

REQUEST FOR MARINE MAMMAL PROTECTION ACT INCIDENTAL HARASSMENT AUTHORIZATION

Astoria Waterfront Bridge Replacement Project City of Astoria Clatsop County, Oregon

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OBEC Consulting Engineers, a DOWL LLC
Company
Corporate Office:
920 Country Club Road, Suite 100B
Eugene, Oregon 97401



AKS Engineering & Forestry, LLC
Keizer Office:
3700 River Road N, Suite 1
Keizer, Oregon 97303

541.683.6090 | www.OBEC.com

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APPENDICES

Appendix A: Project Plan Excerpts

LIST OF ABBREVIATIONS

AREMA.....	American Railway Engineering and Maintenance-of-Way Association
ADT.....	Average Daily Traffic
BMPs.....	Best Management Practices
CBD	Convention on Biological Diversity
CFR	Code of Federal Regulations
CIA.....	Contributing Impervious Area
CWA.....	Clean Water Act
dB	Decibel
dBA.....	A-Weighted Decibel
DPS.....	Distinct Population Segment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAHP	Federal Aid Highway Program
FHWA	Federal Highway Administration
HMT.....	Highest Measured Tide
HUC.....	Hydrologic Unit Code
IWW	In-Water Work
IWWP.....	In-Water Work Period
LCEP	Lower Columbia Estuary Partnership
MHW	Mean High Water
MHHW.....	Mean Higher-High Water
MLW	Mean Low Water
MLLW.....	Mean Lower-Low Water
MMPA.....	Marine Mammal Protection Act
msl.....	Mean Sea Level
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
OBEC.....	OBEC Consulting Engineers, a DOWL LLC Company
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
PAH	Polycyclic Aromatic Hydrocarbons
PCP.....	Pollution Control Plan
PSO	Protected Species Observer
PSU.....	Portland State University
PTS.....	Permanent Threshold Shifts
ROW	Right of Way
RM	River Mile
RMS	Root Mean Square
SAR.....	Stock Assessment Report
SBSTTA.....	Subsidiary Body on Scientific, Technical and Technological Advice
SEL.....	Cumulative sound exposure level over a 24-hour period
SPL.....	Sound Pressure Level
SSV.....	Sound Source Verification
TTS.....	Temporary Threshold Shifts
USACE.....	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
WSDOT	Washington State Department of Transportation
ZOI	Zone of Influence

Detailed Description of the Activity

This section provides a detailed description of the specific class of activities that will occur during construction of the Astoria Waterfront Bridge Replacement Project, hereinafter referred to as the Project. The entire Project proposes to replace six bridges that are located in consecutive blocks from 6th Street through 11th Street along the Astoria waterfront; however, this Request for MMPA Incidental Harassment Authorization (IHA) only covers work activities associated with the removal and replacement of the 6th, 8th, and 10th Street Bridges. Replacement of the other three bridges under Phase 1 of the Project was authorized under a separate IHA issued on April 11, 2018. Phase 1 of the Project is currently underway, with all in-water and over-water work completed. Phase 1 of the Project involved similar actions, and outcomes and lessons learned from the first phase have been used to inform this IHA application for Phase 2.

Overview

The portion of the Project addressed under this IHA will replace three bridges that connect city streets to waterfront piers supporting businesses and attractions, as well as support the existing trolley rail corridor. Project stakeholders include the business and property owners in the immediate vicinity, the Astoria Riverfront Trolley Association, ODOT, FHWA, the City of Astoria (City) Public Works Department, City residents, the City Council, and state and federal regulatory agencies.

The rail corridor is dominated by an existing timber trestle that runs east-west with 15-foot timber stringer spans. The rail trestle is currently in use as a single-track structure with a width of approximately 18 feet throughout the corridor. Additional trestle structure exists to the north at some locations, as historically, the operating railway had spur lines to serve businesses along the Astoria Waterfront. As such, the trestle framing north of the in-service rail line varies by site. The rail trestle consists of timber decking over timber rail ties supported by stringers (one under each rail).

The existing structures are structurally deficient, load posted bridges supported by decayed timber pile. The existing bridges are generally posted for a 3-ton load limit, which severely limits current uses and riverfront development. The proposed solution for the Project is to replace the existing bridges with modern concrete structures supported on steel piles built to current design standards. The bridges carry highway, rail, bicycle and pedestrian users. The street ROW limits extend north of the bridge sites and were established prior to construction of the rail line. The rail ROW is not continuous; it exists only between the street rights of way. This Project is currently limited to replacing the bridges within City street ROW.

Superstructure Removal

Demolition of the existing bridge crossings will require the removal of the bridge decks and other aboveground components for the trestle crossings and roadway approaches. Most of the structure will be timber; however, there are concrete components at some of the crossings. Demolition of the superstructures will likely be accomplished using standard roadway and bridge construction equipment (Table 1). This will include an excavator, backhoe, jackhammer, and concrete and chain saws. In addition, a crane will be used to remove larger timber elements. The use of the excavator, crane, and concrete saw will account for the highest construction-generated noise levels during demolition of the superstructures. All removed

materials will be hauled off-site to an approved upland location for disposal, and all equipment will be operated from the existing roadway, trestle, and upland areas.

Table 1 – Noise Levels for Bridge Demolition Equipment
(Hanan & Associates, 2014)

Equipment	Peak Values (dB RMS) at 20 meters ¹
Backhoe	78
Chain Saw	78
Concrete Saw	93
Crane	89
Excavator	91
Generator Powered Jackhammer	87
Hand Tools	85

California sea lions are known to haul-out near several of the crossings, and harbor seals are likely to be transiting the area during the construction period. Steller sea lions are not likely to be present within the area, though the possibility does exist that they could be transiting the area during construction. The airborne sound levels generated by the construction equipment could exceed the behavioral disruption thresholds, and there are very few structures situated between the river and the trestle crossings. *Based on the sound levels produced by the proposed equipment, existing site conditions, and the likely location of the pinnipeds within the area in relation to the associated construction activities, the City is seeking an IHA for removal of the rail superstructures, because this work could result in acoustic and visual disturbance to pinnipeds.*

Construction activities related to the removal of the roadway approach superstructures will be situated away from the river. Structural noise reduction (FHWA, 2011) is the physical shielding of the construction equipment provided by existing buildings and the decking material of the pier structure. Buildings and other above-grade structures will reduce noise by physically blocking it and reflecting it away from the river. The pier structures will also block noise from reaching the river and bank areas by deflecting it upwards. The combined reduction could range from 5 to 12 dB or more, depending on the location of the equipment and the type and size of the structures between the river and the equipment. Steller sea lions and harbor seals are not known to use the banks within the Project area; however, California sea lions have been seen hauled-out within the area.

Finally, noise levels from much of the construction equipment used for removal of the existing superstructures are no different than many of the existing noise sources in the area. For example, fuel trucks making deliveries to the gas station, delivery trucks accessing businesses in the dock area, or other heavy vehicles using roadways in this area would also produce noise similar to those noted in Table 1. *Based on the sound levels produced by the proposed equipment, existing site conditions, and the likely location of the pinnipeds within the area in relation to the associated construction activities, removal of the roadway approach superstructures are not expected to result in injury to, or disrupt the behavior of, nearby marine mammals.*

¹ Peak values have been rounded up from the original report.

Foundation Removal

The City is seeking an IHA for construction work related to the demolition of the existing bridge substructures at the 6th, 8th, and 10th Street crossings because this work could result in acoustic and visual disturbance to pinnipeds. Though all construction equipment will be operated from the existing roadway and upland areas, demolition activities will require the use of construction equipment that may generate sound levels that exceed the in-air thresholds currently prescribed by NOAA. Similarly, in-water construction would include the removal of previously installed piles using a vibratory hammer and via direct pull. Removal of wooden piling with a vibratory hammer will exceed the underwater behavioral disruption threshold for non-pulse noise. Finally, work related to piling and footing removal could result in visual disturbance to pinnipeds. The following sections further describe the proposed demolition activities.

Timber Structure Removal

The existing bridge crossings are primarily founded on a timber substructure. All timber elements supporting the existing roadway approaches and trestle crossings will be removed. The materials consist of round piles, columns, bottomplates, and lower braces and crossbracing. In addition, abandoned, cutoff timber piles that are located within close proximity to proposed pile locations will be removed. All removed timber elements will be hauled off-site to an approved upland location for disposal.



Photographs of existing timber structure that will need to be removed during demolition activities

An estimated 60 timber structural elements will be removed at each of the three bridge sites, including approximately 50 12-inch timber piles at each bridge. The majority of the timber piling to be removed is located within the intertidal zone between the MHW elevation (7.73 feet above msl) and the MLLW elevation (0.43 feet above msl), with the exception of the 10th Street Bridge where about half of the piles are located below the MLLW elevation. Based on

NOAA tide predictions for the 2019-2020 IWWP, negative tides are possible during the IWWP; however, the negative tides will occur after 5pm when construction will likely have ceased. Due to the limited number of piles below the MLLW elevation, and the rate at which the tides change within this area, the following scenarios are likely (see Table 2 for the Timber Pile Removal Summary):

- **6th Street Bridge** – All but one of the piles to be removed are located at or above six feet msl at this bridge, with the last pile located at six feet msl. Therefore, all piles are likely to be in the dry at least 50 percent of the time. An estimated 25 piles of the anticipated 50 piles to be removed at the 6th Street Bridge will be in the dry, or in water levels less than 2 feet deep, during extraction. The remaining 25 piles will be removed in water depths between 2 and 10 feet.
- **8th Street Bridge** – All of the piles to be removed are located at or below five feet msl, though all of them are located above the MLLW elevation at this bridge. Therefore, all piles are likely to be inundated by water levels greater than two feet deep at least 60 percent of the time. An estimated 20 piles of the anticipated 50 piles to be removed at the 8th Street Bridge will be in the dry, or in water levels less than 2 feet deep. The remaining 30 piles will be removed in water depths between 2 and 10 feet.
- **10th Street Bridge** – The existing trestle piles to be removed are located below the MLW elevation at this bridge. Therefore, all piles are likely to be inundated by water levels greater than two feet deep more than 75 percent of the time. An estimated 10 piles of the anticipated 50 piles to be removed at the 10th Street Bridge will be in the dry, or in water levels less than two feet deep. The remaining 40 piles will be removed in water depths between 2 and 10 feet.

Table 2 – Vibratory Hammer Timber Pile Removal Summary

Bridge Location	Total Piles Removed	Piles in Water <2 Feet*	Piles in Water > 2 Feet and <15 Feet
6 th Street Bridge	50	25	25
8 th Street Bridge	50	20	30
10 th Street Bridge	50	10	40
TOTAL	150	55	95

* Piles removed in water less than two feet includes piles that are removed in the dry.

Old pilings are often in very poor condition near and above the ground surface, making attachment to the pilings for extraction very difficult. Old vertical piles and other obstructions encountered near the surface may need to be extracted or cut below the ground surface elevation per FAHP programmatic criteria.

The remaining timber substructure elements (the last 10 of the estimated 60 structures) consist of the timber bottomplates, lower braces and/or crossbracing. These elements will be removed during low tides and will not require the use of a vibratory hammer. Removal of these elements will be done using standard construction equipment.

Concrete Structure Removal

Though the existing crossings are mostly comprised of timber substructures, there are several concrete footings that will need to be removed to facilitate construction of the new structures at 8th Street and 10th Street. Table 3 provides a summary of the concrete elements that will need to be removed. It is estimated that seven concrete footings will need to be extracted; however, this estimate is preliminary.

Table 3 – Concrete Structure Removal Summary		
Structure Type	8th Street Bridge	10th Street Bridge
Concrete Footings (16"x16")	1	5
Concrete Footings (12'x3')	1	--
TOTAL	2	5

It is anticipated that the contractor will use an excavator, positioned on the existing roadway or adjacent gravel/asphalt parking areas, to reach down and remove the concrete footings. If the vertical or horizontal distance makes a footing unreachable, the contractor will likely drill an anchor into the concrete then attach the crane to the anchor with a chain and pull upwards to extract the concrete. The existing concrete footings are located just below/above the MHHW elevation, so this work is likely to occur in the dry during low tides. All removed concrete will be hauled off-site to an approved upland location.



Photographs of existing concrete footings that will need to be removed during demolition activities

Temporary Work Containment Systems

The City is seeking an IHA for the construction of temporary work containment systems because this work could result in acoustic and visual disturbance to pinnipeds. Selection of the appropriate equipment and design of the work containment systems is the responsibility of the contractor; however, additional pilings to support these structures are not anticipated. The contractor will utilize existing substructure to support them. Construction of the work containment systems will be initiated prior to the removal of the superstructures to catch errant debris during demolition activities. All equipment will be operated from the existing roadway and upland areas when being constructed.

Bridge Design

To provide full pedestrian and vehicle access to the businesses and attractions along this portion of the waterfront, the City will replace the old structures with new concrete bridges that have steel supports. The new bridge designs will feature more lighting, wider sidewalks, and decorative hand railings.

The foundation options considered to support the three replacement bridges included deep foundations consisting of driven piles and drilled shafts. Driven piles were selected since they are less costly and less difficult to construct than drilled shafts. We anticipate foundation loads will require driven piles extending to the mudstone, ± 75 feet below the existing bridge decks.

The following sections provide an overview of the design of each of the three replacement bridges. A total of 65 permanent 24-inch steel piles will be installed to support the new trestle crossings and roadway approaches.

6th Street Bridge

The 6th Street Bridge will require a total of 21 plumb piles. Estimated pile depths range from -74 to -77 feet below msl. The trestle crossing will consist of two end bents and one interior bent with the following pile configurations (total of 9 piles):

- Bent 6-T1: End bent comprised of three piles
- Bent 6-T2: Interior bent comprised of three piles
- Bent 6-T3: End bent comprised of three piles

The trolley bridge will be constructed using precast concrete tee beams. The roadway approach will consist of two bents supported by a total of 12 steel piles, with a pre-cast prestressed slab bridge.

Fifteen of the proposed piles at the 6th Street Bridge are situated between six feet msl and the HMT elevation, with the additional six piles proposed above the HMT elevation. The piles above the HMT elevation will be installed in the dry; however, the piles proposed below the HMT elevation have the potential to be inundated by water levels greater than two feet deep about 60 percent of the time. An estimated 13 piles of the 21 piles to be installed at the 6th Street Bridge will be in the dry, or in water levels less than 2 feet deep. The remaining 8 piles will be installed in water depths greater than 2 feet.

8th Street Bridge

The 8th Street Bridge will consist of a total of 23 plumb piles. Estimated pile depths range from 84 to -85 feet below msl. The trestle crossing will consist of two end bents and one interior bent with the following pile configurations (total of 11 piles):

- Bent 8-T1: End bent comprised of four piles
- Bent 8-T2: Interior bent comprised four piles
- Bent 8-T3: End bent comprised of three piles

The trolley bridge will be constructed using precast concrete tee beams. The roadway approach will consist of two bents supported by a total of 12 steel piles, with a pre-cast prestressed slab bridge.

Most of the proposed pile locations at the 8th Street Bridge are situated between six feet msl and the MHHW elevation, with only five piles proposed above the HMT elevation. The piles above the HMT elevation will be installed in the dry; however, the piles proposed below the HMT elevation have the potential to be inundated by water levels greater than 2 feet deep roughly 50 percent of the time. An estimated 12 piles of the 23 piles to be installed at the 8th Street Bridge will be in the dry, or in water levels less than 2 feet deep. The remaining 11 piles will be installed in water depths between 2 and 10 feet.

10th Street Bridge

The 10th Street Bridge will consist of a total of 21 plumb piles. Estimated pile depth is -64 feet below msl. The trestle crossing will consist of two end bents and one interior bent with the following pile configurations (total of 9 piles):

- Bent 10-T1: End bent comprised of three piles
- Bent 10-T2: Interior bent comprised of three piles
- Bent 10-T4: End bent comprised of three piles

The trolley bridge will be constructed using precast concrete tee beams. The roadway approach will consist of two bents, each constructed on six piles for a total of 12 piles, with a pre-cast prestressed slab bridge.

Most of the proposed pile locations at the 10th Street Bridge are situated at or below the MLW elevation, with only six piles proposed at or above the MHHW elevation. The piles above the MHHW elevation have the potential to be installed in the dry at least 75 percent of the time; however, the remaining piles are likely to be inundated by water levels greater than two feet deep throughout construction. An estimated 6 piles of 21 piles to be installed at the 10th Street Bridge will be in the dry. The remaining 15 piles will be installed in water depths between 2 and 10 feet.

Pile Installation

The City is seeking an IHA for all pile installation activities, including site preparation, and vibratory and impact pile driving, because this work could result in acoustic and visual disturbance to pinnipeds. A total of 65 permanent steel piles are proposed for this Project, all 24 inches in diameter (see Table 4). The piles will be driven open-ended into very soft siltstone and mudstone to develop the required axial resistance using a vibratory hammer followed by a diesel impact hammer. It is estimated that the contractor will be able to advance the piles to roughly 80 percent of the desired depth using the vibratory hammer, then will use the diesel

hammer to seat the piles at the desired depths. It is anticipated that the contractor may employ two crews during construction to keep the Project on schedule. This could result in the use of both a vibratory and impact hammer simultaneously. The hammers would not be used at the same bridge site, but rather at two different sites. The contractor will at no point operate two of the same hammers concurrently. All equipment will be operated from the existing roadway and upland areas.

Foundation construction for these bridges presents significant challenges. The bridge sites are located in a historic waterfront area with nearby buildings and private piers. Further complicating the construction are existing pilings and riprap. As a result, several driving methods and approaches for evaluating and reducing vibrations associated with pile driving were explored. The following sections discuss the methods chosen for the Project.

Site Preparation

The contractor is likely to create a template to facilitate pile installation. The template will consist of a grid pattern in line with the existing boardwalk grade that is made using steel H-piles and steel angle iron/channels, among other materials. The template will accommodate the vibratory installation of 36-inch temporary casings that will demarcate the location of all new 24-inch steel piles. Site preparation work may also include the manual removal of riprap and other obstructions from the riverbed and banks, if such materials prohibit the installation of the temporary casings and permanent pilings. A total of 65 temporary casings will be installed/removed as a component of the templates to facilitate installation of the 65 permanent piles identified in Table 4. Table 4 below provides a summary of the proposed vibratory installation of the 36-inch temporary steel casings. The temporary casings will be installed to a depth of approximately 7 feet below the ground surface elevation.

Table 4 – Vibratory Hammer Steel Casing Installation Summary			
Bridge Location	Total Piles Installed/Removed	Piles in Water <2 Feet*	Piles in Water > 2 Feet and <15 Feet
6 th Street Bridge	21	13	8
8 th Street Bridge	23	12	11
10 th Street Bridge	21	6	15
TOTAL	65	31	34

* Piles installed in water less than two feet includes piles that are installed in the dry.

The contractor has six temporary casings on-site, so they will need to remove the casing once the permanent 24-inch piles are advanced to a low enough depth with the vibratory hammer that the casing prohibits driving the 24-inch pile with the diesel impact hammer. Removal of the temporary casings will be completed using a vibratory hammer. The removed pile will then be positioned elsewhere within the template to guide additional pile installation. Table 5 on the following page provides a summary of the proposed vibratory removal of the 36-inch temporary steel casings.

Table 5 – Vibratory Hammer Steel Casing Removal Summary

Bridge Location	Total Piles Installed/Removed	Piles in Water <2 Feet*	Piles in Water > 2 Feet and <15 Feet
6 th Street Bridge	21	13	8
8 th Street Bridge	23	12	11
10 th Street Bridge	21	6	15
TOTAL	65	31	34

* Piles removed in water less than two feet includes piles that are removed in the dry.

During the preliminary geotechnical investigation, most of the borings encountered riprap. Further, the history of the area suggests that a wide variety of large debris and fill may be present. Attempting to drive the new piles through the fill and other obstructions may induce unacceptable vibration levels on adjacent structures. As a result, the contractor may opt to predrill the piling locations to an elevation of about ± 3 feet below msl; though the need to predrill will be determined on-site once the contractor has identified the exact pile locations. If pre-drilling is not required, the contractor may use a 14-inch H-pile equipped with a torched point at the end to break up the ground at each piling location using the vibratory hammer. This work will be conducted inside the 36-inch temporary casings. No sediment will be removed from within the temporary casing during this site preparation activity.

Vibratory and Impact Hammer Pile Driving

The contractor will first use a vibratory hammer to install the 65 new 24-inch steel piles to the extent practicable; however, they will be required to use an impact hammer to seat the pile tips into the bedrock. It is estimated that the contractor will be able to advance the piles to roughly 80 percent of the desired depth using the vibratory hammer. The FHWA Gates Equation was used to calculate a range of hammer energies required to drive the 24-inch pile sections to a nominal axial resistance of ± 575 kips, with a final driving resistance from two to 10 blows per inch. The results indicate a hammer field energy range of 37- to 88-foot kips (37,000 to 88,000 pound-force) would be required; however, ODOT recommends a minimum hammer field energy of 40-foot kips (40,000 pound-force) for piles driven to a nominal axial resistance between 500 and 600 kips. Because pile driving vibrations decrease with increasing hammer energy and decreasing duration of the pile driving, it will be recommended that the selected pile hammer have an energy level near the upper end of the calculated range. Table 6 provides a summary of the vibratory and diesel hammer installation of the steel 24-inch piles.

Table 6 – Vibratory and Diesel Hammer Steel Pile Installation Summary

Bridge Location	Total Piles Installed	Piles in Water <2 Feet*	Piles in Water > 2 Feet and <15 Feet
6 th Street Bridge	21	13	8
8 th Street Bridge	23	12	11
10 th Street Bridge	21	6	15
TOTAL	65	31	34

* Piles installed in water less than two feet includes piles that are installed in the dry.

Abutment Wingwalls

Wingwalls will need to be constructed at the 10th Street crossing to help contain the roadway approach fill. The wingwalls will be cast-in-place concrete retaining walls that will be installed both above and below the HMT elevation, with all walls above the MHHW. As a result, it is anticipated that the contractor will be able to do this work in the dry; however, the contractor will install isolation measures when necessary. Construction of the wingwalls will require the operation of general construction equipment. Noise levels associated with possible equipment are noted below in Table 7 (Hanan & Associates, 2014), with the maximum sound level of 93 dB RMS at 20 meters from the source during the use of a concrete saw.

Table 7 – Noise Levels for Wingwall Construction Equipment

Equipment	Peak Values (dB RMS) at 20 meters ²
Backhoe	78
Cement Pump	73
Concrete Saw	93
Crane	89
Excavator	91
Hammer	82
Hand Tools	85

All equipment will be operated from the existing roadway and upland areas. The contractor will first excavate existing ground to the desired elevation using an excavator and dump truck positioned on the existing roadway. Then the contractor will frame the wall using pneumatic tools or hammer and nails. Once framed, concrete will be poured into the frame and allowed to cure. *Because California sea lions have been known to haul-out and rest throughout the project area, the City is seeking an IHA for wingwall installation because this work could result in acoustic and visual disturbance to pinnipeds.*

Rail Superstructure

Construction of the superstructure for the rail trestles will require the use of heavy construction equipment. The superstructures are comprised of precast, prestressed slabs with a 2-inch wearing surface. Possible construction equipment includes a crane, excavator, concrete saw, and concrete mixer, which will generate noise levels ranging from 78 dB RMS to 93 dB RMS at 20 meters from the source (Hanan & Associates, 2014).

California sea lions are known to haul-out near several of the crossings, and harbor seals are likely to be transiting the area during the construction period. Steller sea lions are not likely to be present within the area, though the possibility does exist that they could be transiting the area during construction. The airborne sound levels generated by the construction equipment could exceed the behavioral disruption thresholds. *Based on the sound levels produced by the proposed equipment, existing site conditions, and the likely location of the pinnipeds within the area in relation to the associated construction activities, the City is seeking an IHA for construction of the rail superstructures because this work could result in acoustic and visual disturbance to pinnipeds.*

² Peak values have been rounded up from the original report.

Roadway Improvements

Replacement of the three bridges will require roadway work in addition to bridge construction. Roadway improvements will consist of curb and sidewalk construction, asphalt paving, inlet construction, and utility relocates. The roadway work will be completed using standard roadway construction equipment, such as excavators and backhoes, dump trucks, pavers, and rollers. Other equipment that may be employed includes air compressors, jack hammers, concrete pumps and mixers, and pneumatic tools. The work will be conducted landward of the trolley crossings, and will not require IWW, and equipment will be operated away from the river. In-air noise produced by roadway construction equipment will range from 78 dB RMS to 93 dB RMS at 20 meters from the source (Hanan & Associates, 2014).

As previously noted, California sea lions are known to haul-out near several of the crossings; however, Steller sea lions and harbor seals are not known to use the banks within the Project area. The airborne sound levels generated by the roadway construction equipment could exceed the 100 dB RMS behavioral disruption threshold for hauled-out California sea lions; however, airborne sound levels will be attenuated by structural and atmospheric absorption. As previously noted, existing buildings and other above-grade structures will reduce construction noise generated during roadway improvements by physically blocking the noise and reflecting it away from the haul-out sites. The pier structure will also block noise from reaching the river and bank areas by deflecting it upwards. The combined reduction could range from 5 to 12 dB or more, depending on the location of the equipment and the type and size of the structures between the river and the equipment.

Finally, noise levels from much of the construction equipment used for removal of the existing superstructures are no different than many of the existing noise sources in the area. For example, fuel trucks making deliveries to the gas station, delivery trucks accessing businesses in the dock area, or other heavy vehicles using roadways in this area would produce similar noise levels as the construction equipment. *Based on the sound levels produced by the proposed equipment, existing site conditions, and the likely location of the pinnipeds within the area in relation to the associated construction activities, construction of the roadway improvements are not expected to result in injury to or disrupt the behavior of nearby marine mammals.*

Dates, Duration, and Specified Geographic Region

The following sections provide information related to the date(s) and duration of the proposed construction activities, as well as the specific geographical region where the activities will occur.

