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-2022-00978

September 27, 2023

Todd Tillinger
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
4735 East Marginal Way South, BLDG 1202
Seattle, Washington 98134-2388

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Hama Hama Company – Skunk Island Aquaculture, Port Townsend Bay, Washington, 171100191200

Dear Mr. Tillinger:

Thank you for your letter of March 28, 2022, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Hama Hama Company's two projects – Skunk Island Aquaculture pilot project (NWS-2021-54-AQ), and a full-scale commercial operation (NWS-2020-90-AQ), Port Townsend Bay, WA.

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

In this opinion, NMFS concluded that the proposed action is likely to adversely affect Puget Sound (PS) Chinook salmon *(Oncorhynchus tshawytscha*), PS Steelhead (*O. mykiss*), and Hood Canal summer run chum (HCSRC; *O. keta)*. Further, we conclude that the proposed action would not result in the destruction or adverse modification of any of their designated critical habitats. NMFS also concluded that the proposed action is likely to adversely affect Georgia Basin Bocaccio (*S. paucispinis*) critical habitat but not would not result in the destruction or adverse modification of their designated critical habitat.

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the PBO. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with the COE's proposed action.

The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of ESA-listed species.

This document also includes the results of our analysis of the proposed action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH.

Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving our final recommendations. If the response is inconsistent with the EFH conservation recommendations, the Federal action agency must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall 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 request that in your statutorily required reply to us regarding the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

Please contact Maria Pazandak, Central Puget Sound Branch, at maria.pazandak@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: Danette Guy, USACE
Adam James, Applicant

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

Hama Hama Company Skunk Island Kelp Aquaculture Pilot and Skunk Island Aquaculture

NMFS Consultation Number: WCRO-2022-00978

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

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

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: September 27, 2023

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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.), as amended, and implementing regulations at 50 CFR part 402.

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

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

1.2. Consultation History

On April 25, 2022, NMFS received a request from the USACE for formal consultation on their proposed action to permit two projects, both proposed by the Hama Hama Oyster Company.

Between August and September, NMFS discussed proposed project details with the applicant via phone, email, and in person. On September 21, 2022, the applicant had mentioned that they might alter project details. NMFS advised that they should relay all updates and potential changes to the Corps.

On March 10, 2023, the USACE provided an update to NMFS stating that they had been in contact with the applicant and that they had submitted updated site plans.

On March 16, 2023, NMFS requested additional information which included details regarding the aforementioned project updates. The applicant provided additional information to NMFS on March 20, 2023.

In March, 2023, NMFS became aware that humpback whales have been documented within Port Townsend Bay and may occur within the action area. On April 4, 2023, NMFS contacted the Corps via email to confirm whether or not they would like the species to be included in their request for consultation. The Corps responded the same day, confirming that they would like humpback whale to be included in the consultation with an NLAA effects determination.

NMFS determined it had all of the necessary information and initiated consultation on May 1, 2023.

The USACE indicated in their consultation request that effects on Southern Resident killer whale, humpback whale, and PS/GB yelloweye rockfish were Not Likely to Adversely Affect. They also indicated that there would be No Effect to PS/GB yelloweye rockfish and PS steelhead critical habitat. NMFS rationale for our concurrence can be found in Section 2.10.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under 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 Corps is proposing to permit, under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, two projects sought by the Hama Hama Oyster Company.
The project is to install a pilot seaweed and shellfish operation (NWS-2021-54-AQ), as well as a full-scale operation (NWS-2020-90-AQ) for commercial mariculture. The pilot would consist of two 10-foot by 30-foot aluminum frame/polyencapsulated sink floats used for wet storage of shellfish and four 100-foot long ¾" lines of braided rope for Sugar kelp (*Saccharina latissima*) and Bull kelp (*Nereocystis luetkeana*) cultivation. The full-scale operation would consist of a total of 34 100-ft longlines of ¾" braided rope for kelp and/ or floating Pacific oyster (Crassostrea gigas) cultivation. The installation and maintenance would occur north east of Skunk Island, WA in Port Townsend Bay (48.032894 N latitude, -122.750534 W longitude). The following species would be grown and harvested: sugar kelp (*Saccharina latissima*), bull kelp (Nereocystis luetkeana), Pacific oyster (Crassostrea gigas), blue mussel (Mytilus edilus), and rock scallop (Crassedoma gigantea). The proposed farm's efforts would consist of 3 major components and be conducted over 5 phases (see Table 1), beginning in the fall of 2023 pending the issuance of all necessary permits. If the necessary permits are not issued by the proposed start date, work would begin the following year (fall 2024) with the phases shifted back accordingly.

The project would require the use of anchors, buoys, hanging trays, lines, and floats. The site footprint, including the gear area would be approximately 2.85 acres. The farmed area where the floats, rafts, and grow lines are located would be approximately 2.6 acres. The site would be entirely in open water between depths of 20 feet and 45 feet relative to MLLW, and would not modify the shoreline or tidal lands, as it would be approximately a minimum of 100-200 feet from shore (Figure 1).

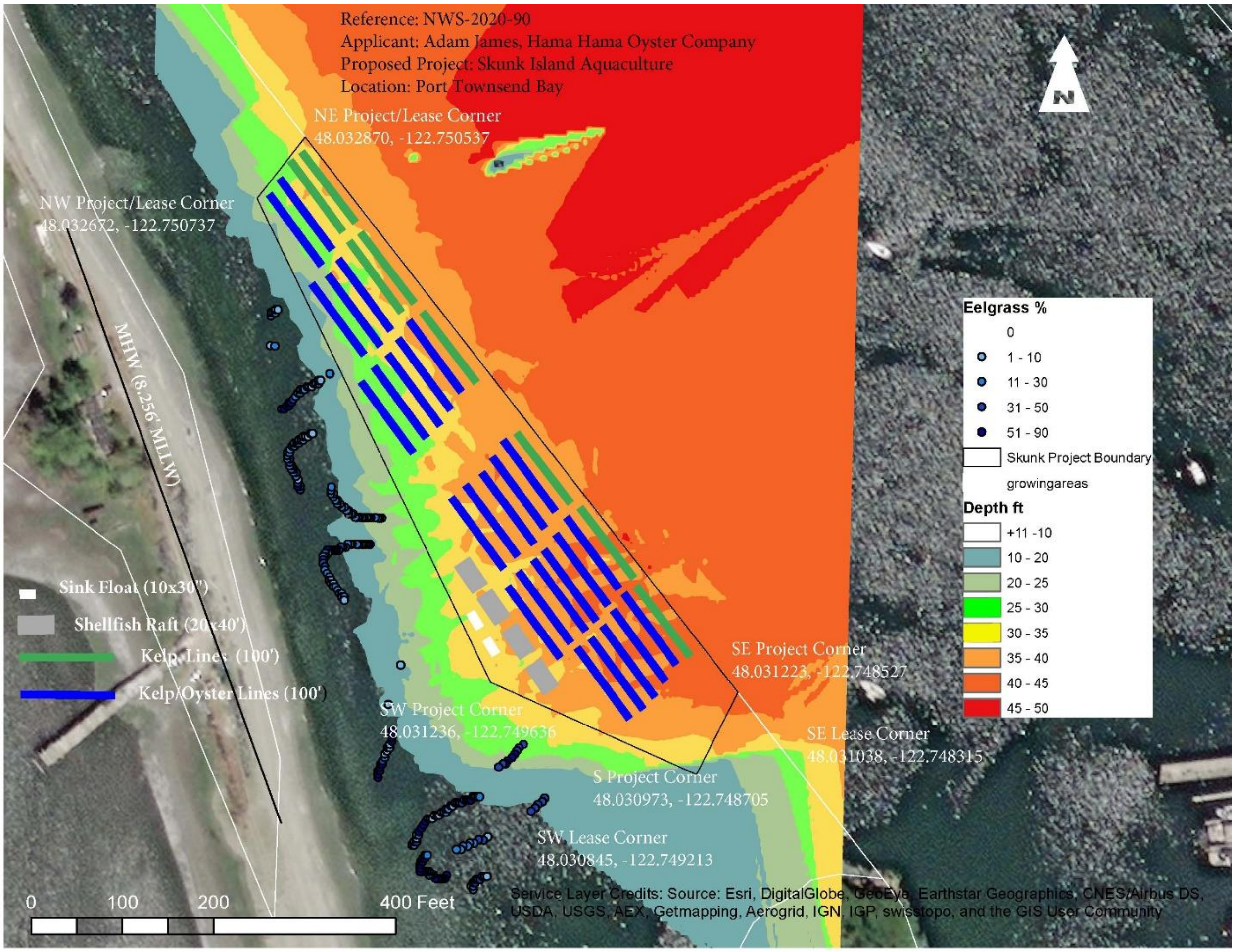

Figure 1. Hama Hama Oyster Co. Skunk Island mariculture project design layout.

