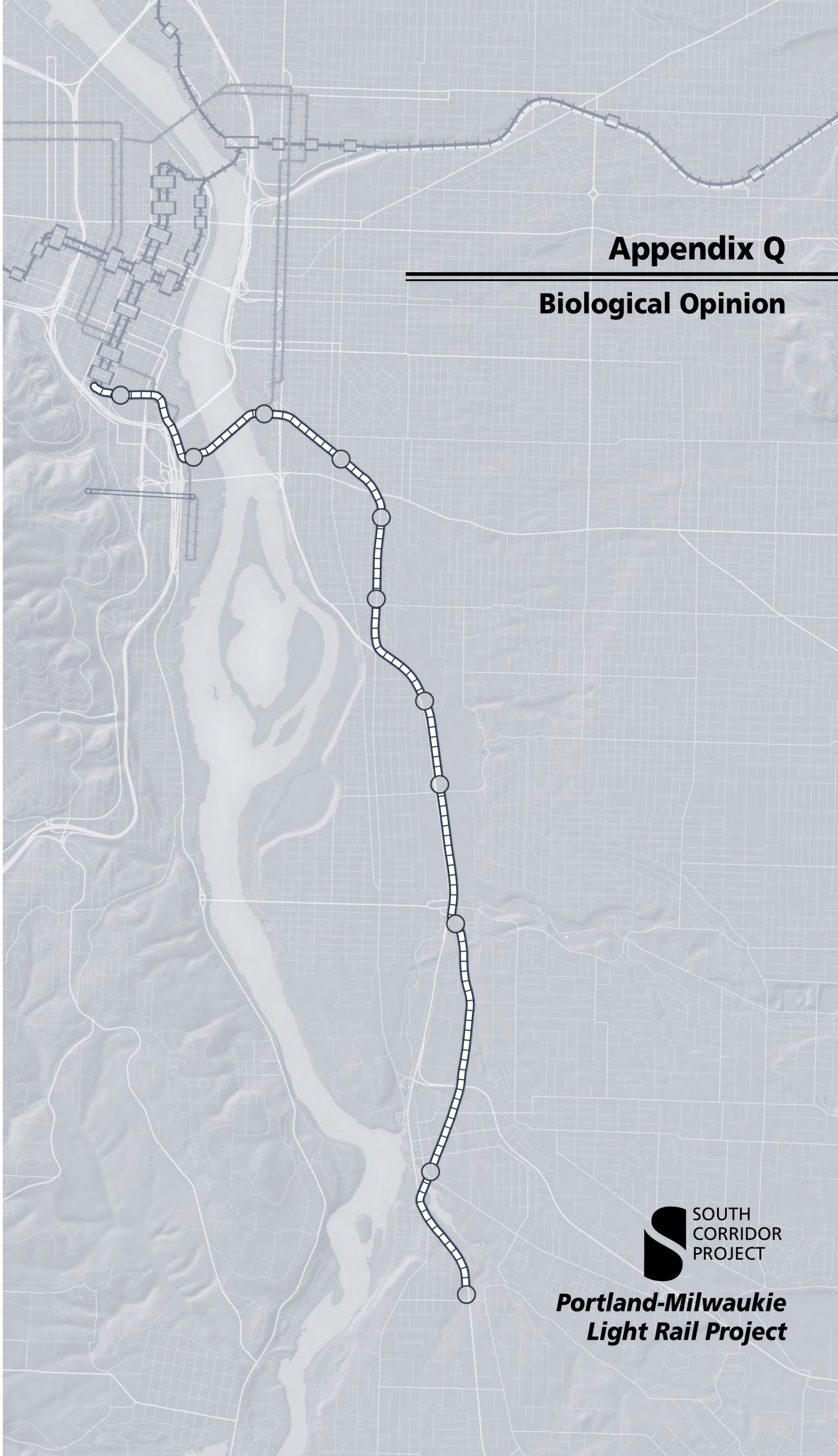

Appendix Q

Biological Opinion

SOUTH
CORRIDOR
PROJECT

Portland-Milwaukie Light Rail Project

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to NMFS No:
2009/05649

June 23, 2010

R.F. Krochalis
Regional Administrator
Attn: Steve Saxton
Federal Transit Administration
915 Second Ave., Suite 3142
Seattle, Washington 98174

Re: Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Conservation Recommendations for the Portland-Milwaukie Light Rail Project, Multnomah and Clackamas Counties, Oregon (6th Field HUCs: 170900120302, 170900120103 and 170900120102)

Dear Mr. Krochalis:

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of the proposed Portland to Milwaukie Light Rail Project being partially financed by the Federal Transit Administration (FTA) through a New Starts Fund (49 U.S.C. 5309) grant to TriMet and Metro, the local agency applicants. In this Opinion, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) spring-run Chinook salmon, LCR coho salmon (*O. kisutch*), LCR steelhead (*O. mykiss*), and UWR steelhead or result in the destruction or adverse modification of designated critical habitat for LCR Chinook salmon, UWR Chinook salmon, LCR steelhead, and UWR steelhead. Critical habitat has not been proposed or designated for LCR coho salmon. NMFS also concludes that the proposed action is not likely to adversely affect green sturgeon (*Acipenser medirostris*) and Columbia River (CR) chum (*O. keta*).

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the Opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that FTA must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. The conservation recommendations are a subset of the ESA take statement's terms and conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendations, FTA must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

If you have questions regarding this consultation, please contact Christy Fellas in the Willamette Basin Habitat Branch of the Oregon State Habitat Office at 503.231.2307.

Sincerely,

William W. Stelle, Jr.
Regional Administrator

cc: Bill Hall, Parametrix
Steve Saxton, FTA
Mark Turpel, Metro
Dave Unsworth, TriMet

Endangered Species Act
Biological Opinion

and

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat
Conservation Recommendations

for the

Portland-Milwaukie Light Rail Project,
Multnomah and Clackamas Counties, Oregon
6th Field HUCs: 170900120302, 170900120103 and 170900120102

Lead Action Agency: Federal Transit Administration

Consultation Conducted By: National Marine Fisheries Service
Northwest Region

Date Issued: June 23, 2010

Issued by:

William W. Stelle, Jr.
Regional Administrator

NMFS No.: **2009/05649**

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INTRODUCTION

This document contains a biological opinion (Opinion) that was prepared by National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402.[1] It also contains essential fish habitat (EFH) conservation recommendations prepared by NMFS in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, *et seq*.) and implementing regulations at 50 CFR 600. The Opinion and EFH conservation recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Data Quality Act) (44 U.S.C. 3504 (d)(1) and 3516), and underwent pre-dissemination review. The administrative record for this consultation is on file at the Oregon State Habitat Office in Portland, Oregon

Background and Consultation History

The Federal Transit Administration (FTA) proposes to partially fund, through the New Starts Fund (49. U.S.C. 3509), the proposed Portland to Milwaukie Light Rail (PMLR) project, in coordination with local agency applicants Metro and TriMet, to connect the City of Portland, City of Milwaukie and north Clackamas County. In 2007, the project team began coordination with NMFS to refine the designs for the stream crossings and pier locations. In the fall of 2008, a draft Biological Assessment (BA) was prepared and shared with NMFS and several interagency meetings and site visits were subsequently held to refine designs, impacts and develop mitigation plans.

On October 15, 2009, FTA initiated formal consultation with NMFS and submitted the final BA. FTA determined that the proposed project is likely to adversely affect Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) spring-run Chinook salmon, LCR coho salmon (*O. kisutch*), LCR steelhead (*O. mykiss*), and UWR steelhead and their designated critical habitats. Critical habitat has not yet been designated for LCR coho salmon. FTA also determined that the proposed project is not likely to adversely affect green sturgeon (*Acipenser medirostris*) and Columbia River (CR) chum (*O. keta*). Critical habitat for CR chum does not extend in to the Willamette River, and at the time the BA was completed, critical habitat for green sturgeon was proposed.

On December 14, 2009, FTA, NMFS and the project team had a meeting to discuss sediment analysis, scour protection for the Willamette River bridge, mitigation options, pile driving and riparian plantings. On February 2, 2010, FTA submitted amendments to the BA to refine the items discussed at the December 14, 2009 meeting. On April 14, 2010, FTA submitted the finalized locations for pile removal mitigation. On May 25, 2010, FTA submitted additional mitigation plans to be included in the proposed project.

NMFS concurs with FTA's determination that the proposed project is likely to adversely affect LCR Chinook salmon, UWR spring-run Chinook salmon, LCR coho salmon (*O. kisutch*), LCR

[1] With respect to designated critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02.

steelhead (*O. mykiss*), and UWR steelhead and their designated critical habitats, except LCR coho which has not yet been proposed or designated. NMFS also concurs with FTA's determination that the proposed action is not likely to adversely (NLAA) affect CR chum, as NMFS does not expect CR chum individuals to be in the action area. Any effects of the proposed project on CR chum are unlikely and therefore discountable due to lack of exposure of chum individuals. CR chum will not be discussed further in this Opinion.

Since the BA was completed in October 2009, critical habitat has been designated for green sturgeon. NMFS concurs that the proposed action is NLAA green sturgeon and also determined it will not affect the designated critical habitat, since no individuals are likely to be in the action area and the final critical habitat designation did not include the Willamette River. The nearest location of report green sturgeon is in the Columbia River, 12 miles downstream and any effects of the proposed action on green sturgeon are discountable. Green sturgeon will not be discussed further in this Opinion.

Description of the Proposed Action

Project Coordination. Since 2007, when FTA and the project team began coordinating with NMFS, they have also been coordinating with a proposed contaminant cleanup proposed at the ZRZ Realty/Zidell (ZRZ) property which overlaps with the proposed west bent of the new Willamette River bridge for the PMLR project. The most recent timelines propose that the bridge construction will begin and the contaminants will be cleaned up during the in-water work window of July 1 – October 31, 2011. NMFS attended several interagency meetings in late 2009 to discuss difficulties of completing two construction projects in the same location at the same time. Construction decisions for the PMLR bridge over the Willamette River, such as placement of rock for scour protection, could preclude cleanup options at the ZRZ property. As of the date of this Opinion, the ZRZ ESA section 7 consultation is still in process and the outcome is unknown.

Interrelated and Interdependent Actions. FTA identified several interrelated and interdependent actions[2] in the BA for the PMLR project. For the purposed of consultation under the ESA, NMFS agrees that the following two actions are interrelated and interdependent to the PMLR:

- The Portland Streetcar Loop project published a NEPA Environmental Assessment (EA) in February 2008, and received a Finding of No Significant Impact (FONSI) from the FTA in July 2008. The project was awarded a federal grant for construction in 2009. As described in the EA, long-range plans for the streetcar system called for a southern crossing of the Willamette River. Although the Portland Streetcar Loop project to the east side of the Willamette River down to OMSI is now being completed and would connect to the Portland-Milwaukie Light Rail Project at the OMSI Station, completing the southern east-west connection for streetcar will add greater utility and efficiency within

[2] As defined in 50 CFR§402.02, Interdependent actions are actions having no independent utility apart from the proposed action and interrelated actions are actions that are part of a larger action and depend on the larger action for their justification.

the overall transit network. The South Waterfront Plan (adopted by the City of Portland under Resolution #36111 and Ordinance #177082, on November 13, 2002, and effective January 20, 2003) supports overall City of Portland and regional objectives to manage future population and employment growth by focusing it in already urbanized areas, served by a transportation system that reduces the need for the automobile. Several planned activities are under way within the South Waterfront area of the City of Portland, with a variety of parties involved. The locally preferred alternative for the Portland-Milwaukie Light Rail Project was developed in close cooperation with the City of Portland and other parties, but the South Waterfront Plan and the individual initiatives are not considered interdependent.

- ZRZ cleanup as described above in the project coordination section.

The PMLR alignment crosses seven streams: the Lower Willamette River, Crystal Springs Creek, Johnson Creek, Crystal Creek, Spring Creek, Kellogg Lake, and Courtney Springs Creek and proposes work near Fairview creek (Figure 1). Of those, the Lower Willamette River, Crystal Springs Creek, Johnson Creek, and Kellogg Lake support fish species listed as threatened under the federal ESA.

Project elements affect ESA-listed species include in-water work such as pile driving, fill placement, scour protection, fish salvage and habitat creation. The proposed action and each location will be discussed in detail below.

Crystal Creek, Spring Creek, Courtney Springs Creek and Fairview Creek. NMFS determined that the proposed project components occurring at Crystal Creek, Spring Creek, Courtney Springs Creek and Fairview Creek are NLAA ESA-listed salmon and steelhead. The proposed culverts to be repaired and extended at Crystal Creek, Courtney Springs Creek and Spring Creek are located above multiple fish barriers and the action areas have no documented presence of ESA-listed fish[3] and are not designated as critical habitat.

Near Fairview Creek the Ruby Junction maintenance facility will be expanded but no construction will take place within 100 feet of the creek. Three parcels of land anticipated to be acquired for the expansion are located within the 100 year floodplain. The expansion would result in the same amount of pollutant-generating impervious surface as currently exists, and all stormwater will be infiltrated onsite.

Based on the above, NMFS determined that the Crystal Creek, Courtney Springs Creek and Spring Creek culvert repairs and upgrades and the Ruby Junction maintenance facility upgrade near Fairview Creek are NLAA ESA-listed salmon and steelhead or their critical habitats and will not be discussed further in this Opinion.

