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

Refer to NMFS No:
WCRO-2018-00111

March 26, 2019

Michelle Walker
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the proposed Wastewater Treatment Plant Outfall Replacement Project in Lynden, Washington (COE Reference No. NWS-2018-27)

Dear Ms. Walker:

Thank you for your letter of April 12, 2018, requesting initiation of formal 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 the proposed Wastewater Treatment Plant Outfall Replacement Project in Lynden, Washington.

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.

The enclosed document contains a biological opinion (Opinion) that analyzes the effects of your proposal to permit the proposed action under the Rivers and Harbors Act (Section 10) and Clean Water Act (Section 404). In this opinion, we conclude that the proposed action is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*), and PS steelhead (*O. mykiss*). Further, we conclude that the proposed action will not result in the destruction or adverse modification of their designated critical habitats.

As required by section 7 of the ESA, we are providing an incidental take statement with the opinion. The incidental take statement describes reasonable and prudent measures we consider necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements that the U.S. Army Corps of Engineers (COE) and any person who performs the action must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

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

If the response is inconsistent with the essential fish habitat 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 the recommendations. In response to increased oversight of overall essential fish habitat 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 essential fish habitat consultation and how many are adopted by the action agency. Therefore, we request that, in your statutory reply to the essential fish habitat portion of this consultation, you clearly identify the conservation recommendations accepted.

Please contact David Price, consulting biologist at the Oregon Washington Coastal Office (david.price@noaa.gov; 360-753-9598), 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: Randel Perry (Corps)

bcc: File copy,
David Price (pdf),
Elizabeth Babcock (pdf)

PCTS #: WCR-2018-9405

PDF Copies sent to the following:

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

for the

City of Lynden Wastewater Treatment Plant Outfall Replacement Project
Hydraulic Unit Code: 17110004
Nooksack River, Lynden, Washington
(COE reference: NWP-2018-27)

NMFS Consultation Number: WCRO-2018-00111

Action Agency: U.S. Army Corps of Engineers, Seattle District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Puget Sound Chinook Salmon (*Onchorhynchus tshawytscha*)	Threatened	Yes	No	No
Puget Sound steelhead (*Onchorhynchus mykiss*)	Threatened	Yes	No	No

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: March 26, 2019

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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.

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). A complete record of this consultation is on file at the Oregon and Washington Coastal Office in Lacey, Washington.

1.2 Consultation History

The City of Lynden began operating its current wastewater treatment plant in 1978. Lynden upgraded the plant in 2002 and 2003 to include several improvements: a new headworks, anoxic tanks to remove nitrogen, effluent clarifiers and filters, an ultraviolet disinfection ditch, and an effluent pump station. The resulting improvements increased the plant's continuous secondary treated effluent capacity to 2.18 million gallons per day. The city operates the plant under NPDES Permit No. WA0022578, which expires October 31, 2022.

The wastewater treatment plant discharges effluent into the Nooksack River via a submerged effluent pipe at a horizontal distance of about 120 feet from the right bank. Original drawings indicate a 20-inch diameter effluent pipe with 32, 3-inch diameter ports discharge through an F-shaped diffuser (see 48 North Solutions, 2018). By 2015, the river had migrated and buried the diffuser ports below the substrate two to five feet and resulted in the diffuser and associated pumps failing to operate as designed. Inspections revealed that most of the effluent was discharging from a single point and is scouring the river bed.

On April 12, 2018, NMFS received a request to initiate formal consultation on the effects of the U.S. Army Corps of Engineers (Corps) authorizing the City of Lynden to replace the Wastewater Treatment plant (WWTP) outfall pipe with a single-port side-bank diffuser under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. NMFS requested additional information on July 16, 2018, and sent a letter to the Corps describing insufficient information to proceed with consultation on August 7, 2018. The Corps provided additional information to

NMFS through multiple emails in the fall of 2018, including mitigation plans by the applicant. Consultation was initiated on November 30, 2018.

This biological opinion is based on information provided in the City of Lynden Wastewater Treatment Plant Outfall Replacement Biological Assessment (BA) prepared by 48 North Consultants, and additional figures, maps, and information provided by the applicant's consultant via email between July 16, 2018 and February 6, 2019.

The Corps determined that the proposed action may adversely affect Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) and Puget Sound steelhead (*O. mykiss*). The Corps also determined that designated critical habitat for the species listed above, and EFH for Chinook and Coho salmon, may be adversely affected by the proposed action. The Corps also concluded that there was no effect from the proposed project on Southern Resident Killer Whale (SRKW) or its critical habitat.

1.3 Proposed Federal Action

"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). "Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). The proposed action, the construction of a wastewater outfall system is part of a larger action - discharging wastewater effluent into the Nooksack River. However, the justification and existence of the treatment plant do not depend on replacement of the outfall, moving the location of the outfall, or the addition of a new diffuser to the outfall, nor do those features increase the treatment plant's capacity. Therefore, we do not consider the existing treatment plant to be interdependent or interrelated to the proposed action. Because the new outfall has been designed and placed to avoid impacts from future flood events, the project is not expected to require frequent large-scale maintenance; however, the applicant may need to perform some maintenance in this location into the foreseeable future. As noted, no increase in WWTP effluent to the Nooksack River is proposed under this project despite the increased effluent capacity of the outfall to do so.

The Corps proposes to permit, under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, the City of Lynden to replace an existing outfall for the WWTP effluent. The City of Lynden WWTP (Figure 1) is operated under an existing National Pollutant Discharge Elimination System (NPDES) Permit, as administered by the Washington Department of Ecology (Ecology). The purpose of the proposed action is to install a larger replacement pipe and diffuser in a more stable channel and bank location, orienting the outfall discharge point toward the river thalweg. The proposed action is reportedly necessary to permanently replace the current outfall pipe, which is broken and failing to operate as designed (48 North Solutions 2018). The existing outfall pipe will be partially removed with the remaining pipe abandoned in place beneath the substrate. The proposed project also involves armoring the stream bank to protect a new outfall. The new outfall will extend from above the ordinary high water line (OHWL) to below the surface of summer base flow level.

Figure 1. Aerial image of the Lynden Wastewater Treatment Plant in proximity to the City of Lynden and the Nooksack River.

To partially minimize impacts from the project, the applicant proposes to financially support the removal of an equivalent sized bank armoring (rip rap) and re-establish a functional riparian area adjacent to the project site. The project consists of the following elements:

New outfall pipe installation: A 24 inch stainless steel replacement outfall pipe will be installed from the existing upslope manhole station to the terminal end located in the thalweg of the Nooksack River. The new pipe will run approximately 100 feet from the manhole station to the terminal end (Figure 2). The pipe trench will be 8-12 feet below existing site grades and terminate above the substrate but below the extreme low water line of the river.

Removal of the existing outfall pipe: The existing outfall pipe will be partially removed. Approximately 120 linear feet of outfall pipe will be removed, of which about 45 feet is currently below the OHWL. Portions of the existing outfall pipe and the damaged diffuser, which are buried below the river substrate, will not be removed and will be decommissioned in place.

New outfall excavation and armoring: The proposed new outfall pipe relocation requires support and protection from debris and flood events along the right bank of the Nooksack River. Approximately 1,200 sq. ft. of bank will be armored with 30-inch-minus rip rap (about 300 cubic yards), requiring approximately 460 cubic yards of soil removal. The rip rap will extend from above the OHWL to below the extreme low water line, and span a horizontal distance of 10 feet on either side of the new outfall pipe. Armoring will be placed at 1.5:1, which is slightly less steep than the existing unarmored bank (1.3:1).

Riparian clearing, replanting, and enhancement: To accommodate the proposed pipe and outfall replacement, 10,500 sq. ft. of riparian vegetation are required for clearing, including 18, 10-inch+ diameter trees. In addition to native trees and shrubs, invasive plants are also present on site and will be removed. The proposed plan includes a replanting plan that replaces and enhances the cleared project site after the outfall has been replaced. In addition, the proposed plan includes the removal of invasive plant species from 30,150 sq. ft. of adjacent riparian area and replanting with native vegetation.

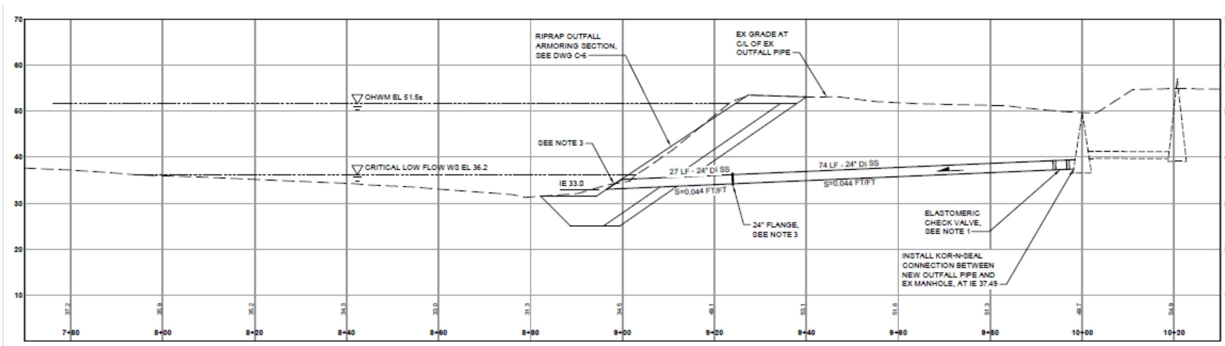

Figure 2. Lynden Wastewater treatment outfall replacement project plan profile (BHC Consultants LLC 2017).

The applicant has proposed the removal of a commensurate amount of rip rap (approximately 1,200 sq. ft.) to minimize the effects of bank armoring that is proposed for installation to protect the outfall and outfall pipe. The City of Lynden has established an agreement with the Nooksack Salmon Enhancement Association (NSEA) and the Lummi Nation to remove a channel-constraining rock berm on Porter Cr., a tributary to the Middle Fork Nooksack River, by funding the non-profit restoration group to remove 1,200 sq. ft. of rock berm as part of a larger restoration project. However, removal of the rock berm, despite having meaningful restoration benefits, is not considered in the Corps' effects determination for this action, and is therefore not considered in this opinion as part of NMFS' affects analyses on listed species.

