UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No:
WCRO-2019-01026

June 1, 2020

Michelle Walker
Corps of Engineers, Seattle District
Regulatory Branch CENWS-OD-RG
P.O. Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for King County's North Mercer Island Interceptor and Enatai Interceptor Upgrade Project, King County, Washington, COE Number: NWS-2016-1132, HUC: 171100120400 – Lake Washington.

Dear Ms. Walker:

Thank you for your letter of June 12, 2019, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for U.S. Army Corps of Engineers (COE) authorization of King County's North Mercer Island Interceptor and Enatai Interceptor Upgrade Project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016). The enclosed document contains the biological opinion (Opinion) prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this Opinion, the NMFS concludes that the proposed action would adversely affect but is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon. The NMFS also concludes that the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon but is not likely to result in the destruction or adverse modification of that designated critical habitat. This document also documents our conclusion that the proposed action is not likely to adversely affect PS steelhead.

This Opinion includes an incidental take statement (ITS) that describes reasonable and prudent measures (RPMs) the NMFS considers necessary or appropriate to minimize the incidental take associated with this action, and sets forth nondiscretionary terms and conditions that the COE must comply with to meet those 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.

Section 3 of this document includes our analysis of the action's likely effects on EFH pursuant to Section 305(b) of the MSA. Based on that analysis, the NMFS concluded that the action would adversely affect designated EFH for Pacific Coast Salmon. Therefore, we have provided 2 conservation recommendations that can be taken by the COE to avoid, minimize, or otherwise offset potential adverse effects on EFH.

Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving this recommendation. If the response is inconsistent with the EFH conservation recommendations, the COE must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and 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.

Please contact Donald Hubner in the North Puget Sound Branch of the Oregon/Washington Coastal Office at (206) 526-4359, or by electronic mail at Donald.Hubner@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Rory Lee, COE
Jacob Sheppard, King County
Karen Walter, Muckleshoot Indian Tribe

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

King County's North Mercer Island Interceptor and Enatai Interceptor Upgrade Project
King County, Washington (6th Field HUC: 171100120400 – Lake Washington)
(COE Number: NWS-2016-1132)

NMFS Consultation Number: WCRO-2019-01026

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Chinook salmon (Oncorhynchus tshawytscha) Puget Sound (PS)	Threatened	Yes	No	Yes	No
Steelhead (O. mykiss) PS	Threatened	No	No	No	No

Affected Essential Fish Habitat (EFH) and NMFS' Determinations:

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: June 1, 2020

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LIST OF ACRONYMS

BA – Biological Assessment
BMP – Best Management Practices
CFR – Code of Federal Regulations
COE – Corps of Engineers, U.S. Army
DIP – Demographically Independent Population
DO – Dissolved Oxygen
DPS – Distinct Population Segment
DQA – Data Quality Act
EF – Essential Feature
EFH – Essential Fish Habitat
ESA – Endangered Species Act
ESU – Evolutionarily Significant Unit
FR – Federal Register
FMP – Fishery Management Plan
HAPC – Habitat Area of Particular Concern
HDD – Horizontal Directional Drill
HDPE – High-Density Polyethylene
HPA – Hydraulic Project Approval
HUC – Hydrologic Unit Code
ITS – Incidental Take Statement
mg/L – Milligrams per Liter
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NTU – Nephlometric Turbidity Units
OHWM – Ordinary High Water Mark
PAH – Polycyclic Aromatic Hydrocarbons
PBF – Physical or Biological Feature
PCB – Polychlorinated Biphenyl
PCE – Primary Constituent Element
PFMC – Pacific Fishery Management Council
PS – Puget Sound
PSTRT – Puget Sound Technical Recovery Team
RL – Received Level
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SAV – Submerged Aquatic Vegetation
SEL – Sound Exposure Level
SL – Source Level
UV-CIPP – Ultraviolet-Cured-In-Place-Pipe
VSP – Viable Salmonid Population
WDFW – Washington State Department of Fish and Wildlife
WDOE – Washington State Department of Ecology

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

We also completed an essential fish habitat (EFH) consultation on the proposed action, 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.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon Washington Coastal Office.

1.2 Consultation History

On December 14, 2016, the NMFS participated in a pre-application meeting hosted by the US Army Corps of Engineers (COE) to introduce the North Mercer Island Interceptor and Enatai Interceptor Upgrade Project and to seek comments from federal, state, and tribal representatives. A second multi-agency meeting was hosted by the COE on February 14, 2018 to discuss project developments and to seek additional comments from the group. On June 12, 2019, the NMFS received the COE's request for formal consultation (COE 2019), with its enclosed biological assessment (BA) (Confluence 2019). Formal consultation for the proposed action was initiated on that date.

On October 28, 2019, updates to the regulations governing interagency consultation (50 CFR part 402) became effective [84 FR 44976]. This consultation was pending at that time, and we are applying the updated regulations to the consultation. As the preamble to the final rule adopting the regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." We have reviewed the information and analyses relied upon to complete this biological opinion in light of the updated regulations and conclude that the Opinion is fully consistent with the updated regulations.

On December 10, 2019, King County, the COE, and the NMFS mutually agreed to the first of three extensions of the consultation due date to accommodate for late-stage project refinements.

The last extension occurred on April 16, 2020, and extended the due date to June 15, 2020 (COE 2020a - c).

This Opinion is based on the information in the BA; supplemental materials and responses to NMFS questions (King County 2020a - f); recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon; published and unpublished scientific information on the biology and ecology of that species; and relevant scientific and gray literature (see Literature Cited).

1.3 Proposed Federal Action

Under the ESA, "Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02), whereas the EFH definition of a federal action is any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

The COE proposes to authorize King County Department of Natural Resources and Parks Wastewater Treatment Division (King County) to conduct the North Mercer Island Interceptor and Enatai Interceptor Upgrade Project (NME Project). The project would install about 17,210 linear feet of new sewer pipeline and other system improvements from the North Mercer Island Pump Station, to the Mercer Island Boat Launch, across the East Channel, to Enatai Beach Park, and then to the Sweyolocken Pump Station in Bellevue, Washington (Figure 1). The project would increase the capacity of the existing facility and pipeline components to convey the 20-year peak wastewater flows projected through the year 2060 from service areas in North Mercer Island, the southwest portion of Bellevue, and the Town of Beaux Arts Village.

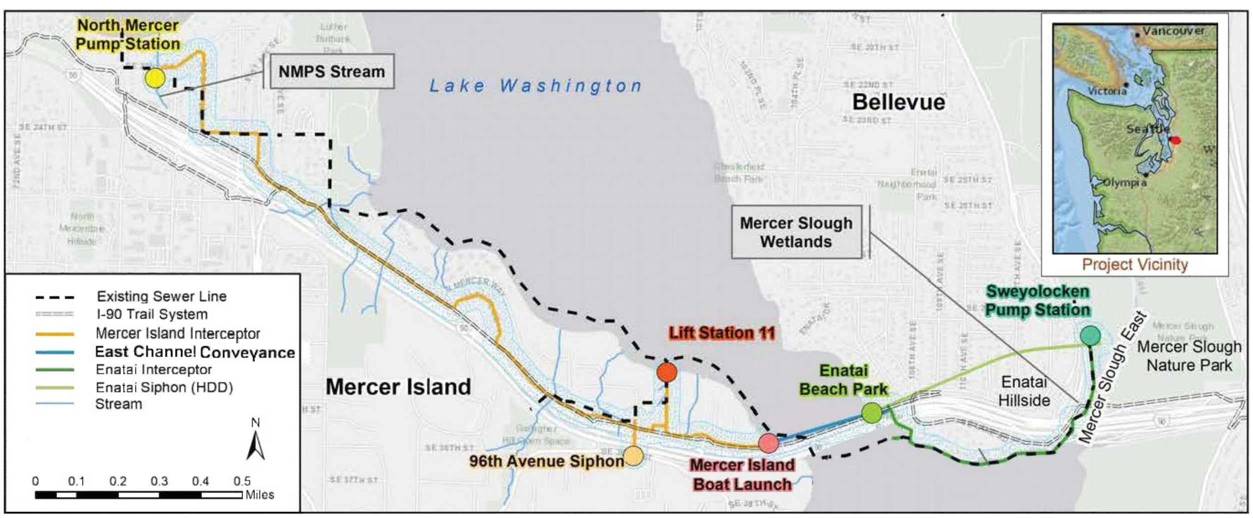

Figure 1. Map of the planned route of the North Mercer Island Interceptor and Enatai Interceptor Upgrade Project as it would run from the North Mercer Island Pump Station, across Lake Washington, and on to the Sweyolocken Pump Station in the City of Bellevue, Washington. (Adapted from Confluence 2019 Figure 1).

The NME Project would consist of three general construction segments: Mercer Island Conveyance, East Channel Crossing, and Bellevue Conveyance. Construction is planned to occur between March 2021 and April 2024, but the County's BA reports that unexpected delays could extend work to December 2025. To be conservative, and to account for possible delays in the project's start date, this biological opinion assumes that regardless of the year work would begin, the project may require construction over five consecutive years.

Further, the exact sequence of some work components could vary from the schedule expressed in the BA and summarized below. For example the in-water project components identified as starting in Year-2 might start in Year-1 or in Year-3. However, they would remain grouped as described, would occur only once over the life of the project, and they would be completed within the work windows expressed in the project description below. This also means that in-water work components could overlap such that in-water work components currently described as starting in different years could start in the same year. Therefore, the total number of in-water work seasons could be fewer than described, but would be limited to a maximum of 3 in-water work seasons, as described in the BA and below.

The County would require their contractors to comply with all conservation measures and best management practices (BMP) identified in their BA, and with the provisions identified in the pending Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) for this project. Further, any in-water work area isolation that would require dewatering and fish salvage would be done in compliance with the U.S. Fish and Wildlife Service's 2012 recommended fish exclusion, capture, handling, and electroshocking protocols and standards (USFWS 2012). Otherwise, in-water work area isolation would be done using sediment curtains that would be installed in a manner to exclude fish from the work area (King County 2020b). Also, in addition to any site-specific habitat enhancement described below, all temporarily affected areas would be restored to baseline conditions using appropriate native substrates and vegetation.

In general, the Mercer Island Conveyance segment would include about 34 months of mostly upland work to install new pipelines between the North Mercer Pump Station (NMPS) and the Mercer Island Boat Launch. The Bellevue Conveyance would include about 32 months of mixed in-water and upland work to install a new pipeline between the Sweyolocken Pump Station and the Enatai Beach Park, and to repair the existing Enatai Interceptor. Work for both of these segments is scheduled to begin in Year-1 of the project. The East Channel Crossing segment would include a mix of mostly in-water work to join the Mercer Island Conveyance with the Bellevue Conveyance. East Channel Crossing in-water work is scheduled to begin mid-June of Year-2 and could extend through February of Year 3 (King County 2020f).

<u>Year-1</u>

<u>March:</u> Upland Mercer Island Conveyance work to upgrade Lift Station 11 (LS-11) would begin (Figure 1). The County's contractors would operate land-based construction equipment to replace the existing LS-11 pump motor with a larger unit, improve electrical systems, and install larger piping. Most work would occur within the existing dry well and vaults, but 280 linear feet of trenching would be done along 97th Avenue SE to extend the existing force main and connect it to the new interceptor, and about 25 feet of additional trenching would be done to install a new power conduit at the lift station. Following construction, they would return all disturbed areas to

pre-construction conditions. About 18 months of work would be required to complete this component (King County 2020f).

April: Upland Mercer Island Conveyance work to upgrade the North Mercer Pump Station (NMPS) would begin. The County's contractors would expand the existing driveway, and construct a new generator building, a yard area with retaining walls, and a temporary pump station. They would also install a new force-main pipe, and install an improved odor reduction system. They would return all disturbed areas to pre-construction conditions. NMPS upgrade work would require about 33 months to complete.

July: Upland Mercer Island Conveyance work to install a new pipeline along the I-90 Trail would begin. This component would extend from the east bank of the NMPS stream to about 150 feet inland of the ordinary high water mark (OHWM) at the Mercer Island Boat Launch. Most of the route would follow the I-90 trail. The County's contractors would work sequentially along this section to excavate a trench, install new high-density polyethylene (HDPE) pipe, maintenance holes, and odor control vaults, and backfill the trench. The route would cross 6 piped streams, but would vertically avoid the pipes by a minimum of 1.5 feet. After construction, the contractors would return all disturbed areas to pre-construction conditions. About 20 months of work would be required to complete this component.

Also in July of Year-1, upland Bellevue Conveyance work would begin with horizontal directional drilling (HDD) to install the Enatai Siphon between the Sweyolocken Pump Station and an upland location under the I-90 Bridge at the Enatai Beach Park (Figure 2). The contractors would also install a cast-place concrete siphon outlet and diversion structure in a second pit at the Enatai Beach Park. The County's contractors would operate land-based construction equipment to excavate pits at both sites then use the HDD equipment at the Sweyolocken Pump Station to bore a hole through the Enatai hillside. The HDD router would emerge from the ground about 95 feet inland of the lake shoreline. The contractors would also use the HDD equipment to pull in the new siphon pipeline as described below.

The contractors would also conduct up to 4 weeks of in-water work to install the Enatai Siphon between July 16 and December 31, and related upland work would continue. At the Enatai Beach Park site, the contractors would operate land-based equipment to fuse HDPE pipe sections to create a single 3,100-foot long pipe. They would install a temporary watertight plate on the far end of the pipe, and sequentially extend the floating pipeline out onto the lake until it is complete (Figure 3). They would operate a combination of tugboats and barge-mounted cranes to position the pipeline while it is on the water. In nearshore areas, the barges would use spuds to hold position. Workboats would be used to keep barges in position in deeper water. After the HDD borehole and the new pipeline are both complete, they would connect the onshore end of the pipe to a pulling head on the HDD equipment, then pull the pipeline through the borehole as the HDD equipment is extracted through the Sweyolocken Pump Station HDD pit. After HDD pipe installation is complete, the contractors would install new pipe and maintenance holes to construct the new Sweyolocken Gravity pipe.