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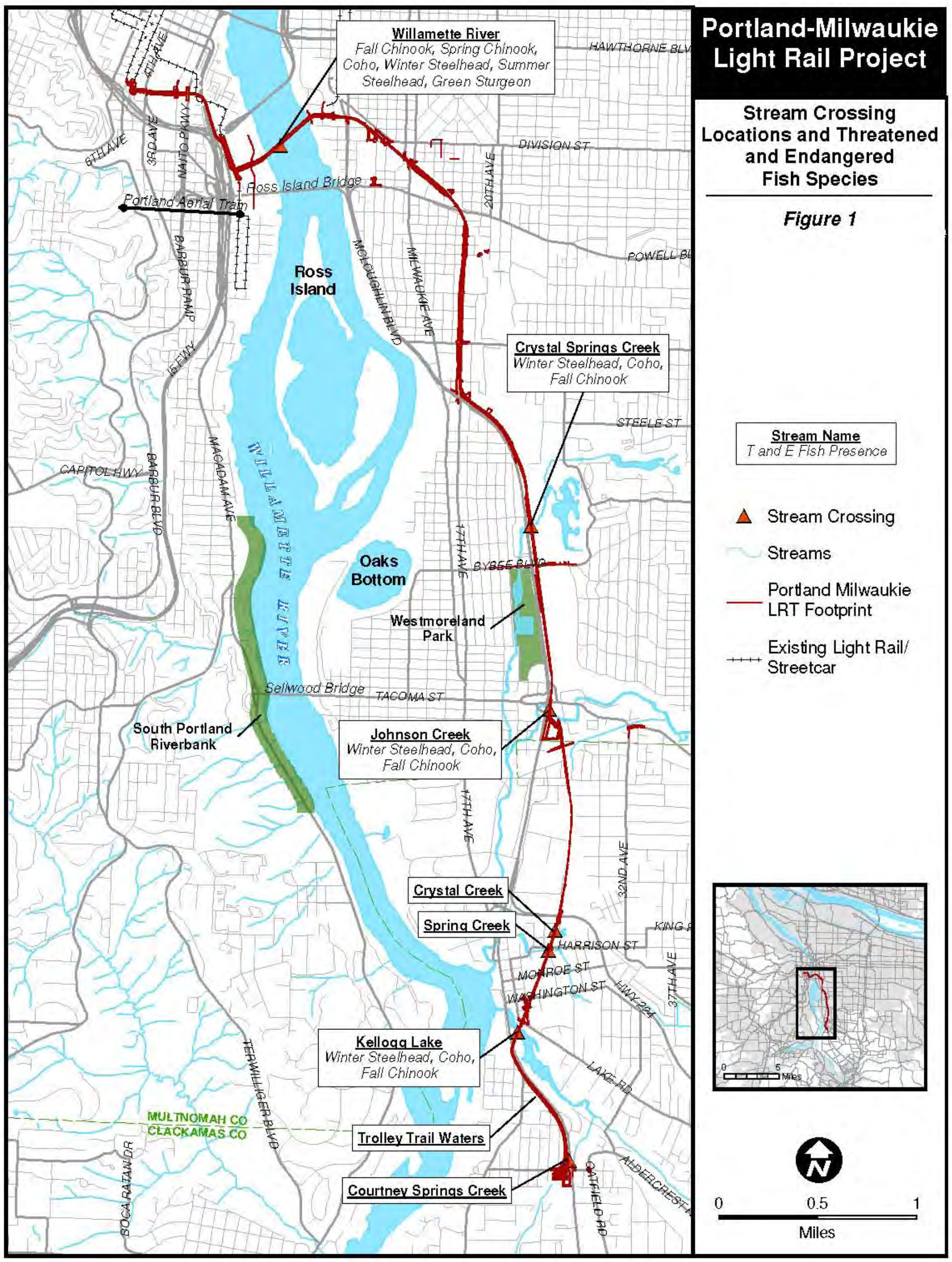
[3] Lack of fish presence documented by search of fish distribution maps at www.streamnet.org and based on professional judgment of ODFW fish biologists present at the site visit.

Figure 1. PMLR project proposed stream crossing and alignment from Portland to Milwaukie. Drawing provided in BA submitted by FTA.



Willamette River. The Willamette River bridge will be a cable-stayed structure with a width of between 66 and 83 feet, including the wind nose, and a total length of approximately 1,720 feet from abutment to abutment. This bridge design entails five spans with two abutments (Abutments 1 and 6), two towers located in the river (Towers 3 and 4), and two landside piers (Bents 2 and 5) above the ordinary high water line (OHW). Bent 2 is above the top of bank and Bent 5 is below the top of the bank (Figure 2). The bridge will provide a vertical clearance for marine navigation of between 75 and 85 feet.

Permanent components of the bridge design include:

- Two in-water piers (Towers 3 and 4), each consisting of a set of nine 10-foot diameter drilled shafts.
- One concrete pile cap for each pier (each pile cap will be approximately 100 feet in diameter and 14 feet deep; pile caps will be placed at the waterline, *i.e.*, the bottom of the pile cap will be at an approximate elevation of -5 feet [COP datum]).
- Up to 18 ship-fendering piles and up to 18 navigation assistance piles.
- Scour protection to protect temporary work structures and prevent resuspension of contaminated sediments.

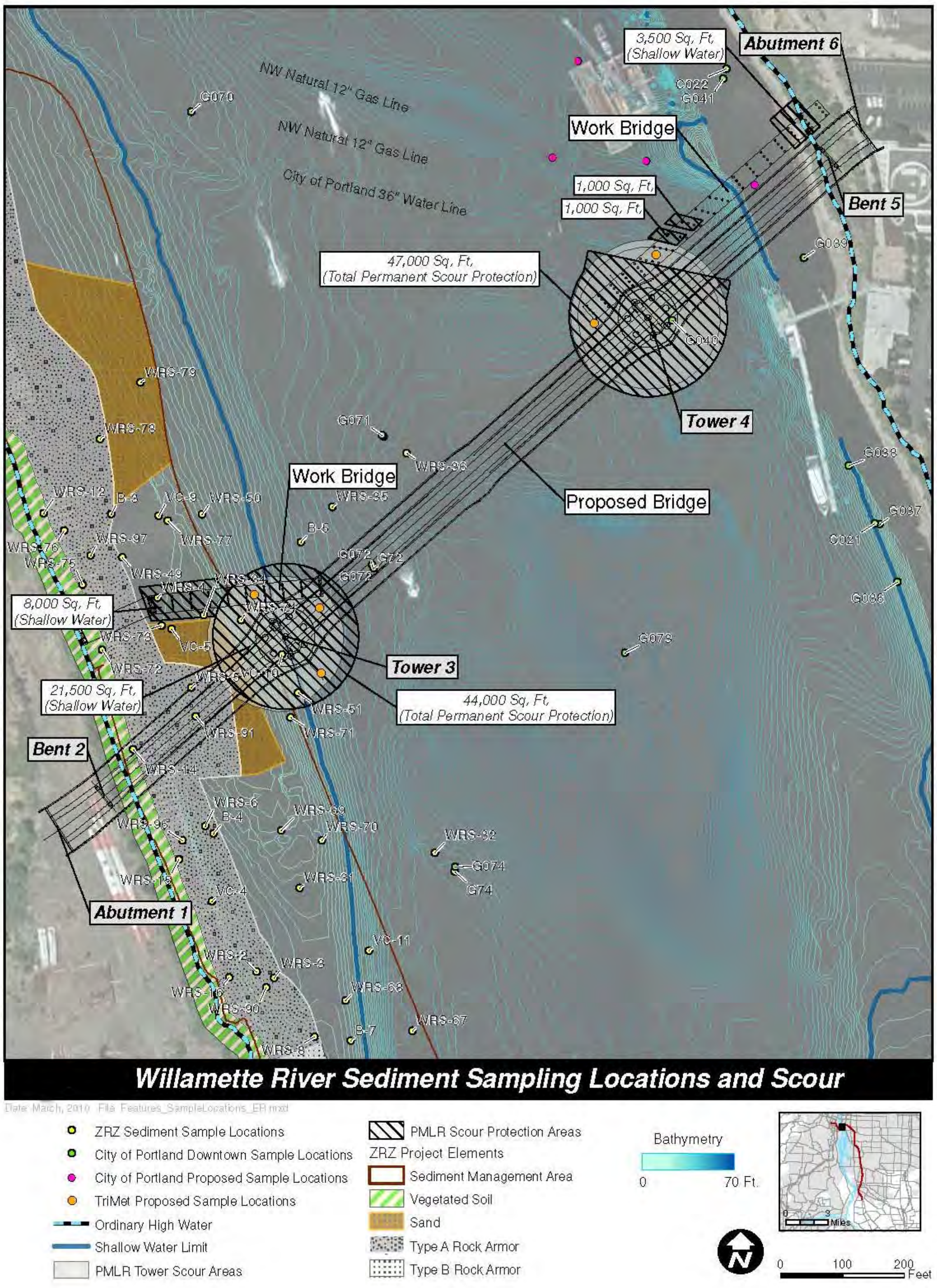
Temporary components include:

- Two 100-foot diameter cofferdams for construction of the in-water piers.
- Up to 126 piles (maximum 36-inch diameter) for two work bridges, one from each bank to the permanent pier locations, of which up to 114 piles will be located below OHW.

A work bridge will be constructed from each bank to the in-water pier locations. These temporary piles for the work bridge will include up to 126 total (with 114 in-water) steel pipe piles, each up to 36 inches in diameter and 20 to 100 feet long. The western work bridge will span approximately 125 feet from the riverbank across the proposed sediment cap to be placed by ZRZ. The remainder of the work bridges will have bents that are placed approximately 30 feet apart. All in-water work will occur during the Willamette River in-water work window of July 1 to October 31.

Contaminated in-water sediments associated with historical landside industrial activities are present in the project area. Sediments within the footprint of the work bridge on the west side within ZRZ's sediment management area (SMA) will be covered by this project with a clean sand layer prior to pile installation. The purpose of the clean sand layer is to limit the extent to which contaminants will be resuspended in the water column and transported downriver during pile installation and removal.

Figure 2. Detailed drawing of the proposed crossing on the Willamette River as provided in the BA submitted by FTA.



Piles will be driven initially by vibratory methods into the cemented gravel layer, estimated to occur at 60 to 80 feet below the mudline of the river. Once the gravel layer is reached, piles may need to be struck with an impact hammer up to 100 times to reach their required load-bearing capacity. Use of hydroacoustic attenuation methods (*e.g.*, bubble curtains, temporary noise attenuation piles) will be used during impact driving and a 10 decibel (dB) reduction in sound is assumed from the proposed attenuation. Work bridge piles will be installed simultaneously on both sides of the river. After piles for the western work bridge are driven, Type B rock will be placed around the work bridge piers to protect the structure from scour for up to a ten-year flow event.

The total driving duration for each pile is estimated to be 1 to 4 hours, or between two and eight piles per day. These numbers will depend on the number of cranes, whether piles are pre-spliced, and whether cranes are located on the work bridge or a barge. Approximately four piles will typically be "proofed" per day (200 impact blows) and the maximum probable blows is for 20 piles, or 800 impact blows within any given 12-hour period.

Scour protection associated with Tower 3 on the west side of the river will be placed to limit resuspension of contaminated sediments within and outside of the identified SMA and to protect the proposed ZRZ sediment caps. The bridge towers are designed to withstand a 500-year flow without the need for scour protection. Permanent scour protection around Tower 3 will consist of 1 foot of sand overlain 4 feet of mixed Class 100 (100 pounds, less than 13" diameter) and Type B (rounded 8" diameter and smaller) rock. The total thickness of additional sand and rock armor will be 5 feet.

Permanent scour protection at Tower 4, to protect a City of Portland 36-inch diameter water supply pipe and to limit the resuspension and redeposition of contaminated sediments, entails a 1-foot layer of sand overlain by rock armor blanket along the water supply pipe that consists of 7-foot thick layer of mixed Class 200 (200 pounds, less than 16" diameter) and Type B rock. In addition, a rock armor blanket would be placed around the Tower 4 pile group and would be comprised of a 1 foot sand layer overlain by a 4 foot layer of mixed Class 200 rock and Type B rock. A foot of sand would be placed in the scour area prior to the placement of the permanent scour. The Project may adjust rock size based on further analysis of supplemental sediment samples from the scour areas around Towers 3 and 4. Sand and rock associated with scour protection will be placed either from the completed work bridges or from barges during the first in-water work window.

Cofferdams for the in-water piers will be constructed of steel sheet pile and placed in an approximately 100-foot diameter circular pattern within the in-water work window. Individual sheets will be installed using vibratory methods. Once the cofferdam is in place, the water level will be lowered by pumping. Pumped water will be disposed of in accordance with applicable permits and regulations. Fish screens meeting NMFS and Oregon Department of Fish and Wildlife (ODFW) criteria will be installed on all pumps prior to pumping. Fish removal and salvage will be performed using approved methods by the ODFW and NMFS. An approximately 1-foot layer of clean sand will be placed at the bottom of both cofferdams to isolate potentially contaminated material. Then Type B and E rock armor will be placed for scour protection and then sand, gravels, and cobbles will be placed into the cofferdam to the bottom of the pile cap.

The placement of riverbed and scour protection materials inside the cofferdams will occur outside of the in-water work window, but will be isolated from the river. Riverbed and scour protection materials will be obtained from a permitted source, and will meet Sediment Evaluation Framework standards for in-water placement.

The two permanent in-water piers will be constructed within fully contained sand, gravels, and cobble islands on 18 ten-foot diameter drilled shafts, each between 160 and 200 feet in length. It is anticipated that the equipment used to install the drilled shafts will be mounted on one or more barges or work bridges around the perimeter of the sand island, and drilling operations are expected to be performed outside of the summer (July 1 to October 31) in-water work window for the Willamette River inside the cofferdam.

Drilled shaft steel casings will be installed using oscillatory (non-vibratory) or vibratory methods approximately to the depth of the Troutdale Formation, which is approximately 100 feet below mudline. Drilled shafts will be installed to approximately 40 feet into the Troutdale Formation. Installation of each 10-foot diameter drilled shaft will require approximately one week to vibrate or oscillate the temporary steel casings to the depth required and to construct each of the concrete shaft foundations.

The anticipated permanent bridge and temporary work bridge foundations are depicted in Appendix A of the BA. The construction contractor will prepare and submit a Work Area Isolation Plan, Temporary Erosion and Sediment Control Plan (TESCP) with Best Management Practices (BMPs), and a Pollution Control Plan (PCP) for TriMet's and NMFS' approval before beginning work. These plans will ensure that spills or leaks of contaminating substances are contained and that turbidity and erosion effects on the river are reduced. These plans will be monitored by TriMet throughout construction. Turbidity curtains for drilling and pile driving may be used, if necessary, to limit turbid discharges to the waterway. Sound attenuation techniques will be used for all in-water pile-driving using impact methods.

