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

Refer to NMFS No:
WCRO-2022-01880

May 22, 2023

Tamara Champagne
1835 Blacklake Blvd SW Unit B
Olympia WA 98512

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Taylor Bay Wastewater Treatment Plant and Outfall Replacement, Taylor Bay Beach Club, Longbranch, Pierce County, Washington. (Hydrologic Unit code 17110019, Taylor Bay).

Dear Ms. Champagne:

Thank you for your letter of August 8, 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 Rural Development U.S. Department of Agriculture Taylor Bay Wastewater Treatment Plant and Outfall Replacement, Taylor Bay Beach Club, Longbranch, Pierce County, Washington.

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), and concluded that the action would adversely affect the EFH of Pacific Coast Salmon, Pacific Coast Groundfish and coastal pelagic species. Therefore, we have included the results of that review in Section 3 of this document.

Please contact Bonnie Shorin at Bonnie.Shorin@noaa.gov, or at 360 995 2750, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Ambrea Cormier, USDA
Brad Thompson, USFWS

WCRO-2022-01880

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

Taylor Bay Wastewater Treatment Plant and Outfall Replacement

NMFS Consultation Number: WCRO-2022-01880

Action Agency: US Department of Agriculture Rural Development

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status		Is Action Likely To Jeopardize the Species?		Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Puget Sound Steelhead (*Oncorhynchus mykiss)*	Threatened		No		NA
Puget Sound Chinook (*O. tshawytscha)*	Threatened		No		No
Puget Sound/Georgia Basin Yelloweye Rockfish (*Sebastes ruberrimus)*	Threatened		No		No
Puget Sound/Georgia Basin Bocaccio (*Sebastes paucispinis)*	Endangered		No		No
Humpback Whales (*Megaptera novaeangliae* CAM and MEX DPS)	CAM – Endangered Mex - Threatened		No		No
Southern Resident Killer whale *(Orcinus area)*	Endangered		No		No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
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: May 22, 2023

TABLE OF CONTENTS

1. INTRODUCTION

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

1.1. Background

The National Marine Fisheries Service (NMFS) prepared 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 Lacey Washington office.

1.2. Consultation History

NMFS received an original request from the US Department of Agriculture (USDA) for consultation for the Taylor Bay outfall replacement project on August 3, 2021. The USDA sought informal consultation, based on its determination that the effect of its funding for this action would be not likely to adversely affect listed species or designated critical habitat.

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 FR 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. As a result, the 2019 regulations are once again in effect, and we are applying the 2019 regulations here. For purposes of this consultation, 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.

On July 8, 2022 NMFS sent a letter of nonconcurrence, based on adverse effects it considers likely to occur.

On July 26, 2022, a new request, for formal consultation, was provided but it retained USDA's findings of "not likely to adversely affect" for all ESA listed species (Puget Sound (PS) Chinook Salmon, PS steelhead, yelloweye rockfish, bocaccio rockfish, and Southern Resident Killer

Whale (SRKW))) with the no exception of a "no effect" call for green sturgeon and eulachon. Because a no effect determination is not a trigger for consultation, we do not address these species further in this document. SRKW critical habitat (CH) and humpback whales were not included in the consultation request. Other critical habitats were also determined by the Action Agency to be NLAA.

On March 10, 2023, NMFS met electronically with USDA officials to discuss details and scale of the project and provide additional reference documentation, including photos of the project site.

On May 2, 2023, the project proponent advised USDA and NMFS during an electronic meeting that the outfall would be placed at a 500-foot distance from the shore rather than 900 feet, due to low contaminant load in the modelled effluent.

On the same date, NMFS sought USDA's confirmation that SRKW and Humpback whales should be included in the consultation. We received their affirmative reply on the same date.

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

The proposed action, located within Longbranch, Washington, would provide funding to replace the Taylor Bay Beach Club (TBBC) wastewater treatment plant (WWTP) and extend the outfall further into Case Inlet (47.18511, -122.77404). The Taylor Bay Wastewater Treatment (TB WWTP) and disposal system was installed in 1969 – 1971 to serve the needs of the TBBC residential community, comprised of 184 building lots located on Taylor Bay at the southwestern end of the Key Peninsula. This WWTP is operated under National Pollutant Discharge Elimination System (NPDES) discharge of treated effluent into Case Inlet in Puget Sound. The existing wastewater treatment facility (WWTF) and outfall were completed in December 1970 (Permit no. WA 37656). The existing outfall discharges into the Case Inlet in a location with shellfish beds. The WWTF is an old package-treatment activated sludge plant which has reached it useful life; the outfall diffuser has fallen off and the entire outfall needs to be replaced. This WWTP services less than 400 people and treats less that 29 thousand gallons per day,

The proposed project would repair 1,000 feet of the TBBC sewer collection system, install a Membrane Bioreactor (MBR) WWTP to improve treatment on the existing site, and replace the effluent pipeline between the TBBC WWTP and marine outfall approximately 1,900 feet offshore near the mouth of Taylor Bay. The Membrane Bioreactor System is an activated sludge treatment system which uses membranes to filter the treated wastewater as it is pumped out of the aeration basin. These membranes are commonly designed to provide microfiltration, removing particles between 0.1 um and 1 um in size, and consistently producing effluent with less than less than 1 mg/L TSS. The microfiltration is very effective at removing solids in the wastewater, including some bacteria.

USDA RD funding and the associated Department of the Army Permit required for outfall replacement pursuant to Section 10 of the Rivers and Harbors Act of 1899 are the federal nexus for this project. The Addendum to the Preliminary Engineering Report (PER) recommended a single port outfall at a depth of 180 ft. At this depth the outfall discharge port meets the minimum sanitary radius of 900 feet from shellfish boundary of 70 feet.

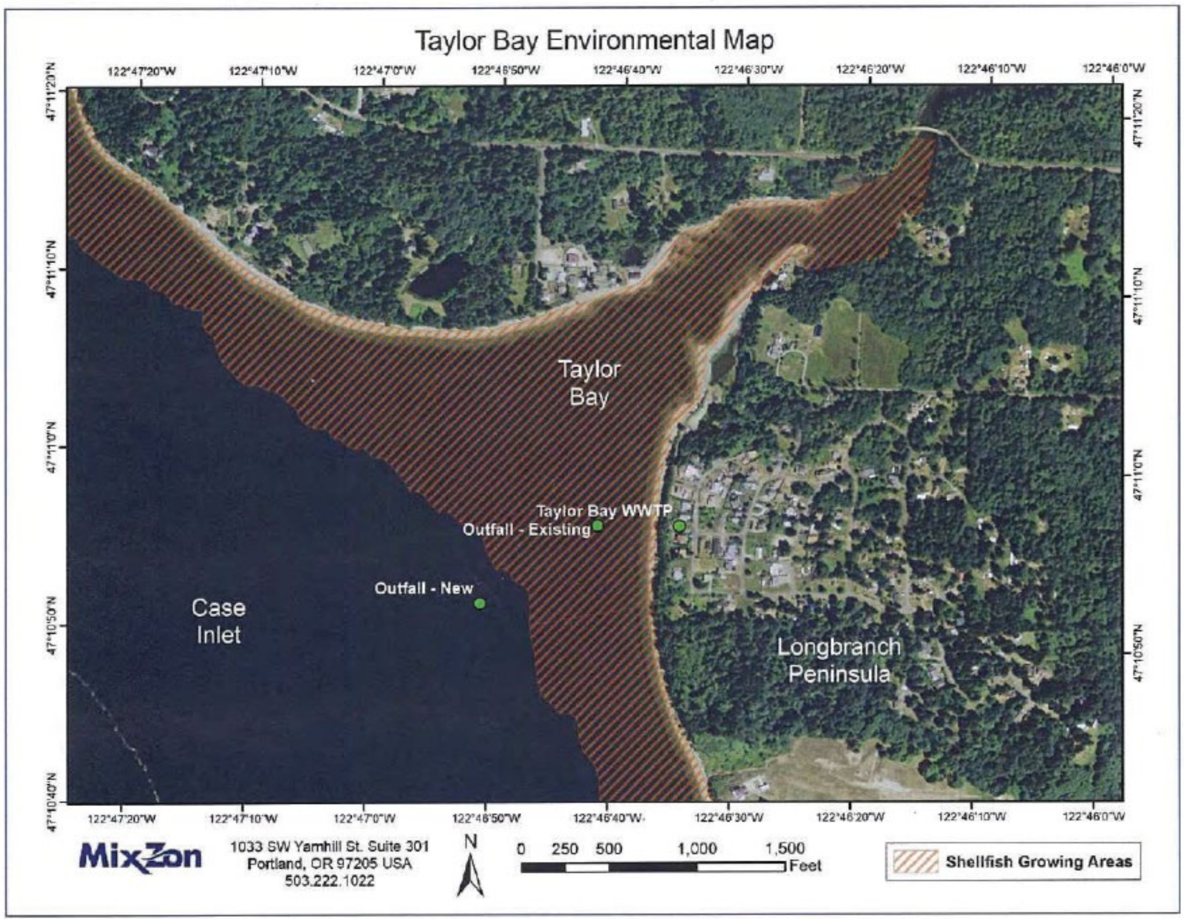

Figure 1: Taylor Bay Environmental Map, Highlighting location of existing outfall and new proposed outfall

