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

Refer to NMFS Tracking No.: 2011/05000

August 29, 2012

Daniel M Mathis
Federal Highway Administration
Suite 501, Evergreen Plaza
711 South Capitol Way
Olympia, Washington 98501-1284

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Steilacoom Ferry Landing Improvement Project, 17110019 (Puget Sound), Pierce County, Washington

Dear Mr. Mathis:

The enclosed document contains a biological opinion prepared by the National Marine Fisheries Service pursuant to Section 7(a)(2) of the Endangered Species Act on the effects of the project referenced above. In this biological opinion, the National Marine Fisheries Service concludes that the proposed action is not likely to jeopardize the continued existence of Puget Sound steelhead, Puget Sound Chinook salmon, Georgia Basin Bocaccio, Georgia Basin canary rockfish, Georgia Basin yelloweye rockfish, and Puget Sound Chinook salmon critical habitat and Southern Resident Killer Whale critical habitat.

As required by section 7 of the Endangered Species Act, the National Marine Fisheries Service provides an incidental take statement with the biological opinion. The incidental take statement describes reasonable and prudent measures the National Marine Fisheries Service considers necessary to minimize incidental take caused by this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements. Incidental take from actions that meet these terms and conditions will be exempt from the Endangered Species Act take prohibition.

This document also includes a description of the action's likely effects on Essential Fish Habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act but does not include conservation recommendations; therefore, no responses are required.

If you have questions regarding this consultation, please contact Michael Grady of the Washington State Habitat Office at (206) 526-4645, or by electronic mail at Michael.Grady@noaa.gov.

Sincerely,

Matthew Longenbaugh for

William W. Stelle, Jr.
Regional Administrator

Enclosure

cc: Bill Leonard, WSDOT
Pete Jilek, FHWA

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion, Section 7(a)(2) "Not Likely to Adversely Affect" Determination, Magnuson-Stevens Fishery Conservation, and Management Act Essential Fish Habitat (EFH) Consultation

Steilacoom Ferry Landing Improvement Project, HUC 17110019 (Puget Sound), Pierce County, Washington

NMFS Consultation Number: 2011/05000

Action Agencies: Federal Highway Administration, U.S. Army Corp of Engineers, Washington Department of Transportation, and Pierce County, Washington

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?
Puget Sound steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	No
Puget Sound Chinook (O. tshawytscha)	Threatened	Yes	No	No
Georgia Basin Bocaccio (*Sebastes paucispinis*)	Endangered	Yes	No	No
Georgia Basin yelloweye rockfish (*S. ruberimus*)	Threatened	Yes	No	No
Georgia Basin canary rockfish (*S. pinniger*)	Threatened	Yes	No	No
Pacific Eulachon (*Thaleichthys pacificus*)	Threatened	No	No	No
Southern Resident killer whale (*Orcinus orca*)	Endangered	No	No	No
Stellar sea lion (*Eumatopias jubatus*)	Threatened	No	No	No
Humpback whale (*Megaptera novaeangliae*)	Endangered	No	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	No
Groundfish species	Yes	No
Coastal Pelagic species	Yes	No

Lead Action Agency: Federal Highway Administration
Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Issued By:

William W. Stelle, Jr.
Regional Administrator

Date: August 29, 2012

TABLE OF CONTENTS

List of Acronyms

BA	Biological Assessment
BMP	Best Management Practices
BRT	Biological Review Team
CFR	Code of Federal Regulations
CHART	Critical Habitat Analysis Review Team
County	Pierce County
COE	U.S. Army Corps of Engineers
dB	Decibel
DOC	Department of Corrections
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FHWA	Federal Highway Administration
FR	Federal Register
HUC	Hydraulic Code
ITS	Incidental Take Statement
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NTU	Nephelometric turbidity unit
Opinion	Biological Opinion
PCB	Polychlorinated biphenyls
PFMC	Pacific Fisheries Management Council
PCE	Primary Constituent Element
PAH	Polyaromatic hydrocarbons
RMS	Root Mean Squared
RPM	Reasonable and Prudent Measure
SEL	Sound Exposure Level
SRKW	Southern Resident
SPL	Sound Pressure Level
Tribes	Western Washington Treaty Tribes
TRT	Technical Recovery Team
VSP	Viable Salmonid Population
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

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

The NMFS also completed an Essential Fish Habitat (EFH) consultation. It was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, et seq.) and implementing regulations at 50 CFR 600. The opinion and EFH conservation recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-5444) ("Data Quality Act") and underwent pre-dissemination review.

The Federal Highway Administration (FHWA) determined the proposed action is likely to adversely affect ESA-listed Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*), PS steelhead (*O. mykiss*), Georgia Basin (GB) bocaccio (*Sebastes paucispinis*), GB canary rockfish (*S. pinniger*), and GB yelloweye rockfish (*S. ruberimus*), and Critical Habitat for Chinook salmon. The adverse effects of the action primarily result from impact pile- driving.
The FHWA determined the project would have insignificant effects on southern resident (SR) killer whales (*Orcinus orca*) and killer whale critical habitat, humpback whales (*Megaptera novaeangliae*), Steller's sea lions (*Eumatopias jubatus*), Southern Pacific eulachon (*Thaleichthys pacificus*) critical habitat, and steelhead critical habitat.

The proposed action is scheduled to avoid the seasonal presence of SR killer whales, humpback whales, eastern Steller's sea lions; therefore, the FHWA determined that the effects to these species are considered discountable. A visual monitoring plan will ensure that the pile- driving activities will temporarily cease if listed marine mammals are detected within 3.3 miles of the project site (Appendix A). Therefore, the FHWA determined that the proposed action is not likely to adversely affect these species. The NMFS agreed with this determination and the species are not considered further in this Opinion.

Eulachon have not been documented to occur in south Puget Sound; however, they are not precluded from transient movements through the area. However, the FHWA determined that the proposed action is not likely to adversely affect these species due to the very low likelihood of their occurrence in Puget Sound. The NMFS agreed with this determination and the species are not considered further in this Opinion.

1.2 Consultation History

The proposed ferry terminal modification project is funded in part by the Federal Highway Administration (FHWA) and requires a Section 404 fill permit from the United States Army Corp of Engineers (COE). The FHWA is the federal lead action agency for this consultation, while the Washington State Department of Transportation-Highways and Local Programs Division (WSDOT) and Pierce County (County) are the project proponents.

A biological assessment (BA) and letter requesting to initiate formal consultation was received at the NMFS on 26 September 2011. The FHWA declared the proposed project is likely to adversely affect several listed species. This biological opinion is based on information provided in the BA, a site visit on 1 February 2012, additional information provided on June 4, 2012, and exchanges of emails until August 13, 2012, and other sources of information. The FHWA, WSDOT, and the County were allowed to review the draft Terms and Conditions and agreed to the requirements on July 3, 2012. Consultation was initiated on July 9, 2012. A complete record of this consultation is on file at Washington Habitat Office, Lacey, Washington.

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. No interrelated or interdependent actions have been identified in the project action area.

The FHWA proposes to fund a project carried out by the WSDOT and the County to add an adjacent, second ferry slip and replace an existing mooring facility in Steilacoom, Washington. The new slip will primarily serve the Department of Corrections (DOC) McNeil Island Correctional Facility and will provide a backup site for the general public ferry service. The new slip includes an approach trestle, transfer span, fenders, pontoon, wing walls, and dolphins. An existing pedestrian gangway in the footprint of the new slip will be removed. An existing pedestrian gangway in the footprint of the new slip will be removed. The new moorage structure occurs in the footprint of the existing structure and includes a pedestrian gangway and dolphins.
All in-water work will occur from three work barges moored in place for the duration of the project. The project is scheduled to begin spring 2014 and end spring 2015. In-water pile work will only occur between July 15 and September 30.

Demolition of existing structures

The County proposes to remove 135 creosote-treated piles supporting the existing moorage and dolphin structures. The piles will be removed using a vibratory hammer and disposed in an approved upland location. Piles that break off will be excavated with a clamshell bucket to remove the entire pile if possible. Piles that cannot be extracted will be cut off two feet below the surface and the void backfilled with clean gravel. Containment Best Management Practices (BMPs) will surround the piles during removal to capture oily sheens and loose material. The demolition also includes vibratory removal of a 24-inch hollow steel pile and the associated pedestrian access trestle.

Construction of new structures

Approximately 74 hollow steel piles will be used to construct the new approach trestle, pontoon fenders, wing walls, pedestrian trestle, and dolphins. The pile diameters range from 16 inches to 36 inches. All piles will be vibrated in until refusal and then impact proofed. A NMFS-approved (2012) monitoring plan will guide collecting underwater noise information. A noise attenuation device, such as a bubble curtain, will surround each pile while they are driven to completion. An exception will be momentary unattenuation on sample piles to establish baseline underwater noise to determine the effectiveness of the noise attenuation.

All piles will be installed from three work barges that may use simultaneously, all positioned adjacent to the existing structures. The three barges would shade up to 15,000 square feet and with anchors impacting up to 75 square feet of subtidal bed surface out to minus 30 feet. All in-water work will be completed between July 15 and September 30.

The existing approach trestle will be extended waterward 65 feet and widened up to 45 feet to accommodate the new slip located between the existing dock and ferry slip. The new deck surface will be composed of cast- in- place concrete.

The transfer span will be 90 feet long and 21 feet wide and will be a clear-spanning concrete deck hinged to the approach trestle on one end while the other end rests on a floating pontoon. This arrangement allows it to rise and fall with the tide. A folding steel apron attaches onto the end of the transfer span and facilitates vehicles moving on and off the ferry.

The floating concrete pontoon will be 27 feet by 42 feet and will be attached to piles with guide frames that allow the structure to rise and fall with the tide. The pontoon will support the unattached end of the transfer span.

There are two proposed wingwalls, one on each side of the transfer span/apron. These pile structures will guide the ferry into its loading position with the transfer span and protect the pontoon from errant vessels.

An existing pedestrian gang-way will be removed from the footprint of the new ferry slip. A new concrete pedestrian access trestle will provide foot passage to a new vessel moorage structure located on the north side of the existing ferry slip. A movable steel gang-way will be hinged on the end to accommodate tidal fluctuations and provides a connection to moored vessels.

A total of six dolphins are proposed. Each dolphin is composed of two steel piles which will be driven into position and welded together with steel beams and covered with laminated rubber fenders. Four dolphins will define the new moorage location while two dolphins will be added for the new slip.

The proposed mechanical and utility systems include hydraulic rams and pump system and electrical controls to raise and lower the steel apron for ferry loading and unloading. The hydraulic pump will be housed inside the proposed pontoon and the hydraulic rams will be positioned beneath the apron deck. Electrical power will be provided via conduit from the Steilacoom shore to power this system and to provide shore power for the docked ferryboat. In addition, this electrical service will provide power for the pontoon lights, controls, circulating fans, navigation lights etc. Water and sewer conduits will also be installed to provide water and sewer hook-ups for moored idle ferries. These project elements will be installed from the approach trestle and associated overwater structures or the construction barges and will not require in-water work.

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 furthest extent of the aquatic action area is defined by the continuous underwater noise from pile- driving (unattenuated) 36-inch hollow steel piles. Using a practical spreading loss model, WSDOT determined that the underwater noise generated from pile-driving activities would exceed biological thresholds for disturbing cetaceans up to 12.12 miles (30.50 square miles) from the Steilacoom Ferry Landing. The disturbance and injury threshold distances are considerably smaller for pinnipeds and fish.

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 on 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 or their critical habitat. If incidental take is expected, Section 7(b)(4) requires the provision of an incidental take statement (ITS) specifying the impact of any incidental taking, and including reasonable and prudent measures to minimize such impacts.

2.1 Introduction to the Biological Opinion

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 to the conservation value of the 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.[1]
We will use the following approach to determine whether the proposed action described in Section 1.3 is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of those species that are likely to be affected by the proposed action, and describe the rangewide status of the designated critical habitat of those species.
- Describe the environmental baseline for the proposed action and evaluate its effect on the species.
- Analyze the effects of the proposed actions on species and on habitat.
- Describe any cumulative effects anticipated in the action area, as defined in NMFS' implementing regulations (50 CFR 402.02.
- 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

[1] 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).

In this consultation, the NMFS reviewed the status of several listed species and their habitats occurring in marine water that may be affected by the action. For PS Chinook salmon and PS steelhead, the NMFS followed McElhany, et. al. (2000) to describe criteria for a 'Viable Salmonid Population' (VSP) and the potential effects the project may have on them. Attributes associated with a VSP include abundance, productivity spatial structure and genetic diversity that maintain the capacity to adapt to various environmental conditions. These viability attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced in turn by habitat and other environmental conditions.

The NMFS determine the range-wide status of critical habitat by examining the condition of its Primary Constituent Elements (PCEs), which were identified when the critical habitat was designated and relied on categorization of value found in the critical habitat assessment review team (CHART) documents (NMFS 2005).

Salmon and their habitats throughout Washington are also likely affected by climate change. Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the state (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region, climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin et al. 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathe 2009) – changes that will shrink the extent of the snowmelt-dominated habitat available to salmon. Such changes may restrict our ability to conserve diverse salmon life histories.

In the state of Washington, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the state of Washington are likely to increase 0.1 to 0.6 °Celsius (0.18 to 1.08°Fehrenheit) per decade (Mote and Salathe 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing and increasing peak river flows, which may limit salmon survival (Mantua et al. 2009). The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour the streambed and destroy salmon eggs (Battin et al. 2007).

Higher water temperatures and lower spawning flows, together with increased magnitude of winter peak flows, are all likely to increase salmon mortality. Higher ambient air temperatures will likely cause water temperatures to rise (ISAB 2007). Salmon and steelhead require cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua et al. 2009).

Climate change is expected to make recovery targets for these salmon populations more difficult to achieve. Habitat actions can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

<u>2.2.1 Status of Listed Species</u>

Puget Sound Chinook Salmon

In 1999, the NMFS listed Chinook salmon in the Puget Sound ESU as threatened (64 FR 14308).

The NMFS compiled the following status summary based on information from the most recent status review (Ford et. al. 2011), and recovery plan elements (Shared Strategy 2007), unless otherwise noted.

In 2005, the Biological Review Team (BRT) concluded that the naturally spawned component of the PS Chinook salmon ESU is likely to become endangered within the foreseeable future, and that hatchery programs do not substantially reduce the extinction risk. The Puget Sound Technical Recovery Team (TRT) recommended that "[a]n ESU-wide recovery scenario should include at least two to four viable Chinook salmon populations in each of five geographic regions within Puget Sound, depending on the historical biological characteristics and acceptable risk levels for populations within each region" (PSTRT 2002). The loss of any additional genetic and life history characteristics from the Puget Sound ESU will affect the ability of the Chinook salmon to persist in the future (Shared Strategy 2007). The TRT stated that "[a]n ESU-wide recovery scenario should include within each geographic region one or more viable population from each major genetic and life history group historically present within that geographic region" (PSTRT 2002).

Juvenile Chinook salmon are known to use both nearshore and mid-water habitats throughout south Puget Sound during early marine rearing and migration between the months of April and July. However, available evidence indicates that juvenile Chinook from populations from throughout the ESU could potentially occur in the action area in limited numbers over broader periods. For example, Fresh et al. (2006) studied marine habitat utilization of Sinclair Inlet, located approximately 36 miles north, by Chinook salmon and found rearing juveniles as early as March and as late as September, with peak abundance in May and June. The majority were of hatchery origin from outplants in local streams. However, they also observed small numbers of tagged hatchery origin fish from rivers throughout the region including the Nisqually, Puyallup, Skykomish, and Samish River systems, tributaries to the Strait of Juan de Fuca, and even the Fraser River in British Columbia, Canada. Assuming that wild origin fish display similar habitat use, this suggests that limited numbers of juvenile Chinook from populations throughout the ESU may occur in the action area, predominantly from April through June as juveniles. Fresh et al. (2006) noted that juveniles were typically found in nearshore habitats during early marine rearing and tended to move offshore into deeper water as they increased in size. Adult Chinook salmon are light sensitive and tend to use deep water habitats between 50 and 100 feet or greater during daylight hours (70 FR 52680).

Because juvenile salmonids (and other fish) less than two grams in weight are considered more susceptible to sound pressure level (SPL) related injury, it is necessary to understand if and when these individuals are likely to be present in order to characterize potential exposure to deleterious effects of impact pile driving. Juvenile Chinook salmon in Puget Sound have typically exceeded two grams in weight by June (FHWG 2008). Calculated weights using observed lengths for Chinook salmon captured in Sinclair Inlet sampling (Fresh et al. 2006) and length to weight relationships established for Chinook salmon from the nearby Green River (Ruggerone et al. 2006) indicate that juvenile Chinook salmon are likely to exceed two grams in weight sometime between mid-April and mid-May. On this basis it is likely that juvenile Chinook salmon smaller than two grams in weight are unlikely to be present after the first week of May.

Spatial Structure and Diversity. "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 (McElhany et al. 2000).