Dates and Duration of Demolition and Construction Activities

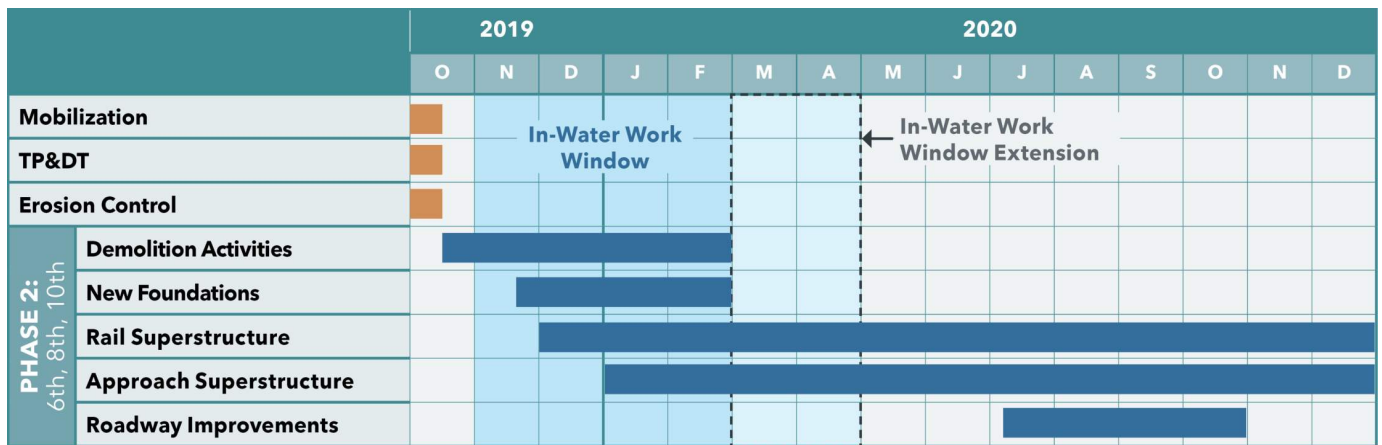
Full bridge closures and detours will be necessary to complete the work safely and efficiently. To provide pedestrian access to the waterfront businesses and attractions during construction, construction activities were split into two phases. This IHA request covers Phase 2 construction activities as indicated within Figure 1. Construction work will consist of demolition and construction activities related to the 6th, 8th, and 10th Street bridge crossings. Construction activities are estimated to occur from October 2019 through December 2020.

The construction activities that could potentially result in acoustic and visual disturbance to pinnipeds within the action area include rail superstructure and foundation removal activities, construction of the temporary work containment systems, piling installation activities, wingwall

construction, and construction of the rail superstructures. Most of these activities will require work below the HMT elevation and will be conducted during the ODFW-prescribed IWWP for the Lower Columbia River. It is also a possibility that the Project will need to request an IWWP extension through April to complete the IWW. This will result in an IWWP from November 1 through April 30.

Demolition activities will be initiated in October 2019. This work will include the removal of all timber and concrete foundations within the vicinity of the new crossing supports. It is anticipated that the contractor will be removing existing substructure elements concurrent with the construction of the new foundations. It is anticipated that construction activities will occur intermittently over the entire proposed IWWP, or 127 workdays. Though the contractor is likely to utilize two crews at different bridges in an effort to complete this work simultaneously, estimates of foundation removal and pile installation duration are provided.

Figure 1 – Construction Activity Schedule



The contractor will extract the existing timber piles via a combination of vibratory hammer work and direct pull extraction. The contractor will use the vibratory hammer to loosen and lift the timber piles to the extent that they can then be wrapped with a choker chain and then removed by crane with a direct upward pull. Vibratory removal of timber piles will take approximately 20 minutes per pile, and removal activities are anticipated to occur intermittently during bridge demolition activities. A maximum of 50 timber piles need to be removed at each bridge location. Vibratory removal of the existing piles is anticipated to only take one day per bridge, for a total of three days of vibratory and direct pull pile extraction work.

Once the existing piles have been removed at each bridge, the contractor will install the templates for the new bridge bents; remove all surface debris and obstructions; and then vibrate the temporary 36-inch steel casings to guide the placement of the permanent 24-inch steel piles. Before attempting to vibrate the new steel piles in, the contractor will predrill or use the vibratory hammer and H-pile with a pointed end to prepare the new pile locations.

The contractor may opt to purchase piles of sufficient length (70-80 feet long) or splice shorter piles together on-site. The contractor will begin installation activities using the vibratory hammer. They will first install the six temporary 36-inch casings, then vibrate in six of the 24-inch steel piles within those casings. Once the permanent piles are vibrated down to the desired depth, they will remove the temporary casings and reposition them at six other pile locations. This process will be

repeated until all the permanent 24-inch piles have been installed with the vibratory hammer. It is estimated that the maximum number of temporary 36-inch steel casings that can be installed and removed in a one-day period is thirty-six (36)³, and the maximum number of permanent 24-inch steel piles that can be installed during a one-day period is eighteen (18). Vibratory installation of the larger temporary casings and new permanent piles will take a maximum of 6 days per bridge, for an estimated total of 18 days of vibratory pile installation, with vibratory work occurring intermittently during each workday and over the course of the anticipated 127 day IWWP.

Once the piles have been vibed down as far as possible, the contractor will remove any remaining 36-inch temporary casings using the vibratory hammer, then attach the diesel impact hammer and drive the piles down to the desired depth. An estimated 500 strikes per pile are anticipated with the diesel hammer. It is assumed that the contractor has the potential to drive all of the piles at each bridge in one single day.

Table 8 below provides a summary of the vibratory pile removal and installation estimates, along with impact pile driving estimates, for each of the three bridge sites.

Table 8 – Pile Removal and Installation Estimates per Bridge

Bridge Site	Number of Timber Piles Removed (12 inch)	Number of Temporary Template Piles (36 inch)*	Number of Permanent Steel Piles (24 inch)	No. Days Vibratory Pile Work**	No. Days Impact Pile Driving Work	Total No. Impact Pile Strikes
6 th St	50	42	21	7	1	10,500
8 th St	50	46	23	7	1	11,500
10 th St	50	42	21	7	1	10,500

* Quantity doubled to account for the installation and subsequent removal of the required number of casings.

** Estimate includes vibratory removal and installation activities

The proposed IWWP, including the extension period, includes 127 workdays. Based on the information provided above, it is estimated that timber pile removal activities will account for three days, vibratory pile installation activities for 18 days, and impact pile driving for three days. The remainder of the proposed IWWP will allow for the removal of existing timber decking and concrete substructures, and the construction of superstructures that are situated below the HMT elevation. Construction of the superstructure elements above the HMT elevation as well as roadway construction activities will likely occur from May through December 2020.

Geographical Setting

The Columbia River originates in the Rocky Mountains of British Columbia, flowing northwest at first, before turning south towards the border between Oregon and Washington, then west towards the Pacific Ocean (PSU, 2016). The Project is in the Baker Bay-Columbia River subwatershed (170800060500) near the mouth of the Columbia River (at approximately RM 9) within the City (Figure 2). This section of the Lower Columbia River represents the most saline portion of the river's estuarine environment. Tidal influence extends from the coast upriver 146 miles to Bonneville Dam (LCEP, 2016). Within the Project area, the Columbia River is wide,

³ This includes a maximum of eighteen 36-inch casings installed and those same eighteen 36-inch casings removed in a one-day period.

extending over nine miles in width in the widest portion, and contains numerous islands, buoys, and sandbars that provide suitable haul-out locations for marine mammals.

Region of Activity

In-water steel pile and casing installation with a vibratory hammer will be the farthest-reaching extent of aquatic impacts. In addition, impact pile driving activities will also generate underwater sound levels that exceed the current NMFS thresholds. As a result, the Region of Activity has been defined by three distances to capture the extent of impacts during these construction activities.

The Practical Spreading Loss Model was used to calculate the distance from the source within which noise is likely to exceed the in-water acoustic threshold for behavioral disruption for non-pulse noise and impulsive noise. This resulted in a Region of Activity that extends approximately 21,545 meters from each pile during the vibratory installation of the temporary 36-inch steel casings, roughly 6,310 meters during the installation of the permanent 24-inch steel piles, and a Region of Activity that extends approximately 432 meters from each pile during impact pile driving activities. During construction, marine mammal behavior may be disturbed by underwater noise within these distances. Figure 3 depicts the Region of Activity for each of the three bridges during pile installation activities.

Geographic Description

The upland portions of the Region of Activity have been highly altered by human activities, with substantial shoreline development and remnants of historical development throughout the Project area. This includes thousands of timber piles, overwater buildings, a railroad trestle, and vehicular bridges. There are no forested riparian areas or wetlands located within the Region of Activity. Riparian vegetation is almost entirely absent except for a few small areas of blackberries and a couple trees and shrubs at two of the bridges.

The remainder of the Region of Activity is in the river channel within the intertidal and subtidal zones. All in-water construction activities will occur within the intertidal zone (above MLLW) where the substrate is primarily made up of historical riprap and other rocks/cobbles. No construction activities are proposed within the soft-bottom subtidal zone.

The USACE is charged with maintaining the navigation channel of the Columbia River to a depth of -25 feet from the Pacific Coast to Portland. Approximately six to nine million cubic yards of dredged material is removed from the Columbia River annually to assist vessel traffic (USACE, 2015a). The Lower Columbia River is used by various types of vessels, including cargo ships, dredging vessels, fishing vessels, trawlers, pollution control vessels, and search and rescue vessels, among others.

Figure 2 – Project Location Map

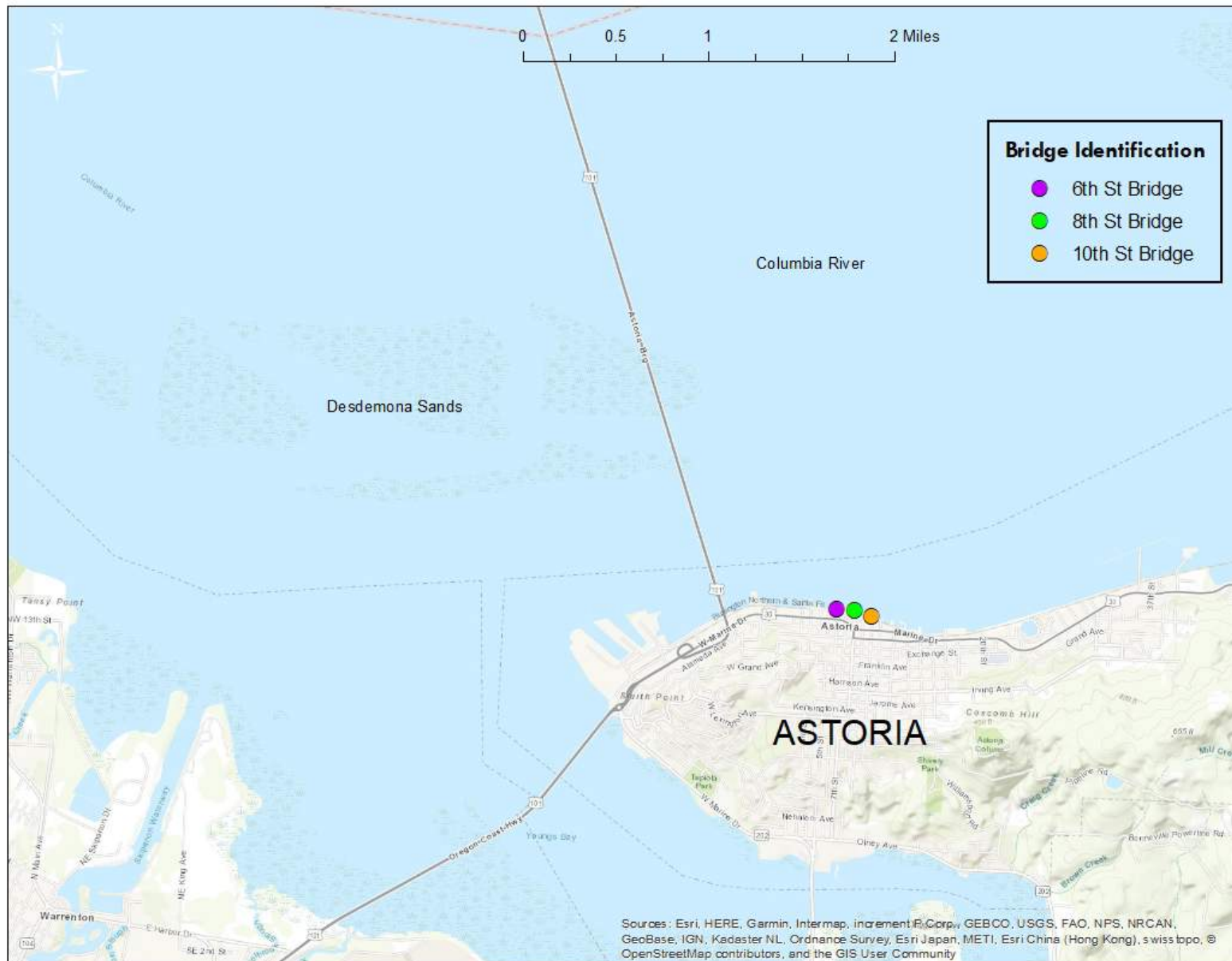
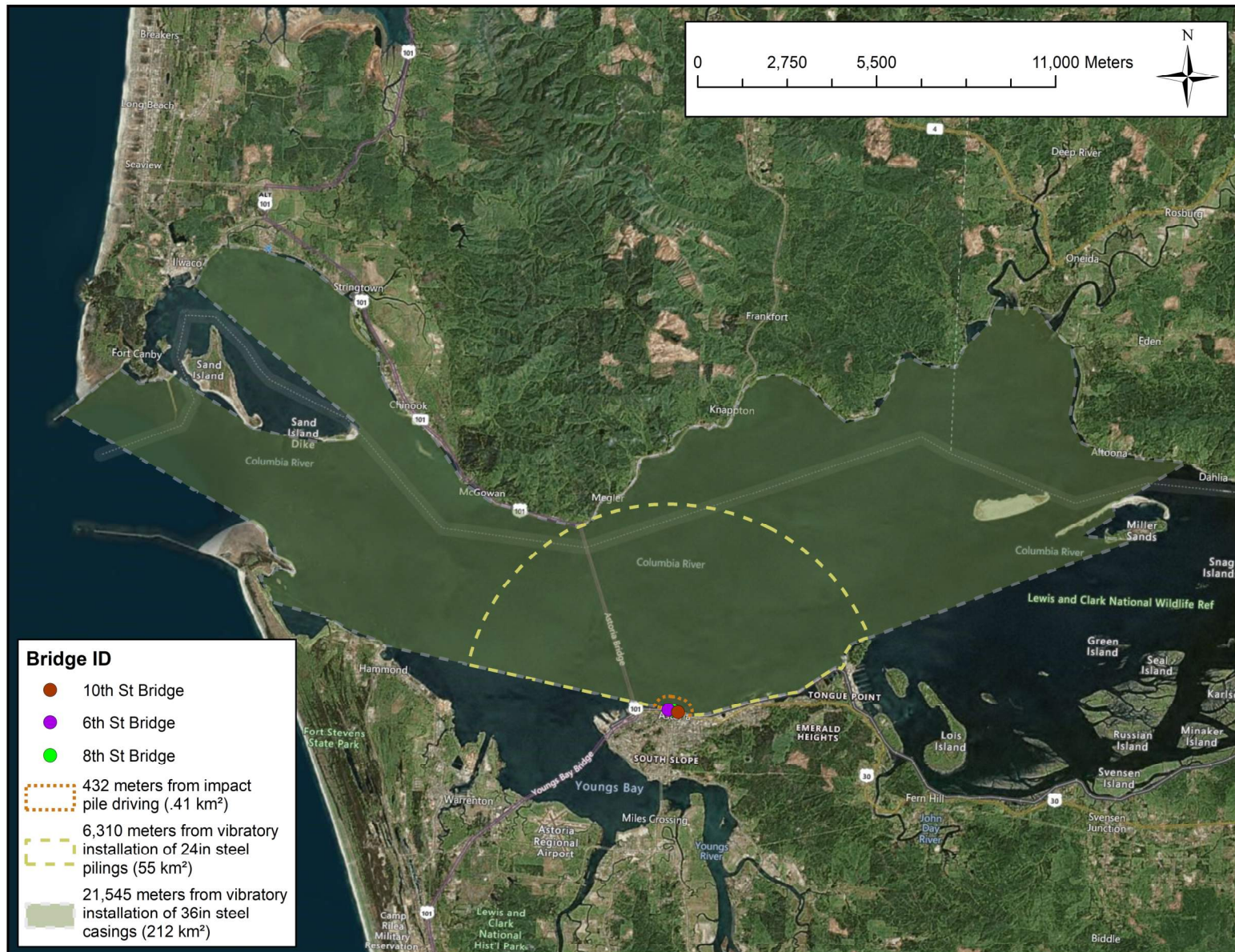


Figure 3 – Region of Activity Map



Species and Number of Marine Mammals

Marine mammals that have been observed within the Region of Activity consist of the California sea lion, Pacific harbor seals, and Steller sea lions. These species frequent the lower Columbia River and adjacent nearshore marine areas (NOAA, 2008).

California Sea Lions

The California sea lion (*Zalophus californianus*) is distributed along the North Pacific waters from central Mexico to southeast Alaska, with breeding areas restricted primarily to island areas off southern California (the Channel Islands), Baja California, and in the Gulf of California (Wright et al., 2010).

The US stock of California sea lions was estimated to be 233,515 individuals in the 2019 SAR (NOAA, 2019). California sea lions are dark brown with broad foreflippers and a long, narrow snout, and there are five genetically distinct geographic populations.

The population seen in Oregon is the Pacific Temperate stock, and they are migratory, commonly seen in Oregon from September through May (ODFW, 2015). Almost all California sea lions in the Pacific Northwest are sub-adult or adult males (NOAA, 2008). California sea lions feed in both the Columbia River and adjacent nearshore marine areas. Their population is lowest in Oregon in the summer months, from May to September, as they migrate south to the Channel Islands in California to breed.

California sea lions may be transiting through the Region of Activity during in-water construction activities or may be temporarily hauled-out along the banks of the waterfront.

Pacific Harbor Seals

The Pacific harbor seal (*Phoca vitulina richardii*) is the most widespread and abundant resident pinniped in Oregon. They are generally blue-gray with light and dark speckling; they lack external ear flaps and have short forelimbs. Harbor seals are generally non-migratory and occur on both the east and west coasts of the US. On the east coast, harbor seals are found from the Canadian Arctic to New York and occasionally in the Carolinas, while on the west coast they range from Alaska to Baja California, Mexico (ODFW, 2015).

The Oregon/Washington Coastal stock of Pacific harbor seals consists of about 24,732 animals as of 2014 (Caretta et al., 2014). They haul-out at low tide on sand bars in most bays and estuaries along the Oregon coast. They are also found on nearshore rocks and islands, usually within three miles of the coast, and use rocks, reefs, beaches, and ice as haul-outs, while feeding in marine, estuarine, and occasionally fresh waters (NOAA, 2014b). In general, their local movements are associated with tides, weather, season, food availability, and reproduction, as they are non-migratory (NOAA, 2014b). Pacific harbor seals are present throughout the year at the mouth of the Columbia River and adjacent nearshore marine areas (NOAA, 2008).

Harbor seals will be present throughout the Region of Activity, particularly during vibratory hammer work, during the proposed IWW.

Steller Sea Lions

The Steller sea lion (*Eumetopias jubatus*) range extends along the Pacific Rim, from northern Japan to central California. They are light blonde to reddish brown in appearance and slightly darker on the chest and abdomen. For management purposes, Steller sea lions inhabiting US waters have been divided into two DPS: the Western US and the Eastern US. The population known to occur within the Lower Columbia River is the Eastern DPS.

Steller sea lions in Alaska are listed as Endangered under the ESA as their population has declined over 60-80 percent during the last 29 years (Allen and Angliss, 2015). The population of Steller sea lions in Oregon is stable and slightly increasing. The Eastern DPS population of Steller sea lions, including those living in Oregon, was ESA de-listed in 2013 following a population growth from 18,000 in 1979 to 70,000 in 2010 (an estimated annual growth of 4.18 percent) (NOAA, 2013b).

Steller sea lions are found on offshore rocks and islands along the Oregon coast. Most of these haul-out sites are part of the Oregon National Wildlife Refuge and are closed to the public. Oregon is home to the largest breeding site in US waters south of Alaska, with breeding areas at Three Arch Rocks (Oceanside), Orford Reef (Port Orford), and Rogue Reef (Gold Beach) (ODFW, 2015). During the breeding season, regulations exist to prohibit boaters from approaching within 500 feet of these rookeries (nursery rocks). Steller sea lions are also found year-around in smaller numbers at Sea Lion Caves and at Cape Arago State Park.

Steller sea lions are not known to use the Region of Activity for hauling-out, but they may be transiting through the Region of Activity during in-water construction activities.

Summary

California sea lions, Pacific harbor seals, and Steller sea lions are the marine mammals that have the potential to be present within the Region of Activity throughout the course of the Project (Table 9). The California sea lion stock is the most abundant of the three, while the OR/WA coast stock of the Pacific harbor seal is the least abundant.

Table 9 – Stock Abundances of Marine Mammal Species within Region of Activity

Common Name	Scientific Name	Stock(s) Abundance Estimate ⁴
California Sea Lions (US Stock)	<i>Zalophus californianus</i>	233,515
Pacific Harbor Seals (Oregon/Washington Coast stock)	<i>Phoca vitulina richardii</i>	24,732
Steller Sea Lions (Eastern US Stock)	<i>Eumetopias jubatus</i>	41,638

⁴ Sources: NOAA, 2014b; NOAA, 2019; and NOAA, 2016g

Affected Species Status and Distribution

The Region of Activity is located within close proximity to known haul-out sites for California sea lions and harbor seals. Within Figure 4, the nearest haul-out site and pupping area for the harbor seal is Desdemona Sands to the northwest (Sites 6 and 7) and Taylor Sands and Tongue Point Sands to the northeast (Sites 8, 26, and 27). The nearest haul-out site for the California sea lion is the East Mooring Basin to the east (Site 29). The nearest haulouts for Steller sea lions are located at the mouth of the river (tip of South Jetty) and the large navigation buoy offshore, both of which are outside of the Region of Activity.

Figure 4 – Haul-Out Sites near the Region of Activity⁵



The following sections provide additional information on the species that may be affected during project construction activities.

California Sea Lions

California sea lions are members of the "eared seal" family, *Otariidae*, and they are among the most recognized of the pinniped species. Their breeding season lasts from May to August, while most pups are born from May through July. Pups are weaned at 10 months old, reaching their sexual maturity at four to five years old, and they have a lifespan of 20 to 30 years. They feed on squid, anchovies, mackerel, rockfish, and sardines (NOAA, 2016e). Researchers believe that California sea lions have fairly acute underwater hearing, with a hearing range of 0.4–32 kHz (Reichmuth & Southall, 2011).

Status

California sea lions are not listed under the ESA, nor are they considered depleted or strategic under the MMPA. The approximate population growth rate for this species is 5.4 percent

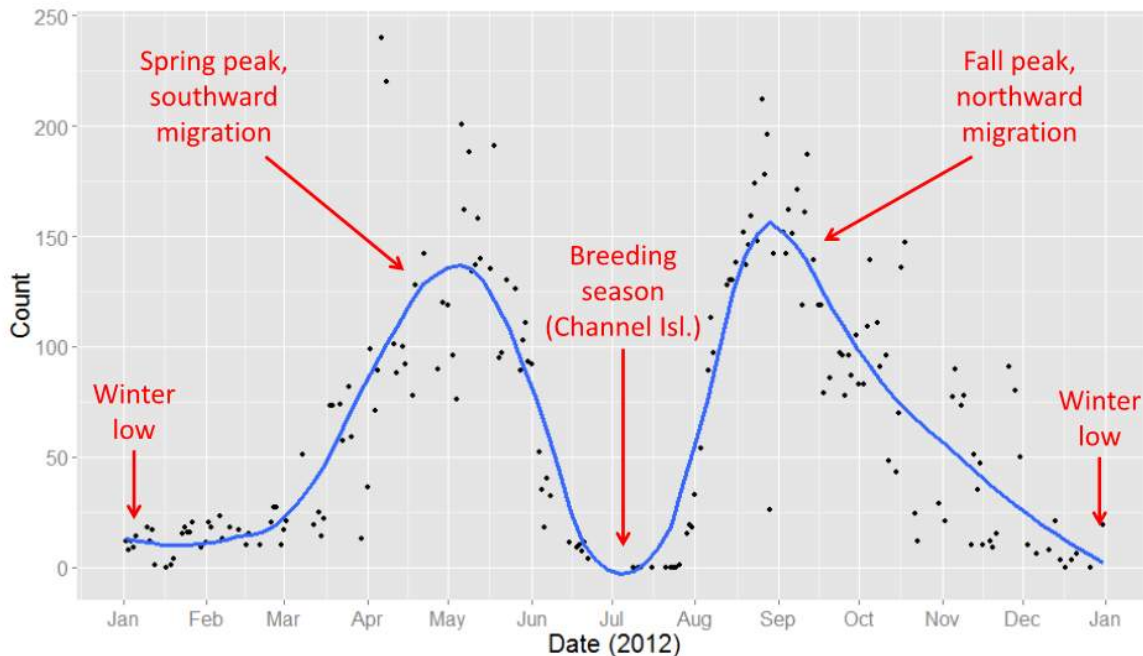
⁵ Source: Jeffries et al., 2000

annually (Caretta et al., 2004). Threats to this species include incidental catch and entanglement in fishing gear, such as gillnets; biotoxins, as a result of harmful algal blooms; and gunshot wounds and other human-caused injuries, as California sea lions are sometimes viewed as a nuisance by commercial fishermen (NOAA, 2016e).

Distribution

California sea lions feed in both the Columbia River and adjacent nearshore marine areas. Except for a few females, all California sea lions in the Pacific Northwest are sub-adult or adult males (NOAA, 2008). Male California sea lions are commonly seen in Oregon from September through May (ODFW, 2015). California sea lions do not breed in Oregon, though a few young animals may remain in Oregon during summer months while most return to California's Channel Islands to breed. Female California sea lions are a rare event in Oregon as most stay in California near the breeding rookeries. From September through May, California sea lions can be found in many bays, estuaries, and on offshore sites along the coast, often hauled-out in the same locations as Steller sea lions. Some pass through Oregon to head north to feed during fall and winter months (see Figure 5).