Table 1. Project Elements and Sequencing

Phase	Date and Duration	Gear
1. Pilot Farm Installation & Use	*Install Dates:* 9/1/2023-9/30/2023 *Pilot Project Period:* 9/1/2023-5/15/2025 *Kelp Planting:* 10/1-11/1 Kelp harvest would take place in April	-Two 10ft by 30 ft aluminum sink floats -4 helical anchors -Four 100 ft long sugar and bull kelp lines -8 pyramid anchors
2. Floating Shellfish Rafts Installation & Use	*Install Dates:* July 2, 2025-August 16, 2025. (Total work won't exceed 14 days)	-Four 40'x40'x2' rafts -120 floats -2 helical anchors
3. Kelp Line Expansion and Floating Oyster Bag Installation & Use	*Install Dates:* July 2, 2025 to September 30, 2025. (Total work won't exceed 14 days)	-20 pyramid anchors OR 20 helical anchors -20 USCG approved buoys -20 floats -Up to ten 100' lines -Up to 300 2'x3' oyster bags with floats
4. Build-Out of Kelp and Floating Oyster Bag Lines	*Install Dates:* July 2, 2026-August 16, 2026. (Total work won't exceed 14 days)	Same as Phase 3.
5. Build-Out Continued	*Install Dates:* July 2, 2027-August 15, 2027. (Total work won't exceed 14 days)	-A total of 34, 100ft longlines

Sink Floats

Details and Installation
During Phase 1 of the proposed project, the applicant proposes to install and utilize 2 10'x30' aluminum frame/polyencapsulated styro sink floats for the wet storage of shellfish (Figure 2). They would be sited at depths between approximately 30-35 feet. The floats would remain on site for the duration of the phases and the length of the permit.

The floats would be attached to the substrate with helical anchors. A total of 4 anchors attach to aluminum shackles that attach to USCG approved surface buoys on the short ends of the sink floats via 5-8m ¾" braided ropes.

Operation and Maintenance
The sink floats would be accessed 2 times a week, not exceeding 4 hours per trip, from May to September each year. For the remainder of the year, the floats may be accessed not in excess of 2 times per month. The sink floats would remain in the water year-round and for the entirety of the permit duration.

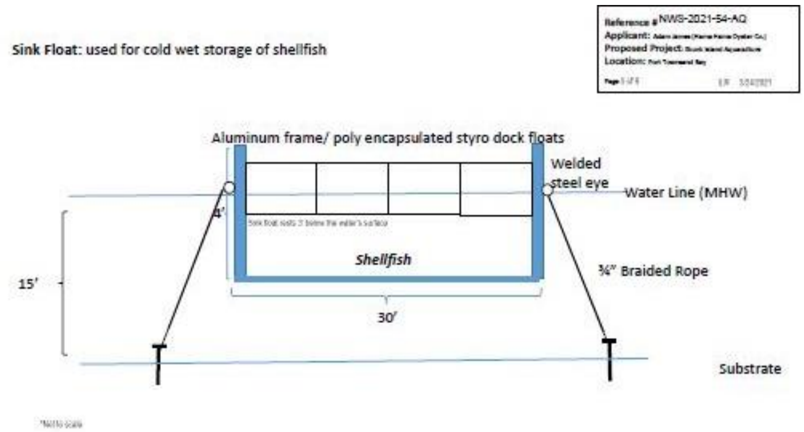

Figure 2. Illustration of proposed sink float

Kelp Lines

Details and Installation
During Phase 1 of the proposed project, the applicant proposes to install and utilize 4 x 100ft lines of ¾" braided rope to grow a combination of bull and sugar kelp (Figure 3). These efforts would begin in Phase 1 of the proposed project and expand during Phases 3-5.

The lines would be anchored via 8 temporary pyramid blocks at depths between approximately 30-45 feet. Pyramid anchors, which rest on the substrate and do not embed, would attach to a total of 12 USCG permitted surface buoys by a 5-8m ¾" braided rope. For bull kelp, seeded lines would attach perpendicular to vertical ropes at 10' above substrate. Seeded sugar kelp lines would attach perpendicular to vertical ropes at 3 meters subsurface with mid-floats to stabilize lines.

The construction of the pyramid anchor and the assembly of the anchor (with eyelet), shackle and 3/8"rope and midline floats and seeded kelp lines would take place offsite in Lilliwaup, where the Hama Hama Company facility is located. Transportation to site would be the same as the transport of sink float materials. Once on the scow, the end of the anchor-line-mid-float assembly would be dropped onto the project site using GPS information from the pilot project design to locate line terminus from the deck of the scow. A surface buoy would be attached to the line running from the anchor to the surface after it is deployed. This process would repeat again on the second terminus of the line. For Phase 1, the deployment of the entire pilot of 4 kelp lines would take place in one day. Across the span of Phases 3-5, a total of 34 lines may be deployed, 50 percent of which would be dedicated to growing kelp. The applicant proposes to leave 5 percent of the seeded kelp lines unharvested for extended habitat use.

Operation and Maintenance
The entire structure, including lines and anchoring, would be deployed September 1. Kelp seed would be out-planted in September and harvested the following April. Kelp lines would be checked approximately every month via boat throughout the growing season. Kelp would be harvested over a 2 month period from mid-March through May, with the lines accessed 3-5 times per week. During Phase 1 of the proposed project, the pyramid anchors and associated gear

would be removed following kelp harvest occurring no later than May 15. For phases 3-5, temporary pyramid anchors may continue to be used and removed following harvest, or alternatively, permanent helical anchors would be installed.

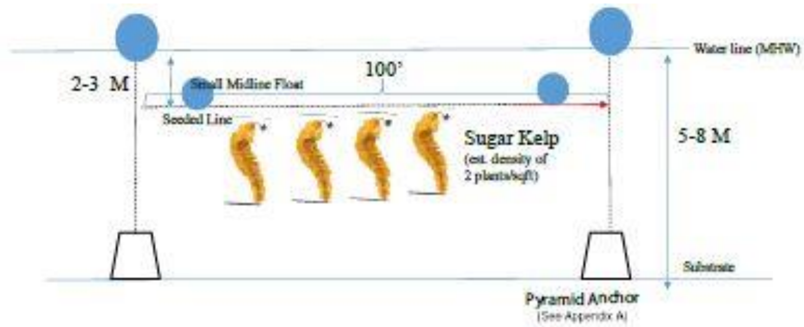

Figure 3. Illustration of proposed sugar kelp lines.

<u>Floating Oyster Bag Lines</u>

Details and Installation
During Phases 3-5, the applicant proposes to install oyster lines in accordance with the description provided in phase 1. Oyster lines strung between mooring buoys would float on the surface of the water as attached to ~30 floating mesh bags that are 2'x3' with 3' poly floats on both sides of the oyster bags (Figure 4). Lines would be spaced 10' laterally and horizontally, with a 60' boat aisle between rows of 3 lines. After the completion of the project, the other 50 percent of the lines would be dedicated to the floating oyster bags.

Operation and Maintenance
Oyster lines would be checked via boat once every two weeks from May-September. From October to April, lines may be accessed once a month. Once oysters reach maturity (approximately after 1.5 years), harvest would be conducted 3-5 days a week over a 2-month period.

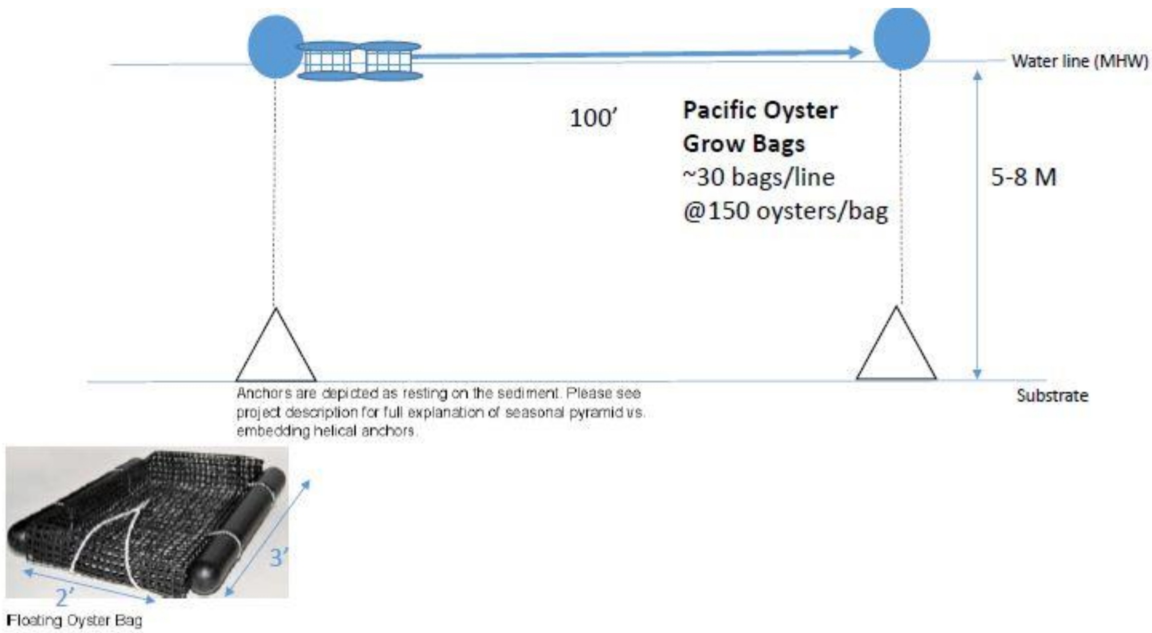

Figure 4. Illustration of the proposed Pacific oyster grow bags.

