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

VIA ELECTRONIC FILING

Refer to NMFS No:
NWR-2013-9721

February 3, 2015

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Reinitiation of Endangered Species Act Section 7 Formal Consultation for the continued operation, and construction, operation and maintenance of license mandated projects for Merwin (FERC No. 935-117), Yale (FERC No. 2071), Swift No. 1 (FERC No. 2111), and Swift No. 2 (FERC No. 2213) Hydroelectric Projects, Lewis River, HUC 17080002, Cowlitz, Clark, and Skamania Counties, Washington

Dear Secretary Bose:

The enclosed document contains a biological and conference opinion (opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to reinitiation of consultation under section 7 of the Endangered Species Act (ESA) on the effects of the continued operation and maintenance of license-mandated projects for the Merwin, Yale, Swift No. 1, and Swift No. 2 Hydroelectric Projects (collectively, hereafter, the 'Projects'). This reinitiation was triggered by, and addresses a species that was listed subsequent to the original Opinion,[1] and that may be affected by the Projects, as well as its critical habitat, which was also designated subsequent to the original Opinion. We also conducted a section 7 conference on a critical habitat that was proposed for designation subsequent to the original Opinion and that may be affected by the Projects. Specifically, this opinion addresses effects of the Projects, licensed through the Federal Energy Regulatory Commission (FERC), on the Southern distinct population segment of Pacific eulachon and its critical habitat and on proposed coho salmon critical habitat.

Eulachon are not a fishery managed by the Pacific Fishery Management Council and therefore do not have designated essential fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Therefore, this document does not include any MSA analysis.

[1] Biological Opinion for ESA Section 7 Consultation for the Operation of PacifiCorp and Cowlitz PUD's Lewis River Hydroelectric Projects (Merwin FERC No. 935, Yale FERC No. 2071, Swift No. 1 FERC No. 2111, and Swift No. 2 FERC No. 2213), Lewis River, Cowlitz, Clark, and Skamania Counties, Washington (NMFS Consultation No. 2005/05891)

NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Therefore to the extent the ITS contains RPMs and terms and conditions that address requirements other than monitoring those are voluntary until any future 4(d) rule goes into effect.

If you have any questions regarding this consultation, please contact Michelle Day at Michelle.Day@noaa.gov or 503-736-4734.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

Enclosure

cc: Service List

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp	)	**Lewis River Hydroelectric Project**
	)	**Merwin FERC No. 935**
Cowlitz PUD	)	**Yale FERC No. 2071**
	)	**Swift No. 1 FERC No. 2111**
	)	**Swift No. 2 FERC No. 2213**

CERTIFICATE OF SERVICE

I hereby certify that I have this day served, by electronic or first class mail, a letter to Kimberly D. Bose, Federal Energy Regulatory Commission, from the National Marine Fisheries Service, regarding National Marine Fisheries Service's Reinitiation of Endangered Species Act Section 7 Formal Consultation for the continued operation, and construction, operation and maintenance of license mandated projects for the Lewis River Hydroelectric Projects: Merwin (FERC No. 935), Yale (FERC No. 2071), Swift No. 1 (FERC No. 2111), and Swift No. 2 (FERC No. 2213) (NMFS Consultation No. NWR-2013-9721) and this Certificate of Service to each person designated on the official service list compiled by the Commission in the above captioned proceeding.

Dated on February 3, 2015

Jennifer McDonald Carlson

Endangered Species Act (ESA) Section 7(a)(2) Biological and Conference Opinion

Reinitiated Consultation (for Newly Listed Species and Critical Habitat) for the continued operation, and construction, operation and maintenance of license mandated projects for the Merwin (FERC No. 935-117), Yale (FERC No. 2071), Swift No. 1 (FERC No. 2111), and Swift No. 2 (FERC No. 2213) Hydroelectric Projects until end of licenses (2058)
Located on Lewis River, HUC 17080002
Cowlitz, Clark, and Skamania Counties, Washington

NMFS Consultation Number: NWR-2013-9721

Action Agency: Federal Energy Regulatory Commission

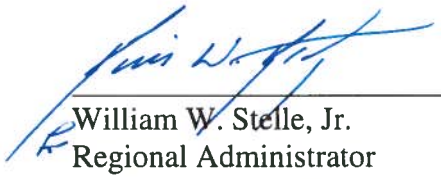
Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Southern distinct population segment, or DPS, of eulachon (Columbia River Smelt) (*Thaleichthys pacificus*)	Threatened	Yes	No	No
Lower Columbia River coho salmon (*O. kisutch*)	Threatened	Yes*	No*	No

*Critical habitat is proposed for Lower Columbia River coho salmon; effects to the species were previously considered in NMFS 2007, only effects to the proposed critical habitat for LCR coho are addressed in this opinion.

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Issued By:



William W. Stelle, Jr.
Regional Administrator

Date: February 3, 2015

TABLE OF CONTENTS

1. INTRODUCTION

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

1.1 Background

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

The opinion and incidental take statement are each in compliance with the Data Quality Act (44 U.S.C. 3504(d)(1) et seq.) and they underwent pre-dissemination review.

1.2 Consultation History

In January 1999, PacifiCorp filed a request with the Federal Energy Regulatory Commission (FERC) for a coordinated relicensing of the Swift No. 1 and No. 2, Yale, and Merwin Hydroelectric Projects, located along the Lewis River in portions of Clark, Cowlitz, and Skamania Counties, Washington.

PacifiCorp proposed relicensing these hydroelectric projects through a collaborative process which resulted in a single, negotiated Settlement Agreement, signed by state and federal agencies, tribes, and other stakeholders on November 30, 2004. The purpose of the Settlement Agreement was to identify and carry out long-term conservation measures for relicensing of the hydroelectric projects.

NMFS analyzed the requirements of the Settlement Agreement in an opinion issued August 27, 2007 (NMFS 2007) with the determination that the proposed action was not likely to jeopardize the continued existence of the Lower Columbia River Chinook salmon, LCR coho salmon, Columbia River chum salmon, or LCR steelhead. We also determined that the proposed action was not likely to destroy or adversely modify designated critical habitat for the above species except that critical habitat was not yet proposed for LCR coho salmon. FERC issued the final Swift No. I and 2, Yale, and Merwin Hydroelectric Project licenses on June 26, 2008. NMFS' August 27, 2007, opinion does not expressly analyze the effects of the Projects and associated Settlement Agreement on the Southern DPS of eulachon or its designated critical habitat. The species was not listed as a threatened species until March 18, 2010 (75 FR 13012), approximately three years after issuance of the 2007 opinion. Its critical habitat was designated on October 20, 2011 (76 FR 65323). Effects to eulachon and its critical habitat are considered in this opinion from the Merwin hydroelectric project and associated activities downstream from the Merwin dam to the confluence of the Lewis River with the Columbia River. Critical habitat for Lower Columbia River coho salmon was proposed on January 14, 2013 (78 FR 2726).

The FERC reinitiated consultation and provided a biological assessment on September 27, 2012. In that assessment FERC concluded that the actions analyzed previously are likely to adversely

affect the Southern DPS of eulachon and may affect, but are not likely to adversely modify its designated critical habitat. A complete record of this consultation is on file at the NMFS, Portland, Oregon office.

The NMFS sent two letters to FERC regarding the status of the consultation: an October 30, 2012, letter and a June 21, 2013, letter to Kimberly D. Bose, Secretary of FERC. The first letter conveyed that all the information required to initiate consultation was either included with FERC's letter and BA or was otherwise accessible for our consideration and reference and provided a timeline to complete this opinion. The second letter explained that we were aware that our delay in completing this opinion according to the original schedule was delaying construction work from occurring. It also explained that the delay occurred because it was the first ESA consultation to address eulachon and screens. We took extra time to work through the new issues that this consultation raised, including implications for listed salmon (e.g. while we have screen criteria for salmonids, we have no screen criterion that protects eulachon or affirms how use of the salmonid screen criteria will affect eulachon). We worked with other NMFS' Regional Offices to evaluate if other smelt species would be representative of this species and, if so, what the appropriate screen criteria or water withdrawal operations to protect listed eulachon might be, if any had been identified. Additionally, we reviewed available literature to aid in formulating an approach.

This reinitiated consultation was warranted by and addresses the listing of Southern eulachon and the designation of its critical habitat, which occurred subsequent to the 2007 opinion and which may be affected by the Merwin (FERC No. 935-117), Yale (FERC No. 2071), Swift No. 1 (FERC No. 2111), and Swift No. 2 (FERC No. 2213) Hydroelectric Projects. We also conducted a section 7 conference on LCR coho critical habitat that was proposed for designation subsequent to the original opinion and that may be affected by the Projects, and this document includes the resultant Conference opinion. In this reinitiation, we use the best available science (e.g., Gustafson et al. 2010, NMFS 2013) to consider effects to Southern eulachon and their critical habitat and to proposed coho salmon critical habitat.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. There are no interrelated or interdependent actions identified.

The proposed action addressed in this Opinion is the operations of the Merwin, Yale, Swift No. 1, and Swift No. 2 Hydroelectric projects (Projects) in accordance with the project's FERC license and Settlement Agreement. This license authorizes the construction and operation of fish release ponds, the rebuilding of the Lewis River hatchery intake and its operation, the Lewis River hatchery dredging project, and the Lewis River boat ramp maintenance project[2]. Below is

[2] The operation and management of every hatchery program is unique in time, and specific to an identifiable stock and its native habitat. Although this consultation addresses the construction of some hatchery infrastructure for the propagation of salmonids, the effects of the day-to-day operation and management of the facility—including the

a summary of the proposed action. Detailed descriptions of each project element are in FERC's September 27, 2012 biological assessment and are incorporated into this Opinion.

1.3.1 Continued operations of the Merwin, Yale, Swift No. 1, and Swift No. 2 Hydroelectric projects

Continued operations include, but are not limited to, flow changes in the lower river. Because these operations have not materially changed, a description of operations in the 2007 opinion is incorporated by reference here.

1.3.2 Construction and operation of fish release ponds

Section 4.4.3 of the Settlement Agreement mandates the construction of Release Ponds below Merwin Dam to be used for downstream, migrating salmonids that are captured at the Swift Reservoir downstream fish collection facility and potential future fish collection facilities in Yale and Merwin Reservoirs, if constructed. Juvenile salmonids captured at the Swift Reservoir collection facility (and/or potential future collection facilities in Yale and Merwin Reservoirs) will be transported by truck to the proposed Release Ponds. The purpose of the Release Ponds is to hold juvenile salmonids for approximately 24 hours to allow PacifiCorp to assess capture and transport mortality prior to their release into the Lewis River downstream of PacifiCorp's hydroelectric projects. This holding of downstream migrants also allows them to acclimate to lower river conditions after their transportation from the upper basin areas before being released into the river. The downstream migrating salmonids will be released from the ponds down a flume connecting directly to the Lewis River to complete their migration. The proposed Release Ponds Project is located along the west bank of the Lewis River at RM 8.8 within the City of Woodland, Washington (Figure 1).

