SR 520 Pontoon Construction Site – Marine Piling Removal Project
UNDERWATER NOISE MONITORING PLAN

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INTRODUCTION

The Washington State Department of Transportation (WSDOT) proposes to remove 19 of 68 piling and associated launch guide appurtenances associated with the State Route 520 (SR 520) floating bridge replacement project. The piling and appurtenances were used to guide completed pontoons out of the terrestrial casting basin and into Grays Harbor in preparation for transport to Lake Washington for the replacement of the SR520 floating bridge. As part of the lease agreement with the DNR, the termination of the lease requires the removal of 19 of the 68 piling and associated launch guide appurtenances from the casting basin launch channel that are located on state-owned aquatic lands.

The proposed Project will occur at the mouth of the Chehalis River where it enters Grays Harbor estuarine waters (Figures 1.1 and 1.2). Several marine mammal species may occur near the Project site. The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of marine mammals, which is defined as to "harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill," except under certain situations. Section 101 (a) (5)(D) allows for the issuance of an incidental harassment authorization (IHA), provided an activity would result in no more than negligible impacts on marine mammals and would not adversely affect subsistence use of these animals.

The 19-steel piling include the following:

- 48-inch steel piling – 1
- 24-inch steel piling – 17
- 18-inch steel piling – 1

Piling are located in Grays Harbor and water depths range from -3.1 to -9.9 feet (ft) mean lower low water (MLLW) where these 19 piling are located.

Each of the 19-steel piling located in Grays Harbor immediately waterward of the pontoon casting basin will be removed completely using a vibratory extractor. A crane located on a barge or flexifloat will be positioned near the piling. Weather and shut-downs due to marine mammals entering the work site could result in the pile removal activities extending beyond 6 days.

The barge will not be allowed to be in contact with the river substrate. The barge will be positioned in an area that is approximately 4-11 ft deep during low tides, depending upon pile location.

Construction is estimated to start in mid-January 2021 and includes vibratory removal of 19 steel pilings at a rate of approximately 3 piling per day, with all 19-piling removed over approximately 6 days. Vibratory pile removal would only occur during daylight hours when visual monitoring of marine mammals can be performed.

