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

Refer to NMFS No:
WCRO-2021-00301

February 23, 2022

Kathy Hollar
Chief, Wildlife and Sport Fish Restoration Program
Fish and Wildlife Service
911 NE 11th Avenue
Portland, Oregon 97232-4181

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Point Hudson Breakwater Replacement.

Dear Ms. Hollar:

Thank you for your letter on December 21, 2020, requesting re-initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Point Hudson Breakwater Replacement. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

We also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)). We concluded that the action would adversely affect the EFH of Pacific Coast Groundfish, Coastal Pelagic Species, and Pacific Coast Salmon. Therefore, we have included the results of that review in Section 3 of this document. EFH recommendations have been provided and require a response from USFWS within 30 days.

In this opinion, we conclude that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon (*Oncorhynchus tshawytscha*), PS steelhead (*O. mykiss*), Hood Canal summer-run chum (HCSRC; *O. keta)*, PS/Georgia Basin (PS/GB) yelloweye rockfish (*Sebastes ruberrimus*) or PS/GB bocaccio (*S. paucispinis*), Central America DPS and Mexico DPS humpback whales (*Megaptera novaeangliae*) and Southern Resident killer whale (SRKW; *Orcinus orca*). Further, we conclude that the proposed action would not result in the destruction or adverse modification of any of their designated critical habitats.

Please contact Nissa Rudh at the Lacey, Washington, Office (360-701-9699 or nissa.rudh@noaa.gov) if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

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

cc: Heidi Nelson, USFWS
Christine Kozfkay, USFWS
Ross Widener, Widener & Associates

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

Point Hudson Breakwater Replacement

NMFS Consultation Number: WCRO-2020-00301

Action Agency: U.S. Fish and Wildlife Service

Affected Species and NMFS' Determinations:

ESA-Listed Species	**Status**	**Is Action Likely to Adversely Affect Species?**	**Is Action Likely To Jeopardize the Species?**	**Is Action Likely to Adversely Affect Critical Habitat?**	**Is Action Likely To Destroy or Adversely Modify Critical Habitat?**
Puget Sound Steelhead (*Oncorhynchus mykiss)*	Threatened	**Yes**	No	NA	NA
Puget Sound Chinook (*O. tshawytscha)*	Threatened	**Yes**	No	**Yes**	No
Hood Canal Summer Run Chum (*O. keta)*	Threatened	**Yes**	No	**Yes**	No
Puget Sound/Georgia Basin Yelloweye Rockfish (*Sebastes ruberrimus)*	Threatened	**No**	No	No	No
Puget Sound/Georgia Basin Bocaccio (*Sebastes paucispinis)*	Endangered	**No**	No	**Yes**	No
Southern Resident Killer whale *(Orcinus area)*	Endangered	**Yes**	No	**Yes**	No
Central America Distinct Population of Humpback Whale (*Megaptera novaengliae*)	Endangered	No	NA	No	NA
Mexico Distinct Population of Humpback Whale (*Megaptera novaengliae*)	Threatened	No	NA	No	NA

Fishery Management Plan That Identifies EFH in the Project Area	**Does Action Have an Adverse Effect on EFH?**	**Are EFH Conservation Recommendations Provided?**
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	Yes	Yes

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

Issued By:

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

Date: February 23, 2022

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1. INTRODUCTION

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

1.1. Background

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

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600 .

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

1.2. Consultation History

NMFS received an original request from the US Fish and Wildlife Service (USWFS) for consultation for the Point Hudson breakwater replacement project for the Port of Port Townsend (applicant) on April 21, 2016. Consultation was initiated on that same day and a letter of concurrence (LOC) was issued to USFWS on August 31, 2016.

Following issuance of our LOC, the construction was not completed due to project concerns brought forth largely by local citizens who (1) wanted to preserve the historic aesthetic of the jetties, and (2) keep large rocky habitat, which divers reported provide habitat for several species of fish, including rockfish, and other marine life.

To address these concerns, the breakwater was redesigned to more closely resemble the existing structure. The new replacement jetty design evaluated within this biological opinion does not use sheet pile, but instead would be constructed from steel pipe batter piles. A new project package showing project updates and changes was received and logged by NMFS on February 18, 2021, along with a request to re-initiation consultation. It included an updated Biological Assessment (BA) that documented changes between the 2016 and 2021 proposals.

On May 5, 2021, NMFS exchanged emails with Heidi Nelson and Christine Kozfkay of USFWS regarding funding considerations and timelines associated with the project. We informed them of a likely non-concurrence letter regarding the submitted project determinations, and asked the applicants to fill out a Puget Sound Nearshore Habitat Conservation Calculator to assist in evaluation of impacts.

USFWS submitted a draft Puget Sound Nearshore Habitat Conservation Calculator for the project via email in June 2021. After an inquiry from Ross Widener (of Widener and Associates, the consultant for the project) to NMFS regarding progress, NMFS staff began reviewing the submitted calculator. Subsequent emails in June between USFWS and NMFS revealed that the project is on a deadline for funding. NMFS proposed a meeting to discuss project constraints and the current draft Conservation Calculator. On July 21, NMFS Nearshore and USFWS staff met and confirmed that USFWS would remain the action agency, and the project will be consulted on individually. NMFS also asked questions related to the Puget Sound Nearshore Habitat Calculator entry at that time.

During late July into August 2021, NMFS staff communicated with Heidi Nelson to confirm creosote tonnage removal and jetty dimensions, resulting in a final Puget Sound Habitat Conservation Calculator value for the project (+265).

During August, 2021, NMFS suggested the proponents amend species and critical habitat determinations for the project. The project initiation package assigned at most NLAA's for species and critical habitat, as well as no adverse effects to EFH. Determinations were not revised for ESA or EFH by USFWS, but it was communicated that NMFS would proceed with NMFS determinations in the biological opinion.

We have concluded that Puget Sound (PS) Chinook salmon, PS steelhead, Hood Canal summer run (HCSR) chum salmon, and are likely to be adversely affected by the proposed action. We have also concluded that PS Chinook salmon, HCSR chum salmon, and SRKW critical habitats are likely to be adversely affected. PS/GB bocaccio rockfish are not likely to be adversely affected by the proposed action but their critical habitat is likely to be adversely affected, though not adversely modified. We also concluded that PS/GB yelloweye, Central America DPS and Mexico DPS humpback whales and their critical habitats are not likely to be adversely affected by the proposed action. The initiation package provided by the applicant identified a NLAA determination for canary rockfish, which are no longer listed under ESA, therefore will not be included in the remainder of the document. NMFS has addressed the two ESA-listed humpback whale DPSs in section 2.11 of the document because we consider them not likely to be adversely affected.

On November 17, 2021 an updated project description including project changes concerning construction timing and minimization measures was shared with NMFS. Those changes are included in the analyses in this document, and did not alter the consultation initiation date of August 26, 2021.

On January 11, 2021 draft terms and conditions from this Opinion were shared with USFWS and the Port. These were accepted by both parties.

1.3. Proposed Federal Action

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

The proposed action, located within the city of Port Townsend, Washington, would replace the Point Hudson (48.116169 -122.750262) north and south breakwaters within the footprint of the existing breakwaters and designated navigation channel. See Figure 1 below for the existing structures. The project would include the removal and replacement of two existing breakwaters, removal of creosote treated piles, installation of new steel piles, removal and replacement of shoreline armoring, and dredging within the existing navigation channels. The project, when evaluated with the Puget Sound Nearshore Habitat Conservation Calculator, results in net positive conservation credits. The positive credits result from the removal of creosote piles associated with the structure of the jetties. Conservation credits from this project will be applied to offset debits associated with WCRO-2020-00202 (NWS-2019-390) – the Port Townsend Breakwater project, which has the same applicant (Port of Port Townsend). The Port Townsend Breakwater project has not been constructed (upon signing of this Opinion) and was consulted through a batched Biological Opinion issued by NMFS in 2021 (WCRO-2021-01620).

The proposed project is funded both by the USFWS Wildlife and Sporting Fish Restoration Program as part of a Boating Infrastructure Grant, and by the Department of Commerce Economic Development Administration. The South Jetty and associated bulkhead has a large public fishing pier funded by the USFWS. The proposed action would receive a section 404 CWA permit and a permit under section 10 of the Rivers and Harbors Act from the USACE.

New breakwaters will include a combined rock & steel pipe pile breakwater system. In addition, a bulkhead extending shoreward of the south breakwater leg will be replaced and select maintenance dredging of the navigation channel will occur after construction of the breakwaters. The in-water construction will consist of removal of existing outer and core materials, dredging, debris disposal, installation of a rock habitat feature using recovered materials, installation of replacement breakwater materials, and installation of the breakwater armoring. Out-of-water construction (above HTL) will include excavation and backfilling behind the replacement bulkhead, placing rock, installing the top whaler above the water line, replacing pavement near the top of the southern breakwater and bulkhead, installing signage, and replacing handrails and navigation lights. New materials will have more environmental benefits, be more structurally sound, and have a 30-year minimum useful life. The proposed construction will reflect the original design concept from when the breakwaters were originally constructed in the 1930s with new materials to ensure functionality, environmental sustainability, and aesthetics.

The majority of construction activities will take place in the water between September 15 and January 15 in 2022-2024; equipment will be on a floating barge for dredging and removal/placement of structures. Construction will be conducted below and above the High Tide Line (HTL) and is anticipated to be completed in two seasons. Work below the HTL will be conducted during the in-water work window of September 15- January 15 during both seasons.

The proposed action elements are shown in Figure 2 below. The jetties (breakwaters) are associated with the entrance to the Point Hudson Marina, which moors vessels inside the cove. According to the Port of Point Hudson website, the marina has approximately 71 moorages ranging from 32-70 feet. Additionally, the South Jetty has a public fishing pier extending its length (See Figure 2 below).

Figure 1. Google satellite imagery of the Point Hudson Marina taken in August of 2020. The South Jetty/Breakwater has a wooden fishing pier.

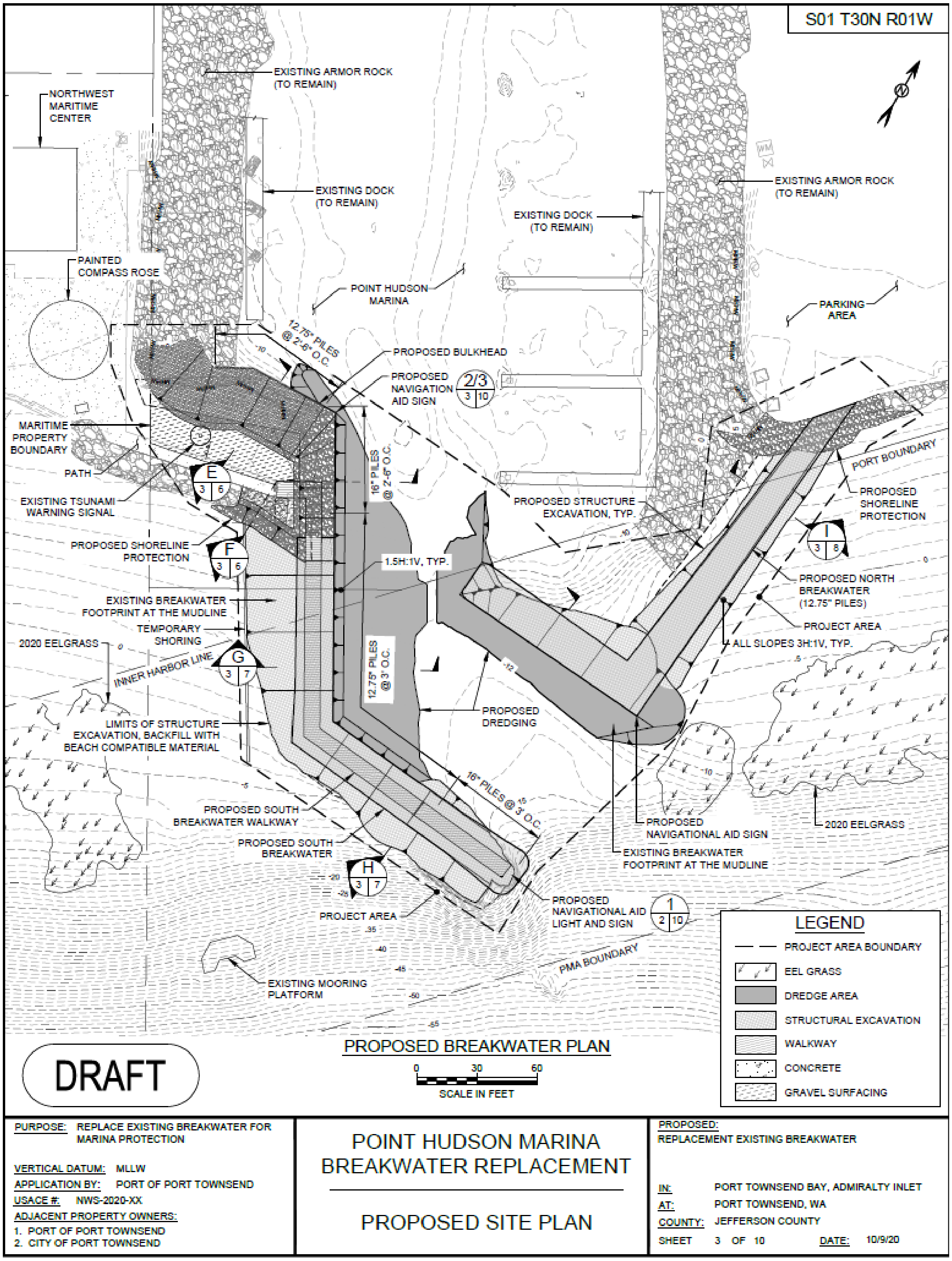

Figure 2. Proposed Site Plan included in the 2020 BA Addendum

Breakwater Replacement:

The proposed action includes the replacement of the existing 241-foot-long south breakwater and the 260-foot-long south bulkhead as well as the 255-footlong north breakwater. Activities include removal of:

- All existing armor stone within 10 feet of either side of the breakwaters
- All existing armor stone above the structure excavation depth for the bulkhead
- All existing creosote-treated timber piles and associated steel cabling
- The entire existing timber pedestrian walkway

Demolition will occur above and below HTL and may be conducted from upland areas and/or by barge with crane and clam bucket and excavator. Demolition materials will be placed on a material barge, transported for suitable upland disposal.

Rocks fallen away from the main jetty structures will not be removed as part of this project, and will remain in place to provide habitat. Sessile and slow organisms (such as anemones and nudibranchs) attached to the large South Jetty rocks may be relocated in a volunteer effort led by the Port Townsend Marine Science Center and the Washington Department of Fish and Wildlife (WDFW).

Pile Removal:

A total of 320 piles of the south breakwater, 151 piles of south bulkhead, and 356 piles of the north breakwater will be removed. All piles except 5 steel piles in the south bulkhead, are creosote-treated timber. Pile extraction will be performed by pulling with a crane or potentially a vibratory extractor. Full-length extraction of existing creosote timber piling will be attempted during demolition, and the remaining local depression in the seabed capped with approximately two feet of beach compatible material. If during extraction a pile breaks off at or below the mudline, the void will be capped with approximately two feet of beach compatible material. All areas around removed piles will be capped with approximately two feet of beach compatible material.

Armor Stone Removal:

The existing armor stone material is made up of roughly 2-3 foot diameter basalt stone that has weathered and fractured into smaller pieces. Removal for the south breakwater will commence after the piles on the marina side of the breakwater have been extracted. The existing stones located within 10 feet of the existing breakwater will then be removed using attachments such as rock grapples, clam buckets, and/or buckets with thumbs. A portion of the stone removed from the north breakwater will be recovered and installed a short distance off the south breakwater to serve as a surrogate habitat feature (see rock habitat feature section below).

Structure Excavation:

Structure excavation work will occur over the area surrounding the south breakwater and the area around the south bulkhead. This work will be performed prior to installing the piles and armor stone for the new south breakwater. The excavator will place the material into a temporary stockpile on a barge prior to loading into trucks for offsite disposal. Filter berms and a silt fence will be used to limit runoff from offloaded material.

While performing structure excavation, a turbidity curtain may be placed around the perimeter of the work area if needed for compliance with water quality certification turbidity requirements. Best Management Practices (BMPs) and water quality protection measures that will be implemented.

Debris Disposal:

Demolished items will be removed and transported to approved upland facilities offsite. All timber removal will occur within a containment boom, a floating boom with absorbent pads will be installed at a sufficient distance from all sides of the structure being removed to ensure capture. The extracted piles will be transferred to a containment basin within a containment boom, which will remain in place until any sheen present has been absorbed or removed. Piles and excavated debris will be moved expeditiously to the containment area, where pilings will be cut into four-foot or less lengths for easier disposal transport.

Suitable rock from the north breakwater will be salvaged to be placed in an offshore location, in 30 feet of water or greater, near the south breakwater and the submarine net anchor to provide additional mitigation and habitat which is further described in the rock habitat feature section below.

Dredging:

Maintenance dredging will be performed in the navigation channel. Dredging work will be conducted utilizing a mechanical dredge and/or excavator. Mechanical dredging operations will occur from land and from floating equipment, depending on the location of dredging and water levels present at the time of construction. In-water dredging equipment will operate atop a floating barge, or crawler crane mounted on a barge. The barge and excavator system will be moved around the dredging work area using a tug. Dredged material will be removed from the seabed using either an excavator or clamshell bucket. The bucket will place the material onto a hopper or bottom dump barge. The design dredging depth will be -12 feet MLLW, with a 1-foot over dredge allowance. The design channel width will be a minimum of 62 feet between structures. Dredged materials will be disposed of at an approved upland facility. For the south breakwater navigation channel, 714 CY (6510 sq. ft.) will be removed and for the north breakwater navigation channel 331 CY (3381 sq. ft.) will be dredged, a total of 1,045 CY (9,891 sq. ft.).

Rock Habitat Feature:

The rock feature has been developed in conjunction with WDFW as a habitat offset between the Port and resource agencies. The plan involves salvaging larger rock from the north breakwater and placing that salvaged rock between the mooring buoy and the end of the south breakwater. The purpose of this work is to provide a habitat feature which would offset potential impacts to benefit various species of rockfish and lingcod that WDFW have documented utilizing the south breakwater. Based on WDFW's research through the local dive community, it has been documented that juvenile rockfish and lingcod use the south breakwater for rearing through the end of September. The intent of this work is to provide a nearby habitat feature free of creosote for those species to continue rearing with minimal impact from the project.

The rock will be salvaged from the north breakwater during the 2022 construction season. The rock will be conserved from an inundated section of the north breakwater starting around elevation zero to minus 10 feet. This provides rocks with the maximum algae and micro-invertebrate coating which will enhance the habitat value of the structure so it can function within one year of installation.

The feature will be constructed with approximately 1.5 to 1 slopes, starting at the sea floor elevation of -30 feet and ending around elevation -50 feet. This work would require about 900 cubic yards of material and will remain in place as a permanent habitat feature to augment the habitat provided by the new breakwaters. The permanent footprint will be approximately 55 feet wide, 49 feet long, and 15 feet tall and would cover about 2,700 square feet of seafloor. It is anticipated the material will be placed with a bottom dump barge.

Although not a component of the proposed action, the Port intends to enter a partnership with the Port Townsend Marine Science Center to relocate rock dwelling invertebrates and other species from the south breakwater to this new habitat feature. The work will occur after the 2022 work window and prior to the September 15th start of the 2023 work window.

Installation of Replacement Breakwater:

Installation of the replacement structures will consist of a bedding layer, geotextile, steel sheet bulkhead, steel piles, armor stone, and a walkway. Installation will be conducted by crane barge. A minimum 3-foot-thick bedding layer will be installed for both the southern and northern breakwaters, and a 2-foot-thick layer for the bulkhead will be installed. The bedding layer materials will consist of approximately 7-inch median diameter stone. To maintain stability of the bedding material, no bedding will be placed above -9 feet MLLW without a cover layer of armor stone or embedment of the bedding stone. For sections with bedding above -9 feet MLLW, a minimum 2-foot embedment of the bedding layer will be required for the breakwater. The embedment material will consist of beach compatible material or armor stone.
A total of 165 steel piles for the south breakwater, 54 steel piles for the south bulkhead, and 197 steel piles for the northern breakwater will be installed. The piles to be installed are steel piles with a diameter of either 12.75 inches or 16 inches. Pile installation will be performed by vibratory hammer and if necessary, an impact hammer at a 5V:1H batter to ensure proper embedment is achieved. No more than 10 percent of piles will be impact proofed. Pile spacing is

3 feet for the south breakwater, 2.5 feet for the south bulkhead, and 3 feet for the northern breakwater.

The first 16-foot section of the south bulkhead will be tied to anchor piles as it transitions from the south breakwater to the bulkhead design grade. Steel sheets welded to the piles will be installed between piles at the bulkhead to retain material. Bedding stone will be placed behind the sheets. The bedding stone is stable under wave attack in this location due to its protected location.

Once the piles for both sides of the breakwater are installed, the armor stone will be placed between the piles using special attachments such as rock grapples, clam buckets, and/or buckets with thumbs to minimize loss of stone and ensure a tightly interlocked mass of armor stone. The armor stone will be 3 feet to 5 feet granite or basalt stone to minimize the chance of any stone passing between the 3-foot spaced steel piles. The Contractor will mechanically place the armor stone using an excavator to produce a well-keyed mass of stone with a maximum level of interlocking to ensure no stones pass between the steel piles. Rearranging of individual stone may be required to secure the well-keyed mass of armor stone. If armor stone should fall out between the piles, the Contractor will be required to carefully extract it and put it back in between the piles so it will not fall out again or replace it with a larger stone.

After the armor stone is fully placed, the steel piles will be structurally connected with a steel beam at the top to the opposing row of piles. The structural connection will be installed using the crane barge above the HTL and bolted to the tops of the piles.

An 8-foot-wide walkway with steel or timber guardrails will be installed on the top of the south breakwater along its full length. The walkway will comply with ADA accessibility regulations. A new 4-foot-thick armor slope at 2H:1V will be placed on the shoreline to provide protection against waves directly adjacent to the new breakwater. This armor slope will connect to the existing armor slope on the shoreline. The armor slope will use 2-foot diameter armor stone. Before the armor stone is placed, a 2-foot layer of bedding stone will be placed on top of geotextile fabric to prevent piping of native material through the shoreline protection structure. Upland work will be performed using excavators on the landside with barge support.

Minimization Measures

The applicant proposes the following minimization measures and best management practices to avoid and minimize impacts.

- A total of 827 creosote-treated wood piles will be removed from below the HTL using a vibratory hammer.
- Suitable rock from the north breakwater will be salvaged to be placed in an offshore location, in 30 feet of water or greater, near the south breakwater and the submarine net anchor to provide refugia during construction, additional mitigation and habitat similar to that of the extant South Jetty.

- Work below the HTL will be conducted during the in-water work window of September 15- January 15 during both seasons. The north breakwater will be replaced in the first season, then the south breakwater in the second season.

- Operations will be conducted in such a manner to limit disturbance to the minimum required to complete the work.

- Turbidity and other water quality parameters will be monitored to ensure construction activities are in conformance with Washington State Surface Water Quality Standards, or other conditions as specified in the WDOE Section 401 Water Quality Certification (WQC). Turbidity restrictions will not allow above water work to generate turbidity above 5 NTU over background in the marine environment. The contractor will observe turbidity during structure excavation operations in order to ensure compliance with WQC requirements. Appropriate BMPs will be employed to minimize sediment loss and turbidity generation during structure excavation, re-handling, dewatering, and material processing.

- All upland soil disturbed areas will be protected in accordance with BMPs as outlined in the WA Department of Ecology Stormwater Management Manual for Eastern Washington. A detailed Upland Erosion & Sediment Control Plan will be developed by the Contractor and submitted to the project engineer for review and approval prior to the start of construction. The Plan will include descriptions of project site specific work equipment, activities and approaches, and the corresponding BMPs and Water Quality Protection measures that will be implemented for conformance with the permit requirements and minimization measures outlined herein. The Contractor will be responsible for the preparation of a Spill, Prevention, Control, and Countermeasure (SPCC) Plan to be used for the duration of the project. The SPCC Plan will be submitted to and approved by the project engineer prior to the commencement of any construction activities. A copy of the SPCC Plan with any updates will be maintained at the work site by the Contractor. The SPCC Plan will provide advanced planning for potential spill sources and hazardous materials (gasoline, oils, chemicals, etc.) that the Contractor may encounter or utilizes as part of conducting the work. The SPCC plan will outline roles and responsibilities, notifications, inspection, and response protocols.

- A detailed Dredging and Dredged Material Handling Plan will be developed by the Contractor and submitted to the project engineer for review and approval prior to the start of construction. The Plan will include descriptions of project site-specific work equipment, activities and approaches, and the corresponding BMPs and water quality protection measures that will be implemented for conformance with the permit requirements and minimization measures outlined herein.

- A floating debris boom will be installed during the time period of dredging, demolition, and excavation work. During the demolition and construction of the south breakwater, a floating debris boom will be deployed each working day to isolate the demolition and dredging work area. This will contain any floating debris produced during the demolition and new construction. A floating silt curtain will be utilized, if necessary, to meet water quality requirements based on the results of water quality monitoring conducted throughout the duration of construction.

- Dredging operations will be conducted in such a manner to limit noise disturbance to the minimum required to complete the work.
- Daily monitoring of the dredge prism through hydrographic surveying techniques which will ensure material removed will be limited to that shown on the plans.
- The Contractor will be responsible for the preparation of a Spill, Prevention, Control, and Countermeasure (SPCC) Plan to be used for the duration of the project.
- Debris on the construction sites will be managed & stored in such a manner that it cannot enter the water. Should debris accidentally enter the water, immediate and appropriate action(s) will be taken to remove the material to an upland site.
- Non-barge based equipment will be refueled at a distance of at least 50 feet from the shore, or where applicable.
- Limit construction noise which is above background levels to no more than 10 hours a day allowing undisturbed access to marine habitat for 14 hours.
- To further minimize the potential effects of noise disturbance, steel piles would not be proofed within 2 hours of sunrise or sunset at any time during the construction period.
- No more than 8 piles will be installed using a vibratory hammer per day, for 30 minutes each. One pile will be impact proofed per day.
- A bubble curtain and/or a wood block cushion which meets both USFWS and NMFS programmatic conditions will be used for sound attenuation.
- Impact hammering would be preceded by a period of vibratory pile driving, which would provide advanced notice to any species near the construction site in advance of impact hammering. The relatively small zones of potential injury from impact hammering noise would not extend far beyond the length of the pile-driving barge.