The project site is comprised of a fallow agricultural field and narrow band of riparian vegetation. There are currently no existing structures or formal uses for the property. A limited amount of upland vegetation will be removed during construction of the facility; however, all disturbed areas outside the footprint of the facility will be restored.

Work conducted below the Ordinary High Water Mark (OHWM) of the Lewis River will occur within an agency-approved in-water work window (likely during the month of August), a period when water levels within the Lewis River are typically at their lowest and eulachon are not likely to be present within the river. In addition, several erosion and sediment control measures are proposed that will significantly minimize the potential for project-related impacts to water quality. These measures include work area isolation and the use of sediment control materials such as floating turbidity barriers, sediment fence, and straw wattles.

The primary features of the proposed facility are two fish holding ponds, with two raceways each. However, several additional facilities and structures are required for the ponds to properly function. The facility will include an intake pipe that extends from the holding ponds east towards the Lewis River that supplies aerated water to the ponds. The end of the intake pipe,

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interactions of hatchery-bred salmonids with naturally produced and native listed salmonids after release—will be addressed in a section 7 ESA consultation on the facility's Hatchery and Genetic Management Plans.

which will be located below the waterline of the Lewis River, will be affixed with a steel cone and NMFS approved fry-criteria fish screen to ensure juvenile salmonids are not entrained in the pump apparatus. The pump will be in operation all year around and will be equipped with an active cleaning device. The approach velocity of the pump will not exceed 0.4 fps in compliance with the NMFS hydraulic criteria. A flume that will extend from the holding ponds will be constructed to serve as both a drain for the ponds as well as the primary method for releasing juvenile salmonids into the Lewis River. The flume will extend east towards the Lewis River and outfall at the location of an informal, historic river access (to minimize disturbance during construction).

All in-water work areas will be isolated and contained prior to beginning in-water construction during the approved in-water work window. The construction contractor will install sandbag isolation measures (totaling approximately 110 cubic yards) and water pumps to ensure that all construction occurs in as dry of an area as possible, with limited impact to aquatic resources. By working in an isolated work environment, the contractor will minimize impacts on fish present in the Lewis River. In addition, a fish salvage (i.e. fish rescue) will occur within the sandbag isolation area to remove fish and aquatic species from the in-water work area before it is pumped dry. Water from within the isolated work area will be pumped to an upland vegetated area to allow it to infiltrate into the ground. Containment measures (e.g., sandbags and turbidity curtains) will be maintained in specific areas throughout in-water construction to minimize inadvertent discharges of material into the river. An In-Water Work Protection Plan (IWWPP) has been prepared and will be strictly followed during all periods of construction that involve in-water work. The construction contractor will also implement erosion control measures and Best Management Practices (BMPs) as outlined in the Stormwater Pollution Prevention Plan (SWPPP) for the project.

Operation of the proposed facility will consist of daily fish deliveries (likely as much as nine truckloads per day during peak outmigration), opening/closing of the pond control weirs, and general maintenance. Temperature and water quality within the ponds will be kept at conditions that are as similar to the Lewis River as possible. Fish held within the ponds will not be fed and it is anticipated that any effluent water will consist of natural and biodegradable materials already present in the Lewis River. Occasional vacuuming of the ponds with a portable pump system may be used to remove sediment if necessary.

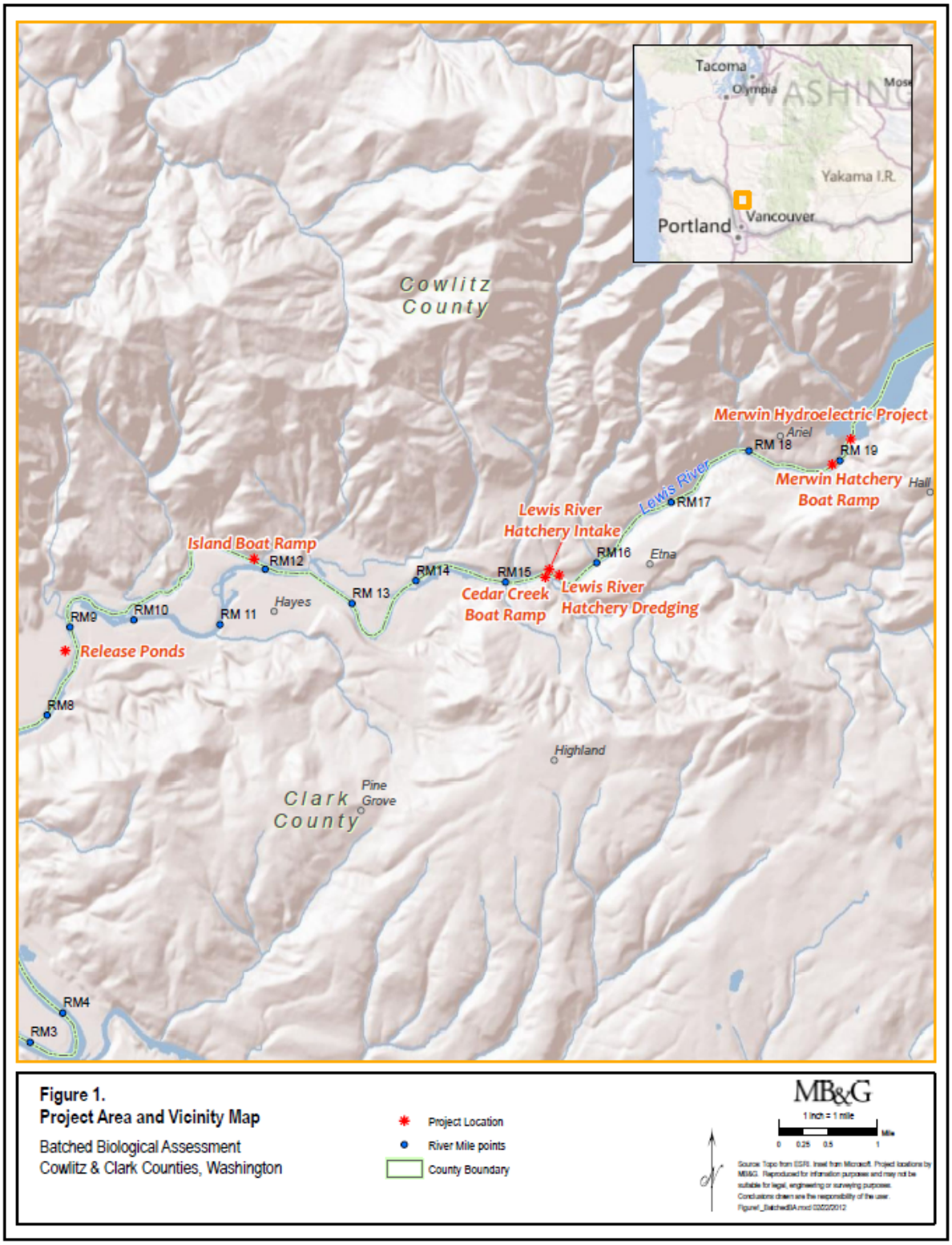

Figure 1.
Project Area and Vicinity Map

Batched Biological Assessment
Cowlitz & Clark Counties, Washington

1.3.3 Lewis River Hatchery Intake Rebuild and Operations

The Lewis River Hatchery is one of three fish hatcheries operated by the Washington Department of Fish and Wildlife (WDFW) within the larger Lewis Hatchery Complex (LHC). The Lewis River Hatchery intakes are located along the north bank of the Lewis River at RM 15.5 and RM 16 within Cowlitz County, Washington (Figure 1). As outlined in Schedule 8.7 of the Settlement Agreement, PacifiCorp is obligated to fund operation and maintenance of the LHC as long as the LHC facilities continue to produce fish for mitigation of the Lewis River hydroelectric projects (PacifiCorp 2004). The proposed Lewis River Hatchery Intake Rebuild specifically addresses necessary structural upgrades and intake screen replacements at the downstream water intake pumps. The downstream intake's existing structural support for the pump cans has been compromised by scour and the intake screens no longer meet NMFS criteria. The action includes repairs and upgrades to the downstream intake and the operation of both intakes.

The project site is comprised primarily of existing hatchery operation facilities and narrow bands of riparian vegetation. Some limited upland vegetation removal may be necessary during construction of the proposed staging areas; however, all disturbed areas outside the footprint of the facilities will be restored. Work conducted below the OHWM of the Lewis River will occur within an agency-approved in-water work window during the month of August a period when water levels within the Lewis River are typically at their lowest and eulachon are not likely to be present within the river.

Continued operation of the Lewis River Hatchery downstream and upstream intake pumps will include water withdrawal from the Lewis River at an average rate of 0-13 cfs for the downstream intake, and 11-48 cfs for the upstream intake, depending on the time of year. Both the downstream and upstream intake pumps will be equipped with a NMFS-approved salmonid fry-criteria fish screen and active cleaning devices. Approach velocities for both intake pumps will remain at or below 0.4 fps throughout operation.

1.3.4 Lewis River Hatchery Dredging

At the request of NMFS and WDFW, PacifiCorp proposes to annually dredge accumulated sediment and debris that currently obstructs the existing fish ladder approach for the Lewis River Hatchery. The proposed Lewis River Hatchery Dredging project is located along the north bank of the Lewis River at RM 15.6 within Cowlitz County, Washington (Figure 1).

As discussed above, PacifiCorp is obligated to fund operation and maintenance of the LHC as outlined in Schedule 8.7 of the Settlement Agreement. The overall objective of the Lewis River Hatchery Dredging project is to enhance PacifiCorp's ability to capture adult hatchery salmon and steelhead at the Lewis River Hatchery, thereby reducing spawning competition with native fish in the river. The proposed action will involve removing no more than 200 cubic yards of river material annually, and transporting it to an upland disposal location on PacifiCorp property near Swift Dam or some other suitable location on PacifiCorp property.

The proposed Lewis River Hatchery Dredging Project will be conducted annually during the approved in-water work window for the Lewis River. It is anticipated that annual dredging activities will require less than two days of actual in-water work. The following is a general sequence for proposed project activities:

1) Conduct overall project mobilization and implement environmental controls (i.e., pollution and sediment control measures).
2) Lower water levels in the Lewis River below Merwin Dam to approximately 600 cfs.
3) Construct temporary access ramp along the river bank.
4) Dredge accumulated sediment and dispose of at an upland location.
5) Remove temporary access ramp.
6) Site restoration, including erosion control seeding and native plantings where soils or vegetation have been disturbed.

