Appendix B – Biological Assessment

CONFLUENCE
ENVIRONMENTAL COMPANY

Bremerton National Airport (KPWT)
Environmental Assessment Projects
BIOLOGICAL ASSESSMENT

Prepared for:

DOWL
June 2025

146 N Canal Street, Suite 111 • Seattle, WA 98103 • www.confenv.com

Bremerton National Airport (KPWT)
Environmental Assessment Projects
BIOLOGICAL ASSESSMENT

Prepared for:

DOWL
15325 SE 30th Pl., Ste. 300
Bellevue, WA 98007

Prepared by:

Confluence Environmental Company

June 2025

This report should be cited as:

Confluence (Confluence Environmental Company). 2025. Bremerton National Airport (KPWT) environmental assessment projects: Biological assessment. Prepared for DOWL, Bellevue, Washington, by Confluence, Seattle, Washington.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

24-hr LC50	lethal 24-hour exposure concentration
6PPD-Q	6PPD-quinone
Airport	Bremerton National Airport
AMP	Airport Master Plan
BA	Biological assessment
BMP	Best management practice
CFR	Code of Federal Regulations
CSWPPP	Construction Stormwater Pollution Prevention Plan
dBA	A-weighted decibels
DPS	Distinct population segment
Ecology	Washington Department of Ecology
EEZ	Exclusive economic zone
EFH	Essential fish habitat
ESA	Endangered Species Act
ESU	Evolutionarily significant unit
FAA	Federal Aviation Administration
FBO	Fixed Base Operator
FMO	Foraging, migrating, and overwintering
FR	Federal Register
GA	General Aviation
HUC	Hydrologic unit code
ISGP	Industrial Stormwater General Permit
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PAH	Polyaromatic hydrocarbon
PBF	Physical or biological feature
PCB	Polychlorinated biphenyl
PFMC	Pacific Fishery Management Council
POP	Persistent organic pollutant
Port	Port of Bremerton
ppb	Parts per billion
SRKW	Southern Resident killer whale
Stormwater Manual	Kitsap County Stormwater Design Manual
SWPPP	Stormwater Pollution Prevention Plan
TDA	Threshold Discharge Area
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

EXECUTIVE SUMMARY

The Port of Bremerton and the Federal Aviation Administration (FAA) are proposing four projects at Bremerton National Airport (Airport) to upgrade existing Airport facilities to address current and projected capacity deficiencies and accommodate current and future demand. The projects constituting the proposed action are referred to as:

1. East Parallel Taxiway
2. Northeast Hangar Development
3. Fixed Base Operator (FBO)/General Aviation (GA) Apron
4. Commercial Service Apron

Each of the four projects that constitute the proposed action are anticipated to be funded through Airport Improvement Program funding, which creates a federal nexus that requires the FAA to comply with Section 7 of the Endangered Species Act (ESA). This Biological Assessment (BA) evaluates the proposed action's potential effects on ESA-listed species and critical habitats that potentially occur in the action area. The aquatic component of the action area is the area that may be affected by stormwater discharges and consists of the East Fork Union River, the North East Fork Union River (also identified as the North Fork by some references), the Union River, and Hood Canal. The terrestrial component of the action area comprises all habitats exposed to construction and activity levels that exceed baseline conditions and project operations associated with each project element.

Summary of Anticipated Effects to Listed Species

Table ES-1 summarizes the species evaluated in the BA and effects determinations for each species and critical habitat. The **proposed action** would not result in any measurable direct construction effects on ESA-listed species or critical areas. All anticipated adverse effects would result from delayed consequences associated with operational stormwater runoff that would be generated by the **proposed action**.

Table ES-1. Effects determinations for ESA-listed species and designated critical habitat

Species/Habitat	Effects Determination
Chinook salmon (Puget Sound ESU)	Likely to adversely affect
Chinook salmon critical habitat	Likely to adversely affect
Steelhead (Puget Sound ESU)	Likely to adversely affect
Steelhead critical habitat	Likely to adversely affect
Chum salmon (Hood Canal summer-run ESU)	Likely to adversely affect
Chum salmon critical habitat	Likely to adversely affect
Bocaccio rockfish (Puget Sound/Georgia Basin DPS)	Likely to adversely affect
Bocaccio rockfish critical habitat	No effect
Yelloweye rockfish (Puget Sound/Georgia Basin DPS)	Likely to adversely affect
Yelloweye rockfish critical habitat	No effect
Killer whale (Southern Resident DPS)	Likely to adversely affect
Killer whale critical habitat	No effect
Bull trout (Coastal-Puget Sound DPS)	Not likely to adversely affect
Bull trout critical habitat	No effect
DPS – Distinct population segment; ESU – Evolutionarily significant unit	

Summary of Anticipated Effects to Essential Fish Habitat

The proposed action was also evaluated for its potential effects on essential fish habitat (EFH). It was determined that the proposed action may adversely affect EFH for groundfish, coastal pelagic, and Pacific salmon species. All effects to EFH would result from operational stormwater discharges that would result in an incremental degradation of water quality and potential indirect effects on prey resources from pollutant exposure.

1.0 INTRODUCTION

Bremerton National Airport (Airport) is in Bremerton, Washington, within Kitsap County directly off State Route 3. The Airport is owned and operated by the Port of Bremerton (Port) and is zoned as public use, general aviation (GA). The Port owns and operates the Airport, and in cooperation with the Federal Aviation Administration (FAA), proposes four projects to upgrade existing Airport facilities to address current and projected capacity deficiencies to accommodate current and future demand. The projects constituting the proposed action are referred to as:

1. East Parallel Taxiway
2. Northeast Hangar Development
3. Fixed Base Operator (FBO)/General Aviation (GA) Apron
4. Commercial Service Apron

The Port, in coordination with the FAA, has prepared an Environmental Assessment to ensure compliance with the National Environmental Policy Act (NEPA). Although discussed as separate projects, all four activities are considered as a single action that is the proposed action for this consultation.

1.1 Federal Nexus

Each of the four projects that constitute the proposed action are anticipated to be funded through Airport Improvement Program funding, which creates a federal nexus that requires the FAA to comply with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 United States Code §§1531-1543). The FAA is the federal action agency as defined by the ESA. Section 7(a)(2) of the ESA specifies that each federal agency shall, in consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of an endangered or threatened species or result in the destruction or adverse modification of critical habitat.

This Biological Assessment (BA) has been prepared to facilitate consultation between the FAA, NMFS, and USFWS. This BA also analyzes effects on essential fish habitat (EFH) under the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

1.2 Purpose and Need

The Airport Master Plan (AMP) aircraft forecast reflects an average annual growth rate of 2.5% for aircraft operations (Century West 2015). Current capacity of the Airport cannot meet the expected growth rate. The proposed action will address the need for added capacity by implementing the four projects. One project (Project 1) is required for operational support, and the remaining three (Projects 2 through 4) will build capacity.

1.3 Consultation History

The Port and FAA have coordinated with NMFS staff throughout the development of the BA. An early pre-consultation meeting between NMFS, the Port, FAA, and consultant team staff occurred on August 28, 2024, to review the scope of the proposed action and discuss key aspects of the consultation process. A follow-up meeting occurred on December 13, 2024, which additionally included representatives from the Washington Department of Fish and Wildlife (WDFW) to discuss elements of concurrent jurisdiction with NMFS. A final pre-consultation meeting occurred on April 10, 2025, specifically to discuss the format and contents of the BA.

2.0 PROJECT LOCATION

The Airport is situated approximately 8 miles southwest of Bremerton at 8850 SW State Highway 3, Bremerton, Washington (Sections 11, 12, 13, and 14 of Township 23 North, Range 01 West, Willamette Meridian) (Figure 1). The project location consists of approximately 720 acres within the larger 1,729-acre Airport property. Location coordinates are 47.7918N, -122.7662W. The project location is in two watersheds. The majority of the project location drains to the north and west within the Tahuya River-Frontal Hood Canal Watershed (hydrologic unit code [HUC] ID: 1711001801), which ultimately discharges to Lynch Cove in southern Hood Canal. A smaller area on the eastern and southern portion of the project location is within the Goldsborough Creek-Frontal Puget Sound Watershed (HUC ID: 1711001906) ultimately draining to Case Inlet in southern Puget Sound. None of the work associated with the proposed action occurs in that portion of the Airport located within the HUC ID: 1711001906 area.

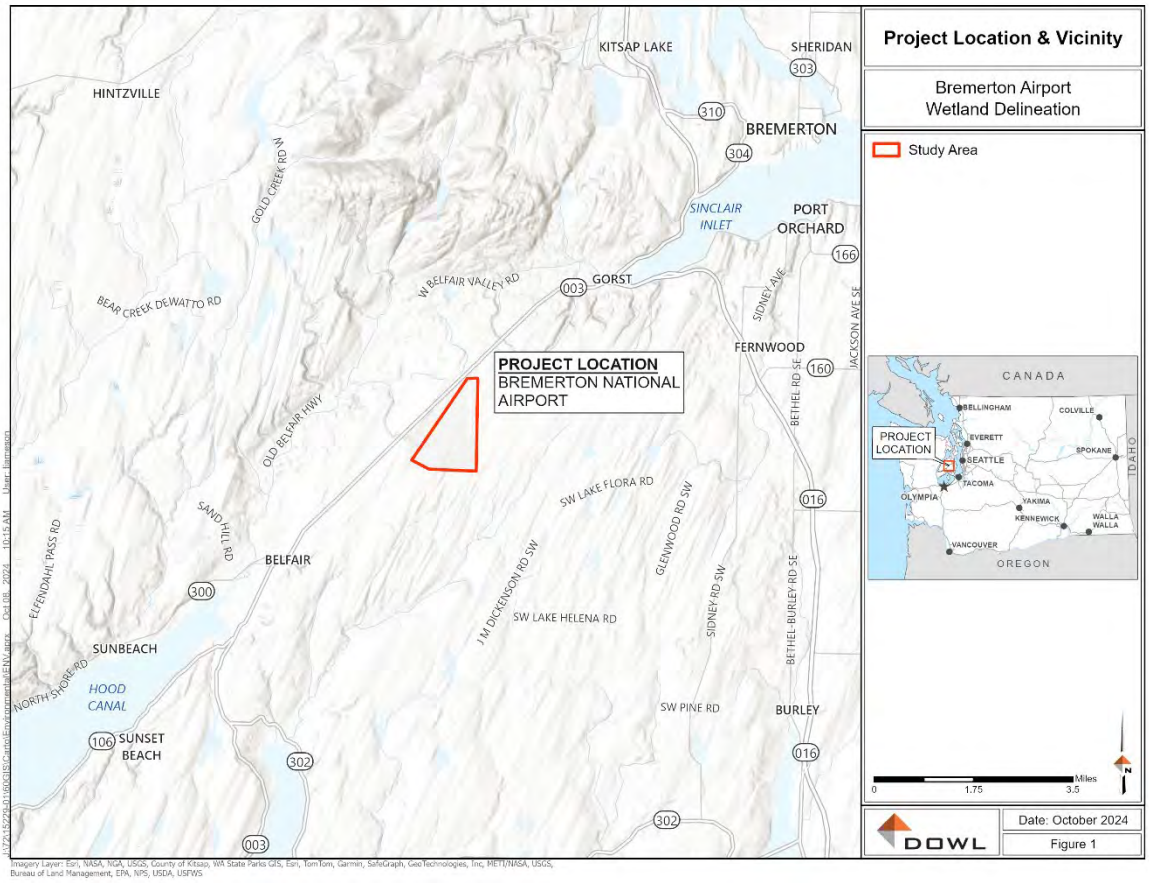


Figure 1. Project location

3.0 PROJECT DESCRIPTION

3.1 Proposed Action

The proposed action for this consultation comprises four project activities:

1. East Parallel Taxiway
2. Northeast Hangar Development
3. FBO/GA Apron
4. Commercial Service Apron

The project activities are shown in relation to the project location in Figure 2. The following descriptions of the project activities are summarized from the Draft Environmental Assessment (in progress).

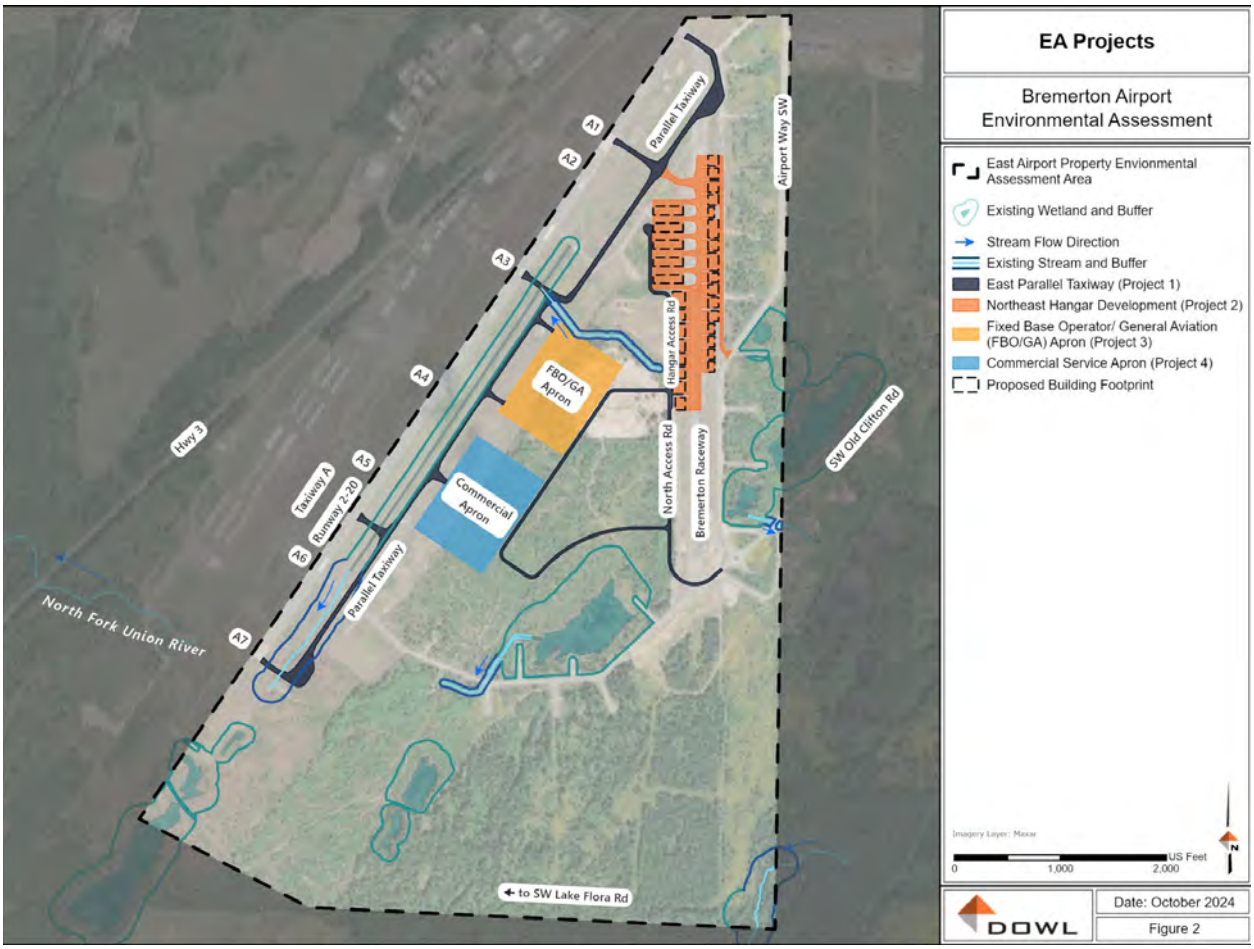


Figure 2. Proposed Environmental Assessment projects

3.1.1 Project 1—East Parallel Taxiway

A full-length parallel 35-foot wide taxiway will be constructed on the east side of Runway 2/20 to provide efficient movement of aircraft to/from the runway. This project activity will include the following elements:

- Construction of a new east parallel taxiway the full length of Runway 2/20 to the new Northeast Hangar Development area (Project 2) north to the end of the existing blast pad/clearway. New taxiway connectors and a hold apron or bypass taxiway will be included (Figure 2).
- Construction of a hangar access road to serve new Northeast Hangar Development (Project 2).
- Construction of the North Access Road from Airport Way SW to serve vehicles to the new apron developments (Projects 3 and 4).
- Stormwater facilities to support the improvements (components of Projects 1 through 4).

Information on the stormwater facilities is included in Section 3.3. To avoid the instrument landing system glide slope antenna, and to eliminate aircraft taxiing through the glide slope critical area, the runway-taxiway separation will be increased to 570 feet from Taxiway A3 to the north end of the new parallel taxiway. The remaining East Parallel Taxiway will have a standard runway-taxiway separation of 400 feet (Figure 2).

3.1.2 Project 2—Northeast Hangar Development

Project 2 will include the construction of new aircraft hangars to be accessed via the new East Parallel Taxiway, North Access Road, and Hangar Access Road (Figure 2). The hangars will accommodate a variety of hangar types and sizes including T-hangars and box hangars. Project 2 will include utility extensions and new stormwater facilities to support the improvements. Information on the stormwater facilities is included in Section 3.3.

3.1.3 Project 3—Fixed Base Operator/General Aviation Apron

The new FBO/GA Apron will be a development reserve area east of Runway 2/20 and a segment of the East Parallel Taxiway. The FBO/GA apron will tie in with the planned East Parallel Taxiway (Figure 2).

3.1.4 Project 4—Commercial Service Apron

As with the FBO/GA Apron, the Commercial Service Apron is a development reserve to support future commercial service. The new apron will be on the east side of Runway 2/20, south of the planned FBO/GA Apron and tie in with the planned East Parallel Taxiway (Figure 2).

3.2 Construction Stormwater Management

Development and construction activities that will occur as a result of the proposed actions must also be consistent with the Kitsap County Stormwater Design Manual (Stormwater Manual; Kitsap County 2021). The Stormwater Manual requires, and the Port will implement, measures to prevent, reduce, or eliminate pollution from stormwater during construction. The Preliminary Stormwater Memorandum for the Project (DOWL 2025) states that a project specific Construction Stormwater Pollution Prevention Plan (CSWPPP) will be prepared for the proposed action consistent with the requirements that will include construction water quality water quality source control best management practices (BMPs) in accordance with the Stormwater Manual. Specific elements of the CSWPPP and BMPs are identified in Section 4.0.

3.3 Post-Construction Stormwater Management

The proposed action will generate stormwater runoff as a result of the construction of 61.67 acres of new impervious surface and the replacement of 10.92 acres of existing impervious surface. The project also includes the removal of 5.84 acres of existing impervious surface that will not be replaced.

3.3.1 Threshold Discharge Areas

Three distinct Threshold Discharge Areas (TDAs) have been identified in the project element areas (DOWL 2025). TDAs are on-site areas draining to a single natural discharge location or multiple natural discharge locations that combine within 0.25 mile. All the TDAs associated with the proposed action are located within HUC ID: 1711001801 and ultimately drain to the Union River and Hood Canal.

3.3.1.1 TDA 1

TDA 1 is in the southeast portion of the project site. The existing area is largely undeveloped, and water within the area flows into an existing collection system that conveys water to the east, which eventually discharges to a small stream and eventually into the North East Fork Union River (also identified as the North Fork by some references). TDA 1 contains a small portion of the North Access Road and the Hangar Access Road (Figure 2).

3.3.1.2 TDA 2

TDA 2 is located throughout various areas of the project site. It contains portions of the proposed Northeast Hangar Development and East Parallel Taxiway projects and both the FBO/GA Apron and Commercial Service Apron. Stormwater runoff from this TDA flows to the west and to the south, where it eventually discharges into a small, ditched stream and into the North East Fork Union River.

3.3.1.3 TDA 3

TDA 3 is located throughout various areas of the project site. It contains runoff from portions of the eastern side of the Airport and includes portions of the proposed Northeast Hangar Development and East Parallel Taxiway projects. Stormwater runoff from this TDA flows to the existing stormwater conveyance system and ultimately into the East Fork Union River.

3.3.2 Design Criteria

The proposed action will be designed in a manner consistent with the current Stormwater Manual (Kitsap County 2021). The Port has also developed a Stormwater Pollution Prevention Plan (SWPPP) for the Airport in support of the Port's Industrial Stormwater General Permit (ISGP) issued by the Washington Department of Ecology (Ecology) (WAR-000901). The Port's ISGP is currently valid through December 2029. Post-construction stormwater will be managed using approved BMPs identified in the Stormwater Manual, and the facilities will be operated and maintained as outlined in the SWPPP as required by the ISGP.

During ground disturbing activities associated with construction, temporary BMPs will be implemented to intercept and mitigate stormwater impacts on receiving waters. See Section 4.0 for a description of construction related BMPs.

3.3.3 Post-Construction Stormwater Treatment Summary

Table 1 is a summary of the new, replaced, and removed impervious surface associated with each TDA and the primary proposed treatment BMP.

Table 1. Impervious surface and stormwater treatment summary

TDA	Impervious Surface Area (acres)					Primary Treatment BMPs
	New	Replaced	New+Replaced	Removed	New Impervious Treatment Area	
TDA 1	0.86	0.22	1.08	0.34	0	▪ Full Dispersion
TDA 2	54.55	3.03	57.58	2.58	4.53	▪ Compost-amended Vegetated Filter Strips ▪ Proprietary Treatment System
TDA 3	6.26	7.67	13.93	2.92	0.92	▪ Compost-amended Vegetated Filter Strips ▪ Proprietary Treatment System
Total	61.67	10.92	72.59	5.84	5.45	

3.4 Related Activities

Related activities are actions that are reasonably certain to occur and would not occur "but for" the proposed action. These related activities include the long-term maintenance and operation of the infrastructure that will be installed as part of each of the four project elements. This includes maintaining, repairing, or replacing impervious surfaces or structures associated with the East Parallel Taxiway, Northeast Hangar Development, FBO/GA Apron, and Commercial Service Apron. The proposed action does not represent any new uses or activities that do not otherwise occur at the Airport. Although there will be additional facilities to maintain because of the proposed action, there are currently similar maintenance, repair, and replacement activities occurring throughout the Airport associated with existing facilities. New activities associated with the proposed action will be incorporated into ongoing requirements.

4.0 IMPACT AVOIDANCE AND MINIMIZATION

The following actions or activities are impact avoidance and minimization measures that will be implemented as part of the proposed action to eliminate or reduce the extent of impacts to ESA-listed species and critical habitats. BMPs that will be implemented by the Port in association with the proposed action include:

- Preparation of a project specific CSWPPP that details the methods and procedures used to comply with the Stormwater Manual requirements (Kitsap County 2021) and the Port's standard operating procedures for construction water quality monitoring (Port 2025). The typical CSWPPP comprises:
  - Stormwater BMP implementation and site-specific performance monitoring plan, (required for all sites larger than 1 acre).
  - Pollution Prevention Plan, a site-specific hazardous materials management plan, and Contractor Erosion and Sediment Control Plan.
  - Contract plans and specifications.
- Preserving vegetation and marking clearing limits: Maintaining natural vegetation to the extent practicable and clearly marking construction limits to minimize land-disturbing impacts.
- Establishing construction access: Minimizing construction activities on unpaved areas, establishing and stabilizing access points, and vacuum/sweeping and wheel washing to prevent sediment trackout.
- Control flow rates: Stormwater management measures to minimize discharge and runoff from construction sites.
- Sediment controls: All stormwater runoff will be filtered through appropriate sediment removal BMPs and tested to verify compliance with turbidity and pH limits before discharge from the site.
- Soil stabilization: Exposed and unworked soil should be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project.
- Slope protection: All cut and fill slopes should be designed, constructed, and protected in a manner that minimizes erosion.
- Drain inlet protection: All storm drain inlets and culverts draining project sites will be protected to prevent unfiltered or untreated water from entering the drainage conveyance system.

- Channel and outlet stabilization: All temporary conveyance channels will be designed, constructed, and stabilized to prevent erosion.
- Seasonal control: All earth disturbing work will occur during the summer dry period. All work within or adjacent to on-site intermittent streams will be conducted in accordance with approved in water work windows. No grading or earthwork below the ordinary high water mark of regulated streams will occur unless the stream is dry and baseflows or surface water is absent.
- Pollutant control: All pollutants, including waste materials and demolition debris, generated on site will be handled and disposed of by the contractor in a manner that does not cause contamination of stormwater.
- Dewatering control: All dewatering water from open-cut excavation, foundation work, trenches, or underground vaults should be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond.
- Construction BMP maintenance: All temporary and permanent erosion and sediment control BMPs should be inspected, maintained, and repaired as needed to ensure continued performance in accordance with intended functions.
- Project management: Construction projects will be scheduled, phased, inspected, maintained, and managed to avoid and minimize stormwater impacts. This includes seasonal phasing of ground-disturbing activities or the implementation of additional BMPs if work during wet weather is unavoidable.

5.0 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.