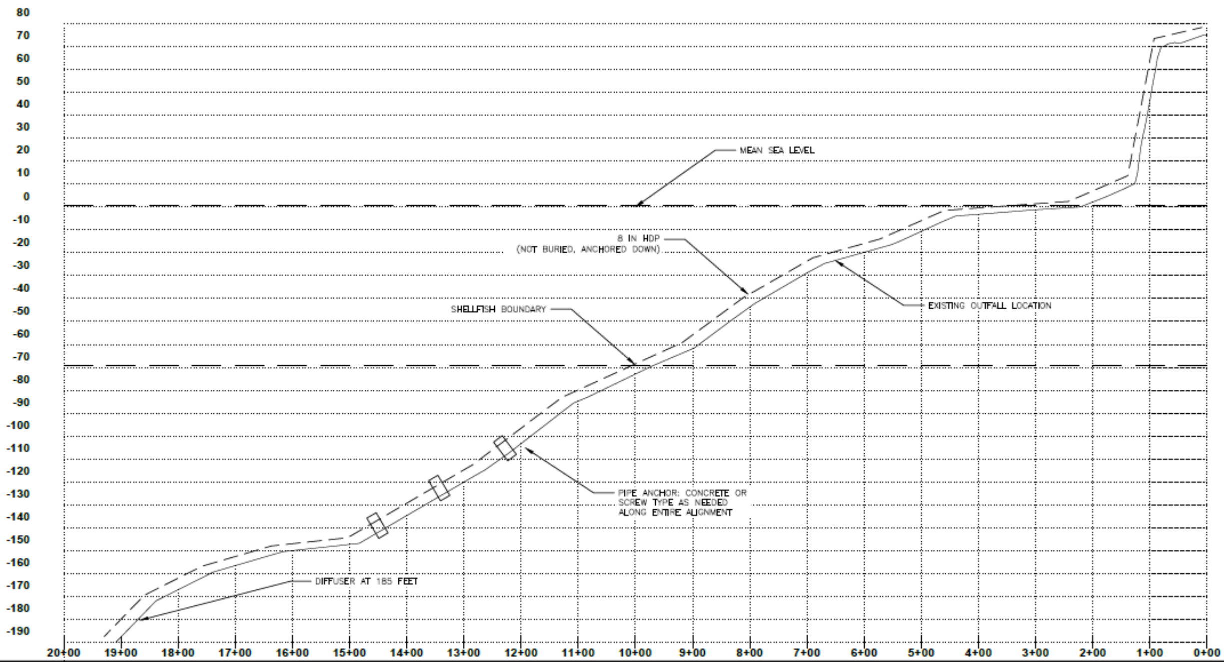

Figure 2: Location of outfall relative to shellfish bed

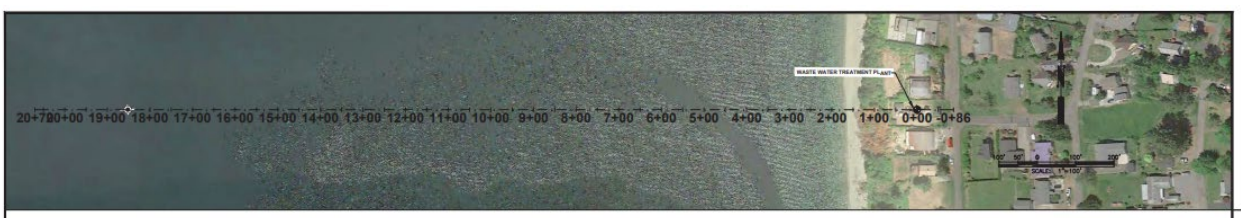

Figure 3: Location of outfall relative to WWTP

Work required for this project would include:

1. Excavation of the existing WWTP site to install new tanks and piping.
2. Use of open-cut trench to replace 1,000 feet of 6- and 8-inch sewer mains in the Taylor Bay Community.
3. Connection of the new 8-inch HDPE effluent pipeline at the end of the UV Disinfection Unit and extending it across the face of the unstable bluff on the ground surface.
4. Open trenching across the beach to a depth of 3 feet to replace 200 feet of the effluent pipeline across the beach to a depth of approximately -2 feet MLLW.
5. Replacement of the existing effluent pipeline and outfall and extension of the outfall pipe to the west to a depth of -150 feet MLLW to eliminate shellfish contamination and to allow commercial harvest of Commercial Geoduck Tract 14300.

Construction of the outfall would be completed by installing the new 8-inch HDPE pipe from the outfall on the disinfection unit across the surface of the bluff to replace the upland portion of the effluent pipeline. Open trenching would be used to install the new 8-inch HDPE pipe across the intertidal zone (approximately 200 feet) and the offshore portion of the outfall would be replaced with weighted 8-inch HDPE pipe that would be lowered into position from a workboat with the assistance of divers, once funding and permits are secured. The new HDPE outfall would be extended approximately 1,900 feet from shore to the west to a depth of -185 feet MLLW to ensure adequate effluent dilution and to eliminate water quality impacts to Geoduck Harvest Tract 14300, which would allow the DOH to open this geoduck bed for commercial harvest. The ambient depth in the vicinity of the new outfall is 15 fathoms (90 ft, 27.4 m), beyond sensitive shellfish area. Extension of the outfall to this depth would eventually allow harvest of the commercial Geoduck Tract 14300 be opened for recreational harvest. It would also eliminate the threat of legal action and fines to penalize TBBC for contamination of the Geoduck Tract 14300.

The replacement of the TB WWTP will occur on the upland half of the existing WWTP site to allow the existing WWTF to process wastewater until the new MBR WWTP comes online. The proposed effluent pipeline and outfall replacement project will occur in the waters of Case Inlet.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would enable continued discharge of effluent, not previously analyzed for its effects on critical habitat or listed species. The project will not increase effluent volume, but will continue to discharge effluent into Taylor Bay. The effluent discharged will be modified, and the effects of that discharge on ESA-listed species and Critical Habitat, as well as effects on EFH, are discussed below.

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 TBBC is located in Sections 26 and 27 of Township 20 North, Range 1 West near Longbranch on the Key Peninsula: Latitude 47.188508, Longitude -122.771654. The TB WWTP is located on Pierce County tax parcel 6925000230 at 8220 178th Avenue in Longbranch, Washington, and currently discharges treated effluent to a shallow subtidal site approximately 800 feet offshore at a depth of approximately -25 feet MLLW under Easement 05022019 (21-034318) from the Washington State Department of Natural Resources (DNR), which owns subtidal lands in Washington State. The presence of the outfall requires the Washington State Department of Health (DOH) to close Geoduck Tract 14300 and the portion of the West Key Peninsula Commercial Growing Area surrounding Taylor Bay.

The action area includes the upland locations where work will occur, the trenched area where the upgraded outfall will be placed, and area adjacent to the trenching where water quality will be disturbed by suspended sediment. It also includes an area up to 1 kilometer from the point of discharge where contaminants in the effluent are likely to be dispersed by tides and currents into South Puget Sound.

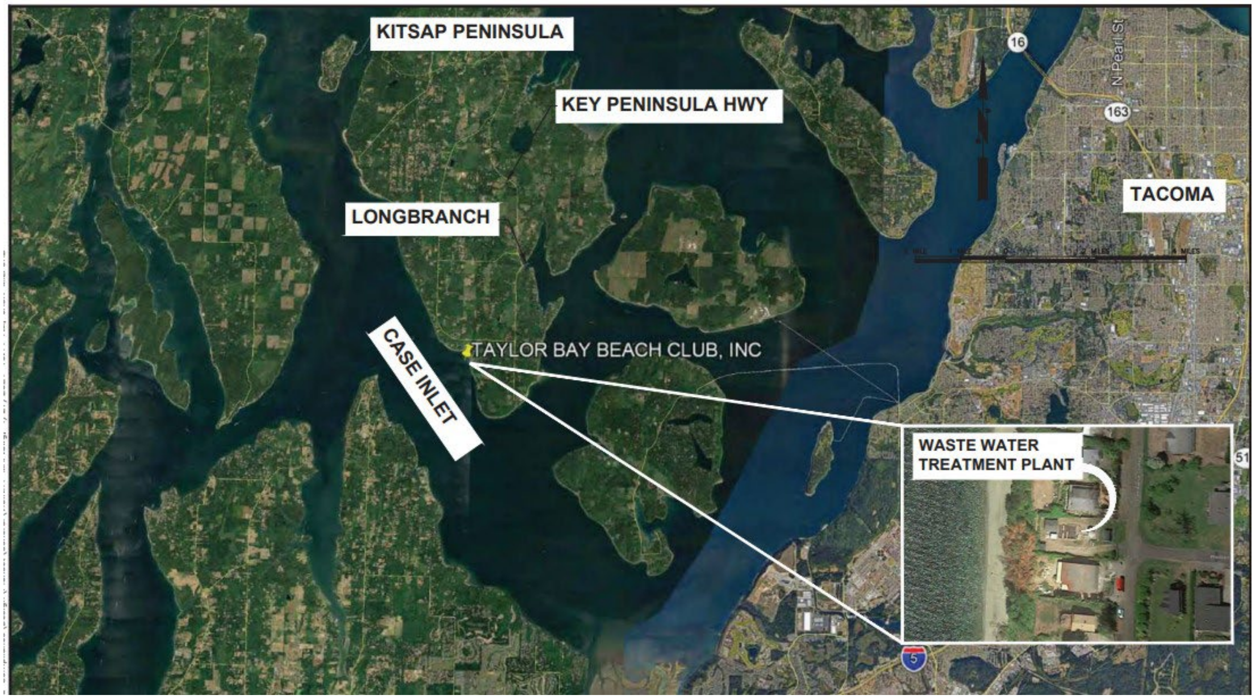

Figure 4: Location of TBBC that discharges treated wastewater via ocean outfall into Case Inlet in the south end of Puget Sound