1.3.5 Lewis River Boat Ramp Maintenance

As set forth in Exhibit K of PacifiCorp's Recreation Resource Management Plan (RRMP), PacifiCorp will continue to maintain three boat ramps located along the Lewis River below Merwin Dam. These three ramps, which are open to the public for fishing access, include the Island and Merwin Hatchery boat ramps in Cowlitz County (RM 12 and RM 19.2, respectively), and the Cedar Creek boat ramp in Clark County (RM 15.7) (Figure 1). Maintenance activities include debris removal and surface repair as needed.

The three boat ramps are comprised of a concrete slab, a concrete plank, and an asphalt/river cobble ramp, respectively. Maintenance activities at the boat ramps will include debris removal, placement of rip-rap or other stabilizing material to address ongoing erosion around ramps and damage from high water events, and ramp surface repair or replacement as needed. Bi-weekly (during the recreation season) and weekly (during the off-season) inspections of the boat ramps will be conducted to determine the need for maintenance. Work conducted below the OHWM of the Lewis River will occur within an agency-approved, summer in-water work window, a period when water levels within the Lewis River are typically at their lowest and eulachon are not likely to be present within the river. In addition, IWWPPs would be prepared for any proposed maintenance below the OHWM of the river. IWWPPs will identify BMPs and isolation measures to be employed during in-water work.

The proposed Lewis River Boat Ramp Maintenance activities will be conducted annually as needed. The following is a general sequence for proposed project activities:

1) Conduct overall project mobilization and implement environmental controls as needed (i.e., pollution and sediment control measures).
2) Remove accumulated debris as needed (e.g., sediment and/or woody material).
3) Rip-rap placement around ramps
4) Repair or replace damaged ramp surfaces as needed.

1.3.6 Settlement Agreement Prescribed Monitoring

Sections 8 and 9 of the Settlement Agreement require development of Hatchery and Supplementation (H&S) and Monitoring and Evaluation (M&E) Plans in support of reintroduction of anadromous fish to the upper Lewis River and tributaries. Section 8.2.3 of the Settlement Agreement outlines required annual operating plans (AOP) describing the methods and protocols necessary to implement the various components of the H&S Plan.
The M&E Plan, to meet objectives of the H&S Plan, must evaluate performance of fish passage and collection facilities within the Lewis River projects.. The H&S Plan was finalized in 2009 and the M&E Plan was finalized in 2010 and is to be updated every 5 years.

Required monitoring downstream of Merwin dam by either the H&S or M&E Plans may directly affect Southern DPS eulachon. As currently proposed, several elements of either the H&S or M&E monitoring programs will occur downstream of Merwin dam, and therefore are likely to directly impact adult or larval eulachon. These actions employ nets to capture winter steelhead broodstock, and seines or traps to collect a wide range of data on juvenile outmigrants. These actions are currently planned, and are representative of additional measures that may be proposed in the future by PacifiCorp, NMFS, U.S. Fish and Wildlife Service, Tribes, the U.S. Forest Service, and Washington Department of Fish and Wildlife through the Lewis River Aquatic Coordination Committee.

1.4 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 project is from Merwin Dam downstream to the confluence of the Lewis River with the Columbia River. This area includes the locations where project activities are proposed in the vicinity of Merwin Dam and the Release Pond, and incorporates the aquatic habitat in which increased smolt densities from the operation of the Release Pond are reasonably likely to be measurable. This action area therefore includes all designated eulachon critical habitat in the Lewis River, and all aquatic habitat therein that is seasonally occupied by the species.

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. Section 7(a)(2) of the ESA requires Federal agencies to consult with the United States Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Section 7(b)(3) requires that at the conclusion of consultation, the Service provide an opinion stating how the agencies' actions will affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires the consulting agency to provide an incidental take

statement (ITS) that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

2.1 Approach to the Analysis

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts on the conservation value of designated critical habitat.

"To jeopardize the continued existence of a listed species" means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[3]

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

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define 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 Southern eulachon, which may be affected by the proposed action. The status is the level of risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses

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

the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early-spring will be less affected. Low-elevation areas are likely to be more affected.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas. Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F. Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

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

Higher winter stream flows increase the risk that winter floods in sensitive watersheds will damage spawning redds and wash away incubating eggs. Earlier peak stream flows will also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation. These effects, while more clearly adverse to salmonids, also adversely affect eulachon that spawn in the winter and spring and therefore are subject to the effects of increased frequency of peak winter flows. Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions of proposed critical habitat for juvenile LCR coho, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel et al. 2006; USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel et al. 2006). Altered ocean conditions have also been recognized as the primary factor in the decline of eulachon (Gustafson et al. 2010; NMFS 2011c) (Table 1). Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Marine

fish species have exhibited negative responses to ocean acidification conditions that include changes in growth, survivorship, and behavior. Marine phytoplankton, which are the base of the food web for many oceanic species, have shown varied responses to ocean acidification that include changes in growth rate and calcification (Feely et al. 2012).

2.2.1 Status of the Southern Distinct Population Segment of Pacific Eulachon

Eulachon are endemic to the northeastern Pacific Ocean. They range from northern California to southwest and south-central Alaska and into the southeastern Bering Sea. NMFS issued a final rule on March 18, 2010 (52 FR 13012) determining that the eulachon spawning south of the Nass River in British Columbia to, and including, the Mad River in California meet the discreteness and significance criteria for comprising the Southern DPS of this species and listing it as threatened for ESA protection.

Puget Sound lies between two of the larger eulachon spawning rivers, the Columbia and Fraser rivers, but lacks a regular run of its own (Gustafson et al. 2010; also "eulachon Biological Review Team"). Within the conterminous U.S., most eulachon production originates in the Columbia River basin and the major and most consistent spawning runs return to the Columbia River mainstem and the Cowlitz River. Adult eulachon have been found at several Washington and Oregon coastal locations, and they were previously common in Oregon's Umpqua River and the Klamath River in northern California. Runs occasionally occur in many other rivers and streams but often erratically, appearing some years but not in others, and only rarely in some river systems (Hay and McCarter 2000; Willson et al. 2006; Gustafson et al. 2010). Hay and McCarter (2000) identified 33 eulachon spawning rivers in British Columbia, and 14 of these were classified as supporting regular yearly spawning runs.

Adult eulachon typically spawn at age 2 to 5, when they are 160 to 250 mm in length (fork length), in the lower portions of rivers that generally have prominent spring peak flow events or freshets (Hay and McCarter 2000; Willson et al. 2006). The spawning migration typically begins when river temperatures are between 0°C and 10°C, which usually occurs between December and June. Run timing and duration may vary interannually and multiple runs occur in some rivers (Willson et al. 2006). Most eulachon are semelparous (i.e., they reproduce just once, dying after they spawn). Fecundity ranges from 7,000 to 60,000 eggs per female, which are approximately 1 mm in diameter. Milt and eggs are released over sand or coarse gravel. Eggs become adhesive after fertilization, attach to sediments in the river bed and hatch in 3 to 8 weeks depending on temperature. Newly hatched larvae are transparent, slender, and about 4 to 8 mm in length (total length). Larvae are transported by spring freshets to estuaries (Hay and McCarter 2000; Willson et al. 2006), and juveniles disperse onto the continental shelf within the first year of life (Hay and McCarter 2000; Gustafson et al. 2010).

NMFS published its final critical habitat designation on October 20, 2011 (76 FR 65324), designating approximately 335 miles of riverine and estuarine habitat in California, Oregon, and Washington within the geographical area occupied by the southern DPS of eulachon. The proposed critical habitat areas contain one or more physical or biological features essential to the conservation of the species that may require special management considerations or protection. NMFS excluded the tribal lands of four tribes from designation after evaluating the impacts of

designation and benefits of exclusion associated with the tribes' ownership and management of these areas. NMFS did not identify any unoccupied areas that were essential to conservation, and thus did not include any unoccupied areas for designation as critical habitat. Within the action area for this consultation, NMFS designated the Lewis River from the confluence with the Columbia River upstream to Merwin Dam as critical habitat for the conservation of this species.

Eulachon recovery planning is underway and a final recovery plan is expected in 2016. Through the recovery planning process, we expect to improve our scientific understanding of population dynamics and the role ocean conditions play in determining the strength of returns. Information gained through recovery planning and from limited test fisheries, such as the one being implemented this year, will be used to adaptively manage eulachon harvest to ensure it does not impede recovery.

As with ESA-listed salmonids, NMFS uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany et al. 2000). These "viable salmonid[4] population"(VSP) criteria therefore 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. These attributes are influenced by survival, behavior, and experiences throughout a species' entire life cycle, and these characteristics, in turn, are influenced by habitat and other environmental conditions.

"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 fundamentally 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 at 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.

[4] Although these criteria were initially developed for salmon populations, they reflect concepts that are well founded in conservation biology and are generally describe demographic risks (indicators of extinction risk) for a wide variety of species. The VSP criteria encompass the species' reproduction, numbers, or distribution" (50 CFR 402.02) and therefore were used by NMFS' Eulachon Biological Review Team to assess the current status and risk of extinction for the southern DPS of eulachon (Gustafson et al. 2010).

For species with multiple populations, once the biological status of a species' populations has been determined, NMFS assesses 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 viability of the listed eulachon DPS in terms of its abundance, productivity, spatial structure, and diversity, and current threats, are discussed in the following sections.

Abundance and Productivity

There are few direct estimates of eulachon abundance. Escapement counts and spawning stock biomass estimates are only available for a small number of systems, and catch statistics from commercial and tribal fisheries are available for others. However, inferring population status or even trends from yearly catch-statistic changes requires assumptions that are difficult to corroborate (e.g., assuming that harvest effort and efficiency are similar from year to year, assuming a consistent relationship among the harvested and total stock portion, and certain statistical assumptions, such as random sampling). However, the combination of catch records and anecdotal information indicates that there were large eulachon runs in the past, which have severely declined. As a result, eulachon numbers are at, or near, historically low levels throughout the range of the southern DPS.

Abundance declines have occurred in the Fraser and other coastal British Columbia rivers (Hay and McCarter 2000, Moody 2008). Over a three-generation span of 10 years (1999 to 2009), the overall Fraser River eulachon population biomass has declined by nearly 97% (Gustafson et al. 2010). In 1999, the biomass estimates were 418 metric tons, and by 2010 had dropped to just 4 metric tons. Abundance information is lacking for many coastal British Columbia sub-area populations, but Gustafson et al. (2010) found that eulachon runs were universally larger in the past. Under the Species at Risk Act, Canada designated the Fraser River population as endangered in May 2011 because of a 98% decline in spawning stock biomass over the previous 10 years (COSEWIC 2011).