The PS Chinook salmon ESU had 31 historical quasi-independent populations, 22 of which are believed to be extant (Ruckelshaus et al. 2006). Ford et. al. (2011) reaffirmed that Puget Sound ESU diversity had not changed since the last status assessment. A majority of the PS Chinook salmon populations and spawning aggregations now believed extinct were early-run (spring) populations (Ruckelshaus et al. 2006). The loss of early run (spring) Chinook salmon stocks in Puget Sound represents an important loss of part of the diversity of the historical ESU (Good et al. 2005). One of the remaining seven spring Chinook salmon populations in the ESU resides the nearby White River located approximately 19 miles north of the proposed project. Juveniles from this river system have been document in the project vicinity (Fresh et al. 2006). These spawning subpopulations are considered part of the South Puget Sound (PS) Chinook salmon stock defined by the WDFW and Western Washington Treaty Tribes (Tribes).

Fall-run Chinook salmon spawning typically occurs from late September through October (WDFW 2002), but staging adult Chinook salmon are likely to be present in the action area as early as the last week of August. Individual "resident" blackmouth Chinook salmon could be present in the action area year round.

The PS Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington (March 24, 1999, 64 FR 14208). Good, et. al. (2005) found that the spatial distribution of Chinook salmon populations with a strong component of natural-origin spawners in the Puget Sound ESU had not changed since the last status assessment by Myers et al. (1998). Populations containing significant numbers of natural origin spawners whose status can be reliably estimated occur in the Skagit River basin, the South Fork Stillaguamish, and Snohomish River basin. The remaining populations in mid- and south Puget Sound, Hood Canal, and the Strait of Juan de Fuca have significant but non-quantifiable fractions of hatchery-origin spawners, so their contribution to spatial structure in the ESU is not possible to estimate.

Of 26 existing artificial propagation programs, eight are directed at conserving PS Chinook salmon. The remaining programs considered part of the ESU are operated primarily for fisheries harvest augmentation purposes (some of which also function as research programs) using transplanted within-ESU-origin Chinook salmon as broodstock. The NMFS determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005).

The PS Chinook salmon ESU had 31 historical quasi-independent populations, 22 of which are believed to be extant (Ruckelshaus et al. 2006). Ford et al. (2011) reaffirmed that Puget Sound ESU diversity had not changed since the last status assessment. A majority of the PS Chinook salmon populations and spawning aggregations now believed extinct were early-run (spring) populations (Ruckelshaus et al. 2006). The loss of early run (spring) Chinook salmon stocks in Puget Sound represents an important loss of part of the diversity of the historical ESU (Good et al. 2005). One of the remaining seven spring Chinook salmon populations in the ESU resides the nearby White River located approximately 19 miles north of the proposed project. Juveniles from this river system have been document in the project vicinity (Fresh et al. 2006). These spawning subpopulations are considered part of the South Puget Sound (PS) Chinook salmon stock defined by the WDFW and Western Washington Treaty Tribes (Tribes).

Abundance and Productivity. Although some of the PS Chinook salmon populations have shown substantial increases in recent years, none of the 22 populations are currently close to meeting the minimum value of the viable planning range for abundance and productivity. Ford et al. (2011) concluded that most PS Chinook salmon populations have decreased since 2009, and despite recent increases in some populations, all PS Chinook populations are well below the TRT planning range for recovery escapement levels. Most populations are also consistently below the spawner recruit levels identified by the TRT as consistent with recovery. All populations are considered to be at high risk, and the condition of all of the populations needs to improve (Shared Strategy 2007; Ford, et.al. 2011). Overall abundance of Chinook salmon in this ESU has declined substantially from historical levels of approximately 690,000 spawners in the early 1900s. The long- and short-term escapement trends for natural Chinook salmon runs in North Puget Sound were predominately negative through the mid-1990s when the North Fork Nooksack, Stillaguamish and Snohomish systems began to show improvements in escapements. In South Puget Sound and Hood Canal, both long- and short-term trends in escapements are predominantly positive. However, the contribution of hatchery fish to natural escapements in many of the populations may be substantial, masking the trends in natural production (NMFS 2008).

Based on the geometric mean number of natural spawners from 2005 to 2009, the PS Chinook salmon ESU consisted of 34,486 (natural origin and hatchery) fish. The geometric mean of natural spawners ranged from 81 (Hood Canal population) to 10,345 (upper Skagit population). Seven of the 22 independent populations exhibited increasing trends in abundance (Ford, et. al. 2011).

Nisqually River Chinook salmon escapement records indicate an average of 1,034 adults returned annually from 1968 to 2009. This population increased to an average of 1,904 per year during the last 10 years from 1999 to 2009. The increase likely reflects hatchery supplementation. However, there was a significant decrease to only 872 in 2009 (WDFW 2011).

Puget Sound Steelhead

The NMFS listed the Puget Sound Distinct Population Segment (DPS) of steelhead as threatened on May 11, 2007 (72 FR 26722).

Spatial Structure and Diversity. Steelhead are located in the majority of accessible larger tributaries in Puget Sound, Hood Canal, and the eastern Strait of Juan de Fuca. Over 50 historical steelhead stocks have been identified in Puget Sound by the Washington Department of Fish and Wildlife (WDFW). The definition of individual populations of steelhead within the DPS is being developed by the PS Steelhead Technical Recovery Team (NMFS 2011a). The PS steelhead BRT determined that lack of spatial structure posed moderate risk to the viability of the DPS due to reduced complexity and diminishing connectivity among populations (Hard et al. 2007). Large numbers of barriers, such as impassable culverts, together with declines in natural abundance, greatly reduce opportunities for adfluvial movement and migrations between steelhead groups within watersheds.

The PS steelhead BRT concluded that the viability of PS steelhead is at moderate risk due to the reduced life history diversity of stocks and the potential threats posed by artificial propagation and harvest in the Puget Sound (Hard et al. 2007). The winter-run steelhead is the predominant run in Puget Sound, in part because there are relatively few basins in the Puget Sound DPS with the flow and watershed characteristics necessary to establish the summer-run life history (NMFS 2011). All summer-run stocks are depressed and concentrated in northern Puget Sound. Production of hatchery stocks that are either out-of-DPS-derived stocks (Skamania River summer run) or within-DPS stocks that are substantially diverged from local populations (Chambers Creek winter run) largely outnumber naturally-produced steelhead in many basins throughout Puget Sound.

Abundance and Productivity. No abundance estimates exist for most of the summer-run populations, which appear to be small, most averaging less than 200 spawners annually (Hard et al 2007). Low abundance of several summer-run populations and the sharply diminishing abundance of some steelhead populations, especially in south Puget Sound, Hood Canal, and the Strait of Juan de Fuca, have increased the risk to the DPS. Trends in abundance have continued to decline despite widespread reductions in direct harvest of natural steelhead in this DPS since the mid-1990's (Hard et al. 2007).

Nearly all populations in the DPS exhibit diminished productivity as indicated by below-replacement population growth rates, and declining short- and long-term trends in natural escapement and total run size (71 FR 15671, Mar 29, 2006, Ford et. al. 2011). In 2007, the BRT found widespread declines in abundance and productivity for most natural steelhead populations in Puget Sound, including those in Skagit and Snohomish rivers, previously considered strongholds for steelhead within the DPS. Dramatic fluctuations in the abundance of adult steelhead returning to rivers in the Pacific Northwest between 2000 and 2006 appear to be linked to climate effects on their ocean survival.

No abundance estimates exist for most of the summer-run populations, which appear to be small; most averaging less than 200 spawners annually (Hard et al 2007). Since 1992, the WDFW has continued to downgrade the status of steelhead in the DPS (WDFW 2012). Over this period, populations categorized as "healthy" decreased from 14 (26.4 percent of all populations in the DPS) to 5 (9.4 percent); and populations categorized as "depressed" increased from 14 (26.4 percent) to 19 (35.8 percent). Populations listed as "critical" remain as 1 (1.9 percent) and the number of populations of unknown status increased from 23 (43.4 percent) to 26 (49.1 percent) (Hard et al. 2007, WDFW 2012). Only four of the 16 PS steelhead populations have exhibited an increasing population (Ford et. al. 2011).

Adult steelhead escapement in the Nisqually River had an average of 1252 per year from 1980 to 2011; however, the past 10 years (2001 to 2011) reflects a decrease to an average of 460 adults per year with 2011 recording the second lowest escapement of only 269 fish (WDFW 2011).

Spatial Structure and Diversity. The PS steelhead DPS includes all naturally-spawning anadromous winter and summer runs of steelhead in the inland waters of Washington State from the Elwha River (inclusive) eastward along the Strait of Juan de Fuca into the inland marine waters of Puget Sound. The DPS includes all rivers and streams flowing into Hood Canal, South, Central, and North Puget Sound, Port Susan, Skagit Bay, and the Washington portion of the Strait of Georgia. The DPS also includes the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks. Most steelhead in Puget Sound are winter-run (BRT 2003). The Washington Department of Fish and Wildlife (WDFW) has identified 53 populations of steelhead (49 remaining historical and four introduced) of which 36 (68 percent) are winter-run. Sixteen of these populations make up the Puget Sound DPS. Northern Puget Sound supports the majority of steelhead abundance in the DPS, with the Skagit and Snohomish rivers supporting the two largest winter-run populations. Summer-run populations are concentrated in northern Puget Sound, Hood Canal, and the Strait of Juan de Fuca.

The quantity and quality of available steelhead habitat in the Puget Sound Basin has been restricted by a number of large hydroelectric dams. These dams have reduced or eliminated access to large areas of historical habitat and degraded remaining habitats by changing river hydrology, temperature profiles, gravel recruitment, and the transport and deposition of large woody debris. In many of the lower reaches of rivers and their tributaries, urban and agricultural development have resulted in the replacement of historical land cover with pollution generating surfaces that diminish habitat productivity.

Puget Sound/Georgia Basin Bocaccio, Canary Rockfish and Yelloweye Rockfish

Puget Sound/Georgia Basin (PS/GB) Distinct Population Segments (DPS) of yelloweye rockfish and canary rockfish were listed as threatened and bocaccio as endangered under the ESA on April 27, 2010 (75 FR 22276). The NMFS determined that PS/GB DPS of bocaccio is at high risk of extinction throughout all of its range and that the PS/GB DPSs of yelloweye rockfish and canary rockfish are at moderate risk of extinction throughout all of their ranges (Drake et al. 2010). The PS/GB DPSs include all yelloweye rockfish, canary rockfish and bocaccio found in waters of the Puget Sound, the Strait of Georgia, and the Strait of Juan de Fuca east of the Victoria Sill (74 FR 18516, April 23, 2009; Drake et al. 2010). The Victoria sill is delineated from Low Point and north to the Canadian Border. Puget Sound can be subdivided into five interconnected basins separated by shallow sills: (1) The San Juan/Strait of Juan de Fuca basin, (2) Main Basin, (3) Whidbey Basin, (4) South Puget Sound, and (5) Hood Canal. We use the term ''Puget Sound Proper'' to refer to all of these basins except the San Juan/Strait of Juan de Fuca basin.

Spatial Structure and Diversity. Yelloweye rockfish spatial structure is likely threatened by a severe reduction of fish throughout all or portions of Hood Canal and the South Puget Sound, combined with their small home ranges as adults. Similarly, several historically large aggregations of canary rockfish in Puget Sound have been depleted by fisheries, including an area of historical distribution in South Puget Sound (Drake et al. 2010). Bocaccio, historically most abundant in the Central and South Puget Sound, are now rarely observed in these areas (Drake et al. 2010). For canary rockfish and bocaccio, positive signs for spatial structure and connectivity come from the propensity of some adults and pelagic juveniles to migrate long distances, which could reestablish aggregations of fish in formerly occupied habitat (Drake et al. 2010).

Rockfish diversity characteristics include fecundity, timing of the release of larvae and their condition, morphology, age at reproductive maturity, physiology, and molecular genetic characteristics. Though genetic data are lacking for the listed DPSs, the unique oceanographic features and relative isolation of some of its basins may have fostered special adaptations, such as larval release timing (Drake et al. 2010).

Size- and age-distributions of ESA-listed rockfish are truncated, which is a form of lost diversity that decreases population fitness. Recreationally caught yelloweye rockfish, canary rockfish, and bocaccio in the 1970s spanned a broad range of sizes. By the 2000s, there was evidence of proportionately fewer older fish (Drake et al. 2010). For each species, shifting the reproductive burden to younger and smaller fish could alter the timing and condition of larval release. When larval release is mismatched with habitat conditions in the Puget Sound, the proportion of viable offspring suffers (Drake et al. 2010).

Abundance and Productivity. There is no single reliable population estimate for any of the DPSs (Drake et al. 2010). Despite this limitation, catch data provides evidence that each species' abundance has dramatically declined (Drake et al. 2010). Catches of yelloweye rockfish, canary rockfish, and bocaccio have declined as a proportion of the overall rockfish catch (Palsson et al. 2009; Drake et al. 2010). The total rockfish population in the Puget Sound region is estimated to have declined by 3 percent per year for the past several decades, which corresponds to an approximate 70 percent decline from 1965 to 2007 (Drake et al. 2010).

Life-history traits of yelloweye rockfish, canary rockfish and bocaccio suggest generally low levels of inherent productivity because individuals are long-lived and mature slowly, with sporadic episodes of successful reproduction (Tolimieri and Levin 2005; Drake et al. 2010). This naturally low-productivity can be exacerbated by fisheries, environmental toxicity, and habitat changes.

Long-term fishing reduced average ages and sizes of females resulting in lower productivity at the population level because larger and older females of various rockfish species have a higher weight-specific fecundity (number of larvae per unit of female weight) (Boehlert et al. 1982; Bobko and Berkeley 2004; Sogard et al. 2008). Maternal age and maturity also affect timing of parturition, which is crucial to achieving favorable oceanographic conditions for the small and vulnerable larvae (Washington et al. 1978). Larvae birthed during favorable oceanographic conditions are more likely to reach maturity (Sogard et al. 2008; Nichol and Pikitch 1994) and larger or older females provide more nutrients to larvae (Berkeley et al. 2004; Fisher et al. 2007), which likely enhances early growth rates (Berkeley et al. 2004), but may also negatively affect their growth and maturation by transferring contaminants to offspring (Palsson et al. 2009).

2.2.2 Status of Critical Habitat

The NMFS has not yet designated critical habitat for Puget Sound steelhead. NMFS designated critical habitat for the PS Chinook ESU on September 2, 2005. The Primary Constituent Elements (PCEs) for PS Chinook salmon critical habitat are the sites and the physical characteristics' of such sites, which are essential to support one or more life stages of the ESU. The PCEs of PS Chinook salmon critical habitat are:

PCE 1 - Freshwater spawning sites with water quantity and quality conditions and substrate that support spawning, incubation, and larval development;

PCE 2 - Freshwater rearing sites with (1) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility, (2) water quality and forage that support juvenile development, and (3) natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

PCE 3 - Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks that support juvenile and adult mobility and survival;

PCE 4 - Estuarine areas free of obstruction and excessive predation 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, side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;

PCE 5 - Nearshore marine areas free of obstruction and excessive predation 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; and

PCE 6 - Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Of the PCEs, only PCE 5 (Nearshore) and PCE 6 (Offshore) occur in the project action area. The project footprint occupies nearshore critical habitat that has been defined to extend from the extreme high tide line to a depth of -30 meters. At the Steilacoom Ferry site, the -30 meter bathometer is approximately 1,000 feet water-ward from the Mean Higher High Waterline.

As part of the process to designate CH within the PS Chinook salmon ESU, the Critical Habitat Analysis Review Team (CHART) assessed the conservation value of habitat within freshwater, estuarine, and nearshore areas at the fifth field hydrologic unit code (HUC), generally corresponding to the watershed scale. Of the 61 HUCs evaluated within the ESU, twelve received a low rating, nine received a medium rating, and 40 rated a "high" conservation value. In addition, all nineteen marine water areas from the extreme tide line out to a depth of -30 meters (encompassing 2,376 miles) also received a rating of high conservation value. Rankings were based on a variety of factors and do not necessarily indicated that PCEs are in optimal or good condition (NMFS 2005).

The degradation of multiple PCEs throughout the nearshore indicates that the conservation potential of the CH is not being reached, even in areas where the conservation value of habitat is ranked high. Impacts to the PCEs include loss of or simplification of deltas and delta wetlands; modification of shorelines by armoring, overwater structures and loss of riparian vegetation; contamination of nearshore and marine resources, including degradation of water quality; and alteration of biological populations and communities. The Washington Department of Natural Resources ShoreZone Inventory estimates that 33 percent of Puget Sound Shorelines have been modified with bulkheads or other modifications that convert intertidal habitat to uplands and alter nearshore processes (PSWQAT 2002). Puget Sound now has 3,500 piers and docks, 29,000 small boat slips, and 700 large ship slips. These structures are likely to interfere with juvenile salmonid migration and diminish aquatic food supply. Related boat traffic is also a source of disturbance and water pollution.

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).

The Steilacoom Ferry is located in southern Puget Sound on the marine shoreline approximately five miles north of the Nisqually River and one mile south of Chambers Creek. Both streams are source populations for anadromous salmonid species that could occur in the project vicinity. Only fall-run Chinook salmon of hatchery-origin are now found in the Nisqually River. Resident Chinook salmon, also known as blackmouth, are raised and released to primarily reside in Puget Sound waters. Individually and collectively, the Nisqually River Chinook salmon populations which rely on the action area, are essential to the survival and recovery of the ESU because they provide vital contributions to its abundance, productivity, diversity, and spatial structure.

