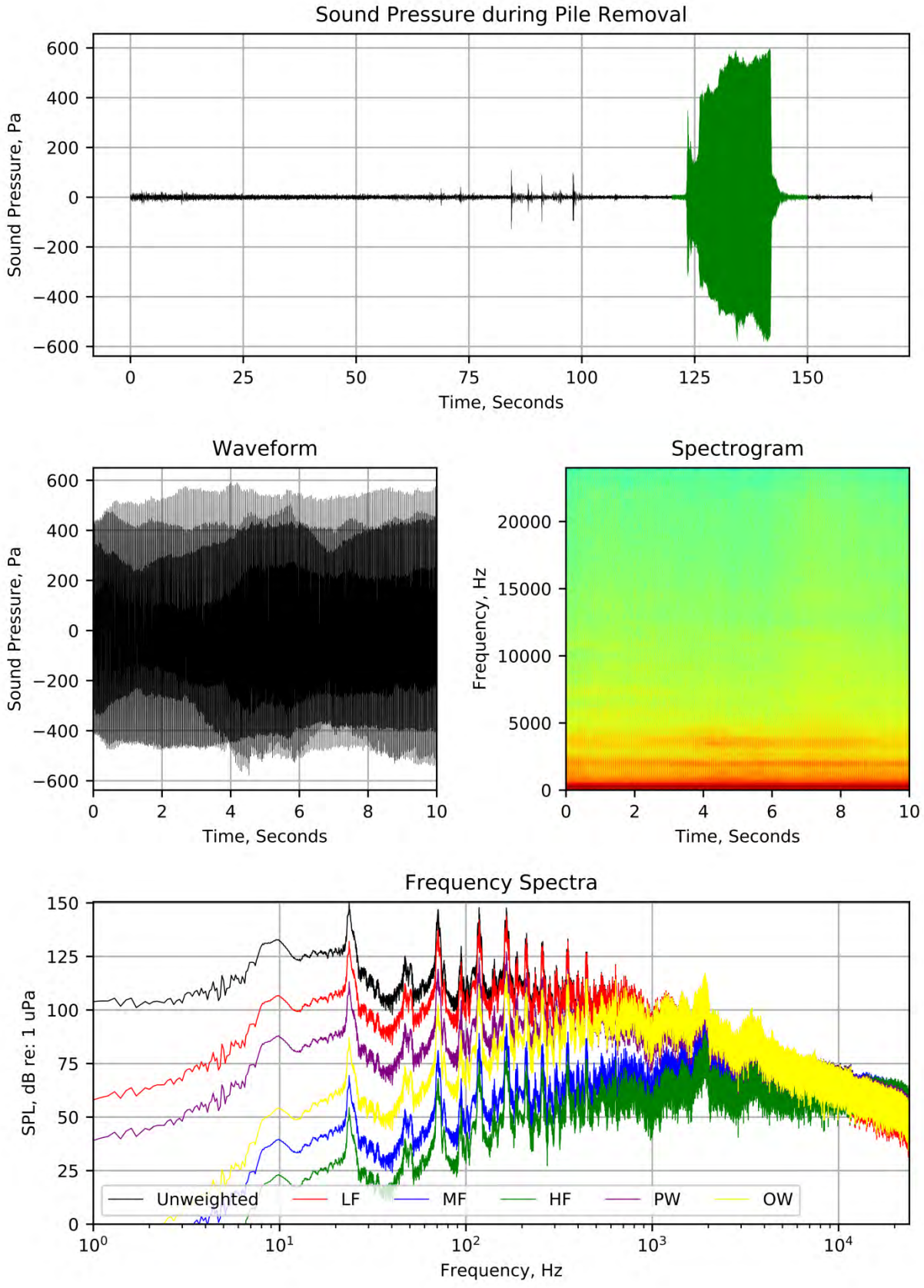
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	161	164	1.5	163	145	153	3.9	150	155	163	3.9	160
Low Frequency Cetacean	161	164	1.5	163	136	144	3.9	141	146	154	3.9	151
Mid Frequency Cetacean	161	164	1.5	163	139	147	3.9	144	149	157	3.9	154
High Frequency Cetacean	161	164	1.5	163	139	147	3.9	144	149	157	3.9	154
Phocid Pinnipeds	161	164	1.5	163	132	139	3.6	136	142	149	3.6	146
Otariid Pinnipeds	161	164	1.5	163	130	136	3.4	134	140	146	3.4	144
Lower Hydrophone												
Unweighted	168	170	1.3	170	154	162	3.8	159	164	172	3.8	169
Low Frequency Cetacean	168	170	1.3	170	145	152	3.7	149	155	162	3.7	159
Mid Frequency Cetacean	168	170	1.3	170	148	156	3.8	153	158	166	3.8	163
High Frequency Cetacean	168	170	1.3	170	149	156	3.8	154	159	166	3.8	164
Phocid Pinnipeds	168	170	1.3	170	140	148	3.7	145	150	158	3.7	155
Otariid Pinnipeds	168	170	1.3	170	138	145	3.7	142	148	155	3.7	152

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 39 (TP-39)

January 19, 2018

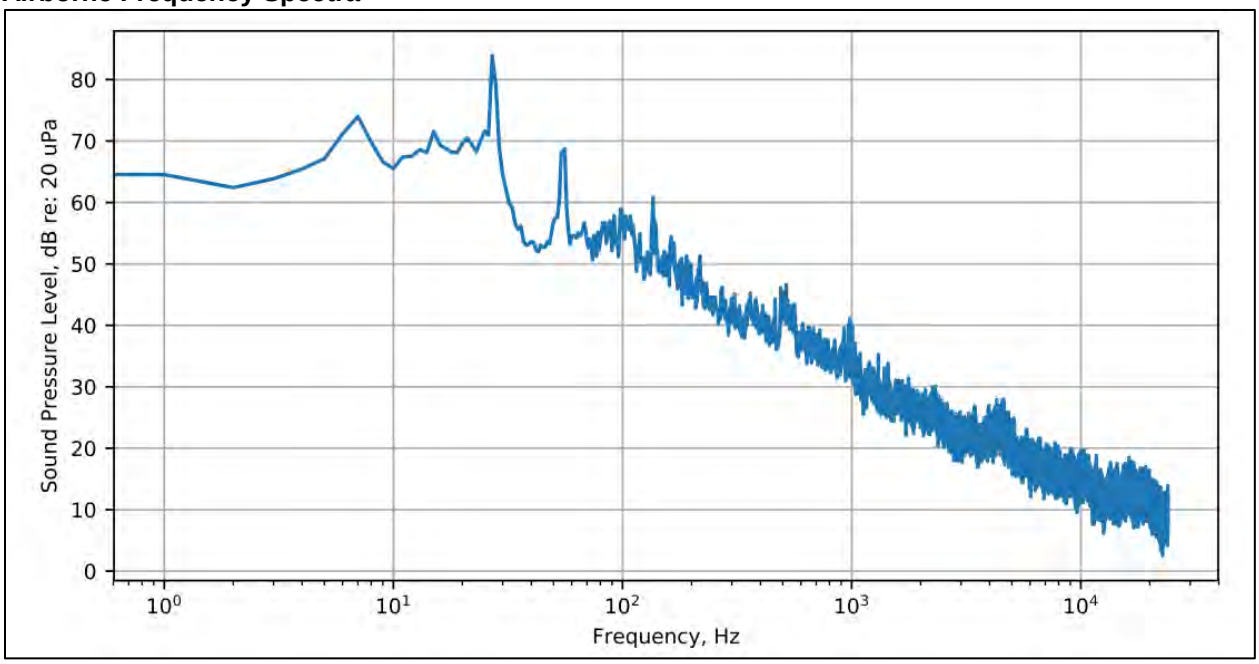
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	15	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
74	98	68

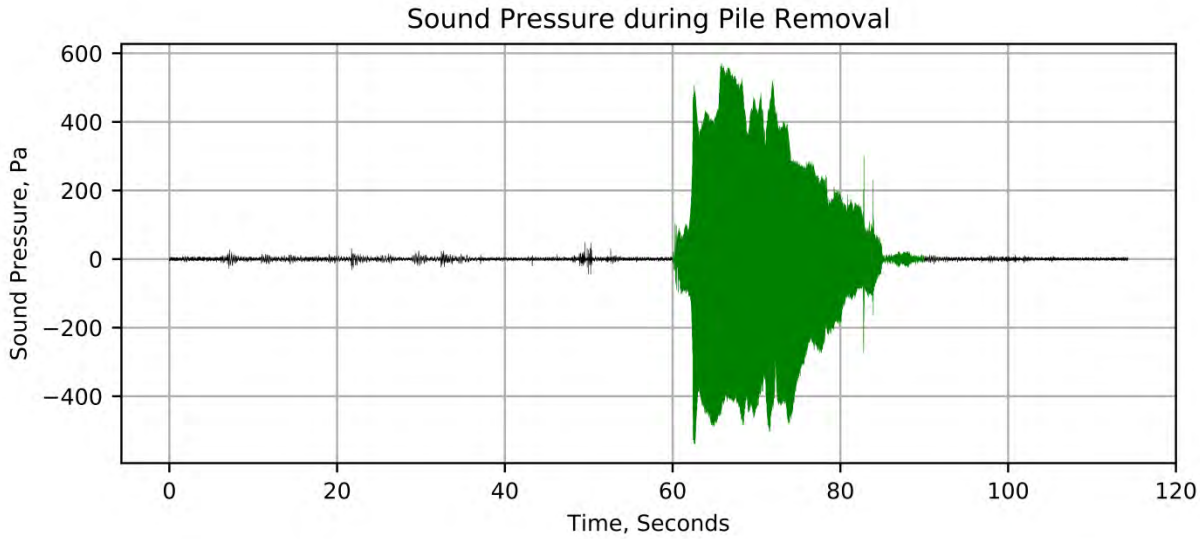
Airborne Frequency Spectra

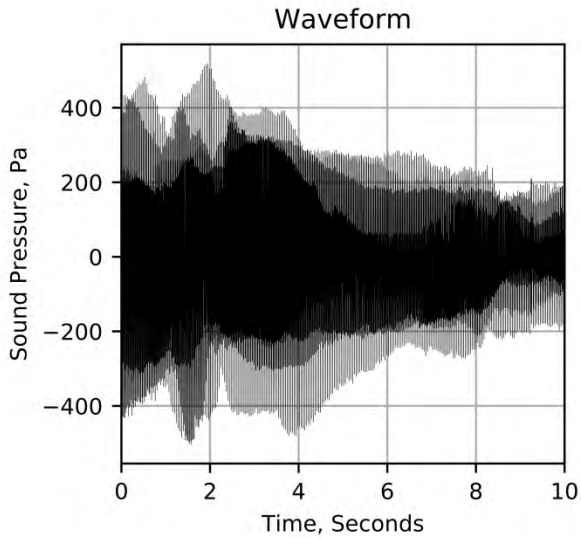


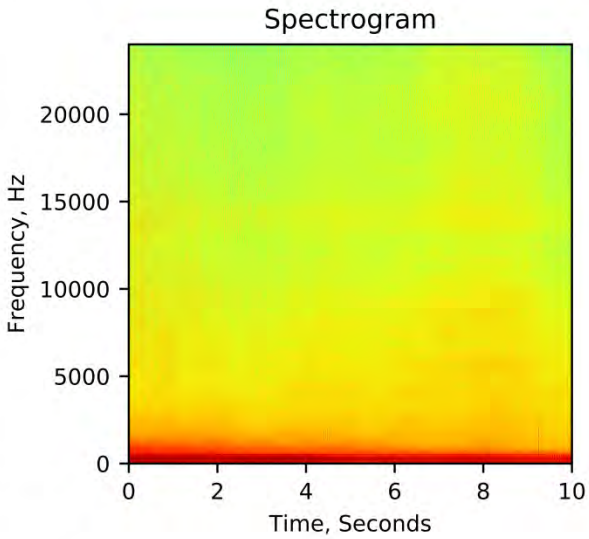
Underwater Sound Levels, dB re: 1 μPa

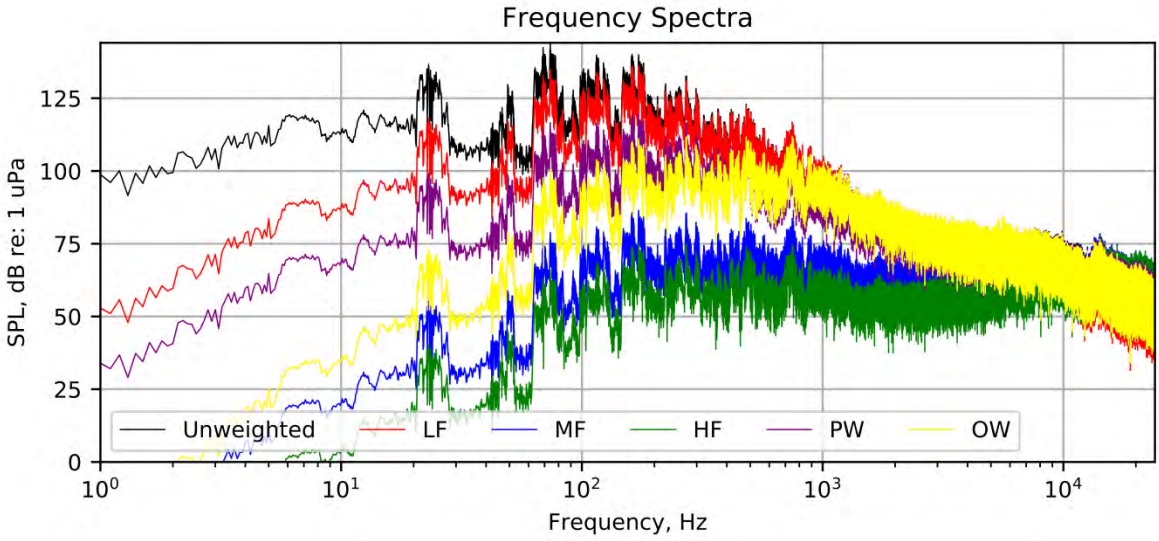
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	163	166	1.8	165	144	154	5.9	152	154	164	5.9	162
Low Frequency Cetacean	163	166	1.8	165	135	146	6.0	144	145	156	6.0	154
Mid Frequency Cetacean	163	166	1.8	165	137	148	5.9	146	147	158	5.9	156
High Frequency Cetacean	163	166	1.8	165	138	149	5.9	147	148	159	5.9	157
Phocid Pinnipeds	163	166	1.8	165	130	140	6.1	139	140	150	6.1	149
Otariid Pinnipeds	163	166	1.8	165	127	138	6.5	136	137	148	6.5	146
Lower Hydrophone												
Unweighted	164	170	3.0	168	146	160	7.3	157	156	170	7.3	167
Low Frequency Cetacean	164	170	3.0	168	137	150	7.2	148	147	160	7.2	158
Mid Frequency Cetacean	164	170	3.0	168	140	153	7.3	151	150	163	7.3	161
High Frequency Cetacean	164	170	3.0	168	141	154	7.3	152	151	164	7.3	162
Phocid Pinnipeds	164	170	3.0	168	132	145	7.3	143	142	155	7.3	153
Otariid Pinnipeds	164	170	3.0	168	129	142	7.3	140	139	152	7.3	150

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 40 (TP-40)

January 19, 2018

Hydrophone and Pile Information, Feet

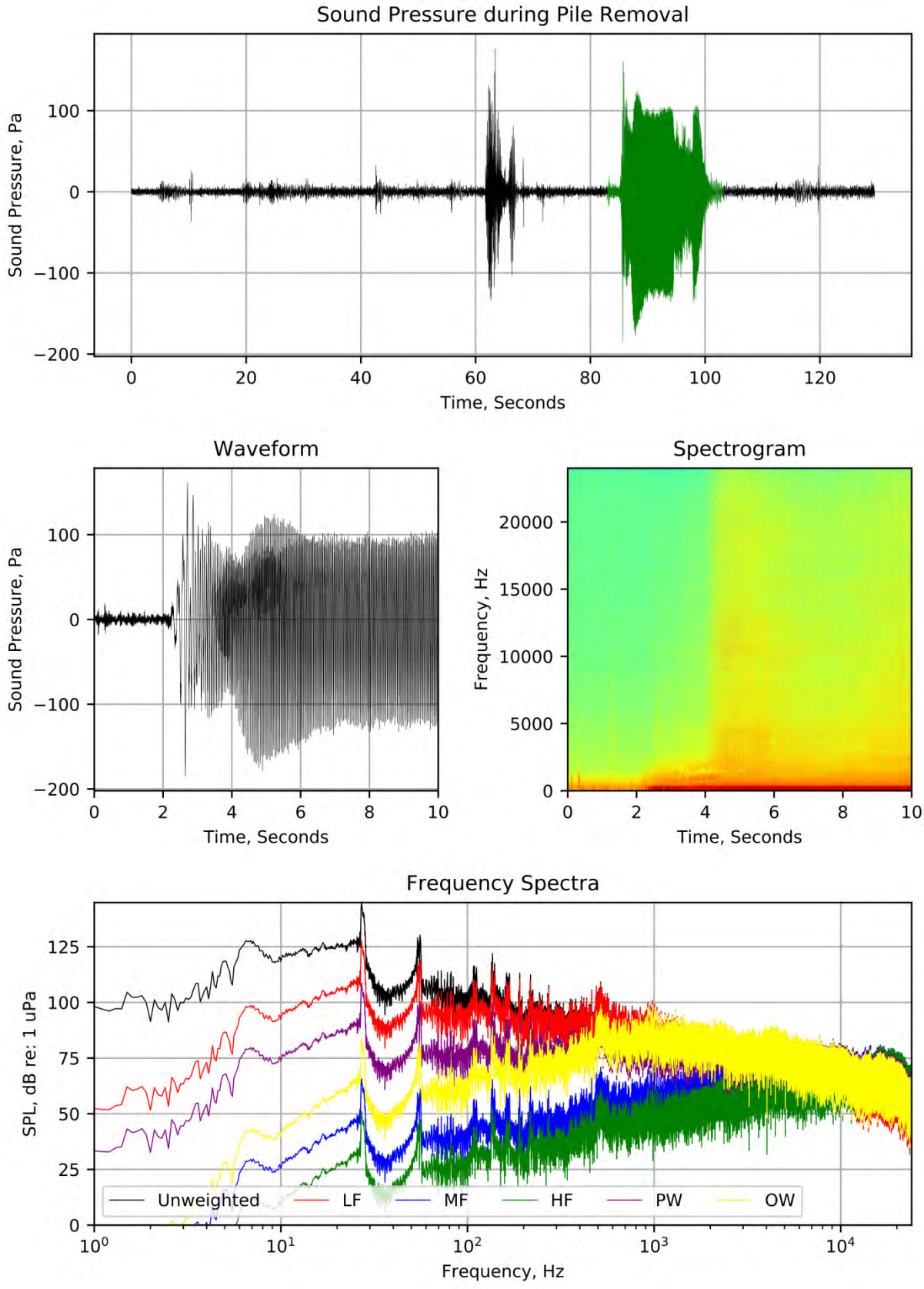
Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	20	215	41	44

(AIRBORNE DATA NOT COLLECTED)

Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	148	148	0.3	148	132	136	2.9	134	142	146	2.9	144
Low Frequency Cetacean	148	148	0.3	148	123	126	1.5	125	133	136	1.5	135
Mid Frequency Cetacean	148	148	0.3	148	126	130	2.8	128	136	140	2.8	138
High Frequency Cetacean	148	148	0.3	148	126	130	2.8	129	136	140	2.8	139
Phocid Pinnipeds	148	148	0.3	148	120	122	1.5	122	130	132	1.5	132
Otariid Pinnipeds	148	148	0.3	148	120	121	0.7	120	130	131	0.7	130
Lower Hydrophone												
Unweighted	157	161	2.5	159	149	152	2.6	151	159	162	2.6	161
Low Frequency Cetacean	157	161	2.5	159	133	136	2.2	135	143	146	2.2	145
Mid Frequency Cetacean	157	161	2.5	159	142	146	2.6	145	152	156	2.6	155
High Frequency Cetacean	157	161	2.5	159	143	147	2.6	145	153	157	2.6	155
Phocid Pinnipeds	157	161	2.5	159	133	137	2.3	135	143	147	2.3	145
Otariid Pinnipeds	157	161	2.5	159	131	134	2.0	133	141	144	2.0	143

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 41 (TP-41)

January 19, 2018

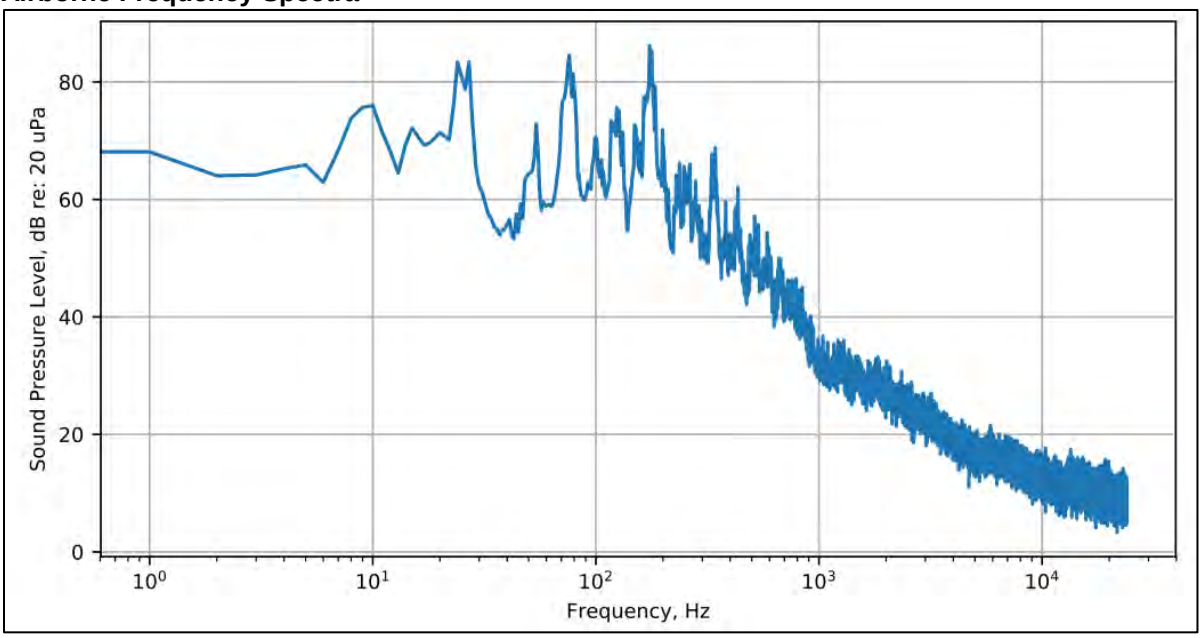
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	25	215	41	44

Airborne Sound Levels, dB re: 20 µPa

Median	Maximum	Minimum
78	109	72

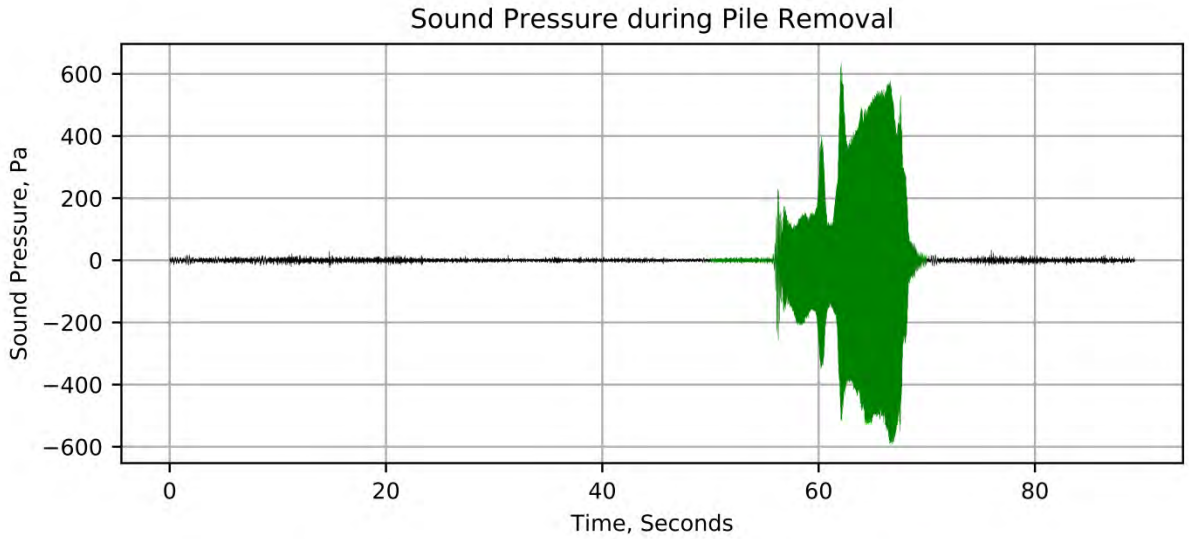
Airborne Frequency Spectra

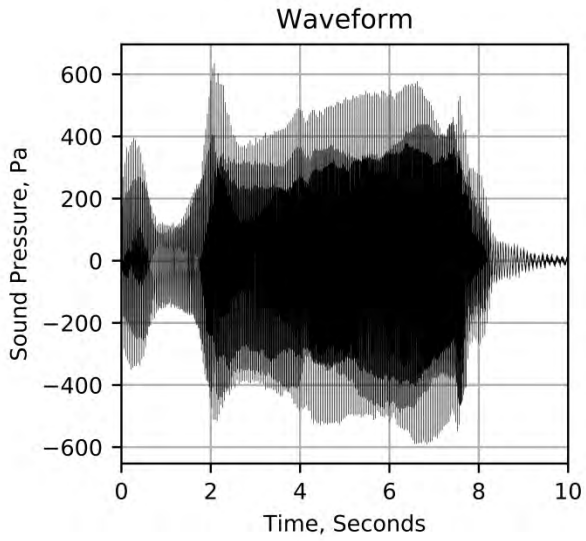


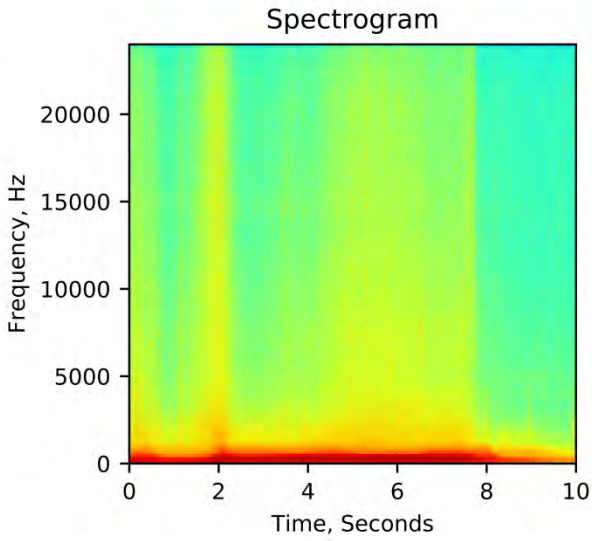
Underwater Sound Levels, dB re: 1 µPa

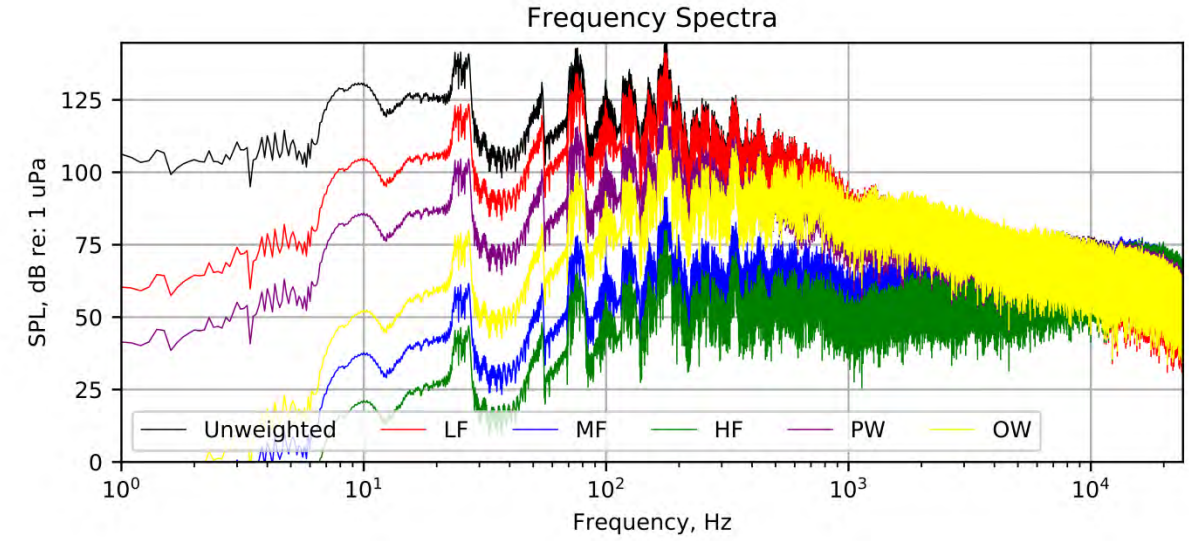
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	155	164	6.5	162	139	155	11.2	152	149	165	11.2	162
Low Frequency Cetacean	155	164	6.5	162	128	147	13.2	144	138	157	13.2	154
Mid Frequency Cetacean	155	164	6.5	162	133	149	11.3	146	143	159	11.3	156
High Frequency Cetacean	155	164	6.5	162	134	150	11.2	147	144	160	11.2	157
Phocid Pinnipeds	155	164	6.5	162	125	141	11.8	138	135	151	11.8	148
Otariid Pinnipeds	155	164	6.5	162	122	138	11.6	135	132	148	11.6	145
Lower Hydrophone												
Unweighted	166	174	6.1	172	154	164	7.0	161	164	174	7.0	171
Low Frequency Cetacean	166	174	6.1	172	138	154	11.7	151	148	164	11.7	161
Mid Frequency Cetacean	166	174	6.1	172	147	157	7.0	155	157	167	7.0	165
High Frequency Cetacean	166	174	6.1	172	148	158	7.0	155	158	168	7.0	165
Phocid Pinnipeds	166	174	6.1	172	138	149	8.0	147	148	159	8.0	157
Otariid Pinnipeds	166	174	6.1	172	135	146	7.6	143	145	156	7.6	153