The Columbia River (including all of its tributaries upstream to RM 180) supports the largest known eulachon run. Although direct estimates of adult spawning stock abundance are limited, commercial fishery landing records begin in 1888 and continue as a nearly uninterrupted data set to 2010 (Gustafson et al. 2010). From about 1915 to 1992, historical commercial catch levels were typically more than 500 metric tons (500 metric tons equals approximately 12,728,100 fish at 11.55 fish per pound), occasionally exceeding 1,000 metric tons. In 1993, eulachon catch levels began to decline and averaged less than 5 metric tons from 2005 to 2008 (Gustafson et al. 2010). Although landings can be biased by level of fishing effort, evidence of persistent low eulachon returns as well as landings in the Columbia River from 1993 to 2000 prompted the states of Oregon and Washington to adopt a Joint State Eulachon Management Plan (WDFW and ODFW 2001).

As a result of continued low eulachon returns and the listing of eulachon as a threatened species under the ESA, all recreational and commercial fisheries for eulachon were closed in Washington and Oregon in 2010, and in California in 2013. Beginning in 2010, ODFW and WDFW began eulachon biomass surveys similar to those conducted on the Fraser River (James 2013). Based on the two years of data that have been collected and analyzed, WDFW calculated a median spawner estimate of 40 million eulachon in the Columbia River in 2011 and 39 million in 2012 (James 2013). Based on these returns, the states of Washington and Oregon opened a limited eulachon fishery in the mainstem and select tributaries of the Lower Columbia River that represented approximately 1% of the total run size that occurred in 2010-2011 and 2011-2012.

There are no long-term eulachon monitoring programs in Northern California. Large eulachon spawning aggregations once occurred regularly in the Klamath River, but abundance has declined substantially (Fry 1979; Moyle et al. 1995; Larson and Belchik 1998; Moyle 2002; Hamilton et al. 2005). Recent reports from Yurok tribal fisheries biologists report capturing several adult eulachon in presence/absence surveys (seine nets) and eggs and larvae (in plankton tows) in the Klamath River in 2012 and 2013.

During strong return years, NOAA Fisheries supports a commercial, sport, and tribal eulachon fishery in the Columbia River if it is limited, conservatively managed, and well monitored to ensure consistency with the recovery. NOAA Fisheries will continue to work with our state and tribal co-managers to ensure any eulachon fishery is sustainable and does not impede recovery.

A limited eulachon fishery will benefit eulachon recovery efforts by:

- Providing essential context for interpreting historical harvest data to better understand trends and variability in eulachon abundance
- Filling critical information gaps such as the length and age structure of spawning eulachon, as well as the temporal and spatial distribution of the run
- Providing a limited public and commercial opportunity for eulachon harvest to maintain a connection between people and the eulachon resource. This connection is important to sustaining public engagement in eulachon conservation and recovery.

Spatial Structure and Diversity

Microsatellite genetic work, in addition to other biological data including the number of vertebrae size at maturity, fecundity, river-specific spawning times, and population dynamics (Gustafson et al. 2010) appears to confirm the existence of significant differentiation among populations in the southern DPS of eulachon. NMFS' eulachon Biological Review Team separated the DPS into four subpopulations (Gustafson et al. 2010). These are the Klamath River (including the Mad River and Redwood Creek), the Columbia River (including all of its tributaries upstream to RM 180), the Fraser River, and the British Columbia coastal rivers (north of the Fraser River up to, and including, the Skeena River).

The Biological Review Team was concerned about risks to eulachon diversity because of data suggesting that Columbia River and Fraser River spawning stocks may be limited to a single age class combined with the species' semelparous life history (individuals spawn once and die).

These characteristics likely increase the species' vulnerability to environmental catastrophes and perturbations and provide less of a buffer against year-class failure than species such as herring that spawn repeatedly and have variable ages at maturity (Gustafson et al. 2010).

Current Threats

Threats include human activities or natural events (e.g., fish harvest, volcanic eruptions) that alter key physical, biological and/or chemical features and reduce a species' viability. Both natural and human-related threats are outlined and organized under the following five ESA listing factors: (1) destruction or modification of habitat; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human factors. Table 1 lists the threats identified by the Biological Review Team and their qualitative ranking by sub-population. The threats are listed from most severe (1) to least severe (16).

Table 1. Eulachon threats and qualitative rankings by subpopulation.

Threats	**Eulachon Subpopulations[1]**			
	Klamath	**Columbia**	**Fraser**	**BC**
	Ranking[2]			
Climate-related impacts on ocean conditions	1	1	1	1
Dams/water diversions	2	4	8	11
Eulachon bycatch	3	2	2	2
Climate-related impacts on freshwater habitats	4	3	4	4
Predation	5	7	3	3
Water quality	6	5	5	8
Catastrophic events	7	8	10	5
Disease	8	11	11	7
Competition	9	12	12	9
Shoreline construction	10	10	9	6
Tribal fisheries	11	14	13	10
Nonindigenous species	12	15	15	13
Recreational harvest	13	13	14	14
Scientific monitoring	-	16	16	15
Commercial harvest	-	9	6	-
Dredging	-	6	7	12

[1] For a detailed description of the qualitative threats and assessment see Gustafson et al. 2010, pp. 166-170.
[2](-) indicates no ranking, due to either no data or not applicable.

2.2.4 Status of Eulachon Designated Critical Habitat

We review the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated area. These features are essential to the conservation of the 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).

NMFS has designated 16 specific areas in California, Oregon, and Washington as critical habitat for eulachon (76 FR 65324). The designated areas are a combination of freshwater creeks and

rivers and their associated estuaries. The designated critical habitat areas contain at least one of the following physical and biological features essential to conservation of the species: (1) freshwater spawning and incubation sites; (2) freshwater and estuarine migration corridors; and (3) nearshore and offshore marine foraging sites. Freshwater spawning and incubation sites are essential for successful spawning and offspring production. Essential environmental components include specific water flow, quality, and temperature conditions; spawning and incubation substrates; and migratory access. Freshwater and estuarine migration corridors, associated with spawning and incubation sites, are essential for allowing adult fish to swim upstream to reach spawning areas and for allowing larval fish to proceed downstream and reach the ocean. Essential environment components include waters free of obstruction; specific water flow, quality, and temperature conditions (for supporting larval and adult mobility); and abundant prey items (for supporting larval feeding after the yolk sac depletion). Nearshore and offshore marine foraging habitat are essential for juvenile and adult survival; essential environmental components include water quality and available prey.

Critical habitat designated for eulachon includes 334.3 river miles of the following 16 rivers and streams in California, Oregon and Washington that contain the physical and biological features that NMFS determined are essential for the conservation of this species and require special management considerations or protection (76 FR 65324): 1) Mad River, 13.0 miles; 2) Redwood Creek, 12.2 miles; 3) Klamath River, 10.7 miles; 4) Umpqua River, 24.2 miles; 5) Tenmile Creek, 0.2 miles; 6) Sandy River, 12.4 miles; 7) Columbia River, 143.2 miles; 8) Skamokawa Creek, 4.8 miles; 9) Gray's River, 11.1 miles; 10) Elochoman River, 5.2 miles; 11) Cowlitz River, 50.2 miles; 12) Toutle River, 6.6 miles; 13) Kalama River, 8.8 miles; and 14) Lewis River, 25.0 miles; 15) Quinault River, 3.0 miles; and 16) Elwha River, 4.7 miles. Each of these areas serves as migration or spawning habitat for this species.

All areas designated were determined to have a high conservation value for the recovery of this species, based on the quantity and quality of the physical and biological features present, the relationship of the area to other areas occupied by this species, and the significance of the population occurring in that area. The physical or biological features essential for conservation of eulachon are summarized in Table 2.

Table 2. Physical or biological features of critical habitats designated for eulachon and corresponding species life history events.

Physical or biological features		Species Life History Event
Essential Features	**Components**	
Freshwater spawning and incubation	Water flow Water quality Water temperature Substrate	Adult spawning Incubation
Freshwater and estuarine migration	Water flow Water quality Water temperature Prey	Adult, larval mobility Larval feeding
Nearshore and offshore marine foraging	Water quality Prey	Adult survival, migration Juvenile survival, growth to maturity

NMFS identified a number of activities that may affect the physical and biological features essential to the conservation of southern DPS of eulachon across its range such that special management considerations or protection may be required. Major categories include dams and water diversions; dredging; shoreline stabilization; sand and gravel mining; pollution; tidal, wind, or wave energy projects; port and shipping terminals; and habitat restoration projects. All of these activities may have an effect on eulachon or its habitat, including one or more of the essential physical and biological features of critical habitat, via their alteration of stream hydrology; water level and flow; water temperature; dissolved oxygen; erosion and sediment input/transport; physical habitat structure; vegetation; soils; nutrients and chemicals; fish passage; and estuarine/marine prey resources. The effects of specific activities on the quantity and quality of essential features vary between areas within the critical habitat designation. Section 2.3 (Environmental Baseline) describes activities that have negative effects on critical habitat in the action area for this consultation.

2.2.5 Status of Proposed LCR Coho Salmon Critical Habitat

For salmon and steelhead, NMFS 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 listed species they support;[5] the conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS' critical habitat analytical review teams (CHARTs; NMFS 2005) evaluated the quantity and quality of

[5] The conservation value of a site depends upon "(1) the importance of the populations associated with a site to the ESU [or DPS] conservation, and (2) the contribution of that site to the conservation of the population through demonstrated or potential productivity of the area" (NMFS 2005).

habitat features (for example, spawning gravels, wood and water condition, side channels), the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Thus, even a location that has poor quality of habitat 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).

NMFS proposes to designate approximately 2,288 stream miles of critical habitat for LCR coho salmon in watersheds that occur within the following 11 subbasins (78 FR 2726 – January 14, 2013):

1) Middle Columbia/Hood, 212 miles
2) Lower Columbia/Sandy, 453 miles
3) Lewis, 299 miles
4) Lower Columbia/Clatskanie, 387 miles
5) Upper Cowlitz, 181 miles
6) Lower Cowlitz, 797 miles
7) Lower Columbia, 370 miles
8) Middle Willamette, 27 miles
9) Clackamas, 253 miles
10) Lower Willamette, 407 miles
11) Lower Columbia Corridor, 118 miles

There are 55 watersheds within the range of this ESU. Three watersheds received a low conservation value rating, 18 received a medium rating, and 34 received a high rating (78 FR 2726). The lower Lewis River rearing/migration corridor has a medium conservation value and was rated high for its connectivity corridor. Of the habitat areas eligible for designation, approximately 27 stream miles or 0.8 percent are being proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. Also, we are proposing to exclude approximately 1,038 stream miles (1,671 km) covered by four HCPs (J.L. Storedahl and Sons HCP, Washington Department of Natural Resources—West of Cascades HCP, Washington Forest Practices HCP, and West Fork Timber HCP) because the benefits of exclusion outweigh the benefits of designation. None of the HCP exclusions overlap with areas also proposed for exclusion due to economic impacts.

