



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No: **WCRO-2021-02376**

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January 3, 2022

William D. Abadie
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, OR 97208-2946

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the J&B Land LLC Superior Farms Irrigation Intake Replacement Project, McNary Reservoir (HUC 170701010206), Columbia River, Umatilla County, Oregon

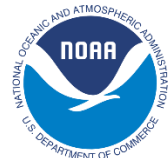
Dear Mr. Abadie:

Thank you for your letter of September 6, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for J&B Land Superior Farms' Irrigation Intake Replacement Project.

Thank you, also, for your request for consultation pursuant to the essential fish habitat provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action.

After reviewing the current status of the species, the environmental baseline, the effects of the proposed action and the cumulative effects, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), UCR steelhead (*O. mykiss*), Middle Columbia River steelhead, Snake River Basin steelhead, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, or SR sockeye salmon (*O. nerka*). NMFS also determined that the action will not destroy or adversely modify designated critical habitats for these species. Rationale for our conclusions is provided in the attached biological opinion (opinion). The enclosed opinion is based on information provided in your biological assessment, email discussions, and other sources of information cited in the opinion.

As required by section 7 of the ESA, NMFS is providing an incidental take statement (ITS) with the opinion. The ITS includes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. Incidental take



from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of the listed species considered in this opinion.

Please contact Rebecca Viray, Columbia Basin Area Office, (541) 962-8524, Rebecca.Viray@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,



Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

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

J&B Land Superior Farms Irrigation Intake Replacement Project

NMFS Consultation Number: WCRO-2021-02376


Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS’ Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Upper Columbia River spring Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	Endangered	Yes	No	Yes	No
Upper Columbia River steelhead (<i>O. mykiss</i>)	Threatened	Yes	No	Yes	No
Snake River spring/summer-run Chinook salmon (<i>O. tshawytscha</i>)	Threatened	Yes	No	Yes	No
Snake River fall-run Chinook salmon (<i>O. tshawytscha</i>)	Threatened	Yes	No	Yes	No
Snake River sockeye salmon (<i>O. nerka</i>)	Endangered	Yes	No	Yes	No
Snake River steelhead (<i>O. mykiss</i>)	Threatened	Yes	No	Yes	No
Middle Columbia River steelhead (<i>O. mykiss</i>)	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies 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: 
Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Date: January 3, 2022

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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

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 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 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 part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [<https://repository.library.noaa.gov/welcome>]. A complete record of this consultation is on file at the Columbia Basin Branch, Ellensburg, Washington.

1.2. Consultation History

NMFS received a request for ESA consultation and biological assessment (BA) from the U.S. Army Corps of Engineers (Corps) on September 6, 2021. The BA was prepared by Campbell Environmental LLC (Campbell LLC) for IRZ Consulting LLC (IRZ), on behalf of J&B Land LLC (J&B). J&B has applied for Corps permits under Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344).

The Corps concluded that the proposed action is likely to adversely affect Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Snake River (SR) spring/summer-run Chinook salmon, UCR steelhead (*O. mykiss*), Middle Columbia River (MCR) steelhead, Snake River Basin (SRB) steelhead, SR fall-run Chinook salmon (*O. tshawytscha*), SR sockeye salmon (*O. nerka*), and designated critical habitat for these seven species. The Corps also concluded that EFH for Chinook salmon and coho salmon, as designated by Section 305 of the Magnuson–Stevens Fishery Conservation and Management Act, is not likely to be adversely affected.

NMFS also reviewed the likely effects of the proposed action on EFH, pursuant to section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)], and concluded that the action would adversely affect the EFH of Pacific Coast salmon (PFMC 2014). Therefore, we have included the results of that review in Section 3 of this document.

NMFS emailed the Corps on September 23, 2021, requesting additional information regarding the project’s proposed in-water construction and pile-driving activities. The consultant provided responses to NMFS in emails on September 24 and October 1, 2021. NMFS initiated formal consultation on October 1, 2021.

1.3. Proposed Federal Action

Under the ESA, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, “Federal action” means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

The Corps proposes to issue a permit to J&B to install a new intake pipeline, fish screen, and associated structures at the Superior Farms’ pump station located on the Columbia River at River Mile (RM) 300.9. This site is within the McNary Reservoir, 8.4 miles upstream from McNary Dam (Figure 1). The project will install a new intake pipeline, a manifold “tee” with two half-barrel fish screens with an air burst system, and sheet-pile walls to surround the pump station.

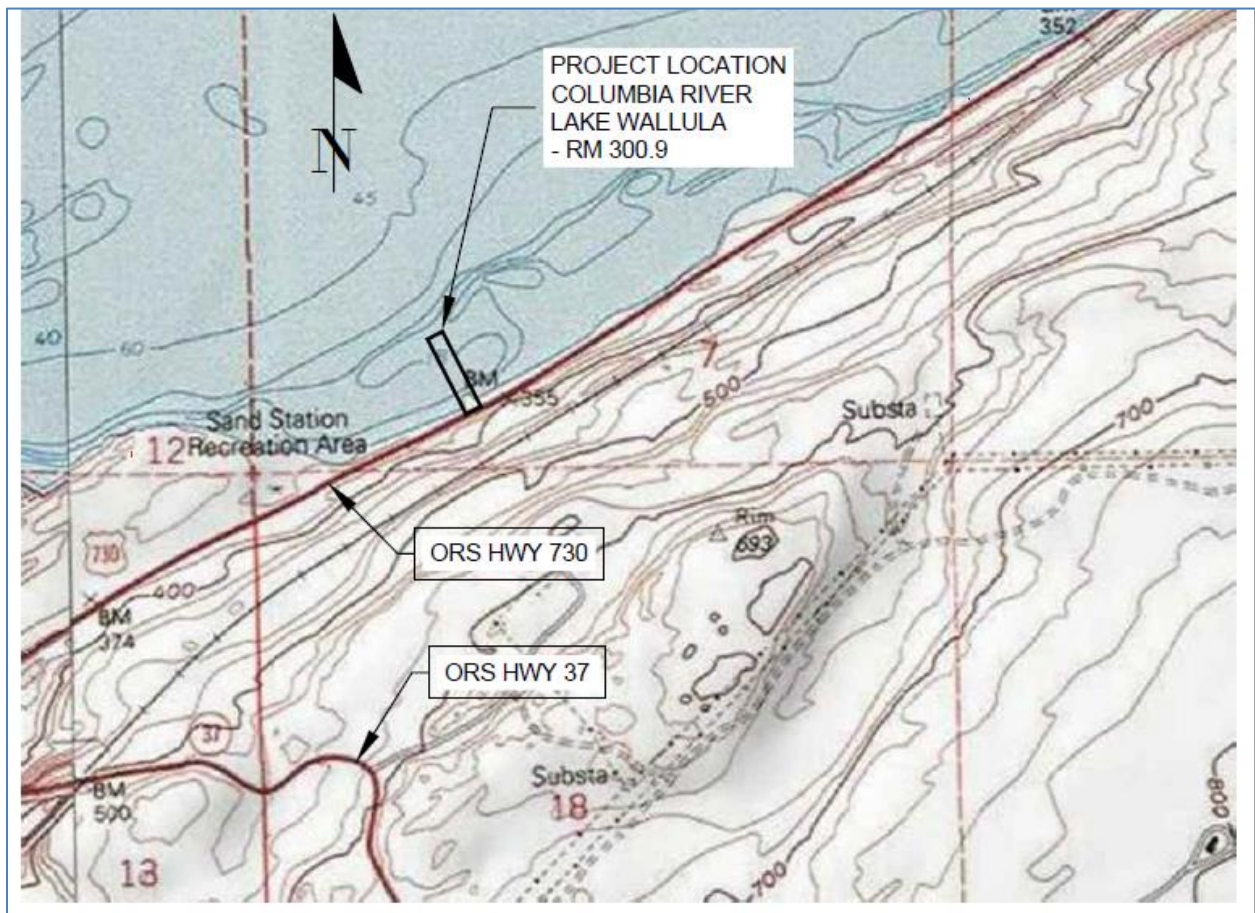


Figure 1. Superior Farms’ Intake Project Site Location in the McNary Reservoir.

The current facilities include the existing pump station, a steel and concrete pump deck, and four vertical turbine pumps, surrounded with box screens along the Columbia River’s southern

shoreline. The existing structure and intake pipes were built in the 1970s, require frequent pump repairs and maintenance at the intakes and do not currently meet NMFS' Fish Screen Criteria. The proposed action will authorize an increase in the easement area further out into the Columbia River to allow in-water construction for the installation of the new steel piles, the sheet-pile walls, the intake pipeline, manifold, and new fish screens (Figure 2). The proposed project will require up to 6 weeks of in-water construction during the in-water work window (IWWW), December 1, 2021–March 31, 2022. The pump station has a total pumping capacity of 9,250 gallons per minute (gpm). The project does not propose any increases in water withdrawals.

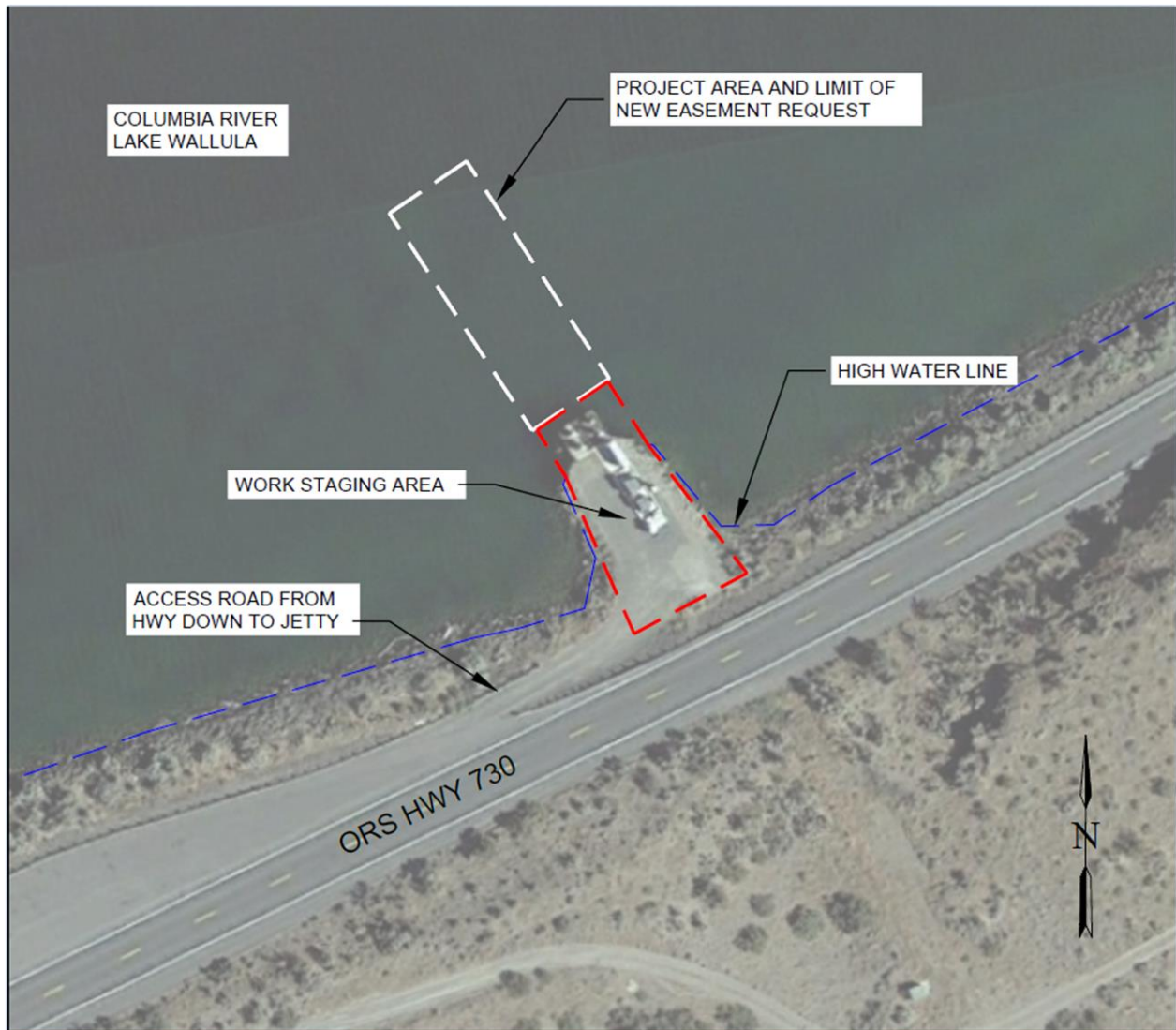


Figure 2. J&B Land Superior Farms' Irrigation Intake Pipeline project site. The white dotted outline represents the footprint where the new construction for the intake pipeline and screen replacement will occur. Image provided in the Final biological assessment by IRZ Consulting LLC.

1.3.1. New Intake Pipelines, Screens and In-water Construction

The proposed action will install a 42-inch diameter, 125-foot-long intake pipeline, twelve 12-inch diameter steel piles, six support pipes for the two 72-inch-wide by 202-inch-long, half-barrel fish screens, and 80 linear feet (LF) of sheet-pile walls surrounding the existing pump deck. The proposed intake pipe and screen designs were reviewed and approved¹ as compliant with NMFS fish passage criteria (NMFS 2011c).