Figure 5 – Seasonal Pattern of CSL Occurrence, East Mooring Basin, Astoria⁶



California sea lions have been observed near several crossings within the Project site; however, this is not their main haul-out. Their main haul-out is the East Mooring Basin, which is located upstream of the Project area (Figure 4). Construction activities are proposed between September and March, which is during the peak usage of the lower river by California sea lions, with roughly 800 to 1,500 animals in the area during those months⁷. During a typical day in May, 800 California sea lions can be seen resting on haul-out sites (such as jetties) in the Columbia River estuary (NOAA, 2008). Recent years have shown an increase in the record numbers of California sea lions at East Mooring Basin, with a 2015 spring record of 2,340

⁶ Source: Brown, et al., 2015

⁷ Information on species abundance within the lower Columbia River provided by the ODFW (S. Riemer, personal communication, May 16, 2016).

individuals (up from 1,420 in 2014). In past years, typical spring counts were closer to 100-300 individuals (Profita, 2015) (Figure 4-1). Changes in climate, food sources, and a growing population approaching 300,000 are all cited as possible reasons for these increases.

Pacific Harbor Seals

The Pacific harbor seals are part of the "true seal" family, *Phocidae*, and are widespread and abundant pinnipeds across their ranges. They are fast, agile swimmers, and as social animals, they form groups of several hundred individuals onshore. Harbor seals mate at sea generally in the warmer months, and pupping season within the Columbia River is from mid-April to July (NOAA, 2016d). Males reach sexual maturity at five to six years of age, females sexually mature at two to five years, and they have a lifespan of about 25-30 years, with a diet consisting mainly of fish, shellfish, and crustaceans. Researchers have found that the harbor seals range of best hearing (10 dB from the maximum sensitivity) was from 0.5 to 40 kilohertz (Kastelein et al. 2008).

Status

The Oregon/Washington stock of Pacific harbor seals is not listed under the ESA, nor are they considered depleted or strategic under the MMPA. The most recent estimate for the population growth rate of the northern Oregon coast stock of harbor seals was approximately 10.1 percent annually (Caretta et al. 2014).

Threats to this species include (NOAA, 2016d):

- incidental capture in fishing gear, including gillnets, trawls, and purse seines
- weirs
- ship strikes
- oil spill exposure and chemical contaminants
- power plant entrainment
- harassment by humans while hauled-out on land

Distribution

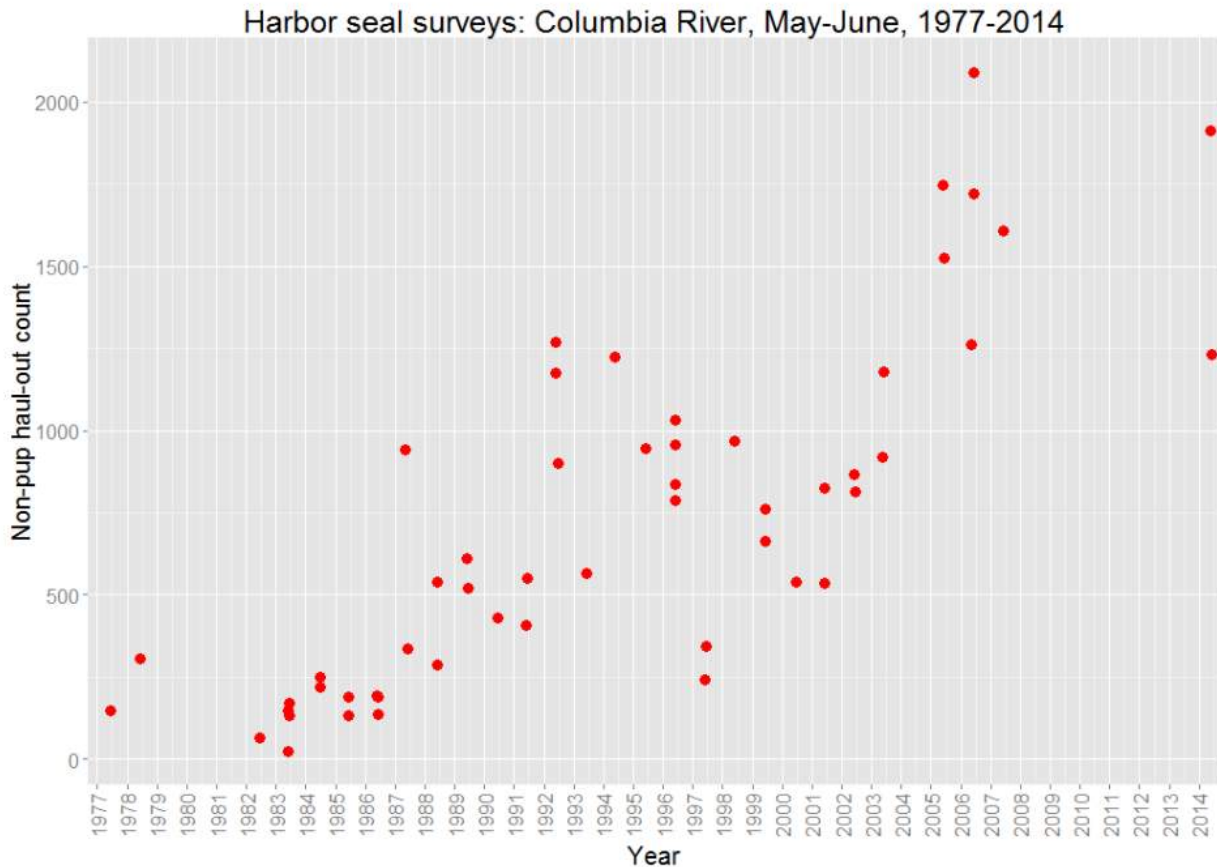
Harbor seals use specific shoreline locations on a regular basis as haul-outs, including beaches, rocks, floats, and buoys. They must rest at haul-out locations to regulate body temperature, interact with one another, and sleep (NOAA, 2016d).

They're present throughout the year at the mouth of the Columbia and adjacent nearshore marine areas, and on a typical May day, approximately 3,000 Pacific harbor seals can be seen resting on haul-out sites in the Columbia River estuary (NOAA, 2008). Known haul-outs within the Columbia River include: South Jetty, Chinook/Baker Bay, Desdemona Sands, Taylor Sands, Tongue Point Sand, Grays Bay, Sandbourn Slough/Green Island, Snag Island, and South of Miller Sands (Figure 4).

The harbor seal is an infrequent visitor at the Astoria Mooring Basin, but they are known to be transiting through the Region of Activity, as well as hauled-out during low tide on several sand bars. Mid-April to July is the pupping period for harbor seals, but their closest haul-out and pupping area is Desdemona Sands, which is downstream of the Astoria-Megler Bridge (Susan Riemer, personal communication, May 16, 2016). Harbor seal surveys within the Columbia River from May through June show a general increase in population numbers over time (Figure 6). Due

to their year-round occurrence in the Columbia River, harbor seals are likely to be found within the Region of Activity during in-water construction.

Figure 6 – Harbor Seal Surveys: Columbia River, May-June, 1977-2014



Steller Sea Lions

The Steller sea lion, also known as the northern sea lion, is the largest member of the *Otariid* family. They have a lifespan of 20-30 years, and are opportunistic predators, foraging and feeding primarily at night on a wide variety of fishes (e.g., capelin, cod, herring, mackerel, pollock, rockfish, salmon, sand lance, etc.), bivalves, cephalopods (e.g., squid and octopus), and gastropods (NOAA, 2016c). Their diet may vary seasonally depending on the abundance and distribution of prey. They may disperse and range far distances to find prey, but are not known to migrate. Steller sea lions breed in Oregon during the months of June and July, and pregnancy lasts about 11.5 months. Males reach sexual maturity between three and eight years of age and can live to be 20 years old, while females reproduce for the first time at four to six years and can live to be 30 (NOAA 2016b). Steller sea lions are known to have a hearing range with frequencies audible at 60 dB RMS re μ 20 Pa of about 0.250-30 kHz, and a region of best hearing sensitivity from 5-14.1 kHz (Muslow & Reichmuth 2010).

Status

Steller sea lions were listed as threatened range-wide under the ESA on November 26, 1990 (55 CFR 49204). In 2006, however, the Eastern DPS was removed from listing based on its annual rate of increase. The current minimum population estimate for the Eastern DPS is

approximately 52,000 individuals (KE KAI OLA, 2016). There are no substantial threats to the species, and the population continues to increase at approximately three percent per year (NMFS, 2011).

Threats to Steller sea lions include (NOAA, 2016c):

- boat/ ship strikes
- contaminants/ pollutants
- habitat degradation
- illegal hunting/ shooting
- offshore oil and gas exploration
- interactions (direct and indirect) with fisheries

Critical habitat was designated for Steller sea lions on August 27, 1993 (58 FR 45269), but is not present within the Region of Activity. Critical habitat is associated with breeding and haul-out sites in Alaska, California, and Oregon. Under the MMPA, all Steller sea lions are classified as strategic stocks and are considered depleted (NOAA, 2016c).

Distribution

For this species, haul-outs and rookeries usually consist of beaches, ledges, and rocky reefs. Steller sea lions are present year-round at the mouth of the Columbia River, with the primary haul-out point on the top South Jetty (downstream, outside of the Region of Activity), and they are also at their peak in the lower river from September through March.⁸ As mentioned, these areas are not critical habitat, which is defined as a 20 nautical mile buffer around specified major haul-outs and rookeries (NOAA, 2008). The South Jetty haul-out is the only artificial structure Steller sea lions regularly use along the Oregon coast.

At South Jetty, typical single-day counts are approximately 100 individuals, while at Phoca Rock/Bonneville Dam, there are approximately 40 individuals in a single day. They feed in both the Columbia River and adjacent nearshore marine areas. Due to their year-round presence and peak of presence during the winter months, Steller sea lions are likely to be transiting the area during in-water construction activities.

Summary

California sea lions, Pacific harbor seals, and Steller sea lions are the marine mammals that have the potential to be present within the Region of Activity during construction (Table 10). During monitoring activities for Phase 1 construction, no Steller sea lions were observed within the Region of Activity; however, the distribution of the species is near enough to the Project area that the species could occur there. None of these marine mammals are ESA-listed as threatened or endangered, but the MMPA status of Steller sea lions is depleted. Two of the marine mammals listed have major documented haul-out locations or breeding areas within the Region of Activity, and all of them are likely to be transiting the area during the construction period.⁹ In addition, California sea lions have been observed hauled-out and resting near several crossings within the Project area, particularly near 8th Street. It is possible that all three species may be impacted by noise generated during in-water construction from November 1 to April 30, as well as construction activities in May to December for California sea lions. Other than exposure to

⁸ Information on species abundance within the lower Columbia River provided by the ODFW (S. Riemer, personal communication, May 16, 2016).

⁹ Information on transiting presence likelihood provided by ODFW (S. Riemer, personal communication, May 16, 2016).

underwater and airborne sounds, and visual disturbance, they are not anticipated to be impacted in any other way during construction.

Table 10 – Status and Frequency of Occurrence

Common Name	Scientific Name	ESA Status	MMPA Status	Frequency of Occurrence ¹⁰
California Sea Lions (US Stock)	<i>Zalophus californianus</i>	Not listed	Non-depleted	Likely
Pacific Harbor Seals (Oregon/Washington Coast stock)	<i>Phoca vitulina richardii</i>	Not listed	Non-depleted	Likely
Steller Sea Lions (Eastern US Stock)	<i>Eumetopias jubatus</i>	Not listed	Depleted	Likely

Type of Incidental Take Authorization Requested

Under the 1994 Amendments to the MMPA, harassment is statutorily defined as any act of pursuit, torment, or annoyance that:

- has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or,
- has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (Level B Harassment).

Under Section 101(a)(5)(D) of the MMPA, the City requests an IHA for the take of small numbers of marine mammals, by both Level A and Level B harassment, incidental to the replacement of three crossings along the Astoria waterfront. The City requests an IHA for incidental take of marine mammals during Phase 2 activities as described in this application for one year commencing on October 1, 2019 (or the issuance date, whichever is later).

Construction Noise Evaluations

In-Air Noise Thresholds

NMFS has been using generic sound exposure thresholds since 1997. Since then, NMFS has worked on developing new science-based thresholds to more accurately determine when an activity produces sound levels that might result in impacts to a marine mammal such that a take by harassment might occur (NOAA, 2005). The most current thresholds identified for in-air noise generated from anthropogenic sound sources are identified in the Interim Sound Threshold Guidance, which provides conservative thresholds of received SPLs, and are provided in Table 11 on the following page (NOAA, 2016a).

¹⁰ ¹³ Information on winter prey species abundance within the lower Columbia River provided by the ODFW (R. Bradley, personal communication, September 15, 2016).

Table 11 – Acoustic Thresholds for Airborne Noise**Level at Which Pinniped Haul out Disturbance
has been Documented***

90 dB RMS (unweighted) for harbor seals

100 dB RMS (unweighted) for all other pinnipeds

* All decibels referenced to 20 micro Pascals (re: 20μPa).

Underwater Disturbance Thresholds

To evaluate potential for behavioral disturbances for marine mammals, NOAA requires that the Practical Spreading Loss Model be used to estimate distances to marine mammal noise thresholds (NOAA 2016a). The current NOAA-directed disturbance thresholds for underwater noise are provided in Table 12 below.

Table 12 – NOAA Disturbance Thresholds for Marine Mammals

Vibratory Pile Driving Disturbance Threshold	Impact Pile Driving Disturbance Threshold
120 dB RMS	160 dB RMS

Underwater PTS Thresholds

In July 2016, NMFS produced advanced acoustic threshold determination guidance for marine mammals to evaluate potential exposure to injurious levels of sound (NOAA 2016b). This guidance provides new methods to identify the received levels, or acoustic thresholds, at which individual marine mammals are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for acute, incidental exposure to underwater anthropogenic sound sources. The thresholds resulting from application of the 2016 guidance rely upon weighting factors to evaluate the likelihood of an underwater sound source being detectable within the hearing frequencies of certain families of marine mammals.

The determination of the PTS onset isopleths in this document are based on the output of the alternative tool developed by NMFS (NMFS User Spreadsheet), looking at noise levels generated by impact and vibratory noise sources. The PTS isopleths or threshold areas identified for each noise source and marine mammal hearing group are described in the next section. Tables 13 and 14 below identify the new acoustic thresholds established in the 2016 guidance for each hearing group for onset of PTS.

Table 13 – Acoustic Thresholds for Non-Impulsive Sounds

Hearing Group	PTS Onset
Phocid Pinnipeds	201 dB SEL
Otariid Pinnipeds	219 dB SEL

Table 14 – Acoustic Thresholds for Impulsive Sounds

Hearing Group	PTS Onset
Phocid Pinnipeds	185 dB SEL
Otariid Pinnipeds	203 dB SEL

During construction, noise will be generated above and below the water by operation of construction equipment and related activities. Incidental take would be a temporary and localized disturbance from elevated sound levels and visual stimulus from construction equipment. A description of potential effects to pinnipeds from Project activities is provided below.

Methods of Incidental Taking

General Construction Activities

Level B behavioral disturbance may occur incidental to the use of construction equipment and its propagation of in-air noise during general construction that is proposed in the dry, above water, or inland within close proximity to the riverbanks. These construction activities are associated with the removal and construction of the rail superstructures, removal of the existing concrete foundations, temporary work platform construction, and wingwall construction. Possible equipment includes an excavator, crane, dump truck, and chain saw. It is estimated that the sound levels during these activities will range from 78 to 93 dB RMS at 20 meters from the sound source, with the loudest airborne noise produced by the use of a concrete saw (Hanan & Associates, 2014). These noise levels are based on acoustic data collected during the City of San Diego Lifeguard Station Demolition and Construction Monitoring project.

Current NMFS practice regarding exposure of marine mammals to high-level in-air sounds, as a threshold for potential Level B harassment, is at or above 90 dB re 20 μ Pa for harbor seals and at or above 100 dB re 20 μ Pa for all other pinniped species (Table 8). The following formula was used to determine the distances at which in-air noise generated from heavy machinery would attenuate to the airborne noise thresholds:

$$D_1 = D_0 * 10^{((\text{initial SPL} - \text{airborne disturbance threshold})/\alpha)}$$

D_1 = distance from the pile at which noise attenuates to the threshold value

D_0 = distance from the pile at which the initial SPLs were measured

α = 20 for hard-site conditions

Using this formula, sound levels would attenuate below the 90 dB RMS threshold for harbor seals at 28 meters, and below the 100 dB RMS threshold for all other pinnipeds at nine meters. The 28-meter Level B (harassment) ZOI is depicted in Figures 7 through 9 on the following pages. Because a PTS Isopleth of 10 meters will be established during rail superstructure demolition and construction activities, a Level B ZOI is not proposed for sea lions. Because harbor seals are not known to use the area along the waterfront, no disturbance to these species is anticipated within the 28-meter Level B ZOI during general construction activities that are proposed in the dry, above water, or inland within close proximity to the riverbanks.

Figure 7 – Airborne Noise ZOI Map – 6th Street Bridge

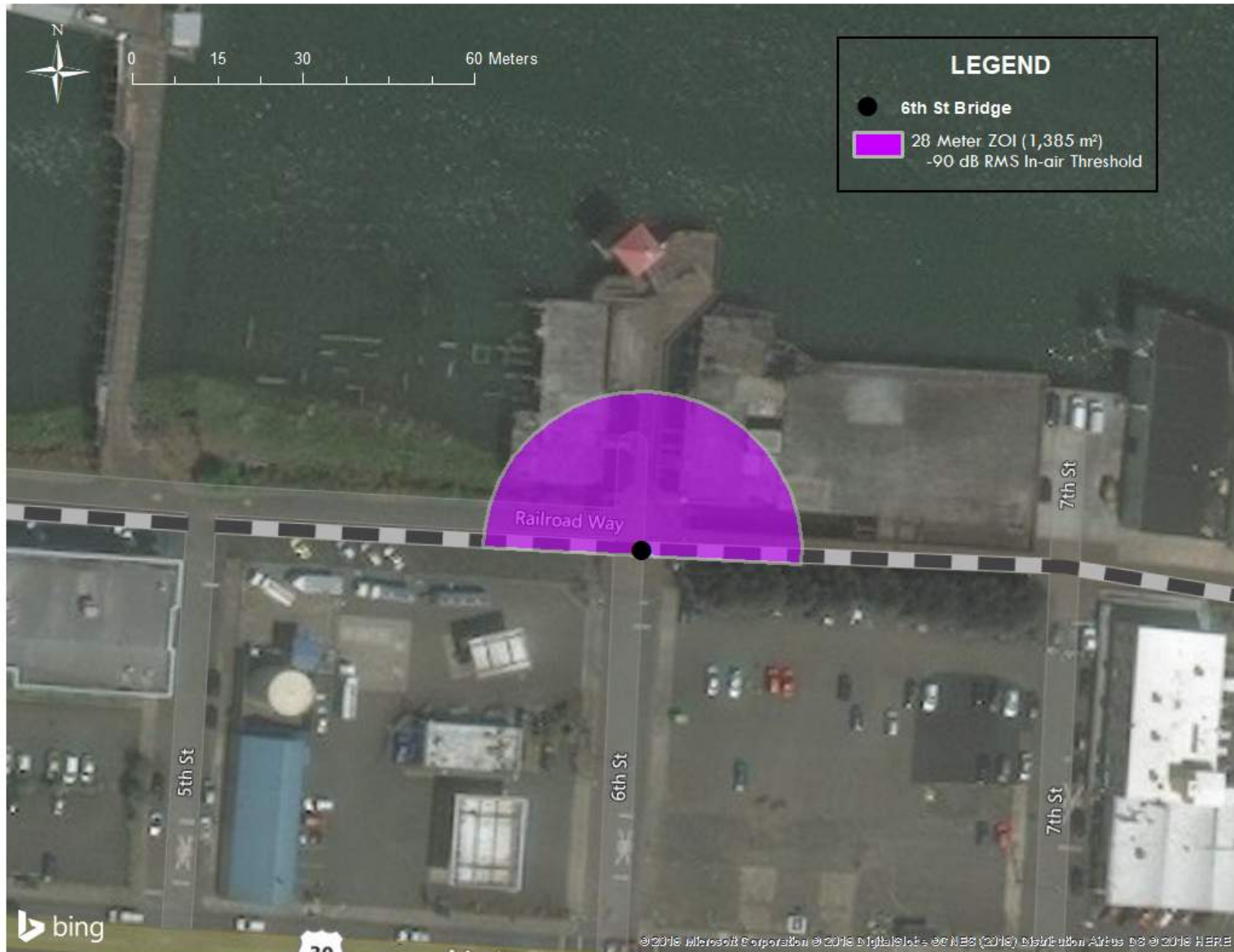


Figure 8 – Airborne Noise ZOI Map – 8th Street Bridge

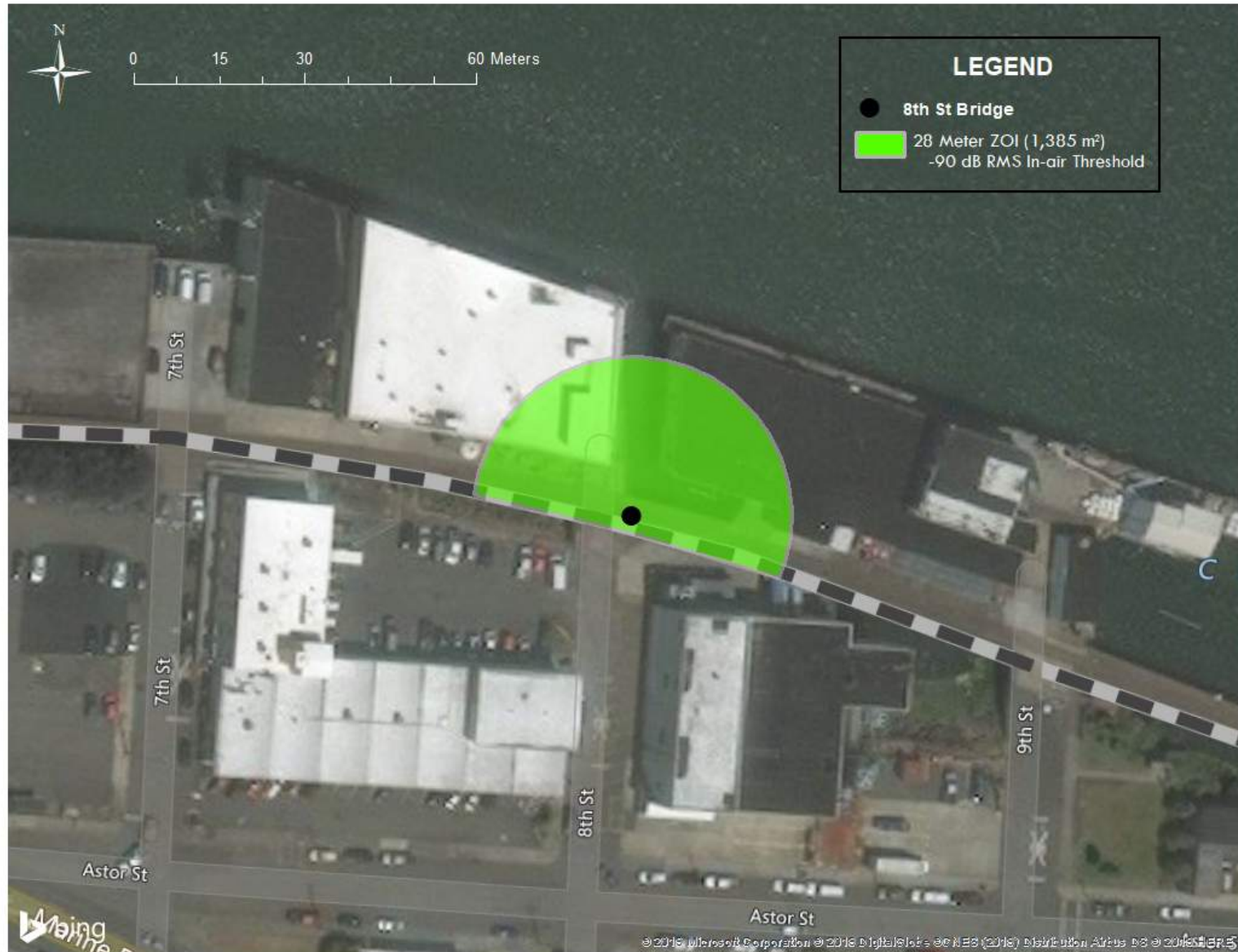
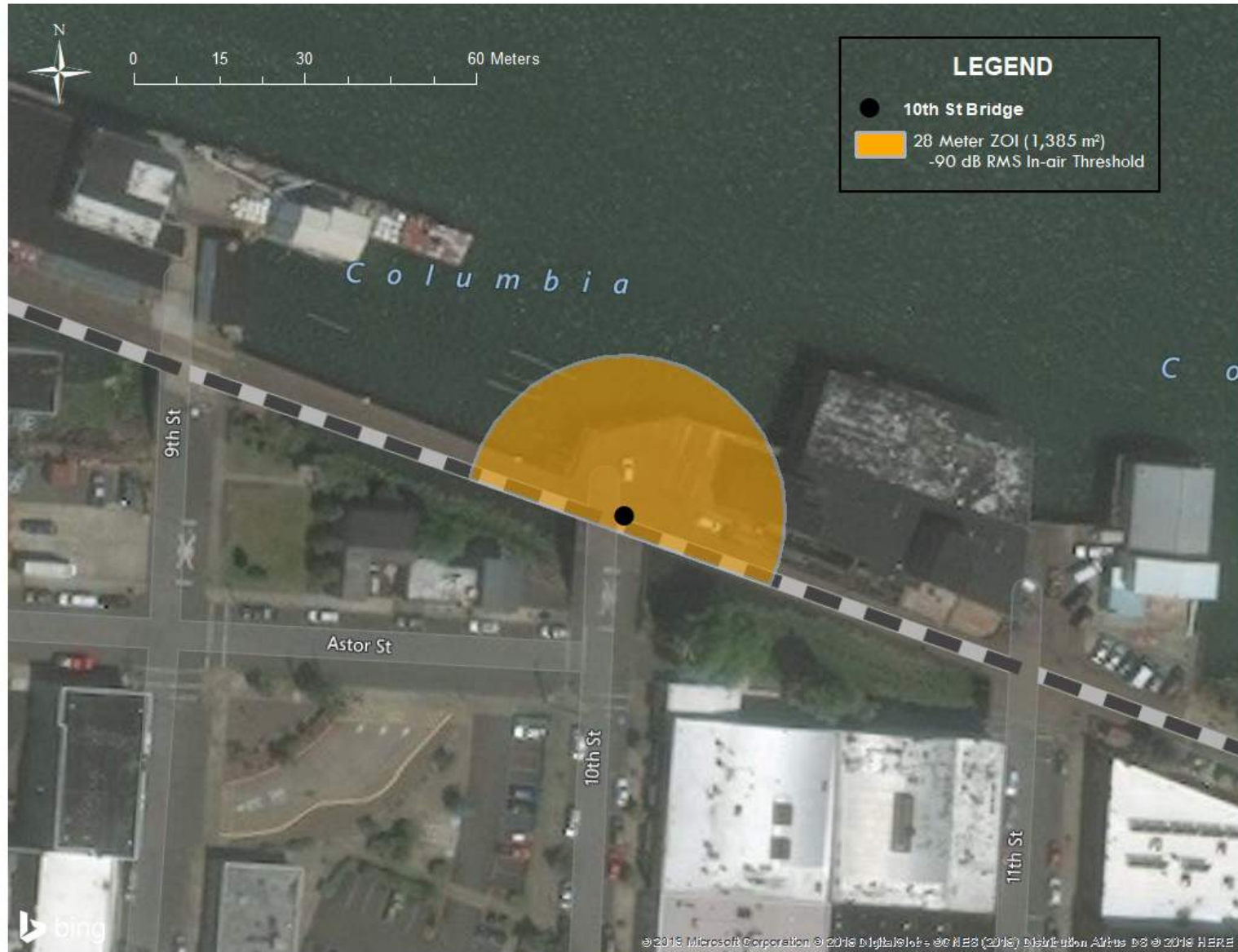


Figure 9 – Airborne Noise ZOI Map – 10th Street Bridge



Vibratory Pile Removal and Installation

An estimated 150 12-inch timber piles will need to be removed using a vibratory hammer during demolition activities. In addition, up to 65 36-inch temporary casings will need to be installed and removed, and up to 65 24-inch permanent steel piles will need to be installed to facilitate construction of the new bridges. In addition, the contractor will either pre-drill or use a 14-inch steel H-pile to prepare each pile location within the temporary casing. Most of the structures are below the MHW elevation; the remaining elements are below the MHHW or the HMT elevation, with only a few piles being removed/installed landward of the HMT elevation. Based on construction activities during Phase 1 of the project, the contractor will use a vibratory hammer during this work. Pile removal and installation via vibratory hammer will result in the greatest amount of underwater noise during construction and will be the farthest-reaching extent of aquatic impacts during pile removal activities.