Shafts will be drilled to the required depth with a rotator-oscillator machine, which will be mounted on a barge or on the sand island cofferdam. Temporary casing pipe will be vibrated or rotated simultaneously with the excavation to prevent soil from entering the hole. Drilling slurry may also be pumped into the hole to facilitate auguring. Excavated soil will be captured, contained, and disposed of at an approved off-site facility. At Abutment 1, Bent 2, and Tower 3, excavated material in the upper 40 feet will be separated, stored, and characterized for hazardous contaminants. Based on its characterization, the waste material will be disposed of at an approved hazardous material facility.

In-water pipe and sheet piles will be driven using a crane- or barge-mounted vibratory hammer to either their required depth or the level where vibratory methods are no longer effective. Piles are anticipated to require splicing via field welding in order to extend down to the bearing layer. To reach the required capacity, piles will be "proofed" with an impact hammer. Sheet piles will not require proofing. Within the limits of the proposed ZRZ sediment cap, if implmented, a turbidity curtain will be installed around the pile, if deemed necessary, prior to pile driving and/or "proofing." A sound attenuation measure will also be used while an impact hammer is in use for in-water pile driving, in accordance with an approved monitoring plan. Piles installed above OHW or out of the water column are proposed to be installed with an impact hammer only. No sounds attenuation is proposed for piles above OHW or out of the water. The City of Portland water line and other underwater utility lines adjacent to the east work bridge and east cofferdam will be protected by a scour protection blanket.

The construction contractor may use barge-mounted equipment to accelerate the work. In-water piles will be installed using vibratory methods. When the pile can no longer be driven using vibratory methods, a diesel impact hammer will be used to proof each pile to the design capacity (30 to 50 blows). A noise attenuation method will be used to reduce hydroacoustic impacts. In addition, pile driving noise will be monitored per a Hydroacoustic Monitoring Plan. This plan may require a small amount of un-attenuated pile driving as a baseline for sound measurements before attenuation methods are used.

Temporary piles and sheet piles will typically be removed using only vibratory methods. After completion of drilled shafts and pile cap for each tower, the cofferdam will be allowed to fill with water, and then will be removed with vibratory methods. Cofferdam removal will occur during the approved in-water work period. The preferred removal approach will be with vibratory methods, but certain segments under the newly constructed bridge superstructure may be difficult to access, hazardous materials may be present, or areas may be adjacent to utilities. Therefore, it may become necessary to cut off some or all of the sheet piles at the ground line using underwater cutting torches. Pile caps for the in-water towers will be cast-in-place. Removal activities would occur during the in-water work window of July 1 through October 31.

If deemed necessary to deflect ships, up to eighteen 24-inch diameter (100-feet deep) steel pipe piles will be arranged in two “V” patterns upstream and downstream of the bridge piers. In addition, up to eighteen 24-inch diameter (100-feet deep) steel pipe piles may be needed near Tower 4 to assist *Portland Spirit* operations in maneuvering to and from its existing dock.

Riparian areas impacted by the projected on the east and west banks with be stabilized and re-planted with native riparian vegetation.

Crystal Springs Creek. The anticipated new bridge for crossing Crystal Springs Creek will be a 68-foot-long single-span structure supported on cast-in-place abutments with a driven pile foundation. The bridge will completely span Crystal Springs Creek; no element of the structure will be within the 20-foot active waterway channel, and no in-water work is anticipated. However, all piles and some retained fill will be within the 100-year floodplain and portions of a jurisdictional wetland. The structure will use an approximately 34-foot-wide bridge section, with an anticipated additional 10 feet of temporary construction easement on either side of the bridge.

There will be approximately 30 steel HP14 piles driven for this bridge, 15 for each abutment. The piles will be driven into an anticipated substrate profile of fills over alluvium over sand/gravel mix over cemented gravels; the expected pile depth is approximately 100 feet. Piles will be driven using a diesel impact hammer mounted on a crane using fixed leads. Each pile will take approximately 12 continuous hours to complete, and all pile installations are anticipated to be complete within 30 days. Pile driving of piles within 30 feet of Crystal Springs Creek will occur during the approved in-water work window (July 15 - August 31) since hydroacoustic impacts may be similar to in-water pile driving. Driving of piles that are further than 30 feet from Crystal Springs Creek may occur at any time of the day and at any time of the year, unless in-water work becomes necessary. No in-water work is anticipated at Crystal Springs Creek. If work is scheduled to occur at night, mobile light plants would be required, but lights will be directed away from the water.

After completion of the pile installation, piles will be cut off to the required elevation and pile cap reinforcement will be installed. Formwork will be installed around the reinforcement and concrete placed. Pile cap construction will use typical cast-in-place concrete construction practices.

Construction of the balance of the abutment is a continuation of the pile cap construction. The abutments may include the construction of wingwalls and backwalls to retain trackway approach material. Construction will use typical cast-in-place concrete practices, with reinforcement and formwork placed to line and elevation. Concrete will be delivered to the formwork using methods that best target proper placement. After completion of concrete curing, the formwork will be stripped and removed from the structure.

Anticipated primary superstructure elements will be fabricated offsite and delivered to the construction site using trucks. Fabrication offsite eliminates the potential for materials used in fabrication (such as wet concrete) to fall into the waterway. After delivery to the job site, the superstructure elements will be picked and placed onto the newly constructed bridge abutments using cranes and connected together using transverse tie rods. BMPs associated with this type of operation will be used to reduce opportunities for items to fall into the stream. For example, netting, diapers or other techniques will be used where appropriate to capture any construction material that may fall from the bridge.

Primary access is currently planned to be within the trackway, and will potentially extend from the railroad access road to the west of the proposed trackway between SE Harold Street to the north and SE Tacoma Street to the south. Staging areas will be located either on the trackway or to the east of the trackway in the vicinity of Crystal Springs Creek. As with all staging areas, appropriate containment and pollution control measures will be put in place before and during staging activities.

Approximately 1.1 acres of wetland in the vicinity of Crystal Springs Creek will be impacted by the light rail transit (LRT) crossing. In addition, approximately 3,080 cubic yards (cy) of 100-year floodplain would be filled, but an equal amount of removal would occur south of the SE Bybee Boulevard bridge. No Federal Emergency Management Agency (FEMA)-identified floodway is present at this stream. The new bridge at Crystal Springs Creek will permanently shade 680 square feet of the creek.

Johnson Creek. The anticipated new bridge over Johnson Creek will be 108 feet long center of bent to center of bent and will span the 35-foot active creek channel. The structure will be a single-span steel through girder structure with PCPS transverse structural elements (floorbeams) on cast-in-place abutments founded on driven piles. The bridge will completely span Johnson Creek, and no in-water work will occur. No element of the structure will be within the active waterway channel or FEMA-identified floodway, or below the OHW. However, all piles will be within the 100-year floodplain. The structure will use an approximately 43-foot out-to-out bridge section, with an anticipated additional 10 feet of temporary construction easement on either side of the structure. The bridge abutments are anticipated to be skewed to better match the existing stream alignment and reduce impacts to the stream. Primary access is currently planned to be within the track alignment from the north and from the south.

There will be 30 steel HP 14 piles driven for this bridge, 15 for each abutment. The piles will be driven into an anticipated substrate profile of typical fills over alluvium over sand/gravel mix over cemented gravels; the expected pile depth is approximately 100 feet. Each pile will take approximately 12 continuous hours to complete, and all pile installations are anticipated to be complete within 30 days. Pile driving of piles within 30 feet of Johnson Creek will occur during the approved in-water work window (July 15 – August 31) since hydroacoustic impacts may be similar to in-water pile driving. Driving of piles that are further than 30 feet from Johnson Creek may occur at any time of the day and at any time of the year. Although night construction is not anticipated at Johnson Creek, if it does occur, mobile light plants will be required and will be directed away from the water to the extent practicable.

Construction of the balance of the abutment will be a continuation of the pile cap construction. The abutments may include the construction of wingwalls and backwalls to retain trackway approach material. Construction will use typical cast-in-place concrete practices, with reinforcement and formwork placed to line and elevation. Concrete will be delivered to the formwork using methods that best target proper placement. After completion of concrete curing, the formwork will be stripped and removed from the structure.

Anticipated primary superstructure elements (steel girders and PCPS structural elements) will be fabricated offsite and delivered to the construction site using trucks. Fabrication offsite eliminates the potential for materials used in fabrication (such as wet concrete) to fall into the waterway. After delivery to the job site, the superstructure elements will be picked and placed onto the newly constructed bridge abutments using cranes. Temporary bracing will be used as required to maintain the girder alignment. BMPs associated with this type of operation will be used to reduce opportunities for items to fall into the stream. For example, diapers, netting or other techniques will be used where appropriate to capture construction material that may fall from the bridge.

Access to the north bridge abutment is proposed to be from the existing access driveway into the site and set back 25 feet from the top of bank. Access to the south bridge abutment is proposed to be from the Tacoma park-and-ride site. Staging will be located outside of the area designated as a conservation zone under the City of Portland Environmental Zone.

Research of past geotechnical data generally indicates non-liquefiable conditions at the LRT crossing at Johnson Creek. However, there is one historical data point south of Johnson Creek in the project vicinity that suggests a limited zone of liquefiable material. Though there is a low probability of the presence of liquefiable soils adjacent to Johnson Creek, mitigation of this condition may be necessary and would consist of subsurface ground improvements in the surrounding area of the pile foundations. The ground improvement treatment area will total approximately 360 square yards. All proposed treatment areas are above OHW.

In addition to the new bridge structure for the LRT over Johnson Creek, there is also an existing 106-foot-long bridge that will be used for access to the new Tacoma park-and-ride structure. The existing bridge will be modified slightly to accommodate pedestrian use. The modifications will include either a 10-foot sidewalk on one side of the bridge or two 8-foot sidewalks on either side of the bridge. Updates to stormwater drainage of the existing structure will be included in the modifications as well.

Approximately 115 cy of fill within the 100-year floodplain is anticipated to occur as part of the Johnson Creek crossing. An equal amount of removal will occur within the 100-year floodplain. The removal will likely occur adjacent to the project alignment and will be designed to provide for flood relief while minimizing the potential for fish stranding after waters recede. No in-water work will occur at this crossing. Approximately 5,000 square feet of riparian vegetation may be removed or shaded at this crossing due to the bridge structure and alignment. The new bridge will permanently shade 1,500 square feet of Johnson Creek's channel.

Kellogg Lake. The anticipated Kellogg Lake LRT bridge crossing Kellogg Lake will be a box girder structure with multiple spans. The box girders, pier foundations, and abutments will be cast-in-place and founded on drilled shafts and driven piles. Additionally, structural provision for a future pedestrian path under the LRT bridge will be included. It is anticipated that the truss for this path will be installed by the City of Milwaukie.

One H-pier consisting of two 6-foot diameter columns will be constructed in the Kellogg Lake bed, with the remainder of the piers above OHW.[4] Two temporary 8-foot diameter steel casings (up to 120 feet in length) will be driven into the creek bed with a crane-mounted vibratory hammer or oscillator. The H-pier will be in shallow-water habitat approximately 12 feet deep. The drilled shafts for the H-pier will be excavated to the scheduled elevation. Then, reinforcing cages will be placed into the excavation and the shaft will be filled with concrete (by tremie methods, if groundwater is present). After completion of the shafts above the water surface, the temporary steel casings will be removed using a crane-mounted vibratory hammer or if it is not possible to remove entire casings, they will be cut off at the lowest elevation possible.

The drilled shafts for the in-water H-pier may require the use of polymer drilling fluids to stabilize the sides of the excavation prior to placement of concrete. If polymer drilling fluids are required, they will be recirculated through on-site Baker tanks or by a similar method to separate suspended drill tailings and to control the drilling fluid. Use of the Baker tanks and active isolation of the work area will prevent spills of the drilling fluid. Drill tailings removed from shafts by cleanout buckets will be separated from drilling fluid by settling in controlled areas,

[4] Note: As of October 1, 2009, the Kellogg Lake Dam located downstream of the project site has been targeted for removal to restore salmonid usage in the ecosystem. The funding of this action through a National Oceanic and Atmospheric Administration (NOAA) restoration grant was not approved in mid-2009. Another funding source has not yet been discovered. The description of this project element assumes that the current condition still exists at the time of the construction and operation of the Portland-Milwaukie Light Rail project. If the dam is removed and the channel is restored, efforts will be made to place the one permanent pier outside the active channel and to decrease the number of temporary piles below the new OHW.

and all drill tailings will be monitored for contamination and will be separated from drilling fluid prior to proper disposal. Drilling fluid will be processed into Baker tanks as the concrete is being placed in the shaft.

Additional in-water work includes installation of approximately 60 steel pipe pilings for support of a temporary work bridge extending from each bank. These temporary work bridges will provide access to the in-water H-pier and all bridge construction operations. Each temporary steel pipe piling will be up to 24 inches in diameter and 100 feet in length and will be installed in shallow-water habitat (0 to 20 feet deep) using a vibratory hammer, with the potential for proofing of the pile with an impact hammer. When the pile can no longer be driven using vibratory methods, a diesel hammer will be used to proof each pile to its design capacity (30 to 50 blows). The total driving duration for each pile is estimated to be one to four hours, or between two and eight piles per day. Approximately four piles will typically be "proofed" per day (200 impact blows), and the maximum probable is 8 piles, or 400 impact blows, within any given 12-hour period.

The temporary piles will be extracted using a vibratory hammer when the bridge is complete. All temporary piles will be plain, untreated steel, and the anticipated substrate consists of fill, alluvium, gravel, and cemented gravel. Because the sediment within the lake has been reported to be contaminated with pesticides and polychlorinated biphenyls (PCBs) (City of Milwaukie 2002), care will be taken to reduce resuspension and transport of existing sediments.