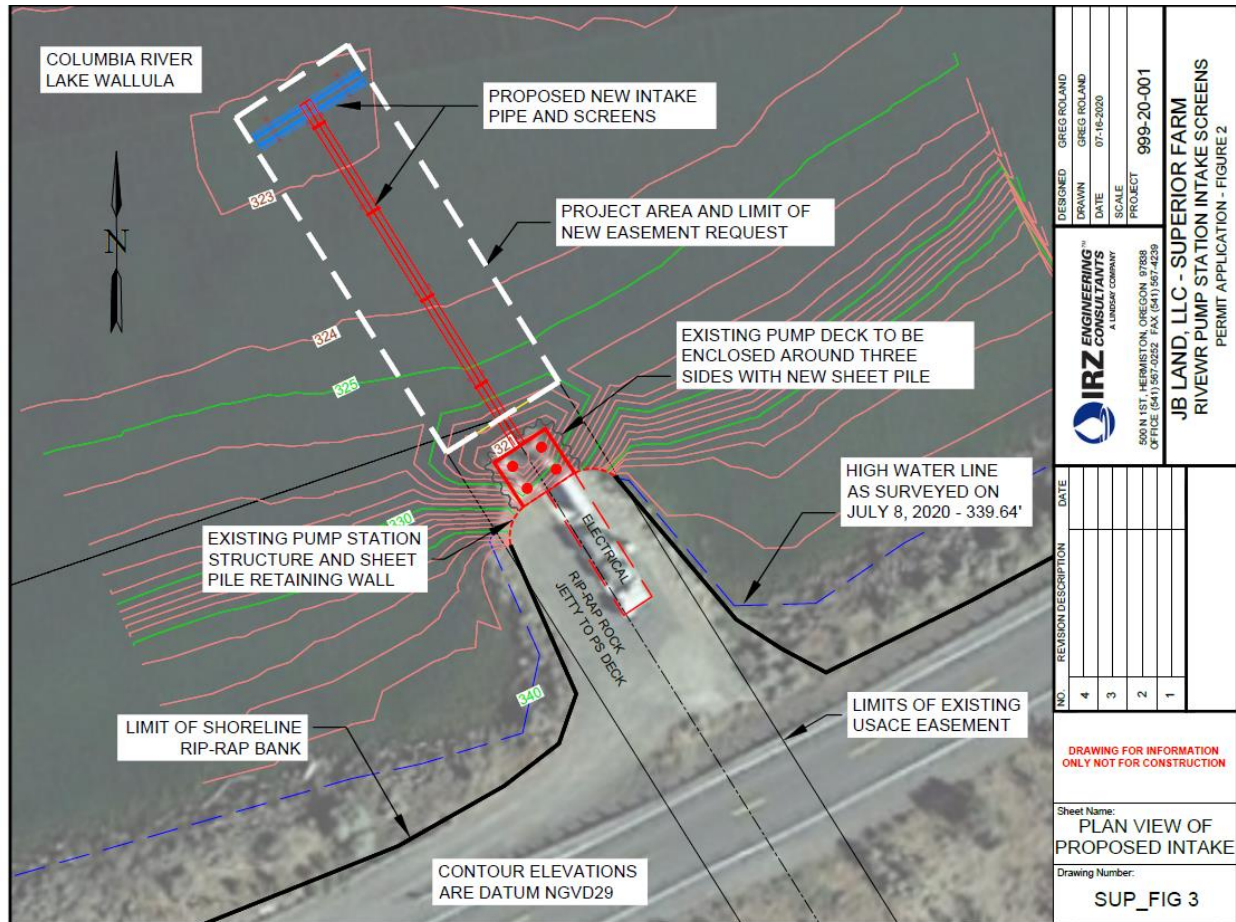


Figure 3. Proposed new intake pipeline and screens for the J&B Land Superior Farms' pump station. The new pipeline is shown within red lines extending into the Columbia River. The new NMFS approved fish screens are shown as blue at the ends of the new pipeline.

A tugboat (30-ft-wide by 90-ft-long) and two barges (50-ft-wide by 120-ft-long, and 30-ft-wide by 100-ft-long) will be used as a work platform, as needed, for heavy equipment and materials during in-water construction. The temporary barges and tugboat are anticipated to be present for up to 6 weeks during in-water construction.

¹ Email on September 15, 2021, from Jeffrey Brown (NMFS hydraulics engineer) to Rebecca Viray (NMFS biologist) confirming Superior Farms' intake and fish screen designs are approved and consistent with the 2011 NMFS Anadromous Fish Passage Criteria.

The project includes new in-water and over-water structures occupying approximate 745 square feet (ft²) below the ordinary high water mark (OHWM), and includes placement of approximately 90 cubic yards of fill. The new intake pipeline will extend approximately 125 feet from the existing pump station and approximately 225 feet from the Columbia River shoreline. All in-water construction activities will occur in an approximate 5,600 ft² area, which includes the easement area for the new pipeline and in-water structures and surrounding vicinity where construction will occur. The intake pipe will be assembled on land, filled with water, and a crane will lower it onto the bed of the Columbia River. The intake pipeline and structures will sit just above the channel substrate and occupy approximately 147 ft² of channel bed. Water depth is approximately 15 feet at the end of the intake pipe. A vibratory driver will install the new sheet-pile walls and surround the three sides of the existing pump station. The pump station will then be contained within an enclosed wet well area.

A manifold “tee” will be connected to the end of the intake pipeline. The manifold will have two 72-inch-wide by 202-inch-long half-barrel screens (total area 220 ft²). The two half-barrel fish screens are designed to have an average approach velocity of 0.20 feet per second (fps), at an intake rate of 10,000 gpm. Each screen shall include an air burst self-cleaning system and are expected to meet the 2011 NMFS fish passage criteria. The fish screens will be designed to achieve a lower approach velocity than required.

1.3.2. Pile-driving Installation

A vibratory driver is proposed to install twelve 12-inch-diameter steel piles, six support beams, and 80 LF of sheet-pile walls. The 12 steel pilings and 6 support beams will provide external support to the pipeline. If the substrate is too firm to use the vibratory driver to install the steel piles, an impact driver will be used. Based on the BA description, the vibratory driving will take approximately 30 minutes to install each sheet-pile or piling. We estimated installation by a vibratory pile driver to have a total duration of up to 40 hours or 5 days within a 1-week timeframe. If pile installation requires an impact driver, up to a maximum of 200 strikes would be needed for the entire project. The contractor will implement appropriate sound attenuation methods during impact driving (i.e., “soft-start” procedures and use of a bubble curtain). Additional best management practices (BMPs) will be used as appropriate and are detailed in the Conservation Measures section below.

1.3.3. Conservation Measures

The following conservation measures and BMPs are identified in the BA to minimize or avoid environmental impact to ESA-listed species or critical habitat:

- All work conducted below the OHWM of the Columbia River will occur during the Oregon Department of Fish and Wildlife (ODFW) recommended IWWW.
- All heavy equipment (i.e., crane and excavator) will access the project site using existing roadways, parking areas, disturbed upland areas, or floating barges.
- All sheet-piles and new steel piles will be installed to a depth of approximately 20 feet into the substrate.
- The contractor will initiate daily “soft start” procedures to provide an opportunity for any individual fish in the vicinity to volitionally flee the area.

- A “soft start” procedure will be used at the beginning of in-water piling installation, or anytime piling installation has ceased for more than 30 minutes.
- For vibratory driver operation, the contractor will initiate noise from vibratory drivers for 15 seconds at reduced energy followed by a 30-second waiting period. The procedure shall be repeated two additional times.
- For impact pile-driving (if necessary), the contractor will provide initial impact driver strikes at reduced energy, followed by a 30-second waiting period, then two subsequent sets.
- Sound attenuation methods will be used during any impact driver installation. A multi-level bubble curtain will be installed to reduce sound pressure levels (SPLs). The bubble curtain system shall conform to the following:
 - If water velocity is greater than 1.6 fps, a confined bubble curtain will surround the pile.
 - Piling shall be completely engulfed in bubbles over the full depth of the water column at all times when an impact pile driver is in use.
- All removed substrate materials and debris will be suitable for in-water disposal.
- A Pollution Control Plan (PCP) will be prepared by the contractor and carried out commensurate with the scope of the project that includes the following:
 - Best management practices to confine, remove, and dispose of construction waste.
 - Procedures to contain and control a spill of any hazardous material.
 - Steps to cease work under high flow conditions.
- All conditions of the Oregon Department of Environmental Quality’s (ODEQ) 401 Water Quality Certification will be followed.
- All equipment will be inspected daily for fluid leaks. Any leaks detected will be repaired before operation is resumed.
- All equipment that will be used below the OHWM will be steam cleaned until all visible oil, grease, mud, and other visible contaminants are removed.
- Stationary power equipment operated within 150 feet of the river will be diapered to prevent leaks.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not. The effects of the future use of the intakes and screens at the pump station are considered in Effects of the Action, Section 2.5. The water withdrawal is an existing water right that is currently being exercised and is not considered an effect of the action. The proposed action does not propose an increase in water withdrawal rates.

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 to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency’s actions would affect listed species and their critical habitats. If

incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes 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 an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of “jeopardize the continued existence of” a listed species, which is “to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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

The designations of critical habitat for the seven species in this opinion use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced 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.

The ESA Section 7 implementing regulations define effects of the action using the term “consequences” (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion we use the terms “effects” and “consequences” interchangeably.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or

indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

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

2.2.1. Status of the Species

For Pacific salmon and steelhead, 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 summary that follows describes the status of salmon, steelhead, 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), as well as applicable recovery plans and 5-year status reports. These additional documents are incorporated by reference (NMFS 2009; NMFS 2015; NMFS 2016a; NMFS 2016b; NMFS 2016c; NMFS 2017a; NMFS 2017b; UCSRB 2007). These documents are available on NMFS West Coast Region website (<https://www.westcoast.fisheries.noaa.gov>). The next 5-year status reviews will be completed in 2022.

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.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)			
Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer-run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Sockeye salmon (<i>O. nerka</i>)			
Snake River	E 8/15/11; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (<i>O. mykiss</i>)			
Middle Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	2/1/06; 71 FR 5178
Snake River Basin	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

Upper Columbia River Spring-run Chinook Salmon ESU

The UCR spring-run Chinook salmon evolutionarily significant unit (ESU) was listed as endangered under the ESA in 1999 (64 FR 14308), and the status was affirmed in 2005 and 2012. In 2016, the 5-year status review for UCR spring-run Chinook salmon concluded that the species should maintain its endangered listing classification (NMFS 2016c; NWFSC 2015).

A recovery plan is available for this species (UCSRB 2007). A 5-year status review was completed in 2016 (NMFS 2016c). Achieving recovery (i.e., delisting the species) of each ESU via sufficient improvement in the abundance, productivity, spatial structure, and diversity is the longer-term goal of the Upper Columbia Salmon Recovery Board (UCSRB) Plan. The recovery plan calls for meeting or exceeding the same basic spatial structure and diversity criteria adopted from the Interior Columbia Technical Recovery Team (ICTRT) viability report for recovery (NWFSC 2015). None of the three extant populations in this ESU are viable with respect to

abundance and productivity (A&P), and they all have a greater than 25% chance of extinction in 100 years (UCSRB 2007).

Spatial structure and diversity. This species includes all naturally-spawned populations of spring-run Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam (excluding the Okanogan River), the Columbia River upstream to Chief Joseph Dam, and progeny of six artificial propagation programs. Historically, UCR spring-run Chinook salmon likely included three major population groups (MPGs). Two of these MPGs were eliminated by the completion of Grand Coulee and Chief Joseph Dams (UCSRB 2007; NWFSC 2015). The remaining North Cascades MPG is comprised of three extant populations: the Wenatchee River, the Methow River, and the Entiat River populations.

The composite spatial structure and diversity (SS/D) risks for all three of the extant populations in this MPG are rated at high risk. The natural processes component of the SS/D risk is low for the Wenatchee River and Methow River populations and moderate for the Entiat River population. All three populations are rated at high risk for diversity, driven primarily by chronically high proportions of hatchery-origin spawners (26 to 76%) in natural spawning areas and a lack of genetic diversity among the natural-origin spawners (ICTRT 2007; NWFSC 2015). This effect is particularly high in the Wenatchee and Methow populations with hatchery spawners composing 66% and 76%, respectively (NMFS 2015). The high proportion of hatchery spawners reflects the large increase in releases from the directed supplementation programs in those two drainages. The hatchery supplementation program in the Entiat was discontinued in 2007 and hatchery fish on the spawning grounds in the Entiat have declined in recent years.

Abundance and productivity. NMFS (2020) discussed updated adult abundance estimates for UCR spring-run Chinook salmon. These indicate a substantial downward trend in natural-origin spawners at the ESU level from 2015 to 2019. Returns through 2018, for each of the three extant populations, remained considerably below the minimum abundance thresholds established by the ICTRT with substantial numbers of hatchery-origin fish on the spawning grounds.

Estimated productivity (returns-per-spawner) was on average about the same in 2009 to 2018 as in 1999 to 2008, and indicates that UCR spring-run Chinook salmon populations are not replacing themselves. Possible contributing factors include density dependent effects, differences in spawning distribution relative to habitat quality, and reduced fitness of hatchery-origin spawners. As of the last status review, the combinations of recent A&P for each population had resulted in a high-risk rating for the ESU when compared to the ICTRT viability curves (NWFSC 2015).

There have been improvements in the viability ratings for some of the component populations, but overall several of the factors cited by the ICTRT (2007) remain as concerns or key uncertainties. Since 2016, observations of coastal ocean conditions indicate that recent outmigrant year classes have experienced below average ocean survival during a marine heatwave and its lingering effects, which led researchers to predict the drop in adult returns observed through 2019 (Werner et al. 2017). Expectations for marine survival are relatively mixed for juvenile Chinook salmon that reached the ocean in 2019 (Zabel et al. 2020). NMFS

will evaluate the implications for viability risk of more recent adult returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on population productivity, diversity, and spatial structure.

Limiting factors. Limiting factors include (NOAA Fisheries 2011; UCSRB 2007):

- Effects related to the hydropower system in the mainstem Columbia River, including reduced upstream and downstream fish passage, altered ecosystem structure and function, altered flows, and degraded water quality.
- Degradation of floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality.
- Degraded estuarine and nearshore marine habitat.
- Hatchery-related effects.
- Persistence of non-native (exotic) fish species.
- Harvest in Columbia River fisheries.

Snake River Spring/Summer-run Chinook Salmon ESU

NMFS listed the SR spring/summer-run Chinook salmon ESU as a threatened species in 1992. The status was affirmed in 2005 and in 2014. NMFS released a final recovery plan for this species in October of 2017 (NMFS 2017a), and the most recent status review was completed in 2016 (NMFS 2016b). This species includes all naturally-spawned populations of spring/summer-run Chinook salmon originating from the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins, and from 10 artificial propagation programs (DOC 2014). The ICTRT recognized 28 extant and three extirpated populations of SR spring/summer-run Chinook salmon, and aggregated these into five MPGs that correspond to ecological subregions (ICTRT 2003; McClure and Cooney 2005). All but one extant population (Chamberlain Creek) are at “high” risk of extinction (Ford 2011; NWFSC 2015).