5.1 Terrestrial Habitat

Habitats at the Airport have been substantially altered from historical conditions. Land cover primarily comprises developed Airport facilities, fragmented open space including managed fields adjacent to runways and taxiways, open fields and shrublands, forested areas, wetlands, and wetland and riparian buffers. Many vegetated habitats around the outer edge of Airport have been developed for commercial, industrial, and recreational uses (e.g., the racetrack and motocross track).

Areas adjacent to airside facilities are maintained and regularly mowed. Vegetation in these areas is dominated by grasses and weedy herbaceous species. In the currently undeveloped areas east of the proposed action there is immature forest dominated by native tree species including Douglas-fir, western hemlock and western white pine. The shrub layer in forested areas is dominated by evergreen huckleberry and salal with invasive Scotch broom and Himalayan blackberry (DOWL 2025).

5.2 Aquatic Habitat

5.2.1 On-Site

DOWL (2024) conducted wetland and stream determination to support the NEPA documentation for the proposed action. DOWL (2024) identified and delineated 12 wetlands and 5 streams on Airport property. These all occur within the action area, but all but three wetlands and segments of three intermittent streams occur beyond the project footprints. All streams within the immediate vicinity of the four project elements are seasonal streams with no documented fish use. The footprints of the proposed projects are all located upstream of documented fish passage barriers. There is no on-site aquatic area that provides habitat for ESA-listed species addressed in this BA (see Section 7.0).

5.2.2 Off-Site

5.2.2.1 Freshwater

The primary area of freshwater aquatic habitat in the project vicinity is the Union River and its tributaries. The entirety of the development work associated with the proposed action occurs within three TDAs that ultimately discharge to the Union River via its tributaries (see Section 3.3.1). The Union River and its tributaries exhibit a range of habitats that support

diverse fish populations. The two main tributaries of the Union River in the aquatic component of the action area are the North East Fork Union River and the East Fork Union River. Both the North East Fork and East Fork flow primarily through managed forested areas with light residential development in their lower and middle reaches. The headwaters of both tributaries are located on the Airport and its associated industrial park to the north.

5.2.3 Marine/Estuarine

The Union River estuary features a mosaic of estuarine wetlands, mudflats, eelgrass beds, and salt marshes. The estuary is located at the inland terminus of Hood Canal and has undergone substantial restoration to reestablish its natural tidal functions. In 2013, a collaborative project between WDFW and the Hood Canal Salmon Enhancement Group breached a dike in two locations, restoring tidal flow to 31 acres of former salt marsh. This effort included constructing 1.7 miles of tidal channels. WDFW has acquired over 177 acres of wetlands in the estuary.

5.3 Water Quality

The Union River watershed has faced several water quality challenges, particularly concerning fecal coliform bacteria contamination attributed to failing septic systems and runoff from agricultural and urban areas. In the late 1990s, monitoring revealed that the Union River and several of its tributaries exceeded Washington State water quality standards for fecal coliform bacteria. This contamination posed risks to shellfish harvesting and recreational activities in Hood Canal. In response, Ecology conducted a Total Maximum Daily Load study in 1999, leading to the development of a Water Cleanup Plan in 2002. Despite these efforts, subsequent monitoring in 2008 and 2009 indicated that fecal coliform levels remained above acceptable standards at several sites. The Union River near Belfair currently remains on the Ecology 303d list as an impaired waterbody due to fecal coliform bacteria. Urban development in the Belfair area has also contributed to water quality degradation through increased stormwater runoff. Industrial activities have played a role, and some industrial facilities in the watershed have been fined for failing to implement adequate erosion control measures.

Issues with bacterial contamination and increased nutrient loading also occur in the Hood Canal portion of the action area and adjacent parts of Hood Canal. Hood Canal, particularly its southern reaches near Belfair, experiences episodes of hypoxia, which is low dissolved oxygen levels that can be detrimental to marine life. These conditions have led to fish kills and declines in invertebrate species. The unique bathymetry of Hood Canal, characterized by its fjord-like structure with limited water exchange, exacerbates these low oxygen conditions, particularly at its inland terminus, which is within the aquatic component of the action area.

6.0 ACTION AREA

The action area for ESA analysis is defined as, "All areas to be affected directly or indirectly by the proposed action and not merely the immediate area directly adjacent to the action" (50 Code of Federal Regulations [CFR] 402.02). The action area includes all surrounding areas where project activities could potentially affect the environment. The action area encompasses all areas exposed to direct and indirect effects, as well as any effects of interrelated or interdependent actions.

The proposed action will result in temporary and permanent modification to existing developed and undeveloped surfaces at the Airport. Project construction will produce elevated in-air noise levels exceeding ambient conditions. The proposed action will create new and replacement impervious surfaces, which may affect the quality and quantity of stormwater discharged to tributary streams, the North East Fork Union River, the East Fork Union River, the Union River, and Hood Canal. In addition, project construction would result in temporary and permanent impacts to wetlands, streams, and buffer areas.

The action area comprises discrete terrestrial and aquatic components, which are displayed on Figure 3. The terrestrial component of the action area comprises all habitats exposed to construction noise and activity levels that exceed baseline conditions and project operations associated with each project element. The aquatic component of the action area comprises all aquatic habitats exposed to temporary or permanent construction impacts and anticipated operational stormwater discharges from the four projects.

6.1 Terrestrial Component

The terrestrial component of the action area is defined by the physical extent of measurable effects resulting from the construction and operation of the proposed action. This comprises all areas exposed to temporary and permanent impacts from project construction (the four project footprints) and the area beyond the project footprints exposed to construction and operational noise levels that exceed ambient conditions.

Construction-related noise is a function of the types of equipment being used, the distance to potential receptors, and the duration of construction activities. Noise impacts are likely to vary between project elements depending on the duration and complexity of construction for each project. Proposed action construction activities would generate in-air noise from operation of equipment used during construction. Construction of the project elements is anticipated to be typical of pavement and hangar construction. Noise levels for commonly used equipment for this type of work range between about 70 and 100 A-weighted decibels (dBA) (FHWA 2024). Estimation of construction noise is based on these sound levels.

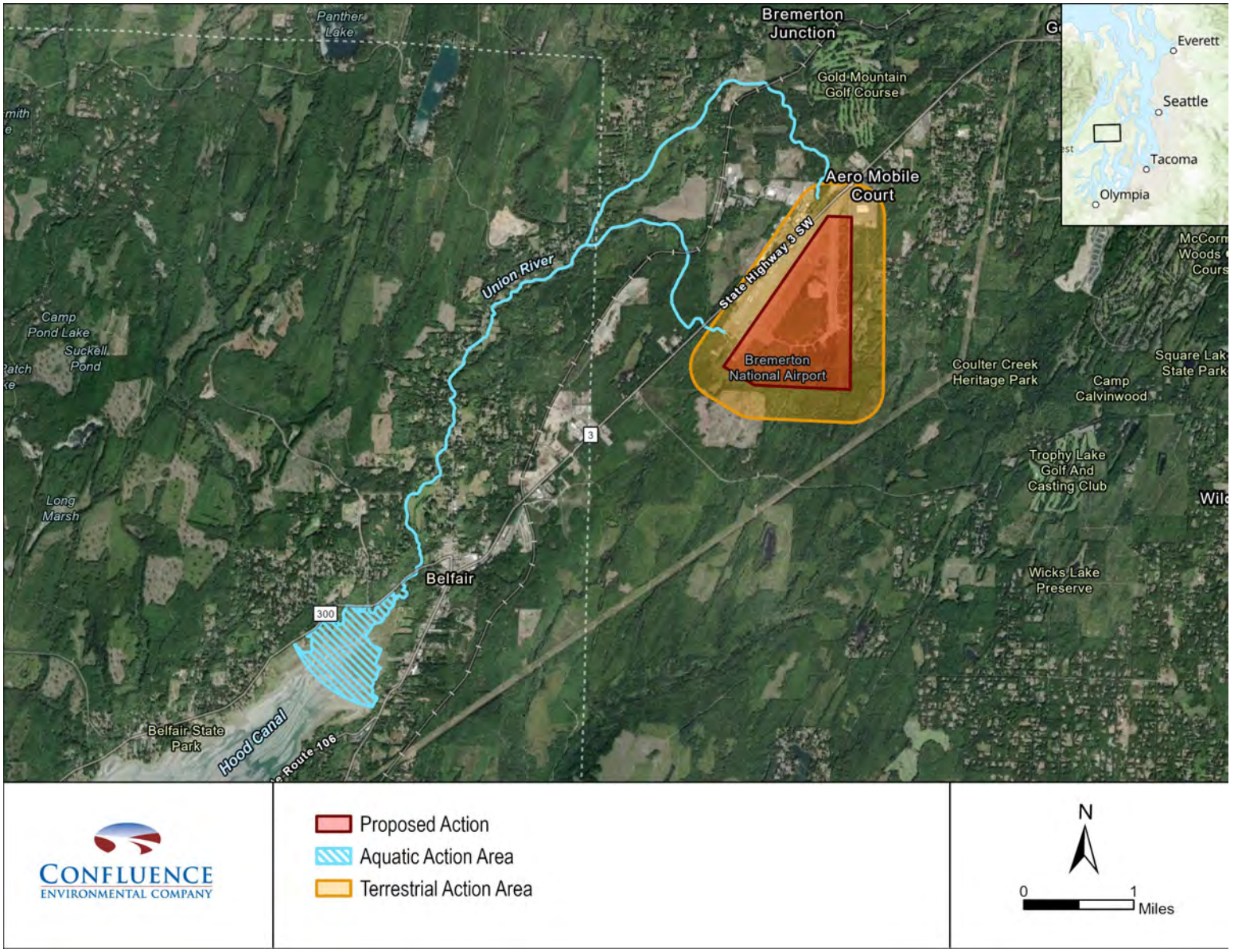


Figure 3. Action area

Standard background noise for populated urban areas is 65 dBA (FTA 2018; WSDOT 2023). The current evaluation did not include site specific noise measurements, but operational noise is anticipated to exceed these background levels. Background noise at the Airport is dominated by operating activities with sound levels that are similar to or exceed sound levels associated with construction. Existing operations include airplanes taxiing, taking off, and landing. Land use within and adjoining the current Airport includes high noise intensity activities including a motocross facility and Bremerton Raceway. The proposed action occurs in proximity to existing Airport operations and between the Airport and the raceway. Construction noise is anticipated to attenuate to the background level at or near the extents of Airport property. However, for the purpose of this assessment, a conservative estimate is that noise from proposed action construction would attenuate to the background level at approximately 0.30 mile from the limits of the proposed action (Figure 3)

6.2 Aquatic Component

The aquatic component of the action area comprises on-site streams within and adjacent to the proposed construction activities and the estimated areas potentially exposed to stormwater from the proposed action either during construction or post-construction during the operation of the facilities. No construction activities are proposed that would result in elevated underwater noise effects because there are no on-site streams accessible to listed fish.

The proposed action would generate stormwater that would discharge through new and existing infrastructure to the North East Fork Union River and the East Fork Union River. The tributaries converge about 2 and 3 miles downstream from the Airport, respectively, to form the mainstem of the Union River. The Union River mouth to Hood Canal is approximately 5 miles downstream of the confluence the mainstem river and North East Fork.

The proposed action includes both construction and post-construction stormwater BMPs to treat stormwater generated by the project elements; however, stormwater contaminants could remain in the aquatic system. Notably, 6PPD-quinone (6PPD-Q) could be transported via tributaries that receive stormwater runoff to nearshore habitats in Hood Canal. As discussed in Section 8.0, the fate and transport of this compound in fresh and marine waters is not fully understood and biological effect thresholds have not yet been established. Moreover, while current treatment technologies may be somewhat effective, stormwater is the primary source for chronic pollution of surface waters by this and several other known and emerging contaminants of concern.

Based on direction provided by NMFS on April 10, 2025, this BA conservatively assumes a large aquatic action area component to evaluate potential effects on listed species. The proposed action is assumed to produce potential impacts on aquatic habitats from discharge of stormwater contaminants in the portions of the Union River and its forks downstream of the terrestrial component of the action area and nearshore marine habitat of Hood Canal where

these systems enter Puget Sound (Figure 3). For the purpose of this assessment, a conservative estimate of the extent of the aquatic component of the action area is that the exposure zone in Hood Canal will include areas within 1 mile of the mouth of the Union River (Figure 3).

6.3 Zone of Influence on the Prey Base for Southern Resident Killer Whale

The zone of influence on the prey base for SRKW includes all areas where salmonid species from the Union River and that portion of Hood Canal within the action area are available as prey for SRKW. This area effectively encompasses the SRKW's entire coastal range, which is from central California (Weitkamp 2010; Shelton et al. 2019) to Southeast Alaska (NMFS 2008; Hanson et al. 2013; Caretta et al. 2021), including the Salish Sea (Weitkamp 2010; Shelton et al. 2019).

7.0 PRESENCE OF LISTED SPECIES AND DESIGNATED CRITICAL HABITAT IN THE ACTION AREA

Confluence consulted the ESA list websites hosted by NMFS and USFWS. NMFS ESA listing information was accessed on April 28, 2025 (NMFS 2025a). USFWS ESA listing information was accessed on April 28, 2025 (USFWS 2025). Species lists are included as Appendix A.

Tables 2 and 3 identify the ESA-listed species and designated critical habitats under the jurisdiction of NMFS and USFWS that are either documented or may occur in the action area.

Table 2. ESA-listed species and critical habitat under the jurisdiction of NMFS potentially in the action area

Species	Federal Status	Critical Habitat in Action Area
Chinook salmon (Puget Sound ESU)	Threatened	Yes
Steelhead (Puget Sound DPS)	Threatened	Yes
Chum Salmon (Hood Canal summer-run ESU)	Threatened	Yes
Bocaccio rockfish (Puget Sound/Georgia Basin DPS)	Endangered	No
Yelloweye rockfish (Puget Sound/Georgia Basin DPS)	Threatened	No
Killer whale (Southern Resident DPS)	Endangered	No
DPS – distinct population segment; ESU – evolutionarily significant unit		

Table 3. ESA-listed species and critical habitat under the jurisdiction of USFWS potentially in the action area

Species	Federal Status	Critical Habitat in Action Area
Marbled murrelet	Threatened	No
Yellow billed cuckoo	Threatened	No
Bull trout (Coastal-Puget Sound DPS)	Threatened	No
Northwestern pond turtle	Proposed Threatened	n/a
Monarch butterfly	Proposed Threatened	No
Suckley's cuckoo bumble bee	Proposed Endangered	n/a
DPS – distinct population segment; n/a - none designated or proposed		

7.1 Key Issue and Species Addressed

While all potential direct and indirect effects of the proposed action were analyzed (see Section 8.0), the key issue addressed in this BA is the potential adverse effects that could result from construction and post-construction stormwater. The potential for adverse effects is related to uncertainty about the effectiveness of current stormwater treatment technology for known and emerging contaminants of concern. For example, current treatment technologies can

reliably reduce the concentrations of known, commonly occurring stormwater contaminants like polyaromatic hydrocarbons (PAHs) and metals. However, no currently approved stormwater BMP can completely remove all contaminants from stormwater discharge. NMFS asked the Port and FAA to prepare this BA primarily to address the ongoing discharge of these pollutants. Specifically, the chemical 6PPD-Q has been identified as a causal agent of pre-spawn mortality of salmonids in urban streams (Ecology 2022). 6PPD-Q is released into the environment when tire wear particles and skid marks containing 6PPD, a vulcanizing agent used in vehicle and aircraft tires, are exposed to weathering and transported to surface waters in stormwater runoff from impervious surfaces. Emerging research demonstrates that exposure to 6PPD-Q is lethal to several species of salmonids at very low surface water concentrations (see Section 8.0).

The extent of potential downstream transport of contaminants from stormwater defines the aquatic component of the action area for this BA and therefore the species addressed. The following species are addressed because they occur in, have potential to occur in, have prey species that occur in, and/or have designated critical habitat present in the action area:

- Chinook salmon, Puget Sound Evolutionarily Significant Unit (ESU)
- Steelhead, Puget Sound Distinct Population Segment (DPS)
- Chum salmon, Hood Canal summer-run ESU
- Bocaccio rockfish (bocaccio), Puget Sound/Georgia Basin DPS
- Yelloweye rockfish, Puget Sound/Georgia Basin DPS
- SRKW
- Bull trout, Coastal-Puget Sound DPS

Life history information for species addressed in this BA are included in Appendix B.

7.2 Species Not Addressed

Table 4 shows ESA-listed species that may occur in the vicinity of the proposed action but are not found in the action area for the reasons described below and are therefore not discussed further in this BA.

Table 4. ESA-listed species and critical habitat not addressed

Species	Lead Agency	Federal Status	Critical Habitat in Action Area
Marbled murrelet	USFWS	Threatened	No
Yellow-billed cuckoo	USFWS	Threatened	No
Northwestern pond turtle	USFWS	Proposed Threatened	n/a
Monarch butterfly	USFWS	Proposed Threatened	No
Suckley's cuckoo bumble bee	USFWS	Proposed Threatened	n/a
n/a – none designated or proposed			

7.2.1 Marbled Murrelet

The marbled murrelet is listed as a threatened species in Washington under the ESA (57 Federal Register [FR] 45328). Critical habitat for Washington was designated on May 24, 1996 (61 FR 26256).

Marbled murrelets are small, robin-sized diving seabirds that forage in marine waters but nest in old-growth forests within range of the coast. The limited forested areas within the action area are not suitable nesting habitat for marbled murrelet due to the absence of contiguous, old-growth forest. The action area does not include any designated critical habitat for this species.

Although marbled murrelets are typically associated with coastal marine environments and old-growth forest nesting sites, occasional inland sightings have been recorded, particularly during breeding season when the birds may venture inland. While they have been observed inland in Washington, such occurrences are rare and typically associated with suitable nesting habitats. Given the lack of suitable nesting habitat and the absence of recorded sightings, it is unlikely that the terrestrial action area is a regular habitat for marbled murrelets.

Rationale for Exclusion: Marbled murrelet presence in the action area during the proposed project is considered discountable. The proposed action would have no effect on the marbled murrelet or designated critical habitat, and it will not be discussed further in this document.

7.2.2 Yellow-Billed Cuckoo

The yellow-billed cuckoo is listed as a threatened species in Washington under the ESA (79 FR 59991). Critical habitat has not been proposed in Washington.

Yellow-billed cuckoos are migratory birds that begin arriving in western North America in May, nest from June through August, and may be present through late September. They have a strong preference for large, continuous riparian zones composed of willows and cottonwoods, usually at least 50 acres. They were once considered abundant along the Columbia River and occasionally observed in western Washington, but they are reported to no longer breed in Washington, Oregon, or British Columbia (Wiles and Kalasz 2017). They historically nested in woody habitats in eastern and western Washington and had been documented in King, Pierce, Whatcom, and Grays Harbor counties (Wahl et al. 2005). However, recent reports of individual cuckoos in Washington are rare and limited to occasional sightings, likely of vagrants or non-breeding migrants. The majority of recent sightings occurred east of the Cascade Mountains (Wiles and Kalasz 2017). Of the 13 sightings since 1990, 11 were in eastern Washington and 2 were around Puget Sound.

Rationale for Exclusion: The proposed action would have no effect on the yellow-billed cuckoo or its critical habitat because this species has been functionally extirpated from Washington State and the action area does not provide suitable habitat for this species.

7.2.3 Northwestern Pond Turtle

7.2.3.1 Federal Status

The northwestern pond turtle was proposed as threatened in 2023. Critical habitat has not been proposed in Washington.

The northwestern pond turtle is a medium-sized turtle native to the northwest United States, occurring in Washington, Oregon, Nevada, and California. It is one of two turtle species native to Washington State. The northwestern pond turtle is primarily aquatic, leaving the water only to lay eggs, overwinter, or disperse to new water bodies. In Washington State, they are only known to occur in lakes or ponds. They become active in March or early April and continue until late September or October, depending on weather conditions (WDFW 2024a). The species was extirpated from Washington State in 1990. Because of recovery efforts, there are now 6 populations in the state, none of them occurring in the action area.

Rationale for Exclusion: The proposed action would have no effect on the northwestern pond turtle or its habitat because this species does not occur in the action area.

7.2.4 Monarch Butterfly

The monarch butterfly was proposed for listing under the ESA as threatened in 2020.

Monarch butterflies in Washington occur primarily east of the Cascades in weedy fields and sparsely vegetated habitats along large river courses and in wetland areas where their obligate milkweed host plant grows. The number of monarchs in Washington is relatively low. Milkweeds are patchily distributed within the Columbia Basin. Monarchs migrating south through Washington often concentrate along the large river courses of the Columbia and Snake Rivers (WDFW 2024b).

Rationale for Exclusion The proposed action would have no effect on the monarch butterfly or its habitat because this species does not occur in the action area.

7.2.5 Suckley's Cuckoo Bumble Bee

Suckley’s cuckoo bumble bee was proposed for listing as endangered under the ESA on December 17, 2024.

In general, bumble bees depend on habitats with rich floral resources throughout the nesting season, and many species select specific suites of plants for obtaining nectar and pollen. Bumble bees are adaptable; they do not require native vegetation. Like other bumble bees, Suckley’s cuckoo bumble bees require suitable foraging, nesting, and overwintering habitat. Suckley’s cuckoo bumble bee females overwinter underground in areas separate from nesting habitat, likely using mulch or other decomposing vegetation (USFWS 2024).

Suckley's cuckoo bumble bee has a broad historical distribution across North America, and it has been found in various habitat types including prairies, grasslands, meadows, and woodlands, from 6 to 10,500 feet in elevation (89 FR 102074). Suckley's cuckoo bumble bee historical observations extend south to Arizona, east to Nebraska and the edge of Minnesota, and north through the Yukon of Canada. Surveys performed by the Pacific Northwest Bumble Bee Atlas across Washington, Oregon, and Idaho from 2018 to 2020 did not detect Suckley's cuckoo bumble bee (Xerces Society 2025). While there have been no documented sightings in the action area in recent history. Habitat suitable for the species is likely present but unoccupied.

Rationale for exclusion: Due to the lack of documented occurrence in the action area, the proposed action would have no effect on the Suckley's cuckoo bumble bee, and it will not be discussed further in this document.

7.3 ESA-listed Species and Critical Habitat Occurrence in Action Area

7.3.1 Puget Sound Chinook Salmon

7.3.1.1 Federal Status

Puget Sound Chinook salmon were listed as a threatened species on June 28, 2005, and updated on April 14, 2014 (70 FR 37160). A recovery plan is in place for Puget Sound Chinook salmon (SSPS 2007; NMFS 2007). The recovery plan adopts ESU and population-level viability criteria recommended by the Puget Sound Technical Recovery Team (Ruckelshaus et al. 2002).

7.3.1.2 Occurrence

The Puget Sound ESU of Chinook salmon consists of 22 extant populations. Several Chinook salmon populations could occur in the aquatic component of the action area, specifically the mixing zones for stormwater discharge to Hood Canal. WDFW (2025) identifies the Union River as having documented rearing and spawning use by Chinook salmon. Neither the North East Fork nor the East Fork is identified as supporting Chinook salmon use. Chinook salmon are likely to occur in the marine portion of the action area as pre-spawn migratory adults and in offshore and nearshore habitats as outmigrant juveniles.

Juvenile Chinook salmon rely on estuarine and nearshore habitats including those at the mouth of the Union River for rearing and to make their transition from fresh to saltwater conditions (smoltification) before migrating out to the open ocean. Juveniles rely on shallow nearshore habitats such as eelgrass beds, intertidal flats or marshes, and subtidal channels. The Hood Canal portion of the action area comprises intertidal and subtidal flats, indicating that the area provides suitable habitat for juvenile Chinook salmon.

According to the 2016 5-year review of the status of the Puget Sound Chinook salmon ESU, the most recent available, all Puget Sound Chinook salmon populations are below the planning ranges identified for recovery. NMFS (2017a) reported that most populations have declined persistently between about 2006 and 2016. There is concern that recovery to a naturally sustaining harvestable population is hindered by habitat factors as well as competition for habitat and food sources between naturally spawning fish and hatchery fish. Population trends vary depending on whether hatchery fish are combined or analyzed separately from natural-origin fish on the river system. NMFS has identified the effect of hatchery strays on wild Chinook salmon production in river systems as a key concern leading to the listing of Chinook salmon (West Coast Salmon Biological Review Team 2003).

7.3.1.3 Critical Habitat

Critical habitat for 12 ESUs of west coast salmon and steelhead in Washington, Oregon, and Idaho was designated on September 2, 2005 (70 FR 52630). The freshwater habitats in the Union River are not mapped as designated critical habitat for Puget Sound Chinook salmon (NMFS 2025b). The estuarine and nearshore marine areas within Hood Canal within the action area are designated as critical habitat.

7.3.2 Puget Sound Steelhead

7.3.2.1 Federal Status

Puget Sound steelhead trout were listed as a threatened species in 2007, and the listing was updated on April 14, 2014 (72 FR 26722). A recovery plan is in place for Puget Sound steelhead, produced through a wide collaboration by the Puget Sound Steelhead Recovery Team (NMFS 2019).