Life of the Structure

The proposed action results in an extension of the time the existing jetties, bulkhead, and navigation channel will exist on the landscape. At the same time, the currently existing, to-be replaced structures are part of the environmental baseline conditions, and in most cases, would persist for some period of time regardless of the proposed action. Thus, for purposes of this analysis, we must differentiate between effects that are part of the baseline and effects that are caused by the proposed action. To do so, NMFS assumes the following:

- The proposed repair and replacement structures are in compliance with state and federal requirements and received proper permitting when they were originally built. Or, the structures were built at a time when federal authorization was unnecessary (i.e., prior to the enactment of the Clean Water Act).
- Previously issued permits for the structure authorized the structure with no end date. However, pursuant to general condition 2 at 33 C.F.R. Part 325, Appendix A, and Nationwide Permit General Condition Number 14, permittees are required to maintain

authorized structures (or fill) in "good condition." Thus, for the structure to remain in compliance with the original federal CWA permit, at some point(s) during the life of the structure it is reasonably certain that the owner will seek a future permit(s) to repair or replace some or all components of the structure.

- If the applicant did not request federal CWA permitting, the existing structure could remain in a structurally sound and good condition for some remaining "useful life period." For this consultation, we assume that the remaining "useful life period" is 10 years. As such, we consider the existing structure (without the proposed repair or replacement) to be part of the environmental baseline and assume that absent the proposed action, the respective projects' current impacts would continue to persist for 10 years.

We discuss these assumptions further in the description of the Environmental Baseline (Section 2.3) below.

Carrying this forward to the consequences of the proposed action, and based on our assumption that the existing structure would have remained in its current state for a remaining "useful life period" (that we assume is 10 years), there are two kinds of effects we consider a consequence, or effect, of the proposed action. First are any positive effects that result from removing the structure (or part being repaired or replaced) for any remaining "useful life period." Second, are the future effects of the proposed structure for a new "useful life." At its simplest, replacement projects extend the life of the structures. Here, based on what we know about the life of the structures, we assume the replaced structures will establish a new "useful life period" of 40 years for bank stabilization and jetties.

Proposed Action within the Puget Sound Nearshore Habitat Conservation Calculator

Based on the rationale outlined above, the Point Hudson Breakwater project has been entered into the Puget Sound Nearshore Habitat Conservation Calculator (PSNHCC). To enter the action, NMFS staff and the applicant have worked together to refine square footages, shore zones, and other features of the proposed action for entry into fields within the calculator. A full copy of the PSNHCC is included as Appendix A of this opinion. Numbers in the PSNHCC may differ from numbers outlined in the project description above due to the way in which structures are entered into the calculator, namely divided into shore zones and square footage from a bird's eye view.

Within the PSNHCC, the proposed action generated 979 debits and 1245 credits, equaling a total of +265. The final credit/debit is divided by 100 to achieve the discounted service acre years (DSAYS), in this case, a net gain of 2.65 service acre years. Debits (-927) generated are associated with the enduring impacts of the new useful life of the structures (50 years for the bulkhead and 40 years for the jetty). And credits (+1245) are associated with removal of existing structures (10 years) and benefits associated with creosote removal. Surplus credits (+265) generated from the proposed action are proposed to be used by the applicant as advanced mitigation for another nearshore project within the same Puget Sound marine basin (Hood Canal – see https://data-wa-psp.hub.arcgis.com/datasets/nearshore-credits-marine-basins/explore) for which avoidance to ESA-listed species is unavoidable. The application of these credits in a future project are not intended to be included in the environmental baseline of future projects.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

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

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

The USFWS determined the proposed action is not likely to adversely affect yelloweye or bocaccio rockfish, and humpback whales (Mexico and Central America DPS). The proposed action is also not likely to adversely affect yelloweye rockfish and humpback whale critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations in Section 2.12.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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

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

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

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

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

For this consultation, NMFS also evaluated the project using a Habitat Equivalency Analysis (HEA)[1] and the Puget Sound Nearshore Habitat Values Model (NHVM) adapted from Ehinger et al. 2015. This model was only used to evaluate the enduring habitat effects of the over or in-water structures and bulkhead. In other words, the model does not evaluate construction effects (example: pile driving or turbidity), but only the continued/future existence of the structure on the habitat (example: square footage of overwater structure being repaired or replaced).

We developed an input calculator (Puget Sound Nearshore Habitat Conservation Calculator – PSNHCC) that serves as a user-friendly interface to simplify model use. Ecological equivalency that forms the basis of HEA is a concept that uses a common currency to express and assign a value to functional habitat loss and gain. Ecological equivalency is traditionally a service-to-service approach where the ecological functions and services for a species or group of species lost from an impacting activity can be fully offset by the services gained from a conservation activity. In this case, we use this approach to calculate the "cost" and "benefit" of certain enduring effects of the proposed action, as well as the impacts of the existing environmental

[1] A common "habitat currency" to quantify habitat impacts or gains can be calculated using Habitat Equivalency Analysis (HEA) methodology when used with a tool to consistently determine the habitat value of the affected area before and after impact. NMFS selected HEA as a means to identify section 7 project related habitat losses, gains, and quantify appropriate mitigation because of its long use by NOAA in natural resource damage assessment to scale compensatory restoration (Dunford et al. 2004; Thur 2006) and extensive independent literature on the model (Milon and Dodge 2001; Cacela et al. 2 2005; Strange et al. 2002). In Washington State, NMFS has also expanded the use of HEA to calculate conservation credits available from fish conservation banks (NMFS 2008, NMFS 2015b)), from which "withdrawals" can be made to address mitigation for adverse impacts to ESA species and their designated critical habitat.

baseline, using the NHVM. NMFS has a webpage with general information, Frequently Asked Questions, and a downloadable calculator and user guide here: https://www.fisheries.noaa.gov/west-coast/habitat-conservation/puget-sound-nearshore-habitat-conservation-calculator.

NMFS developed the PSNHCC based specifically on the designated critical habitat of listed salmonids in Puget Sound, scientific literature, and our best professional judgement. The model, run by inputting project specific information into the PSNHCC, produces numerical outputs in the form of conservation credits and debits. Credits (+) indicate positive environmental results to nearshore habitat quality, quantity, or function. Debits (-) on the other hand indicate a loss of nearshore habitat quality, quantity, or function. The model can be used to assess credits and debits for nearshore development projects and restoration projects; in the past, we have used this approach in the Structures in Marine Waters Programmatic consultation (NMFS 2016a). More recently, on November 9, 2020, NMFS issued a biological opinion (NMFS 2020) for 39 over-, in- and near-shore projects in the marine shoreline of Puget Sound that used the NHVM to establish a credit/debit target of no-net-loss of critical habitat functions.

In sum, outputs from the PSNHCC accounts for the following consequences of the action:

- Beneficial aspects of proposed projects, including any positive effects that would result from removing a structure, or piece of a structure, prior to the end of any remaining "useful life period";
- Minimization incorporated through project design improvements (e.g., credit is given for removal of, or replacement of creosote piles with steel piles as steel piles typically have less impact on water quality);
- Adverse effects that would occur for the duration of a new "useful life period" that would result from the proposed expanded, new, or repaired or replaced structure (or components of an existing structure).

Appendix A contains the PSNHCC showing overall credits/debits of the proposed project. Impacts of the proposed project are extended for 40 years (for overwater structures and jetties) and 50 years (for shoreline stabilization), respectively.

2.2. Rangewide Status of the Species and Critical Habitat

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

2.2.1 Climate Change

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

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

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

Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009). Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Winder and Schindler 2004, Raymondi et al. 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Wainwright and Weitkamp 2013; Raymondi et al. 2013).

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

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

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

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011, Reeder et al. 2013). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007).

Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011, Reeder et al. 2013).

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

2.2.2 Status of the Critical Habitat

This section examines the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated areas. These features are essential to the conservation of the listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging). Table 1 provides a summary of critical habitat information for the species addressed in this opinion. More information can be found in the Federal Register notices available at NMFS's West Coast Region website (http://www.westcoast.fisheries.noaa.gov/).

Table 1. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for Puget Sound Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sounds. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.
Hood Canal summer-run chum	9/02/05 70 FR 52630	Critical habitat for Hood Canal summer-run chum includes 79 miles and 377 miles of nearshore marine habitat in HC. Primary constituent elements relevant for this consultation include: 1) Estuarine areas free of obstruction with water quality and aquatic vegetation to support juvenile transition and rearing; 2) Nearshore marine areas free of obstruction with water quality conditions, forage, submerged and overhanging large wood, and aquatic vegetation to support growth and maturation; 3) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.
Puget Sound/Georgia Basin DPS of bocaccio	11/13/2014 79 FR68042	Critical habitat for bocaccio includes 590.4 square miles of nearshore habitat and 414.1 square miles of deepwater habitat. Critical habitat is not designated in areas outside of United States jurisdiction; therefore, although waters in Canada are part of the DPSs' ranges for all three species, critical habitat was not designated in that area. Based on the natural history of bocaccio and their habitat needs, NMFS identified two physical or biological features, essential for their conservation: 1) Deepwater sites (>30 meters) that support growth, survival, reproduction, and feeding opportunities; 2) Nearshore juvenile rearing sites with sand, rock and/or cobbles to support forage and refuge. Habitat threats include degradation of rocky habitat, loss of eelgrass and kelp, introduction of non-native species that modify habitat, and degradation of water quality as specific threats to rockfish habitat in the Georgia Basin.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Southern resident killer whale	11/29/06 71 FR 69054	Critical habitat includes approximately 2,560 square miles of marine inland waters of Washington: 1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; 2) Puget Sound; and 3) the Strait of Juan de Fuca. Six additional areas include 15,910 square miles of marine waters between the 20-feet (ft) (6.1-meter (m)) depth contour and the 656.2-ft (200-m) depth contour from the U.S. international border with Canada south to Point Sur, California. We have excluded the Quinault Range Site. Based on the natural history of the Southern Residents and their habitat needs, NMFS identified three PCEs, or physical or biological features, essential for the conservation of Southern Residents: 1) Water quality to support growth and development; 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 Water quality in Puget Sound, in general, is degraded. Some pollutants in Puget Sound persist and build up in marine organisms including Southern Residents and their prey resources, despite bans in the 1970s of some harmful substances and cleanup efforts. The primary concern for direct effects on whales from water quality is oil spills, although oil spills can also have long-lasting impacts on other habitat features In regards to passage, human activities can interfere with movements of the whales and impact their passage. In particular, vessels may present obstacles to whales' passage, causing the whales to swim further and change direction more often, which can increase energy expenditure for whales and impact foraging behavior. Reduced prey abundance, particularly Chinook salmon, is also a concern for critical habitat.

2.2.3 Status of the Species

Table 2, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Table 2. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound Chinook salmon	Threatened 6/28/05	Shared Strategy for Puget Sound 2007 NMFS 2006	NWFSC 2015	This ESU comprises 22 populations distributed over five geographic areas. Most populations within the ESU have declined in abundance over the past 7 to 10 years, with widespread negative trends in natural-origin spawner abundance, and hatchery-origin spawners present in high fractions in most populations outside of the Skagit watershed. Escapement levels for all populations remain well below the TRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery.	• Degraded floodplain and in-river channel structure • Degraded estuarine conditions and loss of estuarine habitat • Degraded riparian areas and loss of in-river large woody debris • Excessive fine-grained sediment in spawning gravel • Degraded water quality and temperature • Degraded nearshore conditions • Impaired passage for migrating fish • Severely altered flow regime

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Hood Canal summer-run chum	Threatened 6/28/05	Hood Canal Coordinating Council 2005 NMFS 2007	NWFSC 2015	This ESU is made up of two independent populations in one major population group. Natural-origin spawner abundance has increased since ESA-listing and spawning abundance targets in both populations have been met in some years. Productivity was quite low at the time of the last review, though rates have increased in the last five years, and have been greater than replacement rates in the past two years for both populations. However, productivity of individual spawning aggregates shows only two of eight aggregates have viable performance. Spatial structure and diversity viability parameters for each population have increased and nearly meet the viability criteria. Despite substantive gains towards meeting viability criteria in the Hood Canal and Strait of Juan de Fuca summer chum salmon populations, the ESU still does not meet all of the recovery criteria for population viability at this time.	● Reduced floodplain connectivity and function ● Poor riparian condition ● Loss of channel complexity Sediment accumulation Altered flows and water quality
Puget Sound Steelhead	Threatened 5/11/07	NMFS 2019	NWFSC 2015' NMFS 2017	This DPS comprises 32 populations. The DPS is currently at very low viability, with most of the 32 populations and all three population groups at low viability. Information considered during the most recent status review indicates that the biological risks faced by the Puget Sound Steelhead DPS have not substantively changed since the listing in 2007, or since the 2011 status review. Furthermore, the Puget Sound Steelhead TRT recently concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 populations. In the near term, the outlook for environmental conditions affecting Puget Sound steelhead is not optimistic. While harvest and hatchery production of steelhead in Puget Sound are currently at low levels and are not likely to increase substantially in the foreseeable future, some recent environmental trends not favorable to Puget Sound steelhead survival and production are expected to continue.	● Continued destruction and modification of habitat ● Widespread declines in adult abundance despite significant reductions in harvest ● Threats to diversity posed by use of two hatchery steelhead stocks ● Declining diversity in the DPS, including the uncertain but weak status of summer-run fish ● A reduction in spatial structure ● Reduced habitat quality ● Urbanization ● Dikes, hardening of banks with riprap, and channelization

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Southern Resident Killer Whale	Endangered 11/18/05	NMFS 2008	Ford 2013; NMFS 2016	The Southern Resident killer whale DPS is composed of a single population that ranges as far south as central California and as far north as southeast Alaska. The estimated effective size of the population (based on the number of breeding individuals under ideal genetic conditions) is very small — <30 whales, or about 1/3 of the current population size. The small effective population size, the absence of gene flow from other populations, and documented breeding within pods may elevate the risk from inbreeding and other issues associated with genetic deterioration. As of July 1, 2013, there were 26 whales in J pod, 19 whales in K pod and 37 whales in L pod, for a total of 82 whales. Estimates for the historical abundance of Southern Resident killer whales range from 140 whales (based on public display removals to 400 whales, as used in population viability analysis scenarios.	● Quantity and quality of prey ● Exposure to toxic chemicals ● Disturbance from sound and vessels Risk from oil spills

2.3. Action Area

"Action area" under the ESA, 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 proposed project is in the nearshore intertidal zone of northwestern Port Townsend Bay, and nearby Admiralty Inlet, in Port Townsend, WA. The action area is determined by the outer boundary of any physical, chemical, or biological changes in the environment caused by the proposed action. Here, the action area comprises the entire jetty, associated bulkhead, and navigation channel of the Point Hudson Marina and the full extent of area affected by noise propagation during pile-driving which has the furthest reach of likely effects. The action area will be affected by construction impacts for up to 2 years between July 15 and January 15 on the North Jetty, and between September 15 and January 15 for the South Jetty, which has a restricted work window due to the presence of an active juvenile rockfish and lingcod settlement area and nursery (WAC 220-660-330). The action area based on noise in aquatic habitat, has a radius up to 3.92 miles from the Point Hudson Marina (Figure 3).

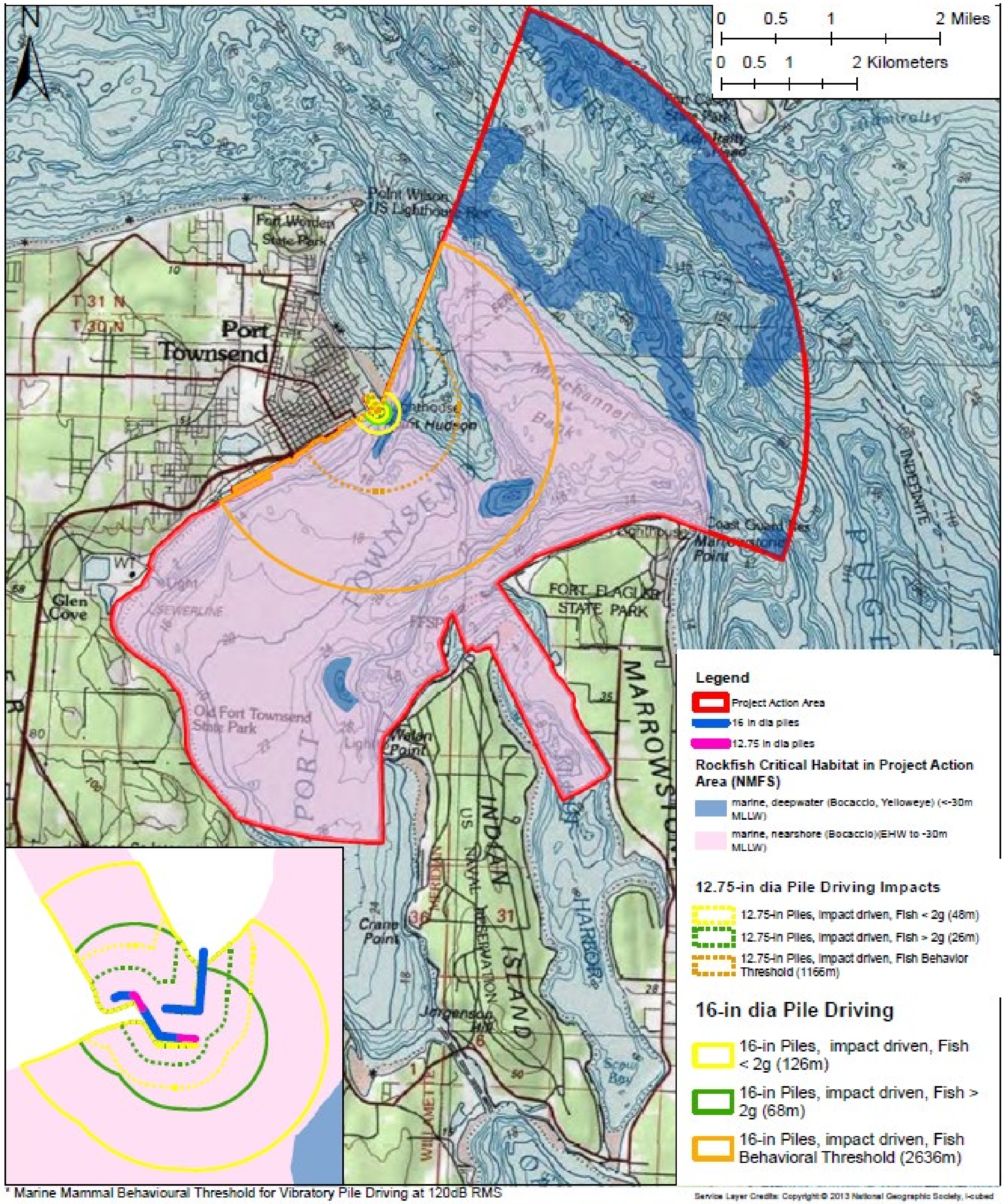

Figure 3. Action area for the Point Hudson Jetty Replacement - outlined in red.

The action area contains designated critical habitat for PS Chinook salmon, HCSR chum salmon, PSGB bocaccio rockfish, PSGB yelloweye rockfish, and SRKW. The action area includes both deep water (greater than 98 feet) critical habitat for PSGB yelloweye and PSGB bocaccio and nearshore (shallower than 98 feet) critical habitat for PSGD bocaccio. The action area is also EFH for Coastal and Pelagic Species, Pacific Coast Groundfish, and Pacific Coast Salmon

2.4. Environmental Baseline

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

PS is one of the largest estuaries in the United States, having over 2,400 miles of shoreline, more than two million acres of marine waters and estuarine environment, and a watershed of more than 8.3 million acres. In 1987, PS was given priority status in the National Estuary Program. This established it as an estuary of national significance under an amendment to the Clean Water Act. In 2006, the Center for Biological Diversity recognized the PS Basin as a biological hotspot with over 7,000 species of organisms that rely on the wide variety of habitats provided by PS (Center for Biological Diversity 2006). The action area includes all populations of the PS ESU of Chinook salmon, the PS DPS of steelhead and the Hood Canal summer-run DPS of chum.

The State of the Sound biannual report produced by the PS Partnership (PSP 2019) summarizes how different indicators of health of the PS ecosystem are changing.[2] The assessment identifies that PS marine and freshwater habitats continue to face impacts of accelerating population growth, development, and climate change; and that few of the 2020 improvement targets (including habitat for ESA-listed salmonids and rockfish) identified by the PSP are being reached.

Over the last 150+ years, 4.5 million people have settled in the PS region. There is a suite of impacts of human development on aquatic habitat conditions in the PS, including water quality effects of stormwater runoff, industrial pollutants and boats, in-water noise from boats and construction activities, and fishing pressure, to name a few (see Hamel et al. 2015). With the level of infrastructure development associated with population growth, the PS nearshore has been altered significantly. Major physical changes documented in the PS include the simplification of river deltas, the elimination of small coastal bays, the reduction in sediment supply to the foreshore due to beach armoring, and the loss of tidally influenced wetlands and salt marsh (Fresh et al. 2011).

[2] The Puget Sound Partnership tracks 52 vital sign indicators to measure progress toward different PS recovery goals. Of the 6 PS recovery goals, the most relevant for this Opinion include: Thriving species and food webs, Protected and Restored Habitat, Healthy Water Quality and Quantity.

The PS Nearshore Ecosystem Restoration Project (PSNERP), an investigation project between the COE and the state of Washington, reviewed the historical changes to PS's shoreline environment between 1850-1880, and 2000-2006, and found the most pervasive change to PS to be the simplification of the shoreline and reduction in natural shoreline length (Simenstad et al. 2011). Recent studies have estimated the loss of nearshore habitat in PS at close to 85 percent or more (Brophy et al. 2019). Throughout PS, the nearshore areas have been modified by human activity, disrupting the physical, biological, and chemical interactions that are vital for creating and sustaining the diverse ecosystems of PS. The shoreline modifications are usually intended for erosion control, flood protection, sediment management, or for commercial, navigational, and recreational uses. Seventy-four percent of shoreline modification in PS consists of shoreline armoring (Simenstad et al. 2011), which usually refers to bulkheads, seawalls, or groins made of rock, concrete, or wood. Other modifications include jetties and breakwaters designed to dissipate wave energy, and structures such as tide gates, dikes, and marinas, overwater structures, including bridges for railways, roads, causeways, and artificial fill. An analysis conducted in 2011 though the PS Nearshore Ecosystem Restoration Project (Fresh et al. 2011; Simenstad et al. 2011) found that since 1850, of the approximately 2,470 miles of PS shoreline:

- Shoreline armoring has been installed on 27 percent of PS shores.
- One-third of bluff-backed beaches are armored along half their length. Roads and nearshore fill have each affected about 10 percent of the length of bluff-backed beaches.
- Forty percent of PS shorelines have some type of structure that impacts habitat quality.
- Conversion of natural shorelines to artificial shoreforms occurred in 10 percent of PS.
- There has been a 93 percent loss of freshwater tidal and brackish marshes. The Duwamish and Puyallup rivers have lost nearly all of this type of habitat.
- A net decline in shoreline length of 15 percent as the naturally convoluted and complex shorelines were straightened and simplified. This represents a loss of 1,062 km or 660 miles of overall shoreline length.
- Elimination of small coastal embayments has led to a decline of 46 percent in shoreline length in these areas.
- A 27 percent decline in shoreline length in the deltas of the 16 largest rivers and a 56 percent loss of tidal wetlands in the deltas of these rivers.

Effects of shoreline armoring on nearshore and intertidal habitat function include diminished sediment supply, diminished organic material (e.g., woody debris and beach wrack) deposition, diminished over-water (riparian) and nearshore in-water vegetation (submerged aquatic vegetation; SAV), including macroalgae, diminished prey availability, diminished aquatic habitat availability, diminished invertebrate colonization, and diminished forage fish populations (see Toft et al. 2007; Shipman et al. 2010; Sobocinski et al. 2010; Morley et al. 2012; Toft et al. 2013; Munsch et al. 2014; Dethier et al. 2016). Shoreline armoring often results in increased beach erosion waterward of the armoring, which, in turn, leads to beach lowering, coarsening of substrates, increases in sediment temperature, and reductions in invertebrate density (Fresh et al. 2011; Morley et al. 2012; Dethier et al. 2016).

The reductions to shallow water habitat, as well as reduced forage potential resulting from shoreline armoring may cause juvenile salmonids utilize deeper habitat, thereby exposing them to increased piscivorous predation. Typical piscivorous juvenile salmonid and bocaccio predators, such as flatfish, sculpin, and larger juvenile salmonids, being larger than their prey, generally avoid the shallowest nearshore waters that outmigrant juvenile salmonids a prefer. When juvenile salmonids temporarily leave the relative safety of the shallow water, their risk of being preyed upon by other fish increases. This has been shown in the marine environment where juvenile salmonid consumption by piscivorous predators increased fivefold when juvenile pink salmon were forced to leave the shallow nearshore (Willette 2001).

In addition to beach armoring, other shoreline changes including overwater structures (i.e., piers and floats), marinas, roads, and railroads reduce habitat quantity and quality, and impact nearshore salmonid migrations and juvenile bocaccio rearing. The prevalence of overwater structures (e.g., piers, ramps and floats) in the PS nearshore has also altered nearshore habitat conditions. Schlenger et al. (2011) mapped 8,972 separate overwater structures in the PS, with a total overwater coverage of 9 square kilometers. These structures, as well as turbidity from boat propeller wash typically associated with them, decrease light levels in the water column and reduce primary productivity and growth of submerged aquatic vegetation (Fresh et al. 2001; Kelty and Bliven 2003; Shafer 1999, 2002; Haas et al. 2002; Eriksson et al. 2004; Mumford 2007). This reduces forage potential and cover for juvenile fish, including ESA-listed salmonids and bocaccio. In addition to reduced cover, shading by overwater structures may also delay salmonid migration and further increase predation risk (Heiser and Finn 1970; Able et al. 1998; Simenstad 1988; Nightingale and Simenstad 2001a; Willette 2001; Southard et al. 2006; Toft et al. 2013; Ono 2010). The biological opinions completed by NMFS on Regional GP 6 (RGP6) for structures in the PS (NMFS 2016c) and on a batch of 39 projects in the nearshore environment of PS (NMFS 2020a) provide detailed summaries of the effects of overwater structures, shoreline armoring and other nearshore structures on ESA-listed species and designated critical habitat in PS.