<u>Floating Rafts</u>

Details and Installation

Oysters, mussels, and pink scallops would be grown in up to four 40'x40'x 2' rafts made of aluminum frame, wrapped in 2x6 Douglas fir, with 2x4 Douglas fir stringers & 2 2x40' plywood walkways (Figure 5). The rafts would be held together by 4" rope, and anchored via two helical anchors on either end of the raft array. Shellfish raft structure would attach to 2 x 4" 5-8 m vertical ropes that fork at the surface to run parallel to the raft structure. Twenty floats would support the raft under the 2"x40" walkway lining each raft. Floats/ walkways would run perpendicular to the shoreline and connecting rope.

Mussels would be grown on 20 ft hanging ropes spaced in a 1'x1' grid on the floating raft at a density equal or exceeding 100/ft. Scallops and oysters would be grown in 2'x 2'x 6" trays stacked 15' deep at 150/unit stocking density.

Operation and Maintenance

The shellfish rafts would be checked via boat once every two weeks from May-September. From October to April, lines may be accessed once a month. Once oysters reach maturity (approximately after 1.5 years), harvest would be conducted 3-5 days a week over a 2 month period. The rafts, anchors, and buoys would remain in the water year-round and for the entirety of the permit duration.

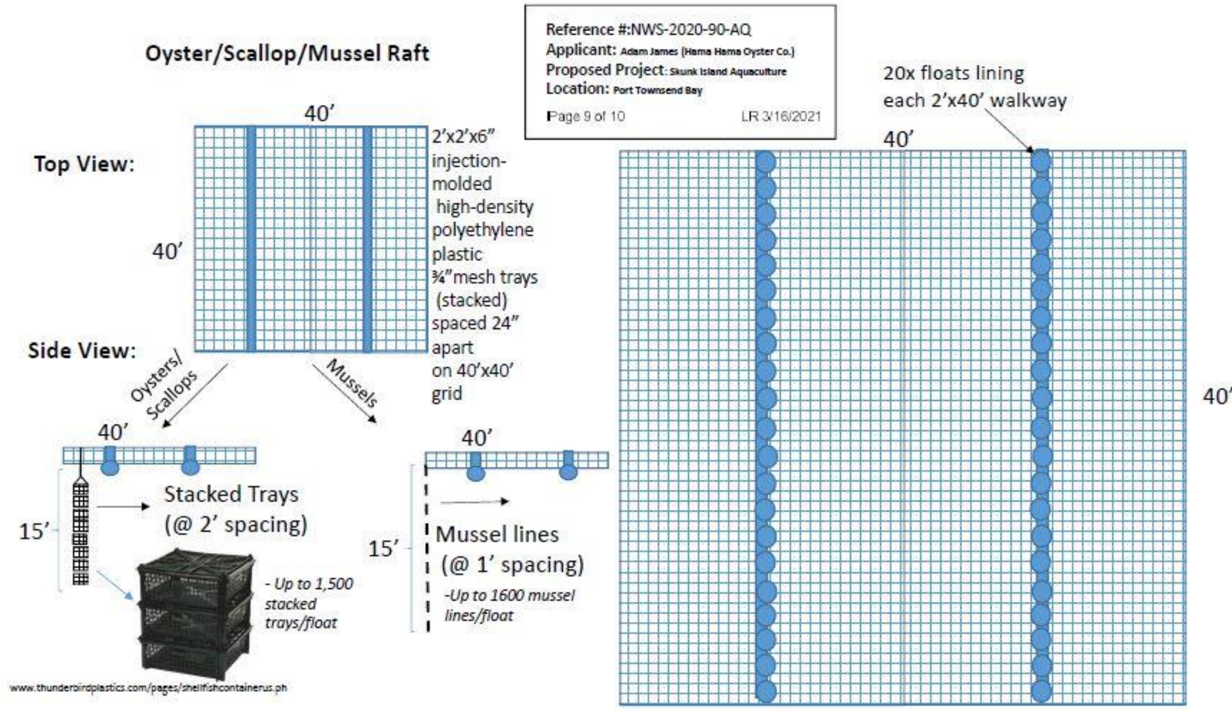

Figure 5. Diagram of proposed oyster/scallop/mussel rafts.

Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

1.4. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The proposed project is in the nearshore subtidal zone of southwestern Port Townsend Bay. The action area for the project includes the geographic area potentially affected by the project construction activities. Potential impacts from construction activities include in-air noise and potential turbidity and changes to prey distribution and abundance. For the purposes of NMFS' analysis, we review the physical, chemical, and biological effects to aquatic features. Here, the action area comprises the proposed farm area and the navigation channel to Hama Hama's existing, adjacent private lease where all vessels would traverse from. The action area would be intermittently affected by construction impacts for up to 5 years between July 16-February 15, kelp maintenance and harvest impacts between September and April, shellfish harvest and maintenance year-round, and for the project's permit length.

The Biological Assessment indicates that a 500-foot buffer around the site be included to account for vessel and construction related noises (30' crane scow with 2x 150 horsepower outboard motors; 20' skiff with a 60-horsepower outboard motor). For the purpose of this consultation, airborne noise will not be considered as it would be unlikely to modify aquatic habitat or be experienced by listed species. Activities that generate sediment may cause turbid water to drift outside of the footprint of the active plot (Table 4), expanding the affected area by as much as a few hundred linear feet, depending on grain size, fetch, and current velocities.

Table 2. Hama Hama Oyster Co. proposed farm footprint

Corner	Latitude	Longitude
NE	48.032870	-122.750537
NW	48.032672	-122.750737
SE	48.031223	-122.748527
S	48.030973	-122.748705
SW	48.031236	-122.749636

Figure 6. Hama Hama Oyster Co. proposed project includes the farm plot (red rectangle) with an additional 500-ft buffer (Google Earth, June 7, 2023).

2. ENDANGERED SPECIES ACT BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

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

The USACE determined the proposed action is not likely to adversely affect PS/GB yelloweye rockfish or SRKW. The USACE also determined the proposed action would have no effect on PS steelhead or PS/GB yelloweye rockfish critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" determinations section (Section 2.11).

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 for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214, February 11, 2016).

The designations of critical habitat for PS Chinook salmon, HCSR chum, and PS/GB bocaccio rockfish uses the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR part 424) 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.

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

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

2.2. Rangewide Status of the Species and Critical Habitat

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

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. Major ecological realignments are already occurring in response to climate change (IPCC WGII, 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4^{th} warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC WGI, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020).

Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2015, 2016, 2017, Crozier and Siegel 2018, Siegel and Crozier 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden et al. (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S. They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh 2021).

Agne et al. (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne et al. (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper et al. (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter's precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek et al. (2018), predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar et al. (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using RCP 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al. 2020, Myers et al. 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature. These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby et al. (2018), identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz et al. 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan et al. 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al. 2018). California and Oregon showed the greatest threat to tidal wetlands (100 percent), while 68 percent of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz et al. (2018) found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz et al. (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay et al. 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux et al. 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou et al. 2015 and Williams et al. 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford 2022, Lindley et al. 2009, Williams et al. 2016, Ward et al. 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al. 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier et al. 2020, FitzGerald et al. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018, Barnett et al. 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman et al. 2012, Burke et al. 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al. 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al. 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al. 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al. 2018, Kilduff et al. 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura el al. 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011; Wainwright and Weitkamp 2013, Gosselin et al. 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter and spring adult migrants, such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006; Crozier et al. 2010, Crozier et al. 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler et al. 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al. (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al. 2019, Munsch et al. 2022).

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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound Chinook salmon	Threatened 6/28/05 (70 FR 37159)	Shared Strategy for Puget Sound 2007	NMFS 2017a; Ford 2022	This ESU comprises 22 populations distributed over five geographic areas. All PS Chinook salmon populations continue to remain well below the TRT planning ranges for recovery escapement levels. Most populations also remain consistently below the spawner–recruit levels identified by the TRT as necessary for recovery. Across the ESU, most populations have increased somewhat in abundance since the last status review in 2016, but have small negative trends over the past 15 years. Productivity remains low in most populations. Overall, the PS Chinook salmon ESU remains at "moderate" risk of extinction.	• Degraded floodplain and in-river channel structure • Degraded estuarine conditions and loss of estuarine habitat • Degraded riparian areas and loss of in-river large woody debris • Excessive fine-grained sediment in spawning gravel • Degraded water quality and temperature • Degraded nearshore conditions • Impaired passage for migrating fish • Severely altered flow regime
Puget Sound steelhead	Threatened 5/11/07	NMFS 2019	NMFS 2016; Ford 2022	This DPS comprises 32 populations. Viability of has improved somewhat since the PSTRT concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 DIPs (Hard et al. 2015). Increases in spawner abundance were observed in a number of populations over the last five years within the Central & South Puget Sound and the Hood Canal & Strait of Juan de Fuca MPGs, primarily among smaller populations. There were also declines for summer- and winter-run populations in the Snohomish River basin. In fact, all summer-run steelhead populations in the Northern Cascades MPG are likely at a very high demographic risk.	• 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
Hood Canal summer-run chum	Threatened 6/28/05	Hood Canal Coordinating Council 2005 NMFS 2007	NWFSC 2015; Ford 2022	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	• Reduced floodplain connectivity and function • Poor riparian condition • Loss of channel complexity Sediment accumulation • Altered flows and water quality

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				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.	

2.2.2 Status of the Critical Habitat

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

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

A summary of the status of critical habitats, considered in this opinion, is provided in Table 3, below.

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

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for PS Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in PS. The PS 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.

2.3. 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).