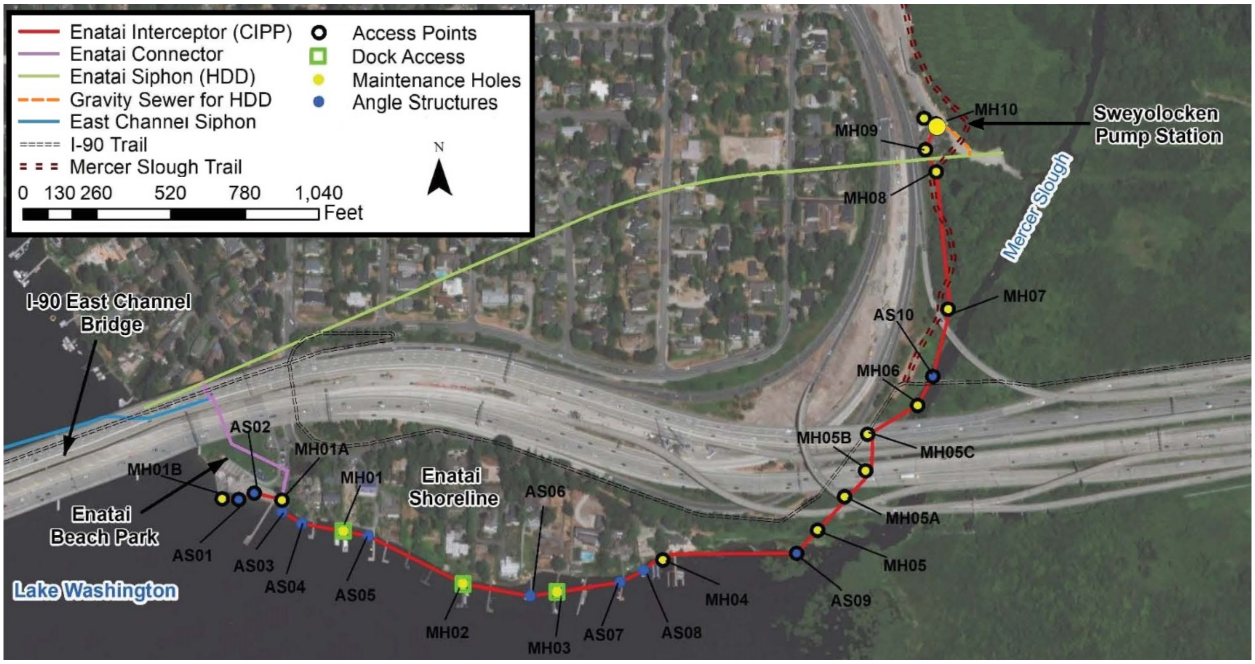

Figure 2. Overhead photograph of the Bellevue Conveyance project area with the various pipeline routes drawn in (Adapted from Confluence 2019 Figure 19).

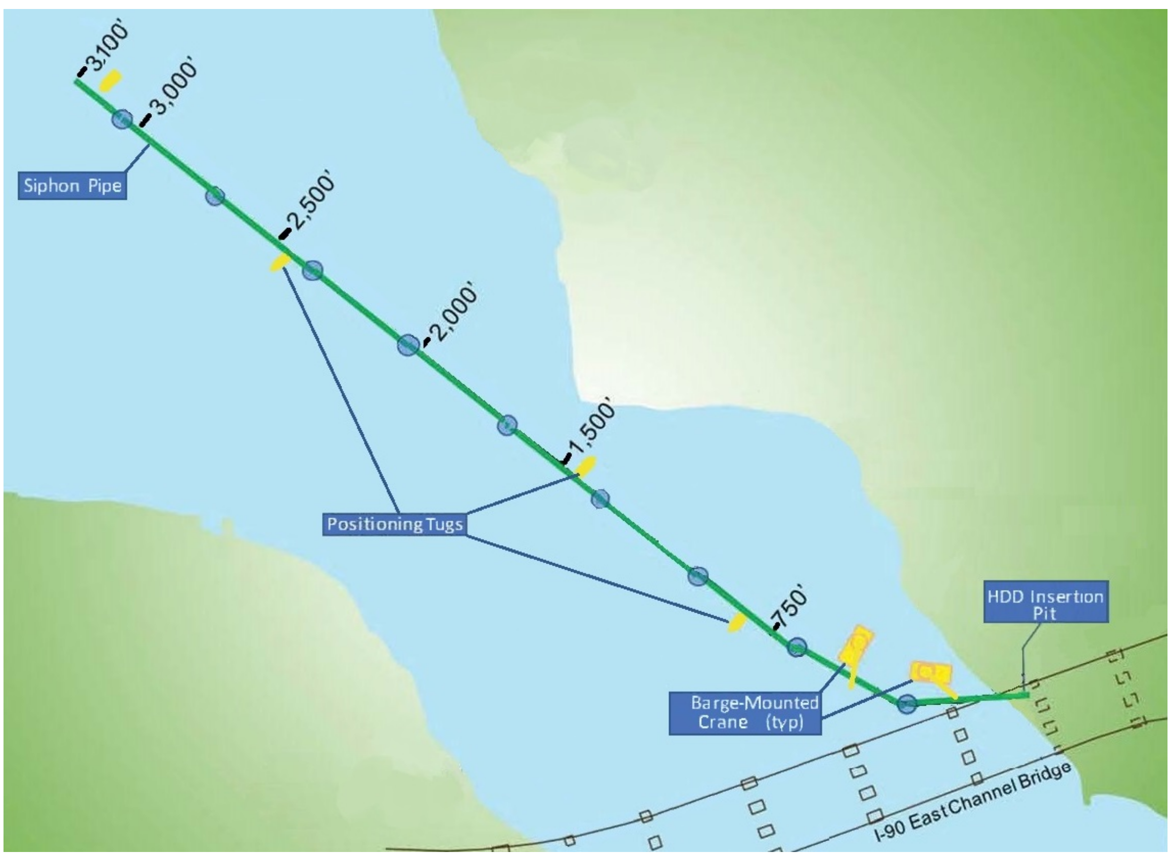

Figure 3. Approximate location the Enatai Siphon HDPE pipe floating on Lake Washington prior to it being pulled through the HDD borehole to the Sweyolocken Pump Station (Adapted from Confluence 2019 Figure 14, per King County 2020b).

Year-2

January: Ongoing upland Mercer Island Conveyance work would continue to upgrade LS-11 and the NMPS facility, and to install a new HDPE pipeline along the I-90 Trail.

Also in January of Year-2, upland Bellevue Conveyance work to install the gravity pipe between the Sweyolocken Pump Station and the Enatai Siphon would begin. The County's contractors would excavate a trench between the end of the Enatai Siphon and the existing maintenance hole at the Sweyolocken Pump Station (MH10 in Figure 2). They would install a new maintenance hole at the east end of the Enatai Siphon, install a connecting pipe between the two maintenance holes, backfill the trench, and return all disturbed areas to pre-construction conditions. About 3 months of work would be required to complete this component.

April: Upland Mercer Island Conveyance work at the 96th Avenue Siphon would begin. The County's contractors would install a temporary above-ground HDPE sewer pipe to bypass the existing pipes. Then, working through existing maintenance holes, they would remove and replace the existing siphon pipe and related hardware that are within an underground casing. They would also excavate a trench to install a new section of pipe that would connect the 96th Avenue Siphon to the new interceptor. They would backfill the trench after making the connection. They would also install 2 new odor control vaults within existing maintenance holes. The new impervious surface area for this work is included with that identified under the I-90 Trail work above. After construction, they would return all disturbed areas to pre-construction conditions. About 6 months of work would be required to complete this component.

May: About 1 month of upland work would be done to repave the Sweyolocken PS access driveway.

June: Mobilization of barges and excavation equipment in the East Channel may begin as early as mid-June in preparation for the East Channel crossing work (King County 2020f).

July: Mercer Island Conveyance work to cross the NMPS stream would begin. This component includes the only in-water work for the Mercer Island Conveyance segment. Although it is a potentially fish-bearing stream, no salmonids have been documented in it (WDFW 2019a). Prior to construction the County's contractors would isolate the in-water work area with block nets, remove any fish with a sein, then install a gravity bypass around the work area. After work area isolation and fish salvage, they would excavate an open trench across the streambed, then remove and replace the existing sewer pipe. They would backfill the trench and return the streambed and banks to pre-construction conditions. They would then restore normal stream flow, remove the temporary bypass, and return all disturbed areas to pre-construction conditions. About 2 months of work would be required to complete the NMPS Stream crossing.

In-water construction work for the East Channel Crossing would begin July 16. This component includes upland work at the Mercer Island Boat Launch and Enatai Beach Park, and in-water work across the East Channel (just north of the I-90 Bridge), (Figure 4). Upland work at both ends would likely begin prior to July, but all in-water substrate disturbing work to install the new HDPE pipeline across the East Channel and to perform shoreline restoration would be done between July 16 of Year 2 and January 31 of Year-3. Pipeline installation work at the Enatai Beach side of the crossing would be completed by the end of November. However, work on the Mercer Island side of the channel might extend through January 31 of Year 3 due to delays that are likely to arise from the need to install the new pipeline under the utilities that exist in that part of the channel, and winter weather conditions. Demobilization of the work barges could extend through the end of February (King County 2020f).

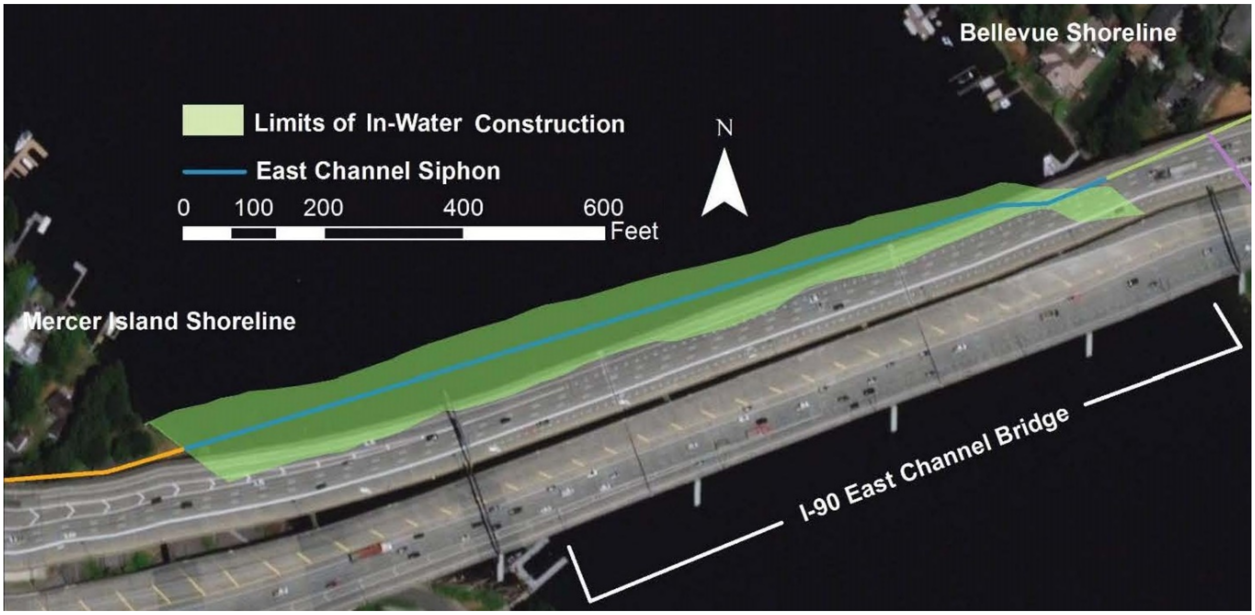

Figure 4. Approximate route of the Mercer Island Interceptor (yellow), East Channel Siphon (blue), and Enatai Siphon (green) relative to the I-90 East Channel Bridge (Adapted from Confluence 2019 Figure 13).

For convenience and ease of understanding, the description of East Channel Crossing work is organized by area. It arbitrarily starts at the Mercer Island boat launch site, then discusses work in the East Channel, then discuss crossing work at Enatai Beach Park site. The actual sequence of work is uncertain, and many components are likely to occur simultaneously.

At the Mercer Island boat launch site, the County's contractors would excavate a trench, install a new concrete access vault, install new pipe to connect the upland portions of the North Mercer Island Interceptor to the in-water portions of the East Channel Siphon, and restore the work area. They would install silt fences around the upland portion of the work area and a full-depth floating turbidity curtain around the in-water portion. The in-water turbidity curtain would be installed along the waterline and extended away from shore in a manner intended to herd fish away from the in-water work area. No dewatering or fish salvage would be done for this work.

Starting at about 150 feet inland of the OHWM, the contractors would use land-based equipment to excavate a pit and install a cast-in-place 10- by 16-foot concrete access vault. From there, they would excavate a trench toward the shoreline. As the trench is cut, they would install a temporary slide-rail shoring system that is designed to be installed and removed in sections as the trench is extended toward the lake. Digging would proceed toward the east-southeast, pipe would be laid behind the digging, and backfilling and slide-rail removal would be done after the pipe has been laid. After backfilling, they would return all disturbed areas to pre-construction conditions. At the shoreline, the contractors would remove about 65 linear feet of an existing vertical concrete and rip rap bulkhead, and continue to use the slide-rail shoring system to about 35 feet beyond the OHWM. Beyond that distance, work would be done from a barge as part of trenching across the East Channel as described below. The post-construction restoration work at the boat launch site, would include the installation of anchored logs, reinforced soil lifts with live stakes, and about 5,000 square feet of fish gravel to create about 133 linear feet of sloped gravel and log embankment across the shoreline crossing area. They would also remove invasive plants from the riparian zone, and install about 6,190 square feet of native riparian plantings.