Construction activities

The proposed action consists of both in-water components (i.e., within Nooksack River) and onshore components (i.e., above the OHWL). The duration of in-water construction would occur over an approximate one-month period occurring from July 15 to September 30, which is within the in-water work window for the Nooksack River.

The construction contractor will submit an *In-Water Work Plan* prior to construction describing the methods for isolating the in-water work area. The work area could be isolated from the main river using several different methods, which are dependent on water depth and river flow during the time of construction. The contractor will isolate work area using a C-shaped structure that connects to the river bank on the up- and downstream ends of the in-water work area. The temporary work area isolation structure will include either stacked Super Sacks backed with an impermeable membrane (preferred) or vibratory-driven sheet piles (if necessary). If the river is deeper at the time of construction and has slower flow velocities, a turbidity curtain will be used to isolate the work area. The isolation work area is anticipated to extend along the entire armoring placement approximately 50 feet along river and extend out from the OHWM approximately 50 feet.

To the extent possible, the diffuser and pipe installation work will be accomplished after dewatering or lowering the water level in the work isolation area. This project may be installed underwater where dewatering is not feasible. The contractor’s isolated work area shall be configured such that turbid water from within the work area is trapped from seeping through, around, or under the isolation structure and into the river. Water pumped from the isolation area would be discharged to adjacent upland areas to percolate via an infiltration basin back to the river as subsurface flow or pumped to a Baker Tank to settle and discharged through an approved filtration system to an infiltration basin or grassy field for dispersion and infiltration.

Water within the work area will be lowered to facilitate fish salvage. Lowering of the water level of the in-water work area would be accomplished using a combination of slow flow diversion and portable pumps with suction lines equipped with fish screens, or other methodology in accordance with the Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards (USFWS 2012). The fish screens would comply with Washington State law (Revised Code of Washington 77.57.010 and 77.57.070), NMFS fish screening criteria for salmonids and any requirements identified by USFWS, Washington Department of Ecology (Ecology), and WDFW.

Fish salvage would occur after placement of the in-water work area isolation structure, and prior to commencement of in-water work. To the extent possible, fisheries biologists will use a large seine net to herd fish from the isolation area working from top to bottom and side to side.

Excavation of the bank for the diffuser structure will be conducted using a large track-mounted excavator (track hoe). A temporary work bench is anticipated to be needed to allow the excavator to safely reach and remove the existing outfall pipe and place the new outfall pipe, gravel filter material, and rock riprap at the toe of the slope. This work bench would be excavated into the bank midway along the slope. Rock material will be deliberately placed. Pipe and outfall diffuser placement would involve preparing a bedding of gravel for the pipe and diffuser structure. Rock armoring would be carefully placed over and around the diffuser. Armoring would extend up to the top of bank.

None of the components of the proposed action are being completed to increase the City of Lynden’s WWTP capacity or expand its service area. The applicant could continue to discharge effluent regardless of whether the Corps took the proposed action. Therefore, we do not consider any impacts resulting from the effluent discharge to be indirect effects for the purposes of this consultation.

The applicant has proposed the following reporting and conservation measures to minimize the effects of the proposed action:

- Construction will be restricted to July 15 to September 30, which is within the in-water work window for the Nooksack River.
- The City proposes to use Ecology's General Stormwater standards (most stringent standard applies). Upland areas to be disturbed will clearly delineated with orange construction fencing. The fencing would delineate the limits of disturbance. The contractor shall not conduct activities related to construction beyond the defined construction limits.
- Silt fencing would be placed down gradient of pipeline trench excavations, parallel with existing ground surface elevation contours. Silt fencing will be installed down gradient of parallel with the existing ground surface elevation contours, as well. Erosion control measures, including silt fencing, will be utilized to stabilize areas disturbed by excavation and other construction activities.
- The project will comply with water quality standards for surface waters of the State of Washington (WAC 173-201A) during project construction.
- To the extent feasible, the pipe trench length and width will be minimized.
- Equipment used near the water will use vegetable-based hydraulic fluid.
- Equipment will be cleaned prior to construction.
- If selected, Super Sacks will be placed within the smallest footprint required to complete the in-water work. All Super Sacks will be removed immediately upon completion of the in-water portion of the outfall construction. Sacks will not be cut, so no material will be deposited within the riverbed.
- If selected, installation of sheet piles will be done using a low-frequency vibratory hammer. Vibratory pile driving of sheet piles will be limited to a maximum of 10 hours a day. Vibratory pile driving of sheet piles will begin using a soft start and ramp up hammering.
- All piles will be removed immediately upon completion of the in-water portion of the outfall construction, enabling the riverbed to naturally restore.
- If needed for this project, concrete work activities will be conducted above the OHWL, such that no concrete is allowed to enter the Nooksack River.
- A Fueling and Spill Recover Plan will be developed prior to construction that includes specific construction BMPs to prevent any spills and to prepare and react quickly should and an incident occur.
- Filters on pump inlets, nets, and other measures, as required, will be used to avoid impacts to fish.
- Using Agency approved protocols for fish capture and water lowering the instream work area.
- Stabilizing exposed soils with a vegetative cover or other erosion control treatment immediately following construction.

We relied on the foregoing description of the proposed action, including all features identified to reduce adverse effects, to complete this consultation. To ensure that this opinion remains valid, we request that the action agency or applicant keep us informed of any changes to the proposed action.

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 provides 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.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that 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 CFR 402.02). 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 for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term 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, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.

- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA 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' current "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 current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring melt (Mote et al. 2014; Mote et al. 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague et al. 2013; Mote et al. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10°F, 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; Mote et al. 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).

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 (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (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; Winder and Schindler 2004; Raymondi et al. 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Wainwright and Weitkamp 2013; Raymondi et al. 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 (McMahon and Hartman 1989; Lawson et al. 2004).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote et al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0-3.7^{o}C by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011; Reeder et al. 2013).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Acidification also impacts sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely et al. 2012, Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011; Reeder et al. 2013). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor Coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011; Reeder et al. 2013).

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.

2.2.1 Status of the Species

For Pacific salmon, steelhead, and certain other species, we commonly use the four "viable salmonid population" (VSP) criteria (McElhany et al. 2000) to assess the viability of the populations that, together, 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 (McElhany et al. 2000).

"Abundance" generally refers to the number of naturally-produced adults (i.e., the progeny of naturally-spawning parents) in the natural environment (e.g., on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle (i.e., 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 declining. McElhany et al. (2000) use the terms "population growth rate" and "productivity" interchangeably when referring to production over the entire life cycle. They also refer to "trend in abundance," which is the manifestation of long-term population growth rate.

For species with multiple populations, once the biological status of a species' populations has been determined, we assess the status of the entire species 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 two 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 (Table 1).

Table 1. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register (FR) decision notices for ESA-listed species considered in this opinion. Listing status: 'T' means listed as threatened; 'E' means listed as endangered; 'P' means proposed for listing or designation.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon *(Oncorhynchus tshawytscha)*			
Puget Sound	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Puget Sound	T 5/11/07; 72 FR 26722	2/24/16; 81 FR 9252	2/7/07; 72 FR 5648

Status of PS Chinook salmon

The Puget Sound 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 (Shared Strategy for Puget Sound 2007) and a supplement by 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 the viability criteria for all VSP parameters are sustained to provide ecological functions and preserve options for ESU recovery.

Spatial Structure and Diversity. The Puget 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 (MPG), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 2).

Between 1990 and 2014, the proportion of natural-origin spawners has trended downward across the ESU, with the Whidbey Basin the only MPG with consistently high fractions of natural-origin spawner abundance. All other MPG have either variable or declining spawning populations with high proportions of hatchery-origin spawners (NWFSC 2015).Overall, the new information on abundance, productivity, spatial structure and diversity since the 2010 status review supports no change in the biological risk category (NWFSC 2015).

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

Abundance and Productivity. Available data on total abundance since 1980 indicate that although abundance trends have fluctuated between positive and negative for individual populations, there are widespread negative trends in natural-origin Chinook salmon spawner abundance across the ESU (NWFSC 2015). 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 shows that most populations have declined in abundance over the past 7 to 10 years. Further, escapement levels for all populations remain well below the TRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery (NWFSC 2015).

Limiting Factors. Limiting factors for this species 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
- Altered flow regime

Status of PS Steelhead

The PS Steelhead TRT produced viability criteria, including population viability analyses (PVAs), for 20 of 32 demographically independent populations (DIPs) and three major population groups (MPGs) in the DPS (Hard 2015). It also completed a report identifying historical populations of the DPS (Myers *et al.* 2015). The DIPs are based on genetic, environmental, and life history characteristics. Populations display winter, summer, or summer/winter run timing (Myers *et al.* 2015). The TRT concludes that the DPS is currently at "very low" viability, with most of the 32 DIPs and all three MPGs at "low" viability.

The designation of the DPS as "threatened" is based upon the extinction risk of the component populations. Hard (2015), identify several criteria for the viability of the DPS, including that a minimum of 40 percent of summer-run and 40 percent of winter-run populations historically present within each of the MPGs must be considered viable using the VSP-based criteria. For a DIP to be considered viable, it must have at least an 85 percent probability of meeting the viability criteria, as calculated by Hard (2015).

On December 13, 2018, we published a proposed recovery plan for PS steelhead (83 FR 64110) (NMFS 2018a). The proposed plan indicates that within each of the three MPGs, at least fifty percent of the populations must achieve viability, *and* specific DIPs must also be viable:

<u>Central and South Puget Sound MPG</u>: Green River Winter-Run; Nisqually River Winter-Run; Puyallup/Carbon Rivers Winter-Run, or the White River Winter-Run; and At least one additional DIP from this MPG: Cedar River, North Lake Washington/Sammamish Tributaries, South Puget Sound Tributaries, or East Kitsap Peninsula Tributaries.