Factors including climate change, contaminants, habitat modification, nutrients and pathogens affect the condition and quantity of habitat features and processes necessary to support the listed species in the area.

Habitat Conditions:

Forage Fish: According to the WDFW Forage Fish Spawning Map online tool (https://www.arcgis.com/apps/mapviewer/index.html?webmap=19b8f74e2d41470cbd80b1af8dedd6b3; accessed on January 25, 2023), there is documented forage fish spawning adjacent to the project site. Herring spawning and smelt spawning occur adjacent.

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.

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.

Eelgrass and Kelp: According to the Ecology online tool, Washington State Coastal Atlas Map (https://apps.ecology.wa.gov/coastalatlas/tools/Map.aspx;accessed on January 25, 2023), the project is within a ShoreZone unit with eelgrass. The sub-aquatic vegetation (SAV) survey conducted found that eelgrass beds occur 25 feet shoreward from the proposed project. From -15 to -35 feet MLLW, patches of sugar kelp (*Saccharina spp*.) were documented at 1-5 percent densities. At -35 to -45 feet MLLW, 50 percent densities of free-floating *Ulva spp.* were the only aquatic vegetation documented (BA, 2021).

Water Quality: In the 20th century, industrial sites were located adjacent to the proposed project location although there is currently no largescale industrial activity occurring. The BA suggests that these activities may have altered species composition and habitat within the area due to "loose oversight on industrial byproduct deposition." During the SAV surveys conducted for the proposed project, debris including a ship hull, a sunken boat, tires, and metal were found nearby. These items may reduce water quality in the bay over time as they degrade.

Within Port Townsend Bay, water quality varies by location, with some areas listed as 303(d) impaired. Port Hadlock/Irondale has two stormwater outfalls that convey water to Port Townsend Bay. Stormwater samples taken from the outfalls in 2003 and 2004 found several pollutants including suspended solids and phosphorus, nitrogen, heavy metals, and grease and oil (Simmons & McNamara 2016).

The majority of the bay meets the standards for clean water and shellfish production, although there are portions that are closed to shellfish production by the Washington State Department of Health (WDOH 2022). In 2022, shellfish growing areas were classified as approved, prohibited, or unclassified. Chimacum Creek Tidelands public beach was closed to recreational shellfish harvesting due to high levels of bacteria detected. According to the WDOH's *Annual Shellfish Growing Area Review 2022: Port Townsend*, the action area is within the approved growing area. The area east of the proposed project is labeled as prohibited due to the existing marina and boating activities.

"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). DO generally stays above 7.0 mg/L (the state standard) in most years. This is partly due to the general lack of water column stratification that is common in other similar embayments such as nearby Discovery Bay. The weak water column stratification in Port Townsend Bay is due to the high degree of mixing that occurs in the adjacent waterbody of Admiralty Inlet. The occasional low DO conditions in Port Townsend Bay are due to deep bottom water, with naturally low DO from the Strait of Juan De Fuca, upwelling at the entrance of Admiralty Inlet adjacent to Port Townsend Bay. There are five untreated stormwater outfalls along the southern shoreline of Port Townsend Bay. Since the majority of the surfaces generating runoff along this shoreline consist of large commercial parking lots and roadways, these stormwater outfalls most likely introduce pollutants to marine waters such as total suspended solids (TSS) and oil. Inorganic nitrogen, usually nitrate, is the leading cause of plankton blooms in marine waters. 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." (BA, 2021)

Surrounding land/water uses: There is a vessel mooring field, commercial shellfish farm, Port Hadlock Marina, and other docks exist near or adjacent to the proposed project location. Live-aboard, recreational, and commercial vessels frequent the area. The State of Washington designated major water uses include commerce and navigation, salmon rearing, shellfish rearing and harvesting, and primary contact recreation.

Use of the action area by listed species:

Salmonids:
The nearest documented salmon-bearing stream is Chimacum Creek, about 1.5 miles north of the project area, 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 HCSR chum. 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).

Bocaccio:
Bocaccio rockfish adults stay in deep waters (98 feet or deeper) but juveniles use shallow areas within their designated critical habitat, and larval lifestages float in the water column. Larvae are born with limited abilities to swim, maintain buoyancy in the water column, and feed. These larvae are pelagic for approximately 2 months and occur in the water column from near the surface to depths of 328 feet or more. Larval presence in Puget Sound peaks in spring and again in summer, and larvae commonly associated with kelp beds. Larvae and small juveniles located within the greater Puget Sound during the spring and summer months are subject to currents that may potentially drift the fish into the action area, but they are not expected to intentionally utilize the action area.

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 Port Townsend Bay (WDNR 2009). Therefore, their numbers in the action area are expected to be in low numbers.

2.4. Effects of the Action

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

After the application of all minimization and conservation measures as described in pages 36-38 of the BA, the proposed action would still result in adverse effects that cannot be avoided. Likely effects include short-term adverse effects from maintenance and harvest activities, and long-term impacts from the existence of the anthropogenic structures. The likely adverse effects are changes in water quality, disturbed substrate, reduced forage, shade and noise.

2.4.1 Effects on Critical Habitat

The Physical and Biological Features (PBFs) of PS Chinook salmon, Hood Canal summer-run chum, and PS/GB bocaccio critical habitat that may occur in the action area are as follows:

PS Chinook salmon and Hood Canal summer-run chum critical habitat PBFs

- Estuarine areas should be free of obstruction and excessive predation, and have available:
  - Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater;
  - Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and
  - Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

- Nearshore marine areas should be free of obstruction and excessive predation, and have available:
  - Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and
  - Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

PS/GB bocaccio rockfish critical habitat PBFs

- Juvenile bocaccio settlement habitats[1] located in the nearshore should have substrates such as sand, rock and/or cobble compositions that also support kelp, along with the following attributes:
  - Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and
  - Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities.

Modified Water Quality

Water quality is a feature of critical habitat for both salmon species and bocaccio. Water quality would occasionally be briefly diminished by 1) the suspended sediments produced during anchor installation, anchor removal, and equipment maintenance; and 2) it may also be diminished by hypoxic/anoxic conditions created when amounts of organic material are deposited in excess of what local micro-flora and fauna can process, exhausting the oxygen available for aerobic decomposition. A third effect is the longer term improvement in water quality associated with shellfish.

[1] Based on the location of the action area, only areas identified for juvenile bocaccio are considered likely to be adversely affected. Critical habitat for adult bocaccio is not further analyzed in this document.

1) Excess Turbidity: The increased turbidity is expected to occur during the on-site work and then to return to baseline within hours after work ceases. This effect is adverse to water quality as a feature of critical habitat, but because its duration is brief, conservation values (for growth, maturation, or physical transitions, survival, reproduction of listed individuals) overall are not impaired.

2) Reduced Dissolved Oxygen: The temporary water quality reduction from reduced dissolved oxygen–are expected to be rare but should it occur, it would likely only be associated with the rafts growing mussels. Mussels may reduce concentrations of dissolved oxygen (DO) due to their oxygen uptake and the demand for oxygen necessary to breakdown the waste they produce. Monitoring studies conducted by NewFields (2008) for mussel rafts in Totten Inlet, WA, found that as parcels of water moved through and exited the rafts, DO concentrations were reduced between 0 percent to 30 percent. Within the rafts, significantly reduced DO levels were observed during summer months although often remaining above 5.0 mg/L concentrations where biological stress may be induced. NewFields (2008) concluded that after the water exists the raft, it would likely dilute/diffuse to ambient DO concentrations within 70m to 200m.

While detrimental when and where such reduced DO occurs, the spatial and temporal extent of reduced DO is small and brief, respectively. Due to the limited characteristics of this project effect, the reduced water quality is not expected to impair the overall value of the designated critical habitat to support PS salmonids' or juvenile PS/GB bocaccio's growth or maturation, transitions, survival or reproduction.

3) Reduced nitrogen and phosphorus/improve clarity: Long term, an indirect benefit of the farm includes improved water quality and clarity by reducing the amount of nitrogen and phosphorus in the water when it is harvested, thus indirectly alleviating harmful algal blooms (Jiang, et al. 2020; Yang et al. 2015). Kelp aquaculture is known for providing a three-dimensional habitat for juvenile fish and small invertebrates and studies have shown an increase in benthic infaunal species abundance and diversity (Visch et al. 2020). Kelp also sequesters carbon allowing for ocean acidification to be locally ameliorated.

Oysters filter small phytoplankton, sediments, and detritus allowing for increased light penetration by improving water clarity through the water column. This benefits kelps, eelgrass, and other submerged aquatic vegetation. Shellfish aquaculture also provides structural habitat for the colonization of small organisms, acting as a refuge against predators and allowing for safe foraging.

Disturbed Substrate

Substrate is a feature of critical habitat for juvenile bocaccio. The proposed project may affect the substrate from 1) the addition of gear and 2) mussel bio-deposits.

Related to the analysis above on water quality, anchoring of equipment or gear would modify substrate by disturbing and suspending sediment, which settles in areas immediately adjacent. Additionally, when all phases are complete, a total of 68 seasonal pyramid anchors may be installed, and these would displace around 272 square feet of benthic habitat.