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
600
400
200
0
−200
−400
−600
0
20
40
60
80
Time, Seconds


Waveform
Sound Pressure, Pa
600
400
200
0
−200
−400
−600
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
125
100
75
50
25
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

TIMBER PILE REMOVAL 42 (TP-42)

January 19, 2018

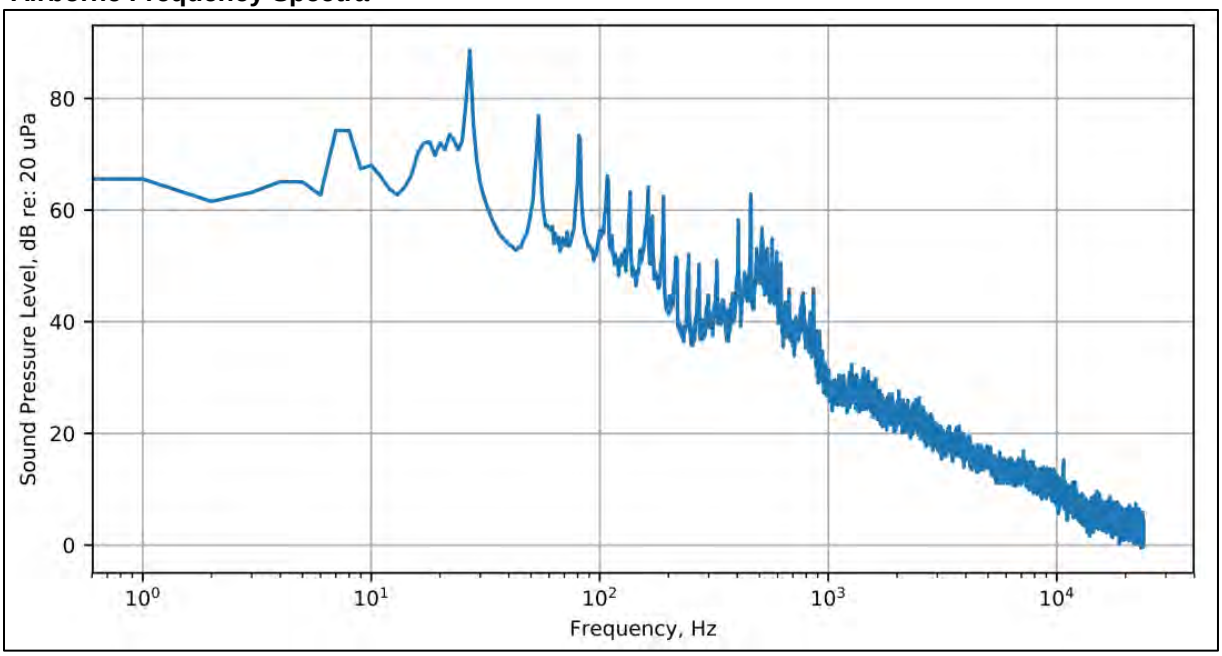
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	100	69

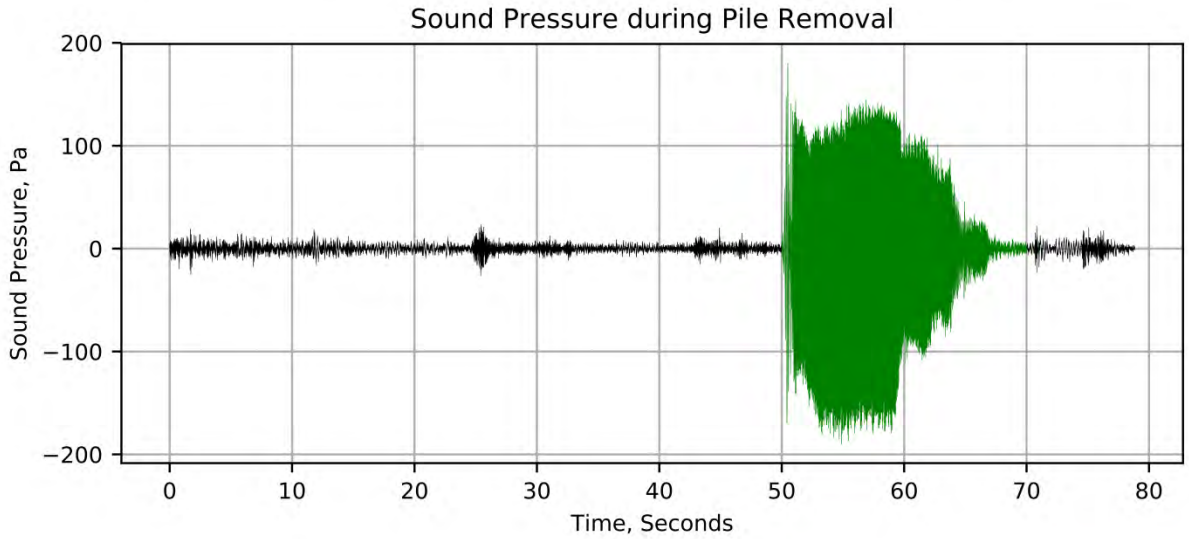
Airborne Frequency Spectra

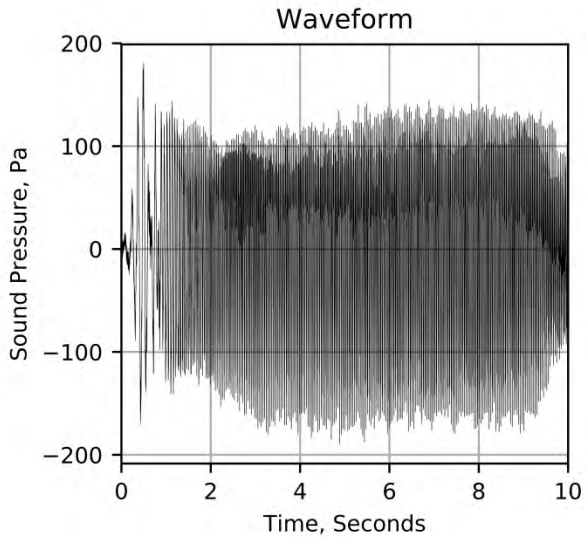


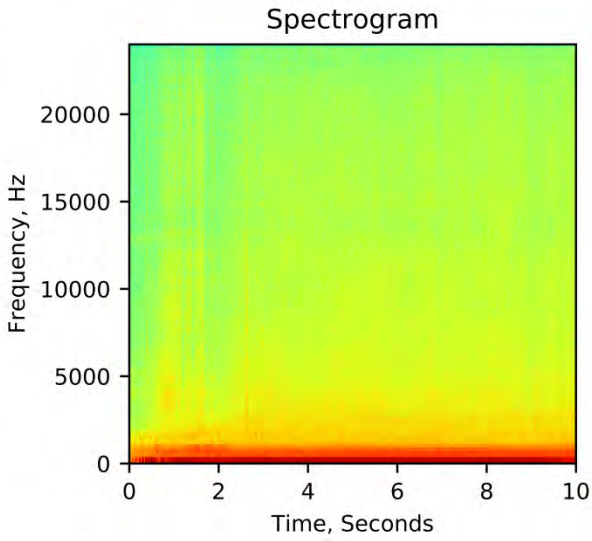
Underwater Sound Levels, dB re: 1 μPa

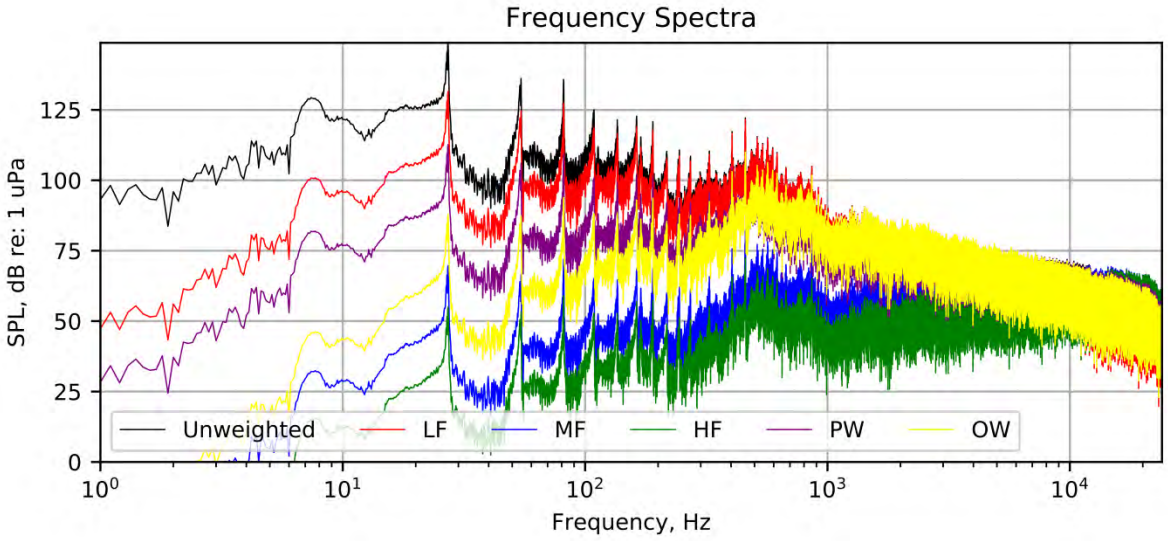
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	152	153	0.2	153	138	143	3.3	141	148	153	3.3	151
Low Frequency Cetacean	152	153	0.2	153	131	133	1.3	132	141	143	1.3	142
Mid Frequency Cetacean	152	153	0.2	153	132	136	3.3	135	142	146	3.3	145
High Frequency Cetacean	152	153	0.2	153	132	137	3.3	135	142	147	3.3	145
Phocid Pinnipeds	152	153	0.2	153	126	129	1.9	128	136	139	1.9	138
Otariid Pinnipeds	152	153	0.2	153	125	126	1.2	126	135	136	1.2	136
Lower Hydrophone												
Unweighted	160	165	2.9	163	149	158	6.5	155	159	168	6.5	165
Low Frequency Cetacean	160	165	2.9	163	136	142	4.4	140	146	152	4.4	150
Mid Frequency Cetacean	160	165	2.9	163	142	152	6.5	149	152	162	6.5	159
High Frequency Cetacean	160	165	2.9	163	143	152	6.5	150	153	162	6.5	160
Phocid Pinnipeds	160	165	2.9	163	134	142	6.0	140	144	152	6.0	150
Otariid Pinnipeds	160	165	2.9	163	131	139	5.7	137	141	149	5.7	147

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 43 (TP-43)

January 19, 2018

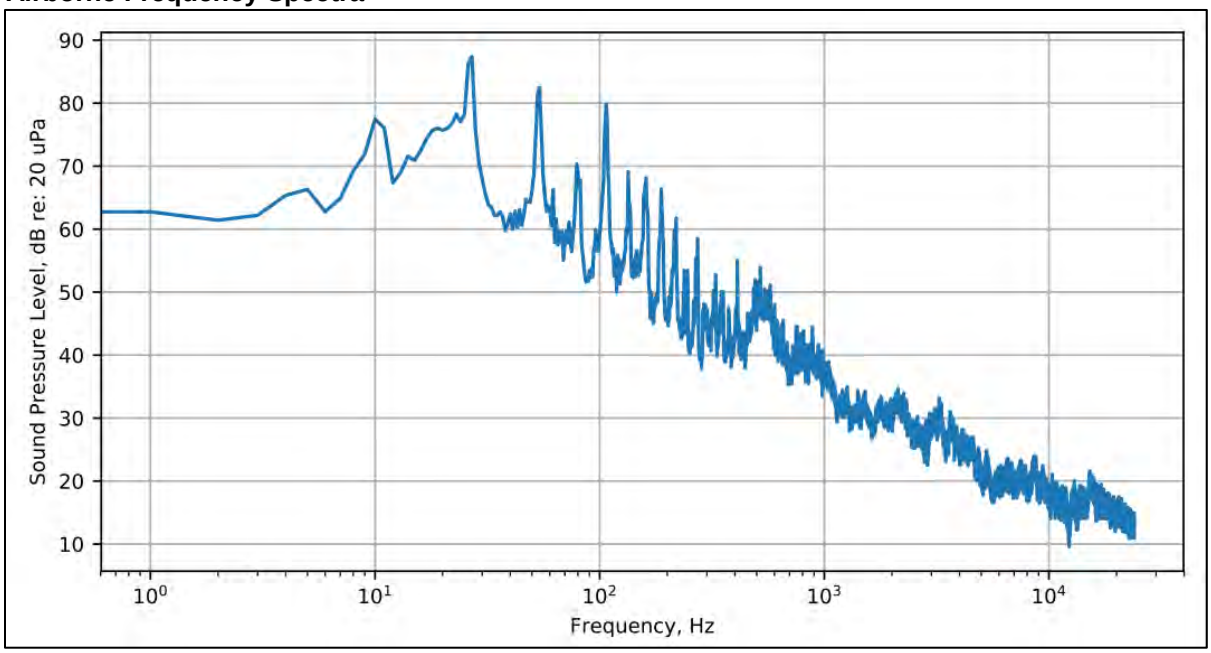
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
77	103	72

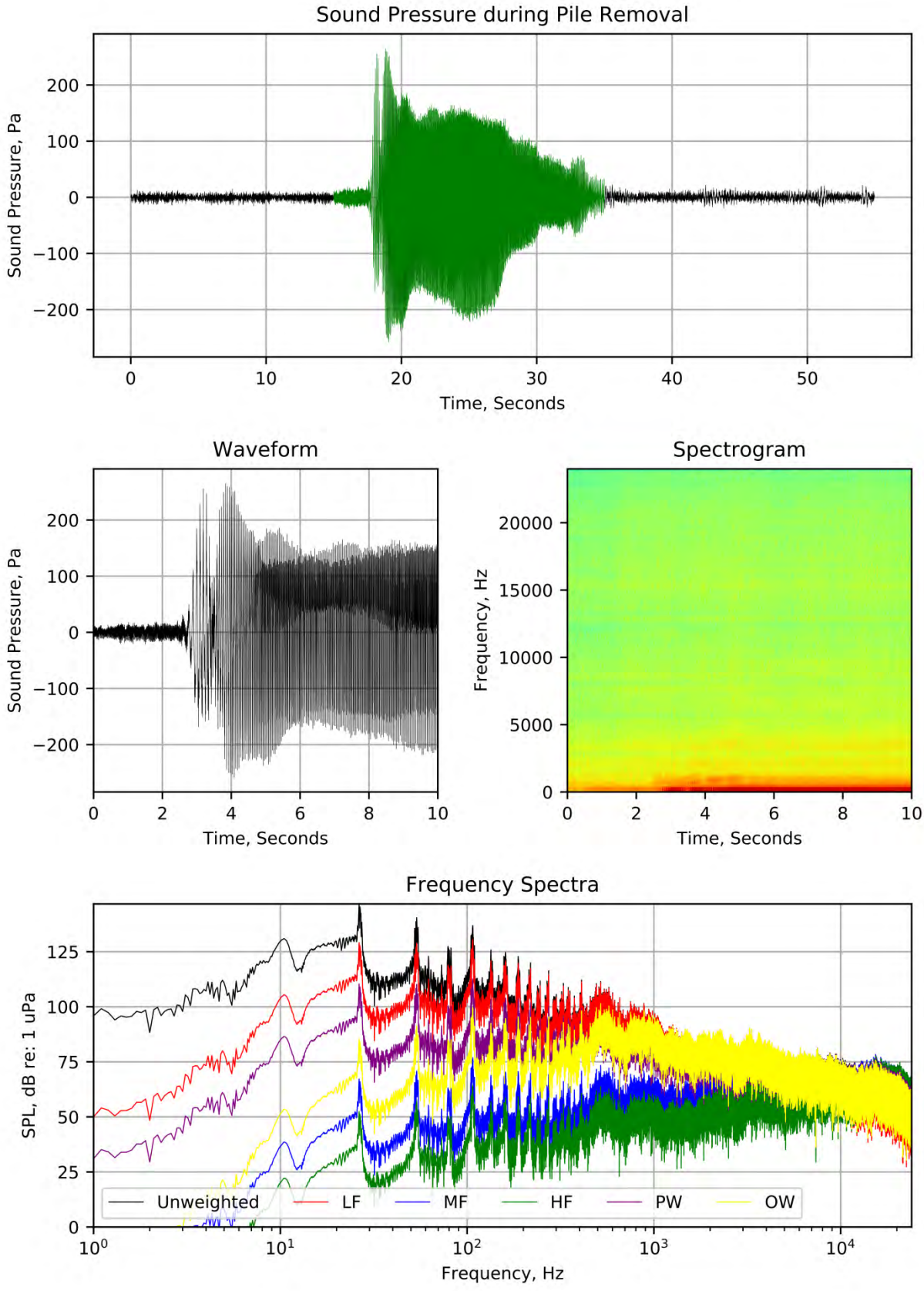
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	156	157	0.3	157	145	146	0.9	146	155	156	0.9	156
Low Frequency Cetacean	156	157	0.3	157	135	135	0.0	135	145	145	0.0	145
Mid Frequency Cetacean	156	157	0.3	157	139	140	0.8	139	149	150	0.8	149
High Frequency Cetacean	156	157	0.3	157	139	141	0.9	140	149	151	0.9	150
Phocid Pinnipeds	156	157	0.3	157	132	132	0.2	132	142	142	0.2	142
Otariid Pinnipeds	156	157	0.3	157	129	129	0.1	129	139	139	0.1	139
Lower Hydrophone												
Unweighted	163	168	3.2	166	154	158	3.1	157	164	168	3.1	167
Low Frequency Cetacean	163	168	3.2	166	141	143	1.6	142	151	153	1.6	152
Mid Frequency Cetacean	163	168	3.2	166	148	152	3.1	150	158	162	3.1	160
High Frequency Cetacean	163	168	3.2	166	148	153	3.1	151	158	163	3.1	161
Phocid Pinnipeds	163	168	3.2	166	139	143	2.7	141	149	153	2.7	151
Otariid Pinnipeds	163	168	3.2	166	136	140	2.7	138	146	150	2.7	148

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 44 (TP-44)

January 19, 2018

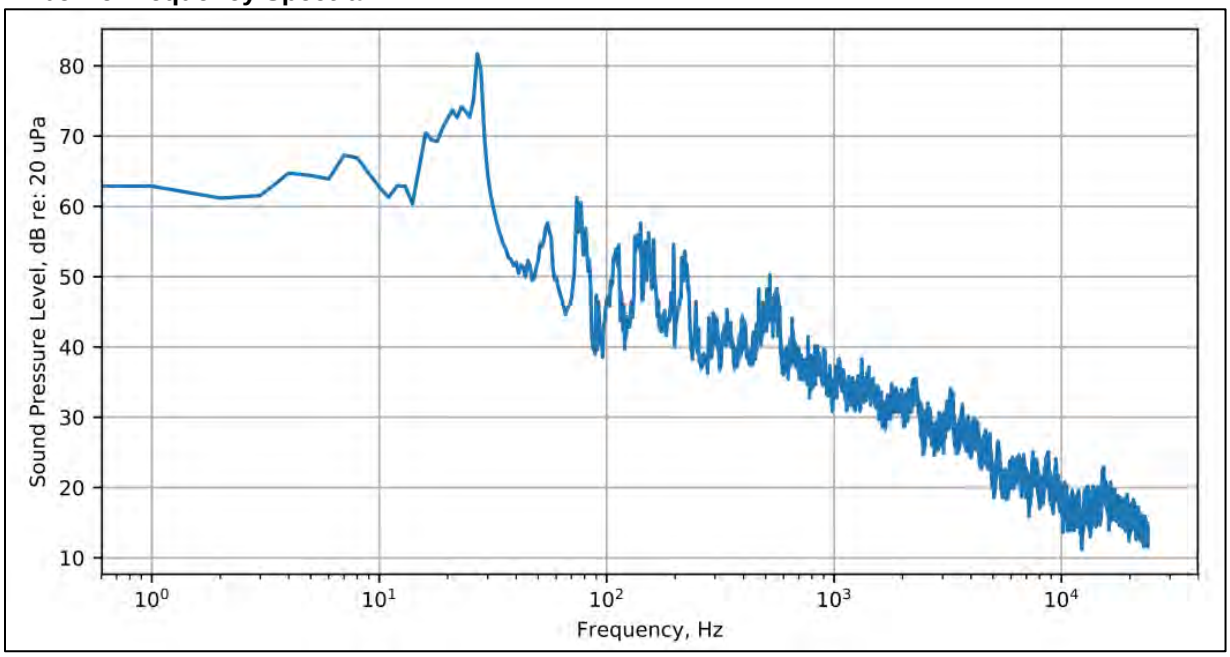
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
76	96	73

Airborne Frequency Spectra

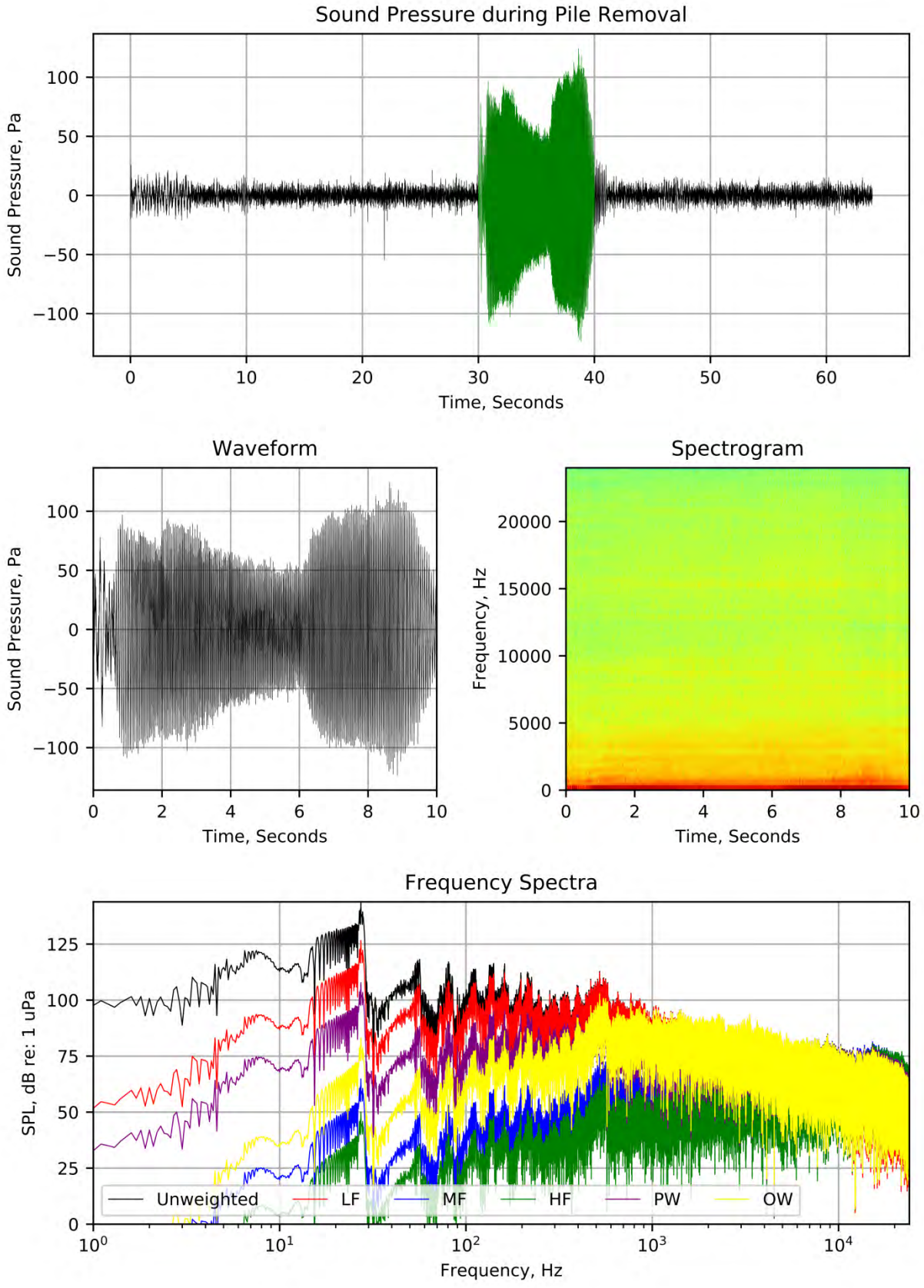


Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	153	153	-	153	137	137	-	137	147	147	-	147
Low Frequency Cetacean	153	153	-	153	130	130	-	130	140	140	-	140
Mid Frequency Cetacean	153	153	-	153	132	132	-	132	142	142	-	142
High Frequency Cetacean	153	153	-	153	133	133	-	133	143	143	-	143
Phocid Pinnipeds	153	153	-	153	128	128	-	128	138	138	-	138
Otariid Pinnipeds	153	153	-	153	127	127	-	127	137	137	-	137
Lower Hydrophone												
Unweighted	161	161	-	161	153	153	-	153	163	163	-	163
Low Frequency Cetacean	161	161	-	161	137	137	-	137	147	147	-	147
Mid Frequency Cetacean	161	161	-	161	146	146	-	146	156	156	-	156
High Frequency Cetacean	161	161	-	161	147	147	-	147	157	157	-	157
Phocid Pinnipeds	161	161	-	161	137	137	-	137	147	147	-	147
Otariid Pinnipeds	161	161	-	161	135	135	-	135	145	145	-	145

Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 45 (TP-45)