Across the East Channel, the County's contractors would excavate a 50-foot wide by 10-foot deep trench and install about 1,400 feet of HDPE pipeline to construct the East Channel Siphon. The trenching would be done with a barge-mounted derrick with a clamshell bucket (dredge). Work could begin at either side the channel where the upland pipe-laying ends at that site, then proceed across the channel, and end where the upland pipe-laying on the opposite shore ends. The barge would moor itself with spuds in shallow water near shore, but anchors would be used in deeper water toward the middle of the channel. A mobile floating turbidity curtain would be installed around the dredging area to reduce the spread of turbidity. The contractors would be required to comply with State water quality standards for lakes that limit turbidity at 150 feet from the work to 5 Nephlometric Turbidity Units (NTU) above background levels of 50 NTU or less, and to 10% above background for background levels above 50 NTU (King County 2020b).

Dredged sediments would be loaded onto specially-designed bottom-dump barges (dredge scows) that would hold the material for transport to the Elliott Bay open-water disposal site. In areas where the trench line crosses existing underwater utility lines, divers would use hand-held hydraulic jets to excavate the sediments from under the utility lines, and they would install temporary webbed trusses that would span the trench to support the utility lines. Pipe sections consisting of three parallel pipes about 12- to 16-inches in diameter would be attached to precast concrete anchor blocks and lowered into the trench by crane, where divers would use hand tools to connect the pipe sections. After pipe installation, the trench would be backfilled with WDFW-approved washed gravel.

Open-water disposal would be accomplished by tugboats that would tow the dredge scows from the site, through the Lake Washington Ship Canal and the Chittenden Locks, then south to the Elliott Bay open-water disposal site. There, the barge operators would open the discharge hatches in the hull to dump the dredge spoils on the seafloor. The potential effects of using the Elliott Bay open-water disposal site are not considered part of the proposed action because those effects have already been considered in separate ESA consultations for the use of Puget Sound open-water disposal sites (NMFS 2015). The activity is described here only for continuity.

At the Enatai Beach Park, the County's contractors would operate land-based heavy equipment under the east end of the I-90 Bridge to excavate a trench and install a pipeline from a location about 187 feet inland of the lake shoreline, and to extend that work to a point about 60 feet beyond the OHWM where the pipeline would connect to the East Channel Siphon described above. This trenching and pipe laying would be essentially identical to the work described above for the Mercer Island Boat Launch transition site. Work at this site would also include the permanent removal of a 285-square foot dock just north of the pipeline's shoreline transition site. Removal would consist primarily of the barge-mounted derrick removing the decking, and pulling a small number of 2-inch diameter steel pipe piles, and placing the debris on a disposal barge or on the shore for proper upland disposal at an approved site. The post-construction restoration work at this site would include the installation of anchored logs, reinforced soil lifts with live willow stakes, and fish gravel to create about 115 linear feet of sloped gravel and log embankment across the shoreline crossing area. They would also remove invasive plants and plant a durable grass mix.

September: Upland work under the east end of the I-90 Bridge would begin to install three below-grade concrete vaults, install the Enatai Connector pipeline, and to construct a permanent access road. The contractors would use standard land-based construction equipment, techniques, and BMPs to excavate a trench between the newly installed Enatai Siphon and the existing Enatai Interceptor. They would also excavate three pits along the trench, where they would construct a cast-in-place concrete vaults. They would also install HDPE pipe within the trench that would connect to each of the vaults and to the Enatai Siphon, the East Channel Siphon, and the Enatai Interceptor to create the Enatai Connector (Purple line in Figure 2). They would backfill the trench and pits with excavated material after the pipe and vaults have been installed. This work would require about 3 months to complete, and the County's contractors would return all disturbed upland areas to pre-construction conditions.

Year-3

January: On Mercer Island, ongoing upland work related to the pipeline installation along the I-90 Trail would continue through the end of February, and ongoing upland work related to the 96th Ave Siphon upgrades would continue through the end of April (King County 2020f). Ongoing upland work to upgrade the NMPS facility on Mercer Island would continue until about the end of the year.

At the Mercer Island Boat Launch site, ongoing in-water work related to the East Channel Crossing would continue through the end of January. Demobilization of the work barges and other equipment at this site could extend to the end of February. Upland demobilization and restoration work may extend through the end of March (King County 2020f).

July: The County's contractors would begin upland work to provide access and staging along the I-90 and Mercer Slough Trails in support of rehabilitation work for the Enatai Interceptor within Mercer Slough (Red line right of MH04 in Figure 2). Starting July 16, in-water and upland work would be begin simultaneously in Mercer Slough, off the Enatai Beach Park swim beach, and along the Enatai shoreline.

Within Mercer Slough, the County's contractors would work through existing maintenance holes and angle structures (access points) to perform Ultraviolet-Cured-In-Place-Pipe (UV-CIPP) rehabilitation of the Mercer Slough portion of the Enatai Interceptor (Red line right of MH04 in Figure 2) between July 16 and December 31.

The County's contractors would operate trucks and other construction equipment on the I-90 and Mercer Slough Trails to reach most of the access points, but shallow-draft workboats and micro-barges would be required to reach some. Some clearing of vegetation would be needed to facilitate land-based equipment access. Silt fences would be installed around upland work areas, and turbidity curtains would be installed around in-water work areas. Also, where land-based access across wetlands is required, the equipment would be driven over and/or be operated from stacked swamp mats and/or hog fuel (coarsely ground-up woody material). The swap mats and hog fuel would be removed from the area after work is complete.

No excavation or work area isolation would be required to access the maintenance holes, which rise above the water surface. However, angle structures AS09 and AS10 are both submerged. Starting on July 16, the County's contractors would perform in-water work from shallow-draft workboats and micro-barges to install super sack or containment tube isolation cells to create temporary cofferdams around AS09 and AS10, and to install turbidity curtains around the cofferdams. They would then dewater the work areas within the cofferdams using pumps that would discharge the water into the space between the cofferdams and their surrounding turbidity curtains. The cofferdams and turbidity curtains would be removed from the site as soon as possible after work is complete.

The County's contractors would work through the access points to insert lengths of fabric tubing that have been saturated with a polyester resin (UV-CIPP liner). They would use a winch to extend the liner along the section of pipe, then use air pumps to inflate the liner to the full diameter of the existing pipe. Following liner inflation, they would pass a UV light system through the pipe section to cure the liner. They would inspect the cured liner with a video camera, and repeat the process, if necessary, for areas that were not lined properly.

At the Enatai Beach Park swim beach, in-water and upland work would be done to repair and/or replace about 225 feet of the Enatai Interceptor (between MH01B and MH01A in Figure 2). This work would include staging and access from barges, workboats, and some upland areas. It would also require the isolation and dewatering of the work area. This work window includes barge demobilization. In-water work for this component, including pre-work barge mobilization would be done between July 16 and December 31.

The contractors would install super sacks or containment tubes to create a temporary cofferdam around the easternmost 225 feet of the Enatai Interceptor at the Enatai Beach Park swim area. They would also install a turbidity curtain outside of the cofferdam, and silt fences around all upland work. They would use screened pumps to dewater the area shoreward of the temporary cofferdam, and discharge the water between the cofferdam and the turbidity curtain. They would then operate a barge-mounted derrick or a land-based excavator to dig a trench along the existing pipeline alignment, and to stockpile the excavated materials landward of the trench for reuse as backfill.

They would remove the western 125 feet of existing pipe and angle structures between MH01B and AS02, then install new pipe and angle structures along the same alignment. No new structures would extend above the lakebed. They would also insert new but slightly smaller diameter HDPE pipe within the eastern 100 feet of existing pipe (slip-line) between AS02 and

MH01A. They would backfill the trench when pipe installation and slip-lining is complete, and remove the cofferdam, and then the turbidity curtain after the turbidity within it returns to background levels. Including barge demobilization, work would be complete by December 31.

Along the Enatai shoreline (red line between MH01A and MH04 in Figure 2), the contractors would conduct UV-CIPP rehabilitation of the Enatai Interceptor between July 16 and December 31. They would work through those access points, and use methods virtually identical to those describe above for work along the Mercer Slough section of the interceptor. Staging and access would largely be done from barges or small boats, with turbidity curtains installed around all in- and overwater work and silt fences installed around upland work. MH01, 02, and 03 are all under docks. The dock over MH01 allows easy access to the maintenance hole. However, MH02 and 03 would require the temporary removal and replacement of decking to access the maintenance holes. Any un-grated decking that is removed for this project would be replaced by grated decking.

<u>Year-4</u>

<u>April:</u> The County's contractors would perform restoration work in the Mercer Slough Nature Park where Enatai Interceptor work impacted wetland and riparian areas. The contractors would remove invasive plants and plant native emergent and scrub-shrubs across about 7,390 square feet (0.17 acres) of wetland. They would also plant native trees and shrubs across about 44,130 square feet (1.01 acres) of riparian habitat. The selected species would be appropriate to the light, temperature, and moisture conditions at the site. Additionally, any trees that were cut during the interceptor rehabilitation work would be placed in the wetland and/or the riparian area, and native trees such as red alder and Pacific willow would be planted to replace those trees at a 1:1 replacement ratio. About 1 month of work would be needed to complete this component.

<u>Other activities that could be caused by the proposed action</u>

The NMFS considered whether or not the proposed action described above would cause any other activities that could affect listed resources. The County and the COE identified no such actions. However, the NMFS questioned the off-site gravel mining that would occur to produce the backfill for the East Channel crossing. The County reports that they would obtain all needed gravel only from established and regulated quarries. Because those gravel producing operations currently exist and would continue regardless of the specific needs of this project, they have their own utility that is separate from the proposed action, and as such the proposed action could not be considered to be the cause of those operations.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The COE determined that the proposed action is likely to adversely affect PS Chinook salmon and PS steelhead, is not likely to adversely affect designated critical habitat for PS Chinook salmon, and would have no effect designated critical habitat for PS steelhead because the action area has been excluded from that designation. Because the proposed action is likely to adversely affect listed species, the NMFS has proceeded with formal consultation. However, as described in Section 2.5 of this opinion, the NMFS has determined that the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon. Further, as described in Section 2.12, the NMFS has also concluded that the proposed action may affect, but is not likely to adversely affect PS steelhead (Table 1).

Table 1. ESA-listed species and critical habitats that may be affected by the proposed action.

ESA-listed species and critical habitat likely to be adversely affected (LAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound	Threatened	LAA	LAA	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
steelhead (*O. mykiss*) Puget Sound	Threatened	NLAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)

LAA = likely to adversely affect NLAA = not likely to adversely affect
N/A = not applicable. The action area is outside designated critical habitat, or critical habitat has not been designated.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

Critical habitat designations prior to 2016 used the terms "primary constituent element" (PCE) or "essential feature" (EF) to identify important habitat qualities. However, the 2016 critical habitat regulations (50 CFR 424.12) replaced those terms with "physical or biological features" (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, EFs, or PBFs. In this biological opinion, we use the term PBF to mean PCE or EF, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the range-wide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the essential PBFs that help to form that conservation value.

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the action area and are considered in this opinion. More detailed information on the biology, habitat, and conservation status and trend of these listed resources can be found in the listing regulations and critical habitat designations published in the Federal Register and in the recovery plans and other sources at:

https://www.fisheries.noaa.gov/species-directory/threatened-endangered, and are incorporated here by reference.

Listed Species

Viable Salmonid Population (VSP) Criteria: For Pacific salmonids, we commonly use four VSP criteria (McElhany et al. 2000) to assess the viability of the populations that constitute the species. These four criteria (spatial structure, diversity, abundance, and productivity) encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends on habitat quality and spatial configuration, and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation in single genes to complex life history traits.

"Abundance" generally refers to the number of naturally-produced adults that return to their natal spawning grounds.

"Productivity" refers to the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is in decline.

For species with multiple populations, we assess the status of the entire species based on the biological status of the constituent populations, using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany et al. 2000).

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, are in the listing regulations and critical habitat designations published in the Federal Register.

Puget Sound (PS) Chinook Salmon: The PS Chinook salmon evolutionarily significant unit (ESU) was listed as threatened on June 28, 2005 (70 FR 37160). We adopted the recovery plan for this ESU in January 2007. The recovery plan consists of two documents: the Puget Sound salmon recovery plan (SSPS 2007) and the final supplement to the Shared Strategy's Puget Sound salmon recovery plan (NMFS 2006). The recovery plan adopts ESU and population level viability criteria recommended by the Puget Sound Technical Recovery Team (PSTRT) (Ruckelshaus et al. 2002). The PSTRT's biological recovery criteria will be met when all of the following conditions are achieved:

- The viability status of all populations in the ESU is improved from current conditions, and when considered in the aggregate, persistence of the ESU is assured;
- Two to four Chinook salmon populations in each of the five biogeographical regions of the ESU achieve viability, depending on the historical biological characteristics and acceptable risk levels for populations within each region;
- At least one population from each major genetic and life history group historically present within each of the five biogeographical regions is viable;
- Tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations are functioning in a manner that is sufficient to support an ESU-wide recovery scenario; Production of Chinook salmon from tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations occurs in a manner consistent with ESU recovery; and
- Populations that do not meet all the Viable Salmon Population (VSP) parameters are sustained to provide ecological functions and preserve options for ESU recovery.

<u>General Life History:</u> Chinook salmon are anadromous fish that require well-oxygenated water that is typically less than 63º F (17º C), but some tolerance to higher temperatures is documented with acclimation. Adult Chinook salmon spawn in freshwater streams, depositing fertilized eggs in gravel "nests" called redds. The eggs incubate for three to five months before juveniles hatch and emerge from the gravel. Juveniles spend from three months to two years in freshwater before migrating to the ocean to feed and mature. Chinook salmon spend from one to six years in the ocean before returning to their natal freshwater streams where they spawn and then die.

Chinook salmon are divided into two races, stream-types and ocean-types, based on the major juvenile development strategies. Stream-type Chinook salmon tend to rear in freshwater for a year or more before entering marine waters. Conversely, ocean-type juveniles tend to leave their natal streams early during their first year of life, and rear in estuarine waters as they transition into their marine life stage. Both stream- and ocean-type Chinook salmon are present, but ocean-type Chinook salmon predominate in Puget Sound populations.