7.3.2.2 Occurrence

In British Columbia and Washington, steelhead are present in most coastal streams, the lower Columbia River, and in all the larger drainages of the Salish Sea (Pietsch and Orr 2015). Steelhead spend the first 1 to 2 years of life rearing in freshwater rivers before out-migrating to the ocean. Steelhead then spend about 1 to 2 years at sea before returning to their freshwater streams of origin to spawn. A small percentage of adults, predominantly females, are repeat spawners. These individuals, referred to as kelts, migrate to the ocean to feed and recover and return to freshwater to spawn again the following year.

WDFW (2025) identifies the Union River as having documented rearing and spawning use by steeelhead. Neither the North East Fork nor the East Fork is identified as supporting steelhead use. Steelhead salmon are likely to occur in the marine portion of the action area, specifically as pre-spawn migratory adults and outmigrant juveniles. Outmigrant juveniles typically migrate rapidly through the offshore, moving from natal rivers to the open ocean within days to weeks

(Berejikian 2016; Moore et al. 2015; Moore and Berejikian 2017) and do not make extensive use of the nearshore habitat (Puget Sound Partnership and WDFW 2011).

According to the NMFS 5-year review of the Puget Sound steelhead DPS, risks for the DPS have not changed since the species' listing in 2007 and the DPS is at very low viability.

7.3.2.3 Critical Habitat

Critical habitat for 12 ESUs of west coast salmon and steelhead in Washington, Oregon, and Idaho was designated on September 2, 2005 (70 FR 52630). The freshwater habitats in the Union River are included in Puget Sound steelhead critical habitat (NMFS 2025b). Neither the North East Fork nor the East Fork is identified as critical habitat. Puget Sound steelhead critical habitat does not include marine habitats; therefore, no designated critical habitat for Puget Sound steelhead is present in the Hood Canal portion of the action area.

7.3.3 Hood Canal Summer-Run Chum Salmon

7.3.3.1 Federal Status

Hood Canal summer-run chum salmon (*Oncorhynchus keta*) are listed as a threatened species under the ESA. This ESU was listed as threatened on March 25, 1999 (64 FR 14508), and the listing was reaffirmed in subsequent status reviews by NMFS. A recovery plan was finalized by NMFS (2007), developed in coordination with local tribes, state agencies, and conservation organizations.

7.3.3.2 Occurrence

Hood Canal summer-run chum salmon are endemic to Hood Canal and the eastern Strait of Juan de Fuca in Washington. This ESU is characterized by early-timed runs, typically returning to natal rivers and streams from mid-June through September, with spawning occurring from September through early November.

The Union River is designated as part of the core spawning area for Hood Canal summer-run chum salmon (NMFS 2007). The watershed supports both spawning and rearing of summer chum. Juvenile chum salmon outmigrate to estuarine and nearshore marine habitats, typically within weeks of emerging from the gravel in early spring. These juveniles rely heavily on estuarine areas such as the Union River estuary and the adjacent Theler Wetlands for foraging and transitional habitat before dispersing into Hood Canal. Both adult and juvenile summer chum salmon are expected to be present seasonally in the action area.

7.3.3.3 Critical Habitat

Critical habitat for Hood Canal summer-run chum salmon was designated on September 2, 2005 (70 FR 52630). This includes freshwater reaches of the Union River essential for spawning, rearing, and migration (NMFS 2025b). The lower approximately 1 mile of the North East Fork

above its confluence with the mainstem Union River (approximately 1 mile downstream of the Airport) is included in the critical habitat designation. Only the lowest reach of the East Fork Union River is included in the critical habitat designation. The East Fork within 3 miles of the Airport is not identified as critical habitat for Hood Canal summer-run chum salmon. The critical habitat designation does not include marine habitats; therefore, no designated critical habitat for Hood Canal summer-run chum salmon is present in the Hood Canal portion of the action area.

7.3.4 Puget Sound/Georgia Basin Boccacio Rockfish

7.3.4.1 Federal Status

Puget Sound/Georgia Basin bocaccio rockfish is listed as an endangered species as of 2010 (75 FR 22276). A recovery plan is in place for Puget Sound/Georgia Basin bocaccio and yelloweye rockfish (NMFS 2017b).

7.3.4.2 Occurrence

Bocaccio is a deep-water species of rockfish typically found along steep slopes of sand or rock substrates. They prefer high relief boulder fields and rocks and may school with other rockfish species. They may occasionally wander onto mudflats or be found well off the bottom substrate (Love et al. 2002). Adults are found in waters ranging from 12 to 478 meters (39 to 1,568 feet) deep but are most frequently found at depths ranging from 50 to 250 meters (164 to 820 feet).

Larvae and pelagic juveniles are found near the surface; juveniles prefer shallow, algae-covered rocks or eelgrass or may shelter under kelp mats (Love et al. 2002; Corps 2012). The juveniles move to deeper waters within 3 to 3.5 months (Love et al. 2002). Larvae of bocaccio can be widely dispersed by surface currents. Offshore of Washington and Oregon, larval release begins in January and may run through April (Drake et al. 2010); little is known of the timing of bocaccios breeding within Puget Sound.

The bocaccio was once common on steep walls throughout Puget Sound, including Hood Canal, but this species is now much rarer (Love et al. 2002). In the last several decades, records indicate bocaccio can be found throughout portions of Puget Sound from the Strait of San Juan de Fuca, Everett, Port Orchard, Hood Canal, Tacoma Narrows, and Alki Point just west of the action area. Adult and juvenile bocaccio could potentially occur in the Hood Canal portion of the of the action area, although this area consists of more shallow waters than where they are most commonly found. Bocaccio eggs and larvae are likely to occur in nearshore marine habitats and may occur within the action area.

Bocaccio populations have declined severely throughout their range. In Puget Sound, stocks appear to have declined based on the frequency of recreational catches between the 1970s and 1990s, and bocaccio were not identified in dockside surveys of several thousand rockfish caught

between 1996 and 2007 in Puget Sound. This suggests a strong decline in bocaccio in these inland waters (Drake et al. 2010, NMFS 2017b).

7.3.4.3 Critical Habitat

NMFS designated critical habitat for both bocaccio and yelloweye rockfish within Puget Sound/Georgia Basin in 2014 (79 FR 68041). This habitat is segmented into nearshore and deepwater rockfish critical habitat (79 FR 68041). Critical habitat for these species occurs further west in Hood Canal but does not extend into the action area for the proposed action (NMFS 2025b).

7.3.5 Puget Sound/Georgia Basin Yelloweye Rockfish

7.3.5.1 Federal Status

Yelloweye rockfish were listed as a threatened species in 2010 (75 FR 22276). A recovery plan is in place for Puget Sound/Georgia Basin bocaccio and yelloweye rockfish (NMFS 2017b).

7.3.5.2 Occurrence

Yelloweye rockfish is a deep-water species associated with rocky reefs, kelp canopies, artificial structures, and rocky bottoms, often near steep slopes (Palsson et al. 2009). This species occurs in deeper waters ranging from 80 to 1,560 feet but is most common between 300 and 590 feet. Juveniles and subadults prefer shallower waters, while the adults tend to use deeper waters. Subadults and adults tend to be solitary and prefer staying close to the substrate in rocky areas with high relief and shelter, such as overhangs, caves, or boulder piles (Love et al. 2002). Yelloweye rockfish eat a variety of prey, including smaller fish, shrimps, and crabs.

Larval release occurs primarily in March to July off of British Columbia (Love et al. 2002). Little is known about this species' breeding timing within Puget Sound or Hood Canal. They are believed to release larvae in early spring to late summer Yelloweye rockfish are viviparous, meaning they give birth to live larvae rather than laying eggs. In British Columbia, parturition (the release of larvae) occurs between April and September, with a peak in May and June (COSEWIC 2025).

Of the two listed species of rockfish, yelloweye rockfish appear to be the most abundant with the widest distribution. According to Miller and Borton (1980), yelloweye rockfish have been caught in the marine waters in Puget Sound. Pietsch and Orr (2015) report that records indicate a range from the south end of Saratoga Passage and off Everett to Golden Gardens and Elliott Bay, with additional isolated records elsewhere in Puget Sound.

Juvenile yelloweye rockfish are not typically found in intertidal waters (Love et al. 1991; Studebaker et al. 2009, NMFS 2017b). Juvenile and larval yelloweye could potentially occur in

the Union River estuary. Adult yelloweye may occur in the estuary, but are most commonly found in deeper waters with high relief rocky habitats.

The yelloweye rockfish is slowly recovering from a significant decrease in abundance across its range. By the late 1990s, stocks off California and Oregon had fallen to about 7 and 12 percent of unfished levels, respectively (Love et al. 2002). This species is rare to uncommon in Puget Sound, and harvested numbers have historically been too small to discern population status and trends (Drake et al. 2010; NMFS 2016).

7.3.5.3 Critical Habitat

NMFS designated critical habitat for both bocaccio and yelloweye rockfish within Puget Sound/Georgia Basin in 2014 (79 FR 68041). This habitat is segmented into nearshore and deepwater rockfish critical habitat (79 FR 68041). Critical habitat for these species occurs further west in Hood Canal but does not extend into the action area for the proposed action (NMFS 2025b).

7.3.6 Southern Resident Killer Whale

7.3.6.1 Federal Status

SRKW were listed as endangered on November 18, 2005 (70 FR 57565) and updated on April 14, 2014.

7.3.6.2 Occurrence

The SRKW DPS comprises three distinct pods (J, K, and L), totaling around 74 individuals (MMC 2024). The three pods are regularly present in the inland waters of Puget Sound, inland waters of southern British Columbia, and the Strait of Juan de Fuca from April through September. During much of this time, they tend to be concentrated around the San Juan Islands. SRKW pods tend to move farther south within Puget Sound in the fall, likely following runs of Chinook and chum salmon. Although SRKW were originally thought to feed exclusively on Chinook salmon, an analysis of SRKW fecal matter suggests that diets vary from season to season, shifting from primarily Chinook salmon during the summer months to a mixture of Chinook and coho in early fall, then Chinook, coho, and chum in the late fall (DeWeerdt 2021).

May and June are the months with the fewest sightings in the central Puget Sound region. Outside of these general patterns, SRKW pods may occur in southern Puget Sound. These family groups are highly mobile and can travel over 80 miles (160 km) in a single day. From 2020 to 2022, there were 277 SRKW observations submitted to the whale museum in the east passage of Puget Sound from Elliot Bay south Des Moines, Washington (Whale Museum 2023). Of these, the 43 records identified as SRKW occurred on 28 unique days in the months of July, September, October, November, December, and January.

SRKWs have been occasionally sighted in Hood Canal—for instance, in 2021, a pod spent approximately 30 days in the canal—but their occurrence in Hood Canal is not as common as in southern portions of Puget Sound. SRKW are not present in the freshwater portion of the action area. The main pathway for the project to affect SRKWs is via trophic link, as impacts to Chinook salmon and chum salmon would affect prey availability for SRKWs.

7.3.6.3 Critical Habitat

Critical habitat was originally designated on November 29, 2006 (71 FR 69054), and subsequently revised on August 29, 2021, to include coastal marine waters of Washington, Oregon, and California (86 FR 41668). The revised designation includes the following three specific areas in the inland marine waters of Washington State:

- The Summer Core Area in Haro Strait and waters around the San Juan Islands
- The Puget Sound Area
- The Strait of Juan de Fuca Area

The majority of Hood Canal, including the action area, is not included in the critical habitat designation for SRKW. There is no critical habitat for SRKW in the action area.

7.3.7 Coastal-Puget Sound Bull Trout

7.3.7.1 Federal Status

Bull trout were listed as threatened on November 1, 1999 (64 FR 58910). The listing applies to all bull trout in the coterminous United States, including the Coastal-Puget Sound DPS. A recovery plan is in place for the coterminous United States population of bull trout (USFWS 2015).

7.3.7.2 Occurrence

Most bull trout reside their entire lives in streams, large rivers, and lakes, but the Coastal-Puget Sound DPS is amphidromous, meaning that the species flexibly uses freshwater, estuarine, and nearshore marine waters at various points during its life cycle. Bull trout from the Coastal-Puget Sound DPS are known to migrate and forage in nearshore waters, using the nearshore zone as a migratory corridor between seasonal habitats in natal and non-natal watersheds (Goetz et al. 2004, 2021). These foraging, migrating, and overwintering (FMO) habitats are crucial to the conservation of the species. Bull trout are apex predators, with adult and subadult migratory bull trout feeding primarily on trout, salmon, sculpin, and other fish species (City of Seattle 2015). Bull trout commonly use estuarine and nearshore marine habitats to forage juvenile salmonid migrants (USFWS 2004). Bull trout have more specific habitat requirements than other salmonids. Specifically, they require a narrower range of colder water temperatures for spawning and rearing, and they are more sensitive to passage barriers and fine sediment in spawning substrates.

Puget Sound bull trout populations spend a significant portion of their life cycle in salt water, moving back and forth between mouths of rivers and streams (Pietsch and Orr 2015). Marine FMO habitat includes the highly productive nearshore and estuarine areas that provide complex habitat structure and abundant prey. The Skokomish River, which flows into Hood Canal west of the action area supports two primary bull trout subpopulations: the Upper North Fork Skokomish River and Lake Cushman subpopulation and the South Fork–Lower North Fork Skokomish River subpopulation. The Upper North Fork Skokomish River and Lake Cushman subpopulation is found primarily within Olympic National Park. Bull trout here are isolated due to the Cushman Dam. The South Fork–Lower North Fork Skokomish River subpopulation is considered "depressed," with fewer than 500 spawners. Habitat degradation from past forestry, agriculture, and hydropower development has impacted this area. No observations were documented within the Union River or freshwater portion of the action area. The Hood Canal portion of the action area is well within the maximum migratory range of bull trout from the Skokomish River or other Hood Canal tributaries. Bull trout could occur in the action area at any time but are most likely to be present from March through July due to the abundance of forage (Goetz et al. 2021).

7.3.7.3 Critical Habitat

Critical habitat for bull trout was designated on October 26, 2005, and then revised on October 18, 2010 (75 FR 63898). The action area does not overlap designated critical habitat for this species.

7.4 Critical Habitat

The action area includes designated critical habitat for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon. This section consists of a discussion of the physical or biological features (PBFs) that have been identified for ESA-listed salmon and steelhead and the potential for their presence within the action area. The original designations of critical habitat for the salmon ESUs and steelhead DPS addressed in this BA used the term “primary constituent element (PCE)” to define critical habitat. The new critical habitat regulations (81 FR 7414) replace this term with the term “PBF.” PBF is used herein to be consistent with the current regulatory framework. The change in terminology does not change the approach used in conducting the effects analysis.

The PBFs relevant to the action area are as follows:

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover, such as shade,

submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

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

These PBFs are described in detail below.

7.4.1 Freshwater Spawning

Spawning habitat is present in the action area for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon. WDFW identifies the mainstem of the Union River above areas of tidal influence as providing suitable spawning habitat for all three salmonids. The lower 1 mile of the North East Fork Union River is also identified as spawning habitat for chum salmon. Each species requires clean gravel substrate and low levels of fine sediment for successful spawning and incubation. Although the stream habitat conditions in the action area have historically been highly modified by past forest practices and agricultural development and continue to be affected by ongoing urban development in the watershed, the Union River and the lower portion of the North East Fork Union River contribute to this PBF for these species. This PBF is present and functions effectively for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon.

7.4.2 Freshwater Rearing

The action area includes rearing habitat for juveniles of Hood Canal summer-run chum, Puget Sound Chinook, and Puget Sound steelhead. For chum salmon, rearing is brief and focused on estuarine environments. For Chinook salmon, juvenile rearing lasts several weeks to months, and they utilize both freshwater and estuarine habitats. The Union River offers rearing habitat with adequate cover (vegetation, large woody debris), off-channel refuge, and food resources. Steelhead juveniles rear in freshwater for 1 to 3 years and require complex stream habitats with

low-velocity refugia, overhead cover, and cold, clean water. Though steelhead likely rear in tributaries and upstream reaches, restored floodplain and mainstem connectivity in the lower Union River contributes to this PBF for the species. Restoration efforts, including the Theler Wetlands restoration in the freshwater reaches of the lower Union River, have improved rearing conditions by increasing floodplain connectivity and revegetating stream banks to improve the PBF natural cover features element in the action area. This PBF is present and functions effectively for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon. This PBF has been impacted by ongoing development and land use within the watershed; however, current restoration activities are underway to improve these conditions.

7.4.3 Freshwater Migration Corridors

The Union River and its estuarine outlet into Hood Canal function as a migratory corridor for all three species. Migration corridors are free of major obstructions in the action area, and ongoing estuarine restoration has enhanced floodplain and tidal connectivity. Water quality is generally adequate and has been improving over the past 20 years, although the Union River is still included on Ecology's 303d list for fecal coliform. Habitat complexity, including submerged vegetation and natural wood features, supports both upstream and downstream passage, and there are no documented fish passage barriers within those portions of the action area included in the critical habitat designations for these species. This PBF is present and functions effectively for both juvenile outmigration and adult upstream migration for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon but has been impacted by ongoing development and land use within the watershed.

7.4.4 Estuarine Areas

The estuarine portion of the action area, including the Lynch Cove estuary and lower Union River, is important habitat for the transition of all three species. Historically channelized and diked, the lower river and estuary have undergone restoration to improve tidal exchange, reduce channelization, and reestablish natural estuarine vegetation. The presence of eelgrass beds, mudflats, and salt marsh provides feeding opportunities and refuge from predators during physiological transition from freshwater to marine life stages. This PBF is present and functional within the action area for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon.

7.4.5 Nearshore Marine Areas

The Union River empties into Hood Canal at its landward terminus. The area includes an abundance of shallow nearshore marine habitats that support the growth and survival of juvenile salmonids as they enter marine waters. The nearshore zone includes shallow benthic habitats and marine vegetation that offer foraging opportunities and refuge from predation. The

nearshore zone beyond the Union River estuary within the action area is largely developed by residential uses and includes areas of armored shorelines and overwater structures. Shoreline vegetation is limited. This PBF is present within the action area for Puget Sound Chinook salmon, Puget Sound steelhead, and Hood Canal summer-run chum salmon but has been impacted by ongoing shoreline development.

8.0 ANALYSIS OF EFFECTS

Impacts 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 (i.e., interrelated and interdependent activities). 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 based on clear and substantial information, using the best scientific and commercial data available. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (i.e., indirect effects, also referred to as delayed consequences). Examples of delayed consequences are as follows:

- Changes to ecological systems resulting in altered predator/prey relationships.
- Changes to ecological systems resulting in long-term habitat alteration.
- Anticipated changes in human activities, including changes in land use.

Effects are generally categorized as being insignificant, discountable, adverse, or beneficial. Insignificant effects relate to the size of the impact (and should never reach the scale where take occurs), while discountable effects are those that are extremely unlikely to occur. Based on best judgment, one would not be able to meaningfully measure, detect, or evaluate insignificant effects or expect discountable effects to occur. Adverse effects are those that are not discountable or insignificant and are likely to result in take of species or designated critical habitat. "Take," as defined by the ESA, includes activities that harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct (ESA Section 3[19]). "Harm" is further defined to include substantial habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Harass" is further defined as actions that create the likelihood of injury to listed species to such an extent as to substantially disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Adverse effects to designated critical habitat may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. In general, take is assumed when harm or harassment to a species or designated critical habitat is likely to occur. Beneficial effects are those effects of an action that are wholly positive, without any adverse effects on a listed species or designated critical habitat.

8.1 Direct Effects

Direct effects are defined as direct or immediate effects of the proposed action on the species or its habitat. Potential direct effects of the proposed action include short-term construction impacts and long-term permanent effects from operation of the proposed action. These impacts are discussed in detail in the following sections.

8.1.1 Noise

As identified in Section 6.1, construction of the proposed action is anticipated to generate noise. Noise will also occur as a result of operation of the new projects. Therefore, an increase in noise is anticipated to be a direct effect of the proposed action. Although the proposed action is expected to result in increased noise, there are no ESA-listed species that occur within the terrestrial component of the action area to be potentially affected by increased noise levels. Increased construction or operational noise will not affect species occurring in the aquatic component of the action area.

8.1.2 Habitat Modification

The proposed action construction would occur primarily in developed areas of the Airport between the existing Airport and the Bremerton Raceway (Figure 1). No areas of significant undisturbed vegetation occur in proximity to the four project elements. Construction of the project elements, including the associated stormwater facility elements, will impact areas in proximity to two seasonal on-site streams. A portion of one stream will be impacted by construction of a detention facility located in TIA 3. No work will occur within wetlands.

8.1.2.1 Effects on ESA-Listed Species

The habitat modification impacts will occur in habitats where no ESA-listed species are present and that are more than 1 mile upstream from where ESA-listed species could potentially occur in the Union River and its tributaries, including the North East Fork. There are no measurable potential impacts to ESA-listed species associated with habitat modifications resulting from the proposed action.

8.1.2.2 Effects on Critical Habitat

Designated critical habitat is not present where impacts to stream habitats would occur. The closest designated critical habitat is for Hood Canal summer-run chum salmon, which includes the lower mile of the North East Fork Union River. This area is approximately 1 mile downstream from the Airport.

Construction BMPs would minimize the potential release of suspended sediments and associated contaminants to designated critical habitat in the North East Fork Union River, Union River, or estuarine or nearshore areas of Hood Canal. Therefore, habitat modifications resulting from the proposed action would have no measurable effects on designated critical habitat.

8.1.3 Stormwater

8.1.3.1 Construction Stormwater

The proposed action will involve the construction of new facilities that will involve vegetation clearing and soil disturbance. Construction of the new stormwater facility for TIA 2 will result in work below the ordinary high water mark of a regulated intermittent stream, which is a direct tributary to the North East Fork Union River. If not properly managed, construction stormwater runoff from construction areas could result in erosion and increased turbidity and sedimentation within downstream habitats. Impacts could also occur if spills of fuels or oils from construction equipment occur and are discharged to downstream surface waters. Potential impacts resulting from construction stormwater are unlikely due to the implementation of construction BMPs required by the Port's SWPPP and the Kitsap County Stormwater Manual in addition to the specific avoidance and minimization measures included as part of the proposed action identified in Section 4.0.

8.1.3.2 Post-Construction Stormwater

The proposed action includes construction of new and replaced impervious surface, which occurs within three TDAs all contributing to the Union River via the North East Fork and East Fork tributaries. Stormwater generated within TDA 1 will occur as a result of construction of a portion of the North Access Road and the Hangar Access Road. Stormwater from TDA 1 will be fully dispersed. Stormwater generated within TDA 2 will result from construction of a portion of the Northeast Hangar Development and East Parallel Taxiway projects and both the FBO/GA Apron and Commercial Service Apron. Stormwater runoff from TDA 2 flows to the west and to the south, where it eventually discharges into a small, ditched stream and eventually flows to the North East Fork of the Union River. Stormwater from TDA 3 will result from construction of a portion of the Northeast Hangar Development and East Parallel Taxiway projects. Stormwater runoff from TDA 3 flows to the existing stormwater conveyance system and ultimately into the East Fork of the Union River.

All new stormwater generated within TDA 2 and TDA 3 as a result of the proposed project will be connected and detained in newly constructed stormwater detention facilities. Stormwater runoff from new impervious surface will be treated using stormwater BMPs. Pollution-generating runoff from the proposed East Parallel Taxiway will be treated using compost-amended vegetated filter strips. Stormwater from other pollution-generating impervious surfaces will be treated using a proprietary media treatment system approved for use by Ecology and implemented in a manner required to meet the requirements of the current Stormwater Manual (Kitsap County 2021). Post-construction stormwater BMPs will be maintained and operated per the requirements of the Port's current SWPPP.

In combination, these measures are likely to be effective at minimizing adverse effects to listed species from stormwater pollutants occurring from the new facilities. However, no existing

treatment method is universally effective and, as described in the following sections, chronic exposure to pollutants at low concentrations can still negatively impact aquatic life. Also, not all impervious surface at the Airport currently is detained or treated to meet current Stormwater Manual criteria. The purpose of the proposed action is to support planned expansion at the Airport, so increases in aircraft and vehicle operation in areas that do not currently meet treatment standards could increase discharges of stormwater associated pollutants. Therefore, while project-related stormwater BMPs are anticipated to effectively treat stormwater runoff from new surfaces, overall discharges of pollutants from stormwater runoff generated at the Airport will increase as a result of the proposed action.

8.1.3.3 Effects of Stormwater on Listed Species

Stormwater runoff from urban and rural environments is a known source of contaminants within portions of the aquatic component of the action area. Stormwater runoff can include pollutant that can be harmful or lethal to aquatic life. Unfiltered (or otherwise untreated) runoff from roadways and other pollution-generating impervious surface can contain thousands of chemical compounds, many of which are known to be toxic to salmon and other aquatic life (Du et al. 2017; Masoner et al. 2019; Peter et al. 2018; Tian et al. 2021). The resulting stressor-response dynamics resulting from repeated acute and chronic exposures to diverse chemical mixtures are complex and likely to produce an array of effects on ESA-listed fish species and their prey. These effects range from acute lethal to subtle sublethal effects that may adversely affect long-term survival and fitness.