Benthic habitats within PS, where rockfish primarily occur, have been influenced by several factors. The degradation of some rocky habitat, loss of eelgrass and kelp, introduction of non-natural-origin species that modify habitat, and degradation of water quality are threats to marine habitat in PS (Palsson et al. 2009; Drake et al. 2010). Some benthic habitats have been impacted by derelict fishing gear that include lost fishing nets, and shrimp and crab pots (Good et al. 2010). Derelict fishing gear can continue “ghost” fishing and is known to kill rockfish, salmon, and marine mammals as well as degrade rocky habitat by altering bottom composition and killing numerous species of marine fish and invertebrates that are eaten by rockfish (Good et al. 2010). Thousands of nets have been documented within PS and most have been found in the San Juan Basin and the Main Basin. The Northwest Straits Initiative has operated a program to remove derelict gear throughout the PS region. In addition, WDFW and the Lummi, Stillaguamish, Tulalip, Nisqually and Nooksack tribes and others have supported or conducted derelict gear prevention and removal efforts. Net removal has mostly concentrated in waters less than 100 feet (33 m) deep where most lost nets are found (Good et al. 2010). The removal of over 4,600 nets and over 3,000 derelict pots have restored over 650 acres of benthic habitat, though many derelict nets and crab and shrimp pots remain in the marine environment. Several hundred derelict nets have been documented in waters deeper than 100 feet deep (NRC 2014). Over 200 rockfish have been documented within recovered derelict gear. Because habitats deeper than 100 feet (30.5 m) are most readily used by adult yelloweye rockfish and bocaccio, there is an unknown impact from deepwater derelict gear on rockfish habitats within PS.

The project would occur in Port Townsend Bay, on the northeast terminus of the Quimper Peninsula, at the northeast tip of the Olympic Peninsula, where the Strait of Juan de Fuca meets Admiralty Inlet. Port Townsend Bay is about six miles north to south and about five miles wide east to west. The city of Port Townsend is located along the northern shore of the bay, with the city of Port Hadlock-Irondale on the southwest shore. The Indian Island Naval Magazine and Marrowstone Island enclose the bay's east side. Chimacum Creek is the only named stream flowing into the bay.

The action area includes operating ferry service, an operational paper mill that was built in the late 1920s, two marinas and a boatyard, including the Point Hudson Marina. The shoreline around the bay is a mix of constructed seawalls, rip rap revetment, piers, and gravel pocket beaches. At subtidal depths, the substrate transitions to sands and muds. In many areas, sand and gravel recruitment from the feeder bluffs has been disconnected from shoreline erosional processes due to fill and seawalls associated with shoreline development.

Currents near shore tend to be weak, and to move parallel to the shoreline; westerly at about 1 foot per second during ebb tide, and less than 0.5 foot per second during the flood. The water quality in the bay is classified as extraordinary for aquatic use. Dissolved oxygen (DO) generally stays above the state standard of 7.0 mg/L in most years (PTMSC 2001).

There are several untreated stormwater outfalls from parking lots and roadways along the southern shoreline of Port Townsend Bay, where Point Hudson is located. These outfalls likely introduce pollutants such as oils, nitrates, and suspended solids. WDOE analyses indicate that Port Townsend Bay has detectable levels of inorganic nitrogen (primarily nitrate), which tend to drop to scarcely detectable levels in summer due to uptake by phytoplankton. Elevated levels of fecal coliform are reported in the vicinity of the boat harbor. The Washington Department of Ecology (WDOE) 2018 303(d) list identifies one parameter of concern for Point Hudson. A category 4C listing for fish and shellfish habitat details that eelgrass beds at the Port Townsend ferry dock are impaired due to inorganic nitrogen loading resulting from human-caused eutrophication. Other 303(d) listings in the Inner Port Townsend Bay include exceedances of benzo(a)anthracene, benzo(a)pyrene, benzo(b)flouranthene, dibenzo(a,h)anthacene, PCBs, chysene, and indeno(1,2,3-c,d)pyrene, in samples of mussels (*Mytilus* sp). The existing Port Townsend ferry terminal (about 0.6 mile NE of the project site) was previously occupied by an oil company dock that was in existence since the early 1900s, with a bulk fuel terminal located nearby. Soil and groundwater contamination are known at the former bulk fuel terminal, and has been included in WDOE's voluntary cleanup program since 2005.

The southern shoreline of Port Townsend, from Point Hudson to Indian Point, is approximately 1 mile long. About 98 percent of the downtown Port Townsend shoreline is armored by riprap, overwater structures, bulkheads, or jetties (Nightengale 2001). Riprap and vertical concrete seawalls extend down to subtidal depths along most of the shoreline. Feeder bluffs along the city waterfront have been cut off from the shore by fill and shoreline armoring.

The water temperature standard for marine water is 55°F. Temperature in the south Port Townsend Bay has been found to exceed 55°F on many occasions. These higher temperatures have been attributed to warmer weather conditions during the summer, which promote temporary water stratification (City of Port Townsend 2002).

Substrate conditions in Port Townsend Bay are generally soft bottom types. The northern portion of the bay tends to have coarser substrate, while the southern end of the bay tends to be muddy. The predominant subtidal substrate type in the project area is sand mixed with clam and barnacle shells and shell fragments.

The shorelines along the City of Port Townsend are part of the Hood Canal and Puget Sound salmon and trout migration corridor, with designated critical habitat for juvenile salmon feeding, rearing, and migration and critical habitat for PS/GB bocaccio (juveniles) and Essential Fish Habitat for Pacific Coastal Salmon, Coastal Pelagics, and Pacific Coast Groundfish. The baseline habitat is degraded by the presence of the structure and its uses, which impair marine migration values.

Deep surface trawl surveys in more offshore waters in the Strait of Georgia and central Puget Sound indicate that Admiralty Inlet is the primary migration route for Chinook and coho salmon from central and southern Puget Sound (Sweeting et al. 2003a). The action area includes Admiralty Inset and the area of enduring effects is immediately adjacent to the inlet.

2.4.1 Extant Submerged Aquatic Vegetation and Macro Algae

A submerged aquatic vegetation survey was conducted adjacent to the jetty structures by divers during August 2020. Areas within the navigation channel and landward of the jetties (in the cove) were not surveyed. The survey documented substrate, vegetation, and macro algae within the survey area (Figure 4).

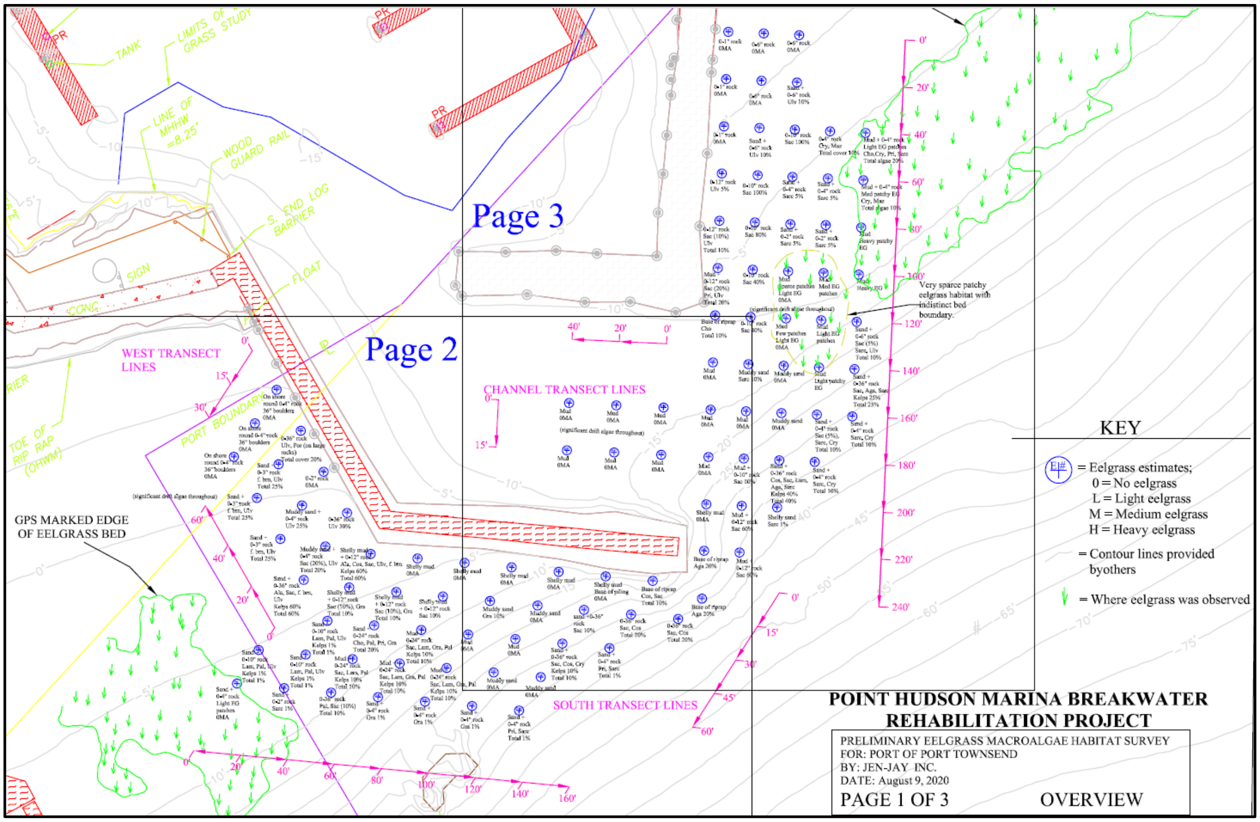

Figure 4. Area surrounding the Point Hudson jetties surveyed for submerged aquatic vegetation during August 2020. Note that green areas are delineated eelgrass beds.

Substrates adjacent to the North and South Jetties were primarily mud and sand. Adjacent to the north jetty had rocks up to 6 inches and boulders up to 36-inches in the deeper areas. Adjacent to the south jetty had rocks up to 36-inches throughout the surveyed area. Areas at the toe of the existing riprap structures revealed loose riprap rocks that had rolled out of the breakwater and onto the seabed.

Large eelgrass beds (*Zostera marina*) were observed and delineated (according to ACOE 2018 Tier 1, Method B) near both the North and South jetties and the marina entrance (Figure 4). The nearest eelgrass bed was approximately 20 feet from the base of the North jetty.

A high diversity of macroalgae were observed where larger rock was encountered. Observed macroalgae genera include *Agarum*, ***Alaria***, *Chondracanthus*, ***Costaria***, *Cryptopleura*, *Gracilaria*, ***Laminaria***, *Mazaella*, *Palmaria*, *Porphyra*, *Prionitis*, ***Saccharina***, *Sarcodiotheca*, and *Ulva*. Bolded genera are large canopy forming kelp that extend into the water column. Vegetation was primarily found growing on riprap, rock debris material, and timber pilings. The toe of the riprap breakwater included high concentrations of these macroalgae. (USFWS BA Appendix C 2020). Overall high diversity of vegetation (algal and floral) and areas of high vegetation coverage (up to 100%) occur at this project site. High diversity and coverage associated with breakwater rocks provides foraging habitat and refuge and rearing for juvenile fishes, especially for rockfishes. Eelgrass and macro algae beds surrounding the jetties may be used by juvenile Chinook salmon for rearing.

2.4.2 Rocky Habitat associated with the South Jetty

As rocks have fallen away from the main jetty structure, the South Jetty has provided a complex habitat on and adjacent to the jetty that likely would not exist but for the rocks. High species diversity is particularly associated with breakwater rocks which provide substrate for sessile organisms and refuge and rearing for juvenile fishes, especially for rockfishes and other species such as the giant Pacific octopus. The area likely does not provide habitat or refuge for juvenile salmonids, due to a lack of forage fish and increased piscavores, such as lingcod, that are commonly observed at the dive location and caught by fishermen off the jetty.

2.4.3 Listed Species' Presence

The nearest documented salmon-bearing stream is Chimacum Creek, about 6 miles south of Point Hudson, which has summer and fall chum, winter steelhead, coho, and pink salmon (WDFW SalmonScape 2021). The Chimacum Creek stock of summer-run chum salmon was introduced from the Salmon/Snow Creek watershed and is considered essential to the survival of HCSRC. Chinook salmon originating from Hood Canal are mostly summer/fall (ocean-type) run populations, entering freshwater systems to spawn from late July through early October with a peak in late August. The Dungeness River largely supports spring/summer populations of Chinook salmon that begin spawning in mid-August and continue through mid-October (WDF et al. 1993).

Marine mammals observed along Port Townsend shorelines include listed Southern Resident killer whale and humpback whale (Orca Network Sightings Archives 2021). Within the action area, Southern Resident killer whales have been sighted in Glen Cove and around Marrowstone Island. From 1990 to 2003, the highest occurrence of sightings in this area spanned from November to March. Although whales have been seen in Glen Cove, they occur in very low numbers, consisting of 1 to 5 individuals seen per documented sighting. According to The Whale Museum Soundwatch Program (Shedd 2020) reports between 1-25 SRKW sightings took place in 2017 within the action area near Point Hudson (Figure 5).

Port Townsend Bay and nearby Kilisut Harbor are important spawning areas for Pacific herring, sand lance, and surf smelt. Herring spawning in the vicinity is referred to as the Kilisut Harbor stock. A large herring pre-spawning holding area is in the deep central portion of Port Townsend Bay.

The South Jetty is a popular dive site and it has been intensely surveyed by SCUBA divers in the REEF (Reef Environmental Educational Foundation) program. REEF has conducted 205 Fish and Invertebrate surveys to document species presence over a 28-year period (1993 to 2021) at the Point Hudson South Jetty (REEF survey code 27010105).

Of the 205 surveys in their online database (Reef 2021), 138 were conducted by REEF Experts. REEF fish survey data are separated into two categories based on experience level: Novice and

Expert. These experience levels are determined by number of surveys completed and examination scores. An Expert (level 4) must have conducted and submitted at least 35 prior surveys to REEF and passed the level 4 test with a 90% or better (REEF 2022).

Expert surveyors identified rockfish species at the Point Hudson survey site including young of year (YOY) specimens. Expert surveyors identified YOY black, YOY canary, YOY quillback, YOY Puget Sound, and YOY brown rockfish, along with adults of these species. Adults of all the identified YOY species have also been identified on site. Many YOY rockfish were unidentified Sebastes spp. (noted in 32% of surveys). Surveys included both deep and shallow habitat, but likely rarely exceed 100 feet in depth. PS/GB yelloweye are deep water species (> 98 feet deep) as juveniles and adults. PS/BG bocaccio have been found in low numbers associated with nearshore environments as juveniles by WDNR during their surveys across the Puget Sound. However, there has been no documented presence of bocaccio adults or juveniles in or near the Port Townsend Harbor (WDNR 2009). Due to the lack of sightings at this intensely studied location and depth range of both the project, diver surveys, and adult and juvenile depth range, it is unlikely that listed rockfish use or occupy the Point Hudson jetties in their current state. More information about species presence/absence documented by the REEF surveys is in the Essential Fish Habitat Assessment (Section 3 of this document).

Port Townsend Bay supports a wide variety of demersal fish. Otter trawls conducted in June of each year over a 10 year period recovered a total of 73 fish species. We note that herring is one of the fishes present and it is an important forage fish. Others are EFH managed species, to be discussed in section 3.0

Habitat in the Point Hudson area includes the nearshore open water (pelagic zones) and intertidal zones, particularly areas supporting eelgrass and macroalgae.

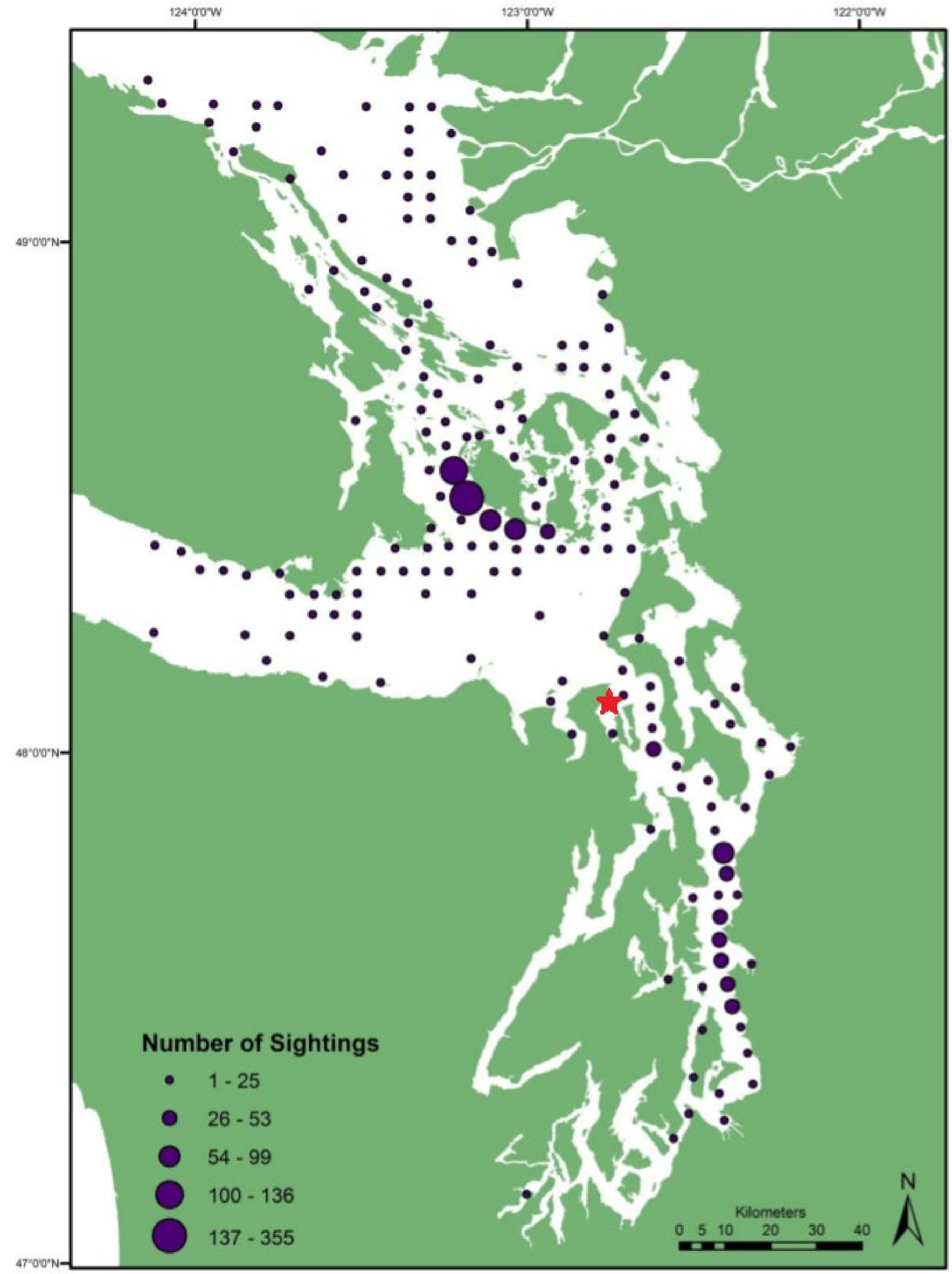

Figure 5. 2017 SRKW sighting data by area from the 2020 Whale Museum Annual Report with project location shown at the red star.

2.5. Effects of the Action

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

The effects of USFWS' action for nearshore construction at the Point Hudson Breakwater will include effects ranging from temporary (typically related to the impacts of construction activity), to persistent and intermittent (from the use or operation of the permitted structures), to enduring (from effects of the structures on the environment and their impacts on habitat features that might be diminished during the new "useful life" period). Also included are positive effects of project design features, designed to reduce the impact of a structure, during any of its remaining useful life.

Authorization of construction of the replacement of structures, despite the use of BMPs to reduce effects, will cause effects to critical habitat and exposure to species.

Temporary habitat effects include 1) water quality disruption, including increased turbidity and decreased DO during construction and contamination associated with creosote pile removal; 2) noise during pile driving; and 3) disruption of benthic and shore habitat. Each of these habitat changes is an exposure pathway to listed species. 4) Additionally, fish may directly be affected by entrainment during dredging.

Enduring habitat effects include: 5) modified nearshore habitat; 6) migration disruption for anadromous fishes (including increased predation); and 7) the removal of an estimated 506 tons of creosote piles will improve nearshore habitat conditions, anadromous migration, and water quality. Species will be exposed to each of the habitat modifications described here.

Future maintenance at the structures would likely include activities such as replacing decking, painting, and minor repairs to bulkheads. These types of activities are not included in our effects analysis and therefore would be subject to future consultation, and are not discussed further in this opinion.

2.5.1 Effects on Habitat in the Action Area

Effects of the proposed action will modify features of habitat. Not all of those features are PBFs of designated critical habitat, and not all features are designated for all species.

Once replaced, the structures at Point Hudson would be expected to remain in the aquatic environment for their useful life. Thus, multiple cohorts of the multiple populations of PS Chinook salmon, PS steelhead, HCSR chum and SRKW would experience the long-term habitat modifications associated with the presence of the structures and long term habitat improvement associated with the removal of creosote.

2.5.2 Temporary Effects

Water Quality Degradation
Pile installation, pile removal, dredging, the removal and installation of jetty material (rock), and bulkhead replacement each can suspend sediment in the water column and cause it to settle out in new locations. Temporary water quality reductions are likely to occur from increased turbidity, reduced dissolved Oxygen (DO), and re-suspended contaminants.

In estuaries, state water quality regulations (WAC173-201A-400) establish a mixing zone of up to 300 feet for dredging (200 ft for non-dredging) plus the depth of water over the discharge port(s) as measured during mean lower low water (MLLW). Re-suspended sediments, reduced DO, and contaminants are not expected to be detectable beyond background levels beyond this established mixing zone. Both turbid conditions and lower DO are expected to persist with the in-water work periods, and then to return to baseline within hours (turbidity) to days (DO) after work ceases.

Turbidity and Low DO: Suspension of anoxic sediment compounds during in-water work can result in reduced DO in the water column within the mixing zone area as sediments oxidize. Based on a review of six studies on the effects of suspended sediment on DO levels, LaSalle (1988) concluded that, when relatively low levels of suspended material are generated and counterbalancing factors such as flushing exist, anticipated DO depletion around in water work activities will be minimal. High levels of turbidity could have contemporaneous reduction in dissolved oxygen within the same affected area. The same mixing zone for turbidity (300 foot max) discussed above is assumed to apply to DO.

Dredging within the navigation channel will also have ephemeral effects on water quality. It would cause no measurable changes in water temperature and salinity, but would mobilize contaminants and suspended sediments into the water column, and may also reduce DO in the water column. Detectable effects on water quality are expected to be limited to the area within 300 feet of dredging, and are not expected to persist past several hours following the cessation of dredging.

Resuspended Contaminants: In-water work is likely to include resuspension of contaminated sediments, including the incidental discharge of contaminated materials during dredging and when creosote treated wood materials are being removed.

The proposed action will occur in a highly industrialized environment that has known hazardous substances in and near it. The CWA 303(d) listings for the Inner Port Townsend Bay can be found in section 2.4 above. Contaminants in sediments and dissolved in water can have varying levels of toxicity, most often occurring as sub-lethal effects. Some of these chemicals of concern include metals (mercury, arsenic, zinc, and tri-butyl tin (TBT)), polychlorinated biphenyls (PCBs), dioxin, polycyclic aromatic hydrocarbons (PAHs), pesticides, butyl benzyl phthalate, benzyl alcohol, and benzoic acid.

Creosote-treated piles contaminate the surrounding sediment up to two meters away with PAHs (Evans et al. 2009). The removal of the creosote-treated piles mobilizes these PAHs into the surrounding water and sediments (Smith et al. 2008; Parametrix 2011). The action could also release PAHs directly from creosote-treated timber if any of the piles break during removal (Parametrix 2011). The concentration of PAHs released into surface water rapidly dilutes. Smith et al. (2008) reported concentrations of total PAHs of 101.8 µg/l 30 seconds after creosote-pile removal and 22.7 µg/l 60 seconds after. However, PAH levels in the sediment after pile removal can remain high for six months or more (Smith et al. 2008). Romberg (2005) found a major reduction in sediment PAH levels three years after pile removal contaminated an adjacent sediment cap.

The magnitude of the exposure will greatly increase during the removal of these structures. We expect increased PAHs in the water column and sediments will remain within the area of increased suspended sediment caused by the project within 200 feet of creosote pile removal and structure demolition, and we do not expect fish to engage in avoidance behaviors within this area once suspended sediment from construction effects have dropped to baseline levels. Within three years after construction, the removal of the creosote-treated timber will begin to reduce the intensity of exposure of listed-fish, and exposure to PAHs at these sites would continue to decline over the long-term.

Noise from Pile Driving
A total of 416 steel piles (up to 16 inches in diameter) are expected to be driven as part of the proposed action. Pile driving can cause high levels of underwater sound and can significantly increase sound waves in the aquatic habitat. The use of a confined or unconfined bubble curtain results in only a 10dB reduction. The sound pressure levels from pile driving and extraction would occur contemporaneously with the work and radiate outward; the effect diminishing with distance. Cumulative sound exposure level (SEL) is a measure of the sound energy integrated across all of the pile strikes. The Equal Energy Hypothesis, described by NMFS (2007b), is used as a basis for calculating cumulative SEL (cSEL). The number of pile strikes is estimated per continuous work period. This approach defines a work period as all the pile driving between 12-hour breaks. NMFS uses the practical spreading model to calculate transmission loss, and define the area affected (Table 3).