Chinook salmon are further grouped into "runs" that are based on the timing of adults that return to freshwater. Early- or spring-run chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and finally spawn in the late summer and early autumn. Late- or fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas, and spawn within a few days or weeks. Summer-run fish show intermediate characteristics of spring and fall runs, without the extensive delay in maturation exhibited by spring-run Chinook salmon. In Puget Sound, spring-run Chinook salmon tend to enter their natal rivers as early as March, but do not spawn until mid-August through September. Returning summer- and fall-run fish tend to enter the rivers early-June through early-September, with spawning occurring between early August and late-October.

Yearling stream-type fish tend to leave their natal rivers late winter through spring, and move relatively directly to nearshore marine areas and pocket estuaries. Out-migrating ocean-type fry tend to migrate out of their natal streams beginning in early-March. Those fish rear in the tidal delta estuaries of their natal stream for about two weeks to two months before migrating to marine nearshore areas and pocket estuaries in late May to June. Out-migrating young of the year parr tend to move relatively directly into marine nearshore areas and pocket estuaries after leaving their natal streams between late spring and the end of summer.

Spatial Structure and Diversity: The PS Sound Chinook salmon ESU includes all naturally spawning populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. The ESU also includes the progeny of numerous artificial propagation programs (NWFSC 2015). The PSTRT identified 22 extant populations, grouped into five major geographic regions, based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity. The PSTRT distributed the 22 populations among five major biogeographical regions, or major population groups (MPGs), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 2).

Table 2. Extant PS Chinook salmon populations in each biogeographic region (Ruckelshaus *et al*. 2002, NWFSC 2015).

Biogeographic Region	Population (Watershed)
Strait of Georgia	North Fork Nooksack River
	South Fork Nooksack River
Strait of Juan de Fuca	Elwha River
	Dungeness River
Hood Canal	Skokomish River
	Mid Hood Canal River
Whidbey Basin	Skykomish River
	Snoqualmie River
	North Fork Stillaguamish River
	South Fork Stillaguamish River
	Upper Skagit River
	Lower Skagit River
	Upper Sauk River
	Lower Sauk River
	Suiattle River
	Upper Cascade River
Central/South Puget Sound Basin	Cedar River
	North Lake Washington/ Sammamish River
	Green/Duwamish River
	Puyallup River
	White River
	Nisqually River

Hatchery-origin spawners are present in high fractions in most populations within the ESU, with the Whidbey Basin the only MPG with consistently high fractions of natural-origin spawners. Between 1990 and 2014, the fraction of natural-origin spawners has declined in many of the populations outside of the Skagit watershed (NWFSC 2015).

Abundance and Productivity: Available data on total abundance since 1980 indicate that abundance trends have fluctuated between positive and negative for individual populations, but productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit watershed. Available data now show that most populations have declined in abundance over the past 7 to 10 years. Further, escapement levels for all populations remain well below the PSTRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the PSTRT as consistent with recovery (NWFSC 2015). The current information on abundance, productivity, spatial structure and diversity suggest that the Whidbey Basin MPG is at relatively low risk of extinction. The other four MPGs are considered to be at high risk of extinction due to low abundance and productivity (NWFSC 2015). The most recent 5-year status review concluded that the ESU should remain listed as threatened (NMFS 2017).

Limiting Factors: Factors limiting recovery for PS Chinook salmon include:

- Degraded floodplain and in-river channel structure
- Degraded estuarine conditions and loss of estuarine habitat
- Riparian area degradation and loss of in-river large woody debris
- Excessive fine-grained sediment in spawning gravel
- Degraded water quality and temperature
- Degraded nearshore conditions
- Impaired passage for migrating fish
- Severely altered flow regime

PS Chinook Salmon within the Action Area: The PS Chinook salmon that are likely to occur in the action area would be fall-run Chinook salmon from the Cedar River population and from the North Lake Washington / Sammamish River population (NWFSC 2015; WDFW 2020a). Both stream- and ocean-type Chinook salmon are present in these populations, with the majority being ocean-types.

The Cedar River population is relatively small, with a total annual abundance fluctuating at close to 1,000 fish (NWFSC 2015; WDFW 2020b). Between 1965 and 2019, the total abundance for PS Chinook salmon in the basin has fluctuated between about 133 and 2,451 individuals, with the average trend being slightly negative. The 2015 status review reported that the 2010 through 2014 5-year geometric mean for natural-origin spawner abundance had shown a positive change since the 2010 status review, with natural-origin spawners accounting for about 82% of the population. WDFW data suggest that natural-origin spawners accounted for about 71% of a combined total return of 855 fish in 2019 (WDFW 2020b).

The North Lake Washington / Sammamish River population is also small, with a total abundance that has fluctuated between about 33 and 2,223 individuals from 1983 through 2019. Natural-origin spawners make up a small proportion of the total population, accounting for about 30% of the 365 total return in 2019, and the trend is rather flat to slightly negative (NWFSC 2015; WDFW 2020b).

Some returning adults and out-migrating juveniles from these populations, as well as individuals that spawn in some of the smaller streams around the lake, are likely to pass through the action area. Adult Chinook salmon pass through Chittenden Locks (aka Ballard Locks) between mid-June through September, with peak migration occurring in mid-August (City of Seattle 2008). Spawning occurs well upstream of the action area between early August and late October. Juvenile Chinook salmon are found in Lake Washington between January and July, primarily in the littoral zone (Tabor *et al*. 2006). Outmigration through the ship canal and through the locks occurs between late-May and early-July, with the peak occurring in June (City of Seattle 2008).

Critical Habitat

This section describes the status of designated critical habitat that would be affected by the proposed action by examining the condition and trends of physical or biological features (PBFs) that are essential to the conservation of the listed species throughout the designated areas. The PBFs are essential because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging). The proposed project would affect critical habitat for PS Chinook salmon.

The NMFS designated critical habitat for PS Chinook salmon on September 2, 2005 (70 FR 52630). That critical habitat is located in 16 freshwater subbasins and watersheds between the Dungeness/Elwha Watershed and the Nooksack Subbasin, inclusively, as well as in nearshore marine waters of the Puget Sound that are south of the US-Canada border and east of the Elwha River, and out to a depth of 30 meters. Although offshore marine is an area type identified in the final rule, it was not designated as critical habitat for PS Chinook salmon.

The PBFs of salmonid critical habitat include: (1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; (2) Freshwater rearing sites with: (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) Water quality and forage supporting juvenile development; and (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; (3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; (4) Estuarine areas free of obstruction and excessive predation with: (i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation; (5) Nearshore marine areas free of obstruction and excessive predation with: (i) Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and (ii)

Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation. The PBF for PS Chinook salmon CH are listed in Table 3.

Table 3. Physical or biological features (PBFs) of designated critical habitat for PS Chinook salmon, and corresponding life history events. Although offshore marine areas were identified in the final rule, none was designated as critical habitat.

Physical or Biological Features		
Site Type	**Site Attribute**	**Life History Event**
Freshwater spawning	Water quantity Water quality Substrate	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Water quantity and Floodplain connectivity Water quality and Forage Natural cover	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	(Free of obstruction and excessive predation) Water quantity and quality Natural cover	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine	(Free of obstruction and excessive predation) Water quality, quantity, and salinity Natural cover Forage	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine	(Free of obstruction and excessive predation) Water quality, quantity, and forage Natural cover	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine	Water quality and forage	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Major tributary river basins in the Puget Sound basin include the Nooksack, Samish, Skagit, Sauk, Stillaguamish, Snohomish, Lake Washington, Cedar, Sammamish, Green, Duwamish, Puyallup, White, Carbon, Nisqually, Deschutes, Skokomish, Duckabush, Dosewallips, Big Quilcene, Elwha, and Dungeness rivers and Soos Creek. Critical habitat throughout the Puget Sound basin has been degraded by numerous activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of large wood from the waterways, intense urbanization, agriculture, alteration of floodplain and stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, dredging, armoring of shorelines, marina and port development, road and railroad construction and maintenance, logging, and mining. Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common limiting factors of critical habitat throughout the basin.

Land use practices have likely accelerated the frequency of landslides delivering sediment to streams. Fine sediment from unpaved roads also contributes to stream sedimentation. Unpaved roads are widespread on forested lands in the Puget Sound basin, and to a lesser extent, in rural residential areas. Historical logging removed most of the riparian trees near stream channels. Subsequent agricultural and urban conversion permanently altered riparian vegetation in the river valleys, leaving either no trees, or a thin band of trees. The riparian zones along many agricultural areas are now dominated by alder, invasive canary grass and blackberries, and provide substantially reduced stream shade and LW recruitment (SSPS 2007).

Diking, agriculture, revetments, railroads and roads in lower stream reaches have caused significant loss of secondary channels in major valley floodplains in this region. Confined main channels create high-energy peak flows that remove smaller substrate particles and LW. The loss of side-channels, oxbow lakes, and backwater habitats has resulted in a significant loss of juvenile salmonid rearing and refuge habitat. When the water level of Lake Washington was lowered 9 feet in the 1910s, thousands of acres of wetlands along the shoreline of Lake Washington, Lake Sammamish and the Sammamish River corridor were drained and converted to agricultural and urban uses. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows. The interchange of surface and groundwater in complex stream and wetland systems helps to moderate stream temperatures. Thousands of acres of lowland wetlands across the region have been drained and converted to agricultural and urban uses, and forest wetlands are estimated to have diminished by one-third in Washington State (FEMAT 1993; Spence et al. 1996; SSPS 2007).

Loss of riparian habitat, elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus, and higher levels of suspended sediment, presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture or livestock impacts, have been documented in many Puget Sound tributaries (SSPS 2007).
Peak stream flows have increased over time due to paving (roads and parking areas), reduced percolation through surface soils on residential and agricultural lands, simplified and extended drainage networks, loss of wetlands, and rain-on-snow events in higher elevation clear cuts (SSPS 2007). In urbanized Puget Sound, there is a strong association between land use and land cover attributes and rates of coho spawner mortality likely due to runoff containing contaminants emitted from motor vehicles (Feist et al. 2011).

Dams constructed for hydropower generation, irrigation, or flood control have substantially affected PS Chinook salmon populations in a number of river systems. The construction and operation of dams have blocked access to spawning and rearing habitat, changed flow patterns, resulted in elevated temperatures and stranding of juvenile migrants, and degraded downstream spawning and rearing habitat by reducing recruitment of spawning gravel and LW to downstream areas (SSPS 2007). These actions tend to promote downstream channel incision and simplification (Kondolf 1997), limiting fish habitat. Water withdrawals reduce available fish habitat and alter sediment transport. Hydropower projects often change flow rates, stranding and killing fish, and reducing aquatic invertebrate (food source) productivity (Hunter 1992).

Juvenile mortality occurs in unscreened or inadequately screened diversions. Water diversion ditches resemble side channels in which juvenile salmonids normally find refuge. When diversion headgates are shut, access back to the main channel is cut off and the channel goes dry. Mortality can also occur with inadequately screened diversions from impingement on the screen, or mutilation in pumps where gaps or oversized screen openings allow juveniles to get into the system. Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in many Puget Sound tributary basins (SSPS 2007).

The nearshore marine habitat has been extensively altered and armored by industrial and residential development near the mouths of many of Puget Sound's tributaries. A railroad runs along large portions of the eastern shoreline of Puget Sound, eliminating natural cover along the shore and natural recruitment of beach sand (SSPS 2007).

Degradation of the near-shore environment has occurred in the southeastern areas of Hood Canal in recent years, resulting in late summer marine oxygen depletion and significant fish kills. Circulation of marine waters is naturally limited, and partially driven by freshwater runoff, which is often low in the late summer. However, human development has increased nutrient loads from failing septic systems along the shoreline, and from use of nitrate and phosphate fertilizers on lawns and farms. Shoreline residential development is widespread and dense in many places. The combination of highways and dense residential development has degraded certain physical and chemical characteristics of the near-shore environment (HCCC 2005; SSPS 2007).

<u>Critical Habitat within the Action Area:</u> All of Lake Washington has been designated as freshwater critical habitat for PS Chinook salmon. The critical habitat within the action area primarily supports the Freshwater Migration PBF for juvenile and adult PS Chinook (NOAA 2020; WDFW 2020a).

2.3 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).

The County's project is located along the east side of Lake Washington, from the North Mercer Island Pump Station, across the East Channel, and on to the Sweyolocken Pump Station in Bellevue, Washington (Figure 1). As described in sections 2.5, project-related water quality effects around in-water excavation and tugboat operations would be the stressor with the greatest range of effects for fish. Those effects are expected to extend about 300 feet from those activities. Fish-detectable noise levels would extend about 72 feet around tugboats. To be conservative, the NMFS defines the action area as including the waters and substrates of the Lake Washington East Channel from 3,500 feet north of the I-90 Bridge to 300 feet south of that bridge, the waters and substrates within 300 feet of shore along Enatai Beach, and all waters and substrates of within the southern-most 1,800 feet of Mercer Slough. The described area overlaps with the geographic ranges of the ESA-listed species and the boundaries of designated critical habitats identified in Table 1. The action area also overlaps with areas that have been designated, under the MSA, as EFH for Pacific Coast salmon.

2.4 Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Environmental conditions at the project site and the surrounding area: The project site is located along the east shore of Lake Washington, from the North Mercer Island Pump Station to the Sweyolocken Pump Station in Bellevue (Figure 1). Lake Washington is a long, narrow, freshwater lake with steeply sloping sides. It is about 22 miles long, north to south, has an average width of 1.5 miles, and covers about 21,500 acres. The lake has an average depth of about 100 feet, and is just over 200 feet deep at its deepest (City of Seattle 2010). The Lake Washington watershed covers about 300,000 acres (472 square miles), and its major influent streams are the Cedar and Sammamish Rivers. The Cedar River enters at the southern end of the lake and contributes about 57 percent of the lake's water. The Sammamish River enters at the north end of the lake, and contributes about 27 percent of the lake's water (King County 2016). Numerous creeks, including Coal, Forbes, Juanita, May, McAleer, Ravenna, and Thornton Creeks also flow directly into Lake Washington.