Figure 5: Location of TBBC WWTP that discharges treated wastewater via ocean outfall into Case Inlet in Taylor Bay

Figure 6: Location of Oceanic Outfall which will discharge effluent into Taylor Bay

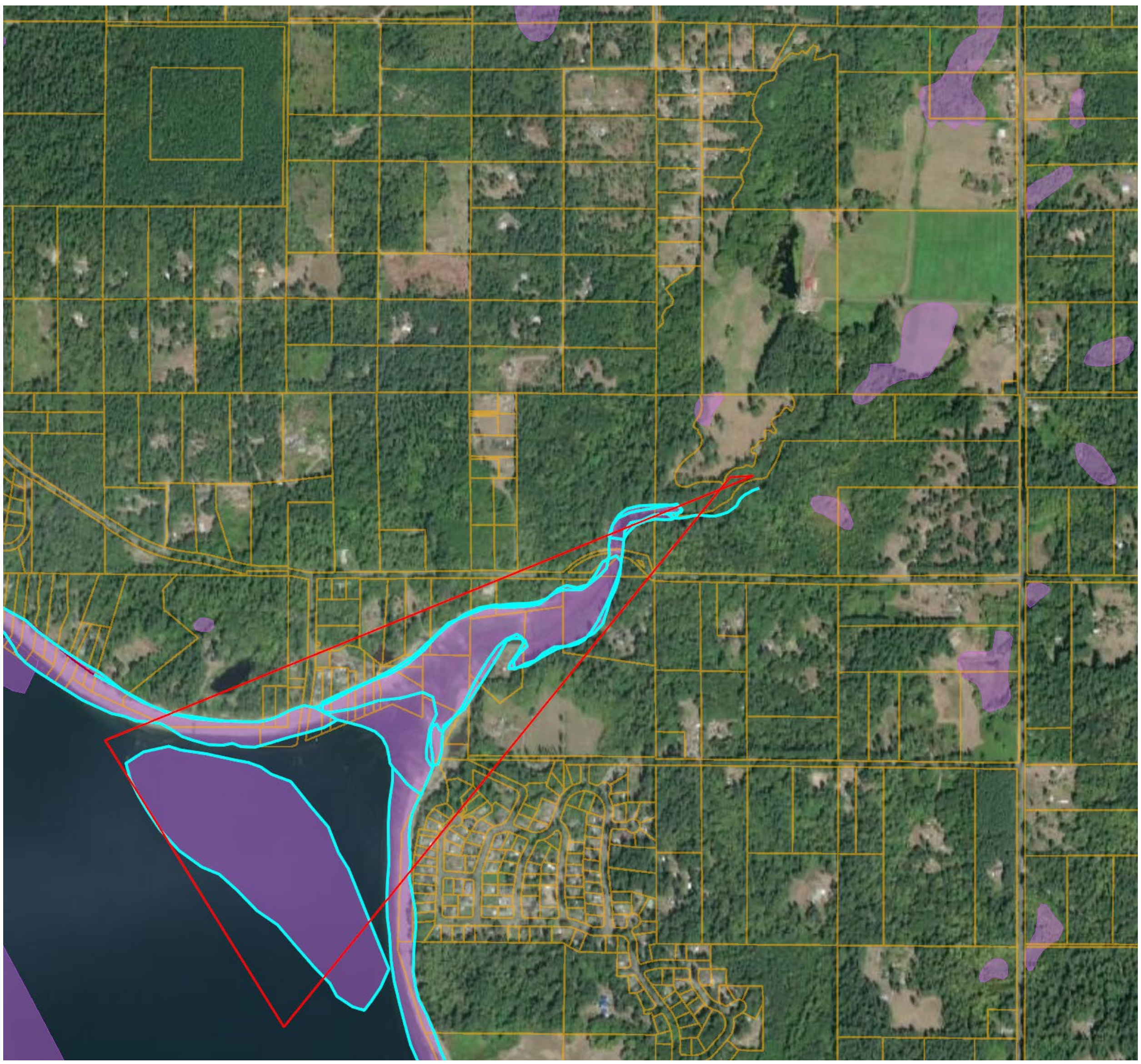

Figure 7: Protected Habitat and Species Data Map & Data for Taylor Bay Beach Club WWTP Outfall Replacement Project

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.

Because the proposed action would cause the continued discharge of municipal effluent from the service area to Puget Sound, in addition to the species and critical habitats identified in section 1.2 of this document, NMFS also analyzed the action's potential effects on humpback whales (Central America and Mexico DPSs), SRKW, and designated critical habitat for SRKW. Based on our analysis, the NMFS concluded that the proposed action is likely to adversely affect PS/GB bocaccio, PS/GB yelloweye rockfish, PS Chinook salmon, PS steelhead, and designated critical habitat for PS Chinook salmon, PS/GB bocaccio, PS/GB yelloweye rockfish and SRKW. Our conclusion that proposed action is not likely to adversely affect humpback whales (Central America and Mexico DPSs) and SRKW is documented in the "Not Likely to Adversely Affect" Determinations section (2.12) of this opinion.

Species	Status	Species	Critical Habitat	Listed / CH Designated
steelhead (*O. mykiss*) Puget Sound	Threatened	LAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound	Threatened	LAA	LAA	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
bocaccio (*Sebastes paucispinis*) Puget Sound/Georgia Basin	Endangered	LAA	LAA	04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041)
yelloweye rockfish (*S. ruberrimus*) PS/GB	Threatened	LAA	LAA	04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041)
Killer whales (Orcinus orca) Southern resident (SR)	Endangered	NLAA	LAA	11/18/05 (70 FR 57565) / 11/29/06 (71 FR 69054)

Table 1: ESA-listed species and critical habitat that may be adversely affected by the proposed action.

LAA = likely to adversely affect
N/A = not applicable. The action area is outside designated critical habitat, or critical habitat has not been designated.
NLAA = not likely to adversely affect

ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Central America humpback whales (*Megaptera novaeanglia*)	Endangered	NLAA	N/A	09/08/16 (81 FR 62259) / N/A
Mexico humpback whales (*Megaptera novaeanglia*)	Threatened	NLAA	N/A	09/08/16 (81 FR 62259) / N/A

Table 1:ESA-listed species and critical habitat that are not likely to be adversely affected by the proposed action.

2.1. Analytical Approach

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

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

The designation(s) of critical habitat for [*list species*] use(s) the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

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

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

2.2. Rangewide Status of the Species and Critical Habitat

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

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 4th 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%), while 68% 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 X, 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 X 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 2006	NMFS 2016; Ford 2022	This ESU comprises 22 populations distributed over five geographic areas. All Puget Sound 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 Puget Sound 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	• 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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				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.	• 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
Puget Sound/ Georgia Basin DPS of yelloweye Rockfish	Threatened 04/28/10	NMFS 2017d	NMFS 2016d	Yelloweye rockfish within the Puget Sound/Georgia Basin (in U.S. waters) are very likely the most abundant within the San Juan Basin of the DPS. Yelloweye rockfish spatial structure and connectivity is threatened by the apparent reduction of fish within each of the basins of the DPS. This reduction is probably most acute within the basins of Puget Sound proper. The severe reduction of fish in these basins may eventually result in a contraction of the DPS' range.	• Over harvest • Water pollution • Climate-induced changes to rockfish habitat • Small population dynamics
Puget Sound/ Georgia Basin DPS of Bocaccio	Endangered 04/28/10	NMFS 2017d	NMFS 2016d	Though bocaccio were never a predominant segment of the multi-species rockfish population within the Puget Sound/Georgia Basin, their present-day abundance is likely a fraction of their pre-contemporary fishery abundance. Most bocaccio within the DPS may have been historically spatially limited to several basins within the DPS. They were apparently historically most abundant in the Central and South Sound with no documented occurrences in the San Juan Basin until 2008. The apparent reduction of populations of bocaccio in the Main Basin and South Sound represents a further reduction in the historically spatially limited distribution of bocaccio, and adds significant risk to the viability of the DPS.	• Over harvest • Water pollution • Climate-induced changes to rockfish habitat • Small population dynamics

2.2.2 Status of the Critical Habitat

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

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 X, below.