Landside bridge supports include twelve 8-foot diameter drilled shafts and two H-piers consisting of two 6-foot diameter drilled shafts for the landside piers and abutments. For the piers, some amount of excavation may be required. The shafts will be drilled to the scheduled depth and temporary 8-foot diameter steel casings (up to 120 feet in length) will be driven with a crane-mounted vibratory hammer or oscillator. Then, reinforcing cages will be placed into the excavation and the shaft will be filled with concrete (by tremie methods, if ground water is present). After completion of the shafts above the water surface, the temporary steel casings will be removed using a crane-mounted vibratory hammer, if possible or will be cut below finished grade and the upper section removed if it is not possible to extract the entire length.

All landside piers and the cross beam associated with the in-water H-pier will be located above OHW. The H-pier shafts and cross beams will be formed, reinforced, and filled with concrete. The shafts for all other piers will be formed, reinforcement installed, and concrete placed. Concrete will be pumped into the formwork, allowing the concrete placement to be controlled and avoiding any spills. Once concrete placement is complete and the concrete begins curing, the formwork for the pier crossbeams will begin. The H-pier cross beam forms will be installed on temporary scaffolding, followed by reinforcement and concrete. After curing is complete, the formwork will be stripped from the pier and crossbeams. After the crossbeam forms are removed, the piers will be ready for the superstructure.

For both landside abutments, the first step will be to excavate for the footing of the abutment. It is anticipated that end-bearing steel H-piling will be driven to the required capacity/depth, then the footing will be formed, reinforcement installed, and the footing concrete poured. The pile driver for the steel H-piling for the landside abutments will be a crane-mounted, diesel-powered impact hammer, and will have a maximum noise level of 120 dBA. The maximum size for the permanent piling at the abutments is anticipated to be HP 14 by 89 with no taper, approximately 100 feet in length. Next, the abutment walls and bearing seats will be formed, reinforcement installed, and the concrete for the abutment walls and bearing seat placed. The forms will be stripped, the bearings placed, and the abutment will be ready for installation of the superstructure.

All concrete bridge support structures are anticipated to be constructed using reusable formwork. Once the drilled shafts are complete, reinforcement will be installed and the formwork will be put around the reinforcement cages. Concrete will be pumped into the formwork, allowing the concrete placement to be controlled and avoiding any spills. Once concrete placement is complete and the concrete begins curing, the formwork for the pier cross beams will begin. The crossbeams will be constructed using temporary scaffolding. The formwork will be installed, reinforcement placed, and the concrete placed into the formwork. After curing is complete, the formwork will be stripped from the pier and cross beams.

Construction of the temporary pipe piles for the access bridges and steel casing for the in-water pier is anticipated to take three months; H-pile installation at the abutments is anticipated to take 18 working days. On average, one H-pile at the abutments, one to eight temporary steel pipe piles, and one-half of an in-water steel casing in Kellogg Creek can be installed per day. Work could be scheduled to occur at any time of the day during the in-water work window for Kellogg Creek (July 15 to September 30). If night work is scheduled, mobile light plants would be used as required, but lights would be directed away from the water surface to the extent practicable.

Once the abutments and piers are constructed, prefabricated structural members will be picked and placed on to the pier caps and abutments with the use of cranes. The prefabricated structural members will be constructed offsite and delivered to the construction site using trucks. Scaffolding and formwork will be used to construct the superstructure of the bridge. During concrete placement activities, the formwork for the superstructure will be diapered to prevent dropping fresh concrete into the water or onto the roadway below. The temporary formwork and scaffolding will be removed once the superstructure is complete.

In addition to the LRT bridge, a pedestrian bridge, which would also accommodate bicycles, is proposed to be built over Kellogg Lake. When constructed by the City of Milwaukie, it will be attached underneath the LRT bridge superstructure. Construction of the approximately 240-foot pedestrian structure would include the installation of Americans with Disabilities Act (ADA)-compliant approach ramps on both the north and south banks attached to concrete substructure supports that would support the main pedestrian superstructure. The anticipated superstructure could consist of a prefabricated 14-foot-wide steel truss with a concrete walking surface attached to the lower chord. The truss would be fabricated offsite and delivered to the construction site using trucks. Fabrication offsite eliminates the potential for materials used in fabrication to fall into the waterway.

Total in-water work construction time entails approximately 12 weeks for both the installation of the temporary piles for the work bridges and the permanent in-water pier. Fill from the permanent piles below existing OHW will cover approximately 60 square feet of the lake bottom. The temporary piles for work bridges below existing OHW will cover approximately 200 square feet.

Permanent shading of the river from the bridge would total approximately 3,600 square feet. Temporary shading from the work bridges would total approximately 800 square feet. At Kellogg Lake, encroachments into the riparian areas will include temporary access roads above OHW, temporary access bridges, material staging areas, landside piers, and approach structures. Areas of riparian encroachments from access roads, bridges, or material staging areas will be revegetated per City of Milwaukie requirements.

Minimization, Conservation Measures, Mitigation and Monitoring.
To reduce effects at all construction sites, erosion and sediment control measures will be put in place, all disturbed areas will be restored during post-construction site restoration, and staging areas will be located at least 150 feet from any waterbody. The following conservation measures, as outlined in the section 6.2 of the BA, are relevant to the effects on ESA-listed species:

- Erosion, Sediment and Pollution Control Plan
- In-water work period
- Piling installation, removal and hydroacoustic monitoring
- Fish capture and removal and work area isolation
- Site preparation and staging areas
- Resuspension of contaminated sediments and scour protection

Additional conservation measures are outlined in the BA. All monitoring reports will be submitted to NMFS.

Mitigation has been proposed as part of the PMLR project to offset adverse effects to ESA-listed species and their habitat. Table 1 summarizes the proposed mitigation for each project component. See Figure 3 for proposed shallow-water habitat mitigation area.

Hydroacoustic monitoring of impact pile installation will occur according to a protocol approved by NMFS. A Hydroacoustic Monitoring Plan will be developed from an approved template. Hydroacoustic monitoring will be implemented by a contractor with proven expertise in the field of underwater acoustics and data collection. If threshold sound levels are exceeded during monitoring, pile driving will cease, NMFS will be notified, and corrective actions will be taken and clearly documented before work continues.

To limit hydroacoustic impacts to listed species, unattenuated impact pile driving to obtain baseline sound measurements will be conducted in the time period of July 1 through October 31 for the Willamette River and July 15 to September 30 for Kellogg Lake, or as defined in the Hydroacoustic Monitoring Plan. Unattenuated impact pile driving for obtaining baseline sound measurements will be limited to the number of piles necessary to obtain an adequate sample size for the project, as defined in the final Hydroacoustic Monitoring Plan.

Within 60 days of completing the hydroacoustic monitoring, a report shall be submitted to NMFS. Content of the report shall be determined during approval of the Hydroacoustic Monitoring Plan.

NMFS relied on the foregoing description of the proposed action, including all features identified to reduce adverse effects (BMPs and mitigation), to complete this consultation. To ensure that this biological opinion remains valid, NMFS requests that the action agency or applicant keep NMFS informed of any changes to the proposed action.

Table 1. Summary of impacts and proposed mitigation for PMLR crossings.

Location	Impact	Proposed mitigation activity	Location of proposed mitigation
Willamette River crossing	44,000 ft^2 of permanent scour protection at tower 3 21,500 ft^2 placed in shallow water (< 20 feet)	Removal of 20,000 square feet of derelict piles and creation of 25,500 square feet of shallow-water habitat	Lower Willamette River
Willamette River crossing	47,000 ft^2 of permanent scour protection placed in deep water (> 20 feet) at tower 4		
Willamette River crossing	Temporary impacts (during 3-4 years of construction) from 126 work bridge pilings and 1,415 ft^2 permanent impacts from drilled shafts		
Willamette River crossing	13,500 ft^2 of permanent impacts from scour protection at temporary work bridges 11,500 ft^2 in shallow water		
Crystal Springs and Johnson Creek	1.1 acres wetland fill	Partial funding of Westmoreland Park Restoration Project or purchase of credits at Foster Creek mitigation bank	Crystal Springs at Westmoreland Park or Foster Creek
Kellogg Lake crossing	60 ft^2 of permanent impact to critical habitat and EFH	Native species planting for 100-300 linear feet and removal of 12 derelict piles and associated bracing	Kellogg Lake

Figure 3. Proposed shallow-water mitigation area in South Waterfront District of Portland, OR, approximately river mile 13.5. Shaded blue area is the proposed shallow-water habitat to be created.

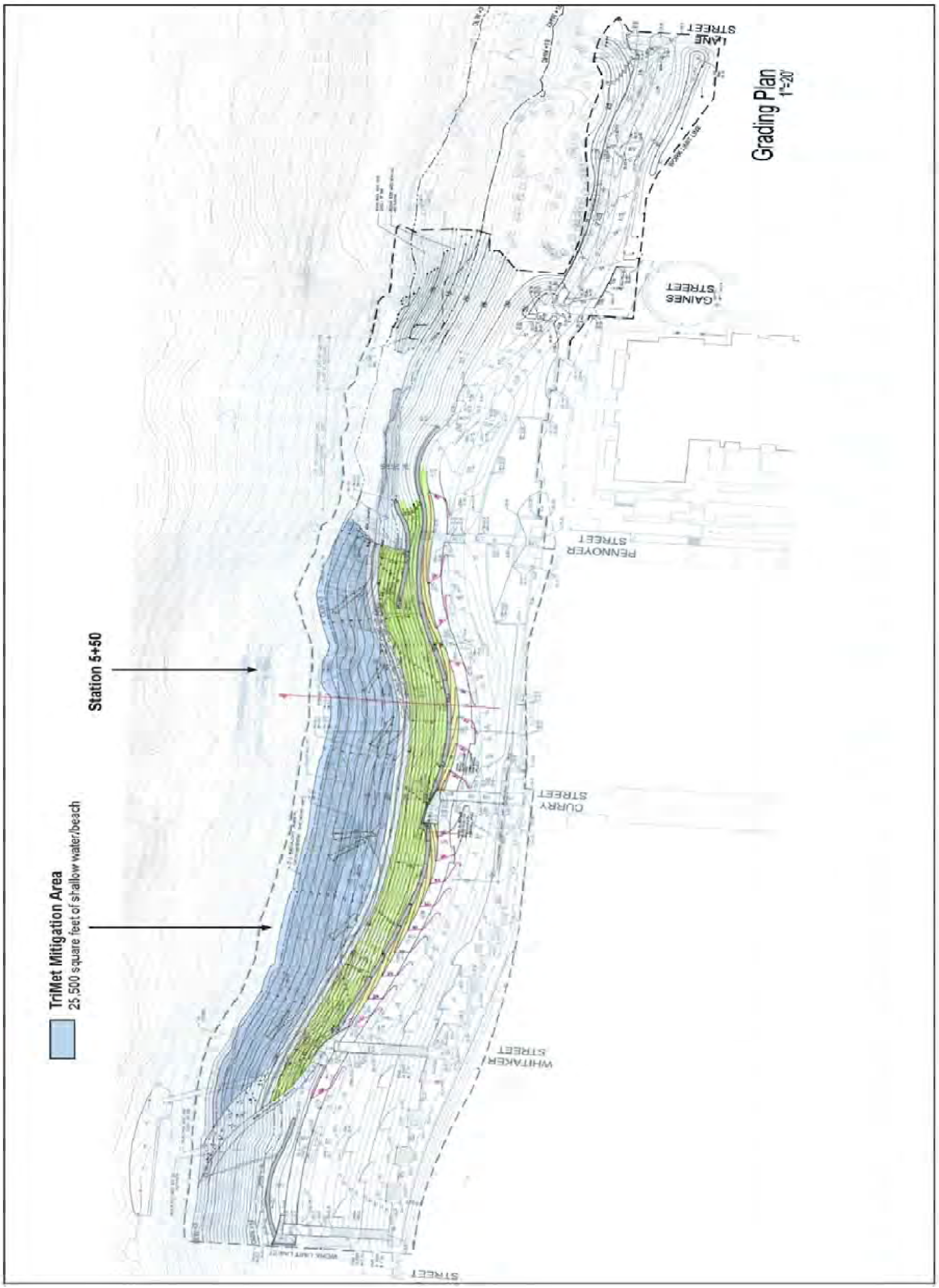


Figure 2
Central District Riverbank Enhancement Site

Action Area

Action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this consultation, the action area is described below for each waterbody. See Figure 1 for exact locations of each crossing. The action area is defined by the linear extent of noise from driving the steel piles based on an analysis using a spreadsheet developed by NMFS[5] (pile driving analysis) to model levels of underwater sound received by fish exposed to pile driving (Table 2 and Appendix A).

Table 2. Extent of action area as defined by pile driving analysis within a line of sight radius that originates from each pile.

Project Component	*Maximum number of pile strikes per day with impact hammer*	*Extent of action area based on pile driving analysis*
Willamette River Bridge	800	17,775 ft (5412 m)*
Kellogg Lake Bridge	400	2814 ft (858 m)*

*This theoretical distance is based on calculations of sound generated from pile driving and the assumption that sound travels unobstructed; when the action occurs on the landscape, the distance is reduced due to dampening of sound by geological features such as islands, river banks and bends in the river.

For the Crystal Springs Creek and Johnson Creek bridges (Figure 1), there is no in-water pile driving and thus the action area is determined by the construction area and associated staging. The action area extends 500 feet upstream and downstream from the stream crossing at these two sites.

ENDANGERED SPECIES ACT BIOLOGICAL OPINION

Section 7(a)(2) of the ESA requires Federal agencies to consult with NMFS to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The Opinion that follows records the results of the interagency consultation for this proposed action. The ITS provided after the Opinion specifies (1) the impact of any taking of threatened or endangered species that will be incidental to the proposed action; (2) reasonable and prudent measures that NMFS considers necessary and appropriate to minimize such impact, and (3) nondiscretionary terms and conditions (including, but not limited to, reporting requirements) that must be complied with by the Federal agency, applicant (if any), or both, to carry out the reasonable and prudent measures.