Current stormwater treatment methods are effective at reducing concentrations of many priority pollutants. Priority pollutants are a set of chemical pollutants the U.S. Environmental Protection Agency (USEPA) regulates and for which the USEPA has published analytical test methods (USEPA 2025). However, no treatment method is completely effective, and many of these contaminants are continually released into the environment at low concentrations. Moreover, historically regulated priority pollutants represent a fraction of the potentially thousands of chemical compounds found in stormwater. Some of these compounds are emerging contaminants of concern, for which the effectiveness of currently available treatment methods is not fully understood. The proposed action would result in the creation of new and replaced pollution-generating impervious surface that would generate stormwater for the foreseeable future, and the action will increase use by aircraft and vehicles in areas that do not meet current stormwater treatment criteria. Therefore, the permitted stormwater discharges from these surfaces will contribute to ongoing aquatic pollution in the action area.

The receiving waters for post-construction stormwater generated by the proposed action provide habitats for all the listed aquatic species covered in this BA. ESA-listed salmonids are known to occur in the freshwater, estuarine, and marine nearshore portions of the action area. Adult bocaccio and yelloweye rockfish generally occur in deeper water than is known to be present in the Hood Canal portion of the action area; estuarine and nearshore areas supporting

juveniles and adults is not precluded. SRKW may occasionally occur in the Hood Canal component of the action area and may be indirectly exposed to stormwater contaminants through their prey species. Bioaccumulation of contaminants in Chinook salmon, chum salmon, and other prey species and reduced prey abundance from stormwater exposure and other development related impacts are known as ongoing risks to the conservation and recovery of SRKW.

As stated, the effects of exposure range in severity from chronic sublethal effects to immediate lethality, depending on the type of pollutant or pollutants; exposure mechanism (i.e., direct or dietary); and the concentration, duration, and frequency of exposure (Brette et al. 2014; Feist et al. 2011; Gobel et al. 2007; Incardona et al. 2004, 2005; McIntyre et al. 2012; Meador et al. 2006; Sandahl et al. 2007; Spromberg et al. 2016). Repeated exposure to certain pollutants, even at sublethal concentrations, can lead to prolonged adverse effects on survival and fitness (Feist et al. 2011; Spromberg and Meador 2006; Spromberg and Scholz 2011).

Examples of stormwater contaminants that could be generated by the proposed action and may harm ESA-listed species include metals (e.g., copper and zinc), a diverse array of PAHs, and other emerging contaminants of concerns (e.g., 6PPD-Q). These contaminants can have a diverse array of individual and synergistic effects on fish and other aquatic life. For example, metals and suspended solids can impair the olfactory system of salmonids and hinder their predator avoidance behavior (Sandahl et al. 2007). PAH exposure has been linked to a wide range of physiological dysfunctions in a wide range of fish species, including neoplasia, endocrine disruption, immunotoxicity, reduced reproductive success, embryonic development, post-larval growth, and transgenerational impacts (Carls et al. 1999; Collier et al. 2014; Harding et al. 2020; Incardona 2017; Incardona and Scholz 2004, 2016, 2017, 2018; Incardona et al. 2011; Tierney et al. 2014). Fish directly exposed to high levels of PAHs experience narcosis, resulting in a general depression of biological and physiological functions (Van Brummelen et al. 1998), making them more vulnerable to predation and other adverse effects on survival.

Fish that recover from acute exposure may experience delayed effects, including reduced immune function and reduced growth with negative effects on survival and fitness (Karrow et al. 1999; Arkoosh et al. 1991). The long-term effects of PAH exposure on salmonid behavior and reproductive success are less well studied, although some laboratory studies have shown abnormal behavioral effects during early development of coho salmon exposed to PAHs (Ostrander et al. 1988, 1989). Coho salmon are particularly sensitive to mixtures of PAHs and other pollutants common in stormwater (Scholz and McIntyre 2015). Casillas et al. (1995) and Arkoosh et al. (1998) reported that juvenile Chinook salmon exposed to PAHs in the Duwamish and Hylebos waterways demonstrated lower growth rates than Chinook salmon in uncontaminated waterbodies.

Recent research has found 6PPD-Q, a contaminant found in rubber particles from tire wear on roads and other surfaces, likely poses a significant risk to ESA-listed salmonids and potentially other aquatic life. Current studies indicate that fish sensitivity to this compound varies among species. For example, coho salmon are acutely sensitive to 6PPD-Q in laboratory studies, suggesting this compound is a likely contributor to observed pre-spawn mortality in urban streams (Tian et al. 2021, 2022). Independent studies have demonstrated median lethal 24-hour exposure concentration (24-hr LC50) for juvenile coho of <0.1 parts per billion (ppb) (Lo et al. 2023; Tian et al. 2021, 2022). While other salmonids appear less sensitive to this pollutant, they are still vulnerable to exposure at very low concentrations. For example, Brinkmann et al. (2022) and Lo et al. (2023) reported 24-hr LC50 of <2 and 67 ppb for steelhead and Chinook salmon, respectively. Conversely, sockeye salmon and chum salmon were unaffected by exposure to stormwater contaminants, including 6PPD-Q, at concentrations sufficient to cause acute mortality in coho salmon (French et al. 2022; McIntyre et al. 2018, 2021). Bull trout sensitivity to 6PPD-Q is not currently known. Brinkmann et al. (2022) and Hiki and Yamamoto (2022) reported 24-hr LC50 concentrations ranging from <1 to 13 ppb for closely related brook trout and Arctic char. These findings are suggestive of potential adverse effects on bull trout but not conclusive given the range of responses observed between other salmonid species.

No studies examining rockfish sensitivity to 6PPD-Q were identified during the development of this BA. It is difficult to make inferences from available research because the findings vary widely within and among species groups. For example, Ackerly et al. (2024) investigated 6PPD-Q toxicity to three early life stages of red drum (*Sciaenops ocellatus*) and found no evidence of acute toxicity or sublethal physiological or morphological effects at exposure concentrations ranging from 10 to 500 ppb. In contrast, Varshney et al. (2021) observed a 24-h LC50 of 309 ppb and sublethal effects on swimming behavior in zebra fish larvae at exposure concentrations of 10 to 25 ppb. As summarized above for salmonids, 6PPD-Q sensitivity varies widely even among closely related species. While the implications of 6PPD-Q exposure for ESA-listed rockfish are unknown, it is reasonable to assume that ongoing chronic exposure to this and other stormwater pollutants is likely to contribute to ongoing adverse effects on these species.

8.1.3.4 Effects of Stormwater on Critical Habitat

While the types of contaminants likely to be generated by the proposed action are predictable, the extent to which the proposed action would alter pollutant levels in habitats used by ESA-listed species is difficult to estimate. Because the fate and transport of many of these contaminants and their synergistic effects are not fully understood, the extent, duration, and severity of stormwater effects cannot currently be quantified with certainty. Therefore, the contribution of the proposed action to pollutant concentrations and the distance from the source required to dilute concentrations below levels likely to cause detectable effects are unknown and likely to vary among stormwater facilities and outfalls. Discharge into the estuarine and marine waters of Hood Canal is also a variable factor of pollutant concentrations as salinity

reduces the toxicity and bioavailability of contaminants such as metals. Runoff volumes will vary and depend on the timing, intensity, and duration of individual storm events. Contaminant concentrations are likely to be greatest during first-flush events, after contaminants have accumulated on impervious surfaces during long periods of dry weather. Such events are most common in early and mid-autumn.

Pollutant effects on water quality are determined by how contaminants are generated, how those pollutants are transported from source areas to aquatic environments, and the toxicity and biological availability of toxic compounds to receptors. This complex process is referred to as fate and transport (ATSDR 2022), the understanding of which varies by contaminant type. The fate and transport of contaminants such as PAHs and metals has received considerable study and is generally well understood. In contrast, while 6PPD-Q toxicity to certain salmonids has been demonstrated in laboratory studies, the fate and transport of this pollutant is not fully understood (Ecology 2022). Currently available information indicates that 6PPD-Q exposure risk is highest during first-flush events following extended dry periods (McKane et al. 2021; Ecology 2022). Accordingly, BMPs that intercept and remove weathered tire particles from impervious surfaces before first-flush events occur, such as the stormwater treatment BMPs included as an element of the proposed action, are likely to reduce exposure risks for ESA-listed fish and other aquatic species (Ecology 2022).

Certain structural BMPs, such as dispersion and filtering runoff through soils (e.g., compost-amended filter strips) appear promising as effective treatments for removing contaminants from stormwater (McIntyre et al. 2015). However, the proposed action will result in ongoing pollution from stormwater that will be discharged to surface water that will eventually flow to areas of the Union River, the North East Fork Union River, and Hood Canal that are designated as a critical habitat for ESA-listed species. These discharges are likely to constitute an incremental adverse effect on PBFs for salmonids associated with water quality. Those effects would continue over the life of the four projects included in the proposed action.

8.2 Indirect Effects/Delayed Consequences

"Indirect effects," also referred to as delayed consequences (WSDOT 2023), refer to consequences of the proposed action that may occur later in time or extend beyond the immediate footprint of the action or to consequences of other activities that are caused by the project (WSDOT 2023). A consequence is caused by the proposed action if it would not occur but for the project and it is reasonably certain to occur. A conclusion of "reasonably certain to occur" must be based on clear and substantial information, using the best scientific and commercial data available (WSDOT 2023).

The proposed action would expand the amount of pollution-generating impervious surface and contribute to the ongoing delivery of stormwater pollutants to the aquatic component of the action area over the life of the project, as discussed in Section 8.1.3.3. Although the proposed

action will be compliant with current stormwater regulations, stormwater discharges would unavoidably contribute to pollutant loading in the aquatic component of the action area. While the Airport represents a fraction of pollutant loading from regional sources, the proposed action would contribute incrementally to these effects and therefore to the indirect effects on ESA-listed species.

Betterments to crucial infrastructure like airports is often associated with increased regional growth and development. The proposed action is being developed to prepare for anticipated growth in demand at the Airport. Demand will increase regardless of the implementation of the proposed action, but the four projects will increase the Airport's ability to accommodate future planned growth. However, the proposed action in and of itself will not fully accommodate all planned future needs. For example, the Commercial Service Apron project will facilitate future commercial services, but no commercial service currently occurs at the Airport. Other improvements will be required prior to the implementation of commercial service at the Airport. As a result, the proposed action is not the sole limiting factor on achieving planned growth at the facility, and the proposed action is not anticipated to directly have a measurable effect on regional development patterns and regional growth.

Therefore, the delayed consequences of the proposed action are limited to the incremental effects of pollutants from ongoing operations.

8.2.1 Indirect Effects on ESA-listed Salmonids

As discussed in Section 8.1, ESA-listed salmonids could be exposed to operational stormwater pollutants at low levels in the water column and through consumption of contaminated prey organisms. O'Neill and West (2009) and West et al. (2008, 2011) documented the bioaccumulation of persistent and toxic contaminants in stormwater runoff in zooplankton and forage fish species in Puget Sound and in predator species including Chinook salmon. While the proposed action is not a probable source of the studied contaminants, these findings demonstrate that projects that generate contaminants of emerging concern could contribute to the bioaccumulation of persistent pollutants in the salmonid food web.

Emerging research demonstrates that 6PPD-Q and other chemical compounds used in tires could contribute to chronic adverse effects on the salmonid food web. For example, Maji et al. (2023) investigated the toxicity of tire rubber compounds in a marine rotifer. They observed only a minor chronic toxicity response for 6PPD-Q but found that another tire rubber derivative, 2′,2‴-dithiobisbenzanilide (DTBBA), significantly retarded population growth and fecundity. Botelho et al. (2023) found that marine amphipods and bacteria were not acutely sensitive to 6PPD-Q at concentrations ranging from 31 to 500 ppb, but both showed evidence of mutagenic effects following exposure. These findings suggest that tire rubber compounds could contribute to adverse effects on marine food webs resulting from chronic exposure to

stormwater contaminants. The broader implications for species at higher trophic levels, such as ESA-listed salmonids, are not quantifiable but are assumed to be similarly negative.

Based on the findings presented here and in Section 8.1, it is reasonable to conclude that the ongoing discharge of pollutants in stormwater that result from the proposed action could result in adverse delayed consequences for ESA-listed salmonids and their critical habitats.

8.2.2 Indirect Effects on ESA-listed Rockfish

Eggs, larva, post-settlement juvenile, and adult bocaccio and yelloweye rockfish that occur in the marine component of the action area could be directly exposed to pollutants in operational stormwater discharge and indirectly exposed to pollutants through the consumption of contaminated prey organisms. This could result in adverse effects on survival and fitness of individuals over the life of the projects. Bocaccio and yelloweye rockfish are long-lived species that take several years to reach reproductive age. Chronic exposure to and bioaccumulation of stormwater contaminants could lead to adverse delayed consequences for individual survival and reproductive fitness.

8.2.3 Indirect Effects on Southern Resident Killer Whale

SRKWs are not precluded from the action area but are not common in southern Hood Canal near the inland terminus. The likelihood of direct exposure to stormwater pollutants is discountable given the relatively limited area of effect and probable duration of occurrence. Indirect exposure to stormwater pollutants could occur over the life of the proposed action through consumption of bioaccumulated pollutants in salmon and other prey organisms. SRKWs are long-lived and are exposed to a diverse array of known and potentially harmful chemical substances in the environment and through consumption of contaminated prey.

Mongillo et al. (2016) determined that chronic exposure to persistent organic pollutants (POPs), which include PAHs, PCBs, and certain other organic pollutants, are a significant factor contributing to SRKW extinction risk. SRKWs carry several of these contaminants at very high body burdens, the result of bioaccumulation through consumption of contaminated prey. Many POPs are known or likely immune and endocrine system disruptors, and the bioaccumulation of POPs is likely having a profound negative effect on both survival and reproductive fitness (Mongillo et al. 2016). The final recovery plan for the SRKW also identifies quantity and quality of prey as a factor that may limit recovery of the species (NMFS 2008). SRKWs have a strong preference for Chinook salmon prey and are also known to prey on chum salmon. Stormwater impacts that affect Chinook or chum salmon abundance and result in the indirect exposure to contaminants through consumption of contaminated prey have the potential to indirectly affect SRKW.

NMFS (2023) produced a technical memorandum providing guidance on ESA consultation specific to SRKWs in the NMFS Northwest Region. The memorandum identifies two indirect

effects pathways to consider when determining the likelihood of adverse effects on SRKW: prey quality and prey quantity.

8.2.3.1 Prey Quality

Projects with potential to cause contamination in waters used by Chinook salmon or chum salmon may represent a possible effect to SRKW through contamination of their prey. Construction BMPs would minimize the potential release of suspended sediments and associated contaminants that would directly impact Chinook salmon or chum salmon. Therefore, no measurable effects on contaminant levels in Chinook salmon or other SRKW prey species are likely to occur as a result of the proposed action because of project construction.

As discussed in Section 8.1, the proposed action would incrementally increase the quantity of operational stormwater pollutants relative to existing conditions at points of discharge. While this effect cannot be quantified for all pollutants, it is reasonable to assume that the proposed action would continue to deliver stormwater pollutants to the environment at low concentrations. This would in turn contribute to exposure of Chinook salmon, chum salmon, and other SRKW prey species to stormwater pollutants, and the potential bioaccumulation of certain contaminants through dietary exposure is probable, although the overall impact is likely not measurable given the minor contribution of prey associated with the action area compared to prey production from drainages throughout the range of the SRKW.

8.2.3.2 Prey Quantity

Projects that result in take of Chinook salmon or chum salmon may also affect the quantity of prey available to SRKW. Impacts that result in a meaningful reduction in Chinook salmon abundance may reduce prey quantity sufficiently to constitute an adverse effect. The proposed action operations would generate stormwater discharges that could result in adverse effects on Chinook salmon and chum salmon and therefore on SRKWs. While these effects cannot be quantified with currently available information, stormwater contaminants from the proposed action could contribute to reducing the fitness of individual Chinook salmon and chum salmon over the life of the proposed action. That could in turn lead to an incremental reduction in the quantity and quality of prey resources available to SRKW. As noted above, the incremental contribution is anticipated to be small based on the low quality of prey associated with the action area compared to prey production from drainages throughout the range of the SRKW.

8.3 Interrelated/Interdependent Actions

Interrelated actions are defined as actions that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02). The project elements included in the proposed action are components of the AMP for the Airport. The AMP identifies those actions needed to support continuing operations and meet future needs for air travel and cargo

transport. The proposed action comprises stand-alone projects identified in the AMP that, although they are associated with planned future uses, also have independent utility, and no other projects depend upon the proposed action for their utility.

8.4 Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA. A cumulative effects analysis is required for projects undergoing formal consultation and to aid NMFS and USFWS in making jeopardy determinations, in preparing biological opinions, and in tracking the environmental conditions throughout the vicinity.

Future state, tribal, local, or private actions are not considered in this BA and are unlikely to occur in the terrestrial component of the action area because these areas are primarily on the Airport. Future projects in these areas are anticipated to require review and approval by FAA. Future actions that directly impact the Union River and its tributaries, Hood Canal, and associated wetlands will require federal permits and will not result in cumulative effects.

The aquatic component of the action area is surrounded by, and receives, stormwater runoff from several local jurisdictions, including the City of Bremerton and communities in unincorporated Kitsap County and Mason County, including Belfair. Each of these jurisdictions has development regulations in place that control future growth, including local critical areas regulations and stormwater regulations to avoid or minimize impacts to riparian areas and shorelines outside of federal jurisdiction. These standards will minimize, but not eliminate, the delivery of pollutants to surface waters in the action area.

Taken as a whole, foreseeable future state, local, tribal, and private actions have the potential to result in adverse cumulative effects to listed species' habitat and conditions in the aquatic portion of the action area. Although some of these actions, such as ongoing riparian restoration and enhancement projects in the watershed, are likely to improve habitat conditions for listed aquatic species, over time, ongoing adverse impacts from stormwater are likely to further degrade water quality in the action area. The proposed action would contribute incrementally to these ongoing cumulative effects.

9.0 CONCLUSIONS AND EFFECT DETERMINATIONS

The effects determinations are the conclusions of the analysis of potential consequences of the proposed action on ESA-listed species and critical habitat. Regulatory guidance from the Final Section 7 Consultation Handbook (USFWS and NMFS 1998) and input from NMFS during pre-consultation meetings identified in Section 1.3 were used to make the effects determination for the proposed action as described below.

A summary of the proposed effect determinations to species and critical habitat is presented in Table 5. The supporting rationale for each determination is provided in the following sections.

Table 5. Proposed action effects determinations for ESA-listed species and critical habitat

Species/Habitat	Effects Determination
Chinook salmon (Puget Sound ESU)	Likely to adversely affect
Chinook salmon critical habitat	Likely to adversely affect
Steelhead (Puget Sound ESU)	Likely to adversely affect
Steelhead critical habitat	Likely to adversely affect
Chum salmon (Hood Canal summer-run ESU)	Likely to adversely affect
Chum salmon critical habitat	Likely to adversely affect
Bocaccio rockfish (Puget Sound/Georgia Basin DPS)	Likely to adversely affect
Bocaccio rockfish critical habitat	No effect
Yelloweye rockfish (Puget Sound/Georgia Basin DPS)	Likely to adversely affect
Yelloweye rockfish critical habitat	No effect
Killer whale (Southern Resident DPS)	Likely to adversely affect
Killer whale critical habitat	No effect
Bull trout (Coastal-Puget Sound DPS)	Not likely to adversely affect
Bull trout critical habitat	No effect
DPS – Distinct population segment; ESU – Evolutionarily significant unit	

9.1 Puget Sound Chinook Salmon

The proposed action **may affect** Puget Sound Chinook salmon because of the following:

- Chinook salmon are documented spawning, rearing, migrating, and foraging in the action area.
- Chinook salmon are documented in the Union River in the action area.
- The proposed action includes construction of new and replaced impervious surface, including new pollution-generating impervious surface.

- The proposed action includes in-water work and work adjacent to surface water streams located upstream of documented Chinook salmon habitat or presence.

The proposed action is **likely to adversely affect** Chinook salmon because of the following:

- The proposed action would generate operational stormwater via existing permitted stormwater facilities.
- Chinook salmon habitat quality could be degraded due to reduced water quality from proposed action–related stormwater pollutants.
- All life stages of Chinook salmon could be directly exposed to degraded water quality conditions due to proposed action stormwater pollutants contributed to the action area.

9.2 Chinook Salmon Critical Habitat

The proposed action **may affect** critical habitat for Chinook salmon because of the following:

- Critical habitat for Puget Sound Chinook salmon is designated in the action area.
- PBFs for critical habitat for Puget Sound Chinook salmon are present in the action area.
- The proposed action would generate operational stormwater that would be discharged to surface waters flowing into the Union River, tributaries, and Hood Canal that are designated critical habitat.

The proposed action is **likely to adversely affect** critical habitat for Chinook salmon because of the following:

- Operational stormwater discharges would result in an incremental degradation of water quality that will affect PBFs for critical habitat for Puget Sound Chinook salmon.

9.3 Puget Sound Steelhead

The proposed action **may affect** Puget Sound steelhead because of the following:

- Steelhead are documented spawning, rearing, migrating, and foraging in the action area.
- Steelhead are documented in the Union River in the action area.
- The proposed action includes construction of new and replaced impervious surface, including new pollution-generating impervious surface.
- The proposed action includes in-water work and work adjacent to surface water streams located upstream of documented steelhead habitat or presence.

The proposed action is **likely to adversely affect** steelhead because of the following:

- The proposed action would generate operational stormwater via existing permitted stormwater facilities.
- Steelhead habitat quality could be degraded due to reduced water quality from proposed action–related stormwater pollutants.
- All life stages of steelhead could be directly exposed to degraded water quality conditions due to proposed action stormwater pollutants contributed to the action area.

9.4 Steelhead Critical Habitat

The proposed action **may affect** critical habitat for steelhead because of the following:

- Critical habitat for Puget Sound steelhead is designated in the action area.
- PBFs for critical habitat for Puget Sound Steelhead are present.
- The proposed action would generate operational stormwater that would be discharged to surface waters flowing into the Union River, tributaries, and Hood Canal, which are designated critical habitat.

The proposed action is **likely to adversely affect** critical habitat for steelhead because of the following:

- Operational stormwater discharges would result in an incremental degradation of water quality that will affect PBFs for critical habitat for Puget Sound steelhead.

9.5 Hood Canal Summer-Run Chum Salmon

The proposed action **may affect** Hood Canal summer-run chum salmon because of the following:

- Chum are documented spawning, rearing, migrating, and foraging in the action area.
- Chum are documented in the Union River and North East Fork Union River in the action area.
- The proposed action includes construction of new and replaced impervious surface, including new pollution-generating impervious surface.
- The proposed action includes in-water work and work adjacent to surface water streams located upstream of documented chum habitat or presence.

The proposed action is **likely to adversely affect** chum because of the following:

- The proposed action would generate operational stormwater via existing permitted stormwater facilities.
- Chum habitat quality could be degraded due to reduced water quality from proposed action–related stormwater pollutants.
- All life stages of chum could be directly exposed to degraded water quality conditions due to proposed action stormwater pollutants contributed to the action area.

9.6 Hood Canal Summer-Run Chum Salmon Critical Habitat

The proposed action **may affect** critical habitat for Hood Canal summer-run chum salmon because of the following:

- Critical habitat for Hood Canal summer-run chum salmon is designated in the action area.
- PBFs for critical habitat for Hood Canal summer-run chum salmon are present.
- The proposed action would generate operational stormwater that would be discharged to surface waters flowing into the Union River, tributaries, and Hood Canal, which are designated critical habitat.

The proposed action is **likely to adversely affect** critical habitat for Hood Canal summer-run chum salmon because of the following:

- Operational stormwater discharges would result in an incremental degradation of water quality that will affect PBFs for critical habitat for Hood Canal summer-run chum salmon.

9.7 Puget Sound/Georgia Basin Bocaccio and Yelloweye Rockfish

The proposed action **may affect** bocaccio and yelloweye rockfish because of the following:

- Planktonic eggs and larvae, post-settlement juvenile, and adult bocaccio and yelloweye rockfish could occur in the action area.
- Eggs, larvae, post-settlement juveniles, and adults in the marine portion of the action area would be exposed to operational stormwater.

The proposed action is **likely to adversely affect** bocaccio and yelloweye rockfish because of the following:

- The proposed action would generate operational stormwater via existing permitted stormwater facilities.
- Habitat quality could be degraded due to reduced water quality from proposed action–related stormwater pollutants.
- All life stages of Puget Sound/Georgia Basin bocaccio and yelloweye rockfish could be directly exposed to degraded water quality conditions due to proposed action stormwater pollutants contributed to the action area, although exposure to adults is less likely than exposure to other life stages.