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

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for Puget Sound Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sounds. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.
Puget Sound/Georgia Basin DPS of yelloweye rockfish	11/13/2014 79 FR68042	Critical habitat for yelloweye rockfish includes 414.1 square miles of deepwater marine habitat in Puget Sound, all of which overlaps with areas designated for canary rockfish and bocaccio. No nearshore component was included in the CH listing for juvenile yelloweye rockfish as they, different from bocaccio and canary rockfish, typically are not found in intertidal waters (Love et al., 1991). 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). 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.
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	Designation Date and Federal Register Citation	Critical Habitat Status Summary
		species that modify habitat, and degradation of water quality as specific threats to rockfish habitat in the Georgia Basin.
Southern resident killer whale	08/02/21 86 FR 41668	Critical habitat includes approximately 2,560 square miles of marine inland waters of Washington: 1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; 2) Puget Sound; and 3) the Strait of Juan de Fuca. Six additional areas include 15,910 square miles of marine waters between the 20-feet (ft) (6.1-meter (m)) depth contour and the 656.2-ft (200-m) depth contour from the U.S. international border with Canada south to Point Sur, California. We have excluded the Quinault Range Site. Based on the natural history of the Southern Residents and their habitat needs, NMFS identified three PCEs, or physical or biological features, essential for the conservation of Southern Residents: 1) Water quality to support growth and development; 2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and 3) passage conditions to allow for migration, resting, and foraging Water quality in Puget Sound, in general, is degraded. Some pollutants in Puget Sound persist and build up in marine organisms including Southern Residents and their prey resources, despite bans in the 1970s of some harmful substances and cleanup efforts. The primary concern for direct effects on whales from water quality is oil spills, although oil spills can also have long-lasting impacts on other habitat features In regards to passage, human activities can interfere with movements of the whales and impact their passage. In particular, vessels may present obstacles to whales' passage, causing the whales to swim further and change direction more often, which can increase energy expenditure for whales and impacts foraging behavior. Reduced prey abundance, particularly Chinook salmon, is also a concern for critical habitat.

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).

South Puget Sound Habitat

The waters of South Puget Sound are designated as "Extraordinary Quality aquatic life use" per WAC 173-201A-210(1), and as such water quality of this use class shall markedly and uniformly exceed the requirements for all uses including, but not limited to, salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning. In Puget Sound, the marine nearshore landscape encompasses the interface between subtidal marine habitats and the upland watershed (including the riparian zone), which is shaped by alongshore processes that affect sediment transport and aquatic species movement patterns. These shoreline processes must continue to function appropriately across the entire landscape to sustain shoreline habitats and ecological functions in a long-term, resilient condition (Williams and Thom 2001; Best 2003; Thom et al. in review). Further, these processes must be intact for restoration of habitat structure to be successful and self-maintaining (Simenstad et al. 2006).

Taylor Bay is surrounded by low levels of shoreline development, has low gradient beaches, and largely has good water quality, sufficient to support shellfish growers and related aquaculture. There is no eelgrass present in the surrounding waters (Christiaen et al 2022). See Figures 10 and 11 below for specifics. The site includes the distribution of effluent from the TB WWTP facility that meets NPDES standards, but does not comport with Washington Department of Health criteria for aquaculture. The action area contains designated critical habitat for PS Chinook salmon, PSGB bocaccio rockfish, and SRKW. The action area includes both deep water (greater than 98 feet) critical habitat for PSGB bocaccio and nearshore (shallower than 98 feet) critical habitat for PSGD bocaccio. The action area is also EFH for Coastal and Pelagic Species, Pacific Coast Groundfish, and Pacific Coast Salmon.

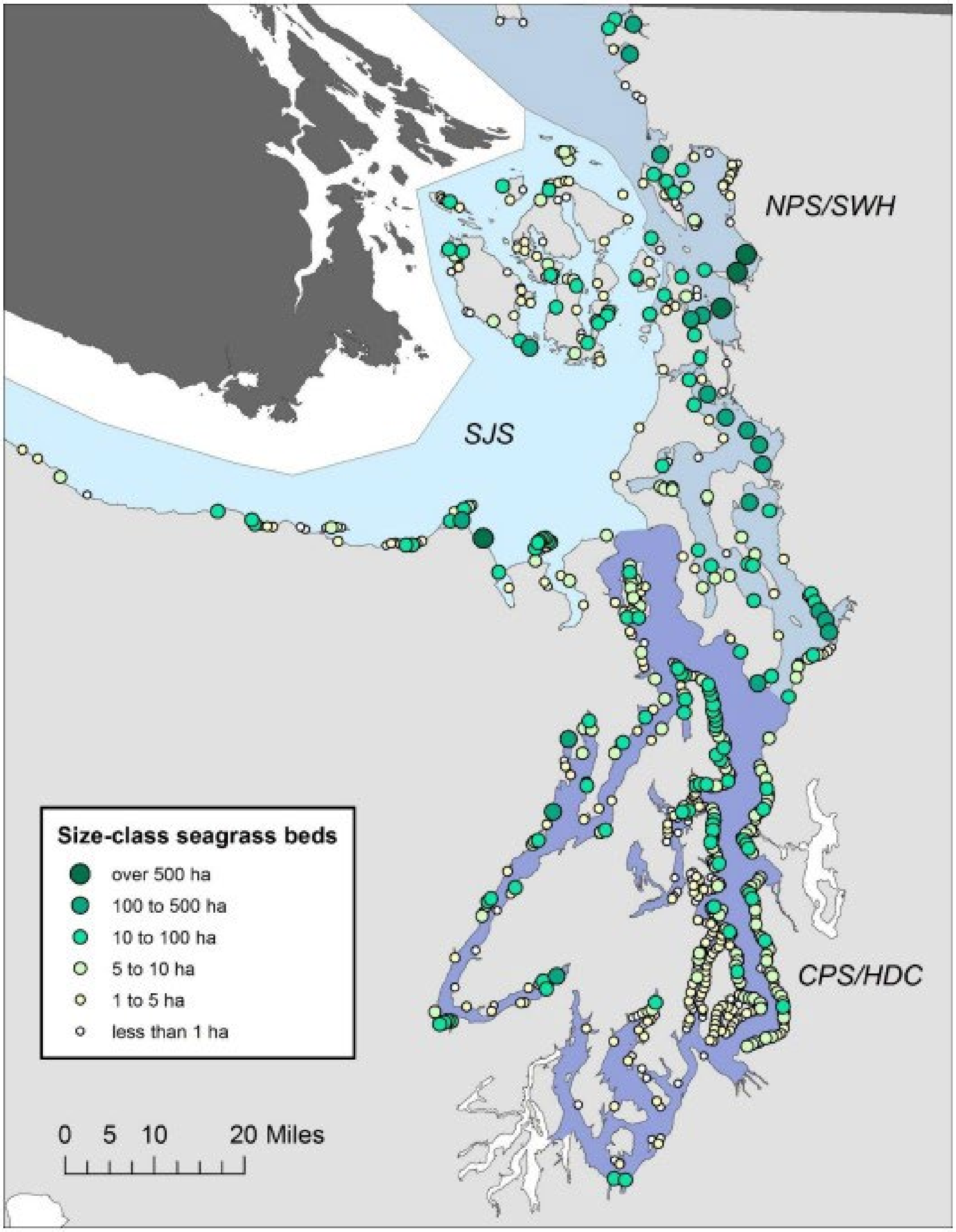

Figure 8: Eelgrass area at individual sites. Larger symbols and darker colors indicate larger eelgrass beds (Ford et al 2022).

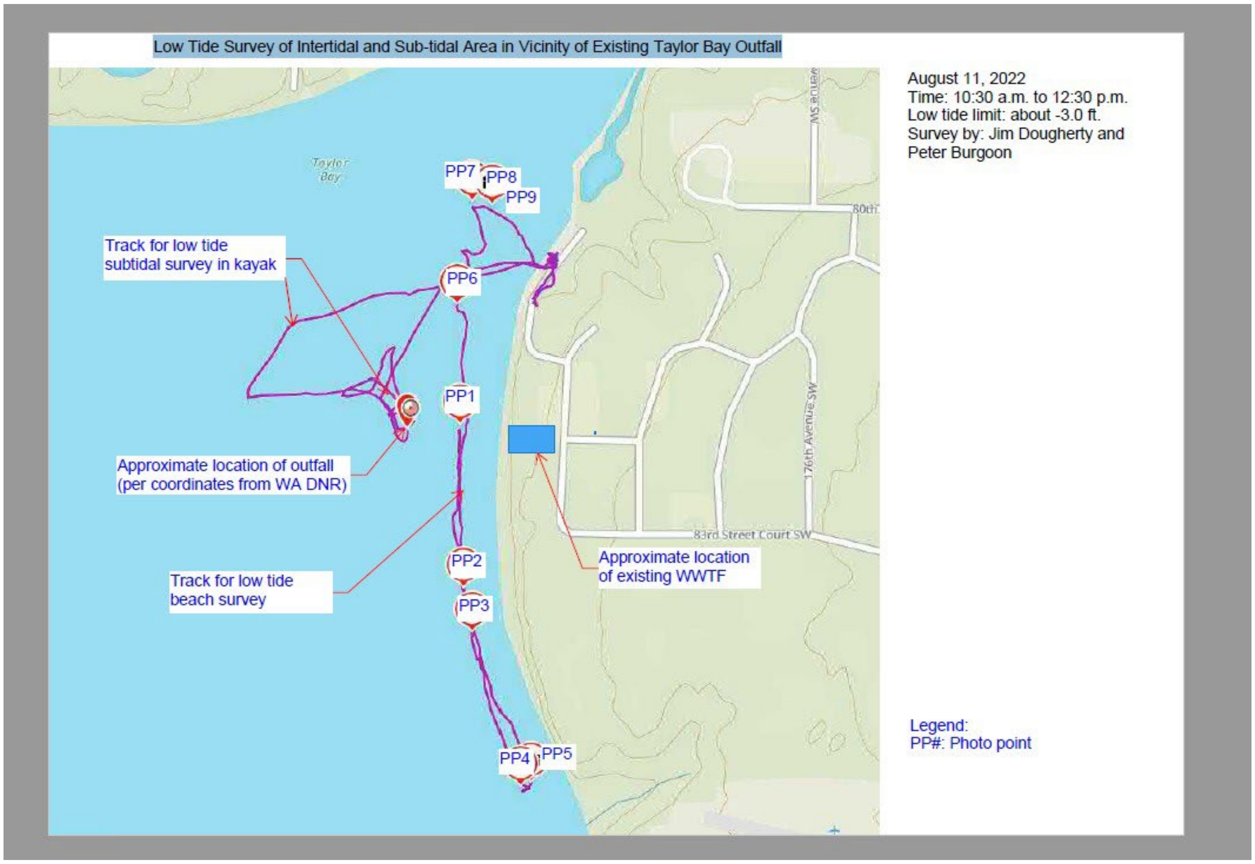

Figure 9: Low Tide Survey of Intertidal and Sub-tidal Area in Vicinity of Existing Taylor Bay Outfall