The geography and ecosystems in and adjacent to the action area have been dramatically altered by human activity since European settlers first arrived in the 1800s. Historically, Lake Washington's waters flowed south to the Duwamish River via the now absent Black River, and the Cedar River did not enter the lake. In 1911, engineers rerouted the Cedar River into Lake Washington to create an industrial waterway and to prevent flooding in Renton. In 1916, the Lake Washington Ship Canal was opened, which lowered water levels in the lake by about nine feet, and stopped flows through the Black River.

The majority of the lake's watershed is now highly developed and urban in nature with 63 percent of the area considered fully developed (King County 2016). The City of Seattle boarders most of the west side of the lake. The cities of Bellevue and Kirkland are along the eastern shoreline, with the Cities of Kenmore and Renton on the north and south ends, respectively.

Water quality in the lake has been impacted by point and nonpoint pollution sources including past sewage discharges. Ongoing sources include stormwater discharges and subsurface runoff containing pollutants from roadways, failing septic systems, underground petroleum storage tanks, and fertilizers and pesticides from commercial and residential sites. It has also been impacted by upstream forestry and agricultural practices. Cleanup efforts since the 1960s and 1970s, including diversion of wastewater away from the lake, have improved conditions, such that water quality in the lake is generally considered good (City of Seattle 2010). The water in the East Channel met required standards for all of the pollutants for which it was tested, but is categorized by the State's Department of Ecology (WDOE) as a Category I waterbody for bacteria (i.e., E. coli) and total phosphorus. However, Mercer Slough is on the State's 303(d) list for temperature and bacteria exceedances (both Category 5), pH (Category 2), and Ammonia-N (Category 1) (WDOE 2020).

Urban development has converted most of the original lake shoreline from a mix of thick riparian forests, shrub-scrub, and emergent wetlands to residential gardens and lawns, with only small scattered patches of natural riparian growth remaining (Toft 2001). Additionally, as of the year 2000, over 70 percent of the lake's shoreline had been armored by bulkheads and rip rap, and over 2,700 docks had been installed around the lake (Toft 2001). It is almost certain that those numbers have increased since then.

The armored shorelines around most of Lake Washington, have converted the gently sloping gravel shorelines with very shallow waters that are favored by juvenile salmon, into artificially steep substrates with relatively deep water. Numerous piers and docks create harsh over-water shadows that limit aquatic productivity and hinder shoreline migration of juvenile salmon. Additionally, the artificial shorelines and overwater structures provide habitat conditions that favor fish species that prey on juvenile salmonids, especially the non-native smallmouth bass. Other predators in the lake include the native northern pikeminnow and the non-native largemouth bass (Celedonia et al. 2008a and b; Tabor et al. 2010).

The upland areas that surround the project route consist mostly of dense residential developments, armored shorelines with piers and docks extending from nearly all shoreline properties, and the I-90 freeway and East Channel Bridge extend across the north end of Mercer Island to Bellevue and east across Mercer Slough (Figure 1). A boat launch is located under the west end of the bridge, while a beach park and swim area is located under and south of the east end of the bridge.

Within the East Channel portion of the project area, water depths range from 0 feet to 60 feet. The typical substrate in the shallower areas of Lake Washington is a mix of gravel, cobble, and fine silt, but consists of sand at the Enatai Beach Park swim beach. The deeper portions of the channel are dominated by fine silt and mud, with interspersed beds of cobble and gravel and occasional boulders. Submerged aquatic vegetation (SAV) within the East Channel and the Lake Washington portion of the Bellevue Conveyance portion of the project area is limited to areas less than 20 feet deep, and consists mostly of invasive Eurasian watermilfoil, hydrilla, and Brazilian elodea, with patches of green filamentous algae growing on hard substrates between 15 feet and 20 feet. Along the eastern shoreline, north of the I-90 East Channel Bridge, an unidentified species of leafy green algae dominates the gravelly shallows.

The water depth at the mouth of Mercer Slough is about 3 to 7.5 feet deep. The substrate within the slough consists of fine silt with high levels of organic matter. Floating mats of fragrant waterlily, which are considered a Class C noxious weed, are the primary aquatic vegetation at the mouth of Mercer Slough. Mercer Slough itself contains no substantial aquatic vegetation, other than a fringe of emergent vegetation along its banks, including large infestations of reed canary grass throughout the project area (King County 2019).

The shore zones where the East Channel crossing would occur are armored by bulkheads or are eroding shorelines with compacted soils. Shoreline riparian vegetation along these shorelines consists mostly of lawn grass, red alder, and Himalayan blackberry. There is also a patch of Japanese knotweed near the Mercer Island Boat Launch. The trees along the Mercer Island side consist mostly of Douglas fir, Norway maple, Alaskan cedar, and Leyland cypress, whereas Douglas fir, ginkgo biloba, Japanese maple, monkey puzzle tree, crepe myrtle, and wisteria predominate on the Bellevue side. Riparian vegetation within Mercer Slough is dominated by invasive shrubs and grasses, such as Himalayan blackberry, reed canary grass, and Japanese knotweed. Trees include vine maple, red alder, western red cedar, red twig dogwood, Indian plum, mahonia, black cottonwood, western serviceberry, birch, and various willows (King County 2019).

The past and ongoing anthropogenic impacts described above have reduced the action area's ability to support out-migrating juvenile PS Chinook salmon. However, the action area continues to provide migratory habitat for adults and juveniles, and the area has also been designated as critical habitat for this species.

<u>Climate Change:</u> Climate change has affected the environmental baseline of aquatic habitats across the region and within the action area. However, the effects of climate change have not been homogeneous across the region, nor are they likely to be in the future. During the last century, average air temperatures in the Pacific Northwest have increased by 1 to 1.4° F (0.6 to 0.8º C), and up to 2° F (1.1º C) in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Recent temperatures in all but two years since 1998 ranked above the 20th century average (Mote et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10° F (1.7 to 5.6º C), with the largest increases predicted to occur in the summer (Mote et al. 2014).

Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote et al. 2013 and 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2014). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

The combined effects of increasing air temperatures and decreasing spring through fall flows are expected to cause increasing stream temperatures; in 2015, this resulted in 3.5-5.3º C increases in Columbia Basin streams and a peak temperature of 26º C in the Willamette (NWFSC 2015). Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009).

Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Isaak et al. 2012;

Mantua et al. 2010). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic food webs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Raymondi et al. 2013; Winder and Schindler 2004). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Raymondi et al. 2013; Wainwright and Weitkamp 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode et al. 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (Lawson et al. 2004; McMahon and Hartman 1989).

The adaptive ability of these threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many of these ESUs (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney et al. 2012). These conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future.

2.5 Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

As described in Section 1.3, the COE proposes to authorize the County to install about 17,210 linear feet of new sewer pipeline and to perform other sewer line repairs between the North Mercer Island Pump Station and the Sweyolocken Pump Station in the City of Bellevue, Washington (Figures 1-4). The County's plans include several in-water work components that would occur during the first 3 years of the 4-year project. The sequence of some in-water work components could vary from the currently planned schedule summarized below. However, they would remain grouped as described, would occur only once over the life of the project, and they would be completed within the work windows expressed in the project description. The total number of in-water work seasons would be limited to a maximum of 3, but could be as few two.

During Year-1, up to 4 weeks of in-water work is scheduled to occur in Lake Washington between July 16 and December 31 to temporarily float about 3,100 feet of HDPE pipe on Lake Washington. This work would include the use of workboats, tugboats and barges, as well as land-based and barge-mounted cranes.

During Year-2, up to 7.5 consecutive months of in-water work is scheduled to occur in Lake Washington between mid-June and the end of the following February to conduct the East Channel Crossing work. In-water work would include the use of workboats, tugboats and barges to excavate a trench across the channel, install new pipe, to backfill the trench, and to perform nearshore and riparian enhancement work on both side of the channel. Shoreline work at Enatai Beach Park and at the Mercer Island boat launch would be surrounded by full-depth turbidity curtains, but no de-watering or fish salvage would be required. Additionally, about 2 months of in-water work would be done between July 1 and August 31 to trench across and install new pipe under the NMPS stream, but no ESA-listed fish are thought to occur within the stream.

During Year-3, up to 5.5 consecutive months of in-water work is scheduled to occur in Lake Washington and in Mercer Slough between July 16 and December 31 to rehabilitate the Enatai Interceptor. In Lake Washington, off of the Enatai swim beach, in-water work would include the use of a tugboat and a barge with an excavator, as well as work area isolation, dewatering, and possible fish salvage. Along the Enatai Beach shoreline, in-water work would include the use workboats and docks to reach existing access structures that would be surrounded by full-depth turbidity curtains, but no de-watering or fish salvage would be required. Within Mercer Slough, in-water work would include the use of shallow-draft work boats and micro-barges, as well as work area isolation, dewatering, and possible fish salvage at AS09 and AS10.

As described in Section 2.2, PS Chinook salmon inhabit the action area. Also, the action area has been designated critical habitat for that species. The proposed in-water work windows avoid the typical period of juvenile PS Chinook salmon out-migration, but overlap with the return of adults, and some juveniles are known to remain in the system year-round. Therefore, the planned construction may cause direct effects on PS Chinook salmon and/or the PBFs of their critical habitat through fish salvage, construction-related noise, entrainment or bucket strike, water quality impacts, and propeller wash. It may also cause indirect effects on PS Chinook salmon and/or the PBFs of their critical habitat through impacts on altered benthic habitats and reduced riparian vegetation.

2.5.1 Effects on Listed Species

Construction-related Fish Salvage

Exposure to fish salvage is likely to adversely affect PS Chinook salmon. Fish that are within the temporary cofferdams that would be installed and dewatered to isolate the in-water work areas around two Mercer Slough access structures and off the swim beach work may be exposed to removal by nets and/or by hand, and to electrofishing if they not readily spotted and removed.

Handling and transfer processes can cause physical trauma and physiological stress responses in exposed fish (Moberg 2000; Shreck 2000). Contact with nets can cause scale and skin damage, and overcrowding of small fish in traps can cause stress and injury. The primary contributing factors to stress and mortality from handling are: (1) Difference in water temperatures between the lake and the holding buckets; (2) dissolved oxygen levels; (3) the amount of time that fish are held out of the water; and (4) physical trauma. Stress from handling increases rapidly if water temperature exceeds 18ºC (64ºF), or if dissolved oxygen is below saturation. Debris buildup in traps can also injure or kill fish.

Electrofishing and capture can cause stress, physical trauma, and mortality in exposed fish. Dalbey et al. (1996), Emery (1984), and Snyder (2003) describe responses that range from muscular contractions to mortality from exposure to electrofishing. Depending on the pulse train used, and the intensity and duration of exposure, muscular contractions may cause a lactic acid load and oxygen debt in muscle tissues (Emery 1984), it can cause internal hemorrhage and spinal fractures in 12 to 54% of the exposed fish, and acute mortality in about 2% (Dalbey et al. 1996). Severe interruption of motor function can stop respiration, and combinations of lactic acid load and oxygen debt may be irreversible, causing delayed mortality in apparently healthy fish. Obvious physical injuries often lead to reduced long-term growth and survival, whereas uninjured to slightly injured fish showed long-term growth and survival rates similar to unexposed fish of similar age (Dalbey et al. 1996).

Based on the timing of the work, very few juvenile Chinook salmon are expected to be present within the actions area during work area isolation and dewatering. However, because low numbers of juveniles are known to remain in the watershed year-round, the County and the NMFS believe that some juveniles could be present within the action area year-round as well. Further, the in-water work window overlaps with the expected return of adults to freshwater.

We lack sufficient site-specific information to accurately estimate the numbers of individuals that could be affected by fish salvage. Therefore, the County and the NMFS have based their estimate on the information presented in a 2013 biological opinion completed for restoration activities in the Pacific Northwest Region (NMFS 2013). Based on the best available information for the region, that opinion estimated that projects that included fish salvage captured an average of 132 ESA-listed salmon and steelhead per project, and that up to 5% of the captured fish are seriously injured or killed by the activity.

The PS Chinook salmon populations within the Lake Washington watershed are very small. Further, the September 1 through December 31 in-water work window for the work that would include work area dewatering is well outside the juvenile out-migration season in the lake. Therefore, it is extremely likely that the estimated regional average far exceeds any reasonable expectations for the number of juvenile Chinook salmon that may be captured during this project's fish salvage activities. The mobility and speed of adult Chinook salmon suggest that few if any individuals would remain close to the work areas during the installation of the isolation barriers. Based on the available information, and on the need to avoid underestimating the potential take for this activity, the County and the NMFS estimates that the combined total of captured fish for all three dewatered work areas would not exceed 33 individuals, and that no more than 2 of those individuals would be seriously injured or killed. The remaining fish would likely experience sub-lethal effects that are unlikely to affect their fitness or survival. Because the fish that may be injured or killed by this stressor would comprise such a small subset of their cohort, their potential loss would cause no detectable population-level effects.

Construction-related Noise

Exposure to construction-related noise would cause minor effects in PS Chinook salmon. Elevated in-water noise at levels capable of causing detectable effects in exposed fish would be caused by the in-water excavation/dredging and tugboat operations, including spud deployment.

The effects of fishes' exposure to noise vary with the hearing characteristics of the exposed fish, the frequency, intensity, and duration of the exposure, and the context under which the exposure occurs. At low levels, effects may include the onset of behavioral disturbances such as acoustic masking (Codarin et al. 2009), startle responses and altered swimming (Neo et al. 2014), abandonment or avoidance of the area of acoustic effect (Mueller 1980; Picciulin et al. 2010; Sebastianutto et al. 2011; Xie et al. 2008) and increased vulnerability to predators (Simpson et al. 2016). At higher intensities and/or longer exposure durations, the effects may rise to include temporary hearing damage (a.k.a. temporary threshold shift or TTS, Scholik and Yan 2002) and increased stress (Graham and Cooke 2008). At even higher levels, exposure may lead to physical injury that can range from the onset of permanent hearing damage (a.k.a. permanent threshold shift or PTS) and mortality. The best available information about the auditory capabilities of the fish considered in this Opinion suggest that their hearing capabilities are limited to frequencies below 1,500 Hz, with peak sensitivity between about 200 and 300 Hz (Hastings and Popper 2005; Picciulin et al. 2010; Scholik and Yan 2002; Xie et al. 2008).