The action area has been affected by a long history of human activity, which includes artificial fills, dredging, and construction of a railroad that runs along much of the eastern shoreline of Puget Sound. Natural sediment erosion into the nearshore and beach enrichment has been disrupted since the latter half of the 1800's when the railroad was originally constructed. The rail bed is heavily armored with angular rock and occupies portions of the littoral zone where it occurs along the shoreline, impairing natural slope and preventing riparian vegetation from becoming established, both of which serve young salmonids after they enter the saltwater environment. Stream outlets to the Sound have been channelized or confined in culverts to pass under the rail bed.

The city of Steilacoom maintains six untreated stormwater outfalls spread over three miles of Puget Sound shoreline. The storm drains are fed by 16 miles of storm drain pipe and three miles of open ditches by stormwater from roads, parking lots, and driveways. These stormwater outfalls likely introduce pollutants to marine waters such as total suspended solids (TSS), dissolved metals, and oil, each of which affects young salmonids differently.

Eelgrass and kelp, which provide cover for young salmonids and also are valuable as spawning areas for forage fish upon which salmonids prey, is spotty along the shoreline with little or none occurring in the project footprint. Propeller wash from several years of ferry traffic precludes eelgrass from becoming established in the path of the boats. The shoreline and offshore habitats in the project vicinity are fairly uniform with a steep sloping and soft-bottomed substrate lacking in eelgrass. In places where the railroad bed occurs within or adjacent to the littoral zone wave action reflecting off of this hard surface has contributed to erosion of the beach and the adjacent intertidal bench. The beach has eroded down to hardpan in many areas, and fine substrates capable of supporting intertidal vegetation, like eelgrass, are generally lacking.

A sediment characterization study was completed before the Steilacoom Ferry Landing facilities were replaced in 1994. The study included researching historic uses as well as sampling and analysis of sediments adjacent to the landing. Sediments were sampled and characterized in accordance with the Washington Sediment Quality Standards and an Ecology approved Sampling and Analysis Plan (WAC 173-204). The study concluded that significant sediment contamination was not present in the area (Sverdrup 1994). Ecology's review of the sediment study results ranked the area as a low-priority and attached no conditions to federal approval of the proposed project.

Some sediment contamination may occur immediately adjacent to the existing creosote-treated piles within the project site. Sediment- bound environmental toxins associated with the creosote include polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals including copper, zinc, and arsenic (Poston 2001). Goyette and Brooks (1998, 2000) studied sediment contamination resulting from the installation of several new creosote-treated timber pile dolphins in British Columbia. They found measurable PAH contamination within approximately 25 feet of the structures, with concentrations of some contaminants exceeding the biological effects thresholds (35 µg/g) for benthic macroinvertebrates within eight feet (Griffiths and Smith 2010). The distribution of contaminants was patchy and variable and decreased over time as a result of physical and biological dispersion. Poston (2001) notes that PAH concentrations surrounding creosote treated structures tend to decrease over time due to biological degradation. Given that the existing creosote treated structures have been in place for several years, it is unlikely that significant sediment contamination occurs beyond the area immediately surrounding the existing creosote-treated structures.

2.4 Effects of the Action on the Species and its 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. 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.

No interrelated or interdependent actions have been identified with this project. Each of these habitat effects will in turn cause effects among individuals of the listed species.

2.4.1 Effects on ESA-listed Fishes

Project effects during construction will include a temporary reduction in water quality, disturbance to the benthic habitat, an increase in overwater cover from construction equipment and elevated underwater sound. Long-term effects will occur from a 4,435 square foot increase in overwater cover and 52.2 square foot increased pile footprint. Temporary effects include up to 15,000 square feet of shading from work barges, elevated turbidity from pile installation and removal, and elevated underwater noise from impact pile driving. Each of these habitat effects will in turn cause effects among individuals of the listed species.

Water Quality

Pile removal and installation will suspend small amounts of sediment in the water column, and the sediment may include some contaminants that has leached from the creosote piles. During pile removal events at the Friday Harbor Ferry Terminal and Eagle Harbor Maintenance Facility, turbidity levels did not exceed 1 nephelometric turbidity unit (NTU) over background conditions (WSF et al. 2009). During pile removal at the SR 520 Bridge site in Lake Washington, turbidity levels reached approximately 25 NTU above background at 50 feet from a pile in one case, but turbidity levels at 100 feet rarely exceeded 5 NTU above background. Turbidity tended to return to background levels approximately 30 to 40 minutes after the construction activity ceased.

Turbidity levels did not exceed 3 NTU above background at 150-feet from the piles (Bloch 2010). Turbidity levels remained below 10 NTU 50 feet from a pile installed with an impact driver using an unconfined bubble curtain and decreased to less than 2 NTU within five minutes after pile driving ended (Bloch 2010).

Increased turbidity levels over time can adversely affect the physiology, behavior, and habitat of steelhead. Tissue injury can result from abrasive silt particles entering delicate fish gills, interfering with respiration. The resulting stress can affect the parr-smolt transformation, resulting in impaired migratory behavior and reduced early marine survival. Turbidity can also affect feeding rates, reaction distance, prey selection and abundance due to the reduction in visibility. The reduced underwater visual range of fish may either act as a protective cover from predators (e.g. larger fish or piscivorous birds) or reduce the ability of these species to detect predators (Sigler et al. 1984, Bash et al. 2001, Berg and Northcote 1985). The turbidity effects of the project from the removal of the flow diversion structures are likely to extend up to 1000 feet downstream of each block net (at MP 2.5 and MP 2.25) but are expected to be of short duration. The NMFS expects fish exposed to turbidity will experience sublethal effects including temporary displacement from preferred habitats and physiological stress.

Project permit conditions issued by Washington Department of Ecology will require turbidity not exceed 5 NTUs beyond 150 feet from the source but it is anticipated that elevated turbidity will be confined to a smaller area. Based on the preceding data, NMFS believes the suspended sediment causing turbidity and any associated contaminants caused by the proposed action will be localized around each pile, then will be quickly diluted or will settle back to the substrate (WSF 2005; Bloch 2010). Listed fish will be exposed only to low concentrations of suspended sediments and contaminants, and the exposure will be of short duration. Therefore, suspended sediment and contaminants are not expected to measurably affect PS listed fish species' ability to forage, migrate, or avoid predation. In the long term, the removal of the creosote treated piles should improve water quality.

Benthic Disturbance

The removal and installation of piles will also disturb the benthic environment, which is a source of biological productivity that ultimately contributes food for the listed fish species. The project will incrementally increase (52.2 square feet) the footprint of the existing structure and any potential effect to listed fish species due to a slight decrease in forage production would be insignificant.

Temporary Overwater Coverage

The construction barges will create up to 15,000 square feet of overwater cover that may impede juvenile Chinook salmon and steelhead migration while it is present. The NMFS believes that the short time these relatively small sources of overwater cover are present will have no measureable effects on fish migration, particularly for steelhead smolts because they are expected to seek deeper water soon after leaving their natal stream. Juvenile Chinook salmon will be able to negotiate around the barges, which is similar to the existing condition. Larval rockfish will still drift with the tidal currents regardless of the work barges.

Permanent Overwater Coverage

The expanded ferry terminal structure will permanently increase nearshore shading an additional 4,435 square feet from the existing 34,109 square feet. The additional shading is insignificant in area of Puget Sound that has few nearshore anthropomorphic structures (3 piers, 1 railroad trestle, and one marina) in the 12 miles between the Nisqually River delta and Tacoma Narrows Bridge.

Underwater Noise from Pile Driving

Pulse Noise. The NMFS does not consider vibratory noise to have injurious effects on fish. In contrast, pulse sound produced by impact pile driving to proof the piles can injure or kill fish (Longmuir and Lively 2001; Stotz and Colby 2001; Caltrans 2001). Fish with swim bladders, which includes salmonids and rockfish, may be damaged by high sound pressure levels (Yelverton et al. 1975; Turnpenny et al. 1994). Other injuries can include inner ear damage, hemorrhaging, eye damage, and damage to internal organs (Turnpenny et al. 1994; Caltrans 2001). Even if fish are not immediately killed, these injuries can affect survival and fitness. For example, sub-lethal injuries may make a fish more susceptible to predation.

Fish may also show behavioral reactions to elevated sound levels. In their literature review, Hastings and Popper (2005) identified reduced feeding activity in, and/or avoidance of areas exposed to elevated sound levels. Feist (1991) observed that the number of pink salmon (*O. gorbuscha*) and chum salmon (*O. keta*) schools in a cove isolated from pile driving noise to the number of schools in a construction area was about 2:1 on pile driving days and 1:1 on non-pile driving days. In another study, fish survey transects using a fathometer indicated schools of fish did not move away from the pile being driven or the general area of the pile driving barges during pile driving operations (Caltrans 2001). Feist (1991) qualitatively observed that schools of juvenile pink and chum salmon exposed to pile driving noise were less apt to startle when approached by observers compared to schools in a cove that was acoustically isolated from the pile driving sound. Broadly, the effects of underwater noise on organisms range from no observable effects to immediate death. Over this continuum of effect, there is no easily identifiable point at which behavioral responses occur, or where they transition to physical injury.

A multi-agency working group of Federal and State transportation and resource agencies, including underwater acoustics experts, fish biologists, and transportation specialists, has released agreed-upon "interim criteria" for evaluating the potential for physical effects (i.e., injury) on fish from underwater noise levels caused by pile driving. These criteria represent threshold values for received levels, with the onset of injury expected if either: 1) the peak pressure of any strike exceeds 206 dB (re: 1 μPa); or 2) Sound Exposure Level (SEL), accumulated over all pile strikes, exceeds 187 decibel (dB) (re: 1 μPa2•sec) for fishes two grams or larger and 183 dB for fishes smaller than two grams (FHWG 2008). A Root Mean Squared (RMS) level of 150 dB (re: 1μPa) 5 is a threshold where fish behavior could still be affected, but direct injury or death would not be expected. During the work window, large and small sizes of PS Chinook salmon and PS steelhead adults, and larval and juvenile rockfish are expected to be present in the zone of disturbing and injurious noise levels.

The Practical Spreading Loss model, developed by NMFS and available on the WSDOT website (http://www.wsdot.wa.gov/Environment/Biology/BA/default.htm#Noise) to estimate the area around each pile where fish would be considered at risk of injury or behavioral disruption during (http://www.wsdot.wa.gov/NR/rdonlyres/A3B6FF43-DC7B-4D98-9228-C8764635587A/0/PileDiameterNoiseLevels.pdf), a single strike on a 16-inch hollow steel pile will produce a peak pressure of 200 dB and 187dBrms, while a single strike to a 24-inch hollow steel pile will produce a peak pressure of 212 dB, 181 dB SEL, and 189 dB rms, and a single strike on a 36-inch hollow steel pile will produce a peak pressure of 212 dB, 186 dB SEL, and 201 dB rms.

A representative pile of each size (16-inch, 24-inch, and 36-inch) will be impact- driven with no noise attenuation for up to 90 seconds to calibrate the baseline noise levels to be used for evaluating the effectiveness of the noise attenuation device. Noise from the 36-inch pile is expected to be the loudest of the three sizes and will be used to determine the worst case scenario for the extent of underwater noise. It is estimated there will be up to 675 proofing strikes per day on the 36-inch pile from the impact hammer.

Unattenuated Impact Pile Driving

Unattenuated piles will be driven to gather baseline noise levels. One pile from each size of piles (36-inch, 24-inch [20-inch piles are assumed to be similar to 24-inch and will not be sampled], and 16-inch) will be sampled to provide the baseline information. The piles will initially be vibrated into resistance. The vibratory head is then replaced with an impact driving pile head. A noise attenuation device, likely a bubble curtain, is deployed and operates as the impact pile driving ramps up from a slow start to full compression. The bubble curtain is then turned off for 2, 90-second sessions (a total of 3 minutes per pile sample [Nine minutes total for all samples]). One session occurs near the beginning and one is near the end of pile driving. Noise is not monitored during the first 60 seconds of each session to allow bubbles in the water column to rise and disperse. The remnant bubbles can alter the results. During the last 30 seconds of "bubbles off", data is recorded and analyzed to define the baseline of maximum noise.

For listed fish that are less than two grams, which includes larval and juvenile bocaccio, yelloweye rockfish, and canary rockfish, take is exempted for 36-inch piles up to 2,329 feet, 24-inch piles up to 1,083 feet, and 16-inch piles 430 feet from the unattenuated pile driving activity. This distance defines the extent where the cumulative SEL exceeds 183 dB (re: 1 μPa2 • sec).

For fish two grams or larger, which includes PS Chinook salmon juveniles and adults, PS steelhead juveniles and adults, and juvenile bocaccio, yelloweye rockfish, and canary rockfish, take is exempted for 36-inch piles up to 1,260 feet, 24-inch piles up to 584 feet, and 16-inch piles 233 feet from the unattenuated pile driving activity from pile driving activity. This distance defines the extent where the cumulative SEL exceeds 187 dB (re: 1 μPa2 • sec).

For the 36-inch pile, the area of potential injury to all fish from peak pressures will be a 112-foot radius around each pile. For the 24-inch pile, the area of potential injury to all fish from peak pressures will be an 82-foot radius around each pile. And for the 16-inch pile, the area of potential injury to all fish from peak pressures will be a 13-foot radius around each pile.

Unattenuated sampling will not exceed three minutes total on the three piles that will be sampled on separate days. It is important to emphasis that this is a worse-case scenario and that this extent of injurious noise will only occur during the two, 90-second baseline analysis for each of the three sample piles. Up to 25 strikes may occur during each 90-second period (six sample events times 25 strikes per sample equals 150 total unattenuated strikes). All other pile strikes will be attenuated and noise will be reduced by at least 10 dBs.

Attenuated Impact Pile Driving

After each session of unattenuated baseline noise information is recorded, the noise attenuation device is turned back on ("bubbles on") for the duration of the impact pile driving. It is assumed that the noise attenuation device will reduce noise by a minimum of 10 dBs.

For listed fish that are less than two grams, which includes larval and juvenile bocaccio, yelloweye rockfish, and canary rockfish, take is exempted for up to 863 feet from proof impact pile driving activity. This distance defines the extent where the cumulative SEL exceeds 183 dB (re: 1 μPa2 • sec).

For fish two grams or larger, which includes PS Chinook salmon juveniles and residents, PS steelhead juveniles and adults, and juvenile bocaccio, yelloweye rockfish, and canary rockfish, take is exempted up to 466 feet from pile driving activity. This distance defines the extent where the cumulative SEL exceeds 187 dB (re: 1 μPa2 • sec).

The attenuated noise analysis in this opinion only examined 36-inch piles receiving up to 675 strikes per pile to define the worse-case scenario. Twelve, 36-inch piles will be installed for this project. Smaller-sized piles are expected to produce less noise over a shorter distance. Impact pile-driving and removal for all piles will not exceed 40, 12-hour days between July 15 to September 30.

Fish not injured or killed by exposure to the sounds from pile driving in the action area are likely to respond through changed behavior that could impair individual performance. Examples of typical behavioral effects include displacement, increased vulnerability to predation, interrupted feeding, or delayed migration. The NMFS estimates that during the worse-case scenario (36-inch pile during the unattenuated sampling) the behavioral threshold of 150 dBrms would be exceeded for a distance of 15.61 miles from the most water-ward pile. The behavior of all listed fishes within this distance, and in direct line-of-site of the pile driver, may be adversely affected. However, land masses at Anderson Island, McNeil Island, Fox Island, and the Key Peninsula block the furthest extent of elevated noise from impact pile driving at 12.12 miles.

Permanent Increased Overwater Coverage and Pile Footprints

Overwater structure at the ferry terminal will permanently increase by 4,435 square feet after construction of the transfer span and apron. Overwater structures can affect ecological functions of nearshore habitat and interfere with habitat processes supporting the key ecological functions of spawning (i.e., forage fish spawning), rearing, migration, and refugia. For the proposed project, this increase in overwater cover is likely to alter fish migration behavior and incrementally decrease the amount or quality of eelgrass present by reducing light intensity and altering patterns of ambient light (Nightingale and Simenstad 2001).

Studies in the Puget Sound region have suggested that under-pier light limitations, particularly contrasting light and dark edges, could result in the following behavioral changes in fishes: 1) migration delays due to disorientation; 2) loss of schooling in refugia due to fish school dispersal under light-limited conditions, and 3) increased size selective predation risk due to changes in migratory routes to deeper waters to avoid light changes (Nightingale and Simenstad 2001; Southard et al. 2006). Ono et al. (2010) reviewed the literature and summarized the effects of over-water and shoreline structures on juvenile salmon behavior. Many studies show that these structures can affect juvenile salmonid behaviors and ecological interactions, though other studies did not have the same conclusions. These studies indicate that different over water structures could affect fish behavior differently, and it is difficult to state with certainty the effects, if any, that over water structures may have on listed salmonids and rockfish. For this analysis, we will rely mainly on research at the Port Townsend Ferry Terminal as the best insight into the potential effects of the proposed Steilacoom ferry structure may on listed fish and habitats.