Table 3. Pile driving information used as assumptions in the practical spreading model for noise resulting from the proposed action.

Total Piles	Pile Type	Largest Pile Dia. (inches)	Pile Install Method	Bubble Curtain?	Max Piles/Day (vib + impact)	Max Strikes /Pile/day	Minutes /Pile (vibratory)	Minutes /Day (vibratory)
416	Steel	16	Vibratory and Impact	Yes	1 impact; **4** total for N. Jetty and **8** total for S. Jetty	525	30	120

Given the assumptions above, underwater sound from the piles driving could exceed behavioral and injury thresholds for fish and marine mammals, including listed species that may be within the action area (Table 4 and Figure 3).

Table 4. Injury and behavioral thresholds to fish and marine mammals from proposed pile driving.

Impact Pile Driving Response: Behavioral for fish (150dBRMS) (meters)	Vibratory Pile Driving Response: Behavioral for fish (150dBRMS) (meters)	Impact Pile Driving Response: Injury Fish ≥ 2g (187dBcumSEL) (meters)	Impact Pile Driving Response: Injury Fish < 2g (183dBcumSEL) (meters)	Vibratory Pile Driving Response: Behavioral for SRKW and Hump-backs (120dBRMS) (km)	Impact Pile Driving Response: Behavioral for SRKW and Hump-backs (160dBRMS) (meters)	Vibratory Pile Driving Injury for mid-frequency SRKW (198cumSEL) (meters)	Impact Pile Driving Injury for mid-frequency SRKW (185cumSEL) (meters)
2636	63	68	126	6310	568	2 (1 for N. Jetty)	4

Disruption of Benthic and Nearshore Habitat
Sediment and rock disruption during construction will disturb and diminish habitat and prey communities. In areas where suspended sediment settles on the bottom, a layer of sediment can occur which also disrupts the benthic communities. Rocks fallen away from the main jetty structure will not be removed as part of this project, and will remain in place to provide habitat. The speed of recovery by benthic communities is affected by several factors, including the intensity of the disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Additionally, the ability of a disturbed site to recolonize is affected by whether or not adjacent benthic communities are nearby that can re-seed the affected area. Thus, recovery can range from several weeks to many months.

Dredging would cause a short-term change in the characteristics of the benthic in-faunal biota within the dredge footprint, of which the majority are expected to recover within a few months to two years after dredging, based on the results of studies in other areas. For example, Romberg et al. (2005), studying a subtidal sand cap placed to isolate contaminated sediments in Elliott Bay, identified 139 species of invertebrates five months after placement of the cap. The benthic community reached its peak population and biomass approximately two and one-half years after placement of the cap, and then decreased, while the number of species increased to 200 as long-lived species recruited to the population (Wilson and Romberg 1996).

2.5.3 Enduring Effects

Modified Benthic and Nearshore Habitat
Overwater Structures: There are approximately 503,106 acres of overwater structure in the nearshore of Puget Sound (Schlenger et al. 2011). Replacement of the structures at Point Hudson maintains impacts to PS Chinook salmon, PS steelhead, and HCSR chum salmon and prolongs their recovery. In the marine nearshore, there is substantial evidence that overwater structures (OWS) impede the nearshore movements of juvenile salmonids and reduce feeding rates for

those fish that do utilize OWS areas (Heiser and Finn 1970; Able et al. 1998; Simenstad 1999; Southard et al. 2006; Toft et al. 2007; Moore et al. 2013, Munsch et al. 2014, see ref). In the Puget Sound nearshore, 35 millimeter to 45 millimeter juvenile chum and pink salmon were reluctant to pass under docks (Heiser and Finn 1970). Southard et al. (2006) snorkeled underneath ferry terminals and found that juvenile salmon were not underneath the terminals at high tides when the water was closer to the structure, but only moved underneath the terminals at low tides when there was more light penetrating the edges. Moore et al. (2013) concluded in their study that the Hood Canal Bridge may attract PS steelhead smolts to its shade while also inhibiting passage by disrupting Hood Canal currents. They found this delayed migration, for a species whose juveniles typically migrate rapidly out to the open ocean, likely resulted in steelhead becoming more susceptible to predation by harbor seals and avian predators at the bridge. These findings show that overwater-structures can disrupt juvenile salmonid migration in the Puget Sound nearshore.

An implication of juvenile salmon avoiding OWS is that some of them will swim around the structure (Nightingale and Simenstad 2001b). This behavioral modification will cause them to temporarily utilize deeper habitat, thereby exposing them to increased piscivorous predation. Hesitating upon first encountering the structure, as discussed, also exposes salmonids to avian predators that may use the floating structures as perches. Typical piscivorous juvenile salmonid predators, such as flatfish, sculpin, and larger juvenile salmonids, being larger than their prey, generally avoid the shallowest nearshore waters that outmigrant juvenile salmonids prefer—especially in the earliest periods of their marine residency. When juvenile salmonids temporarily leave the relative safety of the shallow water, their risk to being preyed upon by other fish increases. This has been shown in the marine environment where juvenile salmonid consumption by piscivorous predators increased fivefold when juvenile pink salmon were forced to leave the shallow nearshore (Willette 2001).

<u>Direct Habitat Elimination</u>: Jetties, like other over and in-water structures, adversely affect submerged aquatic vegetation (SAV), if present, and inhibit the establishment of SAV where absent, by effectively eliminating large areas of nearshore habitat. (Kelty and Bliven 2003). Areas adjacent to Point Hudson have eelgrass beds, kelp, and high organism diversity. The elimination of habitat by large rocks or piled sediment above the high tide line lowers overall productivity, which is ultimately reflected in lower SAV shoot density and biomass (Shafer 1999; 2002). While the rocks at and around the Point Hudson South Jetty may create valuable rockfish habitat and surface for sessile organisms to adhere, an overall continued loss of habitat occurs due to the direct elimination of square footage of substrate by the replacement jetties themselves. The South Jetty will likely continue to provide habitat for juvenile rockfishes associated with jetty materials following the recovery of the epilithic community.

Overall, the proposed action would result in 17,794 square feet of direct nearshore habitat elimination associated with the replacement of the North and South Jetties. The South Jetty bulkhead cuts off an estimated 4000 square feet of nearshore habitat from tidal inundation. The replacement jetties themselves (with estimated 40 year useful life) also act as bulkheads to the area of shoreline which they protrude from.

The structures are located in a location with adjacent eelgrass beds, and other high-density SAV. Jetties will create an artificially steep wall, extending above the high tide line, and eliminate square footage from access to listed species. It will also result in 9,891 square feet of dredging effects adjacent to the jetties, altering the bathymetry.

Along with physical loss of habitat, the impacts of nearshore modification include the loss of functions associated with that habitat, such as forage fish and invertebrate (food) production, filtration of pollutants, floodwater absorption, shading, sediment sources, and nutrient inputs.

<u>Shading</u>: Jetties increase shading. Reduced light in these areas will also reduce eelgrass shoot density and biomass of other SAV. In addition to reduced SAV biomass and shoot density, shading also has been shown to be correlated with reduced density of the epibenthic forage (Haas et al. 2002, Cordell et al. 2017). Eelgrass is a substrate for herring spawning, and herring is an important Chinook salmon forage species. We expect reduced SAV to cause a reduction in potential spawning habitat (i.e., eelgrass) for Pacific herring, another forage species of Chinook salmon.

<u>Changes in Substrate:</u> Wave energy reflected off rock structures tends to steepen and coarsen the shoreline waterward of structure. Structures in the intertidal zone change the hydrodynamics of the waves washing up on the beach. Hard structures reflect waves without dissipating their energy the way a natural beach would, especially if vegetation is present. This energy can lower the beach, make it steeper, and wash away fine sediments that would otherwise accumulate at the project site. The intertidal zone is also expected to deepen adjacent to both the jetties and bulkhead.

Native shellfish and eelgrass have specific substrate requirements and altered geomorphic processes can leave shellfish beds and eelgrass meadows with material that is too coarse or with too much clay exposed.

<u>Forage</u>: The changes in substrate discussed above directly reduce primary productivity and invertebrate density within the intertidal and nearshore environment (Bilkovic and Roggero 2008; Fresh et al. 2011; Morley et al. 2012; Dethier et al. 2016). Reductions in fine-grain sediments will reduce sand lance and surf smelt spawning habitat adjacent to the structures. Surf smelt and sand lance are important forage fish for listed salmonids.

The replacement jetties and bulkhead located within the intertidal zone (below HAT) will continue to prevent upper intertidal zone and natural upper intertidal shoreline processes such as accumulation of beach wrack (Sobocinski et al. 2010; Dethier et al 2016). This is an additional mechanism that reduces primary productivity within the intertidal zone and diminishes invertebrate populations (forage for Chinook) associated with beach wrack (Sobocinski et al. 2010; Morley et al. 2012; Dethier et al. 2016).

<u>Reduced SAV:</u> As a result of deepening and wave energy on the areas adjacent to the jetties, the replaced structures are expected to reduce adjacent SAV (Patrick et al. 2014).

Point Hudson is classified as an accretion shore zone with no appreciable drift, according to the Washington Department of Ecology Coastal Atlas Map (WDOE 2021, Accessed Nov 2021). Sediments that would naturally accumulate in the location of the jetties and navigation channel, and provide spawning substrate for forage fish, would continue to be disrupted. Accumulated sediment can be seen on the shoreline in satellite imagery both to the northeast and southwest of the project location.

We expect reduced SAV adjacent to the sides of the jetties that receive the most direct wave action and in the entire navigation channel – in a similar way to bulkheads (as described above). This would cause continued reduction in potential spawning habitat (i.e., eelgrass) for Pacific herring, another forage species of Chinook salmon.

Migration disruption due to presence of structures
The North and South Jetties create breaks in nearshore habitat, running roughly perpendicular to the shoreline, that are physical obstacles to out-migrating juvenile Chinook and juvenile HCSR. They will remain in place for the life of the structures, affecting each cohort of juveniles of these species. Adult Chinook, adult and juvenile steelhead, adult chum, and juvenile PS/GB bocaccio do not migrate along shallow nearshore habitats. Therefore, the jetties will not obstruct their movements.

<u>Increased predation</u> will occur due to habitat modifications associated with the structures in the proposed action. The jetties provide perches from which avian predators can hunt. The navigation channel creates deeper water that increases the likelihood of predation of salmonids by predators. The jetties also force nearshore migrating salmonids (HCSR chum and Chinook) out into deeper waters and across the navigation channel, which is more likely to result in predation.

Habitat Improvement through Removal of Creosote (long term)
Removal of approximately 506 tons of creosote timber piles would improve nearshore habitat conditions at the replaced jetties, by reducing a major source of water quality and sediment quality contamination. The removal would reduce chronic leaching of harmful chemical compounds into nearshore and marine sediments at the project site for the foreseeable future. This also reduces the bioaccumulation of contaminants by benthic prey communities, which in turn limits future bioaccumulation in higher trophic level species (e.g. forage fish, salmonids, SRKW). This would result in a continued reduction of exposure of all life stages of all listed species present in the area that was previously contaminated by the creosote piles.

2.5.4 Effects on Critical Habitat

As stated earlier in this document, the action area contains critical habitat for each species, even though species presence may not be likely. The habitat effects described above may also modify physical or biological features of designated critical habitat. We evaluate here if those modifications alter the conservation role that the designated area is intended to support.

In estuarine and marine areas, the features of designated habitat common to all species with critical habitat in the action area are (a) water quality and (b) forage or prey.

Water quality PBF: The temporary reduction in water quality described above, is adverse for roughly 6 months in each of the 2 years it occurs, for turbidity and reduced DO but ameliorates within hours to days after work ceases daily, and also at the end of the work window; the area adversely affected is relatively small.

Water quality is likely to decline for a very brief period (minutes) during and post creosote removal. We do expect however, that this removal, while largely positive, could temporarily impair the value of critical habitat for growth and maturation for several years in the area immediately adjacent to the pile-field that forms the existing jetty, as detrital bits of creosote break off and settle in the adjacent substrate. This diminishment is likely to last for 6 months or longer (Smith 2008), but is expected to have abated and improved by 3 years post project (Romberg 2005). The long term water quality effects include benefits from removal of creosote.

When short and long term effects are taken together, we consider that the critical habitat conservation role growth, maturation and physiological transition of HCSR chum and PS Chinook salmon is maintained.

For juvenile bocaccio, the 2 years of water quality disruption, together with long term water quality improvement from creosote pile removal overall maintains value of the habitat in supporting growth, survival, or reproduction. Based on the fact that the temporary water quality impairment ameliorates and the diminishment is in a relatively small area, we consider the overall effect on the PBF is to maintain the growth and survival of juvenile bocaccio.

For SRKW, the water quality PBF must support growth and development. Temporary water quality diminishment in the immediate area surrounding in-water work is not likely to significantly affect SRKW growth and development, because they are not likely to be present in the area while construction is occurring. The MMMP in place should prevent them from entering the area during construction. For approximately two years following construction, when contaminants are still leaching from soils after creosote pile removal, PAHs may indirectly be introduced to SRKWs through forage. That is, fishes that have been exposed to these contaminants in the nearshore may be consumed by SRKWs, causing a bioaccumulation in tissues. Though this may occur in a handful of instances, the long term effect of decreased contaminants (including PAHs) in the water surrounding the jetties will improve water quality and lower contaminant risk - further supporting growth and development.

Forage PBF:
Port Townsend Bay and nearby Kilisut Harbor are important spawning areas for Pacific herring, sand lance, and surf smelt. These are important forage species for PS Chinook and HCSR chum. Herring spawning in the vicinity is referred to as the Kilisut Harbor stock. The herring pre-spawning holding area is in the deep central portion of Port Townsend Bay. The known spawning season for this stock runs from early February to early April (Penttila 2007). There are scattered surf smelt and sand lance spawning beaches within Port Townsend Bay.

The action area overlaps with documented forage fish spawning habitat. The nearest documented sand lance spawning occurs 0.5 miles south of Point Hudson, next to the Port Townsend Ferry Terminal. The nearest documented smelt spawning occurs across Port Townsend Bay, on

Marrowstone Island. The nearest documented herring spawning occurs across Port Townsend Bay, off of Indian Island. Herring pre-spawner holding is also documented in the middle of Port Townsend Bay. No forage fish spawning or holding habitat is currently documented in within the area of enduring impacts of the breakwaters (WDFW Forage Fish Spawning Map, accessed Sept 2021).

Disturbing the extant sediment, SAV, and structures will simultaneously disrupt the benthic communities that live within those sediments and on the substrates, temporarily reducing prey availability in the footprint of the in-water work and adjacent areas where suspended sediment settles out. Construction activities will force individuals to look for prey elsewhere, potentially increasing competition for food and increasing exposure to predation.

The role of forage in HCRS chum and PS Chinook nearshore and marine critical habitat supports salmonid growth and maturation of juveniles. A temporary reduction in prey is expected to last roughly 12 months across the 2-year work period, and we expect it to begin ameliorating over weeks to months. SAV, which also supports prey communities for salmonids, will be reduced, with limited capacity to re-establish. Over the long term, the area's lowered capacity for prey abundance for SRKWs is maintained by the structures as opposed to a higher capacity if the structure was removed. This exerts some life-long limitation on the character of prey associated with the area of direct habitat elimination and other physical changes to habitat surrounding the jetties. Forage will be improved by the removal of creosote, which will support survival of forage species.

Forage for rockfish juveniles is related to nearshore habitat with substrates such as sand, rock, and/or cobble components that support kelp. The areas surrounding the North and South jetties have areas of dense vegetation and four documented genera of kelp, providing high-value forage habitat for juvenile rockfish within bocaccio critical habitat. The value of forage and refuge created by this habitat for the species will be diminished during construction activities for two seasons, for approximately 12 months total.

After several years following construction, we expect forage species (invertebrates, other small fishes) to recolonize areas disturbed by construction, including on the jetty rocks themselves. In the long term, this location will continue to provide complex substrates that support kelp species. The diminishment of critical habitat where the jetties block the nearshore entirely and the continued existence of the navigation channel will continue to limit the amount of kelp which can grow the area for the life of the structures. Forage will also be improved in the long term by creosote removal.

Adult bocaccio forage within critical habitat may diminish slightly in the action area during pile driving. However, it is expected to be insignificant due to the attenuation of sound as a product of 1) the distance from pile driving, 2) the depth at which adults live, and 3) the high rugosity of bottom-structures that adults of these species tend to occupy.

Forage/prey for SRKW - Sufficient quantity, quality, and availability of prey are an essential feature of the critical habitat designated for Southern Residents. Given the total quantity of prey available to SRKWs throughout their range numbers in the millions, the reduction in prey related to short-term construction effects from the proposed action is extremely small. Therefore, NMFS anticipates that the short-term reduction of Chinook salmon from temporary effects would have little effect on SRKWs. However, long term effects to Chinook, as a result of continued existence of the structures and accompanied changes in migration and direct reduction of habitat are expected. Over the long term, the area's lowered capacity for prey abundance for SRKWs is maintained by the structures as opposed to a higher capacity if the structure was removed.

Migration PBF:
Safe migration is a critical habitat feature for both Chinook salmon and HCSR. Structures can disrupt juvenile out-migration of these species in the Puget Sound nearshore, reducing the value of the critical habitat for its designated purpose of juvenile salmonid migration in estuarine and nearshore ocean environments. Through continued diminishment of safe migration for PS Chinook, survivorship decreases and this, in turn, decreases prey for SRKWs. Short term construction effects could disrupt the late-winter out-migration of juvenile chum, but will most likely avoid the majority of HCSR chum runs with a work end date of January 15th. Short term construction will likely have an even smaller effect on juvenile Chinook, who begin to use estuarine habitats in early January and continue through late summer. Long term safe migration will continue to be disrupted for these species by the replacement jetties which jut out dramatically from the nearshore and by the navigation channel which increases depth throughout their design lives. Creosote removal will permanently improve this PBF by reducing toxicity of both the water column and prey items for both juveniles and in-migrating adults.

Passage conditions allowing for migration, resting and foraging is a habitat feature essential to the conservation of SRKWs. SRKWs may encounter temporarily diminished migration, resting and foraging areas during construction in the action area. Sound in the large action area may interfere with normal behavior of the species, particularly through Admiralty Inlet, a common migration route for the DPS. We do not believe the critical habitat feature will be diminished significantly for this species as a result of the proposed action due to the temporary nature of pile driving and the implementation of a MMMP.

In addition to PFBs, NMFS has considered the effects of a direct reduction in critical habitat in the nearshore environment for PS chinook, HCSR Chum, PS/GB Bocaccio, and SRKW. While overall critical habitat area will not be further diminished from its current condition, in the long term the replacement of structures and navigation channel will maintain the current loss of critical nearshore habitat, and its associated PFBs (described above).

<u>Habitat with Suitable Conditions for Growth and Maturation (Including SAV)</u>

Designated critical habitat would have enduring continued diminishment of SAV and benthic communities in rearing areas of juvenile PS/GB bocaccio, and migration areas of juvenile salmonids. We anticipate impacts to SAV and epibenthic forage will continue to be diminished in areas eliminated and shaded by the jetty. The jetties and bulkhead will reduce overall SAV which is a PFB of adult and juvenile Chinook, chum, and juvenile PS/GB bocaccio. Dredging in the navigation channel, during project implementation, will diminish SAV by physically detaching kelp and algal species and uprooting of eelgrass. SAV is important in providing cover and a food base for juvenile PS Chinook salmon, HCSR chum salmon, and juvenile PS/GB bocaccio and, for that reason, is a PBF of these species. Repeated disturbance, together with the enduring reduction in direct square footage available for SAV to grow, will create an incremental systemic decline in prey for listed species. This has the potential to increase competition due to habitat availability and therefore diminishes survival among every cohort of each population of each of the listed species described above.

The South Jetty will continue to provide refugia and suitable rearing habitat for juvenile and nursery habitat young of year rockfish following construction and re-establishment of epilithic and benthic communities.

2.5.5 Effects on Species

Effects on species are a function of exposure and response. The degree of exposure (duration and intensity) will influence response, as will the specific species, life stage, and underlying health of the individuals exposed.

Individuals of the listed species will have exposure to both long and short term effects in their habitat, described above, as well as experiencing "direct effects" – consequences of the proposed action that are focused on or can be immediately discerned among exposed individual fishes. For the proposed action, NMFS determined that direct effects to listed species are fishing and entrainment during dredging. These direct effects occur among species despite use of best management practices and minimization measures.

Once replaced, the structures at Point Hudson would be expected to remain in the aquatic environment for their useful life (expected to be approximately 40 years for the purpose of this analysis), and the removal of creosote piles will be permanent. Thus, multiple individuals from successive cohorts of the multiple populations of PS Chinook salmon, PS steelhead, HCSR chum, and SRKW are likely to be exposed to the permanent effects of the structures and related uses.

Species Presence by Lifestage During the Work Windows

As described in Section 1.3 (Proposed Action), **all in-water work would occur between July 16 and January 15 for the North Jetty, bulkhead, and dredging and between September 15 and January 15 for the South Jetty.** Construction will occur for two consecutive years (work windows).

Juvenile PS Chinook salmon generally emigrate from freshwater natal areas to estuarine and nearshore habitats from January to April as fry, and from April through early July as larger sub-yearlings. However, juveniles have been found in PS neritic waters between April and November (Rice et al. 2011). The work window avoids peak juvenile Chinook presence from mid-February through mid-July, and partially avoids exposure in the second half of January. Additionally, a substantial percentage of Chinook salmon rear in Puget Sound without migrating to ocean areas (O'Neill and West 2009). These individuals may experience exposure to temporary effects.

Juvenile PS steelhead primarily emigrate from natal streams in April and May, and appear to move directly out into the ocean to rear, spending little time in the nearshore zone (Goetz et al. 2015). However, steelhead smolts have been found in low abundances in the marine nearshore, outside of their natal estuary, between May and August (Brennan et al. 2004), which overlaps with the in-water work window for the North Jetty construction. Juvenile steelhead will therefore be present in Puget Sound during the early part of the work window, July 15 through August. Because they enter the Sound after a longer freshwater residency, they are larger and less dependent on nearshore locations where work would occur. The proposed work window would minimize overlap of temporary construction effects with the presence in nearshore habitat of juvenile PS steelhead in the action area, but will not avoid all exposure.

Juvenile Hood Canal summer run chum. In late winter, juvenile chum can spend up to one month in estuarine shallow waters (all salinity zones) before moving to the ocean. After leaving estuaries, juveniles may exhibit extended residency within Puget Sound before migrating, and may even overwinter in the sound (Salo 1991, Johnson et al. 1997). Wait et al (2018) show widespread use of nearshore habitat by summer run chum, even at sites that are distant from natal streams. Small chum salmon fry (< 50-60 mm) appear to migrate primarily along the shoreline in shallow water less than 2 meters in depth. Use of shallow water habitats relates to predator avoidance and prey availability. When present in shallow water habitats, juvenile chum salmon less than 60 mm consume primarily epibenthic invertebrates, particularly harpacticoid copepods and gammarid amphipods. These epibenthic prey are primarily associated with protected, fine-grained substrates, and often eelgrass, and are especially abundant early in the year in some locations. This suggests that these habitat types are especially important to small, early migrating chum salmon, some of which are presumably summer chum salmon. Exposure to effects is likely among HCSR chum juveniles (Fresh 2006).

Adult salmonids. The presence of adult PS Chinook salmon and PS steelhead in the Puget Sound overlaps with the proposed in-water construction window Adult in-migrating PS steelhead utilize deep water, generally deeper than the location where the structures are proposed. Adult Chinook also in-migrate in deeper water. Thus, we expect the direct habitat effects from the structures to create little exposure or response among adult PS Chinook salmon and PS steelhead. However, some data suggests that up to 70 percent of PS Chinook salmon spend their adult period in Puget Sound without migrating to the ocean (Kagley et al. 2016), suggesting that adult PS Chinook will experience far reaching effects such as sound from pile driving, some water quality diminishments, and reduced prey.

Southern Resident Killer Whales. Between the three pods that comprise this DPS, identified as J, K, and L, some members of the DPS are present in Puget Sound at any time of the year. Observations since 1976 generally show that all three pods are in Puget Sound during June through September. SRKWs could enter the action area during the designated work windows. As discussed in the Status section, the whales' seasonal movements are only somewhat predictable because there can be large inter-annual variability in arrival time and days present in inland waters from spring through fall. The Whale Museum Soundwatch Program (Shedd 2020) reports between 1-25 SRKW sightings in the action area near Point Hudson in 2017. The likelihood of exposure to the temporary effects of construction are high (Olson et al. 2018) but are reduced through the implementation of a Marine Mammal Monitoring Plan.

Species Exposure and Response to Effects

PS Chinook salmon, HCSR chum, and PS steelhead are likely to be present during in-water construction activities and likely to be exposed to the temporary construction effects, most notably elevated levels of noise and suspended sediment as juveniles and adults. Of these three species, only Chinook are expected to have a longer duration of exposure. This is due to juveniles being smaller sized and thus with a shallow water preference at this lifestage. Juvenile steelhead are larger and move more quickly to deeper waters outside of the mixing zone, and their presence only overlaps with the work for about 6 weeks. Because a high percentage of adult Chinook stay in Puget Sound for the duration of their marine life stage, some individuals are likely to also experience these effects. All species with a likely to adversely affect determination are likely to experience long-term effects of the replaced structures.

Water Quality (temporary)

Turbidity and Low DO:

Turbidity and TSS levels would return to background levels quickly and be localized to the in-water construction areas (200-foot radius turbidity mixing zone and 300-foot radius for dredging projects). Decreased DO is expected to be contemporaneous with and in the same footprint of the suspended sediment. While juvenile PS Chinook salmon are likely to encounter these areas, they can detect and avoid areas of high turbidity, and exposure is expected to be brief, and adult Chinook, with greater swimming strength are expected to have greater capacity for avoidance. While exposure to high levels of turbidity for extended periods can injure or kill juvenile salmonids (Newcombe and Jenson 1996), because the salmonids here are free swimming and can detect suspended sediment (Quinn 2005; Simenstad 1988) we expect the likely response of any present salmonid will be avoidance behavior. Thus, duration and intensity of exposure of PS Chinook is also unlikely to cause injury; any exposure prior to avoidance could briefly cause cough, raised cortisol, and reduced predator or prey detection, but these abate within a short time. Because of this avoidance pattern, exposure to low DO, which is coterminous with high turbidity, is also very brief.