<u>Hood Canal and Strait of Juan de Fuca MPG</u>: Elwha River Winter/Summer-Run; Skokomish River Winter-Run; One from the remaining Hood Canal populations: West Hood Canal Tributaries WinterRun, East Hood Canal Tributaries Winter-Run, or South Hood Canal Tributaries WinterRun; and One from the remaining Strait of Juan de Fuca populations: Dungeness Winter-Run, Strait of Juan de Fuca Tributaries Winter-Run, or Sequim/Discovery Bay Tributaries Winter-Run.

<u>North Cascades MPG:</u> Of the eleven DIPs with winter or winter/summer runs, five must be viable: One from the Nooksack River Winter-Run; One from the Stillaguamish River Winter-Run; One from the Skagit River (either the Skagit River Summer-Run and Winter-Run or the Sauk River Summer-Run and Winter-Run); One from the Snohomish River watershed (Pilchuck, Snoqualmie, or Snohomish/Skykomish River Winter-Run); and One other winter or summer/winter run from the MPG at large.

Of the five summer-run DIPs in this MPG, three must be viable representing in each of the three major watersheds containing summer-run populations (Nooksack, Stillaguamish, Snohomish Rivers); South Fork Nooksack River Summer-Run; One DIP from the Stillaguamish River (Deer Creek Summer-Run or Canyon Creek Summer-Run); and One DIP from the Snohomish River (Tolt River Summer-Run or North Fork Skykomish River Summer-Run).

Spatial Structure and Diversity**.** The PS steelhead DPS is the anadromous form of O. mykiss that occur in rivers, below natural barriers to migration, in northwestern Washington State that drain to Puget Sound, Hood Canal, and the Strait of Juan de Fuca between the U.S./Canada border and the Elwha River, inclusive. The DPS also includes six hatchery stocks that are considered no more than moderately diverged from their associated natural-origin counterparts: Green River natural winter-run; Hamma Hamma winter-run; White River winter-run; Dewatto River winter-run; Duckabush River winter-run; and Elwha River native winter-run. Steelhead are the anadromous form of *Oncorhynchus mykiss* that occur in rivers, below natural barriers to migration, in northwestern Washington State (Ford 2011). Non-anadromous ''resident'' *O. mykiss* occur within the range of PS steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard *et al.* 2007).

DIPs can include summer steelhead only, winter steelhead only, or a combination of summer and winter run timing (*e.g.,* winter run, summer run or summer/winter run). Most DIPs have low viability criteria scores for diversity and spatial structure, largely because of extensive hatchery influence, low breeding population sizes, and freshwater habitat fragmentation or loss (Hard *et al.* 2007). In the Central and South Puget Sound and Hood Canal and Strait of Juan de Fuca MPGs, nearly all DIPs are not viable (Hard 2015). More information on PS steelhead spatial structure and diversity can be found in NMFS' technical report (Hard 2015).

Abundance and Productivity. Abundance of adult steelhead returning to nearly all Puget Sound rivers has fallen substantially since estimates began for many populations in the late 1970s and early 1980s. Smoothed trends in abundance indicate modest increases since 2009 for 13 of the 22 DIPs. Between the two most recent five-year periods (2005-2009 and 2010-2014), the geometric mean of estimated abundance increased by an average of 5.4%. For seven populations in the Northern Cascades MPG, the increase was 3%; for five populations in the Central & South Puget Sound MPG, the increase was 10%; and for six populations in the Hood Canal & Strait of Juan de Fuca MPG, the increase was 4.5%. However, several of these upward trends are not statistically different from neutral, and most populations remain small. Inspection of geometric means of total spawner abundance from 2010 to 2014 indicates that 9 of 20 populations evaluated had geometric mean abundances fewer than 250 adults and 12 of 20 had fewer than 500 adults. Between the most recent two five-year periods (2005-2009 and 2010-2014), several populations showed increases in abundance between 10 and 100%, but about half have remained in decline. Long-term (15-year) trends in natural spawners are predominantly negative (NWFSC 2015).

There are some signs of modest improvement in steelhead productivity since the 2011 review, at least for some populations, especially in the Hood Canal & Strait of Juan de Fuca MPG. However, these modest changes must be sustained for a longer period (at least two generations) to lend sufficient confidence to any conclusion that productivity is improving over larger scales across the DPS. Moreover, several populations are still showing poor productivity, especially those in the Central & South Puget Sound MPG (NWFSC 2015).

Little or no data is available on summer-run populations to evaluate extinction risk or abundance trends. Because of their small population size and the complexity of monitoring fish in headwater holding areas, summer steelhead have not been broadly monitored.

Limiting factors. In our 2013 proposed rule designating critical habitat for this species (NMFS 2016), we noted that the following factors for decline for PS steelhead persist as limiting factors:

- The continued destruction and modification of steelhead habitat
- Widespread declines in adult abundance (total run size), despite significant reductions in harvest in recent years
- Threats to diversity posed by use of two hatchery steelhead stocks (Chambers Creek and Skamania)
- Declining diversity in the DPS, including the uncertain but weak status of summer run fish
- A reduction in spatial structure
- Reduced habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and reduced movement of large woody debris
- In the lower reaches of many rivers and their tributaries in Puget Sound where urban development has occurred, increased flood frequency and peak flows during storms and reduced groundwater-driven summer flows, with resultant gravel scour, bank erosion, and sediment deposition
- Dikes, hardening of banks with riprap, and channelization, which have reduced river braiding and sinuosity, increasing the likelihood of gravel scour and dislocation of rearing juveniles

Table 3, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. These documents are available on the NMFS West Coast Region website.

Table 3. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound Chinook salmon	Threatened 6/28/05	Shared Strategy for Puget Sound 2007 NMFS 2006	NWFSC 2015	This ESU comprises 22 populations distributed over five geographic areas. Most populations within the ESU have declined in abundance over the past 7 to 10 years, with widespread negative trends in natural-origin spawner abundance, and hatchery-origin spawners present in high fractions in most populations outside of the Skagit watershed. Escapement levels for all populations remain well below the TRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery.	• Degraded floodplain and in-river channel structure • Degraded estuarine conditions and loss of estuarine habitat • Degraded riparian areas 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
Puget Sound steelhead	Threatened 5/11/07	NMFS 2018a (Proposed)	NWFSC 2015	This DPS comprises 32 populations. The DPS is currently at very low viability, with most of the 32 populations and all three population groups at low viability. Information considered during the most recent status review indicates that the biological risks faced by the Puget Sound Steelhead DPS have not substantively changed since the listing in 2007, or since the 2011 status review. Furthermore, the Puget Sound Steelhead TRT recently concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 populations. In the near term, the outlook for environmental conditions affecting Puget Sound steelhead is not optimistic. While harvest and hatchery production of steelhead in Puget Sound are currently at low levels and are not likely to increase substantially in the foreseeable future, some recent environmental trends not favorable to Puget Sound steelhead survival and production are expected to continue.	• Continued destruction and modification of habitat • Widespread declines in adult abundance despite significant reductions in harvest • Threats to diversity posed by use of two hatchery steelhead stocks • Declining diversity in the DPS, including the uncertain but weak status of summer-run fish • A reduction in spatial structure • Reduced habitat quality • Urbanization • Dikes, hardening of banks with riprap, and channelization

2.2.2 Status of the Critical Habitat

This section describes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

NMFS designated critical habitat for PS Chinook salmon on September 2, 2005 (70 FR 52630), effective January 2, 2006 (NMFS 2006). Designated critical habitat for PS Chinook salmon includes PS nearshore marine habitat and all of the mainstem Snohomish River from its confluence with Puget Sound to the natural upstream limit of migration.

Critical habitat was designated for Puget Sound steelhead on February 24, 2016 (81 FR 9251), including habitat areas suitable for spawning, rearing, and unobstructed migration corridors to and from spawning and rearing habitats.

As described above, the designations of critical habitat for species uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7214) replace this term with physical or biological features (PBFs). In our September 2, 2005 critical habitat designation (NMFS 2005b), NMFS defined PBFs for listed salmon as sites essential to support one or more life stages of the ESU (sites for spawning, rearing, migration, and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU (for example, adequate spawning gravels, water quality and quantity, side channels, forage species). Specifically, the freshwater PBFs of PS Chinook salmon, and consequently PS steelhead, critical habitat are:

1) Freshwater spawning sites with water quantity and quality conditions and substrate capable of supporting spawning, incubation and larval development.
2) Freshwater rearing sites with:
    - Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility,
    - Water quality and forage supporting juvenile development; and

- 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.

Critical habitat throughout the Puget Sound recovery domain has been, and continues to be, degraded by numerous management and development activities (Judge 2011). Activities that affect PBFs in Puget Sound include hydropower development (reduced or lost fish passage, disrupting water quantity), loss of mature riparian forests (degrading natural cover), increased sediment inputs (impairing water quality), removal of woody material (eliminating rearing areas), intense urbanization (altering water quality and quantity), agriculture (eliminating riparian vegetation and impairing water quality), alteration of floodplain and stream morphology (e.g. channel modification, dikes and levees, resulting in reduced rearing habitat), wetland draining and conversion, dredging, armoring of shorelines (reducing forage and rearing), marina and port development (impairing migration and forage), road and railroad construction and maintenance, and mining. The degradation of multiple PBFs throughout critical habitat of the listed species indicates that the full conservation potential of the critical habitat is not being reached, even in areas where the conservation value of habitat is ranked high.

The action area for this consultation serves as spawning and rearing habitat and as a migration corridor for both juvenile and adult PS Chinook salmon and steelhead. Ruckelshaus et al. (2006) identified two historically independent populations of PS chinook in the Snohomish Basin, including the Skykomish River and the Snoqualmie River populations. The CHART concluded that all of the occupied areas contained one or more PBFs for this ESU and identified management activities that may affect the PBFs and gave the area a high conservation value for Chinook salmon.

Two extant populations of PS steelhead have been identified in the Nooksack Basin, including the NF Nooksack River winter run and SF Nooksack River summer run (Myers et al. 2015). The Nooksack River winter steelhead population was historically abundant in considerable numbers. The Nooksack watershed contains about 7% of the intrinsic potential habitat for steelhead (Hard et al. 2015). The CHART concluded that all of the occupied areas of the Nooksack Basin contained one or more PBFs for this DPS and identified management activities that may affect the PBFs. Therefore, the CHART gave the Nooksack River tributaries high to medium conservation values for steelhead.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 4, below.