Spatial structure and diversity. Spatial structure ratings remain unchanged or stable with low or moderate risk levels for the majority of the populations in the ESU. Four populations from three MPGs (Catherine Creek and Upper Grande Ronde of the Grande Ronde/Imnaha River MPG, Lemhi River of the Upper Salmon River MPG, and Lower Middle Fork Salmon of the Middle Fork Salmon River MPG) remain at high risk for spatial structure loss. Three MPGs in this ESU have populations that are undergoing active supplementation with local broodstock hatchery programs. In most cases, those programs evolved from mitigation efforts and include some form of sliding-scale management guidelines that limit hatchery contribution to natural spawning based on the abundance of natural-origin fish returning to spawn—the more natural-origin fish that return, the fewer hatchery fish that are needed to spawn naturally. Sliding-scale management is designed to maximize hatchery benefits in low abundance years and reduce hatchery risks at higher spawning levels.

Abundance and productivity. NMFS (2020) discussed updated adult abundance estimates for SR spring/summer Chinook salmon. These indicated a substantial downward trend in natural-origin spawners at the ESU level from 2014 to 2019. Returns during the last 3 years in the series, 2017 through 2019, were the lowest since 1999. These data also showed recent and substantial

downward trends for most of the MPGs and populations, except those in the Lemhi River, Camas Creek, and Upper Grande Ronde Mainstem, when compared to the 2009 to 2013 period. All populations except Chamberlain Creek remained considerably below the minimum abundance thresholds established by the ICTRT. For many populations, the total spawner counts include substantial numbers of hatchery-origin adults. Exceptions were the entirety of the Middle Fork MPG and several populations in the Upper Salmon MPG. NMFS will evaluate the implications for viability risk of these more recent returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on population productivity, diversity, and spatial structure.

Most populations will need to see increases in A&P in order for the ESU to recover. As of the last status review, NWFSC (2015) stated that the SR spring/summer-run Chinook salmon ESU remained at high overall risk.

Limiting factors. Limiting factors for this species include:

- Degradation of floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality.
- Effects related to the hydropower system in the mainstem Columbia River, including reduced upstream and downstream fish passage, altered ecosystem structure and function, altered flows, and degraded water quality.
- Harvest-related effects.
- Predation.
- Poor ocean survival.

Snake River Fall-run Chinook Salmon ESU

Snake River fall-run Chinook salmon were originally listed as threatened in 1992 (57 FR 14653). The status was affirmed in 2005 and in 2014. NMFS released a final recovery plan for this species in November 2017 (NMFS 2017b). A 5-year status review was completed in 2016 (NMFS 2016b). This species includes all naturally-spawned populations of fall-run Chinook salmon originating from the mainstem Snake River below Hells Canyon Dam; from the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins; and from four artificial propagation programs (DOC 2014).

The ICTRT identified three populations of this species, although only the lower mainstem population exists at present, and it spawns in the lower mainstem of the Clearwater, Imnaha, Grande Ronde, Salmon, and Tucannon rivers. The extant population of SR fall-run Chinook salmon is the only remaining population from a historical ESU that also included large mainstem populations upstream of the current location of the Hells Canyon Dam complex (ICTRT 2003; McClure and Cooney 2005). The extant population has a high proportion of hatchery-origin spawners.

NMFS (2020) discussed updated adult abundance estimates for SR fall Chinook salmon. These indicated a substantial downward trend in the abundance of natural-origin spawners at the ESU level during 2013 to 2019. However, overall abundance remained higher than before 2005.

NMFS will evaluate the implications for viability risk of these more recent returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on productivity, diversity, and spatial structure.

The SR fall Chinook salmon ESU is composed of a single demographically independent population. Five-year geometric means in the numbers of natural-origin and total (natural- plus hatchery-origin) spawners through 2018 indicated very small negative changes in abundance between the two most recent 5-year periods (NMFS 2020).

As of the last status review, the ESU was considered viable, but would need to see an increase in productivity combined with a reduction in diversity risk to recover (ICTRT 2010; NWFSC 2015). The single population delisting options provided in the draft Snake River Fall Chinook Recovery Plan would require the population to meet or exceed minimum requirements for highly viable with a high degree of certainty (NWFSC 2015).

Limiting factors. Limiting factors for this species include:

- Degradation of floodplain connectivity and function and channel structure and complexity.
- Harvest-related effects.
- Loss of access to historical habitat above Hells Canyon and other Snake River dams.
- Impacts from mainstem Columbia River and Snake River hydropower systems.
- Hatchery-related effects.
- Degraded estuarine and nearshore habitat.

Snake River Sockeye Salmon ESU

The SR sockeye salmon were ESA-listed in November 1991 (56 FR 58619) as endangered. We reaffirmed the listing in 2005 (70 FR 2853). Best available information indicates that the SR sockeye salmon ESU is at high risk and remains at endangered status. NMFS released a final recovery plan for this species on June 8, 2015 (NMFS 2015). The most recent 5-year status review was completed in 2016 (NMFS 2016b). Overall, the recovery strategy aims to reintroduce and support adaptation of naturally self-sustaining sockeye salmon populations in the Sawtooth Valley lakes.

Spatial structure and diversity. This species includes all anadromous and residual sockeye salmon from the SRB, Idaho, and artificially-propagated sockeye salmon from the Redfish Lake Captive Broodstock Programs (DOC 2014). The ICTRT defined Sawtooth Valley sockeye salmon as the single MPG within the SR sockeye salmon ESU. The MPG contains one extant population (Redfish Lake) and two to four historical populations (Alturas, Petit, Stanley, and Yellowbelly lakes) (NMFS 2015). At the time of listing in 1991, the only confirmed extant population included in this ESU was the beach-spawning population of sockeye salmon from Redfish Lake, with about 10 fish returning per year (NMFS 2015). At this stage of the recovery efforts with limited distribution across the Sawtooth Valley lakes, the ESU remains rated at high risk for both spatial structure and diversity (NWFSC 2015).

Abundance and productivity. NMFS (2020) discussed updated adult abundance estimates for SR sockeye salmon. These indicate a substantial downward trend in the returns of hatchery-origin and natural-origin adults to the Sawtooth Valley since 2014. The 5-year geometric mean of total spawner counts declined 6% in 2014 to 2018 when compared to 2009 to 2013. NMFS will evaluate the implications for viability risk of these more recent returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on productivity, diversity, and spatial structure.

Limiting factors. The key factor limiting recovery of the SR sockeye salmon ESU is survival. In the Sawtooth Valley natal lakes, limiting factors include: blocked access; low zooplankton density (which can restrict sockeye salmon growth and fitness); current and legacy effects of land use and other human activities such as mining, grazing, recreational use, lakeshore development, and irrigation diversions; lake poisoning; and introduction and continued stocking of non-native species (such as brook trout, rainbow trout, lake trout, and kokanee).

Portions of the migration corridor in the Salmon River are impaired by reduced water quality and elevated temperatures (IDEQ 2011). The natural hydrological regime in the upper mainstem Salmon River Basin has been altered by water withdrawals. Survival rates from Lower Granite Dam to the spawning grounds are low in some years (e.g., average of 31%, range of 0–67% for 1991–1999) (Keefer et al. 2008b). Keefer et al. (2008b) conducted a radio tagging study on adult SR sockeye salmon passing upstream from Lower Granite Dam in 2000 and concluded that high in-river mortalities could be explained by “a combination of high migration corridor water temperatures and poor initial fish condition or parasite loads.” Keefer et al. (2008b) also examined current run timing of SR sockeye salmon versus records from the early 1960s, and concluded that an apparent shift to earlier run timing recently may reflect increased mortalities for later migrating adults. In the Columbia and lower Snake River migration corridor, predation rates on juvenile sockeye salmon are unknown, but terns and cormorants consume 12% of all salmon smolts reaching the estuary, and piscivorous fish consume an estimated 8% of migrating juvenile salmon (NOAA Fisheries 2011), a significant source of mortality.

Climate change is a substantial threat to SR sockeye salmon, especially during the marine rearing phase and adult migration phase of their life cycle. High temperatures in 2013 and 2015 resulted in unusually high mortality rates in both the lower Columbia (Bonneville to McNary Dam) and lower Snake River (McNary to Lower Granite Dam) reaches, as well as in the reach from Lower Granite Dam to the Sawtooth Basin. Excluding 2015, recent adult survival rate estimates for SR sockeye salmon have averaged about 77% from Bonneville to McNary Dam (2010 to 2019), about 89% from McNary to Lower Granite Dams (2010 to 2017) and 65% from Bonneville to Lower Granite Dams (2010 to 2017). In 2015, due to unprecedented early high water temperatures that persisted throughout the summer in the Columbia River basin, only 15% of adult SR sockeye salmon survived from Bonneville to McNary Dam and only 4% survived from Bonneville to Lower Granite Dam (NMFS 2020). It is uncertain how frequently similar conditions might occur in the future, though it will certainly be more often than in the past.

The quality of data used to evaluate climate-related threats is limited, and our understanding of how salmonids, and the ecosystems upon which they depend, might respond is even more limited. However, climate change would likely affect SR sockeye salmon in the following ways:

- Changes in ocean survival.
- Changes in growth and development rates.
- Changes in disease resistance.
- Changes in flow regime (especially flooding and low-flow events) that could affect survival and behavior (run timing, spawning timing, etc.)

Recent analyses by Crozier et al. (2019) rated the vulnerability of SR sockeye salmon as very high. We generally expect that abundance could decrease and extinction risk increase as a result of climate change.

Upper Columbia River Steelhead DPS

The UCR steelhead distinct population segment (DPS) was originally listed under the ESA in 1997 (62 FR 43937). The Upper Columbia Recovery Plan calls for "...restoring the distribution of naturally-produced spring-run Chinook salmon and steelhead to previously occupied areas where practical, and conserving their genetic and phenotypic diversity" (UCSRB 2007). In 2015, the 5-year review for the UCR steelhead concluded the species should maintain its threatened listing classification (NMFS 2016c).

Spatial structure and diversity. The UCR steelhead DPS is composed of a single MPG which includes four naturally-spawned anadromous steelhead populations below natural and artificial impassable barriers in streams within the Columbia River Basin, upstream from the Yakima River, Washington, to the United States–Canada border, as well as six artificial propagation programs. Historically, there were likely three MPGs. Two additional steelhead MPGs likely spawned above Grand Coulee and Chief Joseph Dams, but these MPGs are extirpated, and reintroduction is not required for ESA recovery (UCSRB 2007). NMFS has defined the UCR steelhead DPS to include only the anadromous members of this species (70 FR 67130).

All extant natural populations are considered to be at high risk of extinction for SS/D (NWFSC 2015). With the exception of the Okanogan population, the UCR steelhead populations were rated as low risk for spatial structure. Each population is at high risk for diversity, largely driven by chronic high levels of hatchery spawners within natural spawning areas and lack of genetic diversity among the populations. The proportions of hatchery-origin returns in natural spawning areas remain extremely high across the DPS, especially in the Methow and Okanogan River populations.

Abundance and productivity. NMFS (2020) discussed updated adult abundance estimates for UCR steelhead. These indicate a substantial downward trend in the number of natural-origin spawners at the DPS level from 2014 to 2019. Population level estimates of natural-origin and total (natural- and hatchery-origin) spawners through 2018 also showed recent and substantial downward trends for most of the populations. All populations remain considerably below the minimum abundance thresholds established by the ICTRT.

NMFS will evaluate the implications for viability risk of these more recent returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on productivity, diversity, and spatial structure.

Limiting Factors. Limiting factors for this species include (NOAA Fisheries 2011; UCSRB 2007):

- Adverse effects related to the mainstem Columbia River hydropower system.
- Impaired tributary fish passage.
- Degradation of floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality.
- Hatchery-related effects.
- Predation and competition.
- Harvest-related effects.

Snake River Basin Steelhead DPS

This ESU was first listed as threatened under the ESA in 1991 (62 FR 43937). In October of 2017, NMFS released the final SR Spring/Summer-run Chinook Salmon and Steelhead Recovery Plan (NMFS 2017a). The most recent 5-year status review was completed in 2016 (NMFS 2016b). The overall viability ratings for natural populations in the SRB steelhead DPS range from moderate to high risk. Four out of the six MPGs are not meeting the specific objectives in the recovery plan; the Grande Ronde MPG is tentatively rated as viable.

Spatial structure and diversity. The SRB steelhead DPS includes all naturally-spawned anadromous steelhead populations originating below natural and manmade impassable barriers in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. Twenty-four historical populations (an additional three are extirpated) within six MPGs comprise the SRB steelhead DPS. Inside the geographic range of the DPS, 12 hatchery steelhead programs are currently operational. Five of these artificial programs are included in the DPS. With one exception, spatial structure ratings for all of the SRB steelhead populations were low or very low risk, given the evidence for distribution of natural production within populations. The exception was the Panther Creek population, which was given a high-risk rating for spatial structure based on the lack of spawning in the upper sections. No new information was provided for the 2015 status technical review that would change those ratings (NMFS 2016b).

Abundance and productivity. NMFS (2020) discussed updated adult abundance estimates for SRB steelhead. These indicate a substantial downward trend in the abundance of natural-origin spawners at the DPS level from 2014 to 2019. The number of natural-origin spawners in the Upper Grande Ronde Mainstem population appears to have been at or above the minimum abundance threshold established by the ICTRT, while the Tucannon River and Asotin Creek populations have remained below their respective thresholds. The 2019 abundance level for the Tucannon River population was lower than the most recent 5-year geomean. For many other SRB steelhead populations, spawning ground surveys are not feasible due to high spring flows that would wash out weirs and low visibility that precludes redd counts. The Idaho Department of Fish and Game, Columbia River Inter-Tribal Fish Commission, and the Northwest Fisheries Science Center (NWFSC) therefore collect tissue samples from adult steelhead trapped at Lower Granite Dam and assign these fish to genetic stocks by comparing them to samples taken inside the boundary of each spawning population (NMFS 2020). The genetic stock identification groups are broader than spawning populations, but fit within the MPGs. The most recent 5-year

geometric means indicate large decreases in natural-origin abundance for most of the genetic stocks/MPGs, with a smaller decrease for the Upper Clearwater genetic stock group.

NMFS will evaluate the implications for viability risk of these more recent returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on population productivity, diversity, and spatial structure.