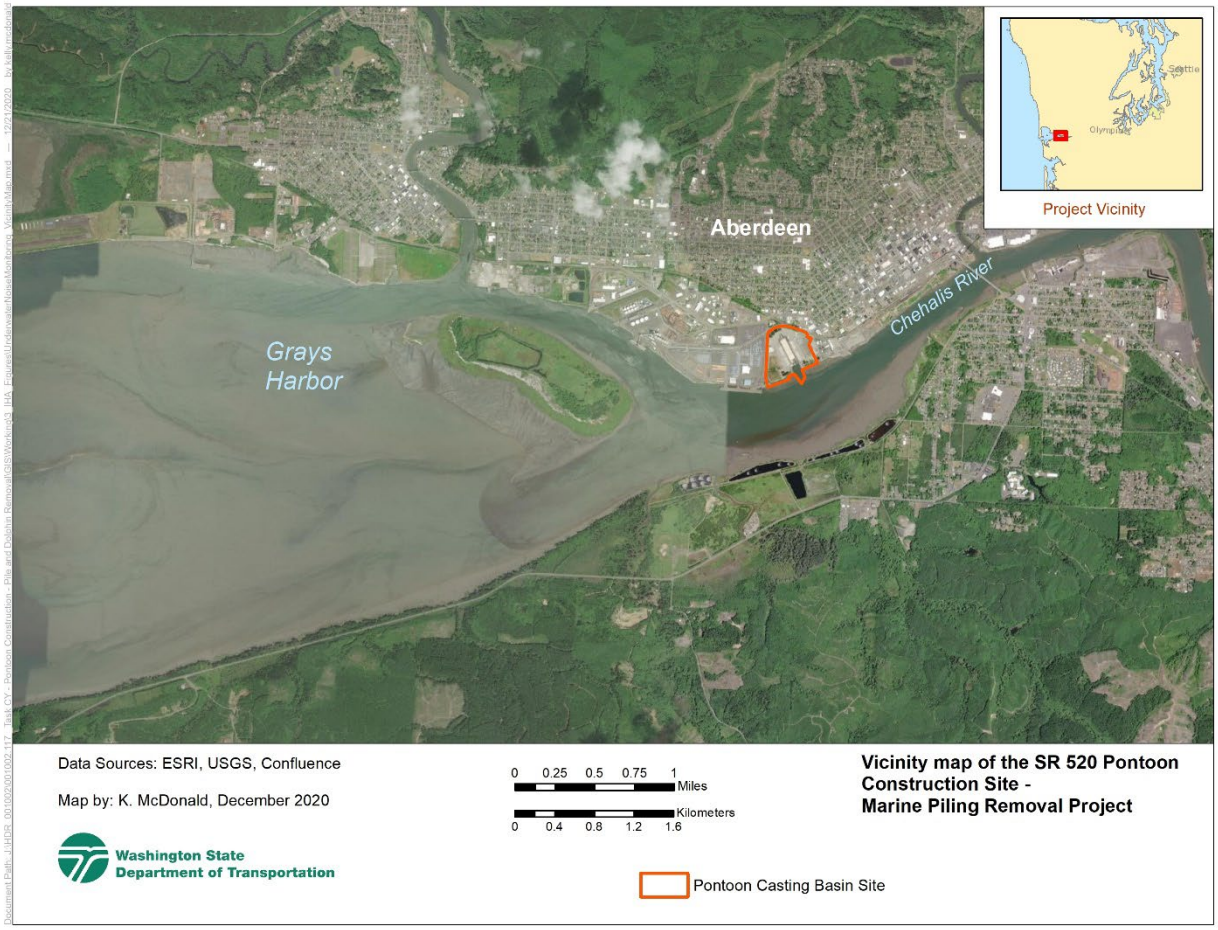

Figure 1. Vicinity map of SR 520 Pontoon Pontoon Construction Site – Marine Piling Removal Project.

PROJECT AREA

The proposed Project will occur at the mouth of the Chehalis River where it enters Grays Harbor estuarine waters (Figures 1). It is located in USGS hydrologic unit (HUC) 17100105 – Grays Harbor. Piling are located in Grays Harbor and water depths range from -3.1 to -9.9 feet (ft) mean lower low water (MLLW) where these 19 piling are located.

PERMIT/ESA CONDITIONS

The following Terms and Conditions from the Fish Passage and Restoration Programmatic Endangered Species Act Consultation must be met (NMFS and USFWS 2008, NMFS 2017):

Structural Removal Conservation Measures

1) Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.

2) The applicant will comply with the removal and containment best management practices (BMPs) specified under GCM 8: Treated Wood.

GCM1 – Pre-Construction Activities

1) A Temporary Erosion and Sediment Control plan and a Spill Prevention Control and Containment plan, commensurate with the size of the project, must be prepared and carried out to prevent pollution caused by surveying or construction operations. The plan will be available to the Corps and NMFS by request.
2) A Spill Prevention, Control, and Clean-Up plan will be prepared prior to construction for every project that utilizes motorized equipment or vehicles. The plan will be available to the Corps and NMFS by request.

GCM 2 – Construction Requirements

1) Work windows will be applied to avoid and minimize impacts to listed salmonids and forage fish. Please work with local WDFW biologist or see latest work windows on the Corps' website.

GCM 3 – Equipment and Barge Use

1) Heavy equipment will be limited to that with the least adverse effects on the environment (e.g. minimally-sized, low ground pressure equipment, use of matting, etc.).
2) When conducting in-water or bank work, machine hydraulic lines will be filled with vegetable oil for the duration of the project to minimize impacts of potential spills and leaks. If this conservation measure is not practicable, the applicant will propose alternative BMPs in the to avoid the discharge of hydraulic fluids to the aquatic environment as described in Minor Project Modifications as described below. If this conservation measure is not practical the applicant will use low-hour machinery.
3) Spill prevention and clean-up kits will be on site when heavy equipment is operating within 25 feet of the water.
4) Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water.

GCM 4 – Planting and Erosion Control (NOT APPLICABLE)

GCM 5 – Water Quality

1) Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the U.S.

GCM 6 – Turbidity Monitoring (NOT APPLICABLE)

GCM 7 – Piling

1) 1. In-water pile driving:
    a. Prior to submittal to the Corps, applicants proposing projects in marine waters must coordinate with NMFS to determine whether a marine mammal monitoring plan will be required. If NMFS requires a monitoring plan it must be appended to the Project Information Form. In addition, the applicant must include in the Project Information Form the following information regarding the coordination: a.

NMFS biologist with whom the coordination took place. b. Outcome of the coordination.