Table 4. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for Puget Sound Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sounds. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.
Puget Sound steelhead	2/24/16 81 FR 9252	Critical habitat for Puget Sound steelhead includes 2,031 stream miles. Nearshore and offshore marine waters were not designated for this species. There are 66 watersheds within the range of this DPS. Nine watersheds received a low conservation value rating, 16 received a medium rating, and 41 received a high rating to the DPS.

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).

For this consultation, the action area is within and adjacent to the Nooksack River and includes distances upstream and downstream from in-water excavation for 0.5 miles, which is based on the estimated worst-case extent of suspended sediment dispersion and construction noise during excavation, anchoring, and burial of the new outfall pipe and removal of the existing outfall pipe sections above riverbed. It is assumed that construction noise, specifically from vibratory pile driving, may propagate upstream and downstream until it encounters the riverbank, and therefore the upstream and downstream action area boundaries were set as the maximum linear distance between the pipe trench and a point upstream and downstream that sound may travel prior to encountering riverbank. The action area includes approximately 1.0 acre along the riverbank where the riparian area will be disturbed by upland trenching and installation of the new outfall pipe and for riparian plantings.

Two ESA-listed species, PS Chinook salmon and PS steelhead, use the action area for adult migration as well as juvenile rearing and migration. Critical habitat has been designated for both species. The action area is designated EFH for PS Chinook, pink, and Coho salmon (PFMC 2014), and is an area where environmental effects of the proposed action may adversely affect EFH of those species. The effects to EFH are analyzed in the MSA portion of this document.

2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The climate change effects on the environmental baseline are described in Section 2.2 above.

The greater Nooksack River watershed is located in northwest Washington and covers over 830 square miles with more than 1,400 stream and river miles, stretching from the Cascade Mountains, through floodplains and valleys, and eventually draining into Bellingham Bay. Early development by Euro-American settlement resulted in the logging of lowland forests, draining of wetlands for agricultural conversion, and straightening and hardening the river to convey and control floods (SRB WRIA01 2005, Smith 2002). Today, the majority of the land is designated as forests. The remaining approximate 25 percent is divided between agriculture, rural, and urban development. The downstream portions of the Nooksack have been intensely developed with roads, residences, and businesses.

The Nooksack River is divided into three forks: the North, Middle, and South, totaling approximately 75 miles in length. All three forks are fed by run-off from rainfall, snowmelt, and groundwater. The North and Middle forks also gather water from glacial melt. Because the South fork is not glacially fed, it can have less flow during the summer and fall. The South fork experiences high temperatures approaching lethal levels for salmonids from the combination of low flows and mixed land uses. Stream flows in each of the forks combine just east of Deming (downstream of the action area), forming the mainstem of the Nooksack River. The mainstem Nooksack River eventually flows to Bellingham Bay in Puget Sound.

The drainage basin is dominated by two physiographic provinces: the Puget Lowland and the west slope of the Cascade Range. The Puget lowland gently rises from sea-level to about 1,000 feet elevation at the foothills of the Cascades. The west slope of the Cascade Range rises east from the Puget Lowland to a series of ridges 3,000 to 6,000 feet in elevation, with the glaciated summits along the eastern drainage divide. In the lowlands, annual average precipitation ranges from 30 to 50 inches. In the higher elevations, precipitation averages approximate 70 to 140 inches per year with much falling as snow on the Mount Baker slopes. Mean annual discharge of the Nooksack River at the North Cedarville gage is 3,852 cfs. Logging has continued at low elevations in the upper basin from the 1930s to the present.

2.4.1 Status of the Species in the Action Area

The Nooksack basin supports two independent native populations of spring PS Chinook salmon which enter the Nooksack River beginning in March and generally spawn from September through early October. One population of PS Chinook salmon occupies the North Fork and Middle Fork (Middle Fork/North Fork population), and one population occupies the South Fork Nooksack River (South Fork population). These populations are distinct from PS Chinook salmon in the rest of the Puget Sound ESU in their genetic attributes, life history, and habitat characteristic (NMFS 2006). In addition, a fall Chinook run (mostly non-native) generally enters the Nooksack River as early as mid-July and as late as mid-November and spawns shortly thereafter. Fall Chinook salmon spawn in the mainstem, associated tributaries, and all three forks (SRB WRIA 01 2005). Because both spring and fall populations of Chinook salmon reside in the Nooksack River, both ocean-type (out-migrate as sub-yearlings) and stream-type (out-migrate as yearlings) life history patterns are present.

Spring PS Chinook salmon spawn in the NF Nooksack from the confluence of the South Fork at river mile (RM) 36.6 to Nooksack falls at RM 65, and in the lower Middle Fork, downstream of the diversion dam, located at RM 7.2 (SRB WRIA 01 2005). Spawning also occurs in numerous larger tributaries. The South Fork spring PS Chinook population spawns from the confluence with the North Fork up to Sylvester’s falls at RM 25.

The status of both Nooksack spring PS Chinook salmon populations is critical (PSIT and WDFW 2010). Returns of natural origin fish have been chronically low since the early 1990s (Figure 3).

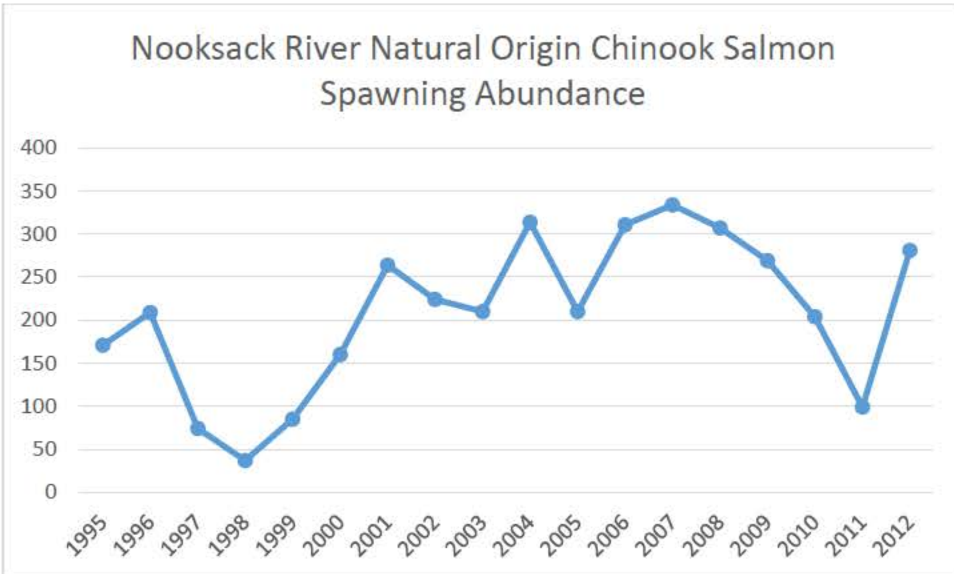

Figure 3. Abundance of natural origin Chinook salmon spawning in the Nooksack River from 1995 to 2012 (WDFW 2019).

Fall Chinook salmon spawn in the mainstem down to RM 10.2 in the vicinity of Wiser Lake Creek and mainstem tributaries including Bertrad, Fishtrap, Tenmile, Anderson, and Smith creeks (SRB WRIA 01 2005). Fall Chinook salmon also spawn in all three forks and in larger tributaries to them.

Ocean-type juvenile Chinook salmon (fry) move downstream through the Nooksack River from late March through early-August. These juveniles gradually migrate downstream within weeks to a few months after they rise from the spawning gravels. Stream-type juvenile Chinook salmon rear in the Nooksack River for about a year after emerging from spawning gravels. These juveniles (fry, juveniles, and ultimately smolts) require more extensive resources in the river to feed, seek refugia from predators and elevated river temperatures. Available feeding and predator avoidance habitat in the Nooksack River is usually associated with slower velocities along the river margins or around large woody debris (LWD), along shallow margin habitats of cobble and gravel bars, and in tributaries, side channels, and sloughs within the river system. Given the general lack of rearing habitat, residence time of juvenile Chinook salmon in the Action Area is likely less than a few days for fry and slightly longer for older juveniles.

The Puget Sound Steelhead Technical Recovery Team (PSSTRT) has preliminarily delineated two populations in the Nooksack basin: winter steelhead in the Nooksack River and summer steelhead in the upper portion of the South Fork Nooksack River. The Nooksack River winter-run steelhead population includes winter-run steelhead in the North, Middle, and South Forks of the Nooksack River. A winter run hatchery stock (predominately of non-local origin) is currently released from the Kendall Creek hatchery on the North Fork. Adults from this program typically return to the river during the winter. Currently, there is considerable spawning area in low elevation, low gradient tributaries, such as Fishtrap and Bertrand Creeks.

Historical estimates from in-river harvest suggested that the Nooksack River may have supported more than 10,000 adult steelhead the late 1800's (Hard et al. 2007; Gayeski et al. 2011; Myers

2015). Intrinsic Potential modelling (see Burnett et al. 2007) indicate that the geomorphic capacity of Nooksack River steelhead is between 22,000 and 44,000 spawners (Hard et al. 2015). In recent years, depressed adult steelhead runs have been estimated between 1,500 and 2,000 fish (Figure 4).