The Practical Spreading Loss Model was used to calculate the Level B ZOI during vibratory removal and installation activities using the latest underwater noise threshold for behavioral disturbance during vibratory pile driving (120 dB RMS). When the WSDOT source level measurements (WSDOT, 2016) are used in the Practical Spreading Loss Model, the following Level B ZOIs are calculated for vibratory hammer work:

- 12-inch Timber Pile Removal – 1,359.36 meters
- 36-inch Temporary Steel Casings/Pre-Drilling – 21,544.35 meters
- 24-inch Permanent Steel Piles – 6,309.57 meters
- 14-inch Steel H-Pile Site Preparation – 1,000 meters

The extent of the Level B ZOIs during vibratory hammer use are depicted in Figures 10 through 13. The noise generated from vibratory pile removal and installation extends north/northwest towards Desdemona Sands and east towards the East Mooring Basin. The underwater sound levels will remain above the disturbance threshold for up to 13.38 miles into the river channel during vibratory installation/removal of the 36-inch temporary steel casings, though this distance does not account for tide levels. There is a chance that pile installation work could be done during low tides, where exposed sand bars could significantly reduce the Level B ZOI. It is anticipated that all three marine mammals identified in this application could be utilizing this area during construction. Underwater noise levels exceeding the threshold could alter pinniped behavior by forcing them to alter their activities or interrupt them entirely, forcing them to swim away from the noise source. Their response may also include alert behavior. Seals and sea lions within the Level B ZOIs, however, are often already exposed to elevated underwater sound levels from recreation boating activities, cargo ships, and other large marine vessels that are known to use the Lower Columbia River.

Figure 10 – 12-inch Timber Pile Vibratory Removal Level B ZOI

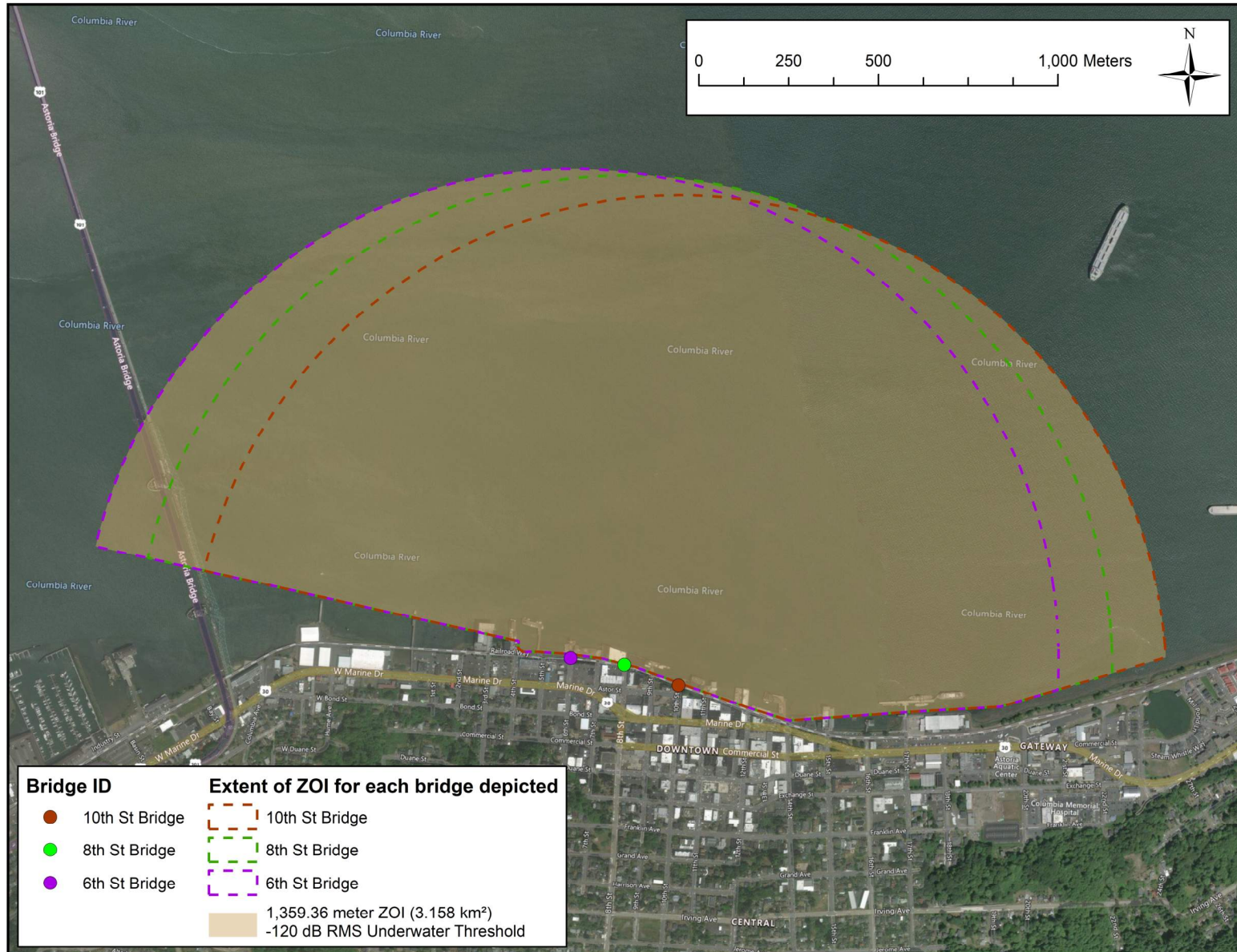


Figure 11 – 36-inch Temporary Casing Vibratory Install/Removal Level B ZOI



Figure 12 – 24-inch Steel Pile Vibratory Installation Level B ZOI

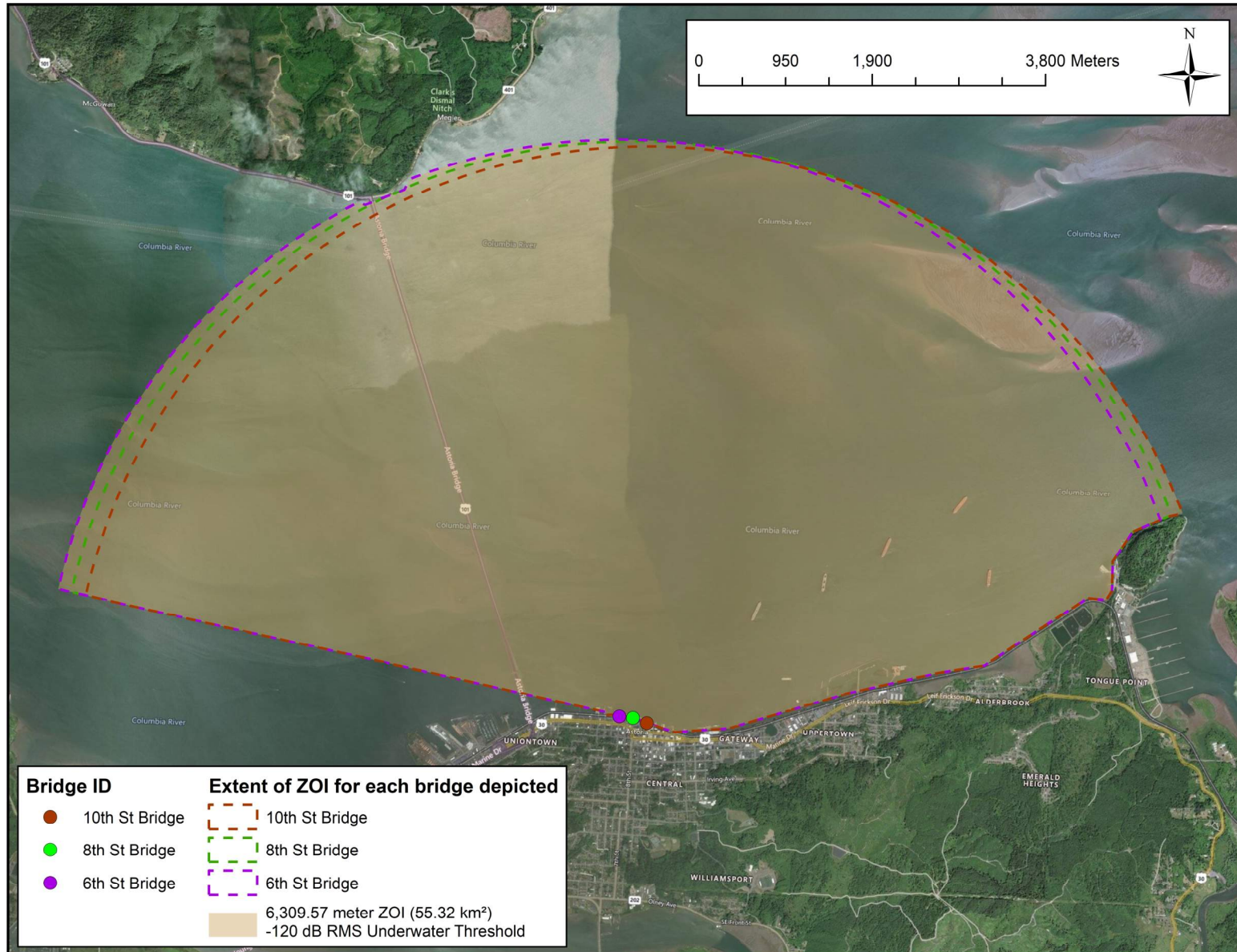
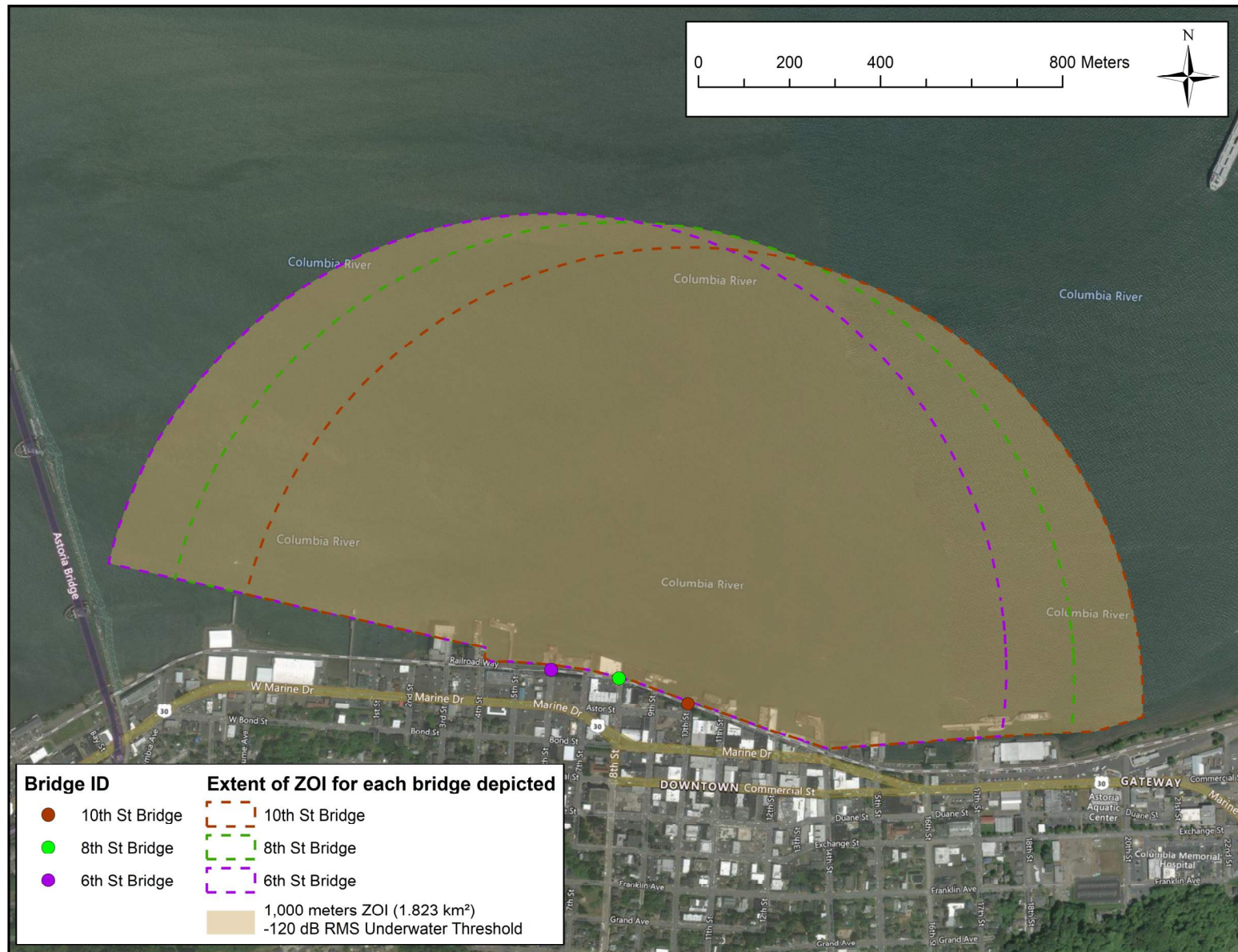


Figure 13 – 14-inch Steel H-Pile Vibratory Site Preparation Level B ZOI



Impact Hammer Pile Installation

Level B behavioral disturbance may occur incidental to the use of an impact hammer and its propagation of underwater noise during the installation of the new 24-inch steel piles. The Project proposes to install a total of 65 permanent piles for the three foundations during Phase 2. Based on the most recent WSDOT data, the unmitigated sound pressure level associated with 24-inch steel piles during impact pile driving is 194 dB RMS (WSDOT, 2016). The contractor will be required to employ sound attenuation devices, such as bubble curtains, during impact pile driving activities in compliance with the conditions of the FAHP Programmatic Biological Opinion, which is being used for ESA coverage for listed fish species. Use of an attenuation device was assumed to decrease initial sound levels by 7 dB, resulting in an initial SPL of 187 dB RMS at 10 meters from the source.

When these values are used in the Practical Spreading Loss Model, the distance to the behavioral disturbance threshold is calculated at a distance of 630.95 meters from the pile when a noise attenuation device is used. Within Figure 14 on the following page, the extent of the 630.95 meter Level B ZOI during impact pile driving of the 24-inch permanent steel piles is depicted. The noise generated from impact hammer pile installation will extend out into the river channel approximately 0.39 mile. These areas are likely to be used by transiting seals and sea lions. Underwater noise levels exceeding the threshold could alter the behavior of transiting pinnipeds by forcing them to alter their activities or interrupt them entirely to swim away from the noise source. Their response may include alert behavior. The seals and sea lions within the area are often already exposed to elevated underwater sound levels from recreation boating activities, cargo ships, and other large marine vessels that are known to use the Lower Columbia River.

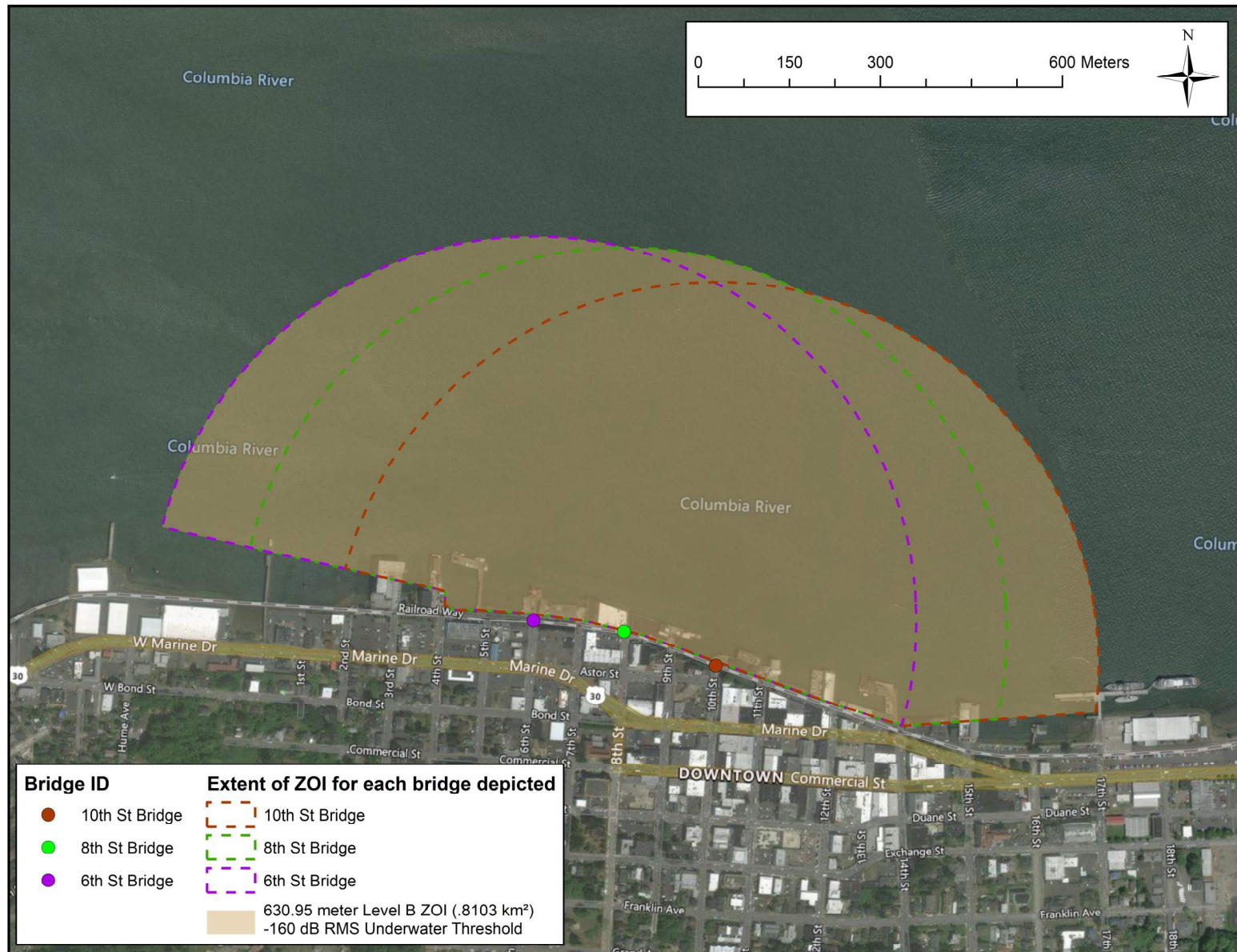
Airborne Pile Removal and Installation Noise

Airborne noises could also affect pinnipeds during IWW requiring the use of a vibratory and/or impact hammer; however, in-air noise was not a factor in assessing take for in-water activities because the Level B ZOI for underwater noise extends farther. During IWW, temporary in-air disturbance would be limited to marine mammals swimming on the surface through the immediate Project area, or California sea lions flushed from their temporary haul-outs. At this distance, the marine mammals would have already been taken by the in-water noise levels; therefore, there is no need to distinguish between in-air and underwater noise impacts. For these reasons, in-air noise during the use of a vibratory and/or impact hammer is not considered further in this document.

Visual Disturbance

Behavioral disturbance may potentially occur incidental to the visual presence of humans and demolition/construction activities; however, pinnipeds within the project site have likely adapted or become habituated to human presence along the Astoria waterfront.

Figure 14 – 24-inch Steel Pile Impact Hammer Installation Level B ZOI Map



PTS Isopleths

The distances from the proposed vibratory and impact hammer activities containing sound levels at or above the PTS levels (PTS isopleths) were identified for underwater noise using the NMFS User Spreadsheet. The distance to PTS isopleth defines the area within which auditory damage to marine mammal hearing groups could possibly occur. Under most situations, PTS isopleths would be confined within a relatively small area near the actual work activities. For pile installation and removal activities, PTS isopleths are expected to begin immediately adjacent to the pile installation activity and expand outward into the waters of the Columbia River Estuary.

Per coordination with NMFS during Phase 1 of the Project, a minimum 15-meter PTS Isopleth will be established for California sea lions and stellar sea lions during all vibratory work. In addition, a minimum 15 meter PTS Isopleth will be established for harbor seals during vibratory removal of the 12-inch timber piles, and during site preparation with the 14-inch steel H-piles. For vibratory work involving the installation and removal of 36-inch steel casings and the permanent 24-inch steel piles, a 47 meter and 16 meter PTS Isopleth will be established, respectively, for harbor seals. Figures 15 through 18 display the data utilized to calculate these distances. Within Figure 19, the extent of the largest PTS isopleth (47 meters) is depicted. The remaining 15 meter and 16 meter isopleths are not depicted due to mapping scale. Existing conditions within 47 meters of the proposed vibratory pile driving consist primarily of overwater structures with substantial amounts of timber substructure elements. As a result, harbor seals and Steller sea lions are not likely to be present. California sea lions, however, have been observed within 15 meters of the trestle bridges.

During installation of the permanent 24-inch steel piles with an impact hammer (and pre-drilling if determined to be necessary), the PTS Isopleths increase in extent, as depicted in the data provided in Figure 20. During impact hammer work, a Level A zone of 31.4 meters will be established for California sea lions and Stellar sea lions, while a 431.5 meter Level A zone will be established for harbor seals. The limits of the 431.5 meter isopleth is depicted in Figure 21 (see Figures 7 through 9 for an approximate depiction of the 31.4 meter isopleth). Based on existing conditions, Steller sea lions are not likely to be present within the 31.4 meter Level A zone; however, California sea lions and harbor seals, are likely to be present within their defined Level A zones during impact pile driving activities.