Based on a telemetry study with Chinook salmon and coho salmon juveniles conducted at the Port Townsend Ferry Terminal, Southard et al. (2006) concluded that the Port Townsend ferry terminal does not prevent juvenile salmon from moving along the shoreline, but that daylight may affect these movement patterns. Also at the Port Townsend Ferry Terminal, 13 percent of 151 juvenile salmon shoals observed by Ono et al. (2010) in 2008 were seen under the terminal, while 11 percent of 71 juvenile salmon shoals observed in 2009 were under the terminal. They observed that juvenile salmon generally stayed at around 6.6 to 16.4 feet away from the terminal edge, but there was an additional peak at the edge. Ono et al. (2010) also observed significantly fewer juvenile salmon under the terminal during morning and afternoon snorkel surveys in 2009. They concluded that juvenile salmon did not swim under the Port Townsend Ferry Terminal during high tides, but stated that their results should not be generalized to low tides or to other over water structures without further investigation. Ono et al. (2010) stated there is a high probability that small juvenile pink salmon experienced more than nine hours of migration delay per dock encounter, during high tides, on a sunny day, but didn't have data to generalize this finding to other salmon species. Observations of pink salmon movement delays are expected to be more applicable to juvenile Chinook salmon because of similarity of affected age classes.

Juvenile steelhead are not expected to experience the same disruption as they are more likely to seek deeper water after acclimating to the salinity rather than occupying the nearshore where the ferry terminal deck could slightly lengthen the migration pattern of juvenile salmonids in the vicinity of the Steilacoom terminal if they go around the structures, rather than under, possibly incrementally delaying their migration timing or increasing their travel distance around the terminal, which also increases their expenditure of energy. Larval rockfish will drift with the tidal currents regardless of the overhead shading. The increased surface area of the proposed terminal deck (4,435 square feet) relative to the existing ferry terminal (approximately 32,390 square feet) will be so small that this effect will be insignificant.

The ecological importance of eelgrass has been well documented. Mumford (2007) summarized eelgrass ecosystem functions in the nearshore, including contributing to the aquatic food web as detritus, providing three dimensional structures, trapping and stabilizing sediments, providing a substrate for algae and invertebrates, and providing habitat for other aquatic organisms, such as crabs and juvenile fish. Simenstad et al. (1988) provided evidence that the predominant prey of juvenile chum salmon, surf smelt and Pacific sand lance in Padilla Bay were harpacticoid copepods, which live in subtidal areas, including eelgrass beds. Thom et al. (1988) found higher densities of juvenile salmonids (including Chinook salmon) and epibenthic zooplankton (those known to be preferred juvenile salmonid prey) in eelgrass habitat compared to mud flats. Pentilla (2007) reported that the native eelgrass Zostera marina is of primary importance as a pacific herring spawning substrate.

There is a zone surrounding the current ferry terminal facility where eelgrass does not grow, presumably as a result from the shade of the existing facility, propeller wash, and anthropogenic structures along the shoreline. It is expected that the increased shading will not affect any existing eelgrass patches and unlikely affect future growth due to the inhospitable growing conditions.

Existing creosote-treated piles and one steel pile occupy 147.5 square feet of benthic habitat. The existing wood piles and single steel pile will be replaced with steel piles but increase the area of impact by 52.2 square feet. The increased of affected area will likely have no discernible effect to listed species and removing the creosote piles will improve water quality surrounding the piles.

2.4.2 Effects on Critical Habitat

PS Chinook Salmon

The proposed project will have both short and long-term effects to the nearshore marine PCE. In the short-term, construction will affect water quality, migration ("free of obstruction"), and forage. Water quality will be degraded by suspended sediment, which will occur over a period of approximately 40 total days when piles are removed or installed. The water quality and migration components in the nearshore marine areas will also be affected by increased sound from impact pile driving. Impact pile driving includes up to 2,600 strikes daily for 40 days for all 74 piles installed during July 15 to September 30; however, each 12 hour period of impact pile driving will be followed by a 12-hour cessation. The construction barges will create overwater cover that may temporarily impede fish migration. The construction equipment will be removed at project completion. Disturbance of the substrate at pile removal and installation sites will slightly reduce forage production, but recolonization could begin within a week (Bolam et al. 2004; Guerra-García and García-Gómez 2006). Because these effects are all short-term and limited in extent, the ability of the nearshore marine area to provide for the conservation of PS Chinook salmon will not be permanently reduced.

The expanded ferry terminal approach trestle and apron will permanently shade 4,435 square feet of nearshore benthic habitat; however, there will be a net increase of 52.2 square feet of seabed impacts when existing wooden support piles are replaced with steel piles. This will be a long-term adverse effect on the critical habitat in the action area, affecting the forage, natural cover, and migration components of the Nearshore PCS for PS Chinook salmon. However, removing the 135 creosote-treated wood piles will have incremental beneficial effects by removing a source of water pollution.

Southern Resident Killer Whale

The proposed action occurs within and affects critical habitat designated for the SR killer whales.

Based on their natural history and their habitat needs, we identified three physical or biological features essential to the conservation of SR killer whale designated critical habitat: (1) water quality to support growth of the whale population and development of individual whales, (2) prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth, and (3) passage conditions to allow for migration, resting, and foraging. This analysis considers effects to these features.

The proposed action is likely to adversely affect Chinook salmon (the primary prey of SR killer whales). Impacts to Chinook salmon, up to the maximum extent and amount, would result in an insignificant reduction in prey resources for SR killer whale that may intercept these species within their range. Therefore, the NMFS anticipates direct or indirect effects on SR killer whale prey quantity and quality would be insignificant. The potential for vessels or sound from the proposed impact pile driving to interfere with SR killer whale passage is unlikely to occur because the project is scheduled to occur during the time of year when SR killer whales are least likely to be present in the action area. However, if SR killer whales do enter the South Sound, there is ample room for them to avoid the zone of injurious noise levels and when passing beyond 1,260 feet from the project or on the lee side of islands and land forms where they would be shielded from all project-related in-water noise. The effects of the additional distance traveled are unlikely to cause a significant increase in an individual's energy budget, and the effects would therefore be temporary and insignificant.

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.

The city of Steilacoom is currently fully developed. The only significant non-federal actions likely to occur in the future are possible redevelopment projects within the city of Steilacoom. Much of the existing development occurred before the advent of modern stormwater treatment standards, meaning that the majority of this untreated stormwater currently drains directly to surface waters of Puget Sound. Future redevelopment actions will comply with improved stormwater detention and treatment standards providing incremental improvements in stormwater quality. Any future Federal actions would be considered for possible section 7(a)(2) consultation under the ESA. Compliance with current water quality requirements would reduce pollutants in stormwater; thus, reducing impacts on listed fish and their prey.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step of NMFS' assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) 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) result in appreciable reductions in the likelihood of both survival and recovery of the 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 probable adverse effects on listed fish from this project include the effects of increased underwater sound pressure levels from impact pile driving, turbidity, nearshore shading, and pile footprint. The pile driving action, turbidity, and barge-related shading will not permanently affect the environmental baseline. However, these actions will affect individuals through direct injury by sound pressure or by disrupting their behavior which could make them more susceptible to predation. This will cause a onetime, very minimal decrease in abundance of each affected ESU or DPS.

Within each ESU or DPS, no single salmonid population is expected to be solely affected by pile driving due to the geographic location of the action area. Despite the relative proximity to the Nisqually River, individuals from mid and northern Puget Sound populations may also occur in the action area. The pile driving work window will minimize the number of salmonids that could be exposed to increased sound pressure. Juvenile Chinook salmon and steelhead densities in the action area are expected to be low because peak emigration begins in early spring, and continues through early summer for these species. Adult Chinook salmon may occur in the action area but are more resilient than juveniles to noise from impact pile driving (FHWG 2008).

For the three DPS rockfish species, only larvae or juveniles would be exposed to injurious sound pressure in the action area. A small decrease in abundance at this life stage will have no measureable effect on the adult population numbers. This will not alter abundance trends for any of the three listed rockfish species.

The increased footprint of piles will further degrade the environmental baseline of the action area, resulting in an additional slight decrease in forage production for juvenile Chinook salmon and larval rockfish. Any individuals exposed to these changed conditions may expend more energy foraging and have an increased susceptibility to predation, resulting in a very small reduction in the productivity of each affected population. For the salmonids, no single population is expected to be affected disproportionately, and the effect will not be measureable at the population scale. Likewise for rockfish, the effect will be too small to be measured at the population scale.

For PS Chinook salmon, PS steelhead, bocaccio, canary rockfish and yelloweye rockfish, the abundance and productivity VSP parameters will be slightly, negatively affected by the proposed project. When added to the environmental baseline and a lack of cumulative effects, these effects will be too small for the NMFS to conclude that this project will appreciably reduce the likelihood of both the survival and recovery of these listed species. However, the project will not support recovery efforts for these ESUs and DPSs.

The proposed action will adversely affect Chinook salmon nearshore and offshore habitats with injurious levels of underwater noise and localized turbidity plumes when impact proofing the hollow steel piles. The effects will be temporary (up to 40, 12-hour days). Existing nearshore conditions surrounding the existing ferry terminal are disturbed compared to natural conditions by ferry propeller wash, shading from the terminal deck, and wave agitation from the armored shoreline. These elements combine to preclude eelgrass and kelp from recolonizing. The proposed project will decrease the available habitat with larger piers that occupy 52.2 square feet more than existing conditions and shade an additional 4,435 square feet of nearshore habitat.

PS Chinook salmon critical habitat nearshore marine PCE will be slightly degraded by the proposed action due to the long-term effects of the increased deck and pile footprint. This will further diminish an already degraded baseline in the action area. However, at the scale of the entire marine nearshore designated critical habitat listings for PS Chinook salmon, the effects of this project will not be measureable. Therefore, it is difficult for NMFS to conclude that these effects will reduce the value of designated critical habitat for the conservation of these 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, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon, PS steelhead, bocaccio, canary rockfish, yelloweye rockfish, SR killer whale, Steller sea lion, and humpback whales, or to destroy or adversely modify PS Chinook salmon or SR killer whale designated critical habitat.

2.8. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. For purposes of this consultation, we interpret "harass" to mean an intentional or negligent action that has the potential to injure an animal or disrupt its normal behaviors to a point where such behaviors are abandoned or significantly altered.[2] Section 7(b)(4) and Section 7(o)(2) provide that taking that

[2] NMFS has not adopted a regulatory definition of harassment under the ESA. The World English Dictionary defines

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.

2.8.1 Amount or Extent of Take

The PS Chinook salmon, PS steelhead, and PS/Georgia Basin DPSs of yelloweye rockfish, canary rockfish, and bocaccio are present in the action area and are likely to be exposed to elevated underwater sound from impact pile driving. This exposure is likely to injure or kill some fish. Therefore, incidental take of these species in the form of harm is reasonably certain to occur.

Although available information indicates that fish from the listed species will be present in small numbers and exposed to the effects of elevated underwater sound, the density of each species in the action area is unknown and cannot be predicted for the time when exposure of each animal will occur. Without knowing how many animals will be exposed to the effects and experience injury or death in their response to that exposure, the NMFS cannot quantify the number of fish that would be exposed to these effects. In such circumstances, the NMFS quantifies the extent of take based on the extent of habitat modified by the project.

For this opinion, the extent of take is defined as the distance away from the noise source where underwater sound created by the proposed project will harm listed fish species by causing auditory and other tissue damage. The extent of take is described by the area affected by underwater sound created by unattenuated sampling and attenuated production impact pile driving hollow steel piles. Monitoring underwater noise during impact pile driving will identify the area of affect; therefore, the noise threshold for take is described below and exceeding these noise levels is not authorized.

For unattenuated noise, take of marine habitat is authorized up the following cumulative SEL as measured at 10 meters for each pile size:

36-inch: 211 dB

24-inch: 206 dB

16-inch: 200 dB

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harass as "to trouble, torment, or confuse by continual persistent attacks, questions, etc." The U.S. Fish and Wildlife Service defines "harass" in its regulations as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). The interpretation we adopt in this consultation is consistent with our understanding of the dictionary definition of harass and is consistent with the U.S. Fish and Wildlife interpretation of the term.

For attenuated noise, take of marine habitat is authorized up to the following cumulative SEL as measured at 10 meters for each pile size:

36-inch: 204 dB

24-inch: 199 dB

16-inch: 193 dB

Additionally, the extent of take is defined by the footprint of the new piles. Take is exempted for 52.2 square feet of nearshore substrate habitat and for 4,435 square feet of additional shading (directly below the expanded transfer span and apron) that will exhibit decreased productivity. Exceeding any of these limits will trigger the reinitiation provisions of this opinion.

2.8.2 Effect of the Take

As stated in the conclusion, the anticipated take will not create jeopardy, or significantly alter viability characteristics of the affected populations of ESA-listed fishes. Take from underwater sound will cause a small, one-time reduction in abundance in one cohort of juvenile and adult PS Chinook salmon, PS steelhead, and among young PS/Georgia Basin DPSs of yelloweye rockfish, canary rockfish, and bocaccio; thereby incrementally reducing population recruitment and recovery. Take from substrate and macroalgae habitat loss will result in a slight permanent decrease in carrying capacity because the increased footprint of 52.2 square feet on the substrate and water column will create stasis in the productivity of populations that rely on the action area, and is likely to create a corollary stasis in abundance of these populations.

2.8.3 Reasonable and Prudent Measures and Terms and Conditions

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

The NMFS believes that the full application of minimization measures included as part of the proposed action, together with use of the reasonable and prudent measures (RPMs) and terms and conditions described below, are necessary and sufficient to avoid, minimize, and offset the incidental take of listed species resulting from the proposed action. The proposed project has been scheduled to minimize impacts to listed species and habitats by performing impact and vibratory pile driving during a time of year with the least chance of encountering marine mammals and fish and will reduce the level of underwater noise to minimize the extent of injurious sound pressures.

The FHWA and the COE both shall:

RPM 1. Minimize the incidental take of listed marine mammal, salmonid, and rockfish species from the effects of pile driving.

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

The FHWA and COE must fully comply with the following terms and conditions that implement the RPMs described above:

1. To implement RPM number 1 (pile driving), the FHWA shall:

   A. Ensure that all sound levels are measured at mid-depth at 33 feet (10 meters) from the pile driving activity.

   B. Do not exceed 40, 12-hour days for all pile installation and removal.

For unattenuated pile sampling:

   A. Do not exceed 211 dB cumulative SEL (re: 1 μPa2 • sec) at 10 meters when sampling 36-inch piles.

   B. Do not exceed 206 dB cumulative SEL (re: 1 μPa2 • sec) at 10 meters when sampling 24-inch piles.

   C. Do not exceed 200 dB cumulative SEL (re: 1 μPa2 • sec) at 10 meters when sampling 16-inch piles.

   D. Do not exceed two, 90-second unattenuated noise sampling sessions per day.

For attenuated production pile driving:

   A. Do not exceed 204 dB cumulative SEL (re: 1 μPa2 • sec) at 10 meters when monitoring 36-inch piles.

   B. Do not exceed 199 dB cumulative SEL (re: 1 μPa2 • sec) at 10 meters when monitoring 24-inch piles.

   C. Do not exceed 193 dB cumulative SEL (re: 1 μPa2 • sec) at 10 meters when monitoring 16-inch piles.

2. To implement RPM number 2 (monitoring and reporting), the FHWA shall:

   A. Implement the FHWA's final Underwater Noise Monitoring Plan and Marine Mammal Monitoring Plan. The FHWA will submit the results of the monitoring to NMFS within 60 days of project completion.

All reports shall be sent to National Marine Fisheries Service, Washington State Habitat Office, Attention: Michael Grady (7600 Sand Point Way NE, Seattle, WA 98115).

NOTICE: If a sick, injured or dead specimen of a threatened or endangered species is found in the action area, the finder must notify NMFS Law Enforcement at (206) 526-6133 or (800) 853- 1964, through the contact person identified in the transmittal letter for this opinion, or through the NMFS Washington State Habitat Office. The finder must take care in handling sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder should carry out instructions provided by Law Enforcement to ensure evidence intrinsic to the specimen is not disturbed unnecessarily.

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).

1. Design and implement a plan that results in no net loss of eelgrass habitat due to this project, preferably in or near the action area (e.g. remove debris from potential eelgrass habitat to allow for recolonization).

2.10 Reinitiation of Consultation

As provided in 50 CFR 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 on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or 4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely to Adversely Affect" Determinations

The proposed action is scheduled to avoid seasonal presence of southern resident (SR) killer whales, humpback whales, eastern Steller's sea lions; therefore, the FHWA determined that affects to these species are considered discountable. A visual monitoring plan will ensure that pile driving activity will temporarily cease if listed marine mammals are detected within 3.3 miles of the project site (Appendix A). Effects to the SR killer whale's primary prey, Chinook salmon, will not result in a realized decrease of their overall prey base and these effects are considered insignificant. Southern Pacific eulachon have not been documented to occur in south Puget Sound; however, they are not precluded from transient movements through the area. The FHWA also determined that the effects to eulachon are considered discountable due to the very low likelihood of their occurrence in Puget Sound, particularly south Puget Sound. Critical Habitat for SR killer whales has been designated in the project action area but the greatest effects from underwater noise are temporary and are scheduled when SR killer whales would not likely occur in those areas. Critical Habitat for eulachon and steelhead does not occur in the action area. Because potential impacts to these species and critical habitats are considered insignificant or discountable they will not be further analyzed in this consultation.

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

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the FHWA and descriptions of EFH for Pacific coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific coast salmon (PFMC 1999) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action will temporary alter the ambient noise environment, producing elevated underwater noise in south Puget Sound up to 12.12 miles from the source.

The following table lists the Groundfish Species, Pacific Salmon Species, and Coastal Pelagic Species that may be affected by the proposed project.