Juvenile Chinook salmon are present when migrating offshore in the fall as they grow larger. Mature Chinook salmon are present in Case Inlet during the spring and summer/fall runs. Puget Sound steelhead also spawn and rear in the Nisqually River and are likely to pass through the project area, offshore in Case Inlet, each year. Critical habitats for both protected Puget Sound rockfish species are present in Case Inlet offshore of Taylor Bay. Both yelloweye and bocaccio are potentially present in the project vicinity as well.

An intertidal riparian survey was conducted to determine eelgrass abundance within the action area and its surrounding waters (Figure 11). There is no eelgrass present (Christiaen et al, 2022) and the nearest eelgrass is 2 miles north.

Water Quality

Water quality in the action area is good despite receiving discharge from the Taylor Bay Wastewater Treatment and disposal system, operated under National Pollutant Discharge Elimination System (NPDES) Permit #WA-003765-6 for discharge of treated effluent into Case Inlet in Puget Sound.) with a Maximum Day Flow of 0.029 MGD (20 GPM), Peak Flow of 0.078 MGD (60 GPM) and a BOD5 Load of 0.2lb./day/capita (58 lb./day). The existing outfall discharges to a shallow subtidal area approximately 800 feet off-shore that could be exploited as a commercial geoduck bed if the TBBC WWTP outfall were not present.

Discharge from the existing TB WWTP is currently treated with UV light as a final disinfecting stage and can help remove some chemicals of emerging concern (CECs). UV light treatment is able to destroy microorganisms in wastewater, but not a strong enough oxidant to successfully breakdown many CECs in wastewater.

2.4. Effects of the Action

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

Effects of the action will occur in Taylor Bay. Short term effects are associated with the construction of the new outfall. These include noise during trenching (1 day), increased turbidity (water quality disruption, 1-2 days), and modified substrate and benthic prey communities (forage reduction, several weeks to several months).

The long-term effects are the discharge of modified effluent into Taylor Bay subsequent to the work at the WWTP (water quality). This effect is chronic and expected for up to 30 years (estimated service life of the revised WWTP and outfall).

2.4.1 Effects on Critical Habitat

In the action area, critical habitat is not designated for PS steelhead or Humpback whales.

The primary constituent elements (PCEs) of PS Chinook salmon in the estuarine and marine environment are:

> Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes.

The physical and biological features (PBFs) of rockfish critical habitat are:

> Benthic habitats and sites deeper than 30 m (98 ft) that possess or are adjacent to areas of complex bathymetry consisting of rock and or highly rugose habitat, water quality with sufficient levels of dissolved oxygen, adequate quantity, quality, and availability of prey species (adult bocaccio and yelloweye; juvenile yelloweye)
>
> Nearshore areas are contiguous with the shoreline from the line of extreme high water out to a depth no greater than 30 meters (98 ft) relative to mean lower low water. Juvenile settlement habitats located in the nearshore with substrates such as sand, rock and/or cobble compositions that also support kelp, quantity, quality, and availability of prey species, water quality with sufficient levels of dissolved oxygen (juvenile bocaccio).

The PBFs of SRKW critical habitat are:

> Water quality capable of supporting growth and development; sufficient quantity and quality of prey species, and passage conditions to allow for migration, resting, and foraging.

PS Chinook salmon rely on nearshore locations, including the action area, for forage during their growth and maturation. Rockfish also rely on the action area for growth, development, maturation, and reproduction. Finally, the conservation role for SRKW in the action area is also growth, maturation, development and reproduction.

<u>Noise</u>

While "quiet" is not a feature of critical habitat for ESA-listed fish, noise can interfere with the role/s for which critical habitat was designated. This proposed project will temporarily impact aquatic habitat by causing noise. Noise during construction is expected to disrupt the aquatic conditions for all habitats designated as critical (i.e., PS Chinook salmon, rockfishes, SRKW) for roughly 7 to 24 hours. We anticipate this disturbance to cease when trenching is complete, after which the environmental condition will return to the original baseline levels for ambient noise. Due to the brevity of sound disruption as an adverse effect in the aquatic environment, while behaviors that dictate the conservation role may be affected (foraging, resting, migration) none of the values for which the critical habitat is (e.g. growth, maturation, survival, reproduction) designated will be diminished for any of the designated habitats.

<u>Turbidity</u>

The coextensive consequences of trenching and outfall pipe placement would be turbid conditions, largely contemporaneous with noise. Suspended sediments will diminish water quality and this effect will last slightly longer than noise, as the sediment will take several hours to disperse and settle once work has ceased. The turbid conditions will briefly degrade water quality and reduce suitability of the habitat for that period, primarily for We anticipate that the brevity of the water quality reduction is low enough (trenching will be completed in 1 day during 1 tide cycle) to not impair the conservation role for any of these designated critical habitats.

<u>Foraging</u>

Effects to prey communities will last longer than the duration of immediate construction. It is estimated that it will take anywhere from 6 weeks to 6 months for benthic prey communities to reestablish to prior composition and abundance. Prey is not considered limiting for PS Chinook salmon in the estuary or marine environments, thus the reduction in available prey along the trench for these highly mobile species, is unlikely to modify the conservation value for growth of juveniles, over any time-scale. Rockfish are not as mobile a species, with site fidelity and a preference for rocky substrates. In this location sediments are more sandy, so we do not expect high reliance on this area by rockfish. While prey resources within the critical habitat for rockfish may be adversely affected, we do not expect this effect to be at a scale that meaningfully alters the role of the habitat.

For SRKW, Chinook salmon are a significant component of their forage base, but effects on Chinook are largely brief (i.e. noise and turbidity) or low level (i.e. benthic forage availability), thus we do not anticipate a reduction in the number of juvenile Chinook salmon at a scale that would be detected by SRKW foraging for adult Chinook salmon in Puget Sound.

Water Quality

Repair of the aging sewer system would eliminate leaks that currently cause discharge of untreated wastewater throughout the TBBC service area, and improve the quality of effluent discharged by further reducing the contaminant load.

In general, despite treatment, discharge of municipal wastewater effluent adversely affects water quality in a receiving water body. The extent of adverse effects are directly related to the level of treatment and the baseline water quality. Effluent has been shown to contain trace amounts of many chemicals found in a variety of products that are disposed of via municipal sewer systems. Therefore, municipal effluents have been identified as sources of endocrine disrupting chemicals (EDCs), pharmaceuticals and personal care products (PPCPs), persistent, bioaccumulative and toxic chemicals (PBTs), and other compounds of anthropogenic origin in surface waters of the United States, and Europe (Kolpin 2002; Lazorchak 2004).

Modeled estimate plume dilution for the Taylor Bay wastewater effluent to discharged from the proposed outfall in Case Inlet at 185 feet depth at 900 feet from shore. Since the model predicted extremely high dilution of the effluent when discharged with the 900 foot setback outfall, the project was confirmed to be suitable at a 500 foot distance for the point of discharge.

Results for all alignments, summarized below, show that minimum dilution requirements are met during maximum ambient stratification (deepest depth at which plume is confined below dense ambient water) and during minimum ambient stratification (shallowest depth at which plume is confined below dense with ambient water).

Critical Conditions	Minimum Requirement	Outfall depth of discharge, ft		
		185	150	142
Winter Condition with *maximum ambient stratification* occurred in February				
Minimal radial setback, ft	900	900	500	500
Dilution at minimum radial setback	1000	176,587	87,211	86,662
Depth of stratification at minimal radial setback, ft	70	175	140	132
Winter Condition with *minimum ambient stratification* occurred in December				
Minimal radial setback, ft	900	900	500	500
Dilution at minimum radial setback	1000	1,700,000	972,618	980,642
Depth of stratification at minimum dilution, ft	70	128	95	88

Figure 10: Effluent Plume Dilution and Depth of Stratification for Three Outfall Locations

Contaminants of Emerging Concern (CEC's)

CECs are a risk to the health of humans and marine life, and the environment in general, given their presence and frequency of occurrence. Although some CECs have unknown sources, effluent discharged from WWTPs can be a major source of CECs to the receiving waters. CECs include:

- POPs such as flame retardants mentioned above (PBDEs and organophosphate esters) and other global organic contaminants such as perfluorinated organic acids;
- Pharmaceutical and personal care products (PPCPs), including prescribed drugs (e.g., antidepressants, blood pressure), over-the-counter medications (e.g., ibuprofen), bactericides (e.g., triclosan), sunscreens, synthetic musks;
- Veterinary medicines such as antimicrobials, antibiotics, anti-fungals, growth promoters and hormones;
- Endocrine-disrupting chemicals (EDCs), including estrogen (e.g.,17α-ethynylestradiol, which also is a PCPP, 17ß-estradiol, testosterone) and androgens (e.g., trenbolone, a veterinary drug), as well as many others (e.g., organochlorine pesticides, alkylphenols) capable of modulating normal hormonal functions and steroidal synthesis in aquatic organisms; and
- Nanomaterials such as carbon nanotubes or nano-scale particulate titanium dioxide, of which little is known about either their environmental fate or effects.