Figure 15 – PTS Isopleth Data for Vibratory 14-inch Timber Pile Removal**STEP 3: SOURCE-SPECIFIC INFORMATION**

Source Level (RMS SPL)	152
Number of piles within 24-h period	50
Duration to drive a single pile (minutes)	20
Duration of Sound Production within 24-h period (seconds)	60000
10 Log (duration of sound production)	47.78
Propagation (xLogR)	15
Distance from source level measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimate distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL _{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	11.2	1.0	16.5	6.8	0.5

Figure 16 – PTS Isopleth Data for Vibratory 36-inch Steel Casing Installation/Removal**STEP 3: SOURCE-SPECIFIC INFORMATION**

Source Level (RMS SPL)	170
Number of piles within 24-h period	36
Duration to drive a single pile (minutes)	8
Duration of Sound Production within 24-h period (seconds)	17280
10 Log (duration of sound production)	42.38
Propagation (xLogR)	15
Distance from source level measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL _{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	77.4	6.9	114.4	47.0	3.3

Figure 17 – PTS Isopleth Data for Vibratory 24-inch Steel Pile Installation**STEP 3: SOURCE-SPECIFIC INFORMATION**

Source Level (RMS SPL)	162
Number of piles within 24-h period	18
Duration to drive a single pile (minutes)	20
Duration of Sound Production within 24-h period (seconds)	21600
10 Log (duration of sound production)	43.34
Propagation (xLogR)	15
Distance from source level measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimate distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL _{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	26.3	2.3	38.9	16.0	1.1

Figure 18 – PTS Isopleth Data for Vibratory 14-inch Steel H-Pile Site Preparation**STEP 3: SOURCE-SPECIFIC INFORMATION**

Source Level (RMS SPL)	150
Number of piles within 24-h period	36
Duration to drive a single pile (minutes)	25
Duration of Sound Production within 24-h period (seconds)	54000
10 Log (duration of sound production)	47.32
Propagation (xLogR)	15
Distance from source level measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimate distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL _{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	7.7	0.7	11.3	4.7	0.3

Figure 19 – 47 meter PTS Isopleth for Harbor Seals during Vibratory Pile Work

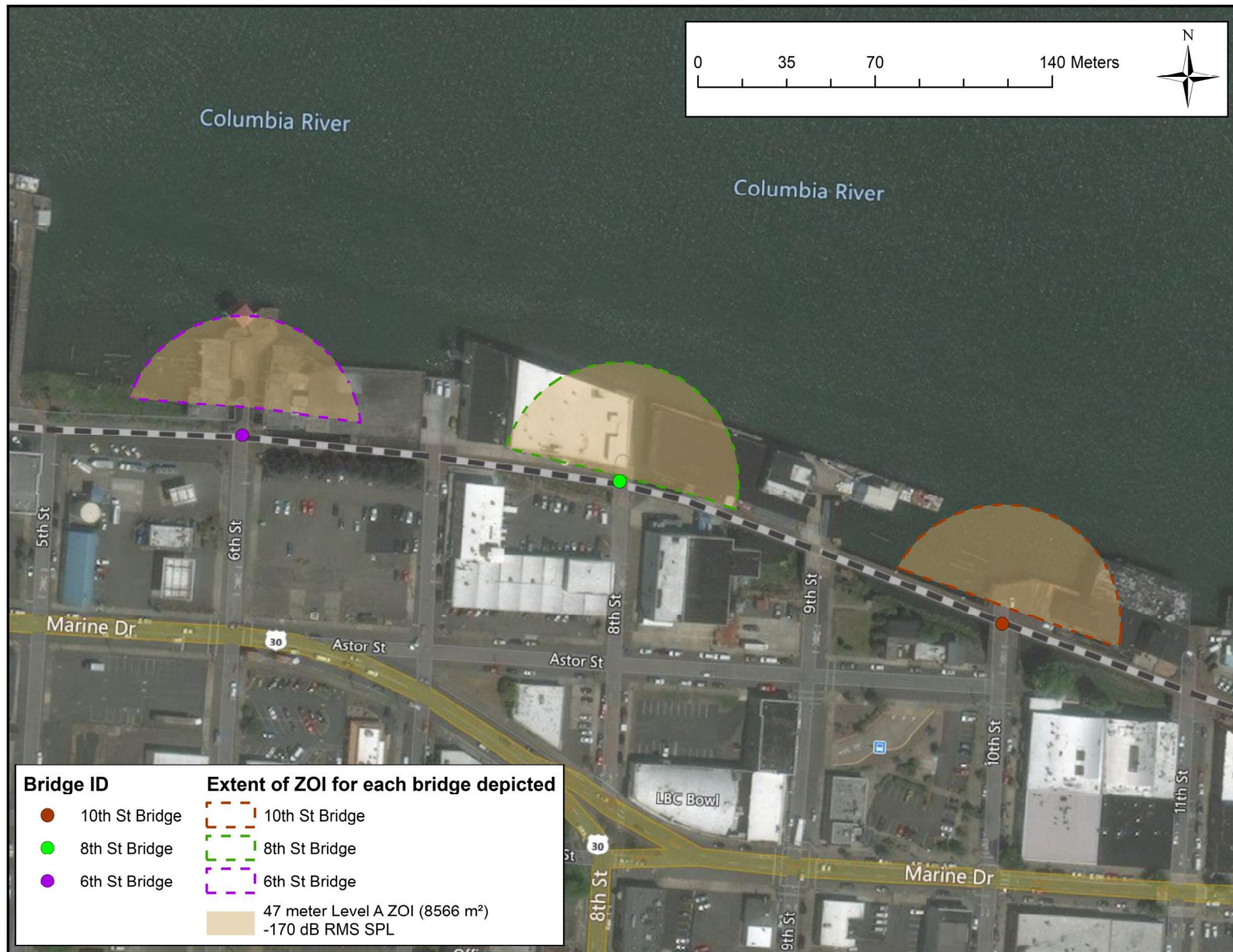


Figure 20 – PTS Isopleth Data for Impact Hammer 24-inch Steel Pile Installation**E.1-2: ALTERNATIVE METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT)**

Unweighted SEL _{cum} (at measured distance) = SEL _{ss} + 10 Log (# strikes)	211.6
--	-------

SEL_{cum}

Source Level (Single Strike SEL)	171
Number of strikes per pile	500
Number of piles per day	23
Propagation (xLogR)	15
Distance of single strike SEL measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

PK

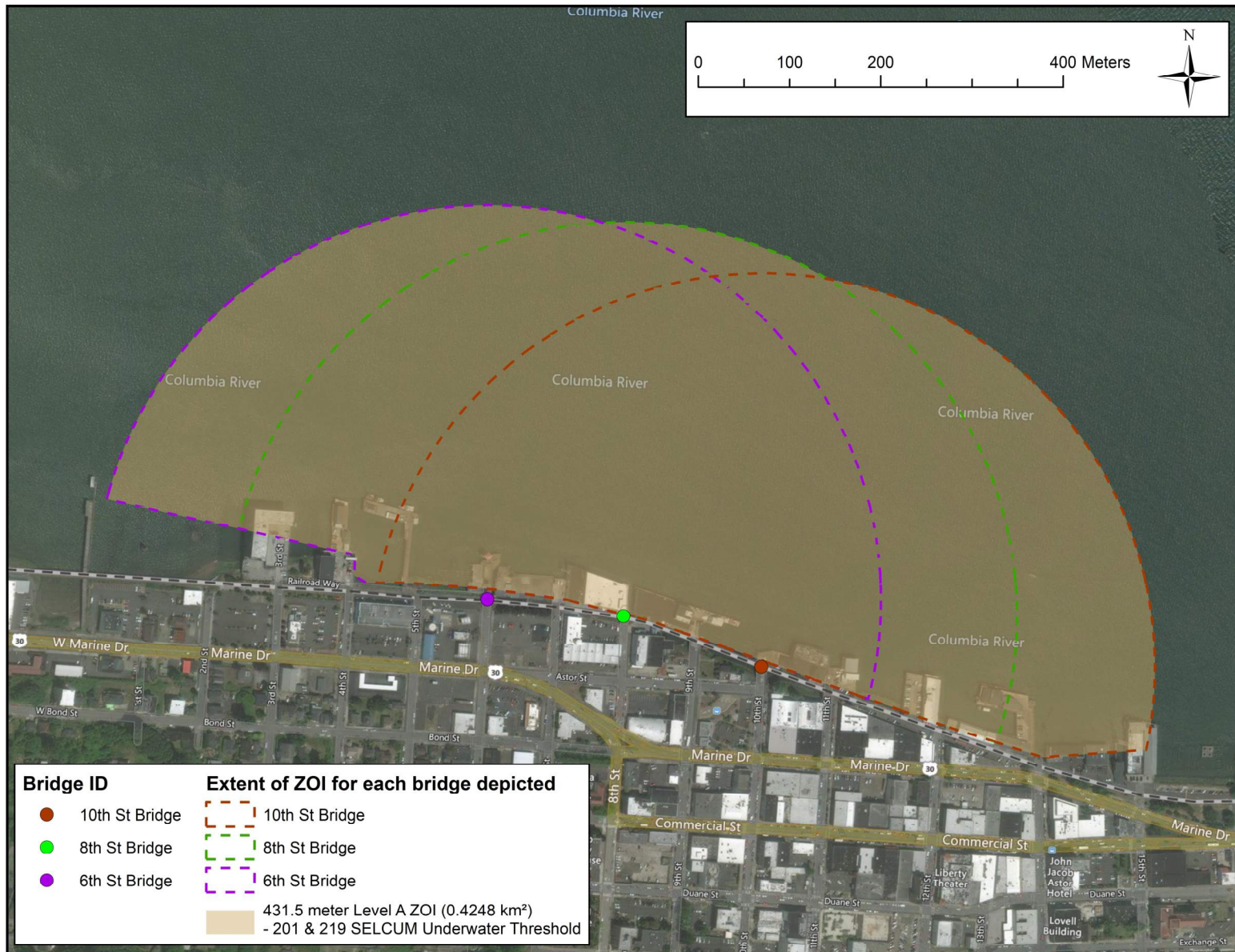
Source Level (PK SPL)	207
Distance of source level measurement (meters)*	10
Source level at 1 meter	222.0

*Unless otherwise specified, source levels are referenced 1 m from the source.

RESULTANT ISOPLETHS**Impulsive sounds have dual metric thresholds (SEL_{cum} & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL _{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	806.4	28.7	960.5	431.5	31.4
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	1.6	NA	21.5	1.8	NA

Figure 21 – 431.5 meter PTS Isopleth for Harbor Seals during Impact Hammer Use



Compounding Noise Levels

As noted earlier, the contractor may elect to operate two pile crews for the Project. As a result, one vibratory hammer and one impact hammer may be active at the same time. The contractor will not operate more than one of each hammer type at a single time, and the use of multiple hammers will occur at different bridge sites. For example, the contractor may elect to operate the vibratory hammer to remove timber piles at the 6th Street bridge while operating the diesel hammer at the 8th Street bridge to install the new 24-inch steel piles.

The multiple-source decibel rule was used when determining the Level A and B harassment zones for the Project, as shown in Table 15 below (WSDOT, 2019). Two noises of equal level (± 1 dB) combine to raise the noise level by 3 dB. However, if two noises differ by more than 10 dB, there is no combined increase in the noise level; the higher output covers any other noise.

Table 15 – Rules for Combining Noise Levels	
When two decibels differ by:	Add the following to the higher dB value
0-1 dB	3 dB
2-3 dB	2 dB
4-9 dB	1 dB
>10 dB	0 dB

Although noise from multiple sources results in louder levels than a single source alone, decibels are measured on a logarithmic scale, so noise levels cannot be added by standard addition. It is not possible to know in advance the location of the crews and hammers on a given day, nor how many crews will be working each day. The multiple-source decibel addition method does not result in significant increases in the noise source when an impact hammer and vibratory hammer are working at the same time, because the difference in noise sources is greater than 10 dB. At no point during construction will the contractor operate more than one of each hammer type at a single time.

Number of Marine Mammals that May Be Affected

This authorization is requesting incidental taking by Level A and Level B harassment for construction activities that require IWW, and for the demolition and construction of the rail (trestle) superstructures due their proximity to the river. All remaining activities will be located away from the river and will not result in acoustic or visual disturbances, as previously discussed. All IWW will occur within the ODFW-prescribed IWWP and anticipated two-month extension, and rail superstructures will be constructed during the following 8-month period. As a result, this analysis will focus on the take estimations for the months of November 2019 through December 2020.

Level B ZOI Summary

During construction, underwater and in-air noise will be generated by operation of construction equipment and related activities. Incidental take would be a temporary and localized disturbance from elevated sound levels and visual stimulus from construction equipment.

Table 16 below provides a summary of the Level B harassment ZOI that have been calculated for the Project using the Interim Sound Threshold Guidance as previously discussed.

Table 16 – Level B ZOI Summary			
Construction Activity	In Air or Underwater Noise	Initial SPL*	Level B ZOI (meters)
Rail Superstructure Removal	In-Air	110 dB RMS	28 (harbor seals)
Concrete Removal	In-Air	110 dB RMS	28 (harbor seals)
12" Timber Pile Removal (Vibe)	Underwater	152 dB RMS	1,359.36
36" Steel Casing Installation/Removal (Vibe)***	Underwater	170 dB RMS	21,544.35
24" Steel Pile Installation (Vibe)	Underwater	160 dB RMS	6,309.57
14" Steel H-Pile Site Preparation (Vibe)	Underwater	150 dB RMS	1,000
24" Steel Pile Installation (Impact)	Underwater	187 dB RMS	630.95
Rail Superstructure Construction	In-Air	110 dB RMS	28 (harbor seals)

* In-air noise decibels referenced to 20 micro Pascals; underwater noise decibels referenced to 1 micro Pascal

** Includes 10 dB reduction for the use of a sound attenuation device

*** Includes pre-drilling activities if determined to be necessary

Level A ZOI Summary

Based on the initial source levels noted in Table 16 above, data generated using the NMFS User Spreadsheet (Figures 15 through 18), coordination with NMFS staff, and the issued IHA for Phase 1 of the Project, the following Level A PTS isopleths will be established at each bridge site prior to initiating the specified construction activities (see Table 17 on the following page).

Table 17 – Level A ZOI Summary

Construction Activity	In Air or Underwater Noise	Level A ZOI (Sea Lions)	Level A ZOI (Seals)
12" Timber Pile Removal (Vibe)	Underwater	0.5 Meters	6.8 Meters
36" Steel Casing Installation/Removal (Vibe)	Underwater	3.3 Meters	47 Meters
24" Steel Pile Installation (Vibe)	Underwater	1.1 Meters	16 Meters
14" Steel H-Pile Site Preparation (Vibe)	Underwater	4.7 Meters	0.3 Meters
24" Steel Pile Installation (Impact)*	Underwater	31.4 Meters	431.5 Meters

* Includes pre-drilling activities if determined to be necessary

Species Counts

Species counts were obtained from the most recent ODFW pinnipeds counts for 2000-2014 and personal communication with NMFS (USACE, 2015b; Leah Davis, personal communication, August 20, 2019). It is anticipated that the contractor will begin the work covered under this IHA starting in November 2019. In-water work is expected to occur intermittently within the ODFW IWWP of November 1 through February 28, as well as during the two-month extension in March and April 2020. Rail superstructure activities will occur from May through December 2020. As a result, monthly species counts were identified from November 2019 through December 2020 to determine take estimated under this IHA.

Estimated Level B Harassment Exposures

Although three species of pinniped occur near the Project, they do not occur in equal numbers. Harbor seals and Steller sea lions are only known to occur out in the river channel and would only be harassed if they are transiting through the larger ZOIs. As a result, harbor seals and Steller sea lions would be exposed during vibratory installation of the temporary 36-inch steel casings (18 days) as well as during impact hammer installation of the new 24-inch steel piles (3 days). To determine the estimated Level B exposure and take for harbor seals and Steller sea lions, the maximum daily count and averaged species count were used in addition to the number of workdays for steel pile removal and installation work, respectively (See Table 18).

Table 18 – Level B Take Calculation for Harbor Seals and Stellar Sea Lions

	Maximum/Average Daily Count	Number of Workdays	Total Take (Level B)
Harbor seal¹	57	21	1,197
Steller sea lion²	372	21	7,812

¹ WDFW 2014.

² Bryan Wright, personal communication, September 4, 2019.

California sea lions are the most commonly seen in the area and are known to haul-out on the riverbanks and structures near the bridges. California sea lions may be harassed by underwater sound resulting from vibratory pile removal and impact pile driving (at the distances listed above), as well as visual disturbance and airborne sound resulting from roadway and railway demolition and construction. As a result, the City is requesting take of California sea lions throughout the anticipated construction duration from November 2019 through December 2020. To determine the estimated California sea lion exposure and take, it is assumed that sea lions could be exposed to elevated noise levels up to eleven days per month, which amounts to roughly half of the work days (minus holidays and weekends) in a given month. This was then multiplied by the daily average maximum counts from the South Jetty haul-out (USACE, 2015b) for months when in-water work may occur (November through April), and by the estimated number of sea lions hauled-out within the bridge locations during the remainder of the Project, as summarized in Table 19 below.

Table 19 – Level B Take Calculation of California Sea Lions			
Month	Daily Average Maximum¹	Number of Work Days²	Total Takes per Month (Level B)
October	16	11	176
November	141	11	1,551
December	135	11	1,485
January	408	11	4,488
February	893	11	9,823
March	1,191	11	13,101
April	982	11	10,802
May	16	11	176
June	16	11	176
July	16	11	176
August	16	11	176
September	16	11	176
October	16	11	176
November	141	11	1,551
December	135	11	1,485
TOTAL			45,518

¹ USACE, 2015b; City of Astoria staff species count estimates for hauled-out individuals, 2018.

For California and Steller sea lions, sub-adult and adult males could be harassed during construction activities. For harbor seals, sub-adult and adult males and/or females could be harassed during construction activities. Abundance of sea lions and seals subject to harassment may decline over the work period, since animals may not forage or haul-out in the location of the work area once they have been subjected to a few disturbance events.

Estimated Level A Harassment Exposures

California sea lions and harbor seals could be present within the Level A ZOI during construction; Steller sea lions are not expected to be present within the specified zones for sea lions. Individual harbor seals could be transiting through the Level A harassment zone during the vibratory installation and removal of the temporary 36-inch steel casings (47 meter zone), and during the installation of the permanent 24-inch steel piles with the impact hammer (431.5 meter zone). As a result, harbor seals could be exposed during vibratory installation across the 21 workdays anticipated to be necessary to complete this work. This was multiplied by the number of individuals (2) estimated to be present within the Level A zones based on the size of the zone, per NMFS communication.

For California sea lions, the largest Level A harassment zone is 31.4 meters; however, the area around the Astoria waterfront is actively utilized by California sea lions, particularly within the 8th Street bridge location where the Buoy Beer facility has an illuminated platform to attract them. California sea lions are often seen swimming around underneath the existing structures, and commonly use these areas when transiting from known temporary haul-outs and foraging sites in the river channel. Therefore, California sea lions could be present during all IWW, including over-water work below the HMT. As a result, Level A take calculations for California sea lions are based on the City's estimate for hauled out individuals (16). This number was then multiplied by the 21 workdays calculated above for the harbor seals.

Table 20 – Level A Take Calculation of Harbor Seals and California Sea Lions

	Maximum Daily Count	Estimated Number of IWW Workdays	Total Take (Level A)
Harbor seal¹	2	21	42
California sea lion²	16	21	336

¹ Leah Davis, personal communication, October 4, 2019.

² City of Astoria staff species count estimates for hauled-out individuals, 2018

Though a more conservative approach was used for estimating Level A exposure during construction, the numbers are still small and the overall impact of the Project on the abundance stocks for harbor seals and California sea lions is negligible as discussed in the following section.

Anticipated Impact of the Activity

In-water construction activities resulting in an increase in underwater noise levels, specifically pile removal and installation, is the primary concern to pinnipeds using the Region of Activity, particularly within the identified PTS Isopleths. Additionally, seals and sea lions within the Region of Activity may be exposed to airborne noise and visual disturbance while surfacing within the designated ZOIs.

The current stock estimates for California sea lions, harbor seals, and steller sea lions are 233,515; 24,732; and between 60,131 and 74,448 individuals, respectively. All three species populations have seen continual growth between three and 10 percent annually. This application requests incidental taking by Level A and Level B harassment as summarized in Table 21 on the following page. The anticipated in-water and airborne/visual impacts are temporary disturbances that may alter behaviors and cause individuals to temporarily disperse from the area. Temporary disturbance could also be caused by other construction activities and the presence of humans. These disturbances could cause animals to avoid travel through the Region of Activity, but existing marine traffic, recreational boaters, and human presence along the waterfront already occurs in the area. Thus, it is likely that seals and sea lions are habituated to these disturbances while transiting the Region of Activity.

Repetitive, short-term displacement is likely to cause repetitive, short-term disruptions in their normal behavioral patterns throughout the Region of Activity. Disruption from airborne or visual disturbance would be limited to working hours during the predicted construction seasons. It is estimated that the in-water acoustic threshold may be exceeded for up to 66 days during the anticipated 127-day IWWP. In-water work will not likely occur consistently within those 66 days, rather, work will likely occur intermittently throughout the IWWP. Further, the background acoustic levels around the waterfront are likely to be very high given the strong tides, high winds, and breaking surf conditions.

California sea lions that use the Project area to occasionally haul-out will likely spend less time in the immediate vicinity during construction activities. Further, all pinnipeds may refrain from transiting through or foraging within the ZOIs during construction; however, there are alternative foraging and haul-out areas available to the affected individuals. There are no current threats to the species that are either part of the environmental baseline or proposed as a component of the Project that could have additional impacts on the species stocks. In addition, no reduction in prey resources is anticipated as a result of the Project. As a result, effects of the Project are not anticipated to appreciably reduce the species' ability to survive and recover.

Table 21 – Species Stock Impact Summary

Month	Current Stock Estimates	Requested Level B Take	Percent of Stock Taken Level B	Requested Level A Take	Percent of Stock Taken Level A
California sea lions	233,515	45,518	19.5%	336	0.1%
Harbor Seals	24,732	1,197	4.8%	42	0.2%
Steller Sea Lions	60,131 - 74,448	7,812	10.5 – 13%	--	--

Anticipated Impact on Subsistence Uses

No impacts to the availability of California sea lions, Pacific harbor seals, or Steller sea lions to the Northwest treaty tribes will occur as a result of the Project.

Anticipated Impacts on Habitat

Impacts to marine mammal habitat from the proposed construction actions are expected to be temporary and include increased human activity and noise levels, minimal impacts to water quality, and negligible changes in prey availability near the individual Project sites. Beneficial effects on marine mammal habitat from the proposed construction actions include the removal of several hundred treated timber piles from within the Columbia River.

Effects of Project Activities on Marine Mammal Habitat

As previously discussed, California sea lions, Pacific harbor seals, and Steller sea lions are likely to be found transiting through the area during construction activities and throughout the length of the Project. For these marine mammals, habitat is defined as the locality or environment that is essential for an animal's survival (feeding areas, resting areas, transit routes, socializing, and breeding areas), and consists of in-water areas, haul-out sites, or rookeries.

As a result of in-water construction activities, some degree of localized reduction in water quality would occur. This effect would occur during the installation and removal of piles from the substrate when bottom sediments are disturbed. Any effects to turbidity are expected to be short-term and minimal, and turbidity is expected to return to normal levels shortly following completion of the proposed actions. No direct effects to marine mammals are expected from turbidity impacts.

There are no designated critical habitats within this area of the Columbia River for the pinnipeds covered under this IHA. Further, the proposed Project will not result in permanent impacts to habitats used by marine mammals. The Project will result in temporary changes in the acoustic environment; thus, the pinnipeds may experience a temporary loss of habitat because of temporarily elevated noise levels, and there may be minor visual disturbance due to the construction. The most likely impact to marine mammal habitat would be from impact hammer pile-driving effects on marine mammal prey at and near the Project area and minor impacts to the immediate substrate during installation of piles.

Effects of Project Activities on Marine Mammal Prey

Besides physical locations, habitat also includes the available prey upon which these pinnipeds feed. Long-term effects of any prey displacements are not expected to affect the overall fitness of the pinnipeds present; effects will be minor and will terminate after cessation of the proposed construction actions. Specific Project impacts to fish species will be covered under the FAHP, but below is a discussion of fish prey impacts as they relate to marine mammals transiting the Region of Activity.

The diets of California sea lions, Pacific harbor seals, and Steller sea lions vary by season and location. Generally, harbor seals are opportunistic feeders who consume sole, flounder, sculpin, hake, cod, salmon, smelt, herring, octopus, and squid (NOAA, 2016d). California sea lions feed

on squid, anchovies, mackerel, rockfish, and sardines (NOAA, 2016e). Steller sea lions' diet consists of a wide variety of fish (e.g., capelin, cod, herring, mackerel, pollock, rockfish, salmon, sand lance, etc.), bivalves, cephalopods (e.g., squid and octopus), and gastropods (NOAA, 2016c). They all consume a variety of marine and estuarine prey, including squid, smelt, herring, flatfish, perch, pollock, hake, rockfish, and salmon. Based on scat samples collected from several Pacific Northwest estuary and ocean sites (including the Columbia River estuary), salmon species generally make up 10-30 percent of these animals' diet (NOAA 2008). The anticipated IWWP for this construction activity is from November 1 to April 30, which would coincide with prey species including a variety of salmonids (coho or fall Chinook, possibly chum, steelhead, early spring Chinook salmon). This would include adults migrating upstream and juveniles rearing in or passing through the estuary. Green sturgeon, white sturgeon, and eulachon could be present in the vicinity, and some marine species, such as starry flounder or surfperch, might be included.¹³ In 2015, record numbers of pinnipeds were reported at the mouth of the Columbia (at Desdemona Sands, South Jetty, and East Mooring Basin haul-out locations) driven north by starvation in California to the healthy smelt and salmon runs in the Columbia River. Smelt runs and adult spring Chinook salmon are yearly continuous food sources for these species within this area (Stratton, 2015).

Fish populations in the Columbia River that serve as pinniped prey could be affected by noise from in-water pile driving. In general, fish perceive underwater sounds in the frequency range of 50 to 2,000 hertz, with peak sensitivities below 800 Hz (Popper and Hastings, 2009). Strong and/or intermittent sounds may elicit changes in fish behavior and local distribution and may have the potential to harm fish. Research has shown that high underwater sound pressure levels, such as those occurring during pile-driving or removal activities, have the ability to alter behavior, cause hearing loss, and injure or kill individual fish by causing serious internal injury (Hastings and Popper, 2005). Pile-driving and removal activities have been shown to have the potential to cause traumatic fish injuries ranging from mild (recoverable injuries such as swim bladder deflation or hematomas), to moderate (e.g. intestinal hemorrhage), to mortal (leading to death, such as heart or liver hemorrhage), with effects varying based on the life stage and species of fish, the distance from the activity, etc. (Halvorsen et al., 2012). In general, the closer the animal is to the source, the higher the likelihood of high energy and a resultant effect. Any of these effects could reduce fitness and lead indirectly to mortality, although it is difficult to assess the disturbance of the natural behavior of pinniped prey fish species or the potential masking of the communication and orientation signals due to exposure to noise levels. It is not possible to say how long behavioral effects, if any, will continue following pile driving. However, the uncertainty regarding direct and indirect effects on prey species will be mitigated due to the seasonal presence of salmonids and other prey present in the area, and the mitigation measures already in place to reduce impacts to fish under FAHP. Further, it is anticipated that almost half of the pile driving activities will occur in the dry. If pile driving is required through the water column, appropriate sound attenuation devices will be installed.