The NMFS uses two metrics to estimate the onset of injury for fish exposed to high intensity impulsive sounds. The metrics are based on exposure to peak sound level and sound exposure level (SEL), respectively. Both are expressed in decibels (dB). The metrics are: 1) exposure to 206 dB_{peak}; and 2) exposure to 187 dB SEL_{cum} for fish 2 grams or larger, or 183 dB SEL_{cum} for fish under 2 grams. Any received level (RL) below 150 dB_{SEL} is considered "Effective Quiet". The distance from a source where the RL drops to 150 dB_{SEL} is considered the maximum distance from that source where fishes can be affected by the noise, regardless of accumulation of the sound energy (Stadler and Woodbury 2009). Therefore, when there is a difference between the ranges to the isopleths for effective quiet and SEL_{cum}, the shorter range shall apply. The discussion in Stadler and Woodbury (2009) makes it clear that the thresholds likely overestimate the potential effects of exposure to impulsive sounds. Further, the assessment did not consider non-impulsive sound because it is believed to be less injurious to fish than impulsive sound. Therefore, any application of the criteria to non-impulsive sounds is also likely to overestimate the potential effects in fish. However, this assessment applies the criteria to both impulsive and non-impulsive sounds for continuity, and as a tool to gain a conservative idea of the sound energies that fish may be exposed to during the majority of this project.

The estimated in-water source levels (SL, sound level at 1 meter from the source) used in this assessment are based on the best available information, as described in a recent acoustic assessment for a similar project (NMFS 2016), and in other sources (Blackwell and Greene 2006; COE 2011a; Dickerson et al. 2001; Reine et al. 2012 & 2014; Richardson et al. 1995). The best available information supports the understanding that all of the SLs would be below the 206 dB_{peak} threshold for the onset of instantaneous injury in fish.

In the absence of location-specific transmission loss data, variations of the equation RL = SL – #Log(R) are often used to estimate the received sound level at a given range from a source (RL = received level (dB); SL = source level (dB, 1 m from the source); # = spreading loss coefficient; and R = range in meters (m). Acoustic measurements in shallow water environments support the use of a value close to 15 for projects like this one (CalTrans 2009). This value is considered the practical spreading loss coefficient.

Application of the practical spreading loss equation to the expected SLs suggests that noise levels above the 150 dB_{SEL} threshold could extend to about 177 feet (54 m) around the barges when they deploy spuds, 72 feet (22 m) around tugboats, and about 13 feet (4 m) around excavation work (Table 4). Individuals that are beyond the 150 dB_{SEL} isopleth for any of these sources would be unaffected by the noise. However, fish within the 150 dB_{SEL} isopleth are likely to experience a range of impacts that would depend on their distance from the source and the duration of their exposure.

Table 4. Estimated in-water source levels for the loudest project-related sources with the estimated ranges to the source-specific effects thresholds for fish.

Source	Acoustic Signature	Source Level	Threshold Range
Spud Deployment	< 1.6 kHz Impulsive	201 dB_{peak}	206 @ N/A
		176 dB_{SEL}	150 @ 54 m
Tugboat Propulsion	< 1 kHz Combination	185 dB_{peak}	206 @ N/A
		170 dB_{SEL}	150 @ 22 m
Dredge Bucket Strike	< 370 Hz Impulsive	184 dB_{peak}	206 @ N/A
		167 dB_{SEL}	150 @ 4 m

Project-related in-water work would likely require the use of multiple spud-barges and multiple tugboats. Spud-barges typically have 2 or more spuds (steel pipes or girders) that they drop to the substrate and lock in place to hold their position (instead of using anchors). Each time a spud strikes the substrate, it would cause a brief sound impulse that would be fish-detectable up to 177 feet away. The exact per-day number spud deployments for this project is unknown and would be highly variable over time, but they would be relatively infrequent and too few in number to be a concern for accumulated sound energy impacting listed fish.

Although tugboats could be in operation relatively continuously during any day they are used, their frequent movement would effectively preclude any concern for accumulated sound energy impacting listed fish. Similarly, although in-water excavation would be source of relatively continuous noise during a work day, is extremely unlikely that any fish would remain within 13 feet of that work long enough for accumulated sound energy to be a concern. Additionally, these three sound sources are very unlikely to have any additive effects with each other due the differences in the frequencies and other characteristics of their sound. At most, the combination of the various types of equipment noise during any given day may cause fish-detectable in-water noise levels across the entire workday.

Based on the best available information, the most likely effect of exposure to project-related noise would be minor behavioral disturbances, such as mild acoustic masking, brief startle responses and altered swimming patterns, and temporary avoidance of the source. These responses would cause no measurable effects on the fitness of the exposed individuals, nor would it prevent their migration past the areas or prevent access to important habitat resources.

Entrainment or Bucket Strike

Exposure of PS Chinook salmon to excavation/dredging-related entrainment or bucket strike is extremely unlikely. The County's contractors would operate excavators and cranes with clamshell buckets to dig a trench across the Lake Washington East Channel between July 16 and November 30 during Year-2 work, and to excavate the western 225 feet of the Enatai Interceptor off the swim beach between September 1 and October 31 during Year-3.

Any fish that are captured within a digging bucket (entrainment) or that are struck by it would likely be killed. However, the occurrence of these events are extremely rare. In the Southeast Region of the US, where closely monitored heavy dredging operations occur regularly in areas inhabited by sturgeon and sea turtles, only two live sturgeon (NMFS 2012) and two live sea turtles (NMFS 2011) are known to have been taken by clamshell dredging since 1990. This is likely due to a combination of factors. In order to be entrained in a clamshell bucket, a fish must be directly under the bucket when it drops. The small size of the bucket, compared against the scattered and low-density distribution of the fish across the available habitat make this situation is extremely unlikely, and that likelihood would decrease after the first few bucket cycles because mobile organisms such as salmon are likely to move quickly away from the noise and turbid water. Further, mechanical dredges and excavators typically stay within an area limited to the range of the crane/excavator arm for many minutes to several hours before moving to the adjacent area. The risk of entrainment and bucket strike during the excavation work off of the Enatai swim beach would be even lower because it would be done behind dewatered cofferdams and after fish removal from the work area. Therefore, based on the best available information, the NMFS considers it extremely unlikely that any Chinook salmon would be entrained or struck by a bucket during project-related mechanical dredging or excavation.

Degraded Water Quality

Exposure to construction-related degraded quality would cause minor effects in PS Chinook salmon. As stated above, the County's contractors would dig a trench across the Lake Washington East Channel between July 16 and November 30 during Year-2 work, and excavate the western 225 feet of the Enatai Interceptor off the swim beach between September 1 and October 31 during Year-3. They would also operate tugboats in nearshore areas during Years 1 through 3. This work would temporarily affect water quality through increased turbidity that may also temporarily reduce dissolved oxygen (DO) concentrations. Also, construction-related spills and discharges may release toxic materials into lake waters and into Mercer Slough.

Turbidity: Project-related excavation and/or dredging and tugboat propeller wash would mobilize bottom sediments and cause turbidity plumes with relatively low concentrations of total suspended sediments (TSS). The intensity of turbidity is typically measured in Nephlometric

Turbidity Units (NTU) that describe the opacity caused by the suspended sediments, or by the concentration of TSS as measured in milligrams per liter (mg/L). A strong positive correlation exists between NTU values and TSS concentrations. Depending on the particle sizes, NTU values roughly equal the same number of mg/L for TSS (i.e. 10 NTU = ~ 10 mg/L TSS, and 1,000 NTU = ~ 1,000 mg/L TSS) (Campbell Scientific Inc. 2008; Ellison et al. 2010). Therefore, the two units of measure are easily compared.

Water quality is considered adversely affected by suspended sediments when turbidity is increased by 20 NTU for a period of 4 hours or more (Berg and Northcote 1985; Robertson et al. 2006). The effects of turbidity on fish are somewhat species and size dependent. In general, severity typically increases with sediment concentration and duration of exposure, and decreases with the increasing size of the fish. Bjornn and Reiser (1991) report that adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that may be mobilized during storm and snowmelt runoff episodes. However, empirical data from numerous studies report the onset of minor physiological stress in juvenile and adult salmon after one hour of continuous exposure to suspended sediment concentration levels between about 1,100 and 3,000 mg/L, or to three hours of exposure to 400 mg/L, and seven hours of exposure to concentration levels as low as 55 mg/L (Newcombe and Jensen 1996). The authors reported that serious non-lethal effects such as major physiological stress and reduced growth were reported after seven hours of continuous exposure to 400 mg/L and 24 hours of continuous exposures to concentration levels as low as about 150 mg/L.

Mechanical dredging in areas containing high levels of fine-grained material is likely to cause suspended sediment plumes that could extend 200 to 500 feet down-current from the point of dredging, and may take hours after work has stopped to return to background levels. LaSalle (1991) reported respective suspended sediment concentrations of about 700 and 1,100 mg/L at the surface and bottom of the water column, about 300 feet from clamshell dredging in areas containing high levels of fine-grained material. During monitored clamshell dredging of inner Grays Harbor, the suspended sediment concentrations exceeded 500 mg/L in 23 of 600 samples, and seven of those samples were for tests of ambient conditions (COE 2011b). The single highest reported concentration was 3,000 mg/L when the ambient TSS concentration was 700 mg/L.

The County's contractors would surround the cross-channel dredging with floating turbidity curtains that would limit surface turbidity beyond the curtains. Additionally, the County would require their contractors to limit the turbidity at 150 feet from the source to 5 NTU (5 mg/L) above background levels of 50 NTU (50 mg/L) or less, and to 10% above background for background levels above 50 NTU (King County 2020). Additionally, the excavations done along the shore at the Mercer Island boat launch and at the Enatai Beach Park pipeline transition sites would be done shoreward of full-depth sediment curtains that would be installed in a manner to exclude fish from those work areas, and the excavation done at the Enatai swim beach would be done within a full depth cofferdam and after fish removal.

Tugboat propeller wash would also mobilize bottom sediments. The intensity and duration of the resulting turbidity plumes are uncertain, and would depend on a combination of the tugboat's thrust, the water depth under it, and the type of substrate. The higher the thrust and the finer the sediment, the more sediment that is likely to be mobilized. Fine material (silt) remains mobilized longer than coarse material (sand). The shallower the water, the more thrust energy that would reach the substrate. A recent study described the turbidly caused by large tugboats operating in Navy harbors (ESTCP 2016). At about 13 minutes, the plume extended about 550 yards (500 m), where the TSS concentration was about 80 mg/L. The plume persisted for hours and extended far from the event, but the TSS concentration fell to 30 mg/L within 1 hour and to 15 mg/L within 3 hours. At its highest concentration, the plume was below the concentrations required to elicit physiological responses reported by Newcombe and Jensen (1996). The exact extent of turbidly plumes from tugboat operations for this project are unknown, but it is extremely unlikely that would exceed those described above. Based on that information, and on the consultations for similar projects in the region, sediment mobilization from tugboat propeller wash would likely consist of relatively low-concentration plumes that could extend to about 300 feet from the site, and low number of hours hour after the disturbance.

Based on the best available information, construction-related turbidity concentrations would be too low and short-lived to cause more than temporary, non-injurious behavioral effects such as avoidance of the plume, mild gill flaring (coughing), and slightly reduced feeding rates in any PS Chinook salmon that may be exposed to it. None of these potential responses, individually, or in combination would affect the fitness or meaningfully affect normal behaviors in exposed fish.

Dissolved Oxygen (DO): Mobilization of anaerobic sediments can decrease dissolved oxygen (DO) levels (Hicks et al., 1991; Morton 1976). The impact on DO is a function of the oxygen demand of the sediments, the amount of material suspended in the water, the duration of suspension, and the water temperature (Lunz and LaSalle 1986; Lunz et al. 1988). Reduced DO can affect salmonid swimming performance (Bjornn and Reiser 1991), as well as cause avoidance of water with low DO levels (Hicks 1999). However, the relatively low expected concentrations of TSS suggests that any DO reductions would be small. Further, the County reports that their contractors would be required to ensure that DO levels remain at or above 6.5 mg/L, WDOE's DO for salmonid rearing and migration (WDOE 2019). Based on the best available information, construction-related impacts on DO would be relatively small, short-lived (hours), and largely limited to the turbidity plumes described above. The most likely effects of salmonid exposure to the reduced DO would be limited to temporary, non-injurious behavioral effects such as avoidance of the plume, which would not affect the fitness or meaningfully affect the normal behaviors of the exposed fish.

Toxic Materials: Toxic materials may enter the water through construction-related spills and discharges and/or by the mobilization of contaminated sediments. Fish can uptake contaminants directly through their gills, and through dietary exposure (Karrow et al. 1999; Lee and Dobbs 1972; McCain et al. 1990; Meador et al. 2006; Neff 1982; Varanasi et al. 1993). Many of the fuels, lubricants, and other fluids commonly used in motorized vehicles and construction equipment are petroleum-based hydrocarbons that contain Polycyclic Aromatic Hydrocarbons (PAHs), which are known to be injurious to fish. Other contaminants can include metals, pesticides, Polychlorinated Biphenyls (PCBs), phlalates, and other organic compounds.

Depending on the pollutant, its concentration, and/or the duration of exposure, exposed fish may experience effects that can range from avoidance of an affected area, to reduced growth, altered immune function, and mortality (Beitinger and Freeman 1983; Brette et al. 2014; Feist et al.

2011; Gobel et al. 2007; Incardona et al. 2004, 2005, and 2006; Mcintyre et al. 2012; Meadore et al. 2006; Sandahl et al. 2007; Spromberg et al. 2015).

The project includes BMPs specifically intended to reduce the risk and intensity of discharges and spills during construction. In the unlikely event of a construction-related spill or discharge, the event would likely be very small, quickly contained and cleaned. Additionally, non-toxic and/or biodegradable lubricants and fluids are strongly encouraged by the State, and are commonly used by many of the local contractors. Based on the best available information, the in-water presence of spill and discharge-related contaminants would be very infrequent, very short-lived, and at concentrations too low to cause detectable effects should a listed fish be exposed to them.