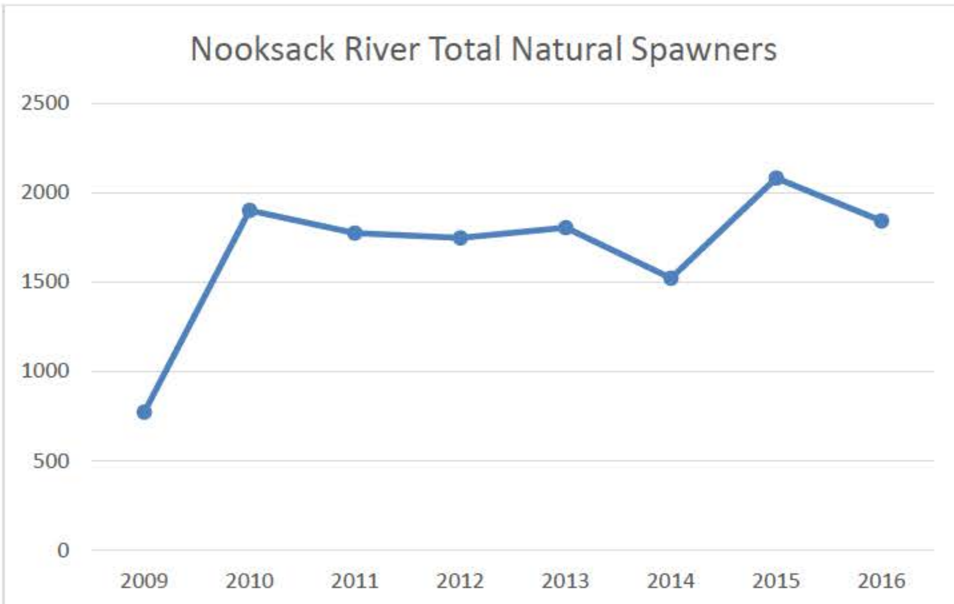

Figure 4. Abundance of natural origin steelhead spawning in the Nooksack River from 2009 to 2015 (WDFW 2019).

Winter-run steelhead migrate to natal streams in late fall and winter while summer-run steelhead migrate upstream during spring and summer. Winter-run steelhead are at various stages of maturity during upstream migration and spawn within a few months of entering freshwater. Alternatively summer-run steelhead are immature and require instream maturation prior to spawning in the spring following entry to natal streams (Pauley et al., 1986). Steelhead require cool, clear, well-oxygenated streams for spawning with suitable gravels and water flows (Pauley et al., 1986). Steelhead are iteroparous – they have several reproductive cycles over their lifetimes unlike semelparous salmon such as Chinook salmon, which die after reproducing once (NMFS, 1998). Repeat spawners are generally female but the incidence of repeat spawning decreases from south to north along the Pacific Coast (Pauley et al., 1986). Winter-run steelhead spawning and juvenile rearing occur in the Nooksack River and all three forks (WDFW 2016; StreamNet 2012).

Summer-run steelhead enter the Nooksack River during the spring and summer as immature fish, mature and then spawn the following spring in higher reaches of river. In the specific action area, summer steelhead migrate past the project area to reach holding/spawning areas further upstream outside of the action area (WDFW 2016; StreamNet 2012). The winter-run steelhead population in the Nooksack Sub-basin is augmented by hatchery stock, including approximately 150,000 releases of juvenile fish from Kendall Creek Hatchery in April and May to provide sustainable recreational and tribal fisheries. Hatchery origin fish are not included in the ESA listing for the Puget Sound DPS and therefore are not designed to augment the abundance of natural spawners and do not contribute to the population viability or recovery of listed steelhead (NMFS 2018). Average hatchery-spawner escapement from 2001 to 2013 is 133 spawners (WDFW 2014).

In the specific action area of this project, WDFW's SalmonScape (WDFW 2016) shows that winter steelhead spawn in the mainstem NF Nooksack upstream of the vicinity of the project area. Summer steelhead also migrate through the action area in the mainstem river to reach holding/spawning areas further upstream of the action area (WDFW 2016; StreamNet 2012).

2.4.2 Status of Critical Habitat in the Action Area

The action area is within the Nooksack Hydrologic Unit Code (HUC) 5 Code 1711000405. The NMFS rated PS Chinook salmon critical habitat within this unit as having a "high" conservation value. A high conservation ranking does not mean that all PCEs are in good condition; the relative importance of high ranked HUCs is based on multiple factors such as life history expressed there, or relative importance of the population that uses that watershed. The CHART rated this subbasin as having a "high" conservation value in part because the HUC supports two historically independent populations in this subbasin: North Fork Nooksack River and South Fork Nooksack River PS Chinook salmon (NMFS 2005). The action area provides the freshwater spawning, rearing, and migration PBFs for both salmonid species.

The elements of the CH PBFs include: 1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; 2) Freshwater rearing sites with 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 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; and finally, 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. Analysis of effects on critical habitat begins with considering how the proposed action bears on some or all of these features, if at all.

Habitat limiting factors in the greater Nooksack basin are floodplain loss, increased impervious surfaces, riparian habitat loss, and impaired water quality. Smith (2002) identified poor riparian habitat as a primary limiting factor in the mainstem of the Nooksack, with nearly all of the of the Nooksack River segments downstream of Everson (downstream of the action area) classified as low ("poor") for near-term large woody debris (LWD) recruitment potential with a mix of moderate to low LWD recruitment potential between Everson and the Forks (Coe 2001). High water temperatures are also a major salmonid habitat concern in the Nooksack basin. Smith (2002) identified lack of shade (riparian habitat loss), loss of wetlands and channel changes as the probable root cause of the high temperatures. Low water flows, partially attributable to withdrawal for agriculture, have also contributed to high water temperatures and poor water quality. Mass-wasting occurs in the upper watershed, and the upper watershed slopes have become unstable from land management activities (SRB WRIA 01 2005, Smith 2002). Slope instability has resulted in an increased erosion rate and sediment delivery to streams. Increased sediment load, along with loss of riparian habitat and in-stream large woody debris, have resulted in dramatic migrations of river channels during winter months. Water quality (including temperature), water quantity, and large wood are essential features of each of the PBFs in the action area.

2.5 Effects of the Action

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

The proposed action, the construction of a wastewater outfall system is part of a larger action - discharging wastewater effluent into the Nooksack River. However, the justification and existence of the treatment plant do not depend on replacement of the outfall, moving the location of the outfall, or the addition of a new diffuser to the outfall, nor do those features increase the treatment plant's capacity. Therefore, we do not consider the existing treatment plant to be interdependent or interrelated to the proposed action. Because the new outfall has been designed and placed to avoid impacts from future flood events, the project is not expected to require frequent large-scale maintenance; however, the applicant may need to perform some maintenance in this location into the foreseeable future. As noted, no increase in WWTP effluent to the Nooksack River is proposed under this project.

2.5.1 Effects on Listed Species

The applicant proposes to complete all in-water construction within a work window starting approximately July 15, 2019 and completing work by September 30, 2019. The proposed work window coincides with the least impactful timing on PS Chinook salmon and PS steelhead.

The end of the upstream migration of adult spring-run PS Chinook salmon through the action area occurs before anticipated in-water work begins. These fish hold in river reaches upstream of the action area, and are not likely to be present during construction. Also, the beginning of the adult fall-run PS Chinook salmon migration occurs as the proposed action is anticipated to end. They unlikely to be present during the proposed work windows. Adult summer-run PS steelhead are known to hold in upstream reaches of the Nooksack basin during the proposed work window, and are not likely to be present in the action area. Adult winter-run PS steelhead are unlikely to have entered the Nooksack River prior to the end of in-water construction activities.

Ocean-type PS Chinook salmon (fry) are likely to have fully migrated to the marine environment during the proposed work window. Very few of these fish, if any, migrate through the action area during the work window. Stream-type PS Chinook salmon, in contrast, are likely to be present in the action area and during the work window. Likewise, juvenile PS steelhead, which reside in the Nooksack River throughout the year and throughout the watershed, are likely to be present in the action area and during the work windows. Although the presence of these fish in the action area is likely, the habitat available to them in the action area is relatively poor. They are likely to be present only in low densities and abundances. Other life history stages (e.g., eggs) are not present during the work windows and in the action area.

The proposed action will affect juvenile life stages of salmonid species considered in this opinion through physical disturbance, entrainment by construction equipment, and hydroacoustic effects, and by causing physical, chemical, and biological changes to the environment. These effects are discussed below.

Effects from Disturbance

The disturbance caused by excavation, removal of the existing outfall pipe, installation of the new outfall pipe and diffuser, and backfilling the trench will affect the behavior of ESA-listed salmon and steelhead. Juvenile Chinook salmon and steelhead are likely to be displaced from the construction area (the isolated work area) and adjacent areas in the action area. These fish are mobile and capable of evading some construction disturbance, but these fish will be forced to move into other suitable habitats already occupied by other fish as natural cover is scarce in the action area and riparian cover will be temporarily removed. Thus, we anticipate an increased risk of predation on the juveniles while they move and hold below the construction area and the action area. The forced movement may also cause juveniles to expend additional energy while swimming in the Nooksack River current. Increased energetic costs, especially in the elevated stream temperatures of later summer, combined with physiological stress caused by response to the construction disturbance are likely to reduce growth and fitness and survival in a small number of juveniles. The action effects may increase the risk of entrainment by the excavator during trenching, and increase exposure to elevated suspended sediment (effects discussed below).

Effects from Entrainment

Entrainment of migrating and rearing juvenile fish can occur when fish are trapped during the uptake of sediments and water by excavation machinery, which can cause injury or death. The probability of entrainment is largely dependent upon the likelihood of fish occurring within the work area, fish densities, work depth, location of work within the river, equipment operations, time of year, and the species' life stage. Low densities of ESA-listed salmonids are likely to be present in the action area during excavation and backfilling of the trench. Fish are likely to be transitory in the immediate area being excavated (as a result of poor habitat conditions at the project site) where they could be entrained, and the limited area of excavation along the new outfall pipe alignment will lower the likelihood of fish entrainment. Juvenile Chinook salmon and steelhead are even less likely to be encountered at the depth and flow conditions found at excavation areas near the thalweg of the Nooksack River, where the new diffuser will be placed. The marginal quality of the habitat during construction should further reduce the risk of entrainment. However, based on previous evidence that dredging in the lower Columbia River can entrain juvenile salmon and steelhead (Larson and Moehl 1990; NMFS 2002), the proposed action is likely to injure or kill a few rearing juvenile Chinook salmon and steelhead.