9.8 Bocaccio and Yelloweye Rockfish Critical Habitat

The proposed action will have **no effect** on critical habitat for bocaccio and yelloweye rockfish because none is designated in the action area.

9.9 Southern Resident Killer Whale

The proposed action **may affect** SRKW because of the following:

- SRKW may occur in the action area, although occurrence is uncommon.
- The proposed action would generate operational stormwater.
- SRKWs' primary food source is Chinook salmon. Chum salmon are also known prey, but to a lesser extent.
- Chinook salmon, chum salmon, and other SRKW prey organisms may be exposed to adverse long-term effects from operational stormwater discharges.
- The proposed action is likely to adversely affect Chinook salmon and chum salmon.

The proposed action is **likely to adversely affect** SRKW because of the following:

- The proposed action would generate operational stormwater.
- SRKW habitat quality could be degraded due to reduced water quality from proposed action–related stormwater pollutants.
- SRKW could be directly exposed to degraded water quality conditions.
- The proposed action could incrementally reduce the quality and quantity of prey available to SRKW and contribute to the bioaccumulation of potentially harmful contaminants.

9.10 Killer Whale Critical Habitat

The proposed action will have no effect on critical habitat for SRKW because none is designated in the action area.

9.11 Coastal-Puget Sound Bull Trout

The proposed action **may affect** Coastal-Puget Sound bull trout because of the following:

- Bull trout have been documented to occur in Hood Canal drainages in proximity to the action area, although no observances are known in the action area.
- The proposed action includes construction of new and replaced impervious surface, including new pollution-generating impervious surface.

The proposed action is **not likely to adversely affect** bull trout because of the following:

- Bull trout spawning and rearing are unlikely in freshwater portions of the action area.
- Bull trout use is anticipated to include occasional use by foraging juveniles and adults that are part of bull trout populations from other drainages. While bull trout may forage on juvenile ESA-listed salmon affected by the project, they have other available prey. Impacts to prey species are anticipated to have a discountable effect on bull trout.

9.12 Bull Trout Critical Habitat

The proposed action will have no effect on bull trout critical habitat because none is designated in the action area.

10.0 EFFECTS TO ESSENTIAL FISH HABITAT

The MSA includes a mandate that NMFS must identify EFH for federally managed marine fishes and federal agencies must consult with NMFS on all activities or proposed activities authorized, funded, or undertaken by the agency that may adversely affect EFH. The Pacific Fishery Management Council (PFMC) has designated EFH for the Pacific salmon fishery, federally managed groundfishes, and coastal pelagic fisheries (NMFS 1999; PFMC 1999).

10.1 Essential Fish Habitat Background

EFH is defined as, "Waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" in the MSA [16 United States Code 1802(10)]. Adverse effects on EFH include any direct or indirect impacts that reduce the quality or quantity of EFH. The objective of this EFH assessment is to determine whether or not the project "may adversely affect" designated EFH for relevant commercial, federally managed fisheries species in the action area. This assessment also references conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the project.

Wherever possible, NMFS uses existing interagency coordination processes to fulfill EFH consultations with federal agencies. For the proposed action, this goal is being met by incorporating EFH consultation into the ESA Section 7 consultation, as represented by the BA presented in sections 1.0 through 9.0.

10.2 Location and Description of the Proposed Action

The FAA is consulting on the Port's proposed action, in the BA. The construction and operation of the proposed action would occur primarily on currently developed land at the Airport, with some development requiring clearing of vegetation, soil disturbance, and the generation of construction and post-construction stormwater. Stormwater would discharge to the Union River, which flow directly into Hood Canal.

10.3 Conservation Measures and Best Management Practices

Conservation measures and BMPs are included for proposed action activities and are described in this BA. Conservation measures would avoid or minimize potential effects to existing habitat conditions, including EFH, in the action area. The project includes BMPs intended to avoid or minimize impacts from construction stormwater and reduce impacts from post-construction stormwater, including the implementation of water quality treatment required by the Stormwater Manual (Kitsap County 2021).

10.4 Identification of Essential Fish Habitat

Under the MSA, the PFMC has designated EFH for federally managed fisheries within the waters of Washington, Oregon, and California. Detailed descriptions and identification of EFH are contained in the fishery management plans for groundfish (PFMC 2019a), coastal pelagic species (PFMC 2019b), and Pacific salmon (PFMC 2016).

Designated EFH for groundfish and coastal pelagic species encompasses all waters along the coasts of Washington, Oregon, and California that are seaward from the mean high water line, including the upriver extent of saltwater intrusion in river mouths to the boundary of the U.S. economic zone, approximately 200 miles (321.9 km) offshore (PFMC 2019a,b).

Designated EFH for salmonid species within marine water extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (EEZ) offshore of Washington, Oregon, and California, north of Point Conception to the Canadian border (PFMC 2016).

Groundfish, coastal pelagic, and salmonid fish species and life-history stages that have designated EFH in the Hood Canal portion of the action area are listed in Table 6. Salmonid fish species that have designated EFH in the freshwater portion of the action area are listed in Table 7. Assessment of the impacts on species that may occur in the action area is based on life-history stages described in PFMC (2016, 2019a,b).

Table 6. Species of fish with designated EFH that may be present in the Hood Canal portion of the action area

EFH Species	Eggs	Larvae	Juvenile	Adult	Spawning
Groundfish					
Spiny dogfish, *Squalus acanthias*			x	x	
Spotted ratfish, *Hydrolagus colliei*			x	x	
Lingcod, *Ophiodon elongatus*			x		
Cabezon, *Scorpaenichthys marmoratus*			x		
Kelp greenling, *Hexagrammos decagrammus*			x		
Pacific cod, *Gadus macrocephalus*			x		
Pacific hake, *Merluccius productus*			x	x	
Sablefish, *Anoplopoma fimbria*		x	x	x	x
Brown rockfish, *S. auriculatus*		x		x	
China rockfish, *S. nebulosus*		x		x	
Copper rockfish, *S. caurinus*		x		x	
Quillback rockfish, *S. maliger*		x		x	
Thornyheads, *Sebastolobus* spp.		x		x	
Other rockfishes		x		x	
Pacific sanddab, *Citharichthys sordidus*		x	x	x	

EFH Species	Eggs	Larvae	Juvenile	Adult	Spawning
Dover sole, *Microstomus pacificus*			x	x	
English sole, *Pleuronectes vetulus*		x	x	x	x
Flathead sole, *Hippoglossoides elassodon*		x	x	x	x
Petrale sole, *Eopsetta jordani*		x	x	x	
Rex sole, *Errex zachirus*		x	x	x	
Rock sole, *Pleuronectes bilineata*		x	x	x	x
Sand sole, *Psettichthys melanostictus*		x	x	x	
Starry flounder, *Platichthys stellatus*		x	x	x	x
Coastal Pelagic Species					
Northern anchovy, *Engrauilis mordax*		x	x	x	
Chub mackerel, *Scomber japonicus*				x	
Jack mackerel, *Trachurus symmetricus*				x	
Pacific sardine, *Sardinops sagax*				x	
Market squid, *Loligo opalescens*		x	x	x	x
Pacific Salmon Species					
Chinook salmon, *Oncorhynchus tshawytacha*			x	x	
Coho salmon, *O. kisutch*			x	x	
Puget Sound pink salmon, *O. gorbuscha*			x	x	

Table 7. Pacific salmon species with designated EFH that may be present in the freshwater aquatic portion of the action area

EFH Species	Eggs	Larvae	Juvenile	Adult	Spawning
Chinook salmon, *Oncorhynchus tshawytscha*	x		x	x	x
Coho salmon, *O. kisutch*	x		x	x	x

10.4.1 Groundfish

The west coast groundfish management unit includes 83 species that typically live on or near the bottom of the ocean. The EFH designation for groundfishes and coastal pelagics is defined as those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery. This includes, "All waters and substrate within the following areas: (1) depths less than or equal to 3,500 meters (1,914 fathoms) to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt [part per thousand] during the period of average annual low flow; (2) seamounts in depths greater than 3,500 meters as mapped in the EFH assessment geographic information system (GIS); and (3) areas designated as HAPCs [Habitats of Primary Concern] not already identified by the above criteria." (PFMC 2019a).

Groundfish EFH occurs in the action area at proposed action-related stormwater discharges, as follows (NMFS 2024):

- **Hood Canal**: Groundfish EFH is designated in the Hood Canal portion of the action.
- **Union River and tributaries:** Groundfish EFH is not present in these aquatic areas.

10.4.2 Coastal Pelagics

Coastal pelagics are schooling fishes, not associated with the ocean bottom, that migrate in coastal waters. West coast pelagics include finfish such as the Pacific sardine (*Sardinops sagax*), chub mackerel (*Scomber japonicus*), northern anchovy (*Engraulis mordax*), and jack mackerel (*Trachurus symmetricus*); market squid (*Loligo opalescens*); and krill. The EFH designation for coastal pelagics is defined as those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery. The EFH includes, "All marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range between 10°C and 26°C." (PFMC 2019b). Coastal pelagic EFH occurs in the action area at proposed action–related stormwater discharges, as follows (NMFS 2024):

- **Hood Canal**: Coastal pelagic EFH for finfish, market squid, and coastal pelagic krill is designated in the Hood Canal portion of the action.
- **Union River and tributaries:** Coastal pelagic EFH is not present in these aquatic areas.

10.4.3 Pacific Salmon

The Pacific salmon management unit includes Chinook salmon, coho salmon, and pink salmon. The EFH designation for the Pacific salmon fishery is divided into two groups:

- The freshwater group includes all those streams, lakes, ponds, wetlands, and other waterbodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassible barriers identified by PFMC (1999, 2016).
- The marine and estuarine group occurs, "From the extreme high tide line in nearshore and tidal submerged environments within state territorial waters out to the full extent of the EEZ (200 nautical miles or 370.4 km)"(PFMC 1999).

Pacific salmon EFH occurs in the action area at proposed action–related stormwater discharges, as follows:

- **Hood Canal:** Pacific salmon EFH is designated in the Puget Sound portion of the action area. Chinook salmon, coho salmon, and pink salmon all may use the nearshore habitat in Puget Sound in the action area at some point in their life histories, particularly during juvenile outmigration and adult spawning migration.

- **Union River and tributaries:** Pacific salmon EFH is present. Chinook salmon and coho salmon have been documented spawning and rearing in the Union River. Pink salmon are not documented in the Union River.

10.5 Potential Adverse Effects of the Proposed Action

The BA describes in detail the potential impacts to habitat constituents important to ESA-listed fish species, which are similar to those for EFH species. There are no potential adverse construction impacts to EFH species in the action area due to the implementation of construction BMPs. The analyses presented in the BA address potential effect mechanisms specific to EFH; for this proposed action the primary effect mechanism is post-construction stormwater. Those elements of the BA are included by reference in these sections.

Stormwater runoff is known to deliver toxic and potentially lethal contaminants from urban and rural areas if left untreated. Because the effectiveness of treatment methods on multiple pollutants is unknown, treated stormwater is also likely to result in adverse effects to EFH species.

Examples of stormwater contaminants that could be generated by the project and may harm EFH fish include copper, zinc, and total suspended solids, which can impair the olfactory system of salmonids and hinder their predator avoidance behavior (Sandahl et al. 2007). Recent research has found 6PPD-Q, a contaminant found in rubber particles from tire wear on roads and other surfaces, to be a major contributor to pre-spawning mortality in coho salmon (Tian et al. 2021, 2022). Coho salmon are acutely sensitive, demonstrating 24-hr LC50 concentrations of <0.1 ppb (Lo et al. 2023; Tian et al. 2022). These findings have spurred concerns that 6PPD-Q could pose a significant risk to other EFH salmonid species. Brinkmann et al. (2022) and Lo et al. (2023) reported 24-hr LC50 of 67 ppb for Chinook salmon. While pink salmon sensitivity to 6PPD-Q has not yet been studied, the lethal concentrations observed in other salmonid species suggest that a presumption of potential for harm is warranted.

10.6 Conclusion and Effect Determinations

While the project would provide treatment for new and replaced pollution-generating impervious surface that would minimize adverse impacts, these will not capture all pollution that may be created by the proposed action. Ongoing stormwater discharges would result in an incremental degradation of water quality from pollutant exposure.

10.6.1 Groundfish Essential Fish Habitat

Operational stormwater discharges would result in an incremental degradation of water quality and potential indirect effects on prey resources from pollutant exposure.

Overall, based on the operational stormwater discharges of the project, the project **may adversely affect** groundfish EFH.

10.6.2 Coastal Pelagic Essential Fish Habitat

Operational stormwater discharges would result in an incremental degradation of water quality and potential indirect effects on prey resources from pollutant exposure.

Overall, based on the operational stormwater discharges of the project, the project **may adversely affect** coastal pelagic EFH.

10.6.3 Pacific Salmon Essential Fish Habitat

Operational stormwater discharges would result in an incremental degradation of water quality and potential indirect effects on prey resources from pollutant exposure.

Overall, based on the operational stormwater discharges of the project, the project **may adversely affect** Pacific salmon EFH.

11.0 REFERENCES

Ackerly, K.L., K.J. Roark, K. Lu, A.J. Esbaugh, Z. Liu, and K.M. Nielsen. 2024. Acute toxicity testing of 6PPD-quinone on the estuarine-dependent sport fish, *Sciaenops ocellatus*. Ecotoxicology May 2024: DOI: 10.1007/s10646-024-02755-x.

Arkoosh, M.R., E. Casillas, E. Clemons, B. McCain, and U. Varanasi. 1991. Suppression of immunological memory in juvenile Chinook salmon (*Oncorhynchus tshawytscha*) from an urban estuary. Fish Shellfish Immunol. 1:261–277.

Arkoosh, M.R., E. Casillas, P. Huffman, E. Clemons, J. Evered, J.E. Stein, and U. Varanasi. 1998. Increased susceptibility of juvenile Chinook salmon from a contaminated estuary to *Vibrio anguillarum*. Transactions of the American Fisheries Society 127(3): 360–374.

ATSDR (Agency for Toxic Substances and Disease Registry). 2022. Public health assessment guidance manual, conducting scientific evaluations – Element 2: Environmental fate and transport. Available at: https://www.atsdr.cdc.gov/pha-guidance/conducting_scientific_evaluations/index.html.

Berejikian, B.A., M.E. Moore, and S.J. Jeffries. 2016. Predator-prey interactions between harbor seals and migrating steelhead smolts revealed by acoustic telemetry. Marine Ecology Progress Series 543:21-35.

Botelho, M.T., G.F.G. Militão, M. Brinkmann, and G. De Aragão Umbuzeiro. 2023. Toxicity and mutagenicity studies of 6PPD -quinone in a marine invertebrate species and bacteria. Environmental and Molecular Mutagenesis 64(4): DOI: 10.1002/em.22560.

Brette, F., B. Machado, C. Cros, J.P. Incardona, N.L. Scholz, and B.A. Block. 2014. Crude oil impairs cardiac excitation-contraction coupling in fish. Science 343(6172): 772-776.

Brinkmann, M., D. Montgomery, S. Selinger, J.G.P Miller, E. Stock, A.J. Alcaraz, J.K. Challis, L Weber, D. Janz, M. Hecker, and S. Wiseman. 2022. Acute toxicity of the tire rubber-derived chemical 6PPD-quinone to four fishes of commercial, cultural, and ecological importance. Environmental Science & Technology Letters 9(4): 333–338.

Carls, M.G., S.D. Rice, and J.E. Hose. 1999. Sensitivity of fish embryos to weathered crude oil: Part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval Pacific herring (*Clupea pallasi*). Environmental Toxicology and Chemistry 18: 481-493.

Carretta, J.V., Oleson, E.M., Forney, K.A., Muto, M.M., Weller, D.W., Lang, A.R., Baker, J., Hanson, B., Orr, A.J., Barlow, J., Moore, J.E., and Brownell, R.L. 2021. Killer Whale (Orcinus orca): Eastern North Pacific Southern Resident Stock, U.S. Pacific Marine Mammal Stock

Assessments: 2020. NOAA-TM-NMFS-SWFSC-629. U.S. Department of Commerce. NOAA, NMFS, and SWFSC.

Casillas, E., B.B. McCain, M. Arkoosh, and J.E. Stein. 1995. Estuarine pollution and juvenile salmon health: Potential impact on survival. In Estuarine and ocean survival of northeastern pacific salmon: Proceedings of the workshop. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-29.169-181.

Century West Engineering. 2015. Bremerton National Airport – Airport Master Plan. Available at https://centurywest.com/portfolio/bremerton-national-airport-airport-master-plan

City of Seattle. 2015. Seattle biological evaluation. Seattle Public Utilities. Available at http://www.seattle.gov/utilities/construction-resources/design-standards/seattle-biological-evaluation.

Collier, T.K., B.F. Anulacion, M.R. Arkoosh, J.P. Dietrich, J.P. Incardona, G.M. Ylitalo, and M.S. Meyers. 2014. Effects on fish of polycyclic aromatic hydrocarbons (PAHs) and napthenic acid exposures. Fish Physiology 33:195-255.

Corps (U.S. Army Corps of Engineers). 2012. Supplement to the programmatic biological evaluation for maintenance dredging of the Swinomish Channel, Washington.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2025. Yelloweye rockfish in Pacific Ocean (Sebastes ruberrimus): COSEWIC assessment and status report. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/yelloweye-rockfish-pacific-ocean.html. Accessed June 3, 2025.

DeWeerdt, S. 2021. Southern residents' winter diet comes into focus. Salish Sea Currents, a publication of the Encyclopedia of Puget Sound by the Puget Sound Institute at the UW Tacoma Center for Urban Waters. Published May 10, 2021.

DOWL. 2024. Wetland and Stream Delineation Report: Bremerton National Airport Environmental Assessment. Prepared for Port of Bremerton, Bremerton, Washington, by DOWL, Bellevue, Washington.

DOWL. 2025. Preliminary Stormwater Memorandum: Bremerton National Airport (KPWT) Environmental Assessment AIP No. 3-53-0007-038-2023 / AIP No. 3-53-0007-039-2024.

Drake J.S., E.A. Berntson, J.M. Cope, R.G. Gustafson, E.E. Holmes, P.S. Levin, N. Tolimieri, R.S. Waples, S.M. Sogard, and G.D. Williams. 2010. Status review of five rockfish species in Puget Sound, Washington: Bocaccio (*Sebastes paucispinis*), canary rockfish (*S. pinniger*), yelloweye rockfish (*S. ruberrimus*), greenstriped rockfish (*S. elongatus*), and redstripe

rockfish (*S. proriger*). U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), Tech. Memo. NMFS-NWFSC-108.

Du, B., J.M. Lofton, K.T. Peter, A.D. Gipe, C.A. James, J.K. McIntyre, N.L. Scholz, J.E. Baker, and E.P. Kolodziej. 2017. Suspect and non-target screening of organic contaminants and potential toxicants in highway runoff and fish tissue with high resolution time of flight mass spectrometry. Environmental Science: Processes and Impacts 19:1185-1196.

Ecology. 2022. 6PPD in road runoff – assessment and mitigation strategies. Prepared by the Environmental Assessment Program and Water Quality Program. Publication 22-03-020. Olympia, Washington.

Feist, B.E., E.R. Buhle, P. Arnold, J.W. Davis, and N.L. Scholz. 2011. Landscape ecotoxicology of coho salmon spawner mortaliy in urban streams. PLoS ONE 6(8):e23424.

FHWA (Federal Highway Administration). 2024. Construction Noise Handbook, 9.0 Construction equipment noise levels and ranges, Table 9.1. Available at: https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/handbook09.cfm

French, B.F., D.H. Baldwin. J. Cameron, J. Prat, K. King, J.W. Davis, J.K. McIntyre, and N.L. Scholz. 2022. Urban roadway runoff is lethal to juvenile coho, steelhead, and Chinook salmonids, but not congeneric sockeye. Environmental Science and Technology Letters 9: 733-738.

FTA (Federal Transit Administration). 2018. Transit noise and vibration impact assessment manual. FTA Report No. 0123. September 2018. Available at: https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123

Göbel, P., C. Dierkes, and W. G. Coldewey. 2007. Storm water runoff concentration matrix for urban areas. Journal of Contaminant Hydrology 91(1):26–42.

Goetz, F.A., E. Jeanes, and E. Beamer. 2004. Bull trout in the nearshore. Preliminary Draft. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington.

Goetz, F., E. Beamer, E.J. Connor, E. Jeans, C. Kinsel, J.W. Chamberlin, C. Morello, and T.P. Quinn. 2021. The timing of anadromous bull trout migrations in estuarine and marine waters of Puget Sound, Washington. Environmental Biology of Fishes 104(9):1073-1088.

Hanson, M.B. C.K. Emmons, E.J. Ward, J.A. Nystuen, M.O. Lammers. 2013. Assessing the coastal occurrence of endangered killer whales using autonomous passive acoustic recorders. J. Acoust. Soc. Am., 134 (5) (2013), pp. 3486-3495.

Harding, L.B., M. Tagal, G.M. Ylitalo, J.P. Incardona, N.L. Scholz, and J.K. McIntyre. 2020. Urban stormwater and crude oil injury pathways converge on the developing heart of a shore-spawning marine forage fish. Aquatic Toxicology 229:105654.

Hiki, K. and H. Yamamoto. 2022. The tire-derived chemical 6PPD-quinone is lethally toxic to the white-spotted char *Salvelinus leucomaenis pluvius* but not to two other Salmonid species. Environmental Science & Technology Letters 9(12): 1050–1055. https://doi.org/10.1021/acs.estlett.2c00683

Incardona, J. P. 2017. Molecular mechanisms of crude oil developmental toxicity in fish. Archives of Environmental Contamination and Toxicology 73:19-32.

Incardona, J. P. and N.L. Scholz. 2016. The influence of heart developmental anatomy on cardiotoxicity-based adverse outcome pathways in fish. Aquatic Toxicology 177:15-525.

Incardona, J. P. and N.L. Scholz. 2017. Environmental pollution and the fish heart. Vol. 36B in A.K. Gamperl, T.E. Gillis, A.P. Farrell, and C.J. Brauner (Eds). Fish Physiology, The cardiovascular system: phenotypic and physiological responses. Elsevier, London.

Incardona, J. P. and N.L. Scholz. 2018. Case study: the 2010 Deepwater Horizon oil spill. In W. Burggren and B. Dubansky (Eds). Development, physiology, and environment: A synthesis. Springer, London.

Incardona, J.P., T.K. Collier, and N.L. Scholz. 2004. Defects in cardiac function precede morphological abnormalities in fish embryos exposed to polycyclic aromatic hydrocarbons. Toxicology and Applied Pharmacology 196(2):191–205.

Incardona, J.P., M.G. Carls, H. Teraoka, C.A. Sloan, T.K. Collier, and N.L. Scholz. 2005. Aryl hydrocarbon receptor–independent toxicity of weathered crude oil during fish development. Environmental Health Perspectives 113(12):1755–1762.

Incardona, J.P., T.L. Linbo, and N.L. Scholz. 2011. Cardiac toxicity of 5-ring polycyclic aromatic hydrocarbons is differentially dependent on thre aryl hydrocarbon receptor 2 isofrom during zebrafish development. Toxicology and Applied Pharmacology 257:242-249.

Karrow, N.H. Boermans, D. Dixon, A. Hontella, K. Solomon, J. Whyte, and N. Bols. 1999. Characterizing the immunotoxicity of creosote to rainbow trout (*Oncorhynchus mykiss*): A microcosm study. Aquatic Toxicology 45:223-239.

Kitsap County. 2021. 2021 Kitsap County Stormwater Design Manual: Volumes I and II. Effective October 4, 2021. Kitsap County Department of Public Works and Department of Community Development, Port Orchard, Washington. Available at: https://dcd.kitsapgov.com/ordnances/Stormwater_HTML_20210902/Content/FrontMatter/TitlePage.htm

Lo, B.P, V.L. Marlatt, X. Liao, S. Reger, C. Gaililee, A.R.S. Ross, and T.M. Brown. 2023. Acute toxicity of 6PPD-Quinone to early life stage juvenile Chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon. Environmental Toxicology and Chemistry 42(4): 815–822. DOI: 10.1002/etc.5568.

Love, M.S., M. Carr, and L. Haldorson. 1991. The ecology of substrate-associated juveniles of the genus Sebastes. Environmental Biology of Fishes 30:225-243.

Love, M.S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press, Berkeley, CA.

Maji, U.J., K. Kim, I.C. Yeo, K.Y. Shim, and C.B. Jeong. 2023. Toxicological effects of tire rubber-derived 6PPD-quinone, a species-specific toxicant, and dithiobisbenzanilide (DTBBA) in the marine rotifer Brachionus koreanus, Marine Pollution Bulletin, Volume 192, 2023.