The physical or biological features essential for conservation of LCR coho are summarized in Table 3 and include:

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

- Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
- Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
- Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
- Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Identified threats to LCR coho habitat include forest practices; grazing practices; agricultural practices; road building and maintenance; channel modifications and diking; urbanization; sand and gravel mining; mineral mining; dams; irrigation impoundments and withdrawals; river, estuary, and ocean traffic; wetland loss/removal; beaver removal; exotic/invasive species introductions; and human harvest of salmon prey species (78 FR 2726). All of these activities have PCE-related impacts via their alteration of one or more of the following: stream hydrology, flow and water-level modifications, fish passage, geomorphology and sediment transport, temperature, dissolved oxygen, vegetation, soils, nutrients and chemicals, physical habitat structure, and stream/estuarine/marine biota and forage.

Table 3. Primary constituent elements (PCEs) and physical or biological features essential to the conservation of LCR coho salmon, and corresponding species life history events.

Primary Constituent Elements		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 Fry/parr/smolt growth, development, and seaward migration
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 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
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

2.3 Environmental Baseline

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

In Section 4 of the 2007 opinion, NMFS considered the environmental baseline affected by the proposed action; that assessment is incorporated here by reference. Briefly, both LCR coho salmon and eulachon require properly functioning habitat components and many of these habitats have been negatively affected by natural and man-made influences in the action area, including dams and diversions, dredging, urbanization, agriculture, silviculture in the upper watershed, and transportation infrastructure inherent to the environmental baseline. The loss of riparian habitat, degraded water quality (e.g., elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus loading, and higher levels of turbidity), and loss of habitat complexity and connectivity have impaired critical habitat designated for eulachon and proposed for LCR coho salmon. Existing impairment of proposed critical habitat for LCR under the environmental baseline does not allow the action area able to fully serve its conservation role for this species.

As discussed in section 2.5.5, the lower Lewis River rearing/migration corridor captured within the action area has a medium conservation value and was rated high for its connectivity corridor for eulachon. Eulachon production from the lower Lewis River, however, represents a very minor component of the annual production of eulachon from the Columbia River, and the factors of decline for the species are primarily associated with ocean conditions, past harvest, and dams and water diversions (Table 1). Thus, the degree to which other federal and non-federal actions inherent to the environmental baseline affect eulachon is far less significant than the effects of these past and ongoing actions on proposed LCR coho salmon critical habitat because juvenile coho salmon reside in freshwater for an extensive period and are therefore more vulnerable to adverse habitat effects in the action area environment.

Although the environmental baseline has changed since 2007, we do not estimate there to be a material adverse change. NMFS reached a no-jeopardy or a not likely to adversely affect conclusion for every section 7 consultation completed that included actions with effects in the action area since August 27, 2007. Those conclusions were based in part on careful consideration of all relevant recovery plan documents including all relevant documents prepared to support and carry out recovery plans. Moreover, each incidental take statement for those biological opinions included an incidental take statement designed by NMFS to minimize incidental take from the project to the extent necessary or appropriate.

To the extent the proposed action has been implemented since 2007, it is now included in the baseline for this consultation. Other habitat-altering actions can be broadly classified as public land management, restoration, transportation, or waterway alterations. The nature of habitat-altering actions usually does not allow for an evaluation of their effects as quantifiable impacts to individuals, populations, or other biological viability criteria. But they are well-suited for consideration of the habitat-based threats that caused the species to be listed, and each consultation addressed those factors in ways intended to reduce their role in limiting species viability and improve the environmental baseline. For example, consultations on land management actions often focus on improvement of riparian conditions, restoration actions target specific factors limiting recovery, transportation actions require improvements in water quality or floodplain connectivity, and waterway alterations often involve fish passage improvements. Thus, although each of these actions typically involves short-term impacts due to construction effects, each one is also likely to have made a long-term contribution to improvement of the environmental baseline.

2.4 Effects of the Action on Species and Designated Critical Habitat

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Factors considered in the analysis include: proximity of the action, distribution, timing, nature of the effect, duration and disturbance frequency, intensity, and severity. This effects analysis is based on the best scientific data available concerning the impact of the proposed action on eulachon and their designated Critical Habitat.

Lower Columbia River coho salmon proposed critical habitat in the action area has substantially the same PCEs as those described for LCR Chinook salmon and LCR steelhead critical habitat. We find that the effects to coho habitat are likely be the same as the effects to Chinook and steelhead critical habitat articulated in the 2007 opinion and therefore incorporate by reference relevant parts of the text from that 2007 opinion. Therefore, effects described below relate to eulachon and their critical habitat.

2.4.1 Direct Effects

This section addresses potential direct effects of the Projects, including H&S and M&E monitoring activities, on Southern eulachon and their designated Critical Habitat. Direct effects include all immediate impacts (adverse and beneficial) from project-related actions. Given that the eulachon presence within the Lewis River is generally limited to the short duration of the yearly spawning run (January – March) and larval out-migration to the estuary (April and May), it is anticipated that adult and/or larval eulachon will not be present within the Lewis River during the proposed in-water construction periods for the Release Ponds (August 1 – August 15), Lewis River Hatchery Intake Rebuild (August 1 – August 31), Lewis River Hatchery Dredging (August 1 – August 15), and Lewis River Boat Ramp Maintenance (summer months) Projects. As such, given the timing of in-water work and proposed isolation methods, direct effects to eulachon are not expected to result from proposed construction activities associated with these four Projects. However, eulachon are likely to be present within the Lewis River during regular operation of these completed Project facilities. As such, direct effects to eulachon are likely to result from egg and/or larval entrainment within the pump intakes located below the OHWM of the Lewis River at the Lewis River Hatchery and Release Ponds. In addition, operation of the Merwin Hydroelectric Project may result in direct effects to eulachon associated with altered flow regimes and temporarily degraded water quality (caused by elevated total dissolved gas (TDG) during spill events).

Direct impacts to eulachon may also occur as a result of prescribed monitoring in support of the H&S and M&E Programs. As discussed below, the combination of timing, methods and anticipated sampling equipment is expected to limit adverse effects of monitoring activities.

Critical habitat elements potentially affected by the proposed projects include temporarily degraded near-shore water quality (caused by turbidity and elevated TDG) and minor alteration of in-water substrates during in-water work. In addition, two of the proposed Projects (Release Ponds and Lewis River Hatchery Intake Repair) will result in the placement of new in-water structures within designated Critical Habitat.

Entrainment

Entrainment may occur when eulachon eggs and/or larvae smaller than the 3/32-inch intake screens are drawn into the pump systems or impinged upon the screens at the Release Ponds intake and Lewis River Hatchery upstream and downstream intakes. The probability of entrainment is largely dependent upon the frequency, density, and duration of eulachon eggs or larval eulachon or both occurring within proximity of the pump intakes, the approach and sweeping velocity of the pumps, the surface area of the screens, and the average intake volume. It is expected that given proposed approach velocities, adult eulachon will be able to avoid entrainment due to their swimming ability. A summary of the proposed intake pump design criteria for the Release Ponds and Lewis River Hatchery intake facilities is shown below (Table 4).

Table 4. Proposed intake pump design criteria.

Pump Facility	Approach Velocity	Sweeping Velocity	Screen Face Material	Intake Volume[1]	Operation
Release Ponds intake (equipped with active cleaning device)	0.4 fps	Greater than approach velocity	Steel cone with 3/32-inch openings and a minimum 27% open area	4.2 cfs	All year around
Lewis River Hatchery *downstream* intake (active cleaning)	0.4 fps	Greater than approach velocity	Steel clam shell with 3/32-inch openings and a minimum 30% open area	3.4 – 13.3 cfs	All year around
Lewis River Hatchery *upstream* intake (active cleaning)	0.4 fps	Greater than approach velocity	Galvanized steel with 3/32-inch openings and a minimum 27% open area	26.3 – 40.7 cfs	All year around

[1]Intake volumes were calculated by PacifiCorp based on the number of individual intakes pumps, total horsepower, and maximum optimal output. Intake volumes vary throughout the year based on existing river levels and hatchery operations.

Field sampling of larval eulachon in the North Fork Lewis River by the Cowlitz Tribe in 2011 recorded an average larval density (based on average catch per day) during the peak outmigration (April and May) of 0.0019[6] larvae per cubic foot (CIT 2012). These are currently the only data available regarding estimated larval densities within the Lewis River. This average larval density was multiplied by the intake volumes (cfs) at each of the intake pump locations from March 15 – June 15 to estimate potential larval entrainment (Table 5).

[6] CIT 2012 stated 0.0011 larvae per cubic foot with the 95 percent confidence interval for larvae density + or – 0.0008. Therefore, to be conservative, we used the higher level of the confidence interval resulting in 0.0019 (i.e., 0.0011 + 0.0008 = 0.0019).

Table 5. Estimation of potential larval entrainment at Release Ponds and Lewis River Hatchery intakes from March 15 – June 15.

Pump Facility	Intake Volume[1]	Potential Larval Entrainment per Day[2]	Days of Operation (3/15 – 6/15)	Potential Larval Entrainment per Year
Release Ponds Intake	4.2 cfs (March 15 – June 15)	689	93	64,077
Lewis River Hatchery *downstream* intake	13.3 cfs (March)	2,183	17	37,117
	11.1 (April)	1,822	30	54,665
	3.4 (May)	558	31	17,302
	6.7 cfs (June)	1,100	15	16,498
Lewis River Hatchery *upstream* intake	26.3 cfs (March)	4,317	17	73,396
	27.2 (April)	4,465	30	133,955
	33.6 (May)	5,516	31	170,989
	40.7 cfs (June)	6,681	15	100,220
			Total	668,219

[1]Intake volumes were calculated by PacifiCorp based on the number of individual intake pumps, total horsepower, and maximum optimal output. Intake volumes vary throughout the year based on existing river levels and hatchery operations.

[2]Potential daily entrainment numbers were calculated by multiplying a larval density of 0.0019 per cubic foot by the intake volumes (cfs) at each pump facility, and then multiplying again by 86,400 (seconds per day).