January 19, 2018

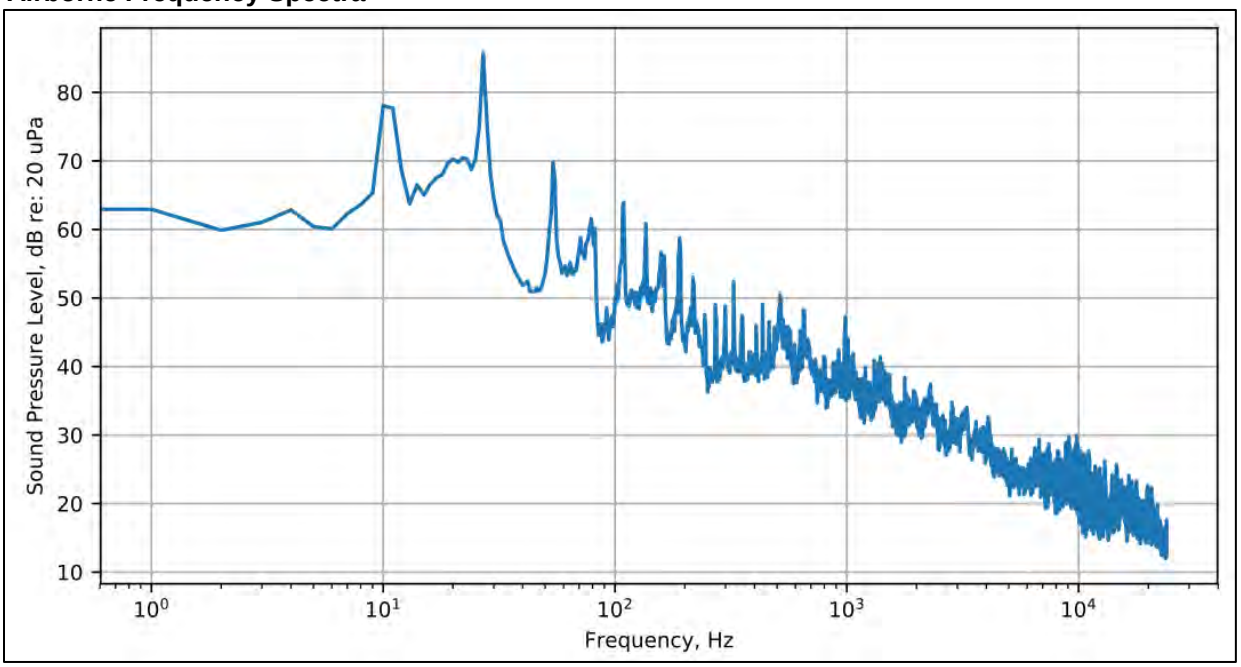
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/38	35	30	215	41	44

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
75	103	72

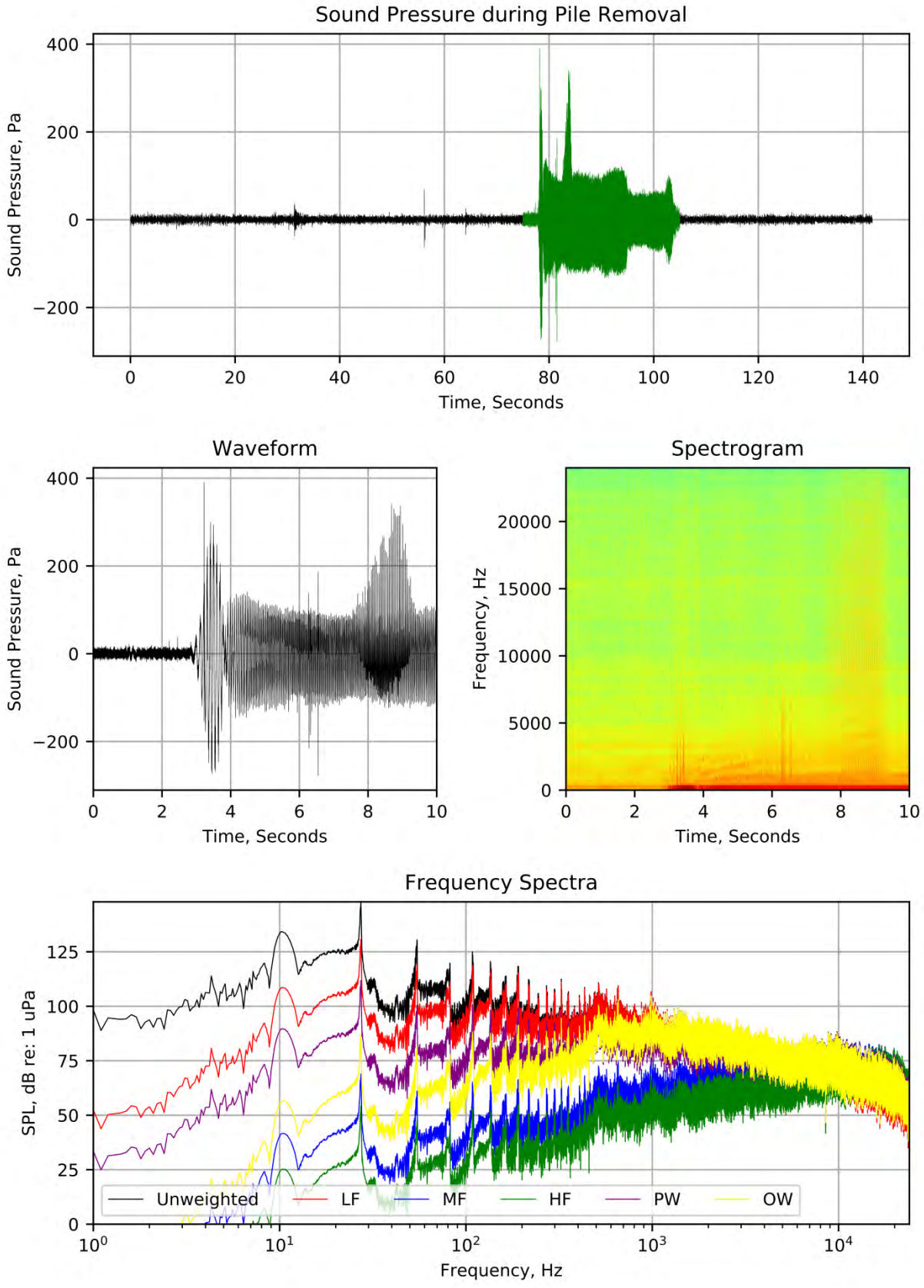
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	152	160	4.3	156	137	139	0.7	138	147	149	0.7	148
Low Frequency Cetacean	152	160	4.3	156	129	130	0.2	130	139	140	0.2	140
Mid Frequency Cetacean	152	160	4.3	156	132	134	0.8	133	142	144	0.8	143
High Frequency Cetacean	152	160	4.3	156	133	134	0.7	133	143	144	0.7	143
Phocid Pinnipeds	152	160	4.3	156	128	130	0.9	129	138	140	0.9	139
Otariid Pinnipeds	152	160	4.3	156	127	129	1.2	128	137	139	1.2	138
Lower Hydrophone												
Unweighted	160	171	6.3	167	149	155	3.2	154	159	165	3.2	164
Low Frequency Cetacean	160	171	6.3	167	135	139	2.2	138	145	149	2.2	148
Mid Frequency Cetacean	160	171	6.3	167	143	149	3.2	147	153	159	3.2	157
High Frequency Cetacean	160	171	6.3	167	144	149	3.2	148	154	159	3.2	158
Phocid Pinnipeds	160	171	6.3	167	134	140	3.0	138	144	150	3.0	148
Otariid Pinnipeds	160	171	6.3	167	132	138	2.9	136	142	148	2.9	146

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 46 (TP-46)

January 22, 2018

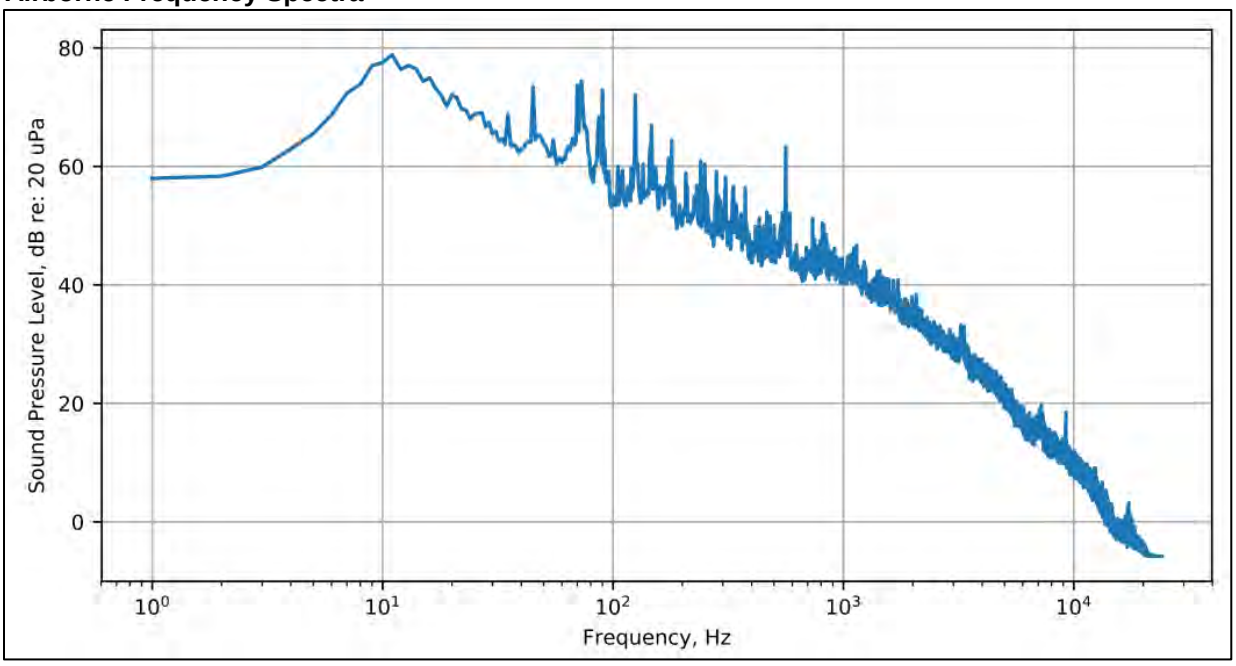
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	40	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	95	85

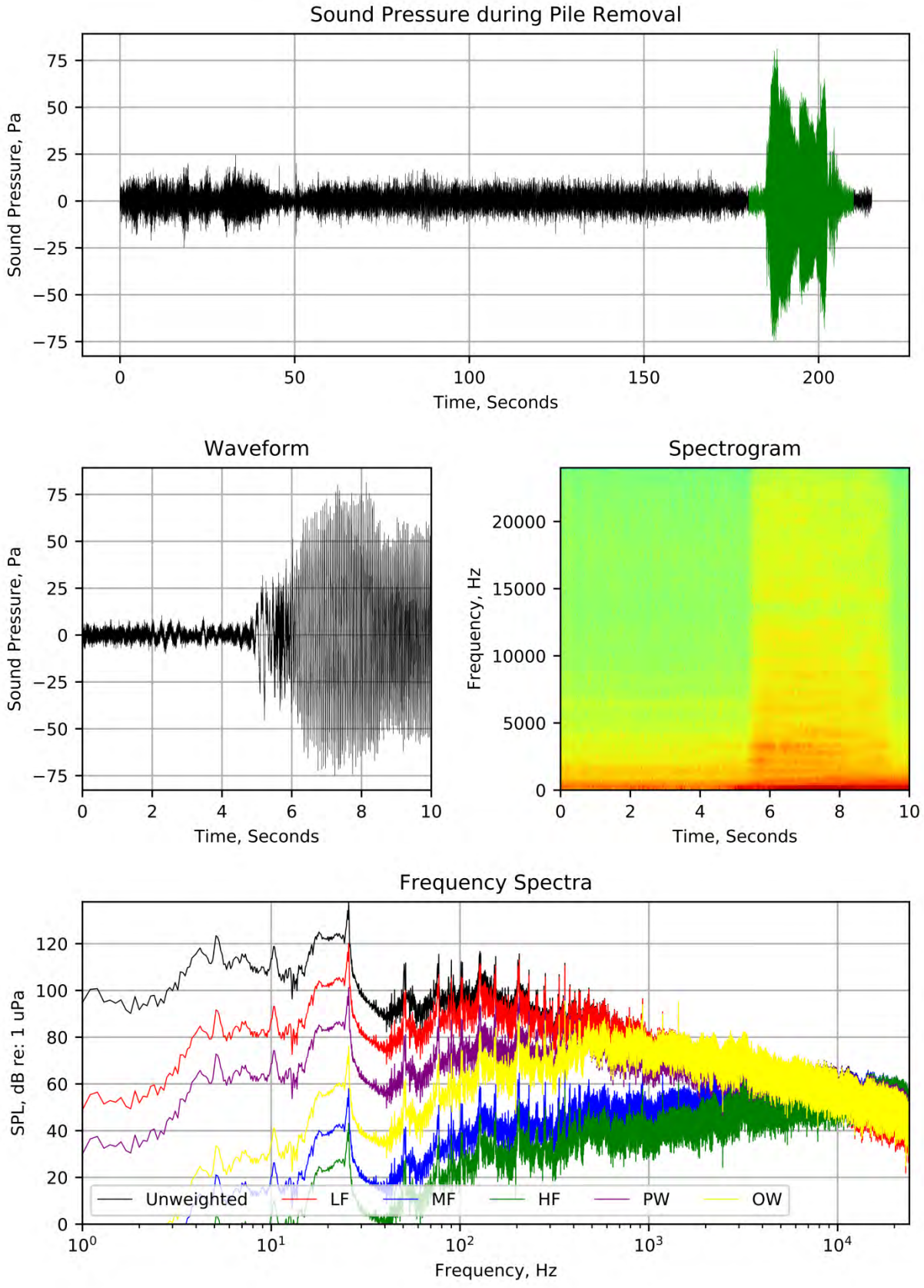
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	150	155	2.3	153	132	135	1.6	134	142	145	1.6	144
Low Frequency Cetacean	150	155	2.3	153	119	125	3.8	124	129	135	3.8	134
Mid Frequency Cetacean	150	155	2.3	153	125	129	1.6	127	135	139	1.6	137
High Frequency Cetacean	150	155	2.3	153	126	129	1.6	128	136	139	1.6	138
Phocid Pinnipeds	150	155	2.3	153	118	122	2.5	121	128	132	2.5	131
Otariid Pinnipeds	150	155	2.3	153	116	122	2.8	120	126	132	2.8	130
Lower Hydrophone												
Unweighted	157	159	1.3	158	146	149	1.3	148	156	159	1.3	158
Low Frequency Cetacean	157	159	1.3	158	129	134	2.5	132	139	144	2.5	142
Mid Frequency Cetacean	157	159	1.3	158	140	142	1.3	141	150	152	1.3	151
High Frequency Cetacean	157	159	1.3	158	140	143	1.3	142	150	153	1.3	152
Phocid Pinnipeds	157	159	1.3	158	130	133	1.4	132	140	143	1.4	142
Otariid Pinnipeds	157	159	1.3	158	128	130	1.4	129	138	140	1.4	139

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 47 (TP-47)

January 22, 2018

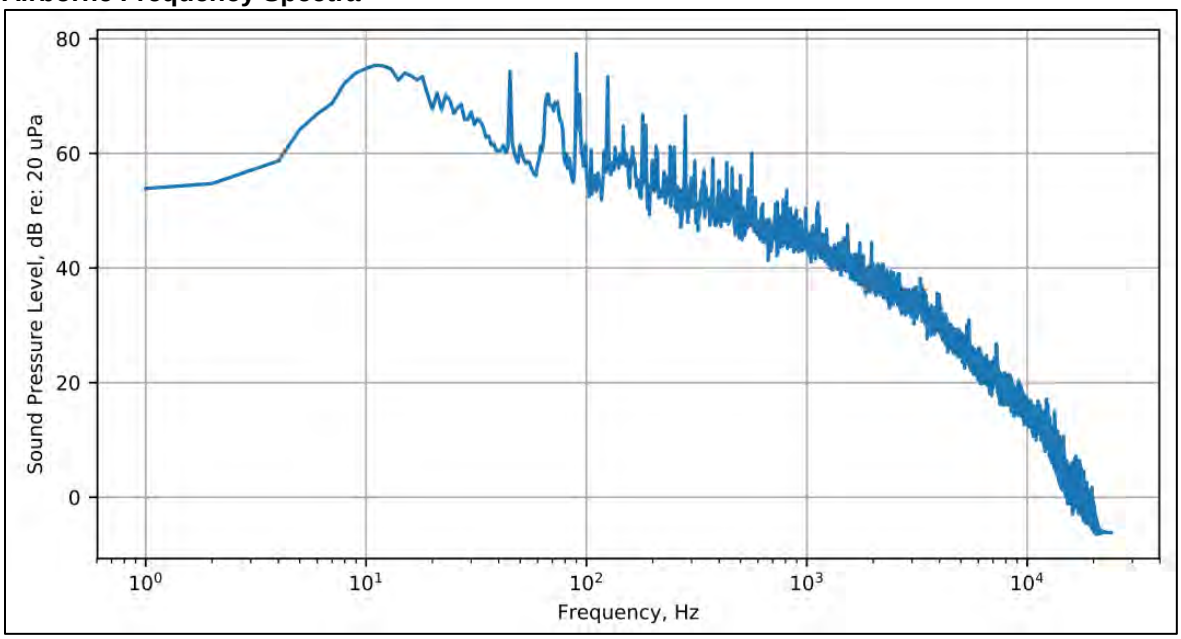
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	40	175	34	34

Airborne Sound Levels, dB re: 20 µPa

Median	Maximum	Minimum
89	93	86

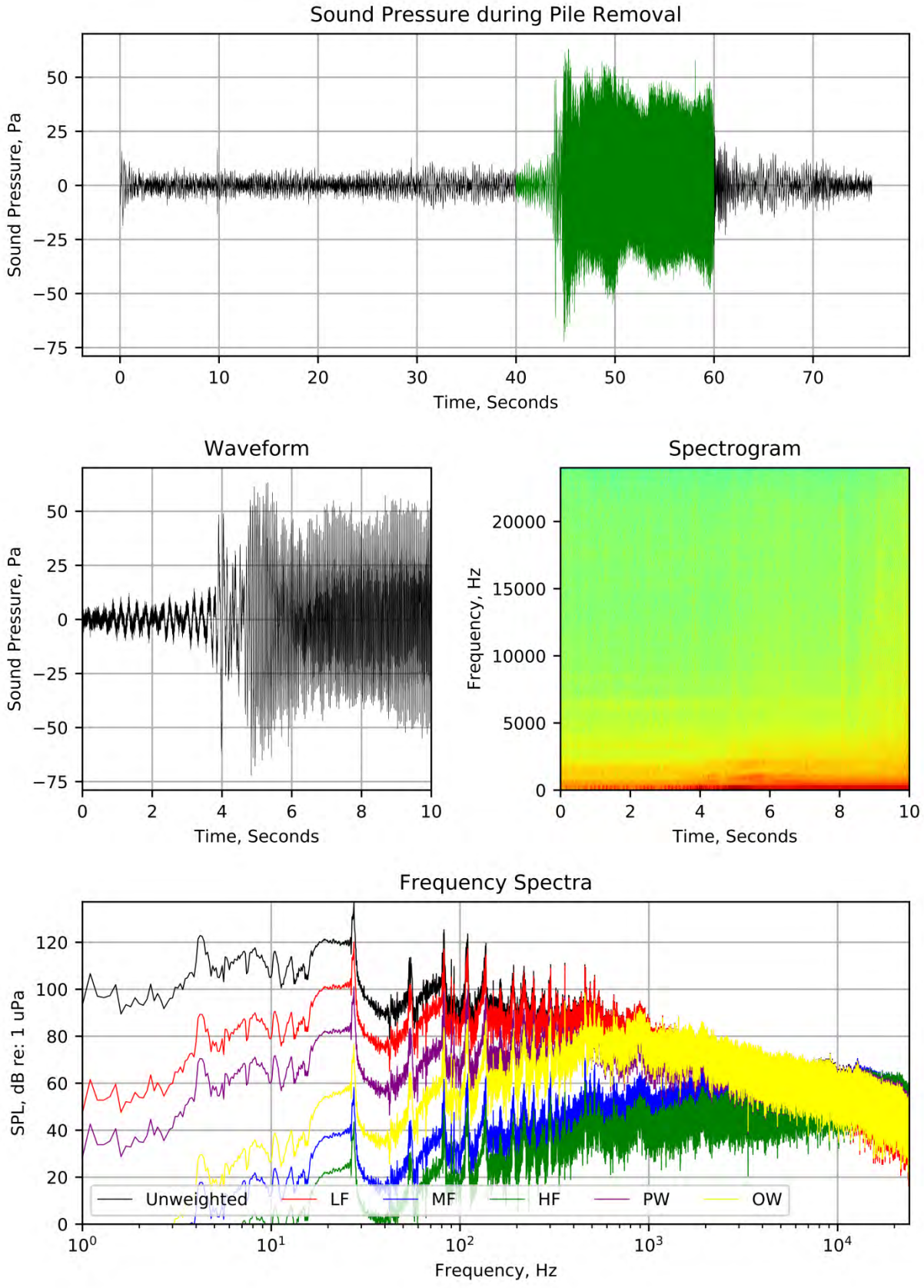
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 µPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	147	151	2.8	150	134	136	1.2	135	144	146	1.2	145
Low Frequency Cetacean	147	151	2.8	150	124	127	1.7	126	134	137	1.7	136
Mid Frequency Cetacean	147	151	2.8	150	128	130	1.2	129	138	140	1.2	139
High Frequency Cetacean	147	151	2.8	150	129	130	1.2	130	139	140	1.2	140
Phocid Pinnipeds	147	151	2.8	150	120	123	1.7	122	130	133	1.7	132
Otariid Pinnipeds	147	151	2.8	150	118	121	1.9	120	128	131	1.9	130
Lower Hydrophone												
Unweighted	157	157	0.6	157	147	147	0.1	147	157	157	0.1	157
Low Frequency Cetacean	157	157	0.6	157	132	133	0.9	133	142	143	0.9	143
Mid Frequency Cetacean	157	157	0.6	157	140	141	0.1	140	150	151	0.1	150
High Frequency Cetacean	157	157	0.6	157	141	141	0.1	141	151	151	0.1	151
Phocid Pinnipeds	157	157	0.6	157	131	132	0.3	131	141	142	0.3	141
Otariid Pinnipeds	157	157	0.6	157	129	129	0.4	129	139	139	0.4	139

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 48 (TP-48)

January 22, 2018

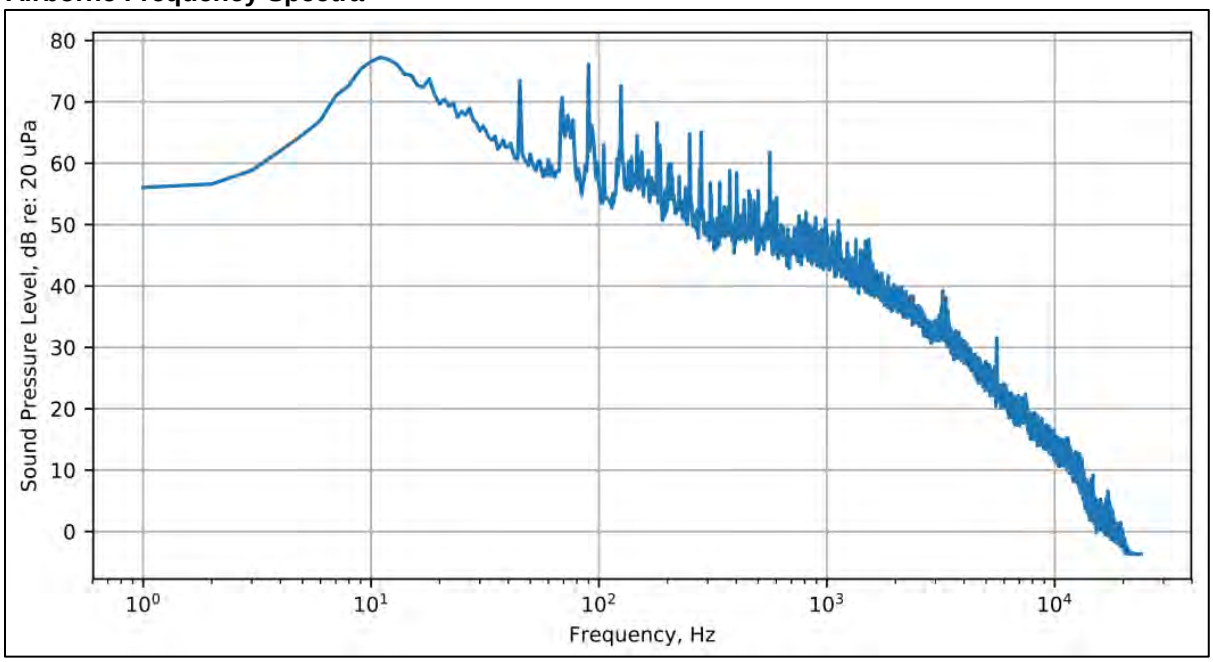
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	33	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	93	84