Sedimentation in the construction will kill some benthic forage communities that live within sediments by smothering. We expect that benthic prey density in these areas will recover back to baseline conditions (pre-construction) within two years but will represent a temporary decrease in prey available to listed salmonids for those two years. Because the jetty structures themselves are not suitable nearshore habitat for juvenile salmonids, we expect this decline in prey to be insignificant on the species.

PAHs:

Due to life history behaviors associated with shoreline habitats, Chinook salmon (juveniles and adults) spend a greater amount of time within the action area and will have the highest probability of exposure to PAHs associated with creosote removal. Though HCSR chum and PS steelhead are not present for long durations within the action area, we cannot discount the possibility of exposure to PAHs. Exposed salmonids, from both uptake through their gills (during pile removal) and dietary exposure (Landrum and Scavia 1983; Landrum et al. 1984; Neff 1982), for up to two years following creosote removal, could experience immunosuppression and reduced growth. Of the listed fish exposed to PAHs and other contaminants, all are likely to have some degree of immunosuppression and reduced growth (Varanasi et al. 1993), which, generally, increases the risk of death. There are no physical cues to indicate contaminated sediment to listed species and we expect they will not display avoidance behavior in areas with these sediments. Two years following the removal of creosote, associated PAHs are expected to dissipate to a level that will no longer act as a pathway of harm to listed species.

SRKWs can experience effects of pollutants through reduced prey numbers and through consumption of prey species that contain these pollutants. These are stored in the killer whale's blubber and can later be released; when the pollutants are released, they are redistributed to other tissues. The release of pollutants can also occur during gestation or lactation (Noren et al. 2018). Once the pollutants mobilize into circulation, they have the potential to cause a toxic response. Therefore, nutritional stress from reduced prey, including Chinook salmon that contain higher levels of some POPs than other salmon species (Krahn et al. 2007; O'Neill and West 2009; Veldhoen et al. 2010; Mongillo et al. 2016), may act synergistically with high pollutant levels in killer whales and result in adverse health effects.

Noise from Pile Driving (temporary)

Even with use of a bubble curtain to reduce peak SPL, noise from impact pile driving, (limited to 1 pile per day) can injure or kill fish, and alter behavior (Turnpenny et al. 1994; Turnpenny and Nedwell 1994; Popper 2003; Hastings and Popper 2005). Fish suffering damage to hearing organs may suffer equilibrium problems, and may have a reduced ability to detect predators and prey (Turnpenny et al. 1994; Hastings et al. 1996).

Based on the area in which pile driving noise occurs, juvenile HCSR chum, PS Chinook, and PS steelhead, and adult Chinook and steelhead could occur, with the largest likelihood of exposure among PS chinook. Juvenile fish are the most likely to suffer acute response to noise from impact driving. During the in-water work window for the North Jetty (July 15 to January 15), all exposed PS Chinook salmon, PS steelhead, and HCSR chum individuals will be at least two grams, which reduces the likelihood of death.

Vibratory pile driving (up to 8 piles/day) can generate noise levels that fish detect and respond to, but well below the thresholds for physical injury (Erbe and McPherson 2017). Fish may exhibit behavioral responses to vibratory driving, such as startle, raised cortisol, and diminished ability to detect both prey and predators. Fish may also habituate to persistent noise.

The work windows will generally prevent exposure to construction noise during peak migration of salmonids, but do not guarantee exposure will not occur. Chinook will have the highest potential for exposure due to their extensive use of nearshore habitats. This will occur in January for two years for out-migrating Chinook. Juvenile chum also depend on estuarine and nearshore habitats, but they migrate more rapidly out of Puget Sound. Adult Chinook, adult and juvenile steelhead, and adult chum make little use of nearshore habitats, and will be exposed to injurious levels of underwater sound in very small numbers.

SRKWs could be injured or disturbed by sound pressure generated by pile driving. The temporary effects of vibratory pile driving would span the action area for two work seasons – up to 2 hours every day. During construction, SRKW pods may use Admiralty Inlet as a migration corridor during pile driving activities - as the action area reaches 1.3 miles northwest for SRKW (behavioral threshold for vibratory pile driving). SRKWs may also enter Port Townsend Bay.

However, criteria for monitoring and stop-work on sighting of any killer whale for this project is intended to ensure that SRKW will not experience duration or intensity of pile driving, either impact or vibratory, that would result in disturbance or harm to any individual of this species.

Disruption of Benthic and Nearshore Habitat (temporary)

The benthic forage base for listed species will be diminished in the substrate immediately surrounding the jetties. Because benthic prey recruits from adjacent areas via tides and currents, the prey base may re-establish in a matter of weeks to many months following construction, depending on if adjacent communities are able to re-seed the affected area (Dernie et al 2003). We expect the cohorts of PS Chinook salmon, PS steelhead, and HCSR chum that are present in the action area to be exposed to this temporary reduction of prey in the replacement and dredging areas for up to two years following construction. We expect that other prey is abundant in close proximity, feeding, growth, development and fitness of the individuals that are present during habitat disruption from construction would not be affected. Therefore, we consider the temporary effects on any juvenile PS Chinook salmon, PS steelhead, and HCSR chum in the action area to be unlikely to cause injury at the individual scale.

The reduction in prey for SRKWs (PS Chinook salmon) from the temporary construction effects of the proposed actions is small due to the application of work windows to avoid peak presence of this species at the juvenile life stage and the other reasons discussed above. Diet data suggest that SRKWs consume mostly larger (i.e., generally age 3 and up) Chinook salmon (Ford and Ellis 2006). Given the total quantity of prey available to SRKWs throughout their range, this short-term reduction resulting from the temporary construction effects is extremely small.

Entrainment (temporary)

Entrainment is the process where objects are enclosed and transported within some form of vessel or where solid particles are drawn-in and transported by the flow of a fluid. In this context, entrainment refers to the uptake of aquatic organisms by dredge equipment, as well as the transport of organisms by the downward motion of sediments during in-water disposal. In-water disposal of sediments entrains organisms that are caught by the currents that are created within or very close alongside discharge plumes as they descend through the water column.

Mechanical dredges trap and injure organisms that are captured within the clamshell bucket. Mechanical dredges commonly entrain slow-moving and sessile benthic epifauna along with burrowing fauna that are removed with the sediments. They also entrain algae and aquatic vegetation.

Dredged materials at Point Hudson will be removed with an excavator or clamshell bucket, not a not a hydraulic or hopper dredge.

Fish entrainment during this project is be dependent upon the likelihood of fish occurring within the dredge prism, dredge depth, fish densities, the entrainment zone (water column of the clamshell impact), the location of dredging within the estuary, the type of equipment operations, time of year, and species life stage. Listed fish could be entrained however, forage fish species for salmon, such as sand lance, or demersal fish like sculpins, and gobies are most likely to be entrained as they reside on or in the bottom substrates with life-history strategies of burrowing or hiding in the bottom substrate (Nightingale and Simenstad 2001a).

If listed fish are entrained, they are likely to be injured or killed. However, the total number of salmon or steelhead entrained is expected to be low because of the proposed work windows and the relative mobility of these species at their juvenile life stages.

Because all dredged materials will be disposed of at an approved upland facility, effects associated with in-water disposal is not discussed.

Modified Nearshore Habitat. (long term)

When physical processes are altered and new materials are introduced, there is a shift in biological communities. This is particularly evident at the South Jetty at Point Hudson. Instead of (likely) a large semi-continuous eelgrass bed within the intertidal area, there is rocky habitat with protection from wave action. The number and types of invertebrates, including shellfish, is altered from historic conditions; forage fish have reduced spawning areas; and juvenile salmon and forage fish have reduced feeding grounds that they use as they migrate along the shore (Shipman et al. 2010). The continued existence of the rock jetties, bulkhead, and navigation channels will continue to reduce prey and habitat for listed species associated with Puget Sound nearshore habitat, such as eelgrass beds.

Finer materials like gravel and sand provide important spawning substrate for sand lance and surf smelt. Therefore, a continued reduction to this substrate type within the intertidal and nearshore zone as a result of the bulkhead would reduce potential spawning habitat availability and fecundity of both species (Rice 2006; Parks et al. 2013), which are important prey species of PS Chinook salmon.

The loss of fine material adjacent to the jetties and bulkhead and in the dredged area can affect juvenile salmonids by reducing the amount of available shallow habitat for food and cover and by preventing access to habitat upland of the bulkheads and jetties at high tides. A reduction in shallow habitat will continue to eliminate refugia from predaceous fish for juvenile salmonids.

The persistent habitat elimination caused by the jetties and bulkhead (approx. 12,794 sqft) causes a continued reduction in SAV, particularly eelgrass beds that are documented around the marina.

SAV provides cover and a food base for juvenile PS Chinook, HCSR chum salmon, and PS steelhead. Bax et al. (1978) determined the abundance of chum fry was positively correlated with the size of shallow nearshore zones, and sublittoral eelgrass beds have been considered to be the principal habitat utilized by these fry.

The reduction in food source due to habitat elimination by the jetties and bulkhead includes epibenthos (Haas et al. 2002) as well as forage fish such as sand lance and herring. This reduction occurs in areas where smoltified salmonids have entered salt water and require abundant prey for growth, maturation and fitness for their marine life history stage. Reduced primary productivity within the intertidal zone due to substrate changes and the absence of wrack will also continue to depress invertebrate populations (Sobocinski et al. 2010; Morley et al. 2012; Dethier et al. 2016). Invertebrates associated with wrack are an important food source for PS Chinook salmon and for forage fish prey species of salmonids. Invertebrates associated with the jetty structure will not provide forage for listed salmonids. The structures will continue to reduce forage for listed fish for their useful life periods.

When salmonids from multiple cohorts from all populations present in Port Townsend Bay have reduced prey availability and increased competition, it is reasonable to assume that the carrying capacity is constrained and abundance of listed salmonid species will be curtailed or reduced. For these species, particularly because Chinook salmon as returning adults are prey of SRKW, this reduction constrains the prey availability for SRKW as well.

When prey is scarce, SRKWs likely spend more time foraging than when prey is plentiful. Increased energy expenditure and prey limitation can cause poor body condition and nutritional stress. Because SRKWs are already under pressure due to the cumulative effects of multiple stressors, and the stressors can interact additively or synergistically, any additional stress such as reduced Chinook salmon abundance likely has a greater physiological effect than they would for a healthy population. Lowered prey abundance across multiple years may have even greater effect because SRKWs likely require more food consumption during certain life stages and effects of prey availability on reproduction should be combined across consecutive years. Females are likely to stop foraging behaviors in the presence of vessels (within 400 yards) which may affect reproduction if they are unable to forage to meet energetic requirements for reproduction (Holt et al. 2021). This effectively eliminates populated and frequently trafficked areas from foraging SRKWs. We expect that, following the replacement of Point Hudson structures, SRKWs will continue to utilize the immediate area for foraging at a low to very low frequency and will continue to experience the effects of a reduced Chinook prey base for their useful life.

Migration Disruption (long term)

Juvenile Chinook and juvenile HCSR chum migrate along shallow nearshore habitats, and the Point Hudson jetties will disrupt their migration and increase their predation risk.

Juvenile salmon, in both the marine nearshore and in freshwater, migrate along the edge of shadows rather than through them (Nightingale and Simenstad 2001b; Southard et al. 2006; Celedonia et al. 2008a; Celedonia et al. 2008b; Moore et al. 2013; Munsch et al. 2014). And in the case of the Point Hudson Jetties, juvenile Chinook and HCSR chum have no option but to go around the structures. The structures would continue to impede the nearshore movements of these juveniles (Heiser and Finn 1970; Able et al. 1998; Simenstad 1999; Southard et al. 2006; Toft et al. 2007).

Swimming around structures lengthens migration distance and is correlated with increased mortality. Anderson et al. (2005) found migratory travel distance rather than travel time or migration velocity has the greatest influence on the survival of juvenile spring Chinook salmon migrating through the Snake River. In and overwater structures cause delays in migration for PS Chinook salmon from disorientation, fish school dispersal (resulting in a loss of refugia), and altered migration routes (Simenstad 1999).

Dredging in the nearshore will result in the deepening of shallow water migratory corridors for listed juvenile salmonids. This effect could persist for years, depending on how long it takes for the dredge channel to fill back in.

Increased Predation: As HCSR chum and Chinook swim around the jetties, they will temporarily utilize deeper habitat, thereby exposing them to increased piscivorous (fish eating) predation with a potential 5 fold increase in predation rates (Willette 2001). Hesitating upon first encountering a structure, also exposes salmonids to avian predators that may use the floating structures as perches. Typical piscivorous juvenile salmonid predators, such as flatfish, sculpin, and larger juvenile salmonids, being larger than their prey, avoid the shallowest nearshore waters that out-migrating juvenile salmonids prefer—especially in the earliest periods of their marine residency. Exposure to these predators will increase when juvenile Chinook and HCSR chum are forced to leave shallower habitats.

Removal of Creosote (long term)

Because creosote piles are chronic sources of contaminants, leaching throughout their lifetime, the removal will result in improved water quality and benthic conditions for listed species in the long run. PHAs affect juvenile salmonids that migrate through contaminated estuaries by reducing their growth and altering immune function. Herring eggs exposed to creosote have a high mortality rate. PAHs can increase disease and alter growth and reproductive function in English sole. (WADNR 2014). Removing the piles would directly reduce toxic conditions for the organisms around the Point Hudson Jetties, benefitting all listed species.

Fishing (intermittent, long term)

Intermittent and long term exposure to fishing associated with the fishing pier on the South Jetty at Point Hudson Marina will occur. We expect fishing effort at this location to be relatively high, particularly on weekends, because the pier is large, publically accessible, and the species diversity and habitat associated with the South Jetty likely creates high catch rates among anglers. Juvenile out-migrating Chinook and HCSR are unlikely to be large enough to take bait, but juvenile steelhead may be large enough to be caught. Chinook that remain within the Puget Sound, and do not migrate to the ocean could also be caught. Also, adult in-migrating salmon

(Steelhead, Chinook and HCSR chum) could all be caught. Overall fishing pressure will likely be higher at this location when adults are in-migrating.

Species including listed fish will experience direct injury and death associated with fishing on and around the jetties. Adult salmonids, and potentially juvenile steelhead removed from the population will not reproduce, and injured fish will overall have reduced success rates and may also die as a result of angling injuries.

2.6. Cumulative Effects

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

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

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

The population of Port Townsend expanded from 8,334 during the 2000 census to 9,113 people in 2021. A similar, if not larger, population increase is expected from the 2020 census. Adjacent to Admiralty Inlet, and with multiple ports, the action area sees high levels of vessel traffic and an overall high background decibel level. We expect this to continue and possibly increase in the future as populations in the Puget Sound region continue to grow.

NMFS is unaware of any specific future non-federal activities that are reasonably certain to affect the action area. However, NMFS is reasonably certain that future non-federal actions such as the previously mentioned shoreline and watershed activities are all likely to continue and increase in the future as the human population continues to grow across the region. Habitat loss and degradation of water quality from development and chronic low-level inputs of non-point source pollutants will likely continue and act against the recovery of ESA-listed aquatic species.

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

Additionally, some future non-federal activities are reasonably certain to contribute to climate change effects within the action area. The degree to which future habitat conditions degrade because of climate change, and to what level future non-federal actions are likely to continue or exacerbate existing trends cannot be readily determined. Qualitatively, climate change is likely to adversely affect the overall conservation value of designated critical habitat, though it may have some beneficial effects in certain circumstances. The adverse effects are likely to include, but are not limited to, reduction of cold-water habitat and other variations in quality and quantity of tributary spawning, rearing and migration habitats. It is also likely to include the conversion of estuarine tidal marshes to shallow and deep subtidal habitats as sea levels rise (see Section 2.2).

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

PS Chinook, PS steelhead, and HCSR chum are listed as threatened by extinction risk, and SRKWs are listed as endangered by extinction risk. The status of these species is due to lower abundance and productivity, and for salmonids reductions in spatial structure and diversity as well. These reduced viability parameters are due in part to reductions in habitat quality (and for salmonids, reduced habitat quantity) throughout some or all of their range. These degraded habitat conditions are described as limiting factors and impairments of features of critical habitat, even where conservation value of the habitat remains high.

Consistent with conditions rangewide, the baseline conditions in the action area, including along the inner bay shoreline of Port Townsend, are currently degraded, with many in and overwater structures and bulkheads. The existing structures that are the subject of this consultation itself currently constrain the critical habitat conditions potentially limiting the capacity of the site to support listed species through the presence and use of the structures.

To this context, we add the effects of the proposed action to evaluate their effect on the conservation value of the critical habitat, and on the survival and recovery of species.

Critical Habitat: Impacts associated with habitat debits generated by proposed action at Port Hudson would be offset within the PSNHCC, using the NSHVM by the removal of existing structures and the removal of approximately 506 tons of creosote from the project location. The ongoing habitat benefits gained from the removal of creosote would represent function trading, meaning that we recognize that benefits associated with creosote removal are not the same, functionally, as impacts associated with the continued existence of the jetties, bulkhead, and navigation channel. While the removal of creosote will be beneficial and numerically offsets the impacts of the structure replacement and dredging within the PSNHCC, they were not relied on to reach the ESA determinations within this consultation.

Critical habitat value within the Port Hudson jetty area will be maintained at its current degraded state apart from an improvement associated with the removal of creosote. We therefore conclude that the conservation role of critical habitat for each species will be retained at its current level, after the temporary effects of construction have abated. The existing critical habitat for PS Chinook, HCSR chum, SRKW, and PS/GB bocaccio are not further diminished by the proposed action, and continue to support the conservation roles for which they were designated.

Species:

Salmonids

The replacement of the jetties at Point Hudson will have temporary adverse effects that may reduce abundance of PS Chinook salmon, HCSR chum salmon, and PS steelhead. The numbers of these species so affected is impossible to estimate, but the effect would occur in each year of the work (affecting two cohorts). The structures themselves also constitute a nearshore habitat modification that negatively affects salmonids. While this effect may constrain carrying capacity at the site, it neither increases nor decreases carrying capacity of salmonids as a result of this project. Chinook migration, refuge, and forage will continue to be affected by the structures throughout their useful life, but the overall population's abundance during construction or thereafter will not be further diminished. The two work seasons' adverse effects on salmonids is not expected to reduce abundance of any species in a manner that would also reduce productivity, spatial structure, or diversity.

SRKW

The project is expected to reduce the number of PS Chinook salmon, the primary prey of SRKW, in each of the two work seasons, reducing the number of returning adult Chinook in subsequent years. However, this reduction is not expected to reach a level that reduces the productivity, spatial structure, or diversity of the species, and this effect therefore is not expected to be a source of harm to SRKW. As described above, Chinook will continue to be affected by the replaced structures throughout their design life. While this does not further reduce forage for SRKW, it maintains the current depressed quantity of forage for the species. Noise may cause whales to avoid the action area and thereby temporarily reduce SRKW's ability to forage, rest, and migrate in the action area during the work windows. Finally, the removal of creosote contaminants may slightly improve the quality of food sources that the whales obtain by reducing PAHs as a bioaccumulative in the environment.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon, HCSR chum salmon, PS steelhead, or SRKW, nor is it likely to destroy or adversely modify designated critical habitat for PS Chinook salmon, HCSR chum salmon, PS/GB bocaccio, or SRKW.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

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

- Harm of PS Chinook (juvenile and adult), PS steelhead (juvenile and adult), HCSR chum (juvenile and adult), and SRKWs from temporary effects of water quality disruption, noise, and the disruption of substrate.
- Harm of PS Chinook salmon (juvenile and adult), PS steelhead (juvenile and adult), HCSR chum salmon (juvenile and adult), and SRKWs from long term effects resulting from the presence of the replacement structures. These effects are migration disruption, increased predation, habitat elimination, and reduced forage.

For this Opinion, even with the best available science, NMFS cannot predict with meaningful accuracy the number of listed species that are reasonably certain to be injured or killed annually by exposure to these stressors. Distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action.

NMFS uses the causal link established between the activity and the likely extent of timing, duration and area of changes in habitat conditions to describe the extent of take as a numerical level. If any of the take surrogates established here are exceeded, they are considered meaningful reinitiation triggers.

The timing (in-water work window) and duration (days) of in-water work is linked to harm of listed PS Chinook, PS steelhead, and HCSR chum, because the in-water work windows avoid the expected peak presence of listed species in the action area. Construction outside of the in-water work window could increase the number of fish that would be exposed to construction related stressors, as would working for longer than planned. Therefore, take from noise, and turbidity, is co-extensive with the defined in-water work window and number of in-water work days.

The extent of take in the form of harm from noise and turbidity is limited to 2 consecutive years, for approximately 10 hours each day in the designated work windows as follows:

> The North Jetty work window is July 15 to January 15 (184 days/7 months), for two years, for a total possible 368 days/14 months.
>
> The South Jetty work window is September 15 to January 15 (122 days/5 months), for two years, for a total possible 244 days/10 months

Overlapping these work windows, the maximum amount of construction time is 14 months over a 2 year period, for an average of 10 hours each day.

The extent of take of salmonids in the form of harm from water quality disruption can also be identified as that location where suspended sediment and reduced DO are likely to exceed background during construction. The background levels as per state water quality regulations (WAC173-201A-400) resume at 200 ft for non-dredging activities and 300 ft for dredging.

The extent of take in the form of harm from temporarily increased sediment contamination from PAHs associated with creosote piles is expected up to 200 ft from the previous location of piles. These contaminants will likely not directly affect adult in-migrating salmonids (adult Chinook with an oceanic life history, adult steelhead, and adult HCSR chum).

SRKWs are not expected to be within 300 ft of construction, and turbidity is not a take pathway for this species.

The extent of take in the form of harm and harassment of PS Chinook, PS steelhead, and HCSR chum from pile driving is measured as the number of pile strikes per day, the number of days of pile driving, and the distance of predicted responses. Each day during construction, up to 120 minutes of pile driving may take place (with only one pile allowed to be impact driven with a maximum of 525 strikes per day). A total of 416 piles will be driven, with a maximum of 4 piles each day. At the fastest, pile driving could occur in 104 days. An average of more than one pile must be driven each day to complete the driving within the maximum work window of 368 days (North Jetty) and 244 days (South Jetty). Injury response for fish extends 126 meters from the source (harm) and maximum behavioral response for fish extends 2636 meters (harassment)

Take in the form of harassment of SRKW from pile driving noise will occur if any individual of the species comes closer than 6310 meters from the source. The MMMP does not assure that no SRKW will enter the area of behavioral response. Harassment under the ESA produces a behavioral response, and is not considered take under the Marine Mammal Protection Act, as no physical injury will result.

The extent of take in the form of harm of PS Chinook (juveniles), and HCSR chum (juveniles) due to sediment and rock disruption is 200 ft (or 300 ft for dredging) from the project site. Recovery (recolonization) of substrate is expected to take up to three years following completion of construction.

The extent of take in the form of harm to Chinook and HCSR chum from migration obstruction, increased predation during migration, decreased forage, and direct habitat elimination is measured as the square footage of structures themselves and will continue throughout the useful life of the structures:

17,794 square feet of direct nearshore habitat elimination associated with the replacement of the North and South Jetties; 4,000 square feet of nearshore habitat elimination from tidal inundation from the South Jetty bulkhead. In addition to the total 21,794 square feet of direct habitat elimination, a buffer of 200 ft surrounding all replacement structures will also experience altered habitat conditions.

An additional 9,891 square feet of dredging effects adjacent to the jetties will alter the bathymetry of this location. This area may fill back in within a matter of years, or it may take decades to return to a more natural nearshore topography. Herein we assume that the dredged channel will maintain its altered bathymetry until a subsequent dredging consultation is initiated.

The extent of take in the form of harm of SRKW due to decreased forage directly coincides with the resulting harm to PS Chinook described above.

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

1) Reduce predation of listed fishes associated with the replacement structures

2) Implement monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded.

3) Ensure a no-net-loss of habitat function via equivalent credit allocation or debit offset through the use of the Puget Sound Nearshore Habitat Conservation Calculator (PSNHCC).