Summary

Impacts to seal and sea lion habitat and prey species availability are expected to be minor and temporary. The area likely impacted by construction is relatively small compared to the available habitat in this river, and there are no haul-outs or rookeries within the Region of Activity¹⁴. The most likely impact to fish and prey species from the construction actions will be

¹³ Information on winter prey species abundance within the lower Columbia River provided by the ODFW (R. Bradley, personal communication, September 15, 2016).

¹⁴ California sea lions have been observed hauling within the Project area, but this is not their main haul-out location.

temporary behavioral avoidance of the immediate area. Affected fish would represent only a small portion of food available to marine mammals in the area. Shortly following construction activities, a return to normal prey species behavior is anticipated, and any behavioral avoidance by fish of the disturbed area will still leave significantly large areas of fish and marine mammal foraging habitat in the Columbia River. Therefore, the impacts on pinniped habitat and prey availability during the proposed construction actions are expected to be negligible.

Anticipated Effects on Habitat Impacts on Marine Mammals

Descriptions of the proposed Project impacts on habitat were previously discussed. The effects of the proposed Project on marine mammal habitat are expected to be short-term and minor. The greatest impact on marine mammals associated with the proposed actions will be a temporary loss of habitat and displacement of prey species because of elevated noise levels. Displacement of marine mammals by noise will not be permanent and there will be no long-term effects to their habitat. The proposed Project is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations, since pile driving and removal activities will be temporary, short-term, and intermittent.

Mitigation Measures

The following mitigation measures will be employed by the contractor during all construction activities to avoid and minimize impacts to the Lower Columbia River, ESA-listed species and their designated critical habitat, and species protected under the MMPA to the maximum extent practicable.

General Construction Measures

All construction activities will be performed in accordance with the current ODOT Standard Specifications for Construction, the Contract Plans, and the Project Special Provisions. In addition, the following general construction measures will be adhered to.

- All work will be performed according to the requirements and conditions of the regulatory permits issued by federal, state, and local governments. Seasonal restrictions, i.e., work windows, will be applied to the Project to avoid or minimize potential impacts to listed or proposed species based on agreement with, and the regulatory permits issued by the Department of State Lands and USACE in consultation with NMFS.
- ODOT will have an inspector on-site during construction. The role of the inspector is to confirm contract compliance. The inspector and the contractor will have a copy of the Contract Plans and Specifications on-site and will be aware of all requirements. The inspector will also be trained in environmental provisions and compliance.
- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the Project site to confirm that no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly.
- Mobile heavy equipment will be stored, fueled, and maintained in a contained vehicle staging area placed 150 feet or more from the river, or in an isolated hard zone such as a paved parking lot. It will be inspected daily for fluid leaks before leaving the vehicle

staging area and steam-cleaned before operation on the barge or adjacent to the harbor.

- Generators, cranes, and any other stationary equipment operated within 150 feet of the river will be maintained and protected as necessary to prevent leaks and spills from entering the water.
- Erosion and sediment control BMPs will be installed prior to initiating any construction activities.
- All work below the HMT elevation will be completed during the ODFW-prescribed IWWP of November 1 through February 28, with an anticipated extension of March 1 through April 30 (to be approved by regulatory agencies if needed).
- The contractor will be responsible for the preparation of a PCP. The PCP will designate a professional on-call spill response team, and identify all contractor activities, hazardous substances used, and wastes generated.
- The PCP will describe how hazardous substances and wastes will be stored, used, contained, monitored, disposed of, and documented.

Pile Removal and Installation BMPs

The following mitigation measures will be implemented to minimize disturbance during pile removal and installation activities (adopted from NOAA, 2016f).

- The City shall conduct briefings between construction supervisors and crews, marine mammal monitoring team, and City staff prior to the start of all construction work, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.
- An bubble curtain system or other noise attenuation device will be employed during impact installation unless the piles are driven in the dry.
- When PSOs are on-site, they will actively communicate with the ODOT inspector(s) to confirm that construction activities are being conducted in accordance with this IHA.
- If at any time during construction, the pile removal and installation parameters covered under this IHA are exceeded, that activity will cease and the City, or their representative, will contact NMFS staff immediately to determine what, if any, course of action needs to be taken.
- The contractor will implement a soft-start procedure for pile installation. The objective of a soft-start is to provide a warning and/or give animals in close proximity to pile driving a chance to leave the area prior to an impact driver operating at full capacity, thereby exposing fewer animals to loud underwater and airborne sounds. A soft-start procedure will be used at the beginning of each day that pile installation activities are conducted.
 - For impact driving, an initial set of three strikes would be made by the hammer at 40 percent energy, followed by a 1-minute wait period, then two subsequent 3-strike sets at 40 percent energy, with 1-minute waiting periods, before initiating continuous driving.
- In addition to a soft start at the beginning of the day for impact pile driving, a soft start must also be used at any time following cessation of impact pile driving for a period of thirty minutes or longer.

- Monitoring of marine mammals will take place starting 30 minutes before construction begins and continuing until 30 minutes after construction ends.
- Before commencement of above-water construction activities and work conducted in the dry, the City will establish a 10-meter Level A Shutdown Zone to prevent injury from physical interaction with construction equipment.
- Prior to initiating construction activities, the City will establish the following Level B ZOIs.
 - The Level B ZOI for the removal of the existing 12-inch timber piles will be established out to a distance of 1,359.36 meters from the pile.
 - The Level B ZOI for the vibratory installation of the temporary 36-inch steel casings will be established out to a distance of 21,544.35 meters from the pile.
 - The Level B ZOI for the vibratory installation of the permanent 24-inch steel piles will be established out to a distance of 6,309.57 meters from the pile.
 - The Level B ZOI during all site preparation work within the temporary casings will be established out to a distance of 1,000 meters from the pile.
 - The Level B ZOI during the impact pile driving of the proposed 24-inch steel piles will be established out to a distance of 630.95 meters from the pile.
 - The Level B ZOI during rail superstructure demolition and construction will be established out to a distance of 28 meters from the construction area for harbor seals. No Level B ZOI for California and Steller sea lions is proposed.
 - If a marine mammal enters the Level B ZOI, a “take” will be recorded and the work will be allowed to proceed without cessation. Marine mammal behavior will be monitored and documented.
- Prior to initiating construction activities, the City will establish the following Level A ZOIs.
 - The Level A ZOI for the removal of the existing 12-inch timber piles will be established out to a distance of 15 meters from the pile for both seals and sea lions.
 - The Level A ZOI for the vibratory installation of the temporary 36-inch steel casings will be established out to a distance of 15 meters from the pile for sea lions and 47 meters for harbor seals.
 - The Level A ZOI for the vibratory installation of the permanent 24-inch steel piles will be established out to a distance of 15 meters from the pile for sea lions and 16 meters for harbor seals.
 - The Level A ZOI during all site preparation work within the temporary casings will be established out to a distance of 15 meters from the pile for both seals and sea lions.
 - The Level A ZOI for the impact driver installation of the permanent 24-inch steel piles will be established out to a distance of 31.4 meters from the pile for sea lions and 431.5 meters for harbor seals.
 - If a marine mammal enters the Level A ZOI, a “take” will be recorded and the work will be allowed to proceed without cessation. Marine mammal behavior will be monitored and documented.
- The City will implement shutdown measures as follows:
 - To prevent Level B takes when the take of a pinniped species is approaching the authorized take limits.
 - If marine mammals within the Level B ZOI appear disturbed by the work activity.

- If the Level A and Level B zones are obscured by fog or poor lighting conditions, pile removal and installation activities will not be initiated until the entire zones are visible.
- A Shutdown Zone of 10 meters will be established during all IWW to prevent injury during equipment operation.
 - If a marine mammal approaches or enters the 10 meter Shutdown Zone, work will be halted and delayed until either the animal has voluntarily left, or 15 minutes have passed without re-detection of the animal.
- IWW will only commence once observers have declared the Shutdown Zone clear of marine mammals.
- A monitoring plan will be implemented. This plan includes the Shutdown Zone and specific procedures in the event a mammal is encountered.
- Take of unauthorized species must be avoided by ceasing construction activity before the animal enters the Level B harassment zone.

Arctic Plan of Cooperation

The proposed activity will take place in the Columbia River (RM 9), and no activities will take place in or near a traditional Arctic subsistence hunting area. Therefore, this element is not applicable to the Project.

Monitoring and Reporting

Impacts to marine mammals are likely to be temporary and negligible, and the mitigation measures are meant to avoid and minimize impacts to the Lower Columbia River, ESA-listed species, and seal and sea lions to the maximum extent practicable. The following Monitoring and Reporting measures (adapted from NOAA, 2016f) will be implemented to further minimize disturbance to marine mammals, improve understanding of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and increase the general knowledge about these marine mammals and the effectiveness of the mitigation measures.

The following minimal monitoring zones will be established during construction activities at the 6th Street, 8th Street, and 10th Street crossings (Table 22 on the following page). The specified zone distances apply to all three seals and sea lions covered under this IHA unless otherwise specified.

The Level B zones will be established at each bridge site prior to initiating the specified construction activities per the monitoring schedule developed for this Project. The monitoring zone for California and Steller sea lions during roadway and railway demolition and construction activities was determined to be nine meters. Because this falls inside the proposed 10-meter Shutdown Zone for all species during this type of work, no Level B monitoring zone is proposed for sea lions.

Table 22 – Minimum Level B Monitoring Zone Distances

Construction Activity	Monitoring Zone Level B ZOI (meters)
Rail Superstructure Removal	28 (harbor seals only)
Concrete Removal	28 (harbor seals only)
12" Timber Pile Removal (Vibe)	1,360
36" Steel Casing Installation/Removal (Vibe)*	21,545
24" Steel Pile Installation (Vibe)	6,310
14" Steel H-Pile Site Preparation (Vibe)	1,000
24" Steel Pile Installation (Impact)	635
Rail Superstructure Construction	28 (harbor seals only)

* Includes pre-drilling activities if determined to be necessary

In addition to the Level B zones, the following zones will be established prior to initiating construction activities to monitor and record Level A take (Table 23).

Table 23 – Minimum Level A Monitoring Zone Distances

Construction Activity	Level A ZOI (Sea Lions)	Level A ZOI (Seals)
12" Timber Pile Removal (Vibe)	15 Meters	15 Meters
36" Steel Casing Installation/Removal (Vibe)	15 Meters	50 Meters
24" Steel Pile Installation (Vibe)	15 Meters	20 Meters
14" Steel H-Pile Site Preparation (Vibe)	15 Meters	15 Meters
24" Steel Pile Installation (Impact)*	35 Meters	435 Meters

* Includes pre-drilling activities if determined to be necessary

Monitoring

- 1) Protected Species Observers: the City will employ qualified PSOs to monitor the extent of the Region of Activity for marine mammals. Qualifications for marine mammal observers include:

- a) Visual acuity in both eyes (correction is permissible) sufficient for discerning moving targets at the water's surface with ability to estimate target size and distance. Use of binoculars is necessary to correctly identify the target.
 - b) Advanced education (at least some college level course work) in biological science, wildlife management, mammalogy or related fields (bachelor's degree or higher is preferred, but not required).
 - c) Experience or training in the field identification of marine mammals (cetaceans and pinnipeds).
 - d) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
 - e) Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.
 - f) Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
 - g) Writing skills sufficient to prepare a report of observations that would include such information as the number and type of marine mammals observed; the behavior of marine mammals in the project area during construction, dates and times when observations were conducted; dates and times when in-water construction activities were conducted; and dates and times when marine mammals were present at or within the defined Region of Activity.
- 2) Marine mammal monitoring during pile driving and removal must be conducted by NMFS-approved PSOs in a manner consistent with the following:
- a) Independent PSOs (i.e., not construction personnel) who have no other assigned tasks during monitoring periods must be used.
 - b) Where a team of three or more PSOs are required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience working as a marine mammal observer during construction.
 - c) Other PSOs may substitute education (degree in biological science or related field) or training for experience.
 - d) The City must submit PSO CVs for approval by NMFS prior to the onset of pile driving.
- 3) Monitoring Schedule: PSOs shall be present on-site during IWW construction activities and over-water construction work as follows:
- a) During vibratory pile removal of the existing 12-inch timber piles:
 - i) Two PSOs will be on-site the first day of timber pile removal at each bridge, and two PSO will be on-site every third day thereafter.
 - ii) One observer will be stationed at the best practicable land-based vantage point to observe the Shutdown Zone and a portion of the Level A and Level B ZOIs.
 - iii) One observer will be stationed at the best practicable land-based vantage point to observe the remainder of the Level A and Level B ZOIs. Likely locations include the 6th Street viewing platform and the Pier 12 parking lot.
 - iv) The ODOT on-site inspector will be trained in species identification and monitoring protocol and will be on-site during all impact pile driving activities to confirm that no species enter the 10-meter Shutdown Zone.
 - b) During vibratory pile installation activities:
 - i) Three PSOs will be on-site the first day of vibratory hammer installation at each bridge, and three PSOs will be on-site every third day thereafter during vibratory hammer installation work at each bridge.
 - ii) One observer will be stationed at the best practicable land-based vantage point to observe the Shutdown Zone and a portion of the Level A and Level B ZOIs.

- iii) One observer will be stationed along the north bank of the river at the Washington State Dept of Transportation Rest Area: Dismal Nitch.
 - iv) One observer will be stationed at the best practicable land-based vantage point to observe the remainder of the Level A and Level B ZOIs. Likely locations include the 6th Street viewing platform and the Pier 12 parking lot. If vibratory installation of the 36-inch casings occurs, this observer will be position along the north bank of the river downstream of the Project site within the Chinook County Park.
 - v) The ODOT on-site inspector will be trained in species identification and monitoring protocol and will be on-site during all vibratory removal and installation activities to confirm that no species enter the 10-meter Shutdown Zone.
- c) During impact pile driving activities:
- i) Two PSOs will be on-site the first day of impact pile driving at each bridge, and two PSO will be on-site every third day thereafter.
 - ii) One observer will be stationed at the best practicable land-based vantage point to observe the Shutdown Zone and a portion of the Level A and Level B ZOIs.
 - iii) One observer will be stationed at the best practicable land-based vantage point to observe the remainder of the Level A and Level B ZOIs. Likely locations include the 6th Street viewing platform, the Pier 12 parking lot, or the Washington State Dept of Transportation Rest Area: Dismal Nitch on the north bank of the river.
 - iv) The ODOT on-site inspector will be trained in species identification and monitoring protocol and will be on-site during all impact pile driving activities to confirm that no species enter the 10-meter Shutdown Zone .
- d) During substructure demolition activities (not including pile removal) and superstructure demolition and construction activities:
- i) The ODOT on-site inspector will be trained in species identification and monitoring protocol and will be on-site during all construction activities to confirm that no species enter the 10-meter Shutdown Zone.
- 4) Monitoring Protocols: PSOs will monitor marine mammal presence within the Level A and Level B ZOIs per the following protocols:
- a) The limits of the Level A and Level B ZOIs and 10-meter Shutdown Zone will be defined prior to initiating construction activities.
 - b) A 30-minute pre-construction marine mammal monitoring period will be required before the first pile driving or pile removal of the day. A 30-minute post-construction marine mammal monitoring period will be required after the last pile driving or pile removal of the day. If the contractor's personnel take a break between subsequent pile driving or pile removal for more than 30 minutes, then additional pre-construction marine mammal monitoring will be required before the next start-up of pile driving or pile removal.
 - c) If marine mammals are observed, the following information will be documented:
 - i) Species of observed marine mammals;
 - ii) Number of observed marine mammal individuals;
 - iii) Life stages of marine mammals observed;
 - iv) Behavioral habits, including feeding, of observed marine mammals, in both presence and absence of activities;
 - v) Location within the Region of Activity; and
 - vi) Animals' reaction (if any) to pile-driving activities or other construction-related stressors including:
 - (1) Impacts to the long-term fitness of the individual animal, if any

- (2) Long-term impacts to the population, species, or stock (e.g. through effects on annual rates of recruitment or survival), if any
- vii) Overall effectiveness of mitigation measures
- d) PSOs will use binoculars to monitor the Region of Activity.

Reporting

- a) The City will provide NMFS with a draft monitoring report not later than 90 days following the end of construction activities. This report will detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed.
- b) If comments are received from the NMFS West Coast Regional Administrator or NMFS Office of Protected Resources on the draft report, a final report will be submitted to NMFS within 30 days thereafter. If no comments are received from NMFS, the draft report will be considered to be the final report.
- c) In the unanticipated event that the construction activities clearly cause the take of a marine mammal in a manner prohibited by the NMFS authorization, such as an injury, serious injury, or mortality (e.g., gear interaction), the City will immediately cease all operations and immediately report the incident to the Supervisor of Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinators. The report must include the following information:
 - i) Time, date, and location (latitude/longitude) of the incident;
 - ii) Description of the incident;
 - iii) Status of all sound sources used in the 24 hours preceding the incident;
 - iv) Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility, and water depth);
 - v) Description of marine mammal observations in the 24 hours preceding the incident;
 - vi) Species identification or description of the animal(s) involved, including life stage; the fate of the animal(s);
 - vii) Photographs or video footage of the animal (if equipment is available). Activities will not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with the City to determine what is necessary to minimize the likelihood of further prohibited takes and confirm MMPA compliance. Activities may not be resumed until notified by NMFS via letter, email, or telephone; and
 - viii) Discussion of all coordination with NMFS during construction, as well as any changes or approved modifications implemented during construction.
- d) In the event that the City discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), the City will immediately report the incident to the Supervisor of the Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinators. The report must include the same information identified above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with the City to determine whether modifications in the activities are appropriate.
- e) In the event that the City discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the City will report the incident to the

Supervisor of the Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinators within 24 hours of the discovery. The City will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. The City can continue its operations under such a case.

Suggested Means of Coordination

In-water noise generated by Project construction actions, such as piling removal and installation, is the primary issue of concern relative to the marine mammals potentially within the Project Region of Activity: California sea lions, Pacific harbor seals, and Steller sea lions. Pinniped monitoring will be conducted to collect information on the presence of marine mammals within the Level A and Level B ZOIs for the Project. The monitoring report, which will include a discussion of any behavioral changes in harbor seals and sea lions resulting from the proposed IWW, will be submitted to NMFS, and therefore, the monitoring report will be available to public review in the future. As such, the Applicant and other Project proponents who might undertake similar projects in the future will be able to use the results of this Project's monitoring report to inform future project designs and plan projects that minimize the take of marine mammals associated with pile driving and removal activities. The monitoring data will inform NMFS and future permit applicants about the behavior and adaptability of pinnipeds for future projects of a similar nature.

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APPENDIX A

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A, 1A-2	Index Of Sheets Cont'd. & Std. Drg. Nos.

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
PLANS FOR PROPOSED PROJECT

GRADING, DRAINAGE, STRUCTURES, PAVING, SIGNING, ILLUMINATION

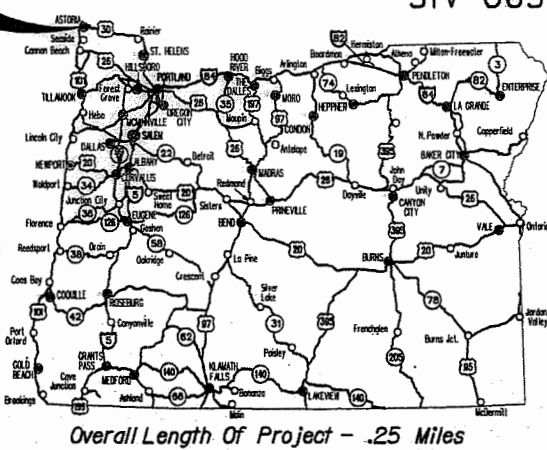
6TH THROUGH 11TH STREET: WATERFRONT BRIDGES
(ASTORIA) PROJECT

VARIOUS STREETS

CLATSOP COUNTY

JULY 2018

PROJECT LOCATIONS



ATTENTION:
Oregon Law Requires You To Follow Rules
Adopted By The Oregon Utility Notification
Center. Those Rules Are Set Forth In
OAR 952-001-0010 Through OAR 952-001-0090.
You May Obtain Copies Of The Rules By Calling
The Center. (Note: The Telephone Number For
The Oregon Utility Center Is (503) 232-1987.)

LET'S ALL
WORK TOGETHER
TO MAKE THIS
JOB SAFE

OREGON TRANSPORTATION COMMISSION

Tammy Baney	CHAIR
Bob Van Brocklin	COMMISSIONER
Alando Simpson	COMMISSIONER
Sean O'Hollaren	COMMISSIONER
Paula Brown	COMMISSIONER
Matthew L. Garrett	DIRECTOR OF TRANSPORTATION

PLANS PREPARED FOR
OREGON DEPARTMENT OF TRANSPORTATION



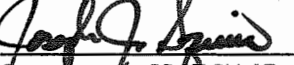
CORPORATE OFFICE:
820 COUNTRY CLUB ROAD,
SUITE 100B
EUGENE, OREGON 97401-8089

These plans were developed using AASHTO design standards.
Exceptions to these standards, if any, have been submitted
and approved by the ODOT Chief Engineer or their delegated
authority.

Approving Authority:  4/30/2018
Signature & date

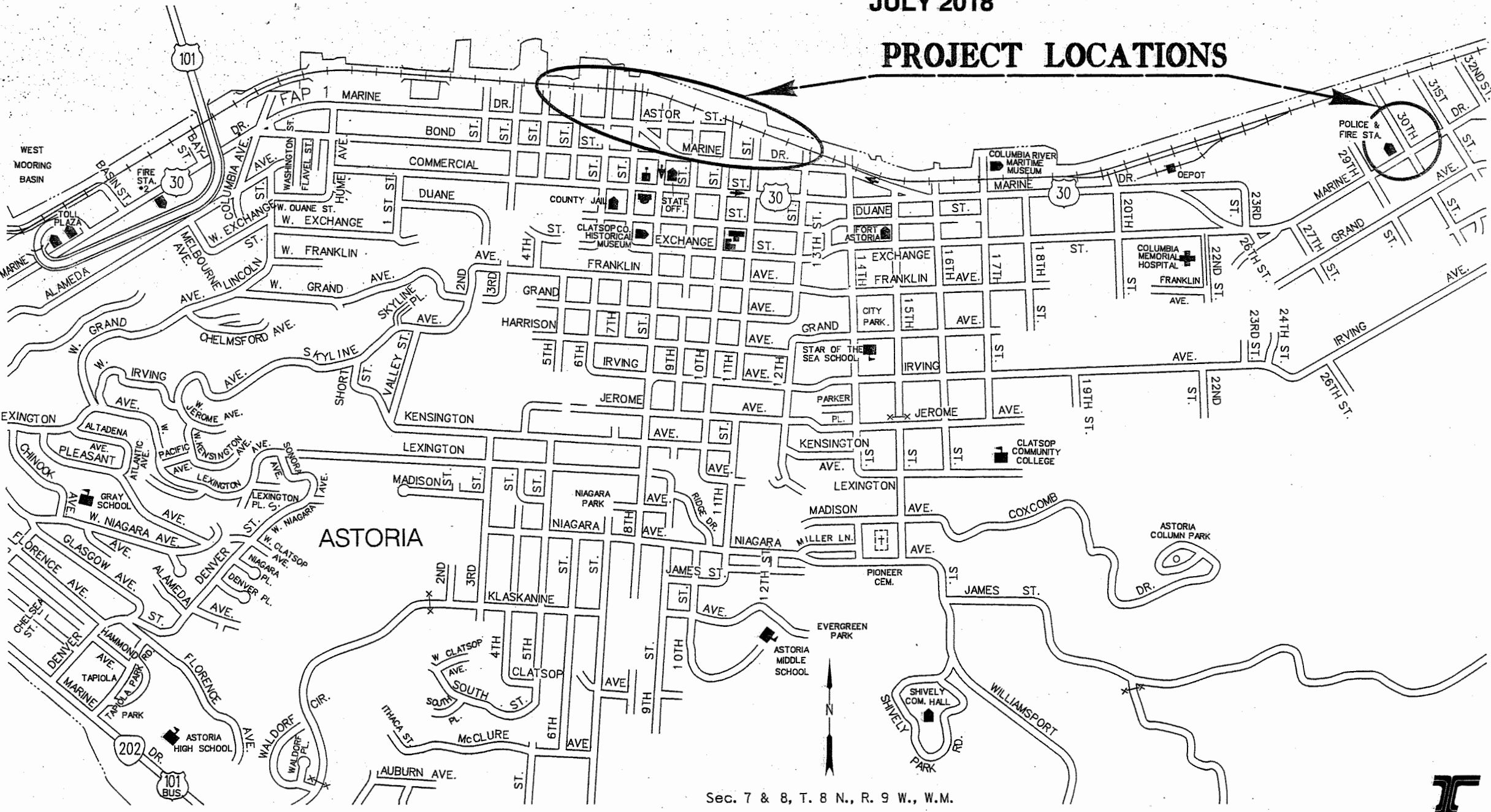
JEFF PARKER - PROJECT MANAGER

Print name and title


Concurrence by ODOT Chief Engineer

6TH THROUGH 11TH STREET: WATERFRONT BRIDGES
(ASTORIA) PROJECT
VARIOUS STREETS
CLATSOP COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	0315(019)	1

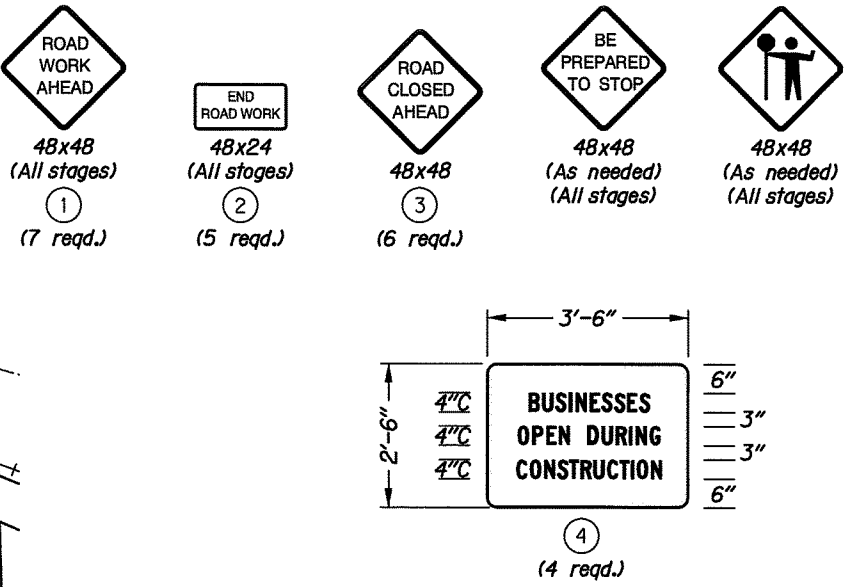
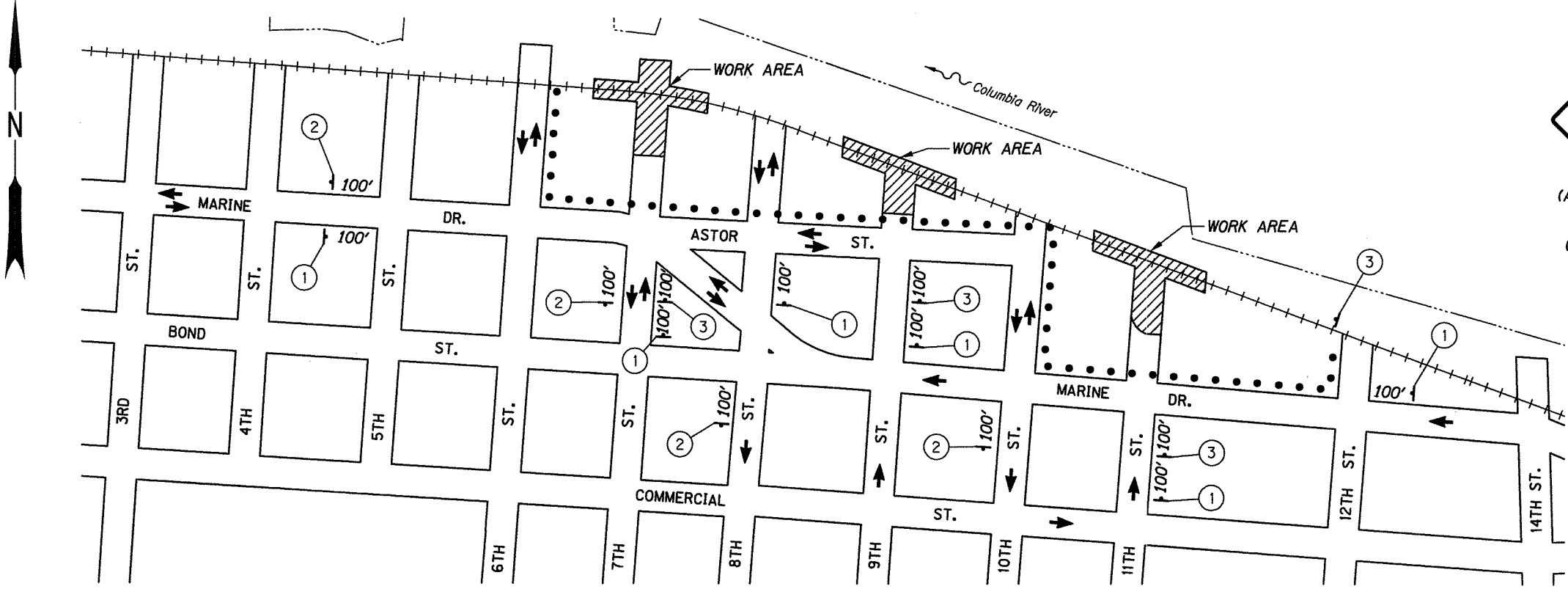


Sec. 7 & 8, T. 8 N., R. 9 W., W.M.