GCM 8 – Treated Wood (NOT APPLICABLE)
GCM 9 – Listed Species Considerations (NOT APPLICABLE)
CGM 10 – Minor Project Modifications (NOT APPLICABLE)

PILE REMOVAL LOCATION

The proposed activities will occur waterward of the Pontoon Casting Basin located in Grays Harbor in the City of Aberdeen, Washington (see Figures 1-1 and 1-2). Figure 2 indicates the location of the pile removal. There will be a total of 19 piles removed as part of the SR 520 Pontoon Construction Site – Marine Piling Removal Project.

Figure 2. Location of 19 pile removal locations where pile driving activity will take place.

PILE REMOVAL

Vibratory Pile Driving for Marine Mammal Consultations

Currently, hydroacoustic monitoring of vibratory pile installation is not required for fish, marbled murrelet, or marine mammal consultations. Monitoring of vibratory pile installation is voluntary and is designed to evaluate site specific conditions so that the biological monitoring area for marine mammals may be reduced. The first three piles will be monitored during vibratory removal.

Figure 3. Location of the piles that will be monitored on the casting basin pile removal site.

CONTRACTOR REQUIREMENTS

The contractor will submit a detailed description of their qualifications, which must include a minimum of a bachelor's degree in a related field[1] and 3 years' experience in noise monitoring and analysis, and monitoring plan based on this template for approval by NMFS. A list of the contractors' proposed sound level monitoring equipment shall be included along with specifications and a description of the purpose. The measurement range in terms of amplitude (in dB referenced to one micropascal (re: 1 uPa)), sensitivity and frequency shall be stated. A minimum frequency range of 20 Hz to 20 kHz and a minimum sampling rate of 48,000 Hz will be used when monitoring. Sampling rates higher than 48 kHz are preferred. Table 2 describes the minimum requirements of the equipment to be used. In addition to the equipment selection, quality control/quality assurance procedures should be described (e.g., how will system responses be verified and how will data be managed).

Table 2.

Equipment for underwater sound monitoring (hydrophone, signal amplifier, and calibrator). All have current National Institute of Standards and Technology (NIST) traceable calibration.

Item	Specifications	Minimum Quantity	Usage
Hydrophone	Receiving Sensitivity--211dB re 1V/µPa	2	Capture underwater sound pressures near the source and convert to voltages that can be recorded/analyzed by other equipment.
Environmental Noise & Building Acoustics Analyzer	ANSI S1.4.2014 Class 1, ANSI S1.43-1997 (R 2007), Type 1	1	Capture airborne sound and environmental noise.
Calibrator (pistonphone-type)	Accuracy-IEC 942 (1988) Class 1	1	Calibration check of hydrophone in the field.
Digital Signal Analyzer	Sampling Rate-48kHz or greater	1	Analyzes and transfers digital data to laptop hard drive.

[1] This can include Institute of Noise Control Engineering of the USA (INCE/USA) certification or related fields such as acoustics, physics, oceanography, geology or other physical sciences that have required coursework in physics.

Laptop computer or Digital Audio Recorder	Compatible with digital signal analyzer	1	Record digital data on hard drive or digital tape.
Real Time and Post-analysis software	-	1	Monitor real-time signal and post-analysis of sound signals.

To facilitate further analysis of data full bandwidth, time-series underwater signal shall be recorded as a text file (.txt) or wave file (.wav) or similar format. Recorded data shall not use data compression algorithms or technologies (e.g. MP3, compressed .wav, etc.).

METHODOLOGY

Vibratory Pile Removal for Marine Mammal Consultations

Background underwater sound levels will be measured for a minimum of three 12-hour cycles (i.e., 6 am to 6 pm) in the absence of construction activities to determine background sound levels (NMFS, 2012a). Analysis will be conducted using both data from the full range of frequencies recorded (typically 20 Hz to 20 kHz) and using high pass filters at 7 Hz, 50 Hz, 60 Hz, and 150 Hz thus eliminating those frequencies below these levels (NMFS, 2012a) which follows the marine mammal functional hearing groups of Southall et al. (2007) and NMFS (2018). Data will be used to calculate 30-second Root Mean Square (RMS) values for each 30 seconds of the three 24-hour cycles measured. These data will be used to calculate and plot a Cumulative Distribution Function (CDF) (NMFS, 2012a). Overall background sound levels will be reported as the 50% CDF and include a spectral analysis of the frequencies (NMFS, 2012a) for a minimum of one hourly cycle. Sound attenuation monitoring is not required for marine mammal monitoring.