Limiting factors. Limiting factors for this species include (NMFS 2011a; NMFS 2011b):

- Adverse effects related to the mainstem Columbia River hydropower system.
- Impaired tributary fish passage.
- Degradation of floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality.
- Increased water temperature.
- Harvest-related effects, particularly for B-run steelhead.
- Predation.
- Genetic diversity effects from out-of-population hatchery releases.
- Harvest-related effects.
- Effects of predation, competition, and disease.

Middle Columbia River Steelhead DPS

In 1999, NMFS listed MCR steelhead under the ESA as a threatened species (64 FR 14517). A recovery plan is available for this species (NMFS 2009). The most recent 5-year status review was completed in 2016 (NMFS 2016a).

Spatial structure and diversity. This species includes all naturally-spawned steelhead populations originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood rivers (exclusive) to and including the Yakima River, excluding steelhead originating from the SRB. This DPS includes steelhead from seven artificial propagation programs (DOC 2014). The DPS does not currently include steelhead that are designated as part of an experimental population above the Pelton Round Butte Hydroelectric Project in the Deschutes River Basin, Oregon (DOC 2014). The ICTRT identified 17 extant populations in this DPS (ICTRT 2003; McClure and Cooney 2005). The populations fall into four MPGs: Cascade eastern slope tributaries (five extant and two extirpated populations), the John Day River (five extant populations), the Walla Walla and Umatilla rivers (three extant and one extirpated populations), and the Yakima River (four extant populations) (ICTRT 2003; McClure and Cooney 2005). Viability ratings for these populations range from extirpated to viable (NMFS 2009, NWFSC 2015).

Abundance and productivity. NMFS (2020) discussed updated adult abundance estimates for MCR steelhead. These indicate a substantial downward trend in the abundance of natural-origin spawners at the DPS level from 2014 to 2019. Population level estimates of natural-origin and total (natural- plus hatchery-origin) spawners through 2018 or 2019 also showed recent and substantial downward trends in abundance for most of the MPGs and populations (exceptions are the Klickitat and Yakima River populations) when compared to the 2009 to 2013 period. In

many cases, the most recent 5-year geometric mean in natural-origin abundance is considerably below the minimum abundance thresholds established by the ICTRT. However, the Klickitat, Middle Fork John Day, and Umatilla River populations are well above these thresholds. A relatively limited number of hatchery fish is present on the spawning grounds within this DPS.

NMFS will evaluate the implications for viability risk of these more recent returns in the upcoming 5-year status review, expected in 2022. The status review will also consider new information on productivity, diversity, and spatial structure.

Limiting factors. Limiting factors for this species include (NMFS 2009; NOAA Fisheries 2011):

- Degradation of floodplain connectivity and function, channel structure and complexity, riparian areas, fish passage, stream substrate, stream flow, and water quality.
- Mainstem Columbia River hydropower-related impacts.
- Degraded estuarine and nearshore marine habitat.
- Hatchery-related effects.
- Harvest-related effects.
- Effects of predation, competition, and disease.

2.2.2. Status of Critical Habitat

In this section, we examine the status of designated critical habitat by examining the condition and trends of the essential PBFs of that habitat throughout the designated areas (Tables 2 and 3). 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). Rangewide, all habitat types are impaired to some degree, even though many of the watersheds comprising the fully designated area are ranked as providing high conservation value. The proposed action, however, affects only freshwater rearing and freshwater migration habitats.

Table 2. Physical and biological features of critical habitat designated for ESA-listed species considered in this opinion (except Snake River spring/summer-run Chinook salmon, Snake River fall-run Chinook salmon, and Snake River sockeye salmon), and corresponding species life history events.

Physical or Biological Features		Species Life History Event
Site Type	Site Attribute	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration

Physical or Biological Features		Species Life History Event
Site Type	Site Attribute	
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and “reverse smoltification” Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing

Table 3. Physical and biological features of critical habitats designated for Snake River spring/summer-run Chinook salmon, Snake River fall-run Chinook salmon, and Snake River sockeye salmon and corresponding species life history events.

Physical or Biological Features		Species Life History Event
Site Type	Site Attribute	
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook) Spawning gravel Water quality Water temperature (sockeye) Water quantity	Adult spawning Embryo incubation Alevin growth and development Fry emergence from gravel Fry/parr/smolt growth and development
Adult and juvenile migration corridors	Cover/Shelter Food (juvenile) Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration

For salmon and steelhead, NMFS’ 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 are 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 (e.g., spawning gravels, wood and water condition, side channels), the relationship of the area compared to other areas within the species’ range, and the significance of the population occupying that area to the species’ viability criteria. Thus, 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 (e.g., one of a very few spawning areas), a unique contribution of the population it served (e.g., a population at the extreme end of

geographic distribution), or the fact that it serves another important role (e.g., obligate area for migration to upstream spawning areas).

Interior Columbia Recovery Domain

Critical habitat has been designated in the Interior Columbia recovery domain (ICRD), which includes the SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, and SRB steelhead.

Habitat quality in tributary streams in the ICRD varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban developments. Critical habitat throughout much of the ICRD has been degraded by intense agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been affected by the development and operation of the Columbia River System dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately-owned dams in the Snake and Upper Columbia River basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho, including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good et al. 2005), and Grand Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River.

Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adults and juveniles. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles. Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have altered hydrological cycles.

A series of large regulating dams on the middle and upper Deschutes River affect flow and block access to upstream habitat, and have extirpated one or more populations from the Cascades Eastern Slope major population. Also, operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have significantly modified flow regimes and degraded water quality and physical habitat in this domain.

Many stream reaches designated as critical habitat in the ICRD are over-allocated, with more allocated water rights than existing streamflow. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for all listed salmon and steelhead species in this recovery domain except SR fall-run Chinook salmon and SR sockeye salmon (NMFS 2007; NMFS 2011a).

Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water all contribute to elevated stream temperatures. Contaminants such as insecticides and herbicides from agricultural runoff and heavy metals from mine waste are common in some areas of critical habitat.

The ICRD is a very large and diverse area. The CHARTs determined that few watersheds with PBFs for Chinook salmon or steelhead are in good to excellent condition with no potential for improvement. Overall, most ICRD watersheds are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some potential for improvement.

Despite these degraded habitat conditions, the HUCs that have been identified as critical habitat for these species are largely ranked as having high conservation value. Conservation value reflects several factors, including: (1) how important the area is for various life history stages; (2) how necessary the area is to access other vital areas of habitat; and (3) the relative importance of the populations the area supports relative to the overall viability of the ESU or DPS. The Columbia River corridor is ranked as high conservation value. The CHARTs noted that this corridor connects every watershed and population for all listed ESUs/DPSs with the ocean, and is used by rearing and migrating juveniles, and migrating adults, of every component population.

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

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
Upper Columbia River spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four subbasins in Washington containing 15 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PBFs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. We rated the conservation value of HUC5 watersheds as high for 10 watersheds, and medium for five watersheds. The conservation value of migration habitat in this area has been affected by the development and operation of the dams and reservoirs of the Columbia River Systems.
Snake River spring/summer-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Columbia River Systems.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Columbia River Systems.
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit, and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Columbia River Systems.
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated the conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Snake River Basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Columbia River Systems.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PBFs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated the conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.

2.2.3 Climate Change

One factor affecting the range-wide status of salmon and steelhead and aquatic habitat is climate change. The U.S. Global Change Research Program (2018) reports average warming in the Pacific Northwest of about 1.3 degrees Fahrenheit (°F) from 1895 to 2011, and projects an increase in average annual temperature of 3.3°F to 9.7°F by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat-trapping gases; the increases are projected to be largest in summer (Melillo et al. 2014; USGCRP 2018). The five warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey and Dahlman 2020). Climate change has negative implications for designated critical habitats in the Pacific Northwest (Climate Impacts Group 2009; ISAB 2007; Scheuerell and Williams 2005; Zabel et al. 2006), characterized by the Independent Scientific Advisory Board (ISAB) as follows:

- Warmer air temperatures will result in diminished snowpack and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.
- With a smaller snowpack, watershed runoff will decrease earlier in the season, resulting in lower stream flows in June through September. Peak river flows, and river flows in general, are likely to increase during the winter due to more precipitation falling as rain rather than snow.
- Water temperatures are expected to rise, especially during the summer months when lower stream flows co-occur with warmer air temperatures.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Low-lying areas are likely to be more affected. Climate change may have long-term effects that include, but are not limited to, depletion of important cold-water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, earlier emergence of fry, and increased competition among species (Goode et al. 2013; Reeder et al. 2013).

Climate change is predicted to cause a variety of impacts to Pacific salmon and their ecosystems (Crozier et al. 2008; Martins et al. 2012; Mote et al. 2014; Mote et al. 2016; Wainwright and Weitkamp 2013). The complex life cycles of anadromous fishes, including salmon, rely on productive freshwater, estuarine, and marine habitats for growth and survival, making them particularly vulnerable to environmental variation. Ultimately, the effects of climate change on salmon and steelhead across the Pacific Northwest will be determined by the specific nature, level, and rate of change and the synergy among interconnected terrestrial/freshwater, estuarine, nearshore, and ocean environments.

The primary effects of climate change on Pacific Northwest salmon and steelhead are:

- Direct effects of increased water temperatures on fish physiology.

- Temperature-induced changes to stream flow patterns, which can block fish migration, trap fish in dewatered sections, dewater redds, introduce non-native fish, and degrade water quality.
- Alterations to freshwater, estuarine, and marine food webs that alter the availability and timing of food resources.
- Changes in estuarine and ocean productivity that affect the abundance and productivity of fish resources.

Climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows (Mantua et al. 2010). Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

2.3. Action Area

“Action area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed action includes the area surrounding the in-water activity at the Superior Farms’ pump station at RM 300.9. The action area extends in a radius up to 2.47 miles (3,981 meters) from impact pile-driving. The extent of the action area is based on the anticipated behavioral effects from underwater sound pressure levels generated during impact pile-driving. The action area includes the in-water project site, riparian and upland areas, and areas upstream and downstream of the in-water work area that are likely to be affected by the proposed action.

2.4. Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR 402.02).

Current conditions within much of the mainstem Columbia River are degraded relative to historical conditions, a reflection of a multitude of actions whose effects frame the environmental baseline in the action area. The hydropower system has greatly modified natural flow and altered the hydrograph of the Columbia River. Water impoundments have altered water quality resulting in higher water temperatures during some parts of the year and elevated background turbidity (Gilbreath et al. 2000), changed fish community structure leading to increased rates of piscivorous predation on juvenile salmon and steelhead (Harnish et al. 2014), and altered fish passage and delayed migration for both adults and juveniles. Shoreline development has reduced natural vegetation, disconnected floodplains, and reduced available off-channel refugia.

On the mainstem Columbia River, hydropower projects, water storage projects and the withdrawal of water for irrigation and urban uses have significantly degraded salmon and steelhead habitats (NMFS 2013). The volume of water discharged by the Columbia River varies seasonally according to runoff, snowmelt, and hydrosystem demands. Mean annual discharge is estimated to be 265 thousands of cubic feet per second (kcfs), but may range from lows of 71 to 106 kcfs to highs of 539 kcfs. Water management activities have reduced flows in the Columbia River, measured at Bonneville Dam, from April through July. Flow management for hydropower has increased flows measured at Bonneville Dam during winter months. Naturally occurring maximum flows on the Columbia River occur in May, June, and July as a result of snowmelt in headwater regions. Minimum flows occur from September to March, with periodic peaks due to winter rains.

The mainstem dams and reservoirs, such as McNary Reservoir continue to substantially alter the mainstem migration corridor habitat. The reservoirs have increased the cross-sectional area of the river, reducing water velocity, altering the food web, and creating habitat for native and non-native species that are predators, competitors, or food sources for migrating juvenile salmon and steelhead. Travel times of migrating smolts increase as they pass through the reservoirs (compared to a free-flowing river), increasing exposure to both native and nonnative predators, and some juveniles are injured or killed as they pass through the dams (turbines, bypass systems, spillbays, or surface passage routes) (NMFS 2019). Harnish et al. (2014) documented significant mortality of smolts and juvenile Chinook salmon in reservoirs from the large populations of piscivorous fish and bird colonies.

In addition, numerous anthropogenic features or activities near the project site and throughout the action area (e.g., dams, pump stations, ports, marinas, docks, roads, railroads, bank stabilization, and landscaping) have become permanent fixtures on the landscape, and have displaced and altered native riparian habitat. Consequently, the potential for normal riparian processes (e.g., litterfall, channel complexity, and large wood recruitment) to occur is diminished and aquatic habitat has become simplified. Shoreline development has reduced the quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials, and by further disconnecting the Columbia River from historical floodplain areas. Furthermore, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by invasive, non-native species. The riparian system is fragmented, poorly connected, and provides inadequate protection of habitats and refugia for sensitive aquatic species.

The Columbia River shoreline, shallow water habitat, and natural vegetation is altered with in-water structures, rock, and riprap. Shoreline developments and alterations have reduced rearing habitat suitability (e.g., less habitat complexity, reduced forage base), reduced spring water velocities (which hampers downstream migration by smolts), and created better habitat for juvenile salmonid predators (e.g., birds, and native and non-native fish). These factors further limit habitat function by reducing cover, attracting predators and reducing foraging efficiency for juvenile salmonids. The Columbia River within the action area likely serves as juvenile rearing habitat and as an adult and juvenile migration corridor for all ESUs/DPSs. Project activities will occur during winter, the recommended in-water work period, when adults do not typically occupy the project area.

The Superior Farms' pump station is located along the southern shoreline of the Columbia River, within the McNary Reservoir in Oregon. The location is adjacent to U.S. Route 730 and in a rural area dominated by large-scale irrigated agriculture. Multiple other pump stations exist on the shoreline of the Columbia River and the portions of the McNary National Wildlife Refuge are located near the project site. The project site includes the current pump station facilities that contain the existing pumps, intakes and screens, concrete pad structure, facility buildings and a gravel access road. McNary Dam has created reservoir conditions in the project vicinity, with daily fluctuations in water level. McNary Reservoir is considered water quality limited by the ODEQ and it is on the Clean Water Act section 303(d) list for water temperature and dissolved gas (ODEQ 2020). Water temperatures in the action area are often elevated in the summer and early fall. Chemical contamination, nutrients and dissolved oxygen are also issues of water quality concern in the area. Turbidity in the reservoir is often elevated.