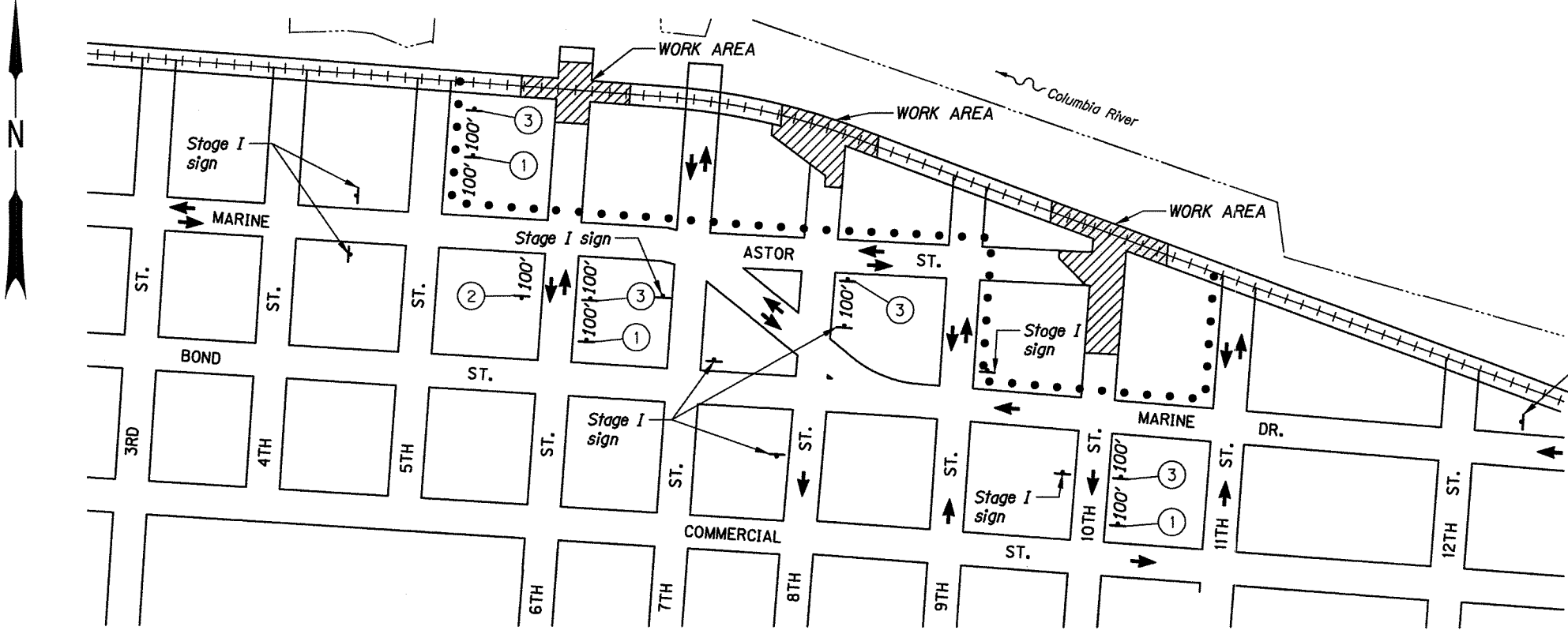
STAGE I

To be accompanied by drg. nos. 51V-065
TM500, TM670, TM671, TM800, TM820,
TM821, TM822, TM840, TM841 & TM844.



- GENERAL NOTES:
- 1. Maintain access to driveways shown within work area at all times.
 - 2. Install signing and temp. traffic control measures on temp. pedestrian access route. For additional details, see drg. no. TMB44.
 - 3. Closure of streets adjacent to work area is not allowed.
 - 4. All signs are type "04" unless otherwise shown.
 - 5. Sign dimensions are shown in inches.
 - 6. See traffic control plans sheets for sign no. 4 locations.
 - 7. Install temp. signs inside R/W.

STAGE II



REGISTERED PROFESSIONAL ENGINEER
70925
Stanley Petroff
OREGON
JUNE 14, 2007
STANLEY ANGELOFF PETROFF
EXPIRES: 12/31/18

LEGEND

- Temporary pedestrian access route
- Temp. sign on temp. support

OREGON DEPARTMENT OF TRANSPORTATION

CONSULTING ENGINEERS
www.obec.com

CORPORATE OFFICE:
920 COUNTRY CLUB ROAD,
SUITE 100B
EUGENE, OREGON 97401-6089

6TH THROUGH 11TH STREET: WATERFRONT BRIDGES (ASTORIA) PROJECT
VARIOUS STREETS
CLATSOP COUNTY

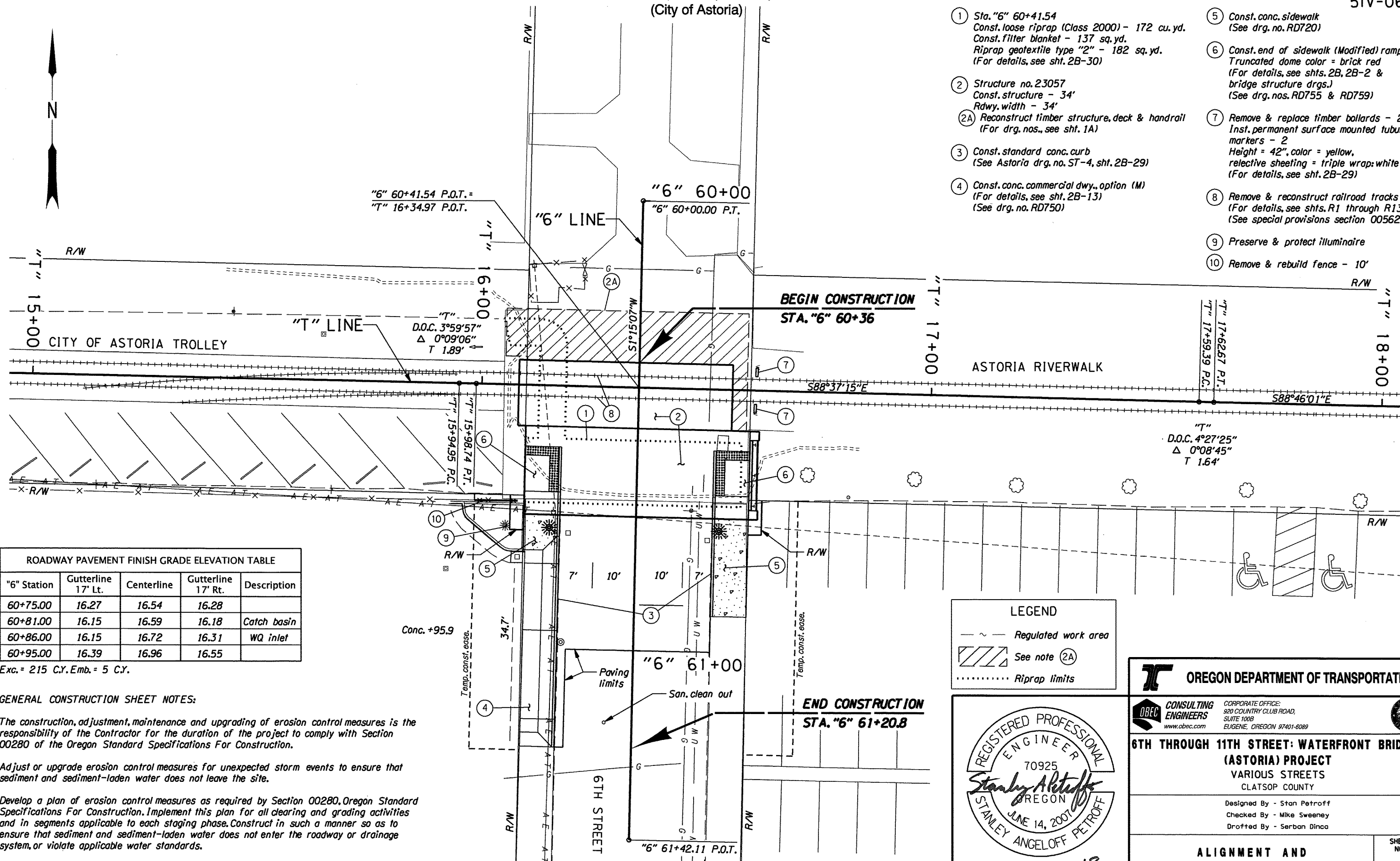
Designed By - Mike Sweeney
Checked By - Stan Petroff
Drafted By - Serbon Ilina

**TRAFFIC CONTROL PLAN
ADVANCE SIGNING**

SHEET NO. 2C

51V-065

Sec. 7 & 8, T. 8 N., R. 9 W., W.M.
(City of Astoria)



- 1 Sta. "6" 60+41.54
Const. loose riprap (Class 2000) - 172 cu. yd.
Const. filter blanket - 137 sq. yd.
Riprap geotextile type "2" - 182 sq. yd.
(For details, see sht. 2B-30)
- 2 Structure no. 23057
Const. structure - 34'
Rdwy. width - 34'
- 2A Reconstruct timber structure, deck & handrail
(For drg. nos., see sht. 1A)
- 3 Const. standard conc. curb
(See Astoria drg. no. ST-4, sht. 2B-29)
- 4 Const. conc. commercial dwy., option (M)
(For details, see sht. 2B-13)
(See drg. no. RD750)
- 5 Const. conc. sidewalk
(See drg. no. RD720)
- 6 Const. end of sidewalk (Modified) ramp
Truncated dome color = brick red
(For details, see shts. 2B, 2B-2 & bridge structure drgs.)
(See drg. nos. RD755 & RD759)
- 7 Remove & replace timber bollards - 2
Inst. permanent surface mounted tubular markers - 2
Height = 42", color = yellow,
reflective sheeting = triple wrap: white
(For details, see sht. 2B-29)
- 8 Remove & reconstruct railroad tracks
(For details, see shts. R1 through R13)
(See special provisions section 00562)
- 9 Preserve & protect illuminaire
- 10 Remove & rebuild fence - 10'

ROADWAY PAVEMENT FINISH GRADE ELEVATION TABLE				
"6" Station	Gutterline 17' Lt.	Centerline	Gutterline 17' Rt.	Description
60+75.00	16.27	16.54	16.28	
60+81.00	16.15	16.59	16.18	Catch basin
60+86.00	16.15	16.72	16.31	WQ inlet
60+95.00	16.39	16.96	16.55	

Exc. = 215 C.Y. Emb. = 5 C.Y.

GENERAL CONSTRUCTION SHEET NOTES:

The construction, adjustment, maintenance and upgrading of erosion control measures is the responsibility of the Contractor for the duration of the project to comply with Section 00280 of the Oregon Standard Specifications For Construction.

Adjust or upgrade erosion control measures for unexpected storm events to ensure that sediment and sediment-laden water does not leave the site.

Develop a plan of erosion control measures as required by Section 00280, Oregon Standard Specifications For Construction. Implement this plan for all clearing and grading activities and in segments applicable to each staging phase. Construct in such a manner so as to ensure that sediment and sediment-laden water does not enter the roadway or drainage system, or violate applicable water standards.

Install erosion control measures within the right-of-way unless directed otherwise.

LEGEND

Regulated work area

See note 2A

Riprap limits

REGISTERED PROFESSIONAL ENGINEER

70925

Stanley A. Petroff

OREGON

JUNE 14, 2007

STANLEY ANGELOFF PETROFF

EXPIRES: 12/31/18

OREGON DEPARTMENT OF TRANSPORTATION

OBEC CONSULTING ENGINEERS
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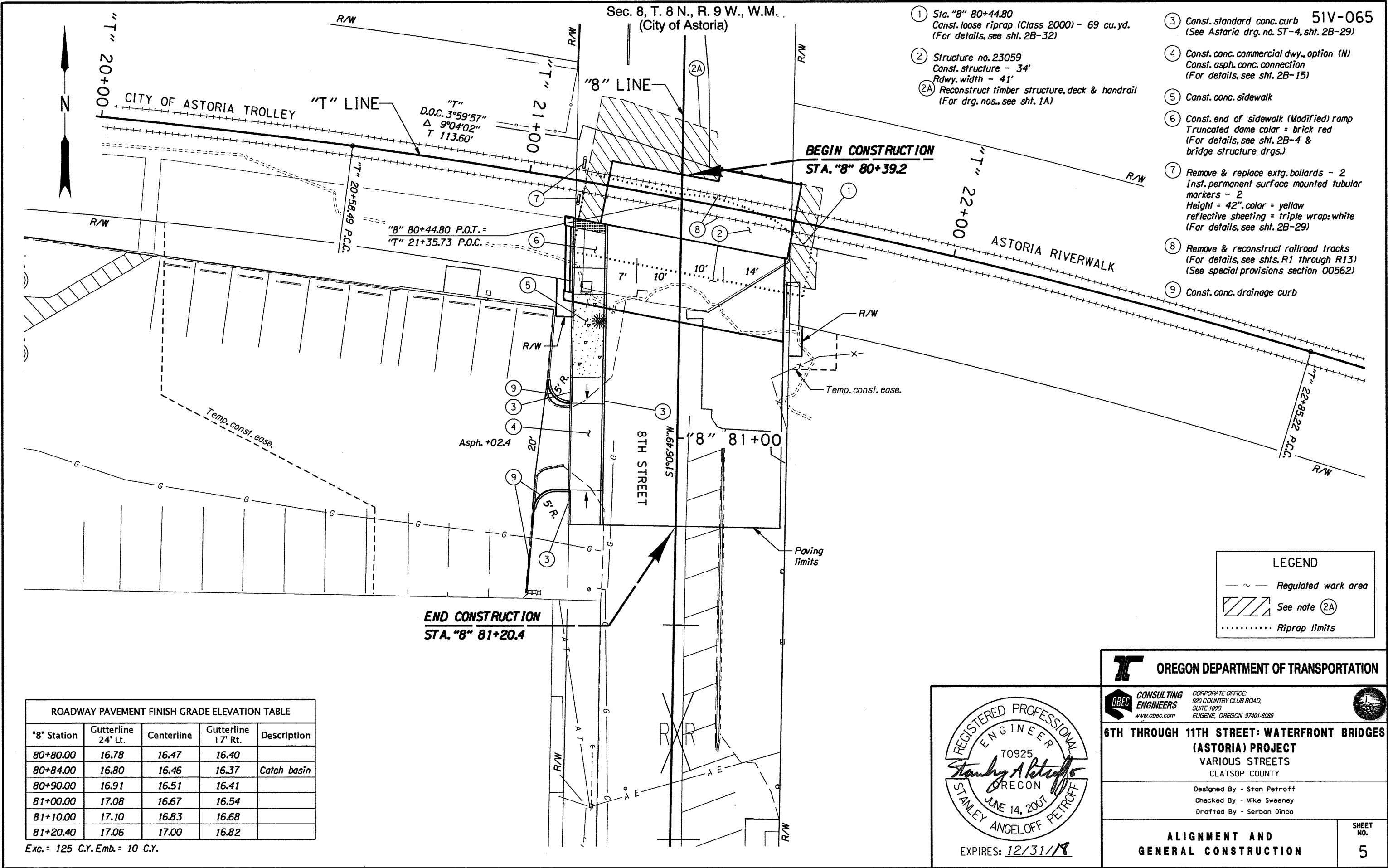
CORPORATE OFFICE:
920 COUNTRY CLUB ROAD,
SUITE 100B
EUGENE, OREGON 97401-6089

6TH THROUGH 11TH STREET: WATERFRONT BRIDGES
(ASTORIA) PROJECT
VARIOUS STREETS
CLATSOP COUNTY

Designed By - Stan Petroff
Checked By - Mike Sweeney
Drafted By - Serban Dinca

ALIGNMENT AND
GENERAL CONSTRUCTION

SHEET NO.
3



ROADWAY PAVEMENT FINISH GRADE ELEVATION TABLE				
"8" Station	Gutterline 24' Lt.	Centerline	Gutterline 17' Rt.	Description
80+80.00	16.78	16.47	16.40	
80+84.00	16.80	16.46	16.37	Catch basin
80+90.00	16.91	16.51	16.41	
81+00.00	17.08	16.67	16.54	
81+10.00	17.10	16.83	16.68	
81+20.40	17.06	17.00	16.82	

Exc. = 125 C.Y. Emb. = 10 C.Y.



EXPIRES: 12/31/18

OREGON DEPARTMENT OF TRANSPORTATION



CORPORATE OFFICE:
920 COUNTRY CLUB ROAD,
SUITE 100B
EUGENE, OREGON 97401-6089

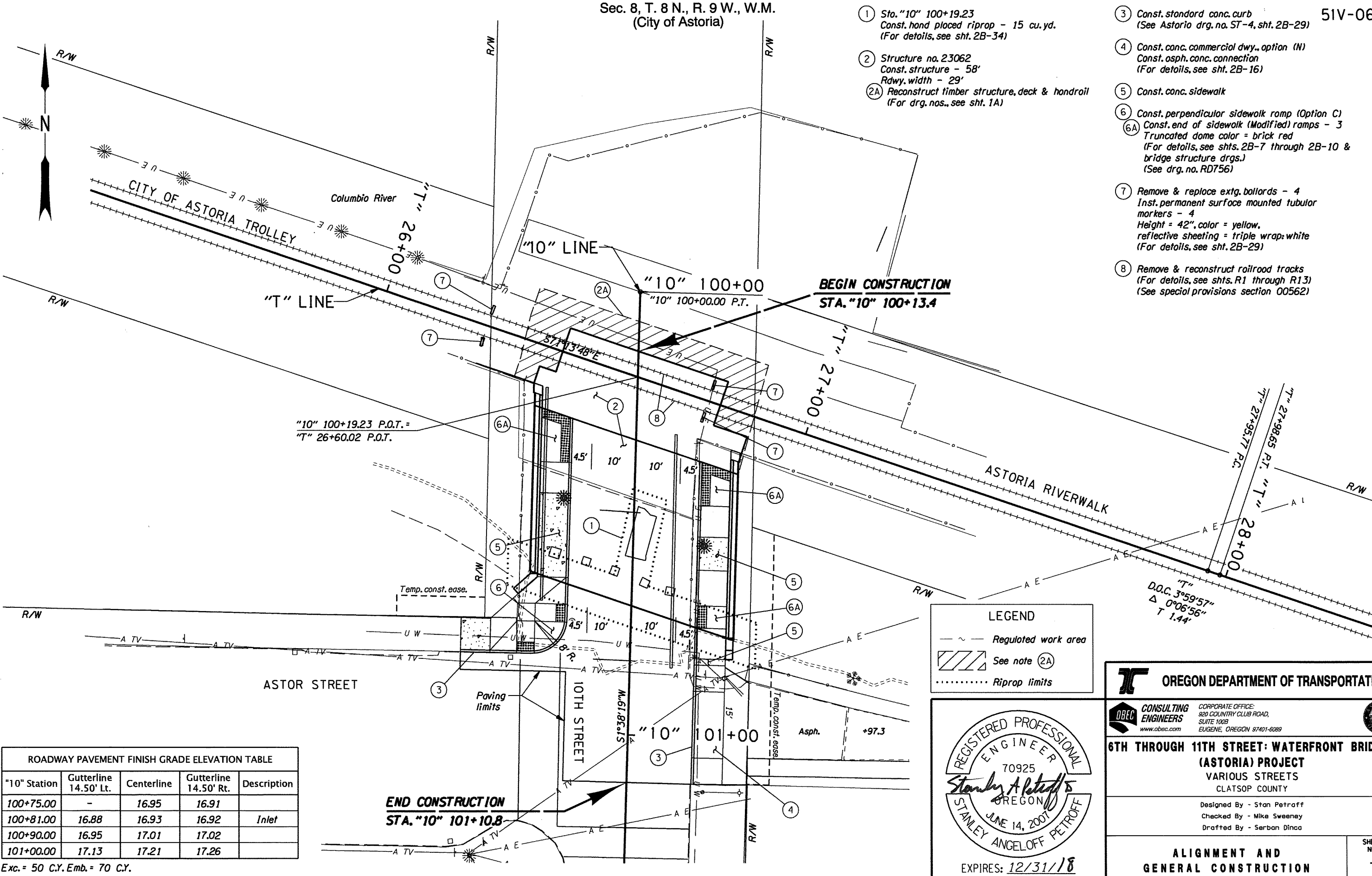
**6TH THROUGH 11TH STREET: WATERFRONT BRIDGES
(ASTORIA) PROJECT
VARIOUS STREETS
CLATSOP COUNTY**

Designed By - Stan Petroff
Checked By - Mike Sweeney
Drafted By - Serban Dinca

**ALIGNMENT AND
GENERAL CONSTRUCTION**

SHEET
NO.
5

Sec. 8, T. 8 N., R. 9 W., W.M.
(City of Astoria)



- 1 Sto. "10" 100+19.23
Const. hand placed riprap - 15 cu. yd.
(For details, see sht. 2B-34)
- 2 Structure no. 23062
Const. structure - 58'
Rdwy. width - 29'
- 2A Reconstruct timber structure, deck & handrail
(For drg. nos., see sht. 1A)

- 3 Const. standard conc. curb
(See Astoria drg. no. ST-4, sht. 2B-29)
- 4 Const. conc. commercial dwy., option (N)
Const. asph. conc. connection
(For details, see sht. 2B-16)
- 5 Const. conc. sidewalk
- 6 Const. perpendicular sidewalk ramp (Option C)
- 6A Const. end of sidewalk (Modified) ramps - 3
Truncated dome color = brick red
(For details, see shts. 2B-7 through 2B-10 & bridge structure drgs.)
(See drg. no. RD756)
- 7 Remove & replace extg. ballards - 4
Inst. permanent surface mounted tubular markers - 4
Height = 42", color = yellow,
reflective sheeting = triple wrap, white
(For details, see sht. 2B-29)
- 8 Remove & reconstruct railroad tracks
(For details, see shts. R1 through R13)
(See special provisions section 00562)

LEGEND

- Regulated work area
- See note (2A)
- Riprap limits

REGISTERED PROFESSIONAL ENGINEER
70925
Stanley A. Petroff
OREGON
JUNE 14, 2007
STANLEY ANGELOFF PETROFF
EXPIRES: 12/31/18

ROADWAY PAVEMENT FINISH GRADE ELEVATION TABLE				
"10" Station	Gutterline 14.50' Lt.	Centerline	Gutterline 14.50' Rt.	Description
100+75.00	-	16.95	16.91	
100+81.00	16.88	16.93	16.92	Inlet
100+90.00	16.95	17.01	17.02	
101+00.00	17.13	17.21	17.26	

Exc. = 50 C.Y. Emb. = 70 C.Y.