The TBBC WWTP's effluent has not been routinely monitored for CECs. The described treatment, which includes the aeration basin for biological treatment, a secondary clarifier, and UV disinfection system, is suitable for managing biological contaminants before discharging into Case Inlet, however municipal discharge is known to include a wide array of contaminants that are not removed by these methods.

Current science indicates the emergence of CECs in Puget Sound. These chemicals generally occur at low levels in waterbodies, however they may be widespread and may build-up or bio-accumulate in fish or mammals. Many of these chemicals come from residential sources, and include pharmaceuticals and personal care products (PPCPs) and a number of Because the aeration, secondary clarifier, and UV disinfection system would remove suspended sediment and other debris, but nonetheless would result in discharges of CEC's that still contains detrimental levels of other contaminants.

In recent years, NMFS has conducted formal ESA consultations with EPA on the permitting of wastewater discharge into the Pacific Ocean by large scale wastewater treatment facilities (NMFS 2018, 2021, 2022). In particular, concern has risen over how the large-scale discharge of wastewater into the marine environment is contributing to the bioaccumulation of contaminants that may persist, be potentially harmful in low amounts, or otherwise emerging as concerns for long-lived ESA-listed species in the ocean. In recent consultations, we have estimated that large wastewater treatment facilities may be discharging relatively large amounts of some POPs (persistent organic pollutants) and other chemicals of emerging concern (CECs) with the potential to cause harm to ESA-listed species. However, due to the small scale of this WWTP, while we expect that effluent is likely to contain an indeterminant amount of these compounds, we do not predict that the level of contaminants will discernibly modify critical habitat values for any of the listed species, even when considered for the anticipated 30-year life of the project.

To sum, we consider the suite of adverse effects, both temporary and long term, are at a level that will not alter conservation values for any designated critical habitat.

2.4.2 Effects on Listed Species

Species likely to be exposed to both the temporary construction effects and long-term water quality effects, presented above, are PS Chinook, PS steelhead, bocaccio rockfish, and yelloweye rockfish. Substrate conditions in the action area may not have sufficient rugosity to support high levels of rockfish use so exposure of bocaccio and yelloweye is expected to occur among very few individuals. Based on the low frequency of sightings in this area, SRKW are not likely to be present during construction effects but could be exposed to long term WQ effects, however we consider this species not likely to be adversely affected, see section 2.12 for our rationale. Similarly, humpback whales could be exposed to long term water quality reductions but are also considered not likely to be adversely affected (see section 2.12),

Individual fish from populations comprising the Central/South Puget Sound's PS Steelhead Major Population Group (MPG) group are the most likely to be exposed, specifically the Demographically Independent Population (DIP) S2, The South Puget Sound Tributaries. Similarly, the effluent discharges into the area identified for PS Chinook Salmon's Central/South Puget Sound's MPG. Specifically, DIP 5 and DIP 6 (White and Puyallup, respectively) are most likely to be exposed to all effects of the proposed action. Both yelloweye and bocaccio are potentially present in the action area, particularly in the deep-water habitat where long term effects will occur.

Noise

Exposure to construction-related noise is likely to adversely affect juvenile salmonids by interfering with their prey and predator detection, and can interfere with behavior of rockfish due to the masking of fish communication, thought to be for reproductive purpose (Zhang et al. 2021). Elevated in-water noise at levels capable of causing detectable effects in exposed fish would occur during construction, trenching, and installation of the outfall pipe.

The response of fish to noise varies with the hearing characteristics of the fish, the frequency, intensity, and duration of the exposure, and the context under which the exposure occurs. At low levels, effects may include the onset of behavioral disturbances such as acoustic masking (Codarin et al. 2009), startle responses and altered swimming (Neo et al. 2014), abandonment or avoidance of the area of acoustic effect (Mueller 1980; Picciulin et al. 2010; Sebastianutto et al. 2011; Xie et al. 2008) and increased vulnerability to predators (Simpson et al. 2016). At higher intensities and or longer exposure durations, the effects may rise to include temporary hearing damage (a.k.a. temporary threshold shift or TTS, Scholik and Yan 2002) and increased stress (Graham and Cooke 2008). At even higher levels, exposure may lead to physical injury that can range from the onset of permanent hearing damage (a.k.a. permanent threshold shift or PTS) and mortality. The best available information about the auditory capabilities of the fish considered in this opinion suggest that their hearing capabilities are limited to frequencies below 1,500 Hz, with peak sensitivity between about 200 and 300 Hz (Hastings and Popper 2005; Picciulin et al. 2010; Scholik and Yan 2002; Xie et al. 2008).

The listed fish that are within the area for project-related trenching are likely to respond with behavioral changes, such as startle responses, altered swimming patterns, and failure to detect presence of predatory fish. While the response to noise exposure would be primarily behavioral, the likelihood of some individual juveniles, both salmonids and rockfish, being eaten by predators, increases. Noise is also likely to impair rockfish calling behavior, which occurs among both juvenile and adult bocaccio – the purpose of calling among adults is suspected to be for reproductive purpose, but among juveniles the purpose is unclear (pers. Comm. David Lowry, NMFS) so the effect of masking is also unclear. However, the intensity of these effects would increase with increased proximity to the source and or duration of exposure.

Because the duration of noise in the aquatic environment is very brief (hours), we expect the number of juvenile PS Chinook salmon and PS steelhead, or juvenile or adult rockfish of either species, that would be impacted by this stressor, while not specifically quantifiable, would be very small. As the number of individuals that would be exposed to construction-related noise would represent an extremely small subset of their population cohort, and the numbers of exposed fish that would be injured or killed as a consequence would be even lower, we do not expect detectable population-level effects.

<u>Turbidity</u>

The range of response of ESA listed fish exposed to suspended sediments are species and size dependent. In general, severity also increases with sediment concentration and duration of exposure, but decreases with the increasing size of the fish. At concentration levels of about 700 to 1,100 mg/l, minor physiological stress is reported in juvenile salmon only after about three hours of continuous exposure (Newcombe and Jensen 1996). Water quality is considered adversely affected by suspended sediments when turbidity is increased by 20 NTU for a period of 4 hours or more (Berg and Northcote 1985; Robertson et al. 2007).

Based on the available information, project-related turbidity would consist of TSS concentrations well below those described by Berg and Northcote (1985) and Robertson et al. (2007), and would be largely undetectable beyond 50 feet downstream of the project site, and last no more than 7 -24 hours after conclusion of construction (Bloch 2010). Because of expected avoidance behaviors and strong swimming ability, the duration of exposure would likely be measured in minutes for any salmonids expected to be very briefly exposed to project-related turbidity. Plume concentrations would most likely be too low to cause more than temporary, non-injurious behavioral effects such as avoidance of the plume and mild gill flaring. None of the potential responses, individually, or in combination would affect the fitness of exposed fish nor meaningfully affect their normal behaviors

No specific data on response of rockfishes to suspended sediment was found. Extrapolative analysis indicates that larval life stages could be adversely affected. Larval rockfish (bocaccio and yelloweye) passively drift at this life stage, and avoidance behaviors would not be possible. Larval rockfish occur year-round in the Puget Sound and it is possible that they could be present in large numbers. No available studies indicated larval response to high levels of turbidity. However, we expect that effects on other larval species could be relevant here. Ohata et al. (2011) performed a study which indicates that anthropogenic increases of turbidity may increase the relative impact of jellyfish predation on fish larvae of red sea bream and larval ayu (a species related to smelt). Assuming that predation could increase in the area in which rockfish larvae and turbid conditions coincide, given the overlap spatially is limited, and also constrained to a 1 day period, we assume the total numbers of rockfish larvae at this increased risk would be relatively small.

Foraging

Because recovery of affected forage base takes weeks to months, all ESA listed fishes in this analysis will be exposed to prey reduction. The exact duration of these impacts is uncertain, and juvenile salmonids are expected to be able to pursue forage in adjacent areas due to their highly migratory behavior at this life stage. Therefore, for this species, and given the limited footprint of the disturbed benthic communities, we do not anticipate either of the salmonid species will experience reduced growth or survival. This is true in part for this location because sea grasses, which support salmonid forage, are absent in the action area and therefore not affected by the proposed action.