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Groundfish Species					
Arrowtooth flounder	X	X	X		
Big skate	X	X	X		X
Black rockfish	X		X		
Bocaccio			?	X	
Brown rockfish	X	?	?	X	
Butter sole	X	X	X		
Cabezon	X	X	X	?	X
California skate	X				
Canary rockfish	?	?	X		
China rockfish	X		X		
Copper rockfish	X		X	?	
Curlfin sole	X				
Darkblotched rockfish	X		X		
Dover sole	X	X	X		
English sole	X	X	X	X	X
Flathead sole	X	X	X		
Greenstriped rockfish					
Kelp greenling	X	X	X	X	X
Lingcod			X	X	
Pacific cod	X	X	X	X	X
Pacific Ocean perch	X		X		
Pacific sanddab				X	X
Pacific whiting (Hake)			X		
Petrale sole	X		X		
Quillback rockfish	X		X	?	
Ratfish	X				
Redbanded rockfish	X				
Redstripe rockfish	?				
Rex sole	X				?
Rock sole	X	X	X		
Rosethorn rockfish	X		X		

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Rosy rockfish	?				
Rougheye rockfish	X		?		
Sablefish			X		
Sand sole	X	X	X		
Sharpchin rockfish	X		?		
Shortspine thornyhead	X		X		
Spiny dogfish	X		X		X
Splitnose rockfish	X		X		
Starry flounder	X	X	X	X	X
Stripetail rockfish	X				
Tiger rockfish	X		X		
Vermilion rockfish	X	?	X		
Yelloweye rockfish	X				
Pacific Salmon Species					
Chinook salmon	X		X		
Coho salmon	X		X		
Puget Sound pink salmon	X		X		
Coastal Pelagic Species					
Northern anchovy	X	X	X	X	X
Pacific sardine	X				
Pacific mackerel	X				
Market squid	X				
Northern anchovy	X	X	X	X	X

? = occurrence in Puget Sound is uncertain.

3.2 Adverse Effects on Essential Fish Habitat

EFH for Pacific groundfish, Pacific salmon, and coastal pelagic species could be affected by the types of work described in Section 1.3. Short-term effects on EFH may result from minor turbidity exposure. As discussed in the section 2.4.1 of the main document, these short-term water quality impacts are expected to have an insignificant effect on the availability and suitability of EFH in the action area.

The proposed action will also result in temporary alteration of the ambient noise environment, producing underwater noise likely to cause injury or mortality for any EFH species occurring within 2,329 feet of impact pile driving activities. These effects will occur between July 15 to September 30 of the construction year, with the most significant effects from impact pile driving limited to a total of no more than 40, 12-hour work days during this period.

Finally, the proposed action will result in the permanent displacement of a net 52.2 square feet of benthic and water column habitat and a net increase in benthic and water column shading of a net 4,435 square feet within the -35 MLLW bathymetric isopleth. These permanent adverse impacts would be minimized through the results of consultation because: 1) The marginal increase in benthic habitat displacement is insignificant relative to the amount of similar habitat in the vicinity; 2) The new in-water and overwater structures will be placed in previously disturbed areas within the footprint of the existing Steilacoom Ferry Landing; 3) No eelgrass or other habitat types particularly sensitive to the types of impacts likely to result from the proposed action occur in the project vicinity; and 4) The existing overwater structures appear to have had an insignificant effect on subtidal habitat suitability for groundfish in the project vicinity.

3.3 Essential Fish Habitat Conservation Recommendations

Because the effects of the action on EFH have been minimized through the results of consultation, NMFS makes no EFH conservation recommendations.

3.4 Statutory Response Requirement

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

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the FHWA, the U.S. Army Corps of Engineers (COE). Other interested users could include Washington State Department of Transportation, Pierce County, Washington, and others interested in the conservation of the affected ESUs. Individual copies of this opinion were provided to the FHWA. 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.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

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

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

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

5. REFERENCES

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6. APPENDICES

Appendix A: Marine Mammal Monitoring Plan

1.0 INTRODUCTION

Pierce County Public Works and Utilities, Airports and Ferries Division (Pierce County) has developed this Marine Mammal Monitoring Plan (MMMP) to provide marine mammal monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973.

As background, Pierce County and the Federal Highway Administration (FHWA) plan to improve the Steilacoom Ferry Landing by constructing a second ferry slip south of and adjacent to the existing slip and relocating existing ferry mooring facilities (Steilacoom Ferry Project). Federal Highway Administration is providing funding for the proposed action through the Washington State Department of Transportation (WSDOT) Highways and Local Programs (HLP) office.

The Steilacoom ferry landing provides sole public access to Anderson and Ketron Islands. It also served as the Washington State Department of Corrections only access to the McNeil Island Correctional Facility, a high security state prison that is now closed. The primary objectives of the proposed action are to reduce operational conflicts between these two users, improve public safety, and increase overall operational reliability.

Key elements of the proposed action include the removal of existing landing and moorage structures, construction of a new bridge trestle, transfer span, apron for vehicle loading, a pontoon, wing walls, and dolphins to secure and moor ferry vessels.

A Biological Assessment (BA), to which this MMMP is appended, has been prepared in compliance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

Pursuant to the MMPA, Pierce County will be requesting an Incidental Harassment Authorization (IHA) from National Marine Fisheries Service (NMFS) to incidentally take, by harassment, small numbers of California sea lion (*Zalophus californianus*), Pacific harbor seal (*Phoca vitulina richardsi*), Stellar sea lion (*Eumetopias jubatus*), Orca whale (*Orcinus orca*), and possibly gray whale (*Eschrichtius robustus*) in Puget Sound.

This marine mammal monitoring plan has been prepared and submitted in compliance with NMFS's requirements for an MMMP. This MMMP plan discusses:

Project Location,

Regulations pertaining to marine mammals,

Marine Mammals of Concern,

Potential impacts to marine mammals,

Methods for monitoring and reporting the activity of marine mammals near the construction areas, and

Mitigation measures to avoid impacts.

2.0 PROJECT LOCATION

The project site is the existing Steilacoom Ferry Landing, located on the eastern shoreline of Puget Sound in the town of Steilacoom, Washington (Figure 1). The ferry landing

Figure 1

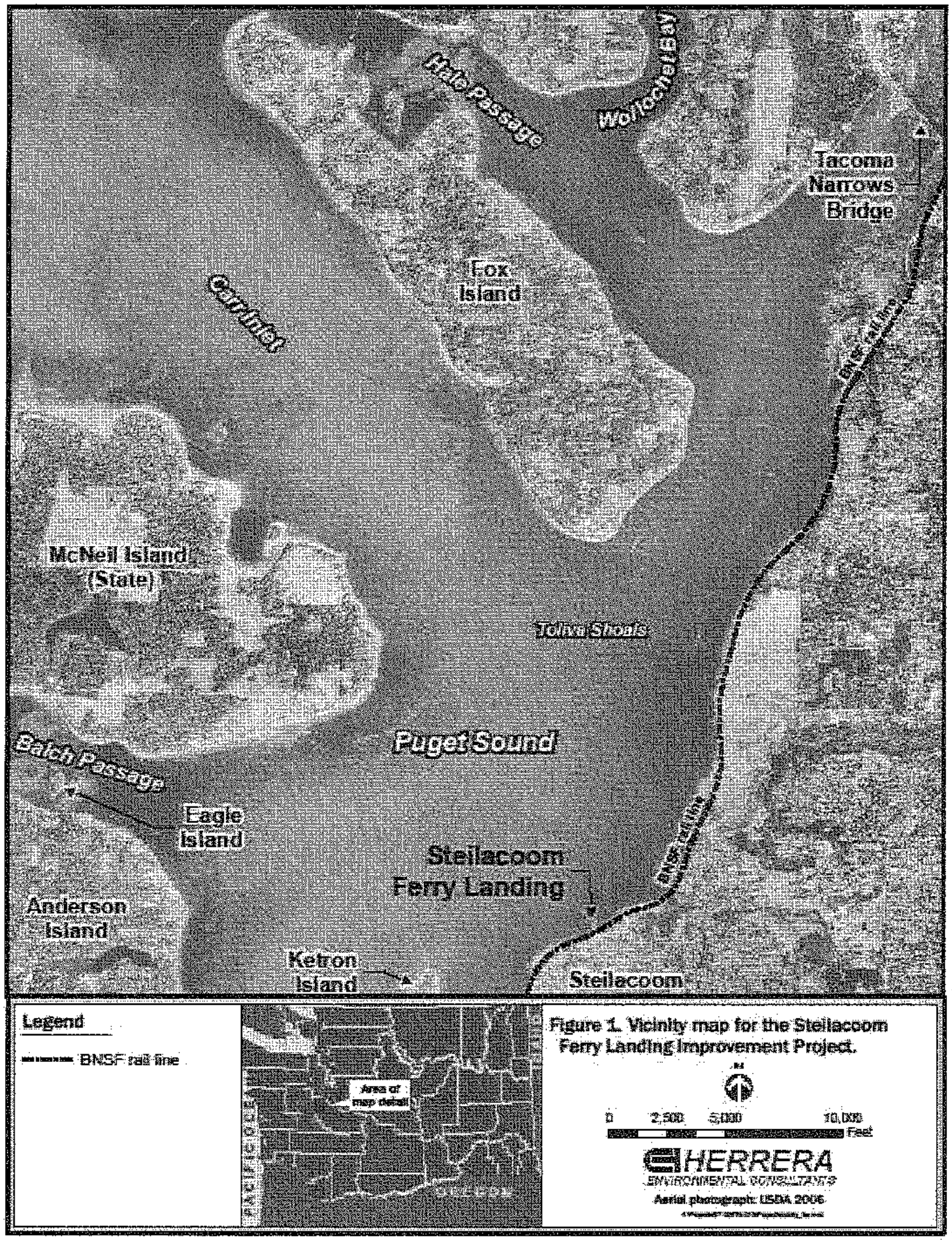


Figure 1. Vicinity map for the Steilacoom Ferry Landing Improvement Project.

is located on the western boundary of Township/Range/Section T20-0N R2-0E in 6th field HUC 17110019 (Puget Sound), and is also within Washington State Water Resource Inventory Area (WRIA) 12 (*Chambers-Clover*). The area in question lies within Washington State Tidal Reference Area 3 (WAC 220-110-240). This ferry crossing and the related terminal facilities are identified by WSDOT as Bridge #31202-A.

3.0 REGULATIONS PERTAINING TO MARINE MAMMALS

Pursuant to the MMPA enacted in 1972 and last amended in 1994, it is forbidden to intentionally harass marine mammals. Harassment is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment) or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption to behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

National Marine Fisheries Service currently considers that underwater sound pressure levels (SPLs) above 190 decibels referenced to 1 micropascal, root-mean-square (abbreviated as 190 dB re 1 μPa RMS [broadband])[3]1 could cause injury (Level A harassment) in harbor seals and sea lions and SPLs above 180 dB re 1 μPa RMS (broadband) could cause injury (Level A harassment) in whales (*NMFS 2012*). Behavioral disruption (Level B harassment) of pinnipeds and cetaceans associated with impulsive noise (i.e., impact pile driving) occurs at 160 dB RMS (*NMFS 2012)*, Behavioral disruption (Level B harassment) of marine mammals associated with non-pulse noise (i.e., vibratory pile driving, drilling) occurs at 120 dB RMS. However, the 120 dB RMS threshold may be slightly adjusted if background noise levels are at or above this level (*NMFS 2012).* In-Puget Sound vibratory pile-driving and removal, as well as impact pile-driving has the potential to harass harbor seals, sea lions, orcas and gray whales that may be swimming, foraging, or resting in the project vicinity. The effects of elevated SPLs on marine mammals may include avoidance of an area, tissue rupturing, hearing loss, disruption of echolocation, masking, habitat abandonment, aggression, pup/calf abandonment, annoyance, and helplessness (*Parsons, Brinckerhoff 2002*).

In accordance with the MMPA, Pierce County will provide NMFS with a marine mammal monitoring plan and request authorization from NMFS for possible harassment of small numbers of three pinniped species, California sea lion, Pacific harbor seal, and Stellar sea lion, and two cetacean species, killer and gray whales, incidental to conducting the Steilacoom Ferry Project.

Prior to issuance of an Incidental Harassment Authorization (IHA), NMFS specifies the following requirements for the MMMP:

"The complete monitoring plan must include: (1) a description of the proposed survey techniques that will be used to determine the movement and activity of marine mammals near the construction

[3] RMS (impulse): The root square of the energy divided by the duration. When presented as a level in dB re 1 μPa, the RMS pressure level is equivalent to the average square pressure level of the pulse. The 5 percent of the energy that occurs in the initial rise of the impulse and the 5 percent of energy that occurs at the final decay of the impulse are excluded from the average.

areas; and (2) scientific rigor that will allow NMFS to verify that any impacts on marine mammal populations from this specific activity are small in number and negligible." (*Federal Register 2001*)

This MMMP is provided with the BA to fulfill these requirements.

4.0 MARINE MAMMAL SPECIES OF CONCERN

Five marine mammal species, stocks or Distinct Population Segments (DPS) of a species, including two listed as threatened under ESA may be found in South Puget Sound over the course of the year (Table 4-1). They include harbor seal, California sea lion, Steller sea lion, gray whale and Orca whale (transient and southern resident distinct population segments). These species are protected from harassment under the MMPA, as amended.

Table 4-1. Marine Mammals That Occur in Southern Puget Sound.

Species	Timing of Occurrence	Frequency of Occurrence
Harbor seal (Phoca vitulina richardsi)	Year-round	Common
California sea lion (Zalophus californianus)	August – April	Occasional
Stellar sea lion (Eumetopias jubatus)	August – April	Infrequent
Orca – Southern Resident (*Orcinus orca*)	October – May	Infrequent
Orca – Transient (*Orcinus orca*)	October – May	Rare
Gray Whale (Eschrichtius robustus)	January – May	Occasional

Each species is discussed in detail below.

4.1 Pinnipeds

Figure 4-1 shows the pinniped haulout locations and density in proximity to the project. Each pinniped species is discussed below.

4.1.1 California Sea Lion (*Zalophus californianus)*

4.1.1.1 Description

The California sea lion is the most common eared seal. Dominant males maintain a harem of females and can grow up to 2.5 meters (8 feet) in length and weigh over 280 kilograms (kg) [600 pounds (lbs)]. Females attain a length of 2 meters (6 feet) and generally weigh less than 90 kg (200 lbs). California sea lions can live up to 24 years (*Seal Conservation Society 1998a*).

California sea lions frequently forage in groups and prey opportunistically on schooling fish such as northern anchovy (*Engraulis mordax*), sardine (*sardinops asgax caerulrus*), whiting (*Theragra chalcogramma*), mackerel (*Scomber scombrus*), rockfish (*Sebastes caurinus*), and market squid (*Loligo opalescens*). Feeding occurs mainly at night.

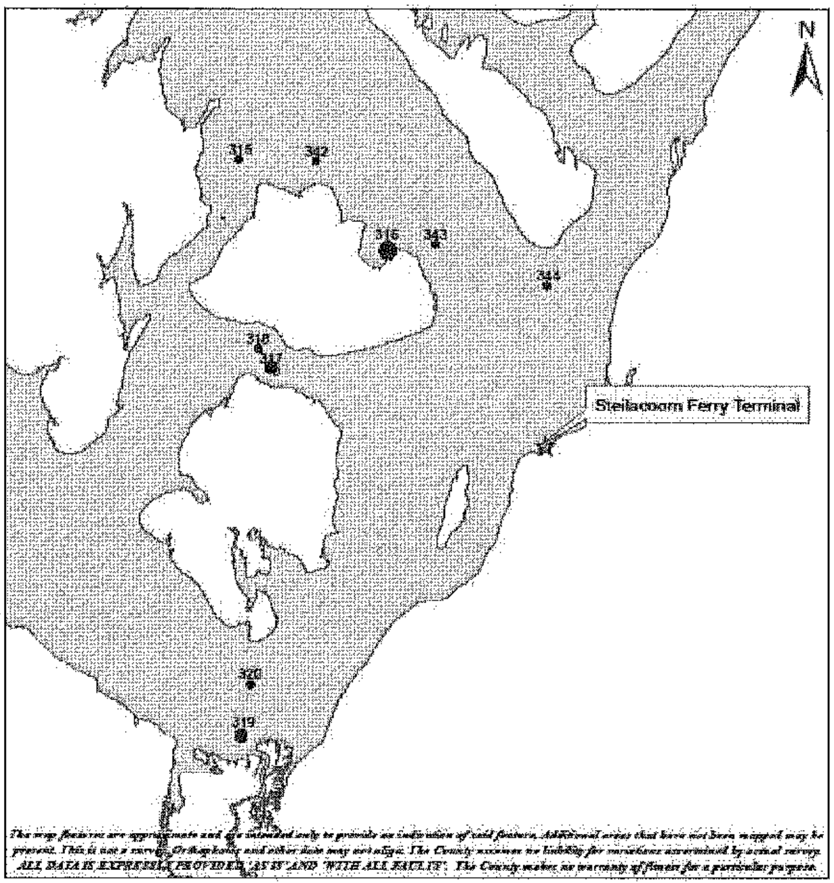
4.1.1.2 Distribution

California sea lion occur in the North Pacific Ocean from Mexico to Vancouver Island and dispersing males occur in the Puget Sound. California sea lions are separated into three subspecies, of which only one occurs in western North America (*NMFS 2003*). The subspecies is further separated into three stocks, the United States (US) stock, the Western Baja California stock, and the Gulf of California stock (*NMFS 2003*). Mainly male California sea lions are seen from fall to spring in the Puget Sound region. There are five haul-out sites and rookeries in South Puget Sound near the Steilacoom Ferry Project (Figure 4-1).