OREGON DEPARTMENT OF TRANSPORTATION

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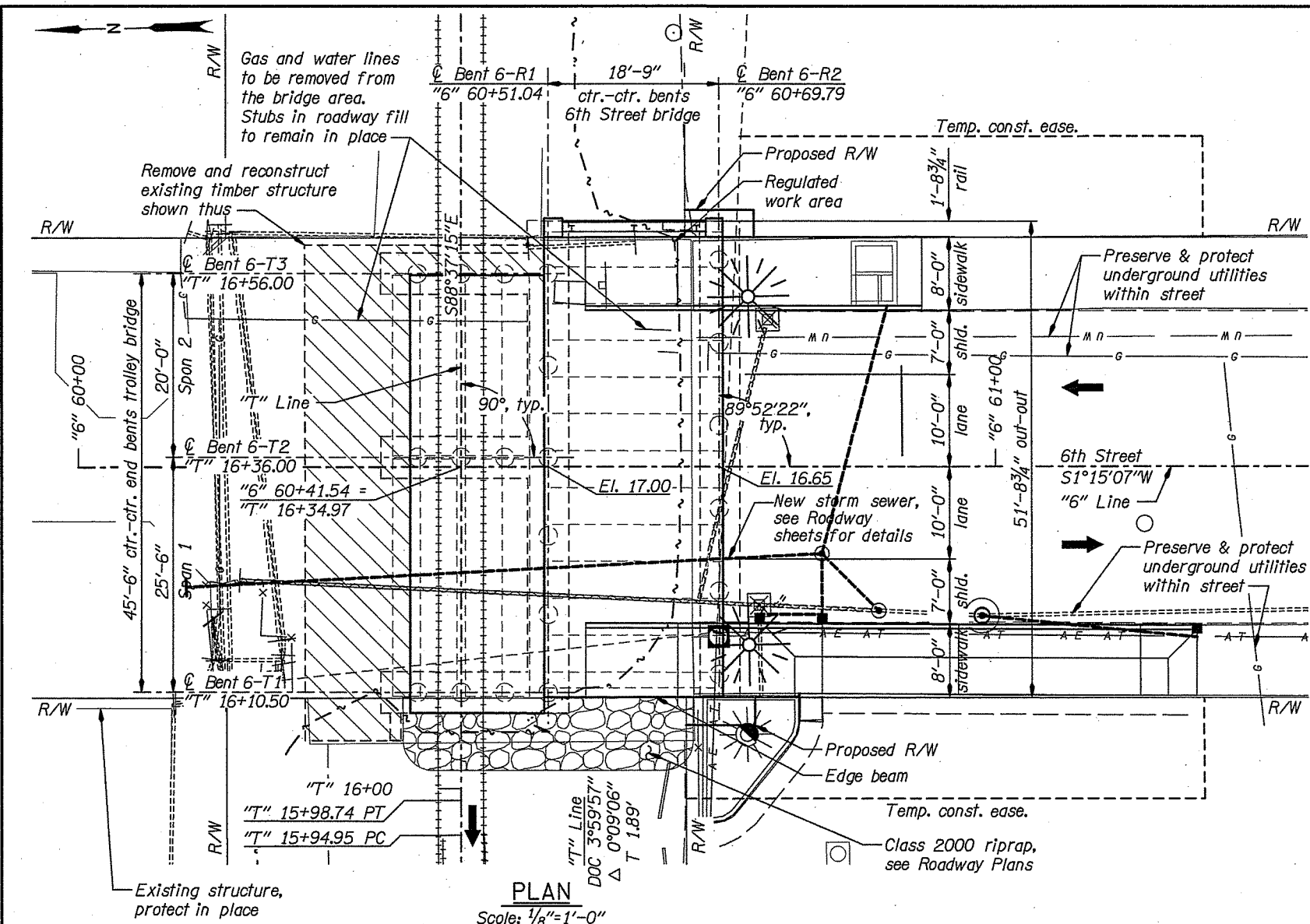
CORPORATE OFFICE:
920 COUNTRY CLUB ROAD,
SUITE 100B
EUGENE, OREGON 97401-6089

6TH THROUGH 11TH STREET WATERFRONT BRIDGES (ASTORIA) PROJECT
VARIOUS STREETS
CLATSOP COUNTY

Designed By - Stan Petroff
Checked By - Mike Sweeney
Drafted By - Serban Dinca

ALIGNMENT AND GENERAL CONSTRUCTION

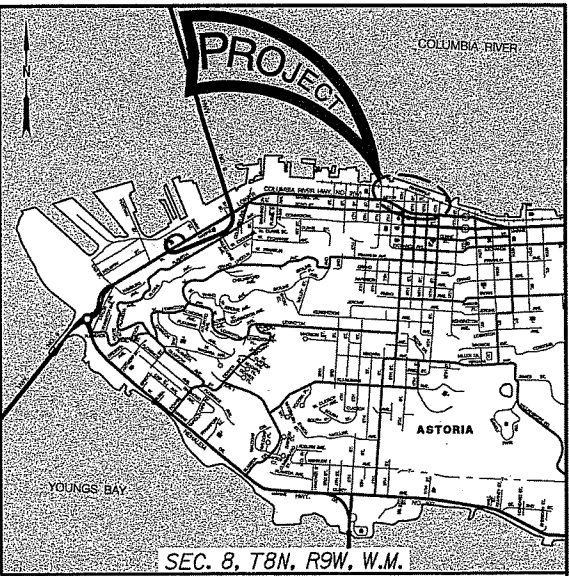
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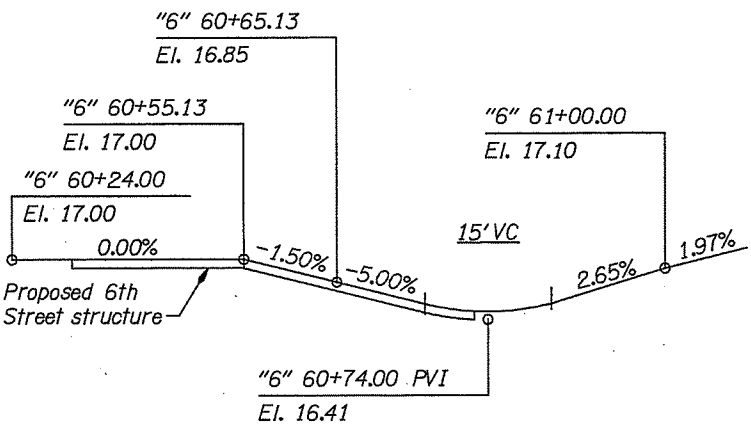
Notes:
Elevations shown are finish grade at "6" Line at \angle of bents.

All existing utilities to be relocated by others unless otherwise noted.

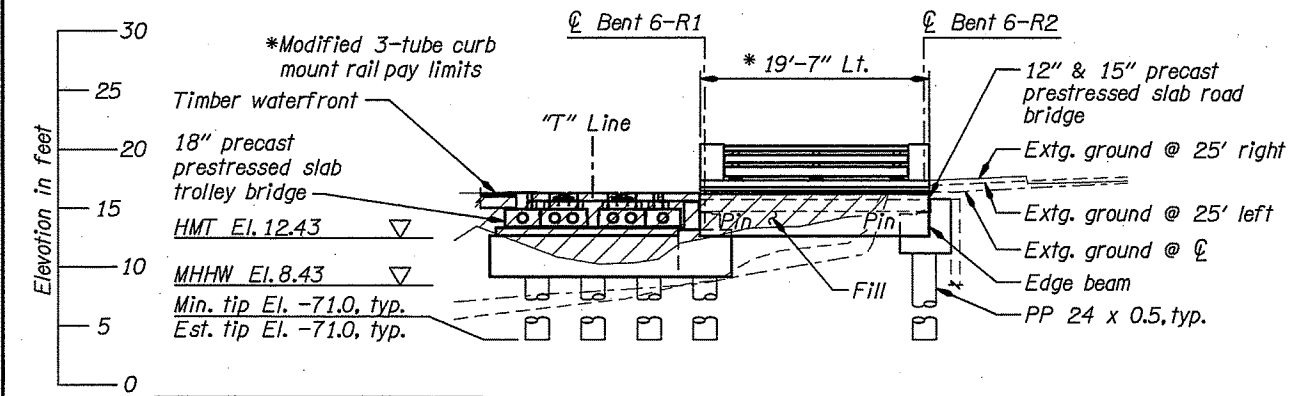
Existing bridge is load restricted. Provide temporary shoring or work platform as required to support construction loads.



LOCATION MAP
No Scale



"6" GRADELINE DIAGRAM
No Scale

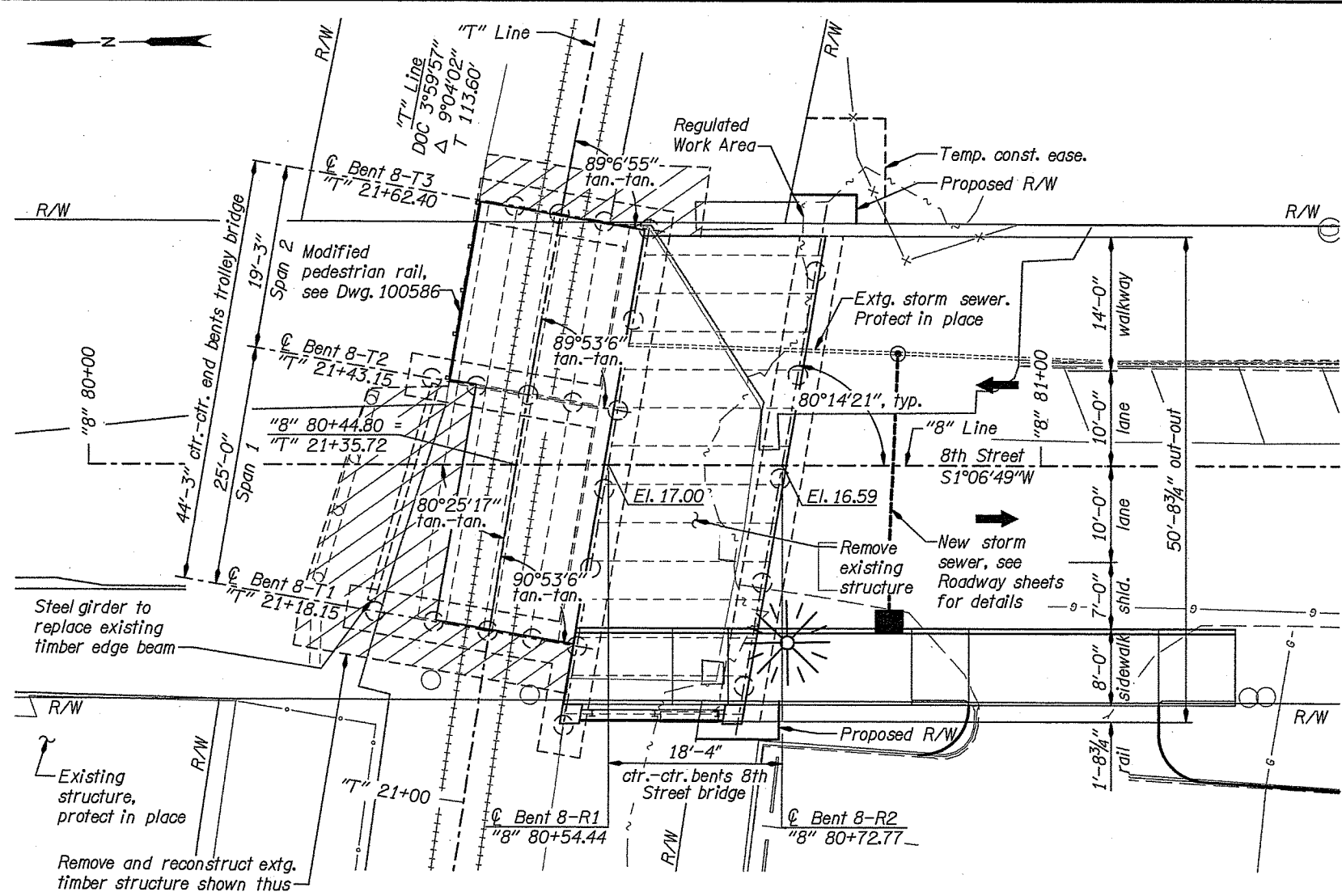


"T" GRADELINE DIAGRAM
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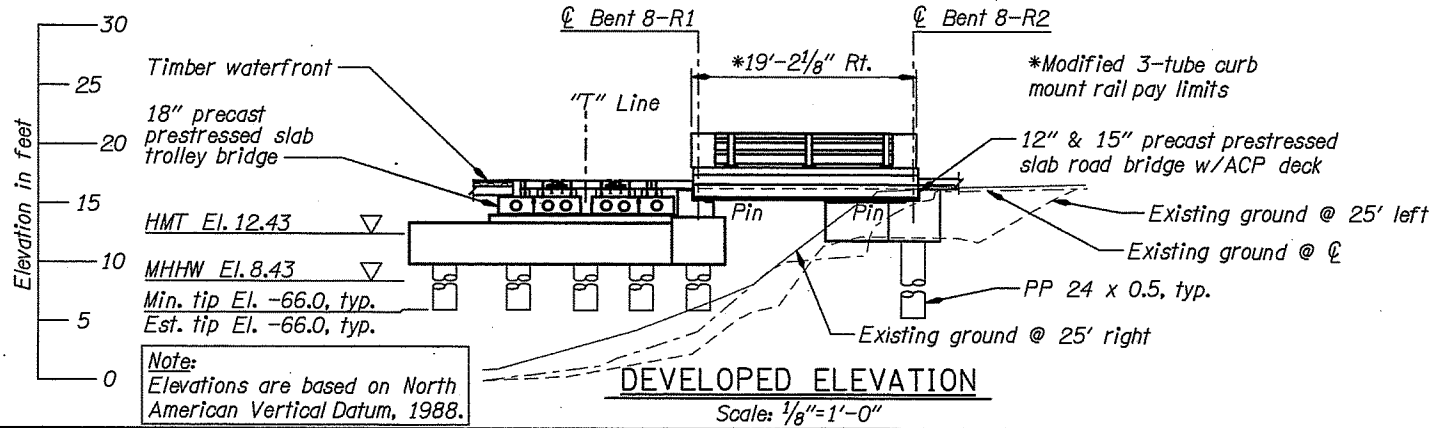
Note:
Elevations are based on North American Vertical Datum, 1988.

ELEVATION
Scale: 1/8"=1'-0"

		DATE	REVISION	BY



PLAN
Scale: 1/8"=1'-0"



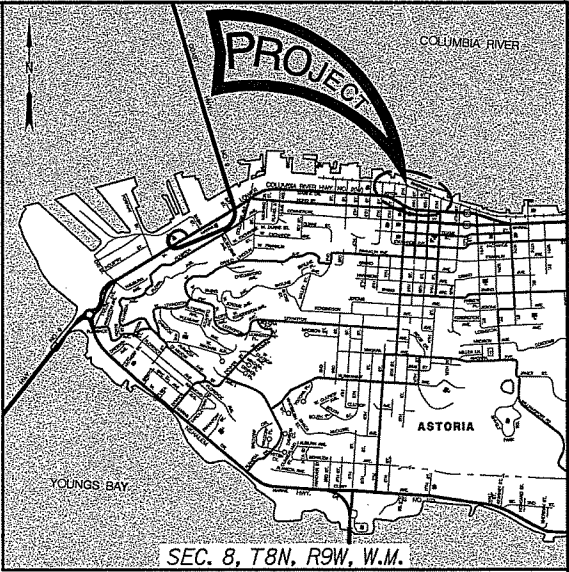
DEVELOPED ELEVATION
Scale: 1/8"=1'-0"

Notes:

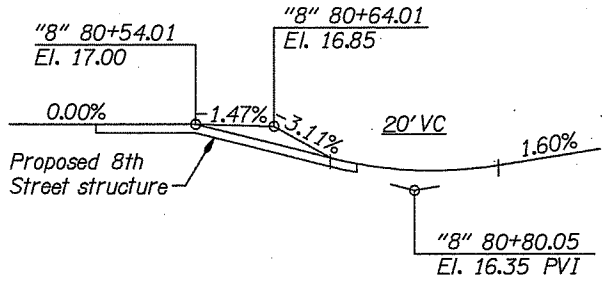
Elevations shown are finish grade at "8" Line at \mathcal{C} of bents.

All existing utilities to be relocated by others unless otherwise noted.

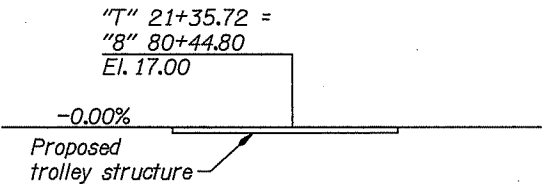
Existing bridge is load restricted. Provide temporary shoring or work platform as required to support construction loads.



LOCATION MAP
No Scale




"8" GRADELINE DIAGRAM
No Scale

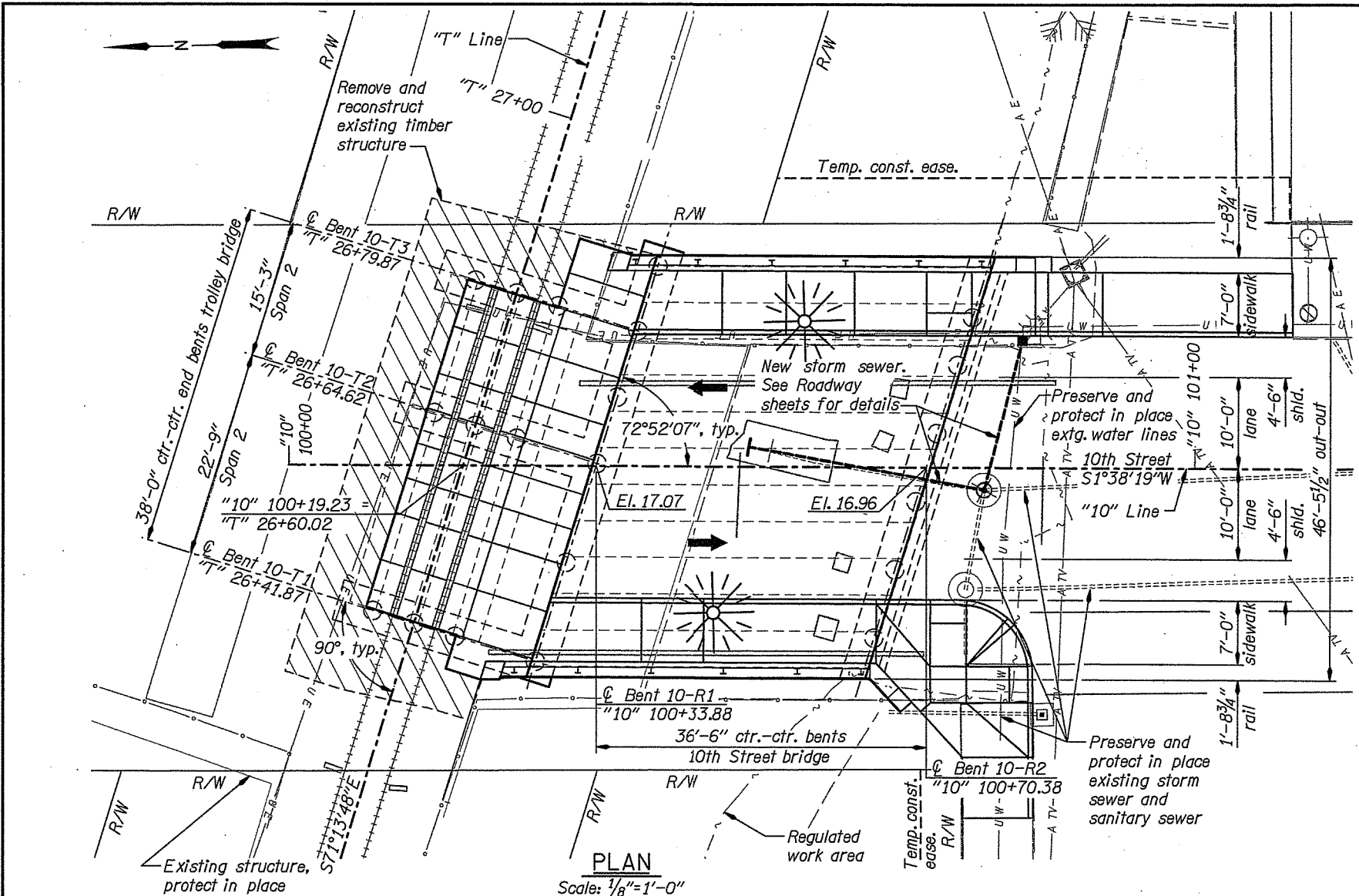


"T" GRADELINE DIAGRAM
No Scale

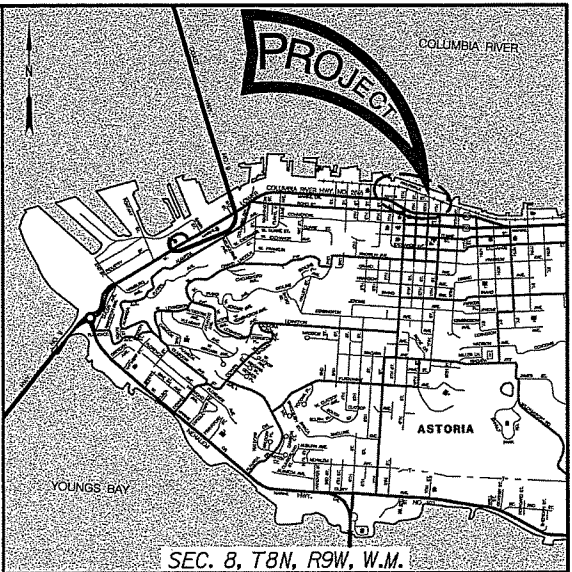
SCALE WARNING

If scale bar does not measure one inch then drawing is not to scale

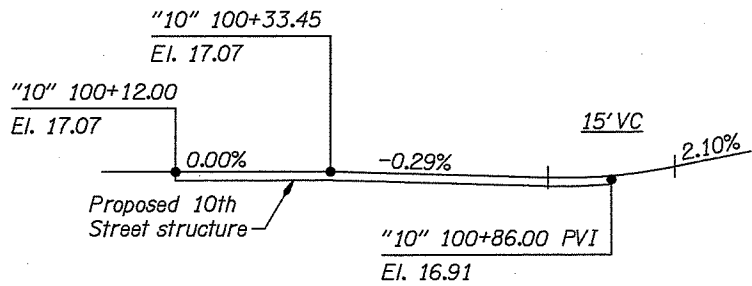
		DATE	REVISION	BY



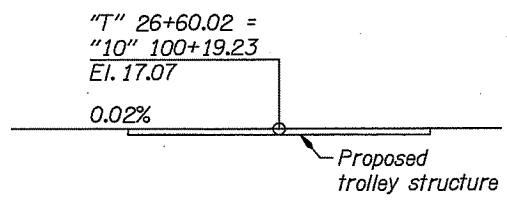
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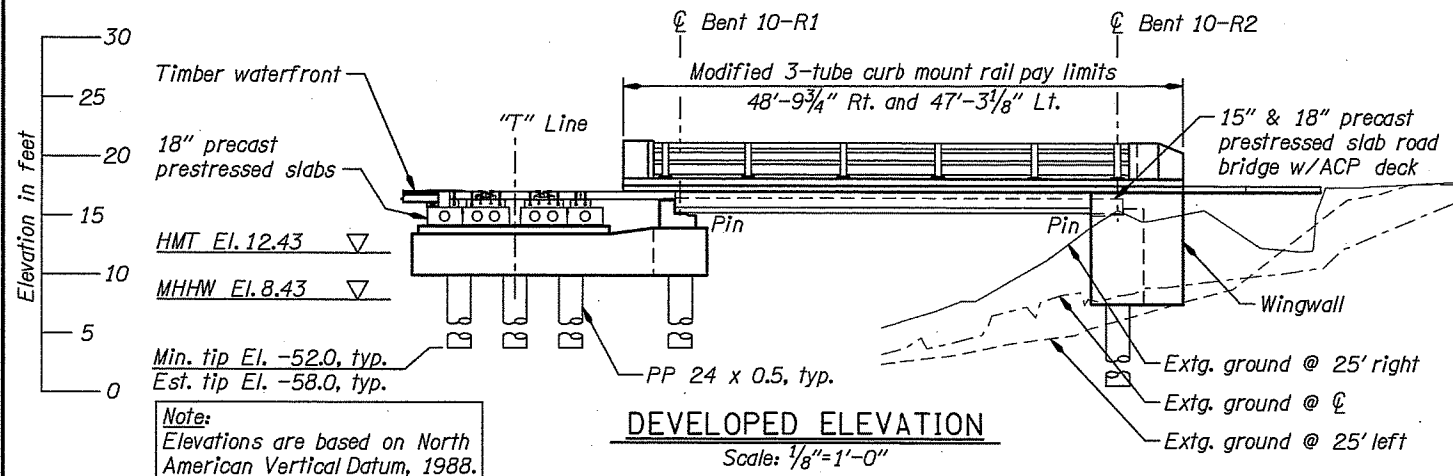
LOCATION MAP
No Scale



"10" GRADELINE DIAGRAM
No Scale



"T" GRADELINE DIAGRAM
No Scale



SCALE WARNING
If scale bar does not measure one inch then drawing is not to scale

		DATE	REVISION	BY	OBEC CAD					STRUCTURE NO.		10TH STREET BRIDGE @ WATER FRONT		SHEET	
					DRAFTER:			OREGON DEPARTMENT OF TRANSPORTATION		23062		6TH THROUGH 11TH STREET: WATERFRONT BRIDGES		1	
					DESIGNER:					DATE		(ASTORIA) PROJECT		OF	
					CHECKER:					March 2018		10TH STREET (MP 0.00)		31	
					REVIEWER:					CALC. BOOK		CLATSOP COUNTY		DRAWING NO.	
ACCOMPANIED BY DWGS. 100622-100651, BR208, BR209, BR405, BR410, BR445					Peter R. Pagter, PE, SE				6990		PLAN AND ELEVATION		100621		