Hydroacoustic Effects

Standard construction equipment would place either the sheet piles or Super Sacks in the Nooksack River to isolate the construction work area. Sound pressure waves generated by in-water construction activities have the potential to injure and even kill fish and disturb or alter their behavior (ICF Jones & Stokes and Illingworth and Rodkin 2009; Popper and Hastings 2009). Work in the water would only occur during installation of the in-water work area isolation structure**.** The underwater noise generated by vibratory pile driving of the sheet piles is expected to be elevated above ambient in-water noise levels. Impacts on fishes have not been observed in association with the use of vibratory hammers, and therefore the use of a vibratory hammer will not appreciably impact listed salmonids (WSDOT 2015, Buehler et al. 2015). Compared to impact hammers, vibratory hammers make sounds that have a longer duration (minutes vs. milliseconds) and have more energy in the lower frequencies (15-26 Hz vs. 100-800 Hz) (Würsig et al. 2000). Fish consistently avoid sounds like those of a vibratory hammer, and appear not to habituate to these sounds even after repeated exposure (Enger et al. 1993; Dolat, 1997; Knudsen et al. 1997). Therefore, the effects of the vibratory sheet pile installation will likely be to temporarily disturb juvenile fish and cause them to move away from the noise source. Fish would likely vacate the area upon detection of increased sound pressure levels caused by the onset of sheet pile installation, but are unlikely to be negatively impacted by the sound.

The underwater noise generated by installing Super Sacks, if used, is expected to be minimal and unlikely to be elevated significantly above background ambient noise levels in the action area at the time of construction. Once the isolation structures are in place, the construction area would be separated from the river, thereby limiting additional underwater noise. Because aquatic sound pressure levels generated by the proposed action would be minimal, aquatic noise would likely have an insignificant and discountable effect on listed fish species.

Effects on Water Quality

In-water work during excavation, backfilling, and existing pipe removal will re-suspend sediment in the action area. Elevated total suspended solids (TSS) have been reported to cause physiological stress, reduce growth, and adversely affect survival in salmonids (Bash et al 2001). Exposure duration and frequency, as well as TSS concentration, determine the occurrence and magnitude of turbidity-caused physical or behavioral effects (Newcombe and MacDonald 1991, Newcombe and Jensen 1996). Salmonids have been observed moving laterally and downstream to avoid turbid plumes (Lloyd 1987, Servizi and Martens 1991), and juveniles tend to avoid streams that are chronically turbid unless they traverse these streams along migration routes (Lloyd 1987). At moderate levels, turbidity has the potential to adversely affect primary and secondary productivity, and at high levels, has the potential to injure and kill adult and juvenile fish (Newcombe and Jensen 1996). Other behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985). Chronic exposure to elevated TSS can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd 1987; Redding et al. 1987; Servizi and Martens 1991). However, a potentially positive effect of turbidity is that it can enhance cover conditions and reduce piscivorous fish and bird predation rates (Gregory and Levings 1998). However, juvenile salmonids in the action area primarily feed visually on zooplankton and drifting aquatic insects in the summer, so their ability to feed will decline where suspended sediments are elevated.

Grading and excavation activities above OHWL, including removal and replacement of the stormwater drainage, will disturb soils and the riverbank and will increase the short-term erosion potential and suspended sediment in the action area. Increased erosion is therefore likely to be minimal, but may add to the effects of increased turbidity in the action area.

Turbidity increases from in-water work will be limited to the one month construction period and associated staging, and trenching activities (approximately three months total). The riverbed substrate is silt, sands, gravel, cobbles, and boulders, so turbidity and suspended sediment increases may travel 400 meters downstream or more before settling to background levels. However, the proposed conservation measures to minimize turbidity (see Section 1.3) will limit the magnitude and extent of elevated TSS. Some runoff from areas with limited vegetation during this time may also contribute suspended sediments until site restoration is complete.

There is a small chance of an accidental contaminant release from construction equipment or activities. However, any release likely would be small and quickly contained due to the implementation of a pollution control plan. Use of biodegradable vegetable-based instead of hydrocarbon-based oils and lubricants where possible will also minimize potential impacts of a spill, and therefore such a release is not likely to have an adverse effect on ESA-listed species.

Installation of the new diffuser, which will improve effluent mixing and move the mixing zone further towards the thalweg of the river, is likely to improve water quality in the immediate vicinity of the existing outfall, although the same volume of effluent will ultimately be discharged into the action area. Given higher flows near the thalweg, extending the outfall pipe and adding the new diffuser will reduce the potential of exposing listed species to high concentrations of wastewater constituents.

Localized increases of turbidity during in-water work would likely displace fish in the project area and disrupt normal behavior. Reduced feeding efficiency would also likely reduce growth, and ultimately fitness and survival in a small number of juvenile fish exposed to elevated TSS. There is a low probability of direct mortality from turbidity associated with proposed activities because the turbidity would be localized, and occur when ESA-listed fish are least likely to be present. Given the small area of river affected, the temporary duration of the in-water and riverbank work, isolated work area and BMPs employed, and the small number of ESA-listed salmonids likely to be present and exposed to elevated TSS, only a few ESA-listed fish in the action area are likely to experience any of the effects caused by suspended solids as described above.

<u>Effects on Physical Habitat and Prey Base</u>

Before replanted vegetation can grow, mature, and function to improve water quality, the loss of riparian vegetation will reduce shade, leaf litter, and forage for juvenile Chinook salmon and steelhead in the action area. The proposed pipeline layout and pipeline extension to the new diffuser would require minimal removal of existing woody vegetation. Vegetation removal would be required within the 10,500-square foot temporary construction impact area. Impacts would include clearing and then re-planting with native vegetation. Riparian vegetation would primarily be impacted by the disturbance, with the removal of 18 trees, 10-inch diameter at breast-height or larger. These trees would be replaced at a mitigation ratio of 4:1 for each tree removed. Additional mitigation will occur with a 30,150-square foot area of the floodplain immediately south of the project area. This area would be planted with native conifers and shrubs species to replace lost riparian functions. As a consequence, the riparian habitat in the impacted area would be degraded in the short-term, but habitat complexity would be increased over the long-term. After completion of construction activities vegetation will regenerate in disturbed areas, and over time the planned bank stabilization plantings provide habitat complexity, serve as future sources of large wood, and provide cover, leaf litter, and forage for juvenile Chinook salmon in the project area.

A permanent loss of instream habitat would occur due to bank stabilization at the outfall with new 30-inch-minus angular rock riprap, covering approximately 1,200 sq. ft. and 50 lf. of stream bank. This structure will occur on the outside bend of the river where riparian habitat is currently limited. However, the addition of the rip rap will preclude riparian habitat or instream structures (such as the deposition of large wood) from occurring.

The temporal extent of disruptions to benthic feeding will be longer, as benthic invertebrate populations within the excavation area will be absent or reduced until the new surface layer is fully recolonized. Benthic food items will also be temporarily reduced by deposition of sediment, both as it is sidecast during trenching and from sediment suspended during construction activities within partially isolated in-water work areas and downstream of deeper trenching which can't be isolated. The loss of prey in the 2,400-square foot isolation area would be temporary, and when flow returns to the area, benthic macroinvertebrates from outside the dewatered area would return. The effects on benthic productivity and availability of prey items are likely to last several months after construction is completed until sediments in the area are recolonized.

Based on the foregoing analysis, effects on food items are likely to have minor, localized effects on juvenile salmonids rearing in the action area for a period of months following project construction. Short term change in prey availability and the disturbance to the benthic community at the site will not alter generally available feeding opportunities for salmonids elsewhere in the river. It is unlikely that the proposed action will result in measurable changes to the forage community over the long term.

<u>Fish handling effects</u>

Even though the goal of the fish exclusion is to reduce overall stress and mortality, capturing and handling fish can cause short-term stress, disrupt normal behavior, and may result in injury or mortality (Frisch and Anderson 2000). Fish handling may increase predation exposure and predator avoidance (Olla et al. 1992). Injury and handling stress from nets and seines are expected to be lower than the stress from electroshocking but may still result in adverse effects.

Work site isolation, fish exclusion, and fish handling pose inherent risks to fish, especially if the activity involves electroshocking to capture and relocate any fish present within the in-water isolation area. Because all listed fish species may be present during proposed construction, it is possible that some juvenile Chinook salmon or steelhead maybe be injured or killed during the initial portion of in-water work, as the isolation structures are placed within active flows. The applicant would minimize risks by ensuring that only qualified biologist(s), who is also experienced with work area isolation, oversee the fish exclusion activities and follow guidance outlined in the NMFS' Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols (NMFS 2000) and USFWS Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards (Snyder 2003; USFWS 2012).

Summary of Effects on Listed Species

Some juvenile fish will be present during project construction. Most of the fish present will incur short-term stress due to interaction with construction equipment, noise, increased energetic costs, and reduced water quality and foraging ability. This stress is likely to reduce long-term fitness and survival for some of these fish, and a few fish are likely to be entrained by the excavation equipment. A few additional fish may die as a result of the combined effects of the proposed action and additional stressors imposed by the environmental baseline or a lack of genetic diversity and resilience.

Considering the low density and abundance of juvenile ESA-listed salmonids in the action area during the proposed work window, and the ability of these fish to move away from in-water disturbance, any effects on the survival of ESA-listed salmonids in the action area are likely to be too small to significantly affect population abundance, productivity, distribution or diversity.

2.5.2 Effects on Critical Habitat

Designated and proposed critical habitat within the action area for ESA-listed salmon and steelhead considered in this opinion consists of freshwater rearing sites and freshwater migration corridors and their essential physical and biological features (PBFs) as listed below. The effects of the proposed action on these features are summarized as a subset of the habitat-related effects of the action that were discussed more fully above.

Freshwater rearing

Floodplain connectivity – No effect.

Forage – Decreased quantity and quality of forage due to disturbance of the substrate in the excavation area (about 2,400 sq. ft.), and increased suspended sediment, during and for a period of months following excavation and backfilling of the trench.

Natural cover – Increase in cover due to suspended sediment in the water column during excavation and backfilling of the trench. Decrease in shoreline riparian cover while riverbank excavation work is conducted, and until restored riverbank vegetation becomes established. Some permanent loss of instream habitat would occur due to bank stabilization at the outfall with new 30-inch-minus angular rock riprap, covering approximately 1,200 sq. ft. and 50 lf. of stream bank.