SIGNAL PROCESSING

Vibratory Pile Removal for Marine Mammal Consultations

Vibratory monitoring data will be analyzed by calculating 10-second RMS and SEL values for every 10 seconds for each pile. The 10-second RMS values will be averaged for the entire pile and reported as the average RMS. The SEL values will be accumulated over the duration of the pile drive and for all piles driven on the same day and reported as the cumulative SEL (cSEL). Analysis will be conducted using both data from the full range of frequencies recorded (typically 20 Hz to 20 kHz) and using high pass filters at 7 Hz, 50 Hz, 60 Hz, and 150 Hz thus eliminating those frequencies below these levels (NMFS, 2012a) which follows the marine mammal functional hearing groups of Southall et al. (2007) and NMFS (2018).

ANALYSIS

Vibratory Pile Removal for Marine Mammal Consultations

Vibratory monitoring results will include the maximum and average RMS and cSEL values for each pile monitored and a comparison of the frequency content between piles. The maximum and overall average RMS calculated from 10-second RMS values and cSEL during the drive of the pile for will be calculated for the full range of frequencies and for each of the functional hearing groups of Southall et al. (2007) (NMFS, 2012b; 2018).

REPORTING

A draft report including data collected and summarized from all monitoring locations will be submitted within 60 days of the completion of hydroacoustic monitoring. The results will be summarized in graphical form and include summary statistics and time histories of impact sound values for each pile. A final report will be prepared and submitted within 30 days following receipt of comments on the draft report. The report shall include:

1. Size and type of piles.
2. The hammer size and energy rating used to remove the piles, make and model of the hammer.
3. A description of the sound monitoring equipment.
4. The distance between hydrophone*(s)* and pile.
5. The depth of the hydrophone*(s)* and depth of water at hydrophone locations.
6. The distance from the pile to the waters edge.
7. The depth of water in which the pile was driven.
8. The background sound pressure level reported as the 50% CDF.
9. The results of the hydroacoustic monitoring, including the frequency spectrum, ranges and means for RMS cumulative SEL, duration of the pile removal (seconds) and an estimation of the distance at which the RMS and cumulative SEL values reach the respective marine mammal thresholds and background sound levels.
10. Provide electronic recordings of background and pile removal monitoring in the form of a text (.txt) and/or wave (.wav) file format(s).

REFERENCES

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2008. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic.

NMFS. 2012a. Guidance Document: Data Collection Methods to Characterize Underwater Background Sound Relevant to Marine Mammals in Coastal Nearshore Waters and Rivers of Washington and Oregon. Memorandum: NMFS Northwest Fisheries Science

Center – Conservation Biology Division and Northwest Regional Office – Protected Resources Division, January 31, 2012.

NMFS. 2012b. Guidance Document: Data Collection Methods to Characterize Impact and Vibratory Pile Driving Source Levels Relevant to Marine Mammals. Memorandum: NMFS Northwest Fisheries Science Center – Conservation Biology Division and Northwest Regional Office – Protected Resources Division, January 31, 2012.

NMFS. 2017. Programmatic Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Seattle District Corps of Engineers Permitting of Fish Passage and Restoration Action in Washington State (FPRP III).

NMFS. 2018. Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0). Offic of Protected Resources. Natiional Marine Fisheries Service. NMFS-OPR-59, April 2018.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33(4): 411-521.

APPENDIX A – 50% CDF CALCULATION

Calculation of a Cumulative Distribution Function and Plot for Background Sound Level Analysis

Data from three full 24-hour underwater measurement cycles (minimum) are used to calculate a 30-second Root Mean Square (RMS) value for each 30-second period for the entire dataset. The RMS should be calculated for both the full frequency range recorded as well as a separate dataset which has been passed through a high pass filter thus eliminating those frequencies below 1000 Hz. These datasets are then grouped into 24-hour periods. To determine if the data is approximately log-normal in distribution, each 24-hour period is plotted as a Probability Density Function (PDF). Each 24-hour period can be plotted on the same PDF plot. The plots should be approximately log normal in distribution and thus can be used in the further analysis. Each day of data should have an approximately Gaussian sigmoid shape, the differences between them and the ideal might be hard to spot, but the sigmoid from day to day will show noticeable variation. Data which does not approximate a log normal distribution should be excluded from further analysis.

The Cumulative Distribution Function (CDF) plot is obtained by plotting the normalized cumulative sum vs. the bin location. You can also get the PDF from plotting the normalized bin count vs. the bin location. The normalized bin count is obtained by dividing the count column by (number of data points multiplied by the space between 2 consecutive bins). This provides the integral of the PDF equal to 1. For instructions on creating a histogram in Microsoft Excel, see: http://www.vertex42.com/ExcelArticles/mc/Histogram.html