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The USFWS or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. Do not install additional lighting on the jetties beyond navigational as outlined in the proposed action for the life of the structures. Keep lumens (light levels) as close to the minimum required by law as possible.
    b. Affix permanent conical pile caps on each new pile and replace them throughout the life of the structures. These will deter predatory birds from perching on the piles.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. On the start date of the construction, the applicant (or designated agent) shall notify NMFS, via projectreports.wcr@noaa.gov, that construction has commenced and include:
        i. Email subject line: "NOTIFICATION OF START DATE WCRO-2021-00301"
        ii. A written verification that all USACE-required best management practices (including implementation of a MMMP) are being implemented.
    b. Within 60 days of a project being completed, the USFWS shall require the applicant to prepare and send to NMFS a project completion report that contains the following:
        i. Project identification; Project name; Project location; USFWS contact person(s)

ii. Dump receipts verifying total creosote tonnage removed and photos of vessels/vehicles with creosote at the disposal facility:
    1. See Term and Condition #3 below - If the total tons of creosote estimated for the project (506 tons - as entered into the PSNHCC attached in Appendix A) greater than the actual weighed tonnage, this will result in a change the habitat equivalency analysis in-part used to reach the conclusions in this Biological Opinion.

iii. The Timing and Duration of Project Work:
    1. Starting and ending dates for work completed;
    2. Number of days of in-water work

iv. Evidence of Construction-Related Noise
    1. For Piles Installed, the final report must identify:
       Number of days pile installation occurred, number of piles, pile types, pile sizes, methods for installation, daily records of impact hammer strikes, daily record of vibratory hammer time (minutes).
    2. For Piles Removed, the final report must identify:
       Number of days pile removal activities occurred, number of piles, pile types, pile sizes (length and diameter particularly for creosote piles), methods used for removal, daily record of vibratory hammer time.

v. Suspended Sediment and Contaminant Monitoring
    1. Monitoring data collected, or use of BMPs that demonstrate that 200 ft buffers (for non-dredging actions) and 300 ft (for dredging) buffers were not exceeded

vi. Square footage information for structures and dredging
    1. Final amount of square feet dredged
    2. Final square feet of the replaced jetties
    3. Final length in linear feet of replaced bulkhead

vii. Photo documentation.
    1. Photos of habitat conditions at the project site before, during and after project completion
    2. Label each photo with date, time, project name, photographer's name, and the subject and project number.

viii. A description of how the USFWS met the terms and conditions contained in this Opinion

3. The following terms and conditions implement reasonable and prudent measure 3:

   a. Conservation credits (PSNHCC values greater than 0) resulting from this project may only be used as conservation offset for WCRO-2020-00202.

      i. If total tons of creosote estimated in decrease such that this project is still positive in the PSNHCC, but no longer has enough credits to offset WCRO-2020-00202 fully, credits in excess of 0 may be applied to that project but the remainder must be fully offset to comply with the Batched Biological Opinion's RPAs.

ii. The Port of Port Townsend must keep a ledger of conservation credits and confirm their allocation with NMFS consultation staff on WCRO-2020-00202.

b. If this project results in a negative value in the PSNHCC (due to fewer tons of creosote than projected), the applicant must offset those remaining debits within one year, within the Hood Canal Puget Sound Partnership service area.

i. Offsets may be achieved by on-site conservation or off-site conservation actions within the same Puget Sound Basin. These will be evaluated with the PSNHCC.

ii. Offsets may also be purchased through a conservation bank.

iii. As no credits would be associated with this action, WCRO-2020-00202 would not be able apply credits to meet the Batched Opinion RPA and must meet the RPA by other means (as described in WCRO-2021-01620)

2.10. Conservation Recommendations

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

- Partner with REEF and other organizations to monitor the biology of the South Jetty and document the impact and recovery of the area in publicly available outlets or publications.
- Work with WDFW, the Port Townsend Marine Science Center, and other entities to preserve existing kelp and eelgrass beds and encourage growth of new kelp and eelgrass surrounding the jetties.
- Install no-anchor and no-wake signs/buoys in areas with known kelp and eelgrass beds.
- Install a day-use fee or donation box at the South Jetty that funds nearshore salmonid habitat restoration (specifically) and incorporates a description of how nearshore structures eliminate salmon habitat and block migration.
- Reduce stormwater runoff from the Port through utilization of stormwater best management practices associated with existing harbor facilities. In particular, consider low impact development (LID) and increase riparian buffers associated with parking areas.
- Complete as little in-water work in January (both years) as possible to reduce construction effects on juvenile salmonids.

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

2.11. Reinitiation of Consultation

This concludes formal consultation for the Point Hudson replacement jetties, bulkhead, and navigation channel.

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

2.12. "Not Likely to Adversely Affect" Determinations

2.12.1 Mexico DPS and Central America DPSs of Humpback Whale

Humpback whales were listed as endangered under the Endangered Species Conservation Act in June, 1970 (35 FR 18319), and remained listed after the passage of the ESA in 1973 (35 FR 8491). Humpbacks are divided globally by NMFS into 14 DPSs and place four DPSs (Western North Pacific, Arabian Sea, Cape Verde/Northwest Africa, and Central America) as endangered and one (Mexico DPS) as threatened (81 FR 62259).

Photo-identification and modeling efforts indicate that a large proportion of humpback whales feeding along the coasts of northern Washington and southern British Columbia are from the Hawaii DPS (63.5 percent), with fewer animals from the Mexico (27.9 percent) and Central America (8.7 percent) DPSs (Wade 2017).

Humpback whales sightings in the Salish Sea have been increasing since the early 2000s (Calambokidis et al. 2018). We have limited information about humpback whale foraging habits and space use in the inside waters of Washington, and do not have specific fine-scale information for the project area.

Humpback whales may occasionally be present in Port Townsend Bay but are more likely to occur in Admiralty Inlet, a part of the action area associated with pile driving effects. While individual of each DPS may also enter the bay to feed on forage fish, particularly herring that spawn in the center of the bay, we have no documented frequency of their presence and expect any exposure that could occur to project effects is limited to piledriving noise in the winter from work at the South Jetty. Humpbacks are typically migrating to their winter habitat during this period and exposure is likely to be limited to a roughly 4 mile portion of their migration pathway where noise is present. The project includes marine mammal monitoring protocols that include stop-work measures on any whale sighting. For these reasons, exposure is expected to be so brief that no injury or harm will occur to any individual exposed. Effects are insignificant.

2.12.2 GB/PS Yelloweye and Bocaccio Rockfish

Yelloweye rockfish float at variable depths as larvae and are in the water column associated with drifting algae, seagrass, and detached kelp. In subsequent life stages, they occupy habitat with rocky or complex structure ranging from 90 to over 1000 feet (NMFS 2017d).

Bocaccio, like yelloweye, are a deepwater species at adult lifestages. Bocaccio larvae settle from a planktonic stage into nearshore and demersal habitats beginning in late spring through the summer months. Pelagic young of the year are found in shallow habitats and subadults are also more common in shallower water than adults. Areas with floating and submerged kelp support the highest densities of juvenile bocaccio (Love et al. 2002). A movement of adults to deeper water with size and/or age has been observed though adults occur in a broad range of habitats and depths, including midwater. High adult densities have been typically associated with complex substrata (rocks, high relief) (Field et al. 2010).

Two-hundred and five surveys have been conducted by REEF at the Point Hudson South Jetty over the past 28 years. Of these 205, 138 were conducted by REEF Experts (2022). Several surveys identified species specific young of year rockfishes, and almost all identified adult species of rockfishes. No PS/GB yelloweye or bocaccio rockfish were documented, at any lifestage.

Expert surveyors identified rockfish species at the Point Hudson survey site including young of year (YOY) specimens. Expert surveyors identified YOY black, YOY canary, YOY quillback, YOY Puget Sound, and YOY brown rockfish, along with adults of these species. Adults of all the identified YOY species have also been identified on site. Many YOY rockfish were unidentified Sebastes spp. (noted in 32% of surveys). Surveys included both deep and shallow habitat, but likely rarely exceed 100 feet in depth. PS/GB yelloweye are deep water species (> 98 feet deep) as juveniles and adults. PS/BG bocaccio have been found in low numbers associated with nearshore environments as juveniles by WDNR during their surveys across the Puget Sound. However, there has been no documented presence of bocaccio adults or juveniles in or near the Port Townsend Harbor (WDNR 2009). While depth quickly increases off the South Jetty, it is not deep enough to support yelloweye rockfish juveniles or adults. At approximately 60 feet southwest of the South Jetty, the depth is 55 feet according to site plans with topographic lines. Habitat suitable for juvenile and adult yelloweye rockfish (> 98 feet) begins approximately 350 feet away from the jetties.

We expect that if no adults are present, planktonic larvae also are unlikely to be present within the action area. Oceanographic conditions within many areas of Puget Sound likely result in the larvae staying within the basin where they are born rather than being more broadly dispersed by tidal action or currents (Drake et al. 2010).

Due to the lack of sightings at this intensely studied location and depth range of both the project, diver surveys, and adult and juvenile depth range, it is unlikely that listed rockfish use or occupy the Point Hudson jetties in their current state. More information about species presence/absence documented by the REEF surveys is in the Essential Fish Habitat Assessment (Section 3 of this document). For these reasons, we consider presence during the two years of work (with a reduced work window to accommodate larval rockfish settlement – see below) unlikely and exposure and response to temporary effects are discountable. Similarly, as decades of observation have not indicated presence of either of these listed species, we believe their exposure to the permanent effects of the project is also discountable.

Because the South Jetty has been identified by the area WDFW biologist as an active juvenile rockfish settlement and nursery area, a restricted work window (September 15 to January 15) applies to this Jetty. (WAC 220-660-330). This will further protect any larval and juvenile yelloweye and bocaccio, though their presence is unlikely.

2.12.3 Yelloweye Critical Habitat

Because PS/GB yelloweye habitat begins approximately 350 ft from the proposed action (within the action area), effects to critical habitat are expected to only be temporary noise associated with pile driving and will return to background conditions following construction. The depth as well as distance from driving will attenuate sound levels such that no significant change is expected to any PBFs. For these reasons, we expect response to critical habitat to sound exposure is insignificant. Turbidity and siltation from maintenance dredging is expected to attenuate at a maximum of 300 ft from the dredge location, and therefore is not expected to diminish the value of PS/GB yelloweye critical habitat.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

3.1. Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in Section 1 of this document.

The action area, including the area directly impacted by the replacement structures and dredging includes Essential Fish Habitat for 1) Coastal Pacific Salmonids 2) Coastal Pelagic Species and 3) Groundfish. The PFMC described and identified EFH for Pacific coast groundfish (PFMC 2005), Pacific salmon (PFMC 2014), and coastal pelagic species (PFMC 1998). In addition, estuarine habitats within the action area are considered a habitat area of particular concern (HAPC). HAPCs are identified for groundfish at and immediately adjacent to the project location are **estuary, habitat associated with canopy-forming kelp, rocky reef, and seagrasses.** HAPCs for salmon are **estuaries, and submerged aquatic vegetation.** There are no designated HAPCs for coastal pelagic fishes. See section 2.3 above in the ESA consultation for detailed information regarding the habitat currently present at Point Hudson.

Port Townsend Bay supports a wide variety of demersal fish. Otter trawls conducted in June of each year over a 10 year period recovered a total of 73 fish species.

Of these, the most abundant species in the bay was Pacific tomcod. Other relatively abundant species included snake prickleback, Pacific herring, walleye pollock, **English sole**, ribbed sculpin, **flathead sole**, blackbelly eelpout, Pacific sand dab, and spotted ratfish (CH2MHILL 2006). Other species observed in the vicinity included sand lance; perch; gunnel; **starry flounder**; chum, **pink, and Chinook salmon**; and coastal cutthroat trout.

In the 2009 WDFW report, The Biology and Assessment of Rockfishes in Puget Sound, distribution of rockfishes found in the Port Townsend area included copper, black, yellowtail, all EFH species. These have been verified to occur at Point Hudson by REEF surveys.

Reef Environmental Education Foundation (REEF) has a database of 205 total species surveys conducted via SCUBA and snorkelers at the Point Hudson jetty from 1993 to 2021 (REEF 2021). Over all the surveys, **135** fish and invertebrates species have been recorded in 205 total surveys. This shows the high species diversity associated with this survey site.

<u>EFH Groundfish observed by divers at Point Hudson</u>

Black Rockfish
Brown Rockfish
Cabezon - Sculpin
Canary Rockfish
Copper Rockfish
Pacific Sanddab - Lefteye Flounder
Quillback Rockfish - Scorpionfish
Spotted Ratfish - Chimaera
Southern Rock Sole
English Sole - Righteye Flounder
Lingcod - Greenling
Pacific Cod
Starry Flounder - Righteye Flounder
Vermilion Rockfish - Scorpionfish
Yellowtail Rockfish - Scorpionfish

EHF Coastal Pelagic species observed by divers at Point Hudson

Northern Anchovy

EFH Salmonid species observed by divers at Point Hudson

Juvenile Salmonid (sp. unknown)

Pelagic Fishes

Port Townsend Bay and nearby Kilisut Harbor are important spawning areas for Pacific herring, sand lance, and surf smelt. Herring spawning in the vicinity is referred to as the Kilisut Harbor stock. The herring pre-spawning holding area is in the deep central portion of Port Townsend Bay. The known spawning season for this stock runs from early February to early April (Pentilla 2007). There are scattered surf smelt and sand lance spawning beaches within Port Townsend Bay.

The action area overlaps with documented forage fish spawning habitat. The nearest documented sand lance spawning occurs 0.5 miles south of Point Hudson, next to the Port Townsend Ferry Terminal. The nearest documented smelt spawning occurs across Port Townsend Bay, on Marrowstone Island. The nearest documented herring spawning occurs across Port Townsend Bay, off Indian Island. Herring pre-spawner holding is also documented in the middle of Port Townsend Bay. No forage fish spawning or holding habitat is documented within the area of enduring impacts of the breakwaters (WDFW Forage Fish Spawning Map, accessed Sept 2021).

3.2. Adverse Effects on Essential Fish Habitat

The project includes both detrimental and beneficial effects on EFH for Pacific Salmon, Groundfish, and Coastal Pelagics. The creosote removal at the site will reduce the amount of contamination in sediment and in the surrounding water column at the site. This benefits water quality, sediment quality, and prey quality.

Detrimental effects of the proposed project on EFH are detailed above is section 2 of this document. The features of essential fish habitat that are adversely affected include water quality, substrate quality, subaquatic vegetation, and preybase.

Water quality: is diminished by suspended sediment and low DO for up to 14 months over a 2 year period. An increase in PAH subsequent to pile removal will persist during pile removal, and for several minutes post-project.

Substrate quality: Dispersal of PAHs into adjacent substrate will occur with pile removal. this degradation is expected to persist at least 6 months, but be ameliorated within 3 years.

Subaquatic vegetation: See HAPCs, below.

Prey quality: Disruption of rocks will kill sessile organisms and it is expected to take several years for animals to recolonize rocks on the replacement jetty and sediment nearby. Some rocks may be reused from the original structure and these will likely be recolonized more quickly. A study in False Bay, South Africa, found that artificial substrate planted in the bay was colonized within nine months, albeit with primarily pioneer species (Henschel et al. 1990). Species dynamics may also change at Point Hudson as a result of the disturbance and removal of colonized rocks. Manual relocation of some rocks from the old North Jetty into deeper waters near the South Jetty, as part of this project, will help provide temporary refuge for mobile organisms and possible recolonization populations that will expedite population recovery post-construction. Sessile and slow organisms (such as anemones and nudibranchs) attached to South Jetty rocks may be relocated in a volunteer effort led by the Port Townsend Marine Science Center and WDFW.

HAPCs

Estuary (Salmon and Groundfish) - The replacement structures will continue to directly constrain estuary habitat for groundfishes and salmonids by placing fill in a large area that would otherwise be estuarine and intertidal.

Canopy-Forming Kelp (Groundfish)- These kelp attach to rocky substrates. Several canopy forming kelp genera are documented at Point Hudson. Replacement of the structures will not remove pieces of rock substrate from the original structures that have fallen substantially away from the jetties. The new design will consist of a combination of old and new rocks. Rock from the North Jetty will be placed to the south of the South Jetty during construction. This rock may act as new substrate for kelp to adhere to. This HAPC will be maintained in the long term.

Rocky Reef (Groundfish) - Rocks at the site are associated with original quarry rocks fallen away from the jetty. The man made structures at Point Hudson serve as habitat for sub-adult and adult lingcod and rockfish. These will be maintained and several more rocks will be introduced from the North Jetty relocation.

Seagrass and other submerged aquatic vegetation (Salmon and Groundfish) - large seagrass beds are near/adjacent to the jetties at Point Hudson. These seagrass beds will continue to be inhibited by the presence of the jetty structures, the bulkhead, and continued existence of the navigation channel. The man made structures at Point Hudson serve as habitat for subadult and adult lingcod and rockfish, potential predators for other larval groundfish. The replacement structures will continue to directly and indirectly constrain areas of seagrass and lower-shore-zone habitat that would otherwise be capable of supporting SAV. During construction, SAV up to 300 ft from the action area may be eliminated due to disturbance and increased turbidity and siltation.

Reduced SAV associated with the continued existence of these structures also constrains habitat for larval rockfish, which in their pelagic stage rely on free-floating algae, seagrass, and kelp SAV for prey and cover for several months (Shaffer et al. 1995, Love et al. 2002). Seagrass will be unable to establish in areas that it would otherwise normally exist and will not contribute as a source of free-floating SAV .

3.3. Essential Fish Habitat Conservation Recommendations

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

1) Coordinate with REEF divers to document and monitor the rock relocation from the North Jetty to the deeper water near the South Jetty. Identify and photograph genera/species on the rocks at the time of removal, and monitor the species present on and around them during future dive surveys. Provide a summary memo of the results to NMFS 1 year and 5 years following the completion of construction.
2) Coordinate with applicable volunteer groups to document and monitor the relocation of sessile organisms from jetty rocks. Provide a summary including the relocation site used and survival rates by species to NMFS 1 year following the completion of relocation. Display the effort and results in a public outreach forum in some way, such as in a news article, Marine Science Center display, or presentation open to the public.
3) To reduce adverse alteration of substrate and forage:
    a) Confine the dredge prism to the minimum area necessary, and within the current official federal channel boundaries;
    b) Limit sediment removal to the minimum necessary to achieve project goals;
    c) Place any logs, root wads, or other woody debris that are removed during dredging in a suitable location in the water outside the navigation channel so they can continue to provide refuge and habitat

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, fo*r* Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species.

3.4. Statutory Response Requirement

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

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

3.5. Supplemental Consultation

USFWS 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)).

If you have specific FWCA recommendations, include the following section. Numbering may change, depending upon inclusion of EFH consultation.

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the USFWS. Other interested users could include the Port of Port Townsend, the citizens of Point Hudson, WDFW, and the Port Townsend Marine Science Center, and REEF survey coordinators. Individual copies of this opinion were provided to the USFWS and the Port of Port Townsend. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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6. APPENDIX A: FINAL PUGET SOUND NEARSHORE HABITAT CONSERVATION CALCULATOR COMPLETED FOR POINT HUDSON

Final Calculator Completed for Point Hudson WCRO-2021-00301

Blue cells contain Section Headings
Rose cells contain questions that need to be answered to fill out calculator.
Grey cells contain units requested for entry.
Yellow cells indicate user entry fields.
Green cells contain additional explanations and resource links.
Maroon cells contain summary values.

Action Agency Reference #	REINI 2016-4573 (USFWS project)
FWS or NMFS #	WCRO-2021-00301
Project Name	Port Townsend Point Hudson Breakwater
Prepared on and by:	Nissa Rudh 7/12/2021 Updated based on Table 1 and Heidi Nelson Email numbers on 8/12/2021

Puget Sound Nearshore Conservation Calculator

Version: 3/10/2021

This calculator estimates conservation points for the Puget Sound nearshore.

		Conservation Credits/Debits	DSAYs	Notes
Overwater Structures	Debit	0	0.00	
	Credit	911	9.11	Includes credits from creosote removal
	Balance	911	9.11	
Shoreline Armoring	Debit	-194	-1.94	
	Credit from Armor Removal	64	0.64	
	Credit from Creosote Removal	0	0.00	
	Balance	-129	-1.29	
Maintenance Dredging	Balance	-17	-0.17	
Boatramps, Jetties, Rubble	Debit	-362	-3.62	
	Credit	133	1.33	
	Balance	-230	-2.30	
Boatramps, Jetties, Rubble #2	Debit	-406	-4.06	
	Credit	137	1.37	
	Balance	-270	-2.70	
Beach Nourishment	Credit	0	0.00	
Riparian Enhancement/Degradation	Conservation Points	0	0.00	
Total Points		265	2.65	

Project Details Tab

We included the project details tab to encourage users to detail the metrics needed to fill out the calculator worksheets here.
Record where you found the relevant information (JARPA, BE, other)
If you have to perform calculations like determining the average elevation of the toe of hard armoring, explain details here.

Port Townsend Point Hudson Breakwater WCRO-2021-00301 REINI 2016-4573
Project Notes
Nissa Rudh 07/12/2021
Location:
48.11617 -122.75
J:\ESA - MSA - HCPs\ECO\1514-22 ESA-MSA\2021\DOI\USFWS\WCRO-2021-00301_REINI 2016-4573 Point Hudson Breakwater
Project Description:

Replace the dilapidated Point Hudson breakwater within the footprint of the existing breakwater and designated navigation channel. The project will include the removal of 829 creosote treated piles, installation of new steel piles, removal and replacement of the existing breakwater, removal and replacement of shoreline armoring, and dredging within the existing navigation channels.

Table 2. Changes to Authorized Project Actions

2016 Authorized Action	2020 Updated Proposed Action
Removal and disposal of more than 827 (76,000 square feet (SF)) creosote-treated timber piles	No change
Removal and re-use or disposal of 8,890 cubic yards (CY) (15,600 SF) of breakwater fill rock	Removal and disposal of 7,826 CY (17,315 SF) of breakwater and bulkhead rocky materials
Removal and disposal of 328 CY rock armor and debris	Removal and disposal of 588 CY of rock armor and debris along adjacent shorelines
Dredging to remove 2,310 CY of sediment from limited areas at the base of the breakwater	Dredging to remove 1,045 CY of sediment in the navigation channels surrounding the breakwaters
Installation of 109 steel pipe piles (footprint of 810 SF) and 572 linear feet (LF) of sheet piling (footprint of 18 square feet) to replace existing breakwater jetties	Installation of 416 steel pipe piles (footprint of 417 SF) and 0 LF of sheet piling to replace existing breakwater jetties.
Addition of soldier pile wall (77.5 LF) for abrasion protection on north jetty	Eliminated from project
Addition of 2,185 CY (4,680 SF) rock armoring at limited locations along breakwater	Addition of 6,427 CY of armor stone and 2,257 CY of bedding stone below HTL within the breakwaters and adjacent shorelines
Addition of 5,250 SF of concrete pile cap on the breakwater	Eliminated from project
Replacement of breakwater bulkhead at end of south jetty	The bulkhead will have an increase in area of approximately 91 SF within the marina compared to the 2016 design
Reconfiguration of approximately 85 LF of the north jetty from one right angle to two obtuse angles and shortening by approximately 20 LF	North jetty (breakwater) will be reconstructed to one right angle. North breakwater will be shortened in its extent toward the southern jetty by approximately 12 feet. The northern breakwater structure is 7 feet shorter than the 2016 design. The southern breakwater will be approximately 5 feet longer than the 2016-authorized design.
Recovery of approximately 16,500 SF of natural habitat at Point Hudson through removal of breakwater structures	Recalculations show that total removal of the breakwaters will include 17,315 SF of rock and debris below HTL. The new breakwater footprints will be 14,444 SF in area.

Site Specific Factors:

Natal Estuary: No

Pocket beach/embayment: No

Smelt or Sand lance: No

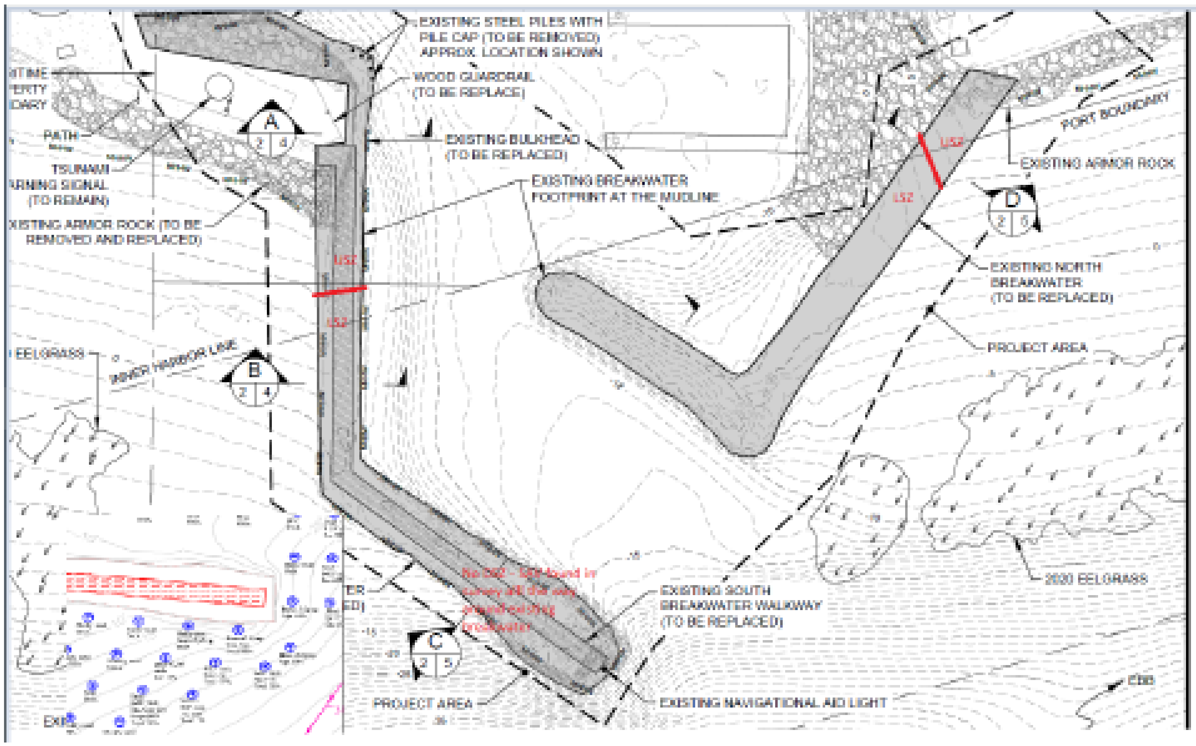
Drift Cell: No

Herring spawning: No

SAV?

Survey conducted by Jen-Jay in Aug 2020

Some areas with high veg cover, including kelp and eelgrass around the structures. Assigning a LSZ score of 2 (25-75% cover) and a USZ of 1 (5-30% cover)



Shore zones shown in red.

<u>Calculator:</u>

<u>Creosote piles</u>

Remove and replace Batter Piles – Piles are acting as breakwater/jetty. Therefore remove and replace them as a part of the whole jetty structure. Still get credit for creosote tonnage.