The action area includes the footprint of in-water construction at depths up to 15 feet below the OHWM, as well as areas along the shoreline and banks of the Columbia River. The Columbia River shoreline is composed of coarse sand, cobble size rock, and depositional materials. The topography of the uplands is relatively flat and transitions to areas of steeply sloping, riprap-armed banks down to the shoreline. There is sparse vegetation composed of a narrow band of sagebrush-steppe vegetation communities, including sagebrush, bitterbrush, cheatgrass, and willow species. The site does not contain large woody material, pools or off-channel habitat or refugia.

Irrigation water will continue to be withdrawn using the existing facilities. The existing water withdrawals are part of the environmental baseline for the action area. The proposed action does not include any change or an increase in the existing water withdrawals from the Columbia River.

2.5. Effects of the Action

Under the ESA, “effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

The effects of the action includes effects caused by: in-water construction below OHWM; temporary over-water structures (barges); vibratory and impact pile-driving; and installation of the new in-water/overwater structures (sheet-pile walls, pilings, pipeline, manifold, and new fish screens). Effects to habitat in the action area will likely occur as a consequence of construction and installation of these structures in and along the Columbia River.

2.5.1. Fish Presence in the Action Area

Fish presence in the action area consists of different-sized species and age classes of salmon and steelhead that rear and migrate throughout the Columbia River. In general, juvenile salmon of different sizes often have different behavior, disposition to migrate, and distribution in reservoirs (Peven 1987), which will influence the degree to which effects of the project are experienced by individual fish. Some juvenile steelhead and salmon of all ESUs and DPSs in this opinion may migrate and overwinter in the McNary Reservoir (Table 5). A few adult steelhead of each DPS could be present year-round in the mainstem Columbia River (Keefer et al. 2008a). However, based on habitat quality and the number of adults in the McNary Reservoir, we anticipate that the number of adult steelhead of any DPS to be holding or migrating in the action area during the in-water construction work window (December 1–March 31) will be small (a few fish). Adult sockeye salmon are not typically present during the winter months when in-water construction will occur. We anticipate a few individual adult Chinook salmon may migrate through the Bonneville Reservoir starting in mid-March towards the end of the IWWW.

Adult Chinook salmon are not expected to be in near shore waters of the project during in-water construction. An occasional adult UCR, MCR, and SRB steelhead could be present year round in the mainstem Columbia River. Daily counts at the McNary Dam have found few individual adult steelhead migrate during the winter months, with small increases in numbers of individual adults passing the dams in late February and March (Columbia River DART 2021).

Older juvenile salmon and steelhead (+1 age class) use a variety of habitats including nearshore, off-channel, mid-channel, and deep-water habitats. Subyearling Chinook salmon generally remain close to the water surface, favoring habitat less than 6 feet deep and where currents do not exceed 0.1 feet/second. They seek lower energy areas where waves and currents do not require them to expend considerable energy to remain in position while they consume invertebrates that live on or near the substrate. These areas typically have fine-grain substrates supporting benthic prey production. Dauble et al. (1989) found that spring-run Chinook salmon smolts were often abundant just after sunset in shallow nearshore areas (less than 30 centimeters deep) of low current velocity. Beeman and Maule (2006) observed a difference in daytime swim depth between yearling steelhead and yearling Chinook salmon, with steelhead migrating at a mean depth of 6 feet and Chinook salmon migrating at a mean depth of 10 feet. A study by Timko et al. (2011) recorded juvenile steelhead migrating in the top 5 to 15 feet of the water column in the Priest Rapids Project (which is located upstream of the project area). Bradford and Taylor (1997) reported similar results with subyearlings dispersing downstream from natal tributaries to mainstem habitats. This mostly occurred during the night with fish moving to the stream margins and nearshore areas during the day. Thus, we expect spring-run juvenile Chinook salmon and steelhead to be present at the project site during the in-water construction.

Table 5. Timing of Fish Presence in the Action Area.

Species	Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				*IWWW									
UCR Steelhead	Adult	MIGRATION											
	Juvenile	MIGRATION and REARING											
MCR Steelhead	Adult	MIGRATION											
	Juvenile	MIGRATION and REARING											
SRB Steelhead	Adult	MIGRATION											
	Juvenile	MIGRATION and REARING											
UCR Spring-run Chinook salmon	Adult			MIGRATION (mid-March to mid-June)									
	Juvenile	MIGRATION and REARING											
SR fall-run Chinook salmon	Adult								MIGRATION				
	Juvenile	MIGRATION and REARING											
SR Spring-Summer Chinook salmon	Adult			MIGRATION (mid-March to late October)									
	Juvenile	MIGRATION and REARING											
Sockeye Salmon	Adult					MIGRATION (mid-May to mid-November)							
	Juvenile	MIGRATION and REARING											

*Oregon Department of Fish and Wildlife recommended in-water work window (IWWW) from December 1 to March 31.

2.5.2. Effects to Species

We anticipate short-term effects to exposed species and life stages during in-water construction, pile-driving and the installation of the new pipeline, fish screens and associated in-water structures. The short-term effects include the potential for behavior modification, as well as harm, injury and death from in-water construction; reduced fitness from degraded water quality during construction; harm, injury and death from pile-driving; and temporary altered fish passage and migration. We anticipate long-term effects as a consequence of potential increased predation risk from the presence of new in-water and over-water structures, and injury and death from potential entrainment and impingement at the fish screens. These effects are described below.

Harm, Mechanical Injury or Death during In-water Construction

The proposed action includes in-water construction using heavy equipment to install sheet-pile walls, piles, the intake pipeline, and fish screen structures. In-water construction will occur in waters up to 15 feet deep across approximately 5,600 ft² of the Columbia River. The structures will occupy 745 ft² below the OHWM. During in-water construction, fish will likely experience behavioral modifications if they remain within the immediate work area, most are expected to move into the substrate, others may swim away to avoid the in-water construction. Adults and older juveniles are generally better at avoiding this kind of disturbance. However, some smaller fish are less likely to avoid construction activities, and may be injured or killed. In-water activities will take up to 6 weeks, occurring between December 1 and March 31.

Based on the work window timing and water depth, only adult steelhead (SRB, MCR, and UCR), subyearling Chinook and juvenile steelhead from any of the ESUs/DPSs are expected to be present in the McNary Reservoir. Since adults and larger juveniles are better able to avoid disturbance, we anticipate adult steelhead in the construction area will flee from the area into deeper waters or nearby areas away from the in-water work.

In-water construction will occur intermittently over a 6-week time period. A few adult and juvenile fish from each of the ESUs and DPSs are expected to experience the effects from construction. Most will move away from construction activities. We expect all adult steelhead to be capable of swimming away from construction activities. However, we do expect some juvenile salmonids to be killed or injured from in-water construction. As construction begins each day, rearing fish will likely move into the river bottom substrate and be killed or injured. Juvenile fish that can move out of the construction area are not expected to be harmed because there is habitat of similar quality nearby that will support adequate feeding and resting. The juvenile fish that remain in the construction area may be injured and harmed. We anticipate that will be just a few fish because the distribution of a low abundance of fish throughout the migration and rearing corridor results in a low density. Further, we expect the injured and dead fish to be distributed across multiple populations and MPGs.

Water Quality

Sedimentation and turbidity. The proposed project includes in-water construction involving pile-driving below the OHWM to install the intake pipeline, screens, and sheet-wall structures. Heavy machinery equipment and pile-drivers will install new in-water structures and disturb the channel substrate during in-water work. Suspended sediment and turbidity will temporarily increase during the in-water work.

Effects to salmonids are reasonably likely to occur from substrate disturbance through in-water construction and pile-driving activities. These activities will temporarily increase delivery of fine sediments, increase turbidity in the water column, and degrade water quality.

All in-water construction is anticipated to occur for up to 6 weeks. The proposed action will increase turbidity each day construction disturbs the channel substrate, or pile driving occurs. Turbidity levels will increase in the immediate in-water work site each day and will likely settle out overnight, but rise again in the morning when in-water work resumes. Due to the small size of proposed substrate disturbance during pile-driving, we expect the turbidity levels to be near or slightly above background turbidity levels in the reservoir in winter. Because background levels are naturally high in the large river, we expect turbidity monitoring measurements as required by ODEQ to not exceed 50 nephelometric turbidity unit (NTU), or 10% above background levels down current of the in-water construction area. This additional suspended sediment will occur during project implementation and extend just minutes following completion. Any fish remaining near the immediate construction and in-water work will experience the full effects of increased turbidity levels and be harmed or injured. However, since the area is in the mainstem of the Columbia River, the turbidity is expected to dissipate in a downstream direction rather quickly (minutes). Although some fish may experience the effects of turbidity, we expect these to only rise to the level of injury of a few juvenile fish during construction activities that generate high levels of turbidity, including the substrate disturbance.

The effects of suspended sediment and turbidity on fish range from beneficial to detrimental. Elevated total suspended solids (TSS) have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival, but elevated TSS has also been reported to cause physiological stress, reduce feeding and growth, and adversely affect survival. Although fish that remain in turbid waters may experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998), chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd et al. 1987; Redding et al. 1987; Servizi and Martens 1991). Salmonid gill-flaring and behavioral modifications including feeding changes have been observed in response to pulses of suspended sediment (Berg and Northcote 1985) and turbidity plume avoidance has been observed in salmonids and other fish (Sigler et al. 1984, Lloyd et al. 1987, Servizi and Martens 1991).

During in-water work, any juvenile salmonid or steelhead present within the project site are most likely to experience one or more of these physical or behavioral effects from the reduction in water quality. They are likely to exhibit reduced feeding and behavior modifications. During in-water construction, turbidity levels will be close to background, which are naturally high during the winter, and we do not expect juvenile or adult fish to respond to the small water quality changes. Larger fish will move out of the area with higher turbidity. Smaller juveniles that are less likely to flee may exhibit reduced feeding for a few minutes. This is not expected to reduce their fitness because there are opportunities for resting and feeding nearby. We anticipate fine sediments will dissipate and settle onto the channel substrate relatively quickly or be carried downstream. Given the small work area, the short duration of in-water work and increased turbidity, and the small number of fish expected to be in the area, the effects of increased turbidity on ESA-listed salmonids are expected to be small, isolated, and short-term, and distributed across all populations within the action area during the in-water work period.

Chemical contamination. As with all construction activities involving the use of mechanized equipment, accidental release of fuel, oil, and other contaminants may occur during construction. NMFS expects that the use of machinery will result in a small amount (not more than a few ounces) of oil and hydraulic fluid being leaked during operations. Any leak will likely be very small where it would have short-term adverse effects on water quality and macroinvertebrates. Operation of machinery in close proximity to a stream increases the chance a large fuel spill or hydraulic line rupture will contaminate the water. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain polycyclic aromatic hydrocarbons (PAHs), which can kill salmon at high concentrations, and can cause sublethal, adverse effects at lower concentrations (Meador et al. 2006). If enough of the fuel or contaminant spills, it could injure or kill aquatic organisms. The proposed action will include the use of heavy equipment (an excavator) deployed on the riverbank and from floating barges. There is the potential for accidental spills of petroleum products or other hazardous materials into the river from this equipment.

However, based on review of past projects implemented while using similar best management practices, NMFS anticipates PAH releases of only very small quantities (ounces) are likely with each accidental release or spill. Conservation measures (staging areas, pollution control plan, and diapering of heavy equipment) will be implemented to minimize the use of toxic substances and prevent or contain any spill that may occur.

The ODEQ requires the proposed action (and the contractor) to comply with water quality requirements, daily inspection of equipment for work below the OHWM, and multiple conservation measures to maintain and protect water quality. The proposed action will limit in-water work to the winter season, when the densities of ESA-listed fish are lowest in the Columbia River. For these reasons, it is unlikely that effects of chemical contamination from the proposed action will injure or harm any juvenile or adult fish.

Substrate Availability and Quality

The proposed action includes disturbance of channel substrate habitat during installation of the sheet-pile walls, piles, pipeline, and fish screens. Approximately 147 ft² of the channel substrate and shallow water habitat will be disturbed and permanently occupied and covered with new in-water structures from the proposed action. This will occur during pile-driving installation of the sheet-wall and piles; and installation of the pipeline and fish screen structures within the Columbia River. Once the sheet-walls, piles and other in-water structures are installed, the channel substrate will be lost as available benthic substrate for invertebrate communities. Any remaining small areas of disturbed substrate are expected to be recolonize with benthic invertebrates within a few days to weeks post project completion. The disturbed and lost substrate area is a small size compared to the overall available shallow water habitat in the action area. The prey base will be slightly reduced in the immediate substrate areas that will be covered by the pipeline. We do not anticipate the small amount of benthic substrate disturbed or permanently lost around the intake pipeline or screens will result in a significant impact to the established benthic invertebrate community at the site. Spring migrating juveniles of any population considered in this opinion could experience temporary, small effects of this loss. However, juvenile salmonids will feed nearby in similar habitats, and thus the effects to feeding will be small to negligible.

Ambient Light/Shading and Predation

The reduction of ambient light (e.g., light attenuation and shading) is one of the primary mechanisms by which overwater (barges, moored vessels) and in-water structures (pipeline, screens, manifold, and pilings) adversely affect salmon and steelhead. The two temporary barges and a tugboat (up to 11,700 ft²) will be in the Columbia River for up to 6 weeks. We anticipate the barges will likely move along the pipe length and vicinity, as needed, to access the work area. In addition, the new intake, twelve steel piles, manifold, and screens will create 745 ft² of new permanent in-water structures in the Columbia River. These structures will create shaded areas and may attract piscivorous predators. Pilings placed in flowing water create low velocity microhabitats that allow predators such as smallmouth bass and northern pikeminnow to conserve energy by holding in these areas and catching prey as it passes (Petersen et al. 1993). The temporary barges will be present only during construction, which will last for up to 6 weeks. The new pipeline, screens and structures will be in the Columbia River for as long as the pump station exists.