Water quality – Increased suspended sediment during excavation and backfilling of the trench, and for a short period thereafter. These effects will occur for less than one month, and are likely to persist for up to a few hours after operations have ceased.

Water quantity – No effect.

Freshwater migration

Free of artificial obstruction – Displaced juvenile movement during construction, which will occur for approximately one month during the in-water work window.

Natural cover – Increase in cover due to suspended sediment in the water column during excavation and backfilling of the trench. Decrease in shoreline riparian cover while riverbank excavation work is conducted, and until restored riverbank vegetation becomes established. Some permanent loss of instream habitat would occur due to bank stabilization at the outfall with new 30-inch-minus angular rock riprap, covering approximately 1,200 sq. ft. and 50 lf. of stream bank.

Water quality – Increased suspended sediment during excavation and backfilling of the trench, and for a short period thereafter. These effects will occur for approximately one month, and are likely to persist for up to a few hours after operations have ceased.

Water quantity – No effect.

In summary, the proposed action is likely to cause a minor, localized and temporary degradation of critical habitat PBFs for water quality, natural cover, forage, and free passage. Due to their temporary nature, none of the effects are likely to reduce the quality and function of the PBFs within the action area. The critical habitat in the action area will retain its ability to provide rearing sites and freshwater migration corridors for the species considered in this opinion.

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). 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.

For this action, state or private activities in the vicinity of the project location are expected to cause cumulative effects in the action area. Additionally, future state and private activities in upstream areas are expected to cause habitat and water quality changes that will be expressed as cumulative effects in the action area. Our analysis considers: (1) how future activities in the Nooksack Basin are likely to influence habitat conditions in the action area, and (2) cumulative effects caused by specific future activities in the vicinity of the project location.

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 2.4).

In the Nooksack Basin, agriculture, urbanization, water withdrawals, timber harvest, fishing, mining and other resource-based industries have caused many long-lasting environmental changes that harmed ESA-listed species and their critical habitats. Those include basin-wide loss or degradation of stream channel morphology, spawning substrates, instream roughness and cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants), fish passage, and habitat refugia. Those changes reduced the ability of populations of ESA-listed species to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduce their survival throughout their life cycle. The environmental changes also reduced the quality and function of critical habitat PBFs that are necessary for successful spawning, production of offspring, and migratory access necessary for adult fish to swim upstream to reach spawning areas and for juvenile fish to proceed downstream and reach the ocean. The collective effects of these activities tend to be expressed most strongly in lower river systems, such as the lower reaches of the Nooksack River, where the impacts of numerous upstream land management actions aggregate to influence habitat processes and water quality.

The human population in Whatcom County increased more than 20% from 2000 to 2010 to include more than 200,000 people (WOFM 2018). Population trends have continued to climb in the county by as much as 1.8% per year since 2010 with most new inhabitants (79%) migrating from other states (WOFM 2018). Whatcom County's current population is estimated to be 220,350 persons (WOFM 2018). The town of Lynden (adjacent to the action area) has grown from 12,000 persons in 2010 to over 14,000 in 2018. The effects of activities associated with such development (such as land clearing, increased impervious surfaces, and other land use changes which can adversely affect salmon habitat) have been expressed as changes to physical habitat, loadings of pollutants, and water quality. These past effects are described in the environmental baseline (Section 2.4). Population growth in Whatcom County is projected to continue at a rate of 1.8% for the next 20 years (WOFM 2018).

Water use and associated treated wastewater discharge volumes are expected to increase with projected population growth and economic development. Current discharge rates from the Lynden WWTP will continue, and are likely to increase towards, or reach, the effluent design limit in the future (44% increase in capacity). However, as installation of the new diffuser will improve effluent mixing and move the mixing zone further towards the thalweg of the river, this discharge is expected to have proportionately less impact on water quality than effluent currently discharged at the outfall.

While widespread degradation of aquatic habitat associated with intense natural resource extraction is no longer common, ongoing and future land management actions are likely to continue to have a depressive effect on aquatic habitat quality in the Nooksack River basin. As a result, recovery of aquatic habitat is likely to be slow in most areas and cumulative effects at the basin-wide scale are likely to have a neutral to negative impact on population abundance trends and the quality of critical habitat PBFs.

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) Reduce appreciably 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 diminishes the value of designated or proposed critical habitat for the conservation of the species.

The current extinction risk for PS Chinook salmon is moderate to high, and the recovery goal for this ESU is to have very low extinction risk. The current extinction risk for PS steelhead is moderate to high and the recovery goal for this DPS is to have very low extinction risk (NWFSC 2015). All adult PS Chinook salmon and PS steelhead from populations above the action area in the Nooksack River basin must migrate through the action area to reach their respective spawning grounds. All juvenile PS Chinook salmon and PS steelhead from these populations must migrate to the ocean through the action area. Therefore, individuals from several populations of these two species could potentially be affected by the proposed action. Currently, the two PS Chinook salmon populations considered in this consultation are at high risk of extinction but with stable or increasing viability trends. The two PS steelhead populations considered in this consultation are currently at moderately high risk of extinction, and both have declining viability trends (NWFSC 2015). Over the past several years, NMFS has engaged in various section 7 consultations on Federal projects affecting these populations and their habitats, and those effects have been taken into account in this opinion as part of the environmental baseline.

The environmental baseline is such that individual ESA-listed salmonids in the action area are exposed to reduced water quality, lack of suitable riparian and aquatic habitat, and restricted movement due to residential, industrial, commercial and agricultural development, construction and maintenance of hydropower and river navigation infrastructure, and other changes in land use practices. These stressors, as well as those from climate change, already exist and are in addition to any adverse effects produced by the proposed action. Major factors limiting recovery of the ESA-listed salmonids considered in this opinion include degraded freshwater habitat; degraded water quality; degraded floodplain connectivity and function; reduced access to spawning and rearing habitats due to impaired passage at dams; altered streamflow; predation/competition; hatchery impacts; and disease. The proposed action will affect two of the factors limiting recovery for the ESA-listed salmonids considered in this opinion by causing a temporary reduction in water quality and habitat quality in the action area.

The reduction in water quality affecting listed species will be from the temporary increase in suspended sediment during excavation and backfilling. These effects will be intermittent during actual operations over the short term (at most, 2.5 months) and limited to a relatively small area. Other effects on listed species include disturbance from excavation equipment operation, hydroacoustic effects, and possible entrainment in the excavator. Because these effects are relatively brief or small in scale, survival and recovery of ESA-listed salmonids will not be affected. This is primarily because the number of fish within the action area during construction activities will be very low when compared to the total abundance of individuals within the populations affected by this action. The cumulative effects described above should have a neutral to slightly negative effect on ESA-listed populations.

The numbers of adults and juveniles that are likely to be injured or killed due to the action are too small to cause a measurable effect on the long-term abundance or productivity of any affected population, or to appreciably reduce the likelihood of survival and recovery of any listed species. The proposed action will have no effect on population diversity or spatial structure. Therefore, the effects of the proposed action will not reduce the productivity or survival of the affected populations of PS Chinook salmon or PS steelhead, even when combined with a degraded environmental baseline and additional pressure from cumulative effects and climate change.

Critical habitat value for ESA-listed species in the lower reaches of the Nooksack River is limited by poor water quality, altered hydrology, lack of floodplain connectivity and shallow-water habitat, and lack of complex habitat to provide forage and cover. In the vicinity of the action area habitat has been degraded due to past land use practices, including agriculture, natural resource extraction, operation of hydropower facilities, and residential, commercial, and industrial development. Despite this, the critical habitat in the action area has a high conservation value for PS Chinook salmon and PS steelhead due to its critical role as a migration corridor and juvenile rearing habitat.

The same effects of the proposed action that will have an effect on ESA-listed salmon and steelhead will also affect critical habitat PBFs for salmon and steelhead critical habitat. The reduction in habitat quality associated with the proposed action will be due to the temporary decrease in riparian cover along the riverbank and reduction in benthic forage caused by site preparation, excavation, and backfilling. These effects may be longer in duration than effects on water quality, lasting weeks (benthic forage) to years (riparian vegetation) until habitat function is fully recovered. However, the effects of this action will be limited to a relatively small area, and will not lower the quality and function of the necessary habitat attributes in the action area over the long term.

At the watershed scale, the proposed action will not increase the extent of degraded habitat within the basin, add to the degradation of water quality, or further decrease limited rearing areas or limit access to rearing habitat over the long term. Even when cumulative effects and climate change are included, the proposed action will not negatively influence the function or conservation role of critical habitat at the watershed scale. Critical habitat for PS Chinook salmon and PS steelhead will remain functional, or retain the current ability for the PBFs to become functionally established, to serve the intended conservation role for the species, in this case, to provide freshwater rearing sites and migration corridors.

For all the reasons described in the preceding paragraphs of this section, the proposed action will not appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction or distribution, nor will the proposed action reduce the value of designated critical habitat for the conservation of the species.

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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon or PS steelhead nor to destroy or adversely modify critical habitat designated for these species.

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 ITS.

2.9.1 Amount or Extent of Take

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

- Harm to juveniles of all ESA-listed salmon and steelhead considered in this opinion due to impaired resting habitat and refugia from predators related to avoidance of noise and interaction with construction equipment during excavation and backfilling of the trench, installation of the new outfall pipe and diffuser, removal of existing pipeline sections, and associated staging activities, including fish salvage.
- Death of a few juveniles of all ESA-listed salmon and steelhead considered in this opinion due to entrainment in the excavation equipment related to the excavation and backfilling of the trench for the new outfall pipeline and diffuser.
- Harm to juveniles of all ESA-listed salmon and steelhead considered in this opinion due to a temporary removal of access to forage species related to the removal of benthic substrate during trench excavation and deposition of trenched sediments not used as fill.
- Harm to all ESA-listed salmon and steelhead considered in this opinion due to a decrease in shoreline riparian habitat while riverbank excavation work is conducted, and until restored riverbank vegetation becomes established.