Biodeposits, also described as a pathway that can affect water quality, can also alter the substrate composition. Observations conducted by the Maine Department of Marine Resources found that several farms with mussel-rafts surveyed had accumulated a substantial amount of mussel shells underneath, in one case 4-5 inches thick. Substrates beneath two of the six farms observed showed signs of hypoxic or anoxic conditions from organic loading and shell accumulation. (Lewis & Nelson 2008)

Here, the installation, removal, and existence of the anchors, as well as the bio-deposits and shell accumulation, will reduce suitable substrate for settlement habitat for PS/GB juvenile bocaccio by 272 square feet. This small amount, while adverse, is insufficient to reduce the conservation role of substrate for juvenile bocaccio survival, feeding, and growth.

Reduced Forage

In the nearshore environment, forage, a PBF of Chinook salmon, HCSR chum, and PS/GB bocaccio rockfish may be reduced by the placement and removal of anchors, over the long-term due to the mussel culture, and by shading created from the structures. Larval and juvenile rockfish feed on small organisms, such as zooplankton, copepods, phytoplankton, small crustaceans, invertebrate eggs, krill and other invertebrates (see NMFS 2017b). Juvenile salmonids also feed on copepods and invertebrates.

<u>Anchor Installation, Removal, Maintenance:</u>

As described above, the semi-annual installation and removal of the concrete anchors physically disturb the substrate, which affects sediment and also benthic fauna. The activity may cause a minor disturbance of benthic habitat affecting the availability of benthic food resources for juvenile PS/GB bocaccio for a short period of time following the disturbance. The activity would likely displace a small number of invertebrates from the substrate, localized to the disturbance areas.

In places with normal benthic diversity, with regular flows and normal nutrient balance, benthic species rapidly recolonize after disturbance, making food available again at the disturbed site. Benthic prey communities are expected to regain their original composition and abundance in several weeks to a few months (see, e.g., Straus et al. 2008).

Additionally, the repeated substrate disturbance from the seasonal anchoring activities may inhibit SAV's ability to expand or grow in their footprint (forage fish such as herring lay their eggs on SAV, and these eggs are often part of the forage base for other fishes, including rockfish). Colonization of exposed anchor structures by invertebrates and algae could occur, providing increased cover and forage opportunities for listed species. However, due to semi-annual anchor removal, increased cover and forage provided by organisms and SAV would be temporary and intermittent.

<u>Mussel Culture Effects:</u>

In addition to adverse effects from the anchors, effects to forage species may occur from the mussel's bio-deposits. Shellfish produce faeces, pseudofaeces, and marine litter which may accumulate beneath or around the farm. Biochemical processes may be influenced from the organic loading, which has the potential to effect benthic respiration and modify benthic communities. Lewis & Nelson (2008) documented (during a study conducted in Maine waters) that two out of six mussel rafts observed showed hypoxic or anoxic conditions which appeared to "greatly diminish the epibenthic community." Conversely, the other rafts observed either showed unaffected or enhanced epibenthic communities.

Studies have found that inshore mussel farms "increase the structural complexity of the seabed… providing food and refuge from predation" while also attracting predators (Cabre et al. 2021). In areas with high currents, the biodeposits are carried away, having little effect on the substrate. We do not have evidence that anoxic conditions have occurred near mussel farms in Washington State.

Shade:

Eelgrass was documented occurring shoreward of the project, between -5 and -15 MLLW, but not documented as coinciding with the project area. Ulva spp. was the most predominate macroalgae observed and was found in a few patches at depths between 30-35 feet. The shaded areas created by the in- and overwater structures may inhibit SAV's potential expansion or growth in the area.

The farmed site footprint would be approximately 2.6 acres with the growlines/oyster bags and lines being spaced 10 feet apart horizontally and laterally. The growlines would be located roughly at depths between 25 to 50 feet. The growlines themselves are mostly open to sunlight and may cast some shadows in shallower areas. In these shallower areas, shade can impair growth of vegetation and of prey communities that rely on substrate and/or vegetation. Also, the kelp itself would grow up to 10 feet or longer before being harvested, which may impede some light transmission. Kelp, however, hosts prey communities for listed species.

Any shade cast by kelp gear and oyster bags would not be in a constant location as the kelp would be continuously moved by wave action. Thus, any shade effects would not be continuously in one location of aquatic habitat, reducing the intensity of effect, and allowing adequate light in shallower areas to support both vegetation and the prey communities that rely on substrate and vegetation.

Additionally, submerged aquatic vegetation may experience reduced growth or ability to expand into areas where shade or sedimentation may occur due to the proposed project. The sink floats and rafts may create enduringly shaded areas. Although the rafts would be grated, the stacked trays attached to them may extend up to 15 feet below reducing light penetration. This would reduce juvenile Chinook and juvenile bocaccio's prey base as well as increasing their bio-energetic expenditures.

Effects on forage below the farm are likely to vary over time, with fluctuations associated with environmental changes (e.g., water temperature), changes in the amount of the grown species' biomass and the amount of in-water equipment used, and during fallow periods. However, we assume effects on forage would occur indefinitely, for the length of time the farm is in operation.

When evaluating the influence of this forage diminishment on the conservation role for which this PBF was identified (survival, growth, maturation), we must note that forage is not a limiting factor for any of these species in the nearshore environment, therefore the PBF for these three species, while diminished, is not expected to impair the conservation role for the three listed species.

Modified Migration

Structures:

Safe migration of salmonids may be diminished by the presence of in and overwater structures. The project requires the introduction of a considerable amount of hard, physical structure into the substrate and water column. The presence of these structures can alter migration pathways and patterns, and increase the risk of predation on juvenile salmonids.

The proposed rafts, floats, and hanging trays represent an artificial habitat structure that constitutes an alteration of undisturbed habitat conditions. The structures may present conditions that are disruptive to normal feeding, rearing, and migration behaviors, as well as posing elevated risks of predation by creating preferred habitat for ambush predators. The structures and the shade they produce may cause avoidance by out-migrating salmonids and increase their migration time, thus increasing the possibility of predation. The shellfish rafts would create 6,400 square feet of grated overwater coverage. Despite them being grated, the stacked oyster and scallop trays attached would be 2'x2'x6" and stacked 15 feet into the water column. The trays would be spaced 24 inches apart, and any of the 4 rafts could solely utilize this method of growing creating up to 6,000 cubic feet of potential in-water structure per float.

The proposed action would cause long-term, small-scale diminishments by increasing obstruction and predation risk in the migratory area. These adverse effects are not expected to occur at a level that modifies the conservation role of the area for migratory purposes, however.

Noise:

Noise in the aquatic environment would occur during the installation of gear, and when vessels are operating at the project site. Noise disrupts the aquatic condition by sending vibration through the water. Such vibration ceases when equipment ceases operating, when vessel motors are turned off, and when operating vessels leave the action area. When the source of these sounds cease, the action area immediately returns to the baseline level of noise. While noise occurs, it can mask the ability of salmonids to detect predators and prey. Critical habitat is only briefly diminished, occurring at installation and intermittently to maintain gear or conduct harvest, therefore all values of the critical habitat to support PS Chinook, bocaccio largely are retained.

Long-term beneficial effects

Habitat complexity:

Additionally, shellfish and kelp aquaculture can provide habitat for other aquatic species, such as macroalgae and SAV, which play important roles in absorbing excess nutrients and improving water quality. By providing habitat for these species, the health of estuarine habitats is supported. The culture's structures and accessories can provide a substrate for other aquatic species to attach to and grow on. This can include the structure of the gear itself, such as ropes, nets, or baskets, as well as the shells of the shellfish themselves.

The attachment of other species, such as macroalgae and seagrasses, can create a diverse and complex habitat that supports a wide range of aquatic species, including finfish, crustaceans, and other invertebrates. This habitat can provide essential food and shelter for these species within the Bay.

Additionally, in limited amounts, the waste produced by the shellfish can provide a source of food and nutrients for other aquatic species, helping to further support the health of the ecosystem. In conclusion, shellfish aquaculture has the potential to create habitat by providing substrate for other species to attach and grow on, supporting the health of the ecosystems through the creation of diverse and complex habitats

2.4.2 Effects on Listed Species

Effects on species are a function of exposure and response. The degree of exposure (duration and intensity) to habitat changes described above will influence response, as will the specific species, life stage, and underlying health of the individuals exposed. Installation is expected to occur during the July 16 – February 15 work window, which will reduce the number of juvenile salmonids (PS Chinook, PS steelhead, and HCSR chum) exposed, however presence/exposure is not fully avoided. The project effects are not likely to adversely affect bocaccio, see Section 2.11.

Response to Suspended Sediment/Water Quality
Salmonids could be briefly exposed to areas of reduced water quality while sediment is suspended during the installation and removal of gear. Typical response of salmonids is avoidance, so no injury from exposure to sediment is anticipated among individuals from PS Chinook, HCSR chum, or PS steelhead. Avoidance behavior however can increase the likelihood that juvenile salmonids enter deeper water where larger fish may prey upon them.

The above listed species may also be exposed to reduced water quality from the mussel rafts and potential areas of reduced DO, although this effect is expected to be infrequent. Should reduced DO occur, effects are expected to be localized. Because the salmonids can detect and avoid areas of low DO, exposure among salmonids is not expected to injure these fish directly, but as above, avoidance behavior can increase risk of predation.

Response to Prey Reduction
It is likely that listed fish would encounter areas where prey is slightly reduced. While it is an expected behavior that salmonids would continue foraging behavior by seeking out locations where prey is more abundant, it is possible that a small number of individuals would have greater bioenergetic expenditure relative to prey consumption, that could reduce or delay their growth. Because smaller fish are more likely to be preyed upon, this suggests that a very small number of listed fish could be more susceptible to predation as a result of prey reduction. Because forage is not limiting, we expect this effect among only a very low number, even over the entire life of the proposed action.