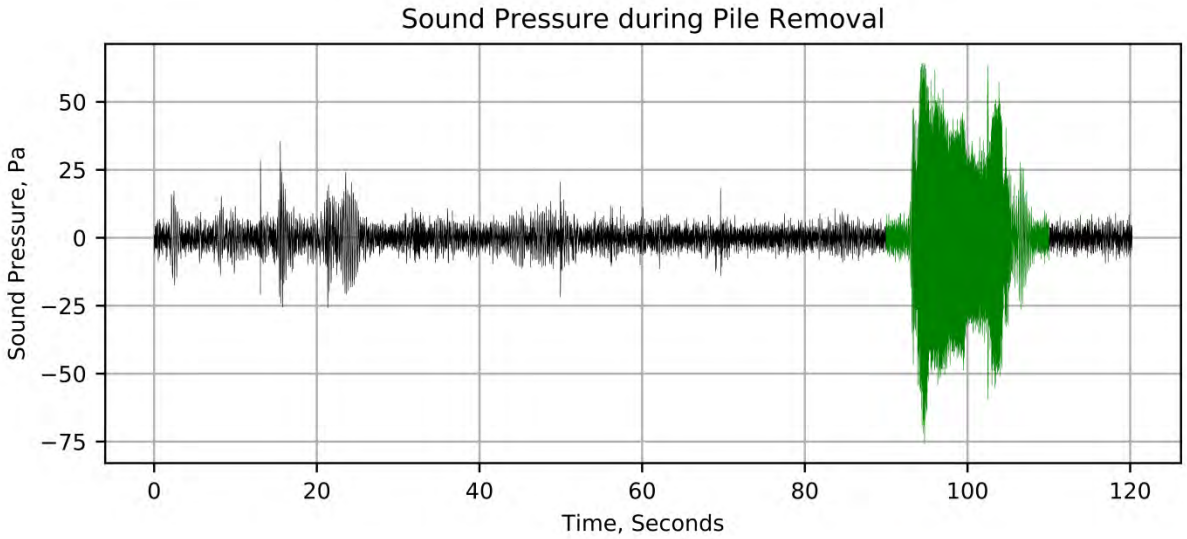
Airborne Frequency Spectra

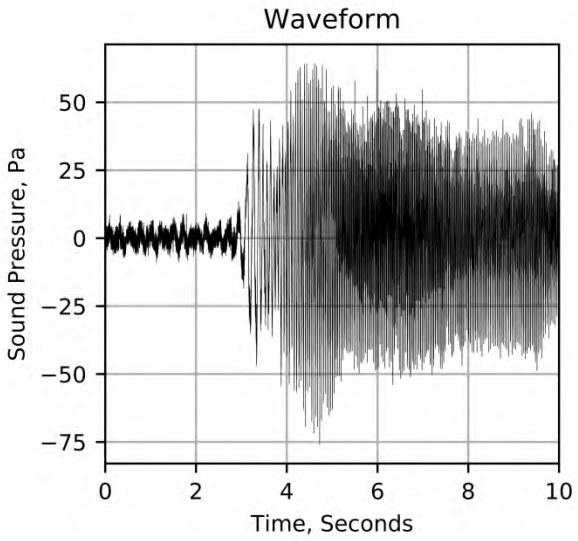


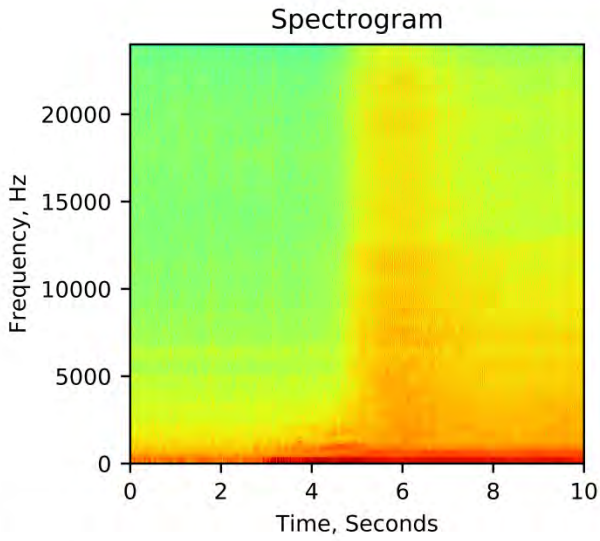
Underwater Sound Levels, dB re: 1 μPa

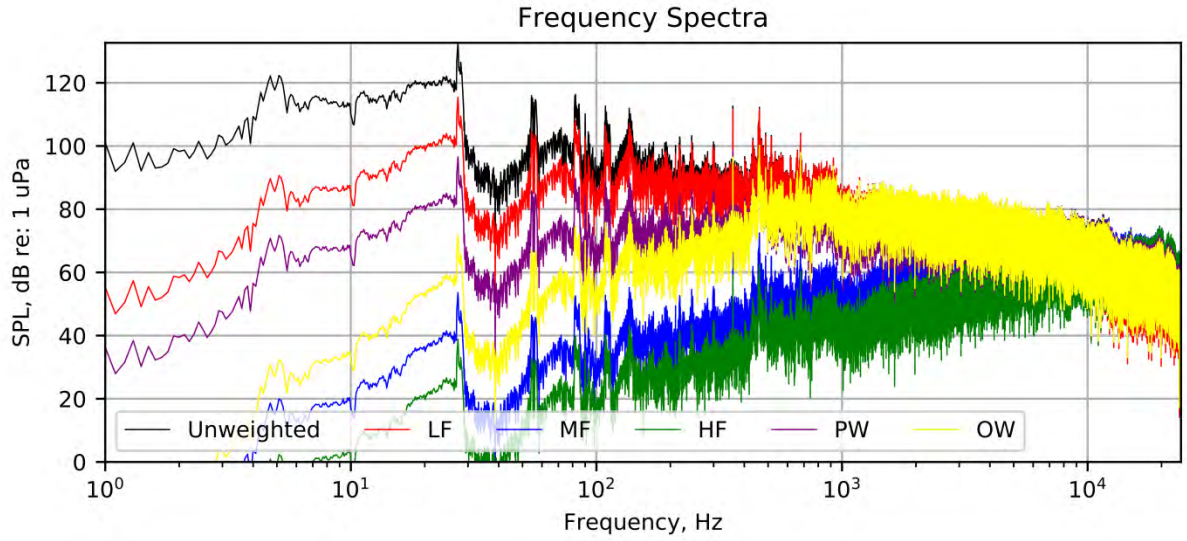
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	155	157	1.1	156	131	135	2.6	133	141	145	2.6	143
Low Frequency Cetacean	155	157	1.1	156	123	126	2.8	125	133	136	2.8	135
Mid Frequency Cetacean	155	157	1.1	156	125	129	2.7	127	135	139	2.7	137
High Frequency Cetacean	155	157	1.1	156	125	129	2.7	128	135	139	2.7	138
Phocid Pinnipeds	155	157	1.1	156	121	124	2.7	123	131	134	2.7	133
Otariid Pinnipeds	155	157	1.1	156	120	124	2.5	123	130	134	2.5	133
Lower Hydrophone												
Unweighted	156	156	0.1	156	143	145	1.8	144	153	155	1.8	154
Low Frequency Cetacean	156	156	0.1	156	128	131	2.1	130	138	141	2.1	140
Mid Frequency Cetacean	156	156	0.1	156	136	139	1.8	138	146	149	1.8	148
High Frequency Cetacean	156	156	0.1	156	137	140	1.8	139	147	150	1.8	149
Phocid Pinnipeds	156	156	0.1	156	128	131	1.9	129	138	141	1.9	139
Otariid Pinnipeds	156	156	0.1	156	126	129	1.8	127	136	139	1.8	137

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 49 (TP-49)

January 22, 2018

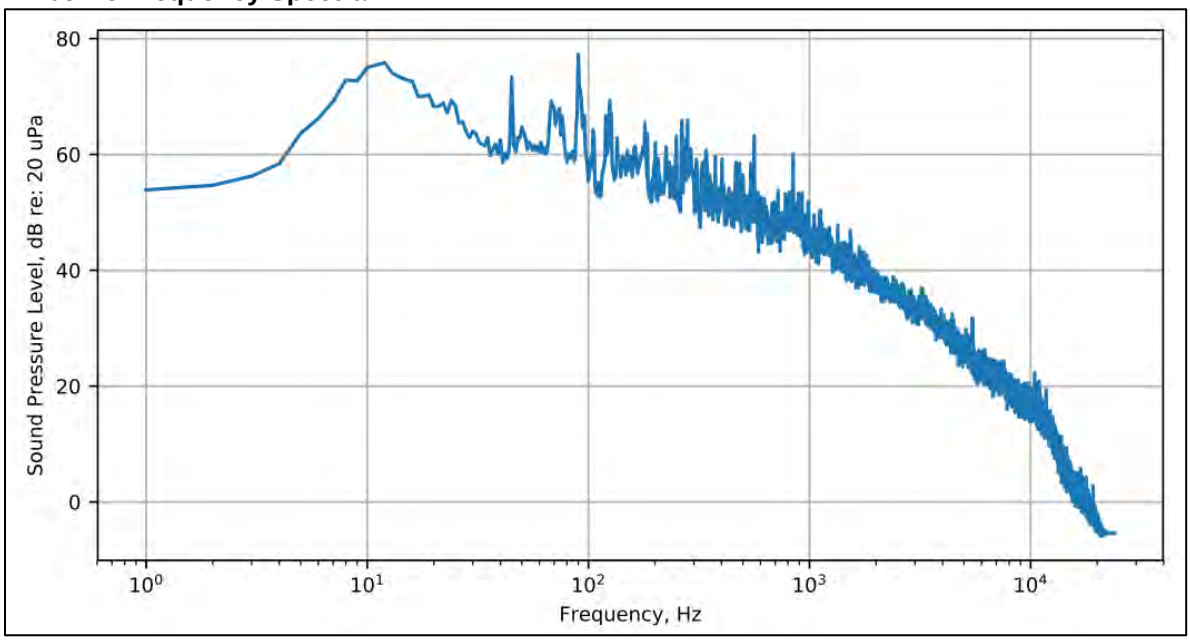
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	33	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	96	85

Airborne Frequency Spectra

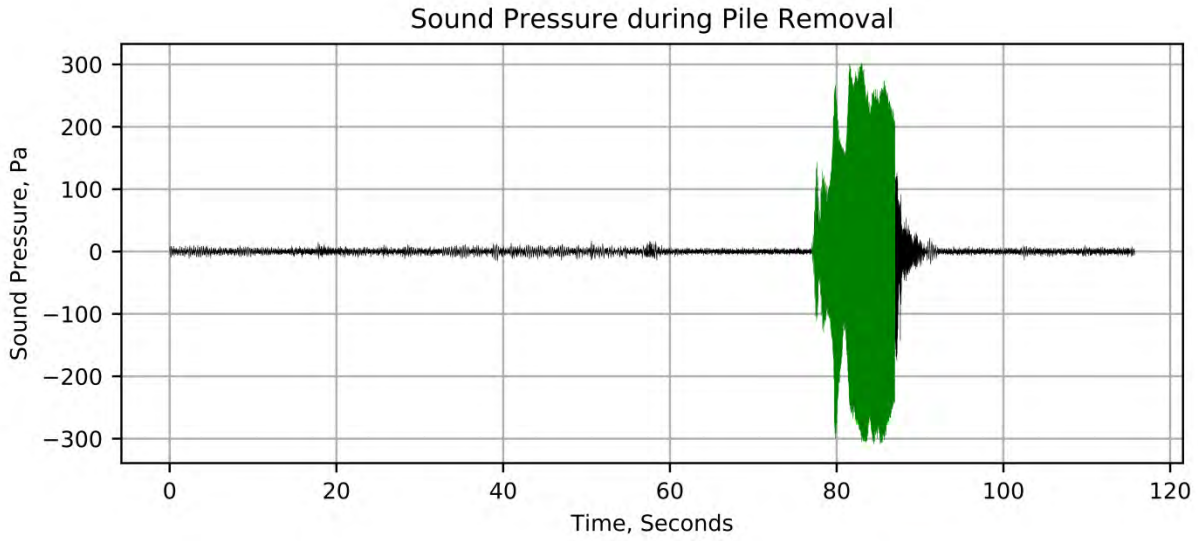


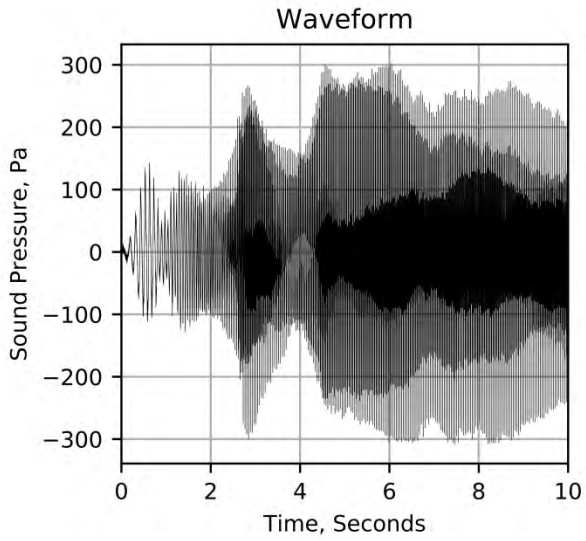
Underwater Sound Levels, dB re: 1 μPa

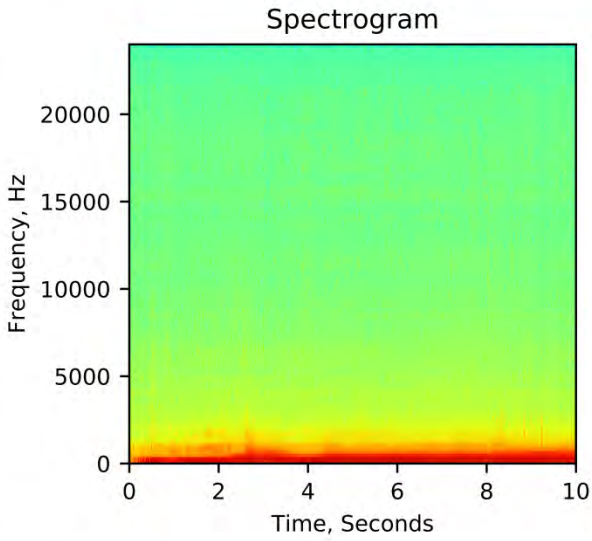
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	163	163	-	163	152	152	-	152	162	162	-	162
Low Frequency Cetacean	163	163	-	163	143	143	-	143	153	153	-	153
Mid Frequency Cetacean	163	163	-	163	146	146	-	146	156	156	-	156
High Frequency Cetacean	163	163	-	163	146	146	-	146	156	156	-	156
Phocid Pinnipeds	163	163	-	163	138	138	-	138	148	148	-	148
Otariid Pinnipeds	163	163	-	163	135	135	-	135	145	145	-	145
Lower Hydrophone												
Unweighted	170	170	-	170	160	160	-	160	170	170	-	170
Low Frequency Cetacean	170	170	-	170	149	149	-	149	159	159	-	159
Mid Frequency Cetacean	170	170	-	170	154	154	-	154	164	164	-	164
High Frequency Cetacean	170	170	-	170	154	154	-	154	164	164	-	164
Phocid Pinnipeds	170	170	-	170	145	145	-	145	155	155	-	155
Otariid Pinnipeds	170	170	-	170	142	142	-	142	152	152	-	152

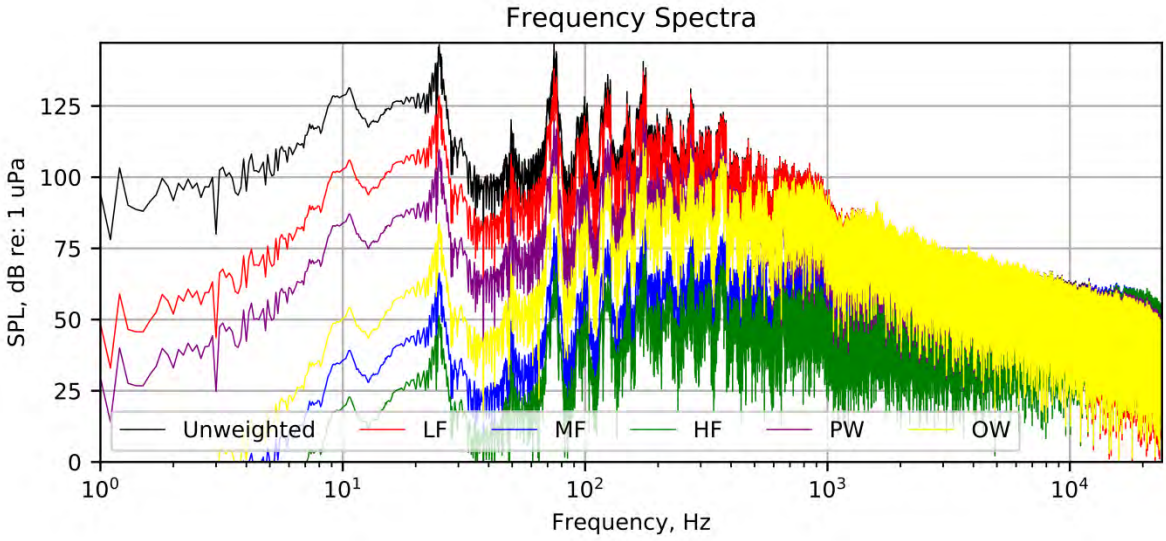
Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 50 (TP-50)

January 22, 2018

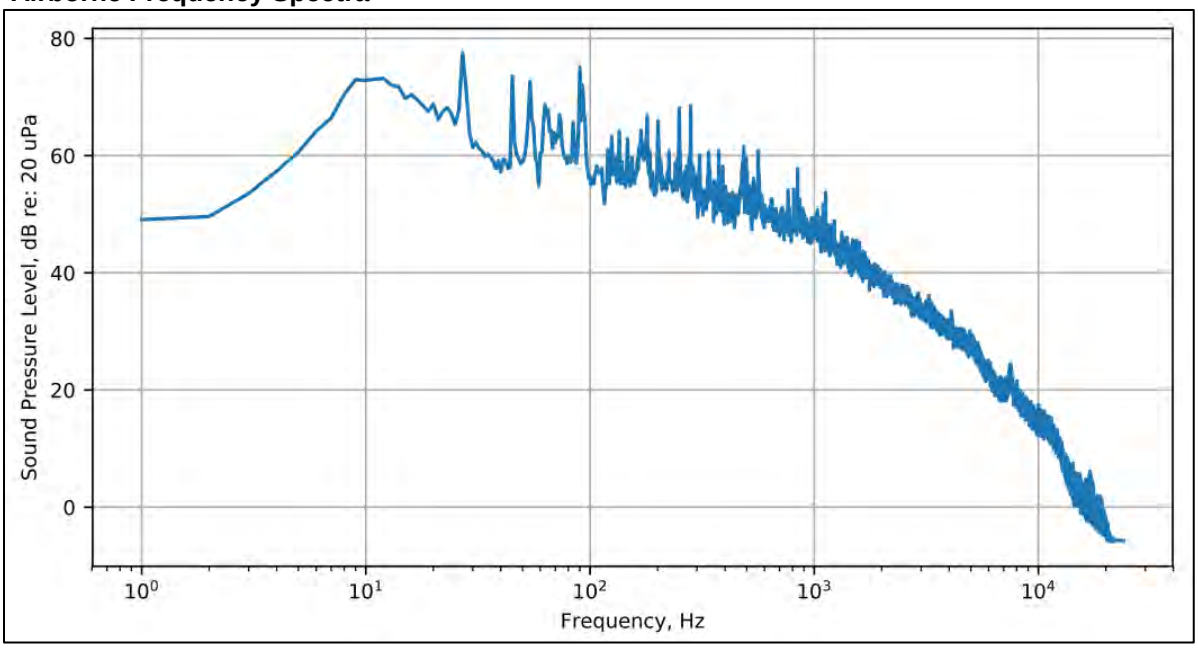
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	33	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
89	102	84

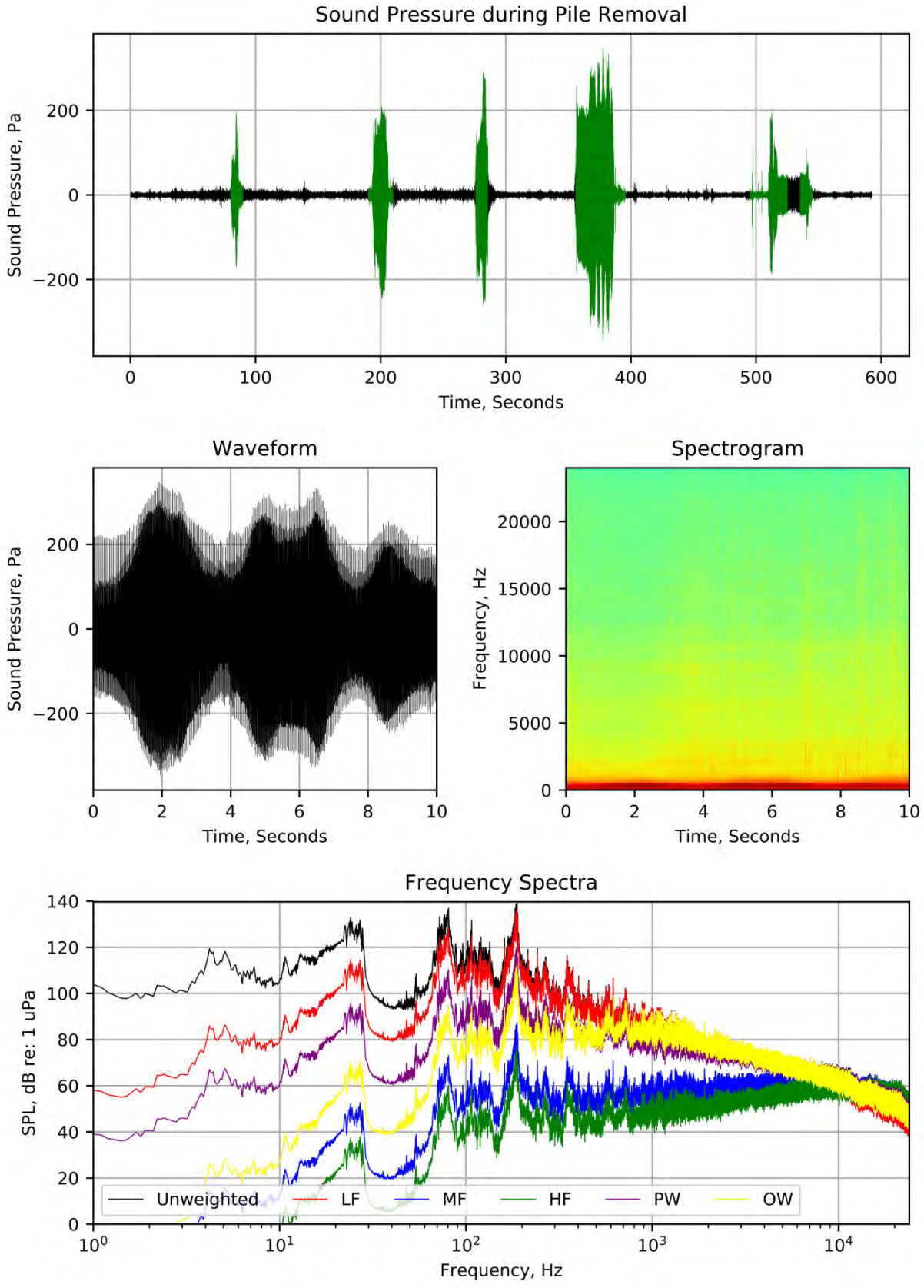
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	151	163	3.6	160	124	155	9.8	149	134	165	9.8	159
Low Frequency Cetacean	151	163	3.6	160	115	147	10.1	141	125	157	10.1	151
Mid Frequency Cetacean	151	163	3.6	160	118	149	9.6	143	128	159	9.6	153
High Frequency Cetacean	151	163	3.6	160	119	149	9.7	144	129	159	9.7	154
Phocid Pinnipeds	151	163	3.6	160	114	141	8.8	135	124	151	8.8	145
Otariid Pinnipeds	151	163	3.6	160	114	138	7.8	132	124	148	7.8	142
Lower Hydrophone												
Unweighted	161	171	3.6	167	130	163	9.1	157	140	173	9.1	167
Low Frequency Cetacean	161	171	3.6	167	120	154	10.1	148	130	164	10.1	158
Mid Frequency Cetacean	161	171	3.6	167	124	156	9.1	151	134	166	9.1	161
High Frequency Cetacean	161	171	3.6	167	124	157	9.1	151	134	167	9.1	161
Phocid Pinnipeds	161	171	3.6	167	119	149	8.6	143	129	159	8.6	153
Otariid Pinnipeds	161	171	3.6	167	118	145	7.8	139	128	155	7.8	149

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 51 (TP-51)

January 22, 2018

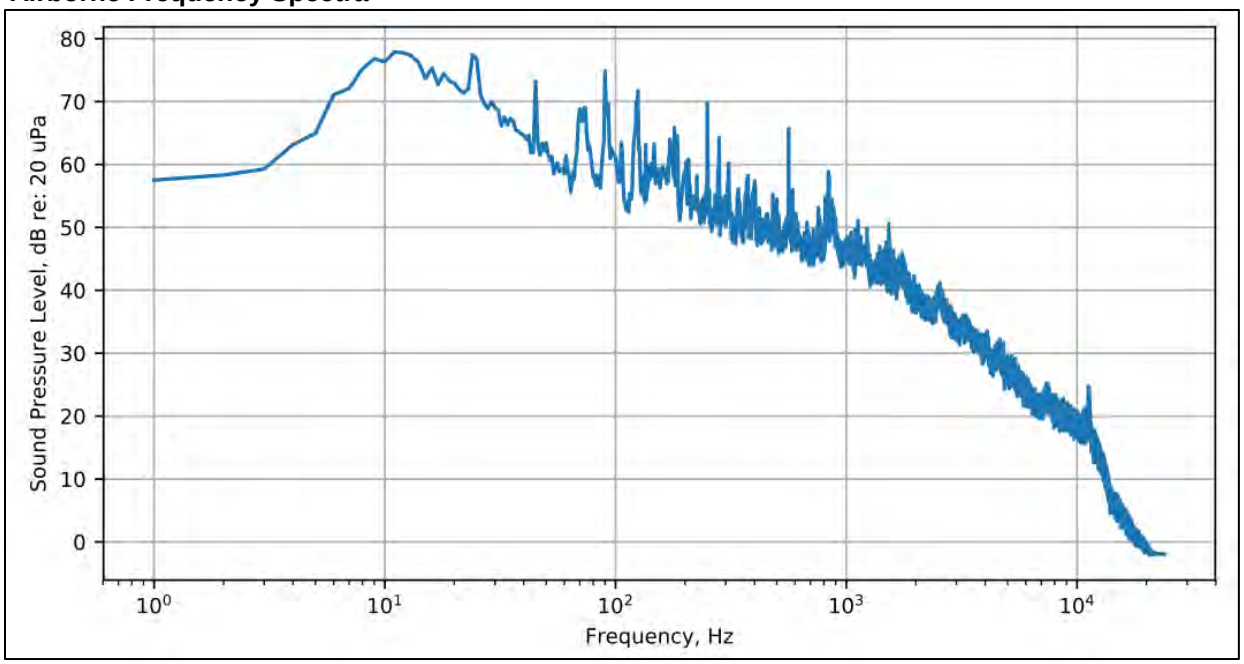
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	33	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
90	94	86

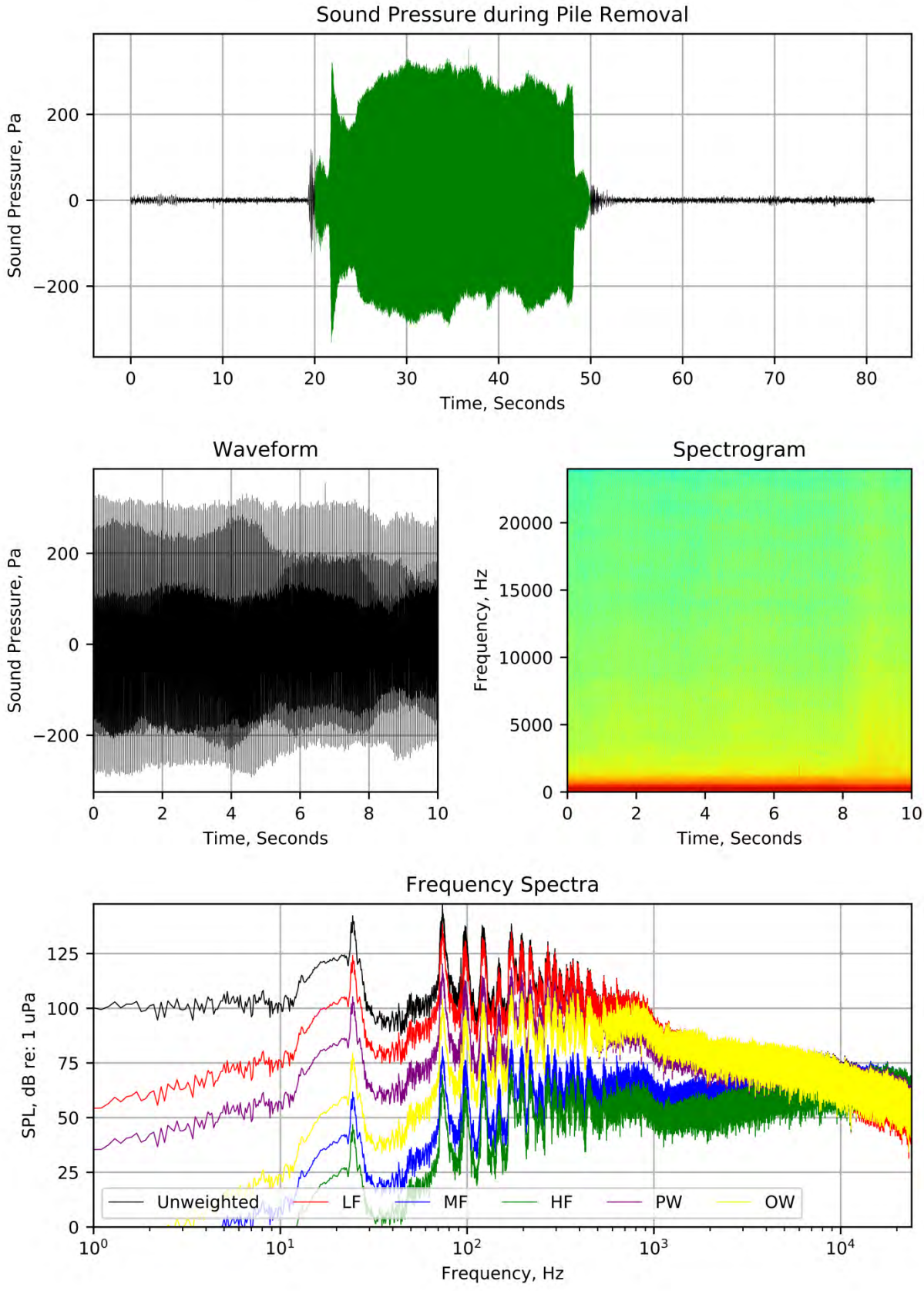
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	162	164	1.2	163	152	155	1.6	154	162	165	1.6	164
Low Frequency Cetacean	162	164	1.2	163	143	146	1.5	145	153	156	1.5	155
Mid Frequency Cetacean	162	164	1.2	163	146	149	1.5	147	156	159	1.5	157
High Frequency Cetacean	162	164	1.2	163	146	149	1.5	148	156	159	1.5	158
Phocid Pinnipeds	162	164	1.2	163	138	141	1.5	140	148	151	1.5	150
Otariid Pinnipeds	162	164	1.2	163	135	138	1.4	137	145	148	1.4	147
Lower Hydrophone												
Unweighted	170	171	0.7	170	159	162	1.3	160	169	172	1.3	170
Low Frequency Cetacean	170	171	0.7	170	149	152	1.4	150	159	162	1.4	160
Mid Frequency Cetacean	170	171	0.7	170	153	155	1.3	154	163	165	1.3	164
High Frequency Cetacean	170	171	0.7	170	154	156	1.3	155	164	166	1.3	165
Phocid Pinnipeds	170	171	0.7	170	145	147	1.4	146	155	157	1.4	156
Otariid Pinnipeds	170	171	0.7	170	142	144	1.3	143	152	154	1.3	153