The sediments that would be mobilized during in-water excavation/dredging have been tested and determined to comply with the Dredged Material Management Program's (DMMP's) standards for unconfined aquatic disposal in the marine environment. Therefore, in-water contaminants from dredging/excavation are unexpected. In the unlikely event of contaminant mobilization, it would be short-lived and at very low concentrations. The NMFS estimates that all detectable water quality impacts would limited to the extent of the project-related visible turbidity, which is unlikely to exceed 300 feet and a low number of hours after cessation of the work. In the unlikely event of fish exposure to waterborne contaminants, the concentrations would be too low, and exposure too brief to affect the fitness or meaningfully affect the normal behaviors of the exposed individuals.

Based on the best available information, as described above, any fish that may be exposed to construction-related water quality impacts would experience no more than temporary low-level behavioral effects, which individually, or in combination would not affect the fitness or meaningfully affect the normal behaviors of the exposed individuals.

Construction-related Propeller Wash

Construction-related propeller wash is likely to adversely affect juvenile PS Chinook salmon. Spinning boat propellers kill fish and small aquatic organisms (Killgore et al. 2011; VIMS 2011). Spinning propellers also generate fast-moving turbulent water that is known as propeller wash. Exposure to propeller wash can displace and disorient small fish. It can also mobilize sediments and dislodge aquatic organisms and SAV, particularly in shallow water and/or at high power settings. This is called propeller scour.

During in-water work with tugboats and other work boats, vessel operations would cause propeller wash within the action area. Adult Chinook salmon that migrate through the action area are likely to avoid construction-related noise and activity. Further, they would be able to swim against most propeller wash they may be exposed to without any meaningful effect on their fitness or normal behaviors. Conversely, juvenile Chinook salmon that are within the area are likely to be relatively close to the surface and too small to effectively swim against the propeller wash. Individuals that are struck or very nearly missed by the propeller would be injured or killed by the exposure. Farther away, propeller wash may displace and disorient fish. Depending on the direction and strength of the thrust plume, displacement could increase energetic costs, reduce feeding success, and may increase the vulnerability to predators for individuals that tumble stunned and/or disoriented in the wash.

The number of individuals that would be affected by propeller wash is unquantifiable with any degree of certainty. However, as described in more detail in the assessment of the effects of construction-related fish salvage, very few juvenile Chinook salmon are likely to be present in the action area during the in-water work windows. Therefore, the numbers of individuals that are likely to be affected by propeller wash would represent such small subsets of their respective cohorts that their loss would cause no detectable population-level effects.

Construction-related propeller scour may also reduce SAV and diminish the density and diversity of the benthic community at the project sites. However, the disturbances would be relatively brief, the total affected area would likely comprise a tiny portion of the SAV-supporting substrate within the action, the affected SAV consists primarily of non-native invasive species, and the disturbed benthic organisms would likely recover very quickly after the project is complete. Therefore, the effects of propeller scour on SAV and other benthic resources would be too small to cause any detectable effects on the fitness and normal behaviors of Chinook salmon in the action area.

Altered Benthic Habitat

Alteration of benthic habitats would cause minor effects in PS Chinook salmon. Dredging and/or excavation and in-water deposition of gravels would alter benthic habitats and temporarily reduce the abundance of infaunal and epifaunal invertebrate organisms and SAV.

Juvenile salmon prey on planktonic organisms such as copepods and euphausiids, as well as on the larvae of many benthic species and fish (NMFS 2006). SAV provides important structural environments that support epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates and by larval and juvenile fish (NMFS 1997).

Dredging removes benthic infaunal and epifaunal invertebrate organisms (Armstrong et al. 1981). It also removes SAV. Deposition of gravels typically buries those same resources. The removal of the resident benthic invertebrates reduces the availability of their larvae, as well as the availability of copepods, daphnids, and larval fish that prey on them, and in turn are prey for juvenile salmon (NMFS 2006). The loss of SAV reduces primary production, and removes habitat that contributes to trophic systems. Therefore, loss of SAV also reduces prey availability for juvenile salmon, and it reduces the availability of structural habitat that juvenile salmon would use to avoid predators.

The available information to describe ecosystem responses to dredging indicates that little recovery occurs during the first seven months after dredging. After that, early successional fauna would begin to dominate over the next six months (Jones and Stokes 1998). This suggests that full recovery of a site may take years. The rate and degree of SAV recovery is uncertain, but could also take more than a year. Therefore, the proposed excavations and dredging across the East Channel, as well as the installation of gravels to the two shoreline enhancement sites would temporarily reduce the availability of benthic organisms and SAV within the affected areas, and it is likely to take a year or more after the work ends before prey and SAV availability return to pre-construction levels.

The relatively small size of the affected areas as compared to the rest of the benthic habitat near the construction sites, combined with the high levels of water mixing, suggest that any reduction in the availability of planktonic prey for juvenile salmonids would be undetectable. Any detectable reductions in forage and SAV availability would be limited to the narrow footprint of the cross-channel trench (~50 feet wide), and to a combined total of less than 500 linear feet of nearshore habitat at the 3 shoreline sites where trenching and/or gravel deposition would be done. Exposure to project-related altered benthic habitat at these sites would cause little more than a temporary tendency for juvenile Chinook salmon to move past these sites to find more productive habitats along the adjacent shoreline, which would not affect the fitness or meaningfully affect the normal behaviors of the exposed individuals.

Reduced Riparian Vegetation

Construction-related removal of riparian vegetation would cause minor effects in PS Chinook salmon. Construction would cause the removal a few scattered trees, shrubs, and non-native invasive plants from riparian areas at the Mercer Island boat launch, Enatai Beach Park, and in Mercer Slough over a 3-year period. All affected areas would be replanted with native vegetation. However, it will take several years to decades before the replacement vegetation would provide ecological functions equitable to pre-construction levels in areas where mature vegetation would be removed.

Reduced riparian vegetation can alter in-stream chemical and biological functions. Chemical processes involve inputs of thermal energy and organic matter, as well as linkages to terrestrial food webs, the retention and export of nutrients and nutrient cycling in the aquatic food web, and gas exchange (Beechie et al. 2010). Biological processes include aquatic and riparian plant and animal growth, and community development and succession, which establish the biodiversity and influence the life histories of aquatic and riparian organisms (Harman et al. 2012).

Removal of riparian vegetation from the project areas locate under the I-90 Bridge is unlikely to cause detectable shade-related effects because those project areas are shaded by the bridge. Removal from the other areas would could slightly increase summer-time insolation in isolated areas. The potential temperature increases are not predictable with any degree of certainty, but they would be small, and due to the very small size of the affected areas relative to the surface area of the adjacent waters that are regularly exposed to sunlight, project-related temperature increases would be too small to cause detectable effects on the water temperature in the action area, or on the fitness or normal behaviors for any life stage of Chinook salmon.

Many terrestrial insects are forage for salmonids, and vegetative matter that falls into the waters often provides cover for small fish and invertebrates. Terrestrial organic matter is also important to nutrient cycling in aquatic food webs that support aquatic algae and invertebrates that are important resources for juvenile salmonids. Project-related removal of riparian vegetation would slightly reduce the input of terrestrial-origin organic matter in isolated areas of Mercer Slough and Lake Washington until the riparian vegetation returns to pre-construction levels of growth.

Due to the small size and scattered distribution of the affected areas, the impacts on aquatic food webs and shelter would be too small to cause detectable effects on the fitness or normal behaviors for any life stage of Chinook salmon in the action area.

2.5.2 Effects on Critical Habitat

This assessment considers the intensity of expected effects in terms of the change they would cause in affected Primary Biological Features (PBFs) from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Ephemeral effects are those that are likely to last for hours or days, short-term effects would likely last for weeks, and long-term effects are likely to last for months, years or decades.

Puget Sound Chinook Salmon Critical Habitat: The proposed action, including full application of the planned conservation measures and BMPs, is likely to adversely affect designated critical habitat for PS Chinook salmon. The expected effects would be limited to the impacts on the PBF of freshwater migration corridors free of obstruction and excessive predation as described below.

1. Freshwater spawning sites – None in the action area.

2. Freshwater rearing sites:
   a. Floodplain connectivity – The proposed project would cause no effect on this attribute.
   b. Forage – The proposed action would cause long-term minor effects on this PBF. In-water excavation and installation of gravel would slightly reduce prey availability for about a year following the end of work by removing and/or covering benthic organisms and SAV in the East Channel and off the Enatai swim beach. The scattered removal of small amounts of riparian vegetation would cause a years-long slight reduction in the availability of terrestrial-origin insects.
   c. Natural cover – The proposed action would cause long-term minor effects on this attribute, and may cause long term minor improvements. In-water excavation and installation of gravel would reduce SAV availability for about a year following the end of work in the East Channel and off the Enatai swim beach. The scattered removal of small amounts of riparian vegetation would cause a years-long slight reduction in the availability of terrestrial-origin plant matter. The planned shoreline enhancements at the Mercer Island boat launch and at the Enatai Beach Park would reduce the adverse effects of the existing vertical bulkhead, and over time, the native riparian plantings in those areas may improve the conditions as compared to those that currently exist at the sites.
   d. Water quantity – The proposed project would cause no effect on this attribute.
   e. Water quality – The proposed action would cause long-term minor adverse effects on this attribute. The action would cause no measurable changes in water temperature or salinity, but over 3 years, construction would increase suspended solids and may slightly reduce DO, it may also temporarily introduce very low levels of contaminants. Detectable effects are expected to be limited to the area within about 300 feet in-water excavation and to persist no more than several hours after work stops.

3. Freshwater migration corridors:
    a. Free of obstruction and excessive predation – The proposed action would cause long-term minor effects on this attribute, and may cause long term minor improvements. Construction-related elevated turbidity and vessel noise may cause slight levels of area avoidance that may slightly hinder migration past construction sites. The planned sloped shorelines at the Mercer Island boat launch and at the Enatai Beach Park would reduce the adverse effects of the existing vertical bulkhead, and over time, the native riparian vegetation may further improve migratory conditions in those areas.
    b. Water quantity – Same as above.
    c. Water quality – Same as above.
    d. Natural Cover – Same as above.

4. Estuarine areas – None in the action area.

5. Nearshore marine areas – None in the action area.

6. Offshore marine areas – None in the action area.

7. Offshore marine areas – None in the action area.

2.6 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 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline section.

The current condition of ESA-listed species and designated critical habitat within the action area are described in the status of the species and critical habitat and the environmental baseline sections above. The contribution of non-federal activities to those conditions include past and on-going shoreline development, vessel activities, and upland urbanization in and around the action area, as well as upstream forest management, agriculture, urbanization, road construction, water development, and restoration activities. Those actions were driven by a combination of economic conditions that characterized traditional natural resource-based industries, general resource demands associated with settlement of local and regional population centers, and the efforts of conservation groups dedicated to restoration and use of natural amenities, such as cultural inspiration and recreational experiences.

The NMFS is unaware of any specific future non-federal activities that are reasonably certain to affect the action area. However, the NMFS is reasonably certain that future non-federal actions such as the previously mentioned shoreline and upstream activities are all likely to continue and increase in the future as the human population continues to grow across the region. Continued habitat loss and degradation of water quality from development and chronic low-level inputs of non-point source pollutants will likely continue into the future. Recreational and commercial use of the waters within the action area is also likely to increase as the human population grows.

The intensity of these influences depends on many social and economic factors, and therefore is difficult to predict. Further, the adoption of more environmentally acceptable practices and standards may gradually reduce some negative environmental impacts over time. Interest in restoration activities has increased as environmental awareness rises among the public. State, tribal, and local governments have developed plans and initiatives to benefit ESA-listed PS Chinook salmon within the watersheds that flow into the action area. However, the implementation of plans, initiatives, and specific restoration projects are often subject to political, legislative, and fiscal challenges that increase the uncertainty of their success.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

As described in more detail above at Section 2.4, climate change is likely to increasingly affect the abundance and distribution of the ESA-listed species considered in the Opinion. It is also likely to increasingly affect the PBFs of designated critical habitats. The exact effects of climate change are both uncertain, and unlikely to be spatially homogeneous. However, climate change is reasonably likely to cause reduced instream flows in some systems, and may impact water quality through elevated in-stream water temperatures and reduced dissolved oxygen, as well as by causing more frequent and more intense flooding events.
Climate change may also impact coastal waters through elevated surface water temperature, increased and variable acidity, increasing storm frequency and magnitude, and rising sea levels. The adaptive ability of listed-species is uncertain, but is likely reduced due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. The proposed action will cause direct and indirect effects on the ESA-listed species and critical habitats considered in the Opinion well into the foreseeable future. However, the action's effects on water quality, substrate, and the biological environment are expected to be of such a small scale that no detectable effects on ESA-listed species or critical habitat through synergistic interactions with the impacts of climate change are expected.

2.7.1 ESA-listed Species

PS Chinook salmon are listed as threatened, based on declines from historic levels of abundance and productivity, loss of spatial structure and diversity, and an array of limiting factors as a baseline habitat condition. This species will be affected over time by cumulative effects, some positive – as recovery plan implementation and regulatory revisions increase habitat protections and restoration, and some negative – as climate change and unregulated or difficult to regulate sources of environmental degradation persist or increase. Overall, to the degree that habitat trends are negative, as described below, effects on viability parameters of each species are also likely to be negative. In this context we consider the effects of the proposed action's effect on individuals of the listed species at the population scale.

PS Chinook salmon

The long-term abundance trend of the PS Chinook salmon ESU is slightly negative. Reduced or eliminated accessibility to historically important habitat, combined with degraded conditions in available habitat due to land use activities appear to be the greatest threats to the recovery of PS Chinook salmon. Commercial and recreational fisheries also continue to impact this species.

The PS Chinook salmon that occur in the action area would be fall-run Chinook salmon from the Cedar River and/or the North Lake Washington/Sammamish River populations. Abundance in both populations is relatively low, with a total annual abundances fluctuating between less than 100 and about 2,500 individuals since 1965, and slightly negative average abundance trends.