Masoner, J.R., D.W. Kolpin, I.M. Cozzarelli, L.B. Barber, D.S. Burden, W.T. Foreman, K.J Forshay, E.T. Furlong, J.F. Groves, M.L. Hladik, and M.E. Hopton. 2019. Urban stormwater: An overlooked pathway of extensive mixed contaminants to surface and groundwaters in the United States. Environmental Science & Technology 53(17):10070-10081.

McIntyre, J.K., D.H. Baldwin, D.A. Beauchamp, and N.L. Scholz. 2012. Low-level copper exposures increase visibility and vulnerability of juvenile coho salmon to cutthroat trout predators. Ecological Applications 22(5).

McIntyre, J.K., J.W. Davis, C. Hinman, K.H. Macneale, B.F. Anulacion, N.L. Scholz, and J.D. Stark. 2015. Soil bioretention protects juvenile salmon and their prey from the toxic impacts of urban stormwater runoff. Chemosphere 132: 213-219.

McIntyre, J. K., J.I. Lundin, J.R. Cameron, M.I. Chow, J.W. Davis, J.P. Incardona, and N.L. Scholz. 2018. Interspecies variation in the susceptibility of adult Pacific salmon to toxic urban stormwater runoff. Environmental Pollution 238:196–203.

McIntyre, J. K., J. Prat, J. Cameron, J. Wetzel, E. Mudrock, K.T. Peter, Z. Tian, C. Mackenzie, J, Lundin, J.D. Stark, K. King, J.W. Davis, E.P. Kolodziej, and N.L. Scholz. 2021. Treading water: Tire wear particle leachate recreates an urban runoff mortality syndrome in coho but not chum salmon. Environmental Science and Technology 55(17): 11767–11774.

McKane, B., J. Halama, V. Phan, A. Brookes, K. Djang, E. Kolodziej, and K. Peter. 2021. Model analysis and visualization of 6PPD-quinone fate and transport in Longfellow Creek watershed, Seattle, USA. Presentation to EMCON 2021, the 7th International Conference on Emerging Contaminants, Virtual, Oregon, September 13 - 14, 2021.

Meador, J.P., F.C. Sommers, G.M. Ylitalo, and C.A. Sloan. 2006. Altered growth and related physiological responses in juvenile Chinook salmon (*Oncorhynchus tshawytscha*) from dietary

exposure to polycyclic aromatic hydrocarbons (PAHs). Canadian Journal of Fisheries and Aquatic Sciences 63(10):2,364–2,376.

Miller, B.S., and S.F. Borton. 1980. Geographical distribution of Puget Sound fishes: Maps and data source sheets. Fisheries Research Institute, College of Fisheries, University of Washington, Seattle, Washington.

MMC (Marine Mammal Commission). 2024. Southern Resident killer whale. Available at: https://www.mmc.gov/priority-topics/species-of-concern/southern-resident-killer-whale/. Accessed: April 2024.

Mongillo, T. M., G. M. Ylitalo, L. D. Rhodes, S. M. O'Neill, D. P. Noren, and M. B. Hanson. 2016. Exposure to a mixture of toxic chemicals: Implications for the health of endangered Southern Resident killer whales. U.S. Dept. Commer., NOAA Tech. Memo. NMFSNWFSC-135, 107 p. doi:10.7289/V5/TM-NWFSC-135

Moore, M. E., and B. A. Berejikian. 2017. Population, habitat, and marine location effects on early marine survival and behavior of Puget Sound steelhead smolts. Ecosphere 8(5):e01834. 10.1002/ecs2.1834.

Moore, M.E., B.A. Berejikian, F.A. Goetz, A.G. Berger, S.S. Hodgson, E.J. Connor, and T.P. Quinn. 2015. Multi-population analysis of Puget Sound steelhead survival and migration behavior. Marine Ecology Progress Series, 537 (217-232). DOI: 10.3354/meps11460.)

NMFS (National Marine Fisheries Service). 1999. Essential fish habitat consultation guidance. Office of Habitat Conservation, Silver Spring, MD.

NMFS. 2007. Puget Sound salmon recovery plan. NMFS, Northwest Region, Seattle, Washington.

NMFS. 2008. Recovery plan for Southern Resident killer whales *(Orcinus orca).* NMFS, Northwest Region, Seattle, Washington.

NMFS. 2016. 5-Year review for yelloweye rockfish (*Sebastes ruberrimus*), canary rockfish (*Sebastes pinniger*), and bocaccio (*Sebastes paucispinis*) of the Puget Sound/Georgia Basin: Summary and evaluation. NOAA, National Marine Fisheries Service, West Coast Region. Seattle, Washington. Available at: https://www.fisheries.noaa.gov/resource/document/5-year-review-yelloweye-rockfish-sebastes-ruberrimus-canary-rockfish-sebastes.

NMFS. 2017a. 2016 5-year review: Summary & evaluation of Puget Sound Chinook salmon Hood Canal summer-run chum salmon Puget Sound steelhead. NMFS, West Coast Region, Portland, Oregon.

NMFS. 2017b. Rockfish recovery plan for Puget Sound/Georgia Basin yelloweye rockfish and bocaccio. Prepared for the Office of Protected Resources, NMFS, West Coast Regional Office.

NMFS. 2019. ESA recovery plan for the Puget Sound Steelhead Distinct Population Segment (*Oncorhynchus mykiss).* NMFS, West Coast Regional Office.

NMFS. 2023. Advice for ESA consultation for Southern Resident killer whales and other listed marine mammals. Technical memorandum from Scott M. Rumsey, Acting Regional Administrator.

NMFS. 2024. EFH Habitat Mapper. Available at: https://www.habitat.noaa.gov/apps/efhmapper/?page=page_4. Accessed: April 9, 2024.

NMFS. 2025a. Endangered Species Act information. NMFS, West Coast Region. Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/species_list/species_lists.html (accessed on April 28, 2025).

NMFS. 2025b. Essential fish habitat mapper. Available at: https://noaa.maps.arcgis.com/apps/webappviewer/

O'Neill, S.M., and West, J.E. 2009. Marine distribution, life history traits, and the accumulation of polychlorinated biphenyls in Chinook salmon from Puget Sound, Washington. Transactions of the American Fisheries Society 138(3):616-632.

Ostrander, G. K., M. L. Landolt, and R. M. Kocan. 1988. The ontogeny of Coho salmon (*Oncorhynchus kisutch*) behavior following embryonic exposure to benzo(a)pyrene. Aquatic Toxicology 13:325–346.

Ostrander, G. K., M. L. Landolt, and R. M. Kocan. 1989. Whole life history studies of Coho salmon (*Oncorhynchus kisutch*) following embryonic exposure to benzo(a)pyrene. Aquatic Toxicology 15:109–126.

Palsson, W.A., T. Tsou, G.G. Bargmann, R.M. Buckley, J.E. West, M.L. Mills, Y.W Cheng, and R.E. Pacunski. 2009. The biology and assessment of rockfishes in Puget Sound. Washington Department of Fish and Wildlife.

Peter, K.T., Z. Tian, C. Wu, P. Lin, S. White, B. Du, J.K. McIntyre, N.L. Scholz, and E.P. Kolodziej. 2018. Using high-resolution mass spectrometry to identify organic contaminants linked to an urban stormwater mortality syndrome in coho salmon. Environmental Science and Technology 52:10317-10327.

PFMC. 1999. Amendment 14 to the Pacific coast salmon plan, Appendix A, Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

PFMC. 2016. Pacific coast salmon fishery management plan for commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California as Amended through Amendment 19. PFMC, Portland, Oregon.

PFMC. 2019a. Pacific coast groundfish fishery management plan for the California, Oregon, and Washington groundfish fishery. PFMC, Portland, Oregon.

PFMC. 2019b. Coastal pelagic species fishery management plan as amended through Amendment 17. PFMC, Portland, Oregon.

Pietsch, T.W., and J.W. Orr. 2015. Fishes of the Salish Sea: A compilation and distributional analysis. NOAA Professional Paper NMFS 18.

Port (Port of Bremerton). 2025. Stormwater Pollution Prevention Plan (SWPPP). Prepared in support of Industrial Stormwater General Permit Number WAR-000901. January 2025.

Puget Sound Partnership and WDFW (Washington Department of Fish and Wildlife). 2011. Puget Sound steelhead foundations: A primer for recovery planning. Available at: https://wdfw.wa.gov/sites/default/files/publications/01512/wdfw01512.pdf

Ruckelshaus, M., K. Currens, R. Fuerstenburg, W. Graeber, K. Rawson, N. Sands, and J. Scott. 2002. Planning Ranges and preliminary guidelines for the delisting and recovery of the Puget Sound Chinook salmon evolutionarily significant unit. Report of the Puget Sound Technical Recovery Team.

Sandahl, J.F., D.H. Baldwin, J.J. Jenkins, and N.L. Scholz. 2007. A sensory system at the interface between urban stormwater runoff and salmon survival. Environmental Science and Technology 14(8): 2998-3004.

Scholz, N.L. and McIntyre, J.K. 2015. Chemical pollution. In: Conservation of freshwater fishes. G.P. Closs, M. Krkosek, and J.D. Olden (eds.). Cambridge University Press, pp. 149-178.

Shelton, A. O., Satterthwaite, W. H., Ward, E. J., Feist, B. E., & Burke, B. (2019). Using hierarchical models to estimate stock-specific and seasonal variation in ocean distribution, survivorship, and aggregate abundance of fall run Chinook salmon. Canadian Journal of Fisheries and Aquatic Sciences, 76, 95–108.

Spromberg, J.A., and J.P. Meador. 2006. Relating chronic toxicity responses to population-level effects: A comparison of population-level parameters for three salmon species as a function of low-level toxicity. Ecological Modelling 199(3):240–252.

Spromberg, J.A., and N.L. Scholz. 2011. Estimating the future decline of wild coho salmon populations resulting from early spawner die-offs in urbanizing watersheds of the Pacific Northwest, USA. Integrated Environmental Assessment and Management 7(4):648–656.

Spromberg, J.A., D.H. Baldwin, S.E. Damm, J.K. McIntyre, M. Huff, C.A. Sloan, B.F. Anulacion, J.W. Davis, and N.L. Scholz. 2016. Coho salmon spawner mortality in western US urban watersheds: Bioinfiltration prevents lethal storm water impacts. Journal of Applied Ecology 53(2):398–407.

SSPS (Shared Strategy for Puget Sound). 2007. Puget Sound salmon recovery plan. Adopted by National Marine Fisheries Service 19 Volume I (Plan) and Volume II (Local Watershed chapters). Available at: https://www.fisheries.noaa.gov/resource/document/recovery-plan-puget-sound-chinook-salmon.

Studebaker, R.S., K.N. Cox, and T.J. Mulligan. 2009. Recent and historical spatial distributions of juvenile rockfish species in rocky intertidal tide pools, with emphasis on black rockfish. Transactions of the American Fisheries Society 138(3):645-651.

Tian, Z., H. Zhao, K.T. Peter, M. Gonzalez, M., J. Wetzel, C. Wu, X. Hu, J. Prat, E. Mudrock, R. Hettinger, A.E. Cortina, R.G. Biswas, F.V.C. Kock, R. Soong, A. Jenne, B. Du, F. Hou, H. He, R. Lundeen, and E.P. Kolodziej. 2021. A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon. Science 371(6525):185–189.

Tian, Z., M. Gonzalez, C.A. Rideout, H.H. Zhao, X. Hu, J. Wetzel, E. Mudrock, C.A. James, J.K. McIntyre, and E.P. Kolodziej. 2022. 6PPD-Quinone: Revised toxicity assessment and quantification with a commercial standard. Environmental Science & Technology Letters 9(2):140-146.

Tierney, K. B., Farrell, A. P., & Brauner, C. J. 2014. Organic chemical toxicology of fishes. Fish physiology, 33. Academic Press.

USEPA (U.S. Environmental Protection Agency). 2025. Priority Pollutants List. Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-N/part-423#Appendix-A-to-Part-423. Accessed June 3, 2025.

USFWS. 2004. Draft recovery plan for the Coastal-Puget Sound distinct population segment of bull trout *(Salvelinus confluentus)*. USFWS, Region 1, Portland, Oregon.

USFWS. 2015. Recovery plan for the coterminous United States population of bull trout (*Salvelinus confluentus*). USFWS, Portland, Oregon.

USFWS. 2024. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Suckley's Cuckoo Bumble Bee. Federal Register 89(102074): 102074–102088.

USFWS. 2025. Information for Planning and Consultation (IPaC). USFWS, Olympia, Washington. Available at: http://www.fws.gov/wafwo/species_new.html (accessed on April 28, 2025).

USFWS and NMFS. 1998. Endangered species consultation handbook: Procedures for conducting consultation and conference activities under Section 7 of the Endangered Species Act. March. https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf.

Van Brummelen, T., B van Huttum, T. Crommentuijn, and D. Kalf. 1998. Bioavailability and Ecotoxicity of PAH. Pp. 203-263. In Neilson, A., editor. PAH and related compounds-Biology (Volume 3-J, The handbook of environmental chemistry). Springer-Verlag. Berlin Heidenberg.

Varshney, S., A.H. Gora, P. Siriyappagouder, V. Kiron, and P.A. Olsvik. 2021. Toxicological Effects of 6PPD and 6PPD Quinone in Zebrafish Larvae. Journal of Hazardous Materials 424:127623.

Wahl, T.R., B. Tweit, and S.G. Mlodinow, editors. 2005. Birds of Washington: Status and distribution. Oregon State University Press, Corvallis, Oregon.

WDFW. 2024a. Species and Habitats: Species in Washington: Northwestern pond turtle. Available at: http://wdfw.wa.gov/species-habitats/species/actinemys-marmorata. Accessed: April 10, 2024.

WDFW. 2024b. Monarch butterfly. Available at: https://wdfw.wa.gov/species-habitats/species/danaus-plexippus. Accessed May 24, 2024.

WDFW. 2025. SalmonScape [online database]. Washington Department of Fish and Wildlife, Olympia, Washington. Available at: https://apps.wdfw.wa.gov/salmonscape/ accessed on: May 5, 2025.

Weitkamp, L.A. 2010. Marine Distributions of Chinook Salmon from the West Coast of North America Determined by Coded Wire Tag Recoveries. Transactions of the American Fisheries Society, 139: 147-170. https://doi.org/10.1577/T08-225.1

West, J.E., O'Neill, S.M., and Ylitalo, G.M. 2008. Spatial extent, magnitude, and patterns of persistent organochlorine pollutants in Pacific herring (*Clupea pallasi*) populations in the Puget Sound (USA) and Strait of Georgia (Canada). Science of the Total Environment 394(2-3):369-378.

West, J., J. Lanksbury, S. O'Neill, and A. Marshall. 2011. Persistent Bioaccumulative and Toxic Contaminants in Pelagic Marine Fish Species from Puget Sound. Prepared by the Washington Department of Fish and Wildlife for the Washington Department of Ecology. Publication number 11-10-003. Olympia, WA.

West Coast Salmon Biological Review Team. 2003. Draft report: Preliminary conclusions regarding the updated status of listed ESUs of west coast salmon and steelhead. Northwest Fisheries Science Center, Seattle, Washington.

Whale Museum. 2023. Whale Hotline data for orca and humpback sightings. Provided 2023.

Wiles, G.J. 2016. Periodic status review for the killer whale. WDFW, Olympia, Washington. Available at: https://wdfw.wa.gov/sites/default/files/publications/01773/wdfw01773.pdf

Wiles, G.J., and K.S. Kalasz. 2017. Status report for the yellow-billed cuckoo, State of Washington. WDFW, Olympia, Washington.

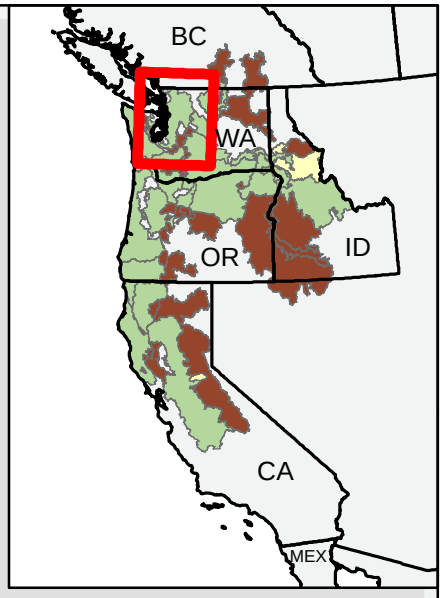
WSDOT. 2023. BA Preparation Manual. Available at: https://wsdot.wa.gov/engineering-standards/environmental-guidance/endangered-species-act-essential-fish-habitat. Updated June 2023. Accessed April 9, 2024.

Xerces Society. 2025. Pacific Northwest Bumble Bee Atlas. Available at: https://www.bumblebeeatlas.org/pages/pnw. Accessed April 29, 2025.

Appendix A
Species Lists

Evolutionarily Significant Unit

Current as of January 2015



Bellingham
Nooksack River
North Fork Nooksack River
Skagit River
North Fork Stillaguamish River
South Fork Stillaguamish River
Port Angeles
Glines Canyon Dam
Dungeness River
Elwha River
Everett
Sultan River
Snohomish R.
Skykomish River
North Fork Skykomish River
Dosewallips River
Seattle
Cushman Dam
SF Skokomish R.
North Bend
Green River
Howard Hanson Dam
Tacoma
Puyallup River
Olympia
Nisqually River
La Grande Dam

County Boundary

Class

ESU Boundary

Historical Watershed: Anthropogenically Blocked

N

0 22.5

Kilometers

0 22.5

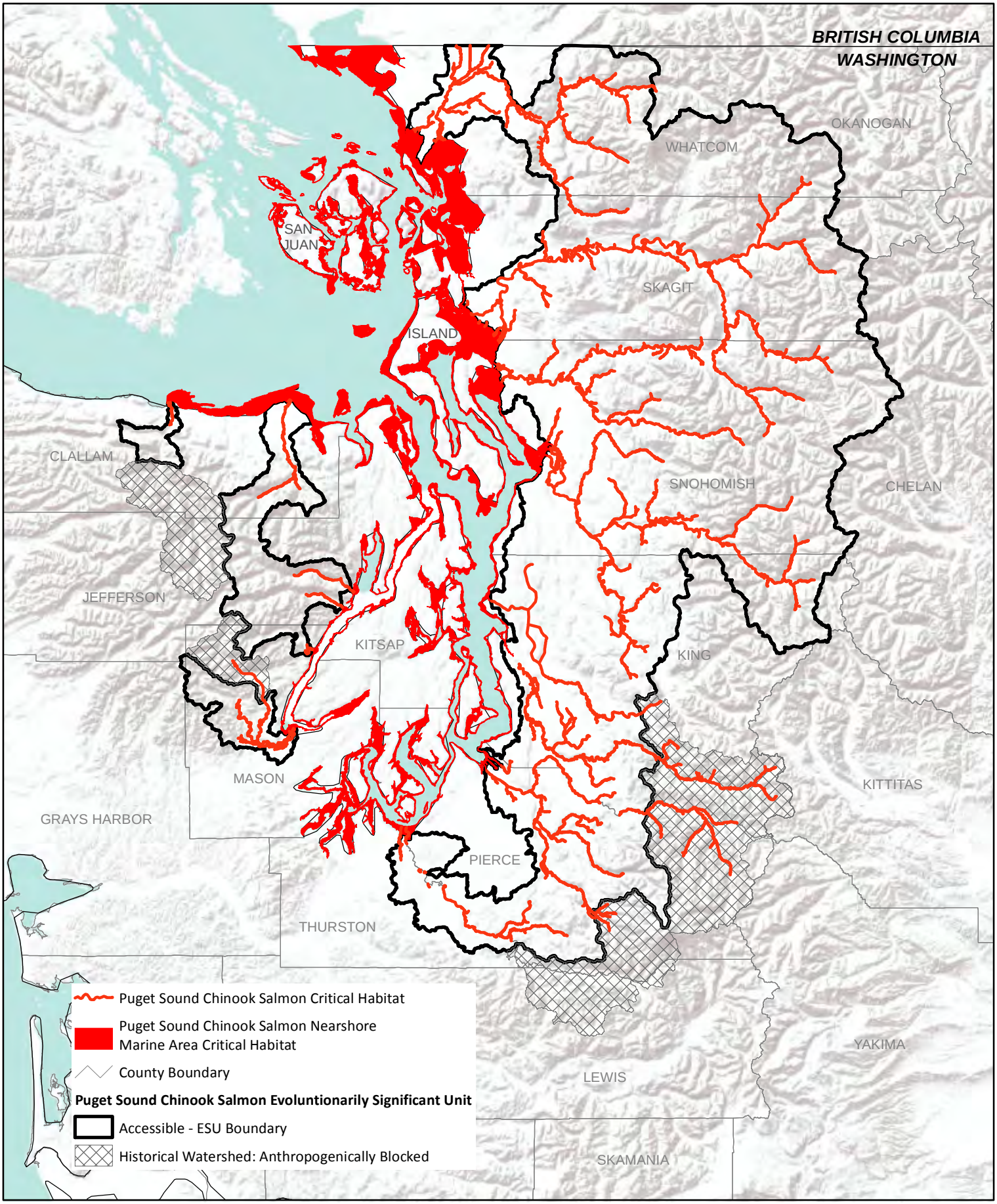
Miles

Map is for general reference only

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmoshperic Administration
NATIONAL MARINE FISHERIES SERVICE
PROTECTED RESOURCES DIVISION
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232

NOAA FISHERIES

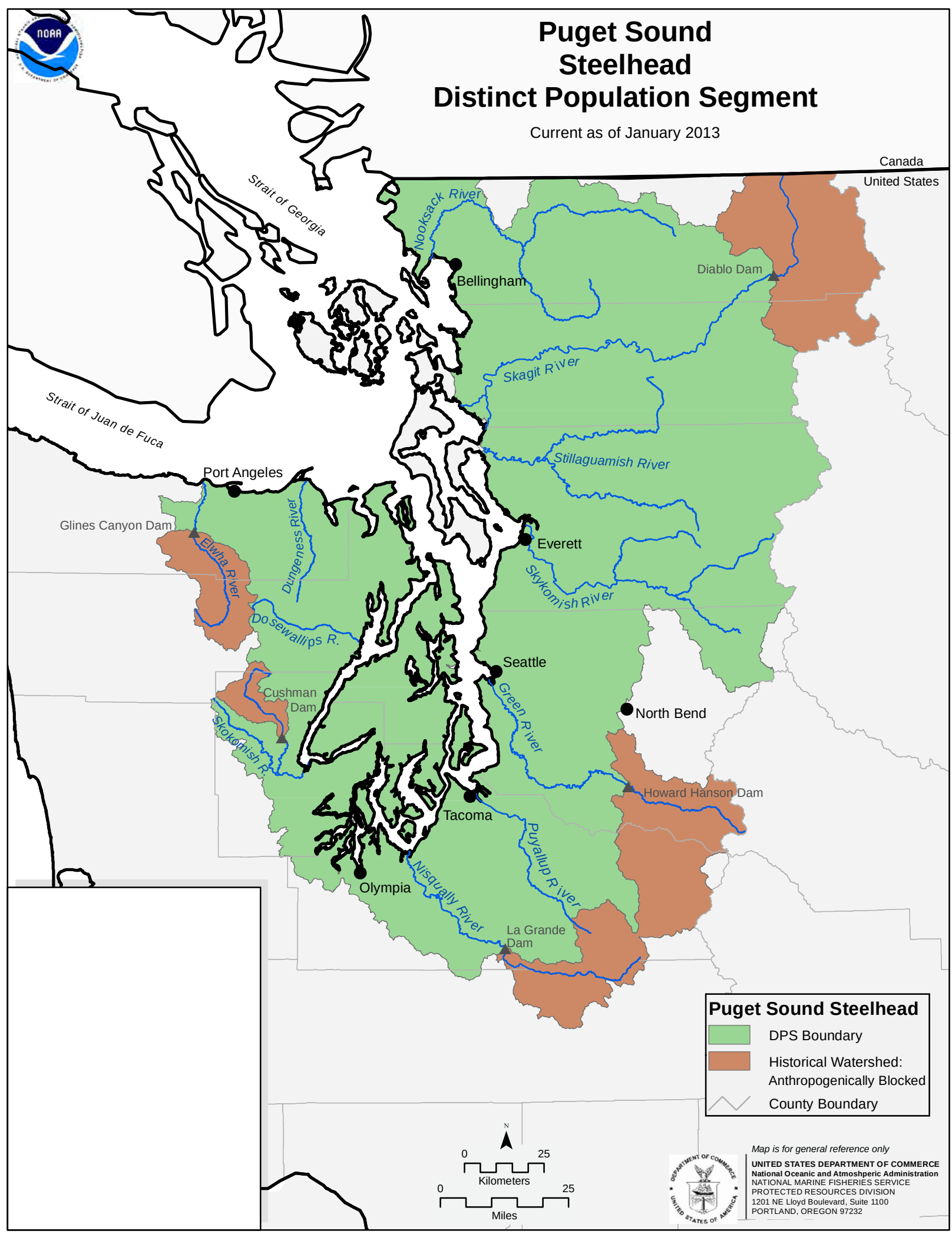
Critical Habitat
Puget Sound Chinook Salmon