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 52 (TP-52)

January 22, 2018

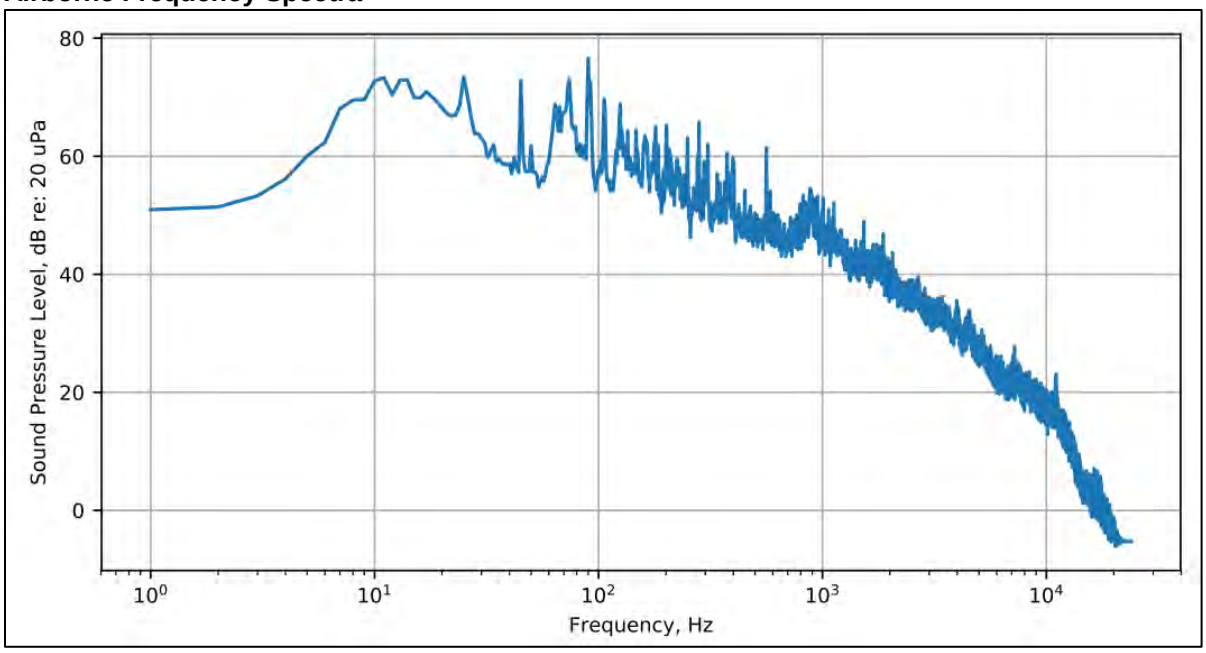
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	33	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	92	86

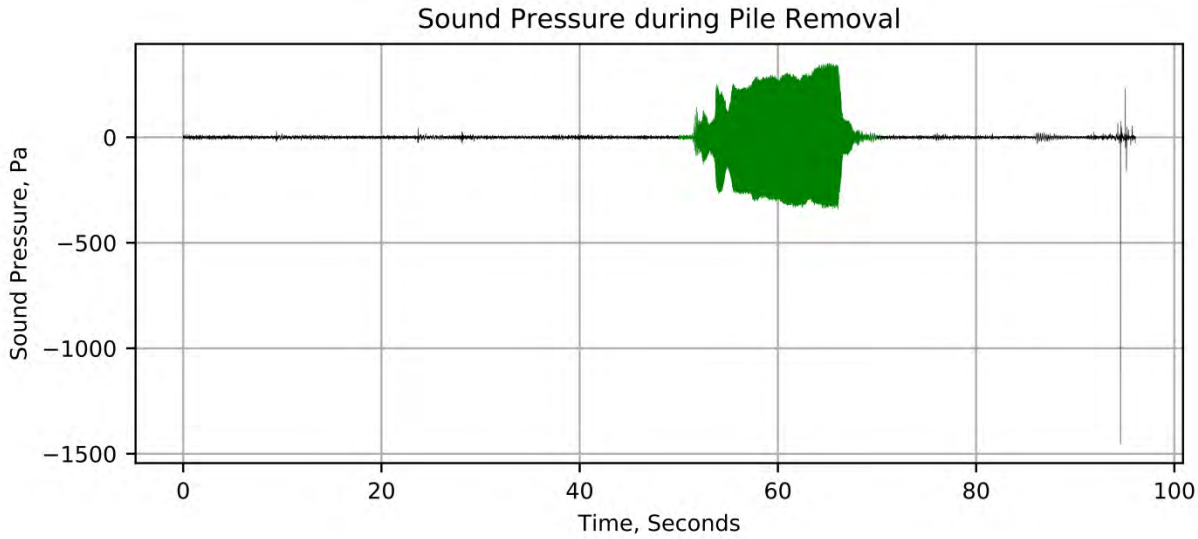
Airborne Frequency Spectra

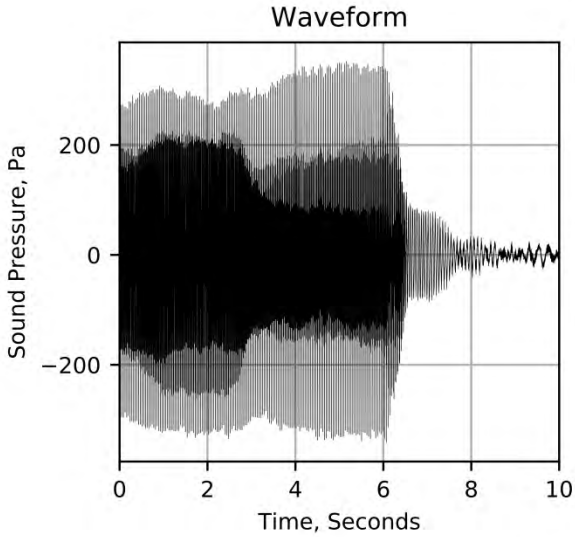


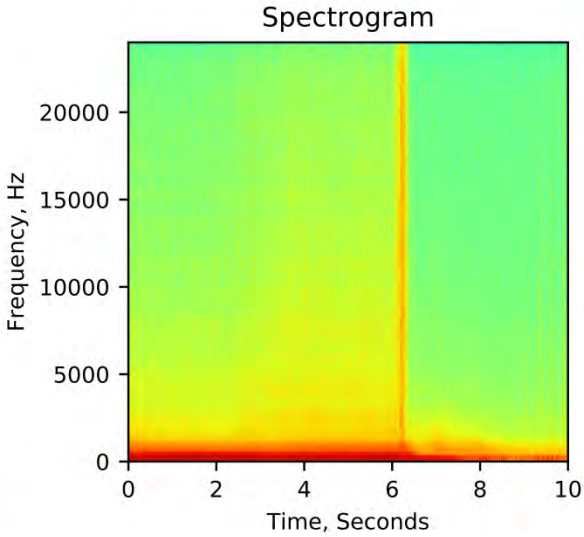
Underwater Sound Levels, dB re: 1 μPa

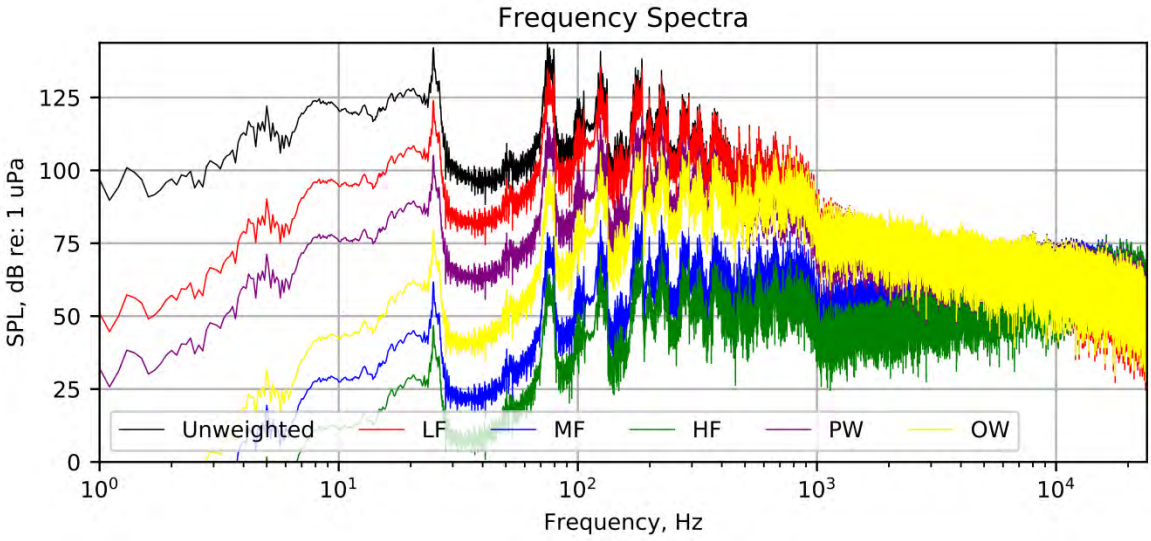
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	164	165	0.4	164	153	153	0.4	153	163	163	0.4	163
Low Frequency Cetacean	164	165	0.4	164	144	144	0.3	144	154	154	0.3	154
Mid Frequency Cetacean	164	165	0.4	164	146	147	0.4	147	156	157	0.4	157
High Frequency Cetacean	164	165	0.4	164	147	148	0.4	147	157	158	0.4	157
Phocid Pinnipeds	164	165	0.4	164	139	139	0.4	139	149	149	0.4	149
Otariid Pinnipeds	164	165	0.4	164	136	136	0.3	136	146	146	0.3	146
Lower Hydrophone												
Unweighted	169	171	1.1	170	159	160	1.0	160	169	170	1.0	170
Low Frequency Cetacean	169	171	1.1	170	149	150	0.9	150	159	160	0.9	160
Mid Frequency Cetacean	169	171	1.1	170	152	154	1.0	153	162	164	1.0	163
High Frequency Cetacean	169	171	1.1	170	153	155	1.0	154	163	165	1.0	164
Phocid Pinnipeds	169	171	1.1	170	144	146	0.9	145	154	156	0.9	155
Otariid Pinnipeds	169	171	1.1	170	141	142	0.9	142	151	152	0.9	152

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
0
−500
−1000
−1500
0
20
40
60
80
100
Time, Seconds


Waveform
Sound Pressure, Pa
200
0
−200
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
125
100
75
50
25
0
Unweighted
LF
MF
HF
PW
OW
10^0
10^1
10^2
10^3
10^4
Frequency, Hz

TIMBER PILE REMOVAL 53 (TP-53)

January 22, 2018

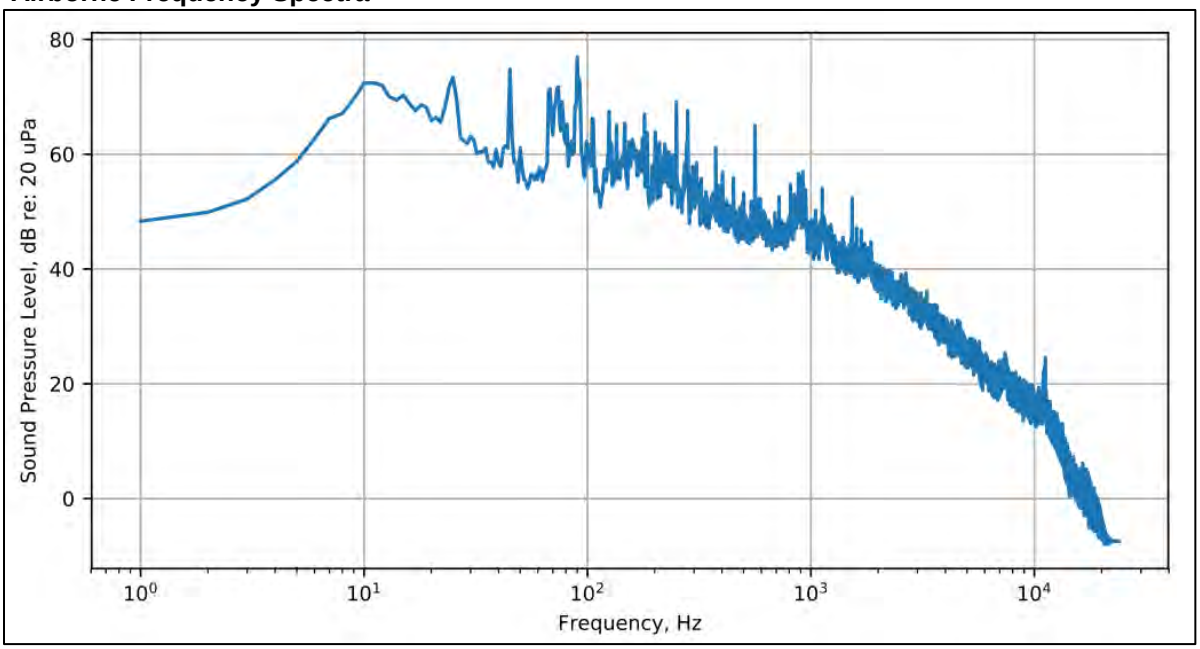
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	30	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	92	86

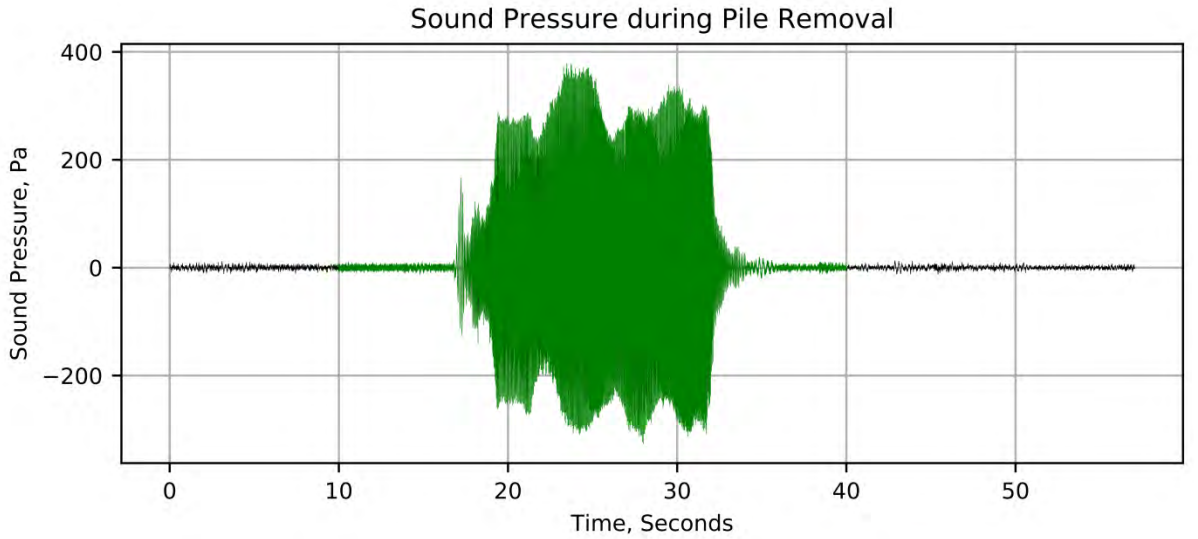
Airborne Frequency Spectra

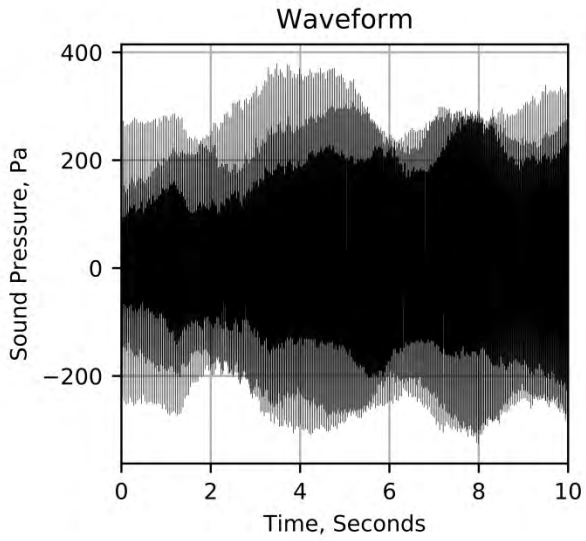


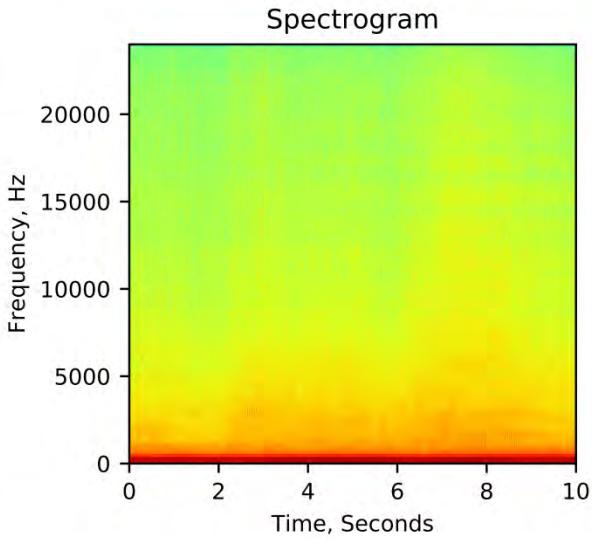
Underwater Sound Levels, dB re: 1 μPa

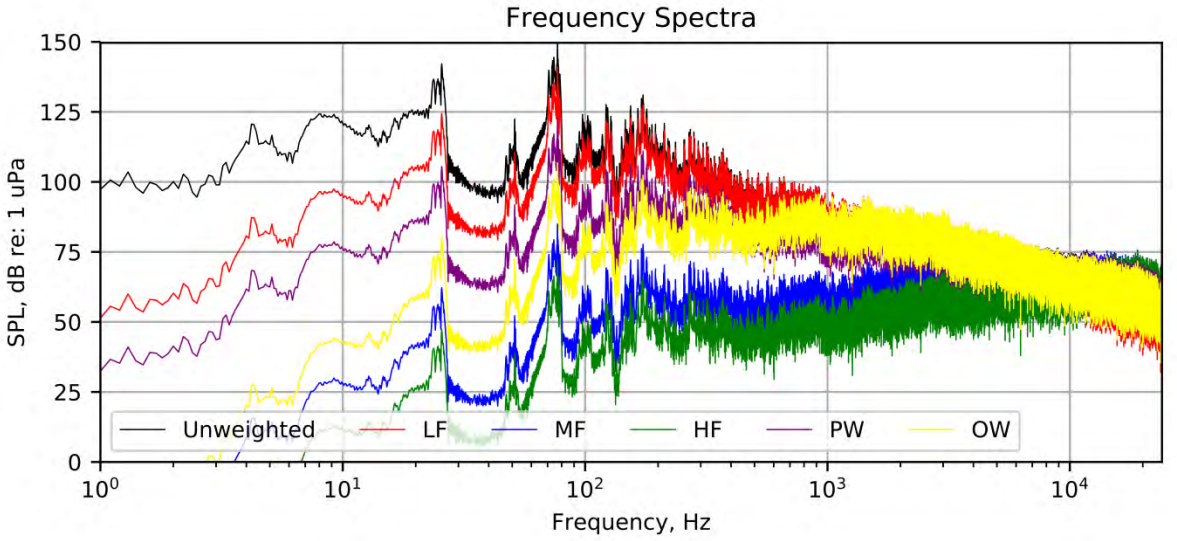
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	160	165	2.7	164	143	155	6.3	152	153	165	6.3	162
Low Frequency Cetacean	160	165	2.7	164	133	144	5.9	141	143	154	5.9	151
Mid Frequency Cetacean	160	165	2.7	164	136	149	6.3	145	146	159	6.3	155
High Frequency Cetacean	160	165	2.7	164	137	150	6.3	146	147	160	6.3	156
Phocid Pinnipeds	160	165	2.7	164	129	141	6.0	137	139	151	6.0	147
Otariid Pinnipeds	160	165	2.7	164	126	138	5.7	134	136	148	5.7	144
Lower Hydrophone												
Unweighted	169	171	1.2	170	153	163	5.3	160	163	173	5.3	170
Low Frequency Cetacean	169	171	1.2	170	140	151	5.8	148	150	161	5.8	158
Mid Frequency Cetacean	169	171	1.2	170	146	157	5.3	153	156	167	5.3	163
High Frequency Cetacean	169	171	1.2	170	147	158	5.3	154	157	168	5.3	164
Phocid Pinnipeds	169	171	1.2	170	138	148	5.4	145	148	158	5.4	155
Otariid Pinnipeds	169	171	1.2	170	134	145	5.2	141	144	155	5.2	151

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 54 (TP-54)

January 22, 2018

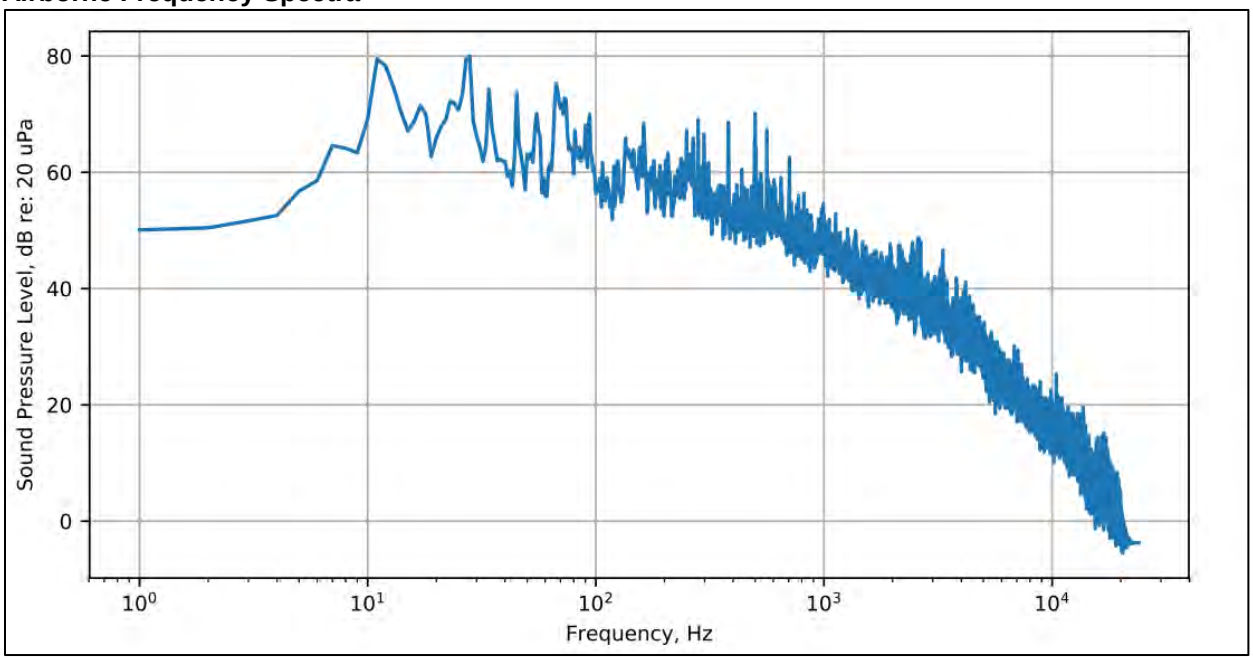
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	25	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
89	97	85

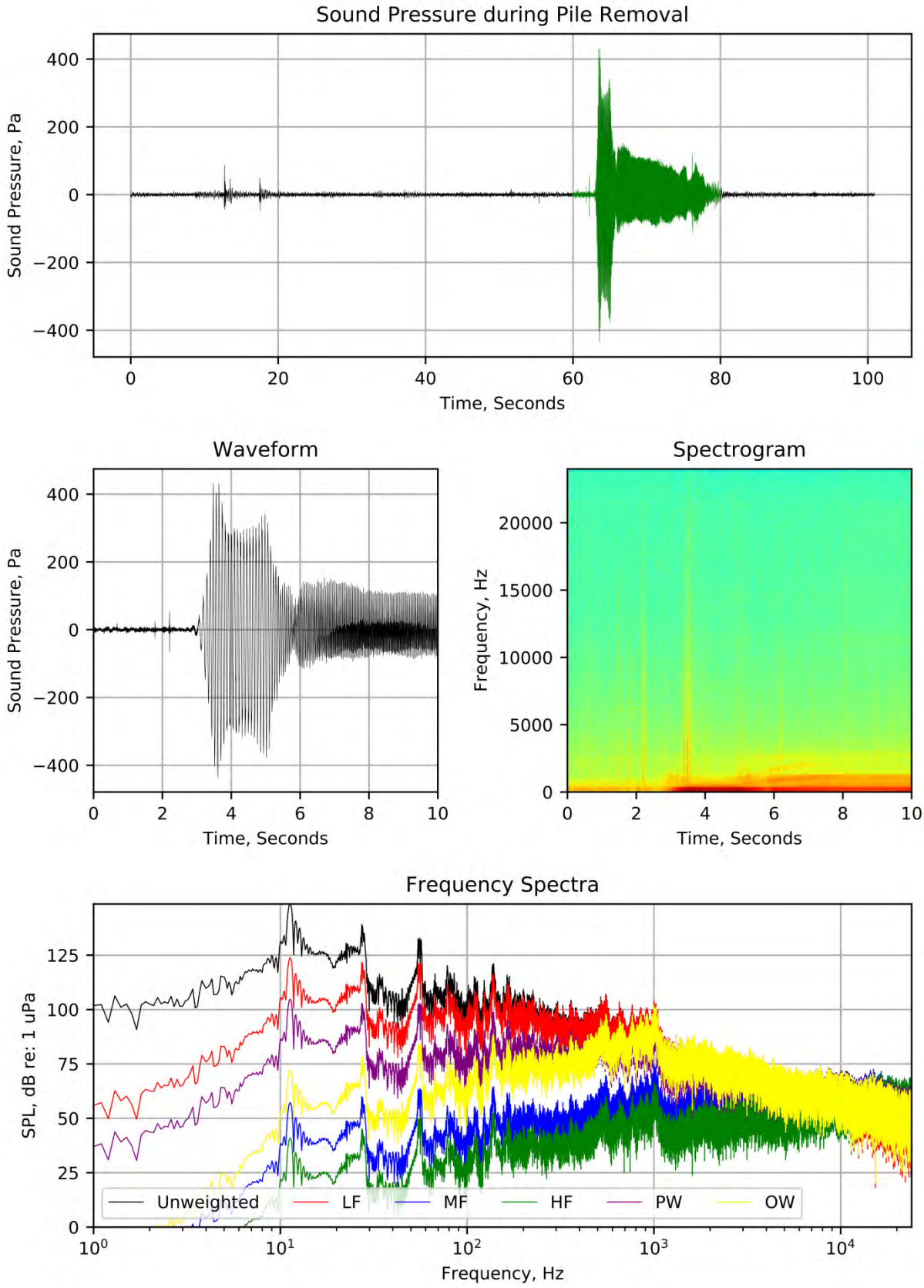
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	155	157	1.6	156	139	141	1.8	140	149	151	1.8	150
Low Frequency Cetacean	155	157	1.6	156	128	130	1.1	129	138	140	1.1	139
Mid Frequency Cetacean	155	157	1.6	156	133	135	1.8	134	143	145	1.8	144
High Frequency Cetacean	155	157	1.6	156	133	136	1.8	135	143	146	1.8	145
Phocid Pinnipeds	155	157	1.6	156	125	126	0.7	126	135	136	0.7	136
Otariid Pinnipeds	155	157	1.6	156	123	124	0.3	124	133	134	0.3	134
Lower Hydrophone												
Unweighted	160	171	7.7	168	149	159	6.7	156	159	169	6.7	166
Low Frequency Cetacean	160	171	7.7	168	134	140	3.8	138	144	150	3.8	148
Mid Frequency Cetacean	160	171	7.7	168	143	152	6.7	150	153	162	6.7	160
High Frequency Cetacean	160	171	7.7	168	143	153	6.7	150	153	163	6.7	160
Phocid Pinnipeds	160	171	7.7	168	134	142	6.2	140	144	152	6.2	150
Otariid Pinnipeds	160	171	7.7	168	131	140	6.2	137	141	150	6.2	147