Light levels are a determining factor that can impair fitness and survival in juvenile salmonids by altering certain behaviors, such as migration, feeding success, and predator avoidance (Nightingale and Simenstad 2001; Rondorf et al. 2010). Overwater structures can substantially reduce light levels necessary for these behaviors. Studies have documented use, and sometimes selection, of in-water and overwater structures by predators such as smallmouth bass and

northern pikeminnow (Pribyl et al. 2004; Celedonia et al. 2008). Studies in the Columbia River reservoirs have estimated juvenile salmonids account for high portions of northern pikeminnow diets (Poe et al. 1991; Zimmerman and Ward 1999; Harnish et. al 2014). A stationary barge moored in shallow water can providing a haven for predatory fish such as smallmouth bass and northern pikeminnow, which prey on juvenile salmonids in the Columbia River system (Vigg et al. 1991; Tabor et al. 2004; Zimmerman and Ward 1999; Fritts and Pearsons 2004). Rieman et al (1991) estimated piscivorous predators may be consuming 17% of the juvenile salmon that enter the John Day Reservoir. The shaded area can increase a predator's capture efficiency of prey. In general, predation on juvenile salmonids increases as light intensity decreases (Petersen and Gadomski 1994; Tabor et al. 1998).

We expect a few individual juvenile salmon or steelhead will experience behavior modifications (reduced feeding success, altered migration, avoidance) that may reduce fitness; and a few individuals may experience injury or death from predation. We anticipate the altered lighting regime will increase predation of juvenile salmon and steelhead in the short-term and long term. We expect short-term effects from the temporary barge including some changes in rearing and migration during the IWWW. We anticipate many of these juvenile salmon and steelhead will flee from the area. However, a few individual juvenile salmon may experience injury or death from predatory fish. We expect long-term effects from the new in-water structures. In-water structures can increase the exposure of juvenile salmon to predators by providing advantageous habitat, reducing refugia, and diverting juveniles into deeper waters. These effects would be experienced by all salmonids and steelhead populations using the nearshore areas where overwater structures are located, but the majority of the effects will be manifested on nearshore-oriented fish, which are generally subyearlings, when they avoid shaded areas produced by these types of structures. We anticipate a few juveniles including subyearling Chinook salmon (including UCR spring-run, SR spring/summer-run, SR fall-run Chinook salmon), and juvenile steelhead (including MCR steelhead, UCR steelhead, and SRB steelhead) are likely to be injured or killed by predation from the new structures as long as the in-water structures exist at the site. Any fish injured or killed will likely be distributed among any of the populations that could be present.

Intake Entrainment/Impingement during Project Operation

The project includes installing a new 42-inch-diameter intake pipe and two 72-inch-wide by 202-inch-long half-barrel fish screens that will extend out 125 feet from the pump station into the Columbia River. The fish screens (total area 202 ft²) will be secured and supported by the manifold "tee" connected to the intake pipeline leading to the pump station. The pump station intake has the capacity to pump at a rate of 9,250 gpm. The new screens are designed to meet 2011 NMFS fish passage criteria. Potential injury or mortality of fish at the existing screens during the irrigation season is likely part of the environmental baseline. The new intake pipe and fish screens meeting NMFS fish passage criteria will minimize injury or mortality of listed salmonids. We expect the new screens' designs will reduce the current risk of potential entrainment and impingement to listed juvenile salmon and steelhead compared to the current existing screens. However, it will not completely eliminate the potential risk to any present juvenile salmon or steelhead from injury, or being killed if present in front of the fish screens and intake during pumping operations.

Adult salmonids and most juvenile salmonids in the vicinity of the intakes and screens will likely volitionally swim away from the area and avoid injury or death from entrainment and impingement at the front of the intake screens and pumps. Subyearling Chinook salmon and juvenile steelhead are the most likely to be exposed to effects during rearing or migrating in the shallow waters (up to 15 feet deep) near the project site. Smaller juvenile fish or smolts present at the immediate front of the intake and screen are more vulnerable to the effects of potential entrainment or impingement at the fish screen and may be injured or killed. We anticipate a few individual juvenile salmon and steelhead of any of the populations present may encounter injury or be killed annually, if they are unable to flee from in front of the intake structures. We do not expect the number of fish killed to be a significant amount to affect the abundance of any population of ESA-listed salmon or steelhead considered in this opinion.

Sound Pressure Levels and Noise

Pile-driving will create short-term hydroacoustic disturbance to any juvenile or adult salmon or steelhead present in the action area. Pile-driving increases SPLs and noise during construction. The project entails pile-driving to install the 80-foot sheet-pile walls around the pump station and twelve 12-inch steel piles. Installation will occur primarily with a vibratory pile-driver. However, an impact pile-driver will be used, only if necessary, to set the piles if substrates prevent complete installation by the vibratory driver. Based on the additional information² provided by Campbell LLC, the cumulative duration of peak underwater noise from pile-driving is anticipated to be up to 5 days (40 hours) from vibratory driver installation. If an impact driver installs piles, a total maximum of 200 strikes by an impact driver is anticipated. All pile-driving installation will be completed during one week of the IWWW. Pile-driving operations will only be completed during the day.

Fishes with swim bladders (including salmonids) are sensitive to underwater impulsive sounds (i.e., sounds with a sharp sound pressure peak occurring in a short interval of time). As the pressure wave passes through a fish, the swim bladder is rapidly compressed due to the high pressure, and then rapidly expanded as the “under-pressure” component of the wave passes through the fish. These injuries resulting from compression and decompression from a sound pressure pulse are known as barotrauma (Halvorsen et al. 2012; Popper et al. 2019). Injuries from intense or continuous underwater sound pressure can include damage to the auditory system. This can result in a temporary or permanent loss of hearing known as either a “temporary threshold shift” (Carlson et al. 2007) or a long-term “permanent threshold shift” (Lieberman 2016). The level of injuries can vary based on the intensity and characteristic of the high pressure, distance to the pressure source, the size and species of the fish (Hastings and Popper 2005; CalTrans 2020). Barotrauma injuries can include external and internal damage including bulging eyes, ruptured organs and swim bladders, hemorrhaging and death (Brown et al. 2009; Brown et al. 2012; Halvorsen et al. 2012) Fish respond differently to sounds produced by impact drivers than to sounds produced by vibratory drivers. Vibratory drivers produce a more rounded sound pressure wave with a slower rise time. Because the more rounded sound pressure wave produced by vibratory drivers produces a slower increase in pressure, the potential for injury and mortality is reduced.

² Email between Eric Campbell (Campbell LLC) to Rebecca Viray (NMFS) on June 25, 2020, containing additional information of total vibratory and impact driving details for removal and installation of sheet-walls and steel piles.

The Fisheries Hydroacoustic Working Group (FHWG), multi-agency work group, determined SPLs where fish are likely to experience effects from pile-driving activities (FHWG 2008). Instant injury or death can occur from levels at or above 206 decibels (dB) peak (single strike). Injury to fish larger than 2 grams occurs at 187 dB sound exposure level (SEL), and at 183 dB SEL where fish are smaller than 2 grams for cumulative strikes. In addition, a “harassment” threshold above SPLs of 150 dB is applied for where behavioral effects or potential physical injury (i.e., harm) to individual salmon or steelhead within a distance of the source may occur (Popper et al. 2006; FHWG 2008).

We anticipate fish will experience behavioral modifications from sounds generated through vibratory driving as fish flee the vicinity. Impact pile-driving can produce underwater sound pressure waves that can have effects on fish, varying upon the variables of type and intensity of sounds, size of the piles, firmness of the substrate, water depth, and the type and size of the pile-driver. Larger piles and firmer substrate require greater energy to drive the pile, resulting in higher SPLs. This is a relationship between driven energy and its transformation into overcoming friction or resonance. Hollow steel piles produce higher SPLs than similarly sized wood or concrete piles (Hastings and Popper 2005). Sound attenuates more rapidly in shallow water than in deep waters (Rogers and Cox 1988). However, fish with swim bladders and smaller fish, which tend to be in shallower water, have been shown to be more vulnerable to injury (Hanson et al. 2003).

Impact pile-driving. For this project, we reviewed projects with comparable data or pile sizes installed at similar project and sites on the Columbia River mainstem, and we reviewed information in the BA. The BA used the NMFS hydroacoustic calculator and data from the Washington State Department of Transportation (WSDOT 2016) to determine distances individual fish may encounter effects from impact pile-driving. The calculator used baseline single strike levels of 207 dB peak, 173 dB SEL, and 189 dB root mean squared (RMS) for a 12-inch-diameter steel piling measured at 10 meters and a default transmission loss constant of 15 meters. However, NMFS hydroacoustic calculator method is conservative to determine maximum distance of direct injury or behavioral modifications to listed species. Popper et al. (2019) studied the onset of tissue injury on juvenile Chinook salmon and found the relationship between the number of injuries and severity increased as the single strike SEL and cumulative SEL increased. Based on the calculations for this project, the instant physical injury or death would occur up to a maximum distance of 10 feet (3 meters) from the pile. The project anticipates, if all work requires pile installation by impact driver, there will be a maximum of 200 pile cumulative strikes total applied for project implementation. Pile-driving will cease overnight. While we anticipate any impact pile driving may occur over several days, our calculations is a conservative approach and assuming all 200 pile strikes completed during only 1 day. Based on these factors, we expect cumulative injury or the onset or auditory tissue injury for fish greater than 2 grams may occur within 30 feet (9 meters). Based on fork length data of juvenile salmonids passing through the Columbia River presented by Cooney (2002) and the length curves presented by MacFarlane and Norton (2002) and Duffy (2003), juvenile salmonids in the action area will be heavier than 2 grams. Potential behavioral effects may occur at a distance of approximately 2,815 feet (858 meters).

We anticipate that most fish will have fled and avoid the work area once in-water construction initiates. This will reduce potential direct injury or death to individual listed fish present within the radius where SPLs will extend. The applicants will use a bubble curtain during any impact driving installation. The proper use of a sound attenuating device (confined bubble curtain) can also result in reductions in SPLs depending on the type of impact driver and site specific conditions, potentially reducing effects to listed species during pile-driving (Wursig et al. 2000; Rodkin and Pommerenck 2014; CalTrans 2020). We expect the use of a bubble curtain will reduce the likelihood of fish being in close proximity to impact pile-driving.

We anticipate if an impact driver will be needed, a few individual juvenile salmon and steelhead of any of the ESUs and DPSs may encounter hydroacoustic SPLs during impact pile-driving that will injure or kill them. We anticipate any individual salmon and steelhead greater than 2 grams and present within 10 feet from the site of impact driving will be injured or killed. To determine the amount of juvenile salmon or steelhead that may be exposed to direct injury or death from pile-driving activities, we considered both the distance of potential injury from onset of impact pile-driving in combination with the potential mechanical injury and death from interactions with heavy equipment during the in-water construction, as previously described. We anticipate any fish exposed to risk of injury or death from pile-driving will also be exposed to injury or death from in-water construction. During winter, the lowest number of fish will be present in the action area. Therefore, we anticipate only a few juveniles and adults will be injured or killed from pile driving since most fish will flee once any construction or sound pressure disturbance begins, and because of the small size of the area where fish may experience injury and death surrounding each pile to be installed. The fish injured or killed will likely be distributed among the remaining populations of each ESU and DPS that could be present. We do not expect the number of juvenile fish killed to be a significant amount to affect the abundance of any population of ESA-listed salmon or steelhead considered in this opinion.

Vibratory pile-driving. It is difficult for NMFS to determine the type of response each individual fish will make. However, vibratory pile-driving is reasonably certain to alter individual salmon and steelhead rearing and migration behavior. In general, it is reasonable to assume some fish will exhibit a behavioral response over the short-term duration of pile-driving activity and will likely flee the immediate area. NMFS anticipates the majority of fish will respond by adjusting their behavior.

The use of a vibratory driver will greatly reduce the level of noise associated with the work, if feasible. We anticipate some individual fish may experience short-term behavioral modifications including reduced feeding success, altered migration, altered reaction time, and increased exposure risk to predators from avoiding elevated SPLs during vibratory pile-driving (CalTrans 2020) for up to several weeks. These behavioral modifications may reduce the fitness of a few juvenile salmon or adult or juvenile steelhead to a point where a few fish may experience delayed injury or increase exposure to death. NMFS does not believe that this response to vibratory driving will result in immediate direct injury or death to juvenile salmon or steelhead.

Reduced Access and Safe Passage

The temporary barges and the installation of the new permanent in-water structures (steel-pilings, intake, manifold and screens) and sheet-wall pilings will create both short-term and long-

term barriers limiting safe passage access to a small footprint within the action area for any juvenile or adult salmon or steelhead present at the project site along the shoreline of the Columbia River. The project will result in a permanent increase of 745 ft² of new in-water structures in the Columbia River. The presence of these structures may prevent full access by some juvenile salmon or steelhead to the immediate habitat or increased risk of predation. The action area contains ample space and migratory access around the site location and we expect adult and juvenile salmonids and steelhead will navigate around the in-water structures.

Project implementation will occur during the winter season; we anticipate the fewest number of juvenile salmon or steelhead would be potentially present or rearing in the project area. We expect a few individual juvenile steelhead will experience behavior modifications as they swim around the site area (reduced feeding success, altered migration, avoidance) but we do not anticipate this will alter the fitness of juvenile salmon or steelhead.

Summary

We estimate that a few juvenile Chinook salmon and juvenile steelhead will be killed or injured from in-water construction activities and pile driving. Juvenile salmon and steelhead present within the in-water work area will likely experience temporary behavioral modifications due to elevated sediments and turbidity during in-water construction. The additional in-water and overwater structures are anticipated to result in potential short-term and long-term exposure to injury or death from predation compared to current existing conditions. We estimate that a few juvenile Chinook salmon and juvenile steelhead will be injured or killed due to predation from temporary presence of overwater structures during project implementation. Over the long-term, we estimate that each year a few juvenile Chinook salmon and juvenile steelhead will be injured or killed annually due to predation from the permanent new in-water and over-water structures. We estimate a few individual juvenile salmon and steelhead will be injured or killed annually due to entrainment and impingement in front of the fish screens from the operation of the intake pumps.

2.5.3. Effects on Critical Habitat

The critical habitat PBFs most likely to be affected are substrate, water quality, forage, and safe passage.

Substrate

Approximately 147 ft² of near-shore, shallow-water benthic habitat will be disrupted by pile-driving, and new in-water structures (up to maximum 15 feet deep) during in-water construction to install the new sheet-pile walls, piles, intake pipeline and fish screen. The substrate is composed of cobble, coarse sand, and depositional materials that provide habitat for benthic invertebrates and forage prey. Approximately 90 cubic yards of materials (piles, pipeline and screens) will be placed below the OHWM of the river. The new in-water pipeline and structures will occupy the substrate and there will be a long-term small loss of the 147 ft² of substrate available for benthic habitat. Overall, this disturbance to substrate is a very small portion of the available habitat in the McNary Reservoir. Increased turbidity from project activities will result in sediment deposition downstream of the in-water work area, which has the potential to adversely affect primary and secondary productivity (Spence et al. 1996) for a short time period during and immediately following in-water work. Excess fine sediment in the action area is

expected to occur over a small area and is likely to be transient, as daily and seasonal increases in water velocity remobilize and redeposit these sediments in slower moving portions of the reservoir. The scale of impact will be minimal relative to the rearing habitat in the action area, and will not meaningfully change the conservation value of substrate within the McNary Reservoir.