0 50 Miles

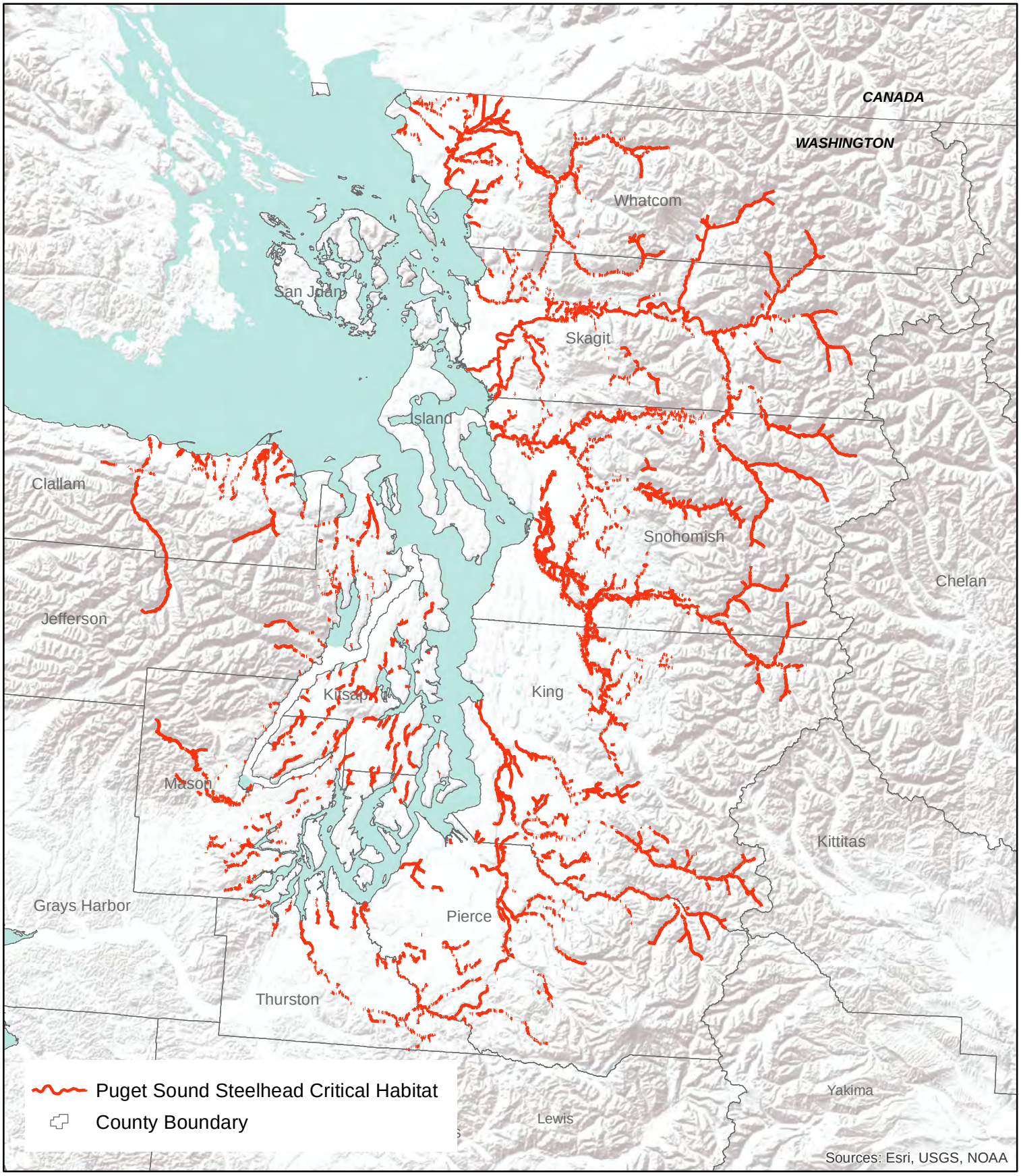
See Federal Register Notice for detailed description of critical habitat (70 FR 52630)

DOC-NOAA Fisheries-West Coast Region


Puget Sound
Steelhead
Distinct Population Segment
Current as of January 2013
Canada
United States
Strait of Georgia
Strait of Juan de Fuca
Nooksack River
Bellingham
Diablo Dam
Skagit River
Stillaguamish River
Port Angeles
Glines Canyon Dam
Elwha River
Dungeness River
Everett
Skykomish River
Dosewallips R.
Seattle
Cushman Dam
Skokomish R.
Green River
North Bend
Howard Hanson Dam
Tacoma
Puyallup River
Olympia
Nisqually River
La Grande Dam
Puget Sound Steelhead
DPS Boundary
Historical Watershed: Anthropogenically Blocked
County Boundary
N
0
25
Kilometers
0
25
Miles
Map is for general reference only
UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmoshperic Administration
NATIONAL MARINE FISHERIES SERVICE
PROTECTED RESOURCES DIVISION
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232

NOAA FISHERIES

Final Critical Habitat
Puget Sound Steelhead



N

0 3.5 7 14 Miles

See Federal Register notice for detailed description of critical habitat (81 FR 9252, February 24, 2016)
DOC-NOAA Fisheries-West Coast Region

Puget Sound Steelhead DPS

April 24, 2025

Summer Steelhead DPS

Threatened, Accessible

1:577,791

0 3.25 6.5 13 mi

0 5 10 20 km

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

West Coast Regional Office

Query Results

Degrees, Minutes, Seconds: Latitude = 47º 28' 53" N, Longitude = 123º 13' 50" W
Decimal Degrees: Latitude = 47.481, Longitude = -122.769

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

EFH

No additional Essential Fish Habitats (EFH) were identified at the report location.

Pacific Salmon EFH

Link	HUC Name	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
	Hood Canal	Chinook Salmon, Coho Salmon, Puget Sound Pink Salmon	All	Pacific	Pacific Coast Salmon Plan

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

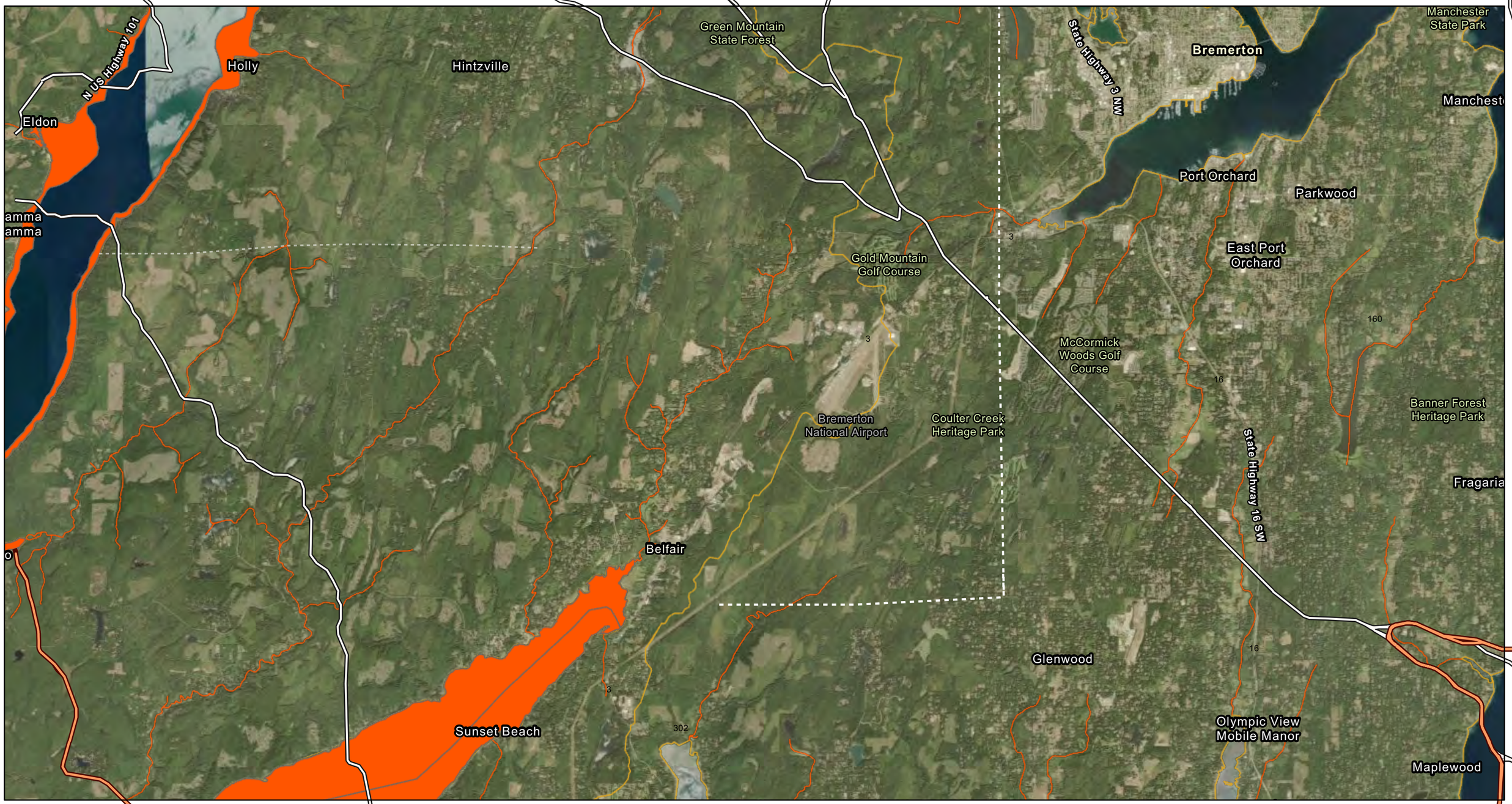
EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. **For links to all EFH text descriptions see the complete data inventory: open data inventory -->
Pacific Coastal Pelagic Species, Jack Mackerel, Pacific (Chub) Mackerel, Pacific Sardine, Northern Anchovy - Central Subpopulation, Northern Anchovy - Northern Subpopulation, **Pacific Highly Migratory Species**, Bigeye Thresher Shark - North Pacific,

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. **For links to all EFH text descriptions see the complete data inventory: open data inventory -->
Bluefin Tuna - Pacific, Dolphinfish (Dorado or Mahimahi) - Pacific, Pelagic Thresher Shark - North Pacific, Swordfish - North Pacific

NMFS West Coast Region, Species and Habitat App - Map Export



4/23/2025, 5:07:04 PM

1:144,448

0 1.25 2.5 5 mi

0 2 4 8 km

Steelhead [Puget Sound DPS] 20160224

Salmon, chum [Hood Canal summer-run ESU] 20050902 poly

Salmon, chum [Hood Canal summer-run ESU] 20050902 line

Salmon, Chinook [Puget Sound ESU] 20050902 line

EFH - Salmon

Species and Habitat App
NOAA, National Marine Fisheries Service (NMFS), West Coast Region (WCR)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405

In Reply Refer To: 04/23/2025 17:30:55 UTC
Project Code: 2025-0087278
Project Name: Biological Assessment at Bremerton National Airport

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

PROJECT SUMMARY

Project Code: 2025-0087278
Project Name: Biological Assessment at Bremerton National Airport
Project Type: Airport - Maintenance/Modification
Project Description: BA At Bremerton National Airport
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@47.49045305,-122.76469205913037,14z

Counties: Kitsap County, Washington

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

BIRDS

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

REPTILES

NAME	STATUS
Northwestern Pond Turtle *Actinemys marmorata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1111	Proposed Threatened

FISHES

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., coterminous, lower 48 states There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened
Dolly Varden *Salvelinus malma* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1008	Proposed Similarity of Appearance (Threatened)

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Suckley's Cuckoo Bumble Bee *Bombus suckleyi* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10885	Proposed Endangered

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Sam Merrick
Address: 146 N Canal Street
City: Seattle
State: WA
Zip: 98103
Email sam.merrick@confenv.com
Phone: 2067556064

You have indicated that your project falls under or receives funding through the following special project authorities:

- DOI WILDFIRE (BIL 40803)

Appendix B
Life Histories

TABLE OF CONTENTS

The information provided in this appendix is meant to accompany and complement the more detailed environmental baseline and effect analysis information provided in the main body of the Bremerton National Airport Environmental Assessment Projects Biological Assessment (BA). The following sections discuss the Endangered Species Act (ESA) listing status, critical habitat status, and general life history information for each ESA species addressed in the BA for the Proposed Action.

1.0 PUGET SOUND CHINOOK SALMON

The Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU) was listed as threatened under the ESA on March 24, 1999 (64 Federal Register [FR] 14308), and its threatened status was reaffirmed on June 28, 2005 (70 FR 37160). The 2016 5-year review of Puget Sound Chinook salmon concluded that this species should remain listed as threatened (80 FR 6695, NMFS 2017a).

Critical habitat for Puget Sound Chinook salmon was designated on September 2, 2005 (70 FR 52629). It includes 1,683 miles of stream/riverine habitat, 41 square miles of lake habitat, and 2,182 miles of nearshore habitat within Washington and the Puget Sound.

1.1 Life History and Population Trajectory

Like most other salmonids, Chinook salmon exhibit an anadromous (meaning they migrate from saltwater to freshwater to spawn) and semelparous (meaning they die after their first reproductive event) life history, thereby occurring in both freshwater river systems as well as the brackish and saltwater waterways of the Puget Sound and Pacific Ocean (USEPA 2021). A Chinook salmon hatches in fresh water, rears in fresh and/or salt water, matures in the ocean, and returns to its natal freshwater streams to breed. Chinook salmon can be separated into 2 distinct life history strategies: ocean-type and stream-type fish. Ocean-type Chinook salmon spend a limited amount of time (i.e., weeks or months) rearing in fresh water before migrating to the ocean, while stream-type fish spend approximately 1-year rearing in fresh water (COSEWIC 2019). Upon entering estuaries, stream-type Chinook salmon are much larger than ocean-type Chinook salmon (COSEWIC 2019). Adult Chinook salmon weigh 40 pounds on average, although as the largest of the west-coast salmon, they may grow up to 120 pounds (NMFS 2024a). Chinook salmon are a cold-water species that rely on clean waters no warmer than 25°C (COSEWIC 2019).

The Chinook salmon population in the Salish Sea (i.e., the larger Puget Sound region including the Strait of Georgia has declined "60% since the Pacific Salmon Commission began tracking salmon abundance in 1984" (EPA 2021). This drastic decline has been due to multiple anthropogenic factors, including reduced habitat quality and accessibility, over-harvesting, and reduced water quality. Recent stock assessments show that most Puget Sound Chinook salmon stocks remain well below population recovery thresholds (NMFS 2006; Pacific Salmon

Commission 2022; Puget Sound Indian Tribes and WDFW 2022; Puget Sound Partnership 2023). There is little indication that Puget Sound Chinook salmon will recover in the near future, although most populations have not significantly decreased over the last few years (Puget Sound Partnership 2023).

1.2 Regional and Local Abundance

The Puget Sound ESU for Chinook salmon includes all naturally occurring Chinook salmon originating in rivers that flow into the Puget Sound. Currently 22 independent populations of naturally occurring Chinook salmon exist within the ESU (NMFS 2017a; Puget Sound Partnership 2023). In addition to these 22 populations, 26 artificial propagation hatchery programs across the Puget Sound augment Chinook salmon escapement numbers by artificially increasing egg survivorship and the number of juveniles hatched (NMFS 2017a).

The population of Salish Sea Chinook salmon was estimated to be over 473,000 in 2018 (USEPA 2021). Estimates of total Chinook salmon abundance across the Puget Sound are not conducted by the Pacific Salmon Commission due in part to the lack of long-term tag data for naturally occurring stocks (Pacific Salmon Commission 2018). However, escapement trends for various indicator stocks of Chinook salmon in the Puget Sound are available. Escapement indicator stocks for the Puget Sound include the Nooksack, Skagit, Stillaguamish, Snohomish, Lake Washington, and Green River stocks (Pacific Salmon Commission 2022). In the years from 1975 to 2021, the collective Puget Sound Chinook salmon indicator stock escapement for summer and fall stocks ranged from a low of approximately 10,300 individuals in 2011 to a high of 45,000 in 2004. The combined escapement was approximately 30,000 in 2021 (Pacific Salmon Commission 2022). Spawning abundance estimates for most populations have therefore not experienced significant change between 1999 and 2021 (Puget Sound Partnership 2023).

1.3 Sensitivity to Environmental Stressors

Chinook salmon are sensitive to many environmental stressors and threats. These include exclusion from upstream habitat and spawning grounds by impassible barriers (i.e., culverts, dams, etc.), and habitat degradation due to human development, including increased sedimentation, water temperatures, and decreased water qualities (NMFS 2024a). The diverse environmental stressors that impact Chinook salmon can be summarized in 4 main factors (USEPA 2021):

- Habitat loss and degradation: Chinook salmon require a vast area of diverse habitat over the span of their lives. Additionally, these habitats must meet specific requirements for Chinook salmon survival and reproduction, including high water quality, low water temperatures, overhanging vegetation and in-stream wood, appropriately sized and clean spawning gravels, etc. With these many requirements, Chinook is especially sensitive to upland development and other human activities that disturb the nearshore,

estuarine, or riverine habitats, including agriculture, timber harvest, and coastal modification.

- Harvest Rates: Despite the protection under ESA for some ESU of Chinook salmon, almost 22 million Chinook have been harvested between 1975 and 2018. Harvest rates have decreased since the Puget Sound ESA-listing in 1999; however, harvest above sustainable limits outside of the Puget Sound may still occur.
- Hatchery Influence: Although hatcheries intend to bolster failing Chinook salmon stocks that are near extinction, they may also have negative impacts on the remaining wild stocks through increased competition, introduction of diseases, dilution of superior wild genetics, and impediment of wild stock migration.
- Water infrastructure that impedes migrations: Culverts, dams, and floodgates can all impact salmonid species by causing fish passage barriers, water quality impairments, loss of habitat, and hydrological changes.

Additionally, global climate change is impacting Chinook salmon stocks by further altering their habitat, increasing water temperatures, and decreasing water quality (USEPA 2021).

Impacts or effect mechanisms that Puget Sound Chinook salmon would be especially sensitive to include:

- Turbidity/suspended sediment
- Water temperature
- Physical disturbance of organisms
- Shading
- Dissolved oxygen and pH
- Water quality/contaminants
- Change in habitat type

Direct effects to lower levels of the food web or other parts of the ecosystem are not expected to indirectly affect Puget Sound Chinook salmon.

2.0 PUGET SOUND STEELHEAD

The Puget Sound steelhead (*Oncorhynchus mykiss*) Distinct Population Segment (DPS) was listed as threatened under the ESA on May 11, 2007 (72 FR 26722). This listing was subsequently updated and reaffirmed on April 14, 2014 (79 FR 20802). The DPS includes naturally spawned steelhead within the Puget Sound, along with steelhead from 6 hatchery programs.

Critical habitat was designated for Puget Sound steelhead on February 24, 2016 (81 FR 9251). It includes approximately 2,031 miles of freshwater and estuarine habitat in Puget Sound.

2.1 Life History and Population Trajectory

The Puget Sound steelhead ESU is primarily composed of winter-run fish, with a few stocks of summer-run steelhead.

The population of Puget Sound steelhead has generally been in decline for more than a hundred years. Historical catch data suggests return sizes of 409,000 to 930,000 adult steelhead each year in the Puget Sound towards the end of the 19th century (NMFS 2019). The current run size is less than 5% to 10% of these historic numbers (Puget Sound Partnership 2023).

2.2 Regional and Local Abundance

Puget Sound steelhead populations are found in all of the major river systems within the Puget Sound, including the Nooksack, Skagit, Stillaguamish, Skykomish, Green, Puyallup, and Nisqually Rivers (NMFS 2019). The Puget Sound DPS of steelhead also includes artificial propagation programs within Hood Canal. Thus, Puget Sound steelhead are well distributed throughout the Puget Sound. Due to the lack of regional abundance and distribution information, details are provided here at the scale of the entire Puget Sound.

Winter-run and ocean-maturing steelhead return as adults to Puget Sound tributaries from December to April (Hard et al. 2007). Spawning occurs from January to mid-June, with peak spawning occurring from mid-April through May. Most steelhead juveniles reside in fresh water for 2 years prior to migrating to marine habitats, with limited numbers migrating as 1- or 3-year-old smolts. Smoltification and seaward migration occur principally from April to mid-May (Hard et al. 2007). The inshore migration pattern of steelhead in Puget Sound is not well understood; it is generally thought that steelhead smolts move quickly offshore (Hard et al. 2007).

2.3 Sensitivity to Environmental Stressors

Environmental stressors like those presented for Chinook salmon are also applicable to steelhead. However, since juvenile steelhead spend more time in freshwater than other species (2-5 years), steelhead are more affected by habitat conditions within a given stream. Puget Sound summer-run steelhead also spend more time in freshwater than other salmon (including winter-run steelhead), as they "return to freshwater during early summer in an immature condition and do not spawn until the following spring" (WDFW 2011). Thus, degraded watershed habitats and processes have a greater cumulative impact on steelhead. Steelhead can also survive to spawn in multiple years, meaning they require adequate downstream passage as well as upstream passage. (WDFW 2011)

Impacts or effect mechanisms that Puget Sound steelhead would be especially sensitive to include the following:

- Turbidity/suspended sediment
- Water temperature
- Physical disturbance of organisms
- Shading
- Dissolved oxygen and pH
- Water quality/contaminants
- Change in habitat type
- Downstream passage at dams or other obstructions

Direct effects to lower levels of the food web or other parts of the ecosystem are not expected to indirectly affect Puget Sound steelhead.

3.0 COASTAL-PUGET SOUND BULL TROUT

The Coastal-Puget Sound DPS of bull trout (*Salvelinus confluentus*) was listed as threatened under the ESA on June 10, 1998 (64 FR 58910). This DPS includes individuals in Idaho, Montana, Nevada, Oregon, and Washington. Critical habitat was subsequently designated in 2005 (70 FR 56212). The most recent version of critical habitat for bull trout was designated on September 30, 2010 (75 FR 63898). It includes approximately 18,795 miles of streams and 488,252 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana, and Nevada, along with 754 miles of marine shoreline in Washington. Bull trout are federally managed by the U.S. Fish and Wildlife Service (USFWS). Dolly Varden (*S. malma*) are listed as threatened under the ESA due to their similarity to bull trout.

3.1 Life History and Population Trajectory

Bull trout exhibit 2 main life history strategies: resident and migratory. Resident fish spend their entire life within the stream or tributary in which they were born. Migratory fish spawn in tributary streams but then migrate to either a lake (adfluvial form), river (fluvial form), or marine ecosystem (anadromous) (USFWS 2015). The form that occurs within the Puget Sound is the anadromous form. The different life history forms may be found together, and one can produce offspring of another type. Bull trout typically reach sexual maturity at ages of 4-7 years and usually live to be about 10 years old (USFWS 2015).

Bull trout have very specific habitat requirements, often referred to as "the four Cs": Cold, Clean, Complex, and Connected habitat (Rieman and McIntyre 1993). Water temperatures typically need to be less than 54°F and habitat should include complex elements like deep pools, overhanging banks, and large woody debris. Suitable habitat must also be connected to spawning and rearing areas.

Spawning typically occurs between August and November, when water temperatures are decreasing. Bull trout often build redds in stream reaches near springs or other sources of cold

groundwater. Migratory bull trout can travel as far as 250 kilometers to reach spawning grounds (USFWS 2015).

Bull trout are opportunistic feeders, relying on a variety of terrestrial and aquatic insects, macro-zooplankton, and small fish. Their food habits primarily depend on their life stage and size. Within the Puget Sound, bull trout often feed on forage fish, like Pacific herring, Pacific sand lance, and surf smelt (USFWS 2015).

A status review of bull trout was completed in 2008, and it was determined that the listing of "threatened" was still warranted (USFWS 2008). Of the 121 core areas that were assessed, 75 had substantial threats to the success and survival of the population. Bull trout have been largely extirpated from about 60% of their historic range (USFWS 2015).

3.2 Regional and Local Abundance

The Chilliwack, Nooksack, lower and upper Skagit, Snohomish-Skykomish, Stillaguamish, upper Cedar, and Puyallup river basins all support populations of bull trout (USFWS 2020). Except for the Chilliwack and upper Cedar River basins, all these basins contain anadromous bull trout that also use the marine waters of the Puget Sound. Thus, bull trout are well distributed throughout the Puget Sound. Acoustic telemetry data on tagged bull trout between 2002 and 2008 showed significant migration distances within the Puget Sound (up to 95 km 1-way) and some use of non-spawning river systems (Goetz et al. 2012). During migrations, most fish stayed close to the shoreline, relying heavily on nearshore habitats.