Given the calculations above, the Release Ponds and Lewis River Hatchery intakes have the potential to entrain approximately 668,219 eulachon larvae per year (combined). Given that the release ponds yet to be constructed and operated, and hatchery operations too can alter slightly based on unpredictable environmental conditions, there is some uncertainty on the total rate of withdrawal associated with these Project operations that cannot be avoided. Therefore, to be conservative and reasonably prudent, we have assumed the rate of withdrawal may exceed the rate provided by up to 15 percent. Therefore, a 15 percent increase would result in a total of 768,452 eulachon larvae entrained per year. However, these calculations of potential entrainment do not reflect the actual zone of influence (ZOI) of each of the intake pumps. Given that the design approach velocities (0.4 fps) will be less than the sweeping velocities of the river, the ZOI for each intake pump will encompass a relatively small area, thereby likely reducing the potential entrainment numbers far below the estimates shown above. Without accounting for ZOI, and based on an estimate of yearly larval production within the Columbia River system (approximately 590 billion [NOAA 2011]), potential larval entrainment resulting from operation of these facilities represents approximately 0.0001 percent of the yearly larval production within the Columbia River and its tributaries. As such, it is reasonably certain that potential larval entrainment will not diminish productivity of the Southern eulachon DPS.

As discussed above, flows in the Lewis River downstream from Merwin Dam are altered as a result of operations to manage floods, produce power, and augment late summer flows. Natural (pre-hydroelectric project) flows are highest during the winter, decrease gradually in the spring, and are lowest during the summer months (PacifiCorp 2005). The results of an analysis of the effects of the hydroelectric dams on flow patterns downstream from Merwin Dam concluded that storage and flood control operations resulted in higher median flows during fall and winter months (September – March), and lower median flows between April and July (see Figure 3

above) (PacifiCorp 2005). In addition, operations have slightly lowered minimum flows (2 to 9 percent) and daily maximum flows (13 to 14 percent) and shifted the timing of low flows from September to August; and the timing of one-day maximum daily flow from December to January (PacifiCorp 2005).

As outlined in the Settlement Agreement and NMFS 2007 Biological Opinion, PacifiCorp restricts daily fluctuation in flows below Merwin Dam from February 16 – August 15 of each year by maintaining flow plateaus (periods of near-steady discharge). In addition, the Merwin license requires PacifiCorp to limit up-ramping below Merwin Dam to 18 inches per hour, down-ramping to less than 2 inches per hour when flows are at or less than 8,000 cfs. These ramping rates have been implemented to protect aquatic resources below Merwin Dam and reduce juvenile fish stranding. This more stable flow regime provides additional area of aquatic habitat in the summer months and reduces the frequency of scouring flows during the winter months (PacifiCorp 2005).

The stranding study conducted by PacifiCorp in 2011found that spawning and rearing habitat for salmonids is plentiful below Merwin Dam, and that the existing flow regime is not causing significant mortality to salmonids given the existing flow restrictions (Stillwater 2011). Although not directly applicable, this study does suggest that operational restrictions effective for salmonids are also benefiting Southern DPS eulachon.

There is currently no information regarding the effects of existing flow conditions on eulachon migration and spawning in the Lewis River below Merwin Dam. Based on “pre” and “post”-hydroelectric project daily flow exceedance curves for the Lewis River at Ariel below Merwin Dam (see Figure 3 [PacifiCorp 2005]), post-hydroelectric project flows during the eulachon spawning run (January – March) ranged from approximately 7,800 cfs at the start of January, down to approximately 5,800 cfs in late March. Natural (or pre-hydroelectric project) flow conditions during this time frame ranged from approximately 4,500 to 5,500 cfs. In addition, post-hydroelectric project flows during the larval out-migration (April) ranged from approximately 5,800 cfs in early April down to 5,500 cfs in late April. Natural flow conditions during the month of April increased from 5,500 cfs in early April up to approximately 6,200 cfs in late April.

Given the relatively low gradient, high sinuosity, and broader floodplain of the Lewis River below Lewis River Hatchery, it is likely that high winter flows dissipate within downstream reaches as they provide areas of lower flow velocity along the margins of the river and mid-channel bars. In addition, the decrease in the natural spring freshet flow regime is relatively minor when pre and post-hydroelectric project discharge volumes are compared. As such, it is reasonably certain that existing controlled flow conditions in the Lewis River below Merwin Dam do not significantly affect eulachon spawning or migration. Similarly, the amount of water withdrawn from the Lewis River for H&S is a tiny portion of the available and will have no impact on eulachon spawning or migration.

Water Quality

As discussed above, the condition and quality of the water that eulachon encounter during their spawning, rearing and migration is extremely important, and can determine such things as

feeding and breeding success rates, stress levels, predisposition to disease, and rates of development. The physical and/or biological features identified by NMFS as essential for eulachon relative to water quality, include pollutant-free waters and relatively low water temperatures.

Sediment/Turbidity
Short-term, localized project-related increases in background turbidity levels within the Lewis River will likely occur as a result of in-water construction activities associated with installation of the Release Ponds inlet pipe and outlet flume, installation of the Lewis River Hatchery downstream intake support structure, dredging of the Lewis River Hatchery fish ladder approach, and maintenance of the Lewis River boat ramps. However, as stated above, it is anticipated that larval and/or adult eulachon will not be present within the Lewis River during the proposed summer in-water work periods for these four Projects. In addition, in-water isolation measures and IWWPPs will be prepared for each of these four Projects and will be strictly followed during all periods of construction that involve in-water work. Furthermore, PacifiCorp will implement erosion and pollution prevention measures and BMPs as outlined in the SWPPPs. As such, short-term, localized Project-related increases in background turbidity resulting from temporary work below the OHWM are not expected to directly impact eulachon or result in a long term, net change in function of the in-stream habitat. It is expected that the concentration of any suspended sediments (turbidity levels) resulting from proposed in-water construction activities will be short in duration and spatially contained so as to not result in any measurable or significant effects to designated Critical Habitat for Southern eulachon.

Although operation of the Merwin Hydroelectric Project will occur during the eulachon spawning run and larval out-migration, operations during this period are not likely to result in significant increases in background turbidity within the action area given the regulated flow regime and ramping rates. In addition, the Lewis River dams, including Merwin Dam, currently trap much of the high sediment loads, resulting in lower rates of suspended sediments in the Lewis River below Merwin Dam than would naturally occur.

Chemical Contamination
Equipment and vehicles operating near and over the river channel within the action areas during construction represent potential sources of chemical contamination. Accidental spills of construction materials or petroleum products would adversely affect water quality within the action areas. The project IWWPPs and SWPPPs include containment measures for construction-related chemical hazards that will significantly reduce the likelihood for chemical releases within the action areas. In addition, the WQC issued as part of the Merwin Hydroelectric Project FERC relicensing identifies specific compliance requirements to protect water quality, and ultimately the aquatic environment, during and after project construction. A copy of the Section 401 WQC (Order Number 3678) is included in Appendix E of FERC 2012.

Temperature
The proposed Projects are not expected to affect water temperature or riparian shade conditions within the action areas given the minimal amount of upland vegetation to be removed, the extent of proposed restoration, and the size of the Lewis River channel. In addition, return water associated with the Release Ponds outfall flume are not anticipated to increase water

temperatures beyond ambient conditions given that temperatures with the fishway and Release Ponds must be kept at conditions that are as similar to the Lewis River as possible to maintain the health of those fish being held within the facilities. Furthermore, based on the results of data collected from 2007 to 2011, temperatures in the Merwin Dam tailrace remained below 10°C during the months of December through May (when eulachon may be present within the action area), with low temperatures of 3°C – 5°C occurring in February/March (PacifiCorp and Cowlitz County PUD 2010).

Total Dissolved Gas

The TDG criteria for the Merwin Hydroelectric Project, as outlined in the WQC, requires PacifiCorp to manage spill to limit TDG production to 110 percent or less saturation, except for flows above the 7-day, 10-year flood (32,884 cfs) (WDOE 2006). Spills above the hydraulic capacity of Merwin Dam and below the 7-day, 10-year flood flow are expected to occur on average of once or twice per year to control lake levels during periods of high rain and/or snowmelt (WDOE 2006). Based on spillway monitoring conducted by PacifiCorp from 2006 to 2011, there have been a total of nine spill events that have resulted in elevated TDG levels above the 110 percent criteria (see Table 4 above). These exceedances occurred primarily in the months of November and December, and for the last six years account for less than 1 percent (0.66 percent) of total daily operations. The highest TDG level recorded in the tailrace during these periods of analysis was 126.12 percent on January 8, 2009 (PacifiCorp and Cowlitz County PUD 2010). As mentioned above, PacifiCorp has prepared a WQAP to address the causative actions and to propose measures to reduce spill related elevated TDG in the Lewis River downstream of Merwin dam, and to implement measures to minimize effects on ESA-listed species if the standards cannot be met.

Limited data exist regarding the effects of elevated TDG levels (i.e., above 110 percent) on eulachon. However, recent literature supports the general view that short-term exposure to TDG levels below 120 percent has minimal effects on migratory juvenile and adult salmonids when compensatory depths are available (McGrath et al. 2006). Monitoring and assessment programs in the Snake and Columbia river from 1995 to the early 2000s consistently documented low incidence of significant gas bubble disease in migrating juvenile or adult salmonids as well as other resident fish (McGrath et al. 2006). As such, it is reasonably certain that potentially elevated TDG levels (i.e., above 110 percent) within the Merwin Dam tailrace during the months of November – January will not significantly affect spawning eulachon or out-migrants given the timing of their spawning run in the Lewis River system (January – March) and the short-term duration of the spill events resulting in TDG exceedances (Table 6).

Table 6. Spill events that exceeded 110 percent Total Dissolved Gas criteria in the Merwin Dam tailrace from 2006 to 2011 (ACC/TCC Annual Report 2010)

Year	Spill Events Resulting in TDG Exceedance	Median / Maximum TDG Levels During Exceedance Event (Percent)	Median Spill Volume During Exceedance Event (cfs)
2006	Nov. 6 – 9 (70 hours)	118.74 / 121.49	15,239
	Nov. 10 – 11 (14 hours)	113.12 / 113.50	8,802
	Nov. 13 – 14 (21 hours)	111.99 / 112.71	7,987
2007	No Exceedance	N/A	N/A
2008	Nov. 12 – 13 (21 hours)	119.75 / 121.13	12,950
2009	Jan. 6 – 10 (104 hours)	119.39 / 126.12	14,400
2010	Dec. 14 (8 hours)	114.75 / 115.03	8,918
2011	Jan. 16 – 18 (71 hours)	121.88 / 123.98	16,748
	Nov. 23 – 24 (18 hours)	112.10 / 113.3	4,567
	Dec. 29 – 30 (20 hours)	110.30 / 110.50	5,323

Dissolved Oxygen

As discussed above, the DO criteria for the Merwin Hydroelectric Project, as outlined in the WQC, requires that DO concentrations below Merwin Dam do not drop below 8 milligrams per liter (mg/l) (WDOE 2006). Low DO levels generally occur in warmer, stagnant waters with little mixing and high organic content. As such, hourly DO levels are measured in the Merwin tailrace during the months of September and October, when water temperatures peak around 15°C – 16°C (PacifiCorp and Cowlitz County PUD 2010). During these periods of analysis, DO levels dipped just below 8 mg/l for seven consecutive days in October of 2009, and periodically dipped below 8 mg/l in the months of September and October 2010 (PacifiCorp and Cowlitz County PUD 2010). The lowest DO level recorded in the tailrace during these periods of analysis was 7.0 mg/l on October 17, 2009 (PacifiCorp and Cowlitz County PUD 2010). Given the timing of the yearly eulachon spawning run (January – March) and larval out-migration (April), it is anticipated that slightly lowered DO levels (i.e., 7-8 mg/l) potentially occurring in September and October will have no effect on eulachon.