Response to Gear in Aquatic Habitat/Passage
Juvenile PS Chinook salmon and juvenile Hood Canal summer-run chum are nearshore oriented, typically migrating within shallow nearshore and intertidal areas (Levings et al. 1991; Duffy et al. 2005; Heerhatz and Toft 2015), shallower than where the project would be located. Juvenile steelhead are less dependent on nearshore habitat, increasing their likelihood of encountering the proposed farm and associated structures during their outmigration to the ocean. Accordingly, some juvenile PS Chinook salmon, HCSR chum, and occasionally PS steelhead, could encounter the proposed farm during their outmigration or residency within Port Townsend Bay, as it would be in the environment for the foreseeable future.

The cultured kelp, shellfish rafts, sink floats, stacked trays for the scallops and oysters, and hanging mussel ropes may obstruct salmonid passage through the water column or at the surface. The structures may disrupt their migration, increase bioenergetic expense, and/or increase their predation risk. In and overwater structures cause delays in migration for salmonids due to disorientation, fish school dispersal (resulting in a loss of refugia), and altered migration routes (Simenstad 1999). It's well documented that juvenile salmonids display avoidance behavior when encountering the edges of structures, or shadows, and that actively migrating juvenile Chinook salmon swim around structures through deeper water rather than swimming underneath a structure (Celedonia et al. 2008a; Celedonia et al. 2008b; Kemp et al. 2005; Moore et al. 2013; Munsch et al. 2014; Nightingale and Simenstad 2001; Ono et al. 2010; Southard et al. 2006). Structure width, light conditions, water depth, and the presence of macrophytes influenced the degree of avoidance. While less likely, should juvenile salmonids enter deeper areas where the floats and rafts would be located, we anticipate that they would display avoidance behavior in these locations as well, though the reaction may not be as pronounced.

We cannot estimate the number of individuals that would experience migration delays and increased predation risk from the proposed structures and gear. Adult salmonids utilize deeper waters when migrating, and may encounter the project. But, adult salmonids are more agile, and have the ability to navigate around the structures without increasing the likelihood of predation. With the structures and gear in the water indefinitely, it is likely that during juvenile migration every year, a small fraction of every cohort would have a reduction in fitness. NMFS assumes that this would likely result in increased juvenile salmonid mortality, affecting a small number of fish in each year the equipment is present.

<u>Noise:</u>
Juvenile salmonids may be exposed to noise as described above. Fish are likely to startle, but are not expected to vacate an area when there is noise from equipment or vessels. Juvenile salmonids may have reduced ability to detect prey or predators during episodes of noise, and elevated cortisol and respiration during sound, abating shortly after sound ceases. When fish are not able to detect predators, their risk of injury or death increases. However, because this effect is brief each time it occurs, we expect that risk subsides promptly, and that very few fish would by injured or killed as an indirect consequence.

<u>Disturbance:</u>
Disturbance is an effect that occurs among fish but is not a habitat alteration, as the other pathways of fish exposure and response described above. Fish respond when they detect

movement in water, and shadows above water. This is typically a startle response that is adaptive to predator avoidance, and is a normal behavior. The brief disturbance caused by boat operations and diver presence may cause localized, short-term avoidance of areas where active project work is occurring, but would not be of a long enough duration or over a large enough area to substantially alter the behavior of Chinook, HCSR chum, and steelhead in a manner that becomes injurious.

Response to Long-Term Beneficial Effects

Improved Water Quality:

Shellfish aquaculture has the potential to bring multiple benefits to water quality in estuarine habitats. One of the main benefits is their role as natural filter feeders who feed by filtering large amounts of water and removing suspended particles, including pollutants and excess nutrients. The process can help reduce levels of pollutants, such as nitrogen and phosphorus, which can contribute to the development of harmful algal blooms and low oxygen conditions in aquatic ecosystems. Shellfish aquaculture can also help mitigate the impacts of other human activities, such as urbanization and agriculture, which can lead to increased levels of pollutants and excess nutrients.

Response to Habitat Complexity:

The kelp, mussels, and shellfish gear may recruit species by creating additional, structured habitat potentially increasing foraging opportunities for juvenile salmonids, forage fish, and their preferred prey when migrating or residing within the area. It may also provide predator refuge as well as breeding opportunities for forage fish.

A recent study conducted in New Zealand observed settlement and recruitment of fish in mussel-kelp co-culture and mussel farm monoculture in comparison to 2 adjacent natural habitats (rocky reef and soft-sediment). Results showed that species settlement and recruitment to both the aquaculture and natural habitats were equivalent, likely due to the similarities between the 3D structure created by the mussel farm and the rocky reef's structural complexity. Notably, they also found that the two farmed habitats did not show differences in fish settlement and establishment. This implies that the addition of kelp itself did not enhance structural habitat in a way that might improve fish settlement or recruitment. The study showed that the mussel farms were able to recruit fish and provide suitable habitat in ways that were similar to natural habitat (Underwood & Jeffs 2023).

The kelp blades and its canopy may provide refuge for salmonids from predators. While research has not yet been published regarding salmonid use of farmed kelp, it has been documented that juvenile salmonids and forage fish use bull kelp forests seasonally in Washington state waters (Shaffer et al. 2020).

Individuals from all species considered in this consultation document that rely on the action area would be slightly benefited in their feeding, growth, maturation, and survival by improved water quality. Any exposure would result in a slightly beneficial response at the individual scale (although difficult to detect or document) for listed fishes.

2.5. Cumulative Effects

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

Conditions in the action area are affected by upland activities. Future private and public development actions are reasonably certain to continue in and around PS. As the human population continues to grow, demand for agricultural, commercial, and residential development and supporting public infrastructure is also reasonably certain to grow. Land use changes and development of the built environment are likely to increase upland sources of water quality degradation that are detrimental to salmonid. Recreational demands of the adjacent waters are likely to intensify over time. Though the existing regulations minimize potential adverse effects on salmon habitat, as currently composed and implemented, they still allow systemic, incremental, additive degradation to occur.

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 ongoing shoreline development, aquaculture, and maritime activities, as well as upstream forest management, agriculture, urbanization, road construction, water development, and restoration activities.

Finally, climate change effects similar to those described earlier in this document are likely to occur within the action, including changing water temperatures, changing salinity, changing acidity, and modified food webs.

The cumulative effects are likely to have some negative impacts on the quality and conservation value of critical habitat of PS Chinook salmon, Hood Canal summer-run chum, and juvenile PS/GB bocaccio in the action area.

2.6. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. 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. The status of these species is due to lower abundance and productivity, and reductions in spatial structure and diversity as well. These reduced viability parameters are due in part to reductions in habitat quality and reduced habitat quantity throughout some or all of their range. These degraded habitat conditions are described as limiting factors, and as impairments of features of critical habitat, even where conservation value of the habitat remains high. 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.

2.6.1 Critical Habitat

Critical habitat was designated for PS Chinook salmon, Hood Canal summer-run chum, and PS/GB bocaccio rockfish in Puget Sound to ensure that specific areas with PBFs that are essential to the conservation of those listed species are appropriately managed or protected. The action area is within designated critical habitat for PS Chinook salmon, Hood Canal summer-run chum, and PS/GB bocaccio rockfish. The salmonid's designated critical habitat share the same physical and biological features for nearshore and estuarine critical habitat. The PBFs for juvenile bocaccio's nearshore critical habitat share similar traits to that of the aforementioned salmonids. We consider how the proposed action's impacts on the attributes of the action area's PBFs would affect these designated critical habitats' ability to support the conservation of the respective species as a whole.

The quality of critical habitat in Puget Sound for salmonids and juvenile PS/GB bocaccio, as mentioned above, and has been diminished by several factors unrelated to shellfish and kelp culture. The most notable impairments to salmonid CH are in freshwater environments and are due to land use practices, man-made fish passage barriers, and water use. The nearshore critical habitat suffers from pervasive systemic reductions in function caused by nearshore development, such as bank armoring, overwater structure, dredging, and upland sources of water pollution. Similar to salmonids, PS/GB bocaccio's CH is impaired by invasive/nonindigenous species, contaminants, nutrient addition, and nearshore development (NMFS, 2017).

In the future, climate change is expected to increase in-stream water temperatures and alter stream flows, possibly exacerbating impacts on baseline conditions in freshwater habitats across the region. Rising sea levels are expected to increase coastal erosion and alter the composition of nearshore habitats, which could further reduce the availability and quality of estuarine habitats. Increased ocean acidification may also reduce the quality of estuarine and nearshore habitats. Also, non-federal land and water use practices and climate change are likely to increase. The intensity of those influences on salmonid and rockfish critical habitat is uncertain, as is the degree to which those impacts may be tempered by adoption of more environmentally acceptable land use practices, by the implementation of non-federal plans that are intended to benefit salmonids and rockfish, and by efforts to address the effects of climate change.

The PBF for PS salmonids critical habitat at and adjacent to the project site is limited to nearshore marine areas free of obstruction and excessive predation. The attributes of the PBF that would be affected by the action are obstruction and excessive predation, water quality, forage, and natural cover. The PBF for PS/GB bocaccio critical habitat at and adjacent to the project site is limited to nearshore areas comprised of sand, rock and/or cobbles with eelgrass or kelp. The attributes of the PBF that would be affected by the action are water quality, forage, and reduction of SAV that supports predator avoidance.