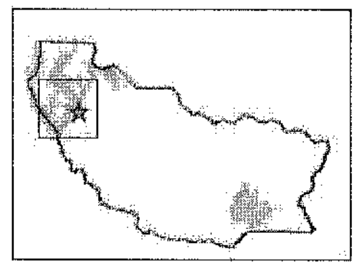
Figure 4-1

Figure 4-1

CRP 6959
Steilacoom Ferry Terminals Improvements - Seal and Sea Lion Haulout & Rafting Sites



ID	LOCATION	SPECIES	GROUP SIZE
315	WYCOFF SHOALS	HARBOR SEAL	LESS THAN 100
316	GERTRUDE ISLAND	HARBOR SEAL	GREATER THAN 500
317	EAGLE ISLAND AREA	HARBOR SEAL	100 TO 500
318	EAGLE ISLAND AREA	CALIFORNIA SEA LION	LESS THAN 100
319	NISQUALLY DELTA AREA	HARBOR SEAL	100 TO 500
320	NISQUALLY DELTA BOUY	CALIFORNIA SEA LION	LESS THAN 100
342	NW McNEAL ISLAND BOUY	CALIFORNIA SEA LION	LESS THAN 100
343	NW McNEAL/ HYDER BOUY	CALIFORNIA SEA LION	LESS THAN 100
344	TOLIVA SHOALS BOUY	CALIFORNIA SEA LION, STELLAR SEA LION	LESS THAN 100



0 3,850 7,700 15,400 23,100 30,800 Feet

The US stock of California sea lion breeds in California and southern Oregon between May and July. California sea lions do not breed in Washington. Pupping occurs on the breeding ground, typically one month prior to mating. Sea lions are typically observed in Washington from August through April, after they have dispersed from breeding colonies. Population estimates are calculated by conducting pup counts. Because California sea lions do not breed in Washington, accurate estimates of the non-breeding population in Washington do not exist. Estimates from the 1980s suggest the population size was just under 3,000 by the mid-1980s (*Bigg 1985, Gearin et al. 1986*). In the 1990s, the number of sea lions in Washington appears to have either stabilized or decreased (*Calambokidis and Baird 1994*).

Molting season occurs from August to October for adult females and juveniles and from November to February for adult males.

4.1.1.3 Status

California sea lions are not listed as "endangered" or "threatened" under the ESA or as "depleted" under the MMPA. They are not considered a "strategic" stock under the MMPA because total human-caused mortality (1,483 fishery-related mortalities plus 78 from other sources) is less than the potential biological removal (8,333) (*Caretta et al. 2007*).

4.1.2 Harbor Seal (Phoca vitulina richardsi)

4.1.2.1 Description

The Pacific harbor seal is a subspecies of the most widely distributed pinniped inhabiting both temperate and sub-arctic coastal areas on both sides of the north Atlantic and north Pacific oceans (*Seal Conservation Society 1998b*). Male and female harbor seals are similar in appearance. Males are slightly larger, measuring up to 2 meters (6 ft) in length and weighing up to 126 kg (300 lbs).

Unlike California sea lions, male harbor seals do not preside over harems. Males will mate with any female in estrus and females may mate with more than one male. Harbor seals generally mate in water but give birth on land (*Schoenher 1995*). Female harbor seals live longer than males; females live up to 30-35 years and males live up to 20-25 years (*Seal Conservation Society 1998b*).

Pacific harbor seals are opportunistic feeders, eating the most abundant prey species available, especially small schooling species. In the Puget Sound, yellowfin goby (*Acanthogobius flavimanus*), an introduced species, is the most common species in the harbor seal diet. Also important are the northern anchovy, Pacific staghorn sculpin (*Leptocottus armatus*), plainfin midshipman (*Porichthys notatus*), white croaker (*Genyonemus lineatus*), and Pacific herring (*Harvey and Torok 1994*).

4.1.2.2 Distribution

Harbor seals range along the northern coasts of North America, Europe and Asia, and are widely distributed in the Puget Sound. Three distinct harbor seal stocks occur along the west coast of the continental US, the Washington inland stock, Oregon/Washington coastal stock, and California stock. The Washington inland stock includes Hood Canal, Puget Sound, and the Strait of Juan de Fuca out to Cape Flattery (*NMFS 2003*).

Harbor seals are the most common pinniped and the only species that breeds in the inland marine waters of Washington (*Calambokidis and Baird 1994*). In 1999, *Jefferies et al. (2003)* recorded a mean count of 9,550 harbor seals in Washington's inland marine waters. The estimated population was approximately 14,612 harbor seals. The population across Washington increased at an average annual rate of 6 percent between 1983 and 1996 (*Jefferies et al. 1997*).

Pupping season, in South Puget Sound, occurs between July and September. Pups nurse for only 4 weeks and mating begins after pups are weaned. In the Puget Sound, mating occurs from April to July and molting season is from June until August (*Jefferies et al. (2003)*.

There are four haul-out sites and rookeries in South Puget Sound near the Steilacoom Ferry Project (Figure 4-1).

4.1.2.3 Status

Harbor seals are not considered to be "depleted" under the MMPA or listed as "threatened" or "endangered" under the ESA (NMFS 2008). Based on currently available data, the level of human-caused mortality and serious injury is not known to exceed the potential biological removal (PBR) of 1,343 harbor seals per year. Therefore, the Oregon/Washington Coast stock of harbor seals is not classified as a "strategic" stock.

4.1.3 Steller Sea Lion (*Eumetopias jubatus*)

4.1.3.1 Description

Steller sea lions are the largest of all sea lions. Their diet consists of fish, squid, octopus, and rarely, smaller seals. Adult animals are lighter in color than most sea lions, ranging from pale yellow to tawny and occasionally reddish. Steller sea lion pups are born almost black, weighing around 23 kg (50 lbs), and remain dark for several months. Adult females and males average 2.5 meters (8 feet) in length and 300 kg (660 lbs). Males are slightly longer than the females; they grow to about 325 cm long and have much wider chests, necks, and general forebody structure and weigh 600-1100 kg (1300-2500 lbs).

4.1.3.2 Distribution

Steller sea lions occur along the North Pacific Rim from southern California north to Alaska, the Aleutian Islands and across to Siberia and Japan. Individuals occur along the outer coast of Washington and occasionally in the Puget Sound. The population center is in the Gulf of Alaska and the Aleutian Island chain. This species is separated into two stocks, Eastern and Western. The Eastern stock ranges from southeast Alaska south to California (*NMFS 2006*). There is one haul-out site in South Puget Sound near the Steilacoom Ferry Project (Figure 4-1).

The Eastern stock breeds in Alaska, British Columbia, Oregon, and California. Like California sea lions, they do not breed in Washington. Breeding typically occurs from May to July.

Pupping occurs within days of returning to the breeding colony. Individuals, especially adult males and juveniles, disperse widely and travel great distances outside of the breeding season. These are typically the animals observed in Washington waters. Individuals typically return to breeding grounds in May, although in 2007-2008 two to six individual Steller sea lions remained all summer near Nisqually (southern Puget Sound near Olympia) on the Toliva Shoals and Nisqually buoys. There was also one Steller sea lion observed at Point Defiance (near Tacoma, WA) in July 2008.

Steller sea lion reports increased in 2007-2008 on the North Vashon, Manchester and Bainbridge Island buoys. There are no estimates of individual numbers for these reports (*Lambourn 2008*). According to *Jefferies (2008)* there are also records from the 1990s of 200 to 300 Steller sea lions using Navy floats at the Fox Island Acoustic Range.

The National Oceanic and Atmospheric Administration (NOAA) calculates population estimates by conducting pup counts. Because Steller sea lions do not breed in Washington, accurate estimates of the non-breeding population in Washington do not exist. The majority of Steller sea lions are observed in the north Puget Sound and Strait of Juan de Fuca, although Steller sea lions are regularly observed at three haulout sites in central and southern Puget Sound (*NOAA 2005)*.

4.1.3.3 Status

Steller sea lions were listed as "threatened" range-wide under the ESA in 1990 (55 Federal Register 49204). The western stock was listed as "endangered" under the ESA in 1997 and the eastern stock remains classified as "threatened" (62 FR 24345). Only the eastern stock is considered in this application because the western stock occurs outside of the geographic area of the activities under consideration. Steller sea lions are listed as "depleted" under the MMPA. Both stocks are thus classified as strategic.

4.2 Cetaceans

4.2.1 Gray Whale (Eschrichtius robustus)

4.2.1.1 Description

Gray whales are baleen whales that feed on bottom-dwelling invertebrates. Gray whales reach lengths of up to about 14 meters (45 ft), with the males being slightly smaller. Unlike other baleen whales, gray whales have no dorsal or back fin; instead they have a raised dorsal area or back. The whales are gray, with a characteristic white mottling resulting from attached barnacles.

4.2.1.2 Distribution

Summer distribution occurs in Alaska and winter distribution occurs along the southern California and Baja Mexico coast. Individuals that occur in Washington are migratory, moving between these two ranges. Gray whales are observed in Sinclair Inlet, the Port Washington Narrows, or Dyes Inlet occasionally during the winter and spring months.

The North Pacific gray whale stock is divided into two distinct stocks: eastern and western (*Rice et al. 1984*). The eastern North Pacific stock ranges from Alaska, where they summer, to Baja California, where they migrate to calve in the winter. Gray whales occur frequently off the coast of Washington during their southerly migration in November and December, and northern migration from March through May (*Rugh et al. 2001*).

The vast majority of all gray whales are found in the Pacific Ocean along the western coastline of North America, spending winters in the waters off Baja California and migrating to Alaska for the summer months (*NOAA 2005*). They are typically seen off the California coastline from December through May as they migrate northward to the Bering and Chukchi Seas, and again on the return trip to Baja California.

Gray whales have been uncommon in Puget Sound during historic times but have been sighted more frequently in recent years. Gray whales are observed in Washington inland waters regularly between the months of January and September, with peaks between March and May. The average tenure within Washington inland waters is 47 days and the longest recorded stay was 112 days (*Washington State Department of Transportation 2009*).

Gray whales are reported in Sinclair Inlet, Port Washington Narrows or Dyes Inlet during migration. Gray whales were sighted off Vashon Island on Easter 2010. Since gray whales are so uncommon in the Puget Sound, it is difficult to predict the number of gray whales that may be present in the Puget Sound during the construction period.

Between 2001 and 2007, gray whale sightings were reported during 3 years (*Orca Network 2007*). Reports occurred in April 2002, February, March and May 2005, and March and April 2007. The May 2005 observation was a stranding mortality at the Kitsap Naval Base in Bremerton (*Orca Network 2007*).

4.2.1.3 Status

Gray whales were removed from listing under the Endangered Species Act in 1994. The Eastern North Pacific stock of gray whales is not classified as a strategic stock. Gray whales formerly occurred in the North Atlantic Ocean (*Fraser 1970, Mead and Mitchell 1984*), but this species is currently found only in the North Pacific (*Rice et al. 1984*). The eastern North Pacific Stock occurs along the west coast of North America.

4.2.2 Orca Whale (*Orcinus orca*)

4.2.2.1 Description

The Orca whales (also known as killer whales) are members of the family Delphinidae, which includes 17 to 19 genera of marine dolphins (*Rice 1998, LeDuc et al. 1999*). The Orca whale is the world's largest dolphin. The sexes show considerable size dimorphism, with males attaining maximum lengths and weights of 9.0 meters and 5,568 kg, respectively, compared to 7.7 meters and 3,810 kg for females (*Dahlheim and Heyning 1999*). Adult males develop larger pectoral flippers, dorsal fins, tail flukes, and girths than females (*Clark and Odell 1999*). The dorsal fin reaches heights of 1.8 meters and is pointed in males, but grows to only 0.7 meters and is more curved in females. Orca whales have large paddle-shaped pectoral fins and broad rounded heads with only the hint of a facial beak. The flukes have pointed tips and form a notch at their midpoint on the trailing edge. Ten to 14 teeth occur on each side of both jaws and measure up to 13 cm in length (*Eschricht 1866, Scammon 1874, Nishiwaki 1972*).

4.2.2.2 Distribution

Orca whales occur in all oceans, but are generally most common in coastal waters and at higher latitudes, with fewer sightings from tropical regions (*Dahlheim and Heyning 1999, Forney and Wade 2007*).

Two sympatric populations of Orca whales are found in the greater Puget Sound. These populations can be discriminated based on diet; one specializes on marine mammal prey (termed "transient") and the other on fish prey (termed "resident") (*Calambokidis and Baird 1994*).

Southern resident Orca whales are seen year-round in Washington's inland waters, primarily in the north Puget Sound in the vicinity of the San Juan Islands, and can be predictably encountered in some areas at certain times of the year (*Calambokidis and Baird 1994*). The southern residents are actually a large extended family, or clan, comprised of three pods: J, K, and L pods and collectively number 83 individuals (*Center for Whale Research 2008*). Transient Orcas can be found in small groups from Mexico to the Bering Sea. They appear only occasionally in Washington's inland waters, usually near Vancouver Island.

While in inland waters during warmer months, all of the pods concentrate their activity from the south side of the San Juan Islands through Haro Strait northward to North and South Pender Islands and Boundary Passage (*Hauser 2006*). Less time is generally spent elsewhere, including other sections of the Georgia Strait, Strait of Juan de Fuca, and San Juan Islands and the Southern Gulf Islands, Rosario Strait, Admiralty Inlet west of Whidbey Island, and Puget Sound. Individual pods are generally similar in their preferred areas of use (*Olson 1998*), although some seasonal and temporal differences exist in areas visited (*Hauser 2006*).

During early autumn, Southern Resident pods, especially J pod, expand their routine movements into Puget Sound to likely take advantage of chum and Chinook salmon runs (*Osborne 1999*). In recent years, this has become the only time of year that K and L pods regularly occur in the

Sound. Movements into seldom-visited bodies of water may occur at this time. Southern Residents (J pod) have also been documented in Hood Canal, by sound recordings in 1995 and 1958, a photograph from 1973 and there are also anecdotal accounts of historical use, but these may be transient whales.

The southern residents are often seen during the summer in the protected inshore waters of Haro Strait (west of San Juan Island), in the Strait of Juan de Fuca, and Georgia Strait near Fraser River. J pod, with 24 members, is the pod that is present in Washington's inland waters during at least part of every month of the year. They are frequently observed near the San Juan Islands, in the lower Puget Sound near Seattle and Vashon Island, and in Georgia Strait at the mouth of the Fraser River. K pod now has 19 members and in recent years has been present in the Puget Sound from May until December. L pod, with 40 members, is by far the largest resident pod and typically spends only the summer months in Washington's inland waters.

Southern resident Orca whale presence is possible but unlikely in the action area. http://Orcas.mapmate.com/maps/1247 contains the most recent sightings.

4.2.2.3 Status

On November 18, 2005, the Southern Resident stock was listed as an endangered DPS under the ESA (70 FR 69903). On November 29, 2006, NMFS published a final rule designating critical habitat for the Southern Resident killer whale DPS (71 FR 69054). Both Puget Sound and the San Juan Islands are designated as core areas of critical habitat under the ESA, but areas less than 20 feet deep (relative to extreme high water) are not designated as critical habitat (71 FR 69054). A final recovery plan for southern residents was published in January of 2008 *(NMFS 2008).*

Transient Orca whales are not listed as "endangered" or "threatened" under the ESA nor as "depleted" under the MMPA.

5.0 POTENTIAL IMPACTS

5.1 Project Description

The proposed action will require the removal of 136 existing piles located below mean higher high water (MHHW), these include:

Two 19-pile creosote-treated dolphins (38, 14-inch diameter piles total)

One 37-pile creosote treated dolphin (14-inch diameter piles)

One existing support pile (24-inch diameter steel) associated with a pedestrian gangway

Two existing 30-pile creosote treated wingwalls (60, 14-inch diameter piles total)

Newly constructed elements of the proposed action include:

A two-span, concrete, approach trestle, approximately 65 feet long supported by approximately 16, 16-inch diameter concrete filled, steel pipe piles

A single-span, concrete, transfer span, approximately 90 feet long

A concrete floating pontoon

A steel apron, approximately 25 feet long

Two pontoon fenders (guide frames) with six, 16-inch diameter steel pipe piles each (for a total of 12)

Two new steel wingwalls with approximately 18, 20-inch diameter steel pipe piles and eight 24-inch diameter steel pipe piles, respectively

A new pedestrian access trestle with approximately six to eight 16-inch diameter steel pipe piles

Relocate existing pedestrian gangway and install one or two new 16-inch diameter steel pipe pile(s)

Six new steel dolphins with two 36-inch diameter steel pipe piles each (12 total)

Ancillary mechanical and utility systems including hydraulic and electrical control systems, water and sewer

The majority of project construction will be conducted from barges moored in the nearshore adjacent to the Steilacoom Ferry Landing. The number and size of construction barges and the quantity and placement of anchoring mechanisms are expected to vary depending on contractor requirements. Pierce County anticipates as few as one or as many as three barges may be required for all construction activities.