[5] Email from John Stadler, National Marine Fisheries Service, to National Marine Fisheries Service, Northwest Region, Habitat Conservation Division, (January 22, 2009) (transmitting a modified spreadsheet for use in assessing the effects of pile driving).

To complete the jeopardy analysis presented in this Opinion, NMFS reviewed the status of each listed species[6] considered in this consultation, the environmental baseline in the action area, the effects of the action, and cumulative effects (50 CFR 402.14(g)). From this analysis, NMFS determined whether effects of the action were likely, in view of existing risks, to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

For the critical habitat adverse modification analysis, NMFS considered the status of the entire designated area of the critical habitat considered in this consultation, the environmental baseline in the action area, the likely effects of the action on the function and conservation role of the affected critical habitat, and cumulative effects. NMFS used this assessment to determine whether, with implementation of the proposed action, critical habitat would remain functional, or retain the current ability for the primary constituent elements (PCEs) to become functionally established, to serve the intended conservation role for the species.[7]

If the action under consultation is likely to jeopardize the continued existence of an ESA-listed species, or destroy or adversely modify critical habitat, NMFS must identify any reasonable and prudent alternatives for the action that avoid jeopardy or destruction or adverse modification of critical habitat and meet other regulatory requirements (50 CFR 402.02).

Status of the Species and Critical Habitat

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the geographic area of this proposed action and are considered in this Opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 3).

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[6] An "evolutionarily significant unit" (ESU) of Pacific salmon (Waples 1991) and a "distinct population segment" (DPS) (Policy Regarding the Recognition of District Vertebrate Population; 61 FR 4721, Feb 7, 1996) are both "species" as defined in section 3 of the ESA.

[7] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (November 7, 2005) (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act).

Table 3. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: 'T' means listed as threatened under the ESA.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	Not applicable	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Lower Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

It is also likely that climate change will play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas (USGCRP 2009). Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F (USGCRP 2009). Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during the summer, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007, USGCRP 2009).

Higher winter stream flows increase the risk that winter floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (USGCRP 2009). Earlier peak stream flows will also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation (USGCRP 2009). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al*. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and

Williams 2005, Zabel *et al*. 2006, USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel *et al.* 2006).

Status of the Species. Over the past few decades, the sizes and distributions of the populations considered in this Opinion generally have declined due to natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Enlarged populations of terns, seals, sea lions, and other aquatic predators in the Pacific Northwest have been identified as factors that may be limiting the productivity of some Pacific salmon and steelhead populations (Bottom *et al*. 2005, Fresh *et al*. 2005).

LCR Chinook salmon. The range of this species includes all naturally-spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon, east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River. Historical records of Chinook salmon abundance are sparse, but cannery records suggest a peak run of 4.6 million fish in 1883. Although fall-run Chinook salmon are still present throughout much of their historical range, they are still subject to large-scale hatchery production, relatively high harvest, and extensive habitat degradation. The spring-run populations are largely extirpated as a result of dams that block access to their higher-elevation habitat. Abundances largely declined during 1998-2000 and trend indicators for most populations are negative, especially if hatchery fish are assumed to have a reproductive success equivalent to that of natural-origin fish. However, 2001 and 2002 abundance estimates increased for most LCR Chinook salmon populations over the previous few years (Good *et al*. 2005).

Factors limiting recovery for LCR Chinook salmon are reduced access to spawning/rearing habitat in tributaries, hatchery impacts, loss of habitat diversity and channel stability in tributaries, excessive sediment in spawning gravel, elevated water temperature in tributaries, and harvest impacts on fall Chinook (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded estuarine and nearshore habitat; floodplain connectivity, and function; channel structure and complexity; riparian areas and large wood; stream substrate, streamflow; fish passage; and harvest and hatchery impacts as the major factors limiting the recovery of this species.

LCR Chinook salmon in the action area are part of the Clackamas fall-run population. Based on a recent viability status report (McElhany *et al*. 2007), there are no reliable abundance data for this population, but estimates put the population in the "extirpated or nearly so" persistence category based on the minimum abundance threshold. There is no abundance or productivity evidence supporting the existence of a viable, natural-origin population in the Clackamas. This population is at significant risk based on the criteria for diversity, spatial structure, and abundance and productivity[8]. From the perspective of all viability criteria, LCR Chinook in

[8] McElhany *et al*. 2007 (Table 1) defines population risk as the following percentage probability of extinction in 100 years: "extinct or very high risk" has a 60-100% probability; "high risk" has a 25-60% probability; "moderate risk" has a 5-25% probability; "low or negligible risk" has a 1-5% probability; and "very low risk" has a >1% probability. At the ESU level, risk is described more generally from the perspective of all populations and viability criteria.

Oregon are at high risk (McElhany *et al*. 2007). Habitat degradation in the basin has reduced the spatial distribution of suitable habitats for fall Chinook.

UWR spring-run Chinook salmon. The UWR spring-run Chinook salmon includes seven populations of native spring-run populations above Willamette Falls and in the Clackamas River. All the populations are in a single stratum since they share a similar life history pattern (spring run) and a single ecozone (McElhany *et al*. 2003, Myers *et al*. 2006). All populations are present in the action area during some portion of the year.

Numbers of spring Chinook salmon in the Willamette River basin are extremely depressed (McElhany *et al*. 2007). Historically, the spring run of Chinook may have exceeded 300,000 fish (Myers *et al*. 2003). The current abundance of wild fish is less than 10,000 fish, and only two populations (McKenzie and Clackamas) have significant natural production. The UWR Chinook have been adversely affected by the degradation and loss of spawning and rearing habitat (loss of 30 to 40%) associated with hydropower development, and interaction with a large number of natural-spawning hatchery fish. Other limiting factors include altered water quality and temperature, lost and degraded floodplain connectivity and lowland stream habitat, and altered streamflow in the tributaries (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded flooplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, water quality, fish passage, and hatchery impacts as the major factors limiting recovery of this species.

McElhany *et al*. (2007) analyzed the population criteria (diversity, spatial structure, and abundance and productivity) for UWR Chinook salmon and found that the risk of extinction is high. The Clackamas population exhibited the lowest extinction risk. However, five of the seven populations were clearly in the high risk category, and thus the ESU can be characterized as having a high risk of extinction.

Chinook salmon generally spawn and rear in mainstem reaches of large rivers such as the Willamette River and the Clackamas River. Juvenile Chinook salmon that have emerged from spawning sites in the Upper Willamette River watershed use the lower mainstem Willamette River and Columbia Slough through Portland for temporary rearing as they migrate to the ocean.

LCR coho salmon. This ESU includes 25 populations that historically existed in the Columbia River basin from the Hood River downstream (McElhany *et al.* 2007). The boundaries do not extend into the upper Willamette portion of the basin because Willamette Falls is a natural barrier to fall-migrating salmon and steelhead. In general, wild coho in the Columbia River basin have been in decline for the last 75 years. The number of wild coho returning historically was at least 600,000 fish (Chapman 1986). As recently as 1996, the total return of wild fish may have been as few as 400 fish (Chilcote 1999). Of the 25 historical populations, only the Clackamas and Sandy populations show direct evidence that coho production is not reproductively dependent on the spawning of stray hatchery fish (McElhany *et al.* 2007). However, in the last 5 years there has been an increase in the abundance of wild coho in the Clackamas and Sandy rivers, plus a reappearance of moderate numbers of wild coho in the Scappoose and Clatskanie rivers after a 10-year period in the 1990s when they were largely absent (McElhany *et al.* 2007).

The NMFS (2007) identified floodplain connectivity and function, degraded channel structure and complexity, degraded riparian areas and large wood recruitment, degraded stream substrate, degraded streamflows, degraded water quality, and harvest and hatchery impacts as the major factors limiting recovery of LCR coho salmon.

The Clackamas population would be the most likely population found in the action area. Based on a recent analysis, this population is most likely in the low risk category for abundance and productivity, although all the other populations are in the high or very high risk category (McElhany *et al.* 2007). Spatial structure scores are reduced because of significant habitat degradation in lower basin tributaries such as Johnson and Kellogg creeks, and other urbanized portions of the Lower Willamette River, Multnomah Channel, and Sauvie Island. This habitat loss has reduced the population's diversity score. Despite this, the Clackamas population is the only population in Oregon's portion of the species that is most likely in the viable category, and the risk of extinction for LCR coho in Oregon remains high (McElhany *et al.* 2007).

LCR steelhead. This species includes all naturally spawning populations of steelhead in streams and tributaries of the Columbia River between, and including, the Cowlitz and Wind rivers in Washington, along with, and including, the Willamette River and Hood River in Oregon. Excluded are steelhead from the Upper Willamette River basin above Willamette Falls and steelhead from the Little and Big White Salmon rivers in Washington (NMFS 2004).

Five populations of winter steelhead and one population of summer steelhead exist in Oregon (McElhany *et al.* 2007). The population most likely to be present in the action area is the Clackamas River population, which is part of the Cascade winter stratum.

In general, wild steelhead numbers are depressed from historical levels but probably exist in most of their historical range, and all historical populations are believed to be extant. However, up until recent years, the presence of naturally spawning hatchery fish in most populations has been high (McElhany *et al.* 2007).

The Clackamas population is at low risk for abundance and productivity, although the future impacts of human population growth and climate change add a degree of uncertainty (McElhany *et al.* 2007). The Upper Clackamas River basin contains most of the historically-productive habitat, and most of that habitat is of high quality today. For the species, the overall risk classification for Oregon LCR steelhead is moderate, with the Clackamas population at the lowest risk.

Factors limiting recovery for LCR steelhead are degraded floodplain and stream channel structure and function, reduced access to spawning/rearing habitat, altered streamflow in tributaries, excessive sediment and elevated water temperatures in tributaries, and hatchery impacts (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, stream substrate, streamflow, water quality, fish passage and predation/competition as the major factors limiting recovery of this species.

UWR steelhead. This species consists of four populations: the Molalla, North Santiam, South Santiam, and Calapooia. All populations of UWR steelhead migrate through and rear in the action area. These populations are depressed from historical levels, with adverse impacts from the alteration and loss of spawning and rearing habitat associated with hydropower development. Based on recent analyses of the population criteria, McElhany *et al*. (2007) concluded that the species risk of extinction is moderate, with the highest risk category being genetic diversity.

Habitat loss, hatchery steelhead introgression, and harvest are the major contributors to the decline of this species. Willamette Falls (RM 26.5) is a known migration barrier. Winter-run steelhead and spring-run Chinook salmon historically occurred above the falls, whereas summer-run steelhead, fall-run Chinook, and coho salmon did not. Detroit and Big Cliff dams have cut off access to 335 miles of spawning and rearing habitat in the North Santiam River. In general, habitat in this species has become substantially simplified since the 1800s by removal of large wood to increase the river's navigability.

The NMFS (2007) identified degraded floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, streamflow, fish passage, and predation/competition and disease as the major factors limiting recovery of this species.

Status of Critical Habitat. Climate change, as described in the introduction above, is likely to adversely affect the conservation value of designated critical habitats in the Pacific Northwest. These effects are likely to include, but are not limited to, depletion of cold water habitat and other variations in quality and quantity of tributary spawning, rearing and migration habitats and estuarine areas.

The action area is within designated critical habitat for the affected salmonid species, except LCR coho salmon, for which critical habitat has not been proposed or designated. The PCEs found at the project site are freshwater rearing and freshwater migration (Table 4).

The NMFS designated critical habitat for all species considered in this Opinion, except LCR coho salmon, for which critical habitat has not been designated. To assist in the designation of salmonid critical habitat in 2005, NMFS convened a critical habitat review teams (CHARTs), organized by major geographic areas that roughly correspond to salmon recovery planning domain (NOAA Fisheries 2005). Each CHART consisted of Federal biologists and habitat specialists from NMFS, the Fish and Wildlife Service, the Forest Service, and the Bureau of Land Management, with demonstrated expertise regarding salmon and steelhead habitat and related protective efforts within that domain.

In designating these critical habitats, NMFS organized information at scale of the watershed or 5^{th} field hydrologic unit code (HUC5) because that scale largely corresponds to the spatial distribution and site fidelity of Pacific salmon and steelhead populations (WDF *et al*. 1992, McElhany *et al*. 2000). The NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of PCEs throughout the designated area. The action area was rated medium and high (Table 5). PCEs consist of the physical and biological features identified as essential to the conservation of the listed species in the documents that designate critical habitat (Table 4).

The value of critical habitat for the species is limited by poor water quality, altered hydrology, lack of floodplain connectivity and shallow-water habitat, and lack of complex habitat to provide forage and cover.

Table 4. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the Opinion (except Snake River spring/summer run Chinook salmon, Snake River fall-run Chinook salmon, Snake River sockeye salmon, and Southern Oregon/Northern California Coasts coho salmon), and corresponding species life history events.

Primary Constituent Elements		**Species Life History Event**
Site Type	**Site Attribute**	
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration

Table 5. Summary of CHART ratings for conservation values of critical habitat in action area. N/A indicates that the waterbody was not part of the ESU evaluated. The mainstem Willamette was rated as important corridor that all species must use when migrating to the ocean.

	LCR steelhead	LCR Chinook	UWR Chinook	UWR steelhead
Willamette River	High value for essential rearing/migration corridor			
Johnson Creek	High	Medium	N/A	N/A
Crystal Springs	High	Medium	N/A	N/A
Kellogg Creek	High	Medium	N/A	N/A

All waterbodies affected in the proposed action are rated medium or high conservation value for critical habitat. All action areas are located in urban areas where the habitat has been degraded due to past land use practices including stormwater runoff and urban development.

Environmental Baseline

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). For more details about the environmental baseline in the action area refer to Section 3 of the BA.

Since 1850, both primary channel and side channels have been lost in the Lower Willamette (Gregory 2002). Much of the off-channel and beach type habitat has been lost over the years due to development and channelization. With development comes clearing of riparian vegetation and direction of stormwater to the river. Gravel continues to be extracted from the river and floodplain and much of the sediment trying to move downstream in the Willamette River is blocked by dams. These river changes contribute to the limiting factors identified for ESA-listed species using the action area.

