

December 13, 2017

TO: Rick Huey

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SUBJECT: Bainbridge Island Underwater Sound Level Meter –USLM- 12-inch H Pile – Zone of Influence Technical Memorandum.

Underwater Noise Levels

This memo summarizes the measurements made to detect the outer boundary of the Zone of Influence (ZOI) for the installation of one 12-inch H steel pile using one vibratory hammer at the Colman dock project. Data was collected in real-time using the Underwater Sound Level Meter (USLM) at different distances from the source on October 10, 2018 (Figure 1).

The measurements were collected from a boat. During the recording there were one nearby vessels that interfered with the measurements.

No frequency weighting (*e.g.*, A-weighting or C-weighting) was applied to the underwater acoustic measurements presented in this report. Underwater sound levels quoted in this report are in decibels relative to the standard underwater acoustic reference pressure of 1 μ Pa. No noise attenuation devices were used during these vibratory measurements. Root Mean Square (RMS) noise levels corresponding to the broadband sound levels are reported in terms of the 5-second average continuous sound level and have been computed from the Fourier transform of pressure waveforms in 5-second time intervals.

The measurement were taken the updated 2018 USLM and software where the Mammal Hearing function RMS were able to be recorded beside the broadband from the previous model version.

Measurements

- Seattle the daytime background RMS Sound level is 141 dB – Comprehensive WSF Background Sound Level Report 2015.
- Seattle RMS values were extracted Mammal Functional Hearings reports included in the 2017 BA manual.
- Underwater noise measurements for the 12 –inch H pile installation were collected at from location ranging from 5 miles to 4.66 miles. Table 1 summarizes the results of the measurements.

Figure 1: Locations of the ULSM noise reading locations between Bainbridge Island and Coleman dock work zone area.

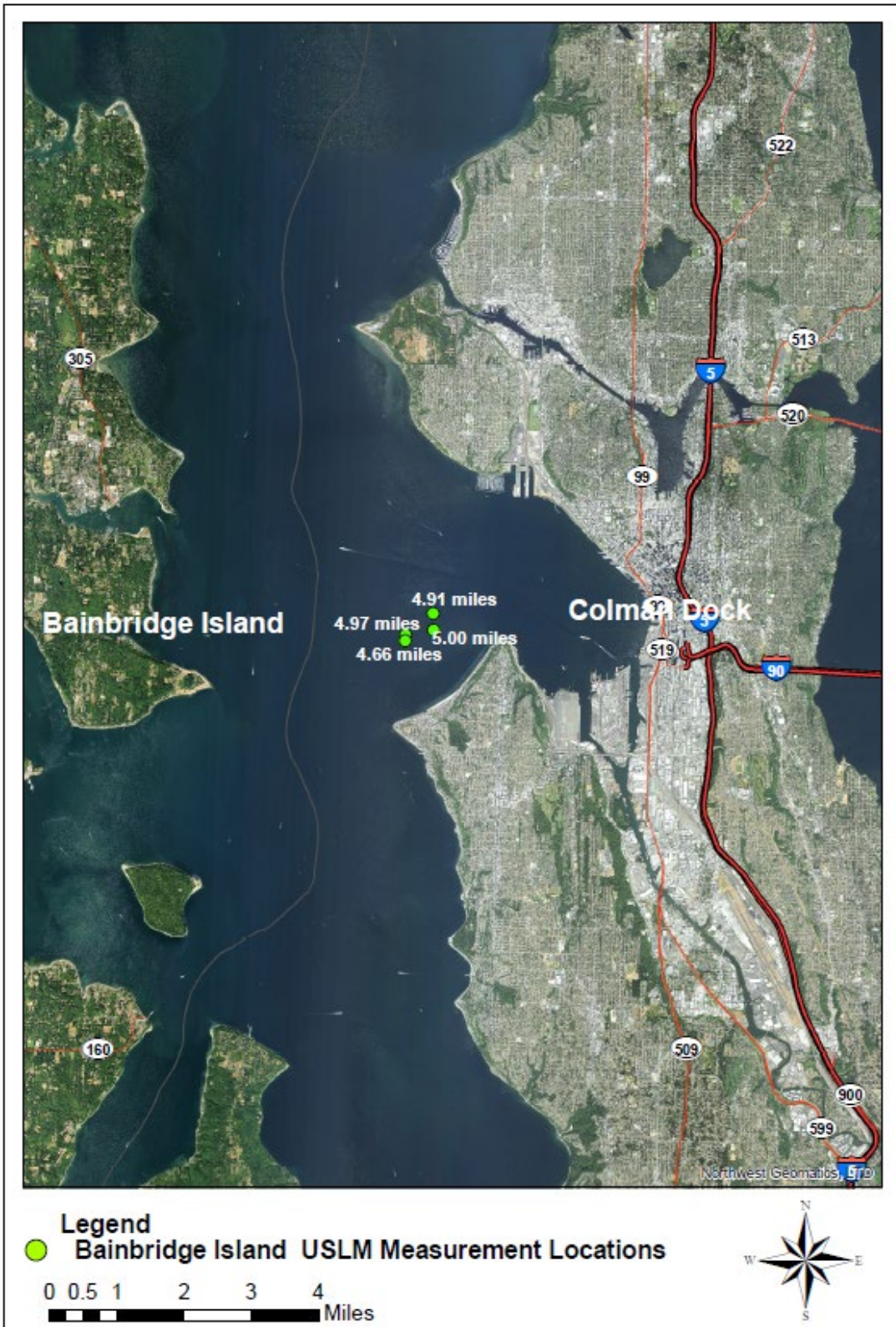


Table 1: Summary Table of Underwater Monitoring Broadband and all the functional Hearing Groups one 12-inch H pile Installation at Colman Ferry Dock Project.

Functional Hearing Group	Location	Distance To Pile (miles)	Average RMS (dB)	Background Sound Level (dB)
Broadband	1	4.66	148	141
	2	4.91	144	141
	3	4.97	148	141
	4	5.00	144	141
Low Frequency	1	4.66	128	130
	2	4.91	120	130
	3	4.97	131	130
	4	5.00	129	130
Mid-Frequency	1	4.66	112	124
	2	4.91	100	124
	3	4.97	123	124
	4	5.00	117	124
High-Frequency	1	4.66	109	124
	2	4.91	98	124
	3	4.97	120	124
	4	5.00	113	124
Otariid	1	4.66	121	127
	2	4.91	111	127
	3	4.97	130	127
	4	5.00	124	127
Phocid	1	4.66	121	127
	2	4.91	111	127
	3	4.97	130	127
	4	5.00	124	127

Summary

The results of Table 1 summarizes the RMS results at four (4) different distance from the location where a H type 12-inch was driven at the Colman Dock project in Seattle. As the objective of these measurement was to provide a ZOI for different Mammal functional hearings we may conclude the follow:

- a. The average broadband RMS value measured at all locations were the 141 dB Background sound.
- b. USML Register RMS below the previous recorded/calculated background Sound level for Low, medium and high frequency. The recommended ZOI would be 4.66 miles.

- c. For the Otariid and Phocid functional hearing group, the registered RMS were above the Background for that group at 4.97 miles while for closer distance were lower. The reason might be that at during that measurement a vessel might have interfered skewing the recording. In this case we would recommend the ZOI at 4.66 miles.

Therefore, considering all the reading outcome we recommend that the ZOI be reduced to 4.6 miles for the installation of an H pile 12-inch.

If you have any questions please call me at (206) 440-4554