The project site is located along the central east shore of Lake Washington, from the North Mercer Island Pump Station to the Sweyolocken Pump Station in Bellevue. The environmental baseline within the action area has been degraded by the effects of intense streambank and shoreline development. The baseline has also been degraded by nearby and upstream industry, urbanization, agriculture, forestry, water diversion, and road building and maintenance.

Construction-related impacts are likely to cause a range of effects that both individually and collectively would cause altered behaviors, reduced fitness, and possible mortality in low numbers of exposed juveniles. However, the annual numbers of individuals that are likely to be impacted by action-related stressors would be extremely low.

Based on the best available information, the scale of the direct and indirect effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause detectable effects on any of the characteristics of a viable salmon population (abundance, productivity, distribution, or genetic diversity) for the affected PS Chinook salmon population. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

2.7.2 Critical Habitat

Chinook salmon critical habitat

As described above at Section 2.5, the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon.

Past and ongoing land and water use practices have degraded salmonid critical habitat throughout the Puget Sound basin. Hydropower and water management activities have reduced or eliminated access to significant portions of historic spawning habitat. Timber harvests, agriculture, industry, urbanization, and shoreline development have adversely altered floodplain and stream morphology in many watersheds, diminished the availability and quality of estuarine and nearshore marine habitats, and reduced water quality across the region.

Global climate change is expected to increase in-stream water temperatures and alter stream flows, possibly exacerbating impacts on baseline conditions in freshwater habitats across the region. Rising sea levels are expected to increase coastal erosion and alter the composition of nearshore habitats, which could further reduce the availability and quality of estuarine habitats. Increased ocean acidification may also reduce the quality of estuarine habitats.

In the future, non-federal land and water use practices and climate change are likely to increase. The intensity of those influences on salmonid critical habitat is uncertain, as is the degree to which those impacts may be tempered by adoption of more environmentally acceptable land use practices, by the implementation of non-federal plans that are intended to benefit salmonids, and by efforts to address the effects of climate change.

The PBFs for PS Chinook salmon critical habitat in the action area are limited to freshwater rearing sites and freshwater migration corridors free of obstruction and excessive predation. The site attributes of those PBFs that would be affected by the action are limited to obstruction and predation, water quality, natural cover, and forage. As described above, the proposed action would cause long-term minor adverse effects, as well as long-term minor beneficial effects on the site attributes of those PBFs within about 300 feet around the project sites.

Based on the best available information, the scale of the proposed action's effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term negative changes in the quality or functionality of any of the site attributes of critical habitat PBFs in the action area. Therefore, the critical habitat will maintain its current level of functionality, and retain its current ability for PBFs to become functionally established, to serve the intended conservation role for PS Chinook salmon.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is the NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon or destroy or adversely modify its designated critical habitat.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations 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 regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement (ITS).

2.9.1 Amount or Extent of Take

In the Opinion, the NMFS determined that incidental take is reasonably certain to occur as follows:

Harm of juvenile Puget Sound Chinook salmon from:

- Exposure to construction-related fish salvage and
- Exposure to construction-related propeller wash.

The NMFS expects that a maximum of 33 juvenile Chinook salmon may be captured during fish salvage activities, with up to 2 of those fish being seriously injured or killed.

The NMFS cannot predict with meaningful accuracy the number of juvenile PS Chinook salmon that are reasonably certain to be injured or killed annually by exposure to construction-related propeller wash. The distribution and abundance of the fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can the NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. Additionally, the NMFS knows of no device or practicable technique that would yield reliable counts of individuals that may experience these impacts. In such circumstances, the NMFS uses the causal link established between the activity and the likely extent and duration of changes in habitat conditions to describe the extent of take as a numerical level of habitat disturbance. The most appropriate surrogates for take are action-related parameters that are directly related to the magnitude of the expected take.

For this action, the timing of in-water work with vessels is the best available surrogate for the extent of take of juvenile PS Chinook salmon from exposure to construction-related propeller wash because the planned work windows were selected to reduce the potential for juvenile salmonid presence at the project sites. Working outside of the planned work windows would increase the number of fish likely to be exposed to propeller wash.

In summary, the extent of PS Chinook salmon take for this action is defined as:

- A combined total of 33 juvenile PS Chinook salmon and PS steelhead captured, with a maximum of 2 seriously injured or killed during fish salvage; and
- Tugboat and other power vessel operations as described in the proposed action section of this biological opinion.

Exceedance of either of the exposure limits described above would constitute an exceedance of authorized take that would trigger the need to reinitiate consultation.

Although these take surrogates could be construed as partially coextensive with the proposed action, they still function as effective reinitiation triggers because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance (33 CFR 326.4).

2.9.2 Effect of the Take

In the opinion, the NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" (RPMs) are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

The COE shall require the applicant to:

1. Minimize incidental take of PS Chinook salmon from fish salvage.

2. Minimize incidental take of PS Chinook salmon from exposure to propeller wash.

3. Ensure the implementation of monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the COE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The COE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement RPM Number 1, Minimize incidental take of PS Chinook salmon from exposure to fish salvage, the COE shall require the County to require their contractors to:
   a. Limit fish salvage to September 1 through December 31.
   b. Comply with the USFWS recommended fish exclusion, capture, handling, and electroshocking protocols and standards (USFWS 2012).

2. To implement RPM Number 2, Minimize incidental take of PS Chinook salmon from exposure to project-related propeller wash, the COE shall require the County to limit project-related use of tugboats and other vessels to no more than 3 in-water work seasons as follows:
   a. Up to 4 consecutive weeks between July 16 and December 31 for the activities to temporarily float the HDD pipe on Lake Washington;
   b. Up to 7.5 consecutive months between mid-June and the end of the following February for the activities to complete the East Channel Crossing component; and
   c. Up to 5.5 consecutive months between July 16 and December 31 for activities to complete the Enatai Interceptor Rehabilitation component.

3. To implement RPM Number 3, Implement monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded, the COE shall require the County to develop and implement a plan collect and report details about the take of listed fish. That plan shall:
   a. Require the contractor to maintain and submit fish salvage logs to verify that all take indicators are monitored and reported. Minimally, the logs should include:
      i. The identity (name, title, organization), qualification, and contact information of the persons conducting fish salvage, and the person completing the report;
      ii. The location, date, time, and air and water temperatures during salvage work;
      iii. The method(s) of capture and handling procedures that were used; and
      iv. The species and quantities of captured fish, and their disposition at release (i.e. alive with no apparent injuries, alive with apparent minor/serious injuries, dead with/without apparent injuries).
   b. Require the contractor to maintain and submit logs to verify the timing of tugboat and other vessel use. Minimally, the logs should include the date, location(s), type and number of vessels, and description(s) of the vessel operations.
   c. Require the contractor to establish procedures for the submission of the construction logs and other materials to the County; and
   d. Require the County to submit reports as needed to the appropriate COE office, and to submit an electronic post-construction report to NMFS within six months of project

completion. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2019-01026 in the subject line.

2.10 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. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. The COE should encourage the County to require their contractors to install full-depth sediment curtains around the excavation and fill work for the East Channel Crossing to limit the spread of suspended sediments.

2. The COE should encourage the County to require their contracted tugboat and other vessel operators to use the lowest safe speeds and power settings when maneuvering in shallow waters close to the shoreline to minimize propeller wash and mobilization of sediments.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S Army Corps of Engineers' authorization of King County's North Mercer Island Interceptor and Enatai Interceptor Upgrade Project on Lake Washington (NWS-2019-1132).

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

This assessment was prepared pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402 and agency guidance for preparation of letters of concurrence.

As described in Section 1.2 and below, the NMFS has concluded that the proposed action would be not likely to adversely affect PS steelhead. Detailed information about the biology, habitat, and conservation status and trends of PS steelhead can be found in the listing regulations and critical habitat designations published in the Federal Register, as well as in the recovery plans and other sources at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered, and are incorporated here by reference, and are incorporated here by reference.

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. The effects analysis in this section relies heavily on the descriptions of the proposed action and project site conditions discussed in Sections 1.3 and 2.4, and on the effects analyses presented in Section 2.5.

PS steelhead are very rare in the Lake Washington watershed. Fewer than 10 adults from the North Lake Washington and Lake Sammamish population returned to the watershed between 1994 and 1999 when the last WDFW survey was done. Similarly, 50 adults from the Cedar River population have returned to the watershed since 2000, with 10 or less returning since 2007 (WDFW 2020c). Given the timing and relatively small spatial scale of the in-water work that would be done for this project, combined with very low numbers of PS steelhead that may be in the watershed, it is extremely unlikely that any individuals from either population would be exposed to any of the stressors identified in Section 2.5. Therefore, the action is not likely to adversely affect PS steelhead.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with the NMFS on all actions or proposed actions that may adversely affect essential fish habitat (EFH). The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, 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 of it 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 the NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the COE and the descriptions of EFH for Pacific Coast Salmon contained in the fishery management plan developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce (PFMC 2014).

3.1 Essential Fish Habitat Affected by the Project

The project site is located near and in the East Channel of Lake Washington and along the east shore of the lake (Figure 1). The waters and substrates of the action area are designated as freshwater EFH for various life-history stages of Pacific Coast Salmon, which within Lake Washington include Chinook and coho salmon. Freshwater EFH for Pacific Coast Salmon is identified and described in Appendix A to the Pacific Coast salmon fishery management plan (PFMC 2014), and consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and holding habitat.

Those components of freshwater EFH for Pacific Coast Salmon depend on habitat conditions for spawning, rearing, and migration that include: (1) water quality (e.g., dissolved oxygen (DO), nutrients, temperature, etc.); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges; (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (e.g., LWD, pools, aquatic and terrestrial vegetation, etc.); (7) space; (8) habitat connectivity from headwaters to the ocean (e.g., dispersal corridors); (9) groundwater-stream interactions; and (10) substrate composition.

As part of Pacific Coast Salmon EFH, five Habitat Areas of Particular Concern (HAPCs) have been defined: 1) complex channels and floodplain habitats; 2) thermal refugia; 3) spawning habitat; 4) estuaries; and 5) marine and estuarine submerged aquatic vegetation. Mercer Slough likely contains some complex channels and floodplain habitat features that meet the definition of Pacific Coast Salmon HAPC. The action area provides no other known HAPC habitat features.

3.2 Adverse Effects on Essential Fish Habitat

The ESA portion of this document (Sections 1 and 2) describes the proposed action and its adverse effects on ESA-listed species and critical habitat, and is relevant to the effects on EFH. Based on the analysis of effects presented in Section 2.5 the proposed action will cause short- and long-term minor adverse effects, and long-term minor beneficial effects on EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species as summarized below.

1. <u>Water quality:</u> – The proposed action would cause long-term minor adverse effects on water quality. The action would cause no meaningful changes in water temperature, and no changes in salinity, but for 3 years, construction would increase suspended solids and may slightly reduce DO, it may also temporarily introduce very low levels of contaminants. Detectable effects would be limited to the area within about 300 feet of in-water excavation and tugboat operations, and would persist no more than several hours after work stops.

2. <u>Water quantity, depth, and velocity:</u> – The proposed action may cause a long-term minor change in the water depth along the East Channel crossing excavation route. No changes in water quantity or velocity are expected.

3. <u>Riparian-stream-marine energy exchanges:</u> – No changes expected.

4. <u>Channel gradient and stability:</u> – Proposed shoreline enhancements on Mercer Island and at the Enatai Beach Park may cause long term minor improvements to the gradient and stability of the lake bank at those sites.

5. <u>Prey availability:</u> – The proposed action would cause long term minor adverse effects on prey availability. In-water excavation and installation of gravel would slightly reduce prey availability for about a year following the end of work by removing and/or covering benthic

organisms and SAV in the East Channel and off the Enatai swim beach. The scattered removal of small amounts of riparian vegetation would cause a years-long slight reduction in the availability of terrestrial-origin insects.

6. Cover and habitat complexity: – The proposed action would cause long-term minor adverse effects on this attribute, and may cause long term minor improvements. In-water excavation and installation of gravel would reduce SAV availability for about a year following the end of work in the East Channel and off the Enatai swim beach. The scattered removal of small amounts of riparian vegetation would cause a years-long slight reduction in the availability of terrestrial-origin plant matter. The planned shoreline enhancements at the Mercer Island boat launch and at the Enatai Beach Park would reduce the adverse effects of the existing vertical bulkhead, and over time, the native riparian plantings in those areas may improve the conditions as compared to those that currently exist at the sites.

7. Water quantity: – No changes expected.

8. Space: – No changes expected.

9. Habitat connectivity from headwaters to the ocean: – No changes expected.

10. Groundwater-stream interactions: – No changes expected.

11. Connectivity with terrestrial ecosystems: – No changes expected.

12. Substrate composition: – The proposed action may cause long-term minor beneficial effects on this attribute. The installation of fish gravel related to the East Channel Crossing work may cause minor improvements in the quality of the substrate along the route and along the shorelines where shoreline enhancement would be done.

The planned work would cause no changes to the nature of the banks and channels within Mercer Slough. Therefore it would not affect the complex channels and floodplain habitats HAPC.

3.3 Essential Fish Habitat Conservation Recommendations

Full implementation of the following EFH conservation recommendations would protect about 11.25 acres of designated EFH for Pacific Coast salmon by avoiding or minimizing the adverse effects described in section 3.2 above.

To reduce adverse impacts on water quality, the Corps should require the County to:

1. Require the installation of full-depth sediment curtains around the excavation and fill work for the East Channel Crossing; and

2. Require contracted tugboat and other vessel operator(s) to use the lowest safe speeds and power settings when maneuvering in shallow waters close to the shoreline.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the COE must provide a detailed written response in to the NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of the NMFS' EFH Conservation Recommendations unless the NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with the NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, the 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 ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The COE 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(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this Opinion are the COE and King County. Other users could include WDFW, the government and citizens of the Cities of Bellevue, Renton, Kirkland, Kenmore, and Seattle, and Native American tribes. Individual copies of this Opinion were provided to the COE, King County, and the Muckleshoot Indian Tribe. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 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.

4.3 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 NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and 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 West Coast Region ESA quality control and assurance processes.

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