The action area is within a bay that is affected by industry and transportation, but water quality conditions are sufficient for aquaculture. The installation and existence of the rafts, floats, and hanging baskets would degrade salmonid critical habitat by creating artificial obstructions to free passage within the bay. In addition to these detriments, however, the kelp and shellfish grown may create additional habitat features, and improve water quality locally. Despite the positive effects, and as described in the effects section, the proposed action would cause short- and long-term minor adverse effects on all of the PBFs. However, based on the best available information, the scale of the proposed action's effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would cause detectable long-term negative changes in the quality or functionality of the estuarine areas PBF in the action area. In light of this, the negative effects are not sufficient, even over the long term, to reduce the conservation role that the habitat provides. Therefore, this critical habitat would maintain its current level of functionality and conservation role for salmonids and PS/GB bocaccio.

2.6.2 ESA Listed Species

PS Chinook salmon, PS steelhead, and Hood Canal summer-run chum are listed as threatened and endangered, based on declines from historic levels of abundance and productivity, loss of spatial structure and diversity, and these are driven in part by an array of limiting factors throughout their range, and as a baseline habitat condition. The environmental baseline within the action area has been degraded by the effects of nearby industry, vessel traffic, urbanization, and shoreline development.

Within the action area, all three species would be affected over time by cumulative effects, some positive – as recovery plan implementation and regulatory revisions increase habitat protections and restoration, and some negative – as climate change and unregulated or difficult to regulate sources of environmental degradation persist or increase. Overall, to the degree that habitat trends are negative, the effects on viability parameters of each species are also likely to be negative. In this context we consider how the proposed action's impacts on individuals would affect the listed species at the population and ESU/DPS scales.

In this context we evaluate the addition of the effects of the proposed action.

PS Chinook and HCSR Chum juveniles are likely to have a low number of individuals, from every cohort while the project is in operation, that experience migration disruption or other behavioral changes that put them at greater risk of reduced growth, or greater susceptibility to predation. An even smaller number of PS steelhead would be expected to have similar consequences, because they are larger fish when they reach this environment. Over the life of the project the same cohorts may also experience some slight habitat benefits (water quality and prey improvements) that could lead to better health or growth.

When all effects are considered, and added to the baseline, even when factoring cumulative effects, the number of fish in each cohort negatively affected are likely to be insufficient to modify the viability attributes (productivity or abundance) of any population.

2.7. Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of Puget Sound Chinook salmon, Hood Canal summer-run chum, or PS steelhead and would not destroy or adversely modify their critical habitat or PS/GB bocaccio's critical habitat.

2.8. Incidental Take Statement

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

2.8.1 Amount or Extent of Take

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

- Harm of juvenile PS Chinook, PS steelhead, and Hood Canal summer-run chum from changes in water quality, reduced forage, and shade associated with project structures and operation.
- Harassment of juvenile PS Chinook, PS steelhead, and Hood Canal summer-run chum from noise and disturbance associated with project installation and operation.

When take is in the form of harm, and harassment, it is often impossible to enumerate the take that would occur because the number of fish likely to be exposed to the harmful or harassing conditions is highly variable over time, influenced by environmental conditions that do not have a reliably predictable pattern, and the individuals exposed may not all respond in the same manner or degree. Where NMFS cannot quantify take in terms of numbers of affected individuals, we instead consider the likely extent of changes in habitat quantity and quality to indicate the extent of take as surrogates. The best available indicators for the extent of take, proposed actions are as follows.

For take in the form of harm of juvenile PS Chinook salmon, PS steelhead, and HCSR chum we use the area (in square feet) of the in- or over-water structures as the surrogate take indicator – this area is approximately 2200 square feet (1600 square feet. from the four rafts and 600 square feet. from the two sink floats). This area functions as a surrogate for take because it is an easily observable measure and the harm is causally related to physical changes in habitat, and the response of fish.

For take in the form of harassment of juvenile PS Chinook salmon, PS steelhead, and HCSR chum, the extent of take is 2 weeks of in water work for installation of equipment in the work window annually, from 2023-2027, with the potential to continue annually should seasonal concrete anchors be used, as the surrogate take indicator. This amount of time functions as a surrogate for take because it is an easily observable measure and the harassment is causally related to the response of fish.

2.8.2 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.

2.8.3 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).

The Corps and/or its applicant shall:

1. Minimize take (harm) of PS Chinook, PS steelhead, and HCSR chum from reductions in water quality.
2. Minimize take (harassment) of PS Chinook, PS steelhead, and HCSR chum from seasonal anchor installation and removal, and in-water gear.
3. Provide a report that shows whether the extent of incidental take surrogate was exceeded.

2.8.4 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 USACE 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. This term and condition implements reasonable and prudent measure 1: Conduct semi-annual observations regarding dissolved oxygen levels within and under the mussel rafts as well as hypoxic or anoxic conditions on the substrate. In order to observe DO, place a sensor in the center of the mussel raft and then record levels at 1 meter and 7 meters below the surface.

   In order to observe substrate conditions, a diver or underwater video recording device would be required. The color of the sediment and dead mussels may be used as an indicator. Grey/black sediments as well as shells, cobbles, or rocks with a black rim may be indicative of anoxic conditions.

2. This term and condition implements reasonable and prudent measure 2: Convert seasonal anchors to helical at earliest possible date, and remove lines and other gear from the water if not in use for 6 months or longer.

3. This term and condition implements reasonable and prudent measure 3: Provide a report within 90 days of the completion of all 5 phases of the project that documents
   a. The number of concrete and helical anchors installed;
   b. That the number of kelp lines, and as-built dimensions of the floats and rafts; and
   c. Any observed episodes of low DO determined when implementing monitoring per term and condition 1.

2.9. Conservation Recommendations

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

The COE should recommend that the applicant do the following:

- Create an inventory of all lines and their specifics (quantity, line type, length, gauge, coloration, line tension, breaking strength, etc.)
- Take photos or ROV video to document the installation of gear, along with the associated latitude and longitude coordinates.
- Report missing line or gear to the State.
- Maintain infrastructure to avoid release of any marine debris such as cultivation lines including the collection and landside disposal of any derelict gear that may collect on their installed gear.
- Conduct pre/post monitoring and inspection of facilities during high surf/wave and storm events to ensure all lines and moorings are secured and tensioned to their specific design standards and not lost or otherwise compromised.
- Collect video monitoring of wildlife interactions with aquaculture gear (including mussel lines, rafts and floats, and kelp) as it would be very valuable in learning about if/how it is used by salmonids or other species.

2.10. "Not Likely to Adversely Affect" Determinations

The applicable standard to find that a proposed action is NLAA listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial.1 Discountable effects cannot be reasonably expected to occur. Insignificant effects are so mild that the effect cannot be meaningfully measured, detected, or evaluated. Beneficial effects are contemporaneous positive effects without any adverse effect to the listed species or critical habitat, even if the long-term effects are beneficial. The NMFS anticipates the proposed action will have only insignificant or discountable effects on the species named in Table 5. Additionally, the proposed action will not take any of the species listed in Table 5. To reach this determination we reviewed the potential effects of all aspects of the proposed activity.

Table 5. Effects determinations for ESA-listed species

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?
PS/GB Bocaccio Rockfish (*Sebastes paucispinis*)	Endangered	Species only- No
PS/GB Yelloweye Rockfish (*S. ruberrimus*)	Threatened	No
Southern Resident Killer Whale (*Orcinus orca*)	Endangered	No
Central America Distinct Population of Humpback Whale (Megaptera novaengliae)	Endangered	No
Mexico Distinct Population of Humpback Whale (Megaptera novaengliae)	Threatened	No

As discussed above in Section 2.5, from the proposed action include bottom disturbance that may affect forage for listed species, elevated noise, impaired ability to migrate, and impact to water quality from bottom disturbance.

Bocaccio

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).

PS/GB bocaccio have been found in low numbers associated with nearshore environments as juveniles by WDNR during their surveys across the Puget Sound. However, neither bocaccio adult or juvenile presence has been documented in or near Port Townsend Harbor, approximately 6 miles north of the proposed project at the northern shore of Port Townsend Bay. The Point Hudson South Jetty, located adjacent to the aforementioned harbor, has been intensely studied over the past 30 years. Two-hundred and twenty-seven surveys have been conducted there with 158 of them having been conducted by REEF Experts (2023). Several surveys identified species specific young of year rockfishes, and almost all identified adult species of rockfishes. No PS/GB bocaccio rockfish were documented, at any lifestage.

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 within Puget Sound and the nearby, intensely studied location, the likelihood of juvenile presence coextensive with the 2.6 acres of the proposed action is low enough that we consider exposure and response to habitat effects associate with the project to be discountable. Adult life stages of this species typically occupy waters deeper than 120 feet with high rugosity and are therefore this lifestage is also unlikely to be within the relatively shallow waters of the proposed project area. We consider, based on very low abundance of bocaccio in Puget Sound, that the exposure of this rockfish at either lifestage is discountable.