Installation of steel piles using both vibratory and impact hammers is a significant construction element. Pile sizes used in this design range from 16-inch diameter to 36-inch diameter. The total number of piles by size category and the area of benthic habitat displaced are summarized for each construction element in Table 1 of the BA. Table 1 also shows the number of existing piles to be removed and the benthic habitat area restored as a result. Pile installation methods are expected to be similar across all construction elements. Each pile will be inserted to refusal or the designated tip elevation using a vibratory hammer and then proofed for load bearing capacity using an impact hammer.

Within the Detailed Project Description section of the BA, each major project element description includes the number and size of piles associated with each structure, an estimate of the time requirements per pile for vibratory hammer installation and impact hammer proofing, and an estimate of the total duration of pile driving activities for that project element. These estimates are conservative approximations, actual time requirements will vary depending on the substrate conditions at each site and the type of equipment used. A reasonable estimate of the number of hammer strikes required to proof each pile can be derived from data collected during construction projects at WSDOT Washington State Ferries facilities (*WSDOT 2009a*). Typical impact hammer strike per pile estimates ranged from approximately 300 to 675 per pile in construction projects at the Bainbridge Island, Friday Harbor, and Anacortes Ferry terminals. Noise modeling for this project assumes up to 2,600 pile strikes per day.

Potential take of marine mammals associated with proposed pile driving or other construction activities when coupled with this monitoring plan, are not likely to be lethal or to have long-term negative consequences for the marine mammal populations. Furthermore, there would be no adverse impact on the availability of marine mammals for subsistence harvest by the Northwest Treaty Tribes.

5.2 Method of Incidental Take

Certain proposed activities (e.g., vibratory and impact pile driving) may result in Level A and B harassment. In addition to pile driving, behavioral harassment could also be caused by airborne noise from the equipment and human work activity in proximity to movement corridors and foraging sites.

In order to monitor for marine mammals, relative to the established acoustic thresholds, the County has defined zones of injury, based upon recent sound monitoring data and Level A thresholds, and zones of disturbance, based upon recent data and Level B thresholds.
For this project, Level A harassment is unlikely, because pile driving will either not start or be halted if marine mammals approach the zone of injury (see Table 5-1). Vibratory pile driving will also be used, and is not expected to injure marine mammals, but could result in behavioral disturbance.

Table 5-1. Marine Mammal Injury and Disturbance Thresholds for Underwater and Air Noise.

	Vibratory Pile Driving	Impact Pile Driving	
Marine Mammals	Disturbance Threshold (injury is not expected)	Disturbance Threshold	Injury Threshold
Cetaceans	120 dB RMS	160 dB RMS	180 dB RMS
Pinnipeds	120 dB RMS	160 dB RMS	190 dB RMS

Table 5-2 summarizes recent Washington State Ferries (WSF) impact pile driving projects that were monitored with and without a bubble curtain. As shown in Table 5-2, all example projects exceeded the behavioral (disturbance) thresholds of 120 dB RMS and 160 dB RMS and the 180 dB RMS injury threshold for cetaceans. All but one exceeded the 190 dB RMS injury threshold for pinnipeds without a bubble curtain. With a bubble curtain, all exceeded the 120 dB RMS and 160 dB RMS behavioral disturbance thresholds, and all but one exceeded the 180 dB RMS threshold for cetaceans. Four of the six sites with good data exceeded the 190 dB RMS threshold for pinnipeds.

Table 5-2. Observed Underwater Sounds from Impact Pile Driving With and Without a Bubble Curtain.

Ferry Terminal	Pile Diameter (in inches)	Without Noise Mitigation* dB Peak	Without Noise Mitigation* dB RMS (impulse)	With Noise Mitigation* dB RMS (impulse)	Sound Reduction Achieved (dB re. 1 µPA)
Friday Harbor	24	212	189	195	4dB average, 10 dB maximum**
Bainbridge	24	211	198	195	0 to 14 dB, 6 dB average
Eagle Harbor	30	211	193	183	9 dB average
Friday Harbor	30	212	195	195	3 dB average, 4 dB maxim
Anacortes	36	214	201	192	3 to 11 dB
Mukilteo	36	214	201	179	19 to 23 dB

*Distance from the source was 10 meters, except for Eagle Harbor, which was between 9 to 16 meters (*Laughlin 2005a, 2005b, 2007, 2008*, and *Sexton (No Date), Appendix F*).

Recent research indicates that 135 dB RMS is not a representative sound level for ambient in-water conditions throughout much of the Puget Sound. WSDOT analyzed broadband background sound (20 Hz to 20 kHz) over three consecutive 24-hour periods at Mukilteo, Port Townsend, Anacortes, Edmonds, and Seattle ferry terminals. The decibels reported for these locations represent 50 percent of the cumulative distribution functions of these three periods, including both daytime and nighttime sound levels. Based on this recent research, the broadband sound level at Mukilteo is 123 dB, at Port Townsend is 104 dB, at Anacortes is 130 dB, at Edmonds is 123 dB, and at Seattle is 128 dB (WSDOT 2011a, WSDOT 2011b). Based upon this new data, because the Steilacoom Ferry landing supports 12 vessel trips daily, sound levels for this analysis are assumed to be similar to those experienced at Port Townsend (104 dB RMS), which experiences a similar level of vessel traffic.

Based upon these data, an assumed background broadband sound level at the Steilacoom Ferry Terminal site of 104 dB RMS, and the thresholds for injury and disturbance, Pierce County has delineated underwater zones of injury and disturbance (Figures 5a and 5b).

Worst case, impact pile driving noise would be expected to attenuate to the injury threshold for cetaceans (180 dB RMS) at 251 meters (823 feet) and the distance to the injury threshold for pinnipeds (190 dB RMS) would be 54 meters (177 feet). These zones will be monitored by qualified marine mammal observers during impact pile driving. This monitoring is expected to

Figure 5a

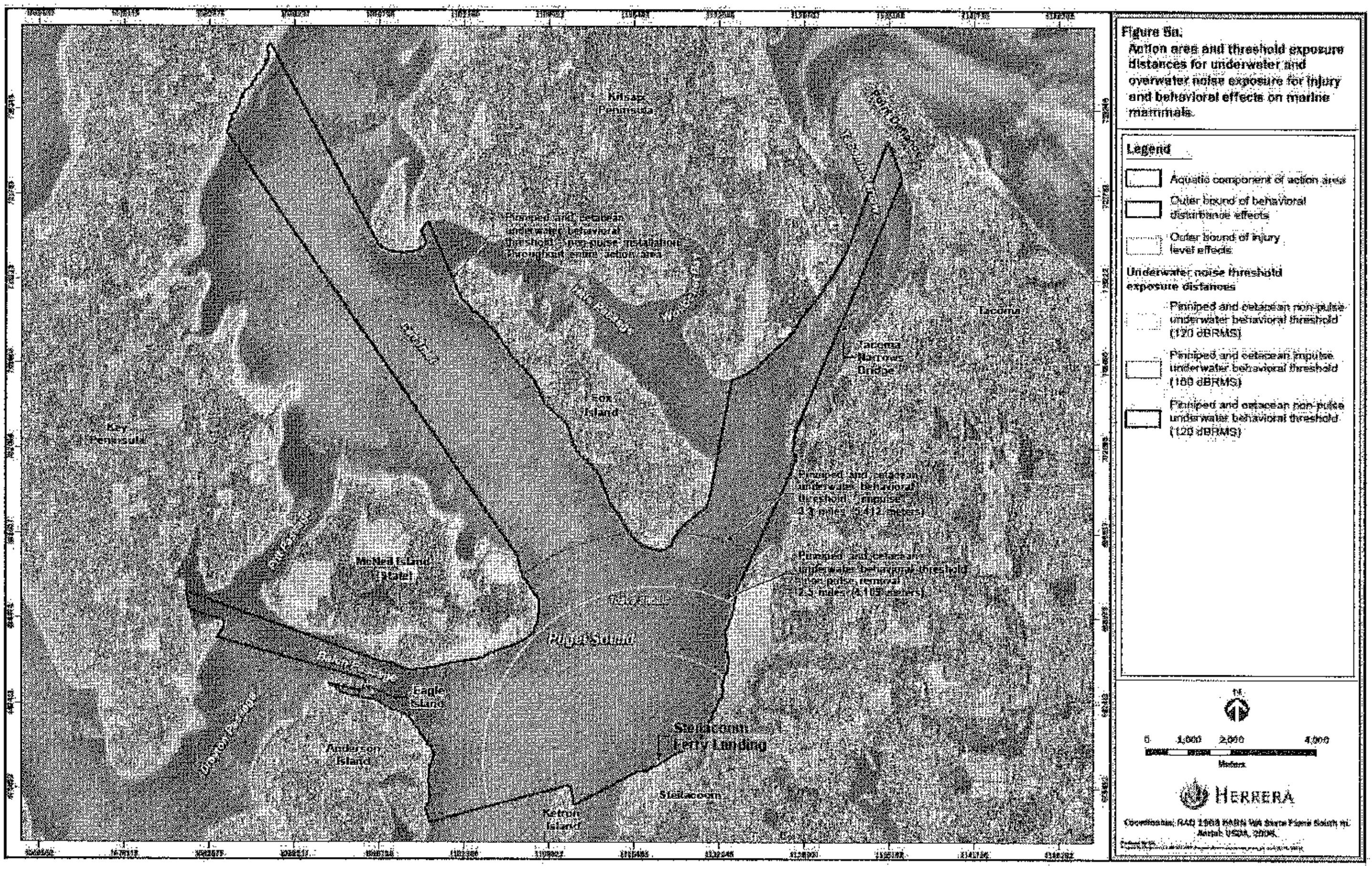
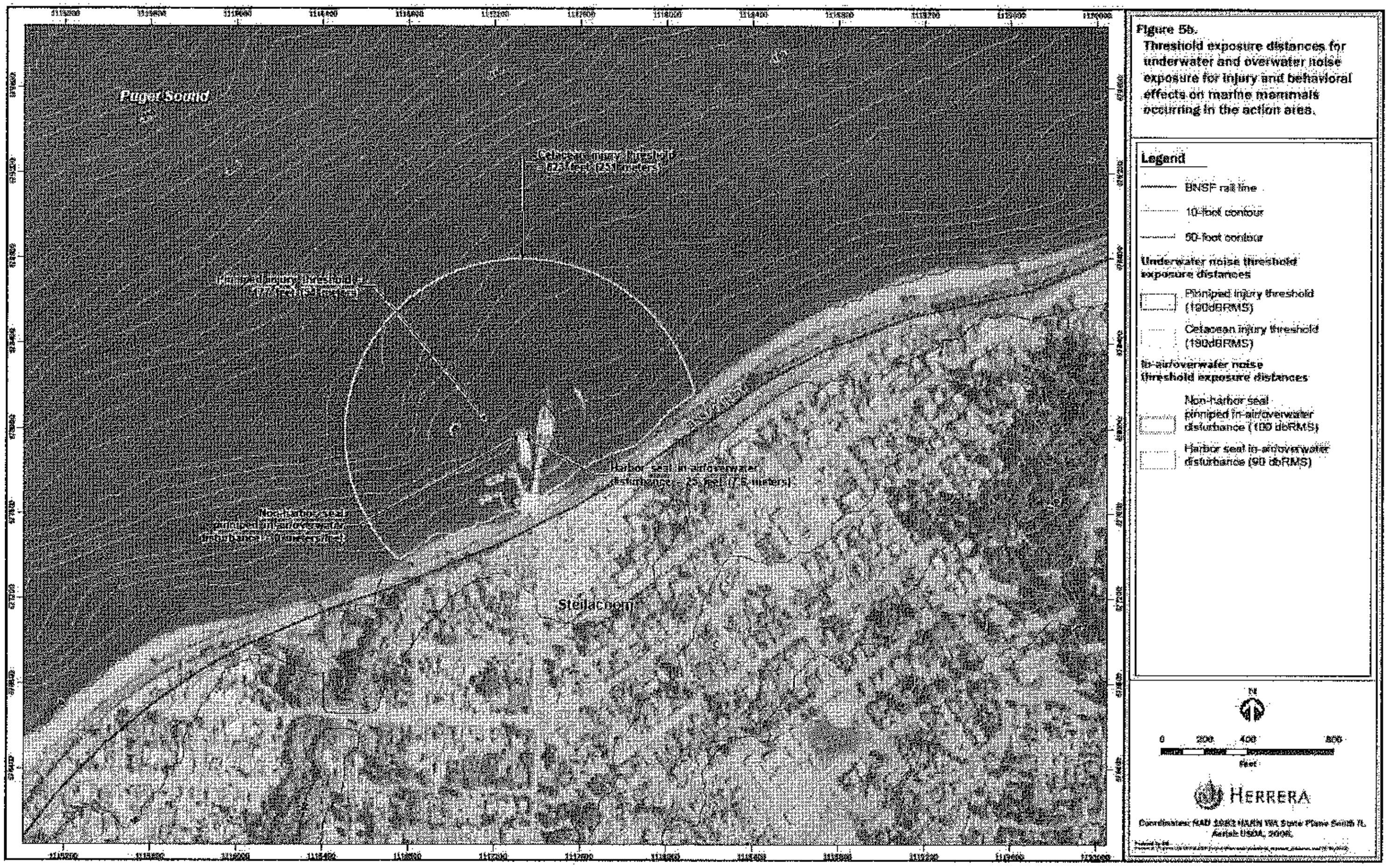


Figure 5a:
Action area and threshold exposure distances for underwater and overwater noise exposure for injury and behavioral effects on marine mammals.
Legend
Aquatic component of action area
Outer bound of behavioral disturbance effects
Outer bound of injury level effects
Underwater noise threshold exposure distances
Pinniped and cetacean non-pulse underwater behavioral threshold (120 dBRMS)
Pinniped and cetacean impulse underwater behavioral threshold (160 dBRMS)
Pinniped and cetacean non-pulse underwater behavioral threshold (120 dBRMS)
0 1,000 2,000 4,000
Meters
HERRERA
Kitsap Peninsula
Key Peninsula
Fox Island
McNeil Island (State)
Anderson Island
Eagle Island
Ketron Island
Puget Sound
Steilacoom Ferry Landing
Steilacoom
Tacoma
Tacoma Narrows Bridge
Point Defiance
Pinniped and cetacean underwater behavioral threshold - impulse - 3.4 miles (5,412 meters)

Figure 5b


Puget Sound
Harbor seal in-air/overwater disturbance = 25 feet (7.6 meters)
Steilacoom
Figure 5b.
Threshold exposure distances for underwater and overwater noise exposure for injury and behavioral effects on marine mammals occurring in the action area.
Legend
BNSF rail line
10-foot contour
50-foot contour
Underwater noise threshold exposure distances
Pinniped injury threshold (190dBRMS)
Cetacean injury threshold (180dBRMS)
In-air/overwater noise threshold exposure distances
Non-harbor seal pinniped in-air/overwater disturbance (100 dbRMS)
Harbor seal in-air/overwater disturbance (90 dbRMS)
N
0
200
400
800
Feet
HERRERA
Coordinates: NAD 1983 HARN WA State Plane South ft.
Aerial: USDA, 2006.

avoid exposure of marine mammals to injurious sound pressure levels by delaying or shutting down pile driving if any marine mammal enters the injury zones.

Worst case, impact pile driving noise would be expected to attenuate to the disturbance threshold for marine mammals at 5.4 kilometers (3.3 miles). Vibratory pile removal noise would attenuate to the 120 dB RMS disturbance threshold at 4.1 kilometers (2.5 miles). Vibratory pile installation noise would attenuate to this same threshold at a maximum of 19 kilometers (12.12 miles).

Due to the large area associated with vibratory pile installation, and the difficulty this area presents for effective marine mammal monitoring, Pierce County proposes that the disturbance zone, and associated monitoring activities, be confined to a 3.3-mile radius from the ferry landing during impact and vibratory pile driving and extraction activities. Based upon monitoring results, this area could be reduced if attenuation to both the 160 dB RMS and 120 dB RMS thresholds was occurring at a shorter distance. Shutdown would be immediate if any protected marine mammals were detected entering the disturbance zone for either impact or vibratory pile driving (160 dB RMS for impulsive sound, 120 dB RMS for non-pulse), thus preventing any incidental take from occurring. Shutdown would not occur if porpoises or dolphins, or non-listed pinnipeds were seen in the disturbance zone for impact pile driving or vibratory pile driving (behavior will be documented).

Analysis of the data from the San Francisco-Oakland Bay Bridge Pile Driving Demonstration project (PIDP), based on the in-air hammer noise measurements, the maximum root mean square (RMS) noise levels received by instrumentation were 96 to 105 dBA (or 101 to 108 dBC) re 20 μPa measured at 100 meters (328 ft) from the pile. The peak SPLs at 100 meters (328 ft) ranged from 115 to 124 dB re 20 μPa. The range in sound pressure levels (SPLs) was the result of pile orientation. A battered pile that was tilted away from the measurement location (top further away than bottom) resulted in higher noise levels than the opposite condition. For a vertical pile, the RMS SPLs were 97 dBA (or 103 dBC) and the peak SPLs were 120 dB re 20 μPA for a similar distance. SPLs were not noticeably different between the large and small hammer.