The proposed in-water work at the TBBC is likely to indirectly adversely affect juvenile PS Chinook salmon through substrate impacts that would briefly diminish forage and shelter availability. Indirect habitat impacts would adversely affect PS Chinook salmon, PS steelhead, PS/GB bocaccio, and PS/GB yelloweye rockfish. The proposed action would cause indirect effects on PS Chinook salmon and PS steelhead through construction-related forage and shelter diminishment, construction-related reduced riparian vegetation, and in-stream construction.

Juvenile salmonids primarily prey on water-dependent aquatic organisms such as copepods, euphausiids, and larvae of many benthic species and fish, and on terrestrial-origin insects that fall into the water. They also utilize submerged aquatic vegetation, leaf litter, small branches, and large wood as shelter from predators.

The available information about ecosystem responses to excavation and dredging indicates that little recovery would occur during the first seven months after the excavation, with early successional fauna increasing in abundance over the next six months (Jones and Stokes 1998). Therefore, the in-stream work would reduce forage and shelter availability within the affected stream reaches for a year. The greatest impacts are not expected last much beyond a year due to the extremely small size of the affected areas.. However, small reductions in forage and shelter availability would persist for several months, until the replacement riparian vegetation recovers to pre-construction levels of organic material input to the creek.

To be conservative, this assessment assumes that some subset of the exposed individuals are likely to experience very brief reduced fitness and reduced long term survival due reduced forage and cover availability that would be attributable the proposed project’s in-water construction. Due to the relatively short expected recovery period for the disturbed substrate and current rarity of PS steelhead in the action area, it is unlikely that any PS salmonids or rockfish would be detectably affected by forage and shelter diminishment related to the proposed in-water work.

Water Quality - Turbidity

Exposure to construction-related water contamination would cause minor effects in salmon and rockfish individuals. Water quality would be temporarily affected by increased turbidity that may also reduce dissolved oxygen (DO) levels. It may also be affected by the introduction of toxic materials.

Water Quality - Effluent

Effluent mixing zones are specific portions of a waterbody within which wastewater discharges are allowed to mix with and become diluted by the surrounding waters. It is beyond the boundary of the zone where specified standards must be met. Acute mixing zones are intended to prevent lethality of organisms that pass beyond the zone's boundary. However, organisms that are within the acute mixing zone may be exposed to higher effluent concentrations. Similarly, the chronic mixing zone is intended to prevent chronic effects in organisms that pass beyond the zone's boundary, but organisms that are within the chronic mixing zone can be exposed to effluent concentrations capable of causing chronic effects.

The effluent plume would create temperature, salinity, contaminant, and dissolved oxygen gradients that would increase in intensity with movement toward the outfall. Further, the settlement of suspended solids from the effluent will likely not alter the benthic habitat around the outfall, as effluent is already flowing into the area. The exact extent of detectable effluent as well as the maximum settlement distance of sediments is unknown.

Given the typical shoreline-obligated behaviors of emigrating juvenile Chinook salmon, it is extremely unlikely, that any juvenile Chinook salmon would swim close enough to the outfall to be detectably affected by its discharge. Conversely, adult Chinook salmon and both juvenile and adult steelhead could be reasonably expected to swim through water with detectable levels of effluent from the outfall.

The outfall is located within water that has been designated as deepwater critical habitat for adult bocaccio and juvenile and adult yelloweye rockfish. It is uncertain how far away the closest suitable habitat is from the outfall, but it is very likely that some suitable habitat would be at least be episodically exposed to detectable levels of effluent from the outfall. Additionally, the outfall itself provides structure that may be attractive to adult bocaccio, juvenile and adult yelloweye, and other rockfish. Therefore, to be protective, the NMFS assumes that over the decades of discharge, some adult bocaccio and juvenile and adult yelloweye rockfish are reasonably likely to be exposed to detectable levels of effluent from the outfall. Additionally, over the decades of discharge, some pelagic larval bocaccio and yelloweye rockfish that are carried by the currents are reasonably likely to pass through the mixing zones.

It is reasonably likely that some subset of exposed individuals would experience strong avoidance behaviors when they detect the effluent-altered water quality at the outer edges of the plume (Beitinger and Freeman 1983). The avoidance of the area is unlikely to cause any harmful effects in any of the fish species considered here. However, not all individuals will avoid the affected area, and those that enter the plume area around the outfall would be exposed to varying concentrations of some combination of the contaminants discussed above. The annual numbers of individuals that would be directly exposed to the effluent is uncertain and likely to be highly variable over time, as are the likely effects that exposed individuals are likely to experience.

Some adult Chinook salmon, and juvenile and adult steelhead, bocaccio, and yelloweye rockfish are likely to enter the effluent plume, including parts of the chronic mixing zone, and some of those individuals are likely ingest and or absorb contaminants from the water. Based on the best available information, as described above, some of the exposed individuals are likely to experience non-lethal fitness impacts that may reduce their long-term survival and or cause negative reproductive effects.

The increasing effluent concentrations, diminishing salinity, and increasing temperature within the chronic mixing zone likely cause fish to avoid the acute mixing zone. Therefore, few, if any, adult Chinook salmon, and or juvenile and adult steelhead, bocaccio, and yelloweye rockfish are likely to experience acute mortality from effluent exposure. However, over the decades-long discharge through the outfall, it is very likely that some pelagic bocaccio and yelloweye rockfish larvae would be carried by currents through the mixing zone where some are reasonably likely to experience exposure.

In general, discharge of municipal wastewater effluent adversely affects water quality in a receiving water body. The extent adverse effects is directly related to the level of treatment and the baseline water quality. Effluent has been shown to contain trace amounts of many chemicals found in a variety of products that are disposed of via municipal sewer systems and through industrial discharges. Therefore, municipal effluents have been identified as sources of endocrine disrupting chemicals (EDCs), pharmaceuticals and personal care products (PPCPs), persistent, bioaccumulative and toxic chemicals (PBTs), and other compounds of anthropogenic origin in surface waters of the United States, and Europe (Kolpin 2002; Lazorchak 2004).

<u>CECs</u>

Pharmaceuticals and personal care products (PPCP's) are an emerging environmental and human health issue. Any product used by individuals for personal, health or cosmetic reasons are considered PPCPs. They are present at low concentrations in surface water, groundwater, soils, sediments, marine waters, and drinking water. Researchers monitoring the environment find PPCPs virtually everywhere domestic wastewater is discharged. PPCPs enter the environment as they pass through the human body or when unwanted PPCPs are disposed in the trash or down the drain. Other significant sources include livestock, aquaculture, pets, and agriculture. PPCPs have not been monitored in the Puyallup WWTP effluent. There is considerable evidence that fishes inhabiting waters that receive effluent from municipal WWTPs are exposed to chemicals that affect reproductive endocrine function. Male fish downstream of some WWTP outfalls produce vitellogenin (egg yolk precursor protein) mRNA (messenger ribonucleic acid, which carries information from DNA in the nucleus to the ribosome sites of protein synthesis in the cell), and protein associated with oocyte (an immature ovum or egg cell) maturation in females, and early-stage eggs in their testes (Jobling et al. 1998). This feminization has been linked to the presence of estrogenic substances such as natural estrogen, 17 beta-estradiol (E2) and synthetic estrogen, 17 alpha-ethenylestradiol (EE2). These substances are usually found in the aquatic environment at low parts per trillion concentrations, typically less than 5 nanograms (ng)/L

(Keene et al. 2007). Synthetic estrogen is used in birth control pills (EE2) and is one of the more potent estrogens and has been linked to the feminization of male fishes in rivers receiving municipal wastewater (Thorpe et al. 2003). Laboratory studies have shown decreased reproductive success of fish exposed to less than 1-5 ng/L of EE2 (Parrott & Blunt 2005). Kidd et al., (2007) showed that chronic exposure of fathead minnows to low concentration (5-6 ng/L) of EE2 led to feminization of males through the production of vitellogenin mRNA and protein, impacts on gonadal development as evidenced by intersex in males and altered oogenesis (egg cell production) in females. This exposure ultimately caused a near extinction of this fish species from the lake where they were being studied. This outcome demonstrated that the concentrations of estrogens and their mimics observed in freshwaters can impact the sustainability of wild fish populations.

Here we expect that effluent will have low concentrations of these CECs and that the function of dilution and the migratory behaviors of salmonids will result in brief exposure at very low levels, producing only sublethal effects. Rockfish, on the other hand, as a long-lived species with site fidelity, are more likely to have chronic exposure, though again at a very low level of intensity, and may bioaccumulate certain compounds. For instance, the Washington State Department of Health recommends no consumption of yelloweye rockfish because they bioaccumulate mercury and PCBs (DOH 2006).

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 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

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

Non-federal activities likely to occur in the action area are limited to recreational uses. Effects of other non-federal activities expected in the action area are those associated with climate change as mentioned above, and from other upland uses such as intensifying development that may contribute non-point runoff. These effects are expected to be slight, and chronically negative over time.

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 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's 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.

2.6.1 ESA Listed Species

All fish species considered this opinion are ESA listed as threatened, except bocaccio, which are listed as endangered. These species are listed due to declines from historic abundance, driven in part be systemic degradation of habitat, including water quality reductions. Other factors for decline include overharvest.