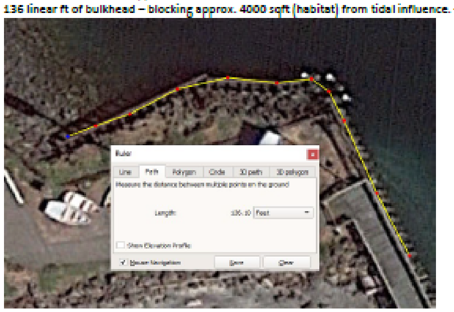
Creosote – 827 creosote treated timber piles – 76,000 sqft
Need to approximate tonnage. Sqft does not help here.
Widener and Associates – each pile is 14" dia x 30 ft long = 506 tons total. I am using this number. (Caveat – if this is an overestimate of creosote, the applicant may have to find additional conservation offsets after the consultation is complete – NMFS requires dump receipts showing creosote tonnage)
506 tons divided between shore zones – approximately 90% LSZ, 10% USZ based on aerial photography.
506*.9= 455.4 in LSZ
506*.1= 50.6 in USZ

Replace North Breakwater (Jetty) Second Jetty Tab
Dimensions for N Jetty using provided by USFWS. See notes and table 1 below
Removal
Total sqft = 8006 (from table below – structural excavation), Length 260
Width = 30.79
18% of total in USZ (approximated using plan drawing)
    1441 sqft in USZ
USZ must be in L and W
    1441 = 46.8x 30 in USZ
82% in LSZ
    6565 sqft in LSZ
Install
Total sqft = 7939 (from table below – bedding layer + armor stone), Length 250
Width = 31.76
10% of total in USZ
    794 sqft in USZ
USZ must be in L and W
    794 = 25 x 31.7 in USZ
90% in LSZ
    7145 sqft in LSZ

Replace South Breakwater (Jetty AND Bulkhead)
Divided jetty and BH up as shown in picture. – Where shoreline armoring begins

South Jetty
Dimensions for S Jetty using provided by USFWS. See notes and table 1 below
Removal
Total sqft = 8122 (from table below – structural excavation), Length 255
Width = 31.85
10% of total in USZ
    812 sqft in USZ
USZ must be in L and W
    812 = 25.5 x 3: in USZ
90% in LSZ
    7310 sqft in LSZ
Install
Total sqft = 9855 (from table below – bedding layer + armor stone), Length 262
Width = 37.61
18% of total in USZ
    1774 sqft in USZ
USZ must be in L and W
    1774 = 47.17 x 3 in USZ
82% in LSZ
    8081 sqft in LSZ

South Bulkhead
Remove and replace vertical bulkhead in Calculator.
Anything above red line – starting where the revetment meets the walkway and wrapping around that point.
Method for Bulkhead – approximated habitat loss due to BH – then back-calculated the SD based on that sqftage of habitat cut off. Equally assigned SDs to USZ1 and USZ2.
136 linear ft of bulkhead – blocking approx. 4000 sqft (habitat) from tidal influence. – using this sqft to approximate the slope distance for shore zones



If 136 linear ft – TOTAL slope distances for USZ1 and USZ2 will be 29 ft. (this accounts for 3944 sqft of habitat loss 29'x136')
Split the difference between USZ1 and USZ2 I assigned slope distances of 14.5' from toe to MHHW, and 14.5 ft from MHHW to HAT.

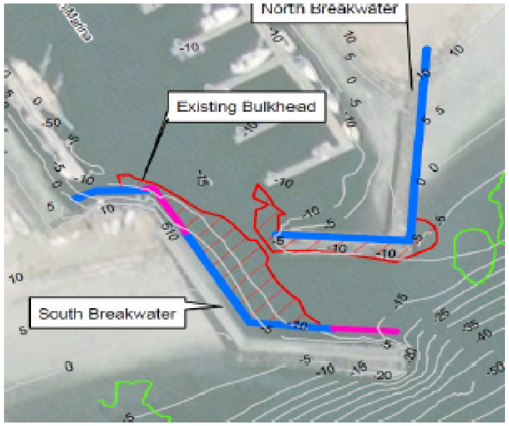
Dredging

Dredging to remove 1,045 CY of sediment in the navigation channels surrounding the breakwaters.

Dredge	Dredging	Navigation Channel - South Breakwater	-	-	714	6510	6510	-
		Navigation Channel - North Breakwater	-	-	331	3381	3381	-

Total 9891 sqft of dredging. Highly modified system, Lower Shore Zone.

Dredging in RED.



	SQFT
N Jetty	7939
S Jetty	9855
S Bulkhead	4000
Dredging	9891
	31685 Total square footage of habitat coverage of all replacement structures and dredging area

Met with USFWS Heidi Nelson. In a follow-up email, she submitted breakwater dimensions to clarify the project plans and refine the calculator:

Square footage confirmed by Heidi with the project engineer.

a. South

Existing:

- Height: Approximately 13' above mean low low water tidal elevation
- Width at top: The width varies from approximately 10.5' to 18.5 at the top of the breakwater. (roughly 13.1' average); Walkway width is 8'
- Width at bottom: Varies from 25' - 35' (roughly 30' average)
- Length: 255'

***from table below – total sqft = 8122

New:

- Height: 16' above mean low low water tidal elevation
- Width at top: 10' width at the top of the breakwater; New walkway width is 8'
- Width at bottom: Varies from 25' - 35' (roughly 30' average)
- Length: 250'

*** from table below – bedding layer + armor stone sqft = 7939

b. North

Existing:

- Height: Approximately 13' above mean low low water tidal elevation
- Width at top: The width varies from approximately 10' to 18.5 at the top of the breakwater. (roughly 13.6' average); No walkway
- Width at bottom: Varies from 25' - 35' (roughly 30' average)
- Length: 260'

*** from table below total sqft – 8006

New:

- Height: 16' above mean low low water tidal elevation
- Width at top: 10'
- Width at bottom: Varies from 25' - 35' (roughly 30' average)
- Length: 262'

The proposed will have the same right angle as the existing.

*** from table 3 below – bedding layer + armor stone sqft = 9855

Table 3. Summary of Work Elements and Proposed Quantities (Mott Macdonald 2020)

	Work Task	Work Item	Above HTL		Below HTL		Total Area (SF)	No.
			Volume (CY)	Area (SF)	Volume (CY)	Area (SF)		
South Breakwater & Bulkhead	Demolition & Excavation	Timber Piles – South Breakwater	-	-	-	194	**194**	**320**
		Armor Stone – South Breakwater	-	-	1560	5350	**5350**	-
		Structural Excavation - South Breakwater	-	-	1838	8122	**8122**	-
		Timber Piles – South Bulkhead	-	-	-	122	**122**	**151**
		Temporary Shoring - 110 Linear Feet	-	-	-	-	-	**1**
		Structural Excavation - South Bulkhead	404	1292	184	1187	**2478**	-
	Replacement	12.75" Dia. Steel Piles – South Breakwater	-	-	-	111	**111**	**125**
		16" Dia. Steel Piles – South Breakwater	-	-	-	56	**56**	**40**
		Armor Stone – South Breakwater	89	-	3035	4799	**4799**	-
		Bedding Layer – South Breakwater	294	1339	1307	1801	**3140**	-
		Beach Compatible Material - South Breakwater	-	-	446	3649	**3649**	-
		12.75" Dia. Steel Piles - South Bulkhead	-	-	-	43	**43**	**31**
		16" Dia. Steel Piles – South Bulkhead	-	-	-	32	**32**	**23**
		Armor Stone – South Bulkhead & Shoreline Protection	79	530	37	961	**1491**	-
		Bedding Stone – South Bulkhead & Shoreline Protection	79	1349	26	1591	**2940**	-
		Geotexile Fabric - South Bulkhead & Shoreline Protection	-	1864	-	5749	**7613**	-
North Breakwater & Shoreline Protection	Demolition & Excavation	Timber Piles – North Breakwater	-	-	-	287	**287**	**356**
		Armor Stone – North Breakwater	421	-	1734	4960	**4960**	-
		Structural Excavation - North Breakwater	-	-	1685	8006	**8006**	-
		Structural Excavation - Shoreline Protection	152	-	436	1313	**1313**	-
	Replacement	12.75" Dia. Steel Piles – North Breakwater	-	-	-	175	**175**	**197**
		Armor Stone – North Breakwater	-	-	3276	8684	**8684**	-
		Bedding Layer – North Breakwater	-	-	866	1171	**1171**	-
		Beach Compatible Material - North Breakwater	-	-	415	3360	**3360**	-
		Armor Stone – Shoreline Protection	168	646	79	672	**1318**	-
		Bedding Stone– Shoreline Protection	173	-	58	-	-	-
		Geotexile Fabric - Shoreline Protection	-	-	-	2688	**2688**	-
Dredge	Dredging	Navigation Channel - South Breakwater	-	-	714	6510	**6510**	-
		Navigation Channel - North Breakwater	-	-	331	3381	**3381**	-

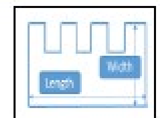
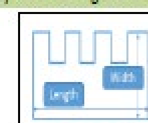
Impact and Benefit Determination for Overwater Structure Elements

To expand an entry block for data entry click on the + sign on the left. Clicking the 2 will expand all entry blocks.

Version: 3/10/2021

Entry Block I: Overwater structure Entry for New or Expansion Overwater Structure Elements

Enter new overwater structure elements in this entry block and all areas that are considered expansions with replacements. Enter replacement overwater structure elements in Entry block II below.

Section	Description	OWS Element	Units	Quantity	Total Conservation Debits	Notes and Examples
SAV	Must enter vegetation scenario for LSZ	Enter LSZ SAV scenario 0-3		0	Reference: LSZ SAV Scenarios	Addition of USZ vegetation scenarios planned for next version
Pier and Ramp to be Installed	Enter dimensions of elevated pier and ramp in respective shore zone. If a pier has partial grating, enter dimensions of grated and ungrated portions into respective fields. Enter central portions of piers wider than 40 feet as floats as there is little side lighting in such structures.	Pier & Ramp USZ fully grated	SqFt	0	0.00	To account for the dark center on wide decks, enter the deck area within 20 feet from the edge as pier, and enter the deck area more than 20 feet from the edge as a float. See Figure below. FYI: Forage fish credit factors do not apply to piers and ramps. Figure by Lee Corum (USFWS)
		Pier & Ramp USZ solid	SqFt	0	0.00	
		Pier & Ramp LSZ fully grated	SqFt	0	0.00	
		Pier & Ramp LSZ solid	SqFt	0	0.00	
		Pier & Ramp DZ fully grated	SqFt	0	0.00	
	Reference: Delineation of Shore Zones	Pier & Ramp DZ solid	SqFt	0	0.00	
Piles	Piles can be steel, concrete, plastic, untreated wood or, outside of DNR land, ACZA-treated and urea coated piles. Installation of creosote wood is not included. Use pile calculator below to determine average pile diameter.	Enter number of piles in USZ		0	0.00	
		Enter average diameter of piles in USZ.	[inches]	0		
		Enter number of piles in LSZ		0	0.00	
		Enter average diameter of piles in LSZ.	[inches]	0		
		Enter number of piles in DZ		0	0.00	
		Enter average diameter of piles in DZ.	[inches]	0		
Grated Float to be Installed	Enter the outside dimensions of new floats with at least 50% grating and 60% or more open space as grated floats (Compliant with WAC 220-660-280). For simplicity and as we expect floats to meet state regulations, grated floats are not split between grated and ungrated portions. For complex floats, enter the longest outside dimensions of the float. See Example Complex Float 1.	USZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0	Enter length and width of floats for buffer determination. Lenth is the longer dimension. For complex floats, enter the sum of the length of each float and the average width of the floats. Set length and width to 0 for zones where no structure present.	 Example Complex Float
			Width [feet]	0		
		LSZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0		
			Width [feet]	0		
		DZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0		
			Width [feet]	0	Reference: Complex Floats	Buffer Area
	The area of the float in each respective shore zone is calculated from length and width entered above. For complex floats, the user should directly enter the square footage of the float in the appropriate zone. BMP: Floats should not be located in the USZ and cannot ground out.	Grated Float USZ	SqFt	0	0.00	- For complex floats the calculated SqFt will not match the actual SqFt. Enter SqFt manually in column E.
		Grated Float LSZ	SqFt	0	0.00	-
		Grated Float DZ	SqFt	0	0.00	- Floats in the DZ in herring spawning & holding areas may have herring factor applied.
Solid Float to be Installed	Solid float have higher adverse effects on the nearshore environment compared to grated floats. We highly encourage applicants to grate overwater structures as much as possible. Because of the higher impacts from solid floats compared to grated floats, resulting conservation debits are higher. Enter the length and width of the float in the appropriate shore zone (see Table 2). For complex floats, enter longest outside dimensions of float. See Example Complex Float 1.	USZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0	Enter length and width of floats for buffer determination. For complex floats, enter the sum of the length of each float and the average width of the floats. Set length and width to 0 for zones where no structure present.	 Example Complex Float
			Width [feet]	0		
		LSZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0		
			Width [feet]	0		
		DZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0		
			Width [feet]	0	Reference: Complex Floats	Buffer Area
	The area of a new float is calculated by shore zone from the length and width entered above. For irregularly shaped floats, enter the square footage of the float in the appropriate zone (see Notes for more information on irregularly shaped floats). BMP: Floats should not be located in the USZ and cannot ground out.	Solid Float USZ	SqFt	0	0.00	0 For complex floats the calculated SqFt will not match the actual SqFt. Enter SqFt manually in column E.
		Solid Float LSZ	SqFt	0	0.00	0
		Solid Float DZ	SqFt	0	0.00	0 Floats in the DZ in herring spawning & holding areas may have herring factor applied.
Sub-Total: Conservation Debits Owed for New Structure Elements					0.00	

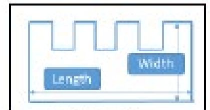
Reference: Delineation of Shore Zones

Entry Block II: Overwater Entry Block for Repair and Replacement of Overwater Structure Elements

Enter replacement and repair of overwater structure elements in this entry block. Enter areas that are considered expansions of the to be replaced structure in Entry Block I above.

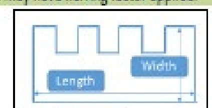
SAV	Must enter vegetation scenario for LSZ	Enter SAV scenario 0-3	1	Reference: LSZ SAV Scenarios	

	Description	OWS Element	Units	Quantity	Conservation Debits	Notes and Examples
Pier and ramp to be installed	Enter dimensions of elevated pier and ramp in respective shore zone. If a pier has partial grating, enter dimensions of grated and ungrated portions into respective fields. Enter central portions of piers wider than 40 feet as floats as there is little side lighting in such structures.	Pier & Ramp USZ fully grated	SqFt	0	0.00	To account for the dark center on wide decks, enter the deck area within 20 feet from the edge as pier, and enter the deck area more than 20 feet from the edge as a float. See Figure below. FYI: Forage fish credit factors do not apply to piers and ramps. Figure by Lee
		Pier & Ramp USZ solid	SqFt	0	0.00	
		Pier & Ramp LSZ fully grated	SqFt	0	0.00	
		Pier & Ramp LSZ solid	SqFt	0	0	
		Pier & Ramp DZ fully grated	SqFt	0	0.00	
	Reference: Delineation of Shore Zones	Pier & Ramp DZ solid	SqFt	0	0.00	
Piles	Piles can be steel, concrete, plastic, untreated wood or, outside of DNR land, ACZA-treated and urea coated piles. Installation of creosote wood is not included. Use pile calculator below to determine average pile diameter.	Enter number of piles in USZ		0	0.00	
		Enter average diameter of piles in USZ.	[inches]	0		
		Enter number of piles in LSZ		0	0.00	
		Enter average diameter of piles in LSZ.	[inches]	0		
		Enter number of piles in DZ		0	0.00	
		Enter average diameter of piles in DZ.	[inches]	0		
Grated Float to be installed	Enter the outside dimensions of replacement floats with at least 50% grating and 60% or more open space as grated floats (Compliant with WAC 220-660-280). For simplicity and as we expect floats to meet state regulations, grated floats are not split between grated and ungrated portions. For complex floats, enter the longest outside dimensions of the float. See Example Complex Float 1.	USZ Outside dimensions of replacement float.	Length [feet]	0	Enter length and width of floats for buffer determination. For complex floats, enter the sum of the length of each float and the average width of the floats. Set length and width to 0 for zones where no structure present.	
			Width [feet]	0		
		LSZ Outside dimensions of replacement float.	Length [feet]	0		
			Width [feet]	0		
		DZ Outside dimensions of replacement float.	Length [feet]	0		
			Width [feet]	0	Reference: Complex Floats	Buffer Area



Example Complex Float 1

	Description	OWS Element	Units	Quantity	Conservation Debits		Notes and Examples
Grated Float	The area of the float in each respective shore zone is calculated from length and width entered above. For irregularly shaped floats, user should directly enter the square footage of the float in the appropriate zone (see Notes for more information on irregularly shaped floats). BMP: Floats should not be located in the USZ and cannot ground out.	Grated Float USZ	SqFt	0	0.00		0 For complex floats the calculated SqFt will not match the actual SqFt. Enter SqFt manually in column E.
		Grated Float LSZ	SqFt	0	0.00		0
		Grated Float DZ	SqFt	0	0.00		0 Floats in the DZ in herring spawning & holding areas may have herring factor applied.
Solid Float to be installed	Solid float have higher adverse effects on the nearshore environment compared to grated floats. We highly encourage applicants to grate overwater structures as much as possible. Because of the higher impacts from solid floats compared to grated floats, resulting conservation debits are higher. Enter the length and width of the float in the appropriate shore zone (see Table 2). For complex floats, enter longest outside dimensions of float. See Example Complex Float 1	USZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0	Enter length and width of floats for buffer determination. For complex floats, enter the sum of the length of each float and average width of floats. Set length and width to 0 for zones where no structure present.		
			Width [feet]	0			
		LSZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0			
			Width [feet]	0			
		DZ Outside dimensions of new float or expanded portion of float.	Length [feet]	0			
			Width [feet]	0	Reference: Complex Floats	Buffer Area	
	The area of a float is calculated by shore zone from the length and width entered above. For irregularly shaped floats, enter the square footage of the float in the appropriate zone (see Notes for more information on irregularly shaped floats). BMP: Floats should not be located in the USZ and cannot ground out.	Solid Float USZ	SqFt	0	0.00		0 For complex floats the calculated SqFt will not match the actual SqFt. Enter SqFt manually in column E.
		Solid Float LSZ	SqFt	0	0.00		0
		Solid Float DZ	SqFt	0	0.00		0 Floats in the DZ in herring spawning & holding areas may have herring factor applied.
	Sub-Total: Conservation Debits Owed for Replacement Structure Elements				0.00		



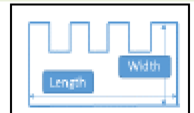
Example Complex Float 1

Debit Factors associated with Installation of OWS

	Site Specific Debit Factors for OWS Installation	Percent more credit		Notes and Examples
For new, expansion, or replacement projects	Is the project located within 5 miles of a Puget Sound Chinook natal estuary zone or within 1 mile of a Hood Canal summer-chum estuary zone? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Application of Credit Factors. Projects located within a natal Chinook or HC summer chum estuary zone will owe 50% more debits. If a project is in a pocket estuary and within a natal Chinook or HC summer chum estuary zone, a combined 90% more debits apply.
	Is the project is located within a pocket estuary/embayment? Puget Sound Natal & Pocket Estuaries	No	0%	Projects located within a pocket estuary/embayment owe 30% more conservation debits. If the pocket estuary is within 5 miles of a natal Chinook estuary, 40% more debits apply.
	Is there observed (as mapped or determined by WDFW) sand lance or surf smelt spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply to forage fish affecting action elements.
	Is there herring spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply to forage fish affecting action elements.

Entry Block III: Overwater Entry Block for Removal, Removal as Part of Replacements, and Repair of Overwater Structure Elements

Determine benefits from both structures to be removed as part of replacements or from structures in close proximity to be removed as mitigation for new structures.

Section	Description	OWS Element	Units	Quantity	Conservation Credits for removal of Existing Structures	Notes and Examples
SAV	Must enter vegetation scenario for LSZ	Enter SAV scenario 0-3		0	Reference: LSZ SAV Scenarios	
	Description	**OWS Element**	**Units**	**Quantity**	**Conservation Credits for removal of Existing Structures**	**Notes and Examples**
Pier and Ramp to be Removed	Enter dimensions of elevated pier and ramp in respective shore zone. If a pier has partial grating, enter dimensions of grated and ungrated portions into respective fields. Enter central portions of piers wider than 40 feet as floats as there is little side lighting in such structures.	Pier & Ramp USZ fully grated	SqFt	0	0.00	To account for the dark center on wide decks, enter the deck area within 20 feet from the edge as pier, and enter the deck area more than 20 feet from the edge as a float. See Figure below. FYI: Forage fish credit factors do not apply to piers and ramps.
		Pier & Ramp USZ solid	SqFt	0	0.00	
		Pier & Ramp LSZ fully grated	SqFt	0	0.00	
		Pier & Ramp LSZ solid	SqFt	0	0.00	
		Pier & Ramp DZ fully grated	SqFt	0	0.00	
	Reference: Delineation of Shore Zones	Pier & Ramp DZ solid	SqFt	0	0.00	
Piles to be removed	Include all piles to be removed including creosote. The amount of creosote is credited separately below. Use pile calculator below to determine average pile diameter.	Enter number of piles in USZ		0	0.00	
		Enter average diameter of piles in USZ.	[inches]	0		
		Enter number of piles in LSZ		0	0.00	
		Enter average diameter of piles in LSZ.	[inches]	0		
		Enter number of piles in DZ		0	0.00	
		Enter average diameter of piles in DZ.	[inches]	0		
Creosote Removal	Creosote removal: Enter tons of creosote to be removed including all in- and over water creosote between HAT and -30 meters. Usually a 70-ft long 12-inch average diameter pile weighs about 1 ton. A volume calculator is provided below.	Tons of Creosote to be removed in USZ	Total in tons	50.6	91.08	Benefit duration for creosote removal is 100 years. Absent removal of piles, we assume that derelict piles on average break off after 40 years. Thus site specific credit factors apply for 40 years, only.
		Tons of Creosote to be removed in LSZ & DZ	Total in tons	455.4	819.72	
Grated Float to be Removed	Enter the outside dimensions of to be removed or replaced floats with at least 50% grating and 60% or more open space as grated floats (Compliant with WAC 220-660-280). Grated floats are not split between grated and ungrated portions. For complex floats, enter the longest outside dimensions of the float. See Example Complex Float 1.	USZ Outside dimensions of float area	Length [feet]	0	Set length and width to 0 for zones where no structure present.	 Example Complex Float 1
			Width [feet]	0		
		LSZ Outside dimensions of float area.	Length [feet]	0		
			Width [feet]	0		
		DZ Outside dimensions of float area.	Length [feet]	0		
			Width [feet]	0		Buffer Area
	The area of a float in each shore zone is calculated from the length and width entered above. For irregularly shaped floats, enter the square footage of the float directly in the appropriate zone. BMP: Floats should not be located in the USZ and cannot ground out.	Grated Float USZ	SqFt	0	0.00	0 For complex floats the calculated SqFt will not match the actual SqFt. Enter SqFt manually in column E.
		Grated Float LSZ	SqFt	0	0.00	0
		Grated Float DZ	SqFt	0	0.00	0 Floats in herring spawning and holding areas may have herring spawning factor applied.
Solid Float to be Removed	Enter the length and width of the to be removed or replaced float in the appropriate zone. For complex floats, enter the longest outside dimensions of the float. See Example Complex Float 1	USZ Outside dimensions of solid float.	Length [feet]	0	Set length and width to 0 for zones where no structure present.	Enter length and width of floats for buffer determination. For complex floats, used sum of length of each float and average width of floats .
			Width [feet]	0		
		LSZ Outside dimensions of solid float	Length [feet]	0		
			Width [feet]	0		
		DZ Outside dimensions of solid float	Length [feet]	0		
			Width [feet]	0		Buffer Area
	The area of a float is calculated by shore zone from the length and width entered above. For irregularly shaped floats, enter the square footage of the float in the appropriate zone (see Notes for more information on irregularly shaped floats). BMP: Floats should not be located in the USZ and cannot ground out.	Solid Float USZ	SqFt	0	0.00	0 For complex floats the calculated SqFt will not match the actual SqFt. Enter SqFt manually in column E.
		Solid Float LSZ	SqFt	0	0.00	0
		Solid Float DZ	SqFt	0	0.00	0 Floats in herring spawning and holding areas may have herring spawning factor applied.
Sub-Total: Conservation Credits for Removal of Existing Structures					910.80	

Credit Factors associated with Removal of OWS - modified application for creosote removal

Credit Factors for Removals

Site Specific Credit Factors for OWS Removals	Percent more credit		Notes and Examples
Is the project located within 5 miles of a Puget Sound Chinook natal estuary zone or within 1 mile of a Hood Canal summer-chum estuary zone? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Application of Credit Factors Projects located within a natal Chinook or HC summer chum estuary zone will receive 50% more credits. If a project is in a pocket estuary and within a natal Chinook or HC summer chum estuary zone, a combined 90% more credits apply.
Is the project is located within a pocket estuary/embayment? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Explanation of Pocket Estuaries and Embayments Projects located within a pocket estuary or embayment owe/receive 30% more conservation debits/credits. If the pocket estuary is within a natal Chinook or Hood Canal summer chum estuary zone, 40% more debits/credits apply.
Is there observed (as mapped or determined by WDFW) sand lance or surf smelt spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more removal credits will be awarded to forage fish affecting action elements.
Is there herring spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with herring spawning, 50% more removal credits will be awarded to forage fish affecting action elements.

Average Diameter Pile Calculator

For projects with multiple piles and pile diameters use the entry area below to determine the average pile diameter. The average pile diameter will then be used above with the total number of piles proposed.

Piles to be removed

Description	Quantity	Pile Size: Diameter in inches
Number of piles with one diameter size	1	8
Number of piles with one diameter size	0	10
Number of piles with one diameter size	0	12
Number of piles with one diameter size	0	14
Number of piles with one diameter size	0	16
Number of piles with one diameter size	0	18
Number of piles with one diameter size (fill in diameter as needed)		
Number of piles with one diameter size (fill in diameter as needed)		
Total number of piles and average pile size	1	8.00

For projects with multiple piles and pile diameters use the entry area below to determine the average pile diameter. The average pile diameter will then be used above with the total number of piles proposed.