National Marine Fisheries Service considers in-air noise levels below 90 dB re 20 μPa RMS to be safe for marine mammals (*Parsons Binckerhoff 2002*). A level of 90 dBA re 20 μPa or less is also considered safe for human workers. Seals have hearing that is 20 to 30 dB less sensitive than humans in the frequency range of noise from pile-driving (*Richardson et al. 1995*).

The highest assumed sound levels associated with impact installation of the 74 steel piles are 110 dBA measured at 50 feet from the pile. Vibratory installation of steel piles will produce elevated in-air and overwater noise levels reaching as high as 100 dBA at a reference distance of 50 feet. As is stated in the BA, the in-air ambient noise levels at the surface of Puget Sound (overwater) is assumed to be 60dBA. Based in these factors, as described in the BA, elevated in-air noise will extend approximately 1,145 feet inland in a semicircular pattern and 15,811 feet overwater in a semicircular pattern from the Steilacoom Ferry landing before attenuating to ambient levels.

To determine the distance point source (construction) noise will travel before it attenuates to the behavioral disruption sound level (100 dB RMS), the un-weighted Root Mean Square (RMS) sound levels must be used. WSDOT un-weighted RMS measurements for vibratory hammers range from 99 dB (18-inch pile) and 98 dB (30-inch pile) at 50 feet (Laughlin 2010). Un-weighted RMS impact hammer in-air sound levels were between 98 dB and 102 dB at 50 feet for 72-inch piles. Given the general lack of un-weighted noise data, for this assessment the un-weighted in-air sound levels associated with either vibratory or impact pile driving is estimated to be 98 dB RMS.

Given the estimated un-weighted pile driving noise (98 dB) will be less than the established threshold (100 dB), it is assumed the in-air acoustic threshold for non-harbor seal pinnipeds will not be exceeded. For harbor seals, the potential for in-air disturbance stemming from pile driving activities extends 7.6 meters (25 feet).

Consequently, it is possible that hauled-out harbor seals will hear the pile-driving activities, but noise from this activity is not expected to adversely affect them because the proposed monitoring activities within the defined underwater injury zones will limit the potential for exposure of harbor seals to elevated in-air sound levels.

The Steilacoom Ferry Project is not expected to result in any significant impacts to marine mammal habitat. Short-term impacts will include the minimal disturbance of the sediment.

6.0 MITIGATION PLAN AND MARINE MAMMAL MONITORING PLAN

6.1 Compliance with Equipment Noise Standards

To mitigate noise levels and therefore impacts to harbor seals, California sea lions, orcas and gray whales, all construction equipment will comply as much as possible with applicable equipment noise standards of the U.S. Environmental Protection Agency, and all construction equipment will have noise control devices no less effective than those provided on the original equipment.

6.2 Briefings

Prior to the start of pile-driving activity, a briefing will be held between the construction supervisors and crews, the marine mammal monitoring team, acoustical monitoring team, and Pierce County staff. The purpose of the briefing will be to establish responsibilities of each party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures. The Resident Engineer will have the authority to stop or delay any construction activity, if deemed necessary. New personnel will be briefed before they join the work in progress.

6.3 Establishment of Safety/Buffer Zones

Prior to commencement of driving of any in-water, permanent piles, a preliminary 500-m (1,640-ft) radius injury zone will be established around the pile-driving site. The injury zone is intended to include all areas where the underwater SPLs are anticipated to equal or exceed 190 dB re 1 μPa RMS (broadband). Once pile driving begins, SPLs will be recorded at the 500-m (1,640-ft) contour. Similar Puget Sound project have similar radii. The injury zone radius for this threshold will then be enlarged or reduced, depending on the actual recorded SPLs.

A potentially larger 180-dB re 1 μPa RMS (broadband) injury zone will be established for pile-driving occurring during the months when cetaceans are potentially present from October through May. Establishing this injury zone will require the same process described above, only the defining threshold will be 180 dB RMS instead of 190 dB RMS.

Observers on boats, will survey the injury zone to ensure that no marine mammals are seen within the zone before pile-driving or once a pile segment begins. If marine mammals are found within the injury zone, pile-driving of the segment will be delayed up to 15 minutes to allow them to move out of the area. If a marine mammal is seen above water and then dives below, the contractor will wait 15 minutes and if no marine mammals are observed in that time it will be assumed that the animal has moved beyond the injury zone. This 15-minute criterion is based on guidance from the IHA for the PIDP. Harbor seals in Puget Sound are known to dive for a mean time of 0.50 minutes to 3.33 minutes (*Harvey and Torok 1994*).

Initial hammering is expected to begin with taps of the hammer at less than full capacity, which may serve to alert marine mammals to leave the area. Due to the limitations of monitoring from a boat, there can be no assurance that the zone will be devoid of all marine mammals. If marine mammals enter the injury zone after pile-driving of a segment has commenced, hammering will continue unabated and marine mammal observers will monitor and record their numbers and behavior.

Once the pile-driving of a segment begins it cannot be stopped until that segment has reached its predetermined depth due to the nature of the sediments underlying Puget Sound. If hammering stops and then resumes, it will potentially have to occur for a longer time and at increased energy levels. In sum, this will amplify impacts to marine mammals, as they will endure potentially higher SPLs for longer periods of time. Pile segment lengths and wall thickness have been specially designed to accommodate this situation so that when work is stopped between segments, the pile tip is never resting in highly resistant sediment layers.

A second disturbance zone will also be established. This zone will be confined to a 3.3-mile radius from the ferry landing during impact and vibratory pile driving and extraction activities. Shutdown would be immediate if any ESA-listed or MMPA protected marine mammals were detected entering the disturbance zone during either impact or vibratory pile driving (160 dB RMS for impulsive sound, 120 dB RMS for non-pulse), thus preventing any incidental take from occurring. Shutdown would not occur if porpoises or dolphins, or non-listed pinnipeds were seen in the disturbance zone for impact pile driving or vibratory pile driving (behavior will be documented).

6.4 Marine Mammal Monitoring Methods

6.4.1 Observer Monitoring

Safety zone (i.e. injury and disturbance zone) monitoring will be conducted during driving of all in-water, permanent piles. Monitoring of the pinniped and cetacean safety zones will be conducted by a minimum of three qualified NMFS-approved observers. The observers will begin monitoring at least 30 minutes prior to startup of the pile-driving. Observers will likely conduct the monitoring from small boats. As discussed previously, pile-driving will delayed up to 15 minutes if any marine mammals are observed in the safety zone prior to the start of pile-driving.

Once driving a pile segment begins, operations will continue uninterrupted until the segment has reached its predetermined depth. Monitoring will continue through the pile-driving period and will end approximately 30 minutes after pile-driving has been completed. Observations will be made using binoculars during daylight hours. Marine mammal observers will have night-time infrared scopes or other tools to conduct monitoring during low-light conditions.

Each member of the monitoring team will have a marine radio for contact with other observers and work crews if necessary. Data on all observations will be recorded and will include items such as species, numbers, sex and age class, behavior, time of observation, location, time that the pile-driving begins and ends, and other acoustic or visual disturbances. The reactions of marine mammals will be recorded based the following classifications:

No response

Head alert (looks towards the source of disturbance)

Approach water (but does not leave)

Flush (leaves haul-out site)

The number of marine mammals under each disturbance reaction will be recorded, as well as the time when seals re-haul after a flush. Baseline monitoring will be conducted for a period of 14 days prior to the beginning of in-Puget Sound work. Baseline monitoring will be conducted in the general project area (before pile-driving begins). The 14-day monitoring period is expected to be an appropriate time frame to assess baseline conditions in the project area and to account for the potential variability in environmental factors, such as tide level, water current, air temperature and other factors that may influence the presence and activity of marine mammals. The information collected from baseline monitoring will be used for comparison with results of monitoring during pile-driving activities.

If pile-driving for the Steilacoom Ferry Project occurs during molting season, a greater proportion of harbor seals will be hauled out and therefore not subject to the potentially elevated underwater SPLs of pile-driving which could affect marine mammals. California sea lions are not known to breed or give birth in Puget Sound. Molting season is from August to October for adult females and juveniles and from November to February for adult males. If gray whales enter Puget Sound, this would occur from December through May during their winter migration to and from Alaska and the Bering Straits. Calves may accompany pods during the spring return to the north. Casual foraging occurs during the northern migration, but is relatively rare compared to the summer and fall feeding in the northern oceans. Southern resident orca whale presence is possible but unlikely in the action area. Historical orca sightings within the action area predominantly occurred between October and May.

6.4.2 Acoustical Monitoring

Both airborne and underwater environmental noise levels will be measured. Underwater monitoring will be consistent with recent NMFS guidance documents (2012). In-air monitoring will be conducted for one pile in every other pair of piers. The in-air measurements will be conducted during the driving of the last half (deepest segment) for any given pile.

6.4.2.1 Underwater Sound Monitoring

The purpose of the underwater sound monitoring is to establish the baseline sound levels, characterize pile driving source levels, and to define safety zones: injury zones based upon established injury thresholds of 190 dB re 1 μPa RMS (broadband) for pinnipeds and 180 dB re 1 μPa RMS (broadband) for cetaceans. The underwater sound monitoring will also define a disturbance zone based upon established disturbance thresholds of 160 dB RMS (impulse) and 120 dB RMS (non-pulse) to a maximum distance of 3.3 miles. For baseline sound levels, one hydrophone will be placed within 500 to 1,000 feet of the propose pile driving activities at least four meters above the bottom. Measurements will be taken during the same period when the proposed action is likely to occur (NMFS 2012a) during at least three consecutive 24-hour periods.

For characterizing source levels, a hydrophone will be located mid-depth 10 m from the proposed pile driving activity (NMFS 2012b). Finally, to determine safety zones, one reference location (far-range hydrophone) will be established at a distance of 20 times the source depth from the source measurement (NMFS 2012c). Noise levels for both the source level and safety zone monitoring will be measured during the entire driving session at these reference locations.

Measurements will be conducted at two depths: approximately mid water column and a depth near the bottom of the water column but at least 1 meter (3 feet) above the bottom. Two additional in-water spot measurements generally 500 meters (1,640 feet) in two directions either west, east, south, or north of the pile-driving site will be conducted at the same two depths as the reference location measurements. In cases where such measurements cannot be obtained due to obstruction by land mass, structures or navigational hazards, measurements will be conducted at alternate spot measurement locations. Measurements will be made at other locations either nearer or farther as necessary to establish the approximate distance for the safety zones.

The underwater noise measurement system shall provide tape-recorded data for subsequent analysis. The measuring system shall include a hydrophone or pressure transducer, along with signal conditioning equipment and signal amplifier. The conditioned and amplified signal will be recorded on a calibrated digital audio tape (DAT) recorder or a recorder with an equivalent frequency response and dynamic range. The measurement system will have the capability to provide a real time readout display. Signal output to an integrating sound level meter or similar device will provide a real time readout display of the measured underwater sound levels.

The hydrophone and DAT recording systems shall have a frequency response of ±1 dB from 10 Hz to 20,000 Hz over the anticipated measurement range of 100 dB to 220 dB Linear Peak re: 1 *u*Pa. Note that hydrophones with differing sensitivities may be required depending upon the acoustic environment.

The hydrophones will be positioned at two depths: mid-water column depth and near bottom depth. The depth of the hydrophone will be measured and documented. This will be accomplished by measuring the lead while taking into account the effect of the current or collocating pressure devices to measure the depth during the pile-driving event. The accuracy of the depth measurement will be to within 1 meter.

The recorded data will be analyzed to determine the amplitude, time history and frequency of acoustical impulses from pile-driving activity. During data analysis, only the periods of maximum hammer energy will be characterized. For purposes of characterizing sound propagation from pile driving sources relevant to marine mammals, analysis of collected data will also eliminate frequencies below the range of function al hearing of marine mammals (described in *Southall 2007* and in *NMFS 2012c*). The marine mammal safety zone will be identified using measured SPLs that are reported in dB re 1 μPa RMS (broadband). Specific acoustical data that will be reported include:

The RMS (impulse) level, or criterion used to identify the marine mammal safety, is the maximum root mean square SPL measured over the duration of the impulse. The underwater noise measurement results obtained during the PIDP indicated that 90 percent of the acoustic energy for most pile-driving impulses occurred over a 50 to 100 msec period with the energy concentrated in the first 30 to 50 msec. Analysis of underwater acoustic data gathered during the PIDP for various pile strikes at various distances demonstrated that the acoustic signal measured using the standard "impulse exponential-time-weighting" (35 msec rise time) or a 1/32 second (31 msec) averaging time correlated to the NMFS RMS (impulse) level measured over the duration of the impulse. The maximum averaging time and representative range of impulse SPLs will be reported.

The representative range of frequency spectra, 1/3rd octave band center frequency SPLs dB re 1 μPa measured over the frequency range of 10 Hz to 20,000 Hz will be reported for each monitored pile.

The Peak SPL dB re 1 μPa – the largest absolute value of the instantaneous sound pressure over the minimum frequency range of 10 Hz to 20,000 Hz – will be recorded.

The maximum and representative range of peak SPLs will be reported for each monitored pile. The distance between the measurement location and the pile will be measured with an accuracy of ±10 percent. Methods to accomplish this should include an infrared range finder or global positioning system (*Parsons Brinckerhoff 2002*).

For vibratory pile driving, overall dB RMS levels will be characterized by taking 10-second averages across the whole event and averaging all the 10 second periods (*NMFS 2012c*). For impact pile driving, overall dB RMS levels will be characterized by integrating sound for each waveform across 90-percent of the acoustic energy in each wave (using the 5 to 95 percentiles to establish the 90-percent criterion) and averaging across all waves in the pile-driving event (as demonstrated in Figure 1 of *Madsen et al. 2006* as referenced in *NMFS 2012c*).

6.4.2.2 Airborne Sound Monitoring

Airborne sound levels will be measured at times and locations that are coincidental to the underwater measurement sites. The measurements will be made at a height of about 1 meter (3.3 ft) above the water surface. Each measurement system will consist of an integrating sound level meter (SLM) connected to a DAT recorder. Microphones will be fitted with windscreens. The instrumentation will meet the American National Institute of Standards (ANSI) S1.4 requirements for a Type 1 (Precision) SLM. The instrument will be set to the fast (125 msec) time setting. The expected total allowable error is ± 1.5 dB. Real time amplitude measurement of airborne sound levels will be reported in dB re 20 μPa. (This will include the reporting of linear peak and RMS using a 125 msec exponential-time constant or SLM "fast" setting [C-weighted] SPLs.)

It is anticipated that the recorded data will be analyzed to determine the amplitude, time history and frequency content of the impulse. Specific acoustical data that will be reported include:

The RMS "fast" C-weighted level, which is the maximum root mean square SPL measured using a 125-msec exponential-time-constant and the C-weighting filter.

The representative range of frequency spectra, 1/3rd octave band center frequency SPLs dB re 20 μPa measured over the frequency range of 25 Hz to 20,000 Hz.

Peak SPL dB re 20 μPa, which is the largest absolute value of the instantaneous sound pressure over the minimum frequency range of 25 Hz to 20,000 Hz.

6.4.3 Quality Control

The acoustic measurement program for both underwater and airborne noise measurements will include regular calibration and calibration checks in the field. At a minimum, field verification will be performed on every underwater and in-air sound level monitoring system at the beginning and end of each field use or at least on a daily basis. Calibration or calibration checks will be conducted in the field by checking the system response to a known acoustic quantity. At a minimum, calibration tones will be recorded on DAT systems prior to and at the end of each measurement day.

Since underwater blast transducers cannot be field-calibrated, annual factory calibration certification will be required. All hydrophones, microphones, integrating measurements systems, and calibrators will be certified on an annual basis.

Calibration of tape recordings will include the recording of calibration tones at the beginning and end of each tape recording or at least on a daily basis. Calibration will be accomplished through subsequent analysis of these recordings. The frequency response of each recording system will be tested and records will be maintained.

All calibration activities will be documented in the final project monitoring report.

6.5 Reporting

NMFS' Northwest Regional Administrator will be notified prior to the initiation of pile-driving for the Steilacoom Ferry Project, and coordination with NMFS will occur on a weekly basis, or as often as necessary. NMFS will be informed of the initial SPL measurements taken at the reference location (20 times the source depth from the source measurement) and the radius of adjusted safety-zones based on SPL measurements.

Monitoring reports will be faxed to NMFS on a weekly basis during pile-driving activity. The weekly report will include species and numbers of marine mammals observed, time and location of observation, behavior, and other recorded data. In addition, the report will include an estimate of the number of California sea lion, Pacific harbor seal, orcas, and gray whales that may have been harrassed as a result of the pile-driving activities.

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8.0 ACRONYMS

BA	Biological Assessment
DAT	Digital Audio Tape
DPS	Distinct Population Segment
ESA	Endangered Species Act
FHWA	Federal Highway Administration
HLP	Highways and Local Programs
IHA	Incidental Harassment Authorization
MHHW	Mean Higher High Water
MMMP	Marine Mammal Monitoring Plan
MMPA	Marine Mammal Protection Act
MMSZ	Marine Mammal Safety Zone
NMFS	National Marine Fisheries Service
PBR	Potential Biological Removal
PIDP	Pile Driving Demonstration Project
RMS	Root Mean Square
SLM	Sound Level Meter
SPL	Sound Pressure Level
WRIA	Washington State Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
WSF	Washington State Ferries