Water Quality

The proposed action will have an intermittent, short-term (up to 6 weeks) negative effect on water quality by increasing suspended sediment and turbidity during the in-water construction. Additionally, an area downstream of the in-water work will have increased suspended sediment as a result of substrate disturbance during in-water construction and pile-driving activities for minutes after the project completion. Excess suspended sediment and increased turbidity will likely settle out in some areas with low velocity, or may settle or disperse to downstream areas within the McNary Reservoir. We expect any increased sediment or turbidity generated will quickly settle into low velocity areas or become mixed with the river and be indistinguishable from background levels. Erosion and sediment measures to reduce excess turbidity and suspended fine sediments from upland construction. NMFS anticipates any excess turbidity will disperse with the river current and not be distinguishable from background levels down current of the proposed action.

The use of heavy equipment may result in very small amounts of pollutants entering waterways as discussed above. However, the project will use conservation measures (storage and fueling of lubricants, fuels in designated areas, hazardous and spill plans) to minimize and limit effects of chemical contamination reducing water quality. With these measures, it is unlikely chemical contamination from heavy equipment use will have more than a minimal effect to water quality, and thus will not reduce the conservation value of the action area.

Given the BMPs, erosion control methods, a PCP plan, and the use of the IWWW, NMFS believes that the effects to water quality will not meaningfully decrease the function of this PBF in the action area.

Forage

The proposed action will have a short-term and long-term negative effect on benthic macroinvertebrates by crushing, covering, or displacing them during installation, and during the long-term presence of the intake pipeline and screens. We expect pipeline and screens will result in the reduction in available benthic habitat and may disrupt established macroinvertebrate communities. This will reduce forage opportunities where the pipeline and in-water structures will be present. Nearby benthic macroinvertebrates will begin to recolonize and will fully recolonize any remaining small disturbed substrate area within a few weeks after project completion. The alteration of this small amount of habitat could have some minimal localized effects to forage for out-migrating and rearing juvenile salmonids and steelhead that use this nearshore area during construction, and for up to several weeks after project completion. We anticipate the localized reduction in available forage will have a small long-term impact to the quality of habitat. However, given the size of the reservoir, and the amount of available local nearshore habitat, we do not anticipate that this project will change the conservation value of forage in the McNary Reservoir.

Safe Passage

The proposed action will create short-term and long-term alteration of PBFs for passage. Short-term safe passage will be reduced during the 6-weeks of in-water construction when the heavy equipment and barges are present. This construction will occur at a time when very few fish of any species will be migrating either upstream or downstream.

The installation of 745 ft² of new in-water structures will reduce a small amount of habitat available for safe passage as long as the pump station exists. The in-water structures will create additional cover where predators may hide. This may result in a small increased risk to juvenile salmonids from additional exposure to additional predation. Bass and northern pikeminnow are predators on juvenile salmonids. The proposed action's additional permanent over-water and in-water structures may increase bass and pikeminnow predation success, and could minimally reduce juvenile salmon and steelhead passage success.

We expect the NMFS-approved fish screens will improve condition and beneficial effects regarding safe passage, reducing risk of entrainment and impingement in front of the intakes; although, the NMFS-approved fish screens will not eliminate all risk of entrainment and impingement of juvenile salmon or steelhead.

We expect both the short-term and long-term alteration of passage will occupy only a small footprint within the McNary Reservoir, around which migration in either direction will be unimpeded. We expect this alteration of the PBFs for safe passage due to the new in-water structures will be permanent.

2.6. Cumulative Effects

“Cumulative effects” are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

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

During this consultation, NMFS searched for information on future State, tribal, local, or private actions that were reasonably certain to occur in the action area. Resource-based activities such as timber harvest, agriculture (including substantial irrigation withdrawals affecting both tributary and mainstem Columbia River flows), mining, shipping, and energy development are likely to continue to exert an influence on the quality of freshwater habitat in the action area. Irrigation of farmlands contributes to large amounts of in-stream water withdrawals throughout the basin. Applications of pesticides and chemicals for agricultural production contribute to pollutant inputs and accumulate to degrade water quality. Additional effects to ESA-listed salmonid and steelhead are anticipated with population growth, urban development, and increases in

recreational use of the Columbia River. The population of Umatilla County, Oregon, grew 2.7%³ from 2010 to 2019. NMFS assumes the population for Umatilla County will continue to grow for the foreseeable future. As the human population in the action area grows, demand for agricultural, commercial and residential development, and recreation is likely to increase as well. Industrial and commercial developments often contribute to increases in shoreline riprap, altered landscapes and increases in impermeable surfaces. The effects of new development are likely to reduce the conservation value of the habitat within the action area. However, the magnitude of the effect is difficult to predict and is dependent on many social and economic factors. NMFS is not aware of any specific future non-Federal activities within the action area that would cause greater effects to a listed species or designated critical habitat than presently occur.

Although these activities are ongoing and likely to continue in the future, the future rate of development will depend on whether there are economic, administrative, and legal factors that can either support or restrict development (or in the case of contaminants, safeguards). Therefore, although NMFS finds it likely that, the cumulative effects of these activities will have adverse effects commensurate to those of similar past activities; it is not possible to quantify these effects. Some of these future activities will require a Federal permit, and thus will undergo ESA consultation. Many future State or tribal actions would likely have some form of Federal funding or authorization and therefore would be reviewed by NMFS. This limits the scope of cumulative effects that can be factored in this analysis.

Based on the analysis above, the cumulative effects of future State and private activities will have a continued negative effect on ESA-listed fish and their habitats.

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 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 diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

2.7.1. Species

The environmental baseline is characterized by degraded floodplain and channel structure, altered sediment routing, altered hydrology, and altered water quality. Within the action area, the major sources of impacts to salmon and steelhead are hydropower dam systems as well as the continued development and maintenance of the shoreline including marinas, docks, roads, railroads, and riprap. Dams and reservoirs within the migratory corridor have altered the river environment and affected fish passage. Water impoundment, dam operations, and upstream land use activities affect downstream water quality characteristics. Salmon and steelhead are exposed

³ U.S. Census Bureau. Available at: <https://www.census.gov/quickfacts/umatillacountyoregon>.

to high rates of natural predation during all life stages from fish, birds, and marine mammals, exacerbated in some locations (by providing perch sites or hiding spots for predators) by development. Shoreline development has reduced the quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials and by further disconnecting the Columbia River from historic floodplain areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by non-native species. The riparian system provides inadequate protection of habitats and refugia for sensitive aquatic species. In addition, the cumulative effects of State and private actions within the action area are anticipated to continue to have negative effects on ESA-listed salmonids.

Climate change is likely to affect the abundance and distribution of the ESA-listed species considered in the opinion. The exact effects of climate change are both uncertain, and unlikely to be spatially homogeneous, and the ability of listed-species to adapt is uncertain. However, most of the effects of the action are short term, and thus climate change will not exacerbate the effects on species and habitat caused by the proposed action. Future potential water temperature rises may increase favorable conditions for piscivorous fish species. The long-term effects of predation risk from over-water structures is likely to continue and the degree to which the effect to predation risk may be altered by climate change remains uncertain.

The action area is used by UCR spring-run Chinook salmon, UCR steelhead, MCR steelhead, SRB steelhead, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon. Upper Columbia River spring-run Chinook salmon and SR sockeye are listed as endangered. All three UCR spring-run Chinook salmon populations, and the single extant SR sockeye salmon population, have an overall viability rating of high risk. The other five species are listed as threatened, and while some populations are viable, most populations within these ESUs/DPSs remain at moderate or high risk of extinction.

NMFS anticipates the proposed action will affect juvenile UCR spring-run Chinook salmon, UCR steelhead, MCR steelhead, SRB steelhead, SR spring/summer-run Chinook salmon, and SR fall-run Chinook salmon within the active in-water work area for a maximum of 6 weeks during the winter months. We do not expect juvenile SR sockeye salmon to be present in the action area during the IWWW. However, an individual juvenile sockeye may on occasion be rearing in the McNary Reservoir. Smaller juvenile fish that are less likely to flee may experience passage alteration if delayed due to avoidance of the in-water construction site, and some individuals are likely to die or be injured by equipment, pile-driving or high levels of turbidity. The work area is small and will affect only a few individuals of any population of each species. Adult steelhead are migrating or holding in the reservoir in the winter, and the avoidance behaviors caused by the proposed action are not expected to reduce their fitness because there is other similar habitat in the vicinity. A few individual adult UCR spring-run Chinook and SR spring/summer Chinook salmon may migrate through the action area beginning mid-March but we expect them to be able to avoid the in-water activities and thus we do not expect the proposed action will kill, injure or harm any adult Chinook. We do not anticipate adult SR fall-run Chinook or adult SR sockeye salmon will be present during the IWWW.

In addition to direct injury or death, juvenile salmonids may be harmed during and in the few months following construction because of the following:

- Pile-driving may create behavioral modifications as juveniles flee the area.
- Increased turbidity may disrupt normal feeding activities of juveniles and displace them to other areas of the reservoir.

These effects will be minor, temporary (days to a maximum of 6 weeks), and will affect all populations of juvenile salmonids that are present in the McNary Reservoir during the winter work window.

In addition to these short-term effects, there are likely to be long-term consequences of the proposed action. The screens on the new intake pipe will comply with NMFS' screening criteria to minimize entrainment of juveniles. However, even with proper maintenance a small number of juveniles may become impinged or scrape along the screen resulting in injury or death. The additional new in-water structures may result in an increase of exposure risk to predation for juveniles of all the species over the long-term existence of the structure. The installation of new in-water structures will result in the long-term loss of 147 ft² of available benthic habitat for macroinvertebrate communities, and reduced opportunity for available prey forage for as long as the pipeline occupies the channel substrate.

Considering the effects of the action added to the environmental baseline and the anticipated cumulative effects, NMFS has determined that the loss of a very small number of juvenile salmon and steelhead that may be caused by the proposed action will not be substantial enough to negatively influence VSP criteria at the population scale and will not appreciably reduce the likelihood of any population maintaining its current status. Because the effects will not be substantial enough to negatively influence VSP criteria at the population scale, the viability of MPGs, ESUs, and DPSs are also not expected to be reduced. The effects of the proposed action are not likely to appreciably reduce survival of any of the seven species considered in this opinion at the species level, nor is the action likely to reduce the likelihood of recovery of these species.

2.7.2. Critical Habitat

The proposed action has the potential to affect numerous PBFs within the action area. Those PBFs include water quality (sediment, turbidity, and chemical contamination), substrate, safe passage, and forage. The primary effects of the action will be short-term (up to 6 weeks) construction-related effects, and the long-term alteration of safe passage from additional in-water structures in the Columbia River. NMFS expects adverse effects to the above PBFs from the reduced water quality, temporary disturbance of the substrate and shallow-water benthic habitat, which will cause a temporary change to prey availability in the disturbed area. Increases in TSS and turbidity during project construction are expected in the immediate work area. We expect the short-term increase in turbidity will be indistinguishable from background levels immediately downstream of the work area and within minutes of work finishing each day. Background levels of turbidity in the Columbia River System reservoirs are quite high, and this temporary increase in turbidity in a small area of the river will not change water quality at the scale of the critical habitat designation.

Benthic disturbance in the construction area will reduce prey availability. The area of disturbed substrate is very small, and invertebrates will start to recolonize the remaining substrate as soon as construction is done. Recolonization will occur within a few weeks. However, the new in-water structures will result in long-term loss of benthic communities, prey availability and loss of a small amount of benthic substrate resulting from presence of the in-water structures. Safe passage will be reduced in the short term during the 6 weeks of in-water construction. The new in-water and over-water structures may slightly reduce safe passage at the immediate area and increase risk of predation as long as the structures exist at the project site. The new NMFS-approved fish screens will improve safe passage, and reduce the risk of entrainment in front of the intake pumps for as long as the pump station exists. The disturbed area is a small fraction of similar quality, shallow habitat area available for use in the McNary Reservoir and thus will not reduce the conservation value of the forage PBF at the scale of the designation.

Based on our analysis that considers the current status of PBFs, adverse effects from the proposed action will cause a small and localized decline in the quality and function of PBFs in the action area. However, because of the scale and extent of the effects to PBFs, we do not expect a reduction in the conservation value of critical habitat in the action area. As we scale up from the action area to the designation of critical for each species, the proposed action is not expected to appreciably reduce the conservation value of the designated critical habitat.

2.8. Conclusion

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

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "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 of juvenile salmon and steelhead is reasonably certain to occur as follows: (1) behavioral changes due to increased turbidity and in-water disturbance; (2) mechanical injury or death from in-water work equipment; (3) behavioral changes, injury and death from hydroacoustic disturbance generated from vibratory or impact pile-driving activities; (4) increased injury and death from predation; and (5) injury and death from entrainment, or impingement from operations of the intakes and fish screens. NMFS is reasonably certain the incidental take described here will occur because: (1) ESA-listed species are known to occur in the action area; and (2) the proposed action includes in-water activities that are reasonably certain to harm or kill juvenile steelhead and salmon.

We anticipate the proposed action is likely to result in harm, harassment, injury and death to juvenile salmon and steelhead from any of the DPSs and ESUs within the active in-water construction area. Subyearling Chinook salmon and juvenile steelhead are the most vulnerable and likely to be exposed to harassment, injury and death while rearing in shallow water habitat during the IWWW. Although juvenile SR sockeye salmon are least likely to be present during the in-water construction, an individual fish may occasionally rear in the winter and thus may experience harassment, injury or death. Based on the timing and shallow water depths, a small number of adult steelhead (SRB, MCR, and UCR) are likely to be present in McNary Reservoir during the in-water work. A small number of adult Chinook may be migrating through the action area during the end of the IWWW. Adult UCR spring-run and SR spring/summer Chinook salmon are least vulnerable to effects from construction. Adult sockeye salmon and SR fall-run Chinook salmon are not anticipated to be in the project area during in-water construction. Adult salmon and steelhead are likely to flee from the in-water work area during in-water construction and installation of the pipeline and screens. All juvenile salmon and steelhead of any ESUs/DPSs are anticipated to be exposed to long-term increased risk of injury or death from predation risk due to the installation of new permanent in-water and over-water structures.