- Harm all ESA-listed salmon and steelhead considered in this opinion due to a temporary increase in suspended sediment during construction.

The distribution and abundance of 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 we 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. In such circumstances, we cannot provide an amount of take that would be caused by the proposed action, and rely instead on indicators of the extent of take due to habitat alteration as surrogates for the amount of take.

The best available indicators for the extent of take are:

1. For harm associated with disturbance from construction, removal of access to forage species, and death due to entrainment: the size of the trench to be excavated., The anticipated take will be exceeded if the final excavated area below OHWL exceeds 2,500 sq. ft. in size. This take indicator operates as an effective re-initiation trigger because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance, including post-construction (33 CFR 326.4);
2. For harm associated with loss of riparian cover and decrease in water quality due to increased erosion: the size of the riparian area disturbed. Thehe anticipated take will be exceeded if the final riparian area cleared is greater than 1.0 acres. This take indicator operates as an effective re-initiation trigger because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance (33 CFR 326.4).
3. For harm associated with an increase in suspended sediment: the extent of suspended sediment plumes. Thehe anticipated take will be exceeded if increased suspended sediment from in-water work causes suspended sediment plumes 100 feet from the boundary of construction activities to exceed 10% over the background level of suspended sediment. This take indicator operates as an effective re-initiation trigger because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance (33 CFR 326.4).

These features best integrate the likely take pathways associated with this action, are proportional to the anticipated amount of take, and are the most practical and feasible indicators to measure. In particular, the size of the trench to be excavated is directly correlated to the area over which harm due to hydroacoustic effects and disturbance from equipment operation during construction is likely to occur. The size of the trench to be excavated is also directly correlated to the area over which benthic forage species will be removed or smothered, and the area where entrainment could occur. Thus, the size of the trench to be excavated is also directly correlated with the number of individuals harmed or killed, as well as the level of impacts to species. Similarly, the area of riparian area to be disturbed is directly correlated to the area where cover, leaf litter, forage, and habitat complexity will be reduced, and therefore the level of impacts to affected fish species. In addition, the extent of suspended sediment plumes rationally reflects the amount of take from suspended sediment caused by in-water work because larger sediment plumes are correlated with harm to a larger number of individual fish.

Exceeding any of the indicators for extent of take will trigger the re-initiation provisions of this opinion.

2.9.2 Effect of the Take

In this biological opinion, 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 when the reasonable and prudent alternative is implemented.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" 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 Corps shall:

1. Minimize incidental take from project-related activities by applying conditions to the proposed action that avoid or minimize construction-related habitat disturbance and adverse effects on water quality.
2. Ensure completion of a monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The Corps 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. The following terms and conditions implements reasonable and prudent measure 1:

    a. Work Window. To minimize effects to Chinook salmon and steelhead, in-water work will be limited to the summer in-water work window of July 15 to September 30.
    b. Minimize Impact Area and Duration. The applicant shall confine all construction, excavation, backfilling, and staging impacts to the minimum area and duration necessary to complete the project. This includes minimizing the removal of riparian vegetation within the action area.
    c. Notice to Contractors. Before beginning work, all contractors working on site shall be provided with a complete list of Corps permit special conditions, reasonable and prudent

measures, and terms and conditions intended to minimize the amount and extent of take resulting from in-water work.

d. Waste Disposal. Waste materials generated during construction will not be disposed of in water, or allowed to enter the water. Waste materials will be collected and recycled or disposed of at an approved upland facility. Construction materials will not be stored where wave action or upland runoff can cause materials to enter surface waters.

e. Spill Response. Corrective actions will be taken in the event of any discharge of oil, fuel, or chemicals into the water including:

    i. In the event of a spill, containment and cleanup efforts will begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup will include proper disposal of any spilled material and used cleanup material.

    ii. The cause of the spill will be assessed and appropriate action will be taken to prevent further incidents or environmental damage.

    iii. Spills of oil or hazardous materials will be reported immediately to the National Response Center and to the Washington Department of Ecology Emergency Response System.

2. The following term and condition implements reasonable and prudent measure 2:

a. Monitoring. Turbidity monitoring shall be conducted and recorded as described below. Monitoring shall occur each day during daylight hours when in-water work is being conducted. Turbidity will be monitored periodically during in-water work and at a distance downstream of the construction zone (mixing zone), as determined by Ecology, to document that nephelmetric turbidity unit (NTU) limit complies with threshold in Table 200 (1)(e) Aquatic Life Turbidity Criteria in WAC 173-201A.

    i. Representative Background Point. An observation shall be taken every 2 hours at a relatively undisturbed area approximately 100 feet upstream from in-water disturbance to establish background turbidity levels for each monitoring cycle. Background turbidity, location, time, and tidal stage shall be recorded prior to monitoring downstream.

    ii. Compliance Point. Monitoring shall occur every 2 hours approximately 100 feet downstream from the point of disturbance, at approximately mid-depth of the waterbody and within any visible plume, and be compared against the background observation. The turbidity, location, time, and tidal stage shall be recorded for each sample.

    iii. Compliance. Results from the compliance points shall be compared to the background levels taken during that monitoring interval. Turbidity may not exceed an increase of **10%** above background at the compliance point during in-water work.

    iv. Exceedance. If an exceedance occurs, the applicant shall

        (1) stop work if the exceedance is 50 NTU or more above background,

        (2) modify the activity to reduce turbidity if the exceedance is 30-49 NTU above background, and continue for a maximum of two hours, at which point work must cease if turbidity is still at this level,

(3) modify the activity to reduce turbidity if the exceedance is 5-29 NTU above background, and continue for a maximum of four hours, at which point work must cease if turbidity is still at this level, and

(4) discontinue work after any of the above exceedance levels and durations have been observed until turbidity is 0-5 NTU above background or less.

v. If the weather conditions are unsuitable for monitoring (heavy fog, ice/snow, excessive winds, rough water, *etc*.), then operations shall cease until conditions are suitable for monitoring.

vi. Copies of daily logs for turbidity monitoring shall be available to NMFS upon request.

b. <u>Reporting</u>. The applicant shall report all monitoring items, including turbidity observations, size of the excavation area, and dates of initiation and completion of in-water work to NMFS within 60 days of the close of any work window in which the proposed action was conducted. Any exceedance of take covered by this opinion must be reported to NMFS immediately.The report will include a discussion of implementation of the terms and conditions in #1, above.

c. The applicant shall submit monitoring reports to:

National Marine Fisheries Service
Oregon Washington Coastal Office
Attn: WCRO-2018-00111
501 Desmond SE
Lacey, WA 97503

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).

The following conservation recommendation is a discretionary measure that is consistent with this obligation and therefore should be carried out by the Corps, or applicants should be encouraged to conduct these activities:

Identify and implement habitat enhancement or restoration activities in the Nooksack River that:

- Increase the amount of shallow-water habitat in the reach to benefit ESA-listed salmonids
- Restore or create off-channel habitat or access to off-channel habitat, side channels, alcoves, wetlands, and floodplains
- Remove old docks and pilings that are no longer in use
- Protect and restore riparian areas to improve water quality, provide long-term supply of large wood to streams, and reduce impacts that alter other natural processes
- Improve or regrade and revegetate streambanks
- Restore instream habitat complexity, including large wood placement

- Remove invasive plants and plant native species

The applicant has proposed the removal of approximately 1,200 sq. ft. of rip rap in partnership with a local restoration group (NSEA) to minimize the effects of bank armoring that is proposed for installation to protect the outfall and outfall pipe. The City of Lynden has established an agreement with the Nooksack Salmon Enhancement Association (NSEA) and the Lummi Nation to remove a channel-constraining rock berm on Porter Cr., a tributary to the Nooksack River, by funding the non-profit restoration group to remove 1,200 sq. ft. of rock berm as part of a larger restoration project. Cooperative conservation measures as the City of Lynden have developed here are noteworthy in their partnership values as they are in their conservation value.

Please notify NMFS if the Corps carries out this recommendation so that we will be kept informed of actions that are intended to improve the conservation of listed species or their designated critical habitats.

2.11 Reinitiation of Consultation

This concludes formal consultation for City of Lynden Waste Water Treatment Plant Outfall Replacement.

As 50 CFR 402.16 states, re-initiation of formal consultation is required 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 agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect 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 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 Corps and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of PS Chinook, PS pink, and PS Coho salmon as identified in the Fishery Management Plan for Pacific Coast Salmon (PFMC 2014).

3.2 Adverse Effects on Essential Fish Habitat

Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have adverse effects on EFH designated for Chinook, pink, and Coho salmon. These effects include a temporary reduction in water quality from increased turbidity, and temporary reduction in habitat value (specifically from reduced forage and cover) caused by riparian clearing and in-water excavation, backfilling, and pipeline removal.

3.3 Essential Fish Habitat Conservation Recommendations

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 1.5 acres of designated EFH for Pacific Coast salmon. Two of these conservation recommendations are a subset of the ESA terms and conditions.

1. Avoid or minimize construction-related habitat disturbance and adverse effects on water quality. The Corps should follow terms and conditions 1(a) – 1(e) as presented in the ESA portion of this document.
2. Monitoring and Reporting: The Corps should follow terms and conditions 2(a) and 2(b) as presented in the ESA portion of this document.
3. The Corps should encourage habitat enhancement or restoration activities in the Nooksack River, as the applicant has proposed, to:
    - Increase the amount of shallow-water habitat in the reach to benefit ESA-listed salmonids
    - Restore or create off-channel habitat or access to off-channel habitat, side channels, alcoves, wetlands, and floodplains
    - Remove old docks and pilings that are no longer in use
    - Protect and restore riparian areas to improve water quality, provide long-term supply of large wood to streams, and reduce impacts that alter other natural processes
    - Improve or regrade and revegetate streambanks
    - Restore instream habitat complexity, including large wood placement
    - Remove invasive plants and plant native species

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to 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 NMFS' EFH Conservation Recommendations unless 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 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, 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 Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(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 user of this opinion is the Corps. Other interested users could include the applicant, citizens of the affected area, and others interested in the conservation of the affected species. Individual copies of this opinion were provided to the Corps and the applicant's consultant. 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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