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 55 (TP-55)

January 22, 2018

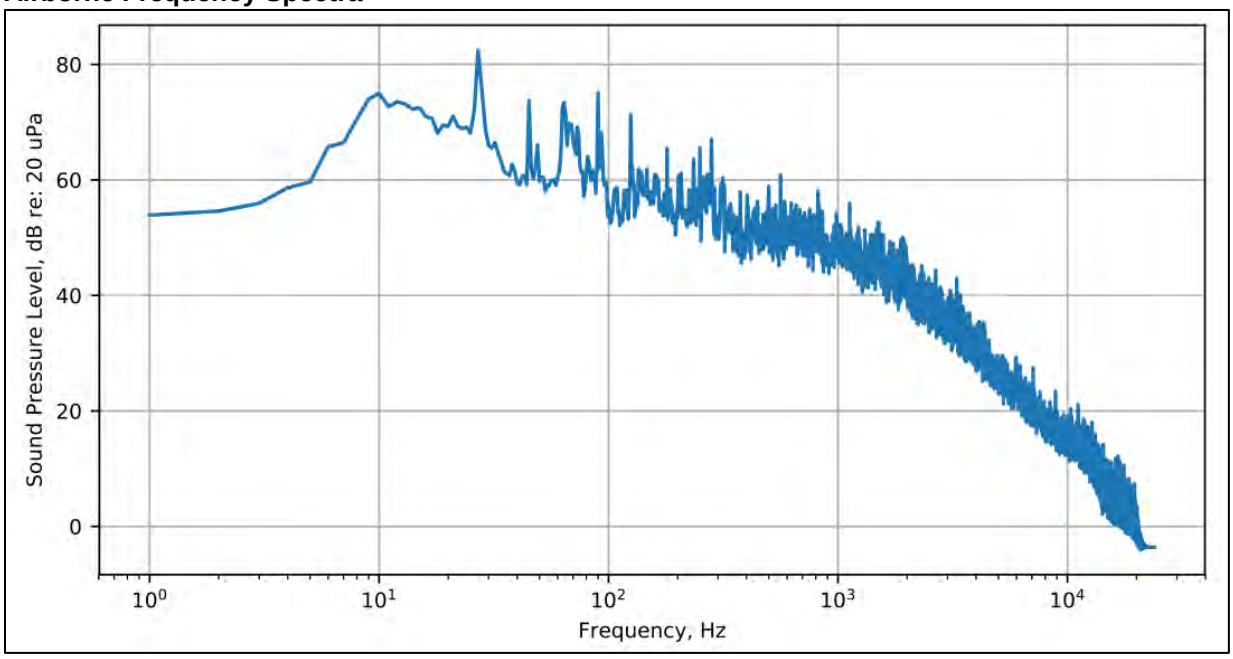
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	15	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
89	97	85

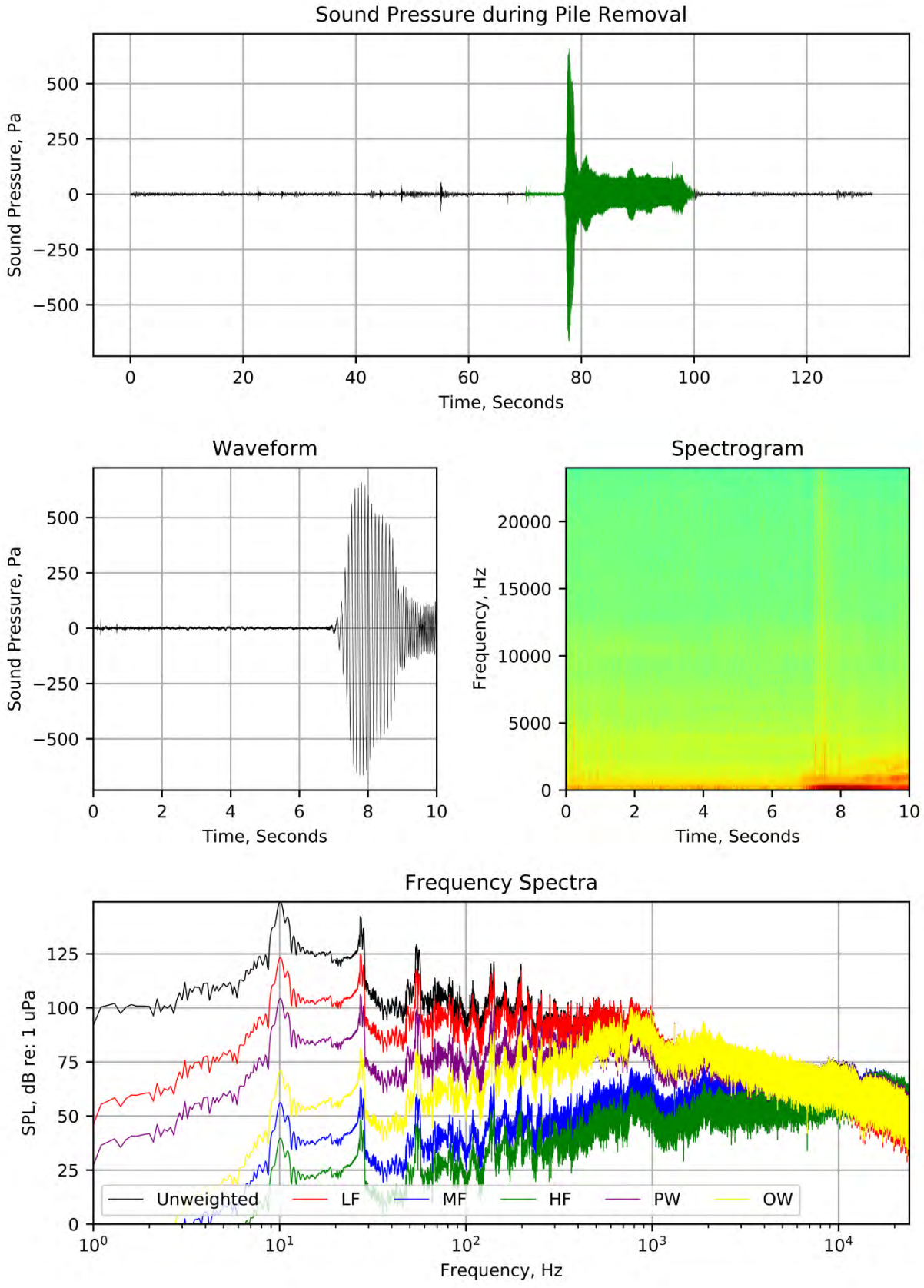
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	149	155	3.0	153	132	138	3.1	136	142	148	3.1	146
Low Frequency Cetacean	149	155	3.0	153	120	128	3.8	125	130	138	3.8	135
Mid Frequency Cetacean	149	155	3.0	153	127	132	2.8	130	137	142	2.8	140
High Frequency Cetacean	149	155	3.0	153	127	133	2.9	131	137	143	2.9	141
Phocid Pinnipeds	149	155	3.0	153	121	124	1.1	123	131	134	1.1	133
Otariid Pinnipeds	149	155	3.0	153	120	122	1.0	121	130	132	1.0	131
Lower Hydrophone												
Unweighted	158	171	7.1	167	146	158	6.1	154	156	168	6.1	164
Low Frequency Cetacean	158	171	7.1	167	131	138	3.5	135	141	148	3.5	145
Mid Frequency Cetacean	158	171	7.1	167	140	152	6.1	148	150	162	6.1	158
High Frequency Cetacean	158	171	7.1	167	141	152	6.1	148	151	162	6.1	158
Phocid Pinnipeds	158	171	7.1	167	131	142	5.7	138	141	152	5.7	148
Otariid Pinnipeds	158	171	7.1	167	129	139	5.6	135	139	149	5.6	145

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 56 (TP-56)

January 22, 2018

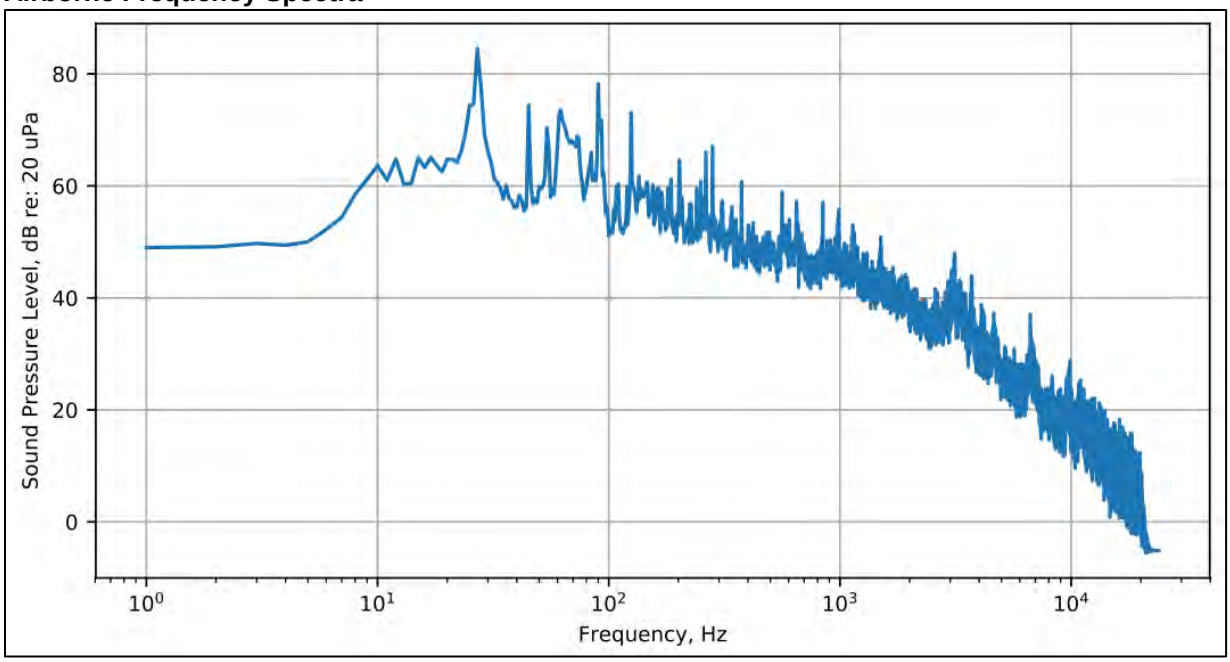
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	15	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
90	93	83

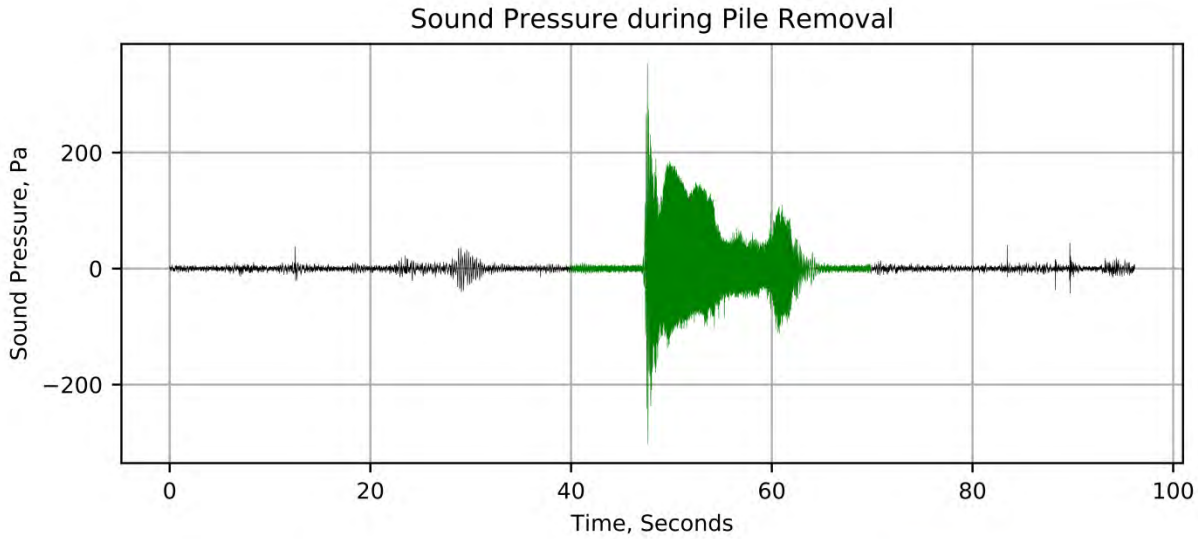
Airborne Frequency Spectra

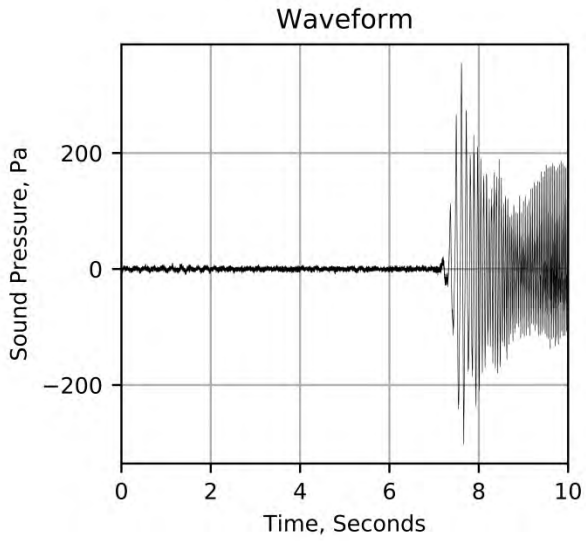


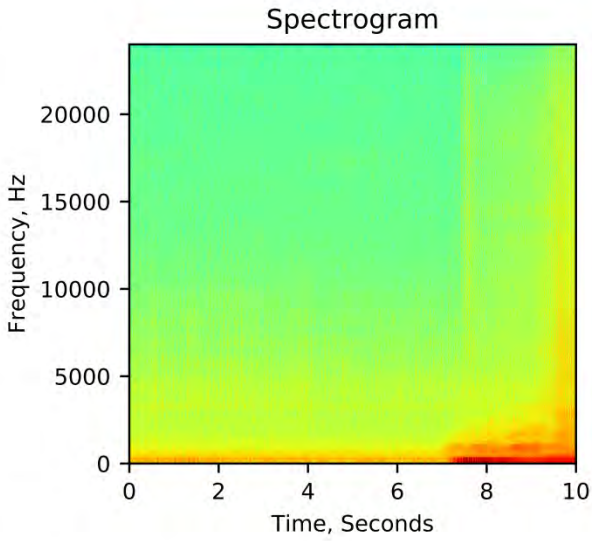
Underwater Sound Levels, dB re: 1 μPa

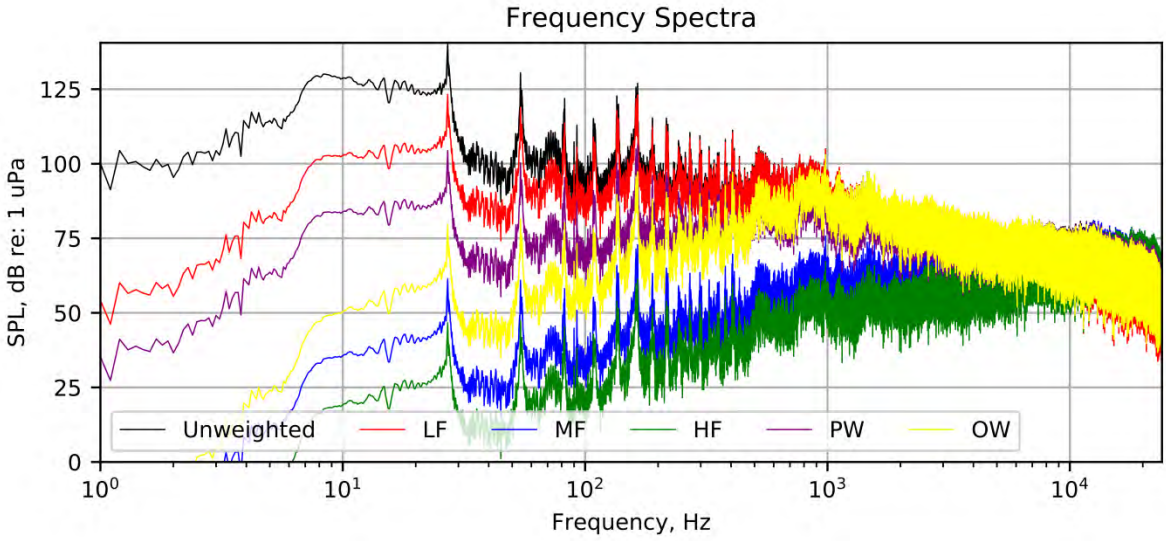
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	147	155	4.1	153	128	137	4.4	134	138	147	4.4	144
Low Frequency Cetacean	147	155	4.1	153	122	129	4.2	125	132	139	4.2	135
Mid Frequency Cetacean	147	155	4.1	153	122	131	4.3	128	132	141	4.3	138
High Frequency Cetacean	147	155	4.1	153	123	131	4.4	128	133	141	4.4	138
Phocid Pinnipeds	147	155	4.1	153	118	125	3.7	122	128	135	3.7	132
Otariid Pinnipeds	147	155	4.1	153	119	125	3.4	122	129	135	3.4	132
Lower Hydrophone												
Unweighted	156	166	5.1	162	142	149	3.7	146	152	159	3.7	156
Low Frequency Cetacean	156	166	5.1	162	126	134	3.8	131	136	144	3.8	141
Mid Frequency Cetacean	156	166	5.1	162	135	143	3.7	140	145	153	3.7	150
High Frequency Cetacean	156	166	5.1	162	136	143	3.7	141	146	153	3.7	151
Phocid Pinnipeds	156	166	5.1	162	126	133	3.5	131	136	143	3.5	141
Otariid Pinnipeds	156	166	5.1	162	125	131	3.2	129	135	141	3.2	139

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
200
0
−200
0
20
40
60
80
100
Time, Seconds


Waveform
Sound Pressure, Pa
200
0
−200
0
2
4
6
8
10
Time, Seconds


Spectrogram
Frequency, Hz
20000
15000
10000
5000
0
0
2
4
6
8
10
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
125
100
75
50
25
0
10^0
10^1
10^2
10^3
10^4
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 57 (TP-57)

January 22, 2018

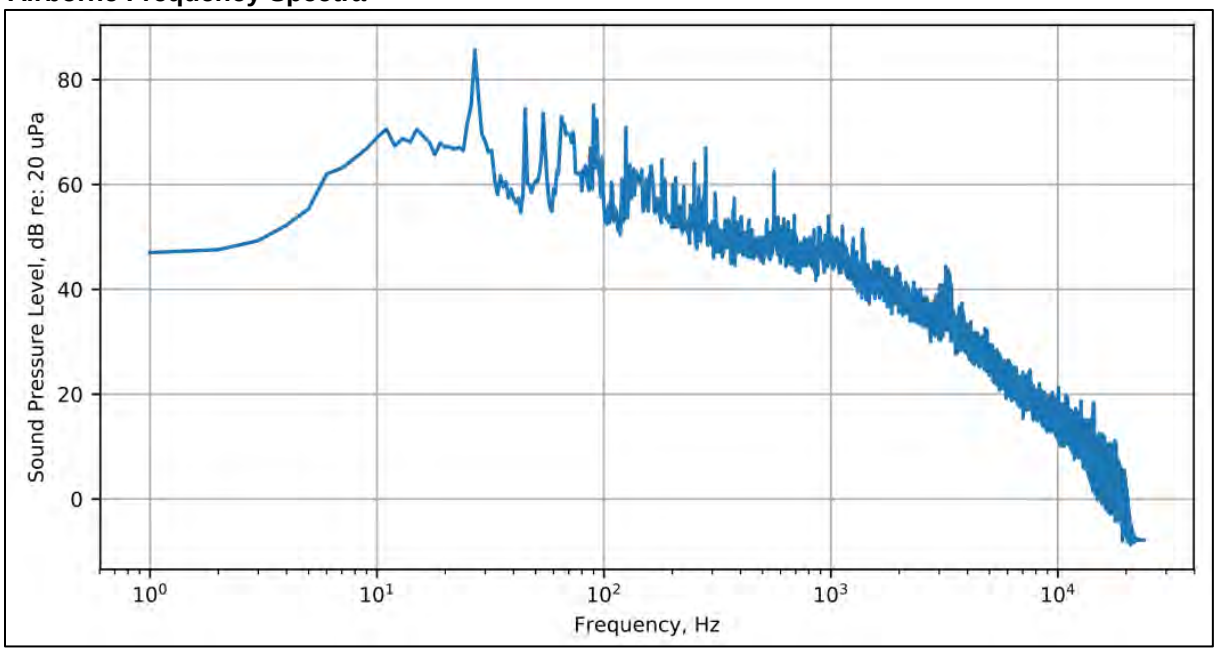
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	20	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
90	94	83

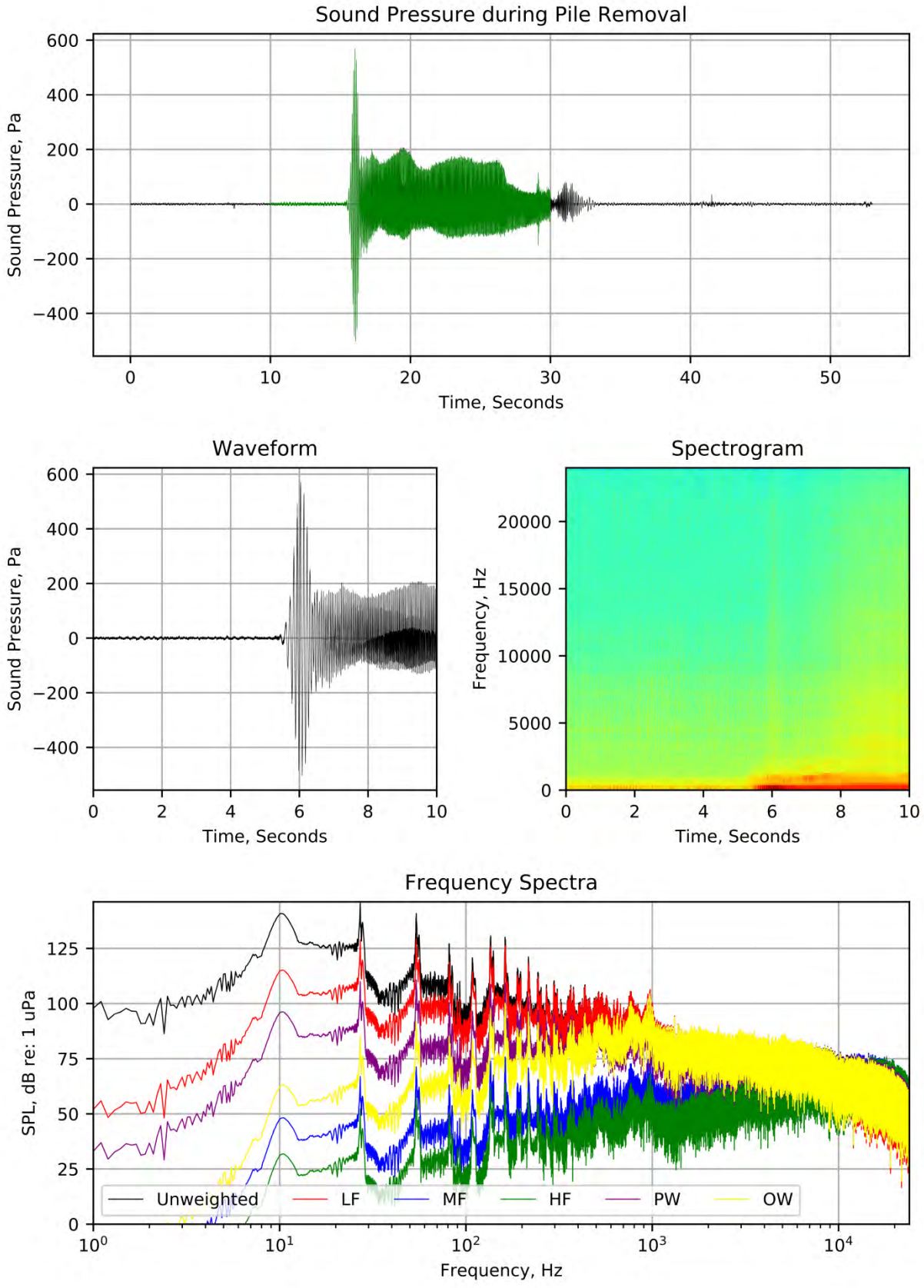
Airborne Frequency Spectra



Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	154	158	2.4	156	140	144	2.7	142	150	154	2.7	152
Low Frequency Cetacean	154	158	2.4	156	130	135	3.7	133	140	145	3.7	143
Mid Frequency Cetacean	154	158	2.4	156	134	138	2.7	136	144	148	2.7	146
High Frequency Cetacean	154	158	2.4	156	135	138	2.7	137	145	148	2.7	147
Phocid Pinnipeds	154	158	2.4	156	126	130	3.3	129	136	140	3.3	139
Otariid Pinnipeds	154	158	2.4	156	123	128	3.3	126	133	138	3.3	136
Lower Hydrophone												
Unweighted	162	172	7.0	169	151	155	2.7	154	161	165	2.7	164
Low Frequency Cetacean	162	172	7.0	169	137	138	0.6	138	147	148	0.6	148
Mid Frequency Cetacean	162	172	7.0	169	145	149	2.7	147	155	159	2.7	157
High Frequency Cetacean	162	172	7.0	169	146	149	2.7	148	156	159	2.7	158
Phocid Pinnipeds	162	172	7.0	169	136	139	2.1	138	146	149	2.1	148
Otariid Pinnipeds	162	172	7.0	169	133	137	2.2	135	143	147	2.2	145

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 58 (TP-58)