Piles to be installed

Description	Quantity	Pile Size: Diameter in inches
Number of piles with one diameter size	1	12
Number of piles with one diameter size	0	13
Number of piles with one diameter size	0	14
Number of piles with one diameter size	0	15
Number of piles with one diameter size	0	16
Number of piles with one diameter size	0	18
Number of piles with one diameter size (fill in diameter as needed)		
Number of piles with one diameter size (fill in diameter as needed)		
Total number of piles and average pile size	1	12.00

Pile Volume Calculator for Creosote Tonnage Estimation

Creosote Piles to be removed

Description	Quantity	Pile Diameter	Length of Pile	Volume (Cubic Feet)
Number of piles with same dimensions	1	12	70	54.98
Number of piles with same dimensions				0.00
Number of piles with same dimensions				0.00
Number of piles with same dimensions				0.00
Number of piles with same dimensions				0.00
Number of piles with same dimensions				0.00
Optional: Enter total volume of creosote material (non-pile) (cubic feet)				0.00
Total Volume of piles (cubic feet)				54.98
Creosote tonnage (1 ton per 55 cubic feet)	To be entered in Cell E100 and or E101			1.00

Impact and Benefit Determination for Shoreline Armoring

No mitigation is required for soft or hybrid stabilization, including pocket beaches. These features are not entered in this tab. Credits are generated by the removal of existing armoring. Enter vegetation changes associated with soft/hybrid armoring in the Riparian Zone tab.	Version: 3/10/2021

Replacements and New Installations

Site Conditions Landward of Hard Armoring up to HAT		
Description	Quantity in sqft	Notes
Enter SF of impervious, gravel, and sand area behind hard armoring and below HAT. If HAT is unknown, use area within 30 ft of bulkhead.	0.7	The conditions described here need to match the before conditions in the RZ tab if any changes in the RZ are proposed to be evaluated. Evaluate habitat improvements through tree or shrub planting in the riparian tab separately. This section assesses the value of the habitat rendered inaccessible to fish via armoring. The inputs here are used to determine percentage of each habitat type behind armoring and below HAT. Thus, if just one habitat type is present it is sufficient to enter a 1 into the respective row. If there is a 50% split of the area between two habitat types, enter a 1 into each row for respective habitat types. For more complicates scenarios enter respective SqFt.
Enter area with herbaceous vegetation like lawn behind hard armoring and below HAT. If HAT is unknown use area within 30 ft of bulkhead.	0.3	
Area with shrubs and trees behind hard armoring and below HAT. If HAT is unknown use area within 30 ft of bulkhead.	0	
Entry Block I: Armoring to be installed.		
Is this a replacement or repair? Enter "No" if a new structure is being installed	Yes	
Description	Quantity	Notes
Pick type of Shoreline Armoring to be installed	linear feet	Consider using soft and hybrid armoring to avoid habitat impacts. For definitions of soft and hybrid armoring see the User Guide.
How many linear feet of proposed armoring will be sloped and/or rock?	0	
How many linear feet of proposed armoring will be vertical armoring including concrete, sheet pile, or wood?	136	
Location: Slope Distance of Toe of Armoring Relative to MHHW	linear feet	See user guide for methods of determining slope distance and default slope distances per foot elevation.
Is the toe of the to be installed armoring at or below MHHW? Enter No if it is above.	Yes	
How many linear feet slope distance is the 'to be installed' armoring below or above MHHW. Enter 0 if toe of armoring is at MHHW.	14.5	
Distance between HAT and MHHW [ft slope distance]	14.5	Use 25 ft as default distance between HAT and MHHW if unknown. Source: NMFS determined average of 4 beach profiles, see calculator user guide for more information.
Pick cover type of upper intertidal vegetation waterward of existing or new armoring.		
Must enter USZ vegetation scenario	1	Reference: USZ vegetation scenarios
Conservation points owed for replacement shoreline armoring	-193.5190129	
Additional points owed for new shoreline armoring	0	

Removal of Existing Armoring

Entry Block II: Removal of Existing Armoring as Standalone Project or as Part of a Replacement or Repair		
Description	Quantity	Notes
Enter duration of site protection	Years	Due to expected sea level rise we cannot provide credit for durations longer than 50 years. Due to the way the model (Habitat Equivalency Analysis) uses time, entry values for time need to be > 0. 0 is an invalid entry.
Replacements: Default for replacement of exiting armoring is 10 years, If armor is non-functioning at time of permit application no removal credit is given for armor removal. Enter 0 below in C 27 and 28. Removals: Enter duration of easement or deed restriction. Enter 10 for none, 50 for in perpetuity.	10	
Pick type of Shoreline Armoring to be removed	linear feet	
How many linear feet of proposed armoring will be sloped and/or rock?	0	
How many linear feet of proposed armoring will be vertical armoring including concrete, sheet pile, creosote pile or wall? For creosote removal also enter quantity of creosote proposed to be removed below.	136	
Location: Slope Distance of Toe of Armoring Relative to MHHW	linear feet	
Is the toe of the to be removed armoring at or below MHHW? Enter No if it is above.	Yes	
How many linear feet slope distance is the 'to be removed' armoring below or above MHHW. Enter 0 if toe of armoring is at MHHW.	14.5	See user guide for methods of determining slope distance.
Distance between HAT and MHHW [ft slope distance]	14.5	Use 25 ft as default distance between HAT and MHHW if unknown. Source: NMFS determined average of 4 beach profiles.
Pick cover type of upper intertidal vegetation waterward of existing armoring.		
Must enter USZ vegetation scenario (See Table 2)	1	
Conservation points gained from old armor removal.	64.15746497	
Water Quality Benefits for Creosote removal.	tons of creosote	Conservation points for creosote removal
Enter tons of creosote associated with shoreline armoring to be removed. Usually a 70-ft long 12-inch average diameter pile weighs about 1 ton.	0	Reference: Pile Volume Calculator
Conservation points gained from creosote removal.	0.00	

Site Specific Credit and Debit Factors for Shoreline Armoring		Percent more credit/debit	Notes
Is the project located within 5 miles of a Puget Sound Chinook natal estuary zone or within 1 mile of a Hood Canal summer-chum estuary zone?			Reference: Application of Credit Factors

Crediting and Debiting Factors for Shoreline Armoring	Puget Sound Natal & Pocket Estuaries	No	0%	Projects located within a natal Chinook or HC summer chum estuary zone will receive 50% more credits. If a project is in a pocket estuary and within a natal Chinook or HC summer chum estuary zone, a combined 90% more credits apply.
	Is the project is located within a pocket estuary/embayment?	No	0%	Reference: Explanation of Pocket Estuaries and Embayments
	Puget Sound Natal & Pocket Estuaries			Projects located within a pocket estuary or embayment owe/receive 30% more conservation debits/credits. If the pocket estuary is within a natal Chinook or Hood Canal summer chum estuary zone, 40% more debits/credits apply.
	Is there observed (as mapped or determined by WDFW) sand lance or surf smelt spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits/credits apply.
	Is the armoring within the same drift cell and updrift of sand lance or surf smelt spawning on the project site? Coastal Atlas Map	No	0%	In areas updrift of forage fish spawning, 20% more conservation debits/credits apply if there is no forage fish spawning on site.
	Is the project located at a feeder bluff? Coastal Atlas Map	No	0%	For armoring at feeder bluffs, 50% more conservation credits/debits apply.
	Herring Spawning - Evaluate effects case by case. WDFW Forage Fish Spawning Map	No	0%	Is there herring spawning on the project site AND does the project affect herring spawning? Depending on the elevation of the shoreline armoring and other projects specific aspects, armoring may or may not affect herring spawning. If there is herring spawning on site, this determination will be made by a NMFS, USFWS, WDFWS, or COE biologist.
	Summary Credit/Debit Factor	1	1	Increases in debits/credits based on special habitat and site conditions. Some credits are multiplied others added depending on underlying biological relationships.

Impact Determination from Maintenance Dredging

		Version:	3/10/2021	
Dredging in USZ			Conservation Points	Notes
Dredged Area	Enter SqFt proposed to be dredged	-	0.00	50% more debits apply in areas with sand lance spawning
Dredging in LSZ			Conservation Points	
Must enter vegetation scenario for LSZ (See Table 1)	Enter SAV scenario 0-3	2		Reference: LSZ SAV Scenarios
Dredged Area	Enter SqFt proposed to be dredged	9,891.00	-16.91	50% more debits apply in areas with herring spawning
Dredging in DZ			Conservation Points	
Dredged Area	Enter SqFt proposed to be dredged	-	0	
Summary			-16.91	

Site Specific Debit Factors for Dredging		Percent more Debit	Notes
Is the project located within 5 miles of a Puget Sound Chinook natal estuary zone or within 1 mile of a Hood Canal summer-chum estuary zone?	No	0%	Reference: Application of Credit Factors
Puget Sound Natal & Pocket Estuaries			Projects located within a natal Chinook or HC summer chum estuary zone will receive 50% more credits. If a project is in a pocket estuary and within a natal Chinook or HC summer chum estuary zone, a combined 90% more credits apply.
Is the project is located within a pocket estuary/embayment?	No	0%	Reference: Explanation of Pocket Estuaries and Embayments
Puget Sound Natal & Pocket Estuaries			Projects located within a pocket estuary or embayment owe/receive 30% more conservation debits/credits. If the pocket estuary is within a natal Chinook or Hood Canal summer chum estuary zone, 40% more debits/credits apply.
Is there observed (as mapped or determined by WDFW) sand lance or surf smelt spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply.
Is there herring spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply.
Summary Debit Factor	1	1	Increases in debits/credits are based on special habitat and site conditions. Some credits are multiplied others added depending on underlying biological relationships.

Impact and Benefit Determination for Concrete Boat Ramps, Jetties, Concrete Rubble

To expand an entry block for data entry click on the + sign on the left. Clicking the 2 will expand all entry blocks. **Version:** 3/10/2021

Entry Block I: Entry for New and Expanded Elements of Existing Structures

Enter new boat ramps, jetties, and breakwaters in this entry block and all areas that are considered expansions of existing or proposed to be replaced structures. Enter replacement structure elements in Entry block II below.

Boat ramp Installation

		Description	Units	Quantity		
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See summary tab table 2). SAV after is 0.	Enter vegetation scenario 0-3	0	Reference: Delineation of Shore Zones	
	LSZ	Must enter LSZ vegetation scenario before installation (See summary tab table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	0		Reference: LSZ SAV Scenarios

		Description	Units	Quantity	Conservation Points	Notes
Boat ramp installation		Is this a Boat ramp installation? "No" indicates installation of concrete footings, or similar with no impact on water quality or shore drift (USZ).	yes/no	No		
	USZ	Pick type of upper intertidal vegetation before installation. Select 0 for replacements. Select "Yes" if saltmarsh vegetation cover is:				
		length of boat ramp to be installed	Ft	0		Length is used to estimate area where interruption of longshore drift occurs.
		width of boat ramp to be installed	Ft	0		
		Area of boat ramp, concrete footing, or similar to be installed	SqFt	0.00	0.00	Includes impact to longshore drift from boat ramps and jetties for E10 = yes. If e10 = "no", area of to be installed concrete or similar substrate covering structure can be entered directly in E14.
	LSZ	Area of boat ramp, concrete footings, or similar to be installed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
	DZ	DZ: Area of boat ramp to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.

Jetty Installation

		Description	Units	Quantity		Notes
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See Ref. tab). SAV after is 0.	Enter vegetation scenario 0-3	0		
	LSZ	Must enter LSZ vegetation scenario before installation (See Ref. Tab). SAV after is 0.	Enter LSZ SAV scenario 0-3	0		Reference: LSZ SAV Scenarios

		Description	Units	Quantity	Conservation Points	Notes
Jetty installation	USZ	length of jetty to be installed	Ft	0		Length is used to estimate area where interruption of longshore drift occurs.
		width of jetty to be installed	Ft	0		
		USZ: Area of jetty to be installed	SqFt	0	0.00	
	LSZ	LSZ: Area of jetty to be installed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
	DZ	DZ: Area of jetty to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.
		Conservation points owed by installation.	Total		0.00	

Entry Block II: Entry for Replacement Structures

Enter replacement boat ramps, jetties, and breakwaters in this entry block. Enter to be removed structure elements in Entry block III below.

Boat ramp Replacement

		Description	Units	Quantity	Conservation Points	Notes
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See summary tab table 2). SAV after is 0.	Enter vegetation scenario 0-3	0	Reference: Delineation of Shore Zones	
	LSZ	Must enter LSZ vegetation scenario before installation (See summary tab table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	0		

		Description	Units	Quantity	Conservation Points	Notes
Boat ramp and Concrete/footings Replacement		Is this a Boat ramp installation? "No" indicates installation of concrete footings, or similar with no impact on water quality or shore drift.	yes/no	No		
	USZ	Pick type of upper intertidal vegetation before installation. Select 0 for replacements. Select "Yes" if saltmarsh vegetation cover is:				
		length of boat ramp to be installed	Ft	0		Length is used to estimate area where interruption of longshore drift occurs.
		width of boat ramp to be installed	Ft	0		
		Area of boat ramp, concrete footing, or similar to be installed	SqFt	0.00	0.00	Includes average impact to longshore drift - 4 ft on either side of boat ramp.
	LSZ	Area of boat ramp, concrete footings, or similar to be installed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
	DZ	DZ: Area of boat ramp to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.

Jetty Replacement

		Description	Units	Quantity		
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See summary tab table 2). SAV after is 0.	Enter vegetation scenario 0-3	1	Reference: Delineation of Shore Zones	
	LSZ	Must enter LSZ vegetation scenario before installation (See summary tab table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	2		

		Description	Units	Quantity	Conservation Points	Notes
Jetty Replacement	USZ	length of jetty to be installed	Ft	31.76		Length is used to estimate area where interruption of longshore drift occurs. Interruption of longshore drift debit is recorded in G47.
		width of jetty to be installed	Ft	25		
		USZ: Area of jetty to be installed	SqFt	794	-30.72	
	LSZ	LSZ: Area of jetty to be installed	SqFt	7145	-331.75	No shored drift interruption considered for LSZ.
	DZ	DZ: Area of jetty to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.
		Conservation points owed by replacement	Total		-362.466	

Entry Block III: Entry for Removal of old Structures

Enter square footage of old boat ramps, jetties, and breakwaters proposed to be removed, repaired, or replaced in this entry block.

Boat ramp and Concrete Rubble Removal

		Description	Units	Quantity		
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter vegetation scenario 0-3	1	Reference: Delineation of Shore Zones	
	LSZ	Must enter LSZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	2		

		Description	Units	Quantity	Conservation Points for Removal of Old Structures	Notes
Boat ramp and Concrete/Rubble Removal		Is this a Boat ramp removal? "No" indicates removal of rubble or concrete pieces.	yes/no	Yes		Boat ramp has to be in functioning conditions for boat ramp removal credit. Otherwise enter as rubble.
	USZ	length of boat ramp to be removed	Ft	0		
		width of boat ramp to be removed	Ft	0		
		Area of boat ramp, concrete, or rubble to be removed; incl. shoreline drift restored by boat ramp removal	SqFt	0.00	0.00	For the removal of several piece of concrete or rubble you may enter the combined square footage in E62 rather than enter in length and width.
	LSZ	Area of boat ramp, concrete, or rubble to be removed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
	DZ	Area of boat ramp, concrete, or rubble to be removed	Ft	0	0.00	No shored drift interruption considered for DZ.
Jetty Removal						
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter vegetation scenario 0-3	1	Reference: Delineation of Shore Zones	
	LSZ	Must enter LSZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	2		
		Description	Units	Quantity	Conservation Points for removal of Old Structures	Notes
Jetty Removal	USZ	length of jetty to be removed	Ft	46.8		Length is used to estimate impact from interruption of longshore drift.
		width of jetty to be removed	Ft	30.79		
		USZ: Area of jetty to be removed	SqFt	1440.972	20.29	
	LSZ	LSZ: Area of jetty to be removed	SqFt	6565	112.49	No shored drift interruption considered for LSZ.
	DZ	DZ: Area of jetty to be removed	SqFt	0	0.00	No shored drift interruption considered for DZ.
		Conservation points gained from removal		Total	132.78	

	Site Specific Credit and Debit Factors for Boat ramps, Jetties, and Rubble.		Percent more Credit/Debit	Notes
Crediting/Debiting Factors	Is the project located within 5 miles of a Puget Sound Chinook natal estuary zone or within 1 mile of a Hood Canal summer-chum estuary zone? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Application of Credit Factors Projects located within a natal Chinook or HC summer chum estuary zone will receive 50% more credits. If a project is in a pocket estuary and within a natal Chinook or HC summer chum estuary zone, a combined 90% more credits apply.
	Is the project is located within a pocket estuary/embayment? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Explanation of Pocket Estuaries and Embayments Projects located within a pocket estuary or embayment owe/receive 30% more conservation debits/credits. If the pocket estuary is within a natal Chinook or Hood Canal summer chum estuary zone, 40% more debits/credits apply.
	Is there observed (as mapped or determined by WDFW) sand lance or surf smelt spawning on the WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply to forage fish affecting action elements.
	Is the structure within the same drift cell and updrift of sand lance, or surf smelt spawning on the Coastal Atlas Map	No	0%	In areas updrift of forage fish spawning, 20% more conservation debits/credits apply if there is no forage fish spawning on site.
	Is there herring spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply to forage fish affecting action elements.

*Site Specific Credit and Debit Factors totals noted as "Conservation points gained from removal" at the end of each section (cells 27F, 52F, and 74F)

Impact and Benefit Determination for Concrete Boat Ramps, Jetties, Concrete Rubble

To expand an entry block for data entry click on the + sign on the left. Clicking the 2 will expand all entry blocks. | Version: 3/10/2021

Entry Block I: Entry for New and Expanded Elements of Existing Structures

Enter new boat ramps, jetties, and breakwaters in this entry block and all areas that are considered expansions of existing or proposed to be replaced structures. Enter replacement structure elements in Entry block II below.

Boat ramp Installation

		Description	Units	Quantity		
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See summary tab table 2). SAV after is 0.	Enter vegetation scenario 0-3	0	Reference: Delineation of Shore Zones	
Vegetation Conditions	LSZ	Must enter LSZ vegetation scenario before installation (See summary tab table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	0		Reference: LSZ SAV Scenarios

		Description	Units	Quantity	Conservation Points	Notes
Boat ramp installation		Is this a Boat ramp installation? "No" indicates installation of concrete footings, or similar with no impact on water quality or shore drift (USZ).	yes/no	No		
Boat ramp installation	USZ	Pick type of upper intertidal vegetation before installation. Select 0 for replacements. Select "Yes" if saltmarsh vegetation cover is:				
Boat ramp installation	USZ	length of boat ramp to be installed	Ft	0		Length is used to estimate area where interruption of longshore drift occurs.
Boat ramp installation	USZ	width of boat ramp to be installed	Ft	0		
Boat ramp installation	USZ	Area of boat ramp, concrete footing, or similar to be installed	SqFt	0.00	0.00	Includes impact to longshore drift from boat ramps and jetties for E10 = yes. If e10 = "no", area of to be installed concrete or similar substrate covering structure can be entered directly in E14.
Boat ramp installation	LSZ	Area of boat ramp, concrete footings, or similar to be installed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
Boat ramp installation	DZ	DZ: Area of boat ramp to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.

Jetty Installation

		Description	Units	Quantity		Notes
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See Ref. tab). SAV after is 0.	Enter vegetation scenario 0-3	0		
Vegetation Conditions	LSZ	Must enter LSZ vegetation scenario before installation (See Ref. Tab). SAV after is 0.	Enter LSZ SAV scenario 0-3	0		Reference: LSZ SAV Scenarios

		Description	Units	Quantity	Conservation Points	Notes
Jetty installation	USZ	length of jetty to be installed	Ft	0		Length is used to estimate area where interruption of longshore drift occurs.
Jetty installation	USZ	width of jetty to be installed	Ft	0		
Jetty installation	USZ	USZ: Area of jetty to be installed	SqFt	0	0.00	
Jetty installation	LSZ	LSZ: Area of jetty to be installed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
Jetty installation	DZ	DZ: Area of jetty to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.
		Conservation points owed by installation.	Total		0.00	

Entry Block II: Entry for Replacement Structures

Enter replacement boat ramps, jetties, and breakwaters in this entry block. Enter to be removed structure elements in Entry block III below.

Boat ramp Replacement

		Description	Units	Quantity	Conservation Points	Notes
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See summary tab table 2). SAV after is 0.	Enter vegetation scenario 0-3	0	Reference: Delineation of Shore Zones	
Vegetation Conditions	LSZ	Must enter LSZ vegetation scenario before installation (See summary tab table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	0		

		Description	Units	Quantity	Conservation Points	Notes
Boat ramp and Concrete/Footings Replacement		Is this a Boat ramp installation? "No" indicates installation of concrete footings, or similar with no impact on water quality or shore drift.	yes/no	No		
Boat ramp and Concrete/Footings Replacement	USZ	Pick type of upper intertidal vegetation before installation. Select 0 for replacements. Select "Yes" if saltmarsh vegetation cover is:				
Boat ramp and Concrete/Footings Replacement	USZ	length of boat ramp to be installed	Ft	0		Length is used to estimate area where interruption of longshore drift occurs.
Boat ramp and Concrete/Footings Replacement	USZ	width of boat ramp to be installed	Ft	0		
Boat ramp and Concrete/Footings Replacement	USZ	Area of boat ramp, concrete footing, or similar to be installed	SqFt	0.00	0.00	Includes average impact to longshore drift - 4 ft on either side of boat ramp.
Boat ramp and Concrete/Footings Replacement	LSZ	Area of boat ramp, concrete footings, or similar to be installed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
Boat ramp and Concrete/Footings Replacement	DZ	DZ: Area of boat ramp to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.

Jetty Replacement

		Description	Units	Quantity		
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See summary tab table 2). SAV after is 0.	Enter vegetation scenario 0-3	1	Reference: Delineation of Shore Zones	
Vegetation Conditions	LSZ	Must enter LSZ vegetation scenario before installation (See summary tab table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	2		

		Description	Units	Quantity	Conservation Points	Notes
Jetty Replacement	USZ	length of jetty to be installed	Ft	47.17		Length is used to estimate area where interruption of longshore drift occurs. Interruption of longshore drift debit is recorded in G47.
Jetty Replacement	USZ	width of jetty to be installed	Ft	37.61		
Jetty Replacement	USZ	USZ: Area of jetty to be installed	SqFt	1774.0637	-66.92	
Jetty Replacement	LSZ	LSZ: Area of jetty to be installed	SqFt	7310	-339.41	No shored drift interruption considered for LSZ.
Jetty Replacement	DZ	DZ: Area of jetty to be installed	SqFt	0	0.00	No shored drift interruption considered for DZ.
		Conservation points owed by replacement	Total		-406.336	

Entry Block III: Entry for Removal of old Structures

Enter square footage of old boat ramps, jetties, and breakwaters proposed to be removed, repaired, or replaced in this entry block.

Boat ramp and Concrete Rubble Removal

		Description	Units	Quantity		
Vegetation Conditions	USZ	Must enter USZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter vegetation scenario 0-3	1	Reference: Delineation of Shore Zones	
Vegetation Conditions	LSZ	Must enter LSZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	2		

		Description	Units	Quantity	Conservation Points for Removal of Old Structures	Notes
Boat ramp and Concrete rubble Removal		Is this a Boat ramp removal? "No" indicates removal of rubble or concrete pieces.	yes/no	Yes		Boat ramp has to be in functioning conditions for boat ramp removal credit. Otherwise enter as rubble.
	USZ	length of boat ramp to be removed	Ft	0		
		width of boat ramp to be removed	Ft	0		
		Area of boat ramp, concrete, or rubble to be removed; incl. shoreline drift restored by boat ramp removal	SqFt	0.00	0.00	For the removal of several piece of concrete or rubble you may enter the combined square footage in E62 rather than enter in length and width.
	LSZ	Area of boat ramp, concrete, or rubble to be removed	SqFt	0	0.00	No shored drift interruption considered for LSZ.
	DZ	Area of boat ramp, concrete, or rubble to be removed	Ft	0	0.00	No shored drift interruption considered for DZ.
Jetty Removal						
Vegetation Conditions	USZ	Must enter LSZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter vegetation scenario 0-3	1	Reference: Delineation of Shore Zones	
	LSZ	Must enter LSZ vegetation scenario before installation (See table 1). SAV after is 0.	Enter LSZ SAV scenario 0-3	2		
		Description	Units	Quantity	Conservation Points for removal of Old Structures	Notes
Jetty Removal	USZ	length of jetty to be removed	Ft	31.85		Length is used to estimate impact from interruption of longshore drift.
		width of jetty to be removed	Ft	25.5		
		USZ: Area of jetty to be removed	SqFt	812.175	11.58	
	LSZ	LSZ: Area of jetty to be removed	SqFt	7310	125.26	No shored drift interruption considered for LSZ.
	DZ	DZ: Area of jetty to be removed	SqFt	0	0.00	No shored drift interruption considered for DZ.
		Conservation points gained from removal	Total		136.83	

	Site Specific Credit and Debit Factors for Boat ramps, Jetties, and Rubble.		Percent more Credit/Debit	Notes
Crediting/Debiting Factors	Is the project located within 5 miles of a Puget Sound Chinook natal estuary zone or within 1 mile of a Hood Canal summer-chum estuary zone? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Application of Credit Factors Projects located within a natal Chinook or HC summer chum estuary zone will receive 50% more credits. If a project is in a pocket estuary and within a natal Chinook or HC summer chum estuary zone, a combined 90% more credits apply.
	Is the project is located within a pocket estuary/embayment? Puget Sound Natal & Pocket Estuaries	No	0%	Reference: Explanation of Pocket Estuaries and Embayments Projects located within a pocket estuary or embayment owe/receive 30% more conservation debits/credits. If the pocket estuary is within a natal Chinook or Hood Canal summer chum estuary zone, 40% more debits/credits apply.
	Is there observed (as mapped or determined by WDFW) sand lance or surf smelt spawning on the WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply to forage fish affecting action elements.
	Is the structure within the same drift cell and updrift of sand lance, or surf smelt spawning on the Coastal Atlas Map	No	0%	In areas updrift of forage fish spawning, 20% more conservation debits/credits apply if there is no forage fish spawning on site.
	Is there herring spawning on the project site? WDFW Forage Fish Spawning Map	No	0%	In areas with forage fish spawning, 50% more conservation debits apply to forage fish affecting action elements.

*Site Specific Credit and Debit Factors totals noted as "Conservation points gained from removal" at the end of each section (cells [illegible])