Substrate

The minor alterations to existing in-stream substrates from the actions inherent to the proposed project are reasonably certain to avoid adverse effects on designated Critical Habitat for Southern eulachon because of the in-water isolation measures to be implemented and the relative size of the new in-water structures proposed. In addition, based on the bedrock and riprap substrate conditions at the Lewis River Hatchery intakes and the base of Merwin Dam, these areas do not provide substrate conditions preferred by eulachon for spawning or incubation. Similarly, substrate conditions at the base of the Lewis River Hatchery fish ladder and Lewis River boat ramps do not provide preferable conditions for eulachon spawning given the existing water velocity and recreational disturbances, respectively.

Substrate conditions within the Release Ponds action area may be suitable for eulachon spawning and incubation. As such, those areas impacted below the OHWM during installation of the intake pipe and outfall flume that are not occupied by new in-water structures (i.e., intake fish screen and approximately 50 feet of outfall flume) will be covered with native stream bed material. Short-term changes in substrate embeddedness may occur in proximity to the action area if sedimentation is significant. However, given the proposed in-water isolation measures and

timing of in-water work, sediment inputs during in-water work operations will likely be minimal, highly localized, and will generally constitute a short-term effect at most.

As discussed above, current sediment input to the Lewis River downstream of Merwin Dam is limited to inputs from tributaries and erosion/landslides from the valley walls. Sediment from reaches upstream of the Lewis River dams is blocked from being transported to downstream reaches. As a result, the Lewis River downstream from Merwin Dam has a much lower rate of sediment movement than will have occurred if the dams were not in place (PacifiCorp 2005). Despite the relatively small amount of sediment inputs and the continued trapping of sediment from the upper watershed, there is a large amount of spawning-sized gravel distributed throughout the reach (PacifiCorp and Cowlitz PUD 2004). Studies of reaches downstream of other large dams in the area often show a lack of gravel and finer particles. This occurs because the finer sediment is flushed out of the bed during high flows and not replenished from upstream sources. This increase in grain size and lack of gravel does not seem to be occurring downstream of Merwin Dam (PacifiCorp and Cowlitz PUD 2004). As such, it is reasonably certain that Merwin Hydroelectric Project operations are not significantly affecting the availability of preferable spawning substrates for eulachon.

2.4.2 Settlement Agreement Prescribed Monitoring

Several monitoring activities (actions) associated with either the Lewis River Hatchery and Supplementation (H&S) or Monitoring and Evaluation (M&E) Programs will occur downstream of Merwin dam, and may therefore have direct effects on Southern DPS eulachon.[7] A summary of frequency, timing/duration, and proposed methods for currently proposed actions is shown below (Table 7). These activities are representative of additional monitoring, employing similar sampling equipment and monitoring frequencies, which may be prescribed in the future by the Lewis River ACC under the H&S or M&E Programs.

Table 7. Example of Hatchery and Supplementation and Monitoring and Evaluation Program actions with potential direct impacts to Southern DPS eulachon.

Activity	Frequency	Timing	Methods
H&S/Wild Winter Steelhead Brood Capture	Weekly	Mar 1 - May 15	Monofilament tangle net of 4 inch stretch mesh, length: 75-150 feet; depth: 6 feet.
H&S/Lower River Screw Trap	Daily	Mar 1 - Jun 30	Trap will likely be in the thalweg in the vicinity of Eagle Island
H&S/Spring Chinook, Steelhead, Coho Juvenile seining	Weekly	Mar 1 - Jun 15	Only sampled when flows at Ariel gage are 4,000 cfs or less. Seines will have a mesh size of 1/2 inch and seining will be done from RM 16 to downstream end of Eagle Island.
M&E/Wild fall Chinook and chum juvenile tagging	Weekly	Late May – Early June	Stick seines from River Mile (RM) 16.5-6.6/100,000 young of the year (YOY)/Year

[7] Effects of the M&E program related to the H&S program on ESA-listed salmonids will be addressed in the consultation on the hatchery and genetic management plans of the facility.

Three of the four actions noted above will employ nets or seines to capture target salmonids downstream of Merwin dam. Capture of adult winter steelhead for brood stock will utilize 4-inch mesh monofilament. This mesh size is too large to capture adult or larval eulachon. Seining for juvenile spring Chinook, steelhead, and coho salmon will employ 1/2-inch mesh. Though too large for larvae, these nets could potentially capture adults. However, this activity will begin in March near the end of adult migration/spawning, when few adults would be expected in the river. Seining for juvenile wild fall Chinook and chum salmon would utilize similar mesh size (1/2-inch) which is capable of capturing adult eulachon. However, this activity would begin in late May, following adult eulachon spawning.

As described in the 2012 Hatchery and Supplementation Annual Operating Plan (PacifiCorp 2012), PacifiCorp and the ACC are evaluating placement of a rotary screw trap below Merwin in 2013 to provide additional data on outmigrating juvenile salmonids. A screw trap is a passive sampling gear which takes advantage of flowing water to capture and retain downstream migrating fish. The trap is non-size and non-species selective. Adult or larval eulachon present in the system may be therefore be trapped if present in the sampled water column. The trap is unlikely to capture adults because they migrate along the lower velocity margins of the river and the screw traps are located in the thalweg of the river where velocities are likely too high for eulachon. Furthermore, the trap was operated in the spring of 2013 and 2014 and no eulachon (adult or larvae) were encountered during either of these periods.

With expected low numbers of adults and larvae, and unknown (but likely low) trap efficiencies, capture of eulachon in the screw trap is unlikely. The trap will be visited on a daily basis during operations. If found, adult or larval eulachon will be dip netted from the trap's holding facility and released downstream.

2.4.3 Indirect Effects

Indirect effects of a proposed action are those that are reasonably certain to occur later in time (after the action is complete). As discussed above, eulachon are not anticipated to be present within the Release Ponds, Lewis River Hatchery Intake Rebuild, Lewis River Hatchery Dredging, or Lewis River Boat Ramp Maintenance action areas during proposed in-water construction activities given the timing of in-water work (summer months). However, eulachon may be present within the Lewis River during regular operation of these completed Project facilities. As such, potential indirect impacts could result from increased predation on larval eulachon during the release of salmonids from the Release Ponds in April and May.

Predation

Eulachon larvae encounter numerous predators during their outmigration. Within the Lewis River, these include most resident fish and aquatic bird species. With the addition of the salmonid Release Ponds, there is a potential to increase predation on larval eulachon during their outmigration as a result of increasing the density of salmonid smolts below RM 8.8. Based on an estimate of downstream salmonid migrants that will be collected at Swift Dam, operation of the Release Ponds will result in the addition of approximately 570,000 smolts into the lower Lewis River from April 15 – June 15 (pers. comm. with Frank Shrier, 2012), or approximately 9,000 smolts per day during the larval outmigration. The results of recent juvenile salmonid seining in

the lower Lewis River have determined that salmon smolts spend very little time (on the order of a few days) in the lower Lewis River before they emigrate to the Columbia estuary (pers. comm. with Frank Shrier, 2012). Given the relatively brief occurrence of smolts within the lower Lewis River during the larval outmigration, combined with an estimated larval density of 0.0019 larvae per cubic foot (one larvae per 650 cubic feet of water), it is likely that a very small percent of released salmonid smolts will have an opportunity to prey on larval eulachon. Although this indirect effect cannot be quantified, we are reasonably certain that predation by outmigrating juvenile salmonids from the Release Ponds will have only an insignificant (if not immeasurable) impact on the ESA-listed eulachon DPS as a whole, given the estimated annual Columbia River production of eulachon larvae of approximately 590 billion (NOAA 2011).

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act.

Such actions may include, but are not limited to additional road, residential and commercial development, maintenance and upgrading of existing infrastructure, and watershed enhancement. Non-Federal actions that yield cumulative effects to eulachon and proposed LCR coho salmon critical habitat are likely to be related to human population growth and land use practices. In the action area, state, tribal, and local government actions are likely to be in the form of legislation, administrative rules, or policy initiatives, shoreline growth management and resource permitting. For example, a limited state-authorized tribal, recreational and commercial fishery for eulachon occurred in 2014 and is reasonably certain to occur in the future. However, NMFS will not approve of this fishery, were it to be authorized by Washington State in the future, if the outcome of that fishery would lead to significant adverse effects on eulachon abundance or productivity that could jeopardize the species.

Human population density in the City of Woodland and surrounding areas within the Lewis River watershed is reasonably certain to increase in future years and contribute to cumulative effects. This anticipated growth will increase contaminant loading from wastewater treatment plants, from stormwater, and from sediment that recruits into the action area's waters from agricultural and non-point sources. Impacts from population growth in the watershed are reasonably likely to yield cumulative adverse effects on eulachon and proposed LCR coho salmon critical habitat through two primary mechanisms. Firstly, we anticipate increased residential and commercial development and associated road construction in the foreseeable future for this watershed. This growth-induced development is anticipated to increase the use and application of pesticides, fertilizers, and herbicides, which will increase the delivery of contaminants into the waters of the action area. Secondly, increased demand on water resources from the basin from growth (e.g. for agriculture, residential and/or municipal use) will further limit the use of those water resources to support eulachon in-stream and the functions of proposed LCR coho salmon critical habitat. Non-federally permitted water diversions alter habitat in freshwater systems by affecting stream flows, and by potentially causing

entrainment—an effect particularly hard to avoid for eulachon larvae and eggs for which no screening guidelines have been developed. As stream flows are reduced from diversion, contaminants can also become more concentrated in these systems, exacerbating contamination issues.