Yelloweye Rockfish and its Critical Habitat

Similar to bocaccio, yelloweye rockfish larvae are produced 2 times per year in Puget Sound, and float within the water column for approximately 2 months. Unlike bocaccio, juvenile yelloweye rockfish are most frequently observed in waters deeper than 30 meters (98 ft) near the upper depth range of adults (Yamanaka et al. 2006). The depths at the project site, which are shallower than preferred by adult and juvenile yelloweye rockfish, it is unlikely that adult or juvenile rockfish would be found in the project vicinity. Additionally, during the aforementioned REEF surveys, PS/GB yelloweye rockfish (at any life stage) were not among the rockfish species identified. Based on this, exposure of yelloweye rockfish is considered discountable.

Critical habitat for yelloweye is in areas deeper than the proposed action. Effects of the action are unlikely to extend to areas of critical habitat, and therefore we consider the effects on critical habitat discountable.

Southern Resident Killer Whale and its Critical Habitat

Southern Resident killer whale was listed as endangered on November 18, 2005 (70 FR69903) and critical habitat was designated on November 29, 2006 (71 FR 69054) and expanded on August 2, 2021 (86 FR 41668). A 5-year review under the ESA completed in 2021 concluded that SRKWs should remain listed as endangered and includes recent information on the population, threats, and new research results and publications (NMFS 2021). As of the summer of 2020, there were 72 SRKW, and during fall 2020 two more calves were born (L. Barre, personal communication, October 2, 2020). In January of 2023, 73 individuals remained (Government of Canada 2023).

Critical habitat is designated throughout the marine portions of the action area, excluding Hood Canal. PBFs for SRKW are:

- Water quality to support growth and development;
- Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and
- Passage conditions to allow for migration, resting, and foraging.

Effects to water quality, prey, and passage are detailed in Section 2.4, above. Below is our rationale as to why these effects are discountable or insignificant for SKRW and their critical habitat.

<u>Water Quality:</u>
Any changes to water quality are expected to be localized and minor, and the project is likely to include both negative and positive effects at this small scale. While these occur within the CH designation for SRKW, they are not at a scale or duration that would degrade the conservation role of the habitat. Similarly, there would be insufficient exposure (duration or intensity) of any individual SRKW to implicate adverse response.

<u>Prey:</u>
Adult Chinook salmon have been identified as the preferred prey of SRKW (Hilborn et al. 2012; PFMC 2020; Hanson et al. 2021) and thus a decrease in the abundance of PS Chinook salmon could reduce available forage. While take of individual PS Chinook salmon is likely to occur as described in the analysis, most effects would be among juvenile fish, and most effects do not result in immediate injury or death of these individual juveniles, though they do raise the risk of injury or death. If juveniles are injured or killed, we do not expect the number to be large enough to create any measurable effect on the number of adult returning fish. Adults are not expected to be harmed or killed as a result of the structures or operation associated with the project. Effect on prey is insignificant.

Steelhead are known to make up only a very small portion of their SRKW diet, even during winter months when preferred prey (Chinook salmon) are less prevalent (see Hanson et al. 2021). Therefore, in light of similar effects on steelhead as Chinook as discussed above, and because steelhead are not a preferred prey for SRKW, we do not anticipate effects of the proposed project on PS steelhead to have a measurable effect on SRKW diet composition, or forage availability. Therefore, we do not anticipate a reduction in abundance or quality of salmonids as a prey item to occur at levels or frequency to cause any discernible effect to the forage PBF of SRKW critical habitat. Response of individual SRKW to this insignificant prey effect is also insignificant.

<u>Passage:</u>
The location of the in- and overwater structures would not inhibit or interfere with passage of SRKW for migration, resting or foraging because of the small scale of the structures relative to the action area, and because they are not located within any constricted migration corridors. While SRKW may occasionally utilize Port Townsend Bay, their echolocation capabilities suggest that it is unlikely that lines would be an entanglement hazard. Even though aquaculture

has been long practiced in Puget Sound, no cases have been reported in the Puget Sound of entanglement by any cetacean. Given the small footprint of structures relative to surrounding waters, we consider the effect on passage conditions insignificant, and exposure or response discountable.

Noise:

While SRKW could be present in nearby areas when vessels transit one time per to/from the action area, we expect the applicant to follow current approach regulations to keep vessels a minimum of 300 yards away from SRKW and to cease motor operation within 300 yards of SRKW. The applicant also intends to scan the area for presence of this species prior to work in the action area, and delay work until the species is no longer present. Despite these measures, if SRKW are present when construction vessels arrive or leave the project site, SRKW would notice and are likely to respond vessel noise. SRKW have been noted to have disrupted foraging behavior when vessels are nearby (Holt et al., 2021). However, the period of vessels transiting to or from the action area each week is expected to be very brief (measured in hours, at a maximum) and stop operating procedures are expected to be adhered to. If disrupted feeding behavior occurs, it is expected to abate after the vessels are stationed and the engines cease operating. Based on the brevity of expected exposure, we consider response to noise among SRKW to be insignificant.

Because all potential effects on PBFs of SRKW critical habitat are expected to be insignificant or discountable, the proposed action is not likely to adversely affect critical habitat for SRKW. With no significant indirect habitat effects to SRKW, nor measurable direct effects to SRKW, any potential effects to SRKW are expected to be insignificant

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 whale 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.

Critical habitat was designated for humpback whale DPSs in April, 2021 (86 FR 21082). Critical habitat for the Central America DPS and Mexico DPS of the humpback whale extends from the Pacific Ocean into the Strait of Juan de Fuca, to Angeles Point, just west of Port Angeles. Critical habitat encompasses off shore areas up to 1,200 meters with the shoreward boundary at 50 meters. The action area for this consultation does not overlap with critical habitat for Central America DPS and Mexico DPS of the humpback whales. The physical and biological feature of humpback critical habitat is prey availability. While the action is expected to affect forage fish in Puget Sound, the proposed action will not affect prey resources within critical habitat for the two humpback whale DPSs.

<u>Gear in Aquatic Habitat/Passage:</u>
The cultured kelp and lines associated with the floating structures may obstruct or entangle humpbacks as they utilize Port Townsend Bay. Evidence suggests that the potential for entanglement in gear is low, especially considering the shallow draft of floating gear. A recent review of entanglements within aquaculture gear (specifically gear for longline mussel culture) found just 19 occurrences globally since 1982 (Price et al. 2016). It is notable that these examples were associated with offshore shellfish aquaculture operations in deep water habitat. By contrast, global annual entanglements and bycatch of marine mammals within fishery gear (e.g. gill nets, trawl nets) numbers in the hundreds of thousands (Reid et al. 2006).

But as described above, considering the size of the farm in comparison to the bay in its entirety, historically no reported entanglements with humpback whales with kelp aquaculture farms or mussel rafts, and the lower probability of an ESA listed DPS of humpback whale in the action area, the effect of the gear and farm in the water column on their movement is considered insignificant.

<u>Noise:</u>
While humpback whales could be present in nearby areas when vessels transit to/from the action area, we expect the applicant to scan for species presence prior to work in the action area, and delay work until the species is no longer present. Humpback whales have been noted to have disrupted foraging behavior when vessels are nearby (Holt et al. 2021; Blair et al. 2016). However, the period of vessels transiting to or from the action area is expected to be very brief (measured in hours, at a maximum) and stop operating procedures are expected to be adhered to. If disrupted feeding behavior occurs, it is expected to abate after the vessels are stationed and the engines cease operating. Based on the brevity of expected exposure, we consider response to noise among humpback whales to be insignificant.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Hama Hama Company Skunk Island Kelp Aquaculture Pilot and Skunk Island Aquaculture projects.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

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

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

This analysis is based, in part, on the EFH assessment provided by the COE and that conducted by NMFS, and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council (PFMC 2022a), coastal pelagic species (CPS) (PFMC 2023), and Pacific Coast salmon (PFMC 2022b) in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce. In this case, NMFS concluded the proposed action would not adversely affect EFH for highly migratory species.

3.1. Essential Fish Habitat Affected by the Project

As part of the information provided in the request for ESA concurrence, the USACE determined that the proposed action may have an adverse effect on EFH designated for Pacific Coast salmon, Pacific Coast groundfish, and CPS. The effects of the proposed action of EFH are the same as those described above in the ESA portion of this document. The action area also contains Habitat Areas of Particular Concern (HAPC) for Pacific Coast groundfish.

3.2. Adverse Effects on Essential Fish Habitat

As described in the preceding opinion, the proposed action is expected to affect EFH components in Port Townsend Bay. We conclude that the proposed action would have the following adverse effects on EFH designated for Pacific Coast salmon, Pacific Coast groundfish, and CPS.

1. The proposed anchor installation and removal activities would temporarily reduce water quality. This entails suspended sediments, and potentially, lower dissolved oxygen levels.
2. The proposed anchor installation and removal activities would disturb benthic habitat and reduce the quantity and quality of benthic prey communities.

3. The proposed structures and related equipment would shade SAV which would reduce its density and abundance, and related primary production.
4. The proposed structures and related equipment would create enduring incremental diminishment of migration conditions for Pacific Coast salmon.

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. Where possible, consider using helical or permanent anchors instead of seasonal concrete anchors to limit disturbance to the substrate and potential expansion of seagrasses in the area.
2. If low DO is detected under the mussel rafts, reduce mussel density by removing lines/increasing spacing between lines.

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

3.4. Statutory Response Requirement

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

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

3.5. Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the USACE. Other interested users could include the applicant, the WDFW, tribal entities, the governments and citizens of Jefferson County, and the town of Port Townsend. Individual copies of this opinion were provided to the USACE. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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