The baseline, however, reflects relatively good conditions. We add to this status and baseline, the effects of the proposed action. These are responses to short-term effects caused from construction (mostly behavioral responses with very limited morality) and long-term effects caused by the operation of the TB WWTP (which include sublethal response to low intensity but chronic exposure to contaminants). Even when cumulative effects are considered in combination with the effects of the proposed action, when added to the baseline, NMFS anticipates no discernible influence on population level characteristics (abundance, productivity, spatial structure, or diversity) of PS Chinook, PS steelhead, bocaccio, or yelloweye.

2.6.2 Critical Habitat

ESA listed species with designated critical habitat that may be adversely affected that were considered within this opinion include Puget Sound Chinook, yelloweye and bocaccio rockfish, and SRKW. Water quality is a feature of critical habitat for each of these species. Range-wide, critical habitat is systemically degraded for PS Chinook salmon. For both rockfish species, contaminated sediments, degradation of rocky habitat, loss of eelgrass and kelp, introduction of non-native habitat-modifying species, and degraded water quality were all threats to the species (79 FR 68041; 11/13/2014) within the designated critical habitat. For SRKW, quality and abundance of prey, and anthropogenic sound are degrading factors within their designated area.

All nearshore marine units of critical habitat for PS chinook salmon, including the action area, are rated as having high conservation value based on the vital role these locations serve for survival of the species (NMFS 2005). Critical habitat in the nearshore marine areas of Puget Sound are to have water quality conditions that support growth and maturation which allow juveniles to transition to their life stages which occur within the marine environment. For both species of rockfish, Puget Sound should have water quality to support growth, survival, reproduction, and feeding opportunities for the listed species. For SRKW, prey is vital feature of their designated critical habitat.

The baseline of the designated critical habitat also reflects relatively good conditions. Even when cumulative effects are considered in combination with the effects of the proposed action, when added to the baseline, the conservation values will remain largely unaffected. NMFS anticipates no discernible influence to the contributing factors defining the conservation role of the designated habitats (growth, development viability, maturation, reproduction). The outcome of the modification to this wastewater treatment plant and outfall, is likely to provide a reduction in overall level of pollutant in Puget Sound, conferring a potential improvement to this feature of critical habitat for each species, while still retaining some detriment as a point of discharge.

While the projects effects on critical habitat are adverse, most are temporary, and will ultimately not influence the conservation values for which the habitat was designated. Even when considering long term effects over 30 years, the chronic water quality disruption occurs at such a low level that it will not modify the conversion role of the habitat for any of the designated habitats. These effects might be compounded by habitat changes associated with climate change, but this is an uncertain and unquantifiable consequence.

2.7. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook, PS steelhead, PS/GB bocaccio, or PS/GB yelloweye rockfish. Further, the proposed action is not likely to destroy or adversely modify the designated critical habitat for PS Chinook, PS/GB bocaccio, PS/GB yelloweye rockfish, or SRKW.

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

When take is in the form of harm from habitat degradation, it is often impossible to enumerate the take that would occur because the number of fish and marine mammals likely to be exposed to harmful habitat 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. It is also difficult to further enumerate the anticipated take of ESA-listed species from the proposed action, due to uncertainty in the number of individuals that may be subject to exposure and uncertainty in the response and level of harm that will occur for individuals exposed from each ESA-listed species.

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. As described in our effects analysis, NMFS has determined that incidental take is reasonably certain to occur as follows:

- Harm of PS/GB bocaccio and yelloweye rockfish, PS Chinook salmon, and PS steelhead from chronic low level exposure to water quality contaminants.

- Harm of larval rockfish and juvenile salmonids from elevated turbidity.

The extent of take from turbidity is best described as the temporal duration of excess suspended sediment that will occur with excavating and refilling the outfall trench. The extent of take is 24 hours. This observable metric is considered causal to the form of harm, because a longer duration of suspended sediment would expose a larger number of individuals. Turbid conditions longer than 24 hours would exceed the extent of take.

The extent of take from the effluent is best identified as the improved operating condition of the TB WWTP. This condition is both observable, and is causally tied to the form of harm, because poor maintenance or structural failures of the WWTP will increase discharge of contaminants, intensifying exposure of listed fish. Failure to maintain the WWTP in good operating condition would result in an exceedance of take.

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 following measure is necessary and appropriate to minimize the impact of incidental take of listed species from the proposed action.

1. Minimize take from WWTP discharges.
2. Minimize take from turbidity.
3. Monitor to ensure the extent of take is not 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 USDA RD or its recipient 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.

The following term and condition implements reasonable and prudent measure 1:

The USACE shall instruct the permit applicant to perform all routine maintenance at the TB WWTP to ensure treatment structures and operations remain fully functional and effective at treatment of effluent.

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

a. Confine time associated with trenching and backfilling of trench, ensuring backfilling occurs promptly after outfall placement.

b. Keep the jet head positioned to minimize sediment dispersal.

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

a. Make visual observation of the turbidity plume, and document if it exceeds state mixing zones for estuarine environments (150 foot radially from the point of disturbance).

b. Provide a copy of NPDES reporting to NMFS if/when monitoring demonstrates any exceedances.

c. Reports should be provided to projectreports.wcr@noaa.gov by email, with the WCRO tracking number included in the regarding line.

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).

NMFS offers 1 conservation recommendation, which is to upgrade the WWTP with emerging technology that improves treatment outcomes, when they become available.

2.10. Reinitiation of Consultation

This concludes formal consultation for the Taylor Bay Wastewater Treatment Plant.

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."

2.11. "Not Likely to Adversely Affect" Determinations

Killer Whale

In Washington, the southern resident population of killer whales typically resides in the inland waters around the San Juan Islands from late spring to fall. Less time is generally spent elsewhere, including other parts of the Strait of Juan de Fuca, Puget Sound, and the outer coast. This information suggests that members of the southern resident killer whale DPS are considered rare visitors to south Puget Sound, and they are unlikely to be present in the Taylor Bay project action area during construction. As the project will improve water quality and marine habitat once construction is completed, the proposed TB WWTP Collection System Improvements and Outfall Replacement project may affect, we consider the frequency and intensity of exposure of SRKW individuals to the effluent as at a low enough level that no adverse response is likely.

Humpback Whale

Humpback whale presence in Puget Sound has increased in recent decades (for example, OceanWatch indicates 3,052 locations of humpback whales sighting in the focal area of the waters around the San Juan Islands and Puget Sound reported to the B.C. Cetacean Sightings Network from 1990 through 2016) with some sighting near Kitsap County suggests approximately 69 percent of whales in Puget Sound are from the unlisted Hawaii DPS, while the remainder are from the Central American (6 percent) and Mexico DPSs (25 percent). Critical habitat is not designated within the action area.

Central America DPS humpback whale

Whales from this breeding ground feed almost exclusively offshore of California and Oregon in the eastern Pacific, with only a few individuals have been identified at the northern Washington-southern British Columbia feeding grounds. The Central America DPS is listed as endangered and has been most recently estimated to include 783 whales (CV = 0.170; Wade 2017) with unknown population trend.

Mexico DPS humpback whale

This DPS has also been documented within the Salish Sea (Rockwood et al. 2017). Sightings of humpback whales in general have increased dramatically in the Salish Sea from 1995 to 2015, and at least 11 whales from this DPS have been matched to those sighted within this area (Rockwood et al. 2017). This DPS was most recently estimated to have an abundance of 2,806.

Both DPSs of humpback whales occur only rarely in the action area. The duration of presence at any occurrence is not expected to exceed several hours, as members of these species would normally continue in search of prey during their migration. Given the brevity of exposure to contaminants discharged by the treatment facility, we expect no discernible behavioral or health response. Humpback whales would not be expected in the shallow nearshore area where we anticipated elevated levels of turbidity. While exposure is not discountable, response is expected to be insignificant.

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 USACE and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council (PFMC 2005)), coastal pelagic species (PFMC 1998), and Pacific Coast salmon (PFMC 2014); contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The environmental effects of the proposed action may adversely affect EFH for Pacific Coast salmon, Pacific Coast groundfish and coastal pelagic species, all of which are present in the action area. The action area also contains Habitat Areas of Particular Concern (HAPC) for Pacific Coast salmon and Pacific Coast groundfish. Designated HAPC are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPC will be more carefully scrutinized during the consultation process. Impacts to EFH include water quality degradation by short-term elevated levels of turbidity during construction activity and by the discharge of wastewater effluent from the treatment facility.

3.2. Adverse Effects on Essential Fish Habitat

The feature of EFH of Pacific Coast salmon, Pacific Coast groundfish and coastal pelagic species affected by the proposed action would include diminishments in water quality, as described above in this Opinion. We anticipate degraded water quality from elevated levels of turbidity in the immediate aquatic environment surrounding project construction areas (outfall structure and trenching) during the 1 day of construction. We also expect degraded water quality associated with contaminants in effluent discharged from the wastewater treatment plant.

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. When utilizing jet for trenching, maintain as low profile of the head of the jet as possible to minimize sediment dispersal.

2. Confine time associated with backfilling of trench, ensuring backfilling occurs promptly after trench placement.

3. Ensure compliance with requirements of local water quality standards.

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, Pacific Coast groundfish and coastal pelagic species.

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 USDA RD 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 users of this opinion are the USDA RD. Other interested users could include the permit applicant, and members of the Taylor Bay Beach Club Community. 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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Technical Memorandum – Biological Evaluation and Magnusson-Stevens Fisheries Conservation and Recovery Act Review for Taylor Bay WWTP and Outfall Replacement May 10, 2021

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