Juvenile and sub-adult bull trout generally exit rivers and migrate downstream between mid-February to early September, with peak migration periods between April and July. When juvenile bull trout enter salt water, their time of residence is variable (1 day to more than 4 months). Upon entry into salt water, juveniles may rear in tidal delta marshes or tributary channels, or they may pass through into nearshore marine areas. Larger juveniles may migrate through the nearshore from the natal river to adjacent river basins (Goetz et al. 2012).

3.3 Sensitivity to Environmental Stressors

The recovery plan for bull trout published in 2015 laid out 5 main factors affecting the success and survival of the species[1] (USFWS 2015):

- Present or threatened destruction, modification, or curtailment of its habitat or range
- Overutilization for commercial, scientific, or educational purposes
- Disease or predation

[1] The recovery plan discusses the effects of these factors in more detail.

- Inadequacy of existing regulatory mechanisms
- Other natural or manmade factors affecting its continued existence

Habitat threats make up a large proportion of the overall factors threatening the population of bull trout within the Puget Sound. However, these threats primarily occur within the freshwater habitats used by bull trout for spawning and rearing. Overfishing and disease are generally minor threats to bull trout success, especially since the time of listing. Since listing, regulatory mechanisms to protect bull trout populations have improved and other factors are continuing to be assessed.

In the marine habitats of the Puget Sound, the main factors that could affect the success of bull trout populations include specific threats to nearshore resources. Nonetheless, major habitat concerns relate to fish barriers and changes to water quality in rivers and streams that preclude bull trout use (USFWS 2015).

Impacts or effect mechanisms that bull trout would be especially sensitive to include the following:

- Turbidity/suspended sediment
- Water temperature
- Physical disturbance of organisms
- Shading
- Dissolved oxygen and pH
- Water quality/contaminants
- Change in habitat type

Direct effects to lower levels of the food web or other parts of the ecosystem are not expected to indirectly affect bull trout.

4.0 SOUTHERN RESIDENT KILLER WHALE

The Southern Resident Killer Whale (SRKW) (*Orcinus orca*) DPS was listed as endangered under the ESA on November 18, 2005 (70 FR 69903), and its endangered status was reaffirmed on April 4, 2007 (72 FR 16284). The final rule designating critical habitat for SRKW took effect in December of 2006 and includes the North Puget Sound (NPS), South Puget Sound, San Juan Islands, and Strait of Juan de Fuca (71 FR 69054).

4.1 Life History and Population Trajectory

While both resident and transient forms of killer whales occur in Puget Sound, resident whales of the SRKW DPS have historically been the most commonly observed in Puget Sound (Wiles 2004). The SRKW DPS is known to occupy the North Puget Sound at variable times of the year. This group consists of 3 pods (J, K, and L) and is considered a distinct stock under the Marine Mammal Protection Act. Whales of the J pod are seen year-round in the inland waterways of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia (Wiles 2004; NMFS 2008). From late spring through midwinter, the K and L pods are also present in these waters.

Individuals from all 3 pods have also been seen, albeit infrequently, at all times of the year in coastal waters from central California north to Vancouver Island (Ford et al. 1996; NMFS 2008). Whales of the SRKW DPS tend to remain outside of relatively confined bays or shallow water areas as they move through the central Puget Sound area.

Killer whales are social animals that live and hunt in pods of up to 20 individuals. Members of the pod rely on sound to communicate, navigate, and forage. Killer whales make a variety of noises, included clicks and pulsed calls. Male killer whales live for an average of 30 years, but may reach 60-years-old. Female killer whales live for an average of 50 years, but may reach 90 years of age. Females reach sexual maturity between 10 and 13 years old. Gestation occurs for 15 to 18 months, and once the calf is born, it nurses for a year or longer. The birthrate for killer whales is estimated at every 5 years, although birthrate is not well documented (NMFS 2024b).

The SRKW population is genetically isolated and rarely interbreeds with other killer whale populations (Hoelzel et al. 1998; Barrett-Lennard 2000; Barrett-Lennard and Ellis 2001). Whales of the SRKW DPS also differ behaviorally from transient killer whales in that they rely almost exclusively on fish as a food source. Observations in northern Puget Sound indicate that salmon are preferred prey for killer whales, representing over 96 percent of the prey during the summer and fall (Ford and Ellis 2005). This study also indicated that Chinook salmon constitutes over 70 percent of the identified salmonids taken in the summer and fall, although extensive feeding on chum salmon was also observed in the fall. While salmon appear to be a preferred prey item, 22 other species of fish and 1 species of squid (*Gonatopsis borealis*) are known to be eaten (Ford et al. 1996, 1998). Species such as rockfish (*Sebastes spp.*), Pacific halibut (*Hippoglossus stenolepis*), a number of flatfish, lingcod (*Ophiodon elongatus*), and greenling (*Hexagrammos* spp.) are likely consumed regularly by SRKWs (Ford et al. 1998).

The historical population size for SRKW in the Pacific Northwest has been estimated at no less than 140 individuals (NMFS 2024b). However, populations declined in the 1960s due to a live-capture SRKW fishery for use in marine mammal parks, and only 71 individuals of this DPS remained in the wild in 1974 (NMFS 2024b). While SRKW populations increased thereafter and peaked in 1995 with 98 individuals, recent whale census in 2023 has documented only 75 individuals (Center for Whale Research 2023).

4.2 Regional and Local Abundance

The following sections outline the regional SRKW abundance at the scale of the entire Puget Sound, including the San Juan Islands and the Strait of Juan de Fuca, when appropriate. The local abundance is also included for North Puget Sound.

From late spring to fall, most whales of the SRKW DPS can be found in the waters around the San Juan Islands, including Haro Strait, Boundary Passage, and the northeastern portion of the Strait of Juan de Fuca (Ford et al. 1996; Krahn et al. 2004). During this period, whales are also

present in smaller numbers in Rosario Strait, the interior waters of the San Juan Islands, the southern portions of Georgia Strait and the Strait of Juan de Fuca, Admiralty Inlet, Puget Sound, and the outer coast. Individuals or groups from this population may also be seen at various locations in central Puget Sound each summer, typically for periods of a few days, but occasionally remaining in the area for more than a month. During early autumn, SRKW pods (especially the J pod) expand their movements into Puget Sound, likely to feed on returning adult chum and Chinook salmon (Osborne 1999). Considerably less is known about the wintertime movements of this stock. Whales from the J pod are commonly sighted in inshore waters in winter, while the K and L pods apparently spend more time offshore (Ford et al. 1996; Krahn et al. 2004).

As of July 1, 2023, the SRKW population totals 75 whales, including 25 in J Pod, 16 in K Pod, and 34 in L Pod (Center for Whale Research 2023).

5.0 ROCKFISH

Two species of rockfish are included here because of their listing under the ESA: bocaccio (*Sebastes paucispinis*) and yelloweye (*Sebastes ruberrimus*). Bocaccio were listed as endangered on April 28, 2010 and yelloweye were listed as threatened on the same date (75 FR 22276). This listing is specific to the Puget Sound/Georgia Basin DPS of each species. This includes all "yelloweye rockfish and bocaccio (listed rockfish) in the Puget Sound, the Strait of Georgia…and the Strait of Juan de Fuca east of Victoria Sill (approximately east of Port Angeles)" (NMFS 2017b).

Critical habitat was designated for these species in 2014 (79 FR 68041). It includes 590.4 square miles of nearshore habitat and 414.1 square miles of deepwater habitat within Puget Sound and the Salish Sea.

5.1 Life History and Population Trajectory

Rockfish are long-lived, iteroparous (have multiple reproductive cycles) species that bear live young, in contrast to most other bony fishes (Drake et al. 2010). Rockfish larvae typically spend several months in a pelagic state before settling to demersal habitat. The iteroparity of rockfish is believed to allow populations to persist through many years of poor production.

5.1.1 Puget Sound/Georgia Basin Bocaccio Rockfish

In northern and central Californian waters, bocaccio were found to mature typically around 3 years of age (Drake et al. 2010). Bocaccio females produce between 20,000 and 2,298,000 eggs annually (Love et al. 2002). Off the coasts of Washington and Oregon, larval release typically occurs between January and April (Drake et al. 2010). Most larvae remain in a pelagic state for about 3.5 months before settling into shallower habitats. Females typically grow more quickly

than males and can reach larger sizes, which a maximum of 91 cm and 6.8 kg (Love et al. 2002; MacCall 2003). The maximum age has been estimated at 54 years.

Bocaccio rely on shallower habitats as juveniles but move out to deeper waters as they age. They typically remain within home ranges for most of their adult lives (Drake et al. 2010).

Bocaccio prey base changes as they grow. Bocaccio larvae feed on larval krill, diatoms, and dinoflagellates. Juveniles are opportunistic feeders, relying on fish larvae, copepods, and krill. As adults, their prey base shifts to primarily other fish, including hake, sablefish, anchovies, lanternfishes, squid, and other rockfish (Love et al. 2002). Predators of smaller bocaccio include Chinook salmon, terns, and harbor seals (Love et al. 2002).

The population of Puget Sound/Georgia Basin bocaccio has generally been in decline, warranting a listing under the ESA. Between 1975 and 1979, bocaccio were reported as 4.63% of rockfish catch on average, while no bocaccio were observed between 1996 and 2007 out of 2,238 rockfish identified from recreational catches (Drake et al. 2010).

5.1.2 Puget Sound/Georgia Basin Yelloweye Rockfish

Yelloweye rockfish are commonly found associated with rocky, high-relief zones, both as juveniles and adults (Drake et al. 2010). Juveniles are typically found in shallower habitats than adults. Adults have been found to have a high affiliation with caves and crevices in deepwater habitats (Drake et al. 2010). Yelloweye inhabit a wide depth range throughout their lives, with depths recorded between 15 and 549m (Drake et al. 2010). The lifespan of yelloweye can reach up to 150 years (NMFS 2023). As with other rockfish, yelloweye are internally fertilized and store sperm for several months prior to fertilization. In the Puget Sound, fertilization is believed to occur in the winter to summer months and birth in the early spring to late summer (Washington et al. 1978). Female yelloweye can produce 1.2 million to 2.7 million eggs in a given reproductive season.

Yelloweye larvae typically remain in a pelagic state for about 2 months prior to settlement. As they grow, they move towards deeper habitats but generally associate with crevices and other rocky substrates. Throughout their lives, yelloweye are opportunistic feeders, with their prey resources depending on size and life stage. Adult yelloweye rockfish typically rely on sand lance, gadids, flatfishes, shrimp, crabs, and gastropods for prey (Love et al. 2002; Yamanaka et al. 2006).

The population of yelloweye rockfish in the Puget Sound/Georgia Basin has generally been in decline, warranting a listing under the ESA.

5.2 Regional and Local Abundance

The following sections describe specifics of the distribution and abundance of bocaccio and yelloweye rockfish throughout the Puget Sound and within the regions of interest identified in Section 1.

Bocaccio used to be relatively common along steep walls within the Puget Sound but have become more rare (Love et al. 2002). Yelloweye are also generally rare within the Puget Sound (Drake et al. 2010). Juvenile and larval yelloweye could potentially occur in the Union River estuary. Habitats within the Puget Sound (e.g., eelgrass, kelp, drift vegetation, and cobble fields) are more commonly used by juvenile rockfish following settlement (Puget Sound Institute 2011). As adults, when present in the Puget Sound, bocaccio and yelloweye rockfish are generally associated with deepwater habitats.

5.3 Sensitivity to Environmental Stressors

Rockfish are sensitive to a variety of environmental threats, including loss of habitat and overfishing. They are especially vulnerable to overfishing because most species do not start reproducing until 5-20 years of age, and very few young survive to adulthood (NMFS 2023). Habitat threats within the Puget Sound include loss of kelp forests and eelgrass beds. These habitats are especially important for juvenile rockfish.

Impacts or effect mechanisms that yelloweye rockfish and bocaccio would be especially sensitive to include:

- Turbidity/suspended sediment
- Water temperature
- Physical disturbance of organisms
- Shading
- Dissolved oxygen and pH
- Water Quality/contaminants
- Change in habitat type

Direct effects to lower levels of the food web or other parts of the ecosystem are not expected to indirectly affect yelloweye rockfish or bocaccio.

6.0 HOOD CANAL SUMMER-RUN CHUM SALMON

Hood Canal summer-run chum salmon (*Oncorhynchus keta*) are listed as a threatened species under the ESA. This ESU was listed as threatened on March 25, 1999 (64 FR 14508), and the listing was reaffirmed in subsequent status reviews by NMFS. A recovery plan was finalized by NMFS (2007), developed in coordination with local tribes, state agencies, and conservation organizations.

6.1 Life History and Population Trajectory

Chum salmon typically spawn in the lower reaches of rivers, with redds (gravel nests excavated by spawning females) usually dug in the mainstem or in side channels of rivers from just above the saltwater interface to 100 km from the sea. Juveniles out-migrate to seawater almost immediately after emerging from the gravel covered redds (Salo 1991).

6.2 Regional and Local Abundance

Hood Canal summer-run chum salmon are a distinct population that enter freshwater to spawn between August and mid-September, with specific timing varying by watershed (Cook-Tabor 1995). They primarily spawn in the lower reaches of rivers, from just above tidal influence to about 100 kilometers inland, often in shallow, low-gradient streams or side channels, and typically near the head of riffles rather than preferentially choosing areas of upwelling groundwater (Salo 1991; Johnson et al. 1997; Crawford 1997 in Johnson et al. 1997). Shortly after hatching, chum fry emerge—usually at night—and begin migrating downstream to estuarine habitats (Salo 1991).

Juvenile chum salmon rely heavily on estuarine environments, feeding in shallow sublittoral zones before moving into neritic habitats as they grow and as prey availability changes (Simenstad et al. 1982; Johnson et al. 1997). Their early life history includes a brief freshwater phase and extended estuarine residence, which they share with ocean-type Chinook salmon (Healey 1982). Migration within estuaries and eventual ocean entry are influenced by multiple environmental and physiological cues, including stream temperature, discharge, day length, and prey availability (Salo 1991; Johnson et al. 1997).

As they grow, juvenile chum move offshore into the Gulf of Alaska, where they remain until maturity (Salo 1991; Hartt 1980). Chum salmon typically mature at 3 to 5 years of age, with most returning to spawn at 4 years, and older age classes more common in northern populations (NMFS 1998). The Union River is designated as part of the core spawning area for Hood Canal summer-run chum salmon (NMFS 2007). Juveniles rely heavily on estuaries like the Union River estuary and adjacent Theler Wetlands for foraging and transitional habitat before dispersing into Hood Canal.

6.3 Sensitivity to Environmental Stressors

Hood Canal summer-run chum salmon are sensitive to many environmental stressors and threats. These include exclusion from upstream habitat and spawning grounds by impassible barriers (i.e., culverts, dams, etc.), and habitat degradation due to human development, including increased sedimentation, water temperatures, and decreased water qualities (NMFS 2024c).

Impacts or effect mechanisms that Hood Canal Summer-Run Chum Salmon would be especially sensitive to include the following:

- Turbidity/suspended sediment
- Water temperature
- Physical disturbance of organisms
- Shading
- Dissolved oxygen and pH
- Water quality/contaminants
- Change in habitat type
- Downstream passage at dams or other obstructions

7.0 REFERENCES

Barrett-Lennard, L. G. 2000. Population structure and mating patterns of killer whales (Orcinus orca) as revealed by DNA analysis. Ph.D. Thesis, University of British Columbia, Vancouver, BC.

Barrett-Lennard, L. G., and G. M. Ellis. 2001. Population structure and genetic variability in northeastern Pacific killer whales: towards an assessment of population viability. Canadian Science Advisory Secretariat, Fisheries and Oceans Canada, Research Document 2001/065, Ottawa, Ontario, Canada.

Center for Whale Research. 2023. Population, southern resident killer whale [online resource]. https://www.whaleresearch.com/orca-population.

Cook Tabor, C. K. 1995. Summer chum salmon in Hood Canal. U.S. Fish and Wildlife Service, Western Washington Office, Division of Aquatic Resources, Lacey, WA 98503.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2019. Chinook Salmon (Oncorhynchus tshawytscha): COSEWIC assessment and status report 2018. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/chinook-salmon-2018/page-1.html.

Crawford, B.A. 1997. Letter to M. Schiewe, dated April 25, 1997: Response to partial draft of NMFS review of the status of chum salmon, 62 p. + attachments. Avail. Environmental and Technical Services Div., Natl. Mar. Fish. Serv., 525 NE Oregon St., Suite 500, Portland, OR.

Drake, J. S., E. A. Berntson, J. M. Cope, R. G. Gustafson, E. E. Holmes, P. S. Levin, N. Tolimieri, R. S. Waples, S. M. Sogard, and G. D. Williams. 2010. Status review of five rockfish species in Puget Sound, Washington. Page 234. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-108.

Ford, J. K. B., and G. M. Ellis. 2005. Prey Selection and Food Sharing by Fish-Eating □Resident□ Killer Whales (Orcinus orca) in British Columbia. Canadian Science Advisory Secretariat, Fisheries and Oceans Canada, Research Document 2005/041.

Ford, J. K. B., G. M. Ellis, and K. C. Balcomb. 1996. Killer Whales: The Natural History and Genealogy of Orcinus Orca in British Columbia and Washington. UBC Press.

Ford, J. K., G. M. Ellis, L. G. Barrett-Lennard, A. B. Morton, R. S. Palm, and K. C. Balcomb III. 1998. Dietary specialization in two sympatric populations of killer whales (Orcinus orca) in coastal British Columbia and adjacent waters. Canadian Journal of Zoology 76(8):1456□1471.

Goetz, F., E. Connor, E. Jeanes, and M. Hayes. 2012. Migratory Patterns and Habitat Use of Bull Trout in the Puget Sound.

Hard, J. J., J. M. Myers, M. J. Ford, R. G. Cope, G. R. Pess, R. S. Waples, G. A. Winans, B. A. Berejikian, F. W. Waknitz, P. B. Adams, P. A. Bisson, D. E. Campton, and R. R. Reisenbichler. 2007. Status review of Puget Sound steelhead (Onchorhynchus mykiss). NOAA Technical Memorandum:117.

Hartt, A.C. 1980. Juvenile salmonid in the oceanic ecosystem - the critical first summer. *In W.* J. Mc Neil and D.C. Himsworth (eds.) Salmonid ecosystems of the North Pacific. Oregon State University Press, Corvallis, OR.

Healey, M.C. 1982. Juvenile Pacific salmon in estuaries: the life support system. Pp. 315-341 *In* V.S. Kennedy, editor. Estuarine Comparisons. Academic Press, New York.

Hoelzel, A. R., M. Dahlheim, and S. J. Stern. 1998. Low genetic variation among killer whales (Orcinus orca) in the eastern North Pacific and genetic differentiation between foraging specialists. Journal of Heredity 89(2):121-128.

Johnson, O. W., W. S. Grant, R. G. Cope, K. Neely, F. W. Waknitz, and R. S. Waples. 1997. Status review of chum salmon from Washington, Oregon, and California. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-32.

Krahn, M.M., M.J. Ford, W.F. Perrin, P.R. Wade, R.P. Angliss, M.B. Hanson, B.L. Taylor, G.M. Ylitalo, M.E. Dahlheim, J.E. Stein, and R.S. Waples. 2004. 2004 Status review of southern resident killer whales (*Orcinus orca*) under the Endangered Species Act. NOAA Technical Memorandum NMFS-NWFSC-62. NMFS, Northwest Fisheries Science Center, Seattle, Washington.

Love, M. S., M. Yoklavich, and L. K. Thorsteinson. 2002. The Rockfishes of the Northeast Pacific. University of California Press.

MacCall, A. D. 2003. Status of bocaccio off California in 2003. Pacific Fishery Management Council, Portland, Oregon.

NMFS (National Marine Fisheries Service). 1998. Endangered and Threatened Species: Proposed threatened status and designated critical habitat for Hood Canal summer-run chum salmon and Columbia River chum salmon; Proposed rule.

NMFS. 2006. Final supplement to the shared strategy's Puget Sound salmon recovery plan. National Marine Fisheries Service, Northwest Region, Seattle, Washington.

NMFS. 2007. Puget Sound salmon recovery plan. NMFS, Northwest Region, Seattle, Washington.

NMFS. 2008. Recovery Plan for Southern Resident Killer Whales (Orcinus orca). National Marine Fisheries Service, Northwest Region, Seattle, Washington.

NMFS. 2017a. 5-year Review: Summary & Evaluation of Puget Sound Chinook Salmon, Hood Canal Summer-run Chum Salmon, and Puget Sound Steelhead. National Marine Fisheries Service, West Coast Region, Portland, OR.

NMFS. 2017b. Rockfish recovery plan: Puget Sound/Georgia Basin yelloweye rockfish (Sebastes ruberrimus) and bocaccio (Sebastes paucispinis). National Marine Fisheries Service, Seattle, Washington.

NMFS. 2019. ESA Recovery Plan for the Puget Sound Steelhead Distinct Population Segment. Page 174. National Marine Fisheries Service, Seattle, WA.

NMFS. 2023. Yelloweye rockfish [online resource]. NMFS, Silver Spring, Maryland. Available at: https://www.fisheries.noaa.gov/species/yelloweye-rockfish.

NMFS. 2024a. Chinook salmon (protected) [online resource]. NMFS, Silver Spring, Maryland. Available at: https://www.fisheries.noaa.gov/species/chinook-salmon-protected.

NMFS. 2024b. Killer whale. NMFS, Silver Spring, Maryland. Available at: https://www.fisheries.noaa.gov/species/killer-whale#overview

NMFS. 2024c. Chum salmon (protected) [online resource]. NMFS, Silver Spring, Maryland. Available at: https://www.fisheries.noaa.gov/species/chum-salmon-protected

Osborne, R. 1999. A historical ecology of Salish Sea 'resident' killer whales (Orcinus orca): with implications for management. PhD Thesis, University of Victoria, Victoria, BC.

Pacific Salmon Commission. 2018. Pacific Salmon Commission Joint Chinook Technical Committee Report, Annual Report of Catch and Escapement for 2017. Page 235. TCChinook (18)-02.

Pacific Salmon Commission. 2022. Pacific Salmon Commission Joint Chinook Technical Committee Report, Annual Report of Catch and Escapement for 2022. Page 132. TCCHINOOK (23)-02.

Puget Sound Indian Tribes, and WDFW. 2022. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component.

Puget Sound Partnership. 2023a. Puget Sound vital signs [online resource]. Puget Sound Partnership, Olympia, Washington. Available at: https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/Detail/4.

Puget Sound Institute. 2011. The Puget Sound Science Review: Rockfish. https://www.eopugetsound.org/science-review/7-rockfish.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S. Forest Service, Intermountain Research Station, General Technical Report INT-302, Boise, Idaho.

Salo, E. 1991. "Life history of chum salmon (Oncorhynchus keta)." Pages 231-310 in C. Groot and L. Margolis, (eds.). Pacific salmon life histories, Vancouver, University of British Columbia Press.

Simenstad, C.A., K. L. Fresh, and E. 0. Salo. 1982. The role of Puget Sound and Washington coastal estuaries in the life history of Pacific salmon; an unappreciated function. *In* V.S. Kennedy, editor. Estuarine Comparisons. Academic Press. New York.

USEPA (U.S. Environmental Protection Agency). 2021. Salish Sea, Chinook Salmon. Reports and Assessments. https://www.epa.gov/salish-sea/chinook-salmon.

USFWS (U.S. Fish and Wildlife Service). 2008. Bull trout (*Salvelinus confluentus*) 5-year review: Summary and evaluation. U.S. Fish and Wildlife Service, Portland, OR.

USFWS. 2015. Recovery Plan for the Coterminous United States Population of Bull Trout (Salvelinus confluentus). Page xii + 179 pages. U.S. Fish and Wildlife Service, Portland, OR.

USFWS. 2020. Bull Trout Draft Recovery Plan and proposed Critical Habitat: Puget Sound Recovery Unit.

Washington, P. M., R. Gowan, and D. H. Ito. 1978. A biological report on eight species of rockfish (Sebastes spp.) from Puget Sound, Washington. National Marine Fisheries Service, Northwest and Alaska Fisheries Center Processed Report, Seattle, Washington.

WDFW (Washington Department of Fish and Wildlife). 2011. Puget Sound Steelhead Foundations: A Primer for Recovery Planning. Pages 8-13, 91-92. Washington Department of Fish and Wildlife, Olympia, WA.

Wiles, G.J. 2004. Washington State status report for the killer whale. WDFW, Olympia, Washington.

Yamanaka, K. L., L. C. Lacko, R. Withler, C. Grandin, J. K. Lochead, J. C. Martin, N. Olsen, and S. S. Wallace. 2006. A review of yelloweye rockfish Sebastes ruberrimus along the Pacific coast of Canada: Biology, distribution, and abundance trends. Canadian Science Advisory Secretariat, Research Document 2006/076, Ottawa, Ontario, Canada.

CONFLUENCE
ENVIRONMENTAL COMPANY