The Willamette River is approximately 1,400 feet wide and approximately 45 feet deep in the action area. The banks in the action area are comprised of numerous commercial and industrial facilities separated from the river by a public, multi-use pathway in some locations. Remnant riparian vegetation communities on both banks are highly disturbed and dominated by invasive species. The portion of the Willamette River located in the project area currently is on Oregon’s 303(d) list because it does not meet water quality standards for multiple contaminants, biological criteria and bacteria (DEQ 2009).

Crystal Springs Creek is not on the state’s 303(d) list for any parameters (DEQ 2009), nor have there been any Total Maximum Daily Load standards developed for it. Its water quality is assumed to be consistent with the other urban streams encountered along the project corridor, though it is worth noting that it originates from springs east of Reed Lake and is considered to be the purest water source in the Johnson Creek watershed. Also, Crystal Springs Creek is one of a handful of historic waterways in the City of Portland that has not been paved, rerouted, or drained

At the location where the project is proposed to cross Crystal Springs Creek, the creek channel is 1 to 2 feet deep and 15 to 20 feet wide. About 37% of the Crystal Springs Creek watershed is covered by impervious surface, and the majority of the channel flows through developed areas from its origin at Crystal Springs Lake at Reed College.

The lower portion of Johnson Creek flows primarily through urbanized land with industrial, commercial, and residential areas. This is in contrast to the eastern portion of the creek, which flows through undeveloped open space, rural residential areas, and agricultural land. Overall, 54% of the watershed is residential, 33% is rural, 8% is commercial/industrial, and 5% is parks and open space (JCWC 2009). About 39% of the lower portion of Johnson Creek is covered by impervious surface, which is associated with road-building and development.

At the proposed LRT crossing, Johnson Creek's floodplain is restricted by the high-density commercial and transportation facilities located adjacent to the site. The active channel width is approximately 35 feet, with bank slopes less than 30% and average channel depth of approximately 8 feet.

Within the project area, Kellogg Creek exists as an artificially impounded reservoir; therefore, its substrate is likely dominated by fines and its habitat is a fairly uniformly shaped pool. Very little instream habitat diversity exists in this location, limiting refugia and spawning opportunities that might otherwise be present at the site. Some woody debris has accumulated on the upstream side of the UPRR trestle pilings during flood events, but little or no large wood that meets the 60-centimeter-diameter/50-foot-length standard was present. The existing habitat elements at this site indicate that the creek is not properly functioning in terms of meeting salmonid biological requirements.

Within the project area, Kellogg Creek provides rearing and migration habitat for fall-run LCR Chinook salmon, LCR coho salmon, and winter-run LCR steelhead. Kellogg Dam, at the confluence of Kellogg Creek and the Willamette River, is the only fish barrier downstream of the project area. The box culvert and fish ladder under SE McLoughlin Boulevard is a partial fish barrier.

Species within the Action Area

The action area in the Willamette is located downstream of the Clackamas River and Johnson Creek watersheds. The Clackamas River is the natal stream for populations of UWR Chinook, LCR Chinook, LCR steelhead and LCR coho and Johnson Creek is the natal stream for LCR Chinook and coho. NMFS expects that many ESA-listed fish found in the action area are likely to have been produced in the Lower Willamette River tributaries.

Additionally, those fish produced in the upper river, above Willamette Falls, migrate through the action area. According to the 2005 Friesen study, Chinook in the action area are subyearlings from lower basin tributaries, such as the Clackamas River, and larger yearlings are from the upper basin tributaries, such as the Santiam River. Since the Willamette River is a migratory corridor, both adult and juvenile life history stages are expected to be in the action area. During the proposed in-water work window, it is likely that juveniles of all species will be present and Chinook adults will be migrating upstream.

In Johnson, Crystal Springs and Kellogg creeks only juvenile life history stages will be present during construction of the proposed project. No adults will be present.

Individuals in the action area are exposed to reduced water quality, lack of suitable habitat and restricted movement due to developed urban areas and land use practices. These stressors already exist and are in addition to any additional adverse effects produced by the proposed action.

Critical Habitat within the Action Area

All action areas of the proposed project are located in developed urban areas. Species in the action area are exposed to reduced water quality, a multitude of fish barriers, insufficient riparian areas and lack of floodplain.

The proposed Willamette River bridge would be located adjacent to a shallow area. As discovered in a recent Lower Willamette River study, beach areas provide important habitat for ESA-listed fish and seem to be the preferred nearshore habitat type for juvenile coho (Friesen 2005). A primary recommendation of this multi-year study is to protect existing beach habitat (Friesen 2005). Additional development in beach and shallow water areas may prevent access to these areas by ESA-listed fish for rearing and migration.

In Johnson, Crystal Springs and Kellogg creeks the action area is surrounded by dense development and experiences seasonal flooding due to reduce channel capacity and limited access to the adjacent floodplain. Crystal Springs and Kellogg creeks have multiple fish passage barriers that prevent free passage for some life stages and during some flow conditions.

Effects of the Action

Effects of the action refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

The effects of the proposed PMLR project include those associated with construction activities (contaminants and suspended sediments, reduction and disturbance of aquatic habitat, hydroacoustics) and post-construction (shading and stormwater) and handling of fish during fish salvage.

Suspended Sediments. Of the four crossings, only two are likely to result in increased suspended sediments – Willamette River and Kellogg Lake. Contaminants that are likely to be present in the sediments on the west side of the Willamette River include antimony, cadmium, copper, lead, mercury, nickel, zinc, PAHs, and TBT. Contaminants on the east side may include PCBs, mercury, cadmium, DDT, DDE, dichlorodiphenyldichloroethane (DDD), chlordane, PAHs, TBT, and dioxin/furans. Sediments in Kellogg Lake have been shown to be contaminated with PCBs and pesticides.

Toxicological effects of these pollutants are dependent on their concentration, composition and environmental condition. Of these pollutants, PCBs appear to have the most ecological risk to benthic organisms, fish, and other aquatic life. PCBs have been identified as a carcinogen, bioaccumulate through the food chain, and are linked to liver, stomach and thyroid damage, and immune disorders in fish (Meador *et al.* 2001).

At Kellogg Lake, temporary piles and steel casing will be driven and may result in suspended sediment increases. Any suspended sediment is not likely to travel far due to the project proximity to Kellogg Dam downstream and low water levels during the summer in-water work window. In addition, a clean layer of sand may be placed to prevent suspending contaminated sediments. Due to low numbers of fish present and the proximity to the dam, adverse effects from suspended sediment are not expected.

At the Willamette River bridge, clean sand and rock will be placed to prevent contaminants from being suspended and adversely affecting salmon and steelhead in the project area. These measures, along with working during the summer when the fewest ESA-listed species are present will reduce exposure of these fishes to contaminants. However, placing rock in the Willamette River for permanent scour protection is likely to result in an adverse affect on the designated critical habitat in the project area as discussed below.

Aquatic Habitat Modification. Permanent placement of pilings at the Kellogg and Willamette crossings and placement of permanent scour protection in the Willamette will adversely affect ESA-listed species and their habitat. The shallow-water areas affected are important for rearing and migration of ESA-listed species, especially juveniles (Friesen 2007). Although the number of predators in the Lower Willamette is thought to be low (Friesen 2005), the conversion of shallow-water habitat from small grained sediment to the proposed riprap is likely to provide additional desirable habitat for predators such as smallmouth bass. It is unknown whether additional predators would use this new habitat in significant numbers.

Creation of Shallow-Water Habitat for Mitigation. Beaches and shallow-water habitat have been lost in the Willamette River basin over time and as a result this type of habitat has become more limited. Loss of habitat is a limiting factor for ESA-listed species in the Willamette River basin and most populations in the basin must pass through the Lower Willamette River on both upstream and downstream migration.

To offset the adverse impacts of permanently modifying habitat, a shallow-water beach area will be created in the Lower Willamette River and derelict pilings will be removed (Table 1). The creation of shallow-water habitat will provide an area for ESA-listed species to feed, rest and seek refuge in the Lower Willamette River. In addition, the removal of piling in the Lower Willamette River and Kellogg Lake will increase the contiguous shallow water available to juvenile salmon and steelhead. ESA-listed species in Crystal Springs Creek will also benefit from the proposed riparian and wetland restoration at Westmoreland Park. The proposed project will improve fish passage by removing barriers and improve water quality by improving riparian vegetation. Both of these mitigation projects will undergo separate consultation under section 7 of the ESA at a later date once the designs and details are finalized.

Hydroacoustics. Biological effects to ESA-listed Pacific salmon are likely to result from the high sound pressures produced if piles are driven with an impact hammer. To reduce sound impacts on fishes, vibratory hammers can be used instead of impact hammers, size of piles can be reduced and sound attenuation devices can be employed during pile driving. Vibratory hammers do not reach levels of concern even when piles are many times larger than proposed for this project are driven (up to 72 inches in diameter; CALTRANS 2007). For the proposed project, the maximum impact (24- inch piles) using an impact hammer to drive piles was analyzed.

Fishes with swimbladders (including salmonids) are sensitive to underwater impulsive sounds, *i.e.*, sounds with a sharp sound pressure peak occurring in a short interval of time, (Caltrans 2001). As the pressure wave passes through a fish, the swimbladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under pressure component of the wave passes through the fish. The pneumatic pounding may rupture capillaries in the internal organs as indicated by observed blood in the abdominal cavity, and maceration of the kidney tissues (Caltrans 2001). The injuries caused by such pressure waves are known as barotraumas, and include hemorrhage and rupture of internal organs, as described above, and damage to the auditory system. Death can be instantaneous, can occur within minutes after exposure, or can occur several days later. A multi-agency work group determined that to protect listed species, sound pressure waves should be within a single strike threshold of 206 dB, and for cumulative strikes 187 dB sound exposure level (SEL) where fish are larger than 2 grams (NMFS 2008). Based on the pile driving analysis in Appendix A, the proposed pile driving is likely to meet the 187 dB threshold at 521 feet from each pile in the Willamette River and 154 feet from each pile in Kellogg Creek.

NMFS assumes a 10 dB attenuation with the use of a confined bubble curtain when the bubble curtain is set up and operated properly. However, a bubble curtain is not likely to bring the sound pressure levels below injury thresholds, and some death or injuries of ESA listed salmonids are likely to occur. To reduce the potential risk to juvenile ESA-listed Pacific salmon, a bubble curtain will be used whenever an impact hammer is in operation.

Shading. The proposed crossings of the Willamette River and Kellogg Lake are elevated structures and shading impacts are expected to be minimal due to height of the structure and the angle of light throughout the day. The proposed crossings at Johnson and Kellogg creeks are located in right of ways next to existing roads and bridges. These new crossings are not likely to increase shading significantly over current conditions.

Stormwater. Stormwater runoff from developed areas, including roads, culverts, and bridges, discharges a variety of pollutants to waterways. These pollutants include but are not limited to: nutrients, PCBs, metals (*e.g.*, arsenic, copper, chromium, lead, mercury, nickel), PAHs, sediment, and pesticides (LCREP 2007). Exposure to these contaminants has the potential to affect the survival and productivity of salmonids, and of juveniles in particular. Short-term exposure to contaminants such as pesticides and dissolved metals may disrupt olfactory function and interfere with associated behaviors such as foraging, antipredator responses, reproduction, imprinting (odor memories), and homing (the upstream migration to their natal stream). Exposure to bioaccumulative toxicants such as PCBs and DDTs has been shown to cause immunotoxic effects, immunosuppression, reduced disease resistance, disrupted smoltification, and reduced growth rates in juvenile salmon (Fresh *et al*. 2005; LCREP 2007).

Improvements to stormwater treatment along the proposed PMLR alignment are expected to provide a long-term net improvement to water quality and hydrology for aquatic habitat and fish species in the Lower Willamette River basin due to decreases in pollutant concentrations in project waterways and increased infiltration opportunities for stormwater runoff. Various levels of stormwater treatment currently exist within the project footprint, and all new and replaced impervious surfaces will undergo enhanced treatment.

Stormwater will be collected on-site and treated using a variety of methods (swales, stormfilters, tanks) and using on-site infiltration where possible on the 15.6 acres of impervious surface created by the proposed action. Additionally, 9.4 acres of existing impervious surface will not require treatment because it will be converted to open pervious space and pervious track ballast will be used on the light rail alignment. The construction of the light rail line is also expected to reduce pollutants in stormwater by reducing vehicle miles and hours traveled in the project area.

Fish Salvage. Fish salvage will be necessary at any dewatered work sites (*e.g.*, cofferdams on the Willamette River) that have been shown as supporting ESA-listed fish species, and will include seining, electrofishing, trapping and other necessary fish capture techniques. Although in-water work area isolation is a conservation measure intended to reduce potential effects to water quality and fish from construction, fish present in the work isolation area will be captured, handled, and released. Immediate or delayed death or injury of juvenile salmonids from capture and relocation stress are likely to occur during fish capture by electrofishing, which can cause injury or death, removal and relocation within the in-water work isolation area.

Table 6. Summary of effects of the proposed action categorized by location and type of effect.

	Willamette River	Johnson Creek	Crystal Springs Creek	Kellogg Creek	Proposed mitigation sites
Contaminants and Suspended Sediments	Resuspension of contaminants during in-water work	No in-water work proposed	No in-water work proposed	Resuspension of contaminants during in-water work limited area due to downstream dam	Resuspension of contaminants during in-water work (limited duration)
Reduction and Disturbance of Aquatic Habitat	Permanent placement of riprap and bridge bents will reduce rearing habitat available and convert shallow beach type habitat to rock	No in-water work proposed	No in-water work proposed	Permanent placement of piles will reduce rearing habitat available	Increase in rearing habitat from piling removal and creation of shallow-water habitat
Hydroacoustics and Pile Driving	Behavioral disturbance and/or injury from impact hammer striking in-water piles	Behavioral disturbance and/or injury from impact hammer striking piles within 30 feet of water	Behavioral disturbance and/or injury from impact hammer striking piles within 30 feet of water	Behavioral disturbance and/or injury from impact hammer striking in-water piles	No effect
Shading	Shading from bridge decks is not likely to have an adverse effects due to the elevation of the structures above the water	No significant increase in shading	No significant increase in shading	Shading from bridge decks is not likely to have an adverse effects due to the elevation of the structures above the water	No effect
Predation	No significant increase in predation	No in-water work proposed	No in-water work proposed	No significant increase in predation	No effect
Stormwater	Stormwater will be treated to maintain/improve water quality				No effect
Fish Salvage	Direct effects from salvaging fish from cofferdams	No fish salvage proposed	No fish salvage proposed	No fish salvage proposed	No effect

Species Within the Action Area

Rearing and migrating juveniles are likely to be in the action area year round. In the Willamette River, upstream migrating Chinook adults are likely to present in July and upstream migrating coho adults are likely to be present in October. Any ESA-listed species in the action area during pile driving are likely to be affected by sound waves created by the pile driving hammer. As mentioned above, sounds waves created by pile driving may result in behavioral changes, injury or death of fish. All pile driving and in-water work will take place during the work window and the effects to species within in the action area have been evaluated based on the presence of ESA-listed species during the relevant work window identified below.