Although these factors are ongoing to some extent and likely to continue, the future level of activity will depend on whether there are economic, administrative, and legal impediments or safeguards in place. Therefore, NMFS finds it likely that the cumulative effects of these activities will have adverse effects on eulachon population abundance and productivity, eulachon critical habitat, and on proposed critical habitat for LCR coho salmon..

2.6 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 will add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).

The BRT concluded that eulachon may be at significant risk at population sizes that are a fraction of their historical levels, but that are still large compared to what would be considered normal for other ESA listed species (Gustafson et al. 2010) and no new information of which we are aware would alter the BRT's 2010 conclusions. Critical habitat designated for eulachon includes the physical and biological features that support freshwater spawning and incubation, and freshwater and estuarine migration. Critical habitat proposed for LCR coho salmon includes physical and biological features that are identical to ones designated as critical habitat for other LCR salmon and steelhead that occupy the Lewis River.

As discussed under the Environmental Baseline, critical habitat for eulachon and proposed LCR coho salmon critical habitat in the lower Lewis River has been significantly altered by the effects of dam and reservoir development upstream, channelization and diking, and the removal of in-channel and riparian wood, thereby significantly diminishing both the complexity and productivity of aquatic habitats. The Project operations have incorporated measures, e.g., ramping rates, minimum flows, etc., to protect and minimize impacts to listed fish and their habitat. BMPs will minimize impacts from construction operations. A few section 7 consultations have occurred in the action area since the 2007 opinion, including some on habitat altering actions such as land management on public lands and restoration/habitat improvement projects. Those consultations included consideration of the habitat-based threats that have caused salmonid species in the action area to be listed, and included voluntary actions or reasonable and prudent measures, and terms and conditions, to reduce those threats

Similarly, cumulative impacts within the action area (e.g., residential development, etc.) are reasonably certain to yield adverse water quality and other habitat impacts. It is expected that NMFS involvement with local governments, etc. will help familiarize them with measures to minimize impacts to listed fish and result in a trend of reduced impacts from the past. However, when factored with the certain trend of intensifying development watershed conditions we conclude the cumulative effects of the proposed actions to have at least some temporally negative effects on eulachon and proposed LCR critical habitat.

The effects of the proposed action on eulachon are primarily associated with the likelihood of entrainment and associated mortality to the species from the operation of the hatchery intakes and Release ponds. Similarly, the proposed action, through the structures built and operated for the hatchery intakes and Release Ponds that ultimately lead to effects of entrainment on eulachon from the salmonid Release Pond operations, will slightly reduce the functionality of Lewis River critical habitat for eulachon. Minor effects from predation are also anticipated.

Effects of the proposed actions on proposed critical habitat for LCR coho salmon are likely to reduce the conservation value of critical habitat PCEs for the coho salmon rearing and migration corridor within the action area, in the direct impact area, while construction is taking place. However, these effects are too small in scale and too brief to affect the conservation value of the lower Lewis River proposed LCR coho salmon critical habitat, as a whole. Further, the long-term effects of the operation of the Project will include the reestablishment of salmon and steelhead populations above the dams, outcomes which are consistent with actions identified in the recovery plan for the lower Columbia River. Thus, it is likely that critical habitat will remain functional and retain the current ability for PCEs to become functionally established, to serve the intended conservation role for the species.

2.7 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the southern DPS of eulachon, or destroy or adversely modify designated eulachon critical habitat. Similarly, the proposed action will not destroy or adversely modify LCR coho salmon's proposed critical habitat.

You may ask NMFS to adopt the conference opinion as a biological opinion when critical habitat for LCR coho salmon is designated. The request must be in writing. If we review the proposed action and find there have been no significant changes to the action that would alter the contents of the opinion and no significant new information has been developed (including during the rulemaking process), we may adopt the conference opinion as the biological opinion on the proposed action and no further consultation will be necessary.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is

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

The measures described in this section are nondiscretionary and must be required by FERC and undertaken by the Licensee. FERC has a continuing duty to regulate the activities covered by this Incidental Take Statement. If FERC or the Licensee fail to assume and implement the terms and conditions of this Incidental Take Statement, the protective coverage of section 7(o)(2) may lapse. To monitor the effect of incidental take, the Licensee and FERC must report the progress of the action and its effect on each listed species to NMFS, as specified in this Incidental Take Statement (50 C.F.R § 402.14(i)(3)).

NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Therefore, to the extent this ITS contains RPMs and terms and conditions that address requirements other than monitoring, those are voluntary until any future 4(d) rule goes into effect However, our jeopardy analysis is based on an anticipated levels of eulachon incidental take and so we have included a take indicator for eulachon that will function as a reinitiation check on that jeopardy conclusion. Monitoring requirements related to the take indicator go into effect immediately so that there is a way to know if the reinitiation trigger has been exceeded. 50 CFR 402.14(i)(3).

2.8.1 Amount or Extent of Take of Eulachon

As discussed in the effects section of this opinion, we estimate there is an average of 0.0019[8] eulachon larvae per cubic foot in the Lewis River during the period during which water diversion for the Release Ponds operation would be required—and eulachon entrainment would be likely (CIT 2012). Based on this density of larvae, and the rate of water withdrawal projected for the project, the Release Ponds and Lewis River Hatchery intakes have the potential to entrain approximately 768,452 eulachon larvae per year (combined). Based on the total production of eulachon larvae in the Columbia River (590 billion est.), The Release Ponds and Lewis River Hatchery intakes are expected to entrain no more than 0.0001[9] percent of the yearly eulachon

[8] CIT 2012 stated 0.0011 larvae per cubic foot with the 95 percent confidence interval for larvae density + or – 0.0008. Therefore, to be conservative, we used the higher level of the confidence interval resulting in 0.0019 (i.e., 0.0011 + 0.0008 = 0.0019).

[9] In 2011 based on estimated water withdraws the take would have been 768,452. This amount of take conservatively assumes up to a 15 percent increase in the water withdrawal projected by the project to address the uncertainty of the total withdrawals fromhatchery operations, and the yet to be constructed and operated release ponds, allowing for some reasonably prudent flexibility for the system to operate efficiently once on line. Also, there is limited eulachon abundance data available for the North Fork Lewis River, and this take estimate is based on one year of data collected in 2011 (CIT 2012).

larval production the Columbia River and its tributaries[10] As previously discussed, these calculations do not reflect the zone of influence (ZOI) of each of the intake pumps and so likely overestimate the eulachon take from entrainment. There is, however, no practical way to count eulachon larvae given current sampling protocols and technologies. The best available surrogate take indicator is the volume of water projected to be withdrawn for the Projects operation of the Release Ponds and hatchery intakes when eulachon larvae presence would overlap with the period of water withdrawals for hatchery and release pond use (March 15 through June 15 each year). In this case, the volume of water withdrawn during this period of overlap is estimated to be 404,474,688 cubic feet[11] of water each year. This surrogate is rationally related to the amount of take because the amount of entrainment is correlated with the amount of water withdrawn through the intake pumps

2.8.2 Effect of the Take

In Section 2.7, NMFS determined that the level 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.

2.8.3 Reasonable and Prudent Measures

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

1. The Licensee (or their designated contractors conducting research) shall monitor the estimated level of eulachon take associated with the Lewis River Hatchery and Release Pond intakes (that must be annually coordinated with NMFS). The observed take from these specific actions as well as any other observed take will be reported to NMFS annually. However, in the event that the eulachon take estimated through the monitoring outlined in Term and Condition 1 below exceeds that identified in this opinion from which our jeopardy analysis is founded, NMFS shall be contacted immediately in order to address the need for reinitiation of consultation on the action.

2. In the event that a 4(d) rule is promulgated prohibiting eulachon take during the license period, the Licensee will meet with NMFS to discuss further means of minimizing eulachon take at the Lewis River projects. At that time, NMFS will have regulatory authority to impose further RPMs/Terms and Conditions necessary and appropriate to minimize take of eulachon.

[10] This number may be revised by NMFS if a more comprehensive record of eulachon larval abundance data for the North Fork Lewis River becomes available.

[11] This number is arrived at using the values in Table 5: Days of operation multiplied by 86,400 seconds per day multiplied by the amount of average intake cfs for each facility and added that all together. Then to be conservative to address the uncertainty of total water withdrawal from changing hatchery operations and yet to be constructed and operated release ponds, we multiply the total by 1.15 (a 15 percent increase). 351,717,120(1.15)=404,474,688

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Federal Energy Regulatory Commission or any applicant must comply with them in order to implement the reasonable and prudent measures above (50 CFR 402.14). The Federal Energy Regulatory Commission 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 incidental take statement (50 CFR 402.14). If the following terms and conditions are not complied with, the protective coverage of section 7(o)(2) will likely lapse.

1. This program of monitoring is designed to confirm that the take of eulachon eggs and larvae from which our jeopardy analysis is based is not exceeded. As such, it focuses on the monitoring of water intake withdrawals, which is recognized as the mechanism by which incidental take is likely to occur from the proposed action.

a. By April 15 of each year, the applicant will report all monitoring items to include, at a minimum, the following. All reports will be sent to National Marine Fisheries Service, Oregon-Washington Coastal Area Office, Attention: Michelle Day, 1201 NE Lloyd Blvd, Suite 1100, Portland, Oregon, 97232. Include the NMFS Tracking Number: NWR-2013-9721.

i. Project identification.
   1. Project name and location.
   2. Type of activity.
   3. Applicant name, address, and contact person.
   4. Starting and ending dates for work completed.

ii. Project data.
   1. Explanation of why any terms and conditions or minimization measures were not met, or were modified (if applicable).
   2. Release pond pump operations.
      a. Total number of pumping days; total volume pumped; number of hours of pumping per day; and volume pumped per day.
      b. Dates pumping occurred.

2. In the event that a 4(d) rule is promulgated prohibiting eulachon take during the license period, the Licensee will engage in discussions with NMFS on take minimization measures, which may include discussions about any screening criteria to protect eulachon that have been issued (see Reasonable and Prudent Measure 2 above).

2.9 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). There are no Conservation Recommendations at this time.

2.10 Reinitiation of Consultation

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

If new information reveals effects on eulachon from intake screens that were not considered in this opinion, then the regulatory reinitiation criterion (2) above would likely be met.

3. DATA QUALITY ACT DOCUMENTATIONAND PRE-DISSEMINATION REVIEW

The 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.

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Federal Energy Regulatory Commission. Other interested users could include PacifiCorp, Cowlitz PUD, Washington Department of Fish and Wildlife, and the Cowlitz Indian Tribe. Individual copies of this opinion were provided to the Federal Energy Regulatory Commission. This opinion will be posted on the NMFS Northwest Region web site (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

3.2 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.

3.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA

regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

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

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