Incidental Take from Increased Turbidity and Disturbance

NMFS expects salmon and steelhead to be temporarily displaced and likely have reduced feeding (harm) due to elevated turbidity levels resulting from in-water work and pile-driving associated with the installation for the new pipeline and fish screen structures. Because it is not feasible to observe fish harmed, NMFS will use the extent of elevated turbidity levels as a surrogate for take resulting from degraded water quality. These indicators are causally linked to incidental take from in-water construction including: substrate disturbance, pile-driving and installation of pilings, sheet-pile walls, and fish screens in waters containing the seven species covered in this opinion. We use the extent and duration of the turbidity because the amount of take increases as turbidity associated with the in-water work increases in extent and duration. Therefore, NMFS will consider the extent of take exceeded if turbidity is greater than 50 NTU during project construction (as measured consistent with ODEQ's required water monitoring during in-water work) or exceeds 10% of background measurements 100 feet downstream of the in-water work area when monitored every 2 hours during in-water work.

Incidental Take from Mechanical Injury or Death

NMFS anticipates the proposed action will result in injury or death as a result of in-water construction; including substrate disturbance and fill. Estimating the specific number of animals injured or killed by interactions with heavy equipment is not possible because of the range of responses that individual fish will have, because the numbers of fish present at any time is highly variable, and because it is not possible to observe the fish being injured or killed. While this uncertainty makes it difficult to quantify take in terms of numbers of animals injured or killed, our best estimate is that no more than a few juvenile Chinook salmon and juvenile steelhead will experience injury or death during in-water work at the project site location. We anticipate locating and finding all potential injured or killed fish may be impossible and hard to track. However, the extent of habitat altered by disturbance and loss of channel substrate during installation of the pipeline, pilings, fish screen and sheet-pile walls is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, the estimated extent of habitat encompassed by the substrate disturbance and new in-water structures represents the extent of take associated with mechanical injury and death. The proposed surrogate is causally linked to anticipated take because it describes conditions that will cause take due to in-water work. Specifically, NMFS will consider the extent of take exceeded if the proposed action places more than 100 cubic yards of fill, or covers over 150 ft² of channel substrate. This amount includes a small amount above the proposed action that we considered would not have additional anticipated effects.

Incidental Take from Hydroacoustic Sound Pressure Levels during Pile-Driving

NMFS expects the proposed action will result in harm, harassment, injury, or death to salmon and steelhead by exposure to hydroacoustic SPLs during vibratory and impact pile-driving activities. Salmon and steelhead experience behavior modifications (harm) through reduced feeding success and altered migration from avoiding elevated SPLs during vibratory pile-driving. The modifications may result in reduced fitness and survival to any juvenile steelhead or salmon present. Impact pile-driving can result in injury or death to any fish present in the vicinity out to 10 feet from the steel pile installation.

Estimating the specific number of animals injured or killed by pile-driving is not possible because of the range of responses that individual fish will have and because the numbers of fish present is highly variable and impossible to predict. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the duration of the pile-driving activities to which fish will be exposed is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, the duration of vibratory pile-driving (excess of 40 hours) or the total number of strikes (excess of 200 strikes in total) by an impact pile driver represents the extent of take associated with hydroacoustic SPLs during impact pile-driving activities. The proposed surrogate is linked to anticipated take because it described conditions that will cause take due to fish experiencing behavioral modifications during either vibratory pile-driving, or injury or death from impact pile-driving during the in-water pile installation activities. Specifically, NMFS will consider the extent of take exceeded if construction includes above 40 hours of vibratory pile-driving, or exceeds a total of 200 strikes by an impact pile-driver.

Incidental Take from Increased Predation

NMFS expects the proposed action will result in harm, harassment, injury or death to juvenile salmon and steelhead by increases in exposure to piscine predators. Salmon and steelhead fleeing from predators may experience behavior modifications (harm) through reduced feeding success and altered migration from avoiding predators (harassment). The modifications may result in reduced fitness and survival to any juvenile steelhead or salmon present. We expect injury or death of juvenile salmon and steelhead from increased predators due to the increase in ambient light and shade from the additional increase in permanent in-water structures. We expect some juvenile salmon and steelhead will experience direct injury or be killed from increased interactions with predators.

Estimating the specific number of animals injured or killed annually by increased predation is not possible because of the range of responses that individual fish will have, and because the numbers of fish present is highly variable both spatially and temporally. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the extent of the permanent change in habitat to which fish will be exposed is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked.

The increased predation associated with new permanent additional in-water and over-water structures (745 ft²) will likely occur as long as the Superior Farms' pump station, pipelines and fish screens exist. Therefore, the increased predation from the new permanent structures is best represented by the size of the footprint the new structures will occupy. The proposed surrogate is linked to anticipated take because it describes both the amount of area of changes in habitat conditions that will cause take due to increases in predator habitat. Also, this clearly quantifiable amount of area can easily be measured to determine if take is exceeded. Specifically, NMFS will consider the extent of take exceeded if the overall amount of the new in-water and over-water structures (pipeline, fish screens, piles, manifold, and sheet-pile walls) area exceeds 745 ft². Therefore, the increase in the areas of the new in-water structures represents the extent of take exempted from increased predation in this ITS.

Incidental Take from Entrainment and Impingement

NMFS anticipates the proposed action will result in injury or death as a result of entrainment and impingement at screens at the intake pump station. Estimating the specific number of animals injured or killed at intake screens is not possible because of the range of responses that individual fish will have, and because the numbers of fish present at any time is highly variable. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the rate of water withdrawal at the intake screens is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. The intake will have fish screens designed and installed appropriate for the authorized water right pumping rate to minimize entrainment or impingement of individual fish. The fish screens will meet NMFS fish passage criteria and thus minimize injury or death to the greatest extent practicable. Therefore, the estimated rate of the water withdrawal while pumping at the intakes represents the extent of take associated with entrainment or impingement. The proposed surrogate is linked to anticipated take because it described conditions that will cause take due to fish experiencing entrainment or impingement at the intake pump and screen. Specifically, NMFS will consider the extent of take exceeded if the withdrawal-pumping rate exceeds 9,250 gpm from both intake screens.

The surrogates described above are measurable, and thus can be monitored and reported. For this reason, the surrogates function as effective reinitiation triggers.

2.9.2. Effect of the Take

In the 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.

2.9.3. Reasonable and Prudent Measures

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

1. Avoid or minimize take from habitat disturbance and mechanical injury.
2. Avoid or minimize take from reduced water quality.
3. Avoid or minimize take from injury or death from pile-driving activities.
4. Avoid or minimize take from increased predation.
5. Conduct sufficient monitoring to ensure that the project is implemented as proposed, and the extent of take is not exceeded.

NMFS believes that full application of conservation measures included as part of the proposed action, together with use of the RPMs and terms and conditions described below, are necessary and appropriate to minimize the likelihood of incidental take of listed species due to completion of the proposed action.

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. 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 implement RPM 1:
 - a. A fish biologist experienced with fish salvage and relocation in the Columbia River should be consulted regarding the feasibility and effectiveness of an in-water isolation area. Methods may include installing seines, turbidity curtains, or electrofishing to remove fish from the project site, or other methods to minimize fish present in the immediate work area during in-water construction. Such methods should follow appropriate protocols for fish handling and relocation or NMFS electrofishing guidelines (NMFS 2000).
 - b. Document implemented methods to minimize potential fish presence during in-water construction work.

2. The following terms and conditions implement RPM 2:
 - a. Conduct turbidity monitoring as follows:
 - i. All in-water construction shall be conducted following the proposed sediment control measures and follow State and Federal water quality requirements to minimize sedimentation and turbidity in the Columbia River.
 - ii. Monitoring will be conducted daily, each 2 hours monitoring interval during daylight hours, when in-water work is conducted.
 - iii. Observations shall occur daily before, during, and after commencement of construction activities and compared to observable baseline turbidity measurements upstream of the action area.
 - iv. Background measurements will be measured or observed at an undisturbed site within the flow channel approximately 100 feet upstream of the project area.
 - v. Compliance measures will be measured or observed in the flowing channel approximately 100 feet downstream from the project area. Turbidity measurements should not exceed above 10% of the background measurements or 50 NTU. If turbidity is exceeded, BMPs will be modified and additional sediment control measures will be installed to minimize downstream increase of turbidity and fine sediments.
3. The following terms and conditions implement RPM 3:
 - a. Drive each piling as follows to minimize the use of force and resulting sound pressure:
 - i. Use the smallest driver and the minimum force necessary to complete the job.
 - ii. Use a drop driver or a hydraulic impact driver whenever feasible, and set the drop height to the minimum necessary to drive the piling.
 - iii. When possible, place a block of wood or other sound dampening material between the driver and the piling being driven.
 - iv. If water velocity is 1.6 fps or less, surround the piling being driven by a confined or an unconfined bubble curtain that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column.
 - v. If water velocity is greater than 1.6 fps, surround the piling being driven by a confined bubble curtain (e.g., a bubble ring surrounded by a fabric or metal sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.
4. The following terms and conditions implement RPM 4:
 - a. Any piles or over water structures that rise above the water surface should have conical cones or methods to defer avian predators, if feasible.
5. The following terms and conditions implement RPM 5:

- a. Track and monitor construction activities (as described below) to ensure that the conservation measures are not exceeding the authorized extent of take.
- b. Submit a completion of project report to NMFS 2 months after project completion. The completion report shall include, at a minimum, the following:
 - vi. Starting and ending dates for work completed, with in-water work period specified.
 - vii. Details of total footprint of disturbed area during in-water construction to ensure meeting the extent of take requirements.
 - viii. Summary and details of turbidity monitoring including:
 - (1) Any daily observed turbidity monitoring from the in-channel work area down current during the in-water construction period. Observations shall occur daily before, during and after commencement of construction activities and compared to observable turbidity.
 - (2) Description of the visually monitored downstream extent of turbidity plumes resulting from in-water construction and any substrate disturbance activities.
 - (3) A summary of turbidity monitoring results, including results of implementing required BMPs, and including a description of any erosion control failure, excess turbidity release, and efforts to correct such incidence.
 - ix. Summary and details of pile-driving activities including:
 - (1) Description of the total details of actual pile-driving implementation for installation of piles by both vibratory and impact-driving methods.
 - (2) Total hours of vibratory driving methods and total number of impact hammer strikes to install piles.
 - x. Photos of habitat conditions (open water including sediment control measures, shoreline, banks, vegetation, etc.) at the in-water work site before, during, and after project completion. General views and close-ups showing details of the project and project area, including pre- and post-construction. Label each photo with date, time, project name, photographer's name, and the subject. Provide and record the number and species of any observed injured or dead listed salmon or steelhead found at the in-water work site.
- c. All reports will be sent to:
 - National Marine Fisheries Service
 - Columbia Basin Branch
 - 304 South Water Street, Suite 201
 - Ellensburg, Washington 98926
 - Reference to NMFS consultation number: WCRO-2021-02376
- d. If the amount or extent of take is exceeded, stop project activities and notify NMFS immediately.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, “conservation recommendations” are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. Work with stakeholders in the Columbia River basin to remove any abandoned and obsolete old anthropogenic structures such as old pilings, concrete, rock or other non-natural debris below OHWM in the Columbia River to restore the natural channel substrate and features.

2.11. Reinitiation of Consultation

This concludes formal consultation for J&B Land Superior Farms’ Irrigation Intake Replacement Project.

Under 50 CFR 402.16(a): “Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) if the amount or extent of taking specified in the incidental take statement is exceeded; (2) if new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) if a new species is listed or critical habitat designated that may be affected by the identified 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. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species’ contribution to a healthy ecosystem. For the purposes of the MSA, EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”, and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). 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) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

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 PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The proposed project action area includes EFH for various life-history stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*) (PFMC 2014).

3.2. Adverse Effects on Essential Fish Habitat

Based on information provided in the BA and the analysis of effects presented in Section 2 of this document, NMFS concludes that the proposed action will adversely affect EFH designated for Chinook and coho salmon because it will have effects on water quality, substrate, benthic communities, and habitat connectivity.

The proposed project includes disturbance of channel substrate, pile-driving and installation of the new permanent pipeline, piles, fish screens structures, and sheet-piles below the OHWM and substrate of the Columbia River. This will result in in-water structures permanently occupying 745 ft² below the OHWM, and alter approximately 147 ft² of river bottom, altering benthic habitat and macroinvertebrate production. This action will result in disturbance of sediments and increased turbidity resulting in short-term and long-term adverse effects to water quality and feeding habitat.

Specifically, NMFS has determined that the action will adversely affect EFH as follows:

1. The temporary alteration of the near-shore environment by substrate disturbance and placement of new permanent structures within the channel substrate, which will affect juvenile rearing and, the quality of habitat in the migration corridor.
2. Temporary reduction in prey availability from removal and disturbance of the macroinvertebrate community and as a result of substrate disturbance and increased fine sediment in stream substrates due to instream work.
3. Short-term elevation of turbidity and sedimentation within the construction area and immediately down current from construction activities.
4. Habitat disturbance due to vibratory and possibly impact pile-driving (hydroacoustic impacts). The sound associated with pile-driving alters the physical properties of the habitat, temporarily reducing the quality of the habitat in the action area.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

We provide the following conservation recommendation:

1. Implement RPM 1, RPM 2, RPM 3, and RPM 5, and their terms and conditions described in the ITS in the ESA portion of this document, to minimize adverse effects to EFH due to pile-driving, operation of heavy equipment, and sediment disturbance.

2. Implement RPM 5(b), and its terms and conditions described in the ITS in the ESA portion of this document, to ensure completion of monitoring and reporting to confirm that these terms and conditions are effective for avoiding and minimizing adverse effects to EFH.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, for Pacific Coast salmon.

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 the 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 J&B Land LLC, consultants, citizens of affected areas, and

others interested in the conservation of the affected ESUs/DPSs. Individual copies of this opinion were provided to the Corps. The document will be available within 2 weeks at the NOAA Library Institutional Repository [<https://repository.library.noaa.gov/welcome>]. The format and naming adhere 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 part 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, 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, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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