Willamette River (July 1 to October 31 work window)

1. Embryos and alevins
   a. Incubation – no incubation occurs in the action area.
   b. Emergence – no emergence occurs in the action area.

2. Juveniles
   a. Rearing – rearing juveniles in the action area are likely to be subject to hemorrhage and rupture of internal organs, and damage to the auditory system due to pile driving and stress, external hemorrhages (bruising) and internal spinal damage and muscle hemorrhage during fish salvage activities. Loss of rearing is likely to occur as a result of riprap being placed in shallow water and these adverse affects will be offset by the creation of shallow water habitat at the mitigation site.
   b. Migration – migrating juveniles in the action area are likely to be injured or killed by pile driving and stress, external hemorrhages, and internal spinal damage and muscle hemorrhage during fish salvage activities.
   c. Smoltification – no smoltification occurs in the action area.

3. Adults
   a. Sub-adult growth and development – this life stage is not present in the action area.
   b. Upstream migration and holding – Chinook adults migrate upstream in July and coho adults migrate upstream in October and are likely to subject to hemorrhage and rupture of internal organs, and damage to the auditory system due to pile driving in the action area.
   c. Spawning – no spawning occurs in the action area.
   d. Seaward migration (steelhead) – steelhead adults will not be migrating through the action

Johnson and Crystal Springs Creeks (July 15 to August 31 work window)

4. Embryos and alevins
   a. Incubation – no incubation occurs in the action area.
   b. Emergence – no emergence occurs in the action area.

5. Juveniles
   a. Rearing – rearing juveniles in the action area are likely to be affected by pile driving.
   b. Migration – migrating juveniles in the action area are likely to be affected by pile driving.
   c. Smoltification – no smoltification occurs in the action area.

6. Adults
   a. Sub-adult growth and development – this life stage is not present in the action area.
   b. Upstream migration and holding – adults will not be migrating or holding in the action area.
   c. Spawning – no spawning occurs in the action area.
   d. Seaward migration (steelhead) – steelhead adults will not be migrating through the action

Kellogg Creek (July 15 to September 30 work window)

7. Embryos and alevins
   a. Incubation – no incubation occurs in the action area.
   b. Emergence – no emergence occurs in the action area.

8. Juveniles
    a. Rearing – rearing juveniles in the action area are likely to be affected by pile driving.
    b. Migration – migrating juveniles in the action area are likely to be affected by pile driving.
    c. Smoltification – no smoltification occurs in the action area.
9. Adults
    a. Sub-adult growth and development – this life stage is not present in the action area.
    b. Upstream migration and holding – adults will not be migrating or holding in the action area.
    c. Spawning – no spawning occurs in the action area.
    d. Seaward migration (steelhead) – steelhead adults will not be migrating through the action

Critical Habitat Within the Action Area

Designated critical habitat within the action area for the ESA-listed salmon and steelhead considered in this Opinion consists of a freshwater rearing site and freshwater migration corridor and their essential physical and biological features (PCEs) as listed below. The effects of the proposed action on these features are summarized below as a subset of the habitat-related effects of the action that were discussed more fully above. The noise and water quality effects described will be short-term (*i.e.,* weeks) during and immediately following in-water work (pile driving).

None of action areas are located in a freshwater spawning area, nearshore marine area or offshore marine area. Therefore, freshwater rearing and migration PCEs will be discussed for each creek

Willamette River
1. Freshwater rearing
    a. Floodplain connectivity –maintain the current limited connection to floodplains due to riprap being placed in shallow water.
    b. Forage– reduced forage from placement of rock in fine substrate, shallow-water habitat and increase in available predator habitat; increased shallow-water habitat will be created at the mitigation sites.
    c. Natural cover –no effect.
    d. Water quality – short-term effects will occur from pile driving and in-water work.
    e. Water quantity –no effect.

2. Freshwater migration
    a. Free of artificial obstruction –no effect.
    b. Natural cover –no effect.
    c. Water quality – short-term effects, such as hemorrhage and rupture of organs and hearing damage, will occur from pile driving and in-water work.
    d. Water quantity –no effect.

Based on the most recent study of the Lower Willamette River (Friesen 2005), shallow-water, beach-type habitat was preferentially selected by juvenile salmon. The proposed project would affect this type of habitat by placing rock armor over 33,000 ft^2 of shallow-water habitat. These impacts will be offset by the creation of 25,500 ft^2 shallow-water habitat and the removal of 20,000 ft^2 of derelict piles from shallow-water habitat.

<u>Johnson and Crystal Springs Creeks</u>

3. Freshwater rearing
   a. Floodplain connectivity – maintain the current limited connection to floodplains.
   b. Forage – no effect.
   c. Natural cover – no effect.
   d. Water quality – short-term effects, such as hemorrhage and rupture of organs and hearing damage, will occur from pile driving and in-water work.
   e. Water quantity – no effect.

4. Freshwater migration
   a. Free of artificial obstruction – the proposed project will have no effect.
   b. Natural cover – the proposed project will have no effect.
   c. Water quality – short-term effects, such as hemorrhage and rupture of organs and hearing damage, will occur from pile driving and in-water work. Water quantity – the proposed project will have no effect.

<u>Kellogg Creek</u>

5. Freshwater rearing
   a. Floodplain connectivity – maintain the current limited connection to floodplains.
   b. Forage– no effect.
   c. Natural cover – no effect.
   d. Water quality – short-term effects, such as hemorrhage and rupture of organs and hearing damage, will occur from pile driving and in-water work.
   e. Water quantity – no effect.

6. Freshwater migration
   a. Free of artificial obstruction – no effect.
   b. Natural cover – no effect.
   c. Water quality – short-term effects, such as hemorrhage and rupture of organs and hearing damage, will occur from pile driving and in-water work.
   d. Water quantity – no effect.

Cumulative Effects

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). NMFS expects development to continue as the population in the action area continues to grow.

The BA identified future land use consistent with the South Waterfront Plan as a category of actions that are reasonably certain to occur within the action area. In addition, NMFS is aware that the property adjacent to the Willamette River action area on the west side is planned for development of large residences, office buildings, road expansions and waterfront trails and recreation areas. These developments are likely to result in additional stormwater runoff, floodplain fill and reduced riparian vegetation due to trails and infrastructure.

Synthesis and Integration of Effects

Species at the Population Scale

The applicant has proposed to complete all in-water work during the preferred summer in-water work windows, and to provide off-site mitigation, which will reduce adverse effects to adult and juvenile ESA-listed salmonids that migrate and rear in the action area by scheduling work when salmon presence is low. The in-water work window is designed to avoid peak migrations periods of adults and allow work when the fewest number of juveniles are present. Individuals in the Willamette River action area represent all populations of UWR Chinook and UWR steelhead since all individuals must migrate through the action area to the upper Willamette basin. For LCR Chinook, LCR steelhead and LCR coho individuals in the action area are likely to be from the Clackamas River populations. Floodplain fill, pile driving and fish salvage are likely to result in stress, injury or death of individuals in the action areas.

Willamette River. The proposed project is likely to adversely affect individual fish as a result of fish salvage and pile driving and floodplain fill. Both juvenile and adult fish are likely to be present during the summer work window proposed for in-water work. Most of the fish will incur short-term stress due to loud sounds during construction. Any non-lethal stress experienced by individual fish is likely to be brief (weeks). A few fish may be injured or killed by pile driving or by the culmination of joint causes, such as a previous wound acquired from exposure to the environmental baseline and genetic weakness.

Any Chinook adults present in July and coho adults present in October are important to the population because they represent genetic diversity resulting in migration timing outside the peak timing for the species. Since the Willamette River is a migration corridor for LCR Chinook salmon, UWR Chinook salmon, LCR steelhead, UWR steelhead, and LCR coho salmon, the proposed in-water work will affect individuals in many species and populations. For UWR species, all individuals of the species must pass the action area during upstream and downstream migration. Few adults and juveniles are likely to be injured or killed but too few to affect the abundance or productivity of any affected population or to appreciably reduce the likelihood of survival and recovery of any listed species.

Floodplain fill from the scour protection and bridge towers will reduce the floodplain connectivity and the ability for individuals to access shallow water habitat. Availability of shallow water habitat will be increased by the proposed creation of shallow water habitat in the Lower Willamette.

Kellogg Creek. The proposed project is likely to adversely affect individual LCR steelhead, LCR Chinook and LCR coho juveniles as a result of pile driving. Due to run timing, adult fish are not likely to be present in Kellogg Creek during the summer work window proposed for in-water work. NMFS does expect a small number of fish to be present during construction. Most of the fish will incur short-term stress due to loud sounds during construction.

Any non-lethal stress experienced by individual fish is likely to be brief (days). A few fish may be injured or killed by pile driving or by the culmination of joint causes, such as a previous wound inflicted by the environmental baseline and genetic weakness.

Considering the low abundance of ESA-listed juvenile salmonids in the action area, it is likely that the net effect of the proposed action will be a very small and temporary reduction in the number of juvenile fish, far too few to significantly reduce adult returns, and thus too few to affect the abundance or productivity of any affected population or to appreciably reduce the likelihood of survival and recovery of any listed species.

Johnson and Crystal Springs Creeks. The proposed project is likely to adversely affect individual LCR steelhead, LCR Chinook and LCR coho juveniles as a result of pile driving. Due to run timing, adult fish are not likely to be present in Johnson or Crystal Springs Creeks during the summer work window proposed for in-water work. NMFS does expect a small number of fish to be present during construction. Most of the fish will incur short-term stress due to loud sounds during construction. Any non-lethal stress experienced by individual fish is likely to be brief (days). A few fish may be injured or killed by pile driving or by the culmination of joint causes, such as a previous wound inflicted by the environmental baseline and genetic weakness.

Considering the low abundance of ESA-listed juvenile salmonids in the action area, it is likely that the net effect of the proposed action will be a very small and temporary reduction in the number of juvenile fish, far too few to significantly reduce adult returns, and thus too few to affect the abundance or productivity of any affected population or to appreciably reduce the likelihood of survival and recovery of any listed species.

Critical Habitat at the Watershed Scale

The same effects of the proposed action that will have an adverse affect on listed salmon and steelhead will also have an adverse affect on critical habitat PCEs for salmon and steelhead. The proposed action is likely to result in reduced conservation value of critical habitat in the construction area and some beneficial effects from the proposed mitigation.

Willamette River. The effects of the temporary bridge in the Willamette River will last several years, and the bridge piers and scour protection will be permanent. A total of 105,000 ft^2 (2.43 acres) will be permanently impacted, of which 33,000 ft^2 (0.75 acre) is located in shallow water. The permanent modification of shallow-water habitat will have an adverse effect on the conservation value at the watershed scale. The baseline and trends indicate that the Willamette River will continue to be developed and shallow-water habitat will continue to be lost.

To offset the impacts of scour protection at the Willamette River bridge, 25,500 ft^2 of shallow-water habitat will be created in the Lower Willamette River, approximately 0.5 mile upstream in the South Waterfront district, between Whitaker and Pennoyer streets. This new habitat will provide important rearing and migration habitat for ESA-listed species in the Lower Willamette River. In addition, 20,000 ft^2 of derelict piles will be removed from shallow-water habitat in the Lower Willamette River to benefit migrating and rearing ESA-listed species.

Kellogg Creek. These effects will last for the same a period of time during bridge construction, *i.e.*, re-suspension of sediments while installing piles and the noise of pile driving during pile installation, and longer as a result of establishing the new bridge. Together, these effects are likely to cause a minor reduction in the conservation value of critical habitat PCEs for the rearing and migration corridor within the action area, but are too small and brief to affect the conservation value of the Willamette River, or critical habitat as a whole. Therefore, critical habitat will remain functional and retain the current ability for PCEs to become functionally established, to serve the intended conservation role for the species.

Johnson and Crystal Springs Creeks. These effects will last for the same a period of time during bridge construction, *i.e.*, the noise of pile driving during pile installation, and longer as a result of establishing the bridge. Together, these effects are likely to cause a minor reduction in the conservation value of critical habitat PCEs for the rearing and migration corridor within the action area, but are too small and brief to affect the conservation value of the Johnson Creek, or critical habitat as a whole. Therefore, critical habitat will remain functional and retain the current ability for PCEs to become functionally established, to serve the intended conservation role for the species.

Conclusion

After reviewing the status of LCR Chinook salmon, UWR Chinook salmon, LCR steelhead, UWR steelhead, and LCR coho salmon and designated critical habitats, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UWR Chinook salmon, LCR steelhead, UWR steelhead and LCR coho salmon and does not result in destruction or adverse modification of designated critical habitat for LCR Chinook salmon, UWR Chinook salmon, LCR steelhead and UWR steelhead.

Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Fish and Wildlife Service as an intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of an incidental take statement.