January 22, 2018

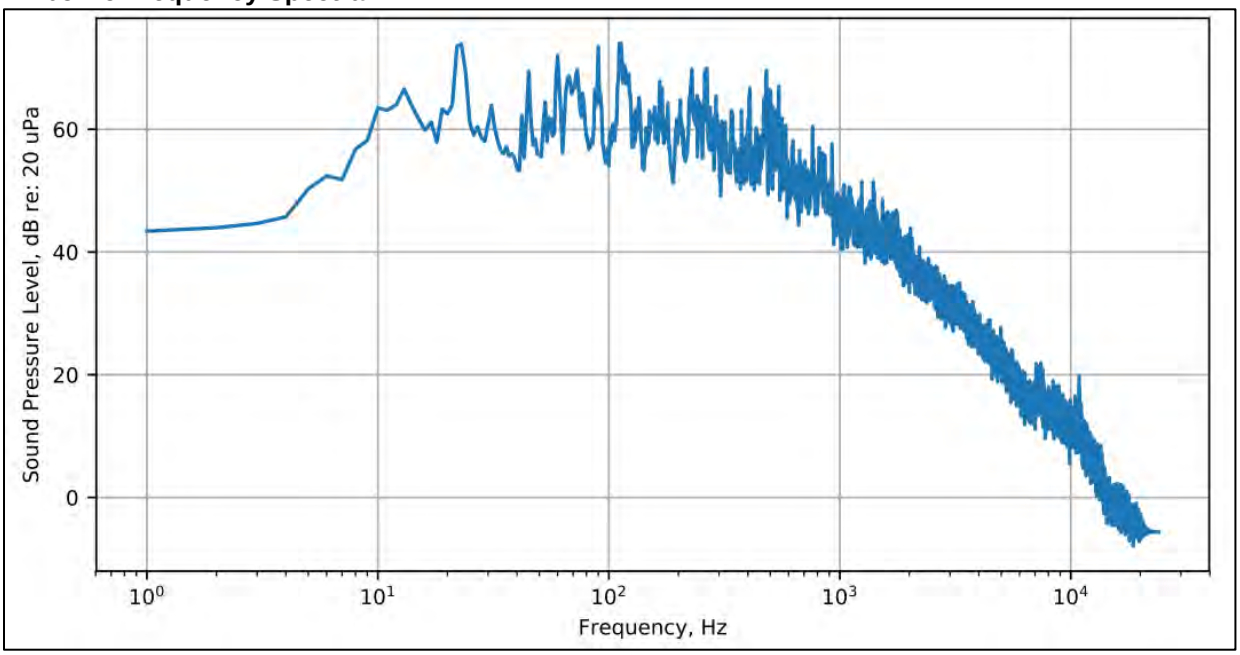
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	60	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
89	96	87

Airborne Frequency Spectra

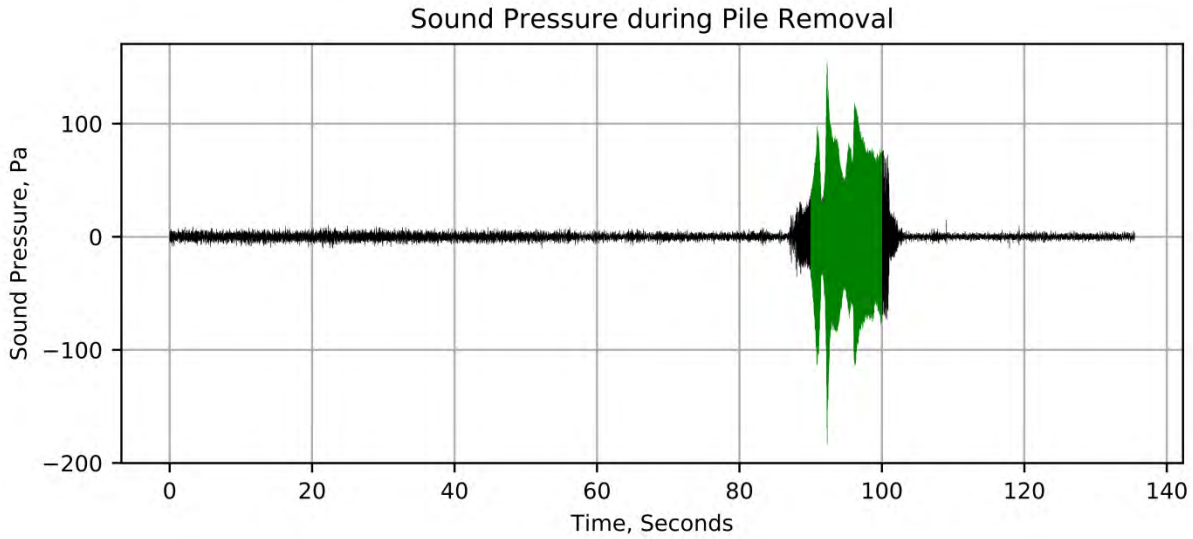


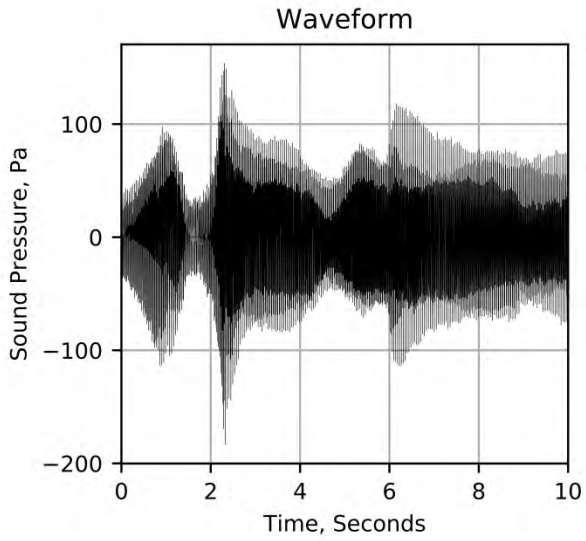
Underwater Sound Levels, dB re: 1 μPa

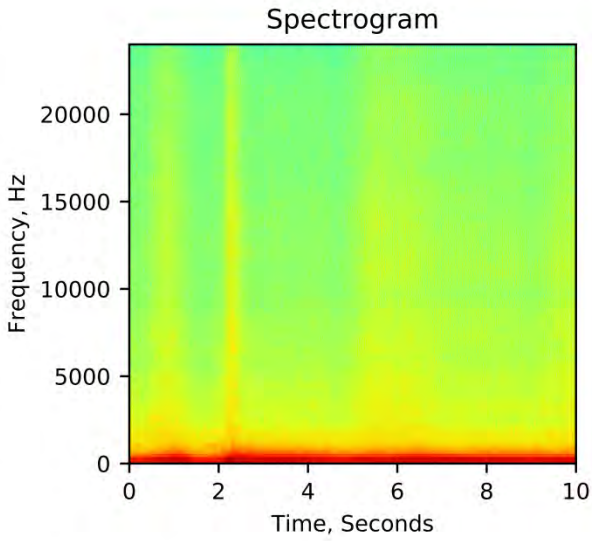
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	166	166	-	166	155	155	-	155	165	165	-	165
Low Frequency Cetacean	166	166	-	166	146	146	-	146	156	156	-	156
Mid Frequency Cetacean	166	166	-	166	148	148	-	148	158	158	-	158
High Frequency Cetacean	166	166	-	166	149	149	-	149	159	159	-	159
Phocid Pinnipeds	166	166	-	166	141	141	-	141	151	151	-	151
Otariid Pinnipeds	166	166	-	166	137	137	-	137	147	147	-	147
Lower Hydrophone												
Unweighted	168	168	-	168	156	156	-	156	166	166	-	166
Low Frequency Cetacean	168	168	-	168	144	144	-	144	154	154	-	154
Mid Frequency Cetacean	168	168	-	168	150	150	-	150	160	160	-	160
High Frequency Cetacean	168	168	-	168	150	150	-	150	160	160	-	160
Phocid Pinnipeds	168	168	-	168	141	141	-	141	151	151	-	151
Otariid Pinnipeds	168	168	-	168	138	138	-	138	148	148	-	148

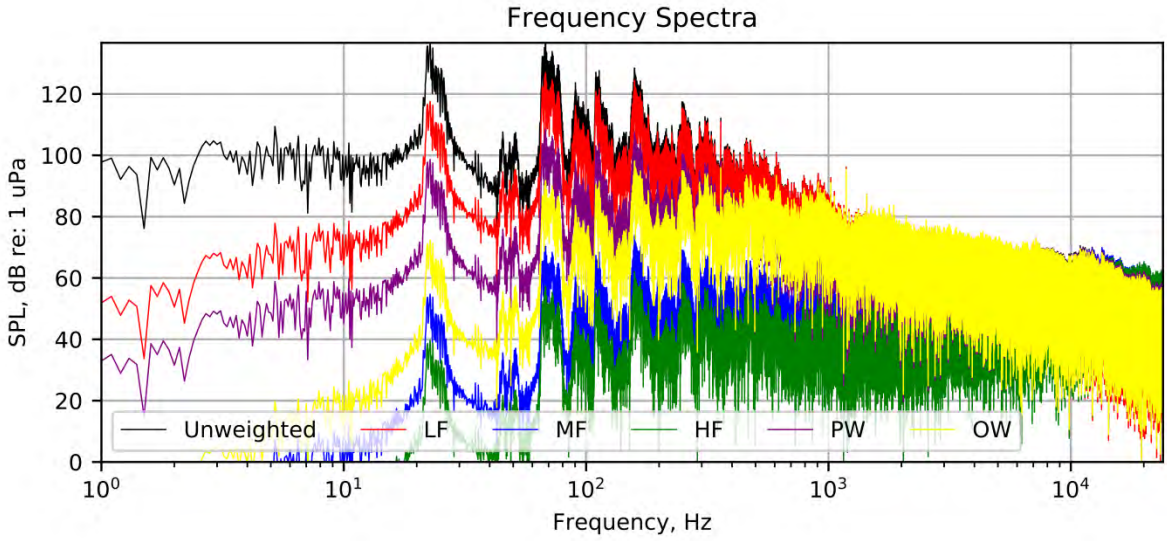
Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 59 (TP-59)

January 22, 2018

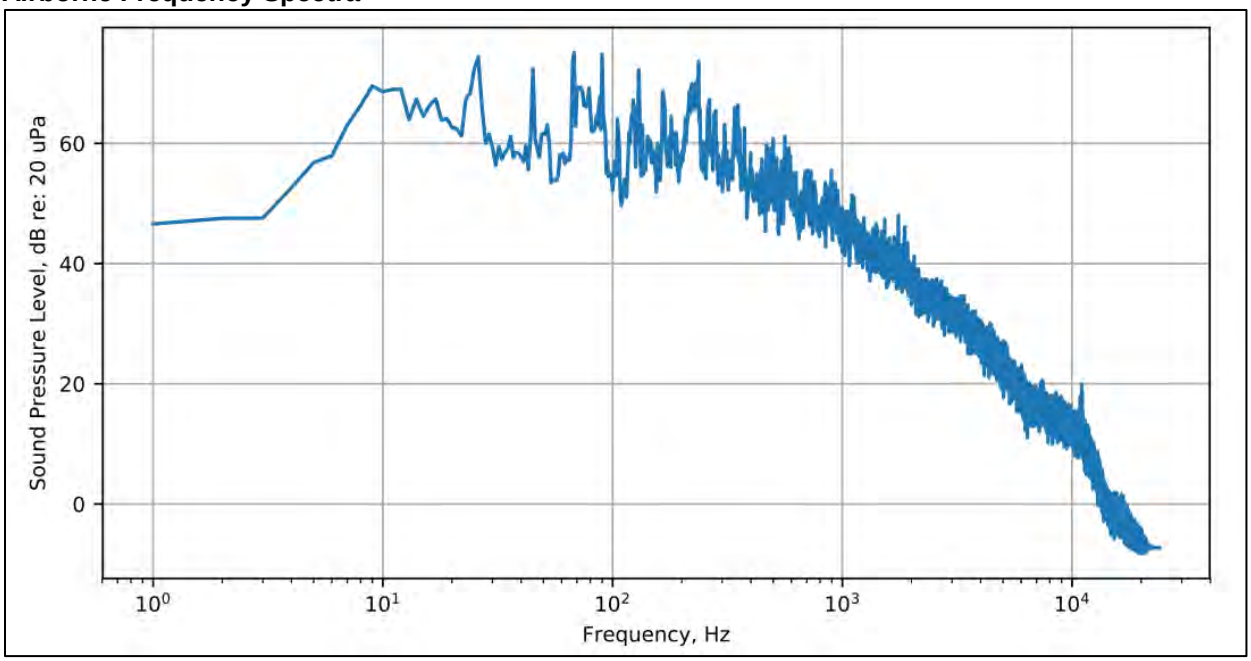
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	60	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
89	92	86

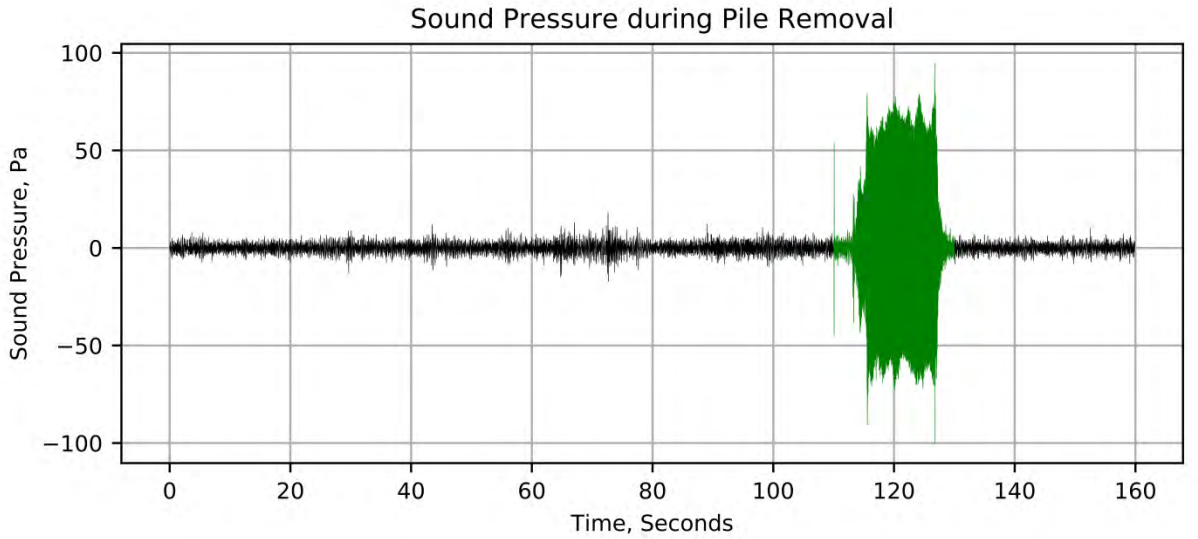
Airborne Frequency Spectra

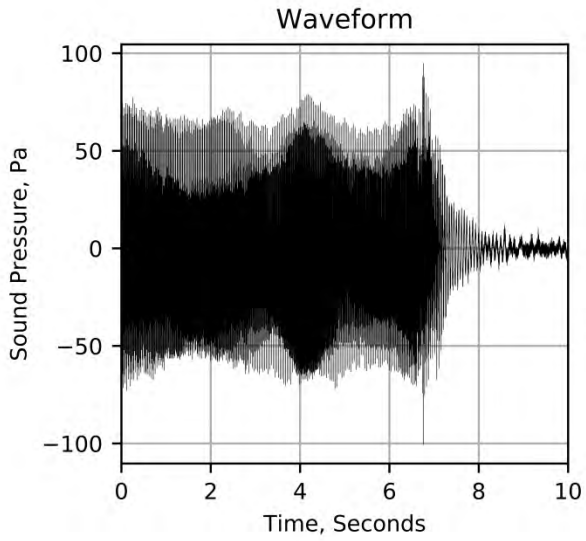


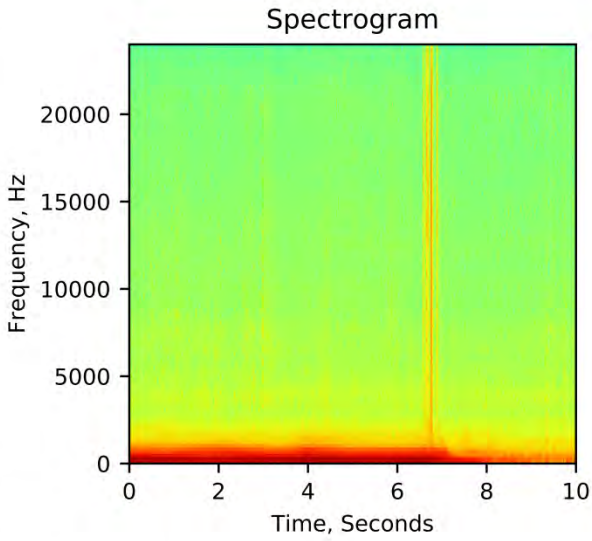
Underwater Sound Levels, dB re: 1 μPa

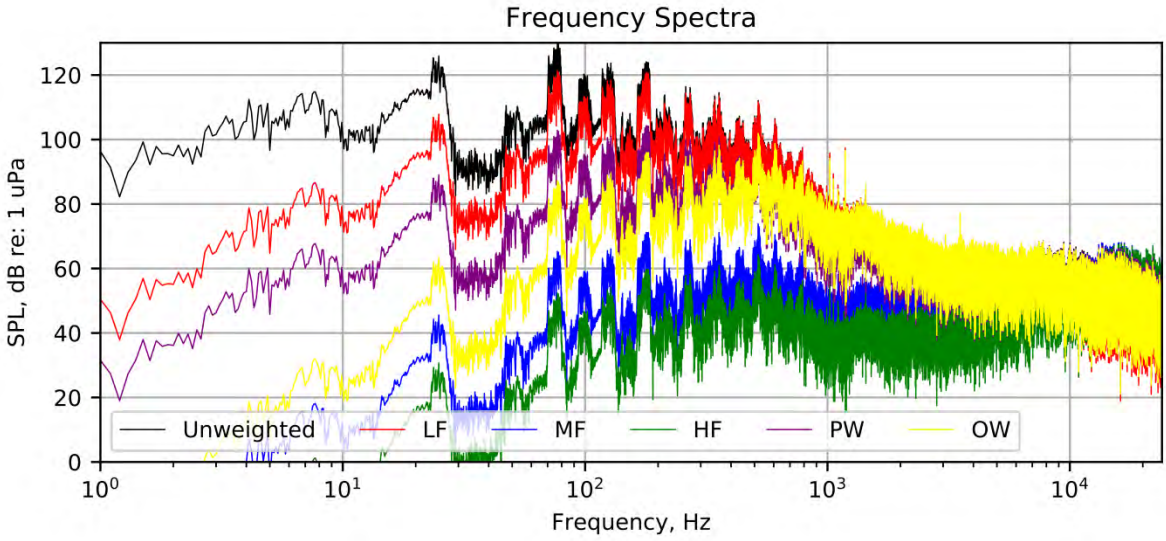
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD	Avg	Min	Max	SD	Avg	Min	Max	SD	Avg
Upper Hydrophone												
Unweighted	162	162	0.1	162	149	154	3.2	152	159	164	3.2	162
Low Frequency Cetacean	162	162	0.1	162	141	146	3.4	144	151	156	3.4	154
Mid Frequency Cetacean	162	162	0.1	162	143	147	3.2	146	153	157	3.2	156
High Frequency Cetacean	162	162	0.1	162	144	148	3.2	146	154	158	3.2	156
Phocid Pinnipeds	162	162	0.1	162	135	140	3.3	138	145	150	3.3	148
Otariid Pinnipeds	162	162	0.1	162	132	137	3.2	135	142	147	3.2	145
Lower Hydrophone												
Unweighted	162	163	1.1	163	151	153	1.5	152	161	163	1.5	162
Low Frequency Cetacean	162	163	1.1	163	141	144	1.7	143	151	154	1.7	153
Mid Frequency Cetacean	162	163	1.1	163	145	147	1.5	146	155	157	1.5	156
High Frequency Cetacean	162	163	1.1	163	146	148	1.5	147	156	158	1.5	157
Phocid Pinnipeds	162	163	1.1	163	137	139	1.5	138	147	149	1.5	148
Otariid Pinnipeds	162	163	1.1	163	134	136	1.5	135	144	146	1.5	145

Note: Measurement distances normalized to 33 feet (10 meters)


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 60 (TP-60)

January 22, 2018

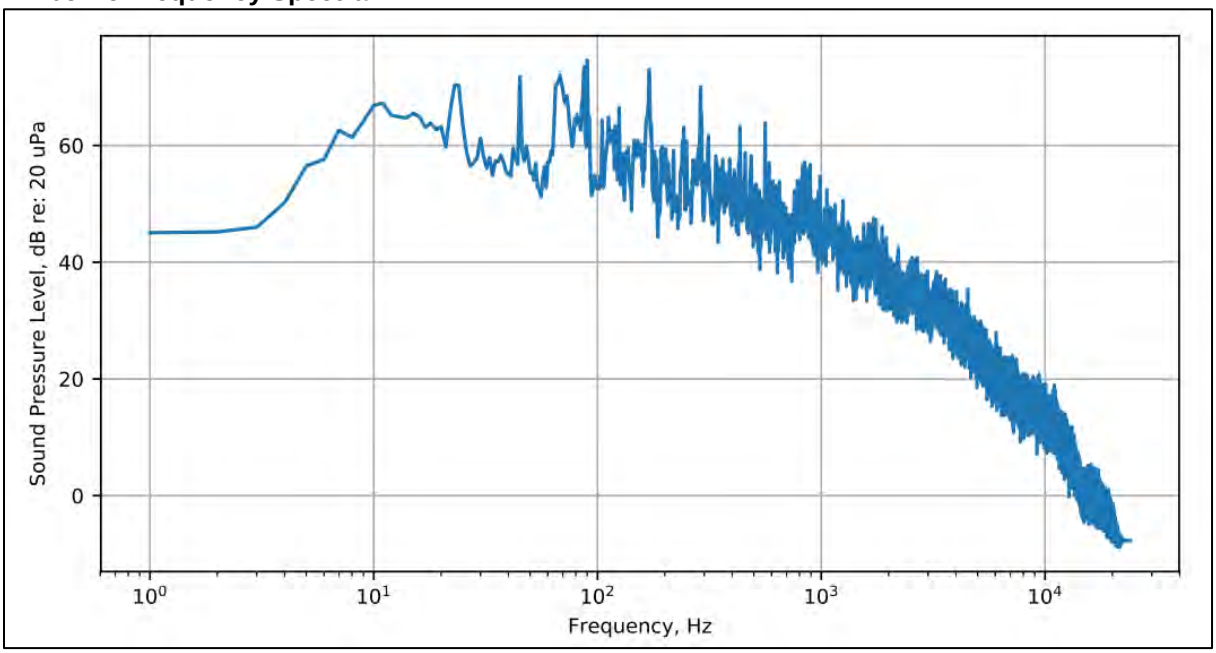
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	55	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	90	83

Airborne Frequency Spectra

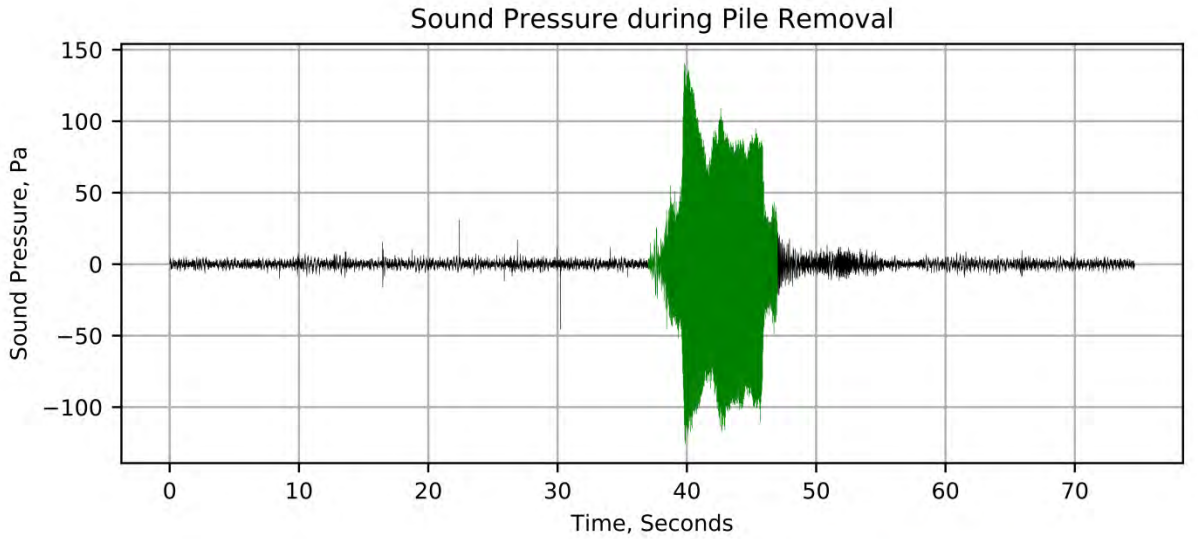


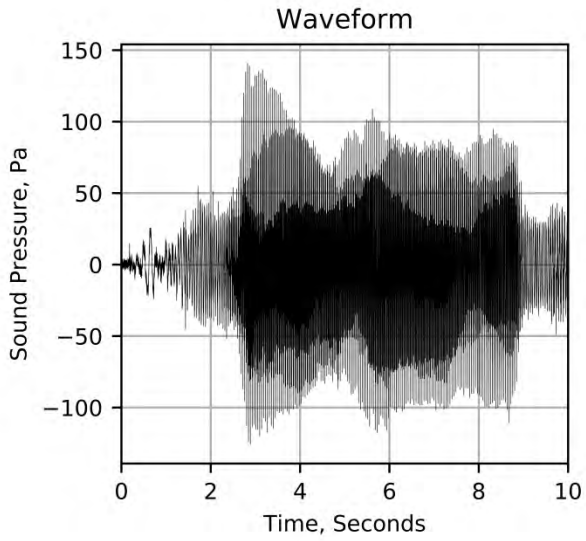
Underwater Sound Levels, dB re: 1 μPa

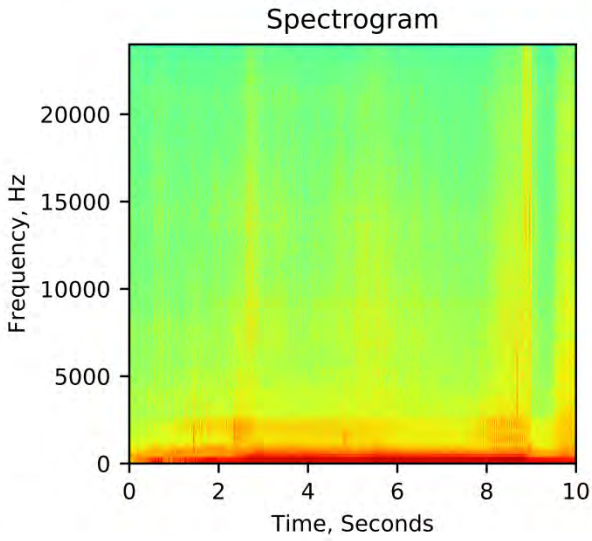
Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	164	164	-	164	150	150	-	150	160	160	-	160
Low Frequency Cetacean	164	164	-	164	140	140	-	140	150	150	-	150
Mid Frequency Cetacean	164	164	-	164	143	143	-	143	153	153	-	153
High Frequency Cetacean	164	164	-	164	144	144	-	144	154	154	-	154
Phocid Pinnipeds	164	164	-	164	135	135	-	135	145	145	-	145
Otariid Pinnipeds	164	164	-	164	132	132	-	132	142	142	-	142
Lower Hydrophone												
Unweighted	166	166	-	166	155	155	-	155	165	165	-	165
Low Frequency Cetacean	166	166	-	166	143	143	-	143	153	153	-	153
Mid Frequency Cetacean	166	166	-	166	148	148	-	148	158	158	-	158
High Frequency Cetacean	166	166	-	166	149	149	-	149	159	159	-	159
Phocid Pinnipeds	166	166	-	166	140	140	-	140	150	150	-	150
Otariid Pinnipeds	166	166	-	166	137	137	-	137	147	147	-	147

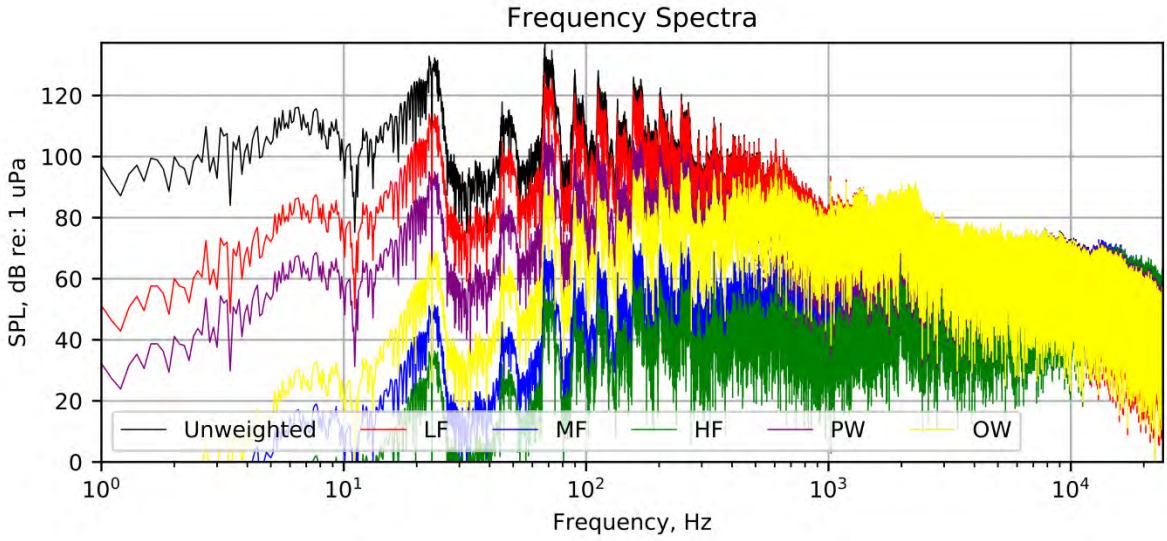
Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds


Waveform
Sound Pressure, Pa
Time, Seconds


Spectrogram
Frequency, Hz
Time, Seconds


Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 61 (TP-61)

January 22, 2018

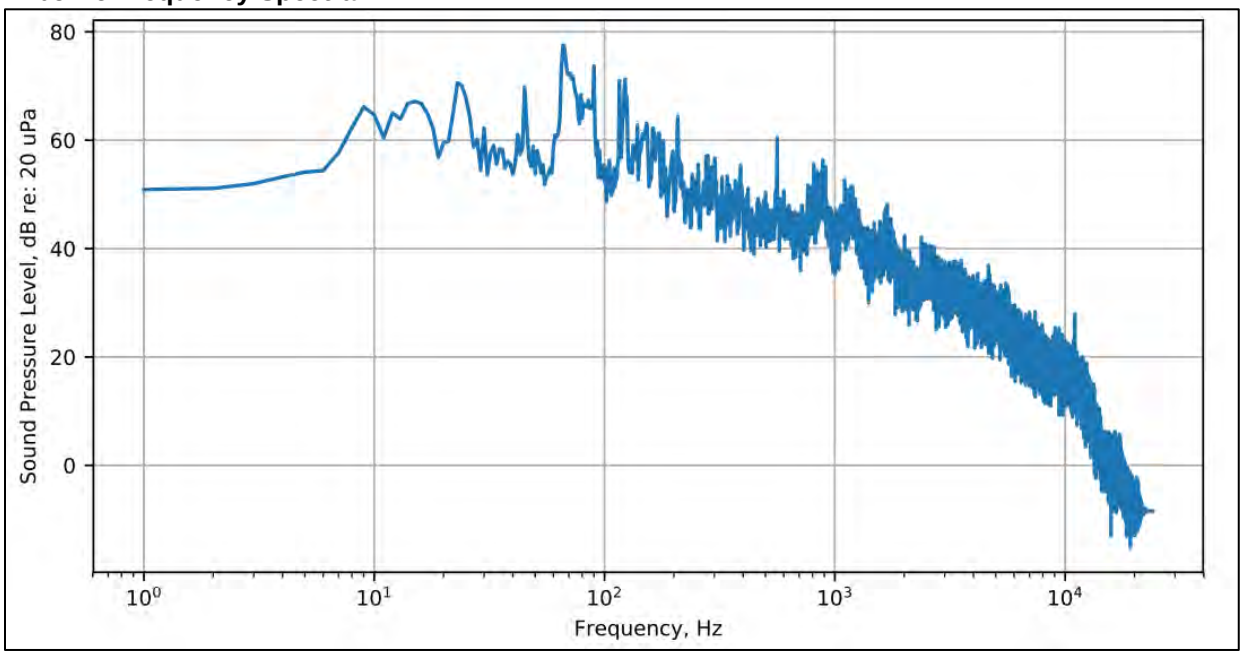
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	55	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
86	91	86

Airborne Frequency Spectra

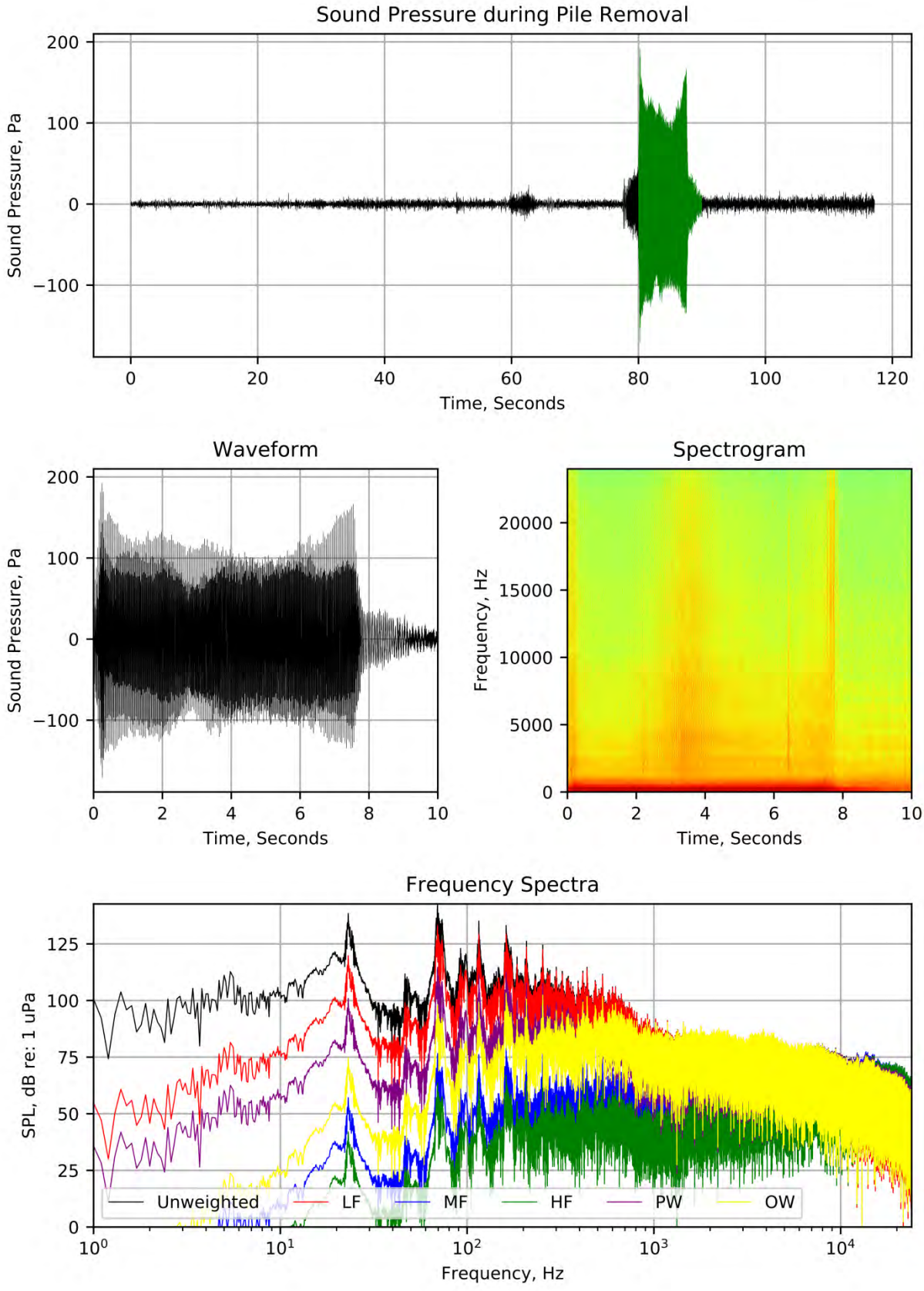


Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	165	165	-	165	153	153	-	153	163	163	-	163
Low Frequency Cetacean	165	165	-	165	144	144	-	144	154	154	-	154
Mid Frequency Cetacean	165	165	-	165	147	147	-	147	157	157	-	157
High Frequency Cetacean	165	165	-	165	148	148	-	148	158	158	-	158
Phocid Pinnipeds	165	165	-	165	139	139	-	139	149	149	-	149
Otariid Pinnipeds	165	165	-	165	136	136	-	136	146	146	-	146
Lower Hydrophone												
Unweighted	169	169	-	169	157	157	-	157	167	167	-	167
Low Frequency Cetacean	169	169	-	169	146	146	-	146	156	156	-	156
Mid Frequency Cetacean	169	169	-	169	151	151	-	151	161	161	-	161
High Frequency Cetacean	169	169	-	169	152	152	-	152	162	162	-	162
Phocid Pinnipeds	169	169	-	169	143	143	-	143	153	153	-	153
Otariid Pinnipeds	169	169	-	169	139	139	-	139	149	149	-	149

Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Spectrogram
Frequency, Hz
Frequency Spectra
SPL, dB re: 1 uPa
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 62 (TP-62)

January 22, 2018

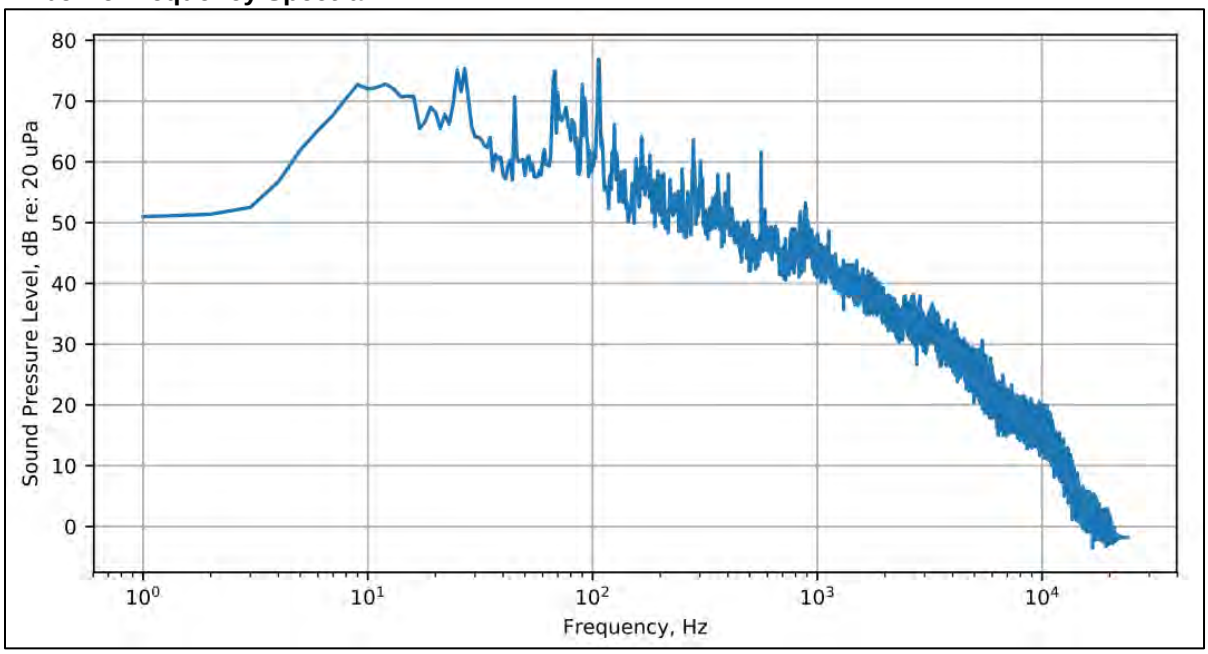
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	55	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
88	92	85

Airborne Frequency Spectra

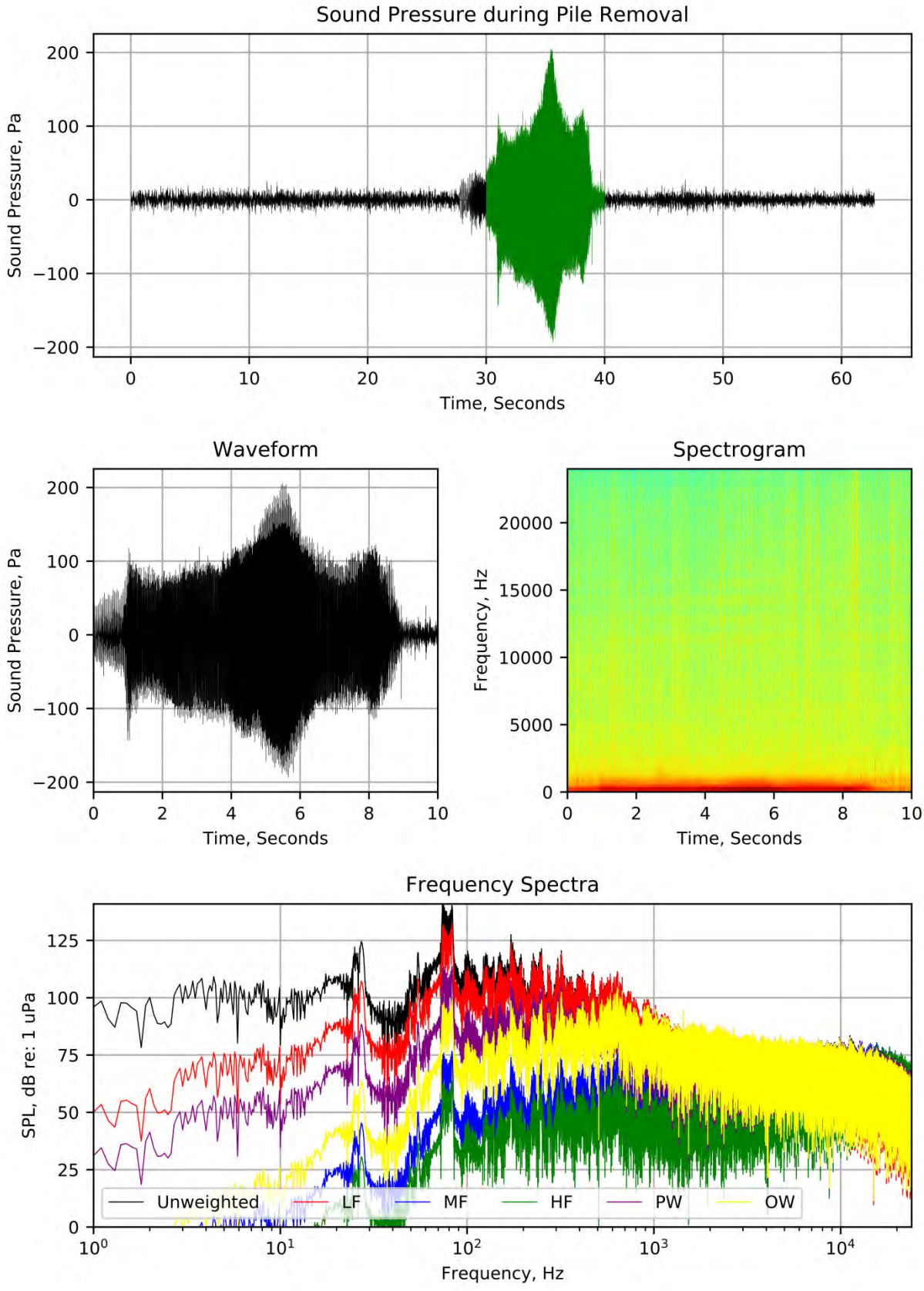


Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	167	167	-	167	156	156	-	156	166	166	-	166
Low Frequency Cetacean	167	167	-	167	146	146	-	146	156	156	-	156
Mid Frequency Cetacean	167	167	-	167	149	149	-	149	159	159	-	159
High Frequency Cetacean	167	167	-	167	150	150	-	150	160	160	-	160
Phocid Pinnipeds	167	167	-	167	142	142	-	142	152	152	-	152
Otariid Pinnipeds	167	167	-	167	139	139	-	139	149	149	-	149
Lower Hydrophone												
Unweighted	170	170	-	170	159	159	-	159	169	169	-	169
Low Frequency Cetacean	170	170	-	170	148	148	-	148	158	158	-	158
Mid Frequency Cetacean	170	170	-	170	153	153	-	153	163	163	-	163
High Frequency Cetacean	170	170	-	170	154	154	-	154	164	164	-	164
Phocid Pinnipeds	170	170	-	170	145	145	-	145	155	155	-	155
Otariid Pinnipeds	170	170	-	170	141	141	-	141	151	151	-	151

Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

TIMBER PILE REMOVAL 63 (TP-63)

January 22, 2018

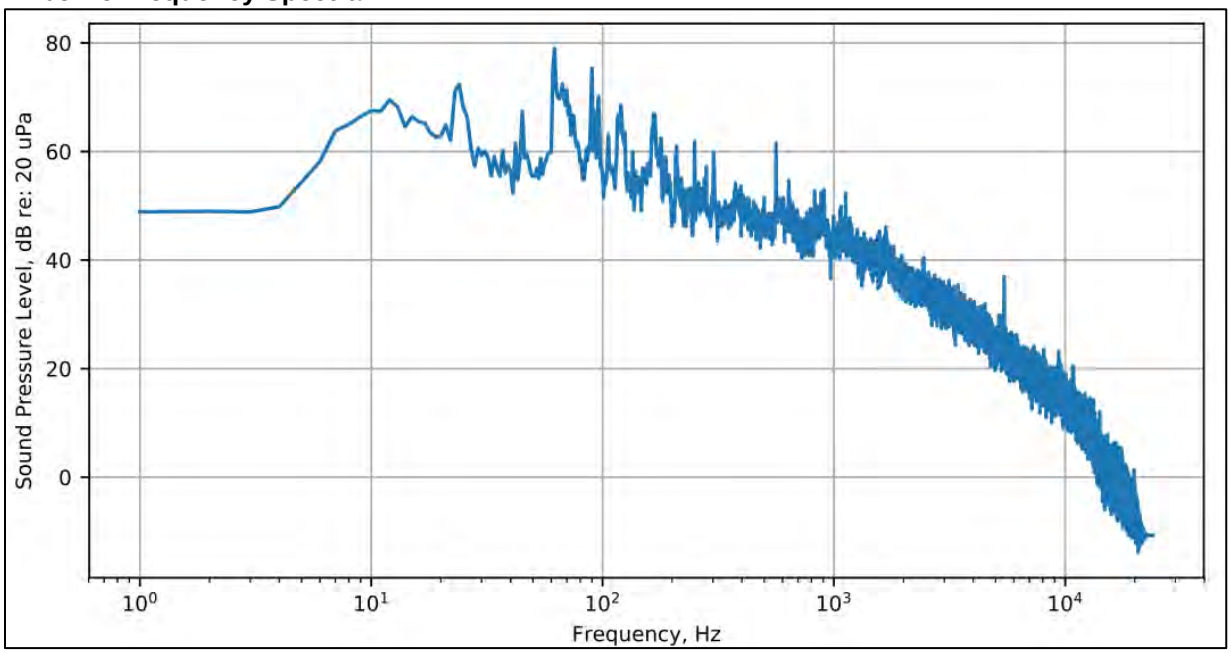
Hydrophone and Pile Information, Feet

Hydro Depth (upper/lower)	Distance			Water Depth	
	Between Hydros	Hydros to Pile	Pile to Water's Edge	Hydros	Pile
3/31	28	55	175	34	34

Airborne Sound Levels, dB re: 20 μPa

Median	Maximum	Minimum
87	92	84

Airborne Frequency Spectra

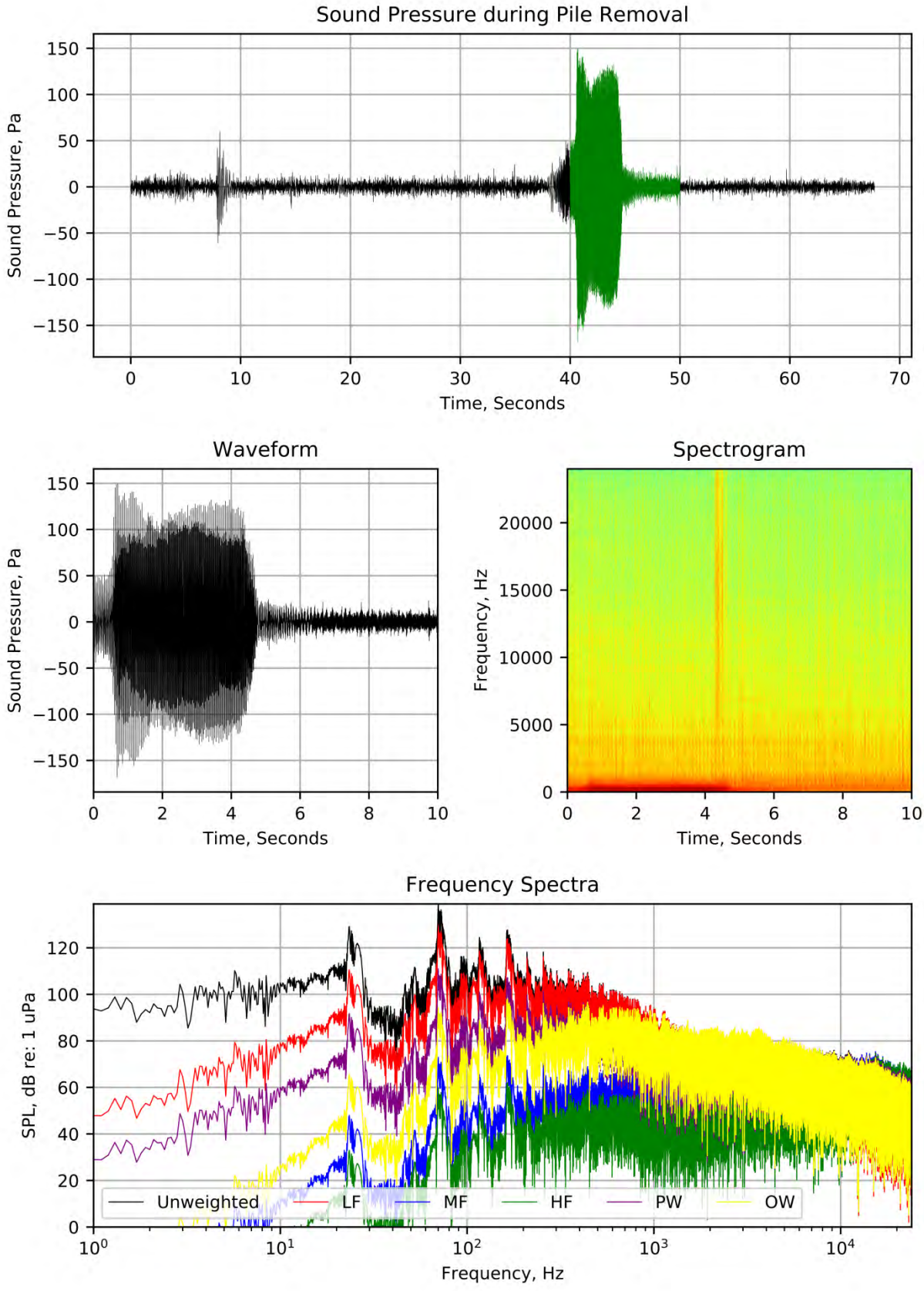


Underwater Sound Levels, dB re: 1 μPa

Frequency Range	Peak				RMS				SEL			
	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg	Min	Max	SD[1]	Avg
Upper Hydrophone												
Unweighted	166	166	-	166	153	153	-	153	163	163	-	163
Low Frequency Cetacean	166	166	-	166	144	144	-	144	154	154	-	154
Mid Frequency Cetacean	166	166	-	166	146	146	-	146	156	156	-	156
High Frequency Cetacean	166	166	-	166	147	147	-	147	157	157	-	157
Phocid Pinnipeds	166	166	-	166	139	139	-	139	149	149	-	149
Otariid Pinnipeds	166	166	-	166	135	135	-	135	145	145	-	145
Lower Hydrophone												
Unweighted	167	167	-	167	155	155	-	155	165	165	-	165
Low Frequency Cetacean	167	167	-	167	144	144	-	144	154	154	-	154
Mid Frequency Cetacean	167	167	-	167	149	149	-	149	159	159	-	159
High Frequency Cetacean	167	167	-	167	150	150	-	150	160	160	-	160
Phocid Pinnipeds	167	167	-	167	141	141	-	141	151	151	-	151
Otariid Pinnipeds	167	167	-	167	138	138	-	138	148	148	-	148

Note: Measurement distances normalized to 33 feet (10 meters)

1. Due to the short duration of pile removal standard deviation was not able to be calculated.


Sound Pressure during Pile Removal
Sound Pressure, Pa
Time, Seconds
Waveform
Sound Pressure, Pa
Time, Seconds
Spectrogram
Frequency, Hz
Time, Seconds
Frequency Spectra
SPL, dB re: 1 uPa
Frequency, Hz
Unweighted
LF
MF
HF
PW
OW

3.0 PILE DRIVER INFORMATION

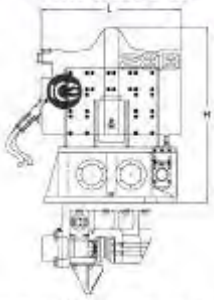
International Construction Equipment
301 Warehouse Drive
Matthews, NC 28104
Phone: 704 821-8200
Email info@iceusa.com

Designed and manufactured in the USA by ICE®, world leader in cost-effective foundation equipment since 1974.

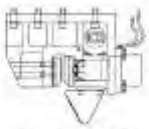
INTERNATIONAL CONSTRUCTION EQUIPMENT, INC.

ICE® Model 28B
Hydraulic Vibratory Driver/ Extractor with Model 350E Power Unit

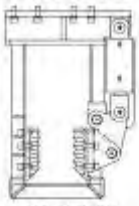
Dimensions



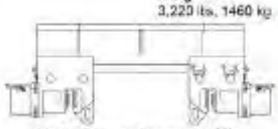
Clamps & Accessories



Model 140C Sheeting Clamp
Clamping force
140 tons, 1245 kN
Weight
2,200 lbs, 1000 kg



Model 40 Wood, Concrete & Pipe Clamp
Clamping force
40 tons 355 kN
Weight
3,220 lbs, 1460 kg



5' Caisson Beam with Model 100BH Caisson Clamps
Clamping force
220 tons, 1975 kN
Weight
2,990 lbs, 1356 kg

Other Model 28B Accessories
6' Caisson beam
10' Clamp extension
90° Turning plate
Bias weights
Vibrator stand
Wireless remote

Model 28B Vibrator Specifications

Eccentric moment	2,800 in-lbs	32 kg-m
Maximum frequency	1700 vpm	
Driving force	123 tons	1097 kN
Centrifugal force	119 tons	1062 kN
Amplitude (free w/o clamp)	1.1 in	29 mm
Standard line pull for extracting	54 tons	480 kN
Maximum line pull for extracting	54 tons	480 kN
Weight (no clamp or hoses)	7,750 lbs	3515 kg
Non-vibrating weight	2,960 lbs	1342 kg
Height without clamp (H)	80 in	2032 mm
Length (L)	77 in	1943 mm
Width (W)	21 in	524 mm
Throat width (TW)	14.25 in	362 mm
Hydraulic hose length	150 ft	46 m
Hydraulic hose weight	1,425 lbs	646 kg
Height with sheeting clamp* (HH)	121 in	3070 mm
Weight with sheeting clamp & 1/2 hoses*	10,665 lbs	4838 kg
Height with beam & caisson clamps*	113 in	2870 mm
Weight with beam & caisson clamps*	10,740 lbs	4871 kg

* See "Clamps and Accessories Manual" for in depth description

Model 350E Power Unit Specifications

Engine	Caterpillar C9	
Power	350 HP	261 kW
Operating speed	1,850 rpm	1850 rpm
Max. motors pressure	5,500 psi	380 bar
Motors flow (no load)	97 gpm	367 lpm
Clamp pressure	4,500 psi	310 bar
Clamp flow	6 gpm	24 lpm
Weight (w/ full fluid & 1/2 fuel)	11,350 lbs	5150 kg
Length	130 in	3300 mm
Width	63 in	1600 mm
Height	87 in	2200 mm
Hydraulic reservoir	275 gal	1040 litres
Fuel capacity	118 gal	445 litres

International Construction Equipment, Inc.
301 Warehouse Drive
Matthews, NC 28104 USA
888-ICE-USA1 / 704-821-8200
sales@iceusa.com / www.iceusa.com