Amount or Extent of Take

Actions necessary to construct the proposed PMLR project will occur during the summer in-water work window when juvenile LCR Chinook salmon, UWR Chinook salmon, LCR coho salmon, and UWR steelhead and adult Chinook and coho are likely to be present. These species use the action area in the Willamette River as a migratory and rearing corridor.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish. This is because the precise distribution and abundance of juvenile fish within the action area, at the time of the action and for many years to follow, are not a simple function of the quantity, quality, or availability of predictable habitat resources within that area. Rather, the distribution and abundance of fish within this action area also show wide, random variations due to biological and environmental processes operating at much larger demographic and regional scales. In such circumstances, NMFS uses the causal link established between the activity and a change in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

The best available indicators for the extent of incidental take are 33,000 ft^2 of permanent scour protection in shallow water habitat and observed sound pressure levels that meet or exceed 187 dB (dB re: 1µPa), the threshold of the onset of physical injury. These variables are directly proportional with an important cause of incidental take attributable to this action, *i.e*., the amount of noise that will be generated during pile driving with an impact hammer. The proposed action is likely to cause harm, injury or death of salmon and steelhead of the species considered in this Opinion as a result of noise generated during pile installation, fish salvage and habitat alteration. Take due to pile driving noise will occur within a radius extending approximately 521 feet (in the Willamette River) and 154 feet (in Kellogg Creek) around each pile that is driven using an impact hammer[9]. In the accompanying Opinion, NMFS determined that this level of incidental take is not likely to result in jeopardy to the listed species.

In the Willamette River, sound pressure levels that meet or exceed 187 dB (dB re: 1µPa) at a distance of 521 feet from each pile driven by an impact hammer will exceed the level of permissible incidental take and trigger the reinitation provisions of this Incidental Take Statement. In Kellogg Creek, sound pressure levels that meet or exceed 187 dB (dB re: 1µPa) at a distance of 610 feet from each pile driven by an impact hammer will exceed the level of permissible incidental take and trigger the reinitation provisions of this Incidental Take Statement..

For Johnson and Crystal Springs Creeks, sound pressure levels in the water that exceed 187 dB (dB re: 1µPa) during pile driving will exceed the level of permissible incidental take and trigger the reinitation provisions of this Incidental Take Statement.

[9] See Appendix A for detailed calculation of pile driving analysis.

Reasonable and Prudent Measures

The following measures are necessary and appropriate to minimize the impact of incidental take of listed species due to the proposed action:

The FTA shall:

1. Minimize incidental take by from construction and in-water work by avoiding and minimizing adverse effects to water quality, habitat and the ecology of aquatic systems.

2. Ensure completion of a monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

Terms and Conditions

The measures described below are non-discretionary, and must be undertaken by the FTA or, if an applicant is involved, must become binding conditions of any permit or grant issued to the applicant, for the exemption in section 7(o)(2) to apply. The FTA has a continuing duty to regulate the activity covered by this incidental take statement. If the FTA (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the FTA or applicant must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement.

1. To implement reasonable and prudent measure #1 (construction and in-water work**)**, the FTA shall ensure that:

    a. <u>In-water Work Window</u>. To minimize effects of in-water work, work shall occur during the in-water work windows proposed for each stream.
    b. <u>Pile Driving Work Window</u>. To minimize effects of pile driving to adult Chinook and coho salmon, pile driving with an impact hammer in the Willamette River shall occur between July 10 and October 15.
    c. <u>Conservation Measures</u>. All conservation measures and best management practices proposed in the BA shall be followed for construction activities.
    d. <u>Pile Driving</u>. Piling driving shall occur only during daylight hours with the sun above the horizon. This is to ensure that pile driving does not occur at dawn or dusk, which can be peak movement time for juvenile and adult salmonids.
        i. When possible, use a vibratory hammer for piling installation.
        ii. When using an impact hammer to drive or proof steel piles, one of the following sound attenuation devices must be used to reduce sound pressure levels by a minimum of 10 dB:
            (1) Completely isolate the pile from flowing water by dewatering the pile.

(2) If water velocity is 1.6 feet per second or less, surround the piling being driven by an unconfined bubble curtain that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column.

(3) If water velocity is greater than 1.6 feet per second, surround the piling being driven by a confined bubble curtain (*e.g.*, a bubble ring surrounded by fabric or metal sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.

iii. For each pile to be driven in the water, install and operate a bubble curtain with the following specifications:

(1) General - A confined bubble curtain is composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe(s), and a means of confining the bubbles.

(2) The confinement shall extend from the substrate to a sufficient elevation above the maximum water level expected during pile installation such that when the air delivery system is adjusted properly, the bubble curtain does not act as a water pump (*i.e.*, little or no water should be pumped out of the top of the confinement system).

(3) The confinement shall contain resilient pile guides that prevent the pile and the confinement from coming into contact with each other and do not transmit vibrations to the confinement sleeve and into the water column (*e.g.* rubber spacers, air filled cushions).

(4) In water less than 15 meters deep, the system shall have a single aeration ring at the substrate level. In waters greater than 15 m deep, the system shall have at least two rings, one at the substrate level and the other at mid-depth.

(5) The lowest layer of perforated aeration pipe shall be designed to ensure contact with the substrate without sinking into the substrate and shall accommodate for sloped conditions.

(6) Air holes shall be 1.6 mm (1/16-inch) in diameter and shall be spaced approximately 20 mm (3/4 inch) apart. Air holes with this size and spacing shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.

(7) The system shall provide a bubble flux of 2.0 cubic meters per minute per linear meter of pipe in each layer (21.53 cubic feet per minute per linear foot of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring:

Vt = 2.0 m3/min/m * Circ of the aeration ring in m
or Vt = 21.53 ft3/min/ft * Circ of the aeration ring in feet

iv. Flow meters shall be provided as follows:
   (1) Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.
   (2) Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.
   (3) Flow meters shall be installed according to the manufacturer's recommendation based on either laminar flow or non-laminar flow.

e. Isolation of In-water Work Area. The work area will be well isolated from the active flowing stream using inflatable bags, sandbags, sheet pilings or similar materials.
   i. After completion of the project, the existing isolation area should be rewatered in a way that will not degrade water quality or cause fish stranding.
   ii. An experience biologist shall be on site to monitor for fish stranding during this process.
   iii. The existing flow downstream from the action area will be maintained throughout the construction.

f. Capture and Release. Fish will be captured and released from the isolated area using trapping, seining, electrofishing or other methods as are prudent to minimize risk of injury.
   i. A fishery biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish must conduct or supervise the entire capture and release operation.
   ii. If electrofishing equipment is used to capture fish, the capture team must comply with NMFS' electrofishing guidelines.
   iii. The capture team must handle ESA-listed fish with extreme care, keeping fish in water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling.
   iv. Captured fish must be released as near as possible to capture sites.
   v. ESA-listed fish may not be transferred to anyone except NMFS personnel, unless otherwise approved in writing by NMFS.
   vi. Other Federal, state, and local permits necessary to conduct the capture and release activity must be obtained.
   vii. The NMFS or its designated representative must be allowed to accompany the capture team during the capture and release activity, and must be allowed to inspect the team's capture and release records and facilities.

g. Best Management Practices and Conservation Measures. All BMPs and conservation measures outlined in the BA shall be carried out as described, including any monitoring reports generated shall be sent to NMFS.

2. To implement reasonable and prudent measure #2 (monitoring), the FTA shall ensure that:

   a. Pile Driving Monitoring Plan. The FTA shall prepare a pile driving monitoring plan, as described in WSDOT (2009), at least 60 days before pile driving commences, and submit the plan to NMFS for approval. Pile driving shall be monitored at a minimum of two locations, approximately 30 feet and 521 feet (Willamette) and 154 feet (Kellogg) from the piles. At Johnson and Crystal Springs Creek pile driving will be monitored in water, in line with the crossing.
   b. Pile Driving Monitoring. During construction, if an impact hammer is used and hammer strikes are exceed, contact NMFS immediately at 503-231-2307 or Christina.fellas@noaa.gov.
   c. Reporting. Within 90 days following the completion of the proposed construction project, the applicant shall report all monitoring items to include, at a minimum, the following:
      i. Pollution control. Give a summary of pollution control practices, including a description of any contaminant release, and efforts to correct such incidences.
      ii. Pilings. Number, size and type of piles installed.
      iii. Piling installation. Report the number of strikes per day, number of hours of impact pile driving and per pile and type of hammer used.
      iv. Pile Driving Monitoring. Submit results from pile driving monitoring plan.
   d. The applicant submits monitoring reports to:

      National Marine Fisheries Service
      Oregon State Habitat Office
      Attn: 2009/05649
      1201 NE Lloyd Boulevard, Suite 1100
      Portland, OR 97232-2778

   e. The applicant posts the following notice prominently at the work site: NOTICE: If a sick, injured or dead specimen of a threatened or endangered species is found in the project area, the finder must notify NMFS through the contact person identified in the transmittal letter for this Opinion, or through the NMFS Office of Law Enforcement at 1-800-853-1964, and follow any instructions. If the proposed action may worsen the fish's condition before NMFS can be contacted, the finder should attempt to move the fish to a suitable location near the capture site while keeping the fish in the water and reducing its stress as much as possible. Do not disturb the fish after it has been moved. If the fish is dead, or dies while being captured or moved, report the following information: (1) NMFS consultation number; (2) the date, time, and location of discovery; (3) a brief description of circumstances and any information that may show the cause of death; and (4) photographs of the fish and where it was found. The NMFS also suggests that the finder coordinate with local biologists to recover any tags or other relevant research information. If the specimen is not needed by local biologists for tag recovery or by NMFS for analysis, the specimen should be returned to the water in which it was found, or otherwise discarded.

Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species.

1. Provide additional riparian plantings at stream crossings and approaches to provide water quality benefits and sources of wood for streams that support ESA-listed species.
2. Reduce or remove floodplain fill to provide access for ESA-listed species to additional habitat.

Please notify NMFS if FTA carries out this recommendation so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit the listed species or their designated critical habitats.

Reinitiation of Consultation

Reinitiation of formal consultation is required and shall be requested by the Federal agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that has an effect to the listed species or designated critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat is designated that may be affected by the identified action (50 CFR 402.16).

If FTA does not complete the mitigation components proposed as part of the action, NOAA Fisheries may consider this to be a modification of the action that causes an effect on listed species not previously considered, potentially resulting in the need to reinitiate consultation.

To reinitiate consultation, contact the Oregon State Habitat Office of NMFS, and refer to the NMFS Number assigned to this consultation (2009/05649).

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect EFH. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitats, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) described and identified EFH for groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Chinook salmon, coho salmon, and Puget Sound pink salmon (PFMC 1999). The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook and coho. Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have the following adverse effects on EFH designated for Pacific Coast salmon:

> Degradation of floodplain connectivity, forage and water quality required for rearing and migration in the Lower Willamette River as described in the Opinion above.

Essential Fish Habitat Conservation Recommendations

The following two conservation measures are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH. These conservation recommendations are a subset of the ESA terms and conditions.

1. NMFS recommends that FTA follow Term and Condition 1b, related to the pile driving work window.

2. NMFS recommends that FTA follow Term and Condition 2a, b and c related to pile driving monitoring and reporting.

Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations [50 CFR 600.920(k)].

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

Utility: Utility principally refers to ensuring that the information contained in this document is helpful, serviceable, and beneficial to the intended users.

The Opinion in this document concludes that the proposed PMLR project will not jeopardize the affected listed species. Therefore, the FTA can fund this action in accordance with its authority. The intended users are the FTA and local project partners.
Individual copies were provided to the FTA and the local project partners. This consultation will be posted on the NMFS Northwest Region website (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA regulations (50 CFR 402.01, *et seq*.) and the MSA implementing regulations regarding EFH [50 CFR 600.920(j)].

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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APPENDIX A. PILE DRIVING CALCULATIONS

Project Title	PMLR, Willamette Bridge
Pile information (size, type, number, pile strikes, etc.)	126 36-inch diameter steel piles, (114 in water)

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmission loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)*	**214**	**186**	**201**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**800**

Cumulative SEL at measured distance
215

	Distance (m) to threshold*			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB** Fish ≥ 2 g	Cumulative SEL dB** Fish < 2 g	RMS dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**34**	**739**	**1366**	**25119**

Fish < 2 g not likely in mainstem Willamette during work window

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)
(This model was last updated January 26, 2009)

Project Title	PMLR, Willamette Bridge
Pile information (size, type, number, pile strikes, etc.)	126 36-inch diameter steel piles, (114 in water) -- WITH ATTENUATION FROM BUBBLE CURTAIN

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmission loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)*	**204**	**176**	**191**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**800**

Cumulative SEL at measured distance
205

	Distance (m) to threshold*			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB** Fish ≥ 2 g	Cumulative SEL dB** Fish < 2 g	RMS dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**7**	**159**	**294**	**5412**

Fish < 2 g not likely in mainstem Willamette during work window

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)
(This model was last updated January 26, 2009)

*If bubble curtain is deployed, Peak/SEL/RMS are all reduced by 10 db

Project Title	PMLR, Kellogg Bridge
Pile information (size, type, number, pile strikes, etc.)	60 24-inch diameter steel piles for temporary bridge

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)*	**212**	**181**	**189**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**400**

Cumulative SEL at measured distance
207

	Distance (m) to threshold*			
	Onset of Physical Injury			Behavior
	Peak	Cumulative SEL dB**		RMS
	dB	Fish ≥ 2 g	Fish < 2 g	dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**25**	**216**	**399**	**3981**

Fish < 2 g not likely in mainstem Willamette during work window

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

Project Title	PMLR, Kellogg Bridge
Pile information (size, type, number, pile strikes, etc.)	60 24-inch diameter steel piles for temporary bridge - WITH ATTENUATION FROM BUBBLE CURTAIN

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmission loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)*	**202**	**171**	**179**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**400**

Cumulative SEL at measured distance
197

	Distance (m) to threshold*			
	Onset of Physical Injury			Behavior
	Peak	Cumulative SEL dB**		RMS
		Fish ≥ 2 g	Fish < 2 g	
	dB			dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**5**	**47**	**86**	**858**

Fish < 2 g not likely in mainstem Willamette during work window

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)
(This model was last updated January 26, 2009)

*If bubble curtain is deployed, Peak/SEL/RMS are all reduced by 10 db